

**FISHERY MANAGEMENT PLAN REVIEW
FOR WEAKFISH (*Cynoscion regalis*)
2002 FISHING YEAR**

Plan Review Team

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October 2003

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I. Status of the Fisheries Management Plan

The Atlantic States Marine Fisheries Commission (ASMFC) approved Amendment 4 to the Weakfish Fishery Management Plan in November 2002. The amendment was implemented for the first time in 2003. This review, however, is of activities of the 2002 fishery and Amendment 3.

The ASMFC adopted its first Fishery Management Plan for Weakfish in 1985. Amendment 1 to the FMP, which superseded the original plan, was adopted in 1992, and Amendment 2 was adopted in October 1994. Weakfish are currently managed under the guidelines contained in Amendment 3, which was approved by the Commission in May 1996 and completely replaced all previous amendments. Amendment 3 and Addendum 1 have been replaced by Amendment 4.

The goals of Amendment 3 were to utilize interstate management so that Atlantic coastal weakfish recover to healthy levels which will maintain commercial and recreational harvest consistent with self-sustaining spawning stock and to provide for restoration and maintenance of essential habitat. The management objectives were: 1) to restore the weakfish population over a 5-year period; 2) to reach and maintain a target fishing mortality rate (F) of 0.5; 3) to restore the expanded age and size structure; 4) to achieve compatible and equitable management measures among jurisdictions; 5.) to promote cooperative interstate research, monitoring and law enforcement; 6) to promote identification and conservation of habitat; and 7) to establish standards and procedures for both the implementation of Amendment #3 and for determination of states' compliance with provisions of the management plan.

Weakfish were managed under this plan as a single stock throughout their coastal range. All states from Massachusetts to Florida and the Potomac River Fisheries Commission have a declared interest in the Weakfish FMP. Responsibility for the FMP is assigned to the Weakfish Management Board, Plan Review Team, Technical Committee, Stock Assessment Sub-Committee and Advisory Panel.

II. Status of the Stock

A weakfish stock assessment of data through 1998 was conducted in 1999 and reviewed by the Stock Assessment Review Committee for peer review at the 30th Northeast Regional Stock Assessment Workshop (NMFS 2000). This report indicated that weakfish were “at a high level of abundance and subject to low fishing mortality rates.” This assessment was updated in 2002 with data through 2000. Much of the language below was taken from this updated assessment (Kahn 2002).

Virtual population analysis was used to estimate fishing mortality and stock size (ADAPT VPA in FACT, Northeast Fishery Science Center; Gavaris 1988; Conser and Powers 1990). This is a type of analysis that uses data on the number of fish caught at various ages or lengths to estimate fishing mortality as well as numbers of spawning individuals in a population.

The most recent stock assessment update conducted with data through 2000 indicates that the management measures put in place in Amendment 3 resulted in positive trends for the weakfish population. The absolute magnitude of impact should be viewed with caution given the uncertainty of the fishing mortality and spawning stock biomass estimates for the most recent year of the assessment, which is often the case with these final year estimates. Once more data is added to the assessment the fishing mortality is expected to rise and the spawning stock biomass is expected to decrease.

This assessment indicates that weakfish are at a high level of abundance and fishing mortality appears to be low. Recent history of the coast-wide stock shows that spawning stock biomass (total weight of fish in a stock that are old enough to spawn) estimates were low from 1982 through 1985. High recruitment of age one weakfish in 1985-1987 produced a brief increase in biomass. By 1989, biomass had again declined and remained low through 1993. Since then, biomass has been building to higher levels. While the exact level of bias in the most recent estimates is unknown, the current level of SSB is well above the proposed threshold level in Amendment 4 of 14,400 MT (Figure 1).

Estimates of fishing mortality (the rate fish are being removed by human activity) range from a high in 1994 of 2.52 to a low of in 2000 of 0.12. Since 1995, estimates of F have been below the Amendment 3 target of 0.50. The 2000 estimate of 0.12 could be underestimated. Despite this bias, the corrected value would still be below the fishing mortality target of 0.31 in Amendment 4 and far below the proposed fishing mortality threshold of 0.50 (Figure 2).

