

1994
Striped Bass
Fisheries Monitoring Report

Massachusetts

Prepared for the ASMFC Striped Bass
Technical Committee - April 1995

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Introduction

This report characterizes the commercial and recreational striped bass fisheries that were conducted in Massachusetts during 1994. The information was collected from monitoring programs which are considered to be essential elements of the long-term management approach described in Section 7 of the Atlantic States Marine Fisheries Commission's (ASMFC) Fisheries Management Report No. 15 (Supplement to the Striped Bass FMP-Amendment #4). Several sources of information have been used to estimate harvest, total catch (which include fish that are 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 - September

Harvest Cap: 213,400 pounds (The Amendment #4 base harvest cap for Massachusetts is 238,000 pounds. That amount was reduced by 24,600 pounds in 1994 to compensate for an overage that occurred in 1993).

Allowable Gear Type: Hook and line

Minimum Size: 36 inches total length

Licensing and Reporting: In order to purchase striped bass directly from fishermen, fish dealers were required to obtain special authorization from the DMF in addition to standard seafood dealer permits. Dealer reporting requirements included weekly telephone reports of all striped bass purchases; a toll-

free number and an interactive telecommunication system was supplied for this purpose. Following the close of the season, dealers were also required to provide a written transcript consisting of purchase dates, number of fish, pounds of fish, and names and permit numbers of fishermen that they purchased from.

Fishermen had to have a commercial fishing permit and a special striped bass fishing permit to sell their catch. They also had to file catch reports at the end of the season, which included the name of the dealer(s) that they sold to and extensive information describing their catch composition and catch rates. In addition, a number of fishermen voluntarily provided daily fishing logs. The dealer telephone survey was used to gauge the distance to the harvest cap, while the dealer written transactions provided the final estimate of the harvest. Information from voluntary fishermen logs was useful for characterizing effort in the fishery.

Box 1. Attributes of the Massachusetts Striped Bass Commercial Fishery: 1990-1994.

SEASON	SEASON LENGTH (D)	HARVEST (LBs/NOs) 000s	DEALER PERMITS	FISHING PERMITS	HOURS FISHED
1990	93	160.6/6.3	95	1,498	87,000
1991	59	234.8/10.4	92	1,739	82,900
1992	39	239.2/11.3	135	1,861	70,000
1993	35	262.6/13.0	152	2,056	55,100
1994	24	199.6/10.4	150	2,367	43,200

The harvest cap has been reached over a shorter period of time each year since 1990. The shorter season lengths are a result of annual increases in effort (hours per day fished) and increases in striped bass biomass and abundance. In 1994, 199,600 pounds were harvested in 24 d (Box 1).

Harvest Levels and Catch Composition

Dealer transcripts indicated 199,600 pounds (10,400 fish) were harvested during 1994. The size distribution of the harvest was estimated from 302 striped bass sampled by the DMF at dealerships located throughout the state. Catch reports collected from 84% of licensed commercial fishermen stated that 184,062 pounds (9,253 fish) were sold. The catch reports were used to characterize the disposition of the catch (the proportion kept or released), the catch weight and size composition by category. The pounds and numbers reported for each category were expanded by 8% and 11%, respectively, to compensate for under-reporting of fishermen v. dealers. A functional geometric regression of weight on length was conducted on 808 fish sampled from the 1993 commercial harvest to derive the following weight-length relationship:

$$W = .00053L^{2.89} \quad (1)$$

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

The size composition by category of disposition is presented in Tables 1 (numbers) and 2 (pounds). The total commercial catch of 66,400 striped bass (838,200 pounds) was dominated by the released sublegal category (RELSUB), 80% by number and 69% 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. As puzzling as it may seem, commercial license holders, as in past years, reported releasing legal size fish during the commercial season (RELLEG). Seventeen percent of the total commercial catch in 1994 was greater than legal size (36 inches); this percentage was 15 and 20 in 1992 and 1993, respectively.

