

SOUTH CAROLINA MARINE RECREATIONAL FISHERY SURVEYS, 1985 AND 1986

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## ABSTRACT

Three surveys of marine recreational fishermen were conducted during June 1985 - June 1986. These were: 1) a coastal tackle shop questionnaire survey (June-December 1985), 2) a public launching ramp creel census (June 1985 - May 1986), and 3) a public launching ramp drop-box survey (November 1985 - June 1986).

Results from the tackle shop questionnaire provided information on fishing modes and activities, boat and access site utilization, reactions to licensing of marine recreational fishermen, and constituency perceptions of problems associated with marine sport fishing. The sampled population consisted mostly of local coastal residents, who were more strongly oriented to inshore fishing from small private boats than the statewide marine angling population appears to be. The response in favor of the adoption of a marine recreational fishing license was four-to-one, provided that the receipts are used exclusively to support marine recreational fishing. Principal problems identified with marine sport fishing included lack of or poor public boat access, commercial fishing, lack of management, gillnetting, and pollution.

Results from the on-site surveys furnished data on species preference, catch, catch rates (CPUE), length composition of red drum and spotted seatrout catches, and site utilization. Site usage peaked during May-November, with weekends being more popular than weekdays. Most fishermen returned during the afternoon. Rod-and-reel fishing, crabbing, and shrimping were popular activities, although most shrimping appeared to be done with cast nets to provide bait for fishing. Red drum was the most preferred species statewide, followed by spotted seatrout and flounders. These species and spot were the most abundant components of the statewide catch, although there were substantial differences by season and area. Catch rates were generally low (averaging less than five fish per angler per trip overall), with a high percentage of trips with no fish caught in the central and southern districts. Comparison of catch estimates from the Division survey data with those prepared by the National Marine Fisheries Service suggested that about half of the statewide private boat marine catch was taken at the landings surveyed (for inshore species).

Both on-site surveys encountered serious problems unique to the method employed. Voluntary response rates to the drop-box survey in the northern district were very low and there was a prohibitive level of box vandalism there. Response rates were satisfactory in the central area, but marginal in the southern district, although vandalism was not a limiting factor in either area. Creel survey coverage, as measured by the number of completed trips intercepted, was satisfactory in the northern area in all seasons, was inadequate during fall and winter in the central district, and inadequate during all seasons in the southern area. The scattered distribution and low utilization of public landings in the southern area limits the effectiveness of a roving creel census in that area.

## INTRODUCTION

In South Carolina, approximately 2,876 miles of tidal shoreline and 500,000 acres of tidal bottom are available for recreational use (Bearden 1969, Bearden and McKenzie 1973). Marine fishing is widely diversified (Cupka 1977) (including rod-and-reel angling, gillnetting, gigging or spearing, crabbing, shrimping, and shellfish gathering) and geographically dispersed (in tidal creeks and bays, on the beaches, in coastal and offshore waters, including the Gulf Stream) along the entire coast. Opportunities for access (from shore, bridges, ocean piers, public ramps, private marinas, headboats, etc.) are extensive and utilization of some component of the resources occurs year-round.

Marine recreational fishing is of major social and economic importance in coastal South Carolina. In 1968, an estimated 250,000 anglers fished in marine waters (Bearden 1969) and another survey in 1974 reported that 396,000 residents and 326,000 nonresidents participated in saltwater fishing (Mabrey et al. 1977). During 1979-1985, nearly 8% of all coastal residents (those within 50 miles of the coast) contacted in a telephone survey had gone saltwater fishing within the previous two months (U.S. Department of Commerce 1984, 1985a, 1985b, 1986). Estimated annual participation during 1979-1985 (1984 data excluded) included an average of 208,000 resident and 275,000 nonresident anglers, with an average combined effort of 1.45 million trips. In 1968, an estimated \$15 million was spent directly on marine sport fishing (Bearden 1969), while total (direct and indirect) expenditures in 1980 were calculated at about \$40.3 million (U.S. Department of Interior 1983). The estimate of total expenditures in 1983 was \$187 million (D. Liao, SCWMRD, pers. comm.)

Because the state does not have a marine recreational fishing license, it is difficult and costly to identify the numbers of anglers and percentages of total expenditures associated with each form of fishing activity. Previous surveys by the Marine

Resources Division have been short-term and limited in scope. These studies have either 1) concentrated on a specific activity originating from restricted access points (e.g. ocean pier fishing, Hammond and Cupka 1977; the Arthur Smith King Mackerel Tournament, Moore 1984) or 2) addressed a particular user group from a general population, such as the list of registered boat owners (e.g. offshore sport fishermen, Liao and Cupka 1979a and 1979b; shellfish gatherers, Moore et al. 1984). The first approach has been satisfactory because of the limited scope and confined sampling population. The second technique has not produced particularly reliable results, due to the high probability of bias inherent in a limited, imprecise sampling of an ill-defined population. In the few cases where the population of users has been readily identifiable due to a license (e.g. gillnetters, Moore 1980), the sampling procedure has been more reliable and the results more credible.

National and regional surveys have provided estimates of participation (number of anglers), effort (number of trips), and catch (numbers and weights of species groups) per state, but there typically are large sampling errors associated with these figures because the numbers of anglers contacted are usually very small. National surveys (by the U.S. Fish and Wildlife Service) are done every five years, while regional surveys are conducted every year (since 1979) by the National Marine Fisheries Service (NMFS). The NMFS survey is the most reliable at the state level and is based on telephone interviews of households within 50 miles of the coast and intercept interviews of fishermen at various times and points of access. The accuracy and precision of results from this annual effort would be significantly improved, however, if more data were available regarding access utilization to increase the probability and number of angler intercepts.

Two of the primary responsibilities of the Marine Resources Division are the orderly development of the state's marine resources, including their recreational usage, and the management of these resources for the best interests of the state's citizens. Neither task can be accomplished without detailed knowledge of the extent to which the resources are being exploited and by whom. No comprehensive Division survey has been conducted of inshore marine recreational fishing activity, particularly rod-and-reel fishing by private boat anglers. South Carolina's population is projected to increase 14% between 1980 and 1990 (South Carolina Budget and Control Board 1984), with much of this growth anticipated in the coastal zone. It is likely that some form of resource distribution among competing user groups will become necessary. In order to ensure that such distribution is equitable, the utilization characteristics of each group need to be documented. In order to obtain

These catch and effort data with reliable direct methods such as creel censuses, but at acceptable cost, the necessary surveys must be structured on statistically sound sampling designs (Carlander et al. 1958).

Although the basic management issue to be resolved is who will get what, some biological characteristics of the resources also need to be better described. Because life history studies are tedious and expensive, it is essential to identify those species that are most important to recreational anglers. Because species preference is a most useful survey measure for determining species management, this identification should be based on objective findings rather than circumstantial or anecdotal evidence (Duttweiler 1976). The constituency's perception of problems associated with these resources and their usage must be recognized, so that the proper priorities can be assigned to such research.

During June 1985-June 1986, a comprehensive study of marine recreational fishing in inshore and coastal waters was conducted by the Division. Objectives were to: 1) determine relative participation in marine recreational fishing activities, 2) identify species preferences, 3) document utilization of primary public boat landings, 4) record species composition and catch rates by private boat fishermen, and 5) recognize constituency-identified problems associated with marine recreational fisheries. Three methods were employed: 1) a questionnaire survey in coastal tackle shops, 2) a creel census at public boat ramps, and 3) an on-site (boat ramp) drop box survey. Each activity addressed one or more of the objectives in common and at least one objective uniquely. The purpose for this multiple approach was to permit comparison of results from each method, in order to determine which was best suited (in terms of reliability of data and cost of acquisition) for particular sites and tasks. Division results were evaluated relative to those obtained by the NMFS on-site survey during the same period. This comparative analysis will be used to develop an optimal sampling strategy for estimating catch and effort in the inshore-coastal recreational fishery. Data from these studies, combined with those from life history investigations by the Marine Resources Research Institute, will provide a sound information base for rational management of South Carolina's marine recreational fisheries.

#### METHODS

##### Tackle Shop Questionnaire

This project began in June 1985 and ended in December 1985. Locations were chosen from a recreational fishing news publication (South Carolina Fish Finder Magazine) containing statewide advertisements. Large general merchandisers and shops catering to specific user groups (e.g. pier shops, marine offshore supply houses) were omitted. Sites were included on the basis of 1) location (within

10 miles of the coast), 2) familiarity within the community, 3) willingness to participate, and 4) generalized inventory and sales orientation (i.e., marine directed, but not strongly to any particular segment). At any particular time, about 20 stores were part of the survey, with about six each in the southern (Jasper, Beaufort, and Colleton Counties) and northern (Georgetown and Horry Counties) districts and eight in the more populous central area (Charleston County). Survey boxes were rotated among shops according to owners' reactions and rates of response. A collection box was also placed at the inshore fisheries booth at the annual recreational fishing exposition held at the Marine Resources Center.

At each site, a collection box labeled with instructions was placed in a conspicuous location. Questionnaires were provided on the side of the box and proprietors were asked to encourage customers to complete one. The format is shown in Fig. 1.

#### Creel Census

Seven to nine public launching ramps were designated in each of the three districts (Fig. 2-4). A census clerk was assigned to each district. Distribution of sampling days by month and district is shown in Table 1. Most sampling was conducted between 0800 and 1600; no attempt was made to count trailers or interview anglers between 1800 and 0800. Because recreational fishing effort is sensitive to climatic conditions (Malvestuto et al. 1979), most sampling was done on days of reasonably good weather.

On a scheduled sampling day, the census clerk randomly selected a starting location and time. He counted the boat trailers by state and interviewed any boaters, according to the format shown in Fig. 5, during a visit of approximately 15-20 minutes. He then proceeded to additional landings and repeated the procedure. At the final site, the clerk remained for an indefinite period and interviewed any boaters returning. Throughout the survey, the clerks measured (total length in inches) as many spotted seatrout (*Cynoscion nebulosus*) and red drum (*Sciaenops ocellatus*) as practical.

#### On-Site Drop-Box Survey

A total of 30 sites received collection boxes: five in the northern area, 15 in the central district, and 10 in the southern region. Boxes were provided with instructions on the front and questionnaires (Fig. 6) in a bottom rack. Boaters were requested to complete a card for each trip and deposit it in the box. Boxes were placed at conspicuous points as close to the ramps as practical and were serviced about once a week (during periods of peak usage). In most areas, boxes were in place from late November 1985 through June 1986, although some were removed at intervals for maintenance or relocated to more productive locations. At sites where vandalism was a continual

problem, boxes were permanently removed after two had been tampered with within a three-month period.

Methodology of the NMFS annual survey is described in U.S. Department of Commerce (1986). In South Carolina, there is no sampling during January and February. Estimated values for participation, effort, and catch during this interval are 10% of the totals observed during the remaining 10 months. During March-December, on-site interviewers were assigned to the more heavily-utilized sites, grouped by mode of fishing (beach/bank, charter/headboat, private/rental boat, or manmade structure), during two-month sampling periods (waves). Distribution of interviews by mode and wave was based on empirical data and informed estimates from previous surveys, modified by results from the current survey.

Data analysis for the tackle shop questionnaire survey consisted of simple compilation of responses in the various categories. This applied to most of the data collected from the boat ramp drop-box survey as well. In the latter, some respondents failed to indicate the number of people in their boat who participated in the indicated activity (fishing, crabbing, etc.). Missing observations were regenerated by multiplying the average number of occupants per boat in the indicated size range and activity by the number of nonrespondents. Many individuals engaged in more than one activity during a trip. In these cases, a positive response was noted for each activity checked. The percentages of responses/activity were then calculated by dividing the number of activity responses by the total number of responses received, thus these percentages are not necessarily additive nor mutually exclusive.

Analysis of activity participation in the creel census was similar. Only those boats (intercepts) engaged in recreational activity (including nonconsumptive forms such as water skiing or sightseeing) were included. Government boats were omitted from the tabulations. Commercial fishing boats were treated as a separate category.

Catch-per-unit-of-effort (CPUE) for the on-site drop-box survey, creel census, and NMFS intercept survey was calculated using slightly different methodologies. CPUE from data obtained in the drop-box survey was calculated in two ways. The first (method 1) simply divided the catch of each species by the total number of anglers who reported any fish catch (0 included), regardless of species. This produced underestimates for most species, because most fishermen target one or a few kinds of fish and are unlikely to catch anything else. A reasonable alternative approach (method 2) is to assume that people were fishing for what they caught (Malvestuto 1983) and calculate CPUE for the species by dividing the catch of it by the number of fishermen reporting it. In this application, fishermen reporting no catch were included

1. Which type of saltwater fishing do you do most often (check one)?  
 Bank or bridge       Ocean headboat       Ocean private boat  
 Pier or surf       Ocean charterboat       Inshore private boat
2. If you own a private fishing boat(s), specify size range(s):  
 16 ft or less       17-23 ft       24-31 ft       32 ft or larger
3. Which launching ramp or area do you use most often (specify by name or location) \_\_\_\_\_
4. Which activities do you engage in (check one or more)?  
 Rod-and-reel fishing       Crabbing (traps)       Shrimping (seine)  
 Gillnetting       Giggling (graining)       Shrimping (cast net)
5. Which fish do you fish for most often? \_\_\_\_\_
6. Would you buy a recreational saltwater icense (fishing, shrimping, shellfish, etc.)?  
 Yes, but only if the fee was used to support such activities  
 Yes, regardless of fee's application  
 No      Why no? \_\_\_\_\_
7. What do you think is the biggest problem with saltwater fishing in South Carolina? \_\_\_\_\_

Fig. 1. Questionnaire used in tackle shop collection box survey.



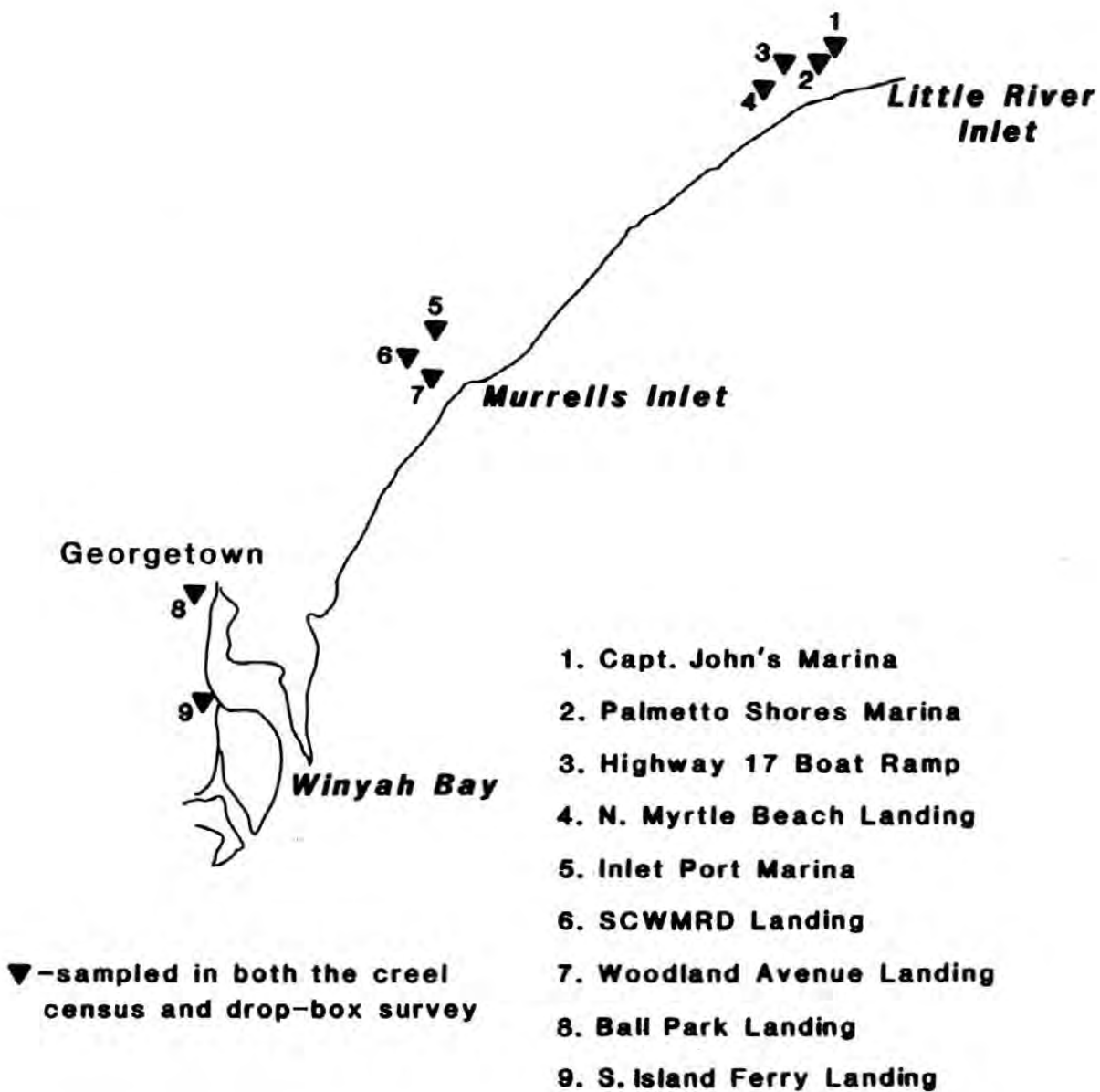


Fig. 2. Boat access sites in the northern district.

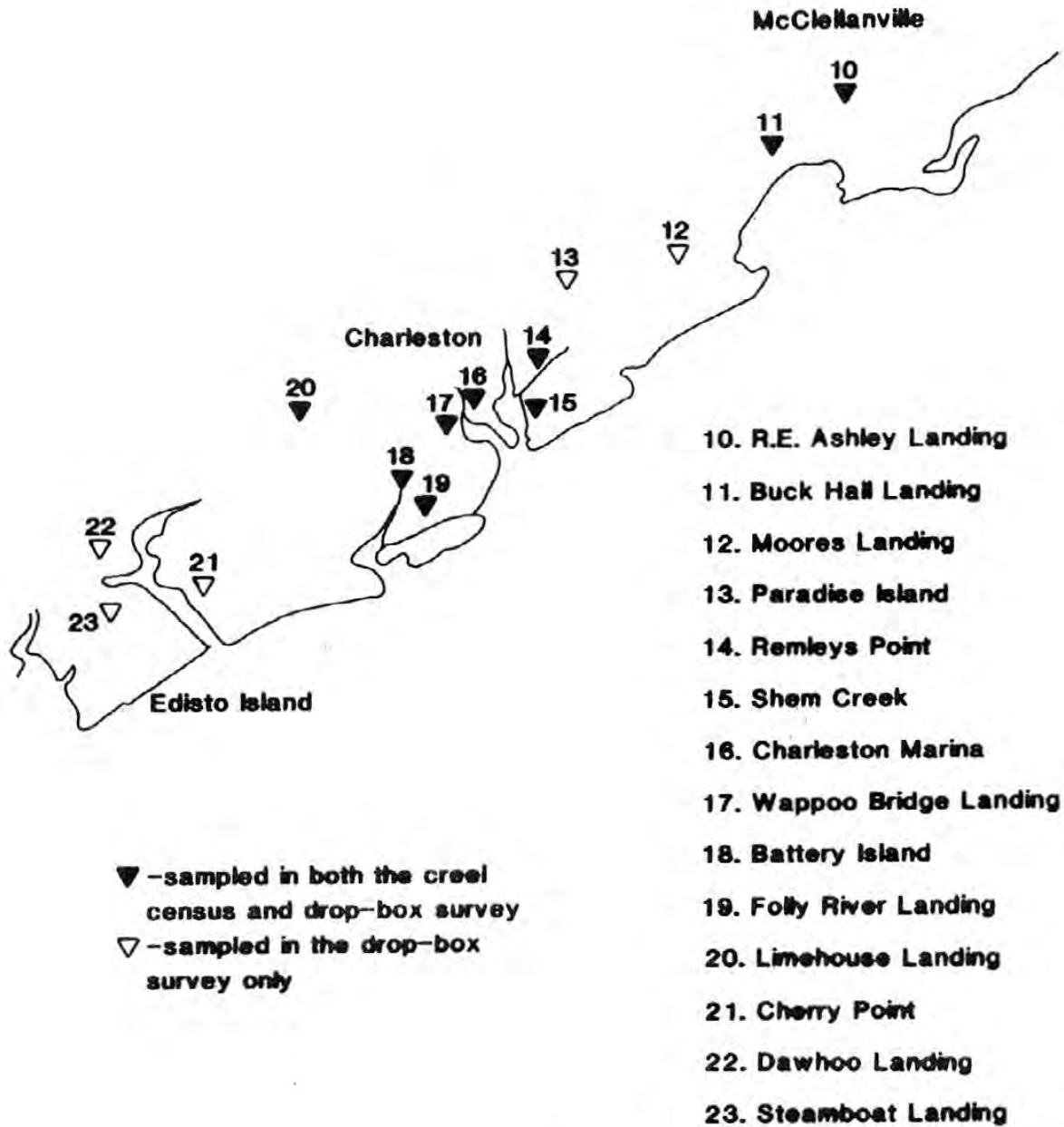


Fig. 3. Boat access sites in the central district. Not shown is Riverland Terrace (sampled during the drop-box survey only), in practically the same location as Wappoo Bridge Landing (17).

