2004 REVIEW OF THE FISHERY MANAGEMENT PLAN FOR ATLANTIC CROAKER
(Micropogonias undulatus)

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I. Status of the Fishery Management Plan

The *Fishery Management Plan (FMP) for Atlantic Croaker* was adopted in 1987 and includes the states from Maryland through Florida. In reviewing the early plans created under the Interstate Fisheries Management Plan process, the Atlantic croaker plan was seen by the Atlantic States Marine Fisheries Commission (ASMFC) as in need of review and possible revision. The South Atlantic State/Federal Fisheries Management Board of ASMFC reviewed the status of several plans in order to define the compliance issues to be enforced under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). The Board found recommendations in the Atlantic Croaker FMP to be vague and no longer valid. The Board recommended that an amendment be prepared to the Atlantic Croaker FMP to define management measures necessary to achieve the goals of the FMP. In their final schedule for compliance under the ACFCMA, the Interstate Fisheries Management Program (ISFMP) Policy Board adopted the finding that the current Atlantic Croaker FMP does not contain any management measures that states are required to implement.

In 2003 and 2004, the Atlantic croaker Stock Assessment Sub-Committee developed an updated stock assessment through the Southeast Data Assessment and Review (SEDAR) process. This assessment was peer reviewed by a SEDAR panel and approved for use in management in the spring of 2004. The Management Board was presented with this information in August 2004 and initiated the development of Amendment 1 to the Atlantic Croaker FMP. A Plan Development Team has been appointed by the South Atlantic Board in order to begin preparation of the amendment.

II. Status of the Stock

The latest stock assessment was completed in 2004 and reviewed by the SEDAR peer review panel. The stock assessment committee used an Age Structured Production Model. This assessment only accounts for the mid Atlantic region (North Carolina and north). There is currently not enough data to assess the South Atlantic region (Florida through South Carolina). In this assessment, fishing mortality rates (F) are based on the average population weighted F for ages 1-10+. Fishing mortality rates for Atlantic croaker exhibit a cyclical trend over the time series. From 1977 to 1979, F rose rapidly reaching a maximum of 0.5 in 1979. From 1980 onwards, F rapidly declined reaching its lowest levels in 1992 (Figure 1) Since 1993, F has gradually increased and between 1997 and 2002 remained relatively stable around 0.11.

For the base mid-Atlantic run, the trend in population abundance indicates a step-wise increase reaching a peak of 974 million fish in 1999. Population estimates from 1999 to 2002 have ranged from 663 to 974 million fish. Spawning Stock Biomass (SSB) estimates exhibit a cyclical trend over the time series. From the early 1970's to 1983 SSB declined to its lowest level (11,746 MT). Since 1984, SSB has increased in three distinct phases, with estimates reaching a

maximum in 1996 (Figure 2). Between 1999 and 2002 SSB estimates have ranged between 80-91,000 metric tons.

The mid-Atlantic model, which is the core of the population, indicates fishing mortality rates were high in the mid 1970's, abruptly declined, and has been low and stable since the mid 1990's. Between 1973 and 2002 the relationship between the different sources of removals has changed. In particular, estimates of scrap/discards reached their peak in 1979 (3,200 MT) and since then declined to their lowest levels in 2002 (425 MT). Between 1973 and 1995, scrap/discard removals averaged 1,687 MT per year, whereas between 1996-2002 scrap/discards averaged 595 MT per year. It appears that the significant reduction in removals of predominantly age 1 and younger fish may have contributed to relatively stable fishing mortality and spawning stock biomass estimates since the mid 1990's. In relation to the proposed reference points the Atlantic croaker population is not overfished or undergoing overfishing. The commercial and recreational catch-at-age data from recent years also shows an increasing age distribution, with a few fish of 12 years being observed in the commercial landings. Anecdotal evidence from the mid-Atlantic indicates an expansion of the population at the northern part of the range. For example, in Delaware, fishery independent indices indicate a recent increase in abundance of Atlantic croaker in the region (D. Kahn, personal communication). In addition, both commercial and recreational landings from New Jersey and Delaware have increased recently. The population has benefited from good recruitment in recent years, which may also be tied to the regulatory changes that have affected some of the fisheries that indirectly target Atlantic croaker.

