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Stock Assessment of Summer Flounder for 1999

by

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ABSTRACT

This assessment of the summer flounder (*Paralichthys dentatus*) stock along the Atlantic coast from Maine to North Carolina is an update through 1998 of commercial and recreational fishery catch data, research survey indices of abundance, and the analyses that use those data. The assessment was peer reviewed and accepted by the Mid-Atlantic Fisheries Management Council Scientific and Statistical Committee on July 8, 1999. An analytical assessment (virtual population analysis, VPA) of commercial and recreational total catch-at-age (landings plus discard) was conducted. Indices of recruitment and stock abundance were developed from Northeast Fisheries Science Center winter, spring and autumn, Massachusetts spring and autumn, Rhode Island annual, Connecticut spring and autumn, New Jersey annual, and Delaware annual trawl survey data. Recruitment indices were also developed from young-of-year surveys conducted by the states of North Carolina, Virginia, Maryland, Delaware, New Jersey, Massachusetts, and Rhode Island. The 1982 and 1983 year classes are the largest in the 1982-1998 VPA time series, at 74 and 81 million fish, respectively. Recruitment declined from 1983 to 1988, with the 1988 year class the weakest at only 13 million fish. Recruitment since 1988 has improved, and the 1995 year class, at about 47 million fish, was the strongest since 1986. The 1997 and 1998 year classes appear to be below average, and are currently estimated to be about 23 and 26 million fish. VPA results indicate that the fishing mortality rate (F) on summer flounder was very high during 1982-1996, varying from 0.6 to 2.2, far in excess of the overfishing definition level (F_{max}=0.26) defined by the MAFMC in Fishery Management Plan (FMP) Amendment 12. The fishing mortality rate peaked in 1992 at 2.2 (83% exploitation rate), and has since declined to 0.52 (37% exploitation rate) in 1998, but continues to exceed the management target. Total stock biomass reached 48,500 mt in 1983, before falling to 16,000 mt in 1989. Total stock biomass has increased substantially since 1991, and in 1998 was estimated to be 38,600 mt. The FMP Amendment 12 biomass target (B_{MSY}) required to produce Maximum Sustainable Yield (MSY) is estimated to be B_{MSY} = 106,444 mt, and the FMP Amendment 12 biomass threshold of one-half B_{MSY} = 53,222 mt. The stock is overfished and overfishing is occurring with respect to the FMP Amendment 12 overfishing definition. The assessment indicates that the stock is rebuilding from the low levels observed during 1989-90.

INTRODUCTION

This assessment of the summer flounder (*Paralichthys dentatus*) stock along the Atlantic coast is an update through 1998 of commercial and recreational fishery catch data, research survey indices of abundance, and the analyses that use those data. The most significant changes in data and analyses from the previous assessment conducted in 1997 (NEFSC 1997b) include a revision in the recreational fishery release mortality rate from 25% to 10%, and a revision in the age of full recruitment to the fisheries, from age 2 to age 3. These changes have resulted in a slightly different historical pattern of fishing mortality rates and stock abundance than in the 1997 assessment. This assessment of summer flounder was peer reviewed and accepted by the Mid-Atlantic Fisheries Management Council's (MAFMC) Scientific and Statistical Committee on July 8, 1999.

For assessment purposes, the previous definition of Wilk *et al.* (1980) of a unit stock extending from Cape Hatteras north to New England has been accepted. The joint MAFMC, Atlantic States Marine Fisheries Commission (ASMFC) Fishery Management Plan (FMP) for summer flounder has as a management unit all summer flounder from the southern border of North Carolina, northeast to the U.S.-Canadian border. Amendment 1 to the FMP (1990) established the overfishing definition for summer flounder as fishing mortality rate equal to F_{max}, initially estimated as 0.23 (NEFC 1990). Amendment 2 to the FMP set target fishing mortality rates for summer flounder for 1993-1995 (F = 0.53) and 1996 and beyond (F_{max} = 0.23). Major regulations enacted under Amendment 2 in August 1992 to meet those fishing mortality rate targets included: 1) an annual fishery landings quota, with 60% allocated to the commercial fishery and 40% to the recreational fishery, based on the historical (1980-1989) division of landings, with the commercial allocation further distributed among the states based on their share of commercial landings during 1980-1989, 2) commercial minimum landed fish size limit at 13 in (33 cm), as established in the original FMP, 3) a minimum mesh size of 5.5 in (140 mm) diamond or 6.0 in (152 mm) square for commercial vessels using otter trawls that possess 100 lb (45 kg) or more of summer flounder, with exemptions for the flynet fishery and vessels fishing in an exempted area off southern New England (the Northeast Exemption Area) during 1 November to 30 April, 4) permit requirements for the sale and purchase of summer flounder, and 5) annually adjustable regulations for the recreational fishery, including seasons, a 14 in (36 cm) minimum landed fish size, and possession limits.

Amendment 3 to the FMP revised the western boundary of the Northeast Exemption Area to 72°30'W (west of Hudson Canyon), increased the large mesh net possession threshold to 200 lbs during 1 November to 30 April, and stipulated that only 100 lbs could be retained before using a large mesh net during 1 May to 31 October. Amendment 4 adjusted Connecticut's proportion of the commercial landings quota of summer flounder and revised the state-specific shares of the commercial quota accordingly. Amendment 5 allowed states to transfer or combine the commercial quota. Amendment 6 allowed nets with non-conforming mesh on board commercial fishing vessels if properly stowed, and changes the deadline for publication of overall catch limits and annual commercial management measures to 15 October and the recreational management measures to 15 February.

The results of previous assessments indicated that summer flounder abundance was not increasing as rapidly as projected when Amendment 2 regulations were implemented. In anticipation of the need to reduce fishery quotas in 1996 to meet the management target of F_{max}, the MAFMC and ASMFC modified the fishing mortality rate reduction schedule in 1995 to allow for more stable landings from year to year while slowing the rate of stock rebuilding. Amendment 7 to the FMP set target fishing mortality rates of 0.41 for 1996 and 0.30 for 1997, with a target of F_{max} = 0.23 for 1998 and beyond. Total landings were to be capped at 8,400 mt (18.51 million lbs) in 1996-1997, unless a higher quota in those years provided a realized F of 0.23. Amendment 12 to the FMP (1999) defined overfishing for summer flounder to occur when the fishing mortality rate exceeds the threshold fishing mortality rate of F_{MSY}. Since F_{MSY} could not be reliably estimated for summer flounder, F_{max} = 0.24 was used as a proxy for F_{MSY}, and was also defined as the target fishing mortality rate. The stock was defined to be overfished when the total stock biomass falls below the minimum biomass threshold of one-half of the biomass target, B_{MSY}. Because B_{MSY} could not be reliably estimated, the biomass target was defined as the product of total biomass per recruit and contemporary (1982-1996) median recruitment, estimated to be 153,350 mt (338 million lbs), and the biomass threshold as 76,650 mt (169 million lbs).

FISHERY DATA

Commercial Fishery Landings

Total U.S. commercial landings of summer flounder from Maine to North Carolina peaked in 1979 at nearly 18,000 metric tons (mt; 40 million lbs, Table 1). The reported landings in 1998 of 5.084 mt (about 11.2 million lbs) were about 1% over the initial quota of 5,040 mt (11.1 million lbs). Since 1980, 70% of the commercial landings of summer flounder have come from the Exclusive Economic Zone (EEZ; greater than 3 miles from shore). The percentage of landings attributable to the EEZ was lowest in 1983 and 1990 at 63% and was highest in 1989 at 77%. Large variability in summer flounder landings exist among the states, over time, and the percent of total summer flounder landings taken from the EEZ has varied widely among the states.

Northeast Region trawl fishery landings

Annual commercial landings data for summer flounder in years prior to 1994 were obtained from trip-level detailed landings records contained in master data files maintained by the NEFSC (the weighout system; 1963-1993) and from summary reports of the Bureau of Commercial Fisheries and its predecessor the U.S. Fish Commission (1940-1962). Beginning in 1994, landings estimates were derived from mandatory dealer reports under the current NMFS Northeast Region (NER) summer flounder quota monitoring system.

Prior to 1994, summer flounder commercial landings were allocated to statistical area (Figure 1) according to interview data (Burns et al. *In* Doubleday and Rivard 1983). For 1994-1998, dealer landings were allocated to statistical area using fishing Vessel Trip Reports (VTR data) according to the general procedures developed by Wigley *et al.* (1997), in which a matched set of dealer and VTR data is used as a sample to characterize the statistical area distribution of monthly

state landings. A comparison of the distribution of landings by state and month as indicated by the dealer, VTR, and matched set data for 1994-1998 is summarized in Tables 2-6.

The distribution of 1992-1998 landings by three-digit statistical area is presented in Table 7. Areas 526, 537, and 538 (Southern New England), areas 612, 613 and 616 (New York Bight), areas 621, 622, and 626 (Delmarva region), and areas 631 and 632 (Norfolk Canyon area) have generally accounted for about 80% of the Northeast Region commercial landings. A summary of length frequency and age sampling of summer flounder landings sampled by the NEFSC commercial fishery weighout system in the Northeast Region (NER; ME to VA) is presented in Table 8. For comparability with the manner in which length frequency sampling in the recreational fishery has been evaluated, sampling intensity is expressed in terms of metric tons of landings (mt) per 100 fish lengths measured. The sampling is proportionally stratified by market category (jumbo, large, medium, small, pee-wee, and unclassified), with the sampling distribution generally reflecting the distribution of weighout landings by market category. The proportion of large market category fish in the NER landings has increased since 1996, while the proportion of small market category landings has become very small (Figure 2).

1994-1998 Northeast Region trawl fishery landings

The age composition of the NER commercial landings for 1994-1998 was estimated semiannually by market category and (usually) 1-digit statistical area (e.g., area 5 or area 6), using standard NEFSC procedures (market category length frequency samples converted to mean weights by length-weight relationships; mean weights in turn divided into landings to calculate numbers landed by market category; market category numbers at length apportioned to age by application of age-length keys, on semiannual area basis).

The distribution of 1994-1998 length frequency samples by market category, 1- and 2-digit statistical area (division), and calendar quarter is presented in Tables 9-18. NER landed numbers at age were raised to total NER (general canvas) commercial landings when necessary by assuming that landings not accounted for in the weighout/mandatory reporting system had the same age composition as that sampled, as follows: calculate proportion at age by weight; apply proportions at age by weight to total NER commercial landings to derive total NER commercial catch-at-age by weight; divide by mean weights-at-age to derive total NER commercial landed numbers at age (Table 19). Mean weights-at-age are presented in Table 20.

North Carolina winter trawl fishery landings

The North Carolina winter trawl fishery accounts for about 99% of summer flounder commercial landings in North Carolina. A separate landings-at-age matrix for this component of the commercial fishery was developed from North Carolina Division of Marine Fisheries (NC DMF) length and age frequency sampling data. The NC DMF program sampled about 10% of the winter trawl fishery landings annually, at a rate of between 53 and 5 mt of landings per 100 lengths measured (Table 21). All length frequency data used in construction of the North Carolina winter

trawl fishery landings-at-age matrix for 1982-1998 were collected in the NC DMF program. Age-length keys from NEFSC commercial data and NEFSC spring survey data were used to convert the NC DMF commercial fishery lengths to age, by appropriate statistical area and semiannual period, for 1982-1987. Age-length data collected by the NC DMF commercial fishery sampling program were used to form the age-length keys used to resolve the 1988-1998 NC DMF commercial fishery lengths to age. Fishery regulations in North Carolina also changed between 1987 and 1988, with increases in both the minimum mesh size of the codend and minimum landed fish size taking effect. It is not clear whether the change in regulations or the change in keys, or some combination, is responsible for the decreases in the numbers of age-0 and age-1 fish estimated in the North Carolina commercial fishery landings since 1987. Landed numbers at age and mean weights at age from this fishery are shown in Tables 22-23.

Commercial Fishery Discards

Analysis of variance of sea sample data for summer flounder was used to identify stratification variables for an expansion procedure to estimate total landings and discard from sea sample data kept and discard rates (weight per day fished) in the commercial fishery. Initial models included year, quarter, fisheries statistical division (2-digit area), area (divisions north and south of Delaware Bay), and tonnage class as main effects, with quarter and division emerging (along with year) as consistently significant main effects without significant interaction with the year. The kept and discard estimation procedure expanded geometric mean catch rates in year, quarter, and division strata by total days fished (days fished on trips landing any summer flounder by any mobile gear, including fish trawls and scallop dredges) to estimate fishery landings for comparison with reported landings. The geometric mean catch rates were corrected for log-transformation bias on re-transformation to the arithmetic scale. For strata with no sea sampling data, catch rates from adjacent or comparable strata were substituted as needed (except for Division 51, which generally has very low catch rates and negligible catch). Estimates of discard are stratified by 2 gear types (scallop dredge and trawl and others) for years when data are adequate (1992-1998). Estimates at length and age are stratified by gear only for 1994-1998, again due to sample size considerations.

While estimates of catch rates from the NER sea sample data are used in this assessment to estimate total discards, information on catch rate is also reported in the VTR data. A comparison of discard to kept ratios for the sea sample and VTR data sets for trawl and scallop dredge gear indicated similar discard rates in the trawl fishery from the two data sources, while discard rates in the scallop dredge fishery were higher in the sea sample data. Overall, sea sample and VTR discard to kept ratios were comparable during 1994-1998 (Tables 24-25).

Finally, the change from the interview/weighout data reporting system to the VTR/mandatory dealer report system has required a change in the estimation of effort (days fished) used as a multiplier with the sea sample geometric mean discard rate in the procedure used to estimate total discard for 1994-1998. An initial examination of days fished and catch per unit effort (CPUE; landings per day fished) for cod conducted at SAW 24 compared these quantities as reported in the full weighout and VTR data sets (DeLong *et al.*, 1997). This comparison indicated a shift to a higher

frequency of short trips (trips with one or two days fished reported), and to a mode at a lower rate of CPUE. It was not clear at if these changes were due to the change in reporting system (units reported not comparable), or real changes in the fishery, and so effort data reported by the VTR system were not used quantitatively in the SAW 24 assessments (NEFSC 1997a). In the SAW 25 assessment for summer flounder (NEFSC 1997b), a slightly different comparison was made. The port agent interview data for 1991-93 and merged dealer/VTR data for 1994-1996 (the matched set data), which under each system serve as the "sample" to characterize the total commercial landings, were compared in relative terms (percent frequency). For summer flounder, the percent frequency of short trips (lower number of days fished per trip) increased during 1991-1996, but not to the degree observed for cod, and the mode of CPUE rates for summer flounder increased in spite of lower effort per trip. For the summer flounder fishery, these may reflect actual changes in the fishery, due to increasing restrictions of allowable landings per trip (trip landings limits might lead to shorter trips) and increasing stock size (higher CPUE). As with cod, however, the influence of each of these changes (reporting system, management changes, stock size changes) has not been quantified. Total, non-standardized days fished in the summer flounder fishery were comparable between 1989-1993 period and 1994 (Tables 26-34; WO DF and WO/VTR DF). With increasing restrictions on the fishery in 1995-1998 (lower landings quota, higher stock size, and thus increasing impact of trips limits and closures), total days fished declined. Despite questions about the accuracy of the VTR data, the effort measure is critical to the estimation of discards for summer flounder, and so the VTR data were used as the best available data source to estimate summer flounder fishery days fished for 1994-1998.

Two adjustments were made to the dealer/VTR matched data subset days fished estimates to fully account for summer flounder fishery effort during 1994-1998. First, the landings to days fished relationship in the matched set was assumed to be the same for unmatched trips, and so the days fished total in each discard estimation stratum (2-digit area and quarter) was raised by the dealer to matched set landings ratio. This step in the estimation accounted for days fished associated with trips landing summer flounder, and provided an estimate of discard for trips landing summer flounder (Tables 33-42, variable SS EST DISC 1).

Given the restrictions on the fishery which result in closed seasons and restrictive trip limits, there is fishing activity which results in summer flounder discard, but no landings. The days fished associated with these trips was accounted for by raising strata discard estimates by the ratio of the total days fished on trips catching any summer flounder (trips with landings and discard, plus trips with discard only) to the days fished on trips landing summer flounder (trips with landings and discard) (Tables 33-42, variable NO KEPT RATIO), for VTR trips reporting discard of any species (DeLong *et al.* 1997). For this step , it is necessary to assume that the discard rate (as indicated by the sea sample data, which includes trips with discard but no landings, and which is used in previous estimation procedure steps) is the same for trips with only discard as for trips which both land and discard.

NER discard estimates for 1989-1998 are summarized in Tables 26-42 (variable SS EST DISC MT). Discard as a proportion of the sea sample data estimated landings (SS EST LAND MT)

was highest in 1990 and 1991 (38 and 24%), and lowest in 1995 and 1996 (5 and 7%). Results summarized in Tables 26-42 show that the expansion procedure provided estimates of landings ranging from within 5 to 35% of reported landings in the fisheries, with discard ranging from 41 % (1990) to 6% (1995) of the reported landings. Scallop dredge fishery discard to landed ratios are much higher than trawl fishery ratios, purportedly because of closures and trip limits. Reports from the fishing industry indicate that operators of scallop dredge vessels prefer to utilize available hold and ice capacity for shucked scallops, rather than the limited amount of summer flounder available to them under restrictive trip limits for summer flounder (James Fletcher, personal communication, June 1999). Thus, although the scallop dredge landings are less than 5% of the total, the raised estimate of total discard in numbers of fish for the scallop dredge fishery is of the same order of magnitude as that in the trawl fishery.

The discard estimates were based only on the estimate of fishing effort (days fished) for states included in the NER commercial fishery reporting system during 1989-1996, and so it was necessary to raise the discard estimate to account for discarding which occurs in components of the commercial fishery outside the NER commercial reporting system (i.e., state reporting systems such as Connecticut, Virginia, and North Carolina) during 1989-1996. To determine the proper raising factor, landings accounted for in the NER reporting system (which result from the fishing effort on which the sea sample discard estimate is based) were compared with total NER landings, plus that portion of North Carolina landings removed from the EEZ (it is assumed that only the North Carolina fishery in the EEZ would experience significant discard, as mesh regulations in state waters have resulted in very low discards in state waters since implementation of the regulation in 1989; R. Monaghan, pers. comm.). Total discard estimates were raised by 11 to 38% (Table 43). All states' landings and effort data were included in the NER dealer and VTR reporting systems in 1997 and 1998, so no raising was necessary. As used by SAW 16 (NEFSC 1993), a commercial fishery discard mortality rate of 80% was assumed to develop the final estimate of discard mortality (Table 44).

Existing sea sample data were used to develop estimates of commercial fishery discard for 1989-1998. However, adequate data (e.g., interviewed trip data, survey data) are not available for summer flounder to develop discard estimates for 1982-1988. Discard numbers were assumed to be small relative to landings during 1982-1988 (because of the lack of a minimum size limit in the EEZ), but to have increased since 1989 with the implementation of fishery regulations under the FMP. It is recognized that not accounting directly for commercial fishery discards would likely result in an underestimation of fishing mortality and population sizes in 1982-1988.

NEFSC sea sample length frequency data were converted to sample numbers at age and sample weight-at-age frequencies by application of NEFSC survey length-weight relationships and sea sample, commercial fishery, and survey age-length keys. Sample weight proportions at age were next applied to the raised fishery discard estimates to derive fishery total discard weight-at-age. Fishery discard weights-at-age were then divided by sea sample mean weights-at-age to derive fishery discard numbers at age. Conversion to discards-at-age for 1989-1993 was done by semiannual (quarters 1 and 2 pooled, quarters 3 and 4 pooled) periods using NEFSC sea sample age-

length keys, except for 1989, when first period lengths were aged using combined commercial (quarters 1 and 2) and NEFSC spring survey age-length keys. For 1994-1998, only NEFSC winter, spring, and autumn survey age-length keys were used. Sea sample sampling intensity is summarized in Table 44. Estimates of discarded numbers at age, mean length and mean weight-at-age are summarized in Table 45.

Recreational Fishery Landings

Summary landings statistics for the recreational fishery (catch type A+B1), as estimated by the National Marine Fisheries Service (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS), are presented in Tables 46-47. Recreational fishery landings increased 106% by number and 128% by weight from 1995 to 1998, with the fishery landing 169% (5,683 mt, 12.5 million lbs) of the 3,360 mt (7.4 million lbs) target quota established for the recreational sector in 1998. Recreational landings accounted for 32% of the total summer flounder recreational catch (landings plus discards) in numbers, with 68% released alive (Table 48). The 1998 recreational landings of summer flounder in weight were the highest since 1988.

The length frequency sampling intensity for the recreational fishery for summer flounder was summarized by MRFSS subregions (North - Maine to Connecticut; Mid - New York to Virginia; South - North Carolina) as metric tons of landings per hundred lengths measured (Burns et al. *In* Doubleday and Rivard, 1983). For 1998, aggregate sampling intensity averaged 107 mt of landings per 100 fish measured (Table 49).

Recreational (MRFSS) sample length frequency data, NEFSC commercial age-length data, and NEFSC survey age-length data were examined in terms of number of fish measured/aged on various temporal and geographical scales. Correspondences were made between MRFSS intercept date (quarter), commercial quarter, and survey season (spring and summer/autumn), and between MRFSS subregion, commercial statistical areas, and survey depth strata, in order to integrate data from the different sources. Based on the number, size range, and distribution of lengths and ages, a semiannual (quarters 1 and 2, quarters 3 and 4), subregional basis of aggregation was adopted for matching of commercial and survey age-length keys with recreational length frequency distributions for conversion of the lengths to ages.

Recreational landings historically been dominated by relatively young fish. Over the 1982-1996 period, age 1 fish accounted for an average of over 50% of the landings by number; summer flounder of ages 0 to 4 account for an average of over 99% of landings by number. No fish from the recreational landings were determined to be older than age 7. With recent increases in minimum size (to 14.5 in [37 cm] in 1997, and 15 in [38 cm] in 1998), reductions in fishing mortality, and patterns in recruitment to the stock, the age composition of the recreational landings includes more fish at ages 2 to 4 , and fewer at ages 0 and 1, during 1997-1998 (Table 50).

Small MRFSS intercept length sample sizes for larger fish resulted in a high degree of variability in mean length for older fish, especially at ages 5 and older. Attempts to estimate length-weight relationships from MRFSS biological sample data for use in estimating weight-at-age resulted in unacceptable variation. As a result, quarterly length (mm) to weight (g) relationships from Lux and Porter (1966), which are employed in the conversion of length to weight in NEFSC compilation of commercial fishery statistics for summer flounder, were used to calculate annual mean weights-at-age from the estimated age-length frequency distribution of the landings.

Recreational Fishery Discards

Recreational (MRFSS) catch estimates were aggregated on a subregional basis for calculation of the proportion of live discard (catch type B2) to total catch (catch types A+B1+B2) in the recreational fishery for summer flounder. Examination of catch data in this manner shows that the live discard has varied from about 18% (1985) to about 79% (1995) of the total catch (Table 48). Some assumptions about the biological characteristics and hooking mortality rate of the recreational live discard needed to be made to account for all removals from the summer flounder stock by the recreational fishery, because no biological samples are taken from catch type B2. In previous assessments, data available from New York Department of Environmental Conservation (NYDEC) surveys (1988-92) of New York party boats suggested the following for this component (Mid-Atlantic subregion, anglers fishing from boats) of the recreational fishery: 1) nearly all (>95%) of the fish released alive were below the minimum regulated size (during 1988-92, 14 in [36 cm] in New York state waters), 2) nearly all of these fish were age 0 and age 1 summer flounder, and 3) age 0 and 1 summer flounder occurred in approximately the same proportions in the live discard as in the landings. It was assumed that all B2 catch would be of lengths below regulated size limits, and so either age 0 or age 1 in all three subregions during 1982-1996. Catch type B2 was therefore allocated on a subregional basis in the same ratio as the annual age 0 to age 1 proportion observed in the landings during 1982-1996. Mean weights-at-age were assumed to be the same as in the landings during 1982-1996.

The minimum landed size in federal and most state waters increased to 14.5 in (37 cm) in 1997 and 15.0 in (38 cm) in 1998. Applying the same logic employed to classify the 1982-1996 recreational released catch to size and age for 1997 and 1998 implies that the recreational fishery released catch now includes fish of ages 2 and 3. As in previous years, for 1997 and 1998 it was assumed that all B2 catch would be of lengths below regulated size limits, and so of ages 0 to 3. Catch type B2 was therefore allocated on a sub-regional basis in the same ratio as the annual age 0 to age 3 proportions observed in the landings at lengths less than 37 cm in 1997 and 38 cm in 1998 (Table 51). Investigation of data from the CT DEP Volunteer Angler Survey (VAS), comparing the length frequency of CT VAS released fish with the MRFSS data on the length frequency of landed fish less than the minimum size, suggests this assumption was valid for 1997 and 1998 (David Simpson, Connecticut Department of Environmental Protection, personal communication, June 1999).

Studies conducted cooperatively by NEFSC and the Massachusetts Department of Marine Fisheries (MA DMF) suggest a hooking mortality rate of 8% for striped bass (Diodati and Richards 1996) and 5% for black sea bass (Bugley and Shepherd, 1991). Work by the states of Washington and Oregon with Pacific halibut (a potentially much larger flatfish species, but otherwise morphologically similar to summer flounder) found "average hooking mortality...between eight and 24 percent" (IPHC, 1988). An unpublished tagging study by the NYDEC (Weber MS 1984) on survival of released sublegal summer flounder caught by hook-and-line suggested a total, non-fishing mortality rate of 53%, which included hooking plus tagging mortality as well as deaths by natural causes (i.e., predation, disease, senescence). Assuming deaths by natural causes to be about 18%, (an instantaneous rate of 0.20), an annual hooking plus tagging mortality rate of about 35% can be derived from the NYDEC results. In previous assessments of summer flounder, a 25% hooking mortality rate was assumed reasonable for summer flounder released alive by anglers.

Two recent investigations of summer flounder recreational fishery release mortality suggested that a revision in the assumed rate was appropriate. Lucy and Holton (1998) used field trials and tank experiments to investigate the release mortality rate for summer flounder in Virginia, and found rates ranging from 6% (field trials) to 11% (tank experiments). Malchoff and Lucy (1998) used field cages to hold fish angled in New York and Virginia during 1997 and 1998, and found a mean short term mortality rate of 14% across all trials. Given the results of these recent release mortality studies conducted specifically for summer flounder, a 10% release mortality rate has been assumed in this assessment.

As a result, 10% of the total B2 catch-at-age was added to estimates of summer flounder landings-at-age to provide estimates of summer flounder recreational fishery discard at age (Table 51), total recreational fishery catch-at-age in numbers (Table 52) and mean weights-at-age (Table 53). The number of fish discarded and assumed dead in the recreational fishery (1.5 million fish, 517 mt) was 22% by number and 9% by weight of the total landed (6.9 million fish, 5,863 mt) in the recreational fishery in 1998.

Total Catch Composition

Total (NER) commercial fishery landings and discards-at-age, North Carolina winter trawl fishery landings and discards-at-age, and MRFSS recreational fishery landings and discards-at-age totals were summed to provide a total fishery catch-at-age matrix for 1982-1998 (Table 54). The percentage of age-3 and older fish in the total catch in numbers has increased in recent years from 4% in 1993, 6% in 1994, 11% in 1995, 12% in 1996, 27% in 1997, and 43% in 1998 . Overall mean lengths and weights-at-age for the total catch were calculated as weighted means (by number in the catch-at-age) of the respective mean values at age from the NER commercial (Maine to Virginia), North Carolina commercial winter trawl, and recreational (Maine to North Carolina) fisheries (Tables 55-56). The recreational fishery share of the total summer flounder catch has increased since 1995 (Figure 3).

BIOLOGICAL DATA

Work performed for the SAW 22 assessment (NEFSC 1996b) indicated a major expansion in the size range of 1-year old summer flounder collected during the 1995 and 1996 NEFSC winter bottom trawl surveys, and brought to light differences between ages determined by the NEFSC and NC DMF fishery biology staffs. Research and age structure exchanges were performed after the SAW 22 assessment to explore these aspects of summer flounder biology. The results of the first two exchanges, which were reported at SAW 22, indicated low levels of agreement between age readers at the NEFSC and NC DMF (31 and 46%). In 1996, research was conducted to determine inter-annular distances and to back-calculate mean length-at-age from scale samples collected on all NEFSC bottom trawl surveys (winter, spring and autumn) in order to compare with NC DMF samples. While mean length-at-age remained relatively constant from year to year, inter-annular distances increased sharply in the samples from the 1995-1996 winter surveys, and increased to a lesser degree in samples from other 1995-1996 surveys as well. As a result, further exchanges were suspended pending the resolution of an apparent ageing problem.

Age data from the winter 1997 bottom trawl survey, aged utilizing both scales and otoliths by only by one reader, indicated a similar pattern as the previous two winter surveys (i.e., several large age 1 individuals) from scale readings, and some disagreement between scale and otolith ages obtained from the same fish. Because of these problems, a team of five experienced NEFSC readers was formed to re-examine the scales aged from the winter survey. After examining several hundred scales, the team determined that re-ageing all samples from 1995-1997, including all winter, spring, and autumn samples from the NEFSC and MA DMF bottom trawl surveys and all samples from the commercial fishery would be appropriate. The age determination criteria used remained the same as developed at the 1990 summer flounder workshop (Almeida *et al.* 1992) and described in the standard ageing manual utilized by NEFSC staff (Dery 1997). Only those fish for which a 100% consensus of all group members could be reached were included in the revised database. The data from the re-aged database were utilized in analyses in the SAW 25 assessment (NEFSC 1997b).

A third summer flounder ageing workshop was held at NEFSC in February, 1999, to continue the exchange of age structures and review of ageing protocols for summer flounder (Bolz et al., In press). The participants agreed that summer flounder can be aged reliably using scales, if the protocols recommended by the workshop are followed. The participants of the latest workshop concluded that the majority of ageing disagreements in recent NEFSC-NC DMF exchanges arose from the interpretation of marginal scale increments due to highly variable timing of annulus formation, and from the interpretation of first year growth patterns and first annulus selection. It was agreed that the NEFSC and NC DMF age data used in the current assessment are valid for the respective components (NER and North Carolina waters) of the stock and fishery. The workshop recommended regular samples exchanges between NEFSC and NC DMF, and further analyses of first year growth, to ensure continued uniformity of summer flounder age interpretations and conventions.

RESEARCH SURVEY ABUNDANCE AND BIOMASS INDICES

NEFSC spring

Long-term trends in summer flounder abundance were derived from a stratified random bottom trawl survey conducted in spring by NEFSC between Cape Hatteras and Nova Scotia since 1968 (Clark 1978). NEFSC spring survey indices (Tables 57-58) of total stock biomass peaked during 1976-1977, and in 1999 was at about 50% of that peak (Table 58, Figure 4). Age composition data from the NEFSC spring survey indicate a substantial reduction in the number of ages in the stock between 1976-1990 (Table 59). Between 1976-1981, fish of ages 5-8 were captured regularly in the survey, with the oldest individuals aged 8-10 years. Between 1982-1986, fish aged 5 and older were only occasionally observed in the survey, and by 1986, the oldest fish observed in the survey were age 5. In 1990 and 1991, only three ages were observed in the survey catch, and there was an indication that the 1988 year class was very weak. Since 1991, the survey age composition has begun to expand. There is evidence in the 1998-1999 NEFSC spring surveys to suggest increasing abundance at age-3 and older, due to the abundance of the 1994, 1995, and 1996 year classes (Table 59).

NEFSC autumn

Summer flounder are caught frequently in the NEFSC autumn survey at stations in the inshore strata (< 27 meters = 15 fathoms = 90 feet) and in the band of offshore strata of 27-55 meters depth (15-30 fathoms, 90-180 feet), at about the same magnitude as in the spring survey. Furthermore, the autumn survey catches age-0 summer flounder in abundance, providing an index of summer flounder recruitment. Autumn survey indices suggest improved recruitment since the late 1980s, and evidence of an increase in abundance at age-2 and older since 1995. The NEFSC autumn surveys indicate that the 1995 year class of summer flounder is the most abundant in recent years, and that subsequent, weaker year classes are experiencing increased survival (Table 60, Figures 4 and 7).

NEFSC winter

A new series of NEFSC winter trawl surveys was begun in February 1992 specifically to provide improved indices of abundance for flatfish, including summer flounder. This survey targets flatfish during the winter when they are concentrated offshore. A modified 36 Yankee trawl is used in the winter survey that differs from the standard trawl employed during the spring and autumn surveys in that 1) long trawl sweeps (wires) are added before the trawl doors, to better herd fish to the mouth of the net, and 2) the large rollers used on the standard gear are absent, and only a chain "tickler" and small spacing "cookies" are present on the footrope.

Based on a comparison of summer flounder catches during the winter surveys with recent spring and autumn surveys, the design and conduct of the winter survey (timing, strata sampled, and the use of the modified 36 Yankee trawl gear) has resulted in greater catchability of summer flounder

compared to the other surveys. Most fish have been taken in survey strata 61-76 (27-110 meters; 15-60 fathoms), off the Delmarva and North Carolina coasts . Other concentrations of fish were found in strata 1-12, south of the New York and Rhode Island coasts, in slightly deeper waters. Significant numbers of large summer flounder were often captured along the southern flank of Georges Bank (strata 13-18; Table 61).

Indices of summer flounder abundance from the winter survey indicated stable stock size during 1992-1995, with indices of stratified mean catch per tow in number ranging from 10.9 in 1995 to 13.6 in 1993. The NEFSC winter survey index for 1996 increased by 290% over the 1995 value, from 10.8 to 31.2 fish per tow. The largest increases in 1996 catch per tow occurred in the Mid-Atlantic Bight region (offshore strata 61-76), where increases in catch per tow of up to an order of magnitude over the 1995 level occurred in several strata, with the largest increases in strata 61,62, and 63, off the northern coast of North Carolina (Table 61). Most of the increased catch in 1996 consisted of age-1 summer flounder from the 1995 year class. In 1997, the index dropped to 10.3 fish per tow , due to the lower numbers of age-1 (1996 year class) fish caught. As with the other two NEFSC surveys, there is evidence in recent winter surveys of increased abundance of age-3 and older fish relative to earlier years in the time series, due to the abundance of the 1995 year class and increased survival of subsequent year classes (Table 62, Figure 4).

Massachusetts DMF

Spring and autumn bottom trawl surveys conducted by the Massachusetts Division of Marine Fisheries (MA DMF) showed decline in abundance in numbers of summer flounder from high levels in 1986 to record lows in 1990 (MA DMF autumn survey), and 1991 (MA DMF spring survey). In 1994, the MA DMF survey indices increased to values last observed during 1982-1986, but then declined substantially in 1995, although the indices remain higher than the levels observed in the late 1980s . Since 1996, both the MA DMF spring and autumn indices have increased substantially to values last observed during 1982-1986 (Tables 63-64, Figure 5).

Connecticut DEP

Spring and autumn bottom trawl surveys are conducted by the Connecticut Department of Environmental Protection (CTDEP). The CTDEP surveys show a decline in abundance in numbers of summer flounder from high levels in 1986 to record lows in 1989. The CTDEP surveys indicate recovery since 1989, and evidence of increased abundance at ages 2 and older since 1995. The 1998 spring index was the highest of the 1984-1998 time series, and the 1996-1998 autumn indices were the highest of the series (Tables 65-66, Figure 6-7).

Rhode Island DFW

A standardized bottom trawl survey has been conducted during the spring and autumn months in Narragansett Bay and state waters of Rhode Island Sound by the Rhode Island Department of Fish and Wildlife (RIDFW) since 1979. Indices of abundance for ages 0 and 1 summer flounder

have been developed from these data (stratified mean number per tow, age 0 fish separated by visual inspection, fish less than 30 cm total length; age 1 fish separated by visual inspection, fish between 30 and 40 cm total length). The 1988 and 1991 year classes are the weakest in recent years in this time series, and the index shows the 1984-1987 year classes to have been the strongest. A new series of indices was developed from a set of fixed stations sampled monthly during 1990-1998. Age-1 indices from this series indicate that strong year classes recruited to the stock during 1994-1996 (Tables 67-69, Figure 5).

New Jersey BMF

The New Jersey Bureau of Marine Fisheries (NJBMF) has conducted a standardized bottom trawl survey since 1988. Indices of abundance for summer flounder incorporate data collected monthly from April through October. NJBMF supplied annual total mean number per tow indices and associated annual length frequency distributions; lengths were converted to age using the corresponding annual NEFSC combined spring and autumn survey age-length keys. Indices of the 1995 year class at age-0 in 1995 at age-1 in 1996, and at age-2 in 1997 indicate that it is the strongest of the 1988-1998 time series. The NJBMF survey indices show evidence of increased abundance at age-2 and older in the 1995-1998 surveys (Table 70, Figures 6-7).

Delaware DFW

The Delaware Division of Fish and Wildlife (DEDFW) has conducted a standardized bottom trawl survey with a 16 foot headrope trawl since 1980, and with a 30 foot headrope trawl since 1991. A recruitment index (age 0 fish) has been developed from the 16 foot trawl survey data for the 1980 to 1996 year classes. Indices for age-1 to age-4 and older summer flounder have been compiled from the 30 foot headrope survey. The indices incorporate data collected from June through October (arithmetic mean number per tow), with age 0 summer flounder separated from older fish by visual inspection of the length frequency. The 16 foot headrope survey indices suggest poor recruitment in 1988 and 1993, improved recruitment in 1994-95, and poor recruitment since 1995 (Table 71). The 30 foot headrope survey indices suggest stable stock sizes over the 1991-1998 time series, with strong recruitment in 1991, 1994, and 1995 (Table 72, Figure 6).

Maryland DNR

The Maryland Department of Natural Resources (MDDNR) has conducted a standardized trawl survey in the seaside bays and estuaries around Ocean City, MD since 1972. Samples collected during May to October with a 16 foot bottom trawl have been used to develop a recruitment index for summer flounder for the period 1972-1995. This index suggests that weakest year class in the time series recruited to the stock in 1988, and the strongest in 1972, 1983, 1986, and 1994 (Table 73, Figure 8).

Virginia Institute of Marine Science

The Virginia Institute of Marine Science (VIMS) conducts a juvenile fish survey using trawl gear in Virginia rivers and the mainstem of Chesapeake Bay. The time series for the rivers extends from 1979-1998. With the Bay included, the series is available only for 1988 and later, but many more stations are included. Index of recruitment developed from these series suggest weak year classes recruited to the stock in 1988 and 1993, with strongest year classes recruiting during 1980-1984, 1990, 1991, and 1994 (Tables 74-75, Figure 8).

North Carolina DMF

The NC DMF has conducted a stratified random trawl survey using two 30 foot headrope nets with 3/4" mesh codend in Pamlico Sound since 1987. An index of recruitment developed from these data suggest a weak year class in 1988, and strongest year classes in 1987, 1992, and 1996, the highest index of the series. (Table 76, Figure 8).

ESTIMATES OF MORTALITY AND STOCK SIZE

Natural Mortality Rate

The instantaneous natural mortality rate (M) for summer flounder was assumed to be 0.2 in all analyses, although alternative estimates of M were considered in the SAW 20 assessment (NEFSC 1996a). In the SAW 20 work, estimates were derived with the methods described by 1) Pauly (1980) using growth parameters derived from NC DMF age-length data and a mean annual bottom temperature (17.5°C) from NC coastal waters, 2) Hoenig (1983) using a maximum age for summer flounder of 15 years, and 3) consideration of age structure expected in unexploited populations (5% rule, 3/M rule, e.g., Anthony 1982). SAW 20 concluded that M = 0.2 was a reasonable value given the mean (0.23) and range (0.15-0.28) obtained from the various estimates of the instantaneous natural mortality rate for summer flounder.

Estimates of Mortality from ALS Tagging Data

Tagging data for summer flounder from the American Littoral Society (ALS) angler program were used to independently estimate fishing mortality. Since 1983, a total of 23,930 summer flounder has been tagged by ALS anglers. Through 1996, a total of 1758 had been reported as recovered (7%). Based on reported length at tagging, most summer flounder tagged by anglers were ages 0 to 2. Tag release and recapture data were compiled from 1983 through 1996. Estimates of survival rates were made using the MARK framework (White and Burnham, 1996), which has been recently adopted by the ASMFC Tagging Working Group for striped bass mortality estimates. The statistical framework consists of a series of models which consider tag recoveries in sequential years following release to be multinomial random variables. Model structure in terms of recovery rate and survival probability proceeds from most restrictive (no time dependence) to most general (time dependent parameters). Maximum likelihood methods

are used to estimate parameters and provide a covariance matrix for the estimates. Goodness of fit, likelihood ratio tests, and Akaike's Information Criteria (AIC) are used to select the most parsimonious model which adequately fits the data. The models estimate survival rate directly which is transformed into total mortality rate. Total mortality rate was corrected for tag loss on the basis of Sprankle's (1994) study on striped bass which indicated an instantaneous loss of 0.48 per year for the ALS tags. Fishing mortality rate was estimated by subtracting M=0.20 from corrected Z values.

The model allowed estimates of survival and recoveries for the 1983-1996 time series via numerical maximum likelihood techniques. The selected model assumed time independent recovery and survival rate, also known as a general model. Survival rate (S) ranged from 0.11 (SE = 0.04) in 1985-86 to 0.38 (SE=0.12) in 1988-89 without trend. The period of inference for the survival estimate was from July of one year to July in the next. The estimated survival rates correspond to a total instantaneous loss rate ranging from Z= 0.46 to Z=1.7. Allowing for tag loss as estimated in the Sprankle (1994) retention study and natural mortality losses, fishing mortality rate ranged from F=0.26 to 1.5, and the estimate of F in the terminal year (July 1995 to July 1996) was 0.91 for ages 1 and 2. Assuming no uncertainty in the natural mortality or tag loss adjustment rates, a 95% confidence interval on F in 1995-1996 was 0.60 to 1.36 (Table 77).

ASPIC Model

The non-equilibrium surplus production model incorporating covariates (ASPIC; Prager 1994, 1995) can be used to estimate maximum sustainable yield (MSY) and other management benchmarks. An ASPIC analysis applied to summer flounder using various state and federal agency survey biomass indices (the 1998 analysis) was previously reviewed by the NEFMC Overfishing Review Panel (Applegate et al. 1998). Based on total weighted mean squared error (MSE), the NEFSC spring and autumn biomass indices gave the best fit to the data in that analysis. However, the Overfishing Review Panel concluded that biological reference points estimated in the 1998 analysis for summer flounder were unreliable, due to the short time series of reliable catch estimates and lack of dynamic range in the input data (Applegate et al. 1998).

The current ASPIC analysis extends the previously reviewed 1998 work by updating landings for 1998 and 1999, along with survey biomass indices for the NEFSC spring and autumn surveys in 1998 and the NEFSC spring 1999 survey. In addition, model results were further examined for sensitivity by employing the Monte Carlo search routine and by initializing the values of MSY (10,000 to 50,000 mt) and the intrinsic rate of increase (r ; 0.12 to 1.25) over a broad range, with the ratio of initial to current biomass (B1 ratio) assigned a starting value of 0.50.

Overall, the current ASPIC model results for summer flounder were sensitive to small variation in input data and starting parameters, and suggested the possibility of numerous local minima in the sums of squared errors (SSE) response surface. For instance, an initial run employing the same random number seed employed in the 1998 analysis, and updating the data

series for 1998-1999 with starting values of MSY of 25,000 mt and r of 0.5, produced significantly different results compared to the 1998 analysis. With this run, MSY was estimated at 62,800 mt and r was 0.48. Using another random number seed with the same initial starting values gave estimates of MSY=22,000 mt and r=1.17. Based on these results, the Monte Carlo search algorithm was employed in an attempt to provide a better search of the SSE response surface. Results of the Monte Carlo procedure with restarts gave a range of estimates of MSY from 19,000 mt to 58,000 mt and r from 0.49 to 1.08. Due to the number of restarts to reach convergence (>25) and the probable number of local minima, these results also appeared to be too sensitive to input data and starting parameters. Due to the unstable nature of the results, biological reference points for summer flounder estimated by the current ASPIC analysis are considered to be unreliable.

Virtual population analysis and tuning

Sensitivity of VPA results

Terminal F values in 1998 were estimated using the ADAPT method for calibration of the VPA (Parrack 1986, Gavaris 1988, Conser and Powers 1990) as implemented in the NEFSC WHAT version 1.06 VPA. Ages 0-4 were included in the analysis as true ages, with ages 5 and older combined as a plus group. Stock sizes in 1999 were directly estimated for ages 1-4, while the age 5+ group was calculated from Fs estimated in 1998. Fishing mortality on the oldest true age (4) in the years prior to the terminal year was estimated from back-calculated stock sizes for ages 3-4. F on the age 5+ group was assumed equal to the F for age 4. Winter, spring, and mid-year (e.g., RIDFW fixed station, DEDFW, and NJBMF) survey indices and all survey recruitment (age-0) indices were compared to population numbers of the same age at the beginning of the same year. Autumn survey indices were compared to population numbers one year older at the beginning of the next year. Tuning indices were unweighted. As in the SAW 25 summer flounder assessment (NEFSC 1996b), research survey indices with trends that did not reasonably match corresponding patterns in abundance as estimated by the VPA, as evidenced by poor prior correlation and/or high partial variance in tuning diagnostics, were eliminated from the VPA tuning.

A number of exploratory VPA runs using different combinations of survey tuning indices were considered to examine the sensitivity of the summer flounder VPA, including:

1) use of the SAW 25 set of survey indices for tuning the 1999 VPA,
2) use of all available survey indices in tuning,
3) exclusion of the NEFSC Winter survey series, and
4) use of a subset of all available indices, but more indices than the SAW 25 set.