Age and Sex Composition

A sub-sample of 276 striped bass sampled from the 1994 commercial harvest was used to estimate age and sex composition. Age was determined by examination of scales and sex was determined by visual inspection of gonadal tissue (Sykes Method). The age distribution ranged from 7 to 16 years, and 98% were females (Box 2). Approximately 96% of the sub-sample consisted of individuals from 1982-1986 year classes (ages 8-12).

Box 2. Age, Sex and Size Composition of Striped Bass Sampled From the Massachusetts 1994 Commercial Harvest.

YEAR CLASS	NO.	%	MEAN LENGTH	MEAN WEIGHT	1/SEX RATIO
1987	5	1.8	36	17	1:0:0
1986	43	15.6	36	17	42:1:0
1985	112	40.6	37	18	108:2:2
1984	72	26.1	38	20	69:1:2
1983	25	9.1	40	22	24:1:0
1982	12	4.3	41	25	12:0:0
1981	1	0.4	40	24	1:0:0
1980	1	0.4	46	33	1:0:0
1979	3	1.1	47	36	3:0:0
1978	2	0.7	47	38	2:0:0

1/ female:male:unknown

Coastal landings are largely supported by year class produced in Chesapeake Bay. Strong year class production during 1960-1970 in particular, contributed substantially to the coastal harvest from the mid 60s through the late 70s. Members of the dominant 1970 year class composed 25% of the Massachusetts commercial harvest in 1982. A high percentage, given the large magnitude of fisheries and small minimum sizes (12-16 inches) these fish were exposed to up to that time. By the late 1980s, year classes from the 1960s had virtually passed through the coastal fisheries, and the 1970 year class was last observed in Massachusetts landings in 1990.

Passage of these year classes through the fishery is reflected in striped bass age composition sampled from the Massachusetts harvest. Trends in the average age of age 9+ (first fully vulnerable age group in the time series) fish are plotted in Figure 1. Although the trend decreases generally in time, a pronounced drop in average age is observed in recent years. More than 80% of the present coastal stock are products of the new management era (post 1980) and fall below age 9. Although this situation warrants close monitoring, immediate concern does not appear necessary. Modeling information and other indices indicate stock size is more than large enough to facilitate the rebuilding of the age structure in future years.

The average weight of age 9 fish calculated from sample data collected from the Massachusetts commercial harvest shows signs of decay over time (Figure 2.). While many factors can contribute to this phenomenon, such as sample size, time of year, stomach contents, or stock differences, the possibility that striped bass condition is being affected by intraspecific or interspecific competition for food and/or space as striped bass abundance increases can not be ruled out.

Estimation of Effort

Total hours fished obtained from standard fisherman catch reports and average hours per trip obtained from voluntary logs were used to estimate effort in the commercial fishery. To compensate for non-reporting, catch report effort data was expanded by 16% (the outstanding proportion of catch reports). Total hours fished (Jul 1-Jul 24) amounted to 43,241 and hours per trip averaged 5.8. These figures imply 7,455 total trips were conducted.

Characterization of Other Losses

Release mortality in the commercial fishery was estimated by using a hook-release mortality rate of 8% (Diodati 1990) applied against the RELSUB and RELLEG catch. Using information provided in Tables 1 and 2, total losses due to release mortality were 4,325 fish weighing approximately 47,940 pounds.

Recreational Fishery

Season: None

Daily bag Limit: One fish per person

Allowable Gear Type: Hook and line

Minimum Size: 36 inches total length

Licensing and Reporting Requirements: None

Harvest levels

Harvest levels and total catch were estimated from the NMFS MRFSS. Reference should be made to Osborn and Salz (1994) for a description of the new trip estimation procedure and its effect on catch. The MRFSS estimate for average weight of catch Type A striped bass was multiplied by the total number of Type A + B1 fish to estimate the weight of the harvest. The same sources of information described in previous sections were used to estimate the length distribution of the recreational catch, except that catch data from the commercial season (Jul 1-Jul 24) was excluded. The weight of released fish was estimated by using expression (1).

