20 Years Later—A Comparison of Recreational Fishing Pressure and Catch Statistics at Cat Island, Mississippi

Wendell J. Lorio, *Mississippi State University Science and Technology Research Center, Building 1103, Stennis Space Center, MS 39529*

Michael G. Pursley, *Mississippi State University Science and Technology Research Center, Building 1103, Stennis Space Center, MS 39529*

Abstract: Roving-clerk creel surveys were conducted at Cat Island, Mississippi, during two three-year periods: 1977–1979 and 1997–1999. Angler interviews provided data of species caught with estimated weight and number, as well as duration of fishing activity. Periodic aerial counts of fishermen provided further estimates of total fishing activity. Fishing pressure increased significantly ($P \leq 0.05$) during the 20-year study interval in numbers of fishermen and total hours fished. Greatest fishing activity occurred on weekends during both study periods with the greatest fishing pressure from March–November. Despite increased fishing pressure, total catch did not increase significantly ($P \leq 0.05$) between study periods. Catch per unit effort (CPUE) exhibited a decline proportionate with the increase in fishing pressure. The three predominant species caught (ranked by number in descending order) has shifted from spotted seatrout *(Cynoscion nebulosus)*, Southern kingfish *(Menticirrhus americanus)*, and sand seatrout *(Cynoscion arenarius)* in the early study to Southern kingfish, sand seatrout, and spotted seatrout in the later study. The decline in spotted seatrout catch may be due to the recently-imposed minimum length limits in force during the second study.

Key Words: Fishing Pressure, Cat Island, Creel Survey, *Cynoscion nebulosus, Menticirrhus americanus*, Mississippi Sound, CPUE

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Creel surveys gather information from anglers for fisheries management purposes (MacKenzie 1991). Surveys of anglers are important indicators of fishing pressure and are useful in gauging effectiveness of fisheries regulations (Kendall 1991). This study used a roving clerk creel survey on-site intercept survey (Malvestuto 1983).

Management of marine finfish in the Mississippi Sound depends upon many factors, including knowledge of fishing pressure and harvest rates. Catch and effort information was collected by the primary author in a 1977 through 1979 study at Cat Island, Ship Island, and Horn Island. The Cat Island portion of the study was repeated during 1997–1999 and is compared to the 1979–1999 study in the following report.

Table 1. Instantaneous count of sport fishermen during the 1977–1979 and 1997–1999 study periods at Cat Island, Mississippi.

Year	1977	1978	1979	1997	1998	1999
Instantaneous count	207	287	105	293	346	355

The specific objectives of this investigation were: (1) to estimate catch by species of recreational fishermen, (2) to estimate total fishing effort at Cat Island, Mississippi, (3) to calculate CPUE by recreational fishermen in the study area, and (4) to compare the results of the current study with the 1977 through 1979 study.

The overall objective of the initial study (1977 to 1979) was to determine the relative impact of commercial netting and sport fishing on spotted seatrout *(Cynoscion nebulosus)*, red drum *(Sciaenops ocellatus)*, and Spanish mackerel *(Scomberomorus maculatus)*. The commercial netting survey was abandoned in the current study due to more stringent regulations on the use of gill nets by commercial fishermen.

Methods

The study was conducted at Cat Island, the westernmost Mississippi Barrier Island. It is situated about 14 km east of Biloxi, between the Mississippi shoreline and the Louisiana marshes in an area called the Biloxi Marsh.

Survey dates were randomly selected to occur on one weekday and one weekend day every three-week period. Surveys not conducted due to bad weather were canceled and fishing pressure was assumed to be negligible due to unsafe boating conditions. Surveys were canceled when seas were >1 m, winds >8 m/sec, visibility due to fog was <20 m, and during thunderstorms or heavy rain.

A creel census-roving clerk in a motorboat interviewed fishermen at a distance of about 15 m to prevent entanglement in fishing lines and collisions. Each person that agreed to be interviewed was asked the following questions: 1) How long have you been fishing today? 2) What have you caught so far? 3) What is the approximate weight of each fish?

All fishermen observed in the study area were counted and interviewed when possible. Fishermen that did not wish to be interviewed, avoided the survey boat, or could not be reached due to shallow water were counted and added to the instantaneous count for that day.

Results

Instantaneous counts of fishermen at Cat Island for the six study years are presented in Table 1. Mean counts (mean ± SD) for each three-year period increased significantly ($P \geq 0.05$) from 200 ± 91 in 1977–1979 to 331 ± 29 in 1997–1999. Estimated fishing effort of all counted fishermen by day type and year is shown in Table

Table 2. Total estimated sport fishing effort (hours) by recreational fishermen at Cat Island for weekdays and weekends in 1977–1979, 1997–1999.

