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Stock Assessment of Yellowtail Flounder in the Southern New England - Mid-Atlantic Area

by

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A Report of the 36th Northeast Regional Stock Assessment Workshop

Stock Assessment of Yellowtail Flounder in the Southern New England - Mid-Atlantic Area

by

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ABSTRACT

Southern New England and Mid Atlantic yellowtail flounder resources were previously assessed separately, but are combined for this assessment. The combined stock is overfished and overfishing is taking place. The current estimate of fishing mortality is high, much greater than the proposed F_{MSY} proxy ($F_{40\%MSP} = 0.26$). Spawning stock biomass is low (2001 SSB = 1,900 mt), well below the proposed SSB_{MSY} proxy (69,500 mt SSB). Recruitment has been poor for more than a decade. The age structure of the stock is truncated in comparison to MSY conditions.

INTRODUCTION

Yellowtail flounder, *Limanda ferruginea,* inhabit relatively shallow waters (20-100 m) of the northwest Atlantic from Labrador to Chesapeake Bay (Bigelow and Schroeder 1953, Scott and Scott 1988, Collette and Klein-MacPhee 2002). A fishery for yellowtail flounder developed off southern New England in the 1930s, coincident with the increased use of otter trawls, a decline in winter flounder abundance, and demand for food products during World War II (Scott 1954, Royce *et al.* 1959).

The available information on yellowtail flounder stock structure off the northeast U.S. indicates separate stocks on Georges Bank, off Cape Cod, and from southern New England to the Mid-Atlantic Bight. Distributional analyses indicate a relatively continuous distribution from the Mid Atlantic Bight to Nantucket Shoals, a concentration on Georges Bank, and a relatively separate concentration off Cape Cod (Royce *et al.* 1959). Geographic patterns of landings over time suggest that yellowtail resources on Georges Bank on off southern New England are separate harvest stocks (McBride and Brown 1980). Geographic variation indicates that yellowtail off Cape Cod comprise a separate phenotypic stock than resources to the south (Begg et al. 1999). Tagging data indicate low dispersion from Cape Cod, Georges Bank and southern New England fishing grounds, but substantial movement from the Mid Atlantic to southern New England (Royce et al. 1959, Lux 1963). Descriptive information on early life history stages and circulation patterns suggest that yellowtail spawn in hydrographic retention areas, but there may be some advection of eggs and larvae from Georges Bank and Cape Cod to southern New England and the Mid Atlantic Bight (Sinclair 1988). In summary, yellowtail flounder on Georges Bank appear to be a separate harvest stock, yellowtail off Cape Cod can be considered a separate phenotypic stock (with some question on the northern boundary of the stock area), but there is little evidence supporting separate stocks in southern New England and the Mid Atlantic Bight.

Management History

From 1950 to 1977, the International Commission for the Northwest Atlantic Fisheries managed yellowtail flounder resources in southern New England, Georges Bank and the Gulf of Maine (i.e., in ICNAF subarea 5). Gear restrictions and total allowable catch were the primary management strategies of ICNAF, but minimum fish size, fishing effort and closed area and season regulations were also regulated. Minimum trawl mesh size was 114 mm in the 1950s and 1960s. National catch quotas were implemented for southern New England yellowtail flounder from 1971 to 1976, but these were exceeded in most years.

Following the implementation of the Magnuson Fisheries Conservation and Management Act (FCMA) in 1976, U.S. yellowtail resources have been managed by the New England Fisheries Management Council (Table 1). Groundfish regulations included minimum cod end mesh size, minimum fish size, seasonal area closures, mandatory reporting, trip limits and annual quotas. Minimum size for yellowtail was increased from 28cm in 1982 to 30cm in 1986 and 33cm in 1989. Minimum mesh size increased from 140 mm in 1991 (diamond and square mesh) to 140mm diamond-152mm square in 1994 and to 165mm in 1999. A large area south of Nantucket Shoals was closed to fishing since December 1994. Scallop dredge vessels were limited to possession of 136kg of yellowtail flounder since 1996. Scallop dredge vessels were

limited to possession of 136kg of yellowtail flounder since 1996, and in 1999 minimum twine top mesh was increased from 203mm to 254mm to reduce yellowtail bycatch.

Assessment History

The first quantitative stock assessment of yellowtail flounder was on the southern New England - Mid Atlantic resource and fishery. Royce et al. (1959) evaluated landings, length and age composition, effort, and tagging data to conclude that fishing mortality was approximately 0.30 in the 1940s. However, retrospective estimates of F during the 1940s were substantially greater (approximately 0.6, Lux 1969). Lux (1964) concluded that the stock was not overfished during the 1950s, but age-based mortality estimates for the 1960s were high (Lux 1967[1], 1969).

Subsequent assessments of yellowtail flounder in the southern New England area excluded Mid-Atlantic catch and survey data, but indicated increasing F and declining stock size in the late 1960s (Brown and Hennemuth 1971a, 1971b; Pentilla and Brown 1973). Starting in 1974, Mid Atlantic and southern New England yellowtail resources were treated as separate assessment and management units, but analyses for each area indicated high mortality and low stock size in the 1970s (Parrack 1974, Sissenwine et al. 1978, McBride and Sissenwine 1979, McBride et al. 1980, Clark et al. 1981). In the early 1980s, there was indication of strong recruitment of yellowtail from surveys and commercial catches in both southern New England and Mid Atlantic areas, but discard rates were high and F exceeded F_{max} in southern New England (McBride and Clark 1983, Clark et al. 1984, NEFC 1986).

Assessment methods used for southern New England yellowtail progressed to a calibrated VPA in the late 1980s. The 1988 assessment indicated high F in the 1970s and early 1980s and a strong 1980 cohort (F=0.60-1.48; NEFC 1989). Later stock assessments showed another dominant cohort spawned in 1987, but F continually increased through the 1980s, and the stock was depleted to record low biomass in the early 1990s (Conser et al. 1991, Rago et al. 1994). The VPA-based assessment of southern New England yellowtail was updated annually from 1997 to 1999, and assessments indicated a reduction in F in the late 1990s, but little rebuilding of stock biomass (NEFSC 1997, 1998; Cadrin 2000). In 2000, an updated VPA was attempted, but was rejected as a basis for management advice because sampling in 1999 was inadequate to estimate catch at age reliably (Cadrin 2001b). Therefore, recent assessments of southern New England yellowtail have been based on projections of observed catch from the 1999 VPA (Cadrin 2001b, NEFSC 2002). An updated assessment of the southern New England yellowtail flounder stock was prepared concurrently with this assessment for the Groundfish Assessment Review Meeting (Cadrin 2002b).

An analytical assessment of Mid Atlantic yellowtail flounder has not been developed, and management advice has been based on descriptive summaries of landings and survey data. Assessments of the Mid Atlantic yellowtail resource indicated similar trends in catch and survey indices as in southern New England (NEFC 1987, 1988; NEFSC 1991, 1992, 1993; Rago 1995; Overholtz and Cadrin 1998). Based on survey biomass and exploitation ratios,

[1] Although Lux (1967) is titled, "Landings per unit effort, age composition and total mortality of yellowtail flounder (*Limanda ferruginea*) in subarea 5Z," the southern New England analyses also include catch and effort data from statistical area 6.

the Mid Atlantic yellowtail resource was 2% of the B_{MSY} proxy, and the exploitation rate greatly exceeded the F_{MSY} proxy (Cadrin 2001a). An updated assessment of the Mid Atlantic yellowtail flounder stock was prepared concurrently with this assessment for the Groundfish Assessment Review Meeting (Cadrin 2002a).

FISHERY DATA

Commercial Landings

Commercial statistics for southern New England yellowtail flounder are from statistical areas 526, 537, 538, and 539, and mid Atlantic yellowtail are from statistical areas 611-623 (Figure 1). U.S. commercial landings of yellowtail flounder were derived from dealer weighout reports and canvas data according to historical assessment reports (Royce et al. 1959, Brown and Hennemuth 1971, Sissenwine et al. 1978, McBride et al. 1980, McBride and Clark 1983, NEFC 1986, McBride 1989, Rago et al. 1994). Total Mid Atlantic landings from canvas data were allocated to market category according to annual proportions in the weighout database. Previous to 1994, landings were allocated to statistical area, month, and gear type according to interview data collected by port agents (Burns et al. 1983). For 1994, landings reported by dealers were allocated to stock area using fishing vessel logbook data, by fishing gear, port, and season (Wigley, et al. 1998). For 1995-1997, dealers' reported landings were prorated to stock area using a modified proration that included dealer codes (NEFSC 1998).

Landings generally increased in southern New England during the 1930s and early 1940s and the fishery expanded to the Mid Atlantic in the early 1940s, with landings of 28,000mt in 1942 (Table 2, Figure 2). Annual landings were around 10,000mt from 1943 to 1948 with approximately 10% from the Mid Atlantic. A domestic industrial fishery developed in the late 1940s. Landings decreased to less than 2,000mt in the mid 1950s. Landings increased in southern New England in the late 1950s and again expanded to the Mid Atlantic in the 1960s. A distant water fishery developed in the 1960s and total annual landings were greater than 20,000mt from 1963 to 1970. The industrial and foreign fisheries were discontinued in the early 1970s. Landings generally decreased since the 1970s, with temporary increases in the early 1980s and early 1990s. Landings in 1995 were a record low 200 mt, and the proportion of landings from the Mid Atlantic generally increased from approximately 10% in the early 1990s to greater than 20% (e.g., in 1997, 70% of landings in the stock area came from the Mid Atlantic). Landings slightly increased to greater than 1,000mt per year since 1999.

A summary of port samples (each consisting of approximately 100 lengths and 1 age sample per cm) are listed in Table 3. Landings at age were derived by geographic region, half-year and market category, when possible. Landings at age of southern New England yellowtail flounder are described in previous assessment documents (Conser et al. 1991; Rago et al. 1994; NEFSC 1997, 1998; Cadrin 2000; Cadrin 2002b). Mid Atlantic landings were not sampled in several half-year periods, and age distributions of southern New England landings were assumed for Mid Atlantic landings in those periods by quarter and market category (2nd half of 1975, 2nd half of 1981, 2nd half of 1986, 2nd half of 1987, 2nd half of 1988, 1st half of 1989, 2nd half of 1990), or by half and market category for 2000 and 2001. Landings at age and landed mean weights at age are reported in Table 4. In the early 1970s a substantial portion of landings were from older fish (e.g., 17% of 1973 landings were age-6 or older), but

the age distribution of landings rapidly truncated, and the portion of age 6+ fish has generally been less than 3% since 1977.

Discarded Catch

Estimates of discards for the southern New England – Mid Atlantic yellowtail fishery for 1963-1969 were derived from interviews with vessel captains; historical discards were approximated by Brown and Hennemuth (1971a) from the 1963-1969 average discard rate (Table 5). Discards for 1970-1977 were also based on interview data, however yellowtail interview data were suspect from 1978 to 1982 when trip limits were imposed (McBride et al. 1980, Clark et al. 1981). Discards during 1978-1982 were estimated from observer data when available (Sissenwine et al. 1978), derived directly from field selectivity studies (McBride et al. 1980), or from application of selectivity estimates to survey size frequencies (McBride and Clark 1983). Discards for 1983 were from interview data (Clark et al. 1984). Discards at age from southern New England, 1984-1993 were from a combination of sea sampling, interviews and survey data (Conser et al. 1991, Rago et al. 1994). Discards for 1994-2001 were derived from vessel logbooks (NEFSC 1997, 1998; Cadrin 2000). Updated discard estimates for southern New England are listed in Table 5a. Discards of Mid Atlantic yellowtail were from interview data for 1984-1993. Mid Atlantic discards for 1994-2001 were derived from logbook data by gear for all trips that reported discards of any species (NEFSC 1998, Table 5b).

Discarded catch accounted for an average of 30% of total catch annually, but appears to have decreased to approximately 10% since 1995. In 1969, discards peaked at 24,000mt, 40% of the total catch that year. A substantial portion of recent discards are from the scallop dredge fishery.

Discards at age were estimated from observer lengths (Table 3) and survey ages 1994-2001. Discards at age of southern New England yellowtail flounder are described in previous assessment documents (Conser et al. 1991; Rago et al. 1994; NEFSC 1997, 1998; Cadrin 2000; Cadrin 2002b). Age distribution of discards in southern New England were assumed for Mid Atlantic discards for 1973 to 1993 (Table 6). Discards were primarily ages 1 and 2 during from the 1970s through the early 1990s, but shifted to age 2 and 3 in the early 1990s, coincident with regulated mesh size increases.

Estimates of total catch at age reflect the landings at age in that they indicate a relatively wide age distribution in the catch in the early 1970s (e.g., approximately 10% of the catch was age-6 or older from 1973 to 1975; Figure 3, Appendix A). Subsequent catch at age was dominated by the 1980 and 1987 cohorts, but few fish older than age-6 contributed to the catch. Mean weights at age of older fish (age 4+) generally increased in the mid 1970s, were relatively light during the mid 1980s, and generally increased in recent years (Figure 4). Mean weight of age-1 yellowtail generally decreased in the 1990s, presumably from discards of small yellowtail in the scallop fishery.

ABUNDANCE AND BIOMASS INDICES

Stock Abundance and Biomass Indices

The NEFSC spring and autumn bottom trawl surveys have sampled offshore strata since 1963 and 1968, respectively (Despres et al. 1988). However, the southern–most offshore strata (61-76) were not sampled until 1967. Therefore southern strata were included in the spring survey index, 1968-2002 and the winter survey index 1992-2002 (strata 1, 2, 5, 6, 9, 10, 69, 73, 74; Figure 5), but excluded from the fall survey index, 1963-2001 (strata 1, 2, 5, 6, 9, 10). Nearly all yellowtail caught by the survey in the southern New England – Mid Atlantic stock area (99%) are in the spring and winter strata sets. The strata set for the NEFSC scallop survey was determined as all strata that were consistently sampled in the stock area (14, 15, 18, 19, 22-28, 30, 31, 33, 35, and 46).

Indices of abundance and biomass indicate relatively high stock size in the 1960s and early 1970s, followed by a rapid decrease in the mid 1970s (Table 6, Figure 6). Stock biomass increased temporarily in the early and late 1980s with the recruitment of the strong 1980 and 1987 cohorts. Recent distributions of yellowtail catches in surveys are illustrated in Figure 7. The average portion of yellowtail biomass in the Mid Atlantic region has been 45% of the total southern New England – Mid Atlantic yellowtail biomass (Figure 8). Age distribution of yellowtail in surveys indicates abundant cohorts in the 1960s and early 1970s, strong year classes in 1980 and 1987, and relatively truncated age structure since the early 1970s (Table 7, Figure 9).

Correspondence among survey indices was assessed using correlations among normalized observations for the VPA time series 1973-2001 [Ln(x/mean); Table 8]. Normalized indices of catch per tow at age are illustrated in Figure 10. Correlations among survey series were generally low for the winter survey, particularly for older ages, presumably because it is a short series with little contrast. Correlations between spring and fall survey series were strongest at ages 2-4 (r=0.71-0.82).

MORTALITY AND STOCK SIZE

Virtual Population Analysis

Abundance estimates from virtual population analysis of catch of age-1 to age-7+, 1973-1997, were calibrated using an ADAPT algorithm (Gavaris 1988) that estimated age 2-5 survivors in 2002 and survey catchability coefficients (q) using nonlinear least squares of survey observation errors. Abundance at age was calibrated with survey indices of abundance: spring survey indices (age-1 to age-7+) and winter indices (age-1 to age-5) were calibrated to January abundance, and fall survey indices (age-1 to age-7+) were calibrated to mean abundance. The instantaneous rate of natural mortality (M) was assumed to be 0.2 based on tag returns (Lux 1969), relationships of Z to effort (Brown and Hennemuth 1971a), and the oldest individual sampled in the stock area (age-14). Although catches of yellowtail older than age-8 are rare in commercial or research catches, the stock has been heavily exploited for seven decades. Maturity at age for southern New England yellowtail flounder was reported by O'Brien et al. (1993) from 1985-1990 NEFSC spring survey samples. Calibration output is reported in Appendix A. Model Residuals are plotted in Figure 11.

Results show that the stock was abundant in the early 1970s with a relatively wide age structure (11% of the population in 1973 was age 6 or older), but was quickly truncated by the late 1970s (<2% age 6+ from 1978 to 2001; Figure 12c). Fishing mortality generally increase in the 1970s and 1980s to a peak of 2.3 in 1991 and 1992, averaged 1.6 during the 1990s, and appears to have decreased to 0.68 in 2000 and increased to 0.91 in 2001 (Figure 12a). Recruitment was generally strong in the 1970s and moderate during the 1980s, with two exceptional year classes in 1980 and 1987. Recruitment has been low during the 1990s. Spawning biomass was high in the early 1970s, decreased in the late 1970s, and increased briefly in the early and late 1980s with recruitment of the 1980 and 1987 cohorts. Spawning biomass decreased to a record low 622mt in 1994, gradually increased to 2,100mt in 2000, and decreased to 1,900mt in 2001. Retrospective analysis indicates a strong pattern of underestimating F, and overestimating SSB in recent years (Figure 13).

Biomass Dynamics

Given the problems in estimating recent catch at age in the southern New England area (Cadrin 2000) an age-aggregated production model (ASPIC, Prager 1994) was fit to total catch and survey biomass indices. Results are reported in Appendix B. Initial trials did not fit the winter survey biomass series, presumably because it is relatively short and does not have much contrast, nor did the model fit the catch rate data from Lux (1969). Alternative analyses that assumed that stock biomass was at the carrying capacity in 1935 had very similar results.

Results of the biomass dynamics model indicate that biomass decreased during the 1960s and early 1970s to about 10% of the biomass estimated for the early 1960s (Figure 14). Similar to the age-based analysis, the biomass dynamics model indicates brief periods of rebuilding in the early and late 1980s and a further decrease to extremely low biomass in the mid 1990s. However, the biomass dynamics model indicates a slightly faster rate of rebuilding in recent years than indicated by the age-based analysis.

Biological Reference Points

Yield and biomass per recruit were calculated assuming the observed partial recruitment and mean weight at age for 1994-2001 (Thompson and Bell 1934). Results are reported in Table 9 and illustrated in Figure 15. A comparison of recently observed age distributions with the age distribution expected at $F_{40\%}$ shows a relative truncation in current age structure (Figure 16).

Applying the approach used to estimate MSY proxies for southern New England yellowtail (NEFSC 2002), F_{MSY} is approximated as $F_{40\%}$ (0.26). The SSB_{MSY} proxy is 69,500mt, calculated as the product of 40%MSP (1.129 kg spawning biomass) and average long-term recruitment (61.57 million). The average long-term recruitment was derived as the fall survey age-1 index divided by the catchability coefficient estimated by ADAPT (8.08E-5). The MSY proxy is 14,200mt, derived as the product of yield per recruit at $F_{40\%}$ (0.230 kg) and average recruitment.

Such MSY reference point proxies are highly sensitive to the assumed value of recruitment. For example, different periods of observed recruitment produce a wide range of SSB_{MSY} and

MSY proxies (Figure 17). Alternatively, SSB_{MSY} and MSY can be approximated using stochastic long-term projections assuming recent average weights at age and partial recruitment (1994-2001), and the distribution of long term recruitment. Results suggest that at an F of 0.26, the long-term average catch is 13,100mt, and long-term average SSB is 64,500mt (Figure 18). For comparison, the estimate of B_{MSY} from biomass dynamics analysis is 104,700mt of total biomass, F_{MSY} is 0.19 on total biomass, and MSY is 20,300mt.

Projections

Stochastic age-based projections that assume a 15% reduction in F from 2001 to 2002 and recruitment similar to that experienced in the last decade suggest that the stock cannot rebuild to B_{MSY} by 2009 even if F in 2003-2010 is zero. If the same hindcast recruitment values used to derive the reference points are assumed for projections, there stock is expected to have approximately a 50% chance of rebuilding to SSB_{MSY} by 2009 with an F of 0.08 (Figure 19, Appendix A). However, long-term recruitment levels are not likely in the short-term, because SSB is extremely low, and retrospective patterns indicate that projections may be overly optimistic.

DISCUSSION

Although estimation of catch at age from Mid Atlantic area is independent of the estimation for southern New England waters, and the Mid Atlantic area is well sampled by the surveys, temporal patterns of abundance and mortality for the combined area is similar to previous assessments of the Southern New England stock, though scaled up to account for Mid Atlantic catches. However, the estimate of 2001 fishing mortality for the southern New England assessment (Cadrin 2002b) is half of the F estimated for the combined southern New England-Mid Atlantic stock area.

Unlike stocks of yellowtail flounder that have recently rebuilt from low stock sizes on Georges Bank and the Grand Banks, fishing mortality on southern New England-Mid Atlantic yellowtail has not been substantially reduced and is still well above the rate that will allow rapid rebuilding. Accordingly, the rate of rebuilding has been slow. Projections suggest that fishing mortality should be reduced to near zero to achieve rebuilding by the specified management target of 2009.

Some difficulties in the assessment of southern New England yellowtail (e.g., the retrospective pattern of the VPA) also persist in this assessment of the combined southern New England-Mid Atlantic area. However, the overfished and overfishing status is not affected by the retrospective bias. The retrospective pattern suggests that the VPA is not well calibrated. It appears that the surveys do not monitor small differences in relative abundance at such low densities. Perhaps the winter survey, which samples yellowtail more efficiently than the spring and fall surveys, will help to monitor stock rebuilding as more contrast is observed in the relatively short series.

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Table 1. Management history of southern New England – Mid Atlantic yellowtail flounder.

Year	Comments
1977	FCMA implemented March 1 Groundfish plan adopts quotas for cod, haddock, yellowtail flounder
1982	Interim Groundfish Plan adopted: 11 inch minimum size for yellowtail
	Scallop FMP implemented
1986	Northeast Multispecies FMP adopted: Minimum size for yellowtail flounder: 12 inches Seasonal yellowtail closure, March - May, between 69-30 and 72-30W Closed area I and II continued as spawning closures on GB
1989	Amendment 2: Yellowtail minimum size increased to 13 inches Seasonal large mesh area off Nantucket Shoals to protect cod
1991	Amendment 4: Tightened restrictions on carrying small mesh while in Regulated Mesh Areas Minimum mesh size of 5 1/2 inches in Southern New England yellowtail area
1994	Amendment 5 and emergency regulations: December: NLCA closed year round, including to scallop dredges DAS limits for most vessels West of 72-30W. Mesh determined by mesh requirements of summer flounder fishery (5 1/2 inch diamond or 6 inch square) Established Southern New England RMA, mesh of 5 1/2 inch diamond square, to increase to 5 1/2 inch diamond or 6 inch square in year 2. Area from approximately 69-40W to 72-30 W.
	Scallop Amendment 4: adopted permit moratorium, effort control/DAS program, 5.5 inch twine top minimum, and crew limits
1996	Amendment 7 Extended DAS limits to most vessels Limited possession of groundfish by scallop vessels to 300 pounds of regulated multispecies Established criteria for exempted fisheries Mid-Atlantic regulated mesh area fisheries exempt from bycatch certification
1999	Framework 27: (May 1) Increased square mesh minimum size to 6 1/2 inches in GOM/GB/SNE Regulated mesh areas Framework 29: (June)
	Amendment 9: (November): Revised overfishing definitions
2000	Scallop Framework 13: Scallop vessel closed area access programs with yellowtail bycatch limits
	Adopted management measures for small-mesh multispecies, establishing minimum mesh sizes and trip/possession limits to reduce mortality on silver, red, and offshore hake

Table 2. Southern New England – Mid Atlantic yellowtail flounder catch (thousand mt).

	Mid-Atlantic			Southern New England				
year	U.S. landings	U.S. discards	foreign catch	U.S. landings	U.S. discards	industrial landings	foreign landings	total
1960	0.0	0.0	0.0	8.3	3.2	0.5	0.0	12.0
1961	0.0	0.0	0.0	12.3	4.7	0.7	0.0	17.7
1962	0.0	0.0	0.0	13.3	5.3	0.2	0.0	18.8
1963	0.0	0.0	0.0	22.3	5.4	0.3	0.2	28.2
1964	1.8	0.0	0.0	19.5	9.5	0.5	0.0	31.3
1965	2.1	0.0	0.0	19.4	7.0	1.0	1.4	30.9
1966	2.2	0.0	0.0	17.6	5.3	2.7	0.7	28.5
1967	5.3	0.0	0.0	15.3	7.7	4.5	2.8	35.6
1968	3.3	0.0	0.0	18.2	6.3	3.9	3.5	35.2
1969	3.9	0.0	0.7	15.6	2.4	4.2	17.6	44.4
1970	4.1	0.0	0.1	15.2	4.5	2.1	2.5	28.5
1971	6.9	0.0	1.0	8.6	2.2	0.4	0.3	19.3
1972	8.8	0.0	0.1	8.5	1.8	0.3	3.0	22.5
1973	4.9	0.2	0.2	7.2	1.5	0.3	0.2	14.5
1974	1.9	0.0	0.0	6.4	8.7	0.0	0.1	17.1
1975	0.6	0.0	0.0	3.2	1.9	0.0	0.0	5.7
1976	0.3	0.0	0.0	1.6	1.6	0.0	0.0	3.4
1977	0.5	0.0	0.0	2.8	1.9	0.0	0.0	5.2
1978	0.8	0.0	0.0	2.3	5.0	0.0	0.0	8.1
1979	0.2	0.0	0.0	5.3	4.4	0.0	0.0	9.9
1980	0.3	0.0	0.0	6.0	1.7	0.0	0.0	8.0
1981	0.7	0.0	0.0	4.7	1.2	0.0	0.0	6.6
1982	0.4	0.0	0.0	10.3	5.0	0.0	0.0	15.8
1983	1.5	0.2	0.0	17.0	3.5	0.0	0.0	22.2
1984	2.2	0.0	0.0	7.9	1.1	0.0	0.0	11.2
1985	0.9	0.0	0.0	2.7	1.2	0.0	0.0	4.8
1986	0.2	0.0	0.0	3.3	1.1	0.0	0.0	4.6
1987	0.2	0.0	0.0	1.6	0.9	0.0	0.0	2.7
1988	0.1	0.0	0.0	0.9	1.8	0.0	0.0	2.8
1989	0.4	0.0	0.0	2.5	5.5	0.0	0.0	8.3
1990	0.2	0.0	0.0	8.0	9.7	0.0	0.0	17.9
1991	0.2	0.0	0.0	3.9	2.3	0.0	0.0	6.4
1992	0.2	0.0	0.0	1.4	1.1	0.0	0.0	2.7
1993	0.2	0.0	0.0	0.5	0.1	0.0	0.0	0.8
1994	0.2	0.1	0.0	0.2	0.1	0.0	0.0	0.6
1995	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.3
1996	0.2	0.0	0.0	0.3	0.1	0.0	0.0	0.5
1997	0.5	0.0	0.0	0.2	0.0	0.0	0.0	0.8
1998	0.2	0.0	0.0	0.4	0.1	0.0	0.0	0.7
1999	0.5	0.0	0.0	0.7	0.1	0.0	0.0	1.3
2000	0.2	0.0	0.0	0.7	0.0	0.0	0.0	1.0
2001	0.2	0.0	0.0	0.8	0.0	0.0	0.0	1.1

Table 3. Commercial samples of southern New England – Mid Atlantic yellowtail flounder by geographic region, half-year and market category (values in italics are Mid Atlantic observer lengths).

		Southern New England			Mid Atlantic					
year	half	uncl. lengths	large lengths	small lengths	ages	uncl. lengths	large lengths	small lengths	ages	discard lengths
1969	1	5059	0	0	991	950	0	0	143	0
1969	2	5730	0	0	951	1120	0	0	159	0
1970	1	6313	0	0	2515	1238	0	0	377	0
1970	2	9554	0	0	3149	707	0	0	197	0
1971	1	5421	0	0	2165	1212	0	0	387	0
1971	2	3414	0	0	577	1305	0	0	250	0
1972	1	2817	479	741	1483	1132	252	420	442	0
1972	2	1761	364	515	968	395	0	0	99	0
1973	1	1441	675	777	1085	923	0	0	249	0
1973	2	2757	248	362	1035	1293	0	0	299	0
1974	1	2568	112	319	1296	327	251	741	383	0
1974	2	3767	0	299	1396	498	0	0	149	0
1975	1	767	633	1257	1039	220	345	898	456	0
1975	2	321	100	149	189	0	0	0	0	0
1976	1	412	717	843	824	235	157	0	173	0
1976	2	149	190	192	192	426	0	0	161	0
1977	1	0	707	803	572	520	379	340	497	0
1977	2	162	370	275	339	283	0	0	103	0
1978	1	0	747	1222	680	223	85	0	146	0
1978	2	431	433	472	427	322	0	0	104	0
1979	1	249	444	348	379	451	0	0	164	0
1979	2	2050	377	735	1073	164	0	0	54	0
1980	1	1664	1313	1559	1984	214	90	281	228	0
1980	2	916	365	961	803	129	0	0	52	0
1981	1	888	270	151	530	1155	0	0	465	0
1981	2	377	109	1111	554	0	0	0	0	0
1982	1	1071	608	1374	1108	821	0	0	319	0
1982	2	266	401	3361	1210	139	0	188	101	0
1983	1	205	750	2281	1060	578	90	0	197	0
1983	2	252	601	2411	915	0	0	174	50	0
1984	1	416	558	1469	520	1544	0	1244	532	0
1984	2	0	932	2976	832	469	0	161	120	0
1985	1	138	822	2524	833	842	0	260	235	0
1985	2	443	620	2725	759	172	0	154	60	0
1986	1	422	326	1753	537	380	107	410	269	0
1986	2	299	498	1517	472	0	0	0	0	0
1987	1	0	662	964	391	765	0	0	201	0
1987	2	0	586	1042	347	0	0	0	0	0
1988	1	0	800	1272	536	240	0	0	54	0
1988	2	0	381	692	294	0	0	0	0	0
1989	1	0	759	1274	559	0	0	0	0	432
1989	2	0	504	971	351	316	0	0	75	183
1990	1	0	776	1155	504	*565*	0	0	0	1311
1990	2	0	693	956	389	*0*	0	0	0	0
1991	1	0	619	932	384	*151*	0	0	25	273
1991	2	0	671	1034	434	*456*	0	0	0	209
1992	1	0	524	895	400	*376*	0	0	50	1
1992	2	0	520	660	326	*35*	0	0	0	0
1993	1	0	348	625	265	*45*	0	0	0	7
1993	2	0	72	234	0	*7*	0	0	0	0
1994	1	0	102	133	58	*3*	0	0	0	10
1994	2	0	252	254	128	*0*	94	134	0	7
1995	1	78	234	240	143	*17*	0	0	0	70
1995	2	0	94	146	50	*3*	0	0	0	57
1996	1	0	0	0	0	*21*	0	0	0	255
1996	2	0	469	691	305	*28*	0	0	60	479
1997	1	215	813	803	468	*473*	0	0	78	433
1997	2	78	328	679	238	*67*	91	0	17	253
1998	1	0	283	596	275	*27*	0	0	0	41
1998	2	0	0	127	37	*101*	100	0	0	8
1999	1	262	408	333	154	*281*	77	111	83	61
1999	2	0	0	0	0	0	0	0	0	0
2000	1	114	589	94	170	0	85	0	14	537
2000	2	300	715	598	80	0	0	0	0	26
2001	1	0	263	710	249	0	0	117	48	14
2001	2	222	626	1028	526	0	0	0	114	33

Table 4a. Landings at age (thousands) of yellowtail flounder in southern New England.

					Age				
Year	1	2	3	4	5	6	7	8+	Total
1973	28	2570	7169	4630	1716	1517	257	55	17,942
1974	130	1766	3922	5053	2500	950	1021	196	15,538
1975	170	2352	1496	973	1257	549	308	163	7,268
1976	0	1396	898	245	337	391	167	188	3,622
1977	66	2039	3931	392	205	253	123	160	7,169
1978	21	3209	1488	1025	165	34	44	28	6,014
1978	19	4972	8252	1033	428	96	24	0	14,824
1980	119	4557	6324	3619	472	117	19	12	15,239
1981	0	2732	6418	2449	884	128	14	0	12,625
1982	56	17414	12788	1741	404	78	7	0	32,488
1983	57	13823	33242	3347	376	129	35	7	51,016
1984	45	2624	13902	6587	740	244	7	14	24,163
1985	166	3984	1496	1312	774	135	27	4	7,898
1986	39	5926	2882	561	324	119	21	1	9,873
1987	72	1370	2014	803	139	47	8	1	4,454
1988	0	1154	504	407	101	17	6	0	2,189
1989	0	5213	1269	280	41	3	0	0	6,806
1990	0	415	18476	1352	68	5	0	0	20,316
1991	0	253	2230	6606	81	1	17	0	9,188
1992	0	301	896	1687	246	10	3	0	3,143
1993	0	211	361	417	124	4	0	0	1,117
1994	0	15	187	136	120	48	1	0	507
1995	0	154	125	182	18	1	3	0	483
1996	0	224	439	122	15	10	5	1	816
1997	0	33	319	146	14	2	2	1	517
1998	0	300	364	139	25	2	0	0	830
1999	0	9	1231	158	45	11	5	0	1,458
2000	0	420	805	323	12	2	1	1	1,563
2001	0	201	1086	297	83	18	9	0	1,694

Table 4b. Landed weight (kg) at age of yellowtail in southern New England.

	Age							
Year	1	2	3	4	5	6	7	8+
1973	0.210	0.298	0.381	0.420	0.430	0.506	0.611	-
1974	0.203	0.308	0.359	0.429	0.477	0.476	0.518	-
1975	0.218	0.290	0.385	0.439	0.436	0.469	0.515	-
1976	-	0.303	0.427	0.528	0.533	0.568	0.603	-
1977	0.215	0.284	0.385	0.521	0.529	0.484	0.612	-
1978	0.234	0.296	0.402	0.543	0.710	0.791	0.677	-
1979	0.189	0.301	0.366	0.476	0.590	0.684	0.679	-
1980	0.206	0.281	0.384	0.499	0.690	0.891	1.182	-
1981	0.140	0.262	0.343	0.484	0.619	0.664	0.476	-
1982	0.226	0.263	0.354	0.502	0.661	0.821	0.956	-
1983	0.175	0.262	0.341	0.499	0.671	0.829	0.838	-
1984	0.182	0.239	0.298	0.388	0.497	0.652	0.724	-
1985	0.183	0.264	0.370	0.428	0.541	0.620	0.867	-
1986	0.186	0.285	0.335	0.470	0.598	0.617	0.804	-
1987	0.247	0.268	0.361	0.412	0.542	0.595	0.905	-
1988	-	0.293	0.398	0.501	0.664	0.936	0.937	-
1989	-	0.337	0.389	0.546	0.736	0.959	1.278	-
1990	-	0.327	0.378	0.461	0.800	0.884	0.781	-
1991	-	0.336	0.379	0.426	0.715	1.530	0.599	-
1992	-	0.347	0.386	0.460	0.631	0.802	1.432	-
1993	-	0.358	0.430	0.471	0.645	1.040	1.040	-
1994	-	0.319	0.349	0.416	0.556	0.717	0.876	-
1995	-	0.317	0.410	0.460	0.668	0.883	0.863	-
1996	-	0.363	0.399	0.476	0.602	0.680	0.780	-
1997	-	0.347	0.435	0.494	0.677	0.847	0.926	-
1998	-	0.284	0.399	0.528	0.694	0.790	0.707	-
1999	-	0.334	0.440	0.574	0.763	1.106	1.104	-
2000	-	0.371	0.477	0.604	0.690	0.979	1.040	-
2001	-	0.393	0.441	0.617	0.743	0.919	0.948	-

Table 4c. Landings at age (thousands) of yellowtail in the Mid Atlantic.

					Age				
Year	1	2	3	4	5	6	7	8+	Total
1973	0	80	3426	3297	3510	3788	660	8	14,769
1974	0	87	838	2272	1187	648	453	80	5,565
1975	6	340	387	147	340	243	108	81	1,652
1976	0	78	269	82	112	86	63	1	690
1977	2	221	917	115	73	51	44	18	1,441
1978	0	880	669	445	82	27	26	20	2,149
1979	0	142	296	29	10	5	5	1	488
1980	18	217	253	210	40	12	3	4	757
1981	0	284	841	477	227	33	3	5	1,869
1982	0	566	665	114	11	1	0	0	1,357
1983	0	593	3914	237	9	17	2	2	4,773
1984	2	434	5136	1467	138	1	9	0	7,188
1985	0	1046	659	656	335	69	11	0	2,775
1986	1	289	405	74	32	8	0	0	808
1987	4	33	335	123	28	8	1	0	532
1988	0	59	28	99	33	9	0	0	229
1989	0	705	244	51	1	0	0	0	1,001
1990	0	8	446	184	11	0	0	0	649
1991	0	0	113	208	75	33	0	0	429
1992	0	0	115	393	18	4	1	0	532
1993	0	34	71	285	21	0	0	0	411
1994	0	7	79	103	164	77	3	0	432
1995	0	45	14	7	1	2	1	2	73
1996	0	117	105	92	32	5	0	0	353
1997	0	35	751	378	46	3	1	2	1,217
1998	0	96	133	117	46	7	3	0	401
1999	0	18	835	100	44	0	0	0	998
2000	0	74	252	110	3	1	0	0	440
2001		32	200	111	43	14	10	0	409

Table 4d. Landed weight (kg) at age of yellowtail in the Mid Atlantic.

	Age							
Year	1	2	3	4	5	6	7	8+
1973	-	0.184	0.267	0.310	0.358	0.382	0.421	0.830
1974	-	0.210	0.311	0.323	0.358	0.364	0.386	0.450
1975	0.218	0.283	0.342	0.385	0.432	0.430	0.478	0.524
1976	-	0.265	0.342	0.409	0.397	0.429	0.404	0.621
1977	0.201	0.268	0.364	0.447	0.469	0.466	0.511	0.553
1978	-	0.241	0.339	0.520	0.566	0.553	0.568	0.605
1979	-	0.249	0.317	0.424	0.586	0.461	0.344	0.830
1980	0.202	0.269	0.373	0.509	0.581	0.712	0.760	0.696
1981	0.140	0.261	0.337	0.421	0.504	0.687	0.473	0.649
1982	-	0.263	0.325	0.458	0.636	0.863	-	-
1983	0.175	0.238	0.315	0.455	0.523	0.707	0.765	0.765
1984	0.144	0.215	0.287	0.387	0.436	0.704	0.614	-
1985	-	0.235	0.355	0.367	0.419	0.494	0.450	-
1986	0.185	0.258	0.305	0.408	0.476	0.563	0.720	-
1987	0.260	0.282	0.303	0.350	0.409	0.536	0.619	-
1988	-	0.303	0.369	0.459	0.449	0.539	-	-
1989	-	0.359	0.458	0.606	0.700	0.882	-	-
1990	-	0.330	0.351	0.386	0.509	-	-	-
1991	-	0.234	0.392	0.426	0.680	0.881	-	-
1992	-	-	0.382	0.459	0.636	0.808	1.048	-
1993	-	0.302	0.431	0.422	0.614	-	-	-
1994	-	0.323	0.362	0.494	0.602	0.715	0.913	-
1995	-	0.222	0.315	0.350	0.494	0.480	0.594	0.769
1996	-	0.378	0.412	0.471	0.580	0.687	-	-
1997	-	0.296	0.416	0.474	0.552	0.952	1.128	1.941
1998	-	0.344	0.457	0.626	0.827	1.007	1.048	-
1999	-	0.360	0.458	0.548	0.563	-	-	-
2000	-	0.371	0.472	0.616	0.931	1.173	1.040	1.040
2001	-	0.366	0.464	0.643	0.817	0.968	1.030	

Table 5a. Discard estimates for southern New England yellowtail flounder for 2000 and 2001 from logbook (VTR) data (observer data, OB, also listed for comparison).

2000 logbook data

half year	gear	kept (mt)	disc (mt)	d/k	landings (mt)	discards (mt)
1	trawl	69.0	2.1	0.031	343.9	10.5
	dredge	0.1	3.3	23.102	0.6	13.6
2	trawl	97.7	2.5	0.026	402.6	10.5
	dredge	0.1	3.5	38.696	0.1	2.2
	total					36.8

2000 observer data

half year	gear	kept (mt)	disc (mt)	d/k	trips	discard lengths
1	trawl	0.20	0.21	1.069	2	90
	dredge					0
2	trawl	1.57	0.37	0.237	2	82
	dredge	0.04	0.63	17.859	1	22
	total					194

2001 logbook data

half year	gear	kept (mt)	disc (mt)	d/k	landings (mt)	discards (mt)
1	trawl	162.0	3.9	0.024	602.9	14.5
	dredge	0.1	2.2	40.907	0.0	0.4
2	trawl	42.7	1.3	0.029	225.0	6.6
	dredge	0.0	2.5	280.478	0.1	20.1
	total					41.7

2001 observer data

half year	gear	kept (mt)	disc (mt)	d/k	trips	discard lengths
1	trawl	11.15	0.75	0.067	1	72
	dredge	0.00	0.28		1	0
2	trawl	1.46	0.21	0.142	3	82
	dredge				0	0
	total					154

Table 5b. Discard estimates for Mid Atlantic yellowtail flounder, 1994-2001 from logbook (VTR) data (observer data, OB, also listed for comparison).

