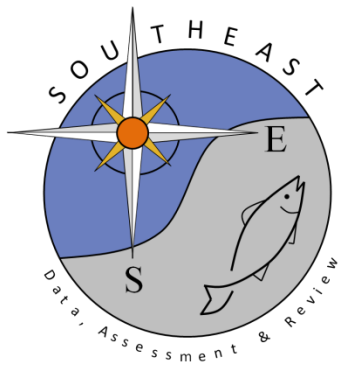


Assessment of participation and resource impact of shrimp baiting in
coastal South Caroling during 1987

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**Assessment of Participation and Resource
Impact of Shrimp Baiting
in Coastal South Carolina during 1987**

by Dale Theiling

Office of Fisheries Management
Division of Marine Resources
S.C. Wildlife and Marine Resources Department

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Table of Contents

	<u>Page</u>
List of Tables	iv
List of Figures	v
Abstract	1
Acknowledgements	1
Background	1
The Fishery	2
Objectives	3
Methods	3
Boat Landing Interviews	3
Registered Boat Mail Survey	8
Results	12
Boat Landing Interviews	12
Registered Boat Mail Survey	18
Discussion	24
Baiting Catch Relative to Trawler Catch	24
Other Shrimp Catches	33
Legislation in 1988	33
Conclusion	35
Literature Cited	36
Appendix A	37
Appendix B	41

List of Tables

	<u>Page</u>
Table 1. Numbers of boats considered in postcard survey, by South Carolina county	11
Table 2. Summary of visits and interviews of shrimp baiters at coastal boat landings	15
Table 3. Seasonal analysis of shrimp baiting interview data summarized by month	16
Table 4. Geographic analysis of shrimp baiting interview data summarized by county of boat landing	16
Table 5. Frequencies of use of bait types, net radii, and mesh sizes by interviewed shrimp baiters	17
Table 6. Frequency of use of ice during each month of the fishery season	18
Table 7. Shrimper conflicts mentioned during boat landing interviews	18
Table 8. Results of postcard survey for each Category I county and combined Category II counties	19
Table 9. Inland counties (Category II) of South Carolina having positive responses to participation question on postcard survey	22
Table 10. Projected numbers of boats participating in South Carolina's 1987 shrimp baiting fishery based on the assumption that non-respondents participated at one-half the rate of respondents	22
Table 11. Numbers of first-year and experienced participants in 1987 using positive response boats, by county with average numbers of trips made by positive response boats	23
Table 12. Estimates of shrimp catch with ice (quarts, heads-on) in the boat fishery based on catch, effort, and a projection of participation from interview and mail survey results	24
Table 13. Four representations of estimated total shrimp take by baiters using boats during 1987, with conversion equations	24
Table 14. Average daily catch of shrimp (heads-on) taken by trawlers in Beaufort County and Charleston County during specified periods of 1987	25
Table 15. Comparison of white shrimp harvests made by commercial trawlers and shrimp baiters	25
Table 16. Average sizes (headless shrimp per pound) and sample sizes of baited white shrimp sampled at specified boat landings during each month September through December 1987, with geographic reference to nearest commercial trawling areas (Refer to Figure 9.)	26

List of Figures

	<u>Page</u>
Figure 1.	Locations of boat landings surveyed in southern coastal South Carolina 4
Figure 2.	Locations of boat landings surveyed in south-central coastal South Carolina 5
Figure 3.	Locations of boat landings surveyed in central coastal South Carolina 6
Figure 4.	Locations of boat landings surveyed in north-central coastal South Carolina 7
Figure 5.	Survey instrument utilized for shrimp baiting fishery interview 9
Figure 6.	South Carolina counties categorized for postcard mail survey 10
Figure 7A.	Obverse of postcard survey instrument to registered boat owners 13
Figure 7B.	Reverse of postcard survey instrument to registered boat owners 14
Figure 8.	Positive response rates from near-coastal counties to fishery participation question on postcard survey 21
Figure 9.	Size distribution of white shrimp shown as percentages of all shrimp taken in specified offshore areas by commercial shrimp trawlers during each month, September through December 1987, with indication of average size of baited white shrimp sampled at geographically related boat landings 28

Abstract

Extreme growth occurred in 1986 in the practice of cast netting for shrimp (principally white shrimp, Penaeus setiferus) in baited coastal waters of South Carolina. A study of participation and resource impact of the fishery, which included a significant unlawful component, was initiated in 1987 to support legislative and management decisions. Principal considerations were access to a publicly owned renewable resource, recreational/commercial allocation of that resource, and the resolution of citizen conflicts. Interviews of fishery participants at boat landing facilities were coupled with a mail survey of sampled boat registrants to produce qualitative and quantitative characterizations of the primarily nighttime fishery.

Projection of participation estimated 21,735 South Carolinians utilized 6,406 boats to catch 1.8 million pounds of shrimp during the 1987 season of mid-August through mid-December. The typical shrimp baiting trip saw two people shrimping for 4 hours from a 14 foot boat using 12 to 15 bait-marking poles and catching 30 to 35 quarts of shrimp (heads-on measure).

Reported on are the prosecution of the fishery, its history in South Carolina, locations of frequently-used boat landing facilities, and seasonal and geographic aspects of the 1987 fishery. Also discussed are citizen conflicts, the fishery's estimated take in relation to that of the traditional commercial trawler fishery, provisions of the South Carolina Shrimp Baiting Act of 1988, and likely future considerations in the fishery.

Acknowledgements

The author recognizes the efforts

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Background

There was major growth in the participation and total yield facets of the practice of baiting and cast netting for shrimp (principally white shrimp, Penaeus setiferus) in coastal waters of South Carolina during 1986 and 1987. Following relatively slow growth during the early 1980's, the practice had become significant but unmeasured in recreational and commercial shrimp fisheries by 1983. In June of that year the sale of shrimp taken over bait was outlawed. A seine or cast net catch limit per boat (50 quarts whole shrimp or 30 quarts with heads removed) was enacted in April 1985. Eruptive growth in 1986 resulted in pressure on the South Carolina Legislature to enact additional restrictions on the activity. Commercial shrimp fishing interests argued that unfair access by baiters to shrimp in nursery areas coupled with a major increase in baiting would

produce a negative effect on success of shrimp trawlers, which were restricted to shrimping outside the estuaries. Established seafood marketers insisted that large quantities of shrimp being easily accessible through baiting to individuals other than traditional commercial fishermen resulted in illegal sales of shrimp, loss of tax revenue, potential health hazards, and lost documentation of resource harvests. General beliefs were that bait-marking poles were a hindrance to navigation; the practice of combined baiting, catching, and selling was too illusive for effective law enforcement; and territoriality, or claim-staking, existed and was intimidating to fishery participants. Proponents of shrimp baiting argued that their activity was environmentally safe, selective for commercial grade shrimp, and a fair allowance of access to a common property resource. All agreed that intimidation on the water was improper, and most agreed that the prohibition of sale of baited shrimp should be continued.

Following review of the fishing activity and hearing the opinions of proponents and opponents, the Director of the Marine Resources Division asked approval by the Marine Advisory Board to pursue legislative action to control inshore shrimping. A prohibition on placing bait and stakes in coastal waters was included. The Board approved in October 1986, and the Wildlife and Marine Resources Commission, its parent organization, concurred in February 1987.

No statutory action was finalized during the 1986 or 1987 sessions of the General Assembly in resolution of this controversial matter. A primary problem in this emotional issue was the lack of official documentation concerning participation and resource impact in the fishery. The present study was to assess the measurable aspects of the 1987 shrimp baiting season through direct contact with partici-

pants in the fishery.

The Fishery

The use of bait to attract shrimp for capture has been common in the saltwaters of South Carolina for generations. Until the late 1970's, the most prevalent method had been to attach smoked herring, crushed blue crab, or other natural food in circular drop nets. Feeding shrimp were captured when the net was retrieved by bridle and line. The baitless method of cast netting had been in wide use with some individuals aware that chicken feed, hog feed, and pet food scattered in an area increased success.

Deliberate placing of bait, prepared for long life by mixing with clayey mud, concentrates shrimp in large, even commercial, quantities. Knowledge of this, and perhaps the first serious shrimp baiting fishermen as well, came to South Carolina from Florida, according to popular information. Passed from fishermen to fishermen, the method spread from Beaufort County and Jasper County to central Charleston County by 1984. In 1986, large numbers of Lowcountry and up-state fishermen were enticed to the method by an especially good crop of fall white shrimp. Whitaker and Wenner (1988) found that shrimp baiting resulted in an average yield 19.6 times as great as does casting without bait.

In shrimp baiting from a boat, poles are pushed into the bottoms of tidal waters of generally two to six feet in depth. They are usually placed in series and parallel to a bank of a river or creek. Poles are commonly bamboo (cane) or plastic pipe of one to three inches in diameter. Other materials observed have been lumber up to 2 inches by 4 inches, small angle iron and reinforcement rod, conduit pipe, and sticks

of many types. Softball sized balls or patties of fish meal mixed with mud are placed at a known distance up to several feet from the stationary poles. Fish meal used is chiefly dried menhaden, and the mud is the pluff mud common in coastal marshes. Casting by means of multi- or mono-filament cast nets begins within minutes after poles are baited. In most cases one shrimper maneuvers the boat under power while another casts from one to three times per pole. Most shrimp baiting is done at night. Many methods of marking and relocating poles and rigging lights have been devised.

Baiting and casting from wharfs and, especially, private docks has become popular and is prosecuted much the same as from boats. Boat and poles become unnecessary in this method.

Objectives

The project to assess participation in this fishery and its impact on the shrimp resource during 1987 had several goals, which follow.

1. To estimate the participation of individuals and boats in the boat fishery and the number of bait-marking poles utilized
2. To document the period of baiting and casting activity
3. To estimate the catch per measure of effort (nightly per pole, man, and boat), and for various water bodies
4. To document the size and species composition of shrimp taken relative to shrimp-ing areas and date
5. To estimate the total take of the fishery

6. To relate the take of the fishery to that of typical commercial trawlers and the state's total reported commercial production

Methods

The project took two approaches toward meeting these objectives. They were:

1. Field interviews of boating participants, and
2. A postcard survey of registered boat owners.

Boat Landing Interviews

Observations of the 1986-shrimp baiting fishery showed that many South Carolina Lowcountry boat landings were used by those participating in the activity. A review of all boat landings on saltwaters was made to specify the extent of their use. Knowledge of this matter was obtained from coastal law enforcement officers, district biologists of the Marine Resources Division (MRD), and MRD fishery management staff members. A list of landings in the coastal counties was reduced to 44, each of which was assigned a grade of heavily used, moderately used, or lightly used by shrimp baiters. These grades were utilized in planning a schedule for nighttime interviews of fishery participants with more heavily used landings to be more heavily interviewed. The schedule was not obligatory but was flexible for the propose of obtaining interviews from the entire range of shrimp baiting activity while maximizing the efficiency of the sampling effort. The 33 landings at which constructive interviews were made are represented in Figures 1 through 4.

Figure 1. Locations of boat landings surveyed in southern coastal South Carolina

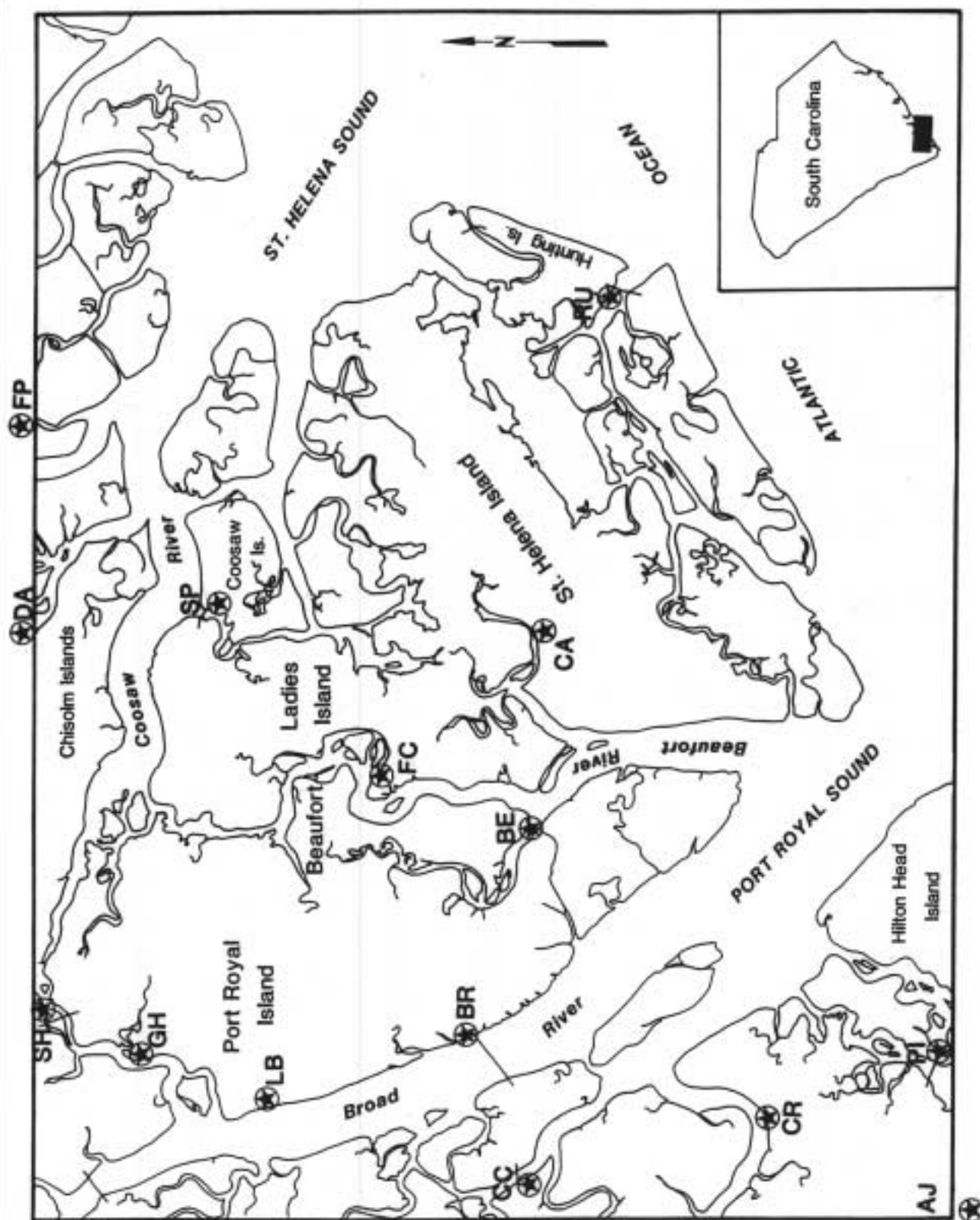


Figure 2. Locations of boat landings surveyed in south-central coastal South Carolina