While this analysis does not capture all of the sources of uncertainty, examination of the effects of alternate weightings of the likelihood components and alternate steepness and natural mortality estimates indicate that reference points derived from the base run are relatively robust. The reference points suggest that there was less than a 10% chance that the population is overfished or undergoing overfishing. Sensitivity analysis evaluating the inclusion/non-inclusion of shrimp bycatch estimates, indicate that SSB_{msy} estimates are sensitive to the inclusion of Atlantic croaker caught as shrimp bycatch. However, increased SSB_{msy} estimates are also accompanied by higher SSB estimates. The ratio of SSB_{2002}:SSB_{msy} when shrimp bycatch is included indicates that the stock is unlikely to be below the threshold estimates. Of concern, would be management goals that define biomass reference points in absolute terms. There appears to be some justification for revising the reference points for the biomass target and threshold to relative terms until a more comprehensive evaluation of Atlantic croaker from shrimp bycatch can be carried out.

III. Status of the Fishery

Atlantic coast commercial landings of croaker have varied from one million pounds in 1970 to 64 million pounds in 1945. Commercial landings increased steadily each year from a low of 3.7 million pounds in 1991 to more than 28 million pounds in 2001 (Table 1). North Carolina landings have continued to grow since 1993, with the highest landings in 2003 (14.4 million pounds). Coastwide landings of Atlantic croaker have remained steady at 25 to 29 million pounds from 1997 to 2003. The commercial harvest has been dominated by North Carolina and Virginia since 1960.

Atlantic croaker is the major component of the North Carolina and Virginia "scrap fishery". A number of regulations instituted by North Carolina, such as banned flynet fishing south of Cape Hatteras, the introduction of BRDs in shrimp trawls, incidental finfish limits taken by shrimp and crab trawls in inside waters, minimum mesh size restrictions in trawls and culling panels in long hauls may have indirectly reduced catches of juvenile croaker and changed the size and age distributions of the harvest. Aggregate, unculled ("scrap") bait fisheries landings data were included for North Carolina and Virginia. At-sea discard data was included from gill net and trawl fisheries. Scrap landings and discards were combined in the model. Between 1973 and 1995 scrap/discards accounted for an average 20% of removals (ranged between 14-30%). From 1996 to 2002, scrap/discards accounted for an average 3% of removals. In Georgia, trawl-caught croaker is sold as unsorted mixed fish along with spot, whiting, and small flounder, therefore, commercial landings are a tenuous measurement there. Small croaker were previously a major part of the bycatch of the south Atlantic shrimp trawl fishery, however the use of TED's and BRD's has reduced this bycatch.

Recreational landings are from the National Marine Fisheries Service Marine Recreational Fishery Statistics Survey (MRFSS). From 1981-2003, recreational landings of Atlantic croaker (Type A+B1 in numbers) from New Jersey through North Carolina have varied between 366 metric tons (1982) and 4,955 metric tons (2001), with landings showing a strong linear increase over this period. Average landings for the period 1981 – 1990 were 786.9 metric tons, while more recent landings (1993-2002) averaged 3,065.2 metric tons. The increased landings in recent years have been at the northern range of the fishery (Massachusetts to North Carolina).

IV. Status of Assessment Advice

In 2003 the Atlantic croaker Stock Assessment Subcommittee conducted a stock assessment for Atlantic croaker. This assessment was reviewed by the SEDAR Peer Review Panel in October, 2003. The panel recommended additional data be added to the assessment and for the Technical Committee to evaluate the use of other types of models. The Stock Assessment Subcommittee re-ran the assessment in 2004 with the changes that the SEDAR panel recommended. This assessment was reviewed by the same SEDAR panel in June 2004. The panel approved this assessment for management purposes.

V. Status of Research and Monitoring

Catch and effort data are collected by state commercial and recreational statistics programs. More complete and timely data should be available as the Atlantic Coastal Cooperative Statistics Program is further developed and implemented. Fishery-independent data, from Cape Hatteras to Cape Canaveral, are collected in the SEAMAP program. Recruitment indices are available from ongoing juvenile surveys in Delaware, Maryland, Virginia, North Carolina, Florida, and through the SEAMAP program. Researchers at VIMS have conducted studies on temperature tolerance, developed a juvenile recruitment model based on the effect of winter water temperature and offshore wind velocities, and developed population dynamics parameters to evaluate growth overfishing potential. The Virginia Marine Resources Commission and state of