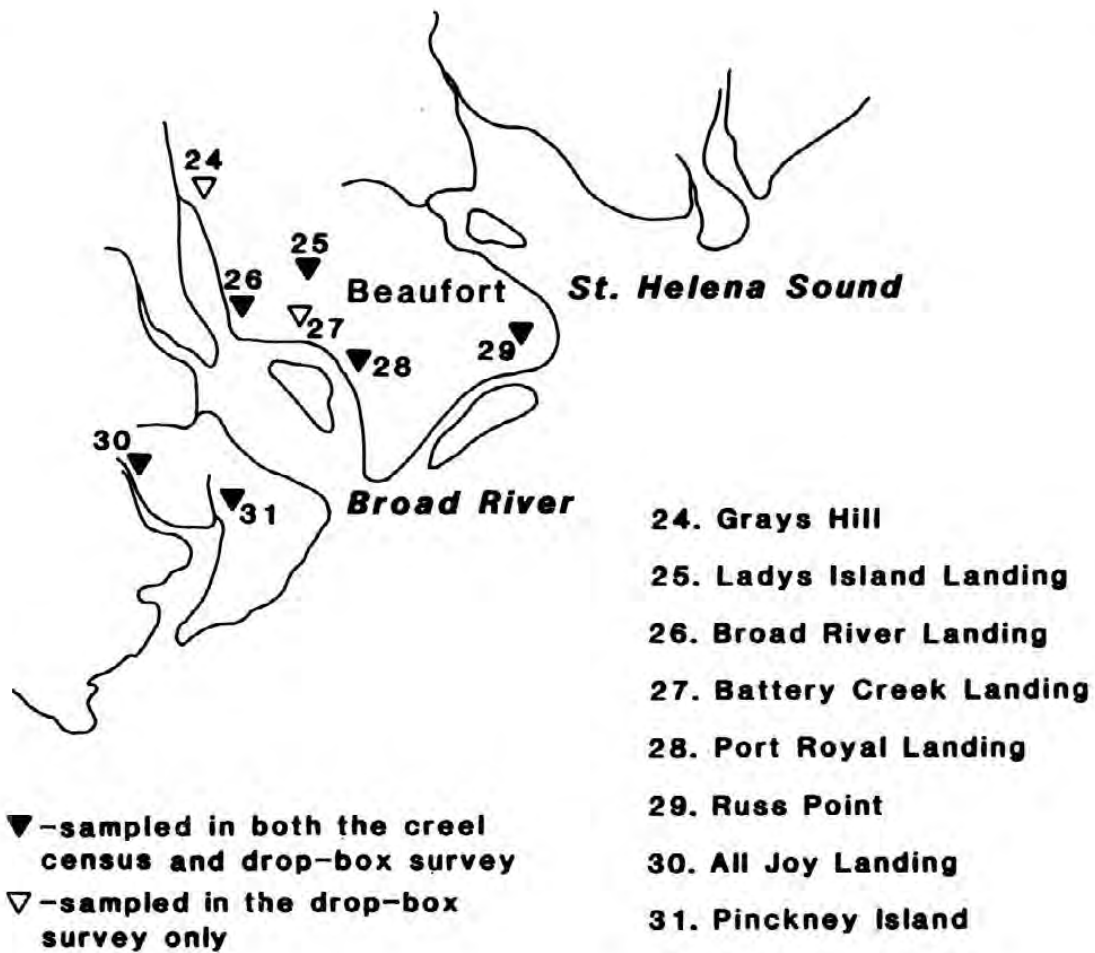


Fig. 4. Boat access sites in the southern district.

Table 1. Distribution of creel census sampling effort.

Month	Northern District		Central District		Southern District	
	Weekdays	Weekend Days	Weekdays	Weekend Days	Weekdays	Weekend Days
June	4	3	4	2	4	2
July	5	2	5	2	5	2
August	5	2	5	2	4	2
September	4	2	4	2	4	1
October	5	2	3	1	4	3
November	4	2	3	2	3	2
December	4	1	3	1	3	1
January	4	2	2	2	4	1
February	5	1	5	0	5	1
March	4	2	5	1	6	0
April	5	2	5	2	5	1
May	5	2	5	2	6	0
Total	54	23	49	19	53	16

Interview Form  
Boat Landing Survey

Boat Landing \_\_\_\_\_  
 Date \_\_\_\_\_ Time \_\_\_\_\_  
 Tide Stage \_\_\_\_\_  
 Weather Excellent \_\_\_\_\_ Good \_\_\_\_\_ Fair \_\_\_\_\_ Poor \_\_\_\_\_  
 Boat Length \_\_\_\_\_ Inboard \_\_\_\_\_ Outboard \_\_\_\_\_  
 Party No. of People \_\_\_\_\_ Residence \_\_\_\_\_ county \_\_\_\_\_ state \_\_\_\_\_  
 Time Out \_\_\_\_\_ Time Returning \_\_\_\_\_ Total Time Out \_\_\_\_\_

Activities During Trip

Fishing \_\_\_\_\_ Sightseeing (joy riding) \_\_\_\_\_  
 Shrimping \_\_\_\_\_ Water Skiing \_\_\_\_\_  
 Crabbing \_\_\_\_\_  
 Oystering or Clamming \_\_\_\_\_

Harvest Other Than Fish \_\_\_\_\_

Fishing

Recreational \_\_\_\_\_ Commercial \_\_\_\_\_  
 Area Fished: Creek \_\_\_\_\_ River \_\_\_\_\_ Bay \_\_\_\_\_ Inlet \_\_\_\_\_ Ocean \_\_\_\_\_  
 Artificial Reef \_\_\_\_\_  
 Technique: Trolling \_\_\_\_\_ Casting \_\_\_\_\_ Drifting \_\_\_\_\_ Still \_\_\_\_\_ Other \_\_\_\_\_  
 Bait: Natural Live \_\_\_\_\_ Natural Dead \_\_\_\_\_ Artificial \_\_\_\_\_

Species Sought (1) \_\_\_\_\_ (2) \_\_\_\_\_ (3) \_\_\_\_\_

Fish Caught			Red Drum		Spotted Seatrout	
Species	Number Kept	Number Released	Length (mm)	Weight (oz.)	Length (mm)	Weight (oz.)
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

Fig. 5. Creel census interview form.

1. How long is your boat? 16 ft or less\_\_ 17-23 ft\_\_ 24-31 ft\_\_ 32+ ft\_\_
  2. What county do you live in? \_\_\_\_\_
  3. What was the purpose of your trip?  
Sightseeing, skiing\_\_ Fishing\_\_ Shrimping\_\_ Crabbing\_\_ Other\_\_\_\_\_
- IF YOU WERE FISHING, SHRIMPING, OR CRABBING, PLEASE ANSWER THE FOLLOWING QUESTIONS
4. How many people fished (shrimped, or crabbed)? \_\_\_\_\_
  5. What time did you return? \_\_\_\_\_
  6. Approximately how many fish did you catch (number and kind)? \_\_\_\_\_
- 
7. In what months do you fish the most? JAN\_\_ FEB\_\_ MAR\_\_ APR\_\_ MAY\_\_ JUN\_\_  
JUL\_\_ AUG\_\_ SEP\_\_ OCT\_\_ NOV\_\_ DEC\_\_ Year-Round\_\_
  8. How often in an average month do you use this ramp? \_\_\_\_\_
  9. Did you do any crabbing? YES\_\_ NO\_\_
  10. Did you do any shrimping? CAST NET YES\_\_ NO\_\_ SEINE YES\_\_ NO\_\_ How many pounds? \_\_\_\_\_
  11. What were shrimp used for? BAIT\_\_ HOME\_\_ SALE\_\_
  12. What problems do you think we have with saltwater fishing/shrimping/crabbing?
- 

Fig. 6. Questionnaire used in the on-site drop-box survey.

because the target species (in this survey) was unknown.

In the creel census, the target species were identified in most interviews and CPUE was derived by dividing the number of fish caught by the number of anglers seeking and/or catching that species (completed trips only).

In those applications where variance estimators were desired, CPUE values for districts and/or seasons were calculated as average-of-ratios statistics, using the catch/angler/trip values from each interview or drop-box card. Use of average-of-ratios values for CPUE estimators is recommended by Rothschild and Yong (1970) for most applications. In other instances, primarily when data from the creel census and drop-box surveys were combined to obtain adequate samples, ratio-of-average statistics were more appropriate and were calculated. In these cases, the total number of fish caught per season, district, or whatever category was being examined was summed for the creel census and drop-box data, then divided by the total number of anglers seeking and/or catching the species.

Estimates of catch and effort (angler-trips) were based on average trailer counts reported during the creel census and CPUE data from both on-site surveys. For each district and season, mean trailer counts for weekend day mornings and afternoons were calculated by averaging the observed means in each period for the various sites. A similar procedure was used to obtain mean values for weekday mornings and afternoons. The average daily usage (trailer count) was figured as the morning mean plus one-half of the afternoon mean. Because of the average trip duration, a reasonable assumption is that about half of the trailers seen in the afternoon were probably there from the morning and that relatively few trailers would arrive after the mid-afternoon count. Then the effort was determined as follows:

Mean trailer count x number of sites in district = average daily count  
 Weekend day average daily count x activity weighting factor = average daily count (weekend day) of boats engaged in activity  
 Average weekend daily count x 26 = seasonal weekend boat count  
 Weekday average daily count x activity weighting factor = average daily weekday count of boats engaged in activity  
 Average weekday daily count x 65 = seasonal weekday boat count  
 Seasonal weekend boat count + weekday boat count = seasonal boat count  
 Seasonal boat count x average fishermen per boat = seasonal angler-trips

The activity weighting factors were the percentages of interviewed boaters engaged in each activity, by season and district.

Catch was determined for each area and season by multiplying the number of angler-trips by the appropriate CPUE value, where mean CPUE was calculated as the total catch divided by the total number of fishermen.

In the NMFS intercept survey, the total catch represents the sum of catches observed (Type A), catches not available for identification but dead (Type B1), and catches released (Type B2). Total catches are estimated by mode and area during each wave, with the total catch by species (or group) being calculated as the number of trips (from the telephone survey) times the CPUE observed (during the intercept survey).

## RESULTS

Where practical, results from each Division survey have been presented in tabular summaries of percentages in equivalent categories to facilitate comparison. In instances where these categories are not directly comparable, explanations are provided in the appropriate sections to aid in interpretation.

### Responses

#### Tackle Shop Questionnaire

A total of 751 valid responses was received (Table 2). The average per location was 20 in the northern district, 39 in the central (Charleston) region, and 28 in the southern district. About 70% in each area were received during the first three months of the survey (i.e., in summer). The typical response pattern at a location was a substantial number of returns during the first few weeks, followed by a sharp drop, with subsequent returns coming in at a rather constant, but low, rate.

#### Creel Census

A total of 1,390 interviews of recreational boaters was conducted (Table 2). Numbers of interviews by site and month are listed in the Appendix, Table A-1. About 32% were made in the summer (July-September) quarter, 27% in the fall (October-December), 9% during the winter months (January-March), and 32% in spring (April-June).

#### On-Site Drop-Box Survey

Distribution of 743 responses is shown in Table 2. There were 59 additional returns from the northern district that were on tackle shop survey cards (due to a mix-up in distribution); these results were included in the tackle shop survey returns. Northern survey sites were the Ball Park landing, Hwy. 90 bridge, Hwy. 17 bridge, Woodland ramp, and SCWMRD ramp at Murrells Inlet. Most of the few returns in this area came from the SCWMRD ramp and the Hwy. 17 site. Vandalism was a

Table 2. Responses (collection boxes) and interviews (creel census) in 1985-1986 Division surveys.

Period surveyed	Tackle Shop Collection Box		Boat Ramp Collection Box		Boat Ramp Creel Census	
	Jul-Dec 1985		Nov 1985-Jun 1986		Jun 1985-May 1986	
<u>District</u>	N	%	N	%	N	%
Northern	201	29	32	5	668	48
Central	312	46	582	78	527	38
Southern	169	25	129	17	195	14
Statewide	751 <sup>a</sup>	100	743	100	1,390	100

<sup>a</sup>Includes 69 from Fish Fair

Table 3. Numbers of responses (tackle shop questionnaire) by fishing mode and district.

Mode	Northern	Central	Southern
Bank or bridge	4	30	13
Pier or surf	15	16	19
Ocean headboat	2	1	0
Ocean charterboat	2	3	7
Ocean private boat	50	82	48
Inshore private boat	128	190	82



severe, chronic problem at most of the northern locations, as was a typically minimal response rate. Most of the cards received in the northern district came in during the initial fall period. Statewide, about 41% of the usable responses were received during the incomplete (late November-December) fall quarter, 14% came in during the winter, and 40% were turned in during April-June. About 5% could not be dated with reasonable certainty. Distribution by site and month is shown in Table A-1.

#### Fishing Modes

Only results from the tackle shop questionnaire apply. Inshore private boat fishing was the most popular activity statewide (56%), followed by ocean private boat fishing (27%), pier or surf fishing (8%), and other shore-based angling (6%). Very few people indicated that for-hire (ocean headboat or charterboat) fishing was their preferred type. The numbers of responses in each category by district are shown in Table 3. The percentage of respondents reporting ocean private boat fishing as their major type was virtually identical in each district. The percentages of replies in the inshore private boat category were equivalent (about 60%) in the central and northern areas and substantially lower (49%) in the southern district.

#### Fishing Activities

Summaries of the results from each survey are shown in Table 4. The tackle shop column should be interpreted as the percentages of the marine recreational "fishing" population that engage in the various activities. The tackle shop survey figures indicate relative participation, which refers to an individual's involvement in an activity over an extended period (and may be very occasional, e.g. one or two trips per year). The "boats" columns for the two ramp surveys are equivalent and these figures indicate relative effort. "Effort" refers to involvement on a trip-by-trip basis and these percentages therefore reflect the numbers of boat trips actually spent in each form of fishing activity.

#### Tackle Shop Questionnaire

This was directed solely at fishermen, so there were virtually no nonfishing (fishing in the sense of rod-and-reel angling) respondents. Shellfish gathering, which tends to be more of a singular recreation, was not listed as an activity choice. Most respondents indicated that they engaged in at least two activities and many practiced three or more; a typical reply was participation in rod-and-reel fishing, crabbing, and cast netting for shrimp.

#### Creel Census

Because interviews were conducted during the daytime, there was a very low probability of intercepting persons who had been gigging, exclusively a nighttime activity. Some positive interviews of shrimpers noted gear

type, others did not, so results were combined (i.e., "shrimping"). The legal (recreational) shellfish season usually extends from mid-September through April, but most gathering occurs between late October and mid-March. Values shown for shellfishing therefore refer to activity during the fall and winter quarters only. Seasonal trip activity by site is listed in Table A-2.

The relative level (i.e., percentage of total trips) of fishing activity was highest in the northern area and was most consistent there (78-88%) over the seasons. Seasonal fishing activity was also fairly uniform (68-79%) in the southern district. Fishing effort was much more seasonal in the central district, peaking in fall (83%) and ranging between 50-65% at other times.

Shrimping activity appeared to be rather variable within and between districts. Because of the very low level of effort (2% of all trips) reported in the northern district, no reliable estimate of relative seasonal activity is possible. In the central district, shrimping was most common in the summer, while in the southern area (where this activity appeared to be much more popular) the percentage of total trips that included shrimping was about equal in summer and fall (24% and 25%, respectively). Statewide, some shrimping occurred during 11% of all boating trips during the summer, 6% of those in the spring, and 4% of those in the fall.

In contrast, crabbing activity appeared to be much more uniform on both an area and seasonal basis, although virtually no activity was reported during the winter quarter. Statewide, crabbing was done on 5-7% of all trips reported during spring, summer, and fall. Crabbing was most popular in spring in the southern area, summer in the northern district (about 10% of all trips in each case), and took place during 4-6% of the trips, regardless of season, in the central area.

Other activities included hunting and nonconsumptive diversions such as water skiing, camping, sightseeing, and sailing. The seasonal percentages of trips devoted to such activities were fairly constant in the northern (9-16%) and southern (19-29%) districts, but highly variable in the central area. "Other" pursuits there occupied more trips during spring and winter, when the relative level of fishing activity was lowest.

Little gillnetting was reported and nearly all of that was in the northern district during the fall. The distinction between recreational and commercial gillnetting was not entirely clear and there probably was some overlap. Statewide, gillnetting took place on only 2% of all trips reported.

The creel census reported the number of commercial fishing or crabbing boats observed. In each area, the relative level of

Table 4. Fishing activities by survey and district. Values are percentages of district or statewide totals engaged in each activity and are not additive due to multiple activity participation.

	Tackle Shop Collection Box	Boat Ramp Collection Box		Boat Ramp Creel Census
	Responses	People <sup>a</sup>	Boats	Boats
<b>Northern District</b>				
Nonfishing	-	-	19	13
Fishing	98	100	81	85
Gillnetting	13	-	-	3
Gigging	24	-	-	-
Crabbing	21	9	13	6
Shrimp seining	21	5	6	) 2
Shrimp cast net	26	38	28	
Shellfishing	-	3	6	14 <sup>b</sup>
<b>Central District</b>				
Nonfishing	-	-	23	32
Fishing	99	92	64	63
Gillnetting	6	-	-	1
Gigging	24	-	-	-
Crabbing	23	28	20	5
Shrimp seining	14	6	3	) 7
Shrimp cast net	57	31	23	
Shellfishing	-	13	14	4 <sup>b</sup>
<b>Southern District</b>				
Nonfishing	-	-	12	24
Fishing	99	93	73	72
Gillnetting	5	-	-	1
Gigging	20	-	-	-
Crabbing	34	25	29	4
Shrimp seining	9	1	1	) 18
Shrimp cast net	50	22	24	
Shellfishing	-	18	19	6 <sup>b</sup>
<b>Statewide</b>				
Nonfishing	-	-	21	21
Fishing	98	93	66	75
Gillnetting	8	-	-	2
Gigging	23	-	-	-
Crabbing	27	26	21	5
Shrimp seining	15	4	3	) 6
Shrimp cast net	47	29	23	
Shellfishing	-	13	14	10 <sup>b</sup>

<sup>a</sup> Does not include nonfishermen

<sup>b</sup> In season, i.e., fall and winter quarters

commercial boats seen was highest in winter (due to reduced recreational activity, in part). Most commercial boats, including nearly all of those fishing (gillnetting), were observed at landings in the northern district, where about 21% of the total number of trips observed were attributable to them. Statewide, about 16% of the total trips intercepted were by commercial fishing, crabbing, or shellfishing boats.

#### On-Site Drop-Box Survey

Activities by individual site and season are listed in Table A-3. Summary percentages are shown in Table 5.

The sample size in the northern district was too small to permit meaningful evaluation, as was the winter sample in the southern area. In contrast to the results from the creel census, the relative level of fishing activity in the central district, as reported by drop-box respondents, stayed fairly constant over all seasons, as did the statewide figures (to be expected, since returns from the central area comprised nearly 80% of the total sample). Activity levels in other consumptive categories (shrimping, etc.) were appreciably higher in all seasons than were reported in the creel census. On a statewide basis, there was close agreement between results of the two surveys regarding the relative level of other (nonconsumptive) activities.

The geographically elongated central district (Charleston County) includes four major fishing areas. The northern area includes Bull Bay and adjacent waterways. The eastern area contains the Wando and Cooper Rivers and the waters behind the Isle of Palms and Sullivan's Island. The western area includes most of Charleston Harbor and the Ashley, Stono, Folly and Kiawah Rivers. The southern area refers mainly to waters in the vicinity of Rockville and Edisto Island. There were minor differences in activity levels by area, as shown in the following percentages of boat trips reported for each category (percentages are not additive because more than one activity may have occurred during some trips):

Activity	N	E	W	S
Fishing	53%	75%	63%	74%
Shrimp seining	4%	4%	2%	4%
Shrimp cast netting	17%	32%	21%	25%
Crabbing	17%	19%	19%	30%
Shellfishing	18%	9%	14%	13%
Other	29%	18%	26%	11%

Fishing was most popular in the area near the Wando River and Charleston Harbor. Cast netting for shrimp also appeared to be more popular here than elsewhere. Crabbing

activity tended to increase to the south, while shellfish gathering was slightly more common in the vicinity of Bull Bay.

The average number of persons per boat observed during the creel census was 2.2 (Table 6), with little difference between areas and seasons. The mean number of rod-and-reel fishermen per boat reported during the drop-box survey was 2.5, with very little difference noted for other fishing activities, seasons, or areas. Average trip duration reported in the creel census was 4.8 hours, with trip length being somewhat greater in summer and less in winter (Table 6).

#### Boat Classification

##### Tackle Shop Questionnaire

Boat owners comprised 89% of the respondents and 9% of these owners reported two or more craft used for fishing. Of the 735 boats reported statewide, 49% were in the 16 ft and under category, 36% were 17-23 ft, 11% were 24-31 ft, and 4% were larger craft (Table 7). The percentage of fishing boats under 17 ft was considerably higher in the northern district (59%) than in the southern area (39%), while the percentages of boats in the 17-23 ft range were similar in all areas. In all districts, boats under 17 ft were dominant choice of inshore fishermen. Except in the southern area, where 24-31 ft vessels were more popular, ocean fishermen utilized 17-23 ft boats most frequently.

##### Creel Census

In the northern district, 64% of the boats used for recreational fishing were less than 17 ft and 36% were 17-23 ft. In both the central and southern areas, 76% of the boats used by fishermen were less than 17 ft and 24% were in the 17-23 ft category.

##### On-Site Drop-Box Survey

A few boats larger than 23 ft were reported, but most of these probably were transients. When these larger craft are omitted, 76% of the boats reported by fishermen in the central district were less than 17 ft and 72% in the southern area were in this category. As with data from the creel census, these figures are not directly comparable to those from the tackle shop survey because the on-site surveys concentrated on ramps used primarily by inshore fishermen. Most of the ramps surveyed are not very suitable for launching larger boats. Statewide, less than 2% of the boats reported in the on-site surveys exceeded 23 ft. When results from both surveys are combined statewide, 69% of the boats were less than 17 ft and 29% were in the 17-23 ft range. Table A-4 lists the distribution of boats by launching site for each survey.

#### Access Point Utilization

Since each survey addressed this aspect in a different way, the results are not directly comparable. The tackle shop questionnaire asked which access point the respondent used most frequently. The on-site drop-box results simply represent the numbers

Table 5. Seasonal fishing activity by district (percentages of trips).  
 CC- creel census, DB- drop-box survey, NS- not sampled, IS- insufficient sample.

District	Activity	Summer		Fall		Winter		Spring	
		CC	DB	CC	DB	CC	DB	CC	DB
Northern	Fishing	85		85		78		88	
	Shrimping	3		0		0		6	
	Crabbing	10	NS	7	IS	0	IS	4	IS
	Shellfishing	4		11		20		1	
	Other	14		13		16		9	
Central	Fishing	65		83	67	58	66	50	62
	Shrimping	15		3	32	0	13	5	26
	Crabbing	6	NS	4	18	6	9	5	26
	Shellfishing	0		1	20	13	22	0	6
	Other	26		15	19	32	19	46	29
Southern	Fishing	68		79	78			72	71
	Shrimping	24		25	36			7	17
	Crabbing	1	NS	2	29	IS	IS	9	31
	Shellfishing	0		2	14			0	12
	Other	29		19	7			21	17
Statewide	Fishing	75		84	69	73	64	67	65
	Shrimping	11		4	27	0	11	6	25
	Crabbing	7	NS	5	20	1	13	5	26
	Shellfishing	1		6	19	19	27	0	6
	Other	21		14	17	20	18	29	26

Table 6. Average number of anglers per boat and average trip duration (hours) observed during the creel census.

