Data Update of Scup (*Stenotomus chrysops*) for 2013

Brian Linton and Mark Terceiro
Northeast Fisheries Science Center
National Marine Fisheries Service

Mid Atlantic Fishery Management Council
Scientific and Statistical Committee
September 17-19, 2013
Last Update: September 10, 2013

BACKGROUND

Data used in the stock assessment of scup (*Stenotomus chrysops*) have been updated through 2012. In particular, the following data sources have been included in this data update: commercial landings and discards, recreational landings and discards, and the research survey indices of abundance. A rumble strip analysis was conducted for scup, using the methods described in the Scientific Uncertainty Subcommittee's report to the Scientific and Statistical Committee of the Mid Atlantic Fishery Management Council (SUN 2013).

COMMERCIAL FISHERY LANDINGS

United States total commercial landings decreased from over 18,000 mt in 1963 to less than 10,000 mt per year in the late 1960s. Landings fluctuated between about 5,000 and 10,000 mt from 1970 to the early 1990s and then decreased to about 1,200 mt in 2000. Commercial landings have since increased to an average of about 6,000 mt during 2010-2012 (Figure 1). Reported 2012 landings in the commercial fishery were 7,122 mt = 15.701 million lbs, about 56% of the commercial quota (27.91 million lbs). About eighty percent of the commercial landings of scup since 1979-2012 were in Rhode Island (38%), New Jersey (24%), and New York (18%; Table 1). The otter trawl is the principal commercial fishing gear, accounting for about 76% of the total catch since 1979 (Table 2). The remainder of the commercial landings is taken by floating trap (10%) and hand lines (6%), with paired trawl, pound nets, and pots and traps each contributing between 1 and 3%.

COMMERCIAL FISHERY DISCARDS

The Northeast Fisheries Science Center (NEFSC) Fishery Observer Program has collected information on landings and discards in the commercial fishery since 1989. Northeast Region (NER; ME-VA) discard estimates were raised to account for North Carolina landings. A discard mortality rate of 100% was assumed because there are no published estimates of scup discard mortality rates. This assumption is based on limited observations and is a point of contention between scientists and fishermen. Previous peer reviews of the assessment have recommended that research be conducted to better characterize the discard mortality rate of scup in different gear types in order to more accurately quantify the absolute magnitude of scup discard mortality (NEFSC 1995, 1997, 1998, 2000, 2002, 2009). Quantifying discards from the commercial fishery is necessary for a reliable scup assessment, but low sample sizes in the past have resulted in uncertain estimates. Despite the uncertainty of the discard data, recent peer review panels have concluded that commercial discarding of scup has been high during most of the last 20 years, generally approaching or exceeding the commercial landings. Since the implementation of the Gear Restricted Areas (GRAs) in 2000, estimated discards have averaged 35%-40% of the total commercial catch.

Commercial discards for scup are estimated using geometric mean discards to landings (GMDL) ratios. Ratios of discards to landings are stratified by landings level (for trip landings < 300 kg (661 lbs), the bycatch fishery; or => 300 kg, the directed fishery) and half-year and multiplied by corresponding observed scup landings from the NEFSC Dealer Report database to provide estimates of scup discards. Geometric mean rates (re-transformed, uncorrected, mean ln-transformed Discards to Landings per trip) are used because the distributions of landings, discards and the ratio of discards to landings on a per-trip basis in the scup fishery are highly variable and positively skewed. Observed trips with both scup landings and discard were used to calculate per trip discard to landings ratios. Only trips with both non-zero landings and discards could be used for this approach to avoid division by zero. The number of trawl gear trips used to calculate the geometric mean discard-to-landings ratios (GMDL) by half year for 1997-2008 ranged from 1 to 104 for trips < 300 kg and from 1 to 35 for trips =>300 kg, with the best sampling occurring since 2003. No trawl gear trips were available for half year two in 1997 and 1999 for trips < 300 kg and for half year two in 1997-2001 for trips => 300 kg. The ratio calculated for half year one was used to estimate discards for half year two when no trawl gear trips were available in half year two. The ratios ranged from 0.03 in 2004 (half year two, trips => 300 kg) to 121.71 in 1998 (half year one, trips => 300 kg; Table 3).

The large 1998 directed fishery ratio and subsequent very high annual discard estimate (111,973 mt) was based on a single trawl gear trip. About 93% of the discard from that trip was attributable to a single tow in which an estimated 68.2 mt (150,000 lbs.) of scup were captured. This tow was not lifted from the water and the captain of the vessel estimated the weight of the catch. There has been debate concerning the validity of the catch weight estimate and whether or not it was representative of other vessels or trips in the fishery. However, the observation was reported by a trained NEFSC observer and was therefore included in the initial calculation of the estimate of scup discards (Table 3). Peer reviews of the assessment have since concluded that the 1998 estimate (173,690 mt) is infeasible, and it has been replaced by the mean of the 1997 and 1999 estimates (3,331 mt; Table 4).

RECREATIONAL FISHERY CATCH

Scup is the object of a major recreational fishery, with the greatest proportion of catches taken in the states of Massachusetts, Rhode Island, Connecticut and New York. Estimates of the recreational catch in numbers were obtained from the NMFS Marine Recreational Fishery Statistics Survey (MRFSS) for 1981-2011, and from the NMFS Marine Recreational Information Program (MRIP) for 2004-2012. These estimates were available for three categories: type A - fish landed and available for sampling, type B1 - fish landed but not available for sampling and type B2 - fish caught and released. The estimated recreational landings (types A and B1) in weight during 1981-2011 as estimated by the MRFSS averaged about 2,000 mt per year (Table 5). MRIP estimated 2012 landings in the recreational rod-and-reel fishery were 1,842 mt = 4.061 million lbs, about 48% of the recreational harvest limit (8.45 million lbs). Since 1981, the recreational landings have averaged 32% of the commercial and recreational landings total.

The commercial fishery VTR system provides an alternative set of reported recreational landings by the party/charter boat sector. A comparison of VTR reports and MRFSS/MRIP estimates indicates that MRFSS/MRIP estimates were on average about 50% higher over the 1995-2012 period, ranging from a factor of 0.34 in 1998 to 2.43 in 2009 (Table 6). It is unclear if this is due mainly to under-reporting of party/charter boat recreational landings in the VTR system, or a systematic positive bias of MRFSS/MRIP landings estimates for the party/charter boat sector.

The MRFSS estimated recreational live discard in weight during 1984-2011 ranged from 39 mt in 1999 to a high of 2,031 mt in 2010, averaging about 600 mt per year, and the MRIP estimated recreational live discard in weight for 2012 was 1,542 mt (Table 7). The weight of discards has been directly calculated only for those years (1984 and later) for which recreational catch at age has been compiled. In compilations of total fishery catch for earlier years, the recreational

discards was assumed to be approximately 2% of the estimated recreational landings, based on the mean discard percentage for 1984-1996, the time period with catch at age estimates before the implementation of the Fishery Management Plan (FMP). The discard mortality rate in the recreational fishery has been reported to range from 0-15% (Howell and Simpson 1985) and from 0-14% (pers. comm, Williams E., University of Rhode Island, Department of Fisheries and Aquaculture. November 1, 1994). Howell and Simpson (1985) found mortality rates were positively correlated with size, due mainly to the tendency for larger fish to take the hook deep in the esophagus or gills. Williams more clearly demonstrated increased mortality with depth of hook location, as well as handling time, but found no association with fish size. Based on these studies, a discard mortality rate in the recreational fishery of 15% has been used in this data update and previous assessments, resulting in a time series average discard mortality of about 100 mt per year.

MARINE RECREATIONAL INFORMATION PROGRAM ESTIMATES OF RECREATIONAL FISHERY CATCH

The NMFS Marine Recreational Fishery Statistics Survey (MRFSS) was replaced by the Marine Recreational Information Program (MRIP) in 2012 to provide improved recreational fishing statistics. The MRIP implemented a new statistical method for calculating recreational catch estimates, with many survey elements related to both data collection and analysis updated and refined to address issues such as data gaps, bias, consistency, accuracy, and timeliness. As part of the implementation of the MRIP, MRFSS recreational fishery catch estimates for 2004-2011 have been directly replaced by those using the MRIP estimation methods. For earlier years, a constant "ratio of means" of the MRFSS and MRIP estimates has been used to adjust the recreational catch estimates (Tables 5, 7). Only MRIP recreational fishery catch estimates are available for 2012.

For the recreational fishery harvest number (catch types A + B1), the largest change was for the commonwealth of MA, with a cumulative 2004-2011 increase of about 4 million fish, about +67% and also the largest cumulative percentage increase amongst the states. The largest absolute decrease was for the state of RI with a cumulative 2004-2011 decrease of about 289,000 fish, or about -7%. The state of MD had the largest cumulative percentage decrease at -67%; however, MD's cumulative harvest (now about 3,600 fish) is only 0.1% of the coastal total. Over all states, the cumulative harvest in numbers increased by about 5.3 million fish (about +19%), ranging from a decrease of 174,000 fish in 2007 (-5%) to an increase of 2.5 million fish in 2004 (+52%; Table 8). Therefore, for the years 1963-2003 recreational harvest numbers were increased by 19% for this data update.

For the recreational fishery harvest weight (catch types A + B1, mt), the most important change was for the commonwealth of MA with a cumulative 2004-2011 increase of about 1,713 mt, or about +67%. The state of DE had the largest cumulative percentage increase at +112%; however, DE's cumulative harvest (now about 4 mt) is less than 0.1% of the coastal total. The largest absolute decrease was for the state of RI with a cumulative 2004-2011 decrease of about 108 mt, about -6%. The state of MD had the largest cumulative percentage decrease at -30%, a cumulative decrease of about 1 mt. Over all states, the cumulative harvest in weight (mt; metric tons) increased by about 2,433 mt (about +18%), ranging from a decrease of 122 mt in 2008 (- 7%) to an increase of 1,356 mt fish in 2004 (+71%; Table 9). Therefore, for the years 1963-2003 recreational harvest weight was increased by 18% for this data update (Tables 5, 21, 24).

For the recreational fishery live releases in numbers (catch type B2), the largest change was for the commonwealth of MA, with a cumulative 2004-2011 increase of about 3.1 million fish, about +38% and also the largest cumulative percentage increase amongst the states. The largest absolute decrease was for the state of NJ with a cumulative 2004-2011 decrease of about 410,000 fish, or about -12%. The state of MD had the largest cumulative percentage decrease at - 47%, a cumulative decrease of about 45,000 million fish. Over all states, the cumulative live release in numbers increased by about 4.5 million fish (about +11%), ranging from a decrease of 239,000 fish in 2008 (-3%) to an increase of 1.7 million fish in 2004 (+36%; Table 10). Therefore, for the years 1963-2003 recreational live release and discard mortality estimates were increased by 11% for this data update (Tables 7, 21, 24).

COMMERCIAL FISHERY LANDINGS AT LENGTH AND AGE

The NER commercial fishery length frequency sampling is summarized in Table 11. Annual sampling intensity has varied from 18 to 687 mt per 100 lengths, with sampling exceeding the informal threshold criterion of 200 mt per 100 lengths since 1995. For this data update, commercial fishery landings at age beginning in 1984 have been updated through 2012, with samples generally pooled by market category (pins/small, medium, large/mix, jumbo, and unclassified) and by half-year (January-June, July-December); samples were pooled on a quarterly basis (e.g., January-March) since 2004. Estimates of commercial fishery landings at age (Figure 2) and mean weights at age are presented in Tables 12-13.

COMMERCIAL FISHERY DISCARDS AT LENGTH AND AGE

The intensity of length sampling of discarded scup from the NEFSC Fishery Observer Program declined in 1992-1995 relative to 1989-1991 (Table 14). Sampling intensity ranged from 489 to 335 mt per 100 lengths sampled in 1992-1995, failing to meet the informal criterion of 200 mt per 100 lengths. Sampling intensity improved to 100 mt per 100 lengths in 1996, but then declined to over 200 mt per 100 lengths in 1997-1999. Sampling intensity has generally met the 200 mt per 100 lengths threshold since 2000. The mean weight of the discard was estimated from length frequency data using a length-weight equation, total numbers discarded were then estimated by dividing total weight by mean weight, and numbers at length were then calculated from the length-frequency distribution. Discards at length were aged using a combination of commercial and survey age-length keys, with discards at age dominated by fish aged 0, 1, or 2, depending on the year under consideration. Estimates of commercial fishery discards at age (Figure 3) and mean weights at age are presented in Tables 15-16.

RECREATIONAL FISHERY LANDINGS AT LENGTH AND AGE

For the recreational fishery, length sampling intensity has varied from 45 to 471 mt per 100 lengths. Sampling in all years except 1984 during 1981-1987 failed to meet the informal criterion of 200 mt per 100 lengths, but since 1988 the criterion has been met except for 1999-2000 (Table 5). Numbers at length for recreational landings were determined from recreational fishery length samples pooled by half-years (January-June; July-December) over all regions and fishing modes, and were converted to numbers at age by applying half-year age-length keys constructed from NEFSC commercial and survey samples. Age-length keys from spring surveys and first and second quarter commercial samples were applied to numbers at length from the first half of the year, while age-length keys from fall surveys and third and fourth quarter commercial samples were applied to numbers at length from the second half of the year. Estimates of recreational fishery landings at age (Figure 4) and mean weights at age are presented in Tables 17-18.

RECREATIONAL FISHERY DISCARDS AT LENGTH AND AGE

No length frequency samples of the scup discard were collected under the MRFSS program before 2005, so recreational discards were assumed to be fish aged 0 and 1, in the same relative proportions and with the same mean weight as the landed catch less than state regulated minimum fish sizes. An inspection of discard length frequency samples from the New York recreational fishery for 1989-1991 indicated that this assumption was reasonable. Since 2005, the MRFSS/MRIP For-Hire Survey discard samples have been used in concert with the MRFSS/MRIP sub-legal landed lengths to characterize the length frequency of the recreational

discard. The informal sampling criterion of 200 mt per 100 lengths has been consistently met since 2007 (Table 7). Numbers at length were converted to numbers at age by applying half-year (January-June; July-December) age-length keys constructed from NEFSC commercial and survey samples. As noted earlier, a 15% discard mortality rate is assumed. Estimates of recreational fishery discards at age (Figure 5) and mean weights at age are presented in Tables 19-20.

TOTAL FISHERY CATCH

Total commercial and recreational landings in 2012 were 8,964 mt = 19.762 million lbs and total commercial and recreational discards were 2,503 mt = 5.540 million lbs, for a total catch in 2012 of 11,477 mt = 25.302 million lbs (Table 21). Estimates of the total fishery catch at age and mean weights at age for 1984-2012 (the time series is limited by the availability of sampled fishery ages) are presented in Tables 22-23. An extended time series of the total catch of scup has been estimated to provide an historical perspective of the exploitation of scup in the years before fishery aging data were available (Table 24). These estimates include commercial and recreational landings and discards. The recreational fishery catch for 2004-2012 has been estimated using the MRIP methods. For earlier years, a constant "ratio of means" of the MRFSS and MRIP estimates has been used to adjust the recreational catch estimates.

The catches before 1981 are the least reliable due to uncertainty about a) the magnitude of domestic commercial fishery discards, b) the magnitude of the distant water fleet (DWF) catch and c) the uncertainty of assumptions made to estimate the recreational catch (50% reduction from interpolations made in Mayo 1982 for 1960-1978; recreational discards assumed to be 2% of the adjusted recreational landings). For years in which no commercial fishery observer data were collected (prior to 1989), commercial discards were estimated using the mean of landings to discards ratios for 1989-2001.

RESEARCH SURVEY INDICES OF ABUNDANCE

Northeast Fisheries Science Center

The NEFSC spring and fall bottom trawl surveys provide long time series of fishery-independent indices for scup. The NEFSC spring and fall surveys are conducted annually during March-May and September-November, ranging from just south of Cape Hatteras, NC to Canadian waters. NEFSC spring and fall abundance and biomass indices for scup exhibit considerable inter-annual variability (Table 25, Figure 6). NEFSC spring survey catches are characterized mainly by scup of

ages 1 and 2 (Figure 7), while the fall survey often captures large numbers of age 0 and 1 fish (Figure 8).

The Fisheries Survey Vessel (FSV) *Albatross IV* (ALB) was replaced in spring 2009 by the FSV *Henry B. Bigelow* (HBB) as the main platform for NEFSC research surveys, including the spring and fall bottom trawl surveys. The size, towing power, and fishing gear characteristics of the HBB are significantly different from the ALB, resulting in different fishing power and therefore different survey catchability. Calibration experiments to estimate these differences were conducted during 2008 (Brown 2009), and the results of those experiments were peer reviewed by a Panel of three non-NMFS scientists during the summer of 2009 (Anonymous 2009, Miller et al. 2010). The terms of reference for the Panel were to review and evaluate the suite of statistical methods used to derive calibration factors by species before they were applied in a stock assessment context. Following the advice of the August 2009 Peer Review (Anonymous 2009), the methods proposed in Miller et al. (2010), and the precedents set in peer reviews of stock assessments for haddock (Van Eeckhaute and Brooks 2010), yellowtail flounder (Legault et al. 2010), silver and red hake (NEFSC 2011a), and winter flounder (NEFSC 2011b), aggregate and length-based calibration factors were used to convert 2009-2012 spring and fall HBB survey catch number and weight indices to ALB equivalents for use in this data update (Tables 26-29; Figure 6).

The NEFSC survey indices sometimes appear to mainly reflect the availability of scup to the survey, rather than true abundance, making it difficult to interpret large inter-annual changes in the indices. For example, the 2002 spring biomass index was about twice the second highest spring index, which was observed in 1977 (Figure 6). The spring numeric abundance indices are similar; the 2002 index is the highest observed in the series and about twice the 1970 index. These dramatic increases were evident across all ages in the estimated 2002 spring numbers at age (Table 30; Figure 7). However, the previous fall survey estimates of numbers at age in 2001 had not reflected relatively large values from which the corresponding 2002 spring numbers at age might have been expected to derive (Table 31, Figure 8) nor did they subsequently translate to exceptional indices of biomass in fall 2002 or spring 2003. Spring survey biomass and abundance indices decreased subsequent to 2002, but are still above the low values of the late 1990s. Fall survey abundance and biomass, although highly variable, have about doubled since the late 1990s.

The NEFSC winter survey was started in 1992 primarily as a flatfish survey, was conducted during February, and ranged from Cape Hatteras, NC to the southwestern part of Georges Bank. The winter survey 2002 abundance and biomass indices were, like the spring survey, the largest of the time series (Table 32, Figure 6). Similar to the spring estimates, numbers at age

estimated for the 2002 winter survey were also exceptionally large (Table 33, Figure 9). Winter survey abundance and biomass decreased subsequent to 2002, but were still above the low values of the late 1990s. The winter trawl series ended in 2007.

The large differences in the absolute magnitude of NEFSC survey catches of ages 0-2 compared to those of fish at ages 3 and older suggests a substantial difference in survey selection at age between these two aggregate age groups. In the 2008 DPS assessment (NEFSC 2009), aggregate biomass indices retracted to the lengths of fish ages 0-2 were constructed for calibration of those ages in the population model (maximum length of 22 cm in the winter, 20 cm in the spring, and 23 cm in the fall series). The 2009-2012 HBB values for these aggregate indices have also been converted to ALB equivalents using length calibration factors (Table 34).

Massachusetts Division of Marine Fisheries

The Massachusetts Division of Marine Fisheries (MADMF) has conducted spring and fall bottom trawl surveys of Massachusetts territorial waters in May and September since 1978. Survey coverage extends from the New Hampshire to Rhode Island boundaries and seaward to three nautical miles, including Cape Cod Bay and Nantucket Sound. The study area is stratified into geographic zones based on depth and area. The MADMF spring survey catches are characterized mainly by scup of ages 1 and 2, while the fall survey often captures large numbers of age 0 fish. The spring biomass and abundance indices decreased sharply from a high in the early 1980s to relatively low levels through the 1990s, and have since exhibited a variable but increasing trend (Table 35, Figure 10). The MADMF fall abundance index can include large numbers of age 0 fish and therefore can be more variable as it reflects inter-annual variance in recruitment. The fall biomass index exhibits an increasing trend since the mid 1990s (Table 35, Figure 10).

Rhode Island Division of Fish and Wildlife

The Rhode Island Division of Fish and Wildlife (RIDFW) has conducted spring and fall bottom trawl surveys based on a stratified random sampling design since 1979. Three major fishing grounds are considered in the spatial stratification, including Narragansett Bay, Rhode Island Sound, and Block Island Sound. Stations are either fixed or randomly selected for each stratum. The RIDFW spring survey mainly catches scup of ages 1 and 2. The spring index shows relatively low scup abundance and biomass through 1999 followed by a steep increase during 2000-2002, in common with the NEFSC and MADMF indices, and high variability since then (Table 36; Figure 11). The RIDFW fall survey is dominated by age 0 scup, and the fall indices show a

general increase to a 1993 peak, followed by a steep decline until 1998, and a steady increase since then. The fall biomass series reached a time series peak in 2012 (Figure 11).

The RIDFW implemented a ventless trap survey in cooperation with commercial fishermen beginning in 2005. The cooperative trap survey has a fixed station format, and survey catches are expressed as catch per trap soak hour. The index of age 0 scup from the trap indicates strong recruitment in 2007 and 2010, while the aggregate index of scup abundance has increased steadily since 2005 (Table 37; Figures 11-12). The RIDFW cooperative trap survey data have not yet been included in the calibration of the assessment population model.

Connecticut Department of Environmental Protection

The Connecticut Department of Environmental Protection (CTDEP) trawl survey program was initiated in May 1984 and encompasses both New York and Connecticut waters of Long Island Sound. The stratified random design survey is conducted in the spring (April-June) and fall (September-October). The CTDEP spring index indicates relatively low abundance through most of the survey period, but has increased substantially since 1999 (Table 38, Figure 13). The CTDEP fall survey, which often catches large numbers of age-0 scup, indicates that recruitment was relatively stable during most of the survey period, but the aggregate fall indices have also increased substantially since 1999. (Table 39, Figures 12-13) Due to vessel engine failure, a complete fall survey was not conducted in 2010.

New York Department of Environmental Conservation

The New York Department of Environmental Conservation (NYDEC) initiated a small mesh trawl survey in 1985 to collect fisheries-independent data on the age and size composition of scup in local waters. This survey is conducted in the Peconic Bays, the estuarine waters which lie between the north and south forks of eastern Long Island. The NYDEC survey provides age 0, 1, and 2+ indices of scup abundance. The age 0 indices are generally low over the survey period, with peaks in 2000, 2002, 2003, 2006, and 2007 that may indicate recruitment of strong cohorts in those years (Table 40, Figure 12). In the early years of the survey there often has not been a strong correspondence between the age 0 indices and age 1 and 2+ indices in the following years (Figure 16).

New Jersey Bureau of Marine Fisheries

The New Jersey Bureau of Marine Fisheries (NJBMF) conducts a stratified random bottom trawl survey of New Jersey coastal waters from Ambrose Channel south to Cape Henlopen Channel. Latitudinal strata boundaries correspond to those in the NEFSC trawl survey; longitudinal boundaries correspond to the 30, 60, and 90 foot isobaths. Each survey includes two tows per stratum plus one additional tow in each of nine larger strata for a total of 39 tows. The NJBMF survey indices exhibit variable patterns over the early part of the time series. The biomass index reached a minimum in 1996 and then generally increased, peaking in 2007 (Table 40; Figure 17).

University of Rhode Island Graduate School of Oceanography

University of Rhode Island Graduate School of Oceanography (URIGSO) has conducted a standardized, two-station trawl survey in Narragansett Bay and Rhode Island Sound since the 1950s, with consistent sampling since 1963. Irregular length-frequency samples for scup indicate that most of the survey catch is of fish from ages 0 to 2. The aggregate numbers-based index reached a peak in the late 1970s, was relatively low during the late 1990s, and has since generally increased. The 2009 index was the third highest of the time series, after the 1976 and 1989 indices (Table 41, Figure 18).

Virginia Institute of Marine Science

Juvenile Fish Trawl Survey

The Virginia Institute of Marine Science (VIMS) has conducted a juvenile fish trawl survey in lower Chesapeake Bay during June-September since 1988. The VIMS age-0 scup indices show a general decline in recruitment from relatively high levels with peaks in the late 1980s to early 1990s, to relatively low levels from the late 1990s to early 2000s, and the indication of several recent strong year classes (Table 40, Figure 12).

Chesapeake Bay Multispecies Monitoring and Assessment Program Trawl Survey

The VIMS Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP) trawl survey is designed to support stock assessment activities at both a single and multispecies scale. While no single gear or monitoring program can collect all of the data necessary for

quantitative assessments, ChesMMAP was designed to fill data gaps by maximizing the biological and ecological data collected for several recreationally and commercially important species in the bay. Total abundance and biomass indices composed mainly of age 0 and 1 fish are available since 2002, and suggest strongest recruitment in 2007 and 2010 (Table 42, Figure 19).

Northeast Area Monitoring and Assessment Program Trawl Survey

The VIMS Northeast Area Monitoring and Assessment Program (NEAMAP) industry cooperative survey was started in fall 2007, providing research survey samples in the spring and fall seasons along the Atlantic coast from Rhode Island to North Carolina, in depths of 20-90 feet (9-43 meters). The NEAMAP survey data have not yet been included in the calibration of the assessment population model (Tables 43, 44; Figure 19).

RUMBLE STRIPS

A rumble strip analysis was conducted for scup, using the methods described in the Scientific Uncertainty Subcommittee's report to the Scientific and Statistical Committee of the Mid Atlantic Fishery Management Council (SUN 2013). The indicators used in the analysis were the NEFSC spring and fall survey biomass indices, mean lengths from the NEFSC spring and fall survey indices, and relative F for the spring and fall. Relative F for the spring and fall was calculated as total catch divided by the NEFSC spring and fall survey biomass indices, respectively.

The rumble strip bounds were specified as the 65% confidence intervals around the 2004-2011 mean for each indicator. The period of 2004-2011 represents a time where the stock is predicted to be at or above SSB at MSY and not experiencing overfishing, according to the 2012 assessment update (Terceiro 2012). A confidence level of 65% was chosen to provide contrast in indicator scores between periods where the stock was predicted to be overfished and experiencing overfishing and where the stock was predicted to be not overfished and not experiencing overfishing.

A score was assigned to each annual indicator value, where a score of 0 signified the indicator was within the rumble strip bounds and a score of 1 signified the indicator was outside of the rumble strip bounds. Correlation coefficients were calculated for each pair of indicators, based on the 0/1 scores (Table 45). Therefore, a high positive correlation coefficient signifies that both indicators tended to have the same score in a given year (i.e., either both indicators tended to

be within the rumble strip bounds, or both tended to be outside the rumble strip bounds). While a high negative correlation coefficient signifies that the two indicators tended to have different scores in a given year (i.e., if one indicator was within the rumble strip bounds, then the other tended to be outside the rumble strip bounds).