North Carolina have evaluated the use of culling panels in pound nets for the release of small spot and croaker. North Carolina also conducted a study to evaluate the use of culling panels in long hauls and swipe nets (Gearhart 2000). The study proved that shifts occurred in the length frequency distribution of many species including croaker, which resulted in rule changes to begin the use of culling panels in some areas of North Carolina since 1999. A flynet characterization study was concluded in April 2003 in North Carolina. A total of 3 trips out of a permitted 18 trips were completed during the study period (January 15 – April 1, 2003. The purpose of the experiment was to test flynet gear in the closed area using the tailbag mesh size (3 ¾" diamond mesh) required by the ASMFC Weakfish Plan to assess the size and species composition of the catches. The results were to be used by the ASMFC and NMFS to determine whether it would be reasonable to consider partial or seasonal reopening of the area south of Cape Hatteras to harvest legal-sized weakfish without an excessive amount of discards. Because only a limited number of tows in the 2002-03 season were conducted, meaningful tow data could not be obtained in the first year of testing. NCDMF is currently in the process of re-applying for another permit for the next two consecutive fishing seasons (2003-04 and 2004-05) to continue this study.

The Potomac River Fisheries Commission has implemented the use of culling panels for pound nets on a voluntary basis, which allows escapement of smaller fish (100% <9"). Gear research for bycatch reduction in shrimp trawls may continue in the future under interstate and federal sponsorship. A number of studies from the University of Delaware were published which investigated the link between recruitment and low temperatures, genetic stock identification, and geographic variation in life history traits/population dynamics. A scale-otolith comparison study for aging croaker was recently completed by NCDMF (NCDMC 2001). NCDMF also initiated a fishery-independent gill net study in Pamlico Sound in 2001 to examine species abundance and gather age/length data (NCDMF 2002 and 2003).

VI.Status of Management Measures and Issues

The PRT recommends the following:

1. Need for more movement data from the south region, including tagging information from Cape Fear south. Examine otolith microchemistry data available and continue research in this area.
2. Need for bycatch and discard estimates from the commercial and recreational fisheries (i.e. shrimp fishery). Characterization of scrap fishery.
3. Standardize ageing procedures for Atlantic croaker and standardize current age data sets. Need for Coast wide collection of bio-profile information and add standardized protocols for those data
4. Produce a general fishery independent index using state survey information. Develop a coast wide and or regional CPUE index.
5. Need for an updated maturity schedule.
6. Examine socio-economic aspects of the fishery.

The FMP for Atlantic croaker identifies the following management measures for implementation:

1. Promote the development and use of bycatch reduction devices through demonstration and application in trawl fisheries.

2. Promote increases in yield per recruit through delaying entry to croaker fisheries to age one and older.

Although the ISFMP Policy Board judged that the FMP management recommendations were too vague and did not furnish objective compliance criteria, progress has been made on developing bycatch reduction devices (BRD's). The October 1993 spot and croaker workshop proceedings summarized experimental bycatch reduction work and examined the population implications of bycatch reduction (ASMFC 1993). It was clear that there were economically viable shrimp gears that reduce finfish bycatch. North Carolina has implemented minimum mesh size restrictions in shrimp trawls (1 ½" tailbag) since 1991, flynets (4" main body, 3" extension, and 1 3/4" tail bag) in 1997, and the closure of ocean waters south of Cape Hatteras to the South Carolina state line for flynets in 1994, all of which may indirectly affect the fishing impact on croaker.

Currently no regulations directly govern fishing practices for Atlantic croaker in North Carolina. However, the regulation limiting the scrapfish catch to 5,000 pounds per vessel per day has an indirect effect since croaker comprise a large percentage by weight of the scrapfish landed by NC commercial fishing gears. BRDs were required in all North Carolina shrimp trawls in the fall of 1992 by proclamation. Flynet fishery restrictions such as a minimum mesh size (3" square or 3.5" diamond) in 1992 and the closure of ocean waters south of Cape Hatteras to flynets in 1994, also affected the fishing impact on croaker. A reduction in the average catch of the scrapfish species occurred in the 1996 haul seine fishery when several crews began to consistently use escape panels in their nets. Rule changes including culling panels in some areas for long haul seines of North Carolina have been in effect since 1999. Reducing the quantity of sub-adult croaker harvested should increase spawning stock biomass and yield per recruit. The Potomac River Fisheries Commission requires large mesh bycatch reduction panels in all pound nets. It is estimated that the panels allow the release of 100% of captured croaker below the minimum legal size of nine (9) inches.

