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PROCEEDINGS: COLLOQUIUM ON SNAPPER-GROUPER FISHERY RESOURCES OF THE WESTERN CENTRAL ATLANTIC OCEAN

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OFFSHORE BOTTOM FISHERIES OF THE UNITED STATES SOUTH ATLANTIC COAST 1/

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ABSTRACT

Commercial fishing for snappers and groupers began off North Carolina, South Carolina, and Georgia in the 19th century, virtually ceased during the 1930's and 1940's, and resumed during the mid-1950's. Georgia's landings were greatest during the early 20th century, exceeding 1 million pounds in 1908; whereas those for North Carolina and South Carolina have been much greater since 1956 than before and totalled 291,000 pounds in 1957. North Carolina's 1974 grouper landings, 70,008 pounds, were the largest ever. A recreational head boat fishery, that began in the 1920's and now consists of about 37 boats operating from 11 ports in North Carolina and South Carolina and one boat in Georgia, takes about 1,500,000 pounds of groupers, snappers, and associated semitropical fishes, and allows over 50,000 angler-days of recreation annually. Red porgy, vermilion snapper, white grunt, and groupers are the most important species by weight. Recreational catches of groupers and snappers currently exceed commercial catches by a factor of five. Concern about fish populations and the welfare of the more valuable recreational fishery precludes encouragement of a larger commercial fishery.

1/ MARMAP Contribution No. 115.

INTRODUCTION

The bottomfish community that supports handline fisheries for snappers and groupers in the Gulf of Mexico and Caribbean Sea extends northward along the U. S. south Atlantic coast to Cape Hatteras, N. C. (approximately 35° N). Irregular rocky topography at the Continental Shelf edge and rock outcroppings and coral patches on the Outer Shelf in combination with warm Gulf Stream water, allow year-round occupancy of the Outer Continental Shelf by many tropical and subtropical fishes (Huntsman, In press).

Research cruises, conducted by the Federal Government aboard the ALBATROSS III, OREGON, COMBAT, and SILVER BAY from 1949 through 1964, and exploratory fishing by the marine fishery agencies of North Carolina and South Carolina in the late 1960's suggested existence of substantial stocks of offshore bottom fishes (Buller, 1951; Bullis and Thompson, 1965; North Carolina,1969; Struhsaker,1969; Bearden and McKenzie, 1971). Examination of catches in a recreational fishery, and experimental fishing aboard the research vessels ONSLOW BAY and EASTWARD from 1972 through 1974 by personnel of the Atlantic Estuarine Fisheries Center of the National Marine Fisheries Service, NOAA, confirmed the existence of a semitropical fish community apparently dominated by red porgy, vermilion snapper, white grunt, black sea bass, gag, scamp, speckled hind, snowy grouper, gray tilefish, and gray triggerfish (Huntsman, In press) (Tables 1 and 2). Red,silk, and blackfin snappers are also occasionally caught.

In this paper I relate the history of recreational and commercial snapper and grouper fishing off Georgia and the Carolinas, examine the relationship of recreational and commercial fisheries, and describe factors limiting development of these fisheries.

THE COMMERCIAL FISHERY

HISTORY

Commercial fishing for groupers and snappers north of Florida has occurred sporadically since the late 19th century, but it is difficult to obtain an adequate description of this fishery. Early fishery statistics were collected infrequently and were often incomplete.

Interpreting records of landings made since 1950 is also difficult. Because vessel propulsion was primitive and refrigeration practically non-existent at the turn of the century, catches landed in a state could be assumed to have been made somewhere near that state; conversely, catches made from the Continental Shelf off a given state could be assumed to have been landed in that or an adjacent state. Now modern vessels travel hundreds or thousands of miles to fish. Florida and Gulf Coast vessels occasionally fish off the Carolinas and Georgia and then unload at their home port or an intermediate port. Catches made in one area may be credited as landings in another. Also, vessels may fish off one state and unload there, but ship their catch by truck to a port where prices are better without any record being made in the state of landing. For these reasons recent

Table 1. Species Commonly Caught by the Carolina Head Boat Industry.

