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Working Paper 1: Skates
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Examination of Potential Biological Reference Points for the Northeast Region Skate Complex

by

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TERMS OF REFERENCE

The following Terms of Reference were provided by the NRCC as the context for this assessment of the Northeast Region skate complex reviewed by the Data Poor Stocks Working Group in December 2008:

a. Recommend biological reference points (BRPs) and measurable BRP and maximum sustainable yield (MSY) proxies for the following data poor stocks: Black sea bass; Deep-sea red crab; Scup; Skates; Atlantic wolffish.

b. Provide advice about scientific uncertainty and risk for Scientific and Statistical Committees (SSCs) to consider when they develop fishing level recommendations for these stocks.

c. Consider developing BRPs for species groups for situations where the catch or landings can not be identified to species. Work on this objective will depend on, and needs to be consistent with, final guidance on implementing the Reauthorized Magnuson-Stevens Act, whenever that guidance becomes available.

d. Comment on what can be done to improve the information, proxies or assessments for each species.

INTRODUCTION

The seven species in the Northeast Region (Maine to Virginia) skate complex are distributed along the coast of the northeast United States from near the tide line to depths exceeding 700 m (383 fathoms). The species are: little skate (*Leucoraja erinacea*), winter skate (*L. ocellata*), barndoor skate (*Dipturus laevis)*, thorny skate (*Amblyraja radiata*), smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*).

In the Northeast region, the center of distribution for the little and winter skates is Georges Bank and Southern New England. The barndoor skate is most common in the Gulf of Maine, on Georges Bank, and in Southern New England. The thorny and smooth skates are commonly found in the Gulf of Maine. The clearnose and rosette skates have a more southern distribution, and are found primarily in Southern New England and the Chesapeake Bight. Skates are not known to undertake large-scale migrations, but they do move seasonally in response to changes in water temperature, moving offshore in summer and early autumn and returning inshore during winter and spring. Members of the skate family lay eggs that are enclosed in a hard, leathery case commonly called a mermaid's purse. Incubation time is 6 to 12 months, with the young having the adult form at the time of hatching (Bigelow and Schroeder 1953).

The first stock assessment for the skate complex was conducted in 1999 at SARC/SAW 30 (NEFSC 2000). At that time there was no Fishery Management Plan (FMP) in place. The National Marine Fisheries Service had been petitioned to list barndoor skate as endangered based on a paper published by Casey and Myers (1998) and was also asked to assess the other species in the complex. SARC 30 found no cause to list barndoor as endangered but recommended that

the species remain on the candidate species list as well as to put thorny skate on the candidate species list. Biomass reference points were developed for all seven species and four were listed as overfished. Fishing mortality reference points were developed for winter and little skate and overfishing was occurring for winter skate.

An FMP was developed following SARC 30 by the New England Fishery Management Council (NEFMC) when they were informed of the overfished status of thorny and barndoor (winter and smooth biomass increased in the 1999 autumn survey and were no longer considered overfished). The FMP was implemented in September of 2003 with a primary requirement for mandatory reporting of skate landings by species by both dealers and vessels. Possession prohibitions of barndoor and thorny skate as well as smooth skate in the Gulf of Maine were also provisions of the FMP. A trip limit of 10,000 lbs was implemented for winter skate with a Letter of Authorization for the bait fishery (little skate) to exceed the trip limit. The biomass reference points developed at SARC 30 were maintained, but new fishing mortality reference points were developed.

The last stock assessment for the skate complex was conducted in 2006 at SARC/SAW 44 (NEFSC 2007). Several methods were attempted to develop fishing mortality estimates and biological reference points. These included the Gedamke-Hoenig length-based mortality estimator, length-based yield-per-recruit, spawner-per-recruit, and a length-tuned model. None of these methods were accepted, although some had promise. The existing reference points were maintained.

Commercial Fishery Landings

Skates have been reported in New England fishery landings since the late 1800s. However, commercial fishery landings, primarily from off Rhode Island, never exceeded several hundred metric tons until the advent of distant-water fleets and the industrial fishery during the 1950s and 1960s. Skate landings reached 9,500 mt in 1969, but declined quickly during the 1970s, falling to 800 mt in 1981 (Table 1, Figure 1). Landings then increased substantially, partially in response to increased demand for lobster bait, and more significantly, to the increased export market for skate wings. Landings increased to 12,900 mt in 1993 and then declined somewhat to 7,200 mt in 1995. Landings increased again and the 2007 reported commercial landings of 19,000 mt were the highest on record (Table 1, Figure 1).

United States landings of skates are reported in all months (Table 2). There is a relatively even distribution of landings across months, but the summer months do show a slightly higher percentage, probably due to the increased demand for lobster bait during those months.

Skate landings are primarily from Massachusetts and Rhode Island (mainly New Bedford and Point Judith) with 85-95% of the landings occurring in those two states (Table 3). Landings from other states did occur back through time and the table somewhat reflects better reporting as more states reported in the NMFS database. Also, the difference in total landings between Table B1.1 and B1.3 is likely the result of landings from the industrial fishery not included in the Weighout database. These landings were sampled during the 1960s and 1970s for species composition and prorated. Skates accounted for about 10% of those landings.

Otter trawls are the primary gear used to land skates in the United States, with some landings coming from sink gill nets (Table 4). In the last couple of years, landings from longline gear have increased slightly in importance. The increase in other gear reflects the new reporting system implemented in 2004.

Landings historically were taken from the Georges Bank and Southern New England during the early 1960s as the industrial fishery operated mainly out of Point Judith and the distant-water fleet fished mainly on Georges Bank (Table 5). Landings from Mid-Atlantic increased through the early 2000s while landings from Georges Bank in 2007 were the highest on record.

Landings are generally not reported by species, with over 99% of the landings reported as "unclassified skates" until the FMP was implemented in September of 2003 (Table 6). Wings are most likely taken from winter and thorny skates, the two species currently known to be used for human consumption. Bait landings are presumed to be primarily from little skate, based on areas fished and known species distribution patterns. Landings of barndoor and thorny skate are being reported by the dealers even though there is a possession prohibition for those two species. There are also wings reported for rosette, little and smooth which are known to be too small for wings. The distribution of skate landings by state and species also shows that some species are landed in areas that they do not occur (Table 7). For example, in 2004, barndoor were landed in Virginia which is too far south for barndoor skate.

Commercial Fishery Discards

Discard estimates from SAW/SARC 44 were revised in this assessment. The ratio-estimator used in this assessment is based on the methodology described in Rago et al. (2005) and updated in Wigley et al 2007. It relies on a d/k ratio where the kept component is defined as the total landings of all species within a "fishery". A fishery is defined as a homogeneous group of vessels with respect to gear type (longline, otter trawl, shrimp trawl, sink gill net, and scallop dredge), quarter (months 1-4, 5-6, 7-8, 9-12), and area fished (GOM, GB, SNE, MA). Mesh size was not used to split out otter trawl trips or sink gill net trips. All trips were included if they occurred within this stratification regardless of whether or not they caught skates.

The discard ratio for skates in stratum h is the sum of discard weight over all trips divided by sum of kept weights over all trips:

$$\hat{R}_h = \frac{\sum_{i=1}^{n_h} d_{ih}}{\sum_{i=1}^{n_h} k_{ih}} \qquad (1)$$

where d_{ih} is the discards for skates within trip i in stratum h and k_{ih} is the kept component of the catch for all species. R_h is the discard rate in stratum h. The stratum weighted discard to kept ratio is obtained by weighted sum of discard ratios over all strata:

$$\hat{R} = \sum_{h=1}^{H} \left(\frac{N_h}{\sum_{h=1}^{H} N_h} \right) \hat{R}_h \qquad (2)$$

The total discard within a strata is simply the product of the estimate discard ratio R and the total landings for the fishery defined as stratum h, i.e., $D_h=R_hK_h$.

Missing cells were inputed using averages of existing cells. If information existed in the same area fished, the annual average discard ratio was applied in the missing cells. If the information was missing in the area fished, but available in the region (i.e. SNE and MA or GOM and GBK), then the annual average for that region was applied. There were some cases for the longline fishery in which the entire year was averaged for all areas or for a span of 12 years (1993-2004). The details of the imputation are given in Appendix 1.

To hindcast the discard estimates back to 1964, a three-year average (the earliest three years of data) of the discards of skates/landings of all species was used. The sensitivity of this estimate was examined using a five-year average and a time-series average (Figure 2). The trends in the total estimates are similar, with the time-series average giving the lowest estimate and the three-year average the highest estimates. Using the three estimates in any future modeling efforts will give some idea of the uncertainty in the data.

Estimated discards by fishery, region and half year for 1964-2007 are summarized in Tables 8-10. The new estimated discards are different than those estimated in SARC/SAW 44 (Figure 3). There are two main reasons for these differences. First, missing cells were imputed in the new method. This should lead to higher values in general. Second, the data for any Special Access Programs for 2005 -2007 were included in the new estimates. These trips showed a higher discard ratio than those outside the closed areas. These should be placed in a separate stratum, however, there is no easy way to determine if a trip in the dealer database was fishing in an SAP.

Recreational Fishery Catch

Aggregate recreational landings of the seven species in the skate complex are relatively insignificant when compared to the commercial landings, never exceeding 300 mt during the 1981-1998 time series of Marine Recreational Fishery Statistics Survey (MRFSS) estimates. Little and clearnose skates are the most frequently landed species of the complex. For little skate, total landings varied between <1000 and 56,000 fish, equivalent to <1 to 15 mt, during 1981-1998. For clearnose skate, total landings varied between 2,000 and 145,000 fish, equivalent to 2 to 232 mt, during 1981-1998. The number of skates reported as released alive averages an order of magnitude higher than the reported landed number. Party/charter boats have historically been undersampled compared to the private/rental boat sector that accounts for most of the recreational catch, and may have a different discard rate. The recreational fishery release mortality rate of skates is unknown, but is likely comparable to that for flounders and other demersal species, which generally ranges from 10-15%. Assuming a 10-15% release mortality rate would suggest that recreational fishery discard mortality is of about the same magnitude as the recreational landings. Data from 1999 through 2005 were similar in magnitude.

Landings by Species Estimation

The landings estimates were not dis-aggregated to skate species in previous assessments because identification of skates is uncertain in the Domestic Observer Program (NEFSC 2007). Alternative methods to estimate landings by species were developed, each of which has both strengths and weaknesses. Therefore, both sets of estimates were chosen to be used in any future modeling efforts as an indication of the uncertainty in the catch of skates.

The first method used the observer lengths of the kept component of the catch directly. In order to split the data into the bait (whole) and wing components of the fishery, a length cutoff of 60 cm was used, since there is no direct way of determining the disposition of the landings until recently. This seemed justified, since the maximum size in the bait fishery was instituted to also be close to the minimum accepted length for the wing fishery. Examination of the samples by the two main gear types also showed two groups of fish with a trough at about 60 cm (Figure 4). The data were apportioned into two regions, Gulf of Maine to Georges Bank (GOMGBK – Divisions 51 and 52), and Southern New England to Mid-Atlantic (SNEMA – Divisions 53 and Subarea 6). The number of fish measured in these regions was barely sufficient (Table 11) so no further areal division was attempted. Pooling over years within a region was still required to get an adequate number of fish (Figure 5). An average skate length-weight equation was applied to the samples and used to estimate the landings numbers at length for each market category (Figure 6).

Length compositions for each species for the two regions (GOMGBK – Offshore strata 13-30, 36-40, and Inshore strata 56-66; SNEMA – Offshore strata 1-12, 61-76, and Inshore strata 1-55) were estimated. The species length-weight equations were then applied to determine weight-at-length by species. The proportions at length by species for both number and weight were applied to the commercial landings-at-length to estimate landings-at-length by species. The lengths had to be grouped into 5 cm intervals to avoid zero cells in the survey and all fish greater than 112 cm were set to be barndoor skate.

For the second method, a selectivity ogive was estimated for observed hauls in each skate fishery compared to the applicable surveys during 2004-2007. The data were fit using a three parameter logistic curve via Millar's (1992) SELECT model. Results of these logistic model fits are given in Table 12 and in Figures 7-10. In most cases where the parameters could be estimated, the L50s for winter and little skates were similar to the overall fit for all skate species (with a notable exception of little skates observed in the retained fraction of gillnet catches). Also the ogives by region were very similar to one another within each fishery and gear type. As a result, pooled selectivity ogives for each gear and skate fishery were used to determine the exploitable species composition at size in each survey stratum. In the following table, the L50s for the newly estimated ogives are compared with the PDT's assumed knife edge selectivity ogive.

Fishery	**L50 for selectivity ogive applied to survey weight per tow data**	**PDT assumed knife edge selectivity**
Trawl wing	66.9 cm	> 40 cm
Trawl whole/bait	44.4 cm and < 59 cm	< 59 cm
Gillnet	54.9 cm	> 65 cm

Average proportional weight per tow by three digit statistical area was re-estimated by determining an average stratum weight per tow and then computing an area-weighted average for the sampled strata within each three digit statistical area. While this approach does not readily allow estimation of variance (like a domain estimator), the averages computed in this way satisfy the conditions of the stratified random survey design. These average proportions of survey catch by skate species were then applied to the VTR data by gear type, fishery (product form), and trimester (corresponding to the spring, fall, and winter surveys).

Comparison of the two methods generally shows higher amounts of winter, clearnose, and rosette skate in method one (length composition) compared to the second method (selectivity ogive) and lower amounts of little, smooth, and thorny skate (Tables 13-14; Figures 11-13). Barndoor skate are generally comparable. The length composition method uses the annual length data when possible, but may be ignoring some sub-regional differences due to the low sample sizes. The selectivity ogive method, on the other hand, uses the sub-regional data while assuming that the length composition of the survey, once the skates are fully selected, reflects the length composition of the fishery. The two methods give a range of values and will both be used in any future modeling efforts.

Discards by Species Estimation

The discard estimates were not dis-aggregated to skate species in previous assessments because identification of skates is uncertain in the Domestic Observer Program (NEFSC 2007). The observer lengths of the discarded component of the catch were used by gear type. The data were apportioned into two regions, Gulf of Maine to Georges Bank (GOMGBK – Divisions 51 and 52), and Southern New England to Mid-Atlantic (SNEMA – Divisions 53 and Subarea 6). The number of fish measured in these regions was barely sufficient (Table 15) so no further areal division was attempted. Pooling over years, sometimes over the entire time series, within a region was still required to get an adequate number of fish (Figure 14). For longline gear, all samples were used for both regions. An average skate length-weight equation was applied to the samples and used to estimate the discard numbers at length by gear category (Figure 15).

Length compositions for each species for the two regions (GOMGBK – Offshore strata 13-30, 36-40, and Inshore strata 56-66; SNEMA – Offshore strata 1-12, 61-76, and Inshore strata 1-55) were estimated. The species length-weight equations were then applied to determine weight-at-length by species. The proportions at length by species for both number and weight were applied to the commercial landings-at-length to estimate landings-at-length by species. The lengths had to be grouped into 5 cm intervals to avoid zero cells in the survey and all fish greater than 112 cm were set to be barndoor skate. The estimates by gear type and species are given in Table 16.

RESEARCH SURVEY DATA-TOTAL STOCK BIOMASS

Indices of relative abundance have been developed from NEFSC bottom trawl surveys for the seven species in the skate complex, and these form the basis for most of the conclusions about the status of the complex. The NEFSC trawl survey has been conducted in the autumn from the Gulf of Maine to Southern New England since 1963 (Azarovitz 1981) and the Mid-Atlantic was added in 1967. A spring survey was started in 1968 with stations <= 27 m added in 1975. All statistically significant NEFSC gear, door, and vessel conversion factors were applied to little, winter, and smooth skate indices when applicable (Sissenwine and Bowman, 1978; NEFC 1991). Juvenile little and winter skates are not readily distinguished in the field. The numbers of juveniles were split between the two species based on the abundance of the adults in the same tow.

For the aggregate skate complex, the spring survey index of biomass was relatively constant from 1968 to 1980, then increased significantly to peak levels in the mid to late 1980s. The index of skate complex biomass then declined steadily until 1994, but increased until 2000

and has since decreased (Figure 16). If the species in the complex are divided into large (barndoor, winter, and thorny) and small sized skates (little, clearnose, rosette, and smooth), it is evident that the large increase in skate biomass in the mid to late 1980s was dominated by winter and little skate (Figure 16). The biomass of large sized skates steadily declined from the mid-1980s to the mid-1990s and has since been stable. The increase in aggregate skate biomass from the mid-1990s to 2000 was due to an increase in little skate and the subsequent decline is also due to little skate (Figure 16).

Indices were also derived for the aggregate skate complex by region. The index of skate biomass in the Gulf of Maine (Offshore strata 26-30,36-40) was steady through the mid-1970s, started to decline and is currently among the lowest on record (Figure 17). The index for the Georges Bank region (Offshore strata 13-25) was relatively low at the start of the time series, increased to high levels in the 1980s and has since declined to low levels (Figure 17). For the Southern New Englan region (– Offshore strata 1-12), the index either increased over time (the spring survey) or was stable (the fall survey) (Figure 18). The index for the Mid-Atlantic (Offshore strata 61-76) region has increased over time (Figure 18).

Indices of relative abundance for some of the species have also been developed from MADMF and CTDEP research surveys. Data are also available from the Maine-New Hampshire inshore survey, the ASMFC shrimp trawl survey, the monkfish survey, and the VIMS trawl survey but have not been developed into indices at this time.

The bootstrap methodology of Smith (1997) was continued from the previous SARC and also applied to the MADMF survey but the complete results are not shown. The data are shown to demonstrate what may be available for future modeling work.

Winter skate

In the NEFSC spring survey offshore strata (1968-2008), the annual total catch of winter skate has ranged from 160 fish in 1976 to 1,891 fish in 1985. In the NEFSC autumn survey offshore strata (1963-2007), the annual total catch of winter skate has ranged from 115 fish in 1975 to 1,187 fish in 1984. Calculated on a per tow basis, these spring survey catches equate to maximum stratified mean number per tow indices for the GOM-MA offshore strata of about 7.9 fish, or 16.4 kg, per tow during 1985; autumn maximum catches equate to indices of 3.7 fish, or 13.3 kg, per tow in 1984 (Tables 17-18).

The catchability of winter skate in the NEFSC winter bottom trawl survey (which substitutes a chain sweep with small cookies for the large rollers used in the spring and autumn surveys, to better target flatfish) is significantly higher than in the spring and autumn series, especially for smaller winter skates. NEFSC winter survey (1992-2007) annual catches of winter skate have ranged from 841 fish in 1993 to 4,055 fish in 1996, equating to a maximum stratified mean catch per tow of 43.5 fish, or 25.2 kg, per tow in 1996 (Table 19). The winter survey is focused in the Southern New England and Mid-Atlantic offshore regions, with a limited number of samples on Georges Bank, and no sampling in the Gulf of Maine and has been discontinued.

Indices of winter skate abundance and biomass from the NEFSC spring and autumn surveys were stable, but below the time series mean, during the late 1960s and 1970s (Figure 19). Winter skate indices increased to the time series mean by 1980, and then reached a peak during the mid 1980s. Winter skates indices began to decline in the late 1980s. Current NEFSC indices of winter skate abundance are below the time series mean, at about the same value as

during the early 1970s. Current NEFSC indices of winter skate biomass are about 20% of the peak observed during the mid 1980s (Figure19).

The NEFSC scallop dredge survey, as with the winter survey also catches winter skates mostly on Georges Bank and also does not sample in the Gulf of Maine and on the very shallowest portions of Georges Bank. However, the trends in abundance are similar to the trends in the spring and autumn surveys (Figure 20).

Indices of abundance for winter skate are available from the Massachusetts Division of Marine Fisheries (MADMF) spring and autumn research trawl surveys in the inshore waters of Massachusetts for the years 1978-2008. MADMF biomass indices of winter skate were moderate to high from 1981 through 1987. Thereafter, both spring and autumn indices declined to time series lows in 1989-1991. The spring index rebounded to moderate levels during 1992-1996 before dropping again to low values in the late 1990s and remaining low through 2008 (Figure 21). The autumn index is more erratic, but generally shows the same pattern.

Indices of abundance for winter skate are available from the Connecticut Department of Environmental Protection (CTDEP) spring and autumn finfish trawl surveys in Long Island Sound for the years 1984-2008 (1992 and later only for biomass). Annual CTDEP survey catches have ranged from 0 to 115 skates. CTDEP survey indices suggest that after increasing to a time series high from 1984 through 1989, winter skate in Long Island Sound has declined slightly (Figure 22).

Little skate

In the NEFSC spring surveys (1976-2008), the annual total catch of little skate has ranged from 2,271 fish in 2006 to 16,406 fish in 1999 (Table 20). In the NEFSC autumn surveys (1975-2007), the annual total catch of little skate has ranged from 1,124 fish in 1993 to 6,523 fish in 2003 (Table 21). Calculated on a per tow basis, these spring survey catches equate to maximum stratified mean number per tow indices for the GOM-MA inshore and offshore strata of about 28 fish, or 10 kg, per tow during 1999; autumn maximum catches equate to indices of 18 fish, or 7.7 kg, per tow in 2003 (Tables 20-21).

The catchability of little skate in the NEFSC winter bottom trawl survey (which substitutes a chain sweep with small cookies for the large rollers used in the spring and autumn surveys, to better target flatfish) is significantly higher than in the spring and autumn series. NEFSC winter survey (1992-2007) annual catches of little skate have ranged from 8,870 fish in 2003 to 18,418 fish in 1992, equating to a maximum stratified mean catch per tow of 170 fish, or 66 kg, per tow in 1992 (Table 22). The winter survey is focused in the Southern New England and Mid-Atlantic offshore regions, with a limited number of samples on Georges Bank, and no sampling in the Gulf of Maine and has been discontinued.

Indices of little skate abundance and biomass from the NEFSC spring and autumn surveys were stable, but below the time series mean, during the 1970s. Little skate spring survey indices began to increase in 1982, reached a peak in 1999, and declined thereafter (Figure 23). Autumn survey indices have been relatively stable over the duration of the time series, with a slight increase in recent years (Figure 23). The application of the NEFSC gear conversion factors to spring survey indices decreased the indices in 1981 and earlier years by 75 percent. This may account for some of the mis-match between the spring and autumn surveys.

The NEFSC scallop dredge survey, as with the winter survey also catches little skates in all areas and also does not sample in the Gulf of Maine, on the very shallowest portions of

Georges Bank, and parts of Southern New England. However, the trends in abundance are similar to the spring and autumn surveys with the indices showing little trend over the time series (Figure 24).

Indices of abundance for little skate are available from the Massachusetts Division of Marine Fisheries (MADMF) spring and autumn research trawl surveys in the inshore waters of Massachusetts for the years 1978-2008 (Figure 25). MADMF biomass indices of little skate declined through the 1980's to time series lows in 1989 (autumn) and 1991 (spring). Biomass indices quickly rose to high levels in the early 1990's, and have since fluctuated without trend.

Indices of abundance for little skate are available from the Connecticut Department of Environmental Protection (CTDEP) spring and autumn finfish trawl surveys in Long Island Sound for the years 1984-2008 (1992 and later only for biomass). Little skate are the most abundant species in the skate complex in Long Island Sound, with annual CTDEP survey catches ranging from 142 to 837 skates. CTDEP survey indices suggest an increase in abundance of little skate in Long Island Sound through 1996 followed by a decline (Figure 26).

Barndoor skate

In the NEFSC spring surveys (1968-2008), the annual total catch of barndoor skate has ranged from 0 fish (several years during the 1970s and 1980s) to 325 fish in 2007 (Table 23). In the NEFSC autumn surveys (1963-2007), the annual total catch of barndoor skate has ranged from 0 fish (several years in the 1970s and 1980s) to 120 fish in 1963 (Table 24). Calculated on a per tow basis, the autumn survey catches equate to maximum stratified mean number per tow indices for the GOM-SNE offshore strata of about 0.8 fish, or 2.6 kg, per tow in 1963 while the spring maximum is 1.5 fish, or 6.8 kg, per tow in 2007 (Tables 23-24). The spring survey index was driven mainly by one large tow (277 fish; >1500 kg).

The catchability of barndoor skate in the NEFSC winter bottom trawl survey (which substitutes a chain sweep with small cookies for the large rollers used in the spring and autumn surveys, to better target flatfish) is significantly higher than in the spring and autumn series and may be particularly higher for smaller skates as in winter skates. NEFSC winter survey (1992-2007) annual catches of barndoor skate have ranged from 0 fish in 1992 to 355 in 2006, equating to a maximum stratified mean catch per tow of 3.2 fish, or 3.0 kg, per tow in 2006 (Table 25). The winter survey is focused in the Southern New England and Mid-Atlantic offshore regions, with a limited number of samples on Georges Bank, and no sampling in the Gulf of Maine and has been discontinued.

Indices of barndoor skate abundance and biomass from the NEFSC spring and autumn surveys were at their highest values during early to late 1960s, and then declined to 0 fish per tow during the early 1980s. Since 1990, both spring and autumn survey indices have steadily increased, with the spring survey at the highest value and the autumn survey nearing the peak values found in the 1960s (Figure 27).

The NEFSC scallop dredge survey, as with the winter survey also catches winter skates mostly on Georges Bank and also does not sample in the Gulf of Maine, on the very shallowest portions of Georges Bank, and parts of Southern New England. However, the trends in abundance are similar to the trends in the spring and autumn surveys showing a large increase since 1992 while the biomass is much noisier (Figure 28).

Thorny skate

In the NEFSC spring surveys (1968-2008), the annual total catch of thorny skate has ranged from 29 fish in 2006 to 574 fish in 1973 (Table 26). In the NEFSC autumn surveys (1963-2007), the annual total catch of thorny skate has ranged from 36 fish in 2005 to 874 fish in 1978 (Table 27). Calculated on a per tow basis, these spring and autumn survey catches equate to maximum stratified mean number per tow indices for the GOMSNE offshore strata of about 2 to 3 fish, or about 6.0 kg, per tow during the early 1970s (Tables 26-27).

NEFSC spring and autumn survey indices for thorny skate have declined continuously over the last 40 years. Indices of thorny skate abundance and biomass from the NEFSC spring and autumn surveys were at a peak during the early 1970s, reaching 2.9 fish per tow (5.3 kg per tow) in the spring survey and 1.8 fish per tow (5.9 kg per tow) in the autumn survey. Kulka and Mowbray (1998) indicated a similar period of high abundance for thorny skate in Canadian waters. NEFSC indices of thorny skate abundance have declined steadily since the late 1970s, reaching historically low values by 2005-2007 that are less than10% of the peak observed in the 1970s (Figure 29).

The NEFSC scallop dredge survey also catches thorny skates primarily on the edges of Georges Bank and a sharp decline followed by no trend (Figure 30). The scallop survey also does not sample in the Gulf of Maine, on the very shallowest portions of Georges Bank and parts of Southern New England.

Indices of abundance for thorny skate are available from the Massachusetts Division of Marine Fisheries (MADMF) spring and autumn research trawl surveys in the inshore waters of Massachusetts for the years 1978-2008. MADMF indices of thorny skate biomass have been variable over the time series, but there is a decreasing trend evident in both the spring and autumn time series. The spring index has stabilized around the median of 0.2 kg/tow throughout the 2000's, while the autumn index has been below the median of 0.6 kg/tow since 1994 except for 2001 and 2002 (Figure 31).

Smooth skate

In the NEFSC spring surveys (1968-2008), the annual total catch of smooth skate has ranged from 12 fish in 1996 to 179 fish in 1973 (Table 28). In the NEFSC autumn surveys (1963-2007), the annual total catch of smooth skate has ranged from 10 fish in 1976 to 130 fish in 1978 (Table 29). Calculated on a per tow basis, these spring and autumn survey catches equate to maximum stratified mean number per tow indices for the GOM-MA offshore strata of 0.6 to 1.6 fish, or about 0.6 to 0.9 kg, per tow during the 1970s (Tables 28-29).

Indices of smooth skate abundance and biomass from the NEFSC surveys were at a peak during the early 1970s for the spring series and the late 1970s for the autumn series (Figure 32). NEFSC survey indices declined during the 1980s, before stabilizing during the early 1990s at about 25% of the autumn and 50% of the spring survey index values of the 1970s.

The NEFSC scallop dredge survey also catches smooth skates primarily on the edges of Georges Bank and the indices have slightly increased (Figure 33). The scallop survey also does not sample in the Gulf of Maine, on the very shallowest portions of Georges Bank and parts of Southern New England.

Clearnose skate

In the NEFSC spring surveys (1976-2008), the annual total catch of clearnose skate has ranged from 9 fish in 1979 to 136 fish in 1993 (Table 30). In the NEFSC autumn surveys (1975-2007), the annual total catch of clearnose skate has ranged from 19 fish in 1983 to 221 fish in 2001 (Table 31). Calculated on a per tow basis, these spring and autumn survey catches equate to maximum stratified mean number per tow indices for the Mid-Atlantic offshore and inshore strata set of 1.2-1.6 fish, or about 0.8-0.9 kg, per tow during the mid 1990s and 2000s (Tables 30-31).

The catchability of clearnose skate in the NEFSC winter bottom trawl survey (which substitutes a chain sweep with small cookies for the large rollers used in the spring and autumn surveys, to better target flatfish) is significantly higher than in the spring and autumn series. NEFSC winter survey (1992-2007) annual catches of clearnose skate have ranged from 343 fish in 1999 to 3,086 fish in 1996, equating to a maximum stratified mean catch per tow of 12 fish or 15 kg per tow in 1996 (Table B32). The winter survey is focused in the Southern New England and Mid-Atlantic offshore regions, with a limited number of samples on Georges Bank, and no sampling in the Gulf of Maine, and has been discontinued.

NEFSC spring and autumn survey indices for clearnose skate increased from the mid-1980s through 2000, declined to about average values, and increased slightly in the last few years (Figure 34).

Indices of abundance for clearnose skate are available from the Connecticut Department of Environmental Protection (CTDEP) spring and autumn finfish trawl surveys in Long Island Sound for the years 1984-2008 (1992 and later only for biomass). The CTDEP survey had caught very few clearnose skate, with annual catches ranging from 0 to 20 skates through 1998, but the indices have increased in Long Island Sound over the times series with 100 caught in 2005 (Figure 35).

Rosette skate

In the NEFSC spring surveys (1968-2008), the annual total catch of rosette skate has ranged from 0 fish, in 1970 and1984, to 70 fish in 1977 (Table 33). In the NEFSC autumn surveys (1967-2005), the annual total catch of rosette skate has ranged from 1 fish, most recently in 1982, to 46 fish in 1999 (Table 34). Calculated on a per tow basis, these spring survey catches equate to maximum stratified mean number per tow indices for the Mid-Atlantic offshore strata set of about 0.6 fish, or about 0.1 kg, per tow during 1977 (Tables 33-34).

The catchability of rosette skate in the NEFSC winter bottom trawl survey (which substitutes a chain sweep with small cookies for the large rollers used in the spring and autumn surveys, to better target flatfish) is significantly higher than in the spring and autumn series. NEFSC winter survey (1992-2007) annual catches of rosette skate have ranged from 143 fish in 1993 to 1029 fish in 2003, equating to a maximum stratified mean catch per tow of 2.8 fish or 0.7 kg per tow in 2003 (Table 35). The winter survey is focused in the Southern New England and Mid-Atlantic offshore regions, with a limited number of samples on Georges Bank, and no sampling in the Gulf of Maine and has since been discontinued.

Indices of rosette skate abundance and biomass from the NEFSC surveys were at a peak during 1975-1980, before declining through 1986. NEFSC survey indices for rosette skate increased from 1986 through 2001, declined slightly and recent indices are near the peak values of the late 1970s (Figure 36).

RESEARCH SURVEY DATA-SPAWNING STOCK BIOMASS

Maturity information was available in some form for all species to split the survey length information into mature and immature animals (Table 36). The series chosen for each species was the same as chosen for reference points at SARC30. There is a protracted spawning as females likely lay eggs year round so there is no need to pick a season based on spawning time. The autumn survey was used for all species except little as it is generally the longest. For little skate, the spring series from 1982 on was used to avoid gear conversion issues.

Winter skate SSB generally follows the pattern of the autumn total biomass index with very low values in the 1970s followed by the large expansion of the size composition in the 1980s (Table 36; Figure B37). The index of SSB declined in the mid- to late 1990s, increased slightly, and is currently at low values. Little skate SSB has been fairly stable through the time series with slightly higher values from 1999-2004 than in the 1980s and early 1990s (Table 36; Figure B37). The pattern in barndoor skate SSB indices is much the same as that of total biomass with high values in the early 1960s, followed by very low to nonexistent values in the 1970s and 1980s, and then a consistent increase in the 1990s and 2000s (Table B36; Figure 37). The decline in thorny skate SSB indices is more pronounced than for the total biomass index (Table 36; Figure 37). Smooth skate SSB indices are very variable, but exhibit a slight decline over the time series (Table 36; Figure 37). Clearnose skate SSB has increased over the time period (Table 36; Figure 37). Rosette skate SSB has been variable but has generally increased (Table 36; Figure 37).

Fishing Mortality Estimates

Gedamke and Hoenig (2006) developed a method to estimate mortality from mean length data in nonequilibrium situations, now called Survival Estimation in Non-Equilibrium Situations Model (SEINE, available at http://nft.nefsc.noaa.gov/). It is an extension of the Beverton-Holt

length-based mortality estimator that assumes constant recruitment throughout the time series and mortality at fixed levels for certain periods within the time series. The approach allows for the transitory changes in mean length to be modeled as a function of mortality rate changes. After an increase in mortality, mean length will gradually decrease due to larger animals being less prevalent in the population. After a decrease in mortality, mean length will increase slowly due to growth of the fish in the population. The rates of change in both cases depend on the von Bertalanffy growth parameters and the magnitude of change in the mortality rates. Since the method requires only a series of mean length above a user defined minimum size and the von Bertalanffy growth parameters, it can be applied in many data poor situations. Gedamke and Hoenig (2006) demonstrated the utility of this approach using both simulated data and an application to data for goosefish caught in the NEFSC fall groundfish survey.

Most of the information for the six species suggests that there is one break-point in the time series. This is not useful in monitoring the species on an annual basis. Further modeling efforts are required to estimate fishing mortality.

BIOLOGICAL REFERENCE POINTS

Current Reference Points

The existing biomass reference points were developed at SARC 30 (NEFSC 2000) and maintained at SARC 44 (NEFSC 2007) with B_{msy}Proxy formulated as the 75th percentile of the given time series of each species, except barndoor (Table 38) and half that value for $B_{threshold}$. It was assumed that all species had at some time passed through B_{msy} at some point in the time series. For barndoor skate, the mean of the first four years of the autumn survey were used instead, given that biomass had been extremely low during most of the time series. To reduce the variability in the survey estimates, a three-year moving average of the survey indices was proposed to evaluate stock status for all species (Figure 37).

The fishing mortality reference points developed at SARC 30 were not accepted by the NEFMC and a different method for evaluating fishing mortality was developed by the Plan Development Team (PDT). The thresholds for fishing mortality are based on annual percentage declines of the three-year average of the NEFSC trawl survey time series chosen for the biomass reference points. The percentages are specified for each species individually based on historical variation within the survey. The thresholds also include what is termed a precautionary "backstop" that indicates that overfishing is occurring if the trawl survey mean weight per tow declines for three consecutive years. The main part of the definition is that overfishing is occurring when the three-year moving average of the given survey biomass index declines by more than the average CV of the time series. The resulting status determinations are given in Table 39.

An Index Method

An Index Method (AIM, available at http://nft.nefsc.noaa.gov/) was attempted for all seven species using both spring and autumn surveys. For this method, the replacement ratios, defined as the biomass index in the current year divided by the average biomass indices from the previous 5 years was calculated. Autumn and spring survey biomass indices and total landings and total catch were used to compute the relative exploitation rates, defined as the catch in the current year divided by the 3 year average survey biomass index for the current year and the previous and following years. These relative exploitation rates (or relative F) may be considered

a proxy for F. The relationship between replacement ratios and relative F was evaluated by a linear regression of the Log_e replacement ratio on Log_e relative F. None of the relationships were significant and some were actually positive. This method was also attempted for the aggregate skate landings/catch for the four regions. These model runs were also unsuccessful.

SPR- Based Reference Points

SPR-based reference points for three skate species, Barndoor, Winter, and Thorny, were derived from life-history parameters and fitted Beverton-Holt stock recruit relationships. Estimated overfishing reference points for these three species are $F_{25\%}$, $F_{37\%}$, and $F_{46\%}$, respectively. Future assessments could estimate comparable F's from mean length models (SEINE, e.g.), or from age-specific assessment models provided discards and landings could be disaggregated to species level. Estimates of overfished reference points are also SPR based, and are defined in terms of depletion, i.e. the proportion of spawners relative to unexploited levels. For Barndoor, Winter, and Thorny skates, the depletion reference points are 0.20, 0.27, and 0.32, respectively. Future assessments could determine stock status by comparing these depletion levels either with depletion in the surveys (provided information is available to estimate depletion for the first year in the survey) or from a stock assessment model that incorporates information about maturity. The same approach to derive reference points was attempted for Clearnose skate, however the parameter estimates from stock recruit curve were unrealistic. There are several important caveats for the methods used in this working paper, namely, that a fixed value of M was assumed for all ages, that the errors in variables problem was ignored in fitting the stock recruit relationship (*status quo*), and that no fishing is assumed to occur prior to the age of recruitment. The sensitivity to the assumed M value is addressed by exploring alternative values. If any fishing were to occur prior to the age of recruitment, then the estimated slope at the origin (*a* in the Beverton-Holt function) would be biased low, leading to an SPR reference point having a positive bias. The details of the SPR-based reference points are given in Working Paper x.x. (Brooks et al).

REFERENCE POINT RECOMMENDATION

Until new models are constructed using the new catch by species information, the existing reference points will have to be sufficient. No alternatives were able to be determined which were measurable.

RESEARCH RECOMMENDATIONS

1) Given the new information on catch by species, efforts should be made to use a more complex model such as Stock Synthesis.

2) The identification of the species composition of the skate catch should be improved.

3) Age and growth studies, for all seven species in the complex, should be continued.

4) Fecundity studies, for all seven species in the complex, are needed. Use of life history models requires these data, and may prove useful in establishing biological reference points for the skate species.

5) Estimates of commercial and recreational fishery discard mortality rates, for different fishing gears and coastal regions and/or bottom types, for all seven species in the complex, are needed.

6) Studies of the stock structure of the species in the skate complex are needed to identify unit stocks. Stock identification studies, especially for barndoor, thorny, winter, and little skate, are needed.

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Table 1. Total commercial landings of skate (mt) in NAFO subareas 5 and 6 by country from 1960-2007. U.S. landings are from NAFO database from 1964-1978, weighout from 1979-2007.

	US	USSR	Others	Total
1964	4081	0	2	4083
1965	2343	0	20	2363
1966	2738	0	106	2844
1967	2715	2121	62	4898
1968	2417	3974	92	6483
1969	3045	6410	7	9462
1970	1583	2544	1	4128
1971	900	5000	5	5905
1972	866	7957	0	8823
1973	1191	6754	18	7963
1974	2026	1623	2	3651
1975	752	3216	0	3968
1976	754	412	46	1212
1977	1143	240	35	1418
1978	1130	216	7	1353
1979	1280	79	64	1423
1980	1577	0	73	1650
1981	838	0	9	847
1982	878	0	0	878
1983	3603	0	0	3603
1984	4157	0	0	4157
1985	3984	0	0	3984
1986	4159	0	94	4253
1987	5078	0	0	5078
1988	7255	0	9	7264
1989	6707	0	0	6707
1990	11403	0	0	11403
1991	11332	0	0	11332
1992	12525	0	0	12525
1993	12904	0	0	12904
1994	8783	0	0	8783
1995	7217	0	0	7217
1996	14213	0	0	14213
1997	10945	0	0	10945
1998	13832	0	0	13832
1999	11684	0	0	11684
2000	13360	0	0	13360
2001	13120	0	0	13120
2002	13004	0	0	13004
2003	15005	0	0	15005
2004	16072	0	0	16072
2005	14113	0	0	14113
2006	16158	0	0	16158
2007	19085	0	0	19085

Table 2. U.S. commerical landings (mt, live wt) of skates (all species) by month from 1964-2007.

