Northeast Fisheries Science Center Reference Document 98-04

A Report of the 26th Northeast Regional Stock Assessment Workshop

26th Northeast Regional Stock Assessment Workshop (26th SAW)

Public Review Workshop

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
Northeast Fisheries Science Center
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OVERVIEW

Introduction

The Public Review Workshop of the 26th Northeast Regional Stock Assessment Workshop (SAW-26) was held in three sessions as part of the meetings of the New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC) and Atlantic States Marine Fisheries Commission (ASMFC). The first session was held January 14, 1998 in Wakefield, MA during the NEFMC meeting, the second session was held January 29, 1998 in Atlantic City, NJ during the MAFMC meeting, and the third session was held February 3, 1998 in Baltimore, MD during the ASMFC meeting.

The purpose of the Workshop was to present the assessment results and management advice on weakfish, surfclams, striped bass, and spiny dogfish, peer reviewed by the Stock Assessment Review Committee at its December 1-5, 1997 meeting, to managers, fisheries representatives, and the public. Copies of the SAW-26 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.

The SAW Chairman, Dr. Emory Anderson of the NMFS, Northeast Fisheries Science Center (NEFSC), briefly summarized the assessment results and management advice for each stock using information contained in this report and supporting information from the *26th Northeast Regional Stock Assessment Workshop (26th SAW) Stock Assessment Review Committee (SARC) Consensus Summary of Assessments.* Several experts assisted in the question-and-answer periods at the sessions. Dr. Paul Rago (NEFSC, Chairman of the SARC Invertebrate Working Group) and Mr. Gary Shepherd (NEFSC, Chairman of the ASMFC Striped Bass Technical Committee) assisted at the NEFMC session; Dr. Rago, Mr. Shepherd, and Dr. James Weinberg (NEFSC Population Dynamics Branch) assisted at the MAFMC session; and Mr. Shepherd and Mr. Mark Gibson (RI DFW, ASMFC Weakfish Stock Assessment Subcommittee) assisted at the ASMFC session.

Status Summaries

Weakfish

The available survey indices clearly show an increase in weakfish abundance in recent years. Recruitment has been above average, and there is some indication that age structure is expanding. A relative exploitation index and catch-curve estimates of Z have declined, suggesting that fishing mortality is declining. Exploratory VPA analyses show a strong increase in SSB in recent years, which is not dependent on the model used. The mean rate of SSB increase has been 22.5% per year since the low point reached in 1991. Fishing mortality rates from VPA have declined sharply since 1990. The mean rate of decline in F was 21.4% per year and was evident from all VPA model results. The weight of evidence indicates that the Atlantic weakfish stock is recovering from low abundance levels reached in the early 1990s. Continued low fishing mortality rates and good recruitment should allow for extension of the age structure to a point comparable to that observed in the early 1980s.

Surfclams

The EEZ surfclam resource is at a medium level of biomass and appears under-exploited overall. The vast majority of the catch is currently taken from the Northern New Jersey (NNJ) area which contains about 36% of the coast-wide resource. Much of the resource is exploited at low levels (Delmarva containing 25% of the resource) or not at all (Georges Bank containing 26% of the resource). During 1991-1997, landings per unit effort off NNJ declined 30% as the fishery expanded offshore to the geographic limits of the resource in that area. For the resource as a whole, estimated exploitation rates range from 1% to 3%, whereas in NNJ, the range is from 2% to 6%, all below the threshold or target fishing mortality or overfishing definitions. Survey age composition data for NNJ and Delmarva indicate at least 18 cohorts, none of which are dominant. Based on the 1997 data, the average size and yield from Delmarva clams are less than from NNJ. Georges Bank (GBK) continues to be closed to harvesting due to previous contamination by PSP. Although a significant fraction of the total stock biomass is on GBK, the amount is probably overestimated because unsuitable habitats have been included in the estimate. Between 74% and 91% of the EEZ landings have been taken from NNJ every year from 1986 to 1997. There appears to be little scope for increased catches in NNJ, given that the fishery now occurs over the entire range of the NNJ portion of the stock and catch approximately equals production.

Striped Bass

The Atlantic coastal stocks of striped bass are at a high level of abundance and are being exploited at a sustainable level. The estimates of fishing mortality in 1996 were at the target level (0.31) and below the level of F_{msy} (0.38). Record high levels of recruitment from the 1993 and 1996 year classes should approach full recruitment by 1998 and 2001, respectively. Spawning stock biomass should continue to increase over the short term under current levels of exploitation.

Spiny Dogfish

The spiny dogfish stock in the Northwest Atlantic has begun to decline as a consequence of the recent increase in exploitation. Swept-area estimates of the fishable biomass (defined as ≥80 cm fish) increased six-fold from 1968 to 1989 and have since declined to less than 150,000 mt. Research vessel survey data document a steady increase in both abundance and biomass since the early 1970s, but total biomass indices in the last several years have been stable at about 600,000 mt. Minimum biomass indices of large fish (i.e., ≥80 cm) already have declined from about 300,000 mt in 1990 to about 150,000 mt in 1997, approximating levels observed in the 1970s. Owing to the targeting of females in the landings, the estimated minimum biomass of females ≥80 cm has declined more sharply than the combined male-female ≥80-cm biomass. Length frequency data from US commercial landings and research vessel survey catches indicate a pronounced decrease in average length of females in recent years. In 1997, 75% of the females landed in the NEFSC spring trawl survey were below the length at 50% maturity.

The estimated number of pups per recruit is below 1.0, and yield per recruit is less than 0.9 kg (maximum yield per recruit of 1.2 kg) occurs at an F of about 0.25). The average F during 1994-1996 was 0.25, and was projected to be 0.41 in 1997. Thus, it is likely that current fishing mortality rates will result in negative replacement, and the stock will eventually decline. Removal of a large fraction of the spawning stock since 1990 will likely reverse the increase in population biomass that occurred in the late 1970s and 1980s. Biomass of males and immature females in the 36-70 cm range should decrease over the next decade as the small cohorts produced in the 1990s grow. Moreover, replacement of the spawning stock, i.e., accumulation of large females in the 100-cm range, could take another decade.

Conclusions of the SAW Steering Committee

The SAW Steering Committee met once during the SAW-26 cycle. A teleconference was held February 17, 1998 to 1) recap the SAW-26 meetings and reports, 2) review the status of joint US/Canada assessment meetings in 1998, 3) adopt the agenda, terms of reference, and meeting schedules for SAW-27, 4) consider the tentative agenda and meeting dates for SAW-28, 5) discuss the future SAW policy on reviewing assessments and producing advice, and 6) consider several other policy issues. A summary of this meeting 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 an important 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. The fishery resource is considered to be under-exploited if the exploitation rate is substantially below the level that is needed to produce MSY.

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, or as 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 SSB. Conversely, fishing down a stock that is at a high level should generally increase the long-term sustainable yield. 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 and indicates the appropriate management advice for each classification.

STOCK LEVEL (columns) / *EXPLOITATION STATUS* (rows)

	LOW	*MEDIUM*	*HIGH*
OVER EXPLOITED	REDUCE EXPLOITATION, REBUILD STOCK	REDUCE EXPLOITATION, BROADEN AGE DISTRIBUTION	REDUCE EXPLOITATION, INCREASE YIELD PER RECRUIT
FULLY EXPLOITED	REDUCE EXPLOITATION, REBUILD STOCK LEVEL	MAINTAIN EXPLOITATION RATE AND YIELD	MAINTAIN EXPLOITATION RATE AND YIELD
UNDER EXPLOITED	MAINTAIN LOW EXPLOITATION WHILE STOCK REBUILDS	INCREASE EXPLOITATION SLOWLY	INCREASE EXPLOITATION, REDUCE STOCK LEVEL

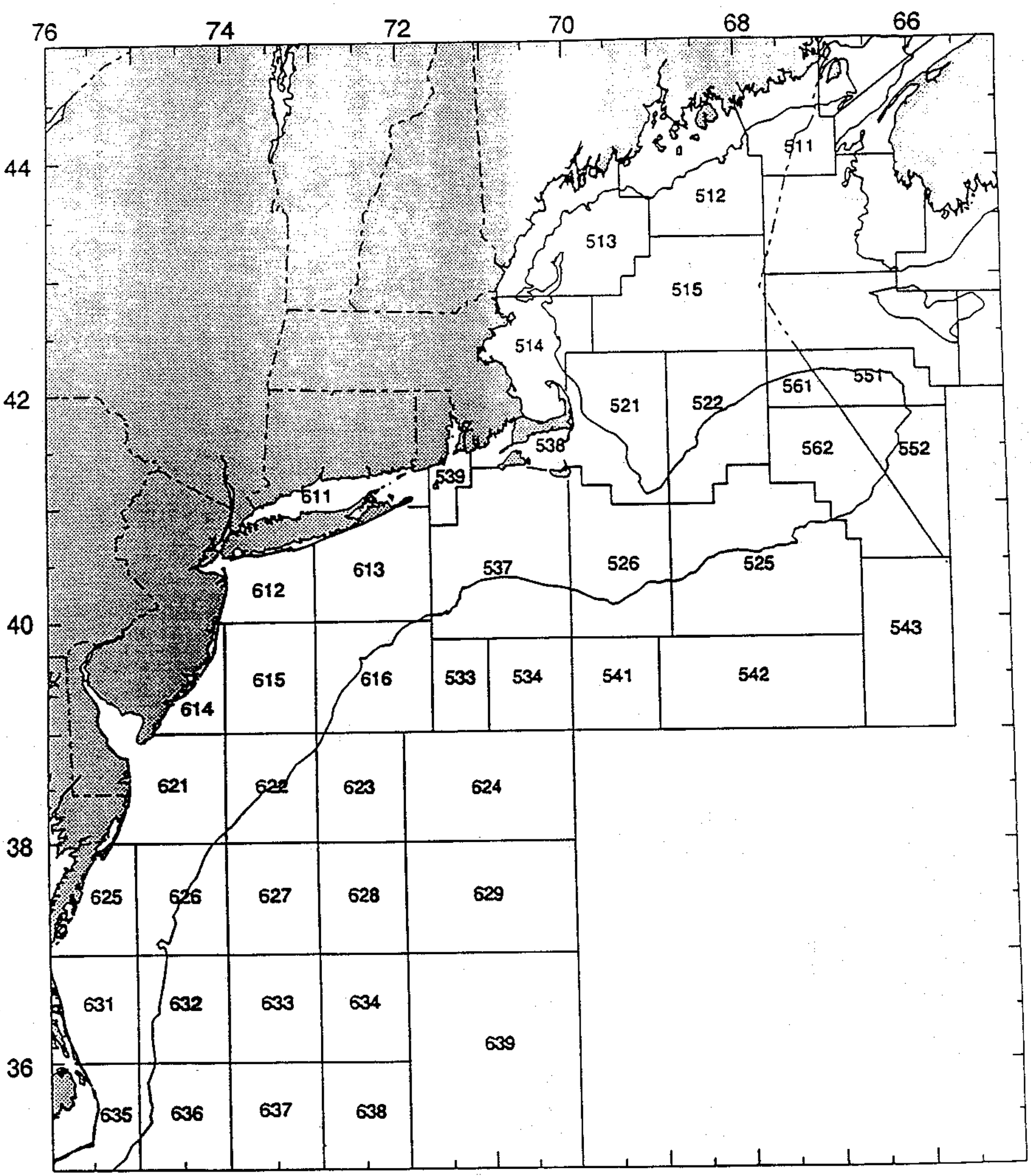


Figure 1. Statistical areas used for catch monitoring in offshore fisheries in the Northeast United States.

GLOSSARY OF TERMS

Biological reference points: These are specific values for the variables that describe the state of a fishery system and 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.

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 (or vector) 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 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).

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

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

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) reference points: 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 are derived from stock-recruitment data which can be used to estimate the level of %MSP necessary to sustain a stock, or they are chosen by analogy using available information on the level required to sustain related.

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

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 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.

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.

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 which are also assumed to be constant.

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. 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 also assumed to be constant.

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

F	Weakfish M = 0.25	Striped bass M = 0.15	Spiny dogfish M = 0.092	Surfclams M = 0.05
0.1	8	9	9	9
0.2	16	17	17	18
0.3	23	24	25	25
0.4	29	31	32	32
0.5	35	37	38	38
0.6	40	42	43	44
0.7	45	47	48	49
0.8	50	52	53	54
0.9	53	56	57	58
1.0	57	59	61	62
1.1	60	63	64	65
1.2	63	66	67	68
1.3	66	69	70	71
1.4	69	71	73	74
1.5	71	73	75	76
1.6	73	76	77	78
1.7	75	77	79	80
1.8	77	79	81	82
1.9	78	81	82	84
2.0	80	82	84	85

A. WEAKFISH ADVISORY REPORT

State of Stock: The weakfish stock is increasing in abundance and is fully exploited. Estimated fishing mortality (F) rates declined an average of 21% per year from 1992 to 1996, were below the management target of 1.27 in 1996, but still likely above the overfishing definition of F = 0.70. Landings in 1996 of about 5,100 mt were about 40% of the level during the early 1980s (Figure A1). Spawning stock biomass (SSB) was minimum during the early 1990s and has since increased an average of 22% per year from 1992 to 1996 (Figure A2). Recruitment has also steadily increased since the early 1990s (Figure A2).

Management Advice: Fishing mortality has reached the 1996 ASMFC target and appears to be moving towards the long-term plan goal (F = 0.5 in Amendment 3). Consideration should be given to the losses of age 0 and 1 weakfish as bycatch in the shrimp trawl fishery, which may be high.

Forecast for 1998: No forecasts were performed.

Catch and Status Table (weights in '000 mt, SSB index in kg/tow, recruitment index in no./tow): Weakfish

Year	1989	1990	1991	1992	1993	1994	1995	1996	Max[2]	Min[2]	Mean[2]
Commercial landings	6.4	4.3	3.9	3.4	3.1	2.9	3.2	3.3	9.6	2.9	6.0
Recreational landings[1]	1.0	0.6	1.1	0.7	0.6	1.1	1.3	1.8	5.3	0.5	2.1
Total landings	7.4	4.9	5.0	4.1	3.7	4.0	4.5	5.1	14.4	3.7	8.3
SSB index	1.02	0.10	0.21	1.00	0.52	2.62	4.92	2.57	4.92	0.10	1.70
Recruitment index	6.76	5.87	8.39	6.83	7.21	11.09	12.47	15.78	15.78	4.08	8.60

[1]Includes recreational landings plus 20% of released fish (i.e., discard mortality rate is 20%). [2]1982-1996.

Stock Distribution and Identification: Recent genetic studies have concluded that Atlantic coast weakfish comprise a single stock.

Catches: Coast-wide landings peaked at about 14,400 mt in 1986 (Figure A1) and declined steadily thereafter to about 5,100 mt by 1996 due to management regulations. Although total landings have decreased in recent years, recreational landings have increased.

Data and Assessment: The assessment was based on age-based research survey abundance indices, fishery landings data, discard estimates, estimates of mortality rates, and exploratory VPAs. Problems with scale vs otolith ageing were unresolved and made the fishery and survey catch-at-age data difficult to interpret. Consistent trends in fishing mortality and stock abundance were observed from various exploratory VPAs employing different tuning methods, but unresolved technical problems made it impossible to adopt absolute estimates. A constant natural mortality rate (M = 0.25) was assumed.

Biological Reference Points: Amendment 3 of the ASMFC weakfish plan has a target of F = 0.5 in the year 2000, with intermediate targets of F = 1.27 in 1996 and 1.0 in 1998 (Figure A3). No new reference points were calculated in this assessment.

