Northeast Fisheries Science Center Reference Document 02-13

35th Northeast Regional Stock Assessment Workshop (35th SAW)

Public Review Workshop

September 2002

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A Report of the 35th Northeast Regional Stock Assessment Workshop

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Public Review Workshop

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
Northeast Fisheries Science Center
Woods Hole, Massachusetts

September 2002

Northeast Fisheries Science Center Reference Documents

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This document may be cited as:

Northeast Fisheries Science Center. 2002. Report of the 35th Northeast Regional Stock Assessment Workshop (35th SAW): Public Review Workshop. *Northeast Fish. Sci. Cent. Ref. Doc.* 02-13; 35 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

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The 35th Northeast Regional Stock Assessment Workshop

The Northeast Stock Assessment Workshop (SAW) is a process for preparing, peer reviewing and presenting stock assessment information. A SAW cycle is six months, thus, twice a year, a number of fishery stock assessments are prepared and presented to a panel of assessment experts. The panel, the Stock Assessment Review Committee (SARC), prepares two reports. The first is the SAW Advisory Report; a brief summary of the stock status, management advice, short term stock forecasts, and other relevant assessment information for each stock assessed and reviewed.. The second report, the SARC Consensus Summary of Assessments, is more detailed, containing specific assessment data, results and SARC discussion and research recommendations.

The Advisory report is presented to the public in a series of Public Review Workshops, described below. Subsequent to the Workshops, the draft Advisory Report is finalized and folded into a larger document known as the Public Review Workshop Report. The Public Review Workshop (PRW) Report also includes a summary of any meetings of the Northeast Coordinating Council (consisting of the Region's executives and responsible for establishing SAW policy and scheduling assessments for review) that may have occurred during the SAW cycle.

This is the Public Review Workshop Report for SAW 35 and the 35th SARC and includes the final version of the Advisory Report and a report from the April 24, 2002 meeting of the Northeast Regional Coordinating Council.

The 35th SARC reviewed assessments for summer flounder (fluke), and scup (porgy). The panel also reviewed a report from the SAW Methods Working Group describing some new tools for stock assessments for stocks which have index-based assessments. Finally, the SARC heard a report on research in progress concerning stock identification of silver hake (whiting). The panel provided comments to the researchers and suggestions for future work.

Assessments, working papers and research reports were peer reviewed by the SARC panel at its June 24-28, 2002 meeting in Woods Hole, MA. The Public Review Workshop of the 35th Northeast Regional Stock Assessment Workshop (SAW 34) was held jointly with the Mid-Atlantic Fishery Management Council and the Atlantic States Marine Fisheries Commission on August 6, 2002 in Philadelphia.

Copies of the 35th SAW Draft Advisory Report on Stock Status and the 35th SAW Draft Consensus Summary of Assessments had been distributed to members of the Commission and the New England and Mid-Atlantic Regional Fishery Management Councils prior to the Workshop.

The SAW Chairman, Dr. Terry Smith of the Northeast Fisheries Science Center (NEFSC), NMFS, conducted the Public Review Workshop.

Status Summaries

Summer flounder

The stock is overfished and overfishing is occurring relative to current biological reference points (see glossary and Advisory Report Introduction for definitions of these terms). The fishing mortality rate in 2001 is marginally above the current overfishing definition reference point but may underestimate the actual fishing mortality rate because of a tendency for the assessment model to underestimate recent F. Total stock biomass has increased substantially since 1989 and, in 2001, is estimated to be 19% below the current biomass threshold. The age structure of the stock has expanded with further expansion expected as biomass increases to biomass target levels. In terms of recruitment, the 2001 year class is below average, the 2000 year class was about average. As with fishing mortality, the current assessment model tends to underestimate actual recruitment.

Scup

The scup stock is not overfished but stock status with respect to overfishing cannot currently be evaluated. The 2001 estimate of spawning stock biomass, based on the 3-year moving average of the NEFSC spring survey, exceeds the biomass index threshold value. The 2002 spring survey index from the trawl survey is the highest on record. Although relative exploitation rates have declined in recent years, the absolute value of F cannot be determined. Survey data indicate strong recent recruitment and some rebuilding of age structure.

ADVISORY REPORT ON STOCK STATUS

INTRODUCTION

The *Advisory Report on Stock Status* is one of two reports produced by the Northeast Regional Stock Assessment Workshop process. The *Advisory Report* summarizes the technical information contained in the *Stock Assessment Review Committee (SARC) Consensus Summary of Assessments* and is intended to serve as scientific advice for fishery managers on resource status.

An important aspect of scientific advice on fishery resources is the determination of current stock status. The status of the stock relates to both the rate of removal of fish from the population – the exploitation rate – and the current stock size. The exploitation rate is simply the proportion of the stock alive at the beginning of the year that is caught during the year. When that proportion exceeds the amount specified in an overfishing definition, overfishing is occurring. Fishery removal rates are usually expressed in terms of the instantaneous fishing mortality rate, F, and the maximum removal rate is denoted as $F_{THRESHOLD.}$

Another important factor for classifying the status of a resource is the current stock level, for example, spawning stock biomass (SSB) or total stock biomass (TSB). Overfishing definitions, therefore, characteristically include specification of a minimum biomass threshold as well as a maximum fishing threshold. If a stock's biomass falls below the threshold ($B_{THRESHOLD}$) the stock is in an overfished condition. The Sustainable Fisheries Act mandates plans for rebuilding the stock should this situation arise.

Since there are two dimensions to the status of the stock– the rate of removal and the biomass level – it is possible that a stock not currently subject to overfishing in terms of exploitation rates is in an overfished condition, that is, has a biomass level less than the threshold level. This may be due to heavy exploitation in the past, or a result of other factors such as unfavorable environmental conditions. In this case, future recruitment to the stock is very important and the probability of improvement is increased greatly by increasing the stock size. Conversely, fishing down a stock that is at a high biomass level should generally increase the long-term sustainable yield. This philosophy is embodied in the Sustainable Fisheries Act — stocks should be managed on the basis of maximum sustainable yield (MSY). The biomass that produces this yield is called B_{MSY} and the fishing mortality rate that produces MSY is called F_{MSY}.

Given this, stocks under review are classified with respect to current overfishing definitions. A stock is overfished if its current biomass is below $B_{THRESHOLD}$ and overfishing is occurring if current F is greater than $F_{THRESHOLD.}$

Overfishing guidelines are based on the precautionary approach to fisheries management and encourage the inclusion of a control rule in the overfishing definition. Control rules, when they exist, are discussed in the Advisory Report chapter for the stock under consideration. Generically, the control rules suggest actions at various levels of stock biomass and incorporate an assessment of risk, in that F targets are set so as to avoid exceeding F thresholds. The schematic noted below depicts a generic control rule of this nature.

		BIOMASS		
		B $<B_{THRESHOLD}$	$B_{THRESHOLD} <$ **B** $< B_{MSY}$	**B** $> B_{MSY}$
EXPLOITATION	$F_{THRESHOLD}$	$F_{THRESHOLD} = 0$ or F min (The minimal achievable mortality rate.)	$F_{THRESHOLD} <$ FMSY (The maximum mortality rate that defines overfishing at various levels of biomass.)	$F_{THRESHOLD} = F_{MSY}$
RATE	F_{TARGET}	$F_{TARGET} = 0$ or F min (The minimal achievable mortality rate.)	$F_{TARGET} < F_{THRESHOLD}$ (Where F_{TARGET} is chosen to minimize the risk of exceeding $F_{THRESHOLD)}$	$F_{TARGET} < F_{MSY}$

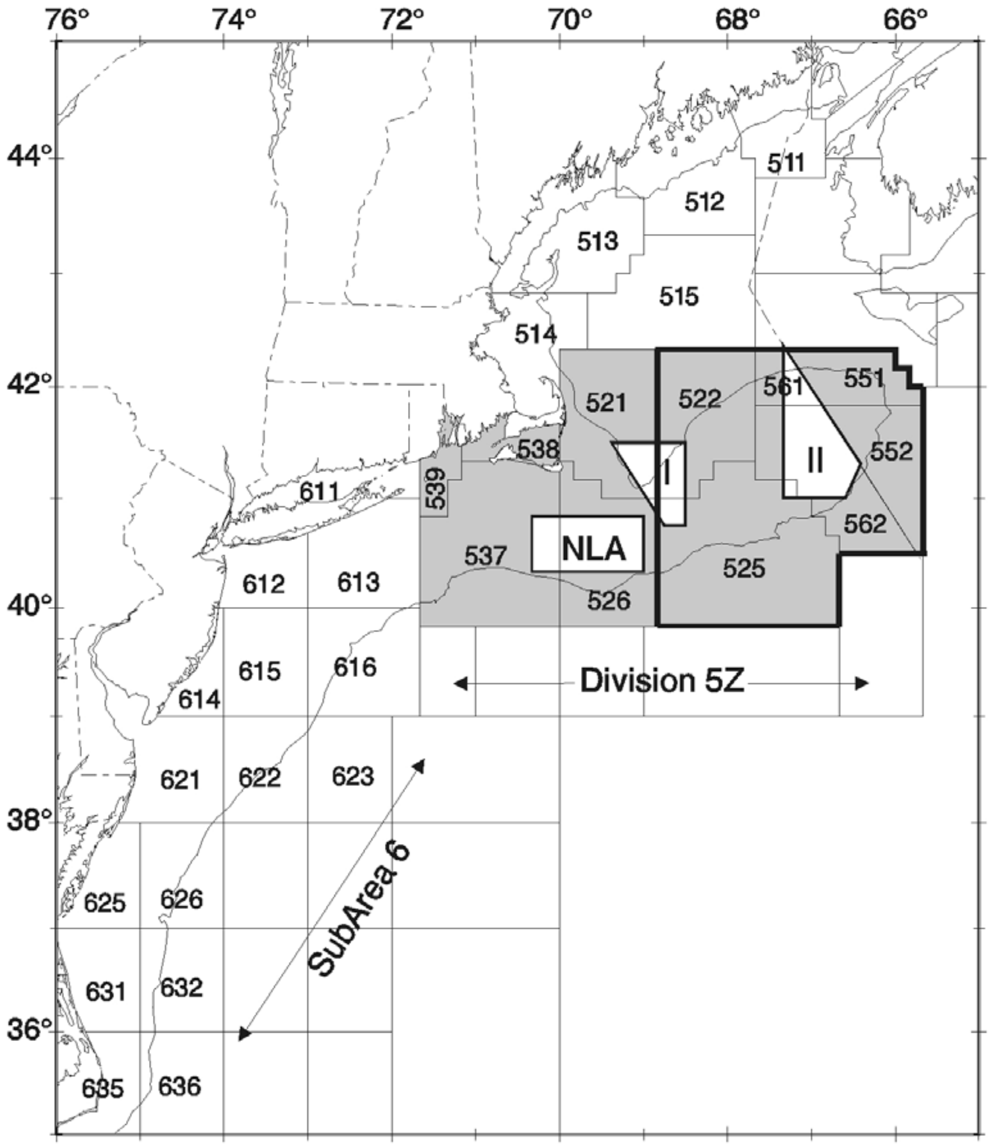


Figure 1. Statistical areas used for catch monitoring in offshore fisheries in the Northeast United States.

GLOSSARY OF TERMS

ADAPT. A commonly used form of computer program used to optimally fit a Virtual Population Assessment (VPA, see below) to abundance data.

Availability. Refers to the distribution of fish of different ages or sizes relative to that taken in the fishery.

Biological Reference Points. Specific values for the variables that describe the state of a fishery system which are used to evaluate its status. Reference points are most often specified in terms of fishing mortality rate and/or spawning stock biomass. The reference points may indicate 1) a desired state of the fishery, such as a fishing mortality rate that will achieve a high level of sustainable yield, or 2) a state of the fishery that should be avoided, such as a high fishing mortality rate which risks a stock collapse and long-term loss of potential yield. The former type of reference points are referred to as "target reference points" and the latter are referred to as "limit reference points" or "thresholds". Some common examples of reference points are $F_{0.1}$, F_{max}, and F_{msy}, which are defined later in this glossary.

