

Atlantic States Marine Fisheries Commission
Striped Bass Technical Committee

**2000 Advisory and Summary Reports on the
Status of the Atlantic Striped Bass**

August 2000

2000 Atlantic Striped Bass Advisory Report

State of the Stock

Stock Size: Results from the virtual population analysis (1982-99) indicate that stock size (numbers of age-1+ striped bass) estimated for January 1, 2000 was 33.8 million fish which is slightly lower than the average stock size (35.8 million striped bass) for the previous six years. The 1993 year class as age 7 in January 2000 has been reduced to an average level of abundance, but this estimate is subject to inherent uncertainties of the terminal year of the virtual population analysis (VPA). The terminal year abundance of the 1996 year class is relatively low but not fully recruited to the fishery.

Stock Biomass: For 1999, the average biomass level of 145 million pounds exceeded the 1995 level of 137 million pounds but was 8.4% lower than the average biomass level for the previous three years (1996-98).

Spawning Stock Biomass (SSB): The biomass of the spawning stock (females only) was estimated as 39.9 million pounds in 1999, compared to 32.9 million pounds in 1995. The average SSB estimate for 1996-98 was 43.4 million pounds. (Note: Need bootstrap probability estimates of SSB from John).

Recruitment: The strength of the 1999 year class was, on average, greater than the time-series average (1989-99) of recruitment strength. The Virginia young of year index was lower than the time series average, but the Maryland, New York and New Jersey indexes of recruitment strength were above the time series average.

Fishing Mortality Rates: Based on the most recent (1999) VPA results, the average unweighted F on ages 4-13 was 0.32 for 1999 and 1998. The target F for this age grouping is 0.31 and the overfishing definition is $F = 0.38$. The fishing mortality rate on age-8+ striped bass was 0.33 in 1999 and 0.33 in 1998, based on this updated VPA.

Average F derived from four tagging programs (New Jersey-Delaware Bay; New York ocean haul seine; Virginia Rappahannock and Delaware-Delaware River) in 1999 was 0.25, for 28-inch and larger striped bass. The technical committee determined that a comparison of this tag-based F (0.25) to the VPA-based F (weighted by N) on age 7-10 striped bass was appropriate, and the VPA-based F, weighted by N, on age 7-10 striped bass was 0.30.

An F of 0.31 was determined from the 1999 Chesapeake Bay direct enumeration of F study. The target $F = 0.28$. The 1999 F estimate reflects a downgrading of the reporting rate from its 1993 estimate of 0.751 to 0.64, as a result of a high-reward tag study conducted in conjunction with the 1999 program. (Note: Need bootstrap probability estimates of F from John)

Catch: Almost 60% of the total 1999 recreational landings (1.33 million fish) were from the age 4-8 group, with 21% of the landings represented by the 1993 year class (age). Ages 4-6 represented 66% of the 1999 commercial landings of 1.1 million striped bass. Catch (landings plus discard estimates, in numbers) were 2.36 million striped bass from recreational fisheries (or 62% of the total catch) and 1.46 million striped bass from commercial fisheries. The total catch was 3.82 million striped bass in 1999 and lower than the previous two years, when 4.4 (1998) and 4.1 million striped bass (1997) comprised the total catch. Total discards (recreational and commercial) represented 36% of the total catch.

Data: Twelve surveys (six are multi-age collections) contributed 55 separate tuning indexes to this VPA update. The technical committee will continue to assess the utility of additional surveys, such as the NMFS trawl survey, for inclusion in future VPA runs. Compared to last year's VPA (through data year 1998), changes to the suite of tuning indexes included the lumping of the 5-7 age group of striped bass collected from the Hudson shad survey and the first-time inclusion of a Hudson spawning stock survey of striped bass (ages 5-6).

Uncertainty was associated with the estimates of discards, lack of poaching estimates and lack of MRFSS estimates of catch in some inland area. For example, commercial discards (roughly 358,000 striped bass) were estimated using tag recovery data relative to recreational discards by area. This method was used for the estimation of commercial discards in 1997 and was employed again for 1999, as there are insufficient sea sampling surveys for use as a more direct estimate of commercial discards.

Management Advice: The technical committee finds that the 1999 $F = 0.32$ on ages 4-13 is not statistically distinct from the target $F = 0.31$. The technical committee also finds that the F on age 8+ (ages 8 - 13) striped bass of 0.33 does not warrant further reductions in F on these ages in 2001, given the current overfishing definition ($F_{MSY} = 0.38$). At the same time, this current reference point is subject to change, by the time of completion of Amendment No. 6.

The technical committee will explore additional analyses (e.g. the relationship of landings to tag-based exploitation rates) in an attempt to corroborate the relatively flat stock growth in recent years.

2000 Atlantic Striped Bass Summary Report

The ASMFC Striped Bass stock assessment subcommittee and Technical Committee met in August 2000 to evaluate the status of the striped bass resource. The assessment includes the Hudson, Delaware, Chesapeake and mixed coastal stocks. The first analytical assessment using virtual population analysis (VPA) was conducted in 1997 (for years 1982-1996) and reviewed by the 26th Stock Assessment Review Committee (SARC) at the Northeast Fisheries Science Center. The results of the review were reported in the proceedings of the 26th Northeast Regional Stock Assessment Workshop (26th SAW): SARC Consensus Summary of Assessments (NEFSC Ref. Document 98-03). The current assessment represents an update with the inclusion of the 1999 catch and survey data.

Commercial Fishery

Commercial landings in 1999 totaled 1,103,812 fish and 6,483,225 pounds (2941 mt) (Table 1, Table 2). The landings represent a decline of 120,016 fish and increase of 9,423 pounds compared to 1998. Maryland and Virginia account for most of the commercial harvest (Table 3). Overall, commercial landings represented 46% by number and 33% by weight of total harvest removals in 1999, and 28 % by number of the total catch.

Commercial discards were estimated in the same manner as in previous years, using tag recovery data relative to recreational discards by area. Catch by gear was also based on tag data and gear specific discard rates were applied to total discard estimates. Total discards losses were estimated as 357,178 fish, representing 9% of total removals (Table 2, Table 4).

Total annual commercial harvest has stabilized at just over 1 million fish over the last 3 years, while estimated discards continues to fluctuate between 200,000 and 500,000 fish (Table 7, Table 8).

Recreational Fishery

Recreational statistics were collected as part of the MRFSS program. Landings (A+B1) in 1999 were 1,328,665 fish totaling 13,218,936 pounds (5996 mt) (Table 1, Table 2). The landings represent an increase of 5,141 fish and an increase of 869,980 pounds compared to 1998. The states landing the largest proportion of the recreational harvest were New Jersey, New York, Massachusetts, Virginia, and Maryland (Table 5). Overall, recreational landings represented 54% by number and 67% by weight of the reported harvest, and 35% by number of total catch.

Recreational discards (B2's) decreased in 1999 to 12,514,721 fish (Table 2). Applying a hooking mortality rate of 0.08 resulted in an estimated loss from hooking mortality of 1,031,454 fish (Table 6). The states with the largest proportion of the overall discards were Massachusetts, Maryland, New York, and New Jersey. Recreational discards represented 27% by number of the total catch.

Total recreational discard and harvest losses increased sharply between 1994 and 1997, and have fluctuated without a strong trend since 1996 (Table 9).

Indices of Abundance

Fishery Independent Indices

The Maryland gillnet survey of spawning biomass has generally declined over the last 4 years and is about 200 units below the time series average (Figure 1). The New York ocean haul seine index increased significantly in 1997, but dropped somewhat in 1998 and dropped sharply in 1999 (Figure 2).

Juvenile indices from the Chesapeake Bay (Maryland and Virginia) showed below average recruitment in 1999

(Figure 3), and appear to be fluctuating without any strong trend since the mid-1990's. However, indices of the Hudson and Delaware stocks showed above average recruitment in 1999 (Figure 4), and are maintaining the increasing trend exhibited since 1991.

The Maryland age 1 index was slightly above average in 1999, and reflects only a slight upward trend over the last few years (

Figure 5). The Long Island age 1 index is significantly above average for 1999 and exhibits a strong increasing trend over most of the series (

Figure 5)

Fishery Dependent Indices

The Massachusetts commercial catch per hour fished dropped slightly in 1999, following 2 years of peak values (Figure 7). The Connecticut volunteer angler catch per trip decreased in 1999 to about the 1995 level, and appears to be fluctuating randomly between 5.5 and 7.5 over the last 5 years (Figure 8).

Previous assessments included bycatch of striped bass in the Hudson River shad fishery as an age-specific index. However, because model diagnostics indicated significant annual correlations in catches at age, the survey was aggregated and tuned to the overall abundance of ages 5-7 for the 2000 assessment. In addition, a Hudson River index of spawning stock abundance was added. These surveys fluctuate sharply during the mid-1990's and may now be leveling off, although values for 1999 are not available for either survey (Figure 10).

Assessment Results

Catch at Age

A catch at age matrix was developed using the same methods described for the 1996 assessment (NEFSC Lab Ref 98-03). Commercial landings at age were based on reported landings by state and associated age/length information. Commercial discard age data was from fishery dependent data and independent surveys using comparable gear. Recreational landings at age were based on a combination of MRFSS length samples, volunteer angler logbooks and ALS lengths of released fish. Age composition of recreational discards were determined from angler logbooks and ALS data.

The predominant age in the catch matrix was age 6, the strong 1993 year class, followed closely by ages 4 and 5 (Table 11). 1999 is the third year in a row in which the 1993 year class has dominated the catch.

Weight at Age

Weight at age from 1996 fishery data was used in the 1999 assessment. Details of developing weights at age can be found in NEFSC Lab Ref. 98-03.

Indicators of Model fit and precision of estimates

The ADAPT program with iterative re-weighting was used for the striped bass VPA. The model resulted in an overall mean square residual of 0.0114 and coefficients of variation for terminal population estimates ranging from 0.24 (age 10) to 0.38 (age 1) (Table 12). Each survey used to tune the VPA contributes to the overall variance in the model, and the amount of the total variance attributable to an index is indicated by its partial variance (PV) (Table 12, Table 13). Surveys or particular ages of surveys with high PV's are often deleted from assessment runs because they are contributing little additional information. However, since this assessment is a compilation of several stocks, iterative re-weighting is used to reduce the influence of high PV surveys while still retaining the information they may provide on the abundance of particular stock components. Most surveys of ages 2-10 abundance had initial partial variances below 1.5, while several indices of older ages had significantly higher partial variances (Table 13). Iterative re-weighting reduces the overall influence of surveys with high variance, and results in all surveys contributing equally to the overall variance (Table 14).

Fishing Mortality

Fishing mortality (F) was fairly stable between 1998 and 1999 (Table 15,

Figure 12). The revised 1998 average F for ages 4 to 13 was 0.32. The 1999 average F for ages 4-13 was also 0.32. The mortality on younger bass (ages 3-8) increased from 0.27 in 1998 to 0.30 in 1999. For individual cohorts, F ranged from 0.03 on age 2 to a high of 0.43 on age 6. In 1999, the 1993 cohort was subjected to the highest

fishing mortality.

