2004 REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN FOR RED DRUM (*Sciaenops ocellatus*)

Prepared by:

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I. Status of the Fishery Management Plan

The Atlantic States Marine Fisheries Commission (ASMFC) adopted a *Fishery Management Plan (FMP) for Red Drum* in 1984. The original management unit included the states from Florida to Maryland. In 1988, the Interstate Fisheries Management Program (ISFMP) Policy Board requested that all states from Florida to Maine implement plan requirements to prevent development of northern markets for southern fish.

In 1990, the South Atlantic Fishery Management Council adopted an FMP for red drum that defined overfishing and optimum yield (OY) consistent with the Magnuson Fishery Conservation and Management Act of 1976. Adoption of this plan prohibited the harvest of red drum in the exclusive economic zone (EEZ). The Council FMP, in recognition that all harvest would take place in state waters, recommended that states implement measures necessary to provide the target level of at least 30% escapement. The moratorium on harvest of red drum in the EEZ still remains in effect.

The ASMFC updated its FMP to be consistent with the Council plan. The 1991 revision to the plan was Amendment 1, with a goal to attain optimum yield from the fishery over time. OY was defined as the amount of harvest that could be taken while maintaining the spawning stock biomass per recruit (SSBR) level at or above 30% of the level that would result if fishing mortality was zero. However, the lack of adequate information on the status of the adult stock resulted in the use of a 30% escapement rate of sub-adult red drum into the adult population.

Substantial reductions in fishing mortality were necessary to increase the escapement of sub-adults to the off-shore adult spawning stock. Because of a lack of data on the status of adult red drum along the Atlantic coast a "phase-in" approach was adopted that required all states to implement or maintain harvest controls necessary to attain at least a 10% SSBR ratio. All states in the management unit north of Florida modified regulations and/or commercial quotas to reach this goal. Florida maintained its strict regulations that were thought to exceed the target escapement rate. The harvest regulations remained unchanged from 1992-1998, except in Florida where regulations were relaxed somewhat by opening the previously closed March-May period. North Carolina, South Carolina and Georgia implemented substantive changes to their regulations from 1998-2001 that restricted the harvest of red drum and increase the escapement rate.

The Council adopted new definitions of OY and overfishing for red drum in 1998. Optimum yield was redefined as the harvest associated with a 40% static spawning potential ratio (SPR), and overfishing was an SPR less than 30%, with a threshold overfishing level of 10% SPR. In 1999, the Council recommended that management authority for red drum be transferred to the states, through the Commission's Interstate Fishery Management Program (ISFMP) process.

Management measures implemented by the states in response to the guidelines of Amendment 1 led to increased escapement rates of juvenile red drum. However, the overall exploitation estimates indicated that overfishing was still occurring with SPR values less than 30% for both the northern (North Carolina through New Jersey) and southern regions (South Carolina through

the east coast of Florida). These regions were based on stock identity, mark-recapture experiments, life history, habitat preferences, human dimensions of the fisheries and management goals (Ross and Stevens 1992, Pafford et al. 1990, Wenner et al. 1990). Management measures of Amendment 1 measures were an intermediate step in a phased approach to recovery of the red drum population, with an initial target of attaining an SPR of at least 10%.

One of the reasons the Council recommended the transferring of management authority to the ASMFC was the inability to accurately determine an overfished status and therefore, stock rebuilding targets and schedules under the new requirements of the revised Sustainable Fisheries Act (1996). With no estimate of the size of the adult population as well as what a rebuilt or healthy stock looks like, it is virtually impossible to determine a rebuilding schedule. However, the duration of a rebuilding schedule should include the generation time of the species. For a long-lived, species with an age of maturity at 3 to 5 years, such as red drum, mean generation time would be on the order of 15-20 years based on age-specific egg production (Vaughan and Carmichael 2000). The oldest of red drum in the northern region range from 50-60 years, whereas, in the southern region it is about 40 years. Given these factors only a considerable period of time will result in noticeable increases in the age structure of the adult population.

The ASFMC adopted Amendment 2 to the Red Drum FMP in June 2002. Its primary objective is to achieve and maintain SPR at or above 40 percent. To achieve this goal, Atlantic coast states from Florida through New Jersey have met appropriate bag and size limit combinations needed to attain 40 percent SPR. All states must also maintain current or more restrictive commercial fishery regulations.

