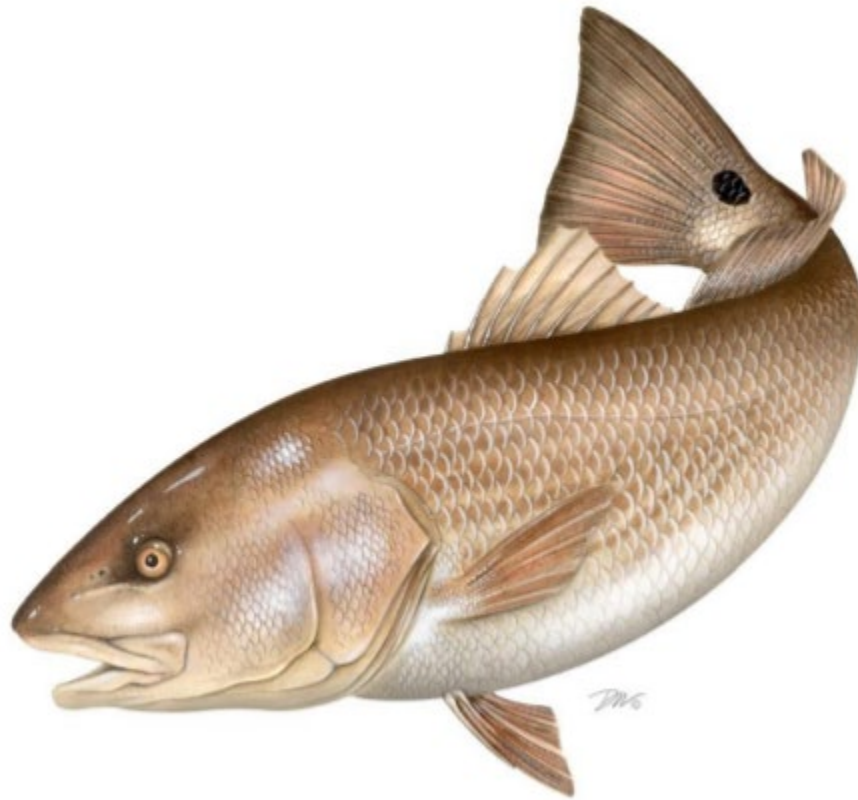


# ATLANTIC STATES MARINE FISHERIES COMMISSION

## REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR RED DRUM  
*(Sciaenops ocellatus)*

2001 FISHING YEAR



Prepared by the Plan Review Team

Approved by the South Atlantic Management Board  
Approved November 2002

# REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN FOR RED DRUM (*Sciaenops ocellatus*)

## 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. This action was the first of two revisions to the 1984 plan.

In 1990, the Council adopted an FMP for red drum which established a definition of overfishing and optimum yield consistent with the Magnuson Fishery Conservation and Management Act of 1976. With adoption of this plan, the Council 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 to the states that they implement measures necessary to provide the target level of escapement. The moratorium on harvest of red drum in the EEZ remains in effect.

Acknowledging the actions taken by the Council, the Commission undertook efforts to update its FMP to be consistent with the Council plan. This was the second revision of the plan and occurred with Amendment 1 in 1991. The goal of Amendment 1 was to attain optimum yield from the fishery over time. Optimum yield 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, as a result of a lack of adequate information on the status of the adult stock, escapement rates of sub-adult red drum into the adult population were used as a proxy for SSBR.

The Commission recognized that substantial reductions in fishing mortality were necessary to increase the escapement of sub-adults to the spawning biomass. However, it also recognized the scarcity of information on the status of adult red drum along the Atlantic coast. Therefore, a "phase-in" approach was adopted which required all states to implement harvest controls necessary to attain a 10% SSBR. All states in the management unit modified regulations and/or commercial quotas to increase escapement of sub-adults. The harvest regulations remained unchanged from 1992-1998. North Carolina, South Carolina and Georgia implemented substantive changes to their regulations during 1998-2001, to further restrict the harvest of red drum and increase the escapement of juveniles into the adult population.

