SPECIES COMPOSITION, MAGNITUDE AND UTILIZATION OF THE INCIDENTAL CATCH OF THE SOUTH CAROLINA SHRIMP FISHERY

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ABSTRACT

The quantity of fish caught incidental to shrimping activities in South Carolina was estimated by determining fish/whole shrimp ratio from commercial catches. The overall median fish/shrimp weight ratio was 1.94:1; however, the median ratio varied seasonally being smaller from September to December (1.24:1) than from May to August (3.58:1). The confidence interval for this estimate was defined by the 25th and 75th percentiles. An estimated fish catch of between 3,358,000 and 15,197,000 kgs was derived from expansion of detailed ratio estimates derived from this study. Sciaenids were the predominant family during the study except for the months of January and April when clupeids and gadids, respectively, comprised the greatest percentage of the catch. In general, fish caught incidental to shrimping were small; mean total lengths of 25 species ranged from 6.90 to 18.58 cm. At the present time, only a fraction of the total incidental catch is landed; the majority is discarded at sea. This apparently reflects a lack of demand for most species captured. It is estimated that 74% of the flounder catch is landed and sold as food fish compared to less than 2% of the sciaenids and scombrids.

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INTRODUCTION

Shrimp represent the most valuable commercial fishery resource of South Carolina in terms of exvessel dollars (South Carolina Landings, 1974, 1975). In 1975, 4,005,595 kg (8,812,309 lbs) of shrimp (heads-on) were landed having a value to the fishermen of $10,745,504 (Fisheries Statistics Division, Office of Conservation and Management, South Carolina Wildlife and Marine Resources Department). While trawling for shrimp, fishermen catch large quantities of fish. These fish were for many years considered "trash" and discarded. In the last 20 years, however, industrial fisheries have developed in the Gulf of Mexico (Gutherz, et al., 1975; Haskell, 1961; and Rothmayr, 1965), California (Best, 1959), New England (Edwards and Lux, 1958) and North Carolina (Fahy, 1966; Wolff, 1972). In general, the fish are canned for pet food or frozen for mink food or crab pot bait. Bullis and Carpenter (1968) estimated that the United States Atlantic coast south of Cape Hatteras has a resource potential of 2,790 million pounds of industrial fish annually; this was more than 300 times the 1968 level of commercial fishery production. North Carolina is the only state in the region with facilities for processing industrial species. The majority of fish processed in North Carolina are caught incidental to fin fish trawling activities; fish caught incidental to shrimping are generally discarded (Wolff, 1972). Likewise, in South Carolina, Georgia and Florida, shrimpers discard large quantities of fish.

Early estimates (Lunz, 1944) indicated that an average of 36% of shrimp trawl catches in South Carolina consisted of "non-usable fish, crabs and other scrap". The objectives of this investigation were to obtain an estimate of the quantity of fish discarded by the shrimp fleet during each shrimping season and to identify the predominant species in the catch. This information will be utilized to evaluate the economic potential of the near-shore fishery resource of South Carolina.

METHODS

Sampling Design

The major commercial shrimping area extends from Georgetown south to Calibogue Sound. Accordingly, the South Carolina coastline was divided into four sampling areas to encompass this region (Figure 1). Boats from Area 1 fished primarily in the Bulls Bay area; Area 2: off Sullivan and Morris Islands; Area 3: Folly Beach to South Edisto River; and Area 4: South Edisto River to Calibogue Sound. In 1974, sampling included commercial shrimp boats docked at piers in Georgetown, McClellanville, Mt. Pleasant, Folly Beach, Rockville and Beaufort; however, in 1975, sampling was restricted to ports in McClellanville, Mt. Pleasant, Rockville and the Beaufort area.

The South Carolina shrimp fishery is seasonal in nature. The season officially opens in May and closes in December. Species

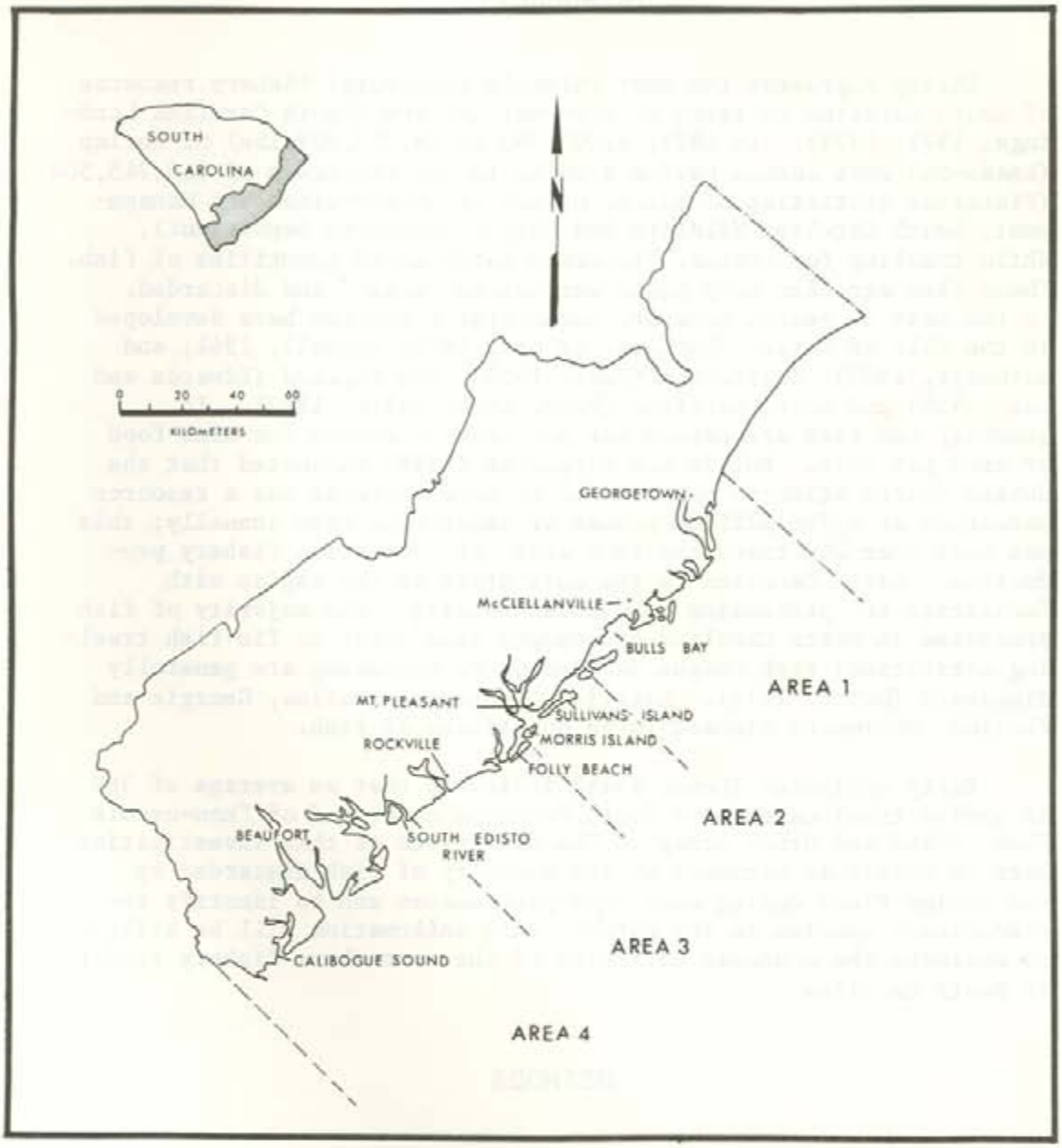

FIGURE 1. Map of the South Carolina coastline indicating the four areas. Shaded area of inset indicates South Carolina coastline.

composition of the fishery fluctuates during the year. Large "roe" white shrimp support the fishery from May to June, young-of-the-year brown shrimp from June to early August, and young-of-the-year white shrimp from mid-August to the end of the season (McKenzie, 1974). In this study, a total of 208 catches of commercial shrimp trawlers were sampled in 1974 and 83 in 1975. Sampling was more intensive from June to August of each year, when two teams of two investigators each sampled a total of four different boats a week, than from September to December when one team sampled on a weekly basis. In the non-shrimping months (January 1 to April 30), fish and shrimp stocks were monitored approximately bi-weekly with the R/V Carolina Pride, a 51-ft vessel of the Division of Conservation and Management, South Carolina Wildlife and Marine Resources Department. Additional R/V Carolina Pride catches were sampled in June 1975. The number of trawls made per day aboard commercial boats ranged from one to six, depending upon abundance of shrimp. Frequency of sampling in each area was dependent upon the activity of the shrimp fleet. If few boats were fishing, it was difficult to make arrangements for on-board sampling. When this occurred, commercial catches were sampled in other areas. Vessels sampled during the survey ranged in length from 39 to 75 feet (Table 1) and all, except one, were double-rigged. In 1973, double-rigged vessels accounted for 68% of the licensed shrimp boats in South Carolina (Rhodes, 1974) and presumably, catch the majority of the shrimp landed in South Carolina. No correlation was found between boat length and engine size (Table 2); vessels 61 to 65 feet in length were powered by engines ranging from 175 to 335 hp. Nets towed by vessels sampled ranged from 35 to 90 feet, headrope length.

Boats fished in depths ranging from 3 to 10 meters (10 to 33 ft) (Table 3); the average fishing depth was 5.3 meters (17 ft). Tow duration was between 0.5 and 3.3 hours (Table 3). Shrimp vessels sampled from May to August 1974, made more tows per day and made tows of shorter length than did vessels sampled during this period in 1975 (Table 4). This difference is attributed to an abundance of the jelly fish, Stomolophus meleagris ("jelly balls" or "cannonballs") which, in 1974, often filled the nets within a half hour, necessitating tows of shorter duration. In 1975, jelly balls were present only in limited numbers and did not seriously interfere with trawling.

On-Board Sampling Procedure

The trawl catch was subsampled by filling a standard 1 bushel wire basket. A representative subsample was obtained by using a flat shovel to sample the catch from at least four areas of the deck. The catch was classified as to: fish, commercial shrimp, tunicates, echinoderms, miscellaneous crustaceans, soft corals, scyphozoans, sponges and horseshoe crabs. Each group of organisms was weighed and the weight recorded directly on computer coding sheets along with the tow location, time of tow, length of tow, boat horsepower, boat length and net size. In 1974, the total weight of shrimp caught per trawl was recorded only periodically; however, in 1975, the total weight of shrimp caught per trawl was

TABLE 1. Number of sampling trips made aboard double-rigged shrimp boats of varying lengths for each area from May to December 1974 and from May to August 1975. ( ) = total number of trawls made during all sampling trips.

BOAT LENGTH (feet)	AREA 1	2	3	4	TOTAL TRIPS	AVERAGE NUMBER OF TRAWLS PER TRIP
39-40				1 (2)	1 (2)	2.0
41-45						
46-50			9 (20)	5 (9)	14 (29)	2.0
51-55	4 (9)	6 (14)	5 (12)	4 (11)	19 (46)	2.6
56-60	5 (14)	4 (9)	8 (16)	7 (13)	24 (52)	2.2
61-65	8 (20)	12 (36)	5 (13)	9 (14)	34 (83)	2.4
66-70	6 (17)	3 (9)	3 (11)		12 (37)	3.1
71-75	4 (18)	8 (18)	4 (9)		16 (45)	2.8
TOTALS	27 (78)	33 (86)	34 (81)	26 (49)	120 (294)	2.4

TABLE 2. Shrimp boats sampled from May 1974 to December 1974 and from May 1975 to Mid-August 1975 classified by length (feet) and engine size (HP).

LENGTH	AREAS				NO. BOATS
(FEET)	1	2	3	4	
36-40				165	1
41-45					
46-50			135,180	180,185 280	5
51-55	255	190,235	150,165 165,165	160,165 220	10
56-60	250,300	185,250 300,335	150,160 160,260	335,380	12
61-65	265,335 335,365	175,260 300,335 335	165,220 250,275	185,235 245,300 335,350	19
66-70	335,335	165,330	335,335		6
71-75	235,330 335	235,250 335,335	335,335		9

TABLE 3. Effort expended and depths fished by vessels sampled from May 1974 to Mid-August 1975. (CP indicates R/V Carolina Pride; all other data from commercial trawlers).

		AVERAGE LENGTH OF TOW (HRS.)	AVERAGE NO. OF TRAWL TOWS PER DAY	AVERAGE HOURS FISHED PER DAY	AVERAGE DEPTH (M)	NO. TRAWL TOWS SAMPLED
1974	MAY	1.1	5.0	5.5	6.0	5
	JUNE	0.8	5.1	4.1	5.1	40
	JULY	2.1	2.9	6.1	3.7	50
	AUGUST	2.3	2.5	5.8	5.2	33
	SEPTEMBER	2.4	2.5	6.0	5.7	27
	OCTOBER	2.4	2.4	5.8	6.5	26
	NOVEMBER	2.7	1.6	4.3	7.4	18
	DECEMBER	2.9	2.6	7.5	7.3	11
1975	JANUARY (CP)	0.5	6.0	3.0	6.1	12
	FEBRUARY (CP)	0.5	3.4	1.7	6.7	27
	MARCH (CP)	0.5	3.0	1.5	6.9	15
	APRIL (CP)	0.5	3.4	1.7	4.1	24
	MAY (CP)	0.5	2.5	1.3	4.6	10
	MAY	2.7	3.5	9.5	4.4	7
	JUNE	2.3	2.6	6.0	4.5	31
	JUNE (CP)	0.5	3.0	1.5	6.3	6
	JULY	2.6	1.9	4.9	5.0	32
	AUGUST	2.6	2.3	6.0	5.3	16

TABLE 4. Seasonal differences in effort for the years 1974 and 1975.

VESSEL TYPE	MONTHS	AVERAGE LENGTH OF TOW (HRS.)	AVERAGE HOURS FISHED PER DAY	AVERAGE NUMBER OF TRAWL TOWS PER DAY
Commercial Trawlers	June to August, 1974	1.7	5.6	3.3
Commercial Trawlers	September to December, 1974	2.5	5.5	2.2
Carolina Pride	January to May, 1975	0.5	1.7	3.4
Commercial Trawlers	June to Mid-August, 1975	2.5	5.5	2.2

routinely estimated by counting the number of 36.4 kg (80 lb) baskets of heads-on shrimp culled from each trawl. The fish fraction of the sample was identified to species and each species weighed and enumerated when time permitted. When large numbers of a species were present, the total number was determined by subsampling. In addition, the total length of at least 25 randomly chosen individuals of the three most abundant species were measured to the nearest centimeter.

Treatment of Data

Ratio Estimates

The ratio of the weight of fish to the weight of heads-on shrimp in the samples was calculated for 290 of 294 trawls (in 4 samples, no shrimp were present). The distribution of these ratios was markedly skewed (Figure 2). Following the recommendations of Dr. Omer Jenkins, the data were log-transformed and the mean and confidence interval were calculated from the transformed data (Figure 3). Ratio estimates were not calculated for the non-shrimping months as shrimp catches in these months were comparatively small, and the object of this investigation was to estimate discards by the commercial shrimp fleet during the shrimping season.

Catch-Per-Unit-Effort

Catch-per-unit-effort data (cpue) are presented as kilograms caught-per-hour (Table 5). Monthly catch rates were calculated for commercial shrimp boats and for the R/V Carolina Pride. The lack of standardization in the shrimp fleet and the use of the R/V Carolina Pride in the non-shrimping months introduced variation into the cpue data. The R/V Carolina Pride towed 2 20-ft try nets compared to the 35 to 90-ft shrimp nets towed by double-rigged trawlers. Considering the difference in headrope length, I assumed the commercial boats to have fishing powers 3 to 7 times greater than those of the research vessel (Table 5). I arbitrarily chose an intermediate factor of 5 to discuss R/V Carolina Pride catch rates with those of commercial vessels.

The total weight of shrimp caught per trawl was routinely recorded in 1975 (68 trawl tows in 3-1/2 months), but infrequently in 1974 (63 trawl tows in 7 months). Some cpue data for 1974 were calculated from catch information reported on a landing ticket system developed by the Fisheries Statistics Section (Rhodes, 1974) and from effort (hours) data recorded by personnel on-board shrimp boats.

Species Composition and Length-Frequency

Species were ranked by number and by weight using computer programs developed at the Marine Resources Research Institute to identify the predominant fish and invertebrate species in shrimp trawl catch for each month, each area and the entire study. Since the total weight of fish or shrimp caught in each trawl was not recorded during the initial phase of the study, the samples could not be

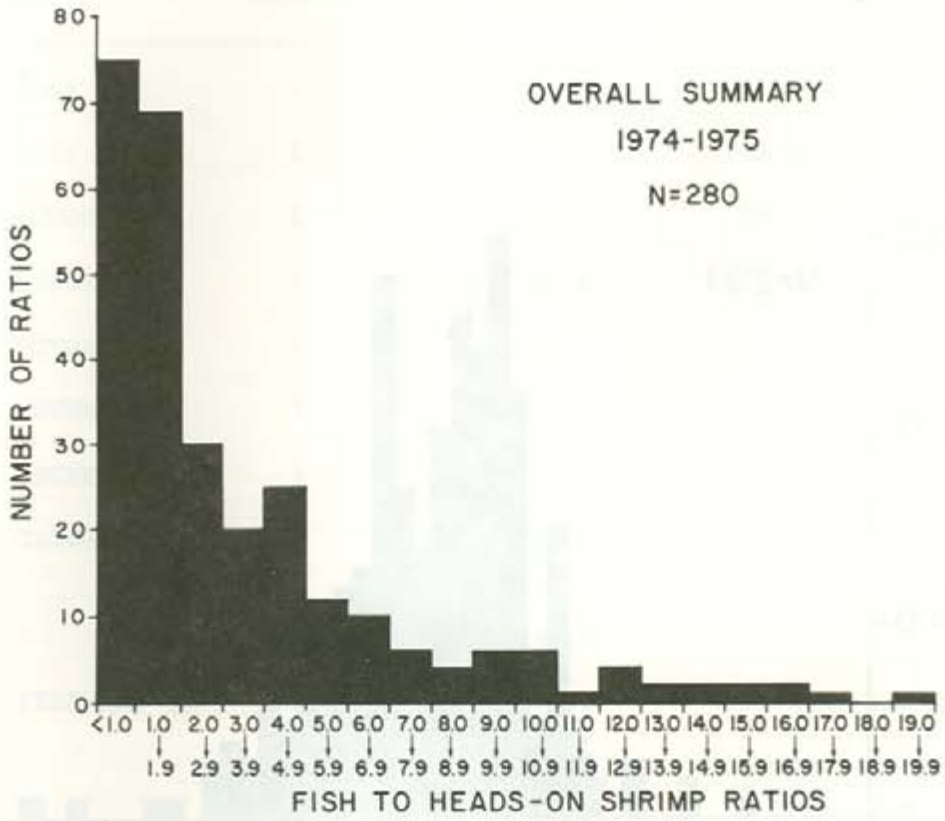

FIGURE 2. Distribution of fish/heads-on shrimp ratios (by weight) calculated from commercial shrimp catches May to December 1974 and May to August 1975 (11 highest ratios not plotted).

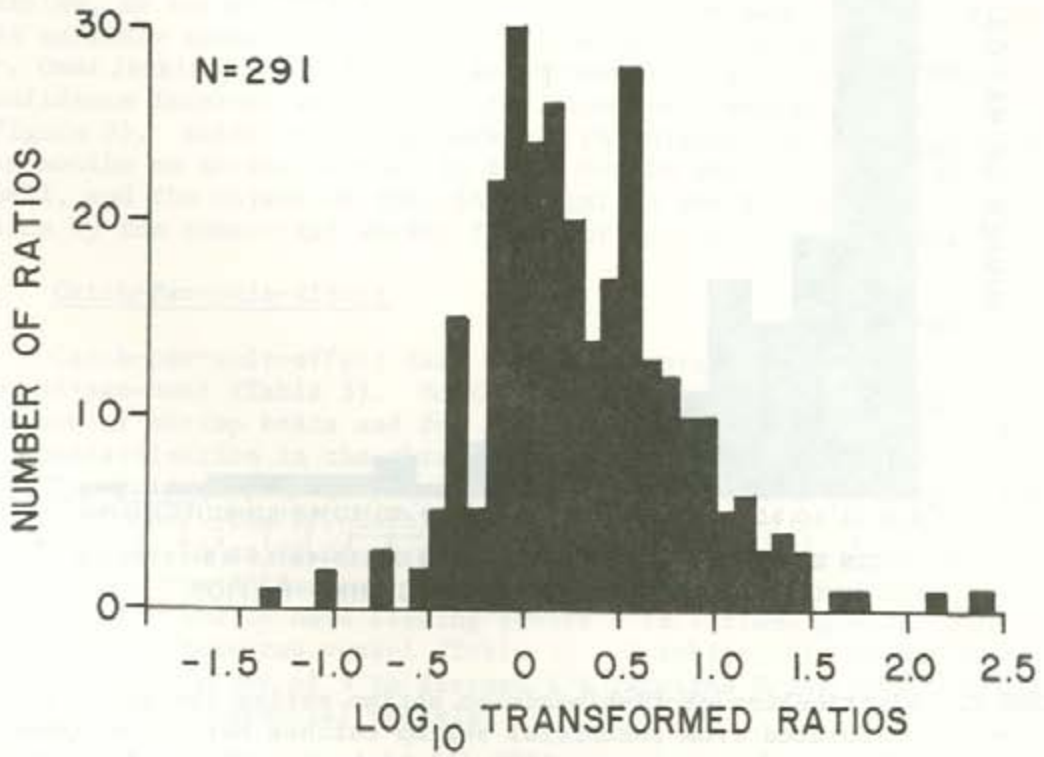

FIGURE 3. Plot of $\log_{10}$ transformed fish/heads-on shrimp ratios (by weight) from commercial shrimp trawlers from May to December 1974 and May to August 1975

TABLE 5. Estimated kilograms of shrimp and fish caught-per-hour by commercial shrimp trawlers and the R/V Carolina Pride. (CP indicates data based on Carolina Pride catches)

YEAR	MONTH	STANDARDIZING FACTOR	SHRIMP (kg/hr)	FISH (kg/hr)	NUMBER OF TRAWL TOWS
1974	JUNE	1	68.6	139.4	23
	JULY	1	51.3	243.5	12
	AUGUST	1	17.3	79.2	9
	SEPTEMBER	1	36.8	14.8	3
	OCTOBER	1	21.9	33.8	7
	NOVEMBER	1	160.3	78.6	5
	DECEMBER	1	24.6	65.5	4
1975	JANUARY (CP)	1	1.5	7.9	11
		3	4.5	23.7	
		5	7.5	39.5	
		7	10.5	55.3	
	FEBRUARY (CP)	1	0.5	29.1	31
		3	1.5	87.3	
		5	2.5	145.5	
		7	3.5	203.7	
	MARCH (CP)	1	4.3	17.9	16
		3	12.9	53.7	
		5	21.5	89.5	
		7	30.1	125.3	
	APRIL (CP)	1	3.3	49.0	20
		3	9.9	147.0	
		5	16.5	245.0	
		7	36.3	343.0	
	MAY (CP)	1	7.4	29.0	9
		3	22.2	87.0	
		5	37.0	145.0	
		7	51.8	203.0	
	MAY	1	20.2	183.7	2
	JUNE (CP)	1	12.8	64.4	2
		3	19.2	109.1	
		5	32.0	198.5	
		7	44.8	277.9	

TABLE 5. (continued)

YEAR	MONTH	STANDARDIZING FACTOR	SHRIMP (kg/hr)	FISH (kg/hr)	NUMBER OF TRAWL TOWS
1975	JUNE	1	33.6	90.4	25
	JULY	1	21.3	97.7	25
	AUGUST	1	18.2	48.4	16

TABLE 5. (continued)

YEAR	MONTH	STANDARDIZING FACTOR	SHRIMP (kg/hr)	FISH (kg/hr)	NUMBER OF TRAWL TOWS
1975	JUNE	1	33.6	90.4	25
	JULY	1	21.3	97.7	25
	AUGUST	1	18.2	48.4	16

weighted by the total catch before ranking. Despite this qualifier, I believe that the data reflect the general trends and changes in species composition occurring in the fishery. Unless otherwise noted, predominant species are discussed in terms of numbers to facilitate comparison with the Marine Resources Research Institute's Estuarine Survey Program and with other data in the literature. An overall summary of the data ranked by numbers and by weight is presented in Appendix Table 1; monthly data ranked by numbers and weight are found in Appendix Table 2.