Two of the six indicators were outside of the rumble strip bounds in 2012 (Figures 20-25). The NEFSC fall survey biomass index was greater than the upper rumble strip bound in 2012, which suggests the stock is in better condition than expected (Figure 21). Fall relative F was less than the lower rumble strip bound in 2012, which suggests the stock is in better condition than expected (Figure 23). It should be noted that these two indicators had the highest correlation coefficient (0.798) of any of the indicators considered in this analysis (Table 45).

REFERENCES CITED

Anonymous. 2009. Independent Panel review of the NMFS Vessel Calibration analyses for FSV *Henry B. Bigelow* and R/V *Albatross IV*. August 11-14, 2009. Chair's Consensus report. 10 p.

Brown, R. 2009. Design and field data collection to compare the relative catchabilities of multispecies bottom trawl surveys conducted on the NOAA ship *Albatross* IV and the FSV *Henry B. Bigelow*. NEFSC Bottom Trawl Survey Calibration Peer Review Working Paper. Northeast Fisheries Science Center, Woods Hole, MA. 19 p.

Howell PT, Simpson DG. 1985. A study of marine recreational fisheries in Connecticut. March 1, 1981 - February 28, 1984. CTDEP, Fed Aid to Sport Fish Restoration F54R. Final Rep. 60 p.

Legault CM, Alade L, Stone HH. 2010. Assessment of Georges Bank yellowtail flounder for 2010. TRAC Reference Document 2010/06. 97 p.

Miller TJ, Das C, Politis PJ, Miller AS, Lucey SM, Legault CM, Brown RW, Rago PJ. 2010. Estimation of Albatross IV to Henry B. Bigelow calibration factors. Northeast Fisheries Science Center Ref Doc. 10-05. 233 p.

Northeast Fisheries Science Center (NEFSC). 1995. Report of the 19th Northeast Regional Stock Assessment Workshop (19th SAW): Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish Sci Cent Ref Doc. 95-08: 221 p.

Northeast Fisheries Science Center (NEFSC). 1997. Report of the 25th Northeast Regional Stock Assessment Workshop (25th SAW): Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish Sci Cent Ref Doc. 97-14: 143 p.

Northeast Fisheries Science Center (NEFSC). 1998. Report of the 27th Northeast Regional Stock Assessment Workshop (27th SAW). Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish Sci Cent Ref Doc. 98-15: 350 p.

Northeast Fisheries Science Center (NEFSC). 2000. Report of the 31st Northeast Regional Stock Assessment Workshop (31st SAW). Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish Sci Cent Ref Doc. 00-15: 400 p.

Northeast Fisheries Science Center (NEFSC). 2002. Report of the 35th Northeast Regional Stock Assessment Workshop (35th SAW). Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish Sci Cent Ref Doc. 02-14: 259 p.

Northeast Fisheries Science Center (NEFSC). 2009. The Northeast Data Poor Stocks Working Group Report, December 8-12, 2008 Meeting. Part A. Skate species complex, Deep sea red crab, Atlantic wolfish, Scup, and Black sea bass. US Dept Commerce, Northeast Fish Sci Cent Ref Doc. 09-02; 496 p.

Northeast Fisheries Science Center (NEFSC). 2011a. 51st Northeast Regional Stock Assessment Workshop (51st SAW) Assessment Report. US Dept Commerce, Northeast Fish Sci Cent Ref Doc. 11-02, 856 p.

Northeast Fisheries Science Center (NEFSC). 2011b. 52nd Northeast Regional Stock Assessment Workshop (52nd SAW) Assessment Summary Report. US Dept Commerce, Northeast Fish Sci Cent Ref Doc. 11-11, 51 p.

Scientific Uncertainty Subcommittee (SUN). 2013. Rumble Strips for Assessing the Performance of Multi-year Acceptable Biological Catch Limits. Report of the Scientific Uncertainty Subcommittee, Scientific and Statistical Committee, Mid-Atlantic Fishery Management Council. 10 p.

Terceiro M. 2012. Stock assessment of scup for 2012. US Dept. Commerce, Northeast FishSci Cent Ref Doc. 12-25. 112 p.

Van Eeckhaute L, Brooks EN. 2010. Assessment of Eastern Georges Bank Haddock for 2010. TRAC Reference Document - 2010/05. 104 p.

TABLES

Table 1. Commercial landings (metric tons; mt) of scup by state. One mt was landed in DE in 1995, included with MD 1995 total. Eight mt were landed in PA in 2004 included with MD 2004 total. Landings include revised Massachusetts landings for 1986-1997.

Year	ME	MA	RI	CT	NY	NJ	MD	VA	NC	Total
1979		782	3,123	92	1,422	2,159	21	397	589	8,585
1980	1	706	2,934	17	1,294	2,310	32	531	599	8,424
1981		523	2,959	44	1,595	2,990	9	1,054	682	9,856
1982		545	3,203	25	1,473	1,746	2	1,042	668	8,704
1983		672	2,583	49	1,103	2,536	13	536	302	7,794
1984		540	2,919	32	904	2,217	6	673	478	7,769
1985		387	3,583	41	861	1,493	17	74	271	6,727
1986		875	2,987	67	893	1,895	14	273	172	7,176
1987	5	735	2,162	301	911	1,817		232	113	6,276
1988	9	536	2,832	359	687	1,334	1	127	58	5,943
1989	32	579	1,401	89	603	1,219	1	45	15	3,984
1990	4	696	1,786	165	755	1,005	4	75	81	4,571
1991	16	553	2,902	287	1,223	1,960	15	56	69	7,081
1992		655	2,676	193	1,043	1,475	17	73	127	6,259
1993		556	1,332	148	729	1,822	10	76	53	4,726
1994		354	1,514	142	688	1,456	7	92	139	4,392
1995		310	1,045	90	511	1,084	2	20	11	3,073
1996		436	773	99	377	1,141	20	72	27	2,945
1997		676	486	50	376	596	1	2	1	2,188
1998		435	361	44	282	758	5	4	7	1,896
1999		300	581	44	206	361		13		1,505
2000		161	461	65	287	232		1		1,207
2001		149	734	45	297	479	1	24		1,729
2002		330	1,668	4	714	419		25	13	3,173
2003		407	1,730	64	839	1,033	21	253	58	4,405
2004		353	1,562	116	865	862	21	203	249	4,231
2005		515	1,553	149	989	880	1	130	50	4,266

Table 1 continued.

Year	ME	MA	RI	CT	NY	NJ	MD	VA	NC	Total
2006		493	1,653	135	1,096	632	0	36	17	4,062
2007		501	1,785	118	1,054	714	1	10	13	4,196
2008		239	977	127	551	351	3	44	60	2,351
2009		326	1,641	90	839	693	1	110	16	3,717
2010		458	1,950	281	1,220	703	9	188	46	4,855
2011		574	2,874	292	1,689	892	25	360	113	6,819
2012		909	2,862	781	1,956	444	4	164	2	7,122

Table 2. Commercial landings (metric tons; mt) of scup by major gear types. Midwater paired trawl landings are combined with other gears during 1994 and later. Landings include revised Massachusetts landings for 1986-1997.

Year	Otter trawl	Paired trawl	Floating trap	Pound net	Pots and traps	Hand lines	Other gear	Total mt
1979	6,387	146	1,305	429	26	215	77	8,585
1980	6,192	160	1,559	194	8	303	8	8,424
1981	7,836	79	1,291	246	49	306	49	9,856
1982	6,563	104	1,514	244	9	226	44	8,704
1983	5,861	398	850	390	8	265	22	7,794
1984	5,617	272	1,266	295	8	287	24	7,769
1985	4,856	417	1,022	229	5	182	16	6,727
1986	5,163	540	629	332	9	493	10	7,176
1987	4,607	237	590	193	213	423	13	6,276
1988	4,142	166	1,052	53	44	396	90	5,943
1989	3,174	89	193	74	104	334	16	3,984
1990	3,205	200	505	60	239	340	22	4,571
1991	5,217	152	988	40	258	395	31	7,081
1992	4,371	94	934	67	303	450	40	6,259
1993	3,865	46	166	25	202	402	20	4,726
1994	3,416		331	79	76	340	150	4,392
1995	2,204		331	42	57	215	224	3,073
1996	2,196		229	8	120	374	18	2,945
1997	1,491		86	12	104	489	6	2,188
1998	1,379		11	4	98	390	14	1,896
1999	1,005		140	30	77	184	69	1,505
2000	773		56		78	205	95	1,207
2001	1,088		229	65	52	215	80	1,729
2002	2,084		220		221	450	198	3,173
2003	2,777		723		168	445	292	4,405
2004	3,767		20		121	196	127	4,231
2005	3,475		117		174	448	52	4,266
2006	3,422		106		201	291	42	4,062
2007	3,332		181		279	373	31	4,196
2008	1,966		103		99	171	12	2,351
2009	3,182		110		191	222	12	3,717
2010	4,351		82		182	224	16	4,855
2011	6,073		121		339	276	10	6,819
2012	6,327		8		290	464	33	7,122

Table 3. Summary NEFSC Fishery Observer Program data for scup. Geometric mean discards to landings ratios (GMDL; retransformed, mean ln-transformed discards to landings ratios [D/L], per trip) are stratified by half-year period (HY1, HY2) and trip landings level (< 300 kg, => 300 kg). N is number of observed trips with both scup landings and discard, which are used to calculate the ratios. Corresponding dealer landings are from the NEFSC database.

1997		Trips <300 kg				Trips =>300 kg		
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.8957	17	258	231	0.8221	4	1,244	1,023
HY 2	0.8957	0	279	250	0.8221	0	413	340
Total			537	481			1,657	1,362

1998		Trips <300 kg				Trips =>300 kg		
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	2.401	7	196	471	121.71	1	920	111,973
HY 2	3.126	10	281	878	121.71	0	496	60,368
Total			477	1,349			1,416	172,341

1999		Trips <300 kg				Trips =>300 kg		
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	1.742	6	245	427	3.766	2	785	2,956
HY 2	1.742	0	178	310	3.766	0	299	1,126
Total			423	737			1,084	4,082

Table 3 continued.

2000	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	4.5818	13	196	898	0.6018	2	655	394
HY 2	3.5001	1	292	1,022	0.6018	0	63	38
Total		14	488	1,920		2	718	432

2001	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.8916	10	180	160	0.9185	4	1,013	930
HY 2	0.4606	2	307	141	0.9185	0	290	266
Total		14	487	302		4	1,303	1,197

2002	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	2.6088	11	423	1,104	0.0653	2	1,484	97
HY 2	3.4522	12	829	2,862	3.6028	3	437	1,574
Total		23	1,252	3,965		5	1,921	1,671

Table 3 continued.

2003	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.1371	9	315	43	0.2560	2	2,473	633
HY 2	1.4299	4	921	1,317	0.2304	5	696	160
Total		13	1,236	1,360		7	3,169	793

2004	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.3370	40	344	116	0.1685	25	2,353	396
HY 2	0.4200	64	868	365	0.0309	10	550	17
Total		104	1,212	480		35	2,903	413

2005	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.7354	31	292	215	0.0732	7	2,390	175
HY 2	0.2740	67	850	233	0.0563	2	694	39
Total		98	1,142	448		9	3,084	214

Table 3 continued.

2006	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.6621	37	472	313	0.0740	10	1,814	134
HY 2	0.8573	40	814	698	0.2631	10	921	242
Total		77	1,286	1,010		20	2,735	377

2007	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.4821	41	461	222	0.2628	10	2,177	572
HY 2	0.9404	54	892	839	0.3389	7	666	226
Total		95	1,353	1,061		17	2,843	798

2008	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.8719	40	422	368	0.2350	16	1,218	286
HY 2	5.2030	12	401	2,086	0.4596	6	303	139
Total		52	823	2,454		22	1,521	425

Table 3 continued.

2009	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	1.1582	83	497	576	0.1810	22	2,043	370
HY 2	0.8504	95	714	607	0.2638	34	463	122
Total		158	1,211	1,183		22	2,506	492

2010	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	1.4322	131	617	884	0.1478	30	2,324	343
HY 2	0.7309	83	1,041	761	0.1379	27	873	120
Total		214	1,658	1,645		57	3,197	463

2011	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	0.7569	86	591	447	0.1895	37	3,272	620
HY 2	0.8572	20	935	801	0.0225	2	2,021	45
Total		106	1,526	1,248		39	5,293	665

Table 3 continued.

2012	Trips <300 kg				Trips =>300 kg			
Period	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)	GM D/L	N	Dealer Landings (mt)	Estimated Discard (mt)
HY 1	1.5188	46	891	1,353	0.0382	31	2,848	109
HY 2	0.6407	62	1,039	666	0.0657	32	2,344	154
Total		108	1,930	2,019		63	5,192	263

Table 4. Summary of landings, discards, and the aggregate geometric mean discards to landings ratio (GMDL). Catches in metric tons (mt).

Year	Landings (mt)	Discards (mt)	GMDL ratio	GMDL Discards PSE (%)
1997	2,194	1,843	0.84	61
1998	1,893	3,331	1.76	35
1999	1,507	4,819	3.20	9
2000	1,206	2,352	1.95	48
2001	1,790	1,499	0.84	32
2002	3,173	5,636	1.78	95
2003	4,405	2,153	0.49	41
2004	4,227	893	0.21	25
2005	4,226	662	0.16	29
2006	4,021	1,387	0.34	27
2007	4,196	1,859	0.44	26
2008	2,351	2,879	1.23	31
2009	3,717	1,675	0.45	22
2010	4,855	2,108	0.43	31
2011	6,819	1,913	0.28	38
2012	7,122	2,282	0.32	15

Table 5. Summary of the landed fish length sampling for scup in the recreational fishery (includes MRFSS/MRIP and state agency sampling). Landings in metric tons (mt). Sampling intensity based on MRFSS when available.

Year	No. of lengths	Estimated landings (A + B1; mt) MRFSS	Estimated landings (A + B1; mt) MRIP	Sampling intensity (mt/100 lengths)
1981	642	2,636	3,116	411
1982	1,057	2,361	2,791	223
1983	1,384	2,836	3,353	205
1984	943	1,096	1,296	116
1985	741	2,764	3.268	373
1986	2,580	5,264	6,223	204
1987	777	2,811	3,323	362
1988	2,156	1,936	2,289	90
1989	4,111	2,521	2,980	61
1990	2,698	1,878	2,220	70
1991	4,230	3,668	4,336	87
1992	4,419	2,001	2,366	45
1993	2,206	1,450	1,714	66
1994	1,374	1,192	1,409	87
1995	822	609	720	74
1996	526	978	1,156	186
1997	399	543	642	136
1998	286	397	469	139
1999	265	856	1,012	323

Table 5 continued.

Year	No. of lengths	Estimated landings (A + B1; mt) MRFSS	Estimated landings (A + B1; mt) MRIP	Sampling intensity (mt/100 lengths)
2000	524	2,469	2,919	471
2001	1,038	1,933	2,285	186
2002	1,006	1,644	1,944	163
2003	2,508	3,848	4,549	153
2004	1,802	1,923	3,278	107
2005	1,794	1,153	1,215	64
2006	2,217	1,334	1,681	60
2007	2,262	1,655	2,085	73
2008	2,426	1,834	1,713	76
2009	2,269	1,334	1,462	59
2010	2,710	2,516	2,715	93
2011	2,412	1,601	1,632	66
2012	2,476	n/a	1,842	74

Table 6. Comparison of Vessel Trip Report (VTR) reported landings of scup by Party (VTRPB) and charter (VTRCB) boats, with landings estimated by the MRFSS for the Party/Charter boat (P/C Boat) sector. Data are numeric landings in thousands of fish.

Year	VTRPB	VTRCB	VTR P/C Boat Total	MRFSS P/C Boat Total	Ratio MRFSS to VTR
1995	641	41	682	767	1.12
1996	280	39	319	573	1.80
1997	216	37	253	451	1.78
1998	447	43	490	165	0.34
1999	435	75	510	822	1.61
2000	609	116	725	1140	1.57
2001	892	129	1021	769	0.75
2002	542	92	634	1309	2.06
2003	769	132	901	1330	1.48
2004	392	91	483	958	1.98
2005	195	47	242	111	0.46
2006	292	54	346	531	1.53
2007	345	100	445	454	1.02
2008	237	62	299	567	1.90
2009	344	56	400	970	2.43
2010	375	80	455	1099	2.42
2011	330	85	415	655	1.58
2012	469	99	568	964	1.70
Mean	434	76	510	758	1.48

Table 7. Summary of the discard fish length sampling for scup in the recreational fishery (includes MRFSS and state agency sampling). Live discards in metric tons (mt) from MRFSS.

Year	No. of lengths	Estimated Live Discards (B2; mt) MRFSS	Estimated Live Discards (B2; mt) MRIP	Sampling intensity (mt/100 lengths)
1984	n/a	199	221	n/a
1985	n/a	358	398	n/a
1986	n/a	578	643	n/a
1987	n/a	252	280	n/a
1988	n/a	208	232	n/a
1989	n/a	258	287	n/a
1990	n/a	256	284	n/a
1991	n/a	518	577	n/a
1992	n/a	314	349	n/a
1993	n/a	188	209	n/a
1994	n/a	245	273	n/a
1995	15	85	95	567
1996	6	133	148	2,217
1997	5	52	59	1,040
1998	6	96	107	1,600
1999	1	39	43	3,900

Table 7 continued.

Year	No. of lengths	Estimated Live Discards (B2; mt) MRFSS	Estimated Live Discards (B2; mt) MRIP	Sampling intensity (mt/100 lengths)
2000	15	367	408	2447
2001	146	1,098	1,222	752
2002	70	912	1,015	1303
2003	73	1,052	1,171	1441
2004	33	895	1,216	2712
2005	679	1,102	1,310	162
2006	109	1,232	1,337	1130
2007	1,869	1,044	1,144	56
2008	1,727	1,971	1,908	114
2009	1,780	1,275	1,409	72
2010	1,370	2,031	2,120	148
2011	836	942	1,156	113
2012	1,719	n/a	1,542	90

Table 8. TOP - Estimated total landings (catch types A + B1, number) of scup by recreational fishermen as estimated by the Marine Recreational Information Program (MRIP). Proportional Standard Error (PSE) is for the TOTAL landings estimate. BOTTOM - Percentage difference in estimated total landings (catch types A + B1, number) of scup by recreational fishermen as estimated by the MRSSS and MRIP ([MRIP-MRFSS]/MRFSS). Positive value indicates MRIP estimate is larger. MRFSS to MRIP comparisons are only available for 2004-2011.

STATE	2004	2005	2006	2007	2008	2009	2010	2011
CT	1,072,232	508,296	532,362	925,236	549,083	288,702	1,087,681	1,071,802
DE	518	3,870	319	2,365	1,338	821	0	50
MD	1,095	1,832	226	305	104	32	18	0
MA	3,312,973	656,524	424,968	1,769,960	761,612	1,069,275	925,222	1,011,190
NJ	60,141	118,667	327,202	99,320	87,186	174,809	739,901	41,825
NY	1,876,973	859,156	1,677,998	1,596,391	1,450,860	1,460,314	1,990,340	496,635
NC	1,710	3,714	14,444	5,268	13,843	3,989	7,580	26,257
RI	816,894	430,747	470,286	353,450	632,839	139,576	398,178	405,423
VA	10,999	8,507	0	586	3,920	527	5,284	7,500
TOTAL	7,153,535	2,591,313	3,447,806	4,752,881	3,500,785	3,138,045	5,154,203	3,060,683
PSE (%)	13	17	20	22	13	14	12	13

STATE	2004	2005	2006	2007	2008	2009	2010	2011	TOTAL
CT	90%	-30%	3%	34%	-18%	26%	8%	36%	16%
DE	-65%	1%	-50%	30%	27%	-15%		134%	-6%
MD	-83%	8%	-49%	16%	-20%	0%	-31%	-100%	-61%
MA	119%	65%	35%	143%	15%	38%	10%	39%	67%
NJ	-48%	-5%	31%	-11%	-34%	-38%	34%	-22%	2%
NY	19%	25%	31%	0%	-10%	11%	7%	-33%	7%
NC	-13%	9%	17%	-7%	-33%	37%	49%	-12%	-6%
RI	-10%	-3%	10%	-22%	11%	-19%	-9%	-23%	-7%
VA	26%	82%		-27%	42%	-75%	22%	-51%	-4%
TOTAL	52%	8%	23%	32%	-5%	13%	9%	6%	19%

Table 9. TOP - Estimated total landings (catch types A + B1, metric tons) of scup by recreational fishermen as estimated by the Marine Recreational Information Program (MRIP). Proportional Standard Error (PSE) is for the TOTAL landings estimate. BOTTOM - Percentage difference in estimated total landings (catch types A + B1, metric tons) of scup by recreational fishermen as estimated by the MRSSS and MRIP ([MRIP-MRFSS]/MRFSS). Positive value indicates MRIP estimate is larger. MRFSS to MRIP comparisons are only available for 2004-2011.

STATE	2004	2005	2006	2007	2008	2009	2010	2011
CT	512	249	353	487	261	163	611	627
DE	0	2	0	1	0	0	0	0
MD	0	1	0	0	0	0	0	0
MA	1,384	335	199	629	371	397	464	484
NJ	28	32	106	39	33	64	282	17
NY	998	398	760	786	757	770	1,191	258
NC	0	1	5	1	6	1	3	11
RI	354	194	259	141	284	66	161	235
VA	2	3	0	0	1	0	2	0
TOTAL	3,278	1,215	1,681	2,085	1,713	1,462	2,715	1,632
PSE (%)	12	16	19	20	14	13	12	14

STATE	2004	2005	2006	2007	2008	2009	2010	2011	TOTAL
CT	88%	-34%	6%	38%	-45%	23%	12%	37%	11%
DE	208%	4465%	-65%	27%	27%	-23%		177%	112%
MD	-63%	2%	-46%	-1%	-41%	18%	-50%	-100%	-30%
MA	154%	86%	100%	120%	23%	31%	4%	25%	67%
NJ	-45%	4%	48%	6%	-34%	-37%	35%	-28%	4%
NY	45%	16%	21%	0%	0%	8%	6%	-35%	9%
NC	174%	12%	24%	-7%	-33%	45%	45%	-16%	-8%
RI	-3%	-10%	25%	-26%	15%	-18%	-15%	-24%	-6%
VA	24%	37%		+9303%	36%	-74%	12%	-90%	-22%
TOTAL	71%	5%	25%	26%	-7%	10%	8%	2%	18%

Table 10. TOP - Estimated total live releases (catch type B2, number) of scup by recreational fishermen as estimated by the Marine Recreational Information Program (MRIP). Proportional Standard Error (PSE) is for the TOTAL landings estimate. BOTTOM - Percentage difference in estimated total live releases (catch type B2, number) of scup by recreational fishermen as estimated by the MRSSS and MRIP ([MRIP-MRFSS]/MRFSS). Positive value indicates MRIP estimate is larger. MRFSS to MRIP comparisons are only available for 2004-2011.

STATE	2004	2005	2006	2007	2008	2009	2010	2011
CT	538,241	752,749	739,778	1,006,174	974,212	1,204,388	1,192,329	576,941
DE	241	2,303	7,611	9,784	2,428	1,563	576	7
MD	5,279	1,531	34,790	1,742	6,322	586	24	161
MA	1,486,750	751,180	1,096,029	1,183,159	1,687,442	1,741,140	1,857,722	1,373,564
NJ	164,381	449,233	802,174	502,779	316,003	146,919	524,877	33,098
NY	3,514,103	1,737,255	2,621,812	1,963,724	2,838,176	2,124,306	1,864,138	929,213
NC	497	389	6,290	4,800	8,723	4,364	1,045	4,379
RI	517,673	689,788	801,281	613,147	1,386,018	332,505	536,204	765,426
VA	45,471	63,940	75,605	22,404	8,262	18,635	23,081	9,287
TOTAL	6,272,637	4,448,369	6,185,371	5,307,714	7,227,587	5,574,406	5,999,997	3,692,075
PSE (%)	15	18	15	12	11	11	11	14

STATE	2004	2005	2006	2007	2008	2009	2010	2011	TOTAL
CT	39%	5%	1%	16%	-14%	27%	4%	9%	8%
DE	-91%	-30%	-20%	11%	9%	-45%	103%	-99%	-21%
MD	-75%	-10%	-41%	-12%	-45%	-12%	-9%	28%	-47%
MA	74%	45%	18%	26%	43%	36%	21%	56%	38%
NJ	-36%	-17%	47%	-27%	-43%	-45%	14%	-8%	-12%
NY	40%	37%	5%	23%	-14%	-3%	-7%	-9%	8%
NC	11%	-32%	-17%	5%	-11%	46%	-26%	-19%	-7%
RI	0%	4%	-9%	-17%	8%	0%	-7%	45%	2%
VA	-33%	101%	143%	133%	-29%	3%	-20%	9%	29%
TOTAL	36%	19%	9%	10%	-3%	10%	4%	23%	11%

Table 11. Summary of the landed fish length sampling for scup in the NER (ME-VA) commercial fishery.

Year	No. of samples	No. of lengths	NER Landings (mt)	Sampling rate (mt/100 lengths)
1979	10	1,250	8,585	687
1980	26	3,478	8,424	242
1981	16	2,005	9,856	492
1982	81	9,896	8,704	88
1983	72	7,860	7,794	99
1984	60	6,303	7,769	123
1985	31	3,058	6,727	220
1986	54	5,467	7,176	131
1987	61	6,491	6,276	97
1988	85	8,691	5,943	68
1989	46	4,806	3,984	83
1990	46	4,736	4,571	97
1991	31	3,150	7,081	225
1992	33	3,260	6,259	192
1993	23	2,287	4,726	207
1994	22	2,163	4,392	203
1995	22	2,487	3,073	124
1996	61	6,544	2,945	45
1997	37	3,732	2,188	59
1998	41	4,022	1,896	47
1999	56	6,040	1,505	25

Table 11 continued.