Common name	Scientific name	Usual size caught (pounds)	Depth (fathoms)	Remarks
Sea basses:	Serranidae:			
Rock hind	*Epinephelus adscensionis*	2-5	15-30	
Speckled hind	*Epinephelus drummondhayi*	4-12	25-55	
Yellowedge grouper	*Epinephelus flavolimbatus*	8-16	35-80	
Red hind	*Epinephelus guttatus*	2-5	15-30	
Red grouper	*Epinephelus morio*	10-20	20-35	
Warsaw grouper	*Epinephelus nigritus*	23-40	30-60	
Snowy grouper	*Epinephelus niveatus*	6-12	30-60	
Gag	*Mycteroperca microlepis*	3-6 (inshore) 12-40(offshore)	15-55	
Scamp	*Mycteroperca phenax*	15-20	20-55	mid-Onslow Bay southward
Black sea bass	*Centropristis striata*	0.5-2.0	7-30	
Porgies:	Sparidae:			
Red porgy	*Pagrus sedecim*	1.75-2.5(inshore) 2.5 -5.0(offshore)	10-55	
Knobbed porgy	*Calamus nodosus*	3-5	10-30	most common off South Carolina
Whitebone porgy	*Calamus leucosteus*	1-3	10-25	
Spottail pinfish	*Diplodus holbrooki*	1-2	10-20	
Scup	*Stenotomus* sp.	0.5-1.5	20-55	

Table 1. (Continued).

Common name	Scientific name	Usual size caught (pounds)	Depth (fathoms)	Remarks
Snappers:	Lutjanidae:			
Red snapper	Lutjanus campechanus	18-22	20-55	
Silk snapper	Lutjanus vivanus	18-22	25-55	
Vermilion snapper	Rhomboplites aurorubens	0.5-1.5 (inshore) 1.6 (offshore)	15-55	
Grunts:	Pomadasyidae:			
White grunt	Haemulon plumieri	1-2	10-25	
Tomtate	Haemulon aurolineatum	0.25-0.75	10-25	
Tilefishes:	Branchiostegidae:			
Gray tilefish	Caulolatilus microps	6-10	30-70	
Jacks and Pompanos:	Carangidae:			
Almaco jack	Seriola rivoliana	15-30	25-100	
Greater amberjack	Seriola dumerili	15-30	25-100	
Triggerfishes and Filefishes:	Balistidae:			
Gray triggerfish	Balistes capriscus	2-7	10-30	

Table 2. Some Fishes of the Outer Continental Shelf of North Carolina, Taken by National Marine Fisheries Service, NOAA Sampling or Occasionally by Head Boats.

Common name	Scientific name	Depth (fathoms)
Requiem sharks:	Carcharhinidae:	
Silky shark	*Carcharhinus falciformis*	15-70
Hammerhead sharks:	Sphyrnidae:	
Scalloped hammerhead	*Sphyrna lewini*	45-50
Guitarfishes:	Rhinobatidae:	
Atlantic guitarfish	*Rhinobatos lentiginosus*	39-78
Skates:	Rajidae:	
Skate (unidentified)	*Raja* sp.	39-78
Stingrays:	Dasyatidae:	
Stingray (unidentified)	*Dasyatis* sp.	39-78
Morays:	Muraenidae:	
Blackedge moray	*Gymnothorax nigromarginatus*	15-60
Reticulate moray	*Muraena retifera*	47
Conger eels:	Congridae:	
Conger eel	*Conger oceanicus*	40-55
Margintail conger ?	*Paraconger caudilimbatus* ?	33
Snake eels:	Ophichthidae:	
Palespotted eel	*Ophichthus ocellatus*	15-57
Anchovies:	Engraulidae:	
Anchovy (unidentified)	*Anchoa* sp.	15-20
Lizardfishes:	Synodontidae:	
Inshore lizardfish	*Synodus foetens*	13
Red lizardfish	*Synodus synodus*	37-58
Snakefish	*Trachinocephalus myops*	15-40
Batfishes:	Ogcocephalidae:	
Pancake batfish	*Halieutichthys aculeatus*	39-78
Roughback batfish	*Ogcocephalus parvus*	39-78
Batfish (unidentified)	*Ogcocephalus* sp.	39-78

Table 2. (Continued).

