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A Report of the 23rd Northeast Regional Stock Assessment Workshop

23rd Northeast Regional Stock Assessment Workshop (23rd SAW)

Public Review Workshop

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National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
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This report is a product of the 23rd Northeast Regional Stock Assessment Workshop (23rd SAW). Proceedings and products of the 23rd SAW are scheduled to be documented and released as issues of the *Northeast Fisheries Science Center Reference Document* series. Tentative titles for the 23rd SAW are:

Current resource conditions in Georges Bank and Mid-Atlantic sea scallop populations: results of the 1996 NEFSC sea scallop research vessel survey

Report of the 23rd Northeast Regional Stock Assessment Workshop (23rd SAW): Public Review Workshop

Report of the 23rd Northeast Regional Stock Assessment Workshop (23rd SAW): Stock Assessment Review Committee (SARC) consensus summary of assessments

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OVERVIEW

Introduction

The Public Review Workshop of the 23rd Northeast Regional Stock Assessment Workshop (SAW-23) was held in two sessions as part of the meetings of the New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC). The first session was held January 29, 1997 in Danvers, MA during the NEFMC meeting and the second session was held February 19, 1997 in Atlantic City, NJ during the MAFMC meeting.

The purpose of the Workshop was to present the assessment results and management advice on goosefish, sea scallops, and bluefish, peer reviewed by the Stock Assessment Review Committee at its November 18-22, 1996 meeting, to managers, fisheries representatives, and the public. Copies of the SAW-23 draft Advisory Report on Stock Status and draft Consensus Summary of Assessments had been distributed to members of each Council prior to the Workshop. Additional copies were available to the public at each session.

A modified format was introduced at the Workshop sessions aimed at shortening the formal presentation of technical material and devoting more time to question-and-answer periods. The SAW Chairman, Dr. Emory Anderson of the NMFS, Northeast Fisheries Science Center, lead the presentations. Dr. Anderson briefly summarized the significant results for each stock using information contained in this report and supporting information from the *23rd Northeast Regional Stock Assessment Workshop (23rd SAW) Stock Assessment Review Committee (SARC) Consensus Summary of Assessments*. A panel comprised of SARC Subcommittee Chairmen Dr. Wendy Gabriel (Southern Demersal), Dr. William Oversholtz (Coastal/Pelagic), and Dr. Paul Rago (Invertebrate) assisted Dr. Anderson in the question-and-answer periods. Dr. Steven Murawski substituted for Dr. Rago at the MAFMC session.

Status Summaries

Goosefish

SAW-23 confirmed the findings for goosefish from SAW-21 (1995); analyses showed low abundance, high fishing mortality, and an alarming paucity of larger fish in the population. Recent landings are at an all-time high and more than twice the 1988-1995 mean level. Egg production is presently less than one-third of the levels observed during the 1970s, a decade during which the commercial fishery for goosefish was much less significant than at present. Recommendations include significant reductions in fishing mortality and the avoidance of any redirection of effort from other fisheries onto this species.

Sea Scallops

Groundfish closed areas are providing sanctuaries for a portion of the Georges Bank sea scallop stock. Analyses show improved survival rates and about three times as many scallops in the closed areas as in the adjacent open areas of the Bank. Analyses indicate moderate or low abundance and no significant increase in recruitment in the open areas of Georges Bank or in the Mid-Atlantic region.

Analyses also show that two major management measures presently in use (increased ring size on scallop dredges and a decrease in maximum crew sizes) are not having their intended effect on scallop landings. The measures are intended, in part, to shift fishing mortality to age 3 and older scallops. Instead, since the measures have been in place, there has been an overall shift in the size composition of landings toward smaller scallops largely as a function of the dependency of the fishery on recruitment.

Analysis of historical patterns in scallop landings. show that the size composition has been primarily determined by 1) natural variation in year-class strength

and 2) the "meat count," a former management measure which required a pound of landed sea scallop meats to be composed of no more than a specified number of individual meats. It was recommended that fishing mortality should be reduced on the Mid-Atlantic portion of the resource stock and that caution be excercised in allowing harvest in any newly opened areas on Georges Bank.

Bluefish

Spawning stock biomass of bluefish, an important recreational species, is estimated to be at about 40% of the level observed in the early 1980s. Recruitment levels have also been low in recent years. A significant reduction in catch (removing 8% or less of the stock rather than 29%, as at present) will be necessary in order to halt the decline in spawning stock biomass.

Conclusions of the SAW Steering Committee

The SAW Steering Committee met three times during the SAW-23 cycle. A meeting was held December 16, 1996 at Virginia Beach, VA to discuss the SAW process in light of increased demands for advice and the need to broaden participation in assessment and peer-review aspects of the process and to set the agenda for SAW-24. This meeting was followed by teleconferences on February 10 and 13, 1997, at which time meeting dates and agendas for SAW-24 and SAW-25 were modified to accommodate a Congressionally-mandated review by the National Research Council (NRC) of Northeast groundfish assessments slated to begin in June 1997. A summary of these meetings is presented in the Conclusions of the SAW Steering Committee section of this report.

ADVISORY REPORT ON STOCK STATUS

INTRODUCTION

The **Advisory Report on Stock Status** is a major product of the Northeast Regional Stock Assessment Workshop process. It 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 whether a stock is currently over-, fully-, or under-exploited. As these categories specifically refer to the act of fishing, they are best thought of in terms of exploitation rates relative to the Councils' overfishing and maximum sustainable yield (MSY) definitions. 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 defined by the overfishing definition, it is considered to be over-exploited. When the stock is at such a level that the MSY can be taken, but the fishery is only removing a small portion of the stock, then it is considered to be under-exploited.

Another important factor for classifying the status of a resource is the current stock level, for example, spawning stock biomass (SSB). It is possible that a stock that is not currently overfished in terms of present exploitation rates is still at a low biomass level due to heavy exploitation in the past. In this case, future recruitment to the stock is very important and the probability of improvement is increased greatly by increasing the SSB. Conversely, a stock currently at a high level may be exploited at a rate greater than the overfishing definition level until such time as it is fished down to a stock size judged appropriate for maximum productivity or desirable from an ecological standpoint. Therefore, where possible, stocks under review are classified as having high, medium, or low biomass compared to historic levels. The figure below describes this classification.

EXPLOITATION STATUS \ STOCK LEVEL	LOW	MEDIUM	HIGH
OVER EXPLOITED	REDUCE EXPLOITATION REBUILD STOCK BIOMASS	REDUCE EXPLOITATION REBUILD AGE STRUCTURE	REDUCE EXPLOITATION INCREASE YIELD PER RECRUIT
FULLY EXPLOITED	REDUCE EXPLOITATION REBUILD STOCK BIOMASS	MAINTAIN EXPLOITATION RATE AND YIELD	MAINTAIN EXPLOITATION RATE AND YIELD
UNDER EXPLOITED	MAINTAIN LOW EXPLOITATION WHILE STOCK REBUILDS	INCREASE EXPLOITATION SLOWLY TO REFERENCE LEVEL	INCREASE EXPLOITATION TO REFERENCE LEVEL

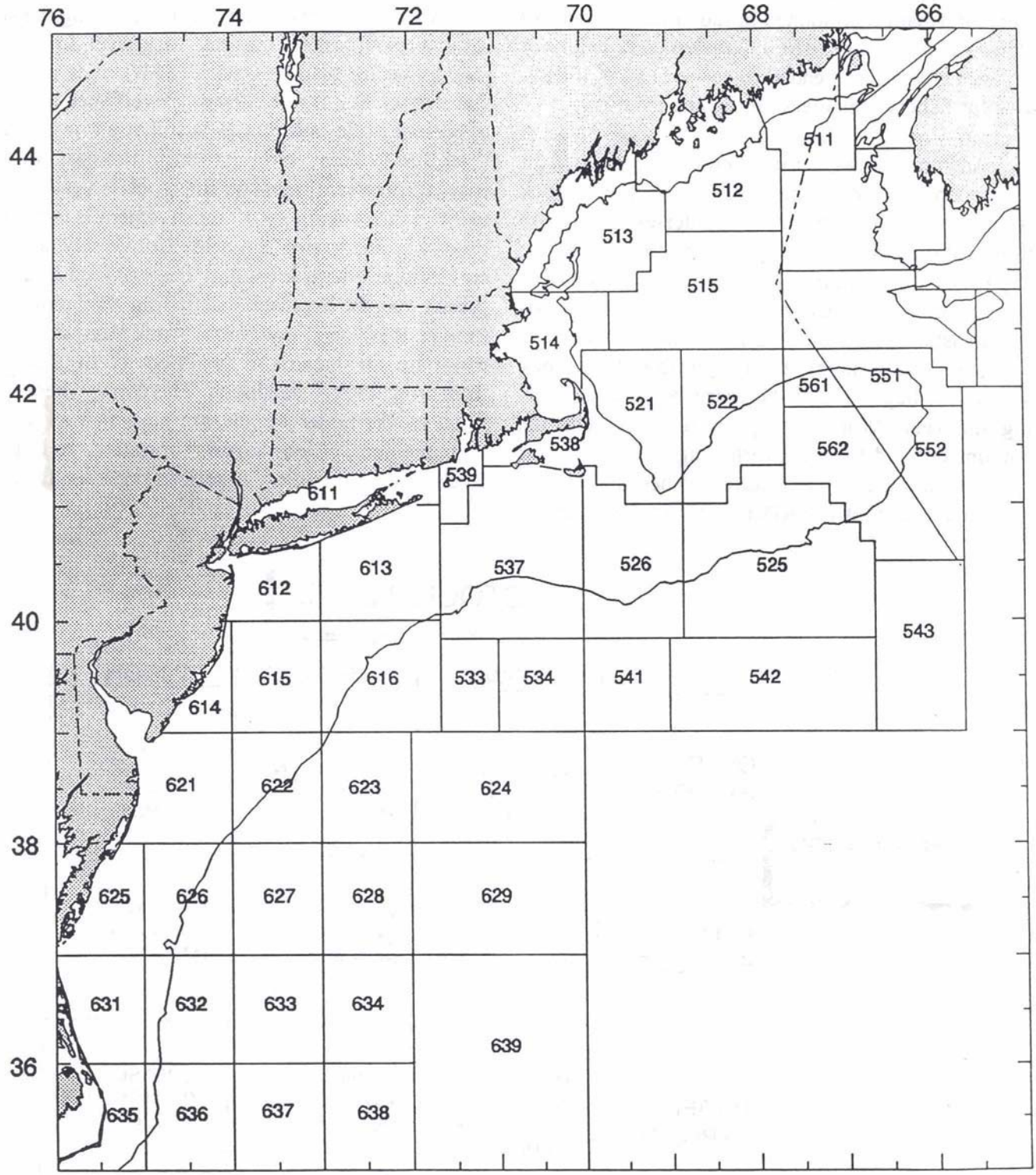


Figure 1. Statistical areas used for catch monitoring in offshore fisheries in the Northeast United States.

GLOSSARY OF TERMS

Biological reference points: Fishing mortality rates that may provide acceptable protection against *growth overfishing* and/or *recruitment overfishing* for a particular stock. The rate and points are usually calculated from equilibrium *yield-per-recruit* curves, spawning stock biomass-per-recruit curves and stock recruitment data. Examples are $F_{0.1}$, F_{MAX}, and F_{MSY}.

Exploitation pattern: The pattern of fishing mortality on different age classes of the stock. 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 [$1{,}000{,}000 \times (1 - 0.00548)^{365}$] 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 [$1{,}000{,}000 \times (1 - 0.00228)^{8760}$]. 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 which 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_{MSY}: The fishing mortality rate which maintains a stock at the level which will produce the maximum sustainable yield.

$F_{10\%}$: The fishing mortality rate which reduces the spawning stock biomass per recruit to 10% of the amount present in the absence of fishing.

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.

Maximum Spawning Potential (MSP): The derived spawning stock biomass per recruit when fishing mortality is zero. The percentage value associ-

ated with MSP for a particular species or stock is derived either from a stock-recruitment relationship or, by analogy, from a closely related species for which more information is available.

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

Recruitment: The number of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to the fishing gear in one year would be the recruitment to the fishable population that year. This term can also refer to the number of fish from a year class reaching a certain age. For example, all fish reaching their second year would be age 2 recruits.

Recruitment overfishing: The situation existing when the rate of fishing mortality reaches a level which 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.

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. An equilibrium value of SSB/R is calculated for each level of F for a given exploitation pattern, rate of growth, and natural mortality.

Status of exploitation: An appraisal of exploitation for each stock is given as under-exploited, fully-exploited, and over-exploited. These terms describe the effect of current fishing mortality on each stock, and are equivalent to the Councils' terms of under-fished, fully-fished, or over-fished. Status of exploitation is based on current data and the knowledge of the stocks over time.

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

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 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. For a given exploitation pattern, rate of growth, and rate of natural mortality, an equilibrium value of Y/R is calculated for each level of fishing mortality.

Table 1. Percentage of stock (in numbers) caught annually (i.e., exploitation rate) for different natural (M) and fishing (F) mortality rates for species considered in this report.

F	M = 0.10 Sea scallop	M = 0.20 Goosefish	M = 0.25 Bluefish
0.1	9	9	8
0.2	17	16	16
0.3	25	24	23
0.4	31	30	29
0.5	38	36	35
0.6	43	41	40
0.7	48	46	45
0.8	53	51	50
0.9	57	55	53
1.0	61	58	57
1.1	64	62	60
1.2	67	65	63
1.3	70	67	66
1.4	73	70	69
1.5	75	72	71
1.6	77	74	73
1.7	79	76	75
1.8	81	78	77
1.9	82	79	78
2.0	84	81	80

A. GOOSEFISH ADVISORY REPORT

State of Stock: The stock is at low levels of biomass and is over-exploited. Landings (converted to live weight) have steadily increased from an annual average of 2,800 mt in the 1970s to 9,800 mt in the 1980s and to 21,000 mt in the 1990s (750% increase from the 1970s). Length distributions from NEFSC trawl surveys have become increasingly truncated over time. By 1990, fish greater than 80 cm in length were uncommon in the length frequency distributions, and by 1996, fish greater than 60 cm had also become uncommon. Maximum lengths have declined by approximately 20 cm or more over the time series.