Trawl Discards		OB	OB	OB	VTR	VTR	VTR		
year	half	kept	discard	d/k	kept	discard	d/k	landings	discards
1994	1	0.054	0.004	0.07	0.292	0.062	0.2127	63.1	13.4
1994	2	0.001	0.024	47.20	0.675	0.043	0.0639	93.3	6.0
1995	1	0.000	0.001		1.436	0.692	0.4817	5.2	2.5
1995	2				2.994	0.170	0.0568	11.1	0.6
1996	1	0.001	0.000	0.00	24.362	1.442	0.0592	83.3	4.9
1996	2	0.000	0.345		22.607	0.815	0.0361	66.0	2.4
1997	1	1.925	0.133	0.07	84.408	3.500	0.0415	451.7	18.7
1997	2	0.000	0.381		9.887	0.714	0.0723	71.3	5.1
1998	1	0.001	0.000	0.00	29.147	2.302	0.0790	117.5	9.3
1998	2	0.018	0.002	0.13	12.033	0.765	0.0636	86.0	5.5
1999	1	0.000	0.009		103.788	4.402	0.0424	409.9	17.4
1999	2				9.022	0.484	0.0536	57.7	3.1
2000	1	0.001	0.030	21.36	46.856	0.968	0.0206	152.8	3.2
2000	2	6.269	0.424	0.07	14.233	0.467	0.0328	65.3	2.1
2001	1	0.079	0.000	0.00	38.375	0.956	0.0249	206.5	5.1
2001	2	0.000	0.003		4.040	0.175	0.0433	27.7	1.2
Dredge Discards									
1994	1	0.045	0.037	0.82	0.320	0.445	1.392	69.1	96.2
1994	2	0.001	0.006	4.57	0.091	0.068	0.747	12.6	9.4
1995	1	0.030	0.245	8.24	0.889	0.494	0.556	3.2	1.8
1995	2	0.014	0.361	25.62	0.439	0.426	0.971	1.6	1.6
1996	1	0.081	0.856	10.54	0.859	0.370	0.430	2.9	1.3
1996	2	0.054	0.674	12.57	0.529	1.150	2.174	1.5	3.4
1997	1	0.211	0.863	4.10	1.179	0.628	0.533	6.3	3.4
1997	2	0.095	0.200	2.11	0.894	0.284	0.317	6.4	2.0
1998	1	0.023	0.103	4.48	1.410	1.281	0.909	5.7	5.2
1998	2	0.000	0.058	144.50	0.839	0.578	0.689	6.0	4.1
1999	1	0.015	0.126	8.37	1.126	0.166	0.147	35.1	5.2
1999	2				0.052	0.009	0.175	0.0	0.0
2000	1	0.000	0.211		0.122	0.227	1.859	2.0	3.8
2000	2	0.000	0.033		0.077	0.261	3.387	0.1	0.4
2001	all	0.079	0.000	0.00	0.062	1.699	27.398	0.9	24.6

Table 6a. Discards at age (thousands) of yellowtail flounder in southern New England.

	Age						
Year	1	2	3	4	5	6	7
1973	160	2486	1130	43	0	0	0
1974	728	26568	793	45	0	0	0
1975	8670	1427	1	10	0	0	0
1976	214	5203	14	0	0	0	0
1977	5376	2732	42	0	0	0	0
1978	8677	10102	7	0	0	0	0
1979	185	14253	119	0	0	0	0
1980	869	5441	18	0	0	0	0
1981	38	4013	319	0	0	0	0
1982	113	17716	905	3	0	0	0
1983	2469	4607	5373	17	0	0	0
1984	465	3107	941	74	0	0	0
1985	2064	3031	20	0	0	0	0
1986	423	3754	39	0	0	0	0
1987	1518	2034	19	0	0	0	0
1988	5899	896	4	0	0	0	0
1989	24	14002	1834	131	6	0	0
1990	192	1633	23709	673	11	0	0
1991	445	1354	2820	2883	12	0	0
1992	477	1152	1086	659	33	0	0
1993	13	212	15	9	0	0	0
1994	9	134	35	29	12	2	0
1995	7	94	38	27	12	3	0
1996	21	81	56	29	13	2	0
1997	1	23	32	4	1	0	0
1998	0	88	114	40	9	3	1
1999	3	64	215	22	11	2	0
2000	31	35	29	13	0	0	0
2001	1	35	75	3	2	0	0

Table 6b. Discarded weight at age of southern New England yellowtail flounder.

	Age						
Year	1	2	3	4	5	6	7
1973	0.210	0.298	0.381	0.420			
1974	0.203	0.308	0.359	0.429			
1975	0.218	0.290	0.385	0.439			
1976	0.228	0.303	0.427				
1977	0.215	0.284	0.385				
1978	0.234	0.296	0.402				
1979	0.189	0.301	0.366				
1980	0.206	0.281	0.384				
1981	0.140	0.262	0.343				
1982	0.226	0.263	0.354	0.502			
1983	0.175	0.262	0.341	0.499			
1984	0.182	0.239	0.298	0.388			
1985	0.183	0.264	0.370				
1986	0.186	0.285	0.335				
1987	0.247	0.268	0.361				
1988	0.270	0.293	0.398				
1989	0.311	0.337	0.389	0.546	0.736		
1990	0.301	0.327	0.378	0.461	0.800		
1991	0.206	0.248	0.302	0.387	0.413		
1992	0.167	0.308	0.351	0.354	0.344		
1993	0.122	0.358	0.430	0.471			
1994	0.108	0.323	0.349	0.416	0.556	0.358	
1995	0.123	0.317	0.410	0.477	0.668	0.883	
1996	0.147	0.404	0.495	0.424	0.610	0.922	
1997	0.143	0.220	0.325	0.532	0.722		
1998	0.020	0.284	0.399	0.528	0.694	0.790	0.707
1999	0.208	0.272	0.389	0.565	0.767	0.586	1.183
2000	0.020	0.314	0.473	0.572			
2001	0.153	0.327	0.363	0.568	0.528		

Table 6c. Discards at age (thousands) of Mid Atlantic yellowtail flounder.

				Age		
Year	1	2	3	4	5	6
1973	32	496	225	9	0	0
1974	3	98	3	0	0	0
1975	64	11	0	0	0	0
1976	0	0	0	0	0	0
1977	69	35	1	0	0	0
1978	0	0	0	0	0	0
1979	1	52	0	0	0	0
1980	0	0	0	0	0	0
1981	0	0	0	0	0	0
1982	0	0	0	0	0	0
1983	142	265	309	1	0	0
1984	5	34	10	1	0	0
1985	9	13	0	0	0	0
1986	0	1	0	0	0	0
1987	0	0	0	0	0	0
1988	0	0	0	0	0	0
1989	0	0	0	0	0	0
1990	0	1	12	0	0	0
1991	1	3	6	6	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	145	592	11	13	13	0
1995	0	15	3	3	0	1
1996	1	5	26	5	0	0
1997	1	11	64	10	0	0
1998	3	27	24	10	1	2
1999	3	15	39	8	3	0
2000	4	38	5	2	0	0
2001	0	7	51	13	2	0

Table 6d. Discarded weight at age of Mid Atlantic yellowtail flounder.

	Age					
Year	1	2	3	4	5	6
1973	0.210	0.298	0.381	0.420		
1974	0.203	0.308	0.359	0.429		
1975	0.218	0.290	0.385	0.439		
1976	0.228	0.303	0.427			
1977	0.215	0.284	0.385			
1978	0.234	0.296	0.402			
1979	0.189	0.301	0.366			
1980	0.206	0.281	0.384			
1981	0.140	0.262	0.343			
1982	0.226	0.263	0.354	0.502		
1983	0.175	0.262	0.341	0.499		
1984	0.182	0.239	0.298	0.388		
1985	0.183	0.264	0.370			
1986	0.186	0.285	0.335			
1987	0.247	0.268	0.361			
1988	0.270	0.293	0.398			
1989	0.311	0.337	0.389	0.546	0.736	
1990	0.301	0.327	0.378	0.461	0.800	
1991	0.206	0.248	0.302	0.387	0.413	
1992	0.167	0.308	0.351	0.354	0.344	
1993	0.122	0.358	0.430	0.471		
1994	0.065	0.171	0.348	0.407	0.377	
1995	0.146	0.233	0.318	0.385	0.506	0.507
1996	0.163	0.220	0.347	0.358	0.652	0.810
1997	0.133	0.230	0.347	0.399	0.567	0.876
1998	0.162	0.267	0.389	0.507	0.627	0.499
1999	0.234	0.251	0.399	0.501	0.608	0.899
2000	0.149	0.137	0.447	0.570	0.765	
2001	0.153	0.278	0.385	0.590	0.621	0.765

Table 7. NEFSC Survey indices of abundance and biomass of southern New England – Mid Atlantic yellowtail flounder.

Fall Survey

year	age-0	age-1	age-2	age-3	age-4	age-5	age-6	age-7	age-8	age-9	sum	kg/tow
1963	0.030	14.778	12.274	9.972	4.944	0.683	0.059	0.082	0.000	0.000	42.822	14.023
1964	0.000	13.900	19.067	3.381	5.356	2.643	0.543	0.036	0.000	0.000	44.925	13.972
1965	0.166	22.272	12.835	4.327	1.489	1.184	0.146	0.000	0.000	0.000	42.418	10.228
1966	0.569	34.899	10.656	2.342	0.902	0.175	0.000	0.000	0.000	0.000	49.542	9.033
1967	0.177	23.579	29.045	12.719	1.212	0.260	0.047	0.124	0.000	0.000	67.164	14.018
1968	0.000	13.882	21.622	24.639	1.571	0.263	0.325	0.069	0.000	0.000	62.370	13.038
1969	0.056	10.440	11.316	33.936	4.454	0.049	0.019	0.019	0.000	0.000	60.288	14.472
1970	0.067	4.414	8.047	29.866	18.927	3.305	0.359	0.047	0.000	0.000	65.032	16.211
1971	0.000	14.540	12.485	6.886	12.452	1.909	0.162	0.123	0.000	0.000	48.556	8.975
1972	0.000	3.245	32.938	33.089	33.080	18.618	2.305	0.101	0.000	0.000	123.376	31.543
1973	0.000	1.779	1.747	4.086	2.318	1.564	0.768	0.162	0.000	0.000	12.422	3.125
1974	0.132	0.695	1.185	0.433	1.640	0.687	0.297	0.146	0.014	0.042	5.271	1.545
1975	0.000	1.533	0.416	0.136	0.217	0.213	0.048	0.070	0.000	0.000	2.634	0.602
1976	0.000	1.964	4.204	0.350	0.046	0.073	0.190	0.220	0.099	0.000	7.147	1.954
1977	0.028	2.289	1.439	0.519	0.044	0.040	0.035	0.065	0.000	0.000	4.459	1.125
1978	0.000	2.080	4.771	0.296	0.236	0.024	0.006	0.048	0.000	0.021	7.481	2.004
1979	0.000	1.493	3.283	1.579	0.241	0.026	0.026	0.000	0.000	0.000	6.646	1.818
1980	0.000	1.153	2.908	0.757	0.313	0.000	0.000	0.000	0.000	0.000	5.130	1.354
1981	0.000	9.511	9.498	1.251	0.198	0.103	0.037	0.000	0.000	0.000	20.597	4.046
1982	0.000	2.040	17.794	4.392	0.535	0.215	0.000	0.000	0.000	0.000	24.976	5.706
1983	0.000	1.920	11.278	5.593	0.458	0.038	0.000	0.026	0.000	0.000	19.314	4.490
1984	0.000	1.444	1.275	1.529	0.334	0.000	0.000	0.000	0.000	0.000	4.582	1.033
1985	0.000	0.869	0.375	0.134	0.080	0.000	0.000	0.000	0.000	0.000	1.458	0.298
1986	0.000	0.606	1.826	0.523	0.123	0.025	0.000	0.000	0.000	0.000	3.104	0.754
1987	0.073	1.067	0.451	0.359	0.030	0.024	0.000	0.024	0.000	0.000	2.028	0.401
1988	0.000	4.370	0.310	0.141	0.156	0.021	0.034	0.000	0.000	0.000	5.032	0.510
1989	0.000	0.198	10.492	1.370	0.072	0.000	0.000	0.000	0.000	0.000	12.132	2.359
1990	0.000	0.539	1.847	3.117	0.194	0.000	0.000	0.000	0.000	0.000	5.696	1.305
1991	0.000	0.588	0.243	1.516	0.367	0.000	0.000	0.000	0.000	0.000	2.713	0.755
1992	0.000	0.168	0.024	0.072	0.285	0.000	0.000	0.000	0.000	0.000	0.548	0.147
1993	0.000	0.332	0.028	0.130	0.104	0.000	0.000	0.000	0.000	0.000	0.594	0.116
1994	0.000	0.732	0.448	0.107	0.129	0.066	0.025	0.000	0.000	0.000	1.507	0.308
1995	0.000	0.139	0.645	0.257	0.115	0.000	0.000	0.025	0.028	0.000	1.209	0.304
1996	0.000	0.448	0.161	0.320	0.000	0.000	0.000	0.000	0.000	0.000	0.929	0.208
1997	0.000	0.822	0.519	1.459	0.271	0.024	0.000	0.000	0.000	0.000	3.095	0.851
1998	0.023	0.890	1.620	0.124	0.049	0.000	0.023	0.000	0.000	0.000	2.728	0.655
1999	0.000	1.238	0.392	0.279	0.028	0.028	0.000	0.000	0.000	0.000	1.964	0.468
2000	0.000	0.049	1.669	0.303	0.171	0.000	0.000	0.023	0.000	0.000	2.215	0.718
2001	0.000	0.390	0.611	0.158	0.071	0.000	0.000	0.000	0.000	0.000	1.231	0.419

Table 7 cont.

Spring Survey

year	age-1	age-2	age-3	age-4	age-5	age-6	age-7	age-8	age-9	age-10	age-11	sum	kg/tow
1968	1.014	29.910	38.854	13.103	1.076	0.040	0.184	0.000	0.000	0.000	0.000	84.181	18.645
1969	2.941	18.796	29.464	14.069	1.599	0.147	0.048	0.000	0.000	0.000	0.000	67.064	14.311
1970	1.045	7.311	18.942	16.237	3.518	0.656	0.123	0.005	0.022	0.000	0.000	47.860	12.066
1971	0.447	7.616	8.124	20.765	3.713	0.371	0.004	0.000	0.000	0.004	0.000	41.043	9.552
1972	0.196	12.355	11.201	5.986	9.887	2.394	0.303	0.000	0.000	0.000	0.000	42.321	10.815
1973	0.838	5.467	14.753	8.335	6.432	7.987	0.852	0.230	0.083	0.000	0.000	44.977	12.115
1974	0.511	2.188	2.607	5.016	2.891	1.154	1.291	0.145	0.027	0.000	0.000	15.830	4.918
1975	0.358	1.171	0.406	0.665	0.709	0.531	0.156	0.197	0.000	0.000	0.000	4.193	1.307
1976	0.016	4.182	0.536	0.256	0.245	0.338	0.096	0.031	0.000	0.000	0.000	5.699	1.666
1977	1.618	1.557	2.758	0.242	0.154	0.189	0.093	0.080	0.006	0.046	0.000	6.743	1.963
1978	2.681	10.302	1.791	0.778	0.253	0.126	0.123	0.158	0.010	0.000	0.000	16.221	3.513
1979	1.002	2.967	1.601	0.255	0.124	0.018	0.018	0.014	0.000	0.000	0.012	6.009	1.318
1980	0.683	6.353	4.298	2.684	0.261	0.070	0.005	0.009	0.015	0.001	0.005	14.384	4.830
1981	0.810	18.598	4.817	2.502	0.580	0.113	0.000	0.000	0.000	0.000	0.000	27.420	6.930
1982	0.149	17.329	5.610	1.406	0.467	0.135	0.017	0.000	0.000	0.000	0.000	25.114	5.865
1983	0.016	5.329	8.803	0.598	0.191	0.000	0.000	0.000	0.000	0.000	0.000	14.938	4.097
1984	0.038	0.453	0.902	2.110	0.354	0.262	0.000	0.000	0.000	0.000	0.000	4.119	1.302
1985	0.267	1.613	0.406	0.480	0.714	0.135	0.019	0.000	0.000	0.000	0.000	3.634	0.948
1986	0.016	2.893	0.916	0.237	0.124	0.016	0.000	0.000	0.000	0.000	0.000	4.201	1.052
1987	0.000	0.086	0.701	0.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.954	0.319
1988	0.285	0.357	0.125	0.174	0.294	0.029	0.000	0.000	0.000	0.000	0.000	1.263	0.378
1989	0.162	11.211	0.537	0.113	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.022	2.090
1990	0.090	0.485	15.349	2.194	0.079	0.000	0.000	0.000	0.000	0.000	0.000	18.197	5.064
1991	0.228	0.611	2.509	4.156	0.539	0.060	0.000	0.000	0.000	0.000	0.000	8.103	2.508
1992	0.036	0.051	0.571	1.597	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.255	0.794
1993	0.016	0.253	0.112	0.441	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.894	0.341
1994	0.016	0.269	0.016	0.000	0.068	0.019	0.000	0.000	0.000	0.000	0.000	0.389	0.136
1995	0.016	1.169	0.068	0.092	0.019	0.037	0.000	0.016	0.016	0.000	0.000	1.433	0.329
1996	0.000	0.398	1.303	0.566	0.072	0.000	0.000	0.000	0.000	0.000	0.000	2.339	0.747
1997	0.053	0.885	1.144	0.327	0.067	0.000	0.000	0.000	0.000	0.000	0.000	2.475	0.789
1998	0.068	3.016	0.386	0.161	0.036	0.021	0.000	0.000	0.000	0.000	0.000	3.688	0.848
1999	0.036	0.651	1.930	0.349	0.074	0.000	0.023	0.000	0.000	0.000	0.000	3.062	1.138
2000	0.019	1.245	1.006	0.559	0.043	0.000	0.000	0.000	0.000	0.000	0.000	2.873	0.990
2001	0.000	0.069	1.158	0.240	0.082	0.023	0.000	0.000	0.000	0.000	0.000	1.572	0.657
2002	0.049	1.191	0.235	0.200	0.067	0.000	0.000	0.000	0.000	0.000	0.000	1.742	0.510

Table 7 continued.

Winter Survey

year	age-1	age-2	age-3	age-4	age-5	age-6	age-7	age-8	sum	kg/tow
1992	0.011	1.619	3.477	8.063	0.959	0.000	0.000	0.000	14.129	5.264
1993	0.596	1.924	1.057	2.487	0.292	0.000	0.000	0.000	6.357	2.118
1994	0.366	8.654	0.742	1.654	0.966	0.353	0.118	0.000	12.854	3.924
1995	0.090	10.681	2.698	0.597	0.253	0.185	0.016	0.000	14.519	3.464
1996	0.041	1.285	8.235	0.851	0.140	0.065	0.015	0.015	10.648	3.346
1997	0.156	2.380	9.785	2.958	0.529	0.000	0.038	0.000	15.846	5.720
1998	0.118	7.841	1.596	1.158	0.112	0.000	0.018	0.000	10.843	2.780
1999	0.243	2.909	10.176	0.777	0.311	0.056	0.023	0.000	14.494	5.226
2000	0.109	4.917	3.006	1.160	0.073	0.100	0.000	0.000	9.364	3.025
2001	0.028	0.895	8.542	1.615	0.254	0.096	0.046	0.000	11.475	4.786
2002	0.012	2.735	2.578	2.047	0.100	0.020	0.000	0.000	7.492	2.589

Scallop Survey

year	all	age-1
1982	3.123	0.362
1983	0.858	0.255
1984	0.309	0.180
1985	0.577	0.465
1986	0.199	0.015
1987	0.150	0.054
1988	7.482	7.359
1989	3.774	0.579
1990	0.370	0.158
1991	0.230	0.151
1992	0.169	0.108
1993	0.192	0.170
1994	0.732	0.573
1995	0.507	0.072
1996	38.479	0.120
1997	0.886	0.736
1998	0.567	0.253
1999	0.456	0.357
2000	0.432	0.082
2001	0.106	0.063
2002	0.152	0.020

Table 8. Correlation among abundance indices by age.

Age 1	Fall	Spring	Winter	Scallop
Fall	1.00			
Spring	0.45	1.00		
Winter	0.25	0.00	1.00	
Scallop	0.49	0.40	0.47	1.00

Age 2	Fall	Spring	Winter
Fall	1.00		
Spring	0.82	1.00	
Winter	0.45	0.65	1.00

Age 3	Fall	Spring	Winter
Fall	1.00		
Spring	0.71	1.00	
Winter	0.45	0.86	1.00

Age 4	Fall	Spring	Winter
Fall	1.00		
Spring	0.74	1.00	
Winter	0.46	0.57	1.00

Age 5	Fall	Spring	Winter
Fall	1.00		
Spring	0.36	1.00	
Winter	-0.46	0.54	1.00

Age 6	Fall	Spring	Winter
Fall	1.00		
Spring	0.57	1.00	
Winter	-0.49	-0.55	1.00

Age 7+	Fall	Spring	Winter
Fall	1.00		
Spring	-0.18	1.00	
Winter	-0.07	-0.31	1.00

Table 9. Yield and spawning biomass per recruit of southern New England – Mid Atlantic yellowtail flounder.

```
  The NEFC Yield and Stock Size per Recruit Program - PDBYPRC
   PC Ver.1.2 [Method of Thompson and Bell (1934)] 1-Jan-1992
            ---------------------------------------
            Run Date: 17- 9-2002;  Time: 09:41:39.27
SNE-MA YELLOWTAIL FLOUNDER - 1994-2001 INPUT
```

Proportion of F before spawning: .4167
Proportion of M before spawning: .4167
Natural Mortality is Constant at: .200
Initial age is: 1; Last age is: 8
Last age is a PLUS group;
Original age-specific PRs, Mats, and Mean Wts from file:
==> snemayt.dat

Age-specific Input data for Yield per Recruit Analysis

Age	Fish Mort Pattern	Nat Mort Pattern	Proportion Mature	Average Weights Catch	Stock
1	.0100	1.0000	.1300	.131	.131
2	.1700	1.0000	.7400	.310	.310
3	.6400	1.0000	.9800	.418	.418
4	1.0000	1.0000	1.0000	.525	.525
5	1.0000	1.0000	1.0000	.671	.671
6	1.0000	1.0000	1.0000	.869	.869
7	1.0000	1.0000	1.0000	.940	.940
8+	1.0000	1.0000	1.0000	1.026	1.026

Summary of Yield per Recruit Analysis for:
SNE-MA YELLOWTAIL FLOUNDER - 1994-2001 INPUT

```
 Slope of the Yield/Recruit Curve at F=0.00: -->    2.5485
   F level at slope=1/10 of the above slope (F0.1): ----->    .246
     Yield/Recruit corresponding to F0.1: ----->     .2265
   F level to produce Maximum Yield/Recruit (Fmax): ----->    .739
     Yield/Recruit corresponding to Fmax: ----->     .2581
   F level at 40 % of Max Spawning Potential (F40): ----->    .261
     SSB/Recruit corresponding to F40: -------->    1.1288
```

Table 9 continued.

Listing of Yield per Recruit Results for:
SNE-MA YELLOWTAIL FLOUNDER - 1994-2001 INPUT

	FMORT	TOTCTHN	TOTCTHW	TOTSTKN	TOTSTKW	SPNSTKN	SPNSTKW	% MSP
	.000	.00000	.00000	5.5167	3.2532	4.0669	2.8223	100.00
	.100	.21897	.15373	4.4270	2.2137	2.9720	1.8000	63.78
	.200	.33004	.21222	3.8766	1.7151	2.4167	1.3144	46.57
F0.1	.246	.36506	.22653	3.7037	1.5648	2.2416	1.1691	41.42
F40%	.261	.37497	.23015	3.6548	1.5231	2.1921	1.1288	40.00
	.300	.39788	.23774	3.5420	1.4281	2.0776	1.0374	36.76
	.400	.44405	.24951	3.3154	1.2441	1.8470	.8612	30.51
	.500	.47780	.25494	3.1508	1.1173	1.6786	.7405	26.24
	.600	.50373	.25727	3.0249	1.0251	1.5492	.6531	23.14
	.700	.52444	.25804	2.9249	.9552	1.4461	.5872	20.80
Fmax	.739	.53153	.25809	2.8908	.9321	1.4108	.5654	20.03
	.800	.54146	.25801	2.8432	.9005	1.3615	.5357	18.98
	.900	.55578	.25759	2.7747	.8565	1.2904	.4943	17.51
	1.000	.56805	.25698	2.7164	.8203	1.2297	.4603	16.31
	1.100	.57874	.25630	2.6658	.7899	1.1769	.4318	15.30
	1.200	.58817	.25559	2.6214	.7640	1.1304	.4075	14.44
	1.300	.59657	.25490	2.5819	.7416	1.0891	.3865	13.69
	1.400	.60414	.25424	2.5465	.7219	1.0521	.3682	13.04
	1.500	.61100	.25361	2.5145	.7046	1.0185	.3519	12.47
	1.600	.61728	.25301	2.4854	.6891	.9880	.3374	11.96
	1.700	.62305	.25245	2.4586	.6752	.9600	.3244	11.49
	1.800	.62838	.25191	2.4340	.6625	.9342	.3126	11.08
	1.900	.63334	.25140	2.4112	.6510	.9103	.3018	10.69
	2.000	.63796	.25091	2.3899	.6404	.8880	.2920	10.34

Figure 1. Statistical areas for southern New England – Mid Atlantic yellowtail flounder.

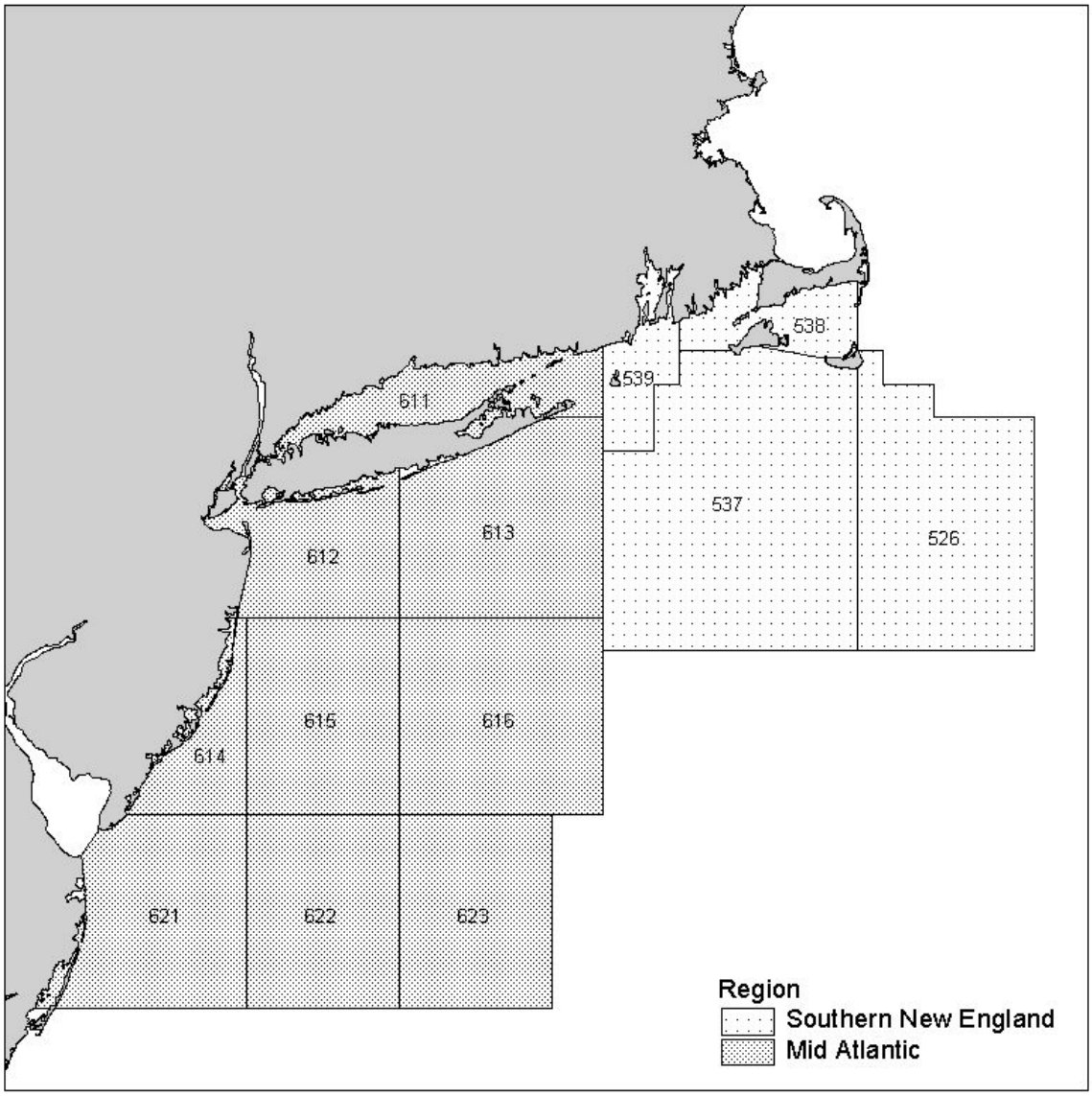


Figure 2. Catch of southern New England- Mid Atlantic yellowtail flounder.

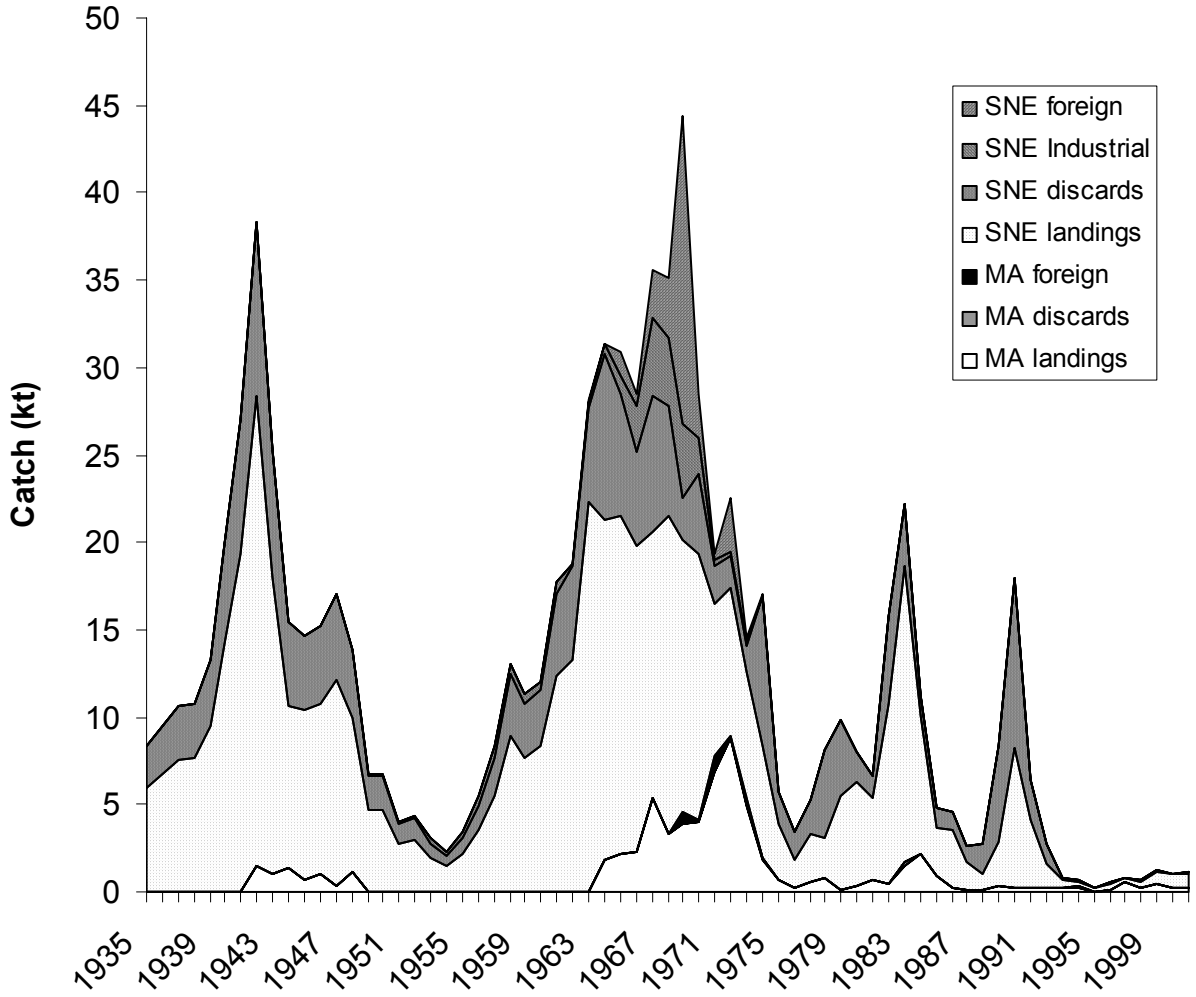


Figure 3. Total catch at age of southern New England – Mid Atlantic yellowtail flounder (size of circle indicates relative magnitude).

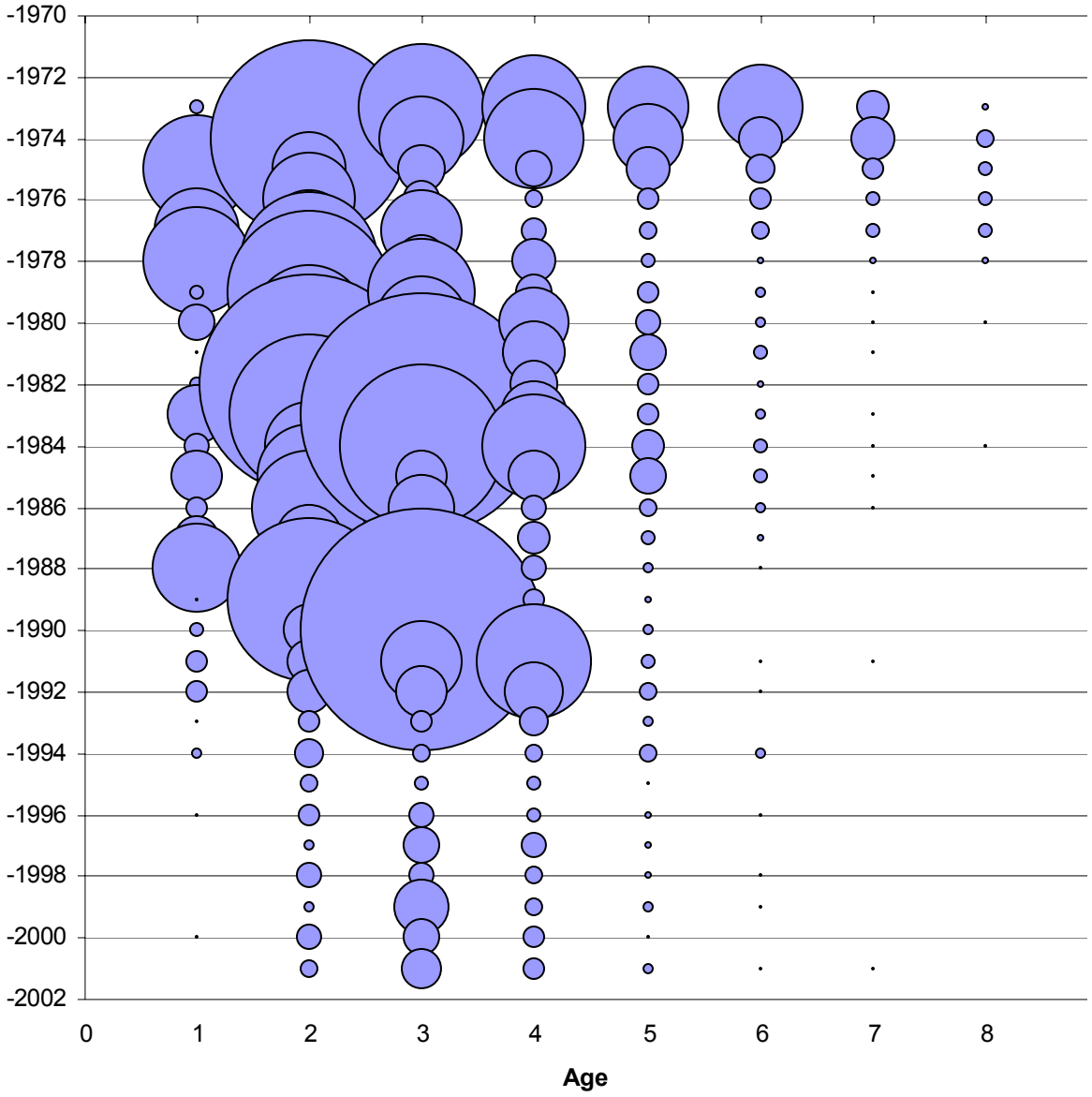


Figure 4. Mean weight at age of yellowtail flounder in the catch.

Figure 5. Survey strata for southern New England – Mid Atlantic yellowtail flounder.

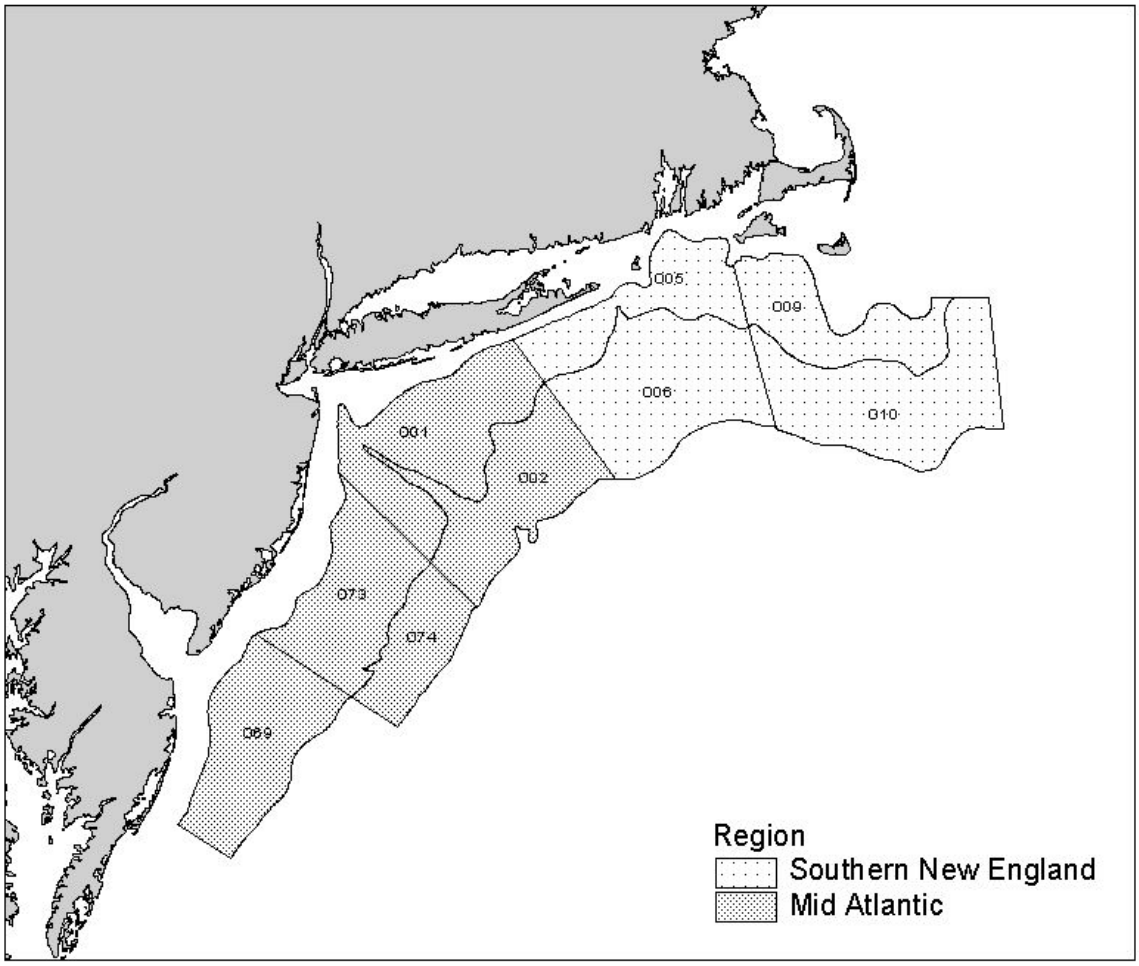


Figure 6. Survey indices of southern New England – Mid Atlantic yellowtail flounder biomass.

