



Data Report 39

February, 2002

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INTRODUCTION

Theiling (1988) described the history of shrimp baiting in South Carolina. Surveys have been conducted annually since 1987, using various approaches to address several objectives and issues (Theiling 1988, Waltz and Hens 1989, Liao 1993, Low 1990 - 1999 and 2001, and Low and Waltz 2000). These studies have obtained statistics on participation, effort, and catch for each season, in addition to information on demographics of participants and constituency opinions on management options, user group conflicts, and economic issues.

Data for the 2001 fishery were obtained from a postseason mailout survey. The objectives were to estimate 1) total participation (i.e., the numbers of active permit holders and their assistants), 2) total effort in numbers of trips, 3) total catch, and 4) effort and catch by shrimping area.

METHODS

The survey package consisted of an introductory statement and a pre-addressed business reply postcard questionnaire (Fig. 1). The package was sent by first class mail to 4,000 of those individuals who purchased a 2001 permit. The sample was randomly selected and stratified in approximate proportion to the percentage of permit holders residing in each county.

RESULTS

The effective mailout (after subtraction of nondeliverables) was 3,934 with a return rate (of usable responses) of 39.6% ($N = 1,558$). The survey results were therefore based on information provided by 11.4% of the total population ($N = 13,698$) of permit holders.

Distributions of the total permit holder populations by county of residence in the previous season and in the current year are shown in Table 1. The distributions of the 2001 permit holder population and survey population are compared in Table 2. As has been generally the case, the postseason return rates from noncoastal residents were slightly higher, but the overall distribution of the postseason sample group was comparable to that of the total population.

PARTICIPATION

About 13.5% of the respondents indicated that they had made no trips using their gear tags. The estimated numbers of active permit holders (Table 3) were obtained by multiplying the number of permits issued in each residence category by the percentage of positive responses received per area. Assistants were the numbers of different individuals who accompanied the permit holders. Although some individuals probably were counted by more than one permit holder, the extent of such duplication was assumed to be negligible. The average numbers of assistants per permit holder in each

1. What county do you live in? _____
2. How many trips did you make using your permit and gear?
 _____ SEP _____ OCT _____ NOV _____ All season
3. Please indicate the number of trips you made in each area
 _____ BEAUFORT _____ CHARLESTON
 _____ ST. HELENA SD. _____ BULLS BAY
 _____ WADMALAW/EDISTO IS. _____ GEORGETOWN
4. How many different people assisted you on boat trips? _____
5. What was your average catch per trip in quarts of whole shrimp? _____
6. What was your total catch for the season? _____ quarts



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Table 1. Distributions of permit holder populations, in percentages of permit holders by County.

County	2000	2001
Abbeville	0.3	0.3
Aiken	3.9	3.8
Allendale	0.7	0.7
Anderson	0.7	0.7
Bamberg	1.1	1.2
Barnwell	1.9	1.9
Beaufort	10.4	10.1
Berkeley	8.1	8.1
Calhoun	1.0	1.0
Charleston	21.9	22.9
Cherokee	< 0.1	0.1
Chester	0.2	0.2
Chesterfield	< 0.1	0.1
Clarendon	0.8	0.8
Colleton	4.4	4.2
Darlington	0.8	0.7
Dillon	0.3	0.3
Dorchester	4.6	4.9
Edgefield	0.5	0.5
Fairfield	0.3	0.4
Florence	2.0	2.1
Georgetown	5.9	5.3
Greenville	1.0	1.1
Greenwood	0.6	0.6
Hampton	2.5	2.7
Horry	3.7	3.3
Jasper	1.7	1.6
Kershaw	0.7	0.6
Lancaster	0.2	0.3
Laurens	0.4	0.4
Lee	< 0.1	< 0.1
Lexington	6.0	6.0
McCormick	< 0.1	0.1
Marion	0.4	0.3
Marlboro	< 0.1	< 0.1
Newberry	0.5	0.5
Oconee	0.3	0.3
Orangeburg	3.8	3.8
Pickens	0.4	0.3
Richland	3.3	3.4
Saluda	0.4	0.4
Spartanburg	0.7	0.9
Sumter	1.2	1.1
Union	0.1	0.1
Williamsburg	1.0	0.9
York	0.7	0.8

Table 2. Distribution of permit holders and sample population.