The run chosen as final includes a subset of all available survey indices selected as "best fitting," based on external correlation analysis and internal VPA diagnostics (magnitude of partial variance, magnitude and trend in residuals). A summary of input catch and comparison with VPA estimated catch biomass is presented in Table 78. The final 1999 assessment VPA,

including input data and assumptions, solution statistics, residuals, and estimates of F at age, stock number, and biomass at age is presented in Table 79.

VPA estimates of fishing mortality rates

Fishing mortality on currently fully recruited ages 3 and 4 summer flounder has been high, varying between 0.6 and 2.2 during 1982-1996 (41%-83% exploitation), far in excess of the revised FMP Amendment 12 overfishing definition, $F_{threshold} = F_{target} = F_{max} = 0.26$ (21% exploitation). The fishing mortality rate has declined substantially since 1995 and was estimated to be 0.52 (37% exploitation) in 1998, but is still in excess of the overfishing definition (Table 79, Figure 9).

The annual partial recruitment of age-1 fish decreased from near 0.50 during most of the VPA series to 0.18 during 1997-1998; the partial recruitment of age-2 fish has decreased from near 1.0 to 0.62 during 1997-1998 (Table 79). These decreases in partial recruitment at age are in line with expectations given recent changes in commercial and recreational fishery regulations. For these reasons, the age range considered to be fully recruited to the fisheries, considered to be ages 2 and older in previous assessments, has been revised to include only ages 3 and older in the current assessment.

VPA estimates of stock abundance

Summer flounder spawn in the late autumn and into early winter (peak spawning on November 1), and age 0 fish recruit to the fishery the autumn after they are spawned. For example, summer flounder spawned in autumn 1987 (from the November 1, 1987 spawning stock biomass) recruit to the fishery in autumn 1988, and appear in VPA tables as age 0 fish in 1988. This assessment indicates that the 1982 and 1983 year classes were the largest of the VPA series, at 74 and 81 million fish, respectively. The 1988 year class was the smallest of the series, at only 13 million fish. The 1995 year class is estimated at 47 million fish, the largest since 1986. The 1997 and 1998 year classes are estimated to be of below average size at 23 and 26 million fish (Table 79, Figures 10-11). Recent recruitment per unit of SSB has been lower than that observed at comparable abundance of SSB observed during the early 1980s.

Total stock biomass (January 1 biomass, calculated from January 1 numbers at age and January 1 mean weights-at-age estimated from fishery catch mean weights-at-age) estimated by VPA (1982-1998) reached 48,500 mt in 1983, before falling to 16,000 mt in 1989. Total stock biomass has increased substantially since 1991, and in 1998 was estimated to be 38,600 mt (Table 79, Figure 10).

Spawning stock biomass (SSB) declined 73% from 1983 to 1989 (19,000 mt to 5,100 mt), but has since increased with improved recruitment and decreased fishing mortality to 25,000 mt in 1998 (Table 79, Figures 10-11). The age structure of the spawning stock has expanded.

Under equilibrium conditions at F_{max}, about 85% of the spawning stock biomass would be expected to be ages 2 and older, with 50% at ages 5 and older (Figure 12).

Precision of VPA F and SSB estimates

A bootstrap procedure (Efron 1982) was used to evaluate the precision of the final VPA estimates with respect to random variation in tuning data (survey abundance indices). The procedure does not reflect uncertainty in the input catch-at-age data (although one obvious source of the lack of fit to survey indices is variation in the catch). One thousand bootstrap iterations were used to generate distributions of the 1998 fishing mortality rate and spawning stock biomass. Histogram plots of the distribution of the terminal year VPA estimates indicate the amount of uncertainty by visually depicting variability. The cumulative probability can be used to evaluate the risk of making a management decision based on the estimated value. It expresses the probability (chance) that the fishing mortality rate was greater than a given level when measurement errors are considered (e.g., some target fishing mortality rate). For spawning stock biomass, the cumulative plot indicates the probability that it was less than a given level (e.g., some desired minimum spawning stock biomass).

The precision and bias of the 1998 fishing mortality rates, 1 January 1999 stock sizes, and 1 November 1998 spawning stock biomass estimates are presented in Table 80. Bias was less than 5% for all parameters estimated. The bootstrap estimate of the 1998 spawning stock biomass was relatively precise, with a corrected CV of 10%. The bootstrap mean (25,311 mt) was slightly higher than the VPA point estimate (25,005 mt). The bootstrap results suggest a high probability (>90%) that spawning stock biomass in 1998 was at least 22,500 mt, reflecting only variability in survey observations (Figure 13).

The corrected coefficients of variation for the Fs in 1998 on individual ages were 25% for age 0, 16% for age 1, and 14% for age 2, 15% for age 3, and 11% for ages 4 and 5 and older. The distribution of bootstrap Fs was not strongly skewed, resulting in the bootstrap mean F for 1998 (0. 5231) being about equal to the point estimate from the VPA (0.5176). There is a 80% chance that F in 1998 was between about 0.46 and 0.58, given variability in survey observations (Figure 13).

Retrospective analysis of VPA

Retrospective analysis of the summer flounder VPA was carried out for terminal catch years 1993-1998 using the final 1999 VPA configuration, in order to include all indices used in the final run (i.e., the NEFSC winter survey). Convergence is generally evident within 4 years prior to a given terminal year.

The retrospective analysis indicates overestimation of fully recruited F (ages 3-4) for 1994-1996, following the pattern observed in the SAW 25 assessment. The largest retrospective overestimation occurred for 1994 and 1995. Spawning stock biomass was overestimated for

1993, and underestimated for 1994-1997. Summer flounder recruitment at age-0 was underestimated for 1993, overestimated for 1994-1995, and underestimated for 1996-1997. (Table 81, Figure 14). The retrospective patterns of fishing mortality and spawning stock biomass are not closely associated in the inverse manner that might be expected, because the spawning stock biomass estimates include major contributions from ages 0, 1, and 2 that are not included in the estimates of the fully recruited fishing mortality rate for ages 3 and older. Recent estimates of fully recruited fishing mortality and spawning stock biomass appear free of significant retrospective bias.

BIOLOGICAL REFERENCE POINTS

The calculation of biological reference points based on yield per recruit for summer flounder using the Thompson and Bell (1934) model was detailed in the Report of the Eleventh SAW (NEFC 1990). The 1990 analysis estimated $F_{max} = 0.23$. In the SAW 25 assessment (NEFSC 1997b) yield per recruit analysis reflecting the partial recruitment pattern and mean weights-at-age for 1995-1996 estimated that $F_{max} = 0.24$. The current analysis, reflecting partial recruitment and mean weights-at-age for 1997-1998, estimates that $F_{max} = 0.26$ (Table 82, Figure 15).

The Overfishing Definition Review Panel (Applegate et al. 1998) recommended that the MAFMC base MSY proxy reference points on yield per recruit analysis, and this recommendation was adopted in formulating the reference points for FMP Amendment 12 (see Introduction). The FMP Amendment 12 fishing mortality reference points, with F_{max} used for both the target (F_{target}) and threshold ($F_{threshold}$) fishing mortality, do not account for the uncertainty of estimates of fishing mortality, in terms of ensuring that the threshold is not exceeded. Current estimates of fully recruited fishing mortality for summer flounder have a coefficient of variation (CV) of 11% (Table 80). Current yield per recruit analysis indicates that $F_{threshold} = F_{target} = F_{max} = 0.26$, yield per recruit (YPR) at F_{max} is 0.55219 kg/recruit, and January 1 biomass per recruit (BPR) at F_{max} is 2.8127 kg/recruit. The median number of summer flounder recruits estimated from VPA for the 1982-1998 period is 37.844 million fish. Based on this recruitment, Maximum Sustainable Yield (MSY) would be 20,897 mt (46 million lbs) at a biomass (B_{MSY}) of 106,444 mt (235 million lbs). The biomass threshold, one-half B_{MSY}, is therefore 53,222 mt (118 million lbs).

PROJECTIONS

Stochastic projections were made to provide projected estimates of catch and stock biomass at various levels of F and landings during 1999-2001, and for a longer term under various fishing mortality and recruitment scenarios, with the aim of achieving stock rebuilding to B_{MSY}. The projections assume that recent patterns of discarding will continue over the time span of the projections. Different patterns that could develop in the future due to further trip and bag limits and fishery closures have not been evaluated. The partial recruitment pattern (including discards) used in the projections was estimated as the geometric mean of F at age for 1997-1998, to reflect recent conditions in the fisheries. Mean weights-at-age were estimated as the geometric means of 1997-

1998 values. Separate mean weight-at-age vectors were developed for the January 1 biomass, landings, and discards.

One hundred projections were made for each of the 1000 bootstrapped realizations of 1999 stock sizes from the final 1999 VPA, using algorithms and software described by Brodziak and Rago (MS 1994). Two recruitment scenarios are projected, generated randomly from a cumulative frequency distribution of VPA recruitment series for 1989-1998 (median recruitment = 30.4 million fish) and for 1982-1998 (median recruitment = 37.8 million fish). These scenarios provide very comparable projected quotas for 2000 because summer flounder currently are not fully recruited to the fisheries until age 3. Other input parameters were as in Table 83; uncertainty in partial recruitment patterns, discard rates, or components other than survey variability was not reflected.

The projections assume the adjusted 1999 quota of 8,295 mt will be landed, and estimate a median (50% probability) F = 0.36 and a median total stock biomass on January 1, 2000 of 51,600 mt (Table 83). There is a 99% probability that the target F for 1999 (i.e., F_{max} = 0.26) will be exceeded. Landings of 7,627 mt and discards of 378 mt in 2000 provide a median F = 0.26 and a median total stock biomass on January 1, 2001 of 61,500 mt, above the biomass threshold of one-half B_{MSY} = 53,200 mt (Tables 83-84, Figure 16). Landings of more than 7,627 mt in 2000 increase the probability that the fishing mortality target of F = 0.26 will be exceeded. Landings of 8,400 mt in 2000 provide a 75% chance that F will be greater than the target F = 0.26 (Table 84, Figure 16). Landings of 9,660 mt and discards of 443 mt in 2001 provide a median F = 0.26 and a median total stock biomass level on January 1, 2002 of 66,700 mt (Table 83).

Long-term deterministic projections at F = 0.26 that account for future expansion of stock age structure, while assuming constant recruitment at 37.8 million fish at age 0, indicate that the FMP Amendment 12 proxy values for MSY (20,900 mt) and B_{MSY} (106,400 mt) estimated by deterministic yield and biomass per recruit calculations will be reached in 2017. Long-term stochastic projections (Figure 17) that assume persistence of the current pattern of variability in recruitment (median recruitment of 37.8 million fish at age 0, with 10th percentile of 22.9 million and 90th percentile of 74.3 million fish) indicate that median yield (including landings and discards) stabilizes at about 22,100 mt in 2017 (with 10th percentile of 18,400 mt and 90th percentile of 26,300 mt), with stable median total stock biomass of about 112,700 mt (with 10th percentile of 95,200 mt and 90th percentile of 132,500 mt). Because the effects of density dependence, future environmental conditions, and expansion of stock age structure on growth and recruitment at higher stock sizes are unknown, these projected levels of stock biomass and landings should be considered with caution. Because the causes of recent low levels of recruitment per unit SSB are unknown and may persist in the future, these projections may be optimistic.

CONCLUSIONS

Assessment results

The stock is overfished and overfishing is occurring with respect to the FMP Amendment 12 overfishing definition. The fishing mortality rate declined from 0.89 in 1995 to 0.52 in 1998 (Figure 9). The 1998 estimate of fishing mortality is above the FMP overfishing definition ($F_{threshold} = F_{target} = F_{max} = 0.26$). There is an 80% chance that the 1998 F was between 0.46 and 0.58 (Figure 13).

The NEFSC spring survey stock biomass index (1968-1999) peaked during 1976-1977, and in 1999 was at about 50% of that peak, and 40% above the time series average (Figure 18). Total stock biomass on January 1 estimated by VPA (1982-1998) reached 48,500 mt in 1983, before falling to 16,000 mt in 1989. Total stock biomass has increased substantially since 1991, and in 1998 was estimated to be 38,600 mt (Figure 10). The FMP Amendment 12 biomass target (B_{MSY}) required to produce maximum sustainable yield (MSY=20,900 mt) is estimated to be $B_{MSY} = 106,400$ mt, and the FMP Amendment 12 biomass threshold of one-half $B_{MSY} = 53,200$ mt.

Spawning stock biomass (age 0 and older) has increased from 5,100 mt in 1989 to 25,000 mt in 1998, the highest level in the 1982-1998 VPA time series (Figure 10). There is an 80% chance that the 1998 spawning stock biomass was between 22,500 mt and 28,500 mt (Figure 13). The age structure of the spawning stock has expanded (Figure 12). The 1995 year class was above average (1982-1998) and the largest since 1986. The 1997 and 1998 year classes are estimated to be below average (Figure 10). Recent recruitment per unit of SSB has been lower than that estimated at a comparable abundance of SSB during the early 1980s.

If the adjusted quota for 1999 (8,295 mt) is not exceeded, the total allowable landings (TAL) in 2000 should be no more than 7,627 mt (16.8 million lbs) to meet the FMP target F rate of $F_{max} = 0.26$ (Figure 16). According to long term deterministic projections, this level of fishing mortality will not allow the stock to rebuild to B_{MSY} until 2017 (Figure 17). Fishing mortality would need to be reduced to F = 0.22 to achieve the FMP Amendment 12 biomass target (B_{MSY}= 106,400 mt) by 2006. The corresponding quota for 2000 would be 6,500 mt (14.3 million lbs).

Research Recommendations

The following major data and analytic needs for future assessments were identified:

1) Continue comparison of NEFSC age-length samples with those collected by NC DMF to ensure consistent ageing of summer flounder, as per the recommendations of the February 1999 Ageing Workshop (Bolz et al. In press).

2) Continue the NEFSC sea sampling program collection of data for summer flounder, with special emphasis on a) comprehensive areal and temporal coverage, b) adequate length and age sampling, and c) continued sampling after commercial fishery areal and seasonal quotas are reached and fisheries are limited or closed, and d) estimation of discard in the scallop dredge fishery. Maintaining adequate sea sampling will be especially important in order to monitor a) the effects of implementation of gear and closed/exempted area regulations, both in terms of the response of the stock and the fishermen, b) potential continuing changes in "directivity" in the summer flounder fishery, as a results of changes in stock levels and regulations, and c) discards of summer flounder in the commercial fishery once quota levels have been attained and the summer flounder fishery is closed or restricted by trip limits.

3) Investigate the utility of MA DMF sea sample data as a supplement to NEFSC data in developing estimates of commercial fishery discard rates.

4) Conduct research to determine the discard mortality rate of commercial fishery summer flounder discards.

5) Update the American Littoral Society tag return mortality estimates for 1997-1998.

6) Conduct research to determine the length and age frequency of recreational fishery summer flounder discards. In particular, investigate whether the ALS tagging program data sets would be useful in characterizing the length frequency of the recreational fishery discard.

7) The present maturity ogive for summer flounder is based on simple gross examination of ovaries, and may not accurately reflect the spawning potential of summer flounder, especially age 0 and age 1 fish. Ongoing work (i.e., at the University of Rhode Island, and others) using various methodologies may provide information to better characterize the spawning contribution of young summer flounder.

8) Although NER commercial fishery biological sampling intensity meets the traditional standards for adequate sampling when considered on an overall annual basis, the sample distribution is sparse for some strata of the fishery. Sampling intensity and coverage improved in 1997 and 1998, and at least this level of coverage should be continued in the future.

9) RI DFW survey length frequencies are currently converted to age using by length cut-offs points. Investigate the utility of applying the appropriate NEFSC or MA DMF age-length keys to convert the RI DFW survey lengths to age.

10) As the NEFSC autumn survey age structure expands, investigate the use of survey mean weights-at-age as stock weights-at-age in yield per recruit, VPA, and projection analyses.

Major sources of assessment uncertainty

The following major sources of uncertainty in the current assessment were identified:

1) The landings from the commercial fisheries used in this assessment assume no under reporting of summer flounder landings. Therefore, reported landings from the commercial fisheries should be considered minimum estimates.

2) The recreational fishery landings and discards used in the assessment are estimates developed from the Marine Recreational Fishery Statistics Survey (MRFSS). While the estimates of summer flounder catch are considered to be among the most reliable produced by the MRFSS, they are subject to possible error. The proportional standard error (PSE) of estimates of summer flounder total landings in numbers has averaged 7%, ranging from 26% in 1982 to 3% in 1996, during 1982-1998.

3) The intensity of sea sampling of the commercial fishery has declined since 1995. The intensity of sea sampling should be increased to at least the 1995 intensity to maintain confidence in future commercial fishery discard estimates.

4) The current assumptions accepted to allow characterization of the length and age composition of the recreational live discard are based on data from a limited geographic area (Long Island, New York, 1988-1992; Connecticut, 1997-1998). Sampling of recreational fishery discards on a annual, synoptic basis is needed.

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Table 1. Summer Flounder Commercial Landings by State (thousands of lb) and coastwide (thousands of lb, Mt).

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD+	VA+	NC+	Total '000 lb	Total mt
1940	0	0	2847	258	149	1814	3554	3	444	1247	498	10814	4905
1941	na	na	na	na	na	na	na	na	183	764	na	947	430
1942	0	0	193	235	126	1286	987	2	143	475	498	3945	1789
1943	0	0	122	202	220	1607	2224	11	143	475	498	5502	2496
1944	0	0	719	414	437	2151	3159	8	197	2629	498	10212	4632
1945	0	0	1730	467	270	3182	3102	2	460	1652	1204	12297	5578
1946	0	0	1579	625	478	3494	3310	22	704	2889	1204	14305	6489
1947	0	0	1467	333	813	2695	2302	46	532	1754	1204	11146	5056
1948	0	0	2370	406	518	2308	3044	15	472	1882	1204	12219	5542
1949	0	0	1787	470	372	3560	3025	8	783	2361	1204	13570	6155
1950	0	0	3614	1036	270	3838	2515	25	543	1761	1840	15442	7004
1951	0	0	4506	1189	441	2636	2865	20	327	2006	1479	15469	7017
1952	0	0	4898	1336	627	3680	4721	69	467	1671	2156	19625	8902
1953	0	0	3836	1043	396	2910	7117	53	1176	1838	1844	20213	9168
1954	0	0	3363	2374	213	3683	6577	21	1090	2257	1645	21223	9627
1955	0	0	5407	2152	385	2608	5208	26	1108	1706	1126	19726	8948
1956	0	0	5469	1604	322	4260	6357	60	1049	2168	1002	22291	10111
1957	0	0	5991	1486	677	3488	5059	48	1171	1692	1236	20848	9456
1958	0	0	4172	950	360	2341	8109	209	1452	2039	892	20524	9310
1959	0	0	4524	1070	320	2809	6294	95	1334	3255	1529	21230	9630
1960	0	0	5583	1278	321	2512	6355	44	1028	2730	1236	21087	9565
1961	0	0	5240	948	155	2324	6031	76	539	2193	1897	19403	8801
1962	0	0	3795	676	124	1590	4749	24	715	1914	1876	15463	7014
1963	0	0	2296	512	98	1306	4444	17	550	1720	2674	13617	6177
1964	0	0	1384	678	136	1854	3670	16	557	1492	2450	12237	5551
1965	0	0	431	499	106	2451	3620	25	734	1977	272	10115	4588
1966	0	0	264	456	90	2466	3830	13	630	2343	4017	14109	6400
1967	0	0	447	706	48	1964	3035	0	439	1900	4391	12930	5865
1968	0	0	163	384	35	1216	2139	0	350	2164	2602	9053	4106
1969	0	0	78	267	23	574	1276	0	203	1508	2766	6695	3037
1970	0	0	41	259	23	900	1958	0	371	2146	3163	8861	4019
1971	0	0	89	275	34	1090	1850	0	296	1707	4011	9352	4242
1972	0	0	93	275	7	1101	1852	0	277	1857	3761	9223	4183
1973	0	0	506	640	52	1826	3091	*	495	3232	6314	16156	7328
1974	*	0	1689	2552	26	2487	3499	0	709	3111	10028	22581	10243
1975	0	0	1768	3093	39	3233	4314	5	893	3428	9539	26311	11934
1976	*	0	4019	6790	79	3203	5647	3	697	3303	9627	33368	15135
1977	0	0	1477	4058	64	2147	6566	5	739	4540	10332	29927	13575
1978	0	0	1439	2238	111	1948	5414	1	676	5940	10820	28586	12966
1979	5	0	1175	2825	30	1427	6279	6	1712	10019	16084	39561	17945

* = less than 500 lb; na = not available; + = NMFS did not identify flounders to species prior to 1978 for NC and 1957 for both MD and VA and thus the numbers represent all unclassified flounders.

Sources: 1940-1977 USDC 1984; 1978-1979 unpublished NMFS General Canvas data

Table 1 continued.

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD+	VA+	NC+	Total '000 lb	Total mt
1980	4	0	367	1277	48	1246	4805	1	1324	8504	13643	31216	14159
1981	3	0	598	2861	81	1985	4008	7	403	3652	7459	21056	9551
1982	18	*	1665	3983	64	1865	4318	8	360	4332	6315	22928	10400
1983	84	0	2341	4599	129	1435	4826	5	937	8134	7057	29548	13403
1984	2	*	1488	4479	131	2295	6364	9	813	9673	12510	37765	17130
1985	3	*	2249	7533	183	2517	5634	4	577	5037	8614	32352	14675
1986	0	*	2954	7042	160	2738	4017	4	316	3712	5924	26866	12186
1987	8	*	3327	4774	609	2641	4451	4	319	5791	5128	27052	12271
1988	5	0	2421	4719	741	3439	6006	7	514	7756	6770	32377	14686
1989	9	0	1878	3083	513	1464	2865	3	204	3689	4206	17913	8125
1990	3	0	628	1408	343	405	1458	2	138	2144	2728	9257	4199
1991	0	0	1124	1672	399	719	2341	4	232	3715	3516	13722	6224
1992	*	*	1383	2532	495	1239	2871	12	319	5172	2576	16599	7529
1993	6	0	903	1942	225	849	2466	6	254	3052	2894	12599	5715
1994	4	0	1031	2649	371	1269	2356	4	179	3091	3571	14525	6588
1995	5	0	1128	2325	319	1248	2319	4	174	3304	4555	15381	6977
1996	8	0	780	1664	266	928	2345	7	225	2280	4218	12721	5770
1997	3	0	745	1566	257	823	1321	5	215	2370	1501	8806	3994
1998	6	0	709	1718	263	823	1863	11	211	2616	2988	11208	5084

* = less than 500 lb; na = not available;

Sources: 1980-1998 unpublished NMFS General Canvas data, 1995-98 NC DMF Trip Ticket System

Table 2. 1994 Summer flounder landings (mt, live and percent) from the Dealer Report data, Vessel Trip Report data, and the matched set, by state and month of landing (proration strata). Most landings for the first quarter of 1994 (Jan-Mar) were reported under the previous NER weighout system, and are not included here.

	Dealer Report		Vessel Trip Report		Matched Set	
State	mt	%	mt	%	mt	%
ME	0.1	0.0	3.0	0.2	0.0	0.0
NH	0.0	0.0	0.0	0.0	0.0	0.0
MA	352.6	16.4	265.8	13.0	109.5	10.3
RI	476.5	22.1	393.2	19.2	253.5	23.9
CT	0.0	0.0	0.0	0.0	0.0	0.0
NY	121.1	5.6	373.8	18.2	67.4	6.4
NJ	633.1	29.4	535.2	26.1	404.0	38.0
DE	0.0	0.0	56.0	2.7	0.0	0.0
MD	45.2	2.1	39.7	1.9	37.2	3.5
VA	524.5	24.4	382.2	18.7	190.3	17.9
Unknown	0.0	0.0	1.1	0.0	0.0	0.0
Total	2152.9	100.0	2049.9	100.0	1061.8	100.0
Month	mt	%	mt	%	mt	%
Jan	0.0	0.0	0.0	0.0	0.0	0.0
Feb	5.2	0.2	0.0	0.0	0.0	0.0
Mar	0.0	0.0	6.8	0.3	0.0	0.0
Apr	114.6	5.3	138.8	6.8	68.6	6.5
May	235.3	10.9	221.0	10.8	92.2	8.8
Jun	228.0	10.6	174.9	8.5	72.2	6.8
Jul	198.2	9.2	186.7	9.1	111.7	10.5
Aug	210.0	9.8	228.1	11.1	104.7	9.9
Sep	355.7	16.5	384.3	18.8	230.3	21.7
Oct	302.4	14.1	301.6	14.7	146.6	13.8
Nov	204.3	9.5	158.3	7.7	99.0	9.3
Dec	299.2	13.9	249.3	12.2	135.5	12.8
Unknown	0.0	0.0	0.0	0.0	0.0	0.0
Total	2152.9	100.0	2049.9	100.0	1061.8	100.0

Table 3. 1995 Summer flounder landings (mt, live and percent) from the Dealer Report data, Vessel Trip Report data, and the matched set, by state and month of landing (proration strata).

	Dealer Repor		Vessel Trip Report		Matched Set	
State	mt	%	mt	%	mt	%
ME	2.4	0.1	9.8	0.2	2.4	0.1
NH	0.0	0.0	7.5	0.2	0.0	0.0
MA	511.7	10.4	487.9	10.5	179.1	8.1
RI	1054.8	21.5	914.9	19.8	569.5	25.6
CT	144.5	2.9	113.1	0.0	0.0	0.0
NY	566.1	11.5	648.5	14.0	141.5	6.4
NJ	1052.0	21.4	984.4	21.3	594.1	26.7
DE	1.9	0.0	0.0	0.0	0.0	0.0
MD	78.8	1.6	56.0	1.2	45.8	2.1
VA	1498.5	30.5	1390.0	30.0	690.2	31.1
Unknown	0.0	0.0	41.1	0.0	0.0	0.0
Total	4910.7	100.0	4666.7	100.0	2222.5	100.0
Month	mt	%	mt	%	mt	%
Jan	1550.1	31.6	1636.6	35.1	749.4	33.7
Feb	692.4	14.1	768.1	16.5	416.5	18.7
Mar	128.8	2.6	137.4	2.9	52.7	2.4
Apr	130.1	2.7	140.5	3.0	80.2	3.6
May	268.3	5.5	304.5	6.5	101.6	4.6
Jun	203.0	4.1	192.9	4.1	67.7	3.1
Jul	188.0	3.8	131.4	2.8	64.7	2.9
Aug	350.0	7.1	325.8	7.0	138.5	6.2
Sep	300.0	6.1	288.7	6.2	145.7	6.6
Oct	338.6	6.9	326.1	7.0	196.9	8.9
Nov	305.3	6.2	141.7	3.0	82.0	3.7
Dec	436.5	8.9	272.9	5.9	126.6	5.7
Unknown	19.8	0.4	0.0	0.0	0.0	0.0
Total	4910.7	100.0	4666.7	100.0	2222.5	100.0

Table 4. 1996 Summer flounder landings (mt, live and percent) from the Dealer Report data, Vessel Trip Report data, and the matched set, by state and month of landing (proration strata).

	Dealer Report		Vessel Trip Report		Matched Set	
State	mt	%	mt	%	mt	%
ME	3.7	0.1	5.3	0.2	1.4	0.1
NH	0.0	0.0	26.5	0.8	0.0	0.0
MA	363.2	9.8	336.9	10.4	167.0	9.7
RI	798.2	21.5	654.8	20.3	441.7	25.5
CT	0.0	0.0	98.0	3.0	0.0	0.0
NY	412.3	11.1	374.6	11.6	99.5	5.8
NJ	1067.9	28.7	974.9	30.2	561.6	32.4
DE	0.0	0.0	0.4	0.0	0.0	0.0
MD	99.6	2.7	91.3	2.8	79.9	4.6
VA	973.5	26.2	634.0	19.7	381.0	22.0
Unknown	0.0	0.0	113.9	3.4	0.0	0.0
Total	3718.4	100.0	3310.6	100.0	1732.1	100.0
Month	mt	%	mt	%	mt	%
Jan	1225.4	33.0	1049.3	31.7	442.2	25.5
Feb	429.6	11.6	418.0	12.6	232.4	13.4
Mar	23.8	0.6	63.9	1.9	13.3	0.8
Apr	110.9	3.0	131.0	4.0	29.6	1.7
May	311.8	8.4	188.4	5.7	109.4	6.3
Jun	217.9	5.9	204.8	6.2	116.2	6.7
Jul	242.8	6.5	204.2	6.2	120.3	6.9
Aug	245.6	6.6	243.2	7.4	116.9	6.8
Sep	573.1	15.4	583.6	17.6	391.1	22.6
Oct	327.0	8.8	209.4	6.3	148.9	8.6
Nov	8.5	0.2	10.4	0.3	10.1	0.6
Dec	2.1	0.1	4.6	0.1	1.9	0.6
Unknown	0.0	0.0	0.0	0.0	0.0	0.0
Total	3718.4	100.0	3310.6	100.0	1732.1	100.0

Table 5. 1997 Summer flounder landings (mt, live and percent) from the Dealer Report data, Vessel Trip Report data, and the matched set, by state and month of landing (proration strata).

	Dealer Report		Vessel Trip Report		Matched Set	
State	mt	%	mt	%	mt	%
ME	1.3	0.0	1.4	0.0	1.4	0.1
NH	0.0	0.0	0.0	0.0	0.0	0.0
MA	338.0	8.5	259.4	7.7	108.1	5.9
RI	710.0	17.8	593.4	17.6	413.0	22.5
CT	116.6	2.9	76.3	2.3	0.0	0.0
NY	373.3	9.3	343.3	10.2	72.4	3.9
NJ	599.2	15.0	541.9	16.0	441.0	24.1
DE	2.4	0.1	0.1	0.0	0.0	0.0
MD	97.5	2.4	80.0	2.4	73.1	4.0
VA	1075.1	26.9	817.4	24.2	624.1	34.0
NC	681.0	17.0	663.6	19.6	100.3	5.5
Unknown	0.0	0.0	0.4	0.0	0.0	0.0
Total	3994.4	100.0	3377.2	100.0	1833.4	100.0
Month	mt	%	mt	%	mt	%
Jan	1684.7	42.2	1427.5	42.3	624.6	34.0
Feb	195.6	4.9	206.3	6.1	76.4	4.2
Mar	216.5	5.4	217.2	6.4	115.3	6.3
Apr	240.1	6.0	193.7	5.7	125.6	6.8
May	213.2	5.3	165.6	4.9	111.9	6.1
Jun	245.2	6.1	192.9	5.7	124.1	6.8
Jul	267.2	6.7	188.5	5.6	94.6	5.1
Aug	202.3	5.1	154.7	4.6	75.2	4.1
Sep	356.6	8.9	312.9	9.3	238.9	13.0
Oct	334.5	8.4	286.8	8.5	233.5	12.7
Nov	24.2	0.6	17.1	0.5	11.7	0.6
Dec	14.3	0.4	13.8	0.4	6.6	0.4
Unknown	0.0	0.0	0.2	0.0	0.0	0.0
Total	3994.4	100.0	3377.2	100.0	1838.4	100.0

Table 6. 1998 Summer flounder landings (mt, live and percent) from the Dealer Report data, Vessel Trip Report data, and the matched set, by state and month of landing (proration strata).

	Dealer Report		Vessel Trip Report		Matched Set	
State	mt	%	mt	%	mt	%
ME	2.6	0.1	3.8	0.1	0.0	0.0
NH	0.0	0.0	0.1	0.0	0.0	0.0
MA	321.8	6.3	221.7	5.6	98.5	3.8
RI	779.1	15.3	569.7	14.4	421.4	16.4
CT	119.2	2.3	101.7	2.6	0.0	0.0
NY	373.4	7.3	297.7	7.5	52.6	2.0
NJ	845.0	16.6	784.2	19.8	641.3	24.9
DE	5.0	0.1	0.1	0.0	0.0	0.0
MD	95.7	1.9	73.5	1.9	68.1	2.6
VA	1186.5	23.3	1017.4	25.6	795.9	30.9
NC	1316.9	26.7	857.3	21.6	494.9	19.2
Unknown	0.0	0.0	41.2	1.0	0.0	0.0
Total	5083.6	100.0	3968.4	100.0	2572.7	100.0
Month	mt	%	mt	%	mt	%
Jan	1642.7	32.3	1325.6	33.4	898.4	34.9
Feb	440.8	8.7	442.6	11.2	191.7	7.4
Mar	204.3	4.0	186.5	4.7	109.3	4.2
Apr	254.3	5.0	226.3	5.7	154.0	6.0
May	297.3	5.8	217.5	5.5	149.3	5.8
Jun	201.7	4.0	122.2	3.1	75.4	2.9
Jul	262.3	5.2	159.7	4.0	77.4	3.0
Aug	147.4	2.9	112.3	2.8	55.5	2.2
Sep	393.6	7.7	337.2	8.5	284.6	11.0
Oct	43.0	0.8	44.2	1.1	13.8	0.5
Nov	528.6	10.4	495.1	12.5	385.6	15.0
Dec	526.1	10.3	299.0	7.5	180.1	7.0
Unknown	141.5	2.8	0.2	0.0	0.6	0.0
Total	5083.6	100.0	3968.4	100.0	2575.7	100.0

Table 7. Distribution of Northeast Region (ME-VA) commercial fishery landings by statistical area.

Area	1992	1993	1994	1995	1996	1997	1998
511	0	0	0	0	1	0	0
512	0	0	0	0	1	1	0
513	0	3	0	0	2	0	0
514	9	11	10	12	3	15	17
515	0	0	0	0	0	0	0
521	8	3	14	4	16	2	9
522	8	8	7	6	13	6	2
561	2	1	0	0	1	1	3
562	6	4	5	10	1	1	0
525	22	35	26	85	137	16	27
526	294	242	193	128	44	22	33
533	0	0	0	0	6	2	3
537	916	557	707	770	539	449	417
538	228	255	341	332	267	270	229
539	217	157	223	258	242	284	372
611	117	35	181	283	166	141	204
612	404	393	169	221	344	297	317
613	237	167	280	242	184	194	128
614	81	97	141	129	18	41	41
615	61	15	49	99	20	37	41
616	532	476	743	730	462	245	279
621	1028	526	258	279	318	266	285
622	299	363	323	522	258	53	141
623	0	6	0	14	28	0	1
625	289	227	122	118	276	227	142
626	743	601	821	347	385	94	502
631	655	98	219	220	21	174	258
632	160	77	60	43	73	30	41
635	45	45	77	55	29	418	228
636	0	0	0	4	2	27	8
Total	6361	4402	4969	4911	3857	3313	3728

Table 8. Summary of NEFSC sampling of commercial fishery for summer flounder, ME-VA[1].

Year	Lengths	Ages	NER Landings (MT)	Sampling Intensity (mt/100 lengths)
1982	8,194	2,288	7,536	92
1983	6,893	1,347	10,202	148
1984	5,340	1,794	11,455	215
1985	6,473	1,611	10,767	166
1986	7,840	1,967	9,499	121
1987	6,605	1,788	9,945	151
1988	9,048	2,302	11,615	128
1989	8,411	1,325	6,217	74
1990	3,419	853	2,962	87
1991	4,627	1,089	4,626	100
1992	3,385	899	6,361	188
1993	3,638	844	4,402	121
1994	3,950	956	4,969	126
1995	2,982	682	4,911	165
1996	4,580	1,235	3,857	84
1997	8,855	2,332	3,313	37
1998	10,055	2,641	3,728	37

[1] Does not include unclassified market category landings for 1982-93.

Table 9. Summary distribution of 1994 NER commercial fishery landings and length samples.

Market Category	1-DIGIT Area		Quarters 1 & 2	Quarters 3 & 4	Total
SMALL	5	Metric tons	6	5	11
		No. Samples	1	0	1
		No. Lengths	103	0	103
SMALL	6	Metric tons	328	173	501
		No. Samples	2	3	5
		No. Lengths	100	208	308
MEDIUM	5	Metric tons	541	311	852
		No. Samples	7	7	14
		No. Lengths	732	708	1440
MEDIUM	6	Metric tons	964	394	1358
		No. Samples	2	5	7
		No. Lengths	200	496	696
LARGE	5	Metric tons	260	200	460
		No. Samples	3	3	6
		No. Lengths	288	203	491
LARGE	6	Metric tons	515	349	864
		No. Samples	1	4	5
		No. Lengths	100	392	492
JUMBO	5	Metric tons	95	59	154
		No. Samples	1	2	3
		No. Lengths	36	79	115
JUMBO	6	Metric tons	108	53	161
		No. Samples	0	2	2
		No. Lengths	0	118	118
UNCLASS	5	Metric tons	31	18	49
		No. Samples	0	0	0
		No. Lengths	0	0	0
UNCLASS	6	Metric tons	259	300	559
		No. Samples	1	3	4
		No. Lengths	46	141	187
ALL	5	Metric tons	933	593	1526
		No. Samples	12	12	24
		No. Lengths	1159	990	2149
ALL	6	Metric tons	2174	1269	3443
		No. Samples	6	17	23
		No. Lengths	446	1355	1801
ALL	ALL	Metric tons	3107	1862	4969
		No. Samples	18	29	47
		No. Lengths	1605	2345	3950

Table 10. Summary distribution of 1995 NER commercial fishery landings and length samples.

Market Category	1-DIGIT Area		Quarters 1 & 2	Quarters 3 & 4	Total
SMALL	5	Metric tons	3	3	6
		No. Samples	0	0	0
		No. Lengths	0	0	0
SMALL	6	Metric tons	176	163	339
		No. Samples	3	2	5
		No. Lengths	194	100	294
MEDIUM	5	Metric tons	380	236	616
		No. Samples	9	0	9
		No. Lengths	748	0	748
MEDIUM	6	Metric tons	984	388	1372
		No. Samples	4	3	7
		No. Lengths	399	269	668
LARGE	5	Metric tons	321	354	675
		No. Samples	3	0	3
		No. Lengths	289	0	289
LARGE	6	Metric tons	760	365	1125
		No. Samples	5	3	8
		No. Lengths	439	239	678
JUMBO	5	Metric tons	86	88	174
		No. Samples	0	0	0
		No. Lengths	0	0	0
JUMBO	6	Metric tons	107	89	196
		No. Samples	2	0	2
		No. Lengths	187	0	187
UNCLASS	5	Metric tons	16	41	57
		No. Samples	0	0	0
		No. Lengths	0	0	0
UNCLASS	6	Metric tons	159	192	351
		No. Samples	1	1	2
		No. Lengths	62	56	118
ALL	5	Metric tons	806	722	1528
		No. Samples	12	0	12
		No. Lengths	1037	0	1037
ALL	6	Metric tons	2186	1197	3383
		No. Samples	15	9	24
		No. Lengths	1281	664	1945
ALL	ALL	Metric tons	2992	1919	4911
		No. Samples	27	9	36
		No. Lengths	2318	664	2982

Table 11. Summary distribution of 1996 NER commercial fishery landings and length samples.

Market Category	1-DIGIT Area		Quarters 1 & 2	Quarters 3 & 4	Total
SMALL	5	Metric tons	3	2	5
		No. Samples	2	0	2
		No. Lengths	105	0	105
SMALL	6	Metric tons	237	192	429
		No. Samples	4	5	9
		No. Lengths	231	250	481
MEDIUM	5	Metric tons	332	140	472
		No. Samples	4	3	7
		No. Lengths	408	304	712
MEDIUM	6	Metric tons	770	470	1240
		No. Samples	6	7	13
		No. Lengths	576	626	1202
LARGE	5	Metric tons	372	151	523
		No. Samples	6	1	7
		No. Lengths	338	100	438
LARGE	6	Metric tons	402	270	672
		No. Samples	7	3	10
		No. Lengths	576	300	876
JUMBO	5	Metric tons	138	62	200
		No. Samples	4	2	6
		No. Lengths	226	131	357
JUMBO	6	Metric tons	106	75	181
		No. Samples	4	1	5
		No. Lengths	232	100	332
UNCLASS	5	Metric tons	25	41	66
		No. Samples	0	0	0
		No. Lengths	0	0	0
UNCLASS	6	Metric tons	28	41	69
		No. Samples	1	1	2
		No. Lengths	32	45	77
ALL	5	Metric tons	870	396	1266
		No. Samples	16	6	22
		No. Lengths	1077	535	1612
ALL	6	Metric tons	1543	1048	2591
		No. Samples	22	17	39
		No. Lengths	1647	1321	2968
ALL	ALL	Metric tons	2413	1444	3857
		No. Samples	38	23	61
		No. Lengths	2724	1856	4580

Table 12. Summary distribution of 1997 NER commercial fishery landings and length samples.

Market Category	1-DIGIT Area		Quarters 1 & 2	Quarters 3 & 4	Total
SMALL	5	Metric tons	1	1	2
		No. Samples	0	0	0
		No. Lengths	0	0	0
SMALL	6	Metric tons	83	2	85
		No. Samples	3	0	3
		No. Lengths	200	0	200
MEDIUM	5	Metric tons	212	147	359
		No. Samples	7	5	12
		No. Lengths	747	529	1276
MEDIUM	6	Metric tons	637	308	945
		No. Samples	27	9	36
		No. Lengths	2623	724	3347
LARGE	5	Metric tons	214	131	345
		No. Samples	3	1	4
		No. Lengths	331	12	343
LARGE	6	Metric tons	472	308	780
		No. Samples	16	10	26
		No. Lengths	1554	727	2281
JUMBO	5	Metric tons	143	61	204
		No. Samples	4	0	4
		No. Lengths	337	0	337
JUMBO	6	Metric tons	131	62	193
		No. Samples	11	3	14
		No. Lengths	705	120	825
UNCLASS	5	Metric tons	28	58	86
		No. Samples	1	0	1
		No. Lengths	101	0	101
UNCLASS	6	Metric tons	192	122	314
		No. Samples	1	1	2
		No. Lengths	106	39	145
ALL	5	Metric tons	598	398	996
		No. Samples	15	6	21
		No. Lengths	1516	541	2057
ALL	6	Metric tons	1515	802	2317
		No. Samples	58	23	81
		No. Lengths	5188	1610	6798
ALL	ALL	Metric tons	2113	1200	3313
		No. Samples	73	29	102
		No. Lengths	6704	2151	8855

Table 13. Summary distribution of 1998 NER commercial fishery landings and length samples.

Market Category	1-DIGIT Area		Quarters 1 & 2	Quarters 3 & 4	Total
MEDIUM + SMALL	5	Metric tons	311	125	436
		No. Samples	5	4	9
		No. Lengths	478	302	780
MEDIUM + SMALL	6	Metric tons	632	432	1064
		No. Samples	25	20	45
		No. Lengths	2459	1873	4332
LARGE	5	Metric tons	312	150	462
		No. Samples	2	2	4
		No. Lengths	130	109	239
LARGE	6	Metric tons	644	524	1168
		No. Samples	20	20	40
		No. Lengths	1840	1753	3593
JUMBO	5	Metric tons	124	41	165
		No. Samples	2	0	2
		No. Lengths	171	0	171
JUMBO	6	Metric tons	118	102	220
		No. Samples	2	8	10
		No. Lengths	200	537	737
UNCLASS	5	Metric tons	33	13	46
		No. Samples	0	0	0
		No. Lengths	0	0	0
UNCLASS	6	Metric tons	90	77	167
		No. Samples	3	0	3
		No. Lengths	203	0	203
ALL	5	Metric tons	780	329	1109
		No. Samples	9	6	15
		No. Lengths	779	411	1190
ALL	6	Metric tons	1484	1135	2619
		No. Samples	50	48	98
		No. Lengths	4702	4163	8865
ALL	ALL	Metric tons	2264	1464	3728
		No. Samples	59	54	113
		No. Lengths	5481	4574	10055

Table 14. Distribution of 1994 NER commercial fishery length frequency samples. Two digit divisions (DIV) defined as: 51 = 511 to 515, 52 = 521 to 562, 53 = 533 to 539, 61 = 611 to 616, 62 = 621 to 629, 63 = 631 to 639.MC = landings market category defined as: 1210 = large, 1212 = medium, 1214 = small, 1218 = jumbo, 1219 = unclassified. Top entry in each table cell is the number of samples, bottom entry is the number of fish measured.

MC = Large, 1210 Landings = 1,323 mt; 26.7% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53	2 188	1 100	1 76	2 127	6 491
61			2 192		2 192
62	1 100			2 200	3 300
63					
Total	3 288	1 100	3 268	4 327	11 983

MC = Medium, 1212 Landings = 2,212 mt; 44.5% of NER Total

DIV	Quarter 1	2	3	4	Total
51		1 122	1 87		2 209
52					
53	3 300	3 310	3 323	3 298	12 1,231
61			2 200	1 96	13 296
62	1 100	1 100		2 200	4 400
63					
Total	4 400	5 532	6 610	6 594	21 2,136

Table 14 continued.

MC = Small, 1214 Landings = 511 mt; 10.3% of NER Total

DIV	Quarter 1	2	3	4	Total
51		1 103			1 103
52					
53					
61			1 56		1 56
62	1 50	1 50		2 152	4 252
63					
Total	1 50	2 153	1 56	2 152	6 411

MC = Jumbo, 1218 Landings = 315 mt; 6.3% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53	1 36		1 22	1 57	3 115
61					
62			1 18	1 100	1 118
63					
Total	1 36		2 40	2 157	5 233

Table 14 continued.

MC = Unclassified, 1219 Landings = 608 mt; 12.2% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53					
61		1 46		1 36	2 82
62			2 105		2 105
63				1 36	1 36
Total		1 46	2 105	1 36	4 187

Table 15. Distribution of 1995 NER commercial fishery length frequency samples. Two digit divisions (DIV) defined as: 51 = 511 to 515, 52 = 521 to 562, 53 = 533 to 539, 61 = 611 to 616, 62 = 621 to 629, 63 = 631 to 639.MC = landings market category defined as: 1210 = large, 1212 = medium, 1214 = small, 1218 = jumbo, 1219 = unclassified. Top entry in each table cell is the number of samples, bottom entry is the number of fish measured.