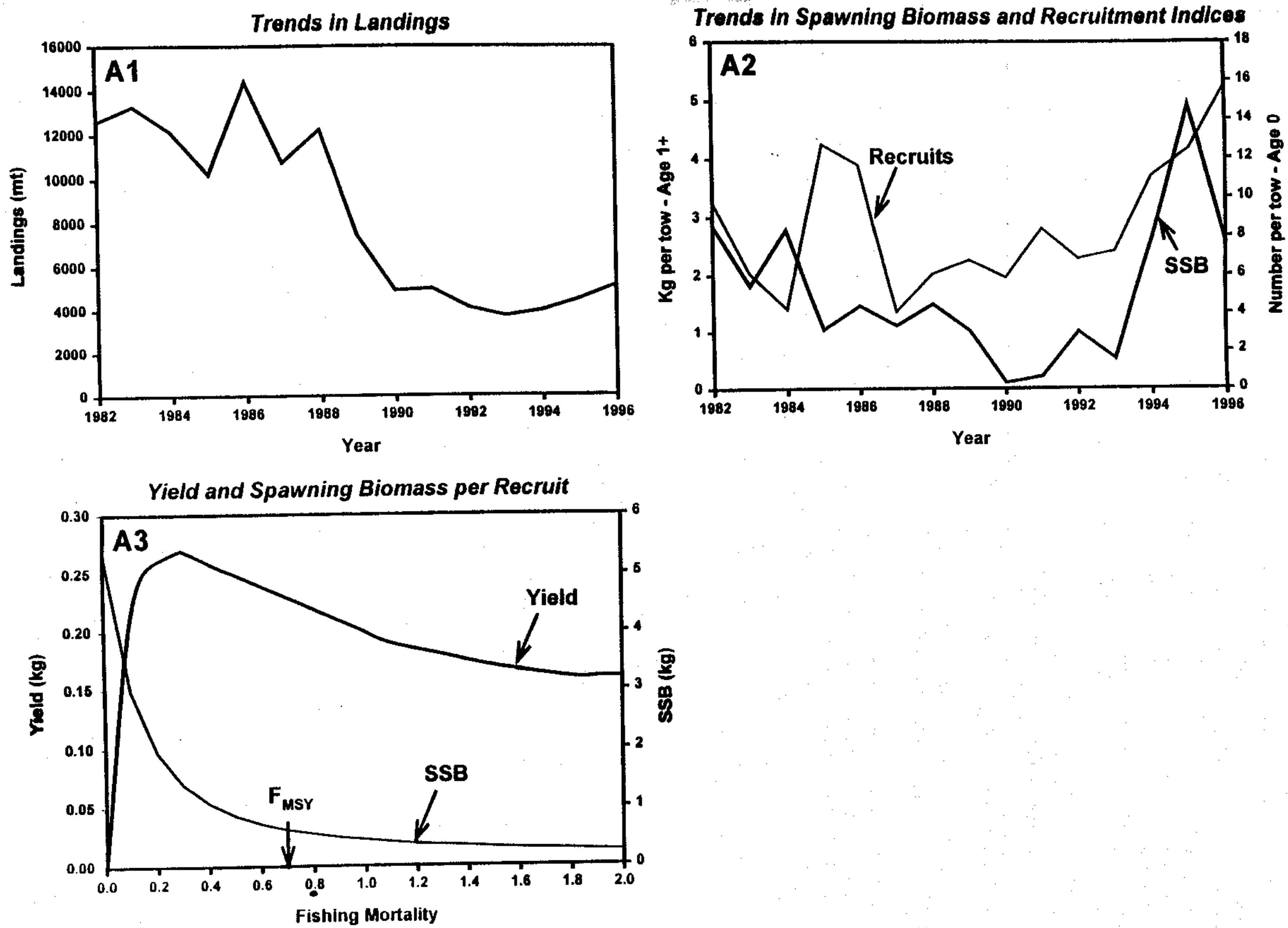
Fishing Mortality: Based on results from several exploratory VPAs, fishing mortality (F) increased dramatically to high levels in 1989 and 1990 and then gradually declined to a level in 1996 below the ASMFC target of 1.27.

Recruitment: Recent recruitment, as measured by a composite survey young-of-year index, has been above the long-term average since 1993 (Figure A2).

Spawning Stock Biomass: Indices of spawning stock biomass (SSB) from NEFSC autumn inshore survey catches declined to a historic low in 1991, but increased subsequently (Figure A2).

Source of Information: Report of the 26th Northeast Regional Stock Assessment Workshop (26th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 98-xx.

Weakfish



Trends in Landings
A1
16000
14000
12000
10000
8000
6000
4000
2000
0
Landings (mt)
1982
1984
1986
1988
1990
1992
1994
1996
Year
Trends in Spawning Biomass and Recruitment Indices
A2
Recruits
SSB
Kg per tow - Age 1+
Number per tow - Age 0
Year
Yield and Spawning Biomass per Recruit
A3
Yield
SSB
F_{MSY}
Yield (kg)
SSB (kg)
Fishing Mortality
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0

B. SURFCLAM ADVISORY REPORT

State of Stock: The EEZ surfclam resource is at a medium level of biomass (Figure B1) and is probably under-exploited overall. The vast majority of the catch (>80%) is currently derived from the Northern New Jersey (NNJ) area (Figure B3), which contains about 36% of the coast-wide resource. Large fractions of the resource are exploited at low levels (Delmarva containing 25% of the resource) or not at all (Georges Bank containing 26% of the resource). From 1991 to 1997, a period for which effort has been reported accurately, landings per unit effort (LPUE) off NNJ declined 30% from 1,063 to 745 kg/hr (Figure B2) as the fishery has expanded offshore to the geographic limits of the resource in that area (Figure B3). NEFSC dredge survey data from the same time period do not show a clear trend (Figure B1). For the resource as a whole, estimated exploitation rates range from 1% to 3%. In NNJ, the estimated exploitation rates range from 2% to 6%. Survey age composition data for NNJ and Delmarva indicate that the populations contain at least 18 cohorts, none of which are dominant (Figure B10). Based on the 1997 data, the average size and yield from clams of the Delmarva region are less than from NNJ (Figures B11 and B12). Georges Bank (GBK) continues to be closed to harvesting due to previous contamination by PSP. Although a significant fraction of the total stock biomass is on GBK, the amount is probably overestimated because rock and boulder habitats have been included in the estimate of that region's area. Between 74% and 91% of the EEZ landings have been taken from NNJ in every year from 1986 to 1997. The current exploitation rate does not exceed threshold or target fishing mortality or overfishing definitions ($F_{20\%}$ = 0.18).

Management Advice: There appears to be little scope for increased catches in NNJ, given that the fishery now occurs over the entire range of the NNJ portion of the stock (Figure B3), and catch approximately equals production (Figures B6-B8). The fishery could be expanded in the Delmarva area, since that is the one area in the Mid-Atlantic which has significant annual net production. Careful consideration needs to be given to implementing stock-wide quota increases because the additional catch would likely be taken in the NNJ area to the detriment of that fishery. There is substantial net production on Georges Bank which is capable of supporting a fishery.

Surfclams in the Delmarva region are now growing slowly, have low meat weights, and may be stunted (Figure B12). It is unclear to what degree this is due to density dependence (Figure B13) or environmental effects. Therefore, it is unclear whether reducing the density through fishing would improve growth and condition.

As stated in the SARC/SAW-22 Consensus Summary, this is "*an appropriate time for the Council to revisit the question of appropriate harvest policies for the surfclam*". The 10-year harvest policy recently used for determining quotas for the surfclam fishery was predicated on a mining strategy and the assumption that strong recruitment events occurred at decadal intervals. The policy was initially intended to assure constant harvests in the interval between large recruitments. It is now clear that moderate levels of surfclam recruitment occurred annually over the past two decades (Figure B10), and these recruitments have supported a sustainable fishery. The SARC recommends that the Council consider developing new harvest policy guidelines which meet its objectives of relatively stable catches and catch rates (LPUE) and which prevent overfishing. In the interim, the SARC recommends that harvest levels be set no greater than the annual biomass production from the resource.

Forecasts: <u>Production Model</u>. A model of total biomass production and harvesting in the various assessment areas was developed based on annual biomass production from survey-based estimates. Annual production (biomass gain from individual growth) minus losses (natural mortality, landings, and unobserved fishing mortalities) was estimated for each area based on survey size compositions, length-weight parameters, growth equations (in shell length), swept-area population estimates from surveys, and natural mortality rates. Effects of uncertainty about dredge efficiency and natural mortality were evaluated (Figures B8 and B9).

If natural mortality (M) is assumed to be 0.05, then under current harvest patterns, total biomass off Delmarva (DMV) and Southern Virginia (SVA) will increase during the next year by about 12,000 mt and 4,000 mt, respectively. In the other Mid-Atlantic areas (e.g., Northern and Southern New Jersey), total biomass will likely not change substantially. On Georges Bank, total biomass may increase by about 30,000 mt, but some of this may not be fishable because of rocky substrate. These forecasts are sensitive to the assumed value of M (Figures B8 and B9).

Forecast Table from Production Model, Short-term 1-year projection, (weights in '000 mt): Surfclams (All Sizes)

Region	Assumed M	Annual production of biomass	Direct + indirect[1] annual landings	Current biomass[2] (mt)	Projected biomass[2] (mt)
Mid-Atlantic regions:					
LI	0.05	0.6	0.0	15.9	16.5
	0.10	-0.3			15.6
	0.15	-1.0			14.9
NNJ	0.05	20.1	19.3	407.3	408.1
	0.10	-0.7			387.3
	0.15	-20.6			367.4
SNJ	0.05	1.5	1.6	36.3	36.2
	0.10	-0.3			34.4
	0.15	-2.1			32.6
DMV	0.05	14.8	2.7	281.5	293.6
	0.10	0.4			279.2
	0.15	-13.3			265.5
SVA	0.05	3.9	0.0	6.9	10.8
	0.10	3.4			10.3
	0.15	2.9			9.8
Mid-Atlantic total	0.05	40.9	23.6	747.9	765.2
	0.10	2.5			726.8
	0.15	-34.1			690.2
Other regions:					
GBK	0.05	33.8	0.0	286.6	320.5
	0.10	18.2			304.9
	0.15	3.3			290.0
SNE	0.05	-0.2	0.1	78.3	78.1
	0.10	-4.0			74.3
	0.15	-7.6			70.7
Total stock	0.05	74.5	23.7	1,112.8	1,163.8
	0.10	16.7			1,106.0
	0.15	-38.4			1,050.9

[1]Indirect landings are assumed to be 20% of the reported landings from 1996 [2]Biomass estimates include all sizes, are based on 1-mm size intervals, and assume dredge efficiency = 0.59.

10-Year Supply Model. In SAW-22, a "10-year supply" model was used to project full-recruit population size, catch, and exploitation rate. The model makes assumptions about levels of natural mortality (M), recruitment, and growth. It computes the annual catch that could be taken for 10 years, after which time population size would be zero. This calculation is updated on an annual basis, so population size does not actually equal zero after 10 years.

Results from this model are given for three spatial scales and three levels of M. For all runs and levels of M, catches for 1999, corresponding to the 10-yr supply, are well above those given in SAW-22. The increase is the result of using a revised estimate of initial full-recruit biomass which is much larger than that estimated for SAW-22. Exploitation rates associated with these catches would exceed the current overfishing level (at $F_{20\%}$, U = 16.1%; SAW-22) in the areas being exploited. However, when all areas are included, the exploitation rate would be reduced to approximately 12%, which is below the present overfishing definition.

Forecast Table for 10-yr Supply Policy (all biomass values are for full recruits only; weights in 000's mt)

Run name	Region(s) exploited	Exploited biomass 1997	Unexploited biomass 1997 (%)	Rec. to expl.	Rec. to unexpl.	Assumed M	Exploited biomass 1999	Expl. + unexpl. biomass 1999	Catch 1999	U (%) on expl. 1999	U (%) on total 1999
NNJ	NNJ	375.9	0%	37.1	0	0.05	420.9	420.9	81.6	19.4	19.4
						0.10	381.7	381.7	69.2	18.1	18.1
						0.15	346.2	346.2	59.7	17.3	17.3
Mid-Atlantic	NNJ + DMV	543.7	8%	73.1	6.3	0.05	666.6	728.1	143.7	21.6	19.7
						0.10	605.7	661.6	124.1	20.5	18.7
						0.15	550.4	601.3	109.1	19.8	18.1
All	NNJ + DMV	543.7	39%	73.1	46.7	0.05	666.6	1118.6	143.7	21.6	12.8
						0.10	605.7	1016.8	124.1	20.5	12.2
						0.15	550.4	924.6	109.1	19.8	11.8

Full-recruit biomass estimates assume a dredge efficiency of 0.59. Rec. = recruitment. U = exploitation rate in %. Expl. = exploited part of stock. Total = expl. + unexpl. full recruits. The 1998 catch is assumed to be 19.779 mt, the EEZ quota.

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

Year		1989	1990	1991	1992	1993	1994	1995	1996	1997	Max[4]	Min[4]	Mean[4]
Quota:	EEZ TAC	25.2	24.3	22.0	22.0	22.0	22.0	19.8	19.8	19.8	-	-	-
Landings:	EEZ	22.3	24.0	20.6	22.1	22.0	21.9	19.3	19.8	[1]18.0	33.8	6.4	19.5
	NNJ	16.4	17.0	17.6	18.3	16.3	17.7	15.7	16.1	[1]14.6	[2]19.2	[2]1.3	[2]12.0
	DMV	3.1	3.5	1.6	1.2	3.4	3.4	2.7	2.2	[1]2.0	[2]6.8	[2]0.1	[2]3.1
	Other	2.8	3.5	1.4	2.6	2.3	0.8	0.9	1.5	[1]1.4	[2]11.7	[2]0.7	[2]5.4
	State	8.1	8.5	9.4	11.7	11.6	9.1	9.4	9.0	-	24.1	1.1	7.7
Discards:	NNJ	1.0	1.1	0.5	0.9	[3]0.0	[3]0.0	[3]0.0	[3]0.0	[3]0.0	3.6	0.0	-
	DMV	0.3	0.1	0.0	0.0	[3]0.0	[3]0.0	[3]0.0	[3]0.0	[3]0.0	2.3	0.0	-
Catch used in assessment:													
	NNJ	16.4	17.0	17.6	18.3	16.3	17.7	15.7	16.1	-	-	-	-
	DMV	3.1	3.5	1.6	1.2	3.4	3.4	2.7	2.2	-	-	-	-

[1]Projected. [2]Over period 1978-1996. [3]Assumed because reported discard data incomplete, but low. [4]1965-1996.

Stock Distribution and Identification: The Atlantic surfclam occurs both in state waters and the US EEZ along the Atlantic seaboard from Maine through North Carolina (Figure B3). Surfclams have planktonic larvae which may disperse sufficiently to cause gene flow throughout this geographical range. Variation in shell morphology along the coast has been reported.

Catches: Annual EEZ quotas have been set since 1978, and total landings typically reflect the quotas. Since 1983, 90-100% of the EEZ landings have been taken from the Mid-Atlantic region. During 1986-1997, 74-91% of the Mid-Atlantic landings came from the Northern New Jersey region, 5-16% came from Delmarva, and 0-10% came from Southern New Jersey (Figure B3). Discarding reached substantial levels (e.g., 33% by weight of the total catch in the NJ region) in the early 1980s, declined through the mid- to late-1980s, and has been low since 1991.

Data and Assessment: Surfclams were last assessed in 1994 and 1996 (SAW-19, SAW-22) using a modified DeLury model of the Mid-Atlantic resource based on commercial landings, LPUE, discard information, and research survey data. The present assessment was based primarily on a refined swept-area biomass survey estimate measured in 1997. An experimentally-derived estimate of dredge efficiency was used to estimate total biomass, although the biomass estimates were biased low. Regional Fs (and exploitation rates) were computed and compared to reference point Fs and spatial and temporal trends in LPUE to determine the state of the stock and provide management advice.

