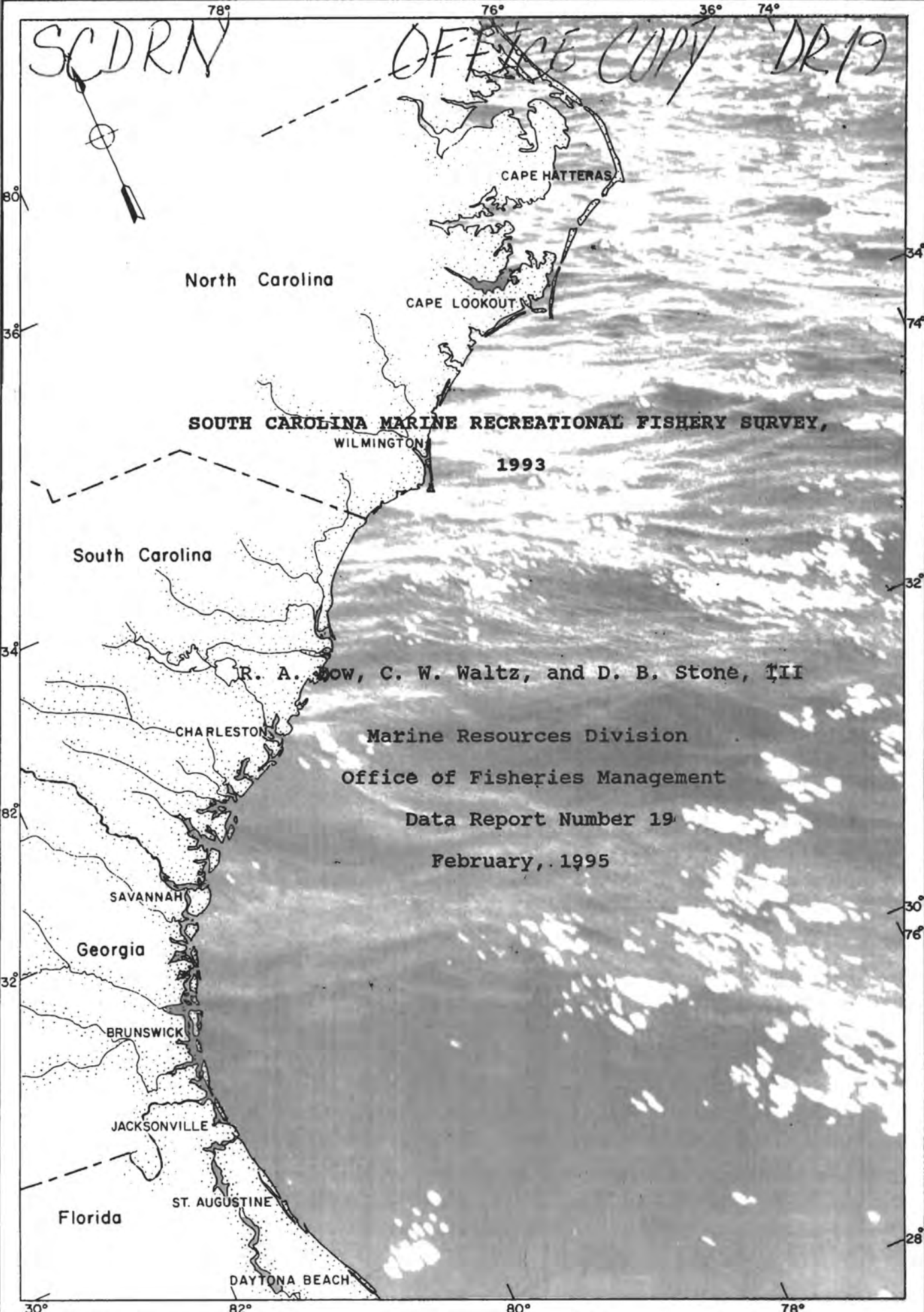


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**SOUTH CAROLINA MARINE RECREATIONAL FISHERY SURVEY,
1993**

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Marine Resources Division
Office of Fisheries Management
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PREFACE

The National Marine Fisheries Service implemented new methods for processing effort data in 1993. There are several versions of the "new" 1993 data. The data included herein were the most recent available at the time of preparation (February, 1995). In March, 1995, a revised 1993 data set was issued. This information has not been included in this report, due to the lengthy recalculations and text revision required.

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INTRODUCTION

The Fisheries Statistics Program (FSP) of the Marine Resources Division (MRD) is responsible for the collection, compilation, analysis, and distribution of fishery-dependent data for South Carolina's marine fisheries. The principal instrument used to obtain such information for recreational finfish fisheries is the Marine Recreational Fishery Statistics Survey (MRFSS) conducted annually in cooperation with the National Marine Fisheries Service (NMFS). This is a generalized survey that was initiated in 1979 for the principal purpose of obtaining participation, effort, and catch data on a regional basis.

In South Carolina, the 1993 MRFSS was conducted during March through December. A telephone poll of coastal households (those within 25 to 50 miles of the coast, depending on season) was conducted by the NMFS contractor (Burke Marketing Research) to obtain information on participation and effort. An on-site intercept survey (creel census) was employed to collect effort, catch, and demographic data. This task also was performed by a contractor (KCA Research Division of David C. Cox & Associates), which subcontracted the field work to the MRD. Fishermen interviewed included those fishing from shore or man-made shore facilities (e.g. docks, piers, and bridges), charterboats, and private boats. Headboat fishermen were not included because their catch and effort data were submitted to the NMFS and the MRD under mandatory logbook reporting requirements. Fishermen using gear other than hook and line were seldom encountered during the MRFSS and the results therefore did not pertain to such activities as gill netting, gigging, and spearfishing by divers.

Private boat fishermen were required by state law to possess a marine fishing stamp for the taking of fish and shellfish. Fishermen on piers, charterboats, and headboats were exempt from this requirement, although the operators of these platforms were required to obtain permits and submit monthly reports of their fishing activities. Pier operators were required to report the numbers of anglers using their sites daily. Headboats were obligated to submit a copy of their NMFS report of daily numbers of anglers and fish caught to the MRD. A similar report was also mandatory for charterboat operators.

Additional catch and effort data for the private boat mode were collected in a State Finfish Survey (SFS) using procedures similar to those of the MRFSS. During 1993, this effort was primarily directed toward fishermen fishing in inland areas.

METHODOLOGY

MRFSS procedures for the telephone and intercept surveys were described by Essig et al. (1991) and Van Voorhees et al. (1992). In 1993, the NMFS implemented several new procedures for processing

effort data obtained in the phone survey. These included 1) different guidelines for treatment of proxy data, 2) imputation for missing data, and 3) adjustment of county fishing effort data for county population size. The resulting effort data were more accurate statistically than those derived previously. The effects of steps 1 and 2 were to increase effort estimates and the catch estimates derived from them. The effects of step 3 were greatest in states where coastal counties vary greatly in population size and the most populated counties have either the lowest or the highest mean household fishing rates.

The differences between estimates derived using the old vs the new methods were larger in South Carolina than in other states with a substantial increase in effort and catch. The 1993 estimates in this report were those obtained using the new procedures (see Preface). Because of the differences in methodology, these data are not comparable to those from previous years, which detracts from the validity of between-years comparisons and trend line analysis. Such treatments have therefore been omitted.

Fundamental field procedures for the intercept survey have remained basically unchanged since 1987, although minor modifications have been made to the annual questionnaires (the 1993 version is shown in Appendix I). FSP staff conducted the 1993 MRFSS at 23 shore-based sites (SH), 7 charterboat docks (CB), and 23 public boat ramps or landings (PB) (Table 1). The sampling schedule, provided by KCA Research Division, was based on historical usage patterns by fishing mode (shore, charterboat, and private boat) and sampling wave (two-month intervals beginning with March-April). Site assignments reflected relative usage rates with the most heavily utilized locations receiving selection priority.

On a scheduled sampling day, the creel clerk proceeded to the assigned site. If the clerk determined that the assigned location would be unproductive, he/she proceeded to the nearest alternative location for that mode. The clerk usually remained on-site until the day's MRFSS interview quota (30) was obtained or further effort appeared unwarranted. SFS sampling followed similar procedures except that the site assignments were determined by the FSP. Distribution of SFS sampling effort is shown in Table 2.

MRFSS interviews were conducted in accordance with procedures and guidelines established by the NMFS and its contractor. An MRFSS interview pertained to an individual fisherman with all members of a fishing party usually being interviewed (there were some exceptions, particularly with charterboat groups). An SFS interview generally applied to more than one angler and represented a trip interview. Responses in both surveys were voluntary and all information was confidential as to personal identity.

Information obtained included the number of anglers in the party, hours spent fishing, area fished, targeted species, and residency of the respondent. Catch data consisted of the numbers

Table 1. Distribution of 1993 MRFSS interviews by site and wave.

County	Site	Mode(s)	Wave					Total
			2	3	4	5	6	
Beaufort	Hunting Is.	SH,PB	11	0	40	11	4	66
	C.C. Haigh	SH,PB	0	5	0	0	0	5
	Broad River	SH,PB	0	11	8	4	9	32
	Port Royal	SH,PB	0	0	9	0	15	24
	Shelter Cove	CB	9	4	23	15	31	82
	Palmetto Bay	CB	8	4	0	16	0	28
	Fripp Is.	CB	7	3	5	17	0	32
	Sam's Pt.	PB	2	5	5	9	9	30
	E.C. Glenn	PB	7	6	0	2	0	15
	Edding's Pt.	PB	0	4	0	0	0	4
	Station Cr.	PB	0	0	12	0	5	17
Paige Pt.	PB	0	0	0	3	0	3	
Colleton	Bennetts Pt.	PB	0	4	4	0	0	8
Charleston	Church Cr.	SH	6	0	0	0	0	6
	County Park	SH	5	3	6	0	0	14
	Breach Inlet	SH	22	40	9	38	0	109
	Bowen's Is.	SH	0	2	0	11	17	30
	Crosby's	SH	0	35	28	7	2	72
	Brittlebank	SH	0	6	0	0	2	8
	Battery	SH	0	0	1	0	0	1
	Capt. Sam's	SH	0	0	4	0	0	4
	Pitt St.	SH	0	0	0	7	0	7
	Remley Pt.	SH,PB	20	10	18	17	20	85
	Limehouse	SH,PB	7	6	0	1	63	77
	Wappoo Cut	SH,PB	6	17	43	7	28	101
	Dawhoo	SH,PB	0	0	15	2	0	17
	Wild Dunes	CB	2	6	15	6	0	29
	Bohicket	CB	19	46	3	0	2	70
	Toler's Cove	CB	3	0	12	0	0	15
	Paradise Is.	PB	4	0	4	1	0	9
	Sol Legare	PB	0	3	12	9	0	24
	Folly River	PB	0	4	2	12	12	30
Shem Cr.	PB	0	0	0	2	0	2	
R.E. Ashley	PB	0	0	0	18	0	18	
Georgetown	Murrells In.	SH	6	1	0	10	0	17
	Midway In.	SH	0	0	0	5	0	5
	Capt. Dick's	CB	10	0	0	0	0	10
	Boulevard	PB	16	0	0	0	0	16
	South Is.	PB	8	0	2	0	8	18
	SCWMRD M.I.	PB	72	116	114	88	8	398
Horry	Myrtle Bch.	SH	20	19	0	0	26	65
	Springmaid	SH	10	5	35	0	14	64
	Cherry Grove	SH	22	32	20	11	40	125

County	Site	Mode(s)	Wave				Total	
			2	3	4	5		6
	Garden City	SH	0	38	28	29	12	107
	C.Grove ldg.	PB	0	0	23	34	0	57

Table 2. Distribution of 1993 SFS interviews by site and wave.