The states of Florida through North Carolina have promoted and require the use of TED's (turtle excluder devices) and BRD's in state waters. North Carolina has implemented minimum mesh size restrictions in shrimp trawls (1 ½" tail bag) since 1991 and flynets (4" main body, 3" extension, and 1 ¾" tail bag) in 1997. Florida has a maximum shrimp trawl size. Evaluation of the beneficial effects of BRD's to the croaker population, which is a component of a mixed species fishery, may be available from work conducted on weakfish during preparation of Amendment 3 to that FMP and should be compiled. A target reduction in bycatch of croaker may be a suitable objective criteria in an amended plan. Size limits that are in place in the states have been there for several years and do not represent a response to the FMP. In order to minimize recreational discard mortality, a new amendment may evaluate the concept of encouraging the use of circle hooks, which minimize such mortality.

In August 2004 the South Atlantic Management Board initiated the development of Amendment 1 to the Atlantic Croaker FMP. A Plan Development Team has been appointed by the Board in order to begin preparation of the amendment.

VII. Implementation of FMP Compliance Requirements as of October 1, 2003

There are no regulatory compliance requirements in the 1987 Atlantic Croaker FMP.

VIII. Recommendations of FMP Review Team

Management and Regulatory Recommendations

Management recommendations in the 1987 Croaker FMP should be adopted and implemented by appropriate regulations or legislation. They are as follows:

- Promote the development and use of Turtle Excluder Devices(TED's) and Bycatch Reduction Devices (BRD's) through demonstration in the southern shrimp fishery, and fish separators in the finfish trawl fishery; and
- Promote increases in yield per recruit through delaying entry to croaker fisheries to age one or older.

Research and Monitoring Recommendations

<u>High Priority</u>

- Determine migratory patterns and mixing rates through cooperative, multi-jurisdictional tagging studies, including tagging information from Cape Fear south. Examine otolith microchemistry data available and continue research in this area.
- Conduct an aging workshop to develop criteria for aging croaker otoliths, comparison study of scales vs. otoliths.
- Studies of croaker growth rates and age structure need to be conducted throughout the species range.
- Age-size data that are representative of all seasons and areas in the fisheries should be developed on an annual basis.
- Fishery-independent size, age, and sex specific relative abundance estimates should be developed to monitor long term changes in croaker abundance.
- Improve catch and effort statistics from the commercial and recreational fisheries.
- Examine reproductive biology of croaker with emphasis on developing maturity schedules and estimates of fecundity across the management unit (partially met: Barbieri et al. 1994).
- Evaluate bycatch and discard estimates from the commercial and recreational fisheries (i.e. shrimp fishery). Characterization of the scrap fishery.
- Produce a general fishery independent index using state survey information. Develop a coast wide and or regional CPUE index.
- Examine socio-economic aspects of the fishery.

Medium Priority

- Conduct stock identification research on croaker (partially met: Lankford et al. 1999).
- Evaluate hook and release mortality under varying environmental factors and fishery practices and include in updated assessment.
- The effects of mandated bycatch reduction devices (BRD's) on croaker catch should be evaluated and compiled.
- In trawl fisheries or other fisheries that historically take significant numbers of croaker, states should monitor and report on the extent of unutilized bycatch and fishing mortality on fish less than age-1.
- The optimum utilization (economic and biological) of a long term fluctuating population such as croaker should be evaluated.
- Continue monitoring of juvenile croaker populations through fishery-independent surveys.
- Identify essential habitat requirements.

Low Priority

- Determine species interactions and predator/prey relationships for croaker (prey) and other more highly valued fisheries (predators).
- Determine the impacts of any dredging activity (i.e. for beach re-nourishment) on all life history stages of croaker.

Identified Management Issues

- Develop appropriate management goals and objectives.