	Month												
year	0	1	2	3	4	5	6	7	8	9	10	11	12	Total
1964	4050.3	2.0	3.9	3.6	3.1	2.0	1.6	0.9	1.3	1.6	2.0	2.1	6.4	4081.0
1965	2304.4	5.4	7.2	7.5	4.3	2.4	0.4	0.6	1.2	0.6	2.3	2.6	4.2	2343.0
1966	2707.1	6.4	7.3	6.0	1.0	0.9	0.2	0.1	0.7	1.7	1.4	2.4	2.9	2738.0
1967	2643.3	15.1	7.3	18.1	7.7	3.0	1.6	0.6	0.4	1.8	6.1	2.9	7.1	2715.0
1968	2381.3	10.3	1.9	5.3	1.3	1.5	1.3	1.5	2.6	3.0	2.8	2.5	1.7	2417.0
1969	2993.4	4.1	6.2	5.7	6.2	2.5	2.3	3.1	3.2	3.0	5.0	5.7	4.6	3045.0
1970	1513.4	6.1	8.6	13.9	7.0	4.1	3.4	5.6	5.3	8.3	4.1	2.1	1.1	1583.0
1971	836.7	4.9	6.2	8.5	7.3	7.7	2.7	3.0	2.8	3.5	8.2	3.9	4.7	900.0
1972	780.1	7.2	6.9	12.1	12.3	9.1	4.9	5.7	7.8	4.3	4.2	5.9	5.5	866.0
1973	1104.1	8.3	3.9	10.4	12.4	7.1	6.7	7.1	7.0	8.1	7.1	4.7	4.1	1191.0
1974	1945.9	5.7	4.9	5.6	12.3	8.0	4.6	4.4	12.3	6.7	5.2	2.6	7.8	2026.0
1975	637.9	7.3	10.1	16.6	16.2	13.0	7.3	6.7	7.6	9.8	5.6	6.9	6.9	752.0
1976	641.8	8.4	12.5	19.2	22.4	9.6	4.3	8.1	4.7	6.9	3.1	6.3	6.8	754.0
1977	994.7	15.4	19.7	27.9	20.0	9.0	8.9	6.8	11.0	7.0	8.8	9.3	4.5	1143.0
1978	827.4	19.3	24.7	11.7	29.8	30.5	46.4	33.9	26.2	23.2	20.9	19.3	16.7	1130.0
1979	787.4	24.8	24.8	46.5	62.6	50.4	28.1	29.4	55.5	38.8	42.1	52.9	36.5	1279.6
1980	961.1	61.5	112.6	121.1	82.8	63.9	27.3	26.4	24.4	22.8	27.4	20.5	25.4	1577.2
1981	509.9	33.9	30.8	54.4	31.1	26.7	25.3	15.1	24.5	23.1	12.3	19.2	31.9	838.4
1982	449.5	30.4	23.3	54.0	47.5	58.2	18.9	25.3	35.1	32.3	34.4	31.3	38.2	878.1
1983	2720.3	84.1	95.9	134.0	95.4	102.3	76.3	44.1	66.1	53.3	37.0	56.6	37.5	3603.0
1984	3325.7	99.4	127.3	134.9	108.6	84.0	36.7	30.9	29.0	25.9	37.0	54.2	63.0	4156.5
1985	3220.7	85.4	85.5	150.6	142.7	31.6	29.9	33.2	29.9	28.8	37.7	59.3	48.6	3984.1
1986	3173.4	98.6	89.7	149.7	147.8	91.8	36.4	33.7	49.0	28.2	72.6	86.3	102.5	4159.5
1987	3638.7	83.8	114.3	207.7	227.0	245.3	106.2	40.3	53.0	33.8	87.6	101.5	139.1	5078.4
1988	5141.7	281.6	338.2	378.7	284.0	150.3	74.5	154.5	137.9	75.0	54.1	66.2	118.8	7255.5
1989	4157.8	240.1	150.3	227.1	454.3	292.6	102.6	142.2	272.3	221.9	174.8	173.0	98.4	6707.3
1990	4252.9	136.6	182.0	424.8	834.4	948.5	1174.9	763.8	818.7	624.4	265.9	542.3	433.4	11402.5
1991	4255.9	464.0	423.8	460.9	606.0	419.8	370.4	658.1	925.7	515.5	565.5	958.9	708.0	11332.3
1992	4782.2	517.3	457.7	510.1	567.1	564.3	816.2	764.4	718.2	862.3	639.1	771.1	555.4	12525.3
1993	4860.4	335.1	265.6	471.2	741.7	875.2	823.2	1005.6	859.1	712.4	535.5	864.0	555.0	12904.0
1994	175.5	338.2	309.8	291.7	501.5	855.1	1238.5	780.9	1263.7	960.6	937.7	787.3	342.9	8783.3
1995	1.0	183.8	285.7	413.6	515.5	752.0	915.7	768.4	752.2	557.7	724.8	897.2	449.7	7217.2
1996	2.3	224.6	229.3	206.5	360.1	1012.0	1389.7	1539.8	1577.6	1720.4	2440.4	2411.8	1098.4	14212.8
1997		530.8	469.9	597.5	395.5	969.4	1127.6	1181.8	1189.6	1062.3	1084.2	1305.2	1031.1	10944.8
1998		518.9	589.8	625.4	814.9	1406.0	1702.2	1643.9	1512.7	1551.5	1224.9	1277.1	964.5	13831.8
1999		511.2	401.0	591.8	678.6	1295.5	1436.2	1039.3	1137.7	1388.8	1055.8	1250.0	898.1	11683.9
2000		667.8	615.2	1024.2	826.2	1187.7	1594.2	1188.5	1534.6	1270.1	946.4	1583.6	921.1	13359.7
2001		802.4	588.6	956.2	967.3	984.0	1058.2	1150.5	1465.1	1197.3	1115.1	1692.1	1143.6	13120.4
2002		742.3	730.7	783.2	1093.9	773.5	1372.6	998.7	1488.6	1247.8	1352.1	1264.4	1156.3	13004.0
2003		548.3	447.6	857.4	1043.7	1006.6	1183.0	1632.9	1867.9	1889.1	1993.3	1563.3	971.9	15004.9
2004		538.1	1278.0	1305.0	1391.0	1155.1	1456.9	2008.8	1557.9	1573.6	1115.7	1541.6	1150.2	16071.8
2005		871.6	1204.4	1077.6	1176.6	1071.0	1314.7	1763.2	1689.3	1336.1	828.5	974.5	805.5	14113.0
2006		939.8	1036.9	1490.8	1564.6	921.8	1250.3	1741.1	1847.2	1071.4	1498.6	1653.3	1142.1	16157.7
2007		778.6	702.9	1225.9	1481.5	1254.7	2524.2	2916.6	2498.0	1587.6	1528.2	1348.4	1238.1	19084.8

Table 3. U.S. commercial landings (mt, live wt) of skates (all species) by state from 1964-2007. Data are from weighout database.

	STATE											
year	CT	DE	ME	MD	MA	NH	NJ	NY	NC	RI	VA	Total
1964					28.2					2.4		30.7
1965					38.1					0.4		38.6
1966					30.1					0.8		30.9
1967					71.1					0.5		71.7
1968					35.7							35.7
1969					51.6							51.6
1970					69.0					0.6		69.6
1971					61.9					1.4		63.3
1972					85.2					0.7		85.9
1973			1.5		80.9					4.6		86.9
1974			8.8		67.2					4.1		80.1
1975			14.9		94.8					4.4		114.1
1976			36.2		74.9					1.1		112.2
1977			62.6		82.0					3.7		148.3
1978			86.9		161.8		2.9			50.9		302.6
1979			181.1		259.0		0.7			51.5		492.2
1980			197.5		297.5		0.4			120.7		616.1
1981			151.2		137.3	2.2	0.8			37.0		328.4
1982			175.0		210.4	3.9	0.1			39.3		428.7
1983			258.8		455.0	3.3	0.6			165.0		882.7
1984			230.8		445.4	2.6	0.7			150.8	0.5	830.8
1985			144.5		409.3	2.3	2.4			204.9		763.3
1986			107.6		363.8	1.1	10.8	55.0		447.2	0.6	986.1
1987			168.9		746.2	20.6	8.9	133.1		361.9		1439.7
1988			81.9		1376.2	51.9	10.5	172.2		420.9		2113.7
1989	12.2		99.8		2030.1	18.6	18.2	107.7		4420.0	0.7	6707.3
1990	146.9		47.1	1.7	5742.0	10.5	8.8	162.4		5282.1	1.1	11402.5
1991	113.3		16.9		5696.1	12.4	125.4	56.9		5310.7	0.6	11332.3
1992	97.0		45.1	0.6	5923.3	10.1	267.2	231.1		5950.1	0.8	12525.3
1993	237.9		167.1	4.1	6118.5	9.5	376.1	168.2		5820.3	2.3	12904.0
1994	175.5		442.9	46.6	6616.4	37.2	186.1	225.3		1047.1	6.4	8783.3
1995	309.3		349.2	45.6	2926.5	24.6	291.4	141.7		3111.5	17.3	7217.2
1996	432.0		267.4	55.8	9016.9	20.3	339.2	164.2		3908.8	8.3	14212.8
1997	357.5		221.0	97.8	3933.4	17.0	794.8	374.5	9.4	5131.4	8.1	10944.8
1998	441.9		162.2	95.6	6325.0	19.1	807.8	575.0	9.1	5372.5	23.6	13831.8
1999	518.3		218.8	63.5	4809.3	26.3	636.8	396.8	2.6	4911.9	99.6	11684.0
2000	493.8		138.0	65.6	6517.8	38.4	564.6	387.7	20.6	4825.0	308.2	13359.7
2001	618.9		138.2	55.5	6683.5	33.2	624.7	366.7	0.1	4536.2	63.4	13120.4
2002	367.6		137.2	52.0	6335.0	24.5	582.4	462.9	0.3	5029.6	12.7	13004.0
2003	433.7		76.4	26.9	8098.0	14.9	448.7	353.3	0.8	5516.6	35.7	15004.9
2004	441.7	0.0	13.3	6.2	10075.9	10.6	374.3	222.7	0.5	4881.0	45.7	16071.8
2005	353.4		10.9	8.4	8988.9	9.4	334.8	157.5	0.5	4219.1	30.3	14113.0
2006	259.6		1.5	14.6	11132.7	11.2	451.6	229.3	0.1	4051.5	5.5	16157.7
2007	256.2		29.9	18.2	13554.4	5.6	524.1	324.9	0.3	4319.4	51.8	19084.8

Table 4. U.S. Commercial landings (mt, live wt) of skates (all species) by gear type from 1964-2007. Landings are from weighout database.

	gear				
year	longline	otter trawl	other	sink gillnet	Total
1964	0.1	30.5		0.0	30.7
1965	0.3	38.2		0.0	38.6
1966		30.9			30.9
1967		71.7			71.7
1968		35.7			35.7
1969		51.5		0.0	51.6
1970	0.6	68.8	0.0	0.2	69.6
1971	1.1	62.0		0.1	63.3
1972	3.7	80.8	0.1	1.3	85.9
1973	7.0	77.9	1.9	0.2	86.9
1974	10.5	64.3	0.2	5.1	80.1
1975	11.7	101.4	0.1	0.8	114.1
1976	16.2	93.3	0.2	2.5	112.2
1977	13.4	126.8	0.9	7.2	148.3
1978	4.4	290.0	3.2	5.0	302.6
1979	18.4	456.0	5.8	12.0	492.2
1980	16.5	577.9	6.0	15.6	616.1
1981	5.1	311.7	1.2	10.4	328.4
1982	2.0	408.4	7.4	10.8	428.7
1983	3.4	846.2	22.5	10.6	882.7
1984	5.0	796.5	19.1	10.3	830.8
1985	3.7	721.5	17.8	20.3	763.3
1986	6.6	954.4	14.2	10.9	986.1
1987	22.4	1384.4	16.1	16.8	1439.7
1988	5.7	2070.7	22.2	15.2	2113.7
1989	30.6	6636.1	27.3	13.4	6707.3
1990	3.8	11339.6	47.7	11.5	11402.5
1991	24.3	11169.9	77.0	61.1	11332.3
1992	21.9	12242.5	35.1	225.8	12525.3
1993	63.4	11913.6	204.6	722.3	12904.0
1994	193.9	7174.3	374.9	1040.1	8783.3
1995	98.6	5725.5	416.2	976.8	7217.2
1996	54.3	12879.6	141.9	1137.1	14212.8
1997	47.6	9157.6	394.0	1345.5	10944.8
1998	53.9	11704.7	449.8	1623.5	13831.8
1999	38.2	10073.7	105.5	1466.6	11684.0
2000	37.7	11444.7	81.7	1795.5	13359.7
2001	13.2	10808.4	46.4	2252.5	13120.4
2002	14.2	9630.3	45.0	3314.5	13004.0
2003	30.0	10553.2	65.1	4356.5	15004.9
2004	24.7	11355.7	665.7	4025.7	16071.8
2005	175.9	9249.8	1078.6	3608.8	14113.0
2006	11.4	10523.0	838.2	4785.0	16157.7
2007	12.2	12531.0	339.1	6202.6	19084.8

Table 5. Landings of skate by region.

	gm	gb	sne	ma
1968	30	2641	3802	10
1969	50	252	8425	735
1970	62	1742	2178	146
1971	51	2681	3014	159
1972	264	5384	3087	88
1973	60	5097	2701	105
1974	63	1116	2359	113
1975	95	2965	722	186
1976	96	450	487	179
1977	126	215	823	254
1978	181	94	871	207
1979	469	215	559	179
1980	609	394	465	182
1981	344	122	272	109
1982	434	165	216	63
1983	486	240	2824	53
1984	445	234	3411	71
1985	372	183	3379	50
1986	309	103	3634	207
1987	585	333	3968	193
1988	1140	404	5394	326
1989	909	1243	4395	160
1990	1076	4905	5249	173
1991	979	4801	5306	246
1992	644	4944	6430	508
1993	982	5143	5826	953
1994	800	5964	1340	680
1995	590	2060	3826	742
1996	579	8210	4579	845
1997	549	3095	5802	1498
1998	1064	5160	5392	2216
1999	909	3997	4390	2388
2000	1050	5517	4508	2284
2001	689	5784	4294	2354
2002	799	4936	4516	2753
2003	491	6811	5575	2129
2004	259	8632	5060	2121
2005	310	6900	5571	1333
2006	337	8367	6173	1280
2007	358	11502	5664	1561

Table 6. U.S. landings (mt, live wt) of skates by species and markey category from 1964-2007. Landings are from weighout database.

	Species and Market Category																	
YEAR	Uncl.	Uncl.	Winter	Winter	Little	Little	Barndoor	Barndoor	Thorny	Thorny	Smooth	Smooth	Clearnose	Clearnose	Rose	Rose	Total	
	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings
1964	30.7																30.7	0.0
1965	38.6																38.6	0.0
1966	30.9																30.9	0.0
1967	71.7																71.7	0.0
1968	35.7																35.7	0.0
1969	51.6																51.6	0.0
1970	69.6																69.6	0.0
1971	63.3																63.3	0.0
1972	85.9																85.9	0.0
1973	86.9																86.9	0.0
1974	80.1		0.0														80.1	0.0
1975	114.1																114.1	0.0
1976	112.2																112.2	0.0
1977	148.3																148.3	0.0
1978	302.6																302.6	0.0
1979	492.2																492.2	0.0
1980	616.1																616.1	0.0
1981	328.4																328.4	0.0
1982	277.2	151.4															277.2	151.4
1983	169.6	713.0															169.6	713.0
1984	68.1	762.8															68.1	762.8
1985	68.3	695.0															68.3	695.0
1986	262.6	723.5															262.6	723.5
1987	87.5	1352.2															87.5	1352.2
1988	74.2	2039.6															74.2	2039.6
1989	4163.1	2544.2															4163.1	2544.2
1990	5002.9	6399.6															5002.9	6399.6
1991	5069.2	6262.5			0.6												5069.7	6262.5
1992	5860.5	6664.7															5860.5	6664.7
1993	5526.6	7377.5	0.0														5526.6	7377.5
1994	703.4	8079.9															703.4	8079.9
1995	3095.1	3985.5			136.6												3231.7	3985.5
1996	3981.5	10230.8	0.4		0.2												3982.0	10230.8
1997	5369.1	5575.6															5369.1	5575.6
1998	5391.8	8440.0			0.0												5391.8	8440.0
1999	5026.7	6655.3					2.1										5028.7	6655.3
2000	3633.2	8690.6	0.0		1036.0	0.1	0.0										4669.1	8690.6
2001	4399.5	8718.5	2.2		0.0	0.1						0.1					4401.7	8718.7
2002	4396.9	8606.9				0.1		0.1									4396.9	8607.1
2003	4327.8	10650.0	0.8	26.0	0.2						0.1						4328.8	10676.0
2004	998.1	8450.3	2.8	2697.5	2867.4	8.6	0.3	0.1	0.0	95.6	1.0	927.2	3.5	16.6		2.7	3873.2	12198.5
2005	417.1	6679.4	59.3	3301.4	3449.6	15.6	0.2	5.4	1.5	126.2	0.6	1.0	33.3		16.6	5.9	3978.2	10134.9
2006	1101.0	8543.5	79.3	2904.6	3138.3	6.4		2.2		137.4	0.6	31.9	189.6		8.5	14.5	4517.2	11640.5
2007	1279.3	11129.7	41.0	2796.4	3479.4	0.3		1.2	11.5	113.4	0.1	26.7	176.1		15.1	14.8	5002.5	14082.4

Table 7. U.S. landings (mt, live wt) of skates by state, species and markey category from 2004-2007.

		Species and Market Category																	
		Uncl.	Uncl.	Winter	Winter	Little	Little	Barndoor	Barndoor	Thorny	Thorny	Smooth	Smooth	Clearnose	Clearnose	Rosette	Rosette	Total	
YEAR	State	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings	Whole	Wings
2004	CT	369.9	71.8															369.9	71.8
	DE	0.0																0.0	0.0
	ME	0.0	12.2		1.2													0.0	13.3
	MD	1.0	2.4		2.7	0.1												1.1	5.1
	MA	17.7	6482.2	0.2	2467.9	97.5				0.0	83.4	0.1	926.8				0.1	115.5	9960.4
	NH		5.1		5.4						0.1							0.0	10.6
	NJ	1.5	131.2	0.3	135.5	103.0	2.7				0.1							104.8	269.5
	NY	23.3	183.6	1.2	0.6	0.7	0.1				12.0	1.0	0.3					26.1	196.7
	NC		0.5															0.0	0.5
	RI	583.7	1537.3	1.2	84.2	2666.1	5.8										2.6	3251.0	1630.0
	VA	1.1	24.0					0.3	0.1					3.5	16.6			4.9	40.8
	Total	998.1	8450.3	2.8	2697.5	2867.4	8.6	0.3	0.1	0.0	95.6	1.0	927.2	3.5	16.6	0.0	2.7	3873.2	12198.5
2005	CT	275.6	77.7															275.6	77.7
	ME		10.2		0.5		0.2											0.0	10.8
	MD	2.3	6.1															2.3	6.1
	MA	60.2	5699.0	21.7	3071.7	21.1			1.3	1.5	111.6	0.0	0.7					104.5	8884.4
	NH	0.0	9.4															0.0	9.4
	NJ	0.4	120.0	24.4	110.7	45.0	1.1					0.4		32.7				102.9	231.9
	NY	12.3	96.6	0.4	1.6	12.7	0.2	0.2	4.1		12.6	0.0	0.3			16.6		42.2	115.3
	NC		0.5															0.0	0.5
	RI	65.9	630.4	12.8	116.9	3370.9	14.1				2.0	0.2	0.1				5.9	3449.7	769.4
	VA	0.3	29.3											0.7				1.0	29.3
	Total	417.1	6679.4	59.3	3301.4	3449.6	15.6	0.2	5.4	1.5	126.2	0.6	1.0	33.3	0.0	16.6	5.9	3978.2	10134.9
2006	CT	190.5	69.1															190.5	69.1
	ME		1.5															0.0	1.5
	MD	5.0	4.2		2.3	2.2	0.9											7.2	7.4
	MA	834.2	7584.2	62.7	2317.9	196.2	0.2				136.6	0.6					0.0	1093.7	10039.0
	NH		11.2								0.0							0.0	11.2
	NJ	5.3	45.8	0.7	165.9	11.8	2.9						31.8		187.4			17.8	433.9
	NY	11.2	176.0		19.3	10.1			2.2				0.1			8.5	2.1	29.7	199.6
	NC	0.1	0.0															0.1	0.0
	RI	54.7	648.1	15.9	399.2	2918.1	2.4				0.8						12.4	2988.6	1062.9
	VA		3.4											2.2				2.2	3.4
	Total	1101.0	8543.5	79.3	2904.6	3138.3	6.4	0.0	2.2	0.0	137.4	0.6	31.9	2.2	187.4	8.5	14.5	4329.8	11827.9
2007	CT	195.4	60.8															195.4	60.8
	ME		29.9															0.0	29.9
	MD	9.0	6.9		1.5	0.4	0.3											9.4	8.8
	MA	958.0	9993.9	22.7	2390.9	56.3				11.5	103.2		18.0					1048.4	12506.1
	NH		5.3		0.3													0.0	5.6
	NJ	0.1	107.2	1.8	203.4	31.8							8.3	171.6				205.2	318.9
	NY	14.3	247.8	8.3	27.8	3.9			1.2		9.4	0.1	0.3			11.9		38.5	286.4
	NC	0.3																0.3	0.0
	RI	91.7	645.4	8.2	171.5	3387.0					1.1			4.5			14.8	3491.5	832.7
	VA																	0.0	0.0
	Total	1268.7	11097.2	41.0	2795.3	3479.4	0.3	0.0	1.2	11.5	113.7	0.1	26.7	176.1	0.0	11.9	14.8	4988.7	14049.2

Table 8. Estimated discards (mt) of skates (all species) by gear type taken in the Gulf of Maine-Georges Bank region, 1964-2007

	Half 1				Scallop		Half 2				Scallop		
year	Line Trawl	Otter Trawl	Shrimp Trawl	Sink Gill Net	Dredge	Total Half 1	Line Trawl	Otter Trawl	Shrimp Tra	Sink Gill Net	Dredge	Total Half 2	Grand Total
1964	449	37,255	0	12	5,868	43,583	403	22,824	0	7	6,541	29,775	73,358
1965	498	38,321	0	16	2,284	41,120	522	24,329	0	5	600	25,456	66,575
1966	380	39,624	0	26	742	40,771	491	22,374	0	7	1,506	24,379	65,149
1967	329	30,462	0	21	575	31,387	323	19,148	0	8	2,295	21,775	53,162
1968	259	26,067	0	36	728	27,090	299	18,036	0	10	1,651	19,995	47,085
1969	281	25,173	0	32	1,004	26,490	455	15,909	0	6	1,935	18,305	44,795
1970	308	22,927	0	22	1,228	24,485	415	15,208	0	7	1,890	17,520	42,005
1971	472	21,746	0	21	1,749	23,988	615	14,941	0	8	1,458	17,023	41,011
1972	476	19,491	0	31	1,217	21,215	659	12,401	0	13	1,724	14,796	36,011
1973	569	19,548	0	30	1,758	21,905	640	13,558	0	15	1,502	15,715	37,620
1974	614	17,687	0	57	1,043	19,400	592	11,947	0	24	1,413	13,976	33,377
1975	680	15,631	280	60	1,303	17,953	613	11,792	36	26	2,047	14,514	32,467
1976	464	15,157	66	97	1,650	17,434	353	12,139	0	37	3,115	15,645	33,078
1977	341	19,662	39	166	3,299	23,507	294	14,148	0	47	7,176	21,664	45,171
1978	561	23,070	0	186	4,012	27,828	321	14,383	0	66	7,889	22,658	50,487
1979	779	22,771	26	153	5,275	29,004	508	16,612	0	67	8,454	25,641	54,645
1980	851	28,570	21	185	7,342	36,969	155	18,066	0	96	6,972	25,288	62,258
1981	332	29,786	99	252	8,206	38,676	95	15,643	0	93	9,501	25,332	64,008
1982	302	26,789	124	89	5,632	32,937	74	19,496	7	83	7,936	27,596	60,533
1983	297	29,695	115	113	4,802	35,022	93	16,467	22	69	5,663	22,314	57,336
1984	307	27,882	152	121	3,463	31,925	19	13,640	53	94	4,359	18,165	50,090
1985	263	22,242	225	112	2,308	25,149	52	10,748	70	81	4,720	15,671	40,820
1986	322	19,142	252	166	4,010	23,892	49	8,856	83	87	6,206	15,281	39,173
1987	536	15,330	288	137	3,905	20,197	166	8,272	46	85	7,574	16,144	36,340
1988	561	17,091	183	158	6,175	24,169	199	8,410	46	90	10,002	18,746	42,915
1989	503	18,497	73	37	6,349	25,459	161	8,727	17	1,265	11,105	21,276	46,735
1990	358	23,476	208	347	7,290	31,680	156	9,910	71	940	15,222	26,299	57,979
1991	1,069	11,624	243	99	9,842	22,877	264	8,680	44	628	10,383	19,999	42,876
1992	1,269	8,056	245	162	8,843	18,575	471	2,848	0	518	10,919	14,756	33,331
1993	169	4,528	35	119	4,512	9,362	125	11,482	1	1,406	4,928	17,942	27,305
1994	82	4,912	11	130	2,294	7,429	146	10,132	1	1,382	2,103	13,764	21,193
1995	147	7,492	8	209	398	8,253	152	2,312	1	2,029	1,647	6,141	14,393
1996	123	7,507	26	284	837	8,777	121	1,181	8	1,921	3,029	6,259	15,037
1997	119	3,788	32	110	1,804	5,854	123	3,189	2	987	3,165	7,466	13,320
1998	99	5,276	8	50	2,376	7,809	142	15,784	0	1,930	4,101	21,957	29,767
1999	112	2,870	4	98	1,207	4,292	123	7,146	0	1,799	2,957	12,024	16,316
2000	62	4,490	5	121	2,086	6,764	131	7,584	0	2,100	1,387	11,201	17,965
2001	87	19,242	0	188	518	20,034	92	6,262	0	1,241	582	8,176	28,210
2002	97	11,085	1	135	1,095	12,413	44	5,761	0	1,844	2,030	9,680	22,093
2003	34	11,684	8	253	1,836	13,815	24	9,848	0	1,995	1,975	13,842	27,656
2004	3	11,505	4	269	294	12,075	17	13,832	0	1,027	1,060	15,937	28,012
2005	91	9,468	2	399	594	10,554	54	12,844	0	925	2,212	16,034	26,588
2006	193	8,042	0	173	1,085	9,494	17	9,344	1	1,599	2,408	13,369	22,863
2007	46	10,703	0	378	871	11,999	27	11,158	0	1,439	3,418	16,042	28,041

Table 9. Estimated discards (mt) of skates (all species) by gear type taken in the Southern New England-Mid-Atlantic region, 1964-2007.

year	Line Trawl	Otter Trawl	Half 1 Sink Gill Net	Scallop Dredge	Total Half 1	Line Trawl	Otter Trawl	Half 2 Sink Gill Ne	Scallop Dredge	Total Half 2	Grand Total
1964	0	16,916	0	1	16,917	0	12,929	0	494	13,422	30,339
1965	0	20,746	0	2,108	22,854	0	15,053	0	7,343	22,396	45,250
1966	0	23,680	0	5,026	28,707	0	11,657	0	4,067	15,724	44,431
1967	0	26,886	0	2,257	29,143	0	13,933	0	1,771	15,704	44,848
1968	0	30,741	0	2,926	33,667	0	13,895	0	2,516	16,411	50,077
1969	1	30,557	0	1,279	31,837	1	11,827	0	683	12,510	44,348
1970	2	21,694	0	399	22,095	0	10,272	0	462	10,734	32,829
1971	2	13,419	0	91	13,511	0	4,979	0	756	5,735	19,246
1972	2	13,272	0	724	13,999	1	6,373	0	488	6,862	20,860
1973	11	15,425	0	391	15,828	4	6,227	0	173	6,404	22,232
1974	30	19,170	0	706	19,906	11	5,279	0	987	6,277	26,183
1975	30	9,882	0	1,069	10,981	11	5,131	0	2,060	7,202	18,183
1976	17	7,688	0	2,175	9,880	9	7,804	0	3,979	11,792	21,672
1977	9	7,639	0	3,302	10,950	3	7,169	0	1,352	8,525	19,475
1978	185	12,605	0	3,946	16,736	168	8,389	0	4,215	12,772	29,509
1979	86	16,229	0	3,399	19,714	164	10,770	0	2,929	13,862	33,576
1980	170	11,730	0	2,314	14,213	131	10,958	0	2,355	13,444	27,657
1981	180	13,828	0	1,065	15,072	131	10,028	0	976	11,135	26,208
1982	115	17,088	0	1,597	18,800	77	17,764	0	2,699	20,540	39,340
1983	99	20,196	0	3,646	23,941	66	15,883	0	4,480	20,429	44,371
1984	79	21,023	0	4,933	26,035	46	17,034	0	4,046	21,126	47,161
1985	56	18,452	0	4,302	22,809	66	12,401	0	3,220	15,687	38,496
1986	94	18,225	0	3,215	21,534	74	17,119	0	4,117	21,310	42,844
1987	99	21,129	0	8,277	29,504	81	15,105	0	8,492	23,678	53,182
1988	78	18,544	0	7,704	26,326	13	13,960	0	6,365	20,339	46,664
1989	45	19,166	0	12,414	31,625	22	11,537	0	5,363	16,923	48,548
1990	35	26,989	0	10,327	37,352	29	25,810	0	4,662	30,501	67,853
1991	112	11,258	0	8,285	19,655	64	21,176	0	5,567	26,807	46,462
1992	234	5,097	107	4,661	10,100	245	16,761	51	7,177	24,234	34,333
1993	75	3,466	94	5,366	9,000	34	10,309	45	7,260	17,648	26,648
1994	36	59,775	135	4,193	64,140	16	6,039	150	3,250	9,454	73,595
1995	18	15,368	234	8,729	24,349	23	9,305	91	18,394	27,813	52,162
1996	40	8,046	135	7,738	15,960	34	23,207	66	8,544	31,851	47,811
1997	58	2,978	282	9,318	12,636	49	2,957	76	3,779	6,861	19,496
1998	47	22,088	167	4,300	26,601	36	4,876	194	4,372	9,479	36,080
1999	23	920	500	6,023	7,466	17	2,370	140	4,990	7,517	14,983
2000	19	2,341	60	3,241	5,661	23	8,924	52	3,335	12,333	17,994
2001	31	1,750	215	3,260	5,256	38	1,989	51	2,701	4,779	10,035
2002	26	1,049	255	5,190	6,520	82	3,721	2,242	5,691	11,736	18,255
2003	36	6,200	268	6,096	12,600	32	7,549	289	6,108	13,978	26,578
2004	36	2,864	180	5,178	8,258	7	7,629	248	3,099	10,982	19,240
2005	0	4,633	634	5,523	10,789	0	6,115	354	2,419	8,888	19,678
2006	2	2,526	676	4,676	7,880	0	2,846	68	2,507	5,421	13,301
2007	0	3,913	661	5,234	9,808	0	5,334	406	4,161	9,901	19,709

Table 10. Estimated discards (mt) of skates (all species) by gear type, 1964-2007.

	Half 1				Scallop		Half 2				Scallop		
year	Line Trawl	Otter Trawl	Shrimp Trawl	Sink Gill Net	Dredge	Total Half 1	Line Trawl	Otter Trawl	Shrimp Tra	Sink Gill Net	Dredge	Total Half 2	Grand Total
1964	449	54,171	0	12	5,869	60,500	403	35,752	0	7	7,035	43,197	103,696
1965	498	59,067	0	16	4,392	63,974	522	39,381	0	5	7,943	47,852	111,826
1966	380	63,304	0	26	5,768	69,478	491	34,031	0	7	5,573	40,103	109,580
1967	329	57,348	0	21	2,832	60,530	323	33,081	0	8	4,066	37,479	98,009
1968	259	56,808	0	36	3,653	60,756	299	31,931	0	10	4,167	36,406	97,162
1969	283	55,730	0	32	2,283	58,327	455	27,736	0	6	2,617	30,815	89,142
1970	310	44,621	0	22	1,627	46,580	415	25,480	0	7	2,352	28,253	74,833
1971	474	35,165	0	21	1,840	37,499	615	19,920	0	8	2,214	22,758	60,257
1972	478	32,764	0	31	1,941	35,213	659	18,774	0	13	2,211	21,658	56,871
1973	580	34,973	0	30	2,150	37,732	644	19,785	0	15	1,674	22,119	59,852
1974	644	36,856	0	57	1,749	39,306	603	17,226	0	24	2,400	20,253	59,560
1975	710	25,513	280	60	2,371	28,934	624	16,923	36	26	4,106	21,716	50,650
1976	481	22,845	66	97	3,825	27,314	362	19,943	0	37	7,094	27,436	54,750
1977	350	27,301	39	166	6,601	34,457	296	21,317	0	47	8,528	30,189	64,646
1978	746	35,675	0	186	7,958	44,565	489	22,772	0	66	12,104	35,430	79,995
1979	864	39,000	26	153	8,674	48,717	672	27,382	0	67	11,382	39,504	88,221
1980	1,021	40,300	21	185	9,656	51,183	285	29,024	0	96	9,327	38,732	89,915
1981	512	43,614	99	252	9,271	53,749	226	25,671	0	93	10,478	36,467	90,216
1982	417	43,877	124	89	7,228	51,737	151	37,260	7	83	10,635	48,136	99,873
1983	396	49,891	115	113	8,448	58,963	159	32,350	22	69	10,143	42,744	101,707
1984	385	48,904	152	121	8,396	57,959	65	30,674	53	94	8,406	39,292	97,251
1985	318	40,693	225	112	6,609	47,958	117	23,149	70	81	7,940	31,358	79,316
1986	415	37,367	252	166	7,225	45,425	123	25,975	83	87	10,323	36,591	82,016
1987	635	36,459	288	137	12,182	49,701	247	23,377	46	85	16,066	39,821	89,523
1988	639	35,635	183	158	13,879	50,495	212	22,370	46	90	16,366	39,085	89,579
1989	547	37,663	73	37	18,763	57,084	183	20,264	17	1,265	16,469	38,198	95,282
1990	393	50,465	208	347	17,618	69,032	185	35,720	71	940	19,884	56,800	125,832
1991	1,181	22,882	243	99	18,127	42,532	328	29,856	44	628	15,950	46,806	89,338
1992	1,503	13,153	245	269	13,504	28,674	716	19,609	0	569	18,096	38,990	67,664
1993	244	7,994	35	212	9,877	18,362	160	21,791	1	1,452	12,187	35,591	53,953
1994	118	64,688	11	265	6,487	71,569	162	16,171	1	1,532	5,352	23,218	94,788
1995	165	22,860	8	443	9,127	32,602	176	11,617	1	2,120	20,041	33,954	66,556
1996	164	15,554	26	419	8,575	24,737	155	24,388	8	1,987	11,573	38,110	62,848
1997	177	6,766	32	392	11,123	18,489	172	6,146	2	1,062	6,944	14,327	32,816
1998	146	27,363	8	217	6,676	34,410	178	20,659	0	2,124	8,474	31,436	65,846
1999	136	3,790	4	598	7,230	11,758	139	9,516	0	1,939	7,947	19,542	31,299
2000	81	6,831	5	181	5,326	12,425	153	16,508	0	2,152	4,721	23,535	35,959
2001	118	20,992	0	403	3,778	25,290	130	8,250	0	1,292	3,283	12,955	38,245
2002	123	12,134	1	390	6,285	18,933	126	9,482	0	4,087	7,721	21,416	40,348
2003	70	17,884	8	522	7,931	26,415	56	17,397	0	2,284	8,083	27,820	54,235
2004	40	14,369	4	449	5,472	20,333	24	21,461	0	1,275	4,159	26,919	47,252
2005	91	14,100	2	1,033	6,117	21,343	54	18,959	0	1,279	4,630	24,922	46,265
2006	194	10,569	0	849	5,761	17,374	18	12,190	1	1,667	4,916	18,790	36,164
2007	46	14,616	0	1,038	6,105	21,807	27	16,492	0	1,845	7,579	25,943	47,750

Table 11. Number of landed skates measured by fishery, region and season. The bait fishery are fish <= 60 cm while the wings are those > 60 cm.

GOM-GBK

YEAR	half 1 bait	half 1 wings	half 1 total	half 2 bait	half 2 wings	half 1 total	Grand Total
1994	27	36	63	19	20	39	102
1995	0	118	118	0	0	0	118
1996	45	38	83	4	14	18	101
1997	0	0	0	1	15	16	16
1998	0	17	17	0	0	0	17
1999	8	160	168	0	251	251	419
2000	43	102	145	0	438	438	583
2001	0	378	378	40	1222	1262	1640
2002	1	591	592	22	2088	2110	2702
2003	4	1304	1308	166	6656	6822	8130
2004	62	1464	1526	114	5931	6045	7571
2005	147	917	1064	146	1543	1689	2753
2006	34	1063	1097	175	7087	7262	8359
2007	232	46	278	39	21	60	338

SNE-MA

YEAR	half 1 bait	half 1 wings	half 1 total	half 2 bait	half 2 wings	half 1 total	Grand Total
1994	0	0	0	155	191	346	346
1995	9	327	336	301	17	318	654
1996	2	408	410	152	128	280	690
1997	295	257	552	14	441	455	1007
1998	27	1462	1489	199	653	852	2341
1999	67	305	372	76	264	340	712
2000	131	335	466	526	69	595	1061
2001	886	502	1388	1359	1967	3326	4714
2002	932	873	1805	95	286	381	2186
2003	540	489	1029	939	2228	3167	4196
2004	811	2542	3353	133	945	1078	4431
2005	706	854	1560	1121	774	1895	3455
2006	1300	563	1863	584	152	736	2599
2007	749	606	1355	2288	332	2620	3975

Table 12. Selectivity parameter estimates for observed skate landings fitted to survey length frequencies using the SELECT model (Millar 1992).

Winter skate

	Trawl, wings			Trawl, whole		Gillnet
	GoM	GB	MA	GoM	GB	
a =	Insufficient data	1.278	Insufficient data	Insufficient data	4.401	
b =		0.103			0.037	
δ =		0.00042			0.00192	
L50%		**66.911**			**60.817**	
SE		34530.57			901.88	
Range		15.32			43.07	
Log-likelihood		-11.74			-26.84	
AIC		29.49			59.68	

Little skate

	Trawl, wings			Trawl, whole		Gillnet
	GoM	GB	MA	GoM	GB	
a =	Insufficient data	Insufficient data	Insufficient data	-0.004	2.094	
b =				0.111	0.125	
δ =				0.01140	0.00082	
L50%				**43.46**	**43.04**	
SE				774.22	4369.11	
Range				14.18	12.58	
Log-likelihood				-8.38	-5.08	
AIC				22.75	16.16	

All landed skates

	Trawl, wings			Trawl, whole				Gillnet
	GoM	GB	MA	All	GoM	GB	MA	All	
a =	Insufficient data	Insufficient data	Insufficient data	-0.080	2.407	1.800	1.689	5.014	
b =				0.112	0.076	0.065	0.031	0.052	
δ =				0.002	0.003	0.010	0.068	0.001	
L50%				**59.85**	**48.75**	**48.35**	**43.03**	**44.36**	
SE				16247.71	1390.32	276.63	27.61	1789.43	
Range				14.05	20.80	24.14	51.36	30.00	
Log-likelihood				-5.28	-19.86	-12.20	-20.96	-11.23	
AIC				16.55	45.72	30.40	47.92	28.45	

Richard equation:

$R(l) = [\exp(a+b*l)/(1+\exp(a+b*l))]^{1/\delta}$

Table 13. Species composition of landings using the length composition method. The first three columns are metric tons, the last three are in pounds.

		market			market		
		bait	wings	Grand Total	bait	wings	Grand Total
1995	winter	1060.72	3392.77	4453.48	2,338,486	7,479,767	9,818,252
	little	1926.66	0.00	1926.66	4,247,565	0	4,247,565
	barndoor	2.08	81.03	83.11	4,584	178,644	183,227
	thorny	0.60	313.97	314.57	1,330	692,180	693,511
	smooth	0.77	0.00	0.77	1,706	0	1,706
	clearnose	214.47	134.01	348.48	472,827	295,431	768,258
	rosette	5.39	0.00	5.39	11,886	0	11,886
	Total	3210.70	3921.77	7132.47	7,078,384	8,646,022	15,724,406
1996	winter	1165.20	8886.34	10051.54	2,568,833	19,591,016	22,159,849
	little	2399.89	0.00	2399.89	5,290,862	0	5,290,862
	barndoor	0.02	336.37	336.39	38	741,568	741,606
	thorny	0.39	759.13	759.51	851	1,673,587	1,674,438
	smooth	0.37	0.00	0.37	822	0	822
	clearnose	377.56	162.33	539.89	832,372	357,871	1,190,243
	rosette	11.01	0.00	11.01	24,268	0	24,268
	Total	3954.44	10144.16	14098.60	8,718,046	22,364,042	31,082,087
1997	winter	1050.68	4303.02	5353.70	2,316,356	9,486,530	11,802,887
	little	3792.04	0.00	3792.04	8,360,013	0	8,360,013
	barndoor	0.01	281.03	281.04	26	619,554	619,580
	thorny	1.38	509.00	510.38	3,046	1,122,149	1,125,195
	smooth	2.64	4.35	6.99	5,815	9,584	15,399
	clearnose	451.84	296.89	748.73	996,134	654,530	1,650,664
	rosette	12.90	0.00	12.90	28,439	0	28,439
	Total	5311.49	5394.28	10705.77	11,709,829	11,892,347	23,602,176
1998	winter	1025.76	7318.49	8344.25	2,261,416	16,134,513	18,395,929
	little	4028.73	0.00	4028.73	8,881,828	0	8,881,828
	barndoor	0.62	160.49	161.12	1,378	353,828	355,205
	thorny	1.91	626.28	628.19	4,205	1,380,710	1,384,915
	smooth	7.83	0.00	7.83	17,264	0	17,264
	clearnose	266.14	181.31	447.45	586,744	399,721	986,465
	rosette	27.33	0.00	27.33	60,253	0	60,253
	Total	5358.33	8286.58	13644.90	11,813,088	18,268,771	30,081,859
1999	winter	1040.52	5826.05	6866.57	2,293,964	12,844,231	15,138,195
	little	3680.41	0.00	3680.41	8,113,912	0	8,113,912
	barndoor	5.59	446.78	452.37	12,324	984,972	997,296
	thorny	0.50	203.22	203.71	1,092	448,014	449,105
	smooth	0.95	1.15	2.09	2,089	2,527	4,617
	clearnose	234.34	90.02	324.36	516,626	198,458	715,084
	rosette	15.35	0.00	15.35	33,841	0	33,841
	Total	4977.65	6567.20	11544.86	10,973,848	14,478,203	25,452,051

Table 13 cont.

		market bait	wings	Grand Total	market bait	wings	Grand Total
2000	winter	833.19	7539.80	8372.99	1,836,873	16,622,407	18,459,279
	little	3334.57	1.45	3336.02	7,351,473	3,197	7,354,670
	barndoor	2.03	492.39	494.42	4,484	1,085,523	1,090,007
	thorny	1.18	465.21	466.39	2,602	1,025,606	1,028,208
	smooth	2.49	5.18	7.67	5,482	11,416	16,899
	clearnose	405.42	96.52	501.95	893,806	212,795	1,106,601
	rosette	19.96	0.00	19.96	44,009	0	44,009
	Total	4598.85	8600.54	13199.39	10,138,729	18,960,944	29,099,673
2001	winter	1057.56	6597.72	7655.28	2,331,521	14,545,480	16,877,001
	little	1700.99	0.00	1700.99	3,750,031	0	3,750,031
	barndoor	5.21	1531.64	1536.85	11,489	3,376,682	3,388,171
	thorny	4.55	190.88	195.42	10,026	420,810	430,836
	smooth	18.78	0.00	18.78	41,397	0	41,397
	clearnose	1558.81	301.26	1860.07	3,436,582	664,174	4,100,756
	rosette	8.61	0.00	8.61	18,992	0	18,992
	Total	4354.50	8621.50	12976.00	9,600,038	19,007,146	28,607,184
2002	winter	1230.90	5863.28	7094.18	2,713,677	12,926,318	15,639,994
	little	2371.81	0.00	2371.81	5,228,949	0	5,228,949
	barndoor	69.34	2054.33	2123.66	152,866	4,529,014	4,681,879
	thorny	2.31	399.32	401.63	5,085	880,356	885,441
	smooth	16.97	0.28	17.24	37,406	608	38,014
	clearnose	588.66	51.55	640.20	1,297,766	113,637	1,411,403
	rosette	10.72	0.00	10.72	23,629	0	23,629
	Total	4290.70	8368.75	12659.45	9,459,378	18,449,932	27,909,310
2003	winter	663.38	9322.73	9986.12	1,462,512	20,553,111	22,015,623
	little	3302.87	0.00	3302.87	7,281,580	0	7,281,580
	barndoor	89.20	765.62	854.82	196,653	1,687,903	1,884,556
	thorny	4.72	298.22	302.94	10,402	657,458	667,861
	smooth	8.11	0.43	8.55	17,890	953	18,843
	clearnose	149.05	186.56	335.61	328,603	411,288	739,891
	rosette	5.82	0.00	5.82	12,834	0	12,834
	Total	4223.16	10573.56	14796.72	9,310,475	23,310,713	32,621,188
2004	winter	1499.08	10288.74	11787.82	3,304,912	22,682,786	25,987,698
	little	1955.26	0.00	1955.26	4,310,621	0	4,310,621
	barndoor	72.65	771.86	844.52	160,176	1,701,668	1,861,844
	thorny	0.82	510.74	511.56	1,809	1,125,978	1,127,787
	smooth	5.63	0.00	5.63	12,410	0	12,410
	clearnose	277.16	67.38	344.54	611,037	148,552	759,590
	rosette	6.80	0.00	6.80	14,998	0	14,998
	Total	3817.42	11638.72	15456.14	8,415,962	25,658,985	34,074,947