The MRFSS preliminary estimate for total catch in numbers (including fish released) is 1,956,100 striped bass (pse=12) weighing an estimated 25,700,000 pounds (Tables 4 and 5). The 1994 total recreational catch and harvest of striped bass increased substantially. Total catch was 250% and harvest was 100% more than the 1990-1993 annual average (Box 3). The number of legal size fish caught and released during 1994 was 25% of the total catch (Table 4), and was 5 times greater than the 1993 level. The MRFSS new estimation of Massachusetts annual total striped bass catch and harvest for 1981-1993 are presented in Box 3. Although trends in harvest over time generally remained the same (Figure 3), new estimates and PSEs averaged 22% and 7%, respectively, lower than the old information.

Estimation of Effort

Information from fisherman catch reports, excluding that collected during the commercial season, indicated that 28,740 hours were spent catching 31,777 striped bass. The average hours per trip estimated from data in voluntary logs prior to and after the commercial season, was 4.6. These figures imply 6,291 trips. Total striped bass related trips in the recreational fishery was then estimated by dividing the total catch (1,956,100 fish) by 31,777 fish and multiplying by 6,291 trips. The total, 387,236 trips, was 150% higher than the 1993 reestimated value (accounting for new MRFSS catch estimates).

Box 3. Massachusetts Recreational Striped Bass Total Catch and Harvest Estimates Based on New MRFSS Estimation Procedures.

YEAR	TOTAL CATCH	PSE	HARVEST	PSE
1981	204,000	38	21,200	40
1982	90,000	41	83,900	44
1983	73,000	35	39,300	51
1984	102,000	47	3,500	71
1985	78,000	75	66,000	88
1986	472,000	37	29,400	41
1987	104,000	24	10,800	40
1988	231,000	15	21,100	22
1989	206,000	14	13,000	33
1990	360,000	13	20,500	34
1991	470,000	12	20,800	21
1992	753,000	10	57,100	20
1993	628,000	10	48,900	13
1994	1,956,000	12	76,000	18

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 111,600 fish (1,115,900 pounds,) and release mortality of legal size stripers was 38,900 fish (801,100 pounds).

Bycatch in Other Fisheries

DMF sea-sampling efforts identified striped bass as bycatch in a Nantucket Sound springtime trawl fishery directed at long-finned squid (*Loligo pealei*). Estimates of striped bass bycatch were 3,066 fish (17,600 pounds). Anecdotal information was also reported for this fishery which suggested that striped bass bycatch ranged from 8,000 pounds per day up to single tows landing 19,000 pounds. Since these reports are undocumented, only the DMF sea-sampling data will be used to characterize losses. However the DMF will continue to monitor and investigate potential sources of striped bass bycatch during 1995.

Characterization of Losses

Since these fish were discarded alive, discard mortality rates needed to be applied to estimate total losses. Dunning et al. (1989) estimated immediate mortality of 18% for striped bass caught by trawl from the Hudson River. Mortality of striped bass after being captured by fish traps from Block Island Sound, tagged with internal anchors, and held 5 days was only 4% (Diodati 1990). Other studies conducted on trawl bycatch mortality in the Delaware River found mortality as high as 40%. The latter estimate may be high, since factors such as water temperature (high), salinity (low), and handling conditions are known to increase mortality rates, and the fishery in question operated in open ocean areas during springtime, and no on-board mortalities were noted. Regardless, the higher rate of 40% was applied to estimate total loss of 1,226 fish (7,038 pounds).

Estimated Total Losses

Total estimated loss of striped bass during 1994 was 242,500 fish weighing 3,938,800 pounds (Table 5). The majority of which, 93% by number and 94% by weight, was attributed to combined losses in the recreational fishery due to harvest and release mortality.

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 have understated the effects fishing has had 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 and the NBS 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. Summary statistics to date are as follows:

YEAR	TRIPS	BOATS	NUMBER TAGGED	AVERAGE LENGTH	SE	LENGTH RANGE	
						MINIMUM	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

