D. Southern New England Yellowtail Flounder by S.X. Cadrin

1.0 Background

The southern New England yellowtail stock was at low biomass (less than 25% B_{MSY}) at relatively low F (fully recruited F was 0.2) in 1998 (Cadrin 2000). This report updates catch and survey indices and estimates 1999 fishing mortality and 2000 stock size.

2.0 2000 Assessment

2.1 1999 Landings

U.S. landings were prorated as described in NEFSC (1998; Table D1; Figure D1). Landings from southern New England increased 89% from 1998 to 1999.

Sampling intensity of landings in 1999 was poor (Table D2). The 1999 southern New England yellowtail fishery was not sampled from April to December, 1999, which accounts for 53% of the annual landings. Landings at length and age were estimated for the entire year by market category for an exploratory VPA.

2.2 1998 Discards

Estimates of total discards were attempted from logbook information on discard to kept ratios by half-year and gear (NEFSC 1998; Table D3). Discards at age were estimated from sea sampled lengths and pooled commercial-survey age-length keys for the exploratory VPA. However 1998 samples were used to characterize trawl discards, because no observations of 1999 trawl discards were available. Alternatively, discards were estimating by projecting the 1999 VPA abundance with observed landings and recent average discard ratios (methods described in Cadrin 2000).

2.3 1998-1999 Survey Indices

Survey abundance and biomass indices are reported in Table D4. Estimates are from valid tows in southern New England (offshore strata 5, 6, 9, 10; scallop strata 33-48), standardized according to net, vessel, and door changes (NEFSC 1998). All survey indices of total abundance and total biomass decreased in 2000 (Figure D2).

3.0 Assessment Results

3.1 Age-Based Analysis

An updated VPA calibration of southern New England yellowtail was attempted, but was rejected because of inadequate sampling of catch at age in 1999 (e.g., there were no samples after the first quarter). Estimating catch at age directly using only first quarter samples

underestimates weight at age and overestimates numbers at age. Retrospective analysis of the exploratory VPA indicated a strong tendency for terminal year estimates of F to be less than converged estimates, and terminal year estimates of biomass to be greater than converged estimates.

Alternatively, projections from the 1999 VPA (methods described in NEFSC 2000) were revised with the estimate of 1999 landings. Results from the revised projection indicate that F increased in 1999 (80% confidence of F_{3-6} = 0.23-0.39; F on biomass = 0.09-0.18), and there was approximately 75% probability of being greater than $F_{0.1}$ (0.27)(Table D5, Figure D3). The value of F assumed for 1999 by the previous assessment (F_{3-6} = 0.20; Cadrin 2000) was less than that estimated by this revised projection. The projected estimate of SSB increased (4,100-7,000 mt with 80% confidence), but there was negligible chance of being greater then the Amendment #7 rebuilding target of 10,000 mt. The projected estimate of mean biomass increased (4,700-9,600 mt with 80% confidence). These bootstrap confidence intervals do not include the substantial retrospective error in VPA estimates (Cadrin 2000).

3.2 Biomass-Based Analysis

Due to continued poor sampling and resulting problems estimating catch at age, surplus production analysis (ASPIC) was updated to provide alternative perspectives on stock status. The estimate of F_{MSY} (0.20) was similar to the 1998 SARC estimate (0.23), but the estimate of B_{MSY} (92,400 mt) was substantially greater than the 1998 SARC estimate (61,500 mt; NEFSC 1998). Estimates of biomass and F are generally similar to the VPA, but 1999 F (F on biomass = 0.04-0.12 with 80% confidence) is less than indicated by the VPA projection, and the estimate of 1999 biomass (5,100-19,400 mt with 80% confidence) is substantially greater than the VPA estimate (Figure D4).

4.0 Harvest Control Rule

The SFA control rule specifies a biomass threshold of 25% B_{MSY}, a maximum F threshold of F_{MSY}, and F on biomass (1+,wb) as the metric for fishing mortality . When biomass is less than B_{MSY}, threshold F is the maximum F that allows rebuilding to B_{MSY} in 5 years. When biomass is below 1/4Bmsy, threshold F = 0. When biomass exceeds B_{MSY}, target F is the tenth percentile of the F_{MSY} estimate. When biomass is less than B_{MSY}, target F is based on rebuilding to B_{MSY} at the tenth percentile of the intrinsic rate of increase estimate (Figure D4). Stochastic projections from the VPA indicate that there was less than 5% chance that mean biomass in 1999 was greater than the Amendment #9 biomass threshold (1/4 B_{MSY} = 15,800 mt, NEFSC 1998). The production model indicates less than 25% chance that 1999 biomass was greater than the Amendment #9 biomass threshold.

