Northeast Fisheries Science Center Reference Document 07-15

Characterization of the Northeast and Mid-Atlantic Bottom and Mid-water Trawl Fisheries Based on Vessel Trip Report (VTR) Data

by Christopher D. Orphanides and Gisele M. Magnusson

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List of Acronyms

ASMFC	=	Atlantic States Marine Fisheries Council
ATGTRT	=	Atlantic Trawl Gear Take Reduction Team
CA	=	closed area
CFDBS	=	Commercial Fisheries Dealer Database
CV	=	coefficient of variation
DAS	=	days at sea
EFH	=	essential fish habitat
FMA	=	fishery management area
FMP	=	fishery management plan
GB	=	Georges Bank
GOM	=	Gulf of Maine
GRT	=	gross registered tons
MA	=	Mid-Atlantic
MAFMC	=	Mid-Atlantic Fishery Management Council
NEFMC	=	New England Fishery Management Council
NERO	=	Northeast Regional Office
NMFS	=	National Marine Fisheries Service
NOAA	=	National Oceanic and Atmospheric Administration
NSNE	=	North Southern New England
OTF	=	otter trawl fish
OTM	=	otter trawl mid-water
OTO	=	otter trawl other
PTM	=	paired mid-water trawl
RMA	=	regulated mesh area
SNE	=	Southern New England
SSNE	=	South Southern New England
TAC	=	total allowable catch
TRP	=	take reduction plan
VHP	=	vessel horsepower
VTR	=	vessel trip report

Abstract

An overview of the United States Northeast and Mid-Atlantic trawl fisheries was created to support the development of a Take Reduction Plan (TRP) by the Atlantic Trawl Gear Take Reduction Team (ATGTRT). The analysis focused on aspects of the fisheries that correlated with marine mammal bycatch and characterized the trawl fisheries from Maine to North Carolina for the period 1996 to 2004 by temporal and spatial effort distributions, harvest patterns, vessel characteristics, gear configurations, and environmental relationships. The primary data used were vessel trip reports (VTRs); additional data sources included remotely sensed data for environmental variables, federal commercial dealer records, and vessel permit data.

The number of vessels in the bottom trawl fishery declined by 28% between 1996 and 2004. Over the same period total trips declined by 15%, days absent declined by 26%, and days fished declined by 40%. Total landings varied from a low of 92,159 metric tons (live) in 2002 to a high of 116,911 metric tons in 2004. Based on a 9-year average of landings, the top 5 species were *Loligo* squid, silver hake, *Illex* squid, skates, and monkfish. Inflation adjusted value declined for the fishery, reaching a low in 2003 but increasing in 2004. Based on a 9-year average of adjusted values, the top 5 species were *Loligo* squid, fluke, monkfish, cod, and winter flounder. Over all years, the majority of bottom trawl effort occurred north and east of the Hudson Canyon, although some significant effort occurred along the shelf break south of Hudson Canyon. Effort shifted to the south during the winter. Southern regions tended to use nets with a smaller mesh than northern areas, while gear size, measured as foot rope length, was closely linked to vessel size.

The number of vessels in the mid-water trawl fishery declined by 18% between 1996 and 2004. Effort measured in trips declined by 1%, days absent declined by 5% and days fished declined by 38%. There were clear differences in data on the fishery after the implementation of the Atlantic Herring Fishery Management Plan in 2001. The 9-year average landings were composed of 80% herring and 18% mackerel, while herring accounted for 65% and mackerel 27% of the average inflation adjusted value. Total landings grew steadily and peaked in 2004; the inflation adjusted value doubled over the 9 years. The mackerel and herring fisheries had a small overlap in effort south of Rhode Island. Herring was harvested year round, with effort focused in the Gulf of Maine (GOM), the northern edge of Georges Bank (GB), and south of Rhode Island. Mackerel were fished from south of New England down through the mid-Atlantic from November through May with larger gear (foot rope length) and larger mesh size than herring.

Both fisheries landed the majority of their catch in Massachusetts; other important states included Rhode Island, Maine, New York, and New Jersey. Effort in both fisheries was concentrated in waters where the sea surface temperature (SST) was less than 10 °C, depth was less than 100 meters and bottom slope was less than 0.5°.

VTRs are compulsory for nearly all vessels participating in the U.S. Northeast and Mid-Atlantic bottom and mid-water trawl fisheries; thus, the records should nearly provide a census of fishing effort for the fisheries. Data accuracy, in particular with measures of effort, was examined; over 90% of the records fell within the norms for the variables. It appears that the VTR data provides a reasonably accurate overall picture of the trawl fishery.

Introduction

Bottom and mid-water trawl fisheries are a major component of the United States Northeast and Mid-Atlantic fisheries. In September 2006, the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) convened the Atlantic Trawl Gear Take Reduction Team (ATGTRT) to address incidental takes of pilot whales (*Globicephala spp.*), common dolphins (*Delphinus delphis*), and white-sided dolphins (*Lagenorhynchus acutus*) in U.S. Atlantic trawl fisheries. The goal of the ATGTRT is to develop a Take Reduction Plan (TRP) to limit the serious injury and mortality of these marine mammals due to accidental entanglement in commercial fishing gear. This paper characterizes a subset of the U.S. Northeast and Mid-Atlantic trawl fisheries to aid in the development of a TRP. Specifically this paper aims to assess characteristics of the fishery that were identified as correlated to marine mammal bycatch. However, it is also expected that this characterization will be comprehensive enough to serve as a reference for other research on these fisheries.

The trawl fisheries have been the subject of much analysis; however, most studies have focused on subsets of the fisheries. As such, the recent literature lacks an overall characterization or description of the U.S. Northeast and Mid-Atlantic trawl fisheries for use by the ATGTRT. Studies within the peer-reviewed literature tend to focus on small subsets of the fisheries and issues may not be relevant for management considerations under a take reduction team process. A significant amount of information on the fisheries is contained in various fishery management plans (FMPs),[1] in particular the Northeast Multispecies FMP documents. However, trawl gear is one of several gear types examined and vessels identified for inclusion in the analysis may be limited to those that hold permits for the species of interest. Rountree (1997) summarized the spatial and temporal patterns for otter trawl vessels for 1982 to 1992. The age of the analysis limits comparisons with this study.[2] A study by Stevenson et al. (2004) focused on gear impacts on fish habitat, and mapped effort in days absent for bottom trawl vessels. The maps allow for partial validation of the results of this study; however, characteristics important to bycatch reduction are not examined.[3]

Historically, reductions in bycatch have been achieved through methods such as gear modifications and time and/or area closures, which require knowledge of the relationship between bycatch, the fleet, and fishing characteristics. Recent research suggests that trawl bycatch of pilot whales, common dolphins, and white-sided dolphins are primarily a function of the spatial and temporal aspects of fishing effort (Rossman [in prep]; Palka [in prep]). However, numerous other fishing characteristics such as gear fished, vessel characteristics, and species targeted have been shown to be correlated with bycatch and could play a role in mitigation measures. As such, this paper covers a broad range of characteristics including the spatial and temporal aspects of fishing effort, the gear fished, the species harvested, and the vessels

[1] Sources for these documents include the New England Fishery Management Council (http://www.nefmc.org) and the Mid-Atlantic Fishery Management Council (http://www.mafmc.org).

[2] Rountree (1997) summarized vessel level data for the otter trawl fishery for 1982-1992, prior to the availability of VTR data. Thus, her results are based on a combination of the commercial fisheries data and port agent reports. In 1992, a total of 1,012 vessels used otter trawl gear.

[3] Stevenson et al. (2004) used VTRs to map total days at sea (days absent) from 1995-2001 by 10-minute square. For the bottom otter trawl (fish) gear type, activity was concentrated in the western part of the Gulf of Maine, along the northwest edge of Georges Bank, east of Long Island, and along the shelf edge south of Rhode Island and Massachusetts.

involved. In addition, this paper summarizes fishing effort and revenues to provide information that could help assess the impacts of proposed mitigation measures.

The organization of the paper is as follows. First, to provide context for the variables examined and the changes identified, information is provided on trawl bycatch calculations and relevant changes in management regimes. Second, fishing effort and variables correlated with bycatch are summarized for 1996 to 2004 and presented separately for bottom and mid-water trawl fisheries. Third, the discussion identifies data concerns and areas for future study.

Background

I. Variables important to assessing marine mammal bycatch in trawl fisheries

Studies on bycatch of marine mammals in the U.S. Northeast and Mid-Atlantic bottom and mid-water trawl fisheries were used to select the fishing characteristics summarized in this paper. The primary predictor variables identified varied by bycatch species and fishery. In the bottom trawl fishery the predictor variables were target species,[4] vessel horsepower, and bottom slope for pilot whale bycatch, SST, and bottom depth for white-sided dolphin bycatch, and statistical area for common dolphin bycatch (Rossman [in prep]). In the mid-water trawl fishery bottom depth and latitude were the most important factors in estimating white-sided dolphin and pilot whale bycatch (Palka [in prep]). The primary predictor variables were used to estimate bycatch rates that were expanded to estimate total bycatch using stratified effort measured in days fished.

In addition to the predictor variables, there were other variables that had significant correlations to bycatch rates but were not used as predictor variables. The correlations do not necessarily indicate a cause and effect relationship, but do point to possible research areas that could lead to effective ways to limit bycatch. The bycatch models use data from the NMFS observer database. The Observer records include many variables that are not included in the vessel trip reports (VTRs) or permit databases nor can they be derived from VTR data. For the bottom trawl fishery,[5] significant correlated variables in addition to the predictor variables mentioned above were:

- Latitude*[6]
- Longitude*
- Month*
- Foot rope length*
- Tow duration*
- Gross vessel tons*
- Vessel length*

For the mid-water trawl fishery, additional significant correlated variables included:

[4] Target species is defined by the vessel captain prior to a fishing trip and is recorded in NMFS observer records. This differs from "main species" which is based on some measure of actual landings (e.g., greatest landed weight).

[5] The bottom trawl analysis focused on those variables that were in both the observer and VTR or permit records or could be determined from data within those records (Rossman [in prep])

[6] Variables with an asterisk (*) are available in the VTR or permit databases or can be derived from information within those databases (e.g. SST is derived using date, latitude and longitude from VTR records).

- Bottom slope*
- SST*
- Region (Northeast vs. Mid-Atlantic)*
- Longitude*
- Date*, month*, and season*
- Target species
- Time of day

II. Relevant fisheries management actions, 1996–2004

Management actions have the potential to affect a number of variables examined in this report.[7] The diversity of harvest by the U.S. Northeast and Mid-Atlantic trawl fishery puts it in contact with a large body of management measures. Management authority for the species caught by the trawl fisheries resides with the New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), and the Atlantic States Marine Fisheries Council (ASMFC). There are 37 FMPs between the 3 organizations, covering about 60 species (Appendix A). As well, the national Highly Migratory Species Plan covers sharks, swordfish, tuna, and billfish. Despite this range of regulations, the principal species harvested suggests a smaller number of FMPs are of major importance to the U.S. Northeast and Mid-Atlantic trawl fishery; in particular, the FMPs for groundfish (multispecies), Atlantic herring, monkfish, mackerel/squid/butterfish, and summer flounder/scup/black sea bass. Aspects of these FMPs relevant to this report are described below.

i. Northeast Multispecies (Groundfish) FMP

By 1996, some management measures were already in place under the Northeast Multispecies FMP. These measures included a minimum mesh size (5.5”), a ban on the use of paired trawls, seasonal closures in the Gulf of Maine (GOM), Georges Bank (GB), and Southern New England (SNE), and year-round closures in Closed Area (CA) I, CA II, and the Nantucket Lightship CA. Amendment 5 (1996) placed a moratorium on new entrants to the fishery and developed a plan to reduce effort by decreasing historical days-at-sea (DAS) by 50%. Mandatory VTR and observer program requirements increased the information available on the fishery. Minimum mesh size for the GOM/GB Regulated Mesh Area (RMA) (Figure 1) was increased to 6.0”.

Closed areas have been expanding in size and duration since 1996, although the general locations were consistent; Figures 2 (seasonal) and 3 (year-round) represent groundfish closed areas as of 2007. Under Amendment 7 (1996), the GOM seasonal closures were expanded to cover all gear types, including trawl gear. The Cashes Ledge CA was implemented as a seasonal closure in 1998, but became year-round in 2002. The Western GOM year-round closure was implemented as a temporary measure in 1998, but remained beyond 2004. In 2004, Amendment 13 created 7 essential fish habitat (EFH) closure areas, which prohibited bottom trawl gear year-round.

Numerous amendments and framework adjustments continued to cap and reduce DAS for vessels. Amendment 13 (2004) resulted in significant changes to DAS, setting unrestricted DAS at 60% of the vessel’s baseline DAS.

[7] For example, regulated minimum mesh sizes may create a truncated distribution when examined by species, and increases (decreases) in minimum mesh size may shift the mean value up (down).

Regulated changes in mesh size have been limited. In 1999, the minimum mesh size was increased to 6.5" square for the GOM, GB, and SNE RMAs. This has remained unchanged except for SNE where the minimum was increased to 7.0" square or 6.5" diamond in 2002. Amendment 13 (2004) clarified the mesh size requirements, indicating that vessels with large mesh permits were to have minimum mesh size of 8.5" diamond or square throughout the net in GOM, GB, and SNE RMA, and 7.5" in Mid-Atlantic RMA.

ii. Atlantic Herring FMP

When the Atlantic Herring FMP was developed, the resource was considered under-exploited (New England Fisheries Management Council 1999). The ASMFC Herring FMP was implemented in 2000, while the NEFMC Herring FMP was effective for the 2001 fishing year. Thus, prior to 2001, herring records are considered incomplete (New England Fisheries Management Council 2006), as not all herring vessels were engaged in other fisheries that had VTR requirements.

The FMP limited herring permitted vessels to less than 165 feet in length overall, less than 750 Gross Registered Tons (GRT) or with propulsion less than 3,000 shaft horsepower. The fishery was divided into 4 fishery management areas (FMAs; Figure 4). Each year a target total allowable catch (TAC) was determined for each management area. When catch reached 95% of the FMA's TAC, targeted harvesting would be halted. Closures, in particular for FMA 1A, were common. In 2002, Framework Adjustment 1 created two quota periods in FMA 1A, winter/spring (January–May) and summer/fall (June–December), in an effort to increase the amount of quota available during the summer/fall peak demand period.

iii. Monkfish FMP

The monkfish fishery is jointly managed by the NEFMC and the MAFMC. The monkfish FMP came into effect November 1999, thus data may be incomplete for earlier years. Limited access permits differentiated between those in the directed fishery and those for which monkfish was primarily a bycatch (holders of multispecies and scallop DAS). Permit holders were each allocated 40 Monkfish DAS. The TAC was to be achieved through a combination of limited access and trip limits. The fishery was divided into the Northern FMA and the Southern FMA; the dividing line runs from the intersection of 70°W longitude and the south-facing shoreline of Cape Cod, MA southward along longitude 70°W to latitude 41°N, then eastward to the U.S.-Canada maritime boundary. Trip limits have been more restrictive in the Southern FMA. When using only a monkfish DAS (i.e., directed fishing), the minimum mesh size for trawls was set at 10" square or 12" diamond.[8]

In May 2003, Framework Adjustment 2 increased trip limits for the Southern FMA for monkfish-only vessels, while there remained no trip limit for the Northern FMA. The 2004 rule restricted use of a vessel's DAS in the Southern FMA to a maximum of 28 DAS and reduced trip limits for the area.

iv. Atlantic Mackerel, Squid, and Butterfish FMP

The MAFMC plan covers all Atlantic mackerel, butterfish, *Loligo pealei* (long-finned squid), and *Illex illecebrosus* (short-finned squid) under U.S. jurisdiction. In May 1996, Amendment 5 included a joint moratorium permit for *Loligo* squid and butterfish, a minimum

[8] If a vessel was using both a monkfish DAS and a multispecies DAS the mesh size must conform to the multispecies minimum mesh size.

mesh size of 1 7/8" diamond for *Loligo* vessels, and seasonal quotas for *Loligo*. Vessels fishing for *Illex* squid during June–September seaward of a line roughly matching the 50-fathom line were exempt from the minimum mesh size requirements; at that time the *Illex* squid fishery was considered underutilized. Closures for the directed fisheries in *Loligo*, *Illex*, butterfish, and mackerel are based on a percentage of the Domestic Annual Harvest level; the trigger is 80% for mackerel and 95% for all others. Over the years both *Loligo* and *Illex* squid fisheries have been closed as the triggers were reached.

In the late 1990s, mackerel was considered underutilized, and a declining annual allocation to joint venture processing sector was provided. Amendment 8 (1999) placed a size restriction on vessels that could fish in the Atlantic mackerel fishery to less than or equal to 165 feet in length and 750 GRT or less than or equal to 3,000 shaft horsepower.

v. Summer Flounder, Scup, and Black Sea Bass FMP

The MAFMC was responsible for the summer flounder (fluke) FMP; in 1996, scup and black sea bass were added to the FMP. Beginning in 1997, vessels issued permits for these species were required to submit VTRs.

All 3 species have been managed with commercial landings quotas that have resulted in closures of the fishery. Fluke used state level quotas, and state level closures have been frequent. Black sea bass initially operated under a coast-wide quarterly quota, but that was converted to a state level quota in 2003. Scup has operated under a coast-wide trimester quota.

Minimum mesh size requirements for trawl vessels differed by species. In 1997, trawls holding a scup moratorium permit were required to use nets with 4" or more diamond mesh. Black sea bass moratorium permit holders were required to use nets with a minimum of 4" diamond or 3.5" square mesh. For fluke, mesh had to be 5.5" diamond or 6.0" square mesh. In 1998, the scup minimum mesh size requirement was set at 4.5" diamond. In 2001, mesh size for black sea bass was increased to 4.5" diamond.

Data

The primary source of data for this analysis was the fishing VTR database. Additional data sources included the Commercial Fisheries Dealer Database (CFDBS), often termed "dealer data," and the NMFS Northeast Regional Office's (NERO) permit database.

The VTR is logbook information provided by fishermen, after completing a fishing trip. The number of vessels required to submit reports have grown over the years, and most federally managed fisheries in the Northeast required VTRs by 2004.[9] Owners or operators of federally permitted vessels are required to provide reports for all trips, including trips targeting species without VTR requirements and trips with no catch. A separate report is required for each portion of a trip when changes occur in gear (mesh or gear size) or location (based on chart or statistical area). Thus, a single trip may have multiple reports, or sub-trips. Each report (Figure 5) includes: (i) vessel and operator identification; (ii) dates of sailing and landing and port landed; (iii) type of trip; (iv) gear characteristics; (v) location fished; (vi) descriptors of effort; (vii) details on species caught, including kept and discarded, and (viii) to whom sold.

[9] The lobster fishery is an exception.

VTR data from 1996 through 2004 was retrieved for otter trawl fish (OTF), otter trawl other (OTO), otter trawl mid-water (OTM), and paired mid-water trawl (PTM) gear types. These fisheries had documented marine mammal bycatch and were part of the ATGTRT.

Key variables, including gear size, mesh size, tow time, and number of hauls, were checked for errors, and unreasonable outliers were replaced with median values. Most outliers were determined using a table of reasonable expected values developed for data quality checks. The table of reasonable expected values was developed by examining both observer and VTR data to determine the real world maximum and minimum values for particular variables in each fishery. However, some variables, such as the number of hauls per trip, were not included in this table. In this case, the number of hauls per trip was examined through calculation of the number hauls per day, since the length of trips vary. After examining the distribution of both VTR and observer data, 10 was set as the maximum number of hauls per day. Tow hours and number of hauls were also compared to the amount of fish kept as a means of checking for invalid zero values. For example, if a trip had positive pounds kept but no hauls, then the number of hauls was replaced with a median value. Tow hours were dealt with in a similar manner; for instance, positive tow hours with no hauls were not considered valid.

To calculate median values, trips were stratified by hull number, gear type, FMP group,[10] year, and state; each unique combination of these variables had a matching median. Outliers were substituted with the stratified median values; each replaced value was representative of similar trips by the same vessel. In cases where an outlier needed to be replaced and no median was available based on the stratification, the hull number was dropped from the stratification criteria and a median was created based on the remaining variables. About 2% of the data for these variables were replaced with median values, although roughly 6% of the gear size observations were replaced (Table 1).

Two additional variables were created from existing VTR variables: "days fished" and "main species." A "days fished" effort variable was created using tow hours, tow minutes, and number of hauls recorded. The average tow time per haul for a trip was converted to decimal days and multiplied by the number of hauls for that trip. A variable describing the "main species" landed on a trip was based on the species with the largest percentage of the trip's live weight.[11] For example, if a trip caught more pounds of fluke than any other individual species, the characteristics of that trip were fully attributed to fluke. The implicit assumption was that vessel captains were targeting the species of which they caught the most, having modified gear, season, and location accordingly. The main species categorization was used to examine gear characteristics and effort measures. For some species (e.g., mackerel) more than 80% of the live weight reported in the VTR was harvested by trips where that species (e.g., mackerel) was identified as the main species (Table 2). However, for some species (e.g., cod, plaice, and witch flounder) less than 50% of the total reported live weight landed was harvested on trips where that species (i.e., cod, plaice or witch flounder) was identified as the main species. The impact of this difference on the summary statistics is unclear.

[10] FMP group was determined by summing landings for all species within a FMP (Appendix A). If landings for a FMP group of species was greater than or equal to 50% of landings, the trips was assigned to that FMP.

[11] From an economic perspective, it would be more reasonable to assume that the main species was that with the largest contribution to trip revenues. Historically, however, the bycatch analysis does not incorporate economic values, focusing instead on physical features such as weight. For consistency the same method was used in this study. This differs from target species, which is recorded in the observer data based on a vessel captain's intentions at the beginning of the trip, but is not available for VTR records.

Environmental variables, including SST, bottom depth, and bottom slope, were created based on location information recorded in the VTR dataset. SST data for each trip was obtained from 5-day SST composites derived from several satellite imagery sources, or 5-day climatology images obtained from NASA's Jet Propulsion Laboratory.[12] Satellite SST imagery sources included AVHRR Pathfinder Version 5, Modis Aqua, Modis Terra, and GOES satellites.[13] These sources were combined when available to create one 5-day median composite image for each day. A Visual Basic for Applications routine in ArcGIS 9.1 extracted SST values at point locations, and using a 3x3 cell window, for both the 5-day median composites and the climatology. The VTR data location variable is reported as the center point of a trip that occurs in one area and in which a consistent gear type and size was used. When choosing which SST to use in the analysis, the 5-day medians were preferred over the climatology, and point locations were preferred over the 3x3 cell medians. Lastly, the resulting SST value was compared to the climatology data to screen for incorrect temperature values.

Depth data for each sub-trip was obtained using bathymetry data acquired from the National Geophysical Data Center.[14] Like SST, bottom depth (Figure 6A) was sampled with ArcGIS at each fishing location recorded by the vessel log. This depth data was preferred over that reported in the VTR for its consistency both in location and in its source.[15] Bottom slope in degrees was calculated using the ArcGIS slope function after projecting the bathymetry data to a Lambert Conformal map projection customized for the area off the Northeast U.S. coast (Figure 6B). Bottom depth and bottom slope are closely correlated.

To estimate revenue, a price series was created from the CFDBS database. For each species, an average weighted price per live pound landed was calculated by year and month. The weighted price took into account the allocation of the species between different grades (e.g., round, dressed) and between ports of landing. For species where the majority of the landings were "unclassified" for a species group (e.g., skates) in the CFDBS, the VTR records were grouped similarly. The price is an average by month over all grade types and ports from Maine to North Carolina, so it does not reflect spatial price differences but does reflect seasonal differences. The value is referred to as the "calculated value" to indicate that it was calculated using the VTR data, rather than taken directly from the CFDBS which is considered a more accurate determination of trip value. Unless indicated, calculated values are in nominal dollars (i.e., not adjusted for inflation), meaning that averages across years are not appropriate. However, where indicated adjusted calculated values were adjusted for inflation using the annual GDP implicit price deflator[16] with a base year of 2000 (i.e., 2000=100).

The NERO permit database was the source of information on vessel characteristics such as GRT, vessel horsepower (VHP), and vessel length. While the majority of vessels within the

[12] Additional information on the climatology data source can be found at: http://podaac.jpl.nasa.gov/products/product111.html

[13] Additional information on the satellite data sources can be found at the following links: AVHRR: http://podaac.jpl.nasa.gov/products/product216.html. MODIS Terra and Aqua, see products 162 and 184 (http://podaac.jpl.nasa.gov/products/product162.html and http://podaac.jpl.nasa.gov/products/product184.html); GOES, see product 190 (http://podaac.jpl.nasa.gov/products/product190.html).

[14] Bathymetry data was acquired from ETOPO Global 2' Elevations CD, available from the National Geophysical Data Center.

[15] There are also concerns about possible errors in the VTR depth data with regard to units.

[16] Source: http://www.econstats.com; accessed September 1, 2005. This is the same deflator used in the annual *Fisheries of the United States* publication by NMFS.

VTR dataset have associated records in the permit dataset, occasionally a match will not be found. Rather than exclude these vessels from the results, these records are identified separately.

To organize the data spatially, 5 fishing regions were defined by grouping statistical areas (Figure 7A). The regions are based on the fishing areas used by NERO and the NEFMC. The NEFMC regions are not exactly aligned with the statistical area boundaries, so adjustments were made. These adjustments were, in part, guided by the ecosystem regions (Figure 7B) identified based on fish communities (Gabriel 1992). The goal was to define regions that were meaningful from both management and ecosystems perspectives. The fishing regions include: GOM, GB, North Southern New England (NSNE), South Southern New England (SSNE), and Mid-Atlantic (MA). Records that lack location information are included in the "unknown" category rather than excluded. The fishing regions are very different in size, and are subject to different management regulations, so comparisons based on total values should be done with caution.

Results

The results are reported separately for the bottom trawl and mid-water trawl fisheries; however, each section follows a similar format. Each fishery is examined in terms of characteristics of effort, harvest, vessels, gear, and environmental variables.

I. Bottom Trawl Fishery (OTF and OTO)

Only vessels reporting the use of OTF and OTO gear on the VTRs are considered in this analysis. While most of these vessels indicate otter trawl gear on all their VTR records, vessels that occasionally report use of otter trawl gear are also included. The number of vessels using bottom (otter) trawl gear decreased between 1996 and 2004 from 944 to 732 (Table 3), a 23% decline. Despite an increase in the number of fisheries covered by VTR requirements during this period, the number of reported trips decreased from 38,748 in 1996 to 33,089 in 2004, a decline of 15%.

i. Effort characteristics

Bycatch rates are multiplied by stratified effort to calculate total bycatch; thus, it is important to understand the distribution of effort relative to factors correlated with bycatch rates. For the Atlantic trawl bycatch estimates, bycatch rates are expanded by days fished. "Days fished" is an encompassing measure of effort that accounts for tow time and hauls and, to some degree, days absent. The focus of this section is the general spatial and temporal distribution of effort, in terms of days fished and its components. Effort is also considered later when fishing and vessel characteristics are examined in other sections, to provide additional information that could be helpful in the assessment of impacts of proposed TRP mitigation measures.

a. Days fished

Over the entire 9-year period, 1996 to 2004, effort in the bottom trawl fishery was focused from the Hudson Canyon north, with areas of high density along the axis of the Hudson Canyon, along the shelf edge, on GB, and in the GOM, particularly off the Massachusetts coast in the transition zone between the GOM, and GB (Figure 8). Some effort extended south of the Hudson Canyon along the shelf break, and along the mid-coast of Virginia and North Carolina. This overall distribution illustrates some of the key fishing grounds for the bottom trawl fishery;

however, some of the discontinuities in the distribution of effort closely match closures for management purposes, discussed and illustrated above. The overall distribution of effort also masks changes over the 9 years in terms of the relative importance of areas.

Between 1996 and 2004, the total days fished by the bottom trawl fishery decreased from 37,381 to 22,324 (Table 4), a 40% decline. Days fished declined in all fishing regions, although the declines were not evenly distributed. The greatest impact was in the GOM, where days fished declined in all years except 2001; the total days fished decreased from 15,806 in 1996 to 8,262 in 2004, representing a 48% decline. This was followed closely by NSNE, where there was a decline in every year except 1998; the total days fished fell from 12,896 in 1996 to 6,926 in 2004, a decrease of 46%. The MA had moderate increases in days fished in 1998 and 2002, but still had an overall decrease from 2,328 to 1,522, for a total decline of 35% over the 9 years. The least affected region was GB, where there were slight increases in days fished in 6 of the 9 years; however, the total decreased between 1996 and 2004 from 5,871 to 5,565, a 5% decline.

As a result of the differences in the decline of days fished by fishing region, the relative importance of the regions in terms of effort has shifted (Table 4). In 1996, The GOM accounted for 42% of total bottom trawl effort (=15,806/37,381), NSNE for 34% (=12,896/37,381), and GB accounted for 16% (=5,871/37,381). By 2004, days fished in the GOM were 37% of the total (=8,262/22,324), NSNE accounted for 31% (=6,926/22,324), and GB accounted for 25% (=5,565/22,324).

The average amount of time spent fishing per trip, as measured by days fished per trip, declined by about 30% between 1996 and 2004 (Figure 9). This decline extended to all fishing regions (Table 5). The relative decline was greater in NSNE where mean days fished per trip decreased from 0.65 in 1996 to 0.36 in 2004, a 45% decline. The smallest decline was in GB, where mean days fished per trip decreased from 3.55 to 3.05, a 14% decline. On average, trips to GB fished the most, while vessels on trips in the NSNE fished the least amount of time per trip.

The amount of effort used in the pursuit of different species has declined overall (Table 6), with a few notable exceptions. Main species trips for haddock increased from 30 days fished in 1996 to 1,594 in 2004, a 52-fold increase, while days fished on Atlantic croaker main species trips doubled from 42 in 1996 to 86 in 2004. There were also small increases in the total days fished for yellowtail flounder and *Loligo* squid trips. The most significant declines in days fished were for American plaice trips, which declined by 90% from 4,517 days to 424 days between 1996 and 2004, and cod, which declined from 4,863 to 1,484 days, a 70% decline. Silver hake, winter flounder, and monkfish trips also exhibited declines in days fished between 1996 and 2004. These changes resulted in some shifts in the relative fishing effort between species (Table 7). In 1996 cod and monkfish main species trips both accounted for approximately 13% of effort in days fished, while American plaice was second at 12% and fluke third at 10% of days fished (Table 7). In 2004, monkfish accounted for 14% of the days fished, fluke accounted for 13%, and *Loligo* squid for 11%; cod had fallen to 7% and plaice to 2%.

Seasonality for the bottom trawl fishery is evident in the average days fished per trip by month (Figure 10). The highest means occurred in the first quarter, fell until July then increased through December; the average for February was almost twice that for July. This seasonality could be in part due to seasonal differences in the species targeted.

Disaggregating average days fished per trip by main species illustrates the high degree of variability within the broadly defined bottom trawl fishery (Figure 11). Differences exist between species, and within a species between months. Among the Northeast multispecies, witch flounder, silver hake (Figure 11A), and other groundfish (Figure 11D) exhibited the same

seasonal pattern as the overall fishery, while winter flounder (Figure 11A) had an opposite pattern. Haddock (Figure 11A) and monkfish (Figure 11C) had the highest days fished per trip, but with opposite seasonal patterns; thus, haddock was highest in the third and fourth quarters while monkfish was highest in the first 2 quarters.

The spatial distribution of days fished by main species (Figure 12) closely matches the distribution of the species.[17] An examination of the maps of effort indicates that the species harvested break into 5 groups spatially:

- croaker (Figure 12C) and *Illex* squid (Figure 12H) have a southern distribution;
- butterfish (Figure 12A), scup (Figure 12M), fluke (figure 12E), *Loligo* squid (Figure 12I), and mackerel (Figure 12J) have a distribution from Rhode Island and southern GB and south;
- monkfish (Figure 12K), silver hake (Figure 12N), skate (Figure 12O), winter flounder (Figure 12P), and yellowtail flounder (Figure 12R) span between Rhode Island and GB up into the GOM;
- cod (Figure 12B), haddock (Figure 12F), American plaice (Figure 12L), and witch flounder (Figure 12Q) are primarily on the northern flank of GB and north into the GOM;
- dogfish (Figure 12D) and Atlantic herring (Figure 12G) are caught throughout the study region.

b. Tow time and number of hauls

The examination of the haul and tow time variables was limited as they were used to calculate the days fished variable, which was examined in detail above. The total number of hauls decreased from 301,241 to 191,032 between 1996 and 2004 (Table 8), a 37% decline. The number of hauls decreased for all main species, except for Atlantic croaker, witch flounder, yellowtail flounder, haddock, and scup. The allocation of hauls between species (Table 9) is similar to that for days fished by species. However, fluke trips generally have a higher percentage of hauls than days fished, while monkfish is the opposite (Table 9 and Table 7). This suggests that fluke tow times are shorter than average, and monkfish tow times are longer than average.

The mean number of hauls per trip declined by about 30% over the 9 years (Figure 13), while mean average tow time per haul both declined by about 10% (Figure 14). Both variables exhibited seasonality, although there were some differences. The mean number of hauls per trip peaked in February and was at its lowest level in July (Figure 15), with about a 40% difference between the two. Mean average tow time per haul was highest in March and lowest in July–September (Figure 16), with about a 30% difference.

c. Days absent

"Days absent" is calculated from the VTR as the number of days between departure and landing, rounded up to the nearest whole day. Days absent is a combination of steam time and fishing time. In the bottom trawl fishery, days absent declined from 101,790 in 1996 to 74,852 in

[17] Information on the distribution of the individual species may be found in the Essential Fish Habitat Source Documents, which are part of the NOAA Technical Memorandum NMFS NE series. These documents are available through the NEFSC's "EFH Source Documents: Life History and Habitat Characteristics" web page (http://www.nefsc.noaa.gov/nefsc/habitat/efh/; accessed July 20, 2007).

2004 (Table 10), a 26% decline. This is less than the decline in days fished discussed above. Days absent could increase relative to days fished if vessels must travel further to fish.

The fishing regions had different patterns in terms of reported days absent (Table 10). The changes in days absent were not consistent between years or in direction; however, the overall trend was downward. The GOM exhibited the largest overall decline in days absent, from 35,635 in 1996 to 20,861 in 2004 (a 42% decline). In the NSNE region, days absent declined from 44,805 to 33,074 (26% decrease). The GB and MA regions both experienced small increases in days absent over the 9 years. The GB region's days absent increased from 12,839 to 13,085, a 2% increase, while the MA went from 7,294 to 7,600, a 4% increase.

Seasonal variation in length of trips, measured by days absent, is evident (Table 11), however, high coefficient of variation (CV) values mean the differences are not statistically significant. Trips in the first quarter (January–March) were slightly longer, while trips in the second and third quarters were shorter. There appears to a less variation in the mean value, as measured by the CV, in January and February, when trip length is near its maximum mean value.

ii. Harvest characteristics

Landings and value for the fishery are important from the perspective of potential impacts from proposed TRP actions. The spatial and temporal patterns of harvest help identify groups of fishermen and regions that may be affected by TRP mitigation actions, while value provides an indication of the level of economic impacts.

a. Species

Over the 9-year period 1996 to 2004, the main species algorithm classified the majority of the trips as fluke trips, followed by *Loligo* squid, cod, winter flounder, and silver hake trips (Table 12). The species making up the majority of the trip's catch by live weight was considered the "main species." These rankings differed from those based on total value and total kept weight, though the top species are similar. In terms of total kept weight (live) the top 5 species based on a 9-year average were *Loligo* squid, silver hake, *Illex* squid, skates, and monkfish (Table 13). The difference in ranking suggests that fluke, cod, and winter flounder trips may be frequent with a small harvest, and indeed there were small trips limits for each species over much of the time examined.

The importance of species by value is expected to differ from measures based on weight as many high volume species (e.g., herring, mackerel, skates, and *Illex* squid) have relatively lower prices per pound, either nominal (Table 14) or adjusted for inflation (Table 15). Nominal calculated value illustrates within-year differences in value (Table 16); however, to compare values between years the adjusted value must be used (Table 17). The top 5 species based on an average of adjusted values are *Loligo* squid, fluke, monkfish, cod, and winter flounder, respectively. Most species have lost real value over the years, although haddock and *Illex* squid posted gains.

b. Fishing regions

The NSNE region, which encompasses the northern Mid-Atlantic Bight, has consistently harvested the most fish by weight (Table 18). The second most productive region for the bottom trawl fishery was more variable, shifting between GB and the GOM. In terms of calculated value (Table 18), the ranking was consistent from 1996–2000, with NSNE first, followed by the GOM, GB, and the MA. Since 2001, the calculated values for the GOM, GB, and NSNE have been similar with each taking a turn at the top valued region.

As the fishing regions are based on ecosystem regions, one would expect differences in the species harvested by fishing region. All the top species were harvested in all fishing regions (Table 19) except for SSNE; however, the importance of individual species to the regional total harvests differed. For the GOM the top 5 species harvested were other groundfish, cod, plaice, monkfish, and winter flounder (Table 19). For GB the top 5 were silver hake, yellowtail flounder, cod, monkfish, and haddock (Table 19). For NSNE the top 5 were *Loligo* squid, *Illex* squid, skates, silver hake, and mackerel, and for the MA the top 5 were croaker, *Illex* squid, fluke, mackerel, and *Loligo* squid (Table 19). The overlap in the top 5 between adjacent regions may be partly explained by statistical areas that include more than one eco-region, but there is also seasonal movement by species. This becomes more apparent when landings by species are examined by region and month (Appendix B). Examination at the month-region-species level illustrates shifts between species that allow harvest levels to be maintained throughout the year.

c. Port of landing

The top states in terms of landings are those closest to the GOM and the NSNE fishing regions (Table 20), where effort is concentrated. Massachusetts was usually the top state for bottom trawl landings, with the exception of 1998 and 2004. In terms of inflation adjusted calculated value, Massachusetts was consistently the top state by a significant margin (Table 20). Over the 9-year period, the average adjusted value indicates Massachusetts was the top state, with almost twice the value of second place Rhode Island, followed by Maine as third, and New York and New Jersey nearly tied as fourth.

iii. Vessel characteristics

Most bottom trawl vessels only report using OTF gear, and dependence on this single gear increased between 1996 and 2004 (Appendix C). In 1996, of the 944 vessels reporting use OTF gear, 623 (66%) used only that gear type. By 2004, 588 of the 732 vessels (80%) reporting use of OTF used only that gear type. Only OTF and OTO VTR records are used in the calculation of the information in this report.

a. Fleet

Most average measures of effort and landings per vessel have remained steady across the 9 years, with small differences rendered insignificant by large CVs. While the number of vessels has steadily declined, the average number of trips increased from 42 per vessel per year to 45 (Table 21); however, the CV remained around 100% throughout the period. While the CVs for average days absent per year and days fished were below 100%, the small declines are insignificant (Table 21). All weight-based measures – including average landings per year (live weight), landings per day absent, and landings per day fished – increased (Table 21), although much of the gain occurred in the last year. Both nominal and inflation adjusted values increased over the years, despite drops in 2002–03 (Table 21). The real value per vessel (revenue, base year 2000) increased from $184,728 in 1996 to $222,160 in 2004 (Table 21), a 20% increase.

b. Ton class

A possible reason for the large CVs for the averages per vessel, discussed above, is a high degree of heterogeneity within the bottom trawl fishery. To address this heterogeneity, vessels may be categorized by a number of categories including size characteristics, depending on the type of analysis. The only "standard" set of categories is that for GRT; the ton class (TC) categories for vessels are: TC1 (1–4 GRT); TC2 (5–50 GRT); TC3 (51–150); TC4 (151–500

GRT); and TC5 (>500 GRT). The majority of bottom trawl vessels were of TC2 and TC3 (Table 22), with small numbers in TC4 and very few in TC1. The number of vessels within each class declined over the 9 years, although not equally.

Within TC categories, vessel size measures exhibited a high degree of homogeneity (Table 23). The average VHP had the highest overall level of variation within a TC; however the means were relatively stable over the years. Average vessel length was very stable within a TC, and had CVs below 20% for all groups except TC1, which had a slightly more erratic pattern. As with length, the average GRT within each class was very stable, both in terms of the mean and CV; the CV was larger for TC2 than TC3, which had more vessels.

Despite the number of vessels in TC2 being slightly smaller than TC3, the TC2 group has consistently taken more total trips than TC3 vessels (Table 24). The trips by TC2 vessels are substantially shorter than TC3 trips as the total number of days absent by TC3 vessels is nearly double that of the TC2 group. Additionally, the total days fished by the TC3 group are almost 3 times greater than that for the TC2 group. The small TC4 group has a higher number of total days absent and total days fished relative to the number of trips than any of the other size groups. The percentage of time spent fishing is greater for the larger TC groups. For example, in 2004 TC2 vessels spent 23% of days absent fishing (=4,950 days fished/21,054 days absent) while TC4 vessels spent 39% of the time fishing (4,546 days fished/11,748 days absent).

Differences in the proportion of time spent fishing may, in part, explain some of the differences in the distribution of harvest and revenues between the ton classes (Table 25). Vessels in TC3 landed 4–6 times the weight of fish as did the similar number of vessels in TC2, while the smaller group of vessels in TC4 vessels landed 3–5 times as much fish as the TC2 vessels. The pattern for nominal and inflation adjusted value (i.e., revenue) is similar (Table 25).

Differences in the species composition of landings by vessels in the TC categories (Table 26) may partly explain differences in both effort and landings. The TC4 vessels had higher average annual landings of squid (*Illex* and *Loligo*), silver hake, and mackerel, relative to other species than did other TC groups. For TC4 vessels the 4 species accounted for 57% (=7,504 + 6,682 + 4,606 + 3,759/39,778) of average kept live weight landings. For TC3 vessels, *Loligo* squid and silver hake are also important, but other top species include skates, other groundfish, monkfish, fluke, and yellowtail flounder, while the top species for TC2 vessels include skates, cod, plaice, fluke, monkfish, *Loligo* squid, and winter flounder. The smallest vessels, TC1, are almost fully dependent on groundfish, including cod, witch flounder, plaice, yellowtail flounder, monkfish, and other groundfish.

iv. Gear characteristics

Two gear characteristics are available in the VTR records: codend mesh size, and gear size as measured by footrope length. Mesh size is determined by target species and fishing method, which in turn are limited by regulations. Minimum mesh size restrictions have been in place for most species fished by the bottom trawl fishery for the entire 9-year period. While numerous exemptions exist for specific times, areas, and target species, one would anticipate that the self-reported data (i.e., VTRs) would closely follow the regulated sizes for the associated main species. In contrast, gear size in terms of footrope length for trawl nets for the most part is not regulated but is limited by fishing conditions and vessel characteristics.

a. Mesh size (codend)

The mean codend mesh (inches) increased over the years (Figure 17A); however, the total increase has been a little over 1/2 inch since the smallest average in 1998. There is a greater difference between months in average mesh size (Figure 17B), perhaps illustrating shifts in

targeted species. There are two peaks in mesh size; generally mesh size was large in the winter and early spring, and decreased in size from June through October (Figure 17B).

There is almost no seasonality present in codend mesh size for a given species (Figure 18), though differences are evident between species. Many of the northeast demersal species have mesh sizes of about 6 inches including haddock, yellowtail flounder, American plaice, winter flounder, witch flounder, cod (Figure 18A), monkfish, and skate (Figure 18B). Scup and fluke, which have distributions from Rhode Island and south, have average mesh sizes of roughly 4.5 and 5.5, respectively (Figure 18B). Spiny dogfish, whose distribution spans the Northeast and MA had a mesh size between 4–5 inches. Squid, herring, mackerel, and butterfish, which are more pelagic and are often caught together, had mesh sizes between 2–3 inches. Silver hake, which often feed on herring and young mackerel (Bigelow and Schroeder 1953), also had an average mesh size of about 3 inches.

When examined by fishing region, the GOM and GB used larger size mesh than NSNE and MA (Table 27). The SSNE region, which is primarily offshore, generally had the smallest mesh size. The general pattern is a decrease in size from north to south, which generally corresponds to the spatial pattern seen by species. All fishing regions except SSNE exhibited an increase in mesh size over the 9 years.

While mean mesh size appears to get smaller as the vessel size increases (Table 28), the differences are small and the CV is large enough to render the sizes indistinguishable. The relatively smaller CV in the TC1 group may suggest a more uniform targeting of species than in the TC4 group, which has a much larger CV.

b. Gear size (footrope length[18])

The average footrope length for the bottom trawl fleet was about 84 feet from 1996–1999; in 2000 there was a sharp increase to almost 88 feet followed by a steady decline to 85 feet in 2004 (Figure 19A). Seasonality was evident (Figure 19B), with larger footrope lengths in the first quarter, which drop sharply from March to the low in May, and followed by a steady increase in size until December. There are some differences in mean gear size between species (Figure 20). Compared to other species, gear size was smaller for trips that caught winter flounder, cod, yellowtail flounder (Figure 20A), fluke (Figure 20B), skate, dogfish, and Atlantic herring (Figure 20C). Trips that caught haddock (Figure 20A), *Illex* squid (Figure 20B), and monkfish (Figure 20C) tended to have larger gear. For most species, seasonal variation was limited (Figure 20). Seasonality was evident for witch flounder, American plaice (Figure 20A), scup, butterfish, both squid species (Figure 20B), and monkfish (Figure 20C).

Gear size varied by fishing region, with the largest gear used in GB, followed by GOM, NSNE, and MA (Table 29). Within each region the CV remained around 30% over the years. The GOM and GB both exhibited a steady increase in the gear size over the 9 years except for 2004, when the average size used decreased in GB region. The NSNE and MA regions had declines in gear size over the years, with the difference larger for the MA. The SSNE region exhibited no clear pattern for gear size, although this may be influenced by the limited number of trips in the fishing region.

The average size of gear (in feet of footrope) was larger for larger vessels (Table 30), and appears to have increased over the 9-year period for all categories.

[18] Footrope length is also referred to as "sweep length" and is an indication of the width of the trawl opening.

v. Environmental and Habitat Characteristics

Fish and marine mammals have particular habitat requirements which may depend in part on environmental variables such as SST, water/bottom depth and bottom slope.

a. Sea Surface Temperature

The annual mean SST for bottom trawl trips varied considerably over the 9-year period from a low of about 13°C in 1996, 1997, and 1998, to a peak of 14°C in 2000 (Figure 21A). This could be the result of inter-annual variability, but may also reflect changes in the location of effort over time, which in turn is related to the species harvested. As one would anticipate, seasonal differences in water temperature were evident (Figure 21B); the monthly mean SST for trips was lowest in the first quarter, increased steadily until August, and then declined to the end of the year. This shift in SST occurred despite shifts in effort between the seasons (Figure 22). There was a greater concentration of effort in the south during the winter (Figure 22A), while during the spring (Figure 22B) and summer (Figure 22C) effort shifted north, and then began to shift back to the south in the fall (Figure 22D).

The mean monthly SST did not differ greatly between species (Figure 23), with patterns that closely reflect the overall seasonal pattern. During the winter and spring, trips that caught predominantly silver hake had a warmer temperature profile than the rest of the Northeast multispecies group (Figure 23A). The mean temperature signature for *Illex* squid (Figure 23B) and Atlantic croaker (Figure 23C) was warmer than almost all other species throughout the year; however, the series for croaker was discontinuous due to the limited number of main species trips. The Mid-Atlantic FMP species (Figure 23B) had warmer temperatures than most of the Northeast multispecies group (Figure 23A). Dogfish, herring, and monkfish (Figure 23C) all had similar temperature distributions, though dogfish had a slightly warmer signature than the other two species during the winter and spring. The temperature distribution for the "other finfish" category (Figure 23D) was warmer in the spring due to several species captured at the southern edge of the MA.

The effort within different SST groups has shifted over the years (Table 31), which in part explains the annual changes noted above. Between 1996 and 2004, the days fished in waters with a SST between 0–5 ºC declined from 9,010 to 3,984, a 56% decline. As effort overall was declining, other SST groups also saw declines in days fished; however, they were not as great as that for the 0–5 ºC group. The result was a shift in the distribution of effort to warmer waters (Table 31), which was more apparent in 2001 and 2002.

The number of hauls within each SST groups also declined and shifted (Table 32), with the 0–5 ºC group shifting from 24% of the total in 1996 to 14% in 2004. The shift from the lowest SST group to higher temperature groups is more pronounced when measured by hauls than by days fished, suggesting that tow time may have increased in the 0–5 ºC group, shortened in other SST groups, or both.

b. Bottom Depth

The distribution of effort in days fished relative to bottom depth indicates that the majority of effort is between 0 and 100 meters, but there was a shift over the 9-year period (Table 33). In 1996 42% of the days fished were in the 0–50 meter depth category, but by 2004 this had dropped to 33%. The majority of the effort shifted to the 50–100 meter category, which increased from 21% to 29% of effort; there was also a small increase in effort in the 200–2000 meter category.

