

**1993
Striped Bass
Fisheries Monitoring Report**

Massachusetts

**Prepared for the ASMFC Striped Bass
Technical Committee - April 1994**

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Introduction

This report characterizes the commercial and recreational striped bass fisheries that were conducted in Massachusetts during 1993. 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

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 bi-weekly telephone reports of all striped bass purchases; a toll-free number and an interactive telecommunication system was supplied for this purpose. The frequency of reporting was increased to weekly as the

Table A. Season Attributes

	<u>Proposed</u>	<u>Actual</u>
Season	1 Jul-30 Sep	1 Jul-4 Aug
Cap	238,000 lbs	262,600 lbs
Gears	Hook & Line	Hook & Line
Min. Sz.	36 in. (TI)	36 in. (TI)

landings cap was approached. 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 diaries. 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 daily fishermen logs was useful in characterizing the striped bass catch that was of sublegal size.

The 1993 season length was 35 days compared to 59 and 39 days in 1991 and 1992, respectively (Table A); the full 3-month season was realized in 1990. The number of authorized striped bass dealers (152) and permitted fishermen (2,056) in 1993 increased by 60% and 37%, respectively, from 1990 levels (Table B).

Table B. Number of Authorized Striped Bass Dealers and Permitted Fishermen.

<u>YEAR</u>	<u>DEALERS</u>	<u>FISHERMEN</u>
1990	95	1,498
1991	92	1,739
1992	135	1,861
1993	152	2,056

Harvest Levels and Catch Composition

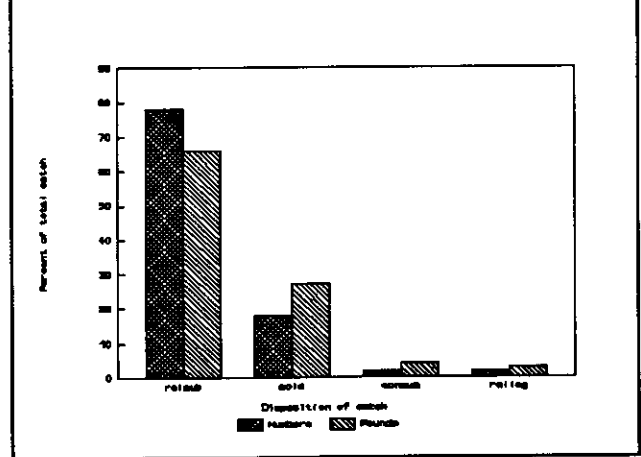
Dealer written transactions reported 262,600 pounds (12,991 fish) harvested during 1993. This represented a cap overage of approximately 10%. Striped bass harvest information collected from 90% of fisherman permit holders indicated 244,087 pounds (11,926 fish) were sold. Fisherman reports, which provided information on the disposition of the catch (kept or released), were used to estimate catch weight and size composition by category. However, a weight/length distribution from 808 striped bass (18,324 pounds) sampled from the commercial harvest was used to characterize that component of catch that was SOLD. The pounds and numbers reported for each category was expanded by 7% and 8%, respectively, to compensate for the under-reporting of fishermen relative to dealers. A functional geometric regression of weight on length was conducted on the 808 fish sample 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 disposition of the commercial catch is displayed in Figure A and the size composition by category of disposition is presented in Tables 1 and 2 by numbers and pounds of fish, respectively. The total catch of 73,531 striped bass (959,930 pounds) was dominated by the released sublegal category (RELSUB). The RELSUB proportion of the total catch, 78% by number and 66% by weight, is consistent with what was observed in the previous year. Twenty percent of the total catch in 1993 was greater than legal size (36 inches), compared to 15% in 1992 (Diodati and Hoopes, 1993), and 8% of the total number of legal size fish caught were released.