Common name	Scientific name	Depth (fathoms)
Cusk-eels:	Ophidiidae:	
Striped cusk-eel	*Rissola marginata*	15-20
Squirrelfishes:	Holocentridae:	
Squirrelfish	*Holocentrus ascensionis*	28
Longspine squirrelfish?	*Holocentrus rufus* ?	28
Cornetfishes:	Fistulariidae:	
Red cornetfish	*Fistularia villosa*	50
Pipefishes and seahorses:	Syngnathidae:	
Lined seahorse	*Hippocampus erectus*	15-60
Pipefish (unidentified)	*Syngnathus* sp.	15-60
Sea basses:	Serranidae:	
Bank sea bass	*Centropristis ocyurus*	15-60
Sand perch	*Diplectrum formosum*	15-60
Marbled grouper	*Dermatolepis inermis*	—
Yellowfin grouper	*Mycteroperca venenosa*	—
Roughtongue bass	*Ocyanthias martinicensis*	39-78
Creole-fish	*Paranthias furcifer*	—
Tattler	*Serranus phoebe*	40-70
Bigeyes:	Priacanthidae:	
Bigeye	*Priacanthus arenatus*	—
Short bigeye	*Pristigenys alta*	18-23
Cardinal fishes:	Apogonidae:	
Twospot cardinalfish	*Apogon pseudomaculatus*	18
Tilefishes:	Branchiostegidae:	
Atlantic golden-eyed	*Caulolatilus chrysops*	40-70
Sand tilefish	*Malacanthus plumieri*	28-50
Cobias:	Rachycentridae:	
Cobia	*Rachycentron canadum*	28
Jacks and pompanos:	Carangidae:	
Round scad	*Decapterus punctatus*	15-18
Snappers:	Lutjanidae:	
Blackfin snapper	*Lutjanus buccanella*	30-50
Wenchman	*Pristipomoides aquilonaris*	—
Yellowtail snapper	*Ocyurus chrysurus*	—

Table 2. (Continued).

Common name	Scientific name	Depth (fathoms)
Drums:	Sciaenidae:	
Jackknife-fish	Equetus lanceolatus	18
Cubbyu	Equetus umbrosus	37-60
Goatfishes:	Mullidae:	
Spotted goatfish	Pseudupeneus maculatus	18
Butterflyfishes:	Chaetodontidae:	
Spotfin butterflyfish	Chaetodon ocellatus	18
Blue angelfish	Holacanthus bermudensis	18
Damselfishes:	Pomacentridae:	
Yellowtail reeffish ?	Chromis enchrysurus ?	18
Dusky damselfish ?	Pomacentrus fuscus ?	40-50
Wrasses:	Labridae:	
Yellowhead wrasse?	Halichoeres garnoti ?	40-50
Pearly razorfish	Hemipteronotus novacula	30-50
Barracudas:	Sphyraenidae:	
Great barracuda	Sphyraena barracuda	28
Stargazers:	Uranoscopidae:	
Southern stargazer ?	Astroscopus y-graecum ?	39-78
Scorpionfishes:	Scorpaenidae:	
Spinythroat scorpionfish	Pontinus nematophthalmus	39-78
Barbfish	Scorpaena brasiliensis	18-70
Deepreef scorpionfish	Scorpaenodes tredecimspinosus	18
Searobins:	Triglidae:	
Northern searobin	Prionotus carolinus	13-20
Lefteye flounders:	Bothidae:	
Eyed flounder	Bothus ocellatus	23
Summer flounder	Paralichthys dentatus	28
Dusky flounder	Syacium papillosum	15-23
Triggerfishes and filefishes:	Balistidae:	
Orange filefish	Aluterus schoepfi	18
Fringed filefish	Monacanthus ciliatus	23
Planehead filefish	Monacanthus hispidus	23

Table 2. (Continued)

Common name	Scientific name	Depth (fathoms)
Puffers:	Tetraodontidae:	
Marbled puffer	*Sphoeroides dorsalis*	23
Bandtail puffer	*Sphoeroides spengleri*	18

landing records for North Carolina, South Carolina, and Georgia underestimate the commercial production of groupers and snappers between Cape Hatteras and Florida.

North Carolina

Grouper and red snapper landings (of unknown quantities) were recorded for North Carolina, South Carolina, and Georgia in 1880, the earliest year for which records are available. In 1897 and 1908, North Carolina produced catches of 34,000 and 13,000 pounds of snappers, respectively. From 1908 to 1956, catches rarely were more than a few thousand pounds per year. North Carolina grouper landings were virtually non-existent until 1956 (Power, 1959) (Table 3).