Year	No. of samples	No. of lengths	NER Landings (mt)	Sampling rate (mt/100 lengths)
2000	22	2,352	1,207	51
2001	40	3,934	1,729	44
2002	26	2,587	3,173	123
2003	78	6,681	4,405	66
2004	144	13,172	4,231	32
2005	124	9,324	4,266	46
2006	152	12,506	4,062	32
2007	198	15,704	4,196	27
2008	154	12,764	2,351	18
2009	112	9,694	3,717	38
2010	105	9,860	4,855	49
2011	99	9,660	6,819	71
2012	103	9,554	7,122	75

Table 12. Commercial fishery scup landings (000s) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	1	2691	6114	7090	5793	1418	536	251	1	0	0	23895
1985	79	3245	6767	7696	2640	346	520	159	0	0	0	21452
1986	9	301	12321	4773	1004	75	106	337	5	0	0	18931
1987	2	1679	9952	10399	1725	177	124	21	18	0	1	24098
1988	17	423	7709	9526	2424	58	127	39	0	0	0	20323
1989	17	1484	4943	7071	685	22	69	24	0	0	0	14315
1990	0	247	10203	6781	1022	355	149	2	0	0	0	18759
1991	0	2412	12956	10202	2161	409	193	0	0	0	0	28334
1992	21	1577	10883	3737	3797	1243	138	0	0	0	0	21396
1993	1	230	6558	6877	1500	1143	124	0	0	0	0	16433
1994	0	1052	13544	6358	836	82	39	0	0	0	0	21911
1995	0	2198	8345	2878	891	248	31	0	0	0	0	14591
1996	0	346	6343	1640	770	469	62	0	0	0	0	9630
1997	0	131	2080	4089	732	84	97	0	0	0	0	7213
1998	0	340	1453	2373	1092	381	2	0	0	0	0	5641
1999	0	1	1148	2688	527	117	0	0	0	0	0	4481
2000	0	0	661	2144	511	15	0	0	0	0	0	3331
2001	0	31	1635	3033	695	46	6	1	1	0	0	5448
2002	0	124	1219	5051	2132	393	5	0	0	0	0	8922
2003	0	2	955	2974	4553	1131	121	41	5	14	0	9796
2004	0	1	844	2406	2826	2089	296	40	4	14	0	8520
2005	0	31	683	1558	2361	2515	807	92	3	3	0	8053
2006	0	89	2233	2231	1119	1477	1219	366	28	3	0	8765
2007	0	91	2787	2661	1390	680	940	590	124	12	0	9275
2008	0	36	1304	2411	1108	306	254	257	34	1	1	5712
2009	0	3	1305	4277	2592	818	220	206	125	10	0	9556
2010	0	34	1717	3788	3863	1791	259	146	97	16	1	11712
2011	0	57	1579	5363	4630	3269	691	178	112	29	2	15910
2012	0	134	2500	2362	5448	3404	1171	272	82	30	2	15405

Table 13. Commercial fishery scup landings mean weights (kg) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	0.033	0.155	0.190	0.293	0.344	0.398	0.767	1.044	1.545	0.000	0.000	0.288
1985	0.043	0.134	0.197	0.293	0.409	0.517	0.739	1.042	0.000	0.000	0.000	0.272
1986	0.036	0.140	0.219	0.357	0.676	0.670	1.010	1.246	1.616	0.000	0.000	0.302
1987	0.034	0.136	0.203	0.244	0.407	0.544	0.747	1.194	1.068	0.000	0.000	0.237
1988	0.044	0.123	0.201	0.263	0.441	0.636	0.715	0.982	0.000	0.000	0.000	0.263
1989	0.025	0.144	0.188	0.275	0.367	0.651	0.721	1.036	0.000	0.000	0.000	0.240
1990	0.000	0.140	0.189	0.246	0.367	0.518	0.842	0.846	0.000	1.096	0.000	0.230
1991	0.000	0.187	0.194	0.263	0.389	0.511	0.729	0.000	0.000	0.000	0.000	0.241
1992	0.039	0.173	0.199	0.325	0.419	0.503	0.859	0.000	0.000	1.096	0.000	0.280
1993	0.031	0.140	0.197	0.261	0.442	0.510	0.782	0.000	0.000	0.000	0.000	0.272
1994	0.000	0.203	0.193	0.259	0.430	0.663	0.742	0.000	0.000	0.000	0.000	0.224
1995	0.000	0.161	0.209	0.295	0.396	0.480	0.724	0.000	0.000	0.000	0.000	0.236
1996	0.000	0.206	0.200	0.325	0.468	0.554	0.784	0.000	0.000	0.000	0.000	0.264
1997	0.000	0.227	0.253	0.300	0.386	0.529	0.749	0.000	0.000	0.000	0.000	0.303
1998	0.000	0.200	0.254	0.313	0.459	0.556	0.748	0.000	0.000	0.000	0.000	0.336
1999	0.000	0.075	0.220	0.323	0.497	0.748	0.000	0.000	0.000	0.000	0.000	0.328
2000	0.000	0.000	0.221	0.367	0.504	0.674	0.000	0.000	0.000	0.000	0.000	0.360
2001	0.000	0.229	0.265	0.346	0.476	0.562	0.779	1.003	1.003	0.000	0.000	0.340
2002	0.000	0.231	0.281	0.339	0.465	0.577	0.748	0.000	0.000	0.000	0.000	0.370
2003	0.000	0.187	0.285	0.362	0.471	0.659	0.859	0.884	1.241	0.000	0.000	0.448
2004	0.000	0.182	0.313	0.398	0.518	0.591	0.812	1.002	1.370	1.674	0.000	0.496
2005	0.000	0.196	0.269	0.362	0.471	0.652	0.809	1.044	1.099	1.311	0.000	0.529
2006	0.000	0.213	0.283	0.344	0.460	0.591	0.727	0.915	1.108	1.314	0.000	0.463
2007	0.000	0.217	0.265	0.353	0.470	0.646	0.768	0.894	1.077	1.697	0.000	0.452
2008	0.000	0.197	0.264	0.321	0.486	0.634	0.804	0.973	1.176	1.435	2.437	0.412
2009	0.000	0.177	0.252	0.29	0.439	0.59	0.821	0.958	1.086	1.36	1.815	0.389
2010	0.000	0.191	0.251	0.313	0.426	0.548	0.784	0.941	1.054	1.232	1.510	0.403
2011	0.000	0.198	0.255	0.309	0.432	0.566	0.803	0.992	1.128	1.252	1.525	0.428
2012	0.000	0.199	0.270	0.246	0.454	0.562	0.747	0.899	1.097	1.193	1.678	0.464

Table 14. Summary of length sampling for scup in the NEFSC Fishery Observer Program.
OT =number of otter trawl trips sampled with scup discard lengths. H1 = first half year; H2 = second half year.
Discards in metric tons (mt).

Year	OT trips	Lengths H1	Lengths H2	Lengths Total	Discards	Sampling Intensity (mt/100 lengths)
1989	61	4,449	2,910	7,359	2,229	30
1990	52	2,582	781	3,363	3,909	116
1991	91	1,237	1,780	3,017	3,530	117
1992	53	1,158	0	1,158	5,668	489
1993	29	275	154	429	1,436	335
1994	7	99	119	218	807	370
1995	18	162	383	556	2,057	370
1996	27	1,093	435	1,528	1,522	100
1997	45	750	1	751	1,843	245
1998	33	618	64	682	3,331	488
1999	35	586	89	675	4,819	714
2000	62	3,981	762	4,743	2,352	50
2001	67	1,231	229	1,460	1,499	103
2002	65	1,422	866	2,288	5,636	246
2003	72	925	284	1,209	2,153	178
2004	80	1,948	1,051	2,999	893	30
2005	73	797	1,159	1,956	662	34
2006	47	1,486	777	2,263	1,387	61
2007	59	1,313	1,058	2,371	1,859	78
2008	54	1,217	1,259	2,476	2,879	116
2009	111	3,498	2,788	6,286	1,675	27
2010	137	5,185	2,466	7,651	2,108	28
2011	113	4,232	2,317	6,549	1,913	29
2012	82	2,851	970	3,821	2,282	60

Table 15. Commercial fishery scup discards (000s) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	78	10847	6367	924	21	0	0	0	0	0	0	18237
1985	52773	13093	6534	1060	10	0	0	0	0	0	0	73470
1986	78	1180	14040	602	3	0	0	0	0	0	0	15903
1987	78	6814	12215	1366	5	0	0	0	0	0	0	20478
1988	1552	1698	9242	1339	10	0	0	0	0	0	0	13841
1989	387	8943	13603	813	28	0	0	0	0	0	0	23774
1990	822	8269	17249	2801	0	0	0	0	0	0	0	29141
1991	1794	17231	5397	1733	5	0	0	0	0	0	0	26160
1992	38804	10023	26380	72	0	0	0	0	0	0	0	75279
1993	5386	1549	6960	224	0	0	0	0	0	0	0	14119
1994	6858	3099	3422	74	0	0	0	0	0	0	0	13453
1995	1855	50174	335	108	14	0	0	0	0	0	0	52486
1996	199	3009	5990	691	21	1	0	0	0	0	0	9911
1997	1	618	8250	1871	0	0	0	0	0	0	0	10740
1998	18	17524	11849	1127	247	57	0	0	0	0	0	30822
1999	1338	2563	18123	3139	691	201	0	0	0	0	0	26055
2000	853	11206	4890	1475	55	57	0	0	0	0	0	18536
2001	3536	4232	2647	355	281	207	57	0	0	0	0	11315
2002	9561	22393	5834	4431	518	571	75	0	0	0	0	43383
2003	1480	1578	3779	937	752	503	93	0	0	0	0	9122
2004	545	1397	1423	1176	220	187	8	0	0	0	0	4956
2005	460	893	1879	516	79	47	15	0	0	0	0	3889
2006	4809	8083	2354	642	53	13	16	0	0	0	0	15970
2007	1412	3936	5370	1420	94	41	87	0	0	0	0	12360
2008	1061	7526	2937	821	215	86	81	128	86	0	0	12941
2009	643	3237	3473	1558	577	134	44	44	29	0	0	9739
2010	398	1345	6155	2314	910	232	38	22	20	5	1	11440
2011	727	8767	4052	2484	744	195	49	19	5	1	0	17043
2012	151	8678	4258	1828	924	248	104	27	15	5	2	16240

Table 16. Commercial fishery scup discards mean weights (kg) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	0.033	0.108	0.125	0.198	0.222	0	0	0	0	0	0	0.118
1985	0.033	0.108	0.125	0.198	0.222	0	0	0	0	0	0	0.057
1986	0.033	0.108	0.125	0.198	0.222	0	0	0	0	0	0	0.126
1987	0.033	0.108	0.125	0.198	0.222	0	0	0	0	0	0	0.124
1988	0.033	0.108	0.125	0.198	0.222	0	0	0	0	0	0	0.120
1989	0.039	0.060	0.111	0.198	0.217	0	0	0	0	0	0	0.094
1990	0.026	0.121	0.137	0.187	0	0	0	0	0	0	0	0.134
1991	0.057	0.127	0.163	0.207	0.252	0	0	0	0	0	0	0.135
1992	0.033	0.078	0.136	0.243	0	0	0	0	0	0	0	0.075
1993	0.026	0.106	0.154	0.269	0	0	0	0	0	0	0	0.102
1994	0.024	0.068	0.122	0.198	0	0	0	0	0	0	0	0.060
1995	0.038	0.037	0.229	0.310	0.331	0	0	0	0	0	0	0.039
1996	0.033	0.110	0.169	0.240	0.268	0.532	0	0	0	0	0	0.154
1997	0.020	0.028	0.137	0.362	0.000	0.000	0	0	0	0	0	0.170
1998	0.092	0.069	0.147	0.224	0.418	0.564	0	0	0	0	0	0.108
1999	0.010	0.037	0.158	0.398	0.599	0.690	0	0	0	0	0	0.183
2000	0.044	0.076	0.195	0.299	0.486	0.768	0	0	0	0	0	0.127
2001	0.015	0.063	0.168	0.345	0.500	0.670	0.944	0	0	0	0	0.108
2002	0.035	0.064	0.201	0.361	0.524	0.757	1.071	0	0	0	0	0.123
2003	0.022	0.091	0.212	0.315	0.537	0.784	0.878	0	0	0	0	0.236
2004	0.029	0.109	0.166	0.268	0.371	0.453	0.750	0	0	0	0	0.180
2005	0.019	0.090	0.154	0.267	0.416	0.652	0.912	0	0	0	0	0.153
2006	0.026	0.086	0.166	0.217	0.313	0.549	0.755	0	0	0	0	0.087
2007	0.041	0.094	0.163	0.282	0.342	0.597	0.770	0	0	0	0	0.148
2008	0.039	0.096	0.182	0.294	0.495	0.742	0.884	1.078	1.442	0.000	0.000	0.158
2009	0.032	0.083	0.160	0.261	0.401	0.582	0.810	0.962	1.154	0.000	0.000	0.172
2010	0.027	0.096	0.147	0.240	0.340	0.516	0.780	0.967	1.144	1.302	1.503	0.185
2011	0.028	0.060	0.166	0.233	0.312	0.519	0.739	0.839	0.877	0.912	0.000	0.128
2012	0.037	0.054	0.183	0.257	0.337	0.516	0.715	0.843	1.287	1.294	1.549	0.141

Table 17. Recreational fishery scup landings (000s) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	23	3036	1353	570	182	219	442	86	51	30	66	6058
1985	431	4478	3054	1330	788	441	137	33	0	0	115	10807
1986	538	4353	15570	2617	845	431	87	5	4	57	315	24822
1987	77	2299	4686	1261	824	598	112	0	0	11	46	9914
1988	9	1001	2229	1824	460	216	123	92	20	0	86	6060
1989	311	3978	3371	823	86	235	154	13	0	50	148	9169
1990	169	1352	5091	1102	147	112	36	7	2	3	22	8043
1991	299	4838	3797	3319	700	210	19	0	2	20	68	13272
1992	99	1850	4457	530	672	84	12	6	8	7	30	7755
1993	46	1245	3051	908	254	133	2	2	0	2	7	5650
1994	31	1473	1840	691	95	88	21	6	0	0	0	4245
1995	15	613	1399	225	89	20	3	3	0	0	0	2367
1996	9	351	1467	812	365	54	10	15	0	0	0	3083
1997	32	52	983	562	168	63	33	17	6	0	0	1916
1998	13	223	257	415	248	19	13	23	0	0	0	1211
1999	61	469	2169	359	182	11	0	0	0	0	0	3251
2000	6	912	3443	2113	641	129	0	0	0	0	0	7244
2001	0.3	514	1511	1705	806	244	101	218	0	0	0	5099
2002	7	70	688	1635	1005	179	24	39	0	0	0	3647
2003	0.3	75	1723	2655	3127	1407	350	115	0	0	0	9452
2004	0.9	45	284	1551	1441	1166	470	32	0	0	0	4990
2005	0	13	100	513	700	845	349	26	0	0	0	2546
2006	1	50	658	819	404	431	541	46	0	1	0	2951
2007	3	47	456	1347	775	378	605	206	26	1	0	3844
2008	2	52	732	1352	842	205	338	133	17	1	0	3674
2009	1	37	159	1007	1003	365	109	64	24	2	0	2771
2010	2	10	282	1221	1575	804	222	422	162	8	1	4709
2011	1	14	79	386	1029	897	290	142	48	13	1	2900
2012	1	43	213	425	1068	920	598	146	81	17	13	3525

Table 18 Recreational fishery scup landings mean weights (kg) at age.

Year	0	1	2	3	4	5	6	7	8	9	10
1984	0.044	0.117	0.266	0.373	0.472	0.557	0.678	0.825	0.912	1.002	1.145
1985	0.038	0.125	0.253	0.340	0.573	0.718	0.913	1.087	0.000	0.000	1.673
1986	0.052	0.101	0.234	0.374	0.534	0.654	0.801	0.912	1.003	1.003	1.638
1987	0.029	0.105	0.242	0.381	0.548	0.698	0.737	0.000	0.000	1.003	3.808
1988	0.026	0.142	0.240	0.325	0.497	0.663	0.794	1.144	1.099	0.000	1.532
1989	0.035	0.123	0.234	0.376	0.433	0.653	0.696	0.657	0.000	1.003	1.332
1990	0.057	0.128	0.208	0.325	0.461	0.567	0.761	0.939	1.088	1.202	1.947
1991	0.064	0.150	0.275	0.361	0.474	0.714	0.675	0.000	1.003	1.003	1.305
1992	0.092	0.140	0.240	0.373	0.454	0.598	0.804	0.859	1.311	1.003	2.117
1993	0.087	0.135	0.226	0.336	0.460	0.524	0.912	0.827	0.000	1.026	1.100
1994	0.054	0.180	0.281	0.357	0.467	0.674	0.905	1.430	0.000	0.000	0.000
1995	0.065	0.155	0.279	0.450	0.557	0.756	1.044	1.311	0.000	0.000	0.000
1996	0.093	0.171	0.231	0.368	0.540	0.772	0.876	1.383	0.000	0.000	0.000
1997	0.083	0.110	0.253	0.299	0.510	0.684	0.819	1.342	0.779	0.000	0.000
1998	0.072	0.121	0.211	0.312	0.491	0.866	1.066	1.950	0.000	0.000	0.000
1999	0.095	0.173	0.274	0.451	0.635	0.900	0.000	0.000	0.000	0.000	0.000
2000	0.075	0.138	0.296	0.424	0.544	0.825	0.000	0.000	0.000	0.000	0.000
2001	0.092	0.220	0.344	0.485	0.637	0.776	0.875	1.127	0.000	0.000	0.000
2002	0.110	0.152	0.296	0.427	0.618	0.795	0.932	1.427	0.000	0.000	0.000
2003	0.092	0.161	0.314	0.416	0.536	0.720	0.908	1.499	0.000	0.000	0.000
2004	0.094	0.151	0.325	0.437	0.523	0.575	0.858	0.748	0.000	0.000	0.000
2005	0.000	0.112	0.270	0.384	0.516	0.679	0.881	1.098	0.000	0.000	0.000
2006	0.092	0.151	0.304	0.411	0.525	0.695	0.883	0.999	0.000	1.311	0.000
2007	0.111	0.152	0.313	0.418	0.509	0.672	0.882	0.935	1.056	1.322	0.000
2008	0.080	0.162	0.318	0.442	0.545	0.714	0.996	1.035	1.201	1.350	0.000
2009	0.064	0.127	0.279	0.419	0.539	0.666	0.918	1.035	1.085	1.409	0.000
2010	0.028	0.129	0.282	0.408	0.521	0.667	0.897	1.372	1.201	1.307	1.482
2011	0.041	0.119	0.279	0.377	0.512	0.626	0.823	1.084	1.129	1.219	1.549
2012	0.060	0.178	0.269	0.397	0.494	0.605	0.814	0.969	1.144	1.198	1.658

Table 19. Recreational fishery scup discards (000s) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	2	255	0	0	0	0	0	0	0	0	0	257
1985	40	417	0	0	0	0	0	0	0	0	0	457
1986	100	807	0	0	0	0	0	0	0	0	0	907
1987	12	357	0	0	0	0	0	0	0	0	0	369
1988	2	219	0	0	0	0	0	0	0	0	0	221
1989	24	308	0	0	0	0	0	0	0	0	0	332
1990	36	284	0	0	0	0	0	0	0	0	0	320
1991	31	505	0	0	0	0	0	0	0	0	0	536
1992	17	325	0	0	0	0	0	0	0	0	0	342
1993	8	204	0	0	0	0	0	0	0	0	0	212
1994	4	203	0	0	0	0	0	0	0	0	0	207
1995	63	135	0	0	0	0	0	0	0	0	0	198
1996	44	222	0	0	0	0	0	0	0	0	0	266
1997	163	10	0	0	0	0	0	0	0	0	0	173
1998	80	139	0	0	0	0	0	0	0	0	0	219
1999	208	0	0	0	0	0	0	0	0	0	0	208
2000	20	561	25	0	0	0	0	0	0	0	0	606
2001	0.3	484	325	0	0	0	0	0	0	0	0	809
2002	14	199	381	55	0	0	0	0	0	0	0	649
2003	1	168	550	63	0	0	0	0	0	0	0	782
2004	7	232	242	211	0	0	0	0	0	0	0	692
2005	5	88	232	135	44	46	11	1	0	0	0	562
2006	1	143	644	66	0	0	0	0	0	0	0	854
2007	20	185	375	124	20	2	1	0	0	0	0	727
2008	24	230	511	282	50	9	5	8	1	0	0	1120
2009	11	137	307	247	46	6	1	1	1	0	0	757
2010	6	74	287	273	148	40	14	9	7	4	0	862
2011	3	40	125	163	97	23	1	1	0	0	0	453
2012	4	185	181	150	182	54	4	1	1	1	0	763

Table 20. Recreational fishery scup discards mean weights (kg) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	0.044	0.117	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.116
1985	0.038	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.117
1986	0.052	0.101	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096
1987	0.029	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.103
1988	0.026	0.142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.141
1989	0.035	0.123	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.117
1990	0.057	0.128	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.120
1991	0.064	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.145
1992	0.092	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.138
1993	0.087	0.135	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.133
1994	0.054	0.180	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.178
1995	0.063	0.065	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.064
1996	0.075	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075
1997	0.043	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.045
1998	0.061	0.068	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.065
1999	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.028
2000	0.075	0.087	0.189	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.091
2001	0.092	0.194	0.218	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.204
2002	0.110	0.155	0.238	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.211
2003	0.092	0.141	0.215	0.251	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.202
2004	0.094	0.149	0.206	0.233	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.194
2005	0.035	0.114	0.215	0.311	0.481	0.698	0.810	1.110	0.000	0.000	0.000	0.294
2006	0.092	0.148	0.229	0.243	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.216
2007	0.067	0.127	0.220	0.322	0.408	0.567	0.000	0.000	0.000	0.000	0.000	0.215
2008	0.039	0.121	0.242	0.343	0.507	0.781	0.854	1.074	1.233	0.000	0.000	0.264
2009	0.048	0.125	0.226	0.313	0.432	0.662	0.937	0.980	1.093	0.000	0.000	0.253
2010	0.048	0.132	0.226	0.342	0.471	0.730	0.898	1.092	1.218	1.678	0.000	0.354
2011	0.047	0.122	0.243	0.331	0.408	0.474	0.732	0.807	0.827	0.000	0.000	0.312
2012	0.060	0.142	0.233	0.363	0.422	0.491	0.760	0.865	0.914	0.000	0.000	0.303

Table 21. Total catch (metric tons) of scup from Maine through North Carolina. Landings include revised Massachusetts landings for 1986-1997. Commercial discards for 1984-1988 calculated as the geometric mean ratio of discards to landings numbers at age for 1989-1993. Commercial discard estimate for 1998 is the mean of 1997 and 1999 estimates. Recreational catch from MRIP (2004-2012) and MRFSS adjusted by MRFSS to MRIP ratio (1981-2003).

Year	Commercial Landings	Commercial Discards	Recreational Landings	Recreational Discards	Total Catch
1981	9,856	n/a	3,116	59	13,031
1982	8,704	n/a	2,791	52	11,548
1983	7,794	n/a	3,353	63	11,210
1984	7,769	2,158	1,296	33	11,256
1985	6,727	4,184	3,268	60	14,239
1986	7,176	2,005	6,223	97	15,501
1987	6,276	2,537	3,323	42	12,178
1988	5,943	1,657	2,289	35	9,923
1989	3,984	2,229	2,980	43	9,237
1990	4,571	3,909	2,220	42	10,742
1991	7,081	3,530	4,336	87	15,034
1992	6,259	5,668	2,366	52	14,345
1993	4,726	1,436	1,714	31	7,907
1994	4,392	807	1,409	41	6,649
1995	3,073	2,057	720	14	5,864
1996	2,945	1,522	1,156	22	5,645
1997	2,188	1,843	642	9	4,682
1998	1,896	3,331	469	16	5,712
1999	1,505	4,819	1,012	7	7,343
2000	1,207	2,352	2,919	61	6,539
2001	1,729	1,499	2,285	184	5,697
2002	3,173	5,636	1,944	152	10,905
2003	4,405	2,153	4,549	176	11,283
2004	4,231	893	3,278	182	8,584
2005	4,266	662	1,215	270	6,413
2006	4,062	1,387	1,681	426	7,556
2007	4,196	1,859	2,085	346	8,486
2008	2,351	2,879	1,713	287	7,229
2009	3,717	1,675	1,462	211	7,065
2010	4,855	2,108	2,715	318	9,996
2011	6,819	1,913	1,632	173	10,537
2012	7,122	2,282	1,842	231	11,477

Table 22. Total fishery scup catch (000s) at age.

Year	0	1	2	3	4	5	6	7	8	9	10	Total
1984	104	16829	13834	8584	5996	1637	978	337	52	30	66	48447
1985	53323	21233	16355	10086	3438	787	657	192	0	0	115	106186
1986	725	6641	41931	7992	1852	506	193	342	9	57	315	60563
1987	169	11149	26853	13026	2554	775	236	21	18	11	47	54859
1988	1580	3341	19180	12689	2894	274	250	131	20	0	86	40445
1989	739	14713	21917	8707	799	257	223	37	0	50	148	47590
1990	1027	10152	32543	10684	1169	467	185	9	2	3	22	56263
1991	2124	24986	22150	15254	2866	619	212	0	2	20	68	68302
1992	38941	13775	41720	4339	4469	1327	150	6	8	7	30	104772
1993	5441	3228	16569	8009	1754	1276	126	2	0	2	7	36414
1994	6893	5827	18806	7123	931	170	60	6	0	0	0	39816
1995	1933	53120	10079	3211	994	268	34	3	0	0	0	69642
1996	252	3928	13800	3143	1156	524	72	15	0	0	0	22890
1997	196	811	11313	6522	900	147	130	17	6	0	0	20042
1998	111	18226	13559	3915	1587	457	15	23	0	0	0	37893
1999	1607	3033	21440	6186	1400	329	0	0	0	0	0	33995
2000	879	12679	9019	5732	1207	201	0	0	0	0	0	29717
2001	3537	5261	6118	5093	1782	497	164	219	1	0	0	22671
2002	9582	22786	8122	11172	3655	1143	104	39	0	0	0	56601
2003	1481	1823	7007	6629	8432	3041	564	156	5	14	0	29152
2004	553	1675	2793	5344	4487	3442	774	72	4	14	0	19158
2005	465	1025	2894	2722	3184	3453	1182	119	3	3	0	15050
2006	4811	8365	5889	3758	1576	1921	1776	412	28	4	0	28540
2007	1435	4259	8988	5552	2279	1101	1633	796	150	13	0	26206
2008	1087	7844	5484	4866	2215	606	678	526	138	2	1	23447
2009	655	3414	5244	7089	4218	1323	374	315	179	12	0	22823
2010	406	1463	8441	7596	6496	2867	533	599	286	33	3	28723
2011	731	8878	5835	8396	6500	4384	1031	340	165	43	3	36306
2012	156	9040	7152	4765	7622	4626	1877	446	179	53	17	35933

Table 23. Total fishery scup catch mean weights (kg) at age.