II. Status of the Stocks

It is important to remember that the population models used in the coast wide assessments (specifically yield per recruit and static SPR) are based on equilibrium assumptions. Previous estimates of escapement rates (relative survival of red drum from age at entry to fishery to age 4) for 1992-94 ranged from 10.4% for the northern region and 17.2% for the southern region (Vaughan 1996). Escapement rate estimates for Florida Atlantic coast red drum (to age 4) during 1992-94 ranged from 30-64% depending on the assumed size structure of released fish (Murphy 2002). This may mean that rates in Georgia and South Carolina are lower than the regional estimate. Estimates of static SPR (the ratio of spawning stock biomass per recruit with and without fishing mortality) ranged from 9% for the northern region to 14% for the southern region. This may be an overestimate because most states north of North Carolina allow a fishery for adults and the analysis assumes no adult fishing mortality or any discard mortality from commercial fishing operations and recreational use of commercial (gillnet) gear.

Based on the most recent full assessment (Vaughan and Carmichael 2000), results for the northern region indicated that escapement rates were on the order of 18%, but may be overestimated due to the lack of discard data from both the commercial fishery and recreational netting practices. Also, the estimate for the southern region (15%) may not be reflective of escapement rates throughout the region, where there appears to be significant regional differences between Florida and Georgia/South Carolina. The red drum population on the east

coast of Florida appears to be recovering faster than in neighboring state waters, which may be a result of very strict harvest controls in Florida. The 1999-2000 estimates of annual escapement rates on Florida's Atlantic coast ranged 16-54% and was highly dependent on the assumed size structure of the released catch (Murphy 2002).

III. Status of the Fishery

Few commercial landings of red drum have been recorded in states north of Maryland since 1960 (Table 2). Only Rhode Island, New York and New Jersey have reported any commercial landings since 1980. Coastwide commercial landings show no particular temporal trends, ranging from 58,000 to 422,000 pounds annually from 1960-2003. Coastwide commercial landings for 2003 were approximately 109,00 pounds; the majority (96%) from North Carolina.

Historically, the major commercial harvesters were North Carolina and Florida. However, commercial harvest has been prohibited in Florida under state regulations, since January 1989. An annual cap of 250,000 pounds controls the commercial harvest of red drum in North Carolina. The North Carolina Marine Fisheries Commission recently approved a red drum FMP that: prohibited the possession or sale of red drum larger than 27 inches; reduced the recreational bag limit to 1 fish per day between 18-27 inches; imposed a commercial daily trip limit of seven (7) fish with a 250,000 pound annual cap; and required fishermen to attend gill nets less than five-inch stretch mesh from May 1-October 31 in order to reduce regulatory discards. In 2003, the South Atlantic State/Federal Fisheries Management Board approved a motion to allow the North Carolina Fisheries Director to raise or lower the seven fish commercial trip limit while maintaining the 250,000 pound harvest cap.

The number of red drum harvested by recreational fishermen has generally been in the 300-500,000 range since 1981. Over a million fish were taken in both 1984 and 1985, but this was exceptional. The recreational harvest for 2003 was almost 478,770 fish (1.57 million pounds), the majority of which were taken by Florida, Georgia, and South Carolina anglers. (Table 3 and 4). South Carolina anglers harvested more red drum than any other state; an increase of almost 400% from previous years. This is a large increase in landings, however it correlates with the increase in abundance shown in South Carolina's state surveys. The number of red drum harvested decreased in Delaware, Maryland, Virginia, and North Carolina from the previous year. The number of red drum released by recreational fishermen was approximately 1.5 million in 2003, a decrease from the previous year (Table 5).

IV. Status of Research and Monitoring

In cooperation with the states, the NMFS laboratory in Beaufort, North Carolina has compiled information and performed analyses on status of the stocks periodically since 1989. Fishery independent data collected by the states (North Carolina, South Carolina, Georgia, Florida) have been utilized in coastwide stock assessment. Virtual population analyses utilize the MRFSS as the primary fishery dependent data source.