The mean length, standard deviation, maximum and minimum lengths, and the average weight were determined for each species measured during the study.

RESULTS

Ratio Estimates

Fish/shrimp weight ratios ranged from 0.3:1 to 136.1:1. Only 10 of 290 ratios, however, exceeded 20.0:1. These high fish/shrimp ratios were not characteristic of any class of boats and were preceded or followed by ratios considerably smaller (Figure 4). Most of the high ratios occurred on either the first or the second tow of the day. Only in one instance did a boat return to port after catching a very small amount of shrimp. The variability in ratios was indicated by the catch ratios of one 65 ft boat whose fish/shrimp ratios were uniform from one tow to the next on one sampling day in June (Figure 4, "A"), but fluctuated widely on another day in that month (Figure 4, "A").

The distribution of the individual ratios varied from month to month (Figure 5). With the exception of three months, the average monthly ratios ranged from 1:1 to 3:1; however, the variation between individual ratios within a month as indicated by the 95% confidence limit varied considerably (Table 6). The wide confidence interval for June in both years suggests that ratios in that month typically exhibit wide variation. In the months of September, October, November and December, the majority of the ratios were less than 2:1 and the confidence limit around the mean in these months was comparatively narrow.

The mean ratio estimate had a wide 95% confidence interval. By excluding the 10 highest values (<4% of the samples and possibly anomalous values), the 95% confidence interval of the log-transformed fish/shrimp ratio was reduced from $0.66 \leq 2.22 \leq 31.05$ to $0.22 \leq 1.98 \leq 17.84$. Using the latter figures, I estimated that an average of 6,687,000 kg (14,711,400 lbs) of fish were caught incidental to shrimping in 1974 and 7,930,800 kg (17,447,760 lbs) in 1975. Monthly estimates of fish discards were not made because of the wide confidence limits surrounding monthly mean ratios.

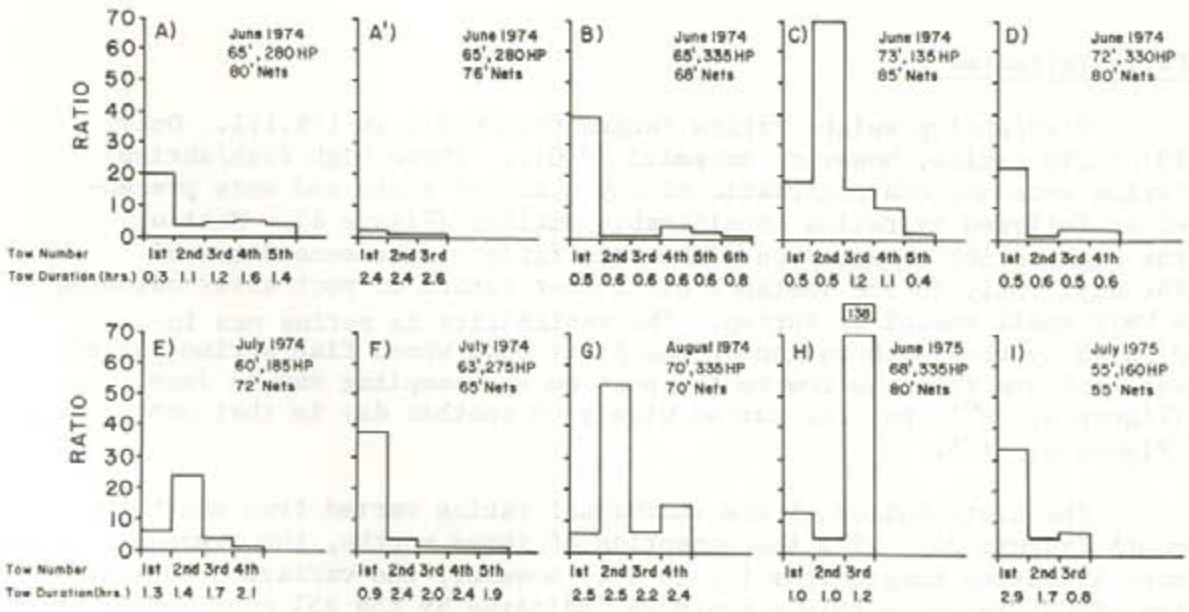

FIGURE 4. "A" to "I" illustrate the variation among those tows having high fish/shrimp ratios and other tows by the same boat during that day. "A'" illustrates that at other times fish/shrimp ratios may be uniform from one tow to the next (A & A''s information is from the same boat on different sampling days).

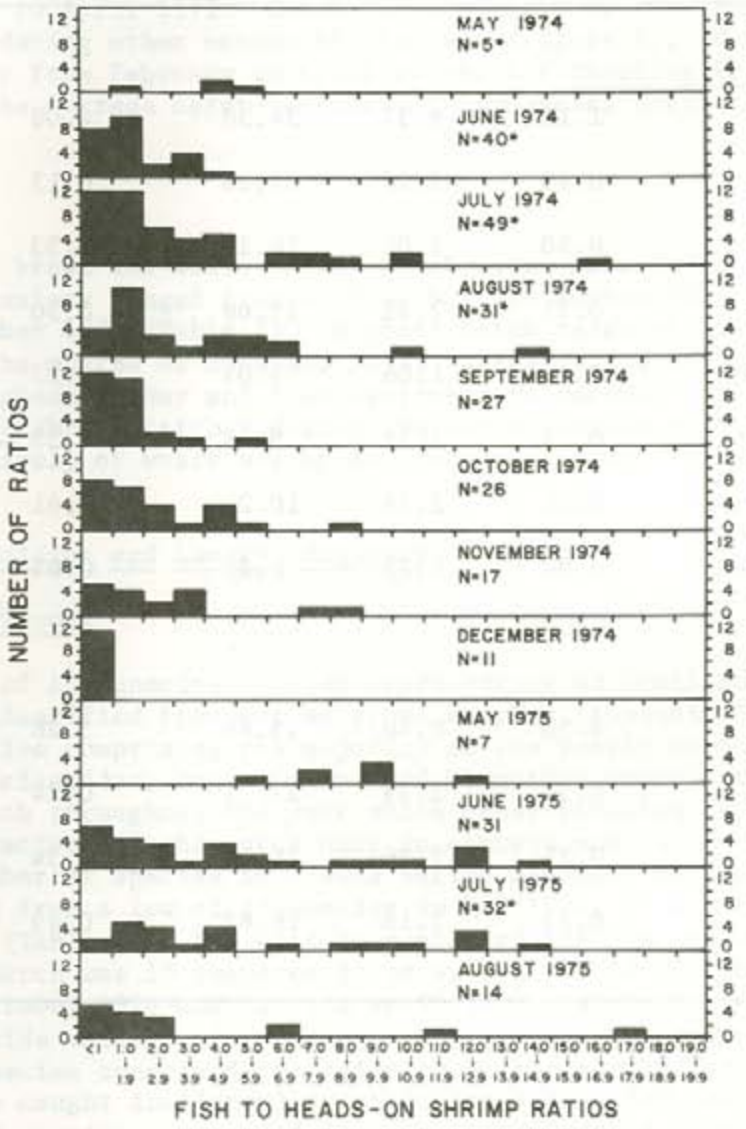

FIGURE 5. Monthly variation in fish/heads-on shrimp ratios derived from commercial shrimp trawler catches. (*) indicates some ratios were greater than 20:1.

TABLE 6. Average monthly fish/heads-on shrimp ratio estimates and associated 95% confidence intervals ($\pm t_{.05}$ standard deviations) calculated from $\log_{10}$ transformed data; ratios greater than 20:1 excluded from computations.

YEAR	MONTH	$-t_{.05}s$	MEAN	$+t_{.05}s$	MINIMUM RATIO	MAXIMUM RATIO	n
1974							
	May	1.18	6.37	34.38	4.08	20.00	5
	June	0.19	2.28	27.16	0.15	18.14	36
	July	0.30	2.06	14.21	0.33	16.37	47
	August	0.31	2.21	15.68	0.30	14.92	29
	September	0.23	1.08	5.01	0.17	5.78	27
	October	0.24	1.56	9.98	0.33	8.78	26
	November	0.31	1.78	10.24	0.61	8.34	17
	December	0.04	0.23	1.21	0.05	0.41	11
1975							
	May	4.50	8.40	15.68	5.28	12.60	7
	June	0.21	2.39	27.71	0.24	12.85	31
	July	0.71	3.36	16.01	0.54	15.00	30
	August	0.25	2.16	18.82	0.49	17.09	14

Catch-Per-Hour Data

Fish

Monthly catch-per-hour rates for fish (all species combined) from commercial vessels ranged from a low of 14.8 kg (32.6 lb) hr^{-1} in September 1974, to a high of 243.5 kg (535.7 lb) hr^{-1} in July 1974 (Table 5); whereas cpue for the R/V Carolina Pride ranged from 39.5 kg hr^{-1} (catch rates multiplied by 5) in January 1975, to 245.0 kg hr^{-1} in April 1975. Catch rates were lower from August to January than during other months of the year (Figure 6). The average catch-per-hour from February to April of the R/V Carolina Pride was higher than the average catch-per-hour of commercial boats from May to December.

Shrimp

Combined brown and white shrimp catch rates calculated from commercial trawlers ranged from 17.3 kg hr^{-1} in August 1974 to 160.3 kg hr^{-1} in November 1974 (Table 7). Highest catch rates of brown shrimp occurred in the months of June and July, whereas white shrimp catch rates were highest in May and from September to December. R/V Carolina Pride shrimp catches during the non-shrimping months consisted almost entirely of white shrimp and ranged from 2.5 to 37.0 kg hr^{-1}.

Species Composition and Length-Frequency

General Trends

A total of 105 species of fish representing 45 families and 15 orders were identified from shrimp trawl samples (Appendix Table 1), with 11 families comprising the majority of the yearly catch (97.54%) (Table 8). Sciaenidae, Engraulidae, and Clupeidae contributed to the total catch throughout the year while other families represented a sizeable fraction of the catch only in certain months (Table 8). The total number of species in trawls varied markedly during the year, ranging from a low of 25 species in May 1974, to a high of 63 in June 1975 (Table 9). The average number of species present from November to March was 35 compared to an average of 52 for the period of June to October 1974 and 55 from April to August 1975. Although there was a wide variety of species in the catches, characteristically, only a few species comprised the majority of the catch (Table 9). In general, fish caught incidental to shrimping are small; mean total lengths of 25 species measured during the study ranged from 6.90 to 18.58 cm (Table 10).

Seasonal Variation

Sciaenids were the predominant family in all months except January and April, when clupeids and gadids, respectively, comprised the greatest percentage of the catch (Figure 7, Table 8). Clupeid representation in the catch fluctuated in an apparent random manner throughout the year. The percentage of gadids in the catch increased

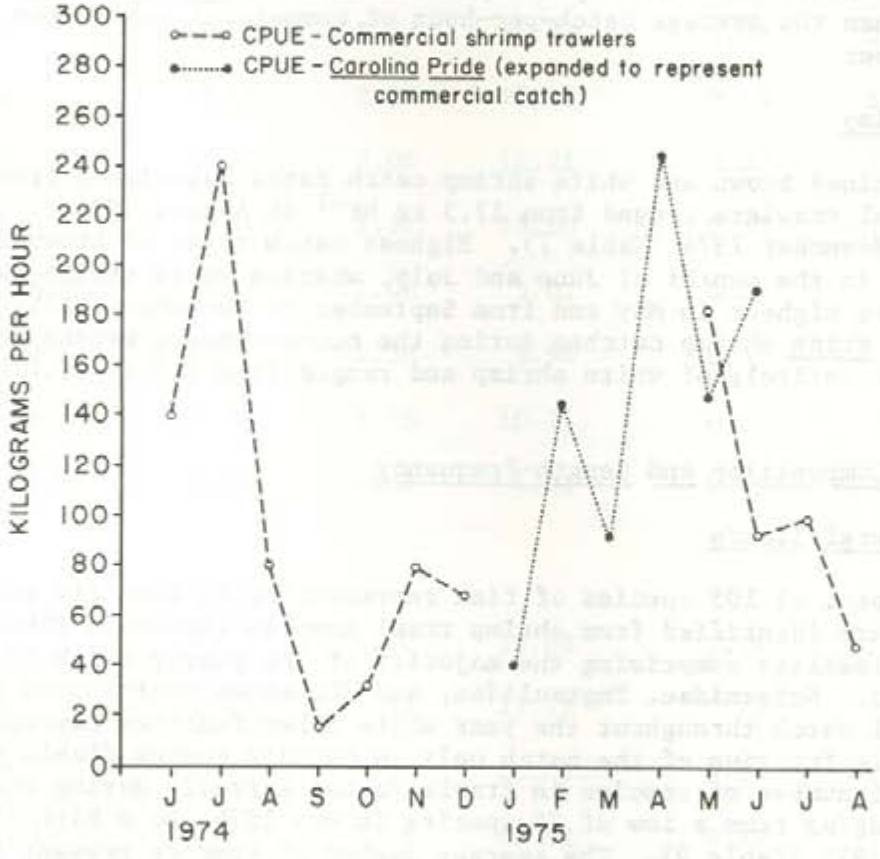

FIGURE 6. Monthly averages of kilograms of fish caught per hour (cpue) by commercial shrimp boats and the R/V Carolina Pride.

TABLE 7. Monthly estimates of kilograms of white and brown shrimp caught-per-hour by commercial vessels and the R/V Carolina Pride (CP) (CP cpue multiplied by 5).

MONTH 1974	CATCH (kg) PER HOUR		
	Both Species	White	Brown
June	68.6	29.9	38.7
July	51.3	5.8	45.5
August	17.3	6.4	10.9
September	36.8	26.0	10.7
October	21.9	20.9	1.0
November	160.3	157.6	2.7
December	24.6	24.6	-
1975			
January CP	7.5	7.4	0.1
February CP	2.5	2.5	-
March CP	21.5	21.5	-
April CP	16.5	16.5	-
May CP	37.0	37.0	-
June CP	32.0	1.8	30.2
May	20.2	20.2	-
June	33.6	6.9	26.7
July	21.3	1.8	19.5
August	18.2	12.9	5.3

TABLE 8. Percent contributuon (by number) of 11 families to the monthly shrimp trawl samples (May through August represents a composite of 1974 and 1975 samples). (-) indicates none in samples during the month.

FAMILY	MONTHS												OVERALL
	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	
Sciaenidae	22.36	68.63	45.52	36.68	45.48	77.79	71.05	62.29	50.55	51.22	45.50	50.44	60.46
Engraulidae	19.71	10.25	4.26	3.83	5.61	6.34	10.39	9.86	16.96	21.06	21.73	16.35	9.16
Clupeidae	40.21	4.41	15.09	2.20	20.90	6.19	5.18	8.24	3.35	5.09	16.37	10.82	8.26
Gadidae	4.33	5.15	21.50	36.94	13.94	0.02	-	-	-	-	-	-	7.30
Carangidae	-	-	-	-	0.09	0.71	2.75	0.94	16.81	1.96	1.85	-	2.56
Bothidae	3.68	1.55	3.91	2.04	1.28	1.56	2.25	2.76	2.27	3.12	4.26	9.29	2.37
Stromateidae	0.08	0.91	3.03	4.22	6.31	0.42	1.52	2.27	2.05	3.35	4.32	0.96	2.26
Cynoglossidae	6.42	3.16	4.32	8.62	0.48	0.12	0.31	0.32	1.02	1.93	0.94	6.25	2.05
Soleidae	0.12	0.16	0.45	3.65	0.92	0.52	0.59	1.33	1.78	1.59	1.41	3.53	1.18
Ariidae	-	-	-	0.08	0.32	2.26	0.43	2.26	0.92	0.53	0.03	-	0.94
Scombridae	-	-	-	-	0.05	0.58	2.23	2.24	2.56	1.06	0.40	-	1.00
TOTALS	97.91	94.21	98.08	98.26	95.38	96.51	96.70	92.51	98.27	90.91	96.81	97.64	97.54

TABLE 9. Total number of species in monthly samples and the number of those species representing 90% or more (by number) of the monthly samples.

Months	Total number of species per month in samples	Number of species representing 90% or more of monthly samples
May	25	9
June	49	8
July	55	10
Aug.	54	12
Sept.	49	13
Oct.	49	14
Nov.	43	12
Dec.	26	9
Jan.	32	6
Feb.	39	6
March	31	8
April	51	8
May	42	10
June	63	9
July	61	13
Aug.	54	14

TABLE 10. Mean length, standard deviation, and size ranges of selected fishes in shrimp trawl samples.

	Mean (cm)	Std. Dev.	Range Minimum	Range Maximum	n
Clupeidae					
Brevoortia tyrannus	15.73	3.15	8.0	28.0	1313
Opisthonema oglinum	12.69	0.95	11.0	7.0	125
Sardinella anchovia	7.36	0.50	7.0	8.0	14
Engraulidae					
Anchoa hepsetus	11.76	0.83	10.0	13.0	17
Anchoa mitchilli	7.08	0.64	6.0	8.0	25
Ariidae					
Arius felis	15.40	9.20	4.0	30.0	25
Gadidae					
Urophycis regis	13.09	2.18	6.0	22.0	975
Pomatomidae					
Pomatomus saltatrix	18.58	1.93	14.0	22.0	24
Carangidae					
Chloroscombrus chrysurus	15.20	1.53	12.0	21.0	25
Sparidae					
Lagodon rhomboides	10.79	1.47	8.0	14.0	75
Cynoglossidae					
Symphurus plagiusa	13.96	1.53	10.0	19.0	323
Sciaenidae					
Bairdiella chrysura	13.14	1.54	10.0	19.0	103
Cynoscion regalis	13.27	3.22	7.0	21.0	144
Larimus fasciatus	13.33	3.66	6.0	21.0	150
Leiostomus xanthurus	13.70	3.12	4.0	25.0	4723
Menticirrhus americanus	15.15	3.36	6.0	28.0	270
Micropogon undulatus	11.03	2.87	4.0	22.0	1624
Stellifer lanceolatus	9.75	2.30	3.0	16.0	894
Scombridae					
Scomberomorus maculatus	17.37	4.20	11.0	28.0	51
Stromateidae					
Peprilus triacanthus	9.52	3.91	4.0	19.0	223
Triglidae					
Prionotus scitulus	14.92	2.72	11.0	22.0	25

TABLE 10. (continued)

	Mean (cm)	Std. Dev.	Range Minimum	Range Maximum	n
Bothidae					
Etropus crossotus	10.47	1.74	7.0	14.0	17
Scophthalmus aquosus	8.49	2.24	6.0	20.0	25
Soleidae					
Trinectes maculatus	6.90	1.01	5.0	10.0	51

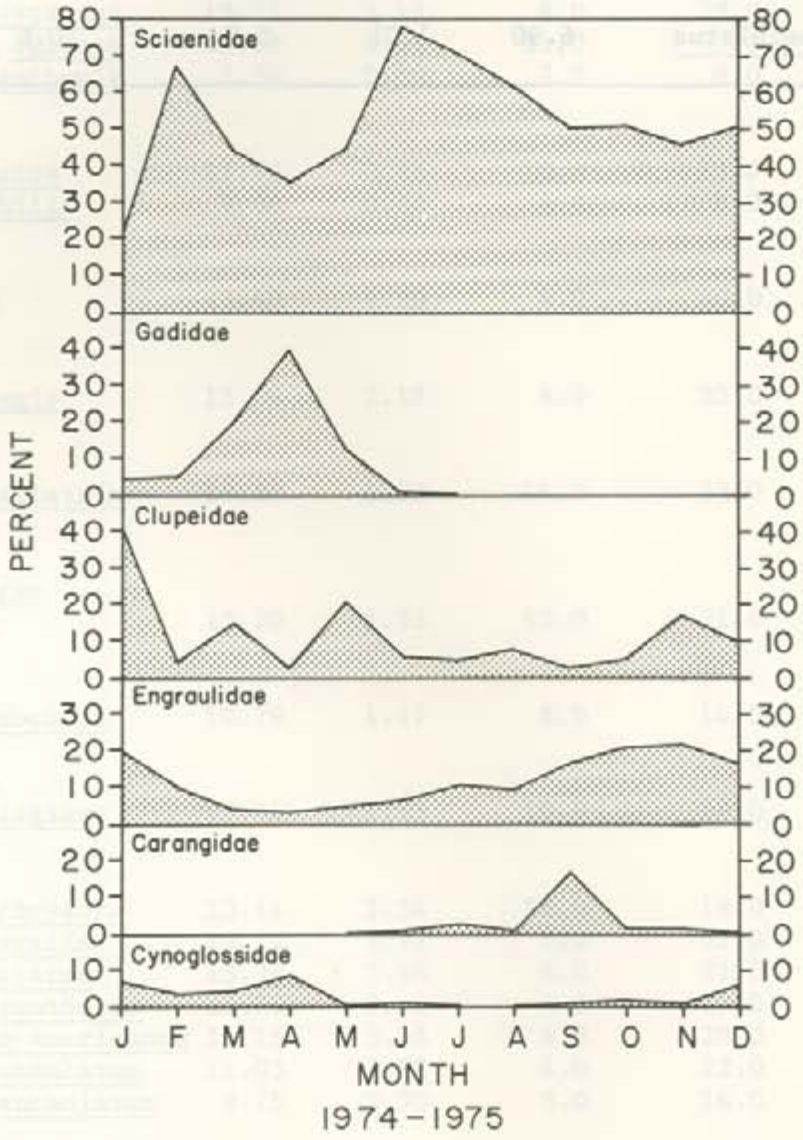

FIGURE 7. Percent contribution of six families to trawler catch samples (January to April data based on R/V Carolina Pride catches; May to December data based on shrimp trawler catches).

gradually from January to April and then decreased rapidly from May to June; after July, they disappeared entirely from the catches. Engraulids comprised 16% or more of the samples from September to January (Table 8) and were most abundant in the samples during October and November. From December to April, the percentage of cynoglossids in the catch ranged from 3.16 to 8.62%; however, they were uncommon in other months. The percentage of carangids in the samples was less than 1% except for the months of July, September, October and November. In September, carangids represented 16.81% of the catches.

Areal Differences in Species Composition

In general, the five predominant species in the samples did not differ markedly among areas (Table 11). Major differences in species composition among areas were often the result of the capture of a schooling species - e.g., Atlantic menhaden, Atlantic bumper, Atlantic thread herring, striped anchovy, bay anchovy - in certain areas and not in others. Certain species appeared to be more common in one area than in another - e.g., sea catfish, Arius felis: Area 4 - while other species fluctuated randomly in abundance from one area to another - e.g., banded drum, Larimus fasciatus.

