B1. Southern New England/Mid-Atlantic Winter Flounder

State of Stock: The Southern New England/Mid-Atlantic (SNE/MA) winter flounder stock complex is overfished and overfishing is occurring. Fully recruited fishing mortality in 2001 was 0.51 (exploitation rate = 37%), about 60% above F_{msy} =0.32. (Figures B1.1 and B1.5). The current VPA indicates an 80% probability that F_{2001} was between 0.44 and 0.58 (Figure B1.4). Spawning stock biomass was estimated to be 7,600 mt in 2001, about 25% of SSB_{msy} = 30,100 mt (Figures B1.2 and B1.5). There is an 80% probability that the spawning stock biomass was between 6,800 mt and 8,400 mt in 2001 (Figure B1.4).

Spawning stock biomass declined substantially from 13,000-14,000 mt during the early 1980s to 2,700 mt during the years 1994-1996. SSB has increased since the mid 1990s to about 7,600 mt in 2001 as a consequence of the reduced fishing mortality rates since 1997 (Figure B1.2). Recruitment to the stock has been below average since 1989, and early indications are that the 2001 year class is the smallest in 22 years (Figure B1.2).

Management Advice: The fishing mortality rate should be reduced to F_{reb} = 0.24 in 2003, to promote rebuilding to B_{msy} by 2013. Managers should recognize that given the estimation uncertainty in the assessment, current fishing mortality rates are likely much higher than the 2001 estimate of 0.51, potentially by nearly 100%. Current SSB may in turn be substantially overestimated.

Forecast for 2003-2013: If F_{2002} is assumed to be 85% of F_{2001} (i.e. F_{2002} = 0.43), due to the impact of management measures implemented in response to court orders during 2002, then 2002 landings are expected to be about 3,000 mt. At this reduced F, spawning stock biomass is still projected to fall to 5,900 mt in 2002 (Figure B1.6). Given this value of F_{2002}, a fishing mortality rate of F_{reb} = 0.24 will be necessary to rebuild the spawning stock to SSB_{MSY} (30,100 mt) by 2013, with 50% probability (Figure B1.6). Stochastic forecasts have not been adjusted for the retrospective pattern in stock size estimates.

Forecast Table: 2003-2013 recruitment estimated from a stochastic Beverton & Holt stock recruitment relationship (NEFSC 2002). F_{2002} is assumed $0.85*F_{2001}$ (15% decrease in F from 2001 to 2002); F during 2003-2013 as indicated.

Forecast Medians (50% probability level); 1,000s of mt

2002				2003				2013				
F	Land	Disc	SSB	F	Land	Disc	SSB	F	Land	Disc	SSB	P (%) SSB > SSB_{MSY}
0.43	3.0	0.2	5.9	F_{sq}=0.43	3.3	0.2	7.0	F_{sq}=0.43	8.0	0.5	16.4	0%
				F_{msy}=0.32	2.6	0.2	7.2	F_{msy}=0.32	8.3	0.5	23.3	6%
				F_{reb}=0.24	2.0	0.1	7.3	F_{reb}=0.24	8.1	0.4	30.1	50%

Catch and Status Table: SNE/MA winter flounder
(weights in '000 mt, recruitment in millions)

Year	1994	1995	1996	1997	1998	1999	2000	2001	Max[1]	Min[1]	Mean[1]
Commercial landings	2.2	2.6	2.8	3.4	3.2	3.4	3.8	4.4	11.2	2.2	5.0
Commercial discards[2]	0.3	0.1	0.2	0.3	0.5	0.3	0.1	0.1	1.5	0.1	0.7
Recreational landings	0.6	0.7	0.7	0.6	0.3	0.3	0.8	0.6	5.8	0.3	1.8
Recreational discards[3]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1
Catch used in assessment	3.1	3.4	3.7	4.4	4.0	4.1	4.8	5.1	15.8	3.1	7.6
Spawning stock biomass	2.7	2.8	2.7	3.5	4.0	4.9	6.0	7.6	14.8	2.7	6.7
Recruitment (Age 1)	8.3	12.6	17.6	21.1	18.8	13.4	12.7	19.0	62.9	5.6	23.9
Fully recruited F (age 4-5)	0.43	0.72	0.93	1.23	0.98	0.58	0.55	0.51	1.38	0.42	0.85
Exploitation rate (age 4-5)	32%	47%	55%	65%	58%	40%	38%	36%	69%	31%	52%

[1]Over period 1981-2001; [2]Assuming 50% discard mortality; [3] Assuming 15% release mortality.