Residence category	Total population		Sample population	
	N	%	N	%
North Coast				
Georgetown	728	5.3	89	5.7
Horry	456	3.3	59	3.8
Total	1184	8.6	148	9.5
Central Coast				
Berkeley	1103	8.1	123	7.9
Charleston	3129	22.9	321	20.6
Dorchester	674	4.9	85	5.5
Total	4906	35.8	529	34.0
South Coast				
Beaufort	1383	10.1	156	10.0
Colleton	579	4.2	57	3.7
Hampton	370	2.7	23	1.5
Jasper	215	1.6	18	1.2
Total	2547	18.6	254	16.3
Central Inland				
Aiken	516	3.8	61	3.9
Allendale	90	0.7	12	0.8
Bamberg	158	1.2	17	1.1
Barnwell	265	1.9	20	1.3
Lexington	820	6.0	98	6.3
Orangeburg	520	3.8	59	3.8
Richland	462	3.4	64	4.1
Total	2831	20.7	331	21.2
Other	2225	16.2	296	19.0
Total	13693		1558	

Table 3. Estimated participation by residential category.

	North Coast	Central Coast	South Coast	Central Inland	Other	Total
Permits issued	1184	4906	2547	2831	2225	13693
Percent active permits	82.4	88.3	85.8	87.0	85.1	86.5
Number of active permits	976	4332	2185	2463	1893	11849
Average number of assistants	1.83	2.26	2.14	2.16	2.26	2.18
Total number of assistants	1786	9790	4676	5320	4278	25850
Total number of participants	2762	14122	6861	7783	6171	37699
Percent of total	7.3	37.5	18.2	20.6	16.4	

Table 4. Estimated numbers of trips by residential category.

	North Coast	Central Coast	South Coast	Central Inland	Other	Total
Average trips/permit holder	4.95	6.83	6.87	5.10	4.15	5.79
Percentage by month						
September	45	32	27	31	33	32
October	44	47	47	48	50	47
November	11	21	26	21	17	21
Estimated trips/month						
September	2174	9468	4053	3894	2592	22181
October	2126	13906	7055	6029	3928	33044
November	531	6214	3903	2638	1336	14622
Total	4831	29588	15011	12561	7856	69847
Percent of total	6.9	42.4	21.5	18.0	11.2	

residence category were multiplied by the estimated numbers of active permit holders to obtain the estimated total numbers of assistants. The total numbers of participants equaled the sums of the active permit holders and their assistants.

EFFORT

The average numbers of season trips per active permit holder were obtained by summing the numbers of trips reported in each residence category and dividing these figures by the numbers of respondents who reported trips. These means were then multiplied by the numbers of estimated active permit holders in the overall populations to obtain estimates of seasonal effort by residence category (Table 4). The estimated numbers of trips per month were calculated by multiplying these season totals by the appropriate percentages of trips in each month. These were determined from the data provided by respondents who broke their seasonal effort down into complete monthly components. The estimated effort figures in the **Total** column were generated by adding these categorical figures. The distribution of seasonal effort by residential category is shown in Table 5.

The coastal area was divided into six geographical components, as described below.

BEAUFORT- from the Savannah River to the south end of St. Helena Island, including the Beaufort River

ST. HELENA SOUND- from the south end of St. Helena Island to the South Edisto River and southern end of Edisto Island

WADMALAW/EDISTO ISLANDS- from the South Edisto River to the Stono River, including Edisto, Wadmalaw, Seabrook, Kiawah, and Johns Islands

CHARLESTON- from the Stono River to the north end of the Isle of Palms

BULLS BAY- from the north end of the Isle of Palms to the southern boundary of Georgetown County, near the Santee River

GEORGETOWN- Georgetown and Horry Counties, including Winyah Bay

The distribution of estimated effort in each area is indicated in Table 6. These figures were obtained by multiplying the total numbers of trips in each residence category by the percentages of effort reported in each area. These percentages were determined by summing all trips reported by area within each residence category, then dividing the numbers associated with each area by these sums.

Table 5. Distribution of seasonal effort, in percentages of respondents by residential category.