In 1956 Lloyd Reed and John Chivas made the first modern attempt at handline snapper fishing from a North Carolina port. Fishing from the 38-foot PANDION, they landed 130,000 pounds of "red snapper" (actually mixed red, silk, and blackfin snappers) and 27,000 pounds of groupers at Beaufort, N. C. In 1957 they produced 225,100 pounds of red snapper and 64,900 pounds of groupers. In the winter of 1957-58, water temperature in outer Onslow Bay was the lowest in the 20-year period of 1948-67 (McLain, Mayo, and Owen 2/). The cold water severely affected red snapper stocks and, as this was the only species which had high market value, the incipient commercial fishery essentially ended. From 1958 to 1973, North Carolina landings were small, with the greatest landings in 1958 when 31,000 pounds of groupers and 28,000 pounds of snappers were landed. Resurging interest in offshore fishing resulted in a record landing of 70,008 pounds of groupers in 1974. Apparently snapper populations have never rebounded from the 1957-58 mortality and, even with the effort expended to take the record catch of groupers, only 21,076 pounds of snappers were produced.

South Carolina

South Carolina had moderate grouper and snapper landings from 1880 through 1908. Virtually no landings were recorded from 1908 until 1956. As in North Carolina, South Carolina local interest in offshore fishing revived in 1956, and snapper and grouper landings have been recorded every year since. Snapper landings were larger in the late 1950's and early 1960's; 137,000 pounds were landed in 1961, but only 14,790 pounds in 1974. Groupers are now much more important, and a record 82,723 pounds were landed in 1973 and 62,124 pounds in 1974.

2/ McLain, D. R., F. V. Mayo, and M. J. Owen. Monthly maps of sea surface temperature anomalies in the northwest Atlantic Ocean and Gulf of Mexico, 1948-1967. Unpublished manuscript. Pacific Environmental Group, NMFS, NOAA, Monterey, CA 93940.

Table 3. Commercial Landings of Snappers and Groupers for North Carolina, South Carolina, and Georgia (1880-1974).

Year	North Carolina		South Carolina		Georgia	
	Groupers	Snappers	Groupers	Snappers	Groupers	Snappers
	(pounds)		(pounds)		(pounds)	
1880	1/	1/	1/	1/	1/	1/
1887	1/	1/	1/	1,000	1/	1/
1888	1/	1/	1/	1,000	1/	3,000
1889	1/	1/	1/	1/	1/	1/
1890	1/	1/	1/	18,000	1/	-----
1897	---	34,000	33,000	54,000	---	-----
1902	---	---	41,000	10,000	---	125,000
1908	---	13,000	40,000	12,000	160,000	880,000
1918	---	---	---	---	28,000	112,000
1923	---	1,000	8,000	2,000	11,000	105,000
1927	---	1,000	---	---	26,000	64,000
1928	---	2,000	---	---	8,000	22,000
1929	---	15,000	---	---	8,000	33,000
1930	---	5,000	---	---	7,000	30,000
1931	---	2,000	---	---	----	-----
1932	---	---	---	---	----	-----
1934	---	---	---	---	----	-----
1936	---	---	---	---	----	-----
1937	---	---	---	---	----	-----
1938	---	1,000	---	---	----	-----
1939	---	2,000	2,000	---	----	-----
1940	---	---	2,000	---	----	-----
1945	---	4,000	---	---	----	-----
1950	---	---	15,000	5,000	----	-----
1951	2/	8,000	---	---	----	-----
1952	---	5,000	---	---	----	-----
1953	---	---	---	---	----	2,000
1954	---	---	---	---	----	3,000
1955	---	---	---	---	----	-----
1956	26,700	130,400	---	12,000	----	2/
1957	64,900	225,100	---	1,000	----	2/
1958	31,000	28,000	1,000	2/	----	-----
1959	10,000	15,000	2,000	18,000	----	-----
1960	2/	2/	7,000	2,000	2,000	8,000
1961	1,000	6,000	6,000	137,000	4,000	3,000
1962	1,000	2,000	---	62,000	2/	3,000
1963	2/	2,000	---	10,000	2/	2,000
1964	1,000	2/	2/	8,000	2/	1,000
1965	---	---	51,000	34,000	----	2/

Table 3. (Continued).