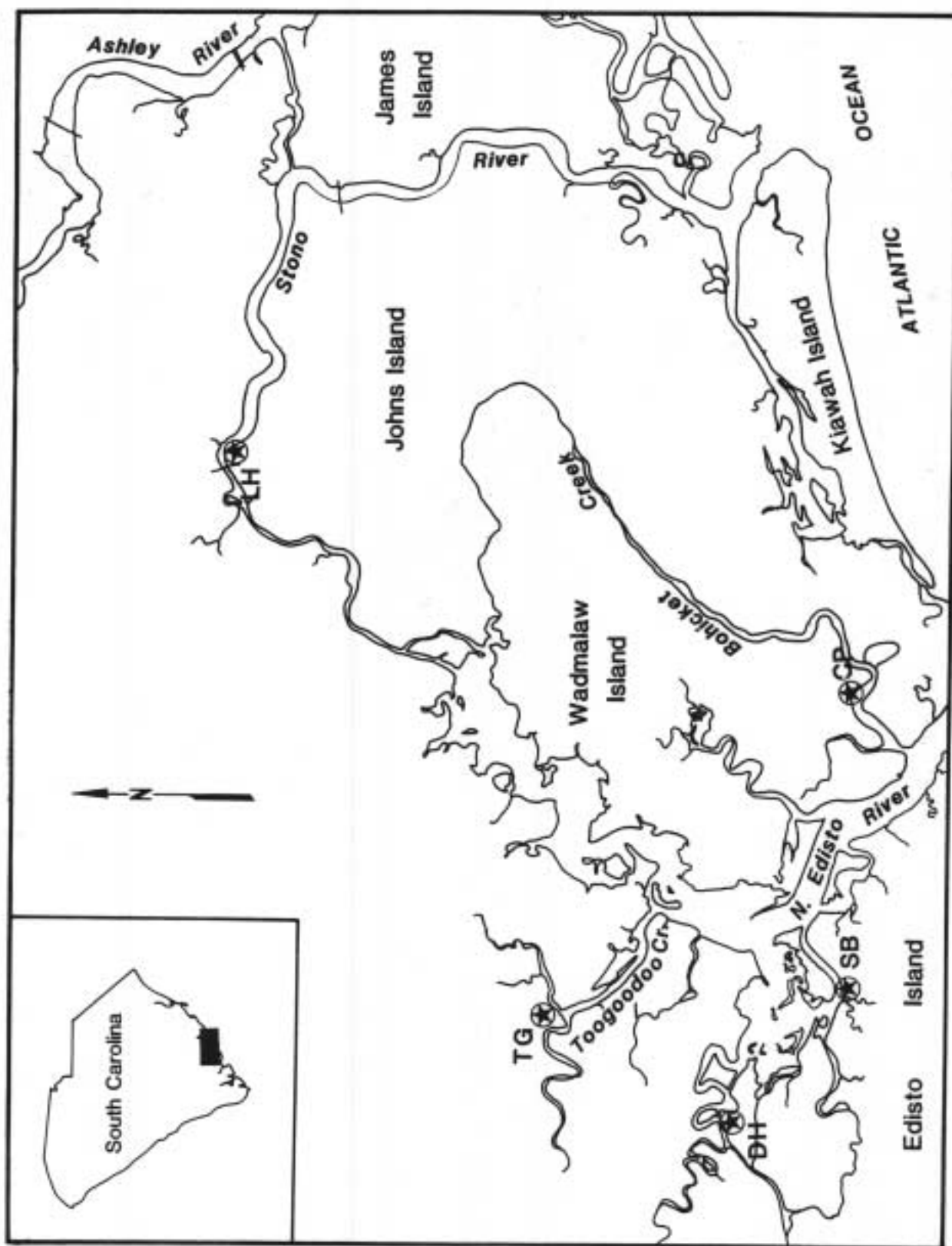


Figure 3. Locations of boat landings surveyed in central coastal South Carolina

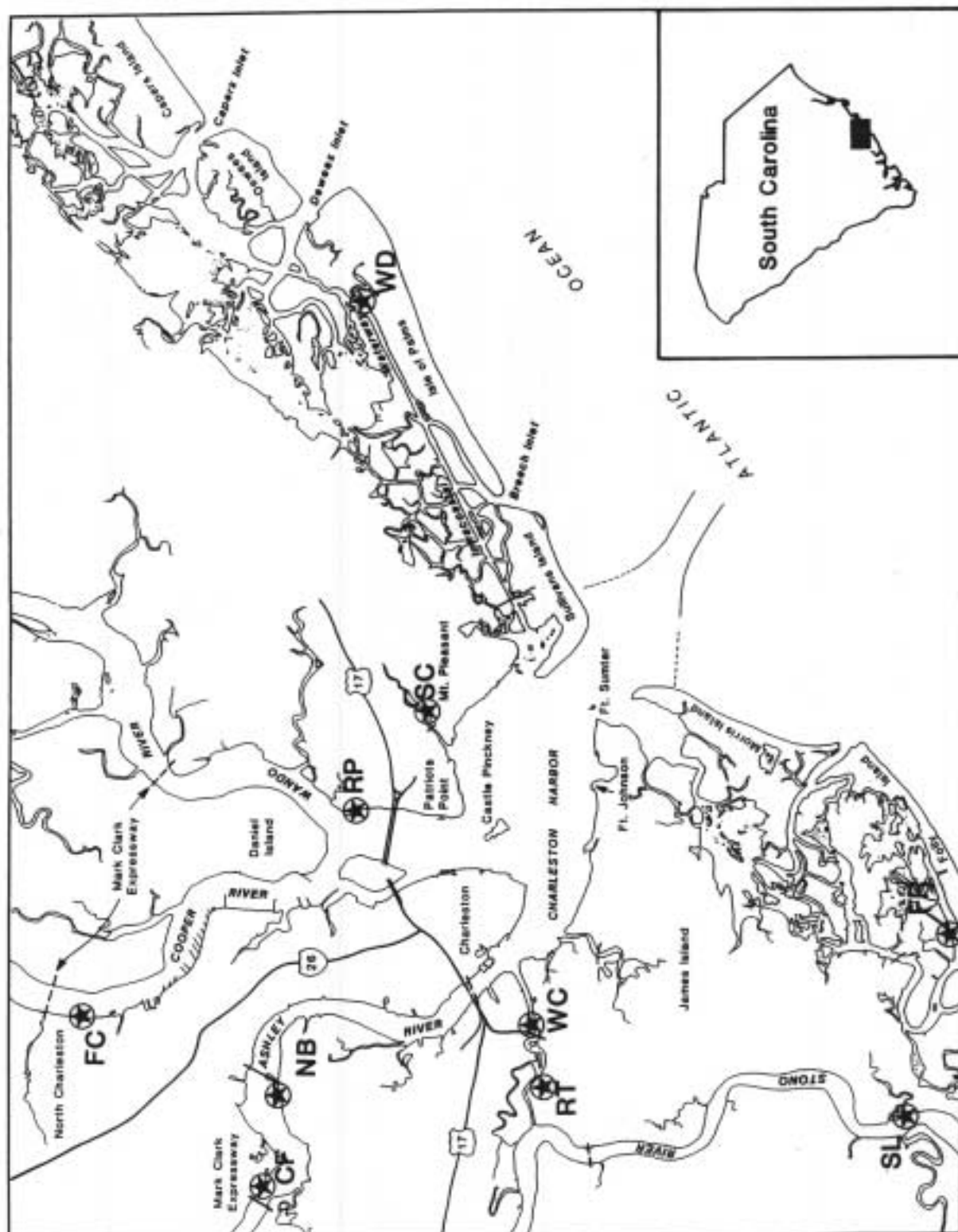
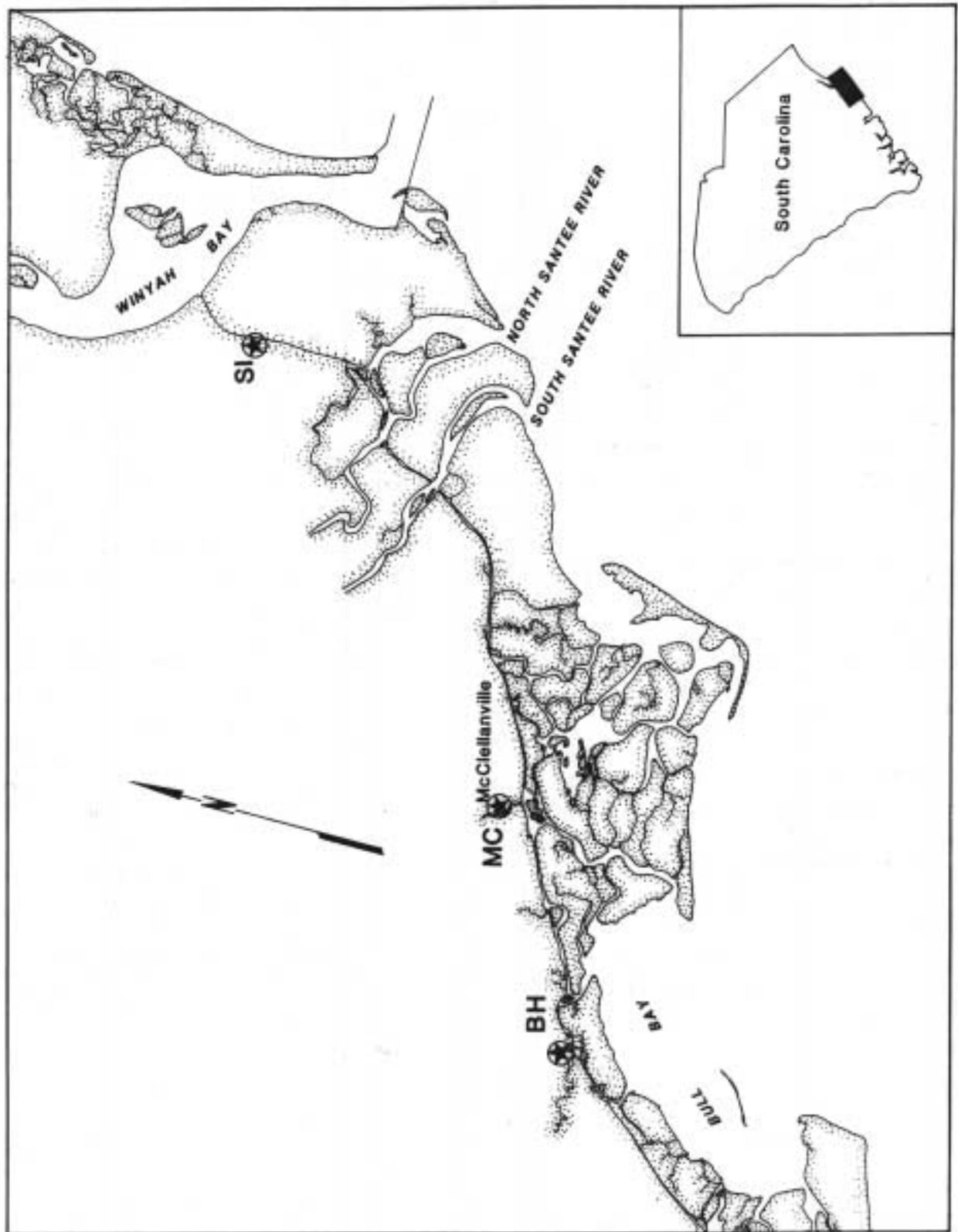


Figure 4. Locations of boat landings surveyed in north-central coastal South Carolina



One interviewer was assigned to the Beaufort County-Colleton County area and one to the Charleston County-Georgetown County area. They spent an average of 25 hours during five or six nights per week at scheduled landings. To boaters evidently involved in the subject fishery, they identified themselves as interviewers of the South Carolina Wildlife and Marine Resources Department and asked if they would voluntarily respond to several questions concerning their night's baiting activity.

The boat landing interview form (Figure 5) was completed by the interviewer. It was designed so that answers would be numerical to allow for quantitative analysis. The survey did not solicit opinions; only the question, "Did you have any conflict tonight or any night this season?" was intended to generate qualitative responses. As was expected, a great deal of such information was gained by interviewers through their observations and conversations with shrimp baiters.

Estimates of total catch were made by surveyors by visual inspection. Length measurements of shrimp taken by baiting were recorded for as many catches as possible. Generally from 20 to 50 whole individuals randomly selected were measured by interviewers to complete field interviews. For each boat landing, monthly mean lengths in metric units were later converted to commercial market size categories. This facilitated seasonal and geographic comparisons of baited shrimp data to that routinely collected from the trawler industry.