In November 1994, the states of North Carolina, South Carolina and Georgia initiated a multi-year study to collect fishery independent data utilizing trammel nets and tagging techniques. The Florida Fish and Wildlife Commission's Florida Marine Research Institute has monitored juvenile fishes and animals, including red drum, abundance in the northern Indian River Lagoon since 1990, in the southern Indian River Lagoon since 1997, and in the lower reaches of the St. Johns, St. Marys and Nassau rivers since 2001. Beginning in 1997 in the Indian River Lagoon and in 2001 in the lower reaches of the three major rivers in northeast Florida, the programs expanded to include the use of a 183-m haul seine to monitor larger-sized fishes and animals. Age data are collected from random samples of red drum captured in the 183-m haul seine and the age and length data are used to create age-length keys. A coastwide red drum stock assessment was completed in late 1999, and peer-reviewed by both the Red Drum Technical Committee and the SAFMC Science and Statistics Committee during 2000. A revised bag and size limit analysis was developed for each region using the new overfishing definitions and standards as benchmarks (Vaughan and Carmichael 2001).

V. Status of Management Measures

Discussions between the Council's Red Drum Management Committee and the South Atlantic Board, led the Council to recommend in December 2000 the transferal of management authority to the states. This necessitated the development of Amendment 2 to the current Interstate FMP. The Board's intent had been to initiate the development of Amendment 2 after the update and review of the stock assessment. This occurred in 2000-01 and Amendment 2 was developed (2001-2002) and approved by the Board (May 2002).

The approval of Amendment 2 in 2002, required states to implement appropriate bag and size limits to attain the management goal of 40% SPR (Table 1). All states in the management unit also implemented a 27" total length or smaller maximum size limit for red drum. In order to avoid the establishment of any new commercial fisheries for red drum, all states shall maintain their current level of restrictions.

VI. Implementation of FMP Compliance Requirements as of October 1, 2004

There are three compliance criteria in Amendment 2: 1) states are required to implement harvest controls (e.g. bag and size limits) to achieve a minimum 40% Spawning Potential Ratio (SPR); 2) a maximum size limit of 27 inches or less; and 3) states must maintain their current or more restrictive commercial fishery regulations for red drum. All states in the management unit have implemented these criteria and have been approved by the Board. The first compliance reports were due on May 1, 2004. Below is a summary of regulations from each state, the PRT comments, and if that state meets the requirements in the Amendment.

Table 1. Red Drum Plan Review Team compliance review summary for 2003.
(New Jersey through Florida are required to meet the requirements in the FMP, states north of New Jersey are encouraged but not required to follow these regulations.)

State	Size Limit	Possession Limit	Other	PRT Comments	Meets FMP Requirement
ME	None	None			N/A
NH	14" - 27"	5 fish			N/A
MA	14"	None			N/A
RI	None	None			N/A
CT	Not greater than 27”	None			N/A
NY	Not greater than 27”	None			N/A
PA	None	None			N/A
NJ	18" - 27"	1 fish	Requests de minimis status	The PRT Recommends granting de minimis status*	Yes
DE	20" - 27"	5 fish	Requests de minimis status	The PRT Recommends granting de minimis status*	Yes
MD	18" - 27"	1 fish	Commercial regulations: 18”-25”, five fish limit		Yes
PRFC	18" - 25"	5 fish			Yes
VA	18" - 26"	3 fish	No directed commercial fishery		Yes

NC	18" - 27"	1 fish	0 fish > 27" TL; Annual commercial cap = 250,000 lbs.; daily trip limit of 7 fish (NC fisheries director can raise or lower the trip limit), must be less than 50% of catch (pounds); gill nets < 5" stretch mesh must be tended from 5/1-10/31	The PRT recommends that if the commercial trip limit is changed, determine what this will do to the SPR. The PRT recommends that a 40%SPR be maintained even if the trip limit is changed	Yes
SC	15" - 24"	2 fish	Gamefish - no sale; 0 fish > 24"		Yes
GA	14" - 23"	5 fish	0 fish > 23" TL		Yes
FL	18" - 27"	1 fish	Gamefish - no sale		Yes

* The PRT recommends granting New Jersey and Delaware de minimis status because their landings are insignificant when compared to the rest of the coastal harvest. The PRT recommends that these states are still required to meet the regulatory requirements in the FMP and submit an annual compliance report.