One goal of Amendment 3 was to support an increase in the size and age structure. The model results indicate this is happening. In 1982, the estimate of the proportion of age 6+ fish was 1.0% of the total. By 1990, this had shrunk to only 0.3% of the total number of weakfish. This proportion has been increasing in recent years to the level of 6.8% of the total in 2001.

III. Status of the Fishery

The majority of commercially and recreationally caught weakfish are landed from state waters. The dominant commercial gears used include gill nets, pound nets, haul seines, and trawls. The majority of commercial landings occur in the fall and winter months, presumably as the fish congregate to migrate. The recreational fishery catches weakfish using live or cut bait, jigging, trolling and chumming. Recreational harvests typically peak in the warmer months (May through October) when effort tends to be greatest. Typically recreational landings are recorded in numbers and commercial landings are recorded in pounds. However, Figure 3 uses converted recreational landings to pounds in order to compare the landings of the fisheries

Commercial Fishery --

The NMFS compiles commercial weakfish landings. The data are cooperatively collected by the NMFS and state fishery agencies from state mandated trip-tickets, landing weigh-out reports from seafood dealers, federal logbooks, shipboard and portside interviews and biological sampling of catches.

Recently there is an increasing trend of the recreational fishery accounting for a higher percentage of the catch. Coastwide commercial weakfish landings from 1950 - 2001 fluctuated from 1,397 mt to 16,312 mt (Table 1).

The commercial weakfish fishery occurs during the fall and winter as the species migrates from estuaries to overwintering grounds in the South Atlantic (Hogarth et al. 1995b). Weakfish are taken primarily by trawls, pound nets, gill nets and haul seines. Weakfish landings were dominated by the trawl fishery from the 1950's through the mid -1980's, when gill net landings began to account for the majority of the landings. Gill net landings in the latter half of the 1990's were about double that of the trawl fishery.

New Jersey, North Carolina and Virginia have dominated commercial weakfish landings since 1950. North Carolina has annually landed the most weakfish since 1972 and Virginia has consistently ranked second since 1993. North Carolina has accounted for about half of all the weakfish commercially landed since 1951.

Recreational Fishery –

Recreational catch statistics are collected by the NMFS in the Marine Recreational Fisheries Statistics Survey (MRFSS). Effort data is collected through telephone interviews. Catch expansions are based on angler interviews and biological sampling conducted by trained interviewers stationed at fishing access sites.

Recreational landings by number ranged from about 960,000 fish in 1992 to a high of 9,344,000 fish in 1981. Recreational landings were relatively high from 1983-1988. Recreational landings abruptly fell in 1989. Annual recreational landings have fluctuated between 1 million and 2.8 million fish since 1993. The number of fish released alive by anglers has been relatively high since 1993. For these trends in pounds, please see Table 2.

Recreational landings from the EEZ accounted for only about 13 percent of the coastwide landings since 1981. Over half of the recreational harvest came from inshore saltwater and brackish water bodies such as bays, estuaries, and sounds. Virginia, New Jersey, Maryland and Delaware have accounted for over 85 percent of the coastwide harvest since 1981. New Jersey has accounted for the majority of the recreational harvest since 1994.

IV. Status of Research and Monitoring

Young-of –the-year indices of relative abundance are produced by Rhode Island, New York, Delaware, Maryland (2 different indices), Virginia, North Carolina and Florida. North Carolina also produces an age 1 index, while Connecticut, New Jersey and Delaware produce age-structured indices of relative abundance from research trawl surveys. The National Marine Fisheries Service also produces an age-structured index for the Mid-Atlantic coast, while SEAMAP produces one for the South Atlantic Coast.

The Marine Recreational Fisheries Statistics Survey collects data on recreational landings. North Carolina, Virginia, Maryland and Delaware collect biological data from commercial landings, including age data. There is no biological data from commercial landings north of Delaware.