County	Site	Wave						Total
		1	2	3	4	5	6	
Beaufort	Russ Point	4	2	33	9	16	0	64
	Station Creek	0	0	0	5	13	5	23
	Sam's Point	6	0	6	0	0	9	21
	E.C. Glenn	0	0	7	3	4	7	21
	Broad River	0	1	12	0	0	0	13
	Lady's Island	0	8	3	0	0	0	11
	Port Royal	1	6	1	0	0	1	9
	Brickyard Pt.	5	0	0	3	0	0	8
	Edding's Pt.	0	3	0	0	0	4	7
	Fripp Pt.	2	0	0	0	0	0	2
	Pigeon Pt.	1	0	0	0	0	0	1
	Ward's	1	0	0	0	0	0	1
		Total	20	20	62	20	33	26
Colleton	Live Oak	0	0	0	13	0	0	13
	Bennett's Pt.	0	0	0	6	0	0	6
	Total	0	0	0	19	0	0	19
Charleston	Remley Pt.	35	72	190	104	122	77	600
	Wappoo Cut	5	26	115	52	77	20	295
	Wild Dunes	40	15	26	40	6	13	140
	Limehouse	25	11	5	10	14	24	89
	Folly River	16	5	24	0	0	1	46
	R.E. Ashley	2	6	0	0	9	6	23
	Sol Legare	6	2	7	0	6	0	21
	Shem Creek	1	6	1	1	4	3	16
	Breach Inlet	2	1	4	0	6	2	15
	Cherry Point	0	3	0	2	0	0	5
	Buzzards Roost	3	0	0	0	0	0	3
	Buck Hall	2	0	0	0	0	0	2
	Paradise Is.	1	0	0	0	1	0	2
	Riverland Terr.	0	0	0	0	1	0	1
	Total	138	147	372	209	246	146	1,258
Georgetown	Murrells Inlet	14	82	170	93	176	101	636
	South Island	23	6	11	17	42	34	133
	Boulevard	30	2	18	36	13	3	102
	Total	67	90	199	146	231	138	871
Horry	Cherry Grove	0	0	5	0	0	2	7
All	Total	225	257	638	394	510	312	2,336

of fish caught by species and their disposition (i.e., retained, discarded dead, released alive, given away, or used for bait). Up to 20 fish of priority species were weighed and/or measured per catch. In cases where catches were pooled for a fishing party (e.g. on charterboats) and anglers didn't recall how many fish they had caught individually, the group catch was divided by the number of fishermen to obtain catch rates (CPUE). It should be emphasized that the numbers and kinds of fish not inspected by the creel clerks (e.g. released or discarded fish) could not be verified.

FSP staff coded and edited MRFSS interview forms and forwarded them to KCA Research Division for additional processing. KCA provided summaries of intercept survey wave data and Burke furnished compilations of information from the phone surveys. The NMFS provided estimates of participation and the numbers of trips (effort). The NMFS also supplied estimates of the total numbers of fish caught by species and wave based on expansions of creel census CPUE data and total numbers of trips. All data from the SFS were processed by the FSP.

RESULTS

Essig et al. (1991) described considerations pertinent to interpretation of results from the MRFSS, e.g. sources of variation and their implications, potential elements of bias, and possible effects of data adjustments. Most of these applied to the South Carolina survey results and are mentioned where appropriate.

Survey Logistics

The telephone survey contacted 7,223 eligible households during waves 2-6 (March-December). No phone sampling was conducted in January and February. In the MRFSS creel census, 1,954 interviews were accepted by the NMFS contractor, distributed by wave and mode as shown in Table 3. Charterboat anglers represented about 14% of the sample population, shore anglers 37%, and private boat fishermen 49%. About 40% of the shore anglers fished from Grand Strand piers with most of the remainder using man-made facilities such as other piers and bridges. Nearly 54% of the charterboat fishermen were interviewed in Beaufort County with 43% intercepted in Charleston County. Almost 42% of the total private boat sample was obtained at the SCWMRD public ramp at Murrells Inlet. Less than 15% originated in Beaufort County. Three sites in Charleston County accounted for most of the remaining private boat angler interviews.

Total on-site time expended in the MRFSS was 989.75 hours (394.50 hours in the shore mode, 164.75 hours in the charterboat mode, and 430.50 hours in the private boat mode). Shore interviews required an average of 0.54 hour per interview, charterboat interviews 0.62 hour, and private boat interviews 0.45 hour. Travel required 928.00 hours with a total mileage of 30,292 miles.

Table 3. Distribution of MRFSS creel census interviews by area of fishing, mode, and wave. Source: KCA Research Division wave reports.

Area	Wave	Mode		Total
		Shore	Charterboat	
Inland	2	51	29	183
	3	104	0	217
	4	87	4	286
	5	72	35	275
	6	30	12	205
	Total	344	80	1,166
Ocean < 3 mi.	2	58	0	65
	3	95	0	107
	4	83	0	100
	5	60	4	75
	6	92	0	95
	Total	388	4	442
Ocean > 3 mi.	2	0	26	54
	3	0	62	110
	4	0	54	114
	5	0	15	41
	6	0	23	27
	Total	0	180	346
All	Total	732	264	1,954

Table 4. Distribution of MRFSS and SFS private boat mode interviews by county.

County	Percent of sample		Combined
	MRFSS	SFS	
Beaufort	12	7	9
Charleston	36	54	49
Georgetown	45	37	40
Horry	6	1	2

A total of 2,336 private boat mode interviews was obtained in the SFS, requiring 1,702.00 hours of on-site time (0.73 hour per interview) and 1,153.75 hours of travel time (31,050 miles). Table 4 shows the comparative distribution of SFS and MRFSS private boat mode interviews by area.

Participation

About 8.7% of the coastal households contacted during the phone survey contained a member who had gone salt water sport fishing during that wave (i.e., in the last two months). At least one member had gone salt water fishing during the past year in 18.0% of all eligible households. Table 5 lists the positive response rates per wave compared with those from previous years.

Coastal residents comprised the majority (54%) of the anglers interviewed in the MRFSS (Table 6). They were the predominant groups in the private boat (73% of those interviewed) and shore (44%) modes. Out of state residents comprised the vast majority of charterboat fishermen (79% of those interviewed) and were a significant component (40%) of the shore mode population.

During July through December, 1993, 73,462 salt water fishing stamps were sold to private boat fishermen. Six-passenger charterboat permits were acquired by 126 individuals (= boats) with 29 permits issued for vessels with larger passenger capacities (mostly headboats). Eight licensed fishing piers were documented.

Total participation was estimated at 522,000 fishermen. Out of state anglers (N = 306,000) were the largest group (59%). There were 139,000 coastal resident anglers (27%) and 77,000 noncoastal resident anglers (14%). Participation was unusually low during wave 2. This was also the case throughout the South Atlantic region and was attributed by the NMFS to the March storm.

Effort

Total effort was estimated at 1.686 M trips, distributed by wave and residential category as indicated in Table 7. Coastal residents contributed 53% of the effort, out of state anglers 33%, and noncoastal residents 14%. Distribution of effort by mode and fishing area is shown in Table 8. About 59% of the total effort was expended in inland areas and 87% occurred on waters under state jurisdiction. Shore-based anglers accounted for 49% of the total effort with shore fishing the dominant mode in coastal ocean (< 3 mi.) waters. Private boat fishing was the principal mode in inland areas with 57% of the effort there and 45% of the overall effort.

The average numbers of trips (= days fished) made per angler in each wave and mode as reported in the phone survey are indicated in Table 9. The annual figures are based on wave 6 responses to the question "how many days did you fish in the last twelve months?"

Table 5. Percentage of coastal households contacted during the MRFSS phone survey that contained a member who went salt water fishing during the indicated wave.
Source: KCA Research Division wave reports.

Year	Wave				
	2	3	4	5	6
1993	6.3	8.8	10.2	9.8	7.4
1992	6.9	7.3	8.1	8.7	5.3
1991	5.6	8.7	9.2	8.4	7.6
1990	5.8	7.6	5.6	6.7	5.7
1989	7.5	5.5	7.1	5.7	5.1
1988	7.0	6.7	10.2	NA	NA
1987	5.9	9.4	8.8	9.1	8.4

Table 6. MRFSS creel census interviews by residence, in numbers of anglers interviewed. C - coastal, NC - noncoastal, OOS - out of state.

Wave	C	Shore			Charterboat			Private boat		
		NC	OOS		C	NC	OOS	N	NC	OOS
2	46	18	45	7	1	47	112	19	7	
3	93	38	68	11	9	42	123	22	28	
4	59	32	79	10	6	42	154	51	67	
5	82	9	41	4	3	47	153	22	30	
6	42	17	63	0	5	30	155	9	6	
Total	322	114	296	32	24	208	697	123	138	

Table 7. Estimated recreational fishing trips by wave and residency (finfish only, excluding headboats). Source: NMFS.

Wave	Mode	Residency			Total
		Coastal	Noncoastal	Out of state	
2	Shore	58,570	22,919	57,297	138,786
	Charterboat	2,531	5,061	32,410	40,002
	Private boat	40,256	6,829	2,516	49,602
3	Shore	83,185	33,990	60,824	177,999
	Charterboat	1,809	2,048	13,551	17,408
	Private boat	89,539	16,015	20,383	125,937
4	Shore	78,016	42,314	104,461	224,791
	Charterboat	3,860	5,095	23,469	32,424
	Private boat	173,523	57,465	75,494	306,482
5	Shore	99,692	10,942	49,846	160,479
	Charterboat	1,987	3,450	18,246	23,683
	Private boat	141,730	20,379	27,790	189,899
6	Shore	40,089	16,226	60,133	116,449
	Charterboat	0	0	0	0
	Private boat	75,295	4,372	2,915	82,582
Annual	Shore	359,551	126,390	332,561	818,503
	Charterboat	10,186	15,654	87,675	113,516
	Private boat	520,343	105,061	129,097	754,502
	All	890,080	247,105	549,333	1,686,521

Table 8. Estimated recreational fishing trips by fishing area and mode (finfish only, excluding headboats).

Mode	Fishing area		
	Inland	Ocean < 3 mi.	Ocean > 3 mi.
Shore	389,170	429,333	0
Charterboat	38,678	1,754	73,084
Private boat	573,808	42,054	138,640
Total	1,001,655	473,141	211,724

Table 9. Average trips per angler by mode and wave. Source: Burke Marketing Research wave reports.

Wave	Mode		
	Shore	Charterboat	Private boat
2	2.85	0.49	4.22
3	3.79	6.44	4.38
4	2.24	0.41	4.72
5	5.69	0	4.96
6	2.28	0.03	5.97
Annual	11.12	0.43	35.95

Table 10. Time of day of fishing. Sources: KCA Research Division and Burke Marketing Research wave reports.

Wave	Morning				Afternoon		Evening	
	0-3	3-6	6-9	9-12	12-3	3-6	6-9	9-12
Trips from phone survey								
2	1	0	2	5	44	51	26	2
3	17	3	1	17	41	157	100	13
4	10	3	2	56	85	300	371	45
5	9	2	7	21	123	303	200	19
6	2	0	0	18	39	208	45	18
On-site survey interviews								
2	0	0	0	15	161	108	18	0
3	0	0	0	34	271	121	8	0
4	0	0	0	52	298	143	7	0
5	0	0	0	22	247	122	0	0
6	0	0	0	22	216	84	5	0

The time of day of fishing as reported in the phone survey is shown in Table 10. About 57% of the trips were made between noon and 6:00 PM. The distribution of creel census interviews is shown for comparison. There was no survey effort prior to 9:00 AM and after 9:00 PM. About 91% of the intercept survey interviews were obtained between noon and 6:00 PM.

Respondents to the phone survey were asked whether they had used public access points or private facilities on their private boat fishing trips. Distribution by point of origin is shown in Table 11. Seventy percent of the trips originated from public locations. Launching ramps were the most common type of access, accounting for 53% of the total reported effort.

Species Preferences

Two-thirds of the fishermen interviewed in the shore mode of the MRFSS expressed no species preference. Table 12 lists target species by county.

Spot was the most popular species sought by shore anglers, particularly those fishing from the Grand Strand piers.

Preferences indicated by private boat anglers in the MRFSS generally paralleled those reported in the SFS. Spotted seatrout and red drum were the most frequently targeted species in inland waters with spotted seatrout relatively more popular in the southern part of the state and red drum more preferred in the northern coastal area. Flounders were the most frequently targeted inland species in the Georgetown/Horry County area, particularly at Murrells Inlet. Sheepshead also were popular targets of inland and coastal fishermen, particularly in Charleston County. King mackerel was the dominant choice of those offshore ocean anglers who expressed a particular species preference regardless of county.

The sources of information in Table 13 were trip reports submitted by vessel operators. Most of the inland charterboat effort occurred in the southern sounds with red drum and/or spotted seatrout targeted on roughly half of the trips directed at particular species (27% of all inland trips were not species-specific). Cobia were popular spring targets with sharks and tarpon sought during the summer.

The majority of the trips in coastal ocean (< 3 mi.) waters occurred over natural bottoms with sharks as the principal targets. Trolling accounted for 18% of the overall coastal charterboat effort with Spanish mackerel the most preferred species using this method.

The most popular form of charterboat fishing was offshore trolling with nearly half of these trips not targeted at any particular species. Mackerels, especially king mackerel, were the most popular fish specifically sought by offshore anglers. A large

Table 11. Number of private boat trips by type of access (from phone survey). Source: Burke Marketing Research wave reports.

Type of access	Wave					Total
	2	3	4	5	6	
Public						
launching ramp	23	110	313	208	155	809
boat slip	6	20	58	33	26	143
mooring dock	5	11	29	10	14	69
other	1	0	36	1	16	54
Private						
personal dock	3	24	91	52	6	176
locked marina	10	17	63	28	1	119
unlocked marina	1	8	27	34	15	85
other	0	1	51	21	1	74
Total trips	49	191	668	387	234	1,529

Table 12. Species preferences by county of shore and private boat anglers interviewed, in numbers of fishermen (MRFSS) or trips (SFS).