B_0. Virgin stock biomass, i.e., the long-term average biomass value expected in the absence of fishing mortality.

B_{MSY}. Long-term average biomass that would be achieved if fishing at a constant fishing mortality rate equal to F_{MSY}.

Biomass. The total weight of all fish in a stock.

Biomass Dynamics Model. A simple stock assessment model that tracks changes in stock biomass rather than numbers. Biomass dynamic models employ assumptions about growth (in weight) and can be tuned to abundance data such as commercial catch rates, research survey trends or biomass estimates.

Catch. The total number or weight of fish that are killed as a consequence of fishing. The catch includes fish that are landed, fish that are caught and released but die as a result of this experience, and fish that escape capture but which die as a result of encounter with the fishing gear.

Catchability. Proportion of the stock removed by one unit of effective fishing effort (typically age-specific due to differences in selectivity and availability by age).

Control Rule. Describes a plan for pre-agreed management actions as a function of variables related to the status of the stock. For example, a control rule can specify how F or yield should vary with biomass. In the National Standard Guidelines (NSG), the "MSY control rule" is used to determine the limit fishing mortality, or Maximum Fishing Mortality Threshold (MFMT). Control rules are also known as "decision rules" or "harvest control laws" in some of the scientific literature.

Catch per Unit of Effort (CPUE). Measures the relative success of fishing operations, but also can be used as a proxy for relative abundance based on the assumption that CPUE is linearly related to stock size. The use of CPUE that has not been properly standardized for temporal-spatial changes in catchability should be avoided.

Exploitation Pattern. The fishing mortality on each age (or group of adjacent ages) of a stock relative to the highest mortality on any age. The exploitation pattern is expressed as a series of values ranging from 0.0 to 1.0. The pattern is referred to as "flat-topped" when the values for all the oldest ages are about 1.0, and "dome-shaped" when the values for some intermediate ages are about 1.0 and those for the oldest ages are significantly lower. This pattern often varies by type of fishing gear, area, and seasonal distribution of fishing, and the growth and migration of the fish. The pattern can be changed by modifications to fishing gear, for example, increasing mesh or hook size, or by changing the proportion of harvest by gear type.

Mortality Rates. Populations of animals decline exponentially. This means that the number of animals that die in an "instant" is at all times proportional to the number present. The decline is defined by survival curves such as:

$$N_{t+1} = N_t e^{-z}$$

where N_t is the number of animals in the population at time t and N_{t+1} is the number present in the next time period; **Z** is the **total instantaneous mortality rate** which can be separated into deaths due to fishing (**fishing mortality or F**) and deaths due to all other causes (**natural mortality or M**) and e is the base of the natural logarithm (2.71828). To better understand the concept of an instantaneous mortality rate, consider the following example. Suppose the instantaneous total mortality rate is 2 (i.e., Z = 2) and we want to know how many animals out of an initial population of 1 million fish will be alive at the end of one year. If the year is apportioned into 365 days (that is, the 'instant' of time is one day), then 2/365 or 0.548% of the population will die each day. On the first day of the year, 5,480 fish will die (1,000,000 x 0.00548), leaving 994,520 alive. On day 2, another 5,450 fish die (994,520 x 0.00548) leaving 989,070 alive. At the end of the year, 134,593 fish [1,000,000 x $(1 - 0.00548)^{365}$] remain alive. If, we had instead selected a smaller 'instant' of time, say an hour, 0.0228% of the population would have died by the end of the first time interval (an hour), leaving 135,304 fish alive at the end of the year [1,000,000 x $(1 - 0.00228)^{8760}$]. As the instant of time becomes shorter and shorter, the exact answer to the number of animals surviving is given by the survival curve mentioned above, or, in this example:

$$N_{t+1} = 1{,}000{,}000e^{-2} = 135{,}335 \text{ fish}$$

Exploitation Rate. The proportion of a population alive at the beginning of the year that is caught during the year. That is, if 1 million fish were alive on January 1 and 200,000 were caught during the year, the exploitation rate is 0.20 (200,000 / 1,000,000) or 20%.

F_{MAX}. The rate of fishing mortality that produces the maximum level of yield per recruit. This is the point beyond which growth overfishing begins.

$F_{0.1}$. The fishing mortality rate where the increase in yield per recruit for an increase in a unit of effort is only 10% of the yield per recruit produced by the first unit of effort on the unexploited stock (i.e., the slope of the yield-per-recruit curve for the $F_{0.1}$ rate is only one-tenth the slope of the curve at its origin).

$F_{10\%}$. The fishing mortality rate which reduces the spawning stock biomass per recruit (**SSB/R**) to 10% of the amount present in the absence of fishing. More generally, Fx%, is the fishing mortality rate that reduces the SSB/R to x% of the level that would exist in the absence of fishing.

F_{MSY}. The fishing mortality rate that produces the maximum sustainable yield.

Fishery Management Plan (FMP). Plan containing conservation and management measures for fishery resources, and other provisions required by the MSFCMA, developed by the Fishery Management Councils or the Secretary of Commerce.

Generation Time. In the context of the National Standard Guidelines, generation time is a measure of the time required for a female to produce a reproductively-active female offspring for use in setting maximum allowable rebuilding time periods.

Growth Overfishing. The situation existing when the rate of fishing mortality is above F_{MAX} and when the loss in fish weight due to mortality exceeds the gain in fish weight due to growth.

Limit Reference Points. Benchmarks used to indicate when harvests should be constrained substantially so that the stock remains within safe biological limits. The probability of exceeding limits should be low. In the National Standard Guidelines, limits are referred to as thresholds. In much of the international literature (e.g., FAO documents), "thresholds" are used as buffer points that signal when a limit is being approached.

Landings per Unit of Effort (LPUE). Analogous to CPUE and measures the relative success of fishing operations, but is also sometimes used a proxy for relative abundance based on the assumption that CPUE is linearly related to stock size.

MSFCMA. (Magnuson-Stevens Fishery Conservation and Management Act). U.S. Public Law 94-265, as amended through October 11, 1996. Available as NOAA Technical Memorandum NMFS-F/SPO-23, 1996.

Maximum Fishing Mortality Threshold (MFMT, $\mathbf{F_{threshold}}$). One of the Status Determination Criteria (SDC) for determining if overfishing is occurring. It will usually be equivalent to the F corresponding to the MSY Control Rule. If current fishing mortality rates are above $\mathbf{F_{threshold}}$ overfishing is occurring.

Minimum Stock Size Threshold (MSST, $\mathbf{B_{threshold}}$). Another of the Status Determination Criteria. The greater of (a) $½B_{MSY}$, or (b) the minimum stock size at which rebuilding to B_{MSY} will occur within 10 years of fishing at the MFMT. MSST should be measured in terms of spawning biomass or other appropriate measures of productive capacity. If current stock size is below $\mathbf{B_{threshold}}$, the stock is overfished.

Maximum Spawning Potential (MSP). This type of reference point is used in some fishery management plans to define overfishing. The MSP is the spawning stock biomass per recruit (SSB/R) when fishing mortality is zero. The degree to which fishing reduces the SSB/R is expressed as a percentage of the MSP (i.e., %MSP). A stock is considered overfished when the fishery reduces the %MSP below the level specified in the overfishing definition. The values of %MSP used to define overfishing can be derived from stock-recruitment data or chosen by analogy using available information on the level required to sustain the stock.

Maximum Sustainable Yield (MSY). The largest average catch that can be taken from a stock under existing environmental conditions.

Overfishing. According to the National Standard Guidelines, "overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis." Overfishing is occurring if the MFMT is exceeded for 1 year or more.

Optimum Yield (OY). The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems. MSY constitutes a "ceiling" for OY. OY may be lower than MSY, depending on relevant economic, social, or ecological factors. In the case of an overfished fishery, OY should provide for rebuilding to B_{MSY}.

Partial Recruitment. Patterns of relative vulnerability of fish of different sizes or ages due to the combined effects of selectivity and availability.

Rebuilding Plan. A plan that must be designed to recover stocks to the B_{MSY} level within 10 years when they are overfished (i.e. when B < MSST). Normally, the 10 years would refer to an expected time to rebuilding in a probabilistic sense.

Recruitment. This is the number of young fish that survive (from birth) to a specific age or grow to a specific size. The specific age or size at which recruitment is measured may correspond to when the young fish become vulnerable to capture in a fishery or when the number of fish in a cohort can be reliably estimated by a stock assessment.

Recruitment Overfishing. The situation existing when the fishing mortality rate reaches a level that causes a significant reduction in recruitment to the spawning stock. This is caused by a greatly reduced spawning stock and is characterized by a decreasing proportion of older fish in the catch and generally very low recruitment year after year.

Recruitment per Spawning Stock Biomass (R/SSB). The number of fishery recruits (usually age 1 or 2) produced from a given weight of spawners, usually expressed as numbers of recruits per kilogram of mature fish in the stock. This ratio can be computed for each year class and is often used as an index of pre-recruit survival, since a high R/SSB ratio in one year indicates above-average numbers resulting from a given spawning biomass for a particular year class, and vice versa.

Reference Points. Values of parameters (e.g. B_{MSY}, F_{MSY}, $F_{0.1}$) that are useful benchmarks for guiding management decisions. Biological reference points are typically limits that should not be exceeded with significant probability (e.g., MSST) or targets for management (e.g., OY).

Risk. The probability of an event times the cost associated with the event (loss function). Sometimes "risk" is simply used to denote the probability of an undesirable result (e.g. the risk of biomass falling below MSST).

Status Determination Criteria (SDC). Objective and measurable criteria used to determine if a stock is being overfished or is in an overfished state according to the National Standard Guidelines.

Selectivity. Measures the relative vulnerability of different age (size) classes to the fishing gears(s).

Spawning Stock Biomass. The total weight of all sexually mature fish in a stock.

Spawning Stock Biomass per Recruit (SSB/R). The expected lifetime contribution to the spawning stock biomass for each recruit. SSB/R is calculated assuming that F is constant over the life span of a year class. The calculated value is also dependent on the exploitation pattern and rates of growth and natural mortality, all of which are also assumed to be constant.

Survival Ratios. Ratios of recruits to spawners (or spawning biomass) in a stock-recruitment analysis.

TAC. Total allowable catch is the total regulated catch from a stock in a given time period, usually a year.

TAL. Total allowable landing is the total regulated landing from a stock in a given time period, usually a year. The TAL is usually less than the TAC as the latter includes fish that are not landed but which die as a result of capture and release or as a consequence of encounter with the fishing gear.

Target Reference Points. Benchmarks used to guide management objectives for achieving a desirable outcome (e.g., OY). Target reference points should not be exceeded on average.

Uncertainty. Uncertainty results from a lack of perfect knowledge of many factors that affect stock assessments, estimation of reference points, and management. Rosenberg and Restrepo[1] identify 5 types: measurement error (in observed quantities), process error (or natural population variability), model error (mis-specification of assumed values or model structure), estimation error (in population parameters or reference points, due to any of the preceding types of errors), and implementation error (or the inability to achieve targets exactly for whatever reason).

Virtual population analysis (VPA) (or cohort analysis). A retrospective analysis of the catches from a given year class which provides estimates of fishing mortality and stock size at each age

1 Rosenberg, A.A., and V.R. Restrepo. 1995. Uncertainty and risk evaluation in stock assessment advice for U.S. marine fisheries. Canadian Journal of Fisheries and Aquatic Sciences 51:2715-2720.

over its life in the fishery. This technique is used extensively in fishery assessments.

Year Class (or cohort). Fish born in a given year. For example, the 1987 year class of cod includes all cod born in 1987. This year class would be age 1 in 1988, age 2 in 1989, and so on.