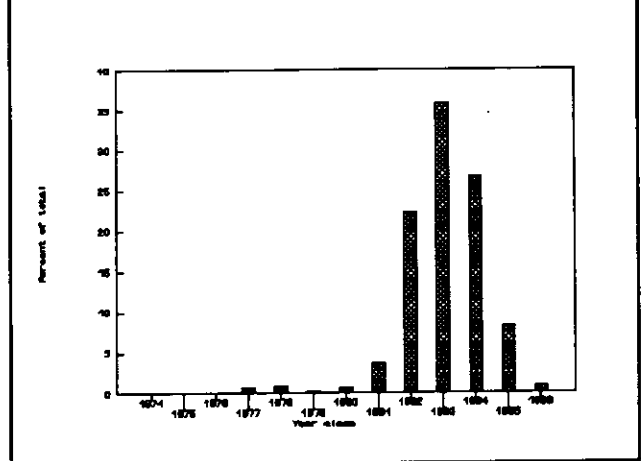
Figure A. Disposition of catch



Age and Sex Composition

A sub-sample of 769 of the 808 striped bass sampled from the 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 19 years and 89% were females (Table 3 and Figure B). About 85% of the sub-sample consisted of individuals from the 1982-1984 year classes (ages 11-9).

Figure B. Year Class Composition of the Commercial Harvest.



Estimation of Effort and CPUE

Total effort in hours fished was obtained from the standard fisherman catch report and average hours per trip was obtained from voluntary dairy information. To compensate for non-reporting, catch report effort data was expanded by 10% (the outstanding portion of catch reports). Total hours fished (Jul 1-Aug 4) amounted to 55,082 and hours per trip averaged 5.2. These figures imply 10,593 total trips, 6.9 fish per trip (1.5 of legal size) and 1.3 fish per hour. Catch per hour in 1992 was similar (1.2 fish).

Characterization of Losses

Estimates of release mortality due to catch and release of sublegal (RELSUB) and legal size (RELLEG) striped bass were 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, the total estimate of release mortality was 4,700 fish weighing approximately 52,600 pounds.

Recreational Fishery

The 1993 Massachusetts recreational fishery had no seasonal restrictions nor were participants required to obtain a fishing permit. Catch was restricted to one fish per angler per day, and a 36 inch minimum size (T1) was enforced. Harvest levels and total catch were estimated from the NMFS MRFSS, relying on estimates based on the "old" trip estimation procedure (Osborn and Salz 1994). Reference should be made to Osborn and Salz (1994) for a description of the new trip estimation procedure and its affect on catch. The MRFSS estimate for harvest weight was used in this report but weight of released sublegal and legal size fish was estimated by the techniques and samples described in previous sections. The same sources of information described in previous sections were used to estimate the length distribution of the recreational catch.

Harvest levels

The MRFSS preliminary estimate for total catch in numbers (including fish released) was 994,852 striped bass (pse=9.7); using the new trip estimation procedure, total catch was 627,815 (pse=9.7). DMF catch report information from fishermen that did not sell bass (392 anglers), was used to estimate the proportion of sublegal size fish in the total catch. These reports indicated that 84% of the total striped bass caught were of sublegal size; this proportion was 92% and 89% in 1991 and 1992, respectively. Therefore, the estimated catch of sublegals was 832,691 fish ($994,852 \times 0.84$) weighing 8,770,279 pounds (Tables 4 and 5).

The MRFSS estimate of harvest, 61,602 fish (pse = 12.8) weighing 1,077,606 pounds, was added to the estimated number of sublegals and this sum was subtracted from the total catch to determine the number of legal size fish caught and released; 100,558 fish (2,098,913 pounds). Legal size fish caught and released represented 62% of all legal size fish caught compared to 26% and 32% in 1991 and 1992, respectively.

Estimation of Effort and CPUE

Catch report information from those anglers that did not sell fish indicated that 20,942 hours were spent catching 19,072 striped bass. The average hours per trip estimated from data in voluntary

diaries (prior to and after the commercial season) was 4.6. These figures imply 4,553 trips. Total striped bass related trips in the recreational fishery was then estimated by dividing the total catch (994,852 fish) by 19,072 fish and multiplying by 4,553 trips. The total, 237,498 trips, was 22% higher than last years figure (and 67% higher than the 1991 estimate), while total hours fished (1,085,366) showed an increase of 11% over the 1992 level. CPUE by trip and hour was 4.2 and 0.9, respectively, compared to 5.0 and 1.0 in 1992.