Sport Fishes Captured by Shrimp Trawlers

Of 40 species listed by Bearden and McKenzie (1972) as sport fishes in South Carolina, 14 were found in shrimp trawl samples (Table 12). However, only 4 of these (Southern kingfish, Menticirrhus americanus; Atlantic croaker, Micropogon undulatus; weakfish, Cynoscion regalis; spot, Leiostomus xanthurus) represented more than 1% (by number) of the annual catch. In general, these fish were of small size; however, spot, Spanish mackerel (Scomberomorus maculatus) and summer flounder (Paralichthys dentatus) were occasionally of marketable size and were culled from the catch for sale.

Major Families

SCIAENIDAE

Sciaenids were the most abundant fishes in shrimp trawl catches. For the sampling period, they represented 60.46% by number of the catch ranging from a low of 22.56% in January to a high of 77.79% in June. Spot, stardrum (Stellifer lanceolatus) and Atlantic croaker were the most abundant species with kingfishes, (Menticirrhus spp), seatrouts (Cynoscion spp) and banded drum also present in numbers at times.

Leiostomus xanthurus. Spot was the most abundant fish in the samples and represented 30.46% of the yearly catch. The percentage of spot in the catches fluctuated during the year in an apparently random manner; catches sampled in January had the smallest percentage of spot (5.08%) while those sampled in February had the highest percentage (65.04%) (Appendix Table 2).

In 1974, the mean size of spot in the samples increased from

TABLE 11. The percent contribution of the five predominant species in Areas 1, 2, 3, and 4 by month from May, 1974, to mid-August, 1975. (CP indicates R/V Carolina Pride catches; all other data based on commercial shrimp trawler samples).

	AREA 1			AREA 2			AREA 3			AREA 4		
MONTH 1974	SPECIES	NO.	%	SPECIES	NO.	%	SPECIES	NO.	%	SPECIES	NO.	%
MAY	NO SAMPLING			Leiostomus xanthurus	680	61.82	NO SAMPLING			NO SAMPLING		
				Stellifer lanceolatus	105	9.55						
				Cynoscion regalis	65	5.91						
				Trichiurus lepturus	44	4.00						
				Micropogon undulatus	25	2.27						
				TOTAL	919	83.55						
JUNE	Leiostomus xanthurus	567	33.29	Leiostomus xanthurus	1274	45.86	Anchoa hepsetus	184	40.71	NO SAMPLING		
	Stellifer lanceolatus	338	19.85	Brevoortia tyrannus	495	17.82	Leiostomus xanthurus	75	16.59			
	Micropogon undulatus	321	18.85	Micropogon undulatus	216	7.78	Stellifer lanceolatus	51	11.28			
	Anchoa hepsetus	148	8.69	Stellifer lanceolatus	178	6.41	Brevoortia tyrannus	33	7.30			
	Menticirrhus americanus	68	3.99	Anchoa hepsetus	155	5.58	Micropogon undulatus	29	6.42			
	TOTAL	1442	84.67	TOTAL	2318	83.44	TOTAL	372	82.30			
JULY	Leiostomus xanthurus	312	25.72	Leiostomus xanthurus	2327	46.02	Leiostomus xanthurus	1277	35.75	Leiostomus xanthurus	62	23.13
	Micropogon undulatus	279	23.00	Anchoa hepsetus	426	8.43	Cynoscion regalis	430	12.04	Micropogon undulatus	51	19.03
	Stellifer lanceolatus	265	21.85	Stellifer lanceolatus	377	7.46	Anchoa hepsetus	402	11.25	Cynoscion regalis	28	10.45
	Anchoa hepsetus	97	8.00	Micropogon undulatus	350	6.92	Micropogon undulatus	360	10.08	Larimus fasciatus	22	8.21
	Cynoscion regalis	48	3.96	Chloroscombrus chrysurus	248	4.91	Menticirrhus americanus	212	5.94	Menticirrhus americanus	18	6.72
	TOTAL	1001	82.53	TOTAL	3728	73.74	TOTAL	2681	75.06	TOTAL	181	67.54
AUGUST	Anchoa mitchilli	600	28.99	Leiostomus xanthurus	164	28.42	Leiostomus xanthurus	1674	30.98	Micropogon undulatus	219	28.26
	Leiostomus xanthurus	587	28.36	Micropogon undulatus	138	23.92	Chloroscombrus chrysurus	774	14.32	Brevoortia tyrannus	161	20.77
	Larimus fasciatus	152	7.34	Brevoortia tyrannus	60	10.40	Opisthonema oglinum	529	9.79	Peprilus alepidotus	64	8.26
	Anchoa hepsetus	151	7.29	Cynoscion regalis	58	10.05	Stellifer lanceolatus	358	6.62	Leiostomus xanthurus	61	7.87
	Menticirrhus americanus	131	6.33	Stellifer lanceolatus	37	6.41	Micropogon undulatus	311	5.75	Chloroscombrus chrysurus	36	4.65
	TOTAL	1621	78.31	TOTAL	457	79.20	TOTAL	3646	67.46	TOTAL	541	69.81
SEPT.	Stellifer lanceolatus	666	44.67	Chloroscombrus chrysurus	217	38.96	Stellifer lanceolatus	306	20.61	Chloroscombrus chrysurus	324	33.93
	Menticirrhus americanus	145	9.73	Leiostomus xanthurus	97	17.41	Anchoa mitchilli	268	18.05	Stellifer lanceolatus	108	11.31
	Chloroscombrus chrysurus	102	6.84	Stellifer lanceolatus	61	10.95	Anchoa hepsetus	186	12.53	Micropogon undulatus	105	10.99
	Anchoa hepsetus	92	6.17	Menticirrhus americanus	45	8.08	Leiostomus xanthurus	142	9.56	Anchoa mitchilli	79	8.27
	Anchoa mitchilli	87	5.84	Opisthonema oglinum	33	5.92	Chloroscombrus chrysurus	90	6.06	Cynoscion regalis	65	6.81
	TOTAL	1092	73.25*	TOTAL	453	81.33	TOTAL	992	66.81	TOTAL	681	71.31
OCT.	Stellifer lanceolatus	546	24.27	Stellifer lanceolatus	265	29.25	Stellifer lanceolatus	83	24.63	Stellifer lanceolatus	239	36.66
	Anchoa mitchilli	395	17.56	Anchoa mitchilli	205	22.63	Etropus crossotus	62	18.40	Cynoscion regalis	130	19.94
	Chloroscombrus chrysurus	259	11.51	Cynoscion regalis	173	19.09	Menticirrhus americanus	37	10.98	Anchoa mitchilli	57	8.74
	Anchoa hepsetus	191	8.49	Brevoortia tyrannus	49	5.41	Cynoscion regalis	30	8.90	Larimus fasciatus	41	6.29
	Leiostomus xanthurus	126	5.60	Vomer setapinnis	43	4.75	Anchoa mitchilli	19	5.64	Menticirrhus americanus	36	5.52
	TOTAL	1517	67.43	TOTAL	735	81.13	TOTAL	231	68.55	TOTAL	503	77.15

	AREA 1			AREA 2			AREA 3			AREA 4		
MONTH	SPECIES	NO.	%	SPECIES	NO.	%	SPECIES	NO.	%	SPECIES	NO.	%
NOV.	Stellifer lanceolatus	37	19.27	Brevoortia tyrannus	235	33.43	Stellifer lanceolatus	277	17.04	Anchoa mitchilli	205	44.57
	Leiostomus xanthurus	32	16.67	Stellifer lanceolatus	177	25.18	Menticirrhus americanus	237	14.58	Brevoortia tyrannus	92	20.00
	Menticirrhus americanus	25	13.02	Leiostomus xanthurus	121	17.21	Anchoa mitchilli	222	13.65	Etropus crossotus	38	8.26
	Cynoscion regalis	18	9.38	Anchoa mitchilli	100	14.22	Brevoortia tyrannus	149	9.16	Bairdiella chrysurus	30	6.52
	Trinectes maculatus	17	8.85	Cynoscion regalis	20	2.84	Anchoa hepsetus	110	6.77	Menticirrhus americanus	25	5.43
	TOTAL	129	67.19	TOTAL	653	92.88	TOTAL	995	61.20	TOTAL	390	84.78
DEC.	NOT SAMPLED			Stellifer lanceolatus	217	61.47	Menticirrhus americanus	126	24.71	Anchoa mitchilli	81	21.04
				Brevoortia tyrannus	92	26.06	Anchoa mitchilli	116	22.75	Menticirrhus americanus	78	20.26
				Menticirrhus americanus	13	3.68	Stellifer lanceolatus	62	12.16	Symphurus plagiusa	74	19.22
				Etropus crossotus	8	2.27	Etropus crossotus	52	10.20	Etropus crossotus	42	10.91
				Anchoa mitchilli	7	1.98	Brevoortia tyrannus	35	6.86	Trinectes maculatus	40	10.39
				TOTAL	337	95.46	TOTAL	391	76.68	TOTAL	315	81.82
1975												
JAN.	Anchoa mitchilli	81	33.47	Brevoortia tyrannus	391	41.86	Brevoortia tyrannus	547	51.22	NOT SAMPLED		
	Leiostomus xanthurus	46	19.01	Larimus fasciatus	172	18.42	Anchoa mitchilli	221	20.69			
(CP)	Brevoortia tyrannus	26	10.74	Symphurus plagiusa	95	10.17	Larimus fasciatus	53	4.96			
	Menticirrhus americanus	15	6.20	Anchoa mitchilli	58	6.21	Symphurus plagiusa	48	4.49			
	Urophycis regius	12	4.96	Etropus crossotus	51	5.46	Stellifer lanceolatus	46	4.31			
	TOTAL	180	74.38	TOTAL	767	82.12	TOTAL	915	85.67			
FEB.	Leiostomus xanthurus	489	33.72	Leiostomus xanthurus	5872	89.23	Anchoa mitchilli	908	40.18	NOT SAMPLED		
	Symphurus plagiusa	273	18.83	Brevoortia tyrannus	207	3.15	Lagodon rhomboides	367	16.24			
(CP)	Urophycis regius	197	13.59	Urophycis regius	186	2.33	Leiostomus xanthurus	332	14.69			
	Brevoortia tyrannus	97	6.69	Anchoa mitchilli	53	0.81	Brevoortia tyrannus	149	6.59			
	Anchoa mitchilli	91	6.28	Menticirrhus americanus	32	0.49	Urophycis regius	146	6.46			
	TOTAL	1147	79.11	TOTAL	6350	96.51	TOTAL	1902	84.16			
MARCH	Urophycis regius	28	44.44	Stellifer lanceolatus	1232	31.31	Peprilus triacanthus	122	18.65	NOT SAMPLED		
	Raja eglanteria	9	14.29	Urophycis regius	880	22.36	Anchoa mitchilli	116	17.74			
	Citharichthys spilopterus	5	7.94	Brevoortia tyrannus	656	16.67	Urophycis regius	92	14.07			
(CP)	Anchoa mitchilli	3	4.76	Leiostomus xanthurus	610	15.50	Symphurus plagiusa	92	14.07			
	Prionotus salmonicolor	3	4.76	Symphurus plagiusa	107	2.72	Leiostomus xanthurus	74	11.31			
	TOTAL	48	76.19	TOTAL	3485	88.56	TOTAL	496	75.84			
APRIL	Urophycis regius	205	40.28	Urophycis regius	4693	37.56	Urophycis regius	804	32.88	NOT SAMPLED		
	Symphurus plagiusa	90	17.68	Leiostomus xanthurus	2201	17.62	Leiostomus xanthurus	363	14.85			
	Trinectes maculatus	73	14.34	Stellifer lanceolatus	2016	16.13	Symphurus plagiusa	356	14.56			
(CP)	Stellifer lanceolatus	31	6.09	Symphurus plagiusa	886	7.09	Anchoa mitchilli	208	8.51			
	Menticirrhus americanus	22	4.32	Peprilus triacanthus	553	4.43	Stellifer lanceolatus	106	4.34			
	TOTAL	421	82.71	TOTAL	10349	82.83	TOTAL	1837	75.14			
MAY	NOT SAMPLED			Urophycis regius	957	35.64	Leiostomus xanthurus	834	29.61	NOT SAMPLED		
				Peprilus triacanthus	444	16.54	Brevoortia tyrannus	494	17.54			
				Micropogon undulatus	340	12.66	Stellifer lanceolatus	370	13.13			
(CP)				Stellifer lanceolatus	281	10.47	Urophycis regius	335	11.89			
				Brevoortia tyrannus	148	5.51	Anchoa mitchilli	168	5.96			
				TOTAL	2170	80.82	TOTAL	2201	78.13			

MONTH	AREA 1			AREA 2			AREA 3			AREA 4		
	SPECIES	NO.	%	SPECIES	NO.	%	SPECIES	NO.	%	SPECIES	NO.	%
MAY	NOT SAMPLED			*Brevoortia tyrannus*	789	38.04	NOT SAMPLED			*Brevoortia tyrannus*	309	29.32
				Leiostomus xanthurus	408	19.67				*Opisthonema oglinum*	197	18.69
				Stellifer lanceolatus	188	9.06				*Stellifer lanceolatus*	150	14.23
				Anchoa mitchilli	123	5.93				*Leiostomus xanthurus*	124	11.76
				Micropogon undulatus	90	4.34				*Anchoa mitchilli*	78	7.40
				TOTAL	1598	77.04				TOTAL	858	81.40
JUNE	NOT SAMPLED			NOT SAMPLED			NOT SAMPLED			*Leiostomus xanthurus*	4689	66.44
										Micropogon undulatus	934	13.24
(CP)										*Arius felis*	526	7.45
										Stellifer lanceolatus	421	5.97
										Cynoscion regalis	203	2.88
										TOTAL	6773	95.98
JUNE	*Leiostomus xanthurus*	1185	39.41	*Leiostomus xanthurus*	949	30.19	*Leiostomus xanthurus*	2168	59.69	*Leiostomus xanthurus*	1309	51.19
	Stellifer lanceolatus	486	16.16	*Micropogon undulatus*	888	28.25	*Micropogon undulatus*	654	18.01	*Anchoa mitchilli*	257	10.05
	Micropogon undulatus	426	14.17	*Brevoortia tyrannus*	580	18.45	*Anchoa mitchilli*	185	5.09	*Opisthonema oglinum*	215	8.41
	Brevoortia tyrannus	200	6.65	*Anchoa sp.*	175	5.57	*Stellifer lanceolatus*	141	3.88	*Stellifer lanceolatus*	190	7.43
	Menticirrhus americanus	88	2.93	*Anchoa mitchilli*	133	4.23	*Chloroscombrus chrysurus*	134	3.69	*Micropogon undulatus*	181	7.08
	TOTAL	2385	79.32	TOTAL	2725	86.69	TOTAL	3282	90.36	TOTAL	2152	84.16
JULY	*Leiostomus xanthurus*	1565	29.03	*Leiostomus xanthurus*	815	28.13	*Leiostomus xanthurus*	823	28.23	*Leiostomus xanthurus*	696	30.45
	Micropogon undulatus	1153	21.39	*Brevoortia tyrannus*	549	18.95	*Anchoa mitchilli*	583	20.00	*Stellifer lanceolatus*	622	27.21
	Stellifer lanceolatus	1121	20.79	*Micropogon undulatus*	433	14.95	*Micropogon undulatus*	462	15.85	*Micropogon undulatus*	361	15.79
	Cynoscion regalis	227	4.21	*Anchoa mitchilli*	423	14.60	*Stellifer lanceolatus*	242	8.30	*Brevoortia tyrannus*	187	8.18
	Larimus fasciatus	151	2.80	*Cynoscion regalis*	97	3.35	*Anchoa hepsetus*	156	5.35	*Arius felis*	75	3.28
	TOTAL	4217	78.22	TOTAL	2317	79.98	TOTAL	2266	77.73	TOTAL	1941	84.91
AUGUST	*Leiostomus xanthurus*	134	23.47	*Micropogon undulatus*	1108	26.80	*Micropogon undulatus*	35	19.13	*Micropogon undulatus*	670	28.88
	Micropogon undulatus	109	19.09	*Stellifer lanceolatus*	787	19.04	*Anchoa mitchilli*	27	14.75	*Stellifer lanceolatus*	595	25.65
	Stellifer lanceolatus	104	18.21	*Cynoscion regalis*	361	8.73	*Larimus fasciatus*	19	10.38	*Leiostomus xanthurus*	311	13.41
	Anchoa mitchilli	99	17.34	*Leiostomus xanthurus*	325	7.86	*Leiostomus xanthurus*	19	10.38	*Arius felis*	229	9.87
	Menticirrhus americanus	22	3.85	*Brevoortia tyrannus*	309	7.47	*Stellifer lanceolatus*	19	10.38	*Cynoscion regalis*	93	4.01
	TOTAL	468	81.96	TOTAL	2890	69.90	TOTAL	119	65.02	TOTAL	1898	81.82

TABLE 12. Mean total length, weight, and number of sport fishes in shrimp trawl catches sampled during this investigation. (*) indicates no measurements.

	MEAN LENGTH (cm)	MEAN WEIGHT (kg)	(lb)	n
Serranidae				
Centropristis striata	*	0.07	0.15	19
Mycteroperca interstitialis	*	<0.10	<0.22	1
Pomatomidae				
Pomatomus saltatrix	18.58	0.06	0.13	584
Carangidae				
Trachinotus carolinus	*	0.11	0.24	18
Caranx hippos	*	0.20	0.44	2
Sciaenidae				
Menticirrhus americanus	15.15	0.04	0.09	3328
Micropogon undulatus	11.03	0.02	0.04	10,600
Cynoscion nebulosus	*	0.13	0.29	23
Cynoscion regalis	13.27	0.02	0.04	3219
Leiostomus xanthurus	13.70	0.04	0.09	36,356
Ephippidae				
Chaetodipterus faber	*	0.05	0.11	53
Scombridae				
Scomberomorus maculatus	17.37	0.05	0.11	1065
Scomberomorus cavalla	*	0.03	0.07	135
Bothidae				
Paralichthys lethostigma	*	0.15	0.33	79

14.83 cm in June to 21.84 cm in November (Figure 8). Spot were most abundant in May (61.82%), decreasing to 4.10% in October. In 1975, spot were most abundant in June (53.05%), decreasing to 10.95% by mid-August. Spot in 1975 were significantly smaller during June and August than they were in 1974 during these months.

Stellifer lanceolatus. Stardrum was the second most abundant fish caught, representing 12.07% of the total samples. Its contribution to the catch also varied during the sampling period from 0.65% in February to 27.33% in October (Appendix Table 2). Stardrum sampled in March 1975 were significantly smaller than those sampled in other months of the study (Figure 9).

Micropogon undulatus. Atlantic croaker was the third most abundant sciaenid and the fourth most abundant species in the samples. The contribution of croaker to the total catch appeared to be seasonal. For the months of May through September 1974, croaker represented between 2.27 and 11.52% of the monthly samples, but from October 1974 to April 1975, they represented <1%. From May to August 1975, croaker comprised between 5.64 and 26.67% of the monthly samples.

In 1974, the mean length of croakers increased from 12.49 cm in June to 17.52 cm in September, while in 1975, the mean length increased from 8.36 cm in April to 11.05 cm in August (Figure 10). A significant decrease in mean length from 12.49 to 10.56 cm occurred between June and July 1974, while in 1975, a significant increase in length from 10.39 to 12.16 cm occurred during this period. This suggests that in 1974, either small croaker moved offshore permaturely or recruitment of young croaker continued through July, thereby depressing the average size of the individuals. In 1975, recruitment was completed by June and the increase in lengths between these months represents growth by recruited individuals.

Cynoscion spp. Three species of sea trouts, Cynoscion nebulosus, C. nothus, and C. regalis, together represented 3.40% of the total samples (Appendix Table 1). Of the three species, C. regalis was the most common, ranking 8th in number for the year (Appendix Table 1).

Menticirrhus spp. Kingfishes-Menticirrhus americanus, M. littoralis and M. saxatilus - together comprised 2.86% of the yearly landings. Of these, M. americanus was predominant, representing 2.79% of the catch and ranking 4th of 105 species identified in trawl catch samples. Kingfishes were more abundant in the catches from September to December than during other months of the year (Appendix Table 2).

Larimus fasciatus. The banded drum represented 2.20% of the trawl catches during the year and was the 10th most abundant species. Banded drum were most abundant in January (9.42%) and represented 5% or less of the samples in all other months (Appendix Table 2).

ENGRAULIDAE

Engraulids represented 9.16% of the total samples by number and 1.19% by weight. Anchoa mitchilli and A. hepsetus were the most abundant species; only 20 A. lyolepis were identified during the 15-month

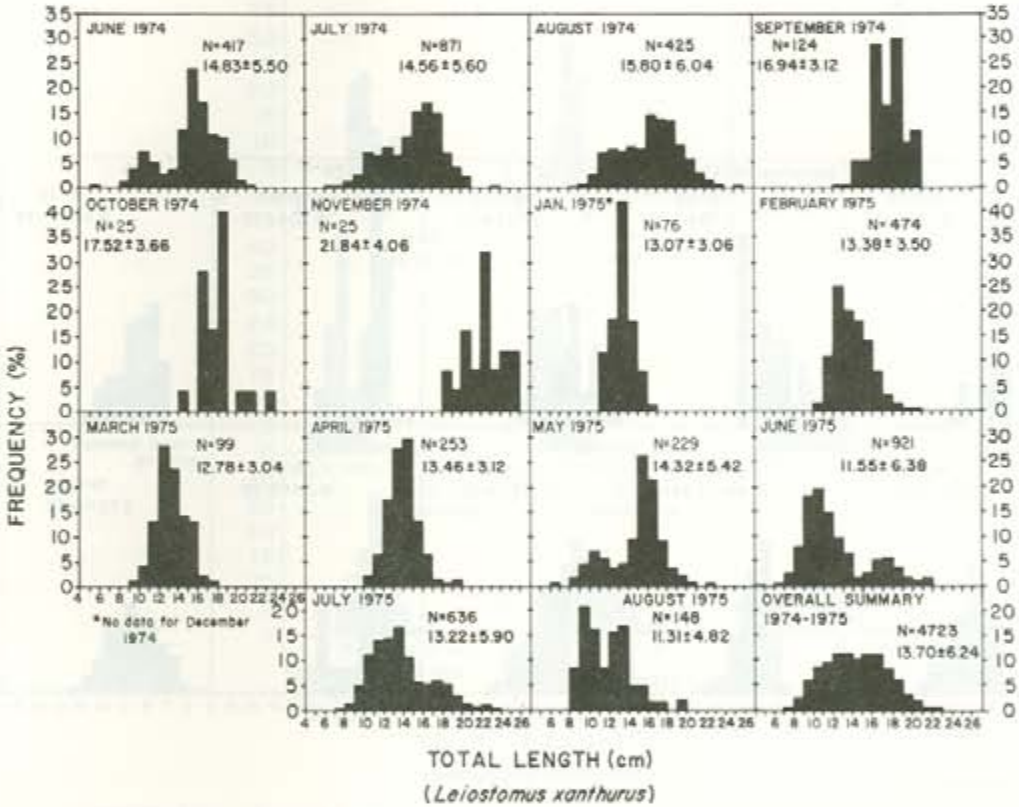

FIGURE 8. Length-frequency relationship for spot, Leiostomus xanthurus.