Yield per Recruit (Y/R or YPR). The average expected yield in weight from a single recruit. Y/R is calculated assuming that F is constant over the life span of a year class. The calculated value is also dependent on the exploitation pattern, rate of growth, and natural mortality rate, all of which are assumed to be constant.

A. SUMMER FLOUNDER ADVISORY REPORT

State of Stock: The summer flounder stock is overfished and overfishing is occurring relative to the current biological reference points. The fishing mortality rate has declined from 1.32 in 1994 to 0.27 in 2001 (Figure A1) marginally above the current overfishing definition reference point ($F_{threshold}$ = F_{target} = F_{max} = 0.26; Figure A7). There is an 80% chance that the 2001 F was between 0.24 and 0.32 (Figure A6). The estimate of F for 2001 may understate the actual fishing mortality as retrospective analysis shows that the current assessment method tends to underestimate recent fishing mortality rates (e.g., by about 1/3 over the last three years).

Total stock biomass has increased substantially since 1989, and in 2001 was estimated to be 42,900 mt, 19% below the current biomass threshold (53,200 mt) (Figures A2, A7). There is an 80% chance that total stock biomass in 2001 was between 39,300 and 46,900 mt (Figure A5).

Spawning stock biomass (SSB; Age 0+) declined 72% from 1983 to 1989 (18,800 mt to 5,200 mt), but has increased seven-fold, with improved recruitment and decreased fishing mortality, to 38,200 mt in 2001 (Figure A2). Comparison with previous assessments shows a tendency to slightly overestimate the SSB in recent years. The age structure of the spawning stock has expanded, with 72% at ages 2 and older, and 14% at ages 5 and older (Figure A9). Under equilibrium conditions at F_{max}, about 85% of the spawning stock biomass would be expected to be ages 2 and older, with 50% at ages 5 and older.

The arithmetic average recruitment from 1982 to 2001 is 40 million fish at age 0, with a median of 36 million fish. The 2000 year class is estimated at 39 million fish. The 2001 year class is currently estimated to be below average, at 27 million fish (Figure A2). It should be noted that retrospective analysis shows that the current assessment method tends to underestimate the abundance of age 0 fish in recent years (e.g., by about 20% over the last three years). Recent recruitment per unit of SSB has been lower than that observed during the early 1980s (Figure A8).

Management Advice: If the landings for 2002 do not exceed the total allowable landings (TAL) and the proportion of catch discarded does not increase, the TAL in 2003 would need to be 10,580 mt (23.3 million lbs) to meet the target F rate of F_{max} = 0.26 with 50% probability (Figure A4). As noted above, retrospective analysis suggests that the assessment tends to underestimate fishing mortality rates and the abundance of age 0 fish in the most recent years.

Forecasts for 2002-2004: Stochastic forecasts only incorporate uncertainty in 2002 stock sizes due to survey variability and assume current discard to landings proportions. If landings in 2002 are equal to the 2002 TAL of 10,991 mt (24.2 million lbs) and discards are 1,700 mt (3.7 million lbs), the forecast estimates a median (50% probability) F in 2002 = 0.32 and a median total stock biomass on January 1, 2003 (equivalent to December 31, 2002) of 57,600 mt, above the biomass threshold of ½ B_{MSY} = 53,200 mt. (Figure A7). Landings of 10,580 mt (23.3 million lbs) and discards of 1,508 mt (3.3 million lbs) in 2003 provide a median F in 2003 = 0.26 and a median total stock biomass level on January 1, 2004 of 65,600 mt (Figures A4, A7). Landings of 12,179 mt (26.9 million lbs) and discards of 1,692 mt (3.7 million lbs) in 2004 provide a median F in 2004 = 0.26 (Figure A7.)

Forecast Table: 2002 Landings = 10,991 mt; 2002-2004 median recruitment from 1982-2001 VPA estimates (35.6 million)

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

2002				2003				2004			
F	Land.	Disc.	TB	F	Land.	Disc.	TB	F	Land.	Disc.	TB
0.32	**11.0**	**1.7**	**51.4**	**0.26**	**10.6**	**1.5**	**57.6**	**0.26**	**12.2**	**1.7**	**65.6**

Summer Flounder Catch and Status Table *(weights in '000 mt, recruitment in millions, arithmetic means)*

Year	1995	1996	1997	1998	1999	2000	2001	Max[1]	Min[1]	Mean[1]
Commercial landings	7.0	5.8	4.0	5.1	4.8	5.1	4.9	17.1	4.0	8.5
Commercial discards[2]	0.3	0.5	0.3	0.4	1.5	0.7	0.6	1.5	0.3	0.8
Recreational landings	2.5	4.7	5.4	5.7	3.8	7.1	5.3	12.7	1.4	5.4
Recreational discards[2]	0.7	0.6	0.6	0.5	0.7	0.9	1.2	1.2	0.1	0.5
Catch used in assessment	10.5	11.6	10.3	11.7	10.8	13.8	12.0	26.5	8.0	14.9
Commercial quota	6.6	4.9	3.8	4.8	4.9	4.9	4.9			
Recreational harvest limit	3.5	3.2	3.4	3.4	3.4	3.4	3.3			
Spawning stock biomass[3]	15.8	16.7	17.6	22.3	22.9	30.0	38.2	38.2	5.2	15.7
Recruitment (age 0)	39.6	32.9	35.6	39.8	30.8	39.5	26.6	80.3	13.0	39.7
Total stock biomass[4]	35.7	37.0	32.3	37.9	36.4	37.1	42.9	48.3	16.1	32.7
F (ages 3-5, u)	1.23	1.14	1.19	0.86	0.73	0.47	0.27	2.15	0.27	1.26
Exploitation rate	66%	63%	65%	53%	48%	35%	22%	83%	22%	66%

[1] Over the period 1982-2001. [2]Released fish that die. 3At the peak of the spawning season (i.e., on November 1), ages 0-7+. [4] On January 1.

Stock Distribution and Identification: The Mid-Atlantic Fishery Management Council (MAFMC) and Atlantic States Marine Fisheries Commission (ASMFC) Fishery Management Plan for summer flounder defines the management unit as all summer flounder from the southern border of North Carolina northeast to the US-Canada border. A recent summer flounder genetics study, which revealed no population subdivision at Cape Hatteras (Jones and Quattro, 1999), is consistent with the definition of the management unit.

Catches: Total landings peaked in 1983 at 26,100 mt. Landings declined markedly during the late 1980s, reaching 4,200 mt in the commercial fishery in 1990 and 1,400 mt in the recreational fishery in 1989. Total landings were only 6,500 mt in 1990. Reported 2001 landings in the commercial fishery were 4,916 mt, about 1% over the commercial quota. Commercial discards are estimated from sea sampling data and represent about 10% of the commercial catch assuming a discard mortality of 80%. Estimated 2001 landings in the recreational fishery were 5,250 mt, about 62% over the recreational harvest limit. Recreational discard losses increased to about 18% of the recreational catch in 2001 (the discard mortality rate is assumed to be 10% based on three recent studies). Total commercial and recreational landings in 2001 were 10,166 mt.

Data and Assessment: An analytical assessment (VPA) of commercial and recreational total catch at age (landings plus discards) was conducted. The natural mortality rate (M) was assumed to be 0.2. Indices of recruitment and stock abundance from NEFSC winter, spring, and autumn; Massachusetts spring and autumn; Rhode Island, Connecticut spring and autumn; Delaware, and New Jersey trawl surveys were used in VPA tuning in an ADAPT framework. Recruitment indices from surveys conducted by the states of North Carolina, Virginia, and Maryland were also used in the VPA tuning. The current VPA tuning configuration is very similar to those used in the 2000 SARC 31 VPA (NEFSC 2000) and in the 2001 SAW Southern Demersal Working Group VPA (MAFMC 2001a). The uncertainty associated with the estimates of fishing mortality and stock biomass in 2001 was evaluated only with respect to research survey variability (Figures A5, A6).

Biological Reference Points: Biological reference points for summer flounder are based on a yield per recruit model (Thompson-Bell). The yield per recruit analysis conducted for the 1999 assessment (Terceiro 1999) indicated that F_{max} = 0.26, which was used as a proxy for F_{target} and $F_{threshold}$. FMP Amendment 12 SFA stock biomass reference points were estimated as the product of yield per recruit (0.552 kg per recruit) and total stock biomass per recruit (2.813 kg per recruit) at F_{max} = 0.26, and median recruitment of 37.8 million fish per year (1982-1998; from Terceiro (1999)). Yield at F_{max}, used as a proxy for MSY, was estimated to be 20,900 mt (46 million lbs), and the corresponding biomass, used as a proxy for $B_{MSY,}$ was estimated to be 106,400 mt (235 million lbs; Figure A7).

The SARC concluded that updating these reference points is not warranted at this time.

Fishing Mortality: Fishing mortality calculated from the average of the currently fully recruited ages (3-5) has been high, varying between 0.9 and 2.2 during 1982-1997 (55%-83% exploitation), far in excess of the revised FMP Amendment 12 overfishing definition, $F_{threshold} = F_{target} = F_{max}$ = 0.26 (21% exploitation). The fishing mortality rate has declined substantially since 1997 and was estimated to be 0.27 (22% exploitation) in 2001, the lowest observed in the 20-year time series (Figures A1, A7). There is an 80% probability that the fishing mortality rate in 2001 was between 0.24 and 0.32. The annual partial recruitment of age-1 fish has decreased from near 0.50 during the first half of the VPA series to about 0.20 since 1994; the partial recruitment of age-2 fish has decreased from 1.00 in 1993 to 0.78 during 1999-2001. These decreases in partial recruitment at age are in line with expectations given recent changes in commercial and recreational fishery regulations. The estimate of F for 2001 may understate the actual fishing mortality as retrospective analysis shows that the current assessment method tends to underestimate recent fishing mortality rates (e.g., by about 1/3 over the last three years).

Total Stock Biomass: Total stock biomass has increased substantially since 1989, and in 2001 total stock biomass was estimated to be 42,900 mt, near the level of the early 1980s, although still 19% below the current biomass threshold (Figures A2, A7). There is an 80% chance that total stock biomass in 2001 was between 39,300 and 46,900 mt (Figure A5). The current biomass target (B_{MSY}) required to produce maximum sustainable yield (MSY=20,900 mt) is estimated to be B_{MSY} = 106,400 mt, and the current biomass threshold of one-half B_{MSY} = 53,200 mt (Figure A7).