5.0 Sources of Uncertainty

- Estimates of catch at age are not reliable due to poor sampling intensity. Therefore VPA will not be possible until sampling improves.
- Although historical perspective from production models are valuable, current biomass levels may not be reliable, because recruitment is implicitly assumed to be a function of stock biomass.
- Inappropriate stock delineation may result in underestimated removals (e.g., from adjacent areas in the mid-Atlantic Bight).
- Estimates of prorated landings and discard ratios are based on preliminary logbook data and are subject to change.

6.0 References

Cadrin, S.X. 2000. Southern New England yellowtail flounder. In Assessment of 11 Northeast Groundfish Stocks through 1999. NEFSC Ref. Doc. 00-05: 65-82.

NEFSC (Northeast Fisheries Science Center). 1998. Southern New England yellowtail flounder. NEFSC Ref. Doc. 98-15: 328-350.

Table D1. Landings of southern New England yellowtail flounder (thousand mt).

year	US Landings	US discards	Industrial landings	Foreign landings	total catch
1960	7.8	3.2	0.5		11.5
1961	11.6	4.7	0.7		17.0
1962	13.1	5.3	0.2		18.6
1963	22.0	5.9	0.3	0.2	27.9
1964	19.0	10.0	0.5		29.0
1965	18.4	9.4	1.0	1.4	27.8
1966	14.9	8.7	2.7	0.7	23.6
1967	10.8	15.0	4.5	2.8	25.8
1968	14.3	13.7	3.9	3.5	28.0
1969	11.4	24.2	4.2	17.6	35.6
1970	13.1	9.3	2.1	2.5	22.4
1971	8.2	4.0	0.4	0.3	12.2
1972	8.2	5.0	0.3	3.0	13.2
1973	6.9	1.5	0.3	0.2	8.4
1974	6.4	8.7		0.1	15.1
1975	3.2	1.9			5.1
1976	1.6	1.6			3.2
1977	2.8	1.9			4.7
1978	2.3	5.0			7.3
1979	5.3	4.4			9.7
1980	6.0	1.7			7.7
1981	4.7	1.2			5.9
1982	10.3	5.0			15.3
1983	17.0	3.5			20.5
1984	7.9	1.1			9.0
1985	2.7	1.2			3.9
1986	3.3	1.1			4.4
1987	1.6	0.9			2.5
1988	0.9	1.8			2.7
1989	2.5	5.5			8.0
1990	8.0	9.7			17.7
1991	3.9	2.3			6.2
1992	1.4	1.1			2.5
1993	0.5	0.1			0.6
1994	0.2	0.1			0.3
1995	0.2	0.1			0.2
1996	0.3	0.1			0.4
1997	0.2	0.0			0.3
1998	0.4	0.1			0.5
1999	0.7	0.2			0.9
average	6.8	4.5	1.5	2.9	11.4

Table D2. Samples of the 1999 southern New England yellowtail fishery.

port samples

quarter	ages	unclassified lengths	large lengths	small lengths	trips
1	154	262	408	333	9
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
	154	262	408	333	9

sea samples

quarter	ages	kept lengths	trawl discard lengths	dredge discard lengths	trips
1	0	0	0	0	0
2	0	10	0	17	3
3	0	0	0	0	0
4	0	0	0	95	4
	0	10	0	112	7

quarter	**survey** ages
1	22
2	101
3	14
4	0
	137

total

quarter	ages	kept lengths	discard lengths	trips	landings (mt)
1	176	1003	0	9	322
2	101	10	17	3	164
3	14	0	0	0	118
4	0	0	95	4	83
	291	1013	112	16	687

Table D3. Estimates of southern New England yellowtail discards in 1999 from logbook data and observer data.

		logbook data			expansion	
half		kept	disc		landings	discards
year	gear	(mt)	(mt)	d/k	(mt)	(mt)
1	trawl	110.1	3.9	0.03	483	17
	dredge	0.2	5.7	29.91 *	3	79
2	trawl	24.0	0.6	0.02	200	5
	dredge	0.0	1.1	29.91 *	1	23
	total			0.18	687	124

* entire year

		observer data				expansion	
half		kept	disc			landings	discards
year	gear	(mt)	(mt)	d/k	trips	(mt)	(mt)
1	trawl				0	483	0
	dredge	0.000	0.021		33	3	0
2	trawl	0.012	0.004	0.31	2	200	62
	dredge	0.007	0.291	42.83	123	1	33
	total			0.14	158	687	94

Table D4a. Survey indices of southern New England yellowtail abundance and biomass.