MC = Large, 1210 Landings = 1,800 mt; 36.7% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53	2 201	1 88			3 289
61	1 105	2 133		1 39	4 277
62	2 201		1 100	1 100	4 401
63					
Total	5 507	3 221	1 100	2 139	11 967

MC = Medium, 1212 Landings = 1,988 mt; 40.5% of NER Total

DIV	Quarter 1	2	3	4	Total
51		2 110			2 110
52					
53	3 285	4 353			7 638
61	1 98	1 100		1 69	3 267
62	2 201		1 100	1 100	4 401
63					
Total	6 584	7 563	1 100	2 169	16 1,416

Table 15 continued.

MC = Small, 1214 Landings = 345 mt; 7.0% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53					
61		1 44			1 44
62	2 150		1 50	1 50	4 250
63					
Total	2 150	1 44	1 50	1 50	5 294

MC = Jumbo, 1218 Landings = 370 mt; 7.5% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53					
61					
62	2 187				2 187
63					
Total	2 187				2 187

Table 15 continued.

MC = Unclassified, 1219 Landings = 408 mt; 8.3% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53					
61		1 62			1 62
62			1 56		1 56
63					
Total		1 62	1 56		2 118

Table 16. Distribution of 1996 NER commercial fishery length frequency samples. Two digit divisions (DIV) defined as: 51 = 511 to 515, 52 = 521 to 562, 53 = 533 to 539, 61 = 611 to 616, 62 = 621 to 629, 63 = 631 to 639.MC = landings market category defined as: 1210 = large, 1212 = medium, 1214 = small, 1218 = jumbo, 1219 = unclassified. Top entry in each table cell is the number of samples, bottom entry is the number of fish measured.

MC = Large, 1210 Landings = 1,193 mt; 30.9% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52	2 20	3 240			5 260
53	1 78		1 100		2 178
61	3 167	4 409			7 576
62			3 300		3 300
63					
Total	6 265	7 649	4 400		17 1314

MC = Medium, 1212 Landings = 1,707 mt; 44.3% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52	1 62	2 200			3 262
53	1 146		1 100	2 204	4 450
61	2 175	4 401	2 156		8 732
62			2 200	2 187	4 387
63				1 83	1 83
Total	4 383	6 601	5 456	5 474	20 1914

Table 16 continued.

MC = Small, 1214 Landings = 434 mt; 11.3% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52		2 105			2 105
53					
61	1 50	3 181	1 50		5 281
62			3 150	1 50	4 200
63					
Total	1 50	5 286	4 200	1 50	11 586

MC = Jumbo, 1218 Landings = 381 mt; 9.9% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52	2 25	2 201			4 226
53			2 131		2 131
61	1 100	3 132			4 232
62			1 100		1 100
63					
Total	3 125	5 333	3 231		11 689

Table 16 continued.

MC = Unclassified, 1219 Landings = 142 mt; 3.7% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53					
61		1 32	1 45		2 77
62					
63					
Total		1 32	1 45		2 77

Table 17. Distribution of 1997 NER commercial fishery length frequency samples. Two digit divisions (DIV) defined as: 51 = 511 to 515, 52 = 521 to 562, 53 = 533 to 539, 61 = 611 to 616, 62 = 621 to 629, 63 = 631 to 639.MC = landings market category defined as: 1210 = large, 1212 = medium, 1214 = small, 1218 = jumbo, 1219 = unclassified. Top entry in each table cell is the number of samples, bottom entry is the number of fish measured.

MC = Large, 1210 Landings = 1,125 mt; 34.0% of NER Total

DIV	Quarter 1	2	3	4	Total
51			1 12		1 12
52					
53	3 331				3 331
61	3 300	5 454	5 435		13 1189
62	4 400	3 300	1 100	4 192	12 992
63	1 100				1 100
Total	11 1131	8 754	7 547	4 192	30 2624

MC = Medium, 1212 Landings = 1,305 mt; 39.4% of NER Total

DIV	Quarter 1	2	3	4	Total
51		1 117	2 199		3 316
52			1 116		1 116
53	3 305	3 325	2 214		8 844
61	6 628	7 651	6 499		19 1778
62	6 601	4 343	3 182	1 43	14 1169
63	4 400				4 400
Total	19 1934	15 1436	14 1210	1 43	49 4623

Table 17 continued.

MC = Small, 1214 Landings = 86 mt; 2.6% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53					
61	1 50				1 50
62	1 100				1 100
63	1 50				1 50
Total	3 200				3 200

MC = Jumbo, 1218 Landings = 398 mt; 12.0% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52		1 41			1 41
53	2 196	1 100			3 296
61	7 495	1 28			8 523
62	1 100	1 10	1 10	2 110	5 230
63	1 72				1 72
Total	11 863	4 179	1 10	2 110	18 1162

Table 17 continued.

MC = Unclassified, 1219 Landings = 399 mt; 12.1% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53		1 101			1 101
61	1 106			1 39	2 145
62					
63					
Total	1 106	1 101		1 39	3 246

Table 18. Distribution of 1998 NER commercial fishery length frequency samples. Two digit divisions (DIV) defined as: 51 = 511 to 515, 52 = 521 to 562, 53 = 533 to 539, 61 = 611 to 616, 62 = 621 to 629, 63 = 631 to 639.MC = landings market category defined as: 1210 = large, 1212 = medium, 1214 = small, 1218 = jumbo, 1219 = unclassified. Top entry in each table cell is the number of samples, bottom entry is the number of fish measured.

MC = Large, 1210 Landings = 1,630 mt; 43.8% of NER Total

DIV	Quarter 1	2	3	4	Total
51		1 30	2 109		2 139
52					
53	1 100				1 100
61	9 791	4 403	9 913		22 2107
62	4 400	2 146	3 91	4 347	13 984
63	1 100			4 402	5 502
Total	15 1391	7 579	14 1113	8 749	43 3832

MC = Medium, 1212 (1,495 mt) plus Small, 1214 (5 mt); Landings = 1,500 mt, 40.3% of NER Total

DIV	Quarter 1	2	3	4	Total
51		1 104	4 302		5 406
52		1 72			1 72
53	1 98	2 204			3 302
61	8 809	4 408	8 710	1 102	21 2029
62	5 440	2 166	1 80	4 377	12 1063
63	6 636			6 604	12 1240
Total	20 1983	10 954	13 1092	11 1083	54 5112

Table 18 continued.

MC = Jumbo, 1218 Landings = 385 mt; 10.3% of NER Total

DIV	Quarter 1	2	3	4	Total
51	1 124				1 124
52					
53	1 47				1 47
61			3 37		3 37
62	2 200			1 100	3 300
63				4 400	4 400
Total	4 371		3 37	5 500	12 908

MC = Unclassified, 1219 Landings = 213 mt; 5.7% of NER Total

DIV	Quarter 1	2	3	4	Total
51					
52					
53					
61	2 116	1 87			3 203
62					
63					
Total	2 116	1 87			2 203

Table 19. Commercial landings at age of summer flounder ('000), ME-VA. Does not include discards, assumes catch not sampled by NEFSC has same biological characteristics as port sampled catch.

	AGE										
Year	0	1	2	3	4	5	6	7	8	9	Total
1982	1,441	6,879	5,630	232	61	97	57	22	2	0	14,421
1983	1,956	12,119	4,352	554	30	62	13	17	4	2	19,109
1984	1,403	10,706	6,734	1,618	575	72	3	5	1	4	21,121
1985	840	6,441	10,068	956	263	169	25	4	2	1	18,769
1986	407	7,041	6,374	2,215	158	93	29	7	2	0	16,326
1987	332	8,908	7,456	935	337	23	24	27	11	0	18,053
1988	305	11,116	8,992	1,280	327	79	18	9	5	0	22,131
1989	96	2,491	4,829	841	152	16	3	1	1	0	8,430
1990	0	2,670	861	459	81	18	6	1	1	0	4,096
1991	0	3,755	3,256	142	61	11	1	1	0	0	7,227
1992	114	5,760	3,575	338	19	22	0	1	0	0	9,829
1993	151	4,308	2,340	174	29	43	19	2	1	0	7,067
1994	119	3,698	3,692	272	64	12	6	0	5	0	7,868
1995	46	2,566	4,280	241	40	8	0	1	0	0	7,182
1996	0	1,401	3,187	798	156	15	3	0	1	0	5,559
1997	0	380	2,442	1,214	261	69	10	4	0	0	4,381
1998	0	196	1,716	2,019	437	71	15	1	0	0	4,455

Table 20. Mean weight (kg) at age of summer flounder landed in the commercial fishery, ME-VA.

	AGE										
Year	0	1	2	3	4	5	6	7	8	9	ALL
1982	0.26	0.42	0.62	1.84	2.33	2.94	2.71	4.04	5.99		0.55
1983	0.31	0.46	0.80	1.40	2.35	1.85	2.76	3.30	4.17	4.37	0.56
1984	0.28	0.39	0.60	0.11	1.43	2.16	3.21	3.62	4.64	4.03	0.54
1985	0.33	0.44	0.59	1.08	1.73	2.22	2.59	4.71	4.78	4.80	0.59
1986	0.30	0.44	0.63	1.11	1.76	1.89	3.14	2.96	4.81		0.63
1987	0.27	0.45	0.62	1.06	2.00	2.85	3.08	3.02	4.14		0.59
1988	0.36	0.46	0.60	1.21	2.07	2.88	3.98	3.91	4.50		0.60
1989	0.36	0.55	0.74	1.06	1.83	2.47	3.57	3.59	2.25		0.74
1990		0.52	0.86	1.37	1.84	2.13	3.21	3.92	5.03		0.72
1991		0.48	0.75	1.54	2.26	3.01	3.91	3.87			0.64
1992	0.34	0.50	0.82	1.88	2.68	3.09		4.59			0.67
1993	0.35	0.49	0.75	1.63	2.10	1.79	2.81	4.14	5.20		0.62
1994	0.39	0.55	0.62	1.43	2.27	3.08	3.32		3.70		0.63
1995	0.33	0.54	0.70	1.54	2.37	2.92		4.09			0.68
1996		0.54	0.58	1.14	1.88	2.85	3.78		4.76		0.69
1997		0.54	0.63	0.84	1.31	2.10	2.56	3.43			0.76
1998		0.55	0.64	0.85	1.39	2.31	2.52	3.98			0.84

Table 21. Summary of North Carolina Division of Marine Fisheries (NCDMF) sampling of the commercial winter trawl fishery for summer flounder.

Year	Lengths	Ages	Total Landings (MT)	Total MT per 100 lengths
1982	5,403	0	2,864	53
1983	8,491	0	3,201	38
1984	14,920	0	5,674	38
1985	13,787	0	3,907	28
1986	15,754	0	2,687	17
1987	12,126	0	2,326	19
1988	13,377	189	3,071	23
1989	15,785	106	1,908	12
1990	15,787	191	1,238	8
1991	24,590	534	1,582	6
1992	14,321	364	1,168	8
1993	18,019	442	1,313	7
1994	21,858	548	1,620	7
1995	18,410	548	2,066	11
1996	17,745	477	1,913	11
1997	12,802	388	681	5
1998	21,477	476	1,355	6

Table 22. Number ('000) of summer flounder at age landed in the North Carolina commercial winter trawl fishery. The 1982-1987 NCDMF length samples were aged using NEFSC age-lengths keys for comparable times and areas (i.e., same quarter and statistical areas). The 1988-1996 NCDMF length samples were aged using NCDMF age-lengths keys.

	AGE									
Year	0	1	2	3	4	5	6	7	8	Total
1982	981	3,463	1,021	142	52	19	6	4	2	5,691
1983	492	3,778	1,581	287	135	41	3	3	<1	6,321
1984	907	5,658	3,889	550	107	18	<1	0	0	11,130
1985	196	2,974	3,529	338	85	24	5	<1	0	7,152
1986	216	2,478	1,897	479	29	32	1	1	<1	5,134
1987	233	2,420	1,299	265	28	1	0	0	0	4,243
1988	0	2,917	2,225	471	227	39	1	6	<1	5,887
1989	2	49	1,437	716	185	37	1	2	0	2,429
1990	2	142	730	418	117	12	1	<1	0	1,424
1991	0	382	1,641	521	116	20	2	<1	0	2,682
1992	0	36	795	697	131	21	2	<1	0	1,682
1993	0	515	1,101	252	44	1	<1	0	0	1,913
1994	6	258	1,262	503	115	14	3	<1	0	2,161
1995	<1	181	1,391	859	331	53	2	<1	0	2,817
1996	0	580	2,187	554	132	56	13	<1	2	3,526
1997	0	17	625	378	18	3	<1	0	0	1,041
1998	18	548	694	230	28	3	<1	0	0	1,520

Table 23. Mean weight (kg) at age of summer flounder landed in the North Carolina commercial winter trawl fishery.

	AGE									
Year	0	1	2	3	4	5	6	7	8	ALL
1982	0.34	0.46	0.76	1.28	1.66	2.05	2.12	2.23	2.58	0.53
1983	0.32	0.45	0.75	1.14	1.26	1.49	1.73	2.43	2.70	0.57
1984	0.33	0.48	0.70	1.06	1.50	2.17	3.48			0.59
1985	0.38	0.46	0.66	1.20	1.66	2.49	3.07	4.57		0.62
1986	0.36	0.51	0.67	1.09	1.62	1.96	3.40	3.23	3.63	0.64
1987	0.33	0.51	0.66	1.09	1.88	2.94				0.59
1988		0.41	0.60	0.93	1.19	1.70	2.24	2.98	3.41	0.57
1989	0.12	0.38	0.60	0.99	1.16	2.10	3.09	2.50		0.78
1990	0.08	0.48	0.66	0.87	1.31	2.10	1.90	3.97		0.77
1991		0.45	0.66	1.07	1.73	2.25	2.51	3.13	4.10	0.77
1992		0.36	0.50	0.85	1.20	1.46	2.30			0.71
1993		0.49	0.61	1.13	1.37	2.95	3.41			0.66
1994	0.27	0.45	0.62	1.27	2.04	2.44	2.89	5.78		0.84
1995	0.04	0.21	0.46	0.85	1.47	2.49	3.79	3.82		0.72
1996		0.42	0.47	0.73	1.35	1.72	2.29	3.20	2.86	0.56
1997		0.41	0.62	0.76	1.32	2.07	3.25			0.68
1998	0.41	0.71	0.89	1.24	1.49	2.80	3.38			0.89

Table 24. Summary NER Sea Sample data for trips catching summer flounder. Total trips (trips are not split for multiple areas), observed tows, total summer flounder catch (lb), total summer flounder kept (lb), and total summer flounder discard (lb), and percentage of summer flounder discard (lb) to summer flounder catch (lb).

Year	Gear	Trips	Obs Tows	Total Catch	Total Kept	Total Discard	Discard: Total (%)
1989	All	57	413	53,714	48,406	5,308	9.9
1990	All	61	463	47,954	35,972	11,982	25.0
1991	All	82	635	61,650	50,410	11,240	18.2
1992	Trawl	66	643	136,632	118,026	18,606	13.6
	Scallop	8	178	1,477	767	710	48.1
	All	74	821	138,109	118,793	19,316	14.0
1993	Trawl	37	410	74,982	67,603	7,379	9.8
	Scallop	15	671	2,967	1,158	1,809	61.0
	All	52	1,081	77,949	68,761	9,188	11.8
1994	Trawl	51	574	174,347	163,734	10,612	6.1
	Scallop	14	651	5,811	435	5,376	92.5
	All	65	1,225	180,158	164,169	15,988	8.9
1995	Trawl	134	1,004	242,784	235,011	7,773	3.2
	Scallop	19	1,051	10,044	2,247	7,778	77.4
	All	153	2,055	252,828	237,258	15,551	6.2
1996	Trawl	111	653	101,389	90,789	10,600	10.5
	Scallop	24	1,083	9,575	1,345	8,230	86.0
	All	135	1,736	110,964	92,134	18,830	17.0
1997	Trawl	59	334	31,707	26,475	5,232	16.5
	Scallop	23	835	5,721	583	5,138	89.8
	All	82	1,169	37,428	27,058	10,370	27.7
1998	Trawl	53	329	72,396	65,507	6,889	9.5
	Scallop	22	359	1,962	652	1,310	66.8
	All	75	688	74,358	66,159	8,199	11.0

Table 25. Summary NER Vessel Trip Report (VTR) data for trips reporting discard of any species and catching summer flounder. Total trips, total summer flounder catch (lb), total summer flounder kept (lb), total summer flounder discard (lb), and percentage of summer flounder discard (lb) to summer flounder catch (lb).

Year	Gear	Trips	Total Catch	Total Kept	Total Discard	Discard: Total (%)
1994	Trawl	4,267	2,149,332	2,015,296	134,036	6.2
	Scallop	85	70,353	22,877	47,476	67.5
	All	4,352	2,219,685	2,038,173	181,512	8.2
1995	Trawl	3,733	2,444,231	2,332,516	111,715	4.6
	Scallop	113	78,758	25,084	53,674	68.2
	All	3,846	2,522,989	2,357,600	165,389	6.6
1996	Trawl	2,990	1,662,313	1,459,155	203,158	12.2
	Scallop	79	69,557	16,657	52,900	76.1
	All	3,069	1,731,870	1,475,812	256,058	14.8
1997	Trawl	3,044	988,599	851,090	137,509	13.9
	Scallop	51	21,553	4,665	16,888	78.4
	All	3,095	1,010,152	855,755	154,397	15.3
1998	Trawl	3,004	1,128,578	868,706	259,872	23.0
	Scallop	62	23,538	10,323	13,215	56.1
	All	3,066	1,152,116	879,029	273,087	23.7

Table 26. Summary of sea sample data for summer flounder by NAFO division and quarter for 1989: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout database days fished on trips landing any summer flounder (WO DF), estimate of landings calculated from sea sampling kept rates and NEFSC weighout database days fished (SS EST LAND MT), landings as recorded in the NEFSC weighout database (WO LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO DF	SS EST LAND MT	WO LAND MT	SS EST DISC MT
51	1	0	0	0	85	0	2	0
	2	1	66	<1	137	9	4	<1
	3	0	0	0	75	0	3	0
	4	1	19	<1	157	3	3	<1
52	1	1	756	48	1319	998	687	64
	2	5	3	8	1250	4	129	10
	3	2	280	<1	536	150	9	<1
	4	1	35	40	1545	54	98	61
53	1	4	588	41	689	405	473	29
	2	10	68	<1	2045	138	224	2
	3	5	260	2	1619	421	298	4
	4	3	91	6	898	82	330	6
61	1	4	544	51	1661	904	528	84
	2	5	107	4	1391	149	165	5
	3	0	213	24	513	109	106	13
	4	5	142	38	575	82	125	22
62	1	5	934	84	1867	1744	1460	158
	2	2	244	101	922	225	85	93
	3	8	213	24	216	46	104	5
	4	1	672	17	1118	752	361	19
63	1	2	1116	110	490	546	323	54
	2	0	244	101	41	10	9	4
	3	0	213	24	40	9	<1	1
	4	0	672	17	616	415	292	10
TOTAL/ MEAN		65	296	28	19,805	7,255	5,817	642

Table 27. Summary of sea sample data for summer flounder by NAFO division and quarter for 1990: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout database days fished on trips landing any summer flounder (WO DF), estimate of landings calculated from sea sampling kept rates and NEFSC weighout database days fished (SS EST LAND MT), landings as recorded in the NEFSC weighout database (WO LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO DF	SS EST LAND MT	WO LAND MT	SS EST DISC MT
51	1	0	0	0	9	0	<1	0
	2	0	0	0	78	0	<1	0
	3	0	0	0	29	0	<1	0
	4	0	0	0	82	0	<1	0
52	1	1	15	5	581	9	148	3
	2	2	12	7	1107	13	31	8
	3	2	14	205	332	5	9	68
	4	3	12	<1	818	10	40	<1
53	1	6	113	3	577	65	129	2
	2	3	50	1	1212	60	51	1
	3	0	92	6	1194	110	187	7
	4	8	92	6	1052	97	288	6
61	1	10	222	40	716	159	84	29
	2	5	14	23	1153	16	22	27
	3	0	91	55	580	53	150	32
	4	3	367	115	535	197	131	62
62	1	4	446	253	2040	911	333	517
	2	9	19	49	558	11	8	27
	3	7	221	74	227	50	126	17
	4	8	360	43	1779	641	368	77
63	1	1	505	321	650	328	258	209
	2	0	19	49	47	1	1	2
	3	0	221	74	0	0	0	0
	4	0	360	43	625	225	384	27
TOTAL/ MEAN		72	166	56	15,980	2,959	2,749	1,121

Table 28. Summary of sea sample data for summer flounder by NAFO division and quarter for 1991: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout database days fished on trips landing any summer flounder (WO DF), estimate of landings calculated from sea sampling kept rates and NEFSC weighout database days fished (SS EST LAND MT), landings as recorded in the NEFSC weighout database (WO LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO DF	SS EST LAND MT	WO LAND MT	SS EST DISC MT
51	1	0	0	<1	29	0	<1	0
	2	0	0	<1	79	0	1	0
	3	0	0	<1	43	0	1	0
	4	1	31	<1	188	6	2	<1
52	1	3	218	128	1254	274	79	161
	2	2	88	3	1756	154	44	5
	3	1	13	<1	706	9	17	<1
	4	1	26	<1	1721	44	53	<1
53	1	7	117	9	806	94	242	7
	2	9	55	1	1688	92	147	2
	3	6	92	1	1401	128	279	1
	4	10	163	4	1475	240	259	6
61	1	6	173	49	2763	477	384	134
	2	5	43	37	2983	128	184	111
	3	1	577	1	572	330	260	1
	4	15	187	24	1855	347	225	45
62	1	5	97	9	1981	192	673	19
	2	4	169	143	1203	203	78	172
	3	4	953	177	555	529	236	98
	4	10	249	38	1935	482	602	73
63	1	0	97	9	382	37	231	4
	2	0	169	143	2	<1	<1	<1
	3	0	953	177	19	18	12	3
	4	4	492	212	702	346	346	149
TOTAL/ MEAN		94	196	42	26,096	4,133	4,355	993

Table 29. Summary of TRAWL GEAR ('05') sea sample data for summer flounder by NAFO division and quarter for 1992: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout database days fished on trips landing any summer flounder (WO DF), estimate of landings calculated from sea sampling kept rates and NEFSC weighout database days fished (SS EST LAND MT), landings as recorded in the NEFSC weighout database (WO LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO DF	SS EST LAND MT	WO LAND MT	SS EST DISC MT
51	1	0	0	0	39	0	<1	0
	2	0	0	0	80	0	2	0
	3	0	0	0	35	0	1	0
	4	1	17	<1	225	4	5	0
52	1	4	427	26	441	188	107	12
	2	1	85	<1	1476	126	112	1
	3	0	11	<1	397	5	11	0
	4	1	11	<1	622	7	72	0
53	1	13	157	11	823	129	386	9
	2	1	21	<1	1836	38	215	1
	3	1	<1	<1	1603	<1	311	0
	4	7	236	13	1561	368	367	20
61	1	16	313	17	757	237	333	13
	2	2	169	36	1350	228	306	49
	3	1	1009	23	954	961	417	22
	4	5	130	6	558	73	208	3
62	1	13	350	23	1589	556	709	37
	2	3	150	71	657	99	88	47
	3	6	502	164	782	392	724	127
	4	4	606	131	925	561	610	121
63	1	4	420	90	491	206	192	44
	2	0	150	71	34	5	1	2
	3	0	502	164	1	1	<1	0
	4	2	381	7	912	347	597	7
TOTAL/ MEAN		85	300	38	18148	4532	5776	517

Table 30. Summary of SCALLOP DREDGE ('13') sea sample data for summer flounder by NAFO division and quarter for 1992: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout database days fished on trips landing any summer flounder (WO DF), estimate of landings calculated from sea sampling kept rates and NEFSC weighout database days fished (SS EST LAND MT), landings as recorded in the NEFSC weighout database (WO LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO DF	SS EST LAND MT	WO LAND MT	SS EST DISC MT
51	1	0	0	0	3	0	<1	0
	2	0	0	0	5	0	<1	0
	3	0	0	0	2	0	<1	0
	4	0	0	0	20	0	<1	0
52	1	0	232	0	961	223	4	0
	2	3	29	<1	1845	53	6	0
	3	1	22	0	443	10	1	0
	4	0	34	10	1079	36	11	11
53	1	1	232	<1	38	9	<1	0
	2	0	29	<1	6	<1	<1	0
	3	1	37	<1	8	<1	<1	0
	4	0	34	10	294	10	17	3
61	1	1	137	<1	1749	239	33	1
	2	0	11	17	909	10	9	15
	3	0	37	<1	152	6	<1	0
	4	1	34	10	1342	45	56	14
62	1	1	75	129	1000	75	45	129
	2	1	11	17	691	8	7	12
	3	0	37	<1	22	<1	<1	0
	4	0	34	10	1480	50	63	15
63	1	1	93	129	224	21	13	29
	2	0	11	17	281	3	4	5
	3	0	0	0	0	0	0	0
	4	0	34	10	283	10	12	3
TOTAL/ MEAN		11	47	3	12837	811	290	237

Table 31. Summary of TRAWL GEAR ('05') sea sample data for summer flounder by NAFO division and quarter for 1993: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout database days fished on trips landing any summer flounder (WO DF), estimate of landings calculated from sea sampling kept rates and NEFSC weighout database days fished (SS EST LAND MT), landings as recorded in the NEFSC weighout database (WO LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO DF	SS EST LAND MT	WO LAND MT	SS EST DISC MT
51	1	0	0	0	77	0	<1	0
	2	0	12	4	58	0	8	0
	3	0	0	0	78	0	3	0
	4	1	<1	55	9	0	<1	0
52	1	4	1018	44	836	851	204	37
	2	3	12	4	1024	13	38	4
	3	0	21	6	390	8	8	2
	4	2	21	6	143	3	24	1
53	1	9	429	58	857	368	344	49
	2	5	105	2	1687	176	109	3
	3	2	143	26	1541	220	304	40
	4	8	121	7	1093	132	138	7
61	1	7	534	48	576	308	393	28
	2	3	29	23	1147	34	181	26
	3	0	526	63	514	274	266	32
	4	2	526	63	114	60	42	7
62	1	1	52	3	1503	78	811	5
	2	0	52	3	601	31	98	2
	3	4	646	177	1120	724	298	200
	4	3	693	55	488	338	411	26
63	1	0	52	3	123	6	63	1
	2	0	52	3	6	<1	<1	0
	3	0	646	177	3	2	<1	1
	4	2	604	18	324	196	131	6
TOTAL/ MEAN		56	368	29	14312	3823	3878	477

Table 32. Summary of SCALLOP DREDGE ('13') sea sample data for summer flounder by NAFO division and quarter for 1993:number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout database days fished on trips landing any summer flounder (WO DF), estimate of landings calculated from sea sampling kept rates and NEFSC weighout database days fished (SS EST LAND MT), landings as recorded in the NEFSC weighout database (WO LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO DF	SS EST LAND MT	WO LAND MT	SS EST DISC MT
51	1	0	0	0	0	0	0	0
	2	0	0	0	18	0	0	0
	3	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0
52	1	1	32	<1	141	4	1	0
	2	3	31	5	1401	44	6	7
	3	0	31	5	109	3	0	1
	4	1	140	61	28	4	0	2
53	1	0	32	<1	61	2	<1	0
	2	0	31	5	32	1	<1	0
	3	0	31	5	3	0	0	0
	4	1	56	9	22	1	5	0
61	1	2	22	16	798	18	16	13
	2	4	12	20	1013	12	9	20
	3	0	<1	15	155	0	0	2
	4	2	97	13	122	12	6	2
62	1	2	88	335	515	46	39	173
	2	2	1	62	295	0	4	18
	3	1	<1	15	12	0	0	0
	4	0	97	13	311	30	9	4
63	1	0	88	335	243	21	13	81
	2	0	1	62	255	<1	4	16
	3	0	0	0	0	0	0	0
	4	0	97	13	101	10	3	1
TOTAL/ MEAN		19	11	10	5635	209	117	340

Table 33. Summary of TRAWL GEAR ('05') sea sample data for summer flounder by NAFO division and quarter for 1994:number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout (WO, quarter 1) and vessel trip report (VTR, quarter 2-4) database prorated days fished on trips landing any summer flounder (WO/VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC WO (quarter 1) and VTR (quarter 2-4) database days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC WO and dealer (DEAL, quarter 2-4) database (WO/DEAL LAND MT), an interim step sea sampling estimate of discard in mt (SS EST DISC 1), a raising factor to account for fishing effort and discards which occur with landings (NO KEPT RATIO), and the raised sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO/VTR DF	SS EST LAND MT	WO/DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	0	0	40	0	0	0	1.0	0
	2	0	0	0	73	0	7	0	1.0	0
	3	0	0	0	6	0	2	0	1.0	0
	4	0	0	0	0	0	0	0	1.0	0
52	1	2	9	6	526	5	217	3	1.0	3
	2	5	165	3	163	27	14	1	1.0	1
	3	0	165	3	378	62	13	1	2.8	3
	4	1	<1	14	4	0	1	0	2.8	0
53	1	10	756	40	924	698	460	37	1.0	37
	2	0	165	3	819	135	234	3	1.1	3
	3	2	387	5	1337	517	371	6	1.0	6
	4	8	167	20	678	113	205	14	1.0	14
61	1	12	380	31	737	280	487	23	1.0	23
	2	0	380	31	1497	569	406	46	1.0	46
	3	1	278	7	603	168	460	4	1.1	4
	4	4	50	23	611	31	188	14	1.0	14
62	1	7	1538	77	1437	2211	1016	111	1.0	111
	2	1	845	177	419	354	96	74	1.1	78
	3	5	241	36	189	45	130	7	1.0	7
	4	2	530	103	500	265	184	51	1.0	51
63	1	1	1538	77	73	112	41	6	1.0	6
	2	0	845	177	38	32	8	7	1.2	8
	3	0	241	36	1	0	0	0	1.0	0
	4	5	451	27	519	234	250	14	1.0	14
TOTAL/ MEAN		66	240	18	11572	5858	4790	422	1.0	429

Table 34. Summary of SCALLOP DREDGE ('13') sea sample data for summer flounder by NAFO division and quarter for 1994: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC weighout (WO, quarter 1) and vessel trip report (VTR, quarter 2-4) database prorated days fished on trips landing any summer flounder (WO/VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC WO (quarter 1) and VTR (quarter 2-4) database days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC WO and dealer (DEAL, quarter 2-4) database (WO/DEAL LAND MT), an interim step sea sampling estimate of discard in mt (SS EST DISC 1), a raising factor to account for fishing effort and discards which occur with landings (NO KEPT RATIO), and the raised sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	WO/VTR DF	SS EST LAND MT	WO/DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	0	0	0	0	0	0	1.0	0
	2	0	0	0	0	0	0	0	1.0	0
	3	0	0	0	0	0	0	0	1.0	0
	4	0	0	0	0	0	0	0	1.0	0
52	1	0	25	37	211	5	1	8	5.0	39
	2	1	25	37	318	8	<1	12	5.0	58
	3	1	<1	36	0	0	0	0	1.0	0
	4	1	<1	64	0	0	0	0	1.0	0
53	1	0	25	37	37	1	<1	1	1.0	1
	2	0	25	37	0	0	1	0	1.0	0
	3	0	<1	36	0	0	1	0	1.0	0
	4	1	<1	58	0	0	1	0	1.0	0
61	1	5	4	59	445	2	6	26	1.0	26
	2	1	<1	66	2282	1	2	151	1.2	186
	3	0	0	0	0	0	0	0	1.0	0
	4	1	110	<1	175	19	11	0	1.0	0
62	1	4	4	126	1031	4	65	130	1.0	130
	2	3	1	35	386	1	4	13	2.5	34
	3	0	0	0	0	0	0	0	1.0	0
	4	0	110	<1	701	77	41	1	1.4	1
63	1	2	42	111	531	23	30	59	1.4	83
	2	0	1	35	678	1	9	24	1.4	33
	3	0	0	0	0	0	0	0	1.0	0
	4	0	110	<1	35	4	4	0	10.3	0
TOTAL/ MEAN		20	3	44	6830	146	178	425	1.4	591

Table 35. Summary of TRAWL GEAR ('05') sea sample data for summer flounder by NAFO division and quarter for 1995: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	3	<1	14	52	<1	<1	1	1.0	1
	2	1	<1	2	97	<1	5	0	1.0	0
	3	0	25	<1	23	1	6	<1	1.0	<1
	4	0	<1	45	11	0	0	0	1.0	0
52	1	6	735	3	438	322	201	1	1.0	1
	2	4	97	21	313	30	25	6	1.0	6
	3	1	25	<1	81	2	3	0	1.0	0
	4	1	<1	45	1	0	<1	0	1.0	0
53	1	3	1245	1	1111	1380	431	1	1.0	1
	2	5	293	6	1180	346	184	7	1.1	8
	3	9	494	1	1429	706	423	2	1.0	2
	4	9	213	2	822	175	326	1	1.0	1
61	1	10	1304	27	951	1229	869	25	1.0	25
	2	14	93	9	807	75	292	7	1.0	7
	3	20	27	7	945	26	319	7	1.0	7
	4	13	118	7	552	65	190	4	1.0	4
62	1	12	1047	32	847	882	748	27	1.0	27
	2	12	141	6	204	29	70	1	1.0	1
	3	25	104	31	209	22	71	6	1.0	6
	4	8	399	30	629	251	341	19	1.0	19
63	1	3	621	68	100	68	114	7	1.0	7
	2	1	1005	5	23	23	9	<1	1.0	<1
	3	0	0	0	0	0	0	0	1.0	0
	4	2	703	16	314	221	190	5	1.0	5
TOTAL/ MEAN		162	140	8	11139	5855	4819	129		130

Table 36. Summary of SCALLOP DREDGE ('13') sea sample data for summer flounder by NAFO division and quarter for 1995: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	0	0	1	0	<1	0	1.0	0
	2	0	0	0	0	0	0	0	1.0	0
	3	0	0	0	0	0	0	0	1.0	0
	4	1	38	<1	0	0	0	0	1.0	0
52	1	1	29	<1	14	<1	<1	0	1.0	0
	2	0	<1	126	0	0	0	0	1.0	0
	3	1	<1	33	4	0	0	0	1.0	0
	4	2	0	75	0	0	1	0	1.0	0
53	1	0	29	<1	191	6	0	0	1.0	0
	2	1	<1	126	<1	0	0	0	1.0	0
	3	0	0	0	0	0	0	0	1.0	0
	4	0	<1	76	5	0	0	<1	1.0	<1
61	1	8	16	21	496	8	9	10	1.2	12
	2	5	9	38	472	4	3	18	1.5	27
	3	0	7	112	45	0	0	5	1.0	5
	4	2	7	112	411	3	18	46	1.6	74
62	1	6	5	61	654	3	34	40	1.3	51
	2	3	3	55	257	1	4	14	2.3	33
	3	0	0	0	0	0	0	0	1.0	0
	4	1	30	<1	345	10	9	0	1.0	0
63	1	0	5	61	55	0	11	3	1.3	4
	2	1	<1	29	65	0	1	2	2.3	4
	3	0	0	0	0	0	0	0	1.0	0
	4	0	30	<1	13	0	0	0	1.0	0
TOTAL/ MEAN		32	5	25	3029	36	92	139		212

Table 37. Summary of TRAWL GEAR ('05') sea sample data for summer flounder by NAFO division and quarter for 1996: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	12	38	1	0	1	0	1.0	0
	2	0	32	4	55	2	2	0	1.0	0
	3	0	242	7	36	9	4	<1	3.0	<1
	4	0	0	0	0	0	0	0	3.0	0
52	1	3	12	38	189	2	87	7	1.0	7
	2	1	32	4	981	31	105	4	1.0	4
	3	0	242	7	229	55	13	2	3.9	6
	4	0	0	0	0	0	0	0	3.0	0
53	1	0	2051	87	750	1539	411	65	1.0	65
	2	14	156	2	1030	160	236	2	1.0	2
	3	9	242	7	1898	459	348	13	1.0	13
	4	5	4	106	329	1	23	35	1.6	56
61	1	4	2051	87	937	1922	469	81	1.0	91
	2	11	143	12	561	82	210	7	1.0	7
	3	21	99	5	968	96	439	5	1.0	5
	4	16	1	37	98	0	25	4	1.6	6
62	1	4	688	45	619	426	611	28	1.0	28
	2	12	19	25	117	2	50	3	1.0	3
	3	9	183	13	164	30	261	2	1.0	2
	4	9	30	53	326	10	268	17	1.0	17
63	1	1	1307	124	84	110	72	10	1.0	10
	2	2	1964	54	23	46	28	1	1.0	1
	3	1	<1	6	2	0	0	0	1.0	0
	4	0	30	53	10	0	15	1	1.0	1
TOTAL/ MEAN		122	36	12	9407	4982	3678	288		319

Table 38. Summary of SCALLOP DREDGE ('13') sea sample data for summer flounder by NAFO division and quarter for 1996: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	0	0	0	0	0	0	1.0	0
	2	0	0	0	0	0	0	0	1.0	0
	3	0	0	0	0	0	0	0	1.0	0
	4	0	0	0	0	0	0	0	1.0	0
52	1	0	0	0	0	0	0	0	1.0	0
	2	9	<1	68	43	0	0	3	2.0	6
	3	0	0	0	0	0	0	0	1.0	0
	4	0	0	0	0	0	0	0	1.0	0
53	1	0	0	0	0	0	0	0	1.0	0
	2	0	0	0	0	0	0	0	1.0	0
	3	0	0	0	0	0	0	0	1.0	0
	4	0	0	0	0	0	0	0	1.0	0
61	1	5	23	44	95	2	5	4	2.0	9
	2	6	2	46	51	<1	0	2	9.5	22
	3	6	1	67	0	0	0	<1	2.3	<1
	4	0	0	0	0	0	0	0	1.0	0
62	1	3	93	85	116	11	10	10	1.8	18
	2	3	1	56	115	<1	7	6	7.3	46
	3	0	0	0	0	0	0	0	1.0	0
	4	1	<1	11	393	<1	6	4	1.0	4
63	1	2	201	126	131	26	12	16	1.8	30
	2	0	0	0	0	0	0	0	1.0	0
	3	0	0	0	0	0	0	0	1.0	0
	4	0	0	0	0	0	0	0	1.0	0
TOTAL/ MEAN		35	2	53	944	42	40	46		135

Table 39. Summary of TRAWL GEAR ('05') sea sample data for summer flounder by NAFO division and quarter for 1997: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	48	7	1	0	0	0	1.2	0
	2	0	14	<1	38	0	6	0	1.0	0
	3	0	85	22	24	2	10	1	1.6	1
	4	0	<1	36	3	0	0	0	5.1	1
52	1	5	48	7	285	14	29	2	1.0	2
	2	1	14	<1	253	4	10	0	1.0	0
	3	0	85	22	135	11	6	3	1.0	3
	4	0	<1	36	19	0	0	1	1.1	1
53	1	14	131	15	852	112	306	13	1.0	13
	2	9	66	5	1293	85	286	6	1.0	6
	3	0	85	22	1223	104	348	27	1.0	27
	4	0	<1	36	769	0	58	27	1.1	30
61	1	20	81	11	1027	83	385	11	1.0	11
	2	2	396	25	739	293	245	18	1.0	18
	3	8	85	22	584	50	287	13	1.0	13
	4	1	<1	36	367	0	29	13	1.2	16
62	1	6	182	55	185	34	113	10	1.0	10
	2	0	396	25	187	74	109	5	1.0	5
	3	0	85	22	139	12	153	3	1.0	3
	4	0	<1	416	201	0	286	83	1.0	86
63	1	3	2578	56	684	1761	1279	38	1.2	45
	2	0	396	25	17	7	13	1	1.0	1
	3	0	85	22	5	0	0	0	1.0	0
	4	1	<1	416	17	0	11	7	1.0	7
TOTAL/ MEAN		70	44	10	9047	2646	3969	282		299

Table 40. Summary of SCALLOP DREDGE ('13') sea sample data for summer flounder by NAFO division and quarter, for 1997: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	2	1	34	0	0	0	0	1.0	0
	2	0	1	34	0	0	0	0	3.1	0
	3	0	9	19	0	0	0	0	4.5	0
	4	0	9	19	0	0	0	0	1.0	0
52	1	0	1	34	0	0	0	0	1.0	0
	2	5	1	65	148	0	0	10	3.1	30
	3	0	9	19	15	0	0	0	4.5	0
	4	0	9	19	0	0	0	0	1.0	0
53	1	0	1	34	0	0	0	0	1.0	0
	2	0	1	65	9	0	0	1	1.0	1
	3	0	9	19	0	0	0	0	1.0	0
	4	0	9	19	0	0	0	0	1.0	0
61	1	7	5	67	244	1	3	16	1.0	16
	2	4	11	43	857	10	15	37	1.2	43
	3	3	9	19	0	0	0	0	4.5	0
	4	0	9	19	563	5	6	11	1.5	16
62	1	4	8	58	16	0	0	1	1.0	1
	2	2	1	27	30	0	1	1	1.2	1
	3	0	9	19	0	0	0	0	4.5	0
	4	0	9	19	46	1	0	0	1.0	0
63	1	0	8	58	0	0	0	0	1.0	0
	2	0	1	27	0	0	0	0	3.1	0
	3	0	9	19	0	0	0	0	4.5	0
	4	0	9	19	0	0	0	0	1.0	0
TOTAL/ MEAN		27	2	39	1928	17	25	77		108

Table 41. Summary of TRAWL GEAR ('05') sea sample data for summer flounder by NAFO division and quarter for 1998: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	45	7	21	1	3	4	1.0	4
	2	0	180	<1	204	37	8	3	1.0	3
	3	0	42	22	6	0	6	2	1.4	3
	4	0	10	36	1	0	0	0	13.4	0
52	1	2	45	7	134	6	30	21	1.0	21
	2	0	180	<1	449	81	35	6	1.6	9
	3	2	42	22	42	2	6	11	1.0	12
	4	0	10	36	140	1	1	4	1.0	4
53	1	8	287	15	1281	368	365	24	1.0	24
	2	4	180	5	1354	243	345	16	1.0	16
	3	0	237	22	1299	308	286	9	1.1	10
	4	0	10	36	1078	11	40	29	1.3	36
61	1	10	159	11	743	118	374	22	1.0	22
	2	2	351	25	731	257	235	15	1.0	15
	3	1	237	22	1037	245	335	8	1.0	8
	4	19	10	36	324	3	45	8	1.3	11
62	1	9	123	55	518	64	530	5	1.0	5
	2	2	463	25	370	171	131	27	1.0	27
	3	0	237	22	184	44	200	1	1.0	1
	4	0	10	416	441	5	353	11	1.0	11
63	1	4	1471	56	1091	1604	963	56	1.0	56
	2	0	351	25	54	19	22	1	1.0	1
	3	0	237	22	28	7	6	0	1.6	0
	4	0	10	416	715	7	715	19	1.0	19
TOTAL/ MEAN		63	59	18	12245	3602	5034	302		318

Table 42. Summary of SCALLOP DREDGE ('13') sea sample data for summer flounder by NAFO division and quarter for 1998: number of sea sampling trips (SSTRIPS; trips in more than one statistical area are split) kept and discard rates (K_DF, D_DF; kg per day fished), NEFSC vessel trip report (VTR) database prorated days fished on trips landing any summer flounder (VTR DF), estimate of landings calculated from sea sampling kept rates and NEFSC VTR database prorated days fished (SS EST LAND MT), prorated landings as recorded in the NEFSC dealer (DEAL) database (DEAL LAND MT), and the sea sampling estimate of discard in mt (SS EST DISCARD).

DIV	QTR	SSTRIPS	K_DF	D_DF	VTR DF	SS EST LAND MT	DEAL LAND MT	SS EST DISC 1	NO KEPT RATIO	SS EST DISC MT
51	1	0	1	22	0	0	0	0	1.0	0
	2	0	1	22	0	0	0	0	1.5	0
	3	0	1	56	0	0	0	0	1.0	0
	4	0	1	44	0	0	0	0	6.6	0
52	1	0	1	22	16	0	1	1	1.0	1
	2	1	1	22	228	0	1	5	1.5	8
	3	2	1	56	0	0	0	0	1.0	0
	4	4	1	44	0	0	0	0	6.6	0
53	1	0	1	22	0	0	2	0	1.0	0
	2	0	1	22	54	0	2	1	1.0	1
	3	0	1	56	0	0	0	0	1.0	0
	4	0	1	44	0	0	1	0	1.0	0
61	1	0	23	90	158	4	3	14	1.3	19
	2	3	14	20	379	5	6	7	2.2	16
	3	3	46	31	173	8	3	5	3.7	19
	4	5	92	9	113	10	2	1	1.0	1
62	1	1	23	90	240	5	8	22	1.0	22
	2	5	4	16	320	1	4	5	1.0	5
	3	0	46	31	662	30	2	21	1.0	21
	4	1	2	81	165	1	4	13	1.0	13
63	1	0	23	90	437	10	7	40	1.1	42
	2	0	4	16	77	1	1	1	1.0	1
	3	0	46	31	0	0	0	0	1.0	0
	4	0	2	81	0	0	3	0	1.0	0
TOTAL/ MEAN		25	5	21	3022	75	50	136		169

Table 43. Summary of exercise to raise commercial fishery discard estimates (mt) based on NER sea sample (SS) and weighout (WO) and dealer (DEAL) data to account for discard by the General Canvas (GC) and North Carolina winter trawl fishery (NC) components of the commercial fishery, which are not sampled by the NER systems. NC EEZ landings calculated as mean EEZ proportion for 1989-1991 (0.778).