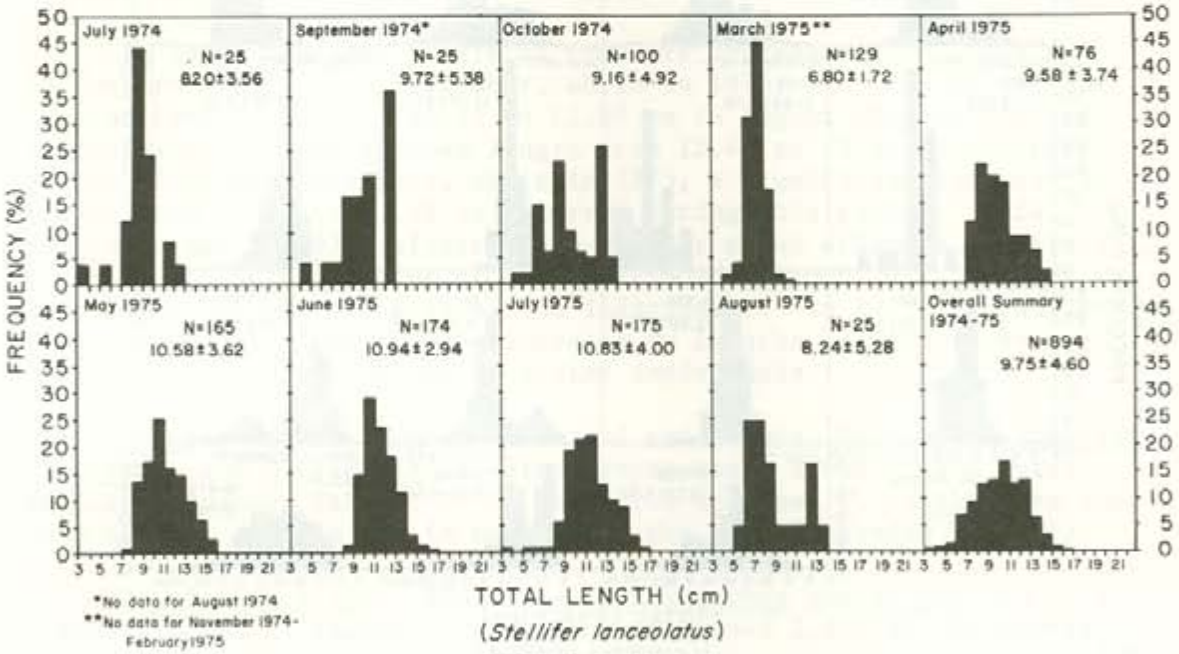

FIGURE 9. Length-frequency relationship for stardrum, Stellifer lanceolatus.

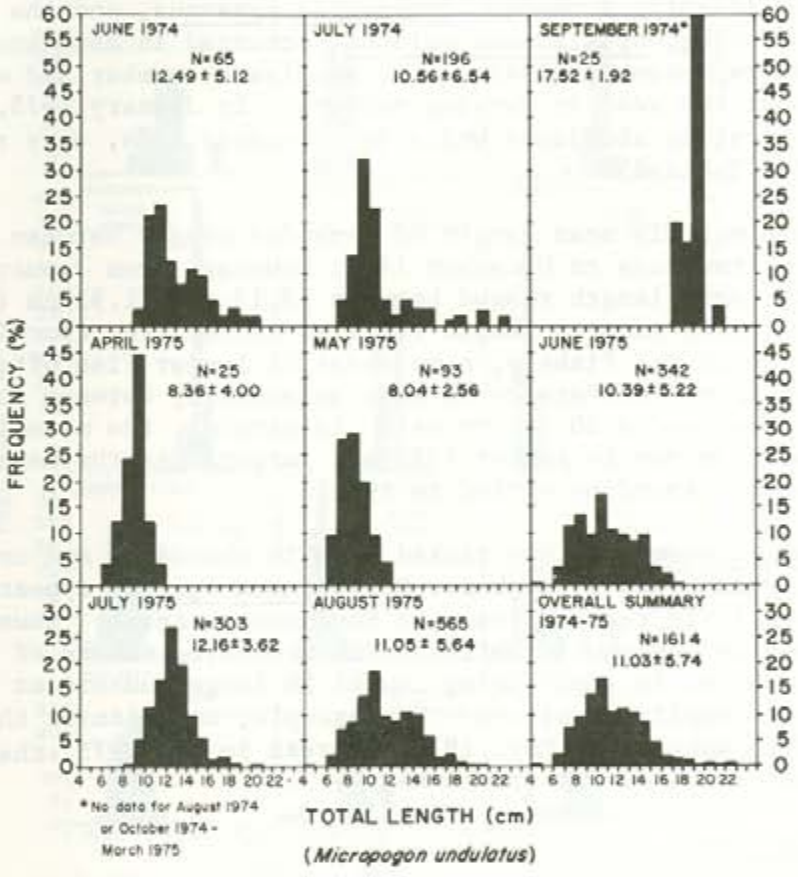

FIGURE 10. Length-frequency relationship for Atlantic croaker, Micropogon undulatus.

study (Appendix Table 1).

In July, August and September 1974, A. mitchilli and A. hepsetus were found in approximately the same numbers; however, from November 1974 through August 1975, A. mitchilli was present in far greater numbers than A. hepsetus (Appendix Table 2).

CLUPEIDAE

Clupeids comprised 8.26% of the samples by number and 10.16% by weight. Seven species of clupeids were present in the samples but only the Atlantic menhaden, Brevoortia tyrannus, and the Atlantic thread herring, Opisthonema oglinum, occurred in abundance. Atlantic menhaden represented 6.84% of the samples by number and occurred throughout the year in varying numbers. In January 1975, menhaden ranked first in abundance while in September 1974, they ranked 19th (Appendix Table 2).

The monthly mean length of menhaden ranged between 17.89 and 19.24 cm from June to December 1974; however, from January to March 1975, the mean length ranged between 12.13 and 11.95 cm (Figure 11). The difference in mean length resulted either from recruitment of young fish to the fishery, a movement of larger fish offshore to spawn or from a difference in gear selectivity between a commercial shrimp trawl and a 20 ft try net. In general, the mean length of menhaden from May to August 1974 was larger than the mean length during the corresponding period in 1975.

Opisthonema oglinum ranked 14th in abundance and comprised 1.39% of yearly landings by number. Opisthonema oglinum appeared only occasionally in the samples from November to April. Abundance in other months apparently reflects the schooling nature of the species, which resulted in their being caught in large numbers at times and only occasionally at others. For example, no Atlantic thread herring occured in samples of May 1974, whereas in May 1975, the species comprised 3.26% of the specimens.

GADIDAE

Gadids represented 7.30% of the yearly catch. The spotted hake, Urophycis regius, was the more abundant of the two species, representing 7.29% of total catches, while the Southern hake, U. floridanus, comprised only 0.01%. Hakes were most abundant from January to April.

CARANGIDAE

Of the 7 carangids, which together comprised 2.56% by number of the samples, the Atlantic bumper, Chloroscombrus chrysurus, was the most abundant. Bumper were not present in samples from December 1974 through April 1975. Atlantic bumper constituted between 3.61 and 16.33% of the monthly catch from July to October 1974, whereas in 1975, they represented less than 1.00% of the monthly samples. The large difference between summer months of the two years is abbributed to the schooling nature of the species. Apparently, shrimp

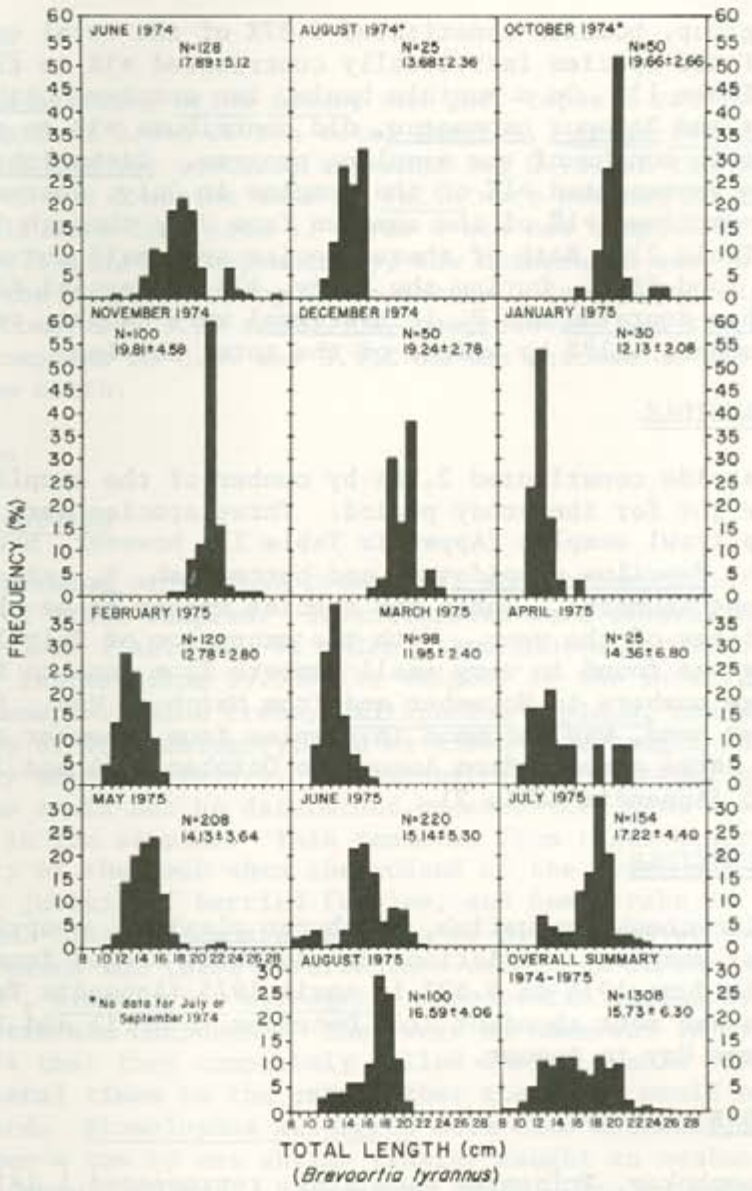

FIGURE 11. Length-frequency relationship for the Atlantic menhaden, Brevoortia tyrannus.

trawlers sampled in 1975 only rarely encountered schools of bumper. In 1974, a wide difference was observed in the number of bumper caught from area to area in the same month. For example, in September, bumper accounted for 39.08% of samples from Area 2, compared to only 6.10% of those from Area 3 (Table 11).

BOTHIDAE

As a group, bothids constituted 2.37% of the total catches, but none of the species individually contributed >1% to the catches (Appendix Table 1). On a monthly basis, two species, Citharichthys spilopterus and Etropus crossotus, did contribute >1% to the samples during certain months of the sampling program. Citharichthys spilopterus represented >1% of the samples in July, whereas, E. crossotus comprised >1% of the samples from July through January (Appendix Table 2). Both of these species are small and are not considered food fish. During the study, 438 commercial flounders (Paralichthys dentatus and P. lethostigma) were caught, representing 0.37% by number, 1.17% by weight of the total samples.

STROMATEIDAE

Stromateids constituted 2.26% by number of the samples and 1.26% by weight for the study period. Three species were identified from shrimp trawl samples (Appendix Table 1); however, Southern harvestfish, Peprilus alepidotus, and butterfish, P. triacanthus, were the most abundant. These two species appear to be abundant at different times of the year. With the exception of July 1974, P. triacanthus was found in very small numbers from June to September and in large numbers in November and from March to May. P. alepidotus, on the other hand, was uncommon in samples from December to May but present in large numbers from August to October 1974 and July and August 1975 (Appendix Table 2).

CYNOGLOSSIDAE

The blackcheek tonguefish, Symphurus plagiusa, comprised 2.05% of the total samples. Variation in abundance ranged from 0.02% of the catch in June 1974 to 8.62% in April 1975 (Appendix Table 2). The species was most abundant from December to April and least abundant from May to August.

SOLEIDAE

The hogchoker, Trinectes maculatus, represented 1.18% by number of total samples. The species contributed between 1.33 and 3.65% of the samples during the months of August to December 1974 and in April 1975. In other months it represented < 1% of the samples (Appendix Table 2).

SCOMBRIDAE

Scombrids comprised 1.00% of the samples by number and 1.45% by weight during the year. Two species were identified in the samples,

the Spanish mackerel, Scomberomorus maculatus, and the king mackerel, S. cavalla. Spanish mackerel was the more common, representing 0.89% of the total samples and 1.94% of the samples from July to September. They did not occur in the samples from December to April (Appendix Table 2). Spanish mackerel, which in this study averaged 17.4 cm in total length, was one of the largest fishes caught by shrimp trawlers.

ARIIDAE

The sea catfish, Arius felis, and gaff-topsail catfish, Bagre marinus, comprised 0.94% of the total samples. Arius felis was the more common of the two species, representing 0.90% of the total samples. In 5 of the 8 months that A. felis were present in the samples, more than half were from Area 4. Area 4 was not sampled from January to May 1975 and, correspondingly, low numbers of sea catfish appeared in the samples during these months. In July and August 1975, sea catfish comprised 3.28 and 9.90%, respectively, of the samples of Area 4, compared to 0.64 and 3.95% of the catches of all four areas for the month.

Other Species

Invertebrates

Invertebrates other than commercial shrimp comprised 3.96% (by weight) of trawl samples. Invertebrates were classified into several divisions (Table 13) of which miscellaneous crustaceans was the largest, representing 39.50% (by weight) of the invertebrate portion of the sample. Blue crabs, Callinectes sapidus, comprised a large portion of this category, and at times were caught in large quantities by shrimp trawlers. Unfortunately, the actual quantity of blue crabs could not be determined because they were inadequately represented in the samples. This resulted from their scurrying to the periphery of the deck when the codend of the trawl was opened, leaving only juveniles, berried females, and dead crabs in the sampling area. The inadequate sampling of blue crabs probably greatly decreased the total invertebrate component of the samples. "Jelly balls", Stomolophus meleagris, represented 15.34% by weight of the invertebrate component. They were so numerous in May, June and July 1974 that they completely filled shrimp trawls within 30 minutes, several times to the extent that the trawl could not be brought aboard. Stomolophus meleagris were also abundant in September 1974, when a tow by one shrimp trawler caught an estimated 600 jelly balls (about 300 kg). Horseshore crabs, Limulus polyphemus, were most abundant in the Beaufort area. The samples did not reflect the quantity of horseshoe crabs in the catch since the shrimpers often culled them from the catch as soon as the net was landed. In the Beaufort area, horseshoe crabs occasionally constituted between 50 and 75% of the volume of the catch. The largest horseshoe crab recorded during this study was a female weighing 5 kg. Squid, Loligo pealii and Lolliguncula brevis, comprised 4.07% of the invertebrates sampled.

TABLE 13. Invertebrates, other than commercial shrimp, identified from shrimp trawl and R/V Carolina Pride catches between May 1974 and Mid-August 1975.

MISCELLANEOUS CRUSTACEANS

Order Stomatopoda

Lylosquilla scabrica
Squilla empusa
Squilla neglecta

Order Decapoda

Suborder Natantia

Alpheus formosus
Sicyonia sp.
Trachypenaeus constrictus
Xiphopenaeus kroyeri

Suborder Reptantia

Arenaeus cribarius
Calappa flammea
Callinectes sapidus
Callinectes ornatus/similis
Hepatus epheliticus
Libinia emarginata
Libinia dubia
Menippe mercenaria
Ovalipes ocellatus
Pagurus pollicaris
Persephona punctata aquilonaris
Portunus gibbesii
Portunus spinimanus

ARTHROPODA

Limulus polyphemus

ECHINODERMATA

Arbacia punctulata
Asterias forbesi
Luidia clathrata
Mellita quinquesperforata tenuis
Ophiuroidea
Thyonella gemmata

COELENTERATA

Alcyonidium hauffi
Alcyonidium spp.
Chiropsalmus quadrimanus - sea wasp
Chrysaora quinquecirrha
Cyanea capillata
Leptagorgia virgulata
Renilla reniformes
Stomolophus meleagris

TUNICATA

Amarouicium pellucidum
Amarouicium spp.
Molgula manhattensis
Molgula spp.

MOLLUSCA

Gastropoda

Busycon caniculata
Busycon carica
Polinices duplicatus

Cephalopoda

Loligo pealii
Lolliguncula brevis

Loggerhead Turtles

Loggerhead turtles were caught from June to September in 7 of 29 shrimp trawl catches sampled during this investigation. Thirty-eight percent of the turtles caught were dead when the nets brought them aboard. Turtle captures occurred along the entire coastline in shallow waters within a mile of shore (Table 14). In addition to turtles captured by commercial trawlers, the R/V Carolina Pride collected one juvenile with a 20 ft otter trawl during a half-hour tow.

DISCUSSION

Weight Ratio Estimates

Shrimp trawl catches along the North and South Carolina coasts are characterized by extremely variable fish/shrimp ratios. In North Carolina, Wolff (1972) sampled 39 shrimp trawls (18 day and 21 night) and reported an average fish/whole shrimp ratio of 5.4:1; however, he did not indicate the variation among the individual ratios. Wolff's individual ratios for day trawls ranged from 0.6:1 to 185.9:1 and in general were larger than those found in this study. By excluding only the largest ratio and log transforming the data, I calculated a mean ratio of 6.3:1 from Wolff's data with a 95% confidence interval of 0.4:1 to 91.2:1. Both the mean ratio and the confidence interval from the North Carolina study were larger than that found for South Carolina. No fish/shrimp ratio data are published for Georgia or the Atlantic coast of Florida; published studies describe species composition and catch-per-hr data (Anderson, 1968; Anderson and Gehringer, 1965; Knowlton, 1972). Juhl (1974) reported that in the Gulf of Mexico, fish/heads-on shrimp ratios ranged from 4.1:1 to 20.0:1. He used an average ratio of 10.0:1 to estimate annual incidental fish catches on shrimping grounds. Chittenden and McEachran (1975a) calculated a ratio of 11.35 volumes of discard (approximately 90% fish) to 1 volume of shrimp (heads-off) from 60 shrimp trawl catches; 95% confidence limits were 9.7:1 and 13.0:1. The overall fish/shrimp (heads-off) ratio was approximately 10.0:1. This corresponds to a fish/shrimp (heads-on) ratio of approximately 6.2:1.

Shrimping activities along the southeastern coast of the United States differ from those of the Gulf of Mexico. Commercial fishing for brown and white shrimp in North and South Carolina is generally restricted to within six miles of shore in waters < 60 meters deep (Eldridge and Goldstein, 1975). In the Gulf of Mexico, however, the white and brown shrimp grounds are distinct, the white shrimp grounds in shallow water (1.1 to 6.7 m; 3.6 to 22 ft) and brown shrimp grounds further offshore in waters of 8.9 and 27.8 meters (29 to 91 ft). Chittenden and McEachran (1975b) found that fish fauna of white shrimp grounds were primarily estuarine-dependent, whereas those of brown shrimp grounds were essentially estuarine-independent. Discard ratios on offshore brown shrimp grounds were 2 to 5 times higher than those on white shrimp grounds (Chittenden and McEachran, 1975c).

TABLE 14. Location and characteristics of loggerhead turtles caught by shrimp trawlers and R/V Carolina Pride during the incidental catch sampling program (CP indicates R/V Carolina Pride).

YEAR	LOCATION		MONTH	LENGTH OF TOW (HR)	NUMBER	AGE 1/	CONDITION	DEPTH (M)
	LATITUDE	LONGITUDE						
1974	33 02'	79 17'	JULY	2.0	1	ADULT	LIVE	5
	33 02'	79 17'	JULY	2.1	1	ADULT	DEAD	5
	32 38'	79 57'	JULY	2.4	1	JUV	LIVE	6
	32 30'	80 15'	AUG.	2.5	1	?	LIVE	5
	33 13'	79 10'	SEPT	2.3	1	ADULT	DEAD	7
1975	32 22'	80 47'	JUNE	0.5	1(CP)	JUV	LIVE	6
	32 53'	79 34'	JULY	2.2	1	?	DEAD	3
	32 26'	80 24'	JULY	3.2	1	ADULT	LIVE	8

1/ Turtles 60 to 70 lbs classified as Juveniles (JUV); Turtles recorded as "large" or "carapace 3 ft in length" classified as Adults; ? indicates no information recorded as to age.

The wide confidence interval associated with ratio estimates limits their usefulness in making resource utilization decisions. In an attempt to obtain information of more value in assessing resource potential, I calculated the median of the untransformed ratio distribution as well as the 25th and 75th percentiles. Confidence limits of the median are defined by these percentiles which encompass 50% of the individual ratios. The median ratio of 1.94:1 was comparable to the mean ratio of 1.98:1 determined from $\log_{10}$ transformed data. The 25th and 75th percentiles were 0.98:1 and 4.43:1, respectively. Examination of monthly mean ratios (Table 6) suggests that the above ratio estimate can be refined by calculating separate ratios for the periods May to August and September to December. The median ratio for May to August (both years combined) was 2.58:1 with confidence limits of 1.24:1 to 5.43:1 while the median for September to December was 1.20:1 with confidence limits of 0.56:1 to 2.66:1. Applying these seasonal ratio estimates to the shrimp landing statistics (South Carolina Landings, 1974, 1975), I estimate that between 3,650,000 and 16,594,000 kg (8,031,000 to 36,507,000 lbs) of fish were caught incidental to shrimping in 1974 and between 3,358,000 and 15,197,000 kg (7,338,000 and 33,434,000 lbs) in 1975.

Not all fish caught by shrimp trawlers are discarded. South Carolina landing statistics for the Central and Southern Districts reveal that in 1974, 76,339 kg (167,945 lbs) of Atlantic croaker, flounders, kingfishes, mackerel and spot were landed. The Northern District (Horry and Georgetown counties) landings were excluded because they include fish caught in haul seines as well as in shrimp trawls. Northern District landings from shrimp trawlers account for less than 20% of the shrimp landed in the state, and exclusion of these fish landings should not significantly affect estimates of incidental fish landings.

The quantity of three major groups: selected sciaenids (Atlantic croaker, spot, kingfish and spotted sea trout), scombrids (Spanish and king mackerel), and commercial flounders (Paralichthys spp) caught monthly were estimated by muliplying the percentage contribution of each group to the monthly samples (Appendix Table 2) times estimated monthly fish catches (Table 15). These estimates were compared to monthly landings in order to compute the percentage of fish marketed to those caught.

The percentage of sciaenids and scombrids caught, that were marketed, differed greatly from that of flounders. Approximately 74% of estimated flounder catches were marketed compared to less than 2% of the sciaenids and scombrids (Table 15). Several reasons exist for these marked differences. Sciaenids on the whole are of very small size and only a fraction of the sciaenid catch is large enough to be marketed locally as food fish (Raymond Rhodes, personal communication). According to Juhl's (1974) length-frequency criterion, all croaker sampled during this investigation would be classified as industrial. Scombrids, on the other hand, are generally of edible size, but there appears to be little demand for these species. During our sampling program, some shrimpers saved every mackerel, while other discarded all of them. In comparison, all shrimpers saved large flounders. Shrimpers

TABLE 15. A Comparison Between Estimated Catches and Estimated Landings of selected Sciaenids, Scombrids, and Bothids Caught Incidental to Shrimp Trawling in South Carolina from May, 1974 to December, 1974 and from May, 1975 to mid-August, 1975. (Source: Shrimp Landings: South Carolina Landings).