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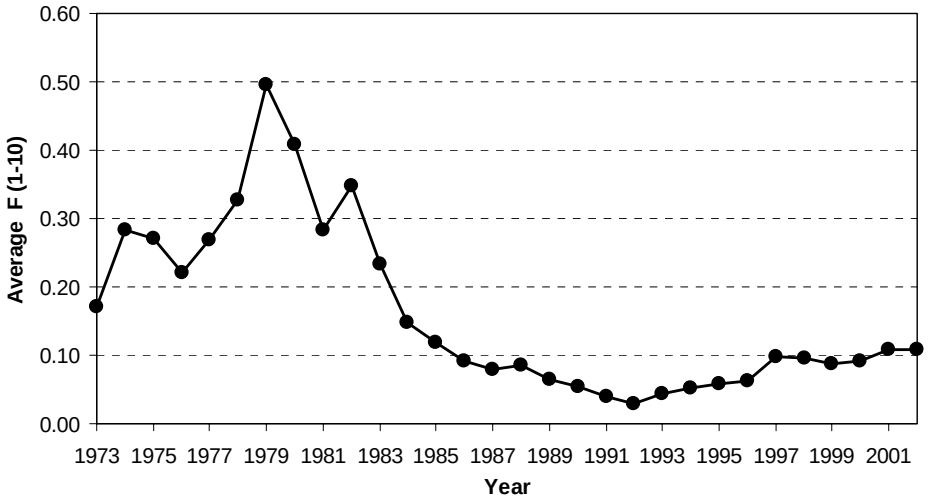

Figure 1. Average fishing mortality rates (ages 1 –10) for Atlantic croaker in the mid-Atlantic.

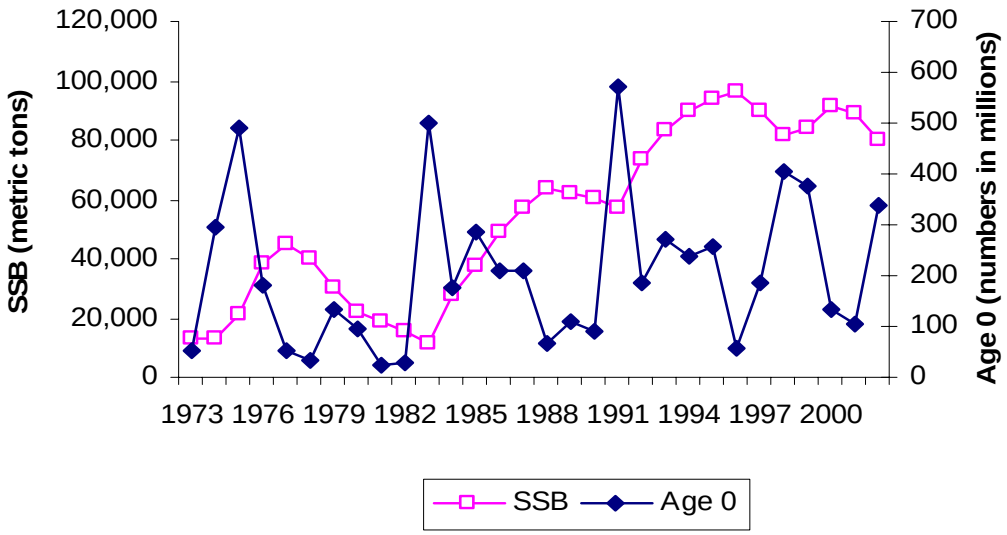

Figure 2. Spawning stock biomass (metric tons) and age 0 recruits (millions of fish) estimates from the base mid-Atlantic model

Table 1. Commercial landings (in pounds) of Atlantic croaker by state, 1960-2002 (source: pers. comm. NMFS Fish. Stats. & Econ. Div.).