Area	Summer		Fall		Winter		Spring	
	Anglers	Hours	Anglers	Hours	Anglers	Hours	Anglers	Hours
Northern	2.3	5.8	2.1	5.0	1.9	4.4	2.0	4.7
Central	2.3	4.7	2.3	4.5	1.8	3.6	2.3	4.3
Southern	2.2	5.2	2.4	5.3	1.9	2.5	2.2	3.8
Statewide	2.3	<b>5.5</b>	2.2	4.9	1.9	4.1	2.2	4.6

Table 7. Boat length categories by type of fishing and district, as compiled from tackle shop survey questionnaires.

Boat length:	Northern			Central			Southern		
	Inshore private	Ocean <sup>1</sup>	Other <sup>2</sup>	Inshore private	Ocean <sup>1</sup>	Other <sup>2</sup>	Inshore private	Ocean <sup>1</sup>	Other <sup>2</sup>
16 ft-or less	106	11	8	127	18	3	48	9	5
17-23 ft	32	35	1	66	48	5	28	22	4
24-31 ft	4	13	0	6	17	1	<b>7</b>	25	2
32 ft, larger	0	3	0	2	12	0	2	5	0

<sup>1</sup> Private boats only

<sup>2</sup> Includes boats reported **by** shore anglers

of cards collected from each site during November-June (not including those where significant vandalism occurred). The creel census data are the mean trailer counts/visit during June-December and April-May (i.e., data from the minimum usage period of January-March are not included). Where known, commercial and government trailers have not been included. Relative ranking of sites by survey is shown in Table 8.

The average count/visit is the most direct index of ramp utilization by recreational boaters. These data, grouped by day of the week and time of day, are listed in Table 9. Counts for each site, by month and two-hour intervals, are listed in Table A-5 (Appendix). The relative utilization rates of these sites are summarized as follows (High = 11 or more trailers/visit, Medium = 6-10, Low = 5 or less):

#### Northern District

##### High

Hwy 90 Bridge  
Ball Park Landing  
SCWMRD Landing  
South Island Ferry  
Woodland Avenue

##### Medium

Capt. John's  
Inlet Port Marina

##### Low

Palmetto Shores  
North Myrtle Beach

#### Central District

##### High

Charleston Marina  
Remleys Point  
Shem Creek  
Wappoo Bridge

##### Medium

Folly River  
Battery Island  
Limehouse  
R.E. Ashley

##### Low

Buck Hall

#### Southern District

##### High

(None)

##### Medium

E.C. Glenn

##### Low

All Joy  
Broad River  
Pinckney Island  
Russ Point  
Port Royal  
Ladys Island

The average weekday count was higher in the afternoon at 68% of the ramps and the weekend day afternoon count was higher at 60% of those with adequate data. Ramps were more heavily utilized on weekend days at virtually all sites.

All of the sites in the northern district were most heavily utilized in the summer, with

fall being the next most popular season. Usage was lowest in the winter at most locations.

In the central area, five of the sites were used most in the fall and four were most popular in summer. Winter was the period of lowest traffic at nearly all locations.

Summer was the time of peak usage at all southern locations except Broad River, where utilization peaked in spring. Fall was the next most popular season at about half of the sites, with spring the other alternative. Winter was invariably the time of lowest usage.

Respondents to the drop-box survey were asked to indicate in which months they fished. Results are summarized in Table 10. In the northern area, May-August was the most popular period for rod-and-reel angling, while May-November was the peak period in the central and southern districts. Little activity occurred during January-March, particularly in the northern area.

The drop-box survey also inquired as to how many trips/month the respondent made at a particular location. Results were as follows:

#### Central District

Charleston City Marina	6.4
Remleys Point	6.4
Paradise Island	6.0
Battery Island	5.6
Riverland Terrace	5.4
Buck Hall	5.2
Wappoo Bridge	5.0
Limehouse	5.0
Folly River	4.8
Shem Creek	4.5
Cherry Point	3.9
R. E. Ashley	3.6
Moore's Landing	3.3
Steamboat Landing	2.6
Dawhoo	1.5

#### Southern District

E. C. Glenn	9.4
All Joy	6.6
Ladys Island	6.2
Port Royal	5.2
Pinckney Island	5.2
Battery Creek	4.0
Russ Point	2.9

Diel fishing activity was determined during the creel census by recording times of departure and return (Fig. 7). Most fishermen began their trips between 0700-1000 and returned between 1200-1700. Return times reported in the drop-box survey were distributed similarly to those observed in the creel census, with about 77% of the respondents returning between 1200-1800. The percentages returning in various time

Table 8. Utilization rates of boat access points, as measured by questionnaire responses (tackle shop and on-site drop-box surveys) and average trailer count/visit (creel census).

Tackle Shop Survey	On-Site Drop-Box Survey	Creel Census
	Northern District	
SCWMRD Murrells Inlet (36)	(Insufficient sample)	Hwy. 90 Bridge (12.2)
Woodland Avenue (35)		Ball Park Landing (12.0)
Hwy. 17, Little River (29)		SCWMRD Murr. Inl. (11.8)
Pawleys Island (12)		S. Island Ferry (11.1)
Ball Park Landing (8)		Woodland Avenue (10.7)
South Island Ferry (8)		Capt. John's (7.8)
Inlet Port Marina (6)		Inlet Port Mar. (6.0)
		Palmetto Shores (5.1)
		N. Myrtle Beach (1.7)
		Central District
Chas. City Marina (47)	R.E. Ashley (78)	Chas. City Mar. (15.2)
Shem Creek (42)	Folly River (72)	Remleys Point (14.2)
Wappoo Bridge (25)	Remleys Pt. (52)	Shem Creek (11.7)
Folly River (23)	Shem Creek (50)	Wappoo Bridge (11.4)
Wild Dunes (21)	City Marina (44)	Folly River (8.7)
Battery Island (17)	Cherry Point (41)	Battery Island (8.4)
Remleys Point (12)	Moore's Ldg. (39)	Limehouse (7.5)
Sullivan's Is. (9)	Wappoo Bridge (38)	R.E. Ashley (6.8)
Detco's (7)	Buck Hall (34)	Buck Hall (2.5)
Limehouse (6)	Limehouse (32)	
Cherry Point (5)	Riverland Terr. (29)	
Riverland Terr. (4)		
	Southern District	
Fripp Is. Mar. (13)	E.C. Glenn (31)	E.C. Glenn (6.9)
Lemon Is. Mar. (12)	Pinckney Is. (18)	All Joy (4.6)
E.C. Glenn (9)	All Joy (15)	Broad River (4.4)
Broad Cr. Mar. (6)	Ladys Island (13)	Pinckney Is. (4.1)
All Joy (6)	Battery Creek (11)	Port Royal (3.5)
Beaufort Mar. (5)	Port Royal (8)	Russ Point (3.9)
Broad River (5)	Grays Hill (5)	Ladys Island (1.3)
Port Royal (5)		
Skull Cr. Mar. (4)		
Station Creek (4)		
Ladys Island (3)		
Parris Is. Mar. (2)		
Russ Point (1)		

Table 9. Average trailer count/visit, June 1985-May 1986, by site, day of the week, and time of day. IS- insufficient sample.

Site	Weekdays		Weekend Days	
	0800-1200	1200-1800	0800-1200	1200-1800
Capt. John's	6.2	8.4	5.6	IS
Palmetto Shores	4.5	5.9	5.0	7.1
N. Myrtle Beach	0.8	3.2	2.3	IS
Hwy. 90 Bridge	8.5	11.4	12.8	16.8
Inlet Port Marina	4.8	6.9	5.9	IS
Ball Park Landing	11.3	9.4	14.7	10.8
Woodland Avenue	7.5	9.5	12.6	8.2
SCWMRD Murr. Inlet	5.5	9.1	7.0	14.6
South Island Ferry	13.5	7.7	12.2	6.2
R. E. Ashley	4.4	4.8	9.5	10.6
Buck Hall	2.0	2.0	3.6	IS
Shem Creek	4.7	5.5	20.1	IS
Remleys Point	6.2	7.4	24.1	20.1
Chas. City Marina	7.0	6.4	32.6	IS
Wappoo Bridge	4.6	5.6	22.2	16.2
Battery Island	4.2	3.1	8.8	18.4
Folly River	3.9	4.4	9.5	19.6
Limehouse	3.1	2.5	6.8	19.9
Ladys Island	0.5	1.2	0.4	2.8
Russ Point	2.6	2.9	4.0	4.0
Port Royal	2.9	1.7	5.0	IS
Broad River	3.7	2.3	5.3	IS
E.C. Glenn	3.3	4.9	11.8	IS
All Joy	2.1	3.6	5.3	6.6
Pinckney Island	2.7	3.1	IS	4.9



Table 10. Percentages of respondents in the on-site drop-box survey who indicated that they fished in a particular month.

Month	Northern	Central	Southern	Statewide
January	8	25	25	24
February	8	23	27	23
March	12	29	31	28
April	36	39	51	41
May	68	59	60	59
June	68	68	61	67
July	56	67	57	64
August	56	63	53	61
September	40	59	61	59
October	40	57	68	58
November	36	52	61	53
December	16	36	33	35

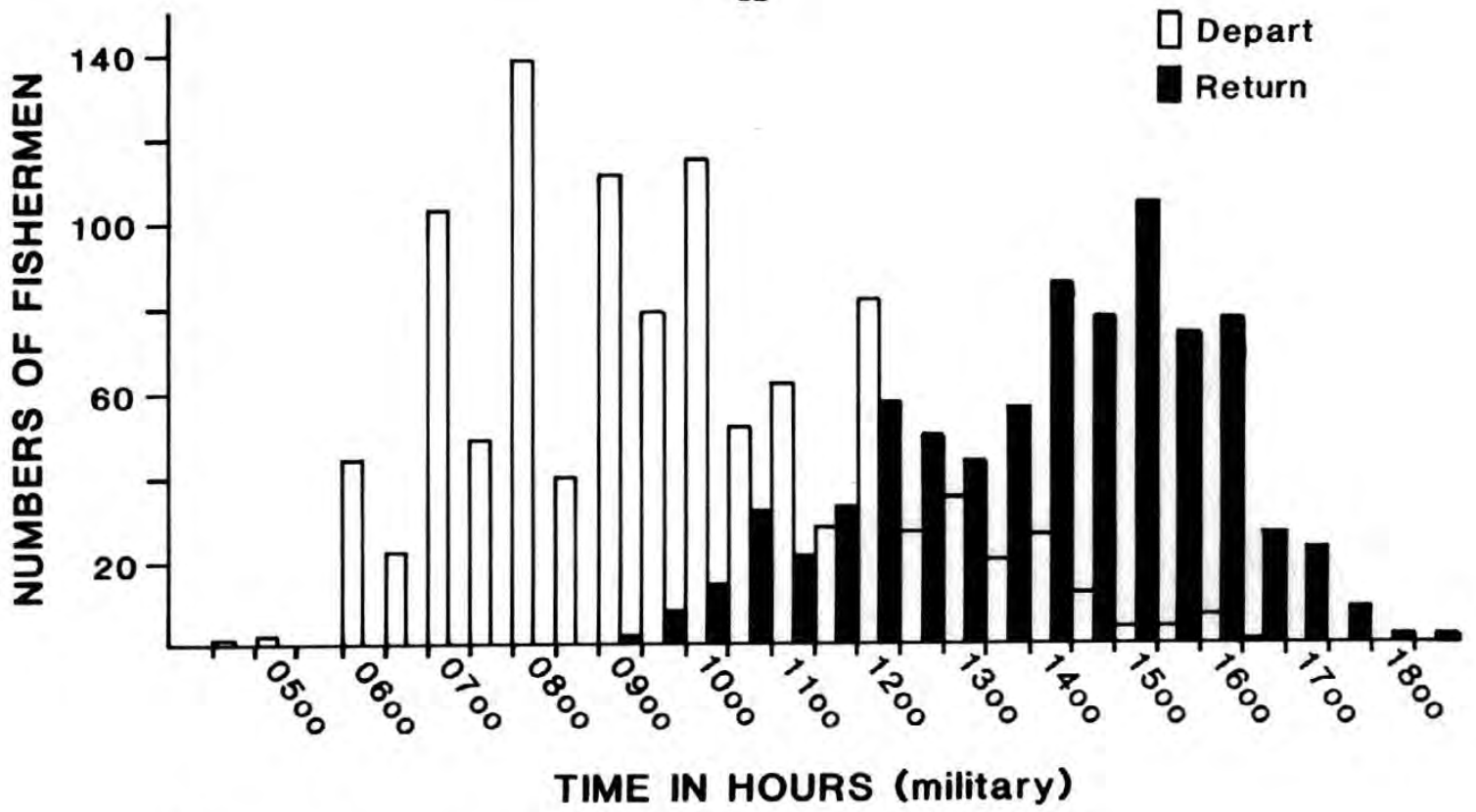


Fig. 7. Departures and returns of fishermen by time of day.

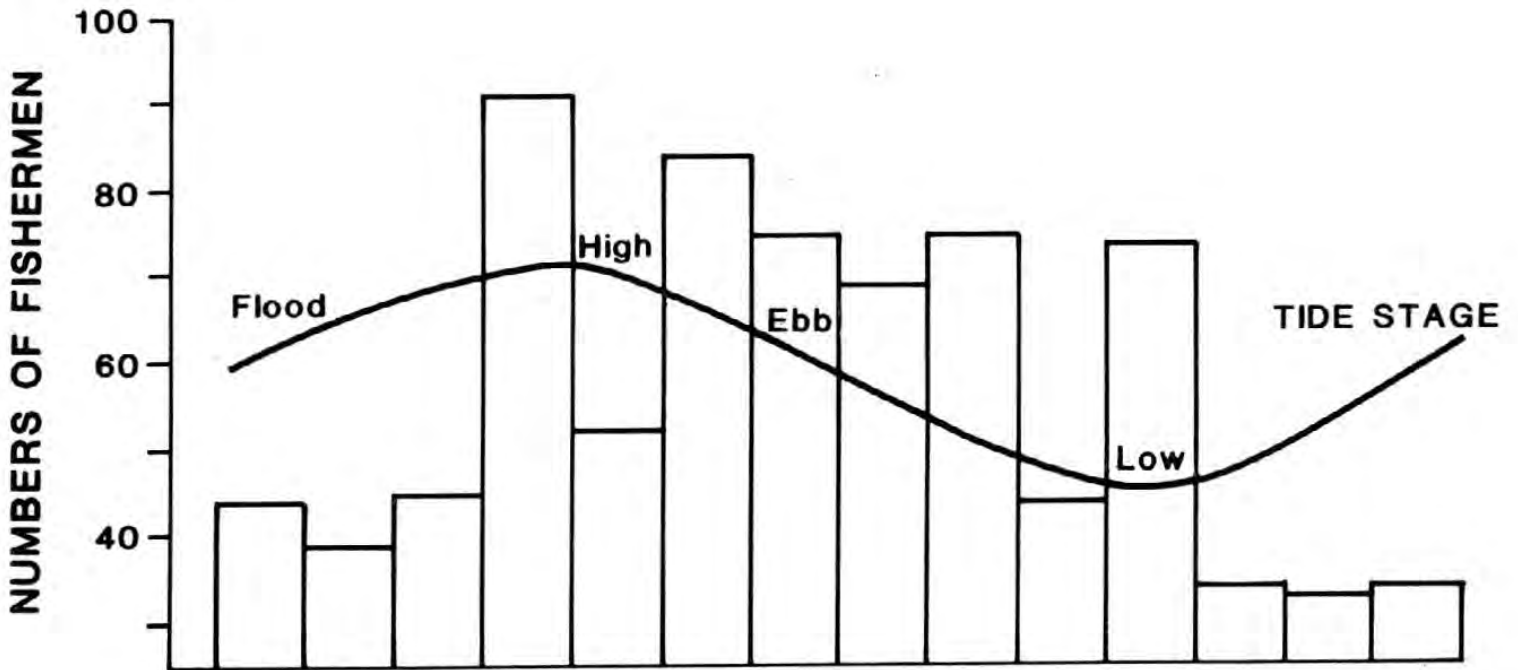


Fig. 8. Numbers of fishermen returning at various tide stages.

intervals were as follows:

0000-0400	1%
0400-0800	<1%
0800-1000	2%
1000-1200	7%
1200-1400	16%
1400-1600	29%
1600-1800	32%
1800-2000	10%
2000-2400	2%

Diel patterns of ramp usage were very similar throughout the coastal area and did not vary greatly between seasons.

Since many fishermen prefer to fish specific tide stages, the creel census investigated this aspect. Most fishermen returned during the ebb tide (Fig. 8), which indicated that most fishing occurred during the incoming and early ebb tides.

#### Residence

Residents accounted for 85% of the trailers counted (as identified by license plate), North Carolina trailers (mostly in the northern district) represented 6%, and Georgia vehicles (nearly all in the southern area) 5%. Virginia and Florida trailers each represented about 1%. The remaining 2% were distributed among residents of 30 other states.

On-site results indicated that 83% of the respondents lived in the coastal area of South Carolina (Fig. 9) and 6% resided in the eastern Piedmont region. People from the western part of the state (Zone 3) represented about 1%. Nonresidents comprised 10%. About 74% of the nonresidents were from North Carolina and Georgia.

#### Reactions to Licensing

The tackle shop questionnaire solicited opinions on the purchase of a recreational saltwater fishing license. Of the 735 responses (Table 11), 72% indicated that they would purchase a license if the fee was used exclusively to support marine recreational fishing activities. Six percent unconditionally approved the purchase of a license, for a combined positive response of nearly four-to-one. The positive rating was slightly higher (85%) in the southern district than elsewhere.

Ocean fishermen were the strongest proponents (or weakest antagonists) of a license (84% in favor), while shore-based fishermen registered the least favorable reaction (29% opposed).

The most frequently cited objection to a license was the belief that the resources were public and their usage should therefore be free. Another common objection was that the state levees too many taxes and fees as it is. A substantial number (17%) of the negative respondents felt that the revenues would be misappropriated. About 22% felt that

a license wasn't necessary, for one reason or another.

#### Problems with Marine Recreational Fishing

Both the tackle shop questionnaire and on-site drop-box survey solicited responses on constituency perceptions. Many respondents either did not complete this part or indicated that they felt nothing was wrong. A fair number of responses, particularly those from the site drop-boxes, addressed issues of a highly localized nature (e.g. the need for ramp repairs), personal complaints, or other matters not amenable to general evaluation.

The remaining responses fell roughly into the categories shown in Table 12. Some problems, e.g. fishing too close to piers (northern district) and shrimp trawling in inside waters (southern district), are primarily restricted to one area. If these are omitted from consideration and the more universally applicable complaints are considered, the most important problems (as measured by numbers of responses statewide) are lack of or poor boat ramps, commercial fishing and lack of management (a tie), gillnets, and pollution.

#### Species Preference

##### Tackle Shop Questionnaire

About 30% of all respondents statewide named the red drum as their most preferred species. Close behind were the spotted seatrout (26%) and flounders (*Paralichthys lethostigma* and *P. dentatus*, 24%). Many inshore anglers included all three in their nomination. Red drum were consistently popular throughout the coastal region. Seatrout were progressively more important to inshore fishermen from north to south, while the popularity of flounders showed the opposite latitudinal trend (Table 13). Also popular with inshore fishermen were various bottomfish, e.g. spot (*Leiostomus xanthurus*), Atlantic croaker (*Micropogonias undulatus*), and kingfishes (*Menticirrhus* spp.). Among inshore fishermen, shore-based angler preferences tended to parallel those of boating fishermen in orders of priority.

The king mackerel (*Scomberomorus cavalla*) was the overwhelming favorite of ocean fishermen. In the central and southern areas, sharks were also popular. On a statewide basis, offshore bottomfish (e.g. black sea bass, *Centropristis striata*), were about equally as popular as sharks.

##### Creel Census

Species preferences are listed by area and season in Table 14. On a district basis, these generally closely paralleled those reported during the tackle shop survey. Statewide, 28% of the fishermen interviewed were seeking red drum. The next most popular species were spotted seatrout (18%) and flounders (17%). This order of ranking was identical to that reported in the tackle shop survey. King mackerel was the most preferred offshore species, followed by sharks.