Partial Recruitment

Maximum abundance in the catch at age data was age 6, which is also reflected in the full recruitment from the back-calculated partial recruitment occurring at age 6. The PR was similar to the exploitation pattern for 1998 (Table 17), although the age of full recruitment dropped back to age 6 in 1999 after increasing to age 13 in 1998.

Population Abundance

Population abundance (stock size as of January 1, 2000) declined from 36.2 million in 1999 to 33.8 million in 2000 (

Figure 12). The 1998 year class dominates the population, representing about 24% of the total abundance (Table 19). After entering the population with the highest observed abundance at age 1, the 1993 cohort is now estimated at about average abundance at age 7. Recruitment of age 1 fish in 1999 (1998 cohort) was 9.5 million fish, above the 1990-1999 average of 8.1 million. Recruitment of the 1999 cohort appears somewhat below average, although the estimate is uncertain at this time.

Spawning Stock Biomass

Female SSB increased from the low of 1.9 thousand mt (4.2 million pounds) in 1982 to a peak of 20.2 thousand mt (44.6 million pounds) in 1997, and has since dropped to 18.1 thousand mt (40 million pounds) in 1999 (Table 20, Figure 14).

Precision Estimates of F and SSB

Uncertainty in the results of the terminal year estimate of F and SSB in the VPA was evaluated using a bootstrap re-sampling algorithm. Five hundred iterations were made to obtain standard errors, coefficients of variation (CV) and bias estimates for stock size estimates of ages 1-15 at the beginning of 2000, fishing mortality of ages 1-15 in 1999, and spawning stock biomass of females on January 1, 2000 (Table 21). Results indicate an 80% probability that F on the fully recruited ages (ages 7-14 as listed in the input specifications) was between 0.27 and 0.36 (Figure 15). The estimate of bias was less than 5% for ages 1-12. The bootstrap mean of the fully-recruited F in 1999 was 0.32 with a 2.4% bias and a CV of 0.31. The 1999 SSB of females was between 16,115 mt and 19,912 mt, with a probability of 80% (Figure 16).

Retrospective Patterns

A retrospective analysis was conducted on the VPA results back to 1995 to determine if there exists a trend in estimation of F or total abundance in the terminal year. The analysis revealed no consistent trend, although there was a slight tendency to over-estimate F in the terminal year in the 1996 to 1998 terminal F's and to significantly under-estimate F in the 1995 terminal year (Figure 18). Age 2+ abundance was over-estimated for the 1998 terminal year, but under-estimated for the 1995 to 1997 terminal years. (Figure 19).

Biological Reference Points

The Technical Committee has devoted significant time and effort over the last 6 months to developing updated biological reference points. However, the evaluation has not been completed at this time and the committee is continuing work on this issue. The current reference points remain at 0.38 for F_{msy}, the overfishing definition, and a target of 0.31 (0.28 in producer areas with an 18" minimum). The point estimate of fishing mortality in 1998 and 1999 is right around the reference threshold (Figure 20).

Table 1. Total Atlantic Coast landings of striped bass in metric tons from 1982 to 1999.

Year	<u>Commercial</u>		<u>Recreational</u>		<u>Total</u>	
	MT	N	MT	N	MT	N
1982	992	428,630	1144	217,257	2136	645,887
1983	639	357,541	1217	299,445	1856	656,986
1984	1104	870,871	579	114,462	1683	985,333
1985	4312	174,621	372	133,523	804	308,144
1986	68	17,681	501	114,621	569	132,302
1987	63	13,552	388	43,755	451	57,307
1988	116.5	33,310	570	86,358	687	119,668
1989	90.7	7,402	332	37,562	423	44,964
1990	313	115,636	1010	163,241	1323	278,877
1991	460	153,798	1651	262,082	2111	415,880
1992	638	230,714	1823	299,209	2461	529,923
1993	777	312,860	2563	428,456	3340	741,316
1994	805	307,443	3084	557,738	3889	865,181
1995	1555	534,914	5080	1,077,819	6635	1,612,733
1996	2178	763,183	6620	1,159,081	8798	1,922,264
1997	2679	1,058,181	7234	1,468,142	9913	2,526,323
1998	2936	1,223,828	5849	1,323,524	8785	2,547,352
1999	2941	1,103,812	5996	1,328,665	8921	2,432,477

Table 2. Total 1999 striped bass discard and harvest in numbers by fishery component.

Fishery Component	Discard	Discard Losses	Harvest	Total
Recreational	12,514,721	1,031,454	1,328,665	2,360,119
Commercial		357,178	1,103,812	1,460,990
Sampling			3,577	3,577
Total		1,388,632	2,436,055	3,824,686

Table 3. Atlantic Coast striped bass commercial harvest in numbers at age by state, 1999.

STATE	AGE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 Total	
Maine																
New Hampshire																
Massachusetts						171	623	2,375	11,237	12,405	7,320	4,278	1,313	796	319	40,838
Rhode Island				376	1,656	3,101	1,408	642	968	1,183	892	747	281	181	125	11,559
Connecticut																
New York			92	1,478	6,282	19,956	10,347	6,744	2,679	1,201	739	185		92		49,795
Hudson																
New Jersey																
Delaware			567	2,970	9,551	17,474	3,096	678	253	126	126					34,841
Maryland	7,344	86,713	162,693	178,757	144,024	36,745	13,153	11,097	4,407	2,614	1,585	505	327	58		650,022
PRFC		3,948	37,449	47,699	1,479											90,575
Virginia		2,677	28,754	31,360	49,720	23,734	16,655	19,395	13,093	11,339	2,952	4,733	439	292		205,143
North Carolina							803	7,005	9,148	2,972	976	136				21,040
Total	7,344	93,998	233,720	275,305	235,925	76,755	47,252	54,777	35,387	24,006	9,883	6,832	1,836	795		1,103,812

Table 4. Estimated Atlantic Coast commercial discard losses at age for 1999.

Year	AGE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1999	709	119,621	86,623	55,876	72,306	10,894	3,944	2,730	1,519	1,264	541	886	266			357,178

Table 5. Total Atlantic Coast striped bass recreational landings in numbers at age by state, 1999.

STATE	AGE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 Total	
Maine		0	1,400	7,131	5,297	6,200	949	52	10	16	20	18	4	4	2	21,102
New Hampshire		0	0	0	7	54	155	443	1,296	1,398	690	494	105			4,641
Massachusetts				410	3,853	10,938	14,313	18,605	29,978	28,852	15,279	9,534	4,238	1,567	623	138,190
Rhode Island	0	0	0	216	2,063	4,921	5,795	6,606	9,750	11,163	5,919	5,458	4,036	337	53	56,318
Connecticut				915	594	3,841	11,449	10,883	7,966	4,611	8,151	4,041	1,588	1,632	142	55,813
New York	0	0	0	4,044	12,905	61,047	46,713	28,831	15,225	9,020	10,676	2,961	914	1,797	3,539	197,672
Hudson	N/A															
New Jersey	0	0	0	2,618	18,207	34,483	51,078	46,284	33,304	23,500	14,971	5,668	2,432	3,507	958	237,009
Delaware					49	270	267	1,115	1,853	3,073	1,693	175	189	59	29	8,772
Maryland	0	1,552	37,986	63,503	58,935	54,613	16,651	11,729	6,278	3,088	3,994	1,515	486	653	0	260,981
Virginia	0	0	11,560	70,410	58,912	89,985	31,699	12,343	10,785	5,413	4,255	2,080	2,668	1,016	241	301,368
North Carolina	0	0	69	2,746	2,109	13,978	9,273	8,615	4,415	2,820	1,036	612	1,118	0	8	46,799
Total	0	1,552	51,014	151,994	162,932	280,328	188,342	145,506	120,860	92,954	66,683	32,556	17,778	10,572	5,595	1,328,665

Table 6. Total Atlantic Coast striped bass recreational discard losses in numbers at age by state, 1999.

STATE	AGE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Maine		216	26,213	12,508	3,636	4,798	1,714	1,074	849	595	245	107	23	5	3	51,985
New Hampshire		144	4,140	2,364	1,257	1,769	586	327	368	347	194	116	28	13	5	11,658
Massachusetts		34	50,960	86,114	68,992	94,616	31,438	15,328	9,434	6,124	2,295	823	185			366,343
Rhode Island	15	178	7,923	5,591	5,230	7,454	2,071	548	326	253	140	107	31	23	31	29,920
Connecticut	546	7,841	9,480	29,470	7,483	4,857	1,691	2,743	1,050	586	1,089	671	395	132	0	68,034
New York	34	2,239	19,379	16,674	12,639	19,862	10,363	6,402	3,228	1,842	2,540	641	217	432	648	97,140
Hudson	N/A															
New Jersey	166	3,283	10,960	15,645	33,631	29,873	13,175	2,403	1,071	579	298	45	27	14	0	111,169
Delaware	7	141	678	1,140	2,199	2,153	1,469	436	126	57	36	10	2	1	0	8,455
Maryland	1,309	7,380	91,302	49,684	17,504	12,852	3,748	2,670	1,847	718	776	312	183	128	0	190,415
Virginia	6,167	28,975	16,750	10,403	5,283	5,387	1,183	356	184	231	134	54	142	9	0	75,260
North Carolina	36	704	2,075	2,816	6,070	5,894	2,546	515	226	126	54	6	3	2	0	21,074
Total	8,281	51,136	239,859	232,410	163,925	189,515	69,985	32,802	18,708	11,459	7,802	2,891	1,236	759	686	1,031,454

Table 7. Atlantic Coast striped bass commercial landings in numbers at age, 1982-1999.

Year	AGE															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
1982	0	45129	200221	117158	22927	5035	3328	2861	1871	4407	5837	7639	2509	2810	6898	428,630
1983	0	54348	120639	120999	38278	7416	1954	677	607	1690	1314	2375	2656	1856	2733	357,541
1984	0	478268	270140	55598	30580	21688	6441	1744	1020	771	146	279	1096	1042	2058	870,871
1985	0	53699	45492	7545	9448	19248	21569	6581	3692	1514	466	607	493	894	3373	174,621
1986	0	639	6020	3207	180	703	1425	1199	546	182	105	220	288	963	2004	17,681
1987	0	0	3087	4265	1618	252	1104	1075	448	233	95	273	302	235	565	13,552
1988	0	0	2086	3961	15491	6469	2803	539	541	218	266	108	250	41	537	33,310
1989	0	0	0	0	0	139	1111	959	1007	631	475	164	343	444	2129	7,402
1990	0	650	12551	48024	29596	15122	3111	2357	1147	519	272	130	428	322	1407	115,636
1991	0	2082	22430	44723	41048	21614	8546	4412	4816	1163	269	125	80	553	1937	153,798
1992	0	640	32277	58009	46661	41581	22186	11514	8746	6314	1062	464	169	346	745	230,714
1993	0	1848	21073	93868	87447	42112	32485	13829	8396	6420	3955	763	184	76	404	312,860
1994	0	1179	22873	71614	101512	48269	28530	14886	8902	5323	2513	1250	198	68	326	307,443
1995	0	6726	35190	114519	134709	98471	38918	34191	37324	21827	8364	3166	997	363	149	534,914
1996	0	557	50102	127825	179031	161361	120693	51995	29907	18864	11663	9674	2264	1134	1449	766,518
1997	0	335	96860	293511	225218	201397	103129	60000	33262	18888	11811	7861	2753	2178	978	1,058,181
1998	0	3122	65861	209898	526183	192473	70124	59604	44017	25365	14592	5878	3837	1387	1487	1,223,828
1999	0	7344	93998	233720	275305	235925	76755	47252	54777	35387	24006	9883	6832	1836	794	1,103,812

Table 8. Atlantic Coast striped bass commercial discard losses in numbers at age, 1982-1999.