Specific objectives of the boat landing phase of the study were to document the number of individuals per boat involved in the fishery, in what counties they resided, and whether they had participated in the fishery in a previous year. Also to be documented were the size of boats used,

radius and mesh-size of cast nets, extent of bait types in use, numbers of bait marking poles in use, and amounts and sizes of shrimp taken.

Registered Boat Mail Survey

With shrimp baiting activity virtually completed by mid-December, a postcard survey mailing was made on December 18, 1987 to assess the use of South Carolina boats in the fishery. The universe of boats was the South Carolina boat registration file prepared and maintained by the Division of Administrative Services of the Wildlife and Marine Resources Department. A sample of this file of over 289,000 boats was used to best bracket boats of the types and sizes involved in the baiting fishery and to assure that all South Carolina counties were equitably sampled within two categories.

Boat landing interviews had revealed that the majority of baiters were from those counties bordering the coast or being in near proximity to saltwaters (Figure 6). These nine counties constituted Category I for sampling and reporting purposes, and all other South Carolina counties constituted Category II.

Interviewer observations documented that participants in the fishery used chiefly small and mid-sized outboard motor boats. Based on this information a bracket of boats of 12 feet in length to less than 20 feet in length was defined. Fully excluded were sailboats, houseboats, and inflatables. By means of random selection computer programming, 8,000 bracketed boats were selected from Category I counties (coastal area), and 4,000 bracketed boats were selected from Category II counties (inland area). Different color cards were utilized for Category I and Category II boat owners to facilitate sorting them when returned. Table 1 presents the numbers of boats in

continue

Figure 5. Survey instrument utilized for shrimp baiting fishery interview

SHRIMP BAITING SURVEY
INTERVIEW FORM

Boat Landing _____ Date _____ Interviewer _____

Have you been interviewed previously? Circle: YES NO

Did you use bait? YES NO What type? MEAL & CLAY PELLETS CRAWFISH _____

How many people were in your boat? _____ Boat length? _____

How many people cast a net tonight? _____

How many of you did _____ or did not _____ cast over bait before this season?

Was a second boat used? Circle: YES NO Boat length? _____

In what areas were you shrimping? _____

How many poles did you set and bait? _____

How many hours did you shrimp? _____

On what tide did you start? HIGH DOWN _____ LOW UP _____

On what tide did you quit? HIGH DOWN _____ LOW UP _____

What size net did you throw? (radius & mesh) Primary _____ Secondary _____

What is home county of each boat occupant? _____ () _____ ()

Did you have any conflict tonight or any night this season? YES NO

If so, what and when? _____

Do you want the results of this survey? Circle: YES NO

If so, what is your address? _____

Surveyor's estimate of total catch: _____ quarts pounds individuals
heads-on heads-off culled not culled ice no ice

Record species and total length of 20 shrimp, randomly selected:

Sp - mm Sp - mm Sp - mm Sp - mm Sp - mm

Fisherman or surveyor's comments:

Figure 6. South Carolina counties categorized for postcard mail survey

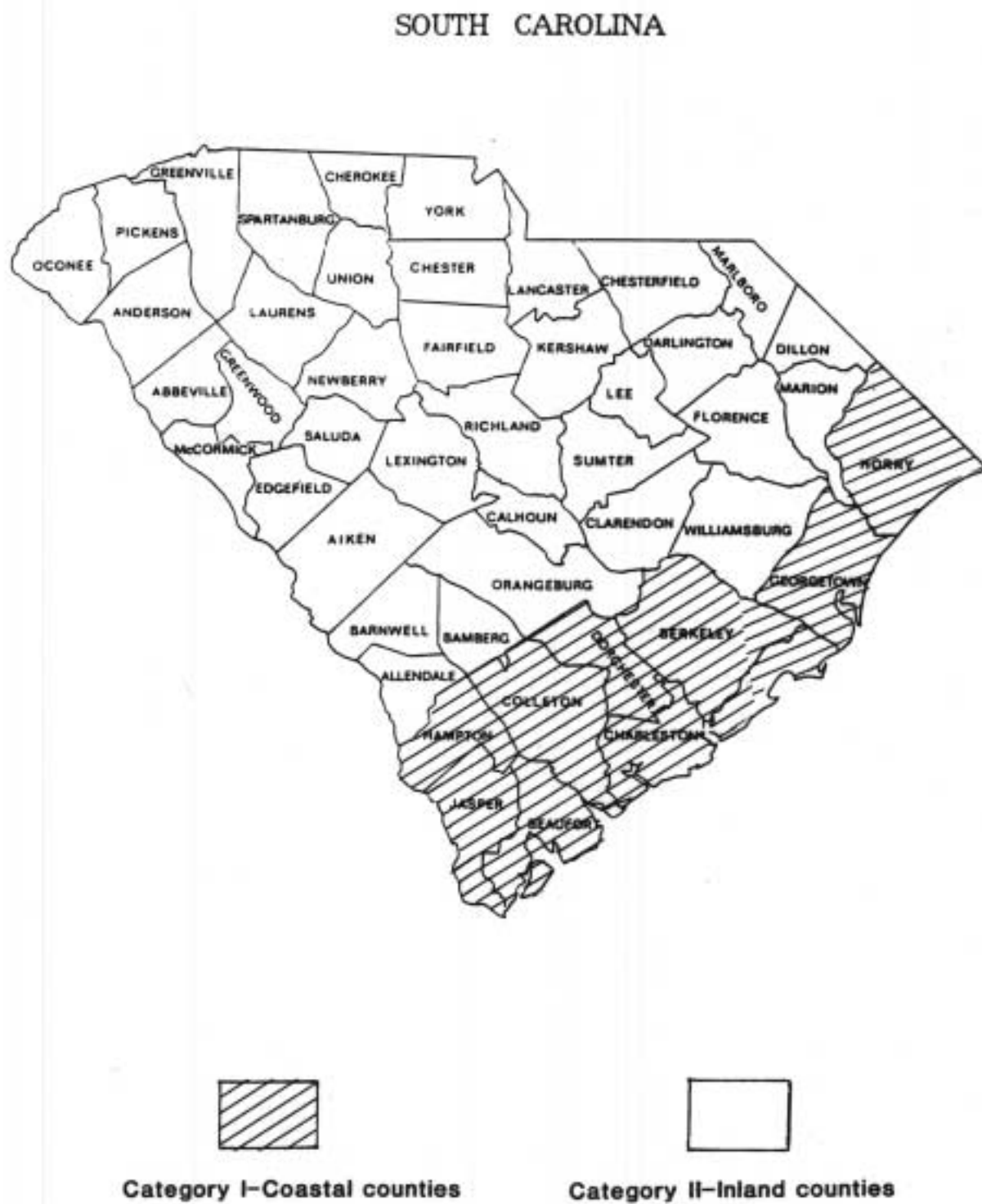


Table 1. Numbers of boats considered in postcard survey, by South Carolina county

Category	County Name	Registered	Bracketed	Sampled	Sample as % of Bracket
I	Beaufort	7452	4519	653	14.5
I	Berkeley	11108	8872	1275	14.4
I	Charleston	24041	18876	2704	14.3
I	Colleton	3035	2533	369	14.6
I	Dorchester	6466	5021	724	14.4
I	Georgetown	5694	4540	656	14.4
I	Hampton	1831	1525	225	14.8
I	Horry	11761	8660	1244	14.4
I	Jasper	1325	1024	150	14.6
II	Abbeville	1572	1349	43	3.2
II	Aiken	9619	7863	246	3.1
II	Allendale	645	563	18	3.2
II	Anderson	9583	7677	240	3.1
II	Bamberg	938	816	26	3.2
II	Barnwell	1724	1393	44	3.2
II	Calhoun	998	820	26	3.2
II	Cherokee	1910	1549	49	3.2
II	Chester	1569	1244	39	3.1
II	Chesterfield	1486	1072	34	3.2
II	Clarendon	2691	1981	62	3.1
II	Darlington	4484	3179	100	3.1
II	Dillon	1841	827	26	3.1
II	Edgefield	989	835	27	3.2
II	Fairfield	1163	908	29	3.2
II	Florence	11763	7569	237	3.1
II	Greenville	14621	11974	375	3.1
II	Greenwood	3413	2775	87	3.1
II	Kershaw	3340	2562	81	3.2
II	Lancaster	2393	1960	62	3.2
II	Laurens	3494	2722	86	3.2
II	Lee	756	553	18	3.3
II	Lexington	16860	13209	413	3.1
II	McCormick	553	426	14	3.3
II	Marion	2918	1634	52	3.2
II	Marlboro	1053	707	23	3.3
II	Newberry	2871	2355	74	3.1
II	Oconee	4474	3405	107	3.1
II	Orangeburg	6546	5241	164	3.1
II	Pickens	4999	4146	130	3.1
II	Richland	12971	10338	324	3.1
II	Saluda	1365	1154	37	3.2
II	Spartanburg	9684	8053	252	3.1
II	Sumter	6943	5564	174	3.1
II	Union	1430	1211	38	3.1
II	Williamsburg	3340	2131	67	3.1
II	York	6676	4835	152	3.1
II	Out of State	2884	1641	24	1.5
	TOTALS	239272	183811	12000	6.5

each county meeting the length and boat-type criteria (bracket) and the numbers selected for the mail survey sample. All counties were included in the sample with boat counts per county ranging from 150 (Jasper County) to 2,704 (Charleston County) in Category I and from 14 (McCormick County) to 413 (Lexington County) in Category II.

The survey instrument (Figure 7A and Figure 7B) was designed to be short and easily returned by postage-free business reply mail to decrease a recipient's reluctance to complete and return it.

Responses to survey questions were utilized to quantitatively estimate several facets of the fishery under the nearly unregulated conditions of 1987. They included levels of participation of boats and individuals in the boat fishery, contribution of each county as to fishery participants, and period of shrimp baiting activity. The survey reached baiters using private as well as public landing facilities. In concert with results of the boat landing interviews, they were used to estimate the total take by shrimp baiters using boats. Based on preliminary results of Liao (1988), a return rate of 25 to 30 percent (3,000 to 3,600) of survey cards was anticipated.

Initial plans were to follow-up by telephone contact with non-respondents to reduce the effects of potential causes of error. (See Results Section.) They were abandoned due to the absence of telephone numbers in the boat registration file.

Results

Boat Landing Interviews

Extremely heavy rainfall during August 30 through September 7, 1988, in coastal South Carolina temporarily delayed

widespread shrimp baiting which had begun sporadically in mid-August. Whitaker and Wenner (1988) reported that salinities at sampling sites in Charleston Harbor had ranged from 17 to 27 parts per thousand during the summer but dropped to 2 parts per thousand on September 10. Subsequent river discharge had a negative impact on baiting success, and therefore effort, through the season, particularly in the Santee and Winyah estuaries. Boat landing interviewers began their survey work on September 9 by which time baiting and casting for white shrimp had begun to increase. The interview period was completed on December 9 when a combination of low water temperature and uncomfortable weather had virtually halted the activity.

Table 2 presents the numbers of nighttime visits made to each of the targeted boat landings and the numbers of interviews prosecuted at each. Some interviews were labeled as low quality in that they were incomplete or for some reason suspected by the interviewer or the author of containing spurious data. These were excluded from analysis as appropriate.

Interview results were summarized to quantitatively define several facets of shrimping methods and success. They were analyzed for seasonal differences (Table 3) and geographic differences (Table 4). Shrimp baiters on average utilized more poles in November (16 poles) than during other months (12 to 14 poles) and shrimped longer in September (4.2 hours) than in December (3.4 hours). Beaufort County shrimpers tended to shrimp for shorter periods (3.7 hours) than those in other counties (4.3 to 5.0 hours), a condition which may be related to the greater tidal range of Beaufort waters. The low number of interviews made in Georgetown County allows little confidence in the high catch per boat figure for that county. Fre-

Figure 7A. Obverse of postcard survey instrument to registered boat owners

Boat Registration Holder:

You and your boat have been selected to help the South Carolina Wildlife and Marine Resources Department learn about the shrimp baiting and cast netting fishery. Even if you do not shrimp, your answers are important because you are part of a sample of the 239,000 boat registrants in our State. Please answer these questions for the boat identified on the mailing label, only. If you receive another card for another boat, answer questions for each boat separately. Your cooperation will aid in the formulation of resource management policy and/or legislation concerning shrimp baiting and cast netting.

Please respond even if you did not bait for shrimp. The return half is postage paid.



No
Postage
Necessary
If Mailed in the
United States

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1180 CHARLESTON, S.C.

POSTAGE WILL BE PAID BY ADDRESSEE

**S.C. MARINE RESOURCES CENTER
ATTN. SHRIMP SURVEY
P.O. BOX 12559
CHARLESTON, S.C. 29412-9985**



Figure 7B. Reverse of postcard survey instrument to registered boat owners

<p>S.C. Marine Resources Center P.O. Box 12559 Charleston, S.C. 29412</p>	<p>BULK RATE U.S. POSTAGE PAID Charleston, S.C. 29412 Permit No. 142</p>
---	--

----- TEAR OFF HERE -----

SHRIMP BAITING SURVEY
S.C. Division of Marine Resources

1. In what county do you live? _____

2. Was the boat indicated on the mailing label used in casting for shrimp over bait in South Carolina during 1987? Circle: YES NO

If NO, do not answer the other questions, but please return this postage paid card. Your response is important. Thank you.