Northern Area

Estimates of current (1991-1995 average) fishing mortality rates of 0.15 (13% exploitation) are substantially above the $F_{Threshold}$ (1970-1979 average of 0.05 or 4% exploitation). Research survey indices of 1.24 kg/tow (1993-1995 average) are below the level at which overfishing is defined to occur ($B_{Threshold}$ = 1.46 kg/tow) and have been below that level since 1989. The relative index of egg production has declined to 22% of the maximum observed level (1980). Although recent length frequency distributions from NEFSC surveys indicate a fairly high abundance of small fish, those modes do not persist for more than two years, possibly due to the high exploitation of fish at sizes smaller than those indexed by the fishing mortality estimates.

Southern Area

Estimates of current (1991-1995 average) fishing mortality rates of 0.51 (37% exploitation) are substantially above the $F_{Threshold}$ (1970- 1979 average of 0.14 or 12% exploitation). Research survey indices of 0.43 kg/tow (1993-1995 average) are below the level at which overfishing is defined to occur ($B_{Threshold}$ = 0.75 kg/tow) and have been below that level since 1987. The relative index of egg production has declined to 6% of the maximum observed level (1967). There has been no evidence of strong recruitment in the southern area in recent years.

Management Advice: Fishing mortality has exceeded all reference points for more than a decade in the northern area and since the early 1980s in the southern area. Fishing mortality should be decreased significantly and any redirection of displaced effort from other fisheries should be avoided to enhance prospects of stock rebuilding.

Forecast for 1997: No forecasts were made.

Catch and Status Table (live weights in '000 mt): Goosefish

Year	1988	1989	1990	1991	1992	1993	1994	1995	Max	Min	[4]Mean
USA commercial landings											
Northern area	5.0	6.2	5.8	5.7	6.9	10.6	[3]9.2	[3]14.6	14.6	3.8	6.4
Southern area[1]	4.9	8.7	7.2	9.9	13.9	15.1	[3]13.9	[3]12.1	15.1	4.0	8.0
Total	9.9	14.9	13.0	15.6	20.9	25.7	23.1	26.7	26.7	8.3	14.4
Canadian landings[2]	0.9	1.2	1.6	1.0	0.4	0.4	0.5	0.4	1.6	0.3	0.8
Discards, commercial	Discards occur but reliable estimates are not available										
Northern area											
Biomass index	1.52	1.38	1.00	1.24	1.10	1.04	0.97	1.71	3.01	0.87	1.44
F[5] (≥ 59 cm, 23.2 in[6])	0.12	0.09	0.10	0.13	0.13	0.12	0.16	0.15	0.17	0.03	0.12
Exploitation rate	10%	8%	9%	11%	11%	10%	13%	13%	14%	3%	10%
Southern area											
Biomass index	0.55	0.63	0.43	0.78	0.31	0.29	0.61	0.39	2.15	0.27	0.69
F[5] (≥ 19 cm, 7.5 in[6])	0.33	0.36	0.38	0.45	0.33	0.39	0.46	0.51	0.51	0.25	0.35
Exploitation rate	26%	28%	29%	33%	26%	29%	34%	37%	37%	20%	27%

[1]Includes landings from North Carolina for which different conversion factors are used to calculate live weight. [2]From Statistical Area 5Zc. [3]Proportions of landings between the northern and southern areas are preliminary for 1994 and 1995. [4]Max, Min, and Mean are for 1982-1995 for US and for 1986-1995 for Canada. [5]Five-year average (year in question and four preceding years). [6]Total length.

Stock Distribution and Identification: Data to definitively distinguish separate stock units of goosefish are currently unavailable. The assessment units as described in SAW-14 should be maintained in order to monitor and address different trends in recruitment and fishery impact by area.

Catches: Total landings (live weight) remained low until the mid-1970s, increasing from several hundred mt to around 6,000 mt in 1978 (Figure A1). Landings remained stable between 8,000 and 10,000 mt until the late 1980s. Since 1989, landings have increased to a peak level of nearly 27,000 mt in 1995. Landings in the northern area (Figure A2), began to increase in the mid-1970s from less than 100 mt in the mid-1960s to over 4,000 mt by 1979. By 1993, landings had increased to over 10,000 mt. In the southern area (Figure A3), the pattern was similar, but with about a 5-year lag. By 1993, landings had reached 15,000 mt in the southern area. Landings (live weight) from Canadian waters (5Zc) are only available since 1986, but exhibited a rapid rise from about 340 mt in 1986 to a peak of over 1,550 mt in 1990. In more recent years, Canadian landings declined to 400-500 mt per year (Figure A1). Trawls in 1994-1996 contributed 57% of the US landings, while dredges and gill nets contributed 23% and 18%, respectively.

Data and Assessment: Goosefish were last assessed at SAW-14 in 1992. Data used in the current assessment included NEFSC bottom trawl survey catch per tow (mean numbers and weights) plus associated length distributions. Inshore survey strata were excluded due to inconsistent coverage during the time series. Total mortality estimates were based on NEFSC autumn trawl survey (1963-1995) catch-per-tow-at-length data.

Biological Reference Points: Biological reference points for goosefish (as defined in the approved overfishing definition in draft Amendment 9 to the Northeast Multispecies FMP) were estimated to be $F_{Threshold}$ (1970-1979 average) = 0.05 (4% exploitation) for the northern area and 0.14 (12% exploitation) for the southern area, $B_{Threshold}$ (33rd percentile of 1963-1994 NEFSC autumn trawl survey catch per tow) = 1.46 kg/tow for the northern area and 0.75 kg/tow for the southern area, F_{Target} = undefined for the northern area and 0.09 (8% exploitation) for the southern area, and B_{Target} (values ≥ the median of the 3-year moving average of the 1965-1981 NEFSC autumn trawl survey catch per tow) = 2.50 kg/tow for the northern area and 1.85 kg/tow for the southern area.

Fishing Mortality: The current (1991-1995 average) fishing mortality rate (F) for the northern area for fish ≥59 cm (23.2 in) total length is 0.15 (13% exploitation), assuming instantaneous natural mortality rate (M) = 0.2 (Figure A2). A substantial fraction of the current landings are below this size. Estimates of F in the 1970s were below 0.1, rose to around 0.1 in the mid-1980s, and then steadily increased in the late 1980s to the present level. The current (1991-1995 average) F for the southern area for fish ≥19 cm (7.5 in) total length is 0.51 (37% exploitation), assuming M = 0.2 (Figure A3). Estimates of F in the 1970s were around 0.15, rose to around 0.3 in the mid-1980s, and then steadily increased in the 1990s to the present level.

Recruitment: In recent years (1990-1994), there have been indications of strong recruitment in the northern area. These fish, however, have not appeared to persist longer than one or two years and have rarely translated into any increase in biomass. In 1995, there was no evidence of this strong recruitment. In contrast, strong recruitment appeared in the southern area in the early 1970s and 1980s and could be followed through several succeeding years of trawl surveys. However, there have been no significant signs of recruitment in recent years.

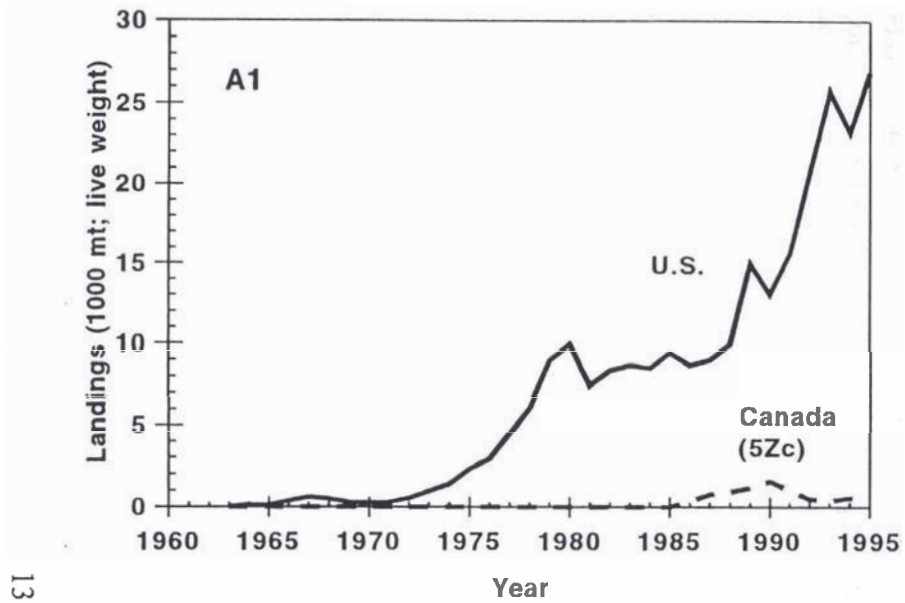
Spawning Stock Index: Results for the relative index of egg production (Figure A4) correspond well with the progressive decline in mean length. Current levels of these indices are at only 22% of the maximum observed value in the northern area and at 6% of the observed maximum in the southern area. In both areas, there has also been a marked erosion in reproductive output contributed by older fish and, therefore, an increasing dependency, for reproduction, on fish smaller than the length at full maturity.

Special Comments: Given the low estimates of total mortality in the northern area, derived estimates of fishing mortality are especially sensitive to any uncertainty in values of natural mortality. However, despite considerable uncertainty in the assumed natural mortality and length at full recruitment, increasing trends in total mortality were clearly apparent in all sensitivity analyses.

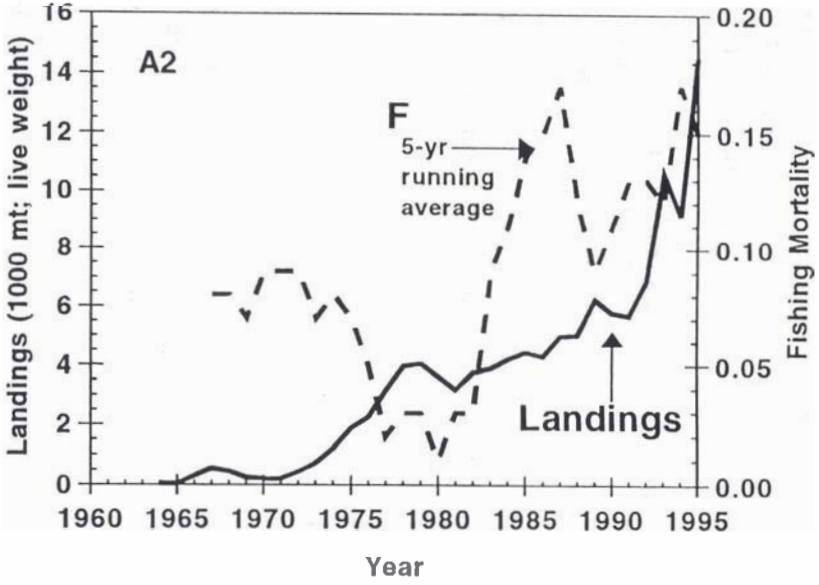
Sources of Information: Report of the 23rd Northeast Regional Stock Assessment Workshop (23rd SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 97-xx.

Goosefish

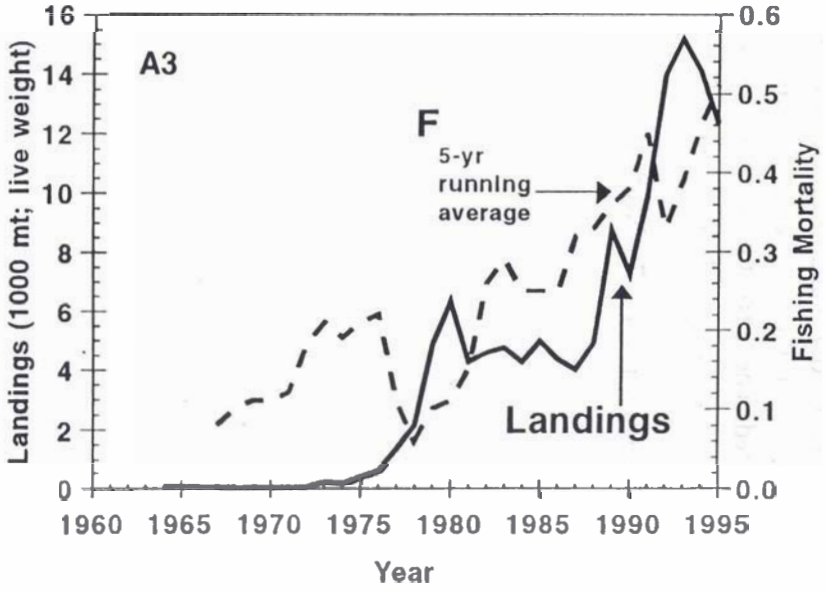
Total Landings of Goosefish



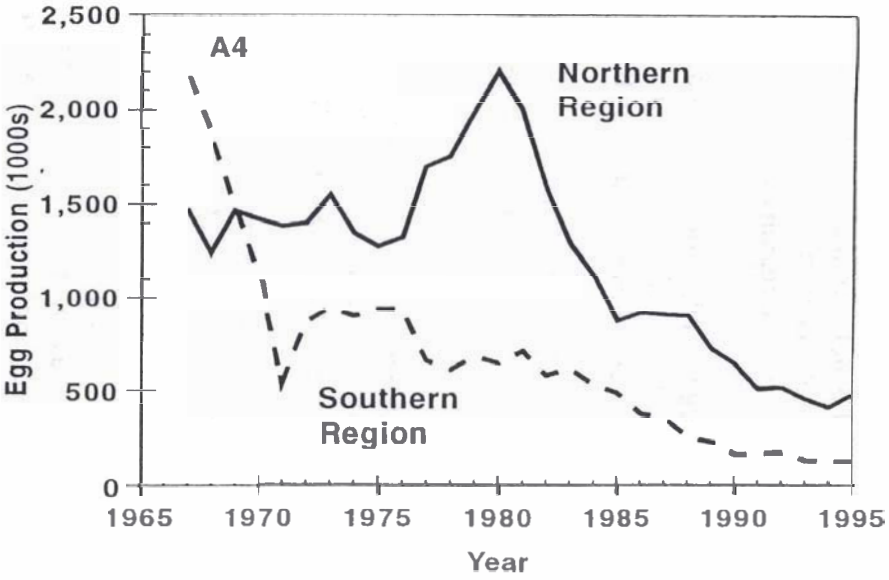
Landings and Fishing Mortality
Northern Region



Landings and Fishing Mortality
Southern Region (Including North Carolina)



Index of Spawning Stock Biomass



B. SEA SCALLOP ADVISORY REPORT

State of Stock: In the areas that are currently open to fishing, the resource is at a low level of biomass and is over-exploited with respect to the biological reference point. Fluctuations in catches from Georges Bank and the Mid-Atlantic regions are driven primarily by variations in the number of recruits entering the fishery.