NEFSC Spring Survey					Age					
Year	1	2	3	4	5	6	7	8+	Total	kg/tow
1968	1.662	31.719	31.913	19.002	0.886	0.168	0.067	0.000	85.416	18.624
1969	5.102	19.866	27.261	14.675	2.540	0.285	0.000	0.000	69.730	13.340
1970	1.486	10.669	19.964	14.136	4.066	1.096	0.235	0.096	51.749	11.721
1971	1.066	11.323	8.519	23.664	6.065	0.967	0.011	0.011	51.627	10.693
1972	0.492	21.844	14.735	4.596	8.813	1.360	0.257	0.000	52.098	10.728
1973	1.301	7.270	12.713	6.276	4.261	6.595	0.820	0.456	39.693	14.678
1974	0.742	2.972	2.326	2.530	1.647	0.593	0.964	0.193	11.967	5.040
1975	0.561	1.556	0.500	0.769	0.810	0.471	0.033	0.146	4.845	1.984
1976	0.026	3.259	0.528	0.250	0.302	0.250	0.157	0.051	4.823	2.452
1977	0.205	1.251	1.556	0.166	0.173	0.080	0.024	0.103	3.557	1.993
1978	2.963	9.783	2.027	0.715	0.187	0.036	0.047	0.138	15.897	5.146
1979	1.542	3.357	1.741	0.354	0.110	0.000	0.000	0.008	7.112	2.147
1980	0.370	4.303	3.278	2.711	0.291	0.116	0.006	0.039	11.115	5.949
1981	0.203	8.622	3.089	1.279	0.464	0.047	0.000	0.000	13.704	6.846
1982	0.333	14.049	7.459	1.860	0.605	0.186	0.020	0.000	24.512	6.001
1983	0.090	3.900	12.916	1.059	0.312	0.000	0.000	0.000	18.278	4.641
1984	0.000	0.500	1.648	2.612	0.665	0.223	0.000	0.000	5.649	1.625
1985	0.561	0.744	0.417	0.201	0.454	0.093	0.000	0.000	2.470	0.666
1986	0.037	4.083	1.492	0.308	0.073	0.036	0.000	0.000	6.029	1.605
1987	0.000	0.198	0.919	0.144	0.000	0.000	0.000	0.000	1.261	0.402
1988	0.327	0.692	0.177	0.245	0.127	0.000	0.000	0.000	1.568	0.399
1989	0.151	10.308	0.604	0.066	0.000	0.000	0.000	0.000	11.129	2.433
1990	0.091	0.368	18.994	3.794	0.031	0.000	0.000	0.000	23.278	7.828
1991	0.438	0.340	1.573	4.484	0.510	0.111	0.000	0.000	7.455	2.786
1992	0.081	0.269	0.275	1.196	0.112	0.000	0.000	0.000	1.933	0.653
1993	0.037	0.533	0.221	0.517	0.097	0.000	0.000	0.000	1.405	0.506
1994	0.031	0.494	0.040	0.019	0.045	0.015	0.000	0.000	0.643	0.219
1995	0.054	0.944	0.284	0.072	0.030	0.011	0.018	0.000	1.413	0.360
1996	0.000	0.528	2.442	0.314	0.063	0.000	0.000	0.000	3.347	1.054
1997	0.119	1.816	1.735	0.274	0.081	0.000	0.000	0.000	4.025	1.183
1998	0.154	3.696	0.433	0.231	0.077	0.000	0.000	0.000	4.590	0.973
1999	0.037	1.426	3.265	0.243	0.036	0.000	0.000	0.000	5.006	1.763
2000	0.000	1.772	2.449	0.198	0.116	0.000	0.000	0.000	4.535	1.444
mean	0.614	5.590	5.682	3.302	1.032	0.386	0.081	0.038	16.723	4.481

Table D4b. Survey indices of southern New England yellowtail abundance and biomass.