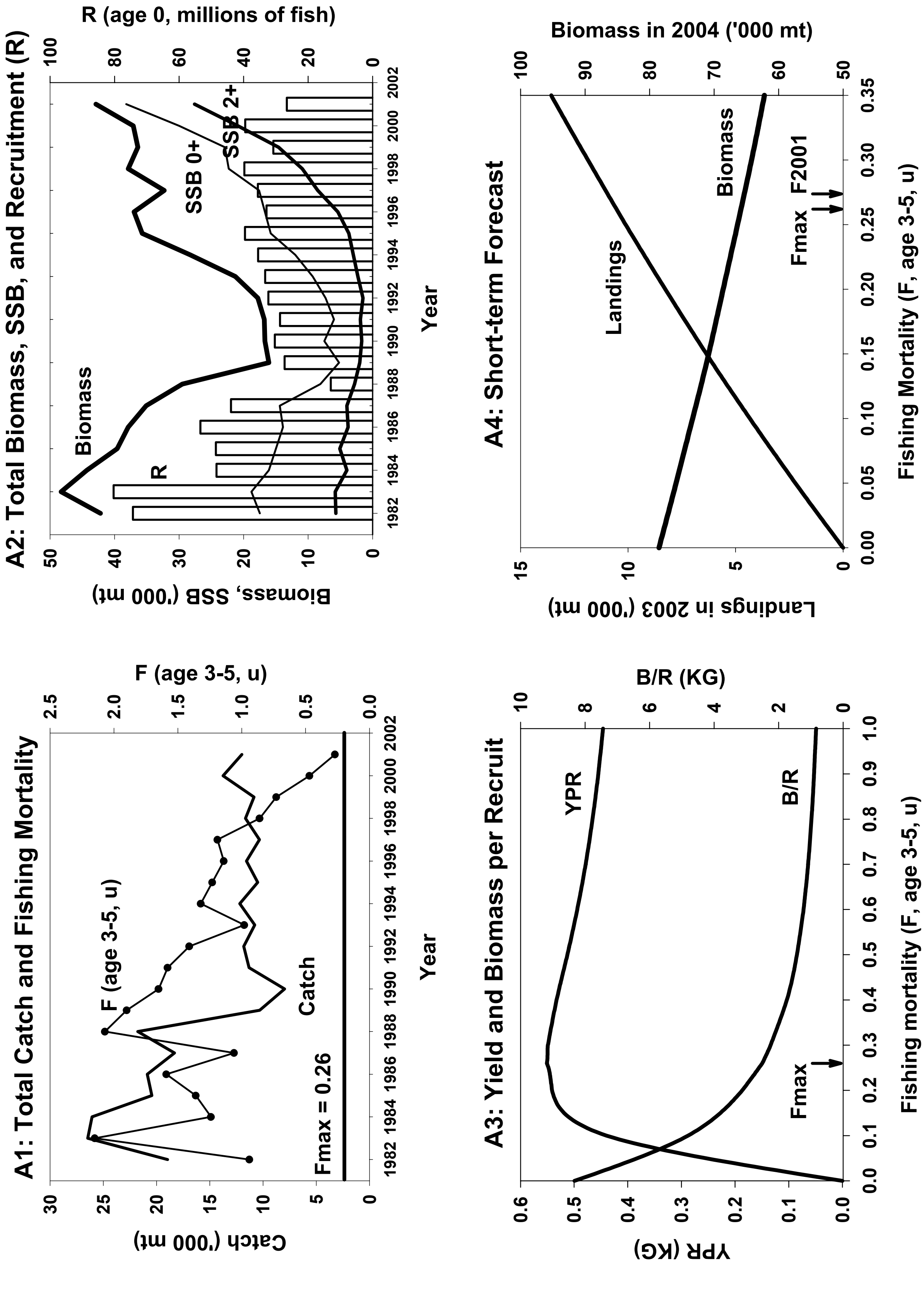
Recruitment: The arithmetic average recruitment from 1982 to 2001 is 40 million fish at age 0, with a median of 36 million fish. The 1982 and 1983 year classes are the largest in the VPA time series, at 74 and 80 million fish (Figure A2). Recruitment declined from 1983 to 1988, with the 1988 year class the weakest at only 13 million fish. Recruitment since 1988 has generally improved. The 2000 year class is estimated at 39 million fish, above the 1982-2001 median. The 2001 year class is currently estimated to be below average, at 27 million fish (Figure A2). It should be noted that retrospective analysis shows that the current VPA tends to underestimate the abundance of age 0 fish for recent year classes. Recent recruitment per unit of SSB has been lower than that observed during the early 1980s (Figure A8).

Spawning Stock Biomass: Spawning stock biomass (SSB; Age 0+) declined 72% from 1983 to 1989 (18,800 mt to 5,200 mt), but has increased seven-fold, with improved recruitment and decreased fishing mortality, to 38,200 mt in 2001 (Figure A2). Comparison with previous assessments shows a tendency to slightly overestimate the SSB in recent years. The age structure of the spawning stock has expanded, with 72% at ages 2 and older, and 14% at ages 5 and older. Under equilibrium conditions at F_{max}, about 85% of the spawning stock biomass would be expected to be ages 2 and older, with 50% at ages 5 and older (Figure A9).

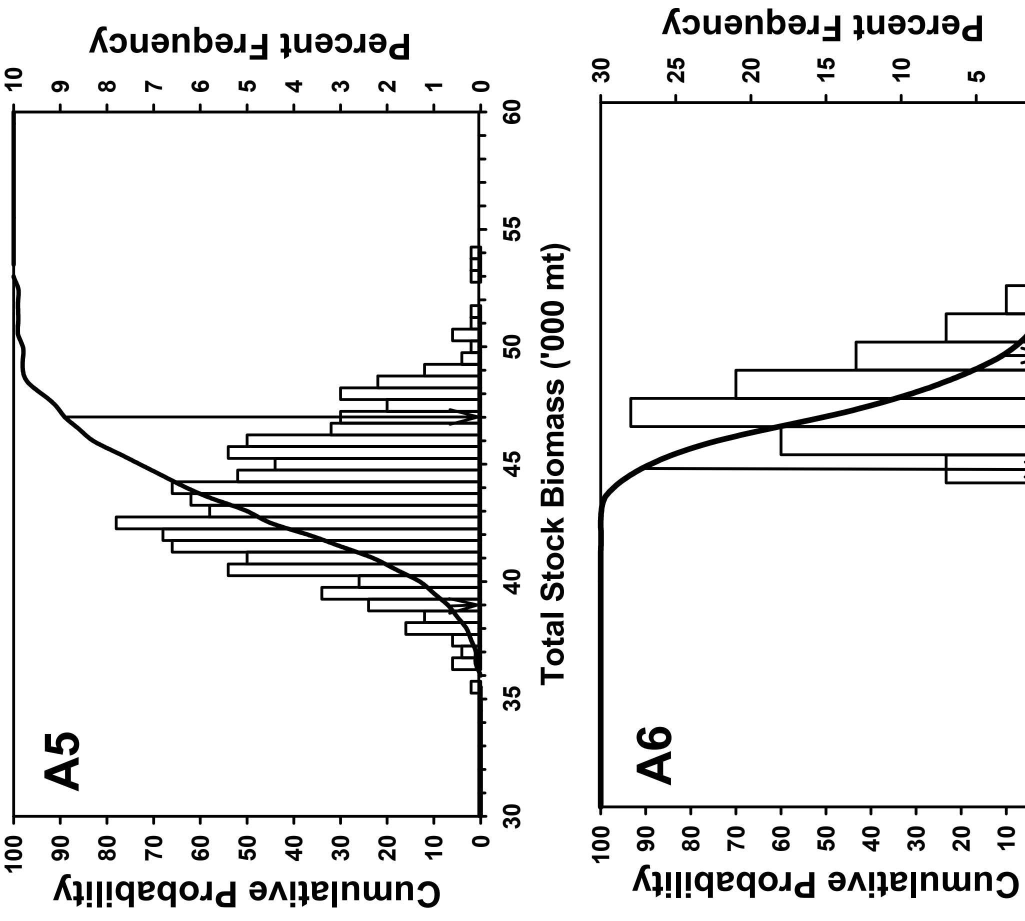
Special Comments: During each of the past six years the recreational fishery has exceeded its harvest limit and, for the entire period, exceeded the limit by 58%. During the same period the commercial fishery exceeded its harvest limit by 5%. These excesses result in a fishing mortality that exceeded the target.

Given that there is a persistent retrospective underestimation of fishing mortality, managers should consider adopting a lower TAL than that implied by the current overfishing threshold.

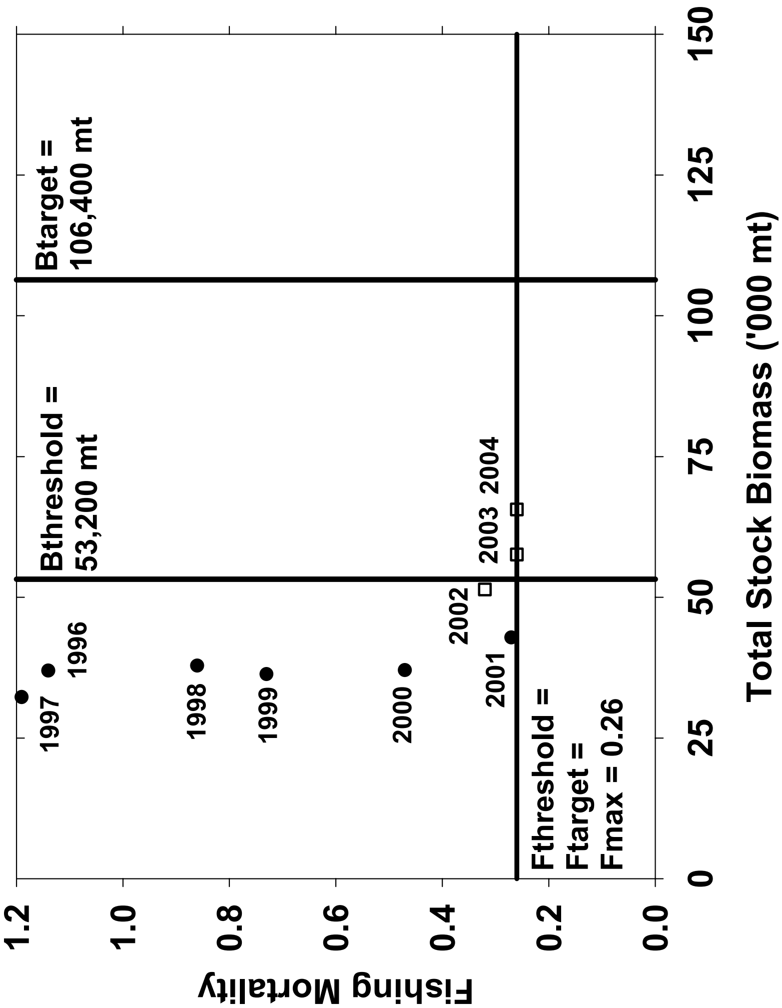
Sources of Information: Jones, W.J., and J.M. Quattro. 1999. Genetic structure of summer flounder (*Paralichthys dentatus*) populations north and south of Cape Hatteras. Marine Biology 133(129-135); Mid-Atlantic Fishery Management Council. (MAFMC). 2001a. SAW Southern Demersal Working Group 2001 Advisory Report: Summer Flounder. 12 p.; Mid-Atlantic Fishery Management Council. (MAFMC). 2001b. SSC Meeting - Overfishing Definition. July 31-August 1, 2001. Baltimore, MD. 10 p.; Northeast Fisheries Science Center (NEFSC). 2000. Report of the 31st Northeast Regional Stock Assessment Workshop (31st SAW): SARC Consensus Summary of Assessments. NEFSC Reference Document 00-15. 400 p.; Northeast Fisheries Science Center (NEFSC). 2002. DRAFT Report of the 35th Northeast Regional Stock Assessment Workshop (35th SAW): SARC Consensus Summary of Assessments. NEFSC Working Document; Terceiro, M. 1999. Stock assessment of summer flounder for 1999. NEFSC Reference Document 99-19. 178 p.