North Carolina has submitted an exempted fishery request endorsed by the ASMFC Weakfish Board. The National Marine Fisheries Service and North Carolina continue to work together to move this request forward. Georgia is continuing their Bycatch Reduction Device (BRD) testing program as well as the bycatch characterization study.

The Potomac River Fisheries Commission in cooperation with Virginia Institute of Marine Sciences (VIMS) has completed research into the use of escape panels in pound nets. These are currently being used in an incentive-based program on the Potomac River. North Carolina also has completed work exploring bycatch reduction in long haul seines.

Biological sampling of commercial landings is an important component of catch-at-age analysis, such as the virtual population analysis currently used to assess weakfish status. Currently, only four states conduct such sampling: North Carolina, Virginia, Maryland and Delaware. Development of sampling programs for states with significant commercial landings is needed to insure accurate assessments. Recent research suggests there are many separate weakfish spawning stocks. Consequently, assuming the catch composition of northern areas is equivalent to that of southern areas is highly questionable and weakens confidence in assessment results.

V. Research Needs for Weakfish

Biological:

High Priority

Collect catch and effort data including size and age composition of the catch, determine stock mortality throughout the range, and define gear characteristics. In particular, increase length-frequency sampling, particularly in fisheries from Maryland and further north.

Develop latitudinal / seasonal / gear specific age length keys for the Atlantic coast. Increase sample sizes to consider gear specific keys.

Derive estimates of discard mortality rates and the magnitude of discards for all commercial gear types from both directed and non-directed fisheries. In particular, quantify trawl bycatch, refine estimates of mortality for below minimum size fish, and focus on factors such as distance from shore and geographical differences.

Update the scale – otolith comparison for weakfish.

Medium Priority

Define reproductive biology of weakfish, including size at sexual maturity, maturity schedules, fecundity, and spawning periodicity. Continue research on female spawning patterns: what is the seasonal and geographical extent of "batch" spawning; do females exhibit spawning site fidelity?

Conduct hydroponic studies to delineate weakfish spawning habitat locations and environmental preferences (temperature, depth, substrate, etc.) and enable quantification of spawning habitat.

Compile existing data on larval and juvenile distribution from existing databases in order to obtain preliminary indications of spawning and nursery habitat location and extent.

Continue studies on mesh-size selectivity; up-to-date (1995) information is available only for North Carolina's gill net fishery. Mesh-size selectivity studies for trawl fisheries are particularly sparse.

Low Priority

Identify stocks and determine coastal movements and the extent of stock mixing, including characterization of stocks in overwintering grounds. (e.g. tagging)

Biological studies should be conducted to better understand migratory aspects and how this relates to observed trends in weight at age.

Continue studies on recreational hook-and-release mortality rates, including factors such as depth, warmer water temperatures, and fish size in the analysis. Studies are needed in deep and warm water conditions. Further consideration of release mortality in both the recreational and commercial fisheries is needed, and methods investigated to improve survival among released fish.

Document the impact of power plants and other water intakes on larval, post larval and juvenile weakfish mortality in spawning and nursery areas, and calculate the resultant impact to adult stock size.

Define restrictions necessary for implementation of projects in spawning and overwintering areas and develop policies on limiting development projects seasonally or spatially.

Develop a coastwide tagging database.

Develop a spawner recruit relationship and examine the relationships between parental stock size and environmental factors on year-class strength.

Social

Assemble socio-demographic-economic data as it becomes available from ACCSP.

Economic

Assemble socio-demographic-economic data as it becomes available from ACCSP.

Detailed information on production activities (e.g., fishing effort and labor used by gear, vessel characteristics, areas fished, etc.) and costs and earnings for the harvesting and processing sectors

Information on retail sales and demand for weakfish in order to estimate the demand and economic benefits of at-home and away-from home consumption of weakfish

Development of bioeconomic models that link the underlying population dynamics to the economic aspects of the commercial and recreational fisheries

Distribution of weakfish to the various markets and across states

Information on the margins of various stages of processing and marketing also need to be obtained; this information is necessary to construct mathematical models that can be used to estimate the economic impacts of management and regulation

A directed data collection program for weakfish including the same variables presently collected by NMFS in support of MRFSS and by the economic add-on. Data collected includes information on travel distance, mode of angling, expenditures, area fished, catch on previous trips, and other information.