Year	AGE															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1982	0	31,645	3,644	11,456	5,623	1,291	2,397	1,014	369	92	85	0	0	7	0	57,624
1983	0	24,067	1,453	2,878	7,761	2,311	610	610	262	174	0	0	0	0	0	40,127
1984	0	33,575	1,611	5,812	9,734	11,272	2,815	117	586	66	0	52	0	0	0	65,639
1985	0	7,728	30,472	5,939	10,891	3,395	2,742	1,045	261	131	131	0	0	0	0	62,734
1986	0	5,841	20,758	100,067	27,989	13,315	4,295	1,415	346	0	0	0	0	0	0	174,024
1987	0	4,206	14,382	28,597	51,389	16,940	6,520	1,319	1,011	395	111	86	111	0	0	125,066
1988	0	6,142	22,593	36,616	70,959	71,694	23,232	9,116	3,110	1,653	218	195	24	0	0	245,552
1989	0	13,854	50,240	49,029	83,396	82,757	33,479	15,502	6,342	705	1,409	1,409	663	41	0	338,827
1990	0	14,526	68,713	80,935	111,888	115,702	71,600	36,256	5,948	1,539	1,401	1,503	0	0	0	510,011
1991	79	12,632	37,009	64,210	77,335	56,894	36,912	24,857	6,610	4,071	6,542	16	0	0	0	327,167
1992	117	3,698	34,218	36,746	44,412	34,688	14,798	11,179	3,398	2,356	991	0	0	0	0	186,601
1993	0	7,449	50,160	79,011	95,116	63,487	20,941	15,351	9,270	4,606	1,651	536	260	0	0	347,839
1994	0	31,770	47,169	45,081	88,122	84,570	39,229	12,524	6,223	3,674	712	415	30	0	0	359,518
1995	0	72,822	75,520	53,551	94,158	121,592	61,447	19,083	7,569	4,269	2,290	2,346	807	0	0	515,454
1996	0	27,133	114,085	76,336	61,884	58,787	30,835	14,916	6,148	3,989	159	502	50	0	0	394,824
1997	476	7,108	64,352	61,871	30,602	20,951	14,002	6,592	1,963	4,309	2,658	801	1,060	0	0	216,743
1998	779	73531	61019	32999	66639	27891	11719	8778	6714	1570	1076	1041	436	985	9	295,186
1999	709	119,621	86,623	55,876	72,306	10,894	3,944	2,730	1,519	1,264	541	886	266			357,178

Table 9. Atlantic Coast striped bass recreational harvest and discard losses in numbers at age, 1982-1999.

Year	AGE															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
1982	1,814	28,845	52,952	92,428	29,946	12,883	18,530	12,956	9,474	6,107	5,106	6,043	940	1,279	1,236	280,539
1983	3,633	31,984	56,270	69,420	104,214	29,626	16,185	2,843	2,031	1,849	3,275	3,277	2,225	2,208	1,884	330,924
1984	5,623	31,241	31,279	21,241	20,276	18,922	9,122	2,837	516	1,255	553	6	1,098	3,233	2,685	149,886
1985	1,316	11,143	26,092	27,099	38,507	20,540	19,283	9,694	2,406	1,766	449	221	29	24	5,530	164,100
1986	11,387	14,599	37,242	29,744	21,834	18,041	14,717	21,486	8,339	5,102	3,265	1,351	590	1,569	4,735	194,001
1987	1,396	6,846	20,573	18,940	14,545	8,010	5,694	4,180	5,026	2,403	1,267	1,641	2,948	1,889	7,105	102,462
1988	2,559	24,674	17,031	22,584	20,595	19,700	14,524	14,717	10,316	3,892	3,183	2,941	2,147	2,983	3,555	165,400
1989	756	22,962	30,508	19,929	22,298	13,007	11,466	4,734	3,188	2,512	1,400	406	943	1,164	3,315	138,588
1990	2,685	39,273	54,639	74,451	40,129	43,433	37,140	37,002	17,199	6,574	4,284	2,370	4,452	3,889	6,219	373,740
1991	1,862	63,176	93,276	108,462	47,356	24,924	49,841	58,316	51,447	20,495	8,003	2,841	2,765	2,990	15,723	551,476
1992	3,156	46,750	150,251	106,592	97,107	37,524	28,701	50,876	52,176	40,748	8,179	4,069	1,754	5,167	9,646	642,694
1993	318	66,842	126,374	171,106	117,375	88,383	36,698	42,272	71,921	72,141	39,358	8,893	4,552	1,215	12,548	859,996
1994	5,689	113,146	280,451	174,987	179,180	100,145	68,078	59,643	85,264	72,395	32,984	20,761	3,150	1,464	9,473	1,206,809
1995	3,705	335,174	336,232	270,013	156,813	241,875	100,806	132,801	103,028	60,283	40,142	10,561	7,451	1,508	3,195	1,803,588
1996	533	71,118	495,306	462,266	311,126	256,759	305,638	150,821	107,214	48,807	32,422	38,152	10,885	3,546	1,168	2,295,762
1997	2,052	279,888	326,120	494,121	362,905	376,245	298,425	315,964	172,701	102,545	47,340	22,251	9,185	5,694	3,925	2,819,361
1998	25,984	216,881	426,583	439,833	633,120	314,055	205,573	194,676	164,437	83,538	76,336	36,766	29,957	13,414	15,806	2,876,959
1999	8,281	52,688	290,874	384,404	326,857	469,843	258,326	178,307	139,567	104,413	74,485	35,447	19,014	11,331	6,282	2,360,119

Table 11. Total Atlantic Coast striped bass catch in numbers at age, including estimated commercial and recreational discard losses, 1982-1999.

Year	AGE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
1982	1,814	105,619	256,817	221,042	58,496	19,209	24,255	16,831	11,714	10,606	11,029	13,682	3,449	4,096	8,134	766,793
1983	3,633	110,399	178,362	193,297	150,253	39,353	18,750	4,131	2,899	3,713	4,589	5,652	4,881	4,064	4,617	728,591
1984	5,623	543,083	303,030	82,651	60,589	51,881	18,377	4,698	2,122	2,092	699	336	2,194	4,275	4,743	1,086,395
1985	1,316	72,570	102,057	40,584	58,846	43,183	43,594	17,319	6,359	3,411	1,045	828	522	918	8,903	401,455
1986	11,387	21,078	64,020	133,018	50,004	32,058	20,437	24,099	9,231	5,284	3,370	1,571	878	2,532	6,739	385,707
1987	1,396	11,052	38,041	51,802	67,552	25,202	13,318	6,573	6,485	3,030	1,473	2,000	3,361	2,124	7,670	241,080
1988	2,559	30,816	41,710	63,162	107,045	97,864	40,559	24,372	13,967	5,762	3,668	3,243	2,420	3,024	4,092	444,262
1989	756	36,816	80,747	68,958	105,694	95,903	46,056	21,196	10,537	3,848	3,284	1,979	1,949	1,649	5,444	484,816
1990	2,685	54,450	135,904	203,410	181,612	174,257	111,851	75,614	24,294	8,631	5,957	4,003	4,880	4,211	7,626	999,387
1991	1,941	77,890	152,715	217,394	165,739	103,432	95,299	87,585	62,873	25,729	14,814	2,982	2,845	3,543	17,660	1,032,441
1992	3,273	51,088	216,746	201,347	188,180	113,792	65,685	73,569	64,320	49,418	10,231	4,533	1,923	5,513	10,391	1,060,009
1993	318	76,139	197,608	343,985	299,937	193,982	90,123	71,452	89,588	83,167	44,964	10,192	4,996	1,291	12,952	1,520,695
1994	5,689	146,095	350,492	291,682	368,814	232,985	135,836	87,053	100,389	81,392	36,209	22,426	3,378	1,532	9,799	1,873,770
1995	3,705	414,722	446,942	438,082	385,680	461,938	201,171	186,076	147,921	86,379	50,797	16,073	9,255	1,871	3,344	2,853,956
1996	533	98,808	659,493	666,427	552,041	476,907	457,166	217,733	143,269	71,661	44,243	48,328	13,199	4,679	2,617	3,457,104
1997	2,528	287,331	487,332	849,504	618,724	598,593	415,556	382,556	207,925	125,742	61,809	30,913	12,998	7,872	4,903	4,094,285
1998	26,763	293,533	553,462	682,730	1,225,942	534,419	287,416	263,058	215,168	110,473	92,004	43,686	34,230	15,786	17,302	4,395,972
1999	9,053	179,851	473,016	674,932	674,864	716,884	339,116	228,335	195,888	141,089	99,050	46,240	26,117	13,173	7,077	3,824,686

Table 12. Estimated parameter values and associated SE, T-Statistic, and CV's from ADAPT.