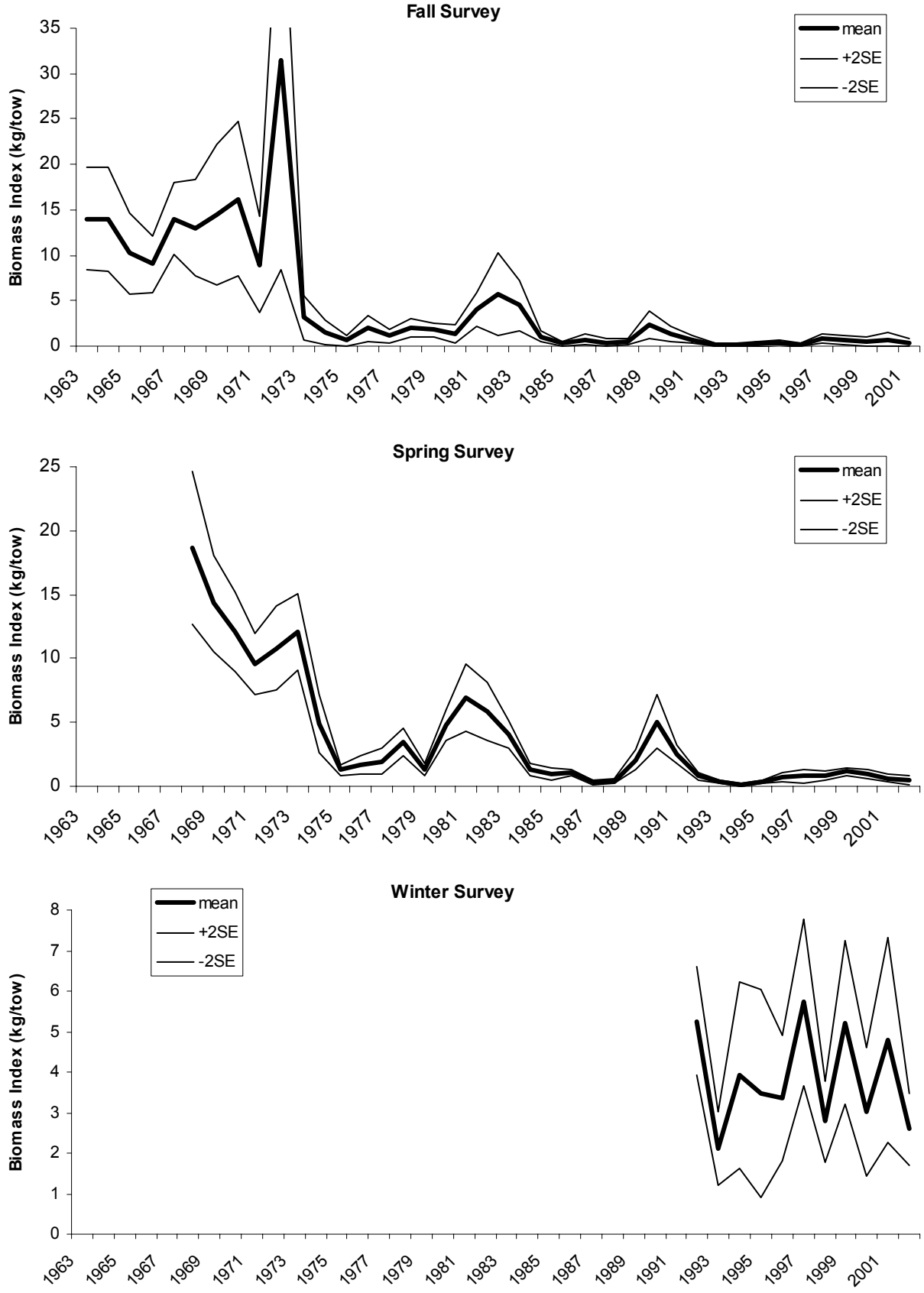


Figure 7a. Distribution of yellowtail flounder in recent NEFSC surveys.

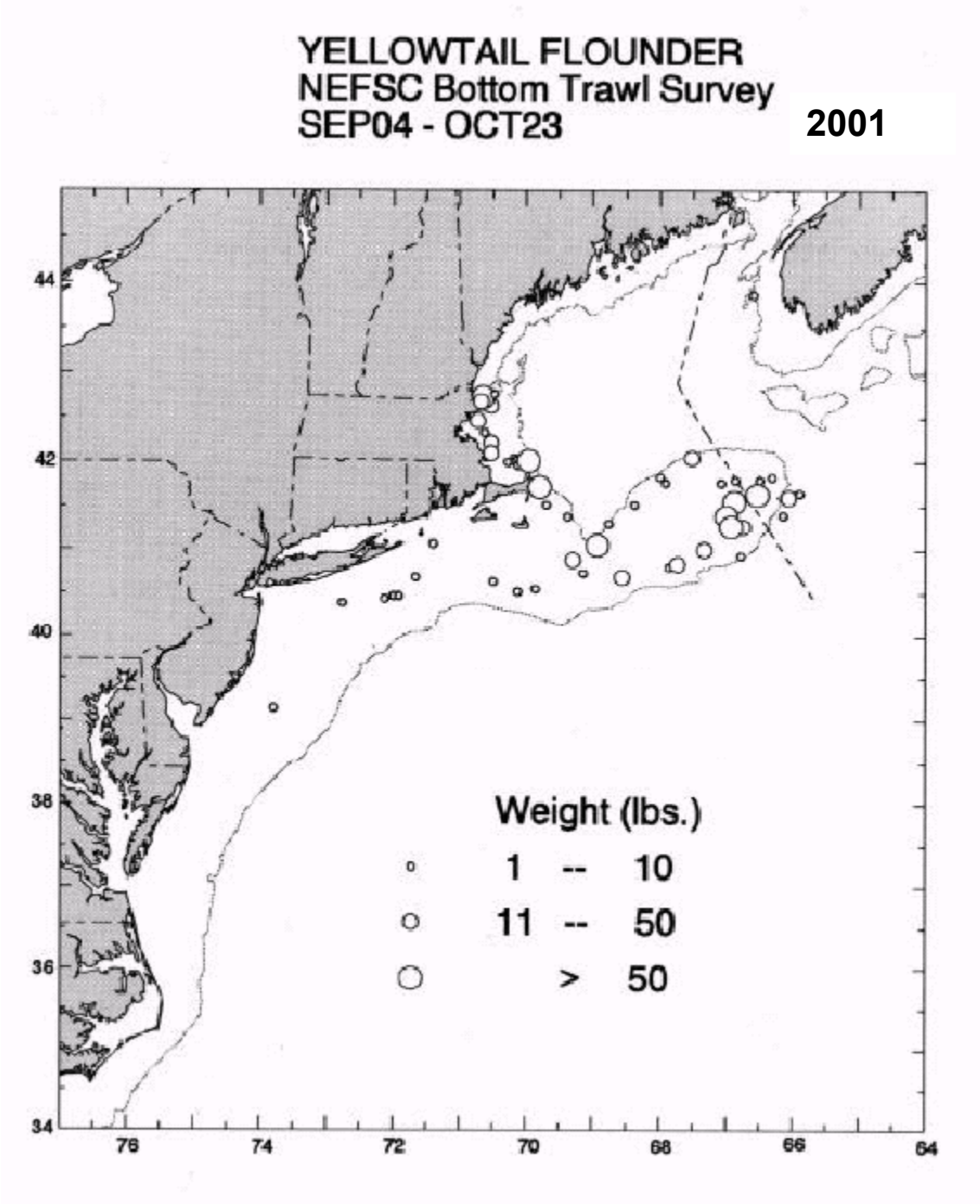


Figure 7b.

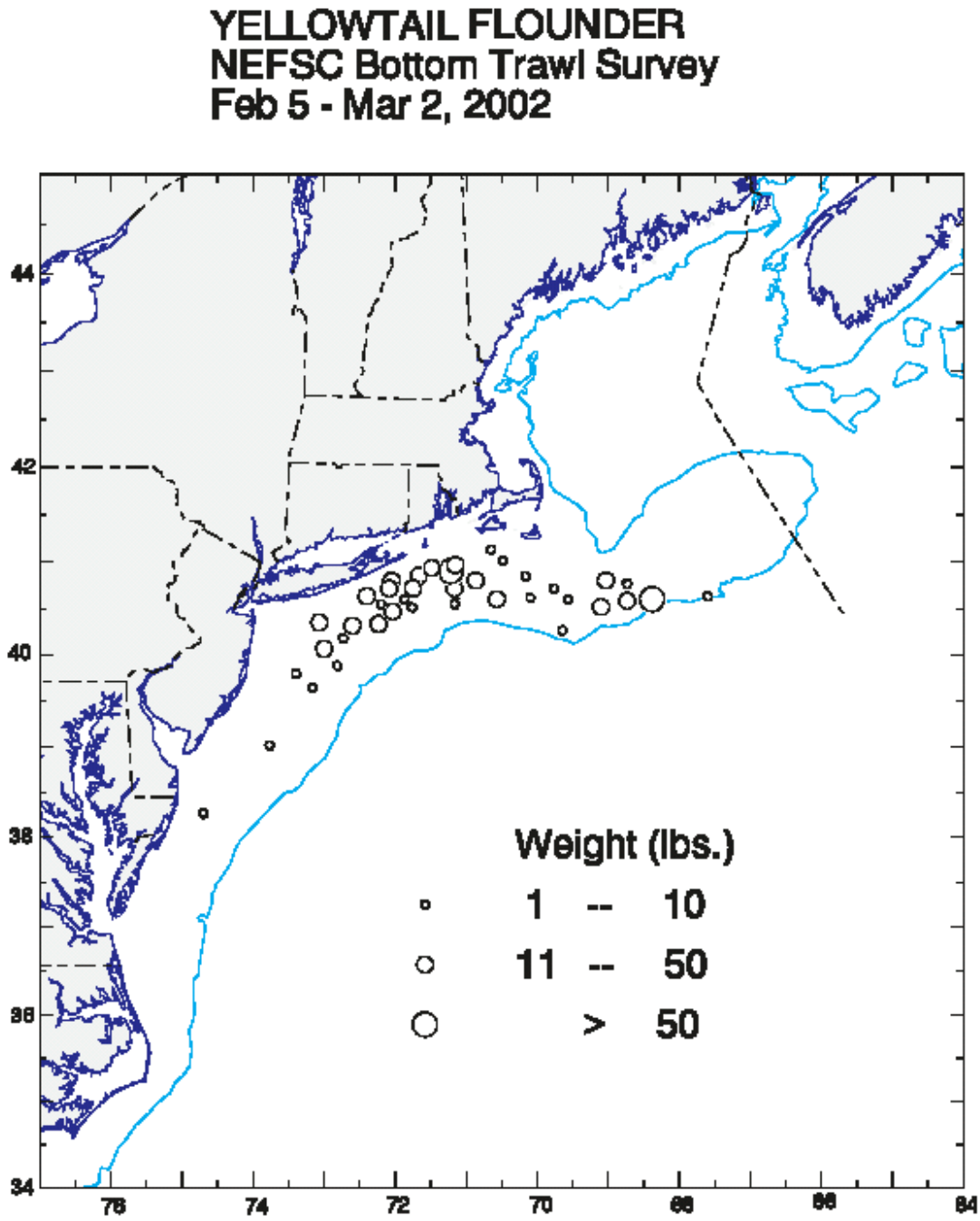

YELLOWTAIL FLOUNDER
NEFSC Bottom Trawl Survey
Feb 5 - Mar 2, 2002
Weight (lbs.)
1 -- 10
11 -- 50
> 50
44
42
40
38
36
34
76
74
72
70
68
66
64

Figure 7c.

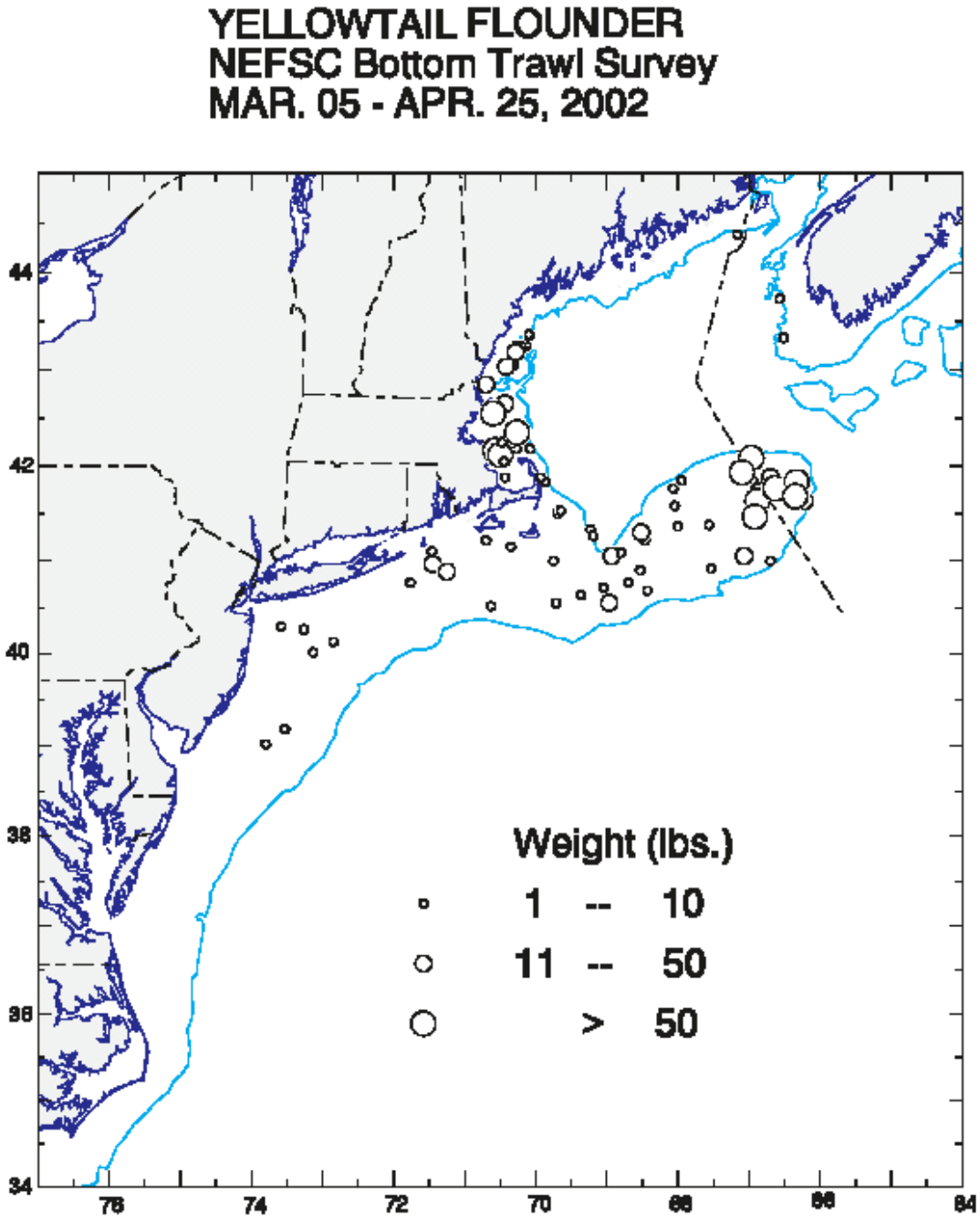

YELLOWTAIL FLOUNDER
NEFSC Bottom Trawl Survey
MAR. 05 - APR. 25, 2002
Weight (lbs.)
1 -- 10
11 -- 50
> 50
44
42
40
38
36
34
76
74
72
70
68
66
64

Figure 8. Area-swept biomass of southern New England – Mid Atlantic yellowtail flounder, by geographic region.

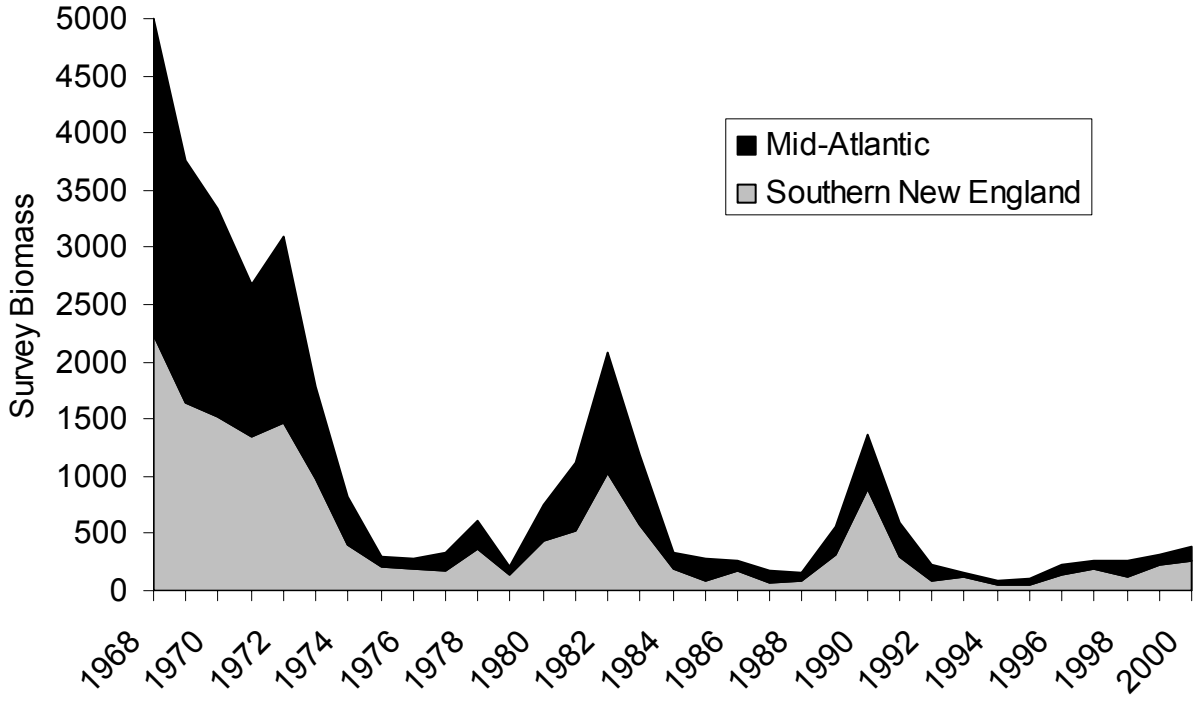


Figure 9a. Age distribution of southern New England – Mid Atlantic yellowtail flounder from NEFSC surveys (circle size indicates relative abundance).

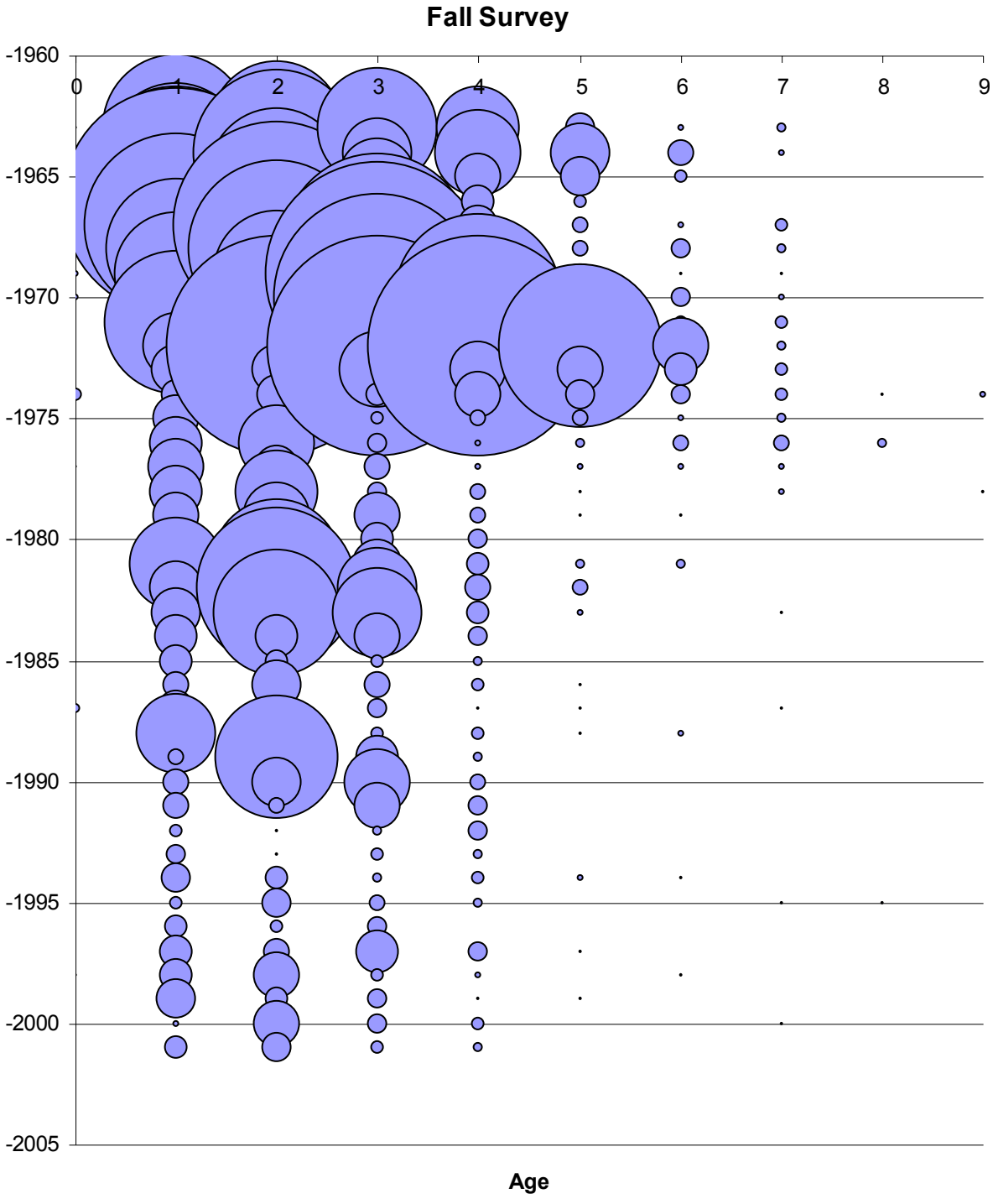


Figure 9b.

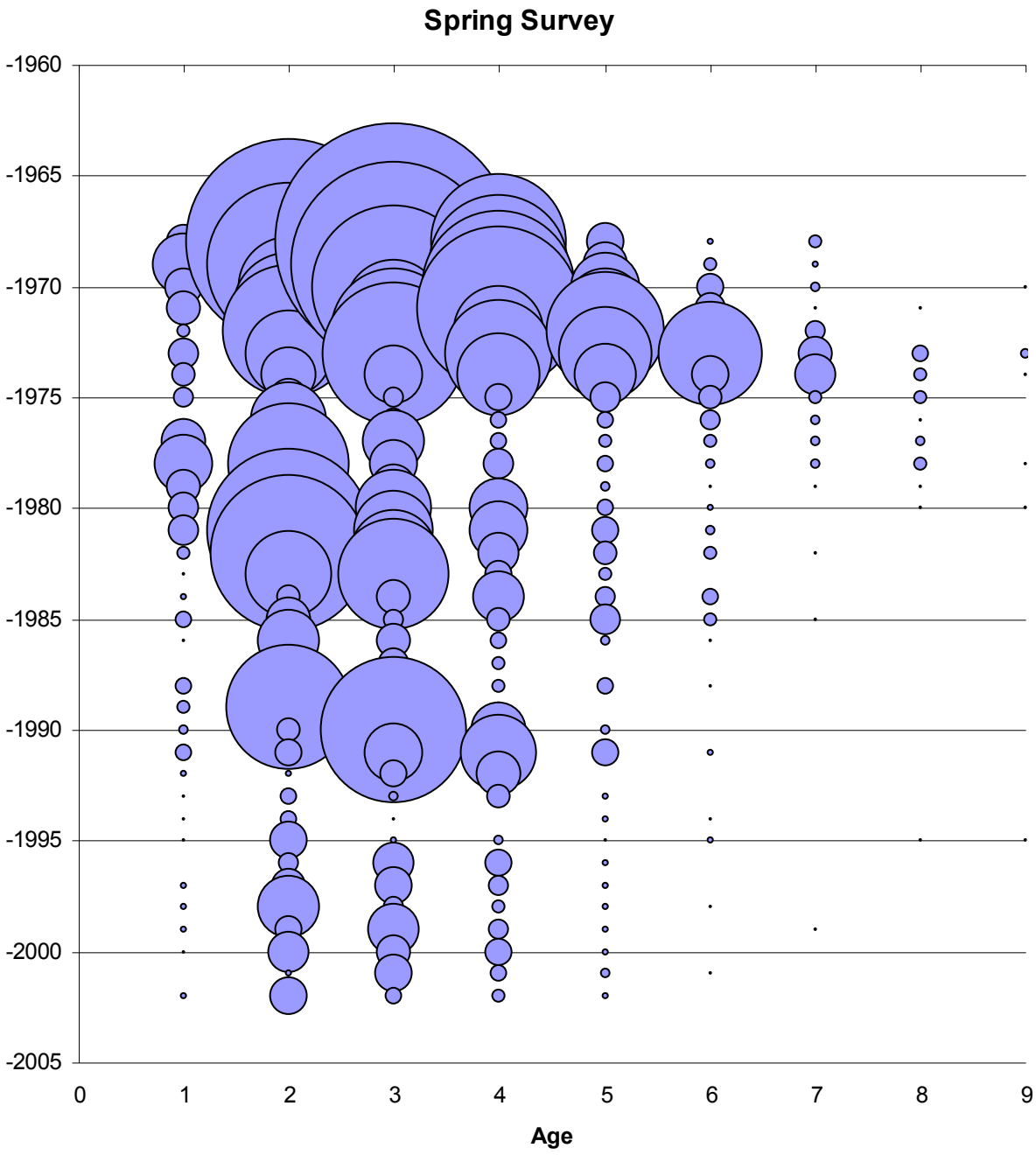

Spring Survey
-1960
-1965
-1970
-1975
-1980
-1985
-1990
-1995
-2000
-2005
0
1
2
3
4
5
6
7
8
9
Age

Figure 9c.

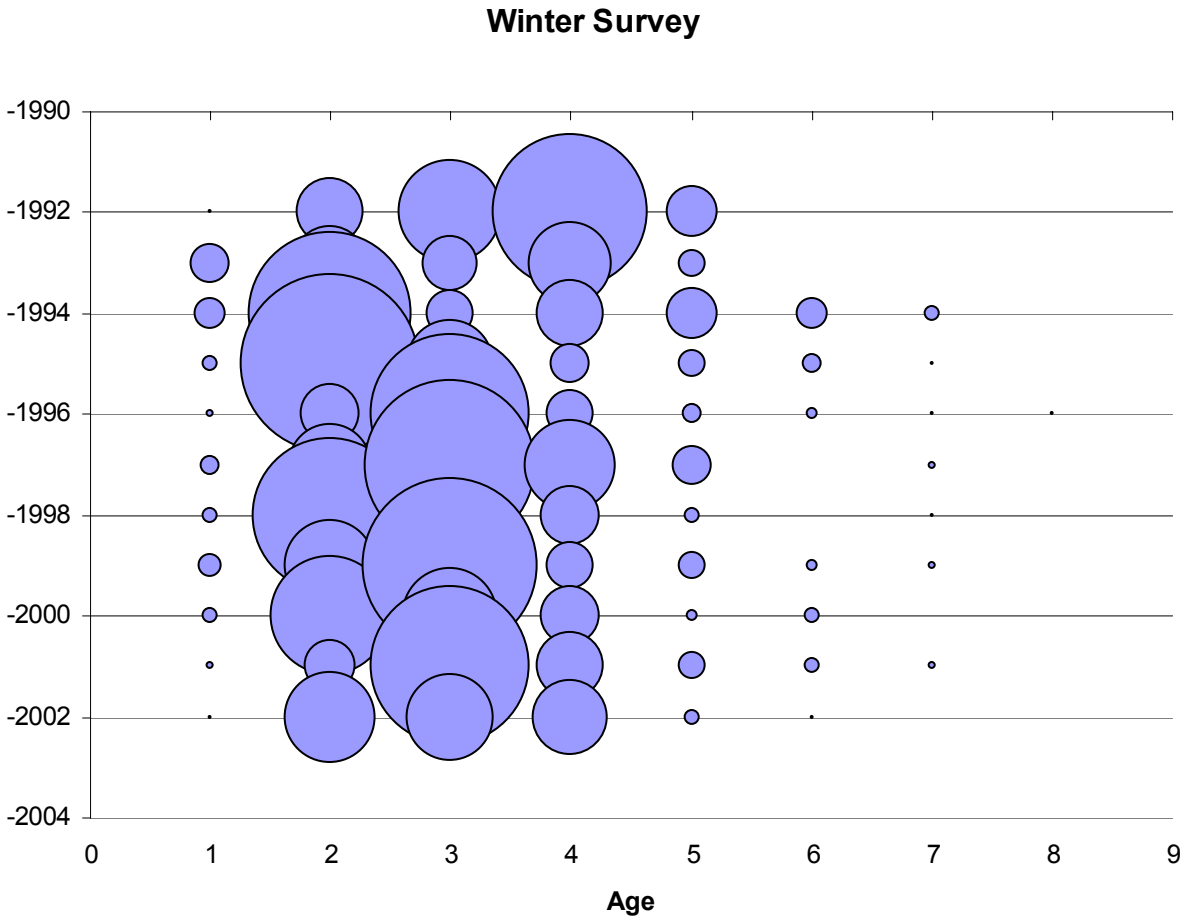

Winter Survey
-1990
-1992
-1994
-1996
-1998
-2000
-2002
-2004
0
1
2
3
4
5
6
7
8
9
Age

Figure 10a. Normalized indices of abundance of southern New England – Mid Atlantic yellowtail flounder, by age.

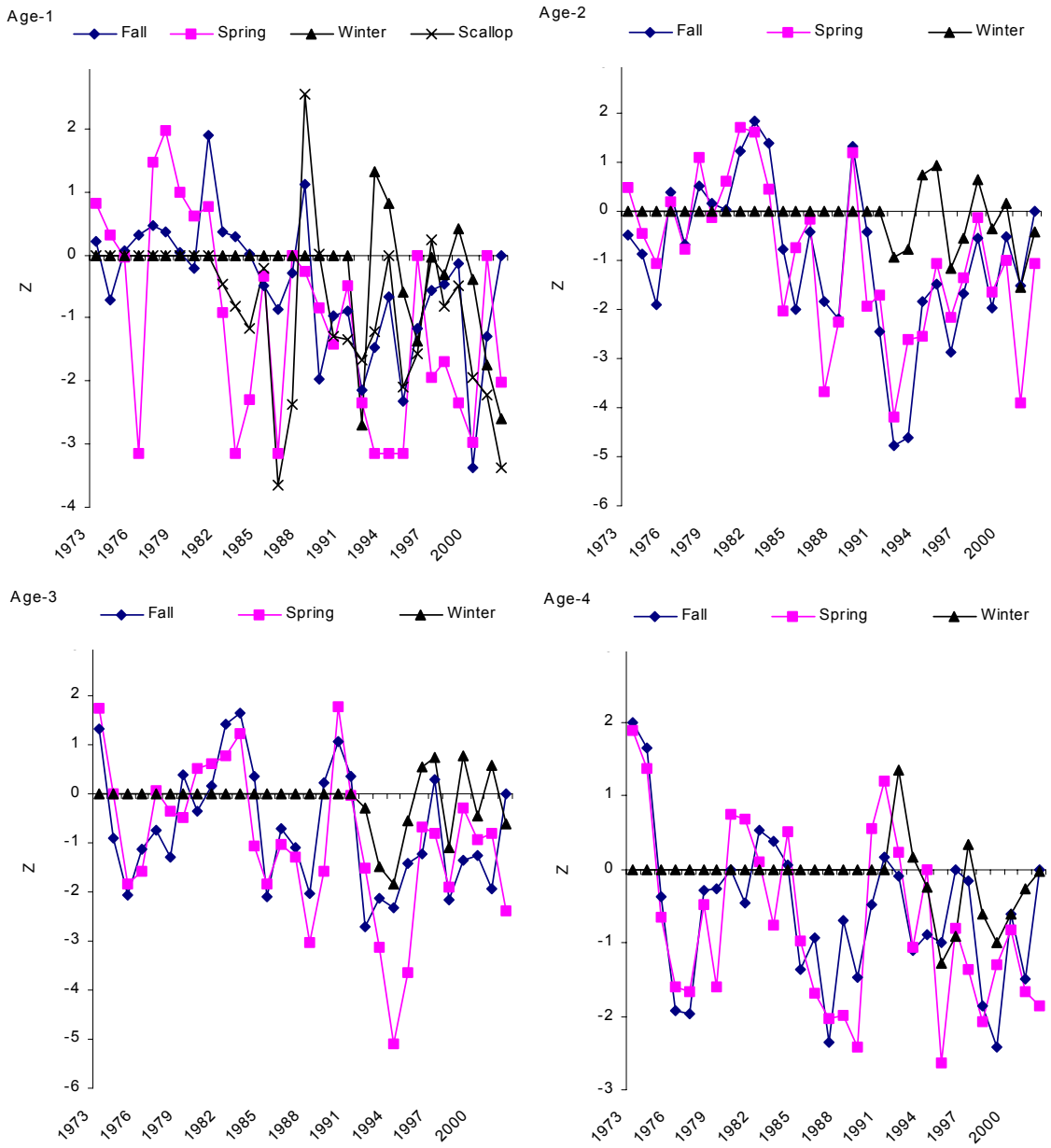


Figure 10b.

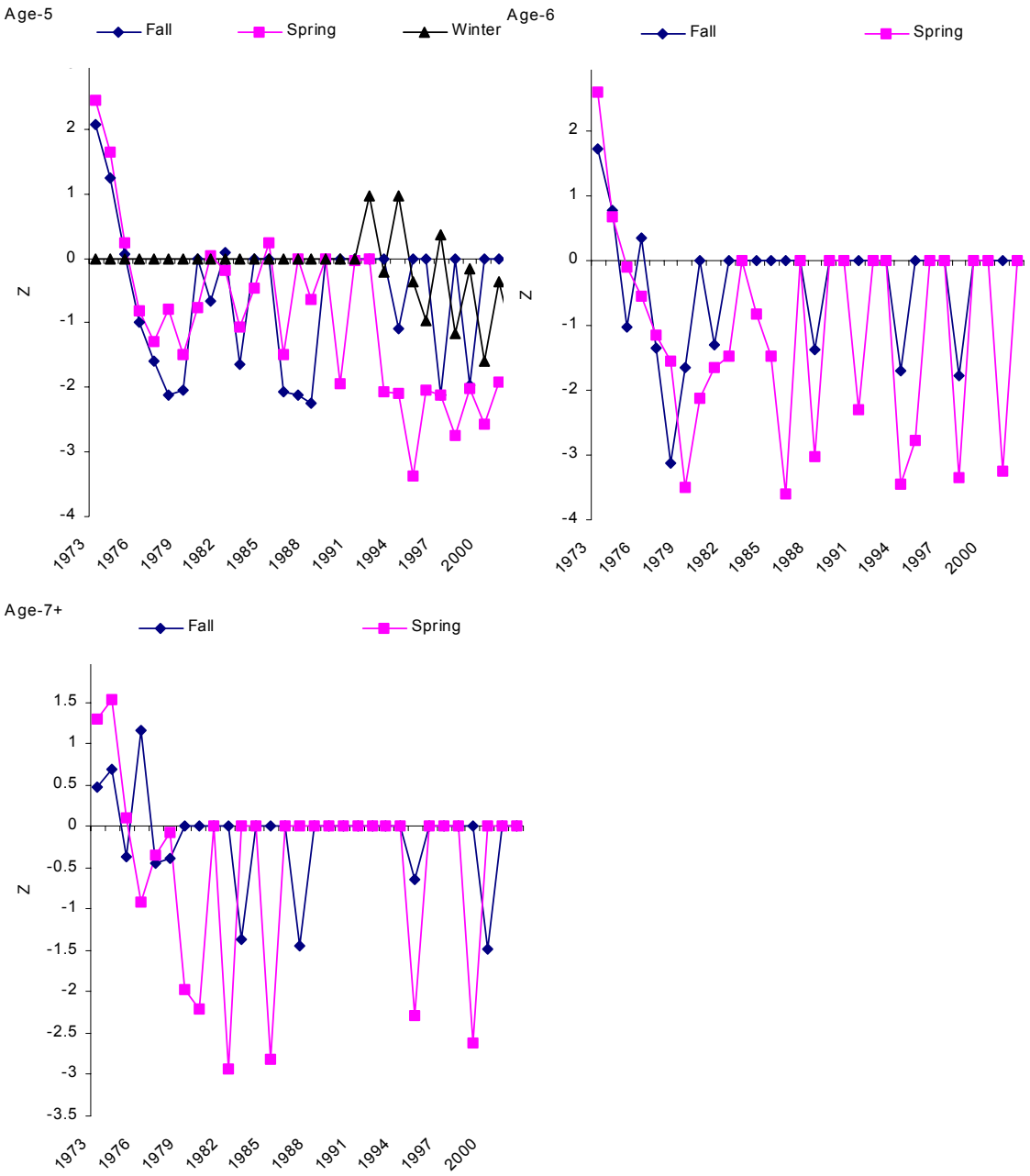

Age-5
Fall
Spring
Winter
Z
Age-6
Fall
Spring
Z
Age-7+
Fall
Spring
Z

Figure 11a. Calibration residuals from southern New England – Mid Atlantic yellowtail flounder ADAPT analysis.

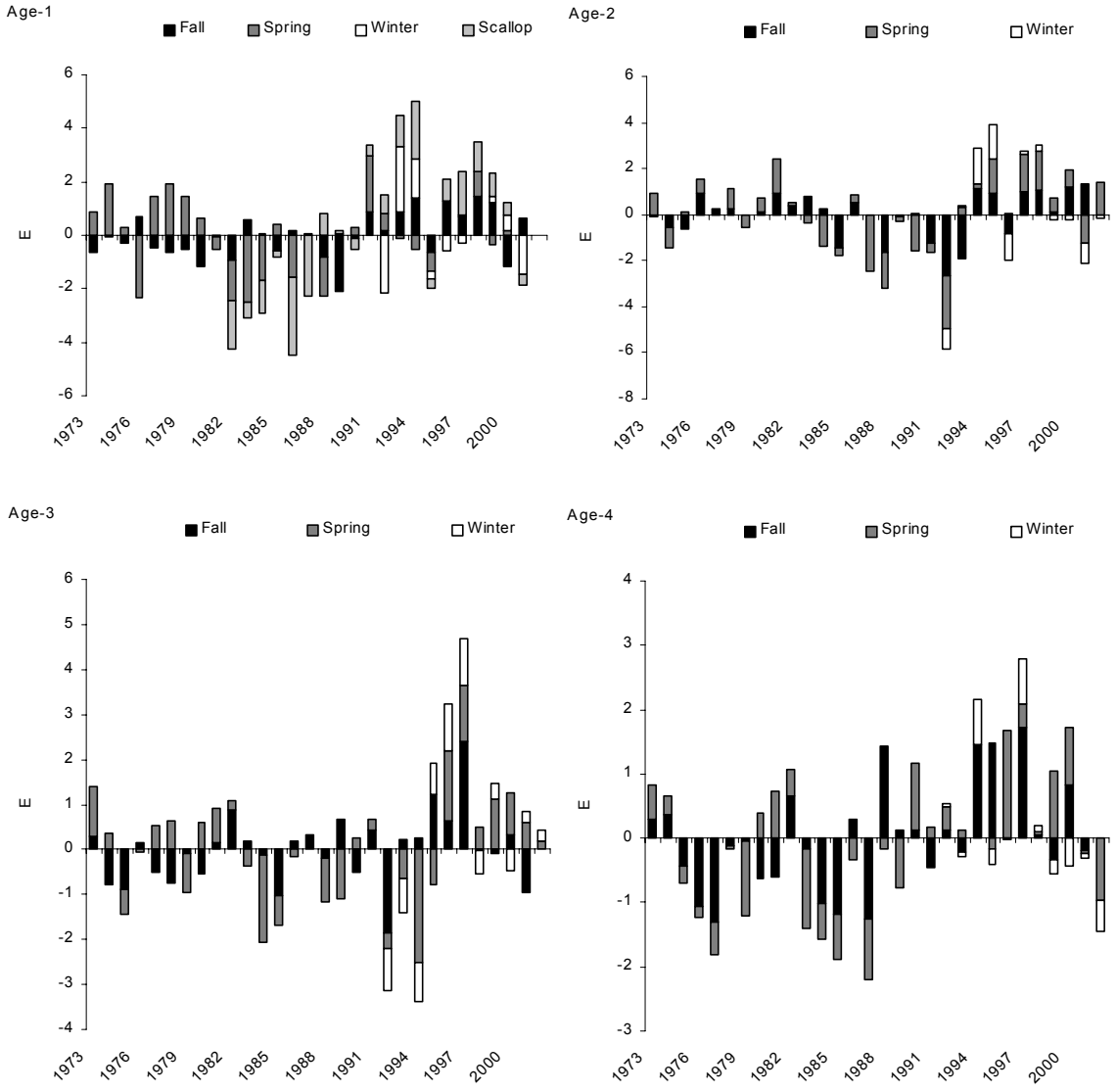


Figure 11b.