Year	NH	MA	RI	NY	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1960					8,100	200	586,000	3,932,700	2,092,800	20,500	300	140,700	6,781,300
1961					56,900		48,900	3,082,300	1,753,500	13,300		142,700	5,097,600
1962					4,300		11,100	1,293,700	1,662,800	33,300	600	161,300	3,167,100
1963							1,500	122,400	2,275,700	36,200	700	113,700	2,550,200
1964							2,400	394,200	1,866,900	10,400	400	101,200	2,375,500
1965							400	1,531,700	1,753,400	3,400	2,100	106,800	3,397,800
1966							800	1,463,200	1,267,000	1,300	5,100	330,700	3,068,100
1967							1,200	323,500	1,282,800		6,000	143,800	1,757,300
1968							100	6,200	1,200,800			70,000	1,277,100
1969							400	63,200	1,368,700	200	1,800	49,900	1,484,200
1970					200		100	127,900	806,800	2,700	9,400	66,900	1,014,000
1971					100		200	264,900	948,200	1,500	500	89,800	1,305,200
1972	17,700				400		500	484,100	4,108,600	400	2,400	101,100	4,715,200
1973				100	37,100		37,300	1,358,300	4,324,100	3,100	14,900	102,900	5,877,800
1974					45,100		120,300	1,501,700	6,081,700	39,900	8,500	65,100	7,862,300
1975					885,100	1,300	639,700	4,721,300	10,251,700	3,500	4,000	61,500	16,568,100
1976		100			700,600	2,600	1,069,100	5,897,600	15,038,000	1,300	13,600	78,400	22,801,300
1977			400		1,478,600	8,900	692,300	8,600,600	18,994,800	600	7,000	49,500	29,832,700
1978			100		654,900	7,300	597,000	8,099,100	19,945,471	730	563	39,470	29,344,634
1979			2,600	6,200	91,000	3,700	97,400	2,136,600	20,558,193	7,082	19,137	38,646	22,960,558
1980				900	12,000		7,100	711,600	21,146,798	5,438	4,721	50,911	21,939,468
1981				200	23,500		2,100	429,800	11,205,342	2,441	1,038	72,112	11,736,533
1982					100		7,000	119,300	10,824,953	386	2,177	95,357	11,049,273
1983		200			200		500	150,400	7,249,680	3,200	1,097	81,737	7,487,014
1984			100	3,000	57,700		27,100	817,700	9,170,160	3,793		131,375	10,210,928
1985		400			48,800	100	9,500	2,171,821	8,695,544	1,256		115,641	11,043,062
1986					106,000	500	137,500	2,367,000	9,424,828	924		177,414	12,214,166
1987					357,600	800	119,300	2,719,500	7,289,191	698	553	217,932	10,705,574
1988					30,100	200	98,700	1,749,200	8,434,415	2,614	304	140,011	10,455,775
1989					137,100		89,500	947,300	6,824,088	1,950		94,909	8,096,472
1990			20		644		3,584	198,195	5,769,512	1,190	32	104,402	6,077,579
1991			10		31,292	700	6,183	164,126	3,436,960			56,761	3,696,032
1992					51,600	800	10,685	1,339,388	2,796,612		210	73,369	4,272,664
1993					183,414	2,500	158,062	5,264,974	3,267,652			51,465	8,928,067
1994					117,256	3,000	218,744	5,773,430	4,615,793			96,018	10,824,241
1995					334,654	13,000	549,716	6,991,044	6,021,332			22,879	13,932,625
1996				1	621,889		810,435	9,442,959	9,961,862			26,045	20,863,191
1997				1,309	1,994,446	10,509	1,455,707	12,790,922	10,711,704			36,572	27,001,169
1998				31	1,029,332	10,368	1,375,646	12,006,988	10,865,928			26,418	25,314,711
1999			4	2	2,071,046	14,729	1,584,412	12,849,954	10,185,535			26,441	26,732,123
2000			40	285	2,130,465	11,121	1,501,655	12,889,406	10,122,634			34,441	26,690,047
2001				315	1,389,837	22,736	2,233,160	12,929,191	12,017,459			14,857	28,607,555
2002			67	224	1,828,484	10,732	1,513,025	12,447,795	10,189,182			17,237	26,006,746
2003				1,837	1,575,735	16,561	1,532,038	10,936,274	14,429,221			16,503	28,508,169
Total	17,700	700	3,341	14,404	18,095,594	142,356	17,358,052	173,613,467	332,238,349	203,302	107,132	3,834,923	545,631,176

Table 2. Atlantic croaker recreational landings (numbers of A + B1 fish) by state, 1981-2003 (source: pers. comm. NMFS Fish. Stats. & Econ. Div.).