3. Was anyone using this boat for baiting surveyed at night by the Wildlife and Marine Resources Department at a public boat landing during 1987? (This does not include checks by Department law enforcement agents. Our interviewer asked such questions as bait type, net size, pole number, and boat size.)
Circle: YES NO

4. When was this boat used in cast netting over bait in 1987?
Date of First Trip _____ Date of Final Trip _____

5. How many nights was this boat used in baiting during 1987? _____

6. How many different people went baiting in this boat during 1987?
_____ First year baiters _____ Baited in a previous year

Table 2. Summary of visits and interviews of shrimp balers at coastal boat landings

County	Boat Landings	Code	Nights Visited	Interviews
Beaufort County	Gray's Hill	GH	14	82
	Sheldon	SH	12	77
	Sams Point	SP	9	29
	Colleton River	CR	5	28
	Chechessee River	CC	4	25
	Beaufort River	BE	3	13
	Broad River	BR	3	11
	Laurel Bay	LB	2	7
	Russ Point	RU	4	5
	All Joy	AJ	1	3
	Dale	DA	2	3
	Factory Creek	FC	1	3
	Pinckney Island	PI	3	3
	Capers	CA	2	1
	Battery Creek	-	1	0
	Brickyard	-	2	0
	Butcher Island	-	3	0
	Johnson Creek	-	3	0
	Pigeon Point	-	1	0
	Station Creek	-	1	0
	Warsaw	-	1	0
Charleston County	Remleys Point	RP	13	104
	Shem Creek	SC	4	24
	Wappoo Cut	WC	5	21
	Filbin Creek	FC	7	18
	Cherry Point	CP	5	16
	Folly River	FR	4	16
	Sol Legare	SL	5	16
	McClellanville	MC	3	12
	Toogoodoo River	TG	5	12
	County Farm	CF	3	6
	Limehouse Bridge	LH	2	6
	North Bridge	NB	2	5
	Wild Dunes	WD	3	5
	Buck Hall	BH	3	4
	Steamboat	SB	3	4
	Dawhoo River	DH	3	2
	Riverland Terrace	RT	2	2
	Bulow	-	3	1
	Moore's Landing	-	1	0
Colleton County	Fields Point	FP	2	4
	Bennetts Point	-	3	0
	Wiggins	-	2	0
Georgetown County	South Island Ferry	SI	3	4
	Meeting Street	-	3	0

Table 3. Seasonal analysis of shrimp baiting interview data summarized by month

	September	October	November	December	Season
Interviews made	125	259	129	20	533
Average quarts per boat	36.6	30.8	37.2	22.5	33.4
Range of quarts per boat	1-150	1-150	1-96	3-85	1-150
Average poles per boat (zeros excluded)	12.0	13.2	16.1	13.8	13.7
Average quarts per pole	3.1	2.3	2.3	1.6	2.4
Range of poles per boat (zeros excluded)	2-28	1-30	3-50	6-24	1-50
Hours shrimping	4.2	4.0	4.1	3.4	4.1
Average quarts per hour	8.7	7.7	9.1	6.6	8.2
Possessions below legal limit	117	251	126	20	514
Possessions at legal limit	6	5	2	0	13
Possessions above legal limit	2	1	1	0	4

NOTE: Low quality and no-bait interviews are excluded. Amounts in possession were estimated by interviewers. Many possessions included ice which was not subtracted. Quarts are of heads-on shrimp.

Table 4. Geographic analysis of shrimp baiting interview data summarized by county of boat landing

	Beaufort	Charleston	Colleton	Georgetown	All
Interviews made	269	254	6	4	533
People per boat	2.1	2.2	2.2	2.0	2.1
Average quarts per man	18.5	13.4	11.5	20.7	15.9
People casting per boat	1.2	1.3	1.3	1.8	1.2
Range of people casting	1-3	1-3	1-3	1-2	1-3
Average boat length	14.3	14.4	14.7	14.5	14.4
Average quarts per boat	38.8	29.5	25.3	41.3	33.4
Range of quarts per boat	1-150	1-118	1-60	30-58	1-150
Average poles per boat (zeros excluded)	14.6	12.9	12.0	14.3	13.7
Average quarts per pole	2.7	2.3	2.1	2.9	2.4
Range of poles per boat (zeros excluded)	1-50	2-26	5-20	12-16	1-50
Hours shrimping	3.7	4.5	4.3	5.0	4.1
Average quarts per hour	10.5	6.5	5.9	8.3	8.2

NOTE: Low quality and no-bait interviews are excluded. Amounts in possession were estimated by interviewers. Many possessions included ice which was not subtracted. Quarts are of heads-on shrimp.

quencies of use of bait types, net radii, and net meshes are shown in Table 5. Fish meal was utilized by 98.5 percent of interviewed baiters. Nets of 5 or 6 feet in radius were used by 82.2 percent of baiters, and 3/8 inch (bar measurement) mesh size was seen most commonly (83.8 percent). The use of ice generally decreased through late summer to early winter (Table 6). Thirty-six interviews were made of boating baiters who did not use poles. Other than in cases of very small catches, only rarely were shrimp landed with heads off.

With all interviews considered, the typical nighttime shrimp baiting trip saw two people shrimping for 4.0 hours from a boat 14 feet in length using 12 to 15 baited

poles and catching 30 to 35 quarts (heads-on) of shrimp.

The general shrimping area was recorded during most interviews, and white shrimp length frequency data were recorded. (These data are discussed in relation to trawler catches in Discussion Section.) Whitaker and Wenner (1988) reported size composition of white shrimp was similar between baited and unbaited sites in a Charleston Harbor study.

The question concerning conflict with other shrimpers was answered in the positive by 23 of 555 shrimpers responding (4.1 percent). Conflicts mentioned were summarized as shown in Table 7. Charleston County boat landings ac-

Table 5. Frequency of use of bait types, net radii, and mesh sizes by interviewed shrimp baiters

	Trips	Percent
Bait Type	532	100.0
Fish meal and clay	497	93.4
Fish meal, clay, and feed pellets	27	5.1
Feed pellets	5	.9
Crawfish bait	1	.2
Other	2	.4
Net Radius (feet)	547	100.0
4.0	13	2.4
4.5	1	.2
5.0	137	25.0
5.5	2	.4
6.0	313	57.2
7.0	70	12.8
8.0	10	1.8
9.0	1	.2
Net Mesh (Inch)	541	100.0
3/8	454	83.8
1/2	75	13.9
5/8	8	1.5
3/4	2	.4
1	2	.4

Table 6. Frequency of use of ice during each month of the fishery season

	September	October	November	December	Season
Ice Used (%)	54.6	43.4	23.0	25.0	40.1
Ice Not Used (%)	45.4	56.6	77.0	75.0	59.9

Table 7. Shrimper conflicts mentioned during boat landing interviews

Type Conflict	Reasons	Occurrences
Verbal exchange	We were casting on someone else's poles.	2
	Someone was casting on our poles.	5
	Poles were placed in a claimed area.	3
	Our poles were run over by another boat.	2
	Unattended poles were run over.	1
Accidents/near misses	No running lights on other boats	2
	Boat handling at dock	1
Purposeful wake	Caused by angry shrimpers	3
Theft	Stolen cooler of shrimp	1
Unknown	Unknown	3
Total conflicts reported to interviewers		23

counted for 11 conflicts, Beaufort County for 11, and Colleton County for 1. Shrimpers at Remley's Point on Charleston Harbor mentioned 4 conflicts, and 3 conflicts were mentioned at both Colleton River in Beaufort County and at Folly Beach in Charleston County.

Registered Boat Mail Survey

Estimates based on results of this survey were susceptible to error caused by at least the following circumstances.

1) Boat registrants who failed to respond

to the mail questionnaire may not have been participants in the fishery in the proportion of those who did respond. If non-respondents included proportionately fewer participants, eventual estimates of total participation and catch, when based on like participation levels, would be excessive. Those unfamiliar with the activity, particularly those residing in Category II counties, would be more inclined not to respond. Therefore, an assumption of non-respondent participation was made in projecting overall participation.

2) Boat registrants who took part in the

unlawful aspects of the fishery, specifically the sale of baited shrimp and exceeding the possession limit, probably did not respond or responded untruthfully. Estimates, particularly of total catch, would therefore be reduced from actual levels and are best viewed as such.

3) The closeness of the mailing survey to the 1987 Christmas and 1988 New Years holiday period may have reduced the overall rate of return by postcard recipients, both baiters and non-baiters.

Through April 1988, 4362 survey cards (36.4 percent of total mailout) with responses had been returned. The overall Category I response rate was 37.4 percent (2990 of 8000 cards returned). Rates for Category I (coastal) counties ranged from 27.9 percent for Horry County to 44.0 percent for Jasper County. The overall response rate for Category II (inland) coun-

ties was 34.3 percent (1372 of 4000 cards returned). A considerable number of respondents misread the word "county" in the first question as "country" and responded "USA" or "America". Additionally, several cards had blanks or "SC" in response to the County question. There were 47 Category I responses and 40 Category II responses answered in this way. Card color was used to determine category in these cases, but actual county was indeterminate.

Responses were analyzed to determine participation and non-participation rates (Table 8). For Category I respondents, 394 boats (13.2 percent) had been used in the shrimp baiting fishery. Positive responses for Category I counties ranged from 1.7 percent in Horry County to 33.3 percent for Jasper County. A geographic ordering of positive response rates revealed a continuous decrease from

Table 8. Results of postcard survey for each Category I county and combined Category II counties

	Survey Responses			
	Boats	% of Sample	Yes (%)	No (%)
Category I				
Beaufort County	258	39.5	43 (16.7)	215 (83.3)
Berkeley County	514	40.3	67 (13.0)	447 (87.0)
Charleston County	1025	37.9	154 (15.0)	871 (85.0)
Colleton County	157	42.5	25 (15.9)	132 (84.1)
Dorchester County	258	35.6	35 (13.6)	223 (86.4)
Georgetown County	214	32.6	23 (10.7)	191 (89.3)
Hampton County	97	43.1	15 (15.5)	82 (84.5)
Horry County	347	27.9	6 (1.7)	341 (98.3)
Jasper County	66	44.0	22 (33.3)	44 (66.7)
USA, SC, Blank	54	-	4 -	50 -
Category I Totals	2990	37.4	394 (13.2)	2596 (86.8)
Category II Totals	1372	34.3	23 (1.7)	1349 (98.3)

Jasper County northeastward to Horry County (Figure 8). Positive Category II responses accounted for 1.7 percent (23) of Category II responses and came from twelve counties (Table 9).

To estimate numbers of boats involved in the fishery from each coastal county and Category II counties as a whole, expansions of response rates were made to the level of boats bracketed. This excluded sailboats and others not likely to be used. In the absence of knowing what portion of non-respondents participated in the fishery, an estimate of boat involvement was made based on the assumption that non-respondents participated at one-half the rate of respondents. In his study of recreational shrimping in South Carolina, which included follow-up contact with a mixed sample of non-respondents from coastal and non-coastal counties, Liao (1988) estimated that 6.0 and 7.4 percent of non-respondents in initial mailings for two sampling waves were actually participants. The assumption of the present study equates to an overall weighted non-response participation rate of 4.4 percent. Liao's sampling of boats and counties were quite different from those of this study. Nevertheless, the lower participation rate resulting from this study's assumption suggests its estimates of participation and total take are conservative ones.

Based on this assumption, 6,406 South Carolina resident boats were utilized in the 1987 shrimp baiting and casting fishery (Table 10). Near-coastal counties accounted for 77 percent (4,887 boats) and non-coastal counties for 23 percent (1,519 boats). The greatest numbers of participating boats were projected to be from Charleston County and Berkeley County with the greatest participation rates for the defined boat bracket being in Jasper County and Beaufort County.

The mail survey queried 1987 fish-

ery participants on their experience in shrimp baiting during prior years. Positive responses represented 743 (54.9 percent) first-year shrimpers and 611 (45.1 percent) with previous experience (Table 11). In total, 1,354 individuals were involved in the use of these 399 positive response boats resulting in an average of 3.39 individuals per boat during the season. Expanding to the projected number of boats involved statewide, 6,406, an estimated 21,735 people participated on resident boats in South Carolina during the 1987 shrimp baiting season. The circumstance that some shrimpers participated on more than one boat would reduce this figure directly.

An estimate of the total catch of the boat fishery was based on results of boat landing interviews and the post card survey. The average catch with ice per night at boat landings in or near each Category I county was multiplied by the average number of nights boats of each county were used in the fishery (Table 12). The product was multiplied by the projected number of participating boats to estimate total catch with ice. The average catch with ice per night for all interviews was used for Category II.

To account for the presence of ice in 40.1 percent of catches of interviewed shrimpers, a reduction of the mean catch rate of 33.4 quarts was made. The assumption was made that 16 pounds or 7 quarts of crushed ice (2 bags, typical size available at retail stores) were included in a full 48-quart cooler. The mean nightly catch per boat of 33.4 quarts would contain 4.9 quarts of ice at this rate (14.6 percent). A reduction of 14.6 percent of 40.1 percent of the nightly possessions is 5.9% of the total estimated catch. By this it is estimated that 1.8 million pounds of whole shrimp were taken by shrimp baiters using South Carolina registered boats during 1987 (Table 13).