Table 13 cont.

		market			market		
		bait	wings	Grand Total	bait	wings	Grand Total
2005	winter	628.98	7021.60	7650.58	1,386,658	15,479,978	16,866,636
	little	3056.36	0.00	3056.36	6,738,126	0	6,738,126
	barndoor	55.49	1920.85	1976.34	122,337	4,234,744	4,357,081
	thorny	1.69	438.17	439.86	3,733	965,997	969,730
	smooth	8.71	1.68	10.39	19,202	3,709	22,911
	clearnose	63.94	104.53	168.47	140,958	230,452	371,410
	rosette	8.97	0.00	8.97	19,773	0	19,773
	Total	3824.14	9486.83	13310.97	8,430,787	20,914,880	29,345,667
2006	winter	1624.28	7632.53	9256.81	3,580,914	16,826,851	20,407,766
	little	2392.33	0.00	2392.33	5,274,186	0	5,274,186
	barndoor	138.00	2494.83	2632.83	304,241	5,500,163	5,804,404
	thorny	2.20	640.77	642.97	4,843	1,412,653	1,417,496
	smooth	15.77	5.73	21.51	34,775	12,637	47,412
	clearnose	248.57	135.92	384.49	547,993	299,656	847,650
	rosette	8.63	0.00	8.63	19,024	0	19,024
	Total	4429.77	10909.79	15339.56	9,765,977	24,051,960	33,817,937
2007	winter	1492.23	11368.57	12860.80	3,289,800	25,063,404	28,353,204
	little	3078.31	0.00	3078.31	6,786,503	0	6,786,503
	barndoor	91.67	1919.79	2011.46	202,088	4,232,420	4,434,509
	thorny	2.23	349.68	351.91	4,914	770,915	775,828
	smooth	8.53	9.30	17.84	18,816	20,512	39,328
	clearnose	193.40	168.33	361.73	426,370	371,098	797,468
	rosette	22.41	0.00	22.41	49,398	0	49,398
	Total	4888.77	13815.67	18704.44	10,777,889	30,458,349	41,236,238

Table 14. Species composition of landings using the selectivity ogive method. The first three columns are metric tons, the last three are in pounds.

		market bait	wings/gill net	Grand Total	market bait	wings/gill net	Grand Total
1995	winter	543.41	2013.59	2557.01	1,198,024	4,439,210	5,637,234
	little	2077.88	551.82	2629.69	4,580,935	1,216,547	5,797,481
	barndoor	1.35	43.45	44.80	2,986	95,787	98,773
	thorny	6.53	1149.72	1156.25	14,389	2,534,702	2,549,091
	smooth	0.66	27.36	28.02	1,461	60,313	61,774
	clearnose	5.11	17.49	22.60	11,273	38,553	49,826
	rosette	1.04	0.08	1.11	2,287	170	2,457
	Total	2635.99	3803.50	6439.49	5,811,355	8,385,281	14,196,636
1996	winter	1059.12	7716.89	8776.01	2,334,952	17,012,833	19,347,785
	little	2751.73	842.40	3594.13	6,066,523	1,857,173	7,923,696
	barndoor	0.02	193.10	193.12	54	425,711	425,765
	thorny	6.42	1213.05	1219.47	14,152	2,674,321	2,688,474
	smooth	0.37	72.48	72.85	821	159,794	160,615
	clearnose	5.56	39.14	44.70	12,261	86,285	98,546
	rosette	0.19	0.04	0.23	408	91	499
	Total	3823.41	10077.10	13900.51	8,429,172	22,216,208	30,645,380
1997	winter	659.60	3149.35	3808.94	1,454,161	6,943,124	8,397,285
	little	4623.60	703.24	5326.84	10,193,302	1,550,375	11,743,677
	barndoor	1.13	145.26	146.39	2,496	320,243	322,739
	thorny	6.66	1016.35	1023.01	14,691	2,240,666	2,255,357
	smooth	1.52	53.07	54.59	3,349	117,002	120,352
	clearnose	42.97	114.89	157.86	94,737	253,281	348,018
	rosette	0.12	0.02	0.14	271	40	311
	Total	5335.61	5182.17	10517.78	11,763,007	11,424,732	23,187,739
1998	winter	929.83	4495.66	5425.49	2,049,928	9,911,233	11,961,161
	little	4015.43	960.18	4975.61	8,852,516	2,116,832	10,969,349
	barndoor	4.62	292.51	297.13	10,175	644,877	655,053
	thorny	1.31	2237.44	2238.76	2,899	4,932,717	4,935,616
	smooth	2.75	69.25	72.00	6,073	152,669	158,743
	clearnose	8.63	38.78	47.42	19,034	85,505	104,539
	rosette	0.33	0.19	0.51	726	409	1,135
	Total	4962.91	8094.01	13056.93	10,941,351	17,844,243	28,785,594
1999	winter	920.69	4431.13	5351.83	2,029,784	9,768,974	11,798,758
	little	3914.15	751.91	4666.06	8,629,229	1,657,669	10,286,898
	barndoor	3.67	292.22	295.90	8,096	644,245	652,341
	thorny	1.81	875.62	877.43	4,001	1,930,410	1,934,411
	smooth	3.27	73.44	76.71	7,204	161,916	169,120
	clearnose	5.12	69.83	74.95	11,279	153,955	165,234
	rosette	1.07	1.30	2.37	2,364	2,866	5,230
	Total	4849.79	6495.46	11345.25	10,691,958	14,320,035	25,011,993

Table 14 cont.

		market bait	wings/gill net	Grand Total	market bait	wings/gill net	Grand Total
2000	winter	306.95	5023.89	5330.84	676,715	11,075,785	11,752,500
	little	4046.00	954.65	5000.65	8,919,903	2,104,651	11,024,554
	barndoor	2.17	449.67	451.84	4,790	991,345	996,135
	thorny	0.79	1782.98	1783.77	1,736	3,930,806	3,932,542
	smooth	1.61	72.34	73.95	3,550	159,473	163,023
	clearnose	64.17	145.20	209.36	141,463	320,105	461,568
	rosette	6.06	0.95	7.01	13,369	2,085	15,454
	Total	4427.75	8429.67	12857.43	9,761,525	18,584,251	28,345,776
2001	winter	504.29	6011.92	6516.21	1,111,776	13,254,016	14,365,792
	little	3606.10	1105.32	4711.42	7,950,090	2,436,815	10,386,905
	barndoor	3.30	494.71	498.01	7,268	1,090,653	1,097,921
	thorny	16.61	830.96	847.57	36,608	1,831,959	1,868,568
	smooth	13.50	56.53	70.02	29,753	124,618	154,371
	clearnose	28.05	68.36	96.41	61,841	150,707	212,548
	rosette	5.46	0.36	5.82	12,044	793	12,836
	Total	4177.30	8568.16	12745.47	9,209,381	18,889,560	28,098,941
2002	winter	580.15	6003.17	6583.32	1,279,018	13,234,716	14,513,734
	little	3785.75	947.41	4733.17	8,346,161	2,088,690	10,434,851
	barndoor	19.15	325.19	344.34	42,213	716,932	759,145
	thorny	5.68	1190.99	1196.67	12,520	2,625,682	2,638,202
	smooth	15.45	58.01	73.46	34,054	127,890	161,944
	clearnose	8.59	34.30	42.89	18,933	75,627	94,559
	rosette	1.20	0.26	1.46	2,644	565	3,209
	Total	4415.97	8559.33	12975.30	9,735,542	18,870,102	28,605,643
2003	winter	446.47	7174.71	7621.18	984,297	15,817,519	16,801,816
	little	4066.26	1449.03	5515.29	8,964,572	3,194,556	12,159,128
	barndoor	17.10	687.24	704.34	37,705	1,515,097	1,552,803
	thorny	33.21	981.39	1014.60	73,219	2,163,595	2,236,813
	smooth	23.03	39.37	62.39	50,766	86,786	137,552
	clearnose	0.99	69.61	70.60	2,190	153,464	155,654
	rosette	0.89	0.05	0.94	1,953	118	2,071
	Total	4587.95	10401.39	14989.34	10,114,702	22,931,134	33,045,837
2004	winter	669.89	9395.37	10065.26	1,476,861	20,713,238	22,190,099
	little	2856.62	599.49	3456.12	6,297,778	1,321,658	7,619,436
	barndoor	17.00	876.63	893.63	37,479	1,932,636	1,970,115
	thorny	0.32	370.51	370.83	701	816,836	817,537
	smooth	7.77	49.48	57.25	17,138	109,075	126,212
	clearnose	2.72	29.64	32.36	6,002	65,334	71,337
	rosette	0.04	0.31	0.36	91	693	783
	Total	3554.37	11321.43	14875.80	7,836,049	24,959,470	32,795,519

Table 14 cont.

		market bait	wings/gill net	Grand Total	market bait	wings/gill net	Grand Total
2005	winter	528.33	6421.31	6949.64	1,164,766	14,156,572	15,321,337
	little	3041.72	1090.08	4131.79	6,705,841	2,403,206	9,109,047
	barndoor	9.30	1255.49	1264.79	20,504	2,767,871	2,788,376
	thorny	6.52	169.88	176.39	14,367	374,512	388,879
	smooth	3.78	153.39	157.17	8,338	338,169	346,507
	clearnose	3.69	25.96	29.65	8,132	57,236	65,368
	rosette	0.14	0.15	0.29	315	334	649
	Total	3593.48	9116.25	12709.73	7,922,263	20,097,900	28,020,163
2006	winter	981.76	6607.23	7589.00	2,164,413	14,566,459	16,730,872
	little	3387.88	1030.19	4418.07	7,469,003	2,271,174	9,740,177
	barndoor	26.84	2816.91	2843.75	59,181	6,210,223	6,269,404
	thorny	13.95	301.22	315.16	30,748	664,068	694,816
	smooth	29.23	287.89	317.11	64,436	634,678	699,114
	clearnose	24.31	20.20	44.51	53,599	44,532	98,131
	rosette	2.62	0.12	2.75	5,780	274	6,054
	Total	4466.60	11063.76	15530.35	9,847,161	24,391,409	34,238,569
2007	winter	752.79	10757.92	11510.70	1,659,612	23,717,145	25,376,757
	little	3824.08	1557.94	5382.02	8,430,648	3,434,679	11,865,327
	barndoor	24.69	452.76	477.45	54,429	998,173	1,052,602
	thorny	7.92	642.53	650.46	17,469	1,416,545	1,434,014
	smooth	5.49	27.79	33.28	12,103	61,265	73,368
	clearnose	32.01	52.32	84.33	70,564	115,340	185,905
	rosette	2.97	0.49	3.45	6,544	1,072	7,616
	Total	4649.94	13491.75	18141.69	10,251,369	29,744,220	39,995,590

Table 15. Number of length samples by region, year, season, and gear type of the discarded component of the skate catch from the Observer Program.

GOM-GBK

	half 1					half 2				
YEAR	longline	otter trawl	shrimp trawl	sink gill net	scallop dredge	longline	otter trawl	shrimp trawl	sink gill net	scallop dredge
1994		0	60	0	0		0		9	332
1995		726	9	55	0		90		37	
1996		626		17	0		107		7	45
1997		265	25	0	9		183		25	0
1998		0		13	1499		60		213	0
1999		0		52	0		77		18	47
2000		464		13	31		393		97	0
2001		1201		80	0		167		58	
2002		752		177	0		6089		224	762
2003	22	7508	186	552	12	0	6949		724	80
2004	41	5783	15	1710	654	56	8229		1703	634
2005	74	19162	29	702	744	13	12705		688	1169
2006	50	8075		459	346	35	8020		404	2500
2007	3	9374		392	703	52	12468		1949	2605

SNE-MDA

	half 1					half 2				
Year	longline	otter trawl	shrimp trawl	sink gill net	scallop dredge	longline	otter trawl	shrimp trawl	sink gill net	scallop dredge
1994		0	na	0	0		619	na	55	354
1995		726	na	55	0		500	na	12	
1996		626	na	17	379		247	na	0	0
1997		265	na	0	52		1323	na	46	179
1998		0	na	13	0		43	na	28	0
1999		0	na	52	0		0	na	10	0
2000		464	na	13	0		922	na	32	86
2001		1201	na	80	0		1664	na	74	
2002		752	na	177	0		1701	na	164	2125
2003	0	7508	na	552	1524	1	520	na	1312	987
2004	0	5783	na	1710	6162	0	2530	na	630	5953
2005	0	19162	na	702	1643	0	3966	na	761	1164
2006	24	8075	na	459	0	1	1743	na	192	3440
2007	0	9374	na	392	1591	0	932	na	39	1319

Table 16. Discards by species, gear type and half year from 1995-2007.

				Half 1 Gear Type					Half 2 Gear Type					Total Gear Type		
year	Species	dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl
1995	winter	2575.94	211.38	118.53	0.19	11984.72	6880.52	1517.84	122.18	0.04	4162.79	9456.46	1729.22	240.71	0.23	16147.51
	little	6357.05	202.52	24.02	1.63	7319.12	12516.80	354.22	18.55	0.15	5902.89	18873.85	556.73	42.57	1.78	13222.00
	barndoor	1.30	0.28	2.70	0.00	206.84	19.40	58.80	19.09	0.00	41.05	20.70	59.08	21.79	0.00	247.89
	thorny	19.58	10.29	12.97	3.98	312.32	90.71	115.10	20.03	0.17	159.80	110.29	125.39	33.00	4.15	472.13
	smooth	8.85	9.92	2.35	1.76	286.58	105.69	43.25	2.75	0.18	103.54	114.54	53.17	5.10	1.93	390.12
	clearnose	103.50	5.55	3.11	0.00	2602.62	140.62	17.38	5.30	0.00	1127.79	244.12	22.94	8.41	0.00	3730.41
	rosette	4.49	0.08	0.00	0.00	6.74	163.92	0.30	0.01	0.00	47.64	168.41	0.38	0.01	0.00	54.38
1996	winter	2617.45	257.18	113.66	3.93	7584.85	3057.90	1438.02	163.78	1.89	6713.87	5675.35	1695.20	277.45	5.82	14298.72
	little	5843.77	139.90	29.59	9.58	6076.34	7836.97	354.78	24.93	2.83	13618.24	13680.74	494.68	54.52	12.41	19694.58
	barndoor	4.31	1.23	6.55	0.91	20.03	14.58	26.98	21.44	0.32	11.20	18.90	28.21	27.98	1.23	31.23
	thorny	13.34	4.39	5.28	7.72	87.04	163.38	105.46	12.21	1.65	81.16	176.72	109.84	17.49	9.36	168.20
	smooth	6.50	1.49	0.36	3.93	51.67	164.40	48.39	3.73	0.99	68.15	170.91	49.88	4.09	4.92	119.81
	clearnose	32.84	11.96	7.21	0.00	1635.71	54.04	10.47	7.78	0.00	3555.45	86.88	22.43	14.99	0.00	5191.16
	rosette	3.78	0.05	0.00	0.00	2.41	210.38	0.63	0.04	0.00	189.70	214.17	0.68	0.04	0.00	192.11
1997	winter	2174.14	168.54	114.86	3.09	3543.37	1920.23	778.96	93.34	0.35	2408.23	4094.37	947.50	208.21	3.43	5951.61
	little	8408.50	183.94	31.36	17.02	2598.91	4581.22	234.94	20.66	0.45	3200.03	12989.73	418.88	52.02	17.47	5798.94
	barndoor	211.92	0.69	7.70	0.00	55.31	17.04	19.70	30.77	0.00	9.37	228.96	20.39	38.47	0.00	64.68
	thorny	38.81	2.79	10.44	6.16	148.38	114.96	92.08	16.98	0.74	136.90	153.77	94.87	27.42	6.90	285.29
	smooth	28.61	0.70	0.38	5.68	31.19	189.77	29.38	3.20	0.67	201.79	218.38	30.08	3.58	6.36	232.98
	clearnose	166.51	32.53	11.22	0.00	336.86	53.65	10.84	5.96	0.00	143.34	220.16	43.37	17.17	0.00	480.20
	rosette	25.55	0.46	0.01	0.00	9.96	24.53	0.21	0.02	0.00	8.52	50.08	0.67	0.03	0.00	18.47
1998	winter	1046.54	72.21	84.83	0.15	8171.28	2343.94	1538.36	132.05	0.03	12338.24	3390.47	1610.57	216.89	0.18	20509.53
	little	5249.09	120.08	32.44	2.93	15693.50	5702.77	490.01	21.50	0.15	6860.44	10951.86	610.10	53.94	3.09	22553.94
	barndoor	10.97	0.66	6.10	0.00	140.29	11.38	10.92	15.65	0.00	68.87	22.35	11.58	21.75	0.00	209.16
	thorny	101.80	1.32	9.48	2.41	350.86	109.09	85.99	3.58	0.17	468.93	210.89	87.31	13.06	2.57	819.79
	smooth	178.62	6.19	4.95	2.49	392.15	33.43	7.78	0.44	0.09	128.80	212.05	13.97	5.38	2.59	520.95
	clearnose	37.82	14.56	7.77	0.00	2414.69	105.83	26.68	3.51	0.00	607.17	143.65	41.24	11.28	0.00	3021.86
	rosette	9.82	0.17	0.02	0.00	32.01	115.28	1.57	0.02	0.00	59.48	125.10	1.74	0.04	0.00	91.49

Table 16 cont.

				Half 1 Gear Type					Half 2 Gear Type					Total Gear Type		
year	Species	dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl
1999	winter	703.27	182.27	92.72	0.23	2137.63	1991.81	1393.05	122.37	0.01	5432.98	2695.08	1575.32	215.09	0.24	7570.62
	little	6369.41	353.58	31.99	0.25	1402.49	5586.79	413.62	20.95	0.04	3082.78	11956.20	767.20	52.94	0.29	4485.26
	barndoor	5.12	0.77	3.99	0.01	18.29	43.56	22.86	26.24	0.00	100.43	48.67	23.63	30.23	0.01	118.72
	thorny	17.03	1.03	1.43	0.87	44.98	116.34	57.38	2.67	0.03	198.34	133.37	58.41	4.10	0.90	243.32
	smooth	33.32	1.55	0.84	2.37	40.50	41.52	16.14	1.25	0.01	153.32	74.84	17.70	2.10	2.38	193.82
	clearnose	49.32	55.01	3.79	0.00	120.89	45.46	23.29	5.64	0.00	472.19	94.77	78.29	9.43	0.00	593.08
	rosette	8.18	0.46	0.00	0.00	1.60	72.41	0.79	0.02	0.00	17.62	80.59	1.25	0.02	0.00	19.23
2000	winter	731.54	82.47	50.29	0.37	3362.87	1203.23	1552.52	87.04	0.01	6321.91	1934.77	1634.99	137.33	0.38	9684.78
	little	4394.88	83.65	20.58	2.88	2849.42	3297.27	439.12	19.60	0.02	7164.16	7692.16	522.76	40.17	2.90	10013.58
	barndoor	39.56	2.92	5.15	0.00	149.55	4.07	25.12	31.63	0.00	1134.40	43.63	28.04	36.78	0.00	1283.95
	thorny	60.54	1.78	1.58	1.66	116.53	37.45	76.84	9.28	0.04	275.87	97.99	78.62	10.86	1.69	392.40
	smooth	24.56	2.57	0.48	0.40	69.87	45.93	36.43	2.33	0.03	159.76	70.48	39.00	2.80	0.43	229.63
	clearnose	40.04	6.11	2.75	0.00	238.26	28.44	8.28	2.58	0.00	1254.93	68.47	14.38	5.33	0.00	1493.20
	rosette	2.55	0.03	0.00	0.00	2.36	75.76	0.38	0.01	0.00	95.30	78.31	0.42	0.01	0.00	97.66
2001	winter	610.66	178.6	68.39292		10483.5	518.056	1005.6	76.0568		4021.27	1128.72	1184.29	144.45	0.00	14504.81
	little	3062	170	34.11211		8579.03	2516.46	276.27	16.29889		1769.56	5578.50	446.31	50.41	0.00	10348.59
	barndoor	10.19	11.91	4.83		683.64	8.70	125.84	27.58		1034.13	18.89	137.76	32.41	0.00	1717.77
	thorny	12.90	10.27	3.55		779.67	10.38	20.48	0.96		85.23	23.29	30.75	4.51	0.00	864.91
	smooth	12.14	4.35	1.60		324.85	40.60	58.60	3.01		239.16	52.74	62.95	4.61	0.00	564.01
	clearnose	31.40	25.04	4.45		10.37	38.67	42.08	4.73		1045.62	70.07	67.12	9.18	0.00	1055.99
	rosette	5.17	0.25	0.00		1.72	129.82	4.04	0.05		4.37	134.99	4.29	0.06	0.00	6.09
2002	winter	413.56	209.52	62.18	0.09	6012.98	1502.58	3372.67	84.28		5864.64	1916.14	3582.19	146.47	0.09	11877.62
	little	5705.43	63.13	34.63	0.31	3473.59	5737.55	272.85	17.61		1960.72	11442.97	335.98	52.23	0.31	5434.31
	barndoor	38.02	55.00	14.04	0.00	1527.48	79.27	300.10	15.12		369.34	117.28	355.11	29.16	0.00	1896.82
	thorny	18.10	12.38	4.76	0.18	696.08	22.90	21.29	0.35		75.81	41.01	33.67	5.11	0.18	771.88
	smooth	38.86	6.23	3.47	0.21	323.61	55.59	40.72	0.64		112.39	94.44	46.95	4.11	0.21	435.99
	clearnose	26.14	41.39	2.83	0.00	33.79	207.14	53.66	7.16		1038.69	233.28	95.06	9.99	0.00	1072.49
	rosette	6.10	0.00	0.00	0.00	0.10	68.42	0.09	0.06		2.21	74.51	0.10	0.07	0.00	2.31

Table 16 cont.

year	Species	Half 1 Gear Type					Half 2 Gear Type					Total Gear Type				
		dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl
2003	winter	1049.56	324.86	39.94	1.04	8936.49	877.36	1545.44	33.89		7232.20	1926.92	1870.30	73.83	1.04	16168.69
	little	6664.13	79.66	17.94	0.60	6948.71	6824.40	309.58	8.50		7902.79	13488.53	389.24	26.44	0.60	14851.49
	barndoor	38.86	79.76	5.25	0.06	702.72	48.35	226.61	8.85		373.64	87.21	306.37	14.10	0.06	1076.36
	thorny	31.42	15.12	1.43	1.64	478.64	94.16	85.95	0.74		469.39	125.58	101.07	2.17	1.64	948.03
	smooth	72.24	9.11	1.05	4.60	460.31	152.53	48.54	0.50		458.02	224.77	57.64	1.54	4.60	918.33
	clearnose	14.15	10.02	3.59	0.00	236.78	26.89	53.38	3.25		847.79	41.05	63.40	6.84	0.00	1084.57
	rosette	12.02	0.05	0.01	0.00	10.15	9.25	0.11	0.00		6.53	21.26	0.16	0.01	0.00	16.68
2004	winter	1521.17	214.72	23.11	0.66	8200.57	1654.52	863.08	14.34	0.02	11645.92	3175.68	1077.80	37.45	0.68	19846.48
	little	3620.75	97.27	9.49	1.99	4591.50	1974.36	233.16	2.45	0.01	6962.03	5595.11	330.43	11.94	2.00	11553.53
	barndoor	58.49	105.04	2.81	0.00	519.91	22.89	77.54	5.39	0.00	657.79	81.38	182.58	8.20	0.00	1177.70
	thorny	5.18	7.67	0.12	0.46	275.00	27.47	35.21	0.37	0.03	369.88	32.65	42.88	0.49	0.49	644.88
	smooth	13.60	15.62	0.14	1.07	571.56	88.88	41.11	0.54	0.11	857.39	102.48	56.72	0.68	1.19	1428.95
	clearnose	211.88	5.65	3.70	0.00	119.12	356.73	16.83	0.62	0.00	806.37	568.61	22.48	4.31	0.00	925.49
	rosette	7.01	0.00	0.00	0.00	2.66	8.61	0.28	0.00	0.00	29.17	15.62	0.29	0.00	0.00	31.83
2005	winter	1964.26	556.59	39.74	0.26	5967.05	1600.00	696.13	26.53	0.01	8071.63	3564.25	1252.72	66.28	0.27	14038.68
	little	3294.29	154.67	17.95	0.28	4855.81	2425.36	290.48	5.60	0.03	8054.99	5719.66	445.15	23.55	0.31	12910.80
	barndoor	379.78	219.52	20.64	0.27	1263.90	277.40	489.30	19.57	0.00	1576.52	657.17	708.83	40.21	0.27	2840.41
	thorny	20.39	21.30	4.98	0.44	478.08	35.54	14.98	0.59	0.01	185.03	55.93	36.28	5.57	0.45	663.11
	smooth	96.95	44.69	7.28	1.15	1136.78	73.48	23.97	0.96	0.05	453.69	170.44	68.65	8.24	1.20	1590.47
	clearnose	293.51	29.28	0.00	0.00	298.89	165.44	58.71	0.00	0.00	478.90	458.95	87.98	0.00	0.00	777.79
	rosette	29.94	0.32	0.00	0.00	12.93	24.68	0.75	0.01	0.00	21.69	54.62	1.07	0.01	0.00	34.61
2006	winter	1870.57	466.42	105.59	0.04	5449.79	1784.91	717.39	89.87	0.09	5404.90	3655.48	1183.81	195.46	0.13	10854.69
	little	3551.05	30.82	37.69	0.05	2755.35	2532.95	206.95	23.42	0.22	4347.21	6084.00	237.77	61.11	0.27	7102.56
	barndoor	166.18	320.57	38.67	0.01	1375.82	227.09	613.16	84.51	0.00	1428.08	393.27	933.73	123.18	0.01	2803.90
	thorny	16.29	2.83	3.31	0.02	125.64	69.86	69.90	7.51	0.13	299.26	86.15	72.72	10.81	0.15	424.89
	smooth	59.35	10.17	7.80	0.04	506.45	89.19	39.94	5.17	0.11	407.48	148.54	50.11	12.97	0.14	913.94
	clearnose	58.37	13.38	0.18	0.00	290.17	165.23	8.55	0.13	0.00	202.28	223.60	21.93	0.32	0.00	492.45

	rosette	3.84	0.01	0.00	0.00	0.42	16.25	0.40	0.00	0.00	25.32	20.09	0.41	0.00	0.00	25.74

Table 16 cont.

		Half 1 Gear Type					Half 2 Gear Type					Total Gear Type				
year	Species	dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl	dredge	gillnet	longline	shrimp	trawl
2007	winter	724.50	704.35	22.80	0.04	5826.92	2964.42	1330.14	12.55	0.00	9437.23	3688.92	2034.49	35.35	0.04	15264.15
	little	5069.34	194.05	10.09	0.10	5200.60	4128.47	238.32	2.57	0.00	4170.34	9197.81	432.37	12.66	0.10	9370.95
	barndoor	135.26	75.39	11.45	0.00	2465.17	167.73	156.75	10.79	0.00	1042.24	303.00	232.13	22.25	0.00	3507.40
	thorny	12.33	5.58	0.69	0.03	172.78	55.58	16.98	0.48	0.02	179.56	67.91	22.56	1.18	0.05	352.35
	smooth	27.01	14.24	1.10	0.08	395.69	101.80	22.13	0.33	0.01	303.58	128.80	36.37	1.42	0.09	699.27
	clearnose	96.347	38.47	0	0	464.41	90.1909	66.433	0	0	1246.24	186.54	104.91	0.00	0.00	1710.65
	rosette	3.0999	0.027	0	0	0.92939	23.916	3.1576	0	0	11.5952	27.02	3.18	0.00	0.00	12.52

Table 17. Abundance and biomass from NEFSC spring surveys for winter skate for the Gulf of Maine to Mid-Atlantic region (offshore strata 1-30,33-40,61-76). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1968-2008.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1968	2.171	1.640	2.978	0.854	0.530	1.178	2.542	32	42	56	58.6	79	112	36	232
1969	5.913	4.283	7.543	2.790	1.907	3.672	2.119	15	25	53	53.5	79	111	68	640
1970	2.645	1.627	3.663	0.971	0.626	1.317	2.723	37	43	59	61.0	83	103	44	275
1971	3.387	2.066	4.708	1.894	0.873	2.915	1.788	15	30	48	51.8	76	103	41	513
1972	4.620	3.033	6.207	2.602	1.253	3.951	1.776	15	24	48	49.5	74	97	63	634
1973	2.905	2.024	3.786	1.257	0.824	1.689	2.311	21	32	55	55.5	79	100	49	347
1974	2.091	1.352	2.830	0.943	0.505	1.381	2.218	29	34	53	55.6	76	101	46	222
1975	2.395	1.521	3.269	0.893	0.556	1.230	2.682	17	38	59	59.4	79	99	46	227
1976	2.153	1.075	3.231	0.628	0.279	0.978	3.428	22	38	64	63.1	86	97	29	160
1977	3.111	1.815	4.408	0.838	0.513	1.163	3.712	20	29	69	64.7	93	106	35	204
1978	8.275	-0.327	16.877	1.355	0.121	2.589	6.108	43	62	79	78.5	89	96	41	395
1979	1.852	1.095	2.608	0.333	0.206	0.459	5.568	23	35	78	73.5	93	105	50	204
1980	2.990	1.751	4.229	0.538	0.331	0.745	5.559	22	45	78	74.8	97	104	49	187
1981	4.140	2.905	5.376	2.083	1.199	2.966	1.988	15	22	39	47.6	91	104	56	586
1982	5.773	3.876	7.670	2.137	1.195	3.080	2.701	15	26	46	54.9	95	109	64	707
1983	14.329	8.182	20.476	3.264	1.772	4.756	4.391	15	28	67	64.4	96	108	65	817
1984	10.480	6.816	14.144	2.948	1.694	4.201	3.555	15	22	60	59.0	94	106	59	753
1985	16.373	11.119	21.627	7.861	4.653	11.069	2.083	15	22	46	54.3	94	116	65	1891
1986	10.019	6.973	13.064	3.538	2.181	4.894	2.832	15	27	58	62.2	97	108	67	969
1987	13.126	8.428	17.824	4.821	2.926	6.716	2.723	15	29	56	60.8	97	108	69	1221
1988	14.543	10.508	18.577	7.409	4.736	10.082	1.963	15	25	43	53.4	95	107	73	1827
1989	10.141	7.736	12.546	4.252	3.095	5.409	2.385	15	25	59	61.4	94	109	74	1429
1990	7.183	5.184	9.183	5.087	2.657	7.517	1.412	15	27	41	49.9	91	105	67	1678
1991	6.965	4.012	9.918	3.239	1.979	4.499	2.150	17	29	54	58.6	93	107	57	1027
1992	5.988	3.369	8.607	5.208	0.635	9.780	1.150	15	23	42	46.2	82	106	51	1303
1993	4.761	3.392	6.131	4.305	2.561	6.049	1.106	15	25	42	46.5	82	103	62	1118
1994	1.421	0.990	1.852	1.673	1.150	2.196	0.849	20	32	43	46.5	69	99	49	519
1995	2.151	1.340	2.961	1.998	1.231	2.766	1.076	15	34	44	48.4	71	103	49	476
1996	4.547	2.499	6.594	4.470	2.384	6.556	1.017	15	34	46	49.0	68	96	56	1004
1997	3.065	1.325	4.806	1.834	0.987	2.680	1.672	15	23	51	53.5	78	93	39	458
1998	1.504	0.913	2.096	1.045	0.561	1.529	1.439	15	32	51	53.4	79	94	52	341
1999	2.968	1.303	4.632	1.876	0.870	2.883	1.582	16	27	54	54.9	79	100	52	482
2000	4.358	2.273	6.443	1.998	1.041	2.954	2.181	15	34	62	62.2	82	99	57	457
2001	3.496	1.889	5.103	2.350	0.912	3.787	1.488	20	27	44	52.1	82	100	48	556
2002	3.132	1.650	4.614	1.688	0.949	2.426	1.856	15	29	59	58.6	82	93	48	407
2003	2.799	1.471	4.127	2.047	1.164	2.931	1.367	15	29	49	53.4	82	100	61	606
2004	2.446	1.512	3.379	1.547	1.015	2.080	1.581	18	29	50	54.6	85	97	56	356
2005	1.757	0.869	2.645	1.672	0.470	2.874	1.051	15	30	45	48.6	75	97	52	375
2006	3.041	1.020	5.062	3.067	0.465	5.668	0.992	15	24	43	47.2	75	99	55	779
2007	4.732	3.428	6.035	1.798	1.326	2.269	2.632	17	36	63	64.4	93	101	66	547
2008	2.996	1.224	4.767	1.843	0.726	2.959	1.625	16	36	56	57.2	81	95	55	750

Table 18. Abundance and biomass from NEFSC autumn surveys for winter skate for the Gulf of Maine to Mid-Atlantic region (offshore strata 1-30,33-40,61-76). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1967-2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1967	2.159	1.248	3.070	0.825	0.544	1.106	2.617	15	32	56	57.0	83	107	35	213
1968	1.865	1.264	2.466	0.928	0.573	1.284	2.009	15	25	51	51.8	80	100	56	227
1969	1.315	0.856	1.774	0.540	0.351	0.730	2.435	16	37	58	58.3	78	90	36	161
1970	2.996	1.663	4.328	1.357	0.576	2.138	2.208	21	33	54	56.0	77	97	53	331
1971	1.078	0.542	1.615	0.588	0.238	0.938	1.833	18	27	50	50.5	77	93	35	163
1972	2.958	2.113	3.804	2.071	1.413	2.728	1.429	15	24	42	46.9	74	96	64	592
1973	4.686	3.348	6.024	2.238	1.510	2.967	2.093	21	32	54	55.1	78	101	48	662
1974	2.097	1.418	2.777	1.024	0.672	1.376	2.048	17	30	52	53.6	77	103	39	262
1975	1.315	0.682	1.948	0.420	0.260	0.580	3.130	16	24	62	60.9	84	103	31	115
1976	2.655	0.918	4.392	0.766	0.257	1.274	3.468	19	22	70	59.9	83	98	21	190
1977	4.095	2.814	5.376	1.617	1.049	2.185	2.533	15	25	47	54.8	87	100	51	662
1978	4.989	3.778	6.199	1.042	0.777	1.307	4.787	15	36	77	73.6	94	105	94	762
1979	5.121	3.768	6.475	1.290	0.976	1.603	3.971	20	31	75	66.0	93	113	89	975
1980	6.233	3.806	8.660	1.558	1.015	2.100	4.002	15	37	66	66.4	95	108	60	602
1981	5.668	3.726	7.610	1.505	0.916	2.094	3.766	15	25	61	62.3	99	110	54	516
1982	8.306	4.780	11.831	3.889	0.502	7.275	2.136	15	22	35	46.7	92	112	45	950
1983	12.852	5.693	20.012	2.590	1.447	3.733	4.962	16	28	78	70.5	95	108	42	843
1984	13.323	8.465	18.181	3.653	2.450	4.857	3.647	15	21	55	59.0	95	110	52	1187
1985	9.182	6.552	11.811	2.665	1.842	3.488	3.446	15	32	79	69.7	97	107	37	827
1986	15.800	7.184	24.415	4.196	2.496	5.895	3.766	15	34	75	71.5	97	110	46	1089
1987	11.063	8.200	13.925	4.291	2.783	5.800	2.578	15	25	58	60.1	97	109	49	1165
1988	7.564	4.961	10.167	3.126	2.223	4.028	2.420	15	23	49	57.4	97	110	45	888
1989	5.081	3.288	6.874	2.084	1.422	2.745	2.439	15	27	59	61.0	96	106	48	720
1990	7.145	4.658	9.632	2.451	1.397	3.505	2.915	22	33	68	66.5	97	107	44	895
1991	4.724	3.627	5.821	2.631	1.866	3.396	1.796	17	31	48	56.3	94	106	58	941
1992	3.582	2.140	5.024	1.862	1.116	2.608	1.923	22	33	51	57.4	91	103	39	509
1993	1.905	1.280	2.530	1.458	0.965	1.951	1.307	16	33	48	52.8	88	104	50	452
1994	2.120	1.432	2.808	1.925	1.217	2.633	1.101	15	26	44	47.6	84	106	52	503
1995	1.985	1.214	2.757	1.769	1.047	2.491	1.122	17	31	46	49.4	77	102	43	424
1996	2.276	1.615	2.937	1.426	0.985	1.867	1.596	17	35	51	54.9	83	104	44	370
1997	2.455	1.150	3.760	1.611	0.738	2.484	1.524	19	34	54	55.5	79	101	55	415
1998	3.753	2.488	5.018	2.140	1.438	2.843	1.753	19	27	55	56.8	83	101	50	609
1999	5.089	2.080	8.098	2.642	1.320	3.963	1.927	15	31	58	58.0	80	111	53	966
2000	4.378	2.390	6.366	2.535	1.351	3.718	1.727	18	25	56	55.5	82	99	45	756
2001	3.887	2.442	5.333	2.165	1.415	2.914	1.796	15	32	58	57.8	83	98	53	601
2002	5.600	3.417	7.782	2.323	1.535	3.111	2.411	16	33	66	63.9	87	101	55	743
2003	3.386	2.111	4.662	1.498	0.928	2.068	2.260	16	33	62	63.0	87	104	43	435
2004	4.031	2.632	5.430	1.942	1.343	2.542	2.075	15	33	62	60.4	87	102	50	611
2005	2.615	1.791	3.439	1.671	1.005	2.337	1.565	18	31	52	55.1	81	98	54	475
2006	2.484	1.416	3.553	1.759	1.124	2.395	1.412	18	31	50	52.2	78	99	52	619
2007	3.705	2.169	5.241	2.324	1.208	3.440	1.594	15	33	53	55.0	80	94	56	747

Table 19. Abundance and biomass from NEFSC winter surveys for winter skate for the Georges Bank to Mid-Atlantic region (offshore strata 1-3,5-7,9-11,13-14,16,61-63,65-67,69-71,73-75). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1992-2007. Stratum 16 not sampled in 1993, 2000, 2002-2007. Strata 13 and 14 not sampled in 2003 and 2007. Stratum 63 not sampled in 1993. Stratum 14 not sampled in 2005 and 2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1992	31.571	21.666	41.476	39.759	23.811	55.707	0.794	15	24	38	42.4	74	105	62	4042
1993	10.261	6.052	14.469	10.676	2.331	19.021	0.961	15	23	41	44.1	81	106	47	841
1994	14.439	10.586	18.293	14.216	8.465	19.966	1.016	15	29	40	45.4	81	102	33	1079
1995	23.268	14.507	32.029	35.528	18.060	52.996	0.655	15	27	40	42.2	59	104	53	3773
1996	25.239	7.110	43.369	43.515	7.434	79.596	0.580	15	25	40	41.2	56	99	59	4055
1997	11.643	7.287	15.999	12.565	7.109	18.022	0.927	15	27	45	46.9	71	98	46	1414
1998	22.464	15.878	29.050	19.950	13.556	26.344	1.126	15	26	48	49.4	74	105	60	2092
1999	21.089	13.628	28.549	18.380	10.899	25.860	1.147	15	24	49	49.0	74	101	52	1932
2000	11.315	4.814	17.815	5.697	2.799	8.596	1.986	18	27	56	57.6	88	101	33	486
2001	28.634	19.682	37.585	15.555	9.234	21.875	1.841	16	30	58	57.5	84	100	76	2025
2002	28.733	17.246	40.220	15.982	6.565	25.400	1.798	15	24	49	55.1	88	107	53	1849
2003	17.425	7.871	26.979	29.540	-6.318	64.399	0.590	15	15	28	34.8	75	99	34	1662
2004	26.618	13.793	39.444	13.833	9.244	18.422	1.924	15	31	55	58.0	86	102	58	1342
2005	19.424	8.976	29.872	16.081	6.327	25.836	1.208	16	26	48	50.3	76	95	46	972
2006	32.411	12.125	52.697	18.233	9.593	26.874	1.778	15	30	56	57.4	86	102	60	1776
2007	14.689	5.443	23.936	13.020	3.847	22.193	1.128	15	27	48	50.2	73	93	38	1087

Table 20. Abundance and biomass from NEFSC spring surveys for little skate for the Gulf of Maine to Mid-Atlantic region (offshore strata 1-30,33-40,61-76, and inshore strata 1-66). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1976-2008.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1976	1.308	0.861	1.755	3.218	2.136	4.301	0.406	8	12	40	36.9	48	58	172	4202
1977	1.347	0.882	1.811	3.336	2.177	4.494	0.404	6	19	41	38.7	48	57	160	4218
1978	1.391	0.962	1.821	3.286	2.363	4.209	0.423	8	11	42	37.5	48	62	160	3945
1979	0.650	0.501	0.799	2.182	1.429	2.934	0.298	4	12	31	32.7	48	56	204	5684
1980	2.206	1.705	2.707	5.898	4.384	7.413	0.374	8	12	37	36.0	48	57	224	9031
1981	1.501	1.200	1.803	3.426	2.714	4.137	0.438	6	15	41	38.3	49	55	175	4113
1982	3.627	2.644	4.611	7.214	5.351	9.076	0.503	9	18	43	40.7	49	55	153	3564
1983	5.718	4.017	7.420	13.024	9.215	16.832	0.439	6	16	42	37.9	48	57	167	6365
1984	4.094	2.615	5.574	10.023	6.787	13.258	0.409	7	11	40	35.8	48	55	139	4573
1985	6.265	4.628	7.901	15.175	10.575	19.775	0.413	8	11	40	36.8	48	57	148	6535
1986	2.753	1.712	3.795	8.554	3.399	13.709	0.322	6	14	33	34.5	48	57	153	3512
1987	4.625	3.149	6.102	16.031	10.222	21.839	0.289	8	12	32	33.1	47	55	145	9584
1988	5.083	3.444	6.721	14.593	9.688	19.498	0.348	8	11	36	34.5	48	55	130	4195
1989	6.634	3.434	9.834	21.643	9.844	33.441	0.307	8	13	34	33.4	46	55	144	10760
1990	4.993	2.397	7.589	14.979	5.250	24.708	0.333	8	11	37	34.7	47	56	132	7085
1991	5.990	4.672	7.308	18.731	14.059	23.403	0.320	8	13	34	34.2	47	58	178	11986
1992	5.297	2.477	8.118	16.793	5.234	28.352	0.315	8	16	33	34.1	46	57	136	6392
1993	7.524	5.187	9.862	22.361	15.110	29.611	0.336	9	12	36	35.0	47	54	160	9574
1994	3.622	2.425	4.819	9.365	6.297	12.434	0.387	9	19	39	37.3	46	54	154	8548
1995	2.872	2.024	3.720	7.574	5.215	9.933	0.379	8	10	39	36.1	47	59	148	3801
1996	7.574	5.522	9.626	18.185	12.647	23.722	0.417	7	17	41	38.3	48	58	168	9086
1997	2.708	2.231	3.184	6.671	5.504	7.837	0.406	9	13	40	37.8	48	54	151	4840
1998	7.471	6.156	8.787	20.938	16.232	25.644	0.357	7	17	37	35.8	47	56	195	15710
1999	9.978	7.688	12.267	28.377	20.345	36.409	0.352	8	12	38	35.4	47	56	157	16406
2000	8.596	6.647	10.545	19.677	15.270	24.083	0.437	9	21	41	38.9	47	57	179	15367
2001	6.835	4.297	9.372	15.347	9.900	20.794	0.445	8	18	42	39.5	48	58	154	6978
2002	6.444	4.546	8.341	16.280	11.306	21.254	0.396	8	11	42	37.7	48	57	154	11983
2003	6.486	4.505	8.486	15.116	10.195	20.036	0.429	9	22	42	40.1	48	55	169	6919
2004	7.219	5.374	9.064	17.039	11.917	22.162	0.424	7	25	42	39.9	47	57	147	9866
2005	3.241	2.305	4.177	7.328	5.515	9.141	0.442	8	13	43	38.9	48	53	138	3108
2006	3.323	1.892	4.753	7.878	4.544	11.211	0.422	7	11	42	38.4	48	55	138	2771
2007	4.459	3.031	5.887	9.081	6.385	11.778	0.491	9	16	44	41.1	48	58	159	5538
2008	7.339	4.537	10.142	16.659	9.678	23.641	0.441	9	17	42	39.1	47	58	149	11863