The pattern of change was very similar for effort measured by number of hauls (Table 34), although hauls were more heavily concentrated in the 0–50 meter depth category than were days fished. In 1996, 51% of the hauls were in waters 0–50 meter deep. By 2004, the share had declined to 43%; the decline was matched by an increase in the 50–100 meter depth category. When considered by bottom depth categories, shallow waters (100 meters or less) had a higher percentage of hauls than days fished, suggesting that tow times were longer for trips in deeper waters.

c. Bottom Slope

The sea floor has relatively little bottom slope over the continental shelf and significantly more slope along the shelf break. The slope decreases again on the continental slope, though it generally is not as flat as on the continental shelf. Effort, in days fished, for the bottom trawl fishery overall and by species is concentrated on the continental shelf where bottom slope is slight. Almost 90% of days fished have been concentrated in the 0–0.5° slope category for the 9-year period (Table 35), and the pattern is similar for effort measured by hauls (Table 36).

II. Mid-water Trawl Fishery (OTM and PTM)

The mid-water trawl fishery consists of both single and pair mid-water trawl vessels. The fishery is smaller and its harvest less diverse than the bottom trawl fishery. All trip reports where the gear was listed as OTM or PTM were included in the analysis. This included vessels that also fished in other fisheries, including the bottom trawl; however, only the records relating to mid-water trawl activity are included.

The number of vessels participating in the mid-water trawl fishery declined from 40 in 1996 to 33 in 2004 (Table 37), an 18% decline. The decline in the number of trips was small, from 1,247 to 1,231 (Table 37), a 1% decline.

i. Effort characteristics

Bycatch rates are multiplied by effort to calculate total bycatch; thus, it is important to understand the distribution of effort relative factors correlated with bycatch rates. For the Atlantic trawl bycatch estimates, bycatch rates are expanded by days fished. “Days fished” is an encompassing measure of effort that accounts for tow time and hauls and, to some degree, days absent. The focus of this section is the general spatial and temporal distribution of effort, in terms of days fished and its components. Effort is also considered later when fishing and vessel characteristics are examined in other sections, to provide additional information that could be helpful in the assessment of impacts of proposed TRP mitigation measures.

a. Days fished

Over the entire 9-year period of 1996–2004, effort in terms of days fished for the mid-water trawl fishery was focused on the shelf south of New England, on the northeastern edge of GB, and in the western GOM (Figure 24). The total number of days fished by the mid-water trawl fishery declined from 484 in 1996 to 302 in 2004 (Table 38), a 38% decline. The decline has not been equal across fishing regions; in fact GB had an increase in days fished from 27 to 40 (Table 38), a 48% increase. However, GB remains a distant third in terms of days fished for the mid-water fishery. In 2001, the GOM became the most important region in terms of days fished, replacing the NSNE. The MA region, which accounted for about 20% of effort in 1996

(=94/484), declined to the point where by 2004 only 7% (=21/302) of days fished were in the region.

The mean days fished per trip for the fishery decreased after the late 1990s (Figure 25), although the true difference was only a little over 0.1 day fished or a little over 2 hours. This decline extended to all fishing regions (Table 39). Overall declines from 1996 to 2004 mask fairly steady days fished per trip for the top 3 regions, GOM, GB, and NSNE, since 2001. In 2004, trips to GB spent the most time fishing at 0.51 days per trip, while those in the GOM spent the least time fishing at 0.19 days per trip.

The amount of effort in days fished declined for all main species trips, except for mackerel, which increased from 35 to 71 from 1996 to 2004 (Table 40), a 106% increase. The mid-water fishery was a more diverse fishery in the 1990s when several different main species were evident. However, by 2004 herring and mackerel trips accounted for 93% (=70%+23%) of all days fished in the fishery (Table 41).

The mean number of days fished per trip varied with month (Figure 26). Fishing effort per trip peaked in March–April and September–October, and reaching lows during January and June. When considered by main species and month (Figure 27), the mean days fished per trip are fairly constant through out the year for Atlantic herring. Atlantic mackerel, however, shows a discontinuous series with a sharp increase in May.

The spatial distribution of effort, in days fished, for mid-water herring and mackerel are distinct, except for a small overlap south of Rhode Island (Figure 28). Herring was fished in the GOM, northern edge of GB and south of Rhode Island (Figure 28A), while mackerel was fished from south of New England down through the mid-Atlantic (Figure 28B).

b. Tow time and number of hauls

The examination of the haul and tow time variables was limited as they were used to calculate the days-fished variable, which was examined in detail above. The total number of hauls in the mid-water fishery decreased from 4,162 in 1996 to 2,632 in 2004 (Table 42), a 37% decline, which closely mirrors the decline in days fished. The distribution of hauls between main species trips (Table 43) shows increased concentration in the herring and mackerel fisheries. The distribution of hauls between fisheries is almost identical to that of days fished, suggesting tow times may not differ between herring or mackerel trips.

c. Days absent

Days absent is calculated from the VTR as the number of days between departure and landing, rounded up to the nearest whole day. In the mid-water trawl fishery, the total number of days absent declined from 3,534 in 1996 to 3,350 in 2004 (Table 44), a 5% decline. The decline in days absent was substantially less than that for days fished, suggesting less time was spent fishing in 2004 than in 1996. All fishing regions experienced declines in days absent except the GB region, which showed an increase (Table 44); however, in 2004 the GB region remained a region with limited use by mid-water trawls, with only 328 days absent of the total 3,350 or about 10% of the total.

There appear to be seasonal differences in the length of mid-water trawl trips, with shorter trips in the summer and early fall (Table 45); however, the high CV makes it unlikely that these differences are statistically significant. There appears to less variation in the mean value in August–September and November–December, when trip length is near the lower end of its range.

ii. Harvest characteristics

a. Species

Between 1996 and 2004, nearly 83% of mid-water trawl trips were classified as Atlantic herring main species trips (Table 46). The species making up the majority of the trip's catch by live weight was considered the "main species." Atlantic mackerel is the main species on almost 10% of the trips. Other species that are occasionally determined to be the main species on a trip include Atlantic croaker, bluefish, *Illex* squid, *Loligo* squid, and scup, although this is largely an artifact of data from 1996–2000. Landings have been quite volatile but have grown over the 9 years (Table 47), and herring has accounted from the majority of landings for the entire period. However, the dominance of herring began to erode in 2002, and by 2004 herring accounted for only 71,446 of the 124,493 metric tons (live weight) landed by the fleet, or 57% of the total. Mackerel landings accounted for an increasing share of the growing landings for the mid-water trawl fishery.

The price for mackerel was higher than that for herring throughout the 9-year period both in nominal (Table 48) and inflation-adjusted prices (Table 49), although the difference narrowed from 2001 onward. The nominal value of the mid-water trawl fishery showed a steady increase from almost $11 million in 1996 to almost $25 million in 2004 (Table 50), a 133% increase. In inflation-adjusted terms (2000=100), the value of the fishery doubled from a little over $11 million to a little over $22 million (Table 51). During this time the value of other species dropped to under $200,000, while the value of mackerel increased to nearly equal that of herring.

b. Fishing regions

In terms of fishing regions, the share of landings from GB and MA has grown (Table 52); however, the GOM and NSNE continue to be the major source of landings. Despite having similar landings in the last few years of the time series, the NSNE region provided a slightly higher share of calculated value than the GOM (Table 52). In nominal and real terms, the combined value of landings from GB and the MA have accounted for approximately one-third of value throughout the time series, with the GOM and NSNE accounting for approximately one-third each.

The species composition of landings by fishing region (Table 53) illustrates a north–south pattern. In the GOM and GB herring dominate. In the NSNE region, landings of herring and mackerel were similar. In the MA, mackerel is the dominant species harvested. Most of the *Illex* and *Loligo* squid was landed in NSNE, while the croaker was predominately landed in the MA. As well as spatial differences, there are seasonal differences in landings when examined by fishing region and month (Appendix D).

c. Port of landing

The port location where mid-water trawl vessels landed their harvest was closely linked to the location of the harvest, with the top states being those closest to the GOM and NSNE fishing regions, which includes Maine, Massachusetts, and Rhode Island (Table 54). On average over the 9-year period, Massachusetts was the top state in terms of landings and value for the mid-water trawl fishery (Table 54); however, the top state within a give year was variable.

iii. Vessel characteristics

The majority of mid-water trawl vessels participate in other trawl fisheries, in particular the bottom trawl fishery (Appendix C); however, by 2004 the majority of pair-trawl vessels used

only that gear type. The number and share of vessels dependent only on mid-water trawl has increased, even while the total number of vessels in the mid-water trawl fishery declined from 40 to 33 from 1996 to 2004 (Table 55), a 18% decline.

a. Fleet

Most average measures of effort and landings per vessel show a clear difference between the periods from 1996–2000 and from 2001–2004 (Table 55). In 2001 the average number of trips per year taken by a mid-water trawl vessel increased from 29 to 36, while days absent increased from 65 to 94 (Table 55). Landings per vessel, per day absent, and per days fished all increased sharply, as did nominal and inflation-adjusted value per vessel. This suggests a sharp change in the fishery, and in 2001 the Atlantic Herring FMP came into effect, requiring VTRs from all vessels permitted for herring. The only measure that did not appear to change was the total days fished per year per vessel, which remained around 9–10 days from all periods after 1996 (Table 55).

b. Ton class

Large CVs for these values may make the measures more apparent than significant. High CVs can be a sign of a heterogeneous fleet. Categorizing vessels may provide for more uniform strata with smaller CV values. One standard set of categories is for GRT (see "Ton Class" under the "Bottom Trawl Fishery" section, above). The distribution of vessels between the size categories has changed between 1996 and 2004 (Table 56). There were no vessels in TC1 or TC5. The number of vessels in TC2 remained relatively constant, while those in TC3 declined and those in TC4 increased (Table 56). By 2004, 20 of the 33 vessels were in TC4, which accounted for over 60% of the mid-water fleet.

Vessel size measures have relatively low CV values within a TC (Table 57). While there is some variation between years, average VHP has increased for all 3 TCs represented. Average vessel length and average GRT have remained steady over the years within TC2 and TC3 (Table 57); however, both measures have increased for TC4. The CV for average length and GRT have been small and steady within TC2 and TC3, but growing in TC4.

Looking at total effort measures by ton class shows strong differences between the different groups of vessels (Table 58). Since 2001, vessels in TC2 have operated as day boats where the number of trips is equal to the number of days absent. There has also been a sharp contraction for TC3 vessels in the number of trips and days absent, which in part reflects a decrease in the number of vessels. Vessels in TC4 showed a decline in trips and days absent in the 1997–2000 period, but both measures increased since 2001. In terms of actual fishing effort, TC4 vessels dominate the fishery. As mentioned above, in 2004 vessels in TC4 made up 61% of the mid-water vessels; however, in 2004 they accounted for 1,089 of the 1,231 trips (88%), 3,078 of 3,332 days absent (92%), and 278 of 302 days fished (92%).

A similar pattern emerges when total landings and value are examined by ton class (Table 59); the TC4 vessels contributing the majority of landings and calculated value. Average landings by ton class illustrate those vessels in the largest class, TC4, predominately target herring while those in TC3 land a mix of herring and mackerel (Table 60).

iv. Gear characteristics

There are two gear characteristics available in the VTR records, codend mesh size, and gear size measured by footrope length.

a. Mesh size (codend)

The mean codend mesh decreased by approximately 0.5 inches from a peak in 1998 (Figure 29A), although size was steady around 1.5 inches since 2001. Monthly mean mesh size was highest during the January–April period, was steady around 1.5 inches from May–October, then increased through November and December (Figure 29B). The reason for this seasonal pattern is evident when mesh size was examined by species (Figure 30). Atlantic mackerel was fished with larger mesh, and only occurred in the first 5 months of the year. Herring is fished throughout the year and uses a smaller mesh size.

Average mesh size by fishing region shows differences that are the result of species targeted (Table 61). In the GOM and GB, where herring is the principal species, mesh size is the smallest and has been steady over the years. In NSNE, where both herring and mackerel are landed the average mesh size is slightly larger and more variable, illustrating the different mix of landings over the years. In the MA, where mackerel is the principal species landed, average mesh size is considerably larger than in the other fishing regions.

Mean codend mesh size by TC illustrates the focus of the different groups of vessels between herring and mackerel (Table 62). Vessels in TC4 have the smallest average mesh size, and it was shown earlier that landings by these vessels are dominated by herring. The average mesh size for vessels in TC3 is larger than that for TC4 vessels, reflecting the greater role of mackerel in the landings for these vessels.

b. Gear size (footrope length)

Gear size, measured as footrope length in feet, shows a sharp increase in 2000 (Figure 31A), after which it has been relatively stable around 200 feet. Footrope length showed a seasonal pattern (Figure 31B), with the shortest lengths in August, slowing increasing to January, sharply decreasing in February, and then slowly increasing to June. Atlantic mackerel trips were distinguished from Atlantic herring trips by their larger footrope length and their limited fishing season from January–May (Figure 32).

There have been changes in average gear size used in the fishing regions (Table 63), and much variation between years. In 1996, the shortest footrope was used in the MA and the longest in the NSNE region; by 2004, the shortest footrope was used in the GOM, and the longest in the MA.

The average footrope length is longer for larger vessels (Table 64), and increased over time for TC2 and TC4 vessels. Gear size appears to have decreased for TC3 vessels, although this group also has the highest CV values.

v. Environmental and Habitat Characteristics

Fish and marine mammals have particular habitat requirements which may depend in part on environmental variables such as SST, water/bottom depth and bottom slope.

a. Sea Surface Temperature

As with the bottom trawl fishery, there was considerable variability in the mean SST by year for the mid-water trawl fishery (Figure 33A). This similarity suggests that the variation by year was likely due to inter-annual variability of SST rather than changes in fishing practices. However, the mid-water trawl annual SST presents a cooler profile than the bottom trawl fishery, with a low of ~11 °C in 1999 and a high of 12 °C in 2000 (Figure 33A). The monthly average SST for the mid-water trawl harvest followed a pattern of declining temperatures from January–March, followed by a period of warming until August, then a decline for the remainder of the

year (Figure 33B). Effort within the fishery shifted north and south with the seasons, with most effort taking occurring in the SSNE and in the MA in the first quarter (Figure 34A), and in the GOM in other quarters (Figure 34B–D).

When examined by main species, the average SST followed a pattern similar to that for the entire fishery, with Atlantic mackerel showing a slightly warmer winter–spring temperature signature than herring (Figure 35). This is a result of the more southerly harvest areas for mackerel, identified above.

Between 1996 and 2004, effort in days fished decreased in waters less than 20 °C (Table 65), and was sustained in the colder waters below 10 °C. This resulted in a slight shift in the distribution of effort to colder waters (Table 65). The relationship between days fished and hauls is highly correlated for SST groups, resulting in a similar pattern when effort is examined by number of hauls (Table 66).

b. Bottom depth and slope

Bottom depth and bottom slope are closely related, as illustrated earlier (Figure 6). In the mid-water trawl fishery, Atlantic herring is caught primarily south of Rhode Island, along the northern edges of GB, and in the GOM. These areas are relatively shallow, with a flat to moderate bottom slope. Atlantic mackerel is primarily caught on the mid-Atlantic shelf, extending north to east of Long Island, especially in the area of the Hudson Canyon. The majority of these areas are less than 100 meters deep and have little bottom slope, except for the localized topography of the Hudson Canyon, where the walls are too close together to be well represented in the bottom slope data source used.

An examination of effort by bottom depth categories shows that the majority of effort in days fished is in waters less than 100 meters (Table 67), with about 60% of days fished. This has changed little over the 9-year period. When effort is measured by number of hauls, we see that effort is slightly more concentrated in the less than 100 meter categories (Table 68); this suggests shorter hauls in the more shallow waters.

Days fished by bottom slope categories shows that a vast majority of effort is concentrated in areas where slope is less than 0.5° (Table 69); this concentration has been growing. By 2004, 92% of days fished were in the category of slope less than 0.5° (Table 69), up from 69% in 1996. A very similar patter is evident when effort is measured based on the number of hauls (Table 70).

Discussion

Between 1996 and 2004, effort in the bottom trawl fishery decreased between 15% and 40%, depending on the unit of measure. Despite these declines, the total harvest kept (live weight) was relatively stable until 2004, when there was a substantial increase. The nominal value of the fishery increased by about 9% over this time; however, the inflation-adjusted value decreased by 5% and the inflation-adjusted value per vessel increased by about 20%. Relative shifts in effort meant that GB became a more important fishing region, and increased shares of effort were directed to yellowtail flounder, fluke, haddock, and *Loligo* squid trips compared to other species. These shifts were accompanied by a larger share of effort in deeper and warmer waters.

The mid-water trawl fishery data shows a sharp division in 2001, the year the Atlantic Herring FMP came into effect. The fishery focuses on herring and mackerel, which are spatially

distinct for most of the year. Both landings and value for the fishery have been increasing, although there is a high degree of inter-annual variability. In 2004, the value of the fishery was almost evenly split between herring and mackerel, although landings for herring were significantly higher. In contrast to the bottom trawl fishery, the GB region has become less important to the mid-water trawl fishery as the SSNE and MA regions have increased in importance both in landings and value. Large vessels (TC4) increasingly dominate the fishery, measured in effort, landings, and value.

In general, the results of this report will not surprise those who are in close contact with the bottom and mid-water trawl fishery. However, the members of the ATGTRT represent a broad cross-section of stakeholders including fishermen, environmental organizations, state agencies, and federal government representatives. Thus a disparate level of knowledge of the fishery may exist; even fishermen who are aware of changes within their fishery or region may be unaware of the broader picture. This report attempted to create a base level of information for all participants in the process. This report is presented at a high level of aggregation, and thus is limited in its ability to determine the potential impact from proposed actions. However, it does illustrate changes that are occurring within the fisheries that may help to identify priorities for actions. For example, shifts in effort to different regions, main species or depths could result in increases in bycatch which may need to be addressed proactively.

The data also highlight the importance of understanding changes in FMPs. Effort patterns within the bottom trawl fishery (Figure 8) illustrate the impact of year-round closures (Figure 3); while the closed areas themselves are clear of effort, effort is highly concentrated along their edges. The expansion of areas closed to bottom trawl gear with the creation of essential fish habitat (EFH) areas could have potential impacts on the location and intensity of bottom trawl effort, and potential bycatch. Similarly, the mid-water trawl fishery showed a high concentration of effort (Figure 24) in herring management area 1A (Figure 4); in the future mid-water trawls will be excluded from this area. The relocation of this effort could have implications for bycatch. This report cannot comment on how effort will shift with management actions, but highlights the need to support existing and future modeling efforts to capture these shifts.

The data presented in this paper was drawn primarily from VTRs. Because these trip reports are mandatory, this data source provides a theoretically complete survey of all bottom and mid-water trawl effort. However, data accuracy may not always be reliable. This may be due to errors on trip reports, data entry errors, or purposeful misrepresentation of trip data by the fishers themselves. We have taken steps to ensure data accuracy, though the true accuracy is unknown. Checks of gear size, mesh size, tow time, and number of hauls against reasonable expected values has shown that in most cases 98% of the data fell within expected limits (Table 1). Comparisons of recent VTR data against observer data have also shown a good match (Rago et al. 2005). Within the Northeast Fisheries Science Center and Regional Office, steps have been taken to improve the accuracy of both incoming and existing VTR data. Despite these efforts and generally good comparisons with other data sources, some data fields such as latitude and longitude were missing values, especially in earlier years, and given the size of the database some errors are nearly undetectable and unknowable. Given the available data, we believe that though each trip record may not be exactly correct, the VTR data are representative as a whole. Upcoming efforts to compare VTR data to dealer data (Magnusson in prep) and a more detailed comparison with observer data (Orphanides in prep) should shed light on this issue and provide a better framework for assessing the VTR data.

Assuming that the VTR data are generally representative, it is still possible to misrepresent the data. Much of the fisheries information was summarized according to what was termed the "main species" of a trip. This meant that if a trip landed more weight of a particular species than any other, then that trip was assigned to that main species and the trip variables were analyzed as being part of the group assigned to that particular species. Using this method each trip is only used once when summarizing variables by species. It is unclear whether this grouping method best represents trip variables for species that did not often make up the majority of the catch. An alternate method would be to summarize trips by all species caught on a particular trip; if a trip caught mostly haddock, but also contained cod and monkfish, then the trip would be included when summarizing variables for haddock, cod, and monkfish. Alternatively, the trips could be categorized based on the species with the highest value within a trip, based on the economic principle of revenue maximization. The question of interest however, is which version of "main species" most closely matches captains' determination of "target species"; this requires additional comparisons with observer data.

It is also important to point out that the spatial and temporal distributions of fish catch shown in this paper may not necessarily reflect true fish distributions. Numerous regulations limit the times and areas where fishers can fish, particularly in the Northeast, and these regulations have changed over time. Regulations also affect the gear characteristics used in certain locations, times of the year, and target species. For example, the Northeast Multispecies FMP, perhaps the most important FMP for the bottom trawl fishery, has resulted in several changes in permitted mesh sizes, with spatial, temporal, and species exemptions. Limited access areas, days at sea, and trip limits have all been added to the FMP and changed over time. Several seasonal and year-round closed areas have been created, removed, and reconfigured resulting in a patchwork of year-round, seasonal, and rolling closed areas. These restrictions make it very difficult to determine the true species distribution from catch data. The ongoing changes in the regulations also make it difficult to compare catch data across years. In addition, these regulations have played a role in the decline of effort in trawl fisheries, which also makes it is difficult to compare across years. Despite all these changes, fishers still have managed to maintain or increase harvest and value.

The aim of this paper was to provide summary statistics on the bottom and mid-water trawl, so it lacks in-depth comparative statistical analysis. Given the size of the fisheries and the wealth of data available, we felt that this paper would best serve as a basis for subsequent analysis in other papers. Similarly, the biological and ecological reasons for the temporal, spatial, and environmental distributions of the fish were not discussed in this paper. Again, we felt that we had to limit the scope of this paper to provide baseline information for the take reduction team process and have left these topics for other possible subsequent papers.

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Table 1. Percent of records replaced by median values by type of data

Source	Hauls	Soak Time	Mesh Size	Gear Size
No change - original data used	97.75	98.34	98.11	93.95
Data replaced by first stratified median[a]	1.56	1.12	1.18	2.8
Data replaced by second stratified median[b]	0.57	0.54	0.71	3.25
Records set to zero	0.12	-	-	-

[a] Median values were calculated by stratifying trips based on hull number (vessel), gear type, FMP, year, and state, so that each unique combination of these variables had a matching median.
[b] Median values were calculated by stratifying trips based on gear type, FMP group, year, and state, so that each unique combination of these variables had a matching median. That is, the same stratification as for the first median, except vessel identification information (hull number) was removed.

Table 2. Percentage, by species, of landed weight (live) landed on main species[a] trips for that species[b] for U.S. Northeast and Mid-Atlantic bottom and mid-water trawl fisheries, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Bottom Trawl (%)									
Cod	6.29	7.13	3.63	4.81	5.82	6.58	7.89	7.09	5.74
Dogfish, Spiny	90.43	86.83	90.60	83.91	95.14	59.45	81.60	66.10	39.61
Flounder, Winter	63.76	76.54	69.49	64.70	65.59	66.20	58.94	57.09	56.48
Flounder, Witch	31.53	27.22	33.16	29.33	29.16	26.17	36.10	41.90	36.84
Flounder, Yellowtail	52.88	60.22	65.12	71.34	73.49	68.53	62.34	67.01	79.53
Fluke	84.45	75.93	79.75	74.60	78.22	76.35	79.49	80.97	78.31
Haddock	4.17	29.39	51.35	65.01	67.58	60.69	64.97	62.08	67.36
Hake, Silver	90.13	88.59	84.67	88.10	90.73	88.92	86.43	85.70	84.19
Herring, Atlantic	95.09	73.07	86.39	66.33	93.17	97.08	81.14	61.66	82.87
Mackerel, Atlantic	91.34	92.91	93.94	94.18	85.39	85.01	92.24	93.98	93.44
Monkfish	63.18	66.09	63.58	68.37	59.81	60.94	59.11	69.26	64.74
Plaice, American	52.79	44.04	47.07	42.71	51.42	43.21	32.82	23.73	17.92
Scup	69.60	67.98	77.94	79.83	71.67	82.24	75.27	81.86	73.59
Skates	88.58	88.25	86.70	85.48	81.16	78.30	78.22	78.72	82.06
Squid, *Illex*	98.68	97.64	99.38	95.36	97.62	95.12	95.02	94.31	99.72
Squid, *Loligo*	83.12	87.29	89.64	89.40	89.82	87.95	91.96	89.22	90.82
Mid-water Trawl (%)									
Herring, Atlantic	99.75	99.84	99.64	99.71	99.54	100.00	99.40	99.67	99.43
Mackerel, Atlantic	89.26	95.27	95.99	91.73	92.03	99.98	98.60	98.90	99.88

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.
[b] For example, in 1996, 6.29% of all cod landings were from trips where cod was the main species, defined as the greatest live weight kept. The remaining 93.71% of cod was landed on trips where another species was the "main species."

Table 3. Total vessels and trips by year for bottom otter trawl fisheries in the U.S. Northeast and Mid-Atlantic, 1996–2004

	Total Vessels	Total Trips
1996	944	38,748
1997	874	36,656
1998	892	38,209
1999	829	36,460
2000	807	36,006
2001	791	34,751
2002	762	35,197
2003	751	32,443
2004	732	33,089

Table 4. Days fished by fishing region[a] for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
1996	15,806	5,871	12,896	33	2,328	447	37,381
1997	12,041	4,722	12,613	33	1,625	382	31,417
1998	11,463	4,926	16,609	25	2,712	419	32,154
1999	10,477	4,966	12,825	25	2,514	289	31,095
2000	10,334	5,521	9,264	34	2,041	147	27,341
2001	11,334	5,849	8,905	5	1,735	41	27,869
2002	10,010	5,472	7,818	2	2,219	7	25,528
2003	9,113	5,880	6,464	22	1,833	0	23,312
2004	8,262	5,565	6,926	12	1,522	37	22,324

[a] Fishing region boundaries are illustrated in Figure 7.

Table 5. Mean days fished per trip by fishing region[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown
1996	1.09	3.55	0.65	2.55	0.97	2.15
1997	1.00	3.34	0.63	1.96	0.60	1.40
1998	0.93	3.23	0.60	0.53	0.85	1.65
1999	1.01	3.06	0.59	1.04	0.97	1.58
2000	0.96	3.25	0.43	1.26	0.95	2.49
2001	0.98	3.15	0.46	0.78	0.88	2.26
2002	0.91	3.29	0.38	0.50	0.96	2.30
2003	0.88	2.91	0.36	1.44	0.82	0.17
2004	0.88	3.05	0.36	0.99	0.56	0.68

[a] Fishing region boundaries are illustrated in Figure 7.

Table 6. Total days fished by main species[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Butterfish	495	484	257	214	157	261	115	71	91
Cod	4,863	3,875	2,955	2,026	2,443	3,139	2,934	2,419	1,482
Croaker, Atlantic	42	153	95	108	95	88	86	82	86
Dogfish	363	292	305	404	195	19	14	10	48
Flounder, Winter	2,543	2,477	2,560	2,037	2,277	2,493	1,799	1,732	1,527
Flounder, Witch	1,474	1,028	1,208	1,266	1,070	982	1,290	1,450	1,391
Flounder, Yellowtail	1,861	1,704	1,959	2,420	2,740	2,623	1,975	1,881	1,955
Fluke	3,787	2,096	2,920	2,596	2,291	2,050	3,068	2,685	2,807
Haddock	30	506	1,510	1,479	1,349	1,671	1,778	1,306	1,594
Hake, Silver	2,511	2,476	2,100	1,617	1,432	1,800	1,034	988	1,036
Herring, Atlantic	104	49	95	50	21	28	17	10	32
Mackerel, Atlantic	363	260	127	93	33	20	42	75	38
Monkfish	4,899	4,105	3,105	4,591	3,503	3,742	3,095	3,743	3,147
Plaice, American	4,517	3,216	3,133	2,887	2,715	2,296	1,525	711	424
Scup	403	198	256	243	122	166	360	432	378
Skate	1,640	1,154	1,534	1,230	1,297	1,205	1,083	1,145	1,347
Squid, *Illex*	480	250	359	267	260	103	98	147	285
Squid, *Loligo*	2,347	3,113	3,598	4,162	2,828	2,915	3,461	2,505	2,426
Other Finfish	459	381	322	307	221	221	227	121	138
Other Groundfish	2,749	2,106	2,210	1,593	1,445	1,361	1,105	1,323	1,394
Other Inverts	1,117	1,256	1,315	1,292	726	583	318	351	561
Other Species	335	239	232	217	122	103	103	126	137
TOTAL	**37,381**	**31,417**	**32,154**	**31,095**	**27,341**	**27,869**	**25,528**	**23,312**	**22,324**

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 7. Percent of annual days fished by main species[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Butterfish	1	2	1	1	1	1	0	0	0
Cod	13	12	9	7	9	11	11	10	7
Croaker, Atlantic	0	0	0	0	0	0	0	0	0
Dogfish	1	1	1	1	1	0	0	0	0
Flounder, Winter	7	8	8	7	8	9	7	7	7
Flounder, Witch	4	3	4	4	4	4	5	6	6
Flounder, Yellowtail	5	5	6	8	10	9	8	8	9
Fluke	10	7	9	8	8	7	12	12	13
Haddock	0	2	5	5	5	6	7	6	7
Hake, Silver	7	8	7	5	5	6	4	4	5
Herring, Atlantic	0	0	0	0	0	0	0	0	0
Mackerel, Atlantic	1	1	0	0	0	0	0	0	0
Monkfish	13	13	10	15	13	13	12	16	14
Plaice, American	12	10	10	9	10	8	6	3	2
Scup	1	1	1	1	0	1	1	2	2
Skate	4	4	5	4	5	4	4	5	6
Squid, *Illex*	1	1	1	1	1	0	0	1	1
Squid, *Loligo*	6	10	11	13	10	10	14	11	11
Other Finfish	1	1	1	1	1	1	1	1	1
Other Groundfish	7	7	7	5	5	5	4	6	6
Other Inverts	3	4	4	4	3	2	1	2	3
Other Species	1	1	1	1	0	0	0	1	1

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 8. Total number of hauls by main species[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Butterfish	6,311	6,446	3,125	2,619	2,039	3,556	1,574	914	1,412
Cod	31,588	24,140	20,206	14,341	17,987	24,082	21,520	18,027	10,875
Croaker, Atlantic	722	2,117	1,476	1,562	1,538	1,288	1,469	1,418	1,688
Dogfish	5,195	3,535	3,936	4,372	2,867	288	253	103	583
Flounder, Winter	25,776	24,718	25,215	20,616	22,539	24,324	18,394	16,829	15,197
Flounder, Witch	7,753	5,304	6,200	6,590	5,968	5,764	7,703	9,136	7,866
Flounder, Yellowtail	15,283	15,295	16,502	20,025	22,574	21,801	17,064	15,910	16,587
Fluke	37,952	23,364	28,617	25,371	22,445	21,499	30,804	27,962	31,023
Haddock	182	2,789	8,849	8,588	8,704	10,182	12,189	9,462	11,361
Hake, Silver	25,031	23,972	20,620	16,045	13,895	16,838	10,201	9,397	9,773
Herring, Atlantic	1,274	725	1,254	809	347	359	315	153	530
Mackerel, Atlantic	3,884	2,804	1,381	987	398	219	626	878	481
Monkfish	28,240	23,233	17,114	24,091	18,346	19,685	15,977	19,391	16,505
Plaice, American	23,159	16,995	16,019	14,662	13,714	11,466	7,262	3,740	2,418
Scup	4,551	2,428	3,124	2,997	1,593	2,481	4,987	6,216	5,430
Skate	16,601	12,169	15,681	13,303	13,427	12,618	11,688	11,573	13,346
Squid, *Illex*	4,021	2,180	3,172	1,996	1,918	815	848	1,262	2,899
Squid, *Loligo*	22,885	30,087	32,603	37,358	26,879	25,861	31,164	21,793	21,847
Other Finfish	4,997	4,282	3,757	3,485	2,635	2,993	3,093	1,729	2,074
Other Groundfish	19,785	14,993	15,681	12,144	11,167	9,874	7,161	8,476	8,237
Other Inverts	13,230	14,746	13,438	13,712	8,353	8,789	4,629	5,527	8,924
Other Species	2,821	2,393	2,378	2,002	1,492	1,308	1,357	1,660	1,976
Total	**301,241**	**258,715**	**260,348**	**247,675**	**220,825**	**226,090**	**210,278**	**191,556**	**191,032**

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 9. Percent of total hauls by main species[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Butterfish	2	2	1	1	1	2	1	0	1
Cod	10	9	8	6	8	11	10	9	6
Croaker, Atlantic	0	1	1	1	1	1	1	1	1
Dogfish	2	1	2	2	1	0	0	0	0
Flounder, Winter	9	10	10	8	10	11	9	9	8
Flounder, Witch	3	2	2	3	3	3	4	5	4
Flounder, Yellowtail	5	6	6	8	10	10	8	8	9
Fluke	13	9	11	10	10	10	15	15	16
Haddock	0	1	3	3	4	5	6	5	6
Hake, Silver	8	9	8	6	6	7	5	5	5
Herring, Atlantic	0	0	0	0	0	0	0	0	0
Mackerel, Atlantic	1	1	1	0	0	0	0	0	0
Monkfish	9	9	7	10	8	9	8	10	9
Plaice, American	8	7	6	6	6	5	3	2	1
Scup	2	1	1	1	1	1	2	3	3
Skate	6	5	6	5	6	6	6	6	7
Squid, *Illex*	1	1	1	1	1	0	0	1	2
Squid, *Loligo*	8	12	13	15	12	11	15	11	11
Other Finfish	2	2	1	1	1	1	1	1	1
Other Groundfish	7	6	6	5	5	4	3	4	4
Other Inverts	4	6	5	6	4	4	2	3	5
Other Species	1	1	1	1	1	1	1	1	1

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 10. Days absent by fishing region[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
1996	35,635	12,839	44,805	98	7,294	1,119	101,790
1997	28,273	10,286	42,215	90	6,385	1,059	88,308
1998	28,167	11,082	43,145	105	9,610	1,180	93,289
1999	25,261	11,572	43,160	90	8,347	790	89,220
2000	26,842	12,482	35,936	127	7,039	307	82,733
2001	30,093	13,562	34,231	35	6,246	128	84,295
2002	25,716	12,538	33,405	11	7,420	320	79,410
2003	23,506	14,046	29,313	69	6,941	329	74,204
2004	20,861	13,085	33,074	51	7,600	181	74,852

[a] Fishing region boundaries are illustrated in Figure 7.

Table 11. Mean and CV of days absent per trip by month for U.S. Northeast and Mid-Atlantic bottom trawl fishery, over 1996–2004

	Mean	CV
January	3.25	80.00
February	3.49	78.25
March	3.40	135.70
April	2.95	97.04
May	2.03	149.55
June	2.02	110.88
July	1.92	107.80
August	1.99	111.63
September	2.14	105.22
October	2.37	105.04
November	2.32	104.89
December	2.59	95.64

Table 12. Percent of trips assigned to main species[a] categories for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

Species	Percent of All Trips
Fluke	17.83
Squid, *Loligo*	10.34
Cod	8.27
Flounder, Winter	8.08
Silver Hake	6.68
Flounder, Yellowtail	6.18
Skate	5.83
Plaice, American	4.76
Monkfish	4.15
Herring, Atlantic	3.12
Flounder, Witch	2.96
Scup	2.84
Spiny Dogfish	1.58
Haddock	1.21
Mackerel, Atlantic	0.79
Squid, *Illex*	0.66
Others Species	12.97

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 13. Total live weight kept by species for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (metric tons)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	Avg
Butterfish	2,853	2,675	1,702	1,856	1,033	3,759	751	484	427	1,727
Cod	6,461	5,864	5,134	4,479	5,357	7,818	6,992	5,757	3,646	5,723
Croaker, Atlantic	1,941	3,529	2,575	3,896	3,424	3,202	3,847	4,728	4,416	3,506
Dogfish, Spiny	2,706	1,871	2,189	1,981	2,608	156	158	55	153	1,320
Flounder, Winter	3,339	3,856	3,915	3,772	5,203	6,332	5,411	5,213	4,473	4,613
Flounder, Witch	1,942	1,635	1,725	1,995	2,255	2,836	2,979	2,950	2,726	2,338
Flounder, Yllwtail	1,972	2,425	3,019	4,061	6,271	6,600	5,010	5,043	6,808	4,579
Fluke	5,008	3,286	4,246	4,125	4,279	4,191	5,665	5,552	7,126	4,831
Haddock	318	1,037	2,036	2,498	3,083	4,684	5,910	5,446	5,915	3,436
Hake, Silver	14,749	14,157	12,879	12,296	10,891	11,801	7,660	7,831	7,619	11,098
Herring, Atlantic	3,918	898	1,614	1,242	1,755	2,293	1,179	1,033	1,994	1,770
Mackerel, Atlantic	8,880	7,862	7,051	5,657	1,555	1,883	2,352	4,351	4,562	4,906
Monkfish	6,414	6,344	5,671	6,737	6,089	7,460	7,638	8,185	7,108	6,849
Plaice, American	3,949	3,480	3,135	2,971	3,792	4,020	3,229	2,194	1,580	3,150
Scup	2,096	1,148	1,617	952	700	1,015	1,894	2,850	2,557	1,648
Skates	8,925	8,186	9,700	9,619	9,165	9,664	7,793	8,129	9,070	8,917
Squid, *Illex*	9,663	12,774	20,712	7,011	7,396	3,447	2,437	6,451	25,289	10,576
Squid, *Loligo*	11,297	12,939	15,819	16,108	15,191	14,554	16,046	10,536	13,825	14,035
Other Finfish	2,248	2,000	2,012	1,761	1,529	1,710	1,888	1,259	1,562	1,774
Other Groundfish	8,011	6,742	7,315	6,712	6,573	7,031	5,401	6,431	5,938	6,684
Other Inverts	4,432	4,590	4,855	4,942	4,583	5,101	1,481	1,999	3,877	3,984
All Others	305	824	289	163	128	203	112	61	37	236
TOTAL	**111,427**	**108,121**	**119,209**	**104,834**	**102,860**	**109,760**	**95,834**	**96,537**	**120,707**	**107,699**

Table 14. Average annual nominal price for by species for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (U.S. dollars per live weight pound)

	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Butterfish	0.65	0.78	0.57	0.58	0.47	0.33	0.53	0.56	0.62
Cod	0.99	1.00	1.20	1.30	1.28	1.13	1.23	1.35	1.55
Croaker, Atlantic	0.27	0.22	0.24	0.21	0.24	0.18	0.20	0.18	0.23
Dogfish, Spiny	0.20	0.15	0.18	0.20	0.21	0.24	0.20	0.28	0.17
Flounder, Winter	1.39	1.34	1.35	1.27	0.99	0.90	1.07	0.96	1.11
Flounder, Witch	1.69	1.69	1.60	1.42	1.31	1.18	1.22	1.34	1.38
Flounder, Yellowtail	1.45	1.51	1.33	1.17	1.01	0.95	1.12	1.15	0.72
Fluke	1.67	1.74	1.65	1.66	1.60	1.45	1.30	1.42	1.47
Haddock	1.35	1.23	1.43	1.50	1.50	1.29	1.31	1.30	1.14
Hake, Silver	0.38	0.44	0.40	0.46	0.43	0.46	0.42	0.49	0.56
Herring, Atlantic	0.06	0.05	0.06	0.06	0.09	0.06	0.06	0.08	0.08
Mackerel, Atlantic	0.13	0.27	0.16	0.13	0.18	0.09	0.12	0.12	0.11
Monkfish	1.14	1.07	1.02	1.31	1.61	1.11	0.78	0.72	0.76
Plaice, American	1.27	1.32	1.32	1.24	1.03	0.98	1.15	1.16	1.18
Scup	1.01	1.31	1.26	1.17	1.11	0.66	0.54	0.52	0.60
Skates	0.30	0.18	0.18	0.17	0.21	0.17	0.18	0.17	0.23
Squid, *Illex*	0.26	0.20	0.19	0.24	0.20	0.21	0.24	0.27	0.30
Squid, *Loligo*	0.70	0.74	0.77	0.78	0.64	0.66	0.64	0.78	0.75
Average all harvest	0.67	0.67	0.64	0.74	0.74	0.71	0.77	0.75	0.67

Table 15. Average annual inflation-adjusted price[a] for principle species for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (U.S. dollars per live weight pound)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Butterfish	0.69	0.82	0.59	0.59	0.47	0.32	0.51	0.53	0.57
Cod	1.05	1.05	1.24	1.33	1.28	1.10	1.18	1.27	1.42
Croaker, Atlantic	0.29	0.23	0.25	0.21	0.24	0.18	0.19	0.17	0.21
Dogfish, Spiny	0.21	0.16	0.19	0.20	0.21	0.23	0.19	0.26	0.16
Flounder, Winter	1.48	1.40	1.40	1.30	0.99	0.88	1.03	0.90	1.01
Flounder, Witch	1.80	1.77	1.66	1.45	1.31	1.15	1.17	1.26	1.26
Flounder, Yellowtail	1.55	1.58	1.38	1.20	1.01	0.93	1.08	1.08	0.66
Fluke	1.78	1.82	1.71	1.70	1.60	1.42	1.25	1.33	1.34
Haddock	1.44	1.29	1.48	1.53	1.50	1.26	1.26	1.22	1.04
Hake, Silver	0.40	0.46	0.41	0.47	0.43	0.45	0.40	0.46	0.51
Herring, Atlantic	0.06	0.05	0.06	0.06	0.09	0.06	0.06	0.08	0.07
Mackerel, Atlantic	0.14	0.28	0.17	0.13	0.18	0.09	0.12	0.11	0.10
Monkfish	1.21	1.12	1.06	1.34	1.61	1.08	0.75	0.68	0.69
Plaice, American	1.35	1.38	1.37	1.27	1.03	0.96	1.10	1.09	1.08
Scup	1.08	1.37	1.31	1.20	1.11	0.64	0.52	0.49	0.55
Skates	0.32	0.19	0.19	0.17	0.21	0.17	0.17	0.16	0.21
Squid, *Illex*	0.28	0.21	0.20	0.25	0.20	0.21	0.23	0.25	0.27
Squid, *Loligo*	0.75	0.78	0.80	0.80	0.64	0.64	0.61	0.73	0.69
Average all harvest	0.71	0.70	0.66	0.76	0.74	0.69	0.74	0.70	0.61

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 16. Calculated nominal value by species for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (thousands of US dollars)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Butterfish	4,119	4,582	2,139	2,360	1,067	2,736	880	602	582
Cod	14,163	12,874	13,537	12,805	14,894	19,527	18,900	17,143	12,488
Croaker, Atlantic	1,157	1,718	1,373	1,836	1,841	1,300	1,668	1,833	2,244
Dogfish, Spiny	1,188	627	863	874	1,235	84	70	34	57
Flounder, Winter	10,223	11,407	11,660	10,569	11,410	12,604	12,714	11,032	10,899
Flounder, Witch	7,221	6,089	6,097	6,246	6,498	7,395	8,012	8,740	8,271
Flounder, Yellowtail	6,297	8,054	8,885	10,457	13,941	13,888	12,420	12,809	10,789
Fluke	18,442	12,594	15,414	15,053	15,126	13,384	16,195	17,361	23,091
Haddock	946	2,801	6,432	8,242	10,172	13,306	17,034	15,554	14,847
Hake, Silver	12,244	13,610	11,428	12,507	10,210	12,018	7,127	8,487	9,369
Herring, Atlantic	480	104	206	159	345	297	165	180	335
Mackerel, Atlantic	2,569	4,743	2,425	1,657	610	372	640	1,146	1,066
Monkfish	16,089	14,981	12,791	19,503	21,596	18,223	13,207	13,060	11,863
Plaice, American	11,058	10,118	9,113	8,092	8,580	8,680	8,170	5,621	4,109
Scup	4,679	3,312	4,478	2,463	1,715	1,487	2,235	3,247	3,400
Skates	5,934	3,243	3,943	3,541	4,307	3,592	3,043	3,087	4,597
Squid, *Illex*	5,502	5,706	8,514	3,697	3,318	1,612	1,271	3,835	16,693
Squid, *Loligo*	17,443	21,092	26,993	27,541	21,420	21,210	22,615	18,037	22,789
Other Finfish	3,683	2,485	2,540	2,525	2,686	3,022	3,321	3,197	3,672
Other Groundfish	11,530	11,761	10,780	9,788	8,518	8,442	8,029	7,683	8,106
Other Invertebrates	8,975	7,641	7,913	9,307	7,793	9,204	4,073	5,873	9,044
All Others	579	669	581	655	537	342	399	232	357
TOTAL	**164,521**	**160,211**	**168,105**	**169,877**	**167,819**	**172,725**	**162,188**	**158,793**	**178,668**

Table 17. Inflation-adjusted[a] calculated value by species for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (thousands of US dollars)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	Avg
Butterfish	4,389	4,802	2,217	2,412	1,067	2,672	845	566	532	2,167
Cod	15,092	13,493	14,033	13,085	14,894	19,070	18,141	16,112	11,413	15,037
Croaker, Atlantic	1,233	1,801	1,423	1,876	1,841	1,270	1,601	1,723	2,051	1,646
Dogfish, Spiny	1,266	657	895	893	1,235	82	67	32	52	575
Flounder, Winter	10,893	11,956	12,087	10,800	11,410	12,309	12,203	10,369	9,961	11,332
Flounder, Witch	7,694	6,382	6,320	6,382	6,498	7,222	7,690	8,215	7,559	7,107
Flounder, Yellowtail	6,710	8,441	9,210	10,685	13,941	13,563	11,921	12,039	9,860	10,708
Fluke	19,651	13,200	15,978	15,382	15,126	13,070	15,544	16,317	21,103	16,153
Haddock	1,008	2,936	6,667	8,422	10,172	12,994	16,350	14,619	13,569	9,637
Hake, Silver	13,047	14,265	11,846	12,780	10,210	11,736	6,841	7,977	8,562	10,807
Herring, Atlantic	511	109	214	162	345	290	158	169	306	252
Mackerel, Atlantic	2,737	4,971	2,514	1,693	610	363	614	1,077	974	1,728
Monkfish	17,144	15,702	13,259	19,929	21,597	17,796	12,676	12,275	10,842	15,691
Plaice, American	11,783	10,605	9,447	8,269	8,580	8,477	7,842	5,283	3,755	8,227
Scup	4,986	3,471	4,642	2,517	1,715	1,452	2,145	3,052	3,107	3,010
Skates	6,323	3,399	4,087	3,618	4,307	3,508	2,921	2,901	4,201	3,918
Squid, *Illex*	5,863	5,981	8,826	3,778	3,318	1,574	1,220	3,604	15,256	5,491
Squid, *Loligo*	18,587	22,107	27,981	28,143	21,421	20,713	21,707	16,953	20,827	22,049
Other Finfish	3,924	2,605	2,633	2,580	2,686	2,951	3,188	3,005	3,356	2,992
Other Groundfish	12,286	12,327	11,175	10,002	8,518	8,244	7,706	7,221	7,408	9,432
Other Invertebrates	9,563	8,009	8,203	9,510	7,793	8,988	3,909	5,520	8,265	7,751
All Others	617	701	602	669	537	334	383	218	326	488
TOTAL	**175,308**	**167,918**	**174,260**	**173,588**	**167,824**	**168,678**	**155,673**	**149,246**	**163,288**	**166,198**

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 18. Total landings (metric ton) and calculated value (thousand of dollars US) by fishing region[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
Total landings live weight (tonnes)							
1996	24,967	15,452	55,707	164	13,876	1,261	111,427
1997	19,819	12,588	59,251	118	15,238	1,108	108,121
1998	18,867	14,966	64,580	94	18,664	2,038	119,209
1999	17,905	17,992	50,735	91	16,948	1,164	104,834
2000	22,142	19,332	45,707	197	14,958	524	102,860
2001	28,923	24,648	43,909	70	12,101	108	109,760
2002	25,781	22,320	37,066	5	10,639	22	95,834
2003	22,913	27,754	31,995	65	13,808	2	96,537
2004	20,538	26,725	58,630	109	14,511	194	120,707
Avg	22,428	20,198	49,731	102	14,527	713	107,699
Total nominal calculated value ($ '000)							
1996	48,882	25,634	69,489	338	18,094	2,083	164,521
1997	43,675	24,644	74,990	168	14,798	1,938	160,213
1998	42,818	27,620	75,611	166	19,224	2,667	168,106
1999	42,887	34,967	71,774	175	18,116	1,958	169,877
2000	50,927	39,501	58,790	227	17,335	1,036	167,817
2001	57,802	44,160	55,861	71	14,695	138	172,725
2002	55,684	45,327	47,895	13	13,235	31	162,184
2003	48,528	52,459	42,290	111	15,401	5	158,794
2004	42,824	48,455	70,697	134	16,223	335	178,668
Total inflation adjusted[b] calculated value ($ '000, 2000=100)							
1996	52,087	27,315	74,045	360	19,280	2,220	175,308
1997	45,776	25,829	78,598	176	15,510	2,031	167,921
1998	44,386	28,631	78,379	172	19,928	2,764	174,261
1999	43,824	35,731	73,342	179	18,512	2,001	173,588
2000	50,929	39,502	58,792	227	17,335	1,036	167,822
2001	56,447	43,125	54,552	69	14,351	134	168,679
2002	53,447	43,507	45,971	12	12,703	30	155,669
2003	45,611	49,305	39,748	105	14,475	5	149,247
2004	39,138	44,284	64,611	123	14,826	306	163,288
Avg	47,961	37,470	63,115	158	16,324	1,170	166,198

a Fishing region boundaries are illustrated in Figure 7.

b Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 19. Average annual landings by species by fishing region[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (live weight, metric tons)

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
Bluefish	10	3	334	1	121	1	469
Butterfish	9	184	1,344	3	157	30	1,727
Cod	3,276	2,169	224	0	14	41	5,723
Croaker, Atlantic	3	3	241	0	3,257	3	3,506
Dogfish, Spiny	306	8	846	3	153	4	1,320
Flounder, Winter	1,826	1,514	1,239	0	12	21	4,613
Flounder, Witch	1,741	525	56	0	2	14	2,338
Flounder, Yllwtail	1,223	2,612	713	0	6	24	4,579
Fluke	26	76	2,429	15	2,264	22	4,831
Haddock	1,733	1,623	64	0	1	15	3,436
Hake, Silver	1,177	4,007	5,772	6	65	72	11,098
Herring, Atlantic	479	171	837	0	279	4	1,770
Mackerel, Atlantic	12	82	3,258	6	1,502	46	4,906
Monkfish	3,219	1,789	1,700	2	78	62	6,849
Plaice, American	2,290	805	30	0	2	23	3,150
Scup	2	6	1,513	3	119	5	1,648
Shad	12	0	126	0	10	0	148
Skates	1,326	1,590	5,814	5	157	26	8,917
Squid, Illex	2	45	7,290	13	3,123	103	10,576
Squid, Loligo	42	1,287	11,191	37	1,348	131	14,035
Other finfish	31	19	627	2	617	9	1,306
Other groundfish	3,442	1,332	1,786	1	78	43	6,684
Other pelagics	4	5	13	0	63	0	85
Other invertebrates	238	343	2,281	4	1,099	20	3,984
All others	0	0	1	0	0	0	1
Total Harvest	**22,428**	**20,198**	**49,731**	**102**	**14,527**	**720**	**107,697**

[a] Fishing region boundaries are illustrated in Figure 7.