		A	B	C	D = B+C	E = D/A	F	E*F
Year	Gear	SS WO mt	WO+GC mt	NC EEZ mt			SS Discard mt	Raised discard mt
1989	All	5,817	6,212	1,813	8,025	1.380	642	886
1990	All	2,749	2,964	755	3,719	1.353	1,121	1,517
1991	All	4,355	4,644	1,123	5,767	1.324	993	1,315
1992	Trawl	5,776	6,077	909	6,986	1.209	517	625
	Scallop	284	284	0	284	1.000	237	237
	ALL	6,060	6,361	909	7,270		754	862
1993	Trawl	3,878	4,266	1,021	5,286	1.363	477	650
	Scallop	117	140	0	140	1.197	340	407
	All	3,995	4,406	1,021	5,426		817	1,057

Table 43 continued.

Year	Gear	A SS WO mt	B WO+GC mt	C NC EEZ mt	D = B+C	E = D/A	F SS Discard mt	E*F Raised discard mt
1994	Trawl	4,790	4,791	1,260	6,051	1.263	429	542
	Scallop	178	178	0	178	1.000	590	590
	ALL	4,968	4,969	1,260	6,229		1019	1132
1995	Trawl	4,819	4,819	1,607	6,426	1.333	130	173
	Scallop	92	92	0	92	1.000	212	212
	All	4,911	4,911	1,607	6,518		342	385
1996	Trawl	3,678	3,817	1,301	5,118	1.392	319	444
	Scallop	40	40	0	40	1.000	135	135
	All	3,718	3,857	1,301	5,158		454	579
1997	No	Raising	Needed					
1998	No	Raising	Needed					

Table 44. Summary of Northeast Region sea sample data to estimate summer flounder discard at age in the commercial fishery. Estimates developed using sea sample length samples, age-length data, and estimates of total discard in mt. An 80% discard mortality rate is assumed. 1995-98 lengths converted to age using 1995-98 NEFSC trawl survey ages.\ N/a = not available.

Year	Gear	Lengths	Ages	Sea Sample Discard Estimate (mt)	Sampling Intensity (mt per 100 lengths)	Raised Discard Estimate (mt)	Raised Estimate with 80% mortality rate (mt)
1989	All	2,337	54	642	27	886	709
1990	All	3,891	453	1,121	29	1,517	1,214
1991	All	5,326	190	993	19	1,315	1,052
1992	All	9,626	331	755	8	862	690
1993	All	3,410	406	817	24	1,057	846
1994	Trawl	2,338	---	429	18	542	434
	Scallop	660	---	590	89	590	472
	All	2,998	354	1,019	34	1,132	906
1995	Trawl	1,822	---	130	7	173	138
	Scallop	731	---	212	29	212	170
	All	2,553	n/a	342	13	385	308
1996	Trawl	1,873	---	319	17	444	355
	Scallop	854	---	135	16	135	108
	All	2,727	n/a	454	17	579	463
1997	Trawl	839		299	36	299	239
	Scallop	556		108	19	108	86
	All	1,395	n/a	407	29	407	326
1998	Trawl	721		318	44	318	254
	Scallop	150		169	113	169	135
	All	871	n/a	487	56	487	389

Table 45. Estimated summer flounder discard at age, mean length at age, and mean weight at age in the in the commercial fishery. 1995-98 lengths converted to age using 1995-98 NEFSC trawl survey ages. Includes assumed 80% discard mortality rate.

Discard numbers at age (000s)

Year	Gear	0	1	2	3+	Total
1989	All	775	1,628	94	0	2,497
1990	All	1,441	2,755	67	0	4,263
1991	All	891	3,424	<1	0	4,315
1992	All	1,155	1,544	36	3	2,738
1993	All	1,041	1,532	179	1	2,753
1994	Trawl	571	1,014	95	0	1,680
	Scallop	0	663	398	36	1,098
	All	571	1,677	493	36	2,778
1995	Trawl	141	294	58	2	495
	Scallop	0	114	148	20	282
	All	141	408	206	22	777
1996	Trawl	23	417	167	56	663
	Scallop	<1	221	72	5	298
	All	23	638	239	61	961
1997	Trawl	8	215	203	50	476
	Scallop	0	34	98	22	154
	All	8	249	301	72	630
1998	Trawl	26	132	146	95	399
	Scallop	1	42	73	52	168
	All	27	174	219	157	567

Discard mean length (cm) at age

Year	Gear	0	1	2	3+	All
1989	All	25.9	31.5	44.2		30.2
1990	All	29.0	31.7	38.9		30.9
1991	All	24.0	30.9	37.0		29.5
1992	All	29.3	30.0	36.6	51.2	29.8
1993	All	30.0	32.5	34.8	55.0	31.7
1994	Trawl	26.0	31.3	34.5		29.7
	Scallop		30.8	38.2	52.1	34.2
	All	26.0	31.1	37.5	52.1	31.5
1995	Trawl	29.6	29.4	37.0	50.9	30.4
	Scallop		30.7	40.6	52.4	37.4
	All	29.6	29.8	39.6	52.5	33.0
1996	Trawl	28.9	32.0	38.1	55.8	35.5
	Scallop	31.4	30.7	38.2	48.5	32.8
	All	29.0	31.6	38.1	55.2	34.7
1997	Trawl	26.9	32.1	37.8	46.6	36.0
	Scallop		32.5	37.2	45.9	37.5
	All	26.9	32.2	37.6	46.3	36.4
1998	Trawl	26.0	32.5	37.5	48.3	37.7
	Scallop	30.0	35.0	39.7	48.9	41.3
	All	26.1	33.1	38.2	48.5	38.8

Table 45 continued.

Discard mean weight (kg) at age

Year	Gear	0	1	2	3+	All
1989	All	0.182	0.296	0.909		0.284
1990	All	0.235	0.304	0.559		0.285
1991	All	0.124	0.275	0.491		0.244
1992	All	0.238	0.256	0.498	1.450	0.252
1993	All	0.253	0.332	0.413		0.307
1994	Trawl	0.177	0.291	0.392		0.258
	Scallop		0.287	0.565	1.565	0.430
	All	0.177	0.289	0.532	1.565	0.326
1995	Trawl	0.244	0.242	0.522	1.505	0.280
	Scallop		0.281	0.702	1.604	0.595
	All	0.244	0.253	0.651	1.597	0.395
1996	Trawl	0.226	0.312	0.586	2.004	0.521
	Scallop	0.305	0.274	0.572	1.254	0.363
	All	0.227	0.299	0.582	1.937	0.472
1997	Trawl	0.178	0.327	0.560	1.088	0.504
	Scallop		0.331	0.553	1.044	0.558
	All	0.178	0.328	0.558	1.075	0.517
1998	Trawl	0.158	0.332	0.533	1.346	0.637
	Scallop	0.247	0.421	0.651	1.357	0.808
	All	0.161	0.353	0.572	1.350	0.688

Table 46. Estimated total landings (catch types A + B1, [000s]) of summer flounder by recreational fishermen. SHORE mode includes fish taken from beach/bank and man-made structures. P/C indicates catch taken from party/charter boats, while P/R indicates fish taken from private/rental boats.

	YEAR										
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
North											
Shore	167	144	62	10	70	39	42	4	16	9	26
P/C	138	201	5	3	48	7	1	1	1	8	1
P/R	1,293	747	568	382	2,562	648	379	137	99	173	211
TOTAL	1,598	1,092	635	395	2,680	694	422	142	116	190	238
Mid											
Shore	682	3,296	977	272	478	251	594	84	96	505	200
P/C	5,745	3,321	2,381	1,068	1,541	1,143	1,164	141	412	589	374
P/R	5,731	12,345	11,764	8,454	5,924	5,499	7,271	1,141	2,658	4,573	3,983
TOTAL	12,158	18,962	15,122	9,794	7,943	6,893	9,029	1,366	3,166	5,667	4,557
South											
Shore	272	523	316	504	689	115	306	91	150	51	50
P/C	53	52	110	81	20	1	1	1	1	1	1
P/R	1,392	367	1,292	292	289	162	355	117	361	159	156
TOTAL	1,717	942	1,718	877	998	278	662	209	512	211	207
All											
Shore	1,121	3,963	1,355	786	1,237	405	942	179	262	565	276
P/C	5,936	3,574	2,496	1,152	1,609	1,151	1,166	143	414	598	376
P/R	8,416	13,459	13,624	9,128	8,775	6,309	8,005	1,395	3,118	4,905	4,350
TOTAL	15,473	20,996	17,475	11,066	11,621	7,865	10,113	1,717	3,794	6,068	5,002

Table 46 continued.

	YEAR					
	1993	1994	1995	1996	1997	1998
North						
Shore	36	49	19	22	27	43
P/C	10	24	6	7	22	26
P/R	250	596	449	717	669	983
TOTAL	296	669	474	746	718	1,052
Mid						
Shore	176	195	175	137	195	241
P/C	872	773	267	1,167	907	330
P/R	3,969	4,372	2,312	4,999	5,059	4,945
TOTAL	5,017	5,340	2,754	6,303	6,161	5,516
South						
Shore	113	180	48	46	32	29
P/C	1	2	1	5	2	2
P/R	236	197	100	274	247	345
TOTAL	350	379	149	325	281	376
All						
Shore	325	424	242	205	254	313
P/C	883	799	274	1,179	931	358
P/R	4,455	5,165	2,861	5,990	5,975	6,273
TOTAL	5,663	6,388	3,377	7,374	7,160	6,944

Table 47. Estimated total landings (catch types A + B1, [mt]) of summer flounder by recreational fishermen. SHORE mode includes fish taken from beach/bank and man-made structures. P/C indicates catch taken from party/charter boats, while P/R indicates fish taken from private/rental boats.

	YEAR										
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
North											
Shore	87	59	17	7	25	21	32	2	16	6	20
P/C	85	87	4	2	45	4	<1	<1	<1	6	<1
P/R	875	454	388	328	2,597	582	289	141	89	150	175
TOTAL	1,047	600	409	337	2,667	607	322	144	106	162	196
Mid											
Shore	295	1,254	399	140	293	129	329	52	56	306	126
P/C	3,112	2,196	1,426	609	1,093	1,098	799	125	264	364	267
P/R	3,085	8,389	5,686	4,187	3,521	3,596	5,003	985	1,665	2,673	2,536
TOTAL	6,492	11,839	7,511	4,936	4,907	4,823	6,131	1,162	1,985	3,343	2,929
South											
Shore	87	134	98	230	425	34	113	57	76	25	25
P/C	12	12	23	20	7	1	<1	<1	<1	<1	<1
P/R	629	102	471	142	96	54	166	71	161	80	91
TOTAL	728	248	592	392	528	89	280	129	238	106	117
All											
Shore	469	1,447	514	377	743	184	474	111	148	337	171
P/C	3,209	2,295	1,453	631	1,145	1,103	801	127	266	371	269
P/R	4,589	8,945	6,545	4,657	6,214	4,232	5,458	1,197	1,915	2,903	2,802
TOTAL	8,267	12,687	8,512	5,665	8,102	5,519	6,733	1,435	2,329	3,611	3,242

Table 47 continued.

	YEAR					
	1993	1994	1995	1996	1997	1998
North						
Shore	25	30	14	15	17	56
P/C	7	14	5	13	17	23
P/R	181	424	371	531	445	847
TOTAL	213	468	390	559	479	926
Mid						
Shore	88	112	108	80	127	172
P/C	534	478	185	746	712	278
P/R	2,453	2,849	1,699	3,155	3,898	4,097
TOTAL	3,075	3,439	1,992	3,981	4,737	4,547
South						
Shore	59	100	29	24	18	18
P/C	<1	1	<1	2	1	1
P/R	136	103	84	138	143	191
TOTAL	196	204	114	164	162	210
All						
Shore	172	242	151	119	162	246
P/C	542	493	191	761	730	302
P/R	2,770	3,376	2,154	3,824	4,486	5,135
TOTAL	3,484	4,111	2,496	4,704	5,378	5,683

Table 48. Estimated summer flounder landings (catch types A + B1), live discard (catch type B2), and total catch (catch types A + B1 + B2) in numbers (000s), and live discard (catch type B2) as a proportion of total catch.

Year	A+B1	B2	A+B1+B2	B2 / (A+B1+B2)
1982	15,473	8,089	23,562	0.343
1983	20,996	11,066	32,062	0.345
1984	17,475	12,310	29,785	0.413
1985	11,066	2,460	13,526	0.182
1986	11,621	13,672	25,293	0.541
1987	7,865	13,159	21,024	0.626
1988	10,113	7,249	17,362	0.418
1989	1,717	960	2,677	0.359
1990	3,794	5,307	9,101	0.583
1991	6,068	10,007	16,075	0.623
1992	5,002	6,907	11,909	0.580
1993	5,663	14,321	19,984	0.717
1994	6,388	10,345	16,733	0.618
1995	3,377	12,860	16,237	0.792
1996	7,374	12,368	19,742	0.626
1997	7,160	12,860	20,020	0.642
1998	6,944	14,951	21,895	0.683

Table 49. Recreational fishery sampling intensity for summer flounder by subregion.

Year	Subregion	Landings (A+B1; mt)	Number of Summer Flounder Measured	mt/100 Lengths
1982	North	1,047	231	453
	Mid	6,492	2,896	224
	South	728	576	126
	TOTAL	8,267	3,703	223
1983	North	600	311	192
	Mid	11,839	4,712	251
	South	248	170	146
	TOTAL	12,687	5,193	244
1984	North	409	168	243
	Mid	7,511	2,195	342
	South	592	283	209
	TOTAL	8,512	2,646	322
1985	North	337	78	432
	Mid	4,936	1,934	255
	South	392	274	143
	TOTAL	5,665	2,286	248
1986	North	2,667	266	1,003
	Mid	4,907	1,808	271
	South	528	288	183
	TOTAL	8,102	2,362	343
1987	North	607	217	280
	Mid	4,823	1,897	254
	South	89	445	20
	TOTAL	5,519	2,559	216

Table 49 continued.

Year	Subregion	Landings (A+B1; mt)	Number of Summer Flounder Measured	mt/100 Lengths
1988	North	322	310	104
	Mid	6,131	2,865	214
	South	280	743	38
	TOTAL	6,733	3,918	172
1989	North	144	107	135
	Mid	1,162	1,582	73
	South	129	358	36
	TOTAL	1,435	2,047	70
1990	North	106	110	96
	Mid	1,985	2,667	74
	South	238	1,293	18
	TOTAL	2,329	4,070	57
1991	North	162	189	86
	Mid	3,343	4,648	72
	South	106	820	13
	TOTAL	3,611	5,657	64
1992	North	196	425	46
	Mid	2,929	4,504	65
	South	117	566	21
	TOTAL	3,242	5,495	59
1993	North	213	338	63
	Mid	3,075	4,174	74
	South	196	995	20
	TOTAL	3,484	5,507	63
1994	North	468	621	75
	Mid	3,439	3,834	90
	South	204	1,467	14
	TOTAL	4,111	5,922	69

Table 49 continued.

Year	Subregion	Landings (A+B1; mt)	Number of Summer Flounder Measured	mt/100 Lengths
1995	North	390	501	78
	Mid	1,992	1,470	136
	South	114	485	24
	TOTAL	2,496	2,456	102
1996	North	559	919	61
	Mid	3,981	3,373	118
	South	164	1,188	14
	TOTAL	4,704	5,480	86
1997	North	480	786	61
	Mid	4,736	2,988	159
	South	162	1,026	16
	TOTAL	5,378	4,800	112
1998	North	926	857	108
	Mid	4,547	3,205	142
	South	210	1,259	17
	TOTAL	5,683	5,321	107

Table 50. Estimated recreational landings at age of summer flounder (000s), (catch type A + B1).

	AGE									
Year	0	1	2	3	4	5	6	7	8	Total
1982	2,750	8,445	3,498	561	215	<1	4	0	0	15,473
1983	2,302	11,612	4,978	1,340	528	220	0	16	0	20,996
1984	2,282	9,198	4,831	1,012	147	5	<1	0	0	17,745
1985	1,002	5,002	4,382	473	148	59	0	0	0	11,066
1986	1,169	6,404	2,784	1,088	129	15	28	0	0	11,621
1987	466	4,674	2,083	448	182	1	5	0	0	7,865
1988	434	5,855	3,345	386	90	3	0	0	0	10,113
1989	74	539	946	135	16	2	5	0	0	1,717
1990	353	2,770	529	118	23	<1	1	0	0	3,794
1991	86	3,611	2,251	79	40	1	0	0	0	6,068
1992	82	3,183	1,620	90	<1	27	0	0	0	5,002
1993	71	3,470	1,981	139	<1	2	0	0	0	5,663
1994	765	3,872	1,549	171	26	<1	5	0	0	6,388
1995	235	1,557	1,426	117	26	16	<1	0	0	3,377
1996	115	3,093	3,664	372	129	1	0	0	0	7,374
1997	4	1,147	4,183	1,464	274	88	0	0	0	7,160
1998	0	760	2,901	2,704	513	63	3	0	0	6,944

Table 51. Estimated recreational fishery discard at age of summer flounder (catch type B2). Discards during 1982-1996 allocated to age groups in same relative proportions as ages 0 and 1 in the subregional catch. Discards during 1997-1998 allocated to age groups in same relative proportions as fish less than the annual minimum size at ages 0 to 3 in the subregional catch. All years assume 10% release mortality.

	Numbers at age					Metric Tons at age				
Year	0	1	2	3	Total	0	1	2	3	Total
1982	172	636	0	0	808	39	257	0	0	296
1983	175	932	0	0	1,107	31	345	0	0	376
1984	210	1,020	0	0	1,230	43	372	0	0	415
1985	40	206	0	0	246	10	82	0	0	92
1986	150	1,217	0	0	1,367	34	544	0	0	578
1987	106	1,210	0	0	1,316	24	498	0	0	522
1988	56	669	0	0	725	16	326	0	0	342
1989	13	83	0	0	96	3	42	0	0	45
1990	60	470	0	0	530	18	216	0	0	234
1991	24	977	0	0	1,001	6	423	0	0	429
1992	17	674	0	0	691	4	340	0	0	344
1993	22	1,410	0	0	1,432	6	730	0	0	736
1994	177	857	0	0	1,034	77	500	0	0	577
1995	170	1,116	0	0	1,286	72	642	0	0	714
1996	24	1,213	0	0	1,237	8	645	0	0	653
1997	18	752	495	21	1,286	4	296	206	9	515
1998	0	543	824	128	1,495	0	129	330	58	517

Table 52. Estimated recreational catch at age of summer flounder ('000; catch type A + B1 + B2). Includes catch type B2 (fish released alive) allocated to ages 0 and 1 (1982-1996) and ages 0 to 3 (1997-1998) with 10% release mortality.

	AGE									
Year	0	1	2	3	4	5	6	7	8	Total
1982	2,922	9,081	3,498	561	215	<1	4	0	0	16,281
1983	2,477	12,544	4,978	1,340	528	220	0	16	0	22,103
1984	2,492	10,218	4,831	1,012	147	5	<1	0	0	18,705
1985	1,042	5,208	4,382	473	148	59	0	0	0	11,312
1986	1,319	7,621	2,784	1,088	129	15	28	4	0	12,988
1987	572	5,884	2,083	448	182	1	5	6	0	9,181
1988	490	6,524	3,345	386	90	3	0	0	0	10,838
1989	87	622	946	135	16	2	5	0	0	1,813
1990	413	3,240	529	118	23	<1	1	0	0	4,324
1991	110	4,588	2,251	79	40	1	0	0	0	7,069
1992	99	3,857	1,620	90	<1	27	0	0	0	5,693
1993	93	4,880	1,981	139	<1	2	0	0	0	7,095
1994	942	4,729	1,549	171	26	<1	5	0	0	7,422
1995	405	2,673	1,426	117	26	16	<1	0	0	4,664
1996	139	4,306	3,664	372	129	1	0	0	0	8,611
1997	22	1,899	4,678	1,485	274	88	0	0	0	8,446
1998	0	1,303	3,725	2,832	513	63	3	0	0	8,439

Table 53. Mean weight (kg) at age of summer flounder catch in the recreational fishery.

	AGE									
Year	0	1	2	3	4	5	6	7	8	ALL
1982	0.22	0.40	0.57	1.33	1.84	1.89	2.98			0.46
1983	0.18	0.37	0.63	0.93	1.19	1.40				0.47
1984	0.21	0.36	0.62	0.97	1.77	2.20	4.17			0.45
1985	0.24	0.40	0.63	1.10	1.75	2.44				0.53
1986	0.23	0.45	0.75	1.29	1.74	2.72	3.48	5.96		0.58
1987	0.23	0.41	0.76	1.34	1.84	3.05	4.81	4.64		0.56
1988	0.29	0.49	0.71	1.11	1.92	2.32				0.58
1989	0.26	0.51	0.81	1.23	1.78	3.33	1.58			0.73
1990	0.30	0.46	0.97	1.44	1.68	2.90	6.46			0.54
1991	0.27	0.43	0.67	1.31	1.37	2.45				0.52
1992	0.23	0.50	0.72	1.62	2.28	3.34				0.59
1993	0.25	0.52	0.72	1.87	2.44	3.03				0.60
1994	0.44	0.58	0.69	1.44	1.92	2.83	3.90			0.61
1995	0.43	0.58	0.82	1.46	2.60	2.93	3.54			0.68
1996	0.34	0.53	0.62	1.34	1.34	2.36				0.61
1997	0.23	0.45	0.65	0.90	1.15	2.38				0.68
1998		0.41	0.61	0.81	1.26	2.51	2.79			0.70

Table 54. Total catch at age of summer flounder (000s), ME-NC. Note that total catch estimates have been revised since the SAW 25 assessment due to reduction of recreational fishery release mortality rate from 25% to 10%.

	AGE										
Year	0	1	2	3	4	5	6	7	8	9	Total
1982	5,344	19,423	10,149	935	328	116	67	26	4	0	36,392
1983	4,925	28,441	10,911	2,181	693	323	16	36	5	2	47,533
1984	4,802	26,582	15,454	3,180	829	95	4	5	1	4	50,956
1985	2,078	14,623	17,979	1,767	496	252	30	5	2	1	37,233
1986	1,942	17,140	11,055	3,782	316	140	58	12	3	0	34,448
1987	1,137	17,212	10,838	1,648	544	25	29	33	11	0	31,477
1988	795	20,557	14,562	2,137	644	121	19	15	6	0	38,856
1989	960	4,790	7,306	1,692	353	55	9	3	1	0	15,169
1990	1,856	8,808	2,187	995	221	30	8	2	1	0	14,108
1991	1,001	12,149	7,148	742	217	32	3	1	0	0	21,293
1992	1,368	11,197	6,026	1,125	151	70	2	1	0	0	19,940
1993	1,285	11,235	5,601	566	73	45	20	2	1	0	18,828
1994	1,638	10,362	6,996	982	205	26	14	0	5	0	20,227
1995	592	5,828	7,303	1,239	397	77	2	1	0	0	15,440
1996	162	6,925	9,278	1,785	417	71	16	1	3	0	18,658
1997	30	2,545	8,046	3,149	553	160	11	4	0	0	14,498
1998	45	2,220	6,354	5,228	978	137	18	1	0	0	14,981

Table 55. Mean length (cm) at age of summer flounder catch, ME-NC.

	AGE										
Year	0	1	2	3	4	5	6	7	8	9	ALL
1982	29.4	34.5	38.8	50.7	55.3	61.0	60.7	68.0	71.2		35.7
1983	28.8	34.5	40.9	46.5	48.8	51.6	60.7	60.9	69.3	72.0	36.3
1984	29.4	33.8	39.1	45.9	51.3	57.9	66.8	68.4	74.0	70.7	36.1
1985	30.6	34.8	38.8	46.8	53.9	58.6	61.5	74.5	73.3	75.0	37.5
1986	29.7	35.6	39.9	47.5	54.0	56.2	65.8	66.4	72.8		38.2
1987	29.9	35.3	39.7	46.9	55.8	63.3	65.9	63.2	73.5		37.7
1988	32.4	35.8	39.1	46.6	53.1	60.2	69.6	68.5	72.7		37.9
1989	27.1	35.7	40.8	45.5	50.6	58.5	59.1	63.1	59.0		39.1
1990	29.6	35.1	41.9	46.8	51.4	57.4	66.4	71.7	75.2		36.6
1991	24.8	34.5	40.4	47.1	54.3	61.0	61.7	68.1			36.7
1992	29.6	36.0	41.2	46.9	49.7	61.0	58.8	72.2			37.9
1993	30.3	36.5	40.6	50.4	52.9	54.7	62.6	70.6	75.5		37.9
1994	32.2	37.1	39.3	49.6	57.3	63.4	66.3		68.5		38.3
1995	33.7	37.1	39.9	44.9	52.4	62.2	70.5	71.9			39.4
1996	32.6	36.9	38.3	45.7	51.3	54.4	58.5	63.0	66.0		38.8
1997	28.5	36.2	39.8	43.4	48.3	58.1	60.8	66.3			40.4
1998	28.7	37.2	40.0	43.4	49.5	59.3	60.9	71.1			41.6

Table 56. Mean weight (kg) at age of summer flounder catch, ME-NC.

	AGE										
Year	0	1	2	3	4	5	6	7	8	9	ALL
1982	0.255	0.419	0.616	1.447	1.907	2.795	2.673	3.758	4.408	4.370	0.504
1983	0.243	0.419	0.716	1.075	1.257	1.495	2.572	2.594	3.849	4.030	0.521
1984	0.251	0.398	0.632	1.046	1.500	2.163	3.302	3.620	4.640	4.800	0.518
1985	0.290	0.429	0.613	1.109	1.726	2.297	2.671	4.682	4.780		0.575
1986	0.256	0.453	0.668	1.160	1.739	1.994	3.311	4.000	4.432		0.613
1987	0.263	0.446	0.651	1.140	1.941	2.855	3.326	3.314	4.140		0.581
1988	0.319	0.462	0.624	1.130	1.739	2.485	3.888	3.545	4.316		0.588
1989	0.207	0.459	0.723	1.044	1.479	2.249	2.399	2.861	2.251		0.668
1990	0.250	0.429	0.810	1.169	1.538	2.121	3.461	3.951	5.029		0.540
1991	0.140	0.404	0.702	1.186	1.811	2.527	2.837	3.586			0.537
1992	0.246	0.467	0.749	1.222	1.390	2.696	2.302	4.479			0.595
1993	0.264	0.480	0.699	1.461	1.659	1.859	2.816	4.136	5.199		0.571
1994	0.342	0.521	0.628	1.353	2.096	2.736	3.437		3.703		0.605
1995	0.375	0.527	0.678	1.056	1.639	2.628	3.750	4.047			0.675
1996	0.327	0.504	0.570	1.080	1.545	1.957	2.546	3.200	3.164		0.621
1997	0.212	0.452	0.639	0.866	1.233	2.252	2.572	3.429			0.697
1998	0.259	0.490	0.648	0.859	1.321	2.410	2.577	3.983			0.759

Table 57. NEFSC spring trawl survey (offshore strata) mean number summer flounder per tow: delta mean, and delta values fitted to an ARIMA model with theta value = 0.240. ***NOTE: 1999 index is from preliminary, unaudited data.***

YEAR	DELTA MEAN	FITTED MEAN	FITTED UPPER 95% ci	FITTED LOWER 95% ci
1968	0.15	0.15		
1969	0.19	0.17		
1970	0.09	0.13		
1971	0.22	0.23	0.39	0.13
1972	0.47	0.44	0.76	0.26
1973	0.75	0.75	1.29	0.44
1974	1.40	1.30	2.23	0.76
1975	1.98	1.89	3.24	1.10
1976	2.72	2.46	4.21	1.43
1977	2.82	2.51	4.30	1.46
1978	2.58	1.92	3.30	1.12
1979	0.40	0.73	1.25	0.43
1980	1.31	1.18	2.02	0.69
1981	1.50	1.46	2.51	0.85
1982	2.23	1.72	2.95	1.00
1983	0.95	1.08	1.85	0.63
1984	0.66	0.93	1.59	0.54
1985	2.38	1.80	3.08	1.05
1986	2.15	1.78	3.05	1.04
1987	0.93	1.11	1.91	0.65
1988	1.46	1.08	1.85	0.63
1989	0.32	0.51	0.87	0.30
1990	0.71	0.71	1.22	0.42
1991	1.11	1.01	1.73	0.59
1992	1.19	1.15	1.92	0.68
1993	1.26	1.17	1.96	0.70
1994	0.92	1.02	1.71	0.61
1995	1.09	1.15	1.92	0.69
1996	1.80	1.48	2.47	0.88
1997	1.06	1.18	1.98	0.71
1998	1.16	1.23	2.06	0.73
1999	1.57	1.46	2.59	0.82

Table 58. NEFSC spring trawl survey (offshore strata) mean weight (kg) of summer flounder per tow: delta values fitted to an ARIMA model with theta value = 0.240.
NOTE: 1999 index is from preliminary, unaudited data.

YEAR	DELTA MEAN	FITTED MEAN	FITTED UPPER 95% ci	FITTED LOWER 95% ci
1968	0.16	0.16		
1969	0.16	0.15		
1970	0.09	0.13		
1971	0.28	0.23	0.37	0.15
1972	0.21	0.26	0.42	0.17
1973	0.52	0.53	0.84	0.33
1974	1.27	1.08	1.72	0.68
1975	1.63	1.51	2.40	0.95
1976	1.94	1.77	2.81	1.12
1977	1.84	1.66	2.64	1.05
1978	1.50	1.22	1.94	0.77
1979	0.35	0.55	0.87	0.35
1980	0.79	0.73	1.16	0.46
1981	0.81	0.81	1.29	0.51
1982	1.15	0.91	1.45	0.58
1983	0.52	0.59	0.93	0.37
1984	0.38	0.51	0.81	0.32
1985	1.21	0.89	1.42	0.56
1986	0.85	0.76	1.20	0.48
1987	0.39	0.48	0.77	0.30
1988	0.66	0.51	0.81	0.32
1989	0.24	0.30	0.47	0.19
1990	0.27	0.30	0.47	0.19
1991	0.37	0.36	0.57	0.23
1992	0.45	0.43	0.67	0.28
1993	0.48	0.46	0.72	0.30
1994	0.46	0.47	0.73	0.31
1995	0.46	0.50	0.77	0.32
1996	0.68	0.63	0.97	0.40
1997	0.62	0.65	1.02	0.42
1998	0.77	0.77	1.21	0.50
1999	1.00	0.93	1.51	0.57

Table 59. NEFSC spring trawl survey (offshore strata 1-12, 61-76) stratified mean number of summer flounder per tow at age.
NOTE: 1999 indices are from preliminary, unaudited data.

	AGE										
Year	1	2	3	4	5	6	7	8	9	10	ALL
1976	0.03	1.70	0.68	0.28	0.01	0.01	0.01				2.72
1977	0.61	1.30	0.70	0.10	0.09	0.01		0.01			2.82
1978	0.70	0.95	0.66	0.19	0.04	0.03	0.03			0.02	2.62
1979	0.06	0.18	0.08	0.04	0.03			0.01			0.40
1980	0.01	0.71	0.31	0.14	0.02	0.06	0.03	0.02		0.01	1.31
1981	0.59	0.53	0.17	0.08	0.05	0.03	0.02	0.01			1.48
1982	0.69	1.41	0.12	0.02							2.24
1983	0.32	0.39	0.19	0.03	0.01				0.01		0.95
1984	0.17	0.33	0.09	0.05		0.01	0.01				0.66
1985	0.55	1.56	0.21	0.04	0.02						2.38
1986	1.49	0.43	0.20	0.02	0.01						2.15
1987	0.46	0.43	0.02	0.01							0.92
1988	0.59	0.79	0.07	0.02							1.47
1989	0.06	0.23	0.02	0.01							0.32
1990	0.62	0.03	0.06								0.71
1991	0.79	0.27		0.02							1.08
1992	0.76	0.41	0.01		0.01						1.19
1993	0.73	0.50	0.04								1.27
1994	0.35	0.53	0.04	0.01							0.93
1995	0.79	0.27	0.02				0.01				1.09
1996	1.08	0.56	0.12								1.76
1997	0.29	0.67	0.09	0.01							1.06
1998	0.27	0.52	0.32	0.06	0.01	0.01					1.19
1999	0.24	0.72	0.44	0.12	0.04	0.01					1.57

Table 60. NEFSC autumn trawl survey (inshore strata 1-61, offshore strata <= 55 m (1,5,9,61,65,69,73)) mean number of summer flounder per tow at age.

	AGE						
Year	0	1	2	3	4	5+	ALL
1982	0.55	1.52	0.40	0.03			2.50
1983	0.96	1.46	0.34	0.12	0.01	0.01	2.90
1984	0.18	1.39	0.43	0.07	0.01	0.01	2.09
1985	0.59	0.80	0.46	0.05		0.02	1.92
1986	0.39	0.83	0.11	0.11			1.44
1987	0.07	0.58	0.20	0.03	0.02		0.90
1988	0.06	0.62	0.18	0.03			0.89
1989	0.31	0.21	0.05				0.57
1990	0.44	0.38	0.03	0.04			0.89
1991	0.76	0.84	0.09		0.01		1.70
1992	0.99	1.04	0.25	0.03	0.01		2.32
1993	0.23	0.80	0.03	0.01			1.07
1994	0.75	0.67	0.09	0.01	0.01		1.53
1995	0.93	1.16	0.28	0.02	0.01		2.40
1996	0.11	1.24	0.57	0.04			1.96
1997	0.17	1.29	1.14	0.29	0.02	0.02	2.93
1998	0.38	2.13	1.63	0.33	0.04	0.01	4.52

Table 61. NEFSC Winter trawl survey (offshore strata 1-18, 61-76, Southern Georges Bank to Cape Hatteras): summer flounder catch number per tow. GB = Georges Bank, SNE = Southern New England, MAB = Middle Atlantic Bight. NS = not sampled.
NOTE: 1999 index is from preliminary, unaudited data.

Region, Stratum Number	Average Depth, 1998 (Fathoms)	1992	1993	1994	1995	1996	1997	1998	1999
GB									
13	42	0.29	0.11	2.43	2.44	0.43	0.33	2.11	1.20
14	78	0.00	5.67	22.00	2.00	4.25	2.33	10.50	8.00
15	121	NS	NS	NS	NS	NS	0.00	0.00	0.00
16	44	0.00	NS	0.00	0.00	0.50	0.00	0.00	0.43
17	80	NS	NS	NS	0.00	0.00	0.00	0.00	1.33
18	117	NS	NS	NS	NS	NS	NS	0.00	NS
SNE									
1	23	4.33	0.00	3.33	1.63	2.75	9.86	1.13	1.88
2	41	9.71	7.71	10.80	10.14	30.25	9.14	13.57	13.57
3	59	1.33	24.50	4.00	18.00	11.33	8.50	9.67	8.33
4	157	NS	NS	NS	1.00	NS	0.00	0.00	0.00
5	27	1.00	5.00	NS	1.00	0.00	9.80	0.00	2.25
6	40	10.11	3.22	11.40	3.00	8.40	5.67	6.44	10.25
7	65	5.50	13.67	5.00	18.00	13.50	3.50	6.33	9.67
8	150	NS	NS	NS	NS	NS	0.00	1.00	0.00
9	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
10	47	10.50	10.13	8.38	5.88	6.60	10.00	13.25	9.56
11	68	22.00	10.50	24.00	6.50	5.67	29.50	16.33	38.67
12	127	NS	NS	NS	NS	NS	0.00	0.00	0.00
MAB									
61	19	34.75	31.20	52.67	47.00	413.50	22.50	17.00	32.50
62	33	8.00	0.50	0.00	3.00	316.50	24.00	11.50	1.50
63	56	1.00	NS	3.50	0.00	100.50	15.50	17.67	3.67
64	174	NS	NS	NS	NS	NS	NS	39.00	NS
65	18	53.14	28.11	25.00	35.38	33.78	35.25	3.33	30.67
66	47	71.00	104.00	23.00	61.00	68.25	13.33	15.67	18.00
67	95	0.00	16.00	7.50	6.50	66.67	5.67	76.00	14.00
68	176	NS	NS	NS	NS	NS	NS	0.00	NS
69	21	10.50	14.50	12.80	12.00	16.33	8.50	28.00	16.13
70	38	13.50	57.00	38.25	31.75	29.60	10.50	6.50	31.50
71	62	2.50	6.50	6.00	9.50	10.00	4.50	8.67	7.00
72	198	NS	NS	NS	NS	NS	1.00	0.00	0.00
73	23	2.40	8.17	9.33	2.60	3.67	5.40	0.40	2.00
74	37	13.75	21.40	22.25	12.25	42.80	21.00	10.50	11.25
75	69	2.00	21.50	1.00	6.00	41.00	1.50	11.00	6.00
76	121	NS	0.00	NS	NS	NS	0.00	0.00	0.00

Table 62. NEFSC Winter trawl survey (offshore strata from 27-185 meters (15-100 fathoms): 1-3, 5-7, 9-11, 13-14, 16-17, 61-63, 65-67, 69-71, 73-75; Southern Georges Bank to Cape Hatteras), mean number, mean weight (kg), and mean number at age per tow.
Note: 1999 indices are from preliminary, unaudited data.

Year	Stratified mean number per tow	Coefficient of variation	Stratified mean weight (kg) per tow	Coefficient of variation
1992	12.295	15.6	4.898	15.4
1993	13.604	15.2	5.497	11.9
1994	12.051	17.8	6.033	16.1
1995	10.930	12.0	4.808	11.6
1996	31.246	24.2	12.351	22.0
1997	10.283	24.0	5.544	16.6
1998	7.756	20.7	5.131	16.6
1999	10.998		8.016	

Year	Age								
	1	2	3	4	5	6	7	8	Total
1992	7.15	4.74	0.33	0.04	0.01	0.03	0.00	0.00	12.29
1993	6.50	6.70	0.31	0.05	0.02	0.02	0.00	0.00	13.60
1994	3.76	7.20	0.82	0.26	0.00	0.01	0.00	0.00	12.05
1995	6.07	4.59	0.25	0.02	0.00	0.00	0.00	0.00	10.93
1996	22.17	8.33	0.60	0.12	0.03	0.00	0.00	0.00	31.25
1997	3.86	4.80	1.04	0.43	0.11	0.04	0.00	0.00	10.28
1998	1.68	3.25	2.29	0.42	0.10	0.01	0.00	0.01	7.76
1999	2.11	4.79	2.89	0.97	0.18	0.02	0.01	0.03	11.00

Table 63. MADMF Spring survey cruises: stratified mean number per tow at age.

Year	Age									
	0	1	2	3	4	5	6	7	8+	Total
1978		0.097	0.520	0.274	0.221		0.042			1.154
1979			0.084	0.087	0.147	0.048	0.011			0.377
1980		0.055	0.061	0.052	0.075	0.053	0.055	0.011		0.362
1981		0.405	0.558	0.074	0.031	0.043	0.060		0.031	1.202
1982		0.376	1.424	0.118	0.084	0.020		0.010		2.032
1983		0.241	1.304	0.544	0.021	0.009	0.003			2.122
1984		0.042	0.073	0.063	0.111	0.010				0.299
1985		0.142	1.191	0.034	0.042					1.409
1986		0.966	0.528	0.140	0.008					1.642
1987		0.615	0.583	0.012			0.011			1.221
1988		0.153	0.966	0.109	0.012					1.240
1989			0.338	0.079			0.010			0.427
1990		0.247	0.021	0.079	0.012					0.359
1991		0.029	0.048	0.010						0.087
1992		0.274	0.320	0.080		0.011	0.011			0.696
1993		0.120	0.470	0.060	0.010		0.020			0.680
1994		1.770	1.160	0.050	0.020		0.020			3.020
1995		0.089	1.245	0.050						1.384
1996		0.072	0.641	0.110	0.012					0.835
1997		0.512	1.212	0.169	0.109		0.005			2.007
1998		0.137	1.144	0.630	0.041	0.047				1.999
1999		0.073	0.814	1.033	0.283	0.028		0.015		2.246

Table 64. MADMF Autumn survey cruises: stratified mean number per tow at age.

Year	Age									
	0	1	2	3	4	5	6	7	8+	Total
1978		0.011	0.124	0.024		0.007				0.166
1979			0.047	0.101		0.019				0.167
1980		0.114	0.326	0.020	0.020	0.010				0.490
1981	0.009	0.362	0.367	0.011						0.749
1982		0.255	1.741	0.016						2.012
1983		0.026	0.583	0.140	0.004					0.753
1984	0.033	0.453	0.249	0.120	0.008					0.863
1985	0.051	0.108	1.662	0.033						1.854
1986	0.128	2.149	0.488	0.128						2.893
1987		1.159	0.598	0.010	0.004					1.771
1988		0.441	0.414	0.018						0.873
1989			0.286	0.024						0.310
1990		0.108		0.012						0.120
1991	0.021	0.493	0.262	0.010						0.786
1992		1.110	0.170							1.280
1993	0.010	0.300	0.430	0.020	0.020					0.780
1994	0.050	2.130	0.070							2.250
1995	0.032	0.401	0.323	0.013						0.769
1996	0.020	0.709	1.165	0.082	0.039	0.004				2.019
1997		0.462	1.399	0.323	0.018	0.030				2.232
1998		0.011	0.553	0.248	0.016	0.011				0.839

Table 65. CTDEP spring trawl survey: summer flounder index of abundance, geometric mean number per tow at age.

Year	Age								
	0	1	2	3	4	5	6	7	Total
1984	0.000	0.314	0.271	0.044	0.000	0.000	0.000	0.000	0.629
1985	0.000	0.015	0.282	0.028	0.052	0.000	0.000	0.000	0.377
1986	0.000	0.751	0.090	0.074	0.008	0.005	0.000	0.000	0.928
1987	0.000	0.951	0.086	0.014	0.004	0.001	0.000	0.001	1.057
1988	0.000	0.232	0.223	0.035	0.009	0.001	0.000	0.000	0.500
1989	0.000	0.013	0.049	0.024	0.016	0.000	0.000	0.000	0.102
1990	0.000	0.304	0.022	0.013	0.006	0.001	0.000	0.001	0.347
1991	0.000	0.392	0.189	0.029	0.028	0.001	0.000	0.000	0.639
1992	0.000	0.319	0.188	0.021	0.004	0.023	0.000	0.000	0.555
1993	0.000	0.320	0.151	0.015	0.018	0.003	0.000	0.001	0.508
1994	0.000	0.496	0.314	0.025	0.018	0.005	0.000	0.002	0.860
1995	0.000	0.199	0.051	0.020	0.005	0.000	0.000	0.006	0.281
1996	0.000	0.578	0.266	0.086	0.023	0.004	0.000	0.004	0.961
1997	0.000	0.391	0.507	0.057	0.036	0.004	0.002	0.002	0.999
1998	0.000	0.064	0.594	0.503	0.116	0.006	0.025	0.002	1.310

Table 66. CTDEP autumn trawl survey: summer flounder index of abundance, geometric mean number per tow at age.

Year	Age								
	0	1	2	3	4	5	6	7	Total
1984	0.000	0.571	0.331	0.072	0.014	0.004	0.004	0.003	0.999
1985	0.238	0.351	0.485	0.078	0.000	0.008	0.000	0.000	1.160
1986	0.170	1.170	0.268	0.068	0.004	0.000	0.000	0.000	1.680
1987	0.075	1.067	0.223	0.033	0.003	0.000	0.000	0.000	1.401
1988	0.015	0.884	0.481	0.037	0.002	0.001	0.000	0.000	1.420
1989	0.000	0.029	0.095	0.015	0.001	0.000	0.000	0.000	0.140
1990	0.032	0.674	0.110	0.042	0.007	0.005	0.000	0.000	0.870
1991	0.036	0.826	0.340	0.036	0.013	0.005	0.004	0.000	1.260
1992	0.013	0.570	0.366	0.046	0.016	0.009	0.000	0.000	1.020
1993	0.084	0.827	0.152	0.039	0.003	0.001	0.002	0.001	1.109
1994	0.132	0.300	0.085	0.024	0.009	0.000	0.000	0.000	0.550
1995	0.023	0.384	0.117	0.012	0.002	0.001	0.000	0.002	0.541
1996	0.069	0.887	1.188	0.042	0.005	0.000	0.000	0.000	2.191
1997	0.033	0.681	1.373	0.373	0.021	0.014	0.004	0.001	2.500
1998	0.000	0.269	1.054	0.321	0.054	0.021	0.000	0.000	1.719

Table 67. RIDFW spring trawl survey summer flounder index of abundance.

Year	Mean number/tow	Mean kg/tow	Mean age 0 number/tow	Mean age 1 number/tow	Mean age 2+ number/tow
1979	0.06	0.03	0.00	0.02	0.04
1980	0.06	0.27	0.00	0.00	0.06
1981	0.49	0.27	0.09	0.22	0.19
1982	0.06	0.03	0.00	0.06	0.00
1983	0.30	0.26	0.01	0.08	0.20
1984	0.27	0.13	0.13	0.07	0.07
1985	0.23	0.12	0.00	0.20	0.03
1986	2.27	0.92	0.56	1.53	0.18
1987	0.94	0.28	0.56	0.33	0.06
1988	0.33	0.14	0.02	0.28	0.02
1989	0.17	0.10	0.00	0.10	0.07
1990	0.17	0.09	0.07	0.05	0.05
1991	0.41	0.24	0.12	0.12	0.17
1992	0.12	0.04	0.03	0.09	0.00
1993	0.00	0.00	0.00	0.00	0.00
1994	0.10	0.07	0.00	0.05	0.05
1995	0.29	0.17	0.02	0.19	0.07
1996	0.21	0.16	0.05	0.02	0.14
1997	0.73	0.41	0.03	0.58	0.13
1998	0.51	0.34	0.02	0.24	0.24
1999	0.33	0.26	0.00	0.16	0.17

Age 0: Proportion of catch < 30 cm
Age 1: Proportion of 30 cm ≤ catch ≤ 39 cm
Age 2+: Proportion of fish > 39 cm

1999 indices are preliminary

Table 68. RIDFW autumn trawl survey summer flounder index of abundance.

