

**SOUTH CAROLINA
MARINE RECREATIONAL
FISH AND SHELLFISH
FISHERY SURVEYS,
1988**

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**PART I: COOPERATIVE
SOUTH CAROLINA/NATIONAL MARINE
FISHERIES SERVICE
MARINE RECREATIONAL FISHERY
STATISTICS SURVEY,
1988**

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INTRODUCTION

South Carolina's marine resources are one of the state's most valuable assets. The 190 mile beachfront combined with rivers, creeks and estuaries offers an extremely diversified range of angling opportunities and outdoor experiences. Most anglers desire a diverse set of outcomes from their fishing experience and overall satisfaction may depend on a variety of factors other than catching fish. In addition to the social benefits of fishing, recent studies (Rockland and Southwick, 1990) identify sport fishing as an important business enterprise. Data for 1985 show that \$27.2 billion were spent directly on fishing related activities (saltwater and freshwater) by fishermen ages 16 and older, generating a total economic output of \$70.6

billion (Rockland and Southwick, 1990). Recent information suggests that recreational saltwater anglers annually spend \$187-\$200 million in South Carolina (Low, et.al, 1986; Low and Waltz, 1988).

Historically, saltwater fishing participation in South Carolina has been thought to approach 400,000 anglers per year. The state's growing coastal population is placing an increasing demand on marine resources, particularly in estuarine areas. In order for the Marine Resources Division (MRD) to properly conserve and manage these resources, detailed knowledge of fishery participation, catch and effort is needed. Since July 1987, MRD in cooperation with NMFS has conducted the Marine Recreational Fishery Statistics Survey (MRFSS) in South Carolina. The cooperative survey adopted overall methodology previously used by NMFS for the collection of regional statistics. Several procedures were modified and the number of MRFSS interviews was increased three-fold to improve the reliability of catch estimates at the state level. MRD personnel collected on-site interviews and conducted supplemental MRD sampling on an opportunistic basis. This report describes the survey effort and results for 1988.

METHODOLOGY

Survey methodology has been described by U.S. Dept. of Commerce (1987) and Low and Waltz (1988). The procedures used to derive expanded trip and catch estimates are explained in Witzig (1988). A

telephone survey is used to obtain information on participation and an on-site intercept survey (creel census) is used to collect catch, effort and demographic data. Information from the two surveys is combined to estimate total catch, effort and participation for two-month periods (waves) and three fishing modes (charterboat, shore fishing and fishing from a privately owned or rented vessel).

MRD personnel conducted the creel census at coastal public access points. The sampling schedule (provided by a NMFS subcontractor) was based on historical effort distribution by wave and fishing mode. Access sites were weighted by a usage rate factor and then chosen at random. Heavily used sites were more likely to be selected in this process. Within the private/rental mode, sample sizes were divided equally between the three major geographical areas of the state (Low and Waltz, 1988). Sampling was allocated approximately 60% on weekends and 40% on weekdays.

On a scheduled sampling day, the creel clerk proceeded to one of the sites. Upon collection of 30 interviews or judgment that further effort would be unproductive, the clerk then proceeded to another. Upon completion of the NMFS quota for the day, the clerk would continue with supplemental MRD sampling. Survey responses were voluntary and the personnel identity of all anglers was confidential.

Interviews were conducted with anglers who had completed fishing, except in the case of shore (pier, bridge, surf and

bank) fishermen, where one-half of the interviews for a particular day could be based on incomplete fishing trips. Each angler represented one interview. Interviews were conducted in accordance with procedures and guidelines established in the Intercept Interviewer Training Manual (1988 revision), using the 1988 finfish intercept questionnaire (OMB No. 0648-0052), 1988 finfish intercept coding form and 1988 Marine Resources Division form (appendix 1, 2 and 3).

Numbers of fish caught by species and disposition, hours spent fishing, species preferences, and general area fished were routinely reported. When feasible, up to 10 fish from all priority species were measured and weighed per catch.

During May-September three additional questions were incorporated into the survey (Appendix 4). The questions were asked of private boat and shore anglers to solicit their opinions on a proposed South Carolina saltwater fishing license.

RESULTS AND DISCUSSION

Annual Overview

During Jan - Dec 1988, a total of 6204 South Carolina households were contacted in the NMFS telephone survey, including 464 fishing households. An estimated 508,000 anglers made 1,759,000 saltwater fishing trips in South Carolina during 1988. Of these fishermen 32.9% were residents of coastal counties, 20.3% were non-coastal residents, and 46.8% were out-of-state residents. Most of the fishing trips (56.8%) were made by coastal residents

(Table 1). Out-of-state residents accounted for 26.3% of the effort and non-coastal residents took 16.9% of the total trips. Most of the fishing effort was in the private/rental boat mode (893,506 trips), followed by shore fishing (755,194 trips) and charterboat fishing (110,676 trips). In the private/rental fishing mode, most of the effort was attributed to coastal residents (69.6%), with the remainder split almost equally between non-coastal and out-of state residents. Coastal residents made 48.9% of the shore based fishing trips, out-of-state visitors 31.1% and non-coastal residents 20.0%. Most of the fishing trips on charterboats were made by out-of-state residents (75.9%), with non-coastal and coastal residents accounting for 15.8% and 8.3%, respectively.

Estimates for 1988 represent a 43% increase in the number of saltwater anglers and a 29% increase in the number of saltwater fishing trips over 1987 (Figures 1 and 2). Estimates derived from this survey have tended to fluctuate greatly from year to year, making interpretation difficult. If the anomalously high figures for 1982 and 1984 are removed, average annual participation is approximately 415,000 saltwater anglers, while the average number of saltwater trips taken was 1,358,000 per year. A trend line (1982 and 1984 were excluded) suggests that average annual participation has increased at a rate slightly less than 1% a year, while effort has increase approximately 3% per year.

Most anglers (86%)

interviewed in the survey were males. Anglers ranging from 20-39 years of age accounted for 51% of the males and 56% of the females interviewed. Youths under 16 years old accounted for 8%, while senior citizens greater than the age of 65 represented only 2% of the total.

King mackerel and red drum were the two most targeted species in 1988 (Table 2). Thirty-six percent (36%) of the anglers did not indicate any particular species preference.

The total recreational catch for 1988 was estimated to be 6,870,000 finfish, a 7% increase over the catch in 1987. Catches are broken down by species and fishing area in Table 3 and by species and disposition in Table 4. Estimates for the two previous years are also provided for comparison.

Landings of offshore pelagic species (dolphins, tunas, little tunny and bonito) continued to decrease. The 1988 estimated catch of these species was only 26% of the 1986 level. With the exception of bluefish and jack crevalle, catches of coastal pelagics increased or remained steady. King mackerel catches were up 63%, while catches of Spanish mackerel increased by 46% over 1987 estimates. Catches of bluefish were down 21% from catches of 1987. In 1988, landings of commonly caught offshore bottomfish were comparable to 1987 estimates. Black seabass continued to be the state's most important offshore bottom species. Notable increases in the catches of grunts have been seen since 1986.

Catches of inshore fish have varied widely since 1986.

Table 1. Estimated effort (in numbers of trips) in South Carolina during 1988 by wave and mode. No sampling is done during wave 1 (January - February).

Mode	Coastal Residents	Non-coastal Residents	Out-of-State Residents
Wave 2 (March-April)			
Shore	26,193	11,641	14,552
Charterboat	0	0	0
Private Boat	23,101	3,891	4,377
Wave 3 (May-June)			
Shore	88,996	41,774	32,693
Charterboat	2,928	6,317	23,882
Private Boat	175,177	34,163	34,890
Wave 4 (July-August)			
Shore	95,525	28,368	77,995
Charterboat	3,625	4,967	22,889
Private Boat	171,797	36,538	46,773
Wave 5 (September-October)			
Shore	123,177	49,078	85,315
Charterboat	2,603	6,225	37,240
Private Boat	121,259	30,492	30,728
Wave 6 (November-December)			
Shore	35,150	19,812	24,925
Charterboat	0	0	0
Private Boat	130,862	23,504	25,954

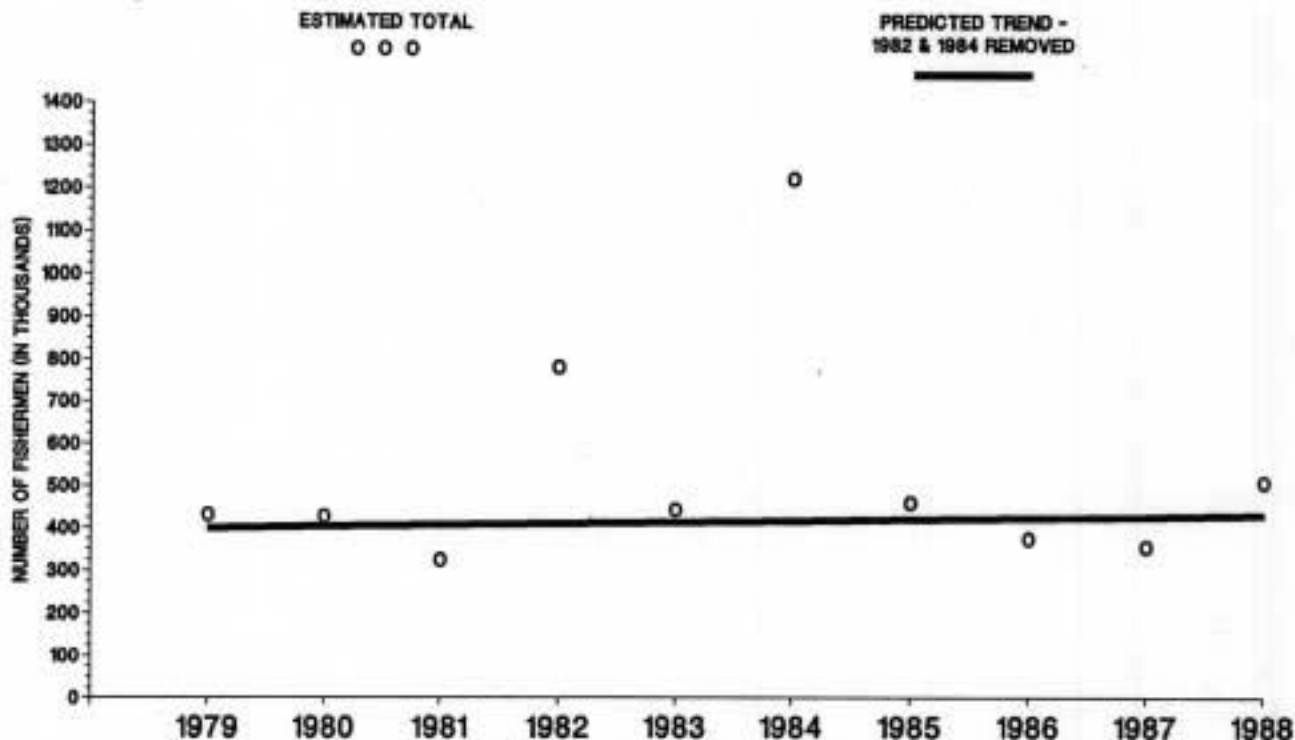


Figure 1. NUMBER OF PARTICIPATING MARINE RECREATIONAL FISHERMEN FROM 1979 TO 1988

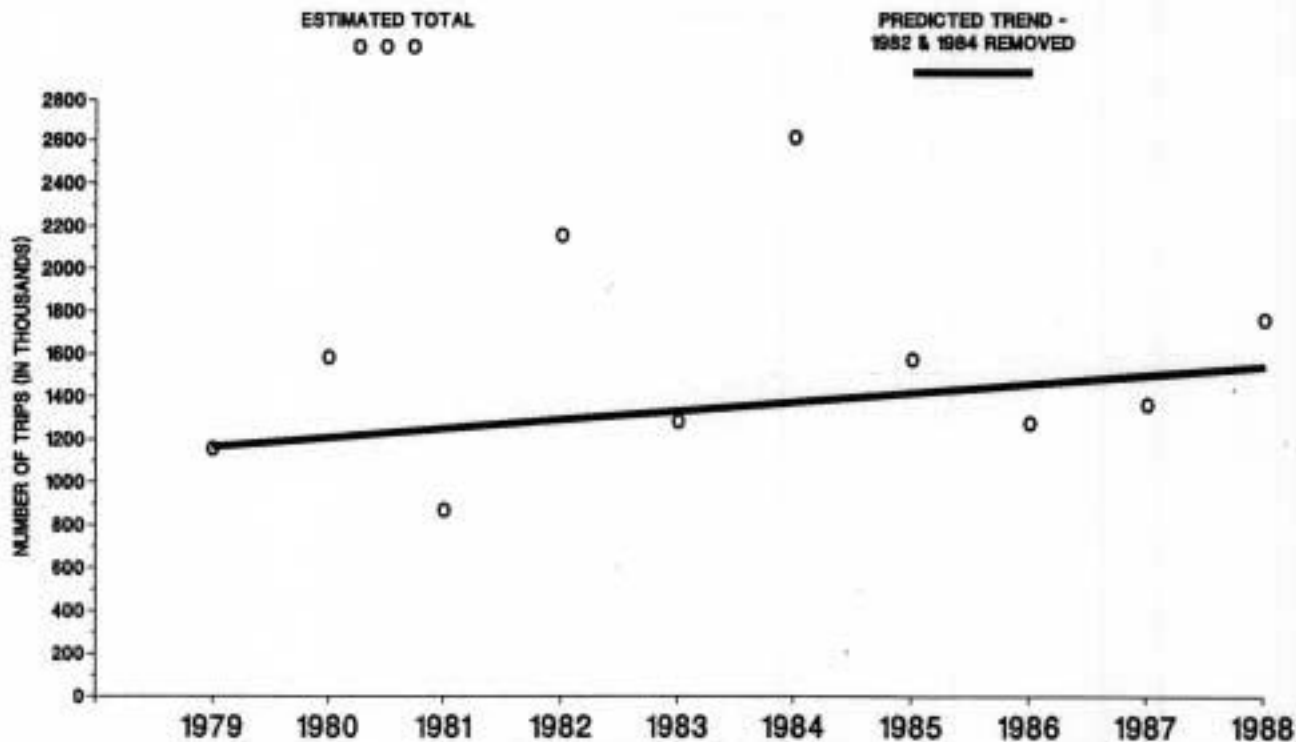


Figure 2. NUMBER OF TRIPS MADE BY RECREATIONAL FISHERMEN FROM 1979 TO 1988

Table 2. Top ten targetted finfish species during 1988.

Species	Percent	Rank
Anything	36.8%	
King mackerel	12.7%	1
Red drum	11.4%	2
Spotted seatrout	8.0%	3
Spot	5.3%	4
Flounders	4.9%	5
Sharks	4.6%	6
Spanish mackerel	3.4%	7
Sheepshead	2.4%	8
Black sea bass	2.3%	9
Cobia	2.0%	10

Table 3. Estimated catch (thousands of fish) of South Carolina recreational fishermen by fishing zone during 1988. Numbers are shown in thousands. Column totals are not necessarily additive due to rounding.

Species	Inshore	Coastal	Offshore
<u>Offshore Pelagics</u>			
Dolphin			26
Little tunny/bonito			18
Tunas/mackerels			3
<u>Offshore Bottomfish</u>			
Black sea bass	177	65	509
Sea basses			19
Groupers	1		2
Red snapper			1
Vermillion snapper			25
Red porgy			27
Other porgies			2
White grunt			6
Grunts			50
Triggerfish	<1	<1	1
Scup			<1
<u>Coastal Pelagics</u>			
King mackerel		5	112
Spanish mackerel	3	35	63
Bluefish	78	56	4
Jack crevalle	10	<1	2
Blue runner		1	1
Amberjacks			10
Barracuda		2	23
<u>Inshore Gamefish</u>			
Red drum	497	13	<1
Spotted seatrout	362	3	<1
Summer flounder	35	11	1
Southern flounder	87	14	<1
Flounders	13	4	
Weakfish	1		
Striped bass	3		
<u>Inshore Bottomfish</u>			
Kingfishes	79	350	6
Spot	685	1273	1
Croaker	184	67	
Black drum	10	2	4
Sheepshead	33	22	19
Pompano		56	
Other drums		1	

Table 3 (cont).

Species	Inshore	Coastal	Offshore
Miscellaneous			
Dogfish sharks	<1	<1	
Sharks	99	51	11
Skates/rays	27	9	
Eels	23	<1	
Freshwater catfish	<1		
Saltwater catfish	468	20	8
Toadfish	107	10	2
Searobins	9	19	<1
Pigfish	87	22	7
Pinfish	429	46	34
Silver perch	33		
White perch	5		
Puffers	6		
Others	58	40	58
TOTAL	3613	2200	1057

Table 4. Estimated total catch (in thousands of fish) by South Carolina recreational fishermen in 1986 - 1988. NR = none reported. Column and row totals are not necessarily additive due to rounding.

Species	Removed	Released	1988 Total	1987 Total	1986 Total
<u>Offshore Pelagics</u>					
Dolphin	26	0	26	<30	72
Little tunny/bonito	6	11	18	<30	34
Tunas/mackerels	1	0	1	<30	65
<u>Offshore Bottomfish</u>					
Black sea bass	284	467	750	732	531
Sea basses	<1	<1	<1	<30	<30
Groupers	3	<1	4	<30	<30
Vermillion snapper	24	<1	25	<30	<30
Other snappers	1	0	1	<30	<30
Red porgy	26	1	27	<30	<30
Other porgies	15	2	17	47	NR
Grunts	19	37	55	<30	NR
Triggerfish	1	<1	2	<30	<30
<u>Coastal Pelagics</u>					
King mackerel	116	<1	117	71	254
Spanish mackerel	90	12	101	69	163
Bluefish	79	60	139	117	159
Jack crevalle	6	6	12	63	69
Blue runner	2	1	2	<30	NR
Amberjacks	8	2	3	<30	33
Jacks	NR	NR	NR	<30	<30
Barracuda	9	16	25	<30	62
<u>Inshore Gamefish</u>					
Red drum	258	253	511	509	196
Spotted seatrout	300	67	367	444	576
Summer flounder	47	0	47	45	NR
Southern flounder	100	2	102	65	206
Flounders	3	14	17	30	NR
Weakfish	1	0	1	<30	78
<u>Inshore Bottomfish</u>					
Kingfishes	268	167	435	474	1,049
Spot	1,857	102	1,960	757	1,863
Croaker	141	111	252	227	616
Black drum	15	<1	16	<30	<30
Sheepshead	72	3	75	<30	70
Pompano	38	17	56	98	159
<u>Miscellaneous</u>					
Sharks	81	81	162	391	207
Skates/rays	3	33	36	45	32
Eels	9	15	24	<30	<30

Table 4 (cont).

Species	Removed	Released	1988 Total	1987 Total	1986 Total
Herrings	0	0	NR	<30	57
Catfishes	241	270	511	631	253
Toadfish	11	108	118	198	138
Searobins	0	29	29	<30	<30
Pigfish	27	90	117	95	<30
Pinfish	120	375	495	677	173
Silver perch	11	22	33	<30	<30
Mulletts	0	0	NR	90	84
Puffers	0	6	6	<30	70
Others	41	130	171	204	-
Total			6,870	6,416	7,527

In 1988 catches of red drum were essentially identical to catches in 1987, while the spotted seatrout catch has continued to decline since 1986. Flounder landings (especially southern flounder) improved over the 1987 level. Catches of spot and croaker were up from 1987 levels, while kingfish and pompano landings decreased. Sheepshead landings increased significantly in 1988, while shark landings were down 59% from 1987. Catches of most miscellaneous species, with the exception of pigfish, were also lower than 1987 estimates.

Shore Mode

A total of 721 shore-based anglers were interviewed. Although sampling was conducted at 26 sites, six locations accounted for 75% of the interviews (Table 5). Most anglers interviewed (83%) were fishing from piers, docks and bridges. Approximately 20% of these interviews were based on incomplete trips. Unless noted, all summary tables and discussion are based on interviews from completed as well as uncompleted fishing trips.