NEFSC Fall Survey					Age					
Year	1	2	3	4	5	6	7	8+	Total	kg/tow
1963	19.798	20.168	14.960	5.830	0.660	0.151	0.000	0.100	61.667	16.842
1964	22.529	31.952	5.861	8.701	3.983	1.108	0.000	0.000	74.133	19.03
1965	13.231	21.390	7.771	2.140	2.167	0.155	0.000	0.090	46.944	12.675
1966	43.305	13.066	2.375	1.247	0.231	0.000	0.000	0.000	60.224	9.431
1967	22.497	31.159	13.716	1.936	0.472	0.079	0.160	0.000	70.019	14.057
1968	11.285	13.352	22.860	1.443	0.115	0.000	0.000	0.000	49.055	10.062
1969	14.481	11.884	33.861	6.351	0.113	0.050	0.050	0.000	66.791	14.401
1970	5.157	6.736	19.936	12.961	3.067	0.520	0.089	0.000	48.466	10.965
1971	7.748	13.298	7.618	18.468	3.287	0.264	0.196	0.000	50.879	11.632
1972	5.135	20.125	24.054	22.993	14.991	2.050	0.054	0.000	89.402	20.114
1973	1.726	1.590	2.224	1.640	1.241	1.057	0.212	0.000	9.689	2.264
1974	1.216	2.047	0.676	2.776	1.166	0.489	0.238	0.093	8.701	2.141
1975	1.981	0.516	0.266	0.329	0.334	0.000	0.104	0.000	3.531	0.715
1976	3.632	7.331	0.877	0.088	0.139	0.361	0.423	0.189	13.041	2.962
1977	1.759	2.275	0.828	0.053	0.046	0.113	0.078	0.000	5.151	1.501
1978	3.247	7.599	0.450	0.392	0.043	0.009	0.079	0.032	11.851	3.057
1979	1.794	4.533	2.537	0.388	0.043	0.041	0.000	0.000	9.335	2.565
1980	1.463	4.506	1.202	0.426	0.000	0.000	0.000	0.000	7.597	1.957
1981	4.704	8.944	1.404	0.334	0.080	0.061	0.000	0.000	15.527	3.789
1982	2.610	29.372	8.673	1.025	0.409	0.000	0.000	0.000	42.088	8.126
1983	4.582	17.956	10.078	0.876	0.073	0.000	0.050	0.000	33.616	6.515
1984	0.719	2.217	2.400	0.659	0.000	0.000	0.000	0.000	5.994	1.365
1985	1.018	0.447	0.161	0.122	0.000	0.000	0.000	0.000	1.748	0.438
1986	0.826	1.685	0.365	0.088	0.000	0.000	0.000	0.000	2.963	0.883
1987	1.515	0.674	0.558	0.047	0.037	0.000	0.037	0.000	2.868	0.607
1988	1.261	0.388	0.173	0.195	0.048	0.000	0.000	0.000	2.065	0.496
1989	0.000	8.004	1.400	0.065	0.000	0.000	0.000	0.000	9.469	2.359
1990	0.000	0.097	2.395	0.270	0.000	0.000	0.000	0.000	2.763	0.974
1991	0.865	0.219	1.709	0.453	0.000	0.000	0.000	0.000	3.247	1.013
1992	0.261	0.062	0.180	0.337	0.012	0.000	0.000	0.000	0.852	0.229
1993	0.070	0.015	0.028	0.020	0.000	0.000	0.000	0.000	0.133	0.053
1994	0.754	0.553	0.198	0.192	0.085	0.011	0.000	0.000	1.793	0.374
1995	0.180	1.306	0.171	0.095	0.000	0.000	0.000	0.000	1.752	0.432
1996	0.653	0.290	0.258	0.025	0.000	0.000	0.000	0.000	1.226	0.266
1997	0.889	0.716	1.687	0.373	0.037	0.000	0.000	0.000	3.702	1.041
1998	1.384	2.141	0.188	0.076	0.000	0.036	0.000	0.000	3.824	0.899
1999	0.189	0.119	0.116	0.000	0.000	0.000	0.000	0.000	0.424	0.101
mean	5.526	7.804	5.249	2.525	0.889	0.177	0.048	0.014	22.231	5.036

Table D4c. Survey indices of southern New England yellowtail abundance and biomass.