Table 20. Total landings and calculated value by state of landing for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004	Avg
Landings in live weight (metric tons)										
Maine	9,218	7,265	6,139	6,169	7,746	10,169	8,996	8,721	7,374	7,977
New Hampshire	791	717	827	618	739	895	899	657	810	773
Massachusetts	28,851	25,014	26,738	28,616	31,173	38,237	36,414	36,169	37,335	32,061
Rhode Island	28,093	34,646	33,779	28,745	25,460	27,155	23,319	25,145	31,510	28,650
Connecticut	4,266	3,821	3,591	4,837	4,857	4,514	3,033	3,110	2,971	3,889
New York	10,684	11,922	13,581	12,728	11,861	12,826	9,322	6,518	8,373	10,868
New Jersey	20,321	16,060	26,254	14,306	12,847	8,741	5,849	6,679	20,510	14,619
Maryland	1,142	990	616	593	622	499	613	416	609	678
Virginia	3,934	3,359	3,581	3,779	3,333	2,643	2,327	2,792	3,935	3,298
North Carolina	4,125	4,100	4,105	4,403	4,225	4,065	5,063	6,308	7,279	4,853
TOTAL	111,425	107,894	119,211	104,794	102,863	109,744	95,835	96,515	120,706	107,665
Nominal calculated value ($ '000 nominal)										
Maine	18,884	16,716	14,863	15,948	19,802	21,017	19,212	17,171	15,962	
New Hampshire	1,201	974	1,182	923	1,682	1,698	1,954	1,366	1,744	
Massachusetts	56,805	53,990	57,366	64,904	68,956	77,701	78,459	76,238	71,171	
Rhode Island	32,223	38,415	36,176	35,883	28,452	29,244	25,453	26,235	32,435	
Connecticut	5,067	4,790	4,508	5,573	6,134	5,643	3,750	3,797	4,019	
New York	14,257	18,036	18,840	18,868	16,482	17,313	12,874	10,675	14,143	
New Jersey	21,660	17,947	23,053	15,987	13,688	10,225	9,279	9,573	19,725	
Maryland	1,365	1,015	751	727	909	791	850	833	1,133	
Virginia	4,925	4,181	5,363	5,781	5,407	4,233	4,205	5,543	7,929	
North Carolina	8,134	3,925	6,004	5,218	6,304	4,841	6,148	7,217	9,569	
TOTAL	164,521	159,989	168,106	169,812	167,816	172,706	162,184	158,648	177,830	
Inflation adjusted[a] calculated value ($ '000 adjusted for inflation with 2000=100)										
Maine	20,122	17,520	15,407	16,296	19,803	20,525	18,440	16,139	14,588	17,649
New Hampshire	1,280	1,021	1,225	943	1,682	1,658	1,876	1,284	1,594	1,396
Massachusetts	60,529	56,587	59,466	66,322	68,958	75,881	75,307	71,654	65,044	66,639
Rhode Island	34,336	40,263	37,501	36,667	28,453	28,559	24,431	24,658	29,643	31,612
Connecticut	5,399	5,020	4,673	5,695	6,134	5,511	3,599	3,569	3,673	4,808
New York	15,192	18,904	19,530	19,280	16,482	16,907	12,357	10,033	12,926	15,735
New Jersey	23,080	18,810	23,897	16,336	13,688	9,985	8,906	8,997	18,027	15,748
Maryland	1,454	1,064	778	743	909	772	816	783	1,035	928
Virginia	5,248	4,382	5,559	5,907	5,407	4,134	4,036	5,210	7,246	5,237
North Carolina	8,667	4,114	6,224	5,332	6,304	4,728	5,901	6,783	8,745	6,311
TOTAL	175,308	167,686	174,261	173,522	167,821	168,660	155,669	149,109	162,522	166,062

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 21. Average values per vessel including number of trips, days absent, days fished, landings per unit of effort, and value, for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (CV in parentheses)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of vessels	944	874	892	829	807	791	762	751	732
Averages per vessel:									
Trips	42	42	43	44	45	45	47	44	47
	(99)	(97)	(102)	(100)	(102)	(102)	(100)	(103)	(100)
Days absent	111	104	106	109	104	109	108	103	107
	(80)	(77)	(74)	(68)	(70)	(69)	(68)	(73)	(74)
Days fished	39	36	36	38	34	35	33	31	30
	(100)	(94)	(91)	(87)	(85)	(87)	(80)	(84)	(88)
Landings (live, '000 lbs)	272	295	316	291	302	332	304	318	414
	(185)	(295)	(279)	(207)	(213)	(230)	(191)	(295)	(353)
Landings per day absent (live lb/da)	2,113	2,034	2,127	2,106	2,322	2,580	2,300	2,351	2,918
	(209)	(156)	(192)	(159)	(129)	(293)	(117)	(142)	(198)
Landings per day fished (live lb/df)	11,086	8,476	9,122	8,943	12,188	11,598	9,489	12,725	17,126
	(448)	(247)	(341)	(324)	(511)	(563)	(244)	(487)	(402)
Nominal value ($)	173,362	183,520	188,459	205,165	207,952	217,812	212,283	211,163	243,085
	(134)	(142)	(133)	(124)	(113)	(128)	(107)	(118)	(137)
Inflation adjusted[a] value ($)	184,728	192,349	195,359	209,647	207,958	212,709	203,756	198,467	222,160
	(134)	(142)	(133)	(124)	(113)	(128)	(107)	(118)	(137)

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 22. Number of vessels within each ton class[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004.

	TC1	TC2	TC3	TC4	Total GRT known	Unknown GRT
1996	13	377	429	125	944	0
1997	10	343	394	123	870	4
1998	11	363	382	125	881	11
1999	10	314	372	126	822	7
2000	7	310	358	122	797	10
2001	8	313	350	111	782	9
2002	8	299	340	102	749	13
2003	10	298	336	93	737	14
2004	7	287	328	94	716	16

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no bottom trawl vessels in TC5. Vessels with unknown GRT include state registered vessels.

Table 23. Mean vessel characteristics by ton class[a] for U.S. Northeast and Mid-Atlantic bottom trawl vessels, 1996–2004

	TC1		TC2		TC3		TC4	
	Mean	***CV***	***Mean***	***CV***	***Mean***	***CV***	***Mean***	***CV***
Average Vessel Horsepower (VHP)								
1996	200	49.4	301	35.2	482	40.5	872	29.1
1997	274	31.8	300	34.8	481	39.1	846	29.5
1998	278	27.1	301	35.4	473	39.9	863	29.2
1999	235	47.1	302	35.0	478	40.3	877	39.2
2000	241	29.6	299	36.8	475	40.4	862	34.4
2001	252	28.2	302	36.7	472	36.5	872	40.9
2002	244	37.1	306	36.5	476	36.6	857	34.7
2003	225	45.3	315	40.1	485	43.2	845	36.2
2004	263	30.4	309	33.4	486	38.2	867	35.2
Average Vessel Length (Feet)								
1996	30	34.1	45	17.2	69	11.6	86	12.0
1997	36	18.8	45	16.5	69	11.8	85	11.5
1998	37	22.9	45	16.6	69	119.9	85	12.6
1999	34	31.7	45	16.1	69	11.8	85	12.8
2000	39	17.0	45	16.3	69	12.0	85	13.5
2001	40	16.1	45	15.6	69	11.8	85	12.4
2002	38	23.8	45	15.5	69	12.5	84	11.4
2003	35	30.3	45	15.4	69	12.5	83	11.4
2004	40	17.1	45	15.9	69	12.6	84	12.5
Average Gross Registered Tons (GRT)								
1996	3	43.0	26	47.8	103	27.6	179	15.1
1997	4	19.4	27	16.9	104	27.3	177	14.1
1998	3	33.7	27	46.7	102	27.5	177	14.1
1999	3	38.6	27	45.7	102	27.4	179	20.3
2000	4	22.0	27	46.7	102	28.0	177	14.1
2001	4	20.5	27	47.3	102	27.8	177	19.1
2002	3	35.8	27	47.4	102	27.5	174	10.3
2003	3	32.3	27	46.7	102	27.4	172	8.1
2004	4	22.0	27	45.8	102	27.3	176	11.2

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no bottom trawl vessels in TC5.

Table 24. Total effort measures by ton class[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	TC1	TC2	TC3	TC4	Total
Total Trips					
1996	269	19,261	15,812	3,166	38,508
1997	210	18,530	14,733	2,959	36,432
1998	268	19,564	14,748	2,988	37,568
1999	290	18,074	14,024	3,070	35,458
2000	305	17,363	14,007	3,273	34,948
2001	408	18,081	12,587	2,624	33,700
2002	508	18,721	12,711	2,347	34,287
2003	563	16,628	11,679	2,029	30,899
2004	399	16,660	12,004	2,251	31,314
Total Days Absent					
1996	309	25,758	55,107	19,572	100,746
1997	230	23,516	46,076	17,575	87,397
1998	354	25,747	48,073	17,513	91,687
1999	339	23,678	45,138	18,295	87,450
2000	411	23,985	41,061	15,481	80,938
2001	495	25,369	40,995	15,167	82,026
2002	642	23,979	39,739	12,947	77,307
2003	773	21,783	37,265	11,585	71,406
2004	588	21,054	38,389	11,748	71,779
Total Days Fished					
1996	93	7,530	21,115	8,579	37,317
1997	71	6,906	16,772	7,627	31,376
1998	88	7,345	17,274	7,336	32,043
1999	84	6,662	16,602	7,639	30,987
2000	88	6,209	14,589	6,345	27,231
2001	104	6,296	14,881	6,501	27,782
2002	124	5,892	13,844	5,554	25,414
2003	159	5,347	12,756	4,861	23,123
2004	133	4,950	12,419	4,546	22,048

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no bottom trawl vessels in TC5.

Table 25. Total landings (live weight) and calculated value (thousands dollars US) by ton class[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	TC1	TC2	TC3	TC4	Total
Total landings, live weigh (metric tons)					
1996	129	10,788	61,650	38,810	111,377
1997	86	10,253	55,445	42,319	108,103
1998	131	10,580	58,630	49,784	119,125
1999	98	10,947	52,593	40,952	104,590
2000	118	12,106	54,518	35,860	102,602
2001	155	14,658	53,519	40,908	109,240
2002	233	12,841	52,106	30,409	95,589
2003	278	10,771	52,014	33,180	96,243
2004	238	10,662	63,613	45,775	120,288
Total nominal calculated value (US $ '000)					
1996	243	18,433	93,679	52,056	164,411
1997	172	18,039	85,827	56,136	160,174
1998	241	19,186	88,828	59,685	167,940
1999	191	18,701	89,078	61,666	169,636
2000	280	22,375	89,931	54,962	167,548
2001	344	24,575	89,727	57,824	172,470
2002	586	22,889	90,599	47,853	161,927
2003	737	20,185	89,986	47,411	158,319
2004	555	20,165	99,649	57,538	177,907
Total inflation adjusted[b] calculated value (2000=100, US $ '000					
1996	259	19,642	99,821	55,469	175,190
1997	180	18,907	89,956	58,837	167,880
1998	250	19,888	92,080	61,870	174,089
1999	195	19,110	91,024	63,013	173,342
2000	280	22,376	89,934	54,964	167,553
2001	336	23,999	87,625	56,469	168,429
2002	562	21,970	86,960	45,931	155,423
2003	693	18,971	84,576	44,560	148,800
2004	507	18,429	91,071	52,585	162,592

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no bottom trawl vessels in TC5.
[b] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 26. Mean annual landings (live weight) by ton class[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (metric tons)

	TC1	TC2	TC3	TC4
Bluefish	0	86	264	100
Butterfish	0	145	642	920
Cod	59	863	2,909	1,891
Croaker, Atlantic	0	54	2,770	681
Dogfish, Spiny	6	275	958	80
Flounder, Winter	4	723	2,823	1,057
Flounder, Witch	19	612	1,227	479
Flounder, Yllwtail	13	580	3,124	862
Fluke	0	744	3,331	728
Haddock	7	80	1,729	1,620
Hake, Silver	5	606	5,881	4,606
Herring, Atlantic	6	173	328	1,218
Mackerel, Atlantic	2	56	1,088	3,759
Monkfish	10	744	3,583	2,512
Plaice, American	14	843	1,600	692
Scup	0	157	1,082	387
Shad	0	62	82	3
Skates	2	2,030	6,086	783
Squid, Illex	0	16	3,055	7,504
Squid, Loligo	0	729	6,620	6,682
Other finfish	0	192	765	334
Other groundfish	8	657	3,833	2,162
Other pelagics	0	5	51	29
Invertebrates	7	1,077	2,209	686
All others	0	0	1	0
TOTAL	**163**	**11,512**	**56,043**	**39,778**

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no bottom trawl vessels in TC5.

Table 27. Mean and CV for codend mesh size (inches) by fishing region[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	Gulf of Maine		Georges Bank		North Southern New England		South Southern New England		Mid-Atlantic		Unknown	
	Mean	*CV*	*Mean*	*CV*	*Mean*	*CV*	*Mean*	*CV*	*Mean*	*CV*	*Mean*	*CV*
1996	5.4	26.7	5.3	25.1	4.4	38.4	5.1	26.4	4.6	31.3	4.6	37.5
1997	5.5	23.6	5.3	25.4	4.4	39.8	4.4	39.5	4.5	30.2	4.7	35.4
1998	5.6	20.5	5.3	26.2	4.2	42.5	5.3	27.4	4.7	28.2	4.7	37.8
1999	5.6	22.2	5.3	25.7	4.3	40.7	4.9	24.7	4.7	28.6	4.6	43.2
2000	5.9	16.0	5.5	24.8	4.3	42.6	4.0	37.2	4.7	28.2	5.2	31.8
2001	5.8	17.3	5.3	26.6	4.5	38.1	4.6	36.1	4.8	26.6	3.2	50.2
2002	6.0	17.8	5.6	24.0	4.7	36.2	5.0	30.0	5.1	20.7	4.3	40.3
2003	6.2	15.2	5.5	28.5	4.9	34.4	5.5	16.3	5.1	19.8	4.7	37.8
2004	6.1	17.9	5.7	24.5	5.1	33.0	4.1	42.4	5.0	22.8	5.3	25.8

[a] Fishing region boundaries are illustrated in Figure 7.

Table 28. Average codend mesh size by ton class[a] of vessel for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (CV in parentheses)

	TC1	TC2	TC3	TC4
1996	5.6 (21.6)	5.0 (30.3)	4.7 (36.5)	4.4 (41.5)
1997	5.9 (11.6)	5.1 (29.5)	4.6 (37.8)	4.3 (42.6)
1998	5.5 (21.6)	5.1 (29.8)	4.5 (39.7)	4.2 (44.9)
1999	5.2 (31.4)	5.0 (32.3)	4.7 (36.4)	4.3 (42.3)
2000	5.7 (17.2)	5.3 (26.3)	4.5 (27.0)	4.1 (22.2)
2001	5.8 (14.4)	5.3 (27.4)	4.8 (34.7)	4.5 (36.3)
2002	6.1 (15.1)	5.5 (27.0)	4.9 (33.3)	4.7 (36.1)
2003	6.3 (11.7)	5.7 (23.4)	5.2 (31.8)	4.7 (38.5)
2004	5.9 (26.1)	5.7 (24.3)	5.2 (31.5)	4.6 (39.5)

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no bottom trawl vessels in TC5.

Table 29. Average footrope length (feet) by fishing region[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown
1996	83.2 (31.7)	92.2 (28.6)	83.9 (31.6)	75.2 (33.3)	86.1 (31.1)	83.3 (38.1)
1997	83.1 (32.0)	94.8 (31.1)	82.8 (33.2)	114.6 (29.9)	87.7 (29.1)	82.9 (34.9)
1998	81.3 (31.7)	99.4 (32.0)	83.2 (34.1)	66.1 (51.3)	84.9 (33.0)	90.2 (38.4)
1999	84.0 (31.4)	103.7 (32.6)	82.7 (31.8)	128.7 (40.6)	86.4 (30.6)	96.4 (31.7)
2000	88.1 (33.1)	114.8 (31.4)	85.6 (32.3)	117.0 (31.8)	86.3 (28.6)	104.7 (34.0)
2001	88.4 (33.7)	117.3 (29.3)	83.1 (32.1)	104.7 (34.9)	84.1 (28.9)	81.8 (41.7)
2002	89.3 (32.0)	117.6 (28.6)	82.0 (29.5)	74.0 (31.1)	79.6 (27.0)	110.9 (33.0)
2003	90.0 (33.3)	117.1 (28.6)	80.8 (28.8)	75.1 (26.4)	77.4 (29.9)	107.5 (28.2)
2004	90.5 (33.6)	114.4 (29.0)	81.3 (31.5)	124.2 (27.1)	75.7 (34.8)	91.4 (27.0)

[a] Fishing region boundaries are illustrated in Figure 7.

Table 30. Mean footrope length (feet) by ton class[a] for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (CV in parentheses)

	TC1	TC2	TC3	TC4
1996	74.9 (33.9)	71.2 (24.7)	93.0 (26.4)	119.1 (24.9)
1997	77.0 (38.9)	71.1 (25.3)	92.4 (27.5)	120.0 (26.5)
1998	65.4 (18.4)	71.2 (24.6)	92.2 (29.3)	124.3 (26.3)
1999	69.4 (41.8)	72.7 (25.0)	92.5 (27.0)	122.3 (26.1)
2000	67.9 (17.2)	74.6 (26.3)	96.8 (27.0)	129.8 (22.2)
2001	72.0 (13.0)	75.5 (26.2)	95.9 (28.2)	131.6 (23.1)
2002	73.5 (16.4)	75.1 (25.3)	95.1 (26.9)	128.7 (21.1)
2003	70.7 (19.8)	76.7 (26.4)	95.2 (27.9)	128.0 (23.5)
2004	73.9 (19.3)	75.1 (25.1)	95.3 (29.2)	129.9 (24.3)

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no bottom trawl vessels in TC5.

Table 31. Total and annual distribution of days fished by SST groups (degrees Celsius) for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total days fished									
0 – 5	9,010	7,783	8,499	6,730	4,065	2,339	2,906	4,258	3,984
5-10	10,136	8,671	8,692	9,322	8,265	10,212	9,840	7,169	6,610
10-15	8,523	5,828	6,761	5,959	6,076	6,379	5,032	5,073	4,937
15 – 20	7,839	6,885	5,976	6,669	6,817	6,900	5,385	5,402	5,092
20 – 25	1,607	1,977	2,130	2,383	1,915	2,158	2,179	1,382	1,387
> 25	61	43	52	158	41	57	89	80	63
TOTAL	37,175	31,186	32,110	31,221	27,178	28,045	25,431	23,363	22,073
Distribution (%)									
0 – 5	24	25	26	22	15	8	11	18	18
5-10	27	28		30	30	36	39	31	30
10-15	23	19	21	19	22	23	20	22	22
15 – 20	21	22	19	21	25	25	21	23	23
20 – 25	4	6	7	8	7	8	9	6	6
> 25	0	0	0	1	0	0	0	0	0

Table 32. Total and annual distribution of hauls by SST groups (degrees Celsius) for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total number of hauls									
0 - 5	70,707	62,426	66,848	52,612	30,595	16,793	20,934	29,716	27,297
5-10	77,076	68,521	66,612	69,569	61,796	76,756	75,090	55,984	52,494
10-15	67,668	47,070	55,231	47,982	49,381	52,605	43,198	42,572	43,888
15 - 20	66,847	59,020	49,874	54,482	57,052	58,273	46,665	47,439	47,499
20 - 25	17,124	19,546	20,978	22,686	20,462	22,429	22,738	15,453	17,364
> 25	489	412	518	1,183	357	571	887	724	768
TOTAL	299,911	256,995	260,061	248,514	219,643	227,427	209,512	191,888	189,310
Distribution (%)									
0 - 5	24	24	26	21	14	7	10	15	14
5-10	26	27	26	28	28	34	36	29	28
10-15	23	18	21	19	22	23	21	22	23
15 - 20	22	23	19	22	26	26	22	25	25
20 - 25	6	8	8	9	9	10	11	8	9
> 25	0	0	0	0	0	0	0	0	0

Table 33. Total and annual distribution of days fished by bottom depth groups (meters) for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total days fished									
0 – 50	15,445	13,817	13,953	13,290	10,672	9,347	9,386	7,653	7,239
50 – 100	7,907	6,929	7,130	6,617	7,117	7,332	6,650	6,311	6,376
100 – 200	9,230	7,018	6,714	7,053	6,351	7,958	6,461	5,898	5,330
200 - 2000	4,476	3,310	4,140	4,101	2,921	3,291	2,807	3,324	3,065
> 2000	118	112	173	160	117	118	127	178	62
TOTAL	37,175	31,186	32,110	31,221	27,178	28,045	25,431	23,363	22,073
Distribution (%)									
0 – 50	42	44	43	43	39	33	37	33	33
50 – 100	21	22	22	21	26	26	26	27	29
100 – 200	25	23	21	23	23	28	25	25	24
200 - 2000	12	11	13	13	11	12	11	14	14
> 2000	0	0	1	1	0	0	0	1	0

Table 34. Total and annual distribution of hauls by bottom depth groups (meters) for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total number of hauls									
0 – 50	152,556	136,451	133,554	127,540	106,655	96,591	97,925	82,316	80,637
50 – 100	61,987	56,502	57,519	53,096	58,571	62,202	56,181	51,871	55,278
100 – 200	55,777	42,250	40,774	41,832	36,240	47,230	37,880	36,267	33,701
200 - 2000	28,621	20,802	26,877	24,786	17,241	20,363	16,565	20,007	19,125
> 2000	969	989	1,337	1,259	935	1,041	960	1,428	569
TOTAL	299,910	256,994	260,061	248,513	219,642	227,427	209,511	191,889	189,310
Distribution (%)									
0 – 50	51	53	51	51	49	42	47	43	43
50 – 100	21	22	22	21	27	27	27	27	29
100 – 200	19	16	16	17	16	21	18	19	18
200 - 2000	10	8	10	10	8	9	8	10	10
> 2000	0	0	1	1	0	0	0	1	0

Table 35. Total and distribution of days fished by bottom slope groups (degree) for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total days fished									
0 - 0.5	32,982	27,929	27,759	26,855	24,643	24,854	22,893	20,109	19,300
0.5 - 1.0.	1,629	1,071	1,406	1,283	904	1,398	1,113	1,376	1,155
1.0 - 4.0	2,092	1,813	2,449	2,527	1,375	1,522	1,190	1,624	1,342
> 4.0	472	373	496	556	257	271	235	254	275
TOTAL	37,175	31,186	32,110	31,221	27,178	28,045	25,431	23,363	22,073
Distribution (%)									
0 - 0.5	89	90	86	86	91	89	90	86	87
0.5 - 1.0.	4	3	4	4	3	5	4	6	5
1.0 - 4.0	6	6	8	8	5	5	5	7	6
> 4.0	1	1	2	2	1	1	1	1	1

Table 36. Total and annual distribution of hauls by bottom slope groups (degree) for U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total number of hauls									
0 - 0.5	268,169	232,982	227,871	218,635	201,829	203,009	190,661	167,454	167,207
0.5 - 1.0.	11,347	7,686	9,933	8,922	6,350	10,162	7,837	9,613	8,445
1.0 - 4.0	16,631	13,391	18,206	16,989	9,325	11,974	9,192	12,816	11,173
> 4.0	3,762	2,935	4,051	3,967	2,139	2,281	1,820	2,006	2,484
TOTAL	299,909	256,994	260,061	248,513	219,643	227,426	209,510	191,889	189,309
Distribution (%)									
0 - 0.5	89	91	88	88	92	89	91	87	88
0.5 - 1.0.	4	3	4	4	3	4	4	5	4
1.0 - 4.0	6	5	7	7	4	5	4	7	6
> 4.0	1	1	2	2	1	1	1	1	1

Table 37. Total vessels and trips by year for mid-water (single and paired) trawl fisheries in the U.S. Northeast and Mid-Atlantic, 1996–2004

	Total Vessels	Total Trips
1996	40	1,247
1997	37	1,039
1998	45	1,073
1999	35	983
2000	40	1,155
2001	36	1,274
2002	35	1,260
2003	35	1,234
2004	33	1,231

Table 38. Days fished by fishing region[a] for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
1996	150	27	210	0	94	3	484
1997	141	17	186	0	29	1	374
1998	158	65	150	0	64	8	445
1999	128	21	147	0	38	2	336
2000	131	41	151	1	21	0	345
2001	159	119	71	0	22	0	371
2002	163	72	86	0	7	0	328
2003	156	78	100	0	15	0	349
2004	137	40	104	0	21	0	302

[a] Fishing region boundaries are illustrated in Figure 7.

Table 39. Mean days fished per trip by fishing region[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown
1996	0.23	0.86	0.43	0.00	1.31	0.49
1997	0.30	0.42	0.40	0.00	0.51	0.31
1998	0.35	0.38	0.46	0.00	0.61	0.27
1999	0.24	0.37	0.45	0.00	0.72	0.25
2000	0.22	0.36	0.37	0.88	0.53	0.00
2001	0.23	0.45	0.28	0.00	0.36	0.00
2002	0.20	0.56	0.27	0.00	0.46	0.00
2003	0.22	0.55	0.28	0.00	0.46	0.00
2004	0.19	0.51	0.30	0.00	0.25	0.25

[a] Fishing region boundaries are illustrated in Figure 7.

Table 40. Total days fished by main species[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Bluefish	35	22	11	33	23	-	-	-	9
Butterfish	9	0	-	-	21	1	-	-	0
Croaker, Atlantic	4	11	9	8	12	7	5	4	0
Herring, Atlantic	229	228	232	219	238	312	255	266	211
Mackerel, Atlantic	35	59	33	20	17	22	49	58	71
Silver Hake	0	-	-	-	1	0	0	-	-
Squid, *Illex*	79	9	41	13	3	1	-	9	-
Squid, *Loligo*	36	9	52	10	13	7	9	-	3
Other Species	57	36	67	32	18	21	10	12	10
TOTAL	**483**	**374**	**444**	**335**	**345**	**372**	**327**	**349**	**303**

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 41. Percent of annual days fished by main species[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Bluefish	7	6	2	10	7	-	-	-	3
Butterfish	2	0	-	-	6	0	-	-	0
Croaker, Atlantic	1	3	2	2	3	2	1	1	0
Herring, Atlantic	47	61	52	65	69	84	78	76	70
Mackerel, Atlantic	7	16	8	6	5	6	15	17	23
Silver Hake	0	-	-	-	0	0	0	-	-
Squid, *Illex*	16	2	9	4	1	0	-	3	-
Squid, *Loligo*	7	2	12	3	4	2	3	-	1
Other Species	12	10	15	9	5	6	3	4	3

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 42. Total number of hauls by main species[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Bluefish	259	151	83	242	201	-	1	-	68
Butterfish	57	3	-	-	180	10	-	-	2
Croaker, Atlantic	67	189	129	114	132	113	61	44	14
Herring, Atlantic	1,842	1,848	1,765	1,629	1,871	2,257	2,018	1,891	1,648
Mackerel, Atlantic	387	649	400	265	190	270	554	582	759
Silver Hake	1	-	-	-	22	7	4	-	-
Squid, *Illex*	626	83	326	88	18	10	-	72	-
Squid, *Loligo*	328	69	418	100	98	56	67	-	44
Other Species	595	293	519	303	142	205	78	98	97
Total	**4,162**	**3,285**	**3,640**	**2,741**	**2,854**	**2,928**	**2,783**	**2,687**	**2,632**

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 43. Percent of total hauls by main species[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004
Bluefish	6	5	2	9	7	-	0	-	3
Butterfish	1	0	-	-	6	0	-	-	0
Croaker, Atlantic	2	6	4	4	5	4	2	2	1
Herring, Atlantic	44	56	48	59	66	77	73	70	63
Mackerel, Atlantic	9	20	11	10	7	9	20	22	29
Silver Hake	0	-	-	-	1	0	0	-	-
Squid, *Illex*	15	3	9	3	1	0	-	3	-
Squid, *Loligo*	8	2	11	4	3	2	2	-	2
Other Species	14	9	14	11	5	7	3	4	4

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 44. Days absent by fishing region[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
1996	1,578	188	1,319	0	419	30	3,534
1997	1,074	157	1,318	0	328	8	2,885
1998	891	573	811	0	465	65	2,805
1999	1,005	213	788	0	235	27	2,268
2000	1,127	373	898	2	172	0	2,572
2001	1,501	1,063	610	0	194	0	3,368
2002	1,722	518	846	0	66	14	3,166
2003	1,535	627	1,240	0	134	9	3,545
2004	1,402	328	1,263	0	356	1	3,350

[a] Fishing region boundaries are illustrated in Figure 7.

Table 45. Mean and coefficient of variation of days absent per trip by month for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, over 1996–2004

	Mean	CV
January	2.44	101.87
February	2.86	89.71
March	3.20	76.38
April	3.39	93.42
May	2.25	96.64
June	2.22	68.85
July	2.82	395.30
August	2.56	62.07
September	2.75	78.58
October	2.72	90.37
November	2.11	70.61
December	2.38	77.33

Table 46. Percent of trips assigned to main species[a] categories for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

Species	Percent of All Trips
Atlantic Herring	82.75
Atlantic Mackerel	9.62
Atlantic Croaker	1.39
Bluefish	1.27
Squid, *Illex*	1.20
Squid, *Loligo*	0.84
Scup	0.51
Other species	2.42

[a] Main species for a trip is defined as the species with the largest total weight (live) of landings.

Table 47. Total live weight kept by species for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (metric tons)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	Avg
Croaker, Atlantic	202	328	144	344	419	313	153	192	92	243
Herring, Atlantic	53,894	50,380	55,615	57,365	76,157	101,844	72,215	84,968	71,446	69,320
Mackerel, Atlantic	2,854	6,167	7,524	5,438	3,723	7,213	23,633	32,368	52,834	15,750
Scup	38	108	50	23	14	5	10	0	41	32
Squid, *Illex*	2,051	359	2,288	497	40	22	0	589	0	649
Squid, *Loligo*	663	192	622	76	90	99	94	3	24	207
All others	610	260	230	217	980	141	40	290	56	314
TOTAL	**60,312**	**57,794**	**66,473**	**63,960**	**81,422**	**109,636**	**96,144**	**118,411**	**124,493**	**86,516**

Table 48. Average annual nominal price for by species for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (U.S. dollars per live weight pound)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Herring, Atlantic	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.08
Mackerel, Atlantic	0.14	0.27	0.17	0.13	0.16	0.07	0.11	0.10	0.11
Average all harvest	0.08	0.09	0.09	0.07	0.07	0.06	0.08	0.08	0.09

Table 49. Average annual inflation adjusted price[a] for principle species for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (U.S. dollars per live weight pound)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Herring, Atlantic	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07
Mackerel, Atlantic	0.15	0.28	0.18	0.13	0.16	0.07	0.11	0.09	0.10
Average all harvest	0.09	0.09	0.09	0.07	0.07	0.06	0.08	0.08	0.08
GDP implicit price deflator[b]	93.85	95.41	96.47	97.86	100.00	102.40	104.19	106.40	109.42

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.
[b] Source: http://www.econstats.com Accessed September 1, 2005.

Table 50. Calculated nominal value by species for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (thousands of US dollars)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Herring, Atlantic	6,529	5,966	7,283	7,542	10,564	13,530	10,318	13,436	12,279
Mackerel, Atlantic	873	3,732	2,831	1,585	1,297	1,161	5,494	7,304	12,244
All Other	3,187	1,169	2,777	836	884	866	282	601	199
TOTAL	**10,589**	**10,867**	**12,891**	**9,963**	**12,745**	**15,557**	**16,094**	**21,341**	**24,722**

Table 51. Inflation adjusted[a] calculated value by species for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (thousands of US dollars)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Herring, Atlantic	6,957	6,253	7,550	7,707	10,564	13,213	9,904	12,628	11,222
Mackerel, Atlantic	930	3,912	2,935	1,620	1,297	1,134	5,273	6,865	11,190
All Other	3,396	1,225	2,879	854	884	846	271	565	182
TOTAL	**11,283**	**11,390**	**13,363**	**10,181**	**12,745**	**15,193**	**15,448**	**20,058**	**22,594**

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 52. Total landings (metric tons) and calculated value (thousand of dollars US) by fishing region[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
Total Landings (Live Weight Metric Tonnes)							
1996	27,727	1,886	28,387	0	2,006	306	60,312
1997	23,320	4,807	27,954	0	1,524	188	57,794
1998	24,401	16,070	18,392	0	6,095	1,515	66,473
1999	32,737	6,107	21,460	0	3,173	484	63,960
2000	38,663	12,603	28,540	98	1,518	0	81,422
2001	47,823	39,747	21,176	0	890	0	109,636
2002	47,236	14,761	33,902	0	244	0	96,144
2003	48,635	21,476	46,102	0	2,174	0	118,411
2004	48,307	10,604	46,665	0	18,819	98	124,493
Total Nominal Calculated Value ($ '000)							
1996	3,511	724	5,002	0	1,289	63	10,589
1997	2,892	607	6,425	0	921	22	10,867
1998	4,165	2,305	4,009	0	2,199	214	12,891
1999	4,572	896	3,410	0	999	85	9,963
2000	5,275	1,884	4,966	11	608	0	12,745
2001	6,280	5,510	2,928	0	406	0	15,124
2002	6,695	2,493	6,777	0	129	0	16,094
2003	7,845	3,385	9,654	0	752	0	21,341
2004	8,516	1,837	10,035	0	4,317	17	24,722
Total Inflation Adjusted[b] Calculated Value ($ '000)							
1996	3,741	771	5,330	0	1,374	67	11,283
1997	3,031	636	6,734	0	965	23	11,390
1998	4,317	2,389	4,156	0	2,280	222	13,364
1999	4,672	916	3,484	0	1,021	87	10,180
2000	5,275	1,884	4,966	11	608	0	12,744
2001	6,133	5,381	2,859	0	396	0	14,770
2002	6,426	2,393	6,505	0	124	0	15,448
2003	7,373	3,181	9,074	0	707	0	20,335
2004	7,783	1,679	9,171	0	3,945	15	22,594

[a] Fishing region boundaries are illustrated in Figure 7.
[b] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 53. Average annual landings by species by fishing region[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (live weight, metric tons)

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown	Total
Bluefish	0	0	53	0	4	0	57
Butterfish	0	5	32	0	5	0	42
Cod	2	0	0	0	0	0	2
Croaker, Atlantic	0	0	6	0	230	6	242
Dogfish, Spiny	3	0	0	0	2	0	6
Flounder, Winter	0	0	0	0	0	0	0
Flounder, Witch	1	0	0	0	0	0	1
Flounder, Yllwtail	0	1	0	0	0	0	1
Fluke	0	0	1	0	2	0	4
Haddock	4	0	0	0	0	0	4
Hake, Silver	0	0	2	0	0	0	2
Herring, Atlantic	37,372	14,076	17,486	11	113	263	69,321
Mackerel, Atlantic	253	107	12,019	0	3,358	15	15,751
Monkfish	1	0	4	0	0	0	6
Plaice, American	1	1	0	0	0	0	2
Scup	0	0	29	0	3	0	32
Shad	1	0	63	0	2	0	66
Skates	0	0	0	0	0	0	0
Squid, Illex	0	16	426	0	207	1	650
Squid, Loligo	0	23	144	0	40	2	208
Other finfish	4	0	8	0	42	0	54
Other groundfish	7	0	2	0	0	0	9
Other pelagics	0	0	14	0	35	0	49
Invertebrates	0	0	1	0	6	0	7
All others	0	0	0	0	0	0	0
Total Harvest	**37,650**	**14,229**	**30,289**	**11**	**4,049**	**288**	**86,516**

[a] Fishing region boundaries are illustrated in Figure 7.

Table 54. Total landings and calculated value by state of landing for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004	Avg
Landings (metric tons)										
Maine	10,895	8,675	5,328	24,117	39,828	45,556	29,479	32,340	26,782	24,778
New Hampshire	104	431	0	740	5,461	11,912	5,411	6,441	5,888	4,043
Massachusetts	20,093	23,959	35,569	15,953	6,007	27,583	28,493	51,832	65,954	30,605
Rhode Island	27,128	20,565	16,668	17,228	23,523	15,672	24,360	11,213	7,594	18,217
New York	422	129	30	101	310	0	1	0	48	116
New Jersey	1,235	3,631	8,711	5,382	5,915	8,420	8,242	15,155	18,103	8,310
Virginia	40	0	21	40	2	47	4	0	14	19
North Carolina	394	404	147	400	377	317	154	158	110	273
TOTAL	60,311	57,794	66,474	63,961	81,423	109,507	96,144	117,139	124,493	86,361
Nominal calculated value ($ '000)										
Maine	1,407	1,129	992	3,451	5,556	6,286	4,381	5,168	4,788	3,684
New Hampshire	12	177	0	91	744	1,625	786	1,079	1,030	616
Massachusetts	2,498	2,933	6,460	2,233	871	3,575	4,270	8,910	13,106	4,984
Rhode Island	5,442	3,874	2,010	2,068	3,437	1,933	4,649	2,327	1,482	3,025
Connecticut	0	0	0	0	0	0	0	0	0	0
New York	213	145	31	110	269	0	3	0	47	91
New Jersey	704	2,399	3,265	1,769	1,661	1,471	1,916	3,475	4,177	2,315
Maryland	0	0	0	0	0	0	0	0	0	0
Virginia	74	0	36	59	2	59	1	0	21	28
North Carolina	238	211	98	180	204	155	87	104	71	150
TOTAL	10,588	10,868	12,892	9,961	12,744	15,104	16,093	21,063	24,722	14,893
Inflation adjusted[a] calculated value ($ '000)										
Maine	1,499	1,183	1,028	3,526	5,556	6,139	4,205	4,857	4,376	3,597
New Hampshire	13	186	0	93	744	1,587	754	1,014	941	592
Massachusetts	2,662	3,074	6,697	2,282	871	3,491	4,098	8,374	11,978	4,836
Rhode Island	5,799	4,060	2,084	2,113	3,437	1,888	4,462	2,187	1,354	3,043
Connecticut	0	0	0	0	0	0	0	0	0	0
New York	227	152	32	112	269	0	3	0	43	93
New Jersey	750	2,514	3,385	1,808	1,661	1,437	1,839	3,266	3,817	2,275
Maryland	0	0	0	0	0	0	0	0	0	0
Virginia	79	0	37	60	2	58	1	0	19	28
North Carolina	254	221	102	184	204	151	84	98	65	151
TOTAL	11,282	11,391	13,364	10,179	12,744	14,750	15,447	19,797	22,594	14,616

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 55. Average values per vessel including number of trips, days absent, days fished, landings per unit of effort, and value, for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (CV in parentheses)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of vessels	40	37	45	35	40	36	35	35	33
Averages per vessel:									
Trips	31	28	24	28	29	36	36	36	37
	(147)	(160)	(149)	(133)	(137)	(129)	(133)	(98)	(111)
Days absent	89	78	62	67	65	94	91	103	102
	(152)	(121)	(131)	(119)	(120)	(110)	(119)	(98)	(99)
Days fished	12	10	10	10	9	10	9	10	9
	(145)	(138)	(152)	(118)	(130)	(118)	(130)	(96)	(107)
Landings (live, '000 lbs)	3,397	3,492	3,275	4,050	4,502	6,755	6,079	7,648	8,360
	(191)	(193)	(190)	(194)	(182)	(155)	(153)	(118)	(113)
Landings per day absent (live lb/da)	30,072	25,692	29,825	32,689	36,118	40,765	37,446	53,820	59,348
	(138)	(104)	(125)	(99)	(100)	(94)	(99)	(67)	(83)
Landings per day fished (live lb/df)	272,976	318,843	266,199	367,228	269,171	405,202	426,787	583,192	847,006
	(145)	(115)	(126)	(160)	(98)	(90)	(115)	(75)	(105)
Nominal value ($)	264,713	293,704	286,469	284,653	318,622	420,106	473,341	627,685	749,141
	(162)	(155)	(160)	(169)	(162)	(151)	(142)	(110)	(107)
Adjusted[a] value ($)	282,069	307,834	296,958	290,872	318,632	410,264	454,327	589,946	684,653
	(162)	(155)	(160)	(169)	(162)	(151)	(142)	(110)	(107)

[a] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 56. Number of vessels within each ton class[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	TC2	TC3	TC4	Total GRT known	*Unknown GRT*
1996	6	16	18	40	0
1997	4	16	17	37	0
1998	7	16	22	45	0
1999	6	14	15	35	0
2000	7	10	22	39	1
2001	4	11	21	36	0
2002	7	6	22	35	0
2003	4	8	23	35	0
2004	6	7	20	33	0

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no mid-water trawl vessels in TC1 or TC5.

Table 57. Mean vessel characteristics by ton class[a] for U.S. Northeast and Mid-Atlantic mid-water trawl vessels, 1996–2004

	TC2		TC3		TC4	
	Mean	**CV**	**Mean**	**CV**	**Mean**	**CV**
Average Vessel Horsepower (VHP)						
1996	311	13	625	37	969	30
1997	285	18	632	75	957	32
1998	385	35	698	69	1,203	47
1999	427	31	709	72	1,152	53
2000	400	30	713	78	1,131	50
2001	431	46	649	81	1,281	50
2002	376	44	904	69	1,363	45
2003	411	29	802	70	1,315	48
2004	429	28	850	71	1,331	42
Average Vessel Length (Feet)						
1996	42	22	75	8	93	20
1997	47	28	74	15	93	20
1998	45	12	75	15	98	19
1999	41	10	75	16	94	18
2000	39	10	78	14	94	17
2001	44	15	76	14	98	19
2002	40	17	81	17	102	22
2003	38	9	73	18	102	22
2004	39	8	75	19	104	22
Average Gross Registered Tons (GRT)						
1996	25	54	118	17	181	8
1997	34	43	112	22	180	8
1998	31	35	118	20	197	35
1999	20	41	115	23	201	39
2000	17	53	121	17	198	35
2001	23	31	121	12	201	34
2002	18	20	127	11	204	38
2003	18	10	114	26	202	38
2004	19	17	117	26	206	39

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no mid-water trawl vessels in TC1 or TC5.

Table 58. Total effort measures by ton class[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	TC2	TC3	TC4	Total
Total Trips				
1996	7	211	1,026	1,244
1997	45	157	837	1,039
1998	77	154	842	1,073
1999	115	131	737	983
2000	65	106	983	1,154
2001	20	92	1,162	1,274
2002	45	116	1,099	1,260
2003	35	125	1,074	1,234
2004	79	63	1,089	1,231
Total Days Absent				
1996	10	611	2,852	3,473
1997	103	610	2,133	2,846
1998	86	489	2,207	2,782
1999	118	413	1,732	2,263
2000	67	343	2,156	2,566
2001	20	374	2,951	3,345
2002	45	355	2,761	3,161
2003	35	333	3,166	3,534
2004	79	175	3,078	3,332
Total Days Fished				
1996	2	131	350	483
1997	6	85	283	374
1998	23	72	349	444
1999	18	95	222	335
2000	10	80	256	346
2001	2	42	328	372
2002	4	42	281	327
2003	2	32	315	349
2004	4	20	278	302

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no mid-water trawl vessels in TC1 or TC5.

Table 59. Total landings (live weight) and calculated value (thousands dollars US) by ton class[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	TC2	TC3	TC4	Total
Total Harvest (live weight, metric tons)				
1996	4	3,109	57,198	60,311
1997	769	2,845	54,180	57,794
1998	102	3,392	62,979	66,473
1999	325	3,822	59,813	63,960
2000	120	3,129	78,173	81,422
2001	23	6,375	103,238	109,636
2002	62	7,737	88,345	96,144
2003	43	9,247	109,121	118,411
2004	85	7,046	117,362	124,493
Total Nominal Calculated Value ($ '000)				
1996	6	1,327	9,254	10,587
1997	101	1,522	9,243	10,866
1998	18	1,725	11,149	12,892
1999	49	1,281	8,633	9,963
2000	16	1,261	11,468	12,745
2001	3	1,214	13,907	15,124
2002	9	1,513	14,572	16,094
2003	7	1,956	19,378	21,341
2004	17	1,712	22,992	24,721
Total Inflation Adjusted[b] Calculated Value ($ '000)				
1996	6	1,414	9,861	11,281
1997	106	1,595	9,688	11,389
1998	19	1,788	11,557	13,364
1999	50	1,309	8,822	10,181
2000	16	1,261	11,468	12,745
2001	3	1,186	13,581	14,770
2002	9	1,452	13,987	15,448
2003	7	1,838	18,213	20,058
2004	16	1,565	21,013	22,593

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no mid-water trawl vessels in TC1 or TC5.
[b] Adjusted for inflation using the GDP implicit price deflator (2000=100) with a base year of 2000, so that all prices are relative to 2000 values.

Table 60. Mean annual landings (live weight) by ton class[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (metric tons)

	TC2	TC3	TC4	Total
Herring, Atlantic	169	2,029	67,123	69,320
Mackerel, Atlantic	0	2,391	13,360	15,750
All Other	2	765	674	1,441
Total	170	5,185	81,156	86,512

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no mid-water trawl vessels in TC1 or TC5.