Biological Reference Points: A new reference point, F_p, was estimated which corresponds to the fishing mortality rate required to harvest the annual surplus production. The suite of reference points for the Northern New Jersey and Delmarva regions was the same: $F_p = 0.05$, $F_{0.1} = 0.07$, $F_{20\%} = 0.18$, and $F_{max} = 0.21$ (Figures B4 - B7). These reference points assume $M = 0.05$, which should be reconsidered in the next full assessment.

Fishing Mortality: For the Northern New Jersey region, where 74-91% of the catch is typically taken, mean F = 0.04 (Figures B6 and B7). This is based on total regional biomass. If uncertainty in the survey estimate of mean biomass per tow is considered (Figure B6), then the 95% confidence interval for the average F is {0.03 - 0.05}. Taking into account uncertainty in dredge efficiency (Figure B7), the 95% confidence interval for this average F is {0.02 - 0.06}. Other regions, which are largely unfished, had smaller estimated Fs.

Recruitment: Fully-recruited surfclams are defined as ≥ 120 mm shell length and ≥ 5 years old. Recruits are surfclams that will grow to be fully recruited within one year, a group with shell lengths of 105-119 mm. Pre-recruits are <105 mm long. Based on the 1997 survey of the Northern New Jersey region, the approximate percentages of individuals in these three size classes are 83%, 10%, and 7%, respectively (Figure B11). For the Delmarva region, the percentages are 41%, 30%, and 29%, respectively. Although this would seem to imply that there is more recruitment in Delmarva, this may not be the case because, in recent years, growth and condition of surfclams in Delmarva have been limited by intraspecific density (Figures B12 and B13) and perhaps by other environmental factors.

Stock Biomass: Based on the 1997 survey (Figure B1), the minimum swept-area biomass of full recruits (and 95% bootstrap confidence intervals) was 221.7 kmt (167.7 - 276.6) in the Northern New Jersey region, 99.0 kmt (64.2 - 145.8) in the Delmarva region, 84.8 kmt (53.2 - 120.3) on Georges Bank, 45.2 kmt (14.9 - 82.6) in Southern New England, 21.3 kmt (7.0 - 37.2) in Southern New Jersey, 8.6 kmt (0.7 - 17.1) off Long Island, and 2.1 kmt (1.9 - 2.4) off Southern Virginia - North Carolina. These estimates can be converted to total biomass of full recruits by dividing by dredge efficiency, an upper estimate of which is approximately 0.59.

Special Comments: Biomasses estimated in the current assessment are significantly larger than those previously reported. The current estimates are based on swept-area biomass calibrated for dredge efficiency and tow-path length. The information required for these calibrations was based on a joint NMFS-industry research program conducted in 1997. Some additional research on dredge efficiency is required, but will be carried out in 1999.

The estimate of annual net production is sensitive to the assumed value of natural mortality (Figures B8 and B9). If the value used, 0.05, is too low, this would result in an overestimate of net production, but the effect is somewhat compensated by a likely overestimate of survey dredge efficiency.

Sources of Information: Report of the 15th Northeast Regional Stock Assessment Workshop (15th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 93-06; Report of the 19th Northeast Regional Stock Assessment Workshop (19th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 95-09; Report of the 22nd Northeast Regional Stock Assessment Workshop (22nd SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 96-16; Report of the 26th Northeast Regional Stock Assessment Workshop (26th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 98-xx; Serchuk, F.M. and S.A. Murawski. 1980. Assessment and status of surf clam *Spisula solidissima* (Dillwyn) populations in offshore middle Atlantic waters of the United States. NMFS, NEFC Lab. Ref. Doc. 80-33; Weinberg, J.R., and T. Helser. 1996. Growth of the Atlantic surfclam, *Spisula solidissima*, from Georges Bank to the Delmarva Peninsula, USA. Mar. Biol. 126: 663-674; Weinberg, J.R. (in press). Density-dependent growth in the Atlantic Surfclam, *Spisula solidissima*, off the coast of the Delmarva Peninsula, USA. Mar. Biol.

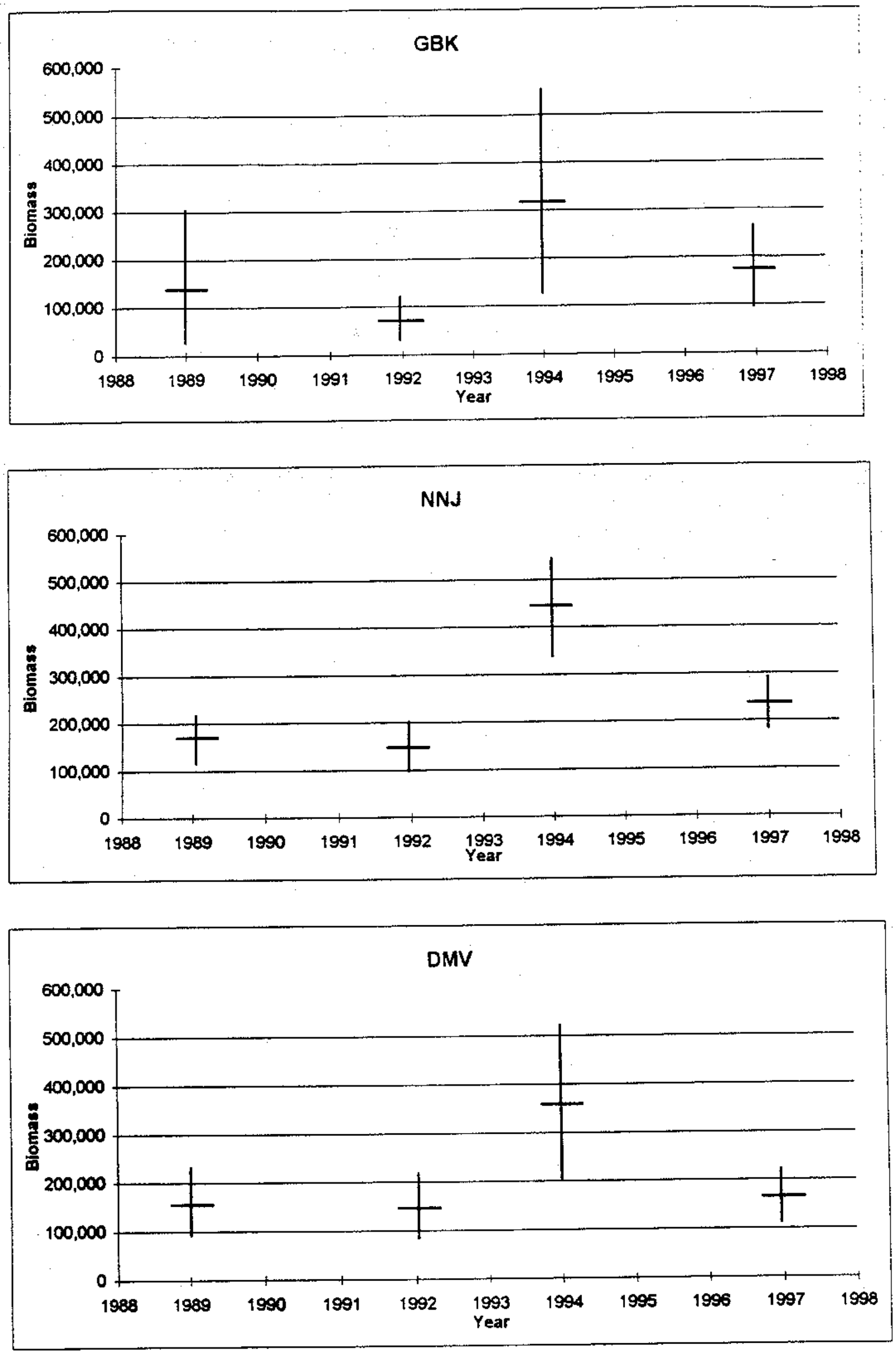


Figure B1. Minimum swept-area biomass estimates (mt) by region from research surveys. Estimates and 95% CIs are from a bootstrap procedure, with 5-mm size intervals, including all size classes. Biomass is not adjusted for dredge efficiency.

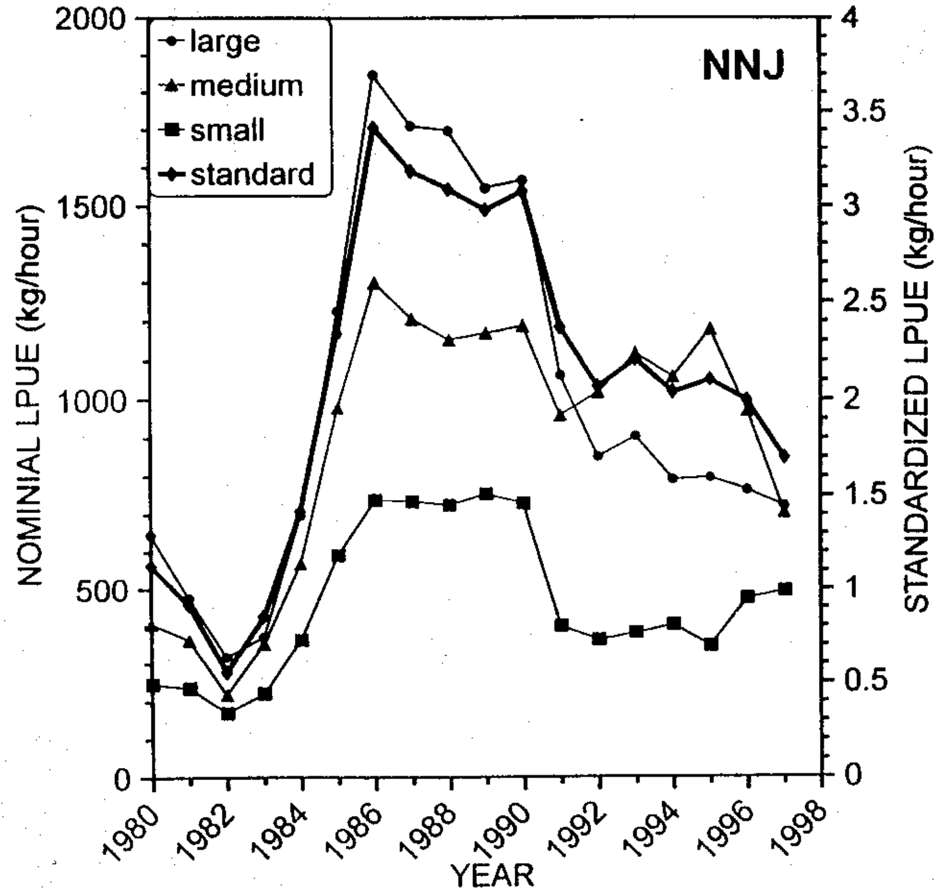


Figure B2. Landings per unit effort for Northern New Jersey by vessel class A General Linear Model was used to derive the "standardized" LPUE.

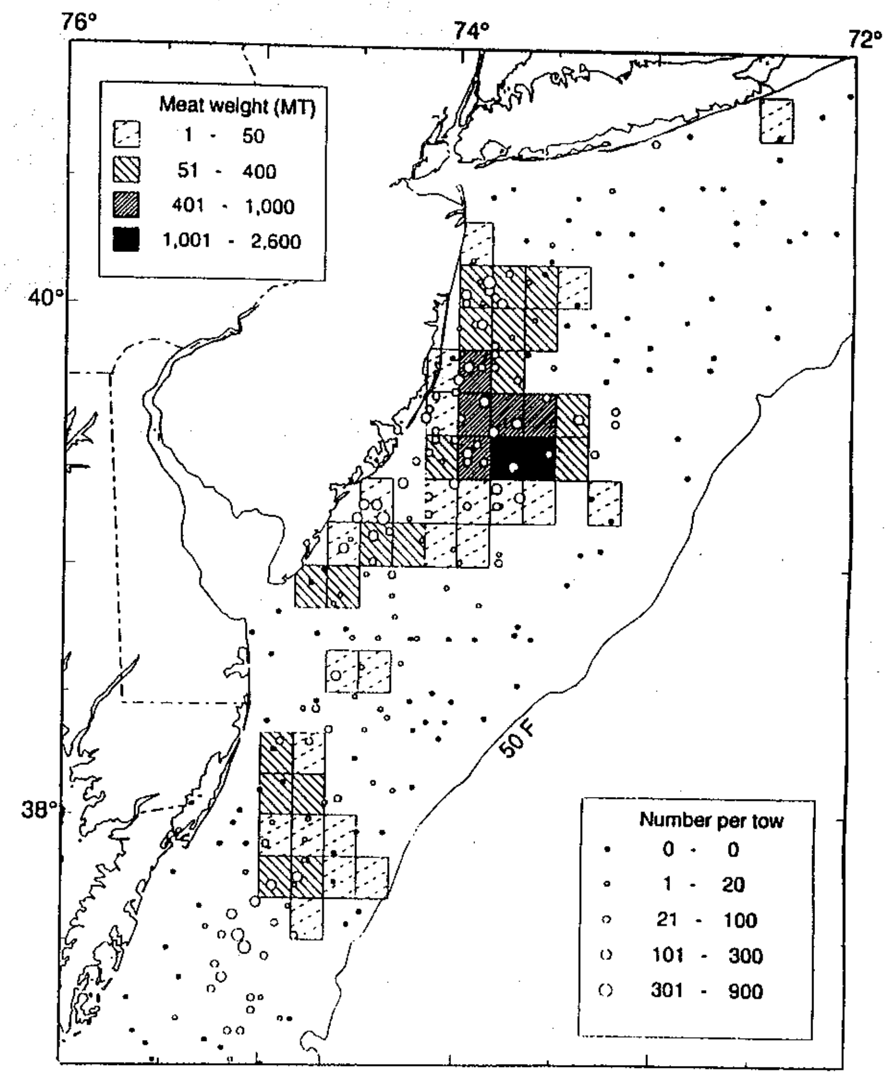


Figure B3. Distribution of 1997 survey surfclam abundance per tow (≥120 mm), adjusted to 0.15 nmi tow distance with sensor data (blade depth = 4 in) and 1997 landings (meat weight in mt).

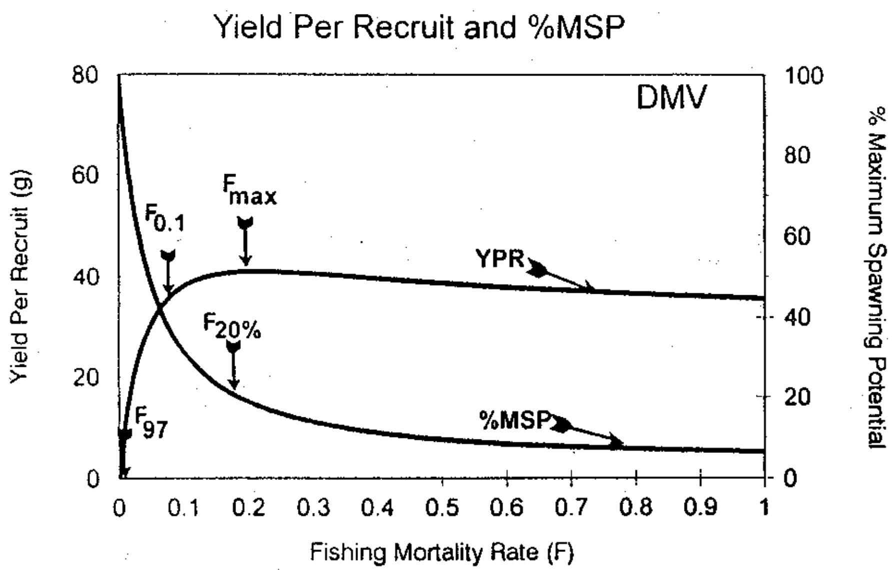


Figure B4.