Most shore anglers (60%) had no target species. The percentage was similar between areas and waves, except in the northern region during wave 6. During November - December the majority of shore anglers (mostly pier fishermen) targeted the fall run of spot. Shore anglers expressing a preference listed spot, flounders, sharks, red drum, spotted seatrout and kingfishes in descending order of popularity. Species preference varied with region and wave

(Table 6).

Based on completed trips only, anglers in the northern region averaged the highest average number of hours fished per trip (Table 7). The typical trip in the north lasted 4.3 hours, while average trip duration in the central and southern areas was 2.4 and 2.9 hours, respectively. Most of the sampling in the north was at fishing piers requiring a fee to fish. Anglers willing to pay may represent a more dedicated group, willing to stick it out for longer periods of time. Anglers in the northern region also appeared to expend more effort in fall fishing as indicated by the average number of trips taken in the previous two month period (Table 7). Fall is the peak of the oceanic pier fishery. Elsewhere, except for the anomalously high figure for wave three in the central area, most shore-based effort, took place in summer and fall.

The average catch per angler and per angler hour (Table 7) indicated that anglers were most successful in the northern region and least successful in the central region. Overall catch rates for each region are given below:

	Average	
	Fish/hr	Fish/Angler
North	2.25	9.33
South	0.59	1.79
Central	0.31	0.75

Fishing success for the six most commonly preferred species in aggregate (spot, flounders, sharks, red drum, spotted seatrout and kingfishes) followed the same trend (Table 7). Unsuccessful

Table 5. Numbers of interviews collected by site during 1988 in the shore mode.

SITE	WAVE						TOTAL
	1	2	3	4	5	6	
NORTHERN REGION							
Kingfisher Pier		10	15	31	36	33	125
Cherry Grove Pier			9	37		20	66
Myrtle Beach. St. Pk.				1	23	21	45
Cherry Grove, 53rd Ave.					20		20
Pawleys Is., S. Shore				5			5
Huntington Beach. St. Pk.				4			4
Cherry Grove Boat Ramp					3		3
Capt. Dick's Marina				1			1
Subtotal		10	24	79	82	74	269
CENTRAL REGION							
Breach Inlet	11	1	3	61	33	34	143
Wappoo Cut Boat Ramp	4	2					6
Limehouse Bridge		1		5			6
Shem Creek		5					5
Live Oak Boat Ramp					3		3
Wild Dunes Yt. Cb.		2					2
Bowens Island		2					2
Charleston Battery			1			1	2
Church Creek Bridge			1				1
Subtotal	15	13	5	66	36	35	170
SOUTHERN REGION							
Broad River Pier		16	23	5	25	3	72
C. C. Haigh	11	29	1	6	23		70
Paradise Pier		1	28	20	17		66
Hunting Is. Lagoon	3	26				9	38
Port Royal Pier			9	12	2	6	29
Russ Point	3						3
Station Creek					2		2
Hilton Head Bridges		1					1
South Beach Marina					1		1
Subtotal	17	73	61	43	70	18	282

Table 6. Target species of shore-based anglers during 1988. Values are percentages.

WAVE 1

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything		47	59	53
Spotted seatrout		33	12	22
Spot		7	29	19
Red drum		13		6

WAVE 2

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	40	39	52	49
Spot	10	15	32	27
Red drum		23	3	5
Spotted seatrout		23	4	7
Shark			5	4
Bluefish	40			4
Kingfishes	10			1
Black sea bass			3	2
Flounder			1	1

WAVE 3

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	75	40	72	71
Shark		40	13	11
Flounder	4		10	8
Kingfishes	13		2	5
Red drum		20		1
Pinfish			3	2
King mackerel	8			2

WAVE 4

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	82	73	75	77
Flounder	3	14	15	9
Shark		4	10	4
Spot	6			3
Kingfishes	5			2
Spotted seatrout		5		2
Black drum		4		1
Red drum	3			1
King mackerel	1			1

Table 6 (cont.)

WAVE 5

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	55	67	78	65
Flounder	10	11	6	9
Spot	13	11		8
Red drum	7		2	4
Bluefish	6	1		3
Sheepshead	5	11		4
Spotted seatrout			5	2
Kingfishes			3	1
Shark			3	3
Florida pompono	1		1	1
King mackerel	3			1

WAVE 6

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Spot	73	44	17	57
Anything	19	41	61	31
Kingfishes	5			3
Red drum			22	3
Flounder		9		2
Pinfish		6		2
Bluefish	3			2

Table 7. Fishing effort and relative fishing success for the shore mode in 1988.

Wave	Northern Region					
	1	2	3	4	5	6
Hrs. Fished *	-	42	94	217	228	244
Hrs. Fished	-	66	130	310	327	290
Mean Hrs./Trip *	-	8.4	6.3	3.8	4.0	4.3
No. Anglers *	-	5	15	57	57	60
No. Anglers	-	10	24	80	82	75
No. Anglers with 0 catches *	-	1	8	25	25	3
Finfish Catch (Numbers)						
Top Six Species	-	10	82	285	39	1684
Total(All Species)	-	15	100	343	196	1874
Average Catch						
Per Hr.	-	0.2	0.8	1.1	1.7	6.5
Per Angler	-	1.5	4.2	4.3	2.4	25.0
Mean Trips during previous two months	-	3.2	4.2	2.4	4.4	6.1
Wave	Central Region					
	1	2	3	4	5	6
Hrs. Fished *	25	21.5	8.5	173	46	58
Hrs. Fished	27	21.5	13.5	189	75	86
Mean Hrs./Trip *	1.8	1.6	2.8	3.0	1.8	2.3
No. Anglers *	14	13	3	57	26	25
No. Anglers	15	13	5	66	36	34
No. Anglers with 0 catches *	14	12	2	32	25	17
Finfish Catch (Numbers)						
Top Six Species	0	1	1	12	1	13
Total(All Species)	0	1	11	74	14	26
Average Catch						
Per Hr.	0.0	0.1	0.8	0.4	0.2	0.3
Per Angler	0.0	0.1	2.2	1.1	0.4	0.8
Mean Trips during previous two months	1.9	2.7	15.7	4.1	3.1	4.5

* Completed trips only

Table 7 (cont). Fishing effort and relative fishing success for the shore mode in 1988.

Wave	Southern Region					
	1	2	3	4	5	6
Hrs. Fished *	38	175	145	110.5	193.5	44
Hrs. Fished	46	223	190.5	143	205	50
Mean Hrs./Trip *	2.5	3.1	3.0	3.0	3.2	2.7
No. Anglers *	17	59	48	37	66	16
No. Anglers	19	75	61	41	69	18
No. Anglers with 0 catches *	13	37	34	26	34	10
Finfish Catch (Numbers)						
Top Six Species	35	374	17	26	27	28
Total(All Species)	60	385	59	47	149	33
Average Catch						
Per Hr.	1.3	1.7	0.5	0.3	0.7	0.7
Per Angler	3.2	3.8	1.0	1.2	2.2	1.8
Mean Trips during previous two months	1.9	2.6	2.6	4.3	4.9	3.2

* Completed trips only

anglers (no catch) were most commonly intercepted in the central region, where 74% of the anglers caught no fish. The nonsuccess rate was 63% in the south and 32% in the northern region.

Even though sampling was conducted during wave one (January - February) in the central and southern region, the high negative response rate encountered in the telephone survey precluded any expansions of the data for that period (Table 8). The six most preferred species (see above) accounted for approximately 77% of the total catch by number, with spot alone constituting 58%. Inshore gamefish (red drum and spotted seatrout) accounted for 1.6% of the total numbers caught. Miscellaneous species (excluding sharks), the bulk of the undesirable and discarded species, represented approximately 15% of the total catch.

Charterboat Mode

During March-December 1988, 829 interviews were obtained from charterboat anglers, including 34 MRD interviews (Table 9). The southern region accounted for 39% of the interviews. The central and the northern regions made up the remaining 36% and 25%, respectively. Most of the interviews were obtained at a few key sites. These sites represent marinas with well established chartering services. The chartering services are well advertized, typically book for several charterboats well in advance, have up-to-date, reliable schedules, and have been very cooperative in helping creel clerks schedule

sampling days. Charterboats from other marinas and independent charters have been difficult to contact, unreliable with frequent cancellations and changes, and thus impractical to sample. At least 44 charterboats were represented in the interviews.

Approximately 46.2% of the anglers spent 3 hours or less fishing, 44.3% spent 3.5 to 6 hours fishing, while 9.5% fished for over 6 hours. Shorter (≤ 3 hr) trips were most common in the central and southern regions, while 21% of all trips in the north involved 6 hours or more of fishing. Most anglers (86%) reported fishing more than three miles offshore, 9.6% fished in coastal waters (0-3mi offshore) and 4.4% fished in inland waters. Most (94%) of the coastal and inland trips occurred in the southern area. Some effort was spent on artificial reefs during 45.7% of the total number of angler trips. Artificial reef fishing was most common in the central and southern region (47% and 34% respectively) and least common (6%) in the northern area.

About 43% of the charterboat fishermen reported no target species, including anglers seeking any bottom species as well as any surface species. When a preference was reported, king mackerel, black sea bass/sea bass, Spanish mackerel, bluefish, amberjacks, and sharks were the top six species groups in descending order. Spanish mackerel was often reported as an alternative target for king mackerel; however, it was seldom the primary target of the trip. King mackerel fishing dominated most waves in

Table 8. Estimated total catch in the shore mode by wave, as provided by NMFS. Catches are shown in thousands of fish.

Species	Mar- Apr.	May- June	July- Aug.	Sep.- Oct.	Nov.- Dec.	Total
<u>Offshore Bottomfish</u>						
Black sea bass		2		1	6	9
<u>Coastal Pelagics</u>						
King mackerel		2				2
Spanish mackerel				10		10
Bluefish	<1	9	22	21	<1	53
Atlantic spadefish				4		4
<u>Inshore Gamefish</u>						
Red drum			12	25	1	39
Spotted seatrout				3		3
Sheepshead			1	4		5
Summer flounder		5				5
Southern flounder	<1	15	5	1	4	25
Flounders		5				5
Seatrout				1		1
<u>Inshore Bottomfish</u>						
Kingfishes	<1	142	75	42	103	363
Spot	215	6	234	12	1072	1539
Croaker		7	16	50	3	76
Pompano			15	41		56
<u>Miscellaneous</u>						
Lizardfish				5		5
Sharks	3	20	20	9		52
Pigfish			3	4		6
Pinfish		33	57	25	8	123
Skates/rays	4	1	1	7		14
Eels	<1	7	4	10	<1	23
Freshwater catfishes			13			13
Saltwater catfishes	<1	36	12	62		110
Toadfish		9	10	3		22
Searobins	<1	3		3	16	23
Puffers	1	2				3
Others		49		3		52

Table 9. Numbers of interviews collected by site during 1988 in the charterboat mode.

SITE	WAVE						TOTAL
	1	2	3	4	5	6	
NORTHERN REGION							
Capt. Dick's Marina		32	104	54	80	14	284
Georgetown Landing			4			5	9
Harbor Gate Marina				3			3
Total	0	32	108	57	80	19	296
CENTRAL REGION							
Bohicket Marina		35	14	60	35	32	176
Wild Dunes Yt. Clb.			3	6		23	32
Buzzards Roost				1			1
Total	0	35	17	67	35	55	209
SOUTHERN REGION							
Harbortown Marina		6	46	22	44	24	142
Shelter Cove Marina			56	19	5	8	88
South Beach Marina				29	6		35
Fripp Is. Marina		4	20	1		6	31
Palmetto Bay Marina		22					22
Paradise Pier			6				6
Total	0	88	91	57	50	38	324

all regions except the southern (Table 10). Anglers in the southern region indicated a wider diversity of targets and also were most likely to target "anything". Most of the charterboat effort (85%) was general trolling directed at coastal pelagics (mostly mackerels). Approximately 8% of the effort was offshore bottomfishing (mainly for black sea bass and groupers) and approximately 2% was Gulfstream fishing (for tunas and sailfish). Many trips initially targeted a specific species (e.g. king mackerel) and ended bottomfishing for black sea bass, if mackerel fishing was slow.

Sampling was conducted during wave 1 (January - February), however because of low participation rates, no estimates were derived for that period. The average fishing time per charter statewide was 3.6 hours. Trip duration was highest in the northern region and lowest in the southern (Table 11). For most anglers, charterboat fishing was seldom pursued on a routine basis. Although some charterboats attract repeat business, commonly on an annual basis, most passengers are one time customers.

Charterboat fishing success is difficult to evaluate because of multispecies effort during many trips. Overall regional catch rates for king mackerel based on trips targeting king mackerel, spanish mackerel and "anything" were as follows. Catch rates for pelagics (including king mackerel) and bottomfish species were based on total trips.

	Number of Fish/Trip		
	North	Cent	South
King mackerel	1.96	.53	.07
Pelagics	2.34	.89	1.50
Bottomfish	4.54	1.86	.94

The average number of king mackerel caught per directed trip was greatest in the northern region and declined progressively to the south. This is partly reflected in the fact that anglers in the south made fewer trips directed at mackerel. The catch rate for aggregated pelagic species was more uniform, but still greatest in the northern region. Bottomfish catch rates also declined to the south. Anglers reporting no catch (Table 11) represented 32% and 33% of the participants questioned in the southern and central regions respectively, but were only 6% in the northern region.

Although sampling was conducted during waves 2 and 6, no expanded estimates were derived for these periods because of the low response rate to the telephone survey. King mackerel accounted for 27% and black sea bass 31% of the total catch (Table 12). The six most commonly targeted species in aggregate accounted for 74% of the catch by number. Approximately 27% of the total catch was released alive.

Private/Rental Boat Mode

Creel clerks obtained 1,577 interviews (including MRD interviews) in the private/rental boat mode. Sampling was conducted at 32 sites and was evenly distributed between the northern, central and southern districts (Table 13). Most of

Table 10. Target species of charterboat anglers during 1988. Values are percentages of responding anglers in each district.

WAVE 2

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	44	60	56	54
Bluefish			22	12
King mackerel	47	11		12
Black seabass		18	12	11
Amberjack			7	4
Grouper		11		3
Tuna	9			2
Spotted seatrout			3	2

WAVE 3

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	56	35	64	58
King mackerel	44	65	29	39
Cobia			1	1
Spanish mackerel			6	2

WAVE 4

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	21	36	32	30
King mackerel	70	55		42
Spanish mackerel			39	12
Shark			25	8
Sailfish		9		3
Black sea bass/sea bass	9			3
Tarpon			<2	<1
Bluefish			<2	<1
Mackerel			<2	<1

WAVE 5

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
King mackerel	72	89		54
Anything	28		82	38
Amberjack		11	12	6
Bluefish			6	2

Table 10 (cont.)

WAVE 6

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
King mackerel		69		34
Anything	100	9	63	43
Black sea bass/sea bass		15	26	16
Spotted seatrout			8	3
Tuna		7		4
Red drum			3	<1

Table 11. Fishing effort and relative fishing success for the charterboat mode in 1988. There was no sampling during wave 1 (January - February).

Wave	Northern Region				
	2	3	4	5	6
Hrs. Fished	157.5	548.5	220.5	473.5	102.0
Mean Hrs./Trip	4.9	5.1	3.9	6.1	5.4
No. Anglers Interviewed	32	108	57	78	19
No. Anglers targeting mackerels/general trolling	29	108	52	74	9
No. Anglers with 0 catches	0	3	16	0	0
Finfish Catch (Numbers)					
King mackerel	80	252	54	139	7
All pelagics	114	298	67	200	8
All bottomfish	339	463	49	216	268
Inshore fish	-	-	-	-	-
Sharks	2	-	1	2	-
All fish	455	761	117	418	276
Mean Trips during previous two months	0	0.05	0	0	0

Wave	Central Region				
	2	3	4	5	6
Hrs. Fished	76.5	48.0	255.5	160.0	177.5
Mean Hrs./Trip	1.7	2.8	3.6	4.6	3.2
No. Anglers Interviewed	45	17	70	35	55
No. Anglers targeting mackerels/general trolling	21	17	61	31	43
No. Anglers with 0 catches	19	4	28	10	13

Table 11(cont.)

Central Region (cont.)

Finfish Catch (Numbers)					
King mackerel	-	5	27	7	52
All pelagics	-	19	76	34	69
All bottomfish	141	9	72	34	156
Inshore fish	-	-	1	-	-
Sharks	-	-	1	-	-
All fish	141	28	150	68	225
Mean Trips during previous two months					
	0.31	0	9.2	1.0	0.08

Wave	Southern Region				
	2	3	4	5	6
Hrs. Fished	253.5	331.5	178.0	122.5	88.0
Mean Hrs./Trip	2.3	3.5	2.0	2.4	2.3
No. Anglers Interviewed	111	95	89	50	38
No. Anglers targeting mackerels/general trolling	49	90	41	41	24
No. Anglers with 0 catches	45	11	15	34	17
Finfish Catch (Numbers)					
King mackerel	-	14	1	3	-
All pelagics	222	204	136	23	9
All bottomfish	111	213	1	-	34
Inshore fish	14	7	7	8	38
Sharks	-	21	24	-	-
All fish	347	445	168	31	81
Mean Trips during previous two months					
	0.05	0.06	0	0	0

Table 12. Estimated total catches in the charterboat mode by wave, as provided by NMFS. Catches are shown in thousands of fish.

Species	May- June	July- Aug.	Sep.- Oct.	Total
<u>Offshore Pelagics</u>				
Dolphin	<1		3	4
Little tunny/bonito	1	1	8	10
Tunas/mackerels	1			1
<u>Offshore Bottomfish</u>				
Black sea bass	93	8	8	109
Red porgy	2	1	10	13
Other snappers	7	2	9	19
Groupers	<1		1	1
White grunt	<1			<1
Triggerfish	<1	<1	1	1
Sea basses	<1		1	2
Other grunts	1	5	2	8
<u>Coastal Pelagics</u>				
King mackerel	42	15	40	97
Spanish mackerel	25	12	3	39
Bluefish	4	<1	<1	4
Jack crevalle	1	2	1	4
Blue runner	3			3
Amberjacks	<1	1	6	6
Barracuda	1	6	5	12
<u>Inshore Gamefish</u>				
Red drum	<1	<1		<1
Spotted seatrout	1			1
<u>Inshore Bottomfish</u>				
Southern flounder	<1			<1
<u>Miscellaneous</u>				
Sharks	3	3	<1	6
Catfishes		<1	2	2
Toadfish		<1		<1
Pinfish	<1		4	4
Pigfish	<1			<1
Searobin	<1			<1

Table 13. Numbers of interviews collected by site during 1988 in private/rental mode.

SITE	WAVE						TOTAL
	1	2	3	4	5	6	
NORTHERN REGION							
Murrells Inlet Ramp	6	84	82	60	47	32	311
Cherry Grove Ramp		3	22	37	25	42	129
South Island			13	15	16		44
Georgetown City Ramp						14	14
Capt. Dick's Marina					1		1
Total	6	87	117	112	89	88	499
CENTRAL REGION							
Remley Point Ramp	8	25	16	25	41	36	151
Wappoo Bridge Ramp		24	37	25	6	6	98
Wild Dunes Ramp	4	7	16	24	4	16	71
Shem Creek Ramp		18	17	20	4		59
Folly Beach Ramp	1	21			5	12	39
Sol Legare Ramp			37				37
Breach Inlet Ramp	2	1			8	12	23
Limehouse Bridge Ramp		4		7	2	5	18
Bohicket Marina				1	8		9
Live Oak Ramp		1		3	4		8
Dawhoo Bridge Ramp					6		6
Tolers Cove Marina				6			6
Leads Ave. Ramp				6			6
Buzzards Roost Marina				1			1
Toogoodoo River Ramp					1		1
Total	15	101	123	118	89	87	533
SOUTHERN REGION							
C. C. Haigh Ramp	11	25	32	24	14	4	110
Port Royal Ramp	1	13	5	47	10	29	105
Russ Point Ramp	4	28	12	16	30	7	97
E. C. Glen Ramp	7		37	2	10	4	60
Broad River Ramp		7	30	7	10	4	58
Station Creek Ramp					24	33	57
All Joy Ramp	3		7	11		5	26
Fripp Is. Marina Ramp			16	7			23
Harbortown Marina			1	3			4
Ft. Frederick Ramp		3					3
Sams Point Ramp			1				1
South Beach Marina				1			1
Total	36	76	141	118	98	86	545

the interviews were obtained at public boat landings, with a very small number from wet slip marinas. No interviews were obtained from anglers leaving private access points.