				Sciaenids				Scombrids				Bothids			
				Croaker, Spot, Kingfishes, Spotted Trout				Spanish and King Mackerel				Summer and Southern Flounders			
Months	Shrimp Landings 1000's of lbs.	Fish/ Heads-on Shrimp Ratios	Total Estimated Fish Catch 1000's of lbs.	Percent in Sample	Estimated Catch 1000's of lbs.	Actual Landings 1000's of lbs.	Percent of Estimated Landings	Percent in Sample	Estimated Catch 1000's of lbs.	Actual Landings 1000's of lbs.	Percent of Estimated Landings	Percent in Sample	Estimated Catch 1000's of lbs.	Actual Landings 1000's of lbs.	Percent of Estimated Landings
1974															
May	796	6.37:1	5070.5	66.09	3351.1	9.8	0.29	-	-	-	-	-	-	3.6	-
June	372	2.28:1	848.2	53.69	455.4	4.6	1.01	0.94	8.0	0.2	2.50	0.37	3.1	1.7	54.84
July	1554	2.06:1	3201.2	53.80	1722.2	24.6	1.40	3.13	100.2	0.1	0.10	0.19	6.1	4.5	74.00
August	950	2.21:1	2099.5	41.39	869.0	24.6	2.83	2.30	48.3	0.4	0.83	0.13	2.7	6.2	-
September	1566	1.08:1	1691.3	18.14	306.8	26.1	8.50	2.56	43.3	0.4	0.90	0.29	4.9	7.9	-
October	920	1.56:1	1435.2	10.37	148.8	18.4	12.40	1.06	15.2	0.2	1.30	0.34	4.9	9.6	-
November	647	1.78:1	1151.7	18.65	214.8	9.4	4.38	0.40	4.6	-	-	0.26	3.0	4.2	-
December	424	0.23:1	97.5	21.80	21.2	4.2	19.80	-	-	-	-	0.64	0.6	0.3	50.00
1975															
May	489	8.40:1	4107.6	24.00	985.8	14.9	1.51	0.06	2.5	0.6	24.00	0.29	11.9	9.5	79.75
June	1164	2.39:1	2782.0	70.37	1957.7	8.8	0.40	0.48	13.4	1.8	13.40	0.69	19.2	5.4	28.10
July	1192	3.36 1	4005.1	49.29	1972.9	20.3	1.03	1.54	61.7	1.5	2.43	0.42	16.8	5.9	35.07
August	763	2.16:1	28137.7	40.98	675.4	10.2	1.50	2.16	35.6	0.6	1.70	0.60	9.9	2.9	29.30
					12681.1	175.9			332.8	5.8			83.1	61.7	
			OVERALL		1.48%				1.74%				74.25%		

generally catch only a few commercial flounder, but those caught are usually of edible size. Flounders are also easily distinquished from the other fish in the catch. The discrepancy between estimated flounder catches and estimated landings in several months (Table 15) results from a lack of precision associated with the small percentage of flounder in the monthly samples. These discrepancies are actually larger than indicated since shrimpers often save flounder for home consumption.

The above discussion shows that shrimpers apparently save fish that can be marketed at a good price and that can be easily culled from the catch. At the present time, no markets exist for the majority of species discarded by shrimpers.

Fish Catch-Per-Hour Rates

Catch-per-hour information presented in this report was obtained from double-rigged trawlers varying in length and horsepower (Table 2). Unfortunately, there is insufficient information to permit standardizing catch-per-hour data obtained from different vessels of the shrimp fleet and to compare R/V Carolina Pride information directly with that of commercial trawlers. The monthly fluctuations in catch-per-hour data observed in South Carolina probably reflect: 1) differences in efficiency of different classes of fishing boats, 2) differences in the skill of various boat captains in avoiding schools of fish, 3) non-random distribution of fish (reflected in the wide variation in fish/heads-on shrimp ratios) and 4) gear modifications in bottom line, net desgin and flotation.

The catch-per-hour data suggest that fish are abundant throughout the year with species composition of the catch varying seasonally. The month-to-month fluctuations in catch-per-hour data observed in this survey appear to be typical of fish assemblages associated with penaeid shrimp. Anderson (1968) and Knowlton (1972) also reported wide monthly variation in fish catches associated with shrimp fisheries in the southeastern United States. A 1930 survey of the South Carolina shrimp grounds estimated that the monthly catch-per-hour of all fish species combined ranged from a low of 2,086 fish hr^{-1} in April to a high of 3,694 in January (Anderson, 1968). Knowlton (1972) reported average yearly catch rates of 58.5 kg (128.8 lb) of fish hr^{-1} on double-rigged trawlers in Georgia. In January, March, April, October and December, catches averaged 41 kg (100 lb) hr^{-1} of trawling, whereas in all other months catches averaged over 54 kg (120 lbs). Peak catches occurred in May and November. The seasonal trends illustrated by our catch-per-hour data do not correspond to those found by either Anderson or Knowlton. However, wide month-to-month or year-to-year variations in catch rates may be typical of fisheries based on species with short life cycles. Neither Anderson nor Knowlton hypothesized as to the causes of these wide monthly variations. Nevertheless, Knowlton's graphs suggested that fluctuations in croaker and spot catch rates were responsible for most of the fluctuations in total fish catch rates. Joseph (1972) evaluated fluctuations in spot, croaker and weakfish of the Middle Atlantic States and concluded that no one factor could explain marked fluctuations in these species. Whereas the causes of long-term

fluctuations in croaker and weakfish could be identified, fluctuations in spot were observed to be random and considered to be typical of a short life-cycle species.

Shrimp Catch-Per-Hour Rates

The wide month-to-month variation in shrimp catch rates (Table 7) reflects the change in species composition during the year. From May to Mid-June, shrimpers fish the "roe" white shrimp. Beginning in June and continuing through August, brown shrimp enter the fishing grounds and support the fishery through early autumn (McKenzie, 1974).

Peak abundance of brown shrimp, as indicated by catch rates and landing information in both years, occurred in July (Table 16). The four-fold decrease in catch rates from July to August of each year (Table 7) suggests that brown shrimp are less available to the shrimping fleet in August than in July. This may reflect an offshore movement of the shrimp or an actual depletion of stocks. The marked differences in catch rates between 1974 and 1975 for the months of July and August cannot be explained from data acquired during this study.

White shrimp, which comprise the majority of the landings from September to December, enter the fishery in August. The high landings of white shrimp, which occurred in September 1974, may reflect an expansion of effort in that month following the opening of the sounds. The low landings of white shrimp in November probably reflect a decrease in effort during that month since catch-per-hour rates were higher than those of September.

Trawl Catch Composition

Anderson's 1930's survey is the only other published study on the fish fauna of the shrimp grounds off South Carolina. His data show that six families represented 93.5% of the catch. Comparison of the two studies reveals that sciaenids were more abundant in Anderson's catches. He found that sciaenids contributed 82.9% of the yearly catch and in some months comprised as much as 94.7% (Figure 12). Only in March and April did sciaenid levels drop below 30% and in these months, gadids were at their highest levels. In our study, gadids were also at their highest levels during this period (Figure 8), peaking at 36.9% in April. Anderson's data show engraulids to be present primarily from February to June decreasing to less than 0.1% of the catch from July to September and never comprising more than 2.5% of the catch for the remainder of the year. In the current study, engraulids were most abundant in the catches from September to January, and the percent contribution was much higher than that reported by Anderson. Clupeids also showed a fall increase on a level of magnitude different than that found by Anderson.

Seasonal differences in abundance between Anderson's 1930 study and our study cannot be explained by available information. Neither can one determine if the percentage decrease in sciaenid composition of the catch from the 1930's to the 1970's indicates an actual decrease in sciaenid stocks or results from a change in gear selectivity or a

TABLE 16. Estimated monthly landings of white and brown shrimp in South Carolina from May 1974 to December 1974 and from May 1975 to August 1975 (Source: Fisheries Statistics Section, Office of Conservation and Management, South Carolina Department of Wildlife and Marine Resources).

YEAR	MONTH	Landings (1000's of lbs) White Shrimp	Brown Shrimp
1974	May	792	4
	June	256	124
	July	178	1350
	August	456	508
	September	1575	74
	October	960	7
	November	718	-
	December	424	23
1975	May	487	2
	June	264	900
	July	158	1034
	August	502	291

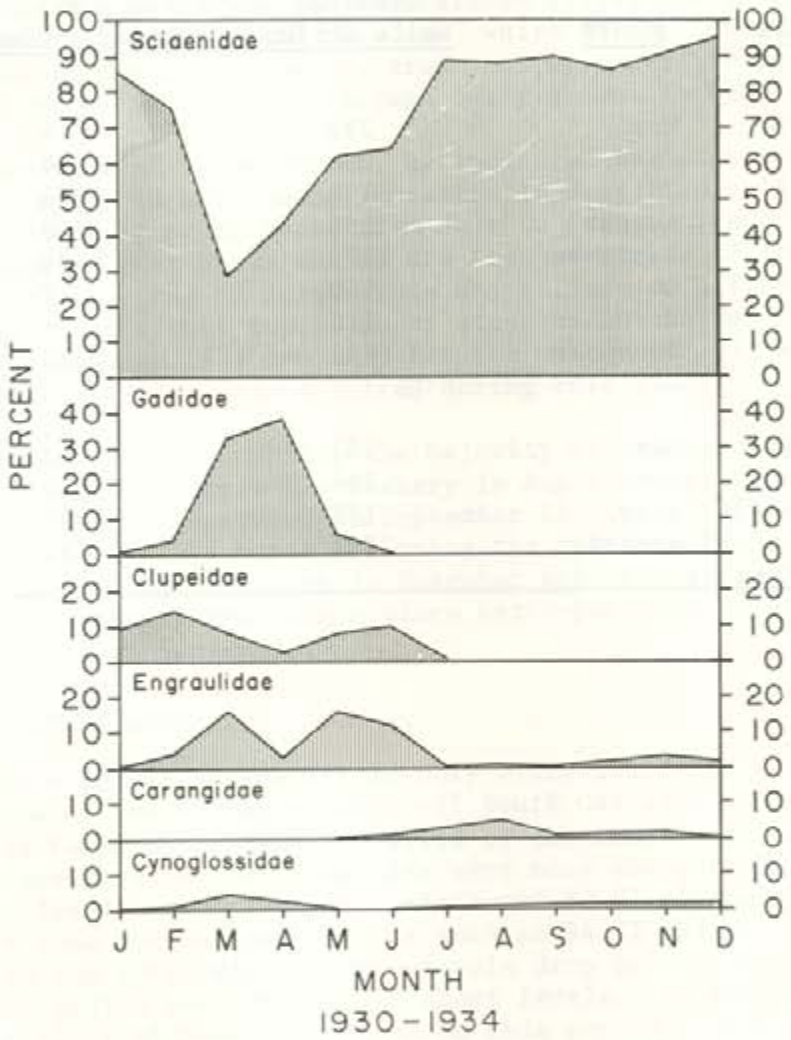

FIGURE 12. Percent contribution of 6 families to shrimp trawl samples (from Anderson, 1968).

shift in fishing grounds.

The species composition of shrimp trawl catches in the 1930's did not differ greatly from that of our study. The fewer number of species reported by Anderson compared to this study does not necessarily imply that he caught fewer species. Anderson classified fish at times only to genera and other times grouped more than one genus together (e.g., "herrings") (Table 17). Aetobatus narinari (Mylobatidae) was the only species identified by Anderson that we did not encounter. Data from the present study (Table 9) and those collected by Anderson (Table 18) showed that in each month only a few species comprised the bulk of the catches.

Four species of sciaenids - spot, Atlantic croaker, kingfishes and weakfish - were the major components of the catches of southeastern United States coastal waters comprising between 57.0% (South Carolina) and 68.2% (North Carolina) of the total weight sampled. In terms of species composition, South Carolina catches were more similar to Georgia's than North Carolina's (Table 19).

CONCLUSIONS

1. Data acquired during this study indicate that between 3,650,000 and 16,594,000 kg of fish were caught incidental to shrimping in 1975. Only a small number of incidental fish are landed in South Carolina, the majority being discarded at sea. Fish landings consist exclusively of fish, such as flounder, Atlantic croaker, spot, that can be marketed as food fish. Spanish and king mackerel reach commercial size, but at the present there is a low market acceptance for these species. The majority of discarded fish are small and suitable only for processing into pet food or other industrial fish products. Utilization of the bulk of incidental fish catches would require processing facilities that do not exist in South Carolina at the present time.

2. There is doubt that incidental catches can be economically utilized. A fishing fleet, distinct from the shrimping fleet, provides the bulk of the incidental fish catches for processing plants in the Gulf of Mexico (Gutherz et al., 1975) as the amount paid to shrimpers for incidental species failed to provide them with sufficient incentive to land a dependable supply of fish. Apparently a similar situation exists in North Carolina where the industrial fish processing plants are also served by their own fleet (Wolff, 1972). Bullis and Carpenter (1968) suggested that the only practical way to utilize incidental fish discards would be to place highly automated reduction or partial processing facilities aboard trawlers.

3. There is presently no evidence to substantiate the concern that shrimp trawling activities are depleting stocks of commercial fish. In fact, in the Gulf of Mexico, a 5-fold increase in fishing effort during the last 20 years has not been followed by a decrease in fish catches (Juhl, 1974). The variety of gear and vessels employed by the shrimp fleet and the desire of shrimpers to avoid fish make it impossible to

TABLE 17. Species found during the current study that were not reported to species by Anderson (1968).

FAMILY	SPECIES	NUMBER	PERCENT OF TOTAL SAMPLE (BY NO.)
Odontaspididae	Odontaspis taurus	2	0.01
Carcharhinidae	Carcharhinus limbatus*	2	<0.01
	Carcharhinus milberti*	2	<0.01
	Mustelus canis	11	0.01
Sphyrnidae	Sphyrna lewini	14	0.01
Squalidae	Squalus acanthias	14	0.01
Rhinobatidae	Rhinobatos lentiginosus	2	<0.01
Dasyatidae	Dasyatis sayi	33	0.03
	Dasyatis centroura	2	<0.01
Myliobatidae	Myliobatis freminvillei	2	<0.01
Acipenseridae	Acipenser oxyrhynchus	4	<0.01
Congridae		2	<0.01
Ophichthidae		2	<0.01
Clupeidae[1/]	Alosa spp.	16	0.01
	Sardinella anchovia	14	0.01
Engraulidae	Anchoa hepsetus[2/]	3162	2.65
	Anchoa lyolepis	20	0.02
	Anchoa mitchilli	7421	6.22
Ophidiidae		3	<0.01
Atherinidae	Menidia menidia	5	<0.01
Syngnathidae	Hippocampus sp.	1	<0.01
Serranidae	Centropristis ocyurus	5	<0.01
	Mycteroperca interstitialis	1	<0.01
Carangidae	Caranx hippos	2	<0.01
	Trachinotus carolinus*	18	0.02
	Trachinotus falcatus	1	<0.01
Gerreidae	Eucinostomus argenteus*	2	<0.01
	Eucinostomus gula*	1	<0.01
Pomadasyidae	Haemulon aurolineatum	4	<0.01
	Haemulon sciurus	10	0.01

TABLE 17. (continued)

FAMILY		NUMBER	PERCENT OF TOTAL SAMPLE (BY NO.)
Sciaenidae	Cynoscion nebulosus	23	0.02
	Menticirrhus americanus[3/]	3328	0.79
	Menticirrhus littoralis[3/]	79	0.07
	Menticirrhus saxatilis	2	<0.01
Sphyraenidae	Sphyraena guachancho[4/]	46	0.04
	Sphyraena borealis[4/]	3	<0.01
	Sphyraena barracuda[4/]	1	<0.01
Scombridae	Scomberomorus cavalla	135	0.11
Triglidae*	Prionotus carolinus*	51	0.04
	Prionotus evolans*	18	0.02
	Prionotus salmonicolor*	3	<0.01
	Prionotus scitulus*	28	0.02
	Prionotus tribulus	3	<0.01
	Prionotus spp		
Bothidae	Ancylopsetta quadrocellata[5/]	104	0.09
	Citharichthys spilopterus[6/]	667	0.56
	Citharichthys macrops[6/]	70	0.06
	Paralichthys lethostigma	79	0.07
Balistidae	Aluterus monoceros	2	<0.01
	Aluterus spp	2	<0.01
	Stephanolepis hispidus	14	0.01
Tetraodontidae	Lagocephalus laevigatus	4	<0.01
	Sphoeroides maculatus	9	0.01
Batrachoididae	Opsanus tau	12	0.01
	Porichthys porosissimus	2	<0.01
Ogcocephalidae	Ogcocephalus parvus	1	<0.01

* Indicates fish not identified to species by Anderson (1968).

1/ All species except Brevoortia spp and Opisthonema oglinum reported by Anderson as "all other genera and species of herrings".

2/ Not reported to species by Anderson, but we also found A. hepsetus and A. mitchilli to predominate catches

3/ Not reported to species by Anderson, but he reported that M. americanus was the predominant species.

4/ Not reported to species by Anderson, but he mentioned that S. guachancho was predominant species

5/ Not mentioned by Anderson for South Carolina.

6/ Not reported to species by Anderson, but he mentioned that C. spilopterus was predominant.

TABLE 18. Total number of species per month in trawl catches and the number of those species representing 90% or more (by number) of the monthly samples. (From Anderson, 1968)

Months	Total number of species per month in samples	Number of species representing 90% or more of monthly samples
Jan.	28	5
Feb.	24	6
March	23	7
April	27	9
May	21	6
June	26	7
July	34	8
Aug.	44	9
Sept.	33	5
Oct.	33	6
Nov.	37	8
Dec.	29	5

TABLE 19. Comparison of the 10 most abundant species (by weight) of trawl samples of South Carolina, Georgia and North Carolina.

Species composition of South Carolina shrimp trawl samples May to December 1974 and May to mid-August 1975.

RANK	SPECIES	PERCENT BY WEIGHT OF DISCARD
1	Leiostomus xanthurus (spot)	40.2
2	Brevoortia tyrannus (Atlantic menhaden)	10.3
3	Micropogon undulatus (Atlantic croaker)	8.8
4	Stellifer lanceolatus (stardrum)	5.0
5	Menticirrhus americanus (Southern kingfish)	5.0
6	Arius felis (sea catfish)	3.4
7	Cynoscion regalis (weakfish)	3.0
8	Rhinoptera bonasus (cownose ray)	2.2
9	Scomberomorus maculatus (Spanish mackerel)	2.1
10	Larimus fasciatus (banded drum)	1.9
	Total Percent	81.9

Species composition of Georgia shrimp trawl samples from July 1969 to June 1971 (Source: Knowlton, 1972)

RANK	SPECIES	PERCENT BY WEIGHT OF DISCARD
1	Leiostomus xanthurus (spot)	28.0
2	Micropogon undulatus (Atlantic croaker)	20.9
3	Menticirrhus spp (kingfishes or whitings)	8.9
4	Brevoortia tyrannus (Atlantic menhaden)	7.0
5	Cynoscion regalis (weakfish)	6.9
6	Stellifer lanceolatus (stardrum)	4.6
7	Dasyatis spp (stingrays)	3.6
8	Arius felis (sea catfish)	3.3
9	Larimus fasciatus (banded drum)	3.2
10	Trichiurus lepturus (Atlantic cutlassfish)	2.8
	Total Percent	89.2

Species composition of North Carolina shrimp trawl samples June through August 1970 (Source: Wolff, 1974)

RANK	SPECIES	PERCENT BY WEIGHT OF DISCARD
1	Leiostomus xanthurus (spot)	38.7
2	Micropogon undulatus (Atlantic croaker)	24.2
3	Orthopristis chrysoptera (pigfish)	8.4
4	Paralichthys spp (2)(Edible flounders)	4.0
5	Cynoscion regalis (weakfish)	3.9
6	(*) (Inedible flounders)	3.1
7	Lagodon rhomboides (pinfish)	2.8
8	Synodus foetens (Inshore lizardfish)	2.0
9	Calamus sp. and Stenotomus sp. (porgies)	1.7
10	Menticirrhus spp (2) (kingfishes and whitings)	1.4
	Total Percent	90.2

(*) Inedible flounders consisted of blackcheek tonguefish (Symphurus plagiusa), fringed flounder (Etropus crossotus), windowpane (Scophthalmus aquosus), spotted whiff (Citharichthys macrops), hogchoker (Trinectes maculatus), ocellated flounder (Ancylopsetta quadrocellata), and naked sole Gymnachirus melas).

evaluate the fish catch-per-hour data derived from shrimp trawlers to determine if fish stocks are declining or in the future will decline. Trawlers specifically designed for industrial fishing should be permitted to enter the fishery with the proviso that detailed catch-per-unit-effort data be recorded and provided to the Fisheries Statistics Section of the Office of Conservation and Management. Such fishing activity would provide the opportunity to acquire detailed catch statistics which could be utilized to assess the impact of commercial trawling on finfish stocks.

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APPENDIX TABLE 1.

Relative abundance (by number and weight) of species in trawl catches of South Carolina's nearshore waters sampled between May 1974 and August 1975.

