Massachusetts 1996 Striped Bass Fisheries Monitoring Report

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Introduction

This report characterizes the commercial and recreational striped bass fisheries conducted in Massachusetts during 1996. Statewide monitoring programs, which are considered to be essential elements of the long-term management approach described in Section 5 of the Atlantic States Marine Fisheries Commission's (ASMFC) Fisheries Management Report No. 24 (Amendment #5 to the Interstate Fishery Management Plan for Atlantic Striped Bass), were used to collect this information. Several data sources were used to estimate harvest, total catch (which include fish caught but released alive), and catch composition (size, sex, and age). These included, Massachusetts Division of Marine Fisheries (DMF) and National Marine Fisheries Service (NMFS) based programs (Diodati, 1990).

Harvest and Losses

Commercial Fishery

Season: July 1 - August 18 (the fishery operated under an open (21d) - close (7d) sequence until the quota was reached).

Harvest Quota: 750,000 pounds minus 32,000 pound overage incurred during 1995, thus, 718,000 pounds(the harvest allowed by Amendment #5 was 802,000 pounds but Massachusetts regulatory action reduced that amount).

Allowable Gear Type: Hook and line.

Minimum Size: 34 inches total length.

Licensing and Reporting: To purchase striped bass directly from fishers, fish dealers are required to obtain special authorization from the DMF in addition to standard seafood dealer

permits. Dealer reporting requirements include weekly telephone reports of all striped bass purchases; DMF supplies a toll-free number and an interactive telecommunication system for this purpose. Following the close of the season, dealers are also required to provide a written transcript consisting of purchase dates, number of fish, pounds of fish, and names and permit numbers of fishers from whom they purchased.

Fishers must have a commercial fishing permit and a special striped bass fishing permit to sell their catch. They are also required to file catch reports at the end of the season, which include the name of the dealer(s) that they sell to and extensive information describing their catch composition and catch rates. In addition, many fishers voluntarily provide daily fishing logs. The dealer telephone survey is used to gauge the distance to the harvest cap, while the dealer written transactions are used to estimate the final harvest. Information from voluntary logs is used to characterize effort in the fishery.

Methods: Size distribution of the harvest was estimated from 688 striped bass sampled by the DMF at dealerships throughout the state. Information from 1,564 fish sampled from the 1994-1996 commercial harvest was used to conduct a functional geometric regression of weight on length. The following weight-length relationship was derived:

$$W = .000479L^{2.916} \quad (1)$$

where W equals weight in pounds and L equals total length in inches. Expression (1) was used to estimate any missing length or weight values.

Catch reports collected from 82% of licensed commercial fishers were used to characterize the disposition of the catch (the proportion kept or released), the catch weight, and size composition by category. Pounds and numbers reported for each category were expanded by 10% and 12%, respectively to compensate for under-reporting by fishers vs. dealers.

Harvest Levels and Catch Composition

Dealer transcripts show 696,815 pounds (38,316 fish) were harvested during 1996(Box 1).

Size composition by category of disposition is presented in Tables 1 (numbers) and 2 (pounds). The commercial catch of 161,354 striped bass (2,011,011 pounds) was dominated by the released sub-legal category (RELSUB), 72% by number and 58% by weight. The CONSUM category represents what commercially licensed anglers harvested for personal use and is counted as a recreational loss later in this report. Some commercial license holders, as in past years, reported releasing legal-size fish during the commercial season (3% by number - RELLEG). About 32% of total catch was greater than 34 inches.

Box 1. Attributes of the Massachusetts Striped Bass Commercial Fishery: 1990-1995.

SEASON	SEASON LENGTH (D)	HARVEST (LBs/NOs) 000s	DEALER PERMITS	FISHING PERMITS
1990	93	160.6/6.3	95	1,498
1991	59	234.8/10.4	92	1,739
1992	39	239.2/11.3	135	1,861
1993	35	262.6/13.0	152	2,056
1994	24	199.6/10.4	150	2,367
1995	57	782.0/41.2	161	3,353
1996	42	696.8/38.3	179	3,801

Age and Sex Composition

Sub-samples of 374 and 658 striped bass sampled from the 1996 commercial harvest were used to estimate age and sex, respectively. Age was determined from scales and sex was determined by visual inspection of gonadal tissue (Sykes Method). Age ranged from 7 to 20 years, and 93% were females. Approximately 92% of the sub-sample consisted of individuals from the 1984-1988 year classes (ages 8-12).