Most (71.5%) of the anglers interviewed were fishing on inland (estuarine) waters. Approximately 18.4% of the anglers fished waters from 0 to 3 miles offshore and 10.1% fished greater than 3 miles offshore. The distribution of fishing effort by area was similar in each district. About 36.2% of the offshore oceanic angler trips were made to artificial reefs. Of the total offshore trips, 52.5% in the northern district and 42.1% in the southern district were made to artificial reefs. Slightly less than 12% of the offshore trips in the central district were to artificial reefs.

Approximately 26.1% of the anglers did not specify a target species. A few listed "any bottomfish" or "any surface species", but the majority targeted "anything". Red drum, spotted seatrout, king mackerel, sharks and flounders were the top five preferences in descending order. Sheepshead and cobia came in a very close sixth and seventh. Species preference varied with the time of year (wave) and region (Table 14). Sheepshead were common target species in the winter and early spring, especially in the central and southern regions. Cobia were an extremely popular target species in spring and early summer at a few sites in the southern region. King and Spanish mackerel and flounders were targeted mainly during the warmer summer months on into fall. King mackerel and

flounders were important target species in the northern region, while Spanish mackerel were most often targeted in the central and southern areas. Shark fishing was a summer activity that increased in popularity from the northern to the southern part of the state. Red drum and spotted seatrout were important fall and winter target species in all regions.

The average private/rental boat angler spent 3.78 hrs./trip fishing (Table 15). Average fishing time per trip was much greater in the northern district (4.50 hrs./trip), while anglers in the central and southern districts spent 3.50 hrs./trip and 3.45 hrs./trip, respectively. Fishermen claimed to take more trips in the central district and less trips in the northern district, with the majority of the effort being expending in the fall.

The average catch per angler trip, based on all trips, is given below by district for various species groups and all species combined:

	North	Cent	South
Red drum and Spotted seatrout	0.24	0.96	0.88
Top seven targets	0.54	1.24	1.28
All species	5.27	3.20	3.46

Anglers in the northern district caught the most fish per trip, however, when fishing success is viewed as the anglers' ability to catch more desirable species, the northern district ranked last (Table 15). The southern and central districts showed similar and.

Table 14. Target species of private/rental anglers during 1988.
Values are percentages.

WAVE 1

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Spotted Seatrout	17	40	35	34
Anything	50	40	8	23
Sheepshead			27	15
Red drum		20	12	30
Black sea bass/sea bass	33		8	9
Striped Mullet			12	6

WAVE 2

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	45	42	42	43
Red drum	17	25	12	19
Sheepshead		9	22	10
Black sea bass/sea bass	8	7	8	8
Shark	6	3		3
Spotted seatrout	2	10		5
Flounders	7	3		3
Bluefish	3	<1	3	2
King mackerel	7			2
Black drum			7	2
Spot	5			2
Cobia			4	1
Kingfishes			3	<1
Atlantic croaker		<1		<1

WAVE 3

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	21	28	35	29
King mackerel	25	15	8	15
Cobia			38	14
Shark	3	8	<1	4
Flounders	30	5	1	11
Red drum	10	7	1	6
Spanish mackerel	3	3	7	4
Spotted seatrout		18		6
Black sea bass/sea bass	7	7	<1	5
Bluefish		3	6	3
Sheepshead		2	<1	1
Spot		2		<1
Black drum	2			<1
Kingfishes			<1	<1

Table 14 (cont.)

WAVE 4

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Anything	31	25	49	35
Red drum	21	10	8	13
King mackerel	19	11	7	12
Shark	3	10	2	5
Flounders	19	8	2	9
Spanish mackerel	3	10	6	6
Spotted seatrout		8	11	6
Sheepshead	2	11	7	7
Atlantic croaker	2	2		1
Dolphin		3		1
Cobia			5	2
Bluefish		2		<1
Black sea bass/sea bass			3	1
Spot	2			<1
Sailfish		<1		<1

WAVE 5

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Red drum	26	36	39	34
Anything	33	24	35	30
Spotted seatrout		26	19	15
Spot	22	3		8
Shark	3			1
Flounders	2	6	2	3
King mackerel	8			3
Sheepshead		2	2	1
Kingfishes		1	3	1
Catfish		2		<1
Red snapper	3			1
Spanish mackerel	2			<1

WAVE 6

SPECIES	NORTH	CENTRAL	SOUTH	TOTAL
Spotted seatrout	49	57	16	41
Red drum	11	22	56	30
Anything	23	9	16	16
Spot	15	8	5	9
Kingfishes		3	2	2
Black sea bass/sea bass			2	<1
Sheepshead			2	<1
Striped bass	2			<1

Table 15. Fishing effort and relative fishing success for the private/rental mode in 1988.

Wave	Northern Region					
	1	2	3	4	5	6
Hrs. Fished	24.5	360.5	567.0	493.0	454.0	439.0
Mean Hrs./Trip	2.4	4.0	4.5	4.4	4.7	5.0
No. Anglers	10	89	127	113	97	88
No. Anglers with 0 catches	7	59	38	40	22	33
Finfish Catch (Numbers)						
Red Drum	-	11	31	10	10	22
Spotted Seatrout	-	1	-	2	-	39
King Mackerel	-	1	9	5	1	-
Sharks	-	-	3	-	-	-
Flounders	-	16	77	17	6	-
Sheepshead	-	-	1	-	-	-
Cobia	-	-	1	1	-	-
All fish	80	183	709	463	860	465
Mean Trips during previous two months	3.0	2.2	3.4	4.6	1.9	8.4

Wave	Central Region					
	1	2	3	4	5	6
Hrs. Fished	38.9	266.0	541.0	470.0	319.0	345.0
Mean Hrs./Trip	2.2	2.6	4.4	3.4	3.4	3.8
No. Anglers	18	103	124	138	93	89
No. Anglers with 0 catches	16	79	42	55	16	38

Table 15 (cont.)

Central Region (cont.)

Finfish Catch (Numbers)						
Red Drum	4	3	15	60	52	29
Spotted Seatrout	-	38	91	45	70	138
King Mackerel	-	-	10	7	-	-
Sharks	-	-	38	1	-	-
Flounders	-	2	13	19	21	3
Sheepshead	-	6	-	21	13	1
Cobia	-	-	-	-	-	-
All fish	4	95	490	360	530	312
Mean Trips during previous two months	8.6	3.1	5.8	5.4	6.3	6.6

Wave	Southern Region					
	1	2	3	4	5	6
Hrs. Fished	97.5	289.0	664.5	443.5	358.5	261.5
Mean Hrs./Trip	2.8	3.8	3.5	3.7	3.4	3.0
No. Anglers	35	76	191	119	107	86
No. Anglers with 0 catches	30	34	63	54	44	34
Finfish Catch (Numbers)						
Red Drum	20	-	2	72	109	215
Spotted Seatrout	-	-	-	24	13	88
King Mackerel	-	-	2	-	-	-
Sharks	-	2	12	20	14	-
Flounders	1	2	12	22	3	2
Sheepshead	3	90	23	13	-	15
Cobia	-	-	11	-	-	-
All fish	200	329	444	399	341	413
Mean Trips during previous two months	4.0	2.1	2.5	6.4	3.3	5.1

much greater catch rates. Unsuccessful anglers (those with 0 catches) were evenly dispersed throughout the region (Table 15). About 37.9% of the anglers in the north reported catching no fish, while figures for the southern and central districts were 42.2% and 43.5%, respectively.

Private boat anglers caught an estimated 3,875,945 fish during 1988 (Table 16). About 47% of this total was reportedly released alive, with miscellaneous species (excluding sharks) most often returned to the water. Approximately 63% of the black sea bass and 49.8% of the red drum were released. The six most often caught species in numbers were black sea bass, red drum, spot, hardhead catfish, pinfish, and spotted seatrout. These six species made up the bulk (68.2%) of the catch in the Private/Rental mode. Black sea bass was the most commonly caught species, making up 16.3% of the total catch. Red drum made up 12.2% of the total catch.

Length Frequencies

The overall average size of red drum during 1988 was 433 mm total length (17.0 in.), compared to 1987 fall averages of 14.3 in. for the Charleston area and 15.1 in. for other parts of South Carolina (Low and Waltz, 1988). Prior to 1988, a 14 in. minimum legal limit (total length) was in effect during June, July, and August. A 1988 amendment extended the size limit through September. The intent was to protect red drum from potential overharvest and provide increased yield. Available information suggested that red

drum in South Carolina would reach 14 in. by September.

During January - May 1988, 8% of the red drum measured were < 14 in. total length (Fig. 3). During the size limit interval (Jun - Sept), approximately 16% were undersized. After the size limit period, the undersized component was 9%. The fall (Oct-Dec), 1988 component was substantially lower than that reported by Low and Waltz (1988) for 1987, when 44% of the measured red drum were under 14 in. The incidence of illegal fish during the size limit window may have reflected the public's lack of knowledge concerning the limit extension; approximately 20% of the illegal fish were encountered in September.

During 1988, 276 spotted seatrout were measured, ranging from 300 to 609 mm with an average total length of 366 mm (14.4 in.). Average length in 1988 was very similar to figures reported in 1987 (14.1 in. in the Charleston area and 14.9 in. in other parts of the state) by Low and Waltz (1988). Approximately 2% of the spotted seatrout observed were less than the 12 in. (total length) legal size limit (Fig. 4).

The South Carolina recreational catch includes two species of flounders (southern and summer). Approximately 30% of the southern flounder and 64% of the summer flounder were less than 12" (Fig. 5 and 6). The average length of southern flounder (346 mm, 13.6 in.) in 1988 was about 1 in. less than observed in 1987 (Low and Waltz, 1988). Mean length of summer flounder also decreased slightly (from 12.3" in 1987 to 11.8" in 1988).

During 1988, Spanish

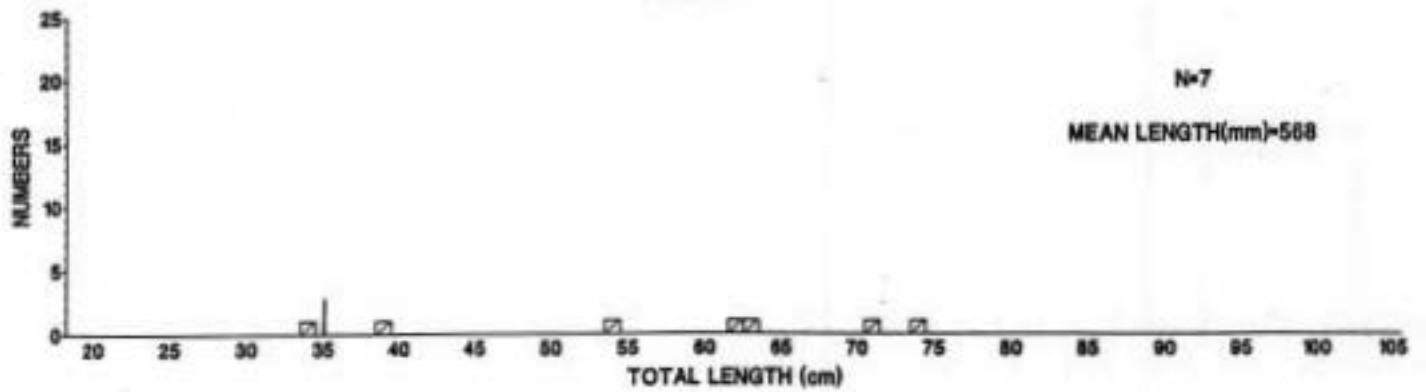
Table 16. Estimated total catches in the private boat mode by wave, as provide by NMFS. Catches are shown in thousands of fish.

Species	Mar.- Apr.	May- June	July- Aug.	Sep.- Oct.	Nov.- Dec.	Total
<u>Offshore Pelagics</u>						
Little tunny/bonito		1	8			8
Tunas/mackerels			2			2
<u>Offshore Bottomfish</u>						
Black sea bass	17	39	55	145	26	632
Groupers		1		1		3
Snappers	<1			6		6
Red snapper		1		1		1
Porgies		1	<1			2
Red porgy	2	2			10	14
White grunt	<1	1		3	1	5
Triggerfish	<1				<1	1
Other grunts		26		16		41
<u>Coastal Pelagics</u>						
King mackerel	<1	12	5	<1		17
Spanish mackerel		33	14	5		52
Bluefish	6	26	16	19	14	81
Jack crevalle		1	3	3		8
Amberjacks		1		3		3
Barracuda		1	12			13
Dolphin			3			3
<u>Inshore Gamefish</u>						
Red drum	2	34	181	112	143	472
Spotted seatrout	1	49	79	44	189	362
Weakfish				<1	1	1
Summer flounder		32	9	1		42
Southern flounder	2	27	30	15	4	78
Flounders		5	6	1		12
Striped bass				2	1	3
<u>Inshore Bottomfish</u>						
Kingfishes	9	18	5	14	25	72
Spot	8	6	9	83	313	420
Croaker		24	119	31	2	175
Black drum	1	9	4	1	1	16
Sheepshead	11	15	22	6	15	70
<u>Miscellaneous</u>						
Sharks	1	42	43	14	1	102
Skates/rays	<1	4	4	5	8	22
Eels			<1	1		1
Freshwater catfish					1	1
Toadfish	2	13	45	33	3	96
Scup				1		1

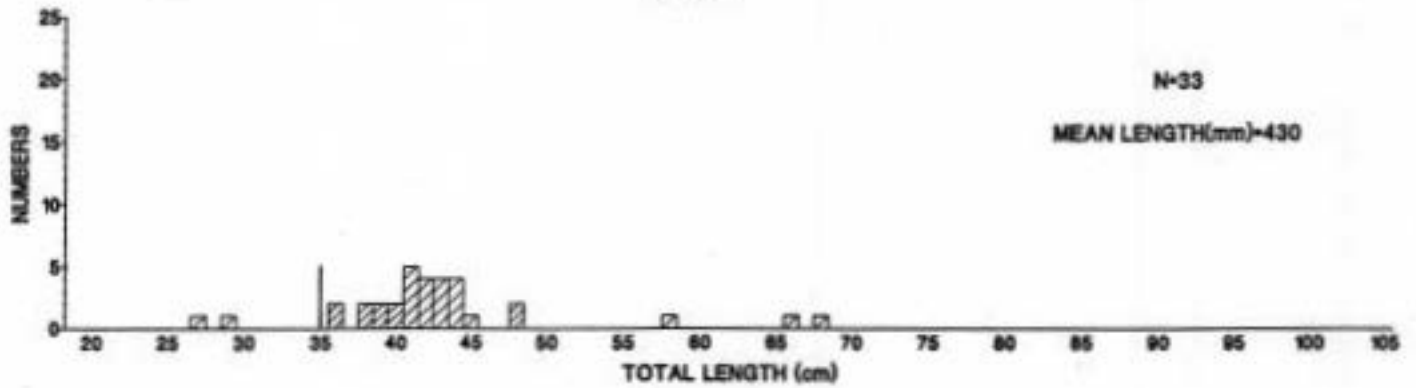
Table 16 (cont).

Species	Mar.- Apr.	May- June	July- Aug.	Sep.- Oct.	Nov.- Dec.	Total
Dogfish	<1	1				1
Saltwater catfish	2	100	83	197	3	96
Silver perch				26	6	33
Pinfish		24	53	178	127	382
Puffers	<1			2		3
Searobins	<1	1	<1		4	6
Pigfish		7	69	35		110
White perch					5	5
Others		66	6	5	1	79