Development of commercial decision-making or behavioral models to explain how fishers might respond to various regulations

Estimation and assessment of consumer (net economic benefits to consumers) and producer (net economic benefits or profits to producers) surplus; the sum of consumer and producer surplus is a measure of the net economic value to society of a good or service

Development of input/output models for all states having commercial weakfish activity, or alternatively, full-blown economic impact models, which might consist of input/output models or General Equilibrium models

Determination of the economic value derived from recreational angling including the economic value of a catch and release fishery

Habitat

Conduct hydroponic studies to delineate weakfish spawning habitat locations and environmental preferences (temperature, depth, substrate, etc) and enable quantification of spawning habitat.

Compile existing data on larval and juvenile distribution from existing databases in order to obtain preliminary indications of spawning and nursery habitat location and extent.

Document the impact of power plants and other water intakes on larval, post larval and juvenile weakfish mortality in spawning and nursery areas, and calculate the resulting impacts on adult stock size.

Define restrictions necessary for implementation of projects in spawning and overwintering areas and develop policies on limiting development projects seasonally or spatially.

VI. Status of Management Measures

Under Amendment 3, each state was required to implement harvest reduction strategies designed to recover weakfish over a 5-year period. Restoration of historic age and size structure, represented currently by the average percentage of fish numbers at each age from 1979 to 1994, is also a plan goal. According to the 26th SAW, the projected fishing mortality for 1996 was achieved and according to the most recent stock assessment fishing mortality is below the Amendment 3 target of 0.50. The most recent update of the stock assessment estimates that the fishing mortality continues to be below the Amendment 4 target of 0.31 with Spawning Stock Biomass above the proposed threshold.

The intent of Amendment 4 is to establish a control rule to accurately categorize the status of the stock by considering both fishing mortality and spawning stock biomass, simultaneously. The control rule is established with targets and thresholds for fishing mortality and a threshold for spawning stock biomass. The use of fishing mortality targets and thresholds and a threshold (spawning stock) biomass provides managers with a series of factors to use when evaluating the status of the stock. Amendment 4 establishes an overfishing definition with a fishing mortality target of $F_{\text{target}} = F_{30\%} = 0.31$, a fishing mortality threshold of $F_{\text{threshold}} = F_{20\%} = 0.5$, and a spawning stock biomass threshold of $SSB_{\text{threshold}} = SSB_{20\%} = 31.8$ million pounds.

To continue current fishing mortality rates that have led to the strong improvements in the weakfish population, Amendment 4 maintains current commercial fishery management measures. However, a new recreational reference period, revised reference points, and a weakfish population, which has changed since the adoption of Amendment 3, lead to changes in the recreational management measures to reduce high creel limits in some states where the limits are no longer appropriate.

VII. Current State-by-State Implementation per Compliance Requirements

As of October 2003, all states were in compliance with Amendment 3 to the Weakfish Fishery Management Plan. However, Rhode Island no longer qualifies for *de minimis* status and the Plan Review Team has recommended that Rhode Island implement additional commercial fishery management measures prior to the 2003 fishing year. The states of South Carolina, Georgia and Florida remain *de minimis* states as defined in Amendment 3. Their landings for 2001 and 2002 are well below the standard for *de minimis* of 1% of coastwide commercial and recreational directed landings for 2001 and 2002.

VII. Status of Assessment Advice

Virtual population analysis was used for the most recent assessments (ADAPT VPA in FACT, Northeast Fishery Science Center). This is a type of analysis that uses data on the number of fish caught at various ages or lengths to estimate fishing mortality as well as numbers of spawning individuals in a population. The stock assessment subcommittee is exploring other approaches for future assessments including using a separable virtual population analysis, Integrated Catch at Age (ICA), and relative exploitation. The Plan Review Team supports the continued exploration of these additional approaches in preparation for the 2004 benchmark assessment for weakfish.