Age-at-weight data for ages 9 to 12 from Massachusetts samples indicateed that mean weight fluctuated during the 1980s but showed a decreasing trend during the 1990s (Figure 1). This suggests slower growth rates during the 1990s than those in the early 1980s. Comparisons of mean weight between 1982 and 1993, two years with the largest sample sizes, showed mean weight decreased by 13%, 18%, 23%, and 17% for ages 9, 10, 11, and 12, respectively.

Box 2. Age and Size Composition of Striped Bass Sampled From the Massachusetts 1996 Commercial Harvest.

YEAR CLASS	NO.	%	MEAN LENGTH	MEAN WEIGHT
1989	13	3.5	34	14
1988	70	18.7	35	15
1987	89	23.8	35	15
1986	81	21.7	37	18
1985	68	18.2	38	20
1984	36	9.6	40	23
1983	11	2.9	41	26
1982	4	1.1	41	26
1981	1	0.3	41	30
1976	1	0.3	49	42

Estimation of Effort

Total hours fished from standard catch reports and average hours per trip from voluntary logs were used to estimate effort. To compensate for non-reporting, effort data was expanded by 18% (the outstanding proportion of catch reports). Effort during the 42d season (between Jul 1-Aug 18) amounted to 148,964 h fished and trips averaged 5.2 h. These figures imply 28,647 trips were conducted.

Characterization of Other Losses

Release mortality was estimated by using a hook-release mortality rate of 8% (Diodati 1990) applied against the RELSUB and RELLEG catch in Tables 1 and 2. Total losses due to release mortality were 9,475 fish weighing approximately 96,429 pounds.

Recreational Fishery

Season: None

Daily bag Limit: One fish per person

Allowable Gear Type: Hook and line

Minimum Size: 34 inches total length

Licensing and Reporting Requirements: None

Harvest levels

Preliminary harvest (A+B1)and total catch (A+B1+B2) estimates were provided by the NMFS MRFSS. Massachusetts paid for approximately 4,000 additional intercept interviews which began during wave 3. A similar þadd-onþ has been conducted since 1988, however, prior to 1995 it began in wave 2. Reference should be made to Osborn and Salz (1994) for a description of the new trip estimation procedure and its affect on catch.

The same sources of information described in previous sections were used to estimate the length distribution of the CONSUM and RELLEG categories, except that RELLEG data collected during the commercial season was excluded. Size distribution of the sub-legal catch was estimated using information provided in the commercial catch reports from those fishers that stated that they did not sell their catch. This estimate will be enhanced by size information from the ALS tagging program as it becomes available. All weights were estimated by using expression (1).

The preliminary estimate of total catch (including fish released alive) is 3,300,000 striped bass (pse<10.0) weighing 33,081,080 pounds (Tables 4 and 5). Catch levels in 1996 remain essentially the same as 1995 (3,351,000 fish). Numbers of fish harvested is also consistent between years, 73,000 in 1995 and 69,000 in 1996. The number of legal size fish caught and released during 1996 was about 6%; this fraction has ranged (between 15-25%) since 1990.

Estimation of Effort

Information from commercial catch reports, excluding that collected during the commercial season, and information from volunteer logs was used to calculate catch per trip estimates. These estimates suggest that 2,196,156 h were spent fishing for striped bass. Average hours per trip was 4.8. These figures imply about 455,087 striped bass fishing trips were made. Similar estimates were recalculated using 1995 data, indicating that 394,631 trips were made at 4.4 h per trip. These 1995 effort values differ from those reported in the 1995 monitoring report. Since 1995 earlier estimates may have in error, they should be disregarded. A more extensive review of striped bass fishing effort data is in progress and any supplementary information will be forwarded as soon as its complete.

Characterization of Losses

The same methods and rates previously described (under **Characterization of Losses** in the commercial fishery section) were used to estimate recreational losses. Release mortality of sub-legals was 243,196 fish (2,237,406 pounds) and release mortality of legal size stripers was 15,204 fish (281,268 pounds). Given that a new source of information (volunteer recreational logs) was used to derive size composition in 1995, comparisons with past years may not be valid.

By catch in Other Fisheries

During 1994, DMF sea-sampling efforts identified striped bass as By catch in a Nantucket Sound springtime trawl fishery directed at long-finned squid (*Loligo pealei*). Those By catch estimates were about 3,100 fish (17,600 pounds). Anecdotal information was also reported for this fishery which suggested that striped bass By catch ranged from 8,000 pounds per day, with up to single tows landing 19,000 pounds. DMF sea-sampled this fishery during 1995 and 1996 and observed incidental catches of striped bass, effort data is currently unavailable to extrapolate sample information. DMF will continue to monitor and investigate potential sources of striped bass By catch during 1997 and will provide past estimates as they become available.