Mode	Species	County		
		Beaufort	Charleston	Georgetown/Horry
Shore (MRFSS)	Any	59	159	267
	Spot	3	26	68
	Flounder	10	13	19
	Red drum	0	20	5
	Spotted seatrout	0	18	2
	Spanish mackerel	0	15	1
	King mackerel	0	0	14
	Sheepshead	0	11	1
	Kingfishes	2	0	6
	Sharks	5	0	0
	Catfish	0	4	0
	Bluefish	0	0	3
	Pinfish	0	0	1
	Private boat (MRFSS)	Any	32	62
Spotted seatrout		38	120	11
Red drum		15	70	62
Flounder		0	12	106
King mackerel		4	7	51
Sheepshead		14	38	0
Spanish mackerel		0	1	41
Spot		0	8	26
Black sea bass		0	0	28
Sharks		10	11	0
Catfish		0	4	5
Striped bass		0	0	9
Kingfishes		5	3	0
Bluefish		0	0	5
Spadefish		0	0	4
Grouper		0	3	0
Tuna		0	3	0
Tarpon		0	2	0
Jack crevalle		0	2	0
White perch		0	0	2
Cobia	2	0	0	
Weakfish	1	0	0	
(SFS)	Any	56	278	229
	Red drum	20	322	135
	Spotted seatrout	44	322	35
	Flounder	6	38	144
	King mackerel	0	85	75
	Sheepshead	21	126	10
	Spot	3	7	130

Mode	Species	Beaufort	Charleston	Georgetown/Horry
	Sharks	14	18	4
	Spanish mackerel	0	7	26
	Black sea bass	3	10	13
	Kingfishes	0	21	1
	Spadefish	0	9	7
	Dolphin	0	14	0
	Crevalle jack	0	14	0
	Striped bass	2	1	10
	Cobia	9	0	1
	Catfish	0	4	6
	Bluefish	0	0	9
	Weakfish	0	0	8
	Croaker	0	3	4
	White perch	0	0	5
	Tunas	0	0	3
	Porgy	0	2	0
	Black drum	0	0	2
	Wahoo	0	1	0
	Tarpon	0	1	0

Table 13. Species preferences of charterboat anglers by fishing area, in numbers of trips. Source: MRD charterboat trip reports.

Fishing area	Species targeted	Trips
Inland	Any	202
	Spotted seatrout	139
	Red drum	127
	Sharks	82
	Tarpon	52
	Cobia	46
	Sheepshead	37
	Flounders	32
	Spanish mackerel	12
	Bluefish	2
	Kingfishes	2
	Crevalle jack	1
	Black sea bass	1
Ocean < 3 miles	Sharks	342
	Any	145
	Spanish mackerel	92
	Red drum	45
	Sheepshead	24
	Black sea bass	23
	King mackerel	18
	Bluefish	13
	Cobia	11
	Weakfish	8
	Spotted seatrout	7
	Tarpon	7
	Flounders	2
	Kingfishes	2
Spot	1	
Ocean > 3 miles	Any	1,660
	King mackerel	955
	Spanish mackerel	298
	Grouper	105
	Billfish	74
	Black sea bass	67
	Sharks	66
	Tuna	66
	Dolphin	62
	Amberjack	51
	Barracuda	37
	Sheepshead	30
Spadefish	18	

Fishing area	Species targeted	Trips
	Wahoo	15
	Cobia	15
	Bluefish	12
	Red drum	8
	Snapper	5

portion (56%) of the non-trolling trips also had no specific target, particularly those made over natural bottom. Groupers were the most popular species targeted in this habitat, while black sea bass was the principal demersal species sought on the artificial reefs.

Catch

MRFSS catch estimates are vulnerable to large sampling errors associated with the numbers of fishermen interviewed and catches inspected (sample size), the range in numbers of fish in individual catches (variability), and the frequency of occurrence of unusually large (or small) catches (probability). Misidentification and confusion over common names can cause substantial errors in the estimated landings of similar species. Only catches inspected by the creel clerks can be verified and, for species having large percentages of the catch either released or discarded, their estimated total landings can be quite inaccurate. For the most frequently caught fish, relative ranking and trends in catch appear to be reasonably reliable when considered in conjunction with commercial landings and anecdotal information.

The total catch of marine species in 1993 was estimated at 4.367 M fish (Table 14). About 31% of the total catch were released. Landings by wave are shown in Table 15 and those by fishing zone in Table 16. About 45% of the overall numerical catch was made in estuarine waters and 84% came from waters under state jurisdiction.

Offshore pelagic species represented a little over 1% of the total numerical catch with dolphin the principal species. Offshore bottomfish comprised about 12% of the overall landings with black sea bass the dominant component.

The principal targets of ocean fishermen were coastal pelagics, particularly mackerels. This group represented about 7% of the total catch with bluefish and Spanish mackerel the most numerous species.

The inshore sportfish category is an arbitrary classification for the most popular inland species. In aggregate, this group represented about 17% of the total 1993 landings. Spotted seatrout and red drum were the principal species.

Inshore bottomfish comprised the largest group, accounting for about 41% of the total catch with spot the dominant species. Roughly one-third of all fish caught in 1993 were spot.

Sharks accounted for 4% of the total catch. Because of identification problems, the species composition was not reliably documented. Small coastal species such as the Atlantic sharpnose, dogfish, and bonnethead probably made up most of the landings.

Table 14. Estimated total catch (in thousands of fish) by South Carolina anglers in 1993 (excluding headboat landings). Source: NMFS.

Category	Retained or discarded dead	Released	Total
Oceanic Pelagics			
Dolphin	29	4	33
Tunas/other	16	0	16
Wahoo	4	0	4
Yellowfin tuna	12	0	12
Reef Fish			
Black sea bass	192	188	379
Other sea basses	2	< 1	3
Groupers	6	10	16
Vermilion snapper	3	0	3
Red snapper	0	5	5
Red porgy	6	0	6
Other porgies	2	0	2
White grunt	14	0	14
Tomtate	44	< 1	45
Triggerfish	5	0	5
Spadefish	23	4	27
Spottail pinfish	< 1	5	6
Amberjacks	1	4	5
Coastal Pelagics			
King mackerel	47	5	52
Spanish mackerel	86	15	101
Bluefish	74	53	127
Crevalle jack	0	4	4
Barracuda	1	7	8
Little tunny/bonito	4	20	24
Inshore Sportfish			
Red drum	111	139	251
Spotted seatrout	212	88	300
Weakfish	7	0	7
Summer flounder	10	0	10
Southern flounder	82	6	88
Flounder, unclassified	5	24	29
Sheepshead	67	5	72
Inshore Bottomfish			
Kingfishes	111	51	162
Spot	1,355	124	1,480
Croaker	30	17	47
Black drum	15	2	17
Pompano	57	7	64

Category	Retained or discarded dead	Released	Total
Sharks			
Unclassified	56	126	182
Miscellaneous			
Skates/rays	0	13	13
Catfishes	129	116	245
Toadfish	< 1	65	66
Searobins	0	12	12
Pigfish	15	0	15
Pinfish	182	156	339
Puffers	1	6	7
Other/unidentified	18	62	80
Total	3020	1345	4367

Table 15. Estimated total catch (in thousands of fish) by wave.
Source: NMFS.

Category	Wave				
	2	3	4	5	6
Oceanic Pelagics					
Dolphin	4	28	1	0	0
Tunas/other (inc. little tunny)	32	3	2	2	0
Reef Fish					
Black sea bass	134	34	188	23	< 1
Other sea basses	< 1	< 1	0	1	0
Groupers	15	0	0	< 1	0
Vermilion snapper	3	0	0	0	0
Red snapper	0	0	5	0	0
Red porgy	3	0	2	0	0
Other porgies	0	2	0	0	0
White grunt	0	0	14	0	0
Tomtate	< 1	0	39	5	0
Triggerfish	2	0	1	2	0
Amberjacks	2	3	0	0	0
Coastal Pelagics					
King mackerel	12	18	17	6	0
Spanish mackerel	0	45	31	26	0
Bluefish	8	77	10	29	3
Creville jack	0	0	0	4	0
Barracuda	0	< 1	6	2	0
Inshore Sportfish					
Red drum	7	0	58	167	19
Spotted seatrout	7	20	39	58	174
Weakfish	< 1	0	3	< 1	2
Summer flounder	0	6	1	2	0
Southern flounder	3	12	40	29	4
Flounder, unclass.	0	5	17	2	5
Sheepshead	24	13	20	0	13
Inshore Bottomfish					
Kingfishes	2	20	36	55	49
Spot	10	366	289	111	703
Croaker	1	2	22	22	0
Black drum	0	< 1	6	9	1
Pompano	0	0	49	15	0
Sharks					
Unclassified	2	92	78	8	2

Category	2	3	Wave 4	5	6
Miscellaneous					
Skates/rays	1	6	3	3	< 1
Catfishes	41	80	91	30	3
Toadfish	11	15	17	21	3
Searobins	0	0	4	9	0
Pigfish	0	0	0	15	0
Pinfishes	8	45	223	67	< 1
Puffers	2	4	0	0	< 1
Other/unidentified	14	2	2	7	0

Table 16. Estimated total catch (in thousands of fish) by fishing area. Source: NMFS.

Category	Inland	Ocean < 3 mi.	Ocean > 3 mi.
Oceanic Pelagics			
Dolphin	0	0	33
Tunas/other	0	0	16
Reef Fish			
Black sea bass	106	38	235
Other sea basses	2	0	< 1
Groupers	< 1	0	15
Vermilion snapper	0	0	3
Red snapper	0	0	5
Red porgy	2	1	2
Other porgies	< 1	0	1
White grunt	0	0	14
Tomtate	0	0	45
Triggerfish	2	0	3
Amberjacks	0	0	5
Coastal Pelagics			
King mackerel	0	7	45
Spanish mackerel	11	32	58
Bluefish	77	38	12
Crevalle jack	0	4	0
Barracuda	0	0	8
Little tunny/bonito	0	< 1	23
Inshore Sportfish			
Red drum	239	11	< 1
Spotted seatrout	282	0	17
Weakfish	5	2	0
Summer flounder	7	2	0
Southern flounder	81	5	1
Flounder, unclassified	21	5	3
Sheepshead	71	0	0
Inshore Bottomfish			
Kingfishes	68	94	0
Spot	338	1,136	6
Croaker	44	3	0
Black drum	16	< 1	0
Pompano	0	64	0
Sharks			
Unclassified	56	101	26

Category	Inland	Ocean < 3 mi.	Ocean > 3 mi.
Miscellaneous			
Skates/rays	10	3	0
Catfishes	207	37	0
Toadfish	53	5	8
Searobins	0	12	0
Pigfish	14	0	< 1
Pinfishes	216	86	42
Puffers	5	3	0
Other/unidentified	21	3	1

Miscellaneous species contributed the remaining 18% of the overall catch with pinfish and catfishes the principal components.

Shore Mode

About 40% of the shore-based anglers interviewed were fishing from Grand Strand piers and most of the remainder were fishing from other man-made facilities. Very few bank or surf fishermen were interviewed. Although most of the piers operated 24 hours a day during most of the season, there was no night sampling.

Eight piers were licensed, although one remained closed for the entire year. Five of the seven operational facilities were on the Grand Strand. Pier operators reported a total annual attendance of 155,889 fishermen. Monthly attendance exceeded 10,000 anglers during May through November with July (29,291 fishermen) and October (26,734 fishermen) the peak months. Total attendance was less than 2,000 anglers per month during December through March. A mid-March storm damaged several facilities, although all but two reopened the following month.

Shore-based anglers accounted for 47% of the total numerical catch. The principal species landed was spot (63% of the mode catch) with landings peaking during the fall (wave 6) outmigration of this species (Table 17). Other prominent components were pinfish, kingfishes (whitings), and catfishes.

Charterboat Mode

There were two sources of catch and effort data: 1) the MRFSS and 2) mandatory trip reports submitted to the MRD by vessel operators. Participation, effort, and catch figures from the MRFSS were expansions generated from catch per unit of effort (CPUE) reported in the creel census and information on participation and effort obtained in the phone survey. Figures from trip reports were unweighted direct summations. Both sets of data are included here. The discussion section contains a comparison of results in selected categories and an evaluation of the reliability of each information set (see also Appendix II).

During calendar year 1993, 155 boats (excluding headboats as defined by the NMFS) held permits. A total of 127 reported making at least one fishing trip with the other 28 either not submitting reports or reporting no business. Participation status by quarter was as follows:

Months	Percent of boats		
	not reporting	making trips	indicating no business
JAN/MAR	6	9	85
APR/JUN	15	60	24
JUL/SEP	9	76	15
OCT/DEC	21	39	40

Table 17. Estimated total catch (in thousands of fish) by wave in the shore mode. Source: NMFS.