Residential category	Trips/permit holder/season				
	1-4	5-10	11-15	16-20	> 20
North Coast	72	19	5	2	1
Central Coast	57	33	7	1	2
South Coast	61	28	4	5	2
Central Inland	67	29	2	<1	<1
Other	68	26	4	<1	<1
Statewide	63	29	5	2	1

Table 6. Estimated number of trips by shrimping area.

Residence category	Beaufort	St. Helena	Wadmalaw/Edisto	Charleston	Bulls Bay	Georgetown
North Coast	25	156	16	311	2702	1621
Central Coast	589	435	4349	21268	2941	6
South Coast	11266	3290	206	162	87	0
Central Inland	6280	3695	935	1076	520	55
Other	1838	2122	800	1115	1446	535
Total	19998	9698	6306	23932	7696	2217
Percentage of total	28.6	13.9	9.0	34.3	11.0	3.2

CATCH RATES

Average seasonal catch rates are listed in Table 7. These were obtained by adding the reported catch per unit of effort (CPUE, in quarts of whole shrimp per trip) in each category and dividing by the numbers of observations. The CPUEs in Table 8 were calculated by summing the season CPUEs for each area and dividing these figures by the corresponding numbers of observations. Only the data from respondents who limited their activity to one area were included, since there was no way to separate catch and effort by area for respondents who shrimped in more than one area.

Because the residential stratification of the sample population was similar to that of the total permit holder population, an unbiased estimate of the average statewide CPUE can be obtained by calculating the mean of the CPUEs reported by the respondents. This value was 20.3 quarts of whole shrimp per trip.

CATCH

The average season catches (quarts of whole shrimp) reported by respondents were as follows for various residence categories:

North Coast	Central Coast	South Coast	Central Inland	Other
44.4	127.2	144.2	113.1	79.4

There are numerous ways to estimate the total catch, depending on the interest in its relative components. The simplest method is to multiply the statewide average CPUE (20.3 quarts per trip) by the estimated total number of trips (69,847). This figure is 1,419,291 quarts.

An estimate can be derived from the average catch data above by multiplying them by the appropriate numbers of active shrimpers. This method produced the following estimates:

Residence category	Estimated catch (quarts)
North Coast	43,325
Central Coast	550,814
South Coast	315,077
Central Inland	278,541
Other	150,228
Total	1,337,985

Catches by residence category were also estimated by multiplying the estimated effort for each by the appropriate CPUE. This approach generated the following results.

Table 7. CPUE (quarts of whole shrimp per trip) by residential category.

Residential category	CPUE									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
North Coast	15.0	26.5	17.9	29.0	13.3	25.4	21.4	20.0	10.6	10.0
Central Coast	24.3	22.3	21.7	27.0	18.7	23.3	19.2	19.5	10.7	20.6
South Coast	26.3	24.0	12.1	28.9	14.8	28.7	23.8	21.2	9.1	22.8
Central Inland	30.3	24.0	16.7	32.3	16.7	29.2	25.3	22.1	10.4	23.9
Other	25.2	24.4	19.9	29.0	16.3	28.5	20.9	23.7	9.9	18.7

Table 8. CPUE (quarts of whole shrimp/trip) by shrimping area.

Area	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Beaufort	24.4	28.7	22.2	13.2	30.6	15.5	30.7	25.7	23.7	9.2	25.8
St. Helena	25.0	29.7	23.8	16.4	27.7	18.8	26.2	21.5	19.5	10.8	20.4
Wadmalaw/Edisto	24.2	30.0	22.5	16.1	25.6	17.1	22.4	21.5	17.6	8.8	19.0
Charleston	14.1	23.4	20.4	21.6	26.1	18.2	23.7	17.7	18.2	9.4	20.8
Bulls Bay	22.5	20.3	26.4	23.1	28.7	15.2	25.2	19.6	22.3	11.6	11.4
Georgetown	10.5	14.4	26.9	13.2	19.9	9.6	23.3	21.5	25.4	9.8	7.0

Residence category	Trips	CPUE	Catch (quarts)
North Coast	4,831	9.98	48,213
Central Coast	29,588	20.59	609,217
South Coast	15,011	22.77	341,800
Central Inland	12,561	23.88	299,957
Other	7,856	18.70	146,907
Total			1,446,094

This approach produced somewhat higher values than the method using average season catch.