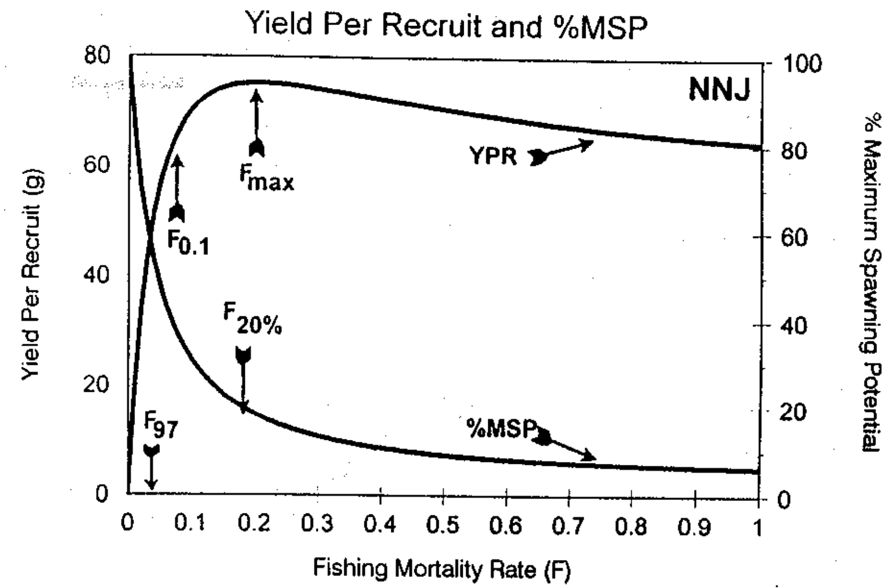


Figure B5.

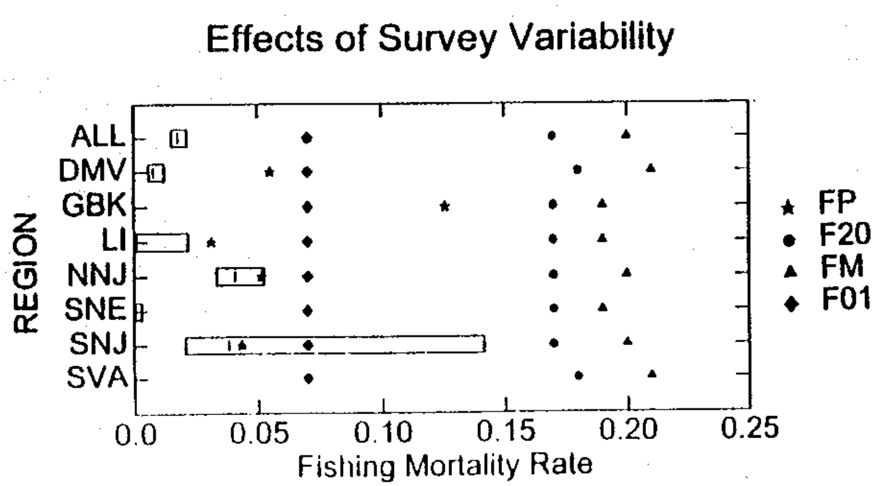


Figure B6. Biological reference points and current fishing mortality rates (vertical lines in boxes) by region.

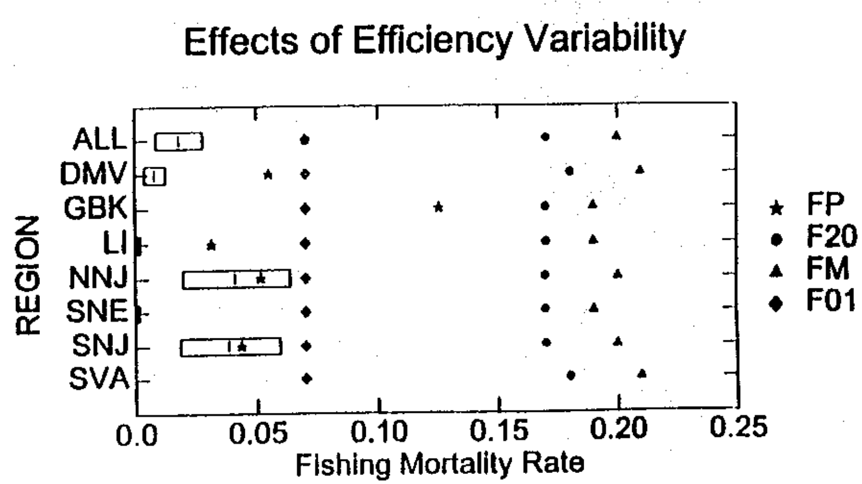


Figure B7. Biological reference points and current fishing mortality rates (vertical lines in boxes) by region.

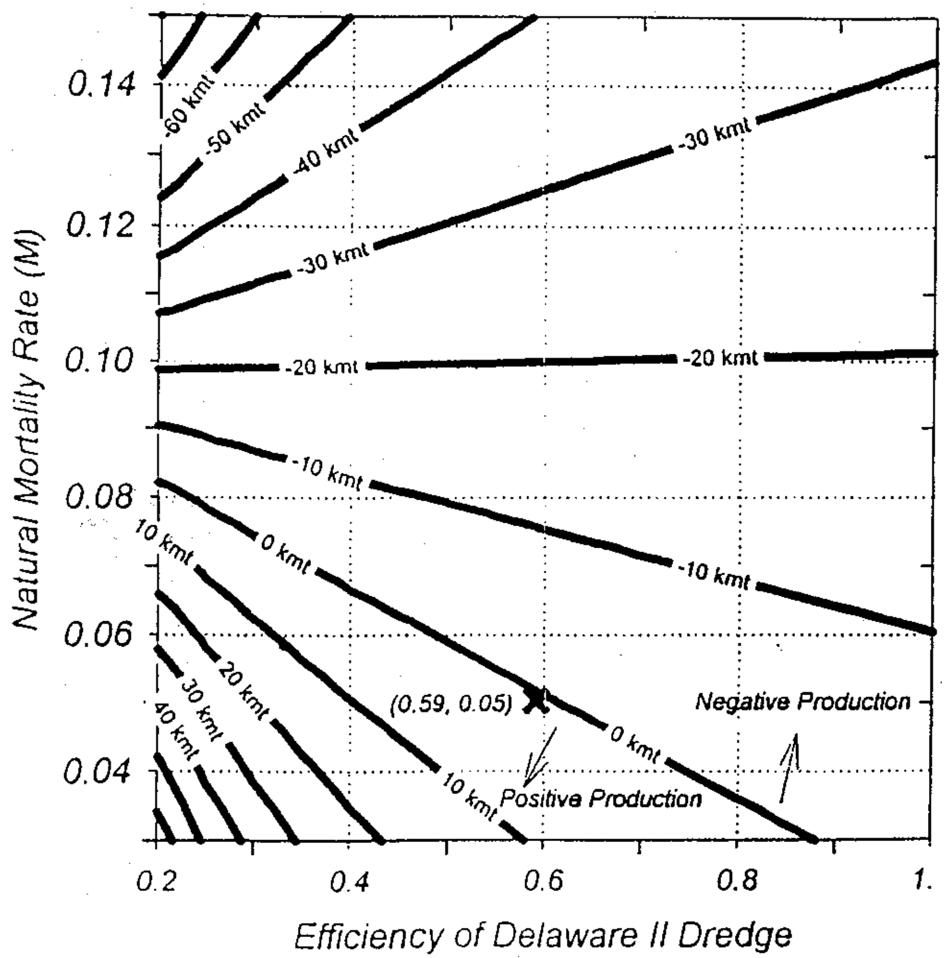


Figure B8. Net biomass production (mt of meats) for Northern New Jersey.

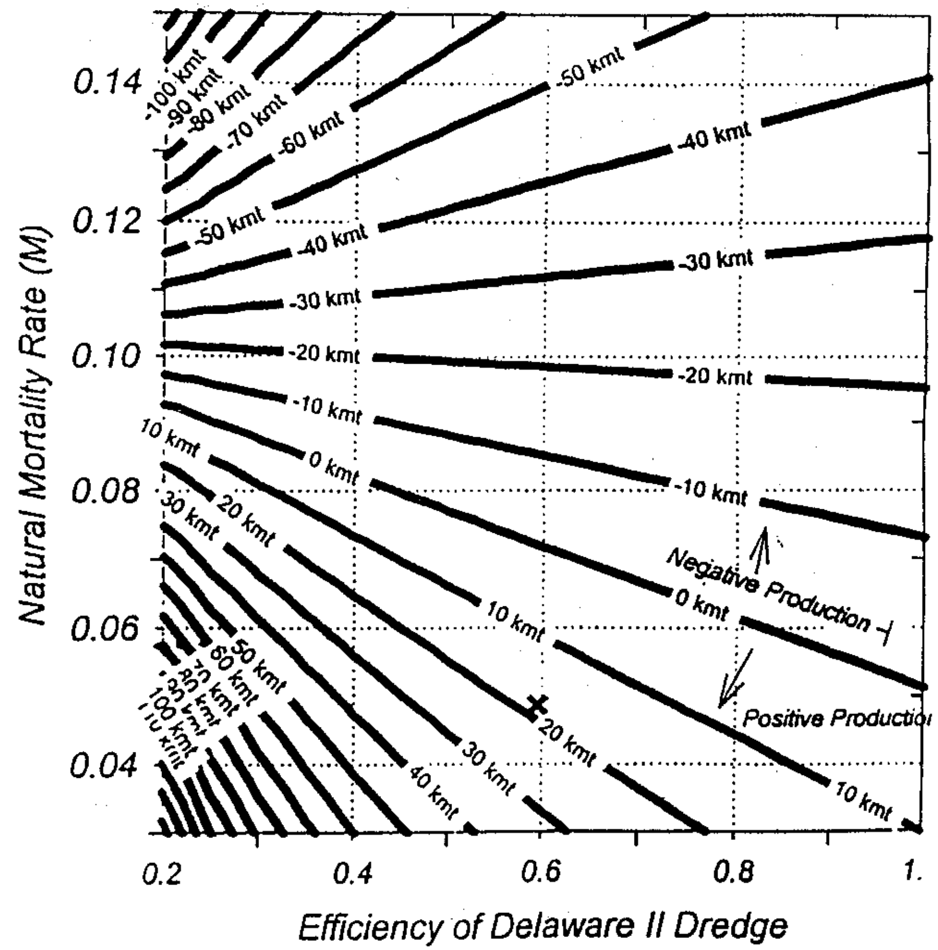


Figure B9. Net biomass production (mt of meats) for the Mid-Atlantic region.

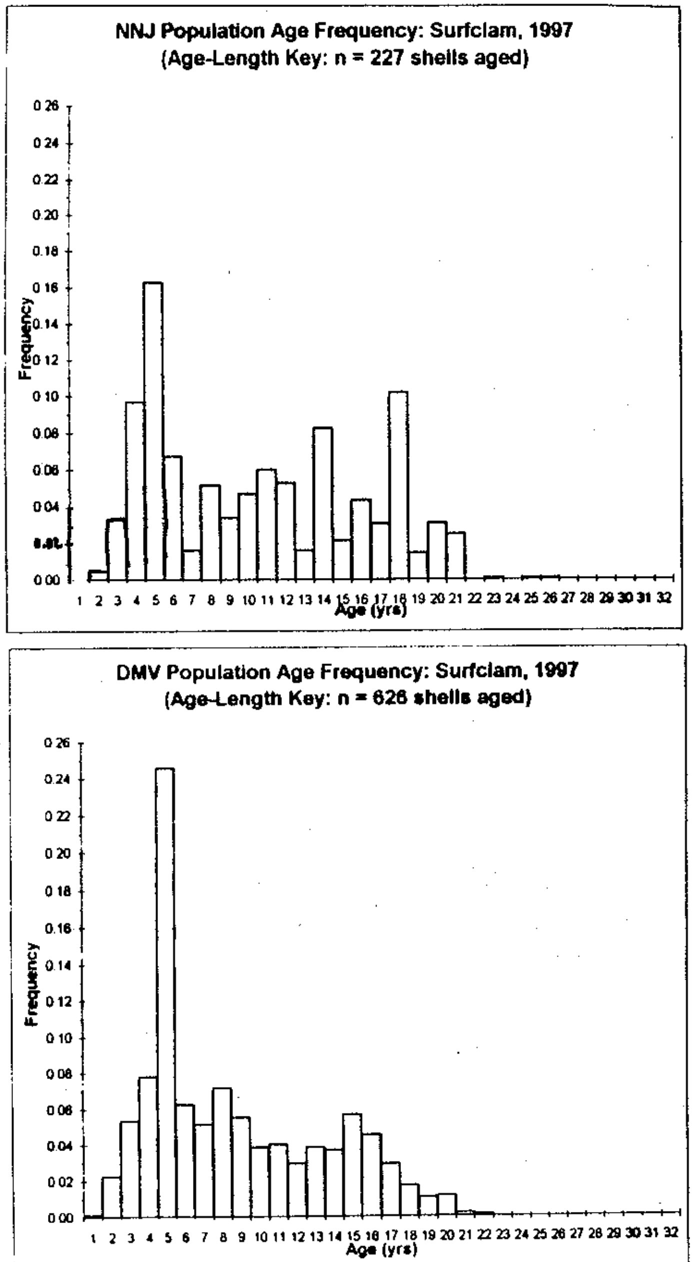


Figure B10. Age frequency distribution in 1997 for surfclams off Northern New Jersey and Delmarva. Age/length keys were applied to the size frequency distribution for each region.

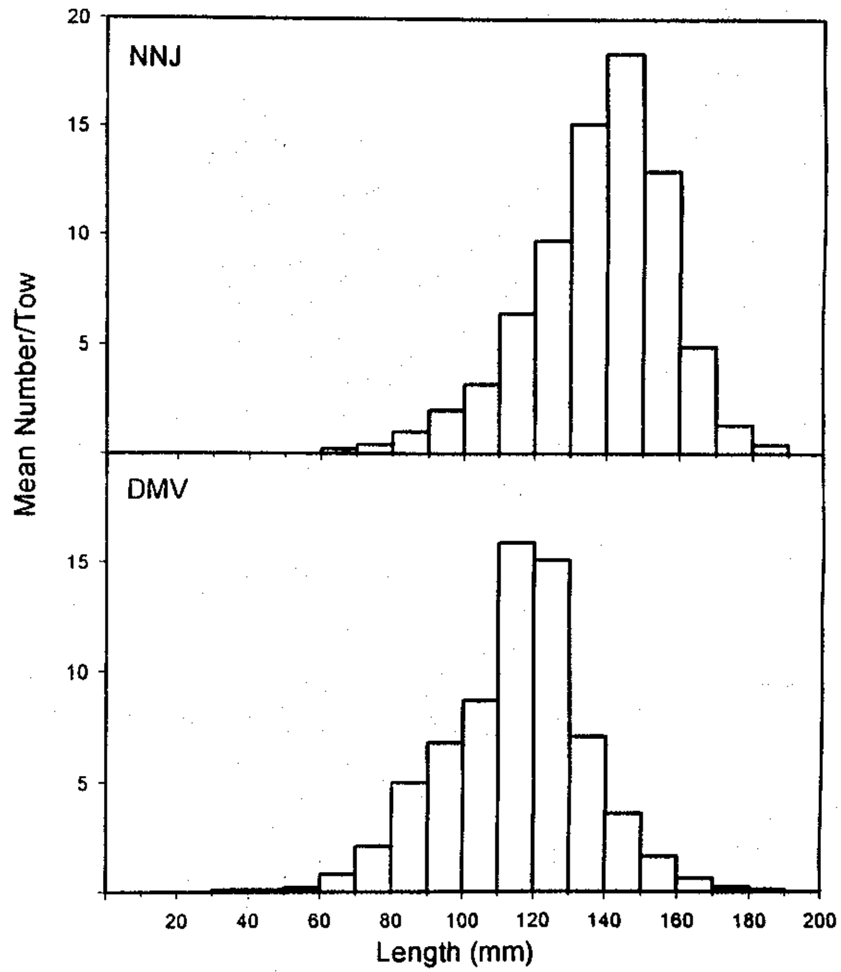


Figure B11. Size frequency distribution of surfclams, by region, based on data from the 1997 survey. Number per tow is standardized to a tow distance of 278 m (0.15 nmi) based on sensor data assuming a minimum blade penetration depth of 10.2 cm (4 in) for fishing. Note that scale varies by region.