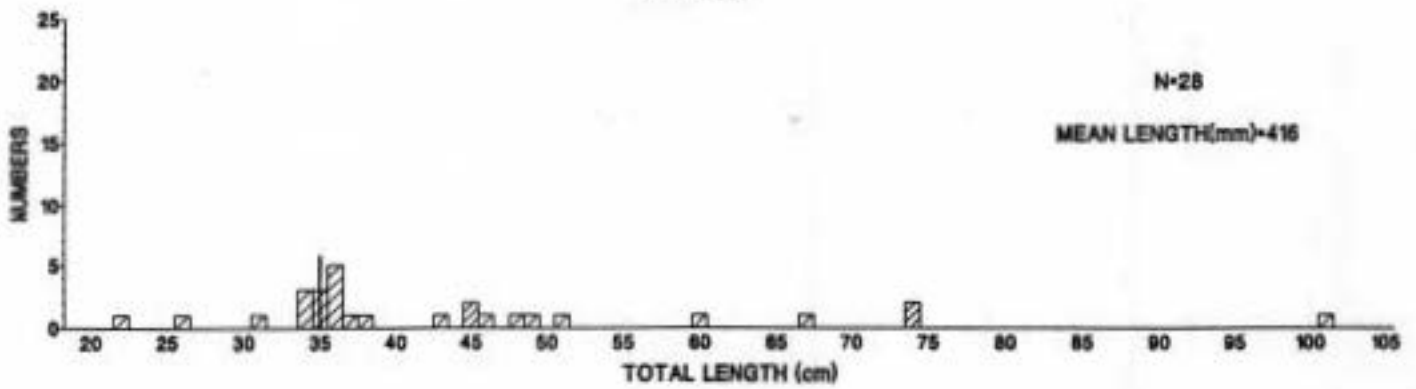
WINTER



SPRING



SUMMER



FALL

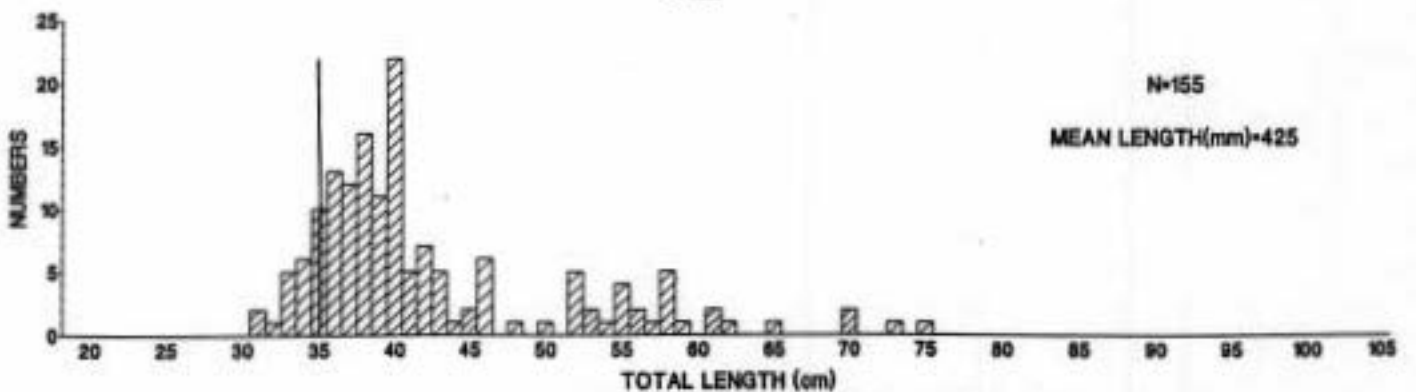
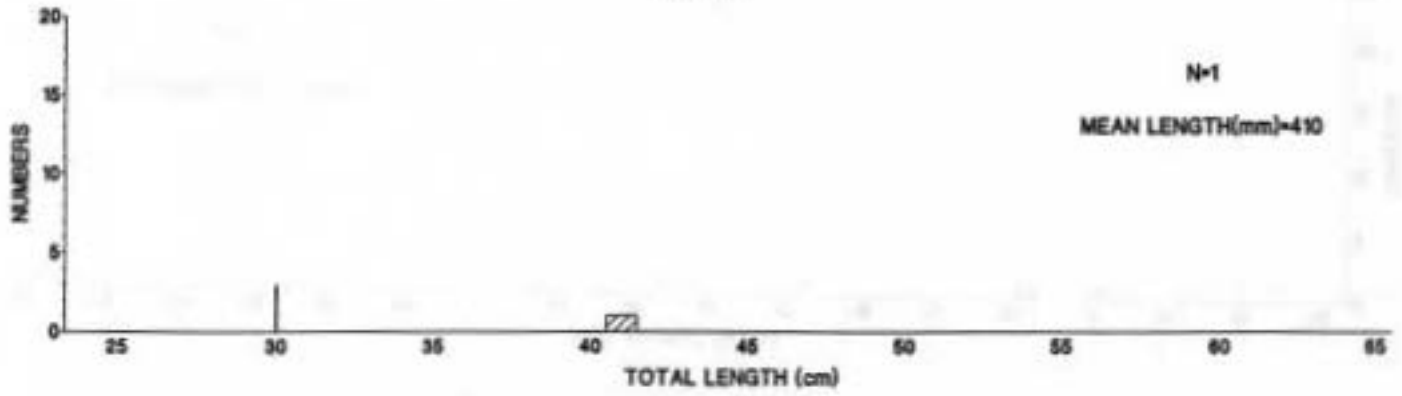
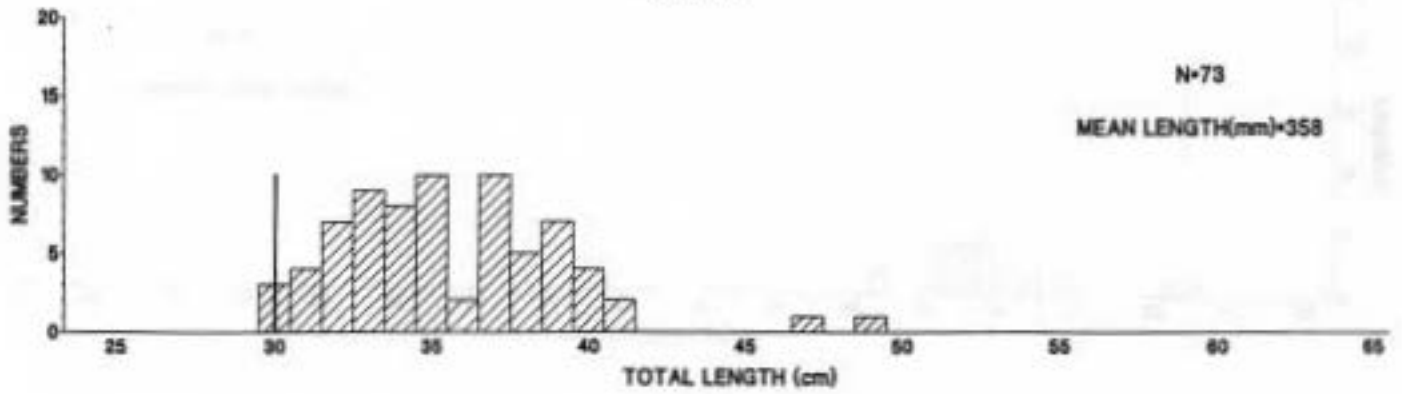


Figure 3. LENGTH FREQUENCY DISTRIBUTION OF RED DRUM, 1988
Vertical bar represents 14 in. minimum size limit effective
June thru September

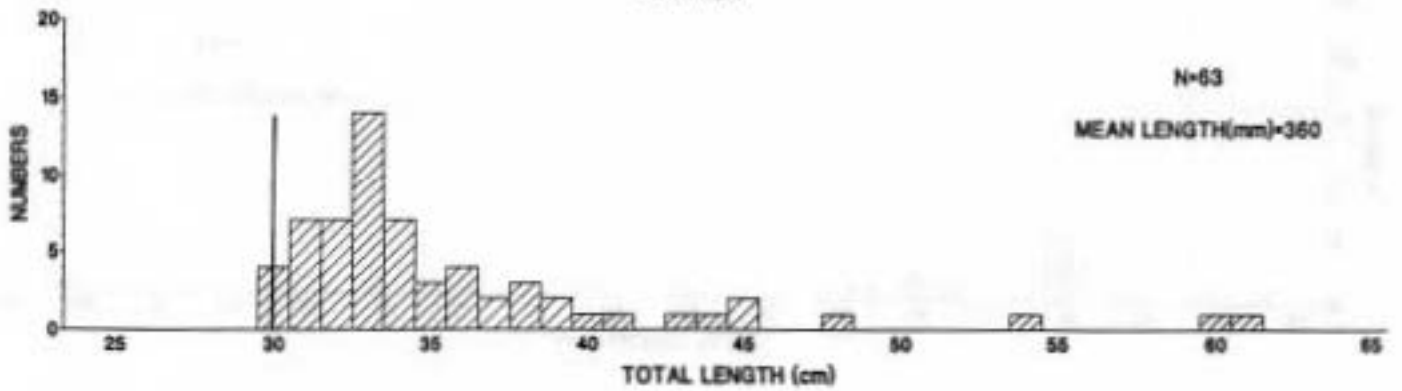
WINTER



SPRING



SUMMER



FALL

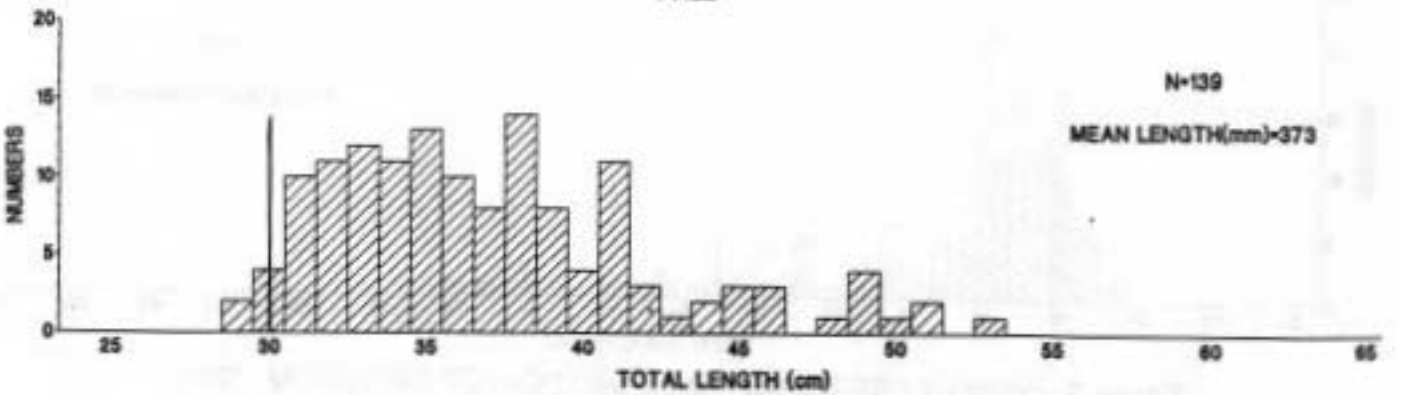


Figure 4. LENGTH FREQUENCY DISTRIBUTION OF SPOTTED SEATRUT, 1988

Vertical bar represents 12 in. minimum size limit

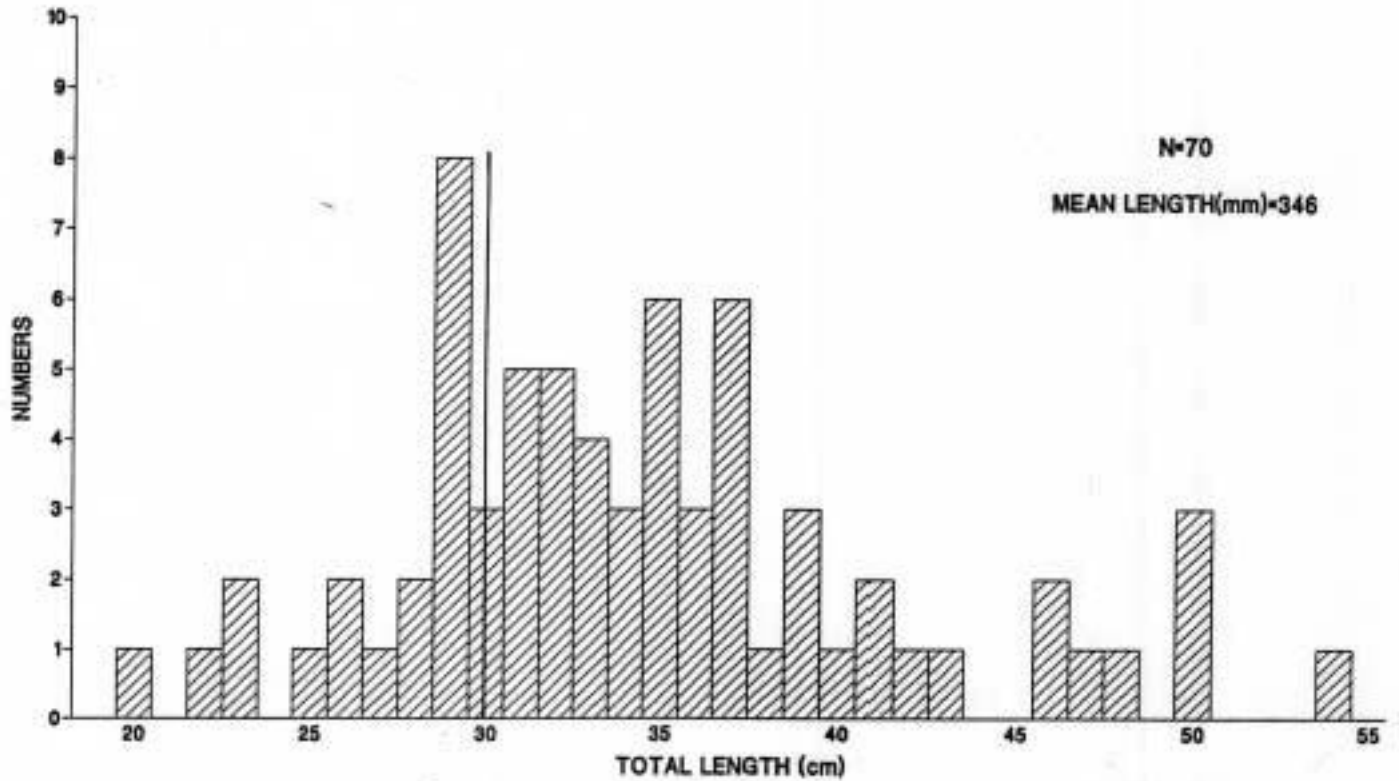


Figure 5. LENGTH FREQUENCY DISTRIBUTION OF SOUTHERN FLOUNDER, 1988
Vertical bar represents 12 in. minimum size limit enacted in 1990

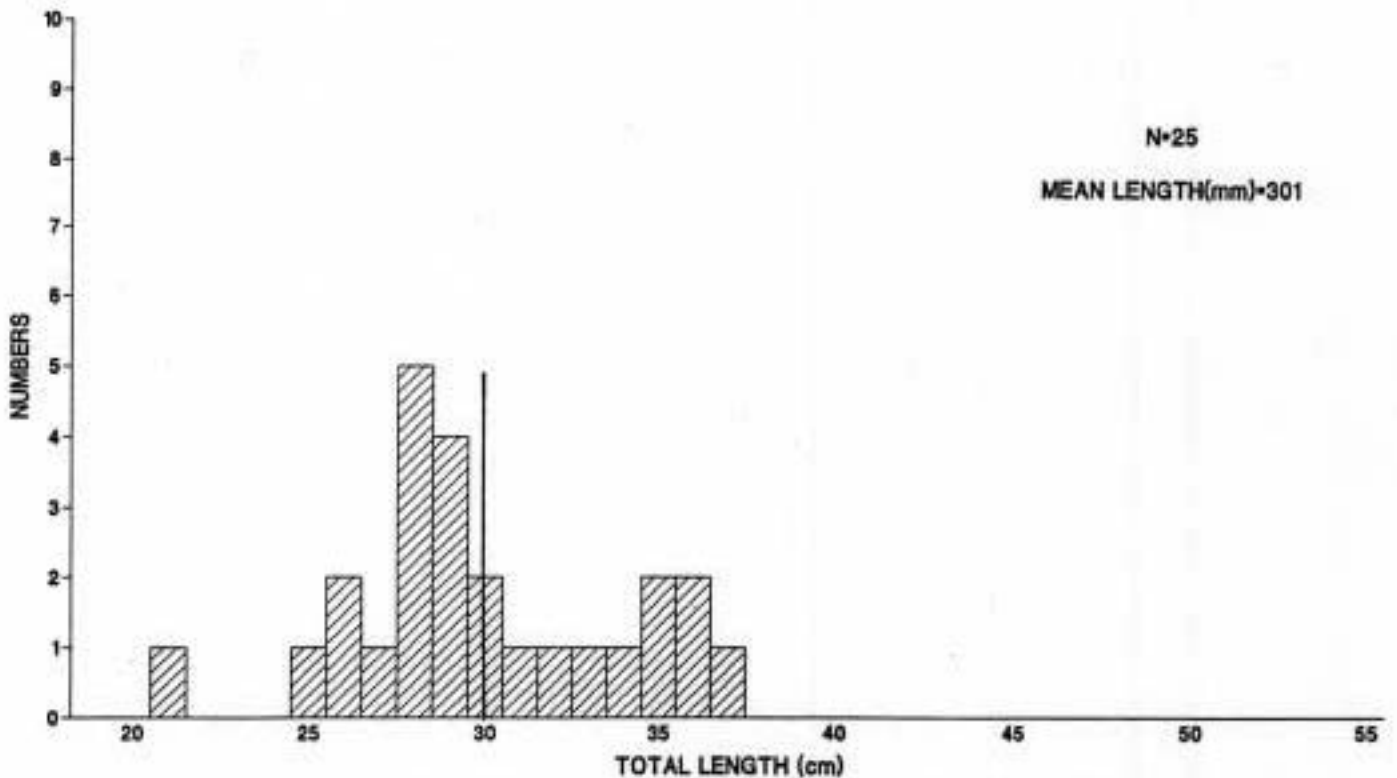


Figure 6. LENGTH FREQUENCY DISTRIBUTION OF SUMMER FLOUNDER, 1988
Vertical bar represents 12 in. minimum size limit enacted in 1990

mackerel ranged from 300 mm (11.8 in.) to 670 mm (26.4 in.) fork length (Fig 7). Less than 1% of the landings were under the 12 in. (fork length) legal size limit. The average length and weight of Spanish mackerel sampled was 422 mm (16.6 in.) fork length and 0.76 kg (1.7 lbs) respectively. Mean fork length in 1988 was slightly less than the 1987 value (17.2 in.) reported by Low and Waltz (1988). Most Spanish mackerel came from charterboat landings (73%), while private boat anglers accounted for 26% of the sampled catch. Pier fishermen accounted for the remainder. All Spanish mackerel were observed before the October 3, 1988 closing of the Atlantic group recreational fishery.

During 1988, king mackerel ranged from 450 mm (17.7 in.) to 1346 mm (53.0 in.) fork length (Fig. 8). The average length was 768 mm (30.2 in.) fork length. This was very similar to the 1987 average length (29.8 in.) reported by Low and Waltz (1988). The average weight for 1988 was 4.28 kg (9.4 lbs). Most fish measured in 1988 came from charterboats. All king mackerel observed were caught before the closure of the recreational fishery on October 17, 1988, even though a court order reopened the fishery on November 15, 1988.

The average total length of black sea bass sampled during 1988 was 265 mm (10.4 in.) (Fig 9). Approximately 8.8% of the fish taken in state waters (\leq 3 miles) and 2.3% of those from federal waters ($>$ 3 miles) were under the minimum 8 in. total length legal size. These percentages were in marked contrast to the 43%

(state) and 16% (federal) illegal catches reported by Low and Waltz (1988) for the previous year.

Black drum ranged from 250-545 mm and averaged 439 mm total length. The average size of sheepshead was 326 mm (Fig 10 and 11).

Other species measured were: bluefish (mean fork length = 378 mm, N = 66), cobia (mean fork length = 928 mm, N = 10), dolphin (mean fork length = 591 mm, N = 16); and red porgy (mean fork length = 314 mm, N = 18).

Saltwater License Opinion Poll

During May through the end of September, 632 saltwater anglers were asked to express their views on the proposed saltwater license. Sites where fishermen were intercepted and the numbers of interviews are listed in Table 17.

Overall, 83% of the anglers interviewed were aware that a license had been proposed. Approximately 33% of the shore fishermen had not heard nor read of a license proposal. About the same proportion of out-of-state anglers (40%) were not aware of a proposed license. Anglers interviewed in Horry County were the least informed about the license (Table 18).