VIII. Recommendations

The Plan Review Team recommends that:

- All states provide recent information and data about the changes in their commercial fisheries since the 1990-92 or (1989-91) base period to the technical committee so that the closed season strategy targets the significant commercial fisheries. The technical committee should determine what is “significant” and outline to the Board changes in what fisheries should be using the closed season strategy.
- All states implement the commercial and recreational measures, and monitoring requirements and recommendations of Amendment 4.

IX. References

- Hogarth, W. T., T. Meyer, P. Perra and R. H. Shaefer. 1995b. Final environmental impact statement and draft regulatory impact review for a regulatory amendment for the Atlantic Coast weakfish fishery in the Exclusive Economic Zone (EEZ). U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Fisheries Conservation and Management, Recreational and Interjurisdictional Fisheries Division, Silver Spring, MD. 84 pp.
- Northeast Fishery Science Center. 2000. Report of the 30th Northeast Regional Stock Assessment Workshop (30th SAW): Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish. Sci. Cent. Ref. Doc. 900-03, Woods Hole, MA.

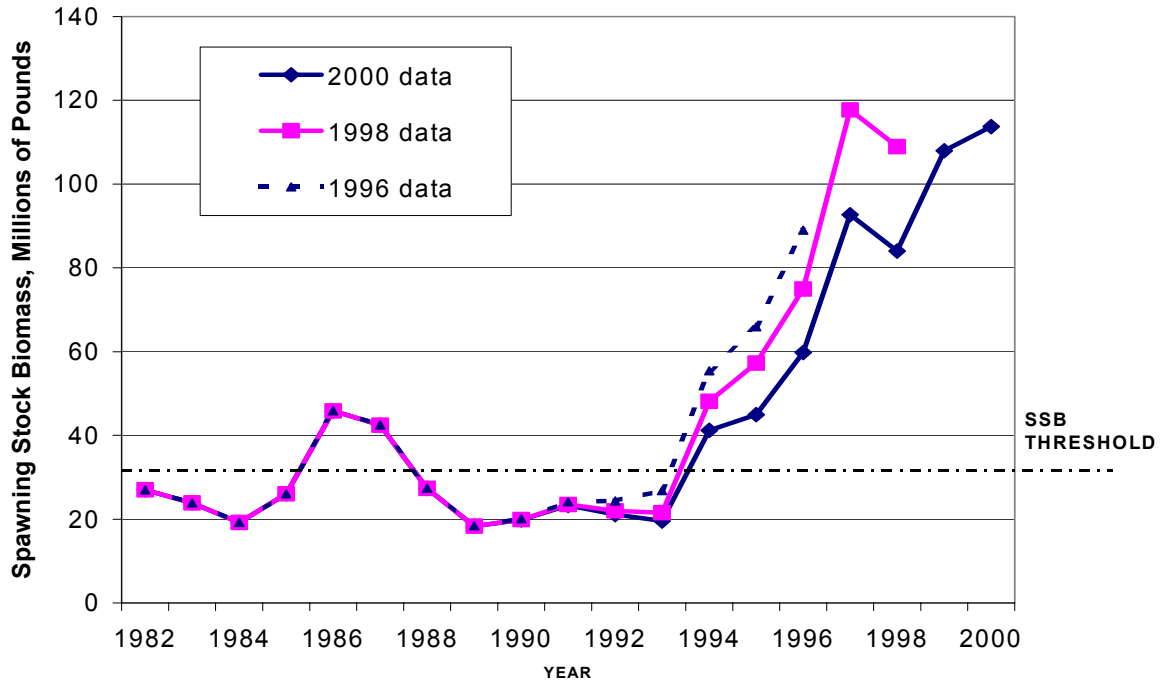


Figure 1: Spawning Stock Biomass - This graph depicts how spawning stock biomass estimates have changed over time based on ASMFC stock assessments. As more data is added to the assessment each year, the estimates of SSB for the most recent years' decreases. This graph also indicates the proposed Amendment 4 SSB Threshold of 31.8 million pounds.