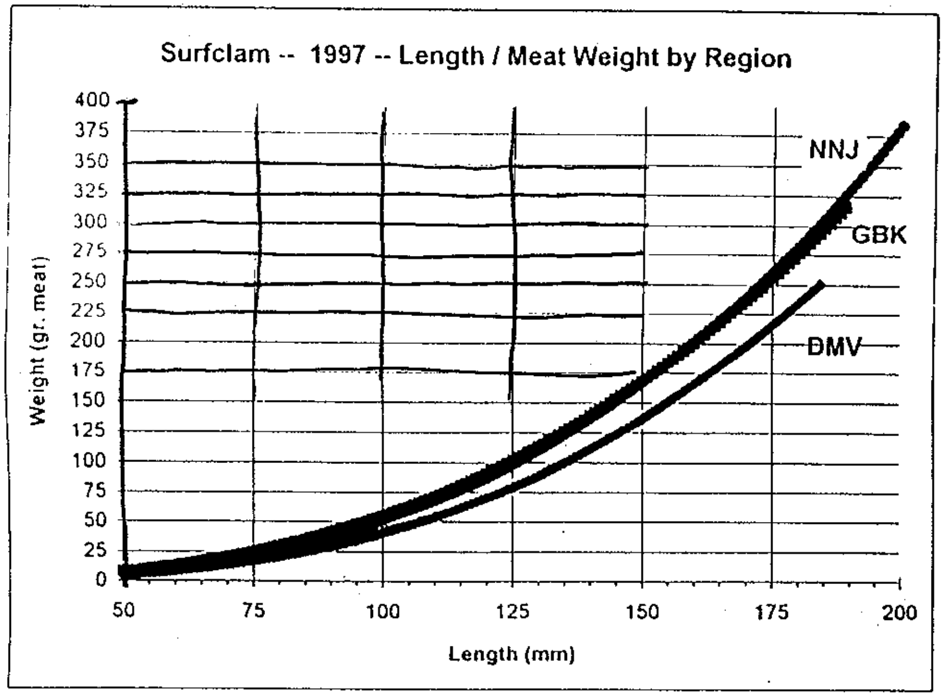


Figure B12. Surfclam shell length and meat weight by region, June-July 1997.

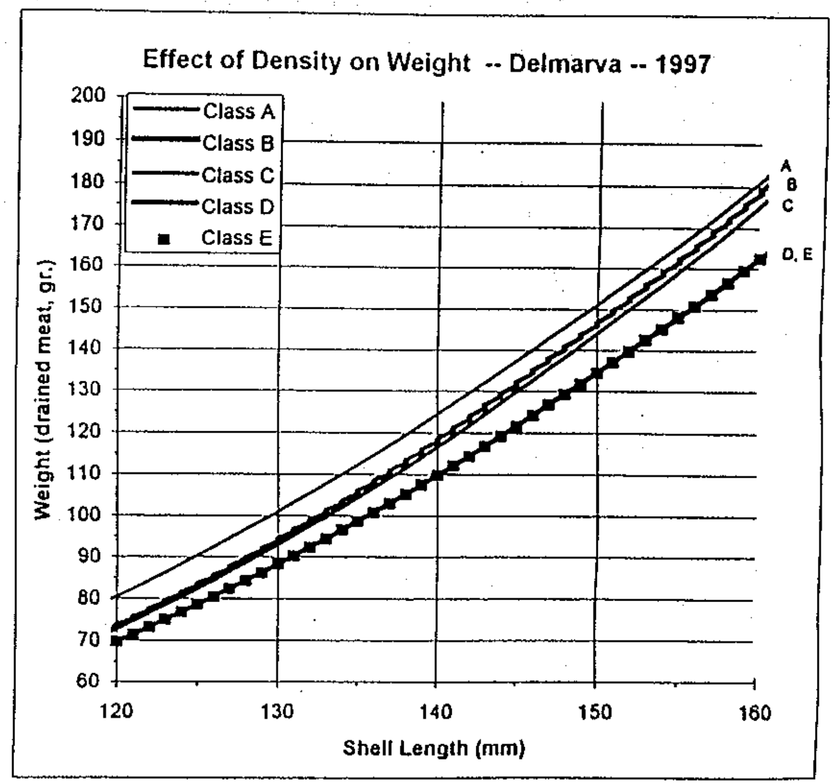


Figure B13. Surfclam shell length and meat weight as a function of surfclam density off Delmarva. Samples collected in 1997. Density classes in #/tow, standardized to 278 m (0.15 nmi), are "A": <10, "B": 10-24.9, "C": 25-49.9, "D": 50-199.9, "E": 200+.

C. STRIPED BASS ADVISORY REPORT

State of Stock: The coastal complex, composed primarily of fish from the Chesapeake, Delaware, and Hudson stocks, is fully exploited and at a high biomass level relative to what has been observed since the 1960s. Estimated fishing mortality rates on striped bass have been at or below F_{target} = 0.31 (25% exploitation) and F_{msy} = 0.38 (29% exploitation) since the reopening of the coast-wide fishery in 1990. Spawning stock biomass has increased steadily since 1983. The age at full recruitment in recent years has dropped from age 10 to age 5. Recruitment of the 1993 and 1996 cohorts in Chesapeake Bay was the highest since 1954. The recreational fishery in 1996 accounted for 73% of the total fishing mortality.

Management Advice: Recent regulations appear to have been appropriate in ensuring that target fishing mortality rates were not exceeded. Recreational hook-and-release mortality is high and accounted for 44% by number of the total recreational removals in 1996. Although this is not a concern in terms of meeting the target fishing mortality rate, alternative regulations or fishing practices to reduce discard losses could be considered. Recreational catch has increased by a factor of 16 since 1989, while stock abundance tripled. The recreational fishery has been managed indirectly by means of bag limits and size limits, with no cap on total removals. Because the increasing stock size is likely to attract additional recreational effort, direct controls on the recreational fishery may be necessary.

Forecast for 1998-1999: Forecasts of stock status during 1998-1999 were made for the target fishing mortality F_{target} = 0.31 (Figure C3). A stochastic forecast model estimated that landings will remain at approximately the *status quo* level through 1999. Spawning stock biomass may decrease slightly by 1998, but will increase as the strong 1993 and 1996 cohorts reach full maturity.

Forecast Table: Basis: starting stock sizes on 1 January 1997 as estimated by VPA bootstrap procedure, recruitment at age 1 in 1998-1999 selected at random from time series of recruitment equivalents determined from Maryland juvenile indices (1955-1977, 1989-1996), partial recruitment pattern for 1994-1996, proportion discarded and mean weights at age are weighted (by fishery) average values from 1994-1996, F = 0.31 (ages 4-13) in 1997-1999 (weights in '000 mt).

Year	Landings	Discards[1]	SSB
1997	7.7	3.2	13.0
1998	8.1	3.5	13.3
1999	8.4	3.8	15.0

[1]Discard losses.

Catch and Status Table (weights in '000 mt, recruitment in millions, arithmetic means): Striped Bass

Year	1989	1990	1991	1992	1993	1994	1995	1996	Max[3]	Min[3]	Mean[3]
Commercial landings	0.1	0.3	0.5	0.6	0.8	0.8	1.6	2.2	2.2	0.1	0.7
Commercial discards	0.9	1.4	0.9	0.5	0.8	0.9	1.1	0.8	1.4	<0.1	0.6
Recreational landings	0.3	1.0	1.7	1.8	2.6	3.1	5.1	6.6	6.6	0.3	1.8
Recreational discards[1]	0.2	0.3	0.6	0.6	0.8	1.5	1.7	1.5	1.7	<0.1	0.5
Spawning stock biomass[2]	4.4	5.6	6.9	7.5	8.8	10.0	11.3	13.1	13.1	1.9	5.7
Recruitment (age 1)	7.3	5.3	5.2	6.6	15.6	5.5	5.9	15.1	15.6	2.4	6.0
F (ages 4-13)	0.09	0.16	0.19	0.16	0.25	0.23	0.26	0.30	0.30	0.07	0.17
Exploitation rate	8%	14%	16%	14%	21%	19%	21%	24%	24%	6%	15%

[1]Assuming 8% mortality. [2]Female SSB only. [3]1982-1996.

Stock Distribution and Identification: Stock identification studies have indicated four primary stocks: Hudson River, Delaware Bay, Chesapeake Bay, and Roanoke River. Stock-specific catch data were not available for the coastal fishery, so the assessment was for the combined Hudson, Delaware, and Chesapeake stocks, which are exploited collectively in a coastal fishery.

Catches: Commercial landings peaked at 5,888 mt in 1973, but then fell steadily to only 63 mt in 1987. The decreasing commercial landings were due to a decrease in striped bass abundance and additional regulatory restrictions. The fishery was reopened coast-wide in 1990, and landings have since increased to 2,178 mt in 1996. Recreational landings were 1,217 mt in 1982, but steadily decreased to 332 mt through 1989. As with commercial landings, the decrease was due to a decline in striped bass abundance and stricter regulations. Since 1990, recreational landings have risen steadily to 6,620 mt in 1996. Commercial discard mortalities, estimated from tag return data, have ranged between 48 mt and 1,357 mt since 1982. Discards averaged 793 mt since 1989 due to quota restrictions on landings. Recreational discards during 1982-1996 have ranged from 15 to 1,660 mt annually. Recreational discards since 1994 were the highest in the time series and averaged 1,565 mt annually. Total catch has increased steadily since 1990 and reached a maximum in 1996 of 11,146 mt (Figure C1).

Data and Assessment: The ADAPT version of VPA was used to produce estimates of fishing mortality and stock size, assuming M = 0.15. Tagging estimates of fishing mortality are consistent with the VPA results. The uncertainty associated with the estimates of fishing mortality and spawning stock biomass in 1996 was evaluated with respect to variability in fishery-dependent and fishery-independent indices (Figure C5 and C6).

Biological Reference Points: Biological reference points for striped bass (Figure C4) are F_{msy} = 0.38 (29% exploitation) and a target value (F_{target} = 0.31 or 25% exploitation) which is 18% less than F_{msy}. The estimate of F_{msy} was revised in the present assessment as a consequence of changing the value for natural mortality from 0.20 to 0.15.

Fishing Mortality: Fishing mortality (F) has been at or below the target level for the past ten years (Figure C1). There is an 80% probability that the F in 1996, estimated to be 0.30 (24% exploitation), was between 0.27 and 0.34 (Figure C6).

Recruitment: The VPA estimate of recruitment in 1996 (15.1 million fish at age 1) was among the highest values for the time series (Figure C2).

Spawning Stock Biomass: Female SSB has increased steadily since 1983 (1,900 mt) and was estimated at 13,100 mt in 1996 (Figure C2). There is an 80% probability that the 1996 estimate was between 11,800 and 14,300 mt (Figure C5). SSB is expected to continue to climb with increasing contributions from the 1993 and 1996 cohorts.

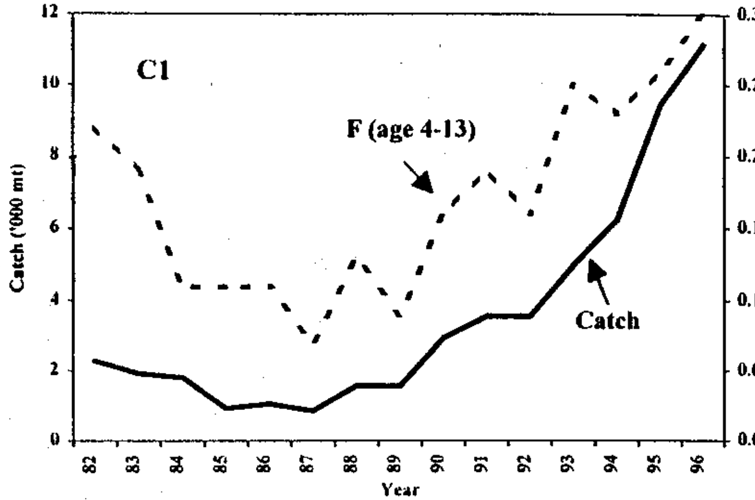
Special Comments: The SSB model, based on a single index of abundance, provided useful information about striped bass in Chesapeake Bay. However, methods that make use of all available information are more useful for assessing stock status coast-wide. In the future, stock assessment approaches, like the VPA, and stochastic projection techniques should be used.

The current VPA provides aggregate estimates of coast-wide fishing mortality and abundance, but not for individual stocks. It will continue to be important to monitor trends in recruitment and age composition of the spawning stock for striped bass stocks in Chesapeake Bay, Delaware Bay, and the Hudson River to ensure that individual stocks are not overfished.

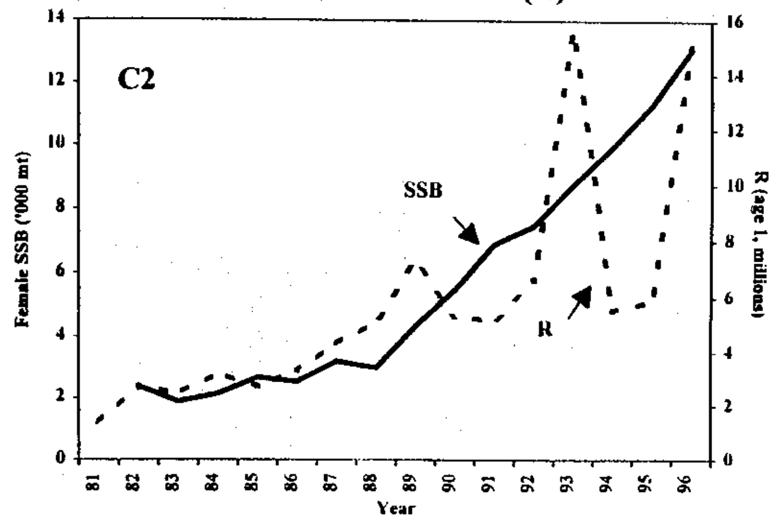
Sources of Information: Report of the 26th Northeast Regional Stock Assessment Workshop (26th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 98-xx; Stock assessment of Atlantic striped bass (*Morone saxatilis*), 1998 Report of the ASMFC Striped Bass Technical Committee, ASMFC Sci. Rept. xx.