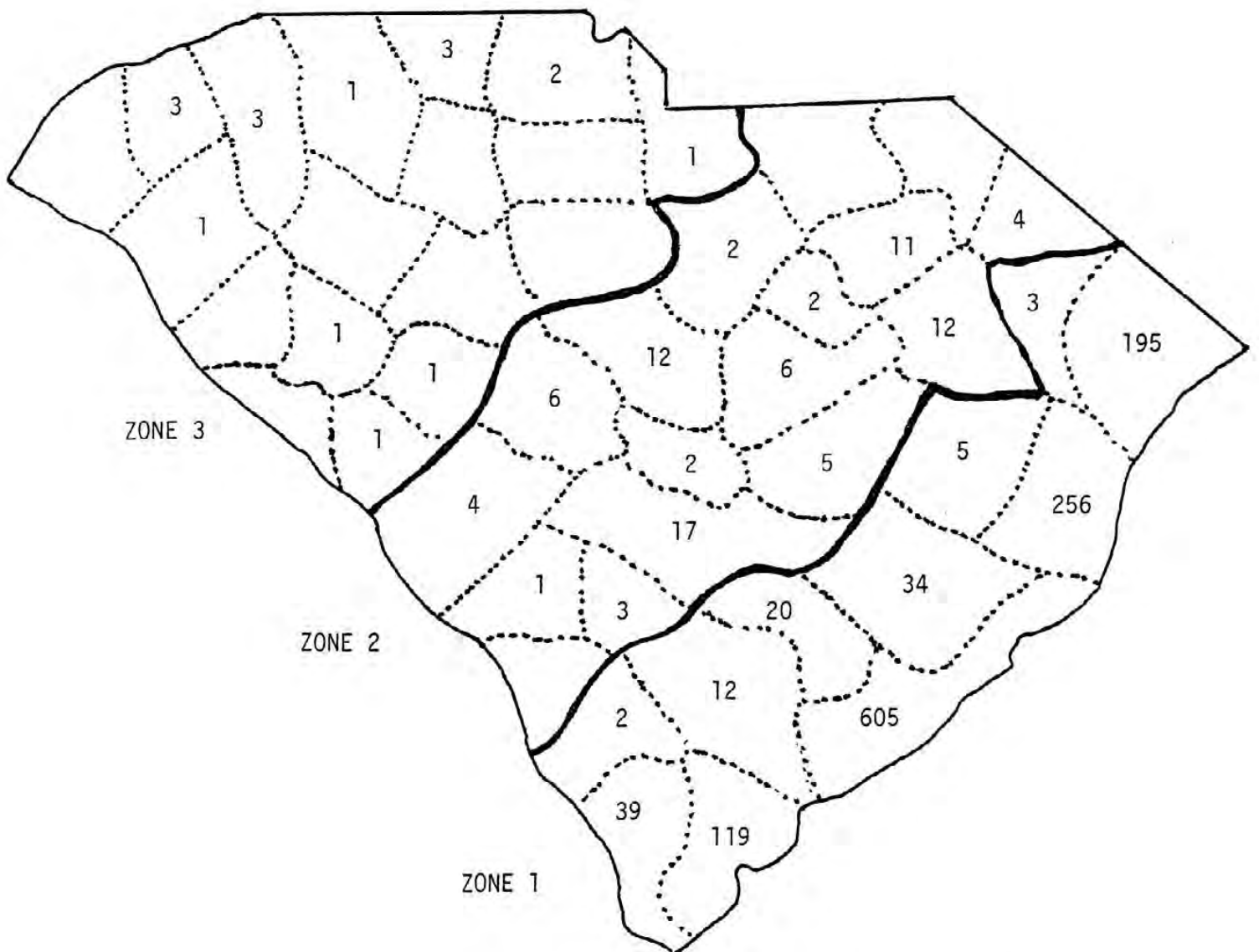


Fig. 9. Counties of residence of respondents in the on-site surveys.

Table 11. Responses to purchase of a marine recreational license by type of fishing and district.

	Southern			Central			Northern		
	Inshore boat	Ocean boat	Shore	Inshore boat	Ocean boat	Shore	Inshore boat	Ocean boat	Shore
Yes, conditional	62	44	22	125	64	20	91	44	11
Yes, unqualified	6	5	2	10	5	2	2	1	1
No	12	5	7	53	15	12	33	7	7
Reasons most frequently cited for not purchasing (combined for all fishing categories):									
	Southern			Central			Northern		
Resource is public and usage should be free	1			16			3		
Too many taxes and fees now	2			10			5		
Not necessary, no valid purpose	2			11			4		
Money would be misappropriated	1			11			1		
All licenses should be consolidated	1			2			2		
Should license nonresidents only	1			-			-		
Would hurt tourism	-			-			4		

Table 12. Most frequently cited problems. Values are numbers of responses.

Problem Category	Tackle Shop Questionnaire			On-Site
	Inshore boat	Ocean boat	Shore	Drop-Box
Northern District				
Gillnets	32	5	3	-
Lack of boat access	11	4	1	1
Lack of management	10	1	1	-
Commercial fishing	7	5	0	2
Lack of artificial reefs	0	7	1	-
Boats/nets too close to piers	2	2	4	-
Pollution	4	2	1	1
Lack of law enforcement	5	1	0	3
Nonresidents	3	0	1	-
Commercial shrimping	1	1	0	-
Ignorant and inconsiderate users	1	1	0	-
Habitat destruction/alteration	1	0	0	-
Overfishing in general	1	0	0	-
Poor ramps	-	-	-	1
Lack of public shellfish grounds	-	-	-	3
Central District				
Commercial fishing	22	21	1	16
Lack of management	23	7	1	28
Poor ramps/parking	14	10	0	28
Lack of boat access	12	6	0	12
Pollution	14	3	1	25
Overfishing in general	7	7	0	10
Ignorant and inconsiderate users	10	1	1	8
Gillnets	8	2	1	10
Lack of shore access	5	0	6	1
Shrimp seining	7	1	0	1
Politics	4	1	0	-
Excessive regulation	2	3	0	4
Lack of security at ramps	4	0	0	10
Lack of artificial reefs	4	0	0	-
Habitat destruction/alteration	1	0	2	4
Lack of good shellfish beds	0	0	0	21
Southern District				
Trawling in sounds and bays	14	12	5	5
Pollution	10	2	3	5
Lack of management	4	6	1	1
Commercial fishing	4	6	1	-
Gillnets	4	7	0	2
Nonresidents	8	3	0	5
Habitat destruction/alteration	6	3	1	1
Lack of artificial reefs	4	4	1	4
Lack of shore access	3	2	3	-
Commercial shrimping (outside sounds)	4	1	0	3
Overfishing in general	3	0	0	-
Politics	1	1	1	-

Table 13. Preferred species, from the tackle shop questionnaire. Values are numbers of responses.

Species	Inshore boat	Ocean boat	Bank/pier/surf
Northern District			
Flounder	63	3	7
Red drum	37	1	6
Inshore bottomfish <sup>1</sup>	36	0	4
Spotted seatrout	30	1	1
Spanish mackerel	8	0	0
Bluefish	5	2	4
King mackerel/pelagics <sup>2</sup>	7	42	3
Offshore bottomfish	0	5	0
Billfish	0	4	0
Sharks	0	3	0
Central District			
Red drum	102	5	14
Spotted seatrout	88	2	6
Flounder	74	0	8
Inshore bottomfish	18	0	12
Sheepshead	13	0	2
Sharks	12	11	1
King mackerel/pelagics	15	49	0
Offshore bottomfish	0	13	0
Billfish	0	8	0
Southern District			
Spotted seatrout	39	6	13
Red drum	32	3	12
Flounder	13	0	5
Sharks	13	9	5
Bluefish	5	1	2
Inshore bottomfish	5	0	5
Spanish mackerel	5	7	0
King mackerel/pelagics	4	31	0
Offshore bottomfish	0	9	0
Billfish	0	1	0

<sup>1</sup> Includes spot, kingfishes, and croaker<sup>2</sup> Offshore species in the troll fishery, excluding billfish

Table 14. Species preferences of anglers interviewed in the creel census, by season and district. Values are percentages of fishermen seeking each species.

Species	Summer	Fall	Winter	Spring
Northern District				
Red drum	14	29	21	32
Spotted seatrout	3	9	41	9
Spot	18	24	15	11
Flounders	34	13	3	32
King mackerel	11	17	-	9
Spanish mackerel	9	3	-	1
Croaker	9	1	3	-
Bluefish	1	2	-	-
Sheepshead	-	-	-	1
Black sea bass	1	1	-	1
Striped bass	-	1	18	3
Central District				
Red drum	32	44	38	31
Spotted seatrout	17	37	48	26
Spot	3	2	7	8
Flounders	10	4	-	9
King mackerel	5	2	-	4
Sharks	10	3	-	4
Croaker	5	2	3	4
Bluefish	6	1	-	5
Sheepshead	1	2	-	1
Black sea bass	3	1	-	4
Striped bass	-	-	3	1
Black drum	-	2	-	-
Catfish	1	1	-	-
Southern District				
Red drum	26	29	33	3
Spotted seatrout	23	32	44	8
Spot	-	3	11	-
Flounders	19	16	-	8
King mackerel	3	3	-	-
Spanish mackerel	3	3	-	3
Sharks	19	7	-	18
Croaker	-	-	-	3
Sheepshead	1	3	11	5
Black sea bass	-	-	-	5
Catfish	-	-	-	8
Cobia	8	-	-	40
Tarpon	-	2	-	-
Wahoo	-	2	-	-



In the northern district, red drum was the most popular species overall, although flounders were preferred in summer and spotted seatrout was by far the most-sought species in winter. Striped bass (*Morone saxatilis*) was also fairly popular in winter. Inshore bottomfishes, primarily spot, were rather consistently targeted by a significant percentage of anglers year-round.

In the central area, red drum was again the most popular species on a year-round basis. Spotted seatrout was the most-sought species by winter fishermen. These species accounted for the vast majority of angler interest, with flounders and inshore bottomfish being relatively much less sought here than in the northern district.

Spotted seatrout was the most preferred species on a year-round basis in the southern region, closely followed by red drum. Sharks and flounders were sought by approximately equal percentages of anglers; the former appeared to be much more popular here than elsewhere in the state.

#### On-site Drop-Box Survey

In the central district, 29% of all anglers who reported their catch caught spotted seatrout, 27% caught red drum, 17% caught sharks, 15% flounders, 10% bluefish, and 7% spot. In the southern area, 20% of the fishermen reported catching red drum, 19% spotted seatrout, 11% sharks, and about 9% in each case reported sea bass, sheephead, and flounders. These can be considered roughly equivalent to angler preferences, given the previously stated assumption that most fishermen catch what they seek (Malvestuto 1983).

#### Catch and CPUE

Trip catch and effort data (completed trips only) are summarized in Table 15. Numbers of trips, anglers, and fish caught by area and month for the on-site surveys are listed in Table A-6 (creel census) and A-7 (drop-box).

About 65% of the total trips reported in the creel census occurred during spring, summer, and fall in the northern district. Of the 730 trips statewide, 73% were in the northern district, 20% in the central area, and 7% in the southern region. Of the 7,589 fish reported, 84% were caught in the northern district, 12% in the central area, and 4% in the southern district. About 83% of the usable trip cards in the drop-box survey were from the central district and 17% from the southern area; distribution of the 3,532 fish catch was similar.

Statewide, the most abundant species reported during the creel census was spot, which accounted for one-third of the total catch. The next most abundant species was red drum, followed by croaker, flounders, and spotted seatrout. Black sea bass was the only other species representing more than 5% of the

catch. There was no summer sampling in the drop-box survey and most of the fish were reported caught during fall and spring in the central district. Spotted seatrout represented 22% of the total catch, followed by red drum (18%), spot (13%), sharks (7%), and flounders (6%).

Data for the northern district are from the creel census only. Spot was the dominant species, representing 57% of the total catch in the fall, when this species was most abundant. Nearly all of the flounders were caught in spring and summer, while most of the spotted seatrout were taken during fall and winter. Significant numbers of red drum were caught in every season.

There was no winter catch reported in the central district during the creel census and fall catches were relatively small. Red drum was the dominant species, followed by croaker and spotted seatrout. Very few flounders were observed. Drop-box survey results were dominated by fall catches and spotted seatrout represented 25% of the total catch during the survey. Red drum and spot each accounted for 17%. Half of the spotted seatrout and nearly 40% of the red drum were reported from the east Cooper area, while most of the spot catch came from the northern end of Charleston County. Most of the few flounders reported were taken in the south end of the county.

The total catch from the southern area reported in both surveys was very small compared to that from the other districts. Most of the fish observed during the creel census were caught in the summer, with red drum by far the dominant species, followed by flounders. Red drum and spotted seatrout dominated the catch reported in the drop-box survey. The catch of species of secondary importance, e.g. kingfishes, sheephead, and bluefish, was much larger here than elsewhere.

Distribution of CPUE by district is shown in Fig. 10 for all species combined (i.e., the total fish catch). In the creel census, no fish (0 catch) were reported caught on 9% of the trips in the northern district, 26% of those in the central area, and 36% of all trips in the southern region. Corresponding values from the drop-box survey were 31% in the central district and 27% in the southern area.

Seasonal CPUE for all species combined is illustrated in Fig. 11. There were insufficient monthly observations from the southern area to permit a similar treatment. For the northern district, the all species combined CPUE during the June 1985-May 1986 period (creel census data only) was 5.8 fish per angler per trip. In the central district, the mean CPUE from combined creel census and drop-box data (445 observations) was 3.9 ( $s^2 = 60.8$ ). In the southern district, CPUE from combined data (110 trips) was 3.5 ( $s^2 = 29.1$ ). Combined data include

Table 15. Trip catch and effort summaries for the on-site surveys, by area and season.

	Northern District				Central District				Southern District			
	Sum	Fall	Wtr	Spr	Sum	Fall	Wtr	Spr	Sum	Fall	Wtr	Spr
	Cree1 Census											
Trips	174	155	64	143	47	58	4	38	24	7	0	16
Fishermen	357	310	119	306	115	117	7	87	56	17	0	39
Total trip hours	952	756	284	730	205	250	14	152	137	37	0	77
Spotted seatrout	63	219	96	1	38	83	0	15	14	7	0	0
Red drum	246	317	76	172	79	111	0	12	107	1	0	0
Flounders	326	96	3	313	2	3	1	3	26	6	0	5
Bluefish	41	67	1	116	13	6	0	9	9	0	0	1
Spot	446	1456	79	366	28	49	0	31	0	0	0	0
Croaker	253	95	40	259	142	0	0	46	1	0	0	0
Kingfishes	0	0	0	0	5	2	0	1	0	0	0	0
Sheepshead	0	7	8	3	12	6	0	1	0	0	0	0
Black sea bass	177	8	0	129	37	13	0	20	0	20	0	13
Sharks	7	1	0	2	5	0	0	21	2	2	0	6
S. mackerel	207	43	0	42	0	0	0	0	6	0	0	1
K. mackerel	73	124	0	30	0	4	0	4	2	0	0	0
Striped bass	0	8	29	1	0	2	0	0	0	0	0	0
Other	102	88	31	132	47	39	0	26	18	5	0	8
Total fish	1941	2540	364	1566	408	318	1	189	185	41	0	36
	Drop-Box Survey											
Trips	-----	-----	-----	-----	---	137	49	117	---	38	6	19
Fishermen	-----	-----	-----	-----	---	310	121	323	---	94	18	46
Spotted seatrout	-----	-----	-----	-----	---	453	63	155	---	99	19	0
Red drum	-----	-----	-----	-----	---	256	96	104	---	180	4	0
Flounders	-----	-----	-----	-----	---	67	14	108	---	14	0	0
Bluefish	-----	-----	-----	-----	---	7	0	71	---	2	0	85
Spot	-----	-----	-----	-----	---	328	0	128	---	4	3	0
Croaker	-----	-----	-----	-----	---	10	2	83	---	0	0	0
Kingfishes	-----	-----	-----	-----	---	3	2	58	---	24	0	30
Sheepshead	-----	-----	-----	-----	---	31	0	0	---	10	25	16
Black sea bass	-----	-----	-----	-----	---	21	0	5	---	5	0	25
Sharks	-----	-----	-----	-----	---	10	21	199	---	2	0	17
S. mackerel	-----	-----	-----	-----	---	0	0	0	---	0	0	0
K. mackerel	-----	-----	-----	-----	---	0	0	7	---	4	0	0
Striped bass	-----	-----	-----	-----	---	0	0	1	---	0	0	0
Other	-----	-----	-----	-----	---	13	3	270	---	29	1	27
Total fish <sup>1</sup>	-----	-----	-----	-----	---	1444	217	1217	---	302	52	300

<sup>1</sup> Does not necessarily represent sum of species totals; some fishermen did not distinguish species

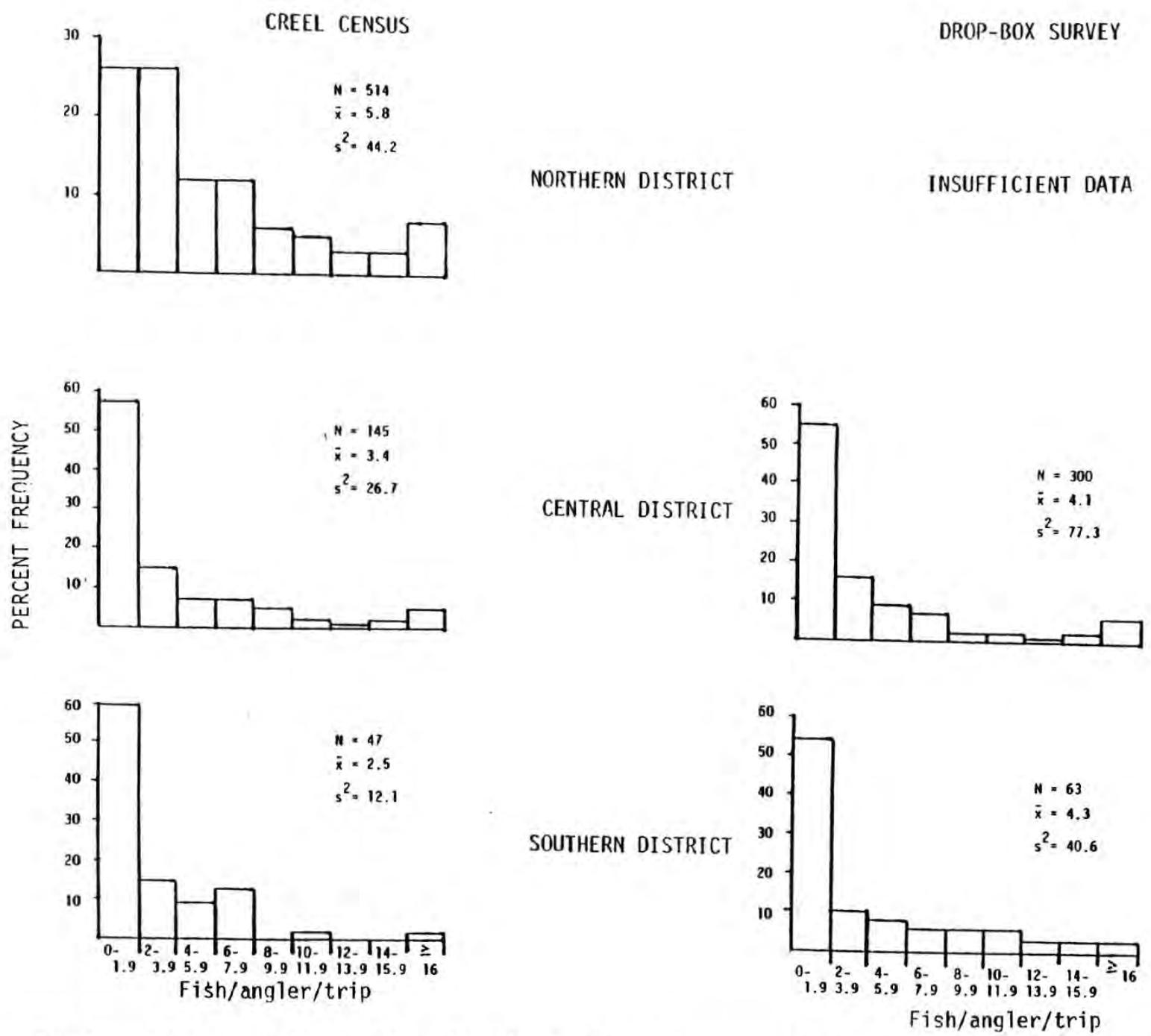


Fig. 10. Catch-per-unit-of-effort (fish/angler/trip) from on-site surveys. All species combined.

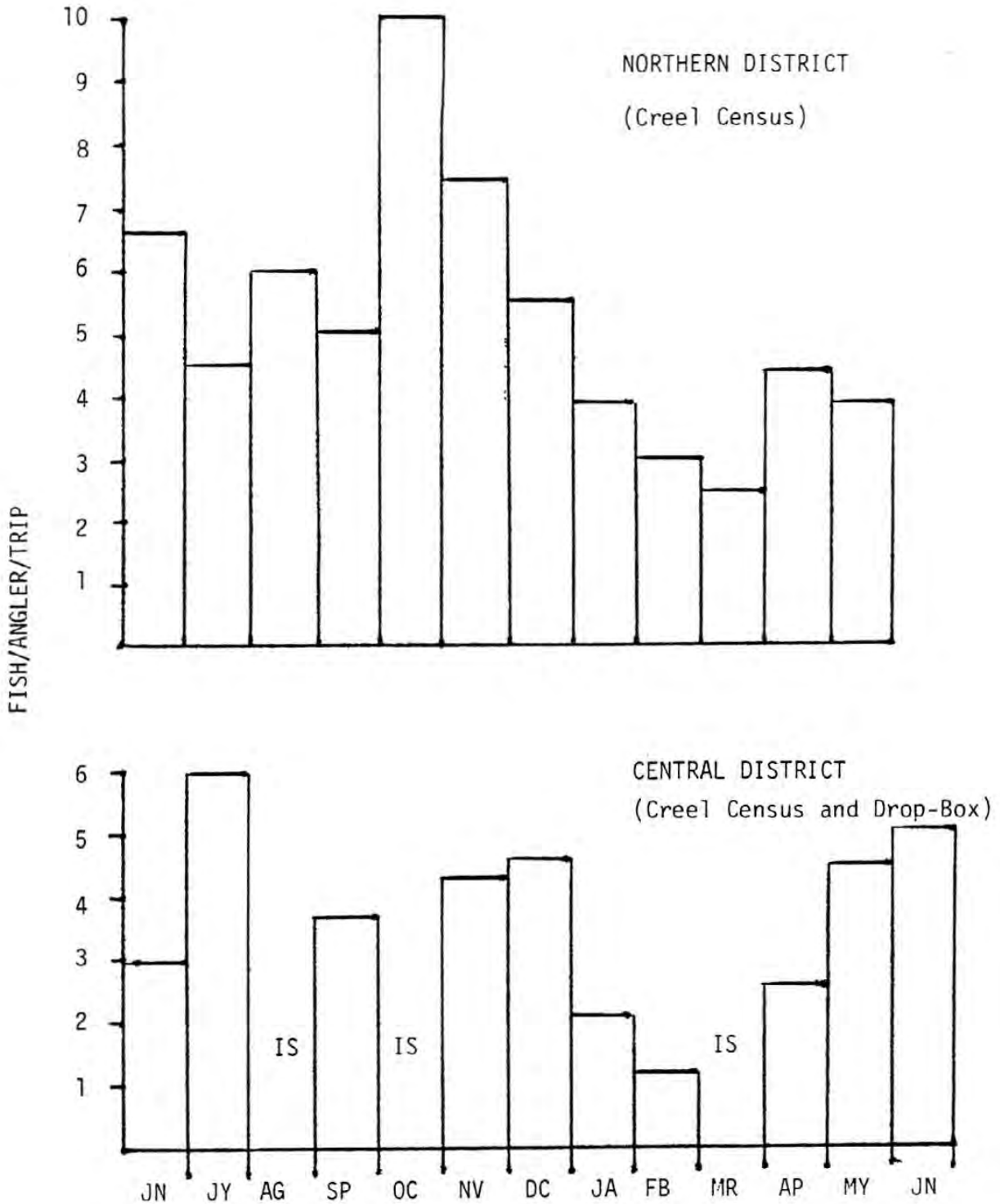


Fig. 11. Monthly all species catch-per-unit-of-effort (fish/angler/trip) in the northern and central districts. IS- insufficient data (sample size  $< 10$ ).

drop-box results from June 1986. The overall statewide average CPUE during these surveys was 4.8 fish per angler per trip ( $s^2 = 50.5$ ) based on 1,069 observations.