NEFSC Winter Survey

	Age									
Year	1	2	3	4	5	6	7	8+	Total	kg/tow
1992	0.000	2.884	1.881	6.418	1.295	0.000	0.000	0.000	12.478	4.402
1993	1.349	3.853	0.711	1.841	0.306	0.000	0.000	0.000	8.060	1.968
1994	0.586	17.778	1.363	2.917	1.258	0.199	0.000	0.000	24.101	6.809
1995	0.368	7.615	4.474	1.317	0.493	0.123	0.036	0.000	14.426	4.059
1996	0.092	2.304	11.703	1.552	0.207	0.109	0.033	0.000	16.000	5.159
1997	0.301	3.976	9.141	2.625	0.508	0.000	0.000	0.000	16.551	5.831
1998	0.267	3.160	1.210	0.365	0.000	0.000	0.041	0.000	5.043	1.281
1999	0.550	10.699	14.210	0.528	0.176	0.000	0.000	0.000	26.163	8.874
1999	0.246	4.540	4.341	1.296	0.000	0.000	0.000	0.000	10.422	3.330
mean	0.418	6.312	5.448	2.095	0.471	0.048	0.012	0.000	14.805	4.635

Scallop Survey

Year	age-1
1982	0.584
1983	0.891
1984	0.205
1985	0.647
1986	0.282
1987	0.601
1988	1.343
1989	0.169
1990	0.026
1991	1.060
1992	0.411
1993	0.419
1994	1.265
1995	0.551
1996	0.608
1997	2.744
1998	1.227
1999	1.270
mean	0.795

Table D5. Projection of southern New England yellowtail flounder VPA with 1999 landings.

INPUT ASSUMPTIONS

Age	1	2	3	4	5	6	7+
Stock Wt.	0.130	0.318	0.398	0.473	0.636	0.785	0.850
Landed Wt.	0.254	0.326	0.398	0.475	0.639	0.783	0.830
Discard Wt.	0.13	0.28	0.4	0.53	0.69	0.79	0.71
Maturity	0.13	0.74	0.98	1.00	1.00	1.00	1.00
PR	0.01	0.12	0.53	1.00	1.00	1.00	1.00
% Discard	1.00	0.44	0.17	0.15	0.25	0.31	0.20

LANDINGS FOR F-BASED PROJECTIONS

YEAR	AVG LANDINGS (000 MT)	STD
1999	0.688	0.000

SPAWNING STOCK BIOMASS (THOUSAND MT)

YEAR	AVG SSB (000 MT)	STD
1999	5.496	1.123

PERCENTILES OF SPAWNING STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1999	3.348	3.939	4.134	4.695	5.414	6.140	7.045	7.520	8.637

ANNUAL PROBABILITY THAT SSB EXCEEDS THRESHOLD: 10.000 THOUSAND MT

YEAR	Pr(SSB > Threshold Value)
1999	0.000

MEAN BIOMASS (THOUSAND MT) FOR AGES:1 TO 7

YEAR	AVG MEAN B (000 MT)	STD
1999	7.117	3.043

PERCENTILES OF MEAN STOCK BIOMASS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1999	3.586	4.357	4.736	5.436	6.449	7.603	9.637	12.616	17.786

ANNUAL PROBABILITY THAT MEAN BIOMASS EXCEEDS THRESHOLD: 61.500 THOUSAND MT

YEAR	Pr(MEAN B > Threshold Value)
1999	0.000

F WEIGHTED BY MEAN BIOMASS FOR AGES:1 TO 7

YEAR	AVG F_WT_B	STD
1999	0.135	0.038

PERCENTILES OF F WEIGHTED BY MEAN BIOMASS FOR AGES:1 TO 7

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1999	0.040	0.069	0.088	0.115	0.134	0.159	0.181	0.193	0.225

RECRUITMENT UNITS ARE:1000. FISH

BIRTH YEAR	AVG RECRUITMENT	STD
1999	28598.914	36179.477

PERCENTILES OF RECRUITMENT UNITS ARE:1000. FISH

BIRTH YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1999	1120.702	2422.346	3578.866	7311.790	15912.085	34470.023	68069.242	100635.180	184369.031

DISCARDS FOR F-BASED PROJECTIONS

YEAR	AVG DISCARDS (000 MT)	STD
1999	0.179	0.010

PERCENTILES OF DISCARDS (000 MT)

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1999	0.160	0.165	0.167	0.172	0.178	0.183	0.190	0.197	0.208