Year	0	1	2	3	4	5	6	7	8	9	10
1984	0.036	0.117	0.168	0.288	0.348	0.419	0.727	0.988	0.924	1.002	1.145
1985	0.033	0.116	0.179	0.289	0.446	0.629	0.775	1.050	0.000	0.000	1.673
1986	0.050	0.104	0.193	0.351	0.611	0.656	0.916	1.241	1.344	1.003	1.638
1987	0.031	0.112	0.174	0.253	0.452	0.663	0.742	1.194	1.068	1.003	3.727
1988	0.033	0.122	0.169	0.265	0.449	0.657	0.754	1.096	1.099	0.000	1.532
1989	0.037	0.087	0.147	0.277	0.369	0.653	0.704	0.903	0.000	1.003	1.332
1990	0.032	0.123	0.164	0.239	0.379	0.530	0.826	0.918	1.088	1.195	1.947
1991	0.058	0.138	0.201	0.278	0.409	0.580	0.724	0.000	1.003	1.003	1.305
1992	0.033	0.099	0.164	0.329	0.424	0.509	0.854	0.859	1.311	1.004	2.117
1993	0.027	0.121	0.184	0.270	0.445	0.512	0.784	0.827	0.000	1.026	1.100
1994	0.024	0.125	0.189	0.267	0.434	0.669	0.799	1.430	0.000	0.000	0.000
1995	0.039	0.044	0.219	0.306	0.409	0.501	0.752	1.311	0.000	0.000	0.000
1996	0.042	0.122	0.190	0.317	0.487	0.577	0.796	1.327	0.000	0.000	0.000
1997	0.049	0.066	0.168	0.318	0.409	0.595	0.767	1.342	0.779	0.000	0.000
1998	0.067	0.072	0.160	0.287	0.458	0.570	1.024	1.950	0.000	0.000	0.000
1999	0.016	0.058	0.173	0.368	0.565	0.718	0.947	1.538	0.000	0.000	0.000
2000	0.045	0.081	0.235	0.371	0.524	0.798	0.947	1.538	0.000	0.000	0.000
2001	0.015	0.091	0.240	0.392	0.553	0.712	0.896	1.126	0.000	0.000	0.000
2002	0.035	0.066	0.223	0.360	0.515	0.701	1.024	1.427	0.000	0.000	0.000
2003	0.022	0.099	0.247	0.376	0.501	0.708	0.893	1.337	1.241	0.000	0.000
2004	0.030	0.116	0.230	0.374	0.512	0.578	0.839	0.889	1.370	1.674	0.000
2005	0.019	0.096	0.190	0.346	0.480	0.659	0.832	1.056	1.099	1.311	0.000
2006	0.026	0.089	0.233	0.335	0.472	0.614	0.775	0.924	1.108	1.313	0.000
2007	0.042	0.099	0.205	0.350	0.477	0.653	0.810	0.905	1.073	1.668	0.000
2008	0.039	0.098	0.225	0.351	0.510	0.679	0.910	1.016	1.345	1.393	2.437
2009	0.032	0.085	0.190	0.303	0.458	0.610	0.848	0.974	1.097	1.368	0.000
2010	0.027	0.100	0.175	0.307	0.438	0.581	0.834	1.248	1.148	1.315	1.498
2011	0.028	0.061	0.193	0.290	0.431	0.576	0.806	1.021	1.121	1.234	1.533
2012	0.038	0.059	0.217	0.267	0.445	0.567	0.767	0.918	1.133	1.182	1.648

Table 24. Extended series of total fishery catch. Catches in metric tons (mt). To estimate commercial discards for 1963-1988, D/L ratio for 1989-1997 = 0.504 was applied to commercial landings. To estimate recreational catch for 1963-1980, 50% of the Mayo 1982 estimates were included. Recreational catch from MRIP.

Year	Comm. Land.	Comm. Disc.	DWF Land.	Rec. Catch	Total Catch
1963	18,884	9,510	5,863	4,166	38,423
1964	17,204	8,664	459	3,945	30,272
1965	15,785	7,950	2,089	3,855	29,679
1966	11,960	6,023	823	2,921	21,727
1967	8,748	4,406	896	2,219	16,269
1968	6,630	3,339	2,251	1,738	13,958
1969	5,149	2,593	485	1,307	9,534
1970	4,493	2,263	288	1,183	8,227
1971	3,974	2,001	889	1,007	7,871
1972	4,203	2,117	1,647	940	8,907
1973	5,024	2,530	1,783	1,319	10,656
1974	7,106	3,579	958	1,639	13,282
1975	7,623	3,839	685	1,657	13,804
1976	7,302	3,677	87	1,397	12,463
1977	8,330	4,195	28	1,651	14,204
1978	8,936	4,500	3	1,482	14,921
1979	8,585	4,324	0	1,443	14,352
1980	8,424	4,242	16	3,745	16,427
1981	9,856	4,964	1	3,175	17,996
1982	8,704	4,383	0	2,844	15,931
1983	7,794	3,925	0	3,416	15,135
1984	7,769	2,158	0	1,329	11,256
1985	6,727	4,184	0	3,328	14,239
1986	7,176	2,005	0	6,320	15,501
1987	6,276	2,537	0	3,365	12,178
1988	5,943	1,657	0	2,323	9,923
1989	3,984	2,229	0	3,024	9,237
1990	4,571	3,909	0	2,262	10,742
1991	7,081	3,530	0	4,423	15,034
1992	6,259	5,668	0	2,418	14,345
1993	4,726	1,436	0	1,745	7,907
1994	4,392	807	0	1,450	6,649
1995	3,073	2,057	0	734	5,864
1996	2,945	1,522	0	1,178	5,645
1997	2,188	1,843	0	651	4,682
1998	1,896	3,331	0	485	5,712
1999	1,505	4,819	0	1,019	7,343

Table 24 continued.

Year	Comm. Land.	Comm. Disc.	DWF Land.	Rec. Catch	Total Catch
2000	1,207	2,352	0	2,980	6,539
2001	1,729	1,499	0	2,469	5,697
2002	3,173	5,636	0	2,096	10,905
2003	4,405	2,153	0	4,725	11,283
2004	4,231	893	0	3,460	8,584
2005	4,266	662	0	1,485	6,413
2006	4,062	1,387	0	2,107	7,556
2007	4,196	1,859	0	2,431	8,486
2008	2,351	2,879	0	1,999	7,229
2009	3,717	1,675	0	1,673	7,065
2010	4,855	2,108	0	3,033	9,996
2011	6,819	1,913	0	1,805	10,537
2012	7,122	2,282	0	2,073	11,477

Table 25. NEFSC spring and fall trawl survey indices for scup. Strata sets include only offshore strata 1-12, 23, 25 and 61-76 for consistency over entire time series. The fall strata set excludes inshore strata 1-61 that are included in the 1984 and later indices at age.

Year	Spring N/tow	Spring Kg/tow	Spring SSB Kg/tow	Spring SSB 3-yr avg	Fall N/tow	Fall Kg/tow
1963					2.12	1.21
1964					118.70	2.23
1965					3.84	0.62
1966					2.00	0.41
1967					29.38	1.46
1968	59.21	2.25	0.94		14.35	0.54
1969	2.26	0.40	0.39	0.88	99.41	4.48
1970	78.50	3.01	1.30	1.09	10.34	0.22
1971	70.91	2.41	1.57	1.28	7.730	0.25
1972	49.80	2.30	0.98	1.21	40.56	2.34
1973	3.62	1.19	1.09	1.38	22.82	0.93
1974	30.28	3.24	2.06	1.92	9.94	1.01
1975	14.01	3.12	2.61	1.73	52.21	3.40
1976	4.09	0.63	0.53	2.50	161.14	7.35
1977	42.46	4.48	4.35	2.49	32.69	1.71
1978	39.85	3.49	2.59	2.77	12.17	1.32
1979	22.42	1.95	1.38	1.69	15.77	0.61
1980	9.31	1.31	1.09	1.12	11.05	0.92
1981	14.72	1.16	0.89	1.00	67.14	3.01
1982	7.88	1.16	1.02	0.65	25.47	1.17
1983	0.80	0.29	0.03	0.46	4.59	0.34
1984	8.52	0.51	0.33	0.24	24.03	1.22
1985	14.67	0.80	0.37	0.68	68.30	3.56
1986	11.74	1.30	1.33	0.98	46.19	1.66
1987	10.82	1.21	1.24	1.10	5.76	0.15
1988	25.41	1.26	0.73	0.66	5.75	0.09
1989	1.63	0.12	0.00	0.35	94.05	3.37
1990	1.17	0.39	0.34	0.26	16.53	0.83
1991	12.61	0.75	0.45	0.32	9.52	0.43
1992	6.79	0.40	0.21	0.32	16.19	1.12
1993	2.93	0.33	0.31	0.18	0.43	0.04
1994	1.54	0.09	0.03	0.15	3.59	0.11
1995	2.90	0.22	0.12	0.06	24.72	0.91
1996	0.53	0.03	0.02	0.08	4.46	0.23
1997	0.91	0.11	0.11	0.06	16.92	0.88
1998	40.04	0.87	0.05	0.08	25.35	0.69
1999	1.70	0.12	0.09	0.08	85.23	2.07
2000	6.71	0.33	0.11	0.25	99.33	4.79

Table 25 continued.

Year	Spring N/tow	Spring Kg/tow	Spring SSB Kg/tow	Spring SSB 3-yr avg	Fall N/tow	Fall Kg/tow
2001	13.03	0.80	0.54	3.30	20.28	1.11
2002	154.86	13.46	9.24	3.31	95.62	3.79
2003	6.01	0.28	0.15	3.74	28.18	0.80
2004	57.58	2.84	1.82	0.69	10.38	0.27
2005	19.22	0.55	0.10	1.32	4.50	0.07
2006	5.71	2.10	2.04	0.76	96.41	1.92
2007	10.60	0.36	0.14	1.16	41.52	2.21
2008	9.68	1.44	1.30		38.49	1.38

Table 26. NEFSC spring and fall trawl survey indices for scup. Spring and fall strata sets include only offshore strata 1-12, 23, 25 and 61-76 for consistency over entire time series. FSV *Bigelow* (HBB) and aggregate factor calibrated indices for the FSV *Albatross IV* (ALB) time series. The aggregate spring catch number calibration factor is 1.371; the aggregate spring weight factor is 0.701; the aggregate fall number factor is 1.740; the aggregate fall weight factor is 1.438.

Year	Spring N/tow HBB	Spring Kg/tow HBB	Spring N/tow ALB	Spring Kg/tow ALB
2009	11.98	0.99	8.74	1.41
2010	31.82	4.62	23.21	6.59
2011	26.67	0.92	19.45	1.31
2012	58.65	2.44	42.78	3.48

Year	Fall N/tow HBB	Fall Kg/tow HBB	Fall N/tow ALB	Fall Kg/tow ALB
2009	160.99	3.85	92.52	2.68
2010	64.18	6.08	36.89	4.23
2011	95.03	2.70	54.61	1.88
2012	147.59	6.62	84.82	4.60

Table 27. NEFSC trawl survey spring and fall survey indices from the FSV Henry B. Bigelow (HBB) and length calibrated, equivalent indices for the FSV Albatross IV (ALB) time series. Spring and fall strata sets include only offshore strata 1-12, 23, 25 and 61-76 for consistency over entire time series. Indices are the sum of the stratified mean numbers (n) at length. The length calibration factors are for the lengths observed in the 2008 calibration experiment and include a constant swept area factor of 0.576. The effective total catch number calibration factors (HBB/ALB ratios) vary by year and season, depending on the characteristics of the HBB length frequency distributions.

Year	Spring (n) HBB	HBB CV	Spring (n) ALB	Effective Factor
2009	11.98	75.1	9.58	1.25
2010	31.82	35.8	27.30	1.17
2011	26.67	76.2	11.31	2.36
2012	58.65	55.1	26.46	2.22

Year	Fall (n) HBB	HBB CV	Fall (n) ALB	Effective Factor
2009	160.99	34.8	50.79	3.17
2010	64.18	35.2	31.18	2.06
2011	95.03	36.3	28.18	3.37
2012	147.59	31.7	71.79	2.06

Table 28. NEFSC trawl survey spring survey indices at age from the FSV Henry B. Bigelow (HBB) and equivalent indices at age for the FSV Albatross IV (ALB) time series. The spring strata set includes offshore strata 1-12, 23, 25, and 61-76. Indices at age are compiled after the application of length calibration factors including a constant swept area factor of 0.576. The effective catch number at age calibration factors (HBB/ALB ratios) vary by year and season, depending on the characteristics of the HBB length frequency distributions.

Spring

2009	0	1	2	3	4	5	6	7+	Total
HBB	0.00	4.56	6.95	0.28	0.13	0.03	0.01	0.02	11.98
ALB	0.00	2.34	6.69	0.33	0.16	0.03	0.01	0.02	9.58
HBB/ALB	0.00	1.95	1.04	0.85	0.81	1.00	1.00	1.00	1.25

2010	0	1	2	3	4	5	6	7+	Total
HBB	0.00	7.96	15.53	3.84	2.42	1.35	0.38	0.35	31.82
ALB	0.00	2.76	15.07	4.57	2.81	1.50	0.33	0.26	27.30
HBB/ALB	0.00	2.88	1.03	0.84	0.86	0.90	1.15	1.35	1.17

2011	0	1	2	3	4	5	6	7+	Total
HBB	0.00	25.41	0.58	0.35	0.25	0.08	0.01	0.00	26.67
ALB	0.00	9.95	0.57	0.41	0.29	0.08	0.01	0.00	11.31
HBB/ALB	0.00	2.55	1.02	0.85	0.86	1.00	1.00	0.00	2.36

2012	0	1	2	3	4	5	6	7+	Total
HBB	0.00	54.98	2.00	0.35	1.06	0.14	0.07	0.05	58.65
ALB	0.00	22.39	2.16	0.42	1.24	0.15	0.06	0.04	26.46
HBB/ALB	0.00	2.46	0.93	0.83	0.85	0.93	1.17	1.25	2.22

Table 29. NEFSC trawl survey fall survey indices at age from the FSV Henry B. Bigelow (HBB) and equivalent indices at age for the FSV Albatross IV (ALB) time series. The fall strata set (aged set) includes offshore strata 1, 5, 9, 61, 65, 69, 73, and inshore strata 1-61, and is different from the fall set used in Tables 20-22. Indices at age are compiled after the application of length calibration factors including a constant swept area factor of 0.576. The effective catch number at age calibration factors (HBB/ALB ratios) vary by year and season, depending on the characteristics of the HBB length frequency distributions.

Fall

2009	0	1	2	3	4	5	6	7+	Total
HBB	197.68	17.64	2.36	0.38	0.15	0.02	0.00	0.00	218.23
ALB	57.08	14.55	2.74	0.45	0.17	0.02	0.00	0.00	75.01
HBB/ALB	3.46	1.21	0.86	0.84	0.88	1.00	0.00	0.00	2.91

2010	0	1	2	3	4	5	6	7+	Total
HBB	64.16	2.09	2.92	2.27	1.99	0.43	0.09	0.01	73.96
ALB	31.06	2.98	5.99	4.63	3.83	0.73	0.13	0.01	49.36
HBB/ALB	2.07	0.70	0.49	0.49	0.52	0.59	0.69	1.00	1.50

2011	0	1	2	3	4	5	6	7+	Total
HBB	127.90	9.41	0.26	0.71	0.49	0.47	0.04	0.03	139.31
ALB	30.70	6.18	0.30	0.84	0.55	0.51	0.04	0.02	39.14
HBB/ALB	4.17	1.52	0.87	0.85	0.89	0.92	1.00	1.50	3.56

2012	0	1	2	3	4	5	6	7+	Total
HBB	127.88	31.56	1.89	0.51	0.82	0.52	0.11	0.03	163.30
ALB	49.75	24.53	2.27	0.59	0.90	0.52	0.09	0.02	78.67
HBB/ALB	1.63	1.29	0.83	0.86	0.91	1.00	1.22	1.50	2.08

Table 30. NEFSC spring trawl survey stratified mean number of scup per tow at age. Strata set includes only offshore strata 1-12, 23, 25, and 61-76. HBB indices length calibrated to ALB equivalents for 2009 and later years.

Spring Year	0	1	2	3	4	5	6	7	8	9	10	11	Total	age 2+	age 3+
1977		6.62	32.08	3.54	0.16	0.04	0.01	0.01					42.46	35.84	3.76
1978		26.90	4.67	6.50	1.31	0.32	0.12	0.03					39.85	12.95	8.28
1979		15.63	4.04	0.88	1.28	0.37	0.06	0.13	0.02	0.01			22.42	6.79	2.75
1980		2.39	5.61	0.57	0.17	0.25	0.15	0.08	0.08	0.01			9.31	6.92	1.31
1981		10.78	2.16	1.15	0.17	0.14	0.05	0.15	0.12				14.72	3.94	1.78
1982		3.80	1.77	1.39	0.38	0.17	0.13	0.07	0.07	0.10			7.88	4.08	2.31
1983		0.70	0.03	0.06				0.01					0.80	0.10	0.07
1984		6.14	1.97	0.22	0.12	0.07							8.52	2.38	0.41
1985		12.11	2.32	0.20	0.04								14.67	2.56	0.24
1986		1.05	10.26	0.43									11.74	10.69	0.43
1987		4.57	3.60	1.81	0.74	0.04	0.02	0.03	0.01				10.82	6.25	2.65
1988		16.74	8.36	0.17	0.03	0.01	0.03	0.07					25.41	8.67	0.31
1989		0.79	0.74	0.09	0.01								1.63	0.84	0.10
1990		0.12	0.30	0.30	0.18	0.09	0.13	0.05					1.17	1.05	0.75
1991		10.61	0.70	1.11	0.19								12.61	2.00	1.30
1992		5.72	0.88	0.07	0.05	0.06	0.01						6.79	1.07	0.19
1993		0.61	2.02	0.17	0.11	0.02							2.93	2.32	0.30
1994		1.34	0.16	0.04									1.54	0.20	0.04
1995		2.29	0.44	0.11	0.05	0.01							2.90	0.61	0.17
1996		0.44	0.05	0.03	0.01								0.53	0.09	0.04
1997		0.17	0.64	0.10									0.91	0.74	0.10
1998		39.90	0.12	0.02									40.04	0.14	0.02
1999		1.03	0.67										1.70	0.67	0.00
2000		5.93	0.71	0.07									6.71	0.78	0.07
2001		7.90	5.03	0.08		0.02							13.03	5.13	0.10
2002		109.01	15.60	26.67	3.27	0.31							154.86	45.85	30.25
2003		5.08	0.79	0.07	0.06								6.01	0.92	0.14
2004		38.69	16.15	1.31	0.82	0.60							57.58	18.89	2.74
2005		18.26	0.81	0.13	0.02								19.22	0.96	0.15
2006		1.56	0.51	0.80	0.35	0.70	1.69	0.10					5.71	4.15	3.64

Table 30 continued.

Spring Year	0	1	2	3	4	5	6	7	8	9	10	11	Total	age 2+	age 3+
2007		9.73	0.41	0.44	0.00	0.01	0.01							10.60	0.87	0.46
2008		0.40	5.82	2.92	0.18	0.09	0.15	0.05	0.07					9.68	9.28	3.46
2009		2.34	6.69	0.33	0.16	0.03	0.01	0.01	0.01					9.58	7.24	0.55
2010		2.77	15.07	4.57	2.81	1.50	0.33	0.08	0.16		0.02			27.30	24.53	9.46
2011		9.95	0.57	0.41	0.29	0.08	0.01			0.004				11.31	1.36	0.79
2012		22.39	2.16	0.42	1.24	0.15	0.06	0.04						26.46	4.07	1.91

Table 31. NEFSC fall trawl survey stratified mean number of scup per tow at age. Strata set includes offshore strata 1-12, 23, 25, 61-76, and inshore strata 1-61. HBB indices length calibrated to ALB equivalents for 2009 and later years.

Fall Year	0	1	2	3	4	5	6	7	8	9	10	11	Total	age 2+	age 3+
1984	47.64	9.20	0.34	0.03	0.01		0.01						59.96	0.39	0.05
1985	61.22	11.53	1.10	0.26	0.06	0.05							74.71	1.47	0.37
1986	70.19	6.58	0.57		0.01								77.36	0.58	0.01
1987	49.93	29.85	0.46	0.01									80.45	0.47	0.01
1988	47.44	15.95	0.67	0.10									64.22	0.77	0.10
1989	176.37	25.92	0.66	0.03									202.99	0.69	0.03
1990	77.45	9.21	0.75	0.04									87.46	0.79	0.04
1991	151.62	12.51	0.07	0.02									164.24	0.09	0.02
1992	25.92	14.51	1.66	0.04	0.02								42.15	1.72	0.06
1993	46.78	9.76	0.32										56.86	0.32	0.00
1994	39.54	3.92	0.04	0.01									43.52	0.05	0.01
1995	33.04	2.61	0.08	0.01									35.74	0.09	0.01
1996	24.42	2.86	0.43	0.01									27.73	0.44	0.01
1997	46.91	0.61	0.02		0.01								47.66	0.03	0.01
1998	57.73	9.64	0.09	0.03	0.01								67.50	0.13	0.04
1999	96.06	9.77	1.37	0.07	0.01								107.28	1.45	0.08
2000	98.72	20.60	3.14	0.48	0.11	0.07							123.12	3.80	0.66
2001	91.84	10.32	1.82	0.12	0.04	0.01							104.15	1.99	0.17
2002	180.09	43.31	0.90	0.35	0.04	0.01							224.70	1.30	0.40
2003	53.70	5.66	2.30	1.33	0.82	0.20	0.02						64.02	4.67	2.37
2004	41.83	33.46	1.14	1.70	0.39	0.12	0.04	0.01					78.69	3.40	2.26
2005	27.26	7.94	1.02	0.14	0.04	0.04							36.43	1.23	0.21

Table 31 continued.

Year	0	1	2	3	4	5	6	7	8	9	10	11	Total	age 2+	age 3+
2006	146.85	20.08	0.92	0.07	0.05	0.01	0.03	0.01					168.02	1.09	0.17
.2007	113.95	40.28	0.60	0.24	0.05	0.03	0.05	0.02					155.22	0.99	0.39
2008	70.43	65.48	0.52	0.06	0.01								136.50	0.59	0.07
2009	57.08	14.55	2.74	0.45	0.17	0.02							75.01	3.38	0.64
2010	31.06	2.98	5.99	4.63	3.83	0.73	0.13		0.01				49.36	15.32	12.33
2011	30.70	6.18	0.30	0.84	0.55	0.51	0.04	0.01	0.01				39.14	2.26	1.96
2012	49.75	24.53	2.27	0.59	0.90	0.52	0.09	0.02					78.67	4.39	2.12

The "Age" header spans columns 0 through 11.

Table 32. NEFSC 1992-2007 Winter trawl survey indices of abundance for scup, offshore survey strata 1-12 and 61-76. The winter survey ended in 2007.

Year	Mean number per tow	Mean kg per tow
1992	65.56	2.87
1993	25.71	2.73
1994	17.09	0.66
1995	69.50	2.26
1996	18.28	1.19
1997	13.90	0.32
1998	46.92	1.20
1999	15.04	0.71
2000	24.21	1.33
2001	55.49	1.58
2002	267.83	7.56
2003	24.16	0.49
2004	380.59	3.82
2005	84.74	1.96
2006	201.96	3.72
2007	101.08	2.95

Table 33. NEFSC 1992-2007 winter trawl survey stratified mean number of scup per tow at age, offshore survey strata 1-12 and 61-76. The 1992, 1993, and 1996 lengths are aged with the corresponding annual spring survey age-length key. The winter survey ended in 2007.

Winter Year	0	1	2	3	4	5	6	7	8	Total	age 2+	age 3+
1992		57.61	4.75	0.19	0.09	0.10	0.45			63.18	5.57	0.82
1993		2.51	22.05	0.56	0.57	0.02				25.71	23.19	1.15
1994		16.31	0.73	0.02	0.02	0.01				17.09	0.78	0.05
1995		64.94	1.87	0.15	0.01	0.01	0.02	0.01		67.01	2.07	0.20
1996		12.95	5.31	0.03	0.01					18.29	5.34	0.04
1997		13.27	0.52	0.11						13.90	0.64	0.11
1998		45.62	0.75	0.22	0.21	0.08	0.03	0.01		46.92	1.30	0.55
1999		12.48	2.41	0.12	0.02	0.01				15.04	2.56	0.15
2000		20.28	3.21	0.68	0.03			0.01		24.21	3.93	0.72
2001		48.54	6.48	0.36	0.09	0.02				55.49	6.95	0.47
2002		257.08	7.44	2.96	0.33	0.01	0.01			267.83	10.75	3.31
2003		23.77	0.28	0.07	0.03		0.02			24.16	0.39	0.11
2004		380.22	0.29	0.07	0.01					380.59	0.37	0.08
2005		80.03	4.62	0.09						84.74	4.71	0.09
2006		198.52	2.64	0.66	0.03	0.04	0.07			201.96	3.44	0.80
2007		99.18	1.86	0.02	0.02					101.08	1.90	0.04

Table 34. NEFSC trawl survey winter, spring and fall survey maximum-length restricted biomass indices from the FSV Albatross IV (ALB) and length calibrated, ALB equivalent indices from the FSV Henry B. Bigelow (HBB) for the spring and fall time series. Spring and fall strata sets include only offshore strata 1-12, 23, 25 and 61-76 for consistency over entire time series. These are the aggregate biomass indices for approximate ages 0-2.

Year	Winter	Winter CV	Spring	Spring CV	Fall	Fall CV
1963					0.03	64.2
1964					2.19	86.7
1965					0.39	65.7
1966					0.05	49.0
1967					1.43	72.0
1968			1.58	81.7	0.55	46.4
1969			0.16	96.6	4.18	66.0
1970			2.78	71.4	0.30	66.5
1971			3.03	82.6	0.29	37.1
1972			2.12	57.3	2.47	41.4
1973			0.18	42.5	0.93	38.3
1974			1.52	54.4	0.77	34.4
1975			1.27	70.7	2.69	23.1
1976			0.24	35.0	7.43	50.1
1977			5.03	92.4	1.52	21.9
1978			1.92	80.0	0.73	23.0
1979			1.07	63.2	0.57	26.3
1980			0.84	82.1	0.90	50.2
1981			0.74	36.4	3.21	37.6
1982			0.37	41.3	1.04	50.7
1983			0.02	46.2	0.34	37.6
1984			0.56	70.2	1.35	62.0
1985			0.81	90.9	3.66	26.3
1986			1.42	58.9	1.86	60.9
1987			0.73	74.2	0.15	56.1
1988			1.48	68.6	0.10	69.8
1989			0.12	77.7	3.99	48.1
1990			0.06	38.0	0.97	40.5
1991			0.50	21.5	0.50	47.1
1992	2.86	45.2	0.35	37.7	1.16	39.2
1993	2.99	86.1	0.26	78.7	0.05	95.8
1994	0.67	8.6	0.08	83.6	0.09	68.3
1995	2.99	68.7	0.16	37.1	1.10	59.0
1996	1.22	62.3	0.03	62.5	0.26	57.0
1997	0.43	63.4	0.09	41.4	1.02	98.1
1998	1.48	45.2	1.31	22.9	0.90	36.1
1999	0.69	46.9	0.14	69.4	2.52	35.9

Table 34 continued.

Year	Winter	Winter CV	Spring	Spring CV	Fall	Fall CV
2000	1.64	55.1	0.41	45.6	5.01	56.0
2001	2.15	41.9	0.98	57.9	1.16	45.1
2002	10.78	54.1	7.53	68.0	4.65	40.7
2003	0.75	69.0	0.30	39.5	0.64	63.8
2004	6.42	83.9	3.13	65.1	0.17	45.6
2005	2.93	41.9	0.81	57.3	0.07	76.0
2006	6.36	39.7	0.18	63.7	2.68	38.1
2007	3.46	57.4	0.37	65.6	2.40	56.3
2008			1.02	90.7	1.74	67.5
2009			1.05	90.1	2.32	28.7
2010			2.32	46.4	2.42	36.1
2011			0.49	69.6	0.48	30.1
2012			1.27	45.4	4.64	48.7

Table 35. MADMF trawl survey mean number of scup per tow and mean weight (kg) per tow for spring (survey regions 1-3) and fall (survey regions 1-5).