Stock Distribution and Identification: Winter flounder are distributed from Labrador to North Carolina. Localized stocks are found in the region=s estuaries. Because the fishery exploits a mixture of these stocks, for assessment purposes, a Southern New England/Mid-Atlantic (SNE/MA) stock complex has been defined as extending from the waters of outer Cape Cod to the south and west, including NEFSC statistical areas 521, 526, 533-538, and 611 to 639.

Catches: Commercial landings peaked in 1966 at 12,000 mt and then declined to 3,300 mt by 1976. Commercial landings increased in the late 1970s and early 1980s to a peak of 11,200 mt in 1981, and then declined to a record low of 2,200 mt in 1994. Commercial landings have since increased to 4,400 mt in 2001. Recreational landings peaked at 5,800 mt in 1984, and then declined to 400 mt in 1992. Recreational landings varied between 300 mt and 800 mt during the years 1993-2000, and were an estimated 550 mt in 2001. Total discards (commercial plus recreational, by weight) as a percentage of total catch peaked in 1989 at 21%, but have since declined to about 2% in 2001. Total catches (including discards) declined from 15,800 mt in 1984 to 3,100 mt in 1994, but have since increased to 5,100 mt in 2001 (Figure B1.1).

Data and Assessment: SNE/MA winter flounder was last assessed at SAW-28 in 1998. The current assessment includes estimated total catch for the period 1981-2001, survey indices through 2002, estimates of fishing mortality and stock size by VPA for 1981-2001/2002, and biological reference points estimated by yield per recruit and stock-recruitment analyses. The current VPA includes several new survey tuning series not available for the SAW-28 assessment. The SARC reviewed new information on maturity, but concluded that more analyses are needed before revisions to the maturity schedule can be adopted. The yield per recruit and stock-recruitment analyses have been updated to include information through 2002. Given the stability of the input data and the results of these analyses, the SARC elected to retain the NEFSC (2002) estimates of biological reference points for this assessment.

Biological Reference Points: NEFSC (2002) re-estimated the biological reference points for SNE/MA winter flounder in 2002 using YPR and SSB/R and stock-recruitment models. The yield and SSB per recruit analyses indicate that $F_{40\%} = 0.21$ and $F_{0.1} = 0.25$ (Figure B1.3). The parametric stock-recruitment model indicated that MSY = 10,600 mt, $F_{msy} = 0.32$, and $SSB_{msy} = 30{,}100$ mt (Figures B1.5 and B1.7). It is recommended that these parametric stock-recruitment model reference points be the basis for the ASMFC and NEFMC FMP overfishing definitions.

Fishing Mortality: During the years 1981-1993, fishing mortality (fully recruited F, ages 4-5) varied between 0.4 (1982) and 1.4 (1988), and was as high as 1.2 as recently as 1997. Fishing mortality has been in the range 0.5-0.6 during the period 1999-2001 (Figures B1.1 and B1.5). Accounting for the uncertainty of the 2001 estimate, there is an 80% probability that F_{2001} was between 0.44 and 0.58 (Figure B1.4). For

1995-1999, retrospective fishing mortality rates underestimate the current values by an average of 128%. The most likely cause of this pattern is a combination of factors including under-reporting of the landings, misclassification of the landings by stock area, and underestimation of the discards.

Recruitment: Recruitment declined from 62.9 million age-1 fish in 1981 to 7.8 million in 1992. It then averaged 14.7 million fish from 1993 to 2001, below the VPA time-series average of 23.9 million. The 2001 year class is estimated to be the smallest in 22 years, just 5.7 million fish (Figure B1.2).

