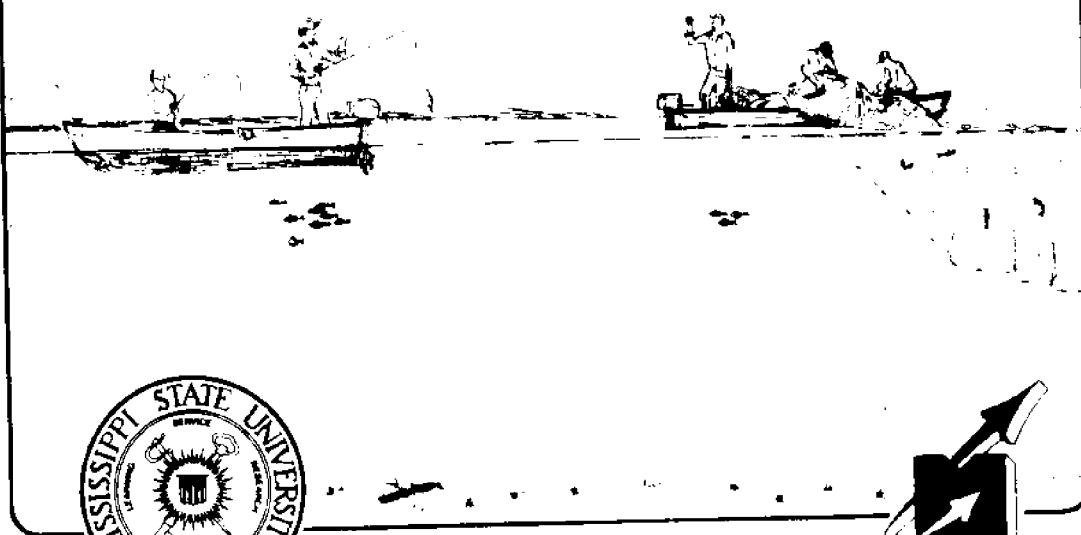


THE RELATIVE IMPACT OF NETTING AND SPORT FISHING ON ECONOMICALLY IMPORTANT ESTUARINE SPECIES

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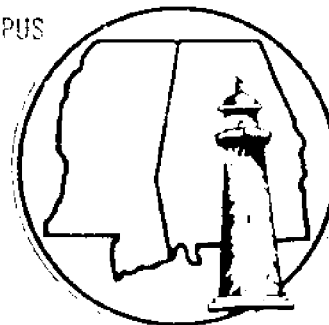
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MISSISSIPPI-ALABAMA
SEA GRANT PROGRAM



MASGP-79-025
OCTOBER 1980

THE RELATIVE IMPACT OF NETTING AND SPORT FISHING ON ECONOMICALLY
IMPORTANT ESTUARINE SPECIES

A

Final Report

Submitted to

Mississippi-Alabama Sea Grant Consortium

by

Wendell Lorio, Director
Teresa Heaton, Research Associate
Opal Dakin, Research Associate
Mississippi State University Research Center
NSTL Station, MS 39529

October, 1980

The Relative Impact of Netting and Sport Fishing on Economically Important Estuarine Species

INTRODUCTION

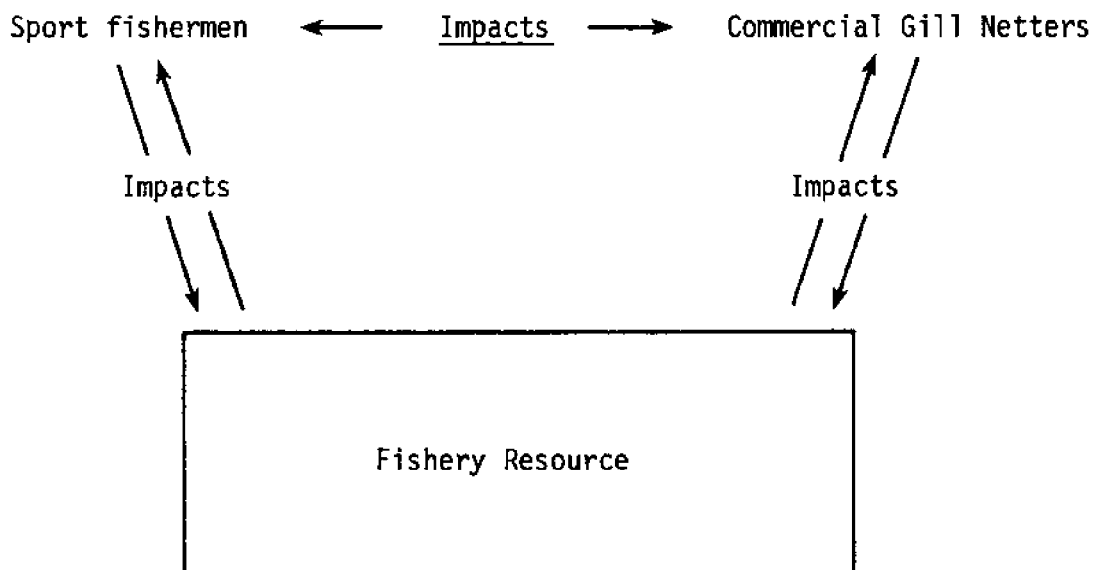
The profession of fishing is among the world's oldest; the profession of fisheries management however, still labors in adolescence (Neilson, 1976). The objectives of scientific fisheries management are: 1) to prevent overfishing; 2) to prevent underutilization; 3) to equitably allocate the resource between competing user groups and 4) to increase production. The third objective is of major concern in the fin fish resource controversy presently existing between sport fishermen and commercial gill netters in the Gulf of Mexico.

Conflicts between user groups of fishery resources have been a problem to fishery managers for many years. Johnstone (1905) reported that British fishermen frequently complained of depleted fisheries before 1850. He stated that complaints were usually accompanied by accusations that competing types of fishing gear caused the alleged depletions. Johnstone said that a new technique called trawling was the most popular scapegoat and various politically oriented restrictions on trawling and other methods were enacted before 1850 in both the British Isles and the United States. Howell (1921) agreed with Johnstone that there was much controversy concerning the new trawling techniques and also stated that one conclusion with which everyone agreed was that no one knew very much about the subject. This lack of knowledge is still with us today in many areas of fisheries management.

Ditton (1977) reported that a model of the critical impact relationships involved in man-resource focus is as follows:

1. Man - Impacts \longrightarrow Fisheries Resource
2. Man \longleftarrow Impacts - Fisheries Resource
3. Man \longleftarrow Impacts \longrightarrow Man

The third step can be modified somewhat to indicate a serious fisheries resource problem, not only found in coastal Mississippi, but by all the coastal states from Maryland to Texas. This is the sport fishermen - commercial gill netter's controversy.



Sport fishing is regarded by many people in the United States as a more desirable allocation of resources than commercial fishing because the recreational benefits extend to more people (Hazzard and Voigt, 1975). By the same token, commercial fishermen depend on fishery resources for a livelihood and should not be deprived of that opportunity. The commercial fishermen are being condemned by sport fishermen for using the most effective gear available to them. Effective management alternatives would insure that both groups receive an equitable allocation of the resource.

To accomplish effective management goals an adequate data base must be available.

An intense controversy exists along the coasts of Mississippi and Louisiana concerning the catching of sport fish by commercial fishermen using 1,000 and 2,000 feet of nylon and monofilament gill and trammel nets. This issue is probably one of the most critical problems facing resource managers of the northern Gulf of Mexico. The sport fisherman - commercial gill netters controversy in Mississippi centers around three principal species of fish identified as spotted seatrout (Cynoscion nebulosus), red drum (Sciaenops ocellata), and spanish mackerel (Scomberomorus maculatus).

The sport fishermen contend that these nets, especially the monofilament gill nets, are depleting the populations of spotted seatrout and red drum. This is a highly emotional issue with neither side having necessary facts to support their opinions. Fishery biologists contend that commercial fishing pressure has had little effect on the populations of spotted seatrout and red drum; however, little data is available to substantiate the claim.

The equitable allocation of this fin fish resource is dependent upon knowledge of fishing pressure and harvest of the two groups involved. This information was gathered by statistically designed creel survey conducted at Horn Island, Ship Island and Cat Island (Figure 1). With information on fishing pressure and harvest gathered over a three year data base, management of this fin fish resource will have the potential of having decisions made on facts rather than politics, opinions or emotionalism as is presently the case.