Year	Mean number/tow	Mean kg/tow	Mean age 0 number/tow	Mean age 1 number/tow	Mean age 2+ number/tow
1979	0.00	0.00	0.00	0.00	0.00
1980	0.81	1.37	0.08	0.25	0.48
1981	3.24	2.13	0.16	2.10	0.97
1982	0.83	0.68	0.00	0.36	0.47
1983	0.62	0.57	0.02	0.25	0.35
1984	1.35	0.95	0.16	0.85	0.34
1985	0.95	0.52	0.33	0.33	0.29
1986	3.49	2.05	0.63	2.20	0.66
1987	1.41	0.90	0.44	0.72	0.25
1988	0.57	0.42	0.02	0.41	0.15
1989	0.07	0.10	0.00	0.04	0.03
1990	0.83	0.54	0.06	0.47	0.30
1991	0.23	0.23	0.04	0.07	0.12
1992	1.37	1.20	0.00	0.77	0.60
1993	0.74	0.84	0.00	0.21	0.53
1994	0.19	0.15	0.00	0.12	0.07
1995	0.76	0.76	0.00	0.29	0.48
1996	2.09	1.44	0.09	1.00	1.00
1997	1.88	1.58	0.00	0.93	0.95
1998	0.55	0.61	0.00	0.05	0.50

Age 0: Proportion of catch < 30 cm
Age 1: Proportion of 30 cm ≤ catch ≤ 39 cm
Age 2+: Proportion of fish > 39 cm

Table 69. RIDFW monthly fixed station trawl survey summer flounder index of abundance.

Year	Mean number/tow	Mean kg/tow	Mean age 0 number/tow	Mean age 1 number/tow	Mean age 2+ number/tow
1990	0.60	0.61	0.000	0.287	0.317
1991	0.18	0.15	0.013	0.118	0.052
1992	0.74	0.64	0.016	0.344	0.377
1993	0.49	0.72	0.019	0.075	0.396
1994	0.40	0.32	0.016	0.190	0.190
1995	1.02	0.94	0.000	0.394	0.622
1996	2.08	1.57	0.109	0.922	1.047
1997	1.92	1.64	0.038	0.824	1.054
1998	0.97	0.89	0.000	0.279	0.690

Age 0: Proportion of catch < 30 cm
Age 1: Proportion of 30 cm ≤ catch ≤ 39 cm
Age 2+: Proportion of fish > 39 cm

Table 70. NJBMF trawl survey, April - October: index of summer flounder abundance.

Year	Age					
	0	1	2	3	4+	Total
1988	0.29	4.22	1.19	0.01	0.00	5.71
1989	1.25	0.54	0.40	0.01	0.01	2.21
1990	1.88	1.89	0.15	0.05	0.00	3.97
1991	1.50	3.11	0.32	0.02	0.01	4.96
1992	1.34	3.76	0.76	0.08	0.05	5.99
1993	3.52	6.95	0.27	0.04	0.02	10.80
1994	2.22	1.46	0.13	0.01	0.03	3.85
1995	4.95	2.93	0.28	0.05	0.16	8.37
1996	1.65	5.60	2.71	0.18	0.05	10.19
1997	1.64	8.25	5.25	1.02	0.18	16.34
1998	0.67	5.80	2.67	0.29	0.03	9.46

Table 71. DEDFW Delaware Bay 16 foot trawl survey: index of summer flounder recruitment at age-0.

Year	Mean number per tow
1980	0.12
1981	0.06
1982	0.11
1983	0.03
1984	0.08
1985	0.06
1986	0.10
1987	0.14
1988	0.01
1989	0.12
1990	0.23
1991	0.07
1992	0.31
1993	0.02
1994	0.29
1995	0.17
1996	0.03
1997	0.02
1998	0.03

Table 72. DEDFW Delaware Bay 30 foot trawl survey: index of summer flounder abundance.

Year	Age					
	0	1	2	3	4+	Total
1991	1.44	1.13	0.18	0.04	0.00	2.79
1992	0.47	0.28	0.08	0.00	0.00	0.83
1993	0.04	1.56	0.73	0.07	0.00	2.40
1994	2.03	0.14	0.22	0.08	0.00	2.47
1995	0.95	1.00	0.28	0.10	0.09	2.42
1996	0.46	0.73	0.48	0.10	0.02	1.79
1997	0.03	0.12	0.49	0.47	0.16	1.27
1998	0.11	0.31	0.83	0.29	0.12	1.66

Table 73. MD DNR Coastal Bays trawl survey: index of summer flounder recruitment at age-0.

Year	Geometric mean	Lower 95% CI	Upper 95% CI
1972	12.3	6.5	21.8
1973	4.2	3.0	5.7
1974	5.1	3.9	6.6
1975	2.1	1.6	2.6
1976	1.9	1.4	2.6
1977	2.4	1.8	3.2
1978	3.2	2.4	4.1
1979	2.9	2.0	4.1
1980	4.2	2.6	6.2
1981	3.9	2.6	5.4
1982	2.0	0.8	3.7
1983	10.6	6.0	17.9
1984	5.4	3.1	8.7
1985	5.6	3.6	8.1
1986	16.2	10.1	25.2
1987	4.6	2.4	7.8
1988	0.5	0.3	0.8
1989	1.3	0.9	1.9
1990	2.1	1.6	2.7
1991	3.1	2.4	3.9
1992	3.5	2.5	4.7
1993	1.6	1.2	2.1
1994	8.2	6.5	10.3
1995	5.0	4.0	6.2
1996	2.6	2.0	3.2
1997	3.3	2.5	4.3
1998	5.2	4.2	6.6

Table 74. VIMS juvenile fish trawl survey, VA rivers: index of summer flounder recruitment at age-0.

Year	Geometric mean catch per trawl	Lower 95% confidence limit	Upper 95% confidence limit	Number of samples
1979	1.0	0.6	1.6	48
1980	7.6	5.0	11.3	5
1981	5.1	3.5	7.3	61
1982	4.3	2.8	6.4	60
1983	5.2	3.7	7.1	62
1984	1.9	1.2	2.9	45
1985	1.1	0.6	1.9	27
1986	1.3	0.8	1.8	53
1987	0.4	0.2	0.8	52
1988	0.5	0.2	1.0	36
1989	1.0	0.6	1.4	36
1990	2.6	1.7	3.8	36
1991	1.4	0.9	2.1	36
1992	0.5	0.2	0.8	36
1993	0.5	0.3	0.8	36
1994	1.1	0.5	1.9	36
1995	0.7	0.4	1.2	36
1996	0.6	0.3	1.0	36
1997	0.7	0.4	1.1	36
1998	0.2	0.0	0.3	36

Table 75. VIMS juvenile fish trawl survey, VA rivers and mainstem Chesapeake Bay: index of summer flounder recruitment at age-0.

Year	Geometric mean catch per trawl	Lower 95% confidence limit	Upper 95% confidence limit	Number of samples
1988	0.5	0.3	0.7	143
1989	1.2	0.9	1.6	162
1990	2.5	2.1	3.1	162
1991	2.8	2.3	3.4	153
1992	0.9	0.7	1.2	153
1993	0.5	0.4	0.7	153
1994	2.5	2.0	3.1	153
1995	0.7	0.5	0.9	153
1996	0.8	0.6	1.1	149
1997	1.0	0.7	1.2	153
1998	0.8	0.6	1.0	153

Table 76. Summary of age-0 summer flounder recruitment indices from NEFSC and state surveys, Massachusetts to North Carolina.

	YEAR CLASS																		
Survey	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
CT Autumn					0.00	0.24	0.17	0.08	0.02	0.00	0.03	0.04	0.01	0.08	0.13	0.02	0.07	.03	0.00
RI Trawl	0.08	0.16	0.00	0.02	0.16	0.33	0.63	0.44	0.02	0.00	0.06	0.04	0.00	0.00	0.00	0.00	0.09	0.00	0.00
MA Seine			3	3	1	19	5	5	2	3	11	4	0	2	1	13	7	0	12
NJ Trawl									0.29	1.25	1.88	1.50	1.34	3.52	2.22	4.95	1.65	1.64	0.67
DE: 16 ft Trawl	0.12	0.06	0.11	0.03	0.08	0.06	0.10	0.14	0.01	0.12	0.23	0.07	0.31	0.02	0.29	0.17	0.03	0.02	0.03
DE: 30 ft Trawl												1.44	0.47	0.04	2.03	0.95	0.46	0.03	0.11
MD	4.2	3.9	2.0	10.6	5.4	5.6	16.2	4.6	0.5	1.3	2.1	3.1	3.5	1.6	8.2	5.0	2.6	3.3	5.2
VIMS Rivers only	7.6	5.1	4.3	5.2	1.9	1.1	1.3	0.4	0.5	1.0	2.6	1.4	0.5	0.5	1.1	0.7	0.6	0.7	0.2
VIMS Rivers and Bay									0.5	1.2	2.5	2.8	0.9	0.5	2.5	0.7	0.8	1.0	0.8
NC Pamlico								19.86	2.61	6.63	4.27	5.85	9.14	5.13	8.17	5.59	30.86	14.14	9.96
NEFSC Autumn			0.55	0.96	0.18	0.59	0.39	0.07	0.06	0.31	0.44	0.76	0.99	0.23	0.75	0.93	0.11	0.17	0.38

Table 77. Summary of summer flounder mortality estimation for American Littoral Society (ALS) angler tagging data. SE = standard error. Fishing mortality estimates from tagging are for the period from e.g., July 1994 to July 1995. and are compared with VPA estimates for age-1 fish on 1 January of the second year, e.g., January 1995. An instantaneous tag loss rate of 0.48 is assumed in the model.

Year	Survival Rate (S)	SE (S)	Total Morality (Z)	SE (Z)	M	F	VPA age-1 F
1983-84	0.21	0.07	1.10	0.36	0.20	0.90	1.29
1984-85	0.19	0.05	1.18	0.26	0.20	0.98	1.03
1985-86	0.11	0.04	1.70	0.33	0.20	1.50	1.13
1986-87	0.26	0.05	0.86	0.19	0.20	0.66	1.06
1987-88	0.25	0.05	0.89	0.18	0.20	0.69	1.50
1988-89	0.39	0.12	0.47	0.31	0.20	0.27	1.26
1989-90	0.26	0.10	0.85	0.36	0.20	0.65	0.85
1990-91	0.14	0.04	1.46	0.28	0.20	1.26	1.34
1991-92	0.17	0.04	1.28	0.21	0.20	1.08	1.35
1992-93	0.29	0.04	0.77	0.15	0.20	0.57	1.04
1993-94	0.19	0.02	1.19	0.13	0.20	0.99	0.99
1994-95	0.31	0.05	0.69	0.15	0.20	0.49	0.75
1995-96	0.20	0.04	1.11	0.18	0.20	0.91	0.52

Table 78. Commercial and recreational fishery landings, estimated discard, and total catch statistics (metric tons) as used in the assessment of summer flounder, Maine to North Carolina, compared with VPA estimates of total catch biomass.

	Commercial			Recreational			Total				
Year	Landings	Discard	Catch	Landings	Discard	Catch	Landings	Discard	Catch	VPA Catch	VPA:Catch ratio
1982	10,400	n/a	10,400	8,267	296	8,563	18,667	296	18,963	18,603	0.981
1983	13,403	n/a	13,403	12,687	376	13,063	26,090	376	26,466	25,118	0.949
1984	17,130	n/a	17,130	8,512	415	8,927	25,642	415	26,057	26,892	1.032
1985	14,675	n/a	14,675	5,665	92	5,757	20,340	92	20,432	21,818	1.068
1986	12,186	n/a	12,186	8,102	578	8,680	20,288	578	20,866	21,547	1.033
1987	12,271	n/a	12,271	5,519	522	6,041	17,790	522	18,312	18,547	1.013
1988	14,686	n/a	14,686	6,733	342	7,075	21,419	342	21,761	23,423	1.076
1989	8,125	709	8,834	1,435	45	1,480	9,560	754	10,314	10,383	1.007
1990	4,199	1,214	5,413	2,329	234	2,563	6,528	1,448	7,976	7,757	0.973
1991	6,224	1,052	7,276	3,611	429	4,040	9,835	1,481	11,316	11,737	1.037
1992	7,529	690	8,219	3,242	344	3,586	10,771	1,034	11,805	12,171	1.031
1993	5,715	846	6,561	3,484	736	4,220	9,199	1,582	10,781	10,987	1.019
1994	6,588	906	7,494	4,111	577	4,688	10,699	1,483	12,182	12,350	1.014
1995	6,977	308	7,285	2,496	714	3,210	9,473	1,022	10,495	10,630	1.013
1996	5,770	463	6,233	4,704	615	5,319	10,474	1,078	11,552	11,772	1.019
1997	3,994	326	4,320	5,378	627	6,005	9,372	953	10,325	10,206	0.988
1998	5,084	389	5,473	5,683	517	6,200	10,767	906	11,673	11,485	0.984
Mean 1982-98	9,115	690	9,521	5,409	439	5,848	14,524	845	15,369	15,871	1.016

Table 79. 1999 Virtual Population Analysis (VPA) for summer flounder.

```
Woods Hole Assessment Toolbox  SS99  Run Number  11   7/9/99   11:56:28 AM
Version 1.0.6
SS99  1982 - 1999
Input Parameters and Options Selected
-------------------------------------
Natural mortality is  0.2
Oldest age (not in the plus group) is  5
For all years prior to the terminal year ( 1998 ), backcalculated
stock sizes for the following ages used to estimate
total mortality (Z) for age  4 : 3 4
This method for estimating F on the oldest age is generally used when a
flat-topped partial recruitment curve is thought to be characteristic of the stock.
F for age  5 + is then calculated from the following
ratios of F[age 5 +] to F[age 4 ]
          1982              1
          1983              1
          1984              1
          1985              1
          1986              1
          1987              1
          1988              1
          1989              1
          1990              1
          1991              1
          1992              1
          1993              1
          1994              1
          1995              1
          1996              1
          1997              1
          1998              1
Stock size of the  5 + group is then calculated using
the following method:  CATCH EQUATION
 Partial recruitment estimate for  1999
 0            0.05
 1            0.5
 2            1
 3            1
 4            1
Objective function is Sum w*(LOG(OBS)-LOG(PRED))**2
 Indices normalized (by dividing by mean observed value)
before tuning to VPA stocksizes
Downweighting is not used
Biomass estimates (other than SSB) reflect mean stock sizes.
SSB calculated as in the NEFSC projection program
(see note below SSB table for description of the algorithm).
```

Table 79 continued.

```
The following indices of abundance are available
 1            NEC_W1
 2            NEC_W2
 3            NEC_W3
 4            NEC_W4
 5            NEC_W5
 6            NEC_S1
 7            NEC_S2
 8            NEC_S3
 9            NEC_S4
 10           NEC_F2
 11           NEC_F3
 12           NEC_F4
 13           MA_S1
 14           MA_S2
 15           MA_S3
 16           MA_F2
 17           MA_F3
 18           MA_F4
 19           CT_S1
 20           CT_S2
 21           CT_S3
 22           CT_S4
 23           CT_F2
 24           CT_F3
 25           CT_F4
 26           CT_F5
 27           RI_F2
 28           RI_F1
 29           RI_F2
 30           NJ1
 31           NJ2
 32           NJ3
 33           DE2
 34           DE3
 35           CT_YO
 36           VA_RYO
 37           NC_YO
 38           MD_YO
 39           NJ_YO
 40           NEC_YO
 41           MA_YO
 42           DE_YO
```

Table 79 continued.

```
The Indices that will be used in this run are:
1           NEC_W1
2           NEC_W2
3           NEC_W3
4           NEC_W4
5           NEC_W5
6           NEC_S1
7           NEC_S2
8           NEC_S3
9           NEC_S4
10          NEC_F2
11          NEC_F3
12          NEC_F4
13          MA_S2
14          MA_S3
15          MA_F3
16          MA_F4
17          CT_S2
18          CT_S3
19          CT_S4
20          CT_F2
21          CT_F3
22          CT_F4
23          RI_F2
24          RI_F1
25          RI_F2
26          NJ1
27          NJ2
28          DE2
29          DE3
30          CT_YO
31          VA_RYO
32          NC_YO
33          MD_YO
34          NJ_YO
35          NEC_YO
36          MA_YO
```

Table 79 continued.

Obs Indices (before transformation) by index and year; with Index means

	1982	1983	1984	1985	1986	1987	1988
NEC_W1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEC_W2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEC_W3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEC_W4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEC_W5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEC_S1	0.69	0.32	0.17	0.55	1.49	0.46	0.59
NEC_S2	1.41	0.39	0.33	1.56	0.43	0.43	0.79
NEC_S3	0.12	0.19	0.09	0.21	0.20	0.02	0.07
NEC_S4	0.03	0.04	0.05	0.04	0.02	0.02	0.03
NEC_F2	0.00	1.52	1.46	1.39	0.80	0.83	0.58
NEC_F3	0.00	0.40	0.34	0.43	0.46	0.11	0.20
NEC_F4	0.00	0.02	0.12	0.07	0.05	0.10	0.03
MA_S2	1.42	1.30	0.07	1.19	0.53	0.58	0.97
MA_S3	0.12	0.54	0.06	0.03	0.14	0.01	0.11
MA_F3	0.37	1.74	0.58	0.25	1.66	0.49	0.60
MA_F4	0.01	0.02	0.14	0.12	0.03	0.13	0.01
CT_S2	0.00	0.00	0.27	0.28	0.09	0.09	0.22
CT_S3	0.00	0.00	0.04	0.03	0.07	0.01	0.04
CT_S4	0.00	0.00	0.00	0.05	0.01	0.00	0.01
CT_F2	0.00	0.00	0.00	0.57	0.35	1.17	1.07
CT_F3	0.00	0.00	0.00	0.33	0.49	0.27	0.22
CT_F4	0.00	0.00	0.00	0.07	0.08	0.07	0.03
RI_F2	2.10	0.36	0.25	0.85	0.33	2.20	0.72
RI_F1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RI_F2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NJ1	0.00	0.00	0.00	0.00	0.00	0.00	4.22
NJ2	0.00	0.00	0.00	0.00	0.00	0.00	1.19
DE2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DE3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CT_YO	0.00	0.00	0.00	0.24	0.17	0.08	0.02
VA_RYO	4.30	5.20	1.90	1.10	1.30	0.40	0.50
NC_YO	0.00	0.00	0.00	0.00	0.00	19.86	2.61
MD_YO	2.00	10.60	5.40	5.60	16.20	4.60	0.50
NJ_YO	0.00	0.00	0.00	0.00	0.00	0.00	0.29
NEC_YO	0.55	0.96	0.18	0.59	0.39	0.07	0.06
MA_YO	4.00	4.00	2.00	20.00	6.00	6.00	3.00

Table 79 continued.

	1989	1990	1991	1992	1993	1994	1995
NEC_W1	0.00	0.00	0.00	7.15	6.50	3.76	6.07
NEC_W2	0.00	0.00	0.00	4.74	6.70	7.20	4.59
NEC_W3	0.00	0.00	0.00	0.33	0.31	0.82	0.25
NEC_W4	0.00	0.00	0.00	0.04	0.05	0.26	0.02
NEC_W5	0.00	0.00	0.00	0.04	0.04	0.01	0.00
NEC_S1	0.06	0.62	0.79	0.76	0.73	0.35	0.79
NEC_S2	0.23	0.03	0.27	0.41	0.50	0.53	0.27
NEC_S3	0.02	0.06	0.00	0.01	0.04	0.04	0.02
NEC_S4	0.01	0.00	0.02	0.00	0.00	0.01	0.00
NEC_F2	0.62	0.21	0.38	0.84	1.04	0.80	0.67
NEC_F3	0.18	0.05	0.03	0.09	0.25	0.03	0.09
NEC_F4	0.03	0.00	0.04	0.00	0.03	0.01	0.01
MA_S2	0.34	0.02	0.05	0.32	0.47	1.16	1.25
MA_S3	0.08	0.08	0.01	0.08	0.06	0.05	0.05
MA_F3	0.41	0.29	0.00	0.26	0.17	0.43	0.07
MA_F4	0.02	0.02	0.01	0.01	0.00	0.02	0.00
CT_S2	0.05	0.02	0.19	0.19	0.15	0.31	0.05
CT_S3	0.02	0.01	0.03	0.02	0.02	0.03	0.02
CT_S4	0.02	0.01	0.03	0.00	0.02	0.02	0.01
CT_F2	0.88	0.03	0.67	0.83	0.57	0.83	0.30
CT_F3	0.48	0.10	0.11	0.34	0.37	0.15	0.09
CT_F4	0.04	0.02	0.04	0.04	0.05	0.04	0.02
RI_F2	0.41	0.04	0.47	0.07	0.77	0.21	0.12
RI_F1	0.00	0.29	0.12	0.34	0.08	0.19	0.39
RI_F2	0.00	0.32	0.05	0.38	0.40	0.19	0.62
NJ1	0.54	1.89	3.11	3.76	6.95	1.46	2.93
NJ2	0.40	0.15	0.32	0.76	0.27	0.13	0.28
DE2	0.00	0.00	0.18	0.08	0.73	0.22	0.28
DE3	0.00	0.00	0.04	0.00	0.07	0.08	0.10
CT_YO	0.00	0.03	0.04	0.01	0.08	0.13	0.02
VA_RYO	1.00	2.60	1.40	0.50	0.50	1.10	0.70
NC_YO	6.63	4.27	5.85	9.14	5.13	8.17	5.59
MD_YO	1.30	2.10	3.10	3.50	1.60	8.20	5.00
NJ_YO	1.25	1.88	1.50	1.34	3.52	2.22	4.95
NEC_YO	0.31	0.44	0.76	0.99	0.23	0.75	0.93
MA_YO	4.00	12.00	5.00	1.00	3.00	2.00	14.00

Table 79 continued.

	1996	1997	1998	1999	Average
NEC_W1	22.17	3.86	1.68	2.11	6.663
NEC_W2	8.33	4.80	3.25	4.79	5.550
NEC_W3	0.60	1.04	2.29	2.89	1.066
NEC_W4	0.12	0.43	0.42	0.97	0.289
NEC_W5	0.03	0.15	0.12	0.24	0.090
NEC_S1	1.08	0.29	0.27	0.24	0.569
NEC_S2	0.56	0.67	0.52	0.72	0.558
NEC_S3	0.12	0.09	0.32	0.44	0.121
NEC_S4	0.01	0.01	0.06	0.12	0.034
NEC_F2	1.16	1.24	1.29	2.13	0.998
NEC_F3	0.28	0.57	1.14	1.63	0.369
NEC_F4	0.02	0.04	0.29	0.33	0.079
MA_S2	0.64	1.21	1.14	0.81	0.749
MA_S3	0.11	0.17	0.63	1.03	0.187
MA_F3	0.32	1.17	1.40	0.55	0.633
MA_F4	0.01	0.08	0.32	0.25	0.076
CT_S2	0.27	0.51	0.59	0.00	0.219
CT_S3	0.09	0.06	0.50	0.00	0.066
CT_S4	0.02	0.04	0.11	0.00	0.024
CT_F2	0.38	0.89	0.68	0.27	0.633
CT_F3	0.12	1.19	1.37	1.05	0.445
CT_F4	0.01	0.04	0.37	0.32	0.083
RI_F2	0.29	1.00	0.93	0.05	0.621
RI_F1	0.92	0.84	0.28	0.00	0.384
RI_F2	1.05	1.05	0.69	0.00	0.527
NJ1	5.16	8.25	5.80	0.00	4.006
NJ2	2.71	5.25	2.67	0.00	1.285
DE2	0.48	0.49	0.83	0.00	0.411
DE3	0.10	0.47	0.29	0.00	0.164
CT_YO	0.07	0.03	0.00	0.00	0.077
VA_RYO	0.60	0.70	0.20	0.00	1.412
NC_YO	30.86	14.14	9.96	0.00	10.184
MD_YO	2.60	3.30	5.20	0.00	4.753
NJ_YO	1.65	1.64	0.67	0.00	1.901
NEC_YO	0.11	0.17	0.38	0.00	0.463
MA_YO	8.00	1.00	13.00	0.00	6.353

Table 79 continued.

Catch at age (thousands) - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	5344	4925	4802	2078	1942	1137	795
1	19423	28441	26582	14623	17140	17212	20557
2	10149	10911	15454	17979	11055	10838	14562
3	935	2181	3180	1767	3782	1648	2137
4	328	693	829	496	316	544	644
5	213	382	109	290	213	98	161
0+	36392	47533	50956	37233	34448	31477	38856

	1989	1990	1991	1992	1993	1994	1995
0	960	1856	1001	1368	1285	1638	592
1	4790	8808	12149	11197	11235	10362	5828
2	7306	2187	7148	6026	5601	6996	7303
3	1692	995	742	1125	566	982	1239
4	353	221	217	151	73	205	397
5	68	41	36	73	68	44	81
0+	15169	14108	21293	19940	18828	20227	15440

	1996	1997	1998
0	162	30	45
1	6925	2545	2220
2	9278	8046	6354
3	1785	3149	5228
4	417	553	978
5	91	175	156
0+	18658	14498	14981

CAA Summary for ages 2 - 5

1982	1983	1984	1985	1986	1987	1988
31048	42608	46154	35155	32506	30340	38061

1989	1990	1991	1992	1993	1994	1995
14209	12252	20292	18572	17543	18589	14848

1996	1997	1998
18496	14468	14936

Table 79 continued.

Weight at age (mid year) in kg - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	0.254	0.240	0.248	0.289	0.253	0.259	0.316
1	0.418	0.417	0.396	0.428	0.453	0.442	0.463
2	0.616	0.716	0.632	0.613	0.668	0.651	0.624
3	1.447	1.075	1.046	1.109	1.160	1.140	1.130
4	1.907	1.257	1.500	1.726	1.739	1.941	1.739
5	2.905	1.665	2.368	2.406	2.498	3.306	2.818

	1989	1990	1991	1992	1993	1994	1995
0	0.208	0.252	0.145	0.245	0.264	0.355	0.390
1	0.460	0.431	0.407	0.470	0.486	0.528	0.537
2	0.723	0.810	0.702	0.749	0.699	0.628	0.678
3	1.044	1.169	1.186	1.222	1.461	1.353	1.056
4	1.479	1.538	1.811	1.390	1.659	2.096	1.639
5	2.295	2.519	2.582	2.716	2.164	3.054	2.682

	1996	1997	1998
0	0.330	0.212	0.259
1	0.510	0.452	0.490
2	0.570	0.639	0.648
3	1.080	0.866	0.859
4	1.545	1.233	1.321
5	2.099	2.296	2.437

January 1 Biomass Weights - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	0.198	0.187	0.189	0.231	0.191	0.194	0.262
1	0.319	0.325	0.308	0.326	0.362	0.334	0.346
2	0.466	0.547	0.513	0.493	0.535	0.543	0.525
3	1.553	0.814	0.865	0.837	0.843	0.873	0.858
4	1.661	1.349	1.270	1.344	1.389	1.501	1.408
5	2.905	1.665	2.368	2.406	2.498	3.306	2.818

	1989	1990	1991	1992	1993	1994	1995
0	0.144	0.198	0.081	0.174	0.187	0.289	0.341
1	0.381	0.299	0.320	0.261	0.345	0.373	0.437
2	0.579	0.610	0.550	0.552	0.573	0.552	0.598
3	0.807	0.919	0.980	0.926	1.046	0.972	0.814
4	1.293	1.267	1.455	1.284	1.424	1.750	1.489
5	2.295	2.519	2.582	2.716	2.164	3.054	2.682

	1996	1997	1998
0	0.282	0.139	0.208
1	0.446	0.386	0.322
2	0.553	0.571	0.541
3	0.856	0.703	0.741
4	1.277	1.154	1.070
5	2.099	2.296	2.437

Table 79 continued.

SSB Weights - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	0.254	0.240	0.248	0.289	0.253	0.259	0.316
1	0.418	0.417	0.396	0.428	0.453	0.442	0.463
2	0.616	0.716	0.632	0.613	0.668	0.651	0.624
3	1.447	1.075	1.046	1.109	1.160	1.140	1.130
4	1.907	1.257	1.500	1.726	1.739	1.941	1.739
5	2.905	1.665	2.368	2.406	2.498	3.306	2.818

	1989	1990	1991	1992	1993	1994	1995
0	0.208	0.252	0.145	0.245	0.264	0.355	0.390
1	0.460	0.431	0.407	0.470	0.486	0.528	0.537
2	0.723	0.810	0.702	0.749	0.699	0.628	0.678
3	1.044	1.169	1.186	1.222	1.461	1.353	1.056
4	1.479	1.538	1.811	1.390	1.659	2.096	1.639
5	2.295	2.519	2.582	2.716	2.164	3.054	2.682

	1996	1997	1998
0	0.330	0.212	0.259
1	0.510	0.452	0.490
2	0.570	0.639	0.648
3	1.080	0.866	0.859
4	1.545	1.233	1.321
5	2.099	2.296	2.437

Computed (Rivard)from midyear weights: Jan 1 Weights - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	0.198	0.187	0.189	0.231	0.191	0.194	0.262
1	0.319	0.325	0.308	0.326	0.362	0.334	0.346
2	0.466	0.547	0.513	0.493	0.535	0.543	0.525
3	1.553	0.814	0.865	0.837	0.843	0.873	0.858
4	1.661	1.349	1.270	1.344	1.389	1.501	1.408
5	2.905	1.665	2.368	2.406	2.498	3.306	2.818

	1989	1990	1991	1992	1993	1994	1995
0	0.144	0.198	0.081	0.174	0.187	0.289	0.341
1	0.381	0.299	0.320	0.261	0.345	0.373	0.437
2	0.579	0.610	0.550	0.552	0.573	0.552	0.598
3	0.807	0.919	0.980	0.926	1.046	0.972	0.814
4	1.293	1.267	1.455	1.284	1.424	1.750	1.489
5	2.295	2.519	2.582	2.716	2.164	3.054	2.682

	1996	1997	1998	1999
0	0.282	0.139	0.208	0.196
1	0.446	0.386	0.322	0.322
2	0.553	0.571	0.541	0.745
3	0.856	0.703	0.741	0.776
4	1.277	1.154	1.070	0.996
5	2.099	2.296	2.437	2.437

Table 79 continued.

Percent Mature (females)- C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	38	38	38	38	38	38	38
1	72	72	72	72	72	72	72
2	90	90	90	90	90	90	90
3	100	100	100	100	100	100	100
4	100	100	100	100	100	100	100
5	100	100	100	100	100	100	100

	1989	1990	1991	1992	1993	1994	1995
0	38	38	38	38	38	38	38
1	72	72	72	72	72	72	72
2	90	90	90	90	90	90	90
3	100	100	100	100	100	100	100
4	100	100	100	100	100	100	100
5	100	100	100	100	100	100	100

	1996	1997	1998
0	38	38	38
1	72	72	72
2	90	90	90
3	100	100	100
4	100	100	100
5	100	100	100

Sex Ratio (Percent Female) - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

	1989	1990	1991	1992	1993	1994	1995
0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

	1996	1997	1998
0	0.5	0.5	0.5
1	0.5	0.5	0.5
2	0.5	0.5	0.5
3	0.5	0.5	0.5
4	0.5	0.5	0.5
5	0.5	0.5	0.5

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pF is 0.83
pM is 0.83

Table 79 continued.

RESULTS

Approximate Statistics Assuming Linearity Near Solution
Sum of Squares: 243.282035696923
Mean Square Residuals: 0.54183

	PAR. EST.	STD. ERR.	T-STATISTIC	C.V.
N 1	2.16E+04	5.89E+03	3.66E+00	0.27
N 2	1.33E+04	2.73E+03	4.89E+00	0.20
N 3	1.40E+04	2.70E+03	5.18E+00	0.19
N 4	6.08E+03	1.45E+03	4.20E+00	0.24
q NEC_W1	2.79E-05	7.42E-06	3.76E+00	0.27
q NEC_W2	6.92E-05	1.83E-05	3.79E+00	0.26
q NEC_W3	1.88E-04	4.97E-05	3.78E+00	0.26
q NEC_W4	6.52E-04	1.74E-04	3.75E+00	0.27
q NEC_W5	2.62E-03	7.43E-04	3.52E+00	0.28
q NEC_S1	2.71E-05	4.75E-06	5.69E+00	0.18
q NEC_S2	5.66E-05	9.91E-06	5.71E+00	0.18
q NEC_S3	1.90E-04	3.43E-05	5.54E+00	0.18
q NEC_S4	8.29E-04	1.66E-04	5.00E+00	0.20
q NEC_F2	6.43E-05	1.16E-05	5.55E+00	0.18
q NEC_F3	1.84E-04	3.31E-05	5.54E+00	0.18
q NEC_F4	7.20E-04	1.39E-04	5.18E+00	0.19
q MA_S2	4.74E-05	8.30E-06	5.71E+00	0.18
q MA_S3	1.61E-04	2.83E-05	5.71E+00	0.18
q MA_F3	2.25E-04	4.07E-05	5.54E+00	0.18
q MA_F4	6.34E-04	1.18E-04	5.36E+00	0.19
q CT_S2	5.36E-05	1.03E-05	5.22E+00	0.19
q CT_S3	1.94E-04	3.72E-05	5.22E+00	0.19
q CT_S4	1.11E-03	2.20E-04	5.05E+00	0.20
q CT_F2	6.04E-05	1.16E-05	5.21E+00	0.19
q CT_F3	2.28E-04	4.38E-05	5.20E+00	0.19
q CT_F4	9.32E-04	1.80E-04	5.18E+00	0.19
q RI_F2	4.24E-05	7.43E-06	5.71E+00	0.18
q RI_F1	2.91E-05	7.23E-06	4.03E+00	0.25
q RI_F2	6.45E-05	1.60E-05	4.04E+00	0.25
q NJ1	3.29E-05	7.37E-06	4.46E+00	0.22
q NJ2	4.14E-05	9.25E-06	4.47E+00	0.22
q DE2	5.94E-05	1.56E-05	3.81E+00	0.26
q DE3	2.45E-04	6.90E-05	3.55E+00	0.28
q CT_YO	2.00E-05	4.30E-06	4.66E+00	0.21
q VA_RYO	1.87E-05	3.38E-06	5.53E+00	0.18
q NC_YO	2.61E-05	5.64E-06	4.63E+00	0.22
q MD_YO	2.00E-05	3.62E-06	5.53E+00	0.18
q NJ_YO	2.70E-05	6.10E-06	4.43E+00	0.23
q NEC_YO	1.98E-05	3.58E-06	5.53E+00	0.18
q MA_YO	1.92E-05	3.48E-06	5.53E+00	0.18

Table 79 continued.

Catchability Estimates in Original Units

	Estimate	Std.Err.	C.V.
q NEC_W1	1.86E-04	4.94E-05	0.27
q NEC_W2	3.84E-04	1.01E-04	0.26
q NEC_W3	2.00E-04	5.29E-05	0.26
q NEC_W4	1.88E-04	5.02E-05	0.27
q NEC_W5	2.35E-04	6.68E-05	0.28
q NEC_S1	1.54E-05	2.71E-06	0.18
q NEC_S2	3.16E-05	5.53E-06	0.18
q NEC_S3	2.30E-05	4.15E-06	0.18
q NEC_S4	2.78E-05	5.56E-06	0.20
q NEC_F2	6.42E-05	1.16E-05	0.18
q NEC_F3	6.79E-05	1.22E-05	0.18
q NEC_F4	5.71E-05	1.10E-05	0.19
q MA_S2	3.55E-05	6.21E-06	0.18
q MA_S3	3.02E-05	5.30E-06	0.18
q MA_F3	1.43E-04	2.57E-05	0.18
q MA_F4	4.79E-05	8.94E-06	0.19
q CT_S2	1.17E-05	2.25E-06	0.19
q CT_S3	1.28E-05	2.45E-06	0.19
q CT_S4	2.69E-05	5.34E-06	0.20
q CT_F2	3.82E-05	7.33E-06	0.19
q CT_F3	1.01E-04	1.95E-05	0.19
q CT_F4	7.70E-05	1.49E-05	0.19
q RI_F2	2.63E-05	4.61E-06	0.18
q RI_F1	1.12E-05	2.77E-06	0.25
q RI_F2	3.40E-05	8.41E-06	0.25
q NJ1	1.32E-04	2.95E-05	0.22
q NJ2	5.31E-05	1.19E-05	0.22
q DE2	2.44E-05	6.42E-06	0.26
q DE3	4.03E-05	1.13E-05	0.28
q CT_YO	1.54E-06	3.29E-07	0.21
q VA_RYO	2.64E-05	4.78E-06	0.18
q NC_YO	2.66E-04	5.74E-05	0.22
q MD_YO	9.51E-05	1.72E-05	0.18
q NJ_YO	5.14E-05	1.16E-05	0.23
q NEC_YO	9.15E-06	1.66E-06	0.18
q MA_YO	1.22E-04	2.21E-05	0.18

Table 79 continued.

Summary of Residuals
NEC_W
Tuned to: 1-Jan
For ages: 1

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.000	0.000	0	0	1	0.000	0.000	00
1992	7.150	0.639	0.071	-0.448	1	0.519	0.705	22901
1993	6.500	0.707	-0.025	-0.347	1	0.322	0.437	25357
1994	3.760	0.739	-0.572	-0.303	1	-0.269	-0.365	26484
1995	6.070	0.823	-0.093	-0.195	1	0.102	0.139	29502
1996	22.170	1.066	1.202	0.064	1	1.139	1.547	38212
1997	3.860	0.901	-0.546	-0.105	1	-0.441	-0.600	32300
1998	1.680	0.523	-1.378	-0.648	1	-0.729	-0.991	18750
1999	2.110	0.602	-1.150	-0.508	1	-0.642	-0.872	21580

Partial Variance: 0.42

NEC_W
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.000	0.000	0	0	1	0.000	0.000	00
1992	4.740	0.556	-0.158	-0.587	1	0.429	0.582	8034
1993	6.700	0.597	0.188	-0.516	1	0.705	0.957	8618
1994	7.200	0.734	0.260	-0.310	1	0.570	0.775	10594
1995	4.590	0.852	-0.190	-0.160	1	-0.030	-0.041	12307
1996	8.330	1.307	0.406	0.268	1	0.138	0.188	18880
1997	4.800	1.732	-0.145	0.549	1	-0.695	-0.944	25019
1998	3.250	1.672	-0.535	0.514	1	-1.049	-1.425	24142
1999	4.790	0.924	-0.147	-0.079	1	-0.068	-0.092	13343

Partial Variance: .0.379

Table 79 continued.

NEC_W
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.000	0.000	0	0	1	0.000	0.000	00
1992	0.330	0.266	-1.173	-1.324	1	0.151	0.205	1418
1993	0.310	0.211	-1.235	-1.555	1	0.320	0.435	1125
1994	0.820	0.373	-0.263	-0.986	1	0.723	0.983	1988
1995	0.250	0.440	-1.450	-0.821	1	-0.629	-0.855	2344
1996	0.600	0.651	-0.575	-0.429	1	-0.146	-0.198	3468
1997	1.040	1.325	-0.025	0.282	1	-0.307	-0.417	7063
1998	2.290	2.478	0.764	0.907	1	-0.143	-0.194	13204
1999	2.890	2.630	0.997	0.967	1	0.030	0.041	14017

Partial Variance: 0.171

NEC_W
Tuned to: 1-Jan
For ages: 4

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.000	0.000	0	0	1	0.000	0.000	00
1992	0.040	0.120	-1.977	-2.121	1	0.144	0.196	184
1993	0.050	0.093	-1.754	-2.373	1	0.619	0.842	143
1994	0.260	0.267	-0.105	-1.322	1	1.217	1.653	409
1995	0.020	0.482	-2.670	-0.730	1	-1.940	-2.635	739
1996	0.120	0.520	-0.878	-0.654	1	-0.225	-0.305	798
1997	0.430	0.798	0.398	-0.225	1	0.623	0.847	1224
1998	0.420	1.913	0.375	0.648	1	-0.274	-0.372	2933
1999	0.970	3.964	1.212	1.377	1	-0.166	-0.225	6080

Partial Variance: 0.898

NEC_W
Tuned to: 1-Jan
For ages: 5

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.000	0.000	0	0	1	0.000	0.000	00
1992	0.040	0.224	-0.811	-1.496	1	0.685	0.931	86
1993	0.040	0.343	-0.811	-1.070	1	0.259	0.352	131
1994	0.010	0.226	-2.197	-1.487	1	-0.711	-0.965	86
1995	0.000	0.000	0	0	1	0.000	0.000	00
1996	0.030	0.448	-1.099	-0.803	1	-0.296	-0.402	171
1997	0.150	1.000	0.511	0.000	1	0.511	0.694	382
1998	0.120	1.212	0.288	0.192	1	0.095	0.129	464
1999	0.240	4.593	0.981	1.525	1	-0.544	-0.739	1756

Partial Variance: 0.288

Table 79 continued.

NEC_S
Tuned to: 1-Jan
For ages: 1

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.690	1.154	0.192	0.144	1	0.048	0.066	42673
1983	0.320	1.515	-0.576	0.415	1	-0.992	-1.347	55994
1984	0.170	1.666	-1.209	0.510	1	-1.719	-2.335	61576
1985	0.550	0.957	-0.035	-0.044	1	0.010	0.013	35360
1986	1.490	1.026	0.962	0.026	1	0.936	1.272	37929
1987	0.460	1.137	-0.213	0.129	1	-0.342	-0.465	42047
1988	0.590	0.940	0.035	-0.061	1	0.097	0.132	34764
1989	0.060	0.265	-2.250	-1.327	1	-0.923	-1.254	9804
1990	0.620	0.582	0.085	-0.542	1	0.627	0.852	21498
1991	0.790	0.629	0.327	-0.464	1	0.792	1.075	23239
1992	0.760	0.620	0.289	-0.479	1	0.767	1.043	22901
1993	0.730	0.686	0.248	-0.377	1	0.625	0.850	25357
1994	0.350	0.716	-0.487	-0.333	1	-0.153	-0.208	26484
1995	0.790	0.798	0.327	-0.226	1	0.553	0.751	29502
1996	1.080	1.034	0.640	0.033	1	0.607	0.824	38212
1997	0.290	0.874	-0.675	-0.135	1	-0.540	-0.733	32300
1998	0.270	0.507	-0.746	-0.679	1	-0.067	-0.092	18750
1999	0.240	0.584	-0.864	-0.538	1	-0.326	-0.443	21580

Partial Variance: 0.527

NEC_S
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	1.410	0.894	0.926	-0.112	1	1.038	1.410	15803
1983	0.390	0.982	-0.359	-0.018	1	-0.341	-0.463	17363
1984	0.330	1.138	-0.526	0.129	1	-0.655	-0.890	20110
1985	1.560	1.492	1.027	0.400	1	0.628	0.853	26361
1986	0.430	0.889	-0.261	-0.117	1	-0.144	-0.196	15719
1987	0.430	0.880	-0.261	-0.128	1	-0.133	-0.181	15545
1988	0.790	1.067	0.347	0.065	1	0.283	0.384	18851
1989	0.230	0.558	-0.887	-0.583	1	-0.304	-0.412	9862
1990	0.030	0.209	-2.924	-1.566	1	-1.358	-1.845	3693
1991	0.270	0.545	-0.727	-0.607	1	-0.120	-0.162	9632
1992	0.410	0.455	-0.309	-0.788	1	0.480	0.651	8034
1993	0.500	0.488	-0.110	-0.718	1	0.608	0.826	8618
1994	0.530	0.599	-0.052	-0.512	1	0.460	0.624	10594
1995	0.270	0.696	-0.727	-0.362	1	-0.365	-0.495	12307
1996	0.560	1.068	0.003	0.066	1	-0.063	-0.086	18880
1997	0.670	1.416	0.182	0.348	1	-0.165	-0.225	25019
1998	0.520	1.366	-0.071	0.312	1	-0.383	-0.520	24142
1999	0.720	0.755	0.254	-0.281	1	0.535	0.727	13343

Partial Variance: 0.325

NEC_S
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.120	0.468	-0.010	-0.759	1	0.749	1.018	2464
1983	0.190	0.713	0.450	-0.338	1	0.788	1.070	3755
1984	0.090	0.825	-0.297	-0.193	1	-0.105	-0.143	4343
1985	0.210	0.471	0.550	-0.752	1	1.302	1.769	2481
1986	0.200	1.009	0.501	0.009	1	0.492	0.668	5315
1987	0.020	0.544	-1.802	-0.608	1	-1.194	-1.622	2867
1988	0.070	0.555	-0.549	-0.589	1	0.041	0.055	2920
1989	0.020	0.429	-1.802	-0.847	1	-0.955	-1.297	2257
1990	0.060	0.278	-0.703	-1.280	1	0.578	0.785	1463
1991	0.000	0.000	0	0	1	0.000	0.000	00
1992	0.010	0.269	-2.495	-1.312	1	-1.183	-1.607	1418
1993	0.040	0.214	-1.108	-1.543	1	0.435	0.591	1125
1994	0.040	0.378	-1.108	-0.974	1	-0.134	-0.183	1988
1995	0.020	0.445	-1.802	-0.809	1	-0.992	-1.348	2344
1996	0.120	0.659	-0.010	-0.417	1	0.408	0.554	3468
1997	0.090	1.341	-0.297	0.294	1	-0.591	-0.803	7063
1998	0.320	2.508	0.971	0.919	1	0.052	0.070	13204
1999	0.440	2.662	1.290	0.979	1	0.310	0.422	14017

Partial Variance: 0.567

Table 79 continued.