Spawning Stock Biomass: SSB declined from 14,800 mt in 1983 to a record low of 2,700 mt in 1994. It has since increased to 7,600 mt in 2001 (Figure B1.2). Accounting for the uncertainty of the 2001 estimate, there is an 80% probability that SSB in 2001 was between 6,800 mt and 8,400 mt (Figure B1.4). For the period 1995-1999, retrospective SSB levels overestimate current values by an average of 76%.

Special Comments: The current assessment provides a much more pessimistic evaluation of stock status than the SAW-28 assessment in 1998. This is mainly due to the retrospective pattern of underestimating F and overestimating SSB in the current VPA. However, while the SNE/MA winter flounder VPA provides uncertain estimates of current F and SSB, it provides a better determination of stock status than reliance on survey indices alone.

An unusually high proportion of the commercial landings for the stock complex was reported from NEFSC statistical area 521 in 1997 and 2001 (63% in 1997 and 56% in 2001, compared with the 1989-1996 average of 43%). When considered along with the distribution of survey catches, this indicates that the commercial fishery focuses on winter flounder along the western side of the Great South Channel.

Source of Information: Report of the 36th Northeast Regional Stock Assessment Workshop (36th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. NEFSC Ref. Doc. 02-xx. Northeast Fisheries Science Center (NEFSC). 2002. Final Report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish. NEFSC Ref. Doc. 02-04, 123 pp.

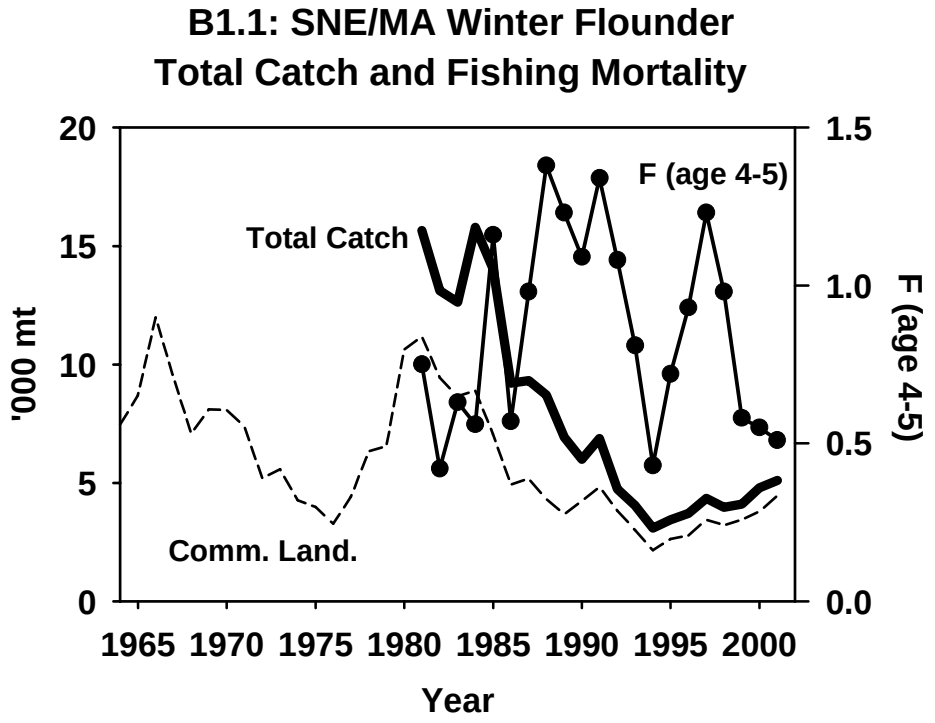

Figure B1.1. Total catch (landings and discards, '000 mt), commercial landings ('000 mt), and fishing mortality rate (F, ages 4-5, unweighted) for SNE/MA winter flounder.