Parameter	Estimate	SE	T-statistic	CV	Parameter	Estimate	SE	T-statistic	CV
N 1	6.30E+03	2.38E+03	2.65E+00	0.38	q MDSSN2	9.40E-05	4.14E-05	2.25E+00	0.44
N 2	8.18E+03	2.42E+03	3.39E+00	0.30	q MDSSN3	2.20E-04	4.82E-05	4.62E+00	0.22
N 3	6.50E+03	1.73E+03	3.76E+00	0.27	q MDSSN4	2.88E-04	6.86E-05	4.32E+00	0.23
N 4	4.31E+03	1.10E+03	3.90E+00	0.26	q MDSSN5	3.65E-04	7.52E-05	5.00E+00	0.20
N 5	3.01E+03	7.42E+02	4.06E+00	0.25	q MDSSN6	5.92E-04	1.08E-04	5.70E+00	0.18
N 6	1.42E+03	4.03E+02	3.52E+00	0.28	q MDSSN7	7.51E-04	1.71E-04	4.75E+00	0.21
N 7	1.25E+03	3.96E+02	3.15E+00	0.32	q MDSSN8	9.44E-04	3.24E-04	3.14E+00	0.32
N 8	9.91E+02	2.57E+02	3.85E+00	0.26	q MDSSN9	9.12E-04	4.05E-04	2.46E+00	0.41
N 9	4.58E+02	1.26E+02	3.64E+00	0.27	q MDSSN10	1.64E-03	7.56E-04	2.37E+00	0.42
N 10	5.26E+02	1.24E+02	4.24E+00	0.24	q MDSSN11	3.21E-03	1.17E-03	3.02E+00	0.33
N 11	3.51E+02	9.66E+01	3.63E+00	0.28	q MDSSN12	4.47E-03	1.87E-03	2.67E+00	0.37
N 12	2.57E+02	7.20E+01	3.56E+00	0.28	q MDSSN13	5.74E-03	2.93E-03	2.15E+00	0.47
N 13	1.05E+02	3.91E+01	2.69E+00	0.37	q MDSSN14	9.35E-03	5.08E-03	1.97E+00	0.51
N 14	7.15E+01	2.65E+01	2.69E+00	0.37	q MDSSN15	7.69E-03	2.43E-03	3.44E+00	0.29
q MACOM8	8.56E-04	1.74E-04	5.45E+00	0.18	q NYOHS5	2.77E-04	6.62E-05	4.33E+00	0.23
q MACOM9	1.29E-03	2.14E-04	6.81E+00	0.15	q NYOHS6	4.07E-04	1.17E-04	3.65E+00	0.27
q MACOM10	2.24E-03	3.18E-04	7.92E+00	0.13	q NYOHS7	7.79E-04	2.39E-04	3.57E+00	0.28
q MACOM11	3.65E-03	8.16E-04	5.04E+00	0.20	q NYOHS8	1.23E-03	4.44E-04	3.02E+00	0.33
q MACOM12	6.30E-03	1.47E-03	4.88E+00	0.20	q NYOHS9	1.98E-03	7.24E-04	3.02E+00	0.33
q MACOM13	1.07E-02	3.79E-03	3.20E+00	0.31	q NYOHS10	3.11E-03	1.00E-03	3.43E+00	0.29
q MACOM14	1.46E-02	5.32E-03	3.11E+00	0.32	q NYOHS11	4.70E-03	2.16E-03	2.42E+00	0.41
q MACOM15	1.43E-02	3.04E-03	5.30E+00	0.19	q NYOHS12	6.82E-03	2.98E-03	2.55E+00	0.39
q CTCPU2	1.19E-04	2.79E-05	4.08E+00	0.24	q NYOHS13	1.39E-02	6.37E-03	2.49E+00	0.40
q CTCPU3	2.36E-04	6.08E-05	3.93E+00	0.25	q NYOHS14	2.39E-02	7.75E-03	3.40E+00	0.29
q CTCPU4	3.56E-04	4.83E-05	7.57E+00	0.13	q NYOHS15	1.46E-02	4.26E-03	3.78E+00	0.26
q CTCPU5	4.67E-04	5.84E-05	8.24E+00	0.12	q YOYNY1	1.52E-04	2.83E-05	5.45E+00	0.18
q CTCPU6	7.45E-04	1.28E-04	6.04E+00	0.17	q YOYNJ1	1.02E-04	2.43E-05	4.23E+00	0.24
q CTCPU7	1.00E-03	1.72E-04	6.23E+00	0.16	q YOYMD1	1.14E-04	2.17E-05	5.33E+00	0.19
q CTCPU8	1.57E-03	2.36E-04	7.09E+00	0.14	q YOYVA1	1.45E-04	1.97E-05	7.42E+00	0.13
q CTCPU9	1.79E-03	3.94E-04	4.90E+00	0.20	q YRLI2	1.54E-04	2.39E-05	6.36E+00	0.16
q CTCPU10	2.81E-03	6.44E-04	4.70E+00	0.21	q YRLMD2	1.75E-04	3.40E-05	5.22E+00	0.19
q CTCPU11	4.34E-03	1.24E-03	3.80E+00	0.26	q HUDSHD5:7	2.21E-04	3.69E-05	6.31E+00	0.16
q CTCPU12	3.96E-03	1.58E-03	2.72E+00	0.37	q HUDSP5:6	2.45E-04	4.46E-05	5.76E+00	0.17
q CTCPU13	6.99E-03	3.17E-03	2.42E+00	0.41					
q CTCPU14	9.66E-03	4.34E-03	2.43E+00	0.41					
q CTCPU15	5.94E-03	3.25E-03	2.00E+00	0.50					

Table 13. Partial variance and proportion of total variance by tuning index, before iterative re-weighting.

Index	Partial Variance	Proportion Total Variance	Index	Partial Variance	Proportion Total Variance		
MACOM	8	0.31	0.005	MDSSN	2	3.153	0.05
MACOM	9	0.187	0.003	MDSSN	3	0.733	0.012
MACOM	10	0.128	0.002	MDSSN	4	0.844	0.013
MACOM	11	0.358	0.006	MDSSN	5	0.625	0.01
MACOM	12	0.377	0.006	MDSSN	6	0.476	0.008
MACOM	13	0.928	0.015	MDSSN	7	0.69	0.011
MACOM	14	0.991	0.016	MDSSN	8	1.506	0.024
MACOM	15	0.326	0.005	MDSSN	9	2.632	0.042
CTCPUE	2	0.564	0.009	MDSSN	10	2.653	0.042
CTCPUE	3	1.217	0.019	MDSSN	11	1.404	0.022
CTCPUE	4	0.318	0.005	MDSSN	12	1.653	0.026
CTCPUE	5	0.266	0.004	MDSSN	13	3.453	0.055
CTCPUE	6	0.506	0.008	MDSSN	14	2.845	0.045
CTCPUE	7	0.472	0.007	MDSSN	15	0.919	0.015
CTCPUE	8	0.362	0.006	NYOHS	5	0.676	0.011
CTCPUE	9	0.774	0.012	NYOHS	6	0.959	0.015
CTCPUE	10	0.843	0.013	NYOHS	7	1.001	0.016
CTCPUE	11	1.154	0.018	NYOHS	8	1.412	0.022
CTCPUE	12	2.412	0.038	NYOHS	9	1.409	0.022
CTCPUE	13	2.538	0.04	NYOHS	10	1.08	0.017
CTCPUE	14	2.513	0.04	NYOHS	11	2.019	0.032
CTCPUE	15	3.495	0.055	NYOHS	12	1.965	0.031
				NYOHS	13	1.57	0.025
				NYOHS	14	1.006	0.016
				NYOHS	15	0.888	0.014
				YOYNY	1	0.61	0.01
				YOYNJ	1	0.978	0.016
				YOYMD	1	0.638	0.01
				YOYVA	1	0.313	0.005
				YRLLI	2	0.343	0.005
				YRLMD	2	0.61	0.01
				HUDSHD	5:7	0.421	0.007
				HUDSP	5:6	0.535	0.008

Table 14. Partial variance and proportion of total variance by tuning index, after iterative re-weighting.

Index		Partial Variance	Proportion Total Variance	Index		Partial Variance	Proportion Total Variance
MACOM	8	0.013	0.02	MDSSN	2	0.013	0.02
MACOM	9	0.01	0.016	MDSSN	3	0.012	0.02
MACOM	10	0.01	0.016	MDSSN	4	0.012	0.019
MACOM	11	0.011	0.018	MDSSN	5	0.011	0.018
MACOM	12	0.012	0.019	MDSSN	6	0.011	0.017
MACOM	13	0.012	0.02	MDSSN	7	0.011	0.018
MACOM	14	0.012	0.02	MDSSN	8	0.011	0.018
MACOM	15	0.013	0.02	MDSSN	9	0.012	0.019
CTCPUE	2	0.013	0.021	MDSSN	10	0.012	0.019
CTCPUE	3	0.011	0.018	MDSSN	11	0.012	0.019
CTCPUE	4	0.01	0.017	MDSSN	12	0.012	0.02
CTCPUE	5	0.01	0.016	MDSSN	13	0.012	0.019
CTCPUE	6	0.011	0.018	MDSSN	14	0.012	0.019
CTCPUE	7	0.011	0.018	MDSSN	15	0.011	0.017
CTCPUE	8	0.012	0.019	NYOHS	5	0.011	0.017
CTCPUE	9	0.012	0.02	NYOHS	6	0.012	0.018
CTCPUE	10	0.012	0.019	NYOHS	7	0.011	0.017
CTCPUE	11	0.012	0.019	NYOHS	8	0.011	0.017
CTCPUE	12	0.012	0.019	NYOHS	9	0.01	0.016
CTCPUE	13	0.012	0.02	NYOHS	10	0.01	0.016
CTCPUE	14	0.012	0.02	NYOHS	11	0.01	0.016
CTCPUE	15	0.012	0.02	NYOHS	12	0.011	0.018
				NYOHS	13	0.011	0.017
				NYOHS	14	0.012	0.019
				NYOHS	15	0.012	0.019
				YOYNY	1	0.012	0.019
				YOYNJ	1	0.011	0.018
				YOYMD	1	0.011	0.017
				YOYVA	1	0.009	0.015
				YRLLI	2	0.009	0.015
				YRLMD	2	0.011	0.018
				HUDSHD	5:7	0.011	0.018
				HUDSP	5:6	0.012	0.018

Table 15. Fishing mortality at age and average across ages, 1982-1999.

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.12	0.1	0.28	0.04	0.01	0	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.05	0.02	0.05	0.05	0.03
3	0.38	0.29	0.43	0.07	0.04	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.08	0.09	0.11	0.12	0.11	0.1
4	0.29	0.52	0.2	0.09	0.12	0.04	0.04	0.04	0.1	0.09	0.06	0.08	0.07	0.13	0.17	0.18	0.23	0.2
5	0.19	0.3	0.29	0.2	0.14	0.08	0.1	0.08	0.14	0.11	0.09	0.12	0.11	0.12	0.22	0.22	0.41	0.38
6	0.12	0.18	0.15	0.32	0.15	0.09	0.15	0.12	0.17	0.11	0.1	0.13	0.12	0.18	0.21	0.38	0.28	0.43
7	0.24	0.16	0.11	0.18	0.23	0.08	0.2	0.09	0.19	0.12	0.09	0.1	0.12	0.13	0.26	0.27	0.29	0.28
8	0.2	0.05	0.05	0.14	0.13	0.11	0.2	0.14	0.21	0.21	0.13	0.12	0.12	0.22	0.2	0.34	0.26	0.38
9	0.17	0.05	0.03	0.08	0.1	0.04	0.32	0.13	0.23	0.25	0.22	0.21	0.24	0.3	0.24	0.28	0.3	0.3
10	0.2	0.07	0.04	0.06	0.09	0.04	0.05	0.13	0.14	0.4	0.3	0.46	0.28	0.31	0.22	0.33	0.22	0.32
11	0.45	0.12	0.02	0.02	0.07	0.02	0.07	0.03	0.28	0.33	0.25	0.47	0.35	0.27	0.25	0.28	0.4	0.31
12	0.26	0.44	0	0.03	0.05	0.06	0.08	0.04	0.05	0.21	0.17	0.39	0.41	0.24	0.42	0.26	0.31	0.35
13	0.12	0.13	0.24	0.04	0.03	0.1	0.07	0.06	0.13	0.05	0.2	0.23	0.18	0.28	0.3	0.18	0.48	0.29
14	0.2	0.21	0.14	0.17	0.14	0.08	0.13	0.09	0.17	0.14	0.11	0.14	0.13	0.17	0.23	0.29	0.33	0.32
15	0.2	0.21	0.14	0.17	0.14	0.08	0.13	0.09	0.17	0.14	0.11	0.14	0.13	0.17	0.23	0.29	0.33	0.32

Average Fishing Mortality. Reference ages (4-13) indicated in bold.