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Order Squaliformes						
Family Odontaspididae	2	< 0.01		102.5	2.8	
Odontaspis taurus - sand tiger	2	< 0.01	66	102.5	2.8	8
Family Carcharhinidae	32	0.02		64.5	1.75	
Carcharhinus milberti - sandbar shark	2	< 0.01	66	8.8	0.24	38
Carcharhinus limbatus - blacktip shark	2	< 0.01	66	1.4	0.04	65
Mustelus canis - smooth dogshark	11	0.01	57	49.5	1.34	14
Rhizoprinodon terraenovae - Atlantic sharpnose shark	17	0.01	51	4.8	0.13	44
Family Sphyrnidae	21	0.01		8.4	0.22	
Sphyrna lewini - scalloped hammerhead	14	0.01	54	5.7	0.15	41
Sphyrna tiburo - bonnethead shark	4	< 0.01	64	0.8	0.02	73
Sphyrna zygaena - smooth hammerhead	3	< 0.01	65	1.9	0.05	58
Family Squalidae	14	0.01		49.2	1.34	
Squalus acanthias - spiny dogfish	14	0.01	54	49.2	1.34	15
Order Rajiformes						
Family Rhinobatidae - Guitarfishes	2	<0.01		0.6	0.02	
Rhinobatos lentiginosus - Atlantic guitarfish	2	< 0.01	66	0.6	0.02	76
Family Rajidae - Skates	96	0.08		78.0	2.12	
Raja eglantera - clearnose skate	96	0.08	34	78.0	2.12	11
Family Dasyatidae - Stingrays	200	0.17		72.0	1.95	
Dasyatis americana - Southern stingray	12	0.01	56	1.7	.05	60
Dasyatis centroura - Roughtail stingray	2	< 0.01	66	1.4	.04	64

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Dasyatis sabina - Atlantic stingray	124	0.10	32	44.3	1.20	17
Dasyatis sayi - bluntnose stingray	33	0.03	43	14.4	0.39	33
Dasyatis sp.	11	0.01	57	3.1	0.08	51
Gymnura micrura - smooth butterfly ray	18	0.02	50	7.1	0.19	39
Family Myliobatidae - Eagle rays	42	0.03		116.4	3.16	
Myliobatis freminvillei - bullnose ray	2	< 0.01	66	1.6	0.04	61
Rhinoptera bonasus - cownose ray	40	0.03	42	114.8	3.12	7
Order Acipenseriformes						
Family Acipenseridae - Sturgeons	4	< 0.01		5.0	0.14	
Acipenser oxyrhynchus - Atlantic sturgeon	4	<0.01	64	5.0	0.14	42
Order Anguilliformes						
Family Congridae	2	< 0.01	66	0.2	0.01	80
Family Ophichthidae	2	< 0.01	66	0.2	0.01	80
Order Clupeiformes						
Family Clupeidae	4864	8.26		373.9	10.17	
Clupeidae	12	.01	56	1.1	0.03	69
Alosa spp.	16	0.01	52	0.6	0.03	75
Brevoortia smithi - Gulf menhaden	2	<0.01	66	0.2	0.01	80
Brevoortia tyrannus - Atlantic menhaden	8,163	6.84	5	340.1	9.24	2
Opisthonema oglinum - Atlantic thread herring	1,657	1.39	14	31.8	0.86	20
Sardinella anchovia - Spanish sardine	14	0.01	54	0.1	<0.01	81

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Family Engraulidae	10,923	9.16		44.2	1.19	
Anchoa hepsetus - striped anchovy	3,162	2.65	9	20.0	0.54	27
Anchoa lyolepis - dusky anchovy	20	0.02	48	0.1	< 0.01	81
Anchoa mitchilli - bay anchovy	7,421	6.22	6	22.9	0.62	25
Anchoa sp.	320	0.27	27	1.2	0.03	68
Order Myctophiformes						
Family Synodontidae - lizard fishes	205	0.17		12.5	0.34	
Synodus foetens - inshore lizard fish	205	0.17	28	12.5	0.34	34
Order Siluriformes						
Family Ariidae - sea catfishes	1,151	0.96		86.8	2.35	
Arius felis - sea catfish	1,105	0.92	17	84.8	2.30	9
Bagre marinus - gafftopsail catfish	46	.04	41	2.0	.05	57
Order Batrachoidiformes						
Family Batrachoididae - toadfishes	14	0.01		1.1	0.03	
Opsanus tau - oyster toadfish	12	0.01	56	0.9	0.02	72
Porichthys porosissimus - Atlantic midshipmen	2	< 0.01	66	0.2	0.01	80
Order Lophiiformes - batfishes						
Family Ogcocephaildae - batfishes	1	< 0.01		0.1	< 0.01	
Ogcocephalus parvus - roughback batfish	1	< 0.01	67	0.1	< 0.01	81

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Order Gadiformes						
Family Gadidae	8,702	7.30		201.1	5.46	
Urophycis floridanus	7	0.01	61	0.5	0.01	77
Urophycis regius	8,695	7.29	4	200.6	5.45	4
Family Ophidiidae	11	0.01	57	1.0	0.03	71
Order Atheriniformes						
Family Atherinidae	5	< 0.01		0.1	< 0.01	
Menidia menidia - Atlantic silversides	5	< 0.01	63	0.1	<0.01	81
Order Gasterosteiformes						
Family Syngnathidae - Pipefishes and seahorses	2	< 0.01		0.2	< 0.01	
Syngnathidae	1	< 0.01	67	0.1	< 0.01	81
Hippocampus sp.	1	< 0.01	67	0.1	< 0.01	81
Order Perciformes						
Family Serranidae - sea basses	48	0.04		3.3	0.09	
Centropristis sp.	1	< 0.01	67	0.1	< 0.01	81
Centropristis ocyurus - bank sea bass	5	< 0.01	63	0.4	0.01	78
Centropristis philadelphica - rock sea bass	22	0.02	47	1.4	0.04	63
Centropristis striata - black sea bass	19	0.02	49	1.3	0.04	66
Mycteroperca interstitialis - yellowmouth grouper	1	< 0.01	67	0.1	<0.01	81
Family Pomatomidae	584	0.49		32.8	0.89	
Pomatomus saltatrix - bluefish	584	0.49	23	32.8	0.89	18

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Family Carangidae - Jacks and pompanos	3,055	2.56		40.4	1.09	
Caranx hippos - crevalle jack	2	< 0.01	66	.2	0.01	80
Caranx chrysos - blue runner	18	0.02	50	1.8	0.05	59
Chloroscombrus chrysurus - bumper	2,568	2.15	11	26.6	0.72	23
Selene vomer - lookdown	89	0.07	35	3.4	0.09	48
Trachinotus carolinus - pompano	18	0.02	50	2.0	0.05	56
Vomer setipinnis - Atlantic moonfish	359	0.3	26	6.3	0.17	40
Trachinotus falcatus - permit	1	< 0.01	67	0.1	< 0.01	81
Family Gerridae - mojarras	3	< 0.01		0.3	0.01	
Eucinostomus argenteus - spotfin mojarra	2	< 0.01	66	0.2	0.01	80
Eucinostomus gula - silver jenny	1	< 0.01	67	0.1	< 0.01	81
Family Pomadasyidae - grunts	26	0.02		2.3	0.07	
Haemulon aurolineatum	4	< 0.01	64	0.3	0.01	79
Haemulon sciurus - bluestriped grunt	10	0.01	58	1.0	0.03	70
Orthopristis chrysoptera - pigfish	12	0.01	56	1.0	0.03	71
Family Sparidae - porgies	593	0.5		17.6	0.48	
Lagodon rhomboides - pinfish	584	0.49	23	17.0	0.46	30
Stenotomus caprinus - Longspine porgy	9	0.01	59	0.6	0.02	75
Family Sciaenidae - croakers	72,144	60.46		2,023.0	54.95	
Bairdiella chrysura - silver perch	630	0.53	22	21.4	0.58	26
Cynoscion nebulosus - spotted seatrout	23	0.02	46	2.9	0.08	52
Cynoscion nothus - silver seatrout	670	0.57	20	17.5	0.47	28
Cynoscion regalis - weakfish	3,219	2.70	8	80.2	2.18	10
Cynoscion spp	127	0.11	31	3.3	0.09	49
Larimus fasciatus - banded drum	2,630	2.20	10	52.9	1.44	13
Leiostomus xanthurus - spot	36,356	30.46	1	1,329.1	36.10	1
Menticirrhus americanus - Southern kingfish	3,328	2.79	7	135.0	3.67	6
Menticirrhus littoralis - Gulf kingfish	79	0.07	36	4.6	0.12	45
Menticirrhus spp	72	0.06	37	2.1	0.06	55

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Menticirrhus saxatilis - Northern kingfish	2	<0.01	66	0.2	0.01	80
Micropogon undulatus - croaker	10,600	8.88	3	211.0	5.73	3
Stellifer lanceolatus - stardrum	14,408	12.07	2	162.8	4.42	5
Family Ephippidae - spadefishes		0.04		2.9	0.08	
Chaetodipterus faber - Atlantic spadefish	53	.04	39	2.9	0.08	53
Family Mugilidae	14	.01		0.6	0.02	
Mugil cephalus - striped mullet	14	0.01	54	0.6	0.02	75
Family Sphyraenidae	50	0.04		3.5	0.10	
Sphyraena guachancho - guaguanche	46	0.04	41	3.2	0.09	50
Sphyraena borealis - Northern sennet	3	<0.01	65	0.2	0.01	80
Sphyraena barracuda - great barracuda	1	<0.01	67	0.1	<0.01	81
Family Uranoscopidae	12	0.01		1.0	0.04	
Astroscopus guttatus - Northern stargazer	2	<0.01	66	0.2	0.01	80
Astroscopus y-graecum - Southern stargazer	8	0.01	60	0.6	0.02	75
Astroscopus sp.	2	<0.01	66	0.2	0.01	80
Family Blennidae	17	0.01		1.1	0.03	
Hyposoblennius hentzi - feather blenny	15	0.01	53	1.0	0.03	71
Hypsoblennius sp.	2	<0.01	66	0.1	<0.01	81
Family Gobiidae	1	<0.01	67	0.1	<0.01	81
Family Trichiuridae	194	0.16		17.3	0.47	
Trichiurus lepturus - Atlantic cutlass fish	194	0.16	29	17.3	0.47	29

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Family Scombridae - Mackerels and tunas	1,200	1.00		53.2	1.45	
Scomberomorus cavalla - king mackerel	135	0.11	30	4.0	0.11	46
Scomberomorus maculatus - Spanish mackerel	1,065	0.89	18	49.2	1.34	16
Family Stromateidae - butterfishes	2,700	2.26		46.1	1.26	
Cubiceps athenae - bigeye cigarfish	4	< 0.01	64	0.2	0.01	80
Peprilus alepidotus - Southern harvestfish	795	0.67	19	14.7	0.40	32
Peprilus triacanthus - butterfish	1,901	1.59	13	31.2	0.85	21
Family Triglidae	612	0.51		19.6	0.54	
Prionotus carolinus - Northern searobin	51	0.04	40	2.4	0.07	54
Prionotus evolans - striped searobin	18	0.02	50	0.9	0.02	72
Prionotus salmonicolor - blackwing searobin	3	< 0.01	65	0.1	< 0.01	81
Prionotus scitulus - leopard searobin	28	0.02	44	3.9	0.11	47
Prionotus tribulus - bighead searobin	3	< 0.01	65	0.3	0.01	79
Prionotus spp	509	0.43	24	12.0	0.33	35
Order Pleuronectiformes						
Family Bothidae - lefteye flounder	2,816	2.37		100.5	2.71	
Bothidae	13	0.01	55	0.1	< 0.01	81
Ancylopsetta quadrocellata - occelated flounder	104	0.09	33	4.8	0.13	43
Citharichthys macrops - spotted whiff	70	0.06	38	1.8	0.05	59
Citharichthys spilopterus - bay whiff	667	0.56	21	15.7	0.43	31
Citharichthys spp	6	0.01	62	0.3	0.01	79
Paralichthys dentatus - summer flounder	359	0.30	26	31.8	0.86	19
Paralichthys lethostigma - Southern flounder	79	0.07	36	11.5	0.31	36
Paralichthys oblongus - fourspot flounder	1	< 0.01	67	0.1	< 0.01	81
Paralichthys squamilentus - broad flounder	1	< 0.01	67	0.1	< 0.01	81
Paralichthys sp.	1	< 0.01	67	0.1	< 0.01	81
Scophthalmus aquosus - window pane	380	0.32	25	10.5	0.28	37
Etropus crossotus - fringed flounder	1,135	0.95	16	23.7	0.64	24

	NUMBER			WEIGHT		
	TOTAL	PERCENT	RANK	TOTAL (kg)	PERCENT	RANK
Family Soleidae	1,410	1.18		28.7	0.78	
Trinectes maculatus - hogchoker	1,410	1.18	15	28.7	0.78	22
Family Cynoglossidae	2,445	2.05		65.4	1.78	
Symphurus plagiusa	2,445	2.05	12	65.4	1.78	12
Order Tetradontiformes						
Family Balistidae	20	0.01		1.6	0.04	
Aluterus monocerus - unicorn filefish	2	< 0.01	66	0.1	< 0.01	81
Aluterus sp.	2	< 0.01	66	0.1	< 0.01	81
Monocanthus hispidus - planehead filefish	14	0.01	54	1.2	0.03	67
Balistidae	2	< 0.01	66	0.2	0.01	80
Family Tetraodontidae	15	0.01		1.3	0.04	
Tetraodontidae	2	< 0.01	66	0.2	0.01	80
Lagocephalus laevigatus - smooth puffer	4	< 0.01	64	0.4	0.01	78
Sphoeroides maculatus - Northern puffer	9	0.01	59	0.7	0.02	74
Family Diodontidae	25	0.02		1.5	0.04	
Chilomycterus schoepfi - striped burrfish	25	0.02	45	1.5	0.04	62

APPENDIX TABLE 2.

Relative abundance (by number and weight) of species in trawl catches of South Carolina's nearshore waters sampled between May 1974 and August 1975.

MAY 1974

Species	RELATIVE ABUNDANCE Total Number In Samples	Percent of Total Sample	Rank	RELATIVE BIOMASS Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Leiostomus xanthurus	680.0	61.82	1	35.09	73.34	1
Stellifer lanceolatus	105.0	9.55	2	1.31	2.73	4
Cynoscion regalis	65.0	5.91	3	2.47	5.16	3
Trichiurus lepturus	44.0	4.00	4	3.50	7.31	2
Micropogon undulatus	25.0	2.27	5	0.20	0.42	13
Synodus foetens	24.0	2.18	6	0.69	1.45	5
Bairdiella chrysura	24.0	2.18	6	0.63	1.37	6
Menticirrhus americanus	22.0	2.00	7	0.45	0.94	7
Anchoa lyolepis	20.0	1.82	8	0.10	0.21	15
Anchoa hepsetus	17.0	1.55	9	0.30	0.63	11
Prionotus carolinus	14.0	1.27	10	0.33	0.69	9
Scophthalmus aquosus	13.0	1.18	11	0.25	0.52	12
Brevoortia tyrannus	12.0	1.09	12	0.31	0.65	10
Peprilus triacanthus	8.0	0.73	13	0.30	0.63	11
Trinectes maculatus	8.0	0.73	13	0.20	0.42	13
Haemulon aurolineatum	3.0	0.27	14	0.20	0.42	13
Peprilus alepidotus	3.0	0.27	14	0.12	0.25	14
Citharichthys spilopterus	3.0	0.27	14	0.20	0.42	13
Centropristis striata	2.0	0.18	15	0.02	0.04	16
Lagodon rhomboides	2.0	0.18	15	0.20	0.42	13
Stenotomus caprinus	2.0	0.18	15	0.20	0.42	13
Sphyrna lewini	1.0	0.09	16	0.10	0.21	15
Raja eglanteria	1.0	0.09	16	0.10	0.21	15
Dasyatis sabina	1.0	0.09	16	0.45	0.95	7
Etropus crossotus	1.0	0.09	16	0.10	0.21	15
TOTAL	1100.0			47.82		

JUNE 1974

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Leiostomus xanthurus	1916.0	39.00	1	99.30	52.20	1
Stellifer lanceolatus	567.0	11.54	2	8.02	4.22	4
Micropogon undulatus	566.0	11.52	3	9.37	4.93	3
Brevoortia tyrannus	534.0	10.87	4	28.57	15.04	2
Anchoa hepsetus	487.0	9.91	5	2.85	1.50	7
Menticirrhus americanus	155.0	3.15	6	7.18	3.78	5
Larimus fasciatus	119.0	2.42	7	2.70	1.42	8
Pomatomus saltatrix	78.0	1.59	8	2.91	1.53	6
Cynoscion regalis	75.0	1.53	9	2.55	1.34	9
Opisthonema oglinum	55.0	1.12	10	1.63	0.86	12
Scomberomorus maculatus	46.0	0.94	11	2.10	1.11	11
Trinectes maculatus	40.0	0.81	12	1.60	0.04	13
Synodus foetens	40.0	0.81	13	1.28	0.67	18
Citharichthys spilopterus	33.0	0.67	13	1.20	0.63	19
Peprilus triacanthus	24.0	0.49	14	1.57	0.83	15
Trichiurus lepturus	24.0	0.49	14	2.13	1.12	10
Lagodon rhomboides	20.0	0.41	15	0.40	0.21	26
Paralichthys dentatus	17.0	0.35	16	1.50	0.79	16
Etropus crossotus	17.0	0.35	16	0.70	0.37	22
Scophthalmus aquosus	9.0	0.18	17	0.90	0.47	21
Prionotus carolinus	9.0	0.18	17	0.70	0.37	22
Chloroscombrus chrysurus	8.0	0.16	18	0.40	0.21	26
Peprilus alepidotus	8.0	0.16	18	0.50	0.26	25
Arius felis	8.0	0.16	18	1.31	0.69	17
Vomer setapinnis	7.0	0.14	19	0.50	0.26	25
Clupeidae	7.0	0.14	19	0.20	0.10	28
Bairdiella chrysurus	5.0	0.10	20	0.50	0.26	25
Rhizoprinodon terraenovae	4.0	0.08	21	0.30	0.16	27
Stenotomus caprinus	4.0	0.08	21	0.10	0.05	29
Ancylopsetta quadrocellata	4.0	0.08	21	0.40	0.21	26

Species	RELATIVE ABUNDANCE Total Number In Samples	Percent Of Total Sample	Rank	RELATIVE BIOMASS Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Menticirrhus littoralis	3.0	0.06	22	0.20	0.10	28
Prionotus evolans	3.0	0.06	22	0.30	0.16	27
Paralichthys lethostigma	2.0	0.04	23	0.10	0.05	29
Sphyrna lewini	2.0	0.04	23	0.91	0.48	19
Orthopristis chrysoptera	2.0	0.04	23	0.20	0.10	28
Gymnura micrura	2.0	0.04	23	0.10	0.05	29
Myliobatis freminvillei	2.0	0.04	23	1.59	0.84	14
Symphurus plagiusa	1.0	0.02	24	0.30	0.16	27
Chilomycterus schoepfi	1.0	0.02	24	0.10	0.05	29
Dasyatis sayi	1.0	0.02	24	0.68	0.36	23
Cynoscion nebulosus	1.0	0.02	24	0.20	0.10	28
Raja eglanteria	1.0	0.02	24	0.60	0.32	24
Ophidiidae	1.0	0.02	24	0.10	0.05	29
Mustelus canis	1.0	0.02	24	0.60	0.32	24
Caranx crysos	1.0	0.02	24	0.10	0.05	29
Sphyraena guachancho	1.0	0.02	24	0.10	0.05	29
Prionotus tribulus	1.0	0.02	24	0.10	0.05	29
Paralichthys squamilentus	1.0	0.02	24	0.10	0.05	29
Centropristis striata	1.0	0.02	24	0.10	0.05	29
Monacanthus hispidus	1.0	0.02	24	0.10	0.05	29
TOTAL	4915.0			189.95		

JULY 1974

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Leiostomus xanthurus	3978.0	39.35	1	260.81	67.32	1
Micropogon undulatus	1040.0	10.29	2	23.88	6.16	2
Anchoa hepsetus	938.0	9.28	3	3.60	0.93	10
Stellifer lanceolatus	838.0	8.29	4	11.26	2.91	4
Cynoscion regalis	643.0	6.36	5	9.40	2.43	5
Larimus fasciatus	422.0	4.17	6	6.12	1.58	9
Menticirrhus americanus	411.0	4.07	7	12.24	3.16	3
Chloroscombrus chrysurus	365.0	3.61	8	2.60	0.67	13
Scomberomorus maculatus	309.0	3.06	9	7.61	1.96	7
Pomatomus saltatrix	159.0	1.57	10	6.93	1.79	8
Brevoortia tyrannus	148.0	1.46	11	8.03	2.07	6
Peprilus triacanthus	120.0	1.19	12	1.90	0.49	17
Opisthonema oglinum	119.0	1.18	13	2.10	0.54	16
Citharichthys spilopterus	104.0	1.03	14	3.10	0.80	12
Etropus crossotus	101.0	1.00	15	3.20	0.83	11
Trinectes maculatus	75.0	0.74	16	2.50	0.64	14
Peprilus alepidotus	50.0	0.50	17	1.80	0.46	18
Symphurus plagiusa	38.0	0.38	18	1.90	0.49	17
Trichiurus lepturus	34.0	0.34	19	2.28	0.59	15
Prionotus spp.	32.0	0.32	20	1.60	0.41	20
Scophthalmus aquosus	24.0	0.24	21	1.20	0.31	22
Anchoa mitchilli	23.0	0.24	22	0.30	0.08	31
Arius felis	23.0	0.24	22	0.80	0.21	26
Paralichthys dentatus	19.0	0.19	23	1.50	0.39	21
Synodus foetens	15.0	0.15	24	1.00	0.26	24
Prionotus carolinus	10.0	0.10	25	0.60	0.16	27
Scomberomorus cavalla	7.0	0.07	26	0.40	0.10	31
Lagodon rhomboides	6.0	0.06	27	0.60	0.16	27

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Caranx crysos	5.0	0.05	28	0.50	0.13	29
Dasyatis sayi	5.0	0.05	28	1.08	0.28	23
Selene vomer	5.0	0.05	28	0.40	0.10	31
Prionotus scitulus	3.0	0.03	29	0.20	0.05	33
Sphyrna lewini	3.0	0.03	29	1.70	0.44	19
Sphyraena guachancho	3.0	0.03	29	0.30	0.08	32
Vomer setapinnis	2.0	0.02	30	0.20	0.05	33
Prionotus evolans	2.0	0.02	30	0.10	0.03	34
Ancylopsetta quadrocellata	2.0	0.02	30	0.10	0.03	34
Rhizoprinodon terraenovae	2.0	0.02	30	0.91	0.24	25
Cynoscion nebulosus	2.0	0.02	30	0.54	0.14	28
Astroscopus guttatus	2.0	0.02	30	0.20	0.05	33
Centropristis striata	1.0	0.01	31	0.10	0.03	34
Raja eglanteria	1.0	0.01	31	0.10	0.03	34
Ophidiidae	1.0	0.01	31	0.10	0.03	34
Chaetopterus faber	1.0	0.01	31	0.10	0.03	34
Rhinobatos lentiginosus	1.0	0.01	31	0.45	0.12	30
Porichthys porosissimus	1.0	0.01	31	0.10	0.03	34
Ogcocephalus parvus	1.0	0.01	31	0.10	0.03	34
Mycteroperca interstitialis	1.0	0.01	31	0.10	0.03	34
Eucinostomus argenteus	1.0	0.01	31	0.10	0.03	34
Orthopristis chrysoptera	1.0	0.01	31	0.10	0.03	34
Menticirrhus saxatilus	1.0	0.01	31	0.10	0.03	34
Paralichthys oblongus	1.0	0.01	31	0.10	0.03	34
Aluterus sp.	1.0	0.01	31	0.10	0.03	34
Syngnathidae	1.0	0.01	31	0.10	0.03	34
Monacanthus hispidus	1.0	0.01	31	0.10	0.03	34
Opsanus tau	1.0	0.01	31	0.10	0.03	34
TOTAL	10109.0			387.44		

AUGUST 1974

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Leiostomus xanthurus	2486.0	28.17	1	128.54	41.94	1
Chloroscombrus chrysurus	849.0	9.62	2	6.89	2.25	10
Micropogon undulatus	750.0	8.50	3	31.05	10.13	2
Anchoa mitchilli	717.0	8.12	4	1.55	0.51	20
Opisthonema oglinum	589.0	6.67	5	8.57	2.80	8
Stellifer lanceolatus	501.0	5.68	6	6.43	2.10	11
Anchoa hepsetus	475.0	5.38	7	2.45	0.80	15
Menticirrhus americanus	388.0	4.40	8	15.80	5.16	4
Larimus fasciatus	369.0	4.18	9	8.22	2.68	9
Cynoscion regalis	344.0	3.90	10	13.34	4.35	6
Brevoortia tyrannus	288.0	3.26	11	21.21	6.92	3
Peprilus alepidotus	265.0	3.00	12	2.63	0.86	14
Scomberomorus maculatus	184.0	2.08	13	14.44	4.71	5
Etropus crossotus	111.0	1.26	14	2.10	0.68	17
Citharichthys spilopterus	85.0	0.96	15	1.40	0.46	22
Arius felis	58.0	0.66	16	12.77	4.17	7
Trinectes maculatus	44.0	0.50	17	1.30	0.42	23
Pomatomus saltatrix	42.0	0.48	18	3.72	1.21	12
Menticirrhus littoralis	27.0	0.31	19	1.75	0.57	18
Synodus foetens	25.0	0.28	20	3.12	1.02	13
Selene vomer	24.0	0.27	21	1.00	0.33	26
Vomer setapinnis	22.0	0.25	22	0.90	0.29	27
Scomberomorus cavalla	19.0	0.22	23	0.60	0.20	29
Lagodon rhomboides	16.0	0.18	24	1.00	0.33	26
Trichiurus lepturus	15.0	0.17	25	2.19	0.72	16
Sphyraena guachancho	13.0	0.15	26	1.25	0.41	24
Alosa sp.	11.0	0.12	27	0.10	0.03	36
Paralichthys dentatus	11.0	0.12	27	1.71	0.56	19
Symphurus plagiusa	11.0	0.12	27	0.50	0.16	31

AUGUST 1974 (Continued Page 2.)