Table 21. Abundance and biomass from NEFSC autumn surveys for little skate for the Gulf of Maine to Mid-Atlantic region (offshore strata 1-30,33-40,61-76, and inshore strata 1-66). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1975-2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1975	2.379	1.508	3.249	4.858	3.063	6.654	0.490	10	18	43	40.3	49	56	118	1386
1976	2.185	1.582	2.788	4.576	3.278	5.875	0.477	8	22	43	40.6	48	58	74	1421
1977	3.172	2.271	4.072	6.589	4.683	8.495	0.481	9	22	43	40.7	49	56	122	2438
1978	2.938	2.140	3.736	5.613	3.947	7.279	0.523	10	22	44	42.0	49	62	144	3171
1979	2.902	2.343	3.461	5.944	4.790	7.098	0.488	8	21	44	41.0	49	58	177	4597
1980	2.312	1.768	2.855	5.055	4.102	6.008	0.457	9	13	43	37.9	49	55	142	2451
1981	2.779	2.175	3.382	5.847	4.479	7.215	0.475	9	19	43	39.9	49	58	111	1728
1982	5.799	2.673	8.925	15.391	6.979	23.803	0.377	9	18	36	36.4	48	56	123	3848
1983	1.990	1.340	2.639	5.244	3.268	7.219	0.379	8	17	38	36.6	49	55	100	1313
1984	2.483	1.688	3.279	5.487	3.789	7.185	0.453	10	13	43	38.3	49	56	95	1350
1985	2.423	1.629	3.217	6.103	4.006	8.199	0.397	9	17	40	37.5	49	58	119	2761
1986	1.502	1.125	1.879	4.203	2.759	5.648	0.357	10	16	36	35.7	49	55	96	1240
1987	2.311	1.532	3.090	8.104	4.084	12.124	0.285	10	14	31	32.4	48	55	96	2093
1988	1.177	0.663	1.692	3.524	2.144	4.903	0.334	9	13	34	33.8	48	56	80	1128
1989	2.321	1.091	3.552	6.698	3.574	9.823	0.347	5	13	38	35.2	48	56	100	2288
1990	1.242	0.802	1.681	3.204	1.913	4.495	0.388	9	17	40	37.3	48	54	98	1183
1991	3.552	1.494	5.610	8.854	3.301	14.408	0.401	11	24	40	39.3	47	55	102	2866
1992	1.542	1.126	1.958	4.294	2.993	5.595	0.359	6	14	38	36.0	49	63	107	1460
1993	1.180	0.805	1.555	3.136	2.174	4.099	0.376	10	14	41	36.3	49	55	115	1124
1994	1.906	1.349	2.463	4.329	3.102	5.556	0.440	9	18	42	39.4	49	59	131	1729
1995	2.682	1.795	3.569	5.527	3.739	7.316	0.485	9	21	43	41.2	48	56	118	2058
1996	2.239	1.504	2.973	5.146	3.582	6.711	0.435	9	13	42	38.1	49	60	112	1878
1997	2.148	1.533	2.763	4.825	3.407	6.243	0.445	10	21	43	40.0	49	60	109	1757
1998	2.704	1.968	3.441	5.914	4.237	7.591	0.457	10	20	43	40.2	49	57	129	1713
1999	3.210	2.344	4.076	7.698	5.042	10.355	0.417	6	21	41	38.4	48	58	143	2289
2000	2.550	1.607	3.493	5.711	3.761	7.661	0.447	10	22	43	40.1	49	63	116	1759
2001	2.845	2.032	3.658	6.044	4.265	7.823	0.471	10	22	43	41.4	49	57	130	1985
2002	3.375	2.371	4.379	7.358	5.170	9.545	0.459	9	23	43	40.8	49	54	135	2515
2003	7.740	5.218	10.261	18.199	11.697	24.702	0.425	10	18	41	39.3	48	55	141	6523
2004	2.265	1.388	3.141	4.556	2.714	6.399	0.497	8	26	43	42.3	49	57	122	2270
2005	3.766	2.281	5.252	7.606	4.698	10.515	0.495	9	21	44	41.8	49	55	122	2437
2006	3.551	2.492	4.611	7.339	5.154	9.524	0.484	9	20	43	41.4	49	57	130	3349
2007	2.030	1.199	2.861	5.111	2.997	7.225	0.397	10	13	42	36.6	49	55	118	1439

Table 22. Abundance and biomass from NEFSC winter surveys for little skate for the Georges Bank to Mid-Atlantic region (offshore strata 1-3,5-7,9-11,13-14,16,61-63,65-67,69-71,73-75). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1992-2007. Stratum 16 not sampled in 1993, 2000, 2002-2007. Strata 13 and 14 not sampled in 2003 and 2007. Stratum 63 not sampled in 1993. Stratum 14 not sampled in 2005 and 2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1992	66.321	50.335	82.306	170.155	127.459	212.852	0.390	9	21	39	38.0	47	62	89	18418
1993	56.377	43.992	68.761	166.927	120.808	213.045	0.338	9	19	36	35.8	46	53	94	16026
1994	49.812	37.387	62.236	131.570	95.199	167.940	0.379	10	20	39	37.5	47	60	67	10113
1995	57.368	39.311	75.424	138.769	87.458	190.081	0.413	8	24	40	39.1	47	53	95	14530
1996	64.056	47.616	80.495	150.579	108.945	192.213	0.425	9	15	41	38.7	47	62	102	15701
1997	51.901	39.986	63.816	117.751	92.288	143.214	0.441	9	23	42	40.2	47	58	92	12084
1998	57.512	49.249	65.775	138.503	111.869	165.136	0.415	9	20	41	38.7	47	57	105	14492
1999	58.566	46.296	70.837	138.876	104.459	173.292	0.422	6	22	41	39.3	48	55	99	14740
2000	50.725	37.806	63.643	115.572	87.597	143.547	0.439	8	20	42	39.5	47	53	92	10722
2001	47.429	38.584	56.274	105.749	85.050	126.447	0.449	8	11	42	39.7	48	63	120	12956
2002	63.321	49.704	76.937	149.228	116.464	181.993	0.424	8	23	42	40.2	48	56	110	17329
2003	63.943	44.340	83.546	151.185	105.428	196.943	0.423	9	24	41	40.0	48	54	62	8870
2004	71.803	50.398	87.208	162.456	128.807	196.106	0.442	10	25	41	40.5	47	54	94	13822
2005	64.149	45.820	82.478	140.444	93.239	187.648	0.457	9	25	42	40.9	47	54	68	9544
2006	59.254	48.374	70.134	116.433	96.399	136.467	0.509	9	23	43	42.1	49	55	87	12687
2007	48.498	33.785	63.210	106.848	70.103	143.593	0.454	9	22	43	40.8	48	58	86	9258

Table 23. Abundance and biomass from NEFSC spring surveys for barndoor skate for the Gulf of Maine to Southern New England region (offshore strata 1-30, 33-40). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1968-2008.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1968	0.374	0.075	0.673	0.138	0.026	0.249	2.716	41	46	61	71.7	115	118	10	21
1969	0.658	-0.364	1.681	0.145	-0.011	0.301	4.539	33	42	70	83.1	119	120	8	22
1970	0.111	0.033	0.188	0.047	0.017	0.078	2.350	45	44	62	68.2	104	105	9	10
1971	0.116	0.018	0.214	0.102	0.021	0.183	1.134	26	31	59	57.1	69	80	8	20
1972	0.222	0.028	0.416	0.023	0.005	0.041	9.617	63	62	119	104.7	123	124	6	6
1973	0.010	-0.001	0.022	0.017	0.000	0.034	0.621	51	51	51	54.1	59	60	3	3
1974	0.020	-0.005	0.045	0.017	-0.002	0.037	1.146	43	43	58	53.3	59	60	3	3
1975	0.001	-0.001	0.003	0.001	-0.001	0.003	0.900	60	60	60	60.0	60	60	1	1
1976	0.010	-0.010	0.030	0.006	-0.005	0.017	1.800	61	61	61	61.0	61	61	1	1
1977	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1978	0.015	-0.009	0.040	0.016	-0.006	0.039	0.933	51	50	55	56.3	61	62	2	3
1979	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1980	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1981	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1982	0.002	-0.001	0.005	0.002	-0.002	0.005	1.000	54	54	54	54.0	54	54	1	1
1983	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1984	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1985	0.001	0.000	0.002	0.007	-0.004	0.017	0.076	20	20	20	24.6	37	38	2	2
1986	0.003	-0.001	0.007	0.011	-0.004	0.026	0.250	33	33	41	37.5	41	42	2	2
1987	0.002	-0.002	0.006	0.007	-0.006	0.020	0.300	37	37	37	37.0	37	37	1	1
1988	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1989	0.007	-0.007	0.021	0.006	-0.006	0.019	1.100	60	60	60	60.0	60	60	1	1
1990	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1991	0.002	-0.002	0.006	0.007	-0.006	0.020	0.300	38	38	38	38.0	38	38	1	1
1992	0.136	-0.117	0.389	0.013	-0.006	0.032	10.397	41	41	117	98.2	124	125	2	4
1993	0.032	0.024	0.039	0.028	0.005	0.051	1.147	31	31	37	45.3	89	90	5	5
1994	0.084	-0.023	0.191	0.029	-0.001	0.059	2.926	46	46	65	70.1	120	121	4	6
1995	0.015	-0.007	0.037	0.012	-0.005	0.029	1.254	55	55	63	59.6	63	64	2	2
1996	0.062	-0.039	0.162	0.025	-0.003	0.054	2.465	23	23	66	63.2	111	112	4	6
1997	0.077	0.006	0.148	0.035	0.007	0.063	2.216	39	39	67	68.7	89	90	6	7
1998	0.169	-0.024	0.363	0.061	0.015	0.106	2.799	26	26	60	64.4	122	123	8	15
1999	0.279	-0.102	0.660	0.052	0.011	0.094	5.343	28	28	74	80.9	125	126	8	11
2000	0.473	0.246	0.699	0.138	0.076	0.200	3.419	19	20	68	71.4	125	127	14	29
2001	0.170	0.032	0.307	0.141	0.048	0.234	1.200	20	20	52	54.8	77	115	13	30
2002	0.477	0.233	0.721	0.129	0.047	0.212	3.690	35	35	66	77.3	127	133	13	26
2003	0.885	0.341	1.429	0.302	0.172	0.432	2.928	19	19	54	64.0	126	132	23	64
2004	0.103	0.039	0.167	0.111	0.032	0.189	0.928	19	19	55	50.6	81	89	12	24
2005	0.670	0.120	1.221	0.319	0.073	0.565	2.101	26	33	68	68.1	109	122	15	59
2006	1.706	-0.995	4.407	0.586	-0.087	1.260	2.910	19	19	69	69.9	123	134	22	196
2007	6.711	6.606	6.816	1.451	1.331	1.572	4.624	20	35	73	83.4	128	133	23	325
2008	1.370	-0.678	3.419	0.519	-0.059	1.096	2.641	28	33	67	70.9	113	133	17	140

Table 24. Abundance and biomass from NEFSC autumn surveys for barndoor skate for the Gulf of Maine to Southern New England region (offshore strata 1-30, 33-40). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1963-2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1963	2.633	1.604	3.663	0.762	0.468	1.056	3.458	28	44	69	74.6	121	136	47	120
1964	1.212	0.489	1.934	0.400	0.229	0.570	3.030	40	41	69	72.7	112	122	32	63
1965	1.822	1.115	2.528	0.695	0.441	0.949	2.622	27	42	67	69.9	111	134	36	95
1966	0.811	0.394	1.229	0.459	0.243	0.675	1.767	23	38	60	63.0	88	115	26	62
1967	0.438	-0.025	0.901	0.064	0.017	0.111	6.844	45	52	65	81.0	119	120	10	14
1968	0.285	0.123	0.447	0.132	0.067	0.198	2.150	42	42	67	69.1	96	132	18	29
1969	0.054	-0.003	0.111	0.035	-0.006	0.076	1.551	51	51	62	62.0	73	74	5	8
1970	0.066	-0.046	0.178	0.011	-0.005	0.027	5.868	66	66	65	89.1	128	129	2	2
1971	0.170	-0.051	0.392	0.117	-0.077	0.311	1.455	35	35	53	54.6	63	120	6	19
1972	0.096	-0.073	0.265	0.012	-0.001	0.026	7.751	59	59	70	90.3	132	133	3	3
1973	0.004	-0.001	0.009	0.008	-0.003	0.019	0.474	41	41	47	48.7	52	53	2	3
1974	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1975	0.017	-0.016	0.049	0.010	-0.010	0.031	1.600	70	70	70	70.0	70	70	1	2
1976	0.047	0.002	0.091	0.058	-0.003	0.119	0.810	50	50	51	54.6	61	62	7	10
1977	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1978	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1979	0.009	-0.008	0.026	0.003	-0.003	0.009	3.000	78	78	78	78.0	78	78	1	1
1980	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1981	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1982	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1983	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1984	0.010	-0.004	0.024	0.003	0.000	0.007	2.900	61	61	84	73.0	84	85	2	2
1985	0.004	-0.004	0.012	0.002	-0.002	0.005	2.300	70	70	70	70.0	70	70	1	1
1986	0.029	-0.018	0.077	0.015	-0.002	0.032	2.008	22	22	52	51.0	90	91	3	3
1987	0.014	-0.005	0.032	0.012	-0.004	0.027	1.200	53	53	63	58.5	63	64	2	2
1988	0.007	-0.005	0.020	0.009	-0.005	0.022	0.850	34	34	33	44.8	76	77	2	2
1989	0.005	-0.005	0.014	0.002	-0.002	0.007	2.100	71	71	71	71.0	71	71	1	1
1990	0.028	-0.022	0.078	0.010	-0.005	0.024	2.964	60	60	66	76.3	95	96	2	3
1991	0.031	0.000	0.062	0.020	0.000	0.040	1.579	54	54	61	61.3	73	74	4	5
1992	0.002	-0.002	0.007	0.004	-0.004	0.013	0.550	46	46	51	49.0	51	52	1	2
1993	0.141	-0.040	0.321	0.023	0.004	0.042	6.180	45	45	74	86.6	127	128	5	6
1994	0.035	0.001	0.069	0.044	0.006	0.082	0.790	33	33	47	49.4	75	76	6	9
1995	0.111	-0.009	0.231	0.040	-0.006	0.085	2.810	48	48	62	70.9	113	114	4	10
1996	0.042	-0.020	0.104	0.023	0.000	0.046	1.841	25	25	61	59.8	92	93	4	5
1997	0.105	-0.024	0.234	0.026	0.004	0.047	4.065	36	36	79	73.3	124	125	5	5
1998	0.089	-0.036	0.214	0.026	0.002	0.050	3.453	48	48	71	73.9	120	121	4	5
1999	0.300	0.051	0.549	0.085	0.041	0.130	3.511	23	23	54	68.0	120	121	13	15
2000	0.288	0.054	0.521	0.054	0.023	0.085	5.360	29	29	89	85.5	121	122	12	15
2001	0.543	0.050	1.036	0.149	0.052	0.247	3.635	24	40	75	75.5	121	126	16	34
2002	0.778	0.351	1.205	0.269	0.130	0.407	2.893	26	27	59	68.0	119	129	24	59
2003	0.553	0.255	0.852	0.251	0.157	0.345	2.203	22	22	48	57.1	115	120	29	55
2004	1.295	0.677	1.913	0.229	0.122	0.336	5.662	42	47	80	90.1	124	128	23	58
2005	1.036	0.482	1.590	0.360	0.207	0.513	2.877	18	25	64	68.1	118	132	29	73
2006	1.168	0.392	1.945	0.435	0.169	0.701	2.687	19	29	58	65.5	118	127	35	102
2007	0.798	0.387	1.208	0.305	0.125	0.485	2.617	26	33	59	67.0	126	140	24	71

Table 25. Abundance and biomass from NEFSC winter surveys for barndoor skate for the Georges Bank to Mid-Atlantic region (offshore strata 1-3,5-7,9-11,13-14,16,61-63,65-67,69-71,73-75). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1992-2007. Stratum 16 not sampled in 1993, 2000, 2002-2007. Strata 13 and 14 not sampled in 2003 and 2007. Stratum 63 not sampled in 1993. Stratum 14 not sampled in 2005 and 2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1992	0.000	0.000	0.000	0.000	0.000	0.000	-	-			-		-	0	0
1993	0.123	-0.066	0.311	0.052	0.004	0.100	2.358	20	20	65	57.3	119	120	4	6
1994	0.185	-0.027	0.397	0.080	0.011	0.148	2.328	21	21	60	63.5	102	103	5	7
1995	0.362	0.121	0.603	0.198	0.056	0.340	1.828	33	33	62	63.6	88	109	11	24
1996	0.291	0.079	0.503	0.203	0.054	0.352	1.434	19	20	61	56.4	85	92	12	23
1997	0.618	0.208	1.028	0.275	0.032	0.519	2.247	35	38	65	67.7	112	117	10	28
1998	0.455	0.146	0.765	0.464	0.092	0.837	0.980	20	26	41	46.8	83	123	12	57
1999	1.053	0.347	1.760	0.709	0.318	1.099	1.486	23	27	46	53.2	113	124	22	81
2000	2.718	0.153	5.284	1.081	0.518	1.643	2.515	19	19	56	62.8	122	126	12	69
2001	1.373	0.375	2.370	0.929	0.168	1.691	1.477	19	30	60	58.7	95	127	21	107
2002	2.126	0.506	3.746	0.950	0.441	1.459	2.238	18	29	58	63.9	119	126	24	123
2003	0.872	0.429	1.316	0.776	0.227	1.324	1.125	26	31	46	52.0	90	131	11	47
2004	3.397	1.214	5.581	1.786	0.972	2.601	1.902	18	30	53	60.9	116	130	23	247
2005	1.061	0.542	1.581	1.23101	0.703	1.759	0.862	18	19	44	47.8	84	102	21	103
2006	3.015	1.519	4.511	3.171	1.622	4.719	0.951	20	29	51	52.9	78	111	37	355
2007	1.847	0.815	2.878	2.318	0.199	4.438	0.797	20	30	44	48.5	80	118	25	220

Table 26. Abundance and biomass from NEFSC spring surveys for thorny skate for the Gulf of Maine to Southern New England region (offshore strata 1-30,33-40). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1968-2008.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1968	3.181	2.137	4.225	1.600	1.067	2.134	1.987	12	16	44	47.8	91	105	60	252
1969	4.526	3.186	5.865	1.680	1.161	2.199	2.694	12	13	47	51.1	98	109	64	294
1970	4.202	3.229	5.174	1.990	1.478	2.502	2.112	12	16	41	48.2	95	110	84	363
1971	3.683	2.475	4.891	1.974	1.473	2.475	1.866	12	15	44	47.8	95	116	81	424
1972	4.984	3.757	6.212	2.219	1.773	2.665	2.246	12	16	47	50.7	94	110	91	443
1973	6.622	4.867	8.377	3.562	2.640	4.483	1.859	12	15	44	47.9	91	108	75	574
1974	3.774	2.939	4.608	2.450	1.938	2.962	1.540	9	14	43	45.8	87	106	81	376
1975	3.189	2.222	4.157	1.360	0.990	1.731	2.344	10	15	46	50.5	95	102	62	192
1976	2.895	2.041	3.750	1.671	1.281	2.060	1.733	13	15	43	47.2	90	106	79	339
1977	1.623	1.175	2.070	0.942	0.675	1.209	1.722	12	15	42	48.1	89	111	74	213
1978	1.250	0.806	1.695	0.800	0.579	1.020	1.564	10	15	49	46.8	83	97	71	191
1979	1.079	0.729	1.429	0.582	0.410	0.754	1.853	12	17	51	50.5	84	102	68	163
1980	2.105	1.308	2.901	1.319	0.880	1.757	1.596	11	13	37	43.6	92	100	60	250
1981	2.700	2.065	3.335	1.535	1.139	1.930	1.760	9	13	47	48.1	87	100	60	255
1982	2.345	1.685	3.004	1.144	0.878	1.411	2.049	10	17	53	52.4	85	97	62	218
1983	2.142	1.398	2.886	0.968	0.728	1.209	2.212	12	15	52	52.3	91	103	55	156
1984	1.453	0.818	2.087	0.608	0.462	0.755	2.389	12	16	51	53.0	96	100	40	97
1985	3.074	2.124	4.024	1.413	1.060	1.766	2.175	11	14	44	48.4	95	102	59	209
1986	2.619	1.974	3.263	1.718	1.377	2.058	1.525	10	15	38	44.0	83	98	69	276
1987	1.469	0.805	2.133	0.852	0.646	1.058	1.724	14	16	42	46.6	87	109	53	141
1988	1.173	0.735	1.612	1.106	0.766	1.446	1.061	11	14	32	38.5	82	98	59	176
1989	1.481	0.793	2.169	1.221	0.801	1.640	1.213	11	15	34	40.0	84	101	57	175
1990	1.565	0.833	2.296	1.097	0.688	1.506	1.427	14	16	39	44.5	82	99	49	167
1991	1.542	0.945	2.139	0.858	0.569	1.147	1.797	11	13	47	48.5	89	99	47	132
1992	1.092	0.621	1.564	0.612	0.384	0.840	1.784	14	15	47	48.4	89	102	31	86
1993	0.700	0.366	1.034	0.486	0.327	0.646	1.440	13	13	36	42.0	91	105	37	79
1994	0.435	0.242	0.629	0.439	0.270	0.609	0.991	12	12	37	39.3	67	92	39	80
1995	0.564	0.307	0.821	0.384	0.236	0.533	1.467	9	12	42	45.8	84	92	31	66
1996	0.371	0.178	0.563	0.321	0.106	0.535	1.156	12	12	36	40.8	80	93	24	63
1997	0.422	0.117	0.727	0.270	0.153	0.387	1.560	15	20	47	47.9	82	87	25	47
1998	0.480	0.209	0.752	0.334	0.236	0.431	1.440	12	14	35	40.8	89	98	42	85
1999	0.369	0.093	0.646	0.255	0.163	0.347	1.448	11	17	40	46.2	83	89	26	44
2000	0.423	0.166	0.680	0.470	0.013	0.927	0.900	12	12	24	34.0	82	89	28	103
2001	0.493	0.217	0.769	0.221	0.080	0.362	2.234	14	33	56	57.7	80	92	16	35
2002	0.333	0.138	0.529	0.248	0.127	0.369	1.340	13	15	38	42.0	88	93	24	53
2003	0.594	0.268	0.920	0.332	0.203	0.461	1.790	19	19	50	50.9	86	102	30	57
2004	0.368	0.178	0.557	0.212	0.128	0.296	1.731	15	15	47	49.3	91	95	22	48
2005	0.435	0.154	0.716	0.371	0.167	0.576	1.171	16	17	44	44.4	76	89	19	62
2006	0.201	0.035	0.366	0.186	0.020	0.352	1.079	12	14	41	41.9	83	87	15	29
2007	0.390	0.144	0.635	0.430	0.228	0.632	0.907	9	11	24	32.3	88	98	26	99
2008	0.255	0.088	0.422	0.184	0.086	0.281	1.387	10	12	37	41.5	90	94	20	39

Table 27. Abundance and biomass from NEFSC autumn surveys for thorny skate for the Gulf of Maine to Southern New England region (offshore strata 1-30, 33-40). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1963-2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1963	5.371	3.788	6.954	1.672	1.305	2.039	3.213	10	15	60	60.4	99	107	65	297
1964	4.403	3.273	5.534	1.651	1.110	2.192	2.667	10	14	49	52.7	96	110	66	278
1965	4.474	3.268	5.681	1.825	1.243	2.408	2.451	10	14	45	49.6	95	107	55	352
1966	7.971	6.163	9.780	2.371	1.855	2.886	3.362	9	13	61	59.4	95	112	72	364
1967	2.712	1.422	4.001	0.982	0.383	1.580	2.763	12	14	49	52.5	95	100	54	165
1968	4.421	3.321	5.521	1.440	1.040	1.840	3.071	12	16	55	57.5	97	107	59	217
1969	5.715	4.320	7.110	1.833	1.359	2.307	3.117	12	14	55	56.7	97	106	72	289
1970	7.347	5.630	9.065	2.216	1.474	2.958	3.316	8	19	57	60.4	98	109	77	403
1971	5.357	4.149	6.565	1.434	1.095	1.774	3.735	12	18	63	64.1	99	111	69	284
1972	4.119	2.974	5.263	1.717	1.302	2.132	2.399	12	16	51	53.1	94	105	75	306
1973	4.564	3.227	5.902	1.536	1.134	1.939	2.971	12	17	59	61.2	95	111	72	274
1974	3.038	2.166	3.910	1.392	1.025	1.759	2.182	10	14	50	51.1	89	111	79	293
1975	2.474	1.483	3.464	1.027	0.716	1.338	2.409	10	12	47	50.0	94	106	70	232
1976	1.720	1.003	2.437	0.798	0.543	1.052	2.157	12	15	44	49.1	91	103	57	143
1977	3.221	2.513	3.928	1.548	1.223	1.874	2.080	10	13	49	50.7	89	107	108	446
1978	4.291	3.473	5.109	2.145	1.643	2.648	2.000	10	16	49	51.1	88	107	155	874
1979	3.612	2.750	4.474	1.283	0.864	1.702	2.815	11	21	59	59.5	89	101	134	486
1980	4.601	3.344	5.859	1.882	1.484	2.280	2.445	11	14	54	54.4	90	100	84	416
1981	3.339	2.551	4.127	1.305	0.957	1.653	2.559	12	15	55	57.1	90	103	71	223
1982	0.646	0.312	0.981	0.393	0.194	0.592	1.644	11	13	33	43.0	85	96	31	83
1983	2.409	1.553	3.266	0.833	0.589	1.077	2.892	15	20	56	58.8	93	108	49	121
1984	2.887	1.978	3.795	1.270	0.975	1.565	2.272	10	13	48	49.8	94	107	70	211
1985	2.877	1.765	3.988	1.438	1.094	1.783	2.000	12	16	49	49.6	87	103	66	260
1986	1.629	1.068	2.189	1.019	0.771	1.268	1.598	11	15	35	44.2	83	101	61	183
1987	0.944	0.590	1.297	0.841	0.600	1.082	1.123	12	14	36	40.2	78	92	49	143
1988	1.488	0.998	1.978	1.099	0.702	1.497	1.354	13	15	31	41.5	84	101	56	208
1989	1.883	0.980	2.786	1.129	0.787	1.471	1.668	12	14	40	46.2	85	101	63	198
1990	1.704	1.090	2.318	1.040	0.744	1.335	1.639	12	17	42	47.2	85	95	53	202
1991	1.632	0.519	2.745	0.921	0.591	1.251	1.772	13	15	47	49.5	86	108	54	153
1992	0.962	0.551	1.373	0.775	0.461	1.088	1.242	12	13	36	41.2	83	99	48	144
1993	1.658	0.639	2.676	0.901	0.440	1.361	1.840	12	13	47	47.8	91	101	50	157
1994	1.509	0.343	2.675	0.981	0.311	1.652	1.538	13	17	45	46.9	84	97	41	170
1995	0.783	0.331	1.235	0.639	0.183	1.095	1.226	13	14	39	42.2	72	99	37	107
1996	0.814	0.360	1.269	0.602	0.362	0.842	1.352	14	14	39	43.3	85	99	37	102
1997	0.849	0.405	1.293	0.404	0.241	0.567	2.101	12	20	50	52.3	83	99	33	79
1998	0.648	0.297	0.999	0.307	0.145	0.468	2.113	13	14	51	52.4	87	93	30	60
1999	0.479	0.249	0.710	0.326	0.195	0.457	1.469	13	14	41	46.3	87	94	38	72
2000	0.832	0.391	1.274	0.374	0.239	0.510	2.224	13	17	49	52.7	92	102	27	70
2001	0.332	0.087	0.577	0.294	0.157	0.430	1.129	16	17	44	44.1	74	82	23	60
2002	0.436	0.188	0.684	0.260	0.126	0.393	1.679	14	15	35	44.2	85	95	25	52
2003	0.742	0.450	1.035	0.930	0.168	1.691	0.798	12	14	23	34.2	74	89	34	175
2004	0.710	0.272	1.148	0.358	0.167	0.550	1.980	14	18	45	50.1	87	90	23	65
2005	0.224	0.092	0.357	0.205	-0.034	0.443	1.096	13	18	39	42.6	76	90	17	36
2006	0.726	0.385	1.066	0.254	0.154	0.354	2.857	13	15	51	54.6	93	94	27	52
2007	0.316	0.083	0.549	0.296	0.072	0.520	1.068	10	13	19	34.6	84	92	22	45

Table 28. Abundance and biomass from NEFSC spring surveys for smooth skate for the Gulf of Maine to Southern New England region (offshore strata 1-30,33-40). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1968-2008.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1968	0.211	0.080	0.342	0.484	0.129	0.838	0.436	12	24	41	42.1	58	64	17	41
1969	0.377	0.193	0.562	0.834	0.521	1.147	0.452	11	19	48	43.3	58	63	28	82
1970	0.346	0.134	0.557	0.702	0.376	1.028	0.492	9	14	47	40.9	57	61	25	68
1971	0.800	0.395	1.205	1.185	0.650	1.719	0.675	9	20	51	48.2	61	63	40	114
1972	0.621	0.355	0.886	1.016	0.582	1.450	0.611	14	20	47	44.3	59	64	34	122
1973	1.000	0.745	1.255	1.907	1.401	2.414	0.524	9	24	45	44.2	59	65	51	179
1974	1.092	0.594	1.590	2.003	1.109	2.896	0.545	9	9	47	42.7	59	63	47	172
1975	0.240	0.133	0.346	0.383	0.224	0.543	0.626	19	25	49	46.8	59	61	22	37
1976	0.534	0.413	0.655	1.150	0.870	1.429	0.464	12	16	43	39.8	57	60	49	134
1977	0.122	0.066	0.178	0.302	0.158	0.445	0.405	15	18	40	41.4	57	60	28	45
1978	0.251	0.144	0.358	0.413	0.258	0.567	0.609	24	26	50	46.7	58	61	33	56
1979	0.218	0.097	0.340	0.410	0.163	0.657	0.533	15	19	39	40.2	54	61	27	54
1980	0.484	0.316	0.651	0.948	0.625	1.271	0.510	16	20	42	41.9	56	60	42	84
1981	0.358	0.227	0.489	0.782	0.513	1.050	0.458	8	13	38	37.2	57	65	38	70
1982	0.152	0.057	0.247	0.225	0.092	0.357	0.677	11	10	52	45.6	57	64	14	23
1983	0.363	0.219	0.507	0.531	0.335	0.727	0.683	11	21	50	47.9	57	69	25	50
1984	0.065	0.010	0.120	0.124	0.026	0.221	0.523	19	20	48	39.8	59	60	9	13
1985	0.211	0.136	0.286	0.450	0.298	0.602	0.469	18	20	41	40.4	57	63	31	59
1986	0.250	0.137	0.362	0.466	0.256	0.677	0.536	20	24	48	46.7	59	65	30	93
1987	0.069	0.029	0.108	0.105	0.044	0.166	0.655	43	42	48	50.2	59	62	12	15
1988	0.115	0.044	0.186	0.328	0.175	0.480	0.350	11	13	36	36.3	57	60	24	49
1989	0.225	0.107	0.343	0.620	0.402	0.838	0.363	13	15	37	38.8	60	63	30	88
1990	0.152	0.010	0.294	0.294	0.080	0.509	0.515	11	16	46	44.0	57	62	18	40
1991	0.137	0.073	0.200	0.237	0.136	0.337	0.576	11	17	49	47.1	59	62	22	34
1992	0.063	0.025	0.101	0.104	0.035	0.172	0.608	22	40	49	48.5	56	57	12	16
1993	0.086	0.021	0.151	0.214	0.020	0.408	0.403	21	23	42	41.2	56	58	14	35
1994	0.098	0.043	0.153	0.176	0.082	0.269	0.558	29	29	47	47.1	56	58	15	30
1995	0.101	0.050	0.152	0.234	0.119	0.349	0.432	9	20	42	41.9	55	59	18	33
1996	0.036	0.014	0.058	0.084	0.038	0.129	0.429	20	19	48	43.8	53	59	10	12
1997	0.037	0.015	0.059	0.122	0.035	0.208	0.307	17	20	36	38.9	55	58	11	22
1998	0.200	0.089	0.311	0.410	0.206	0.613	0.489	9	19	46	44.6	56	60	28	77
1999	0.243	0.068	0.418	0.925	-0.074	1.924	0.262	18	20	32	35.6	51	65	23	111
2000	0.060	0.025	0.095	0.220	-0.021	0.460	0.272	10	10	27	30.9	59	62	13	30
2001	0.058	0.020	0.096	0.125	0.058	0.192	0.466	19	28	46	44.6	57	60	16	25
2002	0.184	0.096	0.271	0.482	0.297	0.667	0.381	10	13	45	40.4	55	61	26	78
2003	0.224	0.161	0.287	0.642	0.429	0.348	0.348	14	19	40	40.4	55	59	36	95
2004	0.262	0.141	0.383	0.650	0.278	1.022	0.403	12	19	43	42.3	56	60	32	125
2005	0.457	0.125	0.788	1.207	0.288	2.126	0.378	10	27	42	42.4	53	60	22	178
2006	0.203	0.005	0.401	0.531	-0.009	1.072	0.382	19	21	41	41.3	56	62	22	71
2007	0.125	0.035	0.214	0.294	0.095	0.494	0.423	16	21	46	41.9	57	60	18	64
2008	0.340	0.075	0.604	1.050	0.156	1.945	0.323	9	14	38	36.8	55	59	20	168

Table 29. Abundance and biomass from NEFSC autumn surveys for smooth skate for the Gulf of Maine to Southern New England region (offshore strata 1-30,33-40). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1963-2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1963	0.498	0.306	0.689	0.543	0.282	0.804	0.917	9	20	48	43.9	58	62	26	53
1964	0.326	0.152	0.501	0.360	0.209	0.512	0.906	9	20	42	41.7	59	64	19	35
1965	0.475	0.140	0.811	1.221	0.440	2.001	0.389	11	16	35	38.1	56	64	27	94
1966	0.323	0.175	0.471	0.867	0.519	1.216	0.372	13	17	37	38.6	58	59	28	60
1967	0.152	0.036	0.268	0.293	0.118	0.469	0.518	22	24	48	46.5	62	69	16	27
1968	0.385	0.211	0.559	0.665	0.375	0.955	0.579	17	20	48	45.9	58	62	24	56
1969	0.290	0.131	0.449	0.604	0.282	0.925	0.481	12	16	41	39.6	58	64	21	50
1970	0.232	0.121	0.343	0.530	0.289	0.771	0.437	9	13	45	38.3	59	62	25	50
1971	0.157	0.077	0.238	0.250	0.120	0.379	0.631	17	36	53	51.0	57	59	18	27
1972	0.332	0.185	0.478	0.499	0.285	0.713	0.664	16	24	49	49.8	62	64	30	52
1973	0.311	0.199	0.423	0.506	0.344	0.667	0.614	17	22	48	46.9	58	60	32	56
1974	0.123	0.055	0.192	0.180	0.088	0.273	0.684	11	11	50	48.5	60	63	13	21
1975	0.076	0.029	0.123	0.104	0.043	0.165	0.727	21	30	49	46.7	56	57	12	15
1976	0.039	0.004	0.074	0.077	0.020	0.135	0.501	17	36	41	43.9	52	60	9	10
1977	0.376	0.274	0.478	0.600	0.443	0.757	0.627	19	24	48	44.9	56	61	50	84
1978	0.450	0.240	0.661	0.635	0.359	0.912	0.709	8	25	50	48.0	59	66	49	130
1979	0.182	0.075	0.288	0.239	0.116	0.362	0.761	9	29	50	48.7	60	62	31	60
1980	0.343	0.167	0.519	0.522	0.254	0.789	0.658	15	23	52	46.4	58	62	37	60
1981	0.119	0.039	0.199	0.167	0.069	0.264	0.715	23	26	49	48.1	60	61	13	18
1982	0.039	0.007	0.071	0.074	0.025	0.123	0.521	9	9	49	41.9	63	64	11	11
1983	0.146	0.056	0.236	0.255	0.085	0.426	0.573	14	14	46	40.9	57	59	12	24
1984	0.199	0.106	0.292	0.389	0.171	0.607	0.512	14	22	37	39.2	58	71	23	39
1985	0.210	0.088	0.332	0.340	0.180	0.500	0.617	12	15	51	45.2	59	63	28	64
1986	0.209	0.118	0.300	0.392	0.216	0.567	0.534	13	21	47	45.0	63	66	24	63
1987	0.095	0.045	0.145	0.164	0.081	0.247	0.581	15	15	48	44.8	60	61	19	28
1988	0.284	0.103	0.465	0.446	0.223	0.670	0.637	20	20	51	48.3	59	65	27	90
1989	0.128	0.072	0.185	0.336	0.194	0.478	0.382	13	16	33	36.8	59	62	27	52
1990	0.194	0.120	0.268	0.332	0.202	0.462	0.584	16	23	48	46.4	58	62	27	45
1991	0.167	0.070	0.265	0.335	0.188	0.482	0.500	18	20	46	43.9	57	62	25	59
1992	0.126	0.024	0.228	0.316	0.120	0.511	0.400	12	18	43	40.0	58	60	16	56
1993	0.227	0.107	0.346	0.818	0.273	1.362	0.277	13	13	26	32.6	56	62	29	123
1994	0.099	0.030	0.169	0.269	0.105	0.433	0.370	11	11	36	38.0	57	59	17	36
1995	0.189	0.115	0.263	0.764	0.315	1.214	0.247	10	13	30	32.6	56	59	29	119
1996	0.176	0.093	0.260	0.421	0.249	0.594	0.418	15	18	46	41.6	56	59	26	55
1997	0.232	0.117	0.347	0.449	0.232	0.665	0.517	16	21	47	45.2	60	64	20	59
1998	0.028	0.005	0.051	0.108	0.021	0.194	0.263	18	17	29	35.2	51	53	11	18
1999	0.070	0.032	0.109	0.110	0.050	0.171	0.638	22	22	50	48.7	60	62	16	22
2000	0.154	0.083	0.226	0.318	0.190	0.447	0.485	10	11	45	42.3	59	73	27	55
2001	0.287	0.169	0.405	0.565	0.349	0.781	0.507	17	23	49	46.5	58	62	29	84
2002	0.111	0.067	0.155	0.209	0.140	0.278	0.533	15	24	50	46.2	60	62	25	32
2003	0.190	0.076	0.304	0.646	0.248	1.045	0.294	10	14	39	36.3	52	62	30	84
2004	0.214	0.126	0.303	0.467	0.283	0.652	0.458	18	24	47	45.3	55	59	29	58
2005	0.131	0.039	0.224	0.291	0.143	0.439	0.451	15	17	47	43.1	59	62	18	44
2006	0.211	0.106	0.316	0.387	0.230	0.544	0.545	10	14	50	45.6	59	62	27	56
2007	0.089	0.048	0.131	0.198	0.107	0.289	0.451	16	24	47	43.6	58	71	19	31