Figure 8. Positive response rates from near-coastal counties to fishery participation question on postcard survey

SOUTH CAROLINA



Table 9. Inland counties (Category II) of South Carolina having positive responses to participation question on postcard survey

County	Positive Responses	As Percentage	Total Responses
Aiken County	3	5.8	52
Allendale County	1	16.7	6
Bamberg County	1	1.5	65
Barnwell County	2	18.2	11
Clarendon County	1	6.3	16
Darlington County	2	13.3	15
Greenville County	1	1.0	99
Greenwood County	1	3.4	29
Lexington County	3	2.4	125
Orangeburg County	4	9.1	44
Richland County	3	3.2	95
Spartanburg County	1	1.3	79
Totals	23	3.6	636

Table 10. Projected numbers of boats participating in South Carolina 1987 shrimp baiting fishery based on the assumption that non-respondents participated at one-half the rate of respondents

	Positive Response Rate	Projected Boats	Resultant Participation Rate
Category I			
Beaufort County	16.7	524	11.6
Berkeley County	13.0	807	9.1
Charleston County	15.0	1963	10.4
Colleton County	15.9	289	11.4
Dorchester County	13.6	467	9.3
Georgetown County	10.7	327	7.2
Hampton County	15.5	169	11.1
Horry County	1.7	95	1.1
Jasper County	33.3	246	24.0
Category I Total	13.0	4887	8.8
Category II Total	1.7	1519	1.2
Statewide Total	-	6406	-

Table 11. Numbers of first-year and experienced participants in 1987 using positive response boats, by county with average numbers of trips made by positive response boats

Home County	Responses	First Year Participants	Previous Year Experience	Responses	Average Trips per Boat
Beaufort County	41	114	51	36	10.2
Berkeley County	61	124	133	60	5.7
Charleston County	149	243	228	134	6.0
Colleton County	25	38	23	22	5.1
Dorchester County	35	52	43	32	3.2
Georgetown County	22	44	20	14	4.1
Hampton County	15	26	37	13	6.5
Horry County	5	7	4	3	2.0
Jasper County	19	43	34	16	14.9
USA	4	4	4	4	6.0
Category II	23	48	34	20	5.2

NOTE: All positive responses did not include both participation and trip count answers. Responses include some daytime shrimp baiting activity.

Table 12. Estimates of shrimp catch with ice (quarts, heads on) in boat fishery based on catch, effort, and projection of participation from interview and mail survey results

Home County	Average Catch /Night	Average Nights /Boat	Participating Boats	Estimated Catch
Beaufort County	38.8	10.2	524	207,399
Berkeley County	29.5	5.7	807	135,734
Charleston County	29.5	6.0	1963	347,451
Colleton County	25.3	5.1	289	37,281
Dorchester County	29.5	3.2	467	44,085
Georgetown County	41.3	4.1	327	55,361
Hampton County	38.8	6.5	169	42,622
Horry County	41.3	2.0	95	7,847
Jasper County	38.8	14.9	246	142,213
USA	-	6.0		
Category II	33.4	5.2	1519	263,850
Total Estimated Catch (with ice)				1,283,843

Table 13.

Four representations of estimated total shrimp take by baiters using boats during 1967, with conversion equations

1,283,843	quarts, heads-on, with ice
1,208,096	quarts, heads-on, without ice
1,787,982	pounds, heads-on, without ice
1,161,027	pounds, heads-off, without ice

NOTE: Conversions for white shrimp

1 quart, heads-on = 1.46 pounds, heads-on
 1 pound, heads-on = .65 pounds, heads-off
 1 pound, heads-off = 1.54 pounds, heads-on

Discussion

Baiting Catch Relative to Trawler Catch

The Fisheries Statistics Section of the Marine Resources Division acquired detailed records of commercial shrimp trawler catches in 1987 with associated effort, trawling area, and species composition data. Such data were collected by means of a voluntary trip ticket system and dockside sampling, and measured the dynamic aspects of the commercial fishery. In 1987, of South Carolina's shrimp trawler catch was recorded by this method (Andrew Applegate, personal communication). Products of the system were catch-per-day-of-effort figures for general areas in nearshore and inshore trawling waters and monthly shrimp size and species composition summaries. Such data provide the best points of comparison between the ostensibly recreational baiting fishery and the commercial trawler fishery.

The average daily catches of trawlers participating in the reporting system

during September through December 1987 were 284 pounds (heads on) in Beaufort County and 255 pounds (heads on) in Charleston County (Table 14). In comparison the average nightly per-boat catches (without ice) by shrimp baiters were 54.0 pounds in Beaufort County and 41.1 pounds in Charleston County. It was documented that trawlers landing in South Carolina during the full 1987 season (June through December) produced 5,479,000 pounds of whole shrimp. Of these, 4,426,000 pounds were white shrimp, the principal target of bait shrimpers. Based on this project, the estimated catch by bait shrimpers who used boats was equal to 40 percent of the trawler white shrimp catch and was 29 percent of the combined recorded white shrimp catch (Table 15).

Table 16 presents numbers and monthly size information for shrimp measured by interviewers. Count groups are those used in shrimp marketing. Figure 9 allows comparison of these sizes with those taken by commercial trawlers from offshore trawling areas geographically adjacent to the inshore areas of the boatings.

Table 14. Average daily catch of shrimp (heads-on) taken by trawlers in Beaufort County and Charleston County during specified periods of 1987

	Beaufort County		Charleston County	
	Days	Pounds per Day	Days	Pounds per Day
September	1348	312	2146	321
October	1136	188	2310	209
November	762	172	1232	222
December	621	225	626	260
Sept. - Dec.	3867	234	6314	255

Source: Fisheries Statistics Section, S.C. Marine Resources Division

Table 15. Comparison of white shrimp harvests made by commercial trawlers and shrimp balters

	Harvests		
	Trawlers'	Balters'	Total
Pounds, whole	4,426,000	1,787,982	6,213,982
As percentage of Total Take	71	29	100
As percentage of Trawler Take	100	40	-

Table 16. Average sizes (headless shrimp per pound) and sample sizes of baited white shrimp sampled at specified boat landings during each month, September through December 1987, with geographic reference to nearest commercial trawling areas (Refer to Figure 9.)

<u>General Inshore Area</u> Calibogue Sound, Beaufort		<u>Nearest Offshore Trawling Area (direction)</u> Savannah River Entrance to Bay Point Island (NE and SW)			
<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	
All Joy (AJ)	-	26/30 (50)	-	-	

<u>General Inshore Area</u> Port Royal Sound, Beaufort County		<u>Nearest Offshore Trawling Area (direction)</u> Savannah River Entrance to Bay Point Island (SW) and Bay Point Island to Fripp Inlet(NE)			
<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	
Beaufort River (BE)	61/70 (63)	-	-	-	
Broad River (BR)	46/50 (63)	36/40 (62)	-	-	
Chechesse River (CC)	26/30 (21)	36/40 (357)	-	-	
Sheldon (SH)	61/70 (87)	51/55 (220)	51/55 (577)	61/70 (97)	
Grays Hill (GH)	51/55 (121)	41/45 (295)	36/40 (669)	61/70 (61)	
Colleton River (CR)	-	41/45 (269)	36/40 (87)	51/55 (19)	
Factory Creek (FC)	-	51/55 (61)	-	-	
Laural Bay (LB)	-	31/35 (122)	-	-	
Pinckey Island (PI)	-	26/30 (71)	-	-	

<u>General Inshore Area</u> Trenchard's Inlet/Fripp Inlet, Beaufort County		<u>Nearest Offshore Trawling Area (direction)</u> Bay Point Island to Fripp Inlet (NE and SW)			
<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	
Russ Point (RU)	61/70 (21)	-	16/20 (20)	-	
Capers (CA)	-	61/70 (21)	-	-	

<u>General Inshore Area</u> St. Helena Sound, Beaufort County		<u>Nearest Offshore Trawling Area (direction)</u> Hunting Island to Edisto Island (NE and SW)			
<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	
Sams Point (SP)	41/45 (165)	36/40 (147)	41/45 (83)	-	
Dale (DA)	-	61/70 (19)	-	-	
Field Point (FP)	-	51/55 (83)	-	-	

Table 16, page 2

General Inshore Area
North Edisto River,
Charleston County

Nearest Offshore Trawling Area (direction)
Botany Bay Island to Klawah Island
(NE and SW)

<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
Toogoodoo (TG)	71 (40)	41/45 (132)	51/55 (99)	-
Steamboat (SB)	-	36/40 (47)	-	-
Cherry Point (CP)	31/35 (60)	36/40 (137)	46/50 (50)	61/70 (22)

General Inshore Area
Stono River, Charleston County

Nearest Offshore Trawling Area (direction)
Folly Island (NW)

<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
Sol Legare (SL)	56/60 (20)	31/35 (88)	51/55 (34)	108 (21)
Folly River (FR)	41/45 (131)	31/35 (125)	-	-

General Inshore Area
Charleston Harbor,
County

Nearest Offshore Trawling Area (direction)
Morris Island to Charleston Jetties (SW) Charleston
and Charleston Jetties to Capers Island (NE)

<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
Limehouse Bridge (LH)	142 (80)	91 (21)	-	-
County Farm (CF)	243 (44)	80 (40)	79 (20)	-
North Bridge (NB)	111 (20)	69 (28)	-	-
Filbin Creek (FC)	94 (20)	56/60 (233)	86 (66)	-
Riverland Terrace (RT)	-	60 (41)	60 (138)	-
Wappoo Cut (WC)	-	51/55 (181)	-	-
Remley's Point (RP)	68 (456)	30/40 (955)	51/55 (370)	136 (21)
Shem Creek (SC)	-	36/40 (232)	46/50 (94)	51/55 (21)
Wild Dunes (WD)	-	36/40 (60)	-	-

General Inshore Area
Bulls Bay, Charleston County

Nearest Offshore Trawling Area (direction)
Bulls Island to Cape Romain (Offshore and NE)

<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
Buck Hall (BH)	83 (20)	31/35 (54)	-	-
McClellanville (MC)	36/40 (40)	46/50 (62)	56/60 (41)	-

General Inshore Area
Winyah Bay, Georgetown County

Nearest Offshore Trawling Area (direction)
Cape Romain to Winyah Bay Entrance (SW)

<u>Boat Landing (code)</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
South Is. Ferry (SI)	56/60 (40)	30/40 (40)	-	-

Figure 9. Size distribution of white shrimp shown as percentages of all shrimp taken in specified offshore areas by commercial shrimp trawlers during each month, September through December 1987, with indication of average size of baited white shrimp sampled at geographically related boat landings

Note: Monthly percentages may not total 100 due to the presence of brown or pink shrimp or to rounding. Codes for boat landings are above bar designating shrimp size landed at each landing. Refer to Table 2 for codes and Table 16 for sample sizes.

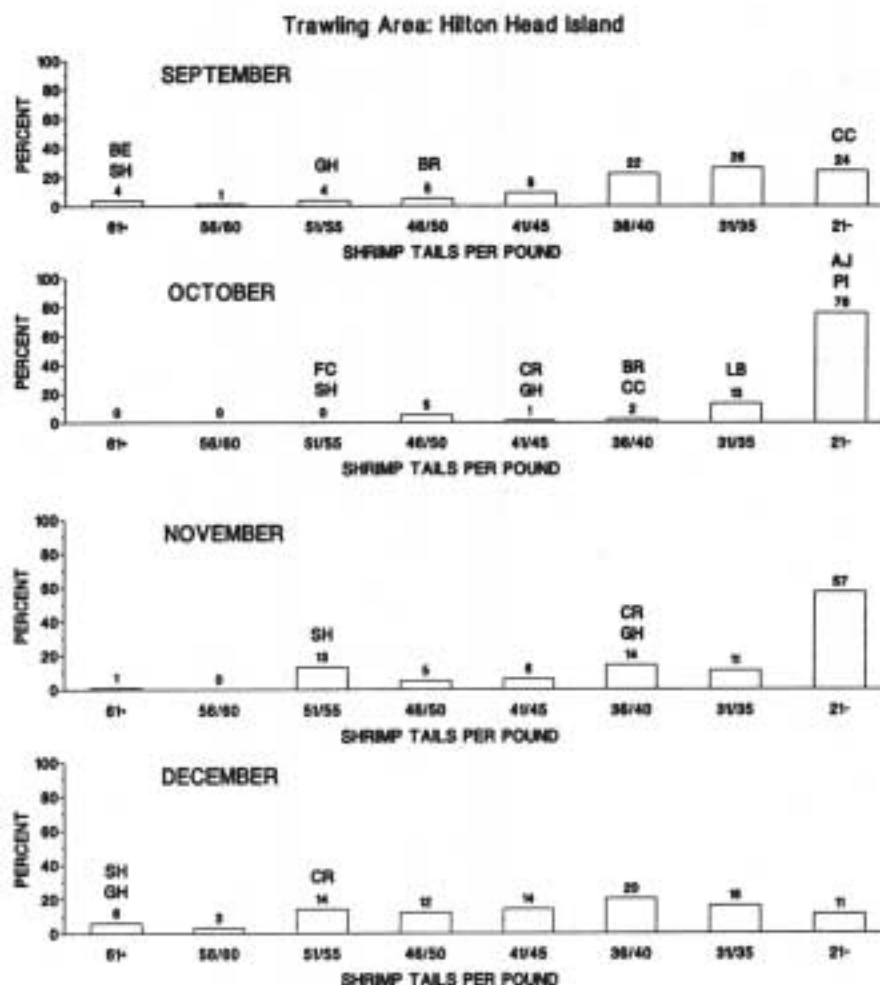


Figure 9, page 2.