Species	RELATIVE ABUNDANCE Total Number In Samples	Percent Of Total Sample	Rank	RELATIVE BIOMASS Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Haemulon sciurus	10.0	0.11	28	1.01	0.33	25
Bairdiella chrysura	8.0	0.09	29	0.40	0.13	33
Chaetodipterus faber	8.0	0.09	29	1.25	0.41	24
Bagre marinus	7.0	0.08	30	0.50	0.16	31
Peprilus triacanthus	7.0	0.08	30	0.50	0.16	31
Prionotus carolinus	7.0	0.08	30	0.40	0.13	33
Trachinotus carolinus	6.0	0.07	31	0.50	0.16	31
Dasyatis sabina	5.0	0.06	32	1.43	0.47	21
Prionotus spp.	4.0	0.04	33	0.40	0.13	33
Orthopristis chrysoptera	3.0	0.03	34	0.20	0.06	35
Caranx crysos	3.0	0.03	34	0.30	0.10	34
Ancylopsetta guadrocellata	3.0	0.03	34	0.20	0.06	35
Dasyatis sayi	2.0	0.02	35	0.55	0.18	30
Chilomycterus schoepfi	2.0	0.02	35	0.20	0.06	35
Scophthalmus aquosus	1.0	0.01	36	0.10	0.03	36
Cynoscion nebulosus	1.0	0.01	36	0.10	0.03	36
Carcharhinus limbatus	1.0	0.01	36	0.68	0.22	28
Rhinobatos lentiginosus	1.0	0.01	36	0.10	0.03	36
Raja eglanteria	1.0	0.01	36	0.45	0.15	32
Congridae	1.0	0.01	36	0.10	0.03	36
Centropristis ocyurus	1.0	0.01	36	0.10	0.03	36
Centropristis philadelphica	1.0	0.01	36	0.10	0.03	36
Gobiidae	1.0	0.01	36	0.10	0.03	36
Aluterus sp.	1.0	0.01	36	0.10	0.03	36
Paralichthys lethostigma	1.0	0.01	36	0.10	0.03	36
Dasyatis americana	1.0	0.01	36	0.10	0.03	36
TOTAL	8826.0			306.50		

SEPTEMBER 1974

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Stellifer lanceolatus	1141.0	25.42	1	11.40	10.29	3
Chloroscombrus chrysurus	733.0	16.33	2	6.44	5.82	5
Anchoa mitchilli	434.0	9.67	3	1.00	0.90	21
Leiostomus xanthurus	342.0	7.62	4	21.74	19.62	1
Anchoa hepsetus	327.0	7.29	5	2.05	1.85	12
Menticirrhus americanus	270.0	6.02	6	9.55	8.62	4
Micropogon undulatus	201.0	4.48	7	11.81	10.66	2
Cynoscion regalis	170.0	3.79	8	5.79	5.23	6
Opisthonema oglinum	117.0	2.61	9	2.63	2.37	10
Larimus fasciatus	95.0	2.12	10	2.94	2.66	9
Peprilus alepidotus	89.0	1.98	11	1.60	1.44	16
Scomberomorus maculatus	87.0	1.94	12	3.85	3.47	8
Trinectes maculatus	80.0	1.78	13	1.71	1.54	15
Etropus crossotus	53.0	1.18	14	1.40	1.26	17
Bairdiella chrysura	49.0	1.09	15	1.81	1.63	13
Symphurus plagiusa	46.0	1.02	16	0.90	0.81	22
Citharichthys spilopterus	36.0	0.80	17	1.30	1.17	19
Arius felis	34.0	0.76	18	1.81	1.63	13
Brevoortia tyrannus	33.0	0.74	19	2.09	1.88	11
Scomberomorus cavalla	28.0	0.62	20	0.80	0.73	23
Chaetodipterus faber	20.0	0.45	21	1.00	0.90	21
Vomer setapinnis	13.0	0.29	22	0.70	0.63	24
Paralichthys dentatus	13.0	0.29	22	4.04	3.65	7
Dasyatis sabina	7.0	0.16	23	1.76	1.59	14
Synodus foetens	7.0	0.16	23	0.65	0.59	26
Bagre marinus	7.0	0.16	23	0.70	0.63	24
Trichiurus lepturus	6.0	0.13	24	1.23	1.11	20
Pomatomus saltatrix	5.0	0.11	25	0.40	0.36	29
Caranx crysos	5.0	0.11	25	0.50	0.45	27
Cynoscion nothus	5.0	0.11	25	0.40	0.36	29
Sphyraena guachancho	5.0	0.11	25	0.50	0.45	27
Sphyrna tiburo	3.0	0.07	26	0.65	0.59	26

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Centropristis striata	3.0	0.07	26	0.10	0.09	32
Peprilus triacanthus	3.0	0.07	26	0.65	0.59	26
Lagocephalus laevigatus	3.0	0.07	26	0.30	0.27	30
Prionotus sp.	3.0	0.07	26	0.20	0.18	31
Selene vomer	2.0	0.04	27	0.20	0.18	31
Trachinotus carolinus	2.0	0.04	27	0.20	0.18	31
Carcharhinus limbatus	1.0	0.02	28	0.68	0.61	25
Sphyrna zygaena	1.0	0.02	28	1.36	1.23	18
Raja eglanteria	1.0	0.02	28	0.45	0.41	28
Dasyatis sayi	1.0	0.02	28	0.68	0.61	25
Opsanus tau	1.0	0.02	28	0.10	0.09	32
Centropristis philadelphica	1.0	0.02	28	0.10	0.09	32
Lagodon rhomboides	1.0	0.02	28	0.10	0.09	32
Cynoscion nebulosus	1.0	0.02	28	0.10	0.09	32
Prionotus carolinus	1.0	0.02	28	0.10	0.09	32
Prionotus scitulus	1.0	0.02	28	0.10	0.09	32
Scophthalmus aquosus	1.0	0.02	28	0.10	0.09	32
Paralichthys lethostigma	1.0	0.02	28	0.10	0.09	32
TOTAL	4489.0			110.77		

OCTOBER 1974

Species	RELATIVE ABUNDANCE Total Number In Samples	Percent Of Total Sample	Rank	RELATIVE BIOMASS Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Stellifer lanceolatus	1133.0	27.33	1	16.35	10.19	2
Anchoa mitchilli	676.0	16.31	2	2.11	1.31	14
Cynoscion regalis	380.0	9.17	3	9.93	6.19	6
Chloroscombrus chrysurus	276.0	6.66	4	2.23	1.39	13
Menticirrhus americanus	231.0	5.57	5	12.17	7.58	4
Anchoa hepsetus	197.0	4.75	6	2.69	1.68	10
Leiostomus xanthurus	170.0	4.10	7	11.02	6.87	5
Brevoortia tyrannus	169.0	4.08	8	13.30	8.29	3
Larimus fasciatus	116.0	2.80	9	3.04	1.90	8
Etropus crossotus	91.0	2.20	10	1.55	0.97	19
Peprilus alepidotus	86.0	2.07	11	1.45	0.91	20
Symphurus plagiusa	80.0	1.93	12	2.32	1.45	12
Vomer setapinnis	79.0	1.91	13	1.10	0.69	24
Trinectes maculatus	66.0	1.59	14	1.85	1.16	15
Peprilus triacanthus	53.0	1.28	15	1.73	1.08	16
Bairdiella chrysura	45.0	1.09	16	1.45	0.91	20
Opisthonema oglinum	41.0	0.99	17	1.18	0.74	21
Micropogon undulatus	29.0	0.70	18	1.71	1.06	17
Scomberomorus maculatus	26.0	0.63	19	1.66	1.04	18
Rhinoptera bonasus	23.0	0.55	20	49.23	30.69	1
Cynoscion nothus	19.0	0.46	21	0.70	0.44	28
Citharichthys spilopterus	19.0	0.46	21	0.80	0.50	26
Pomatomus saltatrix	18.0	0.43	22	2.90	1.81	9
Scomberomorus cavalla	18.0	0.43	22	0.85	0.53	25
Arius felis	17.0	0.41	23	0.40	0.25	32
Chaetodipterus faber	15.0	0.36	24	0.80	0.50	26
Paralichthys dentatus	9.0	0.22	25	2.34	1.46	11
Raja eglanteria	7.0	0.17	26	2.70	1.68	10
Dasyatis sabina	7.0	0.17	26	0.75	0.47	27
Sphyraena guachancho	7.0	0.17	26	0.60	0.37	29

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Bagre marinus	5.0	0.12	27	0.50	0.31	30
Paralichthys lethostigma	5.0	0.12	27	1.12	0.70	23
Scophthalmus aquosus	5.0	0.12	27	0.40	0.25	32
Prionotus spp.	5.0	0.12	27	0.30	0.19	33
Synodus foetens	3.0	0.07	28	0.30	0.19	33
Dasyatis sayi	2.0	0.05	29	1.13	0.71	22
Opsanus tau	2.0	0.05	29	0.10	0.06	35
Caranx crysos	2.0	0.05	29	0.20	0.12	34
Orthopristis chrysoptera	2.0	0.05	29	0.20	0.12	34
Sphyrna tiburo	1.0	0.02	30	0.10	0.06	35
Dasyatis americana	1.0	0.02	30	0.45	0.28	31
Gymnura micrura	1.0	0.02	30	3.86	2.40	7
Clupeidae	1.0	0.02	30	0.10	0.06	35
Centropristis philadelphica	1.0	0.02	30	0.10	0.06	35
Centropristis striata	1.0	0.02	30	0.10	0.06	35
Lagodon rhomboides	1.0	0.02	30	0.10	0.06	35
Stenotomus caprinus	1.0	0.02	30	0.10	0.06	35
Hypsoblennius hentzi	1.0	0.02	30	0.10	0.06	35
Sphoeroides maculatus	1.0	0.02	30	0.10	0.06	35
Congridae	1.0	0.02	30	0.10	0.06	35
TOTAL	4145.0			160.37		

NOVEMBER 1974

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Anchoa mitchilli	531.0	17.81	1	2.26	1.81	8
Stellifer lanceolatus	501.0	16.81	2	2.94	2.35	7
Brevoortia tyrannus	483.0	16.20	3	40.47	32.40	1
Menticirrhus americanus	293.0	9.83	4	16.98	13.60	3
Leiostomus xanthurus	251.0	8.42	5	27.42	21.95	2
Cynoscion regalis	124.0	4.16	6	3.31	2.65	5
Anchoa hepsetus	117.0	3.92	7	1.15	0.92	13
Etropus crossotus	103.0	3.46	8	1.77	1.41	10
Peprilus triacanthus	97.0	3.25	9	5.86	4.69	4
Larimus fasciatus	84.0	2.82	10	1.10	0.88	16
Bairdiella chrysura	81.0	2.72	11	3.10	2.48	6
Trinectes maculatus	42.0	1.41	12	1.76	1.41	11
Peprilus alepidotus	32.0	1.07	13	1.10	0.88	16
Chloroscombrus chrysurus	30.0	1.01	14	0.60	0.48	21
Symphurus plagiusa	28.0	0.94	15	0.50	0.40	23
Vomer setapinnis	24.0	0.81	16	0.60	0.48	21
Sphyraena guachancho	17.0	0.57	17	0.50	0.40	23
Pomatomus saltatrix	16.0	0.54	18	1.57	1.26	11
Citharichthys spilopterus	16.0	0.54	18	0.60	0.48	21
Prionotus spp.	16.0	0.54	18	0.90	0.72	18
Micropogon undulatus	12.0	0.40	19	0.97	0.77	17
Cynoscion nothus	10.0	0.34	20	0.50	0.40	23
Mugil cephalus	10.0	0.34	20	0.44	0.32	24
Trichiurus lepturus	7.0	0.23	21	0.50	0.40	23
Scomberomorus maculatus	7.0	0.23	21	0.75	0.60	19
Paralichthys dentatus	7.0	0.23	21	1.11	0.89	14
Scomberomorus cavalla	5.0	0.17	22	0.20	0.16	26
Opisthonema oglinum	4.0	0.13	23	0.20	0.16	26
Synodus foetens	4.0	0.13	23	0.10	0.08	27
Prionotus scitulus	4.0	0.13	23	0.10	0.08	27

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Raja eglanteria	3.0	0.10	24	1.13	0.91	14
Centropristis philadelphica	3.0	0.10	24	0.20	0.16	26
Chilomycterus schoepfi	3.0	0.10	24	0.30	0.24	25
Dasyatis sabina	2.0	0.07	25	0.55	0.44	22
Gymnura micrura	2.0	0.07	25	0.68	0.54	19
Rhinoptera bonasus	2.0	0.07	25	1.81	1.45	9
Clupeidae	2.0	0.07	25	0.20	0.16	26
Lagodon rhomboides	2.0	0.07	25	0.10	0.08	27
Bagre marinus	1.0	0.03	26	0.10	0.08	27
Selene vomer	1.0	0.03	26	0.10	0.08	27
Eucinostomus argenteus	1.0	0.03	26	0.10	0.08	27
Chaetodipterus faber	1.0	0.03	26	0.10	0.08	27
Astroscopus y-graecum	1.0	0.03	26	0.10	0.08	27
Paralichthys lethostigma	1.0	0.03	26	0.10	0.08	27
TOTAL	2981.0			124.93		

DECEMBER 1974

Species	RELATIVE ABUNDANCE: Total Number In Samples	RELATIVE ABUNDANCE: Percent Of Total Sample	RELATIVE ABUNDANCE: Rank	RELATIVE BIOMASS: Total Weight Of Sample (Kg)	RELATIVE BIOMASS: Percent Of Total Sample	RELATIVE BIOMASS: Rank
Stellifer lanceolatus	297.0	23.80	1	2.42	6.28	3
Menticirrhus americanus	217.0	17.39	2	7.01	18.20	2
Anchoa mitchilli	204.0	16.35	3	0.90	2.34	11
Brevoortia tyrannus	135.0	10.82	4	10.49	27.26	1
Etropus crossotus	102.0	8.17	5	1.81	4.70	6
Symphurus plagiusa	78.0	6.25	6	2.20	5.72	5
Leiostomus xanthurus	45.0	3.61	7	1.68	4.37	8
Trinectes maculatus	44.0	3.53	8	1.29	3.36	10
Larimus fasciatus	32.0	2.56	9	1.76	4.58	7
Centropristis philadelphica	12.0	0.96	10	0.50	1.30	15
Bairdiella chrysura	12.0	0.96	10	0.70	1.82	14
Peprilus alepidotus	12.0	0.96	10	0.80	2.08	12
Cynoscion regalis	11.0	0.88	11	0.50	1.30	15
Paralichthys lethostigma	7.0	0.56	12	1.33	3.47	9
Micropogon undulatus	6.0	0.48	13	0.75	1.96	13
Citharichthys spilopterus	6.0	0.48	13	0.40	1.04	16
Cynoscion nothus	5.0	0.40	14	0.30	0.78	17
Prionotus scitulus	5.0	0.40	14	0.40	1.04	16
Dasyatis sabina	4.0	0.32	15	2.24	5.82	4
Cynoscion nebulosus	4.0	0.32	15	0.30	0.78	17
Trichiurus lepturus	3.0	0.24	16	0.10	0.26	18
Prionotus spp.	2.0	0.16	17	0.10	0.26	18
Alosa sp.	1.0	0.08	18	0.10	0.26	18
Pomatomus saltatrix	1.0	0.08	18	0.10	0.26	18
Menticirrhus littoralis	1.0	0.08	18	0.10	0.26	18
Mugil cephalus	1.0	0.08	18	0.10	0.26	18
Paralichthys dentatus	1.0	0.08	18	0.10	0.26	18
TOTAL	1248.0			38.48		

JANUARY 1975

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Brevoortia tyrannus	964.0	40.17	1	15.72	23.83	1
Anchoa mitchilli	466.0	19.42	2	1.10	1.67	13
Larimus fasciatus	226.0	9.42	3	0.95	1.45	14
Symphurus plagiusa	154.0	6.42	4	3.80	5.76	4
Leiostomus xanthurus	122.0	5.08	5	3.25	4.92	6
Urophycis regius	104.0	4.33	6	0.90	1.36	15
Menticirrhus americanus	81.0	3.37	7	1.59	2.42	9
Etropus crossotus	64.0	2.67	8	1.38	2.09	10
Stellifer lanceolatus	46.0	1.92	9	2.70	4.09	7
Cynoscion regalis	39.0	1.62	10	1.28	1.94	11
Cynoscion nothus	32.0	1.33	11	0.70	1.06	16
Lagodon rhomboides	15.0	0.62	12	0.70	1.06	16
Prionotus sp.	11.0	0.46	13	0.60	0.91	17
Dasyatis sabina	10.0	0.42	14	3.57	5.42	5
Paralichthys lethostigma	10.0	0.42	14	1.23	1.87	12
Raja eglanteria	9.0	0.37	15	9.17	13.90	3
Anchoa hepsetus	7.0	0.29	16	0.10	0.15	20
Menidia menidia	5.0	0.21	17	0.10	0.15	20
Ancylopsetta quadrocellata	4.0	0.17	18	0.30	0.45	18
Citharichthys spilopterus	4.0	0.17	18	0.30	0.45	18
Scophthalmus aquosus	4.0	0.17	18	0.30	0.45	18
Squalus acanthias	3.0	0.12	19	12.70	19.25	2
Bairdiella chrysura	3.0	0.12	19	0.20	0.30	19
Trichiurus lepturus	3.0	0.12	19	0.30	0.45	18
Trinectes maculatus	3.0	0.12	19	0.30	0.45	18
Acipenser oxyrhynchus	2.0	0.08	20	1.81	2.75	8
Hyposoblennius hentzi	2.0	0.08	20	0.20	0.30	19
Paralichthys dentatus	2.0	0.08	20	0.20	0.30	19
Monacanthus hispidus	2.0	0.08	20	0.20	0.30	19
Opisthonema oglinum	1.0	0.04	21	0.10	0.15	20
Peprilus alepidotus	1.0	0.04	21	0.10	0.15	20
Peprilus triacanthus	1.0	0.04	21	0.10	0.15	20
TOTAL	2400.0			65.95		

FEBRUARY 1975

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Leiostomus xanthurus	6693.0	65.04	1	222.96	53.32	1
Anchoa mitchilli	1052.0	10.22	2	2.91	0.70	13
Urophycis regius	529.0	5.14	3	7.99	1.91	9
Brevoortia tyrannus	453.0	4.40	4	10.53	2.52	6
Lagodon rhomboides	391.0	3.80	5	8.61	2.06	8
Symphurus plagiusa	325.0	3.16	6	9.74	2.33	7
Menticirrhus americanus	105.0	1.02	7	4.69	1.12	11
Peprilus triacanthus	92.0	0.89	8	1.40	0.33	16
Citharichthys spilopterus	79.0	0.77	9	1.30	0.31	19
Cynoscion nothus	74.0	0.72	10	1.40	0.33	17
Larimus fasciatus	73.0	0.71	11	1.40	0.33	17
Stellifer lanceolatus	67.0	0.65	12	1.20	0.29	20
Etropus crossotus	67.0	0.65	12	1.80	0.43	15
Cynoscion regalis	42.0	0.41	13	2.39	0.57	14
Prionotus spp.	39.0	0.38	14	1.20	0.29	20
Raja eglanteria	34.0	0.33	15	30.62	7.28	4
Paralichthys dentatus	32.0	0.31	16	4.92	1.17	10
Dasyatis sabina	26.0	0.25	17	18.67	4.44	5
Trinectes maculatus	20.0	0.19	18	0.75	0.18	22
Ancylopsetta quadrocellata	16.0	0.16	19	1.35	0.32	18
Scophthalmus aquosus	13.0	0.13	20	0.90	0.21	21
Squalus acanthias	11.0	0.11	21	36.51	8.68	3
Bairdiella chrysura	8.0	0.08	22	0.60	0.14	23
Micropogon undulatus	8.0	0.08	22	0.60	0.14	23
Mustelus canis	6.0	0.06	23	37.88	9.00	2
Hypsoblennius hentzi	6.0	0.06	23	0.20	0.05	26
Pomatomus saltatrix	5.0	0.05	24	0.20	0.05	26
Paralichthys lethostigma	4.0	0.04	25	0.55	0.13	24
Anchoa hepsetus	3.0	0.03	26	0.20	0.05	26
Trichiurus lepturus	3.0	0.03	26	0.30	0.07	25
Monacanthus hispidus	3.0	0.03	26	0.20	0.05	26
Acipenser oxyrhynchus	2.0	0.02	27	3.18	0.75	12

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Peprilus alepidotus	2.0	0.02	27	0.20	0.05	26
Alosa spp.	2.0	0.02	27	0.20	0.05	26
Clupeidae	1.0	0.01	28	0.10	0.02	27
Urophycis floridanus	1.0	0.01	28	0.10	0.02	27
Centropristis philadelphica	1.0	0.01	28	0.10	0.02	27
Centropristis striata	1.0	0.01	28	0.10	0.02	27
Prionotus carolinus	1.0	0.01	28	0.10	0.02	27
Chilomycterus schoepfi	1.0	0.01	28	0.10	0.02	27
TOTAL	10291.0			418.15		

MARCH 1975

Species	RELATIVE ABUNDANCE Total Number In Samples	Percent Of Total Sample	Rank	RELATIVE BIOMASS Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Stellifer lanceolatus	1232.0	26.48	1	4.61	4.14	9
Urophycis regius	1000.0	21.50	2	22.94	20.61	1
Brevoortia tyrannus	688.0	14.79	3	14.49	13.01	4
Leiostomus xanthurus	684.0	14.70	4	15.40	13.83	3
Symphurus plagiusa	201.0	4.32	5	5.26	4.73	7
Anchoa mitchilli	179.0	3.85	6	2.01	1.80	12
Peprilus triacanthus	141.0	3.03	7	4.96	4.45	8
Larimus fasciatus	92.0	1.98	8	0.20	0.18	20
Etropus crossotus	82.0	1.76	9	1.10	0.99	14
Menticirrhus americanus	75.0	1.61	10	2.31	2.08	10
Scophthalmus aquosus	51.0	1.10	11	0.80	0.72	16
Lagodon rhomboides	29.0	0.62	12	0.30	0.27	19
Cynoscion regalis	23.0	0.49	13	1.38	1.24	13
Trinectes maculatus	21.0	0.45	14	0.30	0.27	19
Ancylopsetta quadrocellata	20.0	0.43	15	0.80	0.72	16
Anchoa hepsetus	19.0	0.41	16	0.20	0.18	20
Raja eglanteria	17.0	0.37	17	16.56	14.87	2
Citharichthys spilopterus	15.0	0.32	18	0.60	0.54	17
Sardinella anchovia	14.0	0.30	19	0.10	0.09	21
Paralichthys dentatus	13.0	0.28	20	0.95	0.86	15
Prionotus spp.	12.0	0.26	21	0.40	0.36	18
Dasyatis sabina	11.0	0.24	22	5.74	5.16	5
Prionotus scitulus	11.0	0.24	22	0.40	0.36	18
Cynoscion nothus	7.0	0.15	23	0.20	0.18	20
Bairdiella chrysura	5.0	0.11	24	0.20	0.18	20
Prionotus salmonicolor	3.0	0.06	25	0.10	0.09	21
Trichiurus lepturus	2.0	0.04	26	0.10	0.09	21
Mustelus canis	1.0	0.02	27	6.35	5.70	5
Dasyatis sayi	1.0	0.02	27	2.27	2.04	11
Gymnura micrura	1.0	0.02	27	0.10	0.09	21
Ophidiidae	1.0	0.02	27	0.10	0.09	21
Paralichthys lethostigma	1.0	0.02	27	0.10	0.09	21
TOTAL	4652.0			111.33		