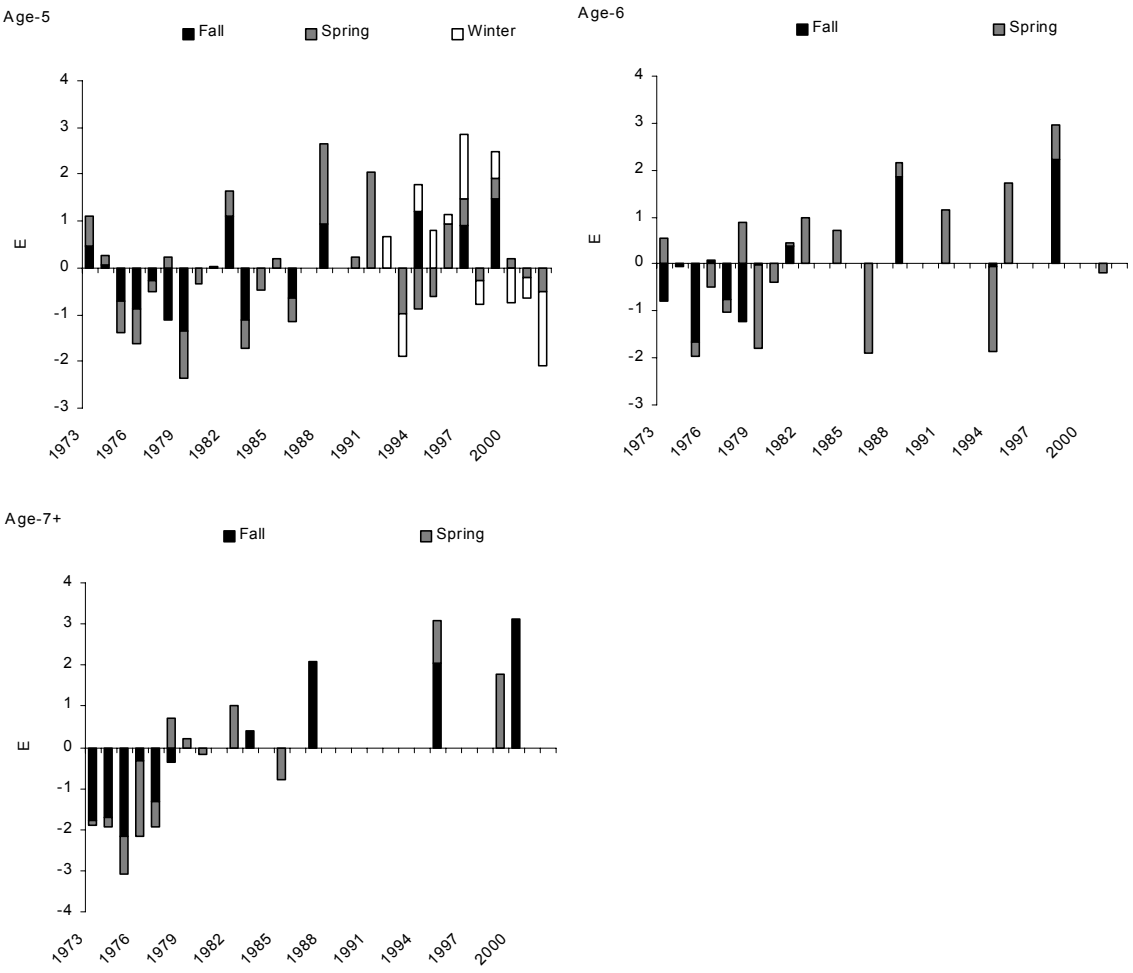

Age-5
Fall
Spring
Winter
E
Age-6
Fall
Spring
E
Age-7+
Fall
Spring
E

Figure 12a. VPA results for southern New England – Mid Atlantic yellowtail flounder.

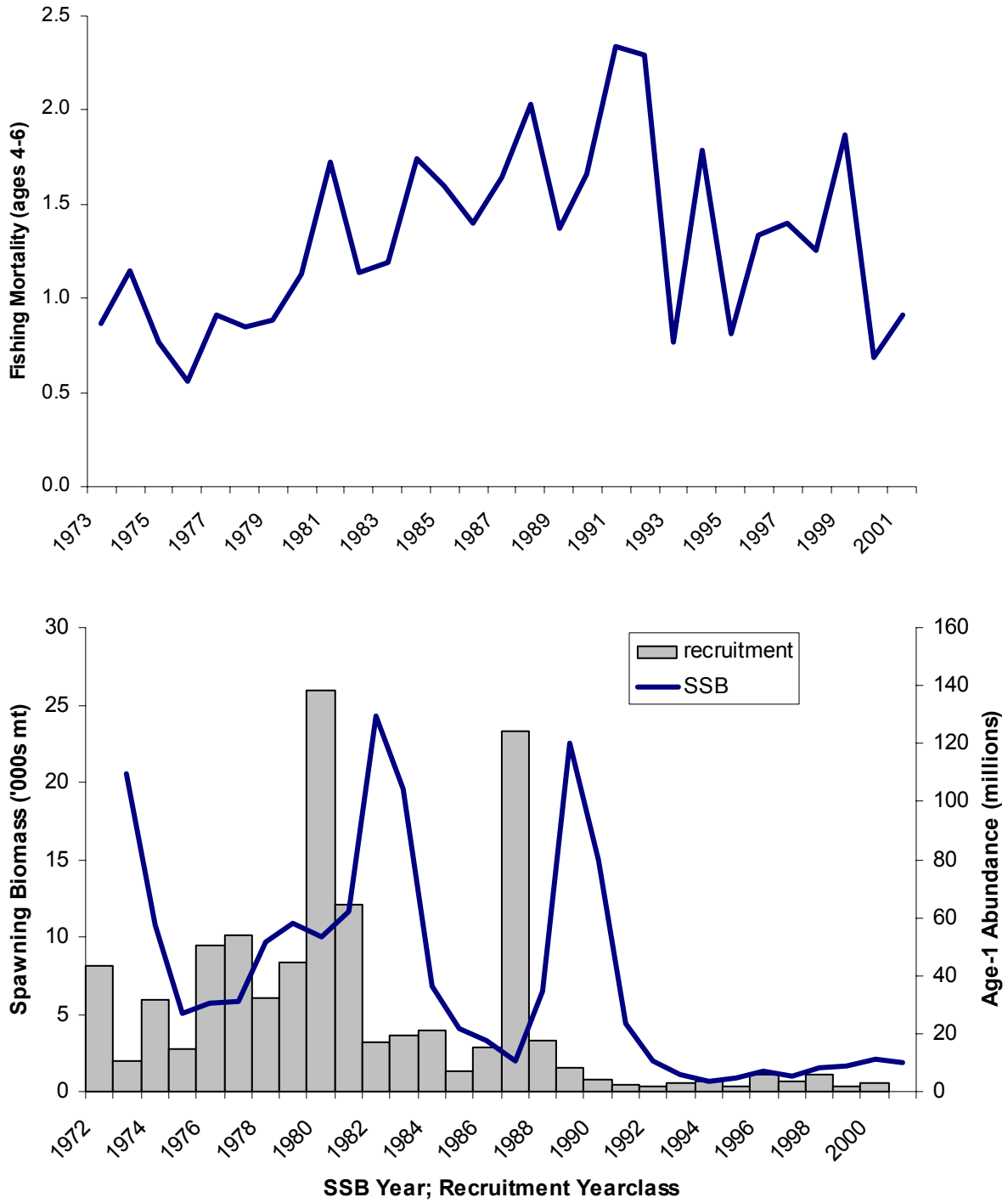


Figure 12b. Spawning stock and recruitment of southern New England – Mid Atlantic yellowtail flounder (points labeled by yearclass).

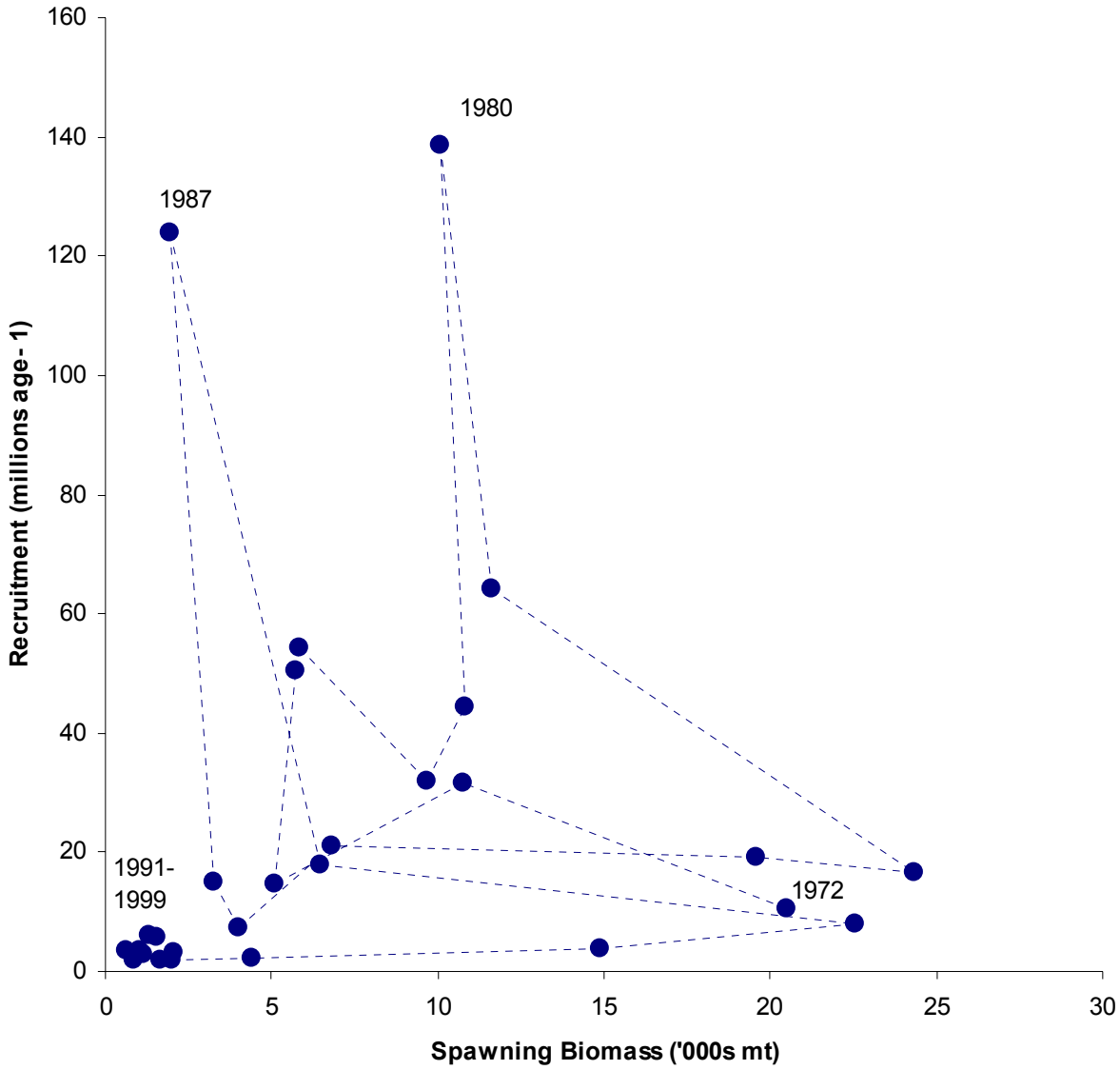


Figure 12c. Abundance at age of southern New England – Mid Atlantic yellowtail flounder.

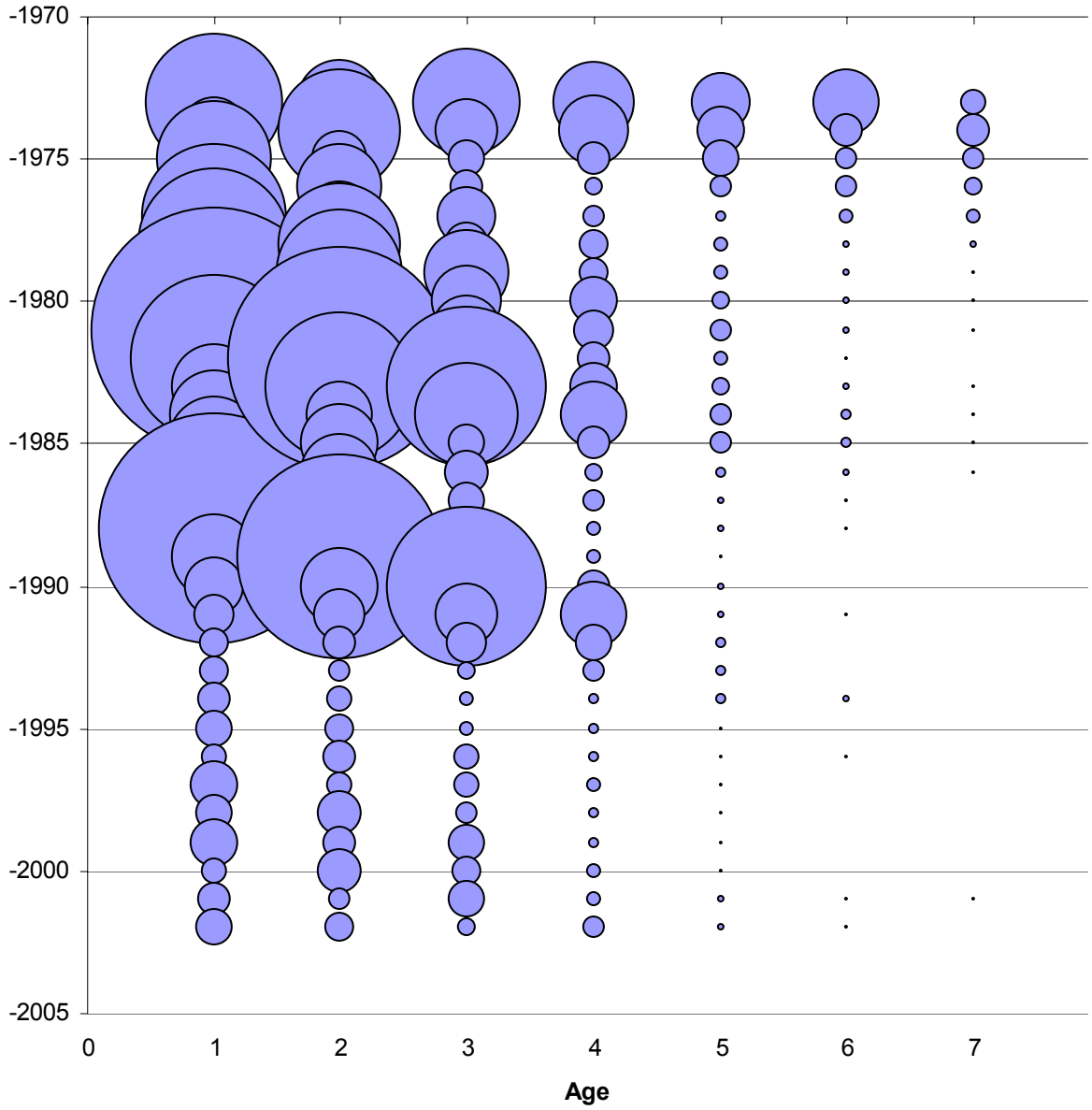


Figure 13. Retrospective analysis of the southern New England – Mid Atlantic yellowtail flounder VPA.

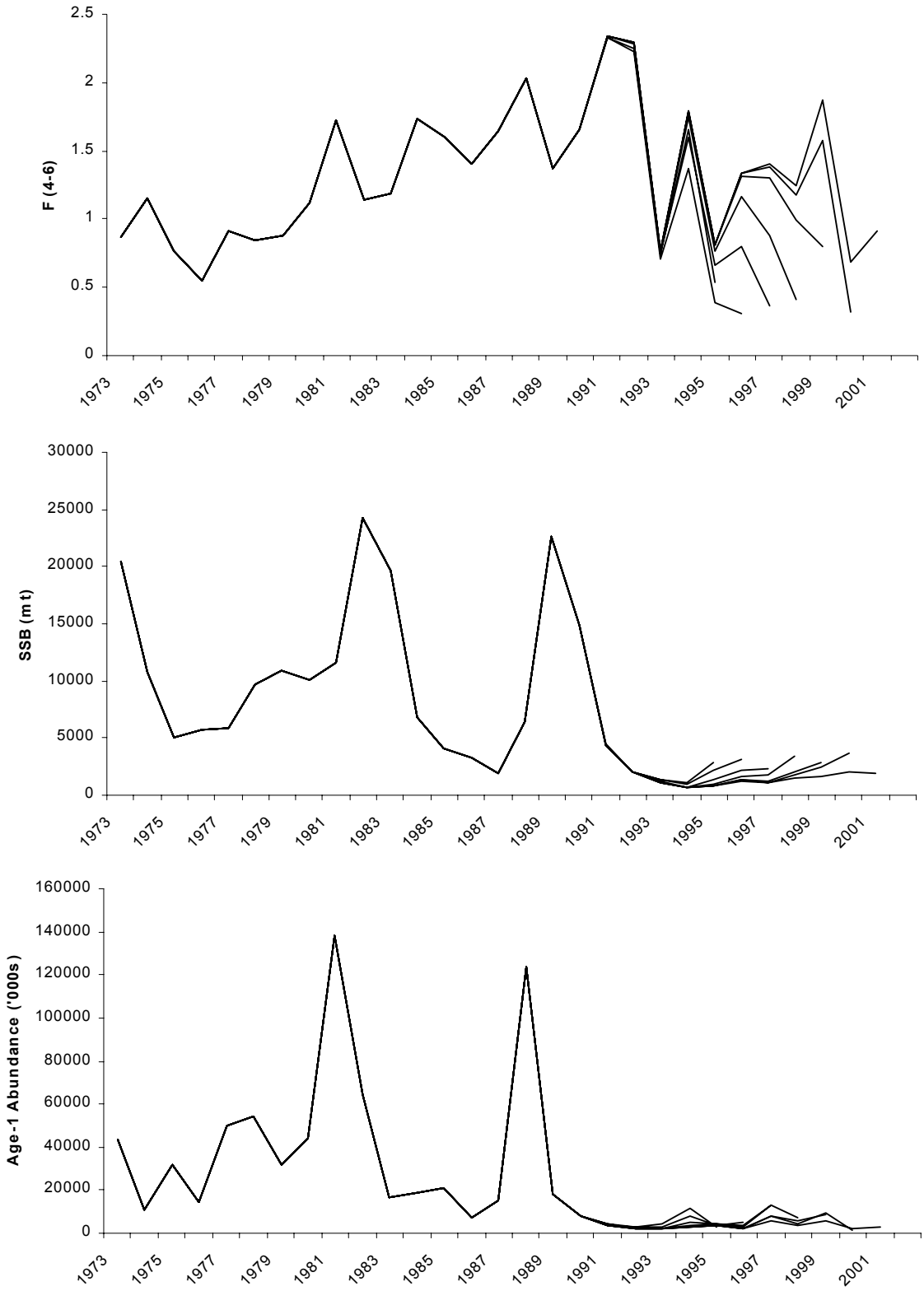


Figure 14. Results from biomass dynamics model (ASPIC) of southern New England – Mid Atlantic yellowtail flounder, with age-based estimates (ADAPT) for comparison.

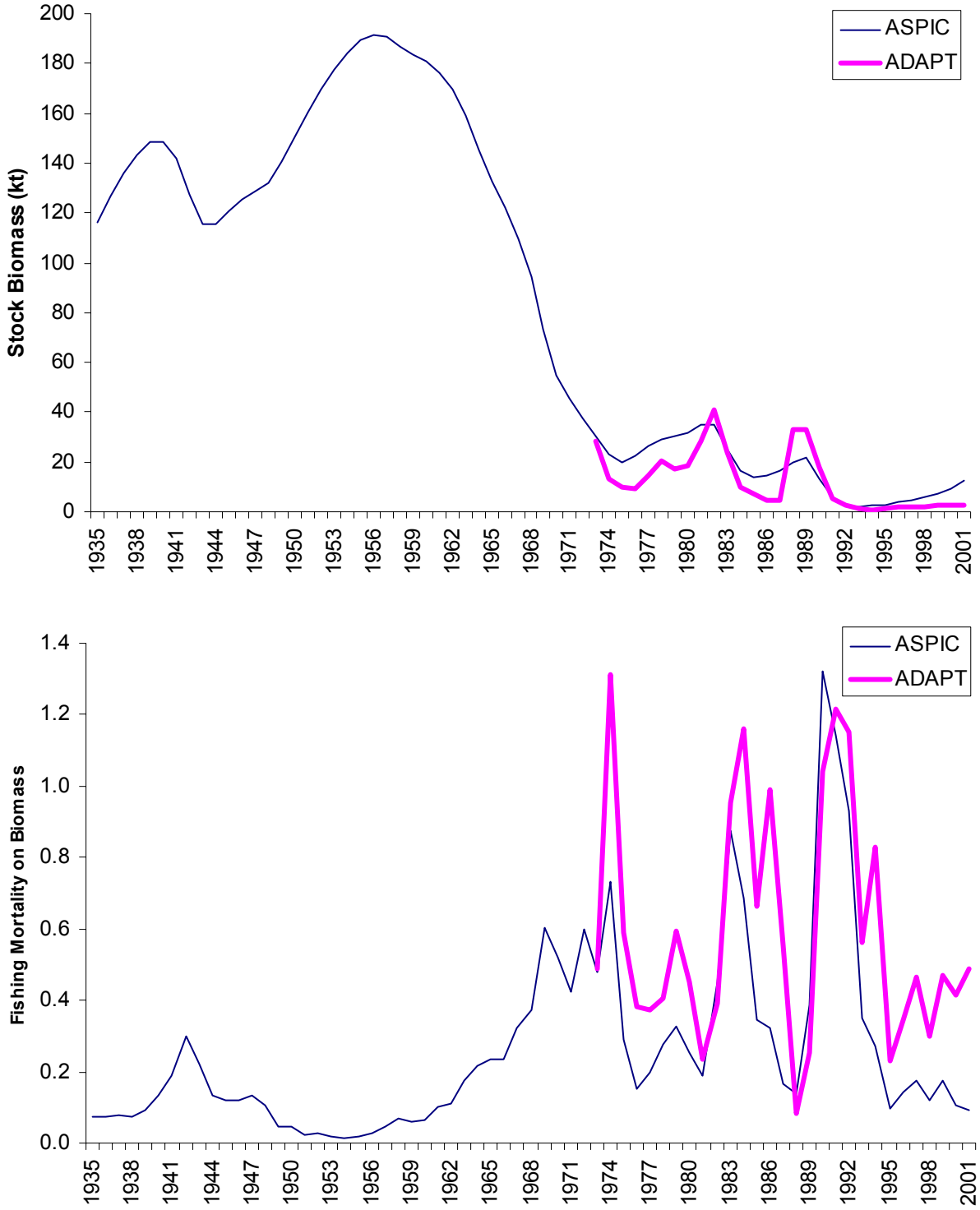


Figure 15. Yield and biomass per recruit of southern New England – Mid Atlantic yellowtail flounder.

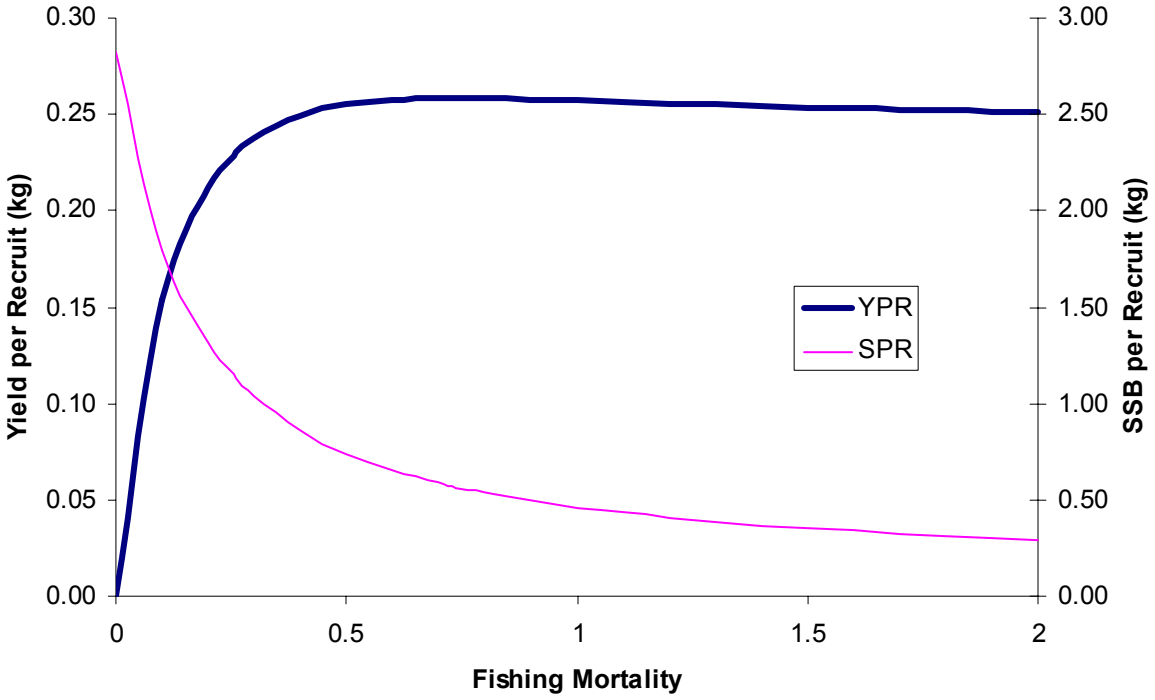


Figure 16. Observed and expected age distribution of spawning biomass at F40% for southern New England-Mid Atlantic yellowtail flounder.

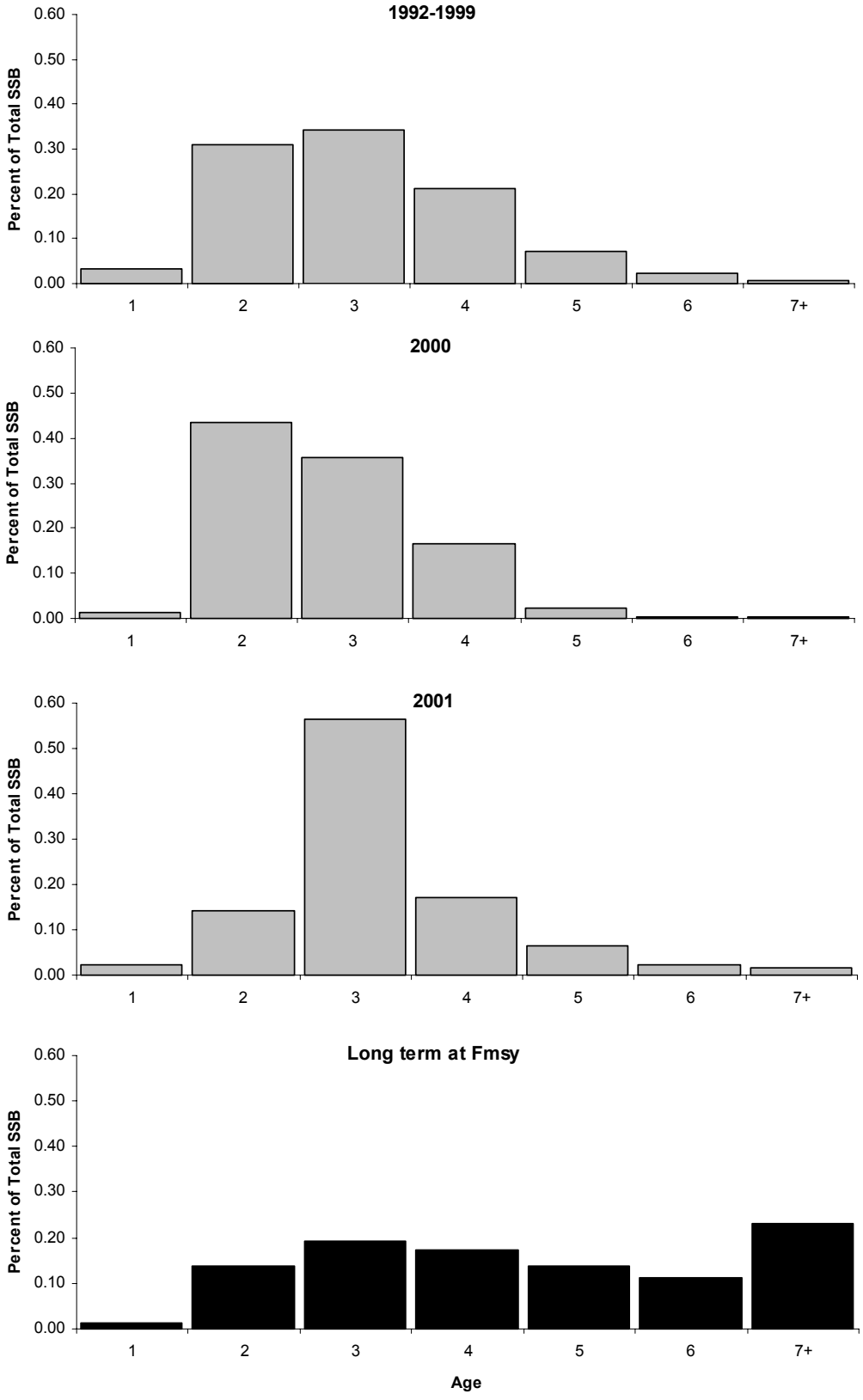
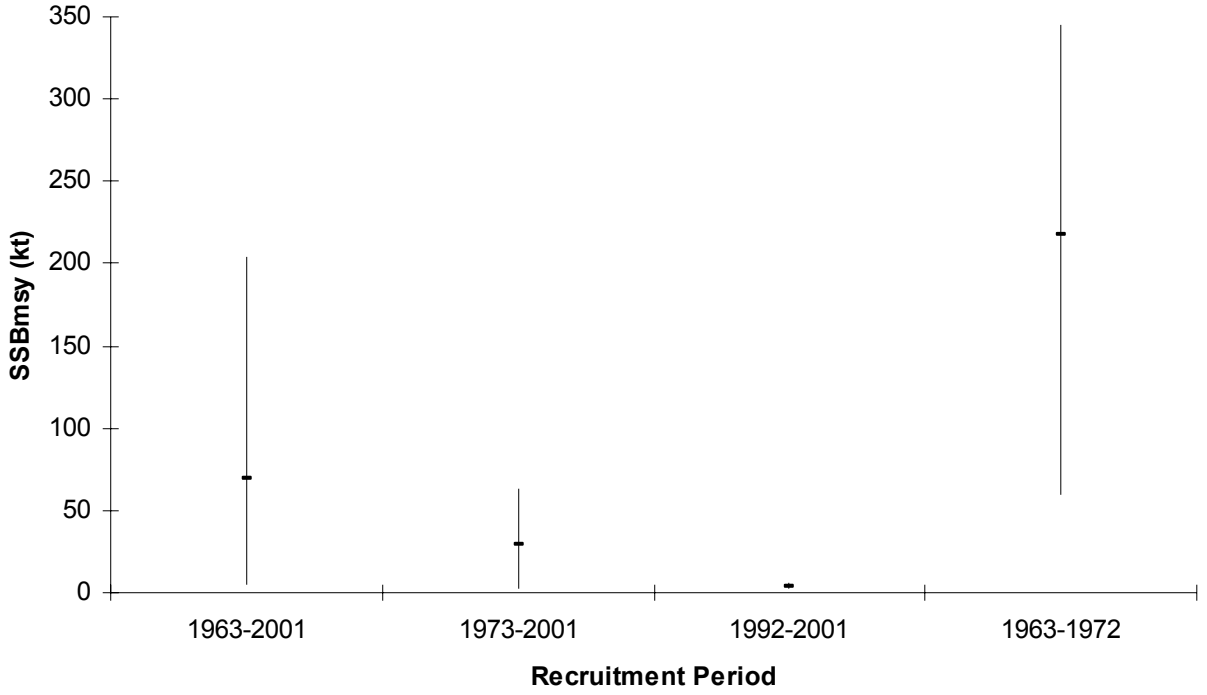


Figure 17. Sensitivity analysis of MSY reference proxies for southern New England-Mid Atlantic yellowtail flounder, assuming different periods of recruitment (with 80% confidence intervals).



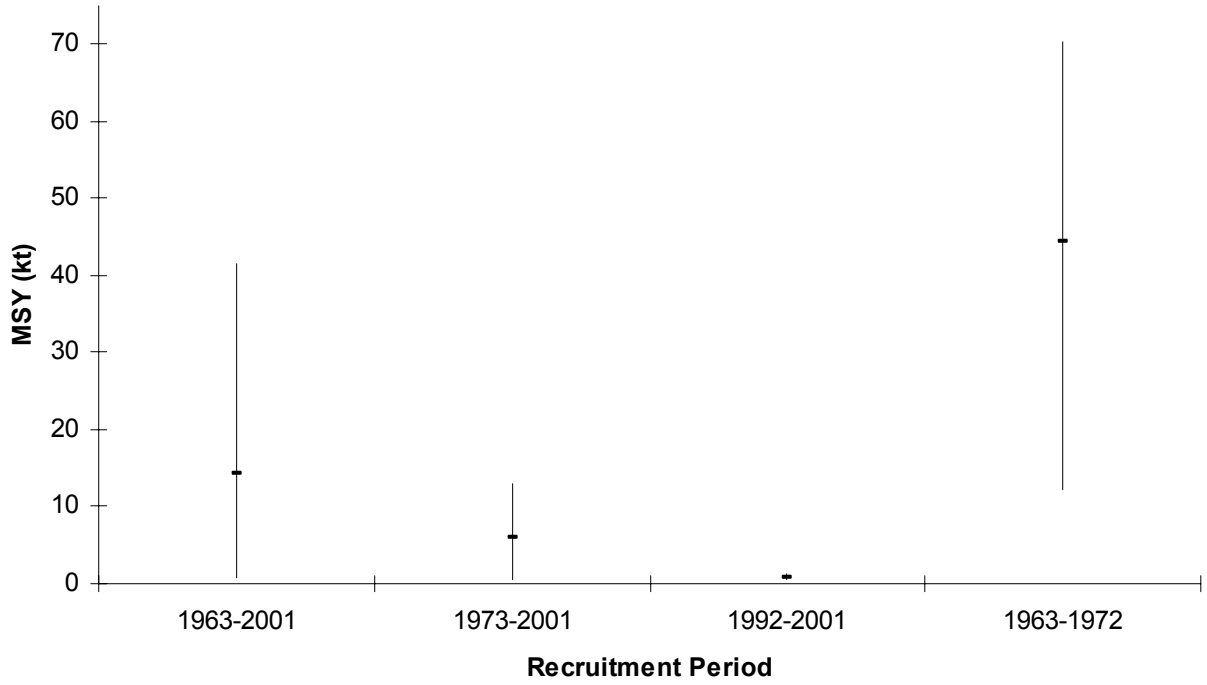


Figure 18. Stochastic projection of southern New England – Mid Atlantic yellowtail flounder spawning biomass (top panel) and landings (bottom panel) at F=0.26, assuming long-term recruitment (dotted lines indicate 90% confidence limits, and the dashed horizontal line indicates SSB_{MSY}).

