A1. SOUTHERN NEW ENGLAND – MID ATLANTIC YELLOWTAIL FLOUNDER

State of Stock: The southern New England and Mid-Atlantic stocks were previously assessed separately, but are combined for this assessment. The combined stock is overfished and overfishing is taking place. The current estimate of fishing mortality is high (2001 $F_{ages\ 4\text{-}6} = 0.91$, Figure A1.1), much greater than the proposed F_{MSY} proxy ($F_{40\%MSP} = 0.26$). Spawning stock biomass is low (2001 SSB = 1,900 mt, Figure A1.2), well below the proposed SSB_{MSY} proxy (69,500 mt SSB). Recruitment has been poor for more than a decade. The age structure of the stock is truncated in comparison to MSY conditions (Figure A1.10).

Management Advice: Fishing mortality should be reduced to near zero.

Forecasts for 2002-2009: Age-based, stochastic projections predict that landings and SSB decrease in 2002 at 85% of $F_{status\ quo}$ ($F_{2002} = 0.77$). Projections with the most optimistic recruitment assumption indicate that there is approximately a 50% probability of rebuilding to SSB_{MSY} by 2009 if 2003-2009 F is reduced to 0.08. Alternative projections that assume the same recruitment observed over the past decade indicate that rebuilding to SSB_{MSY} is not possible at F = 0.

Forecast Table: Basis: For age-based projections, $F_{2002} = 0.77$ (85% of status quo from VPA F_{2001}), average 1994-2001 partial recruitment, mean weights at age, and maturation. Age-1 recruitment for the period 2002-2009 was estimated from the distribution of observed age-1 stock sizes from 1963 to 2000. Landings and SSB in 1,000s of mt.

2002				2003		2004	
F	Landings	SSB	2002-2009 F	Landings	SSB	SSB	Consequences/Implications
0.77	0.7	1.6	0.00 (no fishery)	0.0	2.4	6.4	58% chance of rebuilding to SSB_{msy} by 2009
			0.08 ($F_{rebuild}$)	0.1	2.3	6.3	50% chance of rebuilding to SSB_{msy} by 2009
			0.26 (F_{msy})	0.3	2.2	5.8	29% chance of rebuilding to SSB_{msy} by 2009
			0.77 (85% of $F_{status\ quo}$)	0.7	2.0	5.1	7% chance of rebuilding to SSB_{msy} by 2009

Catch and Status Table: Southern New England – Mid Atlantic Yellowtail Flounder
(weights in '000 mt, recruitment in millions)

	1994	1995	1996	1997	1998	1999	2000	2001	Max[1]	Min[1]	Mean[1]
Landings	0.4	0.2	0.5	0.8	0.6	1.2	1.0	1.0	18.5	0.2	4.2
Discards	0.3	0.1	0.1	0.0	0.1	0.1	0.0	0.1	9.7	0.0	2.2
Total catch	0.6	0.3	0.5	0.8	0.7	1.3	1.0	1.1	22.2	0.3	6.4
Biomass	0.8	1.3	1.7	1.8	2.2	2.8	2.4	2.3	40.8	0.8	12.4
SSB	0.6	0.8	1.3	1.0	1.5	1.7	2.1	1.9	24.3	0.6	7.3
Recruitment (age 1)	3.0	3.4	2.0	6.0	3.4	5.8	1.9	3.1	138.5	1.9	25.9
F (age 4-6, unweighted average)	1.79	0.81	1.34	1.40	1.26	1.87	0.68	0.91	2.34	0.56	1.31
Exploitation Rate	78%	51%	68%	70%	66%	79%	45%	55%	85%	39%	68%

[1]Over period 1973-2001

Stock Distribution and Identification: Yellowtail flounder inhabit relatively shallow waters (20-100 m) of the continental shelf of the Northwest Atlantic from Labrador to Chesapeake Bay. An interdisciplinary evaluation of yellowtail flounder stock structure indicates that, in southern New England and Mid-Atlantic waters, yellowtail constitute a single, self-sustaining resource. The southern New England – Mid-Atlantic yellowtail flounder stock area is defined as the continental shelf from Nantucket Shoals to the southern extent of the species range (U.S. statistical reporting areas 526, 537, 538, 539, and division 6). The geographic distribution of yellowtail flounder in the southern New England – Mid-Atlantic area has been greatly reduced over the last four decades (Figure A1.9)