Estimated Total Losses

Total estimated loss of striped bass during 1996 was 387,900 fish weighing 3,896,100 pounds (Box 3). The majority of which, 86% by number and 76% by weight, was attributed to combined losses in the recreational fishery.

Box 3. Preliminary estimates of striped bass losses occurring in Massachusetts waters during 1995.

	NUMBER	POUNDS	MEAN WT.
COMMERCIAL			
HARVEST	38,300	696,800	18.2
RELEASE MORTALITY	9,500	96,400	10.2
RECREATIONAL			
HARVEST	69,100	1,474,700	21.3
RELEASE MORTALITY	258,400	2,518,700	9.8
TOTALS	375,300	4,786,600	12.8

Required Fishery Independent Monitoring Programs

Massachusetts Tagging Study

The Massachusetts Division of Marine Fisheries (DMF) joined the Striped Bass Cooperative State-Federal Coastwide Tagging Study in 1991. The study's primary objective has been to develop an integrated database of tag releases and recoveries that will provide current information related to striped bass mortality and migration rates. The vast majority of striped bass tagged prior to 1991 (the tagging study began in 1986) have

ranged from 18 to 28 inches in length. Since Atlantic coastal fisheries had employed minimum sizes of 28-36 inches, resulting mortality estimates from these data may understate the effects fishing has on larger striped bass. The Massachusetts tagging effort has therefore focused on the tag and release of larger fish that reach coastwide legal sizes. To accomplish this job, the USFWS, NBS and DMF have contracted several select charter boat captains to take DMF personnel on board to tag and release their catch during regularly scheduled fishing trips. All fish are caught in the fall by trolling artificial baits in shoal areas around Nantucket Island.

Tag summary statistics and an updated release-recapture matrix is presented in Boxes 4 and 5, respectively. Release-recapture data was analyzed using the SURVIV software of White (1983). This software implements the ESTIMATE routines of Brownie, et al. (1985) to make maximum likelihood estimates of survival rate and recovery rate parameters from tag-recapture data. Sequential models of increased generality in terms of survival and recovery rate structure were fit, and goodness of fit and likelihood ratio testing were used to select the most parsimonious model(Box 6).

Box 4. Tag summary statistics.

YEAR	TRIPS	BOATS	NUMBER TAGGED	AVERAGE LENGTH	SE	LENGTH RANGE MINIMUM	LENGTH RANGE MAXIMUM
1991	17	4	388	817	5.4	534	1300
1992	29	3	899	798	4.2	524	1267
1993	15	2	678	784	4.8	515	1210
1994	13	2	375	735	4.8	548	1028
1995	11	2	477	767	5.2	470	1178
1996		2	168				

Box 5. Release-recovery matrix (all sizes included).

Rel. Yr.	No. Rel.	1992	1993	1994	1995	1996	1997
1991	388	28	23	10	17	5	
1992	897		45	42	37	33	
1993	677			39	28	39	2
1994	375				25	18	
1995	433					41	

Box 6. Estimates of Survival Rates from the SURVIV Analysis of Tag-Recapture Data.

SURVIVAL PERIOD	SIZE CLASS	S(SE)	MODEL TYPE SURV.	RECOV.	GOF P-val.
11/91-11/96	ALL	0.822(0.035)	CONST	CONST	0.1
	>=28	0.839(0.041)	CONST	CONST	0.3
	>34	0.829(0.063)	CONST	CONST	0.6

Table 1. Estimated size distribution of the 1996 Massachusetts commercial striped bass catch.
(Number of Fish)