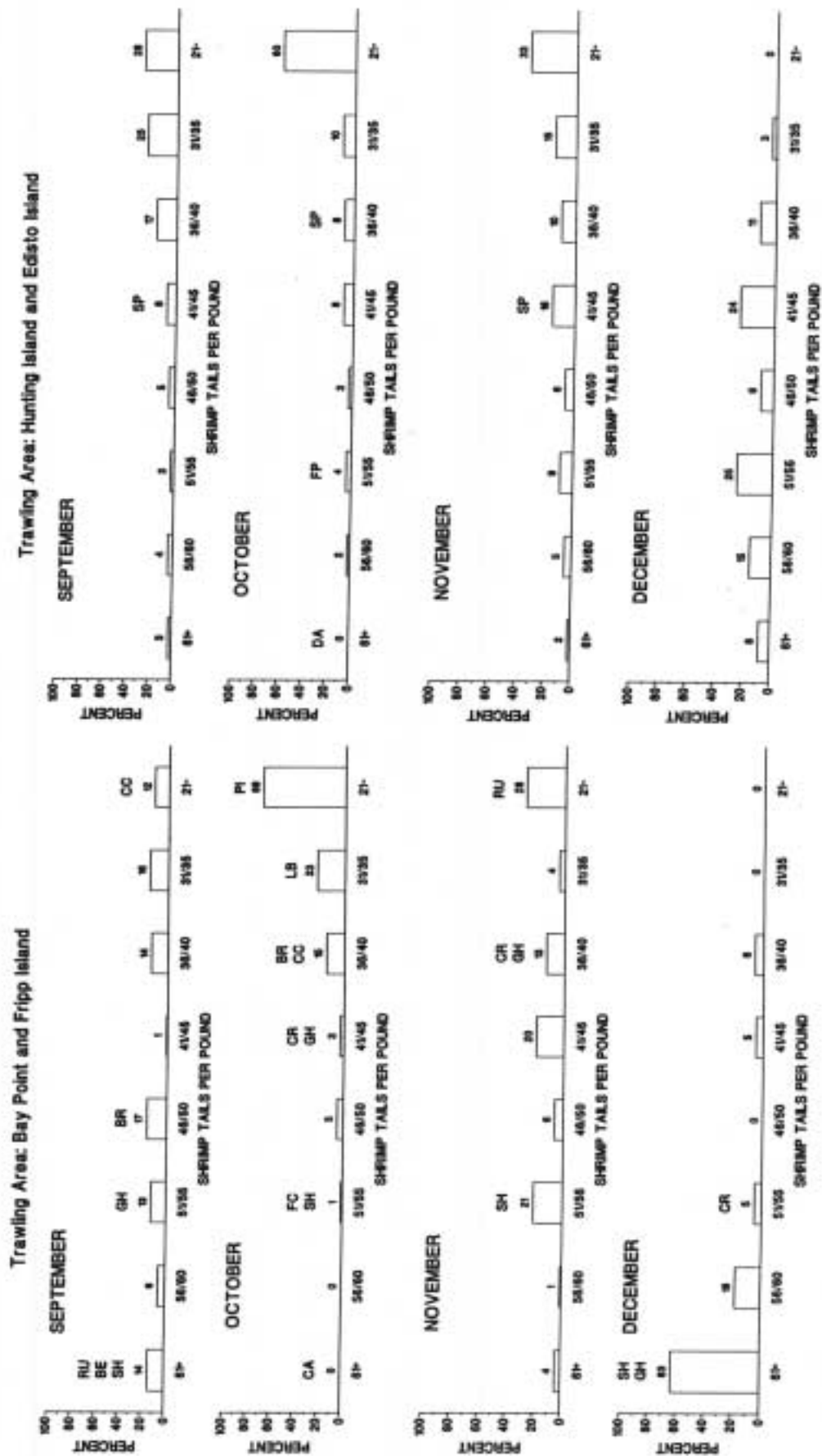


Figure 9, page 3.

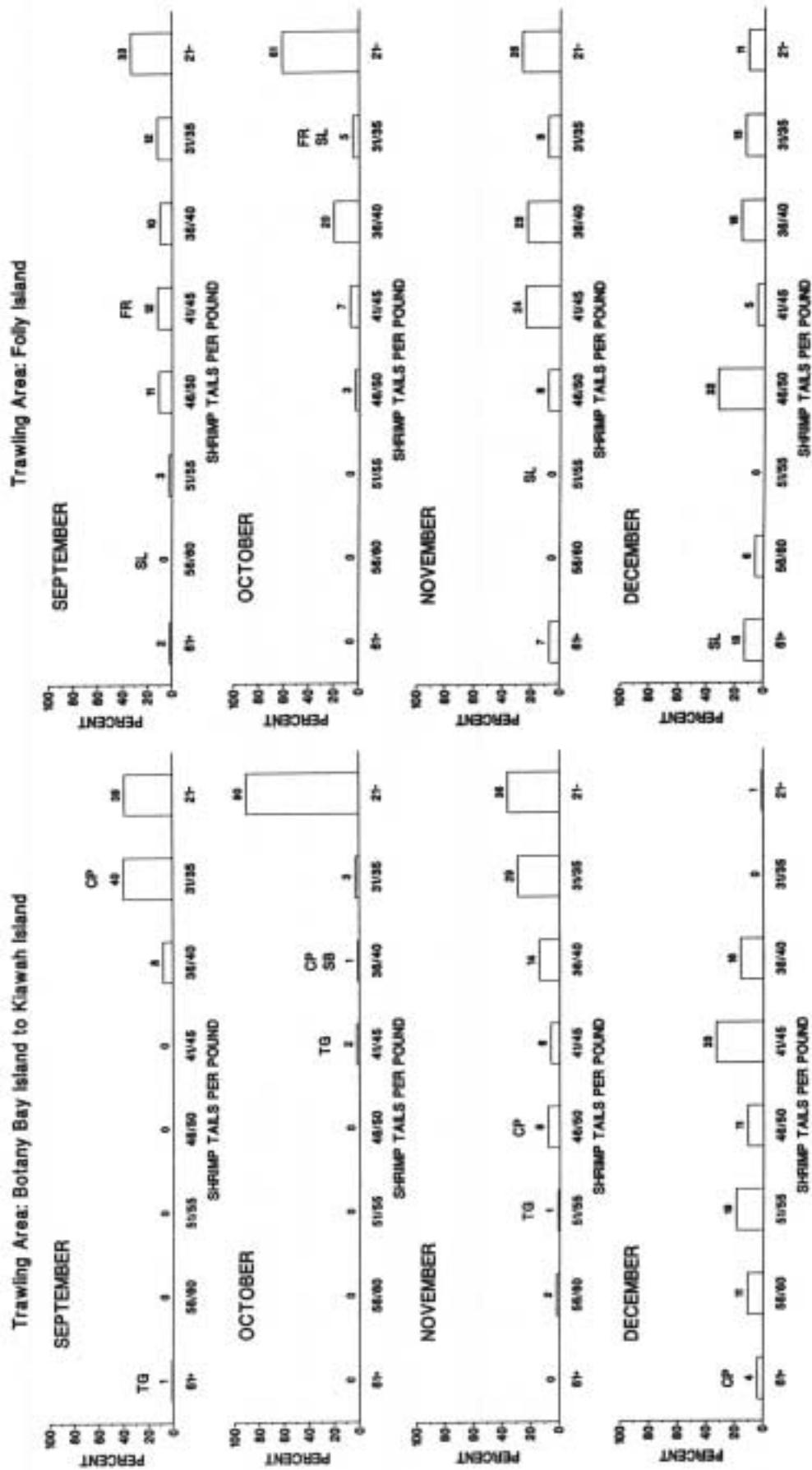
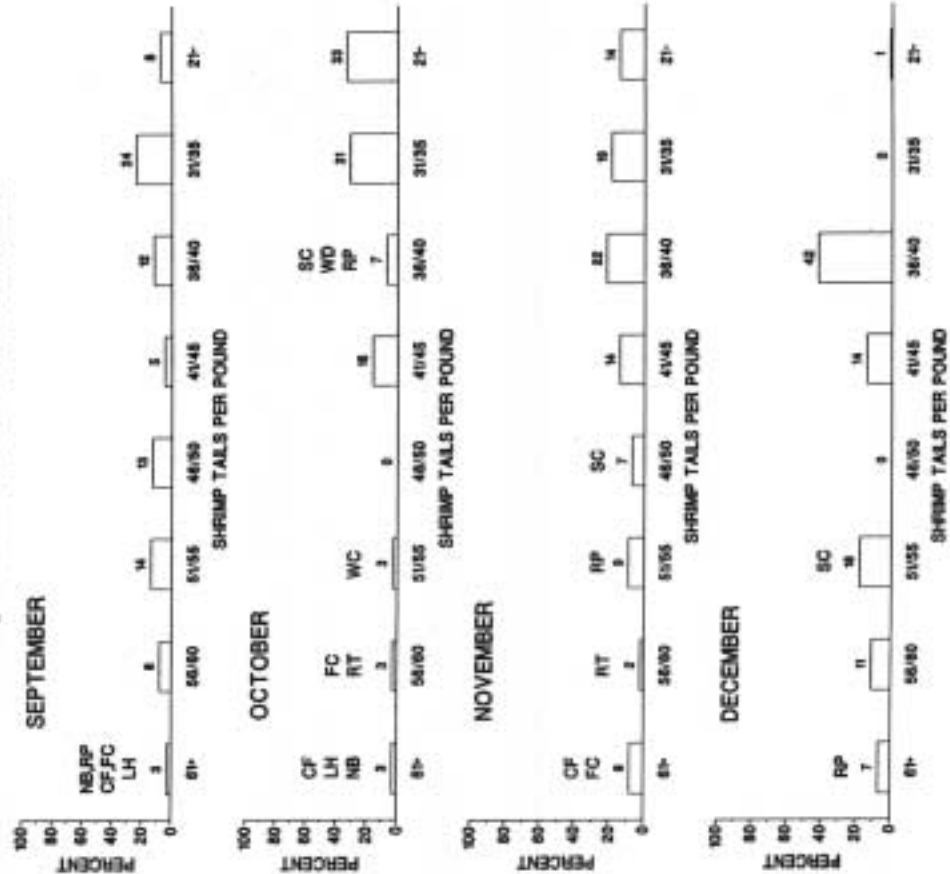


Figure 9, page 4.

Trawling Area: Morris Island to Charleston Jetties



Trawling Area: Charleston Jetties to Capers Island

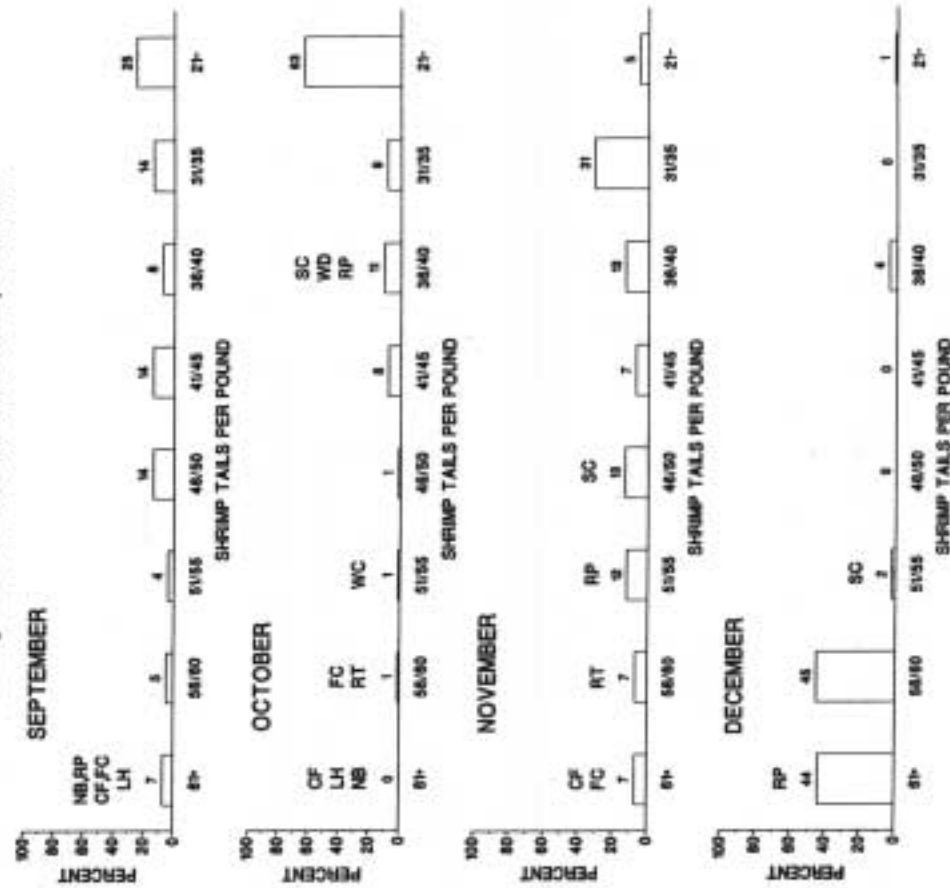
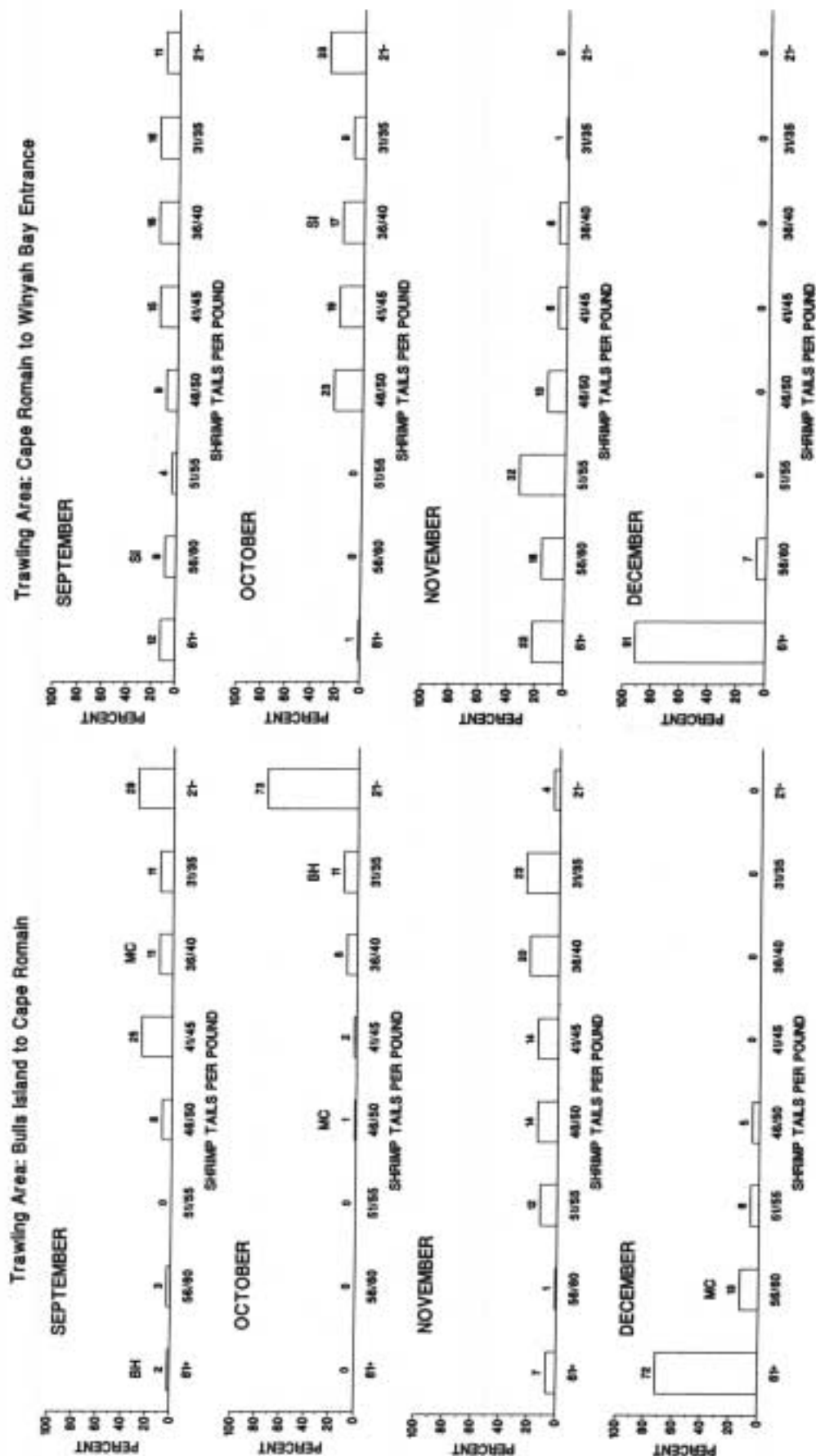