Ages	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
3,8	0.24	0.25	0.21	0.17	0.14	0.07	0.12	0.09	0.14	0.11	0.08	0.10	0.10	0.14	0.19	0.25	0.27	0.30
3,13	0.24	0.21	0.14	0.11	0.11	0.06	0.12	0.08	0.15	0.17	0.15	0.21	0.19	0.21	0.24	0.26	0.30	0.30
4,13	0.22	0.20	0.11	0.12	0.11	0.07	0.13	0.09	0.16	0.19	0.16	0.23	0.20	0.22	0.25	0.27	0.32	0.32
5,13	0.22	0.17	0.11	0.12	0.11	0.07	0.14	0.09	0.17	0.20	0.17	0.25	0.21	0.23	0.26	0.28	0.33	0.34
6,13	0.22	0.15	0.08	0.11	0.11	0.07	0.14	0.09	0.17	0.21	0.18	0.26	0.23	0.24	0.26	0.29	0.32	0.33
8,13	0.25	0.22	0.11	0.09	0.09	0.07	0.10	0.06	0.16	0.17	0.17	0.27	0.24	0.23	0.29	0.26	0.37	0.32

Table 17. Back-calculated partial recruitment and 1996-1999 average PR.

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	96-99 avg
1	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
2	0.27	0.20	0.65	0.12	0.04	0.04	0.03	0.07	0.04	0.03	0.03	0.03	0.06	0.17	0.05	0.12	0.10	0.08	0.09
3	0.85	0.56	1.00	0.23	0.18	0.17	0.07	0.23	0.15	0.10	0.13	0.09	0.19	0.27	0.25	0.32	0.24	0.24	0.26
4	0.64	1.00	0.46	0.28	0.53	0.36	0.12	0.29	0.36	0.21	0.21	0.17	0.18	0.41	0.40	0.49	0.49	0.45	0.46
5	0.43	0.58	0.67	0.63	0.62	0.73	0.32	0.54	0.50	0.27	0.31	0.25	0.26	0.40	0.53	0.58	0.86	0.89	0.72
6	0.27	0.35	0.35	1.00	0.67	0.83	0.47	0.82	0.59	0.27	0.32	0.27	0.29	0.58	0.50	1.00	0.59	1.00	0.77
7	0.53	0.31	0.26	0.55	1.00	0.73	0.64	0.64	0.66	0.31	0.29	0.21	0.28	0.43	0.61	0.72	0.62	0.64	0.65
8	0.44	0.10	0.13	0.44	0.57	1.00	0.63	1.00	0.73	0.52	0.42	0.26	0.30	0.69	0.48	0.90	0.54	0.89	0.70
9	0.37	0.09	0.07	0.25	0.43	0.37	1.00	0.87	0.82	0.63	0.73	0.45	0.58	0.95	0.58	0.75	0.64	0.69	0.67
10	0.44	0.14	0.09	0.18	0.37	0.37	0.16	0.92	0.48	1.00	1.00	0.99	0.69	1.00	0.52	0.87	0.47	0.74	0.65
11	1.00	0.24	0.05	0.07	0.32	0.19	0.21	0.21	1.00	0.83	0.83	1.00	0.85	0.87	0.59	0.75	0.84	0.71	0.72
12	0.59	0.85	0.00	0.08	0.23	0.54	0.24	0.28	0.17	0.53	0.55	0.85	1.00	0.77	1.00	0.69	0.66	0.81	0.79
13	0.26	0.26	0.56	0.11	0.14	0.90	0.23	0.44	0.46	0.11	0.68	0.50	0.45	0.88	0.71	0.48	1.00	0.68	0.72
14	0.44	0.41	0.33	0.54	0.60	0.69	0.41	0.65	0.59	0.35	0.38	0.30	0.32	0.54	0.54	0.76	0.69	0.74	0.68
15	0.44	0.41	0.33	0.54	0.60	0.69	0.41	0.65	0.59	0.35	0.38	0.30	0.32	0.54	0.54	0.76	0.69	0.74	0.68

Table 19. Estimated population abundance at age 1-15, 1982-2000.

AGE	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	1393	2785	2441	2964	2876	3642	4740	5972	8100	7342	6790	8129	10042	6391	7838	7876	9105	9518	6302
2	1001	1197	2393	2096	2550	2465	3133	4077	5139	6969	6318	5841	6997	8638	5497	6745	6777	7812	8184
3	872	763	929	1556	1736	2175	2111	2668	3475	4373	5926	5390	4957	5887	7050	4639	5539	5560	6503
4	959	512	492	518	1245	1435	1837	1778	2221	2864	3622	4899	4456	3942	4652	5456	3541	4255	4309
5	354	621	261	346	408	948	1187	1523	1467	1724	2264	2931	3897	3564	2986	3386	3908	2414	3012
6	181	251	395	168	243	305	753	922	1212	1093	1330	1774	2245	3012	2710	2058	2340	2226	1419
7	123	138	180	292	105	180	239	557	705	882	846	1039	1347	1716	2164	1890	1216	1519	1246
8	102	84	101	138	210	72	143	168	437	503	671	667	810	1033	1290	1439	1241	780	991
9	85	72	68	83	103	159	55	100	125	305	351	509	508	617	717	908	883	824	458
10	66	62	59	57	66	80	131	35	76	85	204	243	355	344	394	484	589	560	526
11	33	46	50	49	46	52	66	107	26	57	49	130	132	230	217	272	300	405	351
12	65	18	35	42	42	37	44	53	90	17	35	33	71	80	151	146	177	173	257
13	29	43	10	30	35	34	30	35	44	73	12	26	19	40	54	85	97	111	105
14	24	22	33	7	25	29	26	24	28	33	60	8	18	14	26	34	61	52	72
15	48	28	41	60	59	117	35	60	56	149	100	107	88	21	16	21	65	28	50
Total	5335	6642	7488	8406	9749	11730	14530	18079	23201	26469	28578	31726	35942	35529	35762	35439	35839	36237	33785

Table 20. Spawning stock biomass of female striped bass in metric tons at age and annual total in MT and millions of pounds, 1982-1999.

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	28	13	15	16	56	58	69	75	86	118	133	184	186	162	202	237	153	184
5	52	89	42	46	61	145	227	286	210	277	390	497	681	603	583	661	748	464
6	144	174	283	126	160	188	638	883	978	735	1034	1344	1664	2312	2568	1919	2202	2064
7	246	218	381	596	172	273	435	1254	1437	1775	1740	2089	2786	3858	5703	4975	3193	3996
8	260	199	255	333	469	151	294	461	1141	1242	1715	1800	2221	2786	4024	4426	3847	2390
9	247	206	219	264	264	416	134	285	331	916	1137	1667	1604	2070	2602	3283	3185	2973
10	267	238	219	201	189	247	349	141	214	243	770	883	1235	1408	1686	2052	2521	2377
11	162	209	199	211	169	191	269	455	90	250	224	565	590	806	936	1171	1277	1739
12	339	86	213	212	180	171	215	247	385	66	206	163	345	362	694	682	822	802
13	179	226	50	165	183	182	163	215	194	335	72	173	102	261	284	452	498	584
14	150	116	180	45	137	161	140	112	142	250	317	54	75	101	153	199	351	296
15	359	145	281	452	437	908	280	482	463	1199	834	774	730	196	127	172	516	221
Total MT	2430	1915	2334	2664	2476	3088	3209	4894	5670	7401	8569	10191	12215	14922	19559	20225	19309	18087
Total Mlb	5.358	4.221	5.146	5.874	5.458	6.809	7.076	10.791	12.502	16.319	18.895	22.470	26.934	32.903	43.128	44.596	42.576	39.881

Table 21. Precision estimates for abundance and fishing mortality at age, age 4-13 fishing mortality, and female spawning stock biomass from 500 bootstrap iterations.

Parameter		Point Estimate	Bootstrap Mean	Percent Bias	80% Confidence Interval	
					Lower Bound	Upper Bound
Number	Age 1	6302	6523	3.50	4251	9633
Number	Age 2	8184	8423	2.93	5848	11202
Number	Age 3	6503	6691	2.89	4911	8685
Number	Age 4	4309	4442	3.09	3182	5548
Number	Age 5	3012	3060	1.60	2346	3969
Number	Age 6	1420	1474	3.84	1001	1812
Number	Age 7	1246	1283	2.93	835	1675
Number	Age 8	991	1020	2.95	712	1285
Number	Age 9	458	462	0.89	345	599
Number	Age 10	526	538	2.24	398	661
Number	Age 11	351	360	2.76	247	446
Number	Age 12	257	264	2.69	187	337
Number	Age 13	105	109	3.85	67	145
Number	Age 14	72	74	3.69	45	106
Number	Age 15	50	49	-1.35	43	59
<hr/>						
F	Age 1	0.00	0.00	3.24	0.00	0.00
F	Age 2	0.03	0.03	1.91	0.03	0.04
F	Age 3	0.11	0.11	1.29	0.08	0.14
F	Age 4	0.20	0.20	2.14	0.15	0.24
F	Age 5	0.38	0.38	0.50	0.31	0.50
F	Age 6	0.43	0.44	2.32	0.34	0.59
F	Age 7	0.28	0.28	1.35	0.22	0.36
F	Age 8	0.38	0.39	2.67	0.30	0.48
F	Age 9	0.30	0.30	0.98	0.24	0.38
F	Age 10	0.32	0.32	1.29	0.26	0.43
F	Age 11	0.31	0.31	1.62	0.24	0.40
F	Age 12	0.35	0.36	3.40	0.26	0.50
F	Age 13	0.29	0.31	5.48	0.20	0.43
F	Age 14	0.32	0.32	2.42	0.27	0.36
F	Age 15	0.32	0.32	2.42	0.27	0.36
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F full	4-13	0.3171	0.3247	2.42	0.27	0.36
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SSB mt	Female	18,088	18,419	1.83	16,115	19,912