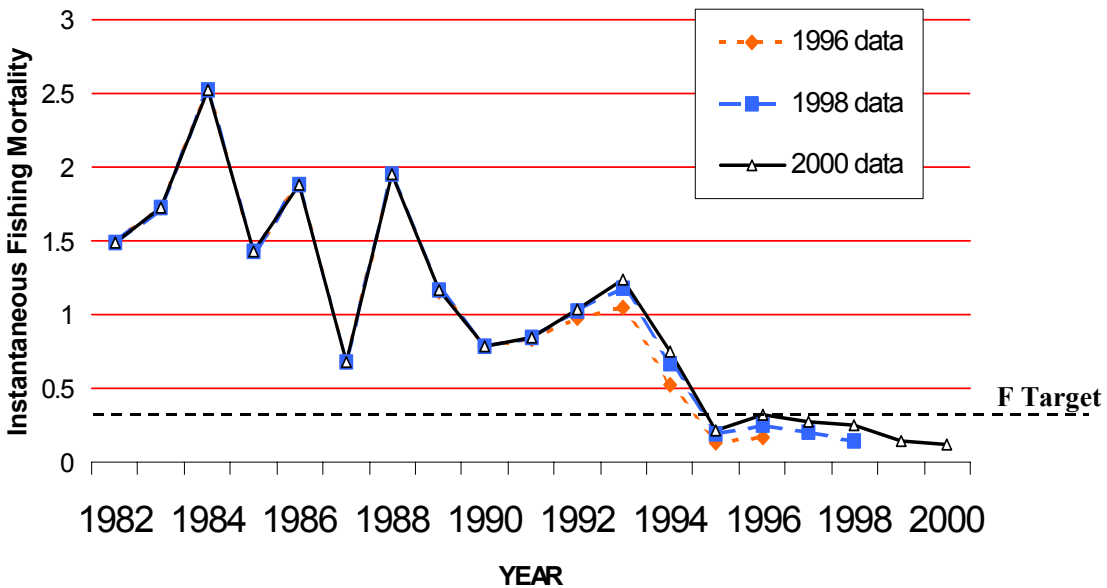


Figure 2: Fishing Mortality - This graph depicts how fishing mortality rates have changed over time based on ASMFC stock assessments. As more data is added to the assessment each year, the estimates of fishing mortality

for the most recent years increase. This graph also includes the proposed Amendment 4 fishing mortality target of 0.31.