Figure 9, page 5.



Other Shrimp Catches

In addition to shrimp catch estimated in this study and that recorded for commercial trawlers, there were unmeasured components. These included catches by seines, cast nets without bait, and some recreational trawling. Cupka and McKenzie (1974) reported a full one-third of recreational shrimpers in 11 coastal counties utilized primarily a gear other than cast net and that one-third used a means of shrimp-ing access other than boat in 1973, when shrimp baiting was negligible. Private docks, banks, and bridges were other means of access in 1987. The take of shrimp by determined outlaw baiters was not recorded, nor were catches of baiters using non-resident boats. There were also unreported catches made by commercial trawlers working in South Carolina. In combination the components represented a significant shortfall in documenting the full 1987-catch of shrimp in South Carolina.

Legislation in 1988

The subject of shrimp baiting received a great deal of public, media, and legislative attention during and following the 1987 season. On February 3, 1988, Governor Carroll Campbell signed into law the Shrimp Baiting Act of 1988. The act and a subsequent amendment of June 1, 1988, amended two code sections of the South Carolina Code of Laws. Since 1983, Section 50-17-1620 made it unlawful to take shrimp by cast net over bait for sale other than as live bait. Provided upon conviction were maximum penalties of a fine of \$200.00 or thirty days imprisonment; suspension for one year of boat, equipment, and land and sell licenses; and forfeiture of boat, rigging, nets, equip-

ment, and catch. Since 1985, Section 50-17-1621 allowed a catch limit of fifty quarts of whole or 30 quarts of headed shrimp per day for each household when a seine or cast net was used. The maximum penalty provided was either a fine of \$200.00 or imprisonment for thirty days.

The Shrimp Baiting Act of 1988 and its subsequent amendment appear as Appendix A and Appendix B, respectively. The principal effects on the two Sections amended by the Act follow.

SECTION 50-17-1620 (Recodified July 1, 1988 to 50-17-660)

1. The sale, for other than as live bait, of shrimp taken by any method outside the legal trawling areas and established channel net zones became prohibited.
2. The sale of shrimp taken over bait remained prohibited.
3. The use of shrimp traps or pots became prohibited.
4. A shrimp baiting season of sixty days was established for each year variably between September 1 and November 15. Shrimp baiting during the closed season became prohibited except with the use of a drop net from any structure permanently affixed to high land.
5. Shrimp baiters became obligated to hold a State issued permit and tags to bait during the season. A permit holder became required to carry his baiting permit and show it to any conservation office upon demand. The amendment of June 1, 1988, clarified the permit requirement and allowed non-permitted residents of South Carolina to assist permitted residents in casting.

6. No person was to borrow, loan, or exchange a permit or tags.

7. Permit and tag fees were established as \$25.00 for a resident and \$500.00 for non-residents. Fees for replacement permits with certification of loss were \$25.00 for residents and \$100.00 for non-residents. Replacement fees for tags were \$1.00 each for residents and \$4.00 each for non-residents. Permit revenues were dedicated to administration and enforcement of shrimp baiting statutes.

8. Each bait deposit was to be marked by a tagged pole no larger than one inch in diameter and marked with reflective tape.

9. No more than ten poles were to be used per boat and a second boat in tow could not be used to increase the number of poles.

10. No more than ten poles could be used per person when no boat was used.

11. A series of poles could not cover more than one hundred yards, and no series of poles could be within twenty-five yards of another series.

12. Poles left unattended would be confiscated.

13. Permittees could shrimp over only his own poles.

14. Having poles or baiting material aboard a boat during closed season became prohibited.

15. Setting poles within fifty yards of a dock or public landing became prohibited.

16. Items 8 through 15 would not apply to anyone catching shrimp in a baited drop

net from a pier, dock, or other structure permanently affixed to high land.

17. The penalty for any violation of items 1 through 3 would be a fine of \$200.00 or imprisonment up to thirty days; suspension of permit, land and sell license, and tags for two years; and forfeiture of boat, motor, trailer, rigging, coolers, nets, fishing devices, and catch.

18. The penalty for any violation of item 4 would be a fine of \$200.00 or imprisonment up to thirty days; forfeiture of boat, motor, trailer, rigging, coolers, fishing devices, and catch; and suspension of privilege to shrimp over bait for two years.

19. The penalty for the first violation of item 5 or 6 would be a fine of \$200.00 or imprisonment up to thirty days, and forfeiture of the catch. Subsequent violations would result in first violation penalties plus forfeiture of the boat, motor, trailer, rigging, coolers, and fishing devices. Additionally, any violation of item 6 would result in the loss of the permittee's right to a permit and tags for the remainder of the season.

20. The penalty for any violation of items 8 through 15 would be a fine of \$200.00 and forfeiture of the catch.

21. Each quart of shrimp taken in any violation mentioned above could be handled as a separate offence.

22. The fines provided could not be reduced.

SECTION 50-17-1621 (Recodified July 1, 1988 to 50-17-665)

1. Catch limits became forty-eight quarts of whole shrimp or twenty-nine quarts of headless shrimp per day for each set of poles when bait was used, or when no bait

was used for each boat or each person not using a boat. The same daily limits would apply for all persons using a seine or seines. A day was to be measured as sunrise to sunrise.

2. Possession of more than the daily limit by a person on or immediately adjacent to the water became prohibited. For persons other than licensed commercial fishermen and seafood dealers, possession of more than two catch limits became prohibited.

3. First convictions for violations of catch or possession limits would bring penalties of \$200.00 fines or imprisonment up to thirty days with forfeiture of the entire catch. If bait were used, the shrimp baiting privilege would be suspended for two years. Subsequent convictions would bring the first conviction penalties plus forfeiture of boat, motor, trailer, rigging, coolers, and fishing devices.

4. The fines provided could not be reduced.

A principal benefit of the permit required by the 1988 legislation would be the production of a list of actual participants in the 1989 and subsequent shrimp baiting seasons. With this, a far more efficient and precise assessment of lawful participation and resource impact could be accomplished. Bracketing of boats in the existing boat registration file would become unnecessary, and the errors in projecting participation would be greatly reduced. The audience of known shrimp baiters would certainly respond to mail inquiries on the subject at a higher rate than did those contacted in the survey reported here.

Conclusion

The short life of widespread shrimp baiting in South Carolina has been studied with controversy, conflict, and contempt. A resource that for decades was shared by sportsmen and commercial fishermen under well-understood ground rules suddenly became the target of components of both user categories utilizing a new and very effective fishing method. The commercial use of the shrimp baiting technique was categorically outlawed in its infancy in 1983. The substantial 1986 inshore crop of white shrimp allowed the recreational component to burgeon. With it, illicit commercial baiting exacted a considerable yet unmeasured toll on the traditional trawler fishery. Marine law enforcement officers had new nighttime on-the-water activity involving hundreds of boats to deal with while being under manpower and work-hour restrictions. Fishery managers recognized the impact of shrimp baiting on the resource and on traditional user groups. South Carolina citizens and non-residents were introduced to a relatively easy and inexpensive method to share in one of the State's most desirable publicly owned resources. Fishermen who would commercialize the process recognized the economic benefit of this not-so-difficult activity, although it was unlawful. Trawler owners and operators saw competition from sportsmen and shrimp marketers in large numbers. Elected officials learned of all these matters and took action in 1988 to quell the controversy to the satisfaction of as many as possible.

Adjustments to the allowances and restrictions resulting from the 1988 legislation are likely. Shrimp baiting was not fully developed at the end of the 1987 season nor had the State finished dealing

with it. Matters which are likely to receive attention in future years follow.

1. Brown shrimp baiting - Only poor crops of summer brown shrimp, Penaeus aztecus, have been seen in South Carolina in recent years. No convincing argument has been presented that a form of shrimp baiting would not be effective on brown shrimp under better stock conditions.

2. Baited pots or traps - Although outlawed by the 1988 legislation and not proven efficient at that time, a properly designed trap might prove cost-efficient and selective for commercial grades of shrimp.

3. Legitimate commercial baiting and casting - With regulation of seasons and areas and of net mesh size to select for traditional market shrimp sizes, shrimp baiting and casting might prove an efficient commercial harvest method for a portion of the State's resource.

4. Additional restrictions - The many variables in shrimp baiting could be subjected to regulation. Shrimping areas, net mesh size, and shrimping hours as well as season, numbers of poles allowed, and possession limits may be controlled in the future. A complete ban on shrimp baiting is an option available to the South Carolina Legislature.

Literature Cited

- Cupka, D.M. and M.D. McKenzie. 1974. South Carolina's Recreational Shrimp Fishery. Unpublished report. S.C. Marine Resources Center. 20 pp.
- Liao, D.S. 1988. The Demand for Recreational Shrimping in South Carolina, 1986. in Proceedings of the Symposium on Demand and Supply of Sport Fishing. S.C. Marine Resources Center, in preparation.
- Whitaker, J.D. and E.L. Wenner. 1988. Species and Size Composition of Penaeus taken by baiting in South Carolina Estuaries. Unpublished report. S.C. Marine Resources Center. 14 pp.