Catches by shrimping area were obtained by multiplying the estimated effort in each by the corresponding average CPUE:

Shrimping area	Trips	CPUE	Catch (quarts)
Beaufort	19,998	25.80	515,948
St. Helena	9,698	20.37	197,548
Wadmalaw/Edisto	6,306	18.95	119,499
Charleston	23,932	20.81	498,025
Bulls Bay	7,696	11.36	87,427
Georgetown	2,217	6.97	15,452
Total			1,433,899

There are trade-offs in probable accuracy and lack of bias associated with each approach and an intermediate value is a reasonable overall estimate. The average of the four estimates shown above is 1,409,317 quarts. The conversion factor from quarts to pounds whole weight is 1.48. The weight equivalent of heads-on shrimp is 2,085,790 pounds. The conversion factor to heads-off weight is 0.649, giving an estimate of 1,353,678 pounds heads-off.

The distribution of season catches by residential category is shown in Table 9. A conservative estimate of the statewide average catch per active permit holder, based on respondents' estimates of their season catches, was 110.3 quarts (163 pounds) of whole shrimp. Assuming that this was evenly divided between the permit holders and their assistants, the typical participant obtained about 52.5 pounds of whole shrimp. A slightly higher value (55.3 pounds) can be obtained by dividing the estimated total catch by the estimated number of participants.

The relative distribution of the fall white shrimp harvest is perceived as an allocation issue. Since 1992, a monitoring system for commercial landings has been in place that permits comparison of recreational and commercial landings for comparable area/time units. The baiting areas and corresponding commercial statistical zones are as follows:

Table 9. Distribution of season catches (quarts of whole shrimp) in percentages of respondents by residential category.

Residence category	Catch per permit holder					
	< 99	100-199	200-299	300-399	400-499	> 500
North Coast	86	12	1	1	-	-
Central Coast	49	31	11	6	2	1
South Coast	52	22	15	7	2	4
Central Inland	54	29	11	3	2	< 1
Other	72	19	6	2	< 1	< 1
Statewide	58	25	10	4	2	1

Table 10. Estimated shrimp baiting catches and reported commercial landings (all gears) by area, in thousands of pounds of whole shrimp.

Area	Baiting	Commercial		Percent baiting	
		In-season	Total	In-season	Total
Beaufort	763,603	91,838	238,409	89	76
St. Helena	292,371	446,052	1,111,358	40	21
Wadmalaw/Edisto	176,859	228,183	378,703	44	32
Charleston	737,077	307,379	418,917	71	64
Bulls Bay	129,392	80,970	167,982	62	44
Georgetown	22,869	53,594	87,041	30	21
Total	2,122,171	1,208,016	2,402,410	64	47

Baiting area	Commercial zone
Beaufort (rivers, sound)	Hilton Head to Bay Point
St. Helena Sound	Bay Point to South Edisto River
Wadmalaw/Edisto Islands	South Edisto River to Stono Inlet
Charleston (rivers, harbor)	Stono Inlet to Dewees Inlet
Bulls Bay	Dewees Inlet to Cape Romain
Georgetown (rivers, bay)	Cape Romain to North Carolina line, Winyah and Santee Bays

The comparison of baiting and commercial landings is shown in Table 10. In-season commercial landings were defined as those during week 3 of September through week 2 of November. Total commercial landings included those from week 1 of August through the closure of the 2001 season (on January , 2002). Combined total recreational and commercial landings are the baiting catch plus the total commercial landings as so defined.

DISCUSSION

Documentation of seasonal statistics began in 1987. Table 11 summarizes the data for each year's fishery.

The total number of permits sold was the lowest since that in 1994 with the distribution by county remaining essentially unchanged from that in recent years. Overall participation was nearly identical to that in 2000, which was the lowest level since that in the 1992 season. It is likely that many potential baiters declined to purchase a 2001 permit, based on the absence of roe shrimp and assumed low abundance of the fall crop.