REALIZED F SERIES FOR QUOTA-BASED PROJECTIONS

YEAR	AVG F	STD
1999	0.314	0.066

PERCENTILES OF REALIZED F SERIES

YEAR	1%	5%	10%	25%	50%	75%	90%	95%	99%
1999	0.186	0.215	0.234	0.269	0.300	0.364	0.393	0.423	0.505

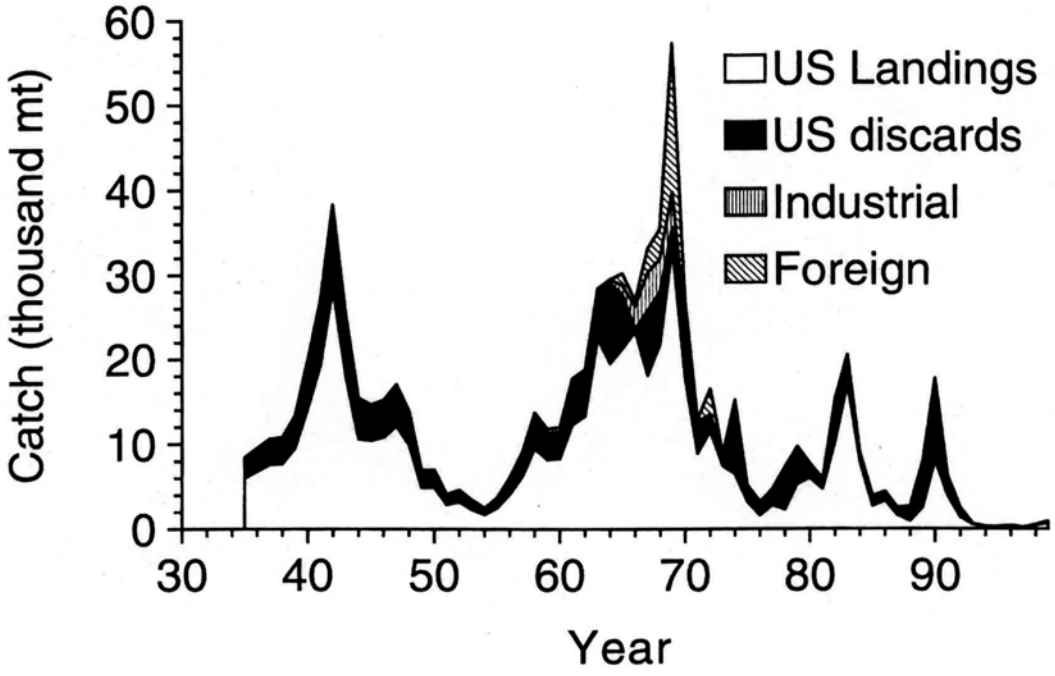

Figure D1. Total catch of southern New England yellowtail flounder.