Table 61. Mean and CV for codend mesh size (inches) by fishing region[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004.

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown
1996	1.3 (42.3)	1.5 (41.7)	1.8 (38.7)	-	3.6 (37.2)	1.2 (29.3)
1997	1.5 (35.1)	1.9 (97.1)	1.8 (43.5)	-	3.7 (35.0)	-
1998	1.8 (63.2)	1.4 (47.5)	1.9 (45.5)	-	3.0 (47.9)	3.1 (68.6)
1999	1.4 (40.6)	1.1 (53.9)	2.2 (39.8)	-	3.3 (50.3)	3.6 (0.0)
2000	1.5 (38.2)	1.5 (33.6)	1.9 (27.8)	-	3.4 (42.9)	-
2001	1.4 (42.0)	1.4 (27.1)	1.8 (30.2)	-	3.4 (36.1)	-
2002	1.4 (39.9)	1.5 (26.4)	1.6 (27.2)	-	3.9 (17.3)	2.4 (-)
2003	1.4 (41.7)	1.3 (33.7)	1.7 (32.9)	-	2.9 (72.9)	-
2004	1.4 (43.8)	1.2 (22.7)	1.6 (33.0)	-	2.2 (39.9)	-

[a] Fishing region boundaries are illustrated in Figure 7.

Table 62. Average codend mesh size by ton class[a] of vessel for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (CV in parentheses)

	TC2	TC3	TC4
1996	5.1 (34.2)	2.8 (40.4)	1.3 (34.0)
1997	1.7 (44.9)	2.9 (44.6)	1.5 (39.6)
1998	2.3 (37.1)	2.8 (46.3)	1.7 (58.8)
1999	1.8 (32.2)	3.1 (37.3)	1.5 (46.3)
2000	2.0 (22.2)	2.9 (24.8)	1.5 (45.0)
2001	2.1 (15.1)	2.9 (35.2)	1.5 (47.6)
2002	1.9 (16.5)	2.1 (48.4)	1.4 (46.9)
2003	2.7 (56.1)	2.1 (48.5)	1.5 (43.6)
2004	2.5 (72.0)	2.7 (60.0)	1.4 (46.0)

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no mid-water trawl vessels in TC1 or TC5.

Table 63. Average footrope length (feet) by fishing region[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	Gulf of Maine	Georges Bank	North Southern New England	South Southern New England	Mid-Atlantic	Unknown
1996	149.6 (54.0)	144.2 (32.1)	152.6 (38.7)	-	116.7 (37.2)	125.3 (29.3)
1997	195.9 (54.5)	143.2 (35.4)	165.4 (43.5)	-	101.5 (35.0)	-
1998	196.2 (51.1)	174.4 (47.5)	174.3 (45.5)	-	145.0 (47.9)	158.6 (68.6)
1999	117.3 (52.2)	165.7 (53.9)	166.1 (39.8)	-	147.0 (50.3)	100.0 (0.0)
2000	202.9 (38.1)	204.3 (33.6)	188.0 (27.8)	-	133.4 (42.9)	-
2001	202.3 (33.1)	230.9 (27.1)	189.5 (30.2)	-	102.1 (36.1)	-
2002	185.4 (35.5)	246.7 (26.4)	235.2 (27.2)	-	94.8 (17.3)	240.0 (-)
2003	178.4 (33.9)	247.7 (33.7)	219.8 (32.9)	-	216.8 (72.9)	-
2004	174.5 (32.8)	220.5 (22.7)	228.7 (33.0)	-	238.0 (39.9)	-

[a] Fishing region boundaries are illustrated in Figure 7.

Table 64. Mean footrope length (feet) by ton class[a] for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004 (CV in parentheses)

	TC2	TC3	TC4
1996	58 (18.0)	132 (26.0)	153 (50.0)
1997	85 (16.0)	111 (23.4)	196 (47.7)
1998	78 (66.5)	131 (17.0)	195 (46.7)
1999	86 (17.9)	127 (26.9)	173 (44.2)
2000	90 (19.4)	132 (25.9)	213 (29.8)
2001	69 (19.1)	131 (64.6)	208 (29.5)
2002	91 (23.3)	128 (63.7)	212 (29.6)
2003	95 (13.6)	159 (67.1)	206 (32.4)
2004	97 (11.2)	121 (57.4)	208 (30.9)

[a] Ton classes are defined as: TC1 is 1-4 Gross Registered Tons (GRT), TC2 is 5-50 GRT, TC3 is 51-150 GRT, TC4 is 151-500 GRT and TC5 is greater than 500 GRT. There were no mid-water trawl vessels in TC1 or TC5.

Table 65. Total and annual distribution of days fished by SST groups (degrees Celsius) for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total days fished									
0 – 5	69	68	51	34	45	28	34	32	33
5-10	130	151	169	144	107	106	95	123	130
10-15	105	63	80	62	66	98	63	87	67
15 – 20	102	67	111	64	97	132	129	90	63
20 – 25	57	23	31	28	29	8	6	15	9
> 25	18	1	1	4	-	0	-	1	-
TOTAL	481	373	443	335	345	372	327	349	302
Distribution (%)									
0 – 5	14	18	12	10	13	8	10	9	11
5-10	27	40	38	43	31	28	29	35	43
10-15	22	17	18	19	19	26	19	25	22
15 – 20	21	18	25	19	28	36	40	26	21
20 – 25	12	6	7	8	8	2	2	4	3
> 25	4	0	0	1	-	0	-	0	-

Table 66. Total and annual distribution of hauls by SST groups (degrees Celsius) for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total number of hauls									
0 – 5	621	541	430	272	342	230	358	263	254
5-10	1,254	1,394	1,372	1,111	872	895	925	1,098	1,234
10-15	928	524	627	474	505	800	491	623	594
15 – 20	796	560	943	656	876	949	954	584	458
20 – 25	426	232	243	207	254	63	59	117	69
> 25	130	12	6	24		4		8	
TOTAL	4,155	3,263	3,621	2,744	2,849	2,941	2,787	2,693	2,609
Distribution (%)									
0 – 5	15	17	12	10	12	8	13	10	10
5-10	30	43	38	40	31	30	33	41	47
10-15	22	16	17	17	18	27	18	23	23
15 – 20	19	17	26	24	31	32	34	22	18
20 – 25	10	7	7	8	9	2	2	4	3
> 25	3	0	0	1	-	0	-	0	-

Table 67. Total and annual distribution of days fished by bottom depth groups (meters) for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total days fished									
0 – 50	153	126	158	120	152	89	65	84	100
50 – 100	131	132	126	111	85	141	131	146	107
100 – 200	125	93	129	92	97	134	116	109	89
200 - 2000	67	22	30	11	9	9	15	11	4
> 2000	4			1	1				2
TOTAL	481	373	443	335	345	372	327	349	302
Distribution (%)									
0 – 50	32	34	36	36	44	24	20	24	33
50 – 100	27	35	28	33	25	38	40	42	35
100 – 200	26	25	29	27	28	36	35	31	29
200 - 2000	14	6	7	3	3	2	5	3	1
> 2000	1	-	-	0	0	-	-	-	1

Table 68. Total and annual distribution of hauls by bottom depth groups (meters) for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total number of hauls									
0 - 50	1,442	1,217	1,429	994	1,344	861	670	699	816
50 - 100	1,090	1,170	985	954	659	1,097	1,140	1,134	1,040
100 - 200	1,012	732	955	691	769	899	877	774	672
200 - 2000	565	144	252	93	67	84	100	86	56
> 2000	46	.	.	12	10	.	.	.	25
TOTAL	4,155	3,263	3,621	2,744	2,849	2,941	2,787	2,693	2,609
Distribution (%)									
0 - 50	35	37	39	36	47	29	24	26	31
50 - 100	26	36	27	35	23	37	41	42	40
100 - 200	24	22	26	25	27	31	31	29	26
200 - 2000	14	4	7	3	2	3	4	3	2
> 2000	1	-	-	0	0	-	-	-	1

Table 69. Total and distribution of days fished by bottom slope groups (degree) for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total days fished									
0 - 0.5	331	327	340	296	301	306	273	290	277
0.5 - 1.0.	52	26	54	27	33	55	42	47	21
1.0 - 4.0	68	14	40	6	4	9	10	11	3
> 4.0	30	6	9	6	6	3	2	1	1
TOTAL	481	373	443	335	345	372	327	349	302
Distribution (%)									
0 - 0.5	69	88	77	88	87	82	83	83	92
0.5 - 1.0.	11	7	12	8	9	15	13	14	7
1.0 - 4.0	14	4	9	2	1	2	3	3	1
> 4.0	6	2	2	2	2	1	0	0	0

Table 70. Total and annual distribution of hauls by bottom slope groups (degree) for U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004.

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total number of hauls									
0 - 0.5	2,899	2,912	2,823	2,431	2,547	2,454	2,392	2,289	2,380
0.5 - 1.0.	407	182	401	202	222	367	304	295	148
1.0 - 4.0	622	122	317	54	36	83	79	106	63
> 4.0	227	47	80	57	44	37	12	3	18
TOTAL	4,155	3,263	3,621	2,744	2,849	2,941	2,787	2,693	2,609
Distribution (%)									
0 - 0.5	70	89	78	89	89	83	86	85	91
0.5 - 1.0.	10	6	11	7	8	12	11	11	6
1.0 - 4.0	15	4	9	2	1	3	3	4	2
> 4.0	5	1	2	2	2	1	0	0	1

Figure 1. Regulated Mesh Areas (RMA) as defined under the Northeast Multispecies Fishery Management Plan (FMP) including Gulf of Maine (GOM) RMA, Georges Bank (GB) RMA, Southern New England (SNE) RMA and Mid-Atlantic (MA) RMA

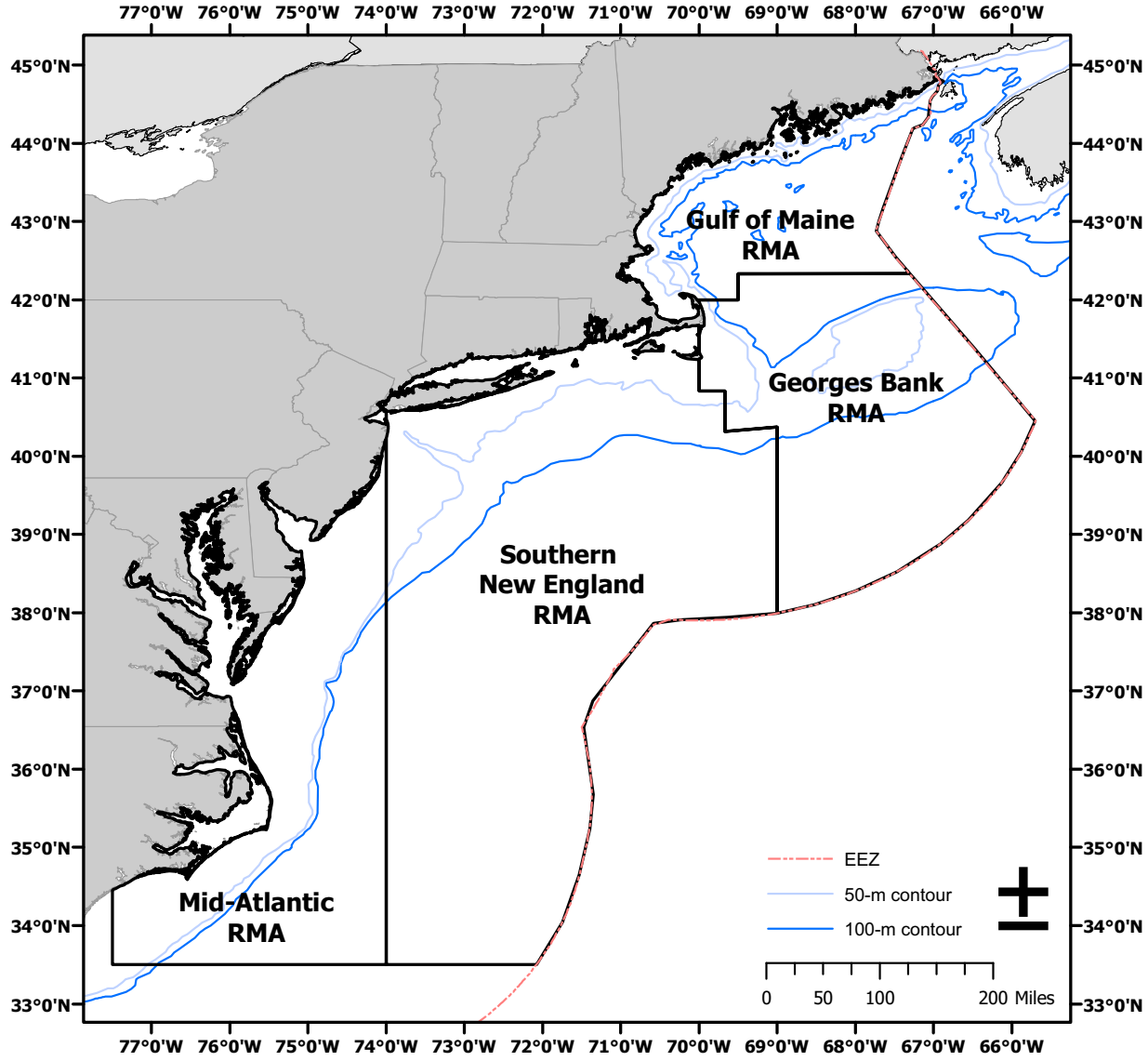


Figure 2. Seasonal closure areas defined under the Northeast Multispecies Fishery Management Plan (FMP) including the Gulf of Maine Rolling Closure Areas (RCA I – V) and Georges Bank Seasonal Closure Area

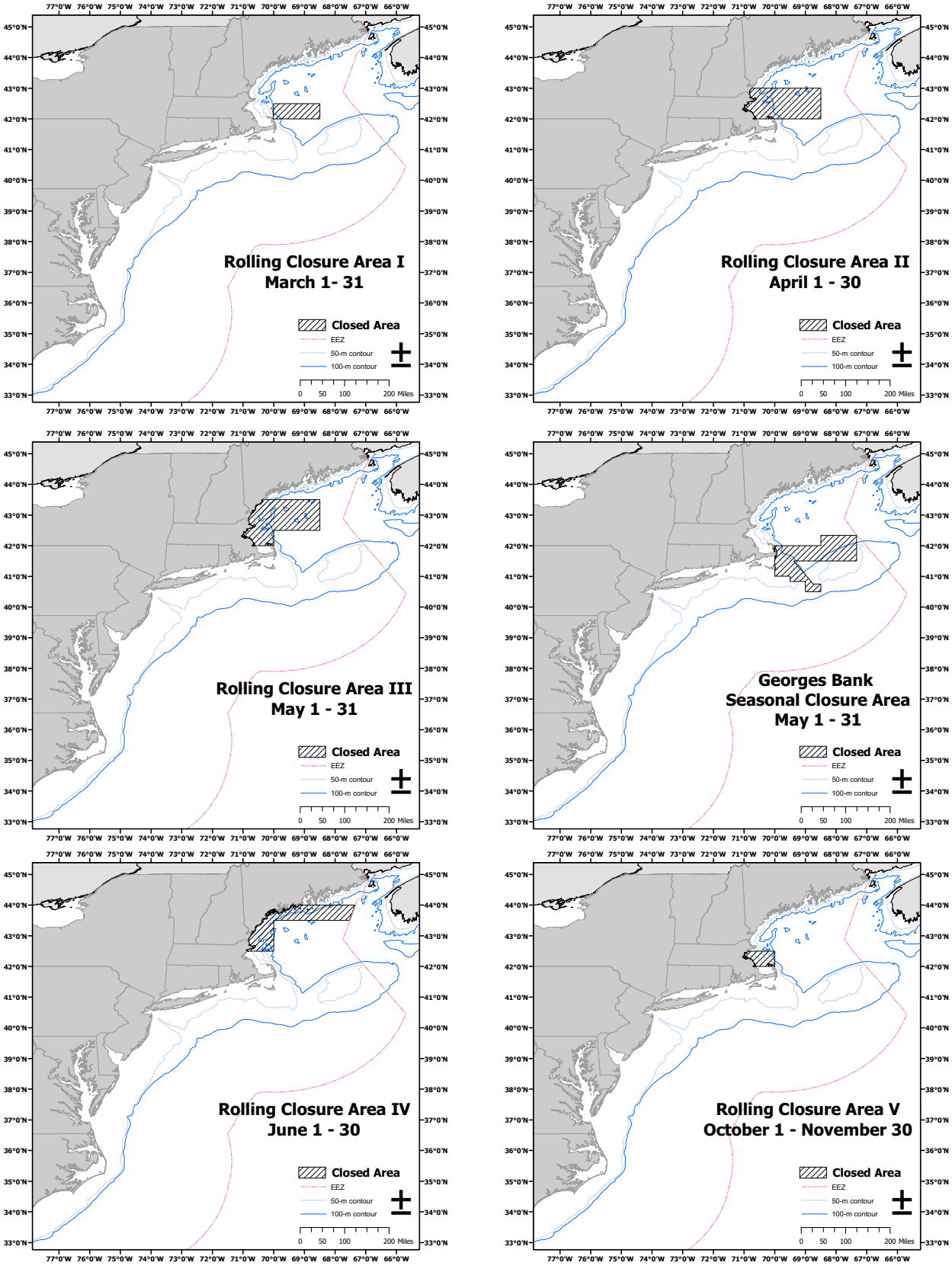


Figure 3. Year-round closure areas under the Northeast Multispecies Fishery Management Plan, including general (FMP) closures and Essential Fish Habitat (EFH) areas closed to bottom trawl gear

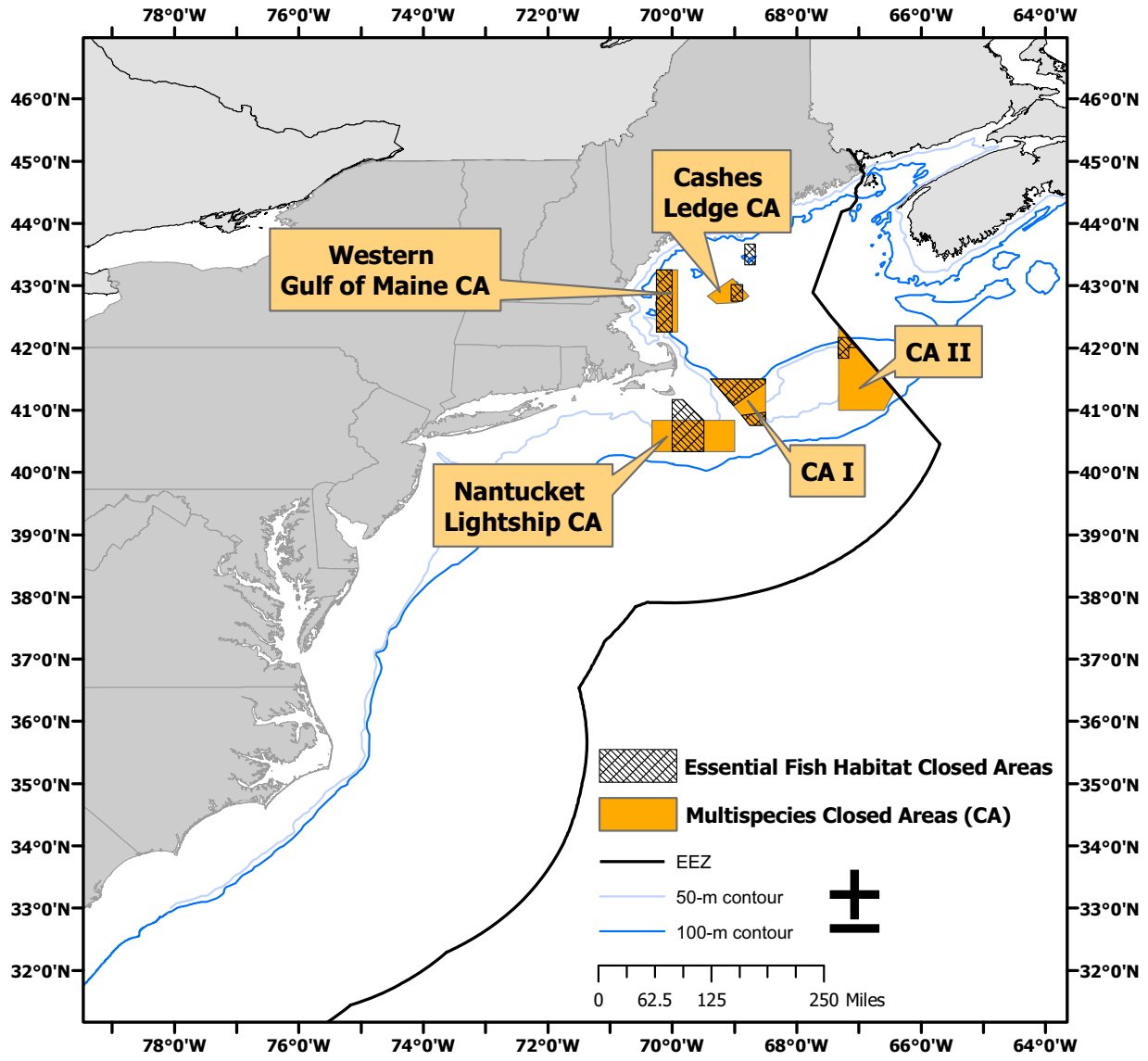


Figure 4. Atlantic Herring Fishery Management Plan management areas

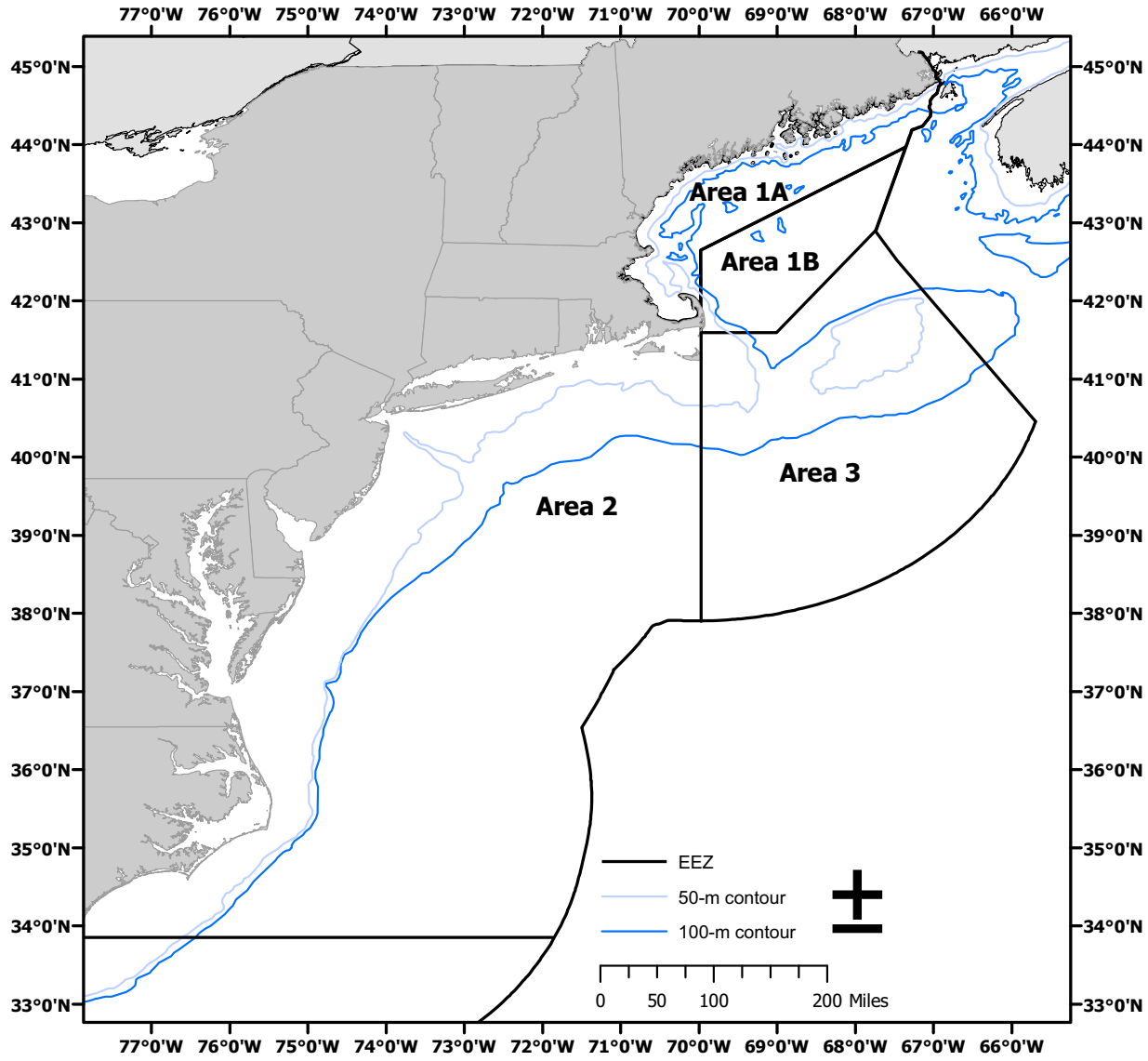


Figure 5. Example Vessel Trip Report form used in instructions to vessel owners and operators (Source: NMFS, Gloucester, MA)

NOAA Form No. 88-30

OMB No. 0648-0212
Expires 7/31/05

FISHING VESSEL TRIP REPORT

☐ DID NOT FISH DURING MONTH/YEAR ____/____

10209618

1. VESSEL NAME	2. USCG. DOC. or STATE REG. NO.	3. VESSEL PERMIT NUMBER	
Albatross	123456	330123	
4. DATE/TIME SAILED DATE (mm/dd/yy) 01 / 30 / 03 TIME (24 hrs.) 03 30	5. TRIP TYPE (CHECK ONE) ✓ COMMERCIAL ☐ PARTY ☐ CHARTER	6. NO. of CREW 5	7. NO. of ANGLERS

FILL OUT A NEW PAGE FOR EACH CHART AREA OR GEAR OR MESH/RING SIZE FISHED

8. GEAR FISHED	9. MESH/RING SIZE	10. QUANTITY OF GEAR	11. SIZE OF GEAR	
OTF	5½	1	80	
12. CHART AREA	14. LATITUDE/LONGITUDE or LORAN LATITUDE	LONGITUDE	15. NO. of HAULS	16. AVERAGE TOW/SOAK TIME
537			3	2 hrs 30 mins
13. AVG. DEPTH 50 fa	STATION/BEARING #1 14500	STATION/BEARING #2 43400		

17. SPECIES CODE NAME	18. KEPT POUNDS (Comm)	18. KEPT COUNT (Rec)	19. DISCARDED POUNDS (Comm)	19. DISCARDED COUNT (Rec)	20. DEALER PERMIT NO	21. DEALER NAME	22. DATE SOLD (mm/dd/yy)
Fluke	700		35		12345	The Fish Co.	01/31/03
COD	50				1	1	1
FLYT	75		25				

23. PORT and STATE LANDED	24. DATE LANDED (mm/dd/yy)	TIME LANDED
Pt. Judith, R.I.	01 / 31 / 03	16 50

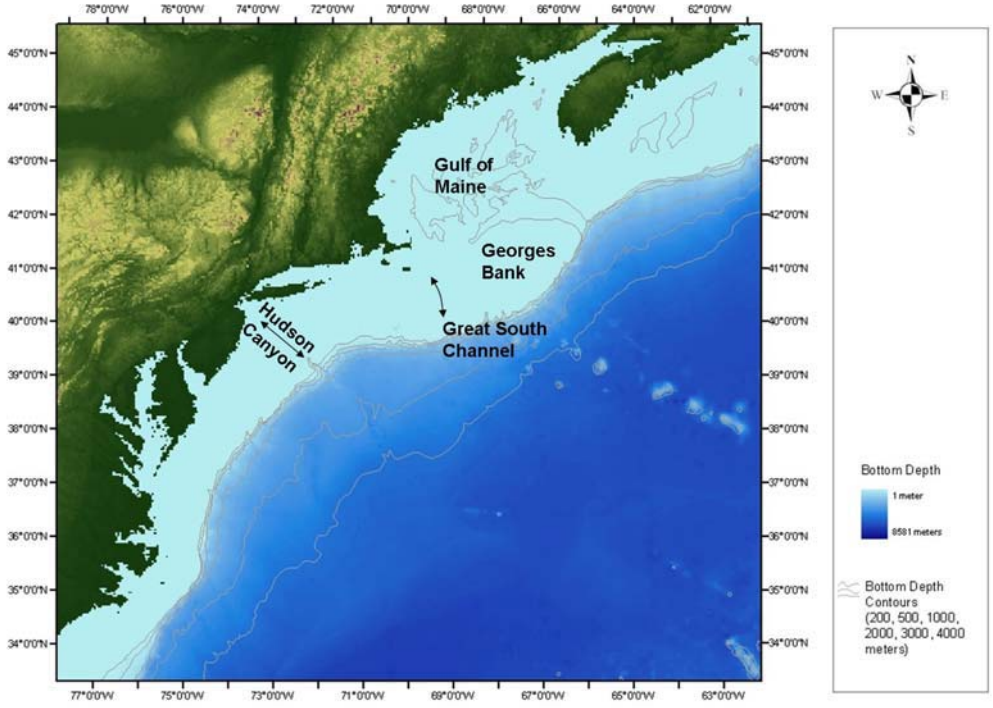
I certify that the information provided on this form is true, complete and correct to the best of my knowledge, and made in good faith. Making a false statement on this form is punishable by law (18 U.S.C. 1001).

25. OPERATOR'S NAME (printed) and PERMIT NUMBER (if required)	26. OPERATOR'S SIGNATURE	DATE
Joseph Fisher 10001010	Joseph Fisher	01/31/03

NMFS COPY

Figure 6. Data on (A) bottom depth and (B) bottom slope used in determination of associated variables

(A) Bottom depth



(B) Bottom slope

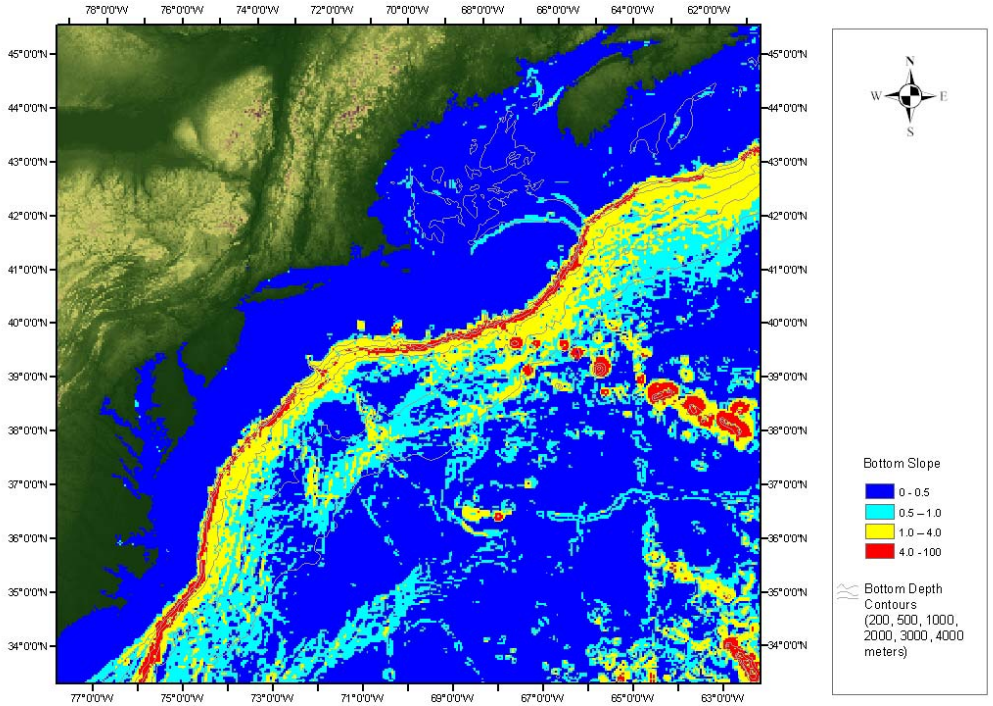
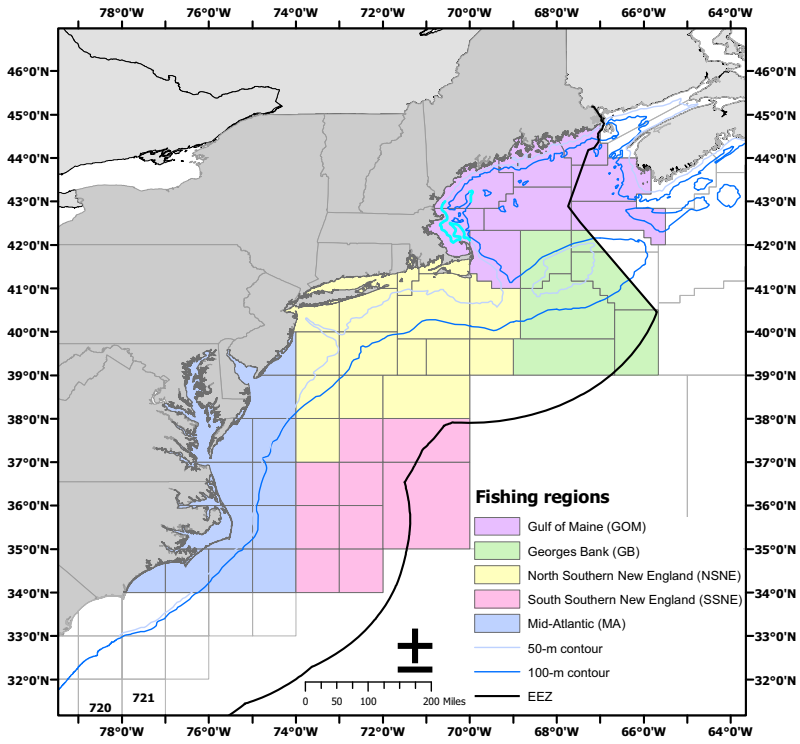


Figure 7. Fishing regions used with (A) associated statistical areas, and (B) relationship to eco-regions

(A) Statistical Areas and fishing regions



(B) Ecosystem regions

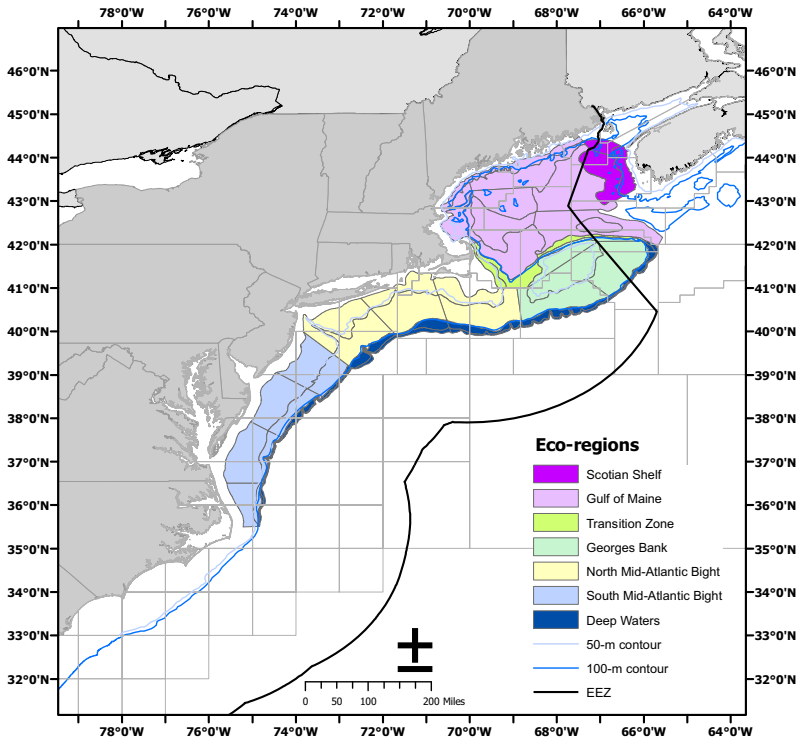


Figure 8. Distribution of U.S. Northeast and Mid-Atlantic bottom trawl effort, in days fished, over the period 1996–2004

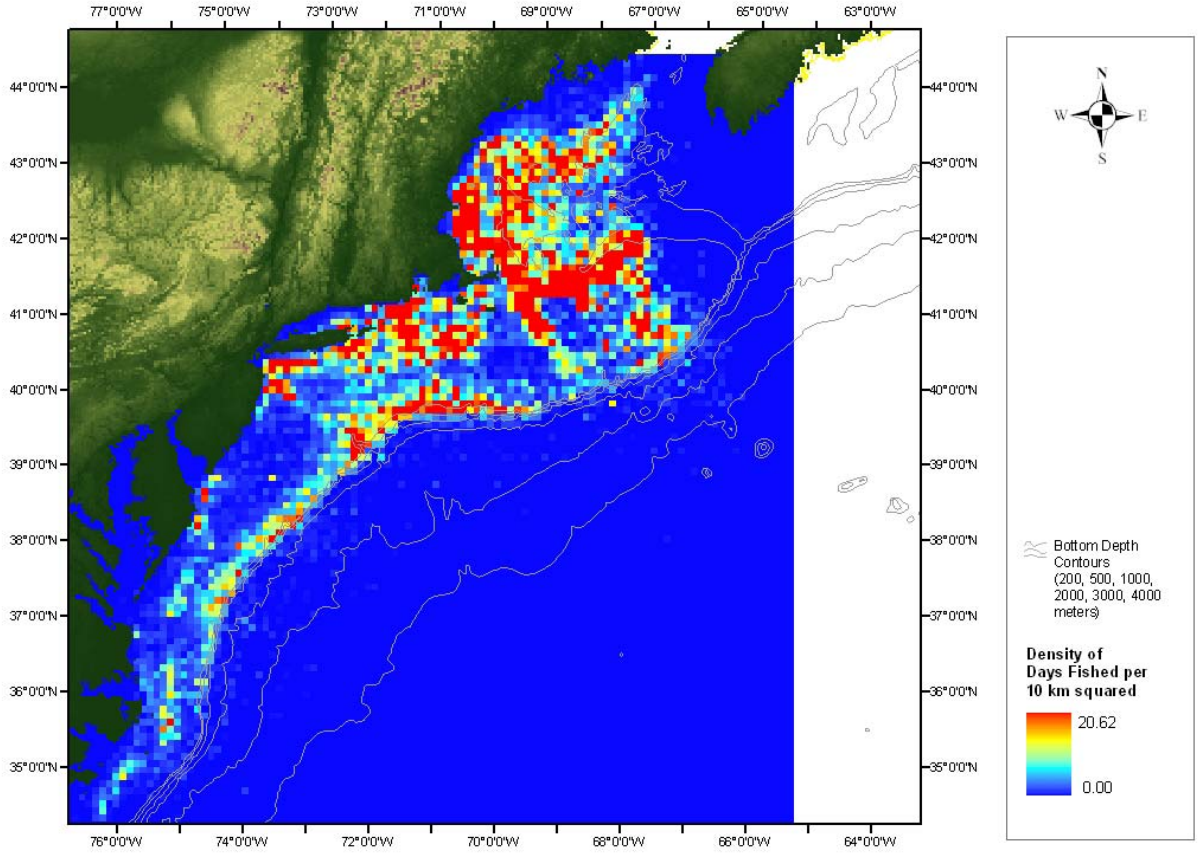


Figure 9. Mean days fished per trip in the U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

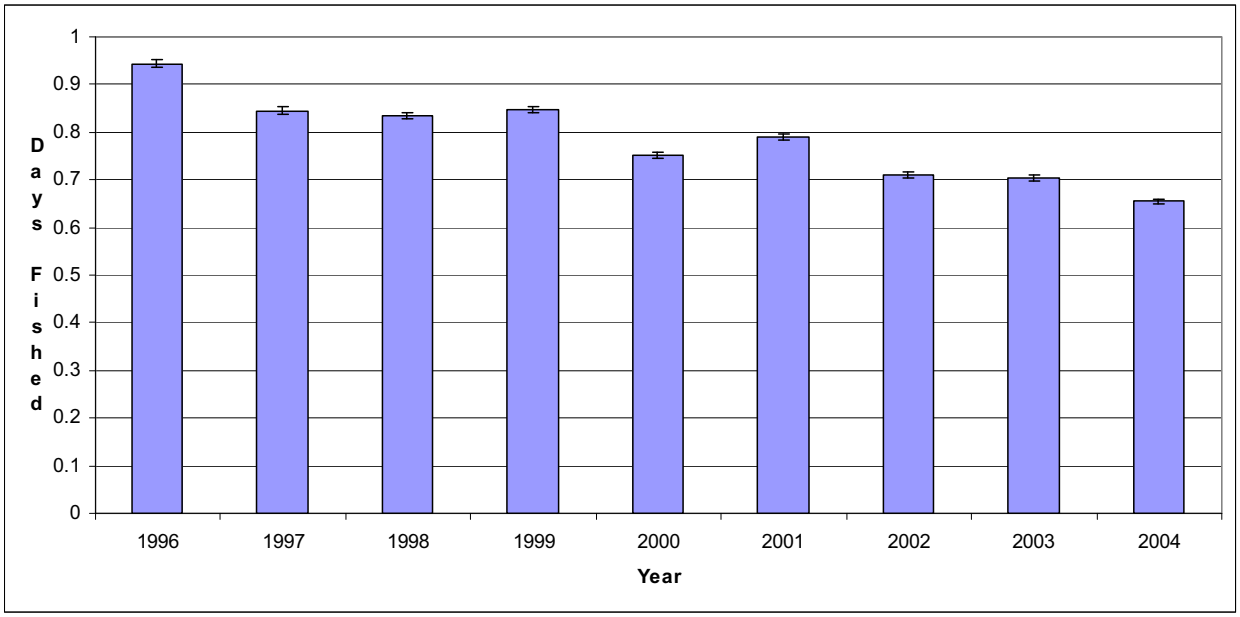


Figure 10. Mean days fished per trip by month for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, using data from 1996–2004

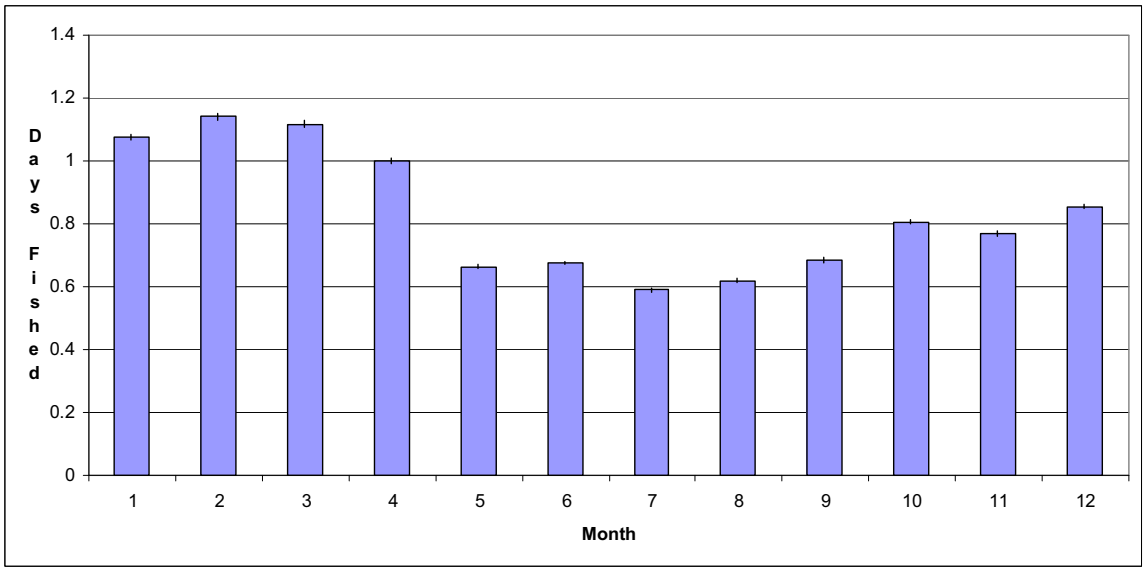
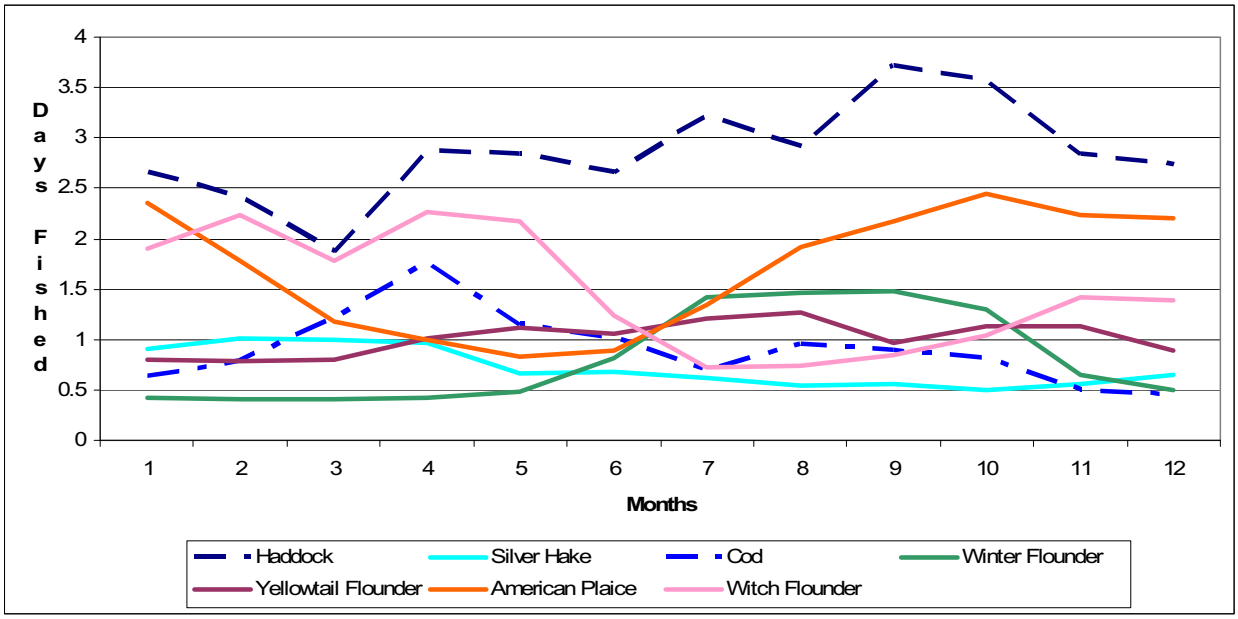


Figure 11. Mean days fished per trip by month and main species for the U.S. Northeast and Mid-Atlantic bottom trawl fishery: (A) Northeast multispecies, (B) mid-Atlantic FMP species, (C) mix of species with individual FMPs from both the northeast and mid-Atlantic, and (D) other species

(A) NE Multispecies



(B) Mid-Atlantic FMP species

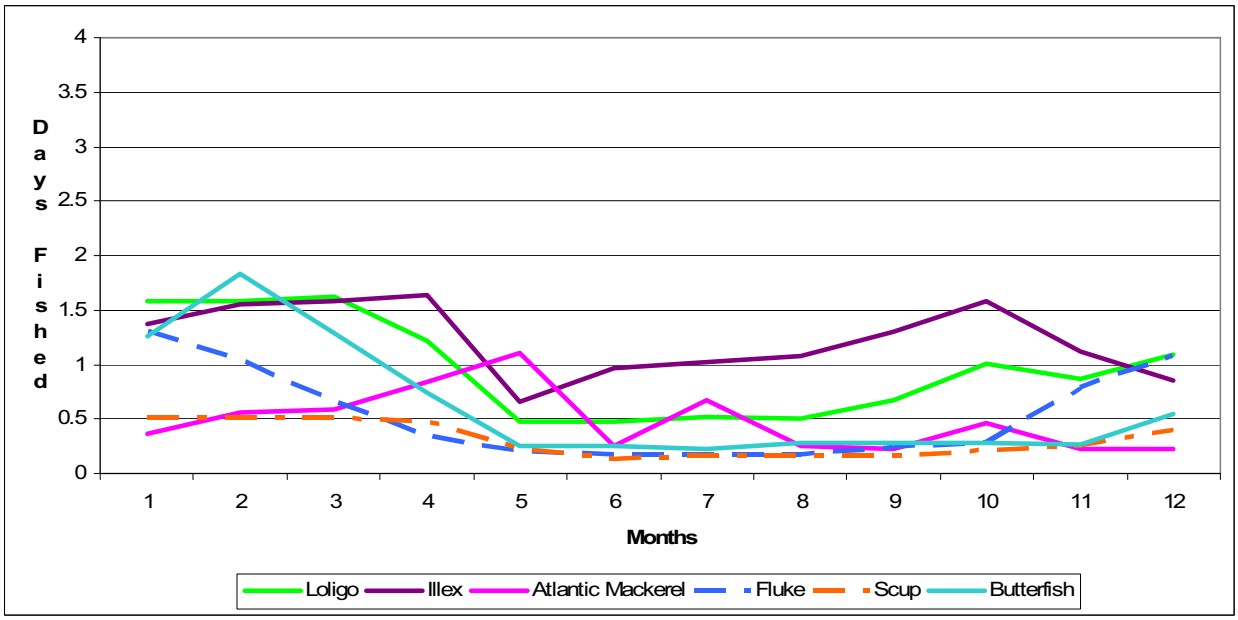
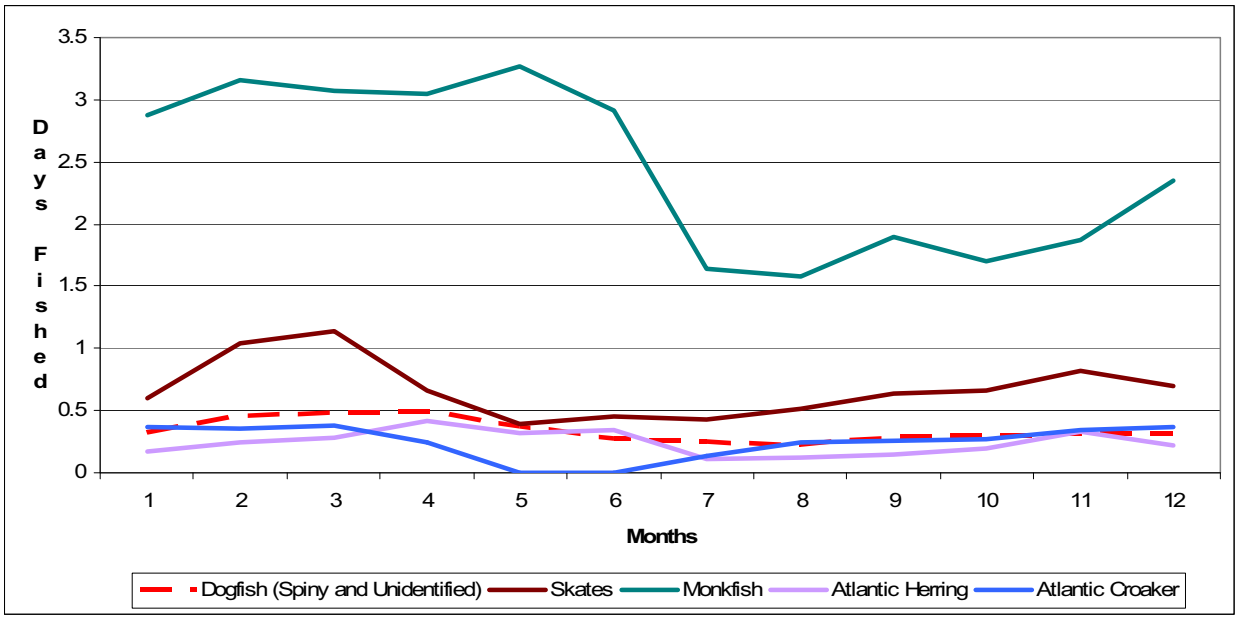


Figure 11 continued.