VII. Status of Assessment Advice

The last red drum assessment was conducted in 1999 and reviewed by the Council's Scientific and Statistical Committee in 2000. Recreational and commercial catches were converted to catch in numbers at age using available length-frequency distributions and age-length keys. Separable and tuned virtual population analyses were conducted on the catch in numbers at age to obtain estimates of fishing mortality rates (F). These estimates of F combined with estimates of growth, sex ratios, sexual maturity and fecundity are used to estimate yield per recruit, escapement to age 4, and static (or equilibrium) spawning potential ratio (static SPR, based on both female biomass and egg production). The FADAPT Virtual Population Analysis methodology was chosen by the Technical Committee as the population modeling approach to determine the status of the stock. Amendment 2 states that the next coastwide assessment will take place five years after implementation. Therefore, the next assessment is scheduled for 2008. Florida is conducting a statewide assessment of red drum that will be completed in November, 2004.

VIII. Recommendations of FMP Review Team

Management and Regulatory Recommendations

1. ASMFC and the Regional Fishery Management Councils should continue to collaborate on cooperative review of stock assessments and formulation of management measures.

2. States north of New Jersey should adopt management measures to avoid open ports for commercial landings (formal request included in Amendment 2).

Prioritized Research and Monitoring Recommendations

(H) = High, (M) = Medium, (L) = Low

Stock Assessment and Population Dynamics

- Design an appropriate state fishery-independent survey of sub-adult and adult red drum to be implemented in Virginia, North Carolina, South Carolina, Georgia, and Florida. (H) *(in progress for sub adult surveys)*
- Each state should develop an on-going red drum tagging program that can be used to estimate both fishing and natural mortality and movements. This should include concurrent evaluations of tag retention, tagging mortality, and angler tag reporting rates. (M)
- Improve catch/effort estimates and biological sampling from recreational and commercial fisheries for red drum, including increased effort to intercept night fisheries for red drum. This should include significant efforts to determine the size and age structure of regulatory discards of live red drum. (H)
- States should maintain annual age-length keys. (H)
- Determine the chronic mortality rate of red drum following regulatory and voluntary discard from commercial and recreational fishing gear, including recreational net fisheries. Evaluate effects of water temperature and depth of capture. (M)
- Evaluate alternatives to VPA for red drum stock assessment. (M)

Biological

- Fully evaluate the effects and effectiveness of using cultured red drum to restore native stocks along the Atlantic coast. (H)
- Explore methods to effectively sample the adult population in estuarine, nearshore, and open ocean waters. (H)
- Continue tagging studies to determine stock identity, inshore/offshore migration patterns of all life stages (i.e. basic life history info gathering). Specific effort should be given to developing a large-scale program for tagging adult red drum (M).
- Determine habitat preferences, environmental conditions, growth rates, and food habits of larval and juvenile red drum throughout the species range along the Atlantic coast. Assess the effects of environmental factors on stock density/yearclass strength. (M)
- Refine maturity schedules on a geographic basis. Thoroughly examine the influence of size and age on reproductive function. Investigate the possibility of senescence in female red drum. (L)

Social

- Examine the effectiveness of controlling fishing mortality and minimum size in managing red drum fisheries.

- Encourage the NMFS to conduct socioeconomic add-on surveys via the MRFSS that are specifically oriented to red drum recreational fishing (Example: the 2000 Northeast Summer Flounder Survey).

Economic

- Encourage the NMFS to continue funding socioeconomic add-on surveys via the MRFSS that include data elements germane to red drum recreational fisheries management.
- Where appropriate, encourage member states to conduct studies to evaluate the economic costs and benefits associated with current and future regulatory regimes impacting recreational anglers including anglers oriented toward catch and release fishing trips.
- Fully evaluate the efficacy of using cultured red drum to restore native stocks along the Atlantic Coast including risk adjusted cost-benefit analyses.
- Conduct a special survey and related data analysis to determine the economic and operational characteristics of the "for-hire sector" targeting red drum especially fishing guide oriented businesses in the South Atlantic states.
- Estimate the economic impacts (e.g. sales, jobs, income, etc.) of recreational red drum fisheries at the state and regional level including the "for-hire sector" (e.g. fishing guides). (Note: The economic impact analysis [Southwick Associates 2001] cited in this document is considered preliminary.)
- Encourage the NMFS to continue funding research on projecting future participation in marine recreational fishing in the Atlantic states with an emphasis on forecasts for major fisheries such as red drum.
- States with significant fisheries (over 5,000 pounds recorded by MRFSS) should collect socioeconomic data on red drum fisheries through add-ons to the MRFSS or by other means.