Forty-nine percent (49%) of the anglers interviewed supported the license, 43% were opposed to it, and 8% were undecided. There was slightly more support from boat anglers than shore fishermen (52% verses 49%). Although the sample size was small, a majority of out-of-state anglers (about 53%) supported the license. Overall, 49% of the state residents interviewed

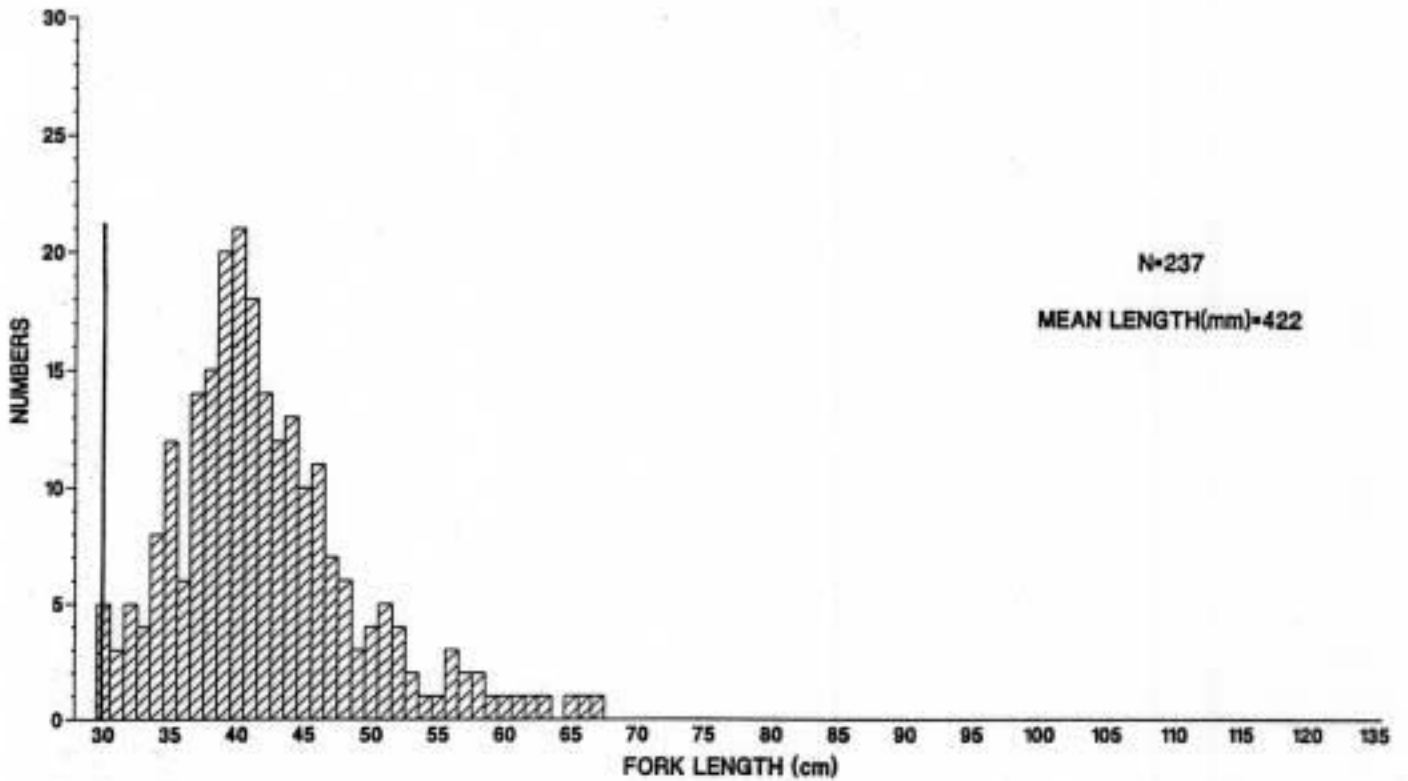


Figure 7. LENGTH FREQUENCY DISTRIBUTION OF SPANISH MACKEREL, 1988
Vertical bar represents 12in. (fork length) minimum size limit

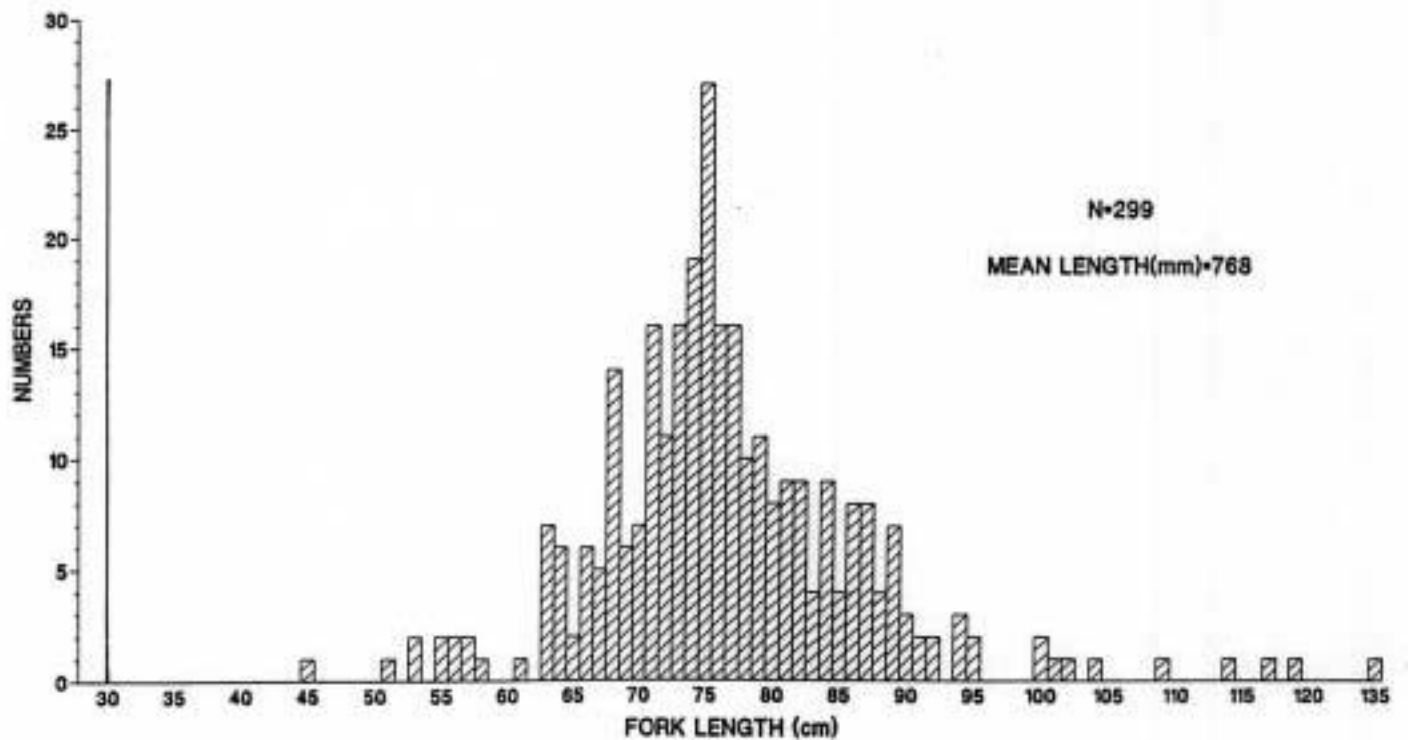
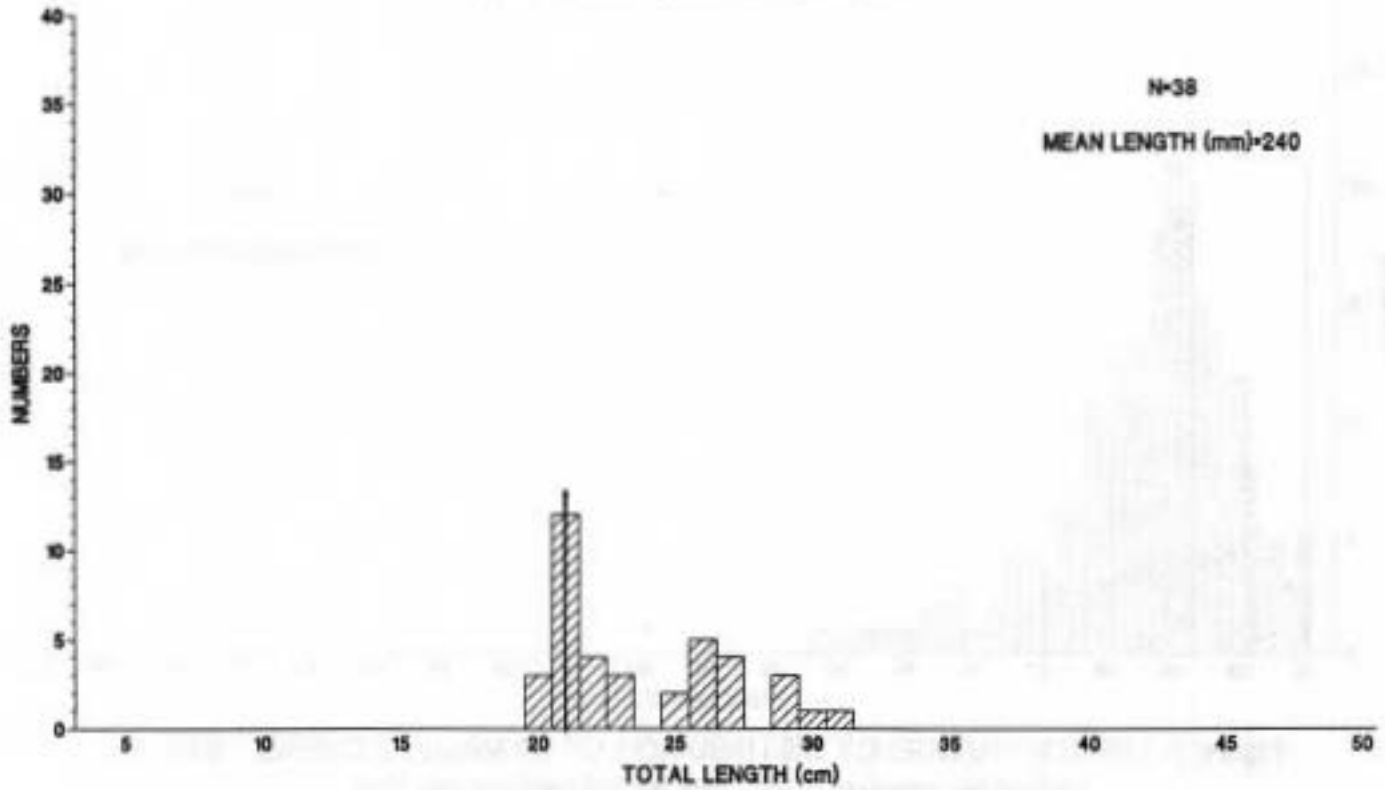


Figure 8. LENGTH FREQUENCY DISTRIBUTION OF KING MACKEREL, 1988
Vertical bar represents 12 in. (fork length) minimum size limit
enacted in 1990

STATE WATERS, 3 MILES OR LESS



FEDERAL WATERS, GREATER THAN 3 MILES

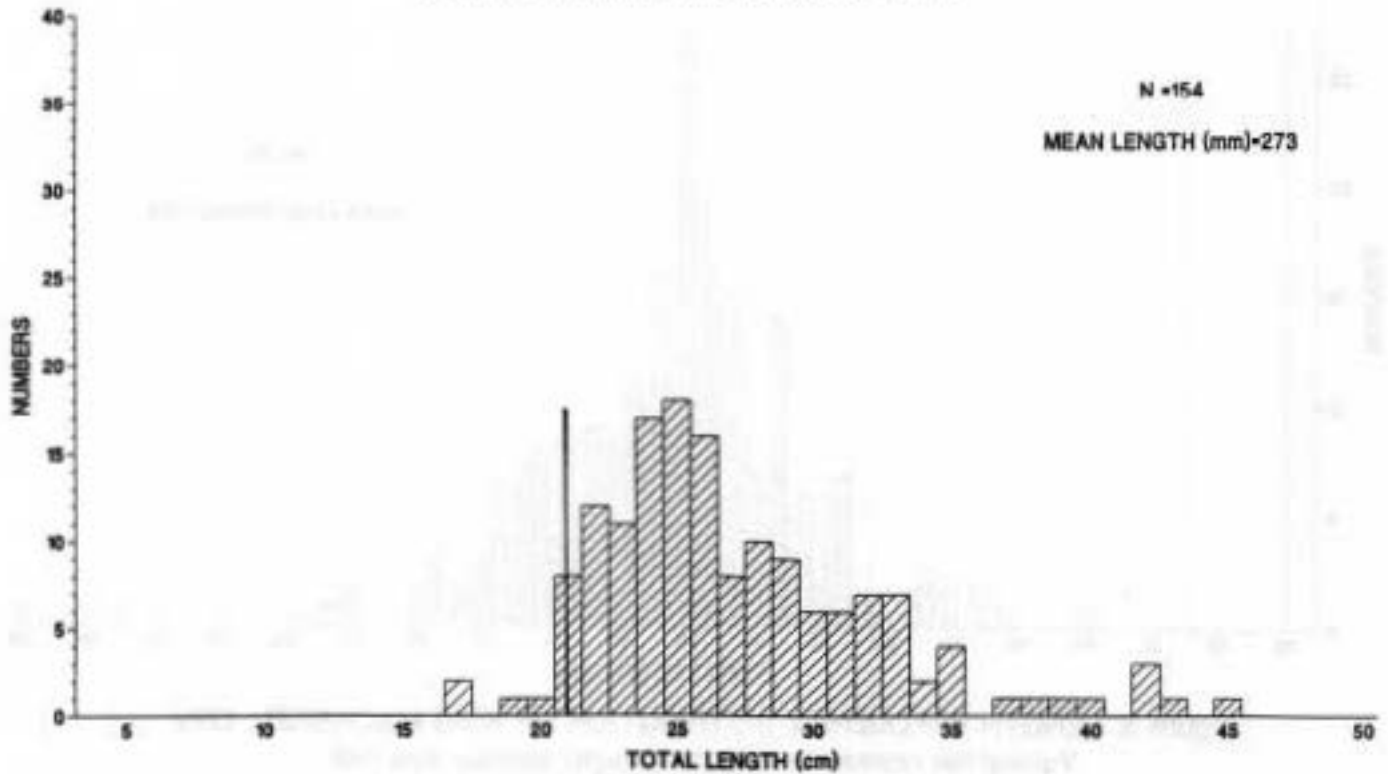


Figure 9. LENGTH FREQUENCY DISTRIBUTION OF BLACK SEABASS, 1988
Vertical bar represents 8 in. (total length) minimum size limit

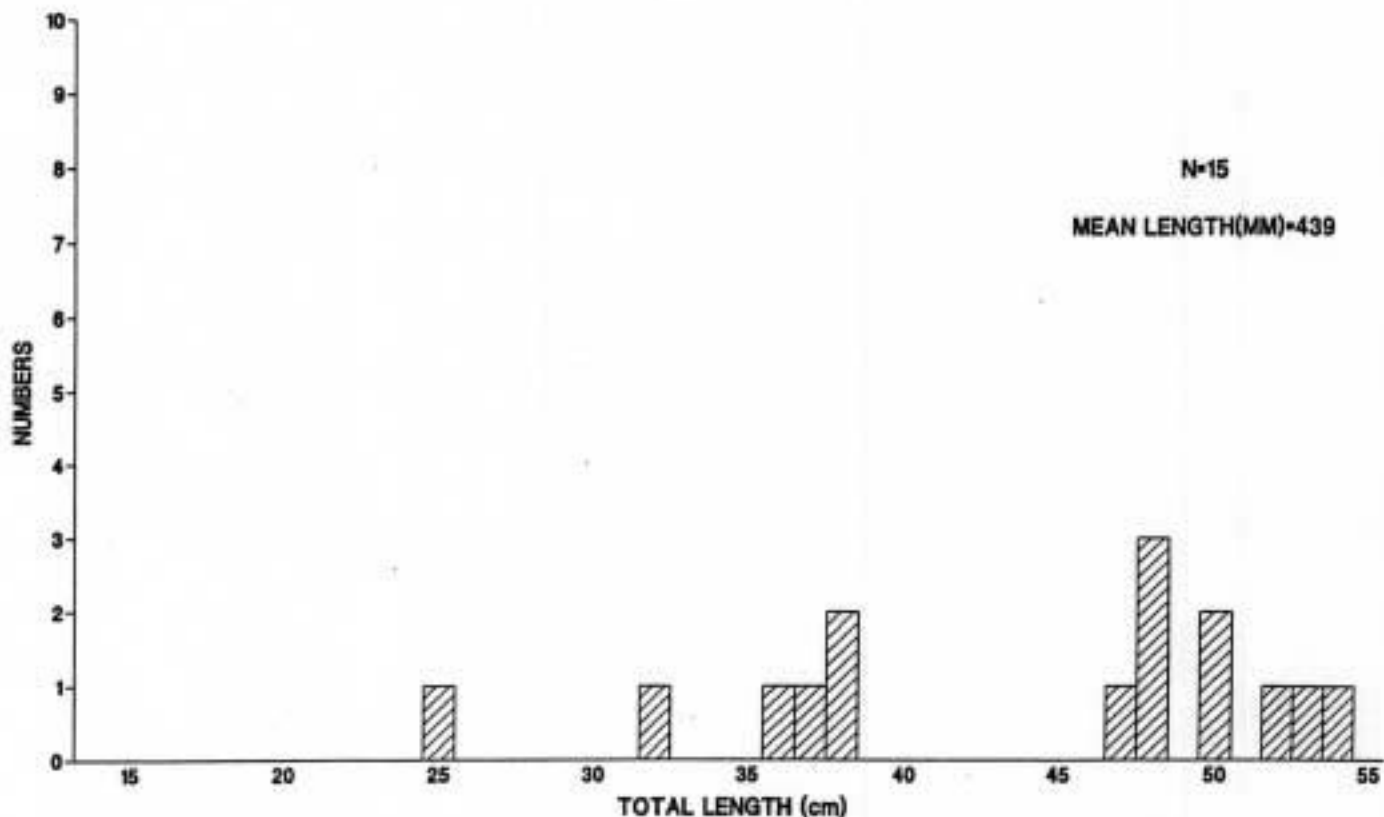


Figure 10. LENGTH FREQUENCY DISTRIBUTION OF BLACK DRUM-1988

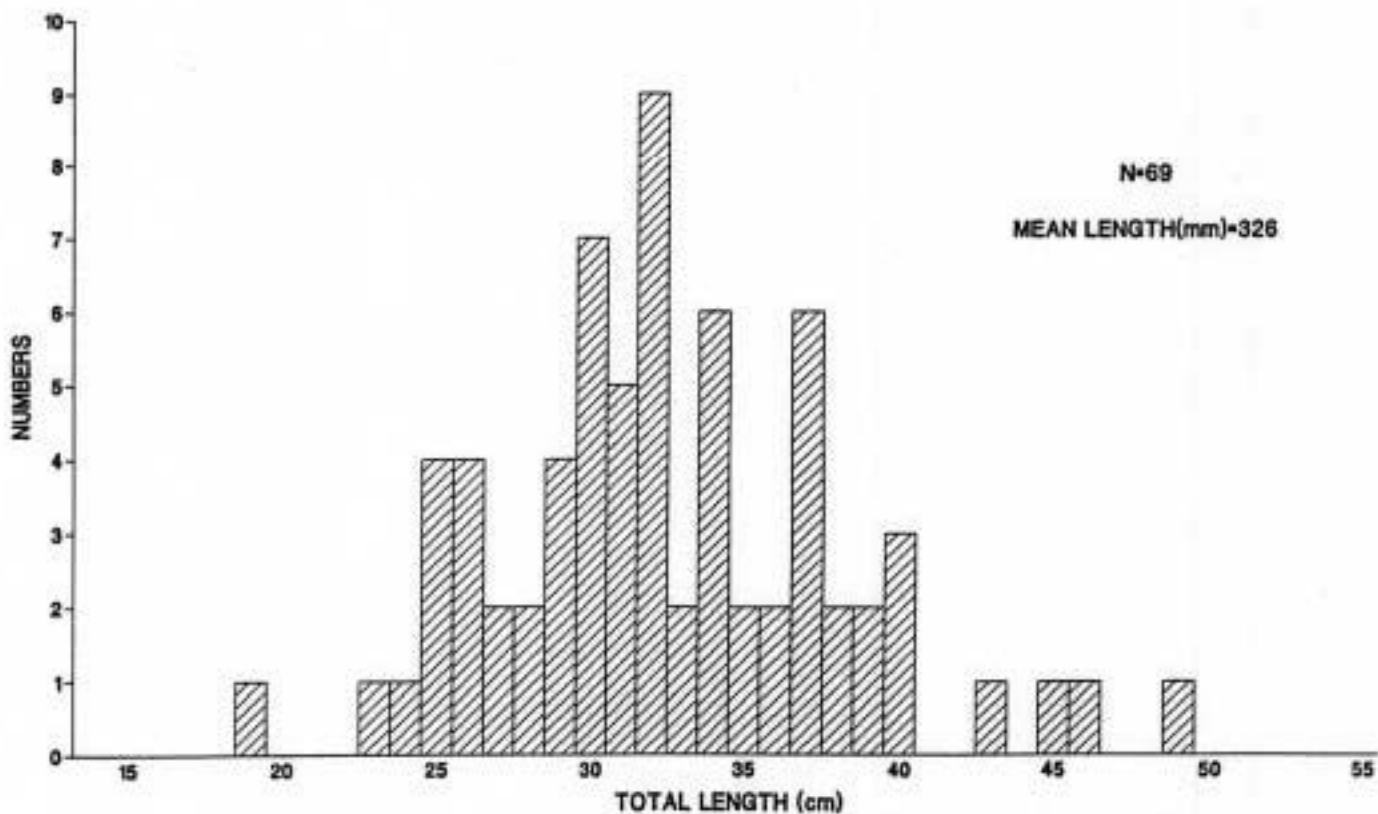


Figure 11. LENGTH FREQUENCY DISTRIBUTION OF SHEEPHEAD-1988

Table 17. Sites where recreational anglers were interviewed concerning the proposed saltwater license.