Year	North Carolina		South Carolina		Georgia	
	Groupers (pounds)	Snappers (pounds)	Groupers (pounds)	Snappers (pounds)	Groupers (pounds)	Snappers (pounds)
1966	7,000	11,000	2/	---	----	2/
1967	9,000	4,000	---	4,000	92,000	55,000
1968	25,000	42,000	2/	37,000	17,000	17,000
1969	2/	2/	10,000	33,000	12,000	14,000
1970	---	2/	14,000	12,000	50,000	16,000
1971	14,000	17,000	9,570	11,470	43,093	54,571
1972	---	121	17,261	20,405	58,305	52,338
1973	16,483	6,784	82,723	22,467	37,331	19,929
1974	70,008	21,076	62,124	14,790	43,913	42,532

1/ Data not available.

2/ Less than 500 pounds.

Sources: Compiled from Fishery Statistics of the United States, U. S. Department of the Interior, Fish and Wildlife Service (to 1967) and U. S. Department of Commerce, NOAA, NMFS (after 1967); and North Carolina, South Carolina, and Georgia Landings (1973-74), Current Fishery Statistics, U. S. Department of Commerce, NOAA, NMFS, Washington, D. C.

Georgia

Georgia landings have displayed the same historical pattern as those of the Carolinas, but early landings were much larger and they continued for a longer period. Georgia reported grouper and snapper landings from 1880 through 1930 and experienced a combined catch of 1,040,000 pounds in 1908. By comparison, Florida east coast grouper and snapper landings were only 105,000 pounds in 1908. Georgia landings were essentially non-existent from 1930 to 1967. Since then, annual landings have ranged from 147,000 pounds (1967) to 26,000 pounds (1969) and averaged 76,600 pounds annually.

THE PRESENT FISHERY

Vessels

Local and transient vessels fish commercially for snappers and groupers north of Florida. There are probably, at most, a dozen local, full-time, handline fishing boats in North Carolina, South Carolina, and Georgia. Additionally, there are a few dozen crews which occasionally engage in handline fishing when they are not operating head boats or charter boats or trapping black sea bass.

The number and home port of transient vessels fishing the southeast Atlantic Shelf north of Florida is not known. Most vessels observed were from the west coast of Florida, although Florida east coast vessels undoubtedly fish the area. The Florida east coast vessels are more likely to return to their home port to unload, while Florida west coast vessels are more likely to use Georgia and Carolina ports.

Gear

Most fish are taken with hook, line, and electrically driven reel . A few snappers, groupers, porgies, and grunts are taken in traps set for black sea bass. Experimental roller trawling has produced some good catches of groupers and vermilion snapper, but commercial fishermen have shown little interest in this technique (North Carolina, 1969). Of nine commercial roller trawling cruises made from Georgetown, S. C. during the winter of 1973-74, three yielded a total catch of 20,000 pounds and the other six were unsuccessful. Damage to gear and bad weather precluded further fishing,and the operators plan no more trawling on rough bottom.

Species Sought

"Red snapper," including red,silk, and blackfin snappers, are always the principal target of commercial fishermen. However, the Georgia-Carolina area produces far more groupers than snappers, and it is the former which attracts transient boats to the area. Scamp, the most valuable grouper,is abundant from mid-Onslow Bay southward in depths of 20-35 fathoms. The gag, a larger but less valuable grouper, is common in the same depths from Cape Hatteras south. In deeper water, 25-80 fathoms, speckled hind, and Warsaw, snowy, and yellowedge groupers provide excellent fishing at certain

locations.

Fishermen from the Gulf States and the Florida east coast discard, or use as bait, species other than snappers or groupers. However, seafood dealers, who ship to the New York Fulton Fish Market or sell retail, pay good prices for such species as vermilion snapper, red porgy, and white grunt.

THE RECREATIONAL FISHERY

Three categories of vessels participate in the recreational fishery for groupers, snappers, and associated bottom fishes in the Georgia-Carolina region: head boats, charter boats, and private boats. Private boats, because so few are capable of the long offshore run, allow the least angler effort, while head boats allow by far the most. This discussion will cover the head boat fishery only.