Habitat

- Identify spawning areas of red drum in each state from North Carolina to Florida so these areas may be protected from degradation and/or destruction. (H)
- Identify changes in freshwater inflow on red drum nursery habitats. Quantify the relationship between freshwater inflows and red drum nursery/sub-adult habitats. (H)
- Determine the impacts of dredging and beach re-nourishment on red drum spawning and early life history stages. (M)
- Investigate the concept of estuarine reserves to increase the escapement rate of red drum along the Atlantic coast. (M)
- Identify the effects of water quality degradation (changes in salinity, DO, turbidity, etc.) on the survival of red drum eggs, larvae, post-larvae, and juveniles. (M)
- Quantify relationships between red drum production and habitat. (L)
- Determine methods for restoring red drum habitat and/or improving existing environmental conditions that adversely affect red drum production. (L)

<u>Identified Management Needs/Issues</u>

- none at this time

References

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Table 2. Commercial landings (in pounds) of red drum along the Atlantic coast, 1960-2002 (source: pers. comm. NMFS, Fish. Stats. & Econ. Div.).

Year	RI	NY	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1960					200	29,400	79,300	4,200	400	129,000	242,500
1961						12,000	89,700	900	1,000	114,500	218,100
1962						12,900	60,900			149,300	223,100
1963						2,700	71,200			134,200	208,100
1964						4,600	101,500	11,500		119,000	236,600
1965					1,200	94,900	71,400			146,300	313,800
1966					200	3,100	35,200	200	2,700	153,000	194,400
1967						1,100	12,800	900	5,800	147,100	167,700
1968						100	12,500		5,500	167,000	185,100
1969					400	700	3,900	700	2,700	119,000	127,400
1970						100	7,500	400	2,200	146,800	157,000
1971						700	17,200	1,300	1,200	85,200	105,600
1972						5,900	42,900	1,200	3,400	128,400	181,800
1973				900		6,200	70,300	600	3,700	166,500	248,200
1974						15,700	142,000	2,300	3,100	137,300	300,400
1975				200		19,600	214,000	12,400	10,000	83,300	339,500
1976						18,600	168,200	2,600	7,300	106,000	302,700
1977				200		300	19,700	800	5,000	103,500	129,500
1978				300		2,100	21,774	4,325	328	104,696	133,523
1979					100	1,900	126,517	1,767	935	92,684	223,903
1980						400	243,223	4,107	1,493	191,222	440,445
1981						200	93,420		261	258,374	352,255
1982						1,700	52,561	2,228	251	139,170	195,910
1983					100	41,700	219,871	2,274	1,126	105,164	370,235
1984						2,600	283,020	3,950	1,961	130,885	422,416
1985						1,100	152,676	3,512	3,541	88,929	249,758
1986					1,000	5,400	249,076	12,429	2,939	77,070	349,669
1987						2,600	249,657	14,689	4,565	42,993	314,814
1988					8,100	4,000	220,271		3,281	284	235,936
1989					1,000	8,200	274,356	165	3,963		287,684
1990					29	1,481	183,216		2,763		187,489
1991					7,533	24,771	96,045		1,637		129,986
1992					742	2,352	128,497		1,759		133,350
1993					121	8,637	238,099		2,533		249,390
1994	5,094				1,152	4,080	142,160		2,141		154,627
1995		668			6	2,992	248,200		2,578		254,444
1996		8				2,073	113,401		2,271		117,753
1997	43				24	4,049	52,548		1,395		58,059
1998	165	57	311		419	6,436	294,415		672		302,475
1999		47	241		707	12,368	372,996		1,115		387,474
2000		1,215			877	11,457	271,013		707		285,269
2001		58	14		727	5,318	149,674				155,791
2002		116				7,752	79,767				87,635
2003		43			819	2,839	105,759				109,460
Total	5,302	2,212	566	1,600	25,456	397,105	5,882,412	89,446	98,215	3,566,871	9,961,790

Table 3. Recreational harvest with percent standard error (PSE) (numbers of A + B1 fish) of red drum along the Atlantic coast, 1981-2003 (source: pers. comm. NMFS, Fish. Stats. & Econ. Div.).