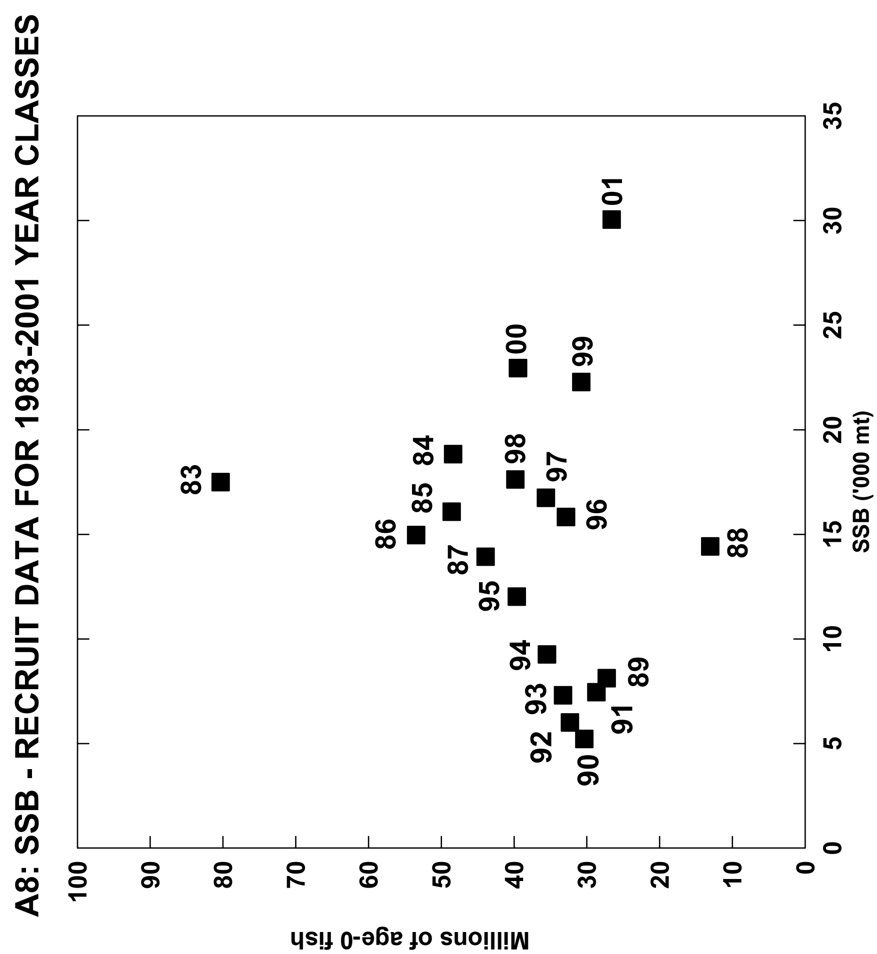

A1: Total Catch and Fishing Mortality
Catch ('000 mt)
F (age 3-5, u)
Catch
Fmax = 0.26
Year
A2: Total Biomass, SSB, and Recruitment (R)
Biomass, SSB ('000 mt)
R (age 0, millions of fish)
Biomass
R
SSB 0+
SSB 2+
Year
A3: Yield and Biomass per Recruit
YPR (KG)
B/R (KG)
YPR
B/R
Fmax
Fishing mortality (F, age 3-5, u)
A4: Short-term Forecast
Landings in 2003 ('000 mt)
Biomass in 2004 ('000 mt)
Landings
Biomass
Fmax
F2001
Fishing Mortality (F, age 3-5, u)

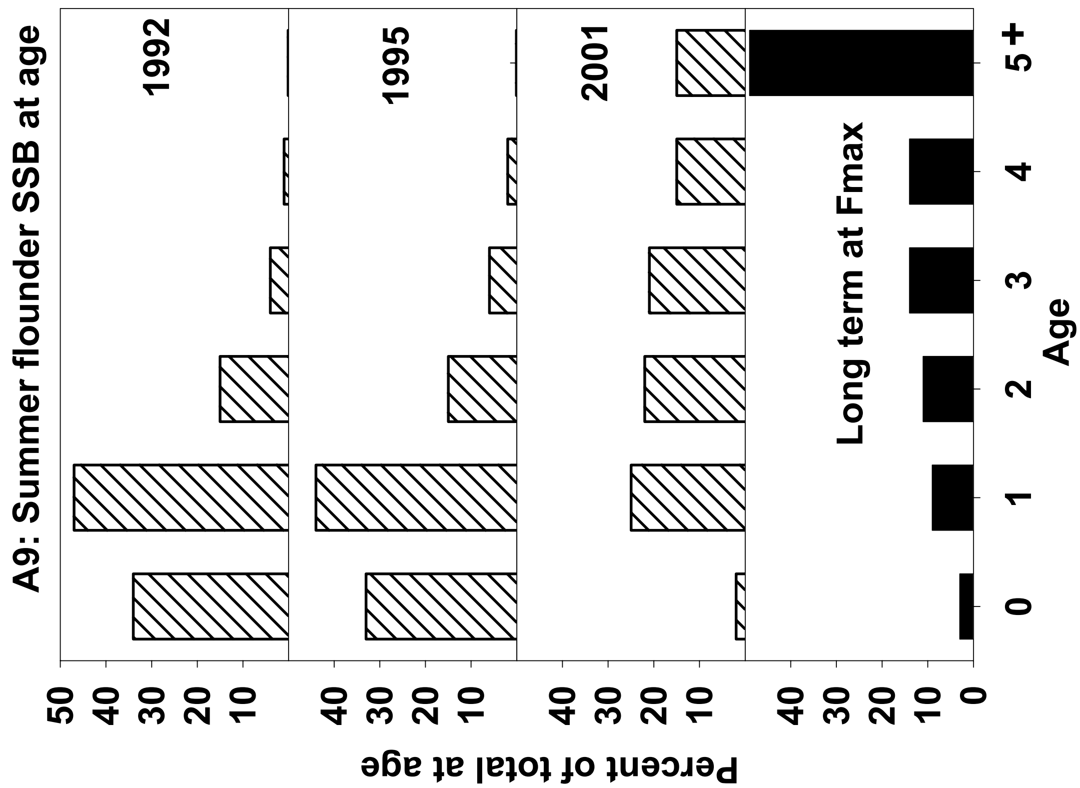
A5-A6: Precision of 2001 Estimates of Stock Biomass and F



A7: SFA Reference Points for Summer flounder




A8: SSB - RECRUIT DATA FOR 1983-2001 YEAR CLASSES
Millions of age-0 fish
SSB ('000 mt)
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
00
01


A9: Summer flounder SSB at age
1992
1995
2001
Long term at Fmax
Percent of total at age
Age

B. SCUP ADVISORY REPORT

Status of Stock: The stock is not overfished, but the stock status with respect to overfishing cannot currently be evaluated. The 2001 estimate of spawning stock biomass (2000-2002 average = 3.20 SSB kg/tow), based on the 3-year moving average of the NEFSC spring survey (Figure B1), exceeds the established biomass index threshold (2.77 SSB kg/tow). The change in stock status results from the extremely high survey index in the spring 2002 survey. Though the relative exploitation rates have declined in recent years (Figure B2), the absolute value of F cannot be determined. Survey data indicate strong recruitment and some rebuilding of age structure.

Management Advice: Management should continue efforts to further reduce fishing mortality rates and minimize fishery discards to rebuild the stock. Managers need to further constrain recreational catches as this sector continues to overshoot its target allocations.

The stock can likely sustain modest increases in catches, but managers should make their decisions with due consideration of high uncertainty in stock status determination.

Forecast for 2003: Reliable forecasts for this stock could not be developed, given the inability to estimate the absolute magnitude of F and uncertainty in the index of SSB. The 2002 spring survey value is highly uncertain since the abundance of all age groups in the survey increased substantially as compared with the 2001 results.

Scup Catch and Status Table (landings, discards, quota in '000 mt; SSB index in kg/tow)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Max[1]	Min[1]	Mean[1]
Commercial landings	6.3	4.7	4.4	3.1	2.9	2.2	1.9	1.5	1.2	1.7	9.9	1.2	5.3
Recreational landings	2.0	1.5	1.2	0.6	1.0	0.5	0.4	0.9	2.4	1.9	5.3	0.4	2.1
Recreational discards	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Total Landings[2]	8.3	6.2	5.6	3.7	4.0	2.7	2.3	2.4	3.6	3.6	12.5	2.3	7.5
Commercial Quota							2.7	2.1	1.1	1.1	2.0		
Rec. Harvest Limit							0.9	0.7	0.6	0.6	0.8		
SSB Index[3]	0.32	0.18	0.15	0.06	0.08	0.06	0.08	0.08	0.25	3.20	3.20	0.06	0.61

[1]Over the 1979-2001 time period. [2]Total catches not provided due to uncertainty in estimating commercial discards, see "Catches" below. Entries may differ from sum of commercial and recreational landings due to rounding. 3Calculated as moving three-year average of NEFSC spring trawl survey biomass index, (kg/tow).

Stock Identification and Distribution: Scup are distributed primarily between Cape Cod, MA and Cape Hatteras, NC, and are assumed to constitute a single unit stock.

Catches: US commercial landings averaged over 18,000 mt per year from 1950 to 1966 (peaking at over 22,000 mt in 1960) and declined to about 4,000 mt per year in the early 1970s (Figure B3). Landings fluctuated between 7,000 and 10,000 mt from 1974 to 1986 and have since declined to less than 2,000 mt. Landings in 2001 were 1,729 mt (3.8 million pounds) — less than 8% of the 48.5 million pound peak observed in 1960. Recreational landings have been increasing since 1999 and, in 2001, accounted for slightly more than 50% of the total landings. Recreational landings were 1,933 mt in 2001; dead discards comprised about 2% of the recreational catch. Limited sea sampling information suggests that commercial discards are variable and large. Total landings in 2001 were * mt, a 67% increase from 2000.

Data and Assessment: Scup was previously assessed at SAW 31 in 2000. As in previous assessment reviews, the SARC concluded that estimates of commercial fishery discards are not reliable due to limited sample size and uncertainty as to their representative nature of the sea sampling data for scup. The uncertainties associated with the catch data led the SARC to conclude that an analytical assessment would be inappropriate as the basis for management decisions for scup at this time. An analytical formulation for scup will not be feasible until the quality and quantity of the input data (biological sampling and estimates of all components of catches) are significantly improved and an adequate time series developed.

Biological Reference Points: A yield-per-recruit analysis from SAW 27 with an assumed M of 0.20 indicates that F_{max} = 0.26 (21% exploitation rate). The biomass threshold is defined as the maximum value of a 3-year moving average of the NEFSC spring survey catch per tow of spawning stock biomass (1977-1979 = 2.77 SSB kg/tow).

Fishing Mortality: Absolute estimates of fishing mortality for scup could not be calculated. Relative fishing mortality rates are available from total landings divided by the 3-year moving average of the spring and fall survey indices, indicating substantial declining trends since the mid-1990s (Figure B2).

Recruitment: Indices of recruitment from the NEFSC fall survey suggest improved recruitment in 1999-2001, with estimated age-0 abundance exceeding the 1984-2001 average of 69.03 fish/tow (Figure B4).

Stock Biomass: NEFSC spring and winter indices of stock biomass and abundance for 2002 were the highest within each respective time series (Figure B5). Other survey indices have increased since the mid-1990s.

Special Comments: Major uncertainties in estimating total catch continue to rule out an analytical stock assessment. The SARC expressed concerns about the failure to collect sufficient catch information that has bedeviled the production of scup assessments in the past. The panel suggested that a working group be tasked to recommend minimum and appropriately representative sampling levels for each component of the catch as a requirement for improving assessments.

Current stock biomass and age structure are uncertain given the high catch and variance in the 2002 NEFSC spring survey. This is one factor that limits the ability to do population projections.

Given the apparent high degree of inter-annual variation in individual survey indices, the use of a biomass index based on multiple survey signals should be explored as the stock status criterion. Alternative estimates of biomass reference points should be evaluated.

Sources of Information: NEFSC. 1998. Report of the 27th Northeast Regional Stock Assessment Workshop (27th SAW): Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. Northeast Fish. Sci. Cent. Ref. Doc. 98-15, 350 p.; NEFSC. 2000. Report of the 31st Northeast Regional Stock Assessment Workshop (31st SAW): Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. Northeast Fish. Sci. Cent. Ref. Doc. 00-15, 400 p. NEFSC. 2002. DRAFT Report of the 35th Northeast Regional Stock Assessment Workshop (35th SAW): Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. Northeast Fish. Sci. Cent. Working Document

Figure B1. Trends in SSB indices for scup. Dashed line represents the biomass threshold. Solid line is the 3-year moving average of the NEFSC spring survey index values.