(C) Other FMP species



(D) "Other" categories

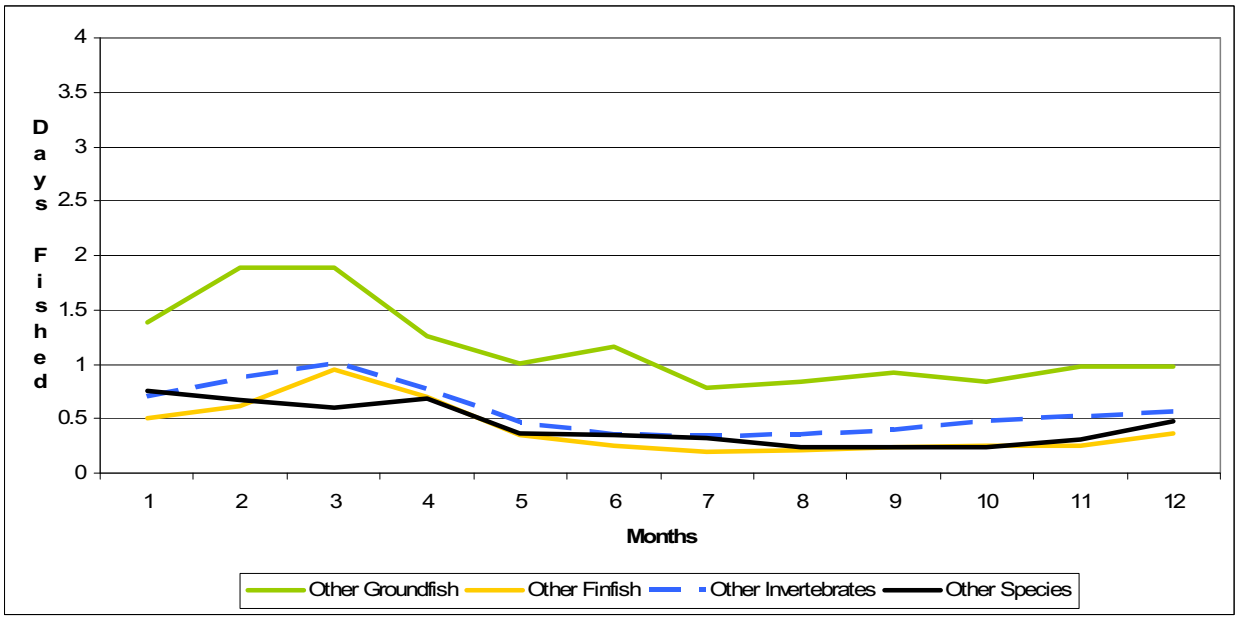
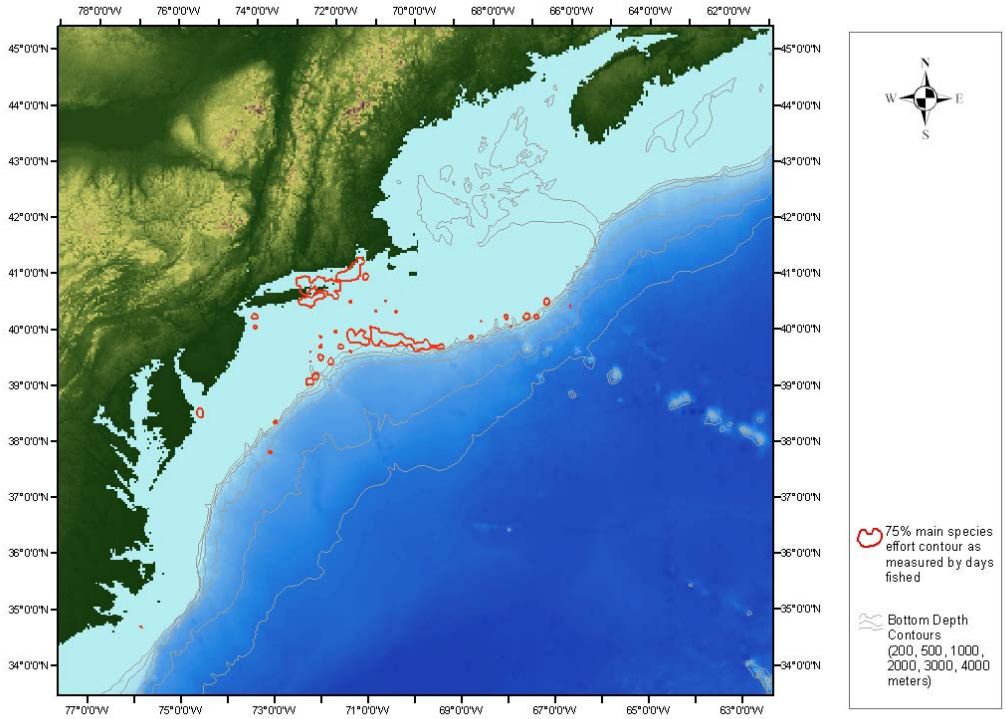


Figure 12. Distribution of U.S. Northeast and Mid-Atlantic bottom trawl effort, in days fished, by main species shown as the 75% effort contour (1996–2004). Main species is defined as the species with the greatest live weight on that trip. (1996–2004)

(A) Butterfish



(B) Cod

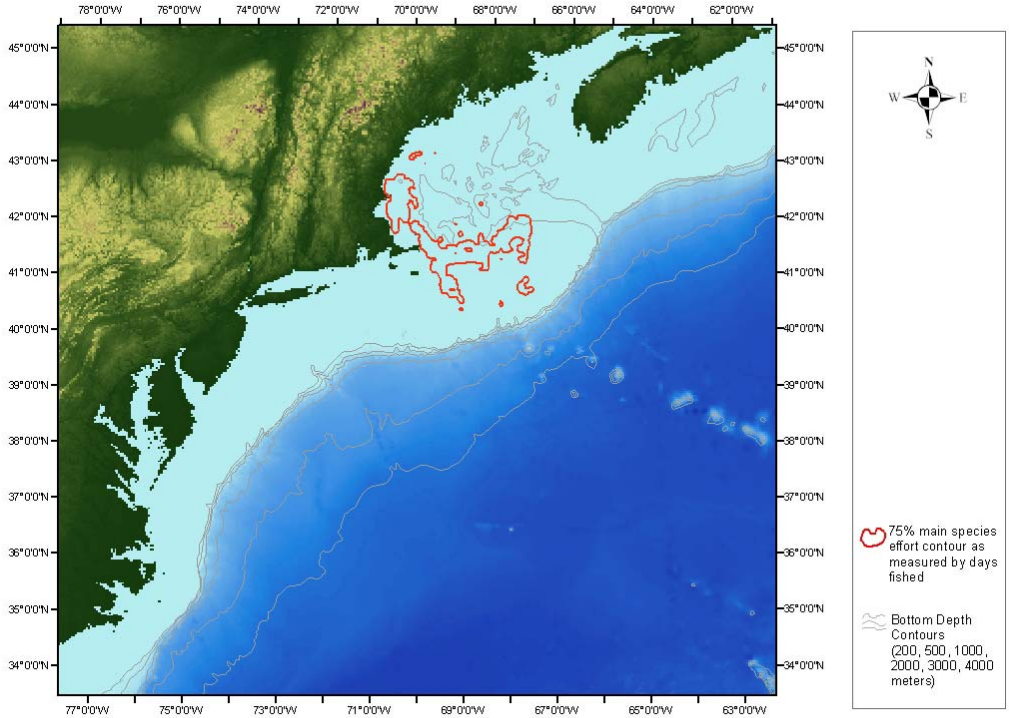
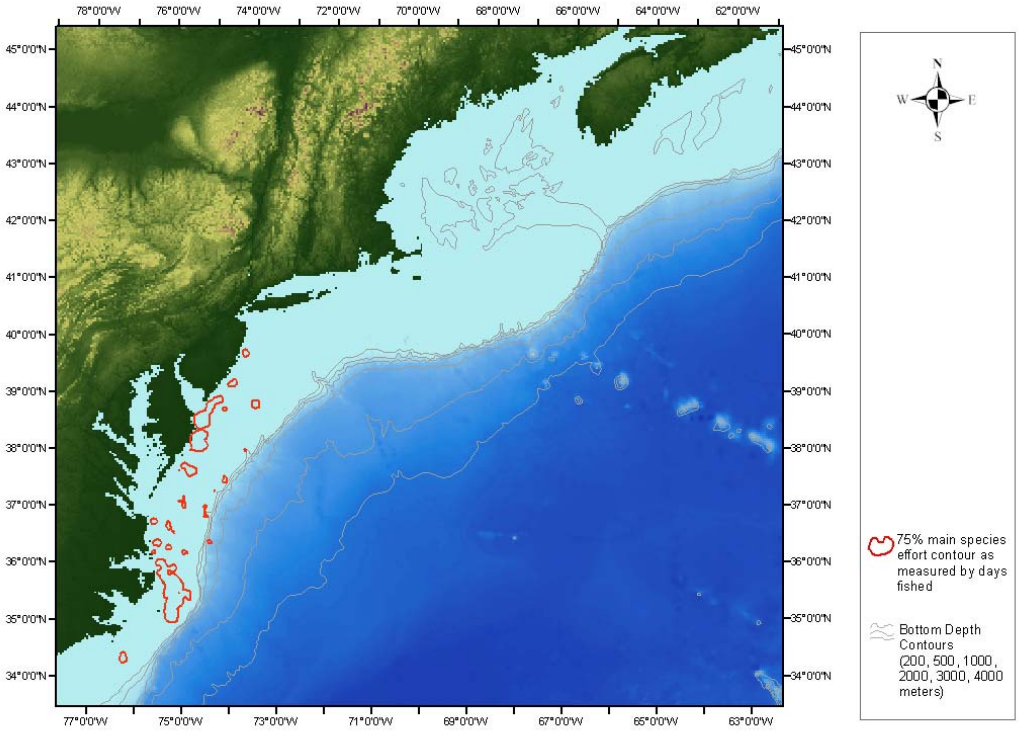


Figure 12 continued.

(C) Atlantic croaker



(D) Spiny dogfish

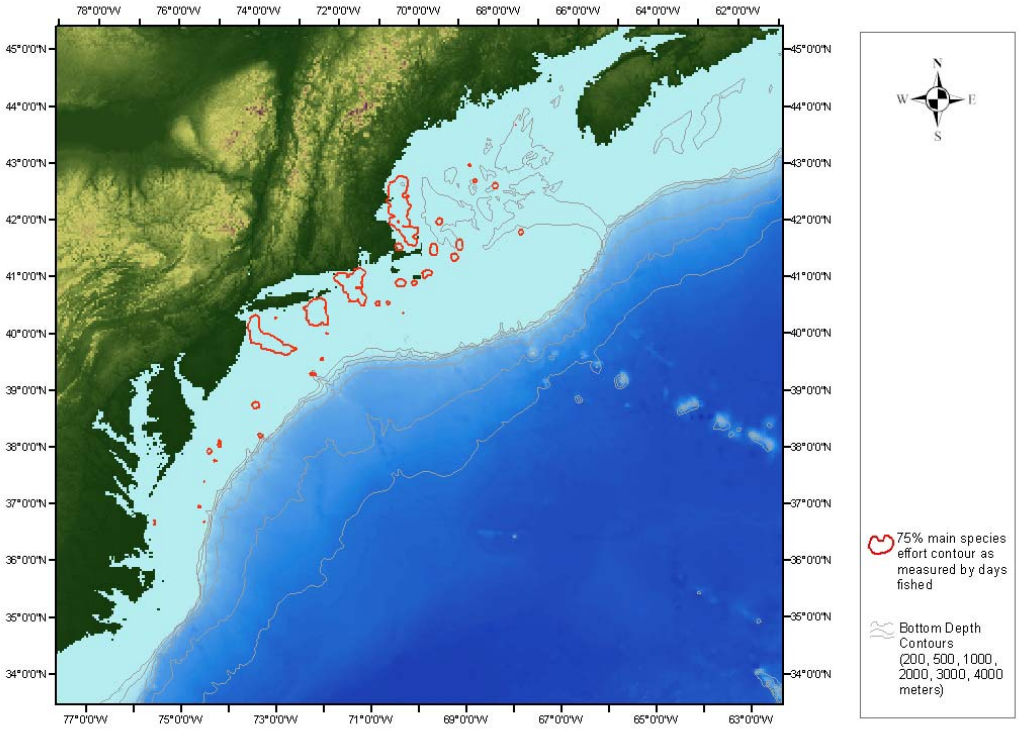
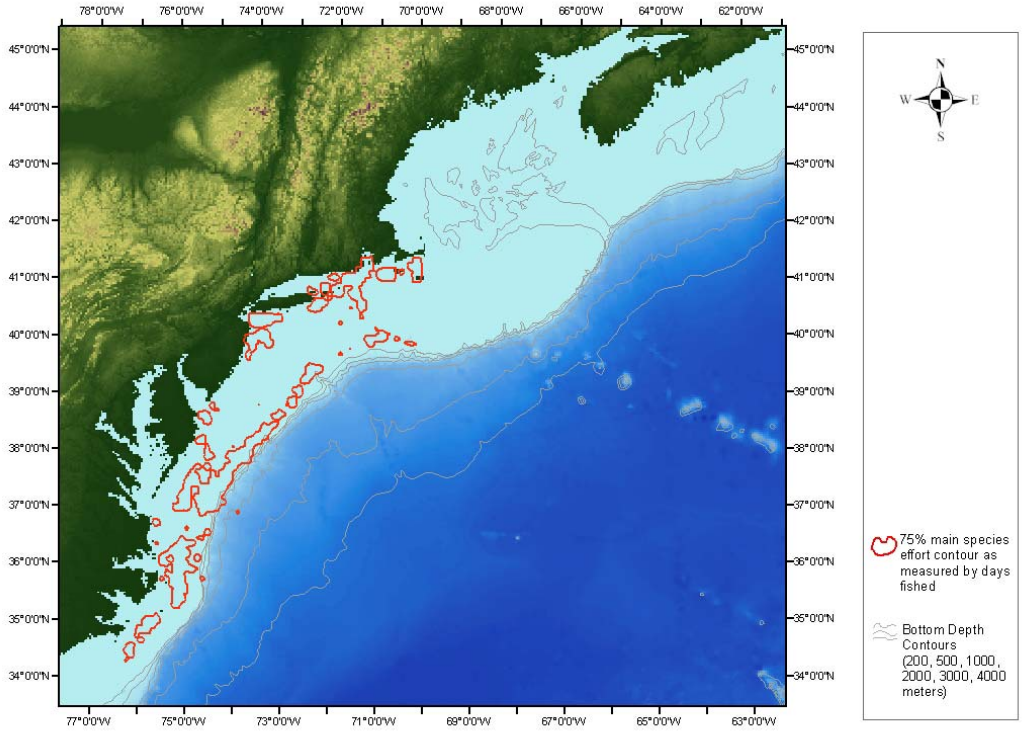


Figure 12 continued.

(E) Fluke (summer flounder)



(F) Haddock

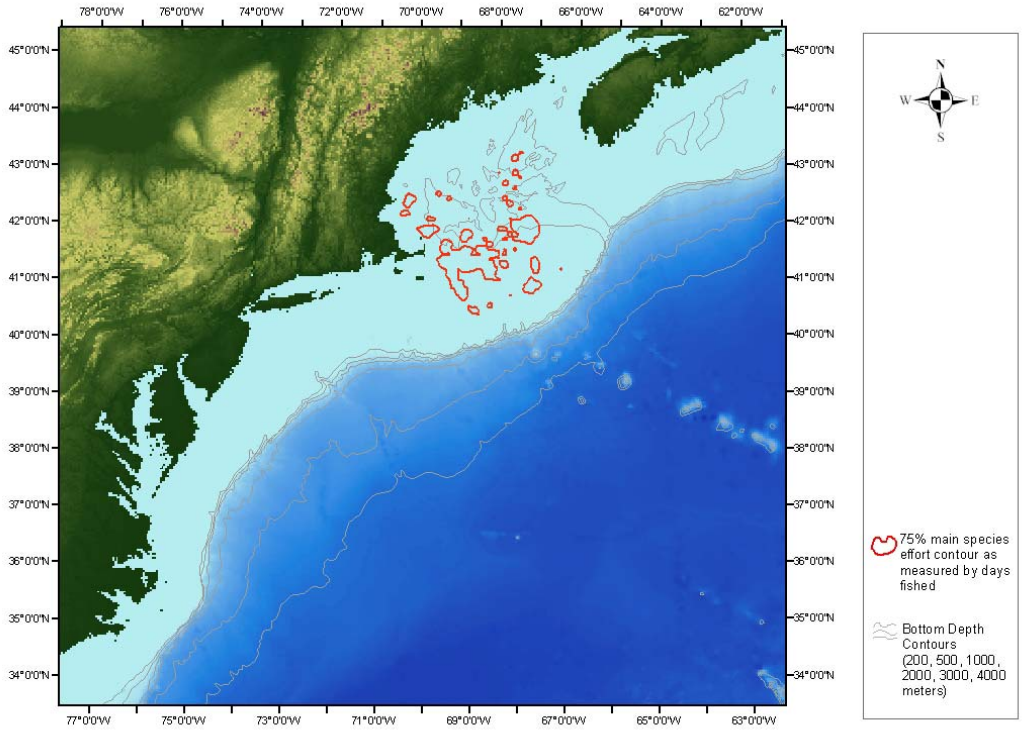
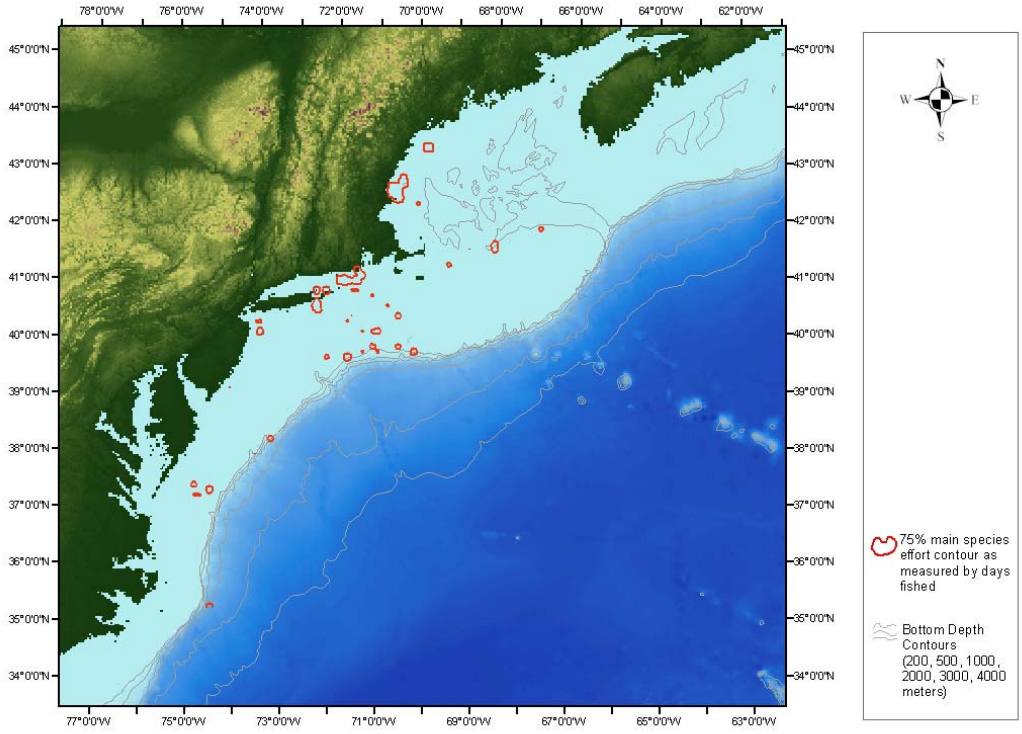


Figure 12 continued.

(G) Atlantic herring



(H) *Illex* squid

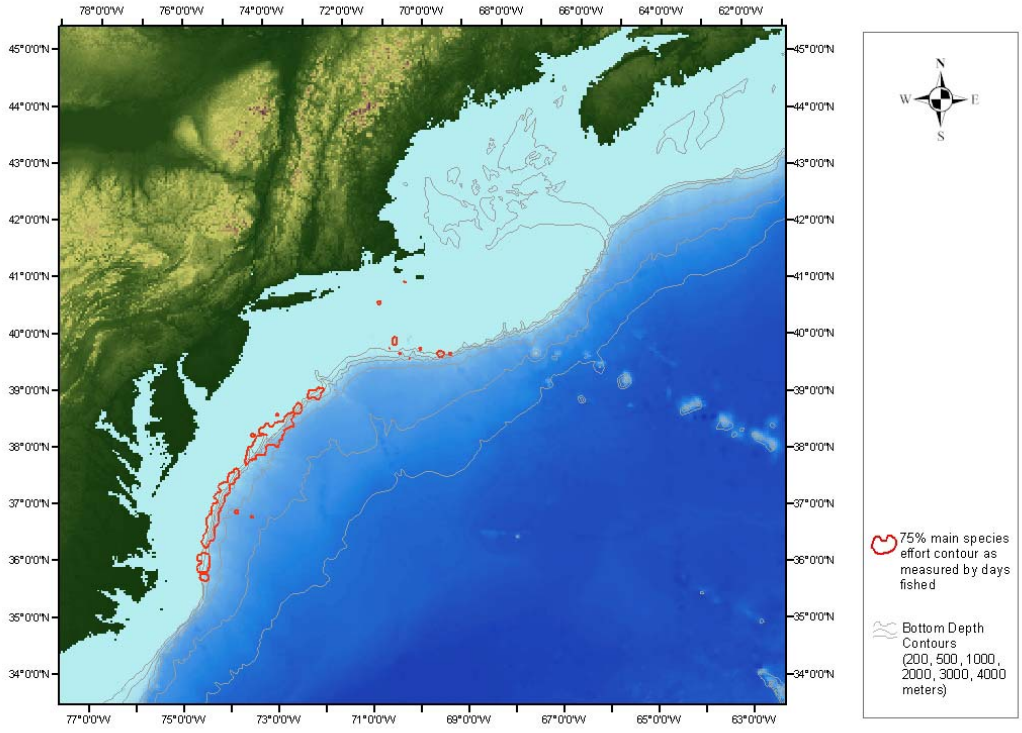
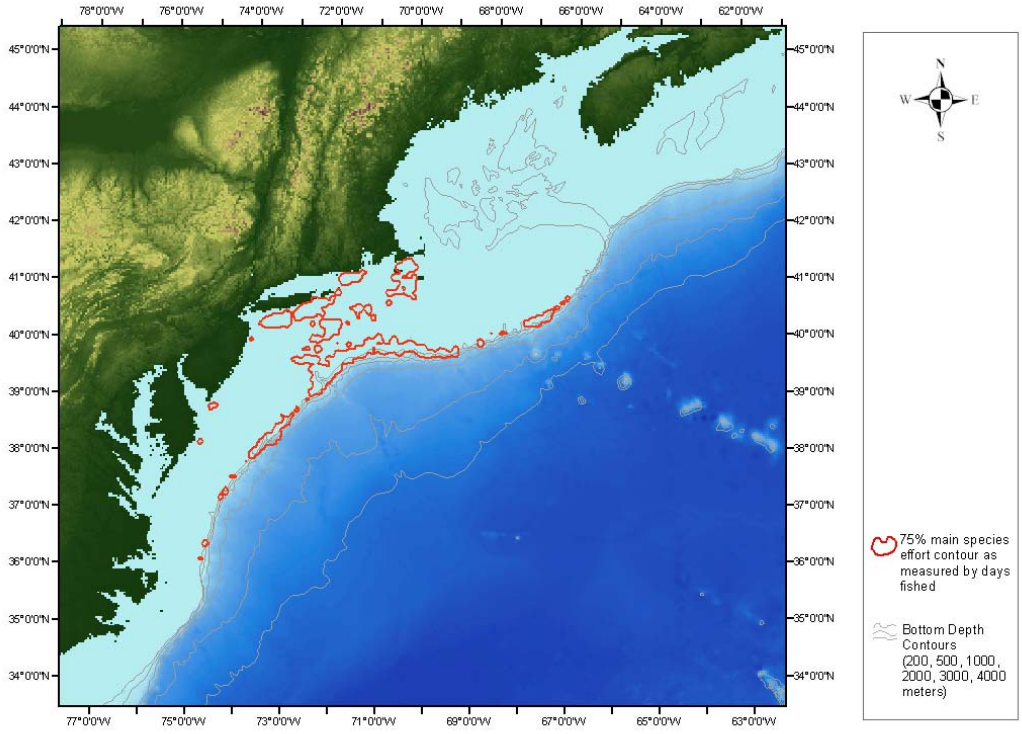


Figure 12 continued.

(I) *Loligo* squid



(J) Atlantic mackerel

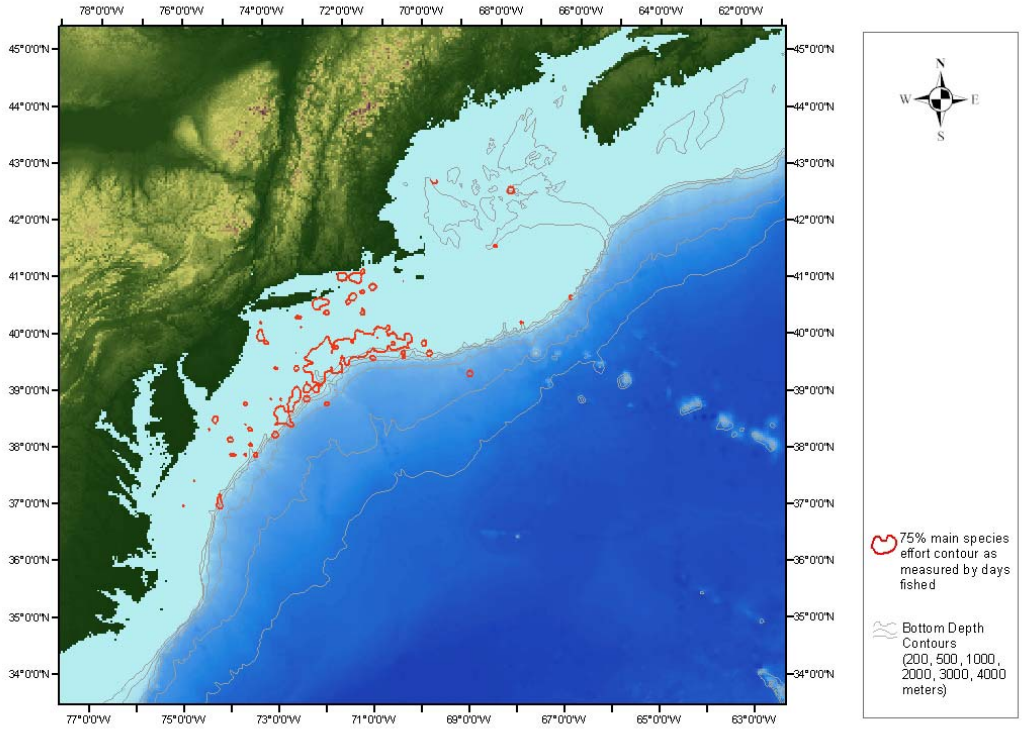
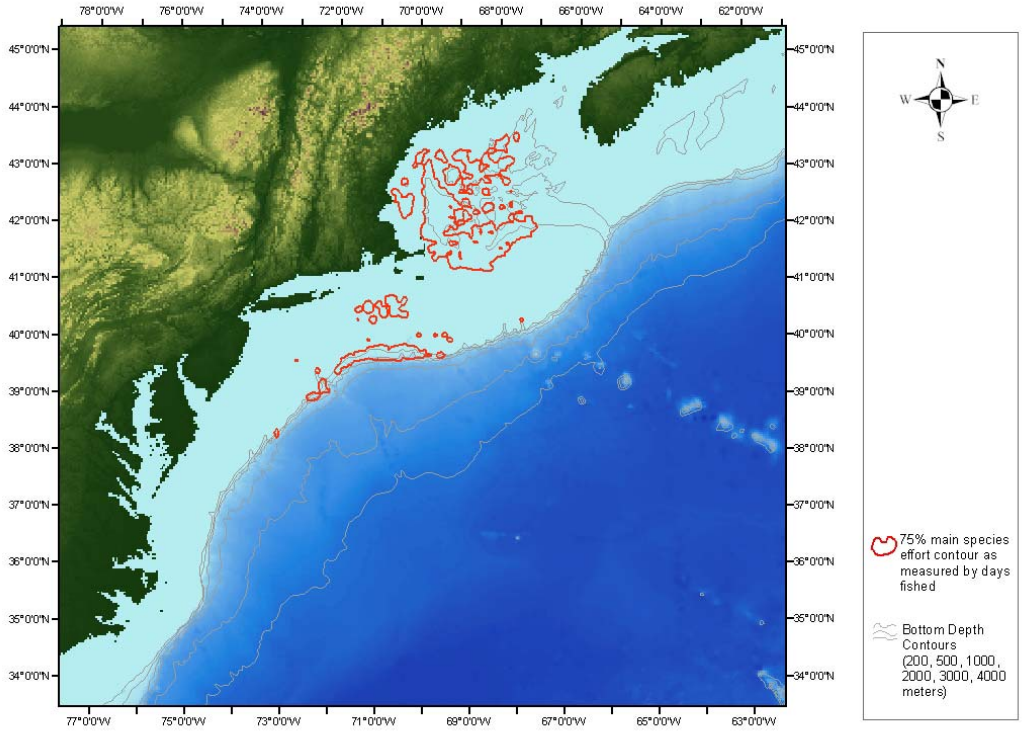


Figure 12 continued.

(K) Monkfish



(L) American plaice

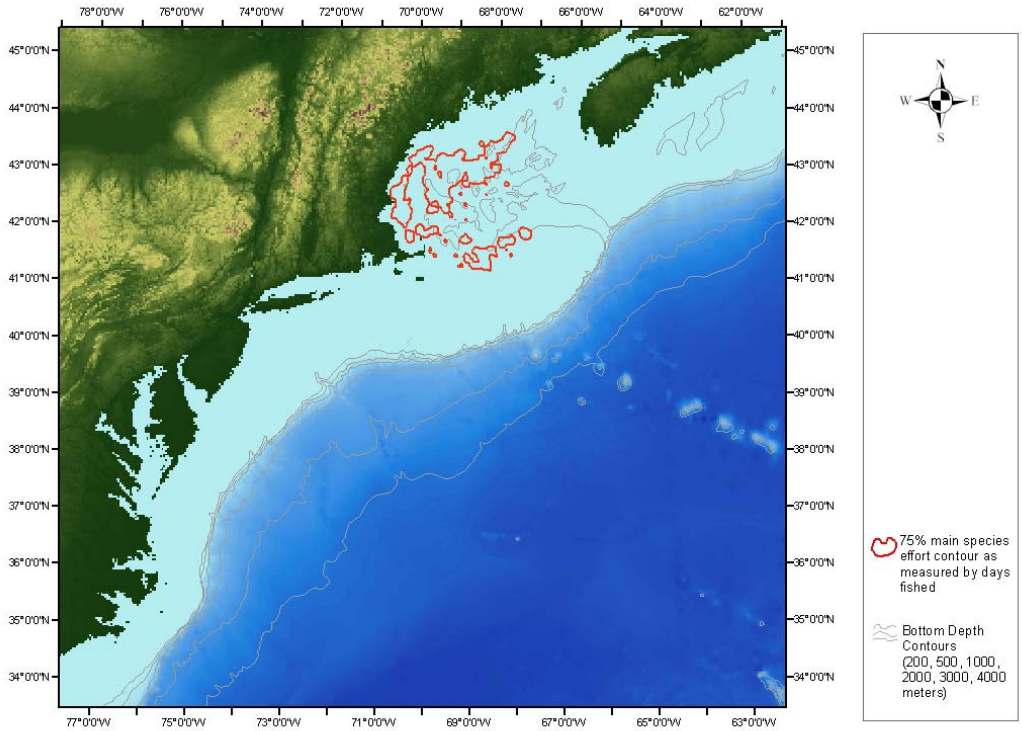
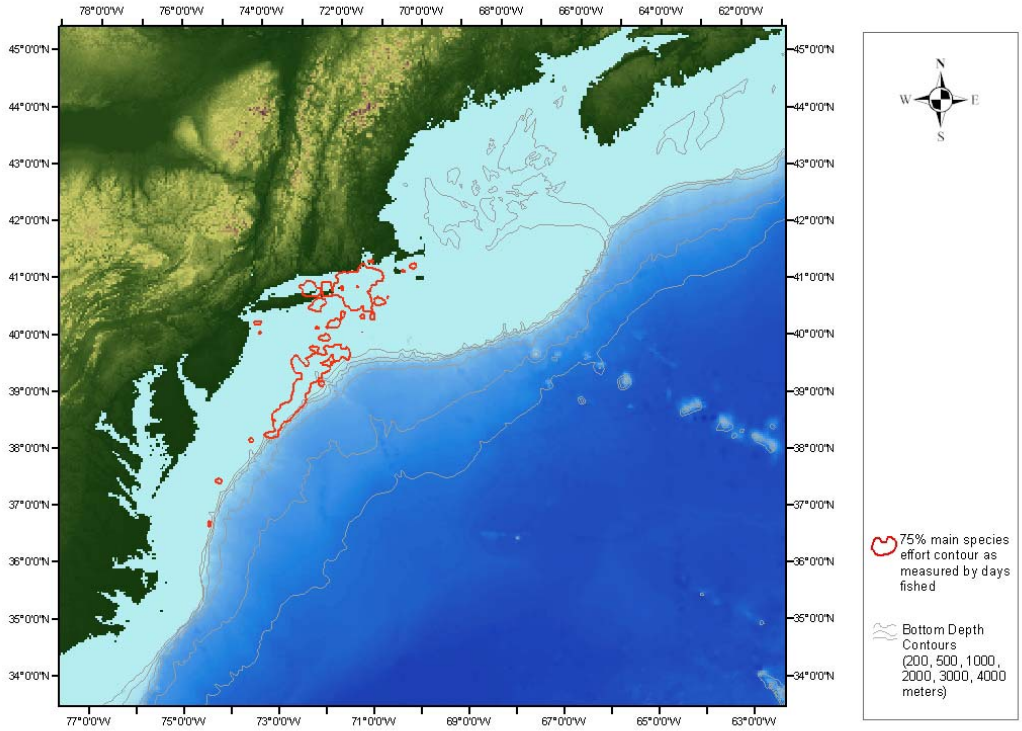


Figure 12 continued.

(M) Scup



(N) Silver hake

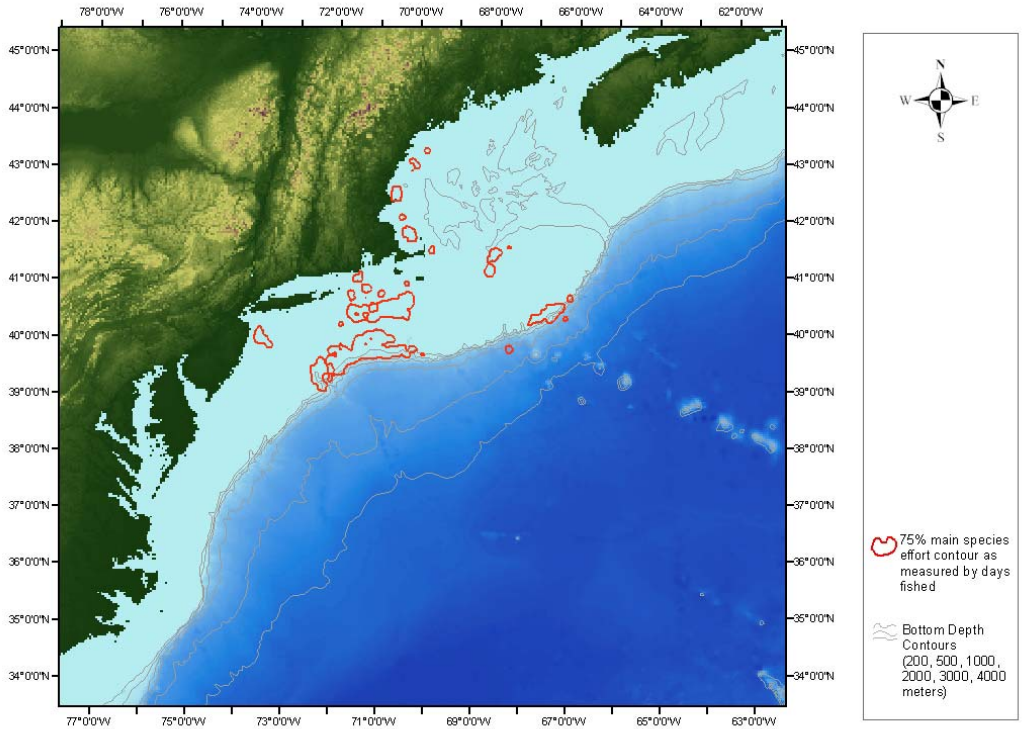
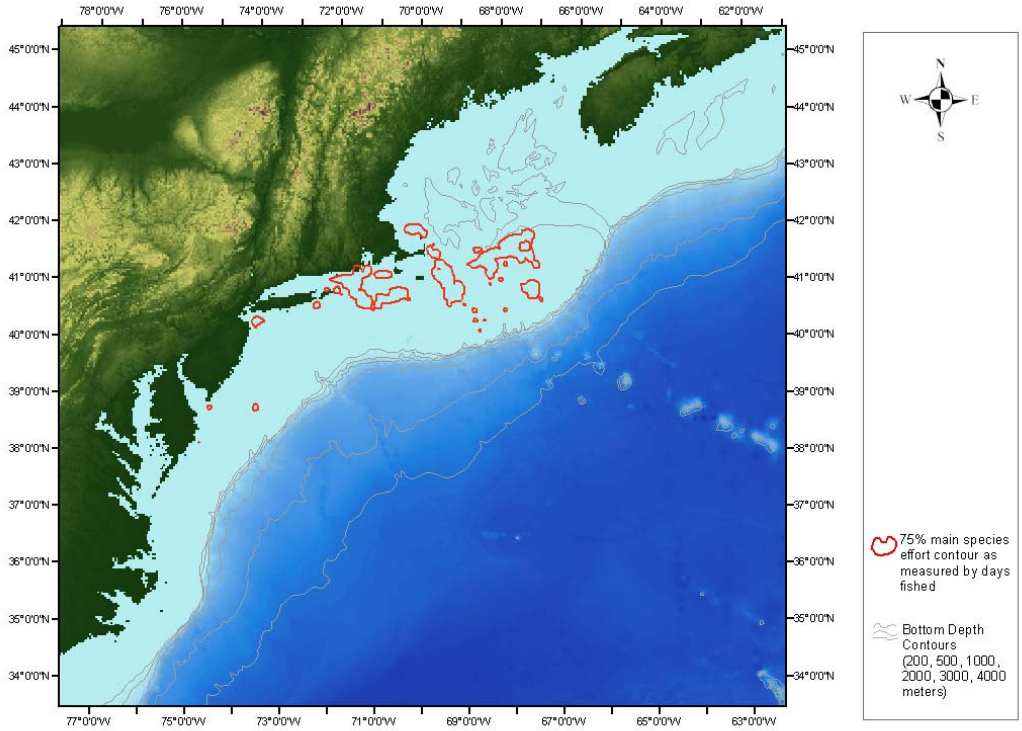


Figure 12 continued.

(O) Skates (all species)



(P) Winter flounder

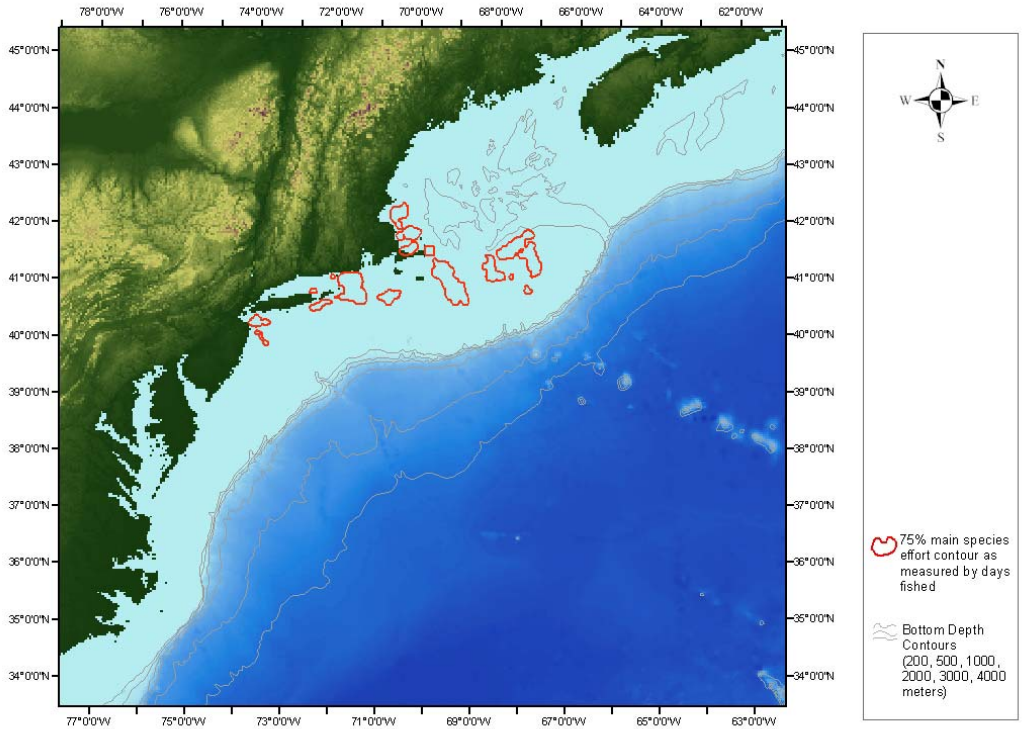
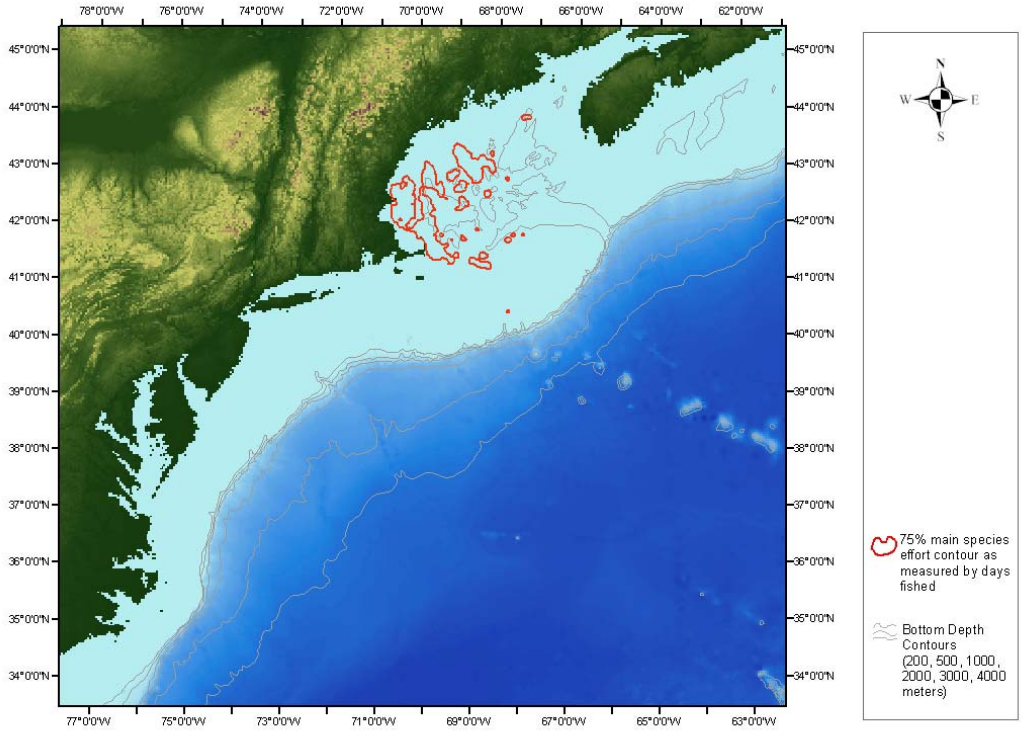


Figure 12 continued.