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 sublegals was 66,615 fish (699,460 pounds,) and release mortality of legal size stripers was 8,045 fish (168,131 pounds).

Bycatch in Other Fisheries

DMF sea-sampling efforts identified striped bass as bycatch in a Massachusetts Bay seine fishery directed at Atlantic menhaden (*Brevoortia tyrannus*) and a Nantucket Sound trawl fishery directed at long-finned squid (*Loligo pealei*). Estimates of striped bass bycatch were 3,300 fish (8,500 pounds) in the seine fishery and 26,260 fish (150,723 pounds) in the trawl fishery. These estimates should be considered maximum values since both were influenced by a "one tow" situation that skewed the catch estimates upward (i.e., in the squid fishery, total pounds of striped bass sampled was 992, but one tow contributed nearly 60% of that total).

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). Using 18 and 4% to estimate the potential trawl and seine losses, respectively, resulted in 4,859 striped bass (27,470 pounds). These estimates, likely are high, since factors such as water temperature (high), salinity (low), and handling conditions are known to increase mortality rates, and both fisheries in question operated in open ocean areas during springtime, and no on-board mortalities were noted.

Estimated Total Losses

Total estimated loss of striped bass during 1993 was 158,815 fish weighing 2,287,914 pounds (Table 6). The majority of which,

81% by number and 78% by weight, was attributed to combined losses in the recreational fishery due to harvest and release mortality of sublegal size striped bass. Fifty two percent of the total losses consisted of fish that were 36 (Tl) or greater.

Required Fishery Independent Monitoring Programs

Massachusetts Tagging Study

Massachusetts began a striped bass tagging study in October 1991. Three hundred eighty seven fish were collected for tagging by rod and reel fishing aboard chartered vessels during 17 trips in 1991 and 894 striped bass were collected during 29 trips in 1992. Tagging efforts were continued in fall 1993, resulting in an additional 675 fish tagged during 15 trips. Floy internal anchor tags supplied by the USFWS were applied. The size distribution of fish tagged in 1993 is shown in Table 7 and tag-recapture matrices for striped bass tagged in earlier years are shown in Table 8.

Table 1. Estimated Size Distribution of the Massachusetts Commercial Striped Bass Catch During 1993 (Numbers of Fish).

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	FREQ.	CUM. FREQ.
14	685				685	0.93	0.93
15	0				0	0.00	0.93
16	1,370				1,370	1.86	2.80
17	0				0	0.00	2.80
18	1,370				1,370	1.86	4.66
19	0				0	0.00	4.66
20	1,370				1,370	1.86	6.52
21	0				0	0.00	6.52
22	1,370				1,370	1.86	8.39
23	0				0	0.00	8.39
24	3,426				3,426	4.66	13.05
25	685				685	0.93	13.98
26	685				685	0.93	14.91
27	4,797				4,797	6.52	21.43
28	2,741				2,741	3.73	25.16
29	2,056				2,056	2.80	27.96
30	5,482				5,482	7.46	35.41
31	1,370				1,370	1.86	37.28
32	6,852				6,852	9.32	46.60
33	5,482				5,482	7.46	54.05
34	6,167	16			6,183	8.41	62.46
35	10,279	80	18	32	10,409	14.16	76.62
36	1,370	1,286	35	65	2,757	3.75	80.36
37		2,524	335	372	3,231	4.39	84.76
38		3,666	359	259	4,283	5.82	90.58
39		2,299	71	210	2,580	3.51	94.09
40		1,109	394	48	1,552	2.11	96.20
41		933	147	97	1,176	1.60	97.80
42		547	76	16	639	0.87	98.67
43		177	118	65	359	0.49	99.16
44		161	24	0	184	0.25	99.41
45		64	71	32	167	0.23	99.64
46		16	18	0	34	0.05	99.68
47		48	24	16	88	0.12	99.80
48		32	53	16	101	0.14	99.94
49		0	0		0	0.00	99.94
50		16	0		16	0.02	99.96
51		0	0		0	0.00	99.96
52		16	6		22	0.03	99.99
53			6		6	0.01	100.00
Totals:	57,560	12,991	1,752	1,228	73,531		
Ave. Size:	29.9	38.6	40.0	38.7	31.8		

* Size interval 14 contains fish measuring from 13.1 to 14 inches.