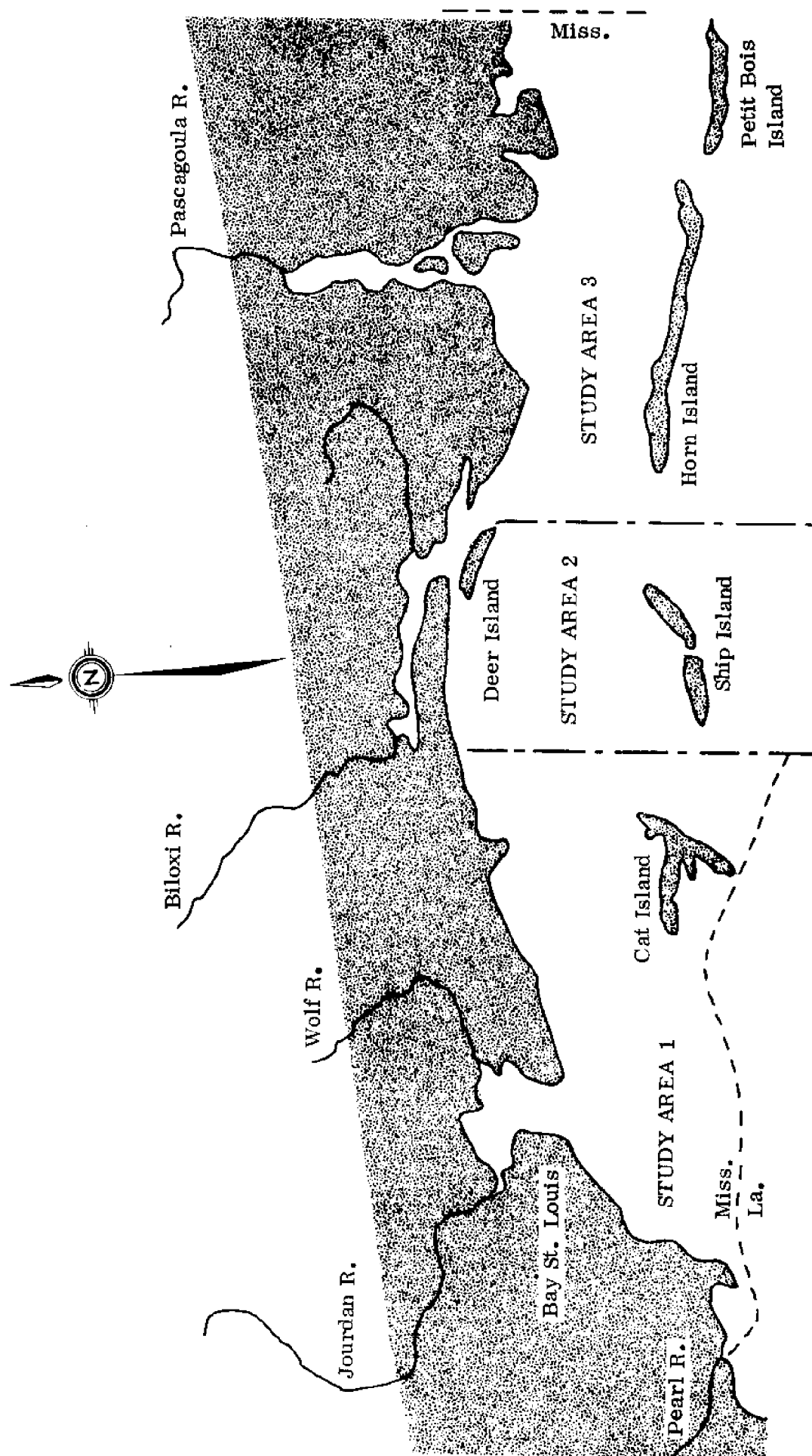


Figure 1. Map of Mississippi Sound showing proposed study areas that will be used to study the effectiveness of commercial gill netting on sport and commercial estuarine fish species.

METHODS AND PROCEDURES

The overall objective of this study was to determine the relative impact of commercial netting and sport fishing on spotted seatrout, red drum, and spanish mackerel. The catch was estimated by a creel census roving clerk technique. The statistical analysis, performed on the data, was conducted at the Institute of Statistics, North Carolina State University.

Sport and commercial fishermen were interviewed in the field. Each interview provided data concerning the occupation of the participant, location, size and species of catch, type of gear used, and duration of fishing. After the interview, a completed trip postal card was given to the fishermen to determine the duration and total harvest of the trip. Figures 2, 3 and 4 illustrate the forms that were used in the survey.

On any given sample day, all fishermen in a predetermined area around either Cat, Ship, or Horn Islands were counted and interviewed where possible. It was sometimes difficult to approach some boats due to speed or other factors, therefore an interview was not made in these instances.

To support the data collected by the interviewers, aerial counts were made of all boats around the Mississippi barrier islands. These flights were coordinated with the roving clerk schedule in order to estimate total fishing pressure and fishing success in the study areas. Three aerial counts were made per month, two on weekend days and one on a weekday. During these flights all fishing boats were counted, categorized as to sport or commercial, and numbers of fishermen per boat were determined.

NOTE: Right-justify all items

TYPE OF FISHING	<u> </u>	DATE	<u> </u>	<u> </u>	<u> </u>	<u> </u>
	1 2		14 15	16 17	18 19	
AREA (either 1, 2, or 3)	<u> </u>	INTERVIEW NO. (must not be duplicated)	<u> </u>	<u> </u>	<u> </u>	
	3 4		20	21	22	
PERIOD (refer to Sampling Design Sheet)	<u> </u>	NO. IN PARTY	NP	<u> </u>	<u> </u>	
	5 6			23	24	
KIND OF DAY (weekday = 1; weekend or holiday = 2)	<u> </u>	TIME FISHING (party hours)	HR	<u> </u>	<u> </u>	
	7 8					
SAMPLE NUMBER (refer to Sampling Design Sheet)	<u> </u>		MIN	<u> </u>	<u> </u>	
	9 10					

LOCALLY - COMMON NAMES	NUMBER CAUGHT	POUNDS CAUGHT
Speckled trout (Spotted seatrout)	SPN	SPP
Sand trout (Sand seatrout)	SDN	SDP
Croaker (Atlantic croaker)	CKN	CKP
Redfish (Red drum)	RDN	RDP
Black drum	BDN	BDP
Flounder	FLN	FLP
Catfish	CTN	CTP
Sheepshead	SHN	SHP
Spanish Mackerel	SMN	SMP
Other (specify)	OTN	OTP

RESIDENCE (check one)	PROPORTION TIME FISHING IN LA. (check one)	PROFESSION (check one)
Mississippi RM <u> </u>	0-20% PRA <u> </u>	Professional PPR <u> </u>
Louisiana RL <u> </u>	21-40% PRB <u> </u>	Business Men PBU <u> </u>
Other RO <u> </u>	41-60% PRC <u> </u>	Small Business PSM <u> </u>
	61-80% PRD <u> </u>	Skilled
	81-100% PRE <u> </u>	Craftsman PSK <u> </u>
		Comm.
		Fisherman PCO <u> </u>
		Salesman PCO <u> </u>
		Other POT <u> </u>

Figure 2. Interview Sheet for Mississippi Sound Creel Census.

NOTE: Right-justify each item except PROBABILITY

TYPE OF FISHING (sport = 1; commercial = 2)

0	
1	2

AREA (either 1, 2, or 3)

0	
3	4

PERIOD (refer to Sampling Design Sheet)

5	6
---	---

KIND OF DAY (weekday = 1; weekend or holiday = 2)

0	
7	8

SAMPLE NUMBER (refer to Sampling Design Sheet)

9	10
---	----

PROBABILITY (refer to Sampling Design Sheet)

26	27	28	29	30
----	----	----	----	----

HOURS ASSOCIATED WITH INSTANTANEOUS COUNT

31	32	33	34	35
----	----	----	----	----

INSTANTANEOUS COUNT (number of fishermen)

36	37	38	39	40
----	----	----	----	----

DATE (month, day, year)

41	42	43	44	45	46
----	----	----	----	----	----

Figure 3. Sample Sheet for Mississippi Sound Creel Census

FRONT

MISSISSIPPI SOUND FISHERIES STUDY
 MISSISSIPPI STATE UNIVERSITY RESEARCH CENTER
 NATIONAL SPACE TECHNOLOGY LABORATORIES
 NSTL STATION, MISSISSIPPI 39529

BACK

STATION			TYPE OF FISHING	PERIOD	
<hr/>			SPORT 01	<hr/>	
1	2	3	COMMERCIAL 02	5	6
KIND OF DAY			SAMPLE NO.	MONTH	DAY YEAR
WEEKDAY 01				/	/
WEEKEND 02			<hr/>	14 15 16 17 18 19	
			9	10	

MISSISSIPPI SOUND FISHERIES STUDY

P C
 21 22

AFTER YOU ARE THROUGH FISHING FOR TODAY PLEASE RECORD YOUR
 CATCH AND LENGTH OF YOUR FISHING TRIP IN HOURS AND MINUTES.

SPECIES	QTY.	WT.