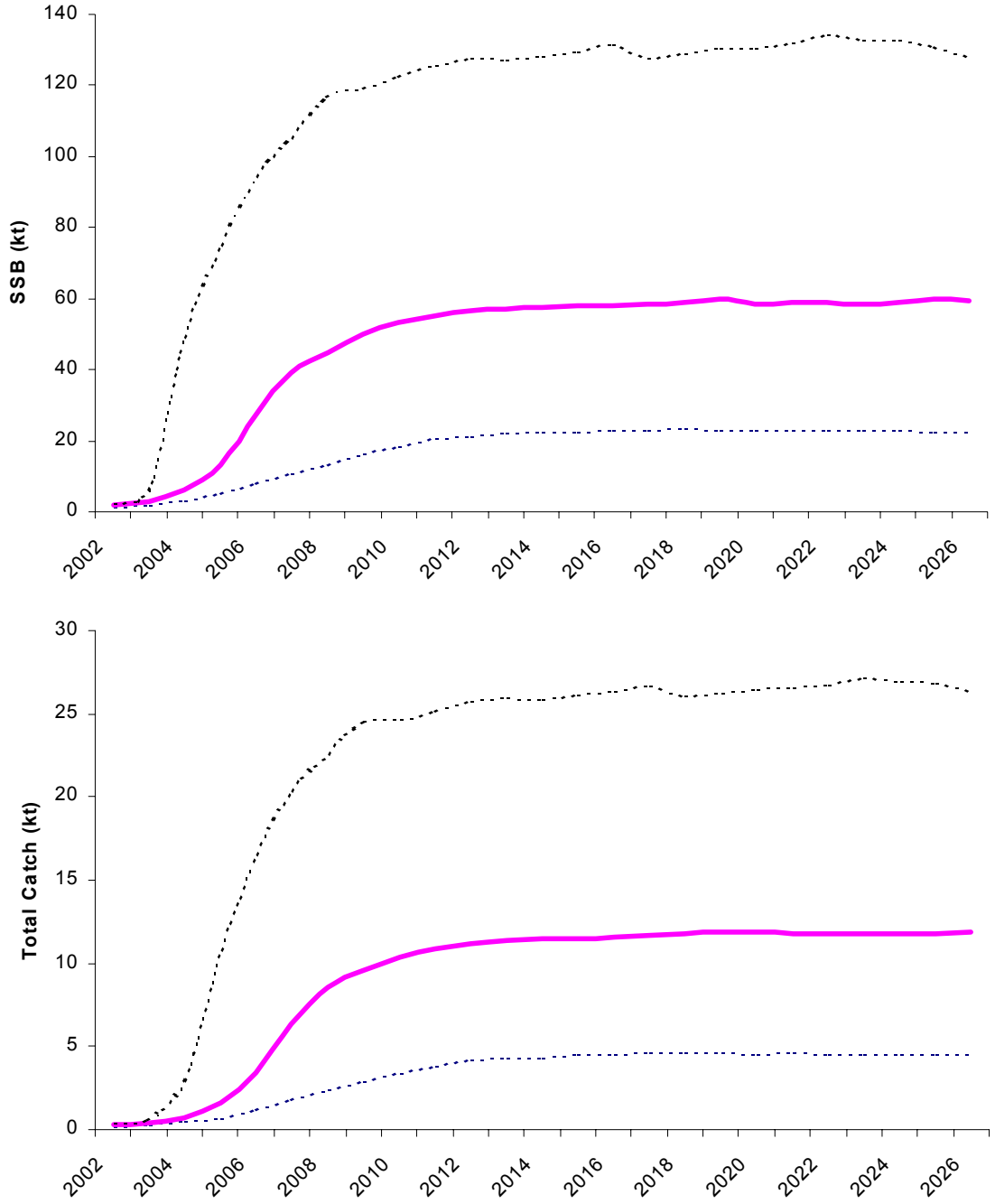
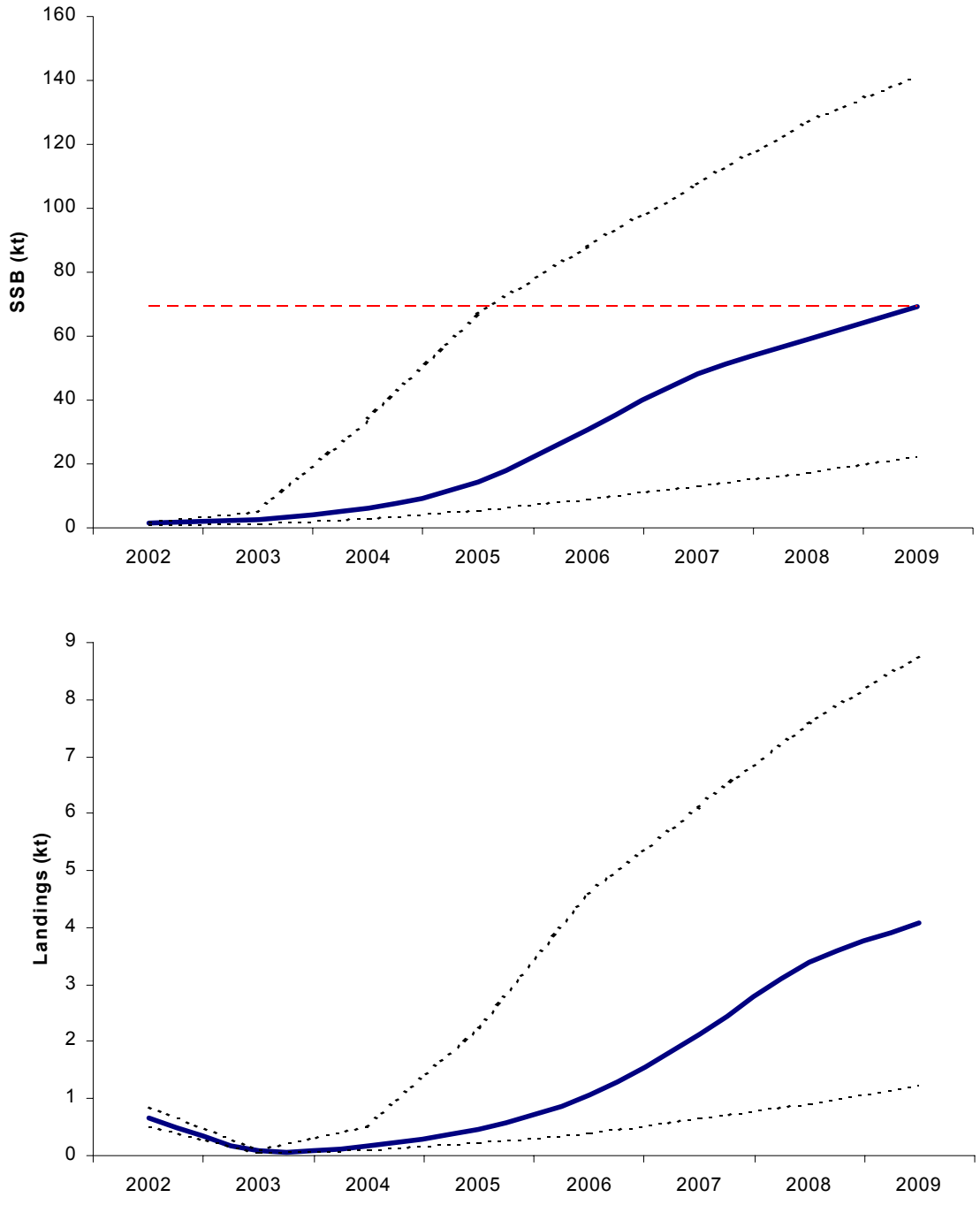


Figure 19. Stochastic projection of southern New England – Mid Atlantic yellowtail flounder spawning biomass (top panel) and landings (bottom panel) at a 2002 F of 0.77 and 2003-2009 F of 0.08, assuming long-term recruitment (dotted lines indicate 90% confidence limits, and the dashed horizontal line indicates SSB_{MSY}).



Appendix A. ADAPT analysis of southern New England – Mid Atlantic yellowtail flounder.

```
Fisheries Assessment Toolbox  Southern New England - Mid Atlantic Yellowtail Flounder - SAW36
2002  Run Number  6   10/21/02   1:07:24 PM
FACT Version 1.5.0
Southern New England - Mid Atlantic Yellowtail Flounder - SAW36 2002  1973 - 2002
Input Parameters and Options Selected
---------------------------------------
Natural mortality is a matrix below
Oldest age (not in the plus group) is  6
For all years prior to the terminal year ( 29 ), backcalculated
stock sizes for the following ages used to estimate
total mortality (Z) for age  6 : 3 4 5 6
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  7 + is then calculated from the following
ratios of F[age 7 +] to F[age 6 ]
          1973              1
          1974              1
          1975              1
          1976              1
          1977              1
          1978              1
          1979              1
          1980              1
          1981              1
          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
          1999              1
          2000              1
          2001              1
Stock size of the  7 + group is then calculated using
the following method:  CATCH EQUATION
 Partial recruitment estimate for  2002
 1             0.01
 2             0.12
 3             0.58
 4             1
 5             1
 6             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 None or Uniform
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).
```

```
Initial estimates of parameters for the Marquardt algorithm
and lower and upper bounds on the parameter estimates:
Par.          Initial Est   Lower Bnd     Upper Bnd
N  2          1.00E+06      0.00E+00      1.00E+08
N  3          1.00E+06      0.00E+00      1.00E+08
N  4          1.00E+05      0.00E+00      1.00E+08
N  5          1.00E+05      0.00E+00      1.00E+08
q Fall1       1.00E-04      0.00E+00      1.00E-01
q Fall2       1.00E-04      0.00E+00      1.00E-01
q Fall3       1.00E-04      0.00E+00      1.00E-01
q Fall4       1.00E-04      0.00E+00      1.00E-01
q Fall5       1.00E-04      0.00E+00      1.00E-01
q Fall6       1.00E-04      0.00E+00      1.00E-01
q Fall7       1.00E-04      0.00E+00      1.00E-01
q Spring1     1.00E-04      0.00E+00      1.00E-01
q Spring2     1.00E-04      0.00E+00      1.00E-01
q Spring3     1.00E-04      0.00E+00      1.00E-01
q Spring4     1.00E-04      0.00E+00      1.00E-01
q Spring5     1.00E-04      0.00E+00      1.00E-01
q Spring6     1.00E-04      0.00E+00      1.00E-01
q Spring7     1.00E-04      0.00E+00      1.00E-01
q Winter1     1.00E-04      0.00E+00      1.00E-01
q Winter2     1.00E-04      0.00E+00      1.00E-01
q Winter3     1.00E-04      0.00E+00      1.00E-01
q Winter4     1.00E-04      0.00E+00      1.00E-01
q Winter5     1.00E-04      0.00E+00      1.00E-01
q Scall1      1.00E-04      0.00E+00      1.00E-01
The following indices of abundance are available
 1            Fall1
 2            Fall2
 3            Fall3
 4            Fall4
 5            Fall5
 6            Fall6
 7            Fall7
 8            Spring1
 9            Spring2
 10           Spring3
 11           Spring4
 12           Spring5
 13           Spring6
 14           Spring7
 15           Winter1
 16           Winter2
 17           Winter3
 18           Winter4
 19           Winter5
 20           Winter6
 21           Winter7
 22           Scall1
 The Indices that will be used in this run are:
 1            Fall1
 2            Fall2
 3            Fall3
 4            Fall4
 5            Fall5
 6            Fall6
 7            Fall7
 8            Spring1
 9            Spring2
 10           Spring3
 11           Spring4
 12           Spring5
 13           Spring6
 14           Spring7
 15           Winter1
 16           Winter2
 17           Winter3
 18           Winter4
 19           Winter5
 20           Scall1
```

Obs Indices (before transvba.formation) by index and year; with Index means

	1973	1974	1975	1976	1977	1978	1979
Fall1	1.78	0.70	1.53	1.96	2.29	2.08	1.49
Fall2	1.75	1.19	0.42	4.20	1.44	4.77	3.28
Fall3	4.09	0.43	0.14	0.35	0.52	0.30	1.58
Fall4	2.32	1.64	0.22	0.05	0.04	0.24	0.24
Fall5	1.56	0.69	0.21	0.07	0.04	0.02	0.03
Fall6	0.77	0.30	0.05	0.19	0.04	0.01	0.03
Fall7	0.16	0.20	0.07	0.32	0.07	0.07	0.00
Spring1	0.84	0.51	0.36	0.02	1.62	2.68	1.00
Spring2	5.47	2.19	1.17	4.18	1.56	10.30	2.97
Spring3	14.75	2.61	0.41	0.54	2.76	1.79	1.60
Spring4	8.34	5.02	0.67	0.26	0.24	0.78	0.26
Spring5	6.43	2.89	0.71	0.25	0.15	0.25	0.12
Spring6	7.99	1.15	0.53	0.34	0.19	0.13	0.02
Spring7	1.17	1.46	0.35	0.13	0.23	0.29	0.04
Winter1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scall1	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	1980	1981	1982	1983	1984	1985	1986
Fall1	1.15	9.51	2.04	1.92	1.44	0.87	0.61
Fall2	2.91	9.50	17.79	11.28	1.28	0.38	1.83
Fall3	0.76	1.25	4.39	5.59	1.53	0.13	0.52
Fall4	0.31	0.20	0.54	0.46	0.33	0.08	0.12
Fall5	0.00	0.10	0.22	0.04	0.00	0.00	0.03
Fall6	0.00	0.04	0.00	0.00	0.00	0.00	0.00
Fall7	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Spring1	0.68	0.81	0.15	0.02	0.04	0.27	0.02
Spring2	6.35	18.60	17.33	5.33	0.45	1.61	2.89
Spring3	4.30	4.82	5.61	8.80	0.90	0.41	0.92
Spring4	2.68	2.50	1.41	0.60	2.11	0.48	0.24
Spring5	0.26	0.58	0.47	0.19	0.35	0.71	0.12
Spring6	0.07	0.11	0.14	0.00	0.26	0.14	0.02
Spring7	0.04	0.00	0.02	0.00	0.00	0.02	0.00
Winter1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scall1	0.00	0.00	0.36	0.26	0.18	0.47	0.02

	1987	1988	1989	1990	1991	1992	1993
Fall1	1.07	4.37	0.20	0.54	0.59	0.17	0.33
Fall2	0.45	0.31	10.49	1.85	0.24	0.02	0.03
Fall3	0.36	0.14	1.37	3.12	1.52	0.07	0.13
Fall4	0.03	0.16	0.07	0.19	0.37	0.29	0.10
Fall5	0.02	0.02	0.00	0.00	0.00	0.00	0.00
Fall6	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Fall7	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Spring1	0.00	0.29	0.16	0.09	0.23	0.04	0.02
Spring2	0.09	0.36	11.21	0.49	0.61	0.05	0.25
Spring3	0.70	0.13	0.54	15.35	2.51	0.57	0.11
Spring4	0.17	0.17	0.11	2.19	4.16	1.60	0.44
Spring5	0.00	0.29	0.00	0.08	0.54	0.00	0.07
Spring6	0.00	0.03	0.00	0.00	0.06	0.00	0.00
Spring7	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Winter1	0.00	0.00	0.00	0.00	0.00	0.01	0.60
Winter2	0.00	0.00	0.00	0.00	0.00	1.62	1.92
Winter3	0.00	0.00	0.00	0.00	0.00	3.48	1.06
Winter4	0.00	0.00	0.00	0.00	0.00	8.06	2.49
Winter5	0.00	0.00	0.00	0.00	0.00	0.96	0.29
Scall1	0.05	7.36	0.58	0.16	0.15	0.11	0.17

	1994	1995	1996	1997	1998	1999	2000
Fall1	0.73	0.14	0.45	0.82	0.89	1.24	0.05
Fall2	0.45	0.65	0.16	0.52	1.62	0.39	1.67
Fall3	0.11	0.26	0.32	1.46	0.12	0.28	0.30
Fall4	0.13	0.12	0.00	0.27	0.05	0.03	0.17
Fall5	0.07	0.00	0.00	0.02	0.00	0.03	0.00
Fall6	0.03	0.00	0.00	0.00	0.02	0.00	0.00
Fall7	0.00	0.05	0.00	0.00	0.00	0.00	0.02
Spring1	0.02	0.02	0.00	0.05	0.07	0.04	0.02
Spring2	0.27	1.17	0.40	0.89	3.02	0.65	1.25
Spring3	0.02	0.07	1.30	1.14	0.39	1.93	1.01
Spring4	0.00	0.09	0.57	0.33	0.16	0.35	0.56
Spring5	0.07	0.02	0.07	0.07	0.04	0.07	0.04
Spring6	0.02	0.04	0.00	0.00	0.02	0.00	0.00
Spring7	0.00	0.03	0.00	0.00	0.00	0.02	0.00
Winter1	0.37	0.09	0.04	0.16	0.12	0.24	0.11
Winter2	8.65	10.68	1.29	2.38	7.84	2.91	4.92
Winter3	0.74	2.70	8.24	9.79	1.60	10.18	3.01
Winter4	1.65	0.60	0.85	2.96	1.16	0.78	1.16
Winter5	0.97	0.25	0.14	0.53	0.11	0.31	0.07
Scall1	0.57	0.07	0.12	0.74	0.25	0.36	0.08

	2001	2002	Average
Fall1	0.39	0.00	1.426
Fall2	0.61	0.00	2.809
Fall3	0.16	0.00	1.079
Fall4	0.07	0.00	0.315
Fall5	0.00	0.00	0.198
Fall6	0.00	0.00	0.135
Fall7	0.00	0.00	0.101
Spring1	0.00	0.05	0.373
Spring2	0.07	1.19	3.412
Spring3	1.16	0.24	2.578
Spring4	0.24	0.20	1.272
Spring5	0.08	0.07	0.556
Spring6	0.02	0.00	0.593
Spring7	0.00	0.00	0.316
Winter1	0.03	0.01	0.161
Winter2	0.90	2.74	4.167
Winter3	8.54	2.58	4.717
Winter4	1.62	2.05	2.124
Winter5	0.25	0.10	0.363
Scall1	0.06	0.02	0.578

Catch at age (thousands) - C:\all_work\yt\2002\SNEMA\snemayt_2002_wg.7

	1973	1974	1975	1976	1977	1978	1979
1	220	861	8910	214	5513	8698	205
2	5632	28519	4129	6677	5027	14191	19419
3	11951	5556	1884	1181	4891	2164	8667
4	7978	7370	1130	327	507	1470	1062
5	5226	3687	1597	449	278	247	438
6	5305	1598	792	477	304	61	101
7	981	1750	660	419	345	119	30
1+	37293	49341	19102	9744	16865	26950	29922

	1980	1981	1982	1983	1984	1985	1986
1	1006	38	169	2668	517	2239	463
2	10215	7029	35696	19288	6200	8074	9970
3	6595	7578	14358	42837	19990	2175	3326
4	3829	2926	1858	3601	8129	1968	635
5	512	1111	415	385	878	1109	356
6	129	161	79	146	245	204	127
7	38	22	07	46	30	42	22
1+	22324	18865	52582	68971	35989	15811	14899

	1987	1988	1989	1990	1991	1992	1993
1	1594	5899	24	192	446	477	13
2	3437	2109	19920	2056	1610	1453	457
3	2368	536	3347	42644	5169	2097	447
4	926	506	462	2209	9703	2739	711
5	167	134	48	90	168	297	145
6	55	26	03	05	34	14	04
7	10	06	00	00	17	04	00
1+	8557	9216	23804	47196	17147	7081	1777

	1994	1995	1996	1997	1998	1999	2000
1	154	07	22	02	03	06	35
2	748	308	427	103	511	105	567
3	312	180	626	1166	635	2321	1091
4	281	219	249	538	306	288	447
5	309	31	60	62	81	103	15
6	127	07	17	05	14	13	03
7	04	08	06	06	04	05	02
1+	1935	760	1407	1882	1554	2841	2160

	2001
1	01
2	275
3	1413
4	424
5	129
6	32
7	19
1+	2293

Weight at age (mid year) in kg - C:\all_work\yt\2002\SNEMA\snemayt_2002_wg.7

	1973	1974	1975	1976	1977	1978	1979
1	0.210	0.203	0.218	0.228	0.215	0.234	0.189
2	0.296	0.308	0.289	0.303	0.283	0.293	0.301
3	0.348	0.352	0.376	0.408	0.381	0.383	0.364
4	0.375	0.396	0.432	0.498	0.504	0.536	0.475
5	0.382	0.439	0.435	0.499	0.513	0.662	0.590
6	0.418	0.431	0.457	0.543	0.481	0.686	0.673
7	0.485	0.481	0.510	0.573	0.596	0.641	0.624

	1980	1981	1982	1983	1984	1985	1986
1	0.206	0.140	0.226	0.175	0.182	0.183	0.186
2	0.281	0.262	0.263	0.261	0.237	0.260	0.284
3	0.384	0.342	0.353	0.339	0.295	0.365	0.331
4	0.500	0.474	0.499	0.496	0.388	0.408	0.463
5	0.682	0.596	0.660	0.668	0.487	0.504	0.587
6	0.874	0.669	0.822	0.815	0.652	0.577	0.614
7	1.098	0.514	0.956	0.831	0.355	0.674	0.767

	1987	1988	1989	1990	1991	1992	1993
1	0.247	0.270	0.311	0.301	0.206	0.167	0.122
2	0.268	0.293	0.338	0.327	0.262	0.316	0.354
3	0.353	0.396	0.394	0.378	0.337	0.368	0.430
4	0.404	0.493	0.553	0.455	0.414	0.434	0.451
5	0.520	0.611	0.735	0.763	0.678	0.599	0.641
6	0.587	0.795	0.957	0.884	0.900	0.804	1.040
7	0.780	0.937	0.793	0.793	0.599	1.375	0.793

	1994	1995	1996	1997	1998	1999	2000
1	0.068	0.123	0.148	0.140	0.162	0.221	0.034
2	0.203	0.299	0.373	0.288	0.294	0.290	0.352
3	0.352	0.401	0.408	0.415	0.411	0.441	0.475
4	0.444	0.458	0.466	0.478	0.565	0.562	0.606
5	0.573	0.663	0.592	0.583	0.768	0.673	0.756
6	0.710	0.720	0.710	0.912	0.848	1.020	1.090
7	0.902	0.714	0.780	1.312	0.970	1.098	1.040

	2001
1	0.153
2	0.378
3	0.438
4	0.622
5	0.763
6	0.938
7	0.990

Percent Mature (females)- C:\all_work\yt\2002\SNEMA\snemayt_2002_wg.7

	1973-2001
1	13
2	74
3	98
4	100
5	100
6	100
7	100

Natural Mortality C:\all_work\yt\2002\SNEMA\snemayt_2002_wg.7

	1973-2001
1	.200
2	.200
3	.200
4	.200
5	.200
6	.200
7	.200

Sex Ratio (Percent Female) - C:\all_work\yt\2002\SNEMA\snemayt_2002_wg.7

	1973-2001
1	0.5
2	0.5
3	0.5
4	0.5
5	0.5
6	0.5
7	0.5

pF is 0.4167
pM is 0.4167

Residual Sum of Squares from Marquardt Algorithm
Number 1
RSS 2254.67452500633
Lambda 1.00E-02

Number 2
RSS 1837.58596458109
Lambda 1.00E-03

Number 3
RSS 1533.87137995026
Lambda 1.00E-01

```
Number  8
RSS            902.470268516996
Lambda        1.00E+00

Number  9
RSS            853.418790581784
Lambda        1.00E+02

Number  10
RSS            773.710725418962
Lambda        1.00E+01

Number  11
RSS            736.70318527732
Lambda        1.00E+00

Number  12
RSS            677.581261671293
Lambda        1.00E+02

Number  13
RSS            575.34423973156
Lambda        1.00E+01

Number  14
RSS            538.653804623563
Lambda        1.00E+00

Number  15
RSS            428.559911705117
Lambda        1.00E+02

Number  16
RSS            346.123578384847
Lambda        1.00E+01

Number  17
RSS            310.039088660565
Lambda        1.00E+00

Number  18
RSS            300.649364298216
Lambda        1.00E+02

Number  19
RSS            299.626622195729
Lambda        1.00E+01

Number  20
RSS            299.598539596868
Lambda        1.00E+00

Number  21
RSS            299.59484703991
Lambda        1.00E-01

Number  22
RSS            299.594128545266
Lambda        1.00E+01

Number  23
RSS            299.594025497619
Lambda        1.00E+00

Number  24
RSS            299.594029756406
Lambda        1.00E-01

Number  25
RSS            299.594024402707
Lambda        1.00E-02
```

RESULTS

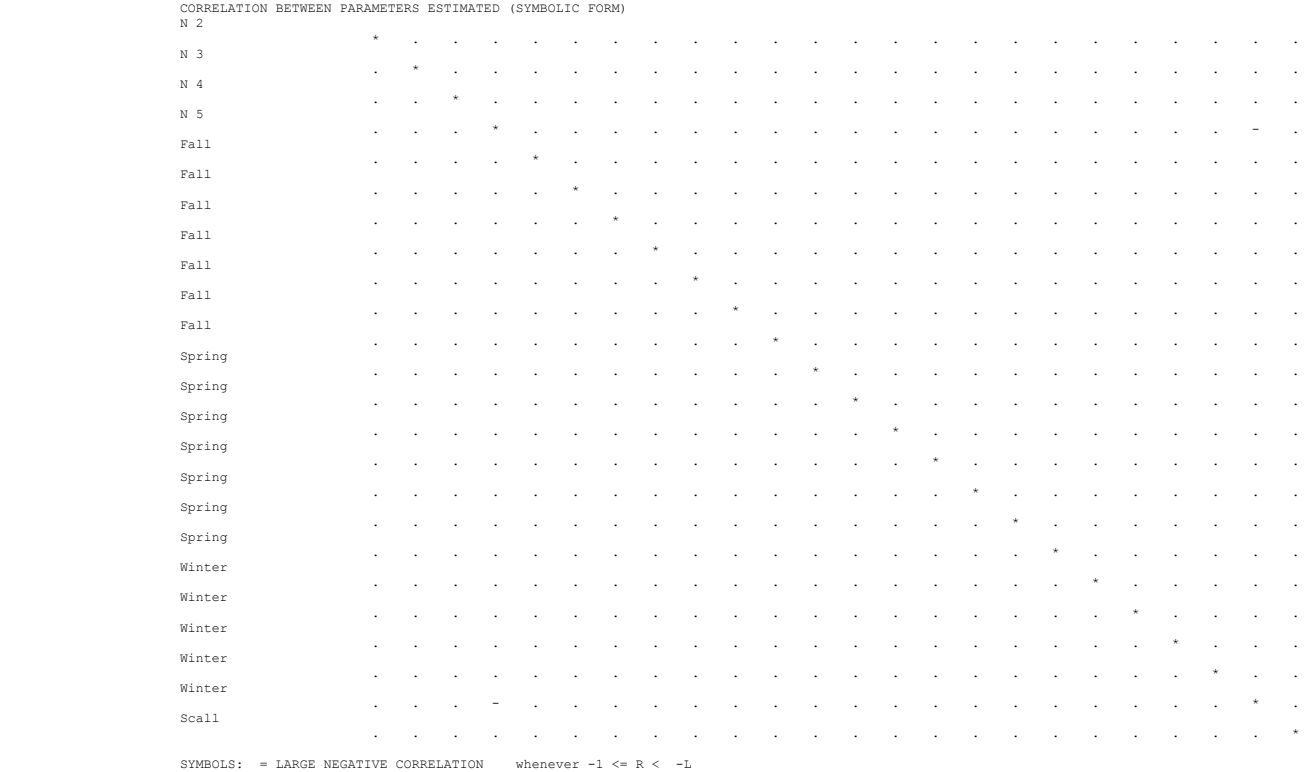
Approximate Statistics Assuming Linearity Near Solution
Sum of Squares: 299.594024402707
Mean Square Residuals: 0.79258

	PAR. EST.	STD. ERR.	T-STATISTIC	C.V.
N 2	2.50E+03	1.04E+03	2.42E+00	0.41
N 3	9.91E+02	3.57E+02	2.77E+00	0.36
N 4	1.46E+03	6.24E+02	2.33E+00	0.43
N 5	2.60E+02	1.24E+02	2.10E+00	0.48
q Fall1	5.67E-05	9.49E-06	5.98E+00	0.17
q Fall2	5.27E-05	8.79E-06	6.00E+00	0.17
q Fall3	1.53E-04	2.55E-05	6.00E+00	0.17
q Fall4	5.60E-04	9.53E-05	5.88E+00	0.17
q Fall5	1.01E-03	2.26E-04	4.47E+00	0.22
q Fall6	1.63E-03	4.39E-04	3.71E+00	0.27
q Fall7	6.05E-03	1.71E-03	3.53E+00	0.28
q Spring1	2.34E-05	4.12E-06	5.68E+00	0.18
q Spring2	3.99E-05	6.57E-06	6.08E+00	0.16
q Spring3	7.83E-05	1.28E-05	6.10E+00	0.16
q Spring4	2.53E-04	4.22E-05	5.98E+00	0.17
q Spring5	7.34E-04	1.28E-04	5.71E+00	0.17
q Spring6	7.61E-04	1.56E-04	4.87E+00	0.21
q Spring7	2.05E-03	5.29E-04	3.87E+00	0.26
q Winter1	2.10E-04	6.07E-05	3.46E+00	0.29
q Winter2	3.07E-04	8.43E-05	3.64E+00	0.27
q Winter3	4.46E-04	1.22E-04	3.66E+00	0.27
q Winter4	1.03E-03	2.82E-04	3.65E+00	0.27
q Winter5	4.33E-03	1.21E-03	3.57E+00	0.28
q Scall1	5.52E-05	1.12E-05	4.95E+00	0.20

Catchability Estimates in Original Units

	Estimate	Std.Err.	C.V.
q Fall1	8.08E-05	1.35E-05	0.17
q Fall2	1.48E-04	2.47E-05	0.17
q Fall3	1.65E-04	2.75E-05	0.17
q Fall4	1.77E-04	3.00E-05	0.17
q Fall5	2.00E-04	4.47E-05	0.22
q Fall6	2.20E-04	5.95E-05	0.27
q Fall7	6.14E-04	1.74E-04	0.28
q Spring1	8.74E-06	1.54E-06	0.18
q Spring2	1.36E-04	2.24E-05	0.16
q Spring3	2.02E-04	3.31E-05	0.16
q Spring4	3.21E-04	5.37E-05	0.17
q Spring5	4.08E-04	7.14E-05	0.17
q Spring6	4.51E-04	9.28E-05	0.21
q Spring7	6.47E-04	1.67E-04	0.26
q Winter1	3.38E-05	9.77E-06	0.29
q Winter2	1.28E-03	3.51E-04	0.27
q Winter3	2.10E-03	5.74E-04	0.27
q Winter4	2.18E-03	5.99E-04	0.27
q Winter5	1.57E-03	4.40E-04	0.28
q Scall1	3.19E-05	6.45E-06	0.20

CORRELATION BETWEEN PARAMETERS ESTIMATED (SYMBOLIC FORM)



SYMBOLS: = LARGE NEGATIVE CORRELATION whenever -1 <= R < -L
- MODERATE NEGATIVE CORRELATION whenever -L <= R < -M
. SMALL CORRELATION whenever -M <= R <= +M
+ MODERATE POSITIVE CORRELATION whenever +M < R <= +L
* LARGE POSITIVE CORRELATION whenever +L < R <= +1

Where R is the estimated correlation, M is, 0.25 and L is 0.5

Summary of Residuals
Fall
Tuned to: mean and number
For ages: 1

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	1.779	3.181	0.221	0.803	1	-0.581	-0.653	39348
1974	0.695	0.744	-0.719	-0.650	1	-0.069	-0.077	9208
1975	1.533	1.941	0.073	0.309	1	-0.236	-0.265	24015
1976	1.964	1.064	0.320	-0.293	1	0.613	0.689	13160
1977	2.289	3.466	0.473	0.888	1	-0.415	-0.466	42875
1978	2.080	3.617	0.378	0.931	1	-0.553	-0.621	44739
1979	1.493	2.339	0.046	0.495	1	-0.449	-0.504	28935
1980	1.153	3.221	-0.212	0.815	1	-1.027	-1.154	39837
1981	9.511	10.144	1.898	1.962	1	-0.064	-0.072	125483
1982	2.040	4.699	0.358	1.193	1	-0.834	-0.937	58127
1983	1.920	1.118	0.298	-0.244	1	0.541	0.608	13824
1984	1.444	1.384	0.013	-0.030	1	0.043	0.048	17118
1985	0.869	1.449	-0.495	0.016	1	-0.511	-0.574	17919
1986	0.606	0.518	-0.856	-1.013	1	0.158	0.177	6403
1987	1.067	1.039	-0.290	-0.317	1	0.027	0.030	12847
1988	4.370	8.853	1.120	1.826	1	-0.706	-0.793	109512
1989	0.198	1.301	-1.974	-0.092	1	-1.883	-2.115	16093
1990	0.539	0.585	-0.973	-0.891	1	-0.081	-0.091	7232
1991	0.588	0.270	-0.886	-1.663	1	0.777	0.873	3344
1992	0.168	0.147	-2.138	-2.275	1	0.136	0.153	1814
1993	0.332	0.149	-1.457	-2.258	1	0.801	0.899	1844
1994	0.732	0.210	-0.667	-1.914	1	1.248	1.401	2601
1995	0.139	0.248	-2.328	-1.748	1	-0.580	-0.651	3071
1996	0.448	0.145	-1.158	-2.287	1	1.129	1.268	1792
1997	0.822	0.436	-0.551	-1.185	1	0.634	0.712	5393
1998	0.890	0.247	-0.471	-1.752	1	1.281	1.439	3059
1999	1.238	0.421	-0.141	-1.219	1	1.078	1.211	5212
2000	0.049	0.137	-3.371	-2.342	1	-1.028	-1.155	1695
2001	0.390	0.224	-1.296	-1.850	1	0.554	0.622	2773
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 0.606

Fall
Tuned to: mean and number
 For ages: 2

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	1.747	1.939	-0.475	-0.371	1	-0.104	-0.117	13095
1974	1.185	1.988	-0.863	-0.346	1	-0.517	-0.581	13424
1975	0.416	0.724	-1.910	-1.356	1	-0.554	-0.622	4888
1976	4.204	1.863	0.403	-0.410	1	0.814	0.914	12583
1977	1.439	1.182	-0.669	-0.865	1	0.196	0.221	7984
1978	4.771	3.743	0.530	0.287	1	0.243	0.273	25276
1979	3.283	3.292	0.156	0.159	1	-0.003	-0.003	22235
1980	2.908	2.691	0.035	-0.043	1	0.077	0.087	18175
1981	9.498	4.241	1.218	0.412	1	0.806	0.906	28644
1982	17.794	12.463	1.846	1.490	1	0.356	0.400	84167
1983	11.278	5.530	1.390	0.677	1	0.713	0.801	37343
1984	1.275	0.999	-0.790	-1.034	1	0.244	0.275	6743
1985	0.375	1.377	-2.014	-0.713	1	-1.301	-1.461	9299
1986	1.826	1.164	-0.431	-0.881	1	0.450	0.506	7860
1987	0.451	0.453	-1.829	-1.824	1	-0.005	-0.006	3061
1988	0.310	1.302	-2.204	-0.769	1	-1.435	-1.612	8793
1989	10.492	11.418	1.318	1.402	1	-0.085	-0.095	77107
1990	1.847	1.798	-0.419	-0.446	1	0.027	0.030	12141
1991	0.243	0.743	-2.447	-1.330	1	-1.118	-1.255	5017
1992	0.024	0.259	-4.763	-2.384	1	-2.378	-2.672	1748
1993	0.028	0.156	-4.608	-2.891	1	-1.718	-1.929	1053
1994	0.448	0.163	-1.836	-2.848	1	1.012	1.137	1099
1995	0.645	0.283	-1.471	-2.295	1	0.824	0.925	1911
1996	0.161	0.340	-2.859	-2.111	1	-0.748	-0.841	2298
1997	0.519	0.208	-1.689	-2.601	1	0.913	1.025	1407
1998	1.620	0.616	-0.550	-1.517	1	0.966	1.086	4162
1999	0.392	0.363	-1.969	-2.046	1	0.077	0.086	2452
2000	1.669	0.590	-0.521	-1.561	1	1.040	1.168	3983
2001	0.611	0.183	-1.525	-2.732	1	1.206	1.355	1235
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 0.83

Fall
Tuned to: mean and number
 For ages: 3

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	4.086	3.113	1.332	1.060	1	0.272	0.305	18871
1974	0.433	0.879	-0.913	-0.205	1	-0.708	-0.795	5326
1975	0.136	0.303	-2.071	-1.270	1	-0.801	-0.900	1837
1976	0.350	0.306	-1.126	-1.259	1	0.133	0.150	1857
1977	0.519	0.815	-0.732	-0.280	1	-0.452	-0.508	4943
1978	0.296	0.571	-1.293	-0.636	1	-0.658	-0.739	3463
1979	1.579	1.720	0.381	0.466	1	-0.086	-0.096	10429
1980	0.757	1.231	-0.354	0.131	1	-0.486	-0.546	7460
1981	1.251	1.080	0.148	0.001	1	0.147	0.165	6545
1982	4.392	2.018	1.404	0.626	1	0.778	0.874	12232
1983	5.593	4.752	1.646	1.483	1	0.163	0.183	28808
1984	1.529	1.687	0.349	0.447	1	-0.099	-0.111	10229
1985	0.134	0.336	-2.086	-1.166	1	-0.920	-1.033	2038
1986	0.523	0.450	-0.724	-0.875	1	0.151	0.170	2725
1987	0.359	0.271	-1.100	-1.381	1	0.280	0.315	1645
1988	0.141	0.170	-2.035	-1.847	1	-0.188	-0.211	1031
1989	1.370	0.744	0.239	-0.372	1	0.610	0.686	4511
1990	3.117	4.823	1.061	1.497	1	-0.437	-0.490	29238
1991	1.516	1.028	0.340	-0.049	1	0.389	0.437	6230
1992	0.072	0.377	-2.707	-1.052	1	-1.655	-1.859	2284
1993	0.130	0.108	-2.116	-2.298	1	0.182	0.205	657
1994	0.107	0.085	-2.311	-2.540	1	0.230	0.258	516
1995	0.257	0.087	-1.435	-2.521	1	1.086	1.220	526
1996	0.320	0.182	-1.215	-1.778	1	0.563	0.632	1105
1997	1.459	0.170	0.302	-1.848	1	2.149	2.414	1031
1998	0.124	0.125	-2.163	-2.157	1	-0.007	-0.007	757
1999	0.279	0.301	-1.353	-1.276	1	-0.076	-0.086	1825
2000	0.303	0.225	-1.270	-1.569	1	0.299	0.336	1362
2001	0.158	0.374	-1.921	-1.059	1	-0.862	-0.968	2268
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 0.513

Fall
Tuned to: mean and number
 For ages: 4

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	2.318	1.798	1.995	1.741	1	0.254	0.285	10185
1974	1.640	1.175	1.649	1.316	1	0.333	0.374	6657
1975	0.217	0.317	-0.373	0.007	1	-0.380	-0.427	1797
1976	0.046	0.118	-1.924	-0.985	1	-0.940	-1.056	667
1977	0.044	0.141	-1.969	-0.804	1	-1.165	-1.309	799
1978	0.236	0.260	-0.289	-0.193	1	-0.097	-0.109	1472
1979	0.241	0.253	-0.268	-0.221	1	-0.048	-0.053	1431
1980	0.313	0.550	-0.007	0.557	1	-0.564	-0.633	3114
1981	0.198	0.341	-0.465	0.078	1	-0.543	-0.610	1930
1982	0.535	0.296	0.529	-0.063	1	0.592	0.665	1676
1983	0.458	0.526	0.374	0.511	1	-0.138	-0.155	2977
1984	0.334	0.822	0.058	0.959	1	-0.901	-1.012	4657
1985	0.080	0.231	-1.371	-0.309	1	-1.062	-1.193	1311
1986	0.123	0.095	-0.941	-1.203	1	0.262	0.294	536
1987	0.030	0.091	-2.352	-1.244	1	-1.108	-1.245	515
1988	0.156	0.043	-0.703	-1.984	1	1.281	1.439	245
1989	0.072	0.064	-1.476	-1.590	1	0.114	0.128	364
1990	0.194	0.172	-0.485	-0.604	1	0.119	0.133	976
1991	0.367	0.546	0.152	0.549	1	-0.396	-0.445	3090
1992	0.285	0.258	-0.101	-0.201	1	0.101	0.113	1460
1993	0.104	0.125	-1.109	-0.922	1	-0.187	-0.210	710
1994	0.129	0.035	-0.893	-2.186	1	1.293	1.452	201
1995	0.115	0.031	-1.008	-2.329	1	1.321	1.483	174
1996	0.000	0.000	0	0	1	0.000	0.000	00
1997	0.271	0.058	-0.151	-1.684	1	1.533	1.722	331
1998	0.049	0.046	-1.861	-1.917	1	0.056	0.063	262
1999	0.028	0.038	-2.421	-2.114	1	-0.307	-0.345	216
2000	0.171	0.081	-0.611	-1.357	1	0.745	0.837	460
2001	0.071	0.084	-1.490	-1.322	1	-0.168	-0.189	476
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 0.564

Fall
Tuned to: mean and number
 For ages: 5

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	1.564	1.023	2.066	1.641	1	0.425	0.477	5114
1974	0.687	0.651	1.243	1.189	1	0.054	0.061	3253
1975	0.213	0.401	0.072	0.706	1	-0.633	-0.712	2006
1976	0.073	0.161	-0.999	-0.210	1	-0.789	-0.886	803
1977	0.040	0.052	-1.600	-1.342	1	-0.258	-0.290	259
1978	0.024	0.065	-2.111	-1.111	1	-1.000	-1.124	326
1979	0.026	0.087	-2.031	-0.825	1	-1.206	-1.355	434
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.103	0.104	-0.654	-0.646	1	-0.009	-0.010	520
1982	0.215	0.081	0.081	-0.897	1	0.978	1.099	404
1983	0.038	0.103	-1.652	-0.653	1	-0.998	-1.121	516
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	0.025	0.044	-2.070	-1.506	1	-0.564	-0.634	220
1987	0.024	0.024	-2.111	-2.101	1	-0.011	-0.012	121
1988	0.021	0.009	-2.245	-3.074	1	0.830	0.932	46
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	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.000	0.000	0	0	1	0.000	0.000	00
1994	0.066	0.023	-1.100	-2.161	1	1.061	1.192	114
1995	0.000	0.000	0	0	1	0.000	0.000	00
1996	0.000	0.000	0	0	1	0.000	0.000	00
1997	0.024	0.011	-2.111	-2.924	1	0.813	0.914	53
1998	0.000	0.000	0	0	1	0.000	0.000	00
1999	0.028	0.008	-1.957	-3.264	1	1.307	1.468	38
2000	0.000	0.000	0	0	1	0.000	0.000	00
2001	0.000	0.000	0	0	1	0.000	0.000	00
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 0.688

Fall
Tuned to: mean and number
 For ages: 6

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.768	1.559	1.736	2.444	1	-0.708	-0.795	7071
1974	0.297	0.312	0.786	0.834	1	-0.049	-0.055	1414
1975	0.048	0.209	-1.037	0.435	1	-1.472	-1.653	949
1976	0.190	0.176	0.339	0.263	1	0.076	0.085	799
1977	0.035	0.069	-1.353	-0.675	1	-0.678	-0.761	313
1978	0.006	0.018	-3.116	-2.023	1	-1.093	-1.228	81
1979	0.026	0.026	-1.650	-1.639	1	-0.011	-0.013	119
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.037	0.026	-1.297	-1.636	1	0.339	0.381	120
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	0.034	0.007	-1.382	-3.029	1	1.648	1.851	30
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	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.000	0.000	0	0	1	0.000	0.000	00
1994	0.025	0.026	-1.689	-1.651	1	-0.039	-0.043	118
1995	0.000	0.000	0	0	1	0.000	0.000	00
1996	0.000	0.000	0	0	1	0.000	0.000	00
1997	0.000	0.000	0	0	1	0.000	0.000	00
1998	0.023	0.003	-1.772	-3.759	1	1.987	2.232	14
1999	0.000	0.000	0	0	1	0.000	0.000	00
2000	0.000	0.000	0	0	1	0.000	0.000	00
2001	0.000	0.000	0	0	1	0.000	0.000	00
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 1.134