On Georges Bank, abundance and fishing mortality are at moderate levels (Figure B1), but this is based on approximately half of the region currently being closed to fishing. Stock rebuilding is occurring in those closed areas, but elsewhere on Georges Bank, fishing mortality is greater than the biological reference point.

Sea scallops in the Mid-Atlantic region are at a low level of abundance and declining and are over-exploited. The large 1990 and 1991 year classes have been fished out, and incoming recruitment is among the lowest on record.

Management Advice: Based on high fishing mortality rates, low stock size, and the lack of significant recruitment, fishing effort should be reduced immediately and significantly in the Mid-Atlantic region to preserve spawning stock biomass and improve yield per recruit.

Expected shifts in the size distribution of the landings, as a result of increased dredge ring size and decreased maximum crew size, did not occur. An analysis of historical patterns demonstrated that the size composition of the catch was primarily influenced by variations in year-class strength and meat-count regulations.

As a result of areas on Georges Bank being closed to fishing during the past 20 months, sea scallop biomass in those areas, as of mid-1996, was estimated to be about three times greater than in the areas open to fishing (Figure B2), and improved survival rates were apparent for all size classes. Closures provide scallop conservation opportunities that should be considered in the future management of the resource (see **Special Comments**). Any plans to reopen the Georges Bank closed areas should proceed with caution. Given the low biomass in the open areas, a major reallocation of fishing effort to any newly-opened area(s) would be expected. The current harvesting capacity of the fleet is capable of rapidly depleting the sea scallop resource. The conservation gains from the closure would be lost and future gains in yield from these areas would be forgone.

Forecast for 1997: No forecasts were performed.

Landings and Status Table (landings in mt, values for recruits and full recruits are adjusted survey abundance indices in mean kg per tow): Sea Scallop

Year	1988	1989	1990	1991	1992	1993	1994	1995	[5]1996	[6]Min	[6]Max	[6]Mean
Landings												
Georges Bank	6,083	5,686	10,009	9,311	8,237	3,655	[2]1,137	[2]1,006	[2]662	1,006	10,009	5,045
Mid-Atlantic	6,521	8,309	6,475	7,011	4,955	2,778	[2]5,872	[2]6,094	[2]2,985	2,778	8,309	5,564
Other[1]	594	781	690	676	846	863	[2]525	[2]737	[2]265	394	863	658
Discards	Discards occur, but reliable estimates not available											
US total	13,198	14,776	17,174	16,998	14,038	7,296	[2]7,534	[2]7,838	[2]3,912	6,742	17,174	11,268
Recruits												
Georges Bank	0.37	[3]-	0.80	0.61	0.77	0.10	0.09	0.17	0.32	0.09	0.80	0.42
Mid-Atlantic	0.32	0.51	0.66	0.20	0.08	0.38	0.37	0.58	0.13	0.05	0.66	0.31
Full recruits												
Georges Bank	0.90	[3]-	1.28	0.78	0.58	0.25	0.32	0.24	1.06	0.24	1.73	0.82
Mid-Atlantic	1.41	1.09	0.95	0.79	0.48	0.37	0.72	0.43	0.67	0.37	1.41	0.73
F[4]												
Georges Bank	0.54	0.96	1.98	1.68	2.37	1.18	0.67	0.41	-	0.41	2.37	1.06
Mid-Atlantic	0.78	0.88	0.97	0.92	0.94	0.67	1.27	0.85	-	0.39	1.27	0.82
Exploitation rate												
Georges Bank	40%	59%	83%	78%	88%	67%	47%	32%	-	32%	88%	63%
Mid-Atlantic	52%	56%	60%	58%	58%	47%	69%	55%	-	31%	69%	54%

[1]Includes Gulf of Maine, Southern New England, and other portions of NAFO Subareas 5 and 6 not included in the Georges Bank or Mid-Atlantic assessment regions; no assessment was done for these areas. [2]Preliminary. [3]Northern Edge and Peak of Georges Bank not sampled in 1989. [4]For total population (F = Z - M), July 1 - June 30 survey year. [5]Landings for January-June only. [6]January-June 1996 landings not included in Min, Max, and Mean (1984-1996).

Stock Distribution and Identification: Sea scallops range from North Carolina to Newfoundland along the continental shelf of North America. In US waters, the population is predominately in the Mid-Atlantic and Georges Bank regions. Overall abundance in Southern New England and the Gulf of Maine is much lower. For management purposes, sea scallops in US waters are treated as a unit stock, but significant differences in growth and reproductive dynamics have been documented.

Catches: During 1982-1995, US landings ranged between 6,742 (1985) and 17,174 mt (1990) (Figure B1). Landings in 1993 (7,296 mt) were the second lowest of the time period and have remained at this low level through 1995. Landings from Georges Bank increased to a period high of 10,009 mt in 1990 before dropping sharply to 3,655 mt in 1993 and 1,006 mt in 1995, a 90% decline from the 1990 level. During 1994-1995, landings from the Mid-Atlantic region increased 115% from the 1993 level. Mid-Atlantic landings from otter trawls increased to 12% of the total during 1994 and 1995. Discard estimates were available for 1992 - June 1996, but were not incorporated into estimates of stock abundance and fishing mortality.

Data and Assessment: The allocation of landings in 1994-1996 to stock regions was based on data obtained from the mandatory logbook reporting system. A reduction in port sampling also occurred during this time. As a result, this assessment required significantly different procedures to estimate landings by weight and numbers. Estimates of the number of scallops landed since 1982 were based on quarterly estimates of landings, the shell height frequency distribution from commercial biological samples (port and sea samples), and region-specific shell-height to meat-weight regression models. Pre-recruit and recruit abundance indices were computed from NEFSC scallop survey data for 1982-1996 and were adjusted for the selectivity of lined dredges on larger scallops prior to their use in a modified DeLury model to estimate stock size and fishing mortality rates.

Biological Reference Points: The overfishing threshold for the entire resource area is $F_{5\%}$, which is 0.71 (49% exploitation) given the current selectivity pattern of the fishery. $F_{0.1}$ = 0.10 (9% exploitation) and F_{max} = 0.18 (16% exploitation) (Figure B3).

Fishing Mortality: During the July 1994-June 1996 assessment years, the median fishing mortality rate in the Mid-Atlantic was 1.05 or 62% exploitation (80% confidence interval of 0.88-1.24 or 56-68% exploitation) (Figure B4), with a 99% probability that the overfishing definition was exceeded (Figure B5). On Georges Bank, the median fishing mortality rate was 0.51 or 38% exploitation (80% confidence interval of 0.43-0.58 or 33-42% exploitation), with only a 1% probability that the overfishing definition was exceeded.

Recruitment: The biomass of scallops entering the Georges Bank fishery during 1996 was slightly less than the 1984-1996 average. In the Mid-Atlantic, the biomass of scallops entering the fishery was less than half the 1984-1996 average (Figure B6). The unadjusted survey abundance index (number of scallops per tow ≤ 70 mm) in 1996 was at a moderate level on Georges Bank and at the lowest level since 1979 in the Mid-Atlantic.

Stock Biomass: Spawning stock biomass estimates were not computed. Swept-area estimates of stock size exceeded those estimated by the DeLury model. Underestimation of catch in numbers, overestimation of surveyed area, or other factors could be responsible for this discrepancy. However, estimates of fishing mortality were based on indices of relative abundance and were unaffected by the problems in specifying absolute levels of abundance or biomass.

Special Comments: The two groundfish areas on Georges Bank closed in December 1994 include historically important sea scallop fishing areas. At that time, sea scallop abundance in those areas was relatively low, as were catches. Since then, abundance in the closed areas has increased and size structure has broadened, consistent with no fishery removals and the low natural mortality rate of the species (M = 0.1). Based on the size composition of survey catches in the summer of 1996 and projected growth rates, sea scallop biomass in the closed areas will continue to increase, potentially doubling by the summer of 1997 if the areas remain closed (Figure B7).

The SARC does not recommend opening the closed areas on Georges Bank to scalloping due to groundfish bycatch concerns and the potential for these areas to serve as a source of scallop recruitment. If these closed areas are eventually opened to scalloping, the SARC strongly recommends that annual removals do not exceed the surplus production of the resource. The long-term stable yield in these areas should be achieved by limiting annual harvests to the net production from recruitment and growth. Because of the abundance and large size of scallops in the closed areas and declining resource prospects in the Mid-Atlantic, unrestrained harvest would quickly deplete these areas and dissipate scallop conservation benefits realized in the past two years. The SARC further recommends that explicit fishing mortality rate targets (as opposed to thresholds) be established for these areas (e.g., F_{MAX}) and that measures be adopted to limit annual harvests to levels associated with the selected F target. Such control measures could include trip and annual quotas, per-vessel effort limitations, mandatory vessel monitoring to assess effort in the areas (e.g., vessel trip reports), seasonal closures of the areas once harvest goals are achieved, as well as bycatch prevention measures for groundfish.

The opportunities afforded by improved sea scallop resource conditions offer the ability to realize benefits to the fishery and resource by transitioning from a fishery which targets recruits to a sustainable fishery on larger scallops. Special management of these areas could serve as a prototype for the entire fishery to augment current and future effort reductions.

Sources of Information: Report of the 23rd Northeast Regional Stock Assessment Workshop (23rd SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 97-xx.

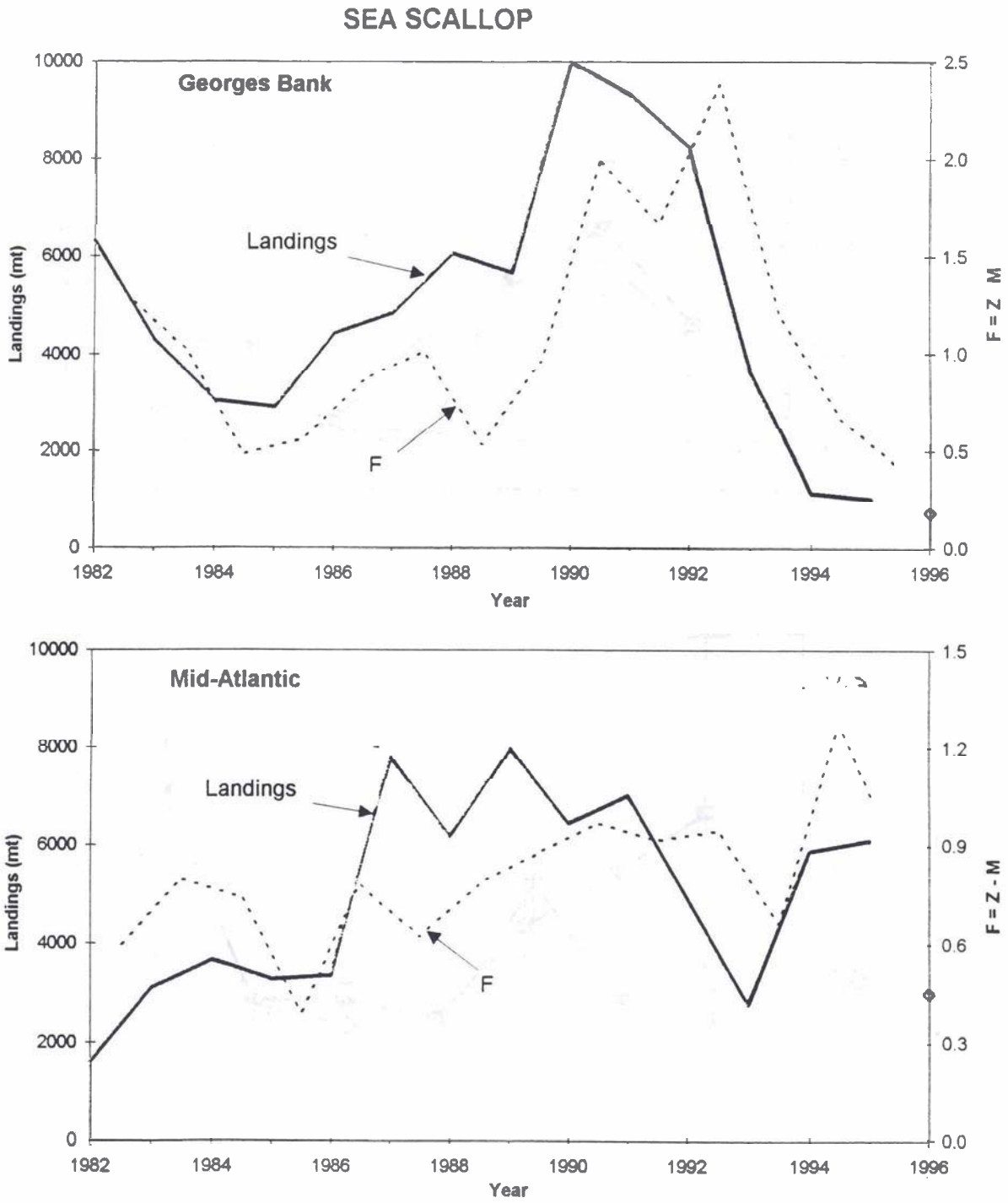


Figure B1. Landings (mt) and fishing mortality (F) rate of total population (F = Z - M) in the Georges Bank and Mid-Atlantic regions. F values are estimated for a July 1 - June 30 survey year and are plotted at the mid-point between years (i.e., July 1). Landings shown for 1996 are only for January 1 - June 30.