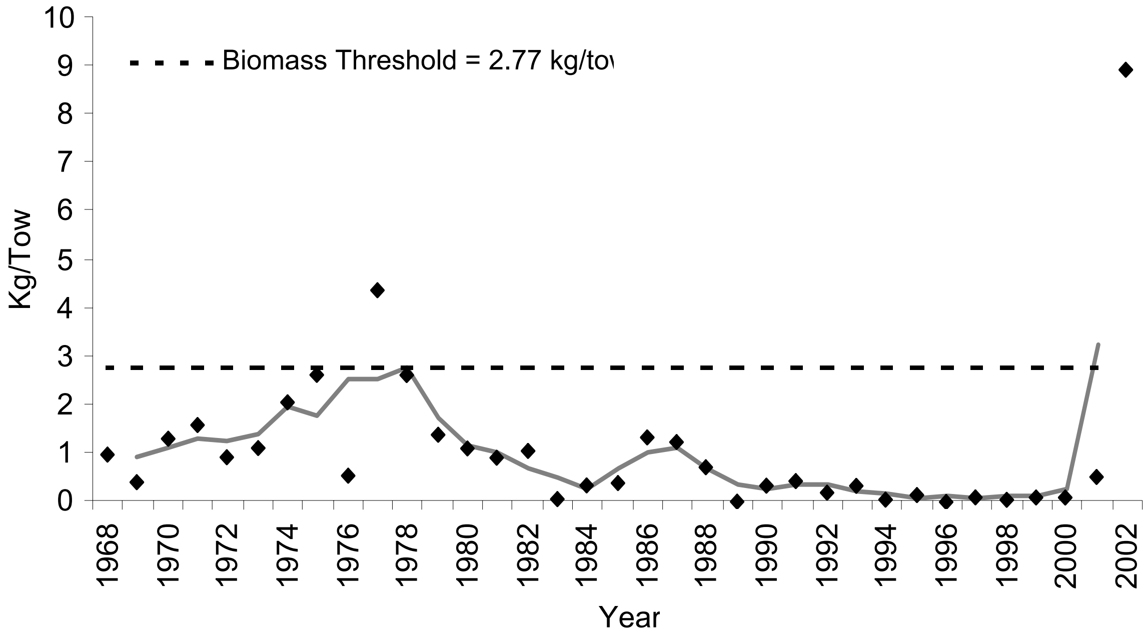


Figure B2. Estimated relative exploitation index based on total landings (1,000's of lbs) and SSB from either the NEFSC spring or NEFSC fall survey (kg/tow; three-year average).

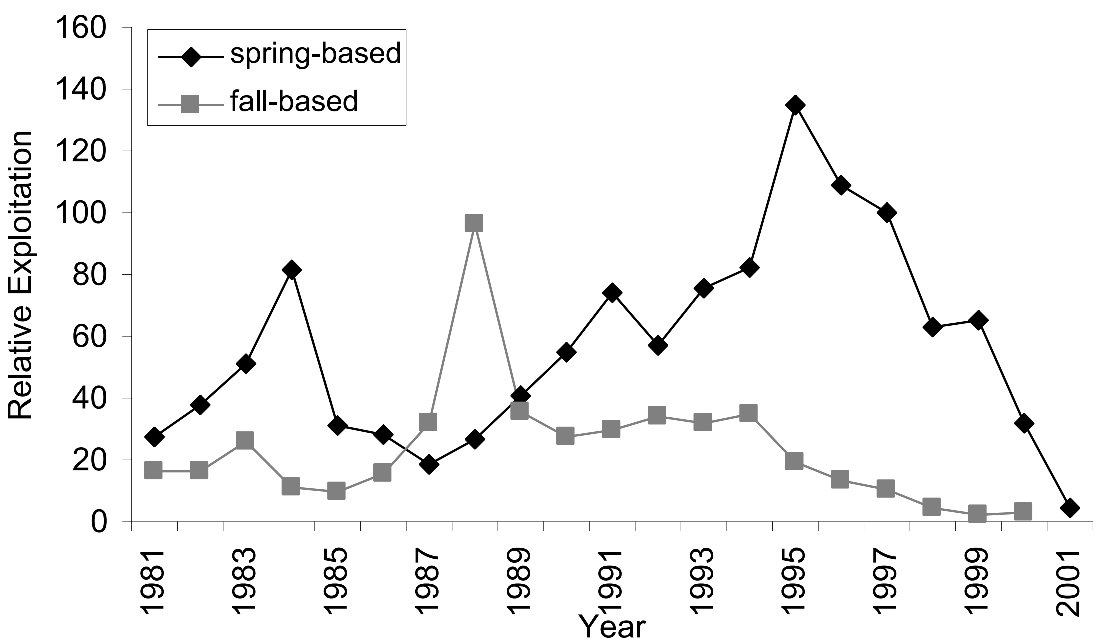


Figure B3. Catch of scup from Maine through North Carolina, including US commercial and recreational landings (1950-2001).

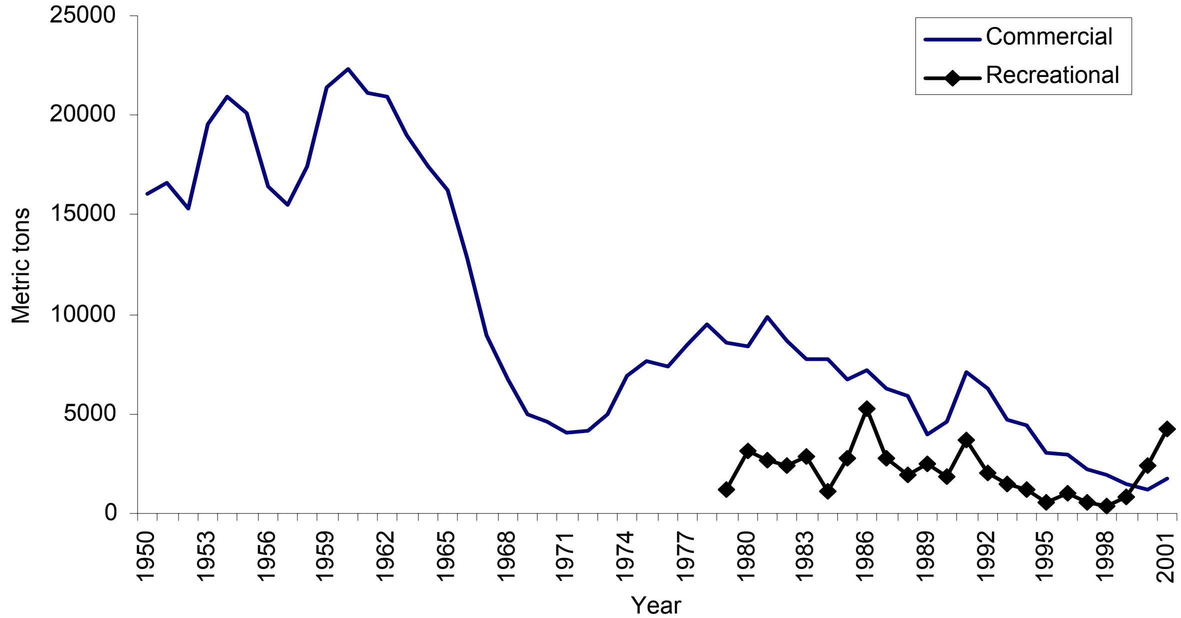


Figure B4. Indices of age-0 abundance (number fish caught per tow) from the NEFSC Fall survey.

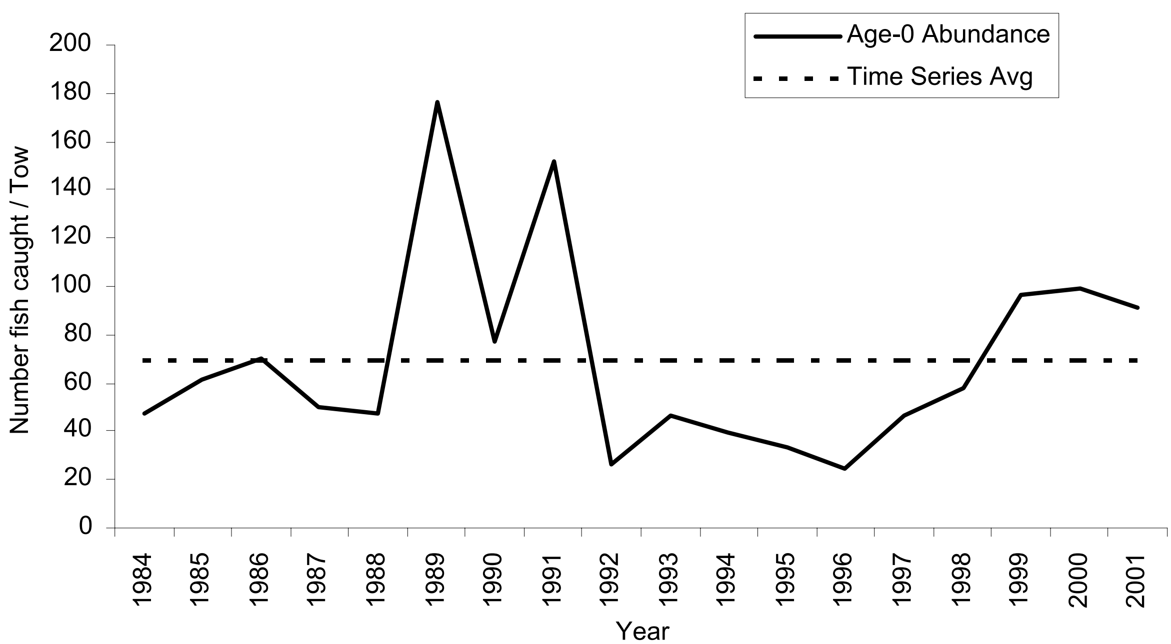
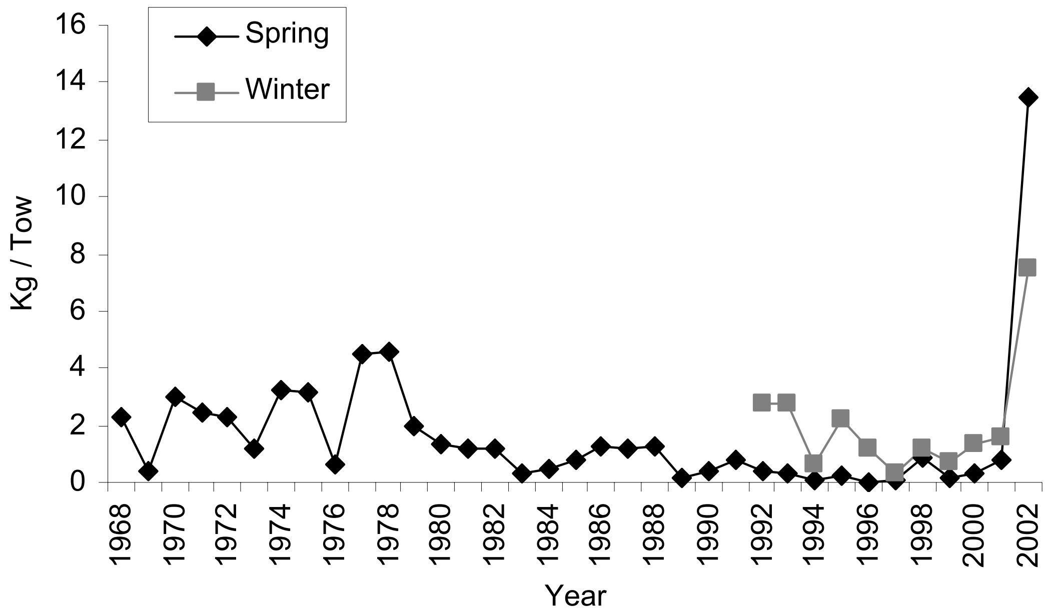


Figure B5. Trends in NEFSC winter and spring survey biomass indices.



C. SAW METHODS GROUP ADVISORY REPORT

The SARC reviewed the working document and presentation describing a new tool for stock assessment, based on the use of survey indices of abundance. This new approach could be applied when assessing certain fish stocks for which limited data might preclude the application of more traditional stock assessment methods. The technique provides a graphical representation of trends in biomass that assists in determining whether management measures are successful in sustaining or rebuilding a fish stock.