Figure 1. Maryland Spawning Stock Index, ages 2-15+, 1985-2000

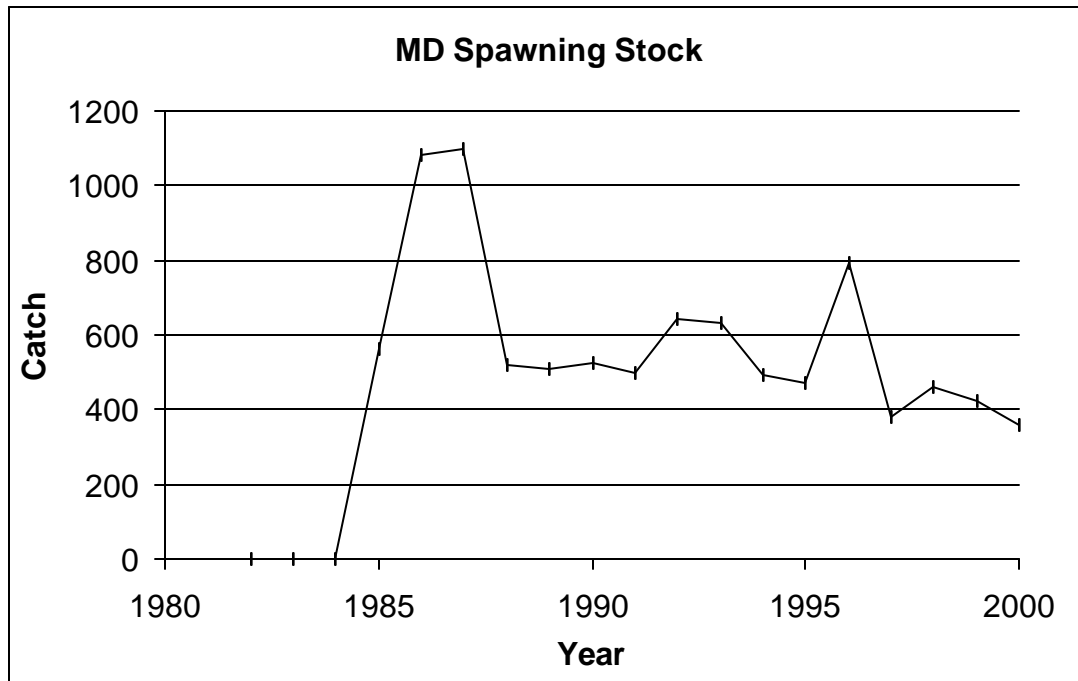


Figure 2. New York Ocean Haul Seine, CPUE ages 5-15+

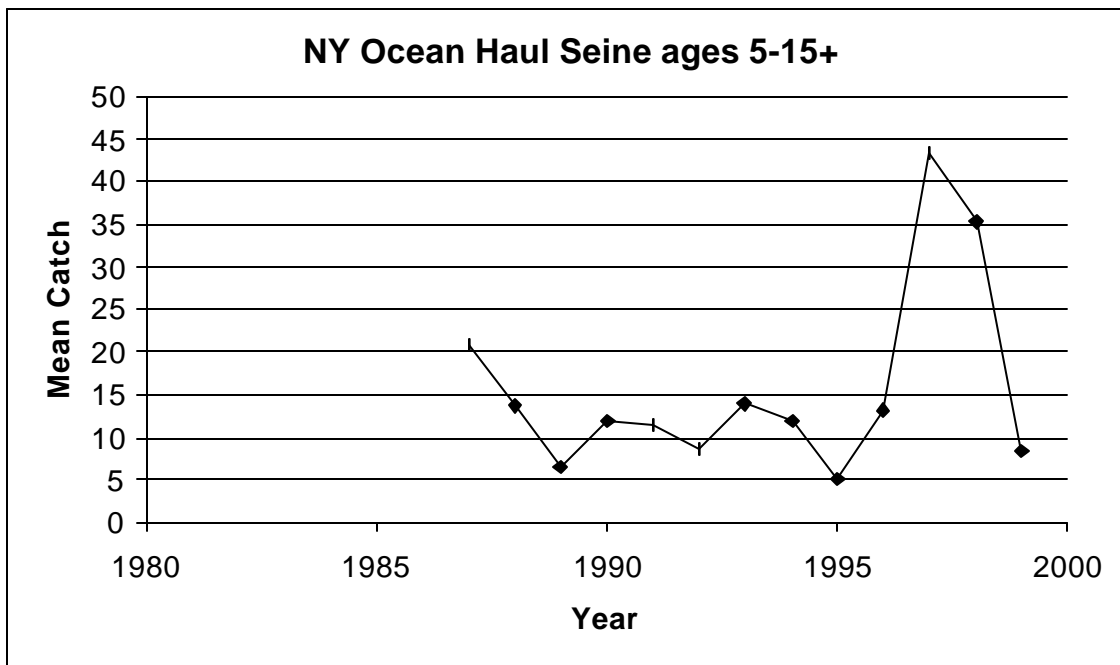


Figure 3. Indices of young of the year abundance for the Chesapeake Stock, Maryland and Virginia surveys, 1981-1999.

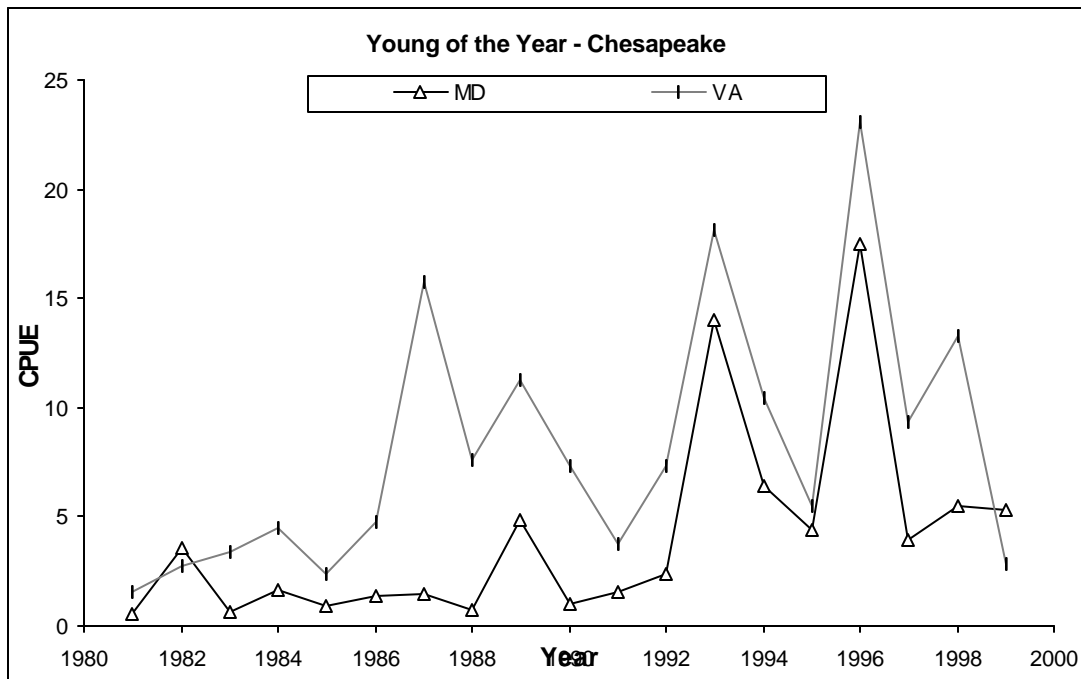


Figure 4. Young of the year survey values for the Hudson (New York) and Delaware (New Jersey) stocks, 1981-1999.

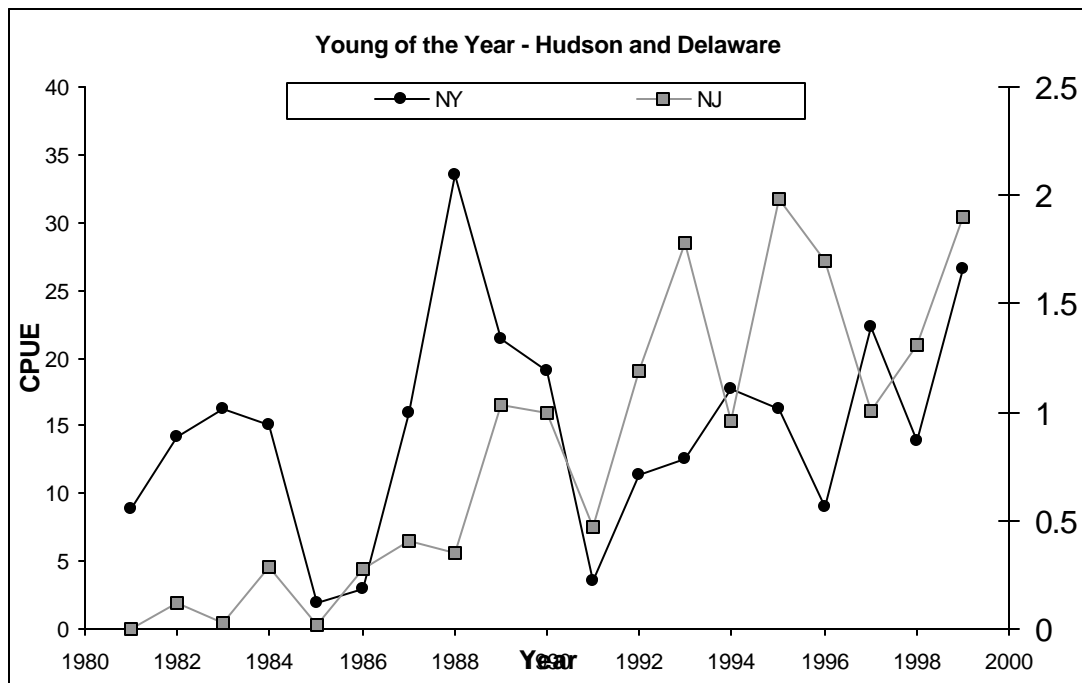


Figure 5. Indices of age-1 abundance, for Long Island and Maryland.

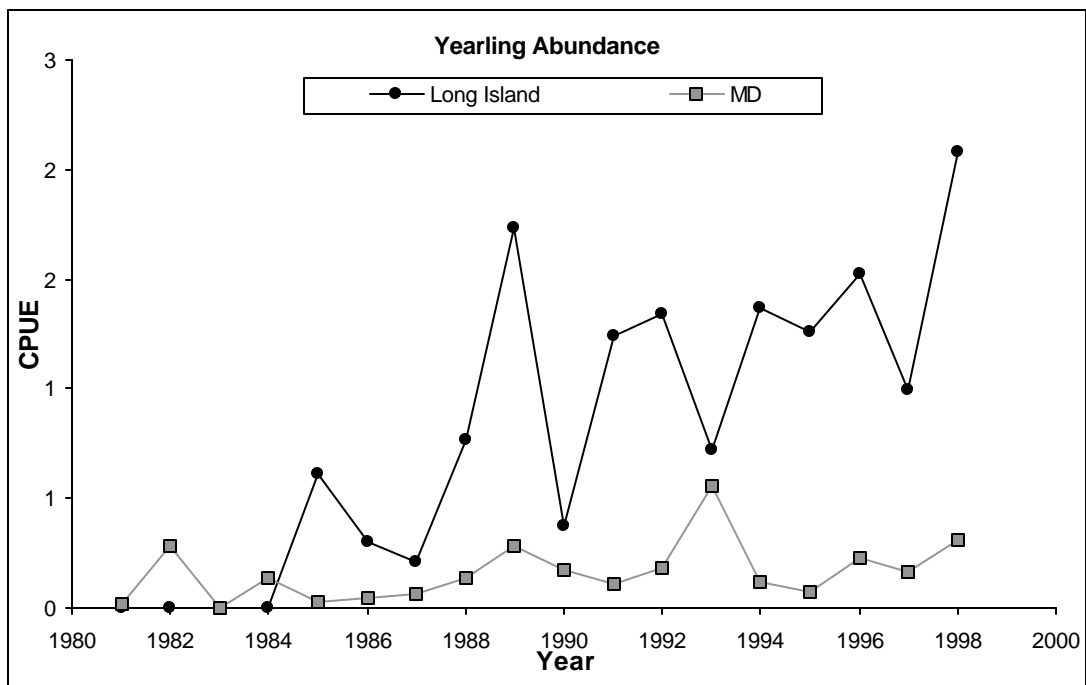


Figure 7. Massachusetts total age 8-15 CPUE, 1990-1999.