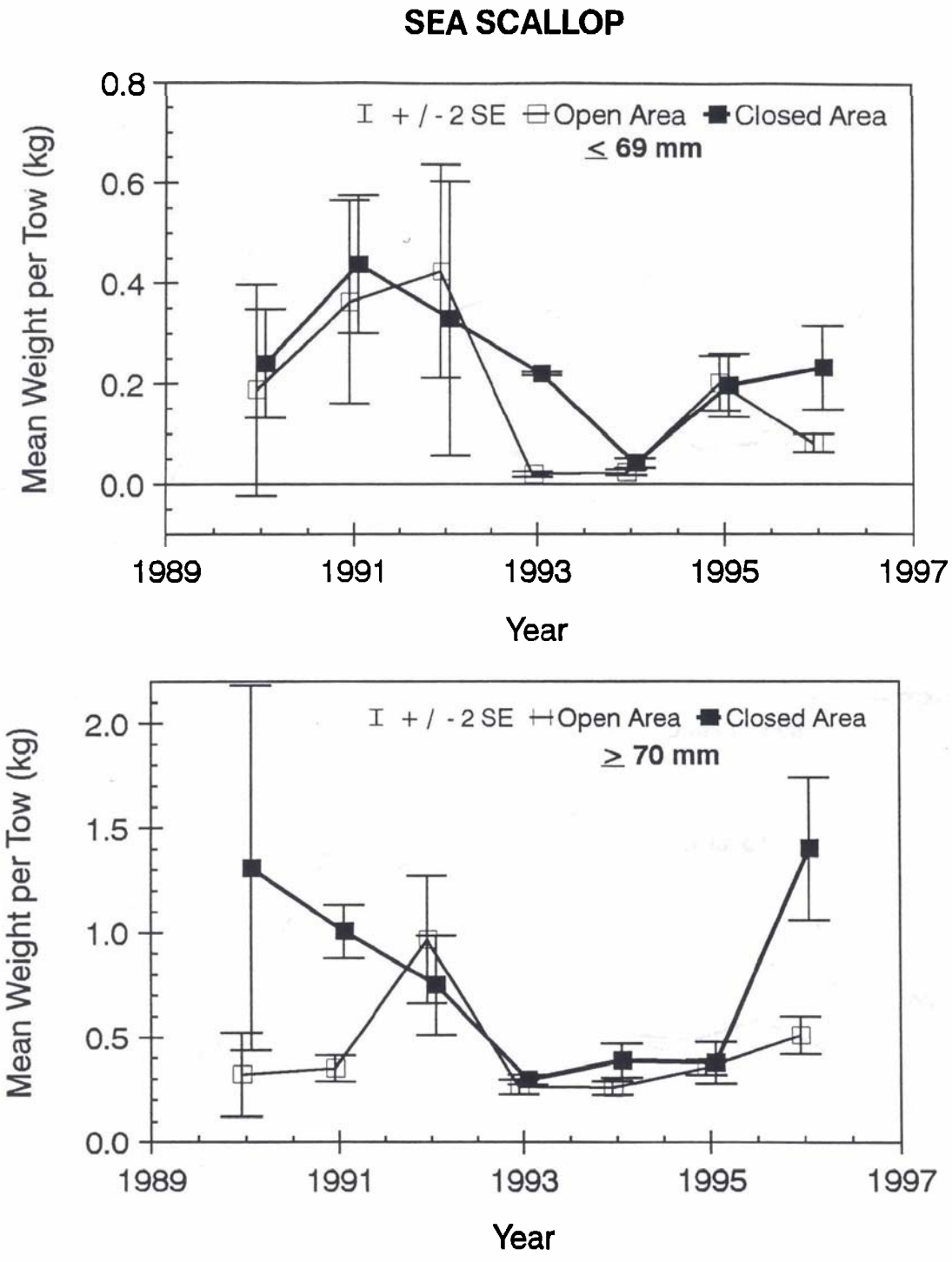


Figure B2. Comparison of post-stratified survey catches of ≤ 69 sea scallops (top) and > 70 mm sea scallops (bottom) from Georges Bank open and closed areas.

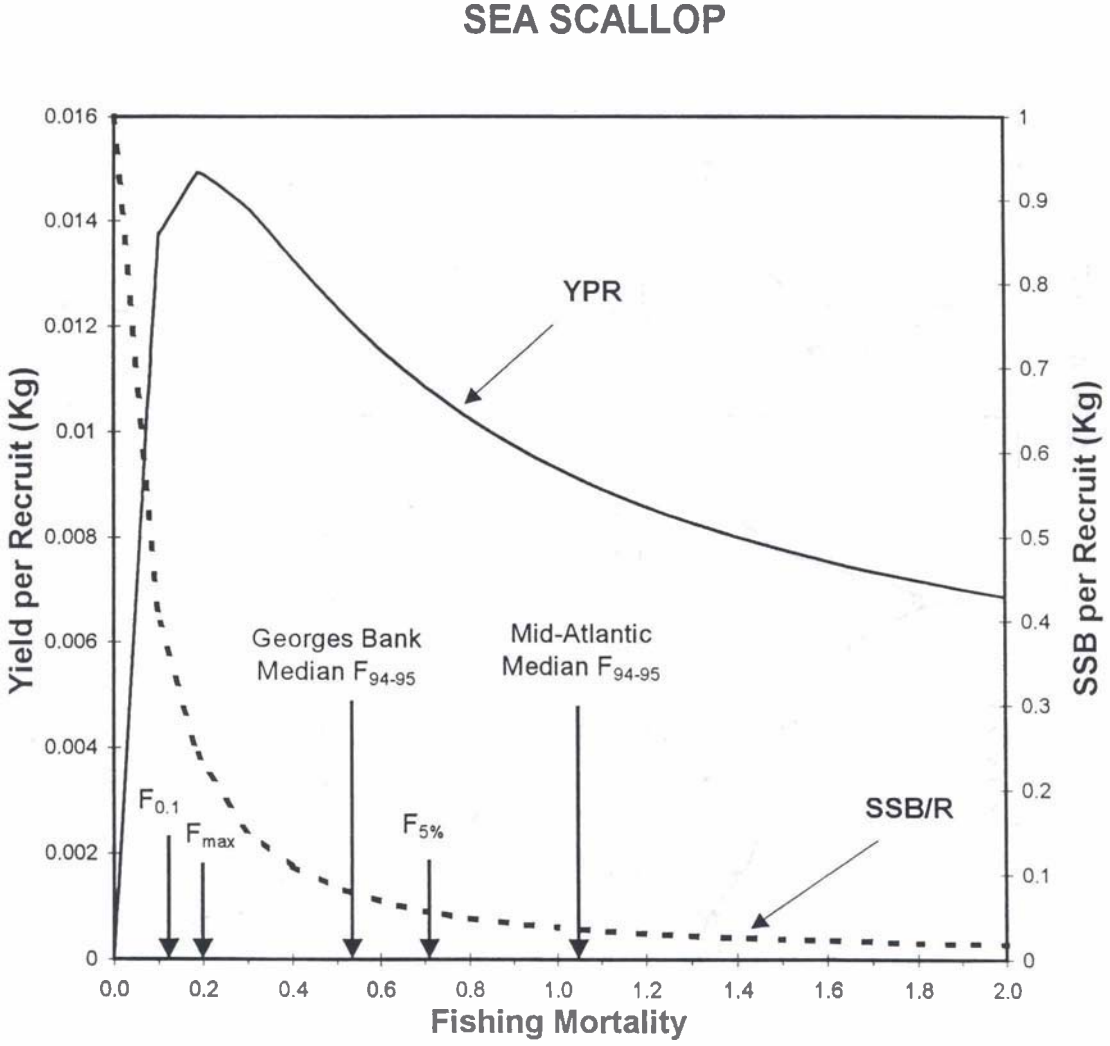


Figure B3. Estimations of yield per recruit (YPR) and spawning stock biomass per recruit (SSB/R) were obtained from Amendment 4 of the Atlantic Sea Scallop FMP. Partial recruitment is 0.26 at age 3 and 1.0 thereafter. Median fishing mortality rates for Georges Bank and the Mid-Atlantic regions were based on 200 bootstrap estimates from the July 1994 - June 1996 assessment years.

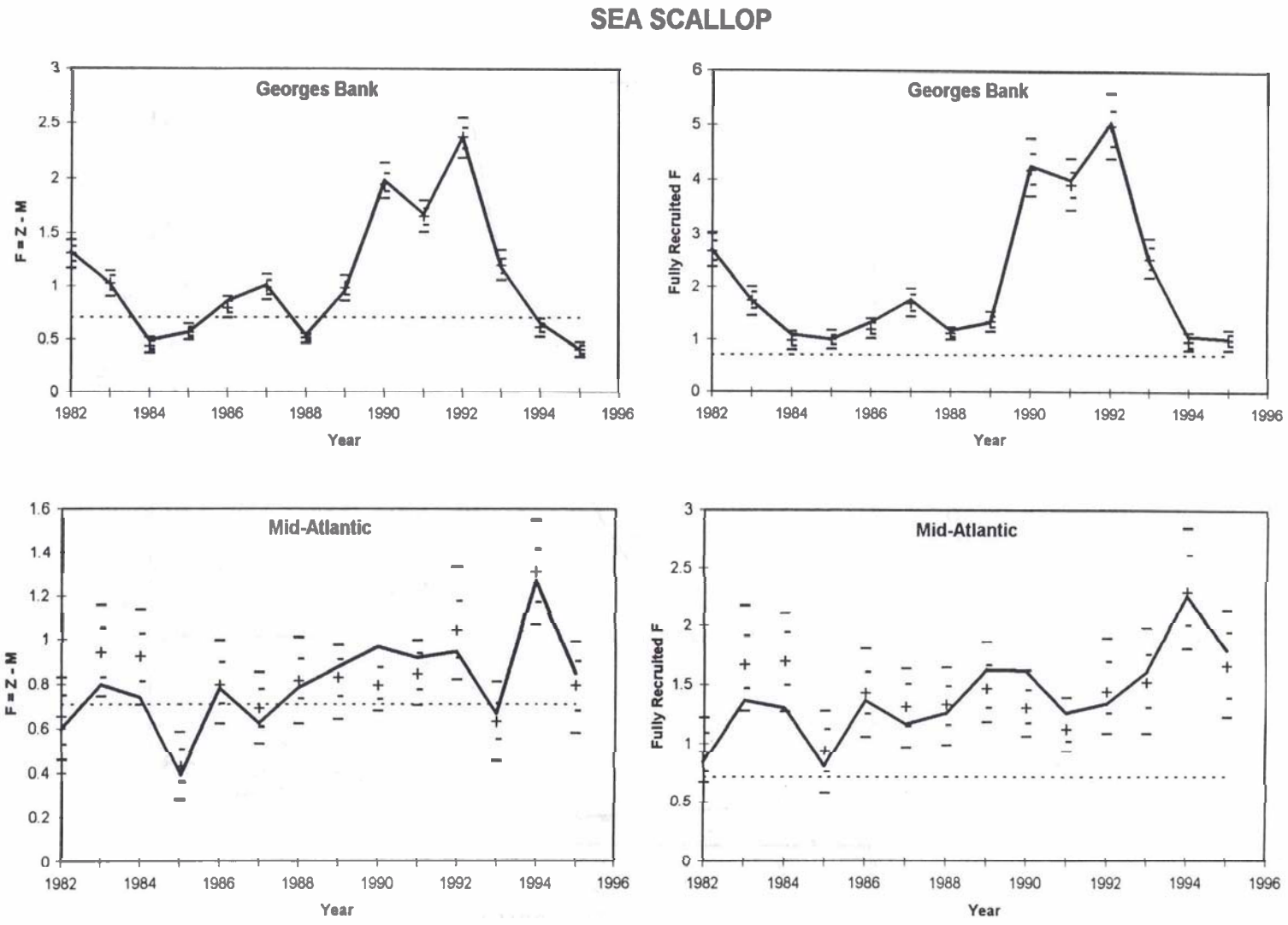


Figure B4. Estimated fishing mortality rates of the total population (F = Z - M) and fully-recruited scallops using a modified DeLury method and their respective bootstrap percentiles (10, 25, 50, 75, and 90%) and the overfishing definition (dashed lines).

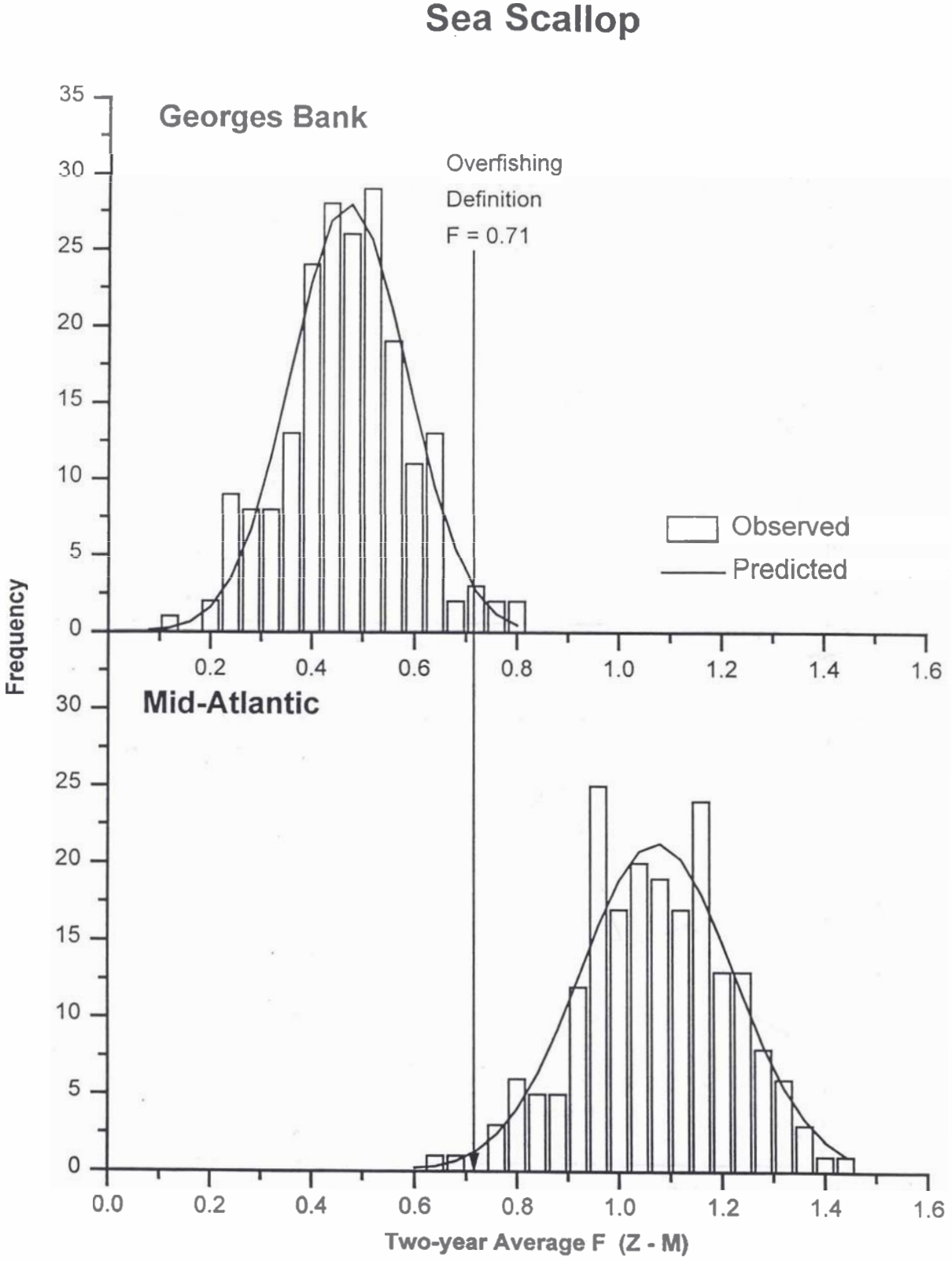


Figure B5. Frequency distributions of 200 bootstrap-estimated, 2-year average fishing mortality rates for the survey years 1994 and 1995 in the Georges Bank and Mid-Atlantic regions. The curves indicate the fitted normal distributions.