Catches: Landings in southern New England generally increased during the 1930s and early 1940s and the fishery expanded to the Mid-Atlantic in the early 1940s, yielding landings of 28,000 mt in 1942 and approximately 20,000 mt annually from 1963 to 1972. Landings in 1995 were a record low of just 200 mt, and the proportion of landings from the Mid-Atlantic generally increased from approximately 10% in the early 1990s to >20%. Since 1999, landings have averaged 1,000 mt annually.

The discarded catch has been considered to account for an average of 30% of total annual catch, although it seems to have decreased to approximately 10% since 1995. In 1969, discards peaked at 24,000 mt, 40% of the total catch that year. A substantial portion of recent discards is derived from the scallop dredge fishery.

Over the past three years total catch has been 66% trawl landings from southern New England, 22% trawl landings from the Mid-Atlantic, 4% dredge landings from the Mid-Atlantic, 4% discards from the southern New England dredge fishery, 2% discards from the southern New England trawl fishery, 1% discards from the Mid-Atlantic dredge fishery, and 1% discards from the Mid-Atlantic trawl fishery.

Data and Assessment: Landings from 1973 to 2001 were estimated from dealer records and interview information. For the period 1994-2001, landings were derived from dealer records based on vessel logbook data. U.S. discards at age for the period 1963-1993 were estimated from vessel interviews, survey length distributions, and at-sea sampling. Discards for the period 1994-2001 were estimated from discard-to-kept ratios reported in vessel logbooks.

A virtual population analysis (VPA) of commercial landings and discards at age was completed (assuming natural mortality, M, of 0.2). Indices of recruitment and stock abundance were obtained from NEFSC spring, autumn, and winter bottom trawl surveys, and NEFSC scallop surveys. Estimates of uncertainty include survey measurement error, but not errors in catch.

A non-equilibrium surplus production model provided auxiliary information on the status of the stock. Input data included commercial landings and discards, and NEFSC spring and fall surveys. Unlike the VPA, this approach is based on biomass and catch, but no information on age structure is required.

Biological Reference Points: F_{MSY} is approximated as $F_{40\%}$ (0.26, Figure A1.3). The SSB_{MSY} proxy is 69,500 mt, calculated as the product of 40%MSP (1.129 kg spawning biomass per recruit) and the average long-term recruitment of 61.57 million for the years 1963-2000 (which includes hindcast values for 1963-1972). The average long-term recruitment was derived as the fall survey age-1 index divided by the catchability coefficient estimated by ADAPT. The MSY proxy is 14,200 mt, derived as the product of yield per recruit at $F_{40\%}$ (0.230 kg) and average recruitment. Estimates of SSB_{MSY} and MSY are highly sensitive to the assumed level of recruitment at F_{MSY}. If historic levels of recruitment (1963-1972) are assumed, MSY reference points are three times greater, and if the VPA series of recruitment is assumed (1973-2001), MSY reference points are some 50% of the estimates using 1963-2001 recruitment. However, the entire series of recruitment (1963-2001) offers the most likely scenario, because excluding any period cannot be justified.

Fishing Mortality: Fishing mortality generally increased in the 1970s and 1980s to peak at 2.3 in 1991 and 1992, averaged 1.6 during the 1990s, but appears to have decreased to 0.68 in 2000 and then increased to 0.91 in 2001, the latter with an 80% confidence limit of 0.65-1.18 (Figure A1.6). Retrospective analysis indicates that fishing mortality was underestimated by an average of 60% for the past five years.