TOTAL FISHING TIME

 :

 HOURS MINUTES

THANK YOU; MISSISSIPPI STATE UNIVERSITY
 RESEARCH CENTER

Figure 4. Backside and front of completed trip postal card.

Experimental netting was confined to Station 1 (Cat Island). Three 600' monofilament gill nets, each having a different mesh size ($1\frac{1}{2}$ ", $1\frac{7}{8}$ ", and $2\frac{1}{2}$ " bar mesh), were used. The nets were set out in the form of a closed circle and fish were retained inside. The nets were also set perpendicular to the shoreline. Species and size classes retained by a given mesh size were determined in this manner. The fish collected were weighed, measured, and examined for sex and gonadal condition.

RESULTS

Fishing effort in hours expended by sport and commercial fishermen in 1977, 1978 and 1979 is shown in Table 1. These estimates of fishing effort are based on the instantaneous count or the number of fishermen interviewed during each year. In 1977 there were 933 sport fishermen and 25 commercial fishermen interviewed; 872 sport fishermen and 32 commercial fishermen in 1978; and 291 sport fishermen and 13 commercial fishermen in 1979. Fishing effort is presented for weekdays, weekends, and by study area in Table 1.

The total effort expended by sport fishermen was estimated to be 106,872 hours, 95,644 hours, and 39,525, in 1977, 1978, and 1979 respectively. This represents an 11% reduction in fishing effort from 1977 to 1978 and a 64% reduction in effort from 1977 to 1979. In 1977, 66% (70,430 hours) effort was expended on the weekends and 34% (36,442 hours) on weekdays. In 1978, 58% (55,342 hours) of the effort was expended on weekdays and 42% (40,303 hours) during the weekends. In 1979 69% (26,884 hours) of the effort was expended on the weekends while 41% (12,641 hours) was expended on weekdays. The reduction in weekend effort in 1978 could be attributed to poor weekend weather conditions in 1978 (National Weather

Table 1. The total estimated sport and commercial fishing effort (hrs.) for weekdays and weekends at Cat, Ship, and Horn Islands, Mississippi, in 1977, 1978 and 1979. Standard error is in parentheses where calculated.

Category	1977		1978		1979	
	Sport	Commercial	Sport	Commercial	Sport	Commercial
Instantaneous Count (Number of Fishermen Interviewed)	933	25	872	32	291	13
Total Weekdays	36442 (9503)	4598 (4282)	55342 (15628)	4965 (1529)	12641 (4740)	1425 (748)
Total Weekends	70430 (26605)	1198 (995)	40303 (8201)	595 (614)	26884 (13212)	142 (146)
<u>Overall Effort:</u>						
Cat Island	23697 (6645)	3078 (1856)	31430 (11980)	1696 (1317)	14242 (9615)	1425 (748)
Ship Island	49418 (23264)	568 (512)	26283 (4790)	1220 (1258)	11325 (6814)	142 (146)
Horn Island	33757 (6293)	2150 (2226)	37932 (8593)	2545 (1000)	13598 (4413)	0 (0)
TOTAL EFFORT	106827	5796 (3985)	95644 (16450)	5561 (1748)	39525 (12063)	1567 (762)

Service, N.O. Office, 1977 - 1979)

Fishing effort by sport fishermen was greatest at Ship Island in 1977, at Horn Island in 1978, and at Cat Island in 1979 (Table 1). Sport fishing effort at Ship Island accounted for 46% (49,418 hours) total effort in 1977. Horn and Cat Islands represented 32% (33,757 hours) and 22% (23,697 hours) respectively. In 1978, 40% (37,932 hours) of the total sport fishing effort was expended at Horn Island, 33% (31,430 hours) at Cat Island and 27% (26,283 hours) at Ship Island. In 1979 Cat Island received 36% (14,242 hours) of the fishing pressure. Horn and Ship Islands received 35% (13,598 hours) and 29% (11,325 hours) respectively.

Sport fishing effort with respect to seasons was highest in the spring for all three years (Figure 5). Secondary peaks in sport fishing effort occurred in the summer of 1978 and 1979 while the secondary peak in effort for 1977 occurred in the fall. Lowest sport fishing effort was expended in the winter months for all three years.

Estimates of commercial fishing effort are probably not as accurate as estimates of sport fishing effort since few interviews of commercial fishermen were obtained (Table 1). Total commercial fishing effort was estimated to be 5,796 hours in 1977. This effort decreased to 5,561 hours in 1978. A further reduction to 1,567 hours in 1979 represents a 73% drop in effort over the two year period. Commercial fishing effort occurred primarily on weekdays rather than weekends for all three years (Table 1).

It was estimated that more commercial fishing effort in 1977 was expended at Cat Island (3,078 hours) rather than at Horn (2,150 hours)

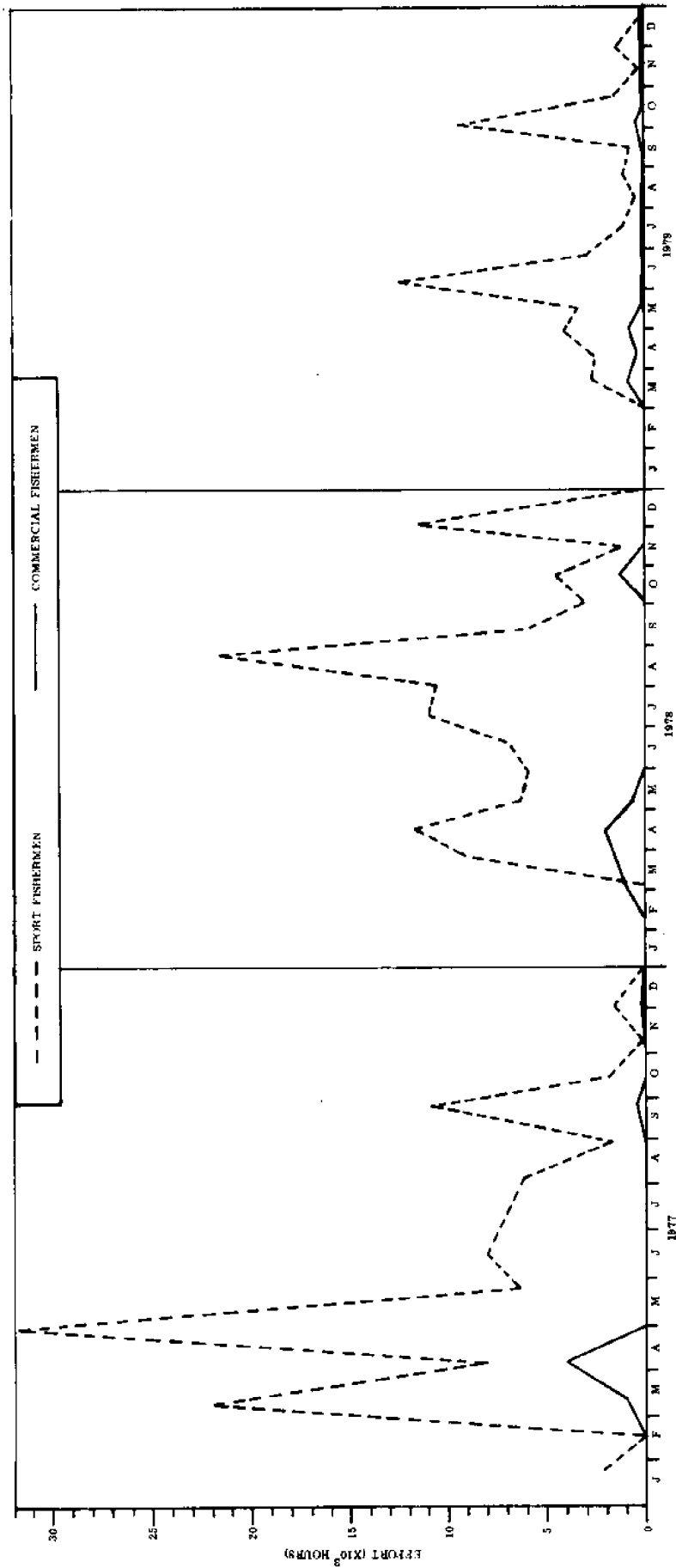


Figure 5. Estimates of effort by sport and commercial fishermen (hours) by periods (months) during 1977, 1978 and 1979.

or Ship (568 hours) Islands. In 1978, an estimated 46% (2,545 hours) effort was accomplished at Horn Island followed by 30% and 24% effort at Cat and Ship Islands respectively. The majority of commercial fishing effort occurred in 1979 at Cat Island (90%) and 10% at Ship Island. No commercial effort estimates are available for Horn Island in 1979.

Seasonally, commercial fishing activities were expended in the spring and fall. There were no interviews between May 15 and September 15 in 1977, 1978 and 1979 because the study area was closed to commercial netting by the Bureau of Marine Resources, Mississippi Department of Wildlife Conservation. This would have been the period that the greatest commercial netting activities would have occurred during any given year.