Striped Bass

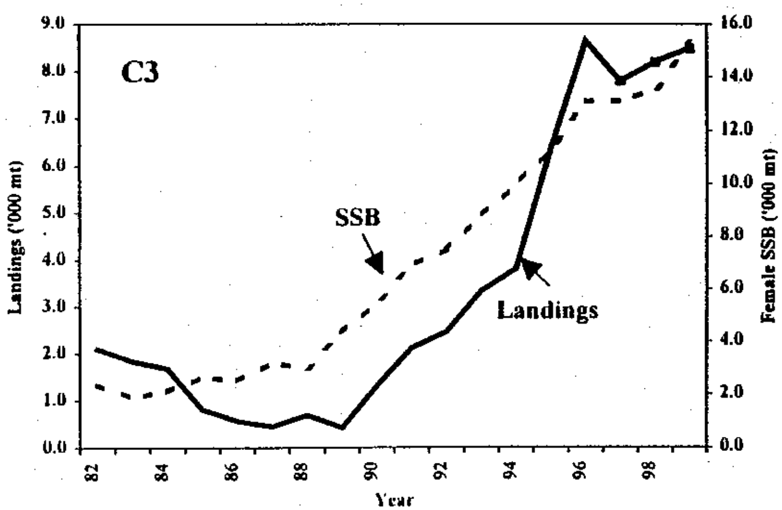
Total Catch and Fishing Mortality



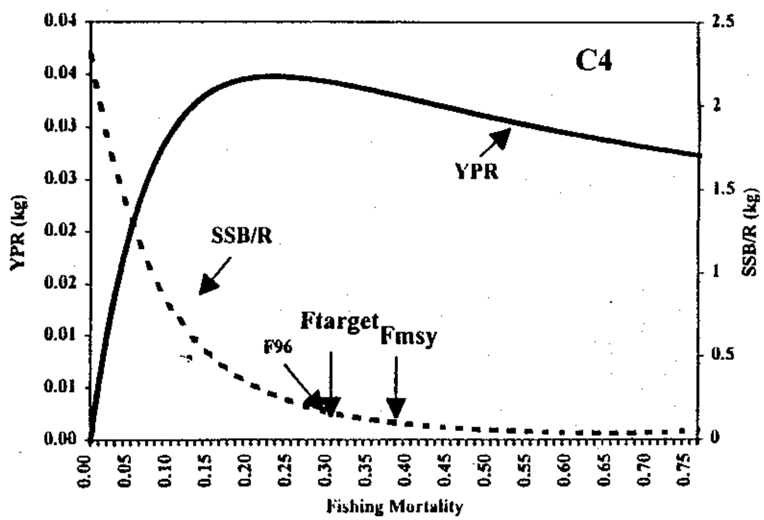
SSB and Recruitment (R)



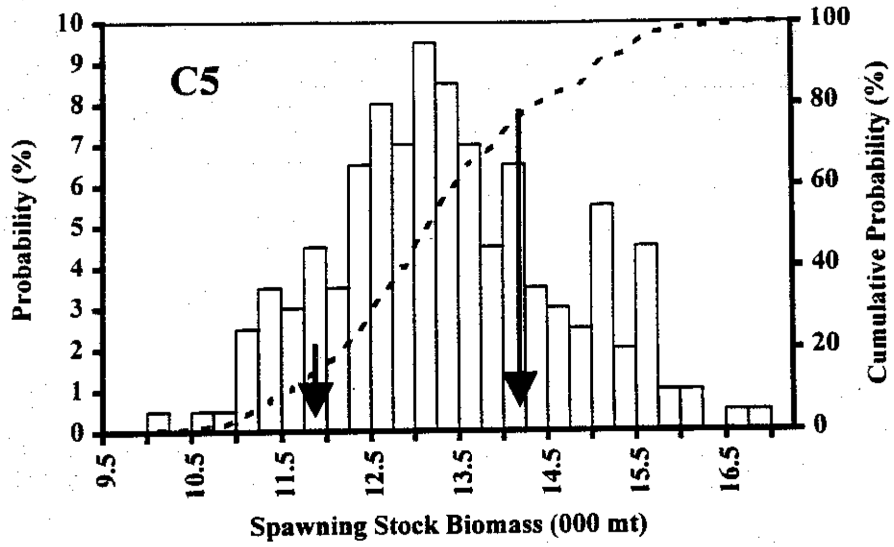
Forecast Landings and SSB

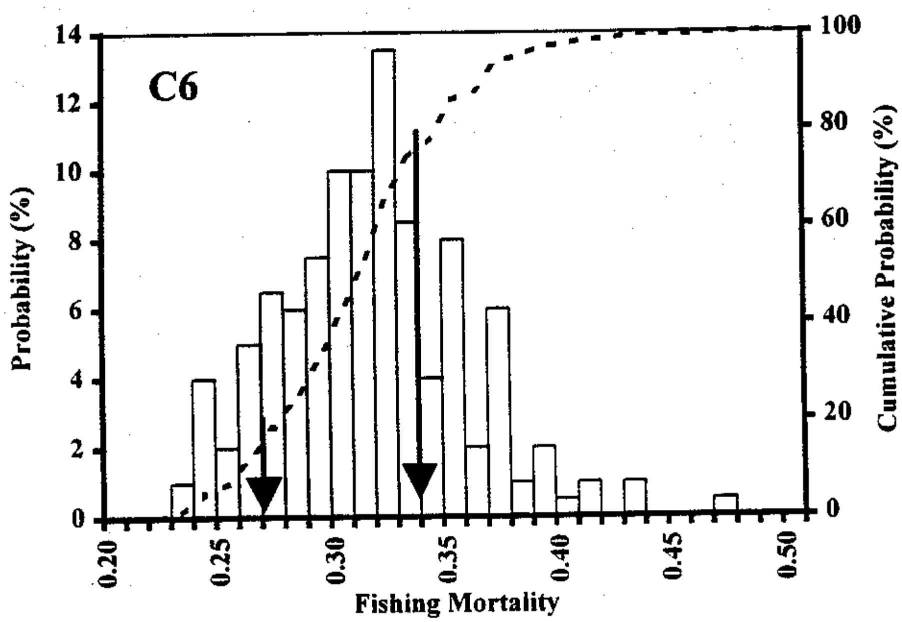


Yield and SSB per Recruit



Striped Bass
Precision of 1996 Estimates of SSB and F





D. SPINY DOGFISH ADVISORY REPORT

State of Stock: Total biomass has been stable at a high level, about two to three times the levels observed in the late 1970s. However, the stock is over-exploited. The reproductive biomass peaked in 1989 and has since declined by over 50%. Minimal estimates of the 1997 mature biomass ≥80 cm and the total biomass were about 135,000 mt and 575,000 mt, respectively. Owing to strong recruitment in the mid 1980s, the biomass of 36-79 cm dogfish has steadily increased to about 435,000 mt in 1997. Recent recruitment (<36 cm fish) has been low, with 1997 being the lowest observed. Total landings increased over six-fold since 1987 to about 28,000 mt in 1996. Data for 1993 indicate at least 14,000 mt of dead discards in the commercial fishery, or 64% of the total reported landings. Fishing mortality (F) on the fishable biomass averaged 0.25 during 1994-1996 and increased 6-fold since the mid-1980s. Prior to 1995, the fishery concentrated primarily on females ≥80 cm. In 1996, males comprised 25% of the landings by weight because of the declining abundance of females. Median length in the commercial landings has declined from 95 cm in the early 1980s to 84 cm in 1996, and an increasing fraction of the landed fish are below 80 cm, the length at first reproduction for females. The median weight of landed females has dropped by almost 1.5 kg since 1990. Mean length and abundance of mature females declined in the NMFS and Massachusetts spring and fall surveys in recent years.

Thus, the assessment indicates that reproductive biomass and recruitment have declined due to high fishing mortality on mature females. Harvest rates have exceeded the replacement level for the stock, and recruitment has declined. Abundance of intermediate sizes is high due to strong recruitment in the mid-1980s, and females from this group will grow beyond 80 cm over the next several years.

Management Advice: In order to establish a long-term sustainable fishery, F should be reduced to a threshold level of about 0.13. This rate of fishing mortality, which is about half the recent average, is the level associated with both maximum yield per recruit (Figure D5) and a female pup per female recruit value of 1 (Figure D6) at a length of entry to the fishery of about 70 cm, and can be viewed as a candidate overfishing reference point. Given the evidence for a single unit stock in the Northwest Atlantic, coordinated assessment and management of this stock with Canada should be considered.

Forecast for 1998: No analytical forecasts were performed. Biomass of males and immature females in the 36-70 cm range should decrease over the next decade, resulting in declining reproductive and harvestable biomass. Subsequent declines in recruitment and total stock biomass could occur if reproductive biomass declines as expected under current harvest levels. Slow growth rates, low fertility, and late maturation mean that rebuilding of the reproductive stock (i.e., accumulation of large females in the 80+ cm range) could take decades.

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

Year	1990	1991	1992	1993	1994	1995	1996	1997	[1]Max	[1]Min	[1]Mean
USA commercial landings	14.7	13.2	16.9	20.6	18.8	22.7	27.2	-	27.2	<0.1	6.4
Foreign commercial landings	1.7	0.5	0.9	1.4	1.8	1.0	0.4	-	24.5	0.3	5.6
USA commercial discards[2]	NA	NA	NA	13.5	NA	NA	NA	-	NA	NA	NA
USA recreational catch[3]	1.3	1.5	1.2	1.2	1.1	0.7	0.4	-	1.8	0.4	1.1
Total landings	17.8	15.2	19.0	23.3	21.7	24.4	28.1	-	28.1	1.5	12.6
Spring survey index[4]	94.8	94.8	94.7	94.4	93.9	93.2	92.3	91.3	94.8	23.3	61.0
Total stock biomass[5]	581.5	584.6	586.9	587.9	587.3	585.0	581.7	577.7	587.9	135.2	368.4
Fishable stock biomass[6]	288.0	268.5	248.6	228.1	206.7	184.3	161.0	137.1	294.8	56.0	179.3
Recruitment index[7]	3.8	4.5	3.7	3.1	15.8	1.2	5.3	0.3	19.8	0.7	5.6

[1]1968-1996. [2]Assuming discard mortality rate of 75% in gillnet catches and 50% in otter trawl catches. [3]Includes all landed and released recreational catch. [4]LOWESS smoothed NEFSC spring survey mean weight (kg) per tow. [5]LOWESS smoothed minimum swept-area biomass estimate. [6]LOWESS smoothed minimum swept-area biomass estimate of individuals ≥80 cm. [7]NEFSC spring survey mean number per tow of individuals ≤35cm.

Species Distribution and Stock Identification: Spiny dogfish are distributed in the Northwest Atlantic between Labrador and Florida, are most abundant between Nova Scotia and Cape Hatteras, and are considered to be a unit stock in NAFO Subareas 2-6. Seasonal migrations occur northward in spring/summer and southward in autumn/winter. Analysis of spatial and temporal abundance patterns from NEFSC spring and autumn and Canadian summer research vessel survey catches suggests that the spring survey provides a valid abundance measure for the entire stock.

Catches: US commercial landings of dogfish were only several hundred mt per year at most until the late 1970s when they increased to average about 4,500 mt per year during 1979-1989. Landings climbed sharply to 14,700 mt in 1990 and to 27,200 mt in 1996. Substantial foreign landings of dogfish occurred during 1966-1977, averaging 13,000 mt per year and peaking at about 24,000 mt in 1972 and 1974, but, since 1978, have averaged only about 700 mt annually. US recreational catches increased from about 350 mt per year in 1979-1980 to about 1,700 mt in 1989, averaged about 1,300 mt during 1990-1994, and declined sharply to an estimated 386 mt in 1996. Total landings climbed rapidly from the late 1960s to a peak of about 25,600 mt in 1974, were fairly stable at about 6,200 mt per year during 1977-1989, but then increased to an historic high of about 28,000 mt in 1996 (Figure D1). Quantitative estimates of discard mortality are only available for 1993 (13,500 mt); limited data suggest discards may have been at least of the same magnitude as reported landings in earlier years. Sea sampling data for 1994-1996 have not yet been analyzed.

Data and Assessment: Spiny dogfish were last assessed in June 1994 (SAW-18). The current assessment updates the findings of SAW-18 and incoporates new estimates of fishing mortality and biological reference points. Age compositions of the landings and estimates of discarded catch (a major source of fishing mortality) are lacking. Indices of abundance were derived from research vessel survey catch per tow. Additional sampling, analysis, and research are required to reduce the uncertainty in the population biology, landings, and discard data of the present assessment. Natural mortality (M) was estimated to be 0.092 based on an assumed longevity of 50 years. Estimates of total and fishable biomass were derived from a survey swept-area method. Fishing mortality was estimated by a change-in-ratio method applied to survey abundance indices and by the Beverton-Holt model based on the length frequency distribution of commercial landings and NEFSC spring trawl survey. A size- and sex-structured equilibrium model incorporating known life history parameters was used to estimate yield per recruit and female pups per female recruit corresponding to varying levels of F and minimum size at entry to the fishery..

Biological Reference Points: Maximum yield per recruit (~1.2 kg) occurs at an F of about 0.25 and a minimum size of 70 cm (Figure D5). Fishing mortality rates in excess of 0.13 on female dogfish ≥70 cm result in negative female pup replacement (Figure D6). At an 84-cm minimum size, the maximum F that would ensure replacement recruitment is about 0.25. The maximum yield per recruit (~1.14 kg) that is consistent with replacement of the spawning stock occurs with an length at entry of about 70 cm and a fishing mortality of about 0.13.

Fishing Mortality: Based on the Beverton-Holt model, estimates of F on the total stock varied between 0.02 and 0.1 between 1982 and 1989 and averaged 0.25 during 1994-1996 (Figure D1). The length at entry to the fishery, estimated as the 25th percentile of length in landings, decreased from 93 cm in 1982 to 80 cm in 1996. If the average size of landed dogfish in 1997 is similar to that observed in 1996, fishing mortality is projected to be 0.41.

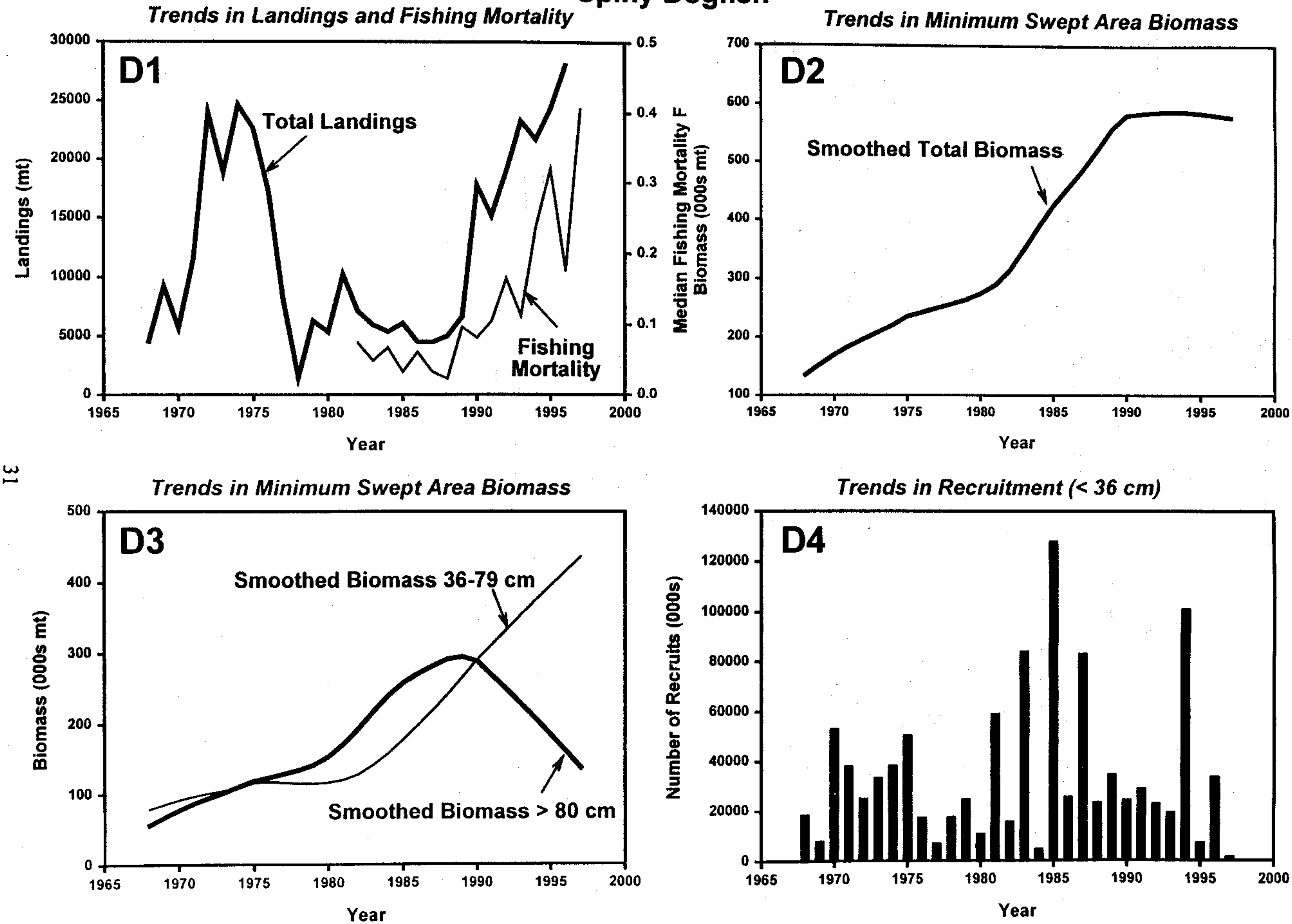
Recruitment: Recruitment, defined as individuals ≤35 cm in NEFSC spring survey catches, was fairly constant during 1968-1991 (Figure D4) except for high values in 1981, 1983, 1985, 1987, and 1994. Recruitment declined after 1991, and the 1997 value was the lowest on record.