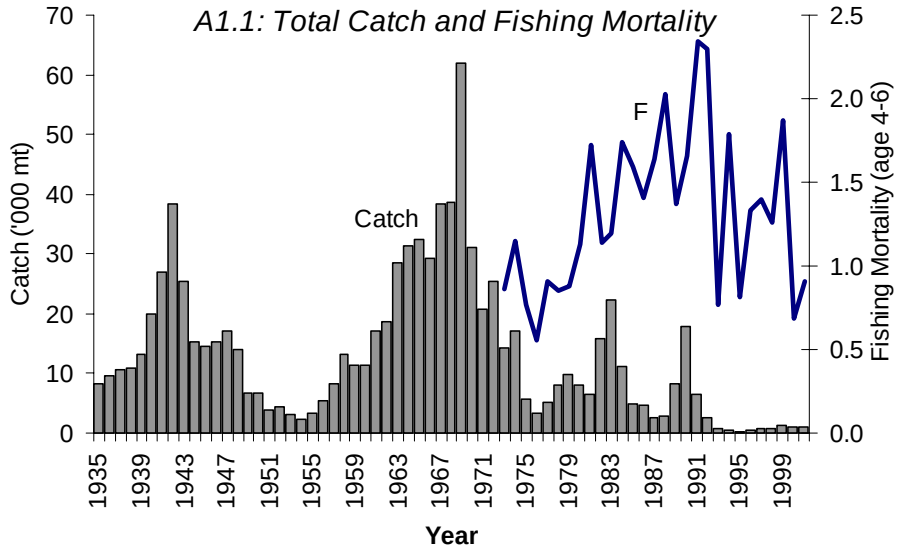
Recruitment: Recruitment was generally strong in the 1960s and early 1970s and moderate during the 1980s, with two relatively strong year classes in 1980 and 1987 (Figures A1.2 and A1.7). Recruitment has since been low. Hindcast estimates of recruitment from 1963 to 1972 are substantially greater than those from the VPA series.

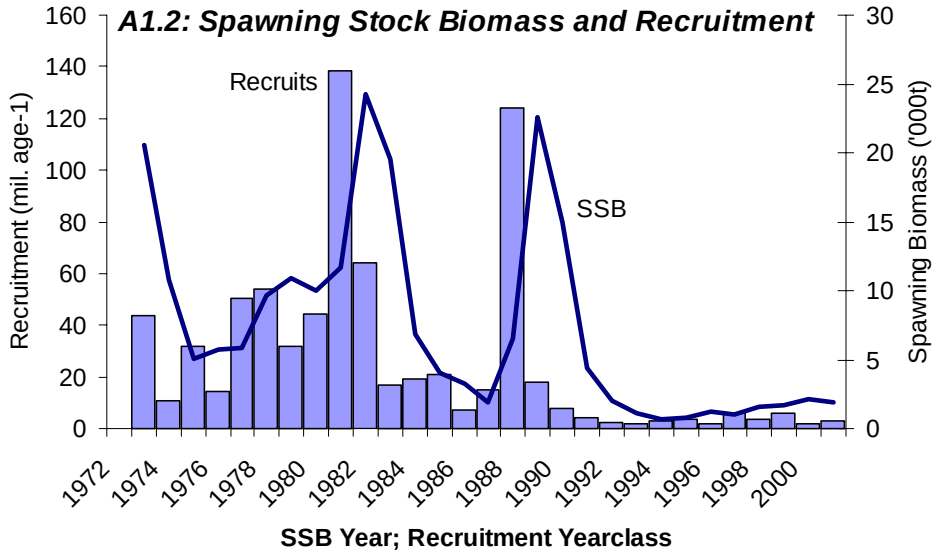
Spawning Stock Biomass: Spawning stock biomass was high in the early 1970s, decreased in the late 1970s, and increased briefly in the early and late 1980s, with the recruitment of the 1980 and 1987 cohorts. SSB decreased to a record low 622 mt in 1994, gradually increased to 2,100 mt in 2000, but then decreased to 1,900 mt in 2001, with an 80% confidence limit of 1,500-2,300 mt (Figure A1.5). Retrospective analysis indicates that spawning stock biomass was overestimated by an average of 130% for the past five years.