Category	Wave					Total
	2	3	4	5	6	
Reef Fish						
Black sea bass	4	4	7	0	0	15
Other sea basses	0	< 1	0	1	0	2
Coastal Pelagics						
Spanish mackerel	0	13	1	6	0	20
Bluefish	3	38	7	23	3	74
Inshore Sportfish						
Red drum	3	0	5	7	3	18
Spotted seatrout	4	5	0	13	19	42
Weakfish	0	0	0	0	2	2
Summer flounder	0	0	1	2	0	3
Southern flounder	0	2	0	9	< 1	11
Flounder, unclass.	0	2	3	0	2	6
Sheepshead	1	< 1	0	0	0	2
Inshore Bottomfish						
Kingfishes	1	20	11	39	46	116
Spot	11	355	166	75	689	1,295
Croaker	0	< 1	4	2	0	7
Pompano	0	0	49	15	0	64
Sharks						
Unclassified	0	72	7	5	2	85
Miscellaneous						
Skates/rays	0	3	0	2	0	5
Catfishes	31	52	5	17	0	105
Toadfish	4	13	8	10	2	36
Searobins	0	0	4	9	0	12
Pigfish	0	0	0	1	0	1
Pinfishes	0	17	50	49	0	116
Puffers	1	4	0	0	0	6
Other/unidentified	10	2	0	1	0	13

Distribution of the fleet by geographic location was as follows:

Area of operation	Total no. of boats	No. active	Boat trips	Average trips per boat
Beaufort County	48	41	2,647	65
Charleston County	56	45	1,112	25
Georgetown/Horry	47	39	1,243	32
Unknown	4	2	18	-
Total	155	127	5,020	-

Nearly all charterboats were certified for six or fewer passengers. Distribution of the active vessels by length category and area of operation is indicated in Table 18.

Charterboat operators reported 22,936 hook and line angler trips on their MRD logsheets, whereas the NMFS effort estimate derived from the MRFSS data was 113,516 trips. Distribution of effort by wave and fishing area from the two sources is compared in Table 19. According to the MRD reports, 12% of the effort occurred in inland areas, 14% in coastal ocean (< 3 mi.) waters, and the remaining 74% in the EEZ (ocean > 3 mi.). The NMFS estimated that 34% of the trips were made in inland areas, 64% in the EEZ, and less than 2% in the coastal ocean zone.

Total charterboat catches as estimated by the NMFS are compared to those reported to the MRD in Table 20. Catches by wave are listed in Table 21 and those by fishing area in Table 22.

The remaining discussion is based on trip reports submitted to the MRD. Charterboat fishermen landed a very diverse catch, particularly during the spring and summer. The principal species caught in estuarine areas were spotted seatrout and red drum with sharks the next largest component. In aggregate, these groups accounted for 72% of all fish caught in inland waters. Nearly 97% of the sharks were released, as were 64% of the red drum and 36% of the spotted seatrout.

Sharks were the dominant catch in coastal non-artificial reef areas (40% of the total numerical catch), followed by Spanish mackerel (19%) and black sea bass (13%). The principal species retained was Spanish mackerel (28% of the fish retained), followed by sharpnose sharks (25%) and black sea bass (14%). The primary catches on the coastal artificial reefs were black sea bass (37% of all fish caught), Spanish mackerel (20%), and sheepshead (10%).

Species composition of offshore landings was very diversified. In non-artificial reef areas, reef demersals represented 61% of the overall numerical catch. About 45% of this group consisted of black sea bass, 12% were grunts (mainly white), 10% were snappers (mostly vermilion), 9% were porgies (primarily red) and 9% were

Table 18. Active charterboats and their effort (boat trips) by length category and county of operation.

	Length category (ft)				
	< 20	20-26	27-31	32-40	>40
Beaufort County	3	15	5	13	5
Charleston County	5	9	6	11	14
Georgetown/Horry Counties	1	6	9	14	9
Unknown	0	0	0	1	1
Total boats	9	30	20	39	29
Total trips	257	1,310	943	1,830	680
Average trips/boat	29	44	47	47	23

Table 19. Comparison of charterboat effort (angler trips) as estimated from the MRFSS and reported to the MRD.

	Wave				
	2	3	4	5	6
NMFS (from MRFSS)	40,002	17,408	32,424	23,683	0
MRD (from reports)	1,437	6,600	10,348	3,826	642

	Fishing area		
	Inland	Ocean < 3 mi.	Ocean > 3 mi.
NMFS	38,678	1,754	73,084
MRD	2,804	3,310	16,822

Table 20. Total charterboat catch (in numbers of fish) as estimated from the MRFSS compared to that reported on MRD trip logsheets. NR - not reported.

Category	MRFSS	MRD trip reports
Oceanic Pelagics		
Dolphin	21,895	3,434
Wahoo	1,413	310
Yellowfin tuna	11,129	823
Blackfin tuna	559	47
Sailfish	1,118	53
Marlins	NR	45
Reef Fish		
Black sea bass	91,266	20,663
Other sea basses	727	0
Groupers	15,031	3,125
Red snapper	NR	617
Vermilion snapper	2,865	2,440
Other snappers	NR	825
Red porgy	3,328	2,567
Other porgies	NR	597
Grunts	NR	4,424
Triggerfish	2,182	1,260
Spottail pinfish	NR	390
Spadefish	NR	386
Amberjacks	5,243	952
Coastal Pelagics		
King mackerel	35,683	7,730
Spanish mackerel	15,424	10,958
Bluefish	7,573	1,419
Crevalle jack	4,386	641
Barracuda	6,069	2,608
Little tunny/bonito	24,088	910
Cobia	NR	259
Blue runner	NR	37
African pompano	NR	6
Inshore Sportfish		
Red drum	61,250	2,659
Spotted seatrout	5,263	2,814
Weakfish	727	392
Southern flounder	1,316	NR
Flounder, unclassified	NR	618
Sheepshead	12,364	1,362
Tarpon	NR	58

Category	MRFSS	MRD trip reports
Inshore Bottomfish		
Kingfishes	NR	322
Spot	12,058	240
Croaker	4,429	106
Black drum	877	194
Sharks		
Unclassified	4,222	6,760
Miscellaneous		
Skates/rays	1,166	118
Catfishes	877	471
Toadfish	NR	13
Pinfishes	1,754	0
Other/unidentified	1,754	200

Table 21. Charterboat catches (in numbers of fish) as estimated from the MRFSS compared to those reported to the MRD.

Category	1		Wave 2		3	
	MRD	MRFSS	MRD	MRFSS	MRD	MRFSS
Oceanic Pelagics						
Dolphin	0	0	85	20,777		2,440
Tunas/other	0	31,516	101	1,123		714
Reef Fish						
Black sea bass	1,150	91,266	3,916	0		5,929
Other sea basses	0	727	0	0		0
Groupers	89	15,031	367	0		856
Red snapper	29	0	154	0		113
Vermilion snapper	20	2,865	145	0		557
Other snappers	0	0	0	0		353
Red porgy	83	3,328	165	0		915
Other porgies	9	0	62	0		122
Grunts	6	0	166	0		1,428
Triggerfish	53	2,182	60	0		158
Spadefish	0	0	0	0		172
Amberjacks	3	1,873	40	3,369		0
Coastal Pelagics						
King mackerel	35	12,078	355	12,073		2,536
Spanish mackerel	0	0	42	3,650		2,977
Bluefish	0	5,818	328	0		272
Crevalle jack	0	0	3	0		141
Barracuda	0	0	3	281		488
Cobia	0	0	3	0		201
Blue runner	0	0	0	0		13
African pompano	4	0	0	0		0
Inshore Sportfish						
Red drum	0	727	135	0		124
Spotted seatrout	0	0	138	0		462
Weakfish	0	727	102	0		44
Flounder	0	0	15	0		100
Sheepshead	0	12,364	780	0		409
Inshore Bottomfish						
Kingfishes	0	0	32	0		20
Spot	0	0	0	0		12
Croaker	0	0	0	0		1
Black drum	0	0	29	0		24
Sharks						
Unclassified	22	1,146	151	281		1,862

Miscellaneous

Skates/rays	0	540	6	0	19
Catfishes	0	0	3	0	73
Toadfish	0	0	0	0	3
Pinfishes	0	0	112	0	76

	4		5		6
	MRFSS	MRD	MRFSS	MRD	MRFSS
			MRD		MRD

Oceanic pelagics

Dolphin	1,118	754	0	206	0	0
Tunas/other	2,795	326	1,754	132	0	8

Reef fish

Black sea bass	0	4,854	0	1,882	0	2,920
Other sea basses	0	0	0	0	0	0
Groupers	0	870	0	805	0	139
Red snapper	0	115	0	181	0	25
Vermilion snapper	0	579	0	1,037	0	102
Other snappers	0	184	0	288	0	0
Red porgy	0	986	0	222	0	196
Other porgies	0	269	0	79	0	56
Grunts	0	2,019	0	679	0	126
Triggerfish	0	466	0	470	0	53
Spadefish	0	205	0	9	0	0
Amberjacks	0	258	0	241	0	23

Coastal pelagics

King mackerel	6,708	3,042	4,824	1,429	0	333
Spanish mack.	7,827	6,331	3,947	1,600	0	8
Bluefish	0	274	1,754	537	0	8
Crevalle jack	0	340	4,386	157	0	0
Barracuda	4,472	1,630	1,316	428	0	8
Cobia	0	47	0	6	0	0
Blue runner	0	16	0	8	0	0
African pompano	0	2	0	0	0	0

Inshore sportfish

Red drum	0	378	60,522	1,384	0	637
Spotted seatrout	0	477	5,263	1,037	0	700
Weakfish	0	19	0	178	0	49
Flounder	0	314	1,316	169	0	20
Sheepshead	0	35	0	81	0	57
Tarpon	0	48	0	10	0	0

Inshore bottomfish

Kingfishes	0	92	0	178	0	0
Spot	11,181	4	877	223	0	1
Croaker	2,236	50	2,193	55	0	0
Black drum	0	27	877	95	0	19

Category	MRFSS	⁴ MRD	MRFSS	⁵ MRD	MRFSS	⁶ MRD
Sharks						
Unclassified	2,795	4,254	0	451	0	20
Miscellaneous						
Skates/rays	0	75	439	14	0	4
Catfishes	0	276	877	119	0	0
Toadfish	0	6	0	4	0	0
Pinfishes	0	59	1,754	85	0	58

Table 22. Charterboat catches (in numbers of fish) by fishing area as estimated from the MRFSS compared to those reported on MRD trip logsheets.

Group/species	Fishing area					
	Inland		Ocean < 3 mi.		Ocean > 3 mi.	
	MRFSS	MRD	MRFSS	MRD	MRFSS	MRD
Oceanic pelagics						
Dolphin	0	0	0	1	21,895	3,433
Tunas/other	727	4	0	10	36,462	2,161
Reef fish						
Black sea bass	19,637	62	0	1,675	71,628	18,926
Other sea basses	0	0	0	0	727	0
Groupers	0	2	0	4	15,031	3,119
Red snapper	0	0	0	0	0	617
Vermilion snapper	0	0	0	0	2,865	2,440
Other snappers	0	0	0	0	0	825
Red porgy	2,182	0	0	0	1,146	2,567
Other porgies	0	5	0	0	0	592
Grunts	0	7	0	4	0	4,413
Triggerfish	2,182	0	0	6	0	1,254
Spadefish	0	0	0	38	0	348
Amberjacks	0	0	0	4	5,243	948
Coastal pelagics						
King mackerel	0	7	4,824	74	30,859	7,649
Spanish mackerel	0	208	0	1,792	15,424	8,958
Bluefish	6,696	132	877	700	0	587
Creville jack	0	70	4,386	268	0	303
Barracuda	0	0	0	16	6,069	2,592
Cobia	0	107	0	36	0	116
Blue runner	0	1	0	16	0	20
African pompano	0	0	0	0	0	6
Inshore sportfish						
Red drum	61,250	2,271	0	270	0	118
Spotted seatrout	5,263	2,679	0	135	0	0
Weakfish	727	150	0	201	0	41
Flounder	1,316	534	0	77	0	7
Sheepshead	12,364	351	0	361	0	650
Tarpon	0	47	0	8	0	3
Inshore bottomfish						
Kingfishes	0	156	0	132	0	34
Spot	12,058	40	0	200	0	0
Croaker	4,429	106	0	0	0	0
Black drum	877	83	0	81	0	30

Group/species	Inland		Ocean < 3 mi.		Ocean > 3 mi.	
	MRFSS	MRD	MRFSS	MRD	MRFSS	MRD
Sharks						
Unclassified	0	2,120	0	2,924	4,222	1,716
Miscellaneous						
Skates/rays	1,166	101	0	16	0	1
Catfishes	877	451	0	19	0	1
Toadfish	0	10	0	0	0	3
Pinfishes	1,754	21	0	2	0	367

groupers (largely gag). Coastal pelagics comprised 28% of the aggregate non-artificial reef landings with mackerels accounting for 79% of this group's contribution. Oceanic pelagics were about 8% of the total non-reef catch with 72% being dolphin. The three most numerous species in the overall offshore non-artificial reef catch were black sea bass (27%), king mackerel (11%), and Spanish mackerel (11%). In terms of landed weight, the principal components were king mackerel (27%), dolphin (14%), and yellowfin tuna (12%). Reef demersals totalled 27% of the total volume with amberjack, gag, and black sea bass the major contributors.