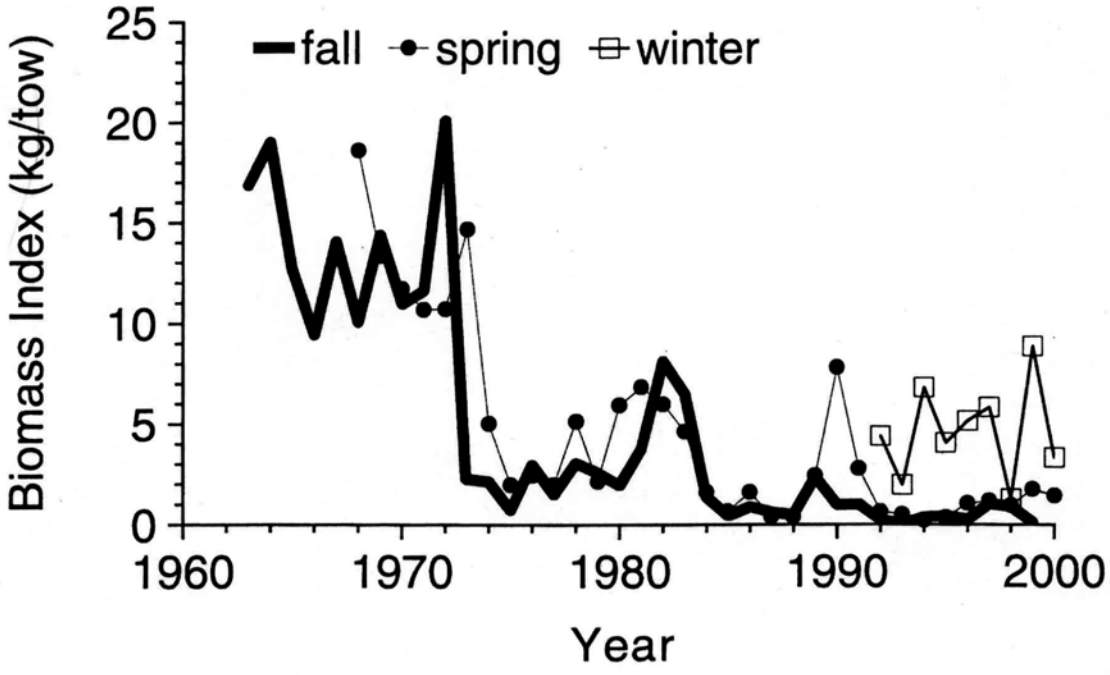

Figure D2. Survey indices of southern New England yellowtail flounder biomass.

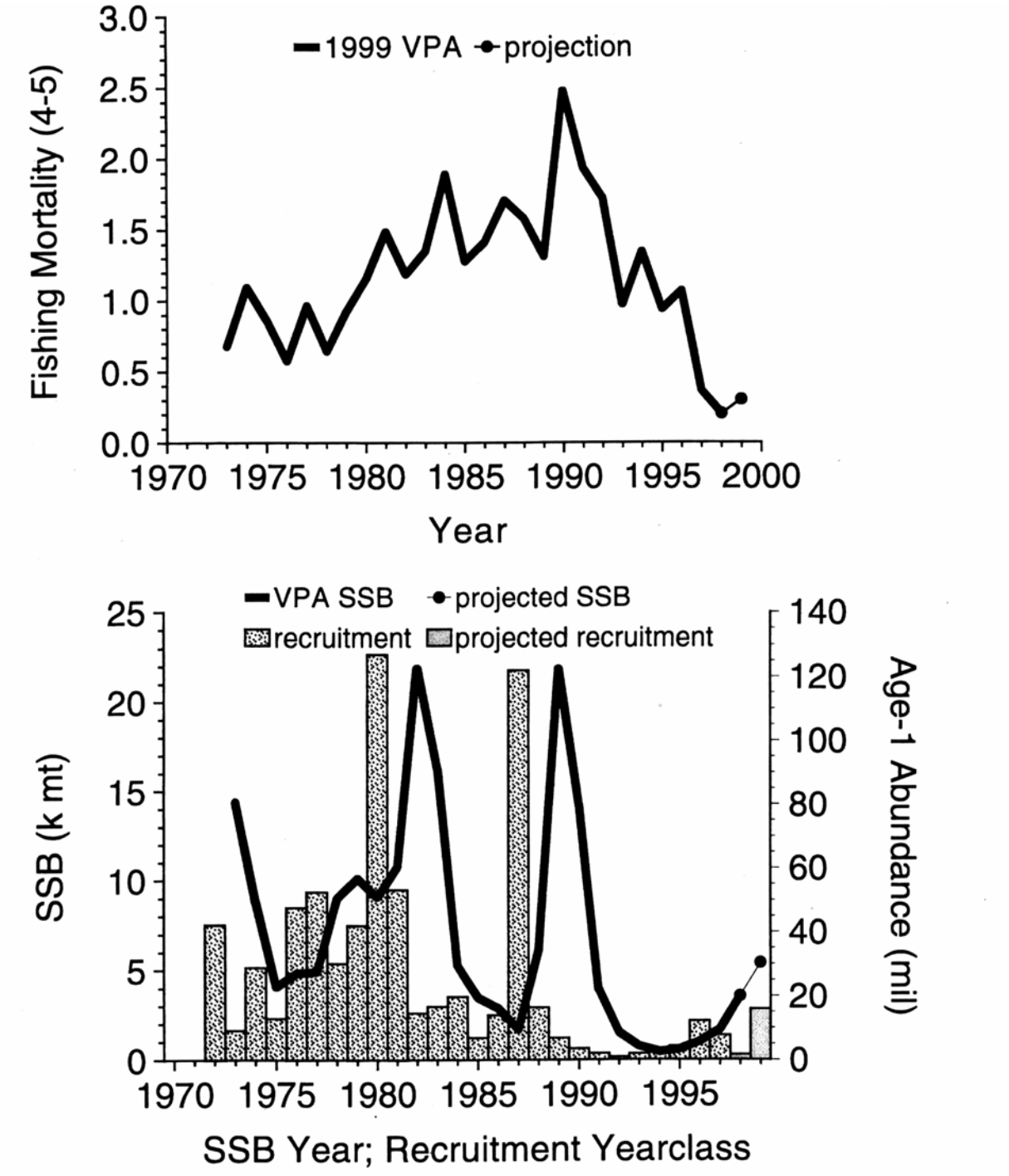

Figure D3. Summary of southern New England yellowtail VPA results from the 1999 assessment with revised projections.