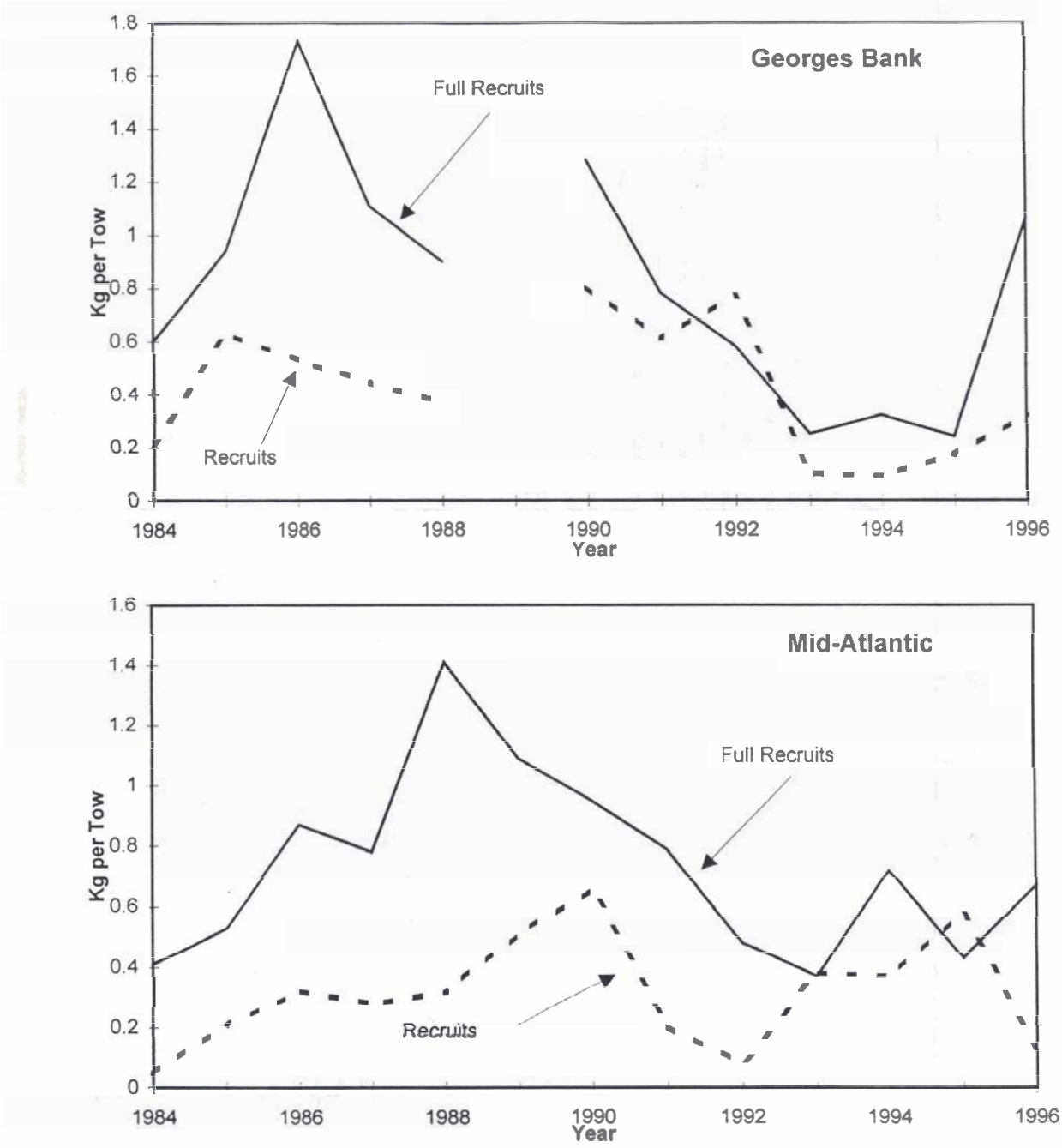


Figure B6. Survey biomass indices derived from adjusted shell-height frequency distributions in the Georges Bank and Mid-Atlantic regions, 1984-1996. The 1989 indices for Georges Bank were not estimated due to incomplete survey coverage in the US Northern Edge and Peak sub-region.

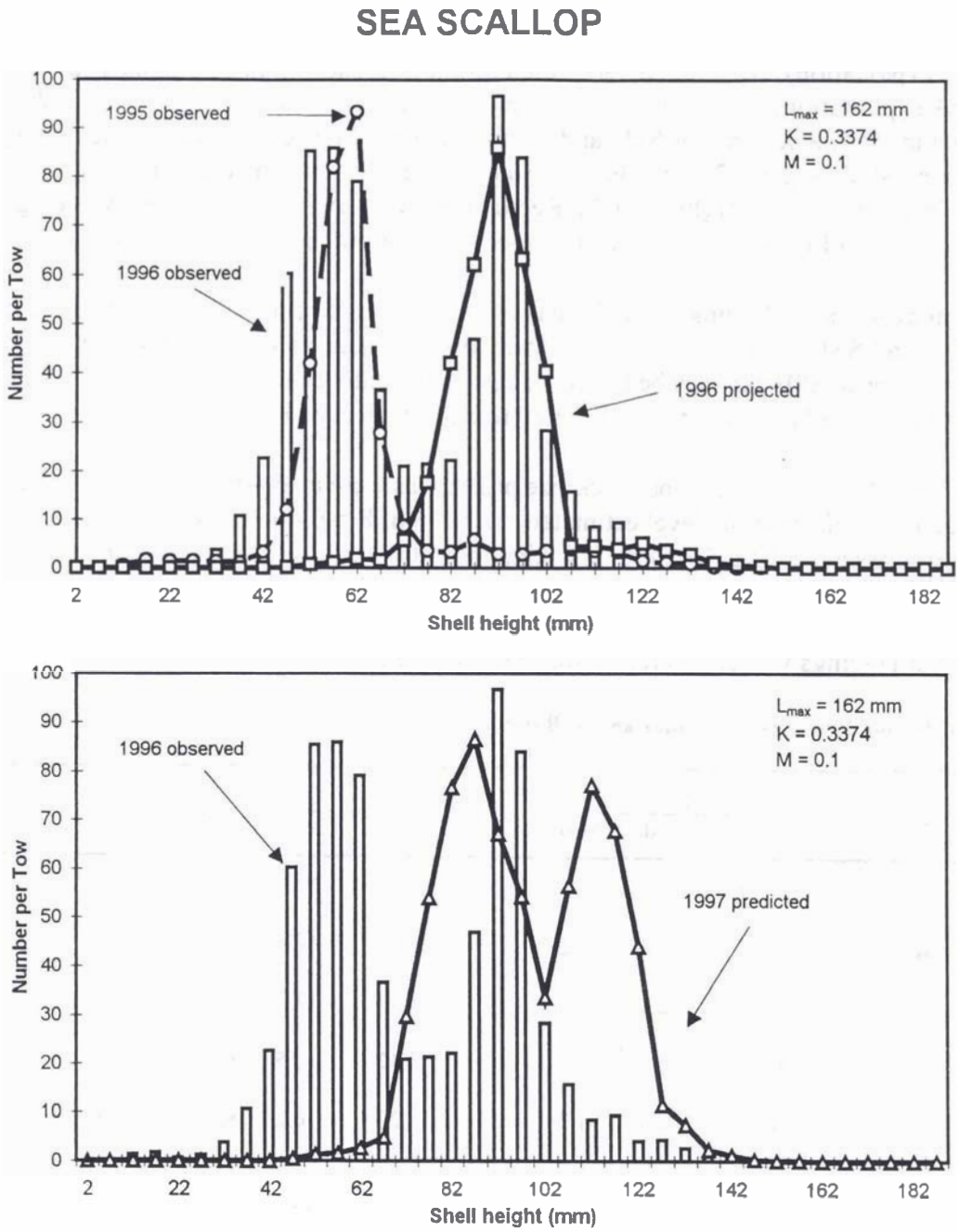


Figure B7. Observed survey shell-height frequency distributions (SFD) for 1995 and 1996 (open bars) for the closed areas on Georges Bank and the projected SFD for 1996 (top), which is based on the 1995 distribution and the von Bertalanffy growth parameters. A comparison of observed 1996 and projected 1997 SFD for closed areas on Georges Bank (bottom).

C. BLUEFISH ADVISORY REPORT

State of Stock: The stock is at a low level of abundance and is over-exploited. Current annual recreational catches of 12,000 mt are about 20% of the level of the early 1980s. Fully-recruited fishing mortality (F) rates for bluefish increased from 0.12 (10% exploitation) in 1988 to 0.51 (36% exploitation) in 1992. F in 1995 was 0.40 (29% exploitation), twice the level of the current reference point estimated at SAW-18 in 1994 (F_{MSY} = 0.20 (16% exploitation) (Figure C1). Spawning stock biomass (SSB) declined from 293,000 mt in 1986 to 110,000 mt in 1995, a decrease of 63% and an historic low (Figure C2). Recruitment at age 0 varied from 68 to 82 million fish during 1982-1984, but has since declined substantially, with the strongest recent year class recruiting in 1989 (65 million) (Figure C2). Recruitment since 1989 has been below average, and the 1993 and 1995 year classes (13 and 14 million fish, respectively) are the poorest of the time series.

Management Advice: Fishing mortality has exceeded the current biological reference point of F_{MSY} = 0.20 since 1991, and SSB in 1995 was at an historic low. Projections suggest that if recruitment continues to be poor, the decline in SSB can only be halted by restricting catches to very low levels. Fishing mortality should be reduced to 0.1 (8% exploitation) or below to halt the decline in SSB.

Forecast for 1996-1998: Yield and stock size projections were made through 1998. Fishing mortality in 1996 was assumed to remain at the level estimated for 1995 of F = 0.40. The short-term average (1992-1995) recruitment was assumed for 1996-1998. If fishing mortality rates remain at 0.40 or greater in 1997-1998, SSB will continue to decline to record lows in 1997 and 1998, with landings of 10,900 - 14,400 mt by 1998. If fishing mortality is reduced to F_{MSY} = 0.20 or to F_{STAB} = 0.06 (5% exploitation) in 1997-1998, SSB should stabilize, but landings will be reduced considerably (Figure C4) to only 2,000 - 6,200 mt by 1998.

Forecast Table for 1996-1998 (landings and SSB in '000 mt):

	1996			1997			1998		
Option	F_{96}	Land.	SSB	F_{97}	Land.	SSB	F_{98}	Land.	SSB
F_{95}	0.40	12.1	91.2	0.40	12.0	81.1	0.40	10.9	72.7
F_{95} (no F on age 0)	0.40	12.1	91.2	0.40	11.8	81.1	0.40	10.9	72.8
$F_{20\%}$	0.40	12.1	91.2	0.59	17.0	79.8	0.59	14.4	66.5
$F_{30\%}$	0.40	12.1	91.2	0.42	12.5	81.0	0.42	11.3	72.0
F_{MSY}	0.40	12.1	91.2	0.20	6.2	82.5	0.20	6.2	79.9
F_{STAB}	0.40	12.1	91.2	0.06	1.9	83.6	0.06	2.0	85.4

Catch and Status Table (weights in '000 mt, recruitment in millions): Bluefish

Year	1988	1989	1990	1991	1992	1993	1994	1995	Max	Min	Mean[4]
Commercial landings	7.2	4.7	6.2	6.2	5.2	4.7	4.3	3.4	7.2	3.4	5.8
Commercial discards	Discards occur but reliable estimates are not available										
Recreational landings[1]	22.9	18.7	14.8	16.2	12.0	10.0	7.9	7.2	43.4	7.2	22.9
Recreational catch[2]	28.8	23.9	20.1	23.1	17.4	14.5	12.5	11.9	50.9	11.9	28.0
Catch used in assessment[3]	30.1	23.4	21.0	22.4	17.2	14.7	12.2	10.6	50.1	10.6	28.7
Spawning stock biomass	194	188	169	163	156	141	125	110	293	110	206
Recruitment (age 0)	39	65	30	24	19	13	24	14	82	13	42
F (age 1)	0.12	0.24	0.18	0.33	0.51	0.48	0.38	0.40	0.51	0.12	0.27
Exploitation rate	10%	19%	15%	25%	36%	34%	28%	29%	36%	10%	21%

[1]Includes recreational landings plus 15% of the released fish (i.e., discard mortality rate is 15%). [2]Includes all recreational catch, landed or released, dead or alive. [3]Sum of commercial landings and recreational landings. [4]Max, Min, and Mean (arithmetic) are for 1982-1995.

Stock Distribution and Identification: Recent studies have concluded that bluefish along the Mid-Atlantic coast comprise a single stock.

Catches: After peaking at nearly 71,000 mt in 1980, total catch (total landings plus 15% of the recreational discards) declined to less than 11,000 mt in 1995 (Figure C1). Most of the decline has been due to a steady drop in recreational landings from nearly 64,000 mt in 1980 to 7,200 mt in 1995. Commercial landings remained stable during 1980-1992 at 5,000 - 7,000 mt. Since 1992, commercial landings have declined steadily, reaching 3,400 mt in 1995.

Data and Assessment: Bluefish were last assessed at SAW-18 in June 1994. The current assessment is analytical using commercial and recreational catch-at-age data. Measures of recreational fishery CPUE and survey catch-at-age were used to calibrate estimates of stock size and fishing mortality. The natural mortality rate (M) was assumed to be 0.25. The uncertainty associated with the estimates of spawning stock biomass and fishing mortality in 1995 was estimated (Figures C5 and C6).