The offshore artificial reef catch consisted mostly of black sea bass (32% of the total numerical catch), Spanish mackerel (30%), and king mackerel (10%). Mackerels comprised most of the landed volume.

In numbers of trips targeted at them and fish caught, spotted seatrout and red drum were the most important species in inland waters. CPUE (fish/angler) for each species improved as the year progressed, although effort was roughly comparable during the spring, summer, and fall quarters. CPUEs were as follows:

Quarter	Red drum	Spotted seatrout
APR/JUN	0.9	2.2
JUL/SEP	2.8	2.4
OCT/DEC	4.0	5.2
Total	2.6	3.3

Sharks were the major group targeted by non-troll fishermen in nearshore ocean waters (0-3 mi.). Because of identification problems, all species were combined for CPUE calculations, although the main one appeared to be the sharpnose. A lot of the blacktips reported were probably other species, particularly small ones that were released. During spring and summer, charterboat fishermen on non-troll trips in coastal non-reef and ocean non-reef areas expended 1,283 boat hours and caught 3,044 sharks. This equalled a CPUE of 2.4 sharks/boat hour.

King mackerel charterboat CPUE is assumed to be a reasonably good index of abundance in this area, since the species is available nearly all year and fished during most of it. CPUE was calculated in fish caught/boat hour and was based on coastal and offshore troll trips targeted at king mackerel. Figures for non-reef and artificial reef areas are summarized below:

Month	Fish	Non-reef		Artificial reef			Total CPUE
		Boat hr	CPUE	Fish	Boat hr	CPUE	
JAN	24	10	2.40	2	4	0.50	1.86
FEB	-	-	-	-	-	-	-
MAR	13	18	0.72	0	2	0.00	0.65
APR	222	106	2.09	-	-	-	2.09
MAY	525	344	1.53	60	52	1.15	1.48

				37			
JUN	492	593	0.83	70	110	0.64	0.80
JUL	858	915	0.94	87	144	0.60	0.89
AUG	396	653	0.61	56	85	0.66	0.61
SEP	232	286	0.81	23	50	0.46	0.76
OCT	350	308	1.14	77	70	1.10	1.13
NOV	179	96	1.86	2	11	0.18	1.69
DEC	6	7	0.86	11	4	2.75	1.55
Total	3,297	3,336	0.99	388	532	0.73	0.95

Figure 1 compares monthly CPUEs for 1993 with those calculated by the NMFS for 1992. The seasonal trends were similar (and typical), although the 1993 monthly values were consistently lower (with the exception of April). The NMFS estimated the overall 1992 CPUE as 1.2 fish/boat hr. Our 1993 estimate was 0.95 or about 79% of the 1992 index.

Spanish mackerel abundance is probably reflected fairly accurately by charterboat CPUE during the seasonal (May-September) fishery. The 1993 figures are summarized below, based on coastal and offshore troll trips targeted at this species:

Month	Non-reef			Artificial reef			Total CPUE
	Fish	Boat hr	CPUE	Fish	Boat hr	CPUE	
MAY	424	118	3.59	148	55	2.69	3.31
JUN	586	150	3.91	197	77	2.56	3.45
JUL	753	149	5.05	377	106	3.56	4.43
AUG	761	169	4.50	344	71	4.85	4.60
SEP	630	159	3.96	100	31	3.23	3.84
Total	3,154	745	4.23	1,166	340	3.43	3.98

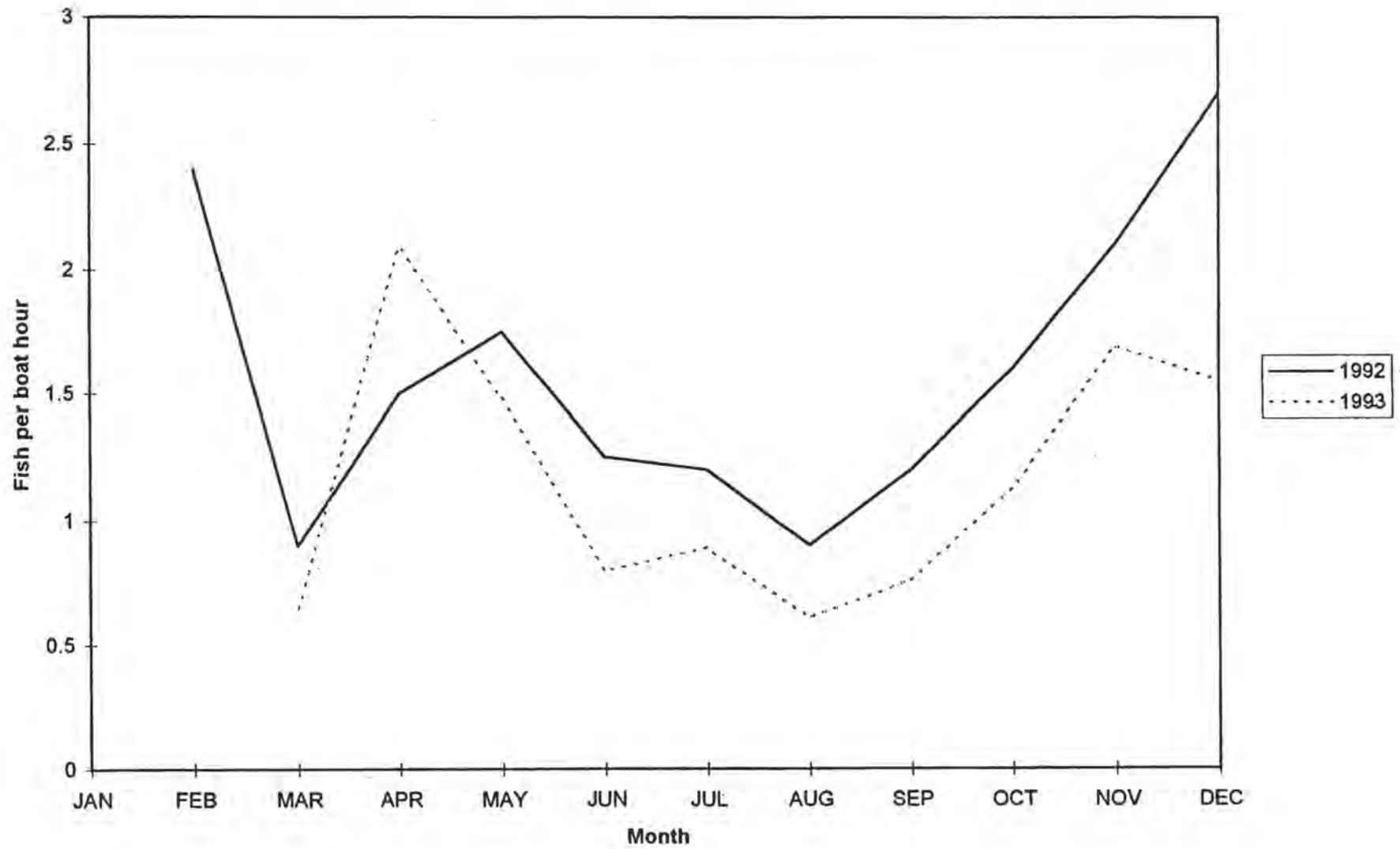
Our overall figure (about 4.0 fish/boat hr) compares favorably with the 1992 NMFS index of 2.8. For both species, the CPUEs on the artificial reefs were generally lower than those in non-reef areas.

Private Boat Mode

The extent of ocean fishing participation and effort attributable to the artificial reefs cannot be determined directly from the available data. Information from other sources suggested that at least one-third of the offshore trips were made to artificial reefs.

A substantial percentage of the MRFSS and SFS interviews was obtained at the SCWMD public boat ramp at Murrells Inlet. This site provided access to two of the oldest artificial reefs in the state (Paradise or Three Mile Reef and Ten Mile Reef). The Pawleys Island Reef is also close to this facility. Of the 176 trips to artificial reefs included in the surveys, 129 were to sites in the Murrells Inlet area. There were 26 trips to Charleston area reefs, 12 to locations off Winyah Bay, 8 in the Beaufort/Hilton Head area, and one to a Little River site.

Fig. 1. South Carolina charterboat catch per unit of effort for king mackerel.



About 44% of the interviewed artificial reef trips were targeted at coastal pelagic species, predominantly king mackerel. About 28% had no species preference. The remaining 28% were directed at bottomfish with black sea bass the main species. Black sea bass was also the most numerous fish in the overall catch, representing 47%. Other bottomfish made up 36%. Pelagic species contributed 13%. The main contributors in this category were Spanish mackerel and bluefish: king mackerel represented a little over 2% of the total artificial reef landings. Sharks comprised the remaining 5%.

The total private boat catch (Table 23) was 1.870 M fish, about 43% of the overall recreational landings. The most abundant species was black sea bass, followed by spotted seatrout, pinfishes, spot, and red drum.

Data from the MRFSS and SFS were used to calculate indices of CPUE for major species caught by private boat anglers. Observations were limited to trips during which the anglers either targeted the species or caught at least one of it. Input data for red drum, spotted seatrout, (primarily southern) flounders, and sheepshead are provided in Tables 24, 25, 26, and 27, respectively.

The MRFSS contributed 16% of the total sample used to derive CPUE for red drum. About 31% of the inland fishermen interviewed in the MRFSS were included. With the exception of Georgetown County, CPUEs estimated from the MRFSS and SFS data sets were similar. Success was greatest in Beaufort County and least in the Georgetown/Horry County area. Statewide, fishermen averaged a little less than a fish apiece per trip and slightly more than half failed to catch at least one.

MRFSS observations represented 19% of the spotted seatrout CPUE data set and included 29% of the inland private boat fishermen interviewed in the MRFSS. Fishermen did considerably better for this species in 1993 than for red drum. The average CPUE was highest in Charleston County, where there was the most directed effort. Depending on area, there was considerable difference between CPUEs derived from the MRFSS and SFS data sets, but the overall statewide averages were very similar. Overall, anglers averaged a little under two fish apiece per trip and slightly more than half caught at least one.

Most of the directed flounder effort occurred in the Murrells Inlet area. Presumably, southern flounders comprised most of the catch, based on inspected landings and areas where most of the effort occurred. Half of the fishermen caught at least one fish during their trip and the average catch rate statewide was 0.74 fish per angler trip.

Although sheepshead have a reputation as being difficult to catch, fishermen fared better with this species than the others on trips where the species was specifically sought. CPUE as

Table 23. Estimated total catch (in thousands of fish) by wave in the private boat mode. Source: NMFS.

Category	Wave					Total
	2	3	4	5	6	
Oceanic Pelagics						
Dolphin	4	7	0	0	0	11
Tunas/other	< 1	2	0	0	0	3
Reef Fish						
Black sea bass	38	30	181	23	< 1	273
Groupers	0	0	0	< 1	0	< 1
Red snapper	0	0	5	0	0	5
Red porgy	0	0	2	0	0	2
Other porgies	0	2	0	0	0	2
White grunt	0	0	14	0	0	14
Tomtate	< 1	0	39	5	0	45
Triggerfish	0	0	1	2	0	3
Coastal Pelagics						
King mackerel	0	6	10	< 1	0	17
Spanish mackerel	0	29	21	16	0	66
Bluefish	0	38	3	5	0	46
Barracuda	0	0	1	< 1	0	2
Inshore Sportfish						
Red drum	4	0	53	99	16	171
Spotted seatrout	4	15	39	40	155	253
Weakfish	0	0	3	< 1	0	4
Summer flounder	0	6	0	0	0	6
Southern flounder	3	10	40	19	3	75
Flounder, unclas.	0	3	15	2	3	22
Sheepshead	11	12	20	0	13	57
Inshore Bottomfish						
Kingfishes	< 1	< 1	26	16	3	46
Spot	0	11	112	35	14	173
Croaker	1	< 1	16	18	0	35
Black drum	0	< 1	6	8	1	16
Sharks						
Unclassified	1	20	69	3	< 1	93
Miscellaneous						
Skates/rays	< 1	3	3	0	< 1	7
Catfishes	10	28	85	12	3	138
Toadfish	7	2	9	11	< 1	30
Pigfish	0	0	0	14	0	14
Pinfishes	8	28	173	17	< 1	227
Puffers	< 1	0	0	0	< 1	1
Other/unidentified	4	0	2	6	0	12

Table 24. Catch and effort data of private boat inland anglers for red drum.