Table 2. Estimated Size Distribution of the Massachusetts Commercial Striped Bass Catch During 1993 (Pounds of Fish).

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	FREQ.	CUM. FREQ.
14	780				780	0.08	0.08
15	0				0	0.00	0.08
16	2,295				2,295	0.24	0.32
17	0				0	0.00	0.32
18	3,226				3,226	0.34	0.66
19	0				0	0.00	0.66
20	4,374				4,374	0.46	1.11
21	0				0	0.00	1.11
22	5,761				5,761	0.60	1.71
23	0				0	0.00	1.71
24	18,520				18,520	1.93	3.64
25	4,168				4,168	0.43	4.08
26	4,668				4,668	0.49	4.56
27	36,443				36,443	3.80	8.36
28	23,132				23,132	2.41	10.77
29	19,201				19,201	2.00	12.77
30	56,473				56,473	5.88	18.65
31	15,522				15,522	1.62	20.27
32	85,066				85,066	8.86	29.13
33	74,382				74,382	7.75	36.88
34	91,220	223			91,443	9.53	46.40
35	165,318	1,215	244	483	167,260	17.42	63.83
36	23,912	21,092	529	1,048	46,581	4.85	68.68
37		44,809	5,059	6,522	56,390	5.87	74.56
38		70,293	2,268	4,901	77,462	8.07	82.63
39		47,529	4,779	4,292	56,600	5.90	88.52
40		24,677	8,131	1,066	33,874	3.53	92.05
41		22,279	3,082	2,289	27,650	2.88	94.93
42		14,004	1,652	409	16,065	1.67	96.60
43		4,850	1,916	1,751	8,517	0.89	97.49
44		4,712	1,417	0	6,130	0.64	98.13
45		2,012	2,185	999	5,195	0.54	98.67
46		536	716	0	1,252	0.13	98.80
47		1,711	1,906	566	4,183	0.44	99.24
48		1,212	608	602	2,422	0.25	99.49
49		0	860		860	0.09	99.58
50		682	2,051		2,733	0.28	99.86
51		0	0		0	0.00	99.86
52		764	0		764	0.08	99.94
53			539		539	0.06	100.00
Totals:	634,460	262,600	37,943	24,927	959,930		
Ave. Wt:	11.0	20.2	21.7	20.3	13.1		

* Size interval 14 contains fish measuring from 13.1 to 14 inches.

Table 3. Age, Size and Sex Composition of Striped Bass Sampled From the Massachusetts Commercial Harvest (1 Jul-4 Aug 1993).

Year Class	NO.	PERCENT	AVE. LENGTH	LENGTH RANGE	AVE. WEIGHT	*SEX RATIO
1974	1	0.1	51		47	1:0:0
1975	1	0.1	42		28	1:0:0
1976	1	0.1	48		39	1:0:0
1977	5	0.7	45	44-47	35	5:0:0
1978	6	0.8	46	44-50	36	6:0:0
1979	2	0.3	43	42-44	27	1:0:1
1980	5	0.7	41	36-46	25	5:0:0
1981	28	3.6	40	36-44	23	25:1:2
1982	171	22.2	39	35-44	21	153:1:17
1983	275	35.8	38	34-43	20	246:5:24
1984	205	26.7	37	35-41	18	179:5:21
1985	63	8.2	37	34-38	18	57:1:5
1986	6	0.8	36	35-39	18	6:0:0

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*FEMALE:MALE:UNKNOWN

Table 4. Estimated Size Distribution of the Massachusetts Recreational Striped Bass Catch During 1993 (Numbers of Fish).