(Q) Witch flounder



(R) Yellowtail flounder

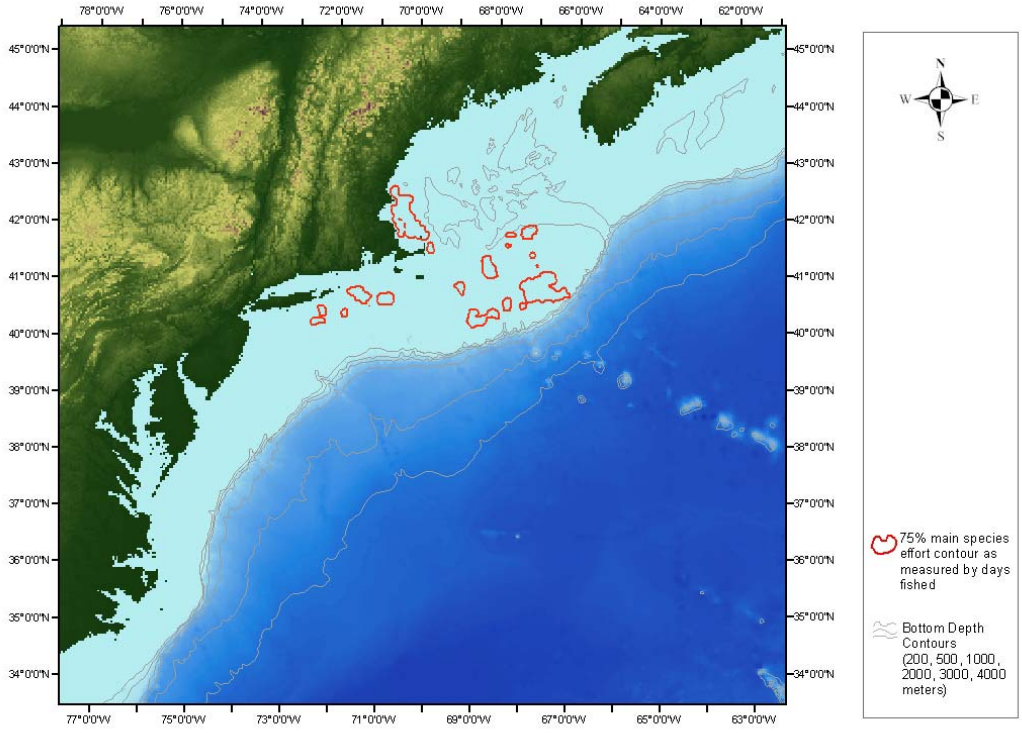


Figure 13. Mean number of hauls per trip for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004

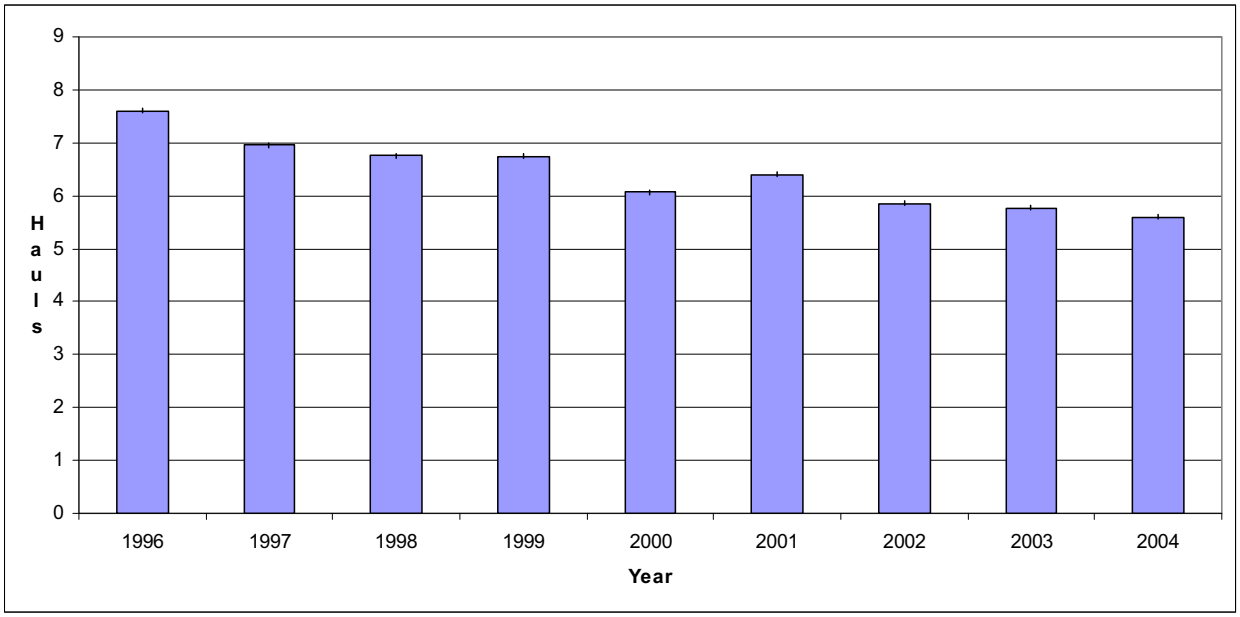


Figure 14. Mean average tow time per haul for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004 (hours)

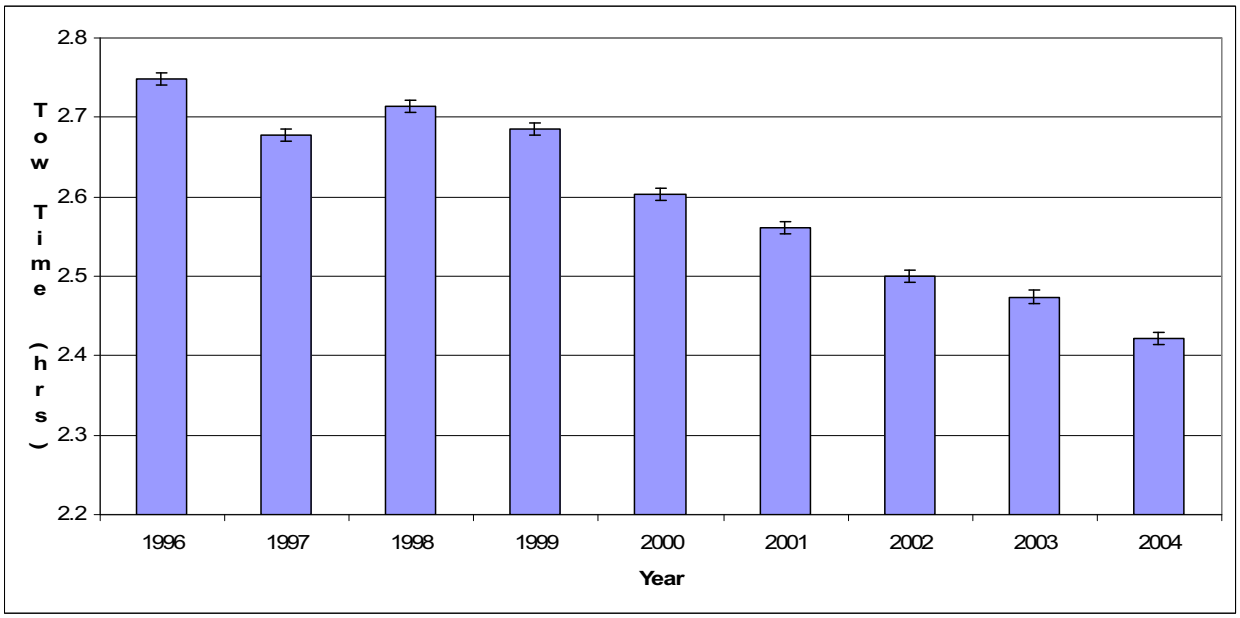


Figure 15. Mean hauls per trip by month over 1996–2004, for the U.S. Northeast and Mid-Atlantic bottom trawl fishery

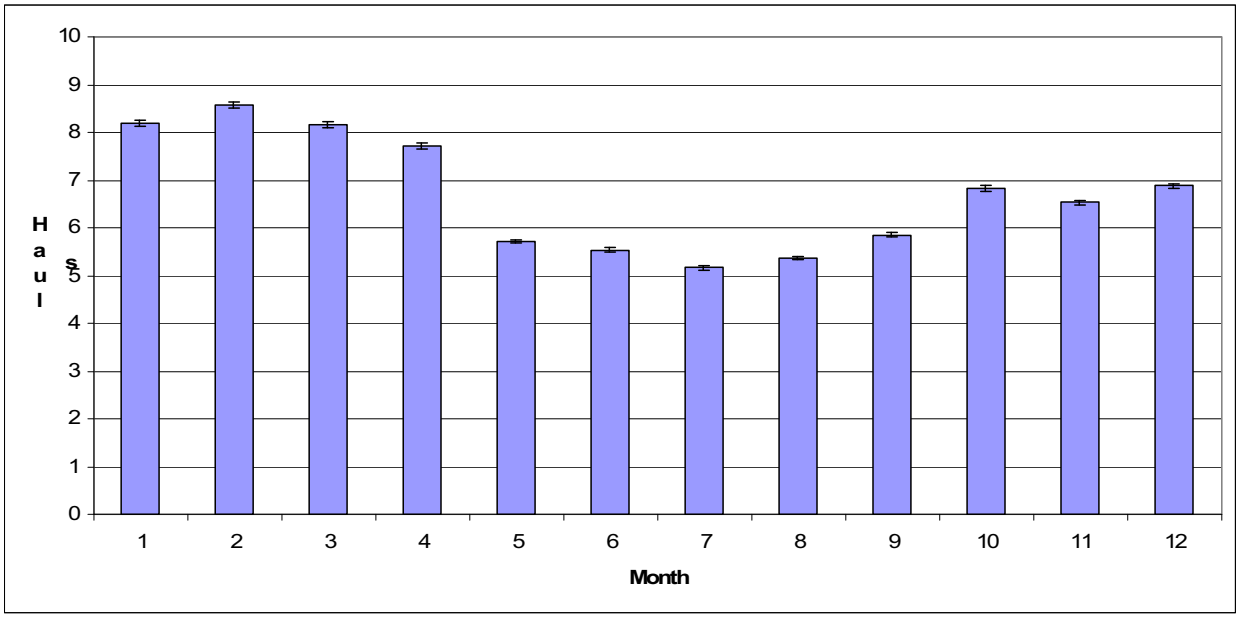


Figure 16. Mean average tow time per haul by month over 1996–2004, for the U.S. Northeast and Mid-Atlantic bottom trawl fishery (hours)

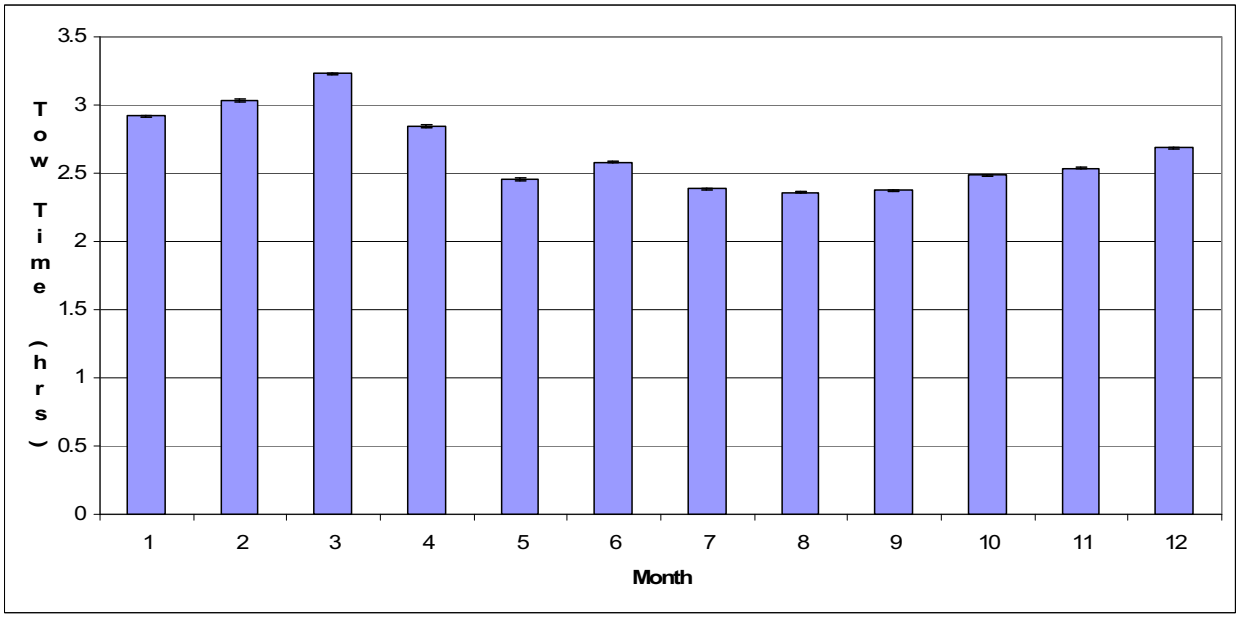
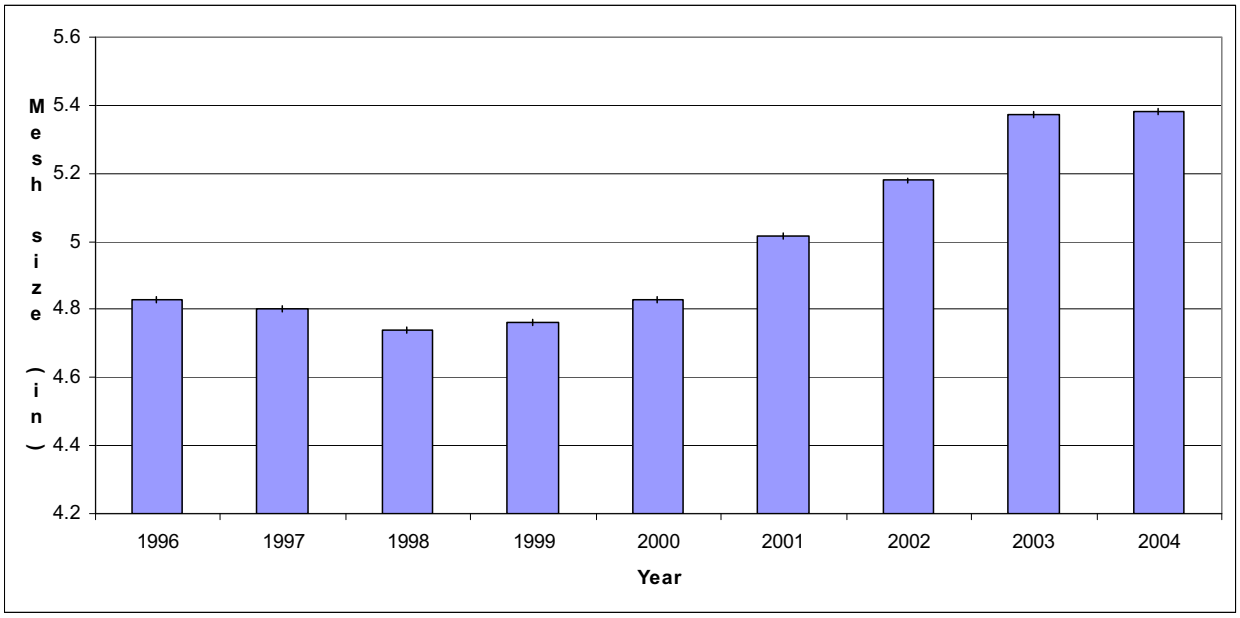


Figure 17. Mean codend mesh size (inches) overall all trips for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004, (A) by year and (B) by month

(A) By year



(B) By month

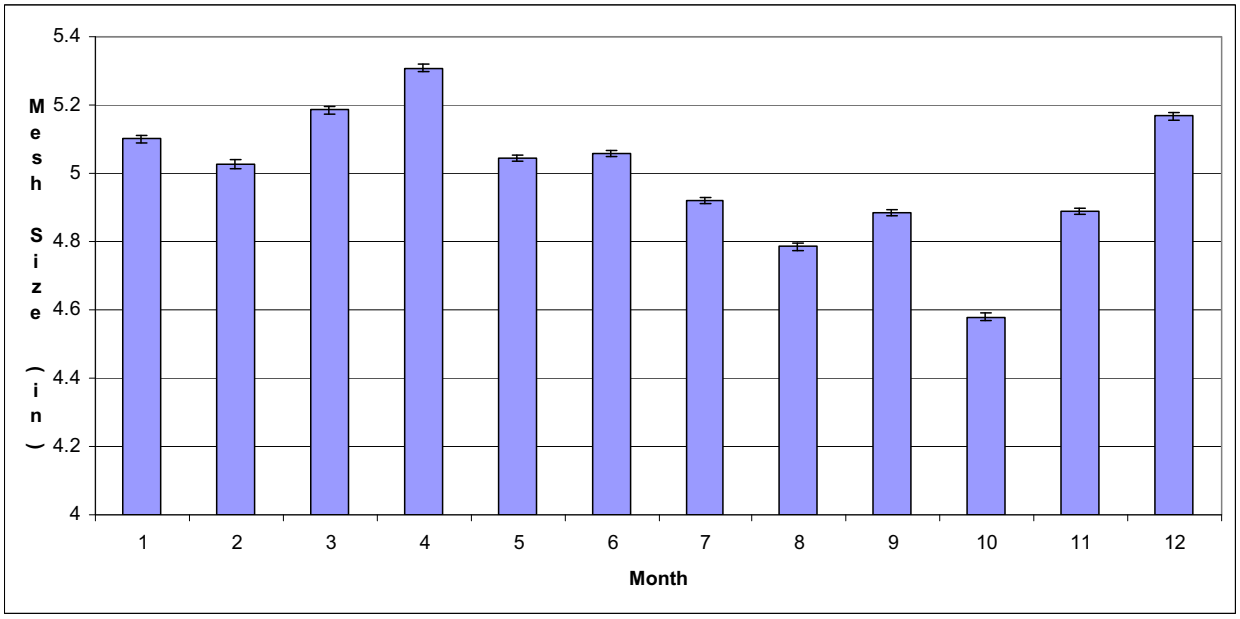
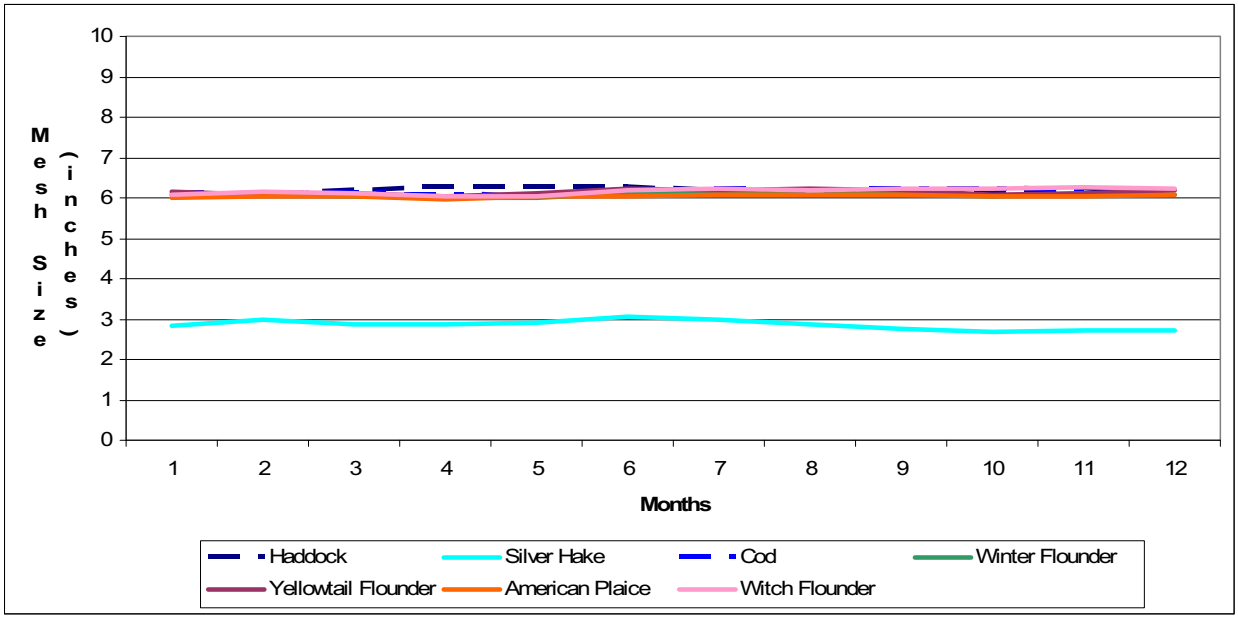


Figure 18. Mean code end mesh size (inches) by month and species for the U.S. Northeast and Mid-Atlantic bottom trawl fishery: (A) Northeast multispecies group, (B) mid-Atlantic FMP species[a], (C) mix of species with individual FMPs from both the northeast and mid-Atlantic, and (D) other species

[a] Note that mean Atlantic mackerel mesh size is not displayed in (B) for months 6-10 because of an extremely small number trips for these months that if shown may be misleading.

(A) NE Multispecies



(B) Mid-Atlantic FMP species

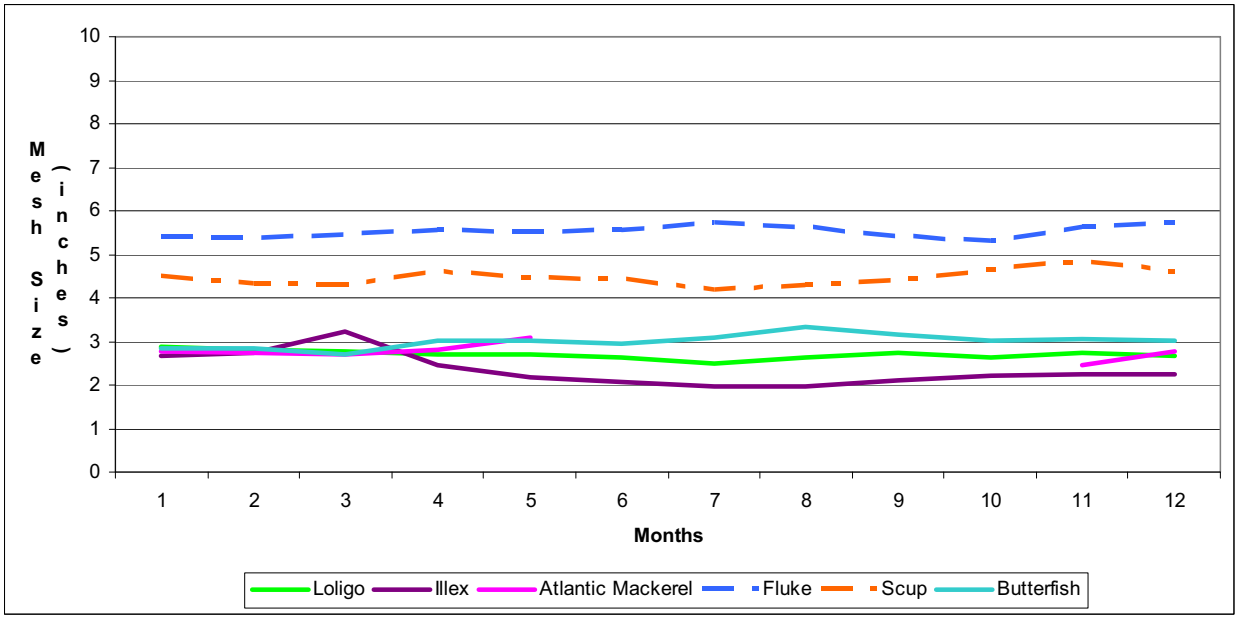
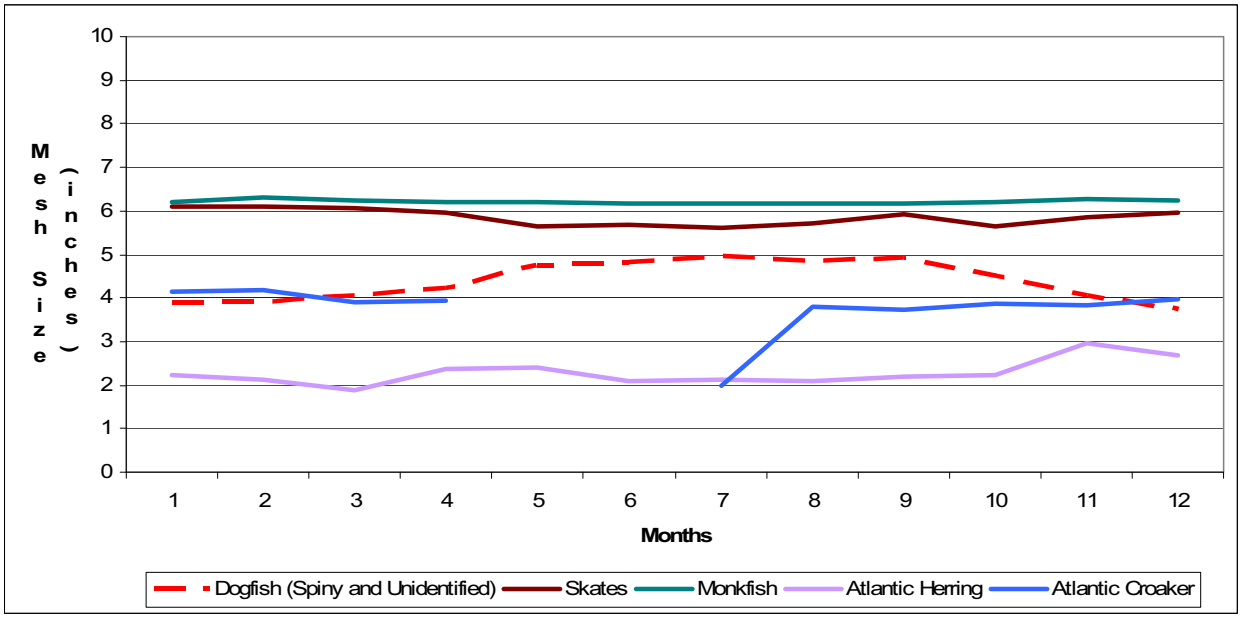


Figure 18 continued.

(C) Other FMP species



(D) "Other" categories

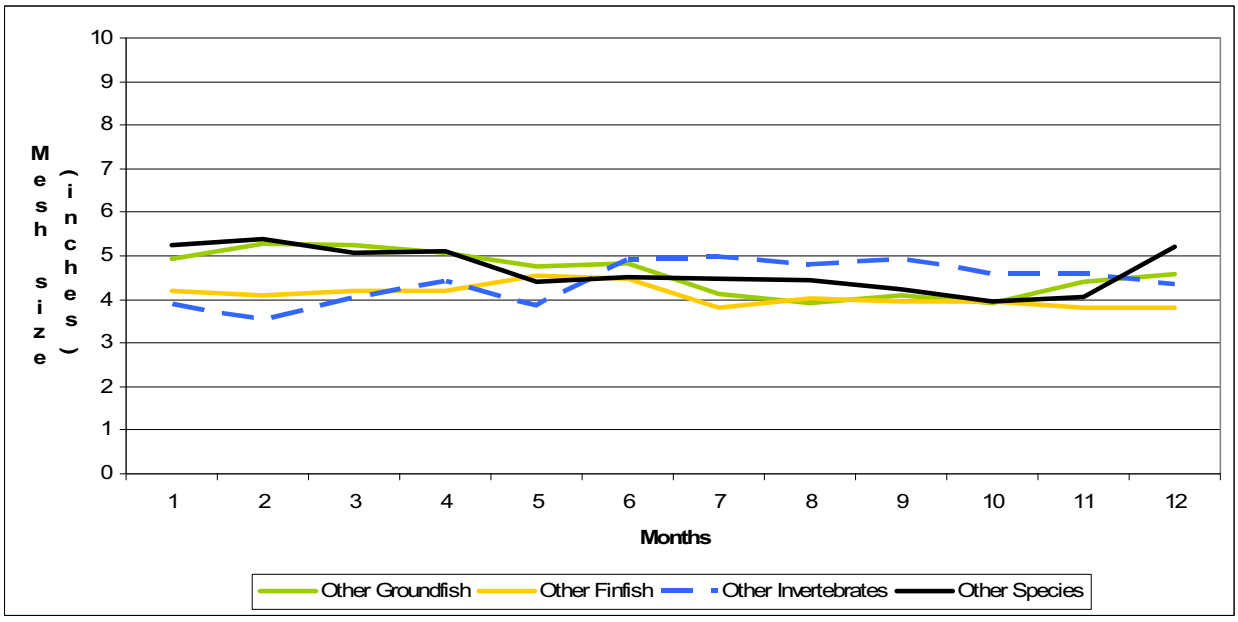
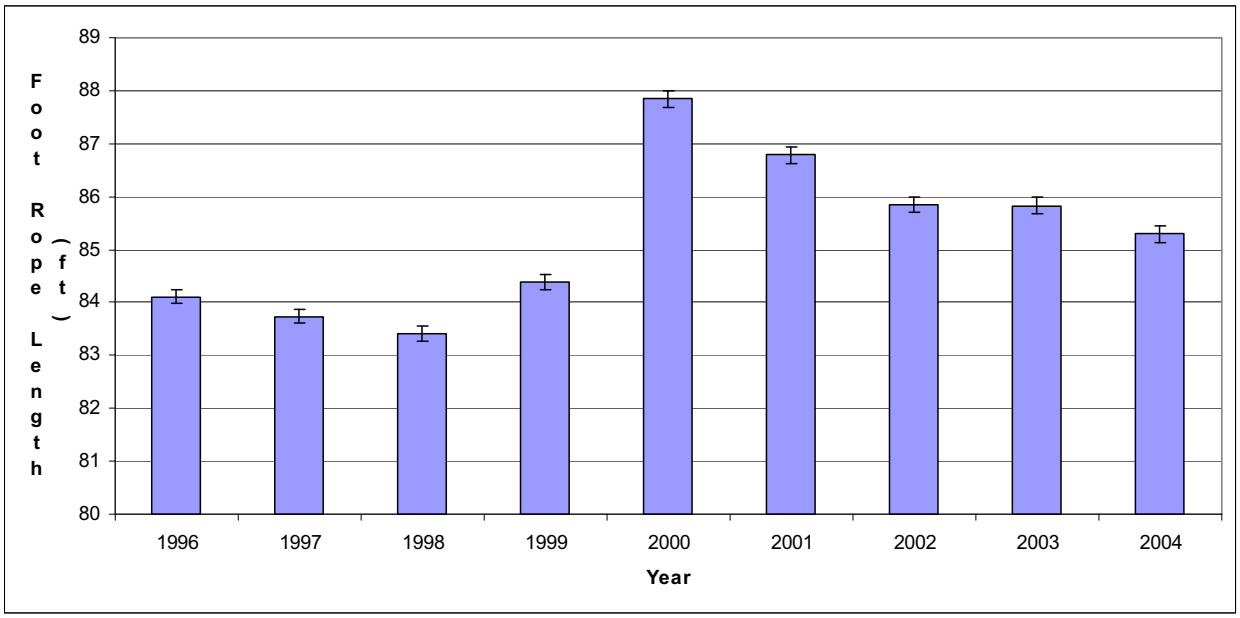


Figure 19. Mean gear size in feet of footrope length for the U.S. Northeast and Mid-Atlantic bottom trawl fishery (A) by year and (B) by month over 1996–2004

(A) By year



(B) By Month

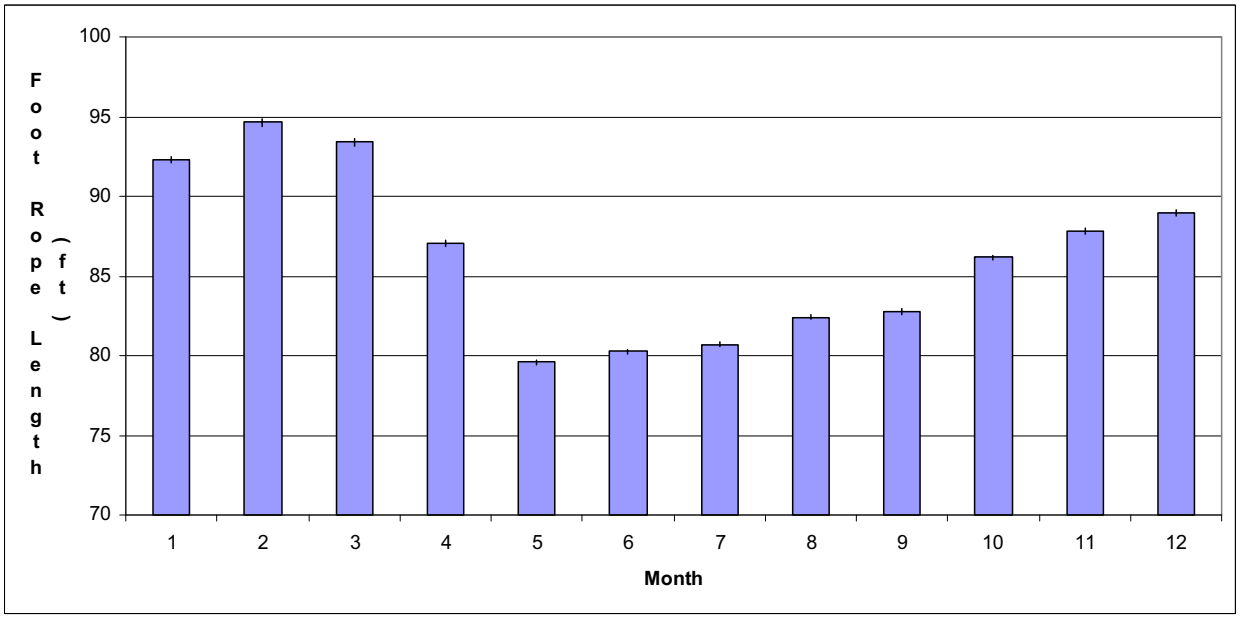
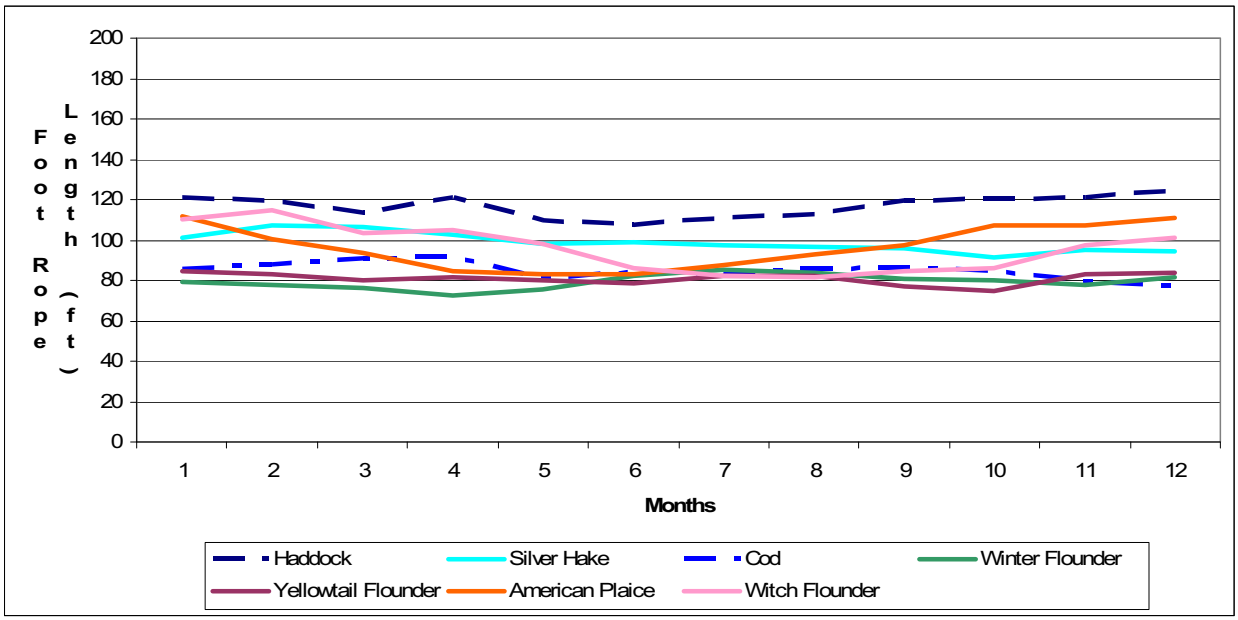


Figure 20. Mean gear size (footrope length in feet) by month and species for the U.S. Northeast and Mid-Atlantic bottom trawl fishery: (A) Northeast multispecies group, (B) mid-Atlantic FMP species[a], (C) mix of species with individual FMPs from both the northeast and mid-Atlantic, and (D) other species

[a] Note that mean Atlantic mackerel gear size is not displayed in (B) for months 6-10 because of an extremely small number trips for these months that if shown may be misleading.

(A) NE multispecies



(B) Mid-Atlantic FMP species

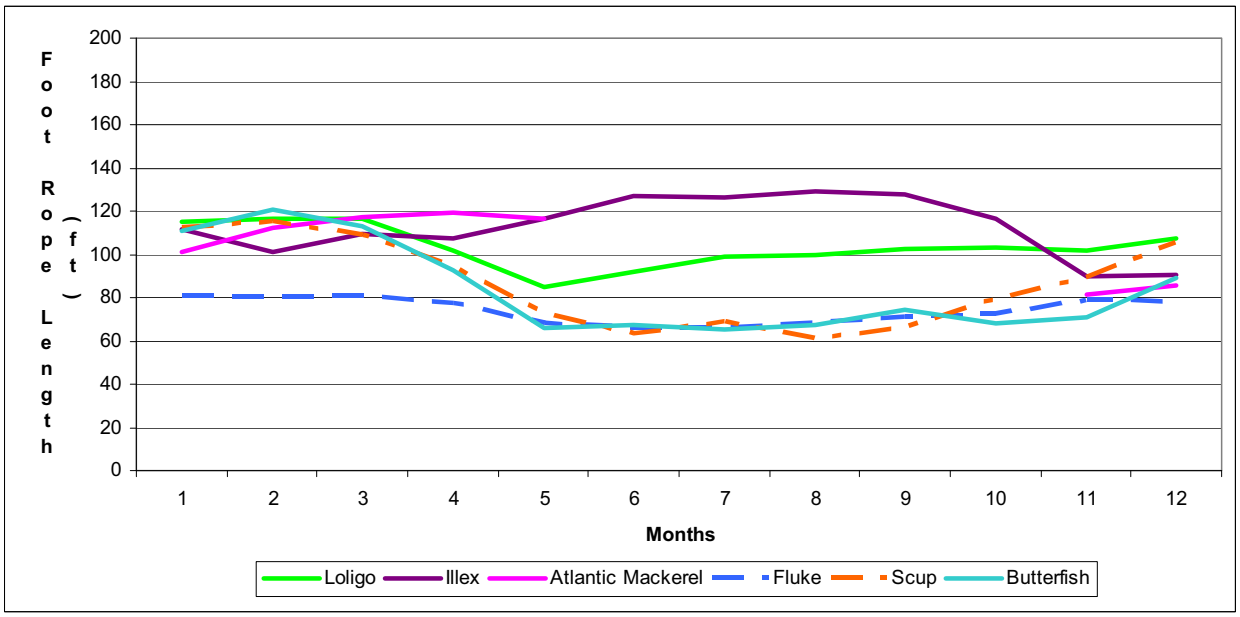
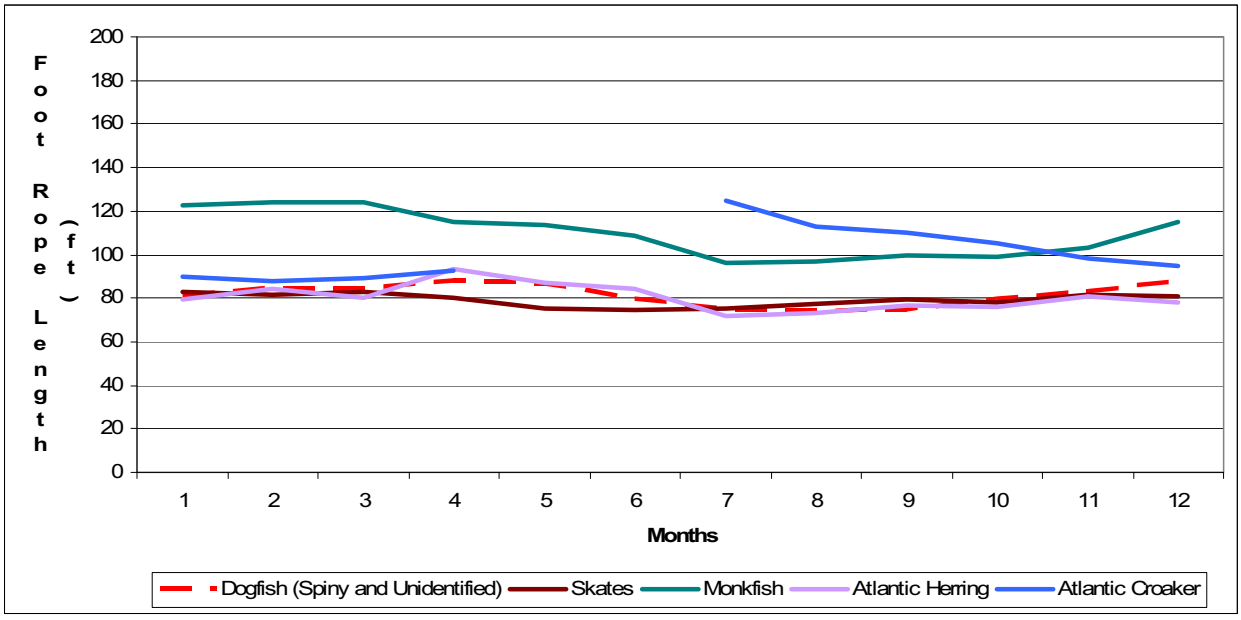


Figure 20 continued.

(C) Other species with FMPs



(D) "Other" categories

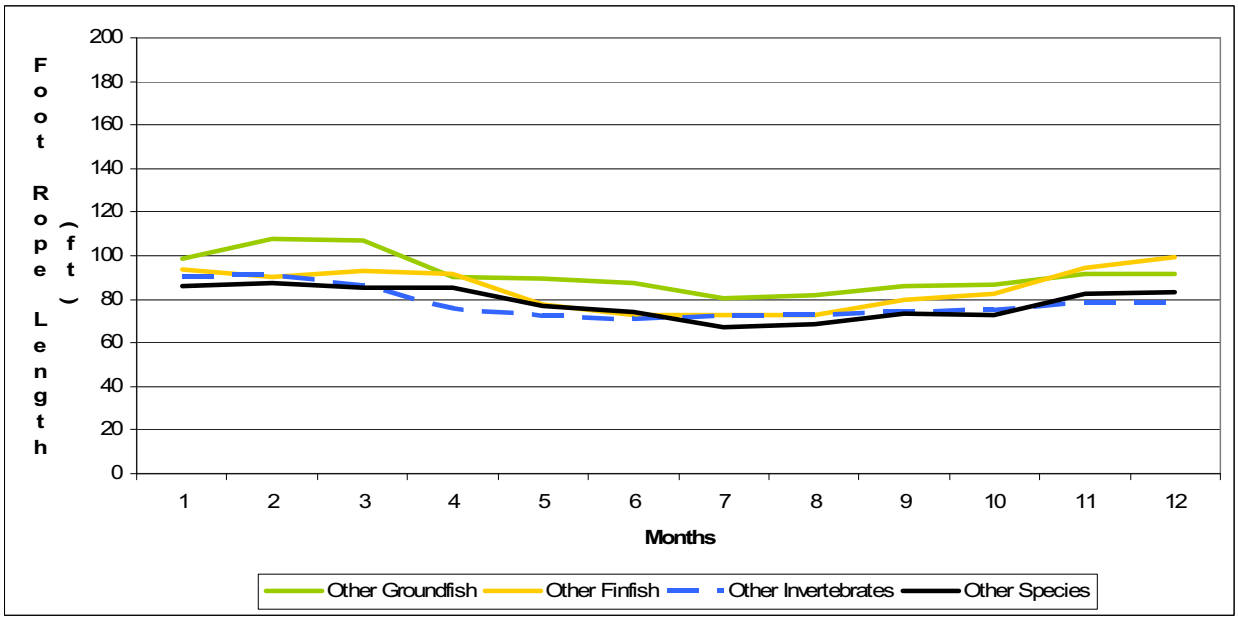
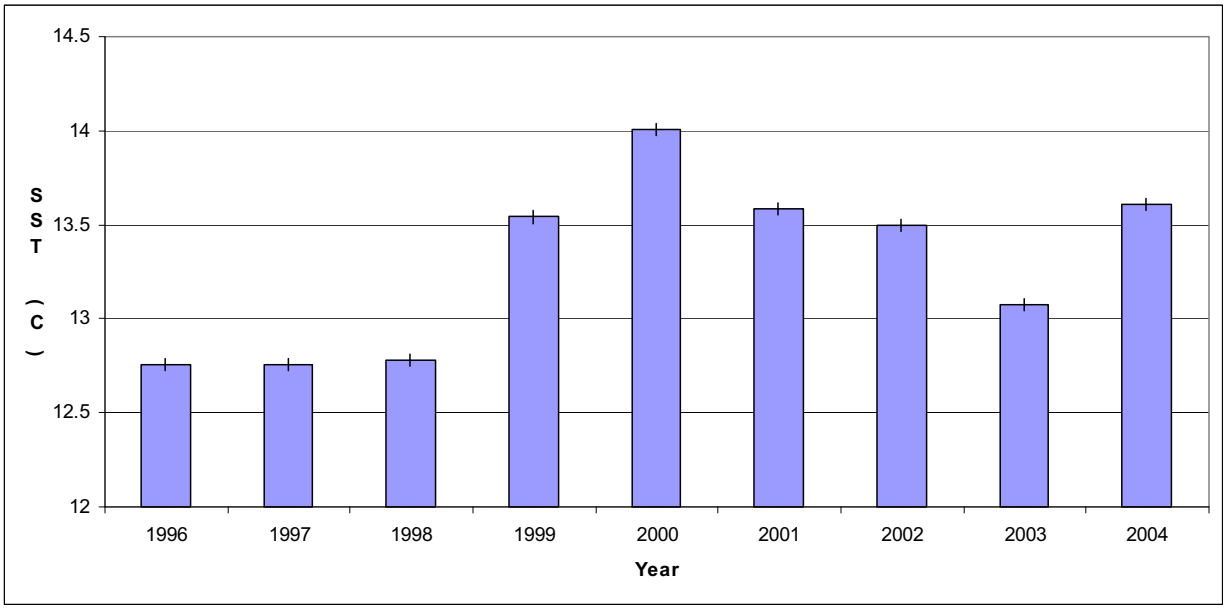


Figure 21. Mean SST (degrees C) for all trips for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, 1996–2004, (A) by year and (B) by month

(A) By year



B) By month

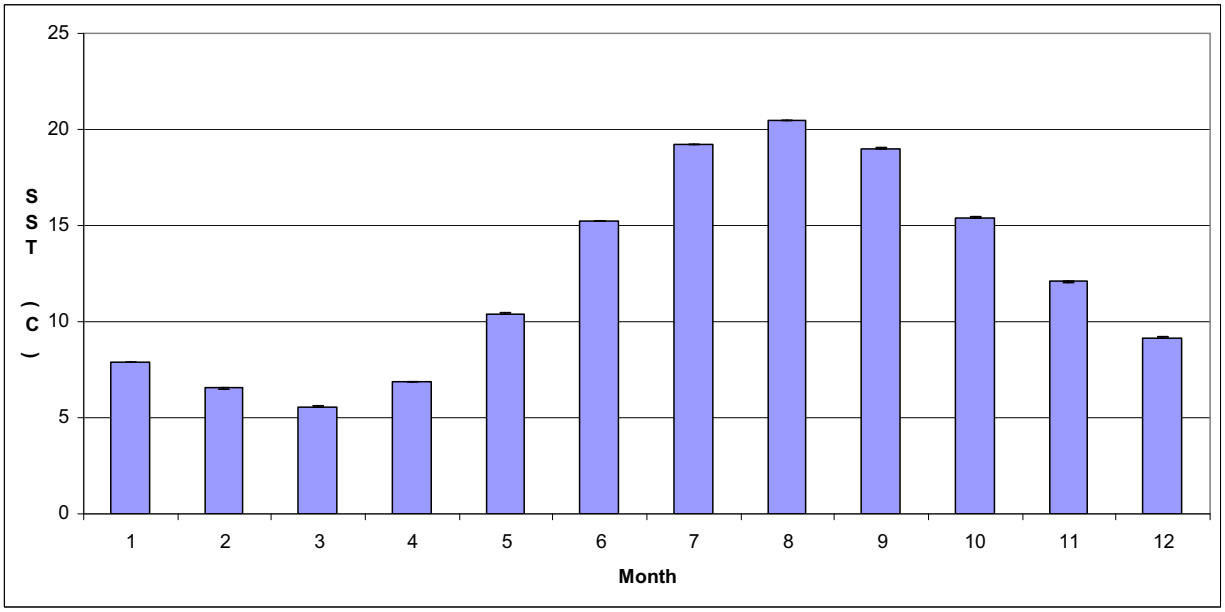
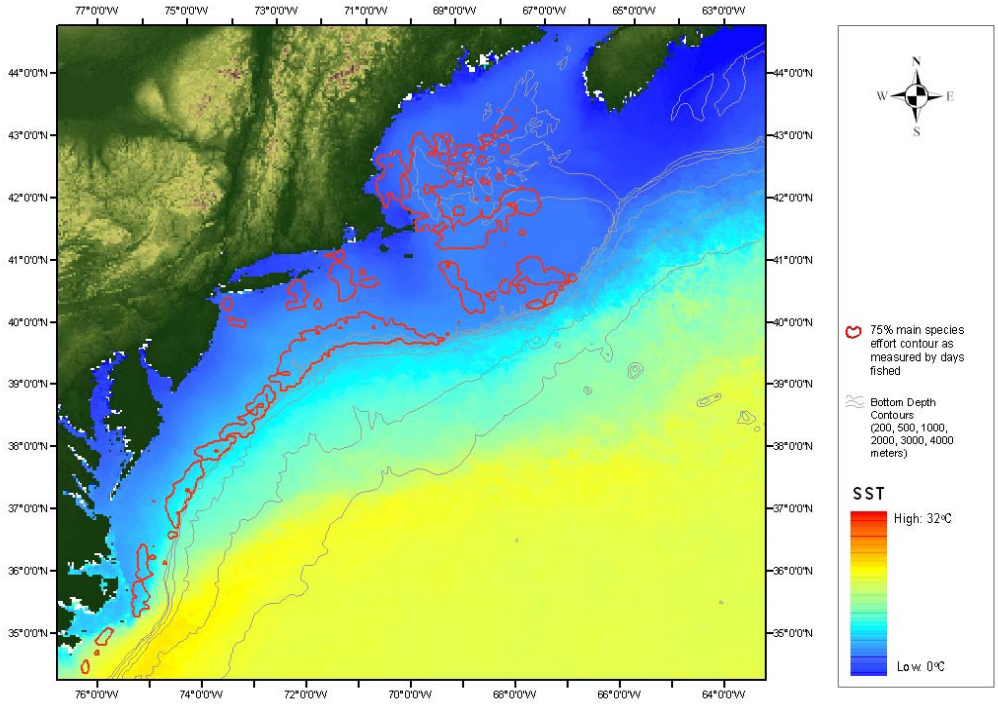


Figure 22. Distribution of U.S. Northeast and Mid-Atlantic bottom trawl effort (days fished) shown as the 75% effort contour by quarter aggregated over 1996–2004, overlaid on 23-year monthly mean SST images: (A) First Quarter, (B) Second Quarter, (C) Third Quarter and (D) Fourth Quarter

(A) First Quarter (Jan.-March.) bottom trawl, SST image from February



(B) Second Quarter (April-June) bottom trawl, SST image from May

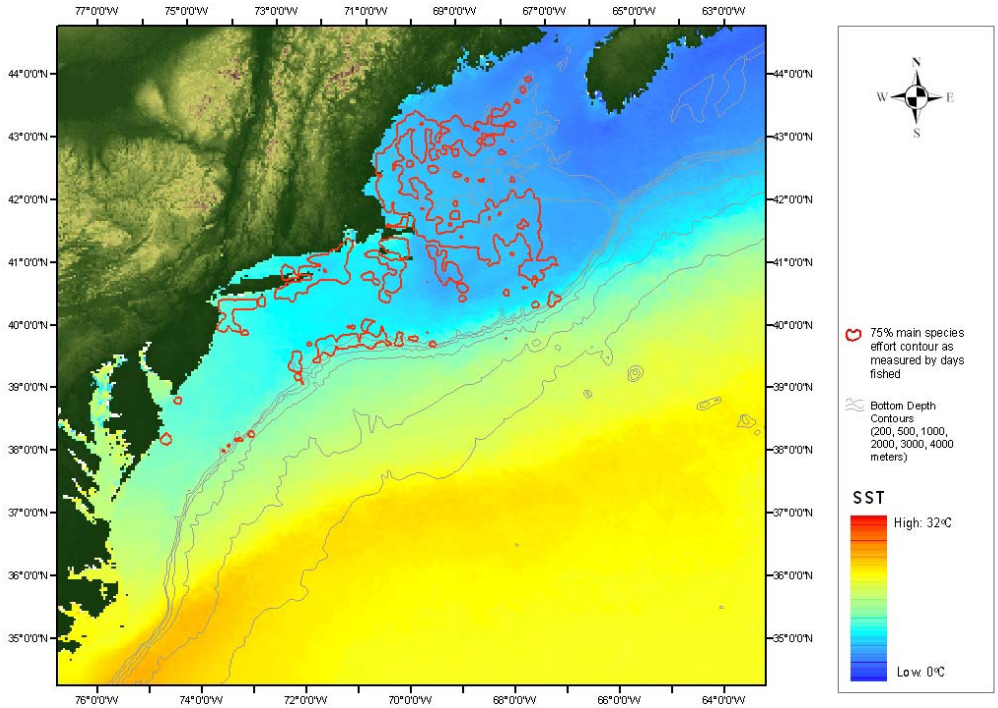
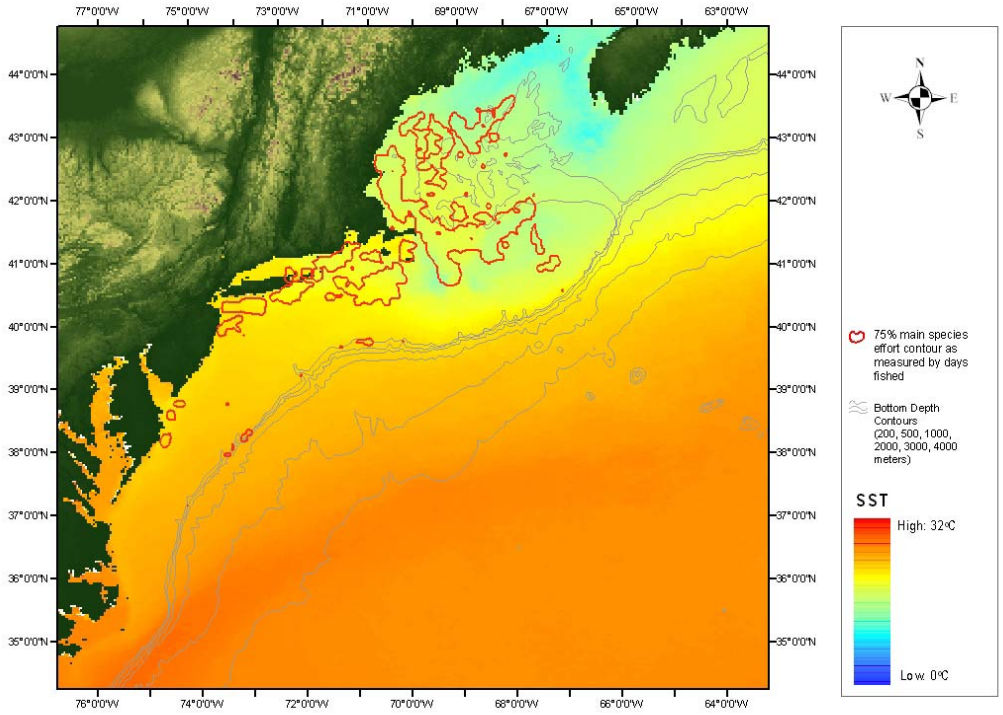


Figure 22 continued.