The Council adopted new definitions of optimum yield and overfishing for red drum in 1998. Optimum yield was now defined as 40% static spawning potential ratio (SPR), an overfishing definition of less than 30% SPR, and 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 set forth in Amendment 1 led to an increase in the escapement rates of juvenile red drum. However, the overall population remained in an overfished condition with SPR values less than 30% for both the northern and southern regions (North Carolina through New Jersey comprise the northern region; South Carolina-Georgia-east coast of Florida comprise the southern region). These regions are 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). Amendment 1 measures were intended to be an intermediate step in a phased in approach to recovering the red drum population, with the interim goal being to raise SPR to at least 10%. The Atlantic coast states from Florida through New Jersey have implemented measures to modify harvest regulations and/or commercial quotas to increase escapement of sub-adults. Under these regulations, the interim management goal appears to have been met and exceeded to some degree in each region. It was expected that additional harvest restrictions would be required in some areas to meet the ultimate goal of the original FMP.

One of the reasons the Council has recommended transferring management authority to the Commission is the inability to accurately determine stock rebuilding targets and schedules under the new requirements of the revised Sustainable Fisheries Act (1996). Since there is no current estimate of the size of the adult population nor is there an estimate of what a rebuilt or healthy stock looks like, it is virtually impossible to determine what a rebuilding schedule should be. However, the duration of a rebuilding schedule should reflect, in part, a measure of the generation time of the species. For a long-lived, but relatively early spawning species 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 maximum age of red drum in the northern region is 50-60 years, while in the southern region it is about 40 years. Given these factors, it may take quite some time for noticeable increases in the age structure of the adult population to become apparent.

Amendment 2 will address the next steps for rebuilding the red drum population as well as updating the FMP to meet the standards for Commission FMPs under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA 1993).

## **II. Status of the Stocks**

It is important to remember that the population models used in the assessment (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). Unpublished data from Florida showed much higher escapement rates of between 55 to 62%; this may mean that escapement 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) the Amendment 1 target of  $SSBR > 10\%$  appears to have been met for both the northern (18%) and southern (15%) regions. The assessment 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 much faster than in neighboring state waters, which may be a result of very strict harvest controls in Florida. The most recent assessment from Florida estimated annual escapement rates of 24-48% (Murphy 2002).

### **III. Status of the Fishery**

Few commercial landings of red drum have been recorded in states north of Maryland since 1960 (Table 1). 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 1960-2001. Coastwide commercial landings for 2001 amounted to 156,000 pounds; the majority (96%) from North Carolina. Based on available information from tagging studies, a large portion of the harvest in state waters appears to be supported primarily by catches of sub-adult red drum (ages-0 to 5).

Historically, the major commercial harvesters had been 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 new red drum FMP which: 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.

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 has proven to be the exception in recent years. The recreational harvest for 2001 was almost 360,000 fish, the majority of which were taken by Florida anglers (Table 2). The number of red drum released by recreational fishermen has averaged about one million fish per year since 1991 (Table 5). Approximately 1.6 million were released in 2001.

### **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) periodically have been utilized in coastwide stock assessment. Virtual population analyses utilize the MRFSS as the primary 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 Marine Research Institute continues to monitor juvenile red drum abundance in the northern Indian River Lagoon. A monitoring program in Florida, which used trammel nets to catch sub-adult red drum for tagging and age composition sampling, was replaced in 1997 by a 300 foot haul seine used in a stratified random sampling design to provide age composition data and relative abundance indices for exploitable-sized fish. A coastwide red drum stock assessment was completed in late 1999, and peer-reviewed by 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).

**Table 1. Commercial landings (in pounds) of red drum along the Atlantic coast, 1960-2001  
(source: pers. comm. NMFS, Fish. Stats. & Econ. Div.).**