*TL	RELSUB	CONSUM	RELLEG	TOTAL	FREQ.	CUM. FREQ.
14	9,913			9,913	1.00	1.00
15	0			0	0.00	1.00
16	19,826			19,826	1.99	2.99
17	0			0	0.00	2.99
18	19,826			19,826	1.99	4.98
19	0			0	0.00	4.98
20	19,826			19,826	1.99	6.98
21	0			0	0.00	6.98
22	19,826			19,826	1.99	8.97
23	0			0	0.00	8.97
24	49,565			49,565	4.98	13.95
25	9,913			9,913	1.00	14.95
26	9,913			9,913	1.00	15.94
27	69,391			69,391	6.98	22.92
28	39,652			39,652	3.99	26.90
29	29,739			29,739	2.99	29.89
30	79,304			79,304	7.97	37.86
31	19,826			19,826	1.99	39.86
32	99,130			99,130	9.96	49.82
33	79,304			79,304	7.97	57.79
34	89,217	620	2,646	92,483	9.30	67.09
35	148,695	1,240	5,293	155,228	15.60	82.69
36	19,826	10,956	30,432	61,214	6.15	88.85
37		4,548	21,170	25,718	2.59	91.43
38		8,889	17,201	26,090	2.62	94.05
39		14,057	3,969	18,026	1.81	95.86
40		4,961	7,939	12,900	1.30	97.16
41		2,481	1,323	3,804	0.38	97.54
42		2,687	5,293	7,980	0.80	98.35
43		1,860	0	1,860	0.19	98.53
44		2,687	2,646	5,334	0.54	99.07
45		827	0	827	0.08	99.15
46		2,067	1,323	3,390	0.34	99.49
47		620	1,323	1,943	0.20	99.69
48		827		827	0.08	99.77
49		1,860		1,860	0.19	99.96
50		0		0	0.00	99.96
51		0		0	0.00	99.96
52		413		413	0.04	100.00
53				0	0.00	100.00
Totals:	832,691	61,602	100,558	994,851		
Ave. Size:	29.9	39.6	37.8	31.3		

* Size interval 14 contains fish measuring from 13.1 to 14 inches.

Table 5. Estimated Size Distribution of the Massachusetts Recreational Striped Bass Catch During 1993 (Pounds of Fish).

*TL	RELSUB	CONSUM	RELLEG	TOTAL	FREQ.	CUM. FREQ.
14	10,784			10,784	0.09	0.09
15	0			0	0.00	0.09
16	31,726			31,726	0.27	0.36
17	0			0	0.00	0.36
18	44,591			44,591	0.37	0.73
19	0			0	0.00	0.73
20	60,463			60,463	0.51	1.24
21	0			0	0.00	1.24
22	79,636			79,636	0.67	1.90
23	0			0	0.00	1.90
24	256,012			256,012	2.14	4.04
25	57,614			57,614	0.48	4.53
26	64,529			64,529	0.54	5.07
27	503,755			503,755	4.22	9.28
28	319,762			319,762	2.68	11.96
29	265,419			265,419	2.22	14.18
30	780,640			780,640	6.53	20.72
31	214,559			214,559	1.80	22.51
32	1,175,882			1,175,882	9.84	32.35
33	1,028,196			1,028,196	8.61	40.96
34	1,260,948	6,926	40,669	1,308,543	10.95	51.91
35	2,285,222	15,028	88,237	2,388,487	19.99	71.91
36	330,540	143,682	549,174	1,023,396	8.57	80.47
37		64,420	412,642	477,062	3.99	84.47
38		135,728	361,409	497,137	4.16	88.63
39		230,933	89,733	320,666	2.68	91.31
40		87,535	192,742	280,276	2.35	93.66
41		46,924	34,440	81,364	0.68	94.34
42		54,411	147,456	201,868	1.69	96.03
43		40,257	0	40,257	0.34	96.37
44		62,051	84,080	146,131	1.22	97.59
45		20,345	0	20,345	0.17	97.76
46		54,124	47,670	101,793	0.85	98.61
47		17,256	50,660	67,916	0.57	99.18
48		24,420		24,420	0.20	99.38
49		58,249		58,249	0.49	99.87
50		0		0	0.00	99.87
51		0		0	0.00	99.87
52		15,318		15,318	0.13	100.00
53				0	0.00	100.00
Totals:	8,770,279	1,077,606	2,098,913	11,946,797		
Ave. Wt:	10.5	17.5	20.9	12.0		

* Size interval 14 contains fish measuring from 13.1 to 14 inches.