	Spring		Fall	
Year	No./Tow	Kg/tow	No./Tow	Kg/Tow
1978	90.08	31.71	1859.40	14.82
1979	76.14	18.05	1150.16	12.20
1980	189.82	41.39	1183.02	12.53
1981	298.53	17.63	971.87	14.34
1982	10.46	0.98	2153.76	9.17
1983	25.29	3.51	1623.13	12.90
1984	17.90	6.53	963.49	12.29
1985	67.02	3.40	647.63	12.09
1986	44.17	7.35	773.61	9.15
1987	6.05	1.37	561.61	7.72
1988	13.98	2.09	1396.86	14.15
1989	13.32	2.02	580.73	7.77
1990	144.06	21.45	1128.07	7.21
1991	28.73	6.05	1150.71	10.18
1992	14.49	2.52	2440.96	11.54
1993	19.13	4.23	1023.11	10.06
1994	9.71	2.85	820.31	9.84
1995	49.29	2.76	507.02	4.11
1996	5.18	0.68	1019.96	9.15
1997	3.22	0.71	921.21	7.25
1998	1.37	0.21	709.61	6.94
1999	11.61	1.93	1212.23	18.07
2000	307.00	18.02	867.00	11.63
2001	7.28	2.37	1205.60	9.89
2002	281.36	18.77	1137.64	8.32
2003	0.22	0.07	3209.61	14.87
2004	41.71	13.04	1483.56	10.07
2005	9.32	3.25	4005.89	21.53
2006	92.97	22.41	1231.49	9.46
2007	13.30	2.03	1774.23	11.65
2008	145.72	27.89	743.19	10.78
2009	82.72	16.02	1087.38	14.10
2010	72.22	12.66	1424.47	14.92
2011	8.65	2.42	1378.56	16.55
2012	556.30	38.46	639.70	11.02

Table 36. RIDFW trawl survey mean number of scup per tow and mean weight (kg) per tow for spring and fall.

| | Spring | | Fall | |
Year	No./Tow	Kg/tow	No./Tow	Kg/Tow
1981	12.49	0.40	196.22	2.54
1982	0.43	0.04	63.87	0.70
1983	3.59	0.32	173.63	2.75
1984	13.24	0.88	589.68	10.57
1985	8.30	0.41	74.27	1.51
1986	1.78	0.33	340.06	4.20
1987	0.04	0.01	314.20	4.73
1988	0.23	0.04	804.00	7.10
1989	0.17	0.04	326.86	6.62
1990	0.64	0.15	527.31	5.66
1991	2.93	0.57	655.69	16.62
1992	1.88	0.61	1105.51	9.10
1993	1.12	0.06	1246.35	8.90
1994	2.08	0.53	236.12	3.66
1995	4.33	0.53	423.02	5.03
1996	0.52	0.07	184.73	3.83
1997	1.93	0.15	597.90	6.04
1998	0.15	0.03	150.38	1.89
1999	0.38	0.07	832.22	12.39
2000	84.05	3.54	588.73	9.11
2001	29.68	5.08	1139.17	11.07
2002	174.80	10.28	716.12	9.27
2003	0.00	0.00	1181.83	11.38
2004	2.59	0.45	1616.24	9.58
2005	2.95	1.63	2216.72	21.35
2006	53.12	3.90	765.90	11.26
2007	1.95	0.24	2410.00	23.76
2008	0.19	0.04	705.10	18.15
2009	1.14	0.39	1705.33	24.99
2010	2.14	0.56	760.14	17.39
2011	3.95	1.66	1167.58	30.60
2012	212.70	3.13	2312.70	39.77

Table 37. RIDFW industry cooperative ventless trap survey: mean number of scup per trap per soak time.

Age/Year	0	1	2	3	4	5	6	7	8+	Total
2005	0.014	0.306	0.904	0.980	0.352	0.391	0.071	0.026	0.003	3.047
2006	0.031	0.472	1.337	0.803	0.263	0.214	0.189	0.125	0.046	3.481
2007	0.041	0.661	1.397	2.204	0.385	0.199	0.628	0.170	0.051	5.735
2008	0.005	0.794	1.664	2.875	0.824	0.352	0.202	0.039	0.068	6.823
2009	0.028	1.557	2.313	3.840	1.150	0.578	0.436	0.068	0.051	10.021
2010	0.112	0.699	4.311	3.897	1.985	0.481	0.408	0.134	0.002	12.029
2011	0.018	0.413	1.551	2.080	1.421	0.710	0.164	0.092	0.010	6.458
2012	0.098	1.930	2.189	0.801	1.528	0.609	0.247	0.075	0.032	7.509

Table 38. CTDEP spring trawl survey mean number of scup per tow at age, total mean number per tow, and total mean weight (kg) per tow.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total No./Tow	Total Kg/Tow	Age 2+
1984	0.49	1.31	0.59	0.30	0.08	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	2.80	0.64	2.31
1985	2.94	2.00	0.33	0.24	0.05	0.02	0.05	0.00	0.00	0.01	0.00	0.00	0.00	0.00	5.61	1.22	2.71
1986	4.44	1.65	0.99	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	0.78	2.79
1987	0.43	1.65	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.37	1.76
1988	1.18	0.30	0.51	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	0.32	0.88
1989	5.63	0.56	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.77	0.63	0.62
1990	2.56	2.06	0.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	0.61	2.30
1991	4.25	1.44	1.26	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.09	0.94	2.80
1992	0.39	1.21	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75	0.48	1.36
1993	0.04	2.29	0.19	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	0.49	2.49
1994	0.81	2.03	0.93	0.10	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88	0.58	3.09
1995	12.94	0.39	0.20	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.24	0.65	0.64
1996	5.20	2.48	0.07	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.25	0.73	2.56
1997	3.16	2.61	1.68	0.06	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.23	0.75	4.39
1998	10.07	0.58	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.25	0.75	0.76
1999	2.71	1.75	0.16	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.22	0.56	2.02
2000	124.5	17.18	4.24	0.20	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.46	4.56	21.71
2001	1.65	18.99	1.57	0.25	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.20	2.85	20.84
2002	49.15	66.61	123.2	17.44	1.29	0.10	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	257.91	13.16	208.76
2003	0.14	4.05	3.28	4.96	0.61	0.07	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	13.12	2.28	12.98
2004	0.01	3.97	8.96	4.90	8.21	0.76	0.08	0.02	0.01	0.00	0.00	0.00	0.00	0.00	26.92	3.93	26.90
2005	1.16	1.28	1.06	1.51	1.27	1.94	0.22	0.05	0.00	0.00	0.00	0.00	0.00	0.00	8.49	1.65	7.33
2006	18.48	23.72	5.63	2.07	2.56	3.16	2.90	0.53	0.01	0.00	0.00	0.00	0.00	0.00	59.06	10.41	40.58
2007	7.51	15.86	5.84	1.49	0.55	0.54	0.54	0.39	0.07	0.01	0.00	0.00	0.00	0.00	32.80	3.32	25.29
2008	16.96	40.62	27.82	4.94	0.91	0.16	0.30	0.24	0.15	0.02	0.00	0.00	0.00	0.00	92.10	5.88	75.14
2009	31.61	28.23	28.41	12.49	2.50	0.61	0.21	0.13	0.25	0.00	0.00	0.00	0.00	0.00	104.45	6.40	72.84
2010	0.42	24.27	22.00	14.00	6.02	1.19	0.12	0.06	0.04	0.01	0.02	0.00	0.00	0.00	68.17	3.14	67.75
2011	2.13	3.29	11.39	9.83	4.12	3.38	1.41	0.24	0.07	0.10	0.08	0.06	0.01	0.00	36.29	9.55	34.17
2012	49.04	25.93	11.98	9.23	9.57	4.67	2.76	0.87	0.14	0.13	0.08	0.02	0.00	0.00	114.54	9.99	65.50

Table 39. CTDEP fall trawl survey mean number of scup per tow at age, total mean number per tow, and total mean weight (kg) per tow. No survey in 2010.

						Age						Total	Total	Age
Year	0	1	2	3	4	5	6	7	8	9	10+	No/Tow	Kg/Tow	2+
1984	7.99	1.04	0.78	0.52	0.28	0.09	0.02	0.00	0.00	0.00	0.00	10.72	1.36	1.69
1985	25.01	4.71	0.40	0.59	0.19	0.04	0.03	0.00	0.00	0.00	0.00	30.97	2.50	1.25
1986	13.06	9.98	2.50	0.19	0.01	0.01	0.01	0.00	0.00	0.00	0.00	25.76	2.95	2.72
1987	12.47	4.17	1.25	0.58	0.06	0.01	0.01	0.00	0.00	0.00	0.00	18.55	1.79	1.91
1988	31.89	5.71	1.82	0.24	0.03	0.00	0.00	0.00	0.00	0.00	0.00	39.69	2.27	2.09
1989	40.88	22.60	1.51	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	65.08	3.65	1.60
1990	54.34	7.74	6.95	0.40	0.03	0.01	0.01	0.00	0.00	0.01	0.00	69.49	5.00	7.41
1991	291.5	17.03	1.76	1.04	0.15	0.01	0.00	0.00	0.00	0.00	0.00	311.57	8.30	2.96
1992	50.91	26.58	5.54	0.40	0.29	0.01	0.01	0.00	0.00	0.00	0.00	83.74	4.96	6.25
1993	74.06	1.83	1.02	0.12	0.01	0.01	0.00	0.00	0.00	0.00	0.00	77.05	3.72	1.16
1994	90.76	1.12	0.46	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	92.53	3.33	0.65
1995	32.46	26.52	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.13	4.63	0.15
1996	51.50	8.56	1.37	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	61.47	3.68	1.41
1997	31.79	8.68	0.63	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.00	41.28	2.49	0.81
1998	90.40	12.24	0.54	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	103.27	4.50	0.63
1999	498.1	30.93	8.35	0.19	0.02	0.01	0.00	0.00	0.00	0.00	0.00	537.68	22.72	8.57
2000	250.3	261.4	8.32	0.79	0.14	0.01	0.00	0.00	0.00	0.00	0.00	521.10	30.76	9.26
2001	140.5	16.90	18.42	1.61	0.19	0.03	0.00	0.00	0.00	0.00	0.00	177.66	11.28	20.25
2002	259.9	47.62	23.32	16.81	0.67	0.33	0.05	0.00	0.01	0.00	0.00	348.70	23.69	41.18
2003	52.91	15.35	32.07	22.39	26.44	2.49	0.54	0.02	0.02	0.00	0.00	152.23	28.95	83.96
2004	251.0	4.13	8.34	15.08	5.98	6.25	0.53	0.07	0.01	0.02	0.00	291.46	16.31	36.28
2005	373.3	32.56	8.14	2.44	4.01	1.50	1.69	0.33	0.06	0.00	0.00	424.05	13.79	18.17
2006	52.16	51.02	9.52	2.34	0.26	0.35	0.38	0.68	0.04	0.00	0.00	116.75	10.49	13.57
2007	319.8	118.0	29.34	5.93	0.90	0.23	0.30	0.31	0.31	0.03	0.00	475.30	24.42	37.35
2008	243.6	35.10	11.92	7.04	3.56	1.05	0.50	0.14	0.12	0.14	0.00	303.26	16.53	24.48
2009	67.49	40.39	20.79	6.93	2.61	0.74	0.21	0.13	0.07	0.02	0.00	139.38	13.73	31.51
2010												n/a	n/a	
2011	119.0	38.41	8.16	14.89	9.67	3.92	3.23	0.59	0.17	0.03	0.26	198.34	20.28	40.91
2012	153.2	54.31	9.96	2.85	2.06	0.57	0.14	0.32	0.08	0.01	0.00	223.52	13.54	15.97

Table 40. NYDEC small mesh trawl survey indices at ages 0, 1 and 2 and older (2+); NJBMF trawl survey mean number of scup per tow and mean weight (kg) per tow; VIMS age 0 index.

| | NYDEC Trawl | | | NJBMF Trawl | | VIMS |
Year	Age 0	Age 1	Age 2+	No/tow	Kg/tow	Age 0
1987	0.33	3.43	0.09			2.07
1988	1.19	1.96	0.05			3.06
1989	0.67	11.02	0.04	72.75	2.75	4.81
1990	5.32	1.30	0.14	74.72	3.77	1.90
1991	13.17	2.31	0.22	200.61	6.17	0.65
1992	15.25	1.54	0.06	227.70	7.16	3.30
1993	0.29	0.72	0.04	256.91	5.21	0.90
1994	6.11	0.36	0.06	86.45	3.30	0.39
1995	0.61	7.49	0.03	27.13	2.08	0.54
1996	0.42	0.94	0.15	30.81	1.04	0.21
1997	20.23	0.74	0.20	52.09	3.82	0.50
1998	73.22	1.46	0.05	220.05	4.88	0.27
1999	35.85	2.25	0.03	209.10	10.30	0.13
2000	186.07	16.73	1.02	262.66	6.56	1.34
2001	83.01	2.99	1.22	163.37	4.32	0.24
2002	346.32	5.47	6.01	568.07	25.65	0.96
2003	266.56	0.38	1.35	804.08	10.19	0.46
2004	40.82	0.92	0.70	449.12	11.70	1.11
2005	n/a	n/a	n/a	147.98	4.19	1.58
2006	n/a	n/a	n/a	943.63	16.52	2.99
2007	109.47	4.18	0.61	1185.54	38.27	0.20
2008	n/a	n/a	n/a	141.17	3.19	2.97
2009	79.10	4.76	0.73	205.66	6.04	4.11
2010	7.83	2.17	3.86	141.11	2.21	0.82
2011	56.77	3.54	2.25	101.74	5.13	0.22
2012	157.05	16.3	2.36	131.73	5.83	

Table 41. University of Rhode Island Graduate School of Oceanography (URIGSO) trawl survey indices for scup (number per tow) Fox Island station.

Year	Fox Is	Year	Fox Is
1959	87.713	2000	279.488
1960	21.772	2001	108.717
1961	21.325	2002	109.125
1962	7.754	2003	51.953
1963	51.982	2004	58.358
1964	55.408	2005	141.163
1965	35.817	2006	187.940
1966	16.394	2007	257.338
1967	106.604	2008	298.097
1968	30.292	2009	330.836
1969	19.068	2010	227.854
1970	17.371	2011	274.779
1971	76.188	2012	294.500
1972	37.683		
1973	109.514		
1974	55.249		
1975	166.406		
1976	408.007		
1977	287.300		
1978	148.249		
1979	139.350		
1980	80.211		
1981	122.392		
1982	56.950		
1983	189.271		
1984	160.896		
1985	187.582		
1986	158.563		
1987	106.625		
1988	99.863		
1989	358.521		
1990	131.329		
1991	256.358		
1992	80.353		
1993	261.838		
1994	55.640		
1995	90.829		
1996	83.663		
1997	62.096		
1998	56.208		
1999	268.650		

Table 42. VIMS ChesMMAP trawl survey indices for scup. Indices are delta-lognormal model stratified geometric mean numbers (N) and biomass per tow. Aggregate indices are delta-lognormal model geometric means per tow. Aged indices are in numbers, are compiled independently, and are aged using a smoothed age-length key, and so do not total to the aggregate numeric indices.

Year	Number (CV %)	Biomass (CV %)
2002	3.47 (22)	0.90 (24)
2003	4.58 (20)	1.20 (21)
2004	13.11 (14)	2.34 (15)
2005	13.03 (18)	1.91 (18)
2006	11.09 (16)	2.15 (21)
2007	20.74 (16)	2.51 (19)
2008	1.31 (30)	0.44 (33)
2009	10.99 (17)	1.90 (19)
2010	27.84 (14)	4.06 (16)
2011	2.28 (26)	0.56 (28)
2012	0.50 (60)	0.20 (38)

Year	0	1	2+	Total
2002	2.14	2.14	0.62	4.90
2003	3.13	3.63	1.09	7.85
2004	5.02	8.45	1.98	15.45
2005	9.04	8.53	1.78	19.35
2006	8.52	4.94	0.90	14.36
2007	13.62	4.72	1.01	19.35
2008	0.91	0.95	0.28	2.14
2009	9.27	4.00	0.59	13.86
2010	21.34	9.32	1.51	32.17
2011	1.97	1.07	0.19	3.23
2012	0.00	0.50	0.00	0.50

Table 43. VIMS NEAMAP trawl survey indices for scup. Indices are delta-lognormal model stratified geometric mean numbers (N) and biomass per tow. Fall aged indices are in numbers, are compiled independently, and are aged using a smoothed age-length key, and so do not total to the Fall aggregate numeric indices.

Season	Number/tow (CV %)	Kilogram/tow (CV %)
Fall 2007	117.20 (4.0)	7.49 (5.6)
Fall 2008	24.82 (5.1)	3.16 (6.6)
Fall 2009	39.11 (4.4)	3.82 (5.6)
Fall 2010	28.50 (4.9)	3.15 (7.5)
Fall 2011	12.85 (6.1)	2.21 (8.0)
Fall 2012	16.12 (16.1)	2.27 (12.0)
Spring 2008	32.54 (3.9)	2.36 (6.4)
Spring 2009	8.28 (6.3)	1.49 (10.8)
Spring 2010	2.27 (7.2)	0.79 (10.7)
Spring 2011	2.45 (7.8)	0.62 (14.6)
Spring 2012	20.42 (17.7)	1.67 (14.1)
Spring 2013	5.31 (11.4)	1.19 (12.4)

Table 44. VIMS NEAMAP trawl survey indices at age for scup. Aged indices are in numbers, are compiled independently, and are aged using a smoothed age-length key, and so do not total to the aggregate numeric indices.

	Spring			
Year	0	1	2+	Total
2008	0	17.41	8.42	25.83
2009	0	4.26	4.63	8.89
2010	0	0.76	1.61	2.37
2011	0	0.83	1.56	2.39
2012	0	15.60	6.68	22.28
2013	0	2.17	3.20	5.37

	Fall			
Year	0	1	2+	Total
2007	60.15	45.92	6.86	112.93
2008	13.12	13.22	3.84	30.18
2009	26.98	16.63	3.55	47.16
2010	17.49	11.72	3.16	32.37
2011	6.88	7.24	2.53	16.65
2012	9.04	8.07	2.54	19.65

Table 45. Correlation coefficients of the rumble strip indicator scores (0/1) of scup (*Stenotomus chrysops*).

	spring kg/tow	fall kg/tow	spring rel F	fall rel F	spring mn len	fall mn len
spring kg/tow	1.000					
fall kg/tow	0.133	1.000				
spring rel F	0.348	-0.197	1.000			
fall rel F	-0.040	0.798	-0.144	1.000		
spring mn len	-0.301	-0.179	0.000	-0.092	1.000	
fall mn len	-0.078	0.595	-0.258	0.547	0.014	1.000