NEC_S
Tuned to: 1-Jan
For ages: 4

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.030	0.709	-0.112	-0.344	1	0.232	0.315	855
1983	0.040	0.971	0.175	-0.030	1	0.205	0.279	1171
1984	0.050	0.912	0.398	-0.092	1	0.490	0.666	1101
1985	0.040	0.562	0.175	-0.576	1	0.751	1.021	678
1986	0.020	0.358	-0.518	-1.026	1	0.508	0.690	433
1987	0.020	0.770	-0.518	-0.261	1	-0.257	-0.349	929
1988	0.030	0.709	-0.112	-0.344	1	0.231	0.314	856
1989	0.010	0.379	-1.211	-0.970	1	-0.241	-0.327	457
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.020	0.247	-0.518	-1.400	1	0.882	1.198	298
1992	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.000	0.000	0	0	1	0.000	0.000	00
1994	0.010	0.339	-1.211	-1.082	1	-0.129	-0.175	409
1995	0.000	0.000	0	0	1	0.000	0.000	00
1996	0.010	0.661	-1.211	-0.414	1	-0.797	-1.083	798
1997	0.010	1.015	-1.211	0.014	1	-1.226	-1.665	1224
1998	0.060	2.430	0.581	0.888	1	-0.307	-0.418	2933
1999	0.120	5.038	1.274	1.617	1	-0.343	-0.466	6080

Partial Variance: 0.348

NEC_F
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	1.520	1.117	0.421	0.111	1	0.310	0.422	17363
1984	1.460	1.294	0.381	0.258	1	0.123	0.167	20110
1985	1.390	1.696	0.332	0.528	1	-0.197	-0.267	26361
1986	0.800	1.011	-0.221	0.011	1	-0.232	-0.315	15719
1987	0.830	1.000	-0.184	0.000	1	-0.184	-0.250	15545
1988	0.580	1.213	-0.542	0.193	1	-0.735	-0.999	18851
1989	0.620	0.634	-0.476	-0.455	1	-0.021	-0.028	9862
1990	0.210	0.238	-1.558	-1.437	1	-0.121	-0.165	3693
1991	0.380	0.620	-0.965	-0.479	1	-0.487	-0.661	9632
1992	0.840	0.517	-0.172	-0.660	1	0.488	0.663	8034
1993	1.040	0.554	0.042	-0.590	1	0.631	0.858	8618
1994	0.800	0.682	-0.221	-0.383	1	0.163	0.221	10594
1995	0.670	0.792	-0.398	-0.233	1	-0.165	-0.224	12307
1996	1.160	1.215	0.151	0.194	1	-0.044	-0.059	18880
1997	1.240	1.610	0.217	0.476	1	-0.259	-0.351	25019
1998	1.290	1.553	0.257	0.440	1	-0.183	-0.249	24142
1999	2.130	0.858	0.758	-0.153	1	0.911	1.238	13343

Partial Variance: 0.167

NEC_F
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.400	0.690	0.080	-0.371	1	0.451	0.612	3755
1984	0.340	0.798	-0.083	-0.226	1	0.143	0.194	4343
1985	0.430	0.456	0.152	-0.786	1	0.937	1.274	2481
1986	0.460	0.976	0.219	-0.024	1	0.243	0.330	5315
1987	0.110	0.527	-1.211	-0.641	1	-0.570	-0.775	2867
1988	0.200	0.537	-0.614	-0.623	1	0.009	0.012	2920
1989	0.180	0.415	-0.719	-0.880	1	0.161	0.219	2257
1990	0.050	0.269	-2.000	-1.314	1	-0.686	-0.932	1463
1991	0.030	0.192	-2.511	-1.651	1	-0.860	-1.169	1045
1992	0.090	0.260	-1.412	-1.345	1	-0.067	-0.091	1418
1993	0.250	0.207	-0.390	-1.577	1	1.186	1.611	1125
1994	0.030	0.365	-2.511	-1.007	1	-1.503	-2.043	1988
1995	0.090	0.431	-1.412	-0.843	1	-0.570	-0.774	2344
1996	0.280	0.637	-0.277	-0.451	1	0.174	0.236	3468
1997	0.570	1.298	0.434	0.261	1	0.173	0.235	7063
1998	1.140	2.426	1.127	0.886	1	0.241	0.327	13204
1999	1.630	2.575	1.484	0.946	1	0.539	0.732	14017

Partial Variance: 0.449

Table 79 continued.

NEC_F
Tuned to: 1-Jan
For ages: 4

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.020	0.844	-1.378	-0.170	1	-1.208	-1.641	1171
1984	0.120	0.793	0.414	-0.232	1	0.646	0.878	1101
1985	0.070	0.489	-0.125	-0.716	1	0.591	0.803	678
1986	0.050	0.311	-0.462	-1.166	1	0.705	0.957	433
1987	0.100	0.669	0.232	-0.402	1	0.633	0.860	929
1988	0.030	0.616	-0.972	-0.484	1	-0.488	-0.664	856
1989	0.030	0.329	-0.972	-1.111	1	0.138	0.188	457
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.040	0.214	-0.685	-1.540	1	0.855	1.162	298
1992	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.030	0.103	-0.972	-2.274	1	1.301	1.768	143
1994	0.010	0.294	-2.071	-1.223	1	-0.849	-1.153	409
1995	0.010	0.532	-2.071	-0.631	1	-1.440	-1.957	739
1996	0.020	0.574	-1.378	-0.554	1	-0.824	-1.119	798
1997	0.040	0.882	-0.685	-0.126	1	-0.559	-0.759	1224
1998	0.290	2.112	1.296	0.748	1	0.549	0.745	2933
1999	0.330	4.378	1.425	1.477	1	-0.051	-0.069	6080

Partial Variance: 0.712

MA_S
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	1.424	0.749	0.642	-0.289	1	0.932	1.266	15803
1983	1.304	0.823	0.554	-0.195	1	0.750	1.019	17363
1984	0.073	0.953	-2.328	-0.048	1	-2.280	-3.097	20110
1985	1.191	1.249	0.464	0.222	1	0.242	0.328	26361
1986	0.528	0.745	-0.350	-0.295	1	-0.055	-0.075	15719
1987	0.583	0.736	-0.251	-0.306	1	0.055	0.075	15545
1988	0.966	0.893	0.254	-0.113	1	0.367	0.499	18851
1989	0.338	0.467	-0.796	-0.761	1	-0.035	-0.047	9862
1990	0.021	0.175	-3.574	-1.743	1	-1.831	-2.488	3693
1991	0.048	0.456	-2.748	-0.785	1	-1.963	-2.667	9632
1992	0.320	0.381	-0.850	-0.966	1	0.116	0.157	8034
1993	0.470	0.408	-0.466	-0.896	1	0.430	0.584	8618
1994	1.160	0.502	0.437	-0.689	1	1.127	1.532	10594
1995	1.245	0.583	0.508	-0.539	1	1.048	1.423	12307
1996	0.641	0.895	-0.156	-0.111	1	-0.044	-0.060	18880
1997	1.212	1.185	0.481	0.170	1	0.311	0.423	25019
1998	1.144	1.144	0.424	0.134	1	0.289	0.393	24142
1999	0.814	0.632	0.083	-0.459	1	0.542	0.736	13343

Partial Variance: 1.011

MA_S
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.118	0.398	-0.462	-0.922	1	0.460	0.625	2464
1983	0.544	0.606	1.067	-0.501	1	1.567	2.129	3755
1984	0.063	0.701	-1.089	-0.355	1	-0.734	-0.997	4343
1985	0.034	0.401	-1.706	-0.915	1	-0.791	-1.074	2481
1986	0.140	0.858	-0.291	-0.153	1	-0.137	-0.187	5315
1987	0.012	0.463	-2.747	-0.771	1	-1.977	-2.686	2867
1988	0.109	0.471	-0.541	-0.752	1	0.211	0.287	2920
1989	0.079	0.364	-0.863	-1.010	1	0.147	0.199	2257
1990	0.079	0.236	-0.863	-1.443	1	0.580	0.788	1463
1991	0.010	0.169	-2.930	-1.780	1	-1.150	-1.562	1045
1992	0.080	0.229	-0.850	-1.475	1	0.624	0.848	1418
1993	0.060	0.182	-1.138	-1.706	1	0.568	0.772	1125
1994	0.050	0.321	-1.320	-1.137	1	-0.184	-0.249	1988
1995	0.050	0.378	-1.320	-0.972	1	-0.348	-0.473	2344
1996	0.110	0.560	-0.532	-0.580	1	0.048	0.066	3468
1997	0.169	1.140	-0.102	0.131	1	-0.234	-0.317	7063
1998	0.630	2.131	1.213	0.757	1	0.457	0.620	13204
1999	1.033	2.263	1.708	0.816	1	0.891	1.211	14017

Partial Variance: 0.676

Table 79 continued.

MA_F
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.367	0.555	-0.545	-0.588	1	0.043	0.058	2464
1983	1.741	0.847	1.012	-0.167	1	1.178	1.601	3755
1984	0.583	0.979	-0.082	-0.021	1	-0.061	-0.083	4343
1985	0.249	0.559	-0.933	-0.581	1	-0.352	-0.478	2481
1986	1.662	1.198	0.965	0.181	1	0.785	1.066	5315
1987	0.488	0.646	-0.260	-0.437	1	0.177	0.240	2867
1988	0.598	0.658	-0.057	-0.418	1	0.361	0.491	2920
1989	0.414	0.509	-0.425	-0.676	1	0.251	0.341	2257
1990	0.286	0.330	-0.794	-1.109	1	0.315	0.428	1463
1991	0.000	0.000	0	0	1	0.000	0.000	00
1992	0.262	0.320	-0.882	-1.141	1	0.259	0.351	1418
1993	0.170	0.254	-1.315	-1.372	1	0.057	0.078	1125
1994	0.430	0.448	-0.387	-0.803	1	0.416	0.565	1988
1995	0.070	0.528	-2.202	-0.638	1	-1.564	-2.125	2344
1996	0.323	0.782	-0.673	-0.246	1	-0.427	-0.580	3468
1997	1.165	1.592	0.610	0.465	1	0.145	0.197	7063
1998	1.399	2.976	0.793	1.091	1	-0.298	-0.404	13204
1999	0.553	3.160	-0.135	1.150	1	-1.285	-1.746	14017

Partial Variance: 0.446

MA_F
Tuned to: 1-Jan
For ages: 4

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.011	0.542	-1.926	-0.612	1	-1.314	-1.785	855
1983	0.016	0.743	-1.552	-0.298	1	-1.254	-1.704	1171
1984	0.140	0.698	0.618	-0.360	1	0.977	1.327	1101
1985	0.120	0.430	0.463	-0.844	1	1.307	1.776	678
1986	0.033	0.274	-0.828	-1.294	1	0.466	0.633	433
1987	0.128	0.589	0.528	-0.529	1	1.057	1.436	929
1988	0.010	0.543	-2.022	-0.611	1	-1.410	-1.916	856
1989	0.018	0.290	-1.434	-1.238	1	-0.196	-0.266	457
1990	0.024	0.201	-1.146	-1.604	1	0.458	0.622	317
1991	0.012	0.189	-1.839	-1.668	1	-0.172	-0.233	298
1992	0.010	0.117	-2.022	-2.149	1	0.127	0.173	184
1993	0.000	0.000	0	0	1	0.000	0.000	00
1994	0.020	0.259	-1.328	-1.350	1	0.022	0.029	409
1995	0.000	0.000	0	0	1	0.000	0.000	00
1996	0.013	0.506	-1.759	-0.682	1	-1.078	-1.464	798
1997	0.082	0.776	0.083	-0.253	1	0.336	0.456	1224
1998	0.323	1.860	1.454	0.620	1	0.833	1.132	2933
1999	0.248	3.854	1.189	1.349	1	-0.160	-0.217	6080

Partial Variance: 0.777

CT_S
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.271	1.079	0.214	0.076	1	0.138	0.187	20110
1985	0.282	1.414	0.253	0.346	1	-0.093	-0.126	26361
1986	0.090	0.843	-0.889	-0.171	1	-0.718	-0.976	15719
1987	0.086	0.834	-0.934	-0.182	1	-0.752	-1.022	15545
1988	0.223	1.011	0.019	0.011	1	0.008	0.010	18851
1989	0.049	0.529	-1.497	-0.637	1	-0.860	-1.168	9862
1990	0.022	0.198	-2.297	-1.619	1	-0.678	-0.922	3693
1991	0.189	0.517	-0.147	-0.660	1	0.514	0.698	9632
1992	0.188	0.431	-0.152	-0.842	1	0.690	0.937	8034
1993	0.151	0.462	-0.371	-0.772	1	0.400	0.544	8618
1994	0.314	0.568	0.361	-0.565	1	0.926	1.258	10594
1995	0.051	0.660	-1.457	-0.415	1	-1.041	-1.415	12307
1996	0.266	1.013	0.195	0.013	1	0.182	0.248	18880
1997	0.507	1.342	0.840	0.294	1	0.546	0.742	25019
1998	0.594	1.295	0.998	0.259	1	0.740	1.005	24142
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.434

Table 79 continued.

CT_S
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.044	0.842	-0.403	-0.171	1	-0.232	-0.315	4343
1985	0.028	0.481	-0.855	-0.731	1	-0.124	-0.169	2481
1986	0.074	1.031	0.116	0.030	1	0.086	0.117	5315
1987	0.014	0.556	-1.549	-0.587	1	-0.962	-1.307	2867
1988	0.035	0.566	-0.632	-0.568	1	-0.064	-0.087	2920
1989	0.024	0.438	-1.010	-0.826	1	-0.184	-0.250	2257
1990	0.013	0.284	-1.623	-1.259	1	-0.363	-0.494	1463
1991	0.029	0.203	-0.820	-1.596	1	0.776	1.054	1045
1992	0.021	0.275	-1.143	-1.291	1	0.148	0.201	1418
1993	0.015	0.218	-1.480	-1.522	1	0.043	0.058	1125
1994	0.025	0.386	-0.969	-0.953	1	-0.016	-0.022	1988
1995	0.020	0.455	-1.192	-0.788	1	-0.404	-0.548	2344
1996	0.086	0.673	0.267	-0.396	1	0.663	0.901	3468
1997	0.057	1.370	-0.145	0.315	1	-0.459	-0.624	7063
1998	0.503	2.561	2.033	0.940	1	1.092	1.484	13204
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.274

CT_S
Tuned to: 1-Jan
For ages: 4

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.052	0.753	0.761	-0.284	1	1.045	1.420	678
1986	0.008	0.480	-1.110	-0.734	1	-0.376	-0.511	433
1987	0.004	1.031	-1.804	0.031	1	-1.834	-2.492	929
1988	0.009	0.950	-0.993	-0.052	1	-0.941	-1.278	856
1989	0.016	0.507	-0.417	-0.678	1	0.261	0.355	457
1990	0.006	0.352	-1.398	-1.044	1	-0.354	-0.481	317
1991	0.028	0.330	0.142	-1.108	1	1.250	1.699	298
1992	0.004	0.204	-1.804	-1.589	1	-0.214	-0.291	184
1993	0.018	0.159	-0.300	-1.841	1	1.542	2.095	143
1994	0.018	0.454	-0.300	-0.790	1	0.491	0.667	409
1995	0.005	0.820	-1.580	-0.199	1	-1.382	-1.877	739
1996	0.023	0.885	-0.054	-0.122	1	0.068	0.092	798
1997	0.036	1.359	0.394	0.306	1	0.087	0.119	1224
1998	0.113	3.254	1.537	1.180	1	0.357	0.486	2933
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.928

CT_F
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.571	1.592	-0.103	0.465	1	-0.567	-0.771	26361
1986	0.351	0.949	-0.589	-0.052	1	-0.537	-0.729	15719
1987	1.170	0.939	0.615	-0.063	1	0.678	0.921	15545
1988	1.067	1.138	0.523	0.129	1	0.393	0.534	18851
1989	0.884	0.595	0.335	-0.518	1	0.853	1.159	9862
1990	0.029	0.223	-3.083	-1.501	1	-1.582	-2.149	3693
1991	0.674	0.582	0.063	-0.542	1	0.605	0.822	9632
1992	0.826	0.485	0.267	-0.723	1	0.990	1.345	8034
1993	0.570	0.520	-0.104	-0.653	1	0.549	0.746	8618
1994	0.827	0.640	0.268	-0.447	1	0.715	0.971	10594
1995	0.300	0.743	-0.746	-0.297	1	-0.449	-0.610	12307
1996	0.384	1.140	-0.499	0.131	1	-0.630	-0.856	18880
1997	0.887	1.511	0.338	0.413	1	-0.075	-0.101	25019
1998	0.681	1.458	0.074	0.377	1	-0.303	-0.412	24142
1999	0.269	0.806	-0.855	-0.216	1	-0.639	-0.868	13343

Partial Variance: 0.556

Table 79 continued.

CT_F
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.331	0.565	-0.295	-0.570	1	0.275	0.374	2481
1986	0.485	1.211	0.087	0.192	1	-0.104	-0.142	5315
1987	0.268	0.653	-0.506	-0.426	1	-0.080	-0.109	2867
1988	0.223	0.666	-0.690	-0.407	1	-0.283	-0.384	2920
1989	0.481	0.514	0.079	-0.665	1	0.743	1.010	2257
1990	0.095	0.333	-1.543	-1.098	1	-0.445	-0.604	1463
1991	0.110	0.238	-1.397	-1.435	1	0.039	0.052	1045
1992	0.340	0.323	-0.268	-1.130	1	0.862	1.171	1418
1993	0.366	0.256	-0.194	-1.361	1	1.167	1.585	1125
1994	0.152	0.453	-1.073	-0.792	1	-0.281	-0.382	1988
1995	0.085	0.534	-1.654	-0.627	1	-1.027	-1.396	2344
1996	0.117	0.790	-1.335	-0.235	1	-1.100	-1.494	3468
1997	1.188	1.610	0.983	0.476	1	0.507	0.689	7063
1998	1.373	3.009	1.128	1.102	1	0.026	0.035	13204
1999	1.054	3.194	0.863	1.161	1	-0.298	-0.405	14017

Partial Variance: 0.412

CT_F
Tuned to: 1-Jan
For ages: 4

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.072	0.633	-0.137	-0.458	1	0.321	0.437	678
1986	0.078	0.403	-0.056	-0.908	1	0.851	1.157	433
1987	0.068	0.867	-0.194	-0.143	1	-0.050	-0.069	929
1988	0.033	0.798	-0.917	-0.225	1	-0.691	-0.939	856
1989	0.037	0.426	-0.802	-0.852	1	0.050	0.068	457
1990	0.015	0.296	-1.705	-1.218	1	-0.487	-0.662	317
1991	0.042	0.278	-0.676	-1.282	1	0.606	0.824	298
1992	0.036	0.172	-0.830	-1.763	1	0.933	1.268	184
1993	0.046	0.133	-0.585	-2.015	1	1.431	1.944	143
1994	0.039	0.381	-0.750	-0.964	1	0.214	0.291	409
1995	0.024	0.689	-1.235	-0.372	1	-0.863	-1.172	739
1996	0.012	0.744	-1.928	-0.296	1	-1.633	-2.218	798
1997	0.042	1.142	-0.676	0.133	1	-0.808	-1.098	1224
1998	0.373	2.735	1.508	1.006	1	0.502	0.682	2933
1999	0.321	5.669	1.358	1.735	1	-0.377	-0.512	6080

Partial Variance: 0.672

RI_F
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	2.100	0.670	1.219	-0.400	1	1.619	2.200	15803
1983	0.360	0.736	-0.545	-0.306	1	-0.239	-0.324	17363
1984	0.250	0.853	-0.909	-0.159	1	-0.750	-1.019	20110
1985	0.850	1.118	0.315	0.112	1	0.203	0.276	26361
1986	0.330	0.667	-0.632	-0.405	1	-0.226	-0.307	15719
1987	2.200	0.659	1.266	-0.417	1	1.682	2.285	15545
1988	0.720	0.800	0.149	-0.224	1	0.372	0.506	18851
1989	0.410	0.418	-0.414	-0.872	1	0.457	0.621	9862
1990	0.040	0.157	-2.742	-1.854	1	-0.888	-1.206	3693
1991	0.470	0.408	-0.278	-0.895	1	0.617	0.839	9632
1992	0.070	0.341	-2.182	-1.077	1	-1.105	-1.502	8034
1993	0.770	0.366	0.216	-1.006	1	1.222	1.660	8618
1994	0.210	0.449	-1.084	-0.800	1	-0.284	-0.385	10594
1995	0.120	0.522	-1.643	-0.650	1	-0.993	-1.349	12307
1996	0.290	0.801	-0.761	-0.222	1	-0.539	-0.732	18880
1997	1.000	1.061	0.477	0.059	1	0.418	0.568	25019
1998	0.930	1.024	0.405	0.024	1	0.381	0.517	24142
1999	0.050	0.566	-2.519	-0.569	1	-1.949	-2.648	13343

Partial Variance: 0.94

Table 79 continued.

RI_F
Tuned to: 1-Jan
For ages: 1

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.287	0.626	-0.290	-0.469	1	0.178	0.242	21498
1991	0.118	0.677	-1.179	-0.391	1	-0.788	-1.071	23239
1992	0.344	0.667	-0.109	-0.405	1	0.296	0.402	22901
1993	0.075	0.738	-1.632	-0.303	1	-1.329	-1.805	25357
1994	0.190	0.771	-0.703	-0.260	1	-0.443	-0.601	26484
1995	0.394	0.859	0.027	-0.152	1	0.179	0.243	29502
1996	0.922	1.113	0.877	0.107	1	0.770	1.046	38212
1997	0.844	0.940	0.788	-0.061	1	0.850	1.155	32300
1998	0.279	0.546	-0.319	-0.605	1	0.287	0.390	18750
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.524

RI_F
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.317	0.238	-0.509	-1.435	1	0.927	1.259	3693
1991	0.052	0.621	-2.316	-0.477	1	-1.840	-2.499	9632
1992	0.377	0.518	-0.335	-0.658	1	0.323	0.438	8034
1993	0.396	0.556	-0.286	-0.588	1	0.302	0.410	8618
1994	0.190	0.683	-1.021	-0.381	1	-0.639	-0.868	10594
1995	0.622	0.793	0.165	-0.232	1	0.397	0.539	12307
1996	1.047	1.217	0.686	0.196	1	0.490	0.665	18880
1997	1.054	1.613	0.693	0.478	1	0.215	0.292	25019
1998	0.690	1.556	0.269	0.442	1	-0.173	-0.235	24142
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.674

NJ
Tuned to: 1-Jan
For ages: 1

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	4.220	1.143	0.052	0.133	1	-0.082	-0.111	34764
1989	0.540	0.322	-2.004	-1.132	1	-0.872	-1.184	9804
1990	1.890	0.707	-0.751	-0.347	1	-0.404	-0.549	21498
1991	3.110	0.764	-0.253	-0.269	1	0.016	0.022	23239
1992	3.760	0.753	-0.063	-0.284	1	0.220	0.300	22901
1993	6.950	0.834	0.551	-0.182	1	0.733	0.996	25357
1994	1.460	0.871	-1.009	-0.139	1	-0.871	-1.183	26484
1995	2.930	0.970	-0.313	-0.031	1	-0.282	-0.383	29502
1996	5.160	1.256	0.253	0.228	1	0.025	0.034	38212
1997	8.250	1.062	0.722	0.060	1	0.662	0.900	32300
1998	5.800	0.616	0.370	-0.484	1	0.854	1.160	18750
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.356

Table 79 continued.

NJ
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	1.190	0.780	-0.076	-0.249	1	0.172	0.234	18851
1989	0.400	0.408	-1.167	-0.897	1	-0.270	-0.367	9862
1990	0.150	0.153	-2.148	-1.879	1	-0.269	-0.365	3693
1991	0.320	0.398	-1.390	-0.920	1	-0.469	-0.638	9632
1992	0.760	0.332	-0.525	-1.102	1	0.577	0.784	8034
1993	0.270	0.356	-1.560	-1.032	1	-0.528	-0.718	8618
1994	0.130	0.438	-2.291	-0.825	1	-1.466	-1.991	10594
1995	0.280	0.509	-1.523	-0.675	1	-0.848	-1.152	12307
1996	2.710	0.781	0.747	-0.247	1	0.994	1.350	18880
1997	5.250	1.035	1.408	0.034	1	1.374	1.866	25019
1998	2.670	0.999	0.732	-0.001	1	0.733	0.996	24142
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.737

DE
Tuned to: 1-Jan
For ages: 2

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.180	0.572	-0.826	-0.558	1	-0.268	-0.365	9632
1992	0.080	0.478	-1.637	-0.739	1	-0.898	-1.220	8034
1993	0.730	0.512	0.574	-0.669	1	1.243	1.688	8618
1994	0.220	0.630	-0.626	-0.462	1	-0.163	-0.222	10594
1995	0.280	0.732	-0.384	-0.313	1	-0.072	-0.098	12307
1996	0.480	1.122	0.155	0.115	1	0.039	0.053	18880
1997	0.490	1.487	0.175	0.397	1	-0.222	-0.301	25019
1998	0.830	1.435	0.702	0.361	1	0.341	0.463	24142
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.381

DE
Tuned to: 1-Jan
For ages: 3

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.000	0.000	0	0	1	0.000	0.000	00
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.000	0.000	0	0	1	0.000	0.000	00
1991	0.040	0.256	-1.413	-1.362	1	-0.051	-0.069	1045
1992	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.070	0.276	-0.853	-1.288	1	0.435	0.590	1125
1994	0.080	0.488	-0.720	-0.718	1	-0.001	-0.002	1988
1995	0.100	0.575	-0.496	-0.554	1	0.057	0.078	2344
1996	0.100	0.851	-0.496	-0.162	1	-0.335	-0.455	3468
1997	0.470	1.732	1.051	0.549	1	0.502	0.682	7063
1998	0.290	3.238	0.568	1.175	1	-0.607	-0.824	13204
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.157

Table 79 continued.

CT_Y
Tuned to: 1-Jan
For ages: 0

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.238	0.974	1.133	-0.027	1	1.160	1.575	48623
1986	0.170	1.071	0.796	0.069	1	0.727	0.988	53502
1987	0.075	0.875	-0.022	-0.133	1	0.111	0.151	43717
1988	0.015	0.257	-1.631	-1.357	1	-0.274	-0.373	12854
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.032	0.609	-0.874	-0.495	1	-0.379	-0.514	30436
1991	0.036	0.582	-0.756	-0.541	1	-0.215	-0.292	29077
1992	0.013	0.650	-1.775	-0.430	1	-1.344	-1.826	32483
1993	0.084	0.676	0.091	-0.391	1	0.483	0.656	33768
1994	0.132	0.758	0.543	-0.277	1	0.821	1.115	37844
1995	0.023	0.948	-1.204	-0.054	1	-1.150	-1.563	47326
1996	0.069	0.794	-0.105	-0.231	1	0.126	0.171	39630
1997	0.033	0.459	-0.843	-0.778	1	-0.065	-0.088	22935
1998	0.000	0.000	0	0	1	0.000	0.000	00
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.57

VA_RY
Tuned to: 1-Jan
For ages: 0

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	4.300	1.390	1.114	0.329	1	0.785	1.066	74298
1983	5.200	1.509	1.304	0.411	1	0.893	1.213	80652
1984	1.900	0.907	0.297	-0.097	1	0.394	0.536	48496
1985	1.100	0.910	-0.250	-0.095	1	-0.155	-0.210	48623
1986	1.300	1.001	-0.082	0.001	1	-0.083	-0.113	53502
1987	0.400	0.818	-1.261	-0.201	1	-1.060	-1.440	43717
1988	0.500	0.240	-1.038	-1.425	1	0.387	0.526	12854
1989	1.000	0.511	-0.345	-0.671	1	0.327	0.444	27319
1990	2.600	0.569	0.611	-0.563	1	1.174	1.595	30436
1991	1.400	0.544	-0.008	-0.609	1	0.601	0.816	29077
1992	0.500	0.608	-1.038	-0.498	1	-0.540	-0.733	32483
1993	0.500	0.632	-1.038	-0.459	1	-0.579	-0.786	33768
1994	1.100	0.708	-0.250	-0.345	1	0.096	0.130	37844
1995	0.700	0.885	-0.702	-0.122	1	-0.580	-0.787	47326
1996	0.600	0.741	-0.856	-0.299	1	-0.556	-0.756	39630
1997	0.700	0.429	-0.702	-0.846	1	0.145	0.197	22935
1998	0.200	0.494	-1.954	-0.705	1	-1.249	-1.697	26408
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.477

NC_Y
Tuned to: 1-Jan
For ages: 0

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	19.860	1.141	0.668	0.132	1	0.536	0.728	43717
1988	2.610	0.336	-1.361	-1.092	1	-0.270	-0.366	12854
1989	6.630	0.713	-0.429	-0.338	1	-0.091	-0.124	27319
1990	4.270	0.795	-0.869	-0.230	1	-0.639	-0.868	30436
1991	5.850	0.759	-0.554	-0.276	1	-0.279	-0.379	29077
1992	9.140	0.848	-0.108	-0.165	1	0.057	0.077	32483
1993	5.130	0.882	-0.686	-0.126	1	-0.560	-0.760	33768
1994	8.170	0.988	-0.220	-0.012	1	-0.208	-0.283	37844
1995	5.590	1.235	-0.600	0.211	1	-0.811	-1.102	47326
1996	30.860	1.035	1.109	0.034	1	1.075	1.460	39630
1997	14.140	0.599	0.328	-0.513	1	0.841	1.143	22935
1998	9.960	0.689	-0.022	-0.372	1	0.350	0.475	26408
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.354

Table 79 continued.

MD_Y
Tuned to: 1-Jan
For ages: 0

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	2.000	1.487	-0.866	0.397	1	-1.262	-1.715	74298
1983	10.600	1.614	0.802	0.479	1	0.323	0.439	80652
1984	5.400	0.971	0.128	-0.030	1	0.157	0.214	48496
1985	5.600	0.973	0.164	-0.027	1	0.191	0.260	48623
1986	16.200	1.071	1.226	0.068	1	1.158	1.573	53502
1987	4.600	0.875	-0.033	-0.134	1	0.101	0.137	43717
1988	0.500	0.257	-2.252	-1.358	1	-0.894	-1.215	12854
1989	1.300	0.547	-1.296	-0.604	1	-0.693	-0.941	27319
1990	2.100	0.609	-0.817	-0.496	1	-0.321	-0.436	30436
1991	3.100	0.582	-0.427	-0.541	1	0.114	0.155	29077
1992	3.500	0.650	-0.306	-0.431	1	0.125	0.169	32483
1993	1.600	0.676	-1.089	-0.392	1	-0.697	-0.947	33768
1994	8.200	0.757	0.545	-0.278	1	0.823	1.118	37844
1995	5.000	0.947	0.051	-0.054	1	0.105	0.143	47326
1996	2.600	0.793	-0.603	-0.232	1	-0.372	-0.505	39630
1997	3.300	0.459	-0.365	-0.779	1	0.414	0.562	22935
1998	5.200	0.529	0.090	-0.638	1	0.728	0.988	26408
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.411

NJ_Y
Tuned to: 1-Jan
For ages: 0

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.000	0.000	0	0	1	0.000	0.000	00
1985	0.000	0.000	0	0	1	0.000	0.000	00
1986	0.000	0.000	0	0	1	0.000	0.000	00
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.290	0.347	-1.880	-1.058	1	-0.823	-1.117	12854
1989	1.250	0.738	-0.419	-0.304	1	-0.115	-0.157	27319
1990	1.880	0.822	-0.011	-0.196	1	0.185	0.251	30436
1991	1.500	0.786	-0.237	-0.241	1	0.004	0.006	29077
1992	1.340	0.878	-0.350	-0.131	1	-0.219	-0.298	32483
1993	3.520	0.912	0.616	-0.092	1	0.708	0.962	33768
1994	2.220	1.022	0.155	0.022	1	0.133	0.181	37844
1995	4.950	1.279	0.957	0.246	1	0.711	0.966	47326
1996	1.650	1.071	-0.142	0.068	1	-0.210	-0.285	39630
1997	1.640	0.620	-0.148	-0.479	1	0.331	0.450	22935
1998	0.670	0.713	-1.043	-0.338	1	-0.705	-0.958	26408
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.248

NEC_Y
Tuned to: 1-Jan
For ages: 0

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	0.550	1.469	0.172	0.385	1	-0.212	-0.288	74298
1983	0.960	1.594	0.729	0.467	1	0.263	0.357	80652
1984	0.180	0.959	-0.945	-0.042	1	-0.903	-1.226	48496
1985	0.590	0.961	0.243	-0.039	1	0.282	0.383	48623
1986	0.390	1.058	-0.171	0.056	1	-0.228	-0.309	53502
1987	0.070	0.864	-1.889	-0.146	1	-1.743	-2.368	43717
1988	0.060	0.254	-2.043	-1.370	1	-0.673	-0.915	12854
1989	0.310	0.540	-0.401	-0.616	1	0.215	0.292	27319
1990	0.440	0.602	-0.051	-0.508	1	0.457	0.621	30436
1991	0.760	0.575	0.496	-0.554	1	1.049	1.426	29077
1992	0.990	0.642	0.760	-0.443	1	1.203	1.634	32483
1993	0.230	0.668	-0.700	-0.404	1	-0.295	-0.401	33768
1994	0.750	0.748	0.482	-0.290	1	0.773	1.050	37844
1995	0.930	0.936	0.698	-0.067	1	0.764	1.038	47326
1996	0.110	0.783	-1.437	-0.244	1	-1.193	-1.621	39630
1997	0.170	0.453	-1.002	-0.791	1	-0.211	-0.286	22935
1998	0.380	0.522	-0.197	-0.650	1	0.453	0.615	26408
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.648

Table 79 continued.

MA_Y
Tuned to: 1-Jan
For ages: 0

Year	Obs.	Pred.	Scd. Obs.	Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1982	4.000	1.428	-0.463	0.356	1	-0.819	-1.113	74298
1983	4.000	1.550	-0.463	0.439	1	-0.901	-1.224	80652
1984	2.000	0.932	-1.156	-0.070	1	-1.086	-1.475	48496
1985	20.000	0.935	1.147	-0.067	1	1.214	1.650	48623
1986	6.000	1.029	-0.057	0.028	1	-0.085	-0.116	53502
1987	6.000	0.840	-0.057	-0.174	1	0.117	0.159	43717
1988	3.000	0.247	-0.750	-1.398	1	0.648	0.880	12854
1989	4.000	0.525	-0.463	-0.644	1	0.181	0.246	27319
1990	12.000	0.585	0.636	-0.536	1	1.172	1.592	30436
1991	5.000	0.559	-0.239	-0.582	1	0.342	0.465	29077
1992	1.000	0.624	-1.849	-0.471	1	-1.378	-1.872	32483
1993	3.000	0.649	-0.750	-0.432	1	-0.318	-0.432	33768
1994	2.000	0.728	-1.156	-0.318	1	-0.838	-1.138	37844
1995	14.000	0.910	0.790	-0.095	1	0.885	1.202	47326
1996	8.000	0.762	0.231	-0.272	1	0.503	0.683	39630
1997	1.000	0.441	-1.849	-0.819	1	-1.030	-1.399	22935
1998	13.000	0.508	0.716	-0.678	1	1.394	1.894	26408
1999	0.000	0.000	0	0	1	0.000	0.000	00

Partial Variance: 0.808

Standardized residuals by index and year; with row/column/grand means

	1982	1983	1984	1985	1986	1987	1988
NEC_W1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEC_W2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEC_W3	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEC_W4	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEC_W5	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEC_S1	0.066	-1.347	-2.335	0.013	1.272	-0.465	0.132
NEC_S2	1.410	-0.463	-0.890	0.853	-0.196	-0.181	0.384
NEC_S3	1.018	1.070	-0.143	1.769	0.668	-1.622	0.055
NEC_S4	0.315	0.279	0.666	1.021	0.690	-0.349	0.314
NEC_F2	0.000	0.422	0.167	-0.267	-0.315	-0.250	-0.999
NEC_F3	0.000	0.612	0.194	1.274	0.330	-0.775	0.012
NEC_F4	0.000	-1.641	0.878	0.803	0.957	0.860	-0.664
MA_S2	1.266	1.019	-3.097	0.328	-0.075	0.075	0.499
MA_S3	0.625	2.129	-0.997	-1.074	-0.187	-2.686	0.287
MA_F3	0.058	1.601	-0.083	-0.478	1.066	0.240	0.491
MA_F4	-1.785	-1.704	1.327	1.776	0.633	1.436	-1.916
CT_S2	0.000	0.000	0.187	-0.126	-0.976	-1.022	0.010
CT_S3	0.000	0.000	-0.315	-0.169	0.117	-1.307	-0.087
CT_S4	0.000	0.000	0.000	1.420	-0.511	-2.492	-1.278
CT_F2	0.000	0.000	0.000	-0.771	-0.729	0.921	0.534
CT_F3	0.000	0.000	0.000	0.374	-0.142	-0.109	-0.384
CT_F4	0.000	0.000	0.000	0.437	1.157	-0.069	-0.939
RI_F2	2.200	-0.324	-1.019	0.276	-0.307	2.285	0.506
RI_F1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RI_F2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NJ1	0.000	0.000	0.000	0.000	0.000	0.000	-0.111
NJ2	0.000	0.000	0.000	0.000	0.000	0.000	0.234
DE2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DE3	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CT_YO	0.000	0.000	0.000	1.575	0.988	0.151	-0.373
VA_RYO	1.066	1.213	0.536	-0.210	-0.113	-1.440	0.526
NC_YO	0.000	0.000	0.000	0.000	0.000	0.728	-0.366
MD_YO	-1.715	0.439	0.214	0.260	1.573	0.137	-1.215
NJ_YO	0.000	0.000	0.000	0.000	0.000	0.000	-1.117
NEC_YO	-0.288	0.357	-1.226	0.383	-0.309	-2.368	-0.915
MA_YO	-1.113	-1.224	-1.475	1.650	-0.116	0.159	0.880
Col Avg	0.240	0.152	-0.412	0.483	0.238	-0.339	-0.204

Table 79 continued.

	1989	1990	1991	1992	1993	1994	1995
NEC_W1	0.000	0.000	0.000	0.705	0.437	-0.365	0.139
NEC_W2	0.000	0.000	0.000	0.582	0.957	0.775	-0.041
NEC_W3	0.000	0.000	0.000	0.205	0.435	0.983	-0.855
NEC_W4	0.000	0.000	0.000	0.196	0.842	1.653	-2.635
NEC_W5	0.000	0.000	0.000	0.931	0.352	-0.965	0.000
NEC_S1	-1.254	0.852	1.075	1.043	0.850	-0.208	0.751
NEC_S2	-0.412	-1.845	-0.162	0.651	0.826	0.624	-0.495
NEC_S3	-1.297	0.785	0.000	-1.607	0.591	-0.183	-1.348
NEC_S4	-0.327	0.000	1.198	0.000	0.000	-0.175	0.000
NEC_F2	-0.028	-0.165	-0.661	0.663	0.858	0.221	-0.224
NEC_F3	0.219	-0.932	-1.169	-0.091	1.611	-2.043	-0.774
NEC_F4	0.188	0.000	1.162	0.000	1.768	-1.153	-1.957
MA_S2	-0.047	-2.488	-2.667	0.157	0.584	1.531	1.423
MA_S3	0.199	0.788	-1.562	0.848	0.772	-0.249	-0.473
MA_F3	0.341	0.428	0.000	0.351	0.078	0.565	-2.125
MA_F4	-0.266	0.622	-0.233	0.173	0.000	0.029	0.000
CT_S2	-1.168	-0.922	0.698	0.937	0.544	1.258	-1.415
CT_S3	-0.250	-0.494	1.054	0.201	0.058	-0.022	-0.548
CT_S4	0.355	-0.481	1.699	-0.291	2.095	0.667	-1.877
CT_F2	1.159	-2.149	0.822	1.345	0.746	0.971	-0.610
CT_F3	1.010	-0.604	0.052	1.171	1.585	-0.382	-1.396
CT_F4	0.068	-0.662	0.824	1.268	1.944	0.291	-1.172
RI_F2	0.621	-1.206	0.839	-1.502	1.660	-0.385	-1.349
RI_F1	0.000	0.242	-1.071	0.402	-1.805	-0.601	0.243
RI_F2	0.000	1.259	-2.499	0.438	0.410	-0.868	0.539
NJ1	-1.184	-0.549	0.022	0.300	0.996	-1.183	-0.383
NJ2	-0.367	-0.365	-0.638	0.784	-0.718	-1.991	-1.152
DE2	0.000	0.000	-0.365	-1.220	1.688	-0.222	-0.098
DE3	0.000	0.000	-0.069	0.000	0.590	-0.002	0.078
CT_YO	0.000	-0.514	-0.292	-1.826	0.656	1.115	-1.563
VA_RYO	0.444	1.595	0.816	-0.733	-0.786	0.130	-0.787
NC_YO	-0.124	-0.868	-0.379	0.077	-0.760	-0.283	-1.102
MD_YO	-0.941	-0.436	0.155	0.169	-0.947	1.118	0.143
NJ_YO	-0.157	0.251	0.006	-0.298	0.962	0.181	0.966
NEC_YO	0.292	0.621	1.426	1.634	-0.401	1.050	1.038
MA_YO	0.246	1.592	0.465	-1.872	-0.432	-1.138	1.202
Col Avg	-0.103	-0.209	0.019	0.175	0.560	0.021	-0.541

Table 79 continued.

	1996	1997	1998	1999
NEC_W1	1.547	-0.600	-0.991	-0.872
NEC_W2	0.188	-0.944	-1.425	-0.092
NEC_W3	-0.198	-0.417	-0.194	0.041
NEC_W4	-0.305	0.847	-0.372	-0.225
NEC_W5	-0.402	0.694	0.129	-0.739
NEC_S1	0.824	-0.733	-0.092	-0.443
NEC_S2	-0.086	-0.225	-0.520	0.727
NEC_S3	0.554	-0.803	0.070	0.422
NEC_S4	-1.083	-1.665	-0.418	-0.466
NEC_F2	-0.059	-0.351	-0.249	1.238
NEC_F3	0.236	0.235	0.327	0.732
NEC_F4	-1.119	-0.759	0.745	-0.069
MA_S2	-0.060	0.423	0.393	0.736
MA_S3	0.066	-0.317	0.620	1.211
MA_F3	-0.580	0.197	-0.404	-1.746
MA_F4	-1.464	0.456	1.132	-0.217
CT_S2	0.248	0.742	1.005	0.000
CT_S3	0.901	-0.624	1.484	0.000
CT_S4	0.092	0.119	0.486	0.000
CT_F2	-0.856	-0.101	-0.412	-0.868
CT_F3	-1.494	0.689	0.035	-0.405
CT_F4	-2.218	-1.098	0.682	-0.512
RI_F2	-0.732	0.568	0.517	-2.648
RI_F1	1.046	1.155	0.390	0.000
RI_F2	0.665	0.292	-0.235	0.000
NJ1	0.034	0.900	1.160	0.000
NJ2	1.350	1.866	0.996	0.000
DE2	0.053	-0.301	0.463	0.000
DE3	-0.455	0.682	-0.824	0.000
CT_Y0	0.171	-0.088	0.000	0.000
VA_RY0	-0.756	0.197	-1.697	0.000
NC_Y0	1.460	1.143	0.475	0.000
MD_Y0	-0.505	0.562	0.988	0.000
NJ_Y0	-0.285	0.450	-0.958	0.000
NEC_Y0	-1.621	-0.286	0.615	0.000
MA_Y0	0.683	-1.399	1.894	0.000
Col Avg	-0.116	0.042	0.166	-0.210

Table 79 continued.

STOCK NUMBERS (Jan 1) in thousands - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	74298	80652	48496	48623	53502	43717	12854
1	42673	55994	61576	35360	37929	42047	34764
2	15803	17363	20110	26361	15719	15545	18851
3	2464	3755	4343	2481	5315	2867	2920
4	855	1171	1101	678	433	929	856
5	549	634	141	386	284	164	208
0+	136643	159569	135766	113890	113181	105269	70453

	1989	1990	1991	1992	1993	1994	1995
0	27319	30436	29077	32483	33768	37844	47326
1	9804	21498	23239	22901	25357	26484	29502
2	9862	3693	9632	8034	8618	10594	12307
3	2257	1463	1045	1418	1125	1988	2344
4	457	317	298	184	143	409	739
5	85	57	48	86	131	86	148
0+	49785	57465	63339	65105	69142	77405	92367

	1996	1997	1998	1999
0	39630	22935	26408	Not estimated
1	38212	32300	18750	21580
2	18880	25019	24142	13343
3	3468	7063	13204	14017
4	798	1224	2933	6080
5	171	382	464	1756
0+	101160	88924	85901	56775

FISHING MORTALITY - C:\Program Files\WHAT\ss99.11

	1982	1983	1984	1985	1986	1987	1988
0	0.08	0.07	0.12	0.05	0.04	0.03	0.07
1	0.70	0.82	0.65	0.61	0.69	0.60	1.06
2	1.24	1.19	1.89	1.40	1.50	1.47	1.92
3	0.54	1.03	1.66	1.55	1.54	1.01	1.65
4	0.55	1.06	1.78	1.65	1.65	1.04	1.78
5	0.55	1.06	1.78	1.65	1.65	1.04	1.78

	1989	1990	1991	1992	1993	1994	1995
0	0.04	0.07	0.04	0.05	0.04	0.05	0.01
1	0.78	0.60	0.86	0.78	0.67	0.57	0.25
2	1.71	1.06	1.72	1.77	1.27	1.31	1.07
3	1.76	1.39	1.54	2.09	0.81	0.79	0.88
4	1.92	1.47	1.64	2.38	0.83	0.81	0.90
5	1.92	1.47	1.64	2.38	0.83	0.81	0.90

	1996	1997	1998
0	0.00	0.00	0.00
1	0.22	0.09	0.14
2	0.78	0.44	0.34
3	0.84	0.68	0.58
4	0.86	0.69	0.46
5	0.86	0.69	0.46

Table 79 continued.