Species CPUEs were calculated for red drum, spotted seatrout, and flounders (the primary species of statewide interest). The figures in Table 16 are based either on CPUE calculated from creel census interviews in which species preference was known or CPUE calculated using method 2 (see Methods section) for the drop-box survey. Central district figures are ratio-of-averages statistics based on data from both surveys. The numbers of observations per month in the southern district were too small to permit meaningful seasonal analysis.

CPUE values for crabbing were available from observations in the northern district only (10 in spring, 19 in summer, and 8 in the fall) and were as follows (crabs per person per trip): 8.5 in spring, 15.4 in summer, and 18.1 in fall.

Virtually all of the creel census data on shrimping are from June-August 1985, while all of the usable drop-box data are from the spring 1986 quarter. Both time frames correspond to periods when brown shrimp (*Penaeus aztecus*) represent nearly all of the recreational catch. For creel census data, the mean CPUE was 5.4 pounds per person per trip (gear not specified). For drop-box data, CPUE for seiners was 2.9 and that for cast netters was 4.5 pounds per person per trip.

Effort (number of angler-trips) and catch estimates are listed in Table 17 for all fish combined, red drum, spotted seatrout, and flounders. Activity weighting factors used to calculate effort were those listed under the creel census in Table 5. These estimates are based on ratio-of-average statistics, calculated as the total number of fish reported (in the creel census only for the northern district, in both surveys for the other areas) divided by the total number of anglers in each area in each season (from Table 15). This is analogous to the approach used by NMFS to estimate area/wave catches in that total trips are used because angler preferences are unknown. NMFS estimates of total catch for the private/rental boat mode are indicated by two-month waves in Table 18.

Effort and catch (number of crabs) estimates for crabbing are listed in Table 19. Activity weighting factors from the creel census were used to estimate effort in the northern district. The others were from the drop-box survey, because there seemed to be some difference in interpretation among the interviewees as to what constituted crabbing (and shrimping) activity. Missing values were regenerated by averaging the figures from the seasons before and after the subject one. The CPUE estimator used in generating the central district winter catch estimate was 6.0, an arbitrary value that seemed consistent with general knowledge.

Estimated shrimping effort during the summer (1985) was 903 trips in the northern district, 4,249 in the central area, and 2,207 in the southern region, producing an estimated catch of about 40,000 pounds. During the spring 1986 quarter, an estimated 1,205 seine trips in the central and southern districts produced 3,400 pounds and 5,206 cast net trips generated an estimated 22,600 pound catch.

#### Length Composition of Red Drum and Spotted Seatrout Catches

Length frequency distribution of red drum measured during the creel census is shown in Fig. 12. The dark vertical marks delineate the 14-inch minimum size set by state law (50-17-55) in June, 1986. The length distribution of spotted seatrout is shown in Fig. 13 and the marks indicate the 12-inch minimum size prescribed in the new regulation.

## DISCUSSION

### Survey Response

In each survey, responses from the southern district comprised a relatively low percentage of the total sample. This needs to be considered carefully in evaluating results based on statewide data bases, since these reflect the preponderant contributions from the northern and central areas.

Responses from the winter quarter also represent a minor portion of the total combined survey sample. This probably is not a major concern, since activity during this period appeared to be uniformly low in all areas.

### Fishing Modes

Inclusion of this category was based on its importance to the stratification of the NMFS survey intercepts, which as proposed for 1987 includes a 14% allocation to the shore-based mode, 41% to charterboats, and 55% to the private (and rental) boat sector.

The combined responses of shore-based fishermen (bank/bridge and pier/surf) in the tackle shop survey represented 14% of the total, identical to the proposed NMFS allocation. Popularity of charterboat and headboat fishing as indicated by questionnaire respondents was extremely low. Small private boat fishermen constituted the largest user group, as was noted in earlier years by Cupka (1977).

Fishery managers are most likely to obtain a true picture of fishermen preferences through a random sample of the total population (including nonfishermen) (Duttweiler 1976). The tackle shop questionnaire was not directed at the entire fishing population, so some qualifications must be assigned to its results. Although most of the responses were obtained during the summer, when recreational offshore and tourist fishing participation are greatest

Table 16. Species CPUE for red drum, spotted seatrout, and flounders.

Season	Red drum			Spotted seatrout			Flounders		
	N	$\bar{x}$	$s^2$	N	$\bar{x}$	$s^2$	N	$\bar{x}$	$s^2$
Northern District									
Spring	48	2.0	3.3	Insufficient data			70	2.1	4.5
Summer	49	2.3	5.4	18	1.7	2.2	61	2.8	3.6
Fall	58	3.3	6.2	44	2.8	3.3	25	2.3	3.0
Winter	23	1.8	1.3	25	2.4	9.3	Insufficient data		
Total	178	2.5	4.8	88	2.4	4.8	159	2.6	3.9
Central District									
Spring	-	1.5	-	-	2.1	-	Insufficient data		
Summer	Insufficient data			Insufficient data			Insufficient data		
Fall	-	2.7	-	-	3.0	-	Insufficient data		
Winter	Insufficient data			Insufficient data			Insufficient data		
Southern District									
Total	43	2.8	17.3	34	1.6	7.5	13	1.3	1.1

Table 17. Estimates of fishing effort (angler-trips) and catch (numbers of fish) by district and season.

District	Category	Spring	Summer	Fall	Winter	Total
Northern	Trips	16,298	25,595	18,190	10,343	70,426
	Red drum	9,161	17,637	18,601	6,606	52,005
	S. seatrout	53	4,517	12,850	8,344	25,764
	Flounders	16,671	23,372	5,633	261	45,937
	All species	83,407	139,159	149,041	31,637	403,244
Central	Trips	11,477	18,410	18,897	2,975	51,759
	Red drum	3,247	12,647	16,242	2,231	34,367
	S. seatrout	4,759	6,083	23,721	1,464	36,027
	Flounders	3,107	320	3,098	349	6,874
	All species	39,358	65,315	77,978	5,067	187,718
Southern	Trips	5,737	6,255	5,926	884	18,802
	Red drum	-	11,952	9,663	196	21,811
	S. seatrout	-	1,564	5,659	933	8,156
	Flounders	337	2,904	1,068	-	4,309
	All species	22,678	20,664	18,312	2,554	64,208
Statewide	Trips	33,512	50,260	43,013	14,202	140,987
	Red drum	12,408	42,246	44,506	9,033	108,183
	S. seatrout	4,812	12,164	42,230	10,741	69,947
	Flounders	20,115	26,596	9,799	610	57,120
	All spp.	145,443	225,138	245,331	39,258	655,170

Table 18. NMFS catch estimates (private/rental boat mode) by two-month waves (NMFS unpubl. data).

Wave	Red drum	Spotted seatrout	Flounders	All species
July-August	26,801	1,787	23,227	850,480
September-October	41,972	6,218	18,655	1,105,261
November-December	84,423	289,654	10,189	609,877
March-April	3,362	840	210	217,861
May-June	27,875	1,810	99,554	969,208
Total	184,432	300,309	151,835	3,752,687

Table 19. Estimated crabbing catch and effort. Catch is number of crabs.

District	Category	Spring	Summer	Fall	Winter	Total
Northern	Trips	740	3,011	1,538	0	5,289
	Catch	6,290	49,380	27,838	0	83,508
Central	Trips	5,968	5,665	4,098	462	16,193
	Catch	50,728	92,906	74,174	2,772	220,580
Southern	Trips	2,470	2,760	2,176	0	7,406
	Catch	20,995	45,264	39,386	0	105,645
Statewide	Trips	9,178	11,436	7,812	462	28,888
	Catch	78,013	187,550	141,388	2,772	409,733

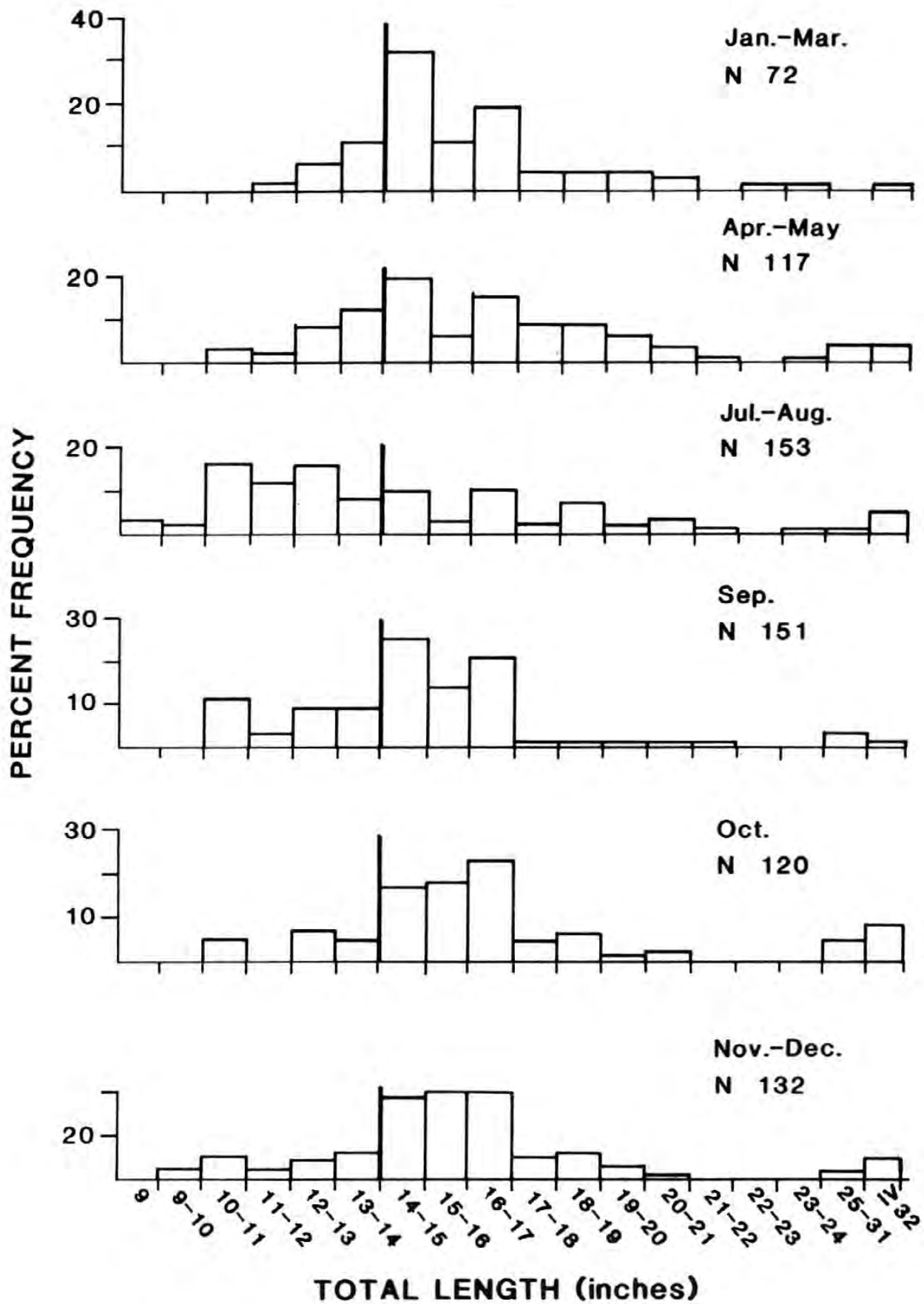


Fig. 12. Length frequency of red drum.



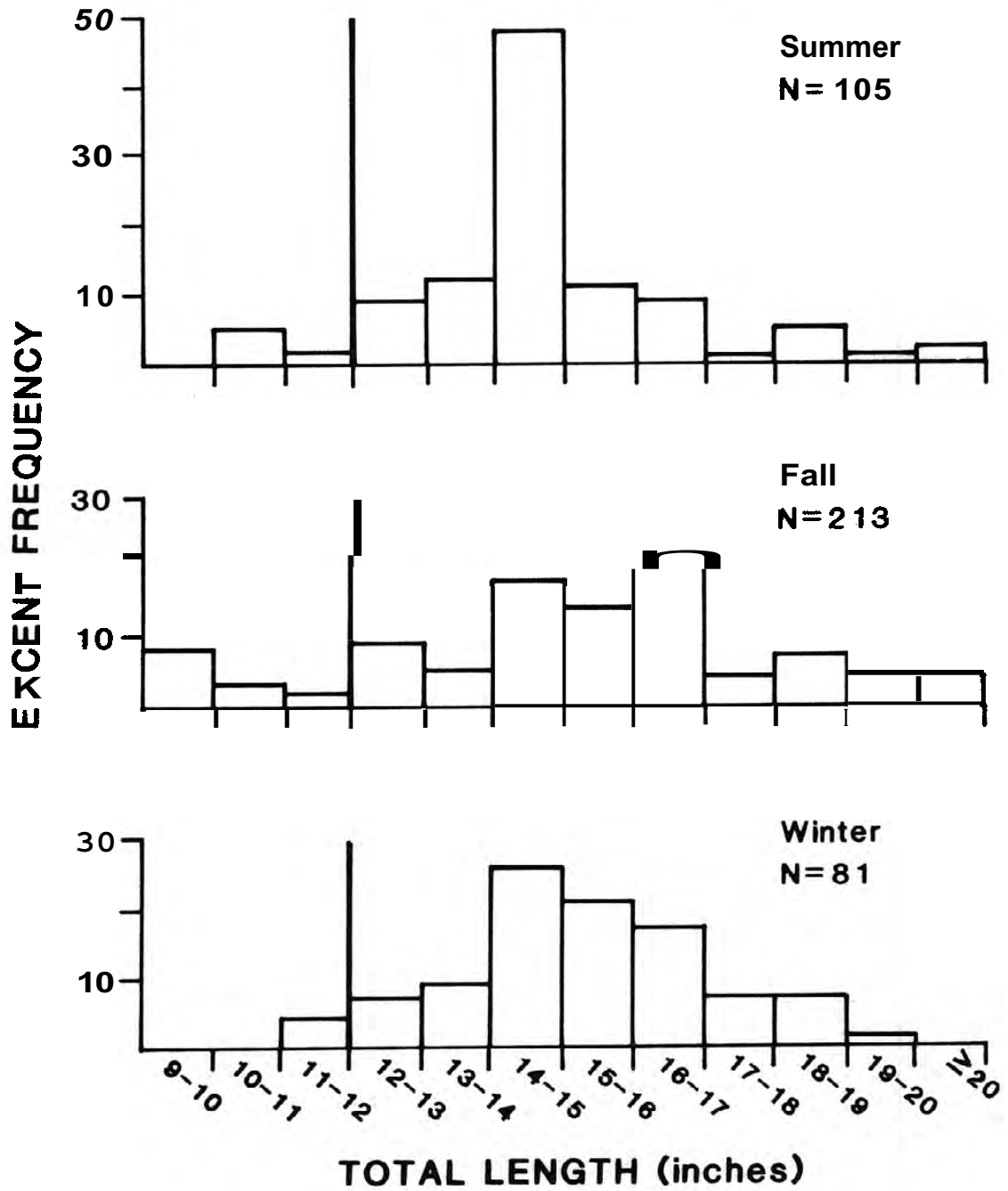


Fig. 13. Length frequency of spotted seatrout.

(Liao and Cupka 1979a), the selection of sites probably resulted in a very high proportion of responses by local (coastal) residents. Pier fishermen usually patronize shops on the piers for convenience and both charterboat and headboat anglers are unlikely to purchase tackle or bait, particularly if they are nonresidents who fish only occasionally in those modes. Hammond and Cupka (1977) estimated that local residents represented only 16% of the total pier attendance, while Liao and Cupka (1979a) concluded that slightly less than 50% of the charterboat passengers and 67% of the headboat fishermen were nonresidents. Thus, the overall allocation of fishing activity in South Carolina among these various modes is probably not accurately reflected in the tackle shop survey results. What probably is represented are the preferences of local (coastal) resident fishermen.

Although ocean private boat fishing was popular with local residents (27% of the tackle shop survey respondents), the overall importance of this mode may also have been underestimated. The study by Liao and Cupka (1979a) found that residents of Charleston, Beaufort, Georgetown, and Horry Counties accounted for about 30% of the state's private boat offshore fishermen. Offshore private boat anglers, however, would have been much more inclined to make their tackle, bait, etc. purchases in coastal tackle shops, where suitable items would have been more available than at sources inland near their residence. Thus, this group probably was better represented in the survey than nonlocal fishermen in other modes.

#### Fishing Activities

The tackle shop survey results suggested that many local residents who fish in salt water also engage in other related activities, such as crabbing and shrimping, during at least some of their trips. Because of their proximity to the resources and probable higher frequency of trips, a logical conclusion is that crabbing and shrimping are relatively more popular with these coastal fishermen than with inland and nonresident anglers.

About 8% of the tackle shop survey respondents indicated that they did some gillnetting, with this activity being most popular with northern district respondents (13%). Virtually all of the intercepts of noncommercial gillnetters were made in the northern area, primarily in the fall. Only 2% of all trips statewide included gillnetting as an activity. There were practically no returns from people indicating gillnetting as a trip activity during the drop-box survey (i.e., in the central and southern districts), although theoretically this survey addressed nighttime anglers as well as daytime fishermen.

Results from the tackle shop survey indicated that 23% of the respondents practiced gigging at some time, with the relative level of participation being about

the same in each district. The sampling design of the creel census precluded contact with fishermen who had been gigging (a nocturnal pursuit) and only a few positive responses were received in the drop-box survey (which also received few replies from fishermen returning during the night or early morning).

Statewide, 27% of the respondents to the tackle shop questionnaire indicated that they participated in crabbing. Creel census interviews reported that crabbing occurred during 5-7% of the trips in most areas and seasons. About 26% of the drop-box trip reports indicated crabbing as a trip activity. Part of this discrepancy may have been attributable to respondents' interpretation of the question asked during the respective surveys. Geographical distribution of the samples (most of the creel census interviews in the northern district, most of the drop-box replies from the central and southern areas) may also have been a factor, since results of the tackle shop survey indicated that crabbing was progressively more popular to the south.

Statewide, the tackle shop survey results indicated that 47% of the respondents participated in cast netting for shrimp and 15% in shrimp seining. Both on-site surveys reported roughly comparable, low levels of shrimp seining. The drop-box on-site survey results suggested a much higher level of effort for shrimp cast netting than was reported in the creel census. The survey respondents' interpretation of the questions asked may again partly explain the discrepancy. Most people who cast netted were apparently doing so to collect bait for fishing (the main trip objective), so that shrimping was an ancillary activity and may not have been reported so frequently by anglers interviewed in the creel census, many of whom were setting out on their trip and had not actually performed any activity as yet. While the daytime sampling restriction of the creel census may also have contributed to the low level of cast netting activity reported, it should also be noted that few reports (9% of all shrimpers) from nocturnal shrimpers were received in the drop-box survey.

#### Boat Classification

Results from both on-site surveys indicated that a substantial percentage of boat usage was devoted to nonfishing activities (e.e. skiing and site-seeing) in certain seasons and areas. This is an important consideration when using the boat owner registration file as a base for surveys of marine fishing activity. Because the number of registered owners is large (about 62,000 boats under 25 ft in the coastal zone 1 of Fig. 8), any valid means of reducing the target population, stratifying it by probable usage, etc. is worth consideration. Ditton et al. (1980) described the methodology for predicting boat employment in various fishing activities from boat registration data (e.g.

horsepower and length). The data obtained during the various surveys are useful for this application, since they identify by length, district, and season the probable levels of boat employment for various activities (additional data on engine characteristics were collected during the creel census and are available, though not included in this report).

#### Access Point Utilization

To a significant extent, the relative success of the creel census as measured in numbers of completed trip interviews per sampling cell is directly related to utilization characteristics of the various sites and their areal distribution. Only two of the nine sites surveyed in the northern district fell into the low utilization category and 55% were in the high-use bracket. Four are in very close proximity in the Little River area, three are close together at Murrells Inlet, and the remaining two in Georgetown are close. Although the distance between these groups is fairly substantial, there are no intervening geographical barriers. A single interviewer can therefore cover a number of sites in a given day, yet still have adequate time to conduct interviews. Two of the sites in each group are high-use locations. In the northern district, the creel clerk can select one site in each of the three principle fishing areas and expect a high probability of positive contacts. This drastically reduces the amount of field time required to obtain adequate samples of catch and CPUE in this area.

A somewhat different situation exists in the central district, which is elongated and has access points distributed uniformly throughout. All four of the high-use sites are in the center of the county and nearly all of the others are medium-use locations. Again, it is logistically feasible for a creel clerk to systematically visit several high-probability-of-contact locations in order to inspect catches. It is much more difficult for the interviewer to operate in a random roving mode, as is necessary to conduct trailer counts or perform similar tasks, as was reported in a roving creel census during June-August 1979 in the Charleston Harbor area (Low and Molony 1979).

The problems confronting effective conduct of a roving census are most severe in the southern district. Nearly all public access points receive low rates of usage and they are geographically isolated by water masses, which makes them difficult to sample within a limited time. Complicating the problem of a low probability of positive contact is the apparently large percentage of private boat trips that originates from sources other than the public boat landings. Results from the tackle shop survey indicated that most of the preferred access points were private marinas. There is also a relatively larger proportion of private docks here than elsewhere. Thus, the roving census of public access points had a lower probability of

intercepting appreciable numbers of fishermen in this district.