FIGURES
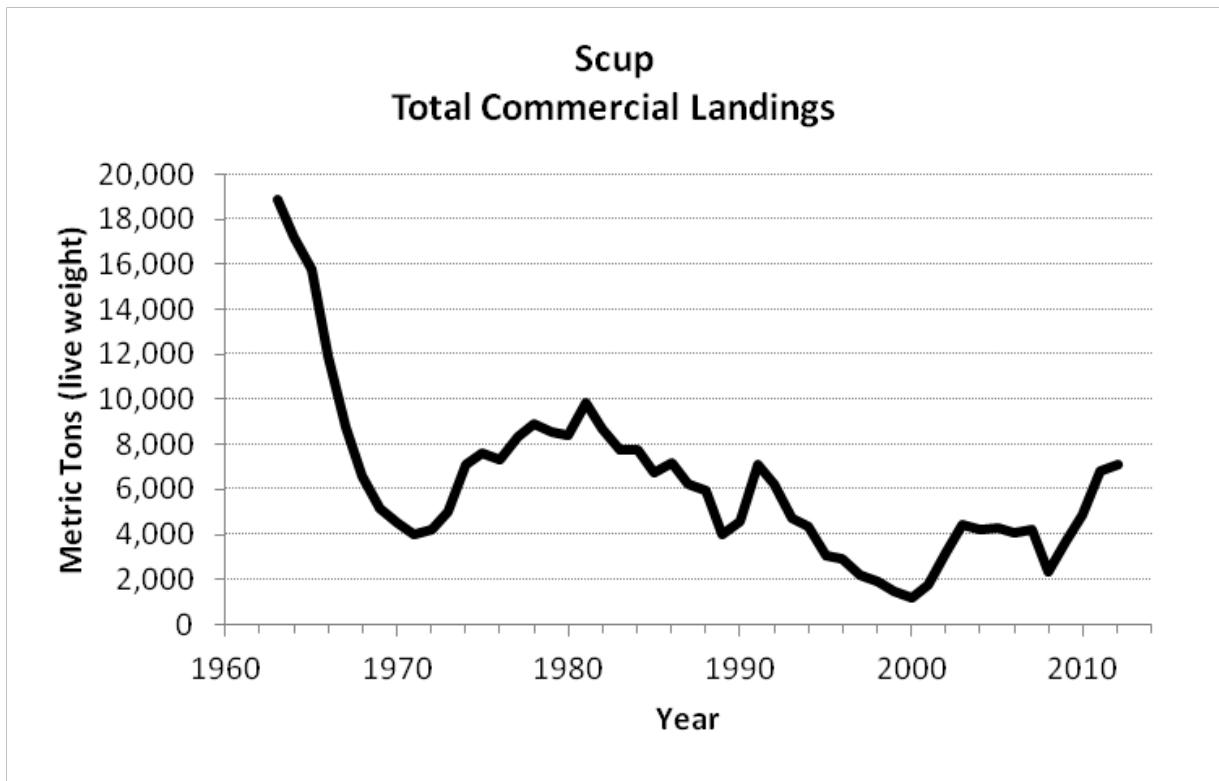
Figure 1. Total commercial fishery landings for scup (*Stenotomus chrysops*).
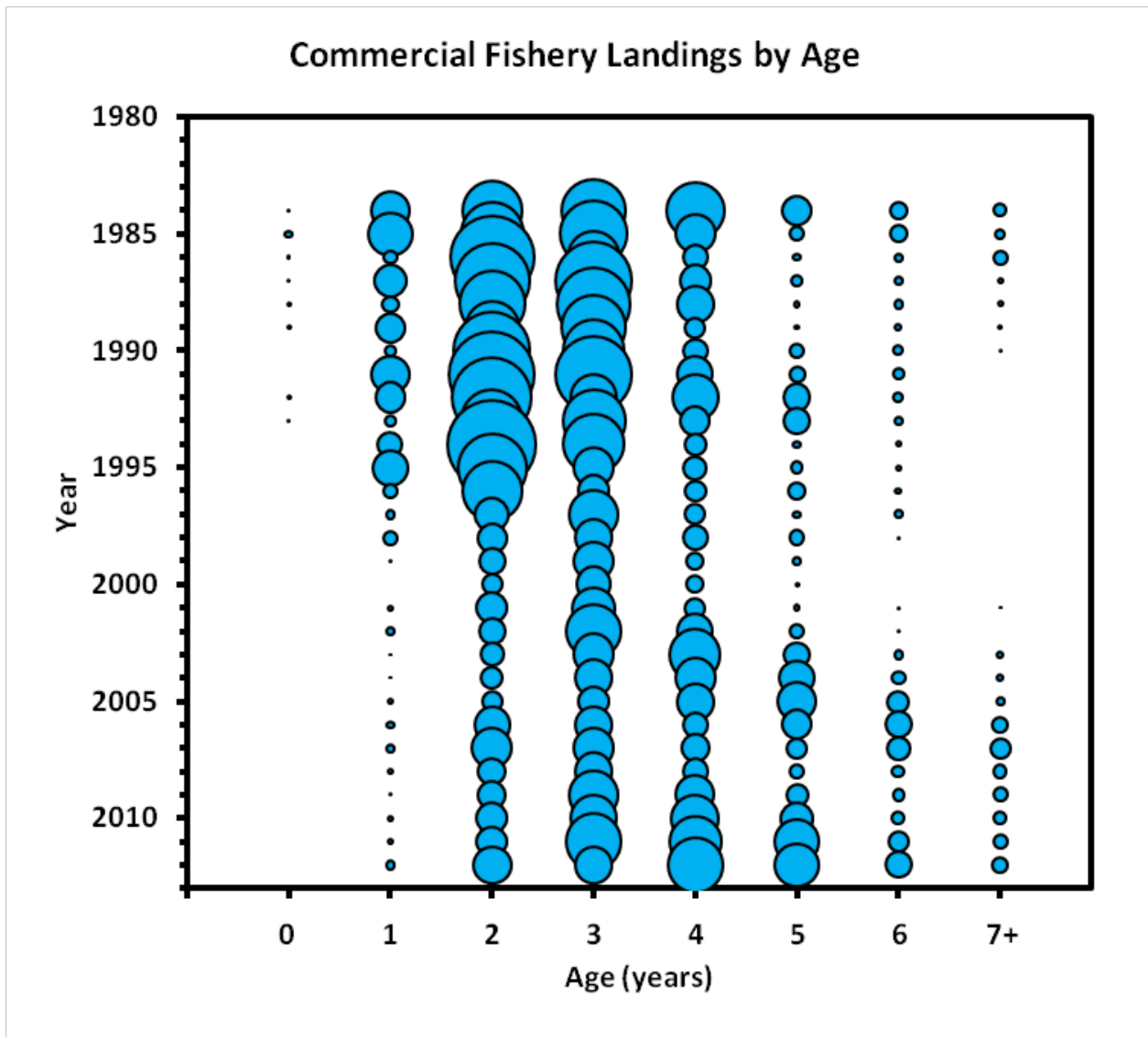
Figure 2. Commercial fishery landings by age for scup (*Stenotomus chrysops*).
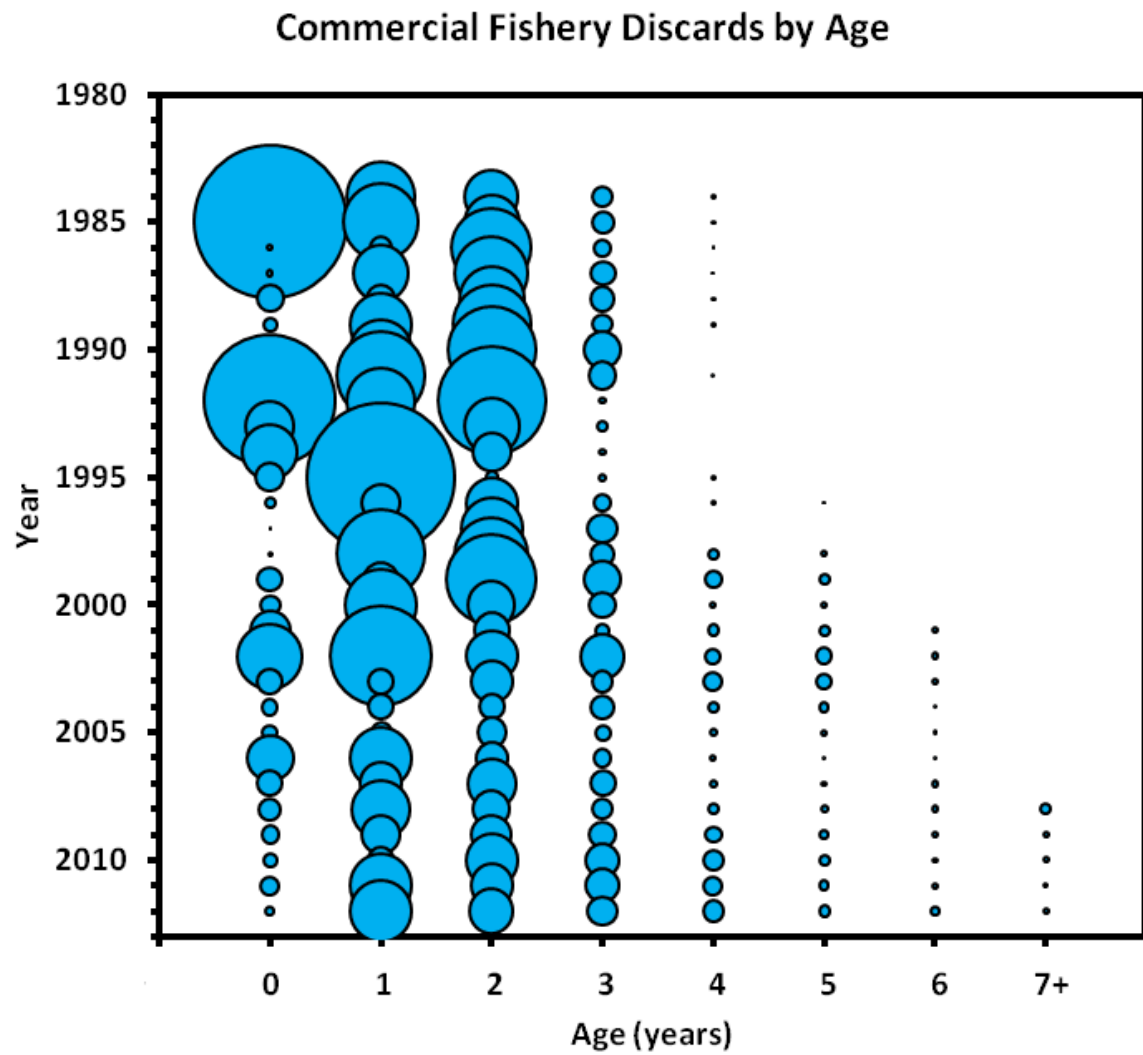
Figure 3. Commercial fishery discards by age for scup (*Stenotomus chrysops*).
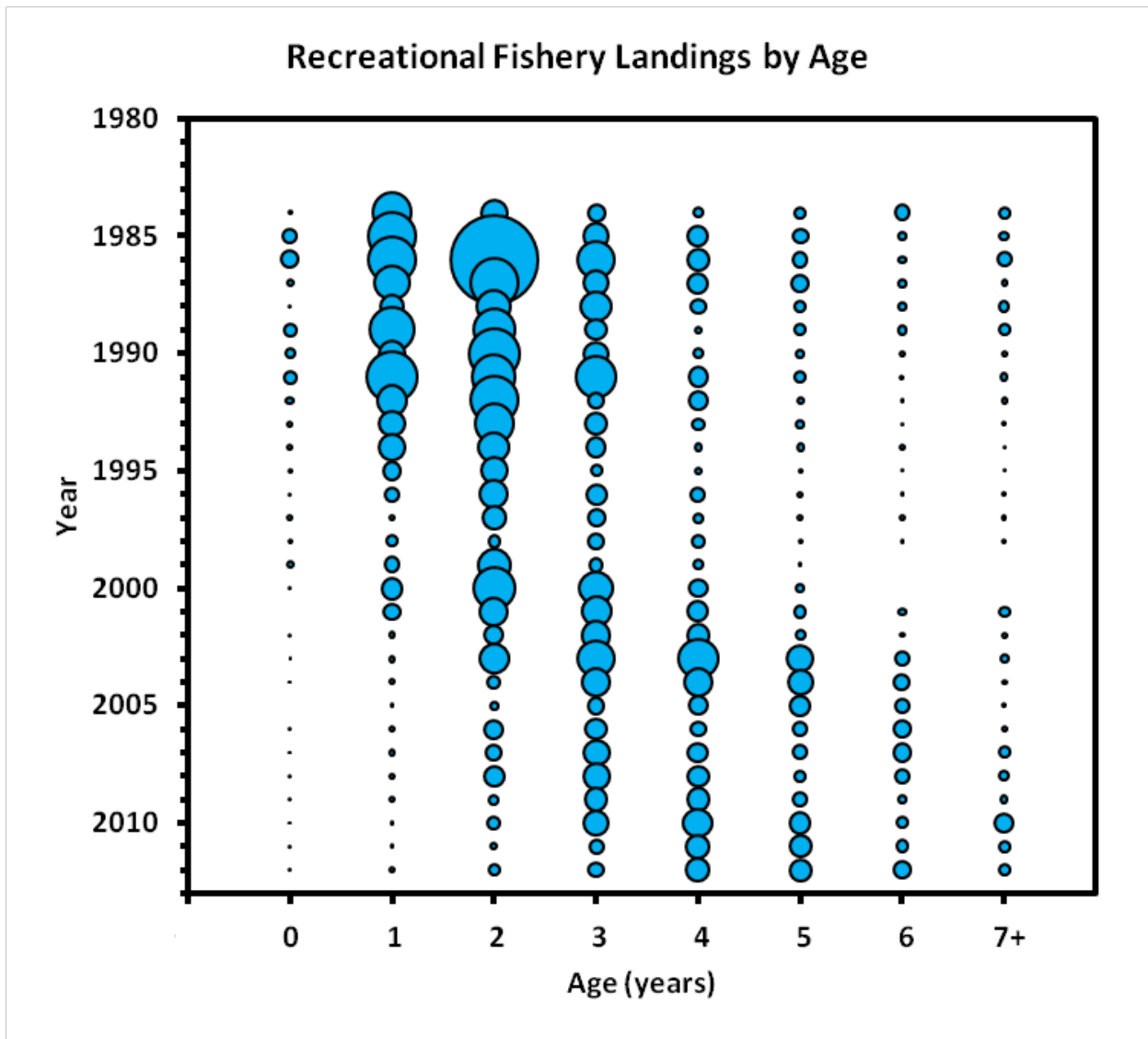
Figure 4. Recreational fishery landings by age for scup (*Stenotomus chrysops*).
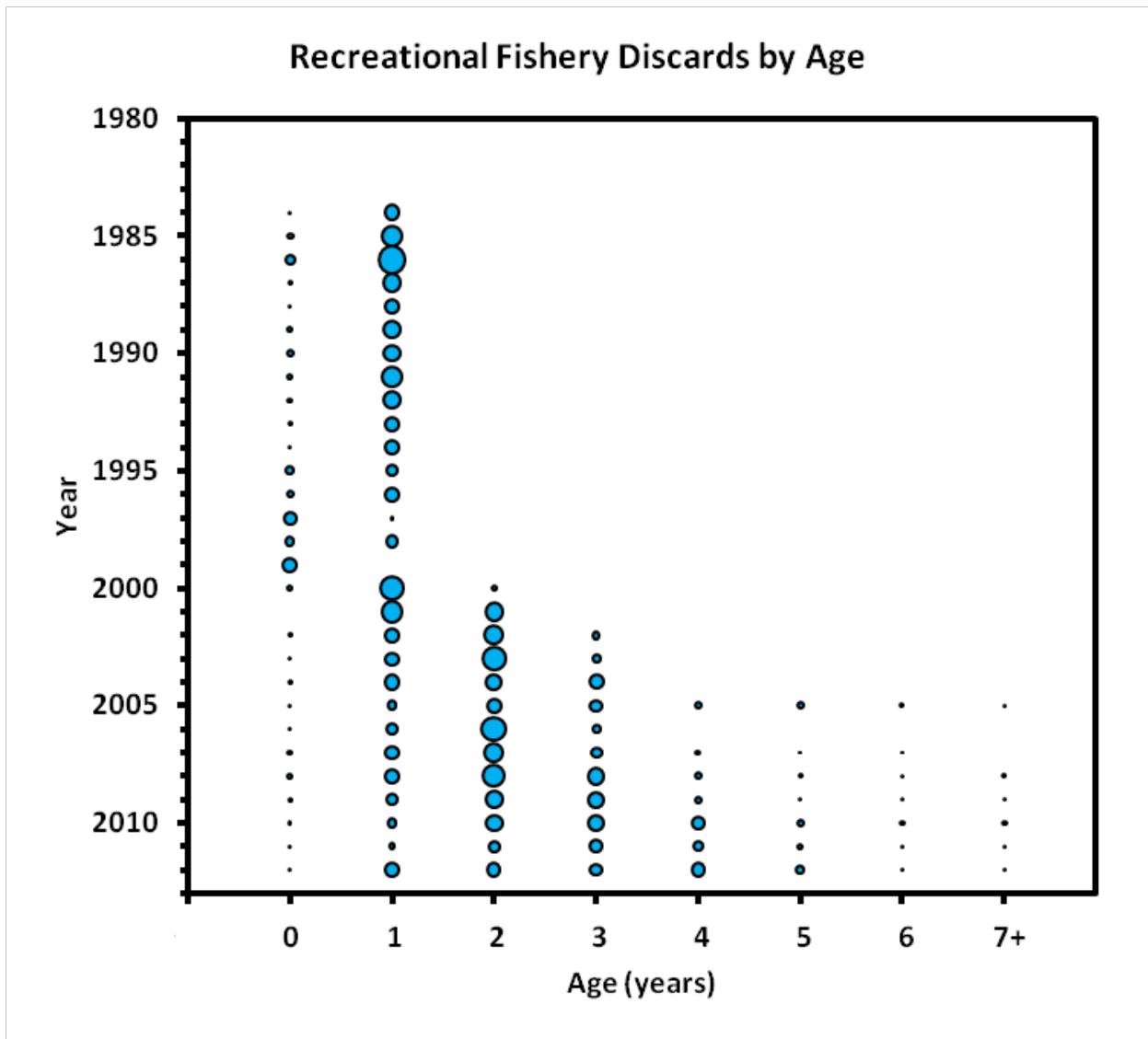
Figure 5. Recreational fishery discards by age for scup (*Stenotomus chrysops*).
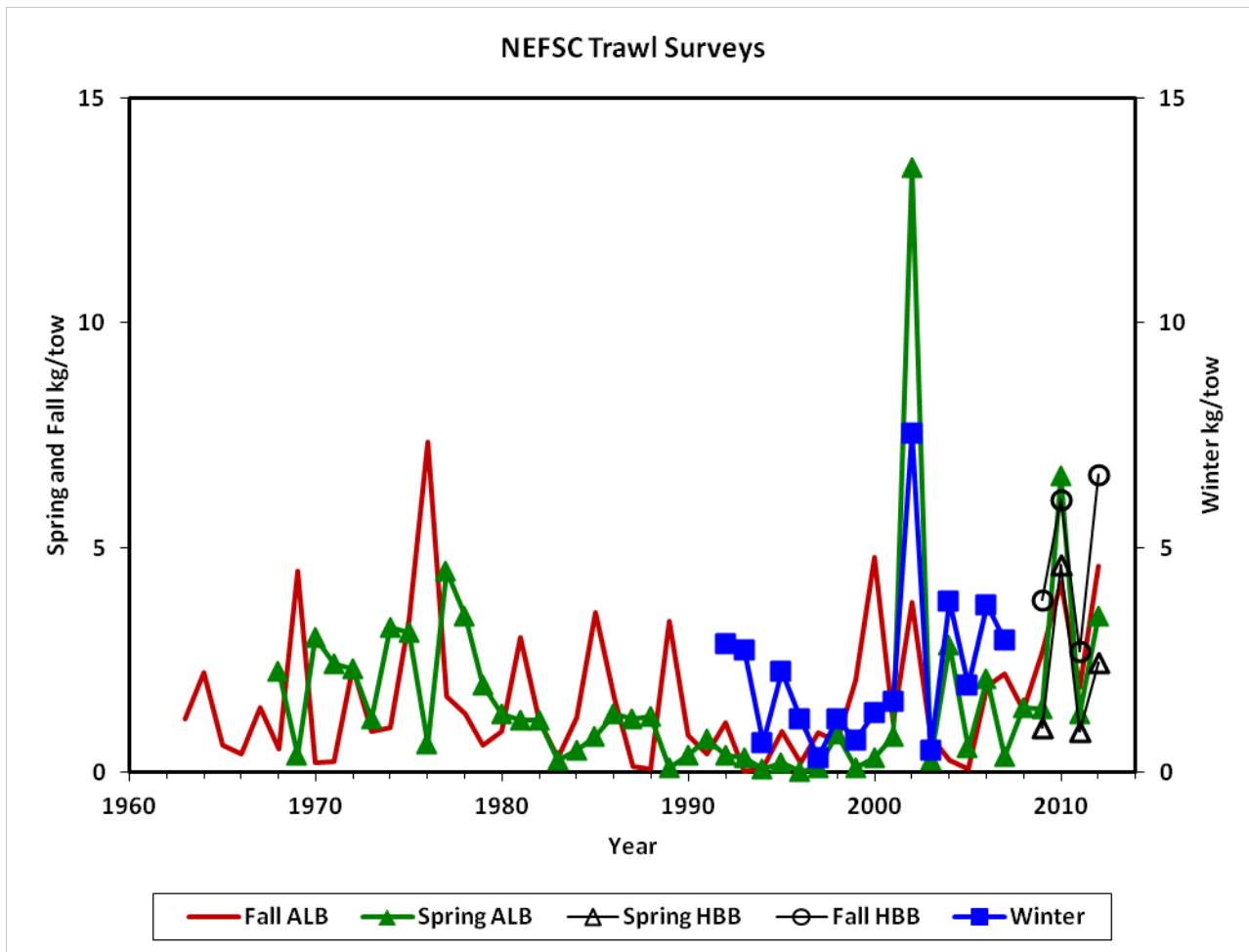
Figure 6. Northeast Fisheries Science Center winter, spring, and fall biomass indices for scup (*Stenotomus chrysops*), including FSV *Henry B. Bigelow* (HBB) and FSV *Albatross IV* (ALB) equivalents.
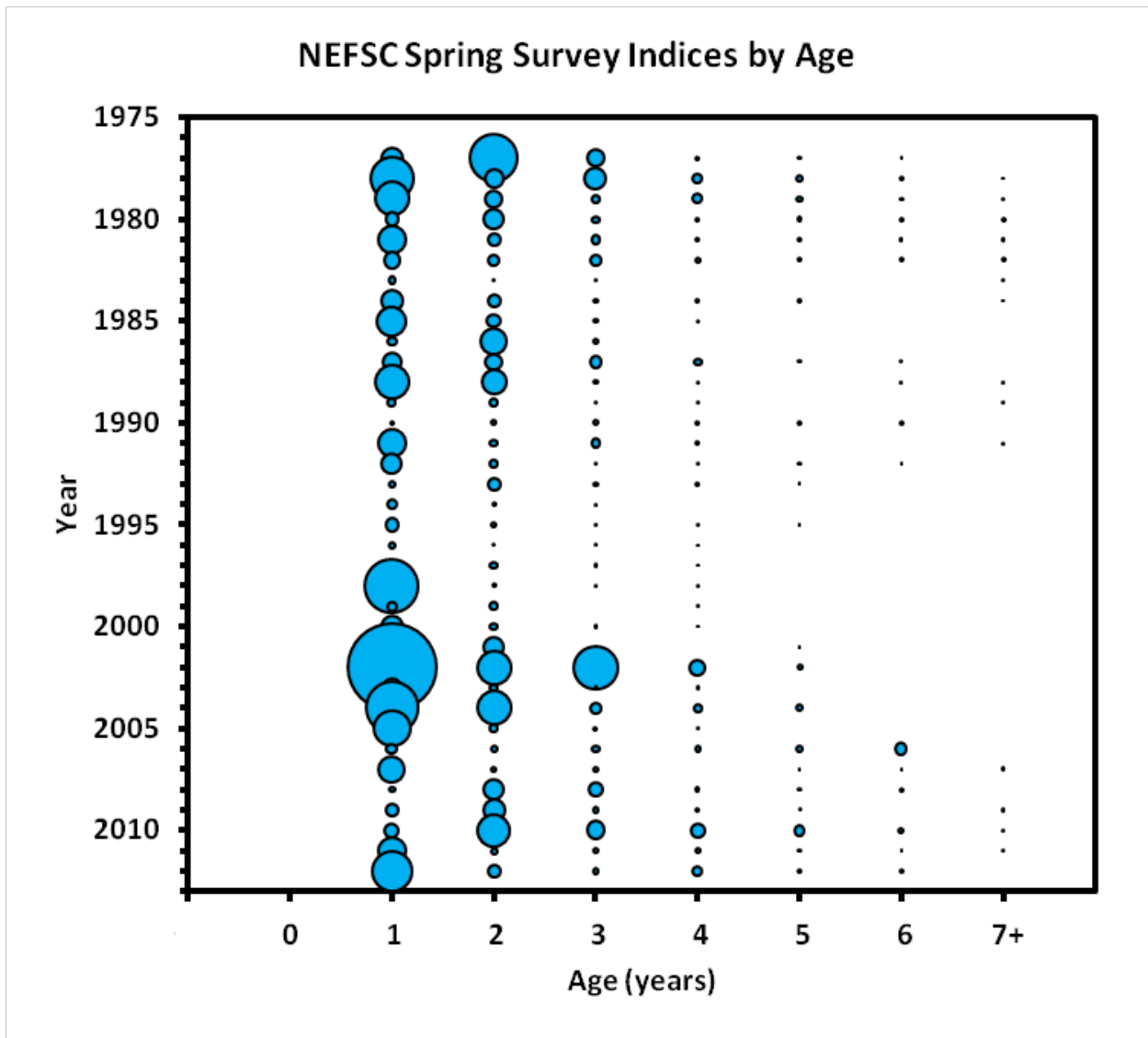
Figure 7. Northeast Fisheries Science Center spring survey indices by age for scup (*Stenotomus chrysops*).
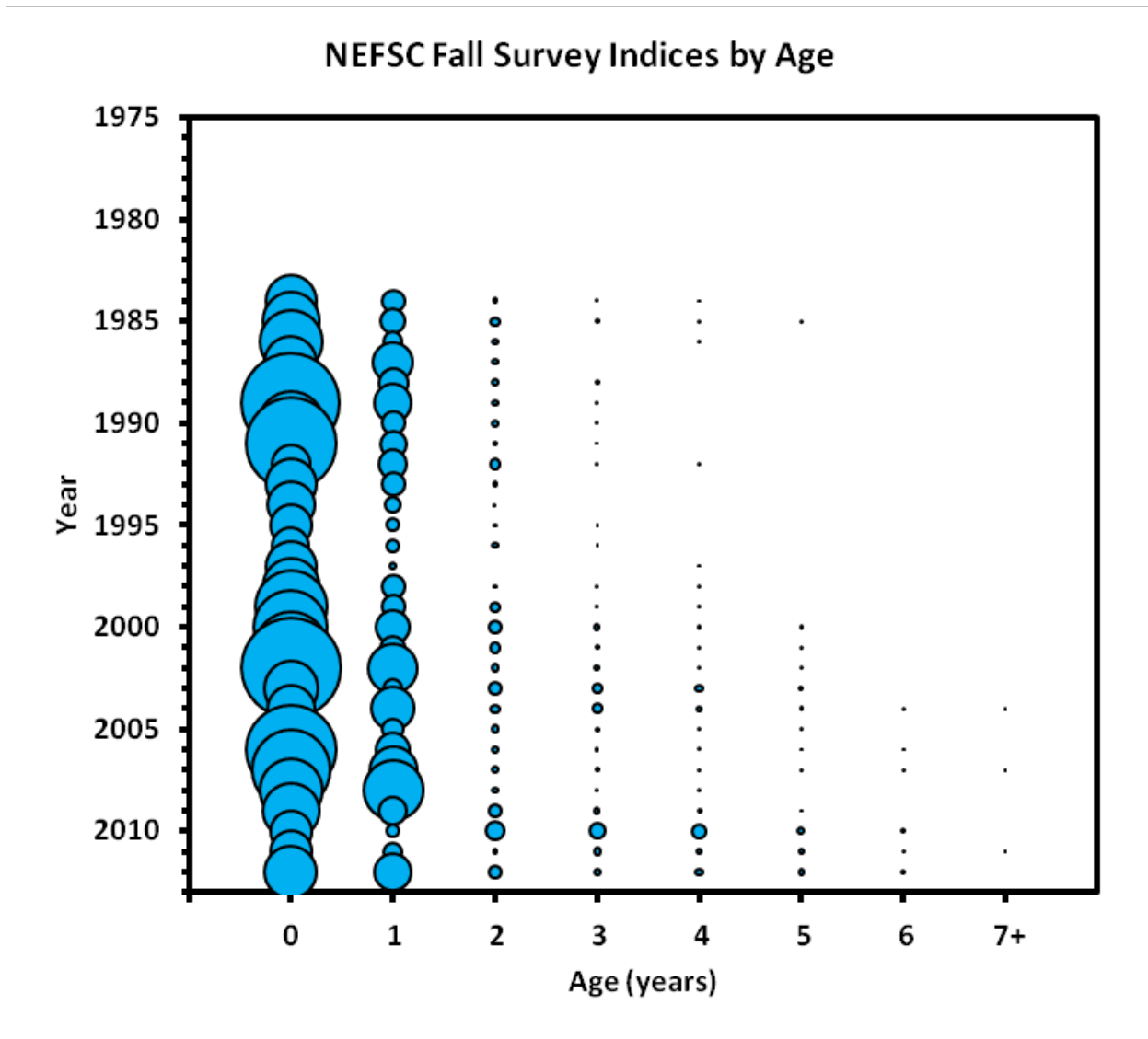
Figure 8. Northeast Fisheries Science Center fall survey indices by age for scup (*Stenotomus chrysops*).
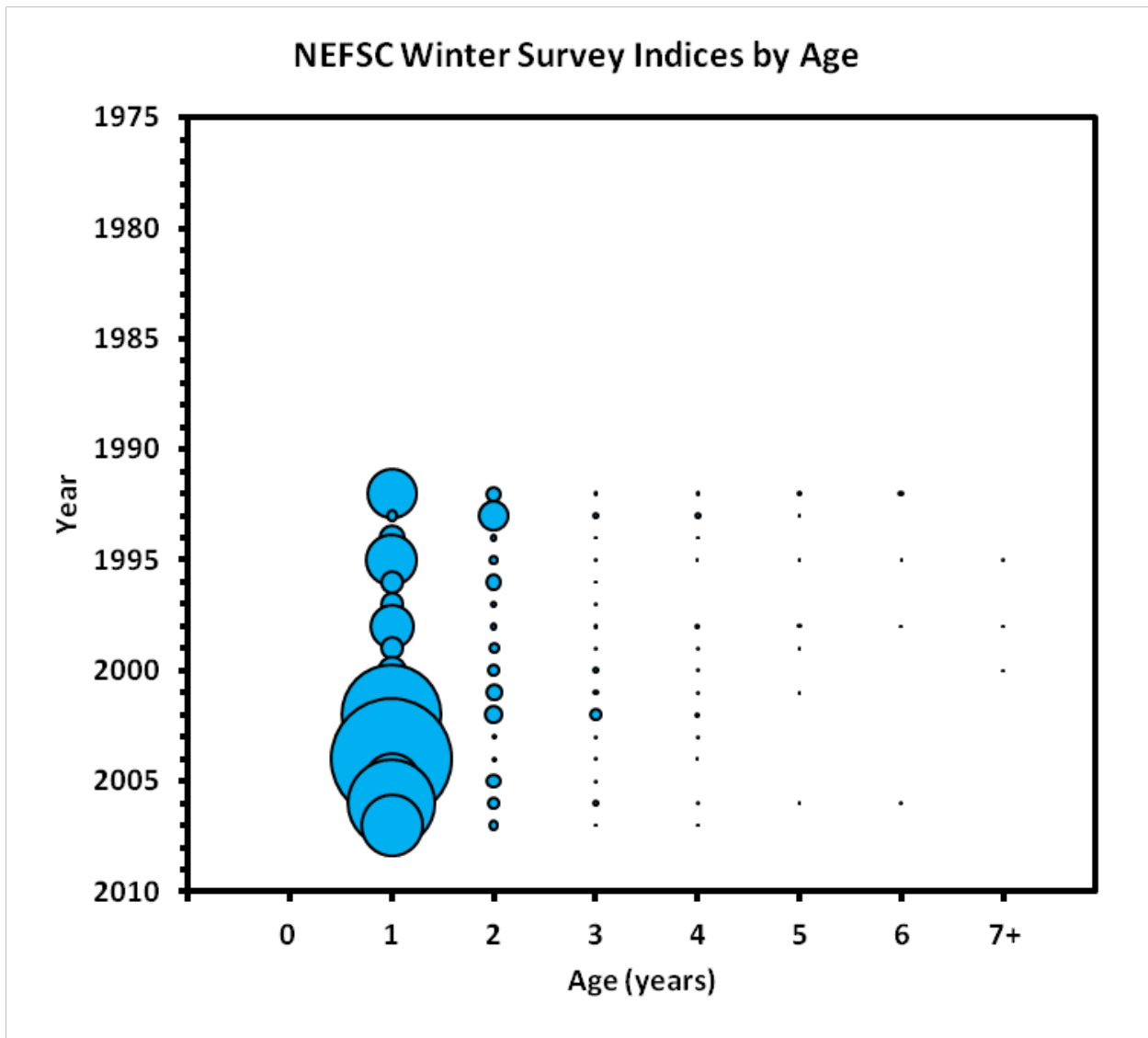
Figure 9. Northeast Fisheries Science Center winter survey indices by age for scup (*Stenotomus chrysops*).
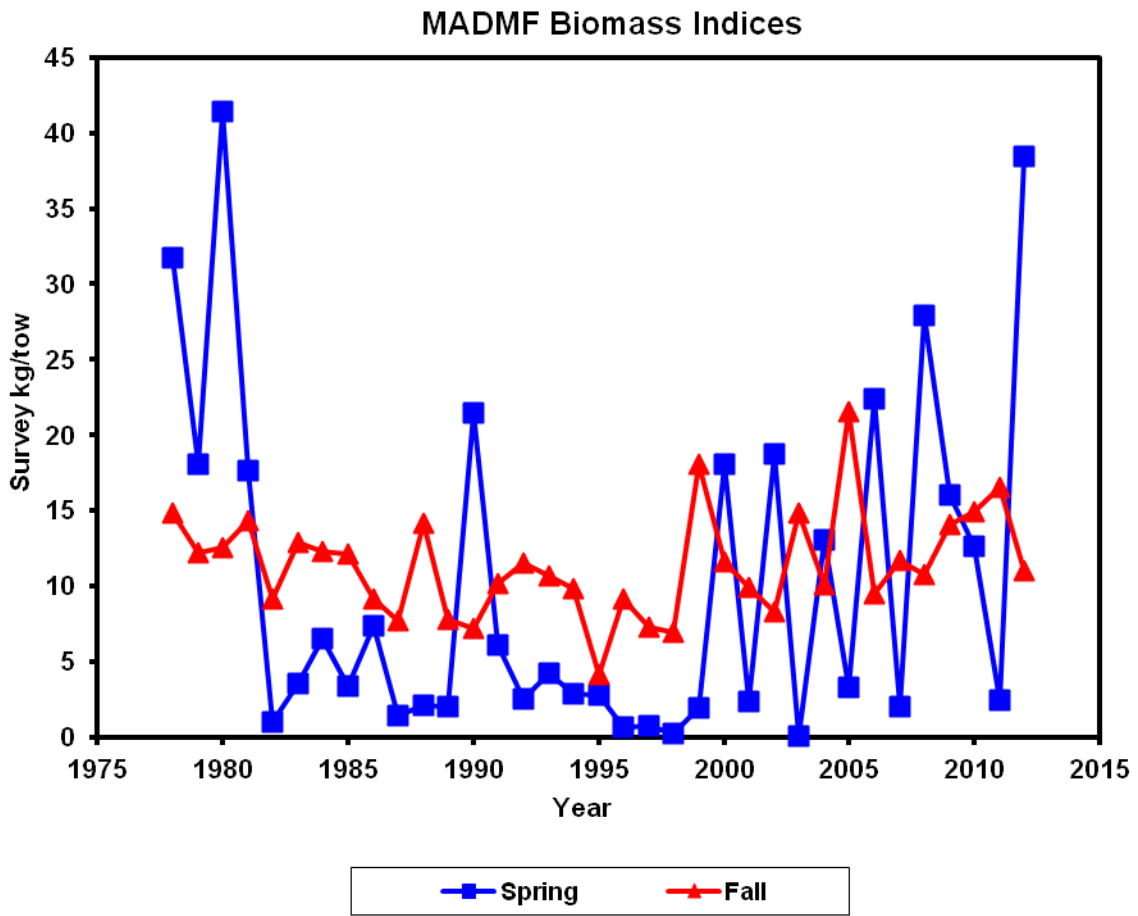