	Hours of fishing effort by year					
Day type	1977	1978	1979	1997	1998	1999
Week days	8,080	18,186	4,555	19,749	19,755	13,680
Weekends	15,617	13,244	9,687	17,762	20,409	28,237
Total hours	23,697	31,430	14,242	37,511	40,164	41,917

Table 3. Average daily numbers of sport fishermen interviewed during creel surveys, those counted by the flight from November 1996 through October 1999.

	November	December	January	February	March	April
Flight	8	8	4	1	54	129
Creel	4	2	1	1	18	11
	May	June	July	August	September	October
Flight	90	106	64	95	32	7
Creel	18	38	33	10	13	4

Table 4. The estimated number, weight (kg), and average weight of fishes caught by sport fishermen at Cat Island during 1977–1979 and 1997–1999.

	Estimated number and weight (kg) of fish caught by year					
	1977	1978	1979	1997	1998	1999
Number	21,838	57,124	13,633	13,019	11,702	68,577
Weight	14,012	22,937	4,474	5,235	7,042	27,916
Avg. wt.	0.64	0.40	0.35	0.88	0.40	0.41

2. The mean total hours of fishing effort (mean ± SD) increased significantly ($P \geq 0.05$) along with effort from 23,123 ± 8,608 h in 1977–1979 to 39,864 ± 2,218 h in 1997–1999. Daily fishing pressure was greatest on weekends.

Table 3 depicts average daily fishing effort in number of fishermen by month from November 1996 through October 1999. March through September exhibited the greatest sport fishing activity as determined by flight counts and creel interviews. Heaviest monthly fishing pressure was observed in June. Greatest number of daily interviews were taken during Memorial Day and Fourth of July weekends. Similar seasonal and daily fishing pressure was observed during the previous study. Estimated number and average weight (kg) of fish caught at Cat Island during both previous and present studies are presented in Table 4. While fishing success varied greatly between individual study years, no significant ($P \leq 0.05$) differences were observed in the mean number and average weight of fish caught during each three-year study period.

Table 5. The estimated number of fishes caught by sport fishermen at Cat Island during 1977, 1978, 1979, 1997, 1998, and 1999.

Species	1977	1978	1979	1997	1998	1999
Spotted seatrout	4,375	23,908	1,242	433	604	8,930
Sand seatrout	4,935	11,023	391	2,391	3,177	29,978
Atlantic croaker	2,926	7,018	1,084	1,818	84	1,098
Red drum	541	1,295	718	719	0	379
Black drum	0	0	0	0	0	0
Southern flounder	1,716	916	0	392	131	1,070
Sea catfish	2,168	2,390	1,942	121	2,377	383
Sheepshead	235	105	282	117	0	27
Spanish mackerel	378	115	1,458	26	3	176
Other species	4,564	10,354	6,516	7,002	5,326	26,536
Totals	21,838	57,124	13,633	13,019	11,702	68,577

Table 6. The estimated weight (kg.) of fishes caught by sport fishermen at Cat Island during 1977, 1978, 1979, 1997, 1998, and 1999.

Species	1977	1978	1979	1997	1998	1999
Spotted seatrout	3,553	9,143	390	229	540	4,576
Sand seatrout	3,220	3,761	89	746	905	11,587
Atlantic croaker	707	1,610	266	406	12	213
Red drum	490	760	652	422	0	841
Black drum	0	0	0	0	0	0
Southern flounder	1,147	647	0	215	95	519
Sea catfish	956	783	771	54	935	69
Sheepshead	266	297	149	308	12	60
Spanish mackerel	318	95	926	52	2	106
Other species	3,355	5,831	1,500	2,803	4,542	9,861
Totals	14,012	22,927	4,743	5,235	7,043	27,832

Table 7. The estimated catch per unit effort (CPUE) in number of fish/hour and kilograms of fish/hour for 1977–1979 and 1997–1999.

CPUE[a]	1977	1978	1979	1997	1998	1999
CPUE (*N* fish/hour)	0.92	1.81	0.95	0.36	0.29	1.64
CPUE (kg of fish/hour)	0.63	0.73	0.33	0.14	0.18	0.67

a. SE averaged 33%.

The number and weight (kg) of species reported in the creel at Cat Island for both studies are presented in Tables 5 and 6. In the 1977–1979 study, spotted seatrout was the predominant fish caught in number and weight followed by sand seatrout and the category "other species." In the 1997–1999 study, sand seatrout followed by the category other species and spotted seatrout were the top three fish caught in number

and weight. The estimated catch per unit effort (CPUE) in number of fish/h and kg of fish/hour for both study periods is shown in Table 7. Mean CPUE (mean ± SD) in fish/h for each three-year period decreased from 1.23 ± 0.505 in 1977–1979 to 0.76 ± 0.76 in 1997–1999. Mean CPUE (mean ± SD) in kg/h decreased similarly from 0.563±0.357 to 0.33±0.30 in the later study.