Year		DE	MD	VA	NC	SC	GA	FLEC	Total
1981	Harvest		601	49630	15054	27319	6323	75244	174171
	PSE (%)		48	60.2	38.7	45.7	37.2	36.7	
1982	Harvest				16445	160760	30757	204401	412363
	PSE (%)				34.7	18.2	37.2	27.5	
1983	Harvest		2413	32940	81528	104806	56854	344513	623054
	PSE (%)		51.8	48.2	55.6	37.8	27.7	19.1	
1984	Harvest			1457	108787	129547	258188	549381	1047360
	PSE (%)			100	67.8	30.7	21.9	16.1	
1985	Harvest			0	22077	530110	183837	265185	1001209
	PSE (%)			0	32.7	30.6	18.6	22.2	
1986	Harvest		12804	28139	17501	193188	102279	113440	467351
	PSE (%)		67.4	22.4	65.7	19.8	18.8	19.8	
1987	Harvest			2186	61100	522420	138062	51225	774993
	PSE (%)			58.8	19.9	17.7	18.4	30.9	
1988	Harvest			4311	142626	287916	147042	9542	591437
	PSE (%)			70.7	18.3	20.2	28.4	72.6	
1989	Harvest		1014	12007	62359	127492	51557	34748	289177
	PSE (%)		90.9	32.2	16.3	20.8	21.9	24.3	
1990	Harvest		1279	0	33149	118666	76304	44280	273678
	PSE (%)		100	0	28.2	22.4	22.5	22.7	
1991	Harvest		2745	17119	38658	125833	162802	102727	449884
	PSE (%)		51.6	39.4	15.3	22.6	23.2	15.7	
1992	Harvest			13275	23593	112534	83861	104265	337528
	PSE (%)			38.3	19.3	15.6	16.7	14.1	
1993	Harvest			14005	49493	119189	105710	65140	353537
	PSE (%)			50	12	16.9	17.9	10.5	
1994	Harvest			1378	28953	129515	134214	120938	414998
	PSE (%)			60.8	16.4	21.5	17.5	9.9	
1995	Harvest			3665	88593	202430	134915	96927	526530
	PSE (%)			53.6	12.3	25.4	17.1	10.7	
1996	Harvest			572	36746	130649	60251	146823	375041
	PSE (%)			99.2	15	14.9	20	16.1	
1997	Harvest	0		1920	8749	129022	39041	75235	253967
	PSE (%)	0		62.3	25.7	12.7	19.2	14.1	
1998	Harvest		0	13070	114638	46509	24929	107982	307128
	PSE (%)		0	30.2	12.1	15.9	20.3	10.3	
1999	Harvest		0	12425	64739	44069	67283	126180	314696
	PSE (%)		0	38.7	14.5	18.3	23.7	7.8	
2000	Harvest		0	22603	61618	37217	94144	191070	406652
	PSE (%)		0	27.8	12.9	23.3	19.7	8.4	
2001	Harvest	275		6967	23142	61420	90376	177633	359813
	PSE (%)	100.1		39.8	15.9	26.8	30.3	8.2	
2002	Harvest	275	5521	49795	42541	41190	90993	119010	349325
	PSE (%)	99.8	71.2	22.8	15.4	21.6	19.1	8.7	
2003	Harvest	0	0	13607	25481	162484	122259	154939	478770
	PSE (%)	0	0	38.1	16.5	23.1	16.9	8.7	
Total Harvest		550	26377	301071	1167570	3544285	2261981	3280828	10582662

Table 4. Recreational harvest (pounds of A + B1 fish) of red drum along the Atlantic coast, 1981-2003 (source: pers. comm. NMFS, Fish. Stats. & Econ. Div.).

Year	DE	MD	VA	NC	SC	GA	FLEC	Total
1981		4,370	347,939	31,519	50,230	9,442	317,963	761,463
1982				37,511	340,686	52,150	480,676	911,023
1983		3,018	51,299	109,540	222,691	67,298	675,924	1,129,770
1984			1,285	1,160,539	183,282	294,583	976,971	2,616,660
1985			0	70,677	1,532,316	185,887	414,176	2,203,056
1986		754,161	145,517	31,594	498,586	173,837	360,725	1,964,420
1987			44,332	200,729	913,639	250,795	227,222	1,636,717
1988			9,030	451,974	1,050,049	385,860	12,507	1,909,420
1989		2,348	27,236	214,849	396,771	127,245	146,064	914,513
1990		2,679	0	302,994	631,819	161,712	258,569	1,357,773
1991		5,635	30,582	108,268	284,290	337,207	516,999	1,282,981
1992			55,324	109,134	411,484	198,751	396,555	1,171,248
1993			45,505	266,459	282,614	328,245	290,930	1,213,753
1994			3,684	192,060	314,632	353,616	578,412	1,442,404
1995			66,270	405,620	417,595	300,337	525,231	1,715,053
1996			1,512	204,556	396,394	164,756	596,483	1,363,701
1997	0		1,810	39,077	296,155	129,836	345,390	812,268
1998		0	34,861	591,428	129,619	84,348	487,091	1,327,347
1999		0	92,794	326,303	103,777	166,630	540,310	1,229,814
2000		0	95,596	316,029	93,043	228,965	885,447	1,619,080
2001	0		51,890	132,578	188,198	155,854	853,714	1,382,234
2002	860	15,154	155,213	182,226	103,830	170,572	551,128	1,178,983
2003	0	0	57,214	118,808	449,399	234,865	708,545	1,568,831
Total	860	787,365	1,318,893	5,604,472	9,291,099	4,562,791	11,147,032	32,712,512