Biological Reference Points: The current reference point, estimated at SAW-18, is $F_{MSY} = 0.20$ (16% exploitation). Biological reference points proposed in Amendment 1 of the FMP for bluefish, calculated using the partial recruitment (selection) pattern estimated in this assessment, are $F_{30\%} = 0.42$ (31% exploitation) and $F_{20\%} = 0.59$ (40% exploitation) (Figure C3). However, given the current stock condition, if recruitment continues to be poor, the decline in SSB can be halted only by restricting catches to very low levels whose associated fishing mortality rates are substantially less than the long-term equilibrium reference points of $F_{30\%}$ and $F_{20\%}$.

Fishing Mortality: Fishing mortality rates for bluefish (age 1) ranged from 0.12 (10% exploitation) to 0.33 (25% exploitation) between 1982 and 1991. F increased to 0.51 (36% exploitation) in 1992 and was 0.40 (29% exploitation) in 1995 (Figure C1). Estimates of precision indicate the 80% confidence interval for F in 1995 to be 0.25-0.65 (20-43% exploitation). There is a 95% probability that F was greater than 0.2 (16% exploitation) in 1995 (Figure C6).

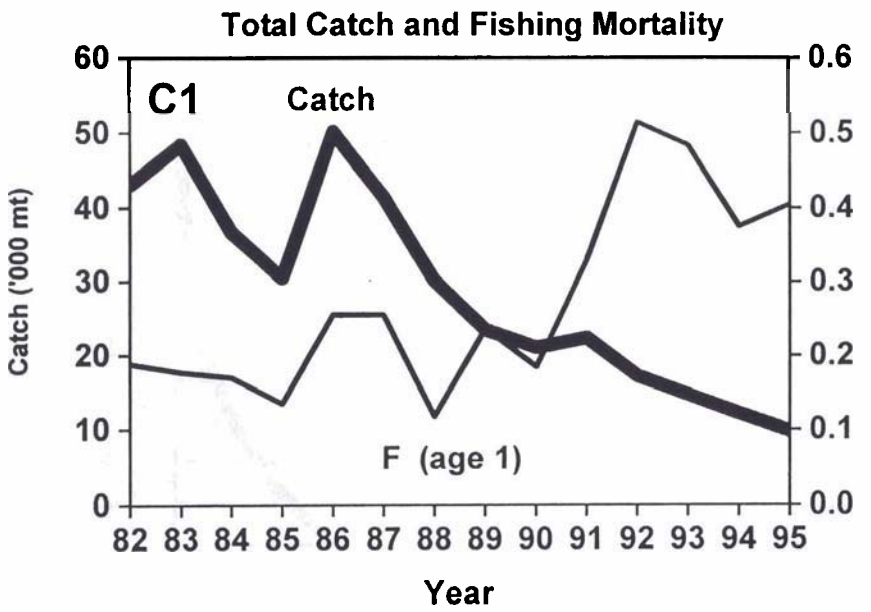
Recruitment: The strongest year class in recent years recruited in 1989, with subsequent recruitment below average (1982-1995). The 1993 and 1995 year classes are the poorest of the time series (Figure C2).

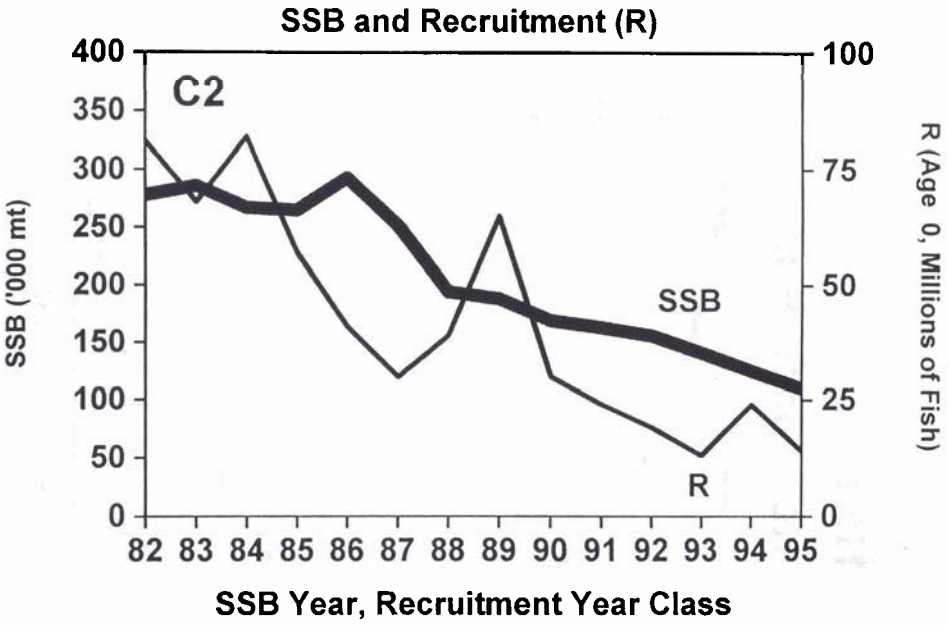
Spawning Stock Biomass: Spawning stock biomass declined steadily from 293,000 mt in 1986 to 110,000 mt in 1995, a decrease of 63% and an historic low (Figure C2). Estimates of precision indicate the 80% confidence interval for SSB in 1995 to be 72,000 - 214,000 mt (Figure C5).

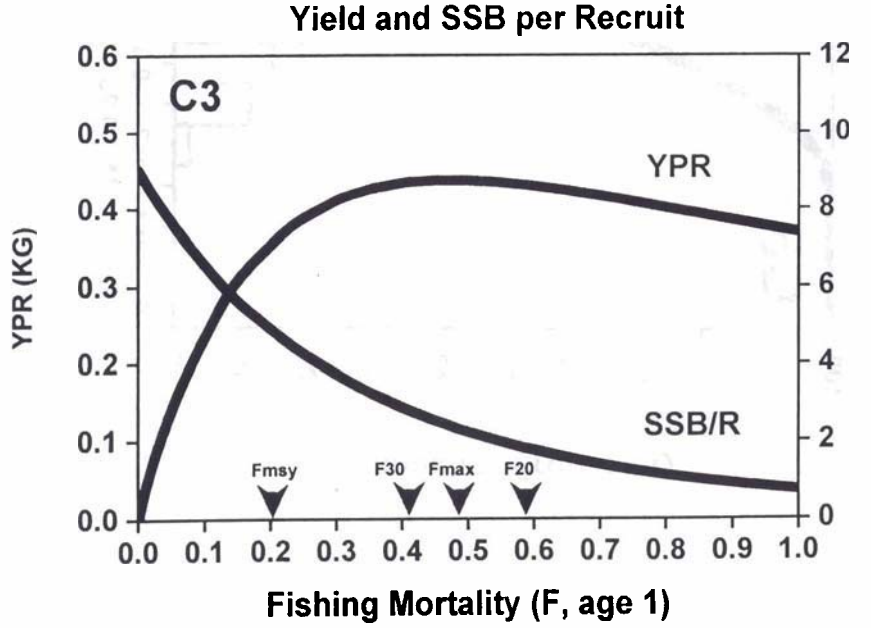
Special Comments: Length and age sampling of bluefish from both the recreational and commercial fisheries is poor, and the assessment is based on age data from only a limited geographical region (North Carolina). These data problems contribute to a high degree of uncertainty in the assessment. Improved sampling of the fisheries is critical to increasing the precision of the assessment. There is some evidence from patterns in the commercial landings that adult bluefish have been displaced further offshore in recent years. Exploratory analyses suggest that bluefish recruitment may be correlated with biotic and environmental variables. It is not clear if these correlations indicate common responses to environmental conditions or the abundance of other species, or simply coincidental trends with no underlying functional relationship.

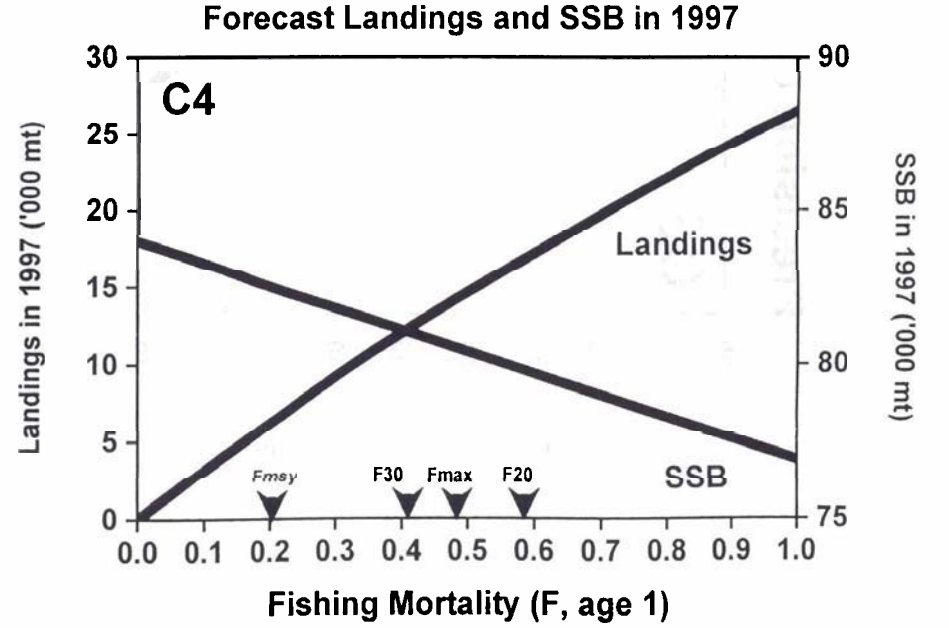
Sources of Information: Report of the 23rd Northeast Regional Stock Assessment Workshop (23rd SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 97-xx.

Bluefish


Total Catch and Fishing Mortality
C1
Catch
F (age 1)
Catch ('000 mt)
F (age 1)
Year
60
50
40
30
20
10
0
0.6
0.5
0.4
0.3
0.2
0.1
0.0
82 83 84 85 86 87 88 89 90 91 92 93 94 95

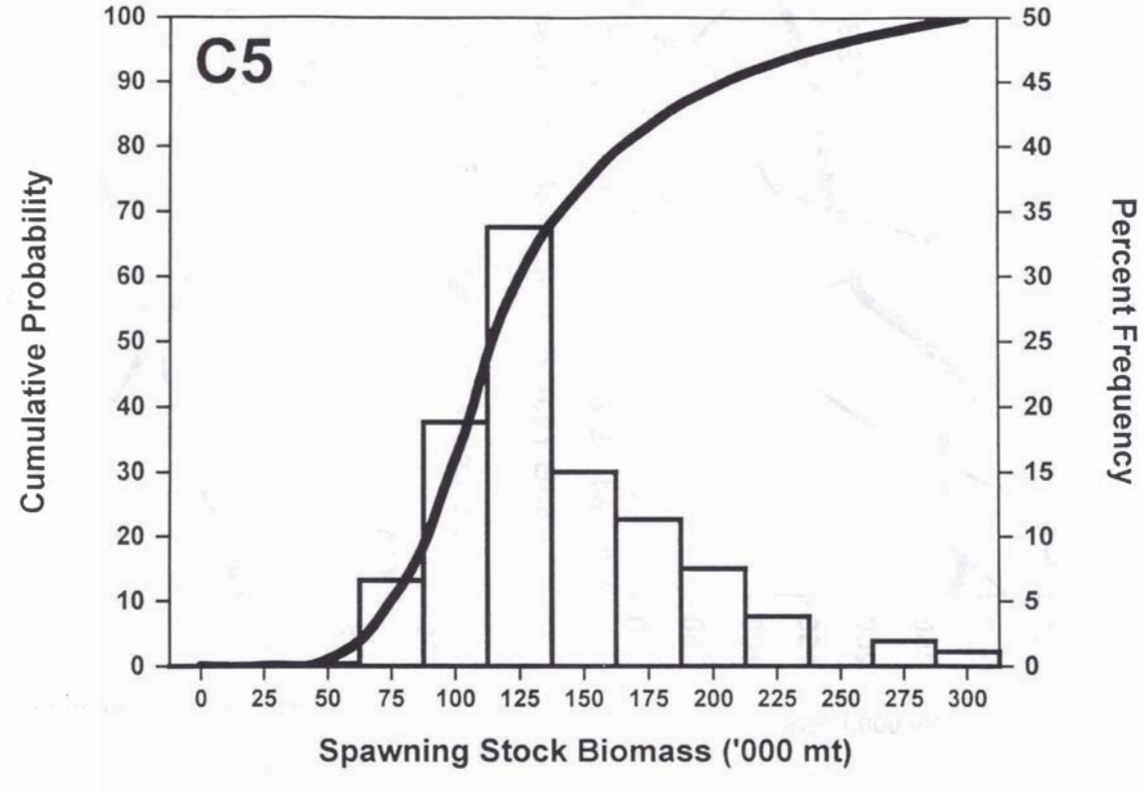

SSB and Recruitment (R)
C2
SSB
R
SSB ('000 mt)
R (Age 0, Millions of Fish)
SSB Year, Recruitment Year Class
400
350
300
250
200
150
100
50
0
100
75
50
25
0
82 83 84 85 86 87 88 89 90 91 92 93 94 95