Table 1 and Figure 6 indicates the relative fishing effort of sport and commercial fishermen in 1977, 1978 and 1979 on weekdays and weekends. In 1977 sport fishing effort constituted 90% total effort for weekdays and 92% for weekends in 1977. In 1978 sport fishing effort comprised 92% of the total fishing effort on weekdays and 99% on weekends. Sport fishing effort constituted 80% total effort for weekdays and 99% for weekends in 1979.

Sport and commercial fishing were compared at Cat, Ship, and Horn Islands in Table 1 and Figure 7 for 1977, 1978 and 1979. Of total fishing effort in 1977, 99%, 94% and 89% was accomplished by sport fishermen at Ship, Horn, and Cat Islands respectively. In 1978, sport fishermen achieved 96% of the total fishing effort at Ship Island, 95% at Cat Island, and 94% at Horn Island. In 1979, 100%, 98%, and 90% was accomplished by

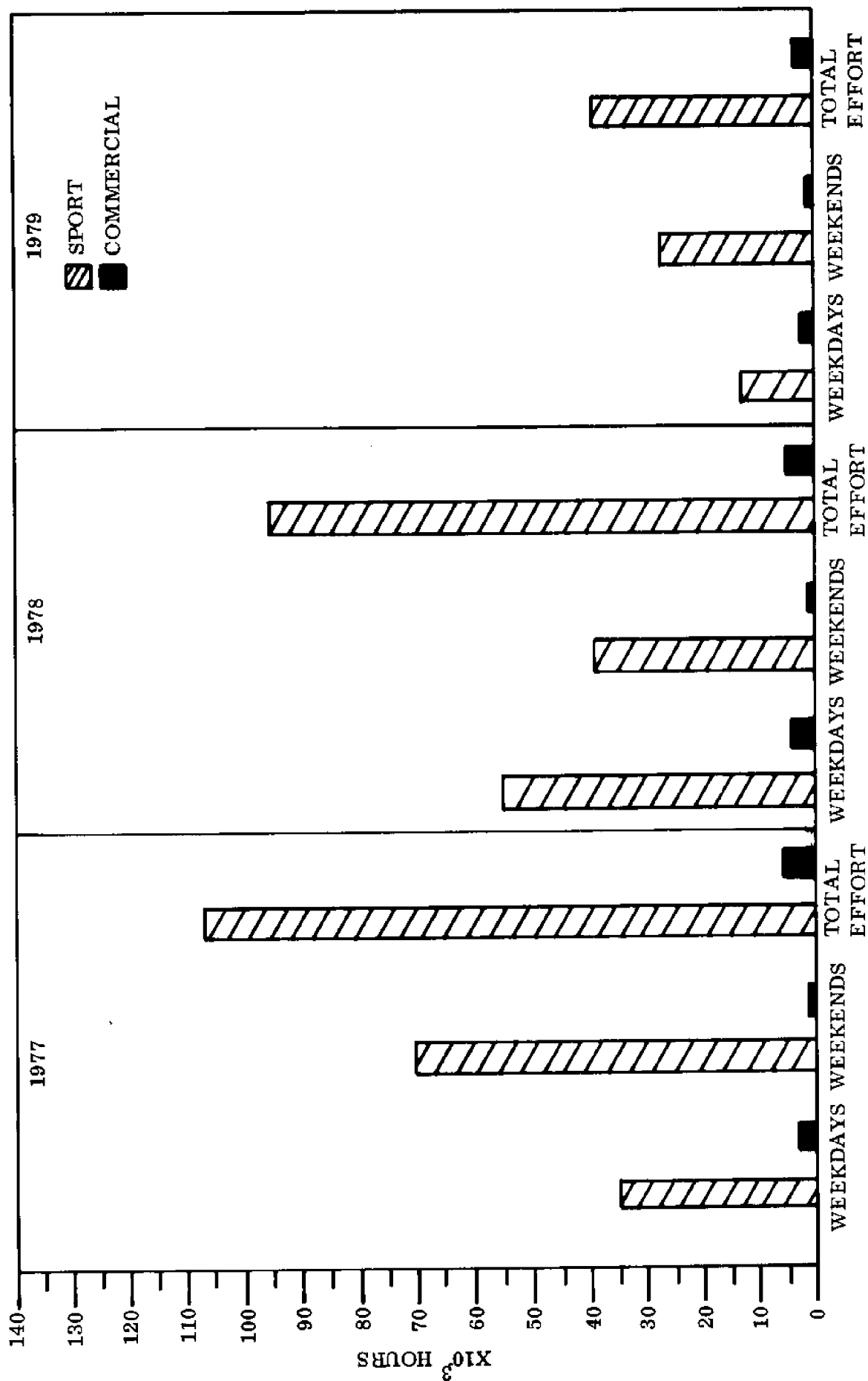


Figure 6. Effort in hours on weekdays and weekends for sport and commercial fishing in 1977, 1978 and 1979.

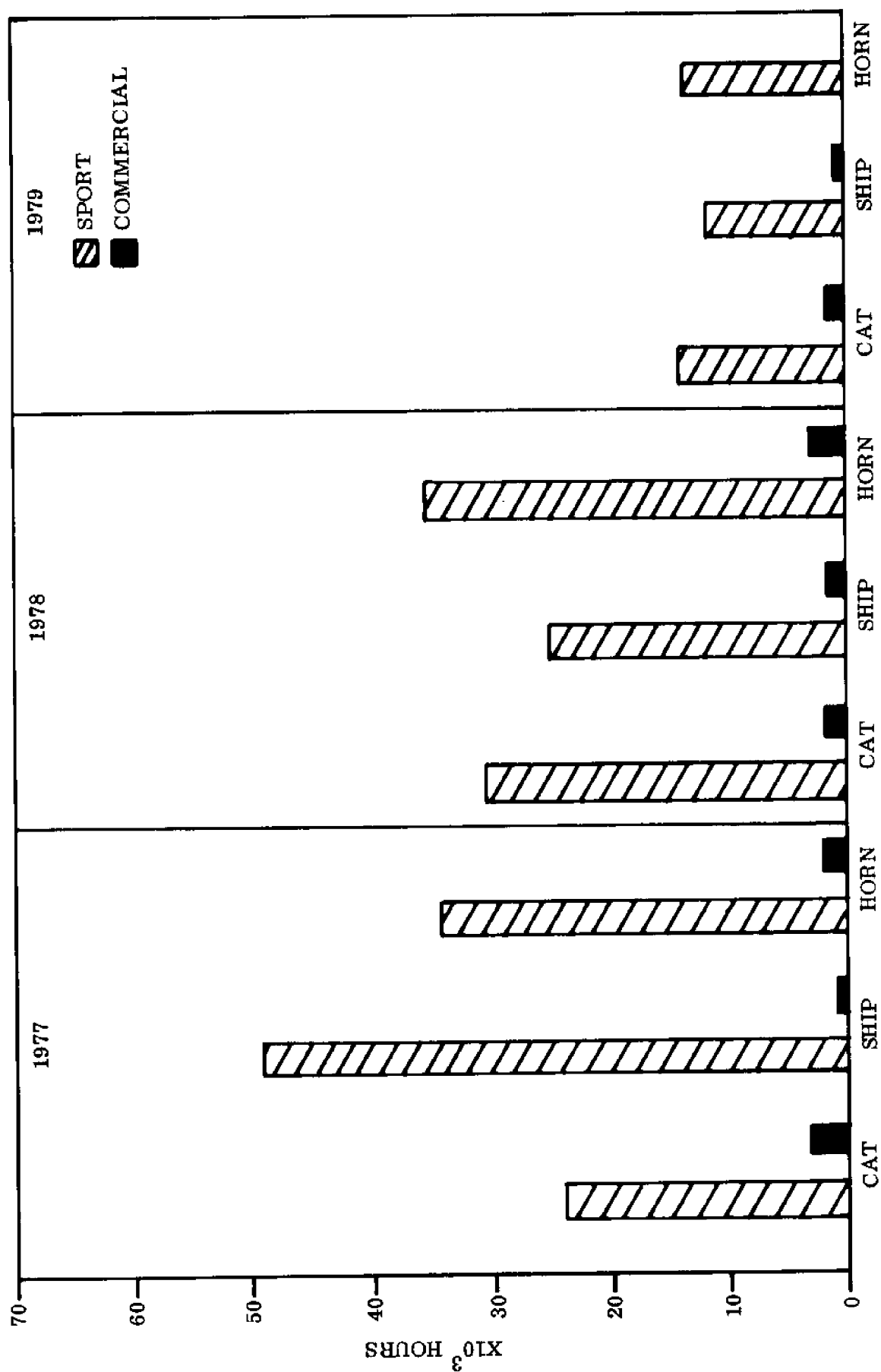


Figure 7. Effort in hours by areas for sport and commercial fishing in 1977, 1978 and 1979.

sport fishermen at Horn, Ship, and Cat Islands respectively.