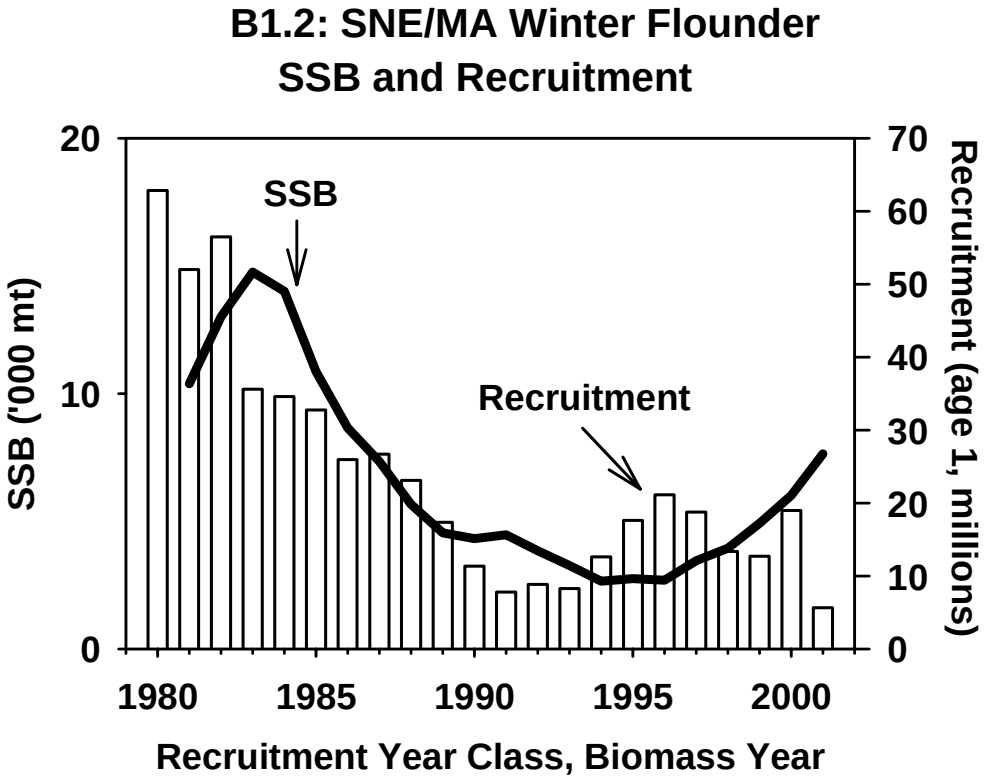

Figure B1.2. Spawning stock biomass (SSB, ages 3-7+, '000 mt) and recruitment (millions of fish at age-1) for SNE/MA winter flounder.