**Table 1. Estimated Size Distribution of the 1994 Massachusetts Commercial Striped Bass Catch.
(NUMBER OF FISH)**

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	PERCENT	CUM. PERCENT
18	943				943	1.42	1.42
19	0				0	0.00	1.42
20	0				0	0.00	1.42
21	0				0	0.00	1.42
22	943				943	1.42	2.84
23	943				943	1.42	4.26
24	2,830				2,830	4.26	8.52
25	0				0	0.00	8.52
26	3,774				3,774	5.68	14.20
27	943				943	1.42	15.62
28	4,717				4,717	7.10	22.72
29	943				943	1.42	24.14
30	2,830				2,830	4.26	28.40
31	11,321				11,321	17.04	45.44
32	943		0	0	943	1.42	46.86
33	4,717		0	0	4,717	7.10	53.96
34	1,887	0	6	22	1,915	2.88	56.85
35	7,547	35	6	22	7,610	11.46	68.30
36	1,887	936	6	0	2,829	4.26	72.56
37	2,830	3,363	390	420	7,003	10.54	83.10
38	0	2,461	124	188	2,774	4.18	87.28
39	0	1,595	396	199	2,190	3.30	90.57
40	0	659	302	66	1,027	1.55	92.12
41	1,887	485	160	77	2,609	3.93	96.05
42	0	347	201	100	647	0.97	97.02
43	0	208	24	11	243	0.37	97.39
44	0	35	65	22	122	0.18	97.57
45	0	35	71	44	150	0.23	97.79
46	0	35	18	11	63	0.10	97.89
47	943	69	71	11	1,095	1.65	99.54
48	0	104	41	22	168	0.25	99.79
49	0	0	18	11	29	0.04	99.83
50	0	0	35	0	35	0.05	99.89
51	0	0	6	0	6	0.01	99.90
52	0	35	12	11	58	0.09	99.98
53	0	0	0		0	0.00	99.98
54	0	0	6		6	0.01	99.99
55	0	0	6		6	0.01	100.00
Totals:		52,829	10,400	1,963	1,239	66,431	
Ave. Size:		31.3	38.4	40.6	39.3	32.9	

* Size interval 18 contains fish measuring from 17.1 to 18 inches.

Table 2. Estimated Size Distribution of the 1994 Massachusetts Commercial Striped Bass Catch.
(POUNDS OF FISH)

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	PERCENT	CUM. PERCENT
18	1,936				1,936	0.23	0.23
19	0				0	0.00	0.23
20	0				0	0.00	0.23
21	0				0	0.00	0.23
22	3,457				3,457	0.41	0.64
23	3,931				3,931	0.47	1.11
24	13,338				13,338	1.59	2.70
25	0				0	0.00	2.70
26	22,412				22,412	2.67	5.38
27	6,249				6,249	0.75	6.12
28	34,706				34,706	4.14	10.26
29	7,682				7,682	0.92	11.18
30	25,419				25,419	3.03	14.21
31	111,781				111,781	13.34	27.55
32	10,210				10,210	1.22	28.77
33	55,799				55,799	6.66	35.42
34	24,331		71	271	24,672	2.94	38.37
35	105,827	503	77	295	106,702	12.73	51.10
36	28,701	14,744	83	0	43,528	5.19	56.29
37	46,599	57,335	5,951	6,577	116,462	13.89	70.18
38	0	45,329	2,045	3,178	50,552	6.03	76.21
39	0	31,658	7,034	3,627	42,319	5.05	81.26
40	0	14,069	5,761	1,301	21,130	2.52	83.78
41	41,795	11,133	3,276	1,630	57,834	6.90	90.68
42	0	8,526	4,422	2,247	15,195	1.81	92.50
43	0	5,475	557	267	6,300	0.75	93.25
44	0	975	1,637	571	3,183	0.38	93.63
45	0	1,041	1,905	1,219	4,165	0.50	94.12
46	0	1,109	508	325	1,941	0.23	94.36
47	31,011	2,360	2,160	346	35,877	4.28	98.64
48		3,762	1,339	734	5,836	0.70	99.33
49		0	609	390	999	0.12	99.45
50		0	1,292	0	1,292	0.15	99.61
51		0	228	0	228	0.03	99.63
52		1,580	482	463	2,526	0.30	99.93
53			0		0	0.00	99.93
54			269		269	0.03	99.97
55			284		284	0.03	100.00
Totals:	575,185	199,600	39,990	23,440	838,215		
Ave. Size:	10.9	19.2	20.4	18.9	12.6		

* Size interval 18 contains fish measuring from 17.1 to 18 inches.