Figure 10. Massachusetts Division of Marine Fisheries (MADMF) spring and fall survey aggregate biomass indices.
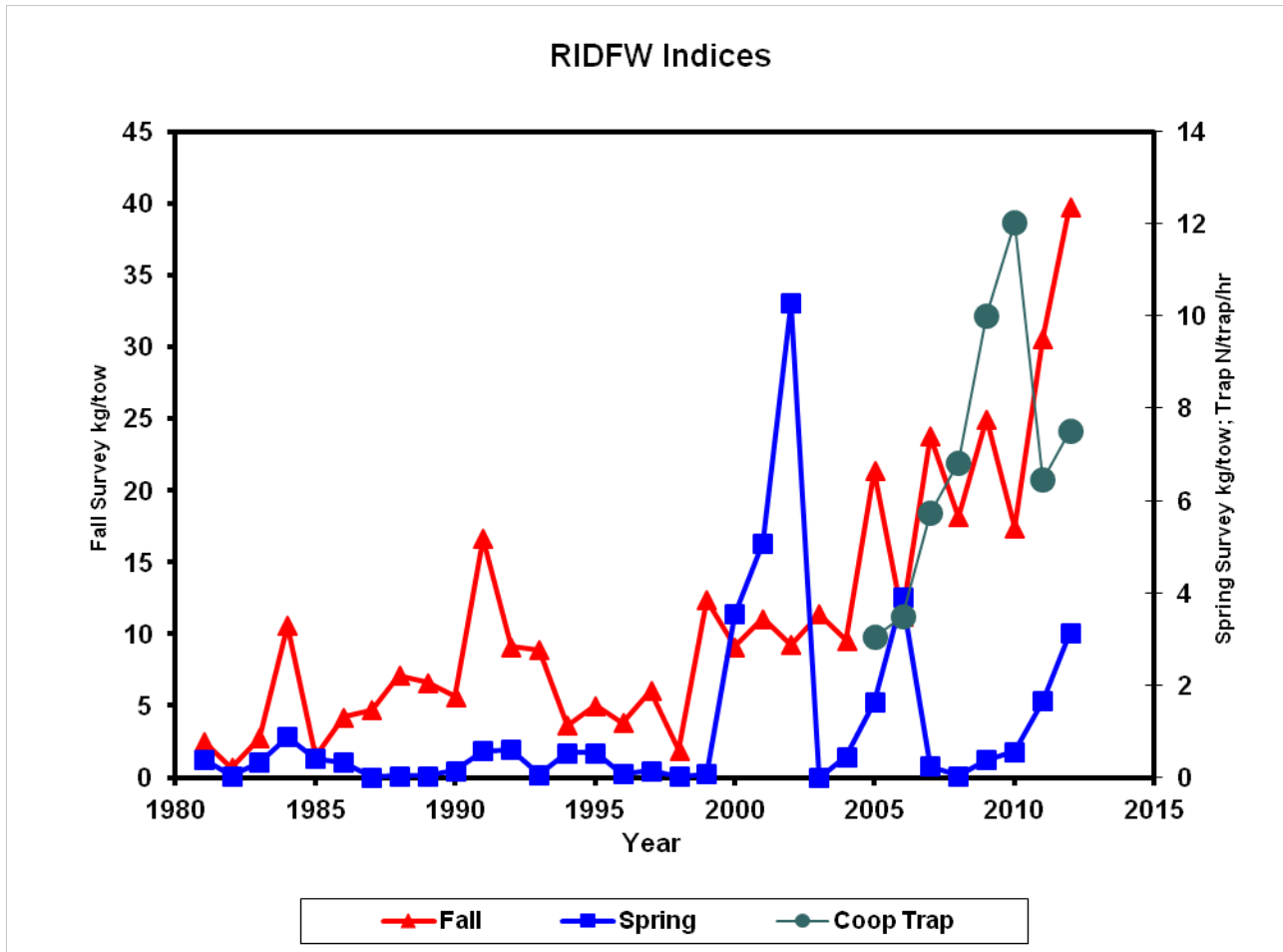
Figure 11. Rhode Island Division of Fish and Wildlife (RIDFW) spring and fall survey aggregate biomass indices.
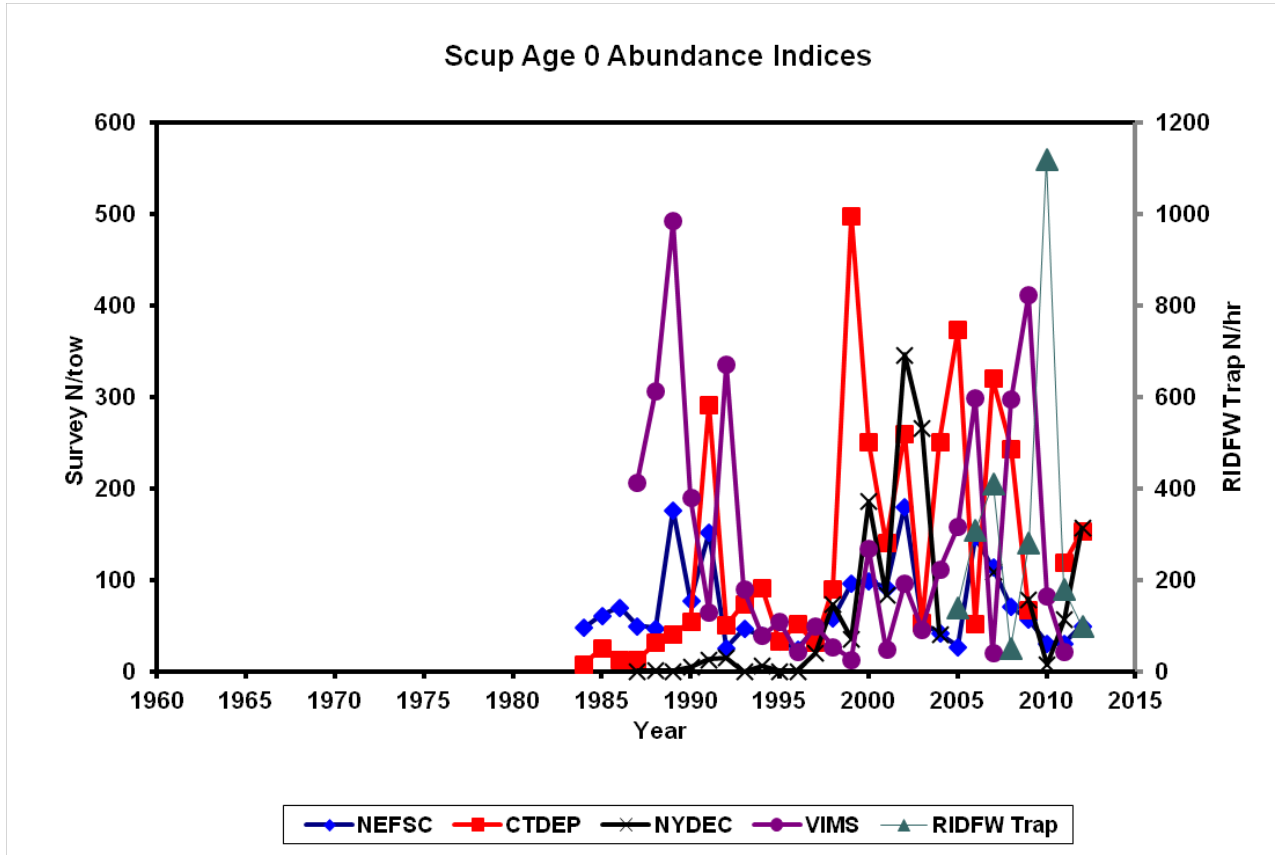
Figure 12. Research survey recruitment indices (age 0 abundance) for scup (*Stenotomus chrysops*). RIDFW = Rhode Island Division of Fish and Wildlife.
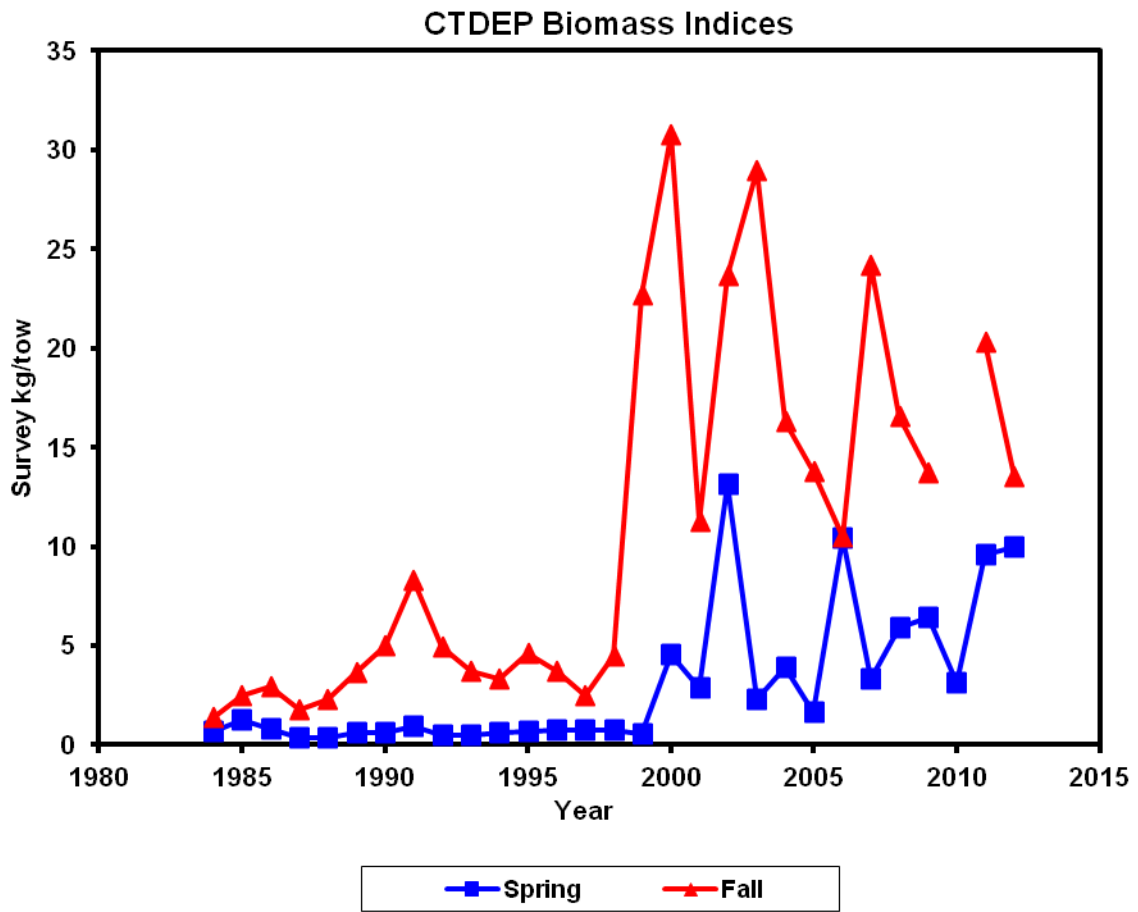
Figure 13. Connecticut Department of Environmental Protection (CTCEP) spring and fall survey aggregate biomass indices.
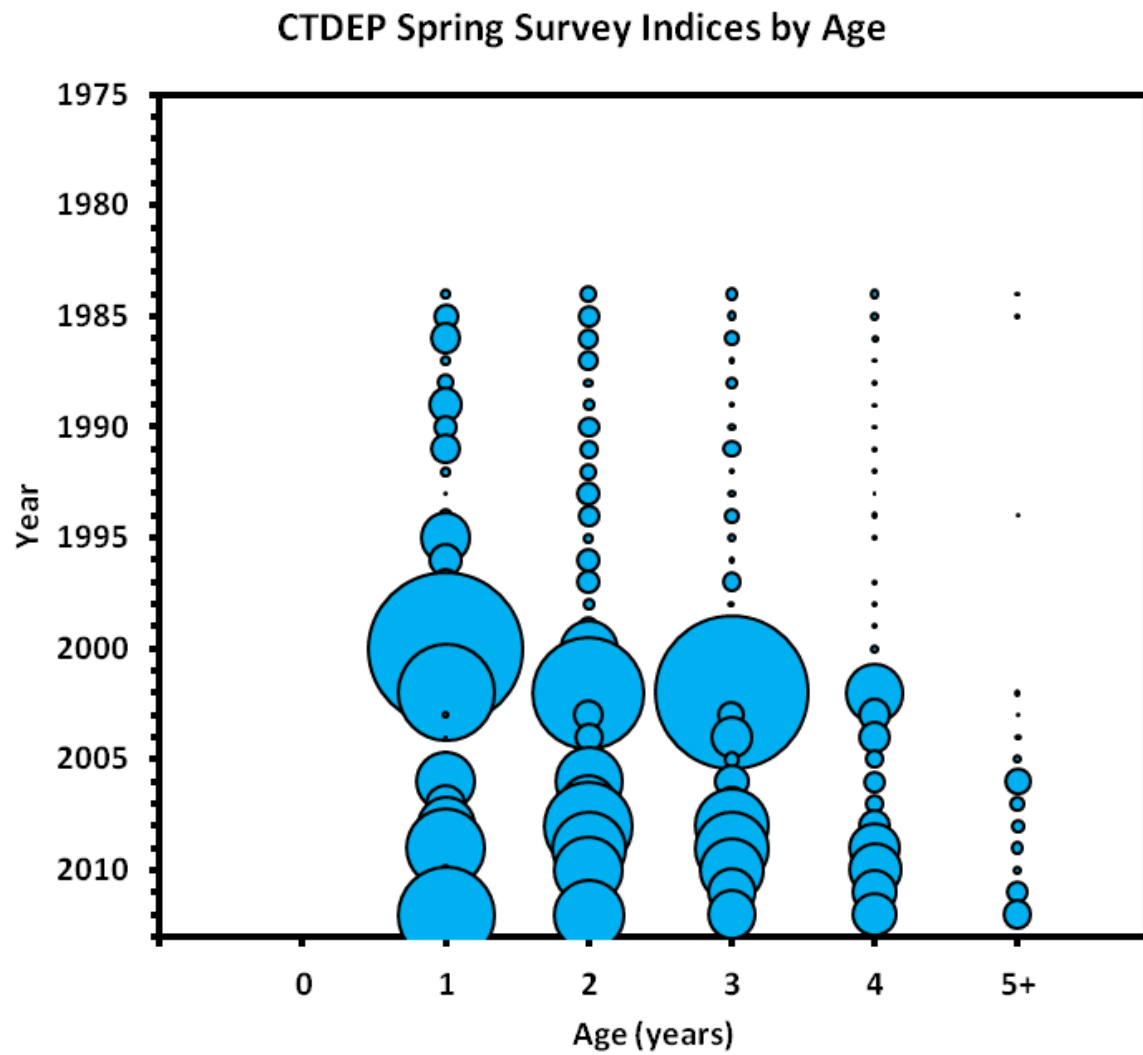
Figure 14. Connecticut Department of Environmental Protection (CTDEP) spring survey indices by age for scup (*Stenotomus chrysops*).
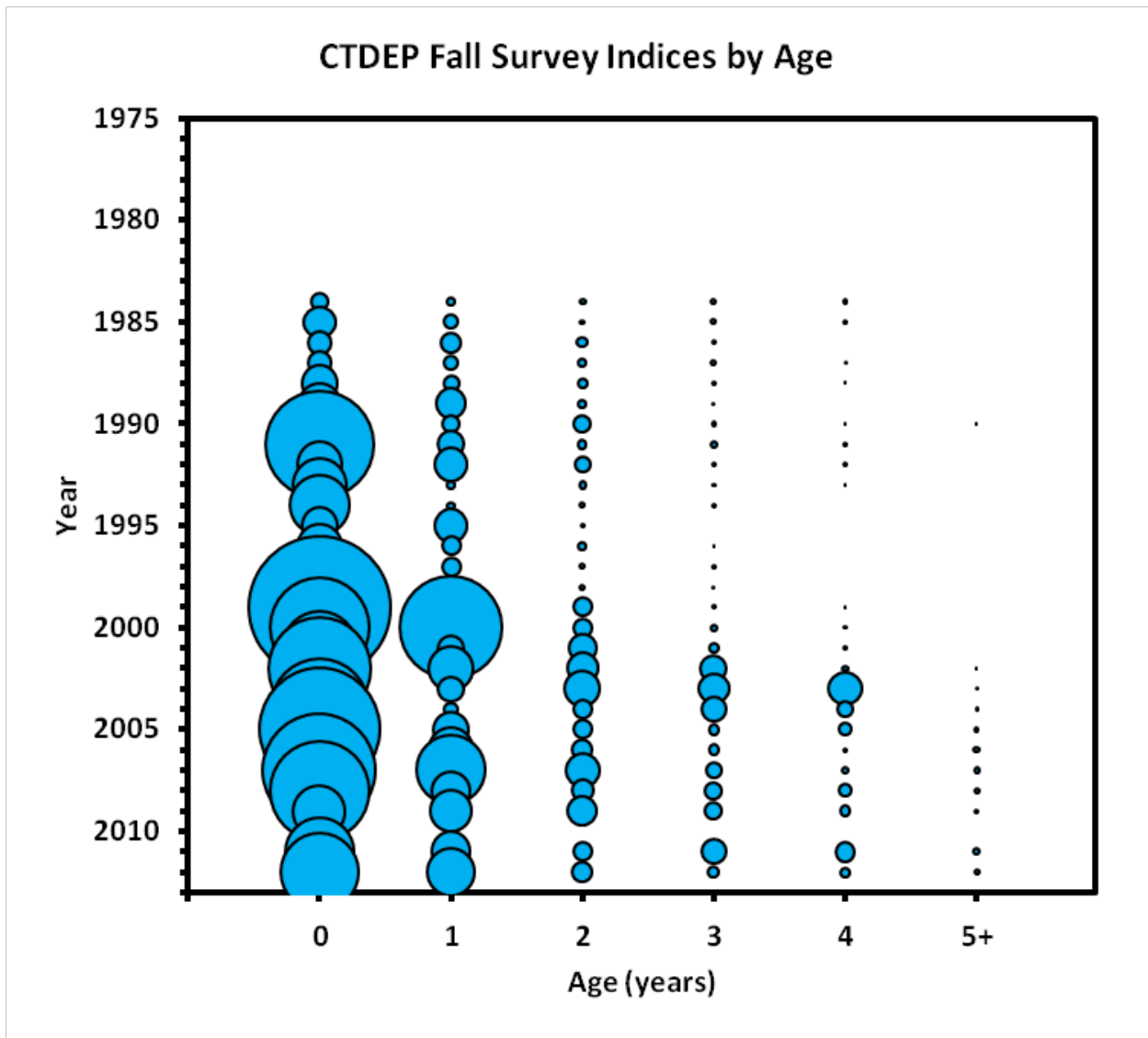
Figure 15. Connecticut Department of Environmental Protection (CTDEP) fall survey indices by age for scup (*Stenotomus chrysops*).
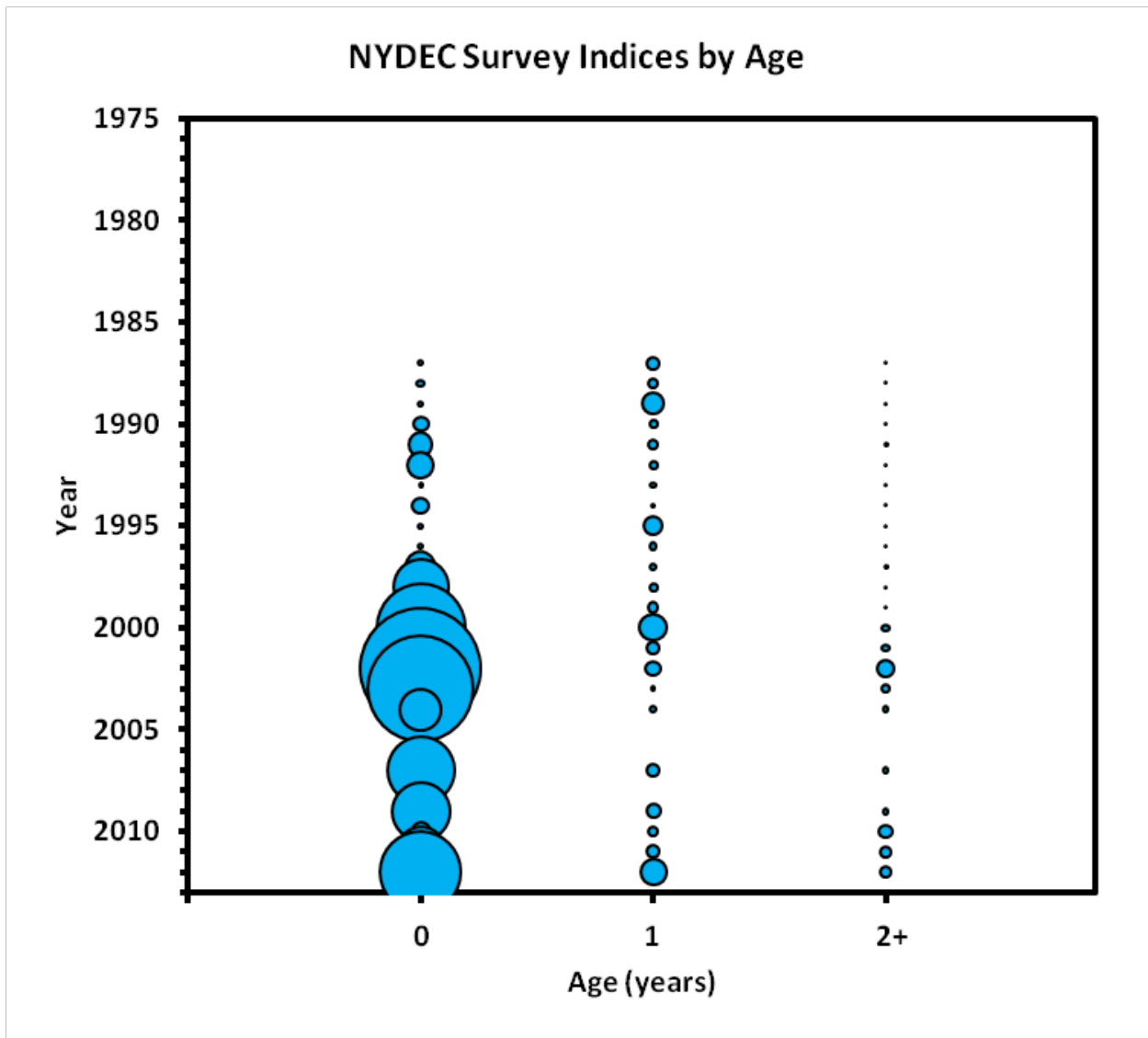
Figure 16. New York Department of Environmental Conservation (NYDEC) survey indices by age for scup (*Stenotomus chrysops*).
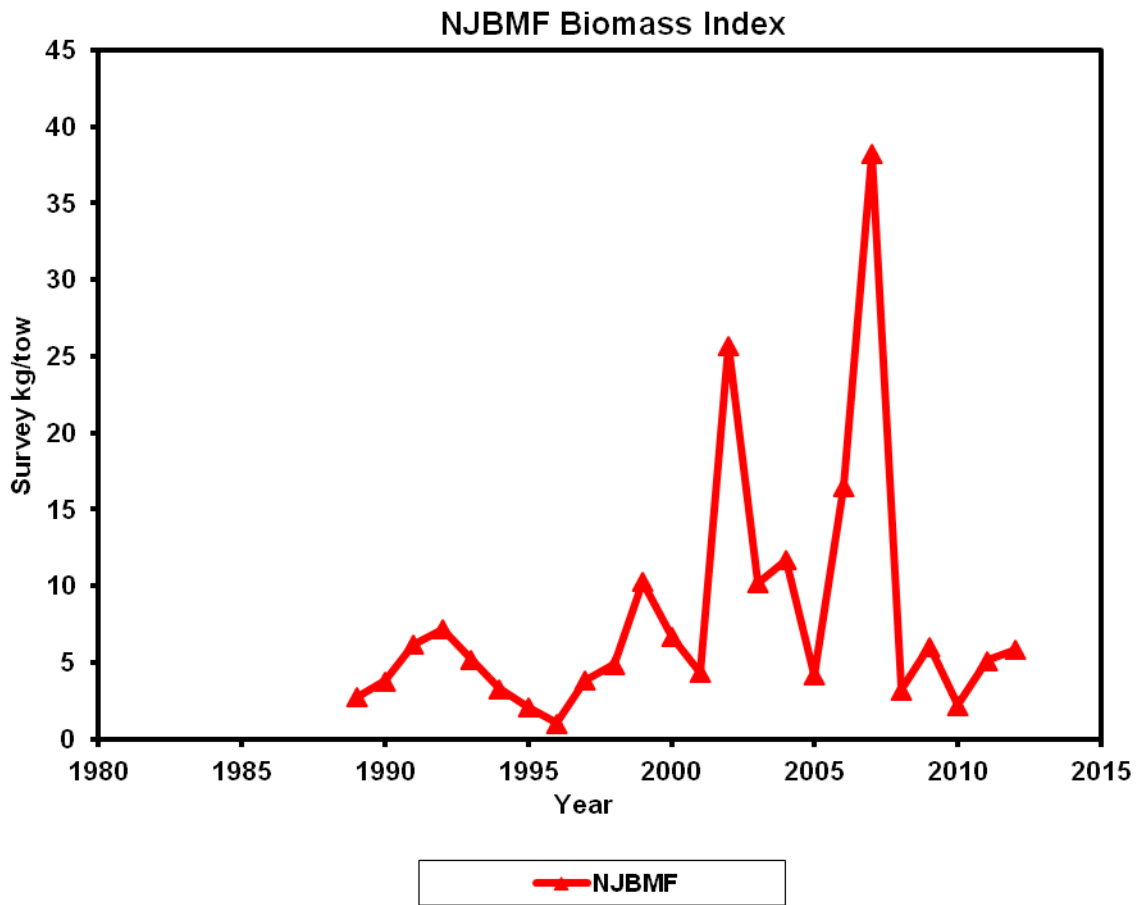
Figure 17. New Jersey Bureau of Marine Fisheries (NJBMF) survey biomass index.
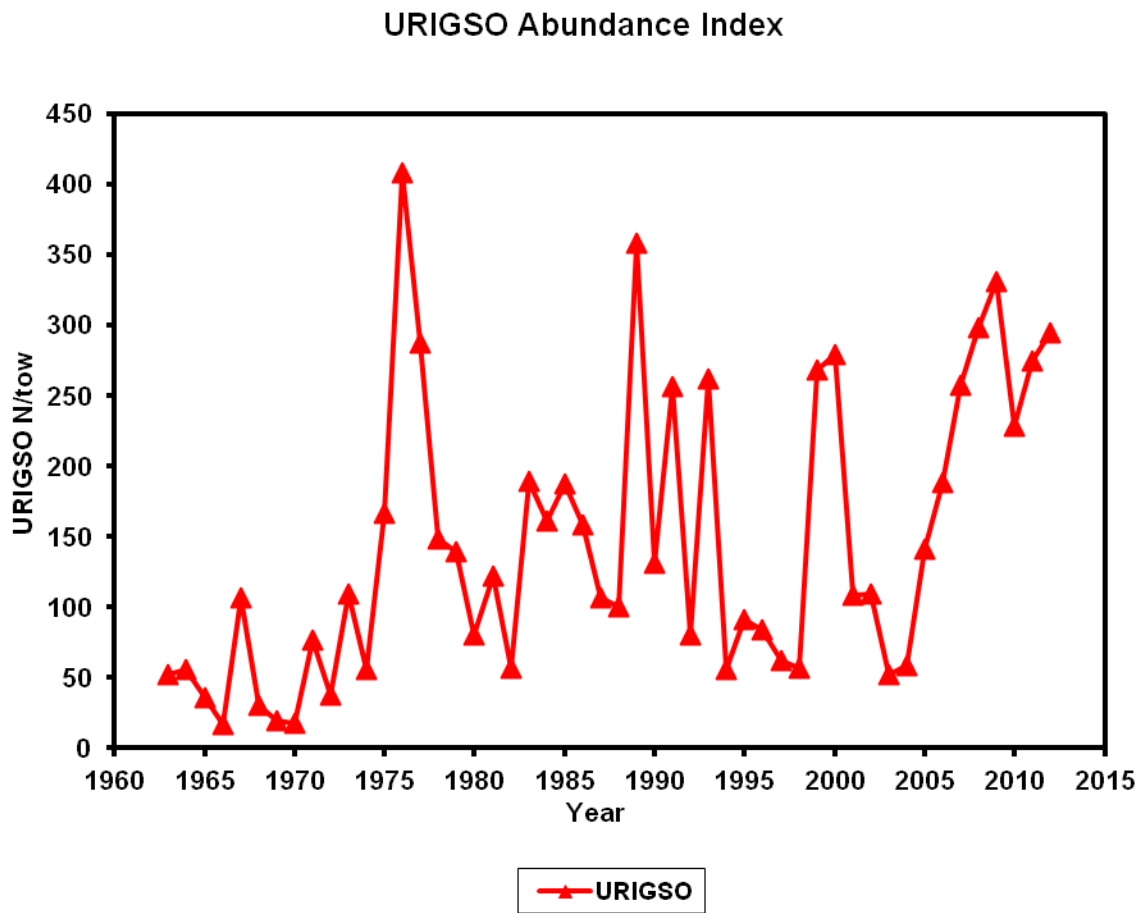
Figure 18. University of Rhode Island Graduate School of Oceanography (URIGSO) survey aggregate abundance index.