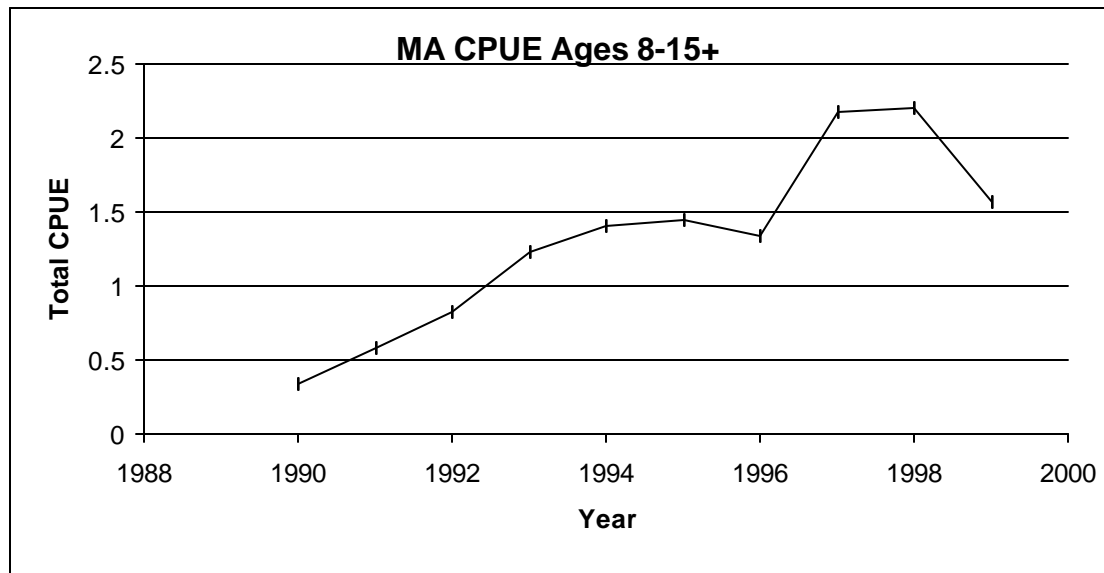


Figure 8. Connecticut total ages 2-15 CPUE, 1981-1999.

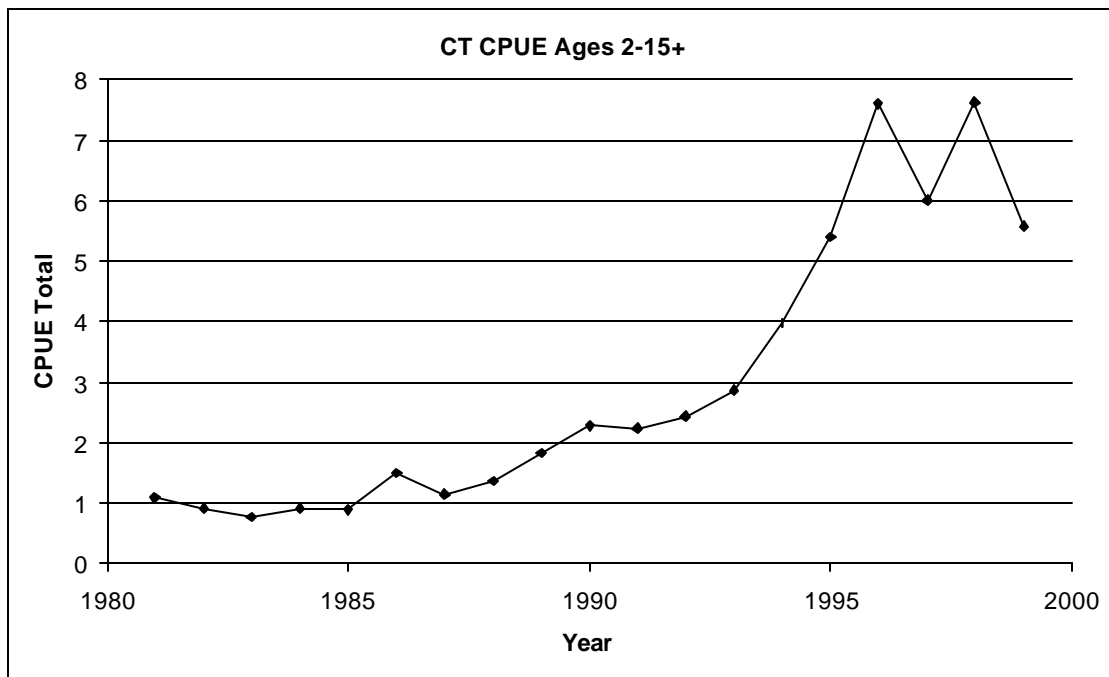


Figure 10. Hudson River shad bycatch and spawning stock indices of abundance.

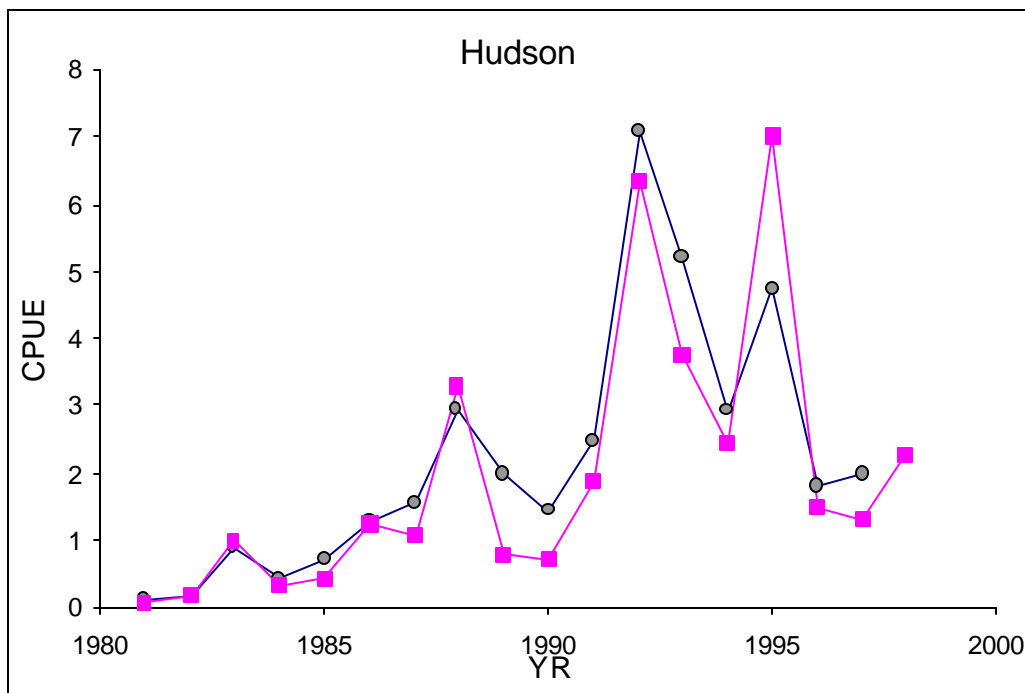


Figure 12 Estimated population and total harvest in thousands of fish and ages 4-13 fishing mortality, 1982-1999.

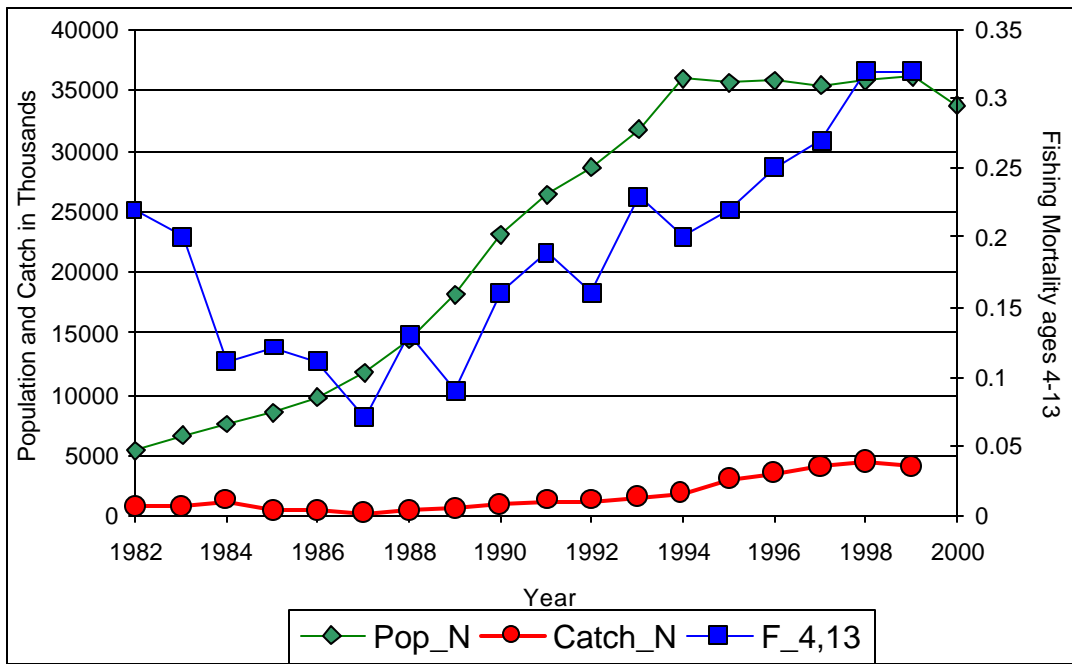


Figure 14 . Trend in female spawning stock biomass, 1982-1999.