Stock Biomass: Research vessel survey data document a steady increase in both abundance and biomass since the early 1970s, but minimum swept-area total biomass indices during 1990-1997 have been stable at about 585,000 mt (Figure D2). Swept-area estimates of the fishable (mainly mature female) biomass (defined as fish ≥80 cm) increased six-fold from about 55,000 mt in 1968 to 295,000 mt in 1989 and have since declined to about 135,000 mt in 1997, a level comparable to that in the 1970s (Figure D3). Swept-area biomass estimates of 36-79 cm dogfish averaged about 100,000 mt during 1968-1980, but steadily increased to about 435,000 mt in 1997 (Figure D3)..

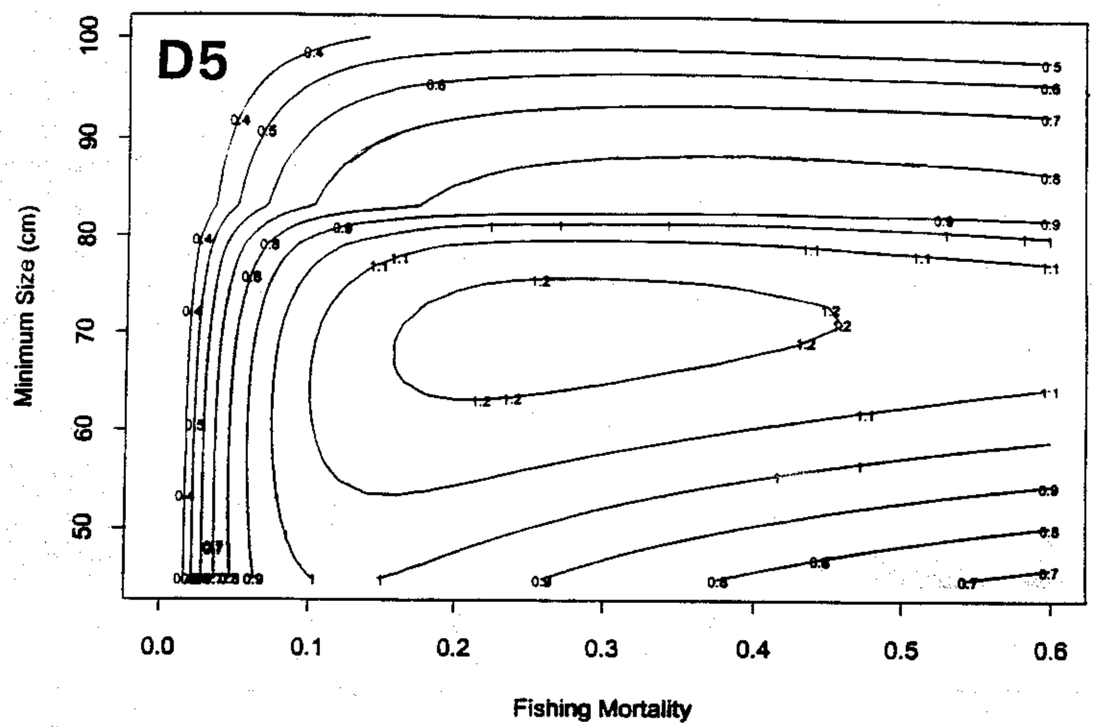
Special Comments: Commercially-exploited species, including cod, haddock, and yellowtail flounder, appear to be negligible components of the diet of spiny dogfish, based on their incidence in dogfish stomachs collected by the NEFSC (Figure D7). There appears to be little justification to reduce the biomass of dogfish solely on the basis of predatory interactions with other species.

Source of Information: Report of the 18th Northeast Regional Stock Assessment Workshop (18th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 94-22; Rago, P.J., K. Sosebee, J. Brodziak, S.M. Murawski, and E.D. Anderson. 1994. Distribution and dynamics of Northwest Atlantic spiny dogfish (*Squalus acanthias*). NEFSC Ref. Doc. 94-19; Report of the 26th Northeast Regional Stock Assessment Workshop (26th SAW), Stock Assessment Review Committee (SARC) Consensus Summary of Assessments, NEFSC Ref. Doc. 98-xx.

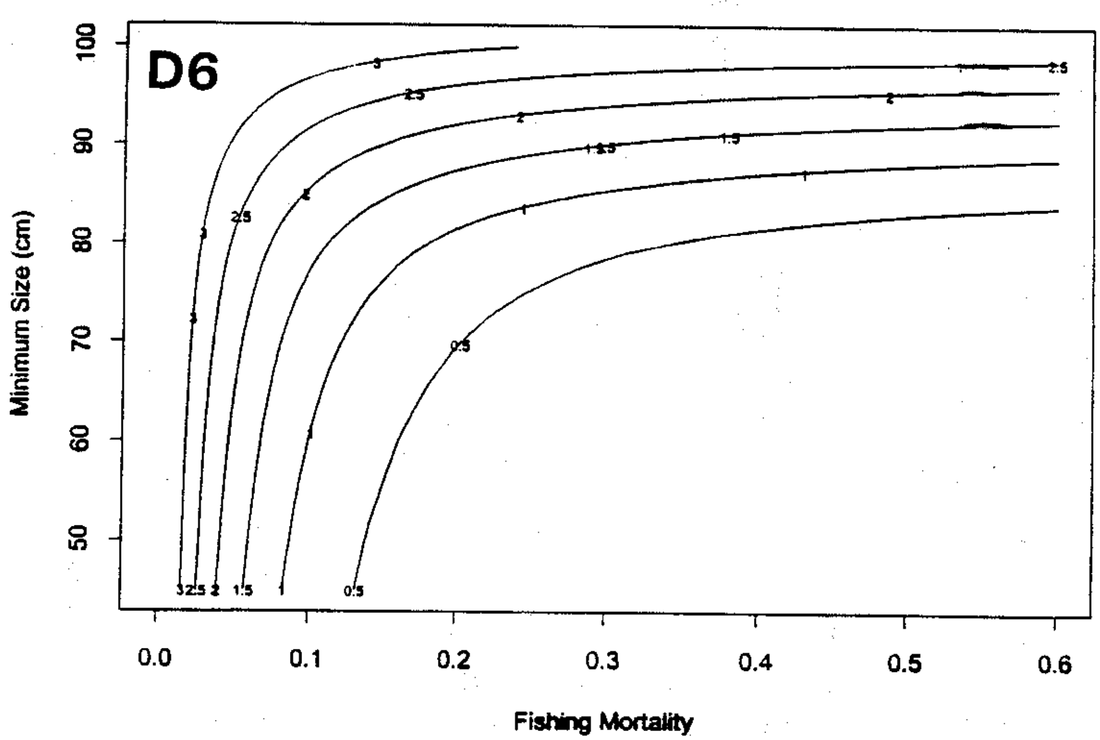
Spiny Dogfish



Yield per Recruit(kg)



Pups per Recruit



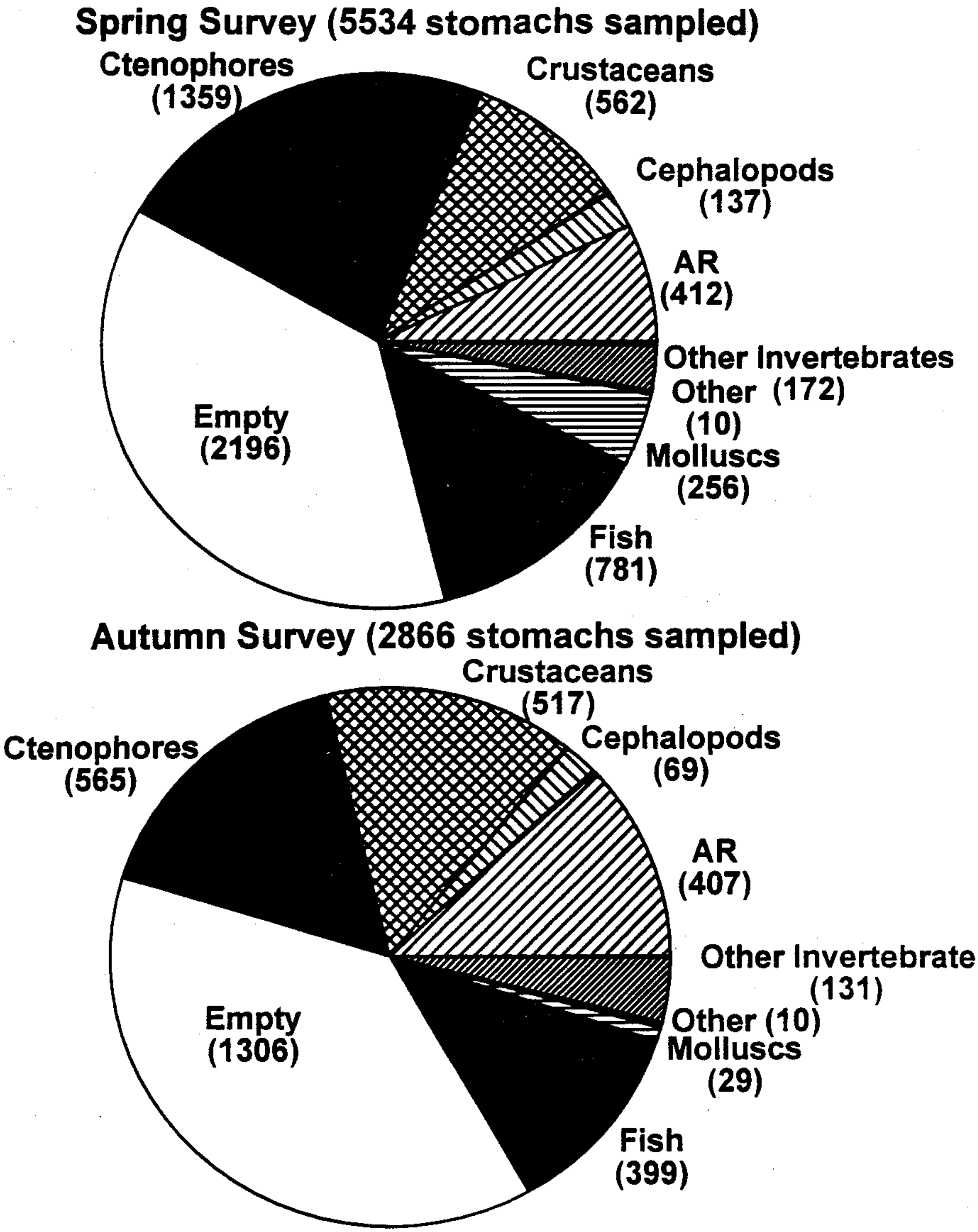


Figure D6. Stomach contents by frequency of occurrence of spiny dogfish collected during NEFSC spring and autumn bottom trawl surveys, 1993-1997.

CONCLUSIONS OF THE SAW STEERING COMMITTEE

CONCLUSIONS OF THE SAW STEERING COMMITTEE

The SAW Steering Committee held one meeting during the SAW-26 cycle: a teleconference on February 17, 1998. The discussion and conclusions from that meeting are summarized below.

Teleconference of February 17, 1998

The SAW Steering Committee met by teleconference on February 17, 1998. Participants were: J. Dunnigan, ASMFC; P. Howard, NEFMC; D. Keifer, C. Moore, MAFMC; A. Rosenberg, NMFS/NER; M. Sissenwine, J. Boreman, E. Anderson (SAW Chairman), and H. Mustafa (SAW Coordinator), NMFS/NEFSC.

The agenda items for the meeting included 1) a recap of SAW-26 meetings and reports; 2) status of joint US/Canada assessment meetings in 1998; 3) agenda, terms of reference, meeting schedules, and documentation for SAW-27; 4) tentative agenda and meeting dates for SAW-28; 5) Future SAW policy on reviewing assessments and producing advice, including recommendations from the NRC review of Northeast groundfish, handling assessment updates, MARFIN status and implications to SAW, and re-assessment of bluefish; 6) FACA implications for the SARC; and 7) other business.

Recap of SAW-26

In addition to sessions of the SAW Public Review Workshop held at NEFMC and MAFMC meetings, a presentation was also made to ASMFC. All three presentations went well and the documentation and advice were well received. Final reports would be finalized as soon as possible.

Joint US/Canada Assessment Meetings in 1998

Plans for joint US and Canadian assessment and peer review of transboundary groundfish stocks were well underway. This new joint effort, however, was viewed as "experimental" in that future meeting and documentation procedures and arrangements would, in part, be based on the experience of the first round of meetings in 1998. Three species (five stocks) would be jointly assessed and peer reviewed in the 1998 meetings: Georges Bank cod (US and Canadian stock units), Georges Bank haddock (US and Canadian stock units), and Georges Bank yellowtail flounder.

The Transboundary Assessment Working Group (TWAG) would meet in Woods Hole March 31 - April 3 under the chairmanship of Ralph Mayo (NEFSC), who would be extending invitations to US participants to this meeting, including state scientists.

The Transboundary Resources Assessment Committee (TRAC) would meet April 20-24 in St. Andrews, NB to peer review the TAWG assessment results. Management advice would be developed later and separately by each country. It was expected that the TRAC membership would include seven or eight US participants and the same number of Canadian participants. US participation would include four or five people from the NEFSC, one from the NEFMC staff, one state scientist, one from academia, and one from another NMFS Science Center or the NER (which would be Dr. John Witzig, new Chief of the NE Fishery Statistics Office). In discussion, it was noted that, because of busy schedules of assessment experts, it might be difficult to find available people to serve on the TRAC. It was likely that some would be asked to serve on both the TRAC and the SAW-27 SARC. Several experts were mentioned as possible candidates for the TRAC, as well as the SARC. It was suggested that the membership list of the new NEFMC Scientific and Statistical Committee would be available by March 12 and could serve as a source of both TRAC and SARC participants.

It was anticipated that technical documents from the TRAC would be published in the Canadian Stock Assessment Secretariat Research Document series when meetings were held in Canada and in the NEFSC Reference Document series when meetings were held in the US. Joint authorship of documents would be encouraged. Since the upcoming TRAC meeting would be held in Canada, there would be a short (e.g., 3-4 pages) summary of the status of each stock (five summaries) published in the Canadian series. Those summaries as well as the individual technical documents would only be referenced instead of being reproduced in the SAW-27 SARC *Consensus Summary of Assessments* report. In discussion, it was noted that the US industry and Council members were now accustomed to and satisfied with the current "user friendly" SAW documentation. It was, therefore, important to ensure that future documentation involving the TRAC process would continue to be "user friendly". It was agreed to try the documentation process as discussed and modify it as needed in the future.

SAW-27

Although more than nine stocks were originally considered for the SAW-27 agenda, American plaice and Georges Bank winter flounder were deferred to SAW-28. The assessments to be reviewed by the TRAC (Georges Bank cod, haddock, and yellowtail flounder) would not be reopened for discussion by the SARC. For those three stocks, only quick overviews would be presented for the purpose of crafting the advice. The SARC would, however, fully review benchmark assessments for Atlantic herring and ocean quahogs, as well as assessments for scup and black sea bass, which had been found to be problematic by the SAW-25 SARC (inadequate input data) and needed to be revisited and examined, if possible, using alternative assessment methods.