Fall
Tuned to: mean and number
 For ages: 7

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.162	0.791	0.469	2.055	1	-1.586	-1.782	1289
1974	0.202	0.931	0.689	2.218	1	-1.528	-1.717	1517
1975	0.070	0.478	-0.371	1.550	1	-1.921	-2.157	778
1976	0.320	0.426	1.149	1.435	1	-0.285	-0.321	693
1977	0.065	0.214	-0.445	0.747	1	-1.192	-1.338	349
1978	0.069	0.096	-0.385	-0.056	1	-0.329	-0.370	156
1979	0.000	0.000	0	0	1	0.000	0.000	00
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.000	0.000	0	0	1	0.000	0.000	00
1982	0.000	0.000	0	0	1	0.000	0.000	00
1983	0.026	0.018	-1.361	-1.734	1	0.373	0.419	29
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	0.024	0.004	-1.441	-3.311	1	1.870	2.101	06
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	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.000	0.000	0	0	1	0.000	0.000	00
1994	0.000	0.000	0	0	1	0.000	0.000	00
1995	0.053	0.009	-0.649	-2.478	1	1.829	2.055	14
1996	0.000	0.000	0	0	1	0.000	0.000	00
1997	0.000	0.000	0	0	1	0.000	0.000	00
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
2000	0.023	0.001	-1.484	-4.252	1	2.769	3.110	02
2001	0.000	0.000	0	0	1	0.000	0.000	00
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 2.818

Spring
Tuned to: 1-Jan and number
 For ages: 1

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.838	0.381	0.809	0.020	1	0.789	0.886	43532
1974	0.511	0.093	0.314	-1.390	1	1.705	1.915	10627
1975	0.358	0.276	-0.042	-0.302	1	0.260	0.292	31562
1976	0.016	0.128	-3.150	-1.070	1	-2.079	-2.335	14634
1977	1.618	0.440	1.467	0.165	1	1.302	1.463	50316
1978	2.681	0.474	1.972	0.238	1	1.734	1.947	54165
1979	1.002	0.280	0.988	-0.287	1	1.275	1.432	32034
1980	0.683	0.389	0.604	0.042	1	0.563	0.632	44493
1981	0.810	1.211	0.775	1.177	1	-0.402	-0.452	138470
1982	0.149	0.562	-0.918	0.409	1	-1.327	-1.490	64223
1983	0.016	0.146	-3.150	-0.937	1	-2.213	-2.485	16726
1984	0.038	0.168	-2.285	-0.801	1	-1.484	-1.667	19164
1985	0.267	0.184	-0.335	-0.710	1	0.375	0.421	20993
1986	0.016	0.064	-3.150	-1.764	1	-1.386	-1.556	7315
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.285	1.084	-0.270	1.067	1	-1.336	-1.501	124008
1989	0.162	0.155	-0.835	-0.876	1	0.042	0.047	17769
1990	0.090	0.071	-1.422	-1.664	1	0.242	0.272	8083
1991	0.228	0.034	-0.493	-2.384	1	1.891	2.125	3934
1992	0.036	0.020	-2.339	-2.935	1	0.596	0.670	2267
1993	0.016	0.018	-3.150	-3.040	1	-0.109	-0.123	2041
1994	0.016	0.026	-3.150	-2.671	1	-0.478	-0.537	2953
1995	0.016	0.030	-3.150	-2.532	1	-0.617	-0.693	3392
1996	0.000	0.000	0	0	1	0.000	0.000	00
1997	0.053	0.052	-1.952	-1.970	1	0.018	0.021	5951
1998	0.068	0.030	-1.703	-2.537	1	0.834	0.937	3377
1999	0.036	0.050	-2.339	-2.004	1	-0.335	-0.376	5753
2000	0.019	0.017	-2.978	-3.118	1	0.140	0.157	1889
2001	0.000	0.000	0	0	1	0.000	0.000	00
2002	0.049	0.000	-2.030	0	0	0.000	0.000	00

Partial Variance: 1.274

Spring
Tuned to: 1-Jan and number
 For ages: 2

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	5.467	2.410	0.472	-0.348	1	0.819	0.920	17681
1974	2.188	4.830	-0.444	0.348	1	-0.792	-0.890	35442
1975	1.171	1.080	-1.069	-1.151	1	0.081	0.091	7921
1976	4.182	2.423	0.204	-0.342	1	0.546	0.613	17779
1977	1.557	1.607	-0.784	-0.753	1	-0.031	-0.035	11788
1978	10.302	4.935	1.105	0.369	1	0.736	0.827	36207
1979	2.967	4.971	-0.140	0.377	1	-0.516	-0.580	36476
1980	6.353	3.549	0.622	0.040	1	0.582	0.654	26042
1981	18.598	4.841	1.696	0.350	1	1.346	1.512	35518
1982	17.329	15.447	1.625	1.510	1	0.115	0.129	113335
1983	5.329	7.146	0.446	0.739	1	-0.293	-0.329	52429
1984	0.453	1.537	-2.019	-0.797	1	-1.222	-1.373	11280
1985	1.613	2.075	-0.749	-0.497	1	-0.252	-0.283	15223
1986	2.893	2.066	-0.165	-0.501	1	0.336	0.378	15161
1987	0.086	0.759	-3.681	-1.503	1	-2.178	-2.446	5570
1988	0.357	1.482	-2.257	-0.834	1	-1.424	-1.599	10875
1989	11.211	13.110	1.190	1.346	1	-0.156	-0.176	96192
1990	0.485	1.980	-1.951	-0.544	1	-1.407	-1.580	14526
1991	0.611	0.878	-1.720	-1.357	1	-0.363	-0.408	6444
1992	0.051	0.384	-4.203	-2.184	1	-2.019	-2.267	2817
1993	0.253	0.194	-2.602	-2.866	1	0.265	0.297	1425
1994	0.269	0.226	-2.540	-2.714	1	0.173	0.195	1660
1995	1.169	0.310	-1.071	-2.397	1	1.326	1.489	2278
1996	0.398	0.378	-2.148	-2.201	1	0.053	0.059	2771
1997	0.885	0.219	-1.349	-2.745	1	1.396	1.568	1608
1998	3.016	0.664	-0.123	-1.637	1	1.514	1.700	4871
1999	0.651	0.376	-1.656	-2.204	1	0.548	0.615	2762
2000	1.245	0.641	-1.008	-1.672	1	0.663	0.745	4705
2001	0.069	0.206	-3.901	-2.805	1	-1.096	-1.231	1515
2002	1.191	0.341	-1.052	-2.302	1	1.250	1.404	2504

Partial Variance: 1.004

Spring
Tuned to: 1-Jan and number
 For ages: 3

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	14.753	5.632	1.744	0.781	1	0.963	1.082	27907
1974	2.607	1.893	0.011	-0.309	1	0.320	0.359	9380
1975	0.406	0.648	-1.849	-1.381	1	-0.468	-0.526	3212
1976	0.536	0.555	-1.571	-1.536	1	-0.035	-0.039	2749
1977	2.758	1.718	0.067	-0.406	1	0.473	0.531	8514
1978	1.791	1.030	-0.364	-0.918	1	0.553	0.622	5103
1979	1.601	3.391	-0.477	0.274	1	-0.751	-0.843	16803
1980	4.298	2.481	0.511	-0.039	1	0.549	0.617	12293
1981	4.817	2.438	0.625	-0.056	1	0.681	0.765	12078
1982	5.610	4.585	0.777	0.576	1	0.202	0.227	22719
1983	8.803	12.208	1.228	1.555	1	-0.327	-0.367	60492
1984	0.902	5.141	-1.050	0.690	1	-1.740	-1.955	25473
1985	0.406	0.732	-1.849	-1.260	1	-0.589	-0.661	3625
1986	0.916	1.041	-1.035	-0.907	1	-0.128	-0.144	5158
1987	0.701	0.685	-1.302	-1.326	1	0.024	0.027	3392
1988	0.125	0.293	-3.027	-2.176	1	-0.851	-0.956	1450
1989	0.537	1.412	-1.569	-0.602	1	-0.967	-1.086	6995
1990	15.349	12.257	1.784	1.559	1	0.225	0.253	60731
1991	2.509	2.025	-0.027	-0.242	1	0.214	0.241	10032
1992	0.571	0.771	-1.508	-1.208	1	-0.300	-0.337	3819
1993	0.112	0.200	-3.136	-2.556	1	-0.581	-0.652	992
1994	0.016	0.152	-5.082	-2.831	1	-2.251	-2.529	753
1995	0.068	0.138	-3.635	-2.930	1	-0.705	-0.792	682
1996	1.303	0.320	-0.683	-2.086	1	1.404	1.577	1586
1997	1.144	0.380	-0.813	-1.915	1	1.103	1.238	1882
1998	0.386	0.247	-1.899	-2.346	1	0.447	0.502	1223
1999	1.930	0.711	-0.290	-1.288	1	0.998	1.121	3525
2000	1.006	0.437	-0.941	-1.775	1	0.833	0.936	2166
2001	1.158	0.674	-0.801	-1.342	1	0.541	0.608	3339
2002	0.235	0.200	-2.395	-2.556	1	0.161	0.181	991

Partial Variance: 0.687

Spring
Tuned to: 1-Jan and number
 For ages: 4

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	8.335	5.167	1.880	1.401	1	0.478	0.537	16078
1974	5.016	3.867	1.372	1.112	1	0.260	0.292	12035
1975	0.665	0.852	-0.649	-0.401	1	-0.248	-0.279	2653
1976	0.256	0.297	-1.603	-1.454	1	-0.150	-0.168	925
1977	0.242	0.380	-1.660	-1.209	1	-0.451	-0.507	1182
1978	0.778	0.818	-0.492	-0.442	1	-0.050	-0.056	2545
1979	0.255	0.713	-1.607	-0.579	1	-1.029	-1.155	2220
1980	2.684	1.901	0.746	0.401	1	0.345	0.388	5915
1981	2.502	1.317	0.676	0.034	1	0.642	0.721	4097
1982	1.406	0.974	0.100	-0.267	1	0.367	0.412	3032
1983	0.598	1.803	-0.755	0.348	1	-1.103	-1.239	5609
1984	2.110	3.460	0.506	1.000	1	-0.495	-0.555	10766
1985	0.480	0.889	-0.975	-0.358	1	-0.617	-0.693	2767
1986	0.237	0.321	-1.681	-1.376	1	-0.304	-0.342	1000
1987	0.167	0.390	-2.031	-1.183	1	-0.848	-0.952	1213
1988	0.174	0.204	-1.990	-1.831	1	-0.158	-0.178	634
1989	0.113	0.226	-2.421	-1.729	1	-0.692	-0.777	702
1990	2.194	0.867	0.545	-0.383	1	0.928	1.043	2699
1991	4.156	3.579	1.184	1.034	1	0.150	0.168	11136
1992	1.597	1.137	0.227	-0.113	1	0.340	0.382	3537
1993	0.441	0.395	-1.060	-1.170	1	0.110	0.124	1229
1994	0.000	0.000	0	0	1	0.000	0.000	00
1995	0.092	0.107	-2.627	-2.472	1	-0.155	-0.174	334
1996	0.566	0.127	-0.810	-2.304	1	1.494	1.678	395
1997	0.327	0.235	-1.359	-1.688	1	0.329	0.369	732
1998	0.161	0.156	-2.067	-2.098	1	0.031	0.034	486
1999	0.349	0.137	-1.294	-2.227	1	0.933	1.048	427
2000	0.559	0.253	-0.823	-1.617	1	0.794	0.892	786
2001	0.240	0.253	-1.668	-1.616	1	-0.052	-0.058	786
2002	0.200	0.468	-1.850	-1.001	1	-0.849	-0.954	1455

Partial Variance: 0.398

Spring
Tuned to: 1-Jan and number
 For ages: 5

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	6.432	3.641	2.448	1.879	1	0.569	0.639	8927
1974	2.891	2.425	1.649	1.473	1	0.176	0.198	5945
1975	0.709	1.299	0.243	0.849	1	-0.605	-0.680	3185
1976	0.245	0.469	-0.819	-0.171	1	-0.649	-0.729	1149
1977	0.154	0.188	-1.284	-1.083	1	-0.201	-0.226	462
1978	0.253	0.208	-0.787	-0.984	1	0.197	0.222	509
1979	0.124	0.307	-1.500	-0.592	1	-0.908	-1.020	754
1980	0.261	0.349	-0.756	-0.465	1	-0.291	-0.327	856
1981	0.580	0.562	0.042	0.011	1	0.031	0.035	1378
1982	0.467	0.288	-0.174	-0.656	1	0.482	0.541	707
1983	0.191	0.327	-1.068	-0.531	1	-0.537	-0.603	801
1984	0.354	0.544	-0.451	-0.021	1	-0.430	-0.483	1334
1985	0.714	0.595	0.250	0.068	1	0.182	0.205	1459
1986	0.124	0.198	-1.500	-1.033	1	-0.467	-0.525	485
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.294	0.063	-0.637	-2.172	1	1.535	1.724	155
1989	0.000	0.000	0	0	1	0.000	0.000	00
1990	0.079	0.064	-1.951	-2.161	1	0.210	0.236	157
1991	0.539	0.086	-0.031	-1.867	1	1.836	2.062	211
1992	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.071	0.170	-2.058	-1.184	1	-0.874	-0.982	417
1994	0.068	0.148	-2.101	-1.323	1	-0.778	-0.874	363
1995	0.019	0.032	-3.376	-2.844	1	-0.533	-0.598	79
1996	0.072	0.031	-2.044	-2.893	1	0.850	0.954	75
1997	0.067	0.040	-2.116	-2.628	1	0.512	0.575	98
1998	0.036	0.046	-2.737	-2.492	1	-0.246	-0.276	113
1999	0.074	0.049	-2.017	-2.422	1	0.406	0.456	121
2000	0.043	0.036	-2.559	-2.728	1	0.169	0.189	89
2001	0.082	0.098	-1.914	-1.740	1	-0.174	-0.195	239
2002	0.067	0.106	-2.116	-1.656	1	-0.460	-0.516	260

Partial Variance: 0.465

Spring
Tuned to: 1-Jan and number
 For ages: 6

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	7.987	4.967	2.601	2.126	1	0.475	0.534	11005
1974	1.154	1.165	0.666	0.675	1	-0.009	-0.010	2580
1975	0.531	0.691	-0.110	0.153	1	-0.263	-0.296	1531
1976	0.338	0.525	-0.562	-0.122	1	-0.440	-0.494	1162
1977	0.189	0.241	-1.143	-0.899	1	-0.244	-0.275	535
1978	0.126	0.057	-1.549	-2.341	1	0.792	0.890	126
1979	0.018	0.087	-3.494	-1.915	1	-1.579	-1.774	193
1980	0.070	0.100	-2.136	-1.783	1	-0.353	-0.397	221
1981	0.113	0.107	-1.657	-1.709	1	0.051	0.058	238
1982	0.135	0.056	-1.480	-2.367	1	0.888	0.997	123
1983	0.000	0.000	0	0	1	0.000	0.000	00
1984	0.262	0.139	-0.816	-1.452	1	0.635	0.713	308
1985	0.135	0.134	-1.480	-1.483	1	0.004	0.004	298
1986	0.016	0.086	-3.612	-1.927	1	-1.685	-1.893	191
1987	0.000	0.000	0	0	1	0.000	0.000	00
1988	0.029	0.022	-3.018	-3.294	1	0.276	0.310	49
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	0.060	0.021	-2.290	-3.328	1	1.037	1.165	47
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	0.019	0.095	-3.440	-1.831	1	-1.609	-1.808	210
1995	0.037	0.008	-2.774	-4.310	1	1.536	1.726	18
1996	0.000	0.000	0	0	1	0.000	0.000	00
1997	0.000	0.000	0	0	1	0.000	0.000	00
1998	0.021	0.011	-3.340	-3.981	1	0.640	0.719	25
1999	0.000	0.000	0	0	1	0.000	0.000	00
2000	0.000	0.000	0	0	1	0.000	0.000	00
2001	0.023	0.027	-3.249	-3.097	1	-0.152	-0.171	59
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 0.807

Spring
Tuned to: 1-Jan and number
 For ages: 7

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	1.166	1.299	1.305	1.413	1	-0.108	-0.121	2006
1974	1.462	1.792	1.532	1.735	1	-0.204	-0.229	2769
1975	0.353	0.813	0.110	0.945	1	-0.834	-0.937	1256
1976	0.126	0.653	-0.920	0.726	1	-1.646	-1.848	1009
1977	0.225	0.386	-0.340	0.199	1	-0.539	-0.606	596
1978	0.291	0.157	-0.083	-0.697	1	0.615	0.690	243
1979	0.044	0.037	-1.972	-2.156	1	0.184	0.207	57
1980	0.035	0.041	-2.201	-2.034	1	-0.166	-0.187	64
1981	0.000	0.000	0	0	1	0.000	0.000	00
1982	0.017	0.007	-2.923	-3.823	1	0.901	1.012	11
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	0.019	0.039	-2.812	-2.099	1	-0.713	-0.801	60
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	0.000	0.000	0	0	1	0.000	0.000	00
1993	0.000	0.000	0	0	1	0.000	0.000	00
1994	0.000	0.000	0	0	1	0.000	0.000	00
1995	0.032	0.013	-2.290	-3.199	1	0.908	1.020	20
1996	0.000	0.000	0	0	1	0.000	0.000	00
1997	0.000	0.000	0	0	1	0.000	0.000	00
1998	0.000	0.000	0	0	1	0.000	0.000	00
1999	0.023	0.005	-2.621	-4.222	1	1.602	1.799	07
2000	0.000	0.000	0	0	1	0.000	0.000	00
2001	0.000	0.000	0	0	1	0.000	0.000	00
2002	0.000	0.000	0	0	0	0.000	0.000	00

Partial Variance: 0.824

Winter
Tuned to: 1-Jan and number
 For ages: 1

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.000	0.000	0	0	1	0.000	0.000	00
1974	0.000	0.000	0	0	1	0.000	0.000	00
1975	0.000	0.000	0	0	1	0.000	0.000	00
1976	0.000	0.000	0	0	1	0.000	0.000	00
1977	0.000	0.000	0	0	1	0.000	0.000	00
1978	0.000	0.000	0	0	1	0.000	0.000	00
1979	0.000	0.000	0	0	1	0.000	0.000	00
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.000	0.000	0	0	1	0.000	0.000	00
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	0.011	0.077	-2.683	-0.741	1	-1.942	-2.181	2267
1993	0.596	0.069	1.309	-0.846	1	2.155	2.421	2041
1994	0.366	0.100	0.822	-0.477	1	1.299	1.459	2953
1995	0.090	0.115	-0.581	-0.338	1	-0.243	-0.273	3392
1996	0.041	0.067	-1.367	-0.872	1	-0.495	-0.556	1988
1997	0.156	0.201	-0.031	0.224	1	-0.255	-0.286	5951
1998	0.118	0.114	-0.310	-0.343	1	0.033	0.037	3377
1999	0.243	0.195	0.412	0.190	1	0.222	0.249	5753
2000	0.109	0.064	-0.389	-0.924	1	0.534	0.600	1889
2001	0.028	0.104	-1.749	-0.441	1	-1.307	-1.469	3060
2002	0.012	0.000	-2.596	0	0	0.000	0.000	00

Partial Variance: 1.277

Winter
Tuned to: 1-Jan and number
 For ages: 2

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.000	0.000	0	0	1	0.000	0.000	00
1974	0.000	0.000	0	0	1	0.000	0.000	00
1975	0.000	0.000	0	0	1	0.000	0.000	00
1976	0.000	0.000	0	0	1	0.000	0.000	00
1977	0.000	0.000	0	0	1	0.000	0.000	00
1978	0.000	0.000	0	0	1	0.000	0.000	00
1979	0.000	0.000	0	0	1	0.000	0.000	00
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.000	0.000	0	0	1	0.000	0.000	00
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	1.619	3.601	-0.945	-0.146	1	-0.799	-0.898	2817
1993	1.924	1.821	-0.773	-0.828	1	0.055	0.062	1425
1994	8.654	2.121	0.731	-0.675	1	1.406	1.579	1660
1995	10.681	2.912	0.941	-0.358	1	1.300	1.460	2278
1996	1.285	3.542	-1.177	-0.163	1	-1.014	-1.139	2771
1997	2.380	2.056	-0.560	-0.707	1	0.147	0.165	1608
1998	7.841	6.226	0.632	0.401	1	0.231	0.259	4871
1999	2.909	3.530	-0.359	-0.166	1	-0.194	-0.217	2762
2000	4.917	6.014	0.165	0.367	1	-0.201	-0.226	4705
2001	0.895	1.936	-1.538	-0.766	1	-0.772	-0.867	1515
2002	2.735	3.201	-0.421	-0.264	1	-0.157	-0.177	2504

Partial Variance: 0.623

Winter
Tuned to: 1-Jan and number
 For ages: 3

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.000	0.000	0	0	1	0.000	0.000	00
1974	0.000	0.000	0	0	1	0.000	0.000	00
1975	0.000	0.000	0	0	1	0.000	0.000	00
1976	0.000	0.000	0	0	1	0.000	0.000	00
1977	0.000	0.000	0	0	1	0.000	0.000	00
1978	0.000	0.000	0	0	1	0.000	0.000	00
1979	0.000	0.000	0	0	1	0.000	0.000	00
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.000	0.000	0	0	1	0.000	0.000	00
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	3.477	8.029	-0.305	0.532	1	-0.837	-0.940	3819
1993	1.057	2.085	-1.496	-0.816	1	-0.679	-0.763	992
1994	0.742	1.583	-1.850	-1.092	1	-0.758	-0.851	753
1995	2.698	1.434	-0.559	-1.191	1	0.632	0.710	682
1996	8.235	3.335	0.557	-0.347	1	0.904	1.015	1586
1997	9.785	3.957	0.730	-0.176	1	0.905	1.017	1882
1998	1.596	2.572	-1.084	-0.607	1	-0.477	-0.536	1223
1999	10.176	7.412	0.769	0.452	1	0.317	0.356	3525
2000	3.006	4.554	-0.451	-0.035	1	-0.415	-0.467	2166
2001	8.542	7.020	0.594	0.398	1	0.196	0.220	3339
2002	2.578	2.085	-0.604	-0.817	1	0.212	0.239	991

Partial Variance: 0.445

Winter
Tuned to: 1-Jan and number
 For ages: 4

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.000	0.000	0	0	1	0.000	0.000	00
1974	0.000	0.000	0	0	1	0.000	0.000	00
1975	0.000	0.000	0	0	1	0.000	0.000	00
1976	0.000	0.000	0	0	1	0.000	0.000	00
1977	0.000	0.000	0	0	1	0.000	0.000	00
1978	0.000	0.000	0	0	1	0.000	0.000	00
1979	0.000	0.000	0	0	1	0.000	0.000	00
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.000	0.000	0	0	1	0.000	0.000	00
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	8.063	7.722	1.334	1.291	1	0.043	0.049	3537
1993	2.487	2.684	0.158	0.234	1	-0.076	-0.085	1229
1994	1.654	0.890	-0.250	-0.870	1	0.620	0.697	407
1995	0.597	0.730	-1.269	-1.069	1	-0.201	-0.225	334
1996	0.851	0.863	-0.915	-0.900	1	-0.014	-0.016	395
1997	2.958	1.599	0.331	-0.284	1	0.615	0.691	732
1998	1.158	1.061	-0.607	-0.694	1	0.088	0.099	486
1999	0.777	0.932	-1.006	-0.823	1	-0.182	-0.205	427
2000	1.160	1.717	-0.605	-0.213	1	-0.392	-0.440	786
2001	1.615	1.717	-0.274	-0.213	1	-0.061	-0.069	786
2002	2.047	3.177	-0.037	0.403	1	-0.440	-0.494	1455

Partial Variance: 0.123

Winter
Tuned to: 1-Jan and number
 For ages: 5

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.000	0.000	0	0	1	0.000	0.000	00
1974	0.000	0.000	0	0	1	0.000	0.000	00
1975	0.000	0.000	0	0	1	0.000	0.000	00
1976	0.000	0.000	0	0	1	0.000	0.000	00
1977	0.000	0.000	0	0	1	0.000	0.000	00
1978	0.000	0.000	0	0	1	0.000	0.000	00
1979	0.000	0.000	0	0	1	0.000	0.000	00
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.000	0.000	0	0	1	0.000	0.000	00
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	0.959	0.531	0.972	0.381	1	0.592	0.664	338
1993	0.292	0.655	-0.217	0.592	1	-0.809	-0.908	417
1994	0.966	0.570	0.980	0.452	1	0.527	0.592	363
1995	0.253	0.125	-0.360	-1.068	1	0.708	0.795	79
1996	0.140	0.119	-0.952	-1.118	1	0.166	0.187	75
1997	0.529	0.155	0.378	-0.852	1	1.230	1.381	98
1998	0.112	0.177	-1.175	-0.716	1	-0.459	-0.515	113
1999	0.311	0.190	-0.154	-0.647	1	0.493	0.554	121
2000	0.073	0.140	-1.603	-0.953	1	-0.650	-0.730	89
2001	0.254	0.376	-0.356	0.035	1	-0.391	-0.440	239
2002	0.100	0.409	-1.288	0.119	1	-1.407	-1.581	260

Partial Variance: 0.646

Scall
Tuned to: mean and number
 For ages: 1

Year	Obs.	Pred.	Ln Scd. Obs.	Ln Scd. Pred.	Wt.	Wt. Res.	Std. Res.	Pred. Stk. Sze.
1973	0.000	0.000	0	0	1	0.000	0.000	00
1974	0.000	0.000	0	0	1	0.000	0.000	00
1975	0.000	0.000	0	0	1	0.000	0.000	00
1976	0.000	0.000	0	0	1	0.000	0.000	00
1977	0.000	0.000	0	0	1	0.000	0.000	00
1978	0.000	0.000	0	0	1	0.000	0.000	00
1979	0.000	0.000	0	0	1	0.000	0.000	00
1980	0.000	0.000	0	0	1	0.000	0.000	00
1981	0.000	0.000	0	0	1	0.000	0.000	00
1982	0.362	1.854	-0.467	1.166	1	-1.633	-1.835	58127
1983	0.255	0.441	-0.818	-0.270	1	-0.548	-0.615	13824
1984	0.180	0.546	-1.166	-0.056	1	-1.110	-1.246	17118
1985	0.465	0.572	-0.217	-0.011	1	-0.206	-0.232	17919
1986	0.015	0.204	-3.651	-1.040	1	-2.611	-2.933	6403
1987	0.054	0.410	-2.370	-0.343	1	-2.027	-2.276	12847
1988	7.359	3.493	2.545	1.799	1	0.745	0.837	109512
1989	0.579	0.513	0.002	-0.118	1	0.120	0.135	16093
1990	0.158	0.231	-1.296	-0.918	1	-0.378	-0.425	7232
1991	0.151	0.107	-1.342	-1.689	1	0.347	0.390	3344
1992	0.108	0.058	-1.677	-2.301	1	0.624	0.701	1814
1993	0.170	0.059	-1.223	-2.285	1	1.061	1.192	1844
1994	0.573	0.083	-0.008	-1.941	1	1.933	2.171	2601
1995	0.072	0.098	-2.082	-1.775	1	-0.308	-0.346	3071
1996	0.120	0.057	-1.572	-2.313	1	0.742	0.833	1792
1997	0.736	0.172	0.242	-1.211	1	1.454	1.633	5393
1998	0.253	0.098	-0.826	-1.779	1	0.953	1.070	3059
1999	0.357	0.166	-0.481	-1.246	1	0.764	0.859	5212
2000	0.082	0.054	-1.952	-2.369	1	0.416	0.468	1695
2001	0.063	0.088	-2.216	-1.877	1	-0.339	-0.381	2773
2002	0.020	0.000	-3.363	0	0	0.000	0.000	00

Partial Variance: 1.303

Partial variance (and proportion of total) by index

Index	Partial Variance	Proportion
Fall 1	0.606	0.036
Fall 2	0.83	0.049
Fall 3	0.513	0.03
Fall 4	0.564	0.033
Fall 5	0.688	0.04
Fall 6	1.134	0.067
Fall 7	2.818	0.166
Spring 1	1.274	0.075
Spring 2	1.004	0.059
Spring 3	0.687	0.04
Spring 4	0.398	0.023
Spring 5	0.465	0.027
Spring 6	0.807	0.047
Spring 7	0.824	0.048
Winter 1	1.277	0.075
Winter 2	0.623	0.037
Winter 3	0.445	0.026
Winter 4	0.123	0.007
Winter 5	0.646	0.038
Scall 1	1.303	0.076

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

	1973	1974	1975	1976	1977	1978	1979
Fall1	-0.653	-0.077	-0.265	0.689	-0.466	-0.621	-0.504
Fall2	-0.117	-0.581	-0.622	0.914	0.221	0.273	-0.003
Fall3	0.305	-0.795	-0.900	0.150	-0.508	-0.739	-0.096
Fall4	0.285	0.374	-0.427	-1.056	-1.309	-0.109	-0.053
Fall5	0.477	0.061	-0.712	-0.886	-0.290	-1.124	-1.355
Fall6	-0.795	-0.055	-1.653	0.085	-0.761	-1.228	-0.013
Fall7	-1.782	-1.717	-2.157	-0.321	-1.338	-0.370	0.000
Spring1	0.886	1.915	0.292	-2.335	1.463	1.947	1.432
Spring2	0.920	-0.890	0.091	0.613	-0.035	0.827	-0.580
Spring3	1.082	0.359	-0.526	-0.039	0.531	0.622	-0.843
Spring4	0.537	0.292	-0.279	-0.168	-0.507	-0.056	-1.155
Spring5	0.639	0.198	-0.680	-0.729	-0.226	0.222	-1.020
Spring6	0.534	-0.010	-0.296	-0.494	-0.275	0.890	-1.774
Spring7	-0.121	-0.229	-0.937	-1.848	-0.606	0.690	0.207
Winter1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter3	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter4	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter5	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Scall1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Col Avg	0.157	-0.083	-0.648	-0.388	-0.293	0.087	-0.443

	1980	1981	1982	1983	1984	1985	1986
Fall1	-1.154	-0.072	-0.937	0.608	0.048	-0.574	0.177
Fall2	0.087	0.906	0.400	0.801	0.275	-1.461	0.506
Fall3	-0.546	0.165	0.874	0.183	-0.111	-1.033	0.170
Fall4	-0.633	-0.610	0.665	-0.155	-1.012	-1.193	0.294
Fall5	0.000	-0.010	1.099	-1.121	0.000	0.000	-0.634
Fall6	0.000	0.381	0.000	0.000	0.000	0.000	0.000
Fall7	0.000	0.000	0.000	0.419	0.000	0.000	0.000
Spring1	0.632	-0.452	-1.490	-2.485	-1.667	0.421	-1.556
Spring2	0.654	1.512	0.129	-0.329	-1.373	-0.283	0.378
Spring3	0.617	0.765	0.227	-0.367	-1.955	-0.661	-0.144
Spring4	0.388	0.721	0.412	-1.239	-0.555	-0.693	-0.342
Spring5	-0.327	0.035	0.541	-0.603	-0.483	0.205	-0.525
Spring6	-0.397	0.058	0.997	0.000	0.713	0.004	-1.893
Spring7	-0.187	0.000	1.012	0.000	0.000	-0.801	0.000
Winter1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter3	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter4	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter5	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Scall1	0.000	0.000	-1.835	-0.615	-1.246	-0.232	-2.933
Col Avg	-0.079	0.283	0.161	-0.409	-0.670	-0.525	-0.542

	1987	1988	1989	1990	1991	1992	1993
Fall1	0.030	-0.793	-2.115	-0.091	0.873	0.153	0.899
Fall2	-0.006	-1.612	-0.095	0.030	-1.255	-2.672	-1.929
Fall3	0.315	-0.211	0.686	-0.490	0.437	-1.859	0.205
Fall4	-1.245	1.439	0.128	0.133	-0.445	0.113	-0.210
Fall5	-0.012	0.932	0.000	0.000	0.000	0.000	0.000
Fall6	0.000	1.851	0.000	0.000	0.000	0.000	0.000
Fall7	2.101	0.000	0.000	0.000	0.000	0.000	0.000
Spring1	0.000	-1.501	0.047	0.272	2.125	0.670	-0.123
Spring2	-2.446	-1.599	-0.176	-1.580	-0.408	-2.267	0.297
Spring3	0.027	-0.956	-1.086	0.253	0.241	-0.337	-0.652
Spring4	-0.952	-0.178	-0.777	1.043	0.168	0.382	0.124
Spring5	0.000	1.724	0.000	0.236	2.062	0.000	-0.982
Spring6	0.000	0.310	0.000	0.000	1.165	0.000	0.000
Spring7	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter1	0.000	0.000	0.000	0.000	0.000	-2.181	2.421
Winter2	0.000	0.000	0.000	0.000	0.000	-0.898	0.062
Winter3	0.000	0.000	0.000	0.000	0.000	-0.940	-0.763
Winter4	0.000	0.000	0.000	0.000	0.000	0.049	-0.085
Winter5	0.000	0.000	0.000	0.000	0.000	0.664	-0.908
Scall1	-2.276	0.837	0.135	-0.425	0.390	0.701	1.192
Col Avg	-0.446	0.019	-0.361	-0.062	0.487	-0.602	-0.030

	1994	1995	1996	1997	1998	1999	2000
Fall1	1.401	-0.651	1.268	0.712	1.439	1.211	-1.155
Fall2	1.137	0.925	-0.841	1.025	1.086	0.086	1.168
Fall3	0.258	1.220	0.632	2.414	-0.007	-0.086	0.336
Fall4	1.452	1.483	0.000	1.722	0.063	-0.345	0.837
Fall5	1.192	0.000	0.000	0.914	0.000	1.468	0.000
Fall6	-0.043	0.000	0.000	0.000	2.232	0.000	0.000
Fall7	0.000	2.055	0.000	0.000	0.000	0.000	3.110
Spring1	-0.537	-0.693	0.000	0.021	0.937	-0.376	0.157
Spring2	0.195	1.489	0.059	1.568	1.700	0.615	0.745
Spring3	-2.529	-0.792	1.577	1.238	0.502	1.121	0.936
Spring4	0.000	-0.174	1.678	0.369	0.034	1.048	0.892
Spring5	-0.874	-0.598	0.954	0.575	-0.276	0.456	0.189
Spring6	-1.808	1.726	0.000	0.000	0.719	0.000	0.000
Spring7	0.000	1.020	0.000	0.000	0.000	1.799	0.000
Winter1	1.459	-0.273	-0.556	-0.286	0.037	0.249	0.600
Winter2	1.579	1.460	-1.139	0.165	0.259	-0.217	-0.226
Winter3	-0.851	0.710	1.015	1.017	-0.536	0.356	-0.467
Winter4	0.697	-0.225	-0.016	0.691	0.099	-0.205	-0.440
Winter5	0.592	0.795	0.187	1.381	-0.515	0.554	-0.730
Scall1	2.171	-0.346	0.833	1.633	1.070	0.859	0.468
Col Avg	0.323	0.507	0.435	0.947	0.520	0.505	0.401

	2001	2002
Fall1	0.622	0.000
Fall2	1.355	0.000
Fall3	-0.968	0.000
Fall4	-0.189	0.000
Fall5	0.000	0.000
Fall6	0.000	0.000
Fall7	0.000	0.000
Spring1	0.000	0.000
Spring2	-1.231	1.404
Spring3	0.608	0.181
Spring4	-0.058	-0.954
Spring5	-0.195	-0.516
Spring6	-0.171	0.000
Spring7	0.000	0.000
Winter1	-1.469	0.000
Winter2	-0.867	-0.177
Winter3	0.220	0.239
Winter4	-0.069	-0.494
Winter5	-0.440	-1.581
Scall1	-0.381	0.000
Col Avg	-0.216	-0.173

Percent of total sum of squares by index and year; with row/column sums

	1973	1974	1975	1976	1977	1978	1979
Fall1	0.113	0.002	0.019	0.125	0.057	0.102	0.067
Fall2	0.004	0.089	0.102	0.221	0.013	0.020	0.000
Fall3	0.025	0.167	0.214	0.006	0.068	0.144	0.002
Fall4	0.022	0.037	0.048	0.295	0.453	0.003	0.001
Fall5	0.060	0.001	0.134	0.208	0.022	0.334	0.485
Fall6	0.167	0.001	0.723	0.002	0.153	0.399	0.000
Fall7	0.840	0.780	1.231	0.027	0.474	0.036	0.000
Spring1	0.208	0.970	0.023	1.443	0.566	1.003	0.542
Spring2	0.224	0.209	0.002	0.099	0.000	0.181	0.089
Spring3	0.310	0.034	0.073	0.000	0.075	0.102	0.188
Spring4	0.076	0.023	0.021	0.007	0.068	0.001	0.353
Spring5	0.108	0.010	0.122	0.141	0.013	0.013	0.275
Spring6	0.075	0.000	0.023	0.065	0.020	0.209	0.832
Spring7	0.004	0.014	0.232	0.904	0.097	0.126	0.011
Winter1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter3	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter4	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter5	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Scall1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
++	2.235	2.337	2.968	3.543	2.081	2.674	2.847

	1980	1981	1982	1983	1984	1985	1986
Fall1	0.352	0.001	0.232	0.098	0.001	0.087	0.008
Fall2	0.002	0.217	0.042	0.170	0.020	0.565	0.068
Fall3	0.079	0.007	0.202	0.009	0.003	0.282	0.008
Fall4	0.106	0.098	0.117	0.006	0.271	0.377	0.023
Fall5	0.000	0.000	0.319	0.333	0.000	0.000	0.106
Fall6	0.000	0.038	0.000	0.000	0.000	0.000	0.000
Fall7	0.000	0.000	0.000	0.046	0.000	0.000	0.000
Spring1	0.106	0.054	0.588	1.634	0.735	0.047	0.641
Spring2	0.113	0.605	0.004	0.029	0.498	0.021	0.038
Spring3	0.101	0.155	0.014	0.036	1.011	0.116	0.005
Spring4	0.040	0.138	0.045	0.406	0.082	0.127	0.031
Spring5	0.028	0.000	0.078	0.096	0.062	0.011	0.073
Spring6	0.042	0.001	0.263	0.000	0.135	0.000	0.948
Spring7	0.009	0.000	0.271	0.000	0.000	0.170	0.000
Winter1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter3	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter4	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter5	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Scall1	0.000	0.000	0.891	0.100	0.411	0.014	2.276
++	0.978	1.314	3.065	2.963	3.228	1.817	4.224

	1987	1988	1989	1990	1991	1992	1993
Fall1	0.000	0.166	1.183	0.002	0.201	0.006	0.214
Fall2	0.000	0.687	0.002	0.000	0.417	1.888	0.985
Fall3	0.026	0.012	0.124	0.064	0.050	0.914	0.011
Fall4	0.410	0.548	0.004	0.005	0.052	0.003	0.012
Fall5	0.000	0.230	0.000	0.000	0.000	0.000	0.000
Fall6	0.000	0.906	0.000	0.000	0.000	0.000	0.000
Fall7	1.168	0.000	0.000	0.000	0.000	0.000	0.000
Spring1	0.000	0.596	0.001	0.020	1.194	0.119	0.004
Spring2	1.583	0.676	0.008	0.660	0.044	1.360	0.023
Spring3	0.000	0.242	0.312	0.017	0.015	0.030	0.112
Spring4	0.240	0.008	0.160	0.288	0.007	0.039	0.004
Spring5	0.000	0.786	0.000	0.015	1.125	0.000	0.255
Spring6	0.000	0.025	0.000	0.000	0.359	0.000	0.000
Spring7	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Winter1	0.000	0.000	0.000	0.000	0.000	1.259	1.551
Winter2	0.000	0.000	0.000	0.000	0.000	0.213	0.001
Winter3	0.000	0.000	0.000	0.000	0.000	0.234	0.154
Winter4	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Winter5	0.000	0.000	0.000	0.000	0.000	0.117	0.218
Scall1	1.371	0.185	0.005	0.048	0.040	0.130	0.376
++	4.798	5.069	1.799	1.118	3.507	6.313	3.922