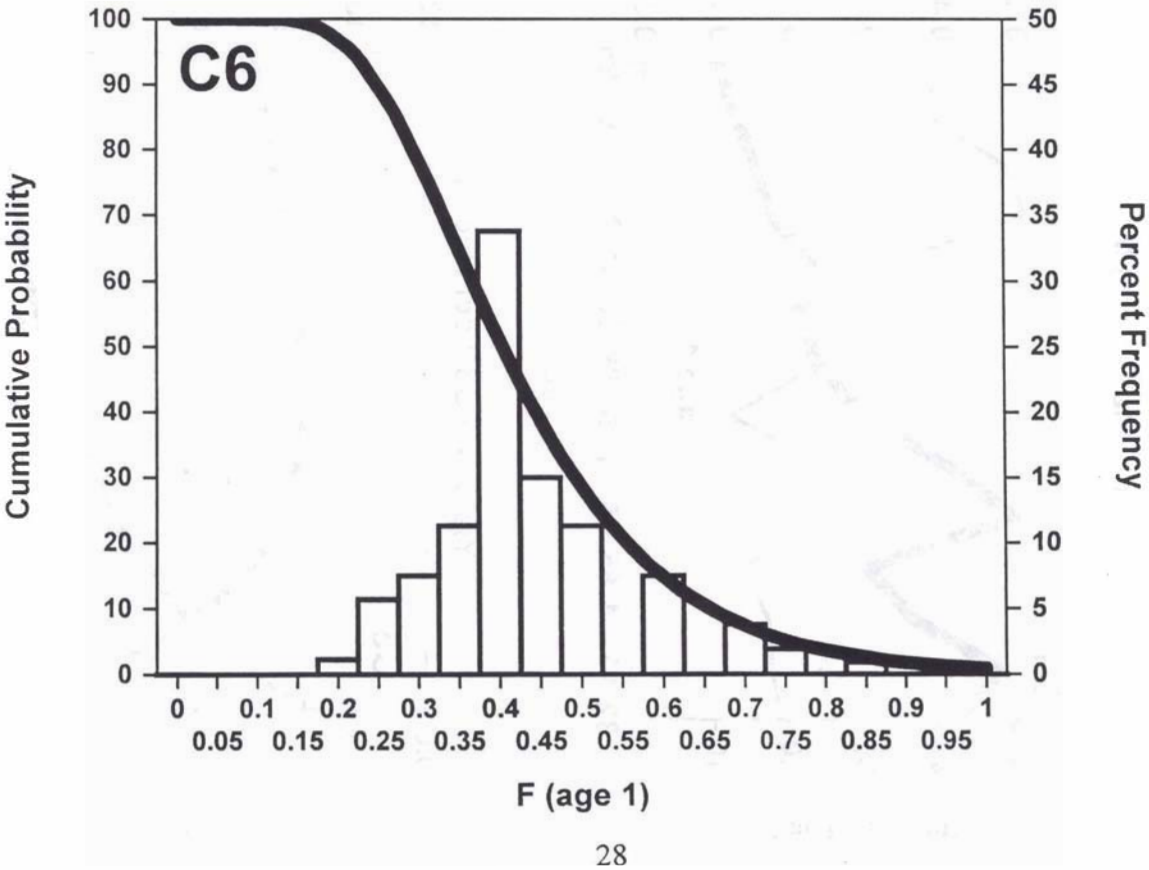

Yield and SSB per Recruit
C3
YPR
SSB/R
Fmsy
F30
Fmax
F20
YPR (KG)
SSB/R (KG)
Fishing Mortality (F, age 1)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
12
10
8
6
4
2
0
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0


Forecast Landings and SSB in 1997
C4
Landings
SSB
Fmsy
F30
Fmax
F20
Landings in 1997 ('000 mt)
SSB in 1997 ('000 mt)
Fishing Mortality (F, age 1)
30
25
20
15
10
5
0
90
85
80
75
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

Bluefish

Precision of Estimates for SSB and F





CONCLUSIONS OF THE SAW STEERING COMMITTEE

CONCLUSIONS OF THE SAW STEERING COMMITTEE

The SAW Steering Committee held the following three meetings during the SAW-23 cycle: 1) December 16, 1996 in Virginia Beach, VA, 2) February 10, 1997 by teleconference, and 3) February 13, 1997 by teleconference. Discussions at and conclusions from those meetings are summarized below.

Meeting of December 16, 1996

The SAW Steering Committee met in Virginia Beach, VA on December 16, 1996. Participants were: J. Dunnigan, G. Lapointe, ASMFC; D. Keifer, C. Moore, MAFMC; C. Kellogg, NEFMC; A. Rosenberg, NMFS/NER; M. Sissenwine, E. Anderson (SAW Chairman), H. Mustafa (SAW Coordinator), NMFS/NEFSC.

Although the main reason for the meeting was to discuss modifications to the SAW process in light of increased demands for advice and the need to broaden participation in the assessment and peer-review aspects of the process, the agenda also included a review of SAW-23 meetings and discussion of species and meeting dates for SAW-24.

SAW-23

Dr. Anderson briefly reviewed the series of SAW-23 meetings. With only three species on the agenda for the SARC meeting of November 18-22, 1996, time had been allocated for a half-day discussion of the SAW process. Key points from that discussion had been summarized and distributed to Steering Committee members prior to this meeting.

SAW-23 SARC documentation was being prepared, and the two reports, "*SARC Consensus Summary of Assessments*" and "*Advisory Report on Stock Status*", would be sent to SARC members for review prior to public distribution. To ensure that the reports would be ready for distribution at the appropriate time, the Chairman would set a cutoff date for comments. Final draft reports would be provided to Steering Committee members about two weeks before the first of the two sessions of the SAW Public Review Workshop.

The possibility of presenting SARC assessments and advice at various meetings scheduled prior to the Public Review Workshop sessions was discussed. It was decided that such information would not be presented in any fora prior to being 1) reviewed by SAW Steering Committee members who should provide any comments to the Chairman by telephone, and 2) distributed to the Councils and, where practical, vetted at the Public Review Workshop. Although, for all practical purposes and to the extent possible, the documents distributed to the Councils would be final, they would still be subject to minor editorial corrections and, thus, would be considered "draft" until published in the NEFSC Reference Document series.

It was also agreed that a press release would be issued at or prior to the first Public Review Workshop session. This would contain a brief summary of the status of and advice on the SAW-23 species and would be handled by Teri Frady, Chief of the NMFS/NEFSC Research Communications unit.

Modified SAW Process

The SAW Chairman reviewed the problems and possible solutions listed in the agenda and discussed at the SARC meeting (see Table 7 in **Meeting Overview** section of "*SARC Consensus Summary of Assessments*"). This formed the basis of a lengthy Steering Committee discussion.

Members agreed that, although the SAW process had always been dynamic with subtle changes occurring as necessary, significant changes were now mandated to cope with heavy demands for scientific advice which were expected to increase further. With this in mind, the Committee concurred that it was necessary to agree on a few major principles.

It was noted that care must be taken not to make the SARC all things to all people (e.g,, inclusion of economic and methods issues). Although issues such

as economics and methods (essential to assessments) must be addressed somewhere, the SARC was not necessarily the appropriate forum.

Perceptions of credibility, communication, and problems associated with the availability of data, or lack thereof, were discussed. Credibility was generally associated with the advice provided and how the advice met the needs of the group dependent on it. Since current data problems may be contributing to the perception of credibility, improvements were needed in communicating, for example, the status of logbook data. Although the data problem could probably never be fully resolved to everyone's satisfaction, the summer flounder analysis was a good example of how to address inadequate data. Also, as proven in the case of bluefish, when information transfer/communication improves, so does the perception of scientific credibility.

Requirements for the SAW process

It was agreed that the fundamental reason for attempting to restructure the SAW process was to be able to provide more assessment advice in a timely fashion. The following requirements were identified as a basis for a modified SAW process:

1) transparency (ability to attend and participate in meetings) and openness (ability to contribute scientific information to as well as participate in meetings);

2) Working Group and SARC consensus of outcome (more independent/external participants, no individual dominance);

3) timeliness of output (timetable matching management specifications, quick dissemination of information);.

4) increased quantity of output (many more stocks than presently, perhaps 20 or more per year);

5) reduce external criticism (build in fail-safe procedures to deflect demands for independent reviews which can be costly and time-consuming).

Types of peer-review processes

Three types of possible peer reviews for a modified SAW were discussed:

1) Integrated review: Integrate peer review into assessment process itself (i.e., a Working Group, with the participation of more external experts, would review its own assessment).

2) Sequential review: Similar to the current process where analysis and peer review are done in sequence by Subcommittees and the SARC, with an overlap between the two tiers and the SARC assuming "ownership" of accepted assessments. The peer-review body would meet more than twice a year. Although advice from Working Groups may be reframed under this format, assessments would not be reworked, but would, if necessary, be referred back to the Working Group for consideration at a later meeting. The peer review would focus on promoting consistency.

3) Independent review: Team-member approach without total independence, or fully independent participation with no organizational ties. This type of peer review would be especially important where high stakes were concerned and would have to be used sparingly. This approach would be recommended for use in case of a major change in, problem with, or question on the status of a stock or in management, for "benchmark" assessments, or a major change in assessment methodology. There would be no overlap between the analysis and peer-review functions, the review forum would not redo unacceptable assessments nor assume "ownership" of accepted assessments.

Sequential review

A two-tier, sequential process, with increased participation by State and independent experts, was the format preferred by the Steering Committee for dealing with most reviews.

1) Working Groups, consisting of either a) current SARC Subcommittees or b) Working Groups in other organizations (i.e., ASMFC) augmented by NEFSC and independent experts, would prepare assessments and provide initial reviews based on terms of reference established by the Steering Committee.

2) The Stock Assessment Review Committee (SARC) would peer review assessments to promote consistency and adopt/reframe advice developed by Working Groups. The SARC would meet three times a year to review assessments, would not redo unacceptable analyses, and would refer unacceptable work back to Working Groups for revision.

An independent review capability should be built into the process to compete with or surpass the quality of an NRC-type review. This capability should be funded separately on an as-needed basis and involve experts with no specific research connection or "vested interest" in the species under review.

The Steering Committee would set priorities on species to be assessed, specify terms of reference, establish the need to review again (independent review) or to re-assess, and schedule special Working Group and other meetings as necessary.

The new process must involve more people and possibly more SARC meetings, perhaps 2-3 instead of 5 days in duration. Funds for such meetings could be raised separately. To simplify the reporting process under an expanded workload, consideration might be given to summarizing meeting results once a year instead of for each meeting. Current SARC Subcommittees would be renamed "Working Groups" and should have more non-NEFSC participants (e.g., State, academic, and other national and international experts). Existing Working Groups in other organizations (e.g., ASMFC) should feed into the SAW process, but need to have a more diversified membership with the infusion of NEFSC personnel and independent participants. Joint assessments with Canada may be another way of increasing the pool of experts.

Two main issues in developing the above process are funding and staffing. SARCs continue to be an excellent training ground for State personnel, and State directors should be encouraged to urge and/or allow their experts to attend. Covering the cost of hotel accommodation for State people attending Working Group and SARC meetings in Woods Hole (e.g., using MBL's Swope Center facilities) and holding meetings at different locations in the Region are two possible ways to make participation by State personnel more affordable.

Although there may be control problems, a whole array of Working Groups could function under the SAW umbrella, including independent expert groups, ASMFC groups, and other groups tasked with developing management advice. Plan Development Teams (PDTs) would still address particular management specifications for Council needs..

There should be more flexibility regarding the establishment of Working Groups. These could include multispecies groups, some long-term groups, some very specific short-term (e.g., species-specific) groups, and some independent/standing groups.

Joint assessments with Canada

Joint assessments with Canada would be done at the Working Group level. For example, a Working Group on Georges Bank Cod, Haddock, and Yellowtail Flounder could be established. Such a Working Group would produce assessments (without management advice) that would benefit from using common data sets, being done concurrently, and employing similar analytical methods and computations. Management advice would continue to be produced separately for each country, i.e., via the Regional Assessment Process (RAP) in Canada and the SARC in the US. The early establishment and implementation of such joint Working Groups would be useful.

Expanding the geographic scope

Expanding the geographic scope of the SAW process to include the Southeast Region was viewed as beneficial from the point of view of infusing ad-

ditional expertise. The focus of a coastwide SARC could initially be on shared species. Possible issues concerning the expansion of the geographic scope may include administrative load, control complications, workload, practicality, and parochialism. There is currently no peer-review process like the SAW in the Southeast and it is uncertain how that Region would feel about a coastwide process. Dr. Rosenberg agreed to contact Dr. Andrew Kemmerer, Regional Administrator, NMFS Southeast Region, to ascertain the extent of any possible interest within the Southeast Region (including the South Atlantic and Gulf Fishery Management Councils and the Gulf States Marine Fisheries Commission) to a coastwide SAW process.

Consultants

A pool of experts (national and international), from which to obtain external participants at Working Group and/or SARC meetings (e.g., for 20 days/year on an as-needed, retainer basis), could be established. A process for funding such experts and a process for verifying their qualifications would also need to be established.

The possibility of requesting advice from the International Council for the Exploration of the Sea (ICES) and having assessments done by ICES Working Groups and the peer review and formulation of advice handled by the ICES Advisory Committee on Fishery Management (ACFM) was also briefly explored. It was acknowledged that this would probably have financial implications for the US as a contracting party of ICES. The potential of using the NAFO Scientific Council peer-review process was also mentioned, but the US position relative to its ultimate use of NAFO for assessment and management purposes was considered to still be unresolved.

SAW presentations

SAW presentations at Public Review Workshops were generally felt to be poorly understood/received by the audience because of being too complicated and long and consequently were in need of some restructuring. With the benefit of an advance distribution of the SARC reports and an appropriate press release, a presentation focusing mainly on the management advice followed by a question-and-answer session involving the audience and a panel of experts (e.g., Subcommittee/Working Group Chairmen) was suggested as a possible remedy.

Interim SAW Process

Until modifications to the present SAW process were agreed and implemented, a number of relatively easy changes would be made, beginning with the Public Review Workshop sessions for SAW-23.

Information on the "latest scientific advice" will be provided in a press release to be prepared by the NEFSC Research Communications unit.

The SARC reports will be distributed to Council members in advance of the Public Review Workshop sessions.

Presentations at the Workshop sessions will be shortened, focus primarily on a quick review of the stock status and management advice, and be followed by questions and answers.

SARC Subcommittees will be renamed "Working Groups" and a joint US/Canada Working Group will be organized as soon as possible to assess the transboundary stocks of Georges Bank cod, haddock, and yellowtail flounder for SAW-24. The US membership of this joint Working Group will, as in the past, be open to representatives from the two Councils, States, and academia. Dr. Sissenwine agreed to pursue the establishment of the joint Working Group with Canadian DFO officials. Efforts will be made to broaden the participation in all Working Groups for SAW-24.

Terms of reference for stocks for SAW-24 will specify whether an updated or new assessment is required. In the case of the assessments identified as "updates" (e.g., summer flounder, scup), the relevant sections of the SAW-24 "*SARC Consensus Summary of Assessments*" will be shortened by including only essential text and supporting material needed to de-

scribe new data points and current results. The usual repetition of "boiler-plate" text, tables, and figures contained in previous reports will be replaced by references to previous reports, as necessary.