The large number of stocks on the agenda would necessitate less time for discussion during the SARC meeting relative to previous meetings. In order to compensate for this, the 2-week deadline for submission of SARC working papers would be strictly enforced to ensure that participants would be given adequate time to read and become familiar with the reports in advance of the meeting.

The proposed terms of reference for the stocks on the SAW-27 agenda were reviewed. It was pointed out that, due to a heavy workload in the NEFSC age and growth unit, it would be impossible to have an updated catch-at-age data base for scup and black sea bass. Since this would make it impossible to update a VPA, the terms of reference for these two stocks would need to focus on updating other available resource indicators and the use of alternative assessment models. It was not anticipated that ageing these species would necessarily be a problem in the future, although current problems with the quality and quantity of biological samples from the recreational and commercial fisheries would also have to be resolved.

It was agreed that Dr. Anderson would revise the terms of reference for herring, scup, and black sea bass to reflect suggestions made during the discussion.

Stocks

Ocean quahogs
Atlantic herring
Scup
Black sea bass
Gulf of Maine cod
Georges Bank cod
Georges Bank haddock
Georges Bank yellowtail founder
Southern New England yellowtail founder

Terms of reference

Ocean quahogs

a. Develop, test, and implement models to estimate ocean quahog abundance and mortality rates, using appropriate indices of abundance and total catch.

b. Review existing biological reference points and advise on new reference points for both ocean quahogs and surfclams to meet SFA requirements.

c. Assess the status of EEZ ocean quahog populations under management, and provide quota options consistent with biological reference points.

d. Consider the importance of refugia to new recruitment by examining biological and economic aspects for three scenarios: 1) no refugia, 2) Georges Bank only, and 3) Georges Bank and deep offshore unfished areas.

Atlantic herring

a. Review the results of the December 1997 Herring Stock Assessment & Research Priorities Workshop and incorporate any relevant recommendations in the present assessment.

b. Evaluate scientific information relating to the stock affinity of herring caught in the New Brunswick fixed gear fishery and define the geographical range of the coastal stock complex.

c. Update the status of the coastal stock complex of Atlantic herring through 1997 and characterize the variability of estimates of stock size and fishing mortality rates.

d. Provide, to the extent possible, information regarding the relative status of the various stocks within the coastal stock complex.

e. Review and evaluate methods and results of virtual population analysis of the Gulf of Maine herring stock and acoustic surveys of spawning herring on Jeffreys Ledge in 1995, 1996, and 1997.

f. Provide projected estimates of catch for 1998-1999 and spawning stock biomass for 1999-2000 at various levels of F for the coastal stock complex and, if possible, for the Gulf of Maine stock.

g. Review existing biological reference points and advise on new reference points for Atlantic herring to meet SFA requirements.

Scup

a. Update commercial and recreational landings and discard estimates for scup through 1997.

b. Evaluate quantitative indicators of exploitation rate, stock abundance, and recruitment from state and Federal research surveys, commercial and recreational fisheries, sea sampling data, and other sources.

c. If possible, use alternative models such as ASPIC to assess the status of scup.

d. Provide total allowable catch recommendations for scup to meet the target exploitation rate for 1999.

e. Review existing biological reference points and advise on new reference points for scup to meet SFA requirements.

Black sea bass

a. Update commercial and recreational landings and discard estimates for black sea bass through 1997.

b. Evaluate quantitative indicators of exploitation rate, stock abundance, and recruitment from state and Federal research surveys, commercial and recreational fisheries, sea sampling data, and other sources.

c. If possible, use alternative models such as ASPIC to assess the status of black sea bass.

d. Provide total allowable landings recommendations for black sea bass to meet the target exploitation rate for 1999.

e. Review existing biological reference points and advise on new reference points for black sea bass to meet SFA requirements.

Gulf of Maine cod

a. Update the status of Gulf of Maine cod through 1997 and characterize the variability of estimates of stock size and fishing mortality rates.

b. Provide projected estimates of catch for 1998-1999 and spawning stock biomass for 1999-2000 at various levels of F.

c. Review existing biological reference points and advise on new reference points for Gulf of Maine cod to meet SFA requirements.

Georges Bank cod

a. Update the status of Georges Bank cod through 1997 and characterize the variability of estimates of stock size and fishing mortality rates.

b. Provide projected estimates of catch for 1998-1999 and spawning stock biomass for 1999-2000 at various levels of F.

c. Review existing biological reference points and advise on new reference points for Georges Bank cod to meet SFA requirements.

Georges Bank haddock

a. Update the status of Georges Bank haddock through 1997 and characterize the variability of estimates of stock size and fishing mortality rates.

b. Provide projected estimates of catch for 1998-1999 and spawning stock biomass for 1999-2000 at various levels of F.

c. Review existing biological reference points and advise on new reference points for Georges Bank haddock to meet SFA requirements.

Georges Bank yellowtail flounder

a. Update the status of Georges Bank yellowtail flounder through 1997 and characterize the variability of estimates of stock size and fishing mortality rates.

b. Provide projected estimates of catch for 1998-1999 and spawning stock biomass for 1999-2000 at various levels of F.

c. Review existing biological reference points and advise on new reference points for Georges Bank yellowtail flounder to meet SFA requirements.

Southern New England yellowtail flounder

a. Update the status of Southern New England yellowtail flounder through 1997 and characterize the variability of estimates of stock size and fishing mortality rates.

b. Provide projected estimates of catch for 1998-1999 and spawning stock biomass for 1999-2000 at various levels of F.

c. Review existing biological reference points and advise on new reference points for Southern New England yellowtail flounder to meet SFA requirements.

Meeting dates and places

SARC
June 22-26, 1998
Woods Hole, MA

Public Review Workshop
NEFMC
August 10-11, 1998
Peabody, MA
MAFMC
August 17-20, 1998
Philadelphia, PA

SAW-28

A number of stocks listed as possibilities for consideration for SAW-28 included sea scallops, Georges Bank winter flounder, American plaice, pollock, witch flounder, Atlantic mackerel, silver hake, red hake, and *Illex* and *Loligo* squid. It was suggested that butterfish should perhaps be done whenever the squids and mackerel were done since all of those species were in the same FMP, although it was recognized that butterfish did not command very high priority at present as it was currently classified as under-utilized. It was agreed that the SAW-28 agenda would include sea scallops, Georges Bank winter flounder and American plaice (both deferred from SAW-27), Atlantic mackerel, which had not been assessed since June 1995 (SAW-20), and one or two additional stocks to be decided later. Pollock (a candidate for joint US/Canada assessment) and red hake (no ageing done for over ten years) were not considered to be of sufficiently high priority at present. Dr. Anderson would investigate the possibility of doing the squids, witch flounder (non-age-based assessment), and silver hake (from survey indices).

The SAW-28 SARC meeting would be held in late November or early December and the Public Review Workshop sessions at the January 1999 Council meetings. The Steering Committee would meet again in May to review and finalize the SAW-28 agenda.

Tentative stocks

Sea scallops
Georges Bank winter flounder
American plaice
Atlantic mackerel
One or two additional stocks

Meeting dates (tentative) and places

SARC
November 16-20, 1998
Woods Hole, MA

Public Review Workshop
January 1999

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

<u>Future SAW Policy</u>

NRC advice

Several of the recommendations made by the NRC Committee to Review Northeast Fishery Stock Assessments particularly applicable to the SAW process were to 1) improve the collection, analysis, and modeling of stock assessment data (including the use of alternative methods and models for data analysis and stock assessment, and better treatment of uncertainty in forecasting); 2) ensure that a greater number of independent scientists from academia and elsewhere participate in the SARC; and 3) increase the frequency of stock assessments (i.e., more frequently than every three years in the case of the NE groundfish stocks). Although there are many who agree with the need to increase the frequency of stock assessments, it would be impossible, given current funding and staffing levels, to undertake full benchmark assessments for all of the major stocks more frequently that about every three years. However, the SAW process was trying to schedule less rigorous updates more frequently.

National pool of experts

Regarding a national pool of experts from which to obtain external participants for stock assessments and their peer review, Dr. Victor Restrepo (NMFS/S&T) would be making a presentation at the next NMFS Science Board meeting. Although some funds had been set aside nationally, it would not be practical to depend on using the pool for SAW-27 meetings. Considering the process of application and selection, pool experts would, at best, be available in the autumn. If the proposed pilot program were to succeed, the number of experts in the pool would be expected to increase over time.

The development of a Region- or nation-wide list of stock assessment experts was discussed. Although it was anticipated that such a list would not reveal many unknown talents, the task was considered to be worthwhile. Ways proposed to assemble such a list included a suggestion to approach local chapters (Maine through North Carolina) of the American Fisheries Society (AFS). Dr. Anderson agreed to explore such possibilities through NEFSC staff who are active in AFS.

Handling assessment updates

To help alleviate the pressure for increased numbers of assessments each year, it was agreed that the SAW had to evolve into a more flexible process utilizing ASMFC Technical Committees and Council S&S Committees. Such arrangements would allow the SAW process, having access to more assessment expertise, to deal with the more technically complicated assessments and reviews, and assigning the Council and ASMFC Committees an increased role in handling assessment updates. The need to avoid redundancy, particularly by the new NEFMC S&S

Committee with respect to updates of stocks reviewed by the TRAC and SARC, was emphasized.

In this evolution, however, the current SAW standards would need to be observed in the preparation of advice: 1) the process must remain open and advice well documented, and 2) the peer review must remain separate from the preparation of the assessment. The role of the SAW Steering Committee would continue to be critical in the prioritization of assessments.

Relative to the issue of how to handle updates and the need to clarify the appropriate role for S&S Committees in the peer-review and advisory process, it was agreed that Dr. Anderson would meet with the leadership of both S&S Committees to discuss possible future arrangements. Such a discussion should consider 1) the situations for which S&S Committee reviews would be warranted, 2) the desired expertise of S&S Committee members to participate in such reviews (e.g., updates of assessments), and 3) the proper forum for such reviews (e.g., perhaps only a subset of members possessing assessment backgrounds).

The Committee noted the desirability of having the NEFSC status-of-stocks publication series (i.e., *Status of the Fishery Resources off the Northeastern United States*) produced annually (last issued in January 1995). For many stocks, this publication could suffice as an adequate assessment update based, at a minimum, on the latest landings data and research trawl survey abundance indices

Availability of SARC documents

The policy issue concerning the release and use of documents (i.e., draft *SARC Consensus Summary of Assessments* and *Advisory Report on Stock Status*) following a SARC meeting was discussed. Mr. Keifer indicated that the MAFMC would need access to the SAW-27 reports on ocean quahogs, scup, and black sea bass by mid-late July for consideration by the Council's industry advisors and monitoring committees prior to the Council's August 17-20 meeting at which time 1999 quota recommendations would be made. Current SAW policy dictated that those reports could not be made public until the time of the SAW-27 Public Review Workshop scheduled for the August Council meeting. The Steering Committee, recognizing that the existing policy based on the old procedure of finalizing reports at the SAW Plenary was somewhat obsolete, agreed that greater flexibility was now required. Accordingly, it was agreed that as soon as the SARC documents were completed and available in draft form, they could be used by the Councils or ASMFC as necessary, independent of the timing of the SAW Public Review Workshop sessions.

MARFIN

The design, goal, and expansion into the Northeast region of the Marine Fisheries Initiative (MARFIN) was briefly discussed. The objective of the program in the Southeast, initiated in 1986, was to "supplement existing funding to support fisheries research and development in the Gulf of Mexico to increase the economic contribution of marine fisheries, develop more valuable products from existing fisheries, develop export markets, forecast variation in yields and conserve and maintain presently exploited resources." In 1998, $500,000 would be administered by the NMFS/NER for projects in the Northeast. Various approaches to MARFIN and its relationship to the SAW would be discussed further at the next Steering Committee meeting. In the meantime, the NER would provide Steering Committee members with a description of the program recently prepared by Harold Mears (NMFS/NER).

Re-assessment of bluefish

Mr. Dunnigan and Dr. Moore reported that a recent update of the bluefish assessment, performed by the ASMFC Bluefish Stock Assessment Subcommittee, had been presented to the ASMFC Bluefish Technical Committee on February 4. The results of the update, which had been an attempt to improve upon the previous VPA assessment reviewed by the SAW-23 SARC (widely viewed as having provided an inaccurate and pessimistic portrayal of stock status), were similarly viewed by the Technical Committee as being inaccurate and unacceptable. The Committee had suggested that additional analyses be conducted to 1) re-estimate fishing mortality rates and stock biomass using alternative data and methods, and 2) re-calculate candidate overfishing definitions based on yield-per-recruit analysis instead of the uncertain stock-recruitment data used to determine F_{msy}, the current overfishing definition.

The Steering Committee discussed possible options for addressing the bluefish problem. The Council and ASMFC felt that they could not go forward with Amendment 1 to the Bluefish FMP based on deficient assessment results. A major re-assessment employing alternative data and methodology (i.e., a benchmark assessment) should ideally be peer reviewed by the SARC. Since this would not be possible for SAW-27, options would be the MAFMC S&S Committee, which had a number of well-qualified assessment experts, or an external review panel such as was established for lobsters in 1996. It was also suggested that the Stock Assessment Subcommittee invite some external experts (e.g., Dr. Restrepo) to participate in the re-assessment.

The Committee agreed to authorize a sequential process in which 1) the ASMFC Bluefish Stock Assessment Subcommittee would perform and complete an alternative assessment update, including new overfishing definition analyses, 2) the ASMFC Bluefish Technical Committee would review the assessment results, and 3) the MAFMC S&S Committee would provide a final peer review of the assessment results prior to subsequent management recommendations and decisions by the ASMFC and MAFMC.

Other Policy Issues

The implications of the Federal Advisory Committee Act (FACA) for advisory panels such as the SARC were briefly reviewed. Although this would be addressed further at the next NMFS Executive Board meeting relative to policy guidance at the national level, a short-term resolution of this issue at the regional level was considered necessary. A preferred approach would be for the SARC to become an advisory panel of one or both Councils. This would exempt the SARC from the requirements of FACA and only obligate it to comply with the guidelines specified for Councils and their S&S Committees and advisory panels by the Magnuson-Stevens Fishery Conservation and Management Act. The only major additional procedural requirement would be for SARC meetings to be announced in the Federal Register. Dr. Anderson was asked to pursue this approach with Mr. Howard, Mr. Keifer, and NOAA General Counsel.

Other Business

Dr. Anderson reported that he intended to establish a SAW web site which could be accessed from the NEFSC home page (www.wh.whoi.edu). The site would carry, for example, a description of the SAW process, list of stocks reviewed at each SAW, agenda for next SAW, terms of reference, and so on. The Committee members were very supportive of this idea.

Table 2. **SAW/SARC Assessment Reviews by Species**

YEAR	85	1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997			1998	
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	27	28
Black Sea Bass	X				+	+			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			X	
Cod, Gulf of Maine	X		X				X					X			X				X		+			X			X	
Cusk	X																				+							
Flounder, Am. Plaice	X	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			X	
Flounder, Yellowtail, GB	X	X					X					X						X			+			X			X	
Goosefish														X							+		X					
Haddock, Georges Bank	X	X		X									X							X	+			X			X	
Haddock, Gulf of Maine	X	X																			+							
Herring, Atlantic					X				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								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					X
Scup	X			X			X		X		X								X						X		X	
Shrimp, Northern	X		X		X																				X			
Silver Hake	X	X		X						X	X						X				+							
Skate	X																											
Spiny Dogfish	X										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																									X		
Surfclam	X		X				X		X						X				X			X				X		
Tautog																				X								
Tilefish	X													X		X										X		
Weakfish			+																									
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

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STANDARD MAIL A

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