HISTORY

The offshore head boat fishery began in the early 1900's, when coastal fishermen took parties bottom fishing for $1 to $2 or, perhaps, an equivalent amount of agricultural products. By the late 1920's and early 1930's, head boats,as we know them, had appeared. The JOSEPHINE, captained by Lawrence Long at Little River, S. C.; Luther Smith's KATHERINE, at Murrells Inlet, S. C.; and Carl Winner's boat, at Carolina Beach, N. C., were among the very first to operate off the Southeast Coast. These early operators sought black sea bass on nearshore reefs and rock outcroppings, used the sounding lead to locate fishing sites, and fished with handlines.

The end of World War II brought a supply of inexpensive and relatively high-powered boats and an overwhelming improvement in marine electronic technology. War surplus vessels equipped with depth recorders and loran, which greatly eased the finding and relocation of fish, were important in the fishery for over 15 years. Sea bass grounds farther offshore were exploited, and some vessels occasionally made the long 24-hour trip to the edge of the Continental Shelf for snappers and groupers. Most second generation vessels are now retired, but a few, including the CAROLINA PRINCESS, at Atlantic Beach, N. C.; the PIRATE, at Snead's Ferry, N. C.; and the THUNDERBIRD II, at Little River, S. C., continue operation.

Head boat operations were sufficiently lucrative to engender construction of a third generation of vessels in the 1960's. These boats also were wooden-hulled, but were sleeker than the second generation. They were driven by two, or even three, V-12 or V-16 engines and commonly attained speeds of 18 - 21 knots. This allowed, at last, anglers to fish the tropical offshore waters for groupers and snappers and return in a single day. Most third generation vessels are still active in the offshore fishery. The CAPTAIN STACY and CAPTAIN STACY III, at Morehead City, N. C., and BUDDY's PIRATE, at Topsail Beach, N.C., are good examples of this vessel class. By the 1960's, depth recorders were sufficiently sophisticated to earn the name "fish-finder," and almost every captain had and relied upon this instrument for a successful fishing day.

By the late 1960's, vessel speed had become a predominant element in competition for anglers and in producing fish, because the "good" fishing was occurring farther and farther offshore. The demand for speed brought the introduction of high-speed, aluminum or steel "crewboats " developed in the offshore oil industry. These vessels are extremely seaworthy and fast but are narrow, lack fishing space, and roll more than some earlier vessels. Crewboats are now the backbone of the offshore head boat industry in South Carolina, and one crewboat operates from Wrightsville Beach, N. C. Simultaneous to arrival of the crewboats was acceptance of such advanced electronic gear as the fish scope and side-scan sonar.

A fifth generation of head boat,that originated in Florida, is now appearing in the Carolinas. An all-aluminum, 85-foot catamaran operates from Carolina Beach, N. C. Catamarans seem the ideal head boat. They are fast, luxuriously roomy, very seaworthy, and they roll little. However, catamarans are expensive and can be profitably operated only where there is a large volume of business.

THE PRESENT FISHERY

The current fishery consists of about 36 head boats carrying between 30 and 150 anglers apiece and operating from 11 ports in North Carolina and South Carolina (Table 4). One head boat has operated parttime in Savannah, Ga. since 1972.

We have divided head boats into two major classes according to the habitat they fish: (1) inshore vessels, which fish the inshore rocks and coral patches from 15 to 25 fathoms, and (2) offshore vessels, which fish the Shelf-break zone and the extreme Outer Continental Shelf from 25 to 80 fathoms. Inshore boats in South Carolina could be subdivided further into those boats which fish almost entirely for black sea bass and those which seek porgies and vermilion snapper; but, this subdivision is not clear-cut.

Handlines were standard on Carolina head boats until the early 1950's when rods and reels became common. In the late 1960's,increased emphasis on deep water fishing led many operators to furnish electrically powered sport reels to ease the labor of retrieving heavy sinkers. Currently, 5- to 6-foot solid fiberglass rods, with the rod blank extending through the butt, are preferred. Reels are from size 4/0 to 9/0, either manual or electrical; line is 60- to 120- pound test monofilament nylon. The bottom rigs are usually made of 80- pound test monofilament and two 6/0 to 8/0 hooks. Depending on the current and the depth fished, 6- to 50- ounce lead sinkers are used.