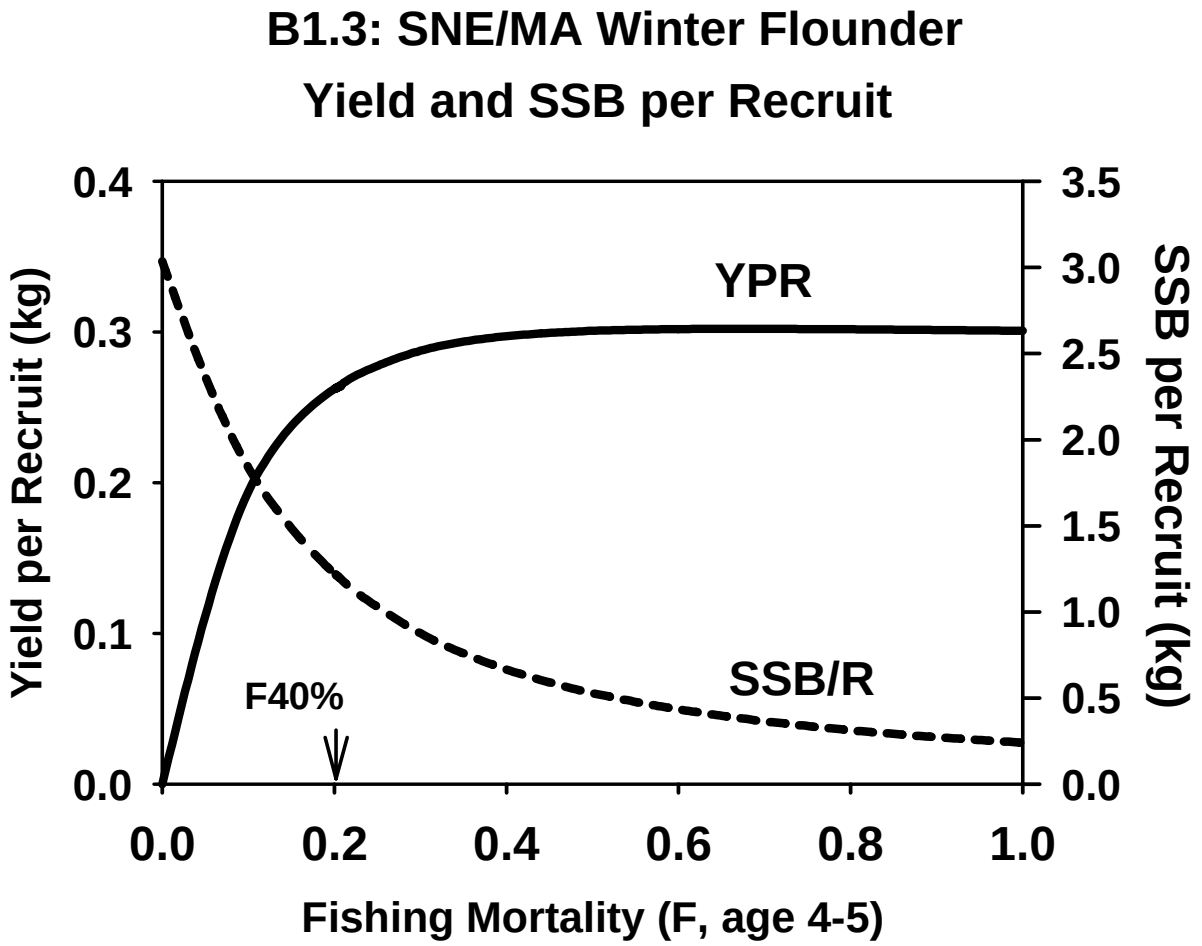

Figure B1.3. Yield per recruit (YPR) and spawning stock biomass per recruit (SSB/R) for SNE/MA winter flounder.