(C) Third Quarter (July-Sept.) bottom trawl, SST image from August



(D) Fourth Quarter (Oct.-Dec.) bottom trawl, SST image from November

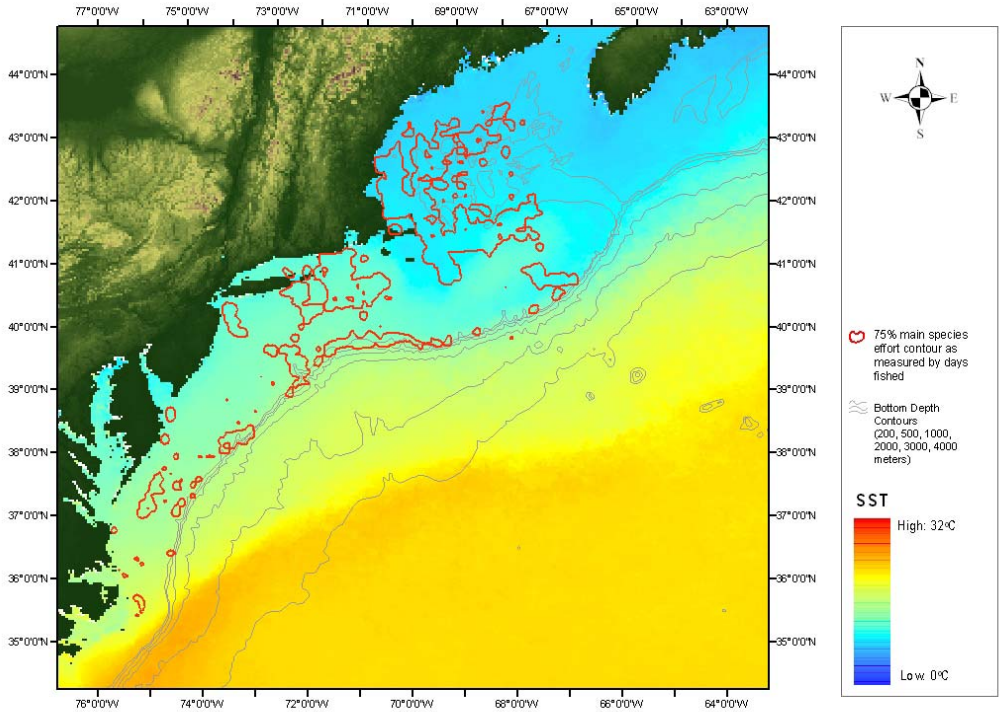
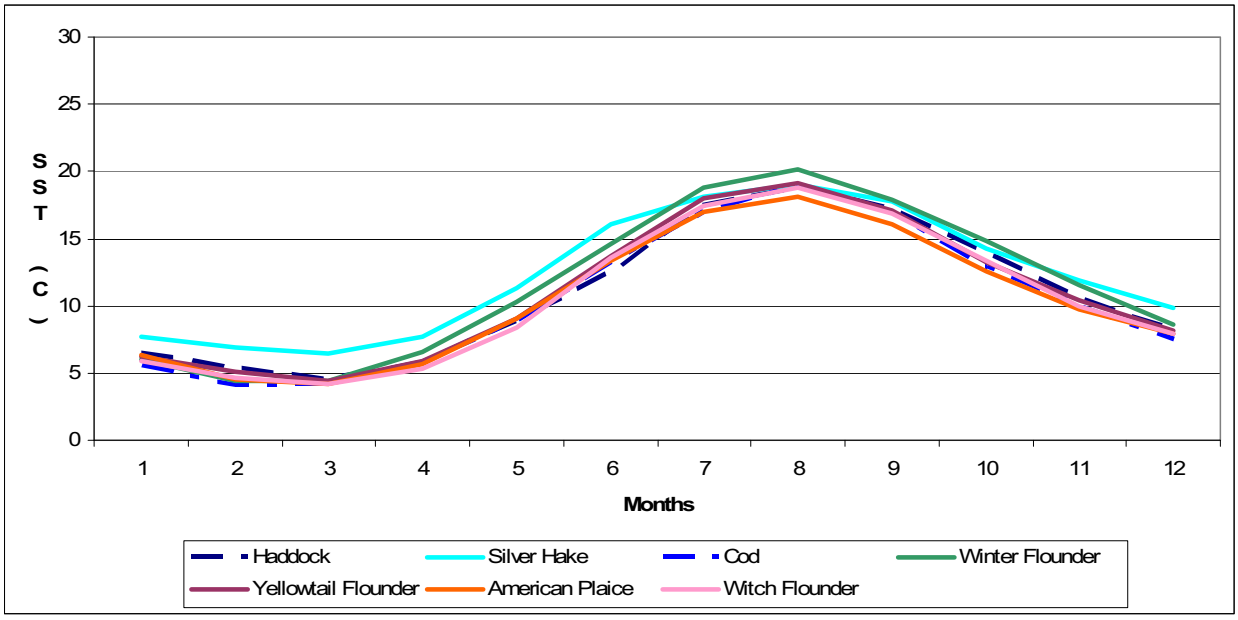


Figure 23. Mean SST (degrees Celsius) by month and species for the U.S. Northeast and Mid-Atlantic bottom trawl fishery: (A) Northeast multispecies group, (B) mid-Atlantic FMP species, (C) mix of species with individual FMPs from both the northeast and mid-Atlantic, and (D) other species

(A) NE Multispecies



(B) Mid-Atlantic FMP species

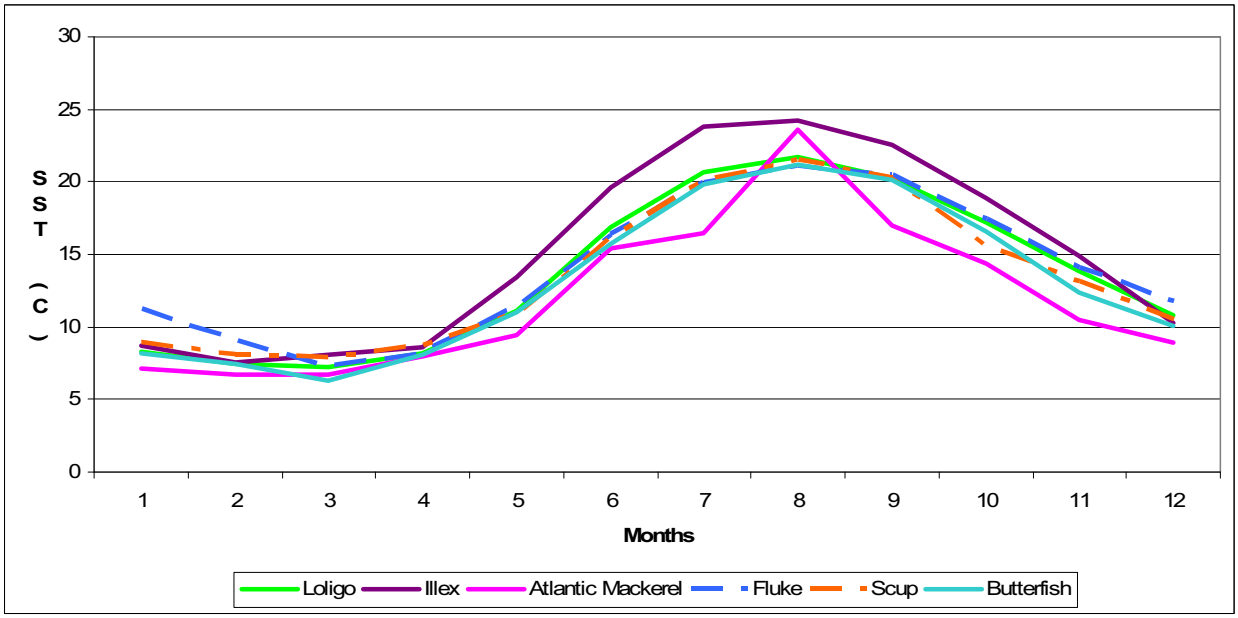
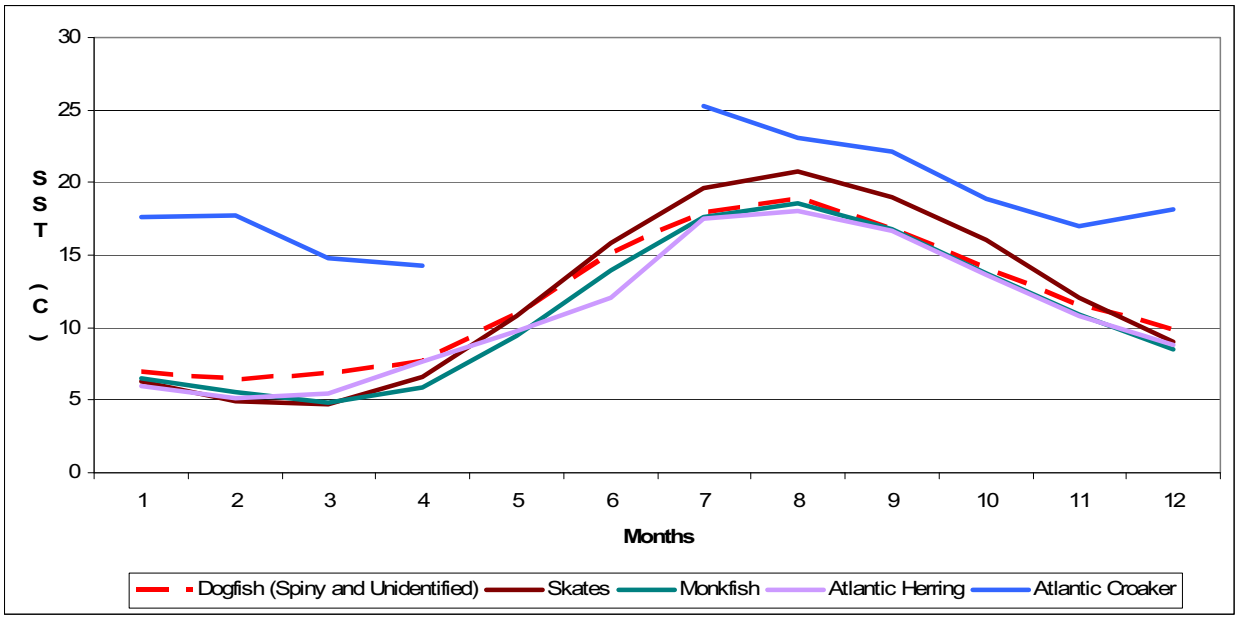


Figure 23 continued.

(C) Other FMP species



(D) "Other" categories

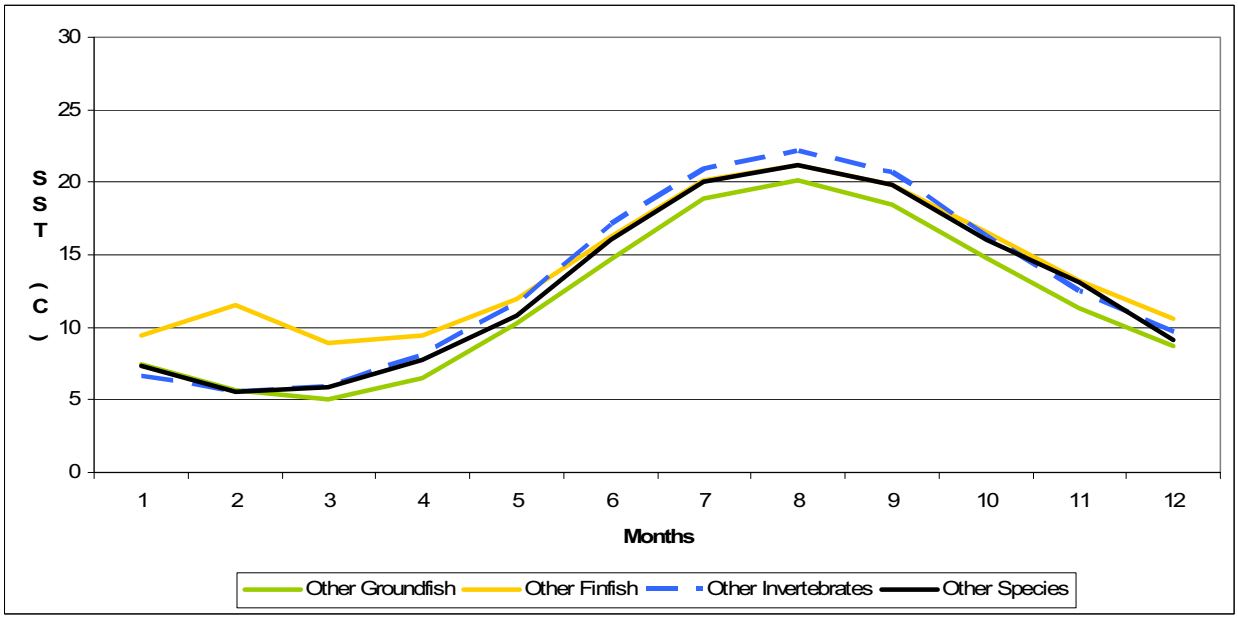


Figure 24. Distribution of U.S. Northeast and Mid-Atlantic mid-water trawl effort (days fished), over the period 1996–2004

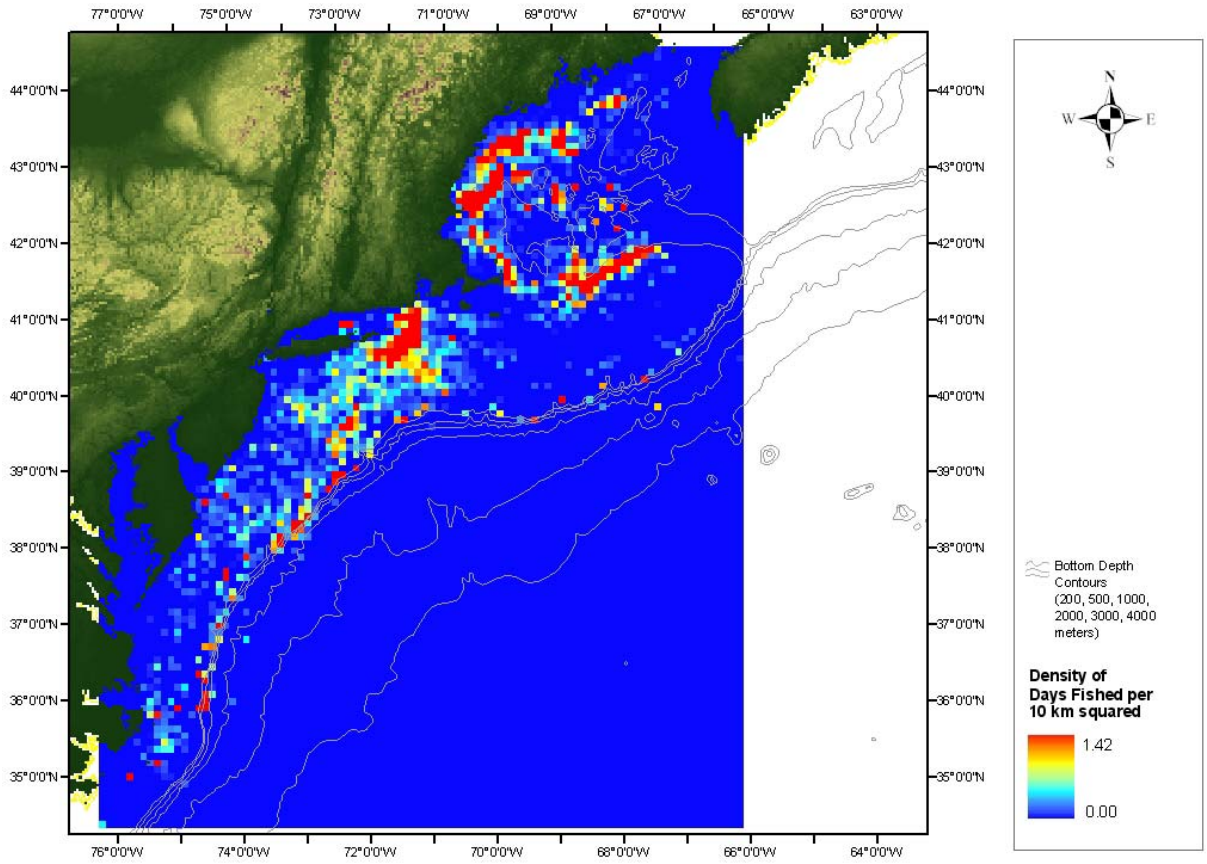


Figure 25. Mean days fished per trip for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

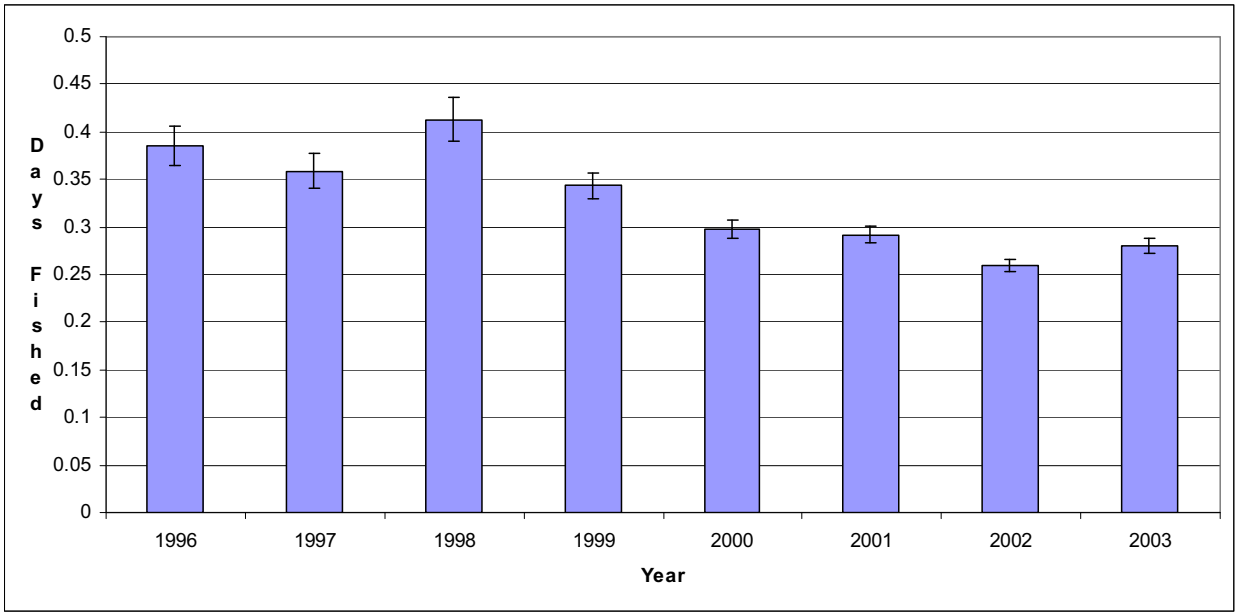


Figure 26. Mean days fished per trip by month for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, using data from 1996–2004

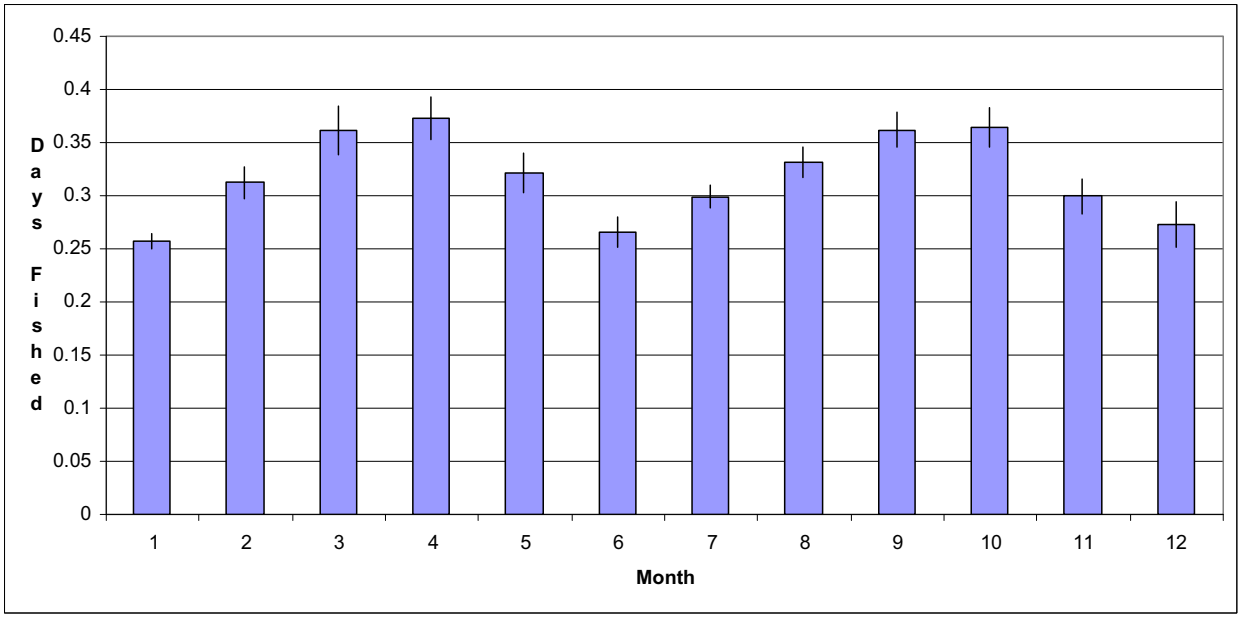


Figure 27. Mean days fished per trip by month and main species for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004

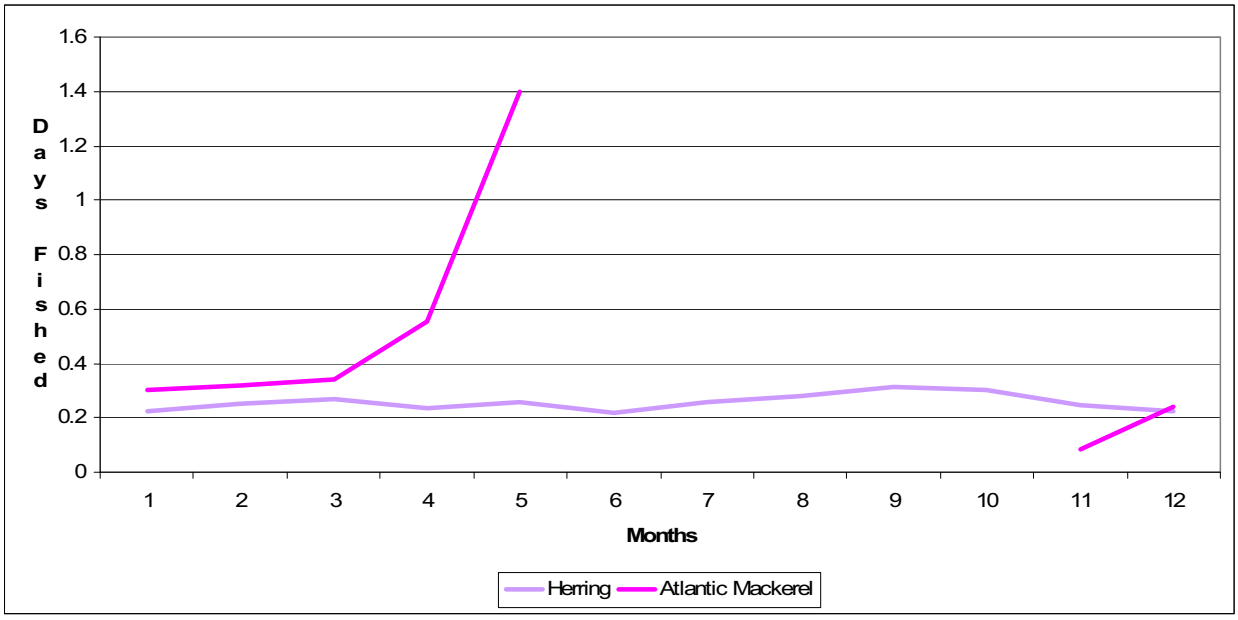
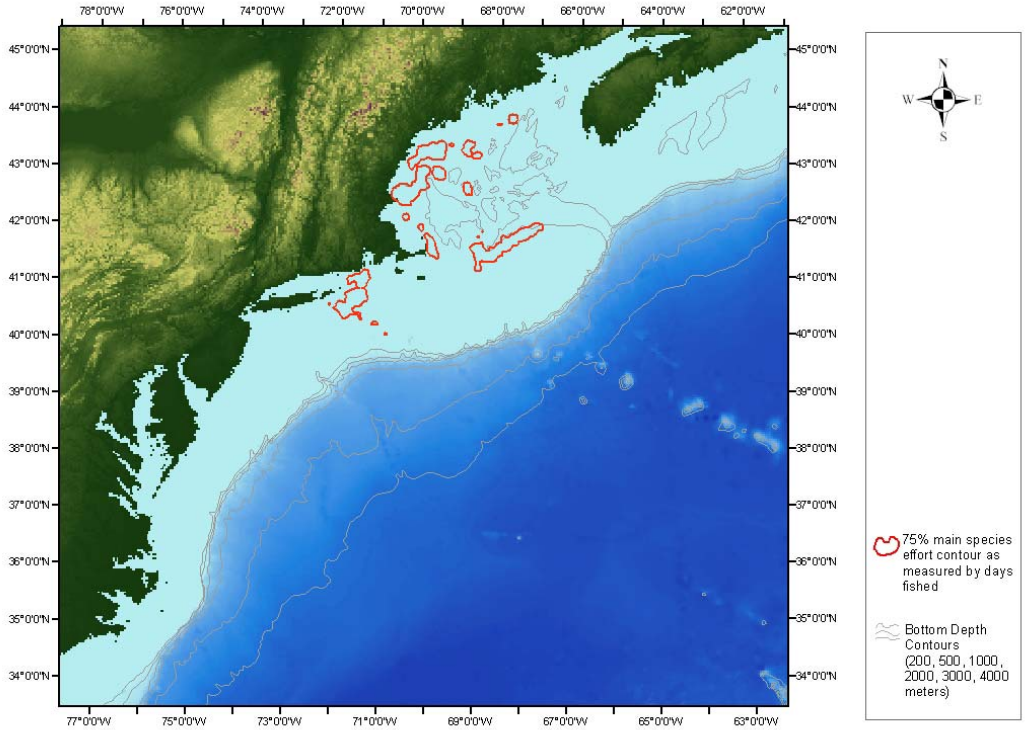


Figure 28. Distribution of U.S. Northeast and Mid-Atlantic mid-water trawl effort for top species shown as the 75% effort contour (days fished) for trips that caught more of identified species by live weight than any other species (1996–2004)

(A) Atlantic herring



(B) Atlantic mackerel

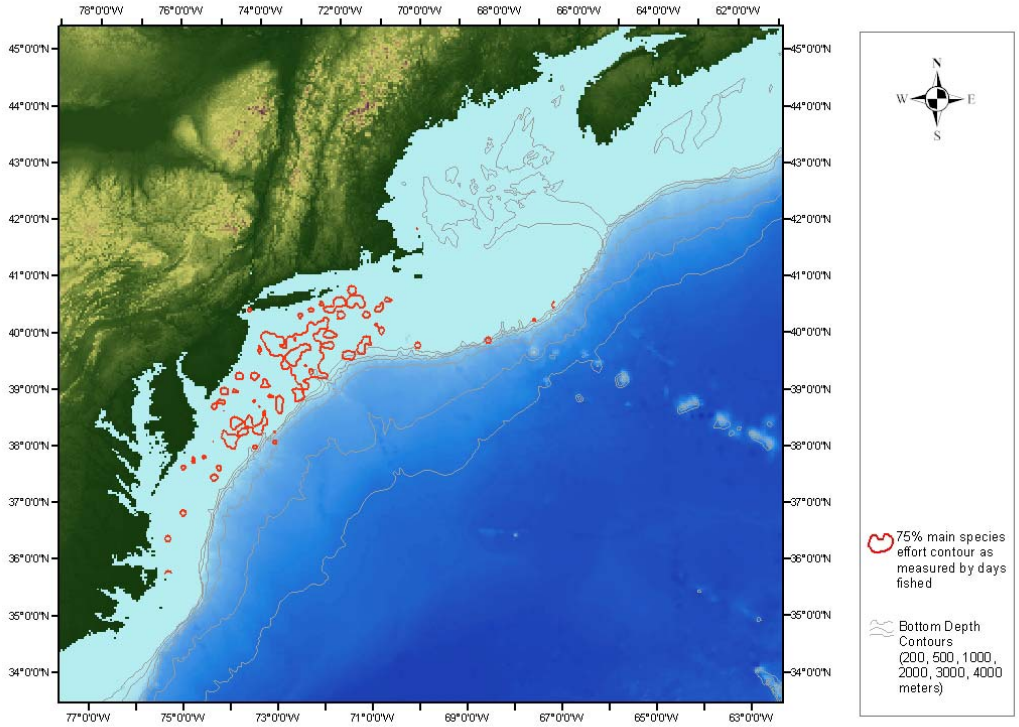
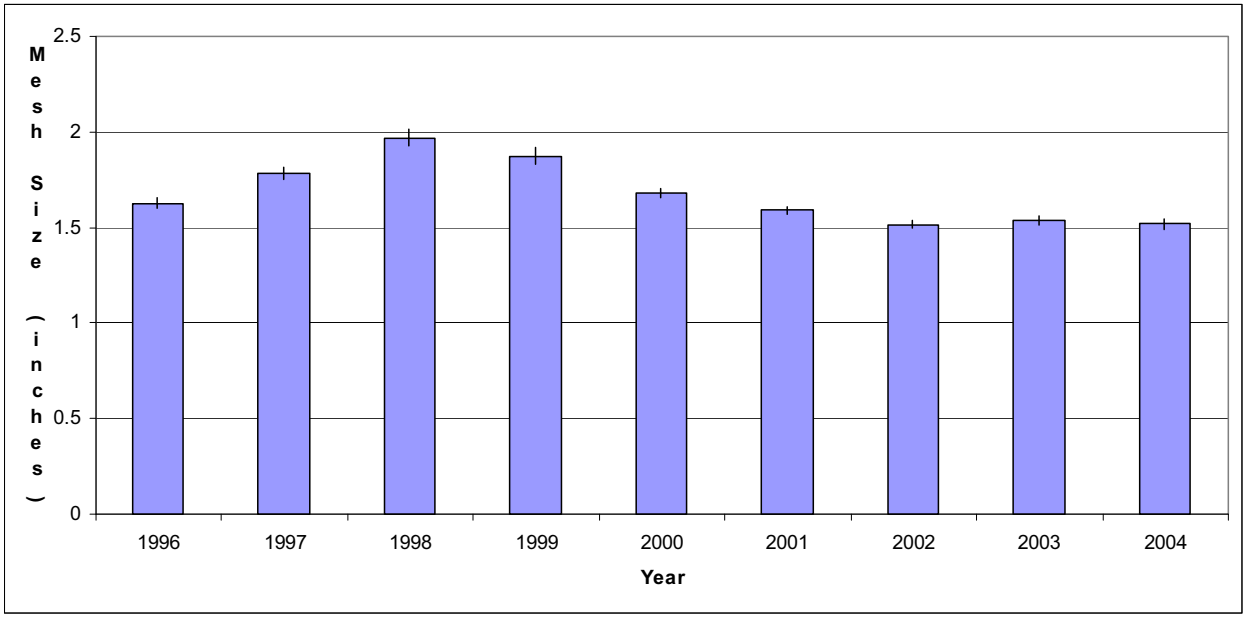


Figure 29. Mean codend mesh size (in inches) for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery (A) by year and (B) by month over 1996–2004

(A) By year



(B) By month

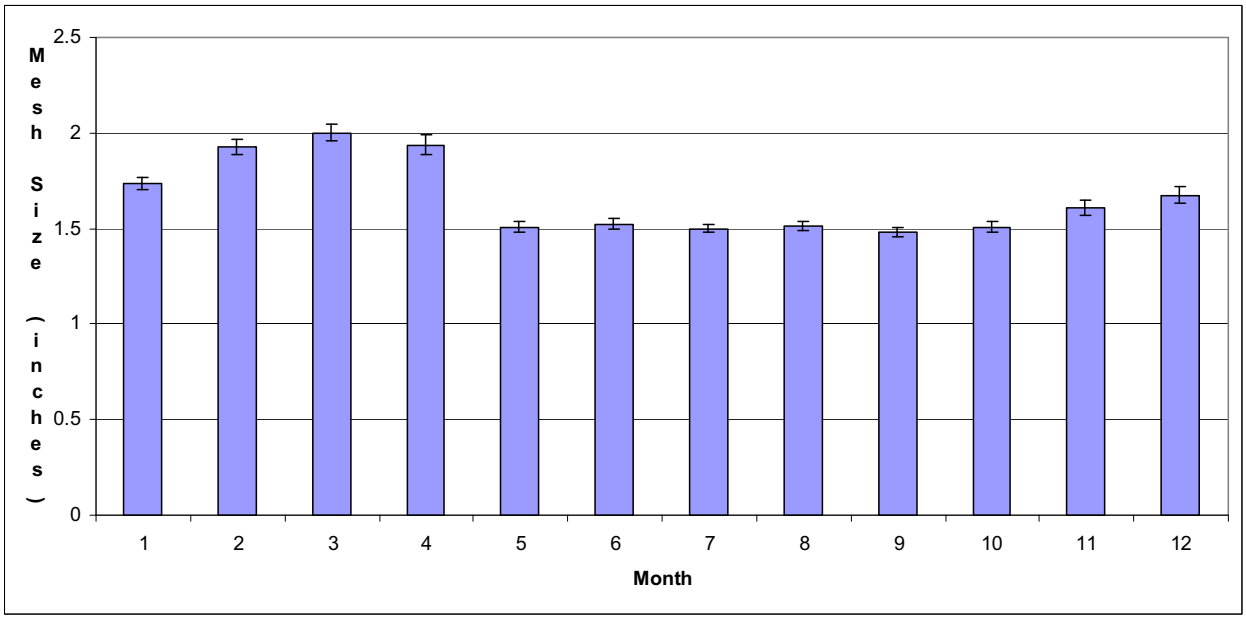


Figure 30. Mean mesh size (codend, inches) by month and species for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, over 1996–2004

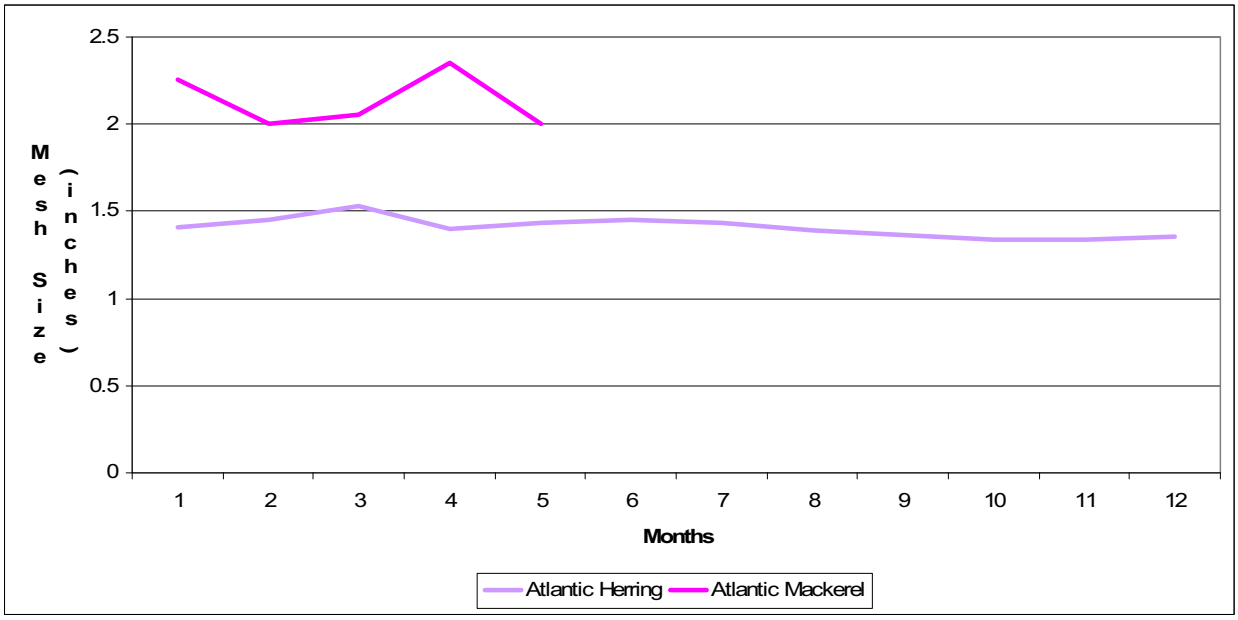
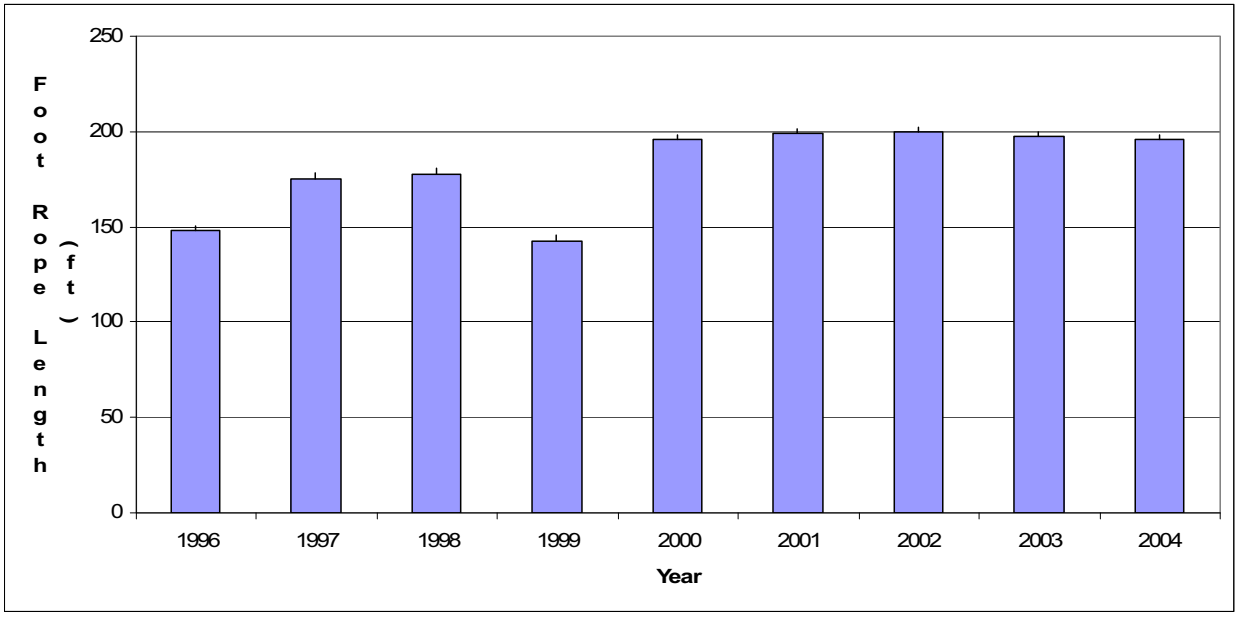


Figure 31. Mean gear size (in feet of footrope) for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery (A) by year and (B) by month over 1996–2004

(A) By year



(B) By month

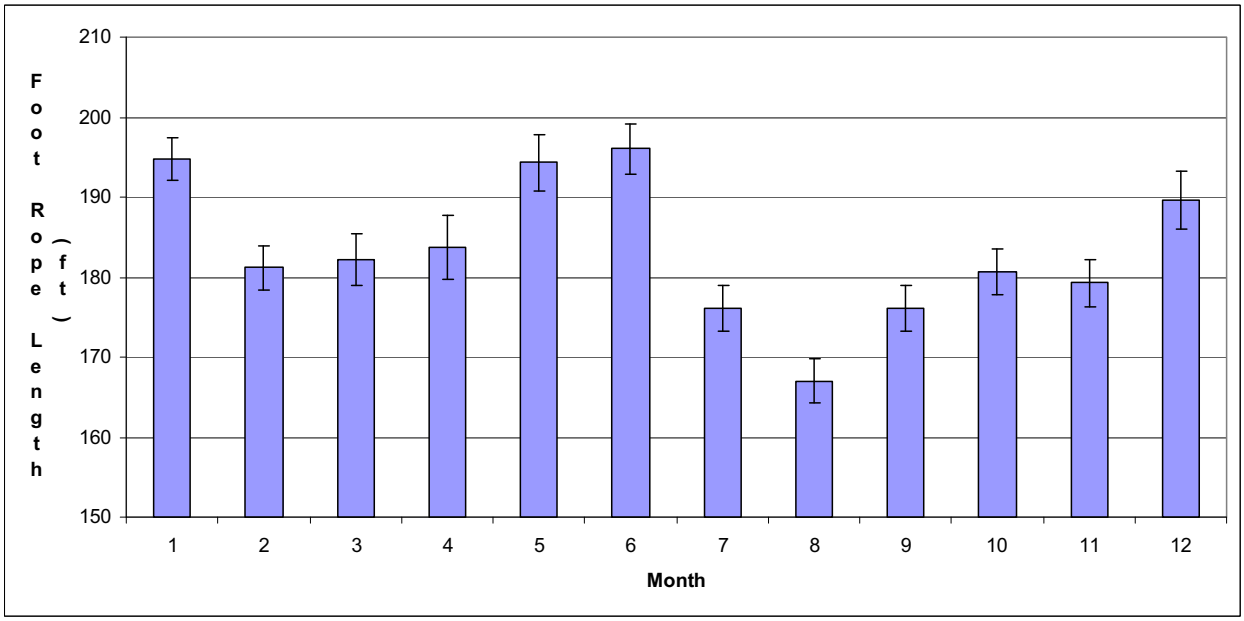


Figure 32. Mean gear size (in feet of footrope) by month and species for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery over 1996–2004