Total effort has exceeded 60,000 trips since 1990. Historical averages referred to below are based on 1990-2000 data. Overall effort in 2001 was 6.4% below the average for that interval. Effort by coastal residents was about 13% below the long-term average, while that by inland residents was up 10%. The distribution of effort by shrimping area was somewhat atypical, compared to that in recent years. Historically, the Beaufort and Charleston areas (the most popular) have attracted nearly identical levels of average effort. During the 2001 season, the effort in Charleston was up about 5% with that in Beaufort down about 10%. St. Helena Sound hosted a relatively high level of effort compared to the historical average, continuing the trend in recent years. The most pronounced difference was for Bulls Bay. Effort there fell below 10,000 trips for the first time since 1993, presumably due largely to the low abundance of shrimp there in 2001.

Trends in CPUE by area have been highly variable with the areal differences especially pronounced in 2001. CPUE in Charleston during 2001 was slightly above the long-term average. That to the south nearly equaled the 1990-2000 average, while catch rates north of Charleston were 54% below.

Table 11. Season comparisons of participation, effort, and catch parameters.

	1987	1988	1989	1990	1991	1992	1993	1994	1995
Permits issued	NA	5509	6644	9703	12005	11571	12984	13366	13919
Percent active permits	NA	92	82	94	89	87	91	86	89
Assistants/permit holder	NA	2.50	2.14	2.79	2.24	2.15	2.43	2.32	2.39
Participants	21735	17749	17171	34662	34821	31812	40620	38081	41971
Trips/permit holder	NA	7.0	5.7	7.8	6.6	6.1	6.8	6.0	6.5
Total trips	40101	35609	31624	71153	71034	62459	80709	70429	81632
Average quarts/trip	28.5	22.1	26.5	25.6	21.3	25.4	23.5	18.5	28.9
Million pounds heads-on	1.80	1.16	1.25	2.75	2.14	2.35	2.72	1.91	3.40
Pounds/participant	83	65	73	79	62	74	67	50	81
	1996	1997	1998	1999	2000	2001			
Permits issued	14156	15488	17497	15895	15929	13698			
Percent active permits	85	91	87	81	81	87			
Assistants/permit holder	2.25	2.44	2.31	2.09	1.93	2.18			
Participants	38932	48544	50436	39514	37622	37699			
Trips/permit holder	5.7	6.6	6.0	5.1	4.8	5.8			
Total trips	68927	94154	92484	66396	61445	69847			
Average quarts/trip	16.9	26.4	21.7	21.1	10.2	20.3			
Million pounds heads-on	1.73	3.63	2.91	2.02	0.91	2.09			
Pounds/participant	44	72	58	46	23	53			

The total baiting catch was about 13% below the 1990-2000 average. The Charleston catch was 8% above average, while that in the areas to the south equaled the long-term average. In contrast, the aggregate catch north of the Charleston area was only 31% of the annual average harvest.

It was a highly unusual year for shrimp. November and December, 2000 were the coldest on record. Abnormally low water temperatures occurred with 18 consecutive days of <46 degree F readings in Charleston Harbor. After a winter kill estimated at 97-99% of the prespawning stock, several steps were taken to protect the remaining portion. State waters were closed to whelk /crab trawling and federal waters off South Carolina and Georgia were closed to shrimp trawling from March 13 – June 15. State waters were not opened to shrimp trawling until June 25. Despite these measures, practically no roe shrimp were seen.

Based on historical observations, the fall white shrimp crop was expected to be 1/6 or less of the long-term average. Nonetheless, fishermen reported good quantities of small shrimp around Charleston during the summer. July and August were wetter than normal, but there were no major storms and conditions for survival and growth of the juveniles were optimal.

In early September, anglers continued to report good numbers of white shrimp in the Charleston area. MRD sampling found modest quantities of moderate-sized shrimp in that area. North of Charleston, shrimp were larger but far less numerous, while to the south there were fair numbers.

The baiting season opened on September 14. Storm Gabrielle passed to the south on opening weekend with much wind, but not much rain. Thereafter, there was practically no rain for the remainder of the season. Nights were unseasonably cool in mid-October, after which there seemed to be a lull in baiting activity and success. The season closed on November 13 following an apparent increase in later-season success.

Anecdotal information indicated that Bulls Bay had unusually low abundance at the outset of the season and word of very low catch rates there spread quickly, resulting in greatly reduced effort. Respondents reported that small shrimp were numerous in the Georgetown area, but disappeared by mid-September. Subsequent activity confirmed the low levels of abundance in most of the northern shrimping area.