Year	RI	NY	NJ	MD	VA	NC	SC	GA	FLEC	Total
1960				200	29400	79300	4200	400	129000	242500
1961					1200	89700	900	1000	114500	207300
1962					12900	60900			149300	223100
1963					2700	71200			134200	208100
1964					4600	101500	11500		119000	236600
1965				1200	94900	71400			146300	311100
1966				200	3100	35200	200	2700	153000	194400
1967					1100	12800	900	5800	147100	167700
1968					100	12500		5500	167000	185100
1969				400	700	3900	700	2700	119000	127400
1970					100	7500	400	2200	146800	157000
1971					700	17200	1300	1200	85200	105600
1972					5900	42900	1200	3400	128400	181800
1973			900		6200	70300	600	3700	166500	248200
1974					15700	142000	2300	3100	137300	300400
1975			200		19600	214000	12400	10000	83300	339500
1976					18600	168200	2600	7300	106000	302700
1977			200		300	19700	800	5000	103500	129500
1978			300		2100	21774	4325	328	104696	133523
1979				100	1900	126517	1767	935	92684	223903
1980					400	243223	4107	1493	191222	440445
1981					200	93420		261	258374	352255
1982					1700	52561	2228	251	139170	195910
1983				100	41700	219871	2274	1126	105164	370235
1984					2600	283020	3950	1961	130885	422416
1985					1100	152676	3512	3541	88929	249758
1986				1000	5400	249076	12429	2939	77070	347914
1987					2600	249657	14689	4565	42993	314504
1988				8100	4000	220271		3281	284	235936
1989				1000	8200	274356	165	3963		287684
1990				29	1481	183216		2763		187489
1991				7533	24771	96045	1475	1637		131461
1992				742	2352	128497		1759		133350
1993				121	8637	238099		2533		249390
1994	5094			1152	4080	142159		2141		149532
1995		668		6	2992	248193		2578		253769
1996		8			2073	113401		2271		117753
1997	43			24	4049	52548		1395		58059
1998	165	57	311	419	6436	294415		672		302475
1999		47	241	707	12368	372996		1115		387474
2000		1215		877	11457	271013		707		285269
2001		58	14	727	5318	149616				155733

**Table 2. Recreational harvest (numbers of A + B1 fish) of red drum along the Atlantic coast, 1981-2001 (source: pers. comm. NMFS, Fish. Stats. & Econ. Div.).**

<b>Year</b>	<b>NJ</b>	<b>DE</b>	<b>MD</b>	<b>VA</b>	<b>NC</b>	<b>SC</b>	<b>GA</b>	<b>FLEC</b>	<b>Total</b>
1981			601	49630	15054	27319	6323	75244	174171
1982					16445	160760	30757	204401	412363
1983			2413	32940	81528	104806	56854	344513	623054
1984				1457	108787	129547	258188	549381	1047360
1985					22077	530110	183837	265185	1001209
1986			12804	28139	17501	193188	102279	113440	467351
1987				2186	61100	522420	138062	51225	774993
1988				4311	142626	287916	147042	9542	591437
1989			1014	12007	62359	127492	51557	34748	289177
1990			1279		33149	118666	76304	44280	273678
1991			2745	17119	38658	125833	162802	102727	449884
1992				13275	23593	112534	83861	104265	337528
1993				14005	49493	119189	105710	65140	353537
1994				1378	28953	129515	134214	120938	414998
1995				3665	88593	202430	134915	96927	526530
1996				572	36746	130649	60251	146823	375041
1997				1920	8749	129022	39041	75235	253967
1998				13070	114638	46509	24929	107982	307128
1999				12425	64739	44069	67283	126180	314696
2000				22603	61618	37217	94144	191070	406652
2001		275		6967	23142	61420	90376	177633	359813

**Table 3. Recreational harvest (pounds of A + B1 fish) of red drum along the Atlantic coast, 1981-2001 (source: pers. comm. NMFS, Fish. Stats. & Econ. Div.).**

Year	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1981			4370	347939	31519	50230	9442	317963	761463
1982					37511	340686	52150	480676	911023
1983			3018	51299	109540	222691	67298	675924	1129770
1984				1285	1160539	183282	294583	976971	2616660
1985					70677	1532316	185887	414176	2203056
1986			754161	145517	31594	498586	173837	360725	1964420
1987				44332	200729	913639	250795	227222	1636717
1988				9030	451974	1050049	385860	12507	1909420
1989			2348	27236	214849	396771	127245	146064	914513
1990			2679		302994	631819	161712	258569	1357773
1991			5635	30582	108268	284290	337207	516999	1282981
1992				55324	109134	411484	198751	396555	1171248
1993				45505	266459	282614	328245	290930	1213753
1994				3684	192060	314632	353616	578412	1442404
1995				66270	405620	417595	300337	525231	1715053
1996				1512	204556	396394	164756	596483	1363701
1997				1810	39077	296155	129836	345390	812268
1998				34861	591428	129619	84348	487091	1327347
1999				92794	326303	103777	166630	540310	1229814
2000				95596	316029	93043	228965	885447	1619080
2001				51890	132578	188198	155854	853714	1382234