The estimated number (Table 2) and weight (Table 3) of fishes caught by sport fishermen in the study area on weekdays and weekends during 1977, 1978, and 1979 are illustrated in the designated tables. Indications are that total number and weight of fishes caught were higher on weekend days in 1977 and 1979. A greater percentage of fishes were caught on weekdays (70,484) rather than weekends (42,791) in 1978. The weekday catch also represented greater weights (23,832) in 1978. In 1979 the numbers were higher on weekends but the poundage was higher on weekdays. The total estimated number of fishes caught in 1978 (113,275) represented a 48% increase in the number of fishes caught in 1977 (76,305) and a 70% decrease (34,237) from 1978 to 1979. The weight of fishes caught in 1978 was slightly less than the weight caught in 1977. There was greater reduction in weight from 1977 to 1979; the latter made up only 27% of the 1977 weight.

The estimated weight of fishes caught by commercial fishermen in the study area on weekdays and weekends during 1977, 1978, and 1979 are illustrated in Table 4. The estimated weight of fishes caught by commercial fishermen was higher in 1977 than in 1978 or 1979. The estimated weight was 582,040 pounds in 1977 as compared to 28,624 pounds in 1978 and 11,686 pounds in 1979. The 1978 estimated catch was only 5% of the 1977 catch and the 1979 catch was only 2% which represents a significant reduction in the estimated commercial fish harvested in 1978 and 1979. In 1977, 95% (557,117 pounds) of the commercial catch was on weekdays. In 1978, 85% (24,571 pounds) of the catch was on weekend days and 100% (11,686 pounds) of the catch was taken on weekdays in 1979.

Table 2. The estimated number of fishes caught by sport fishermen in the study area on weekdays and weekends during 1977, 1978 and 1979.

Species	Weekdays			Weekends			Total	
	1977	1978	1979	1977	1978	1979	1977	1978
Spotted Seatrout	7587	24158	9242	1822	7196	1453	9409	31354
Sand Seatrout	3465	11052	853	2434	7166	922	5899	18218
Atlantic Croaker	1799	7494	741	3822	3226	1071	5621	10820
Red Drum	880	1806	1114	1180	1531	792	2060	3337
Black Drum	0	91	0	0	72	15	0	163
Southern Flounder	1036	5011	71	827	849	277	1863	6860
Sea Catfish	11158	5242	848	6971	2633	3451	18129	7875
Sheepshead	139	4314	0	454	3648	519	593	7962
Spanish Mackerel	1342	3446	3334	8186	3968	1967	9528	7414
Other Species	8628	6770	344	14575	12502	7223	23203	19274
TOTALS	36034	70484	16537	40271	42791	17680	76305	113275
								34237

Table 3. The estimated weight (lbs.) of fishes caught by sport fishermen in the study area on weekdays and weekends during 1977, 1978 and 1979.

Species	Weekdays		Weekends		Total	
	1977	1978	1977	1978	1977	1978
Spotted Seatrout	10491	21199	2934	9493	13425	30692
Sand Seatrout	6368	8579	1915	4628	8283	13207
Atlantic Croaker	1733	3856	2655	2031	4388	5887
Red Drum	5001	3963	9612	3431	14613	7394
Black Drum	0	1652	0	143	0	1795
Southern Flounder	1358	5207	1385	864	2743	6071
Sea Catfish	21159	7310	7481	4206	28640	11516
Sheepshead	523	7455	858	3662	1381	11117
Spanish Mackerel	1856	6642	8980	5194	10836	11836
Other Species	18909	15684	39478	21063	58387	36747
TOTALS	67398	81547	75298	54715	142696	136262
				15583		39425

Table 4. The estimated weight (lbs.) of fishes caught by commercial fishermen in the study area on weekdays and weekends during 1977, 1978 and 1979.

Species	Weekdays			Weekends			Total	
	1977	1978	1979	1977	1978	1979	1977	1978
Spotted Seatrout	7463	1848	491	1242	0	0	8705	1848
Sand Seatrout	0	145	0	0	0	0	0	145
Atlantic Croaker	338	0	0	0	0	0	338	0
Red Drum	122000	427	0	161	0	0	122161	427
Black Drum	0	0	0	0	0	0	0	0
Southern Flounder	90	27	0	0	0	0	90	27
Sea Catfish	22667	0	0	222	22282	0	22889	22282
Sheepshead	3777	0	0	167	0	0	3944	0
Spanish Mackerel	75556	321	96	10783	2289	0	86339	2610
Other Species	325226	1285	11099	12348	0	0	337574	1285
TOTALS	557117	4053	11686	24923	24571	0	582040	28624
								11686

The estimated number of fishes caught by sport fishermen at Cat, Ship, and Horn Islands during 1977, 1978, and 1979 are shown in Table 5. The greatest number of fishes in 1977 were caught at Ship Island (31,283), with Horn Island (23,187) second, and Cat Island (21,840) third. In 1978 the greatest catch of fishes occurred at Cat Island (57,124); succeeded by catches at Ship Island (28,859) and Horn Island (26,185). The greatest number of fishes in 1979 were caught at Horn Island (16,867). Cat Island accounted for 13,633 fishes and Ship Island 3,739.

The estimated weight of fishes caught by sport fishermen at Cat, Ship, and Horn Islands during 1977, 1978, and 1979 are shown in Table 6. In 1977 the greatest weight of fishes was caught at Ship Island (60,609 pounds). The greatest catch by weight in 1978 occurred at Cat Island (50,462 pounds). Horn Island accounted for 50,228 pounds and Ship Island for 35,572 pounds. The greatest weight of fishes was caught at Horn Island (24,135 pounds) in 1979. Cat Island and Ship Island accounted for 10,436 and 4,854 pounds respectively.

The estimated weight of fishes caught by commercial fishermen at Cat, Ship, and Horn Islands during 1977, 1978, and 1979 are shown in Table 7. In 1977 Horn Island was estimated to have the highest catch (433,666 pounds) when compared to Ship (124,429 pounds) and Cat (23,945 pounds) Islands. In 1978 although catches were estimated to be greatly reduced, Horn Island exhibited a total commercial catch of 27,451 pounds. Only 1,173 estimated pounds of fishes were caught at Cat Island and none at Ship Island. In 1979, the total estimated commercial catch of 11,686 pounds was taken at Cat Island.

Table 5. The estimated number of fishes caught by sport fishermen at Cat, Ship, and Horn Islands during 1977, 1978 and 1979.

Species	Cat Island			Ship Island			Horn Island			Total		
	1977	1978	1979	1977	1978	1979	1977	1978	1979	1977	1978	1979
Spotted Seatrout	4375	23908	1242	4951	4159	211	83	2185	9242	9409	31354	10695
Sand Seatrout	4935	11023	391	952	4699	531	12	2498	853	5899	18218	1775
Atlantic Croaker	2926	7018	1084	1933	1756	494	762	2046	234	5621	10820	1812
Red Drum	541	1295	718	1292	1241	75	227	801	1113	2060	3337	1906
Black Drum	0	0	0	0	34	15	0	129	0	0	163	15
Southern Flounder	1716	916	0	34	5400	267	113	544	81	1863	6860	348
Sea Catfish	2168	2390	1942	10826	2960	1217	5135	2525	1140	18129	7875	4299
Sheepshead	235	105	282	200	901	147	158	6956	90	593	7962	519
Spanish Mackerel	378	115	1458	2714	3258	508	6436	4041	3335	9528	7414	5301
Other Species	4564	10354	6516	8378	4451	274	10261	4461	777	23203	19272	7567
TOTALS	21840	57124	13633	31283	28859	3739	23187	26185	16865	26305	113275	34237

Table 6. The estimated weight (lbs.) of fishes caught by sport fishermen at Cat, Ship, and Horn Islands during 1977, 1978 and 1979.