Year	MA	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1981		1,054	3,003	0	964,013	1,043,240	165,742	35,591	598,896	2,811,539
1982				10,452	273,039	596,493	193,554	169,749	1,682,619	2,925,906
1983				108,355	2,154,133	1,620,909	60,811	75,173	1,148,227	5,167,608
1984				211,035	2,047,720	2,147,871	588,114	202,364	2,781,742	7,978,846
1985				21,276	2,284,334	723,933	260,265	144,341	1,306,955	4,741,104
1986			4,694	123,578	6,384,966	356,742	599,442	69,887	5,118,552	12,657,861
1987		0	0	208,488	3,234,224	904,030	166,978	44,783	2,580,727	7,139,230
1988			1,186	1,005,452	4,048,690	2,256,128	144,057	64,093	685,778	8,205,384
1989			478	22,871	2,203,504	2,131,763	217,023	72,598	359,417	5,007,654
1990			281	100,673	2,374,679	1,063,452	346,631	585,380	304,064	4,775,160
1991		16,235	37,500	288,471	4,298,542	434,067	100,816	184,435	1,030,115	6,390,181
1992		0	9,854	117,427	4,524,040	723,823	74,051	440,185	754,595	6,643,975
1993		2,552	19,352	805,560	4,990,098	755,998	32,700	89,734	304,067	7,000,061
1994		1,567	5,718	1,633,581	6,494,691	1,179,735	188,520	102,974	599,032	10,205,818
1995		15,184	136,865	827,183	5,029,708	850,606	75,422	100,826	438,076	7,473,870
1996		35,037	235,389	775,115	4,997,021	662,240	37,464	61,957	116,575	6,920,798
1997		342,089	385,586	1,053,232	8,066,926	661,116	118,428	64,050	235,430	10,926,857
1998	1,477	143,404	391,231	1,126,058	6,730,181	387,427	170,528	64,953	234,360	9,249,619
1999		357,261	662,724	1,209,572	5,881,671	442,185	54,761	104,438	403,982	9,116,594
2000		1,023,442	517,886	2,674,880	5,486,159	391,056	32,332	128,922	455,870	10,710,547
2001		1,177,813	312,005	1,319,928	9,335,313	635,552	19,802	21,503	426,264	13,248,180
2002		253,472	261,634	1,223,385	9,129,060	408,944	66,409	36,497	177,751	11,557,152
2003		692,391	341,174	1,619,766	6,695,192	490,399	198,339	248,853	165,459	10,451,573
Total	1,477	4,061,501	3,326,560	16,486,338	107,627,904	20,867,709	3,912,189	3,113,286	21,908,553	181,305,517

Table 3. Atlantic croaker recreational landings (pounds of A + B1 fish) by state, 1981-2003 (source: pers. comm. NMFS Fish. Stats. & Econ. Div.).

Year	MA	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1981		582	2,317	0	535,297	426,240	67,284	9,665	305,547	1,346,932
1982				70,276	455,250	264,607	67,015	45,161	754,956	1,657,265
1983				32,053	486,006	395,402	14,158	25,412	510,599	1,463,630
1984				86,462	634,870	584,660	161,661	80,684	1,856,599	3,404,936
1985				17,169	843,414	278,214	72,780	40,421	684,449	1,936,447
1986			2,595	116,542	2,034,337	126,888	173,028	21,504	2,783,651	5,258,545
1987		0	0	191,628	1,306,814	352,346	64,696	14,947	1,005,053	2,935,484
1988			827	926,399	2,390,573	935,460	54,313	20,313	316,900	4,644,785
1989			284	19,189	1,329,680	658,567	80,580	21,138	268,335	2,377,773
1990			112	37,873	875,427	347,183	123,795	205,352	127,525	1,717,267
1991		4,264	10,972	117,210	1,728,021	157,660	16,173	54,116	460,453	2,548,869
1992		0	3,291	53,556	1,768,962	233,533	28,512	132,596	407,672	2,628,122
1993		844	9,641	476,866	1,993,915	282,910	18,005	55,604	180,517	3,018,302
1994		818	2,892	991,166	3,024,118	351,230	128,306	34,048	337,474	4,870,052
1995		9,515	82,864	567,149	2,675,381	326,135	25,386	20,862	301,918	4,009,210
1996		39,099	205,526	702,037	2,716,759	346,501	14,480	21,797	50,038	4,096,237
1997		278,758	340,198	1,117,999	5,522,195	309,457	53,863	26,272	113,096	7,761,838
1998	1,790	135,733	293,560	1,150,459	5,920,436	161,117	76,821	30,966	141,756	7,912,638
1999		301,957	522,201	1,024,398	4,969,283	212,991	26,356	32,375	231,692	7,321,253
2000		1,125,730	483,963	2,672,996	4,888,910	201,306	13,457	62,390	242,912	9,691,664
2001		1,132,214	304,127	1,278,699	7,674,759	355,009	10,750	7,844	320,487	11,083,889
2002		268,423	250,899	1,162,278	7,075,130	242,184	29,343	10,622	117,880	9,156,759
2003		682,698	262,114	2,069,176	5,674,111	317,606	59,399	71,881	79,396	9,216,381
Total	1,790	3,980,635	2,778,383	14,881,580	66,523,648	7,867,206	1,380,161	1,045,970	11,598,905	110,058,278