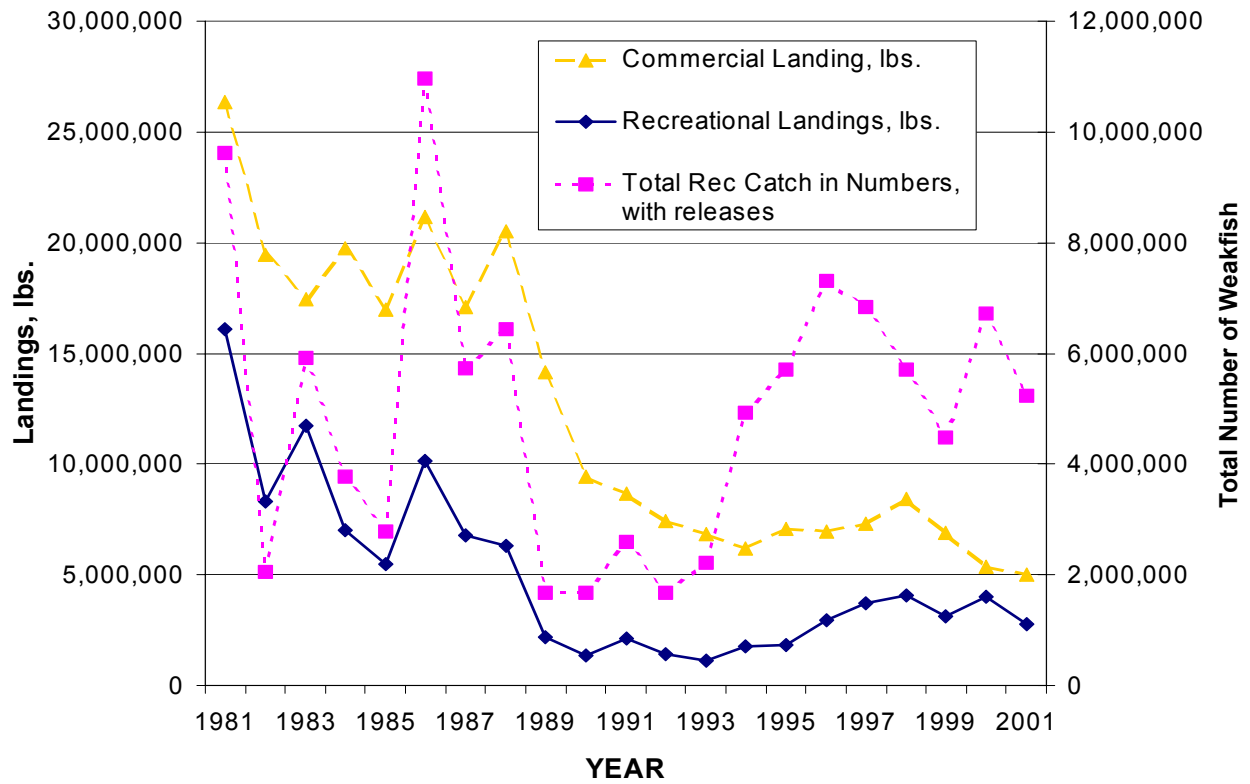


Figure 3: Weakfish landings by fishery. Both the recreational and commercial landings are listed in pounds. However, the total recreational catch with releases is listed in numbers.

Table 1: Atlantic coast commercial fisheries landings (in pounds), by state and year (1982 - 2002).

YEAR	MA	RI	CT	NY	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1982	22,900	176,800	25,600	1,257,100	2,073,500	1,294,500	249,200	2,149,200	12,052,232	443	596	176,203	19,478,274
1983	6,900	163,700	42,800	850,000	2,172,700	901,800	390,000	2,592,900	10,233,734		2,749	117,720	17,475,003
1984	4,800	167,600	31,300	484,500	2,751,600	782,400	325,000	2,109,000	12,990,726		862	125,799	19,773,587
1985	3,100	163,100	28,200	386,200	3,030,100	990,800	316,110	2,082,186	9,821,188		82	132,291	16,953,357
1986	5,700	127,600	13,700	359,900	3,208,600	723,500	336,700	1,994,100	14,309,372		75	108,726	21,187,973
1987	1,700	78,600	29,500	329,100	2,094,100	577,800	366,900	1,962,800	11,508,389		189	123,081	17,072,159
1988	3,800	19,400	2,400	124,500	2,332,800	530,700	832,600	1,473,200	15,091,878			115,124	20,526,402
1989	1,900	9,600	2,300	103,500	1,458,500	530,200	743,800	1,025,200	10,115,747	113		171,318	14,162,178
1990	1,720	24,646	1,281	19,924	968,318	613,000	662,361	1,207,560	5,802,159		33	137,188	9,438,190
1991	1,912	25,009	21,300	111,629	1,174,181	497,300	328,251	1,059,679	5,308,574			164,925	8,692,760
1992	3,033	30,277	3,500	168,087	940,695	362,400	385,426	549,961	4,862,551			147,858	7,453,788
1993	1,080	9,991	1,477	88,379	834,446	194,700	181,863	1,088,047	4,309,249			144,347	6,853,579
1994		18,155	11,000	99,470	695,280	261,900	140,907	1,294,224	3,490,002			179,582	6,190,520
1995	535	52,728	6,431	172,567	867,263	281,200	69,417	1,485,065	4,113,310			50,310	7,098,831
1996	86	43,723	6,937	365,646	822,041	310,849	132,795	1,587,186	3,977,671			4,493	7,251,427
1997	55	31,211	10,958	336,795	1,036,488	558,919	192,634	1,557,980	3,561,099			11,720	7,297,859
1998	410	77,095	14,482	500,183	1,805,938	552,644	244,467	1,863,928	3,354,060			11,518	8,424,725
1999	2,550	126,793	22,172	490,596	1,292,749	440,295	223,455	1,674,117	2,613,727			17,486	6,907,836
2000	527	189,362	7,920	341,833	1,071,428	328,813	208,315	1,362,829	1,869,073			9,345	5,389,445
2001	231	109,568	7,167	588,914	837,550	187,642	185,815	1,121,961	1,960,380			10,821	5,010,049
2002	842	122,781	10,223	513,977	863,088	172,810	111,391	1,144,068	1,819,360			5,746	4,764,286