#### Residence

Utilization of access points was primarily attributable to residents of coastal counties, which suggests that private boat inshore fishing is mostly an activity enjoyed by local residents. Nearly all of the boat fishermen contacted during the summer 1979 survey in Charleston lived close to the ramp at which they were interviewed (Low and Molony 1979). The relatively high fidelity level (expressed as the number of trips per month made at a particular site) indicated in the drop-box results confirms this interpretation. Low and Molony (1979) also found that the number of times people fished per month and the number of trips they made from a particular ramp coincided closely. Although 15% of the trailers counted were from out-of-state, the vast majority of these belonged to residents of adjacent counties in either North Carolina or Georgia, for whom the South Carolina site was the most convenient access point. Compared to the levels of nonresident participation in other major modes (e.g. 57% out-of-state pier attendance, slightly less than 50% charterboat patronage, and 67% of the headboat passengers), nonresident inshore fishing activity is very limited. Even private boat ocean fishing appears to attract a far higher level of participation from people outside the coastal counties. Liao and Cupka (1979a) reported that about 70% of the state residents in this mode lived in inland areas, whereas only 7% of those contacted in the on-site surveys were state residents from outside the coastal (zone 1) area.

#### Reactions to Licensing

Since each survey indicated (although to variable extents) that marine recreational fishing is a diversified experience that includes substantial effort besides rod-and-reel fishing, the type of license is of interest. Rather than license each activity (e.g. gigging, shrimp seining, etc.) separately (as is presently done in some counties), a combined recreational usage permit would be more appropriate. Such a license should retain some means of identifying which activities the holder participates in, in order to form the basis for mail-out surveys (Duttweiler 1976) as well as to document the relative importance of the various activities. A combination license would probably be the most acceptable to the constituency.

The concerns expressed regarding the potential adverse impact of licensing on tourist fishing are not very applicable to the inshore private boat fishing mode, given the low level of out-of-state participation. The principal impact would be on Georgia and North Carolina residents living in adjacent counties. A provision allowing these people to purchase a resident license could be incorporated in the licensing mechanism or,

if they are required by their home state to purchase a marine recreational fishing license, this could be honored under a reciprocal agreement.

#### Problems with Marine Recreational Fishing

"Commercial fishing" was one of the major problems perceived by the constituency. Most of the inshore commercial fishing boats observed during the creel census were employed for shellfishing or crabbing; only a few in the northern district were identified as being operated by commercial finfish fishermen (except for shad netters fishing in fresh water). Most of the fish catches seen by the creel clerk consisted of spot and croaker. The commonly held opinion, however, is that "commercial fishing" takes substantial numbers of preferred species, e.g. red drum, spotted seatrout, and flounders. Data on commercial landings collected by the Division's Fisheries Statistics Section indicate that this is not the case. In both 1984 and 1985, the reported catches of red drum and spotted seatrout (primarily by inshore gillnets and stopnets) were less than 4,000 pounds and 2,000 pounds, respectively. Although the recent annual commercial landings of spot have been in the 125,000-150,000 pound range, nearly all of this harvest has been taken during a short fall fishery by haul seiners working the beach on the Grand Strand. The only inshore species landed to any extent by commercial shrimpers are kingfishes and flounders, most of which are taken at least one-half mile off the beach. Commercial landings of kingfishes during 1984 and 1985 were in the 60,000-80,000 pound range, while those of flounders were 30,000-60,000 pounds.

Spot are popular with inshore recreational fishermen and represent a substantial part of their total annual catch. This species also is the major species landed as bycatch by commercial shrimpers. A study by the Division (Keiser 1976) found that spot comprised 30% (by number) of the total annual bycatch off South Carolina. Although not a preferred target of most fishing trips, anglers do catch significant numbers of croakers, particularly in the summer. This species was the third most abundant component of the bycatch (9% by number). The annual catch of finfish by shrimpers is very substantial (Keiser estimated that the total 1975 South Carolina bycatch was 15.9 million pounds of all fish species combined) and more than 90% of it is shoveled overboard, most of which is dead. Although the magnitude of this discard dismays many conservationists and recreational fishermen (as well as the shrimpers who have to handle it), it probably is relatively small compared to the standing stock of short-lived, prolific species such as spot and croaker, which are among the most abundant coastal fishes in the southeastern United States. There is no scientific evidence to suggest that the incidental bycatch has adversely affected either the populations or recreational catches of these species, despite the fact that commercial

shrimpers have taken large annual bycatches for at least 20 years.

Shrimp trawlers also catch flounders, mostly juveniles. The important species most commonly caught is the summer flounder (*P. dentatus*), found along the beaches and in the inlets. Southern flounder (*P. lethostigma*) is the species that represents most of the inshore recreational catch, particularly in the rivers and creeks that it frequents. Of these two species, only 18% of those sampled in the bycatch study were southern flounders and only 0.07% (by number) of the total bycatch sampled consisted of southern flounder. Only 23 spotted seatrout (0.02% by number in the total catch) and no red drum were observed.

Respondents indicated a negative attitude toward gillnetting all along the coast, but particularly in the northern district (where recreational gillnetting was also most popular). Commercial gillnetting does not appear to be a problem, judging from the low catch levels of preferred species mentioned earlier. Most of the concern surrounds recreational activity. Only 2% of the trips observed statewide during the creel census involved recreational gillnetting and nearly all of these occurred in the northern area during the late fall. Spot and croaker were the major species observed in the catches. A study (Moore 1980) of gillnetters licensed in 1978 found that spot, mullet, and bluefish were the major species harvested on an annual basis. The estimated catch included about 37,000 pounds of spotted seatrout, 29,000 pounds of red drum, and 25,000 pounds of flounder, some of which were sold. Most of the gillnetting in the northern and southern districts took place either in the ocean or in inlets. Less than 15% occurred in rivers, creeks, or other inland areas in the northern counties and about 26% took place there in the southern district. Most of the inside fishing took place in the central district, where about 57% of the netting was in bays, rivers, or creeks (C. Moore, unpubl. data), partly in response to these findings, legislation was later enacted that substantially restricted the legal fishing area in Charleston County and required nets to be constantly tended. The probable impact has been a significant reduction in recreational gillnetting effort, with a consequent reduction in associated fishing mortality on preferred recreational species such as red drum and spotted seatrout.

"Lack of management" was another widely perceived problem. To most anglers, this connotes an absence of minimum size limits, daily bag limits, or similar regulations. Many years ago, South Carolina did have an array of minimum size limits for various finfish, but these were seldom enforced and were eventually repealed. At the time, fishing mortality was probably so low that these regulations served no effective purpose. At present, there are still no reliable scientific estimates of fishing

mortality available for South Carolina inshore species, although a comprehensive field program is being conducted that will address that aspect. Acting on the recommendation of the Atlantic States Marine Fisheries Commission (1984a, 1984b), the state legislature enacted the minimum sizes for red drum and spotted seatrout. The 14-inch minimum size for red drum presently is in force during June-August. In the June-August 1979 survey in the Charleston area, 73% of the red drum measured were smaller than 14 inches (Low and Molony 1979). About 65% of those measured in the creel census during June-August 1985 were smaller than 14 inches. Although the relative abundance of sublegal red drum is greatest during summer, a substantial percentage of the fish available to inshore anglers throughout the year is below 14 inches. About 22% of those caught during the other seasons in 1985-1986 were below 14 inches.

The 12-inch minimum length for spotted seatrout has no window (it is in effect year-round). About 7% of the fish measured in the 1985-1986 creel census fell below this standard. The absence of a spring (April-June) sample is misleading, as there normally are large numbers of sublegal fish present then. The population structure of spotted seatrout in South Carolina is highly variable from year to year. In some years (1986 being a good example), a significant part of the fall population available to inshore anglers consists of fish less than 12 inches. This is usually also the case in the spring and sometimes in the summer; 35% of the seatrout measured in the 1979 Charleston survey were less than 12 inches (Low and Molony 1979). Thus, the impact of the 12-inch size limit on the spotted seatrout fishery will be variable from year to year.

#### Species Preference

Results from the three surveys are in agreement that the red drum is the most popular species with inshore anglers on a statewide basis, followed by spotted seatrout and flounders. Popularity of spotted seatrout is greatest in the winter, while interest in flounders is concentrated in spring and summer. Among ocean private boat fishermen, the predominant favorite statewide is the king mackerel, as was also the case in a previous study (Liao and Cupka 1979a). Sharks were not mentioned in this earlier study, but ranked close to offshore bottomfish in priority during the present surveys.

#### Catch and CPUE

Although generally low, catch rates observed in the 1985-1986 surveys were higher than those reported during comparable periods in other years. In the northern district, the summer 1985 catch rate of 0.93 fish per angler-hour was well above that reported at Murrells Inlet in 1978 (Moore 1978). That in the central district (0.68) was above the 0.37 catch rate seen during the 1979 Charleston Harbor survey (Low and Molony 1979).

When evaluating the catch estimates generated from data collected during the Division surveys, several factors must be kept in mind. The most important is that the estimates are limited to catch and effort at the sites sampled only (the NMFS estimates include all sources of private boat catch). They do not include estimates for catch and effort at other public access points, nor do they address the effort and catch of private boat anglers leaving from private facilities. The latter limitation may be especially relevant. The distribution of CPUEs observed in both on-site surveys is highly skewed, indicating that most angler-trips produced few fish. Addition of a few observations in which CPUE was high would result in an appreciably higher mean value, particularly if calculated as a ratio-of-averages statistic (which is most often used). In the central and particularly the southern district, a substantial percentage of private boat fishermen appears to use private facilities as the primary source of access. Such individuals are likely to be more serious (and knowledgeable) fishermen than their weekend counterparts who use the public sites, and it is also reasonable to assume that their average CPUE, particularly for the most esteemed species (e.g. red drum, spotted seatrout, and flounders), is considerably higher than that noted at public landings. Modest increases in CPUE result in substantially higher catch estimates.

Another important factor is the way in which effort was estimated. A conservative approach was taken by including only half of the afternoon trailer counts. Estimated effort could be increased 33% simply by including the entire afternoon count, for example, which would produce a substantial increase in the estimated catch. Since the catch estimates are dependent on reliable effort estimates for any reasonable accuracy, the assumptions and methods used to calculate effort have considerable bearing on the catch estimates. The estimates of effort produced from a roving creel census become rather tenuous when either the sampling effort is limited (as was the case in the central district during the fall) or the observed levels fluctuate over a wide range (as was often the case).

If effort is estimated from site visit data, e.g. trailer counts, observed numbers of fishermen per sampling period, etc., then stratification of the sampling becomes a critical element. If the stratification results in a biased interpretation of the distribution and level of effort, then everything dependent on those estimates is probably inaccurate as well. Robson (1960) described detailed procedures for obtaining unbiased estimates of total effort, CPUE, and total catch using a stratified random design, but his method is not appropriate where there are many widely dispersed access points. This was obviously a serious problem in the Division creel census, particularly in the

southern district. Hayne (1972) improved the logistic practicality of the stratified random sampling approach by incorporating nonuniform probability sampling, i.e., the method adopted by NMFS for obtaining their CPUE estimates. The NMFS survey minimizes the problems associated with obtaining reliable estimates of effort by avoiding a site-oriented method. The statistical reliability of telephone surveys is good and this is the means by which NMFS estimates effort.

NMFS considers the variability in CPUE to be the principal source of sampling error in their catch estimates and recommends an increase in the number of on-site intercepts as the best way to reduce the coefficients of variation associated with mean CPUE values. Coefficients of variation at the state level for total catch commonly range in the 15-40% bracket, which results in wide confidence limits surrounding the catch estimates. For individual species, the variability is usually much higher and the estimates of catch even more unreliable.

Perhaps the most discouraging aspect of the CPUE data produced in the Division surveys is the extremely large variation associated with most of the mean values, even those for all species combined. Even for a species (group) like flounders, where an angler is highly unlikely to catch more than a few per outing (as was obvious in the creel census data) and wide fluctuations in catch rates are therefore uncommon, the observed coefficients of variation were at the 70% level in most areas, and this was about as low as they got for the various combinations examined. The resulting conclusion was that CPUE, regardless of species, season, or area, is extremely variable in South Carolina and that the precision of any catch estimates is therefore quite low.

The recommended NMFS strategy of increasing the sample size (number of intercepts) appreciably (by two or three times) in order to reduce the coefficients of variation substantially (25-35%) assumes that the major source of variability in the CPUE estimates is attributable to sampling error (i.e., the true CPUE is not highly variable). If true CPUE is highly variable, then increasing the sample size through increased effort may not measurably reduce the coefficients of variation within the practical limitations of sampling. The implication is that a large (and expensive) increase in sampling effort may not substantially improve the precision of catch estimates.

In their creel census, Malvestuto et al. (1978) found that precision in CPUE (as measured by the coefficient of variation) was largely independent of sampling effort, within a range of 5-10 survey days per month. They attributed most of the reduction in variation about CPUE as due to seasonal factors external to the survey (e.g. fishing patterns), not increased number of intercepts. Examination of data collected during the Division surveys

indicates that this also will be the case in South Carolina for any reasonable (and affordable) level of sampling effort (which was 5-7 days per month in the Division creel census). The creel data for the northern area included 514 observations of CPUE. Addition of the data from the other districts more than doubled the sample, but the coefficient of variation for the total catch estimator changed very little (and remained over 100%).

#### Comparison of Census Methods

Both methodologies (roving intercept and voluntary drop-box) have strong and weak points. The roving intercept method has a major advantage in that species and size composition of catches can be verified. There are also intangible benefits from this approach, such as direct Division contact with the constituency and associated public relations aspects. The main negative aspect is the high cost per interview attributable to the extensive field effort required. The number of man-days spent in the field was 214. A total of 730 reports of completed trips was obtained from 1,390 interviews (0.29 man-days per completed trip interview).

The principal disadvantages of the drop-box survey were chronic vandalism of the on-site boxes in some areas and "survey fatigue" (Smith 1983). This tendency for response rates to decrease over time is a common phenomenon in protracted surveys of a limited population subjected to repetitive sampling. It was apparent after the collection boxes had been in place at a given location for extended periods. Another potential negative factor is the reliability of voluntarily-reported catch and effort data that aren't cross-checked with periodic on-site intercepts. The NMFS headboat survey and the South Carolina commercial trip ticket system both rely on information contributed voluntarily by boat operators or their representatives. In both instances, the possible disadvantage of some bias in the data is considered to be outweighed by the reduced expense and effort associated with their collection. Comparative evaluation of the data obtained from both on-site surveys indicated that there was no substantial difference in the results pertaining to rod-and-reel fishing. The number of anglers per boat, the times they returned, and their species preferences were comparable. Allowing for the wide variation associated with catch rates, the mean CPUEs calculated by area and season in each survey were not substantially different.

The major advantage of the drop-box approach was its relatively low cost. In calculating the number of man-days spent in the central and southern districts, effort was estimated as 4 man-days per month during the high-activity months (November, December, April, May, and June) and 2 man-days per month during the low-activity period (January-March). In actuality, the creel clerks serviced the drop-boxes in the course

of their other duties. During the period of the drop-box survey in the central and southern districts, the creel clerks put in 88 man-days to obtain 194 completed trip reports in the creel census (0.45 man-days per interview), while an estimated 52 man-days were spent collecting 366 usable returns from the drop-boxes (0.14 man-days per response).

#### Survey Strategies

The principal objectives of future surveys would probably be estimations of effort and catch rates, which would then be used to generate catch estimates. Likely secondary goals would include monitoring of species and size composition. Other aspects of potential interest might be periodic appraisals of angler perceptions of fishing quality, reactions to regulations, etc.

**Sampling Stratification** - This will depend primarily on the specific objectives. The estimation of effort presents the most problems. Roving creel census estimates are sensitive to bias associated with sampling design and the sampling stratification must closely approximate the actual distribution of fishing effort. When a large number of widely dispersed access points must be sampled within a limited time frame, it is often impractical to attempt effort estimation through a roving on-site survey. Telephone surveys are less expensive, more convenient, and the accuracy of their results is generally superior to that of data obtained by other methods. NMFS uses this approach to generate estimates of effort by fishing mode and sampling wave. Future state surveys could either use NMFS effort estimates or obtain them by a similar method.

The relationship between catch rates, species mix, and size composition and sample-dependent factors (e.g. time and place of sampling) is seldom a systematic one. Any influence that may be apparent within a limited sampling period usually is randomly distributed over an extended time frame. The long-term objective of sampling is to collect the maximum number of observations within practical limits of sampling effort. The primary short-term consideration is the interception of a large number of anglers within a sampling interval. The main purpose of stratification in this application is to maximize the probability of positive contacts with the sampling population.

Very few observations (of catch rates) were obtained during January and February in either on-site survey. NMFS conducts no sampling during those months and assumes that effort and catch during this interval represents 10% of the amount observed during the rest of the year. For some species, e.g. striped bass, this assumption obviously is invalid. Malvestuto et al. (1978) had nearly the same situation as prevails in South Carolina. To effectively estimate winter catches, they would have had to increase their sampling beyond practical limits in order to decrease the coefficients of variation in CPUE substantially, because the distribution of

fishing effort was so sporadic. They concluded, however, that omission of winter sampling would bias their catch estimates because of seasonal species preferences and availability. Our sampling strategy regarding months of sampling would therefore depend on the species of interest.

Most sites surveyed during the creel census were more heavily utilized on weekends (38-56% more traffic). Liao and Cupka (1979) found that 62% of the private boat offshore trips occurred on weekends. NMFS allocates 75% of its intercept sampling to weekends and 25% to weekdays because of this. The probability of positive contact with returning anglers would be maximized by sampling primarily in the afternoons, particularly between 1400 and 1800, regardless of season.

**Sampling Methods** - The distribution of boating access points and their usage characteristics differ substantially between the three districts. This is a major consideration in the choice of appropriate sampling methods by area.

Site and usage distribution is amenable to a roving creel census in the northern district. The sites are fairly close together and there is at least one high-use site in each major fishing area. The negative experience with the drop-boxes in the northern district suggests that voluntary-reporting methods will not work satisfactorily there.

In the central district, the sites receiving the most traffic are those close to Charleston, although the percentage of fishing use at some of the outlying locations is high and tends to compensate for their lower overall use. Voluntary reporting, e.g. as by drop-boxes, appears to be appropriate for relatively short-term applications, particularly at medium-use locations. One consideration is the significant number of fishermen who leave from private access points and are therefore apt to be missed in on-site surveys of public ramps. A roving boat clerk and dispensal of postage-paid card questionnaires to fishermen afloat have been demonstrated as a practical approach in such situations (Wade 1977), although subject to the limitation that there is no catch verification.

In the southern district, the distance between public landings, their low usage rates, and the significant utilization of private facilities detract from the practicality of a roving creel census of public access sites. A roving afloat census and card dispensal approach may be a practical sampling methods here also.

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APPENDIX

Table A-1. Distribution of responses (questionnaires or intercepts) in the on-site drop-box and creel census surveys, by district, site, and month. DB- drop-box, CC- creel census;(does not include commercial boats). NS- not sampled, IS- incomplete sample due to box damage or relocation.

Site		June	July	August	September	October	November	December	January	February
Northern										
Capt. John's	CC	4	14	8	8	13	0	1	4	NS
Capt. Andy's	CC	5	NS	NS	NS	NS	NS	NS	NS	NS
Palmetto Sh.	CC	2	8	11	8	3	0	NS	NS	NS
Hwy. 90 Bridge	CC	9	34	25	27	25	9	5	5	2
Inlet Port Mar.	CC	5	1	9	5	13	7	0	NS	NS
Ball Park Ldg.	CC	17	5	6	8	13	5	7	11	6
S. Id. Ferry	CC	12	2	4	8	9	5	10	4	7
Woodland Ave. (Woodlawn)	CC	0	16	5	5	21	12	4	2	4
SCWMRD M.I.	CC	0	3	NS	NS	NS	24	6	2	7
Central										
R.E. Ashley	CC	0	8	1	4	4	2	2	1	0
	DB						IS-17	13	2	5
Buck Hall	CC	0	0	0	1	0	2	2	1	0
	DB						IS-11	9	0	0
Moore's Ldg.	DB						IS-4	14	2	4
Paradise Id.	DB						NS	7	NS	NS
Remleys Pt.	CC	8	1	7	26	8	18	4	0	0
	DB						IS-18	12	6	4
Shem Creek	CC	23	2	5	6	4	8	1	0	0
	DB						IS-12	8	3	3
Chas. Marina	CC	9	2	2	8	6	8	3	0	1
	DB						IS-9	4	6	4
Wappoo Bridge	CC	10	3	3	8	1	10	2	1	1
	DB						IS-7	5	0	1
River. Terr.	DB						IS-6	2	6	3
Battery Id.	CC	3	11	3	7	1	15	7	2	0
	DB						NS	4	7	IS-0
Folly River	CC	13	6	12	7	3	8	3	3	3
	DB						IS-23	9	3	5
Limehouse	CC	4	3	2	4	1	12	2	0	2
	DB						IS-3	6	2	1
Cherry Point	DB						IS-9	9	7	4
Dawhoo Ldg.	DB						IS-0	IS-0	0	0
Steamboat Ldg.	DB						IS-11	7	1	IS-0
Southern										
Ladys Id.	CC	0	6	2	0	1	1	0	1	0
	DB						IS-10	0	1	0
Russ Point	CC	5	8	4	0	6	1	0	1	0
	DB						IS-10	4	5	0
Port Royal	CC	4	3	4	2	2	2	0	0	0
	DB						IS-3	1	0	0
Broad River	CC	4	7	4	0	4	0	0	1	0
	DB						IS-4	NS	NS	NS

Site		June	July	August	September	October	November	December	January	February
E.C. Glenn	CC	5	9	5	6	7	4	1	1	0
	DB						IS-19	0	1	0
All Joy	CC	5	5	8	4	4	9	1	1	0
	DB						IS-4	2	2	1
Pinckney Id.	CC	5	4	3	0	0	2	3	0	0
	DB						NS	7	2	0
Battery Creek	DB						IS-3	2	0	0
Grays Hill	DB						NS	0	0	0

		March	April	May	June	Total
Capt. John's	CC	NS	NS	NS		52
Capt. Andy's	CC	NS	NS	NS		5
Palmetto Sh.	CC	NS	1	1		34
Hwy. 90 Br.	CC	9	0	8		158
Inlet Port	CC	NS	NS	NS		40
Ball Park Ldg	CC	6	9	8		101
S. Id. Ferry	CC	4	9	3		77
Woodland Ave. (Woodlawn)	CC	6	3	3		81
SCMRD M.I.	CC	9	27	42		120
R.E. Ashley	CC	0	3	3		26
	DB	0	9	15	17	78
Buck Hall	CC	2	3	1		12
	DB	0	2	4	8	34
Moore's Ldg.	DB	0	4	8	3	39
Paradise Id.	DB	IS-0	3	IS-3	4	17
Remleys Pt.	CC	0	12	18		102
	DB	0	8	3	IS-1	52
Shem Creek	CC	1	7	13		70
	DB	1	9	7	7	50
Chas. Marina	CC	3	13	10		65
	DB	0	5	8	8	44
Wappoo Bridge	CC	4	9	19		71
	DB	3	10	7	5	38
River. Terr.	DB	2	1	2	7	29
Battery Id.	CC	0	4	6		59
	DB	NS	2	IS-4	NS	17
Folly River	CC	4	5	9		76
	DB	1	9	7	15	72
Limehouse	CC	3	3	10		46
	DB	NS	10	IS-7	IS-3	32
Cherry Point	DB	NS	1	9	IS-2	41
Dawhoo Ldg.	DB	NS	0	3	8	11
Steamboat Ldg.	DB	NS	1	1	7	28
Ladys Id.	CC	0	1	1		12
	DB	1	1	0	0	13
Russ Point	CC	0	2	0		27
	DB	1	2	2	1	25

Site		March	April	May	June	Total
Port Royal	CC	0	2	0		19
	DB	1	3	0	0	8
Broad River	CC	0	2	13		35
	DB	NS	NS	0	0	4
E.C. Glenn	CC	0	1	2		41
	DB	0	9	2	0	31
All Joy	CC	0	2	2		41
	DB	1	4	0	1	15
Pinckney Id.	CC	1	0	2		20
	DB	1	0	7	1	18
Battery Creek	DB	2	0	4	0	11
Grays Hill	DB	0	3	2	0	5

Table A-2. Creel census intercepts (boats) by activity and season at individual sites. NS- not sampled.