Species	RELATIVE ABUNDANCE: Total Number In Samples	RELATIVE ABUNDANCE: Percent Of Total Sample	RELATIVE ABUNDANCE: Rank	RELATIVE BIOMASS: Total Weight Of Sample (Kg)	RELATIVE BIOMASS: Percent Of Total Sample	RELATIVE BIOMASS: Rank
Urophycis regius	5702.0	36.91	1	142.40	26.27	1
Leiostomus xanthurus	2579.0	16.69	2	79.40	14.65	3
Stellifer lanceolatus	2153.0	13.94	3	24.26	4.48	6
Symphurus plagiusa	1332.0	8.62	4	33.58	6.20	5
Peprilus triacanthus	651.0	4.21	5	4.17	0.77	15
Anchoa mitchilli	590.0	3.82	6	2.55	0.47	17
Trinectes maculatus	564.0	3.65	7	6.83	1.26	11
Brevoortia tyrannus	335.0	2.17	8	10.17	1.88	8
Larimus fasciatus	262.0	1.70	9	1.90	0.35	20
Bairdiella chrysura	227.0	1.47	10	7.02	1.30	10
Menticirrhus americanus	173.0	1.12	11	5.94	1.10	13
Cynoscion nothus	168.0	1.09	12	1.45	0.27	22
Prionotus spp.	149.0	0.96	13	2.21	0.41	18
Scophthalmus aquosus	137.0	0.89	14	2.61	0.48	16
Etropus crossotus	105.0	0.68	15	2.15	0.40	19
Micropogon undulatus	62.0	0.40	16	0.20	0.04	32
Ancylopsetta quadrocellata	47.0	0.30	17	1.40	0.26	23
Cynoscion regalis	37.0	0.24	18	1.65	0.31	21
Dasyatis sabina	28.0	0.18	19	6.45	1.19	12
Pomatomus saltatrix	20.0	0.13	20	1.91	0.35	20
Raja eglanteria	18.0	0.12	21	14.97	2.76	7
Paralichthys dentatus	17.0	0.11	22	2.16	0.40	19
Rhinoptera bonasus	13.0	0.08	23	62.37	11.51	4
Arius felis	12.0	0.08	23	1.00	0.18	26
Trichiurus lepturus	8.0	0.05	24	0.50	0.09	28
Gymnura micrura	5.0	0.03	25	1.46	0.27	22
Lagodon rhomboides	5.0	0.03	25	0.30	0.06	31
Paralichthys lethostigma	5.0	0.03	25	1.01	0.19	25
Urophycis floridanus	4.0	0.03	26	0.20	0.04	32
Menticirrhus littoralis	4.0	0.03	26	0.30	0.06	31
Prionotus carolinus	4.0	0.03	26	0.20	0.04	32
Citharichthys spilopterus	4.0	0.03	26	0.40	0.07	30

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Mustelus canis	3.0	0.02	27	4.64	0.86	14
Odontaspis taurus	2.0	0.01	28	102.51	18.91	2
Dasyatis sayi	2.0	0.01	28	1.36	0.25	24
Anchoa hepsetus	2.0	0.01	28	0.20	0.04	32
Prionotus tribulus	2.0	0.01	28	0.20	0.04	32
Chilomycterus schoepfi	2.0	0.01	28	0.20	0.04	32
Astroscopus sp.	2.0	0.01	28	0.20	0.04	32
Hypsoblennius sp.	2.0	0.01	28	0.10	0.02	33
Carcharhinus milberti	1.0	0.01	29	7.26	1.34	9
Dasyatis centroura	1.0	0.01	29	0.91	0.17	27
Alosa sp.	1.0	0.01	29	0.10	0.02	33
Clupeidae	1.0	0.01	29	0.45	0.08	29
Opisthonema oglinum	1.0	0.01	29	0.10	0.02	33
Centropristis ocyurus	1.0	0.01	29	0.10	0.02	33
Centropristis philadelphica	1.0	0.01	29	0.10	0.02	33
Centropristis striata	1.0	0.01	29	0.10	0.02	33
Vomer setapinnis	1.0	0.01	29	0.10	0.02	33
Peprilus alepidotus	1.0	0.01	29	0.10	0.02	33
Prionotus evolans	1.0	0.01	29	0.10	0.02	33
Ophidiidae	1.0	0.01	29	0.10	0.02	33
TOTAL	15449.0			542.05		

Species	RELATIVE ABUNDANCE: Total Number In Samples	RELATIVE ABUNDANCE: Percent Of Total Sample	RELATIVE ABUNDANCE: Rank	RELATIVE BIOMASS: Total Weight Of Sample (Kg)	RELATIVE BIOMASS: Percent Of Total Sample	RELATIVE BIOMASS: Rank
Brevoortia tyrannus	1740.0	20.16	1	58.72	24.85	2
Leiostomus xanthurus	1422.0	16.48	2	76.78	32.50	1
Urophycis regius	1354.0	15.69	3	26.08	11.04	3
Stellifer lanceolatus	989.0	11.46	4	13.43	5.68	4
Peprilus triacanthus	602.0	6.98	5	5.06	2.14	7
Micropogon undulatus	487.0	5.64	6	4.68	1.98	9
Anchoa mitchilli	477.0	5.53	7	1.20	0.51	19
Opisthonema oglinum	282.0	3.26	8	4.46	1.89	10
Cynoscion nothus	278.0	3.22	9	5.92	2.51	6
Larimus fasciatus	232.0	2.69	10	3.70	1.57	11
Menticirrhus americanus	162.0	1.88	11	5.93	2.51	5
Bairdiella chrysura	128.0	1.48	12	3.55	1.50	12
Trinectes maculatus	82.0	0.95	13	1.75	0.74	16
Prionotus spp	59.0	0.68	14	0.70	0.30	25
Symphurus plagiusa	47.0	0.54	15	1.05	0.44	20
Scophthalmus aquosus	43.0	0.50	16	0.80	0.34	23
Cynoscion regalis	39.0	0.45	17	2.74	1.16	13
Arius felis	31.0	0.36	18	1.89	0.80	15
Etropus crossotus	24.0	0.28	19	0.90	0.38	22
Paralichthys dentatus	24.0	0.28	19	2.31	0.98	14
Anchoa spp	22.0	0.25	20	0.30	0.13	30
Pomatomus saltatrix	17.0	0.20	21	1.62	0.69	17
Lagodon rhomboides	13.0	0.15	22	0.30	0.13	30
Citharichthys spilopterus	11.0	0.13	23	0.60	0.25	27
Anchoa hepsetus	9.0	0.10	24	0.50	0.21	28
Trichiurus lepturus	8.0	0.09	25	0.75	0.32	24
Dasyatis sayi	7.0	0.08	26	4.99	2.11	8
Gymnura micura	5.0	0.06	27	0.68	0.29	26
Scomberomorus maculatus	5.0	0.06	27	0.20	0.08	31
Vomer setipinnis	4.0	0.05	28	0.10	0.04	32
Ancylopsetta quadrocellata	4.0	0.05	28	0.10	0.04	32
Rhizoprionodon terranenovae	3.0	0.03	29	0.45	0.19	29
Astroscopus y graecum	3.0	0.03	29	0.20	0.08	31

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Weight	Rank
Dasyatis spp	3.0	0.03	29	1.36	0.58	18
Synodus foetens	2.0	0.02	30	0.10	0.04	32
Urophycis floridanus	2.0	0.02	30	0.20	0.08	31
Haeumulon aurolineatum	1.0	0.01	31	0.10	0.04	32
Peprilus alepidotus	1.0	0.01	31	0.10	0.04	32
Raja eglanteia	1.0	0.01	31	0.91	0.39	21
Rhinoptera bonasus	1.0	0.01	31	0.45	0.19	29
Opsanus tau	1.0	0.01	31	0.10	0.04	32
Porichthys porosissimus	1.0	0.01	31	0.10	0.04	32
Centropristis ocyurus	1.0	0.01	31	0.10	0.04	32
Chloroscombrus chrysurus	1.0	0.01	31	0.10	0.04	32
Cubiceps athenae	1.0	0.01	31	0.10	0.04	32
Paralichthys spp	1.0	0.01	31	0.10	0.04	32
TOTAL	8630.0			236.26		

JUNE 1975

Species	RELATIVE ABUNDANCE Total Number In Samples	Percent Of Total Sample	Rank	RELATIVE BIOMASS Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Leiostomus xanthurus	10300.0	53.05	1	196.72	44.56	1
Micropogon undulatus	3083.0	15.88	2	37.74	8.55	4
Stellifer lanceolatus	1316.0	6.78	3	18.62	4.22	5
Brevoortia tyrannus	970.0	5.00	4	42.01	9.52	3
Anchoa mitchilli	617.0	3.18	5	2.15	0.49	19
Arius felis	551.0	2.84	6	55.36	12.54	2
Cynoscion regalis	328.0	1.69	7	3.57	0.81	11
Opisthonema oglinum	273.0	1.41	8	5.71	1.29	8
Menticirrhus americanus	249.0	1.28	9	13.60	3.08	6
Anchoa spp.	230.0	1.18	10	0.55	0.12	35
Anchoa hepsetus	207.0	1.07	11	1.10	0.25	30
Chloroscombrus chrysurus	142.0	0.73	12	4.94	1.12	9
Larimus fasciatus	140.0	0.72	13	4.68	1.06	10
Paralichthys dentatus	117.0	0.60	14	3.36	0.76	12
Trinectes maculatus	87.0	0.45	15	2.00	0.45	20
Scomberomorus maculatus	61.0	0.31	16	6.85	1.55	7
Citharichthys spilopterus	57.0	0.29	17	1.40	0.32	27
Peprilus triacanthus	53.0	0.27	18	1.80	0.41	23
Scophthalmus aquosus	52.0	0.27	19	1.20	0.27	29
Lagodon rhomboides	44.0	0.23	20	2.19	0.50	18
Prionotus spp.	44.0	0.23	20	1.30	0.29	28
Pomatomus saltatrix	43.0	0.22	21	2.97	0.67	14
Cynoscion nothus	40.0	0.21	22	1.85	0.42	21
Cynoscion spp.	35.0	0.18	23	0.10	0.02	41
Scomberomorus cavalla	33.0	0.17	24	0.10	0.02	41
Etropus crossotus	31.0	0.16	25	1.30	0.29	29
Synodus foetens	30.0	0.15	26	2.26	0.51	17
Symphurus plagiusa	28.0	0.14	27	1.40	0.32	27
Trichiurus lepturus	25.0	0.13	28	2.29	0.52	16
Menticirrhus littoralis	18.0	0.09	29	0.75	0.17	33
Paralichthys lethostigma	18.0	0.09	29	3.12	0.71	13
Citharichthys macrops	16.0	0.08	30	0.60	0.14	35

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Peprilus alepidotus	16.0	0.08	30	0.70	0.16	34
Chilomycterus schoepfi	13.0	0.07	31	0.40	0.09	38
Bothidae	13.0	0.07	31	0.10	0.02	41
Dasyatis sayi	12.0	0.06	32	1.63	0.37	24
Cynoscion nebulosus	12.0	0.06	32	1.46	0.33	26
Bairdiella chrysura	11.0	0.06	33	0.60	0.14	35
Dasyatis sabina	10.0	0.05	34	0.85	0.19	32
Selene vomer	9.0	0.05	35	0.30	0.07	39
Prionotus evolans	8.0	0.04	36	0.30	0.07	39
Sphyrna lewini	8.0	0.04	36	2.95	0.67	15
Urophycis regius	6.0	0.03	37	0.30	0.07	39
Citharichthys spp.	6.0	0.03	37	0.30	0.07	39
Rhizoprinodon terraenovae	5.0	0.03	38	1.82	0.41	22
Centropristis striata	5.0	0.03	38	0.30	0.07	39
Sphoeroides maculatus	5.0	0.03	38	0.30	0.07	39
Monocanthus hispidus	4.0	0.02	39	0.30	0.07	39
Vomer setapinnis	4.0	0.02	39	0.20	0.04	40
Opsanus tau	3.0	0.02	40	0.20	0.04	40
Cubiceps athenae	3.0	0.02	40	0.10	0.02	41
Stenotomus caprinus	2.0	0.01	41	0.20	0.04	40
Orthopristis chrysoptera	2.0	0.01	41	0.10	0.02	41
Sphyrna zygaena	2.0	0.01	41	0.55	0.12	36
Dasyatis americana	2.0	0.01	41	0.45	0.10	37
Gymnura micrura	1.0	0.01	42	0.10	0.02	41
Raja eglanteria	1.0	0.01	42	0.10	0.02	41
Ophidiidae	1.0	0.01	42	0.10	0.02	41
Carcharhinus milberti	1.0	0.01	42	1.59	0.36	30
Rhinoptera bonasus	1.0	0.01	42	0.91	0.21	31
Alosa sp.	1.0	0.01	42	0.10	0.02	41
Bagre marinus	1.0	0.01	42	0.10	0.02	41
Centropristis philadelphica	1.0	0.01	42	0.10	0.02	41

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Menticirrhus saxatilis	1.0	0.01	42	0.10	0.02	41
Astroscopus y-graecum	1.0	0.01	42	0.10	0.02	41
Prionotus scitulus	1.0	0.01	42	0.10	0.02	41
Hippocampus sp.	1.0	0.01	42	0.10	0.02	41
TOTAL	19416.0			441.50		

JULY 1975

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Leiostomus xanthurus	3899.0	28.86	1	130.28	37.25	1
Micropogon undulatus	2409.0	17.83	2	43.33	12.39	2
Stellifer lanceolatus	2017.0	14.93	3	30.74	8.79	4
Anchoa mitchilli	1150.0	8.51	4	1.70	0.49	17
Brevoortia tyrannus	826.0	6.11	5	42.75	12.22	3
Cynoscion regalis	412.0	3.05	6	9.11	2.60	7
Menticirrhus americanus	303.0	2.24	7	15.08	4.31	5
Larimus fasciatus	283.0	2.09	8	13.09	3.74	6
Anchoa hepsetus	272.0	2.01	9	1.40	0.40	18
Scomberomorus maculatus	195.0	1.44	10	8.30	2.37	8
Peprilus alepidotus	140.0	1.04	11	1.80	0.52	16
Citharichthys spilopterus	135.0	1.00	12	1.20	0.34	21
Vomer setapinnis	132.0	0.98	13	1.20	0.34	21
Pomatomus saltatrix	130.0	0.96	14	5.03	1.44	9
Opisthonema oglinum	127.0	0.94	15	4.05	1.16	11
Prionotus spp.	125.0	0.93	16	1.70	0.49	17
Chloroscombrus chrysurus	97.0	0.72	17	1.20	0.34	21
Anchoa spp.	88.0	0.65	18	0.30	0.09	32
Arius felis	86.0	0.64	19	3.68	1.05	12
Trinectes maculatus	65.0	0.48	20	1.70	0.49	17
Etropus crossotus	56.0	0.41	21	1.40	0.40	18
Paralichthys dentatus	55.0	0.41	22	4.83	1.38	10
Synodus foetens	54.0	0.40	23	2.87	0.82	14
Citharichthys macrops	53.0	0.39	24	1.10	0.32	22
Cynoscion spp.	52.0	0.38	25	2.72	0.78	15
Peprilus triacanthus	47.0	0.35	26	1.00	0.29	24
Cynoscion nothus	37.0	0.27	27	3.49	1.00	13
Symphurus plagiusa	35.0	0.26	28	1.20	0.34	21
Menticirrhus spp.	35.0	0.26	29	0.88	0.25	25
Selene vomer	33.0	0.24	30	0.80	0.23	26

JULY 1975 (Continued Page 2.)

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Lagodon rhomboides	30.0	0.22	31	1.35	0.39	20
Scophthalmus aquosus	25.0	0.19	32	0.70	0.20	27
Menticirrhus littoralis	14.0	0.10	33	0.60	0.17	29
Scomberomorus cavalla	14.0	0.10	33	0.60	0.17	29
Trichiurus lepturus	11.0	0.08	34	1.05	0.30	23
Centropristis striata	5.0	0.04	35	0.40	0.11	31
Prionotus evolans	4.0	0.03	36	0.10	0.03	35
Ancylopsetta quadrocellata	4.0	0.03	36	0.20	0.06	33
Opsanus tau	4.0	0.03	36	0.30	0.09	32
Ophidiidae	4.0	0.03	36	0.40	0.11	31
Prionotus scitulus	3.0	0.02	37	0.10	0.03	35
Rhizoprinodon terraenovae	3.0	0.02	37	1.36	0.39	19
Monacanthus hispidus	3.0	0.02	37	0.20	0.06	33
Paralichthys lethostigma	3.0	0.02	37	0.65	0.19	28
Chilomycterus schoepfi	3.0	0.02	37	0.20	0.06	33
Mugil cephalus	3.0	0.02	37	0.10	0.03	35
Dasyatis spp.	3.0	0.02	37	0.65	0.19	28
Dasyatis sabina	2.0	0.01	38	0.55	0.16	30
Brevoortia smithi	2.0	0.01	38	0.20	0.06	33
Centropristis ocyurus	2.0	0.01	38	0.10	0.03	33
Trachinotus carolinus	2.0	0.01	38	0.10	0.03	33
Hypsoblennius hentzi	2.0	0.01	38	0.20	0.06	33
Aluterus monocerus	2.0	0.01	38	0.10	0.03	35
Balistidae	2.0	0.01	38	0.20	0.06	33
Caranx crysos	2.0	0.01	38	0.20	0.06	33
Chaetodipterus faber	2.0	0.01	38	0.10	0.03	35
Raja eglanteria	1.0	0.01	39	0.10	0.03	35
Cynoscion nebulosus	1.0	0.01	39	0.11	0.03	34
Dasyatis americanus	1.0	0.01	39	0.10	0.03	35
Ophicthiidae	1.0	0.01	39	0.10	0.03	35

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Centropristis philadelphica	1.0	0.01	39	0.10	0.03	35
Trachinotus falcatus	1.0	0.01	39	0.10	0.03	35
Bairdiella chrysura	1.0	0.01	39	0.10	0.03	35
Sphyraena barracuda	1.0	0.01	39	0.10	0.03	35
Sphyraena borealis	1.0	0.01	39	0.10	0.03	35
Tetradontidae	1.0	0.01	39	0.10	0.03	35
TOTAL	13,512.0			349.75		

AUGUST 1975

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Micropogon undulatus	1922.0	26.67	1	44.67	30.00	1
Stellifer lanceolatus	1505.0	20.88	2	7.17	4.82	5
Leiostomus xanthurus	789.0	10.95	3	18.74	12.59	3
Cynoscion regalis	487.0	6.76	4	10.81	7.26	4
Brevoortia tyrannus	385.0	5.34	5	21.25	14.27	2
Anchoa mitchilli	305.0	4.23	6	1.20	0.81	15
Arius felis	285.0	3.95	7	5.79	3.89	6
Menticirrhus americanus	193.0	2.68	8	4.47	3.00	7
Trinectes maculatus	169.0	2.34	9	2.81	1.89	9
Scomberomorus maculatus	145.0	2.01	10	3.42	2.30	8
Etropus crossotus	127.0	1.76	11	1.10	0.74	17
Peprilus alepidotus	89.0	1.23	12	1.66	1.12	12
Anchoa hepsetus	85.0	1.18	13	1.20	0.81	15
Larimus fasciatus	85.0	1.18	13	1.10	0.74	17
Vomer setapinnis	71.0	0.98	14	0.70	0.47	21
Chloroscombrus chrysurus	67.0	0.93	15	1.20	0.81	15
Citharichthys spilopterus	60.0	0.83	16	0.90	0.60	18
Pomatomus saltatrix	50.0	0.69	17	2.55	1.71	10
Opisthonema oglinum	48.0	0.67	18	1.10	0.74	17
Symphurus plagiusa	41.0	0.57	19	0.70	0.47	21
Cynoscion spp.	40.0	0.56	20	0.45	0.30	25
Menticirrhus spp.	37.0	0.51	21	1.21	0.81	14
Bagre marinus	25.0	0.35	22	0.10	0.07	29
Bairdiella chrysura	23.0	0.32	23	0.40	0.27	26
Paralichthys dentatus	22.0	0.30	24	0.80	0.54	20
Paralichthys lethostigma	22.0	0.30	24	1.96	1.32	11
Selene vomer	15.0	0.21	25	0.60	0.40	22
Menticirrhus littoralis	12.0	0.17	26	0.85	0.57	19
Scomberomorus cavalla	11.0	0.15	27	0.40	0.27	26
Dasyatis sabina	11.0	0.15	27	1.21	0.81	14

Species	RELATIVE ABUNDANCE			RELATIVE BIOMASS		
	Total Number In Samples	Percent Of Total Sample	Rank	Total Weight Of Sample (Kg)	Percent Of Total Sample	Rank
Prionotus spp.	9.0	0.12	28	0.50	0.34	24
Lagodon rhomboides	9.0	0.12	28	0.70	0.47	21
Trachinotus carolinus	8.0	0.11	29	1.22	0.82	13
Dasyatis americanus	7.0	0.10	30	0.55	0.37	23
Chaetodipterus faber	5.0	0.07	31	0.30	0.20	27
Dasyatis spp.	5.0	0.07	31	1.11	0.74	16
Hypsoblennius hentzi	4.0	0.06	32	0.30	0.20	27
Cynoscion nothus	3.0	0.04	33	0.55	0.37	23
Astroscopus y-graecum	3.0	0.04	33	0.20	0.13	28
Sphoeroides maculatus	3.0	0.04	33	0.30	0.20	27
Ophidiidae	2.0	0.03	34	0.10	0.07	29
Peprilus triacanthus	2.0	0.03	34	0.20	0.13	28
Orthopristis chrysoptera	2.0	0.03	34	0.20	0.13	28
Scopthalmus aquosus	2.0	0.03	34	0.20	0.13	28
Caranx hippos	2.0	0.03	34	0.20	0.13	28
Sphyraena borealis	2.0	0.03	34	0.10	0.07	29
Synodus foetens	1.0	0.01	35	0.10	0.07	29
Trichiurus lepturus	1.0	0.01	35	0.10	0.07	29
Cynoscion nebulosus	1.0	0.01	35	0.10	0.07	29
Dasyatis centroura	1.0	0.01	35	0.45	0.30	25
Gymnura micrura	1.0	0.01	35	0.10	0.07	29
Opsanus tau	1.0	0.01	35	0.10	0.07	29
Eucinostomus gula	1.0	0.01	35	0.10	0.07	29
Citharichthys macrops	1.0	0.01	35	0.10	0.07	29
Monacanthus hispidus	1.0	0.01	35	0.10	0.07	29
Lagocephalus laevigatus	1.0	0.01	35	0.10	0.07	29
Tetradontidae	1.0	0.01	35	0.10	0.07	29
Centropristis sp.	1.0	0.01	35	0.10	0.07	29
Ophichthidae	1.0	0.01	35	0.10	0.07	29
TOTAL	7207.0			148.90		