Discussion

The average instantaneous count of fishermen increased 66% from the 1977–1979 study to the present study. Total estimated fishing effort (h) also increased (avg. 72%) over the 20-year interval. During the two three-year survey periods, on average 56% of the fishing pressure occurred on weekends and 44% during weekdays. Season, year, and weather were important factors in determining the amount of fishing activity on any given day. During summer, when weather was good there was little difference in fishing pressure between weekdays and weekends. Monday was generally the lightest fishing activity day while Friday exhibited the highest weekday activity. For weekend fishing, more anglers were generally present on Saturdays than on Sundays.

Seasonally, fishing activity was very light from November through February with increased activity beginning in March, peaking through September, and tapering off again in October. The lack of fishing activity in the winter months was likely due to uncomfortable weather and low fish populations. Fish collection data from Lorio and Pursley (2001) indicate fish populations at Cat Island during this period are very sparse. Also during winter, abnormally low tides make boating around Cat Island difficult.

Despite increased fishing pressure, the average number of fish caught in the 1977–1979 study was only 178 more fish per year than the 1997–1999 study. Fishing success as indicated by the number and weight of fish caught was best in 1977 and 1999, with 1999 being the better of the two years. It is not known if fishermen today lack the skills of fishermen 20 years earlier or if fish populations have changed, or both. Personal experience conducting interviews in both studies seems to indicate that having an outdoor experience with friends and family was more important than fishing success in the later time period. In the 1977–1979 study there seems to be no correlation with number of fish caught and average fish size. It might be anticipated that the year with the lowest catch by numbers would produce larger fish because the youngest harvestable size year class may be missing or greatly reduced. This was not the case in the earlier study but seemed to occur during 1998 which exhibited the lowest catch but produced the largest fish.

The population structure of harvested fish at Cat Island may have changed during the 20-year interval between the two studies. In the earlier study spotted seatrout made up 31% of the catch and was the most sought after species. In the late 1990s spotted seatrout was still the most sought-after fish, but made up only 11% of the catch. As a result, most fishermen had to content themselves catching sand seatrout and Southern kingfish.

A decline in the relative abundance of spotted seatrout from 33% to 11% during

the 20-year period cannot be explained by the survey data. Possible reasons include weak year classes in 1994–1996. Sand seatrout and Southern kingfish may have outcompeted spotted seatrout. Habitat alterations favoring sand seatrout and Southern kingfish could have occurred.

Another causative factor may be the size limit regulations on spotted seatrout during the 1990s study. Undersize fish that were harvested in the past but now released may account for some of the creel reduction. It is interesting to note that no fisherman reported a 15-fish limit of legal-sized spotted seatrout in the 1997–1999 study.

Sand seatrout, Southern kingfish, and spotted seatrout make up an estimated 75% of the catch at Cat Island. Most fish are caught in the lagoon area and in Pirate's Cove on the south side of the Island. A combined catch of 50–150 sand seatrout and Southern kingfish from these areas was not uncommon during the later survey. It is evident from the 62% drop in CPUE estimates that fishing success has decreased dramatically over the last 20 years. Standard error for CPUE estimates averaged 33% with a range of 13% for spotted seatrout to 72% for southern flounder *(Paralichthys lethostigma)*. Lester et al. recommend a standard error or sampling precision of 20%, which was met by sampling techniques in which a species or species category was well represented in the creel. More survey days per month would have reduced the standard error. This study was repeated exactly as it was done in 1977–1979 to provide direct comparisons for the 20-year period. Any future study, however, should be patterned after the Duffy study (J. Duffy, Alabama Department of Conservation and Natural Resources, pers. commun.). Duffy's unpublished CPUE data for coastal Alabama fisheries indicate a CPUE estimate (for numbers) of 2.45 with a standard error of 0.17 or 7% precision. At Cat Island the CPUE for numbers of fish averaged 1.23 for the 1977–1979 study period and 0.76 for the 1997–1999 study with a standard error of 30%. This comparison indicates a 322% higher CPUE in coastal Alabama than at Cat Island.

As in many coastal areas, fishing is not as good at Cat Island today as it was 20 years ago. More research is needed to determine the causative factors. The creel data suggest that species composition has shifted to sand seatrout and Southern kingfish from a fishery that was once dominated by spotted seatrout.

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