Overall, conditions were unusually favorable for the baiting fishery. The absence of rain and rather mild weather reduced the seaward migration rate and contributed to the enhanced availability of shrimp in baiting areas. The generally good weather also favored shrimping activity.

The abundance of shrimp does not appear to be a significant factor in terms of the baiting vs commercial trawler division of the fall harvest. With the combined fall catch used as a proxy for abundance, both the baiters' catch and the trawler landings are highly

correlated with it ($r = 0.84$ and 0.93 , respectively). There is no correlation between the baiters' share and abundance, as is readily apparent in comparing the results of the last two seasons. In 2000, the total fall harvest was the lowest since 1988 and the baiters' share, 24%, was the lowest on record. In 2001, total harvest was the next lowest since 1988, but the baiters' share, 47%, was the highest since the fishery began.

The distribution of the fall harvest appears to be affected more by environmental conditions than any other factor, provided that baiting effort remains within the range observed in the last decade. The trawlers generally do relatively better during unusual wet years. A major causative factor for the low baiters' share in 2000 appeared to be the heavy rainfall immediately preceding the baiting season. Many shrimp were flushed out of the baiting areas and August trawler landings were well above the long-term average. In 2001, although August was wetter than normal, there were no heavy rains that promoted outmigration. There was practically no rainfall during the baiting season and the unusually mild weather also contributed to delayed seaward movement. Climatic conditions seemed to be the most obvious cause for the record baiters' share of the fall harvest.

REFERENCES

- Liao, D.S. 1993. Economic analysis of the 1991 South Carolina shrimp baiting fishery. S.C. Marine Resources Division, Charleston, S.C. Technical Report 81.
- Low, R.A. 1990. Survey of the South Carolina shrimp baiting fishery, 1989. S.C. Marine Resources Division, Charleston, S.C. Technical Report 73.
- Low, R.A. 1991. Survey of the South Carolina shrimp baiting fishery, 1990. S.C. Marine Resources Division, Charleston, S.C. Technical Report 76.
- Low, R.A. 1992. Survey of the South Carolina shrimp baiting fishery, 1991. S.C. Marine Resources Division, Charleston, S.C. Data Report 9.
- Low, R.A. 1993. Survey of the South Carolina shrimp baiting fishery, 1992. S.C. Marine Resources Division, Charleston, S.C. Data Report 14.
- Low, R.A. 1994. Survey of the South Carolina shrimp baiting fishery, 1993. S.C. Marine Resources Division, Charleston, S.C. Data Report 15.
- Low, R.A. 1995. Survey of the South Carolina shrimp baiting fishery, 1994. S.C. Marine Resources Division, Charleston, S.C. Data Report 21.

- Low, R.A. 1996. Survey of the South Carolina shrimp baiting fishery, 1995. S.C. Marine Resources Division, Charleston, S.C. Data Report 23.
- Low, R.A. 1997. Survey of the South Carolina shrimp baiting fishery, 1996. S.C. Marine Resources Division, Charleston, S.C. Data Report 25.
- Low, R.A. 1998. Survey of the South Carolina shrimp baiting fishery, 1997. S.C. Marine Resources Division, Charleston, S.C. Data Report 29.
- Low, R.A. 1999. Survey of the South Carolina shrimp baiting fishery, 1998. S.C. Marine Resources Division, Charleston, S.C. Data Report 32.
- Low, R.A. 2001. Survey of the South Carolina shrimp baiting fishery, 2000. S.C. Marine Resources Division, Charleston, S.C. Data Report 35.
- Low, R.A. and W. Waltz. 2000. Survey of the South Carolina shrimp baiting fishery, 1999. S.C. Marine Resources Division, Charleston, S.C. Data Report 33.
- Theiling, D. 1988. Assessment of participation and resource impact of shrimp baiting in Coastal South Carolina during 1987. S.C. Marine Resources Division, Charleston, S.C. Technical Report 69.
- Waltz, W. and B. Hens. 1989. Survey of the South Carolina shrimp baiting fishery, 1988. S.C. Marine Resources Division, Charleston, S.C. Technical Report 71.