Prior to applying new methods in formal stock assessments, it is essential that the technical aspects, utility, and limitations of these methods are subjected to external peer review by scientists with considerable expertise in the field of stock assessment. After a new approach has been endorsed by such an external peer-review process, it may be applied to appropriate data sets with confidence that the results are likely to be reliable. Accordingly, it was appropriate that the SARC review the new technique and provide advice on the adequacy and potential of the proposed new index-based method, prior to endorsing the use of the new method as an additional tool that might be applied in future stock assessments of certain fish stocks.

The standard Advisory Report format for reporting scientific stock status and stock specific management advice is not well suited to reviews of technical issues that are more methodological in nature. Therefore, we provide a brief description of the method and then report on the SARC's findings with respect to the following terms of reference.

Terms of Reference

1) Describe the underlying theoretical basis for the index-based assessment and projection methodologies;
2) Identify critical limitations for application of such methodologies;
3) Compare reference point estimates and projections with results from VPA and other modeling approaches; and
4) Investigate the applicability of these methods to summer flounder and scup assessments for SAW 35.

Brief description of the index-based method

A value termed the 'replacement ratio' is estimated by dividing the value of the annual survey index for a fish stock by a moving average of the previous five values of that index. If the resulting value is 1, the stock has been maintained at the same average level as recorded in the previous five years. However, if the ratio exceeds 1, the abundance of the stock is increasing, and the extent of that increase is reflected in the magnitude of the replacement ratio. Conversely, if the replacement ratio is less than 1, then the abundance of the stock has declined relative to the average level recorded in the previous five years. A plot of the time series of values of the annual replacement ratio reveals the trends in abundance that have occurred through that period of the fishery's history for which survey indices are available (Figure C1b).

The relationship between the changes in stock abundance and changes in the relative levels of fishing mortality can also be determined using the survey indices if the time series of total annual catches (landings plus dead discarded fish) is available. For this, an estimate of the relative F is calculated, as described by Applegate *et al*. (1998), by dividing the value of the catch by the three-point average of the survey indices centered on the year in which that catch occurred. The resulting time series of the values of relative F may be plotted (Figure C1f) and the pattern of changes compared with those of the plots of the time series of replacement ratios (Figure C1b), survey indices (Figure C1d) or landings (Figure C1e). Alternatively, the replacement ratio or survey indices may be plotted against the values of relative F (Figure C1a or C1c, respectively). The resulting six-panel plot is a convenient graphical device to communicate the changes in the annual values of relative F and replacement ratios, thereby allowing examination of the relationships between these variables and the raw catch and survey data.

For many of the fisheries that are subject to assessment and consideration by the SARC, survey indices reveal a pattern of decline associated with increasing exploitation followed by an increase that is linked to the reductions in exploitation resulting from the various management controls that have been implemented. The resulting set of points in the plot of the replacement ratio versus relative F (Figure C1a) often suggests a linear trend, to which a robust regression line has been fitted and an ellipsoid has been drawn, which encompasses points that lie within approximately 1 standard deviation of the means of the two variables. Clusters of points around a replacement ratio of 1 may form if the relative F has been maintained at around the same level for a sufficient period such that the stock has settled around a stable equilibrium.

Techniques that provide estimates of the projected levels of the survey index and associated catches have been described. The method has also been used to hindcast estimates of the survey indices in earlier years of a fishery's history, for which catch data are available but for which no survey data exist.

Theoretical bases for the method

The SARC viewed the method as a useful empirical approach, but a number of issues were raised regarding its theoretical basis. Further work in a number of areas was recommended.

Limitations for application of the methods

- The use of the relative F statistic requires reliable catch data and would thus not be applicable to stocks for which catch records are inadequate, or substantial portions of the catch are poorly estimated (e.g. discards, recreational catch, etc.).

- The method assumes that the survey indices adequately represent the fishable biomass.

- The method will not adequately estimate relative F at replacement when stock trends are mainly driven by environmental effects. Strong year classes or, worse, persistent changes in productivity, such as connected with regime shifts, would lead to spurious results.

- The method would be unsuitable for developing fisheries, or situations when fishing mortality is increasing from a low value.

- The estimate of replacement fishing mortality will be sensitive to transition effects due to variations in recruitment, fishery selectivity, average weights, age structure and other factors.

Comparison of projections with results from VPA and other modeling approaches

- Projections based on this method should not be used to forecast population trends beyond a few years.

- Projections are sensitive to transient effects even in the absence of density dependence. For example, initial stock increases obtained in response to reductions in F may be large initially but the rate of increase would slow as the age structure broadens. The selection of the relative F needed to achieve a given rate of increase in the projections would be sensitive to transient conditions. When required relative F differs markedly from the current F, catch projections will be off scale compared to projections made using conventional age-structured models (e.g., Georges Bank yellowtail flounder).

- Further evaluation of the degree to which the method produces results that are comparable with those produced by a VPA is required, noting that the new method has the potential to be applied when data limit the applicability of other methods.

Applicability to summer flounder and scup assessments for SAW 35

- Due to inadequate catch records, the SARC concluded that the method was not applicable to the scup assessment.

- The method could have potential for summer flounder assessment as an interim technique (between the application of analytical assessments) to evaluate new catch and survey data relative to management targets, especially in combination with medium-term projections from assessments.

Conclusions

The method is a useful addition to the approaches that are used in stock assessment and has value in identifying appropriate stock assessment model structure. Some aspects of the approach, including calculation of the replacement ratios, relative Fs and graphical presentation of the resulting data, were endorsed by the SARC for use in the stock assessment of fisheries with appropriate data. However, performance of the method should be evaluated through simulation studies and the results subjected to peer review prior to use in estimating TACs or TALs, or before the approach is used in formal stock assessments. Such studies are also required to determine whether it is possible to identify alternative reference points, based on the replacement ratio, and how these reference points may relate to existing target and threshold reference points for a stock.

References

Applegate, A., S. Cadrin, J. Hoenig, C. Moore, S. Murawski and E. Pikitch. 1998. Evaluation of existing overfishing definitions and recommendations for new overfishing definitions to comply with the Sustainable Fisheries Act. Final Report, Overfishing Definition Review Panel. New England Fishery management Council, Newburyport, Massachusetts. 179 pp.

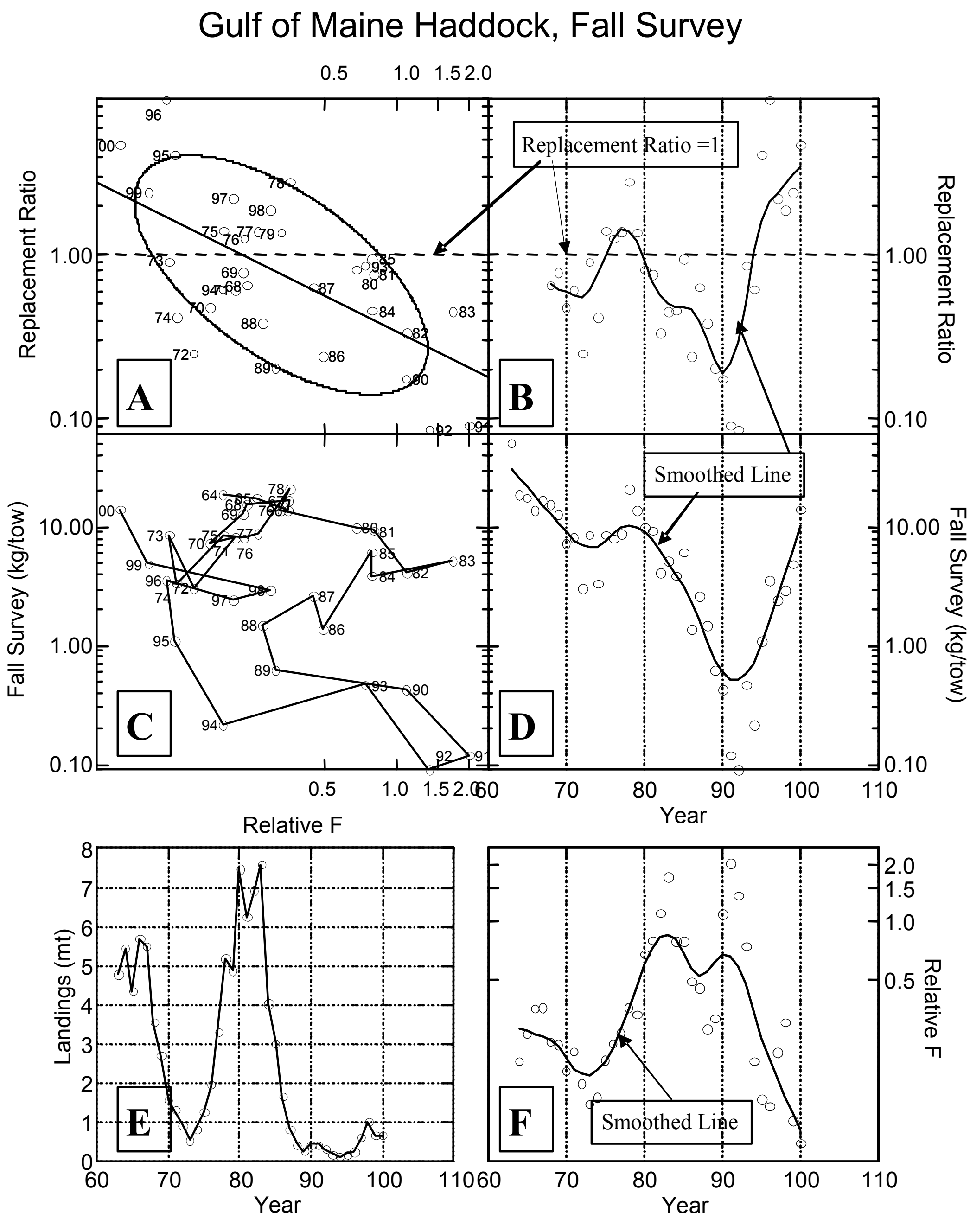


Figure C1. Annotated six-panel plot depicting trends in relative biomass, landings, relative fishing mortality rate (landings/index) and replacement ratios for Gulf of Maine haddock, using NMFS fall survey and commercial landings. Horizontal dashed (---) lines represent replacement ratios = 1 in (A) and (B). The confidence ellipse in (A) has a nominal probability level of 0.68. The diagonal line in (A) uses a robust regression estimator.

D. SILVER HAKE STOCK IDENTITY ADVISORY REPORT

The SARC reviewed the preliminary results arising from a research study concerning silver hake (whiting). Although a formal stock assessment of silver hake had not been undertaken by the current SAW, it was appropriate for the SARC to review the findings of this research study as it had used a microsatellite DNA study to investigate an issue of considerable relevance to the management of this fishery, *i.e.*, a determination of whether the assemblages of silver hake from the Mid-Atlantic Bight, southern and northern Georges Bank, Gulf of Maine, and the Scotian Shelf could be considered as representing different stocks.

The standard Advisory Report format for reporting scientific stock status and stock specific management advice is not well suited to such a review. Therefore, we report on the SARC's findings with respect to the following objectives, which were considered by the research study, and then present our conclusions regarding the stock structure of silver hake.

Terms of Reference

1) Determine whether the abundance of silver hake is related to Mid-Atlantic Bight bottom water temperatures;
2) Determine whether the assemblages of silver hake from the Mid-Atlantic Bight, southern and northern Georges Bank, Gulf of Maine, and the Scotian Shelf represent different stocks.

The relationship between abundance and bottom water temperature

There was no evidence to support the hypothesis that the abundance of silver hake was related to bottom water temperatures. In both spring and fall, these temperature lie well within the range of preferred temperatures for this species, as recorded in published reports.