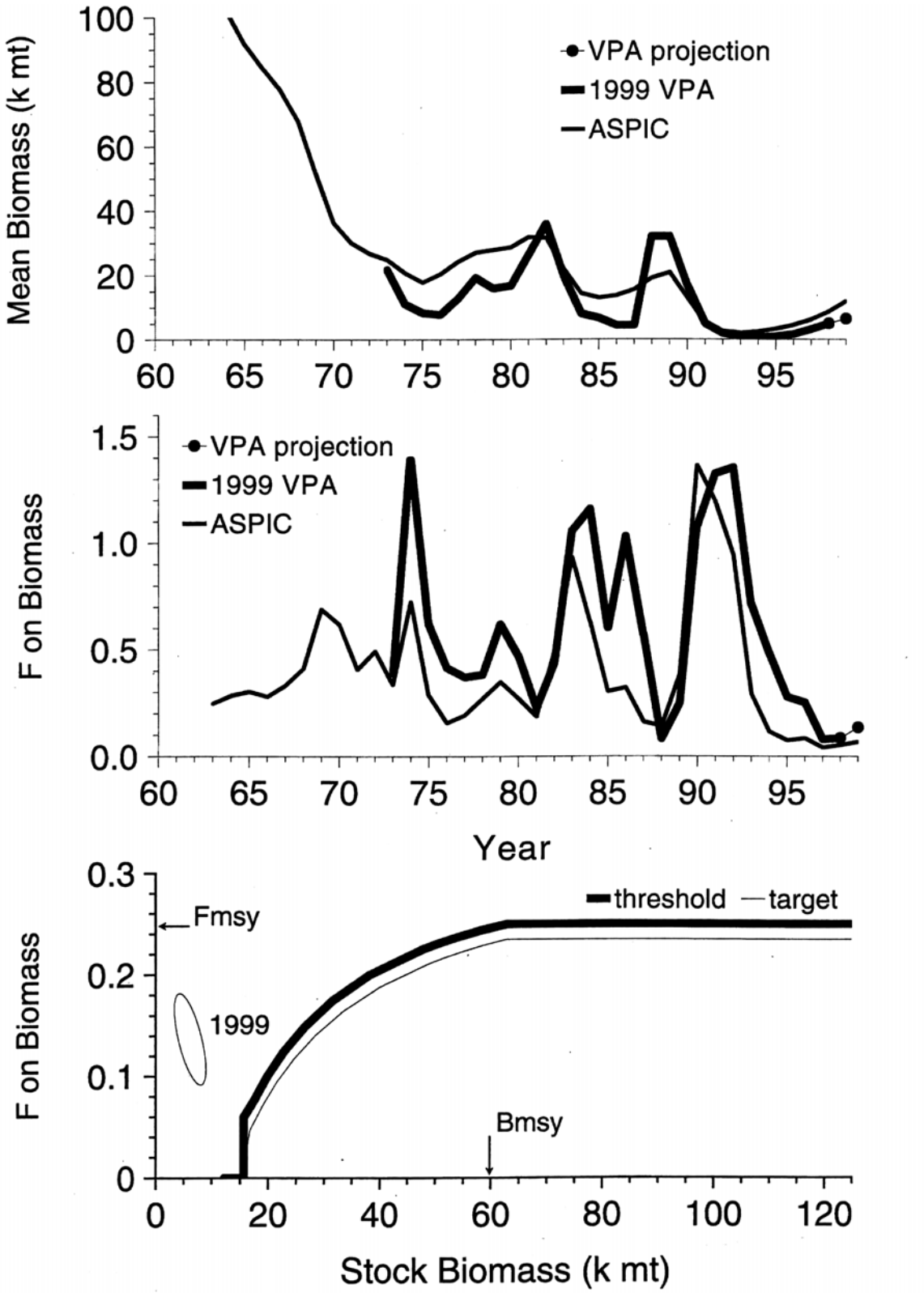

Figure D4. Mean biomass of southern New England yellowtail flounder (upper panel), F on biomass (middle panel), and stock status showing 80% confidence ellipse from projected VPA (lower panel).