(R308, H2742)

AN ACT TO AMEND SECTION 50-17-1620, CODE OF LAWS OF SOUTH CAROLINA, 1976, RELATING TO THE USE OF A CAST NET TO TAKE SHRIMP, SO AS TO PROVIDE THAT IT IS UNLAWFUL TO CATCH OR TAKE SHRIMP BY ANY MEANS, RATHER THAN BY CAST NET ALONE, FOR COMMERCIAL PURPOSES OUTSIDE THE AREAS AS SPECIFIED IN CERTAIN CODE SECTIONS OR OUTSIDE THE LEGAL CHANNEL, NET ZONES AS ESTABLISHED BY THE WILDLIFE AND MARINE RESOURCES DEPARTMENT, MAKE IT UNLAWFUL TO TAKE OR ATTEMPT TO TAKE SHRIMP BY USE OF A SHRIMP TRAP OR SHRIMP POT, REQUIRE THE DEPARTMENT TO ESTABLISH ANNUALLY A SIXTY-DAY OPEN SEASON BETWEEN SEPTEMBER FIRST AND NOVEMBER FIFTEENTH FOR TAKING SHRIMP OVER BAITED AREAS, MAKE IT UNLAWFUL TO TAKE OR ATTEMPT TO TAKE SHRIMP OVER BAIT DURING THE CLOSED SEASON FOR TAKING SHRIMP OVER BAIT EXCEPT BY USE OF A DROP NET FROM CERTAIN STRUCTURES, MAKE IT UNLAWFUL FOR A RESIDENT OR NONRESIDENT TO TAKE SHRIMP BY CAST NET OVER BAIT DURING THE OPEN SEASON UNLESS HE FIRST OBTAINS A SHRIMP BAITING PERMIT AND ASSOCIATED TAGS, MAKE IT UNLAWFUL TO BORROW, LOAN, OR EXCHANGE A BAITING PERMIT OR TAGS WITH ANOTHER PERSON AND PROVIDE CERTAIN PENALTIES, PROVIDE FOR A FEE FOR A RESIDENT SHRIMP BAITING PERMIT AND ASSOCIATED TAGS OF TWENTY-FIVE DOLLARS AND FOR A FEE FOR THE ISSUANCE OF THE NONRESIDENT SHRIMP BAITING PERMIT AND ASSOCIATED TAGS OF FIVE HUNDRED DOLLARS, PROVIDE FOR A FEE FOR THE ISSUANCE OF DUPLICATE SHRIMP BAITING PERMITS OF TWENTY-FIVE DOLLARS FOR RESIDENTS AND OF ONE HUNDRED DOLLARS FOR NONRESIDENTS, PROVIDE FOR A FEE FOR THE ISSUANCE OF EACH DUPLICATE TAG OF ONE DOLLAR FOR RESIDENTS AND OF FOUR DOLLARS FOR NONRESIDENTS, PROVIDE FOR THE USE OF MONIES DERIVED FROM THE ISSUANCE OF ALL PERMITS AND TAGS, MAKE IT UNLAWFUL TO CATCH OR TAKE SHRIMP OVER A BAITED AREA EXCEPT UNDER CERTAIN CONDITIONS AND PROVIDE CERTAIN EXEMPTIONS TO THE PROHIBITION OUTRIGHT, MAKE IT UNLAWFUL DURING THE CLOSED SEASON FOR TAKING SHRIMP OVER BAIT TO HAVE ABOARD ANY BOAT

Appendix A The Shrimp Baiting Act of 1988

ANY POLES OR MATERIAL THAT CAN BE USED TO ATTRACT, LURE, OR CAUSE SHRIMP TO CONGREGATE, MAKE IT UNLAWFUL TO SET POLES WITHIN FIFTY YARDS OF A DOCK OR PUBLIC LANDING OR BOAT RAMP, PROVIDE VARIOUS PENALTIES FOR THE VIOLATION OF DIFFERENT PORTIONS OF SECTION 50-17-1620, PROVIDE THAT EACH QUART OF SHRIMP TAKEN IN VIOLATION OF THE PROVISIONS OF THIS SECTION MAY CONSTITUTE A SEPARATE OFFENSE, PROVIDE THAT NO PART OF THE FINES PROVIDED IN THIS SECTION MAY BE SUSPENDED, AND DELETE CERTAIN LANGUAGE; AND TO AMEND SECTION 50-17-1621, RELATING TO THE LIMIT ON THE CATCH OF SHRIMP BY SEINE OR CAST NET, SO AS TO DELETE CERTAIN PROVISIONS, PROVIDE THAT WHEN TAKING SHRIMP OVER BAIT, THERE IS A CATCH LIMIT OF NOT MORE THAN FORTY-EIGHT, RATHER THAN FIFTY, QUARTS OF WHOLE SHRIMP OR TWENTY-NINE, RATHER THAN THIRTY, QUARTS OF HEADED SHRIMP FOR EACH SET OF POLES A DAY, PROVIDE A CATCH LIMIT WHEN NO BAIT IS BEING USED, PROVIDE A CATCH LIMIT WHEN A SEINE OR SEINES ARE BEING USED TO TAKE SHRIMP, MAKE IT UNLAWFUL, WITH CERTAIN EXCEPTIONS, FOR ANY PERSON TO HAVE IN HIS IMMEDIATE CONTROL OR POSSESSION MORE THAN FORTY-EIGHT QUARTS OF WHOLE SHRIMP OR TWENTY-NINE QUARTS OF HEADED SHRIMP WHILE ON THE WATERS OR THE LANDS IMMEDIATELY ADJACENT TO THE WATERS AND PROVIDE FOR A POSSESSION LIMIT, PROVIDE FOR VARIOUS PENALTIES, AND PROVIDE THAT NO PART OF THE FINES IN THIS SECTION MAY BE SUSPENDED.

Be it enacted by the General Assembly of the State of South Carolina:

Taking or catching of shrimp

SECTION 1. Section 50-17-1620 of the 1976 Code is amended to read:

"Section 50-17-1620. (A) It is unlawful to catch or take shrimp by any means for commercial purposes outside the areas as specified in Sections 50-17-1510, 50-17-1520, 50-17-1590, and 50-17-1600 or outside the legal channel, net

zones as established by the Wildlife and Marine Resources Department, other than for sale as live bait, or in or near any waters or bottoms which have been baited by placing, depositing, or scattering any material to attract or lure shrimp toward the bait or to cause shrimp to congregate in the area where the bait is placed. Furthermore, it is unlawful to take or attempt to take shrimp by the use of a shrimp trap or shrimp pot.

(B) The Wildlife and Marine Resources Department shall establish annually a sixty-day open season between September first and November fifteenth for taking shrimp over baited areas. The sixty days may but are not required to be consecutive. It is unlawful for anyone to take, or attempt to take, shrimp over bait during the closed season for taking shrimp over bait. The provisions of this subsection do not apply to anyone taking or attempting to take shrimp over bait by the use of a drop net from a pier, dock, or other structure permanently affixed to the high land.

(C) It is unlawful for any resident or nonresident of this State to take shrimp by cast net over bait during the open season unless he first obtains from the Division of Marine Resources a shrimp baiting permit and associated tags. Upon receipt of application and fees, the Division of Marine Resources shall issue the permit along with ten marking device tags bearing the corresponding permit number. Every permittee while shrimping over bait shall carry on his person his baiting permit and upon demand shall show it to any conservation officer.

(D) It is unlawful for any person to borrow, loan, or exchange a baiting permit or tags with another person. In addition to the penalties set forth in this section, he shall forfeit any right to any baiting permit and tags issued to him and is prohibited from procuring another baiting permit and tags for the season for which the baiting permit and tags so borrowed, exchanged, or loaned were issued.

(E) The fee for a resident shrimp baiting permit and associated tags is twenty-five dollars. The fee for the issuance of the nonresident shrimp baiting permit and associated tags is five hundred dollars. The Division of Marine Resources may issue duplicate baiting permits or tags upon affidavit from the permittee that he has lost his baiting permit or tags. The duplicate permit or tags must be labeled 'Duplicate'. The fee for the issuance of a duplicate shrimp baiting permit is twenty-five dollars for residents and one hundred dollars for nonresidents. The fee for the issuance of each duplicate tag is one dollar for residents and four dollars for nonresidents.

All monies derived from the issuance of all permits and tags authorized in this section are retained by the department for the purposes of administration and enforcement of this section and Section 50-17-1621.

(F) It is unlawful for any person to catch or take shrimp over a baited area unless:

(1) each bait deposit is marked by a pole not to exceed one inch in diameter which is driven into the ground and with the department-issued tag securely attached to it;

(2) each pole is plainly marked with white reflective tape;

(3) there is a ten-pole limit a boat a day, additional boats in tow may not be used to increase the number of authorized poles;

(4) there is a ten-pole limit for each person who is shrimping over a baited area if no boat is being used;

(5) if more than one pole is being used, the distance between the first and the last pole may not exceed one hundred yards;

(6) the minimum distance between each set of poles may not be less than twenty-five yards;

(7) no pole or set of poles may be left unattended, and if the permittee is not located in the immediate vicinity, the poles must be confiscated by the department;

(8) the permittee is allowed to shrimp over only those poles bearing his corresponding permit number.

It is unlawful during the closed season for taking shrimp over bait to have aboard any boat any poles or material that can be used to attract, lure, or cause shrimp to congregate.

It is unlawful to set poles within fifty yards of a dock or public landing or boat ramp.

(G) The provisions of subsection (F) do not apply to anyone taking or attempting to take shrimp by the use of a drop net over bait from a pier, dock, or other structure permanently affixed to the high land.

(H) Any person who violates the provisions of subsection (A) is guilty of a misdemeanor and, upon conviction, must be fined two hundred dollars or imprisoned for not more than thirty days, and the shrimp baiting permit, associated tags, and the fisherman's land and sell license must be suspended for two years. The boat, motor, trailer, rigging, coolers, nets, fishing devices, and catch must be seized and forfeited as provided in Section 50-17-1615.

(I) Any person who violates the provisions of subsection (B) is guilty of a misdemeanor and, upon conviction, must be fined two hundred dollars or imprisoned for not more than thirty days and the boat, motor, trailer, rigging, coolers, fishing devices, and catch must be seized and forfeited as provided in Section 50-17-1615.

In addition, his privilege to catch shrimp over bait will be suspended for a period of two years from the date of conviction.

(J) Any person who violates the provisions of subsection (C) or (D) is guilty of a misdemeanor, and upon conviction for a first offense, must be fined two hundred dollars or imprisoned for not more than thirty days, and the catch must be seized and forfeited as provided in Section 50-17-1615. Any person who violates these subsections for a second or subsequent offense is guilty of a misdemeanor and must be fined two hundred dollars or

imprisoned for not more than thirty days and the boat, motor, trailer, rigging, coolers, fishing devices, and catch must be seized and forfeited as provided in Section 50-17-1615.

(K) Any person who violates the provisions of subsection (F) is guilty of a misdemeanor and, upon conviction, must be fined two hundred dollars, and the catch must be seized and forfeited as provided in Section 50-17-1615.

(L) Each quart of shrimp taken in violation of the provisions of this section may constitute a separate offense.

(M) No part of the fines provided in this section may be suspended."

Catch limits on shrimp

SECTION 2. Section 50-17-1621 of the 1976 Code is amended to read:

"Section 50-17-1621. (A) When taking shrimp over bait, there is a catch limit of not more than forty-eight quarts of whole shrimp or twenty-nine quarts of headed shrimp, for each set of poles a day. When no bait is being used, the catch limit is forty-eight quarts of whole shrimp or twenty-nine quarts of headed shrimp for each boat a day or for each person when no boat is used. When a seine or seines are being used to take shrimp, one catch limit is allowed a day among the persons using the seines. As used in this section, a day means sunrise on one day to sunrise on the following day.

(B) It is unlawful for any person to have in his immediate control or possession more than forty-eight quarts of whole shrimp or twenty-nine quarts of headed shrimp while on the waters or the lands immediately adjacent to the waters. The possession limit is ninety-six quarts of whole shrimp or fifty-eight quarts of headed shrimp. This subsection does not apply to any commercial fisherman transporting his catch to a licensed seafood dealer, or to any licensed dealer distributing his product.

(C) Any person who violates the provisions of this section:

(1) by taking more than forty-eight quarts of whole shrimp or more than twenty-nine quarts of headed shrimp or for exceeding the lawful possession limit while not on the waters or the lands immediately adjacent is guilty of a misdemeanor and, upon conviction, must be fined two hundred dollars or imprisoned for not more than thirty days, and the entire catch must be seized and forfeited as provided in Section 50-17-1615. If the shrimp involved in the violation were caught over bait, his privilege to catch shrimp over bait must be suspended for two years from the date of conviction;

(2) for a second or subsequent offense of possession of any number of quarts of shrimp over the lawful daily catch limit or possession limit is guilty of a misdemeanor and, upon conviction, must be fined two hundred dollars or imprisoned for not more than thirty days. In addition, the boat, motor, trailer, rigging, coolers, fishing devices, and the entire catch must be seized and forfeited as provided in Section 50-17-1615. If the shrimp involved in the violation were caught over bait his privilege to catch shrimp over bait must be suspended for two years from the date of conviction. No part of the fines provided in this section may be suspended."

Time effective

SECTION 3. This act takes effect upon approval by the Governor.

In the Senate House the 28th day of January
In the Year of Our Lord One Thousand Nine
Hundred and Eighty-Eight.

Nick A. Theodore,
President of the
Senate

Robert J. Sheheen,
Speaker of the House of
Representatives

Approved the 3rd day of February, 1988.

Carroll A. Campbell, Jr.,
Governor

Printer's Date -- 2/5/88 -- S.

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(R696, H4081)

AN ACT TO AMEND SECTIONS 50-17-55 AND 50-17-1620, BOTH AS AMENDED, CODE OF LAWS OF SOUTH CAROLINA, 1976, RELATING TO SHRIMP, SO AS TO PROVIDE THAT THE WILDLIFE AND MARINE RESOURCES DEPARTMENT SHALL ISSUE TAGS AND PERMITS TO TAKE SHRIMP OVER BAIT AND TO PROVIDE THAT THE DEPARTMENT MAY ADOPT BY REGULATION ALL FISHING REGULATIONS PROMULGATED UNDER THE FEDERAL FISHERY CONSERVATION AND MANAGEMENT ACT.

Be it enacted by the General Assembly of the State of South Carolina:

Taking shrimp over bait

SECTION 1. Section 50-17-1620(C) of the 1976 Code as last amended by an act of 1988 bearing Ratification Number 308 is further amended to read:

"(C) It is unlawful for a resident or nonresident of this State to take shrimp by cast net over bait during the open season unless he first obtains from the department a shrimp baiting permit and associated tags, except that a resident possessing the required permit and associated tags, while shrimping from a boat may be assisted in casting by other resident individuals in the boat with him and those individuals are not required to have a permit or associated tags. Upon receipt of application and fees, the department shall issue the permit along with ten marking device tags bearing the corresponding permit number. Each permittee while shrimping over bait shall carry on his person his baiting permit and upon demand shall show it to a conservation officer."

(Portions of this Act not related to shrimp baiting have been removed.)

Time effective

SECTION 3. This act takes effect upon approval by the Governor.

In the Senate House the 31st day of May
In the Year of Our Lord One Thousand Nine
Hundred and Eighty-Eight.

Nick A. Theodore,
President of the
Senate

Robert J. Sheheen,
Speaker of the House of
Representatives

Approved the 1st day of June, 1988.

Carroll A. Campbell, Jr.,
Governor

Printer's Date -- 6/15/88 -- S.

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