Species	Cat Island			Ship Island			Horn Island			Total	
	1977	1978	1979	1977	1978	1979	1977	1978	1979	1977	1978
Spotted Seatrout	7816	20136	857	5500	5446	437	109	5110	11091	13425	30692
Sand Seatrout	7084	8275	195	1187	3314	398	12	1618	178	8283	13207
Atlantic Croaker	1556	3541	585	2401	1287	492	431	1059	117	4388	5887
Red Drum	1079	1673	1435	8651	2835	1357	2883	2886	4369	14613	7394
Black Drum	0	0	0	0	1366	30	0	429	0	0	1795
Southern Flounder	2523	1424	0	69	4108	327	151	539	36	2743	6071
Sea Catfish	2103	1722	1697	24476	4163	390	2061	5631	923	28640	11516
Sheepshead	585	653	328	483	1192	187	313	9272	73	1381	11117
Spanish Mackerel	700	210	2038	4662	6894	872	5474	4732	5798	10836	11836
Other Species	7381	12828	3301	23180	4967	364	27826	18952	1550	58387	36747
TOTALS	32827	50462	10436	70609	35572	4854	39260	50228	24135	142696	136262
											12385
											771
											1194
											7161
											30
											363
											3010
											588
											8708
											5215
											39425

The mean weight (lbs.) of fishes caught by sport fishermen in the study area on weekdays and weekends during 1977, 1978, and 1979 are shown in Table 8. With the exception of Black Drum (Pogonias cromis) and the Spanish Mackerel (Scomberomorus maculatus) the mean weights of fishes caught in 1978 were less than those caught in 1977. From 1978 to 1979 the average size of fishes caught decreased except for Spotted Seatrout. On the average of those species that showed a reduction in mean weight, this decrease represented a 34% reduction in mean weight size from 1977 to 1978 and a 60% decrease from 1978 to 1979. Spanish Mackerel increased on the average of 40% in total weight harvested from 1977 to 1978 and 26% from 1978 to 1979. No weight percentage determination can be given for Black Drum since the estimated catch for 1977 was 0, but decreased 82% from 1978 to 1979. The mean weight of Spotted Seatrout, Red Drum, Southern Flounder (Paralichthys lethostigma), Spanish Mackerel, and a grouping called "other species" which include several species of sharks, Lady Fish (Elops saurus), Southern Kingfish (Menticirrhus americanus), Spot (Leiostomus xanthurus), Pinfish (Lagodon rhomboides) was greater on weekend catches in 1977. In 1978 the mean weight of Spotted Seatrout, Atlantic Croaker (Micropogon undulatus), Red Drum, Southern Flounder, and Sea Catfish (Galeichthys felis) was greater in the weekend catches.

The mean weight and percentage of catch by areas of fishes caught by sport fishermen in 1977 are shown in Table 9. Spotted Seatrout, Sand Seatrout (Cynoscion arenarius) and the grouping of "other species" and contributed 22% or more to the catch at Cat Island. Sea Catfish and "other species" made up 35% and 33% respectively of the catch at Ship Island.

Table 8. The mean weight (lbs.) of fishes caught by sport fishermen in the study area on weekdays and weekends during 1977, 1978 and 1979.

Species	Weekdays		Weekends		1977	Total 1978	1979
	1977	1978	1977	1978			
Spotted Seatrout	1.38	.88	1.61	1.32	1.43	.98	1.15
Sand Seatrout	1.84	.78	.79	.65	1.40	.72	.43
Atlantic Croaker	.96	.51	.69	.63	.78	.75	.65
Red Drum	5.68	2.19	8.14	2.24	7.09	2.22	3.75
Black Drum	0	18.15	0	1.99	0	11.01	1.00
Southern Flounder	1.31	.87	1.67	1.02	1.47	.88	1.04
Sea Catfish	1.90	1.39	1.07	1.60	1.57	1.46	.70
Sheepshead	3.76	1.73	1.89	1.00	2.33	1.40	1.13
Spanish Mackerel	1.38	1.93	1.10	1.30	1.14	1.60	2.02
Other Species	2.19	2.32	2.71	1.68	2.52	1.59	.68

Table 9. The mean weight (lbs.) and percentage of catch by areas of fishes caught by sport fishermen in 1977.

Species	Cat Island		Ship Island		Horn Island		Total	
	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent
Spotted Seatrout	1.79	24	1.11	8	1.31	1	1.43	9
Sand Seatrout	1.44	22	1.25	1	1.00	1	1.40	6
Atlantic Croaker	0.53	5	1.24	2	.57	1	0.78	3
Red Drum	5.69	9	6.69	12	12.70	7	7.09	10
Black Drum	0.00	0	0.00	0	0.00	0	0.00	0
Southern Flounder	1.47	8	1.97	1	1.34	1	1.47	2
Sea Catfish	0.97	6	2.26	35	.40	5	1.58	20
Sheepshead	2.49	2	2.42	1	1.98	1	2.33	1
Spanish Mackerel	1.85	2	1.72	7	0.85	13	1.14	8
Other Species	1.62	22	2.77	33	2.71	70	2.52	41

Other species constituted 70% and Spanish Mackerel made up 13% of the sport catch at Horn Island. Contributions from other fish categories were of little significance. Moving eastward from Cat Island the Spotted Seatrout, Sand Seatrout, Atlantic Croaker, Southern Flounder, and Sheepshead were represented less in the creel. Red Drum were more prevalent at Ship Island while Spanish Mackerel and "other species" were predominant in the catches at Horn Island.

The mean weight and percentage of catch by areas of fishes caught by sport fishermen in 1978 are shown in Table 10. Spotted Seatrout, Sand Seatrout, and Atlantic Croaker were represented less in the creel eastward of Cat Island. Red Drum, Black Drum, Southern Flounder, Sea Catfish, and Spanish Mackerel increased in percentage of catch at Ship Island. Sheepshead and "other species" were more dominant in the creel at Horn Island. Although Spotted Seatrout comprised a smaller percentage of the catch at Horn Island, the mean size was larger, as were the sizes of most species of fishes caught at Horn Island.

Table 11 represents the mean weight and percentage of catch of fishes caught by sport fishermen at each study area in 1979. The grouping "other species" and Spanish Mackerel made up 32% and 19% of the catch respectively at Cat Island. Red Drum and Spanish Mackerel made up 28% and 19% of the catch at Ship Island. Spotted Seatrout comprised 45% of the catch at Horn Island while Red Drum comprised 18%. The "other species" were of less significance at the islands as designated. Except for Sea Catfish, Spanish Mackerel, and the grouping "other species" the fishes caught at Ship Island had higher mean weights than those fish caught in the other areas. Mean weights for Sea Catfish were greater at Cat Island. Spanish

Table 10. The mean weight (lbs.) and percentage of catch by areas of fishes caught by sport fishermen in 1978.

Species	Cat Island		Ship Island		Horn Island		Total	
	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent
Spotted Seatrout	0.84	40	1.31	15	2.34	10	0.97	22
Sand Seatrout	0.75	15	0.71	9	0.65	3	.73	10
Atlantic Croaker	0.50	7	0.73	4	0.52	2	.54	4
Red Drum	1.29	4	2.29	8	3.60	6	2.22	5
Black Drum	0.00	0	10.18	4	3.33	1	11.01	1
Southern Flounder	1.55	3	.76	12	.99	1	0.89	5
Sea Catfish	0.72	4	1.41	12	2.23	11	1.48	9
Sheepshead	6.22	1	1.32	3	1.33	19	1.40	8
Spanish Mackerel	1.83	1	2.12	19	1.17	9	1.60	9
Other Species	1.24	25	2.12	14	4.25	38	1.91	27

Table 11. The mean weight (lbs.) and percentage of catch of fishes caught by sport fishermen at each study area in 1979.

Species	Cat Island		Ship Island		Horn Island		Total	
	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent	Mean Wt. (lbs.)	Percent
Spotted Seatrout	.69	8	2.07	9	1.2	45	1.15	31
Sand Seatrout	.49	2	.74	8	.20	1	.43	2
Atlantic Croaker	.53	6	.99	10	.50	1	.65	3
Red Drum	1.99	14	18.09	28	3.92	18	3.76	18
Black Drum	0	0	2.00	1	0	0	2.00	1
Southern Flounder	0	0	1.22	7	.44	1	1.04	1
Sea Catfish	.88	16	.32	9	.80	3	.70	8
Sheepshead	1.16	3	1.27	3	.81	1	1.13	1
Spanish Mackerel	1.39	19	1.71	18	1.73	1	1.64	22
Other Species	.50	32	1.32	7	1.99	13	.68	13
Area Average	.76		1.29		1.43		1.15	

Mackerel and the grouping "other species" were greater at Horn Island.

The catch/unit effort (lbs./hr. and numbers/hr.) by sport fishermen and (lbs./hr.) by commercial fishermen on weekdays, weekends, and by areas during 1977, 1978, and 1979 are shown on Table 12. The catch per unit effort (CPU) by sport fishermen and commercial fishermen was highest on weekdays rather than weekends. Catch/unit effort (CPU), both in lbs./hr. and nos./hr. for sport fishermen was higher in 1978 than in 1977 with the exception of sport catches of 1.85 lbs./hr. (vs. 1.47 lbs. in 1978) and 1.43 pounds per hour (1.35 lbs. in 1978) at Ship Island. With the exception of weekend catches in 1978 (41.30 lbs./hr.) the 1977 CPU was higher for commercial fishermen. The CPU for weekends in 1977 was 20.80 lbs./hr. In 1979 the CPU by sport and commercial fishermen was highest on weekdays rather than weekends. Since there were no interviews of commercial fishermen at Ship and Horn Islands the total CPU was estimated to be 8.20 lbs./hr at Cat Island. For sport fishermen the highest CPU was in lbs./hr. at Ship Island (2.33) with 1.76 lbs./hr. and .73 lbs./hr. at Horn and Cat Islands respectively. The CPU in nos./hr. was greatest at Horn Island (1.20) followed by Cat Island (.95) and Ship Island (.33).