**Table 3. Estimated Size Distribution of the 1994 Massachusetts Recreational Striped Bass Catch.
(NUMBER OF FISH)**

*TL	RELSUB	CONSUM	RELLEG	TOTAL	PERCENT	CUM. PERCENT
15	21,135			21,135	1.08	1.08
16	21,135			21,135	1.08	2.16
17	21,135			21,135	1.08	3.24
18	21,135			21,135	1.08	4.32
19	21,135			21,135	1.08	5.40
20	42,270			42,270	2.16	7.56
21	21,135			21,135	1.08	8.64
22	42,270			42,270	2.16	10.80
23	0			0	0.00	10.80
24	42,270			42,270	2.16	12.97
25	0			0	0.00	12.97
26	21,135			21,135	1.08	14.05
27	21,135			21,135	1.08	15.13
28	232,483			232,483	11.89	27.01
29	42,270			42,270	2.16	29.17
30	190,214			190,214	9.72	38.90
31	105,674			105,674	5.40	44.30
32	84,539			84,539	4.32	48.62
33	21,135			21,135	1.08	49.70
34	232,483	452		232,936	11.91	61.61
35	147,944	452		148,396	7.59	69.20
36	42,270	0		42,270	2.16	71.36
37		11,310	274,752	286,062	14.62	85.98
38		4,071	63,404	67,476	3.45	89.43
39		13,119	63,404	76,523	3.91	93.34
40		11,762	21,135	32,897	1.68	95.02
41		6,786	0	6,786	0.35	95.37
42		8,143	21,135	29,278	1.50	96.87
43		905	0	905	0.05	96.91
44		4,071	0	4,071	0.21	97.12
45		3,167	21,135	24,301	1.24	98.36
46		905	0	905	0.05	98.41
47		3,167	0	3,167	0.16	98.57
48		2,714	21,135	23,849	1.22	99.79
49		1,357		1,357	0.07	99.86
50		1,810		1,810	0.09	99.95
51		452		452	0.02	99.98
52		452		452	0.02	100.00
53		0			0.00	100.00
54		452			0.00	100.00
55		452			0.00	100.00
Totals:	1,394,900	76,000	486,100	1,956,095		
Ave. Size:	29.3	41.3	38.6	32.1		

* Size interval 18 contains fish measuring from 17.1 to 18 inches.

Table 4. Estimated Size Distribution of the 1994 Massachusetts Recreational Striped Bass Catch.
(POUNDS OF FISH)

*TL	RELSUB	CONSUM	RELLEG	TOTAL	PERCENT	CUM. PERCENT
15	28,066			28,066	0.11	0.11
16	33,821			33,821	0.13	0.24
17	40,297			40,297	0.16	0.40
18	47,535			47,535	0.18	0.58
19	55,574			55,574	0.22	0.80
20	128,909			128,909	0.50	1.30
21	74,215			74,215	0.29	1.59
22	169,788			169,788	0.66	2.25
23	0			0	0.00	2.25
24	218,331			218,331	0.85	3.10
25	0			0	0.00	3.10
26	137,578			137,578	0.54	3.63
27	153,432			153,432	0.60	4.23
28	1,874,798			1,874,798	7.30	11.53
29	377,255			377,255	1.47	13.00
30	1,872,397			1,872,397	7.29	20.28
31	1,143,616			1,143,616	4.45	24.73
32	1,002,809			1,002,809	3.90	28.63
33	274,019			274,019	1.07	29.70
34	3,285,805	5,835		3,291,640	12.81	42.51
35	2,273,682	6,345		2,280,027	8.87	51.38
36	704,724	0		704,724	2.74	54.12
37		186,264	4,958,154	5,144,418	20.02	74.14
38		72,427	1,235,861	1,308,288	5.09	79.23
39		251,571	1,332,207	1,583,777	6.16	85.39
40		242,668	477,779	720,447	2.80	88.20
41		150,356	0	150,356	0.59	88.78
42		193,441	550,128	743,569	2.89	91.68
43		23,006	0	23,006	0.09	91.77
44		110,638	0	110,638	0.43	92.20
45		91,826	671,518	763,345	2.97	95.17
46		27,957	0	27,957	0.11	95.28
47		104,123	0	104,123	0.41	95.68
48		94,847	809,209	904,056	3.52	99.20
49		50,335		50,335	0.20	99.39
50		71,149		71,149	0.28	99.67
51		18,835		18,835	0.07	99.74
52		19,922		19,922	0.08	99.82
53		0		0	0.00	99.82
54		22,218		22,218	0.09	99.91
55		23,428		23,428	0.09	100.00
Totals:	13,896,650	1,767,192	10,034,856	25,698,698		
Ave. Size:	10.0	23.3	20.6	13.1		