## V. Status of Management Measures

With approval of Amendment 1 in 1991, ASMFC adopted a "phase-in" approach to attain the management goal of 30% SSBR in the fishery. The initial phase required all states to adopt measures which would achieve a 10% SSBR; all states have complied with this requirement.

Recent discussions between the Council's Red Drum Management Committee and the South Atlantic Board, led the Council to recommend in December 2000 to transfer 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 once the stock assessment was updated and reviewed which occurred in 2000-01. Amendment 2 was developed during 2001-02 and approved by the Board in May 2002. Management measures which may be implemented through Amendment 2 include revised bag and size limits. However, some states notably North Carolina, South Carolina and Georgia, have already taken steps to reduce the harvest of red drum through revised bag and size limits. Other states are in the process of developing and implementing measures to comply with Amendment 2.

## VI. Implementation of FMP Compliance Requirements as of October 1, 2002

Amendment 1 designated a series of steps to achieve the target SSBR level of 30%. Currently, the South

Atlantic Board has determined that the states must adopt the management measures that will attain an SSBR level above 10% (first step of phase-in approach). The 10% scenario required states to adopt either of two options:

1. 18-inch Total Length (TL) minimum, 27-inch TL maximum, and a 5 fish bag limit with one fish exceeding 27-inch TL; or
2. 14-inch TL minimum, 27-inch maximum, and 5 fish bag limit, with no fish exceeding 27-inches TL

All states subject to these requirements (New Jersey through Florida, including the PRFC), had implemented the appropriate measures.

There are three compliance criteria in Amendment 2: 1) states are required to implement harvest controls (e.g. bag and size limits) in order 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. The states are in the process of submitting their implementation plans for Board approval. The implementation deadline is January 1, 2003. The first compliance report submission deadline is May 1, 2004.

## **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) and population size. 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 VPA methodology was chosen by the Technical Committee as the population modeling approach to determine the status of the stock.



**Table 4. Summary of Atlantic coast red drum regulations by state/jurisdiction, as of October 1, 2002 (N/A = Not Applicable).**

State	Size Limit (TL inches)	Possession Limit	Other	Meets FMP requirement ?
ME <sup>1</sup>	None	None	None	N/A
NH <sup>1</sup>	18" - 27"	None	0 fish > 27" TL	N/A
MA <sup>1</sup>	14"	None	None	N/A
CT <sup>1</sup>	None	None	0 fish < 32" TL	N/A
RI <sup>1</sup>	None	None	None	N/A
NY <sup>1</sup>	14"	None	2 fish > 32" TL	N/A
NJ <sup>2</sup>	18" - 27"	None	1 fish > 27" TL	No
PA <sup>1</sup>	None	None	None	Yes
DE <sup>3</sup>	18" - 27"	5 fish	1 fish > 27" TL	No
MD	18" - 25"	5 fish	0 fish > 25" TL; commercial fishery subject to same possession limits	Yes
PRFC <sup>4</sup>	18" - 27"	5 fish	1 fish > 27" TL	No
VA <sup>5</sup>	18" - 27"	5 fish	1 fish > 27" TL	No
NC	18" - 27"	1 fish	0 fish > 27" TL; Annual commercial cap = 250,000 lbs.; daily trip limit of 7 fish, must be less than 50% of catch (pounds); gill nets < 5" stretch mesh must be tended from 5/1-10/31	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

<sup>1</sup> State is not a part of the management unit; Amendment 2 recommends (non-mandatory) prohibition on harvest, possession and sale of red drum greater than 27" TL (Maine is the only state to respond, no intent at this time to implement regulations for red drum unless a need arises, Commissioner has emergency regulatory authority).