Analyzing the totals for the three years, 1978 offered the best sport fishing. Commercial fishing was most productive in 1977. The CPU for sport fishermen for 1977 was 1.34 lbs./hr. and .71 fish/hr. In 1978 fishing had improved with CPU of 1.43 lbs./hr. and 1.24 fish/hr. The CPU for commercial fishermen was 101.46 lbs./hr. in 1977 and 4.79 lbs./hr. in 1978.

Table 13 provides information on the professions of the sport fishing public based on actual interviews for 1977, 1978, and 1979. Almost half of the sport fishermen in 1977, 1978 and 1979 (47%, 46% and 40% respectively) were categorized by computer as "other" rather than the specific professions

Table 12. Catch/unit effort (lbs./hr. and numbers/hr.) by sport and (lbs./hr.) by commercial fishermen on weekdays, weekends, and by areas during 1977, 1978, and 1979.

Type	Sport Fishermen					Commercial Fishermen			
	Pounds/Hour		Numbers/Hour			Pounds/Hour			
	1977	1978	1979	1977	1978	1979	1977	1978	1979
Weekdays	1.85	1.47	.88	0.99	1.27	1.30	121.17	0.82	8.20
Weekends	1.07	1.35	.57	0.57	1.19	.65	20.80	41.30	0.00
Cat Island	1.39	1.61	.73	0.92	1.81	.95	7.78	0.69	8.20
Ship Island	1.43	1.35	2.33	0.63	1.10	.33	219.07	0.00	0.00
Horn Island	1.16	1.32	1.72	0.69	.69	1.20	201.64	11.027	0.00
TOTAL	1.34	1.43	.99	0.71	1.24	.86	101.46	4.79	8.20

Table 13. Professions of sport fishermen by percent interviewed in the study area during 1977, 1978 and 1979.

Profession	1977	1978	1979	Average
Professional	19%	17%	16%	17%
Businessmen	8%	10%	17%	12%
Small Businessmen	10%	4%	6%	7%
Skilled craftsmen	16%	18%	18%	17%
Commercial fishermen	0%	1%	0%	1%
Salesmen	3%	4%	3%	3%
Other	45%	46%	40%	44%

listed. The 47%, 46% and 40% were composed of previously retired individuals and students. They had more time to fish than did salesmen which accounted for an average of 3% of the fishermen for the three year study.

Commercial fishermen that derived their total income from commercial fishing accounted for 72% of the people in 1977, 77% in 1978, and 100% in 1979 (Table 14). The remaining commercial fishing activities could be considered to be a part time effort by those of other professions.

The residence by percent of interviewed sport and commercial fishermen in the study area during 1977, 1978 and 1979 are illustrated on Table 15. During 1977, 1978 and 1979, 91%, 84% and 90% of the sport fishermen respectively were residents of Mississippi. In 1977, 1978, and 1979, 92%, 100%, and 100% of the commercial fishermen respectively were residents of Mississippi.

The proportion of time during a fishing trip that sport fishermen fished in Louisiana waters for the study areas during 1977, 1978 and 1979 is shown in Table 16. In 1977 (97%), 1978 (91%) and 1979 (90%) the majority of sport fishermen spent less than 20% of their time fishing in Louisiana waters. Only 1% in 1977 and 1978 spent 81% to 100% of the fishing trip in Louisiana waters. For 1979 the percentage was zero for this category.

Table 17 indicates the average trip length (hrs.) for sport fishermen. No trend was noticeable as to the preferred fishing area as judged by trip length. The average trip length in 1977, 1978 and 1979 was 3.7, 3.2 and 3.8 hours respectively. Average length for the study period was 3.5 hours.

Table 14. Professions of commercial fishermen by percent interviewed in the study area during 1977, 1978 and 1979.

Profession	1977	1978	1979
Professional	0%	0%	0%
Businessmen	16%	0%	0%
Small businessmen	0%	0%	0%
Skilled craftsmen	0%	9%	0%
Commercial fishermen	72%	77%	100%
Salesmen	0%	0%	0%
Other	12%	14%	0%

Table 15. Residence by percent of interviewed sport and commercial fishermen in the study area during 1977, 1978 and 1979. Percentages in parentheses indicate commercial fishermen.

Residency	1977	1978	1979
Mississippi	91% (92%)	84% (100%)	90% (100%)
Louisiana	4% (8%)	10% (0%)	3% (0%)
Other	5% (0%)	6% (0%)	7% (0%)

Table 16. Proportion of time of a fishing trip sport fishermen fished in Louisiana waters in the study area during 1977, 1978 and 1979.

Proportion of time fished in Louisiana	1977	1978	1979
0 - 20%	97%	91%	90%
21 - 40%	2%	3%	7%
41 - 60%	0%	2%	1%
61 - 80%	0%	1%	2%
81 - 100%	1%	1%	0%

Table 17. Average trip length (hrs.) for sport fishermen according to year by area. Yearly trip average and overall study period average were also determined from postal card survey.

Year	Area	Mean trip length	Average by year	Average study period
1977	Cat Island	4.6	3.7	3.5
1977	Ship Island	4.6		
1977	Horn Island	2.5		
1978	Cat Island	2.4	3.2	
1978	Ship Island	4.2		
1978	Horn Island	3.4		
1979	Cat Island	3.6	3.8	
1979	Ship Island	5.1		
1979	Horn Island	2.9		

Figure 8 shows the results of the 14 gill net samples. The size range of fish obtained by each of the three mesh sizes is illustrated. Table 18 presents seldom caught species of fish, the length of each, and the mesh sizes in which they were caught. Indications are that the larger mesh size catches the larger fish but also there is evidence as in Mullet that the largest mesh size catches the widest range of fish. The smallest mesh size however, catches larger numbers of fishes for most species. Catches of numerous small size fishes such as Mullet and Spotted Seatrout is important in that this mesh size may impact the resources and lend to over-utilization.

Table 19 shows the results of the aerial counts of sport and commercial fishermen from October 14, 1977 through December 31, 1979. Indications are that sport fishing activities during the period of October 14 through December 31 of each year is very similar, being 106, 127, and 105 for 1977, 1978 and 1979 respectively. Commercial activities dropped 6, 5, and 0 during the same period of three years. Sport fishermen counts for the full years of 1978 and 1979 are 1253 and 1373 respectively, thus showing a slight increase for 1979. For both years (1978, 1979) the highest counts occurred at Horn Island (616 and 537). Ship Island accounted for 343 (1978) and 470 (1979) fishermen while Cat Island recorded 294 (1978) and 366 (1979). During 1979 sport fishermen counts increased from the 1978 counts at Cat and Ship Island whereas Horn Island indicated a decrease. At all three islands commercial fishermen counts dropped during 1979 from 40 to 18 fishermen.