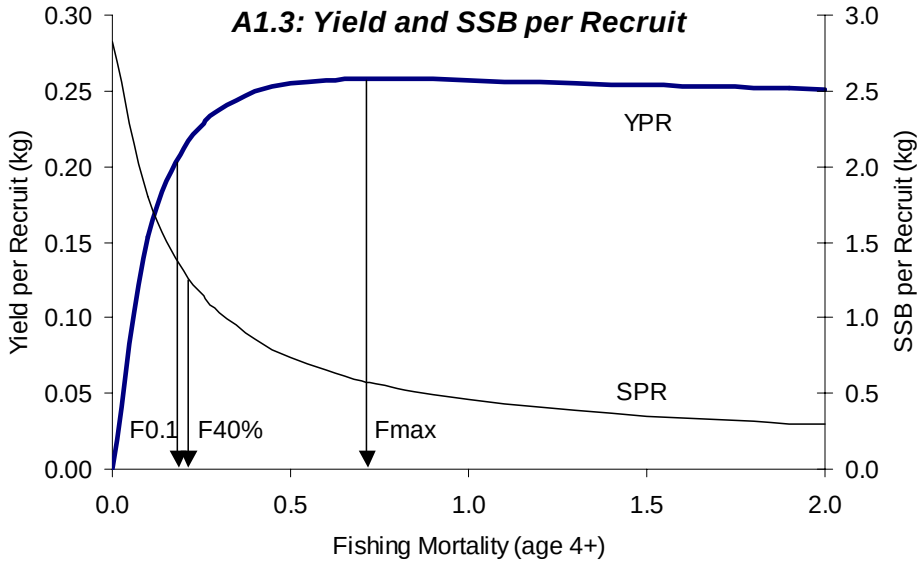
Special Comments: Retrospective analysis indicates a strong pattern of underestimating F and overestimating SSB in recent years. Therefore, the current stock status and the associated projections are likely to be optimistic.

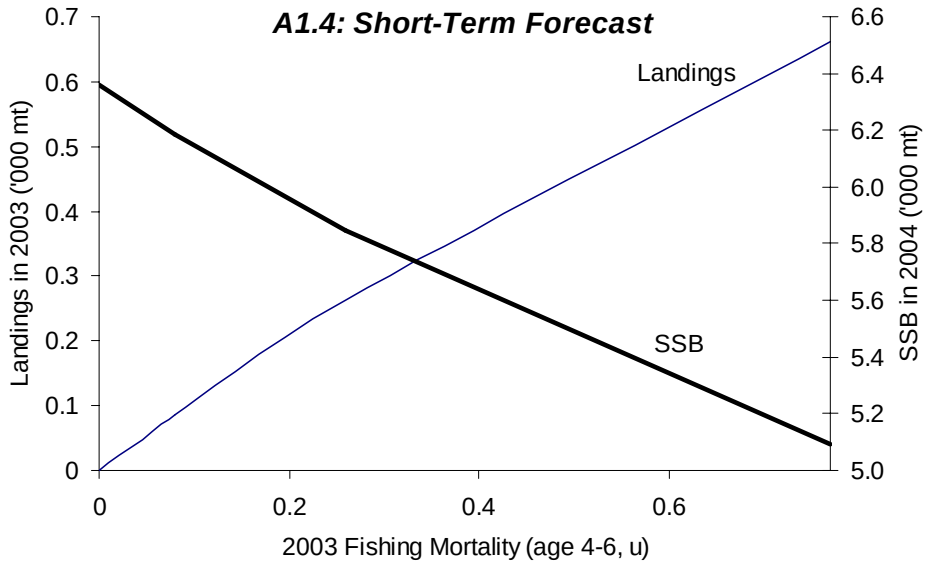
Although this assessment is the first for yellowtail flounder in the southern New England – Mid-Atlantic area since the 1960s, the state of the stock and management advice are similar to those reported for the southern New England management area by the 27th Stock Assessment Review Committee in 1998. Both components of this combined stock were previously determined to be overfished.