Average F for 3,4

	1982	1983	1984	1985	1986	1987	1988
3,4	0.55	1.04	1.72	1.60	1.60	1.02	1.72
	1989	1990	1991	1992	1993	1994	1995
3,4	1.84	1.43	1.59	2.24	0.82	0.80	0.89
	1996	1997	1998				
3,4	0.85	0.69	0.52				

Average F weighted by N for 3,4

	1982	1983	1984	1985	1986	1987	1988
3,4	0.55	1.03	1.68	1.57	1.55	1.02	1.68
	1989	1990	1991	1992	1993	1994	1995
3,4	1.79	1.41	1.56	2.13	0.81	0.79	0.88
	1996	1997	1998				
3,4	0.85	0.68	0.55				

Average F for weighted by Catch for 3,4

	1982	1983	1984	1985	1986	1987	1988
3,4	0.55	1.04	1.68	1.57	1.55	1.02	1.68
	1989	1990	1991	1992	1993	1994	1995
3,4	1.79	1.41	1.56	2.13	0.81	0.79	0.88
	1996	1997	1998				
3,4	0.85	0.68	0.56				

Biomass Weighted F

1982	1983	1984	1985	1986	1987	1988
0.49	0.60	0.77	0.66	0.67	0.60	1.17
1989	1990	1991	1992	1993	1994	1995
0.83	0.49	0.87	0.70	0.53	0.46	0.29
1996	1997	1998				
0.31	0.30	0.31				

Table 79 continued.

BACKCALCULATED PARTIAL RECRUITMENT

	1982	1983	1984	1985	1986	1987	1988
0	0.07	0.06	0.06	0.03	0.02	0.02	0.04
1	0.57	0.69	0.34	0.37	0.42	0.41	0.55
2	1.00	1.00	1.00	0.85	0.91	1.00	1.00
3	0.44	0.87	0.88	0.94	0.94	0.69	0.86
4	0.45	0.89	0.94	1.00	1.00	0.71	0.93
5	0.45	0.89	0.94	1.00	1.00	0.71	0.93

	1989	1990	1991	1992	1993	1994	1995
0	0.02	0.05	0.02	0.02	0.03	0.04	0.01
1	0.40	0.41	0.50	0.33	0.53	0.43	0.23
2	0.89	0.72	1.00	0.74	1.00	1.00	1.00
3	0.92	0.95	0.90	0.88	0.64	0.60	0.82
4	1.00	1.00	0.95	1.00	0.66	0.62	0.84
5	1.00	1.00	0.95	1.00	0.66	0.62	0.84

	1996	1997	1998
0	0.01	0.00	0.00
1	0.26	0.13	0.24
2	0.91	0.64	0.60
3	0.98	0.98	1.00
4	1.00	1.00	0.80
5	1.00	1.00	0.80

MEAN BIOMASS (using catch mean weights at age)

	1982	1983	1984	1985	1986	1987	1988
0	16438	16964	10313	12443	12029	10119	3558
1	11765	14613	16437	10369	11368	12780	9151
2	5164	6727	5325	8056	5045	4915	4879
3	2516	2326	2065	1301	2917	1896	1501
4	1147	837	718	533	343	1033	648
5	1122	600	145	423	323	311	255
0+	38152	42066	35002	33125	32025	31055	19992

	1989	1990	1991	1992	1993	1994	1995
0	5053	6722	3751	7049	7914	11892	16617
1	2879	6370	5826	6869	8221	9768	12779
2	3182	1699	3010	2632	3160	3435	4732
3	1032	856	588	679	1034	1708	1515
4	281	237	247	92	148	540	734
5	81	70	57	83	177	166	241
0+	12509	15954	13478	17405	20654	27509	36618

	1996	1997	1998
0	11827	4404	6193
1	15887	12667	7788
2	6851	11813	12068
3	2328	4070	7891
4	759	999	2837
5	222	581	827
0+	37874	34533	37604

Table 79 continued.

Catch BIOMASS (using catch mean weights)

	1982	1983	1984	1985	1986	1987	1988
0	1362	1185	1195	602	493	295	252
1	8227	12041	10657	6333	7867	7697	9700
2	6389	7977	10076	11290	7576	7235	9379
3	1367	2388	3420	2012	4504	1913	2483
4	632	888	1281	880	565	1076	1154
5	619	636	258	698	532	324	454
0+	18595	25116	26888	21815	21536	18540	23420

	1989	1990	1991	1992	1993	1994	1995
0	200	469	146	336	340	583	231
1	2235	3841	5023	5339	5530	5532	3148
2	5436	1805	5164	4648	4003	4495	5047
3	1819	1191	903	1422	839	1348	1330
4	539	349	404	218	123	436	661
5	156	103	93	198	147	134	217
0+	10385	7758	11733	12162	10982	12528	10634

	1996	1997	1998
0	54	06	12
1	3551	1154	1092
2	5366	5188	4148
3	1958	2762	4541
4	655	691	1304
5	191	402	380
0+	11774	10203	11477

Table 79 continued.

Jan 1 BIOMASS (using Jan 1 mean weights)

	1982	1983	1984	1985	1986	1987	1988
0	14711	15082	9166	11232	10219	8481	3368
1	13613	18198	18965	11527	13730	14044	12028
2	7364	9498	10316	12996	8410	8441	9897
3	3827	3057	3757	2077	4480	2503	2506
4	1421	1580	1398	912	601	1395	1205
5	1596	1055	333	928	708	543	585
0+	42532	48470	43935	39672	38149	35406	29589

	1989	1990	1991	1992	1993	1994	1995
0	3934	6026	2355	5652	6315	10937	16138
1	3736	6428	7437	5977	8748	9879	12892
2	5710	2253	5297	4435	4938	5848	7360
3	1822	1345	1024	1313	1177	1932	1908
4	591	402	433	236	204	716	1100
5	196	145	124	233	284	264	398
0+	15988	16598	16670	17846	21665	29576	39796

	1996	1997	1998
0	11176	3188	5493
1	17043	12468	6038
2	10441	14286	13061
3	2969	4965	9784
4	1019	1413	3139
5	360	878	1130
0+	43007	37198	38644

Table 79 continued.

SSB AT THE START OF THE SPAWNING SEASON -MALES AND FEMALES (MT) (using SSB mean weights)

	1982	1983	1984	1985	1986	1987	1988
0	5671	5879	3516	4345	4211	3557	1233
1	6089	7186	8682	5560	5900	6876	4073
2	2658	3542	2014	3850	2302	2274	1819
3	1924	1458	973	646	1450	1198	708
4	874	517	318	252	162	644	287
5	856	371	64	200	153	194	113
0+	18071	18953	15568	14852	14179	14743	8233
2+	6311	5888	3370	4940	4068	4310	2927

	1989	1990	1991	1992	1993	1994	1995
0	1770	2330	1314	2462	2769	4152	5873
1	1444	3426	2820	3443	4300	5330	7875
2	1317	944	1241	1059	1605	1712	2625
3	462	456	293	258	710	1183	1012
4	117	122	117	30	101	372	486
5	34	36	27	27	121	114	160
0+	5144	7314	5812	7281	9605	12863	18030
2+	1930	1558	1678	1376	2536	3381	4282

	1996	1997	1998
0	4194	1563	2198
1	9873	8255	4988
2	4282	8465	8966
3	1579	2950	5959
4	511	720	2241
5	149	419	653
0+	20587	22373	25005
2+	6520	12555	17819

Table 80. 1999 VPA Bootstrap results: precision of estimates.

The number of bootstraps: 1000

Bootstrap Output Variable: N hat

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
N 1	21580	22081	5075	0.24
N 2	13343	13558	2335	0.18
N 3	14016	14164	2275	0.16
N 4	6080	6175	1217	0.20

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
N 1	501	160	2.32	21079	0.240740
N 2	215	74	1.61	13128	0.177867
N 3	147	72	1.05	13869	0.164035
N 4	95	38	1.57	5985	0.203360

Bootstrap Output Variable: F t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
Age 0	0.0019	0.0019	0.0005	0.25
Age 1	0.1402	0.1418	0.0230	0.16
Age 2	0.3437	0.3471	0.0475	0.14
Age 3	0.5755	0.5817	0.0863	0.15
Age 4	0.4596	0.4644	0.0506	0.11
Age 5	0.4596	0.4644	0.0506	0.11

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
Age 0	0.0000601	0.0000152	3.188	0.0018250	0.26
Age 1	0.0015391	0.0007276	1.098	0.1386994	0.17
Age 2	0.0033629	0.0015012	0.978	0.3403598	0.14
Age 3	0.0062359	0.0027305	1.084	0.5692664	0.15
Age 4	0.0047994	0.0016012	1.044	0.4548131	0.11
Age 5	0.0047994	0.0016012	1.044	0.4548131	0.11

Bootstrap Output Variable: F full t

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
0.5176	0.5231	0.0685	0.11

BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
0.00550	0.00160	1.04	0.5121	0.11

Bootstrap Output Variable: SSB spawn t

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
25005.2466	25311.1305	2484.8882	0.10

BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE
305.88	78.58	1.22	24699.36	0.10

Table 81. 1999 VPA retrospective analysis for summer flounder.

Fishing Mortality

Terminal Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1993	0.55	1.04	1.72	1.60	1.60	1.02	1.72	1.84	1.43	1.60	2.31	0.81					
1994	0.55	1.04	1.72	1.60	1.60	1.02	1.72	1.84	1.43	1.61	2.44	1.11	1.99				
1995	0.55	1.04	1.72	1.60	1.60	1.02	1.72	1.84	1.43	1.59	2.30	0.89	0.97	1.69			
1996	0.55	1.04	1.72	1.60	1.60	1.02	1.72	1.84	1.43	1.59	2.25	0.83	0.82	0.96	1.15		
1997	0.55	1.04	1.72	1.60	1.60	1.02	1.72	1.84	1.43	1.59	2.23	0.82	0.79	0.86	0.78	0.67	
1998	0.55	1.04	1.72	1.60	1.60	1.02	1.72	1.84	1.43	1.59	2.24	0.82	0.80	0.89	0.85	0.69	0.52

Spawning Stock Biomass

Terminal Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1993	18071	18953	15568	14852	14179	14742	8232	5140	7324	5874	7725	10169					
1994	18071	18953	15568	14852	14178	14742	8231	5136	7269	5650	6554	7616	10151				
1995	18071	18953	15568	14852	14179	14742	8232	5141	7300	5760	7015	8835	11433	17170			
1996	18071	18953	15568	14852	14179	14743	8233	5143	7312	5803	7238	9403	12321	17748	19803		
1997	18071	18953	15568	14852	14179	14743	8233	5144	7316	5817	7304	9685	12929	18241	20705	22051	
1998	18071	18953	15568	14852	14179	14743	8233	5144	7314	5812	7281	9605	12863	18030	20587	22373	25005

Population Numbers Age: 0

Terminal Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1993	74298	80652	48496	48623	53502	43716	12850	27298	30651	29698	35256	28060					
1994	74298	80651	48496	48623	53501	43714	12845	27267	30107	27756	29843	27976	47411				
1995	74298	80652	48496	48623	53502	43716	12851	27302	30329	28661	31200	31577	37916	55262			
1996	74298	80652	48496	48623	53502	43717	12853	27316	30417	29005	32300	32468	37317	51307	32071		
1997	74298	80652	48496	48623	53502	43717	12854	27321	30446	29117	32584	34120	36958	49179	36324	21639	
1998	74298	80652	48496	48623	53502	43717	12854	27319	30436	29077	32483	33768	37844	47326	39630	22935	26408

Table 82. Yield per recruit analysis for summer flounder.

```
   The NEFC Yield and Stock Size per Recruit Program - PDBYPRC
    PC Ver.2.0 [Method of Thompson and Bell (1934)] 1-Jan-1999
              ---------------------------------------
              Run Date:  7- 6-1999;  Time: 20:22:39.47
 SUMMER FLOUNDER -  1997-98 PR, MEAN WEIGHTS AT AGE

 Proportion of F before spawning:  .8300
 Proportion of M before spawning:  .8300
 Natural Mortality is Constant at:  .200
 Initial age is:  0; Last age is: 15
 Last age is a TRUE Age;
 Original age-specific PRs, Mats, and Mean Wts from file:
 ==> YPR29.DAT
-------------------------------------------------------------
 Age-specific Input data for Yield per Recruit Analysis
-------------------------------------------------------------
  Age | Fish Mort  Nat Mort | Proportion |    Average Weights
      |  Pattern    Pattern |   Mature   | Catch   SSB   Jan 1 B
-------------------------------------------------------------------
    0 |    .0100     1.0000 |    .3800   |  .234   .234    .170
    1 |    .1800     1.0000 |    .7200   |  .471   .471    .353
    2 |    .6200     1.0000 |    .9000   |  .643   .643    .556
    3 |   1.0000     1.0000 |   1.0000   |  .862   .862    .722
    4 |   1.0000     1.0000 |   1.0000   | 1.277  1.277   1.111
    5 |   1.0000     1.0000 |   1.0000   | 2.330  2.330   1.860
    6 |   1.0000     1.0000 |   1.0000   | 2.565  2.565   2.337
    7 |   1.0000     1.0000 |   1.0000   | 3.537  3.537   3.130
    8 |   1.0000     1.0000 |   1.0000   | 4.592  4.592   4.120
    9 |   1.0000     1.0000 |   1.0000   | 4.841  4.841   4.671
   10 |   1.0000     1.0000 |   1.0000   | 5.336  5.336   4.162
   11 |   1.0000     1.0000 |   1.0000   | 5.767  5.767   5.590
   12 |   1.0000     1.0000 |   1.0000   | 6.135  6.135   5.957
   13 |   1.0000     1.0000 |   1.0000   | 6.445  6.445   6.266
   14 |   1.0000     1.0000 |   1.0000   | 6.704  6.704   6.525
   15 |   1.0000     1.0000 |   1.0000   | 6.917  6.917   6.738

-------------------------------------------------------------
 Summary of Yield per Recruit Analysis for:
 SUMMER FLOUNDER -  1997-98 PR, MEAN WEIGHTS AT AGE

 Slope of the Yield/Recruit Curve at F=0.00: -->    7.9199
   F level at slope=1/10 of the above slope (F0.1): ----->    .160
     Yield/Recruit corresponding to F0.1: ----->     .5200
   F level to produce Maximum Yield/Recruit (Fmax): ----->    .263
     Yield/Recruit corresponding to Fmax: ----->     .5522
   F level at 20 % of Max Spawning Potential (F20): ----->    .367
     SSB/Recruit corresponding to F20: -------->    1.5540
```

Table 82 continued.

Listing of Yield per Recruit Results for:
SUMMER FLOUNDER - 1997-98 PR, MEAN WEIGHTS AT AGE

	FMORT	TOTCTHN	TOTCTHW	TOTSTKN	TOTSTKW	SPNSTKN	SPNSTKW	% MSP
	.00	.00000	.00000	5.2918	8.5471	3.7063	7.7717	100.00
	.05	.12546	.29062	4.7789	6.4893	3.1777	5.7050	73.41
	.10	.21305	.43909	4.3997	5.0891	2.7912	4.3261	55.67
	.15	.27682	.51124	4.1116	4.1140	2.5001	3.3824	43.52
F0.1	.16	.28756	.52000	4.0621	3.9667	2.4503	3.2304	41.57
	.20	.32505	.54245	3.8871	3.4190	2.2748	2.7198	35.00
	.25	.36276	.55189	3.7079	2.9122	2.0959	2.2431	28.86
Fmax	.26	.37146	.55219	3.6662	2.8127	2.0544	2.1392	27.53
	.30	.39311	.54996	3.5620	2.5344	1.9509	1.8919	24.34
	.35	.41811	.54235	3.4410	2.3135	1.8310	1.6273	20.94
F20%	.37	.42548	.53916	3.4052	2.2469	1.7956	1.5540	20.00
	.40	.43913	.53219	3.3389	2.0237	1.7301	1.4239	18.32
	.45	.45710	.52115	3.2515	1.8473	1.6441	1.2644	16.27
	.50	.47267	.51013	3.1758	1.7056	1.5698	1.1372	14.63
	.55	.48634	.49961	3.1095	1.5899	1.5050	1.0341	13.31
	.60	.49845	.48978	3.0508	1.4942	1.4477	.9493	12.22
	.65	.50928	.48073	2.9985	1.4139	1.3969	.8787	11.31
	.70	.51904	.47247	2.9514	1.3459	1.3512	.8191	10.54
	.75	.52789	.46497	2.9088	1.2876	1.3101	.7683	9.89
	.80	.53598	.45817	2.8700	1.2371	1.2727	.7246	9.32
	.85	.54340	.45201	2.8344	1.1930	1.2386	.6865	8.83
	.90	.55024	.44644	2.8017	1.1542	1.2074	.6532	8.41
	.95	.55659	.44140	2.7715	1.1199	1.1786	.6238	8.03
	1.00	.56249	.43683	2.7434	1.0891	1.1519	.5976	7.69

Table 83. Input parameters and short term stochastic projection results for summer flounder. Starting stock sizes on January 1, 1999 are as estimated by VPA bootstrap procedure. Age-0 recruitment levels in 2000-2001 are estimated as the median of 1000 random estimates selected from VPA estimated numbers at age 0 (000s) during 1989-1998 and 1982-1989. Fishing mortality was apportioned among landings and discard based on the proportion of F associated with landings and discard at age during 1997-98. Mean weights at age (landings, and discards) are weighted (by fishery) geometric means of 1997-98 values. Total stock biomass is the product of January 1 numbers at age and January 1 mean weights at age estimated from total catch (landings plus discards) weights. F99 is the F realized if fishery landings quotas, plus associated discard, are caught in 1999 (total landings = 8,295 mt). Proportion of F, M before spawning = 0.83 (spawning peak at 1 November).

Age	Median Stock Size in 1999	Fishing Mortality Pattern	Proportion Landed	Proportion Mature	Mean Weights January 1 Total Biomass	Mean Weights Landings	Mean Weights Discards
0	30436 or 37844	0.01	0.29	0.38	0.170	0.315	0.208
1	21761	0.18	0.64	0.72	0.353	0.505	0.317
2	13365	0.62	0.87	0.90	0.556	0.649	0.453
3	14112	1.00	0.95	1.00	0.722	0.853	0.938
4	6039	1.00	1.00	1.00	1.111	1.277	-----
5+	1738	1.00	1.00	1.00	2.365	2.365	-----

1999 Landings = 8,295 mt; 1999-2001 median recruitment from 1989-1998 VPA estimates (30.4 million)

Forecast medians (50% probability level) (landings, discards, and total stock biomass (B) in '000 mt)

	1999				2000				2001			
Option	F	Land.	Disc.	B	F	Land.	Disc.	B	F	Land.	Disc.	B
1	**0.36**	**8.3**	**0.5**	**42.8**	**0.26**	**7.6**	**0.4**	**51.6**	**0.26**	**9.7**	**0.4**	**61.5**
2	**0.36**	**8.3**	**0.5**	**42.8**	**0.29**	**8.4**	**0.4**	**51.6**	**0.23**	**8.4**	**0.4**	**60.6**
3	**0.36**	**8.3**	**0.5**	**42.8**	**0.32**	**9.0**	**0.5**	**51.6**	**0.25**	**9.0**	**0.4**	**59.8**
4	**0.36**	**8.3**	**0.5**	**42.8**	**0.36**	**10.0**	**0.5**	**51.6**	**0.30**	**10.0**	**0.5**	**58.6**

1999 Landings = 8,295 mt; 1999-2001 median recruitment from 1982-1998 VPA estimates (37.8 million)

Forecast medians (50% probability level) (landings, discards, and total stock biomass (B) in '000 mt)

	1999				2000				2001			
Option	F	Land.	Disc.	B	F	Land.	Disc.	B	F	Land.	Disc.	B
1	**0.36**	**8.3**	**0.5**	**42.8**	**0.26**	**7.6**	**0.4**	**52.9**	**0.26**	**9.7**	**0.4**	**64.7**
2	**0.36**	**8.3**	**0.5**	**42.8**	**0.29**	**8.4**	**0.4**	**52.9**	**0.23**	**8.4**	**0.4**	**63.8**
3	**0.36**	**8.3**	**0.5**	**42.8**	**0.32**	**9.0**	**0.5**	**52.9**	**0.25**	**9.0**	**0.5**	**63.1**
4	**0.36**	**8.3**	**0.5**	**42.8**	**0.36**	**10.0**	**0.5**	**52.9**	**0.29**	**10.0**	**0.5**	**61.8**

Table 84. Stochastic projection results for summer flounder. Probability of exceeding 2000 target F level (0.26) for 1999 landings = 8,295 mt and alternative 2000 quota levels.

Based on 1,000 bootstrapped 1999 VPA stock sizes

1999 Landings = 8,295 mt; F = 0.36

Quota level, 2000 Metric tons	Probability F > 0.26	Median F
7,627	0.50	0.26
8,400	0.75	0.29
9,000	0.90	0.32
10,000	0.99	0.36

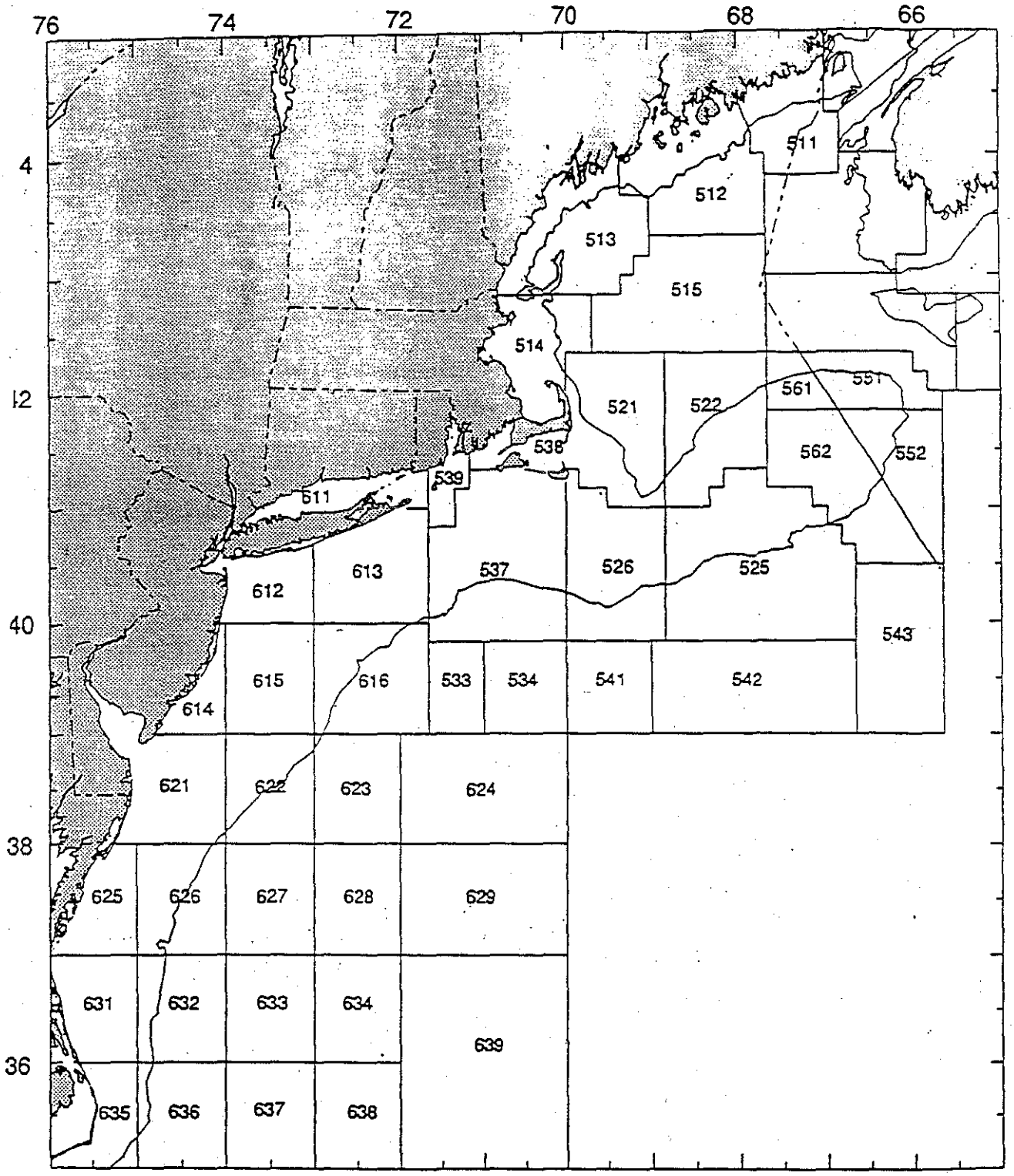

Figure 1. Statistical areas used for Northeast Region catch reporting.

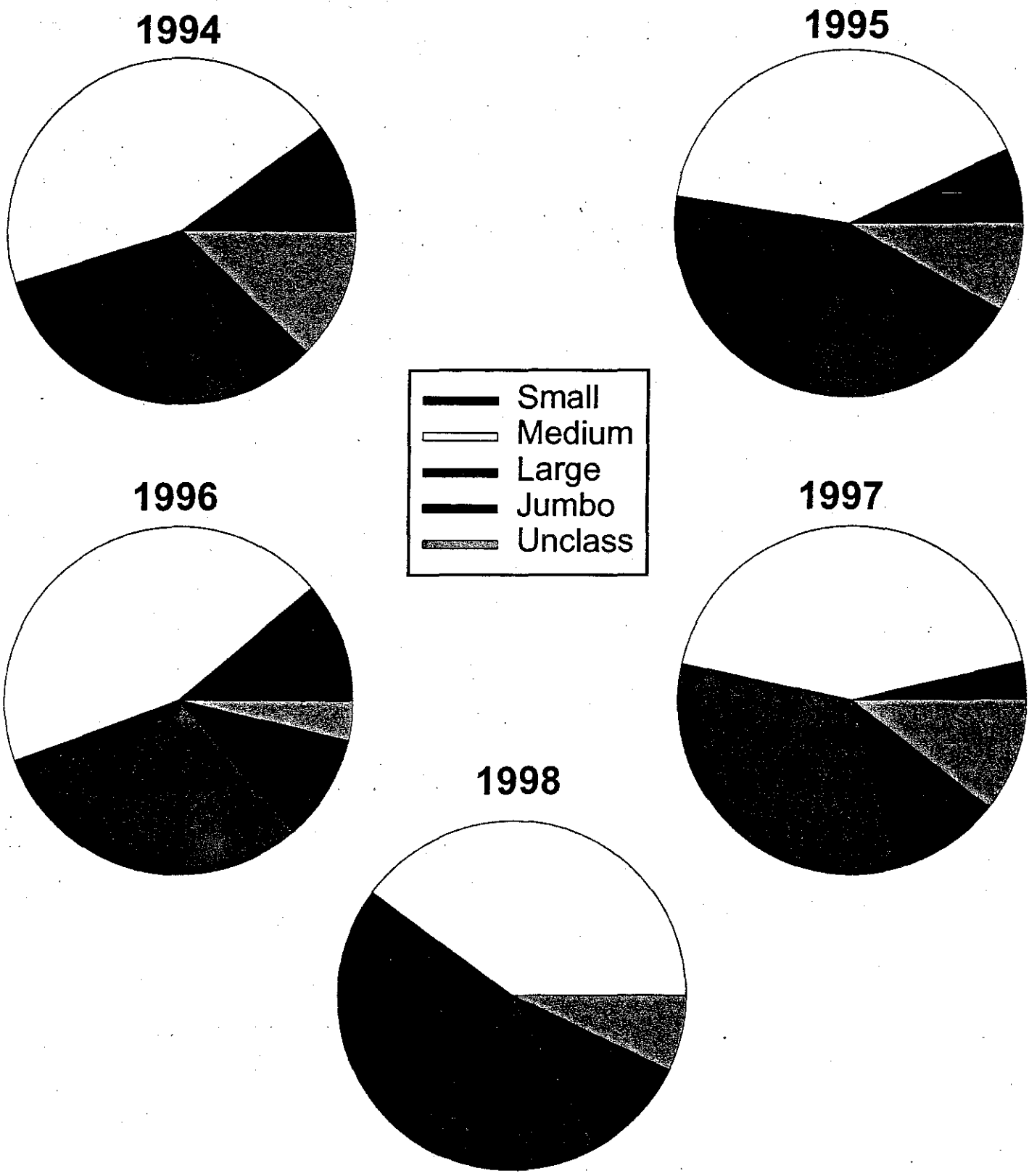

Figure 2. Summer flounder NER commercial fishery landings by market category.

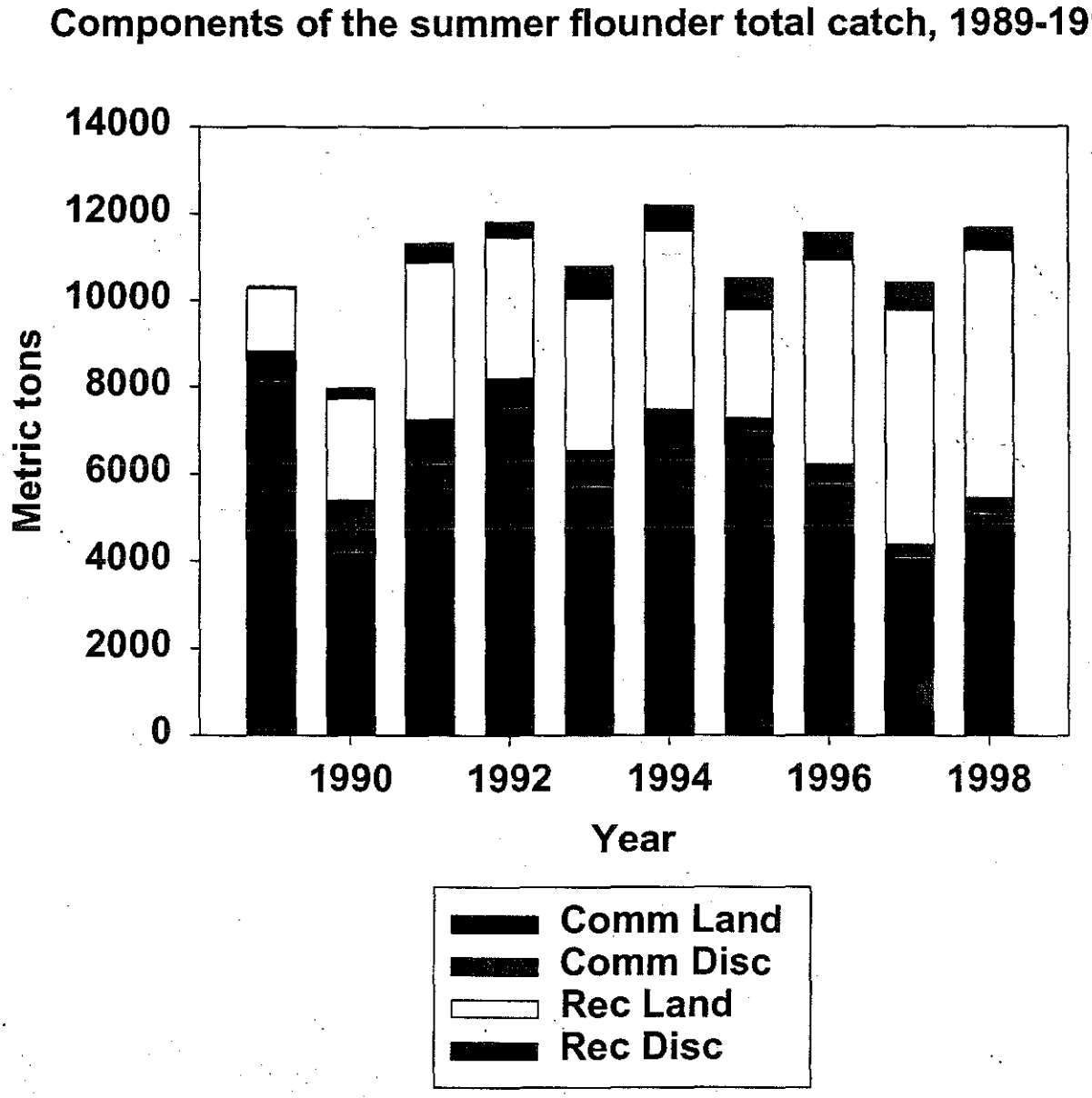

Figure 3. Components of the summer flounder total catch, 1989-1998.

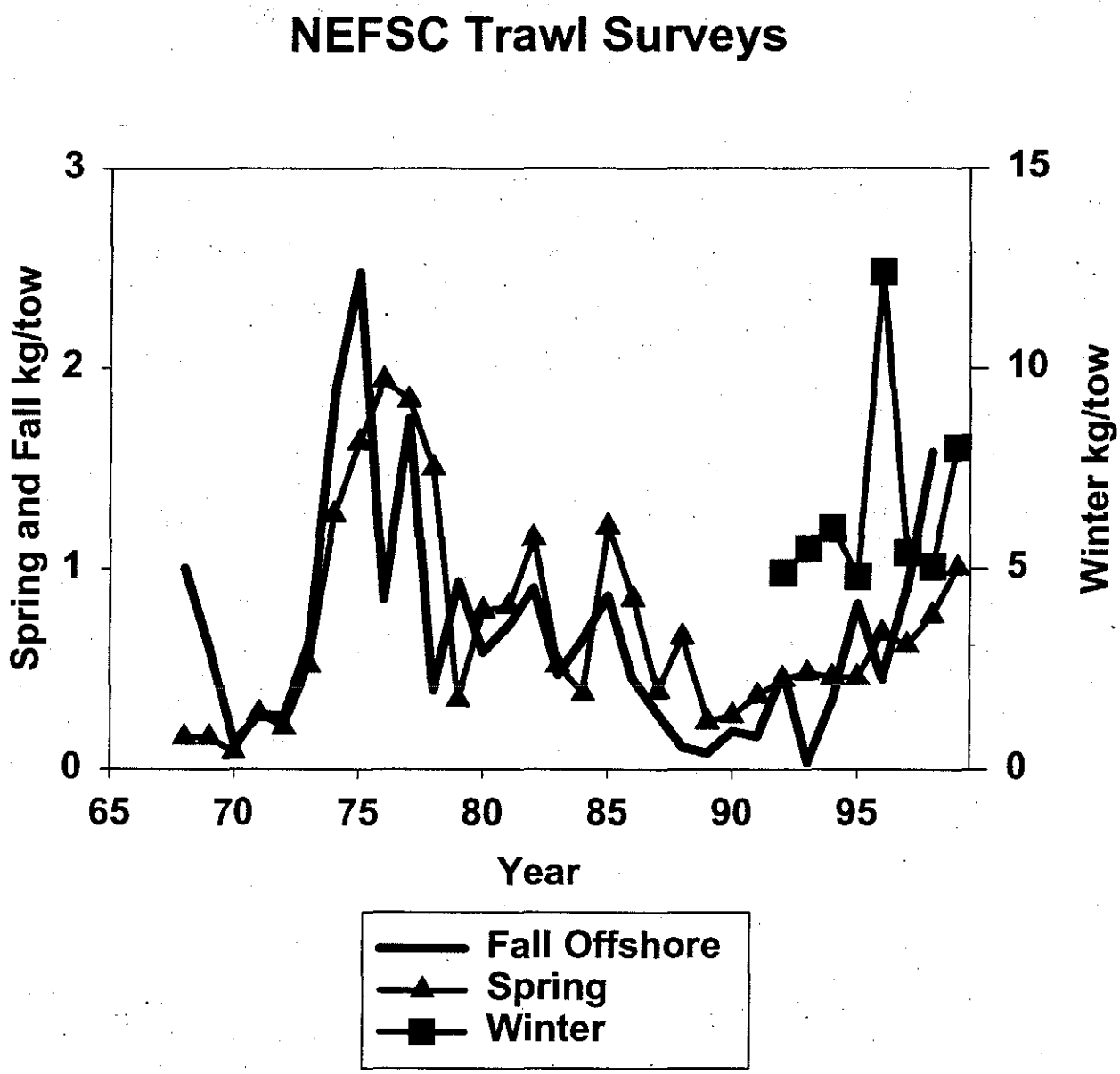

Figure 4. Trends in NEFSC trawl survey biomass indices for summer flounder.

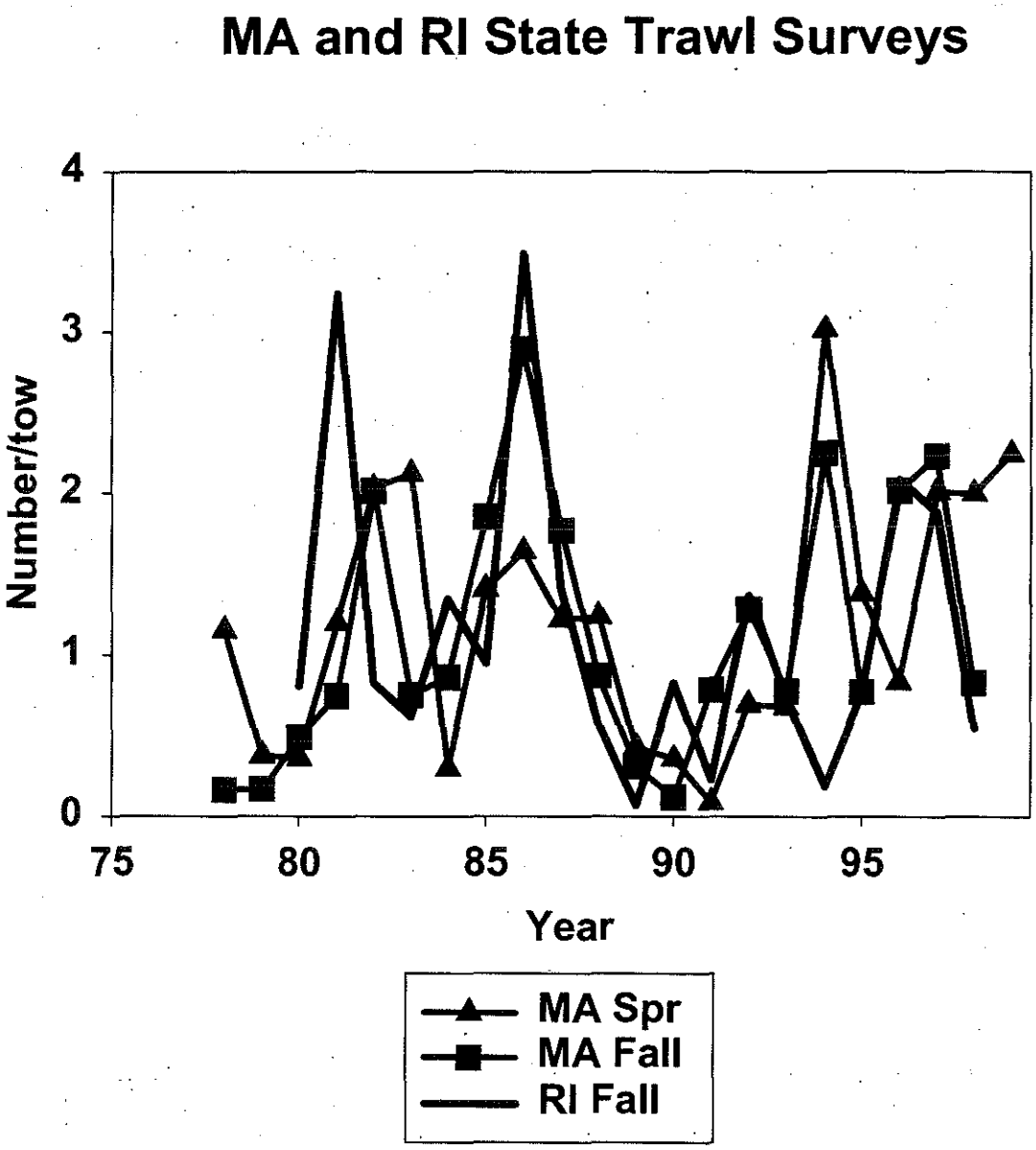

Figure 5. Trends in MA and RI trawl survey abundance indices for summer flounder.

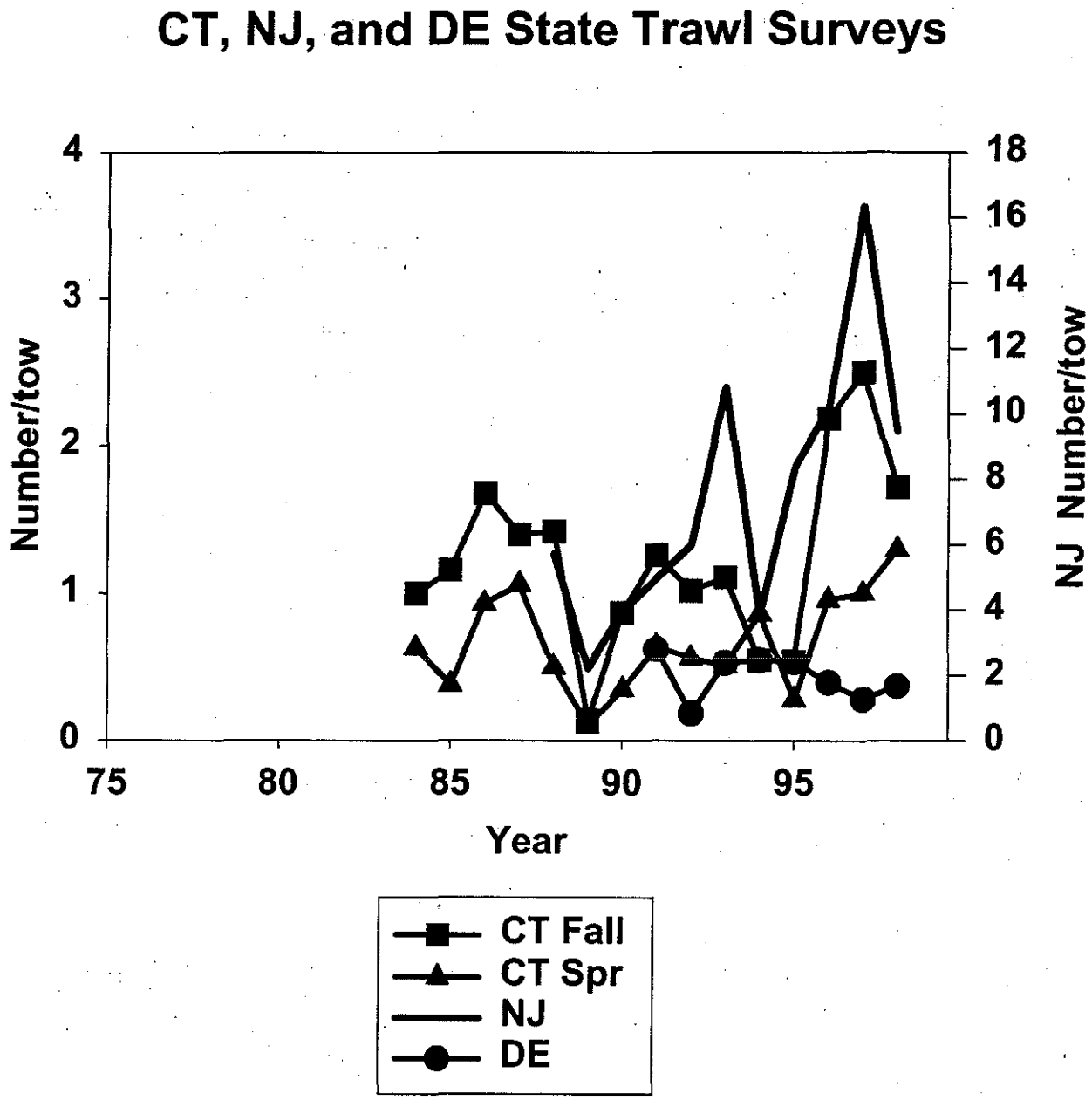

Figure 6. Trends in CT, NJ, and DE trawl survey abundance indices for summer flounder.