	MRFSS	SFS	Combined
Beaufort County			
Number of observations	16	26	42
Number of anglers	34	50	84
Angler hours	153.0	197.0	350.0
Number of fish	47	76	123
Fish per angler	1.38	1.52	1.46
Fish per angler hour	0.31	0.39	0.35
% of anglers with no fish	44	46	45
Charleston County			
Number of observations	62	411	473
Number of anglers	125	811	936
Angler hours	623.0	3,505.0	4,128.0
Number of fish	147	765	912
Fish per angler	1.18	0.94	0.97
Fish per angler hour	0.24	0.22	0.22
% of anglers with no fish	52	53	53
Georgetown/Horry Counties			
Number of observations	34	156	190
Number of anglers	72	320	392
Angler hours	259.5	1,362.5	1,622.0
Number of fish	5	233	238
Fish per angler	0.07	0.73	0.61
Fish per angler hour	0.02	0.17	0.15
% of anglers with no fish	93	58	64
Statewide			
Number of observations	112	593	705
Number of anglers	231	1,181	1,412
Angler hours	1,035.5	5,064.5	6,100.0
Number of fish	199	1,074	1,273
Fish per angler	0.86	0.91	0.90
Fish per angler hour	0.19	0.21	0.21
% of anglers with no fish	64	54	55

Table 25. Catch and effort data of private boat inland anglers for spotted seatrout.

	MRFSS	SFS	Combined
Beaufort County			
Number of observations	28	53	81
Number of anglers	59	108	167
Angler hours	252.0	391.0	643.0
Number of fish	150	138	288
Fish per angler	2.54	1.28	1.72
Fish per angler hour	0.60	0.35	0.45
% of anglers with no fish	36	48	44
Charleston County			
Number of observations	81	400	481
Number of anglers	141	770	911
Angler hours	544.0	3,438.0	3,982.0
Number of fish	256	1,612	1,868
Fish per angler	1.82	2.09	2.05
Fish per angler hour	0.45	0.47	0.47
% of anglers with no fish	47	42	43
Georgetown/Horry Counties			
Number of observations	10	40	50
Number of anglers	17	81	98
Angler hours	64.5	362.5	427.0
Number of fish	3	96	99
Fish per angler	0.18	1.19	1.01
Fish per angler hour	0.05	0.26	0.23
% of anglers with no fish	88	60	65
Statewide			
Number of observations	119	493	612
Number of anglers	217	959	1,176
Angler hours	860.5	4,191.5	5,052.0
Number of fish	409	1,846	2,255
Fish per angler	1.88	1.92	1.92
Fish per angler hour	0.48	0.44	0.45
% of anglers with no fish	47	45	45

Table 26. Catch and effort data of private boat anglers for flounders.

	MRFSS	SFS	Combined
Charleston County			
Number of observations	15	37	52
Number of anglers	27	81	108
Angler hours	124.5	367.0	491.5
Number of fish	25	72	97
Fish per angler	0.93	0.89	0.90
Fish per angler hour	0.20	0.20	0.20
% of anglers with no fish	30	53	47
Georgetown County			
Number of observations	63	139	202
Number of anglers	120	379	499
Angler hours	498.0	1,185.5	1,683.5
Number of fish	69	286	355
Fish per angler	0.58	0.75	0.71
Fish per angler hour	0.14	0.24	0.21
% of anglers with no fish	64	46	50
Statewide			
Number of observations	78	176	254
Number of anglers	147	460	607
Angler hours	622.5	1,552.5	2,175.0
Number of fish	94	358	452
Fish per angler	0.64	0.78	0.74
Fish per angler hour	0.15	0.23	0.21
% of anglers with no fish	58	47	50

Table 27. Catch and effort data of private boat anglers for sheepshead.

	MRFSS	SFS	Combined
Charleston County			
Number of observations	18	123	141
Number of anglers	36	271	307
Angler hours	151.0	1,366.0	1,517.0
Number of fish	49	794	843
Fish per angler	1.36	2.93	2.75
Fish per angler hour	0.32	0.58	0.56
% of anglers with no fish	50	27	30
Statewide			
Number of observations	29	154	183
Number of anglers	54	340	394
Angler hours	210.0	1,640.5	1,850.5
Number of fish	93	919	1,012
Fish per angler	1.72	2.70	2.57
Fish per angler hour	0.44	0.56	0.55
% of anglers with no fish	44	27	29

calculated from the SFS data was substantially greater than that derived from the limited number of MRFSS observations. Most of the sheepshead fishermen were intercepted in Charleston County, where the Charleston jetties are a popular fishing location.

Length Distribution

A total of 664 red drum were measured, including 137 from the MRFSS and 527 from the SFS sampling. The average length statewide was 46.3 cm total length (TL). Length distributions by county are shown in Fig. 2. In contrast to the seasonal distribution in past years, each wave contributed at least 15% of the total sample. About 7% of the fish observed were below the minimum legal size (36 cm, 14.0 in. TL). About 32% were 14-16 in., 19% were in the 16-18 in. range, 13% were 18-20 in., and 23% were in the 20-27 in. category. A little over 4% exceeded 27 in.

A total of 1,203 spotted seatrout were measured (229 in the MRFSS and 974 in the SFS). The vast majority of the sample was obtained in Charleston County (Fig. 3). The statewide average size was 36.8 cm.

Length distributions of other important recreational species are included in Table 28. Mean sizes were as follows: 1) southern flounder, 36.6 cm TL, 2) sheepshead, 31.5 cm TL, 3) black sea bass, 26.1 cm TL, 4) Spanish mackerel, 43.6 cm FL, and 5) king mackerel, 86.2 cm FL.

DISCUSSION

Survey Logistics

Areal distribution of MRFSS interviews within some modes differed substantially from that in previous years. In the shore mode, about 40% of the anglers interviewed in 1993 had fished from the Grand Strand piers, compared to 56% in 1992 and 51% in 1991. Surfside Pier contributed 28% of all shore interviews in 1992 and 31% in 1991, but this facility was closed during 1993.

In recent years, most charterboat interviews have been obtained at Murrells Inlet: 58% of the total 1992 mode sample came from one site there. About 26% of the 1992 charterboat interviews were obtained in the Beaufort/Hilton Head area. The latter area, however, was the principal one for charterboat fishing .

During 1993, the FSP modified the assignment schedule in order to make the areal distribution of interviews more representative of the distribution of overall fishing activity. About 54% of the charterboat interviews were obtained in the Beaufort/Hilton Head area, 43% in Charleston County, and less than four percent came from Murrells Inlet. Based on trip reports submitted to the MRD by boat operators, 53% of the boat trips were made from Beaufort/Hilton Head facilities, 22% originated at Charleston

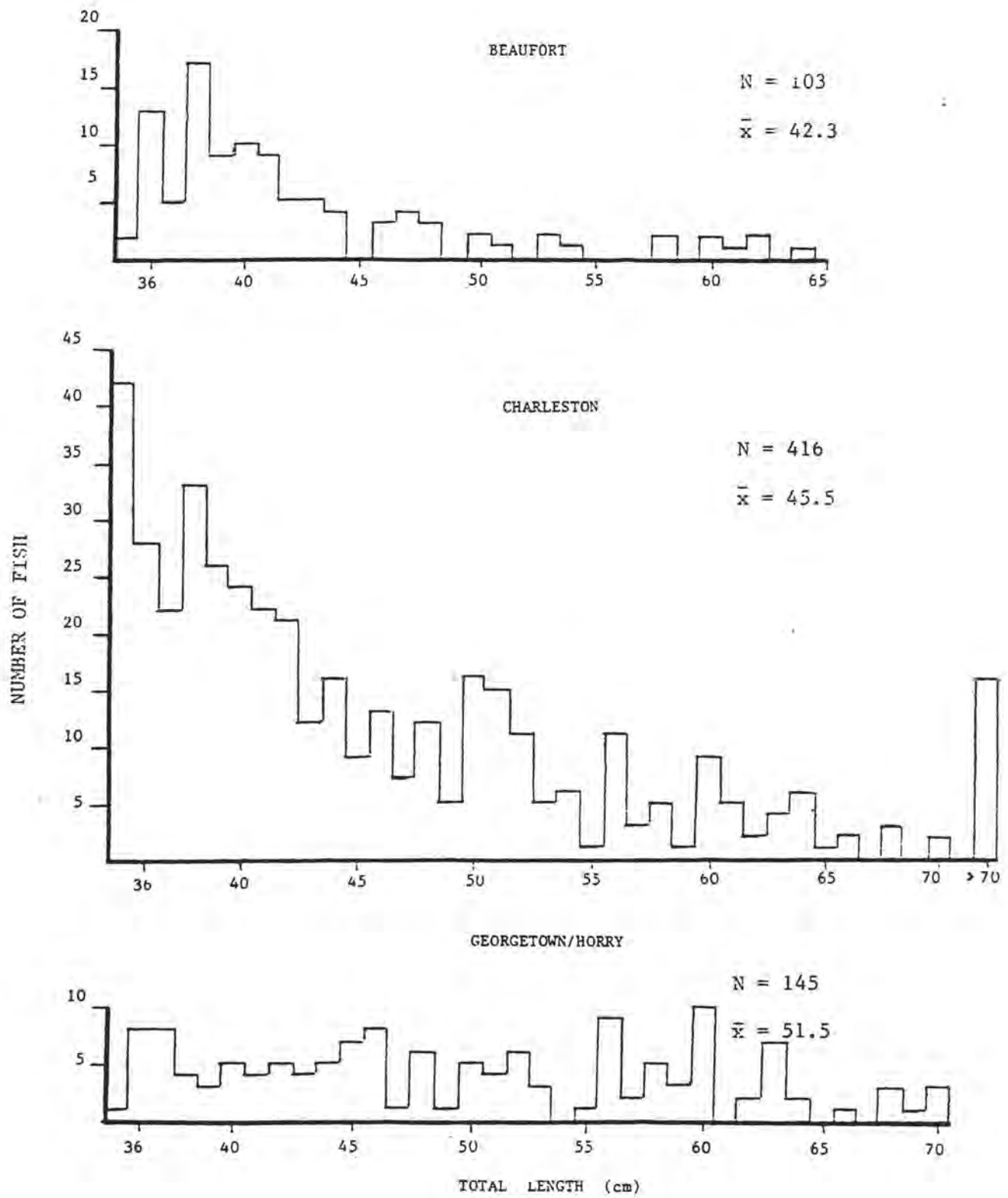


Fig. 2. Length distribution of red drum by county.

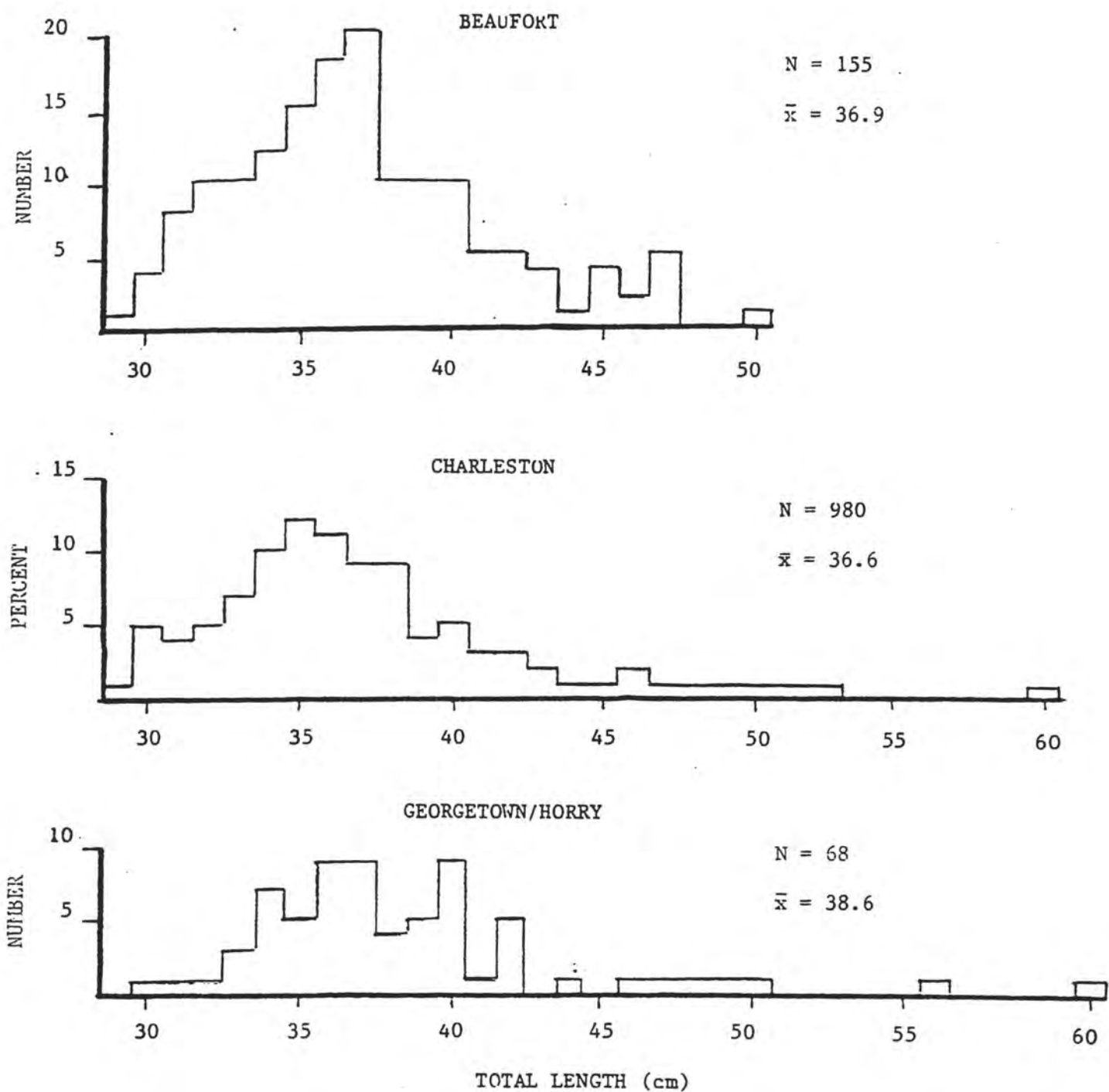


Fig. 3. Length distribution of spotted seatrout by county.