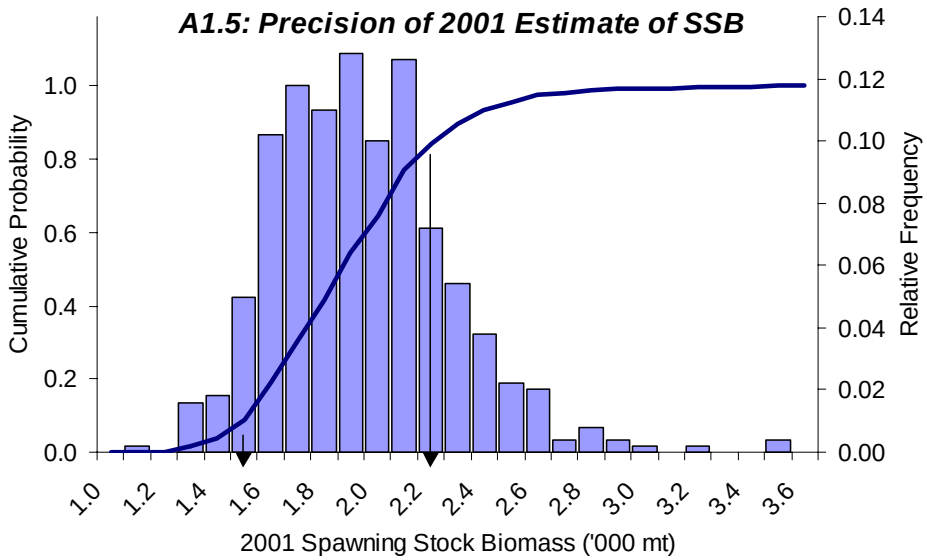
Source of Information: S. X. Cadrin. 2002. Stock assessment of yellowtail flounder in the southern New England – Mid-Atlantic area. NEFSC Ref. Doc. 03-02.

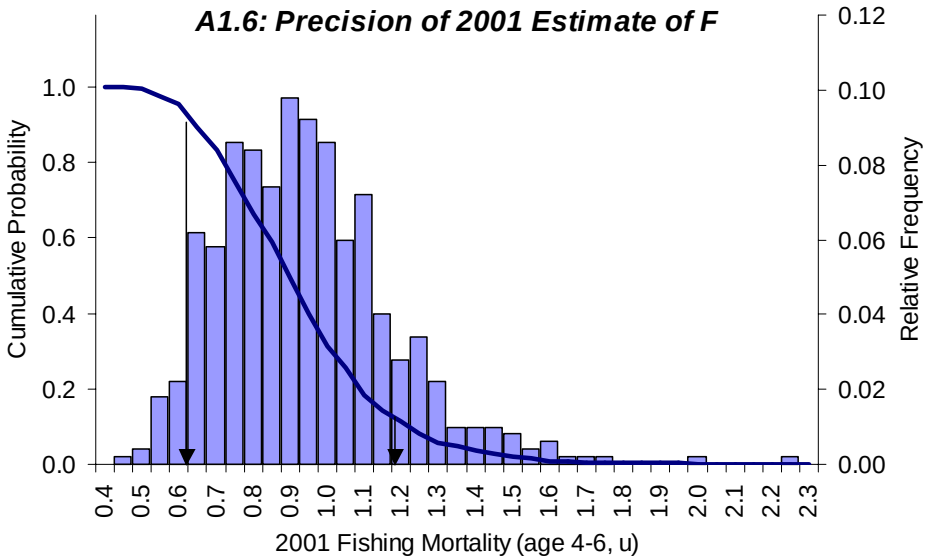

A1.1: Total Catch and Fishing Mortality
Catch ('000 mt)
Fishing Mortality (age 4-6)
Catch
F
Year