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
15					0	0.0	0.0
16					0	0.0	0.0
17					0	0.0	0.0
18					0	0.0	0.0
19	2,107				2,107	1.3	1.3
20	0				0	0.0	1.3
21	4,215				4,215	2.6	3.9
22	0				0	0.0	3.9
23	2,107				2,107	1.3	5.2
24	6,322				6,322	3.9	9.1
25	0				0	0.0	9.1
26	8,429				8,429	5.2	14.4
27	21,073				21,073	13.1	27.4
28	2,107				2,107	1.3	28.7
29	8,429				8,429	5.2	34.0
30	4,215				4,215	2.6	36.6
31	12,644				12,644	7.8	44.4
32	4,215				4,215	2.6	47.0
33	10,537	392			10,929	6.8	53.8
34	18,966	3,361	150	253	22,730	14.1	67.9
35	4,215	7,226	427	475	12,342	7.6	75.5
36	0	6,946	404	380	7,730	4.8	80.3
37	6,322	4,874	748	475	12,419	7.7	88.0
38		5,490	636	190	6,316	3.9	91.9
39		3,697	561	443	4,701	2.9	94.8
40		2,129	531	95	2,755	1.7	96.5
41		1,961	269	63	2,293	1.4	98.0
42		1,008	239	158	1,406	0.9	98.8
43		840	120		960	0.6	99.4
44		224	120		344	0.2	99.7
45		56	135		191	0.1	99.8
46		0	30		30	0.0	99.8
47		0	127		127	0.1	99.9
48		56	30		86	0.1	99.9
49		0	52		52	0.0	100.0
50		56	22		78	0.0	100.0
51					0	0.0	100.0
52					0	0.0	100.0
Totals:	115,904	38,316	4,603	2,531	161,354		
Ave. Size:	29.7	37.2	39	37.1	31.9		

* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

Table 2. Estimated size distribution of the 1996 Massachusetts commercial striped bass catch.
(POUNDS OF FISH)

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
15					0	0.0	0.0
16					0	0.0	0.0
17					0	0.0	0.0
18					0	0.0	0.0
19	5,407		0	0	5,407	0.3	0.3
20	0		0	0	0	0.0	0.3
21	14,477		0	0	14,477	0.7	1.0
22	0		0	0	0	0.0	1.0
23	9,438		0	0	9,438	0.5	1.5
24	32,054		0	0	32,054	1.6	3.1
25	0		0	0	0	0.0	3.1
26	53,975		0	0	53,975	2.7	5.7
27	150,636		0	0	150,636	7.5	13.2
28	16,749		0	0	16,749	0.8	14.1
29	74,214		0	0	74,214	3.7	17.7
30	40,963		0	0	40,963	2.0	19.8
31	135,218		0	0	135,218	6.7	26.5
32	49,445		0	0	49,445	2.5	29.0
33	135,216	4,969	0	0	140,248	7.0	35.9
34	265,526	46,469	2,095	3,543	318,219	15.8	51.8
35	64,210	108,720	6,499	7,230	188,030	9.4	61.1
36	0	113,453	6,684	6,279	127,847	6.4	67.5
37	113,258	86,221	13,407	8,502	222,475	11.1	78.5
38	0	104,976	12,318	3,676	122,294	6.1	84.6
39	0	76,261	11,724	9,251	98,198	4.9	89.5
40	0	47,272	11,949	2,134	61,952	3.1	92.6
41	0	46,791	6,511	1,529	55,421	2.8	95.3
42	0	25,816	6,209	4,101	36,451	1.8	97.2
43	0	23,041	3,325	0	26,656	1.3	98.5
44	0	6,570	3,555	0	10,209	0.5	99.0
45	0	1,754	4,271	0	6,047	0.3	99.3
46	0	0	1,012	0	1,012	0.1	99.3
47	0	0	4,579	0	4,579	0.2	99.6
48	0	2,117	1,146	0	3,289	0.2	99.7
49	0	0	2,129	0	2,129	0.1	99.8
50	0	2,385	968	0	3,382	0.2	100.0
51	0	0	0	0	0	0.0	100.0
52	0	0	0	0	0	0.0	100.0
Totals:	1,160,784	696,815	98,378	46,246	2,011,011		
Ave. Size:	10.0	18.2	21.4	18.3	12.5		

* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

Table 3. Estimated size distribution of the 1996 Massachusetts recreational striped bass catch.
(Number of Fish)