Table 4. Numbers of recreational releases (B2 fish) of Atlantic croaker by state, 1981-2003 (source: pers. comm. NMFS, Fish. Stats. and Econ. Div.).

Year	MA	RI	NY	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1981		246	4,369	0	0	16,233	324,238	704,259	128,192	13,481	85,740	1,276,758
1982						0	77,756	641,327	107,340	111,630	188,277	1,126,330
1983						1,507,184	1,410,151	424,562	119,036	70,499	379,021	3,910,453
1984						70,192	673,080	1,701,418	746,905	37,573	236,432	3,465,600
1985						13,132	1,616,052	1,596,901	238,678	66,649	1,146,582	4,677,994
1986					1,757	43,399	2,578,268	137,841	84,335	40,623	318,511	3,204,734
1987				1,374	861	32,074	2,056,580	560,853	108,366	76,908	1,770,697	4,607,713
1988					582	273,231	832,284	984,219	112,271	20,021	200,630	2,423,238
1989					1,307	41,822	1,342,169	891,926	58,642	17,632	72,822	2,426,320
1990					1,268	88,688	3,922,564	1,351,152	111,085	317,497	168,144	5,960,398
1991				91,633	75,319	3,352,190	7,418,045	669,385	25,168	140,402	647,824	12,419,966
1992				4,103	43,583	856,292	4,167,137	954,494	26,729	178,267	251,343	6,481,948
1993				5,799	13,194	2,504,362	5,795,479	1,499,217	16,949	83,203	138,875	10,057,078
1994				17,253	14,069	1,628,824	7,676,780	3,110,528	141,513	99,026	331,736	13,019,729
1995				31,019	41,574	496,046	5,494,289	1,172,716	108,345	89,609	141,732	7,575,330
1996				17,585	76,851	403,776	5,151,206	1,218,799	64,494	60,282	126,300	7,119,293
1997				111,468	384,233	1,497,670	7,275,160	1,443,568	138,107	25,630	116,276	10,992,112
1998	10,422			221,324	839,932	3,021,780	4,990,541	1,060,928	266,068	159,928	152,744	10,723,667
1999				860,325	1,017,499	2,483,800	5,668,925	1,368,478	116,826	57,567	967,894	12,541,314
2000				688,746	694,813	4,967,856	7,811,048	1,569,385	96,402	169,903	428,131	16,426,284
2001				853,621	285,123	1,585,806	7,086,706	1,256,807	115,284	192,362	282,461	11,658,170
2002				369,003	361,355	2,523,276	7,107,656	925,806	92,498	194,474	217,054	11,791,122
2003				833,508	654,697	1,393,224	6,543,524	1,552,315	440,446	965,496	192,487	12,575,697
Total	10,422	246	4,369	4,106,761	4,508,017	28,800,857	97,019,638	26,796,884	3,463,679	3,188,662	8,561,713	176,461,248

Table 5. Summary of current state and federal regulations for Atlantic croaker.

State/Agency	Recreational	Commercial	Other
New York	none	none	
New Jersey	none	none	trawling prohibited from 0-2 miles from shore
Delaware	8"	none	
Maryland	9"; 25 fish limit	9"	trawling restricted in Ches. Bay; closed 1/1-3/15
PRFC	25 per person/day		
Virginia	none	none	trawling prohibited in state waters
North Carolina	none	none	Flynets excluded south of C. Hatteras and mesh size restrictions; culling panels required in long haul seines/pound nets; TEDs required in flounder trawls in most state waters; TED/BRD requirements and min. mesh restrictions in shrimp trawls
South Carolina	none	none	gear-related restrictions; TED/BRD requirements; license to land/sell
Georgia	8"; 25 fish limit	8"; 25 fish limit	BRD requirement; no trawling in sounds
Florida	none	none	net ban in state waters
Federal (EEZ waters)			