Site	Activity	Summer	Fall	Winter	Spring	Total
Northern District						
Capt. John's	Fishing	29	14	3	3	49
	Shrimping	2	0	0	0	2
	Crabbing	9	5	0	1	15
	Shellfishing	1	1	0	0	2
	Other	0	1	1	1	3
Palmetto Shores	Fishing	21	3	NS	3	27
	Shrimping	0	0	NS	1	1
	Crabbing	2	0	NS	0	2
	Shellfishing	0	0	NS	0	0
	Other	6	0	NS	1	7
Hwy. 90 Bridge	Fishing	69	31	11	17	128
	Shrimping	1	0	0	0	1
	Crabbing	6	2	0	0	8
	Shellfishing	0	2	1	0	3
	Other	16	7	4	0	27
Inlet Port Mar.	Fishing	13	19	NS	3	35
	Shrimping	1	0	NS	1	2
	Crabbing	1	1	NS	0	2
	Shellfishing	0	2	NS	0	2
	Other	1	1	NS	2	4
Ball Park Ldg.	Fishing	16	19	15	26	76
	Shrimping	1	0	0	4	5
	Crabbing	1	2	0	2	5
	Shellfishing	0	3	0	0	3
	Other	4	6	7	7	24
S. Id. Ferry	Fishing	12	16	13	22	63
	Shrimping	0	0	0	1	1
	Crabbing	0	0	0	3	3
	Shellfishing	0	0	4	0	4
	Other	2	8	2	2	14
Woodland Ave. (Woodlawn)	Fishing	23	34	9	6	72
	Shrimping	1	0	0	0	1
	Crabbing	2	2	0	0	4
	Shellfishing	0	9	6	0	15
	Other	2	0	0	0	2
SCWMRD M.I.	Fishing	3	28	18	67	116
	Shrimping	0	0	0	3	3
	Crabbing	0	1	0	1	2
	Shellfishing	0	4	7	1	12
	Other	0	1	0	2	3

Site	Activity	Summer	Fall	Winter	Spring	Total
Central District						
R.E. Ashley	Fishing	6	5	0	3	14
	Shrimping	2	0	0	0	2
	Crabbing	1	1	0	1	3
	Shellfishing	0	0	0	0	0
	Other	5	2	0	3	10
Buck Hall	Fishing	1	3	2	4	10
	Shrimping	0	0	0	0	0
	Crabbing	0	0	1	0	1
	Shellfishing	0	1	1	0	2
	Other	0	0	0	0	0
Shem Creek	Fishing	10	7	0	22	39
	Shrimping	2	1	0	5	8
	Crabbing	2	1	0	2	5
	Shellfishing	0	0	0	0	0
	Other	2	5	1	17	25
Remleys Point	Fishing	26	28	0	20	74
	Shrimping	5	3	0	3	11
	Crabbing	1	2	0	2	5
	Shellfishing	0	0	0	0	0
	Other	7	2	0	18	27
Chas. City Marina	Fishing	5	10	1	11	27
	Shrimping	1	0	0	1	2
	Crabbing	0	0	0	0	0
	Shellfishing	0	0	0	0	0
	Other	7	7	3	21	38
Wappoo Bridge	Fishing	11	11	3	18	43
	Shrimping	0	0	0	0	0
	Crabbing	0	0	0	1	1
	Shellfishing	0	0	0	0	0
	Other	4	2	3	19	28
Battery Island	Fishing	17	22	2	11	52
	Shrimping	1	0	0	0	1
	Crabbing	0	0	0	1	1
	Shellfishing	0	0	0	0	0
	Other	4	1	0	2	7
Folly River	Fishing	11	12	6	16	45
	Shrimping	7	0	0	1	8
	Crabbing	4	1	1	2	8
	Shellfishing	0	1	3	0	4
	Other	5	1	1	10	17
Limehouse	Fishing	5	15	4	5	29
	Shrimping	3	0	0	1	4
	Crabbing	0	1	0	1	2
	Shellfishing	0	0	0	0	0
	Other	3	0	2	11	16

Site	Activity	Summer	Fall	Winter	Spring	Total
Southern District						
Ladys Island	Fishing	0	0	0	1	1
	Shrimping	0	0	0	0	0
	Crabbing	0	0	0	0	0
	Shellfishing	0	0	0	0	0
	Other	8	2	0	1	11
Russ Point	Fishing	10	7	1	6	24
	Shrimping	1	1	0	2	4
	Crabbing	1	0	0	0	1
	Shellfishing	0	0	1	0	1
	Other	3	0	0	1	4
Port Royal	Fishing	6	2	0	3	11
	Shrimping	4	1	0	0	5
	Crabbing	0	0	0	0	0
	Shellfishing	0	1	0	0	1
	Other	3	1	0	2	6
Broad River	Fishing	9	4	0	19	32
	Shrimping	1	1	0	0	2
	Crabbing	0	1	0	0	1
	Shellfishing	0	0	1	0	1
	Other	3	0	0	0	3
E.C. Glenn	Fishing	20	11	1	7	39
	Shrimping	5	3	0	1	9
	Crabbing	0	0	0	1	1
	Shellfishing	0	0	0	0	0
	Other	0	1	0	0	1
All Joy	Fishing	7	9	1	3	20
	Shrimping	7	5	0	1	13
	Crabbing	0	0	0	2	2
	Shellfishing	0	0	0	0	0
	Other	5	5	1	5	16
Pinckney Island	Fishing	5	5	0	3	13
	Shrimping	2	1	0	0	3
	Crabbing	0	0	0	2	2
	Shellfishing	0	0	0	0	0
	Other	2	0	0	3	5



Table A-3. Boat ramp drop-box responses (boats) by activity and season.  
 NS- not sampled.

Site	Activity	Fall	Winter	Spring	Total	Site	Activity	Fall	Winter	Spring	Total
Northern District											
Hwy. 90 Bridge	Fishing	4	NS	0	4	Moores Ldg.	Fishing	8	0	12	20
	Shrimp seine	0	NS	0	0		Shrimp seine	0	0	2	2
	Shrimp cast net	2	NS	0	2		Shrimp cast net	3	0	4	7
	Crabbing	0	NS	0	0		Crabbing	2	0	1	3
	Shellfishing	0	NS	0	0		Shellfishing	10	4	1	15
	Other	0	NS	1	1		Other	5	2	1	8
Ball Park Ldg.	Fishing	1	NS	NS	1	Paradise Id.	Fishing	7	NS	5	12
	Shrimp seine	0	NS	NS	0		Shrimp seine	0	NS	3	3
	Shrimp cast net	1	NS	NS	1		Shrimp cast net	2	NS	1	3
	Crabbing	0	NS	NS	0		Crabbing	3	NS	4	7
	Other	0	NS	NS	0		Shellfishing	0	NS	0	0
Woodland Ave.	Fishing	NS	NS	4	4	Shem Creek	Fishing	15	6	14	35
	Shrimp seine	NS	NS	2	2		Shrimp seine	0	0	0	0
	Shrimp cast net	NS	NS	2	2		Shrimp cast net	5	0	4	9
	Crabbing	NS	NS	2	2		Crabbing	3	0	5	8
	Other	NS	NS	3	3		Shellfishing	2	0	2	4
SCWMRD M.I.	Fishing	NS	NS	8	8	Remleys Pt.	Other	5	1	9	15
	Shrimp seine	NS	NS	0	0		Fishing	26	9	7	42
	Shrimp cast net	NS	NS	3	3		Shrimp seine	2	0	0	2
	Crabbing	NS	NS	2	2		Shrimp cast net	18	5	3	26
	Shellfishing	NS	NS	1	1		Crabbing	2	3	3	8
Hwy. 17	Other	NS	NS	0	0	Chas. City Mar.	Shellfishing	2	4	1	7
	Fishing	NS	NS	9	9		Other	1	1	3	5
	Shrimp seine	NS	NS	0	0		Fishing	6	7	9	22
	Shrimp cast net	NS	NS	1	1		Shrimp seine	0	0	0	0
	Crabbing	NS	NS	0	0		Shrimp cast net	4	0	1	5
Central District	Shellfishing	NS	NS	0	0	Wappoo Bridge	Crabbing	4	0	2	6
	Other	NS	NS	2	2		Shellfishing	0	1	0	1
	Fishing	15	3	21	39		Other	5	3	12	20
	Shrimp seine	1	0	2	3		Fishing	10	2	15	27
	Shrimp cast net	4	0	7	11		Shrimp seine	0	0	1	1
Buck Hall	Crabbing	3	1	5	8	Battery Island	Shrimp cast net	2	0	6	8
	Shellfishing	4	2	1	7		Crabbing	1	1	9	11
	Other	10	2	15	27		Shellfishing	1	0	1	2
	Fishing	12	0	9	21		Other	1	2	5	8
	Shrimp seine	1	0	1	2		Fishing	3	4	2	9
R.E. Ashley	Shrimp cast net	6	0	2	8	Folly River	Shrimp seine	0	1	0	1
	Crabbing	5	0	4	9		Shrimp cast net	0	1	1	2
	Shellfishing	4	0	1	5		Crabbing	0	0	2	2
	Other	3	0	3	6		Shellfishing	1	1	1	3
							Other	0	2	2	4

Site	Activity	Fall	Winter	Spring	Total
Riverland Terr.	Fishing	7	9	3	19
	Shrimp seine	0	0	0	0
	Shrimp cast net	3	2	2	7
	Crabbing	1	2	0	3
	Shellfishing	2	1	0	3
	Other	1	0	7	8
Limehouse	Fishing	8	3	10	21
	Shrimp seine	0	0	1	1
	Shrimp cast net	2	0	5	7
	Crabbing	2	0	6	8
	Shellfishing	1	0	0	1
	Other	1	0	7	8
Cherry Point	Fishing	12	8	10	30
	Shrimp seine	0	0	0	0
	Shrimp cast net	6	0	4	10
	Crabbing	6	0	5	11
	Shellfishing	2	1	2	5
	Other	3	2	1	6
Dawhoo	Fishing	NS	NS	8	8
	Shrimp seine	NS	NS	1	1
	Shrimp cast net	NS	NS	2	2
	Crabbing	NS	NS	3	3
	Shellfishing	NS	NS	0	0
	Other	NS	NS	1	1
Steamboat Ldg.	Fishing	12	1	9	22
	Shrimp seine	0	0	2	2
	Shrimp cast net	6	0	2	8
	Crabbing	5	0	6	11
	Shellfishing	5	0	0	5
	Other	2	0	0	2
Southern District					
Ladys Island	Fishing	8	2	1	11
	Shrimp seine	0	0	0	0
	Shrimp cast net	4	0	0	4
	Crabbing	3	0	0	3
	Shellfishing	1	0	0	1
	Other	0	0	0	0
Russ Point	Fishing	12	3	3	18
	Shrimp seine	0	0	0	0
	Shrimp cast net	4	0	0	4
	Crabbing	3	2	3	8
	Shellfishing	3	2	0	5
	Other	1	2	0	3

Site	Activity	Fall	Winter	Spring	Total
Port Royal	Fishing	3	0	3	6
	Shrimp seine	0	0	0	0
	Shrimp cast net	0	0	2	2
	Crabbing	1	0	1	2
	Shellfishing	1	1	2	4
	Other	0	0	0	0
Broad River	Fishing	4	NS	NS	4
	Shrimp seine	0	NS	NS	0
	Shrimp cast net	1	NS	NS	1
	Crabbing	1	NS	NS	1
	Shellfishing	1	NS	NS	1
	Other	0	NS	NS	0
E.C. Glenn	Fishing	13	1	7	21
	Shrimp seine	0	0	0	0
	Shrimp cast net	6	0	2	8
	Crabbing	5	0	4	9
	Shellfishing	0	1	1	2
	Other	2	0	2	4
All Joy	Fishing	4	0	3	7
	Shrimp seine	1	0	0	1
	Shrimp cast net	3	0	2	5
	Crabbing	2	0	1	3
	Shellfishing	1	3	1	5
	Other	2	1	1	4
Pinckney Island	Fishing	5	2	7	14
	Shrimp seine	0	0	0	0
	Shrimp cast net	5	0	2	7
	Crabbing	5	1	2	8
	Shellfishing	3	1	0	4
	Other	1	0	1	2
Grays Hill	Fishing	NS	NS	3	3
	Shrimp seine	NS	NS	0	0
	Shrimp cast net	NS	NS	1	1
	Crabbing	NS	NS	2	2
	Shellfishing	NS	NS	1	1
	Other	NS	NS	2	2

Table A-4. Boat length composition (nonfishing boats excluded) by site.  
 CC- creel census, DB drop-box survey.

Site		16 ft or less	17-23 ft	24 ft or larger
Northern District:				
Capt. John's	CC	47	1	0
Palmetto Shores	CC	8	18	1
Hwy. 90 Bridge	CC	51	76	0
	DB	0	3	1
Inlet Port Mar.	CC	11	25	0
Ball Park Ldg.	CC	51	26	0
	DB	1	0	0
S. Id. Ferry	CC	33	33	0
Capt. Andy's	CC	5	0	0
Woodland Ave.	CC	79	3	0
	DB	2	4	1
SCWMRD M.I.	CC	81	28	0
	DB	2	5	1
Hwy. 17	DB	3	6	0
Central District:				
R.E. Ashley	CC	12	5	0
	DB	43	7	1
Buck Hall	CC	10	0	0
	DB	18	8	1
Moore's Ldg.	DB	24	4	1
Paradise Id.	DB	15	0	0
Shem Creek	CC	32	13	0
	DB	20	14	1
Remleys Pt.	CC	64	13	0
	DB	33	11	2
Chas. Marina	CC	7	19	2
	DB	4	14	5
Wappoo Bridge	CC	26	18	0
	DB	21	7	1
River Terr.	DB	16	4	0
Battery Id.	CC	38	8	0
	DB	11	1	0
Folly River	CC	45	13	0
	DB	49	11	1
Limehouse	CC	27	2	0
	DB	16	5	0
Cherry Point	DB	25	9	1
Dawhoo	DB	8	0	1
Steamboat Ldg.	DB	22	4	0
Southern District:				
Ladys Id.	CC	1	0	0
	DB	11	1	1
Russ Point	CC	16	7	0
	DB	15	5	1
Port Royal	CC	7	4	0
	DB	5	2	1
Battery Creek	DB	5	5	0
Broad River	CC	25	8	0
	DB	3	1	0
E.C. Glenn	CC	29	11	0
	DB	17	8	2
All Joy	CC	19	7	0
	DB	9	2	0
Pinckney Island	CC	12	2	0
	DB	9	5	2
Grays Hill	DB	3	1	0

Table A-5. Trailer counts by site, month, day of the week (weekday or weekend day), and time of day in the creel census. WD- weekday, WE- weekend.

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800		Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800			
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE			WD	WE	WD	WE	WD	WE	WD	WE	WD	WE		
Capt. John's	JUN	-	9	7	-	8	-	-	-	-	-	N. Mrt. Bch.	JUN	-	-	0	1	-	-	9	-	-	-		
	JUL	12	-	9	4	6	15	-	-	-	-		JUL	3	-	0	2	-	2	-	-	-	-		
	AUG	-	-	3	4	9	11	15	-	-	-		AUG	0	7	0	4	2	-	-	-	-	-	-	
	SEP	-	-	6	7	6	-	-	-	-	-		SEP	0	0	0	3	2	-	-	-	-	-	-	
	OCT	10	7	10	11	5	-	8	-	-	-		OCT	2	-	0	0	1	-	-	-	-	-	-	
	NOV	10	8	3	3	7	-	-	-	-	-		NOV - JAN	-	-	-	-	-	-	-	-	-	-	-	
	DEC	-	-	1	3	-	-	-	-	-	-		FEB	0	-	0	0	-	-	-	-	-	-	-	
	JAN	-	-	3	6	0	2	-	-	-	-		MAR	-	-	0	3	-	0	-	-	-	-	-	
	FEB - MAY	Not Sampled											APR	0	-	0	3	-	-	-	-	-	-	-	
	Palm. Shores	JUN	-	-	2	4	-	7	3	-	-		-	Hwy. 90 Br.	JUN	-	-	5	7	14	7	11	-	-	-
		JUL	-	-	11	8	8	11	8	-	-		-		JUL	-	-	14	12	10	44	-	-	-	
		AUG	10	-	5	4	9	8	9	-	-		-		AUG	-	-	14	19	-	-	18	-	-	
SEP		3	-	10	7	-	4	7	-	-	-	SEP	7		-	15	17	22	-	-	-	-			
OCT		-	3	11	6	-	7	7	1	3	-	SEP	7		-	16	18	25	26	12	15	-	-		
NOV		2	0	2	2	5	8	-	-	-	-	OCT	19		-	17	18	15	22	17	14	14	-	-	
DEC - MAR		Closed										NOV	13		-	18	11	3	-	-	-	-	-		
APR		1	7	0	6	3	-	-	-	-	-	DEC	3		-	18	11	3	4	-	-	-	-		
MAY		-	-	7	7	0	3	-	6	-	-	JAN	4		3	7	4	7	-	-	-	-	-		
					1	3											5								
				3	4										6										
				8											9										

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800			
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE		
Hwy. 90 Br.	FEB	1	-	4 5 6	4	7	-	-	-	-	-	-	
	MAR	2	-	2 4 5	9	-	14	-	-	-	-	-	
	APR	7	-	7 7	6 13	5	-	-	-	-	-	-	
	MAY	-	-	9 5 6 8 8 10	11 27	-	-	-	-	-	-	-	
	JUN	-	-	-	3 6	5 6 6	5	-	-	-	-	-	
Inlet Port	JUL	6	4	3 8	11	13	-	19	-	-	-	-	
	AUG	4 6	-	7	10	3	7	9	-	-	-	-	
	SEP	7 8	4	7	-	8 8	-	-	-	-	-	-	
	OCT	6	9	7 10 12	-	-	12	8	-	-	-	-	
	NOV	-	2	0 1	2	1	-	7	-	-	-	-	
	DEC	-	-	0 2	-	1 3	0	-	-	-	-	-	
	JAN	0	-	0	-	-	-	-	-	-	-	-	
	FEB - MAY	Not Sampled											
	Ball Park Ldg.	JUN	5	10	21	-	-	17	14	-	-	-	-
		JUL	9 10 12 13	9 29	-	-	-	-	10	-	-	-	-
		AUG	11	14	10	-	21	-	14	-	-	-	-
		SEP	13 14	25 21	-	-	-	-	20	7	-	-	-
OCT		10	17	17	-	-	-	14	14	-	-	-	
NOV		15	-	24	-	-	8	-	7	-	-	-	
DEC		7 11	-	11 12	-	-	8	-	7	-	-	-	
		8	-	-	-	7 8 11	6	-	-	-	-	-	

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Ball Park Ldg.	JAN	10	-	-	-	1	4	5	-	-	-
	FEB	18	-	0	-	8	8	5	-	-	-
	MAR	13	5 8	-	-	10	-	10 12	-	-	-
	APR	4	-	7	-	4	11	9	6	-	-
	MAY	1	12	-	-	5	30	6 6	-	3	-
Woodland Ave.	JUN	Not Sampled									
	JUL	15	12	13	35	18	-	15	-	-	-
	AUG	13 15	-	9 12	22	16	6	-	-	-	-
	SEP	-	19	14 16	13	4 15	-	-	-	-	-
	OCT	-	-	8 16 19	-	14 21	24	3	-	-	-
	NOV	-	-	3	14	6	3	6	-	-	-
	DEC	0	-	5	-	6 8	4	-	-	-	-
	JAN	2 3 6	-	3	2	-	7	-	-	-	-
	FEB	5	-	3 7	3	4 5	-	-	-	-	-
	MAR	0	-	3 6	2	-	5	-	-	-	-
	APR	-	-	3 5	-	3 4 14	6	-	-	-	-
	MAY	-	-	3 5 5	-	5 6	4	-	11	-	-
SCMIRD M.I.	JUN - OCT	Not Sampled									
	NOV	9	-	-	13	10	19	-	-	-	-
	DEC	2	-	7	-	6 7	6	-	-	-	-
	JAN	-	2	3 4	6	2 7	-	-	-	-	-
	FEB	3	-	2	-	4 6 6	5	-	-	-	-

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
SCWRD M.I.	MAR	0	-	3	-	9	7	-	-	-	-
	APR	-	-	4	5	10	9	7	21	-	-
	MAY	-	-	8	9	8	-	8	35	-	-
S. Id. Ferry	JUN	10	4	11	-	-	13	18	-	-	-
	JUL	8	6	21	-	-	6	8	-	-	-
	AUG	9	18	-	10	12	-	16	-	-	-
	SEP	13	19	-	-	-	-	9	10	-	-
	OCT	9	26	12	-	-	-	12	8	-	-
	NOV	4	12	30	-	-	4	-	-	-	-
	DEC	8	26	12	-	-	8	5	4	-	-
	JAN	11	-	-	-	0	3	4	4	-	-
	FEB	-	-	-	-	7	-	7	5	7	-
	MAR	9	7	-	-	7	-	4	3	-	-
	APR	-	-	-	-	5	-	7	5	-	8
	MAY	-	6	-	-	6	-	4	7	4	-
R.E. Ashley	JUN	-	-	2	13	-	5	3	-	-	-
	JUL	-	-	4	5	-	-	1	-	-	-
	AUG	-	-	6	10	-	6	2	-	-	-
	SEP	-	-	9	9	4	11	4	-	-	-