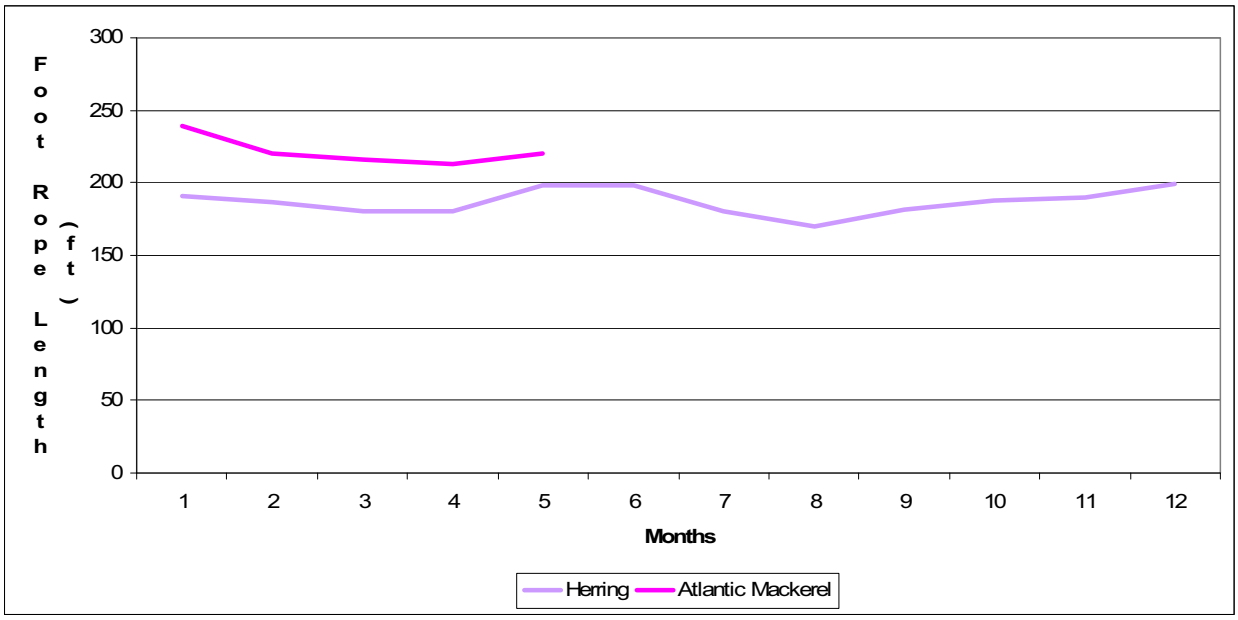
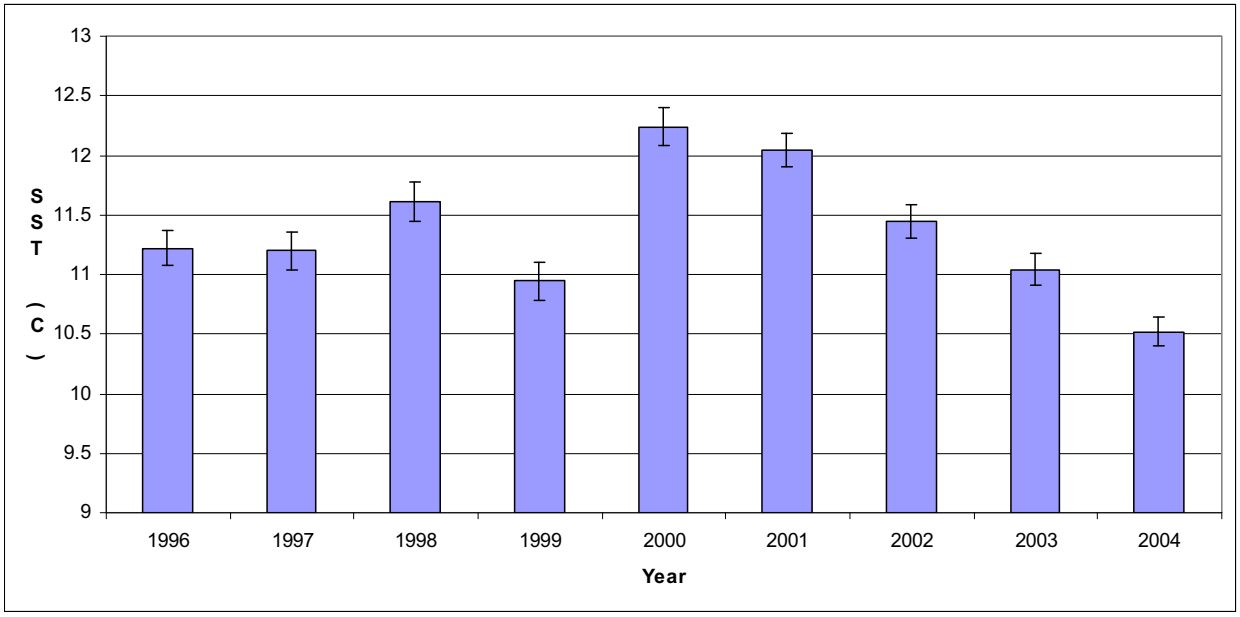


Figure 33. Mean SST (degrees C) for all trips for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, 1996–2004, (A) by year and (B) by month

(A) By year



(B) By Month

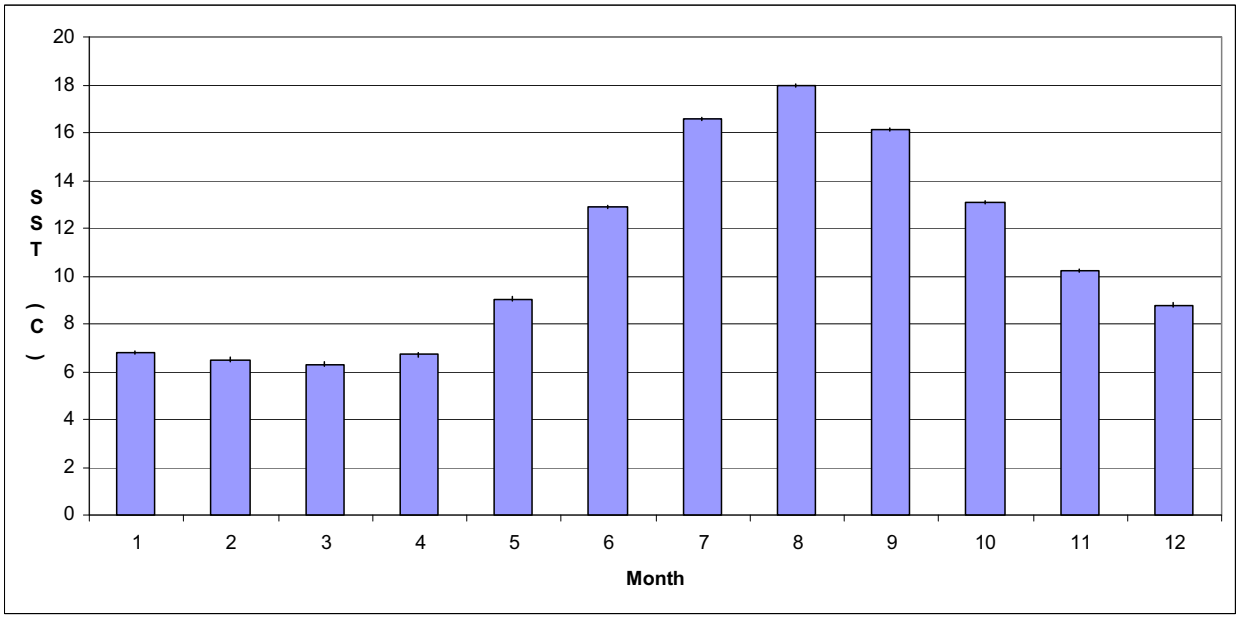
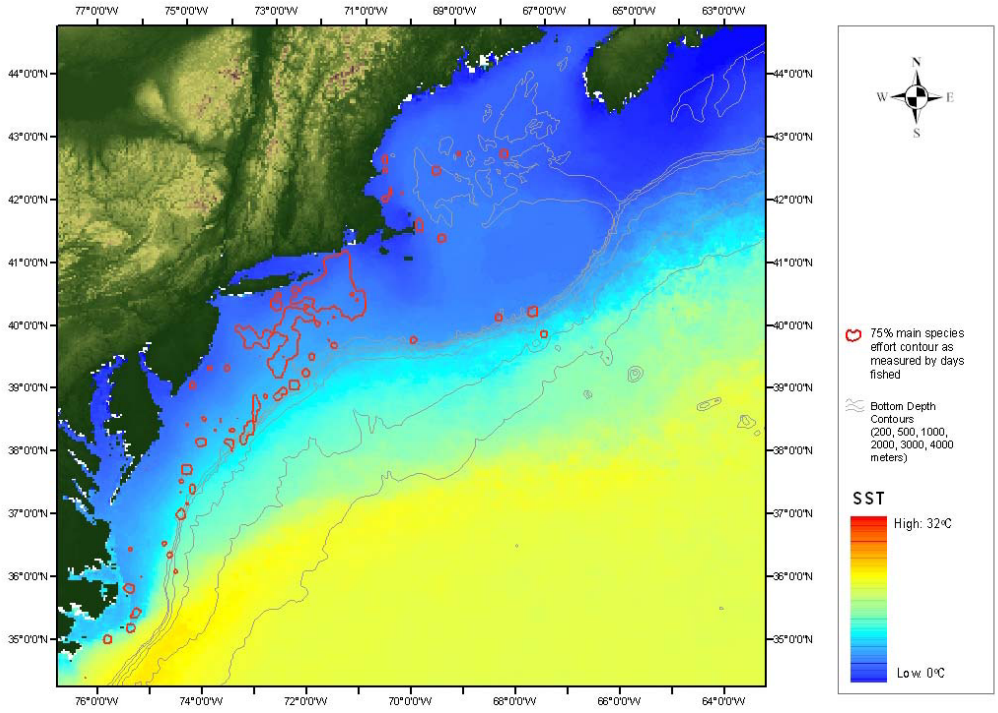


Figure 34. Distribution of U.S. Northeast and Mid-Atlantic mid-water trawl effort (days fished) shown as the 75% effort contour by quarter aggregated over 1996–2004, overlaid on 23-year monthly mean SST images: (A) First Quarter, (B) Second Quarter, (C) Third Quarter and (D) Fourth Quarter

(A) First Quarter (Jan.-March.) mid-water trawl, SST image from February



(B) Second Quarter (April-June) mid-water trawl, SST image from May

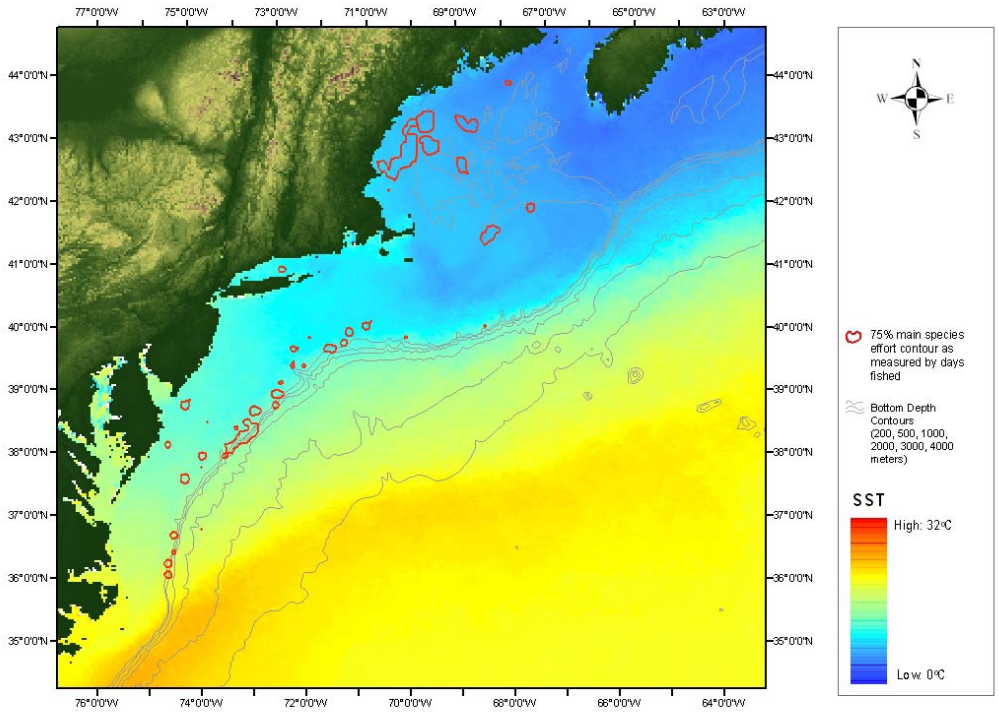
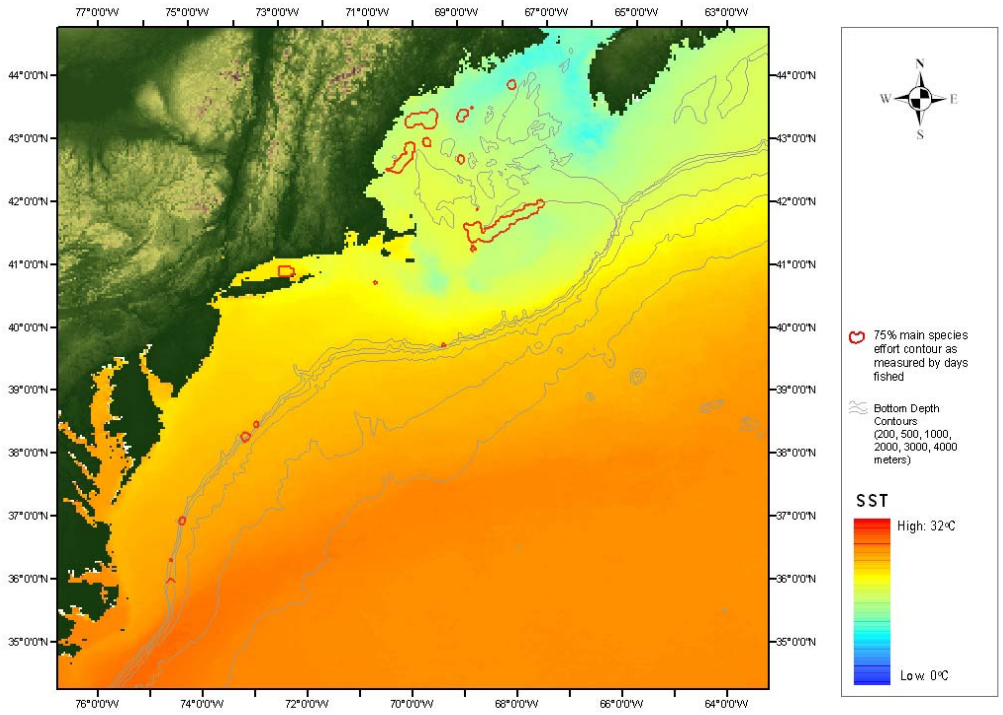


Figure 34 continued.

(C) Third Quarter (July-Sept.) mid-water trawl, SST image from August



(D) Fourth Quarter (Oct.-Dec.) mid-water trawl, SST image from November

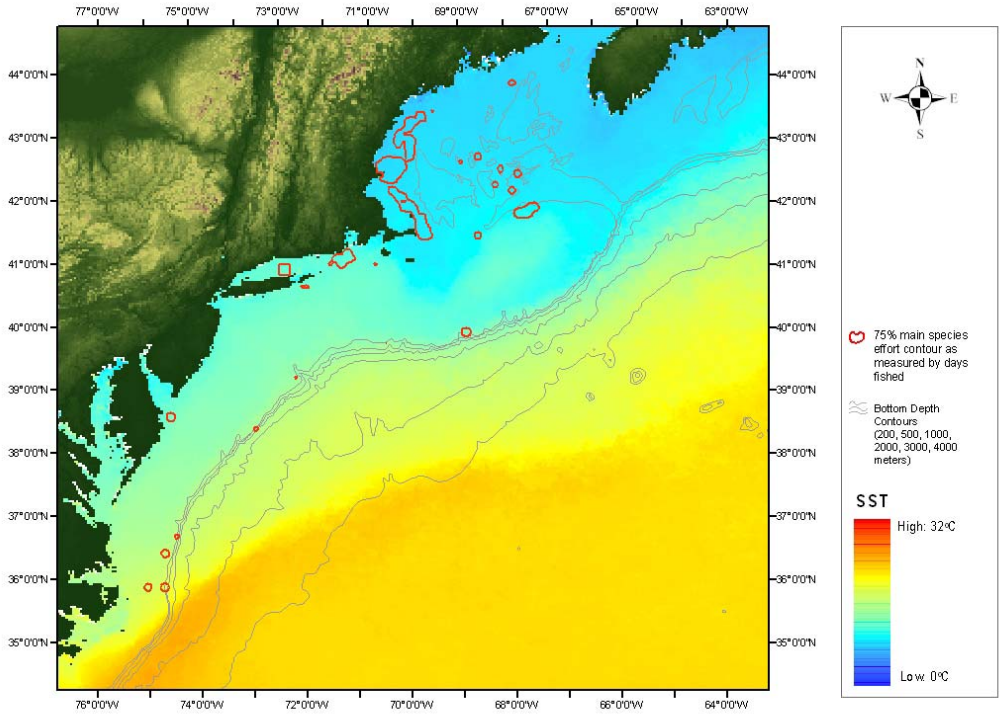
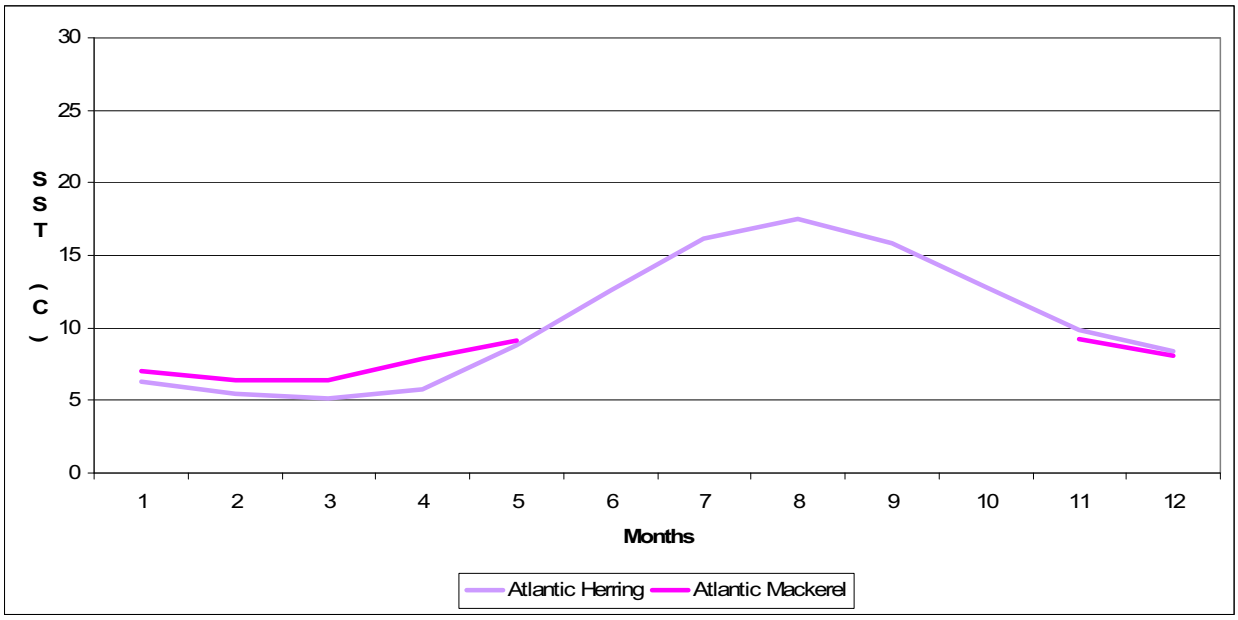


Figure 35. Mean SST by month and species for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, over 1996–2004



APPENDIX A: List of Fishery Management Plans (FMPs) for the Northeast and Mid-Atlantic by management body, and species covered.

FMPs discussed in text are shaded gray.

Management Body	FMP Name	Species Name
ASMFC	American Croaker	Croaker, Atlantic
ASMFC	American Eel	Eel, American
ASMFC	American Lobster	Lobster, American
ASMFC	Atlantic Menhaden	Menhaden
ASMFC	Atlantic Sturgeon	Sturgeon, Atlantic
ASMFC	Horseshoe Crab	Crab, Horseshoe
ASMFC	Northern Shrimp	Shrimp, Atlantic & Gulf, Marine, Unknown
ASMFC	Northern Shrimp	Shrimp, Atlantic & Gulf, Brown
ASMFC	Red Drum	Drum, Red
ASMFC	Shad & River Herring	Alewife
ASMFC	Shad & River Herring	Herring, Blueback
ASMFC	Shad & River Herring	Shad, Hickory
ASMFC	Shad & River Herring	Shad, American
ASMFC	Spanish Mackerel	Mackerel, Spanish
ASMFC	Spot	Spot
ASMFC	Spotted Seatrout (Spotted Weakfish)	Sea Trout, Spotted
ASMFC	Striped Bass	Striped Bass
ASMFC	Tautog	Tautog
ASMFC	Weakfish (Squeteague/Grey Seatrout)	Sea Trout, Gray(Weakfish)
MAFMC	Bluefish	Bluefish
MAFMC	Mackerel, Squid & Butterfish	Butterfish
MAFMC	Mackerel, Squid & Butterfish	Mackerel, Atlantic
MAFMC	Mackerel, Squid & Butterfish	Squid, Long Finned (Loligo)
MAFMC	Mackerel, Squid & Butterfish	Squid, Short Finned (Illex)
MAFMC	Mackerel, Squid & Butterfish	Squids, Unknown
MAFMC	Quahogs & Surf Clams	Clam, Ocean Quahog
MAFMC	Quahogs & Surf Clams	Clam, Surf
MAFMC	Summer flounder, scup & Black sea bass	Flounder, Summer (Fluke)
MAFMC	Summer flounder, scup & Black sea bass	Scup
MAFMC	Summer flounder, scup & Black sea bass	Sea Bass, Black
MAFMC	Tilefish	Tilefish, Golden
MAFMC & NEFMC	Dogfish	Dogfish, Spiny
MAFMC & NEFMC	Monkfish	Goosefish
NEFMC	Herring	Herring, Atlantic, Sea
NEFMC	Multispecies	Cod, Atlantic
NEFMC	Multispecies	Flounder, Winter
NEFMC	Multispecies	Flounder, Witch (Gray Sole)
NEFMC	Multispecies	Flounder, Yellowtail
NEFMC	Multispecies	Flounder, Plaice, American (Dab)
NEFMC	Multispecies	Flounder, Sand Dab (Windowpane)
NEFMC	Multispecies	Haddock
NEFMC	Multispecies	Hake, Atlantic, White
NEFMC	Multispecies	Halibut ,Atlantic
NEFMC	Multispecies	Ocean Perch,(Redfish)

Management Body	FMP Name	Species Name
NEFMC	Multispecies	Ocean Pout
NEFMC	Multispecies	Pollock, Atlantic
NEFMC	Red Crab	Crab, Red At
NEFMC	Scallops	Scallop, Sea
NEFMC	Skates	Skate, Rosette
NEFMC	Skates	Skates
NEFMC	Skates	Skate, Little
NEFMC	Skates	Skate, Winter
NEFMC	Skates	Skate, Barndoor
NEFMC	Skates	Skate, Smooth
NEFMC	Skates	Skate, Thorny
NEFMC	Skates	Skate, Clearnose
NEFMC	Small-mesh multispecies	Hake, Atlantic, Red
NEFMC	Small-mesh multispecies	Hake, Offshore, Unknown (Whiting, Black)
NEFMC	Small-mesh multispecies	Hake, Silver, Unknown (Whiting)
NEFMC	Atlantic Salmon	Salmon, Atlantic
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Nurse
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Sand Tiger
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Dogfish, Unkown
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Dogfish, Smooth
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Thresher
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Bigeye Thresher
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Bonito(Shortfin Mako)
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Mako Unknown
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Longfin Mako
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Unknown
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark,Thresher, Unkown
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Swordfish
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Blackfin
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Unkown
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Skipjack
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Bluefin
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Little (Tunny)
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Bigeye
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Albacore
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Tuna, Yellowfin
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Atlantic Angel
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Scalloped Hammerhead
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Smooth Hammerhead
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, White
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Porbeagle
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Sandbar
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Bignose
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Dusky
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Silky
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Night
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Blacktip
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Spinner
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Bull

Management Body	FMP Name	Species Name
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Oceanic Whitetip
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Tiger
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Lemon
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Blue
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Atlantic Sharpnose
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Hammerhead
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Basking
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Carcharhin, Unknown
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Pelagic, Unknown
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Finetooth
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Small Coastal
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Ridgeback Large
NMFS	HMS Swordfish, Tuna, Billfish, and Shark	Shark, Bigeye Sand Tiger

APPENDIX B: Average monthly landings by fishing region and species for the U.S. Northeast and Mid-Atlantic bottom trawl fishery, over period 1996-2004 (live weight, metric tons)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gulf of Maine												
Bluefish	0	0	0	0	0	0	0	1	3	4	1	0
Butterfish	0	0	1	0	0	0	2	0	2	2	1	0
Cod	187	180	255	286	313	416	289	213	242	278	318	300
Croaker, Atlantic	0	0	0	0	0	1	0	0	1	0	0	0
Dogfish, Spiny	1	0	0	2	6	31	56	72	52	53	24	7
Flounder, Winter	41	27	46	55	68	104	178	243	330	348	227	160
Flounder, Witch	120	146	147	142	128	213	218	167	134	106	101	120
Flounder, Yllwtail	87	39	86	53	117	122	79	72	117	123	101	229
Fluke	3	2	2	1	1	2	5	3	2	2	2	1
Haddock	153	225	171	105	38	104	135	137	164	207	141	152
Hake, Silver	25	22	32	6	17	17	109	162	200	340	210	35
Herring, Atlantic	0	0	0	0	29	23	46	64	101	51	91	72
Mackerel, Atlantic	1	1	1	1	1	0	0	0	1	2	3	2
Monkfish	339	372	403	248	171	219	206	198	216	267	254	325
Plaice, American	151	118	141	144	186	293	271	249	211	178	176	171
Scup	0	1	0	0	0	0	0	0	0	0	0	0
Shad	1	0	0	0	0	0	0	0	4	5	1	0
Skates	28	22	33	47	44	100	119	179	199	165	295	95
Squid, Illex	0	0	0	0	0	0	0	0	0	1	1	0
Squid, Loligo	4	4	3	2	7	1	4	2	1	3	5	7
Other finfish	1	1	1	2	1	1	3	4	4	5	5	2
Other groundfish	260	270	312	164	209	304	332	334	341	380	303	233
Other pelagics	0	0	0	0	0	0	1	0	2	0	0	1
Other invertebrates	25	28	25	16	19	19	22	13	12	16	21	23
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1,428	1,459	1,659	1,274	1,354	1,974	2,075	2,114	2,338	2,538	2,280	1,933
Georges Bank												
Bluefish	0	0	0	0	0	0	0	1	1	1	0	0
Butterfish	17	73	45	17	10	4	5	3	3	2	2	2
Cod	94	94	315	667	443	257	62	39	41	37	35	86
Croaker, Atlantic	0	0	0	0	0	0	0	0	0	1	0	2
Dogfish, Spiny	0	0	0	1	1	0	0	6	0	0	0	0

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flounder, Winter	21	15	32	111	260	317	218	148	98	83	126	85
Flounder, Witch	23	23	60	65	51	68	41	40	51	42	33	28
Flounder, Yllwtail	213	178	267	307	329	288	229	198	65	87	170	283
Fluke	12	14	15	13	6	3	3	3	1	1	2	4
Haddock	117	106	150	316	211	252	112	78	94	69	31	87
Hake, Silver	123	115	179	259	462	534	687	706	514	171	152	104
Herring, Atlantic	0	0	2	5	3	2	8	33	26	90	2	0
Mackerel, Atlantic	1	4	6	38	14	2	3	5	3	1	2	2
Monkfish	96	126	269	205	115	152	108	120	180	182	126	108
Plaice, American	31	29	51	96	110	136	80	64	84	56	36	33
Scup	1	1	0	1	0	0	1	0	0	0	1	0
Shad	0	0	0	0	0	0	0	0	0	0	0	0
Skates	67	116	206	156	110	149	115	141	135	126	142	127
Squid, Illex	2	0	2	16	0	0	2	4	3	10	0	5
Squid, Loligo	367	184	126	94	14	1	2	2	2	15	188	291
Other finfish	1	1	2	5	2	2	2	1	0	1	1	1
Other groundfish	65	77	154	155	187	159	131	123	88	63	68	60
Other pelagics	1	0	0	0	0	0	0	0	0	0	3	0
Other invertebrates	28	29	48	41	18	34	33	32	21	18	20	21
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1,280	1,185	1,930	2,568	2,349	2,360	1,839	1,747	1,414	1,055	1,140	1,331
North Southern New England												
Bluefish	8	1	1	8	10	17	21	23	38	92	102	13
Butterfish	316	232	171	117	77	65	44	50	55	71	63	84
Cod	10	26	59	39	17	23	15	8	6	6	7	9
Croaker, Atlantic	44	47	30	0	0	0	0	4	5	21	35	57
Dogfish, Spiny	100	125	101	38	25	83	26	24	26	74	112	113
Flounder, Winter	55	58	77	184	216	142	99	98	47	47	98	118
Flounder, Witch	2	4	5	6	6	10	6	8	3	2	2	2
Flounder, Yllwtail	109	131	125	78	23	31	53	37	15	16	23	73
Fluke	545	363	223	149	141	131	165	135	214	87	132	144
Haddock	5	7	8	10	12	7	8	1	2	2	2	1
Hake, Silver	664	702	762	622	457	406	326	312	351	356	363	451
Herring, Atlantic	185	176	96	78	54	2	0	0	4	9	15	216
Mackerel, Atlantic	518	537	842	1,062	195	2	3	0	1	5	5	89
Monkfish	137	218	161	160	136	123	69	79	95	198	182	143

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Plaice, American	2	2	4	4	4	4	3	2	1	1	1	2
Scup	352	268	183	145	89	29	19	11	16	39	262	101
Shad	34	34	8	2	1	4	1	0	2	3	5	32
Skates	240	217	224	303	316	542	837	877	736	671	512	339
Squid, Illex	22	16	19	40	422	1,540	2,063	2,076	699	347	22	24
Squid, Loligo	989	1,659	1,454	786	535	484	776	715	520	1,411	866	995
Other finfish	101	81	61	62	36	22	19	19	45	86	51	43
Other groundfish	164	179	198	181	167	166	139	129	140	118	88	116
Other pelagics	0	3	1	1	2	3	0	1	1	1	0	0
Other invertebrates	338	279	205	155	149	158	199	171	151	190	129	158
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4,942	5,364	5,017	4,229	3,089	3,993	4,891	4,781	3,175	3,851	3,076	3,321
South Southern New England												
Bluefish	0	0	0	0	0	0	0	1	0	0	0	0
Butterfish	0	0	0	0	0	0	0	0	5	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0	0	0
Croaker, Atlantic	0	0	0	0	0	0	0	0	0	0	0	0
Dogfish, Spiny	1	2	1	0	0	0	0	0	0	0	1	0
Flounder, Winter	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Witch	0	0	0	0	0	1	0	0	0	0	0	0
Flounder, Yllwtail	0	0	0	0	0	0	0	0	0	0	0	0
Fluke	5	3	4	0	0	1	1	0	0	0	5	2
Haddock	0	0	0	0	0	0	0	0	0	0	0	0
Hake, Silver	0	1	0	0	0	0	0	5	3	1	0	0
Herring, Atlantic	0	0	0	0	0	0	0	0	0	0	0	0
Mackerel, Atlantic	0	0	0	8	0	0	0	0	0	0	0	0
Monkfish	0	0	0	0	0	0	0	1	3	0	0	0
Plaice, American	0	0	0	0	0	1	0	0	0	0	0	0
Scup	0	0	2	2	0	0	0	0	0	0	0	0
Shad	0	0	0	0	0	0	0	0	0	0	0	0
Skates	0	0	0	0	0	0	0	0	1	6	0	0
Squid, Illex	0	0	3	1	0	0	4	9	6	0	0	0
Squid, Loligo	14	1	5	3	0	0	0	3	2	15	4	7
Other finfish	0	0	1	0	0	0	0	0	0	0	0	0
Other groundfish	0	0	0	0	0	0	0	0	1	0	0	0
Other pelagics	0	0	0	0	0	0	0	0	0	0	0	0
Other invertebrates	0	0	0	0	0	0	0	2	0	4	1	0

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	20	8	15	14	1	3	5	21	22	27	10	9
Mid-Atlantic												
Bluefish	20	11	19	17	1	0	0	0	2	3	29	17
Butterfish	3	4	5	3	13	30	1	7	21	27	22	22
Cod	0	0	1	3	1	0	0	0	1	2	0	6
Croaker, Atlantic	412	412	639	53	1	1	0	78	289	386	486	499
Dogfish, Spiny	25	30	39	23	0	0	0	0	0	1	14	20
Flounder, Winter	4	1	1	2	1	0	0	0	1	0	1	1
Flounder, Witch	1	0	0	0	0	0	0	0	0	1	0	0
Flounder, Yllwtail	1	1	1	2	0	0	0	0	0	0	1	0
Fluke	723	464	210	69	22	8	14	19	112	83	280	260
Haddock	0	0	0	0	0	0	0	0	0	0	0	0
Hake, Silver	7	8	8	7	6	5	4	2	5	6	3	5
Herring, Atlantic	41	162	57	18	0	0	0	0	0	0	0	1
Mackerel, Atlantic	234	286	520	459	0	0	0	0	0	1	0	1
Monkfish	12	17	17	8	7	3	5	0	0	2	5	3
Plaice, American	0	0	0	0	0	0	0	0	0	1	0	0
Scup	26	47	26	18	0	0	0	0	0	0	0	2
Shad	0	3	4	2	0	0	0	0	0	0	0	0
Skates	5	2	17	12	28	25	18	18	5	8	10	8
Squid, Illex	0	4	3	4	4	579	922	695	565	263	82	1
Squid, Loligo	20	91	159	109	14	34	79	52	94	293	334	70
Other finfish	66	136	88	38	7	2	2	2	3	49	123	101
Other groundfish	28	11	8	4	1	2	1	1	5	3	5	8
Other pelagics	1	14	22	7	0	0	0	0	2	3	5	8
Other invertebrates	15	10	49	52	74	129	201	190	128	122	107	22
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1,644	1,715	1,893	912	182	818	1,249	1,064	1,233	1,254	1,508	1,055
Unknown												
Bluefish	0	0	0	0	0	0	0	0	0	0	1	0
Butterfish	1	9	9	3	9	5	5	0	1	0	0	3
Cod	8	3	5	13	12	5	2	1	2	2	4	2
Croaker, Atlantic	0	0	0	0	0	0	0	0	1	0	0	3
Dogfish, Spiny	0	1	1	0	0	0	0	0	0	1	0	1
Flounder, Winter	2	2	1	2	4	7	3	3	0	2	2	1
Flounder, Witch	3	1	3	1	2	3	1	1	1	1	1	1

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flounder, Yllwtail	3	4	2	4	9	2	1	4	0	1	0	2
Fluke	8	8	1	1	0	0	1	0	0	0	2	3
Haddock	3	4	2	1	2	1	1	1	3	1	2	1
Hake, Silver	7	16	4	7	6	7	18	11	3	14	11	2
Herring, Atlantic	0	6	1	0	0	0	0	0	0	0	0	0
Mackerel, Atlantic	0	2	46	6	13	0	0	0	0	0	0	0
Monkfish	11	9	22	9	8	4	2	1	5	3	2	8
Plaice, American	5	2	3	2	4	5	2	1	4	2	1	1
Scup	1	1	0	2	2	0	0	0	0	0	1	0
Shad	0	0	0	0	0	0	0	0	0	0	0	0
Skates	2	4	1	2	5	2	1	6	9	1	1	2
Squid, Illex	5	2	0	3	0	1	80	36	5	3	6	1
Squid, Loligo	17	51	41	21	2	5	5	1	9	8	30	12
Other finfish	4	2	3	0	1	5	0	0	0	0	2	2
Other groundfish	12	4	4	5	6	8	3	3	6	4	8	4
Other pelagics	0	0	0	0	0	0	0	0	0	0	0	0
Other invertebrates	3	4	4	2	1	1	2	3	1	8	5	2
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	96	133	154	85	88	61	127	75	50	54	76	50

APPENDIX C: The types and combinations of trawl gear used by bottom and mid-water trawl vessels (A) in 1996 and (B) 2004.

The number of vessels in a group reported the same combination of trawl gears. For example, in 1996, 8 vessels reported using OTF, OTS and OTM gear during the calendar year.

(A) 1996

# gear types reported by vessel	# vessels in group	Gear type reported on VTR report[a]							
		OTF (50)	OTC (52)	PTB (56)	OTS (58)	OTO (59)	PTM (170)	OTM (370)	OTB (350)
3+	8	8			8			8	
	8	8	8		8				
	4	4			4	4			
	2	2					2	2	
	2	2	2			2			
	1	1				1		1	
2	235	235			235				
	32	32	32						
	15	15						15	
	11	11				11			
	2	2		2					
	2				2	2			
	1						1	1	
	1				1			1	
	1	1					1		
1	623	623							
	10							10	
	2					2			
	0						0		
Total		**944**	**42**	**2**	**258**	**22**	**4**	**38**	**0**

[a] The gear codes: OTF-Otter Trawl Bottom, Fish; OTC-Otter Trawl Bottom, Scallop; PTB-Otter Trawl Bottom, Paired; OTS-Otter Trawl Bottom, Shrimp; OTO-Otter Trawl Bottom, Other; PTM-Mid-water Trawl, Paired; OTM-Mid-water Otter Trawl; OTB-Otter Trawl, Beam.

(B) 2004

# gear types reported by vessel	# vessels in group	Gear type reported on VTR report[a]							
		OTF (50)	**OTC (52)**	**PTB (56)**	**OTS (58)**	**OTO (59)**	**PTM (170)**	**OTM (370)**	**OTB (350)**
3+	9	9	9		9				
	5	5			5			5	
	1	1						1	1
	1	1			1				
	1	1	1		1			1	
2	89	89			89				
	19	19	19						
	10	10							10
	5	5						5	
	4	4					4		
	2						2	2	
	1				1			1	
1	588	588							
	11						11		
	3							3	
	0					0			
Total		**732**	**29**	**0**	**106**	**0**	**17**	**18**	**11**

[a] The gear codes: OTF-Otter Trawl Bottom, Fish; OTC-Otter Trawl Bottom, Scallop; PTB-Otter Trawl Bottom, Paired; OTS-Otter Trawl Bottom, Shrimp; OTO-Otter Trawl Bottom, Other; PTM-Mid-water Trawl, Paired; OTM-Mid-water Otter Trawl; OTB-Otter Trawl, Beam.

APPENDIX D: Average monthly landings by fishing region and species for the U.S. Northeast and Mid-Atlantic mid-water trawl fishery, over period 1996-2004 (live weight, metric tons)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gulf of Maine												
Bluefish	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0	0	0
Croaker, Atlantic	0	0	0	0	0	0	0	0	0	0	0	0
Dogfish, Spiny	0	0	0	0	0	1	2	0	0	0	0	0
Flounder, Winter	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Witch	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Yllwtail	0	0	0	0	0	0	0	0	0	0	0	0
Fluke	0	0	0	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0	0	0	0	0	1	1	1	1
Hake, Silver	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Atlantic	1,220	738	376	1,436	3,441	5,005	4,420	3,510	3,245	4,900	6,985	2,750
Mackerel, Atlantic	75	6	2	0	0	0	0	2	0	0	6	189
Monkfish	1	0	0	0	0	0	0	0	0	0	0	0
Plaice, American	0	0	0	0	0	0	0	0	0	0	0	0
Scup	0	0	0	0	0	0	0	0	0	0	0	0
Shad	0	0	0	0	0	0	0	0	1	0	0	0
Skates	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Illex	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Loligo	0	0	0	0	0	0	0	0	0	0	0	0
Other finfish	0	0	0	0	0	3	0	0	0	0	1	0
Other groundfish	0	0	1	0	0	0	0	0	1	2	2	1
Other pelagics	0	0	0	0	0	0	0	0	0	0	0	0
Other invertebrates	0	0	0	0	0	0	0	0	0	0	0	0
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1,296	744	380	1,436	3,441	5,009	4,423	3,512	3,247	4,903	6,996	2,942
Georges Bank												
Bluefish	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	9	1	7	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0	0	0
Croaker, Atlantic	0	0	0	0	0	0	0	0	0	0	0	0

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dogfish, Spiny	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Winter	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Witch	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Yllwtail	0	0	0	0	1	0	0	0	0	0	0	0
Fluke	0	0	0	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0	0	0	0	0	0	0	0	0
Hake, Silver	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Atlantic	589	0	223	382	451	1,202	3,338	4,137	3,595	2,468	131	0
Mackerel, Atlantic	13	16	18	31	110	0	0	0	2	15	0	0
Monkfish	0	0	0	0	0	0	0	0	0	0	0	0
Plaice, American	0	0	0	0	0	0	0	0	0	0	0	0
Scup	0	0	0	0	0	0	0	0	0	0	0	0
Shad	0	0	0	0	0	0	0	0	0	0	0	0
Skates	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Illex	0	135	0	2	0	0	0	0	0	0	0	0
Squid, Loligo	0	0	21	25	0	0	0	0	0	0	0	0
Other finfish	0	0	0	0	0	0	0	0	0	0	0	0
Other groundfish	0	0	0	0	0	0	0	0	0	0	0	0
Other pelagics	0	0	0	0	0	0	0	0	0	0	0	0
Other invertebrates	0	0	0	0	0	0	0	0	0	0	0	0
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	602	160	263	446	563	1,203	3,339	4,137	3,596	2,483	131	0
North Southern New England												
Bluefish	0	0	0	0	0	0	12	14	15	19	7	0
Butterfish	1	1	3	1	3	0	0	3	4	16	9	1
Cod	0	0	0	0	0	0	0	0	0	0	0	0
Croaker, Atlantic	0	6	0	0	0	0	0	0	0	0	0	0
Dogfish, Spiny	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Winter	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Witch	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Yllwtail	0	0	0	0	0	0	0	0	0	0	0	0
Fluke	1	0	0	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0	0	0	0	0	0	0	0	0
Hake, Silver	0	1	0	0	0	0	0	0	0	0	0	0
Herring, Atlantic	6,026	5,174	2,097	560	214	140	287	199	195	117	582	2,319

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mackerel, Atlantic	3,047	3,884	3,666	1,082	158	0	0	0	0	0	0	217
Monkfish	4	0	0	0	0	0	0	0	0	0	0	0
Plaice, American	0	0	0	0	0	0	0	0	0	0	0	0
Scup	3	10	4	11	0	0	0	0	0	0	0	1
Shad	30	8	25	0	0	0	0	0	0	0	0	0
Skates	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Illex	0	8	0	3	79	177	141	91	20	40	0	0
Squid, Loligo	13	36	25	18	6	34	3	1	1	17	2	9
Other finfish	1	2	0	1	1	0	0	0	1	2	0	0
Other groundfish	0	0	0	1	0	0	0	0	0	0	0	0
Other pelagics	0	1	5	0	0	9	0	0	1	0	1	0
Other invertebrates	0	1	0	0	0	0	0	0	0	0	0	0
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	9,125	9,134	5,826	1,677	462	361	444	310	238	214	603	2,547
South Southern New England												
Bluefish	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0	0	0
Croaker, Atlantic	0	0	0	0	0	0	0	0	0	0	0	0
Dogfish, Spiny	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Winter	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Witch	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Yllwtail	0	0	0	0	0	0	0	0	0	0	0	0
Fluke	0	0	0	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0	0	0	0	0	0	0	0	0
Hake, Silver	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Atlantic	0	11	0	0	0	0	0	0	0	0	0	0
Mackerel, Atlantic	0	0	0	0	0	0	0	0	0	0	0	0
Monkfish	0	0	0	0	0	0	0	0	0	0	0	0
Plaice, American	0	0	0	0	0	0	0	0	0	0	0	0
Scup	0	0	0	0	0	0	0	0	0	0	0	0
Shad	0	0	0	0	0	0	0	0	0	0	0	0
Skates	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Illex	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Loligo	0	0	0	0	0	0	0	0	0	0	0	0
Other finfish	0	0	0	0	0	0	0	0	0	0	0	0

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Other groundfish	0	0	0	0	0	0	0	0	0	0	0	0
Other pelagics	0	0	0	0	0	0	0	0	0	0	0	0
Other invertebrates	0	0	0	0	0	0	0	0	0	0	0	0
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	11	0	0	0	0	0	0	0	0	0	0
Mid-Atlantic												
Bluefish	0	0	0	1	0	0	0	0	0	0	2	1
Butterfish	0	0	0	0	0	0	1	0	2	1	2	1
Cod	0	0	0	0	0	0	0	0	0	0	0	0
Croaker, Atlantic	28	58	73	3	0	0	0	29	2	18	37	29
Dogfish, Spiny	0	0	0	0	0	0	0	0	0	0	0	2
Flounder, Winter	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Witch	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Yllwtail	0	0	0	0	0	0	0	0	0	0	0	0
Fluke	1	0	0	0	0	0	0	0	0	0	1	0
Haddock	0	0	0	0	0	0	0	0	0	0	0	0
Hake, Silver	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Atlantic	63	4	8	23	0	0	0	0	0	0	11	21
Mackerel, Atlantic	214	281	2,521	703	0	0	0	0	0	0	0	23
Monkfish	0	0	0	0	0	0	0	0	0	0	0	0
Plaice, American	0	0	0	0	0	0	0	0	0	0	0	0
Scup	0	3	0	0	0	0	0	0	0	0	0	0
Shad	0	1	0	0	0	0	0	0	0	0	0	0
Skates	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Illex	0	0	0	0	0	61	127	88	98	13	23	0
Squid, Loligo	0	3	11	6	0	1	1	1	4	18	7	1
Other finfish	3	11	5	1	1	0	0	5	0	6	8	12
Other groundfish	0	0	0	0	0	0	0	0	0	0	0	0
Other pelagics	0	6	6	3	0	25	0	12	0	0	0	0
Other invertebrates	0	0	0	0	3	7	0	0	0	0	0	0
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	309	368	2,625	742	5	95	130	134	106	57	91	91
Unknown												
Bluefish	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0	0	0

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Croaker, Atlantic	0	15	18	0	0	0	0	0	0	0	0	7
Dogfish, Spiny	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Winter	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Witch	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Yllwtail	0	0	0	0	0	0	0	0	0	0	0	0
Fluke	0	0	0	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0	0	0	0	0	0	0	0	0
Hake, Silver	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Atlantic	17	0	0	58	136	111	68	33	117	175	288	214
Mackerel, Atlantic	0	0	0	65	0	0	0	0	0	0	0	0
Monkfish	0	0	0	0	0	0	0	0	0	0	0	0
Plaice, American	0	0	0	0	0	0	0	0	0	0	0	0
Scup	0	0	0	0	0	0	0	0	0	0	0	0
Shad	0	0	0	0	0	0	0	0	0	0	0	0
Skates	0	0	0	0	0	0	0	0	0	0	0	0
Squid, Illex	0	0	0	0	0	0	0	3	0	0	0	0
Squid, Loligo	0	0	0	0	0	0	0	0	0	0	4	0
Other finfish	0	0	0	0	0	0	0	0	0	0	0	0
Other groundfish	0	0	0	0	0	0	0	0	0	0	0	0
Other pelagics	0	0	0	0	0	0	0	0	0	0	0	0
Other invertebrates	0	0	0	0	0	0	0	0	0	0	0	0
All others	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	9	15	18	123	136	111	68	36	117	175	292	221

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