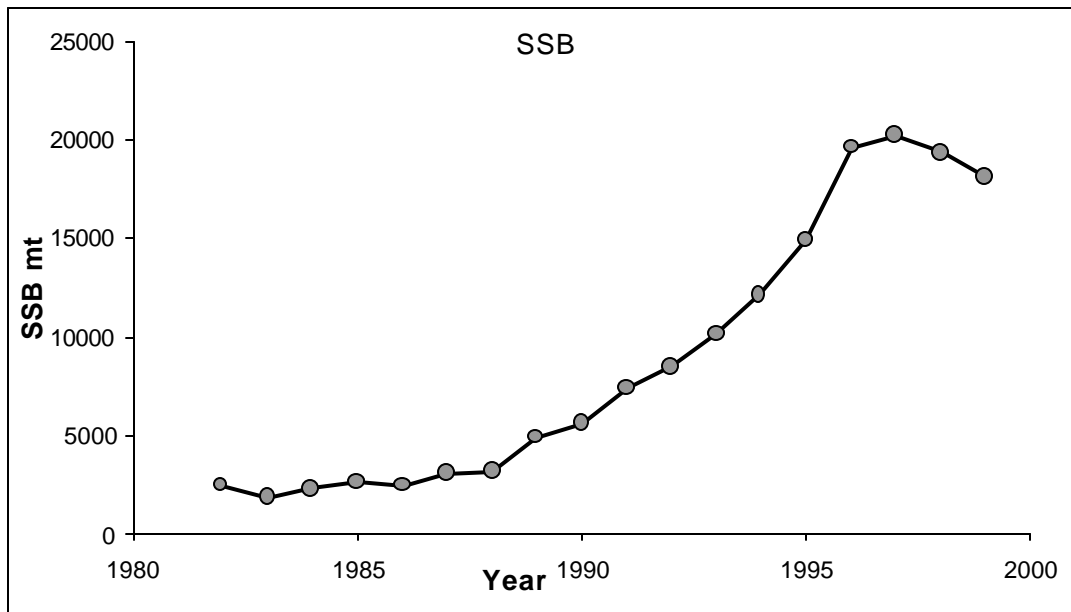


Figure 15. Terminal full F distribution based on 500 bootstrap iterations.

Approximate location of 80% confidence bounds indicated by darker bars, mean by lighter bar.

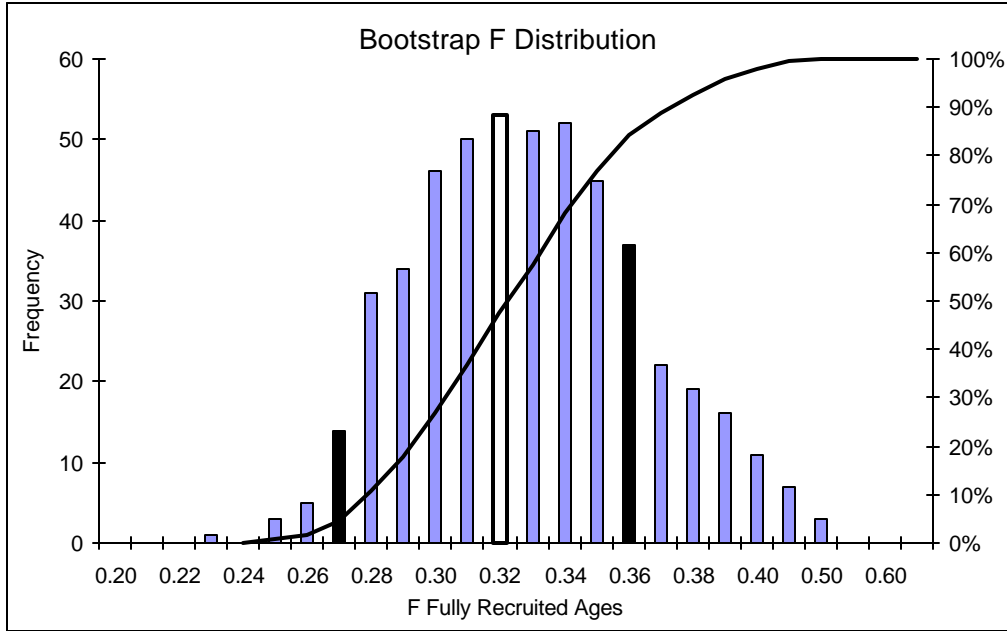


Figure 16. Frequency and cumulative distribution of 1999 SSB based on 500 bootstrap iterations.

Approximate location of 80% confidence bounds indicated by darker bars, mean by lighter bar.

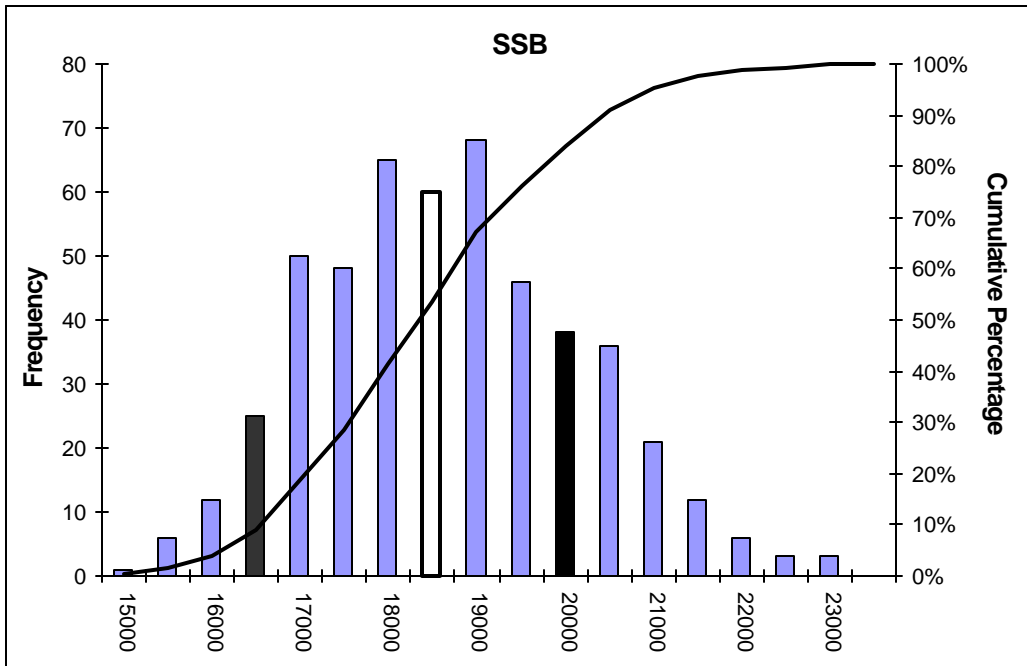


Figure 18. Retrospective trend in age 4-13 fishing mortality, for 1995-1999 terminal years.

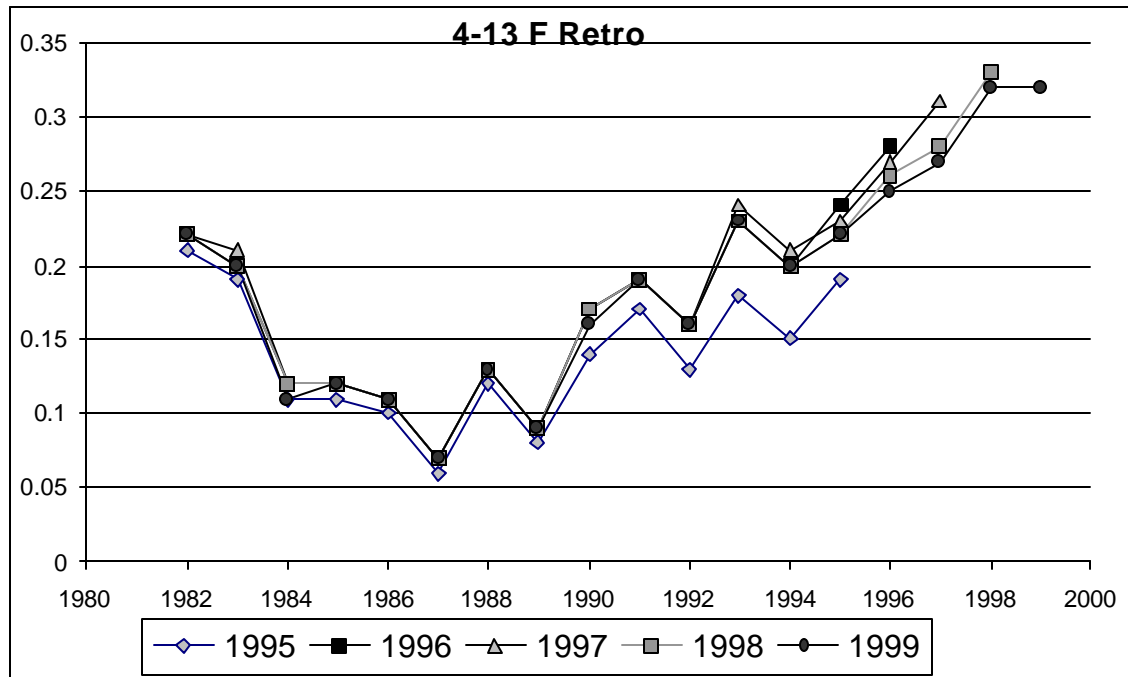


Figure 19. Retrospective trend in age 2+ population abundance, for terminal years 1995-1999.

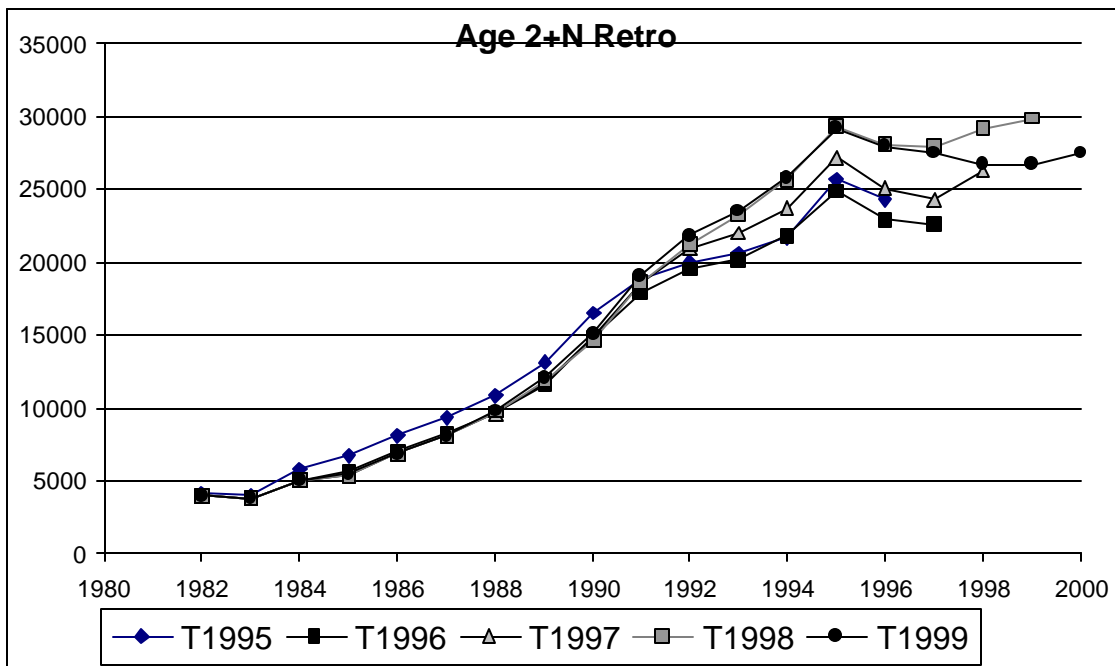


Figure 20 . Age 4-13 fishing mortality, threshold, and Fmsy reference.