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
R.E. Ashley	OCT	-	-	7	13	9	-	5	-	-	-
	NOV	-	-	-	28	6	14	6	-	-	-
	DEC	-	-	2	10	-	-	7	-	-	-
	JAN	-	-	3	4	1	-	-	-	-	-
	FEB	-	-	1	1	-	-	-	-	-	-
	MAR	-	-	6	8	5	-	5	-	-	-
	APR	-	-	0	6	4	-	3	-	-	-
	MAY	-	-	0	1	3	9	2	-	-	-
	JUN	-	-	6	1	-	-	13	4	-	-
	JUL	-	-	1	2	-	-	4	-	-	-
	AUG	-	-	6	6	3	-	1	-	-	-
	SEP	-	-	6	6	12	-	4	-	-	-
Buck Hall	JUN	-	4	1	2	-	-	1	-	-	-
	JUL	-	-	1	4	0	-	0	-	-	-
	AUG	-	-	0	1	2	-	3	1	-	-
	SEP	-	-	1	4	1	-	1	3	-	-
	OCT	-	-	0	4	1	-	1	-	-	-
	NOV	-	-	4	3	2	1	3	4	-	-
	DEC	-	-	5	10	4	-	4	-	-	-
	JAN	-	-	3	10	4	-	4	-	-	-
	FEB	-	-	3	10	10	-	2	-	-	-
	MAR	-	-	2	5	-	-	2	-	-	-
	APR	-	0	6	3	3	-	-	-	-	-
	MAY	-	-	2	2	1	-	0	-	-	-
Shem Creek	JUN	-	-	4	11	0	-	1	-	-	-
	JUL	-	-	1	1	2	4	3	0	-	-
	AUG	-	-	0	2	4	3	0	-	-	-
	SEP	-	-	1	3	1	4	3	0	-	-
	OCT	-	-	2	2	0	4	-	0	-	-
	NOV	-	-	2	5	2	5	1	-	-	-

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Shem Creek	JUL	-	48	9	27	5	-	6	-	-	-
	AUG	-	-	11	26	5	-	6	-	-	-
				3	19	4	34	-	-	-	-
	SEP	-	-	3	12	5	18	-	-	-	-
				5	8	5	12	-	-	-	-
	OCT	-	7	-	-	6	-	0	-	-	-
	NOV	-	-	-	7	5	-	-	8	-	-
					32	6	-	-	-	-	
	DEC	-	-	0	-	0	3	3	-	-	-
	JAN	-	-	0	0	0	-	-	-	-	-
	FEB	0	-	1	-	1	-	4	-	-	-
	MAR	2	-	0	5	2	-	-	-	-	-
1					2	-	-	-	-		
APR	0	-	-	19	1	-	4	-	-	-	
				24	3	-	-	-	-		
MAY	8	8	7	66	5	-	-	-	-	-	
				7	11	-	-	-	-		
Remleys Pt.	JUN	12	-	6	13	8	-	7	-	-	-
	JUL	10	-	-	20	15	-	7	-	-	-
				55	25	7	-	7	-	-	-
	AUG	-	-	8	8	7	-	9	-	-	-
				33	8	9	-	-	-	-	-
	SEP	13	-	6	16	18	-	3	19	-	-
	OCT	-	-	-	32	8	-	6	-	-	-
	NOV	-	-	11	61	22	31	11	-	-	-
					10	9	-	13	-	-	-
	DEC	-	14	-	-	9	-	-	-	-	-
	JAN	-	-	-	0	0	6	0	-	-	-
	FEB	-	-	-	-	0	-	0	-	1	-
MAR	-	-	1	-	2	2	-	-	-	-	
				1	8	-	-	-	-		
APR	-	-	2	-	-	21	2	-	-	-	
				1	21	5	-	-	-		
MAY	-	-	5	18	-	41	2	-	-	-	
				12	-	4	7	-	-		

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Chas. Mar.	JUN	11	41	6	30	16	-	16	-	-	-
	JUL	-	-	53	6	-	10	-	-	10	-
				59	7	-	-	-	-		
	AUG	7	16	-	47	5	38	9	-	-	-
					12	6	10	5	21	-	-
	SEP	-	-	1	10	5	11	-	-	-	
	OCT	4	-	9	-	-	14	2	11	-	-
	NOV	-	16	-	28	4	-	6	-	-	-
	DEC	-	-	-	-	0	11	-	-	-	-
	JAN	0	-	-	-	-	0	1	-	-	-
					2	7	-	-	-	-	
	FEB	-	-	-	0	-	1	-	-	-	-
4					1	-	-	-	-		
MAR	2	-	-	3	6	0	-	-	-	-	
				3	5	-	-	-	-		
APR	-	-	-	7	38	0	-	-	-	-	
				38	4	-	-	-	-		
MAY	4	30	57	5	-	7	-	-	-	-	
				13	18	-	-	-	-		
Wappoo Br.	JUN	6	-	3	9	-	48	7	-	-	-
	JUL	20	36	0	57	17	-	15	-	-	
				6	7	-	-	-			
	AUG	-	11	9	-	4	-	11	-	-	
	SEP	-	-	26	13	6	-	22	-	-	
				2	6	-	13	2	-		
	OCT	2	-	4	-	-	7	5	-	-	
	NOV	5	-	7	12	-	12	32	5	-	
	DEC	-	-	3	-	3	11	3	-	-	
	JAN	-	-	-	-	-	0	0	-	-	
	FEB	-	-	-	2	-	3	-	3	-	-
					2	3	-	0	-		

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Wappoo Br.	MAR	-	-	1	3	0	-	1	-	-	-
	APR	0	-	1	18	1	-	4	-	-	-
	MAY	2	45	-	-	9	21	3	-	-	-
Battery Id.	JUN	4	10	1	-	-	20	3	-	-	-
	JUL	1	-	7	-	3	22	3	-	-	-
	AUG	-	9	-	-	1	-	6	27	7	-
	SEP	-	4	3	-	-	-	0	11	2	-
	OCT	2	-	4	-	-	7	-	-	-	-
	NOV	11	14	-	-	-	-	-	31	14	-
	DEC	-	-	10	-	-	-	1	17	-	-
	JAN	3	-	-	-	-	-	0	0	-	-
	FEB	2	-	0	-	-	-	1	-	-	-
	MAR	-	-	-	-	-	1	4	0	-	-
	APR	1	6	-	-	-	-	1	-	0	-
	MAY	3	10	-	-	3	20	1	-	2	-
Folly River	JUN	8	6	2	-	-	22	4	-	-	-
	JUL	-	-	3	-	-	28	6	-	-	-
	AUG	13	9	-	-	7	-	7	34	7	-
	SEP	-	6	1	-	-	-	1	20	4	-
	OCT	5	-	0	-	-	11	-	-	-	-
	NOV	0	5	4	-	-	-	-	12	7	-

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Folly River	DEC	-	-	4	-	-	-	4	7	0	-
	JAN	-	-	1	-	-	-	0	7	-	-
	FEB	0	-	6	-	-	-	1	-	-	-
	MAR	-	-	-	-	-	-	6	6	-	-
Limehouse	APR	1	13	1	-	-	-	2	-	0	-
	MAY	3	-	1	-	-	27	6	-	4	-
	JUN	2	-	-	3	1	-	4	-	-	-
	JUL	7	-	1	-	-	32	4	-	-	-
	AUG	-	-	3	-	1	-	5	-	33	-
Ladys Id.	SEP	-	-	3	6	-	8	1	-	-	-
	OCT	4	-	3	-	5	2	-	-	-	-
	NOV	-	-	6	13	-	-	4	28	-	-
	DEC	-	-	5	-	-	15	1	-	-	-
	JAN	-	-	0	-	-	0	4	0	2	-
	FEB	-	-	2	-	-	-	0	-	-	-
	MAR	1	1	-	-	0	-	0	-	-	-
	APR	-	-	0	5	-	-	1	-	-	-
	MAY	-	9	0	-	3	15	3	6	-	-
	JUN	0	-	-	0	1	5	0	-	-	-
	JUL	-	1	1	-	4	-	2	4	-	-



Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Ladys Id.	AUG	0	0	1	-	1	7	-	-	-	-
	SEP	-	0	0	-	3	-	-	-	-	-
		0	-	0	-	-	-	-	-	-	-
		0	-	1	0	3	-	-	2	-	1
	OCT	0	-	1	0	3	-	-	2	-	1
	NOV	0	-	-	1	1	-	-	2	1	-
	DEC	-	-	0	-	0	-	0	0	-	-
	JAN	0	0	0	-	-	-	1	-	-	-
	FEB	0	-	0	-	0	-	-	1	-	-
	MAR	0	-	-	-	0	-	-	-	-	-
		0	-	-	-	0	-	-	-	-	-
		0	-	-	-	0	-	-	-	-	-
	APR	0	-	-	1	-	-	1	-	0	-
MAY	-	-	-	-	-	-	1	-	0	-	
	-	-	-	-	-	-	5	-	0	-	
	-	-	-	-	-	-	0	-	-	-	
	-	-	-	-	-	-	2	-	-	-	
Russ Point	JUN	2	4	1	-	-	6	3	-	-	-
		7	-	-	-	-	-	-	-	-	-
	JUL	-	-	2	4	4	2	-	-	-	-
		5	-	5	-	5	-	-	-	-	-
	AUG	2	5	13	10	3	-	-	-	-	-
	SEP	4	1	0	-	3	-	-	-	-	-
	OCT	0	-	5	-	-	6	-	3	-	-
		5	-	7	-	-	-	-	5	-	-
	NOV	4	-	-	-	3	8	5	5	-	-
	DEC	-	-	1	-	-	-	-	1	-	-
	JAN	0	0	-	-	-	-	-	0	-	-
		1	-	5	-	-	-	0	0	-	-
		-	-	0	-	0	-	0	0	-	-
FEB	-	-	0	-	0	-	-	-	-	-	
	-	-	0	-	0	-	-	-	-	-	
	-	-	0	-	0	-	-	-	-	-	
MAR	0	-	-	-	0	-	-	-	-	-	
					1						
					2						
					3						

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Russ Point	APR	-	-	1	4	0	-	-	-	-	-
				2	-	1	-	-	-	-	-
MAY	-	-	-	-	-	4	-	-	-	-	
	-	-	-	-	2	-	1	-	-	-	
	-	-	-	-	6	-	3	-	-	-	
	-	-	-	-	12	-	5	-	-	-	
Port Royal	JUN	-	-	2	4	-	-	-	-	2	-
		4	7	-	-	-	-	-	-	-	-
	JUL	-	7	4	-	2	5	-	-	-	-
		4	-	5	-	6	-	-	-	-	-
	AUG	3	-	8	3	3	-	-	-	-	-
				3	3	-	-	-	-	-	-
	SEP	2	-	5	0	-	-	-	-	-	-
	OCT	3	6	5	-	2	10	-	-	-	-
	NOV	0	-	-	5	-	4	1	-	-	-
	DEC	-	-	1	-	0	-	-	2	-	-
	JAN	-	2	2	-	-	-	1	-	-	-
		0	-	5	-	-	-	1	-	-	-
FEB	0	-	2	-	0	-	-	2	-	-	
MAR	-	-	3	-	0	-	-	-	-	-	
	-	-	0	-	1	-	-	-	-	-	
APR	-	9	0	-	0	-	2	-	-	-	
MAY	-	-	2	-	5	-	3	-	-	-	
	-	-	-	-	0	-	0	-	-	-	
	-	-	-	-	1	-	2	-	-	-	
	-	-	-	-	4	-	4	-	-	-	
Broad River	JUN	-	-	4	21	-	1	4	-	-	
		6	-	10	-	1	6	4	-	-	
	JUL	0	8	1	-	12	6	4	-	-	
AUG	-	-	0	2	3	-	2	-	-	-	
	-	-	3	12	-	-	-	-	-	-	

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
Broad River	SEP	3	-	-	0	-	-	2	-	-	-
								2			
								3			
	OCT	0	6	0	4	0	-	1	3	-	-
								3			
	NOV	0	4	0	1	-	-	-	-	-	-
				1							
				2							
	DEC	-	0	0	-	1	-	-	-	-	-
						1					
	JAN	-	-	1	0	0	-	0	-	-	-
				1							
FEB	1	-	0	-	0	0	-	-	-	-	
					0						
					1						
MAR	0	-	0	-	0	-	-	-	-	-	
			1								
			1								
APR	1	-	3	-	1	5	-	-	-	-	
					1						
MAY	15	-	7	-	12	-	-	-	-	-	
			13								
			21								
E.C. Glenn	JUN	7	-	4	24	-	3	5	-	-	-
		12									
	JUL	-	8	3	-	6	11	6	-	-	-
				5				21			
	AUG	6	24	-	2	1	-	5	-	-	-
								14			
	SEP	8	-	-	1	-	-	4	-	-	-
								7			
								8			
	OCT	-	22	-	19	2	-	1	4	-	-
						2					
						14					
	NOV	-	12	5	-	-	-	-	-	-	-
			18	8							
				11							
	DEC	2	3	2	-	2	-	-	-	-	-
	JAN	-	-	0	5	1	-	0	-	-	-
			4								
FEB	0	4	0	-	0	-	-	-	-	-	
					0						
					0						
					2						
MAR	0	-	0	-	-	-	-	-	-	-	
	0		0								
	4		0								
APR	0	-	2	-	3	-	-	8	-	-	
	0		2								
MAY	2	-	1	-	3	-	-	-	-	-	
	8				3						
					7						

Site	Month	0800-1000		1000-1200		1200-1400		1400-1600		1600-1800	
		WD	WE	WD	WE	WD	WE	WD	WE	WD	WE
All Joy	JUN	8	-	-	-	5	-	-	0	2	11
									4		
	JUL	3	5	5	-	-	-	15	-	0	6
										6	
	AUG	2	-	-	-	3	3	4	9	-	-
								5			
	SEP	0	-	-	-	-	-	3	4	1	-
								7			
	OCT	-	9	-	-	6	-	4	22	5	4
	NOV	4	10	-	5	5	-	7	-	-	-
	DEC	2	-	-	0	1	-	0	-	-	-
	JAN	-	-	1	-	0	-	2	2	-	-
						3					
	FEB	-	-	0	3	0	-	0	-	-	-
				1		0					
	MAR	0	-	0	-	-	-	-	-	-	-
		0		0							
	1										
APR	2	-	0	-	5	-	-	5	-	-	
	3										
MAY	2	-	3	-	5	-	-	-	-	-	
			4								
			5								
Pinckney Id.	JUN	2	-	-	-	-	-	2	-	-	1
		4						7			7
	JUL	4	-	-	-	8	-	25	5	0	-
		7									
	AUG	9	-	-	-	2	-	5	1	-	-
						6			11		
	SEP	1	-	-	-	-	-	1	2	-	-
								4			
								5			
	OCT	-	-	-	3	0	-	-	12	0	-
										3	
	NOV	5	5	-	3	0	-	-	-	-	-
					2						
DEC	1	-	-	1	2	-	1	-	-	-	
JAN	-	-	-	-	0	3	1	-	-	-	
					0						
					0						
FEB	-	-	0	-	0	1	0	-	-	-	
			0				0				
MAR	0	-	0	-	-	-	-	-	-	-	
			1								
			2								
APR	0	-	1	-	-	-	8	-	-	6	
			3								
			6								
MAY	-	-	1	-	2	-	-	-	-	-	
			2								
			4								
			7								

Table A-6. Number of trips, number of anglers, and catch (number of fish) by species in the creel census.

	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	Total
Northern District													
Trips	45	67	52	55	79	52	24	18	18	28	43	55	536
Fishermen	108	145	107	105	159	104	47	31	32	56	89	109	1092
Total trip hours	261	385	295	273	426	229	101	76	78	131	200	269	2724
Spotted seatrout	0	31	21	11	17	120	82	48	16	32	1	0	379
Red drum	3	55	59	132	163	109	45	24	21	31	120	49	811
Flounders	159	119	161	46	75	20	1	2	1	0	48	106	738
Bluefish	28	17	19	5	57	0	10	0	0	1	24	64	225
Spot	263	103	108	235	1015	392	49	9	53	17	50	53	2347
Croaker	252	142	81	30	15	40	40	0	24	16	5	2	647
Kingfishes	0	0	0	0	0	0	0	0	0	0	0	0	0
Sheepshead	1	0	0	0	5	2	0	2	0	6	1	1	18
Black sea bass	0	30	112	35	8	0	0	0	0	0	74	55	314
Sharks	0	7	0	0	0	1	0	0	0	0	0	2	10
S. mackerel	28	105	62	40	43	0	0	0	0	0	0	14	292
K. mackerel	2	23	24	26	97	27	0	0	0	0	0	28	227
Striped bass	0	0	0	2	2	5	11	20	1	8	1	0	50
Other	22	37	37	28	48	26	14	0	16	15	85	25	353
Total fish	758	669	682	590	1545	743	252	105	132	127	409	399	6411
Central District													
Trips	17	15	10	22	5	37	16	1	0	3	7	14	147
Fishermen	44	36	24	55	10	80	27	2	0	5	15	28	326
Total trip hours	90	68	42	96	22	169	60	2	0	12	24	39	624
Spotted seatrout	1	14	8	16	0	67	16	0	0	0	1	13	136
Red drum	9	70	6	3	3	99	9	0	0	0	1	2	202
Flounders	1	2	0	0	0	3	0	0	0	1	0	2	9
Bluefish	3	0	9	4	0	6	0	0	0	0	5	1	28
Spot	6	12	2	14	0	9	40	0	0	0	0	25	108
Croaker	46	36	23	83	0	0	0	0	0	0	0	0	188
Kingfishes	0	0	1	4	2	0	0	0	0	0	0	1	8
Sheepshead	1	12	0	0	0	6	0	0	0	0	0	0	19
Black sea bass	6	35	2	0	0	9	4	0	0	0	0	14	70
Sharks	5	2	1	2	0	0	0	0	0	0	0	16	26
S. mackerel	0	0	0	0	0	0	0	0	0	0	0	0	0
K. mackerel	4	0	0	0	0	4	0	0	0	0	0	0	8
Striped bass	0	0	0	0	0	2	0	0	0	0	0	0	2
Other	8	5	0	42	8	31	0	0	0	0	0	18	112
Total fish	90	188	52	168	13	236	69	0	0	1	7	92	916

	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	Total
Southern District													
Trips	5	9	9	6	5	2	0	0	0	0	5	6	47
Fishermen	12	22	21	13	14	3	0	0	0	0	10	17	112
Total trip hours	34	45	47	46	25	12	0	0	0	0	26	18	251
Spotted seatrout	0	4	1	9	5	2	0	0	0	0	0	0	21
Red drum	0	35	13	59	1	0	0	0	0	0	0	0	108
Flounders	0	1	5	20	4	2	0	0	0	0	5	0	37
Bluefish	0	0	9	0	0	0	0	0	0	0	1	0	10
Spot	0	0	0	0	0	0	0	0	0	0	0	0	0
Croaker	0	0	1	0	0	0	0	0	0	0	0	0	1
Kingfishes	0	0	0	0	0	0	0	0	0	0	0	0	0
Sheepshead	0	0	0	0	0	0	0	0	0	0	0	0	0
Black sea bass	13	0	0	0	12	8	0	0	0	0	0	0	33
Sharks	0	0	2	0	0	2	0	0	0	0	6	0	10
S. mackerel	0	6	0	0	0	0	0	0	0	0	0	1	7
K. mackerel	0	1	0	1	0	0	0	0	0	0	0	0	2
Striped bass	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	2	5	4	9	3	2	0	0	0	0	6	0	31
Total fish	17	52	35	98	25	16	0	0	0	0	18	1	262

Table A-7. Number of trips, number of anglers, and catch (number of fish) by species in the on-site drop-box survey.

	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total
Central District									
Trips	75	62	28	17	4	33	42	42	303
Fishermen	175	135	71	39	11	80	113	130	754
Spotted seatrout	326	127	55	8	0	10	65	80	671
Red drum	145	111	78	15	3	35	30	39	456
Flounders	60	7	2	12	0	16	45	47	189
Bluefish	4	3	0	0	0	47	17	7	78
Spot	280	48	0	0	0	31	60	37	456
Croaker	10	0	0	0	2	36	17	30	95
Kingfishes	0	3	2	0	0	2	44	12	63
Sheepshead	27	4	0	0	0	0	0	0	31
Black sea bass	21	0	0	0	0	0	5	0	26
Sharks	5	5	0	21	0	11	80	108	230
S. mackerel	0	0	0	0	0	0	0	0	0
K. mackerel	0	0	0	0	0	0	4	3	7
Striped bass	0	0	0	0	0	1	0	0	1
Other	6	7	1	2	0	38	73	159	286
Total fish <sup>1</sup>	891	553	154	58	5	227	469	521	2878
Southern District									
Trips	26	12	3	0	3	10	7	2	63
Fishermen	68	26	7	0	11	24	14	8	158
Spotted seatrout	65	34	17	0	2	0	0	0	118
Red drum	128	52	4	0	0	0	0	0	184
Flounders	9	5	0	0	0	0	0	0	14
Bluefish	2	0	0	0	0	1	84	0	87
Spot	2	2	0	0	3	0	0	0	7
Croaker	0	0	0	0	0	0	0	0	0
Kingfishes	1	23	0	0	0	0	30	0	54
Sheepshead	10	0	25	0	0	13	3	0	51
Black sea bass	5	0	0	0	0	25	0	0	30
Sharks	0	2	0	0	0	1	9	7	19
S. mackerel	0	0	0	0	0	0	0	0	0
K. mackerel	4	0	0	0	0	0	0	0	4
Striped bass	0	0	0	0	0	0	0	0	0
Other	1	28	0	0	1	4	23	0	57
Total fish <sup>1</sup>	142	160	46	0	6	44	149	7	554

<sup>1</sup> May not add up to species totals; some anglers reported total fish caught with no species break-down