Table 5. Recreational releases with Percent Standard Error (PSE)(numbers of B2 fish) of red drum by state, 1981-2003 (source: pers comm. NMFS Fish. Stats. and Econ. Div.).

Year		NH	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1981	Released	1334			0	0	2230	417	0	9042	13023
	PSE (%)	100			0	0	100	100	0	70.8	
1982	Released						0	2496	3377	10172	16045
	PSE (%)						0	80.2	65.4	66.9	
1983	Released				0	0	1866	6751	1417	54723	64757
	PSE (%)				0	0	100	63	60	40.2	
1984	Released					0	2931	0	4232	47196	54359
	PSE (%)					0	100	0	52.9	38.1	
1985	Released					1115	0	16688	6315	193399	217517
	PSE (%)					73.4	0	31.3	31.3	29.1	
1986	Released				0	7595	0	24018	56045	100095	187753
	PSE (%)				0	68.1	0	32.4	23	22.4	
1987	Released					0	18499	82595	234676	377959	713729
	PSE (%)					0	36.7	26.6	19.7	21.1	
1988	Released					3958	24874	269176	177319	233988	709315
	PSE (%)					71	57.8	23.6	24.6	27.6	
1989	Released				2918	7038	7566	42824	71162	172303	303811
	PSE (%)				75.5	57.3	34	40.8	27	21.3	
1990	Released				0	934	12452	102611	156263	68667	340927
	PSE (%)				0	100	38.2	39.2	38.9	18.3	
1991	Released				4432	14461	121178	99968	92803	645773	978615
	PSE (%)				66.6	76.1	14.4	42	31.2	23.3	
1992	Released		301			15383	60230	46269	128066	284893	535142
	PSE (%)		99.9			43.5	17.9	27.5	21.4	11.5	
1993	Released					50434	182301	146324	140386	465656	985101
	PSE (%)					44	20.1	27	27.7	11.8	
1994	Released					10684	107662	324706	146039	691261	1280352
	PSE (%)					34.7	14.3	17.2	24.6	10.4	
1995	Released					33560	164520	362844	356618	683706	1601248
	PSE (%)					40.4	10.5	14.9	23.9	9.1	
1996	Released					2424	35752	176517	71983	500374	787050
	PSE (%)					46.3	17.9	15.9	24.1	9.3	
1997	Released			2571		109754	259570	175772	22736	560559	1130962
	PSE (%)			80.6		36.1	10.6	25	29.7	9.7	
1998	Released				2768	93660	199701	84274	33882	481009	895294
	PSE (%)				79.7	22.3	11.3	14.6	21.3	8.7	
1999	Released				2148	232893	247146	87776	18586	565981	1154530
	PSE (%)				73.5	31.4	10.3	14.9	50	8	
2000	Released				1458	196541	203967	94050	129190	693152	1318358
	PSE (%)				100	35.7	14.2	18.6	22.4	7.3	
2001	Released			0		30365	238552	221045	249892	850044	1589898
	PSE (%)			0		31.1	13.7	18.5	25.2	7.5	
2002	Released			1388	18412	801239	640857	142931	168902	663879	2437608
	PSE (%)			45.8	36.7	14.7	10.7	18.6	18.6	9.1	
2003	Released			731	2935	43379	75561	430052	272897	732141	1557696
	PSE (%)			100	75.2	40.1	15	17.5	16.5	8.5	
Total Released		1334	301	4690	35071	1655417	2607415	2940104	2542786	9085972	18873090