<u>Horry County</u>	No. of interviews
AIWW Ramp	45
Kingfisher Pier	36
Cherry Grove Pier	12
Myrtle Beach State Park Pier	8
<u>Georgetown County</u>	
Murrells Inlet Ramp	94
So. Island Ferry Ramp	29
Georgetown Landing Marina	1
Pawleys Island Ramp	6
Huntington Beach State Park	6
<u>Charleston County</u>	
Breach Inlet Bridge	4
Wappoo Cut Ramp	25
Remleys Point Ramp	42
Shem Cr. Ramp	7
Live Oak Ramp	8
County Farm Ramp	6
Limehouse Ramp	3
Breach Inlet Bridge	39
Toogoodoo Ramp	1
Dawhoo Ramp	3
<u>Beaufort County</u>	
C.C. Haigh Ramp	46
All Joy Ramp	5
Russ Point Ramp	15
Fripp Island Marina	27
Broad River Ramp	54
E.C. Glenn Ramp	56
Paradise Pier	32
Port Royal Ramp	22
Total	632

Table 18. Summary of responses to Question #1. Are you aware that a saltwater fisheries license has been proposed by a blue ribbon committee of concerned anglers?

Private Boat Anglers

	AWARE		NOT AWARE		TOTAL
	#	%	#	%	
May	123	91	12	9	135
June	37	100	0	0	37
July	119	94	8	6	127
Aug	51	91	5	9	56
Sept	65	81	15	19	80
Sub Total	395	91	40	9	435

Shore Anglers

May	24	77	7	23	31
June	19	70	8	30	27
July	24	61	15	39	39
Aug	32	60	21	40	53
Sept	32	68	15	32	47
Sub Total	131	66	66	33	197
Total	526	83	106	17	632

Residency

So. Car.	442	88	58	12	500
Non-State	73	60	48	40	121
Total	515	83	106	17	621

County of Interview

Horry	72	71	29	29	101
Georgetown	122	88	17	12	139
Charleston	115	80	29	20	144
Beaufort	217	87	31	13	248
Total	526	83	106	17	632

supported the concept (Table 19). Anglers fishing in Charleston county were the least supportive (35% Yes; 52% No; 13% Undecided).

Anglers that supported the license liked the fact that the money would go back into supporting recreational fishing (Table 20). Better management and access were also high on the list. Several that supported the license qualified their answer with statements like "only if piers are exempt" or "only if it was combined with hunting and freshwater licenses". A few people would like a license because they believe it would help reduce out-of-state fishermen coming into South Carolina.

Major reasons for opposing the license were the cost, the belief that it would not help anything and the idea that the ocean is so big that resources are unlimited. Several anglers did not believe the money would be spent on fishing, while others thought it should be a federal license so they would only need one license to fish in every state. Several people said that they didn't fish much and it wouldn't be beneficial to them. Those that were undecided said they were not convinced the money would be spent properly, while others wanted more information before deciding.

Most of the anglers interviewed during May-September were males (87%). Anglers that supported the license tended to average slightly less time fishing than those opposed. Supporters average 17.3 da/yr saltwater fishing, while those opposed averaged 21.4 da/yr. Of anglers that provided their age, most supporters fell

between 30-39 years of age (approx. 35%), while the modal value for those opposed was 20-29 years (about 30%).

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Table 19. Summary of responses to Question #2. Do you support the proposed saltwater license?

Private Boat Anglers

	YES		NO		UNDECIDED		TOTAL
	#	%	#	%	#	%	
May	65	48	55	41	15	11	135
June	28	76	6	16	3	8	37
July	70	55	50	39	7	6	127
Aug	32	57	20	36	4	7	56
Sept	31	39	43	54	6	7	80
Sub Total	226	52	174	40	35	8	435

Shore Anglers

May	17	55	11	35	3	10	31
June	11	41	14	52	2	7	27
July	18	46	17	44	4	10	39
Aug	21	40	32	60	0	0	53
Sept	14	30	25	53	8	17	47
Sub Total	81	41	99	50	17	9	197
Total	307	49	273	43	52	8	632

Residency

So. Car.	243	49	212	42	45	9	500
Non-State	64	53	53	44	4	3	121
Total	307	49	265	43	49	8	621

County of Interview

Horry	52	51	37	37	12	12	101
Georgetown	76	55	50	36	13	9	139
Charleston	51	35	75	52	18	13	144
Beaufort	128	52	111	45	9	3	248
Total	307	49	273	43	52	8	632

Table 20. Summary of responses to Question #3. What is the main reason that you do/don't support it?

	DO SUPPORT	%
If the money goes back to help recreational fishing	55	
Better management	9	
Money for access	7	
No opinion	6	
Only if combined with freshwater and hunting license	5	
Regulate out-of-state anglers	4	
Only if piers are exempt	3	
Help law enforcement	3	
If the cost is low	2	
Help fishing	1	
Accurate count of anglers	1	
If you don't increase cost later	1	
Help by restocking	>1	
Only if you get rid of gigging and shrimping license	>1	
If people on limited income are not charged	>1	
Protect fishing for the kids	>1	
So Fed's don't do it	>1	
More info	>1	

Table 20 (cont.)

	DO NOT SUPPORT ‡
Cost/No more taxes/Pay enough now	30
Unlimited resources/Too much water/ Ocean belongs to everyone	18
Won't help anything/fishing	10
Freshwater license enough	8
Hurt tourism	6
Money will be lost/Won't go back to resource	5
Don't fish that much	4
License out-of-state anglers only	4
Fed's should do it not the states	3
No opinion	3
Can't enforce it	2
Other states don't have it	1
Can't stock ocean	1
Hurt low income families	1
No fish to catch now	1
Should be one license for all fishing	1
License netters only	<1
Will be hard to find and buy	<1
Administrative costs too high	<1

Table 20 (cont.)

	UNDECIDED ‡
Needs more publicity/Wants more information	40
Not convinced that money will be used to improve fishing	32
No opinion	14
Don't fish that much	4
If money goes to law enforcement	4
Cost too high	2
If it was combined with freshwater license	2
Only license netters and baiters	2

APPENDIX 1.

1988 FINFISH INTERCEPT QUESTIONNAIRE

OMB NO. 0648-0052 (EXPIRES 11/30/89)

- 3. INTERVIEWER CODE: ENTER YOUR 4-DIGIT CODE.
- 4. YR/MO/DAY: ENTER DATE OF INTERVIEW.
- 5. INTERVIEW NO: CONSECUTIVE NUMBER OF THIS INTERVIEW FOR THE DAY.
- 6. HOUR: TIME INTERVIEW WAS COMPLETED. USE 24-HOUR TIME.
- 7. STATE: ENTER STATE CODE WHERE INTERVIEW TOOK PLACE.
- 8. COUNTY: ENTER COUNTY CODE WHERE INTERVIEW TOOK PLACE.
- 9. SITE: ENTER SITE CODE WHERE INTERVIEW TOOK PLACE.
- 10. INTERVIEW STATUS:

Questionnaire complete 1	Language barrier, etc. 4
Refused non-key items 2	Refused key item 5
Initial refusal 3	

● This study is being conducted in accordance with the Privacy Act of 1974. You are not required to answer any question that you consider to be an invasion of your privacy.

11. Would you say you were fishing from (SPECIFY APPROPRIATE MODE COMBINATION)?

- | | |
|--|---|
| SH - Pier, dock 1
Jetty, breakwater, breachway . 2
Bridge, causeway 3
Other man-made structure . . . 4
Beach or bank 5 | PC - Partyboat 6
Charter boat 7
PR - Private or rental boat . . . 8 |
|--|---|

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 CORRECT AREA.

- | | |
|--|---------------------------------|
| Open water (ocean/gulf, open bay) . 1 | |
| Sound (other than those specified) . 2 | Pamlico/Albemarle Estuary . F |
| River (other than those specified) . 3 | Biscayne Estuary G |
| Bay (other than those specified) . 4 | Whitewater Estuary H |
| Other (SPECIFY) 5 | Sarasota/Tampa Bay Estuary J |
| Narragansett/Buzzards Estuary . . . A | Mobile Estuary K |
| Long Island Estuary B | Atchafalaya Estuary L |
| Hudson/Raritan Estuary C | Galveston Estuary M |
| Delaware Estuary D | San Francisco Estuary . . . N |
| Chesapeake Estuary E | Puget Estuary P |
- (CODE Q. 13 AS "8". GO TO Q. 14.)

13. IF SHORE, CODE "I", GO TO Q. 14. Was that three miles or less from shore, or more than three miles? Three miles or less 1 More than three miles 2

WEST FLORIDA ONLY: 13. IF SHORE, CODE "J", GO TO Q. 14. Was that ten miles or less from shore, or more than ten miles? Ten miles or less 3 More than ten miles 4

14. EXCEPT IN THE FOLLOWING CASES, CODE "88", GO TO Q. 15.

- IF WA, CODE THE WASHINGTON PUNCH CARD AREA.
- IF VA, NC, SC, GA, EFL, WFL, AL, MS, or LA, PC or PR MODE, ASK:

Was most of your boat fishing today within 200 feet of an oil or gas platform, or within 200 feet of an artificial reef? IF YES, ASK: Which? No 01 Near oil/gas platform . 02 Near artificial reef . 03

15. Were you fishing for any particular kinds of fish today? IF YES, ASK: What kinds?

16. Have you been fishing here today primarily with a hook and line? Yes . . . 01 IF NO, ASK: What type of gear have you been using primarily?

- | | | |
|---------------------------|--------------------|----------------------------|
| Dip net, A-frame net . 02 | Seine 05 | Spear 08 |
| Cast net 03 | Trawl 06 | Hand 09 |
| Gill net 04 | Trap 07 | Other (SPECIFY) 10 |

17. 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?

18. IF COMPLETE TRIP, CODE "88.8", GO TO Q. 19. How many additional hours do you expect to shore fish

APPENDIX 1(cont.)

- 19. 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? [DK = 998; REF = 999]
- 20. Not counting today, how many days within the past two months? [DK = 98; REF = 99]
- 21. What is your state and county of residence? **IF COUNTY IS UNKNOWN, ASK:** What city or town do you live in?
- 22. What is the ZIP code of your residence? [FOREIGN COUNTRY = 99997; DK = 99998; REF = 99999]
- 23. Do you live in a private residence, or in some other type of housing such as a dorm, barracks, nursing home or rooming house?

Private residence 1
 Institutional housing unit 2 → (CODE Q. 24 AS "8", GO TO Q. 25.)

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

25. How old were you on your last birthday? [DK = 98; REF = 99]

26. **CODE SEX:** MALE . . . 1 FEMALE . . . 2

27. 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? **IF PHONE IS REFUSED, ASK:** -May I have an address?

RECORD NAME AND PHONE NUMBER OR ADDRESS; ENTER ONE OF THE FOLLOWING CODES AT Q. 27:
 PROVIDED PHONE NUMBER . . . 1 PROVIDED ADDRESS 2 REFUSED BOTH 9

28. Did you catch any fish while you were (SPECIFY MODE) fishing today that I might be able to look at?

Yes . . 1 NOTE: MUST HAVE AT LEAST ONE TYPE 3 RECORD.
 No . . 2 → (CODE Qs. 29-31 AS "8" OR "88", GO TO Q. 32. NOTE: NO TYPE 3 OR 4 RECORDS.)
 3 → FISH DESCRIBED ON ANOTHER PERSON'S FORM. CODE Qs. 29-31 AS "8" OR "88", GO TO Q. 32.
 NOTE: MUST HAVE A TYPE 4 RECORD.

29. Did you catch these yourself or did someone else catch some of them?

All caught by fisherman . . 1 → (CODE Qs. 30-31 AS "8" OR "88", GO TO Q. 32.)
 Other contributors 2

30. Can you separate out your individual catch?

Yes . . 1 → (CODE Q. 31 AS "88", GO TO Q. 32.)
 No . . 2

31. How many fishermen including yourself have their catch here? Please don't include anyone who did not catch anything. Only count those people who have their catch here.

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

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

DISPOSITION CODES FOR Qs. 32 and 33

Thrown back alive 1	Sold/Plan to sell 5
Thrown back dead/Plan to throw away . 2	Plan to use for some other purpose (SPECIFY)
Eaten/Plan to eat 3	(e.g., cat food, fertilizer) 6
Used for bait/Plan to use for bait . 4	Other/None of the above (SPECIFY) 7

34. **TYPE 4 RECORD. CATCH ON ANOTHER PERSON'S FORM. IF AVAILABLE CATCH FOR THIS FISHERMAN HAS BEEN RECORDED ON ANOTHER FISHERMAN'S FORM, COMPLETE THE TYPE 4 RECORD. THE DATA IS FROM Qs. 3 - 5 ON THE OTHER FISHERMAN'S FORM.**

35. **NUMBER OF TYPE 2 RECORDS: ENTER NUMBER OF LINES FILLED OUT FOR CATCH UNAVAILABLE FOR INSPECTION.**
 36. **NUMBER OF TYPE 3 RECORDS: ENTER NUMBER OF LINES FILLED OUT FOR CATCH AVAILABLE FOR INSPECTION.**
 37. **IS THERE A TYPE 4 RECORD? YES . . . 1 NO . . . 0**

APPENDIX 2.

1988 FINFISH INTERCEPT CODING FORM (Rev. 12/87)

MFI Job # J545

IF SHORT FORM, CHECK

1. Record Type 2. Form Type (1-2)

3. Interviewer Code: (3-6)

4. Yr/Mo/Day: (7-12)

5. Interview No. (13-14)

6. Hour: (15-18)

7. State: (19-20)

8. County: (21-23)

9. Site: (24-27)

10. Interview Status: (28)

19. Days in Past 12 Months? (25-27)

20. Days in Past 2 Months? (28-29)

21. Residence

State (30-31)

County or City (32-34)

22. ZIP Code? (35-39)

23. Type of Residence? (40)

24. Has Phone? (41)

25. Age? (42-43)

26. Sex: (44)

11. Fishing From Which Mode? (29)

12. Type of Water Fished In? (30)

13. Three Mile Limit? (31)

14. Oil, Gas or Reef?/WA Area: (32-33)

15. Target Species?

27. _____

Phone/Address Provided (45)

(34-43)

28. Were Fish Caught to Look At? (46)

29. Is Catch Mixed? (47)

30. Can Separate Catch? (48)

31. Number Who Caught Fish? (49-50)

(44-53)

32. UNAVAILABLE CATCH } SEE BACK OF FORM

33. AVAILABLE CATCH }

Card 0, Dup 2-14

34. TYPE 4 RECORD → SEE BELOW

16. Gear? (15-16)

17. Time Fishing? (17-20)

18. Additional Hours? (21-24)

35. Number of Type 2 Records: (51-52)

36. Number of Type 3 Records: (53-55)

37. Type 4 Record? (56)

Card 4 (1) Dup 2-14 (15)

34. Type 4 Record 4

Interviewer Code

Yr/Mo/Day

Interview No. (26)

APPENDIX 2.

1988 FINFISH INTERCEPT CODING FORM (Rev. 12/87)

MFI Job # J545

IF SHORT FORM, CHECK

1. Record Type 2. Form Type (1-2)

3. Interviewer Code: (3-6)

4. Yr/Mo/Day: (7-12)

5. Interview No. (13-14)

6. Hour: (15-18)

7. State: (19-20)

8. County: (21-23)

9. Site: (24-27)

10. Interview Status: (28)

19. Days in Past 12 Months? (25-27)

20. Days in Past 2 Months? (28-29)

21. Residence

State (30-31)

County or City (32-34)

22. ZIP Code? (35-39)

23. Type of Residence? (40)

24. Has Phone? (41)

25. Age? (42-43)

26. Sex: (44)

27. _____

Phone/Address Provided (45)

11. Fishing From Which Mode? (29)

12. Type of Water Fished In? (30)

13. Three Mile Limit? (31)

14. Oil, Gas or Reef/WA Area: (32-33)

15. Target Species?

28. Were Fish Caught to Look At? (46)

29. Is Catch Mixed? (47)

30. Can Separate Catch? (48)

31. Number Who Caught Fish? (49-50)

(34-43)

(44-53)

Card 0, Dup 2-14

32. UNAVAILABLE CATCH } SEE BACK OF FORM

33. AVAILABLE CATCH }

34. TYPE 4 RECORD → SEE BELOW

16. Gear? (15-16)

17. Time Fishing? (17-20)

18. Additional Hours? (21-24)

35. Number of Type 2 Records: (51-52)

36. Number of Type 3 Records: (53-55)

37. Type 4 Record? (56)

Card 4 (1) Dup 2-14 (15)

34. Type 4 Record (26)

Interviewer Code Yr/Mo/Day Interview No.

APPENDIX 4.

SALTWATER LICENSE OPINION POLL

PR and SH MODE only

10. Are you aware that a saltwater fisheries license has been proposed by a blue ribbon committee of concerned anglers?

Answer Yes No

If NO, explain it to them, give a brief account of the license and potential benefits, then continue with the following questions;

20. Do you support the proposed saltwater fisheries license?

Answer Yes No Undecided

30. What is the main reason (only one answer) that you do/don't support it?

Answer Put down what the angler tells you but if the answer seems ambiguous or too broad. try to pin him down to one short statement. Example if he says we already have enough taxes ask do you think 10.50 is too high or do you think any amount too high.

**PART II: SURVEY OF SOUTH
CAROLINA'S
RECREATIONAL SHELLFISH FISHERY.**

ACKNOWLEDGEMENTS

Special thanks go to Bill Oldland and Greg Aikens for their efforts during the on-site shellfish survey. Sean Blacklocke processed most of the data.

INTRODUCTION

During January - March 1988, a pilot recreational shellfish survey was conducted to obtain baseline information on harvest, effort, residency of participants and perceived quality of the shellfish beds. This was the first attempt to gather such information since Moore et. al. (1984) survey of the 1980/81 season. A more thorough survey was conducted during the 1988/89 shellfish season (Oct, 1988 - April, 1989). The purposes of the latter survey included collection of socio-economic data, boat length and county of boat registration information.

METHODOLOGY

During the pilot survey in January - March 1988, harvest and effort data were obtained from recreational shellfish gatherers at 11 access sites. These sites provided potential access to 24 state and public shellfish grounds.

The follow-up survey began in October, 1988 and continued through April, 1989. Creel clerks intercepted recreational shellfish gatherers at 9 public boat landings in coastal South Carolina as they were returning from the shellfish grounds. A

small number of interviews were also obtained from three additional sites as part of other Division activities. In both surveys, creel clerks were stationed at boat landings around the time of low tide and remained for two to three hours questioning fishermen. Fishermen were asked to voluntarily provide information on shellfishing location, types of shellfish taken, quantity gathered, trip duration, numbers in their party, previous shellfishing trips, and residency. In addition, the 1988 survey collected information on the perceived quality of the shellfish grounds and the 1988/89 effort collected information on boat length, county of boat registration, and baseline socio-economic data (see Appendix 1 for 1988 Survey Instrument and Appendix 2 for 1988/89 Survey Instrument). One bushel was considered equivalent to two five gallon buckets of shellfish. Mileage traveled to access sites was estimated, using state highway maps, as a direct line from the respondents' city of residence to the access site, therefore figures should be considered conservative.

RESULTS AND DISCUSSION

Pilot Survey (Jan-Mar, 1988)

Sampling effort was distributed equally between the northern, central and southern parts of the state (Table 1); however, during February the northern area was closed to shellfishing due to red tide and sampling was suspended in that area. A total of 44 sampling assignments were completed (11 in the northern district, 19 in the central

Table 1. Access sites sampled during January - March 1988.

District	Access Site	No. Interviews	Shellfish Beds
Northern	Murrells Inlet Ramp	46	Main Creek SSG Allston Cr. POG Clam Bank Landing SSG Clam Bank Flats POG Jones Cr. SSG
	South Island Ferry	2	
Central	Wild Dunes Ramp	3	Santee Pass SSG
	Breach Inlet Ramp	28	Hamlin Cr. POG Swinton Cr. SSG
	Folly River Ramp	204	Folly R. SSG + POG Green Cr. POG Cole Cr. SSG Kiawah R. SSG
Southern	Limehouse Ramp	2	
	C.C. Haigh	11	Mackay/Jarvis Cr. SSG
	All Joy	19	Last End Point POG Bull Cr/ May R. POG Bull Cr. POG
	E.C. Glenn	2	Chechessee Bluff POG
	Broad R.	1	Chechessee R. SSG Broad R. SSG Broad R./Habersham Cr. SSG Marsh Is. SSG
	Russ Pt. Landing	16	Old House Cr. SSG Johnson Cr. SSG

district and 14 in the southern part of the state).