	1994	1995	1996	1997	1998	1999	2000
Fall1	0.519	0.112	0.426	0.134	0.547	0.388	0.353
Fall2	0.342	0.226	0.187	0.278	0.312	0.002	0.361
Fall3	0.018	0.394	0.106	1.542	0.000	0.002	0.030
Fall4	0.558	0.582	0.000	0.785	0.001	0.032	0.185
Fall5	0.376	0.000	0.000	0.221	0.000	0.570	0.000
Fall6	0.000	0.000	0.000	0.000	1.318	0.000	0.000
Fall7	0.000	1.117	0.000	0.000	0.000	0.000	2.559
Spring1	0.076	0.127	0.000	0.000	0.232	0.037	0.007
Spring2	0.010	0.587	0.001	0.650	0.765	0.100	0.147
Spring3	1.692	0.166	0.658	0.406	0.067	0.332	0.232
Spring4	0.000	0.008	0.745	0.036	0.000	0.291	0.210
Spring5	0.202	0.095	0.241	0.087	0.020	0.055	0.009
Spring6	0.865	0.788	0.000	0.000	0.137	0.000	0.000
Spring7	0.000	0.275	0.000	0.000	0.000	0.856	0.000
Winter1	0.563	0.020	0.082	0.022	0.000	0.016	0.095
Winter2	0.660	0.564	0.343	0.007	0.018	0.013	0.014
Winter3	0.192	0.133	0.273	0.274	0.076	0.034	0.058
Winter4	0.128	0.013	0.000	0.126	0.003	0.011	0.051
Winter5	0.093	0.167	0.009	0.505	0.070	0.081	0.141
Scall1	1.247	0.032	0.184	0.705	0.303	0.195	0.058
++	7.540	5.407	3.253	5.778	3.869	3.015	4.510

	2001	2002	++
Fall1	0.102	0.000	5.621
Fall2	0.486	0.000	7.706
Fall3	0.248	0.000	4.758
Fall4	0.009	0.000	5.043
Fall5	0.000	0.000	3.400
Fall6	0.000	0.000	3.709
Fall7	0.000	0.000	8.278
Spring1	0.000	0.000	10.972
Spring2	0.401	0.521	9.651
Spring3	0.098	0.009	6.606
Spring4	0.001	0.241	3.695
Spring5	0.010	0.071	4.003
Spring6	0.008	0.000	4.794
Spring7	0.000	0.000	2.969
Winter1	0.571	0.000	4.178
Winter2	0.199	0.008	2.039
Winter3	0.013	0.015	1.454
Winter4	0.001	0.065	0.401
Winter5	0.051	0.661	2.114
Scall1	0.038	0.000	8.609
++	2.236	1.590	100.000

STOCK NUMBERS (Jan 1) in thousands - C:\all_work\yt\2002\SNEMA\snemayt_2002_wg.7

	1973	1974	1975	1976	1977	1978	1979
1	43532	10627	31562	14634	50316	54165	32034
2	17681	35442	7921	17779	11788	36207	36476
3	27907	9380	3212	2749	8514	5103	16803
4	16078	12035	2653	925	1182	2545	2220
5	8927	5945	3185	1149	462	509	754
6	11005	2580	1531	1162	535	126	193
7	2006	2769	1256	1009	596	243	57
1+	127136	78777	51320	39409	73393	98899	88537

	1980	1981	1982	1983	1984	1985	1986
1	44493	138470	64223	16726	19164	20993	7315
2	26042	35518	113335	52429	11280	15223	15161
3	12293	12078	22719	60492	25473	3625	5158
4	5915	4097	3032	5609	10766	2767	1000
5	856	1378	707	801	1334	1459	485
6	221	238	123	203	308	298	191
7	64	32	11	62	36	60	32
1+	89884	191811	204151	136323	68361	44425	29342

	1987	1988	1989	1990	1991	1992	1993
1	15044	124008	17769	8083	3934	2267	2041
2	5570	10875	96192	14526	6444	2817	1425
3	3392	1450	6995	60731	10032	3819	992
4	1213	634	702	2699	11136	3537	1229
5	244	155	61	157	211	338	417
6	75	49	06	07	47	21	08
7	13	11	00	00	23	06	00
1+	25551	137183	121725	86202	31827	12804	6112

	1994	1995	1996	1997	1998	1999	2000
1	2953	3392	1988	5951	3377	5753	1889
2	1660	2278	2771	1608	4871	2762	4705
3	753	682	1586	1882	1223	3525	2166
4	407	334	395	732	486	427	786
5	363	79	75	98	113	121	89
6	210	18	37	08	25	19	06
7	07	20	13	09	07	07	04
1+	6353	6803	6866	10289	10101	12615	9645

	2001	2002
1	3060	00
2	1515	2504
3	3339	991
4	786	1455
5	239	260
6	59	79
7	35	31
1+	9033	5321

FISHING MORTALITY - C:\all_work\yt\2002\SNEMA\snemayt_2002_wg.7

	1973	1974	1975	1976	1977	1978	1979
1	0.01	0.09	0.37	0.02	0.13	0.20	0.01
2	0.43	2.20	0.86	0.54	0.64	0.57	0.89
3	0.64	1.06	1.04	0.64	1.01	0.63	0.84
4	0.79	1.13	0.64	0.50	0.64	1.02	0.75
5	1.04	1.16	0.81	0.57	1.10	0.77	1.03
6	0.76	1.15	0.85	0.60	0.99	0.76	0.86
7	0.76	1.15	0.85	0.60	0.99	0.76	0.86

	1980	1981	1982	1983	1984	1985	1986
1	0.03	0.00	0.00	0.19	0.03	0.13	0.07
2	0.57	0.25	0.43	0.52	0.94	0.88	1.30
3	0.90	1.18	1.20	1.53	2.02	1.09	1.25
4	1.26	1.56	1.13	1.24	1.80	1.54	1.21
5	1.08	2.22	1.05	0.76	1.30	1.83	1.67
6	1.04	1.38	1.24	1.58	2.12	1.41	1.33
7	1.04	1.38	1.24	1.58	2.12	1.41	1.33

	1987	1988	1989	1990	1991	1992	1993
1	0.12	0.05	0.00	0.03	0.13	0.26	0.01
2	1.15	0.24	0.26	0.17	0.32	0.84	0.44
3	1.48	0.53	0.75	1.50	0.84	0.93	0.69
4	1.86	2.13	1.30	2.35	3.29	1.94	1.02
5	1.41	3.06	1.99	1.00	2.13	3.55	0.48
6	1.66	0.89	0.82	1.62	1.60	1.40	0.81
7	1.66	0.89	0.82	1.62	1.60	1.40	0.81

	1994	1995	1996	1997	1998	1999	2000
1	0.06	0.00	0.01	0.00	0.00	0.00	0.02
2	0.69	0.16	0.19	0.07	0.12	0.04	0.14
3	0.61	0.34	0.57	1.15	0.85	1.30	0.81
4	1.44	1.29	1.19	1.67	1.19	1.37	0.99
5	2.82	0.57	2.11	1.19	1.58	2.84	0.21
6	1.10	0.58	0.71	1.33	1.00	1.40	0.85
7	1.10	0.58	0.71	1.33	1.00	1.40	0.85

	2001
1	0.00
2	0.22
3	0.63
4	0.91
5	0.91
6	0.91
7	0.91

4,6
Average F for 4,6

	1973	1974	1975	1976	1977	1978	1979
4,6	0.87	1.15	0.76	0.55	0.91	0.85	0.88

	1980	1981	1982	1983	1984	1985	1986
4,6	1.12	1.72	1.14	1.19	1.74	1.60	1.40

	1987	1988	1989	1990	1991	1992	1993
4,6	1.64	2.03	1.37	1.66	2.34	2.30	0.77

	1994	1995	1996	1997	1998	1999	2000
4,6	1.79	0.81	1.34	1.40	1.25	1.87	0.68

	2001
4,6	0.91

BACKCALCULATED PARTIAL RECRUITMENT

	1973	1974	1975	1976	1977	1978	1979
1	0.01	0.04	0.36	0.03	0.12	0.19	0.01
2	0.42	1.00	0.82	0.83	0.58	0.56	0.86
3	0.62	0.48	1.00	1.00	0.92	0.62	0.82
4	0.76	0.51	0.61	0.77	0.59	1.00	0.73
5	1.00	0.53	0.77	0.88	1.00	0.76	1.00
6	0.73	0.52	0.81	0.94	0.90	0.75	0.84
7	0.73	0.52	0.81	0.94	0.90	0.75	0.84

	1980	1981	1982	1983	1984	1985	1986
1	0.02	0.00	0.00	0.12	0.01	0.07	0.04
2	0.45	0.11	0.35	0.33	0.44	0.48	0.78
3	0.72	0.53	0.97	0.97	0.95	0.59	0.75
4	1.00	0.70	0.92	0.78	0.85	0.84	0.73
5	0.86	1.00	0.85	0.48	0.61	1.00	1.00
6	0.83	0.62	1.00	1.00	1.00	0.77	0.80
7	0.83	0.62	1.00	1.00	1.00	0.77	0.80

	1987	1988	1989	1990	1991	1992	1993
1	0.07	0.02	0.00	0.01	0.04	0.07	0.01
2	0.62	0.08	0.13	0.07	0.10	0.24	0.43
3	0.80	0.17	0.38	0.64	0.26	0.26	0.68
4	1.00	0.70	0.65	1.00	1.00	0.55	1.00
5	0.76	1.00	1.00	0.43	0.65	1.00	0.48
6	0.89	0.29	0.41	0.69	0.48	0.40	0.79
7	0.89	0.29	0.41	0.69	0.48	0.40	0.79

	1994	1995	1996	1997	1998	1999	2000
1	0.02	0.00	0.01	0.00	0.00	0.00	0.02
2	0.24	0.13	0.09	0.04	0.08	0.02	0.14
3	0.22	0.27	0.27	0.69	0.54	0.46	0.82
4	0.51	1.00	0.56	1.00	0.76	0.48	1.00
5	1.00	0.44	1.00	0.71	1.00	1.00	0.21
6	0.39	0.45	0.34	0.80	0.63	0.49	0.86
7	0.39	0.45	0.34	0.80	0.63	0.49	0.86

	2001
1	0.00
2	0.25
3	0.70
4	1.00
5	1.00
6	1.00
7	1.00

MEAN BIOMASS (using catch mean weights at age)

	1973	1974	1975	1976	1977	1978	1979
1	8263	1869	5235	3001	9218	10469	5469
2	3876	4135	1413	3813	2260	7406	6693
3	6567	1875	691	758	1883	1327	3796
4	3819	2636	777	332	403	789	680
5	1953	1428	873	401	133	216	256
6	2956	609	434	434	150	56	80
7	625	730	397	397	208	100	22
1+	28060	13282	9818	9135	14255	20362	16995

	1980	1981	1982	1983	1984	1985	1986
1	8207	17568	13137	2419	3115	3279	1191
2	5107	7505	22136	9747	1598	2418	2232
3	2864	2238	4318	9766	3018	744	902
4	1557	915	836	1477	1807	535	248
5	329	310	267	344	337	314	129
6	111	80	54	78	78	85	60
7	40	08	05	24	05	20	13
1+	18215	28623	40753	23855	9958	7396	4775

	1987	1988	1989	1990	1991	1992	1993
1	3173	29568	5005	2177	689	303	225
2	821	2576	26062	3970	1315	553	373
3	581	409	1777	11052	2100	841	282
4	208	121	201	444	1279	634	320
5	63	28	18	70	55	53	194
6	20	24	04	03	20	08	05
7	05	06	00	00	06	04	00
1+	4870	32732	33068	17715	5464	2395	1400

	1994	1995	1996	1997	1998	1999	2000
1	177	378	265	755	496	1152	58
2	223	572	857	405	1224	711	1402
3	182	211	451	428	311	805	647
4	89	80	100	158	148	121	279
5	65	37	17	31	41	26	55
6	84	09	17	04	12	10	04
7	03	10	07	06	04	04	02
1+	823	1295	1714	1787	2235	2828	2447

	2001
1	424
2	467
3	994
4	296
5	110
6	34
7	21
1+	2345

00

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

	1973	1974	1975	1976	1977	1978	1979
1	1091	248	704	396	1226	1397	722
2	2974	2970	1090	2933	1742	5701	5164
3	6704	1912	705	773	1922	1354	3879
4	3983	2739	809	345	420	822	709
5	2033	1483	910	417	138	225	267
6	3082	633	452	451	157	58	84
7	652	758	414	414	216	104	23
1+	20518	10742	5084	5730	5820	9662	10847

	1980	1981	1982	1983	1984	1985	1986
1	1085	2318	1734	323	412	436	158
2	3932	5716	16980	7496	1233	1866	1707
3	2927	2276	4388	9789	2920	758	915
4	1612	934	869	1529	1816	547	257
5	342	300	278	359	348	315	131
6	115	82	56	79	76	88	62
7	42	08	06	25	05	21	13
1+	10054	11635	24309	19600	6810	4030	3244

	1987	1988	1989	1990	1991	1992	1993
1	422	3916	661	288	92	41	30
2	630	1962	19864	3013	1005	426	286
3	583	416	1816	11096	2146	859	288
4	208	118	208	424	1075	630	333
5	65	24	18	73	54	43	201
6	20	25	04	03	20	08	05
7	05	07	00	00	06	04	00
1+	1934	6467	22570	14896	4397	2011	1144

	1994	1995	1996	1997	1998	1999	2000
1	23	50	35	100	65	152	08
2	172	433	651	306	926	536	1062
3	185	214	460	435	318	815	661
4	91	82	103	161	154	125	290
5	59	38	17	32	41	23	57
6	87	09	18	04	13	10	04
7	03	10	07	06	04	04	03
1+	622	837	1291	1043	1521	1665	2085

	2001
1	56
2	355
3	1014
4	308
5	115
6	35
7	22
1+	1905

The number of bootstraps: 500

Bootstrap Output Variable: N hat

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
N 2	2504	2616	903	0.36
N 3	991	1005	286	0.29
N 4	1455	1519	535	0.37
N 5	260	268	96	0.37

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
N 2	111	40	4.45	2393	0.377183	1706	3851
N 3	13	13	1.33	978	0.291857	670	1412
N 4	64	24	4.40	1391	0.384760	978	2329
N 5	08	04	2.96	253	0.379237	169	413

Bootstrap Output Variable: Q_unscaled

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
q Fall1	0.0000808	0.0000808	0.0000104	0.13
q Fall2	0.0001481	0.0001487	0.0000196	0.13
q Fall3	0.0001650	0.0001663	0.0000238	0.14
q Fall4	0.0001766	0.0001783	0.0000246	0.14
q Fall5	0.0002000	0.0002016	0.0000379	0.19
q Fall6	0.0002205	0.0002253	0.0000481	0.22
q Fall7	0.0006139	0.0006278	0.0001346	0.22
q Spring1	0.0000087	0.0000088	0.0000012	0.14
q Spring2	0.0001363	0.0001378	0.0000177	0.13
q Spring3	0.0002018	0.0002046	0.0000260	0.13
q Spring4	0.0003214	0.0003253	0.0000444	0.14
q Spring5	0.0004079	0.0004140	0.0000579	0.14
q Spring6	0.0004513	0.0004622	0.0000775	0.17
q Spring7	0.0006472	0.0006572	0.0001314	0.20
q Winter1	0.0000338	0.0000345	0.0000079	0.23
q Winter2	0.0012783	0.0013130	0.0002887	0.23
q Winter3	0.0021025	0.0021916	0.0004958	0.24
q Winter4	0.0021832	0.0022407	0.0004851	0.22
q Winter5	0.0015704	0.0015940	0.0003468	0.22
q Scall1	0.0000319	0.0000327	0.0000052	0.16

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
q Fall1	-0.00000007	0.000000463	-0.092	0.000080916	0.13	0.0000696	0.0000970
q Fall2	0.00000064	0.000000877	0.433	0.000147436	0.13	0.0001253	0.0001761
q Fall3	0.00000135	0.000001063	0.820	0.000163604	0.15	0.0001331	0.0001972
q Fall4	0.00000174	0.000001100	0.988	0.000174815	0.14	0.0001491	0.0002117
q Fall5	0.00000155	0.000001695	0.774	0.000198467	0.19	0.0001596	0.0002567
q Fall6	0.00000479	0.000002152	2.173	0.000215704	0.22	0.0001640	0.0002780
q Fall7	0.00001390	0.000006018	2.264	0.000600007	0.22	0.0004825	0.0008119
q Spring1	0.00000004	0.000000054	0.437	0.000008706	0.14	0.0000073	0.0000105
q Spring2	0.00000148	0.000000793	1.088	0.000134809	0.13	0.0001140	0.0001603
q Spring3	0.00000281	0.000001165	1.394	0.000199007	0.13	0.0001706	0.0002365
q Spring4	0.00000397	0.000001986	1.235	0.000317388	0.14	0.0002681	0.0003838
q Spring5	0.00000609	0.000002590	1.493	0.000401781	0.14	0.0003272	0.0004783
q Spring6	0.00001086	0.000003465	2.406	0.000440473	0.18	0.0003525	0.0005474
q Spring7	0.00000996	0.000005878	1.539	0.000637248	0.21	0.0005042	0.0008452
q Winter1	0.00000065	0.000000354	1.916	0.000033180	0.24	0.0000261	0.0000468
q Winter2	0.00003473	0.000012911	2.717	0.001243555	0.23	0.0009529	0.0016541
q Winter3	0.00008911	0.000022175	4.238	0.002013365	0.25	0.0015846	0.0027634
q Winter4	0.00005752	0.000021694	2.634	0.002125698	0.23	0.0015969	0.0027981
q Winter5	0.00002359	0.000015508	1.502	0.001546815	0.22	0.0012007	0.0020593
q Scall1	0.00000078	0.000000233	2.434	0.000031120	0.17	0.0000260	0.0000383

Bootstrap Output Variable: N t1

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
Age 1	12073.0	12069.0	192.0	0.0159
Age 2	2504.2	2615.6	902.6	0.3604
Age 3	991.5	1004.7	285.5	0.2880
Age 4	1455.3	1519.3	535.3	0.3678
Age 5	260.2	267.9	95.8	0.3680
Age 6	79.2	81.5	29.1	0.3680
Age 7	31.1	32.0	11.5	0.3693

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
Age 1	-4.06	8.59	-0.034	12077.08	0.02	11838.2	12316.1
Age 2	111.35	40.36	4.447	2392.88	0.38	1705.6	3850.5
Age 3	13.22	12.77	1.333	978.26	0.29	670.3	1411.7
Age 4	63.97	23.94	4.396	1391.36	0.38	978.5	2328.8
Age 5	7.69	4.28	2.955	252.53	0.38	168.9	413.0
Age 6	2.34	1.30	2.955	76.83	0.38	51.4	125.7
Age 7	0.93	0.51	2.980	30.18	0.38	20.2	49.4

Bootstrap Output Variable: F t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
Age 1	0.0004	0.0004	0.0001	0.36
Age 2	0.2239	0.2369	0.0663	0.30
Age 3	0.6305	0.6535	0.1717	0.27
Age 4	0.9060	0.9446	0.2350	0.26
Age 5	0.9060	0.9446	0.2350	0.26
Age 6	0.9060	0.9446	0.2350	0.26
Age 7	0.9060	0.9446	0.2350	0.26

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
Age 1	0.0000244	0.0000059	6.762	0.0003368	0.39	0.0002	0.0005
Age 2	0.0129957	0.0029659	5.804	0.2109237	0.31	0.1618	0.3144
Age 3	0.0230126	0.0076774	3.650	0.6074698	0.28	0.4370	0.8347
Age 4	0.0386459	0.0105101	4.266	0.8673368	0.27	0.6547	1.1830
Age 5	0.0386459	0.0105101	4.266	0.8673368	0.27	0.6547	1.1830
Age 6	0.0386459	0.0105101	4.266	0.8673368	0.27	0.6547	1.1830
Age 7	0.0386459	0.0105101	4.266	0.8673368	0.27	0.6547	1.1830

Bootstrap Output Variable: F full t

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
0.9060	0.9446	0.2350	0.26

BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
0.03865	0.01051	4.27	0.86734	0.27	0.6547	1.1830

Bootstrap Output Variable: PR t

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
Age 1	0.0004	0.0004	0.0002	0.42
Age 2	0.2472	0.2585	0.0886	0.36
Age 3	0.6959	0.7028	0.1893	0.27
Age 4	1.0000	0.9826	0.0628	0.06
Age 5	1.0000	0.9826	0.0628	0.06
Age 6	1.0000	0.9826	0.0628	0.06
Age 7	1.0000	0.9826	0.0628	0.06

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
Age 1	0.00002	0.000008	5.57	0.00037654	0.45	0.0002	0.0006
Age 2	0.01135	0.003962	4.59	0.23581026	0.38	0.1568	0.3695
Age 3	0.00690	0.008466	0.99	0.68901412	0.27	0.4486	1.0000
Age 4	-0.01739	0.002809	-1.74	1.01739148	0.06	1.0000	1.0000
Age 5	-0.01739	0.002809	-1.74	1.01739148	0.06	0.4857	1.0000
Age 6	-0.01739	0.002809	-1.74	1.01739148	0.06	0.8500	1.0000
Age 7	-0.01739	0.002809	-1.74	1.01739148	0.06	0.8500	1.0000

Bootstrap Output Variable: PR mean

	NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
Age 1	0.0015	0.0015	0.0003	0.17
Age 2	0.0814	0.0816	0.0103	0.13
Age 3	0.6398	0.6360	0.0581	0.09
Age 4	0.7839	0.7787	0.0243	0.03
Age 5	0.5926	0.5890	0.0178	0.03
Age 6	0.7509	0.7460	0.0205	0.03
Age 7	0.7509	0.7460	0.0205	0.03

	BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
Age 1	0.00002	0.0000117	1.16	0.0014842	0.18	0.0012	0.0019
Age 2	0.00018	0.0004585	0.22	0.0812317	0.13	0.0675	0.0933
Age 3	-0.00376	0.0025972	-0.59	0.6435728	0.09	0.5549	0.7144
Age 4	-0.00518	0.0010885	-0.66	0.7890372	0.03	0.7510	0.7956
Age 5	-0.00358	0.0007954	-0.60	0.5961522	0.03	0.5716	0.6010
Age 6	-0.00489	0.0009181	-0.65	0.7557880	0.03	0.7279	0.7573
Age 7	-0.00489	0.0009181	-0.65	0.7557880	0.03	0.7279	0.7573

Bootstrap Output Variable: Mean Biomass

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
2345.3292	2406.5608	371.0577	0.16

BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
61.2316	16.5942	2.61	2284.0977	0.16	1884.2525	2750.0318

Bootstrap Output Variable: SSB female mean

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
917.5135	938.9216	158.9272	0.17

BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
21.408	7.107	2.33	896.105	0.18	739.0302	1102.0618

Bootstrap Output Variable: SSB spawn t

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
1905.5690	1947.7482	328.0158	0.17

BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
42.18	14.67	2.21	1863.39	0.18	1531.9580	2283.3856

Bootstrap Output Variable: Jan 1 biomass

NLLS ESTIMATE	BOOTSTRAP MEAN	BOOTSTRAP StdError	C.V. FOR NLLS SOLN
2788.5938	2857.2002	376.5306	0.14

BIAS ESTIMATE	BIAS STD ERROR	PERCENT BIAS	NLLS EST CORRECTED FOR BIAS	C.V. FOR CORRECTED ESTIMATE	LOWER 80%CI	UPPER 80%CI
68.61	16.84	2.46	2719.99	0.14	2320.80	3191.17

```
Projection Input:
SNE-MA yellowtail SAW 36
      2002 ! first year
         9 ! number of years
        10 ! recruitment simulations
    123456 ! seed
         0 ! age-2 recruitment?
         0 ! F and quota basis?
         1 ! discards?
         0 ! quota-based?
         0 ! constant catch?
         0 ! F target?
         0 ! index?
         1 ! thresholds?
         0 ! market categories?
         0 ! total mortality?
         0 ! PR?
         1 ! constant discards?
         1 ! bounded recruitment?
         1 ! constant M?
         1 ! bootstrap abundance?
         7 1 7 ! ages, first and last
    0.2        ! M
    0.131 0.310 0.418 0.525 0.671 0.869 0.976 ! spawn wts
    0.201 0.339 0.420 0.528 0.672 0.876 0.968 ! landed wts
    0.131 0.277 0.396 0.495 0.649 0.716 0.591 ! discard wts
    0.13    0.74    0.98    1.00    1.00    1.00    1.00  ! maturity
    0.42 ! spawning time
      14 ! recruitment option
      39 ! hindcast recruitment
 182892327 172024752 275646040 431913366 291823020
 171800743 129205446 54628713 179950495 40162129 22014851 8603342 18977723
 24303218 28325495 25737624 18472772 14269802 77224807 25241337 23761139
 17871287 10756188 7504950 13210396 54077970 2451733 6673267 7275990 2073020
 4111386 9060644 1720297 5547030 10176980 11014851 15320545 610149 4831683
    500  ! number of bootstrap replicates
snemayt.dat
    1000.0  ! bootstrap scaling
   69500000 130200000 0.26 130200000 0.15 ! SSB,Jan1B,Ffull,MeanB,Fwb thresholds
   0.01  0.17 0.64 1.00 1.00 1.00 1.00    ! PR
   1.00  0.39 0.13 0.10 0.08 0.06 0.04    ! proportion discard at age
   0.77 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08  ! schedule of F
```

Projection Output:
PROJECTION RUN: SNE-MA yellowtail SAW 36
INPUT FILE: snemayt.in
OUTPUT FILE: snemayt.out
RECRUITMENT MODEL: 14
NUMBER OF SIMULATIONS: 10

F-BASED PROJECTIONS
TIME-VARYING F

YEAR	F
2002	0.770
2003	0.080
2004	0.080
2005	0.080
2006	0.080
2007	0.080
2008	0.080
2009	0.080
2010	0.080

SPAWNING STOCK BIOMASS (THOUSAND MT)

YEAR	AVG SSB (000 MT)	STD
2002	1.599	0.298
2003	2.860	1.427
2004	13.064	15.107
2005	26.895	25.678
2006	40.607	32.735
2007	53.798	37.935
2008	66.628	42.755
2009	77.313	46.003
2010	85.109	47.370

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2002	1.010	1.145	1.230	1.400	1.576	1.768	1.964	2.109	2.455
2003	1.459	1.635	1.743	1.968	2.316	3.056	4.903	6.155	7.940
2004	2.168	2.781	3.218	4.197	6.347	12.566	34.086	50.377	68.814
2005	3.473	4.788	5.680	8.259	14.216	40.843	67.374	79.008	107.339
2006	5.272	7.569	9.278	13.462	30.733	57.557	88.306	106.690	137.556
2007	7.625	10.536	13.147	20.696	48.275	77.207	107.740	125.456	166.765
2008	10.088	14.348	17.557	29.955	59.017	92.535	127.027	147.530	187.692
2009	12.543	17.810	22.432	41.383	69.407	105.044	141.615	164.215	210.577
2010	15.074	21.368	27.140	50.048	78.121	113.597	149.628	172.825	218.372

ANNUAL PROBABILITY THAT SSB EXCEEDS THRESHOLD: 69.500 THOUSAND MT

YEAR	Pr(SSB > Threshold Value)
2002	0.000
2003	0.000
2004	0.009
2005	0.094
2006	0.191
2007	0.296
2008	0.403
2009	0.499
2010	0.570

MEAN BIOMASS (THOUSAND MT) FOR AGES:1 TO 7

YEAR	AVG MEAN B (000 MT)	STD
2002	2.347	0.438
2003	12.857	16.000
2004	27.036	26.593
2005	41.119	33.791
2006	54.647	38.975
2007	67.652	43.775
2008	80.199	47.993
2009	90.282	50.264
2010	97.850	51.371

PERCENTILES OF MEAN STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2002	1.561	1.719	1.832	2.038	2.285	2.602	2.949	3.123	3.462
2003	2.038	2.445	2.900	3.686	5.582	12.150	35.145	52.908	72.367
2004	3.251	4.517	5.314	7.668	13.393	41.492	69.040	81.475	109.408
2005	5.117	7.166	8.782	12.913	31.047	58.820	90.170	108.789	141.561
2006	7.294	10.348	12.869	20.419	49.264	78.808	109.765	128.767	170.671
2007	10.103	14.271	17.402	30.014	59.633	94.078	129.440	150.296	191.361
2008	12.864	17.985	22.830	42.846	72.269	109.076	147.397	171.181	216.355
2009	15.378	22.150	28.210	53.864	83.806	120.543	159.873	182.652	229.137
2010	17.723	26.220	34.072	59.425	91.292	129.136	168.028	192.651	244.075

ANNUAL PROBABILITY THAT MEAN BIOMASS EXCEEDS THRESHOLD: 130.200 THOUSAND MT

YEAR	Pr(MEAN B > Threshold Value)
2002	0.000
2003	0.000
2004	0.003
2005	0.019
2006	0.047
2007	0.098
2008	0.148
2009	0.203
2010	0.247

F WEIGHTED BY MEAN BIOMASS FOR AGES:1 TO 7

YEAR	AVG F_WT_B	STD
2002	0.339	0.055
2003	0.019	0.012
2004	0.019	0.010
2005	0.029	0.013
2006	0.040	0.017
2007	0.048	0.017
2008	0.053	0.017
2009	0.056	0.016
2010	0.058	0.015

PERCENTILES OF F WEIGHTED BY MEAN BIOMASS FOR AGES:1 TO 7

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2002	0.213	0.248	0.263	0.298	0.340	0.377	0.407	0.432	0.455
2003	0.002	0.003	0.003	0.009	0.019	0.028	0.035	0.040	0.046
2004	0.003	0.005	0.006	0.013	0.018	0.025	0.032	0.037	0.047
2005	0.005	0.008	0.011	0.018	0.029	0.040	0.047	0.049	0.052
2006	0.008	0.013	0.017	0.026	0.041	0.052	0.065	0.071	0.076
2007	0.012	0.017	0.022	0.035	0.049	0.061	0.071	0.073	0.077
2008	0.015	0.022	0.028	0.041	0.055	0.067	0.073	0.075	0.078
2009	0.017	0.026	0.033	0.047	0.059	0.069	0.074	0.076	0.078
2010	0.020	0.029	0.036	0.049	0.061	0.070	0.075	0.076	0.078

ANNUAL PROBABILITY THAT F WEIGHTED BY MEAN BIOMASS EXCEEDS THRESHOLD: 0.150

YEAR	Pr(F_WT_B > Threshold Value)
2002	1.000
2003	0.000
2004	0.000
2005	0.000
2006	0.000
2007	0.000
2008	0.000
2009	0.000
2010	0.000

TOTAL STOCK BIOMASS (THOUSAND MT)

YEAR	AVG TOTAL B (000 MT)	STD
2002	2.738	0.486
2003	10.062	11.516
2004	24.662	24.707
2005	40.440	34.024
2006	55.877	40.800
2007	70.739	46.438
2008	85.083	51.557
2009	96.885	54.654
2010	105.635	56.014

PERCENTILES OF TOTAL STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2002	1.802	2.011	2.155	2.409	2.680	3.033	3.342	3.619	4.147
2003	2.094	2.512	2.817	3.467	4.839	9.568	26.115	38.905	52.614
2004	3.305	4.465	5.209	7.257	12.203	35.879	60.802	77.685	106.955
2005	5.225	7.225	8.751	12.923	28.674	57.674	90.782	109.364	143.211
2006	7.578	10.588	13.253	20.976	48.527	80.248	114.790	134.991	177.643
2007	10.643	14.881	18.235	31.262	62.375	98.908	137.166	158.296	208.638
2008	13.552	19.079	24.064	43.714	75.645	115.795	157.500	183.377	228.320
2009	16.625	23.688	30.492	56.093	89.530	129.495	173.253	198.489	250.636
2010	18.981	28.361	36.776	64.333	98.300	139.949	181.911	208.433	266.101

ANNUAL PROBABILITY THAT TOTAL STOCK BIOMASS EXCEEDS THRESHOLD: 130.200 THOUSAND MT

YEAR	Pr(B > Threshold Value)
2002	0.000
2003	0.000
2004	0.002
2005	0.020
2006	0.058
2007	0.119
2008	0.183
2009	0.247
2010	0.298

RECRUITMENT UNITS ARE:1000. FISH

BIRTH YEAR	AVG RECRUITMENT	STD
2002	58573.279	87822.835
2003	56524.878	84965.556
2004	58471.407	86814.705
2005	57596.970	85476.250
2006	58253.177	87169.046
2007	57140.893	85821.791
2008	55820.108	83912.057
2009	56379.506	85850.529
2010	58637.002	87321.454

PERCENTILES OF RECRUITMENT UNITS ARE:1000. FISH

BIRTH YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2002	1018.267	2071.224	4021.731	8317.955	18503.778	54466.973	180862.574	278699.800	384818.709
2003	1144.985	2064.392	3751.467	8287.612	18627.473	54274.084	179807.293	265690.350	381284.249
2004	1075.200	2144.316	3972.979	8496.329	18515.138	54458.072	180581.827	277279.026	381165.172
2005	1058.458	2072.680	3663.450	7992.174	18518.436	54554.924	180490.794	272068.438	373664.005
2006	921.483	2052.621	4236.482	8431.217	18518.502	54332.282	180924.818	278781.468	377325.052
2007	1074.421	2034.327	3586.985	7731.133	18486.214	54373.408	180345.097	276507.941	373513.187
2008	996.945	2013.260	3825.499	8268.403	18661.578	54186.043	179638.406	262426.739	368414.393
2009	1039.406	2027.709	3775.032	8098.643	18362.350	54248.785	179993.917	276769.805	386213.932
2010	1197.368	2113.122	4112.679	8475.510	18615.929	54416.846	180636.299	276781.524	371811.659

LANDINGS FOR F-BASED PROJECTIONS

YEAR	AVG LANDINGS (000 MT)	STD
2002	0.676	0.149
2003	0.088	0.016
2004	0.254	0.184
2005	0.903	0.973
2006	1.874	1.754
2007	2.825	2.251
2008	3.779	2.658
2009	4.586	2.932
2010	5.190	3.093

PERCENTILES OF LANDINGS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2002	0.390	0.476	0.506	0.568	0.661	0.758	0.859	0.928	1.082
2003	0.057	0.063	0.068	0.077	0.087	0.097	0.108	0.118	0.136
2004	0.104	0.118	0.128	0.146	0.175	0.254	0.515	0.701	0.928
2005	0.157	0.200	0.228	0.298	0.463	0.984	2.250	3.235	4.428
2006	0.249	0.337	0.405	0.593	1.066	2.799	4.588	5.500	7.464
2007	0.372	0.527	0.657	0.976	2.125	3.983	6.123	7.349	9.603
2008	0.531	0.747	0.934	1.489	3.383	5.389	7.595	8.820	11.682
2009	0.692	0.988	1.232	2.102	4.096	6.321	8.764	10.126	12.850
2010	0.842	1.214	1.544	2.734	4.669	7.012	9.488	11.024	14.100

DISCARDS FOR F-BASED PROJECTIONS

YEAR	AVG DISCARDS (000 MT)	STD
2002	0.099	0.019
2003	0.018	0.009
2004	0.082	0.095
2005	0.168	0.162
2006	0.268	0.222
2007	0.345	0.250
2008	0.395	0.262
2009	0.414	0.266
2010	0.428	0.266

PERCENTILES OF DISCARDS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
2002	0.062	0.070	0.076	0.086	0.097	0.109	0.123	0.131	0.150
2003	0.009	0.010	0.011	0.012	0.014	0.019	0.030	0.038	0.048
2004	0.013	0.017	0.020	0.026	0.039	0.079	0.214	0.317	0.433
2005	0.020	0.029	0.034	0.050	0.088	0.256	0.423	0.498	0.677
2006	0.030	0.046	0.057	0.085	0.200	0.380	0.595	0.711	0.944
2007	0.043	0.063	0.080	0.128	0.303	0.493	0.703	0.831	1.087
2008	0.054	0.080	0.100	0.176	0.351	0.553	0.766	0.903	1.134
2009	0.063	0.090	0.117	0.194	0.369	0.570	0.792	0.909	1.200
2010	0.073	0.101	0.128	0.211	0.380	0.584	0.795	0.937	1.202

ANNUAL PROBABILITY FULLY-RECRUITED F EXCEEDS THRESHOLD: 0.260

YEAR	Pr(F > Threshold Value)
2002	1.000
2003	0.000
2004	0.000
2005	0.000
2006	0.000
2007	0.000
2008	0.000
2009	0.000
2010	0.000

Appendix B. Southern New England-Mid Atlantic yellowtail flounder ASPIC.

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SNE-MA Yellowtail (yield and biomass in k mt)                                                                    Page 1
                                                                                                  07 Jan 2003 at 11:53.32

ASPIC -- A Surplus-Production Model Including Covariates (Ver. 3.74)                                             FIT Mode

Author: Michael H. Prager
        National Marine Fisheries Service                                                          ASPIC User's Manual
        Southwest Fisheries Science Center                                                         is available gratis
        3150 Paradise Drive                                                                            from the author
        Tiburon, California 94920  USA


CONTROL PARAMETERS USED (FROM INPUT FILE)
-------------------------------------------------------------------------------------------------------------------------
Number of years analyzed:                      67          Number of bootstrap trials:                              0
Number of data series:                          2          Lower bound on MSY:                          3.333E-01
Objective function computed:             in effort          Upper bound on MSY:                          3.000E+02
Relative conv. criterion (simplex):      1.000E-08          Lower bound on r:                            2.000E-02
Relative conv. criterion (restart):      3.000E-08          Upper bound on r:                            1.000E+01
Relative conv. criterion (effort):       1.000E-04          Random number seed:                            4952335
Maximum F allowed in fitting:                5.000          Monte Carlo search trials:                       50000


PROGRAM STATUS INFORMATION (NON-BOOTSTRAPPED ANALYSIS)                                                        code  0
-------------------------------------------------------------------------------------------------------------------------
Normal convergence.