Table 6. Preliminary Estimates of Striped Bass Losses in Massachusetts During 1993.

CATEGORY	NUMBER	POUNDS	AVE WEIGHT
1/COMMERCIAL			
LEGAL HARVEST	12,991	262,600	20.2
RELEASE SUB-LEGAL	4,605	50,653	11.0
RELEASE LEGAL	98	1,994	20.3
SUB-TOTAL:	17,694	315,247	17.8
RECREATIONAL			
LEGAL HARVEST	61,602	1,077,606	17.5
RELEASE SUB-LEGAL	66,615	699,460	10.5
RELEASE LEGAL	8,045	168,131	20.9
SUB-TOTAL:	136,262	1,945,197	14.3
BYCATCH			
SQUID FISHERY	4,727	27,130	5.7
MENHADEN FISHERY	132	340	2.6
SUB-TOTAL:	4,859	27,470	5.7
GRAND-TOTAL:	158,815	2,287,914	14.4

1/Harvest CONSUM from Tables 1&2 is not recorded here, since this type of harvest was likely accounted for as part of the recreational harvest.

Table 7. Size Distribution of Striped Bass Tagged During the Massachusetts Tagging Study – 1993.

TL	NUMBER	FREQ.	CUM. FREQ.
525	4	0.6	0.6
550	10	1.5	2.1
575	13	1.9	4.0
600	19	2.8	6.8
625	26	3.8	10.6
650	34	5.0	15.6
675	42	6.2	21.7
700	50	7.3	29.1
725	52	7.6	36.7
750	48	7.0	43.8
775	46	6.8	50.5
800	32	4.7	55.2
825	39	5.7	60.9
850	39	5.7	66.7
875	33	4.8	71.5
900	50	7.3	78.9
925	43	6.3	85.2
950	41	6.0	91.2
975	22	3.2	94.4
1000	15	2.2	96.6
1025	11	1.6	98.2
1050	5	0.7	99.0
1075	1	0.1	99.1
1100	2	0.3	99.4
1125	0	0.0	99.4
1150	1	0.1	99.6
1175	1	0.1	99.7
1200	0	0.0	99.7
1225	2	0.3	100.0

TOTAL: 681

AVE.: 784

Table 8. Massachusetts Striped Bass Tag-Recovery Data Matrices.

Year Class	Year of Release	Total Length (mm)		Number Released	YEAR OF RECOVERY				
		Mean	SD		1989	1990	1991	1992	1993
<1982	1989			0					
	1990			0					
	1991	1022	117	15					
	1992	1007	131	44				1	
1982	1989			0					
	1990			0					
	1991	898	55	42				2	
	1992	909	64	46				1	
1983	1989			0					
	1990			0					
	1991	883	56	67			1	4	2
	1992	874	57	77				1	
1984	1989			0					
	1990			0					
	1991	833	54	84			3	7	
	1992	857	53	109				1	
1985	1989			0					
	1990			0					
	1991	792	56	60				3	
	1992	778	66	107				1	2
1986	1989			0					
	1990			0					
	1991	702	63	42			1	3	
	1992	702	61	106				1	2
1987	1989			0					
	1990			0					
	1991	646	51	34				3	2
	1992	645	45	75				1	
1988	1989			0					
	1990			0					
	1991	579	40	3					1
	1992	614	57	9					
1989	1989			0					
	1990			0					
	1991			0					
	1992	525		1					
The following fish have no year class assigned:									
	1989	369	53	827	18	11	3	1	
	1990			0					
	1991	830	68	41			2	1	
	1992	798	110	322				1	
Overall summary of release and recapture data:									
	1989	369	54	827	18	11	3	1	0
	1990	0	0	0	0	0	0	0	0
	1991	817	107	388	0	0	7	23	5
	1992	799	120	896	0	0	0	8	4
	Totals:	694	216	2111	18	11	10	32	9