A total of 334 interviews representing 367 recreational shellfishermen were collected. Although the survey was directed at recreational pursuits, 8 additional interviews were obtained from commercial shellfish harvesters. Three of the eight were clamming on state shellfish grounds by permit. They accounted for 9.8 bu. of clams and expended 10.5 hours of effort. Commercial interviews were excluded from all other analyses.

The vast majority intercepted (92%) named shellfishing as the primary purpose for their outing that day. Those primarily after oysters accounted for 69.7% of the interviews, clams 6.3%, and any shellfish (oysters and clams) 24.0 %. Individuals that had gathered shellfish incidental to other activities listed joy riding/boating (3.9%), fishing (3.6%) and hunting (0.5%) as their primary activity for that day.

Intercepted shellfish gatherers (91%) listed public or state shellfish grounds as the primary location where shellfish had been harvested. Approximately 6.0% said they had not been on state or public grounds and 3.9% said they didn't know if the area was a public/state ground.

During the 3 month period of the survey, 367 shellfishermen harvested 318.3 bu of oysters and 20.3 bu of clams, expending 662.3 man/hr of effort in 152 trips. This represented an average oyster harvest of 0.48 bu per man/hr; 0.87 bu per person per day and 2.09 bu per trip. Trip represents a group effort.

Bushels per trip can mean bushels per boat or bushels per group if no boat was used. The average time spent collecting shellfish per trip was 1.9 hours. The average number of people engaged in shellfishing was 2.4 people per trip. The average recreational clam harvest was 0.03 bu per man/hr; 0.06 bu per person per day and 0.13 bu per trip. Many of the clams harvested (about 64%) were taken incidental to oyster gathering. A total of 20 people specifically sought clams as the primary purpose of their trip. These individuals collected 7.3 bu of clams in 32.5 man hr. Average harvest rates for this group was 0.22 bu man/hr, 0.37 bu per person per day, and 0.73 bu per trip.

Approximately 87% of the interviews were obtained from recreational shellfishermen harvesting oysters and clams from sites accessible by boat only and 13% from grounds accessible by foot. Three hundred and sixteen (316) boaters accounted for 289.9 bu of oysters and 16.1 bu of clams, while those on foot harvested 28.4 bu of oysters and 4.2 bu of clams. Harvest rates for these two groups were:

	Boaters	Non Boaters
Oysters		
Bu/man/hr.	0.49	0.40
Bu/person/da.	0.92	0.56
Bu/trip	2.23	1.29
Clams		
Bu/man/hr	0.03	0.06
Bu/person/da	0.05	0.08
Bu/trip	0.12	0.19

The Folly River ramp was the only site at which enough interviews were made to allow a

close comparison between the two modes in the same area. Shellfishermen utilizing the walk-on shellfish ground (Folly River POG) harvested 23.5 bu of oysters and 1.1 bu of clams in 40.5 man hours and 12 trips, while boaters using the Folly River SSG, Green Cr. POG, Cole Cr. (SSG) and adjacent grounds collected 199.9 bu of oysters and 7.2 bu of clams in 377.1 man hr and 81 trips. Harvest rates for these two groups in these areas were:

	Boaters	Non Boaters
Oysters		
Bu/man/hr.	0.53	0.58
Bu/person/da.	0.99	0.71
Bu/trip	2.47	1.96
Clams		
Bu/man/hr.	0.02	0.03
Bu/person/da.	0.04	0.03
Bu. per trip	0.09	0.09

Statewide, most of the fishermen interviewed assigned the quality of the shellfish and shellfish grounds an average or middle rating in terms of the size and numbers of oysters (Figs 1 and 2). The Murrells Inlet area received the poorest ratings; oysters here were ranked very low in both size and numbers available. The central part of the state received the best ratings. Nineteen percent (19%) rated oysters as very abundant and 21% said their oysters were large to extra large. The southern area had mixed ratings between low and average. Many people believed that oysters had not rebounded from 1986-87 die offs.

Ninety-seven percent (97%) of those interviewed were state residents, with 3% out-of-state participation. Most residents

lived in coastal counties (i.e. Horry, Williamsburg, Georgetown, Charleston, Dorchester, Berkley, Colleton, Beaufort, Jasper). Only 5% of those interviewed were non-coastal residents (Table 2). This is in marked contrast to the 21% non-coastal resident participation reported by Moore et al. (1984) for the 1980-81 season. Ninety-eight percent (98%) of those interviewed were males and 2% females.

The average number of shellfishing trips reportedly taken during the 1986-87 season was 3 trips. Prior to being interviewed in the January - March period, respondents reported having averaged two trips already that season. Moore et al. (1984) found that the average number of trips taken during the 1980-81 season was 5 trips.

Follow-up Survey (October, 1988 - April, 1989)

A total of 52 field assignments were completed during the 1988/89 shellfish season, resulting in the collection of 498 shellfishing interviews (487 recreational and 11 commercial interviews). All commercial fishermen were at the Folly River landing. They accounted for 19.5 bu. of oysters and expended 14 man/hrs. of effort. Commercial interviews were dropped from further analyses. Most of the assignments (37) and interviews (430) were concentrated in Charleston County (Table 3), especially at the Folly River site. The Folly River site is the most heavily used public site for shellfishing in the state. Statewide, the average number of interviews collected per day was 9.3, while the Folly River site

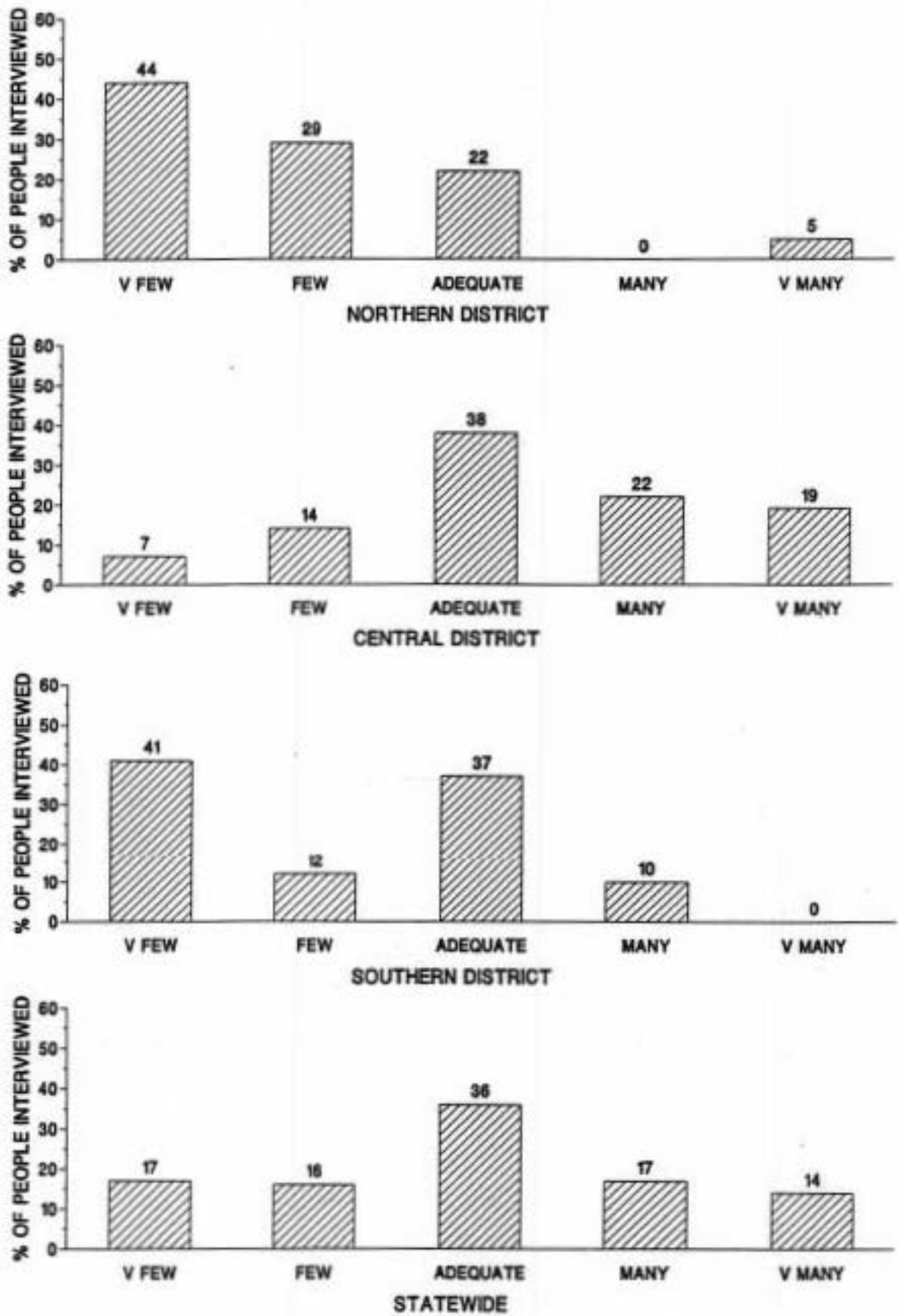
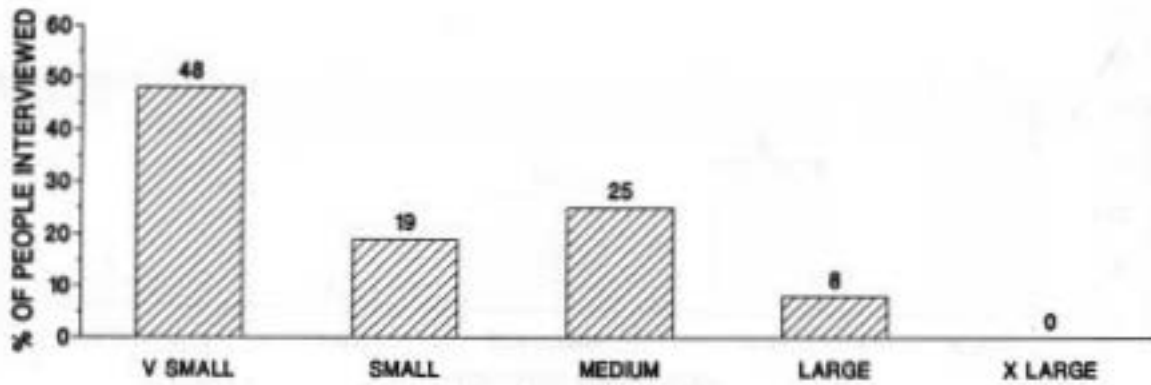
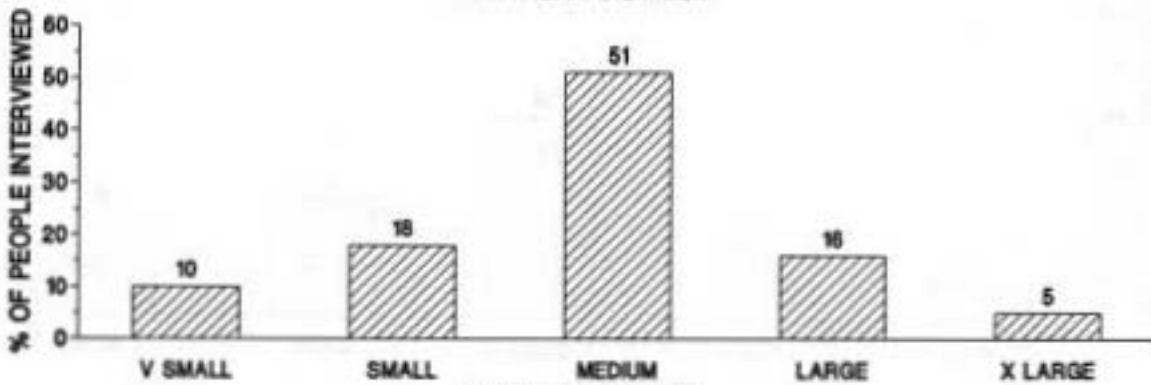


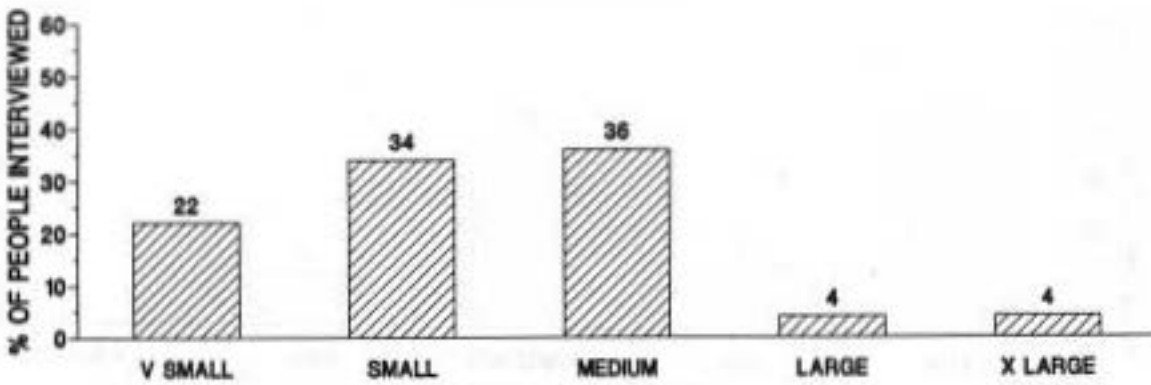
Figure 1. NUMBERS OF OYSTERS AVAILABLE BY AREA



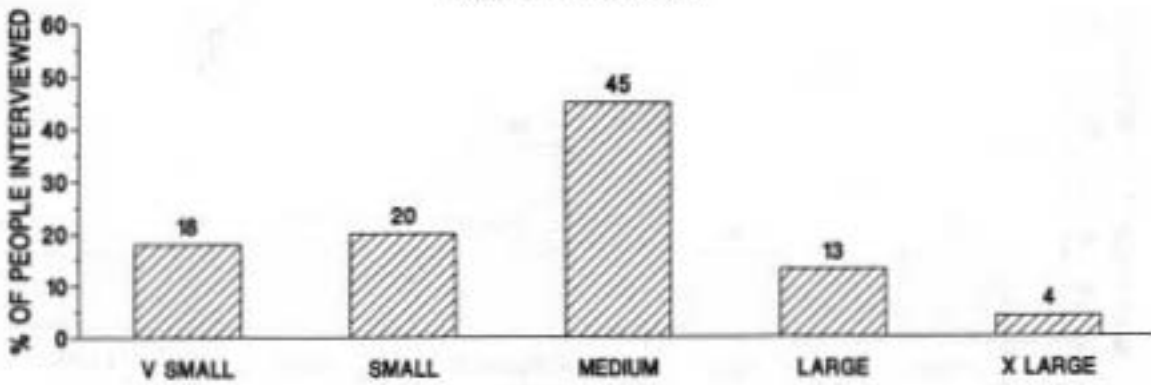
NORTHERN DISTRICT



CENTRAL DISTRICT



SOUTHERN DISTRICT



STATEWIDE

Figure 2. SIZE OF OYSTERS AVAILABLE BY AREA

Table 2. County of residence of shellfish gatherers sampled in the Northern, Central and Southern parts of South Carolina during Jan-Mar 1988.

County	Northern	Central	Southern
Horry	26	1	
Georgetown	12		
Greenville	1	2	
Chesterfield	1		
Florence	2		
Darlington	1		
Williamsburg	1		
Charleston		194	
Berkley		17	
Dorchester		15	
Lexington		1	
Orangeburg		1	1
Colleton		1	
Beaufort			37
Jasper			3
Richland			2
Aiken			2
Bamberg			1

Table 3. Number of assignments and interviews collected by boat landing during the 1988/89 shellfish survey.

Landing	Assignments (No.)	Boat	Interviews (No.)	
			Foot	Commercial
<u>Beaufort County</u>				
All Joy	1	16		
Broad River	1	1		
C.C. Haigh	2	2	3	
E.C. Glenn	1	3		
Russ Point	3	22	5	
Station Cr.	4	11		
<u>Charleston County</u>				
Breach Inlet	9	36		
Moore's	0	2		
Cherry Pt.	0	4		
Folly River	28	333	43	11
Wild Dunes	0	1		
<u>Georgetown County</u>				
Murrell's In.	3	5		

Total	52	436	51	11

averaged 13.8 interviews per day. This site also hosts an extensive shellfish area accessible by foot, which makes it attractive to participants without boats.

Most (92.5%) of those interviewed listed shellfishing as the primary activity of the day. Fishermen primarily after oysters accounted for 77.2%, clams 2.3% and shellfish in general (oysters and/or clams) 13.0%. Other activities included fishing (5.8%), joy riding/boating (1.3%) and hunting (0.4%). Most shellfish gatherers (94.4%) were on one-day excursions. A very small portion (3.6%) were staying on the coast on overnight trips. This small group listed shellfishing (55.6%), visiting friends or relatives (33.3%) and vacationing (11.1%) as the primary reason for being in the area. Within this group only two people (11.1%) had spent money on overnight lodging. All others were staying with relatives or friends. The average distance traveled by fishermen was estimated to be 22.9 miles. Distance traveled ranged from 1 to 363 miles, with most (89.1%) traveling 30 miles or less (Fig 3).

Over ninety-eight percent (98.6%) of those interviewed were state residents, with 1.4% out-of-state participation. Most residents lived in the coastal counties, while only 6.3% were non-coastal residents. Most boat owners (93.4%) harvesting shellfish listed coastal counties as the address for their boat registrations. Three boats (1.5%) were registered out-of-state (Table 4). Recreational shellfish gatherers used boats that ranged from 11 to 21 feet (Fig

4), with most (89.8%) measuring 16 feet or less.

The majority (94%) were males, with only six percent female participation. The modal age group was between 30-39 years (Fig 5), while 3.5% of the participants were greater than 70 years of age.

A total of 487 interviews representing 502 recreational shellfishermen were collected. Participants harvested 530 bu. of oysters and 20.7 bu. of clams, expending 886.7 man/hrs. in 224 trips. This represents an average oyster harvest of 0.74 bu./man/hr., 1.07 bu./man/day, and 2.43 bu./trip. The possession limit for oysters in South Carolina is 2 bu./man/day. The average recreational clam harvest for this period was 0.15 bu./man/hr., 0.24 bu./man/day and 0.43 bu./trip. Most of the clams harvested (86%), were taken incidental to oyster gathering. Participants targeting clams (8) collected 2.9 bu. of clams in 14 man/hr. Average harvest rates for clam gatherers were 0.23 bu./man/hr., 0.35 bu./man/day and 0.58 bu./trip. These values are well below the legal possession limit 0.5 bu./man/day. Typically, shellfish harvesters do not work alone. The average number of participants per boat was 2.3 people, while walk-on participants averaged 1.9 people per party. The average time spent gathering shellfish was 1.8 hrs./trip for boaters and 1.2 hrs./trip for non-boaters.