Stock identity of the different assemblages

The investigators reported that the research team's initial decision to use a single locus for the determination of allelic frequencies was inappropriate and that a larger number of loci are required for such a determination. Other problems, including the small number of fish, inappropriate sampling regime, and use of null alleles, were identified as being major structural problems of the experimental methods. Accordingly, the data that had been collected were not of a sufficient quality to use in further analysis. Preliminary
findings, which had resulted from an analysis of these data, had indicated that the assemblages in each site were drawn from stocks that, on the basis of allelic frequencies, were statistically distinct. However, in addition to the inadequacy of the reported data, this analysis did not use the most appropriate statistical methods. Thus, as the investigators had advised and the SARC had

determined, no valid conclusions can be drawn from these data. The investigators advised that, in their on-going research, they planned to improve their sampling regime, extend the number of loci, and apply appropriate statistical methods.

Conclusions

No additional information on the stock structure of silver hake is available. Accordingly, management agencies should continue to apply the currently accepted description of stock structure when considering strategies for the management of this species.

Report of the Northeast Regional Coordinating Council Meeting

SAW Discussion

April 24, 2002
Gloucester, MA

Participants:
ASMFC - V. O'Shea, B. Beal, L. Kline
NEFMC - P. Howard, T. Hill, C. Kellogg, E. Smith
NERO - P. Kurkul, G. Darcy, D. Morris, J. Witzig
MAFMC - D. Furlong, R. Savage, R. Smith
NEFSC - M. Sissenwine, F. Almeida, J. Boreman, F. Serchuk, P. Smith, T. P. Smith

The Northeast Region Coordinating Council (NRCC) met in Gloucester, MA, April 23-25, 2002, to discuss a number of regional coordination/planning issues among the NMFS, New England and Mid-Atlantic Councils and Atlantic States Marine Fisheries Commission.

Part of the agenda related to the Northeast Regional Stock Assessment Workshop (SAW) process. Material provided at the meeting relevant to the SAW discussions were: a SARC Scheduling Worksheet, a Discussion Paper "What is a Peer Review" by Drs. Sissenwine and Smith, some notes from a recent SARC evaluation by the Center for International Experts (CIE), the SAW/SARC Assessment Species Spreadsheet, a January 29, 2002 memo "Assessments to be reviewed at June 2002 SARC", Draft General Terms of Reference for Stock Assessments (amended 3/2), and two discussion papers ("Towards a More Comprehensive Stock Assessment Process in the Northeast Region" by Dr. Emory D. Anderson and "The Northeast Regional Stock Assessment Model Workshop Model: A New Perspective" by Dr. Terrence Smith).

This report deals only with that part of the meeting that dealt with SAW business.

SAW Scheduling

SAW 35 (June 2002)
The SARC for SAW 35 will take place at the NEFSC's Woods Hole laboratory June 24-28, 2002, and will review benchmark assessments for summer flounder and scup. In addition, the NRCC agreed to schedule a peer review of the newly developed methodology that allows for formal rebuilding plans/stock biomass trajectories for stocks which have index-based assessments. Beyond a vetting of the new methodology, the NRCC would look for

two or more example simulations, perhaps using the two stocks for which benchmark assessments are being prepared. The Coordinating Council also suggested the addition of a presentation from the research group currently doing silver hake stock identification work via genetic markers. This would provide for a review of the research to date, suggestions for fine-tuning future research, and a means of providing some interpretation of results as it might relate to the NEFMC's future whiting management actions/amendments.

SAW 36 (December 2002)
Candidate stocks to be assessed and reviewed at the December 2002 SARC (SAW 36, December 2-6) include Southern New England and Mid-Atlantic yellowtail flounder, Cape Cod yellowtail flounder (with particular focus on yellowtail flounder stock identification issues), Gulf of Maine winter flounder, Southern New England/Mid-Atlantic winter flounder, striped bass, and northern shrimp. The ASMFC would be responsible for preparing the assessments for the winter flounder, striped bass and northern shrimp stocks. The timing of the northern shrimp survey, and subsequent data availability make it difficult to prepare an assessment in time for the fall SARC, but delaying the assessment to spring 2003 is even less attractive. ASMFC staff advised that it should be possible to meet these timelines, compressed as they are.

SAW 37 (June 2003)
Since the NEFSC surfclam/ocean quahog survey is occurring in May/June of this year, the MAFMC asked for a benchmark assessment review for these two stocks. A surfclam assessment review had previously been scheduled for SAW 36 with an ocean quahog review to take place in SAW 37. The NRCC elected to postpone these two assessment reviews one cycle. Thus, a surfclam assessment will be reviewed by the 37th SARC. A bluefish assessment review remains on the agenda. In addition, illex (short-finned squid) was added to the agenda as was spiny dogfish. Issues associated with a nascent hagfish fishery warrant a peer review of an assessment for that stock and review by a June 2003 SARC. The NRCC also discussed assessment reviews for pollock and Atlantic herring. A herring assessment and peer review is scheduled to take place in the Transboundary Resource Assessment Committee (TRAC) venue in the spring of 2003. A pollock assessment still awaits development from the Canadian side and since the preponderance of the stock is in Canadian waters it would be desirable to postpone the assessment until it can be done jointly with Canada. Also included on the agenda for the 37th SARC is an assessment review for witch flounder..

SAW 38 (December 2003)
Stocks tentatively listed for assessment development and review for the fall of next year include ocean quahog, black sea bass, red hake, Gulf of Maine haddock and sea scallops. The ASMFC requested that American Shad and sturgeon be on the agenda. In addition the ASMFC would like to schedule a peer review of the striped bass/bluefish/menhaden multispecies assessment model that has been developed by a sub-group of the Management and Science Committee.

SAW 39, 40 (2004)
In terms of longer-term planning, the NRCC recommended that butterfish and tilefish be assessed and reviewed in one of the 2004 SAW cycles.

Research Recommendations

At its last meeting, the NRCC discussed the fact that the SARC routinely provides research recommendations for work to be completed in support of future assessments for the stock under discussion, or, more generally, for improvements which would benefit multiple assessments.

Those recommendations appear at the end of each stock section in the Consensus Summary of Assessments SAW document but there is no mechanism for reviewing, prioritizing and acting upon those recommendations.

The NRCC asked for further information on this issue so that they might be able to provide advice on how these recommendations might be integrated into the regional management system.

To that end, Frank Almeida (NEFSC) compiled the research recommendations offered on SAW 19 through 34. Some 716 recommendations were developed over this period (1994-2001). All recommendations are contained in a spreadsheet file (available from Mr. Almeida) categorized in a number of dimensions including relevant stock, type of research recommendation, and completion status.

Mr. Almeida presented summary sheets as well as a number of copies of the complete recommendation list.

The NRCC reviewed and discussed the material and suggested that the compilation be referred to the appropriate species technical teams (PDT, monitoring committees or technical committees) for evaluation and comment.

In addition, the NRCC suggested that the recommendations be further categorized to identify research topics that would be amenable to internal or external research. For the latter category, sub-categorization would be appropriate and could include the suitability of referring the recommendations to cooperative industry research programs, the CMER grant programs or Sea Grant (or the like) programs.

SAW Process Review

The balance of the day's discussions was devoted to a critical review of the current SAW process. The discussion can be summarized via a number of component topics including: issues, challenges and perceived problems; peer review definitions; the current SAW process which includes documentation and presentation of results; and education/outreach efforts to better inform the Councils and the public. The endpoint of the discussion was to provide some recommendations for revisions to the system which might better serve the Region's partners.

In terms of the general discussion the following points are useful.

- Council members should become more familiar with the SAW process and the general structure of peer reviews. This is an education/outreach issue. Discussion focused on the definitions of peer reviews offered in the discussion paper on that topic. It would be desirable to set aside some time on a Council meeting agenda to provide an informational presentation on the SAW process, peer review and how/why the SAW is structured as it is.

- Assessment results and management advice provided by the SARC tend not to accurately reflect "real time" observations. That is, there is a lag between the date at which data were 'cut off' to provide for a formal assessment analysis and the time at which the results are presented to the industry who may be interpreting the advice relative to what they observed on their most recent fishing trip. This lag is, in general, at least one year, and, in some circumstances, can reach two years or more.

- Another issue is the ownership of working papers and the change of ownership from the working group to the SARC. This issue is especially important in the case of assessments developed by the ASMFC as additional ownership issues arise post-SARC as the assessment subcommittees present results to their parent technical committees and, ultimately, species management boards. It is not clear how to resolve this issue, but some view the current situation as unfair to the working groups.

- The public workshops need to involve more scientific presence and more time allotted to discussion. It was mentioned that the present peer review system falls into the category of an integrated review. A sequential peer review may have less bias.

- One characterization is that there are perceived problems with respect to choices (benefits and risks), credibility (acceptance of the end result), participation (not enough state and outside representation), and decorum (quality of presentations should be more professional).

And, in terms of integrating and responding to these comments.

- Recent changes of the biological reference points has led to more focus on the credibility of the system where the question of "credibility" rises from whether or not the answer is accepted.

- Is there change necessary to the SARC model? If so, then credibility, communication, relationship between the processes and effect of the workload on Council/Center staff would be involved. This needs to be evaluated.

- There is a need for an array of reasonable choices which would lend to better credibility rather than one firm statement. However, it is not the managers' job to make a science based decision on a SAW report.

Some points that emerged from the discussion of the discussion paper on types of peer review.

- The integrated reports prepared represent the scientific perspective and the answers that one gets from a sequential perspective must be objective.

- SAWs provide high quality peer review and institutionalizes individual staff workload commitments.

Given these discussions the SAW could be 'redesigned' to reflect the following.

- The Working Group meetings, which develop the assessment to be reviewed, could involve more representation from the industry, academia, Councils, States, and Federal government for a more in-depth peer development of an assessment. That is, involve more 'outside' panelists at the working group level. This should provide for a better quality assessment, all else equal, and more 'closure' with respect to the assessment.

- The resulting assessment report would be peer reviewed by a separate, perhaps smaller, panel of outside experts (perhaps all from the CIE). They would accept or reject the assessment or, more simply, pass judgment that the assessment provided an acceptable basis for determining stock status and providing management advice.

- A third group (Council staff, management experts from the Center, Regional office, outside) would receive the report of the working group and peer review panel and interpret the results relative to existing management plans and provide an advisory report to managers (which could take the form of the current advisory report or some other form).

- This tri-part model is not, in overview, any different than the current SAW model which provides for a sequential/integrated review. What is different is a clearer distinction between the steps of assessment preparation, peer review and the crafting of management advice. This difference is manifest in some partitioning of the panel structure and some separation of meetings.

- It is not clear, at this point in time, exactly how this would work, particularly with respect to the issue of the transition between 'panels' so that no information is lost while still providing for a more compact sequential series of reviews/report preparation..

- The NRCC agreed to continue work on the details of such a change and committed to implementing change along these lines in the fall 2002 SARC (SAW 36).

Actions

With respect to changes in the SAW process, several tasks must take place. The two fishery management councils and the ASMFC should schedule some time (an hour or two) on the agenda to talk about the current SAW process in general - discuss peer review models, solicit feedback and talk about new approaches.

Replacements to the traditional SAW Public Review Workshop need to be developed and discussed. This could include team presentations, presentations to the oversight or management committees, and the like.

The three phase assessment development, assessment review, management advice model needs to be further developed and specific recommendations for changes that could be incorporated into the SAW 36 cycle need to be provided.

The SAW chairman will be responsible for further development of these points, but it will likely be necessary to involve the NRCC in further discussion/decisions in the next several months.

As mentioned at the meeting, a group internal to the NEFSC is also looking at recommendations for change. It will be important that the internal review and recommendations dovetails with the NRCC-led efforts.

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Publications and Reports of the Northeast Fisheries Science Center

The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "planning, developing, and managing multidisciplinary programs of basic and applied research to: 1) better understand the living marine resources (including marine mammals) of the Northwest Atlantic, and the environmental quality essential for their existence and continued productivity; and 2) describe and provide to management, industry, and the public, options for the utilization and conservation of living marine resources and maintenance of environmental quality which are consistent with national and regional goals and needs, and with international commitments." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Those media are in four categories:

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