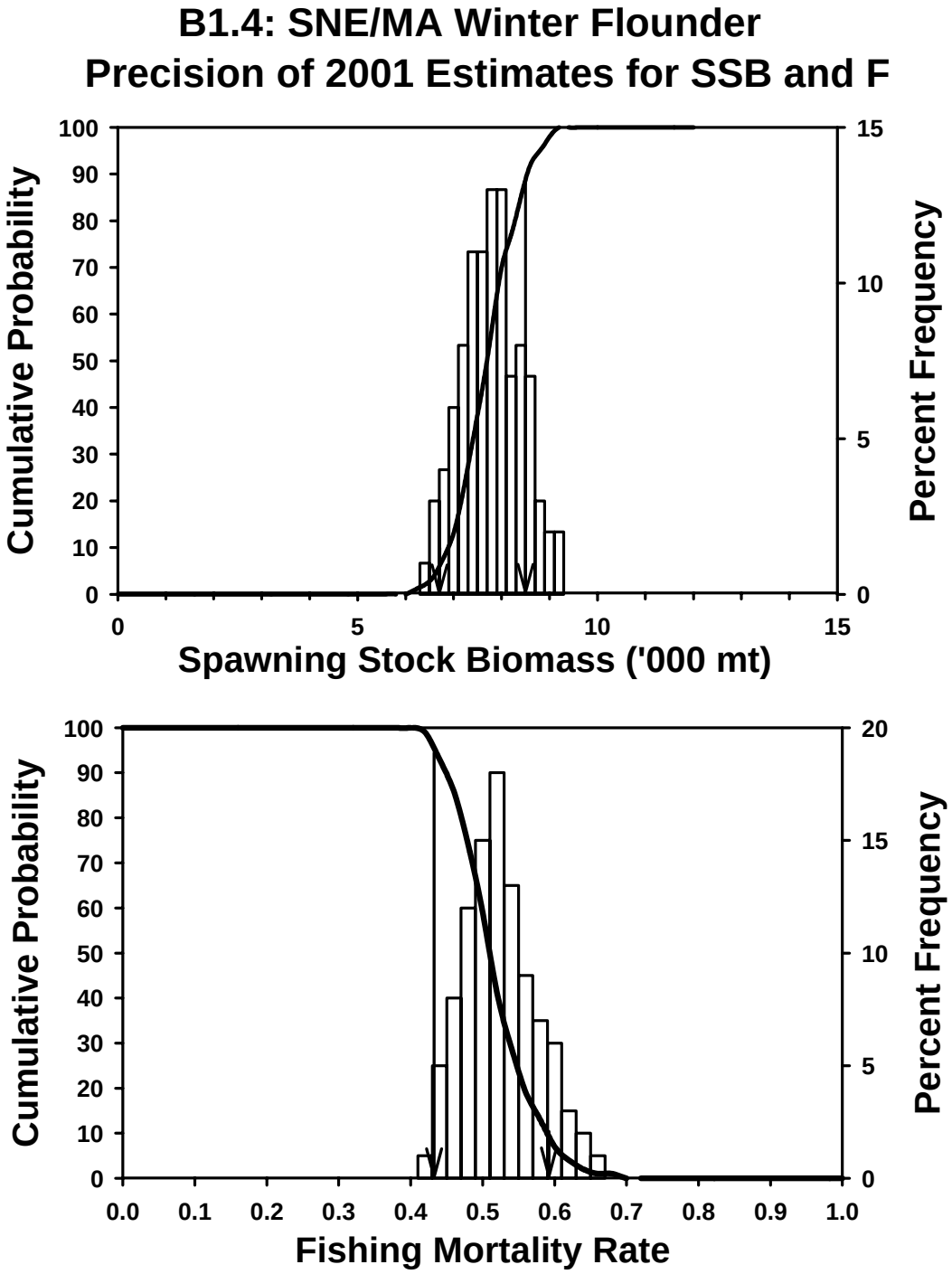

Figure B1.4. Precision of estimates of spawning stock biomass (ages 3-7+, '000 mt) and fishing mortality rate (F, ages 4-5, unweighted) in 2001 for SNE/MA winter flounder. Vertical bars display the range of the bootstrap estimates and the probability of individual values in the range. The solid curve gives the probability of SSB that is less or fishing mortality that is greater than any value along the X axis.