ChesMMAP and NEAMAP Biomass Indices
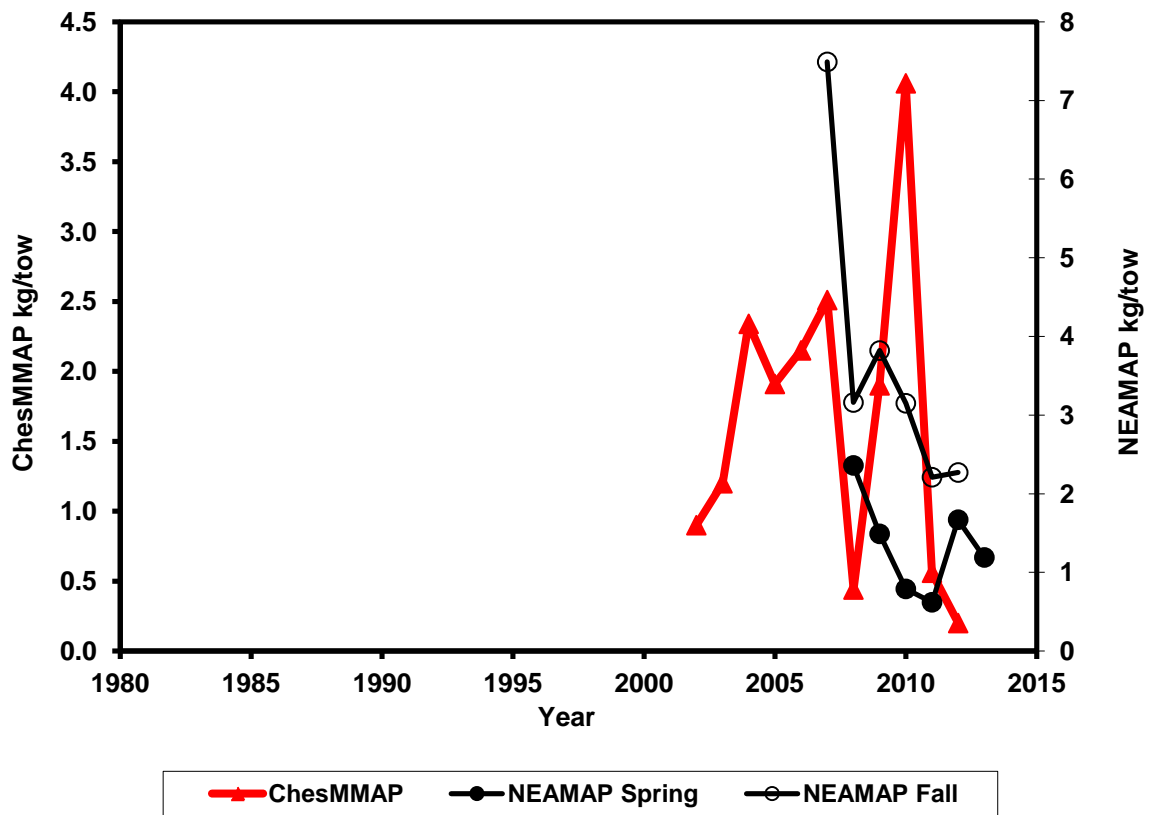
Figure 19. Virginia Institute of Marine Science (VIMS), Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP), and Northeast Area Monitoring and Assessment Program (NEAMAP) spring and fall biomass indices of scup (*Stenotomus chrysops*).
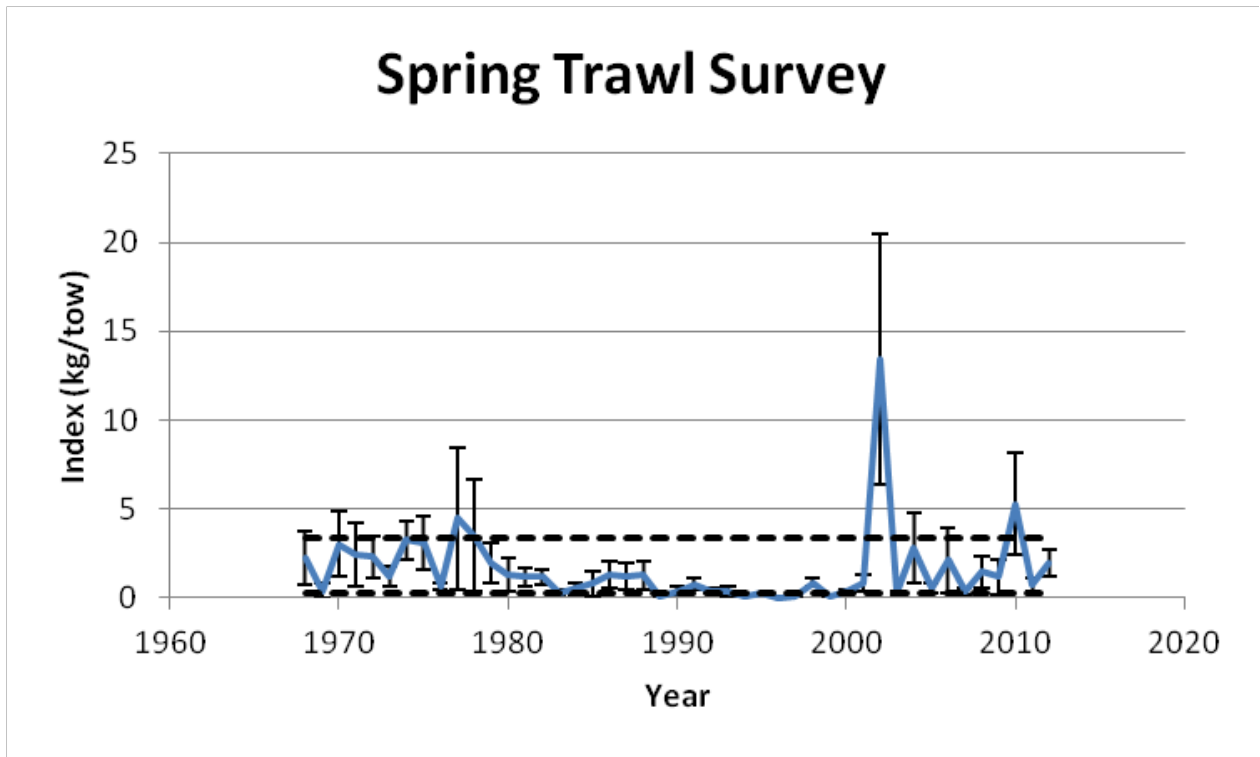
Figure 20. Rumble strip bounds for the NEFSC spring trawl biomass survey index of scup (*Stenotomus chrysops*). Whiskers represent +/- one standard deviation. Dashed lines represent 65% confidence intervals around the 2004-2011 mean.
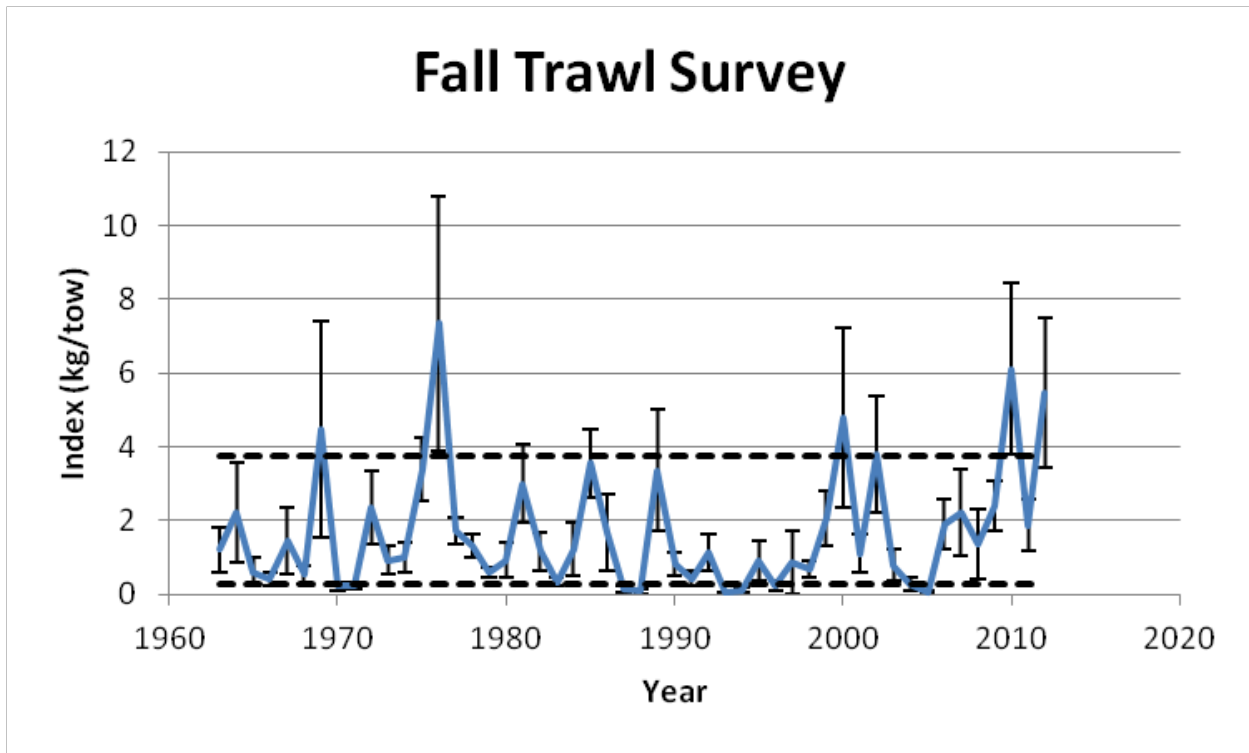
Figure 21. Rumble strip bounds for the NEFSC fall trawl biomass survey index of scup (*Stenotomus chrysops*). Whiskers represent +/- one standard deviation. Dashed lines represent 65% confidence intervals around the 2004-2011 mean.
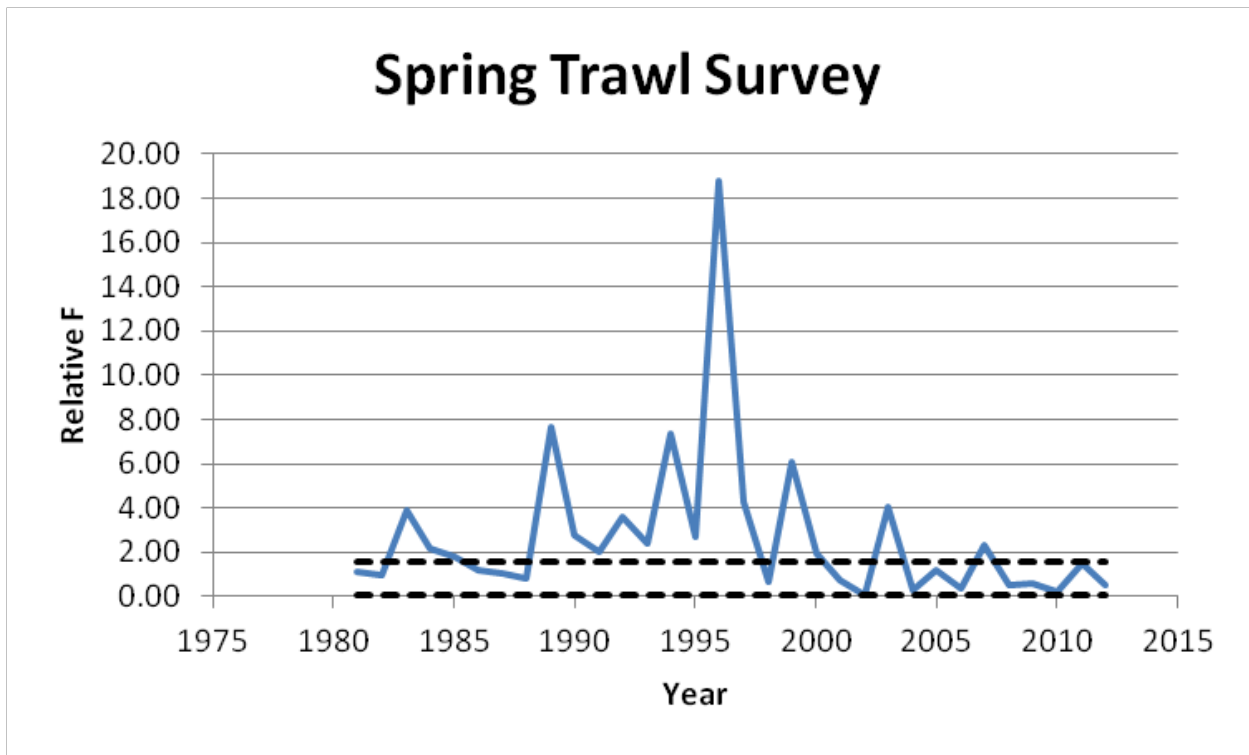
Figure 22. Rumble strip bounds for spring relative fishing mortality of scup (*Stenotomus chrysops*). Dashed lines represent 65% confidence intervals around the 2004-2011 mean.
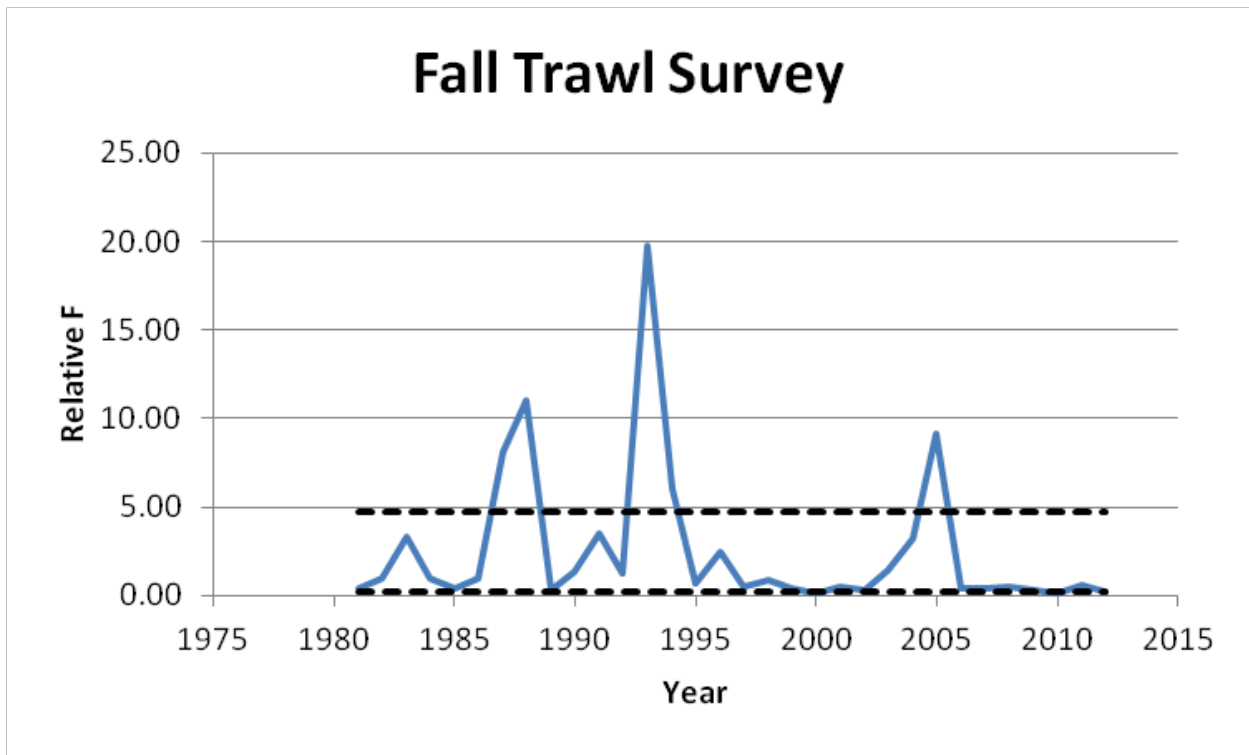
Figure 23. Rumble strip bounds for fall relative fishing mortality of scup (*Stenotomus chrysops*). Dashed lines represent 65% confidence intervals around the 2004-2011 mean.
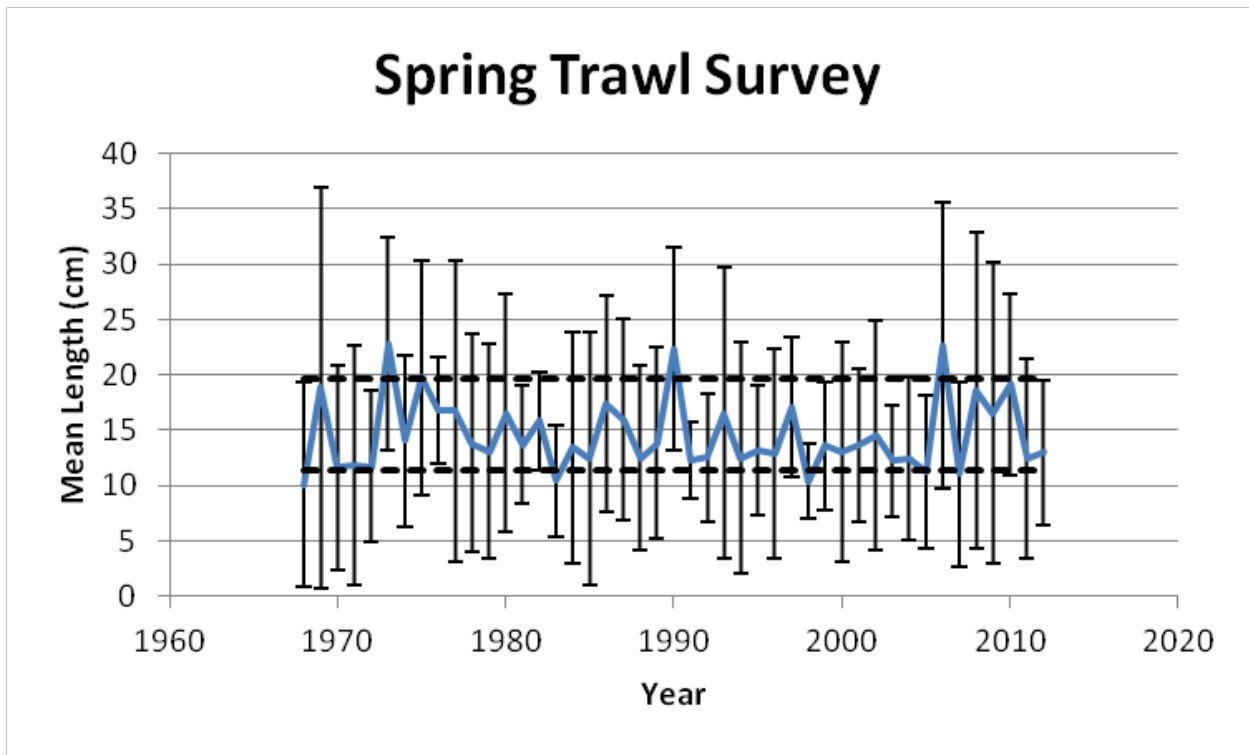
Figure 24. Rumble strip bounds for spring mean length of scup (*Stenotomus chrysops*) from the NEFSC spring survey. Whiskers represent +/- one standard deviation. Dashed lines represent 65% confidence intervals around the 2004-2011 mean.
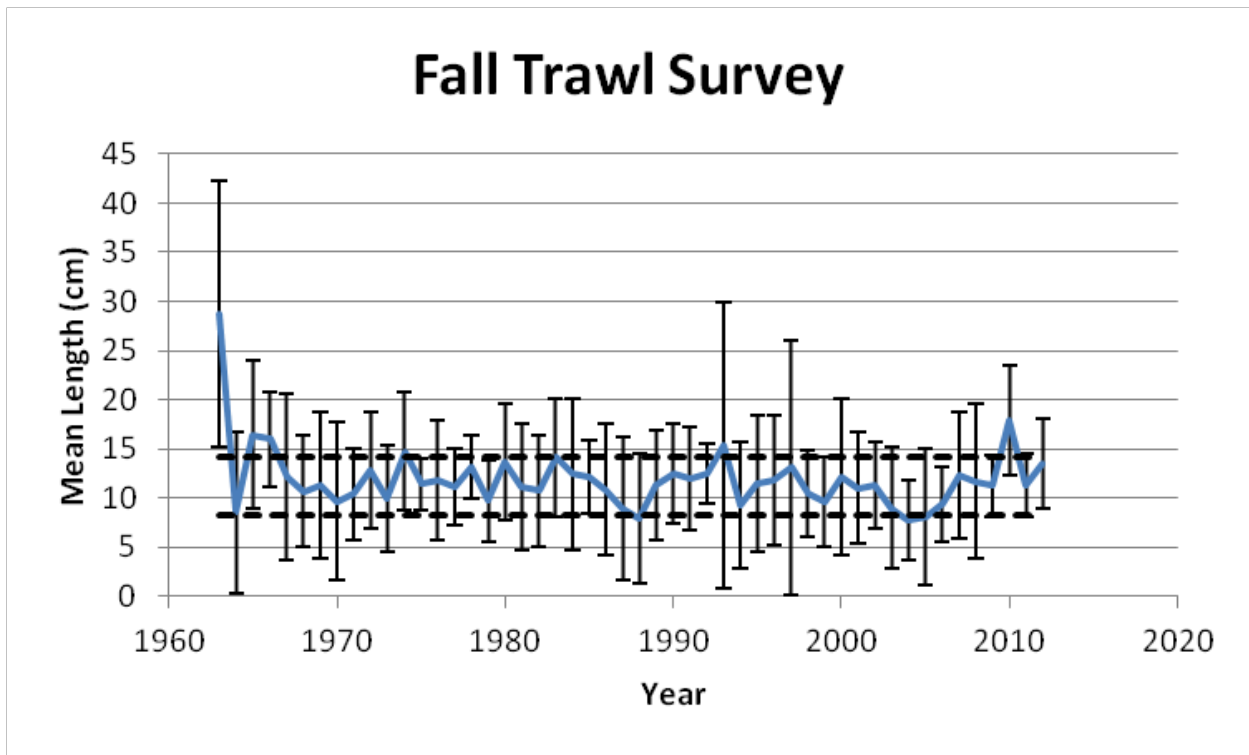
Figure 25. Rumble strip bounds for fall mean length of scup (*Stenotomus chrysops*) from the NEFSC fall survey. Whiskers represent +/- one standard deviation. Dashed lines represent 65% confidence intervals around the 2004-2011 mean.