Table 28. Length distribution of recreationally caught species in 1993, in cm (TL = total length, FL = fork length).

Red drum		Spotted seatrout		Southern flounder		Sheepshead		Black sea bass		Spanish mackerel	
TL	N	TL	N	TL	N	TL	N	TL	N	FL	N
<36	45	<30	9	<30	18	<20	23	<20	19	<30	1
36	49	30	50	30	21	20	8	20	22	30	1
37	35	31	49	31	31	21	8	21	22	31	2
38	54	32	63	32	37	22	17	22	13	32	4
39	38	33	86	33	38	23	27	23	13	33	3
40	39	34	120	34	33	24	20	24	23	34	6
41	35	35	139	35	27	25	32	25	16	35	6
42	31	36	139	36	28	26	19	26	12	36	5
43	21	37	120	37	19	27	15	27	9	37	15
44	25	38	102	38	25	28	29	28	6	38	18
45	16	39	59	39	17	29	21	29	7	39	14
46	24	40	73	40	20	30	51	30	18	40	11
47	12	41	37	41	23	31	41	31	19	41	10
48	21	42	42	42	29	32	71	32	15	42	6
49	6	43	27	43	8	33	60	33	7	43	3
50	23	44	14	44	4	34	49	34	7	44	3
51	20	45	15	45	5	35	36	35	6	45	7
52	17	46	19	46	8	36	33	36	4	46	12
53	10	47	11	47	7	37	15	37	1	47	5
54	7	48	9	48	3	38	17	38	1	48	7
55	2	49	2	49	1	39	6	39	0	49	6
56	20	50	5	50	1	40	12	40	1	50	2
57	5	51	4	51	1	41	13	41	1	51	1
58	12	52	2	52	1	42	5	42	0	52	6
59	4	53	4	53	1	43	7	43	0	53	0
60	21	54	0	54	2	44	3	44	0	54	1
61	6	55	0	55	1	45	2	45	0	55	1
62	6	56	1	56	3	46	6	46	0	56	2
63	11	57	0	57	0	47	2	47	0	57	2
64	9	58	0	58	0	48	3	48	0	58	1
65	1	59	0	59	0	49	3	49	0	59	2
66	3	60	1	60	1	50	5	50	1	60	4
67	0	>60	1	>60	1	51	2			61	2
68	6					52	1			62	0
69	1					53	2			63	1
70	5					54	0			64	1
>70	24					55	2			65	1
						56	0			66	3
						57	0			67	0
						58	1			68	2
						59	1			69	0
						60	1			70	0
										>70	1

King mackerel			
FL	N	FL	N
-----		-----	
60	3	100	2
61	1	101	2
62	3	102	4
63	2	103	6
64	3	104	1
65	3	105	2
66	0	106	0
67	4	107	1
68	4	108	2
69	1	109	4
70	1	110	0
71	5	111	1
72	8	112	3
73	7	113	6
74	3	114	1
75	6	115	0
76	5	116	0
77	4	117	1
78	8	118	0
79	5	119	1
80	3	120	0
81	6	121	0
82	6	122	1
83	3	123	0
84	3	124	0
85	0	125	0
86	3	126	0
87	2	127	1
88	4		
89	3		
90	3		
91	5		
92	4		
93	1		
94	0		
95	2		
96	2		
97	3		
98	11		
99	5		

County sites, 14% left from Murrells Inlet/Georgetown area docks, and 10% were based out of the Little River area. It should be noted in this context that the fishing characteristics (e.g. species targeted, fishing areas, and duration of trips) of boats from Charleston County northward are similar.

With the exception of the private boat mode, the average effort (hours/interview) required to obtain interviews in 1993 was somewhat greater than in 1992. Sample sizes (N) and average effort (f) information for the last four years is summarized below:

Mode	1990		1991		1992		1993	
	N	f	N	f	N	f	N	f
Shore	266	0.47	261	0.58	678	0.42	732	0.54
Charterboat	357	0.26	230	0.60	439	0.44	264	0.62
Private boat	992	0.45	528	0.47	1,390	0.44	958	0.45
Total	1,615	0.41	1,019	0.53	2,507	0.43	1,954	0.51

There appears to be no obvious relationship between the numbers of interviews obtained and average sampling effort required.

Fishery Characteristics

Preliminary analysis by the NMFS of differences in effort and catch estimates derived using the "old" and "new" methods suggested that the impact of the conversions is substantial for South Carolina data. The NMFS does not expect to have revised data from previous years available before early 1995. Because of the incompatibility of data for 1993 and those from previous years, no trend analysis or between-years evaluations were attempted. The remaining discussion is limited to aspects unaffected by the changes in procedures.

The NMFS estimate of charterboat effort was nearly 5X that reported to the MRD and the indicated geographic distribution differed substantially. The NMFS catch estimates were also far higher than the landings reported to the MRD.

The NMFS estimates are highly unrealistic given current operating characteristics of the South Carolina fleet and historical survey data. Of the 155 permitted vessels, 127 reported activity. At an average of four anglers per boat trip, these boats would've had to have averaged 223 boat trips each to generate the NMFS-estimated effort.

In 1993, the vast majority of the South Carolina fleet operated during April through October, a season of 214 days. Few boats made more than one trip per day, since most of the larger boats fished offshore and had long runs to the trolling grounds. There were 39 active boats < 27 ft long: they averaged 40 trips each for the year. The 88 active boats > 26 ft averaged 39 trips. Only 13 boats reported making 100 or more trips.

Liao and Cupka (1979) did a survey of the 1977 offshore (i.e., ocean) fishery. There were an estimated 53 boats that made 2,212 boat trips (approximately 12,700 angler trips). Boats using artificial reefs averaged 54 trips and 308 anglers per year, the others 98 trips and 570 anglers, based on personal logs maintained by the vessel operators.

It is likely that the phone component of the MRFSS contributed to the high effort estimates. Most anglers interviewed in the creel census were from out of state and very seldom went charterboat fishing (i.e., < 0.5 trips per wave), yet the phone survey in wave 3, for example, obtained an average of 6.44 trips per angler per wave.

The NMFS catch estimates, which were based on the effort figures, also were unrealistically high. The following are several of the more prominent examples.

The NMFS estimated that 60,522 red drum were caught in wave 5 (vs 1,384 reported to the MRD), all in inland waters. The average CPUE reported to the MRD was about four fish per angler per trip (the daily bag limit was five). That would imply an effort of > 15,000 angler trips or about 5,000 boat trips (most inshore trips were made with less than four fishermen). MRD records indicated that 21 boats made 182 inland trips during wave 5, carrying 543 anglers: not all of this effort was directed at red drum. Forty boats reported fishing in inland waters during 1993. If all had fished during wave 5 strictly for red drum, they would've had to have averaged 125 boat trips - two per day- to produce the estimated NMFS catch.

The NMFS estimated that 12,078 king mackerel were caught during wave 2 (March-April). Both king mackerel landings and offshore charterboat effort were negligible in March. The weather was bad with a major storm in mid-month that damaged several docks. Nearly all of the wave catch and effort would've had to have occurred in April. The reported average catch per boat hour then was about 2.1 fish per boat hour (a relatively high CPUE) or roughly eight fish per boat trip. Approximately 1,500 boat trips would've been required to produce the estimated NMFS catch, or about 12 April trips for each of the 127 boats that reported some fishing during the entire year. This is very improbable.

An overall review suggests that, while the MRD system undoubtedly included some non-reporting and under-reporting, the figures from it are much more realistic than those generated from the MRFSS. Creel clerks frequently observed activity at the principal charterboat sites and had good rapport with booking agents, dockside staff, etc. Their information strongly supports an overall impression of largely casual, limited operations by most boats rather than the massive, intensive, and sustained level of effort attested to in the NMFS figures.

Comparisons of charterboat CPUE suggested that king mackerel were less abundant and/or available off South Carolina than in 1992, while Spanish mackerel appeared to be more numerous.

Private boat catch rates for red drum were generally lower in 1993 than in 1992. In Charleston County, where most of the effort occurred, the average number of fish per angler was 14% lower than in 1992. The CPUE index in Beaufort County was appreciably higher in 1993, while that in Georgetown County was about half of the 1992 value. Although there has been considerable variability in annual CPUE indices between areas, the average catch rates in Charleston County and statewide have remained relatively stable over the last four years (Table 29).

The trends in CPUE for spotted seatrout have been somewhat similar to those for red drum. Success in 1993 was generally somewhat less than that in 1992. Over the last four years, the CPUE index for Charleston County has fluctuated moderately, but with no unidirectional trend.

Mean lengths of the principal recreational species have remained very similar in recent years (Table 30). Although the average length of king mackerel in 1993 was greater than in recent years, the mean size of the fish in the commercial catch (77.4 cm) was appreciably smaller and more consistent with the typical size of recreationally caught fish in other years.

Table 29. CPUEs for red drum and spotted seatrout, 1990-1993.

Species	Area	Fish/angler			
		1990	1991	1992	1993
Red drum	Beaufort Cty.	2.20	0.90	1.12	1.46
	Charleston Cty.	1.00	0.90	1.13	0.97
	Georgetown Cty.	1.50	1.50	1.21	0.61
	Statewide	NA	1.10	1.15	0.90
Spotted seatrout					
Spotted seatrout	Beaufort Cty.	1.50	3.10	1.65	1.72
	Charleston Cty.	1.70	2.00	2.14	2.05
	Georgetown Cty.	0.50	3.50	1.94	1.01
	Statewide	NA	2.30	2.03	1.92

Table 30. Mean lengths (in cm) of major recreational species as determined from MRFSS and SFS data. Mackerel measurements are fork lengths, all others are total lengths.

Species	1988	1989	1990	1991	1992	1993
Red drum	43.1	46.3	45.7	42.0	43.5	46.3
Spotted seatrout	36.5	37.7	37.1	36.6	36.9	36.8
Southern flounder	34.6	35.0	35.6	35.4	38.6	36.6
Sheepshead	32.6	NA	34.2	32.2	31.9	31.5
Black sea bass	26.4	25.9	NA	25.2	25.9	26.1
King mackerel	76.8	76.7	76.2	85.0	76.5	86.2
Spanish mackerel	42.2	41.2	42.0	45.7	46.4	43.6

REFERENCES

- Essig, R.J., J.F. Witzig, and M.C. Holliday. 1991. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1987-1989. U.S. Dep. Commerce, NOAA/NMFS, Current Fisheries Statistics No. 8904.
- Liao, D.S. and D.M. Cupka. 1979. Economic aspects and fishing success of offshore sportfishing over artificial reefs and natural habitats in South Carolina. South Carolina Marine Resources Center, Technical Report 38.
- Van Voorhees, D.A., J.F. Witzig, M.F. Osborn, M.C. Holliday, and R.J. Essig. 1992. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1990-1991. U.S. Dep. Commerce, NOAA/NMFS, Current Fisheries Statistics No. 9204.