Table 30. Abundance and biomass from NEFSC spring surveys for clearnose skate for the Mid-Atlantic region (offshore strata 61-76, inshore strata 15-44). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1976-2008.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1976	0.100	0.020	0.179	0.129	0.040	0.218	0.770	26	26	43	48.5	66	67	8	12
1977	0.509	0.297	0.722	0.500	0.260	0.741	1.017	23	23	56	52.5	63	64	17	41
1978	0.211	-0.094	0.516	0.237	-0.057	0.530	0.893	20	20	57	52.2	68	69	8	21
1979	0.109	0.010	0.209	0.125	0.004	0.247	0.875	25	25	42	50.3	77	78	6	9
1980	0.319	0.100	0.538	0.456	0.136	0.775	0.700	25	25	41	45.1	64	69	14	44
1981	0.891	-0.141	1.923	0.606	0.106	1.107	1.469	24	26	60	55.9	67	72	10	44
1982	0.328	0.165	0.491	0.368	0.126	0.610	0.892	30	32	52	53.6	66	71	14	40
1983	0.138	0.005	0.270	0.127	0.003	0.252	1.081	13	13	58	51.3	65	66	7	11
1984	0.380	0.103	0.658	0.288	0.018	0.557	1.321	48	48	62	60.7	70	74	11	25
1985	0.493	-0.166	1.151	0.436	-0.203	1.076	1.129	48	48	58	59.3	69	72	10	37
1986	0.155	0.035	0.274	0.232	0.038	0.427	0.666	27	27	44	44.8	68	69	11	15
1987	0.306	0.150	0.463	0.202	0.109	0.204	1.519	49	51	63	61.9	69	72	16	20
1988	0.340	0.171	0.508	0.300	0.097	0.502	1.134	44	44	58	57.1	67	71	11	19
1989	0.424	0.258	0.590	0.415	0.275	0.554	1.023	25	25	58	52.3	68	72	14	40
1990	0.501	0.283	0.719	0.420	0.243	0.597	1.192	30	30	59	56.2	67	72	15	52
1991	0.690	0.463	0.918	0.543	0.354	0.731	1.272	27	27	62	58.8	68	71	23	59
1992	0.748	0.324	1.172	0.489	0.218	0.760	1.529	46	46	63	63.0	68	80	23	47
1993	0.856	0.479	1.233	0.656	0.216	1.096	1.305	21	33	63	58.6	70	74	12	136
1994	0.319	0.052	0.585	0.188	0.043	0.333	1.699	51	57	65	66.0	73	74	8	24
1995	0.669	0.361	0.977	0.464	0.261	0.666	1.443	46	46	67	62.4	68	74	18	32
1996	1.224	0.194	2.254	0.948	0.255	1.641	1.291	13	27	62	59.8	70	75	30	95
1997	1.290	0.885	1.695	0.972	0.542	1.403	1.326	33	39	63	61.3	71	78	22	80
1998	0.903	0.674	1.133	0.667	0.369	0.964	1.355	26	38	62	60.2	70	74	29	81
1999	0.943	0.647	1.238	0.862	0.470	1.255	1.093	26	28	59	57.3	67	72	19	54
2000	1.391	1.046	1.736	1.140	0.789	1.491	1.221	24	40	59	59.4	70	76	31	126
2001	1.380	0.674	2.087	1.097	0.456	1.738	1.258	42	49	62	60.8	68	72	19	74
2002	0.836	0.281	1.392	0.617	0.241	0.993	1.355	29	42	62	60.5	69	74	23	59
2003	0.622	0.366	0.879	0.448	0.265	0.631	1.389	49	49	62	62.7	75	76	16	35
2004	0.433	0.050	0.815	0.376	0.049	0.703	1.151	35	35	59	56.2	70	72	9	23
2005	0.569	0.030	1.109	0.414	0.008	0.820	1.374	42	42	61	61.2	70	73	11	27
2006	0.567	0.189	0.946	0.420	0.179	0.661	1.350	36	41	63	60.7	68	72	18	39
2007	0.857	0.406	1.308	0.745	0.273	1.217	1.150	28	30	60	58.4	69	73	19	48
2008	1.188	0.603	1.773	0.846	0.370	1.322	1.404	27	43	62	62.4	72	79	30	103

Table 31. Abundance and biomass from NEFSC autumn surveys for clearnose skate for the Mid-Atlantic region (offshore strata 61-76, inshore strata 15-44). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1975-2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1975	0.237	0.086	0.388	0.246	0.133	0.360	0.961	21	21	53	50.3	63	66	31	49
1976	0.302	0.189	0.415	0.348	0.236	0.459	0.869	18	34	52	52.1	64	69	26	54
1977	0.768	0.288	1.248	0.742	0.281	1.203	1.035	15	37	57	55.4	65	68	32	106
1978	0.156	0.073	0.240	0.224	0.086	0.363	0.697	10	10	44	40.8	64	66	14	23
1979	0.419	0.116	0.721	0.346	0.146	0.545	1.211	22	24	56	55.4	67	71	27	46
1980	0.685	0.408	0.961	0.549	0.322	0.775	1.248	33	37	59	58.1	69	72	32	80
1981	0.171	0.081	0.260	0.179	0.087	0.271	0.954	27	27	55	51.5	65	68	19	28
1982	0.213	0.099	0.326	0.183	0.095	0.271	1.163	32	43	59	58.3	67	72	26	37
1983	0.141	0.027	0.254	0.127	0.043	0.210	1.110	16	16	57	52.2	64	70	15	19
1984	0.178	0.064	0.293	0.189	0.063	0.315	0.945	34	37	53	54.0	67	83	20	32
1985	0.306	0.173	0.439	0.315	0.182	0.447	0.974	32	41	56	54.9	66	71	23	42
1986	0.545	-0.038	1.027	0.591	0.091	1.092	0.921	23	23	59	52.6	64	71	31	62
1987	0.320	0.176	0.465	0.289	0.167	0.412	1.107	15	41	56	55.5	69	70	23	42
1988	0.335	0.157	0.513	0.329	0.163	0.495	1.019	33	37	57	56.0	66	71	19	60
1989	0.273	0.075	0.471	0.324	0.064	0.584	0.843	37	37	52	52.7	63	70	20	39
1990	0.402	0.157	0.646	0.306	0.114	0.499	1.311	16	41	60	57.9	69	72	17	50
1991	0.922	0.279	1.566	0.816	0.339	1.294	1.130	35	39	58	57.1	69	71	35	119
1992	0.345	0.185	0.505	0.312	0.185	0.440	1.104	16	42	59	56.7	67	69	22	48
1993	0.495	0.145	0.844	0.474	0.188	0.759	1.044	35	40	57	56.8	66	73	27	104
1994	0.938	0.479	1.398	0.842	0.494	1.190	1.115	35	40	57	57.1	66	73	35	129
1995	0.331	0.189	0.473	0.426	0.233	0.618	0.777	14	14	51	45.5	66	72	25	63
1996	0.430	0.194	0.666	0.369	0.163	0.576	1.165	29	45	59	58.8	68	72	20	42
1997	0.614	0.296	0.932	0.484	0.281	0.688	1.269	43	43	61	60.2	69	77	27	60
1998	1.121	0.115	2.128	1.096	0.124	2.068	1.023	34	43	57	57.5	68	73	32	98
1999	1.053	0.536	1.570	0.928	0.525	1.332	1.134	15	32	61	57.8	69	71	41	84
2000	1.032	0.422	1.642	0.795	0.353	1.238	1.298	14	47	60	60.5	69	74	29	61
2001	1.614	1.092	2.136	1.494	0.984	2.004	1.081	13	15	59	55.2	68	73	41	221
2002	0.891	0.372	1.411	0.863	0.317	1.409	1.033	14	38	55	56.0	68	73	27	63
2003	0.661	0.417	0.906	0.640	0.456	0.823	1.034	15	30	54	54.5	71	78	38	81
2004	0.709	0.201	1.217	0.590	0.172	1.008	1.201	37	43	62	60.1	69	75	18	55
2005	0.524	0.192	0.855	0.452	0.207	0.697	1.159	26	37	62	59.6	71	74	30	71
2006	0.533	0.257	0.809	0.654	0.347	0.961	0.816	13	37	53	52.6	64	71	35	77
2007	0.853	0.430	1.276	0.788	0.386	1.191	1.082	13	34	60	57.9	67	74	25	74

Table 32. Abundance and biomass from NEFSC winter surveys for clearnose skate for the Georges Bank to Mid-Atlantic region (offshore strata 1-3,5-7,9-11,13-14,16,61-63,65-67,69-71,73-75). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1992-2007. Stratum 16 not sampled in 1993, 2000, 2002-2007. Strata 13 and 14 not sampled in 2003 and 2007. Stratum 63 not sampled in 1993. Stratum 14 not sampled in 2005 and 2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1992	5.622	3.247	7.997	5.247	2.974	7.519	1.072	23	26	59	54.7	67	93	22	551
1993	6.013	3.818	8.208	5.973	3.852	8.093	1.007	22	33	57	54.3	67	81	23	716
1994	8.854	4.037	13.672	7.692	2.152	13.233	1.151	27	33	60	57.5	69	77	16	639
1995	7.924	2.521	13.327	6.247	1.301	11.194	1.268	24	45	61	60.2	69	76	23	737
1996	14.725	8.266	21.183	11.555	6.347	16.762	1.274	22	40	61	60.0	69	77	32	3086
1997	5.522	3.154	7.890	5.069	2.158	7.980	1.089	22	35	59	56.2	70	76	32	682
1998	6.031	4.470	7.592	4.878	3.195	6.560	1.236	22	36	60	58.3	71	88	32	1091
1999	3.826	2.335	5.317	3.022	1.586	4.459	1.266	23	37	61	59.6	70	76	30	343
2000	10.102	5.693	14.510	8.864	4.579	13.150	1.140	25	42	59	58.2	69	93	43	1449
2001	8.316	5.624	11.008	6.599	4.240	8.957	1.260	25	43	61	60.6	69	86	41	1300
2002	12.223	8.343	16.102	8.864	5.886	11.843	1.379	23	39	63	61.6	70	74	51	1704
2003	19.637	13.819	25.455	15.769	10.902	20.635	1.245	23	39	62	59.1	70	81	36	2260
2004	11.566	7.743	15.389	10.162	6.344	13.979	1.138	20	35	60	58.1	70	80	38	1880
2005	6.036	3.837	8.235	5.078	2.425	7.731	1.189	24	44	60	59.1	70	82	26	1047
2006	11.723	4.862	18.585	11.085	4.693	17.477	1.058	23	35	57	56.7	70	77	41	1916
2007	15.151	10.623	19.679	11.760	8.466	15.054	1.288	25	44	62	60.5	70	82	51	1731

Table 33. Abundance and biomass from NEFSC spring surveys for rosette skate for the Mid-Atlantic region (offshore strata 61-76). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1968-2008.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1968	0.005	-0.002	0.012	0.014	0.000	0.029	0.356	33	33	33	34.4	35	36	3	3
1969	0.001	-0.001	0.002	0.003	-0.003	0.010	0.200	37	37	37	37.0	37	37	1	1
1970	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1971	0.005	-0.005	0.014	0.010	-0.009	0.028	0.500	57	57	57	57.0	57	57	1	1
1972	0.000	0.000	0.001	0.003	-0.003	0.010	0.100	35	35	35	35.0	35	35	1	1
1973	0.006	-0.001	0.012	0.023	-0.006	0.052	0.240	38	38	38	38.6	41	42	4	5
1974	0.005	-0.005	0.015	0.025	-0.024	0.074	0.200	41	41	41	41.0	41	41	1	1
1975	0.001	-0.001	0.003	0.005	-0.005	0.014	0.200	38	38	38	38.5	39	39	1	2
1976	0.007	0.000	0.015	0.035	-0.003	0.073	0.208	31	31	36	36.9	44	45	4	6
1977	0.102	0.019	0.186	0.552	0.107	0.998	0.185	20	26	32	33.6	37	42	11	70
1978	0.010	0.001	0.019	0.041	0.008	0.074	0.232	12	25	35	35.3	40	41	7	10
1979	0.007	0.005	0.009	0.040	0.031	0.048	0.171	13	13	34	31.6	40	41	4	10
1980	0.072	0.030	0.115	0.373	0.167	0.580	0.194	26	27	34	35.3	41	42	15	47
1981	0.013	0.001	0.025	0.057	0.006	0.109	0.231	19	28	37	36.3	41	42	6	17
1982	0.025	0.010	0.040	0.108	0.043	0.174	0.234	22	25	37	37.4	43	44	11	20
1983	0.002	-0.001	0.004	0.012	-0.006	0.029	0.147	29	29	34	34.2	35	36	2	5
1984	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-	0	0
1985	0.005	-0.001	0.011	0.059	0.040	0.079	0.080	17	17	18	21.0	29	42	3	9
1986	0.002	-0.002	0.006	0.012	-0.008	0.031	0.182	32	32	35	35.3	35	36	2	2
1987	0.003	-0.002	0.009	0.017	-0.012	0.046	0.200	35	35	36	36.7	36	37	2	2
1988	0.020	-0.001	0.041	0.111	-0.002	0.223	0.180	26	26	35	32.8	35	36	4	6
1989	0.010	-0.004	0.025	0.051	-0.036	0.137	0.200	28	28	34	34.6	40	41	2	15
1990	0.010	-0.004	0.024	0.049	-0.022	0.121	0.200	36	36	35	36.0	35	36	3	3
1991	0.036	0.014	0.058	0.143	0.057	0.228	0.253	19	33	37	37.2	40	42	7	19
1992	0.014	-0.001	0.029	0.063	0.012	0.113	0.223	24	24	37	36.0	40	41	5	5
1993	0.009	0.007	0.011	0.037	0.030	0.043	0.255	38	38	37	38.6	39	40	2	5
1994	0.005	0.001	0.009	0.021	0.006	0.035	0.243	36	36	38	38.7	40	41	4	4
1995	0.010	0.000	0.020	0.056	0.003	0.110	0.173	19	19	35	32.9	36	37	3	5
1996	0.014	-0.011	0.039	0.095	-0.013	0.203	0.149	9	9	35	29.3	42	43	5	19
1997	0.028	0.022	0.033	0.138	0.091	0.186	0.200	30	30	34	35.6	41	42	4	25
1998	0.038	0.007	0.068	0.132	0.041	0.223	0.287	32	33	38	38.0	41	42	11	15
1999	0.043	0.003	0.083	0.206	0.012	0.399	0.211	15	29	37	36.7	42	43	9	16
2000	0.026	0.009	0.043	0.106	0.040	0.171	0.247	30	32	37	38.0	41	42	7	15
2001	0.010	-0.005	0.025	0.041	-0.012	0.095	0.244	21	21	40	38.2	40	41	4	4
2002	0.019	-0.007	0.045	0.076	-0.029	0.180	0.252	12	12	38	34.1	39	40	3	5
2003	0.028	-0.002	0.057	0.115	0.003	0.226	0.241	9	24	38	37.0	39	41	5	17
2004	0.023	-0.009	0.055	0.084	-0.025	0.193	0.276	30	32	39	39.2	40	41	3	7
2005	0.050	-0.029	0.128	0.216	-0.131	0.564	0.229	13	31	37	36.7	40	41	5	21
2006	0.012	0.007	0.016	0.051	0.020	0.081	0.230	25	25	39	35.5	40	41	5	8
2007	0.006	0.001	0.010	0.033	0.008	0.058	0.167	18	18	31	32.3	39	40	8	11
2008	0.024	-0.008	0.057	0.172	-0.044	0.388	0.142	7	7	27	29.9	38	41	4	24

Table 34. Abundance and biomass from NEFSC autumn surveys for rosette skate for the Mid-Atlantic region (offshore strata 61-76). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1967-2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1967	0.019	0.002	0.037	0.117	0.010	0.224	0.166	10	18	34	34.3	39	42	7	17
1968	0.003	-0.001	0.008	0.023	-0.019	0.065	0.135	28	28	28	28.9	37	38	2	2
1969	0.002	-0.002	0.006	0.010	-0.009	0.028	0.200	38	38	38	38.0	38	38	1	1
1970	0.009	-0.006	0.024	0.033	-0.025	0.090	0.276	39	39	39	39.5	39	40	2	3
1971	0.001	-0.001	0.004	0.006	-0.005	0.016	0.250	40	40	40	40.5	40	41	1	2
1972	0.016	0.001	0.032	0.058	0.021	0.094	0.285	12	12	34	34.2	40	41	7	8
1973	0.012	-0.008	0.032	0.053	-0.016	0.122	0.224	16	16	28	29.0	40	41	3	5
1974	0.012	-0.002	0.026	0.079	-0.014	0.171	0.156	23	23	34	33.8	40	41	4	11
1975	0.004	-0.001	0.009	0.034	-0.001	0.070	0.122	25	25	34	33.6	38	39	4	8
1976	0.024	0.003	0.045	0.149	0.016	0.281	0.163	28	28	33	33.7	37	40	7	21
1977	0.020	-0.002	0.043	0.087	-0.011	0.185	0.231	31	31	33	35.2	40	41	5	8
1978	0.007	-0.007	0.022	0.015	-0.014	0.043	0.500	39	39	39	39.0	39	39	1	1
1979	0.010	-0.004	0.025	0.043	-0.016	0.101	0.242	22	22	35	36.1	39	40	3	6
1980	0.090	0.042	0.138	0.312	0.120	0.505	0.287	14	25	38	36.6	41	42	10	24
1981	0.079	0.011	0.148	0.296	0.052	0.539	0.268	27	28	37	37.5	41	43	10	45
1982	0.006	-0.006	0.018	0.020	-0.019	0.059	0.300	39	39	39	39.0	39	39	1	1
1983	0.001	-0.001	0.003	0.010	-0.010	0.030	0.100	12	12	12	20.7	36	37	1	3
1984	0.029	0.005	0.053	0.128	0.033	0.223	0.229	13	26	36	35.6	39	40	7	16
1985	0.005	0.004	0.007	0.036	0.019	0.054	0.146	14	14	25	28.0	35	36	5	6
1986	0.003	0.001	0.004	0.009	0.005	0.013	0.300	37	37	37	38.2	39	40	3	3
1987	0.028	0.006	0.050	0.112	0.040	0.183	0.253	11	15	38	32.7	41	42	7	10
1988	0.021	0.000	0.043	0.093	-0.002	0.188	0.228	30	30	32	35.0	41	42	5	8
1989	0.018	-0.005	0.041	0.046	-0.012	0.105	0.378	33	33	33	33.5	36	37	3	4
1990	0.023	-0.004	0.049	0.099	0.001	0.198	0.228	32	32	37	37.7	41	42	5	10
1991	0.005	-0.004	0.014	0.021	-0.009	0.051	0.237	15	15	34	31.4	34	35	3	3
1992	0.035	0.006	0.064	0.170	0.033	0.308	0.203	25	25	35	35.3	41	42	9	11
1993	0.021	0.005	0.037	0.102	0.033	0.170	0.211	25	25	37	35.1	40	41	4	8
1994	0.073	0.000	0.146	0.301	0.006	0.597	0.242	27	27	37	36.8	42	43	6	21
1995	0.039	-0.005	0.084	0.174	-0.009	0.358	0.227	19	24	35	35.1	38	39	7	13
1996	0.043	-0.014	0.100	0.273	-0.127	0.674	0.158	7	19	32	31.6	38	42	7	21
1997	0.013	0.000	0.026	0.074	-0.014	0.162	0.176	31	31	33	34.0	42	43	4	6
1998	0.050	-0.008	0.108	0.208	-0.042	0.458	0.241	33	33	37	38.1	40	41	7	22
1999	0.067	0.038	0.096	0.380	0.182	0.578	0.177	12	18	34	32.6	41	42	8	46
2000	0.033	-0.006	0.073	0.134	-0.015	0.283	0.248	26	30	35	36.5	39	40	7	10
2001	0.121	-0.007	0.249	0.472	-0.016	0.961	0.257	11	34	39	38.6	43	44	10	28
2002	0.052	0.009	0.095	0.347	0.045	0.648	0.150	8	8	30	28.0	40	42	11	29
2003	0.033	0.016	0.051	0.136	0.071	0.200	0.247	33	33	36	37.4	39	41	7	18
2004	0.048	0.003	0.092	0.231	0.030	0.432	0.206	19	29	35	35.5	37	40	8	29
2005	0.065	0.001	0.129	0.286	-0.004	0.575	0.227	30	30	35	36.4	39	40	7	24
2006	0.058	0.015	0.101	0.211	0.062	0.361	0.275	35	35	38	39.6	42	43	10	23
2007	0.070	0.002	0.137	0.268	0.037	0.499	0.260	24	24	38	37.4	40	41	7	17

Table 35. Abundance and biomass from NEFSC winter surveys for rosette skate for the Georges Bank to Mid-Atlantic region (offshore strata 1-3,5-7,9-11,13-14,16,61-63,65-67,69-71,73-75). The mean index, 95% confidence intervals, individual fish weight, minimum, mean, and maximum length, 5th, 50th, and 95th percentiles of length, number of nonzero tows, and number of fish caught are presented for 1992-2007. Stratum 16 not sampled in 1993, 2000, 2002-2007. Strata 13 and 14 not sampled in 2003 and 2007. Stratum 63 not sampled in 1993. Stratum 14 not sampled in 2005 and 2007.

	weight/tow			number/tow				length						nonzero	
	mean	lower	upper	mean	lower	upper	ind wt	min	5%	50%	mean	95%	max	tows	no fish
1992	0.264	0.138	0.390	1.125	0.619	1.632	0.235	16	27	36	36.4	41	45	15	230
1993	0.149	0.048	0.251	0.663	0.197	1.130	0.225	26	29	36	36.7	39	41	9	143
1994	0.199	0.148	0.249	0.761	0.608	0.914	0.261	16	28	37	36.8	40	44	15	162
1995	0.195	0.066	0.323	0.774	0.273	1.275	0.252	19	32	37	37.9	41	42	23	197
1996	0.324	0.121	0.526	1.410	0.443	2.376	0.230	19	28	36	36.3	40	46	23	899
1997	0.258	-0.051	0.567	1.079	-0.194	2.353	0.239	13	30	36	36.9	40	44	21	238
1998	0.160	0.102	0.219	0.664	0.421	0.907	0.241	15	30	36	36.5	40	45	21	350
1999	0.271	0.043	0.500	1.151	0.082	2.220	0.236	24	27	37	36.6	41	44	25	228
2000	0.344	0.198	0.491	1.357	0.725	1.989	0.254	8	28	37	37.5	43	47	34	740
2001	0.437	0.185	0.690	1.718	0.797	2.640	0.254	9	24	38	37.6	41	46	36	790
2002	0.723	0.140	1.307	2.655	0.603	4.708	0.272	8	29	38	38.3	42	47	34	913
2003	0.670	0.195	1.144	2.774	0.802	4.745	0.242	8	26	37	36.9	41	47	28	1029
2004	0.300	0.171	0.429	1.192	0.653	1.730	0.252	16	31	37	37.8	41	46	29	784
2005	0.189	0.090	0.289	0.716	0.357	1.076	0.264	12	30	38	38.2	43	45	19	281
2006	0.437	0.209	0.665	1.738	0.821	2.654	0.251	8	31	37	37.7	42	45	28	513
2007	0.634	0.262	1.006	2.446	1.110	3.781	0.259	9	33	38	38.2	41	44	28	750

Table 36. Estimates of size at 50% maturity, length-weight parameters (Wigley et al 2003) and Von Bertalanffy Parameter estimates used to estimate SSB and to calculate Hoenig mortality estimates. Smooth skate data in parentheses are female values. Clearnose data in parentheses are in disk width.

Species (Study)	L50	ln(a)	b	Linf	K	t0 (L0)
Winter (Frisk 2004)	76	-13.1531	3.3199	122.1	0.07	-2.06
Little (Frisk 2004)	44	-12.4462	3.128	56.1	0.19	-1.17
Barndoor (Gedamke 2005)	116	-13.3224	3.2919	166.3	0.14	-1.2912
Thorny (Sulikowski 2005, 2006)	88	-12.088	3.1197	124.0	0.12	-0.35
Smooth (Sosebee 2005; Natanson et al 2007)	50	-13.0139	3.1812	75.4 (69.6)	0.12	11 cm (10cm)
Clearnose(Gelsleichter 1998; Sosebee 2005)	66	-13.8683	3.4235	94.3(61.8)	0.17	-0.88
Rosette (Sosebee 2005)	34	-12.5504	3.0718			

Table 37. Estimates of spawning stock biomass indices from NEFSC surveys using sizes at 50% maturity as knife-edge cutpoints.

	Winter	Little	Barndoor	Thorny	Smooth	Clearnose	Rosette
1963			0.796	3.934	0.202		
1964			0.227	2.799	0.091		
1965			0.135	2.848	0.297		
1966			0.000	4.673	0.218		
1967	0.553		0.063	1.411	0.126		0.022
1968	0.338		0.073	2.857	0.229		0.001
1969	0.183		0.000	3.668	0.190		0.002
1970	0.534		0.060	5.155	0.152		0.009
1971	0.151		0.047	3.921	0.134		0.002
1972	0.464		0.077	2.593	0.244		0.010
1973	0.892		0.000	2.987	0.189		0.001
1974	0.377		0.000	1.368	0.080		0.013
1975	0.327		0.000	1.344	0.039	0.003	0.005
1976	1.117		0.000	0.943	0.015	0.019	0.020
1977	1.863		0.000	1.450	0.201	0.076	0.015
1978	3.008		0.000	1.514	0.288	0.007	0.004
1979	3.400		0.000	1.569	0.112	0.073	0.009
1980	3.663		0.000	1.972	0.217	0.166	0.070
1981	3.513		0.000	1.312	0.079	0.016	0.070
1982	4.203	2.744	0.000	0.261	0.035	0.038	0.005
1983	7.598	4.058	0.000	1.065	0.073	0.006	0.001
1984	7.253	2.655	0.000	1.480	0.095	0.041	0.024
1985	8.514	4.184	0.000	1.077	0.169	0.069	0.003
1986	12.279	1.599	0.000	0.653	0.152	0.030	0.002
1987	7.768	2.168	0.000	0.209	0.062	0.085	0.021
1988	5.594	2.936	0.000	0.521	0.207	0.072	0.011
1989	3.753	2.832	0.000	0.709	0.073	0.028	0.002
1990	6.129	2.983	0.000	0.790	0.122	0.072	0.023
1991	3.499	2.854	0.000	0.734	0.116	0.341	0.003
1992	2.083	2.384	0.000	0.292	0.079	0.080	0.033
1993	1.012	3.875	0.134	0.700	0.146	0.110	0.018
1994	0.841	1.742	0.000	0.434	0.072	0.184	0.063
1995	0.536	1.706	0.000	0.189	0.081	0.097	0.033
1996	0.793	4.551	0.000	0.318	0.128	0.083	0.029
1997	0.664	1.601	0.052	0.333	0.167	0.269	0.009
1998	1.576	3.634	0.062	0.319	0.016	0.234	0.051
1999	1.331	5.078	0.118	0.145	0.062	0.442	0.055
2000	1.753	4.424	0.048	0.420	0.102	0.371	0.028
2001	1.397	4.783	0.250	0.066	0.226	0.376	0.129
2002	3.154	4.858	0.366	0.196	0.094	0.261	0.034
2003	1.912	4.401	0.161	0.233	0.106	0.353	0.032
2004	2.222	4.340	0.773	0.365	0.146	0.259	0.043
2005	1.005	2.455	0.285	0.047	0.082	0.253	0.057
2006	0.638	2.472	0.477	0.482	0.180	0.042	0.060
2007	1.033	3.555	0.353	0.207	0.071	0.228	0.065
2008		5.048					

Table 38. Current estimates of biomass-based reference points for skates. The estimates for barndoor are an average of 1963-1966 biomass estimates.

	75th percentile through 1998/1999 Bmsy	Bthreshold
Winter	6.46	3.43
Little	6.54	3.27
Barndoor	1.62	0.81
Thorny	4.41	2.2
Smooth	0.31	0.16
Clearnose	0.56	0.28
Rosette	0.029	0.015

Table 39. Fishing mortality overfishing definition for skates based on the average coefficient of variation in the survey. The percentages are percent change from one three-year moving average to the next. The shaded cells indicate overfishing is ocurring.

	Winter -20%	Little -20%	Barndoor -30%	Thorny -20%	Smooth -30%	Clearnose -30%	Rosette -60%
1992	-8.8	-7.6	-3.8	-17.6	-0.4	4.5	37.7
1993	-33.9	15.6	180.7	-1.1	6.7	5.6	-2.0
1994	-25.5	-12.6	2.0	-2.9	-13.0	0.9	110.9
1995	-21.0	-14.8	61.3	-4.3	13.8	-0.8	3.8
1996	6.2	0.4	-34.3	-21.4	-9.8	-3.6	16.4
1997	5.3	-6.5	37.3	-21.2	28.6	-19.1	-38.4
1998	26.3	35.0	-8.6	-5.5	-26.9	57.5	11.1
1999	33.2	13.5	109.2	-14.5	-24.2	28.8	22.5
2000	17.0	29.2	37.1	-0.9	-23.6	15.0	15.3
2001	1.0	-2.4	66.0	-16.1	102.3	15.4	47.1
2002	3.8	-13.9	42.5	-2.6	8.1	-4.4	-6.9
2003	-7.2	-9.6	16.5	-5.6	6.5	-10.5	0.2
2004	1.1	1.9	40.7	25.0	-12.4	-28.6	-35.4
2005	-22.9	-15.9	9.8	-11.2	3.7	-16.2	9.7
2006	-9.0	-18.7	21.3	-1.0	3.9	-6.8	16.8
2007	-3.6	-20.0	-14.2	-23.7	-22.4	8.1	12.7
2008		37.2					

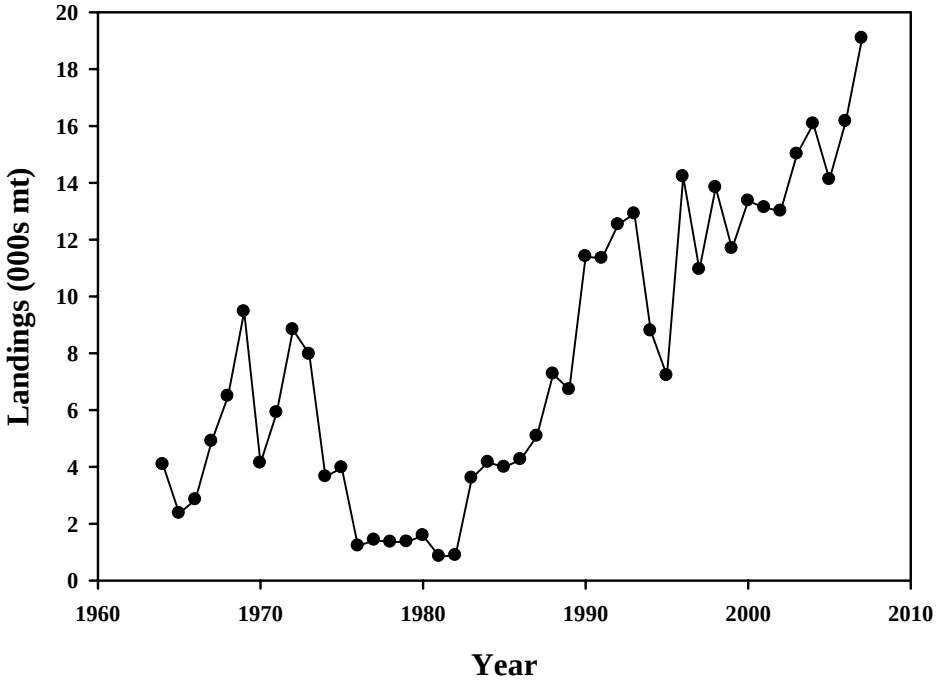


Figure 1. Total reported landings of skates in NAFO subareas 5 and 6.

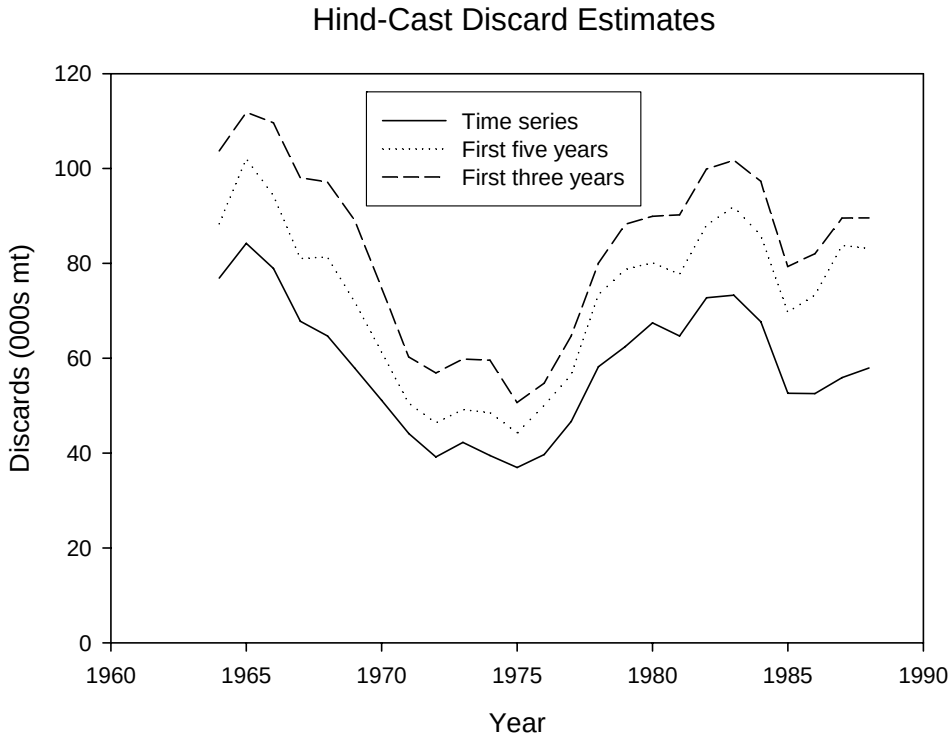


Figure 2. Estimates of discards hind-cast using three different methods.

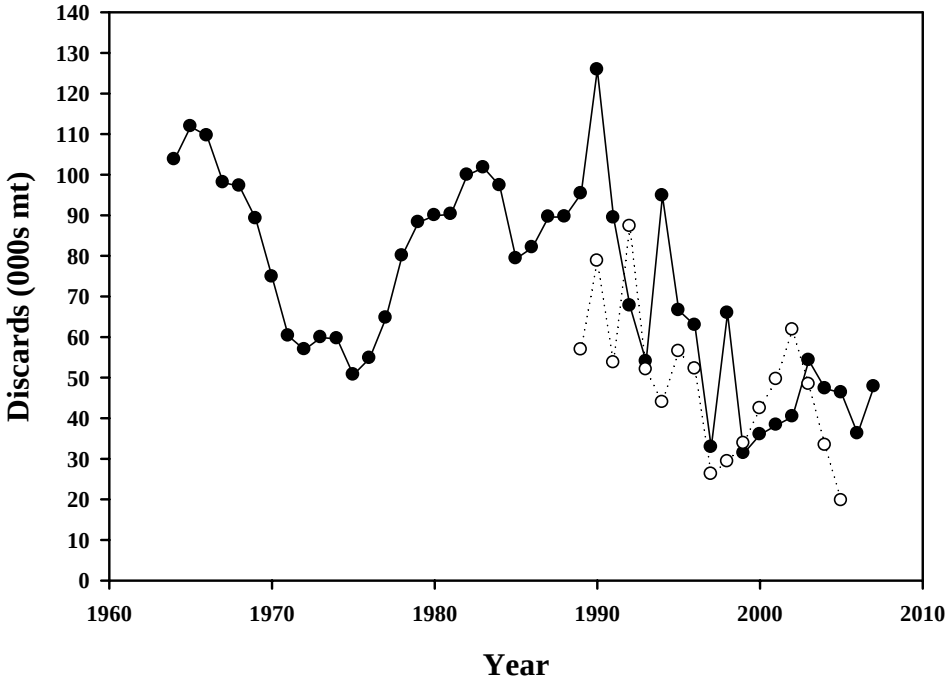


Figure 3. Total discards of skates in NAFO subareas 5 and 6. The closed circles represent the new estimates which include all sources. The circles from 1964-1988 are hind-cast using the first three years. The open circles are the SARC44 estimates which did not impute missing information and/or include Special Access Program trips.

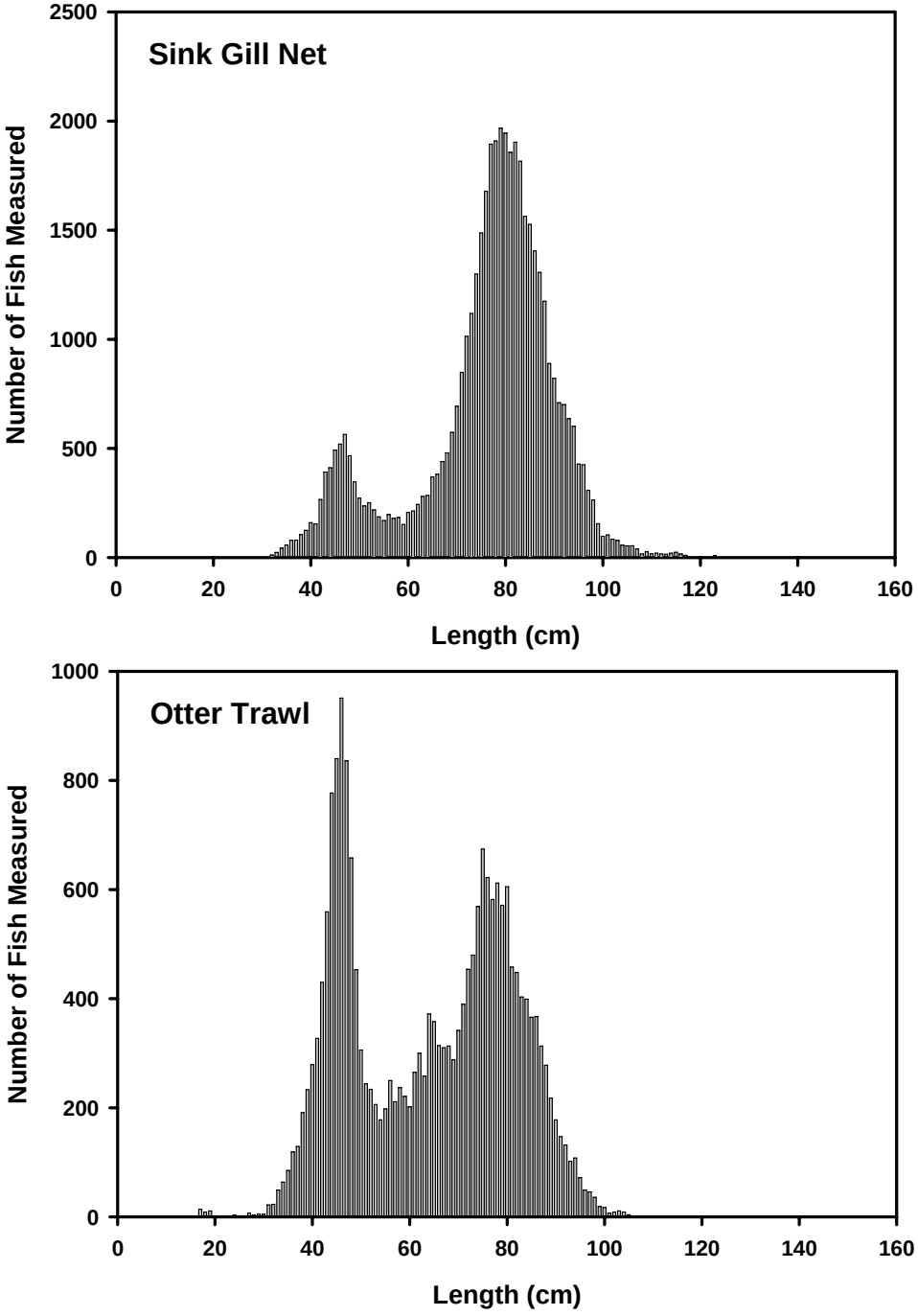


Figure 4. Length composition of the kept skate measured by the Observer Program by gear type.

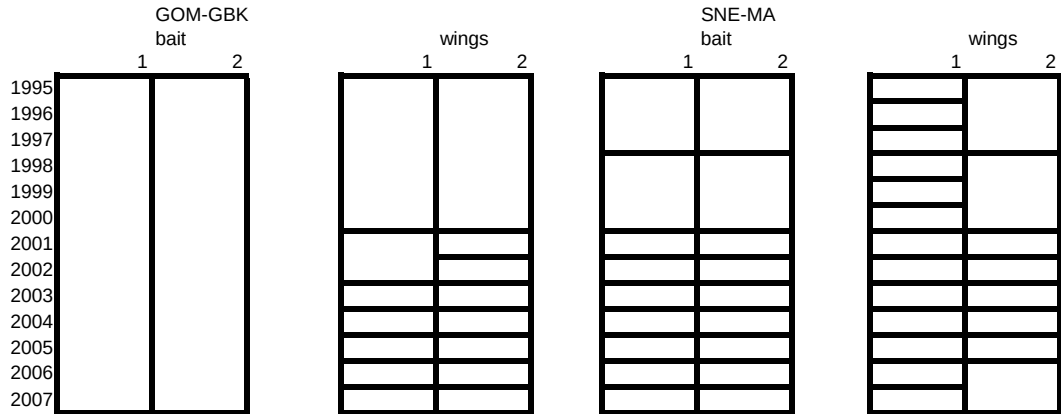


Figure 5. Pooling scheme used to derive length compositions for the landed component of the skate catch.

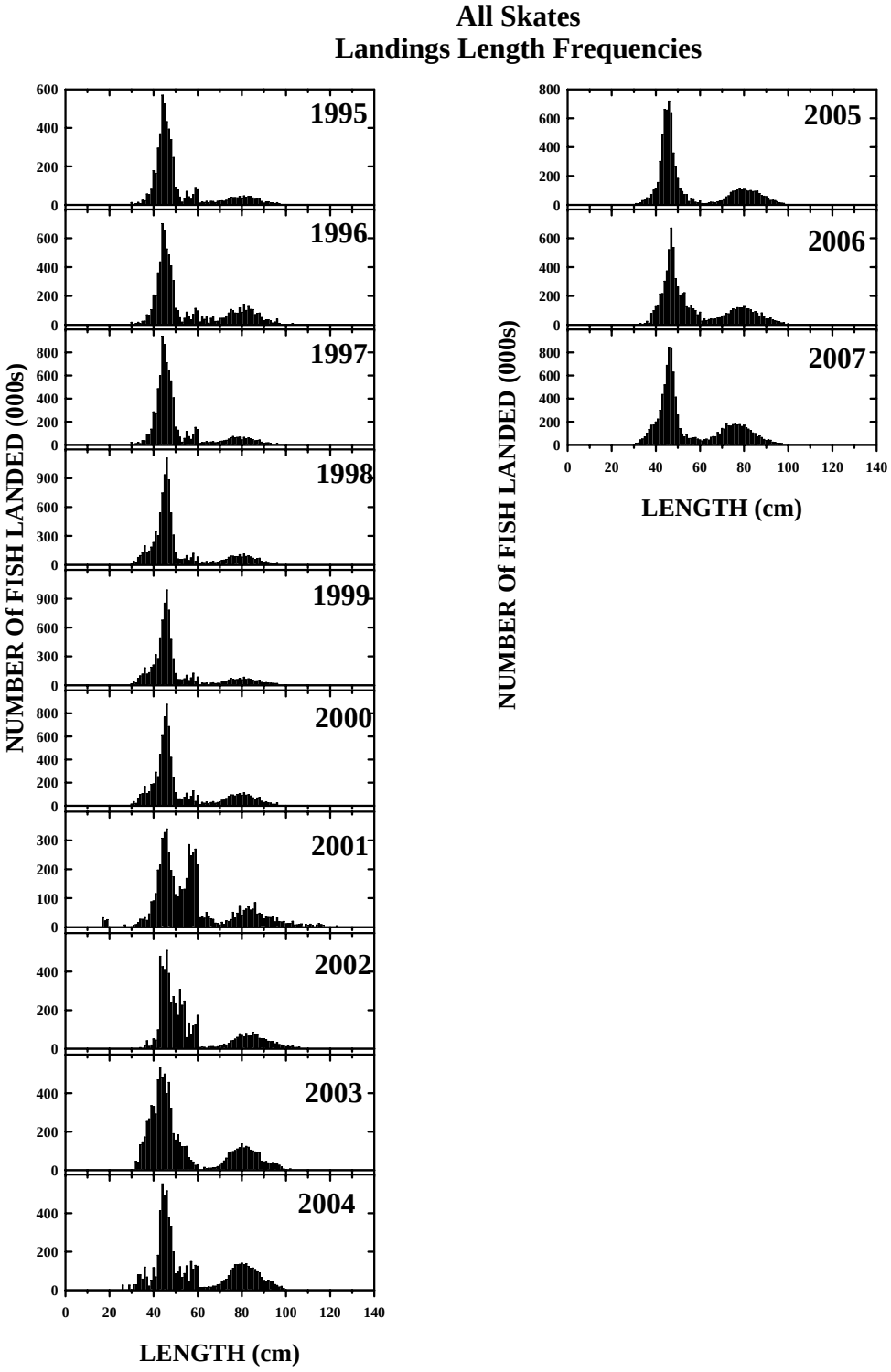


Figure 6. Skate length composition from commercial landings data, 1995-2007.