* Size interval 18 contains fish measuring from 17.1 to 18 inches.

Table 5. Preliminary Estimates of Total Striped Bass Losses Occurring in Massachusetts Waters during 1994.

<u>Category</u>	<u>Number</u>	<u>Pounds</u>	<u>Mean Weight</u>
<u>1/COMMERCIAL</u>			
HARVEST	10,400	199,600	19.2
RELEASE MORTALITY	4,325	47,940	11.1
<u>RECREATIONAL</u>			
HARVEST	76,000	1,767,200	23.3
RELEASE MORTALITY	150,500	1,917,000	12.7
<u>BYCATCH</u>			
SQUID FISHERY	1,226	7,038	5.7
TOTAL:	242,451	3,938,778	16.2

Figure 1. Average age of Striped Bass from Age 9+ Fish Sampled from the Massachusetts Commercial Harvest.

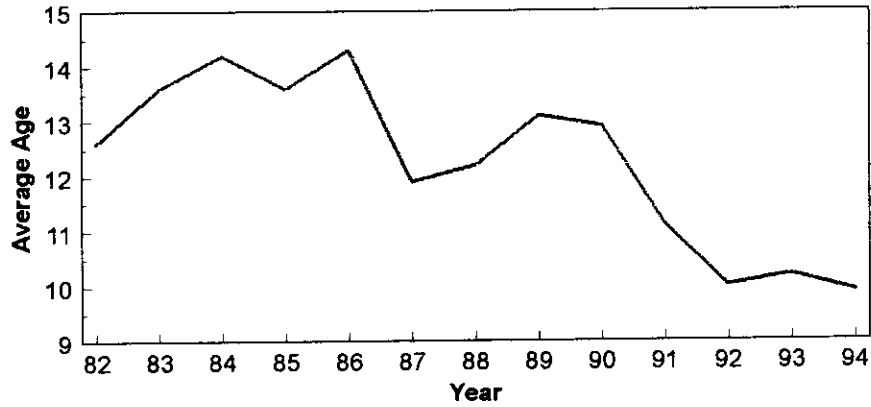


Figure 2. Mean Weight and Abundance of Age 9 Striped Bass Sampled From the Massachusetts Commercial Harvest.

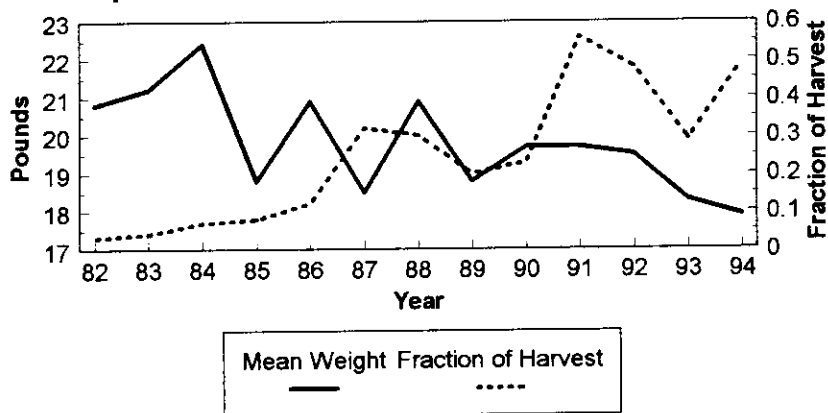


Figure 3. MRFSS Estimates of Massachusetts Striped Bass Harvest.