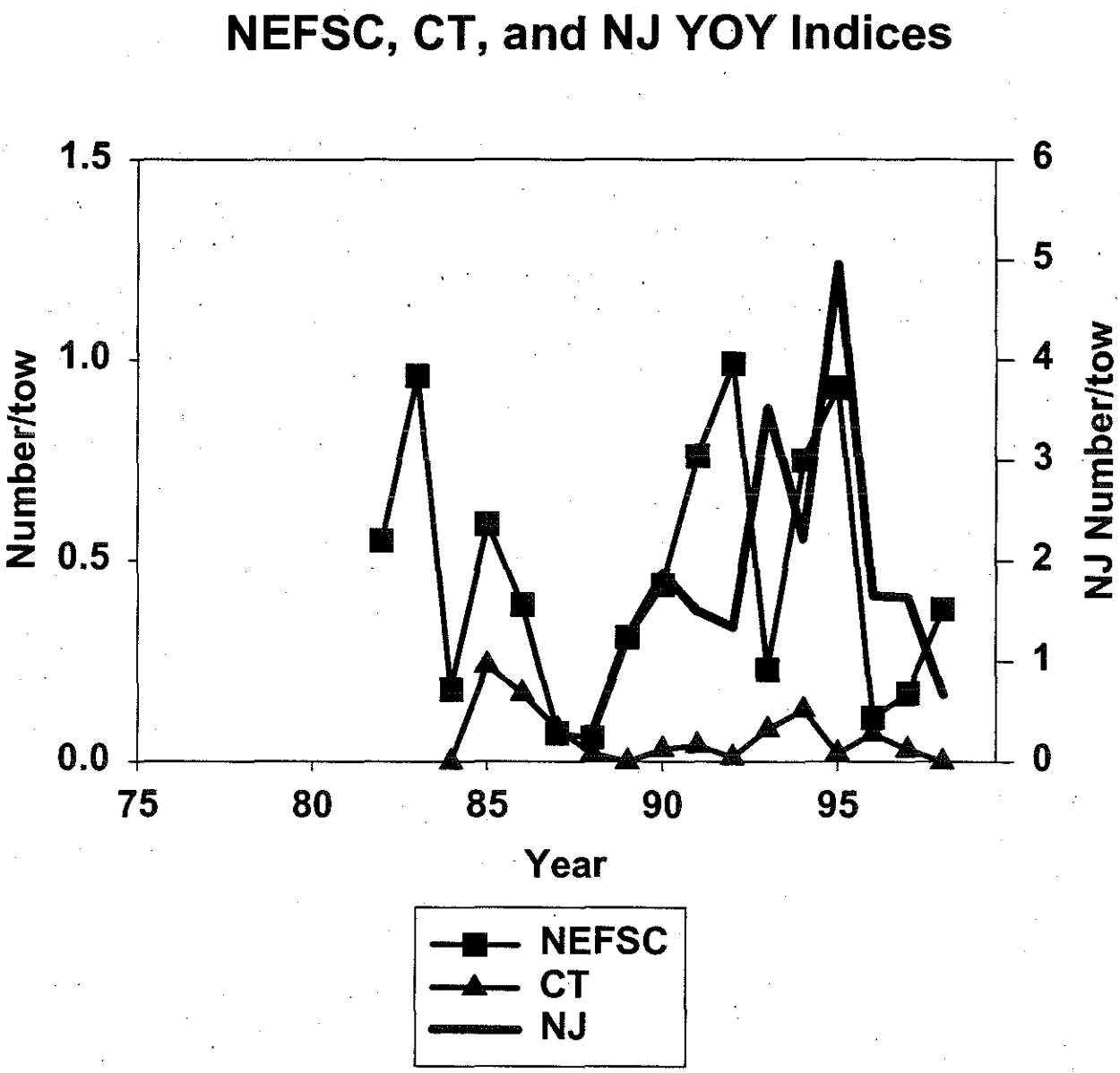

Figure 7. Trends in NEFSC, CT, and NJ trawl survey recruitment indices for summer flounder.

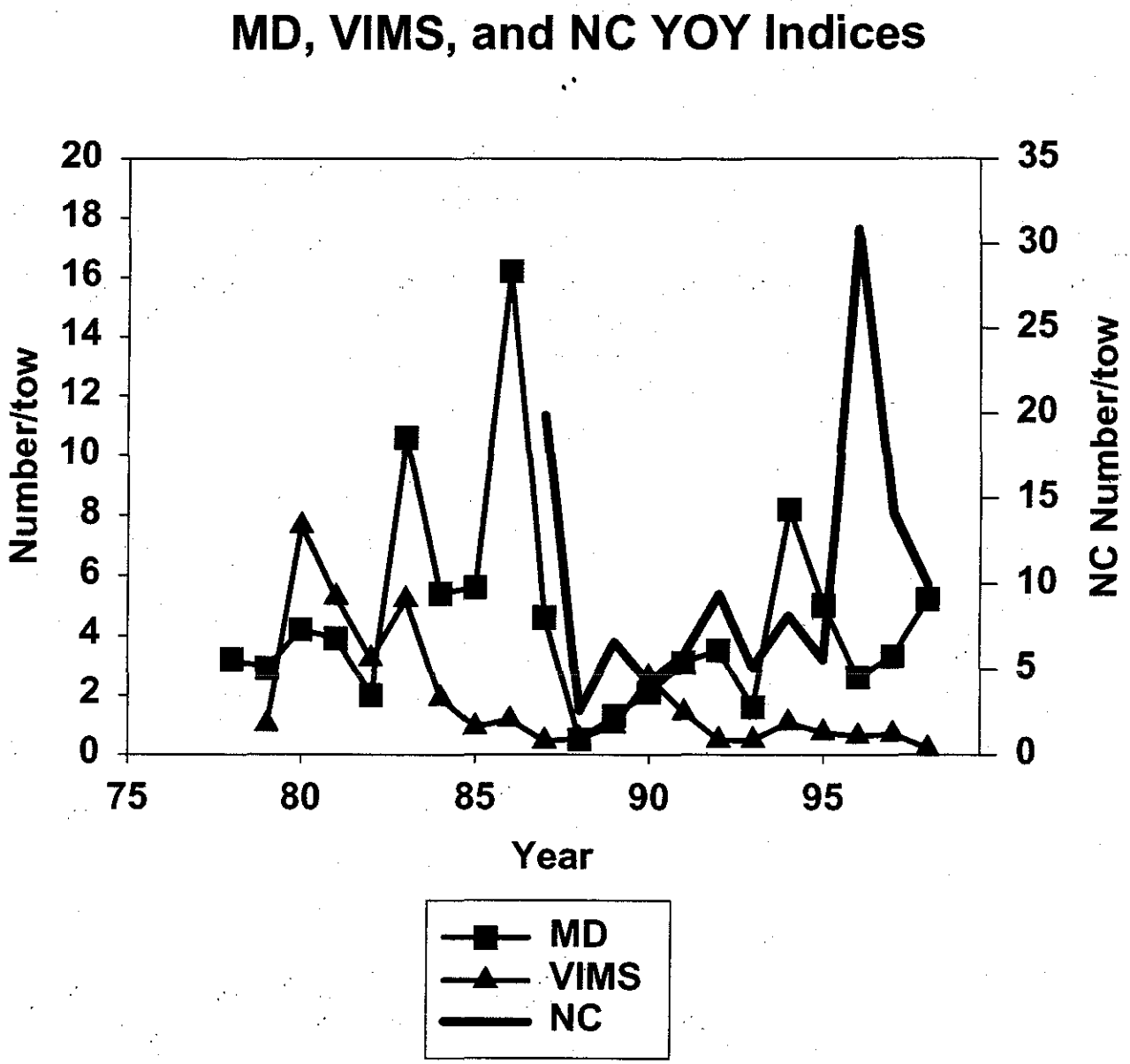

Figure 8. Trends in MD, VIMS, and NC trawl survey recruitment indices for summer flounder.

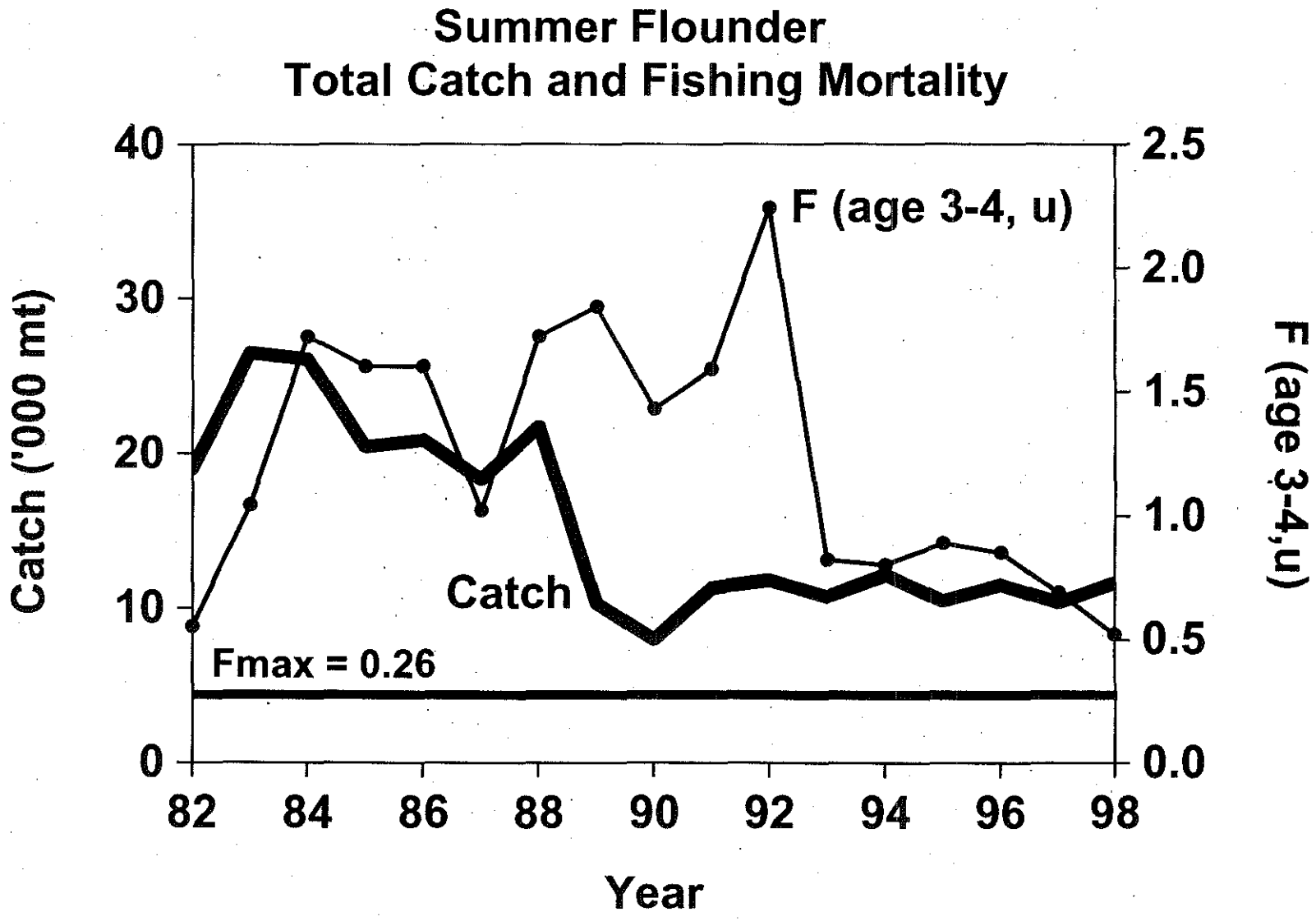

Figure 9. Total catch (landings and discard, thousands of metric tons) and fishing mortality rate (fully recruited F, ages 3-4, unweighted) for summer flounder.

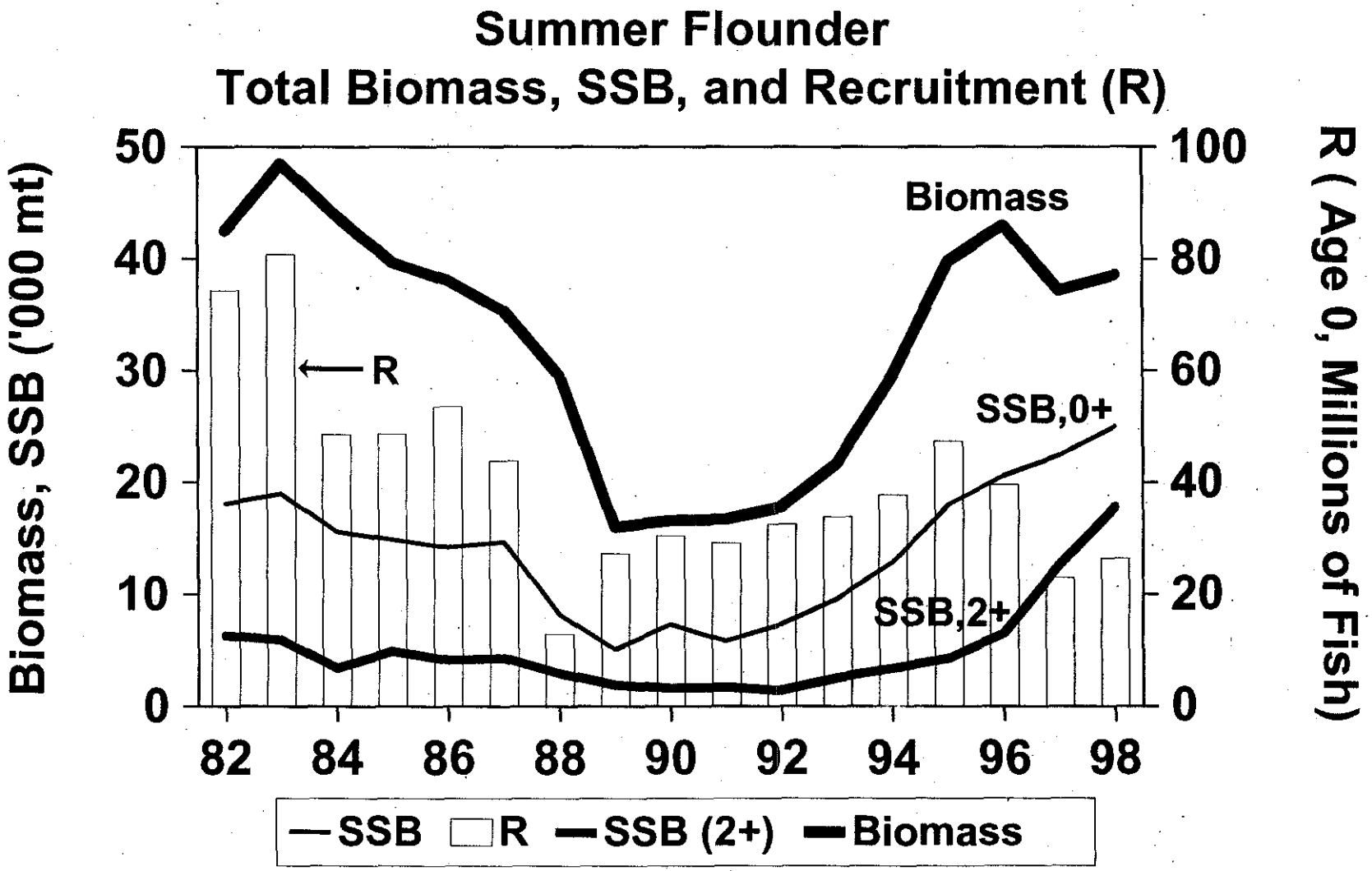

Figure 10. Total stock biomass ('000 mt), spawning stock biomass (SSB ages 0 to 5+, and ages 2-5+, '000 mt) and recruitment (millions of fish at age-0) for summer flounder,

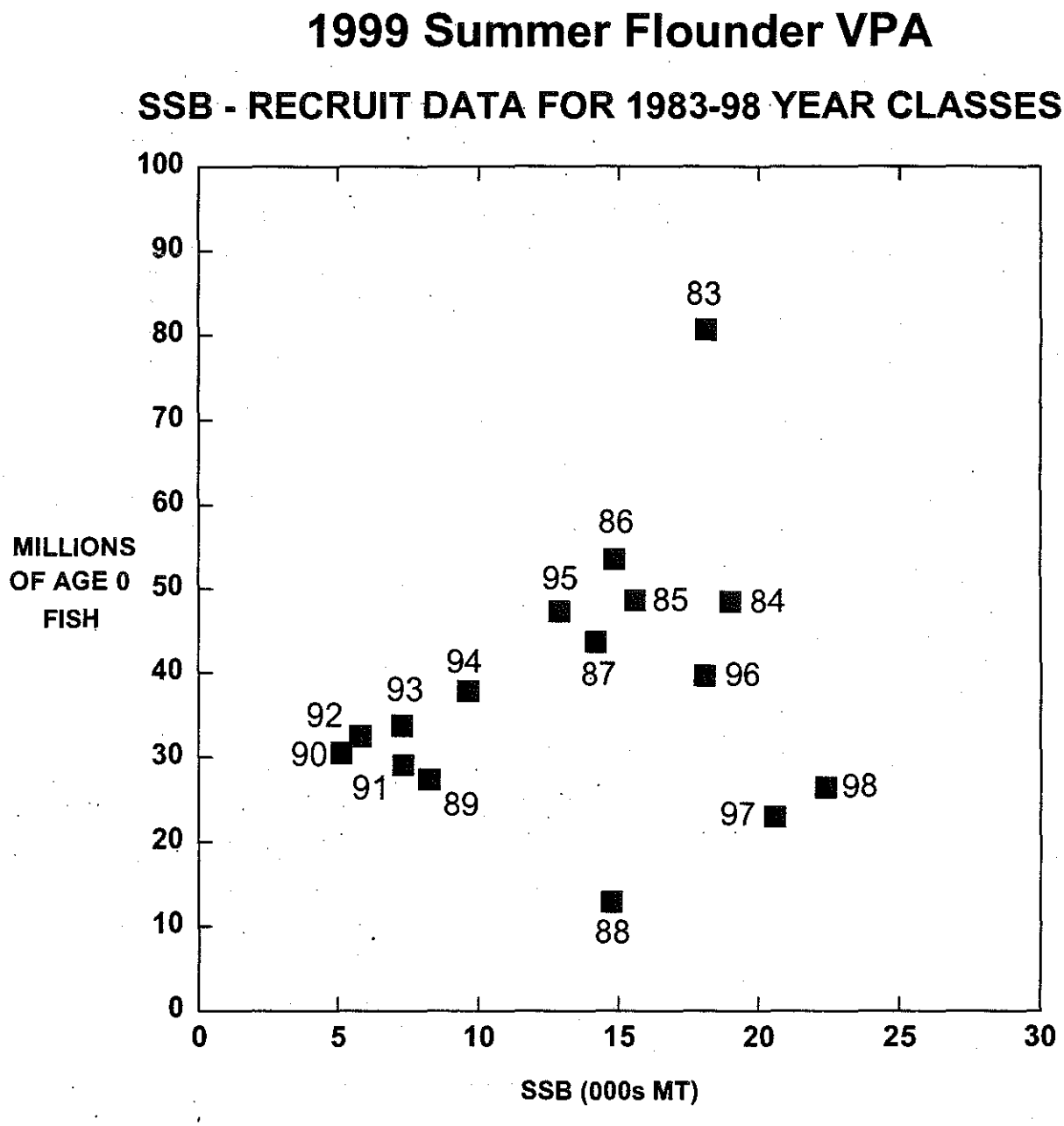

Figure 11. 1999 VPA spawning stock biomass and recruitment estimates for summer flounder.

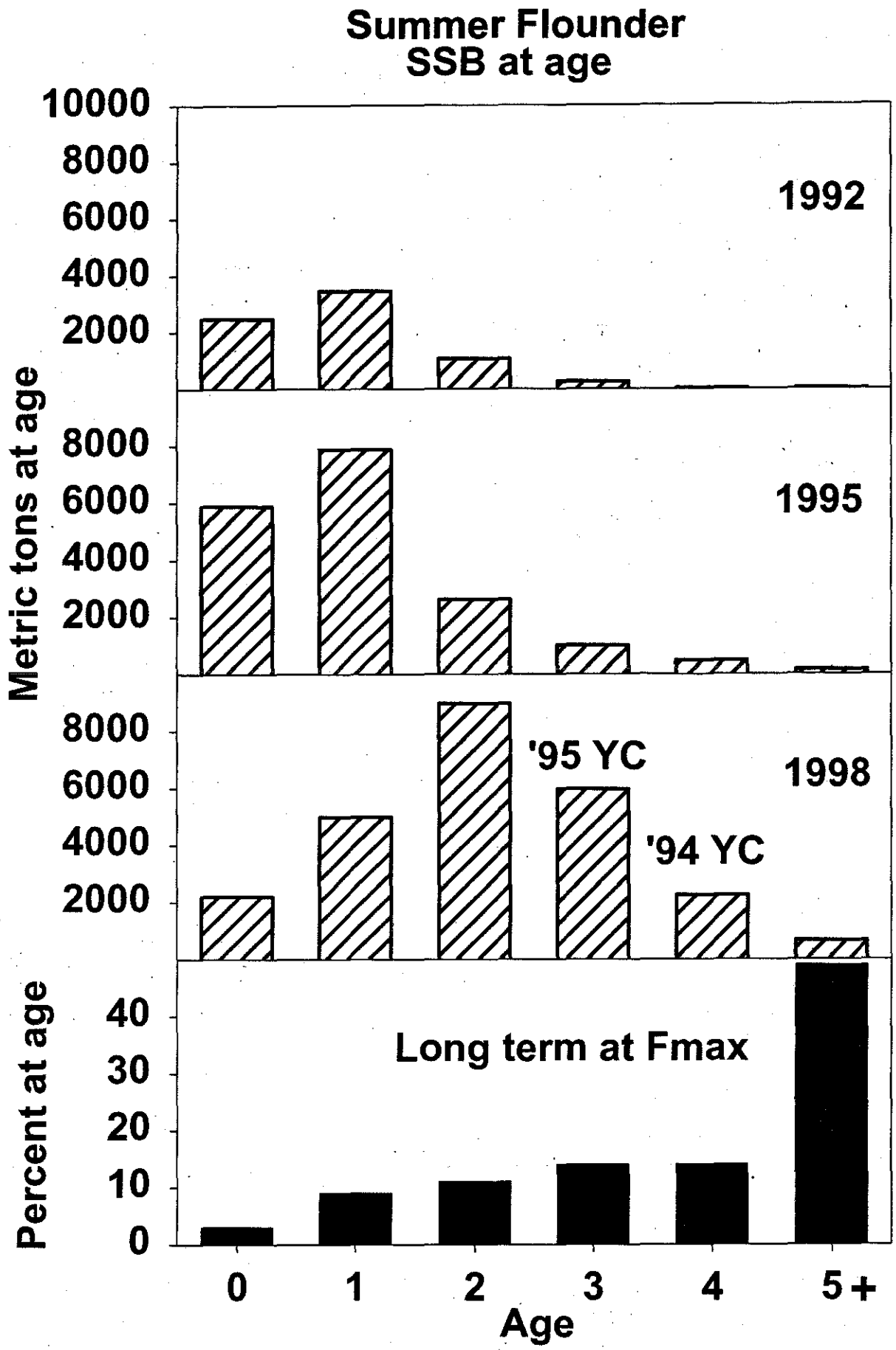

Figure 12. Spawning stock biomass at age for summer flounder.

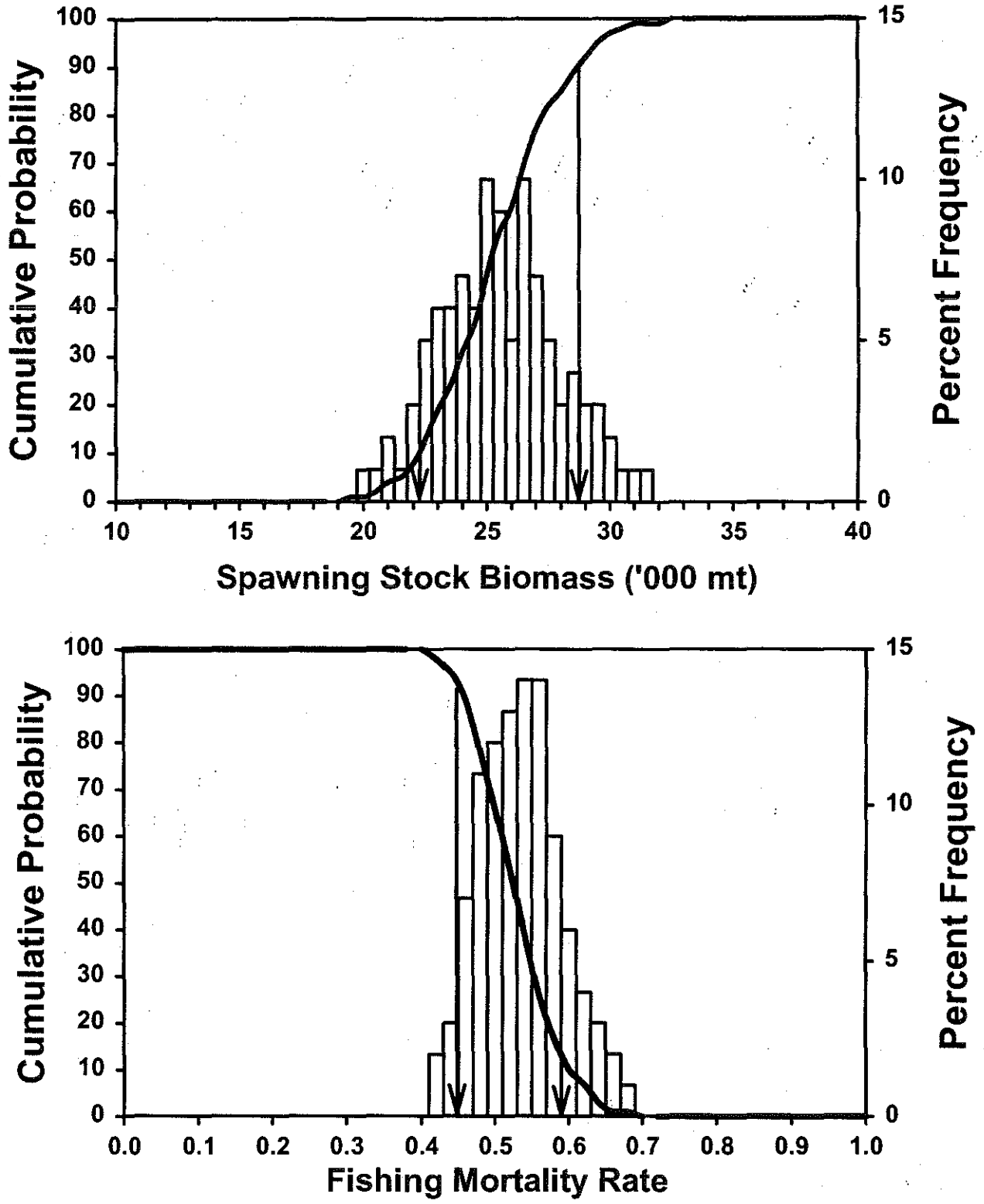

Figure 13. Precision of the estimates of spawning stock biomass (SSB) and fully recruited fishing mortality on age 3-4 (F) in 1998 for summer flounder.

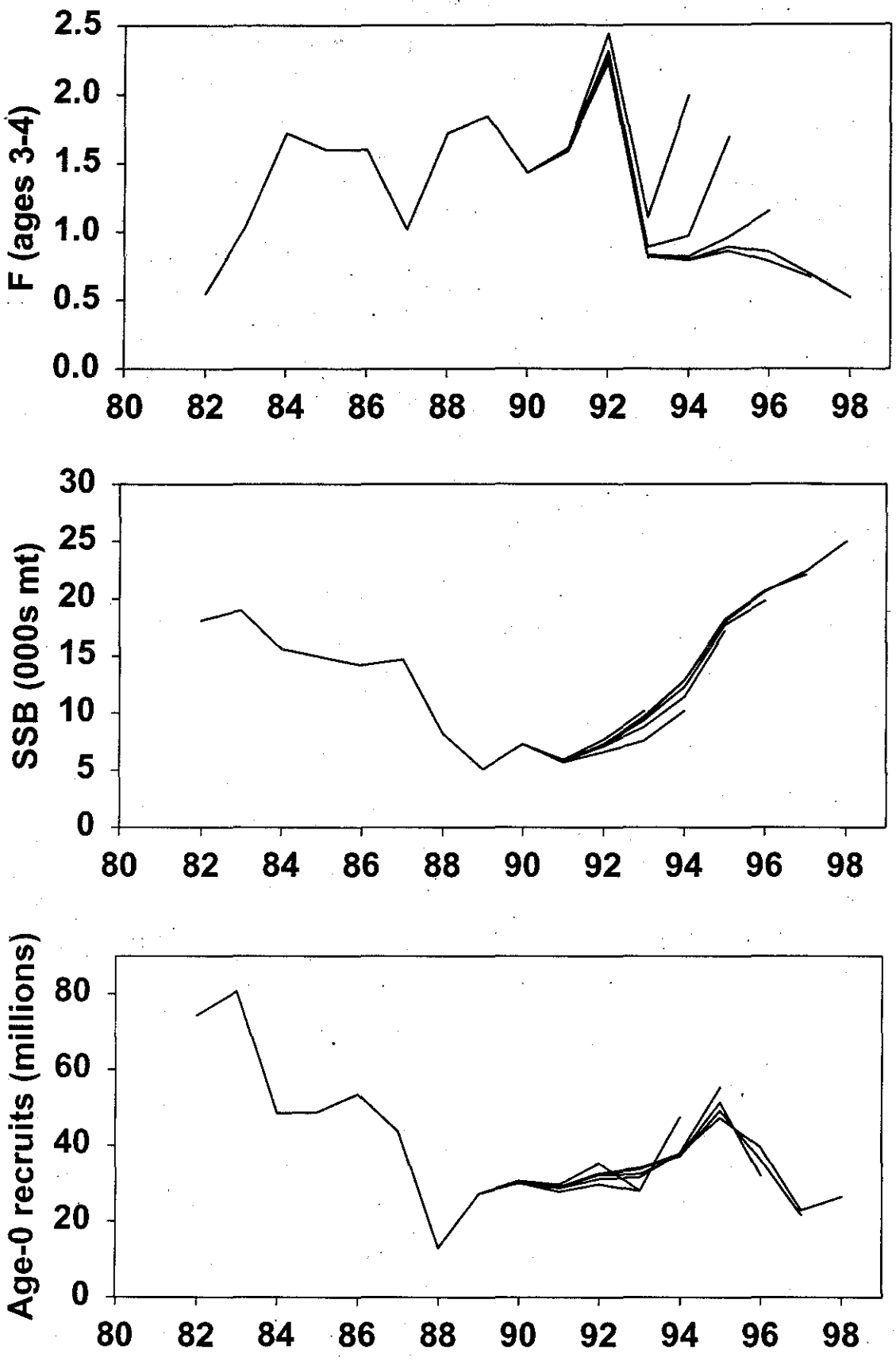

Figure 14. 1999 VPA retrospective analysis for summer flounder.

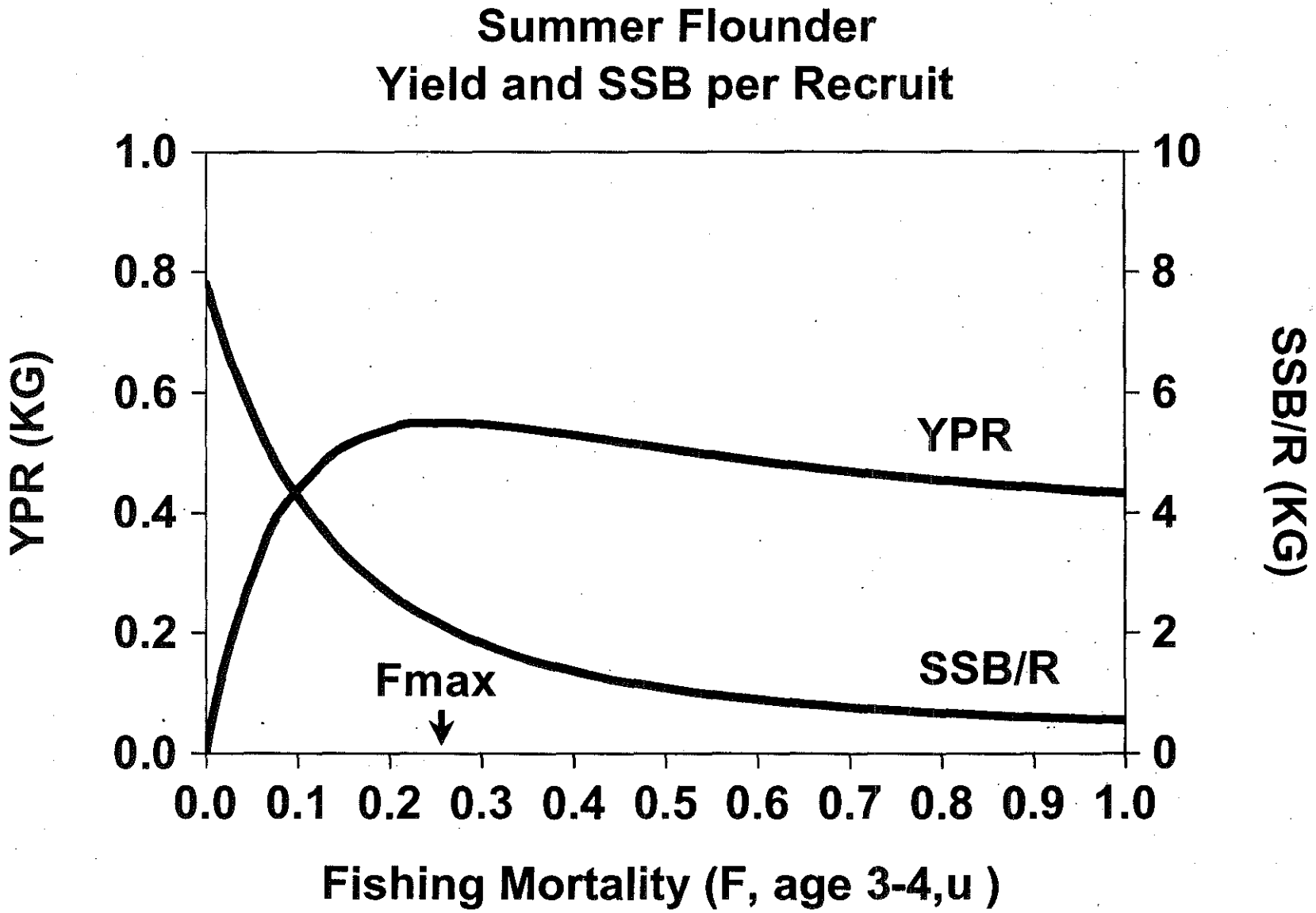

Figure 15. Yield per recruit (YPR) and spawning stock biomass per recruit (SSB/R).

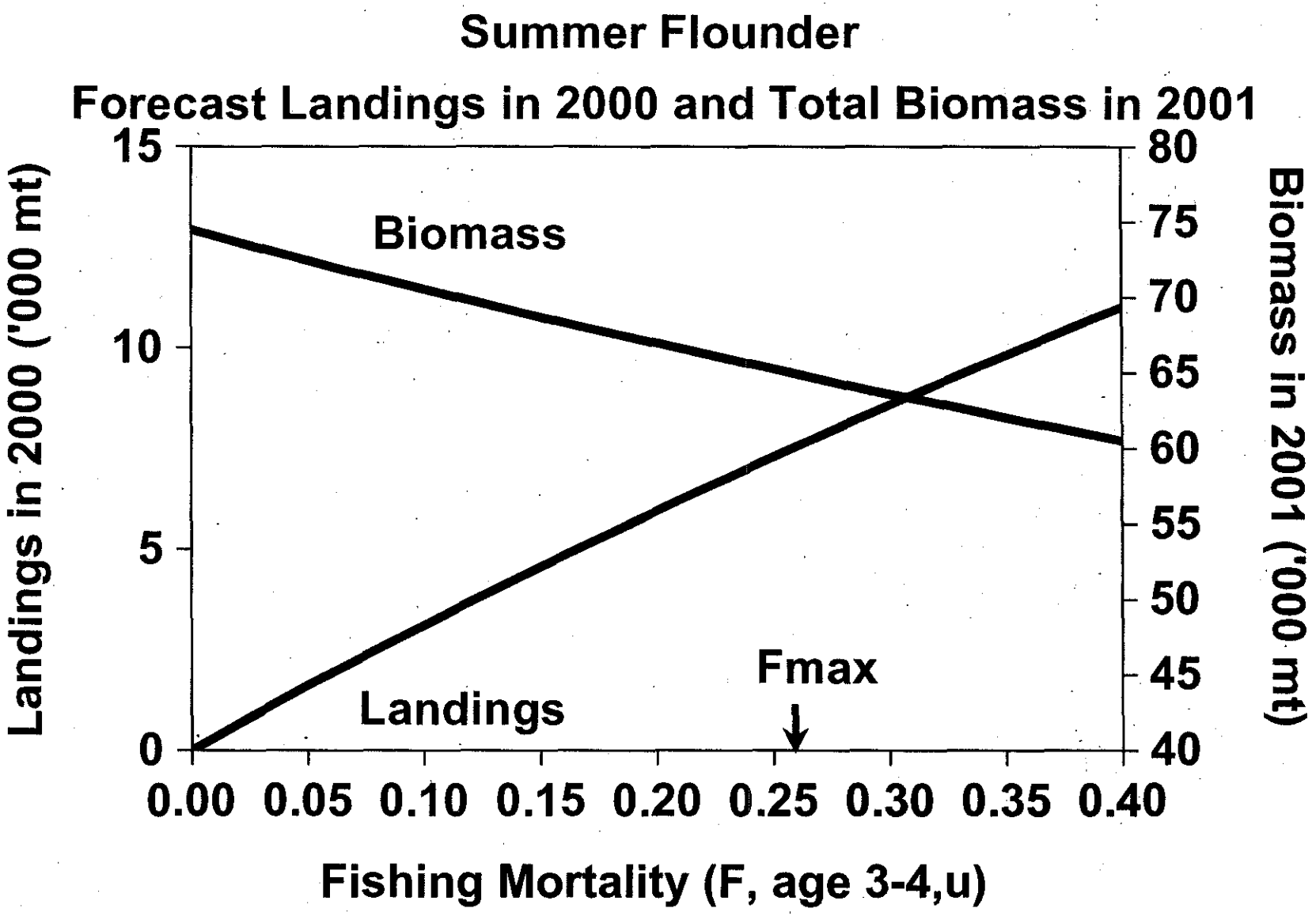

Figure 16. Predicted landings in 2000 and total stock biomass in 2001 of summer flounder over a range of fishing mortalities in 2000.

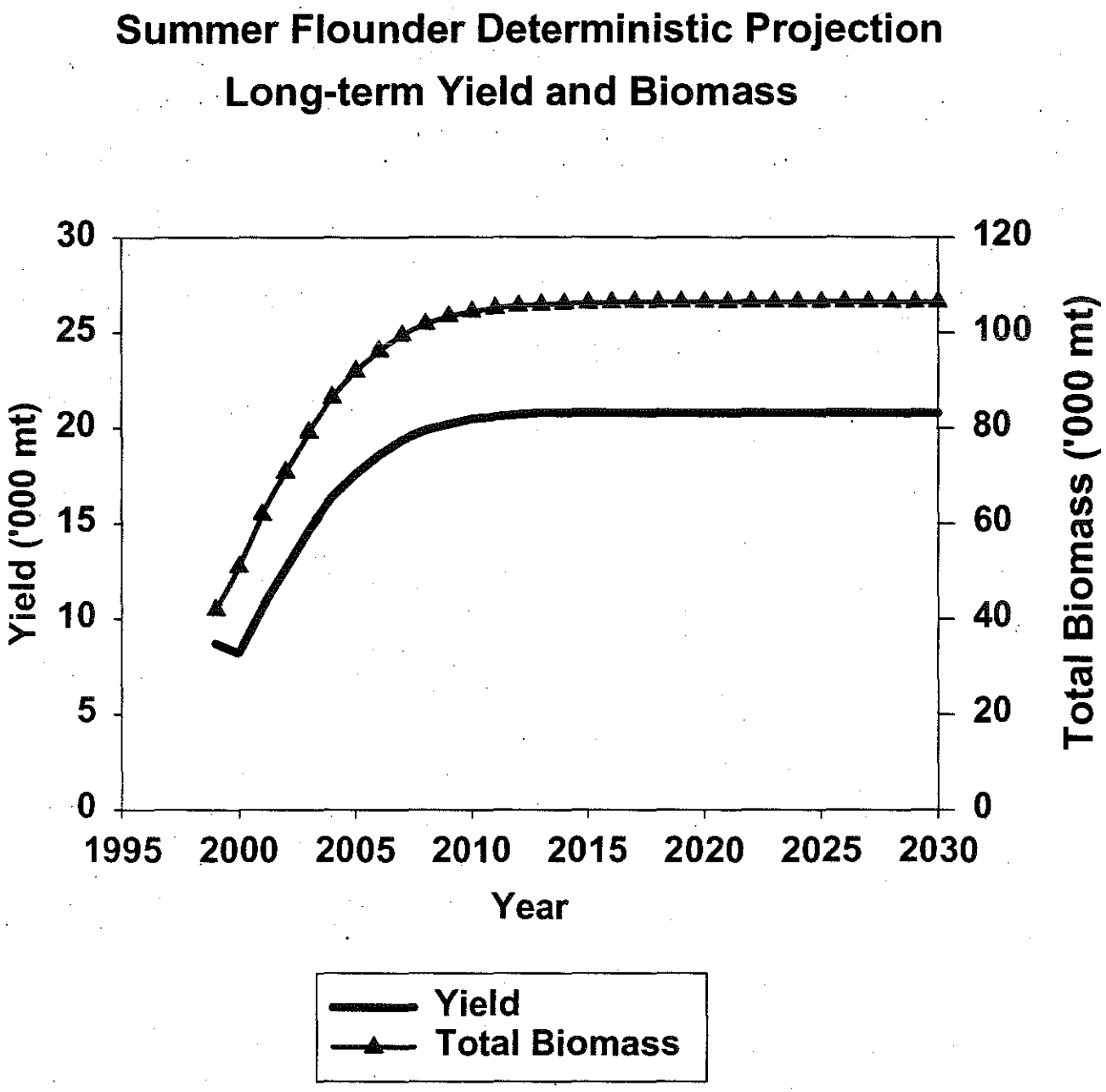

Figure 17. Long-term deterministic projection of total yield and total stock biomass for summer flounder.

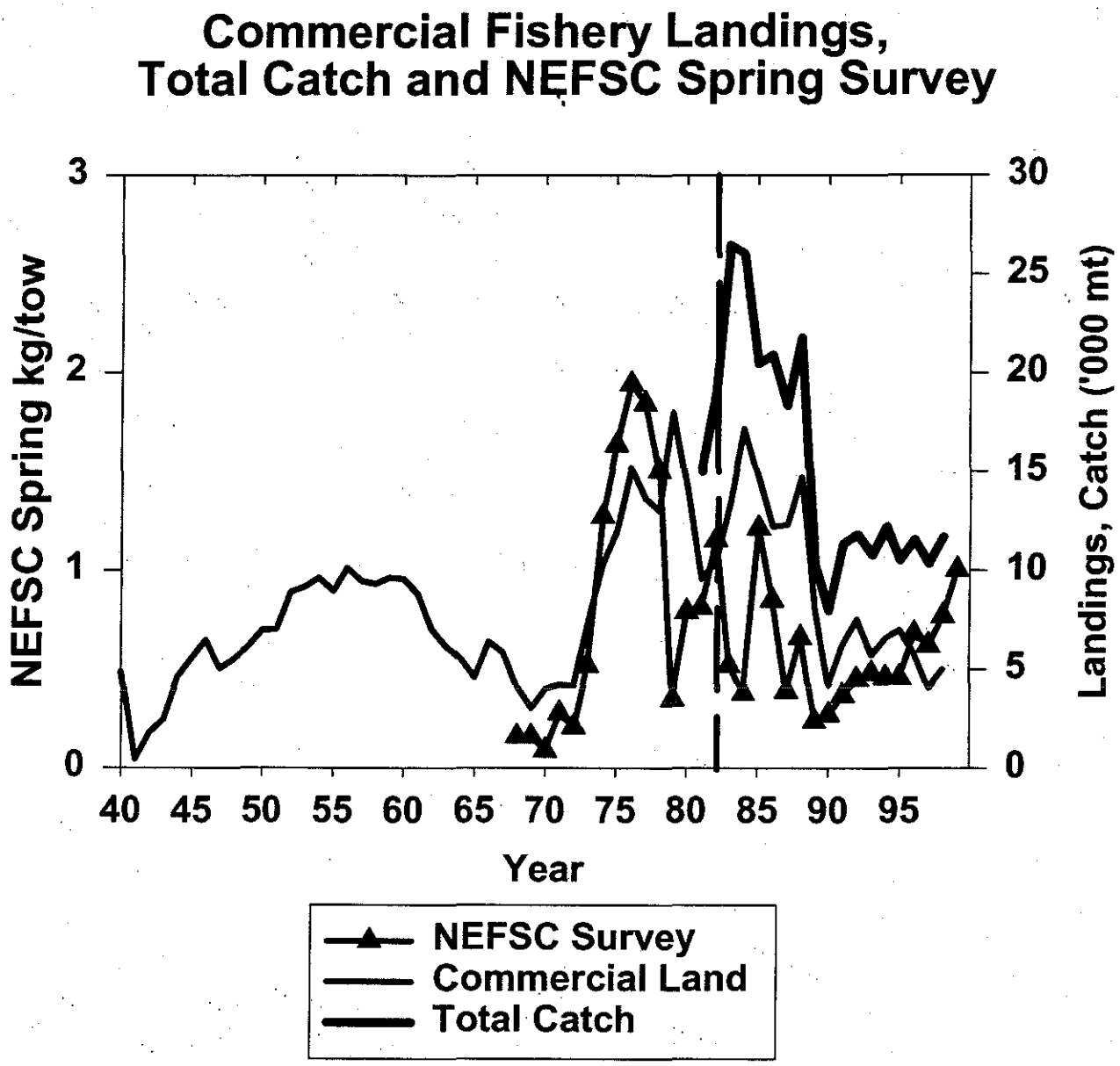

Figure 18. Long term trends in commercial fishery landings (1940-1998), total fishery catch (1981-1998), and NEFSC spring survey biomass index (1968-1999) for summer flounder.