Figure 7. Selectivity of observed winter skate landings by region, gear, and product type, 2004-2007, estimated with the SELECT model (Millar 1992).

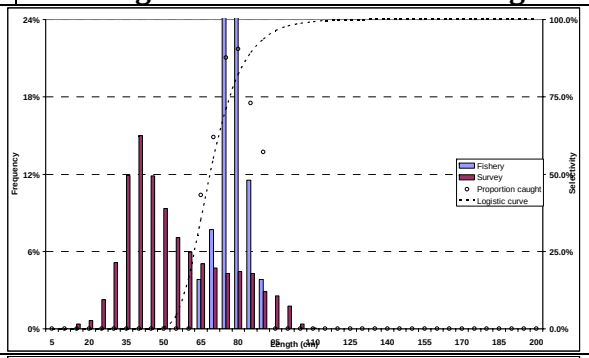
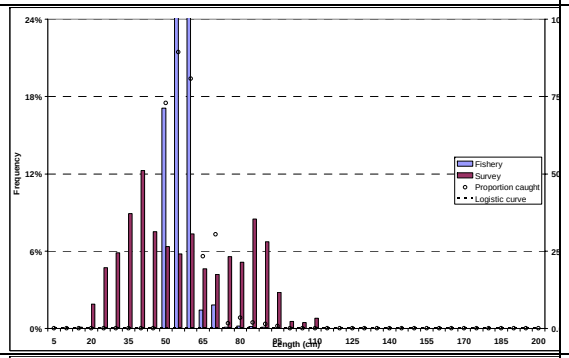
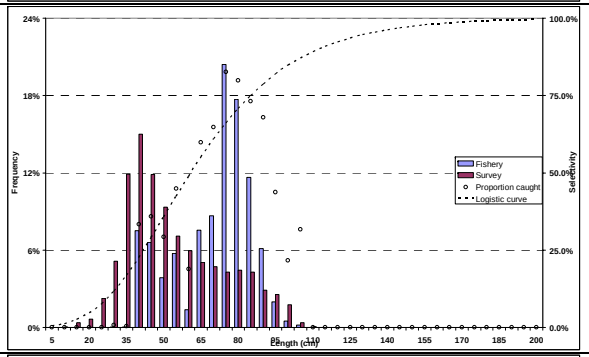
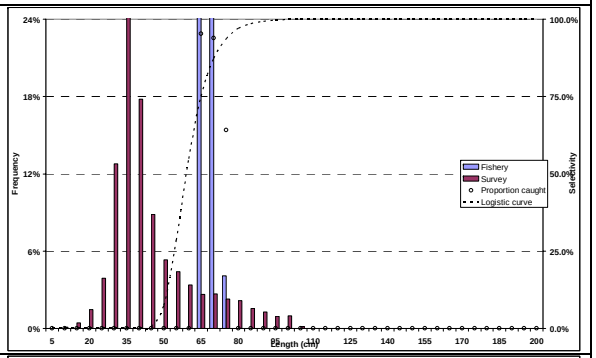
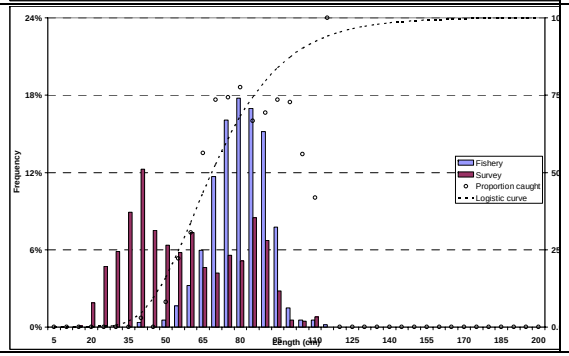
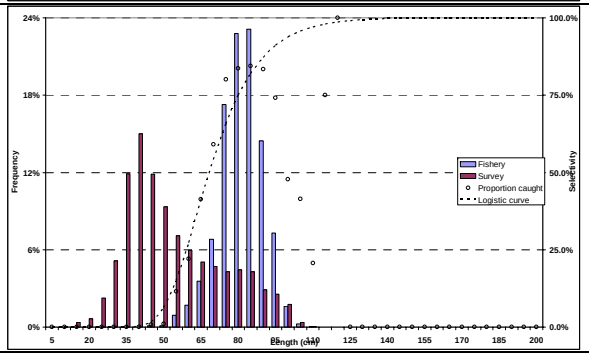
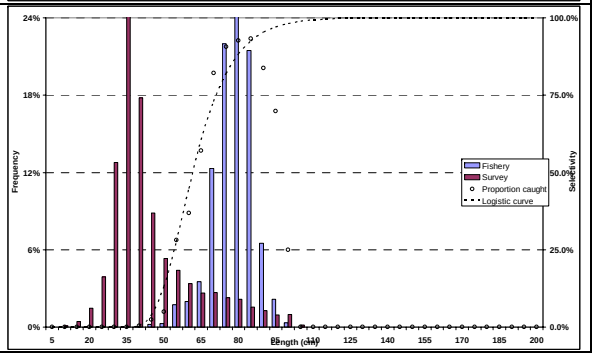
	Gulf of Maine	Georges Bank/Southern New England	Mid-Atlantic
Winter Trawl Wings	**Insufficient data**		**Insufficient data**
Winter Trawl Whole			
Winter Gillnet			

Figure 8. Selectivity of observed little skate landings by region, gear, and product type, 2004-2007, estimated with the SELECT model (Millar 1992).

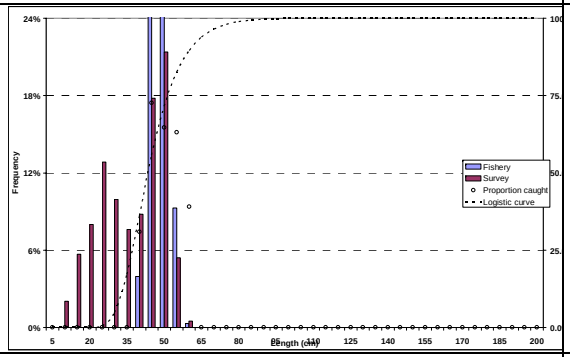
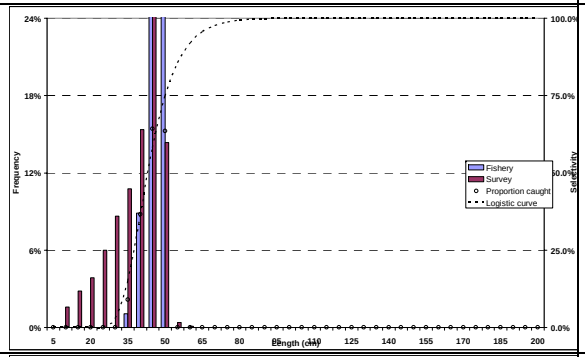
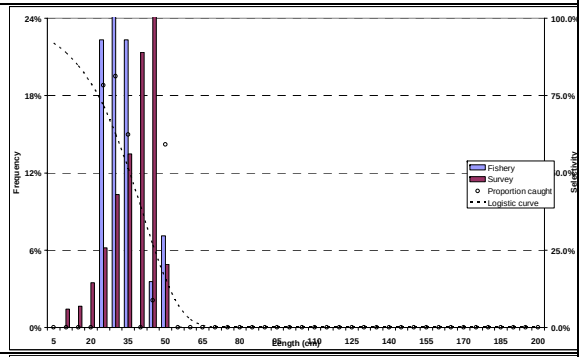
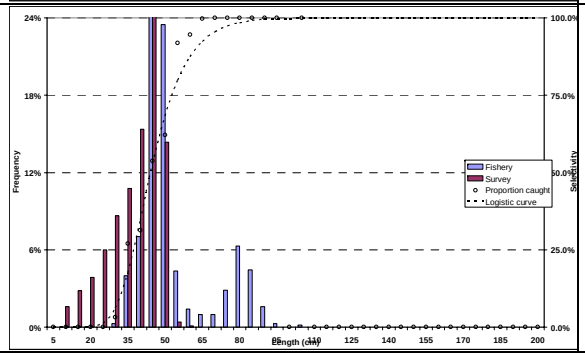
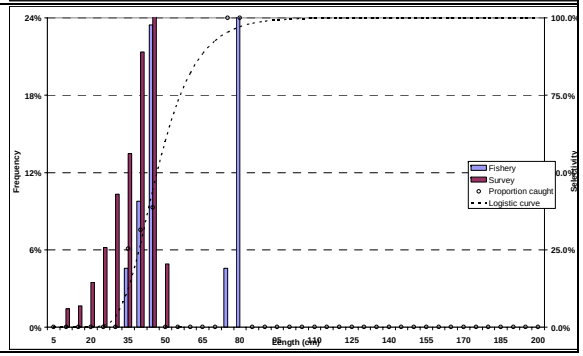
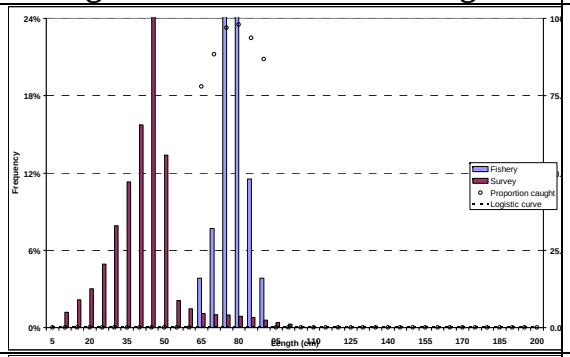
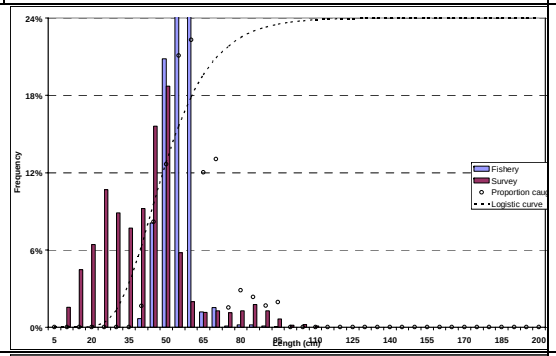
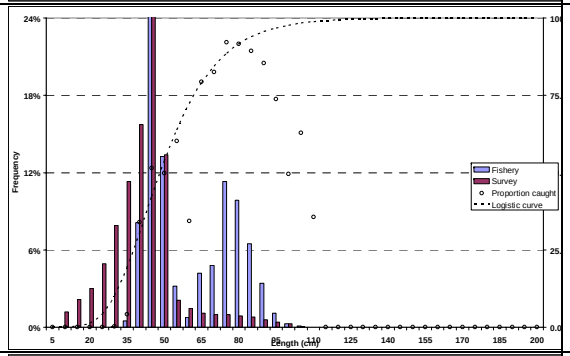
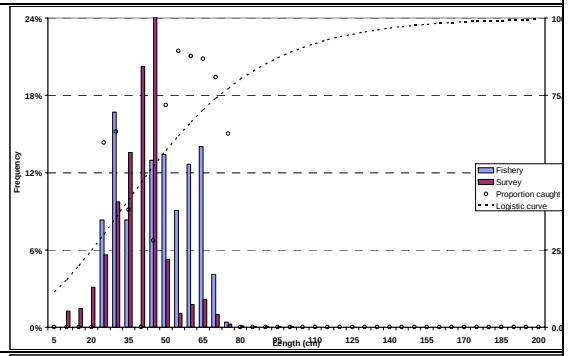
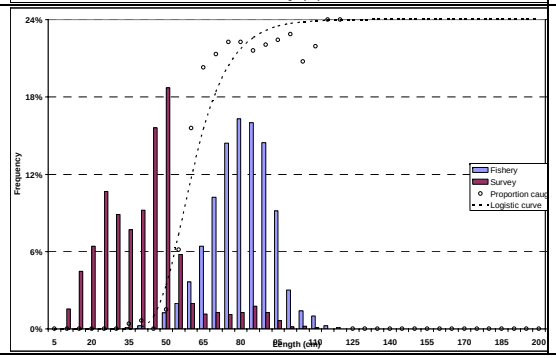
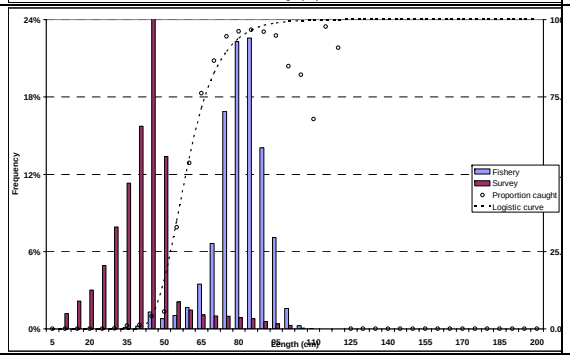
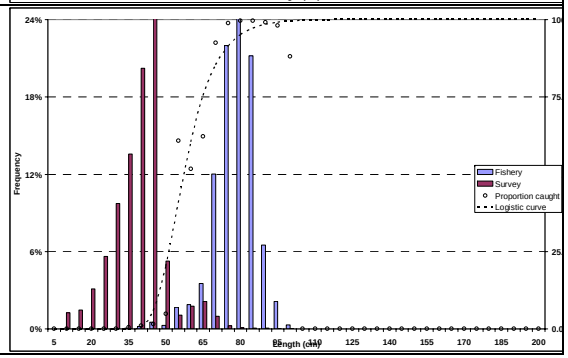
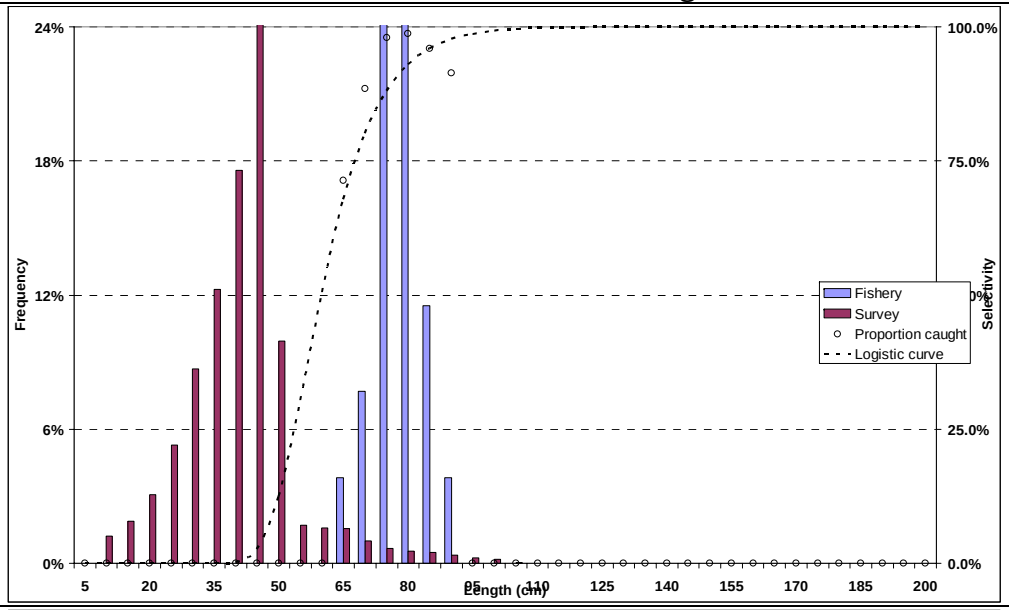
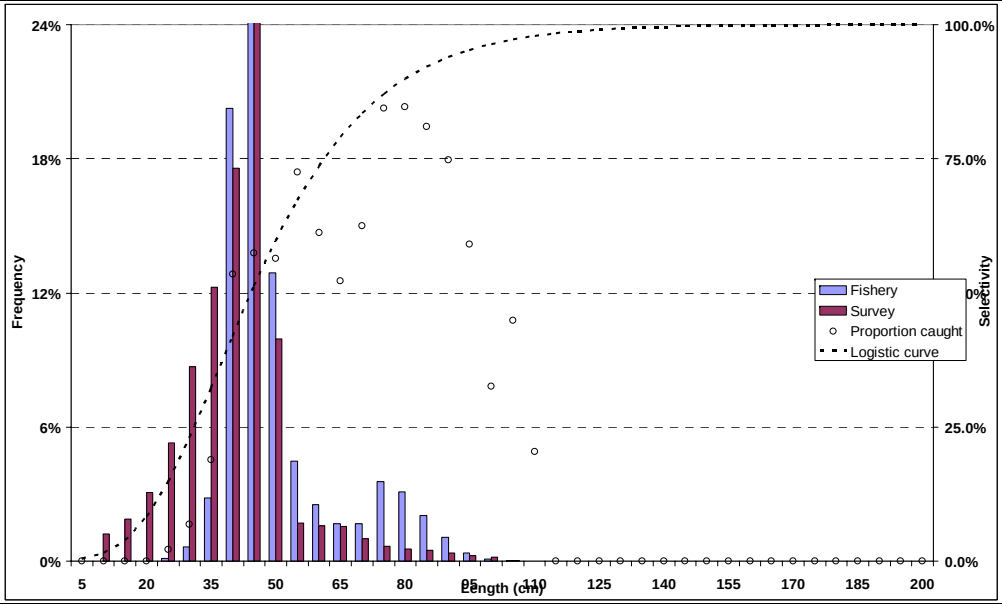
	Gulf of Maine	Georges Bank/Southern New England	Mid-Atlantic
Little Trawl Wings	**Insufficient data**	**Insufficient data**	**Insufficient data**
Little Trawl Whole			
Little Gillnet	**Insufficient data**		

Figure 9. Selectivity of observed aggregate skate landings by region, gear, and product type, 2004-2007, estimated with the SELECT model (Millar 1992). Survey size frequency is for clearnose, little, rosette, and winter skates.

	Gulf of Maine	Georges Bank/Southern New England	Mid-Atlantic
Clearnose, Little, Rosette, & Winter Trawl Wings	**Insufficient data**		**Insufficient data**
Clearnose, Little, Rosette, & Winter Trawl Whole			
Clearnose, Little, Rosette, & Winter Gillnet			

	All regions
Clearnose, Little, Rosette, & Winter Trawl Wings	
Clearnose, Little, Rosette, & Winter Trawl Whole	

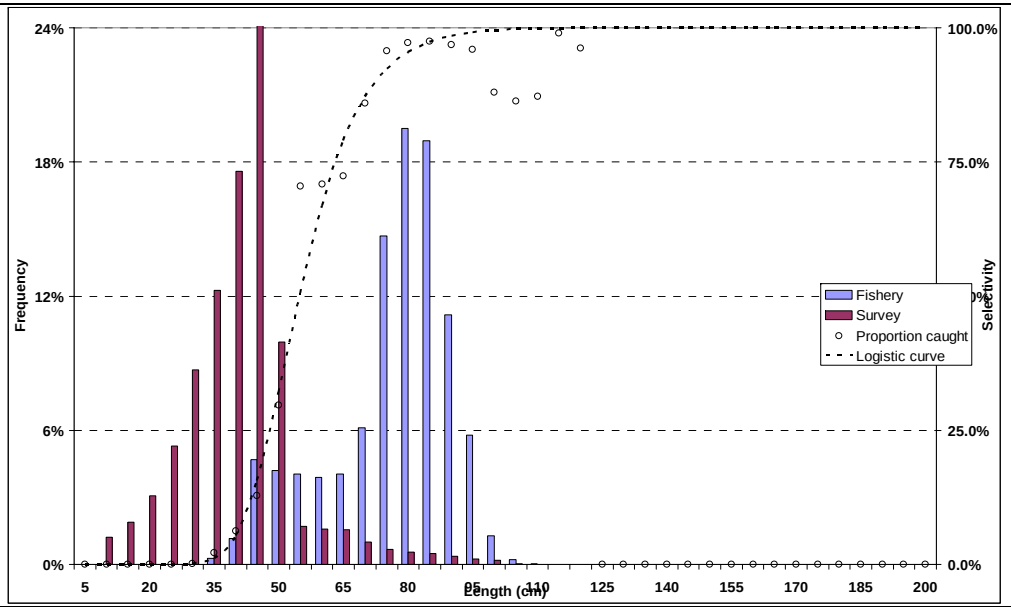
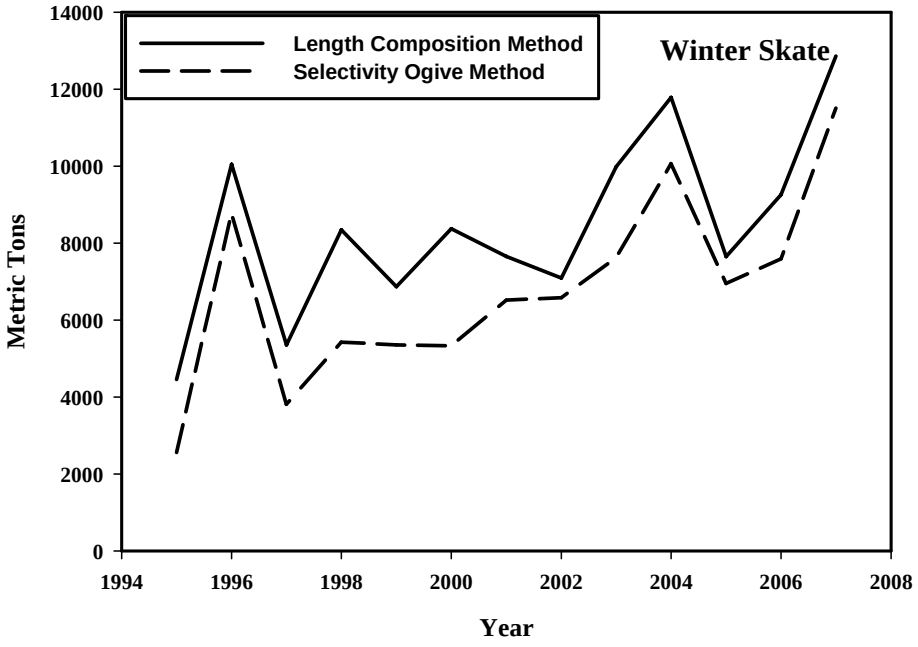
Clearnose, Little, Rosette, & Winter Gillnet	

Figure 10. Selectivity of observed aggregate skate landings by gear and product type, 2004-2007, estimated with the SELECT model (Millar 1992). Survey size frequency is for clearnose, little, rosette, and winter skates.



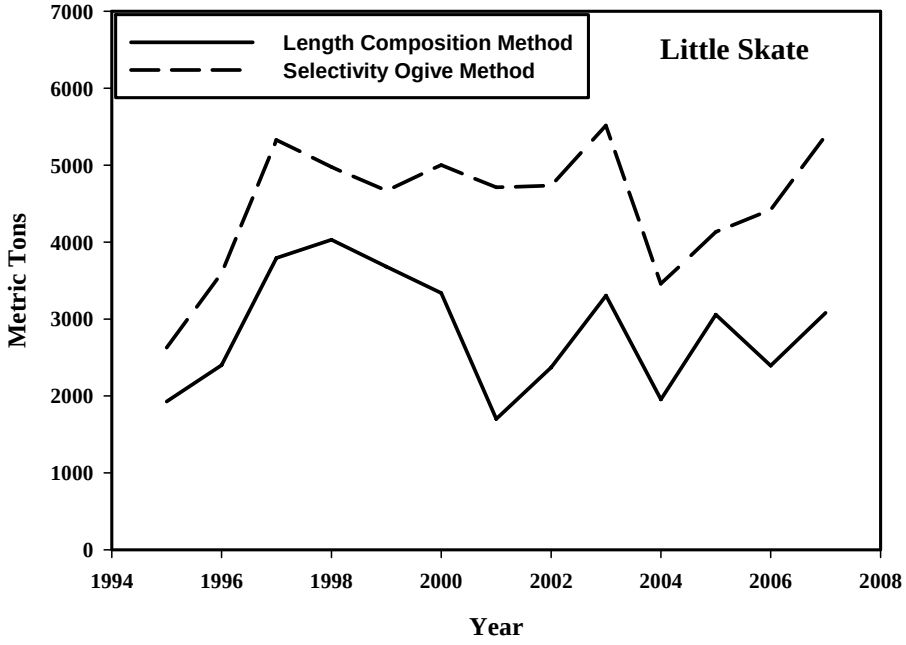
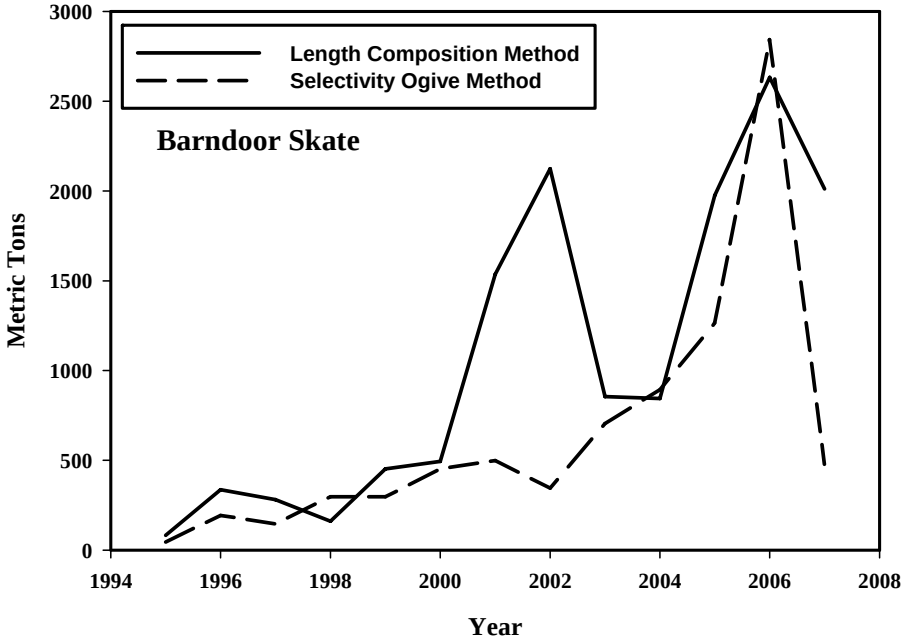


Figure 11. Comparison of landings for winter and little skate using two different methods.



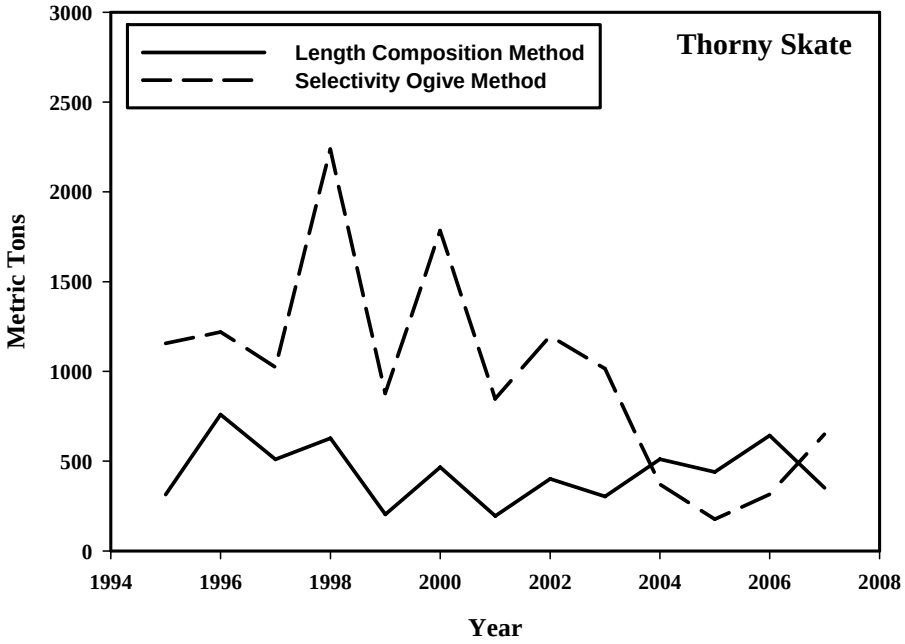


Figure 12. Comparison of landings for barndoor and thorny skate using two different methods.

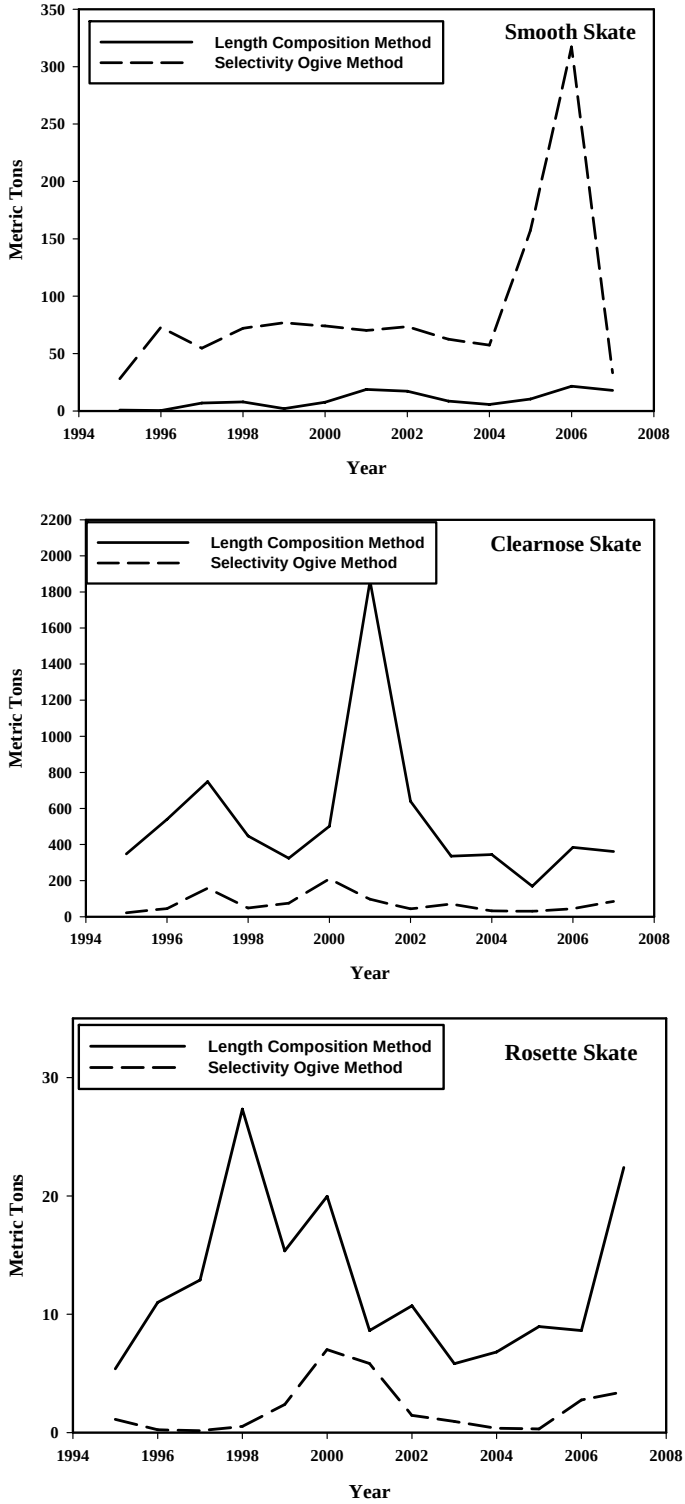


Figure 13. Comparison of landings for smooth, clearnose, and rosette skate using two different methods.

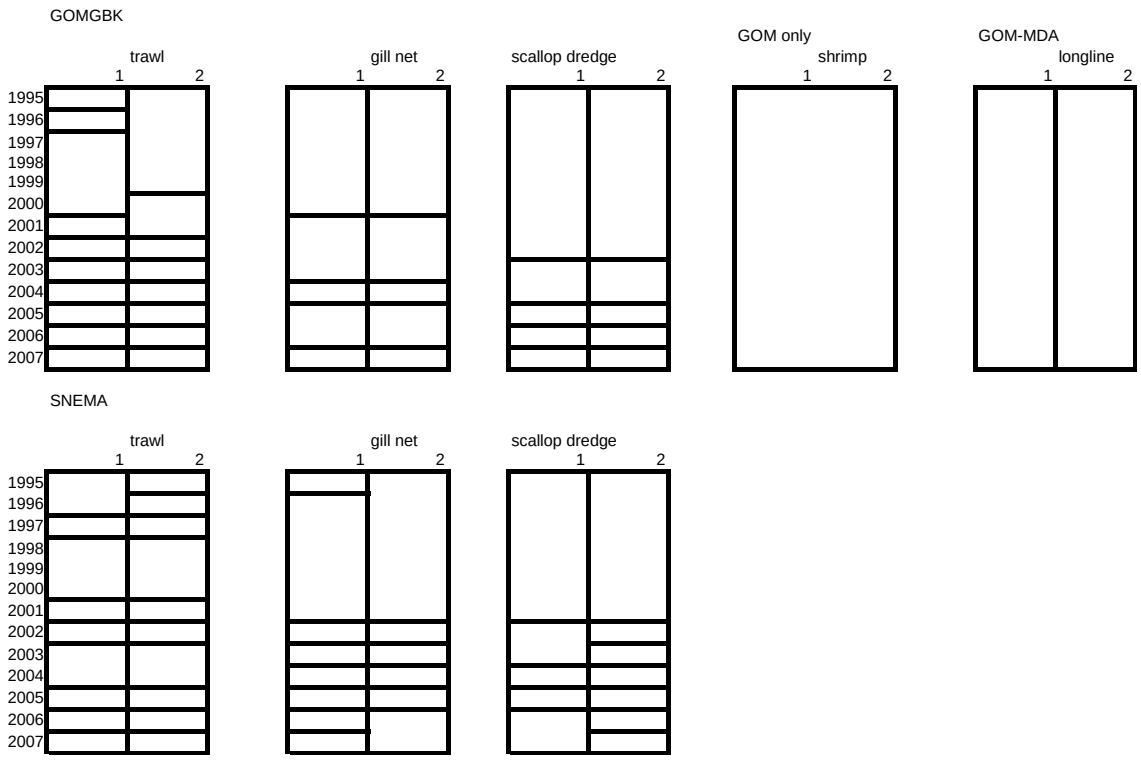


Figure 14. Pooling scheme used to derive the length composition of the discarded component of the skate catch.

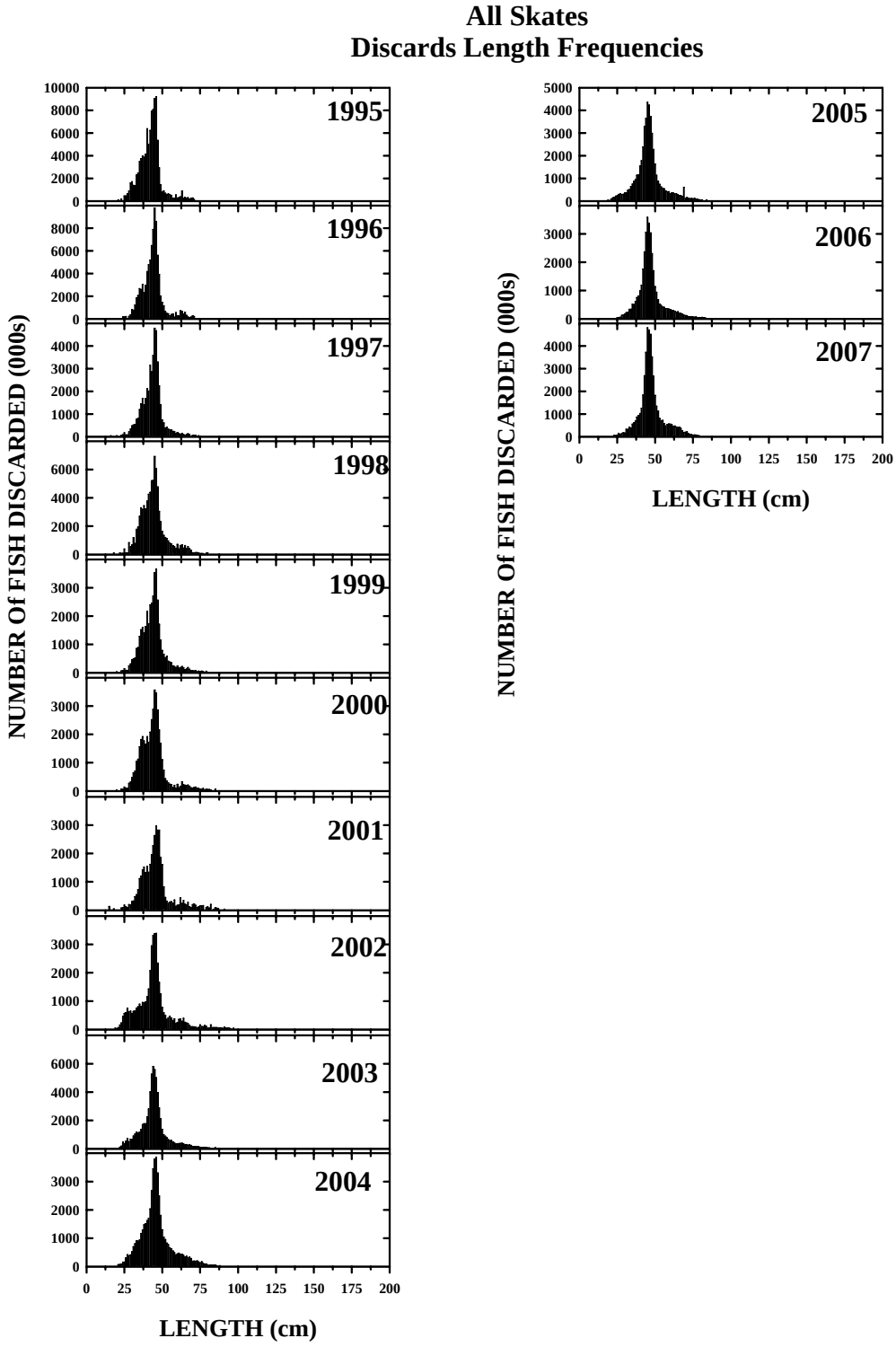


Figure 15. Skate length composition from commercial discard data, 1995-2007.

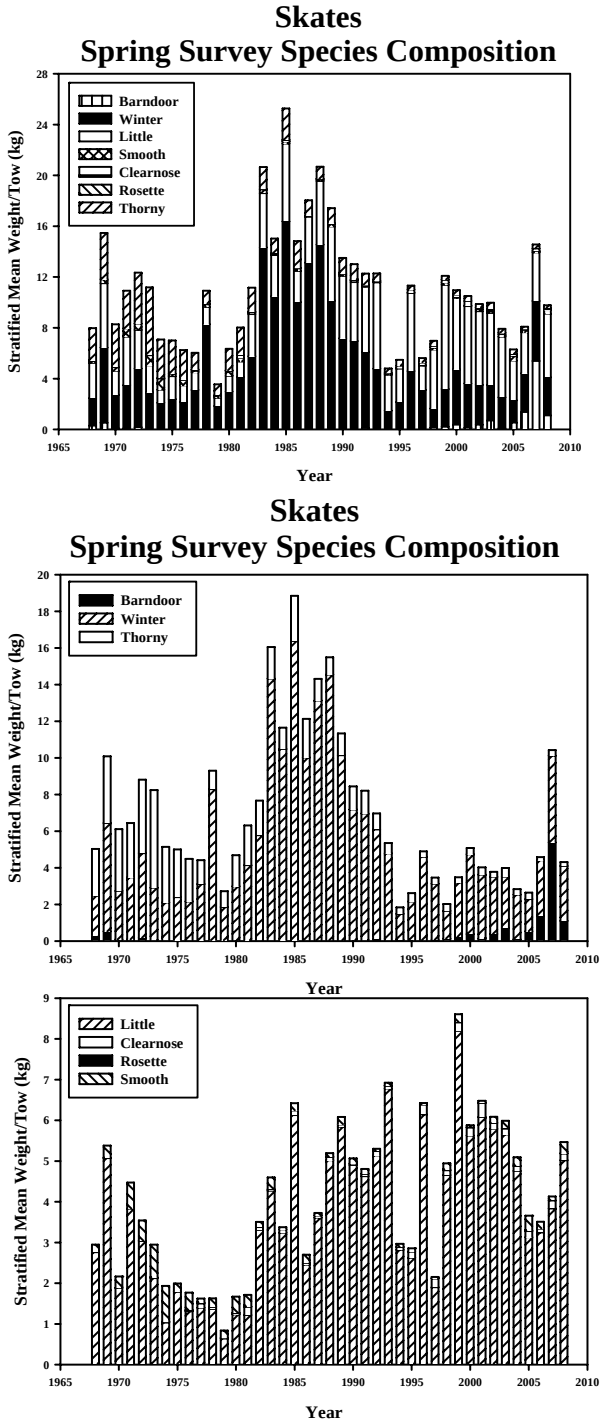


Figure 16. Species composition of skates from the spring survey. The top panel is all skates, the middle panel shows the composition of large species (>100 cm maximum length) while the bottom panel shows the composition of the small species (maximum length < 100cm).