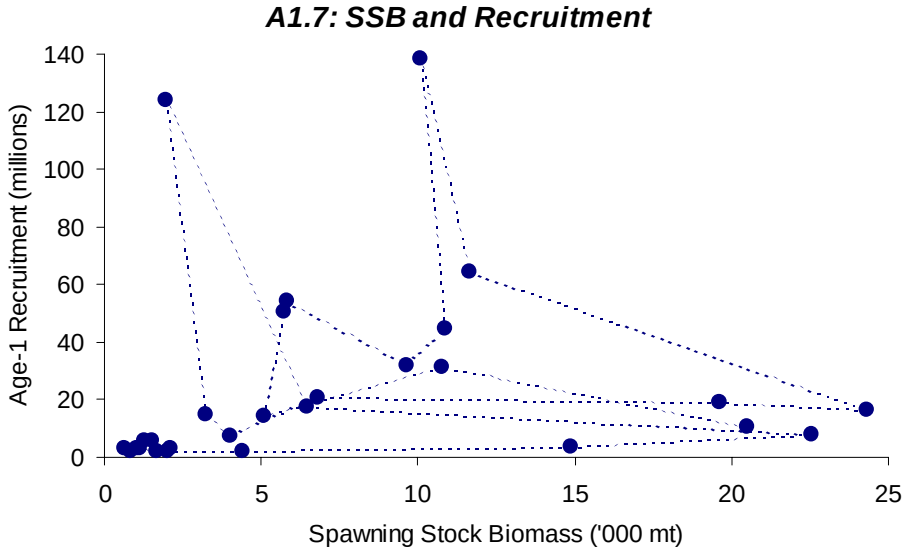

A1.2: Spawning Stock Biomass and Recruitment
Recruitment (mil. age-1)
Spawning Biomass ('000t)
Recruits
SSB
SSB Year; Recruitment Yearclass

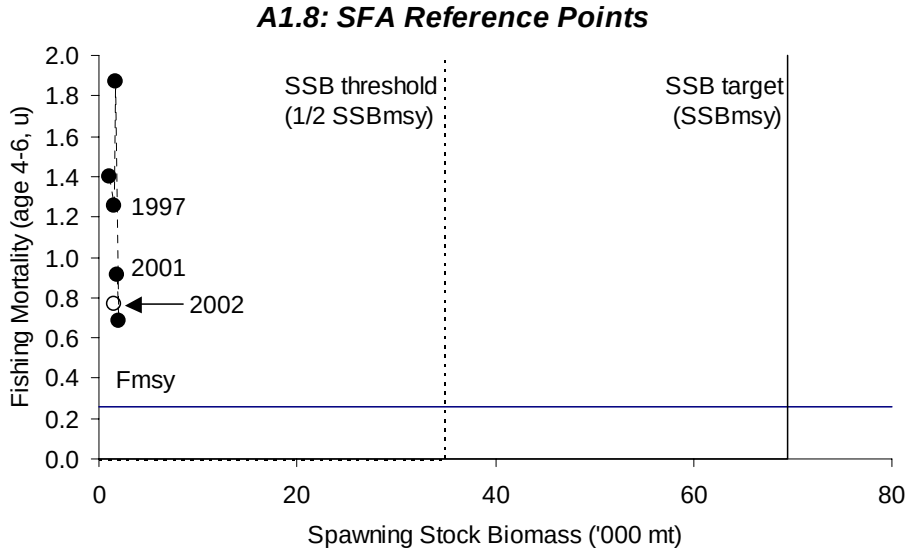

A1.3: Yield and SSB per Recruit
Yield per Recruit (kg)
SSB per Recruit (kg)
YPR
SPR
F0.1
F40%
Fmax
Fishing Mortality (age 4+)


A1.4: Short-Term Forecast
Landings in 2003 ('000 mt)
SSB in 2004 ('000 mt)
Landings
SSB
2003 Fishing Mortality (age 4-6, u)