CORRELATION AMONG INPUT SERIES EXPRESSED AS CPUE (NUMBER OF PAIRWISE OBSERVATIONS BELOW)
-------------------------------------------------------------------------------------------------------------------------
                                    |
 1  Fall Survey                     |   1.000
                                    |      39
                                    |
 2  Spring Survey (lagged)          |   0.805   1.000
                                    |      35      35
                                    ---------------------------------------------------
                                           1       2


GOODNESS-OF-FIT AND WEIGHTING FOR NON-BOOTSTRAPPED ANALYSIS
-------------------------------------------------------------------------------------------------------------------------
                                                    Weighted           Weighted      Current    Suggested    R-squared
Loss component number and title                          SSE    N            MSE       weight       weight      in CPUE

Loss(-1)  SSE in yield                             0.000E+00
Loss( 0)  Penalty for B1R > 2                      0.000E+00    1            N/A    1.000E+00          N/A
Loss( 1)  Fall Survey                              1.993E+01   39     5.387E-01    1.000E+00    9.222E-01        0.350
Loss( 2)  Spring Survey (lagged)                   1.509E+01   35     4.571E-01    1.000E+00    1.087E+00        0.752
TOTAL OBJECTIVE FUNCTION:                        3.50166831E+01

Number of restarts required for convergence:              53
Est. B-ratio coverage index (0 worst, 2 best):         1.8119               < These two measures are defined in Prager
Est. B-ratio nearness index (0 worst, 1 best):         1.0000               <     et al. (1996), Trans. A.F.S. 125:729


MODEL PARAMETER ESTIMATES (NON-BOOTSTRAPPED)
-------------------------------------------------------------------------------------------------------------------------
Parameter                                           Estimate     Starting guess    Estimated   User guess

B1R       Starting biomass ratio, year 1935      1.054E+00          2.000E+00            1            1
MSY       Maximum sustainable yield              2.030E+01          1.000E+01            1            1
r         Intrinsic rate of increase             3.878E-01          5.000E-01            1            1
........  Catchability coefficients by fishery:
q( 1)     Fall Survey                            8.312E-02          1.000E-01            1            1
q( 2)     Spring Survey (lagged)                 1.103E-01          1.000E-01            1            1


MANAGEMENT PARAMETER ESTIMATES (NON-BOOTSTRAPPED)
-------------------------------------------------------------------------------------------------------------------------
Parameter                                           Estimate            Formula         Related quantity

MSY       Maximum sustainable yield              2.030E+01               Kr/4
K         Maximum stock biomass                  2.093E+02
Bmsy      Stock biomass at MSY                   1.047E+02                K/2
Fmsy      Fishing mortality at MSY               1.939E-01                r/2

F(0.1)    Management benchmark                   1.745E-01           0.9*Fmsy
Y(0.1)    Equilibrium yield at F(0.1)            2.009E+01           0.99*MSY

B-ratio   Ratio of B(2002) to Bmsy               1.350E-01
F-ratio   Ratio of F(2001) to Fmsy               4.672E-01
F01-mult  Ratio of F(0.1) to F(2001)             1.926E+00
Y-ratio   Proportion of MSY avail in 2002        2.517E-01          2*Br-Br^2     Ye(2002) = 5.109E+00

........  Fishing effort at MSY in units of each fishery:
fmsy( 1)  Fall Survey                            2.333E+00           r/2q( 1)       f(0.1) = 2.100E+00
```

ESTIMATED POPULATION TRAJECTORY (NON-BOOTSTRAPPED)

Obs	Year or ID	Estimated total F mort	Estimated starting biomass	Estimated average biomass	Observed total yield	Model total yield	Estimated surplus production	Ratio of F mort to Fmsy	Ratio of biomass to Bmsy
1	1935	0.072	1.103E+02	1.162E+02	8.400E+00	8.400E+00	2.003E+01	3.726E-01	1.054E+00
2	1936	0.075	1.219E+02	1.270E+02	9.500E+00	9.500E+00	1.936E+01	3.857E-01	1.165E+00
3	1937	0.078	1.318E+02	1.359E+02	1.060E+01	1.060E+01	1.848E+01	4.023E-01	1.259E+00
4	1938	0.075	1.397E+02	1.432E+02	1.080E+01	1.080E+01	1.754E+01	3.890E-01	1.335E+00
5	1939	0.090	1.464E+02	1.482E+02	1.330E+01	1.330E+01	1.678E+01	4.627E-01	1.399E+00
6	1940	0.134	1.499E+02	1.483E+02	1.990E+01	1.990E+01	1.677E+01	6.922E-01	1.432E+00
7	1941	0.190	1.468E+02	1.419E+02	2.700E+01	2.700E+01	1.772E+01	9.814E-01	1.402E+00
8	1942	0.301	1.375E+02	1.274E+02	3.830E+01	3.830E+01	1.928E+01	1.551E+00	1.314E+00
9	1943	0.219	1.185E+02	1.157E+02	2.530E+01	2.530E+01	2.006E+01	1.127E+00	1.132E+00
10	1944	0.133	1.132E+02	1.156E+02	1.540E+01	1.540E+01	2.007E+01	6.867E-01	1.082E+00
11	1945	0.121	1.179E+02	1.206E+02	1.460E+01	1.460E+01	1.982E+01	6.243E-01	1.127E+00
12	1946	0.121	1.231E+02	1.254E+02	1.520E+01	1.520E+01	1.950E+01	6.253E-01	1.176E+00
13	1947	0.132	1.274E+02	1.286E+02	1.700E+01	1.700E+01	1.923E+01	6.818E-01	1.218E+00
14	1948	0.105	1.297E+02	1.322E+02	1.390E+01	1.390E+01	1.888E+01	5.420E-01	1.239E+00
15	1949	0.048	1.346E+02	1.404E+02	6.800E+00	6.800E+00	1.791E+01	2.498E-01	1.286E+00
16	1950	0.045	1.458E+02	1.507E+02	6.800E+00	6.800E+00	1.635E+01	2.327E-01	1.393E+00
17	1951	0.025	1.553E+02	1.607E+02	4.000E+00	4.000E+00	1.445E+01	1.283E-01	1.484E+00
18	1952	0.026	1.658E+02	1.699E+02	4.400E+00	4.400E+00	1.239E+01	1.335E-01	1.584E+00
19	1953	0.017	1.738E+02	1.776E+02	3.100E+00	3.100E+00	1.043E+01	9.001E-02	1.660E+00
20	1954	0.012	1.811E+02	1.844E+02	2.300E+00	2.300E+00	8.522E+00	6.434E-02	1.730E+00
21	1955	0.018	1.873E+02	1.892E+02	3.400E+00	3.400E+00	7.043E+00	9.266E-02	1.790E+00
22	1956	0.029	1.910E+02	1.914E+02	5.500E+00	5.500E+00	6.355E+00	1.482E-01	1.824E+00
23	1957	0.044	1.918E+02	1.908E+02	8.400E+00	8.400E+00	6.541E+00	2.270E-01	1.833E+00
24	1958	0.070	1.900E+02	1.871E+02	1.310E+01	1.310E+01	7.705E+00	3.611E-01	1.815E+00
25	1959	0.062	1.846E+02	1.833E+02	1.130E+01	1.130E+01	8.850E+00	3.180E-01	1.763E+00
26	1960	0.066	1.821E+02	1.808E+02	1.200E+01	1.200E+01	9.552E+00	3.423E-01	1.740E+00
27	1961	0.101	1.797E+02	1.760E+02	1.770E+01	1.770E+01	1.085E+01	5.185E-01	1.717E+00
28	1962	0.111	1.728E+02	1.695E+02	1.880E+01	1.880E+01	1.251E+01	5.720E-01	1.651E+00
29	1963	0.177	1.665E+02	1.594E+02	2.820E+01	2.820E+01	1.473E+01	9.126E-01	1.591E+00
30	1964	0.215	1.530E+02	1.455E+02	3.131E+01	3.131E+01	1.717E+01	1.109E+00	1.462E+00
31	1965	0.233	1.389E+02	1.325E+02	3.092E+01	3.092E+01	1.883E+01	1.203E+00	1.327E+00
32	1966	0.234	1.268E+02	1.222E+02	2.854E+01	2.854E+01	1.971E+01	1.205E+00	1.212E+00
33	1967	0.324	1.180E+02	1.098E+02	3.564E+01	3.564E+01	2.021E+01	1.673E+00	1.127E+00
34	1968	0.372	1.026E+02	9.460E+01	3.517E+01	3.517E+01	2.007E+01	1.917E+00	9.800E-01
35	1969	0.604	8.747E+01	7.342E+01	4.437E+01	4.437E+01	1.838E+01	3.116E+00	8.357E-01
36	1970	0.520	6.148E+01	5.472E+01	2.847E+01	2.847E+01	1.565E+01	2.683E+00	5.874E-01
37	1971	0.422	4.866E+01	4.585E+01	1.933E+01	1.933E+01	1.388E+01	2.174E+00	4.649E-01
38	1972	0.597	4.322E+01	3.765E+01	2.249E+01	2.249E+01	1.196E+01	3.081E+00	4.129E-01
39	1973	0.479	3.268E+01	3.037E+01	1.455E+01	1.455E+01	1.007E+01	2.471E+00	3.123E-01
40	1974	0.732	2.820E+01	2.335E+01	1.709E+01	1.709E+01	8.032E+00	3.774E+00	2.694E-01
41	1975	0.290	1.915E+01	1.974E+01	5.732E+00	5.732E+00	6.935E+00	1.497E+00	1.829E-01
42	1976	0.153	2.035E+01	2.246E+01	3.436E+00	3.436E+00	7.774E+00	7.889E-01	1.944E-01
43	1977	0.197	2.469E+01	2.654E+01	5.223E+00	5.223E+00	8.985E+00	1.015E+00	2.359E-01
44	1978	0.276	2.845E+01	2.929E+01	8.085E+00	8.085E+00	9.769E+00	1.424E+00	2.718E-01
45	1979	0.327	3.013E+01	3.020E+01	9.883E+00	9.883E+00	1.002E+01	1.688E+00	2.879E-01
46	1980	0.255	3.027E+01	3.144E+01	8.021E+00	8.021E+00	1.036E+01	1.316E+00	2.892E-01
47	1981	0.189	3.261E+01	3.492E+01	6.607E+00	6.607E+00	1.128E+01	9.757E-01	3.116E-01
48	1982	0.451	3.728E+01	3.498E+01	1.576E+01	1.576E+01	1.130E+01	2.324E+00	3.562E-01
49	1983	0.876	3.282E+01	2.536E+01	2.221E+01	2.221E+01	8.617E+00	4.516E+00	3.135E-01
50	1984	0.686	1.922E+01	1.637E+01	1.122E+01	1.122E+01	5.849E+00	3.535E+00	1.837E-01
51	1985	0.345	1.385E+01	1.396E+01	4.817E+00	4.817E+00	5.054E+00	1.779E+00	1.323E-01
52	1986	0.322	1.408E+01	1.437E+01	4.620E+00	4.620E+00	5.189E+00	1.658E+00	1.346E-01
53	1987	0.164	1.465E+01	1.618E+01	2.652E+00	2.652E+00	5.788E+00	8.454E-01	1.400E-01
54	1988	0.140	1.779E+01	1.981E+01	2.782E+00	2.782E+00	6.954E+00	7.241E-01	1.700E-01
55	1989	0.388	2.196E+01	2.152E+01	8.349E+00	8.349E+00	7.489E+00	2.000E+00	2.098E-01
56	1990	1.324	2.110E+01	1.353E+01	1.792E+01	1.792E+01	4.882E+00	6.830E+00	2.016E-01
57	1991	1.140	8.066E+00	5.639E+00	6.430E+00	6.430E+00	2.125E+00	5.880E+00	7.707E-02
58	1992	0.931	3.762E+00	2.894E+00	2.695E+00	2.695E+00	1.106E+00	4.802E+00	3.594E-02
59	1993	0.349	2.173E+00	2.212E+00	7.710E-01	7.710E-01	8.486E-01	1.798E+00	2.076E-02
60	1994	0.272	2.251E+00	2.381E+00	6.480E-01	6.480E-01	9.127E-01	1.404E+00	2.150E-02
61	1995	0.095	2.515E+00	2.915E+00	2.760E-01	2.760E-01	1.115E+00	4.883E-01	2.403E-02
62	1996	0.144	3.354E+00	3.785E+00	5.450E-01	5.450E-01	1.441E+00	7.426E-01	3.204E-02
63	1997	0.174	4.250E+00	4.719E+00	8.200E-01	8.200E-01	1.789E+00	8.962E-01	4.061E-02
64	1998	0.118	5.219E+00	5.958E+00	7.030E-01	7.030E-01	2.244E+00	6.085E-01	4.986E-02
65	1999	0.174	6.760E+00	7.483E+00	1.305E+00	1.305E+00	2.798E+00	8.993E-01	6.459E-02
66	2000	0.107	8.253E+00	9.445E+00	1.012E+00	1.012E+00	3.497E+00	5.526E-01	7.885E-02
67	2001	0.091	1.074E+01	1.236E+01	1.120E+00	1.120E+00	4.509E+00	4.672E-01	1.026E-01
68	2002		1.413E+01						1.350E-01

RESULTS FOR DATA SERIES # 1 (NON-BOOTSTRAPPED) Fall Survey

Data type CC: CPUE-catch series Series weight: 1.000

Obs	Year	Observed CPUE	Estimated CPUE	Estim F	Observed yield	Model yield	Resid in log scale	Resid in yield
1	1935	*	9.662E+00	0.0723	8.400E+00	8.400E+00	0.00000	0.000E+00
2	1936	*	1.056E+01	0.0748	9.500E+00	9.500E+00	0.00000	0.000E+00
3	1937	*	1.129E+01	0.0780	1.060E+01	1.060E+01	0.00000	0.000E+00
4	1938	*	1.190E+01	0.0754	1.080E+01	1.080E+01	0.00000	0.000E+00
5	1939	*	1.232E+01	0.0897	1.330E+01	1.330E+01	0.00000	0.000E+00
6	1940	*	1.232E+01	0.1342	1.990E+01	1.990E+01	0.00000	0.000E+00
7	1941	*	1.179E+01	0.1903	2.700E+01	2.700E+01	0.00000	0.000E+00
8	1942	*	1.059E+01	0.3007	3.830E+01	3.830E+01	0.00000	0.000E+00
9	1943	*	9.620E+00	0.2186	2.530E+01	2.530E+01	0.00000	0.000E+00
10	1944	*	9.612E+00	0.1332	1.540E+01	1.540E+01	0.00000	0.000E+00
11	1945	*	1.002E+01	0.1211	1.460E+01	1.460E+01	0.00000	0.000E+00
12	1946	*	1.042E+01	0.1213	1.520E+01	1.520E+01	0.00000	0.000E+00
13	1947	*	1.069E+01	0.1322	1.700E+01	1.700E+01	0.00000	0.000E+00
14	1948	*	1.099E+01	0.1051	1.390E+01	1.390E+01	0.00000	0.000E+00
15	1949	*	1.167E+01	0.0484	6.800E+00	6.800E+00	0.00000	0.000E+00
16	1950	*	1.253E+01	0.0451	6.800E+00	6.800E+00	0.00000	0.000E+00
17	1951	*	1.336E+01	0.0249	4.000E+00	4.000E+00	0.00000	0.000E+00
18	1952	*	1.412E+01	0.0259	4.400E+00	4.400E+00	0.00000	0.000E+00
19	1953	*	1.476E+01	0.0175	3.100E+00	3.100E+00	0.00000	0.000E+00
20	1954	*	1.532E+01	0.0125	2.300E+00	2.300E+00	0.00000	0.000E+00
21	1955	*	1.573E+01	0.0180	3.400E+00	3.400E+00	0.00000	0.000E+00
22	1956	*	1.591E+01	0.0287	5.500E+00	5.500E+00	0.00000	0.000E+00
23	1957	*	1.586E+01	0.0440	8.400E+00	8.400E+00	0.00000	0.000E+00
24	1958	*	1.555E+01	0.0700	1.310E+01	1.310E+01	0.00000	0.000E+00
25	1959	*	1.523E+01	0.0617	1.130E+01	1.130E+01	0.00000	0.000E+00
26	1960	*	1.503E+01	0.0664	1.200E+01	1.200E+01	0.00000	0.000E+00
27	1961	*	1.463E+01	0.1006	1.770E+01	1.770E+01	0.00000	0.000E+00
28	1962	*	1.409E+01	0.1109	1.880E+01	1.880E+01	0.00000	0.000E+00
29	1963	1.402E+01	1.325E+01	0.1770	2.820E+01	2.820E+01	-0.05707	0.000E+00
30	1964	1.397E+01	1.210E+01	0.2151	3.131E+01	3.131E+01	-0.14409	0.000E+00
31	1965	1.023E+01	1.101E+01	0.2333	3.092E+01	3.092E+01	0.07412	0.000E+00
32	1966	9.033E+00	1.016E+01	0.2336	2.854E+01	2.854E+01	0.11717	0.000E+00
33	1967	1.402E+01	9.130E+00	0.3245	3.564E+01	3.564E+01	-0.42882	0.000E+00
34	1968	1.304E+01	7.863E+00	0.3718	3.517E+01	3.517E+01	-0.50575	0.000E+00
35	1969	1.447E+01	6.102E+00	0.6043	4.437E+01	4.437E+01	-0.86352	0.000E+00
36	1970	1.621E+01	4.548E+00	0.5203	2.847E+01	2.847E+01	-1.27104	0.000E+00
37	1971	8.975E+00	3.811E+00	0.4216	1.933E+01	1.933E+01	-0.85660	0.000E+00
38	1972	3.154E+01	3.129E+00	0.5974	2.249E+01	2.249E+01	-2.31064	0.000E+00
39	1973	3.125E+00	2.524E+00	0.4791	1.455E+01	1.455E+01	-0.21362	0.000E+00
40	1974	1.545E+00	1.941E+00	0.7319	1.709E+01	1.709E+01	0.22799	0.000E+00
41	1975	6.020E-01	1.641E+00	0.2903	5.732E+00	5.732E+00	1.00283	0.000E+00
42	1976	1.954E+00	1.867E+00	0.1530	3.436E+00	3.436E+00	-0.04557	0.000E+00
43	1977	1.125E+00	2.206E+00	0.1968	5.223E+00	5.223E+00	0.67325	0.000E+00
44	1978	2.004E+00	2.434E+00	0.2760	8.085E+00	8.085E+00	0.19455	0.000E+00
45	1979	1.818E+00	2.510E+00	0.3272	9.883E+00	9.883E+00	0.32265	0.000E+00
46	1980	1.354E+00	2.613E+00	0.2551	8.021E+00	8.021E+00	0.65743	0.000E+00
47	1981	4.046E+00	2.902E+00	0.1892	6.607E+00	6.607E+00	-0.33217	0.000E+00
48	1982	5.706E+00	2.907E+00	0.4507	1.576E+01	1.576E+01	-0.67428	0.000E+00
49	1983	4.490E+00	2.108E+00	0.8757	2.221E+01	2.221E+01	-0.75606	0.000E+00
50	1984	1.033E+00	1.361E+00	0.6856	1.122E+01	1.122E+01	0.27566	0.000E+00
51	1985	2.980E-01	1.161E+00	0.3450	4.817E+00	4.817E+00	1.35965	0.000E+00
52	1986	7.540E-01	1.194E+00	0.3216	4.620E+00	4.620E+00	0.45977	0.000E+00
53	1987	4.010E-01	1.345E+00	0.1639	2.652E+00	2.652E+00	1.20988	0.000E+00
54	1988	5.100E-01	1.647E+00	0.1404	2.782E+00	2.782E+00	1.17218	0.000E+00
55	1989	2.359E+00	1.789E+00	0.3879	8.349E+00	8.349E+00	-0.27659	0.000E+00
56	1990	1.305E+00	1.124E+00	1.3244	1.792E+01	1.792E+01	-0.14896	0.000E+00
57	1991	7.550E-01	4.687E-01	1.1402	6.430E+00	6.430E+00	-0.47673	0.000E+00
58	1992	1.470E-01	2.405E-01	0.9312	2.695E+00	2.695E+00	0.49249	0.000E+00
59	1993	1.160E-01	1.838E-01	0.3486	7.710E-01	7.710E-01	0.46034	0.000E+00
60	1994	3.080E-01	1.979E-01	0.2722	6.480E-01	6.480E-01	-0.44252	0.000E+00
61	1995	3.040E-01	2.423E-01	0.0947	2.760E-01	2.760E-01	-0.22695	0.000E+00
62	1996	2.080E-01	3.146E-01	0.1440	5.450E-01	5.450E-01	0.41371	0.000E+00
63	1997	8.510E-01	3.922E-01	0.1738	8.200E-01	8.200E-01	-0.77468	0.000E+00
64	1998	6.550E-01	4.952E-01	0.1180	7.030E-01	7.030E-01	-0.27974	0.000E+00
65	1999	4.680E-01	6.220E-01	0.1744	1.305E+00	1.305E+00	0.28446	0.000E+00
66	2000	7.180E-01	7.850E-01	0.1072	1.012E+00	1.012E+00	0.08921	0.000E+00
67	2001	4.190E-01	1.027E+00	0.0906	1.120E+00	1.120E+00	0.89695	0.000E+00

* Asterisk indicates missing value(s).

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 1

Year	Residual	-4 -3 -2 -1 0 1 2 3 4
1935	0.0000	|
1936	0.0000	|
1937	0.0000	|
1938	0.0000	|
1939	0.0000	|
1940	0.0000	|
1941	0.0000	|
1942	0.0000	|
1943	0.0000	|
1944	0.0000	|
1945	0.0000	|
1946	0.0000	|
1947	0.0000	|
1948	0.0000	|
1949	0.0000	|
1950	0.0000	|
1951	0.0000	|
1952	0.0000	|
1953	0.0000	|
1954	0.0000	|
1955	0.0000	|
1956	0.0000	|
1957	0.0000	|
1958	0.0000	|
1959	0.0000	|
1960	0.0000	|
1961	0.0000	|
1962	0.0000	|
1963	-0.0571	=|
1964	-0.1441	=|
1965	0.0741	|=
1966	0.1172	|=
1967	-0.4288	====|
1968	-0.5057	=====|
1969	-0.8635	=========|
1970	-1.2710	==========|
1971	-0.8566	=========|
1972	-2.3106	========================|
1973	-0.2136	==|
1974	0.2280	|==
1975	1.0028	|==========
1976	-0.0456	|
1977	0.6733	|=======
1978	0.1945	|==
1979	0.3226	|===
1980	0.6574	|=======
1981	-0.3322	===|
1982	-0.6743	=======|
1983	-0.7561	========|
1984	0.2757	|===
1985	1.3596	|==============
1986	0.4598	|=====
1987	1.2099	|============
1988	1.1722	|============
1989	-0.2766	===|
1990	-0.1490	=|
1991	-0.4767	=====|
1992	0.4925	|=====
1993	0.4603	|=====
1994	-0.4425	====|
1995	-0.2270	==|
1996	0.4137	|====
1997	-0.7747	========|
1998	-0.2797	===|
1999	0.2845	|===
2000	0.0892	|=
2001	0.8969	|=========

RESULTS FOR DATA SERIES # 2 (NON-BOOTSTRAPPED) Spring Survey (lagged)

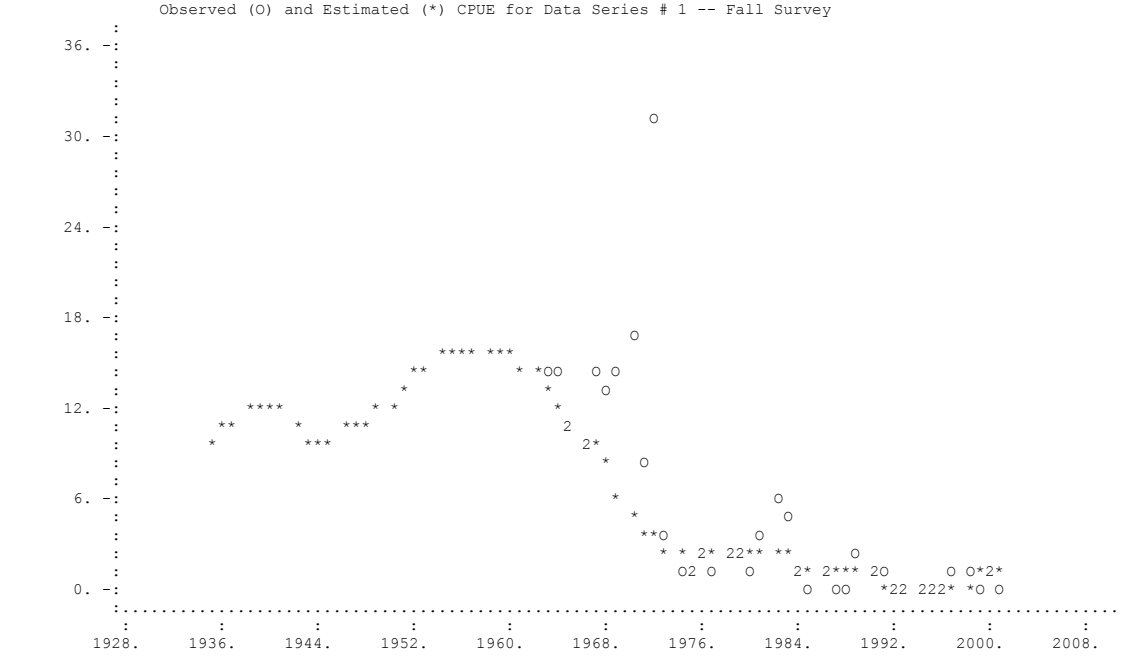
Data type I0: Start-of-year biomass index Series weight: 1.000

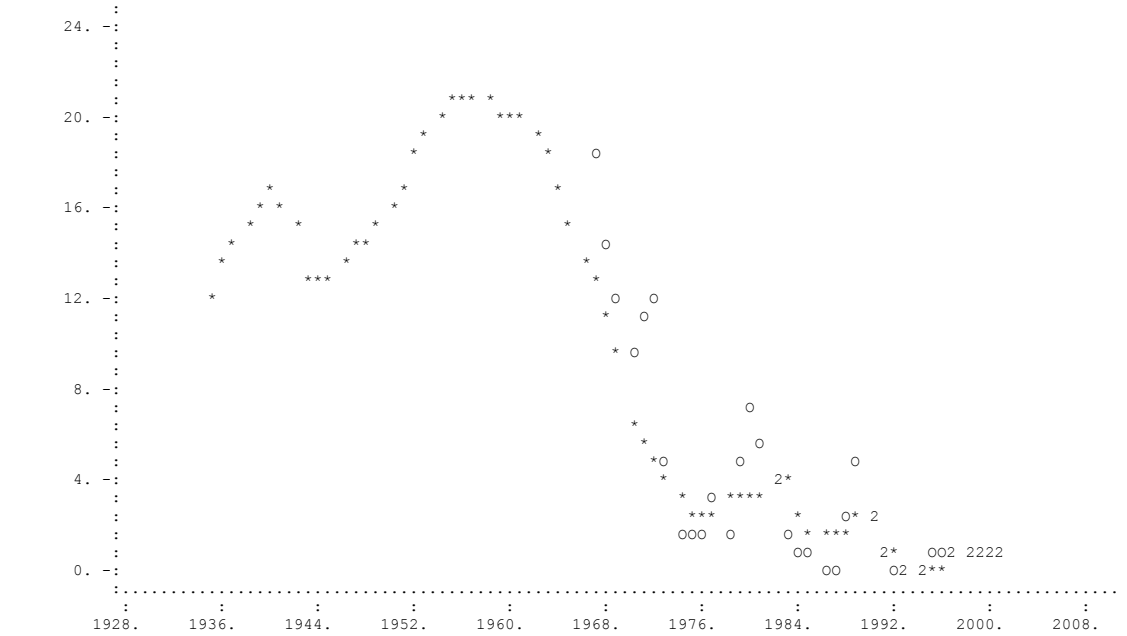
Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Resid in index
1	1935	0.000E+00	0.000E+00	0.0	*	1.217E+01	0.00000	0.0
2	1936	0.000E+00	0.000E+00	0.0	*	1.345E+01	0.00000	0.0
3	1937	0.000E+00	0.000E+00	0.0	*	1.454E+01	0.00000	0.0
4	1938	0.000E+00	0.000E+00	0.0	*	1.541E+01	0.00000	0.0
5	1939	0.000E+00	0.000E+00	0.0	*	1.615E+01	0.00000	0.0
6	1940	0.000E+00	0.000E+00	0.0	*	1.653E+01	0.00000	0.0
7	1941	0.000E+00	0.000E+00	0.0	*	1.619E+01	0.00000	0.0
8	1942	0.000E+00	0.000E+00	0.0	*	1.516E+01	0.00000	0.0
9	1943	0.000E+00	0.000E+00	0.0	*	1.307E+01	0.00000	0.0
10	1944	0.000E+00	0.000E+00	0.0	*	1.249E+01	0.00000	0.0
11	1945	0.000E+00	0.000E+00	0.0	*	1.300E+01	0.00000	0.0
12	1946	0.000E+00	0.000E+00	0.0	*	1.358E+01	0.00000	0.0
13	1947	0.000E+00	0.000E+00	0.0	*	1.405E+01	0.00000	0.0
14	1948	0.000E+00	0.000E+00	0.0	*	1.430E+01	0.00000	0.0
15	1949	0.000E+00	0.000E+00	0.0	*	1.485E+01	0.00000	0.0
16	1950	0.000E+00	0.000E+00	0.0	*	1.608E+01	0.00000	0.0
17	1951	0.000E+00	0.000E+00	0.0	*	1.713E+01	0.00000	0.0
18	1952	0.000E+00	0.000E+00	0.0	*	1.828E+01	0.00000	0.0
19	1953	0.000E+00	0.000E+00	0.0	*	1.916E+01	0.00000	0.0
20	1954	0.000E+00	0.000E+00	0.0	*	1.997E+01	0.00000	0.0
21	1955	0.000E+00	0.000E+00	0.0	*	2.066E+01	0.00000	0.0
22	1956	0.000E+00	0.000E+00	0.0	*	2.106E+01	0.00000	0.0
23	1957	0.000E+00	0.000E+00	0.0	*	2.115E+01	0.00000	0.0
24	1958	0.000E+00	0.000E+00	0.0	*	2.095E+01	0.00000	0.0
25	1959	0.000E+00	0.000E+00	0.0	*	2.035E+01	0.00000	0.0
26	1960	0.000E+00	0.000E+00	0.0	*	2.008E+01	0.00000	0.0
27	1961	0.000E+00	0.000E+00	0.0	*	1.981E+01	0.00000	0.0
28	1962	0.000E+00	0.000E+00	0.0	*	1.906E+01	0.00000	0.0
29	1963	0.000E+00	0.000E+00	0.0	*	1.836E+01	0.00000	0.0
30	1964	0.000E+00	0.000E+00	0.0	*	1.688E+01	0.00000	0.0
31	1965	0.000E+00	0.000E+00	0.0	*	1.532E+01	0.00000	0.0
32	1966	0.000E+00	0.000E+00	0.0	*	1.399E+01	0.00000	0.0
33	1967	1.000E+00	1.000E+00	0.0	1.864E+01	1.301E+01	0.35958	5.631E+00
34	1968	1.000E+00	1.000E+00	0.0	1.431E+01	1.131E+01	0.23518	2.999E+00
35	1969	1.000E+00	1.000E+00	0.0	1.207E+01	9.647E+00	0.22378	2.419E+00
36	1970	1.000E+00	1.000E+00	0.0	9.552E+00	6.781E+00	0.34265	2.771E+00
37	1971	1.000E+00	1.000E+00	0.0	1.081E+01	5.367E+00	0.70066	5.448E+00
38	1972	1.000E+00	1.000E+00	0.0	1.212E+01	4.766E+00	0.93285	7.349E+00
39	1973	1.000E+00	1.000E+00	0.0	4.918E+00	3.605E+00	0.31066	1.313E+00
40	1974	1.000E+00	1.000E+00	0.0	1.307E+00	3.110E+00	-0.86695	-1.803E+00
41	1975	1.000E+00	1.000E+00	0.0	1.666E+00	2.111E+00	-0.23696	-4.455E-01
42	1976	1.000E+00	1.000E+00	0.0	1.963E+00	2.244E+00	-0.13384	-2.811E-01
43	1977	1.000E+00	1.000E+00	0.0	3.513E+00	2.722E+00	0.25492	7.905E-01
44	1978	1.000E+00	1.000E+00	0.0	1.318E+00	3.137E+00	-0.86727	-1.819E+00
45	1979	1.000E+00	1.000E+00	0.0	4.830E+00	3.323E+00	0.37394	1.507E+00
46	1980	1.000E+00	1.000E+00	0.0	6.930E+00	3.339E+00	0.73032	3.591E+00
47	1981	1.000E+00	1.000E+00	0.0	5.865E+00	3.597E+00	0.48902	2.268E+00
48	1982	1.000E+00	1.000E+00	0.0	4.097E+00	4.112E+00	-0.00365	-1.498E-02
49	1983	1.000E+00	1.000E+00	0.0	1.302E+00	3.619E+00	-1.02235	-2.317E+00
50	1984	1.000E+00	1.000E+00	0.0	9.480E-01	2.120E+00	-0.80478	-1.172E+00
51	1985	1.000E+00	1.000E+00	0.0	1.052E+00	1.527E+00	-0.37261	-4.750E-01
52	1986	1.000E+00	1.000E+00	0.0	3.190E-01	1.553E+00	-1.58286	-1.234E+00
53	1987	1.000E+00	1.000E+00	0.0	3.780E-01	1.616E+00	-1.45279	-1.238E+00
54	1988	1.000E+00	1.000E+00	0.0	2.090E+00	1.962E+00	0.06332	1.282E-01
55	1989	1.000E+00	1.000E+00	0.0	5.064E+00	2.422E+00	0.73761	2.642E+00
56	1990	1.000E+00	1.000E+00	0.0	2.508E+00	2.327E+00	0.07488	1.809E-01
57	1991	1.000E+00	1.000E+00	0.0	7.940E-01	8.896E-01	-0.11367	-9.559E-02
58	1992	1.000E+00	1.000E+00	0.0	3.410E-01	4.148E-01	-0.19602	-7.385E-02
59	1993	1.000E+00	1.000E+00	0.0	1.360E-01	2.396E-01	-0.56652	-1.036E-01
60	1994	1.000E+00	1.000E+00	0.0	3.290E-01	2.482E-01	0.28179	8.079E-02
61	1995	1.000E+00	1.000E+00	0.0	7.470E-01	2.774E-01	0.99059	4.696E-01
62	1996	1.000E+00	1.000E+00	0.0	7.890E-01	3.699E-01	0.75755	4.191E-01
63	1997	1.000E+00	1.000E+00	0.0	8.480E-01	4.687E-01	0.59285	3.793E-01
64	1998	1.000E+00	1.000E+00	0.0	1.138E+00	5.756E-01	0.68170	5.624E-01
65	1999	1.000E+00	1.000E+00	0.0	9.900E-01	7.455E-01	0.28360	2.445E-01
66	2000	1.000E+00	1.000E+00	0.0	6.570E-01	9.102E-01	-0.32600	-2.532E-01
67	2001	1.000E+00	1.000E+00	0.0	5.100E-01	1.184E+00	-0.84244	-6.742E-01

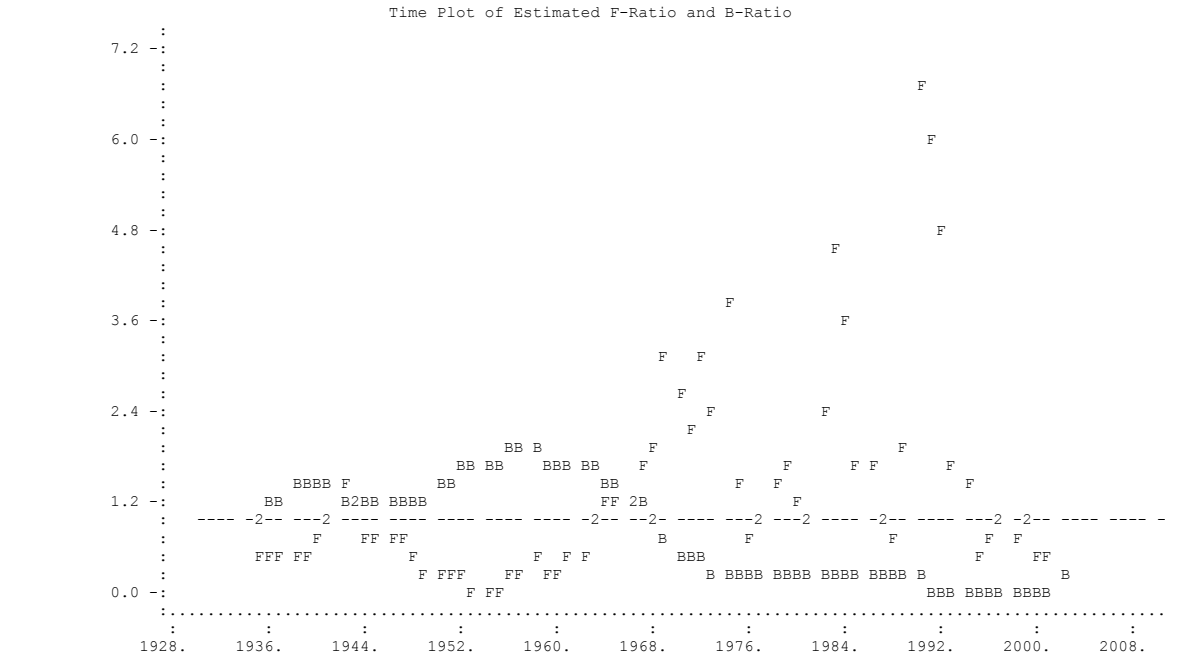
* Asterisk indicates missing value(s).

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 2

Year	Residual	-2 -1.5 -1 -0.5 0 0.5 1 1.5 2
1935	0.0000	|
1936	0.0000	|
1937	0.0000	|
1938	0.0000	|
1939	0.0000	|
1940	0.0000	|
1941	0.0000	|
1942	0.0000	|
1943	0.0000	|
1944	0.0000	|
1945	0.0000	|
1946	0.0000	|
1947	0.0000	|
1948	0.0000	|
1949	0.0000	|
1950	0.0000	|
1951	0.0000	|
1952	0.0000	|
1953	0.0000	|
1954	0.0000	|
1955	0.0000	|
1956	0.0000	|
1957	0.0000	|
1958	0.0000	|
1959	0.0000	|
1960	0.0000	|
1961	0.0000	|
1962	0.0000	|
1963	0.0000	|
1964	0.0000	|
1965	0.0000	|
1966	0.0000	|
1967	0.3596	|=======
1968	0.2352	|=====
1969	0.2238	|====
1970	0.3427	|=======
1971	0.7007	|==============
1972	0.9328	|==================
1973	0.3107	|======
1974	-0.8670	==========|
1975	-0.2370	=====|
1976	-0.1338	===|
1977	0.2549	|=====
1978	-0.8673	==========|
1979	0.3739	|=======
1980	0.7303	|===============
1981	0.4890	|==========
1982	-0.0036	|
1983	-1.0224	==========|
1984	-0.8048	==========|
1985	-0.3726	=======|
1986	-1.5829	==========|
1987	-1.4528	==========|
1988	0.0633	|=
1989	0.7376	|===============
1990	0.0749	|=
1991	-0.1137	==|
1992	-0.1960	====|
1993	-0.5665	==========|
1994	0.2818	|======
1995	0.9906	|====================
1996	0.7576	|===============
1997	0.5929	|============
1998	0.6817	|===============
1999	0.2836	|======
2000	-0.3260	=======|
2001	-0.8424	==========|


Observed (O) and Estimated (*) CPUE for Data Series # 1 -- Fall Survey
36.
30.
24.
18.
12.
6.
0.
1928.
1936.
1944.
1952.
1960.
1968.
1976.
1984.
1992.
2000.
2008.


Observed (O) and Estimated (*) CPUE for Data Series # 2 -- Spring Survey (lagged)
24.
20.
16.
12.
8.
4.
0.
1928.
1936.
1944.
1952.
1960.
1968.
1976.
1984.
1992.
2000.
2008.



RESULTS OF BOOTSTRAPPED ANALYSIS

Param name	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
B1ratio	2.294E-01	1.054E+00	359.41%	2.371E-02	1.251E+00	8.543E-02	8.212E-01	7.357E-01	3.207
K	1.954E+02	2.093E+02	7.15%	1.666E+02	2.159E+02	1.854E+02	2.074E+02	2.203E+01	0.113
r	4.278E-01	3.878E-01	-9.36%	3.675E-01	5.150E-01	3.940E-01	4.681E-01	7.409E-02	0.173
q(1)	9.252E-02	8.312E-02	-10.16%	7.421E-02	1.130E-01	8.285E-02	1.002E-01	1.730E-02	0.187
q(2)	1.214E-01	1.103E-01	-9.14%	1.020E-01	1.678E-01	1.110E-01	1.381E-01	2.710E-02	0.223
MSY	2.112E+01	2.030E+01	-3.91%	1.983E+01	8.572E+01	2.041E+01	2.265E+01	2.244E+00	0.106
Ye(2002)	5.723E+00	5.109E+00	-10.73%	3.743E+00	8.730E+00	4.561E+00	7.007E+00	2.446E+00	0.427
Bmsy	9.768E+01	1.047E+02	7.15%	8.332E+01	1.080E+02	9.268E+01	1.037E+02	1.101E+01	0.113
Fmsy	2.139E-01	1.939E-01	-9.36%	1.838E-01	2.575E-01	1.970E-01	2.341E-01	3.705E-02	0.173
fmsy(1)	2.359E+00	2.333E+00	-1.11%	1.994E+00	2.815E+00	2.174E+00	2.593E+00	4.196E-01	0.178
fmsy(2)	1.759E+00	1.758E+00	-0.04%	1.478E+00	2.074E+00	1.605E+00	1.905E+00	2.992E-01	0.170
F(0.1)	1.925E-01	1.745E-01	-8.42%	1.654E-01	2.317E-01	1.773E-01	2.107E-01	3.334E-02	0.173
Y(0.1)	2.091E+01	2.009E+01	-3.87%	1.963E+01	8.486E+01	2.021E+01	2.243E+01	2.222E+00	0.106
B-ratio	1.448E-01	1.350E-01	-6.78%	9.656E-02	2.227E-01	1.190E-01	1.783E-01	5.925E-02	0.409
F-ratio	4.104E-01	4.672E-01	13.84%	2.718E-01	6.415E-01	3.426E-01	5.252E-01	1.826E-01	0.445
Y-ratio	2.688E-01	2.517E-01	-6.35%	1.838E-01	3.958E-01	2.239E-01	3.248E-01	1.009E-01	0.375
f0.1(1)	2.123E+00	2.100E+00	-1.00%	* * * * *	0.178				
f0.1(2)	1.583E+00	1.582E+00	-0.04%	* * * * *	0.170				
q2/q1	1.331E+00	1.327E+00	-0.34%	1.073E+00	1.632E+00	1.194E+00	1.488E+00	2.946E-01	0.221

NOTES ON BOOTSTRAPPED ESTIMATES:

- The bootstrapped results shown were computed from 500 trials.
- These results are conditional on the constraints placed upon MSY and r in the input file (ASPIC.INP).
- All bootstrapped intervals are approximate. The statistical literature recommends using at least 1000 trials for accurate 95% intervals. The 80% intervals used by ASPIC should require fewer trials for equivalent accuracy. Using at least 500 trials is recommended.
- The bias corrections used here are based on medians. This is an accepted statistical procedure, but may estimate nonzero bias for unbiased, skewed estimators.

Trials replaced for lack of convergence: 7
Trials replaced for MSY out-of-bounds: 0
Trials replaced for r out-of-bounds: 0
Residual-adjustment factor: 1.0356

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