SAW-24

Tentative stocks

Gulf of Maine cod
Georges Bank cod
Georges Bank haddock
Georges Bank yellowtail flounder
Summer flounder
Scup
Black sea bass
Weakfish

Meeting dates and places

SARC
June 23-27, 1997
Woods Hole, MA

Public Review Workshop
MAFMC
August 12-14, 1997
Philadelphia, PA
NEFMC
August 20-21, 1997
Danvers, MA

It was agreed that the assessment and review of Georges Bank winter flounder would be delayed until fall 1997 (SAW-25). Relative to any follow-up consideration by the SARC of lobsters in the Central and Western Long Island Sound area, ASMFC would first need to convene a scientific Working Group to peer review any written documentation of the egg-per-recruit model developed by New York scientists. Next, this Working Group, comprised of lobster assessment experts from throughout the Region, would have to reach consensus on the validity of the New York model and prepare an agreed report for submission to the SARC.

SAW-25

Terms of reference for surfclams and ocean quahogs had been approved by the Steering Committee at a teleconference held on July 29, 1996. No other species were specifically mentioned for inclusion on the SAW-25 agenda. It was agreed to tentatively schedule the SAW-25 SARC meeting for December 1-5, 1997 in Woods Hole, MA.

Fisheries Economics Workshop

The need to organize a workshop on fisheries economics was proposed for the purpose of improving the level of economic analysis and discussing social science issues. It was concluded that such a workshop should not be within the context of the SAW. Mr. Kellogg would explore the organization of such a workshop and report back to the Steering Committee.

Teleconference of February 10, 1997

The SAW Steering Committee met by teleconference on February 10, 1997. Participants were: J. Dunnigan, ASMFC; D. Keifer, MAFMC; P. Howard, C. Kellogg, NEFMC; A. Rosenberg, NMFS/NER; M. Sissenwine, E. Anderson (SAW Chairman), H. Mustafa (SAW Coordinator), NMFS/NEFSC.

Dr. Sissenwine had requested the teleconference to discuss the implications of the Congressionally-mandated National Research Council (NRC) review of Northeast groundfish assessments as well as results of recent communications with DFO Canada concerning a joint US/Canada Working Group assessment meeting on transboundary groundfish species. In order to accommodate the needs and timetable of the NRC review, and in light of the associated heavy workload for NEFSC staff, it would be necessary to modify both the agenda and meeting dates for SAW-24.

The NRC would review the assessments of the five principal groundfish stocks (Gulf of Maine cod; Georges Bank cod, Georges Bank haddock, Georges Bank yellowtail flounder, and Southern New England yellowtail flounder) and submit a report to Congress in September. These assessments and the correspond-

ing management advice would first be peer reviewed by the SARC. The completed SARC reports would then have to be presented to the NRC by June 7. The other species originally on the agenda for SAW-24 would have to be handled at a separate SAW (25) in the summer.

Dr. Sissenwine outlined a timetable for both US and Canadian assessment activities, beginning in early February and continuing until June 7, for data availability, analysis, and meetings to achieve the NRC deadline. Stressing that this timetable had virtually no flexibility, he pointed out that a daily event schedule had been prepared by the NEFSC for meeting the deadline.

Dr. Sissenwine had contacted his Canadian counterpart following the December 16 Steering Committee meeting regarding interest in joint assessments of transboundary stocks. It has been agreed to hold a joint Northern and Southern Demersal Working Group meeting in Woods Hole in early April with additional Canadian participation. Such a meeting would ensure the full exchange of and agreement on input data and analytical methods used in assessing the Georges Bank stocks according to both US and Canadian management units. Results from this meeting (it was unclear yet whether a single report or multiple reports would be produced) would be subjected to separate peer reviews by the RAP and SARC, both benefiting from US and Canadian participation. Management advice would be prepared separately by the existing processes within the two countries. Following the early April Working Group meeting, further analyses (e.g., examination of biological reference points and stock size rebuilding targets, new long-term stock and catch projections) would have to be done in preparation for the SARC meeting.

It was agreed that the SARC meeting to review the five groundfish assessments would be held May 19-23 in Woods Hole. This would allow two weeks to complete and submit the reports to the NRC. The Public Review Workshop sessions would be held at subsequent NEFMC and MAFMC meetings. An additional SARC meeting would be scheduled in late summer to handle the other stocks originally on the SAW-24 agenda. This matter would be discussed further at the February 13 teleconference.

The need for greater participation at SAW-24 Working Group and SARC meetings by experts from States, as well as academia and other NMFS Science Centers, was stressed. Various individuals were suggested. Dr. Rosenberg indicated that the NER would have the necessary logbook catch data available for the assessments and would, if necessary, provide staff assistance.

Committee members expressed their appreciation to Dr. Sissenwine for his timely information and indicated their support in dealing with this extraordinary situation. The modified SAW schedule would have no impact on the ASMFC meeting scheduled for the same week as the SARC or the timing of Council or Commission management decisions.

Teleconference of February 13, 1997

The SAW Steering Committee met by teleconference on February 13, 1997. Participants were: J. Dunnigan, ASMFC; D. Keifer, MAFMC; P. Howard, C. Kellogg, NEFMC; A. Rosenberg, NMFS/NER; M. Sissenwine, F. Serchuk, E. Anderson (SAW Chairman), H. Mustafa (SAW Coordinator), NMFS/NEFSC.

The agenda included 1) a review of the report of the Steering Committee meeting of December 16, 1996, 2) the updated status of the NRC review of Northeast groundfish assessments, and 3) approval of the final list of species/stocks, terms of reference, and timetable of meetings for SAW-24 and SAW-25.

As a follow-up to the teleconference of February 10, Dr. Sissenwine indicated that NMFS had provided the NRC with the timeline of events leading to the delivery of a SARC report on June 7. He also reported on further communications with Canadian officials which indicated that there appeared to be no problems associated with the forthcoming joint assessment meeting and subsequent peer reviews. A meeting on March 26 with Canadian officials would resolve some remaining technical matters relative to the joint assessments and the preparation of documents.

Questions were raised relative to the availability of trawl survey data for the joint groundfish assessments. Data from the NEFSC winter and Canadian

spring surveys would be used, even though the latter would not be completed until March 21. However, data from the NEFSC spring survey would not be available since that survey would not be completed until April 25.

SAW-24

The following stocks, their terms of reference, and dates and places for the SARC meeting and Public Review Workshop sessions were agreed.

Stocks

Gulf of Maine cod
Georges Bank cod
Georges Bank haddock
Georges Bank yellowtail flounder
Southern New England yellowtail flounder

Terms of reference

Gulf of Maine cod:

a. assess the status of Gulf of Maine cod through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates;

b. provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 at various levels of F, including all relevant biological reference points;

c. advise on the assessment and management implications of incorporating recreational catch and commercial discard data in the assessment.

Georges Bank cod:

a. assess the status of Georges Bank cod through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates;

b. provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 at various levels of F, including all relevant biological reference points;

c. advise on the assessment and management implications of incorporating recreational catch and commercial discard data in the assessment.

Georges Bank haddock:

a. assess the status of Georges Bank haddock through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates;

b. provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 at various levels of F, including all relevant biological reference points;

c. advise on the assessment and management implications of incorporating commercial discard data in the assessment.

Georges Bank yellowtail flounder:

a. assess the status of Georges Bank yellowtail flounder through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates;

b. provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 at various levels of F, including all relevant biological reference points;

c. advise on the assessment and management implications of incorporating commercial discard data in the assessment.

Southern New England yellowtail flounder:

a. assess the status of Southern New England yellowtail flounder through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates.

b. provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 at various levels of F, including all relevant biological reference points;

c. advise on the assessment and management implications of incorporating commercial discard data in the assessment.

Meeting dates and places

SARC
May 19-23, 1997
Woods Hole, MA

Public Review Workshop
NEFMC
July 9, 1997
Danvers, MA
MAFMC
August 13, 1997
Philadelphia, PA

Reports would be distributed to the Councils prior to the Public Review Workshop sessions, most likely shortly after June 7 when copies would be provided to the NRC.

SAW-25

The following stocks, their terms of reference, and dates and places for the SARC meeting and Public Review Workshop sessions were agreed.

Stocks

Summer flounder
Scup
Black sea bass

Weakfish, originally scheduled for this SAW, would not be ready until fall 1997.

Terms of reference

Summer flounder:

a. assess the status of summer flounder through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates;

b. provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 at various levels of F, including F_{Target};

c. provide medium- to long-term stock size and catch projections under various constant fishing mortality or constant catch scenarios with the aim of achieving stock rebuilding at an MSY level.

Scup:

a. assess the status of scup through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates;

b. to the extent feasible, provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 and characterize the variability of estimates of stock abundance and fishing mortality rates.

Black sea bass:

a. assess the status of black sea bass through 1996 and characterize the variability of estimates of stock abundance and fishing mortality rates;

b. to the extent feasible, provide projected estimates of catch for 1997-1998 and SSB for 1998-1999 and characterize the variability of estimates of stock abundance and fishing mortality rates.

Meeting dates and places

SARC
July 21-25, 1997
Woods Hole, MA

Public Review Workshop
MAFMC
September 24, 1997 (tentative)
Philadelphia, PA
NEFMC
October 1-2, 1997
Danvers, MA

SAW-26

Tentative stocks

Surfclam
Ocean quahog
Weakfish
Georges Bank winter flounder

Meeting dates and places

SARC
December 1-5, 1997
Woods Hole, MA

Public Review Workshop
January 1998

The species/stocks considered at the various SAWs are listed in Table 2.

Types of Assessments

While discussing terms of reference for SAW-24 and SAW-25, the Steering Committee reviewed the types of assessments that were anticipated for the various stocks on the agendas. The following three categories were viewed as appropriate:

1) Benchmark assessment: update all input data, new analytical methods likely or re-examination of previous assessment assumptions and analytical methods (e.g., all the groundfish stocks for SAW-24);

2) Updated assessment: update catch-at-age data and survey indices for latest year(s), run new VPA, make new catch/stock projections (e.g., summer flounder and scup for SAW-25);

3) Exploratory assessment: characterized as first-time or repeat assessment where data are highly uncertain and output equally uncertain, assemble or update available data (e.g., catch at age, survey), attempt analytical methods and catch/stock projections, (e.g., black sea bass for SAW-25).

Issue Paper

In discussing and suggesting changes and additions to the report of the December 16 meeting, it was agreed that the report should be developed into an issue paper. It was recommended that an East Coast Working Group be set up (following the NRC review) to further explore the options that had been raised for improving the SAW process, using the issue paper as a guide. The issue paper could also be used as a basis for discussion within relevant NMFS Boards (e.g., Science, Atlantic Coastal). Following the description of a preferred modification to the SAW/SARC process, the issue paper could be used to generate support.

SARC Recommendations

Concern was expressed that the many SARC research recommendations rarely reached fruition and were not moving forward. It was agreed that the issue paper should contain a section on research recommendations and how they should be addressed. A prioritization of such recommendations and the connection between them and funding sources (e.g., NMFS and other agencies) would facilitate making choices once funds were identified.

Expanded Participation

Every effort would be made to broaden participation at SARC and Working Group meetings, including industry representation. A funding pool would eventually be established to finance the participation of qualified external consultants, some of whom could be nominated by industry. This would insure the scientific independence and integrity of industry representatives and avoid conflicts of interest arising from their participation being supported financially by the industry.

State experts, who would greatly benefit from attending SAW meetings, should be encouraged to participate. The possibility of subsidizing State people to participate was discussed. Mr. Dunnigan was asked to follow up on this matter with State directors.

The question of expanding the geographic range of the SAW would be discussed at upcoming meetings of the NMFS Coastal Board and Science Board. It was anticipated that an agreement in principal would arise from those meetings, which could be followed by the establishment of the East Coast Working Group to generate further details.

Dr. Anderson noted his participation at the October 1996 meeting of the ASMFC Management and Science Committee where there had been discussion of a draft report on the ISFMP stock assessment peer-review process. He had informed the Committee of plans to modify the SAW process and urged that ASMFC, as a partner in the SAW process, not focus its efforts totally on developing/improving an entirely separate process, but rather seek ways to strengthen and further blend its own process with that of the SAW. He had been invited to participate in the next meeting (probably in March or April 1997) of a subcommittee of the Management and Science Committee tasked with modifying the draft report.

Table 2. SAW/SARC Assessment Reviews by Species

YEAR	85	1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		
SAW #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Black Sea Bass	X				+	+			X		X		X							X					X	
Bluefish	X		X	X	X	X					X						X	X					X			
Butterfish	X	X		X		X		X		X		X					X									
Cod, Georges Bank	X		X				X				X		X		X			X			+			X		
Cod, Gulf of Maine	X		X				X					X			X				X		+			X		
Cusk	X																				+					
Flounder, Am. Plaice	X	X		X							X			X							+					
Flounder, Summer	X		X			X	+	+	X		X		X			X		X		X		X			X	
Flounder, Winter, Offshore	X		X																							
Flounder, Winter, Inshore	X		X		+	+	+						X													
Flounder, Winter, SNE																					X					
Flounder, Winter, GOM																					X					
Flounder, Winter, GB	X		X										X													X
Flounder, Witch	X	X																X			+					
Flounder, Yellowtail, SNE	X	X					X					X					X				+			X		
Flounder, Yellowtail, GB	X	X					X					X						X			+			X		
Goosefish														X							+		X			
Haddock, Georges Bank	X	X		X									X							X	+			X		
Haddock, Gulf of Maine	X	X																			+					
Herring, Atlantic					X				X		X		X			X					X					
Lobster, American	X		X							X		X		X		X						X				
Mackerel, Atlantic	X	X		X		X		X		X		X								X						
Ocean Pout	X										X										+					
Ocean Quahog	X		X							X					X				X			+				X
Pollock	X		X						X	X						X					+					
Red Hake	X	X									X										+					
Redfish	X	X													X						+					
River Herring/Shad	X					X																				
Salmon, Atlantic	X																									
Scallop, Sea	X	X				X			X	X	X	X	X	X						X			X			
Scup	X			X			X		X		X								X						X	
Shrimp, Northern	X		X		X																					
Silver Hake	X	X		X						X	X						X				+					
Skate	X																									
Spiny Dogfish	X										X							X								
Squid, Illex	X	X		X		X		X		X		X		X			X				X					
Squid, Loligo	X	X		X		X		X		X		X		X			X				X					
Striped Bass	X																									
Surfclam	X		X				X		X						X				X			X				X
Tautog																				X						
Tilefish	X													X		X										
Weakfish			+																							X
White Hake	X	X									X								X		+					
Wolffish	X																				+					

+ = No formal assessment review; research needs, working group or special topic report.
X - assessment suggested or X - assessment completed