APPENDIX I

1993 MRFSS interview questionnaire

2. ASSIGNMENT NO.	<input type="text" value="1"/> Cross the '1' out & write in a '2' if this is your second assignment today.	7. STATE CODE	<input type="text" value=""/> See your assignment schedule.
3. INTERVIEWER ID	<input type="text" value=""/>	8. COUNTY CODE	<input type="text" value=""/> See your assignment schedule.
4. YR/MO/DAY	<input type="text" value="9"/> <input type="text" value="3"/> <input type="text" value=""/>	9. SITE CODE	<input type="text" value=""/> See your assignment schedule or your site register.
5. INTERCEPT NO.	<input type="text" value=""/>	10. INTERVIEW STATUS	<input type="checkbox"/>
6. INTERVIEW TIME	<input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/> Enter the time this interview was completed.	Questionnaire Complete...1	Language Barrier...4
		Refused Non-key Item...2	Refused Key Item...5
		Initial Refusal...3	

*11. Would you say you were fishing from (specify the appropriate mode combination)?

SH	Pier, Dock1	PC	Partyboat6
	Jetty, Breakwater, Breachway2		Charterboat7
	Bridge, Causeway3		
	Other Man-Made Structure (SPECIFY)4	PR	Private or Rental boat8
	Beach or Bank5		

*12. Was most of your (SPECIFY MODE) fishing effort today in the ocean/gulf, a sound, river, bay or inlet? IF SOUND, RIVER OR BAY ASK: What (sound/river/bay) was that? PROBE TO DETERMINE THE CORRECT AREA. Open Water (Ocean/gulf, open bay)1 GO TO Q.13

Sound (other than those specified)2	/ GO TO Q.14 & / CODE Q.13 AS '8'
River (other than those specified)3	
Bay (other than those specified)4	
Other (specify)5	

*13. IF SHORE, CODE '1', GO TO Q.14. IF PC OR PR ASK: Was that 3 miles or less from shore, or more than three miles? Three miles or less1 More than three miles2

WEST FLORIDA ONLY:
IF SHORE, CODE '3', GO TO Q.14. IF PC OR PR ASK: Was that 10 mi. or less from shore, or more than 10 mi.? Ten miles or less3 More than ten miles4

14. Were you fishing for any particular kinds of fish today? IF YES ASK: What kinds? 1ST TARGET: 2ND TARGET:

15. Have you been fishing here today primarily with a hook and line? Yes 01

IF NO ASK: What type of gear have you primarily been using?

IF 'NO'	Dip net, A-frame02	Seine05	Spear08
	Cast net03	Trawl06	Hand09
	Gill net04	Trap07	Other (specify) . .10

16. To the nearest half-hour, how many hours have you spent (specify mode) fishing today? That is, how many hours have you actually spent with your gear in the water?

17. CODE 88.8 HERE UNLESS YOU ARE INTERVIEWING A BEACH/BANK ANGLER USING THE INCOMPLETE TRIP METHOD, THEN ASK: How many additional hours do you expect to fish from shore today? That is, how many more hours will you actually have your gear in the water today?

18. Not counting today, within the past 12 months, how many days have you gone saltwater sport finfishing in this state, or from a boat launched in this state? Don't know 998 Refused 999

19. Not counting today, how many days within the past 2 months? Don't know 98 Refused 99

*20. What is your state and county of residence? IF COUNTY UNKNOWN ASK: What city or town do you live in? State Name and Code County Name and Code

21. What is the zip code of your residence? Foreign Country 99997 Don't Know 99998 Refused 99999

22. Do you live in a private residence, or in some type of housing such as a dorm, barracks, nursing home or rooming house? Private residence 1 Institutional Housing 2 (IF '2', CODE Q.23 '8', GO TO Q.24)

23. Does your home have a telephone? Yes 1 No 2

24. In the event that my supervisor wishes to verify that I have been conducting interviews here today, may I have your name and a phone number? Name and phone number provided 1 Name and phone number not given 9

_____ ANGLER'S NAME _____
_____ ANGLER'S PHONE NUMBER _____ (DAYTIME or NIGHTTIME)

*25. Did you catch any fish while you were (specify mode) fishing that I might be able to look at? Yes 1 (IF '1', THERE MUST BE AT LEAST ONE TYPE 3 RECORD)

No 2 (IF '2', CODE Qs 26-28 WITH '8's & GO TO Q.29)

Fish on another 3 (Type 3 CATCH ON ANOTHER ANGLERS FORM. CODE Q's 26-28 WITH '8's, GO TO Q.29, angler's form IF '3', MUST HAVE TYPE 4 RECORD.)

*26. Did you catch these yourself or did someone else catch some of them? All caught by angler 1 (CODE Q's 27-28 WITH '8's, GO TO Q.29)

Other contributors 2

*27. Can you separate out your individual catch? Yes 1 (CODE Q.28 WITH '8's, GO TO Q.29)

No 2

*28. How many anglers including yourself have their catch here? Please don't include anyone who did not catch anything. Only count those anglers who have their catch here.

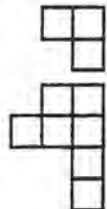
*29. **UNAVAILABLE CATCH.** Did you land any fish that are not here for me to look at? For example, any that you may have thrown back or used for bait? IF YES, COMPLETE TYPE 2 RECORD BY ASKING: What type of fish did you land? What did you (do you) plan to do with the (species)? How many (species) did you (will you) (disposition)? NOTE: FILLETS ARE UNAVAILABLE CATCH.

*30. **AVAILABLE CATCH.** COMPLETE TYPE 3 RECORD BY ASKING: May I look at your fish? What do you plan to do with the majority of the (species)?

DISPOSITION CODES FOR Q's 29-30			
Thrown back alive/legal	1	Thrown back dead/plan to throw away.	6
Thrown back alive/not legal/legality refused.	2	Some other purpose (specify)	7
Eaten/plan to eat	3	Don't know/Didn't ask (NOT TYPE 2)	8
Used for bait/plan to use for bait.	4	Refused (NOT TYPE 2)	9
Sold/plan to sell	5		

*31. How many people fished in your party today? IF ONLY 1, CODE 32 AS '8'. GO TO Q.33.
 *32. Are you the first person in your party I have interviewed?
 Yes 1 No 2 IF 'No', COMPLETE TYPE 6 RECORD BELOW.

33. NUMBER OF TYPE 2 RECORDS. ENTER THE NUMBER OF LINES FILLED OUT FOR CATCH UNAVAILABLE FOR INSPECTION.
 34. NUMBER OF TYPE 3 RECORDS. ENTER THE NUMBER OF LINES FILLED OUT FOR CATCH AVAILABLE FOR INSPECTION.
 35. IS THERE A TYPE 4 RECORD LISTED BELOW. Yes . . . 1 No . . . 0
 36. IS THERE A TYPE 6 RECORD LISTED BELOW. Yes . . . 1 No . . . 0



*37. **TYPE 4 RECORD.** (IF AVAILABLE CATCH FOR THIS ANGLER HAS BEEN RECORDED ON ANOTHER ANGLER'S FORM)
 TYPE INTID# YR/MO/DAY INTERVIEW # WITH ANGLERS TYPE 3 RECORDS ON IT

*38. **TYPE 6 RECORD.**
 TYPE INTID# YR/MO/DAY INTERVIEW # OF 1ST ANGLER IN THE FISHING PARTY

*29. **TYPE 2 RECORDS.** (CATCH UNAVAILABLE IN WHOLE FORM)

		SPECIES CODE	DISP.	# OF FISH
1.	<input type="text" value="2"/>			
2.	<input type="text" value="2"/>			
3.	<input type="text" value="2"/>			
4.	<input type="text" value="2"/>			
5.	<input type="text" value="2"/>			
6.	<input type="text" value="2"/>			
7.	<input type="text" value="2"/>			
8.	<input type="text" value="2"/>			

*30. **TYPE 3 RECORDS.** (CATCH AVAILABLE IN WHOLE FORM)

		SPECIES CODE	# OF FISH	LENGTH (mm)	WEIGHT (kg)	DISP.
1.	<input type="text" value="3"/>					
2.	<input type="text" value="3"/>					
3.	<input type="text" value="3"/>					
4.	<input type="text" value="3"/>					
5.	<input type="text" value="3"/>					
6.	<input type="text" value="3"/>					
7.	<input type="text" value="3"/>					
8.	<input type="text" value="3"/>					
9.	<input type="text" value="3"/>					
10.	<input type="text" value="3"/>					
11.	<input type="text" value="3"/>					
12.	<input type="text" value="3"/>					
13.	<input type="text" value="3"/>					
14.	<input type="text" value="3"/>					
15.	<input type="text" value="3"/>					
16.	<input type="text" value="3"/>					
17.	<input type="text" value="3"/>					
18.	<input type="text" value="3"/>					
19.	<input type="text" value="3"/>					
20.	<input type="text" value="3"/>					

APPENDIX II

Charterboat MRFSS estimates/MRD report - 1993

Beginning in July, 1992, state law required all charterboat operators to submit monthly reports of daily fishing activity. These reports included the numbers of anglers, hours fished, total numbers of fish caught, numbers released, and pounds of fish retained.

During 1993, the MRFSS interviewed 264 anglers from 63 trips aboard 22 boats. There were 127 boats reporting at least one trip to the MRD. Distribution of boats and effort, in percentages of the sample populations, was as follows:

County	Boats		Boat trips	
	MRFSS	MRD	MRFSS	MRD
Beaufort	50	36	56	54
Charleston	50	32	44	22
Georgetown/Horry	0	32	0	24

Distribution by vessel length was as follows:

	Length category (ft)				
	<20	20-26	27-31	32-40	>40
MRFSS	5	32	9	40	14
MRD	7	27	16	29	21

The 22 boats intercepted in the MRFSS represented about 17% of the active fleet. Their size composition was roughly comparable to that of the entire population. About 32% of the MRFSS trips were made in waters under state jurisdiction (inland and 0-3 mi. offshore), compared to 26% of those reported to the MRD.

Direct comparisons of MRFSS interview data with information reported by the boat operators was possible for 50 trips. No monthly reports were filed by the vessel operators for five of the remaining trips and no reports for the appropriate date for eight.

Aggregate results of the 50 comparisons are provided in Table II-1. The percentages shown are the differences of the MRFSS data from the MRD report data (i.e., $MRFSS \pm MRD/MRD$). Match-ups of the information (N = number of observations) reported in the various categories are summarized below. Comparable hours fished was ± 0.5 hour. Comparable numbers of fish caught were $\pm 10\%$.

	All data identical	No. of anglers identical	Hrs fished comparable	Tgt. spp. comparable
N	0	25	7	43
%1993	0	50	14	86
%1992	2	42	16	82

	Catch	
	Comparable species	Comparable spp. & No.
N	29	16
%1993	58	32
%1992	44	27

Many anglers were tired and/or somewhat inebriated when interviewed and nearly all had little local fishing experience or knowledge of the fish. Many boat captains (or their agents) completed their reports at the end of the month based on brief notes in their logs. Given these factors, a high incidence of agreement in the content of interviews and corresponding reports was not expected.

The usual difference in the number of anglers reported was +- one individual and the discrepancy in aggregate results was not excessive. As in 1992, the number of hours fished indicated in the MRFSS interviews substantially exceeded that reported by boat operators. This reflected the tendency of the fishermen to indicate the total duration of their trip, whereas the operators typically reported only the time spent fishing.

As in 1992, there generally was good agreement on target species groups, since relatively few were specifically sought and many trips were offshore trolling exercises targeted at anything. The comparability of catch information varied considerably depending on the species involved. Agreement on aggregate totals was generally good for large and/or relatively uncommon fish such as groupers, offshore pelagics, and king mackerel. Smaller and/or more numerous species caused the most problems, particularly fish caught in inland waters. Agreement in numbers of fish caught by species was considerably better than that observed in 1992.

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Table II-1. Comparison of MRFSS interview and MRD report data.

Category	MRFSS	MRD	% Difference
Number of anglers	174	197	- 12
Total hours fished	282.0	172.5	+ 63
Numbers of fish caught:			
Dolphin	33	35	- 6
Yellowfin tuna	18	12	+ 50
Wahoo	2	2	0
Sailfish	2	2	0
King mackerel	51	57	- 11
Spanish mackerel	18	20	- 10
Barracuda	8	10	- 20
Little tunny	2	32)
Bonito(*1)	29	0) - 3
Bluefish	11	7	+ 57
Jack crevalle	0	2	-
Black sea bass	67	96	- 30
Groupers	14	15	- 7
Porgies	5	10	- 50
Snappers	0	5	-
Grunts	0	1	-
Triggerfish	3	0	-
Amberjack (*2)	15	25	- 40
Sharks	6	7	- 14
Red drum	111	61	+ 82
Spotted seatrout	11	8	+ 38
Weakfish	6	0	-
Flounders	1	1	0
Sheepshead	9	45	- 80
Other	10	6	+ 67

*1 Probably all little tunny; fishermen from other areas usually refer to these as bonito or bonita

*2 Some probably reported by anglers as yellowfin tuna