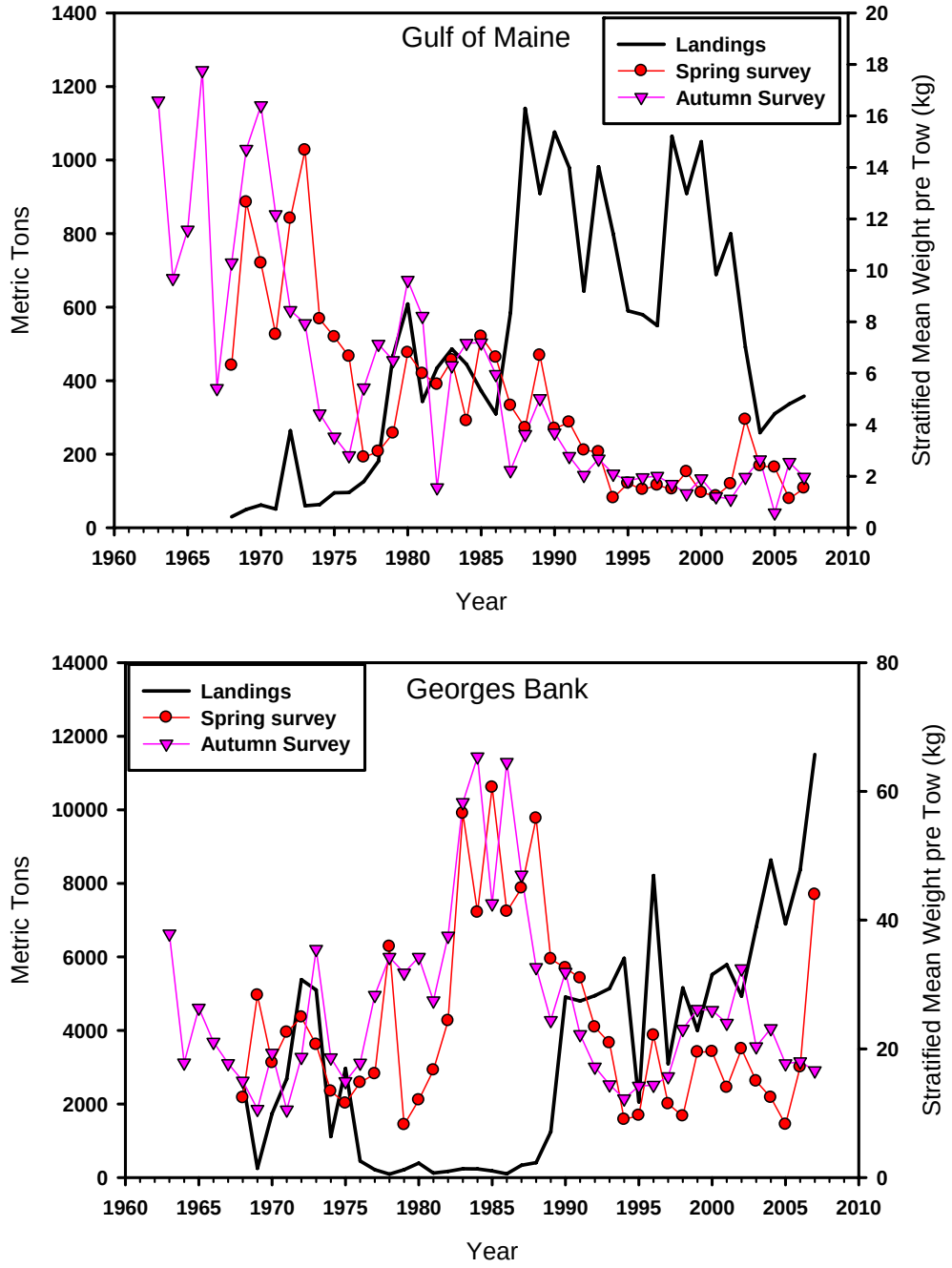


Figure 17. Landings and survey indices of skates from the Gulf of Maine (top panel) and Georges Bank (bottom panel).

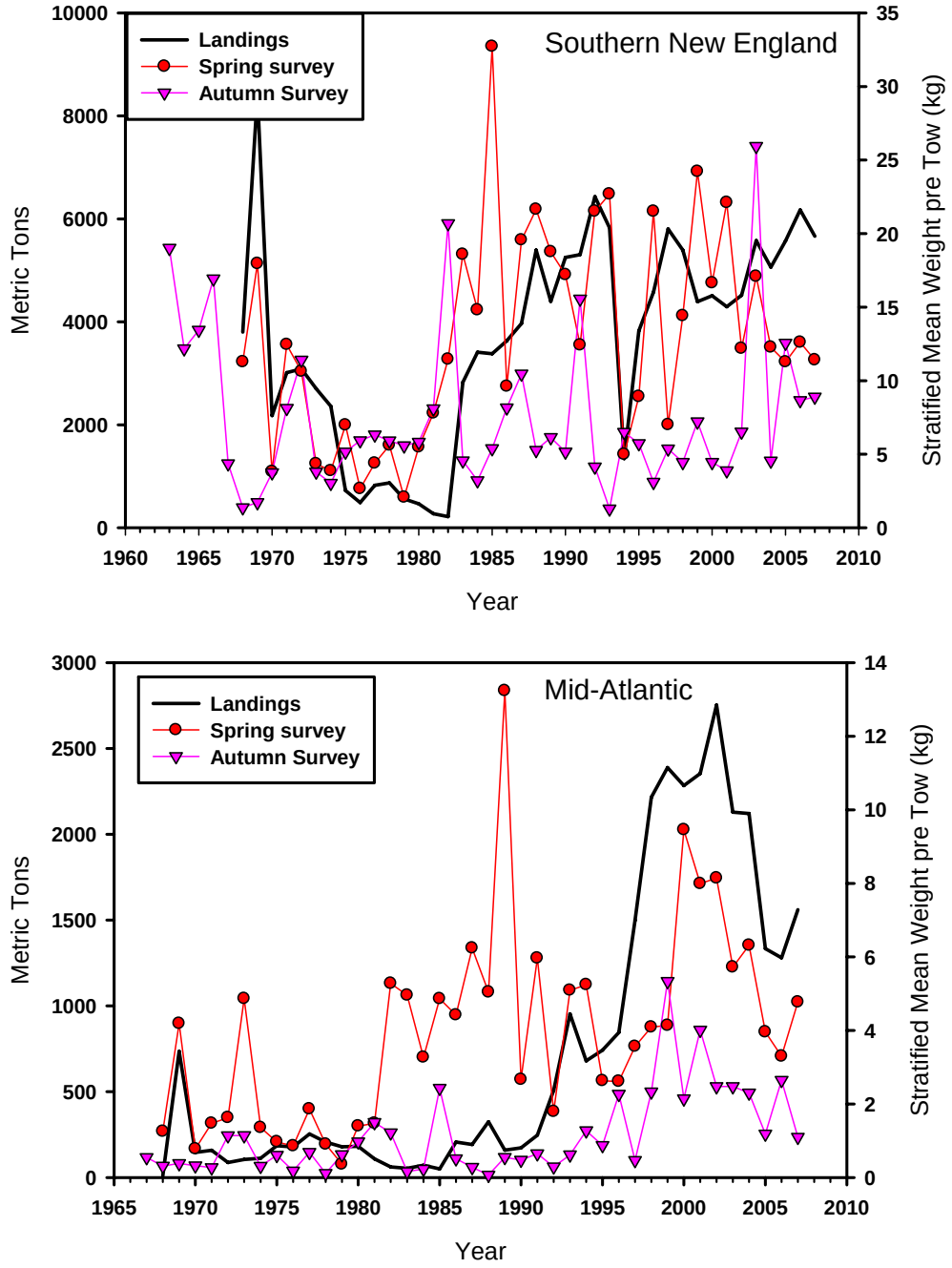


Figure 18. Landings and survey indices of skates from Southern New England (top panel) and the Mid-Atlantic (bottom panel).

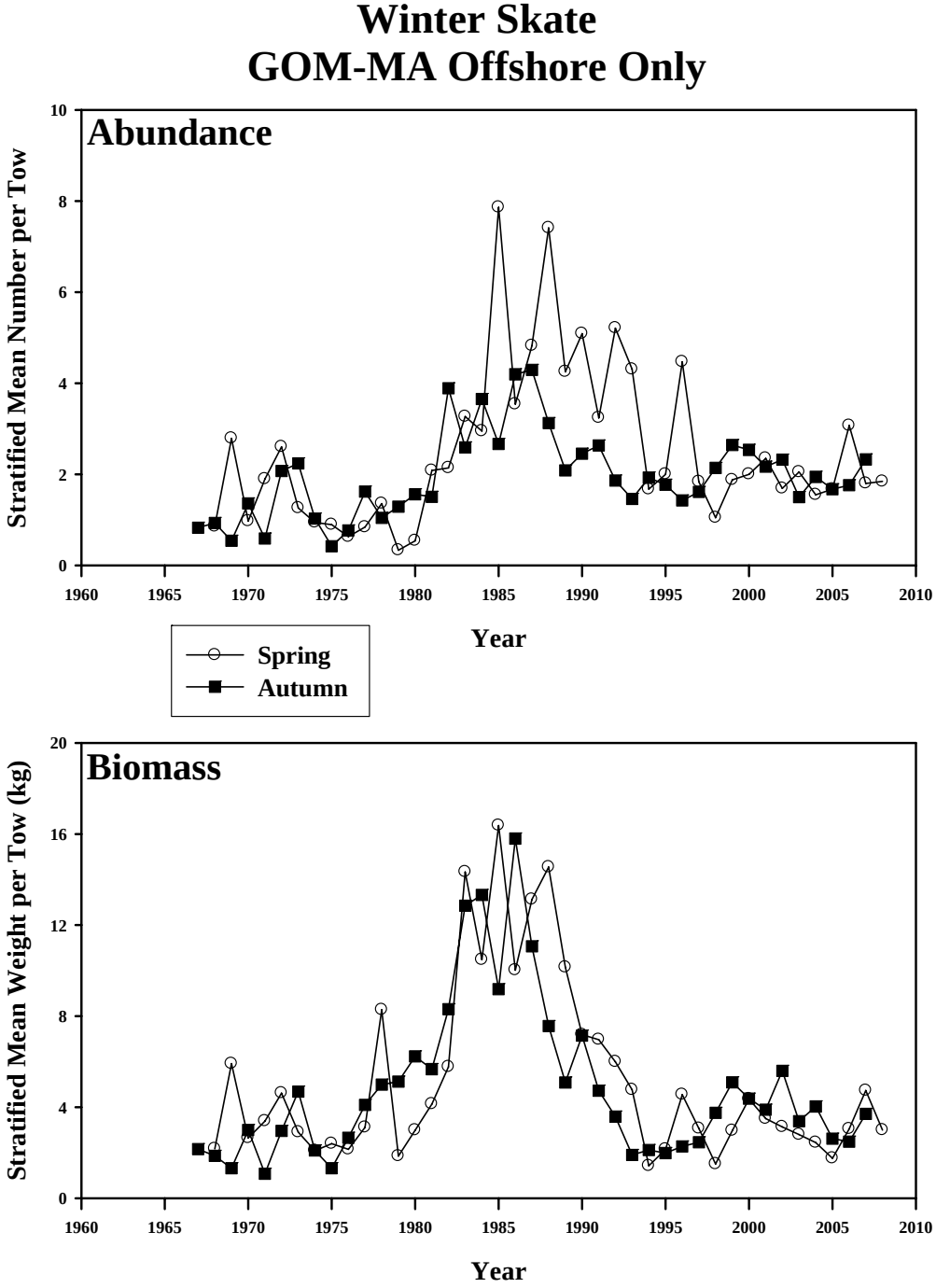


Figure 19. Abundance and biomass of winter skate from the NESFC spring (circles) and autumn (squares) bottom trawl surveys from 1967-2008 in the Gulf of Maine to Mid-Atlantic offshore region.

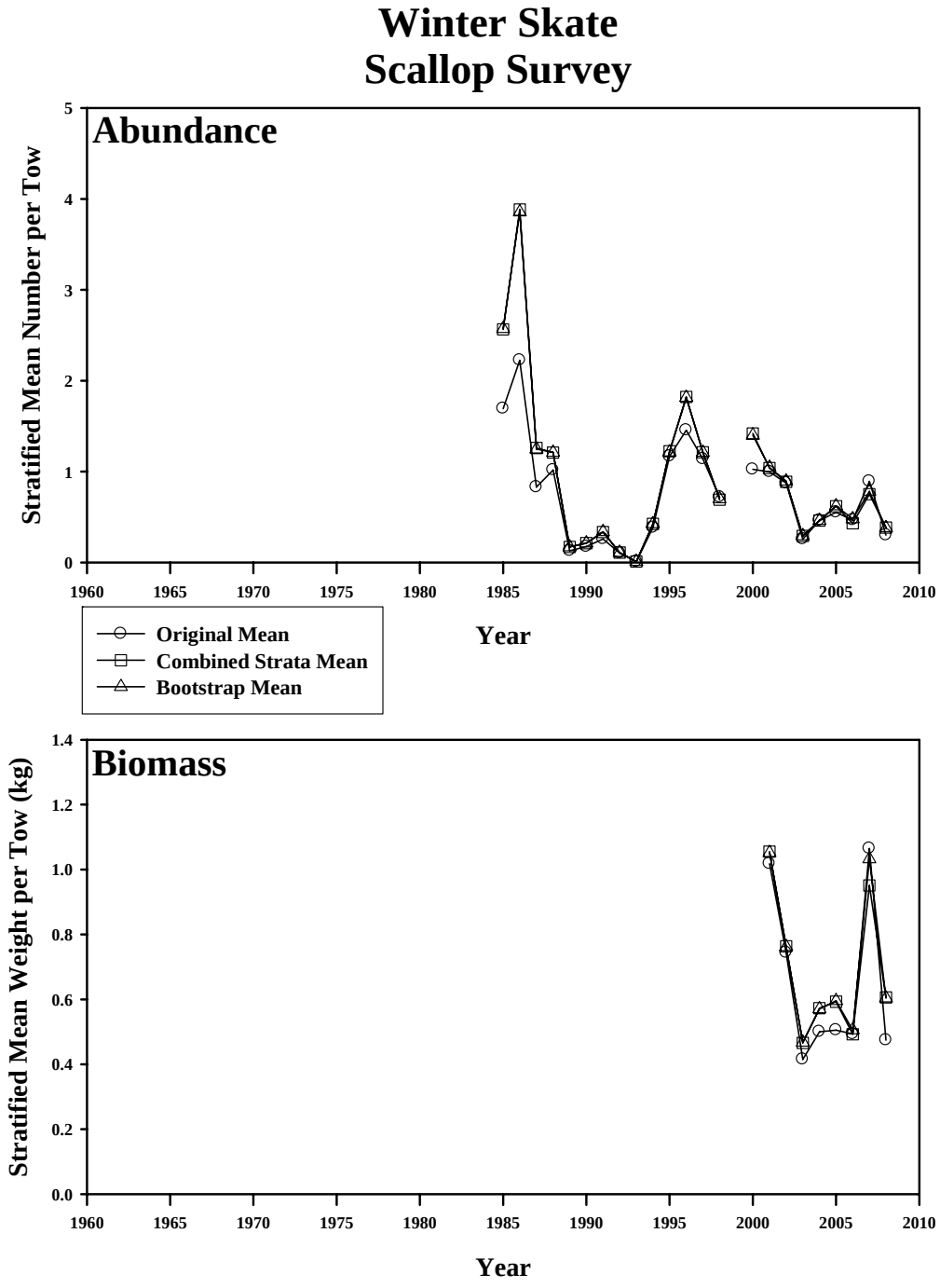


Figure 20. Abundance and biomass of winter skate from the NESFC scallop dredge surveys from 1985-2008. The circles represent the original stratified mean, the squares represent the mean combining strata for bootstrapping, and the triangles represent the bootstrapped mean.

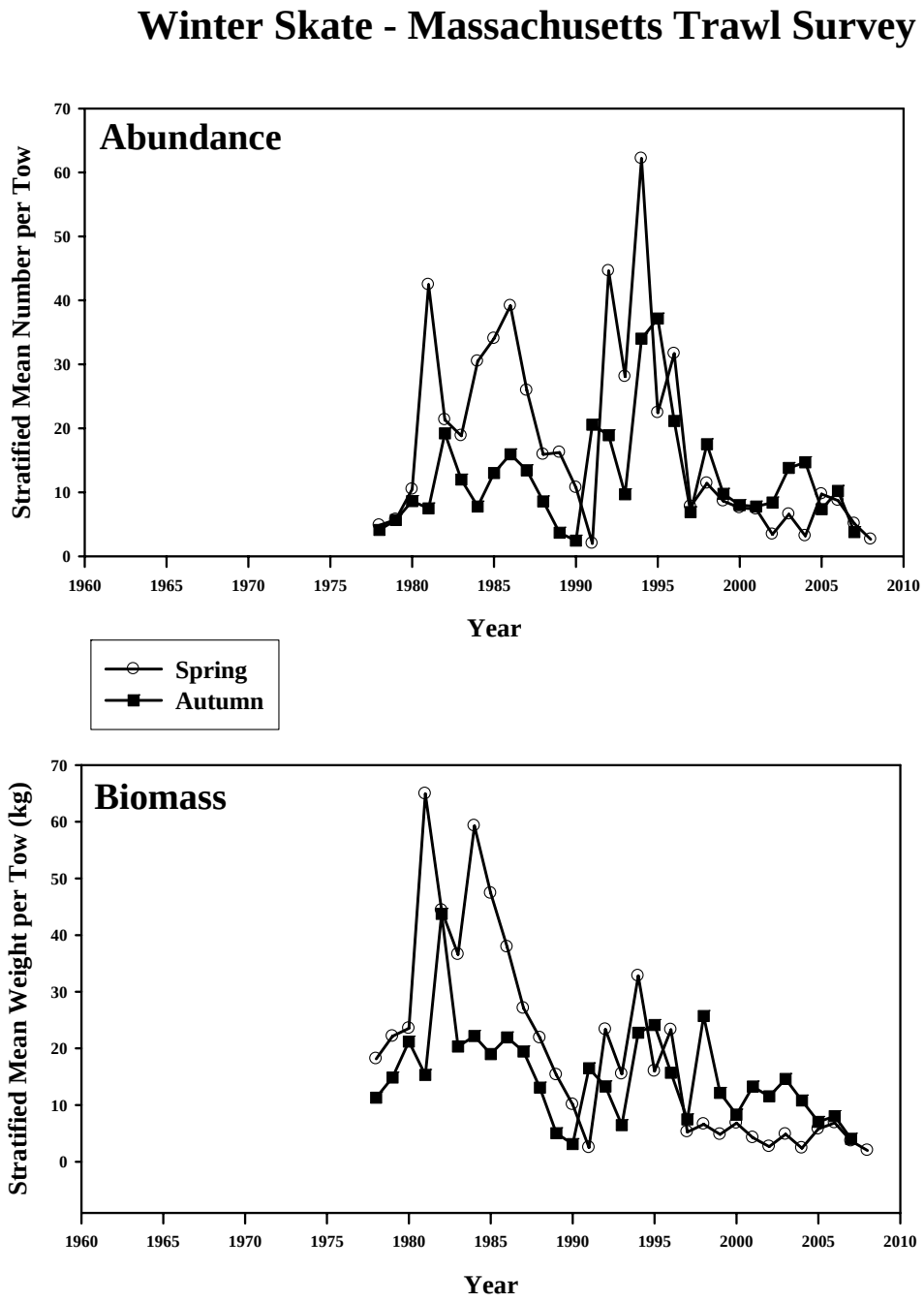


Figure 21. Abundance and biomass of winter skate from the Massachusetts spring and autumn finfish bottom trawl survey in state waters (strata 11-36).

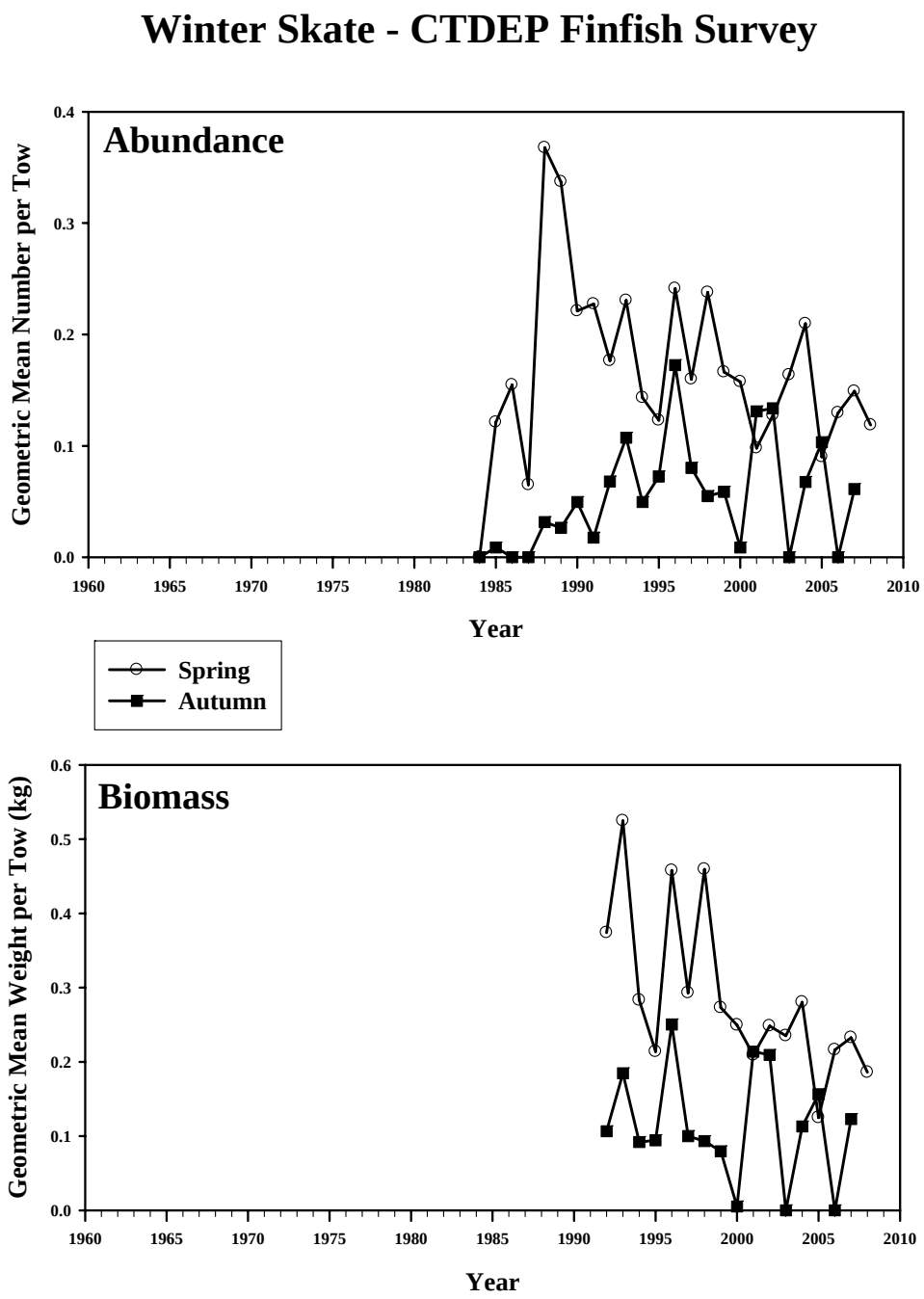


Figure 22. Abundance and biomass of winter skate from the CTDEP spring and autumn finfish bottom trawl survey in Connecticut state waters, 1984-2008.

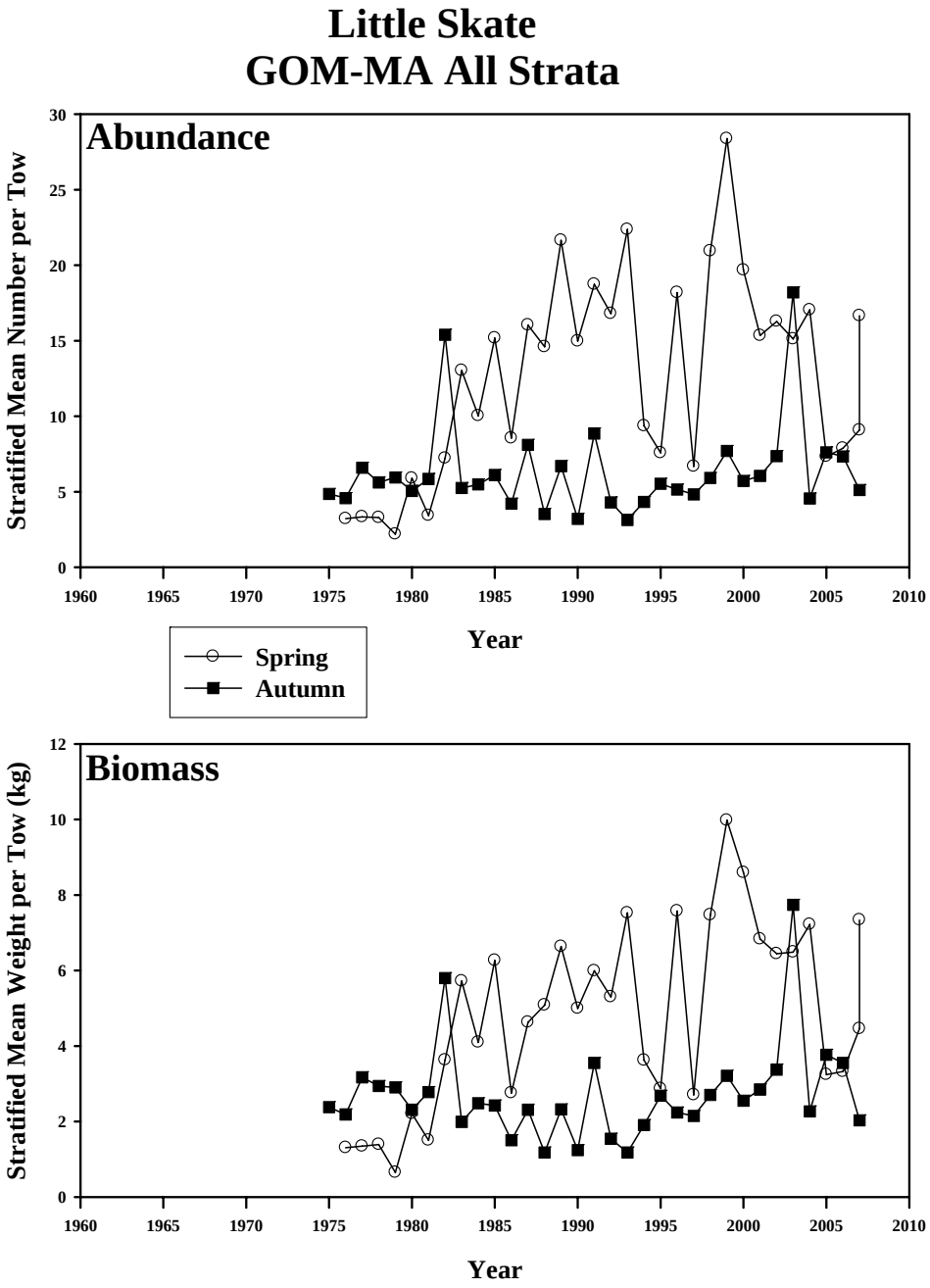


Figure 23. Abundance and biomass of little skate from the NESFC spring (circles) and autumn (squares) bottom trawl surveys from 1975-2008 in the Gulf of Maine to Mid-Atlantic offshore and inshore regions.

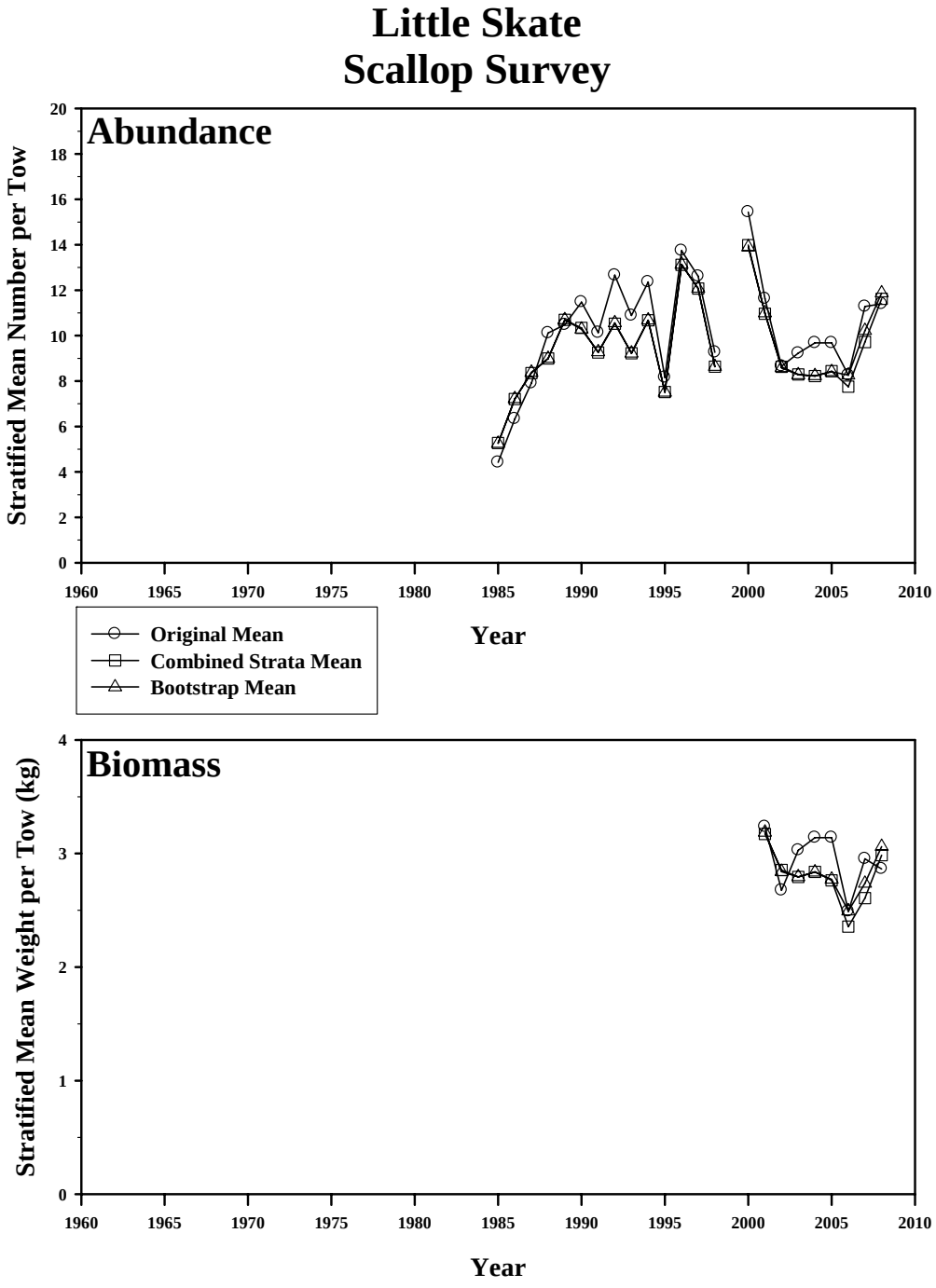


Figure 24. Abundance and biomass of little skate from the NESFC scallop dredge surveys from 1985-2008. The circles represent the original stratified mean, the squares represent the mean combining strata for bootstrapping, and the triangles represent the bootstrapped mean.

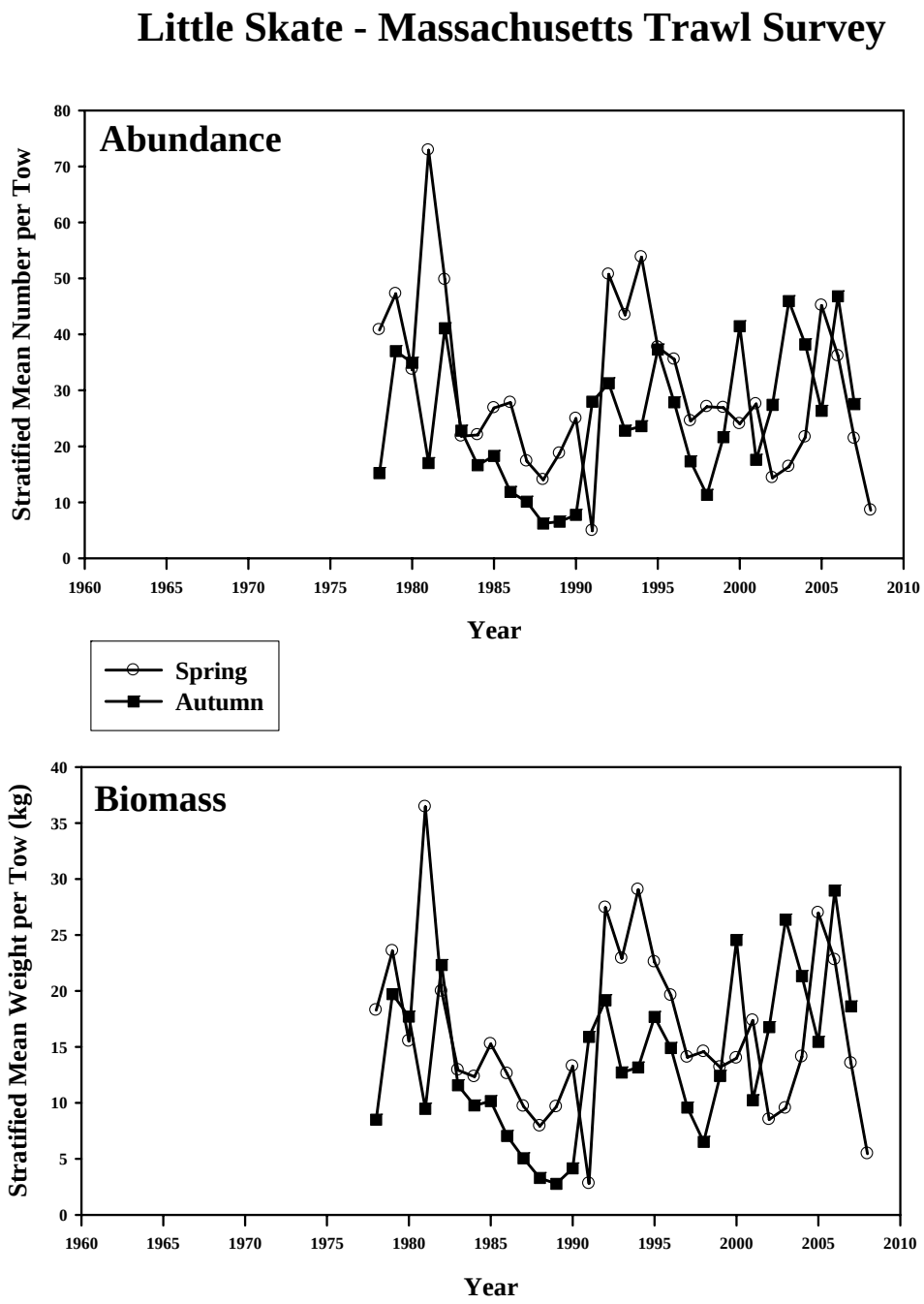


Figure 25. Abundance and biomass of little skate from the Massachusetts spring and autumn finfish bottom trawl survey in state waters (Strata 11-36).

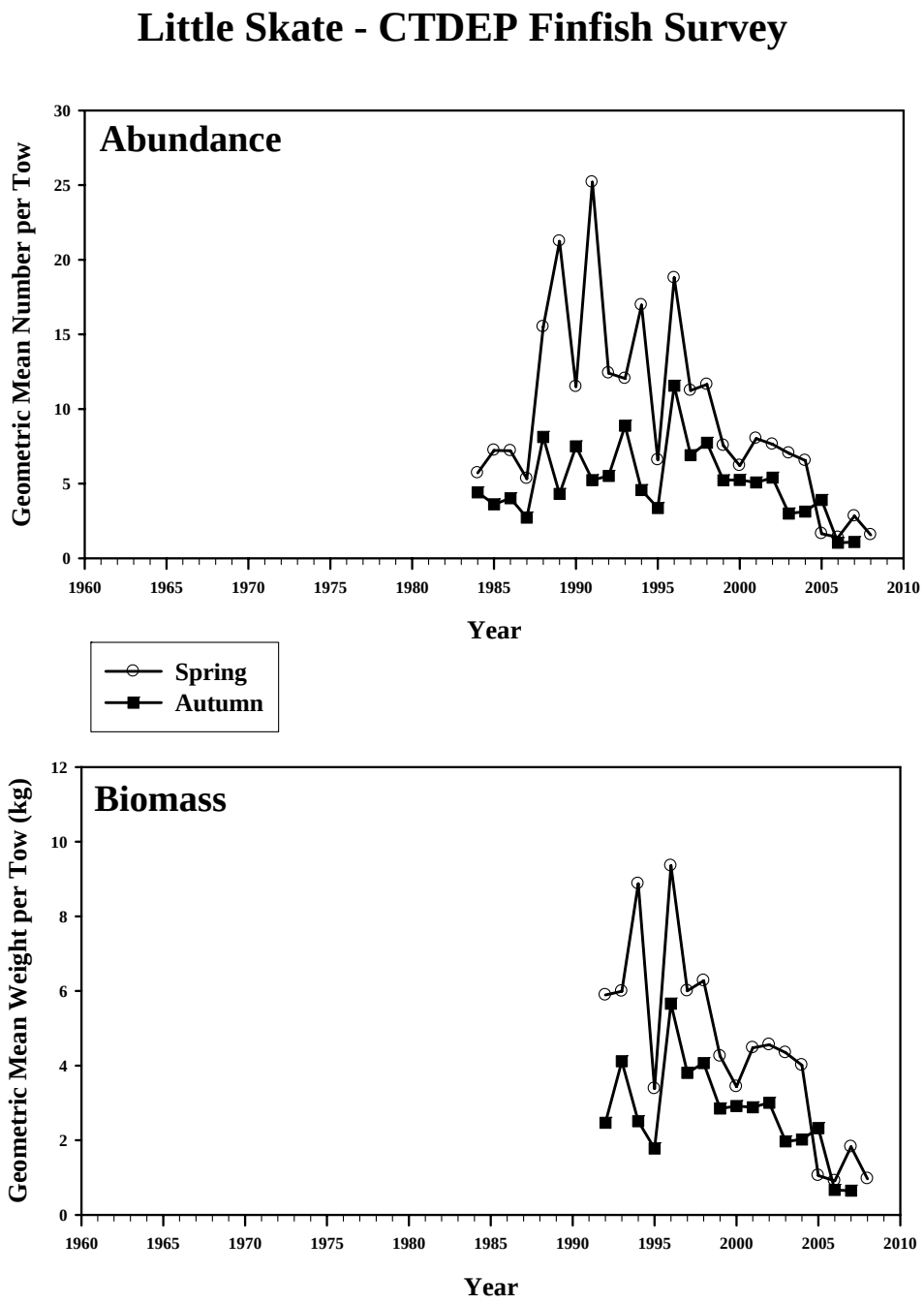


Figure 26. Abundance and biomass of little skate from the CTDEP spring and autumn finfish bottom trawl survey in Connecticut state waters, 1984-2008.

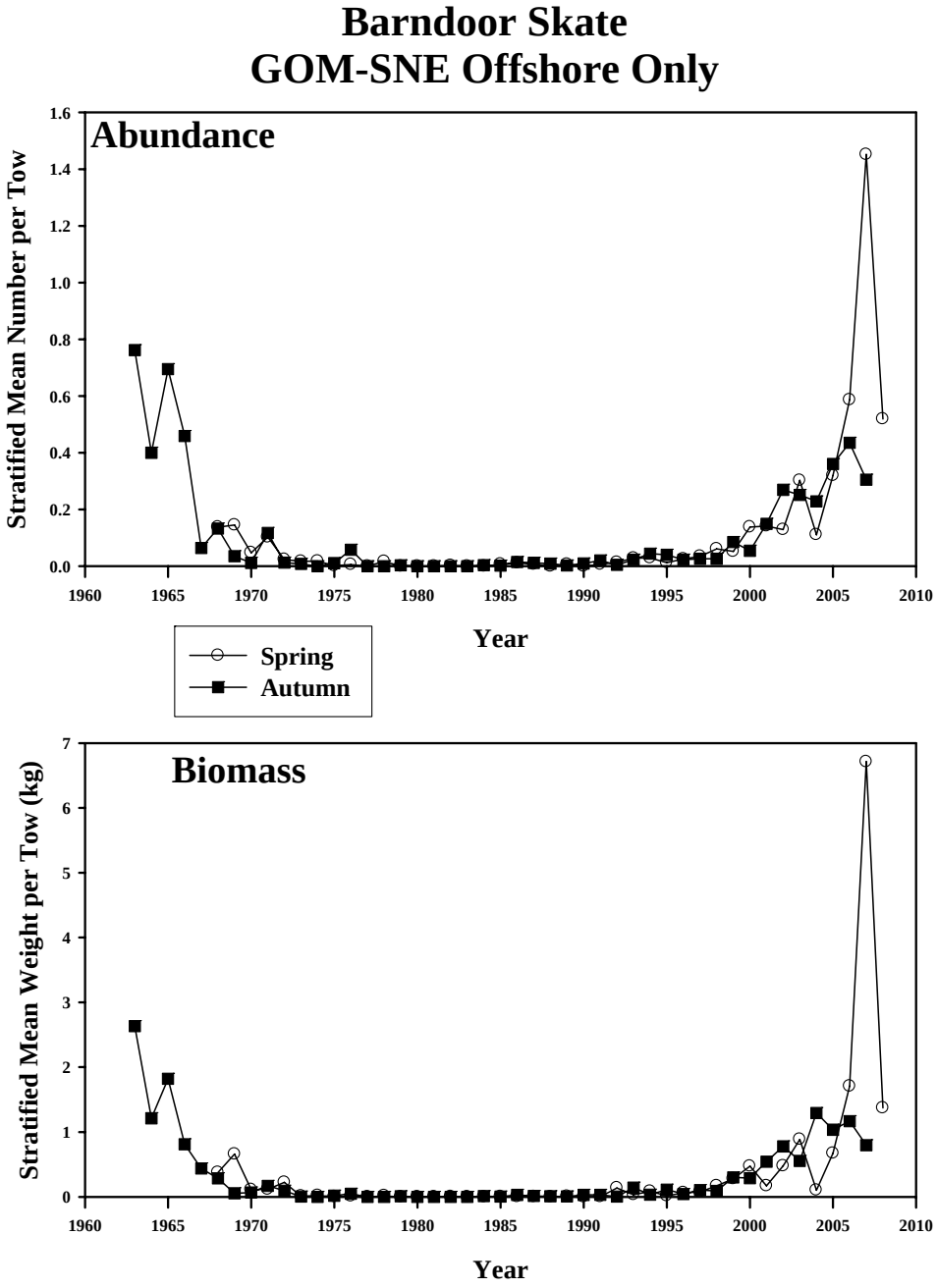


Figure 27. Abundance and biomass of barndoor skate from the NESFC spring (circles) and autumn (squares) bottom trawl surveys from 1963-2008 in the Gulf of Maine- Southern New England offshore region.