*TL	**RELSUB	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
6				0	0.0	0.0
7				0	0.0	0.0
8				0	0.0	0.0
9				0	0.0	0.0
10				0	0.0	0.0
11				0	0.0	0.0
12				0	0.0	0.0
13				0	0.0	0.0
14	49,297			49,297	1.5	1.5
15	32,864			32,864	1.0	2.5
16	65,729			65,729	2.0	4.5
17	32,864			32,864	1.0	5.5
18	49,297			49,297	1.5	7.0
19	65,729			65,729	2.0	9.0
20	16,432			16,432	0.5	9.5
21	115,025			115,025	3.5	13.0
22	16,432			16,432	0.5	13.4
23	16,432			16,432	0.5	13.9
24	65,729			65,729	2.0	15.9
25	98,593			98,593	3.0	18.9
26	197,186			197,186	6.0	24.9
27	131,457			131,457	4.0	28.9
28	65,729			65,729	2.0	30.9
29	361,508			361,508	11.0	41.8
30	131,457			131,457	4.0	45.8
31	509,398			509,398	15.4	61.3
32	164,322	112		164,434	5.0	66.2
33	377,940	112	2,184	380,237	11.5	77.8
34	476,533	2,239	12,014	490,787	14.9	92.7
35		6,383	29,490	35,872	1.1	93.7
36		6,047	19,660	25,707	0.8	94.5
37		11,197	39,320	50,517	1.5	96.0
38		9,518	21,844	31,362	1.0	97.0
39		8,398	27,305	35,704	1.1	98.1
40		7,950	7,646	15,596	0.5	98.6
41		4,031	6,553	10,584	0.3	98.9
42		3,583	9,830	13,413	0.4	99.3
43		1,792	4,369	6,160	0.2	99.5
44		1,792	1,092	2,884	0.1	99.6
45		2,016	3,277	5,292	0.2	99.7
46		448	2,184	2,632	0.1	99.8
47		1,904	2,184	4,088	0.1	99.9
48		448	0	448	0.0	99.9
49		784	1,092	1,876	0.1	100.0
50		336		336	0.0	100.0
51				0	0.0	100.0
52				0	0.0	100.0
Totals:	3,039,954	69,088	190,046	3,299,088		
Ave. Size:	28.7	39.0	37.9	29.4		

* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

**Preliminary size distribution, will be updated using ALS data.

Table 4. Estimated size distribution of the 1996 Massachusetts recreational striped bass catch.
(Pounds of Fish)

*TL	**RELSUB	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
6	0			0	0.0	0.0
7	0			0	0.0	0.0
8	0			0	0.0	0.0
9	0			0	0.0	0.0
10	0			0	0.0	0.0
11	0			0	0.0	0.0
12	0			0	0.0	0.0
13	0			0	0.0	0.0
14	51,911			51,911	0.2	0.2
15	42,320			42,320	0.1	0.3
16	102,166			102,166	0.3	0.6
17	60,961			60,961	0.2	0.8
18	108,026			108,026	0.3	1.1
19	168,631			168,631	0.5	1.6
20	48,959			48,959	0.1	1.8
21	395,112			395,112	1.2	3.0
22	64,645			64,645	0.2	3.2
23	73,592			73,592	0.2	3.4
24	333,263			333,263	1.0	4.4
25	563,086			563,086	1.7	6.1
26	1,262,625			1,262,625	3.8	9.9
27	939,675			939,675	2.8	12.7
28	522,401	0		522,401	1.6	14.3
29	3,182,776	0		3,182,776	9.6	23.9
30	1,277,634	0		1,277,634	3.9	27.8
31	5,447,575	0		5,447,575	16.5	44.3
32	1,927,739	1,314		1,929,052	5.8	50.1
33	4,850,040	1,437		4,851,477	14.7	64.8
34	6,671,467	31,353		6,702,819	20.3	85.0
35	0	97,237	449,274	546,511	1.7	86.7
36	0	100,006	325,159	425,165	1.3	88.0
37	0	200,599	704,407	905,006	2.7	90.7
38	0	184,298	422,984	607,282	1.8	92.5
39	0	175,412	570,334	745,746	2.3	94.8
40	0	178,780	171,929	350,709	1.1	95.9
41	0	97,417	158,370	255,787	0.8	96.6
42	0	92,896	254,849	347,745	1.1	97.7
43	0	49,747	121,311	171,058	0.5	98.2
44	0	53,196	32,430	85,627	0.3	98.5
45	0	63,899	103,880	167,779	0.5	99.0
46	0	15,140	73,837	88,977	0.3	99.2
47	0	68,508	78,616	147,124	0.4	99.7
48	0	17,140	0	17,140	0.1	99.7
49	0	31,854	44,387	76,241	0.2	100.0
50	0	14,480	0	14,480	0.0	100.0
51	0	0	0	,0	0.0	100.0
52	0	0	0	0	0.0	100.0
Totals:	28,094,600	1,474,711	3,511,769	33,081,080		
Ave. Size:	9.2	21.3	18.5	10.0		

* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

**Preliminary size distribution, will be updated using ALS data.

Figure 1. Mean weight by age from Massachesetts samples