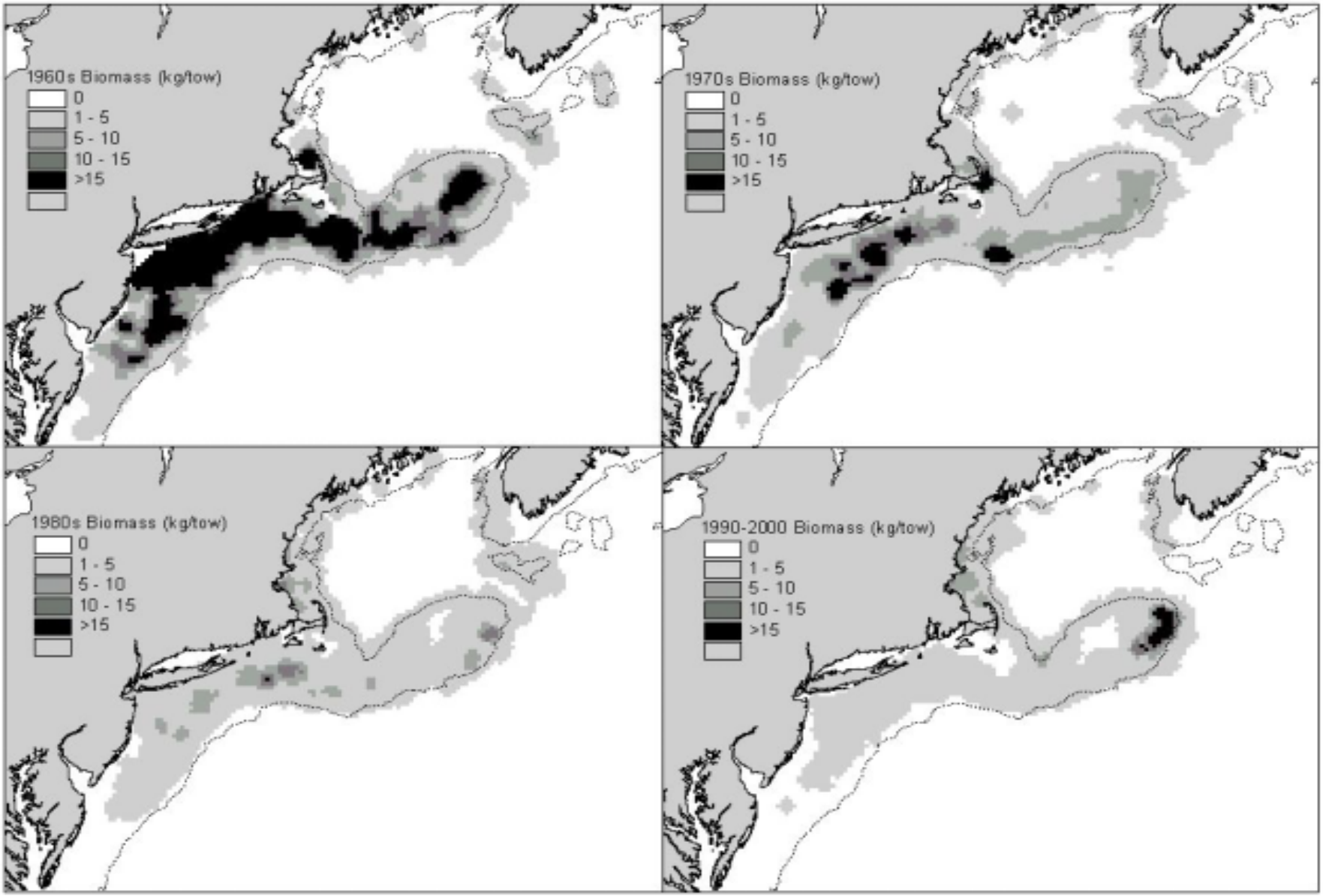

A1.5: Precision of 2001 Estimate of SSB
Cumulative Probability
Relative Frequency
2001 Spawning Stock Biomass ('000 mt)


A1.6: Precision of 2001 Estimate of F
Cumulative Probability
Relative Frequency
2001 Fishing Mortality (age 4-6, u)


A1.7: SSB and Recruitment
Age-1 Recruitment (millions)
Spawning Stock Biomass ('000 mt)


A1.8: SFA Reference Points
SSB threshold
(1/2 SSBmsy)
SSB target
(SSBmsy)
1997
2001
2002
Fmsy
Fishing Mortality (age 4-6, u)
Spawning Stock Biomass ('000 mt)

A1.9 Geographic Distribution of Yellowtail Flounder by Decade



A1.10 Observed and Expected Age Distribution of SSB