The average number of shellfishing trips made during the last season (1987/88) was slightly less than three (2.9) per season. Over forty-eight percent (48.1%) said then did

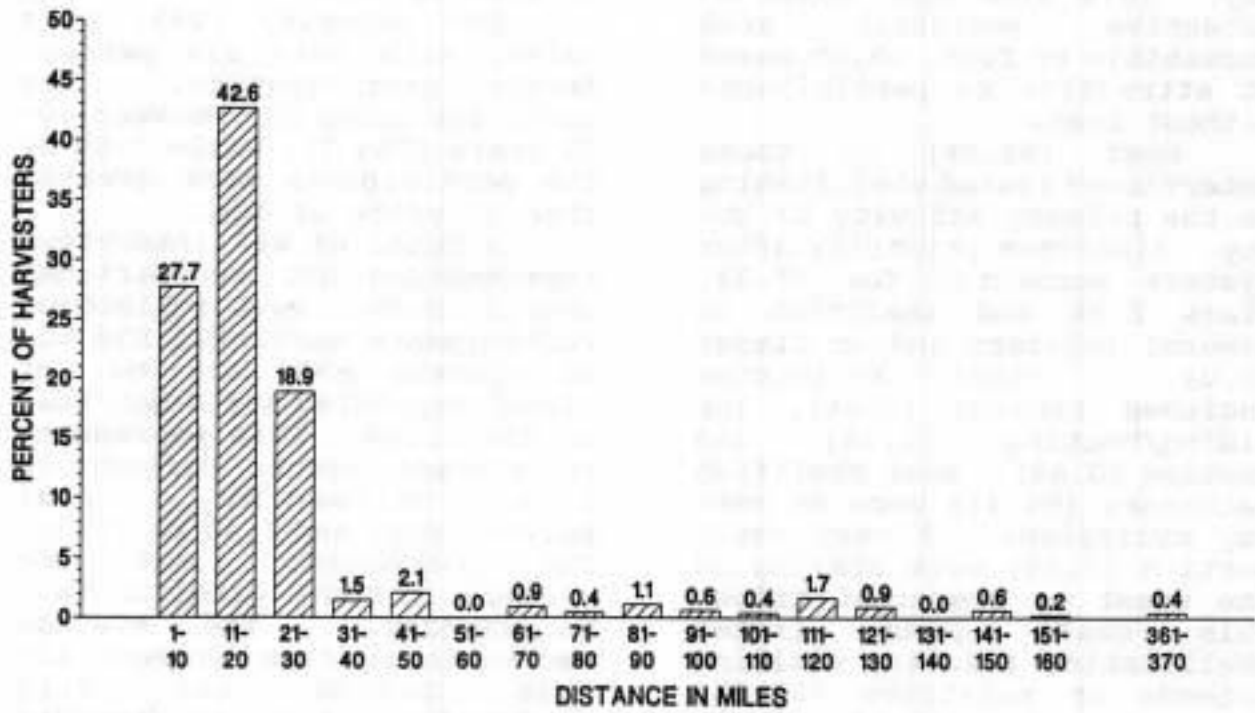


Figure 3. ESTIMATED DISTANCE TRAVELED BY RECREATIONAL SHELLFISH HARVESTERS

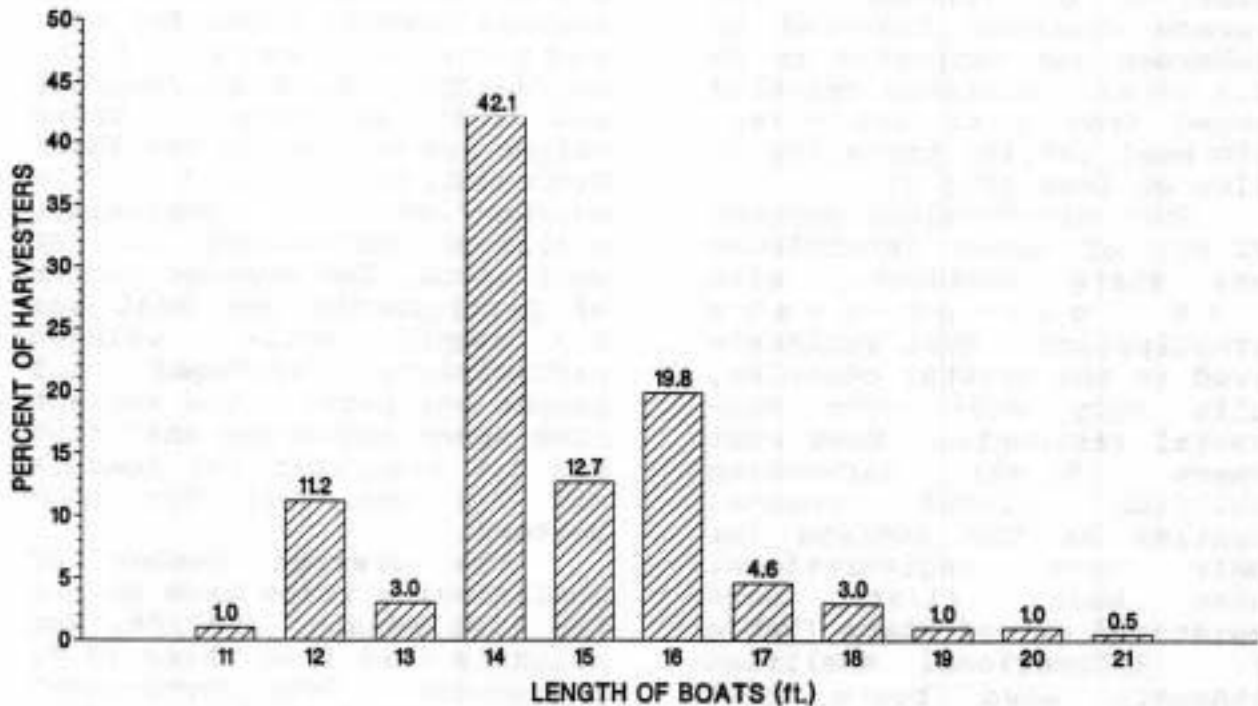


Figure 4. LENGTHS OF BOATS USED BY RECREATIONAL SHELLFISH HARVESTERS

Table 4. Numbers of registered boats by county of registration and county of the boat landing used.

County of Registration	County of Boat Landing			Total
	Beaufort	Charleston	Georgetown	
<u>Coastal Counties</u>				
Berkeley		19		19
Beaufort	12			12
Charleston		135		135
Dorchester		10		10
Georgetown			1	1
Hampton	1			1
Horry		1	2	3
Jasper	1			1

				182
<u>Non-Coastal Counties</u>				
Bamberg	1			1
Chesterfield		1		1
Lexington		2		2
Orangeburg	2	1		3
Pickens		1		1
Saluda	1			1
Sumter		1		1

				10
<u>Out-of-State</u>	1 (GA)	2 (TN, NC)		3
<u>Unknown</u>	6	23		29
<hr/>				
Total	25	196	3	224

not go shellfishing at all during the 87/88 season, while 6% claimed to have gone over 10 times (Fig 6).

The Folly River site yielded enough interviews to afford a close comparison between walk-on and boat harvesters from the same general area. The Folly River POG is routinely replanted by the Division's oyster relay program. Prior to the 1988/89 season, approximately 3,100 bu. of oysters were placed in this area (B. Hens, pers. comm.¹). The Folly ground receives heavy pressure due to it's proximity to the Charleston Metropolitan area. It is the only recreational shellfish ground in Charleston County that can be reached without the use of a boat. One difference between this site and other sites is that most walk-on shellfish gatherers continually concentrate their effort in a relatively restricted space. Boat harvesters can move in search of larger quantities or bigger oysters. Shellfishermen utilizing the Folly walk-on ground harvested 34.9 bu. of oysters and 1.3 bu. of clams in 55.4 man/hrs and 23 trips. Boaters utilizing Folly River SSG, Green Cr. POG, Cole Cr. SSG and adjacent grounds harvested 389.9 bu. of oysters and 12.9 bu. of clams in 623.4 man/hr and 152 trips. Listed below are harvest rates comparing the Folly walk-on ground to other grounds in the Folly area accessible only by boat:

	Folly Boaters	Folly Walk-On
Oysters		
Bu./man/hr.	0.78	0.71
Bu./man/day	1.17	0.81
Bu./trip	2.58	1.66

Clams		
Bu./man/hr.	0.15	0.10
Bu./man/day	0.25	0.12
Bu./trip	0.50	0.16

Slight differences can be detected in harvest rates between walk-on and boat harvesters. Boaters appeared to be more successful at harvesting both oysters and clams. T-test's comparing the harvest rates for oysters showed no significant difference ($t_{\text{approx.}} = 0.6520$ $df = 31.7$) in bushels per man per hour taken by boaters versus walk-on participants at Folly. There were, however, significant differences found when bu./man/day ($t_{\text{approx.}} = 3.0661$ $df = 28.7$) and bu./trip ($t_{\text{approx.}} = 3.0980$ $df = 31.7$) were compared between boaters and walk-on participants. Because variances were unequal, an approximate t value (SAS, 1979) was used for comparisons. As noted above, boaters averaged more time on shellfish grounds and more participants per trip than walk-on participants. These factors may partly explain the differences found in daily and trip harvest rates. These findings suggest that, at present replanting levels, the oyster relay program is only making a minimum impact.

Overview

Comparisons between seasons are difficult to make due to the different survey methodologies that were employed and the time frame. However some of the more comparable values are given in Table 5. Current harvest rates and effort (trips last season) appear to be lower than reported for the 1980/81

Figure 5. AGE DISTRIBUTION OF RECREATIONAL SHELLFISH HARVESTERS DURING THE 1987/88 SEASON

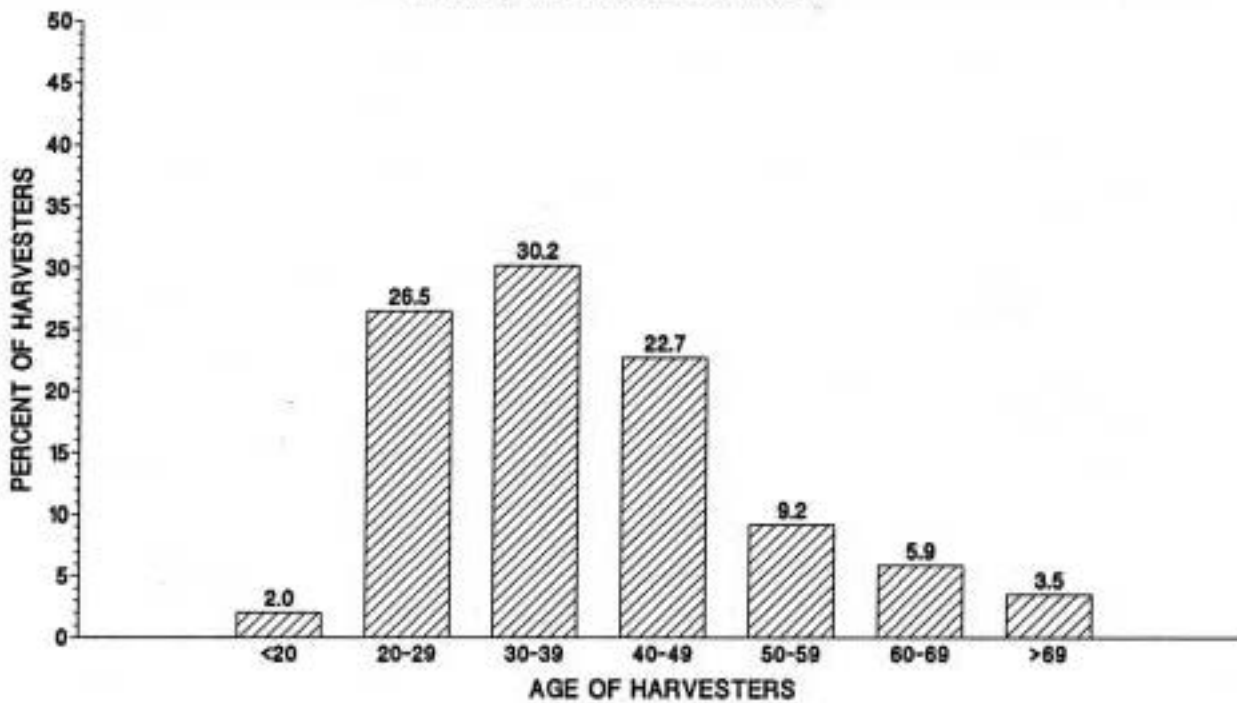


Figure 6. NUMBER OF SHELLFISHING TRIPS MADE DURING THE 1987/88 SEASON

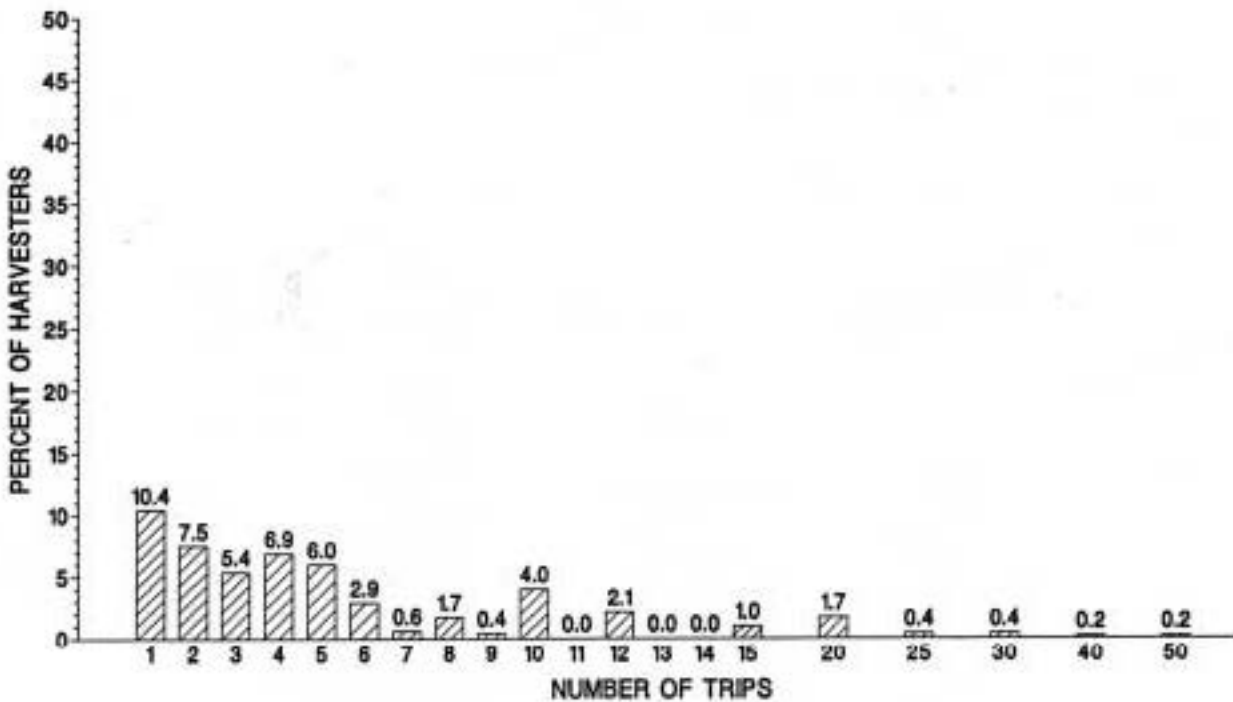


Table 5. Summary of Shellfish Survey Results.

	1980/81 Season	1986/87 Season	1988 Jan-Mar	1988/89 Season
<u>Harvest rate Bu./man/day</u> (Boaters only)				
Oysters	1.5	----	.92	1.10
Clams	0.3	----	.05	0.26
<u>Residency of Participants</u>				
% Coastal	78	----	92	92.3
% Non-Coastal	22	----	5	6.3
% Out-Of-State	--	----	3	1.4
<u>Effort</u>				
Mean Shellfish Trips/Season	5	3	2.9	----
Not using State or Public grounds (%)	53	----	6.0	----
<u>Perceived Quality</u> (Modal Responses)				
<u>Oyster Size</u>				
Statewide	Average	-	Adequate (average)	-
Northern	-----	-	Very Small	-
Central	-----	-	Adequate (average)	-
Southern	-----	-	Adequate (average)	-
<u>Numbers Available</u>				
Statewide	-----	-	Adequate (average)	-
Northern	-----	-	Very Few	-
Central	-----	-	Adequate (average)	-
Southern	-----	-	Very Few	-

season. The residency of participants has also changed, becoming almost exclusively coastal.

Information suggests that recreational shellfishing is not making a significant impact on the local economy. Most shellfish harvesters use access sites close to their primary residence, making one-day trips and spending little money for lodging. Additional data are needed to identify expenditures and provide an estimated value for a day of recreational shellfishing.

Preliminary information obtained at the Folly River site suggests that the oyster relay program is making only a minor impact at that site. Specific information is needed for this site and other areas of enhancement to correlate harvest rates and patterns of effort with replanting efforts.

The survey methodology used in these studies had one serious limitation. Although harvest rates and effort (last seasons) can be estimated from on-site creel surveys, participation can not be estimated. It is strongly suggested that a more comprehensive recreational shellfish survey be undertaken, utilizing a combined approach (mail-out and intercept surveys) to obtain catch, effort and participation estimates. This survey should be similar and comparable to Moore et al. (1984); however, the mail-out should be stratified by county of boat registration and boat length. The study should also include an on-site intercept survey to obtain harvest rates.

FOOTNOTES

¹Hens, B. Recreational Shellfish Section, South Carolina Wildlife and Marine Resources Department, Charleston, S.C.

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- Moore, C. J., H. Mills and D. Cupka. 1984. Recreational Shellfish Gathering in South Carolina 1980-1981. S.C. Mar. Res. Ctr. Tech. Rpt. No. 37.
- SAS. 1979. SAS User's Guide, 1979 Edition. SAS Institute Inc. Cary, N.C. 494 pp.

APPENDIX 1.

SHELLFISH SURVEY FORM (1988)
Group Interview

Name: _____

Date: _____

Site: _____

Time: _____

Mode: Boat _____ Foot _____

What was the primary purpose of your trip today _____

Did you gather oysters for recreational _____ or commercial _____ purposes

Did you gather shellfish from a public shellfish ground Yes ___ No ___ Dn't Know ___

Where did you gather most of the shellfish _____

How. Collecting Shellfish _____

Estimated time spent gathering shellfish (nearest 1/2 hr) _____

Quantity: Oysters _____ bu.

Clams _____ bu.

Individual Interview

Consecutive Intv. No. ----- ----- ----- ----- -----

Previous trips
This season ----- ----- ----- ----- -----

86-87 season ----- ----- ----- ----- -----

On a scale of 1 to 5 how would you rate the size and numbers on the shellfish bed you used today?

	Size	#s	Size	#s	Size	#s	Size	#s	Size	#s
V Small/V Few	1	1	1	1	1	1	1	1	1	1
Small/Few	2	2	2	2	2	2	2	2	2	2
Medium/Adequate	3	3	3	3	3	3	3	3	3	3
Large/Many	4	4	4	4	4	4	4	4	4	4
X Large/V Many	5	5	5	5	5	5	5	5	5	5

State/County of Residence _____/_____ _____/_____ _____/_____ _____/_____ _____/_____

Sex _____ _____ _____ _____ _____

Comments/Ramp Trailer Count:

SHELLFISH FORM (1988-89)

Interviewer Code: (1-4)
 Yr/Mo/Day: (5-10)
 Interview No: (11-12)
 County: (13-15)
 Site: (16-19)
 Type: (20)(Office Use)

Oysters...1 Clams...
 Fishing...6
 Shellfishing(general)
 Boating...3 Hunting
 Other...5

Mode: Boat...1 Foot...2 (21)
 Primary purpose of trip: _____ (22-23)
 Recreational or Commercial use: _____ (24) Rec...1 Com...
 Location where most were gathered: _____ (25-28)

Time Gathering Shellfish: (29-31)
 No. People Participating: (32-33)

Quantity: Oysters bu. (34-36)
 Clams bu. (37-39)

Length of Boat: (40-41)
 County of Boat registration: (42-43)

Individual Interview

Previous Trips this Season (44-45)

87-88 Season (46-47)

Residency State (48-49)

City/Town _____ (50-59)

What is the Primary Purpose of your trip away from home?
 _____ (60-69)

Did you stay overnight or one day trip? Oversight...1 One-day...2
 (70)

If overnight Ask. Did you spend money for lodging or camping? Yes...1 No...2
 (71)

Age (72-73)
 Sex (74)