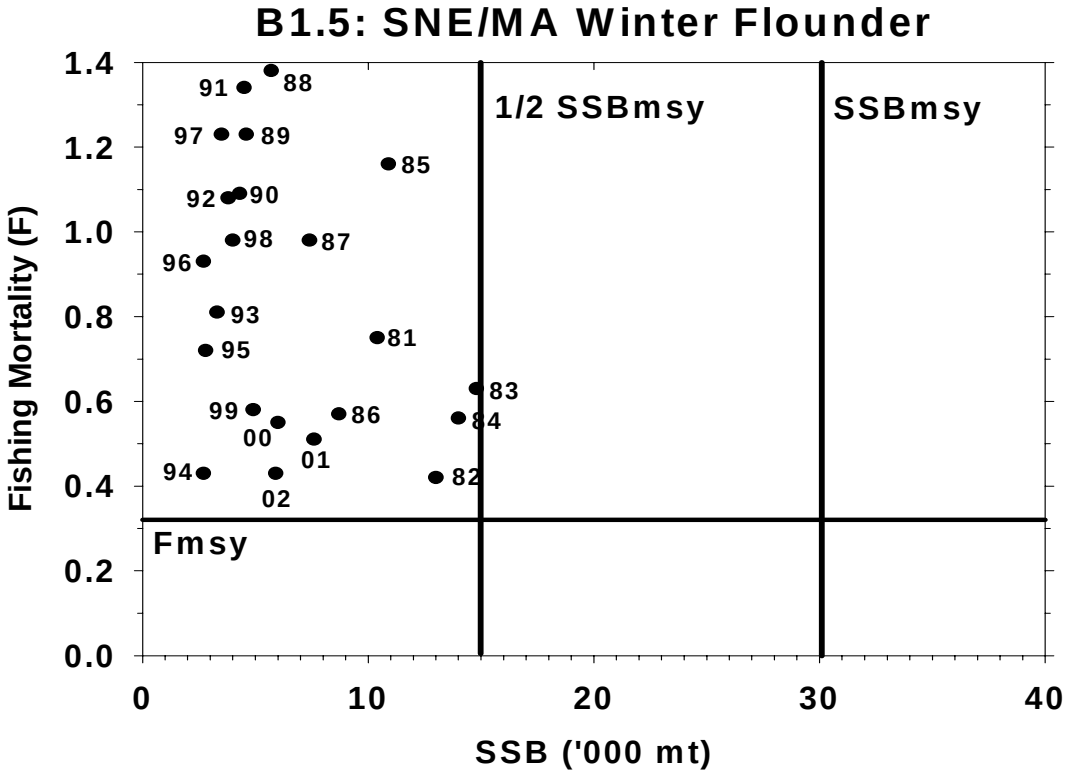

Figure B1.5. SSB and F for SNE/MA winter flounder. NEFSC (2002) biological reference points (Fmsy = 0.32, SSBmsy = 30,100 mt) are also shown.