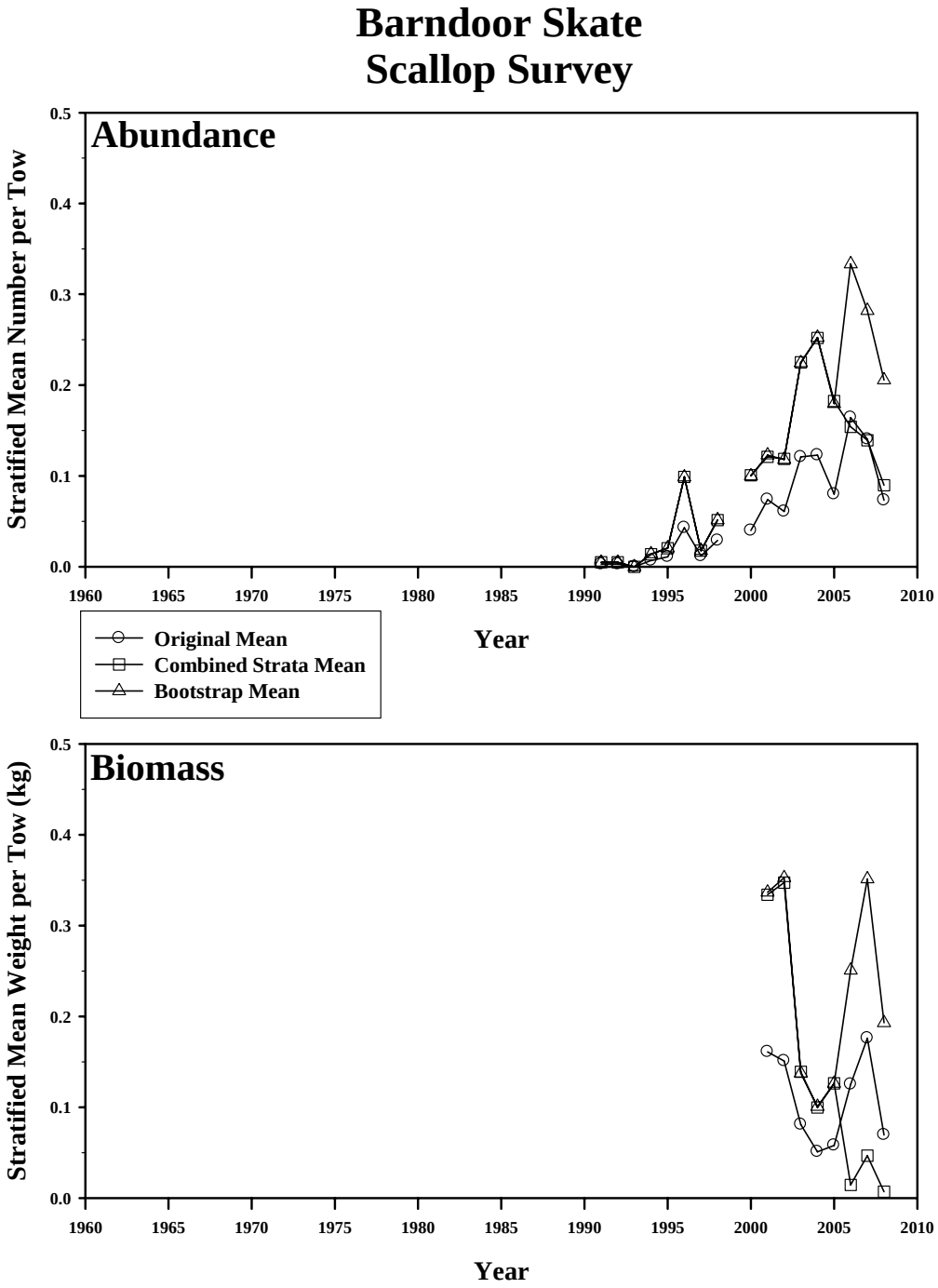


Figure 28. Abundance and biomass of barndoor skate from the NESFC scallop dredge surveys from 1992-2008. The circles represent the original stratified mean, the squares represent the mean combining strata for bootstrapping, and the triangles represent the bootstrapped mean.

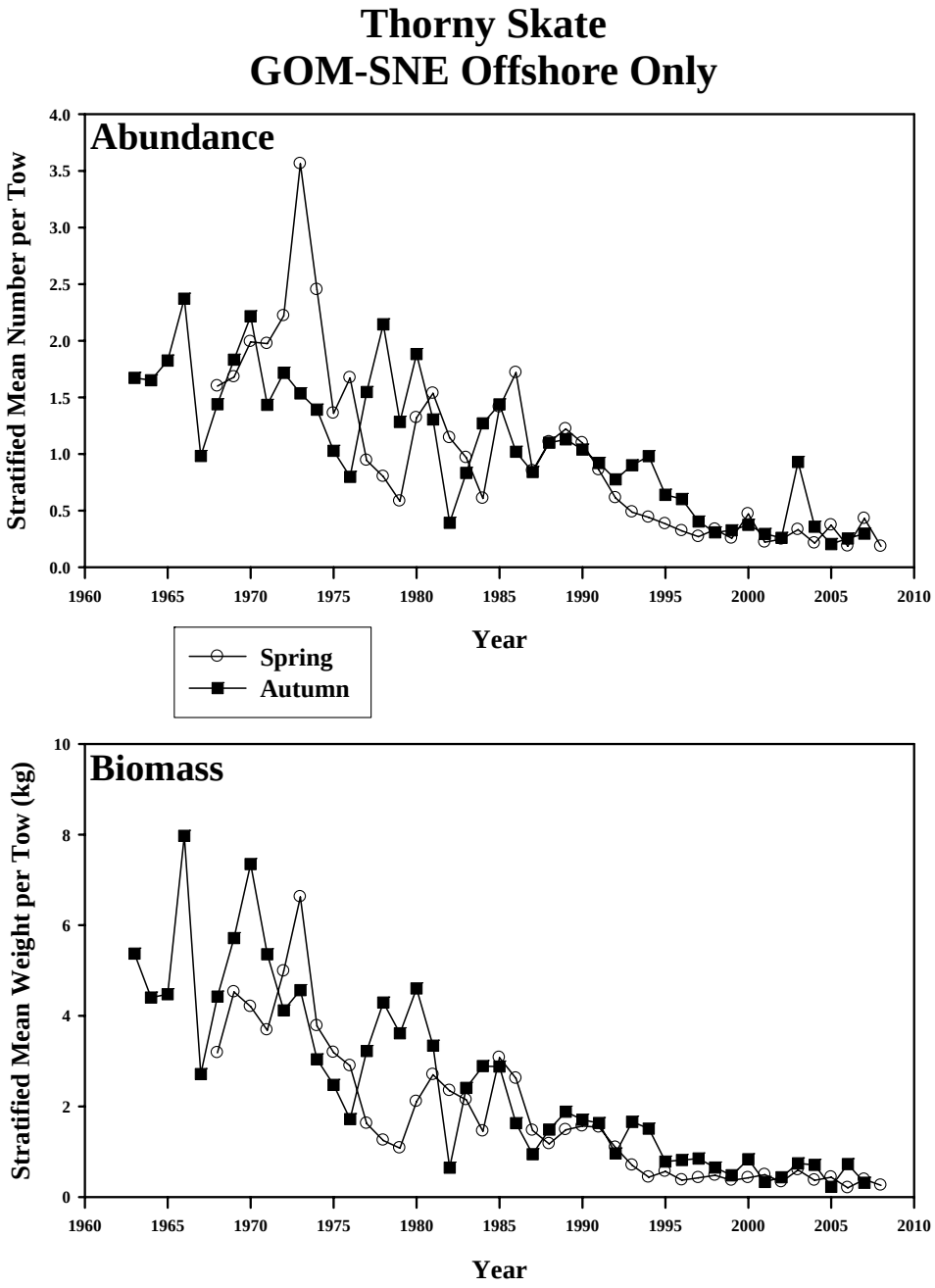


Figure 29. Abundance and biomass of thorny skate from the NESFC spring (circles) and autumn (squares) bottom trawl surveys from 1963-2008 in the Gulf of Maine to Southern New England offshore region.

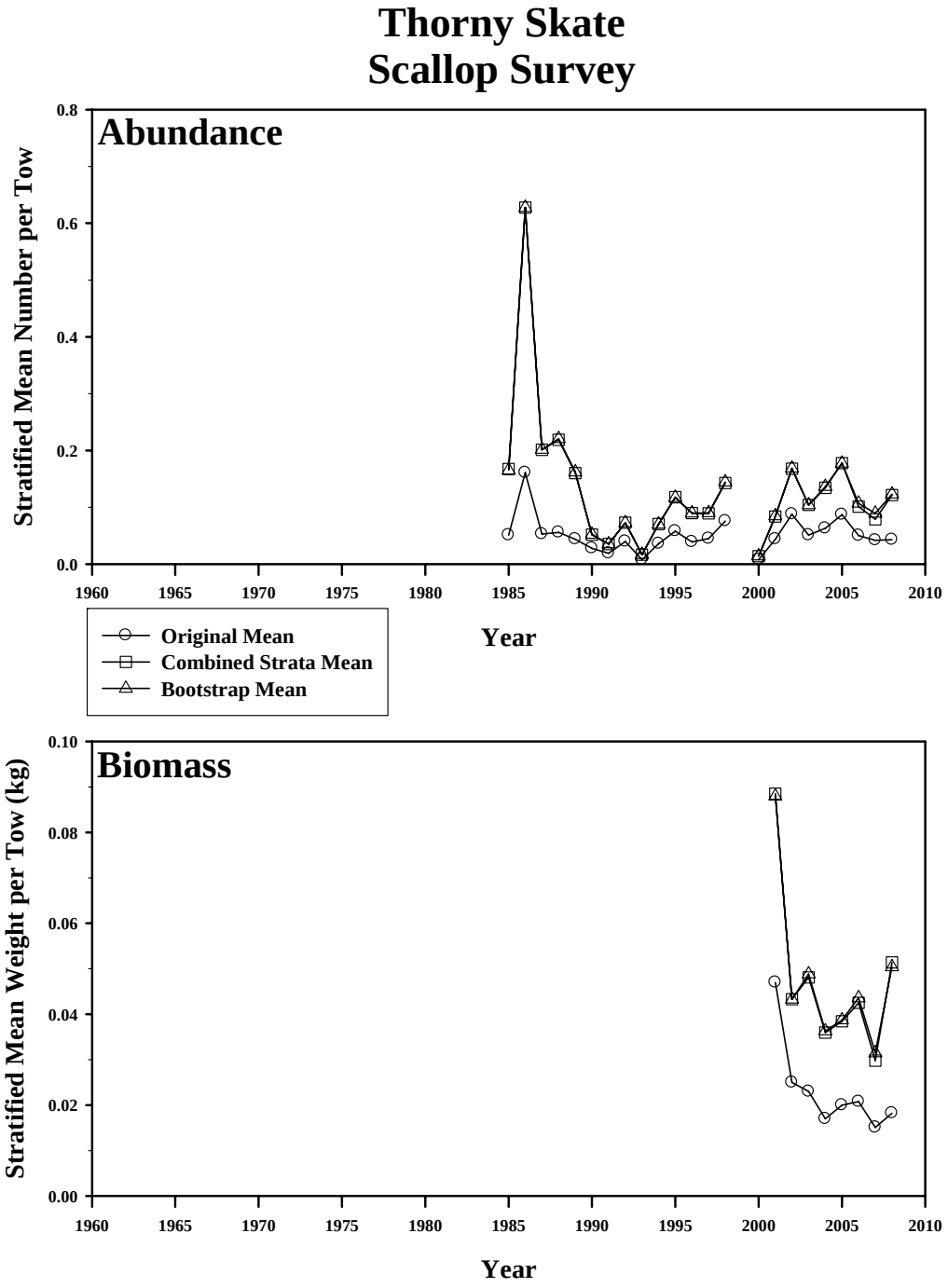


Figure 30. Abundance and biomass of thorny skate from the NESFC scallop dredge surveys from 1985-2008. The circles represent the original stratified mean, the squares represent the mean combining strata for bootstrapping, and the triangles represent the bootstrapped mean.

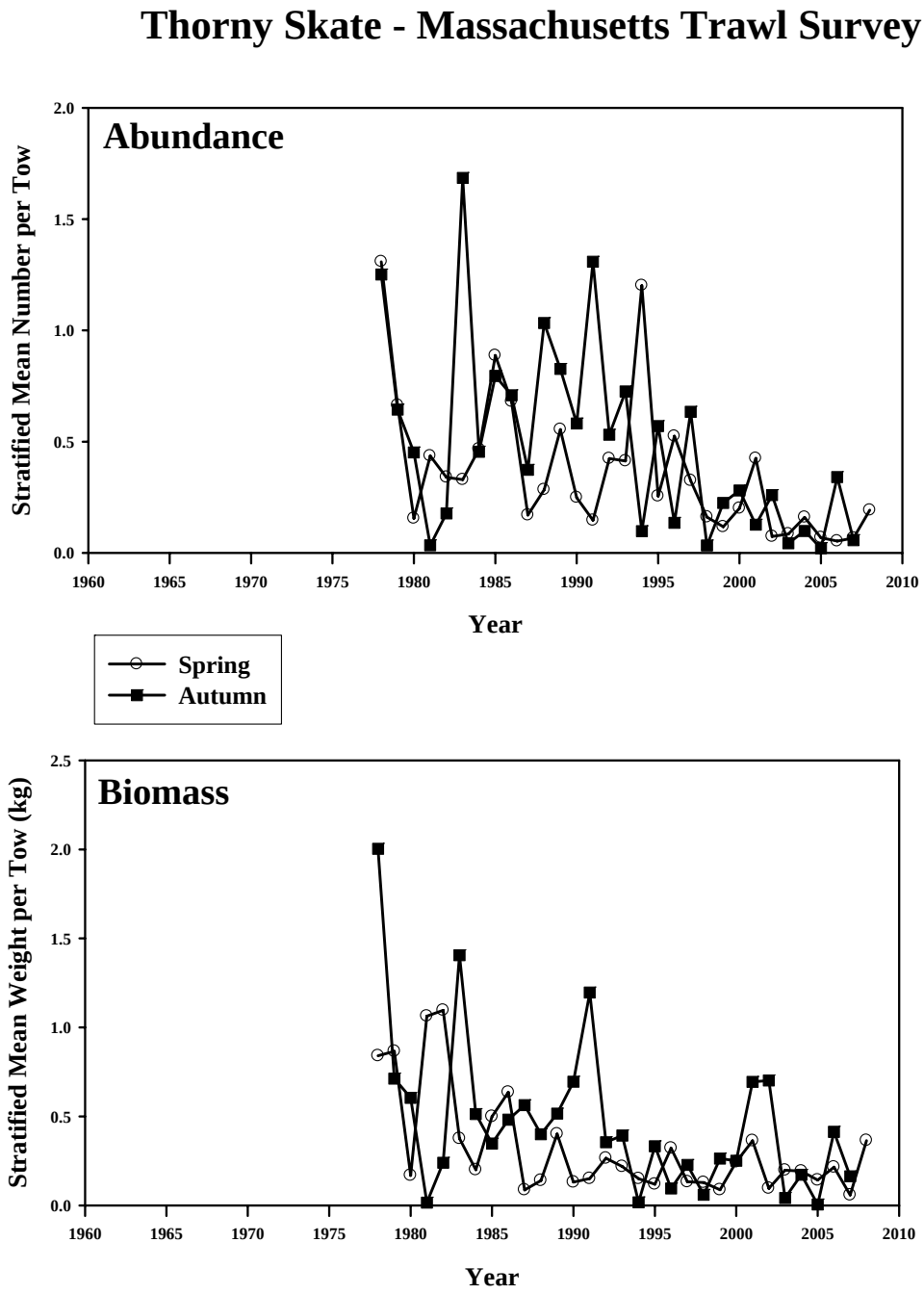


Figure 31. Abundance and biomass of thorny skate from the Massachusetts spring and autumn finfish bottom trawl survey in state waters (Strata 25-36).

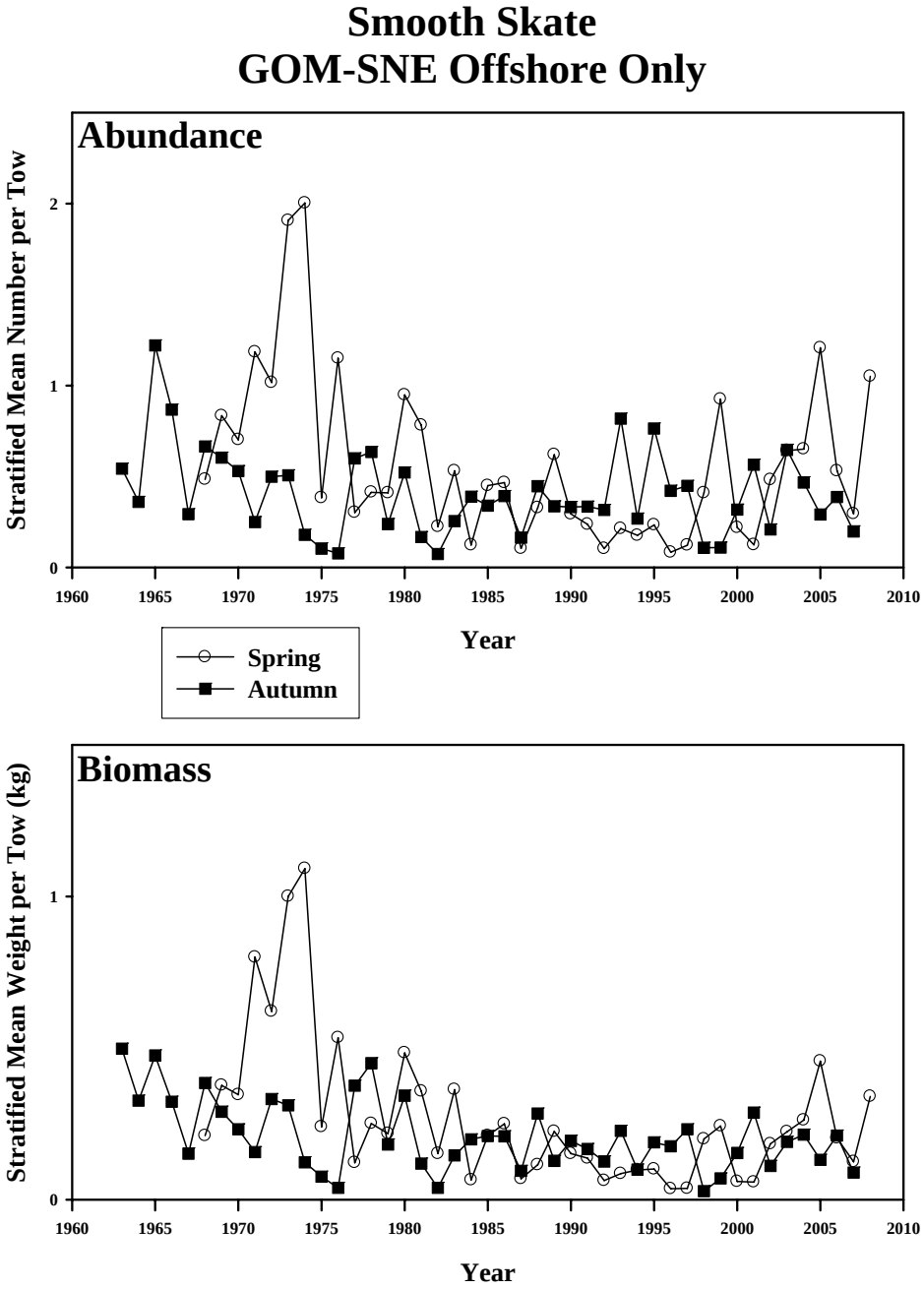


Figure 32. Abundance and biomass of smooth skate from the NESFC spring (circles) and autumn (squares) bottom trawl surveys from 1963-2008 in the Gulf of Maine to Southern New England offshore region.

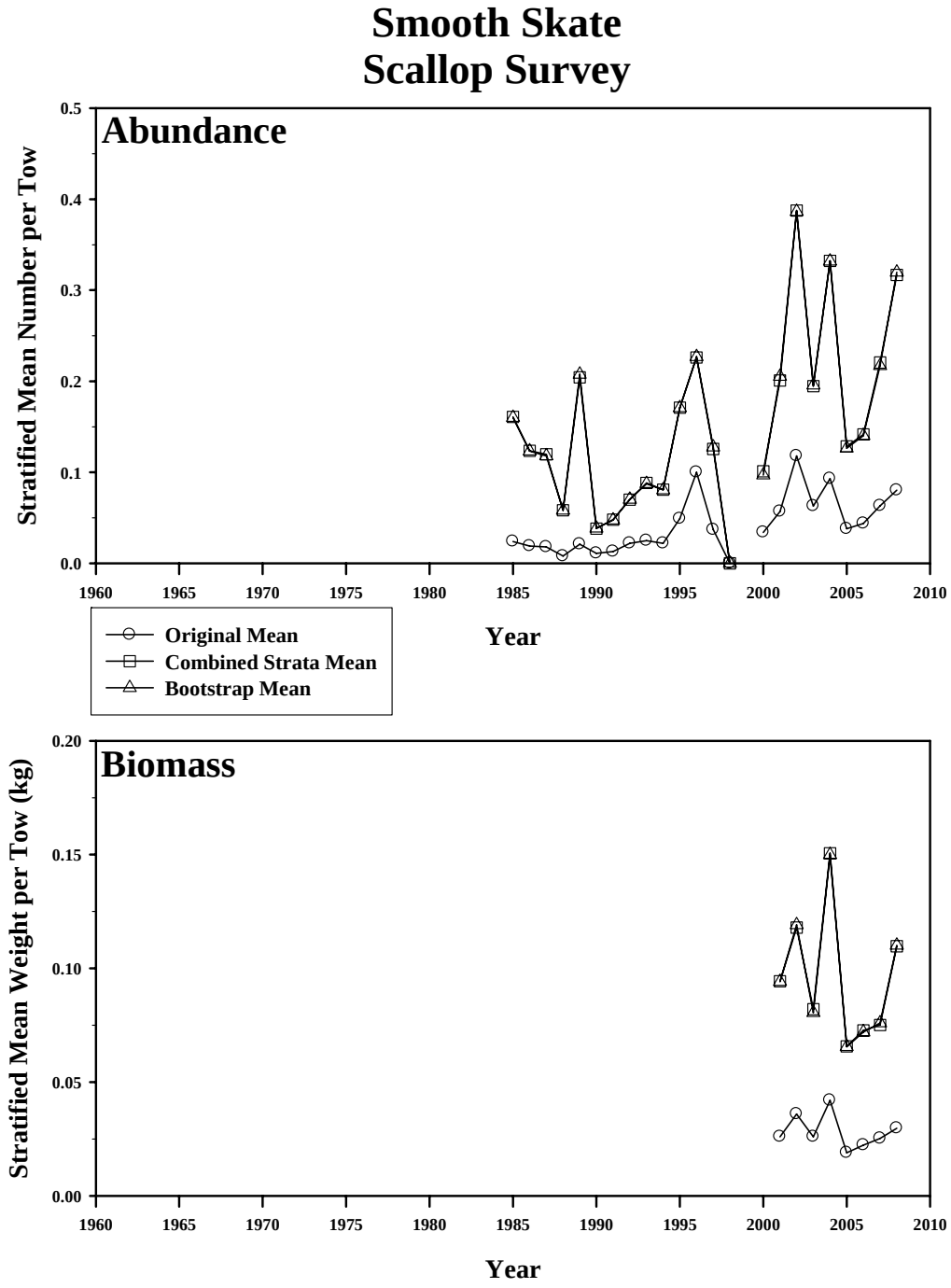


Figure 33. Abundance and biomass of smooth skate from the NESFC scallop dredge surveys from 1985-2008. The circles represent the original stratified mean, the squares represent the mean combining strata for bootstrapping, and the triangles represent the bootstrapped mean.

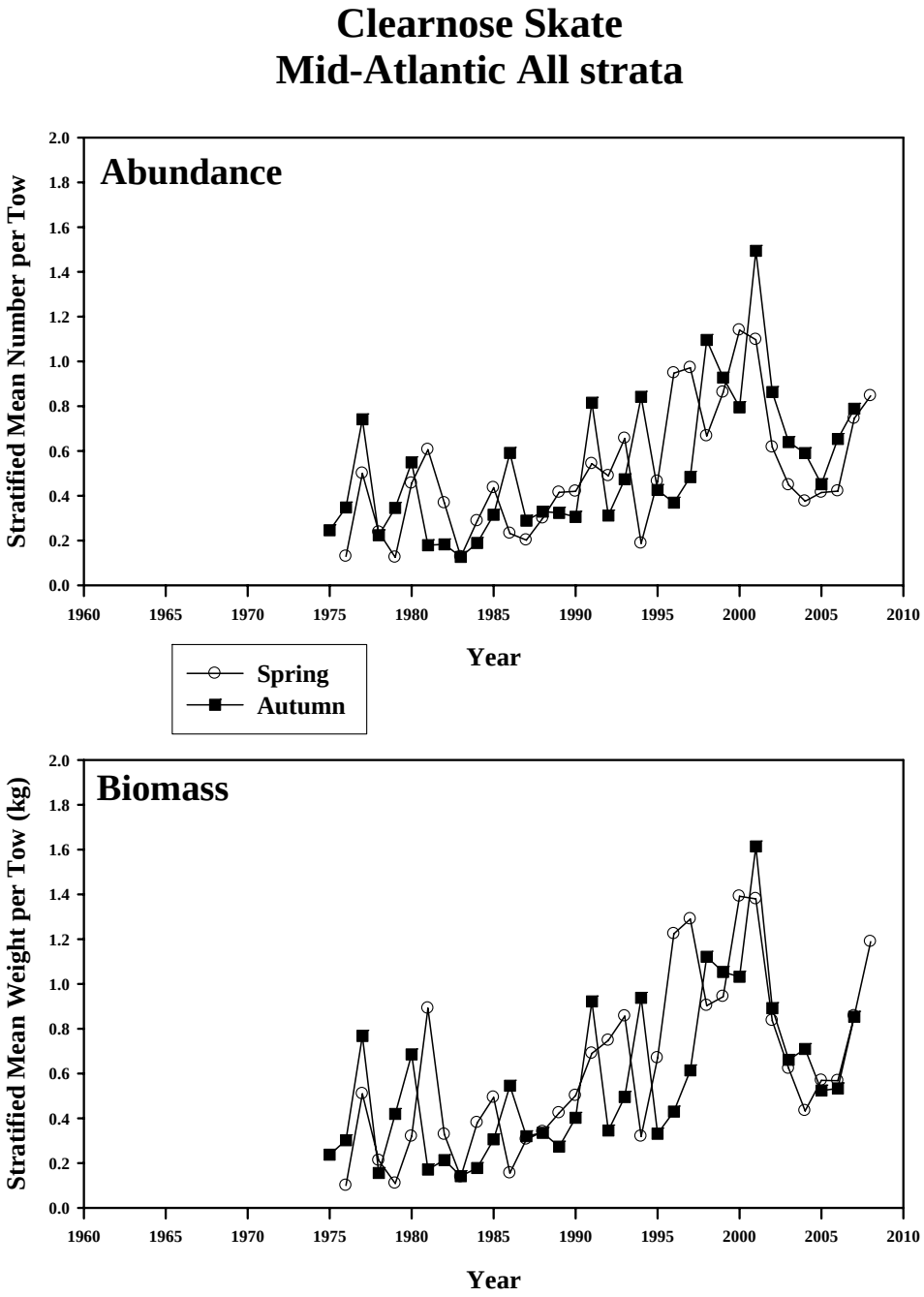


Figure 34. Abundance and biomass of clearnose skate from the NESFC spring (circles) and autumn (squares) bottom trawl surveys from 1975-2008 in the Mid-Atlantic offshore and inshore regions.

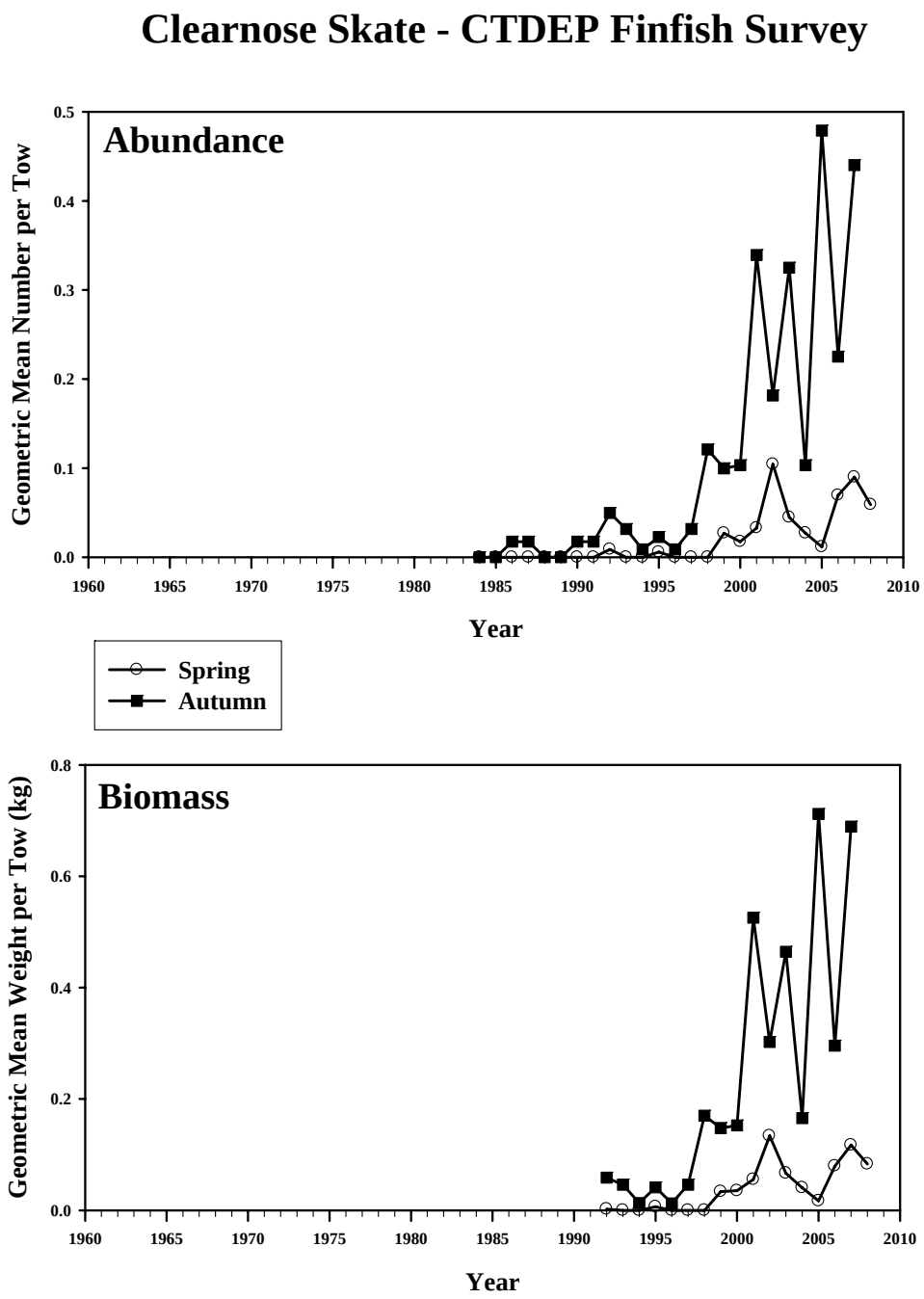


Figure 35. Abundance and biomass of clearnose skate from the CTDEP spring and autumn finfish bottom trawl survey in Connecticut state waters 1984-2008.

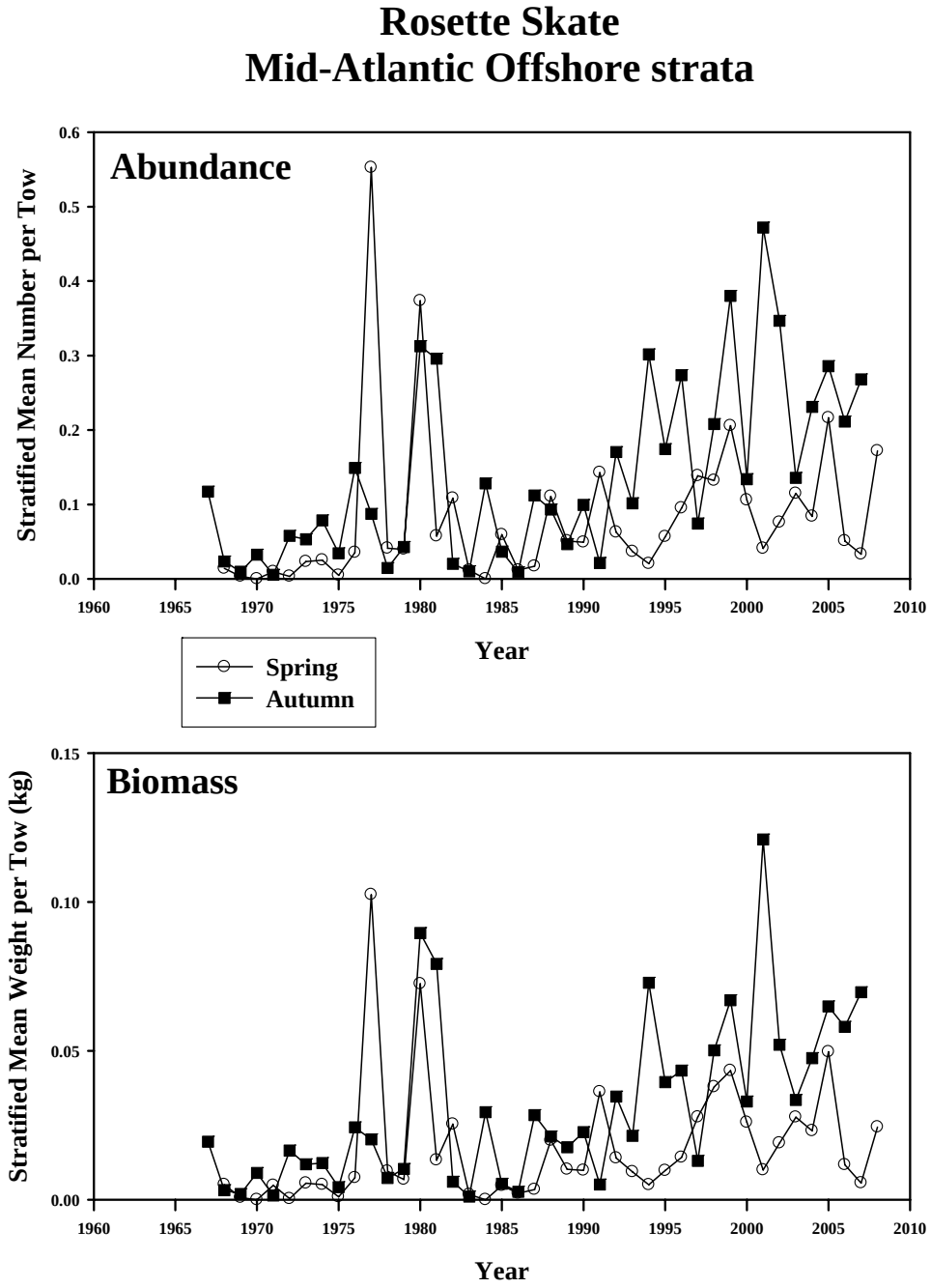


Figure 36. Abundance and biomass of rosette skate from the NESFC spring (circles) and autumn (squares) bottom trawl surveys from 1967-2008 in the Mid-Atlantic offshore region.

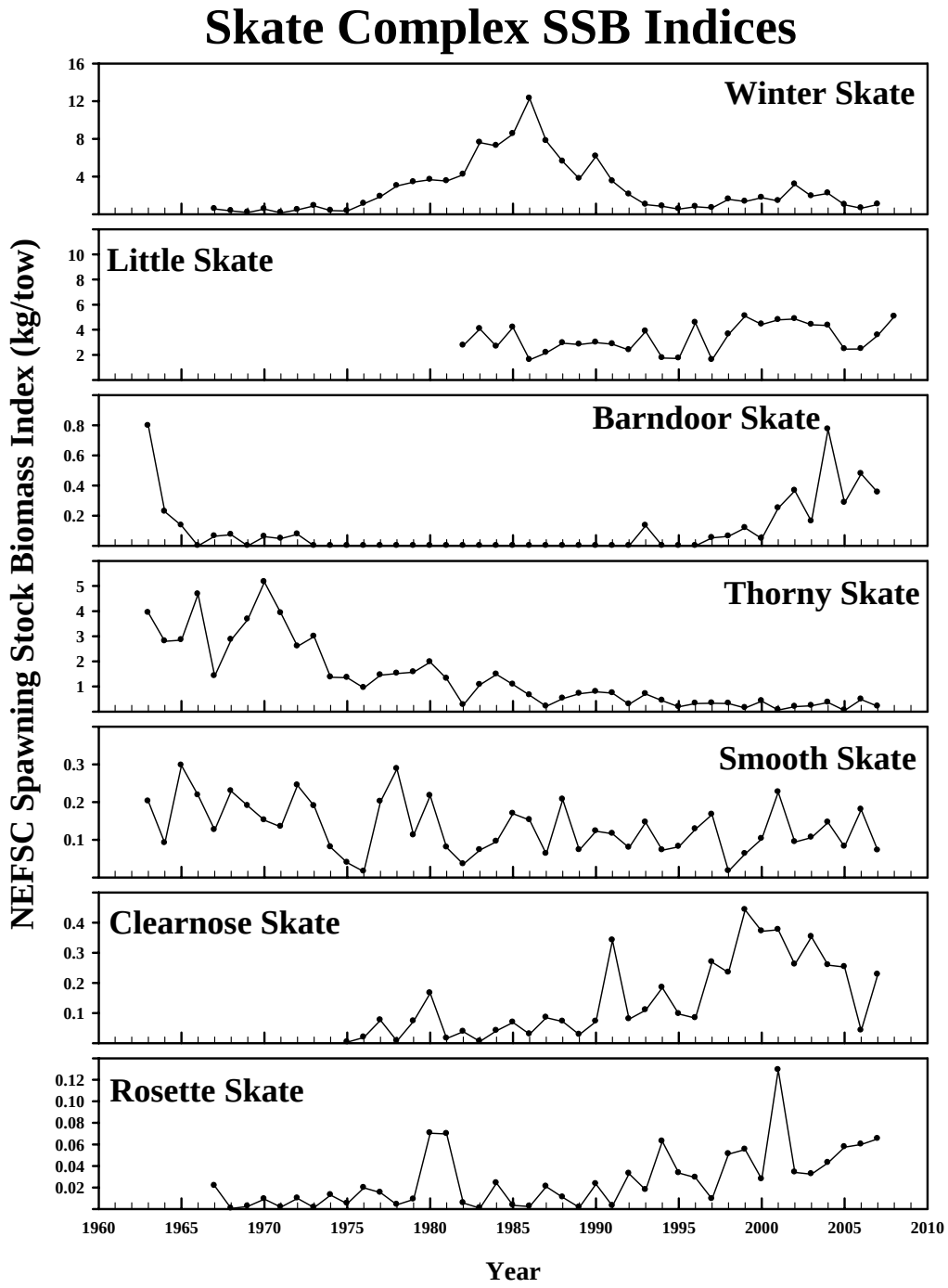


Figure 37. NEFSC survey spawning stock biomass indices (kg/tow).

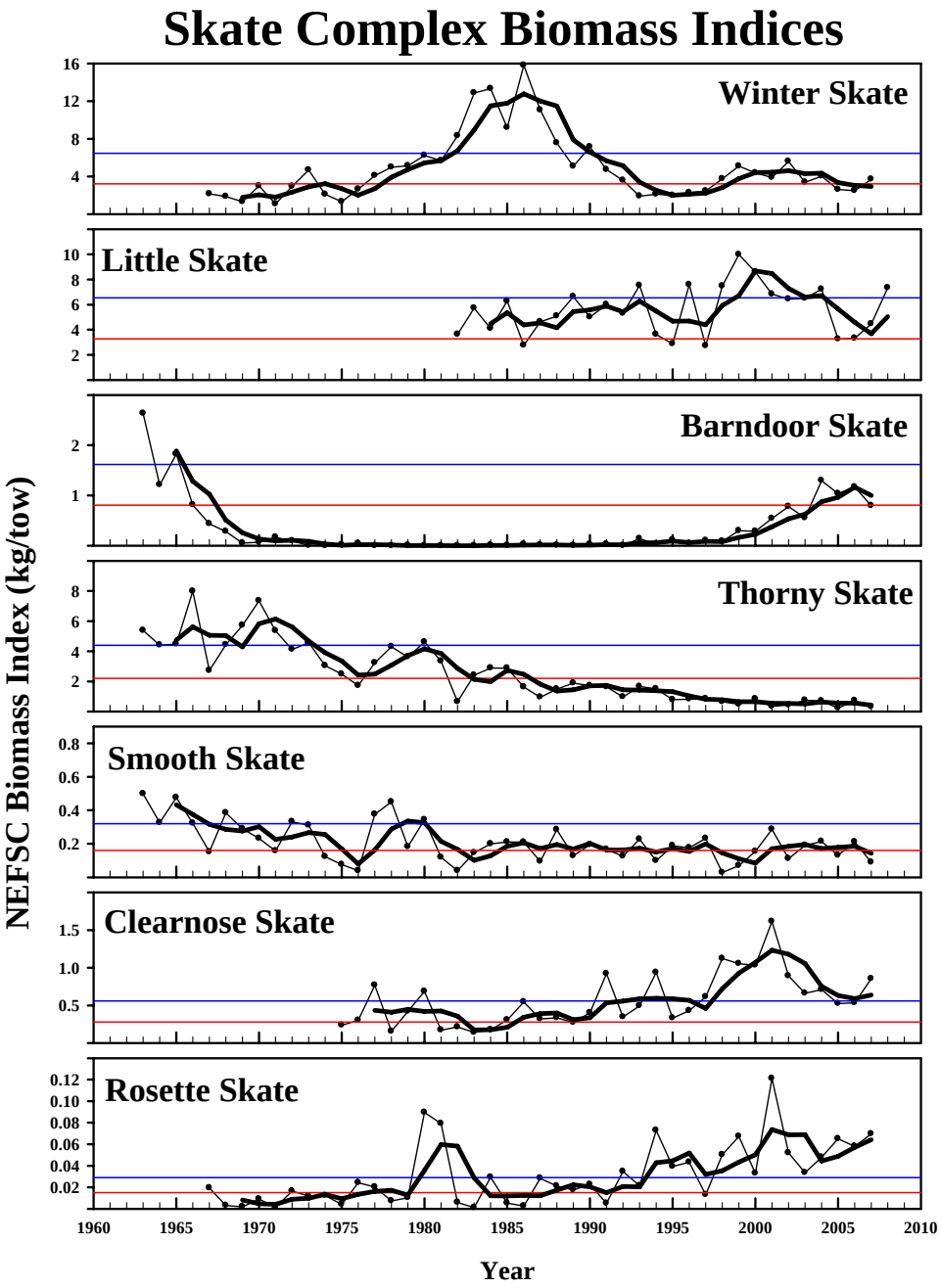


Figure 38. NEFSC survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal line are the biomass target and threshold.