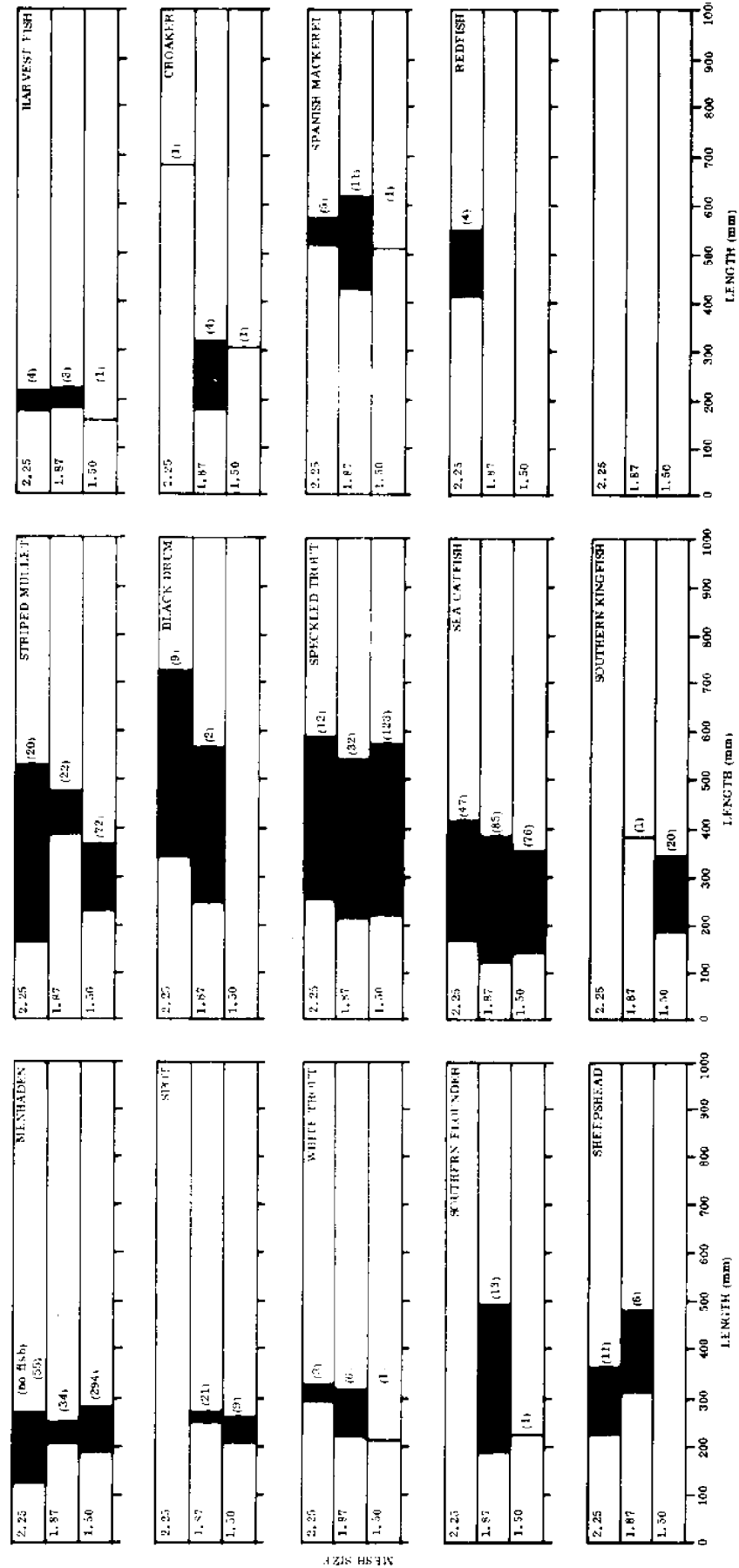


Figure 8. Size ranges of fish captured by each of three gill net mesh sizes. Number in parenthesis represent number of fish caught.

Table 18. Seldom caught species and length of each collected with gill nets according to differing mesh sizes.

Species	Length (mm)	Mesh Size (in.)
Alabama Shad	604	1.50
Smalltooth Sawfish	1028	2.25
Blacktip Shark	1000	2.25
	1000	1.50
	1000	1.50
	1000	1.87
Ladyfish	520	1.50
Alligator Gar	1000	1.50
Bluefish	203	1.87
	420	2.25
Gafftopsail Catfish	415	1.87

Table 19. Aerial counts of sport and commercial fishermen in 1977, 1978 and 1979 at Cat, Ship, and Horn Islands.

Island	October 14 - Dec. 31			Total Count		
	1977	1978	1979	1977	1978	1979
Cat Island						
Sport	46	18	42	42	294	366
Commercial	4	1	0	4	20	8
Ship Island						
Sport	37	40	39	37	343	470
Commercial	0	0	0	0	3	5
Horn Island						
Sport	23	69	24	23	616	537
Commercial	2	4	0	2	17	5
Total						
Sport	106	127	105	106	1253	1373
Commercial	6	5	0	6	40	18

* 1977 aerial survey was not started until October 14, 1977.

DISCUSSION

The three years of data represents information on the sport and commercial catch that was non-existent at the barrier islands prior to this study. Information contained herein can be used as a modest base to manage the fin fish resources along the barrier islands.

The results indicate from interview data that fishing pressure dropped off significantly in 1979. Aerial counts however do not support the findings of the fishing interviews. Aerial counts in 1979 indicated a slight increase in fishing pressure over 1978. The number of interview days (two/week), according to statistical design, was the minimum number that could allow a reliable estimate of fishing pressure. One probable reason for a lower estimate of fishing effort in 1979 was loss of survey days due to rough seas and outboard motor breakdowns. Seldom were flight days lost due to weather, thus they are a more reliable indicator of fishing pressure.

The greatest fishing pressure occurred on weekends, however, fishing harvest was greatest on weekdays. Indications are that more conscientious and consistent fishermen fish on weekdays. This was revealed by distinguishing between the differing groups of fishermen. Many of the weekday fishermen are retired persons and can fish any day of the week. The heavier fishing pressure on the weekends appeared to disturb and break up fish schools, which reduced the harvest. Fishing effort at the three barrier islands was almost equally divided. Most fishermen fish the island closest to their homes. As an example, not many residents of Pascagoula fished Cat Island.

The commercial activities dropped during the three years of the study. This was due mainly to the closing of the study area to commercial gill netting between May 15 through September 15 in 1978 and 1979. This would be the time interval in which the greatest commercial fishing effort would have taken place. In contrast to sport fishing effort, commercial fishing effort made up less than 10% of the total fishing pressure. The catch from 1977, which is the only year that would give some indication of commercial activity, was 582,040 pounds of fish. The sport catch was estimated to be 142,696 pounds. Fifty-eight percent of the commercial catch was categorized as "other species" and was primarily composed of Mullet (Mugil cephalus). Of the remaining 42%, the important species such as Red Drum, Spanish Mackerel, and Spotted Seatrout comprised 21%, 15%, and 1% respectively. Other species caught were of lesser significance to both the sport and commercial fishermen. The commercial fishermen seemed to have confined their activities to the weekdays. Apparently weekend commercial fishing was not profitable.

Prior to this research, reports suggest that fishing in the study area was very poor. The fish contributing to this fishery would have belonged to the 1973 and 1974 year classes. These two years were characterized by heavy flooding along the Northern Gulf of Mexico. Flooding reduced reproductive success, survival, and almost eliminated the 1973 and 1974 year classes of many important species (e.g. Spotted Seatrout). Larger numbers and smaller sizes of fish harvested in 1978 and 1979 indicate that reproductive success increased during 1976 and 1977. These fishes would have entered the fishery in 1978 and 1979. Fishing improved because young fish were entering the fishery. Unfortunately at this time regulations

were levied against commercial fishing after which fishing improved, suggesting that commercial fishing activities were depleting the stocks rather than poor reproductive success due to environmental conditions. It is not felt that fishing improved due to netting restrictions, but that environmental conditions were conducive to increased recruitment by growth.

The three islands studied were three slightly different habitats. Generally speaking, salinities and turbidities increased from west to east. Waters around Horn Island were more marine and Cat Island more brackish. As a result Spotted Seatrout were more numerous at Cat Island, while Spanish Mackerel and large Spotted Seatrout were more numerous at Horn Island. Ship Island seemed to be the preferred habitat for Red Drum.

Most of the fishermen are residents of Mississippi. Since there is no saltwater license, they are enjoying this privilege free-of-charge. An imposed saltwater license would provide funds to continue studies such as this and other management oriented research. Without research dollars, management agencies cannot obtain facts to base management decisions on, and thus must often yield to political factions which may not be in the best interest of the resource.

Gill net data suggest that the smallest mesh size ($1\frac{1}{2}$ " bar) would impact the Spotted Seatrout population because of the numbers of fish caught. In the 14 samples taken, 123 Spotted Seatrout averaged 380 mm from $1\frac{1}{2}$ " mesh; 32 from $1\frac{7}{8}$ " mesh averaged 427 mm; and 12 captured Spotted Seatrout from $2\frac{1}{4}$ " mesh averaged 418 mm. Since all the nets were put out adjacent to each other the catch was random and not selective by locating fish schools.

A 2" or 2¼" mesh size allows most of the smaller fish to go through but harvests Spotted Seatrout of 16" average size.

It is not believed that allowing commercial fishermen to fish gill nets less than 600' in length with 2" bar mesh size would impact the Spotted Seatrout fishery. This would especially be true if commercial fishermen are restricted to fishing from sunrise on Monday through noon on Thursday. This would reduce conflicts between sport and commercial fishermen and still allow both factions to utilize the resource.

Continued monitoring of the catch and pressure is necessary to determine the impact on the resource. This would assist in recognizing overfishing of the resource and thus maintain viable populations for many years to come as long as the quality of the habitat is maintained.

RECOMMENDATIONS

1. Continue monitoring by interview and aerial counts the sport and commercial fishing activities along the Mississippi barrier islands.
2. Allow resident commercial fishermen to gill net the barrier islands from sunrise on Mondays through noon Thursdays.
3. Restrict commercial gill netters to one (1) 600' gill net with a bar mesh size no smaller than 2".
4. Initiate action to pass legislation for the above. Funds for the above recommended research and other management oriented research could be provided for by saltwater sport fishing license.

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