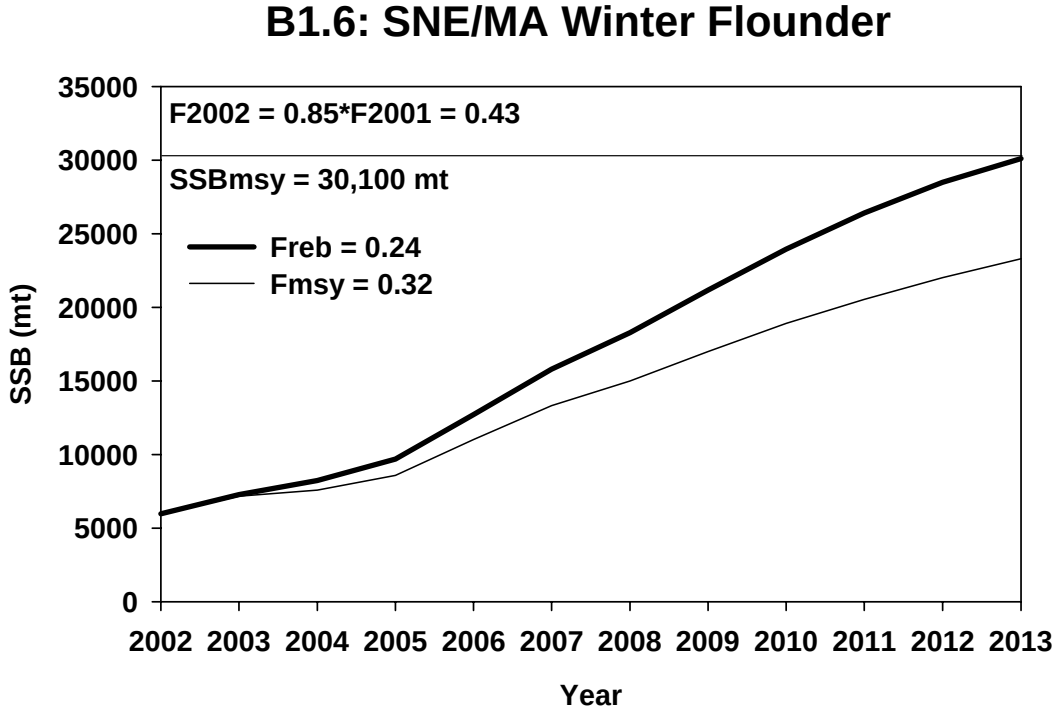

Figure B1.6. Median (50% probability) of forecast spawning stock biomass (SSB, mt) for SNE/MA winter flounder under Fmsy and Frebuild fishing mortality rates during 2003-2013. Assumes F2002 = 0.85*F2001 = 0.43.

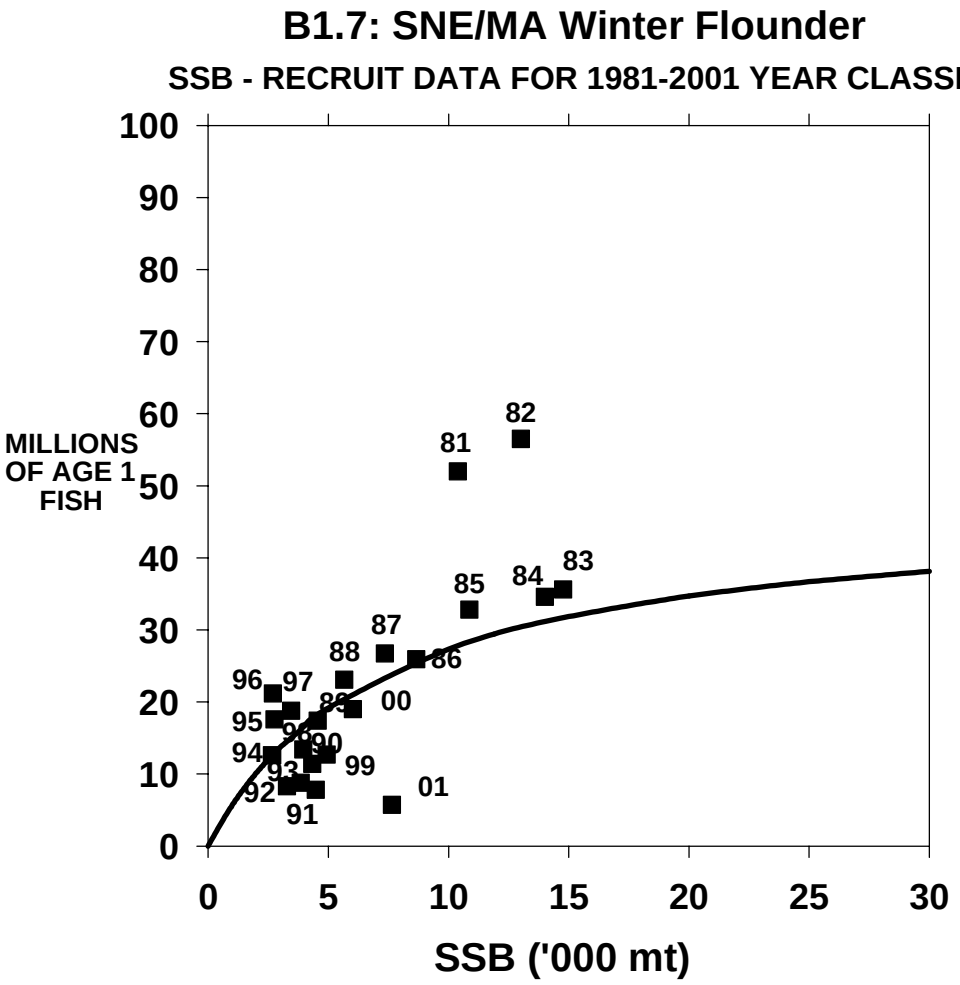

Figure B1.7. SNE/MA winter flounder SARC 36 VPA SSB and recruit data for the 1981-2001 year classes. Curved line is the S-R function estimated by NEFSC (2002).