<sup>2</sup> In process of changing regulations by notice; Marine Council to meet in early Nov.; anticipate having new regulations in place by Jan. 1, 2003; however, no specific proposal was provided.

<sup>3</sup> No specific proposal submitted; considering 5 fish, 20-27"; in process of soliciting public input; will implement new regulations in early 2003; will also be requesting *de minimis* status as only a handful of red drum are caught each year.

<sup>4</sup> In process of soliciting public comment; Commission meeting scheduled for Nov. 14.; proposing a 27" TL maximum size limit, i.e. 0 fish > 27", for all fisheries; bag and size limits to be determined based on Amendment 2 guidelines (Table 19) to attain 40% SPR; measures to be effective Jan. 1, 2003.

<sup>5</sup> In process of soliciting public comment; considering two options: 1) 5 fish at 20-27" TL, or 2) 3 fish at 18-26" TL; public hearing scheduled for early Nov. 2002, with final Commission action at that time; measures to be effective Jan. 1, 2003.

## 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).
- 3. The management unit should be divided at the North Carolina/South Carolina border, and be managed as two separable sub-units of an Atlantic stock (accomplished in Amendment 2).
- 4. States should maintain annual age-length keys.
- 5. A technical review of North Carolina's commercial quota should be made to determine its conservation equivalency in relation to the management options in Amendment 2 (Technical Committee conducted a review in April 2002, approved North Carolina plan).
- 6. 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.

### **Prioritized Research and Monitoring Recommendations**

#### **Stock Assessment and Population Dynamics**

- < Design an appropriate state or estuary-specific fishery-independent survey of sub-adult and adult red drum to be implemented in Virginia, North Carolina, South Carolina, Georgia, and Florida. The purpose would be to provide an index of abundance of immature red drum. (H)
- < 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. (H)
- < 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. (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.

## **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)

## **Identified Management Needs/Issues**

- < none at this time

## **Research Needs Identified as Being Met**

- < none at this time.

## **References**

Murphy, M.D. 2002. Stock assessment of red drum, *Sciaenops ocellatus*, in Florida: status of the stocks through 2000. Report from the Florida Marine Research Institute to the Florida Fish and Wildlife Commission, Division of Marine Fisheries, 32 p.

Vaughan, D.S. and J.T. Carmichael. 2000. Assessment of Atlantic red drum for 1999: northern and southern regions. NOAA Tech. Mem. NMFS-SEFSC-447, 54 p. + app. U.S. DOC, NOAA, Center for Coastal Fisheries and Habitat Research, Beaufort, NC.

Vaughan, D.S. and J.T. Carmichael. 2001. Bag and size limit analyses for red drum in northern and

southern regions of the U.S. South Atlantic. NOAA Tech. Mem. NMFS-SEFSC-454, 37 p. U.S. DOC, NOAA, Center for Coastal Fisheries and Habitat Research, Beaufort, NC.

**Table 5. Recreational releases (numbers of B2 fish) of red drum by state, 1981-2001 (source: pers comm. NMFS Fish. Stats. and Econ. Div.).**

Year	NJ	DE	MD	VA	NC	SC	GA	FLEC	Total
1981					2230	417		9042	11689
1982						2496	3377	10172	16045
1983					1866	6751	1417	54723	64757
1984					2931		4232	47196	54359
1985				1115		16688	6315	193399	217517
1986				7595		24018	56045	100095	187753
1987					18499	82595	234676	377959	713729
1988				3958	24874	269176	177319	233988	709315
1989			2918	7038	7566	42824	71162	172303	303811
1990				934	12452	102611	156263	68667	340927
1991			4432	14461	121178	99968	92803	645773	978615
1992	301			15383	60230	46269	128066	284893	535142
1993				50434	182301	146324	140386	465656	985101
1994				10684	107662	324706	146039	691261	1280352
1995				33560	164520	362844	356618	683706	1601248
1996				2424	35752	176517	71983	500374	787050
1997		2571		109754	259570	175772	22736	560559	1130962
1998			2768	93660	199701	84274	33882	481009	895294
1999			2148	232893	247146	87776	18586	565981	1154530
2000			1458	196541	203967	94050	129190	693152	1318358
2001				30365	238552	221045	249892	850044	1589898