Note: Maine reported 5 lbs of weakfish in 1995.

SOURCE: National Marine Fisheries Service 2004

Table 2: Atlantic Coast recreational fisheries landings of weakfish (pounds), by state and year (1982-2002).

Year	Total													
	MA	RI	CT	NY	NJ	DE	MD	VA	NC	SC	GA	E. FL	Pounds	
1982	154,609			725,194	613,223	1,330,769	2,127,679	2,994,879	276,047	14,786		48,137	8,285,323	
1983	22,452	588,805	12,976	164,227	6,080,018	2,205,140	1,215,376	738,671	338,100	4,515	12,165	348,175	11,730,620	
1984	16,272		11,358	51,464	3,987,542	1,279,594	254,962	850,169	189,031	5,150		368,237	7,013,779	
1985		131,884	17,269	638,913	1,876,608	1,102,095	898,313	508,980	184,485	105,151	3,422	21,907	5,489,027	
1986		41,142	61,281	242,217	3,184,095	1,598,932	2,406,643	2,032,394	417,470	44,185	12,621	100,805	10,141,785	
1987			4,286	51,830	3,353,362	1,072,198	831,615	647,692	710,002	23,781	9,491	45,637	6,749,894	
1988				26,127	833,198	1,664,477	1,679,702	1,677,694	359,606	1,841		89,004	6,331,649	
1989				46,133	575,110	521,648	344,658	424,463	139,979	5,963	8,175	111,105	2,177,234	
1990		897		4,317	358,457	207,131	388,662	256,690	63,420	11,186	961	55,538	1,347,259	
1991				35,931	896,800	427,778	278,176	280,075	99,824	25,210	5,597	81,173	2,130,564	
1992		20,154	908	19,824	677,811	232,204	121,403	206,710	27,363	40,459	1,014	51,127	1,398,977	
1993			6,510	18,889	312,839	291,627	173,952	89,992	78,982	6,929	12,791	109,827	1,102,338	
1994				2,579	706,206	319,491	300,831	142,265	149,159	25,163	783	149,038	1,795,515	
1995				24,467	898,564	419,527	141,511	211,494	72,412	22,875	21,283	43,413	1,855,546	
1996				19,081	1,730,055	690,121	185,074	194,485	79,317	4,980	5,060	17,218	2,925,391	
1997			1,367	220,718	1,817,034	734,800	188,339	463,652	165,032	1,728	34,356	65,690	3,692,716	
1998	4,087		9,808	63,298	1,910,868	616,422	377,820	839,245	192,210	11,288	690	19,237	4,044,973	
1999		5,866	6,371	63,058	1,374,169	484,157	544,474	399,588	161,291	4,383	1,614	98,457	3,143,428	
2000		1,922	35,095	164,525	1,916,093	635,339	696,662	496,205	87,926	6,312	3,503	111,211	4,154,793	
2001			4,883	151,584	1,251,150	172,969	567,625	373,206	158,423		2,983	39,806	2,722,629	
2002		3,801	11,285	58,627	1,213,557	243,156	174,064	295,397	82,747	50,141	683	59,145	2,188,806	

SOURCE: National Marine Fisheries Service 2004