A typical fishing day begins at daybreak and lasts 10-14 hours. After a 2- to 4- hour trip to the fishing ground and a brief search either for fish or bottom topography likely to produce fish, anglers spend 4- to 6- hours fishing and then return to port.

Table 4. Head Boats of North Carolina, South Carolina, and Georgia (1972-75).

Location	Head Boat	Fishing Area	Operated during			
			1972	1973	1974	1975
NORTH CAROLINA						
Hatteras	SHADY LADY	Offshore	-	X	X	X
Morehead City	CAPT. STACY	Offshore	X	X	X	X
Morehead City	CAPT. STACY III	Offshore	X	X	X	X
Morehead City	DEEP BLUE	Offshore	X	X	X	-
Atlantic Beach	CAROLINA PRINCESS	Inshore	X	X	X	X
Sneads Ferry	PIRATE	Inshore	X	X	X	X
Topsail Island	BUDDY'S PIRATE	Inshore	X	X	X	X
Topsail Island	BUCCANEER	Inshore	X	X	X	X
Wrightsville Beach	CAPT. SKIPPY WINNER	Offshore	X	X	X	X
Carolina Beach	STEW BIRD II	Inshore	X	X	X	X
Carolina Beach	CARL WINNER QUEEN	Inshore	X	-	-	-
Carolina Beach	CHEERIO II	Inshore	X	X	X	X
Carolina Beach	FLYING SQUIRREL	Inshore	X	X	-	-
Carolina Beach	PIRATE II	Inshore	X	X	X	X
Carolina Beach	CAPT. WINNER II	Inshore	-	-	X	X
Carolina Beach	CAPT. WINNER IV	Offshore	-	X	X	X
Southport	SKIPPER	Inshore	X	X	X	X
SOUTH CAROLINA						
Little River	CAPT. JUEL I	Offshore	X	X	X	X
Little River	HELEN JEAN	Inshore	X	X	X	X
Little River	HURRICANE	Inshore	X	X	X	X
Little River	GULF QUEEN	Offshore	X	-	-	-
Little River	NEW RASCAL	Inshore	X	X	X	X
Little River	THUNDERBIRD II	Inshore	X	X	X	X
Little River	BONITA	Inshore	-	X	X	X
Murrells Inlet	FLYING FISHER	Inshore	X	X	X	X
Murrells Inlet	FLYING FISHER II	Offshore	X	X	X	X
Murrells Inlet	CAPT. ALEX	Offshore	X	X	X	X
Murrells Inlet	INLET PRINCESS	Inshore	X	X	X	X
Murrells Inlet	NEW INLET PRINCESS	Inshore	-	X	X	X

Table 4. (Continued).

Location	Head Boat	Fishing Area	Operated during			
			1972	1973	1974	1975
SOUTH CAROLINA						
Murrells Inlet	ROCKET	Inshore	X	-	-	-
Murrells Inlet	TOM-A-GATOR	Inshore	X	-	-	-
Murrells Inlet	CAROLINA PRINCESS 1/	Offshore	X	X	-	-
Murrells Inlet	CAROLINA PRINCESS 1/	Inshore	-	-	X	X
Murrells Inlet	CAPT. BILL	Offshore	-	X	X	X
Charleston	GULF STREAM II	Offshore	X	X	X	X
Charleston	MUSTANG II	Inshore	X	X	X	X
Charleston	COMANCHE	Inshore	X	-	-	-
Charleston	JJ	Inshore	X	X	X	X
GEORGIA						
Savannah	CITATION	Inshore	X	X	X	X

1/ Operated offshore during 1972-73 and inshore, 1974-75 .

Fishing occurs at depths of 10-80 fathoms. Generally, captains dislike fishing at depths greater than 35 fathoms, because tangling is frequent and strong currents often prevent lines from reaching the bottom. Depending on conditions, captains may either drift or anchor. According to some head boat captains, anchoring produces the best catches of groupers and drifting allows the best catches of porgies and grunts.

CATCHES, EFFORT, AND ANGLING QUALITY

Since 1972, through a program of dockside sampling and collection of catch information, we have estimated the catch in numbers and pounds of each species taken by the head boat fishery (Huntsman, In press).

To facilitate the estimation and presentation of catch values, we divided the fishing area from Cape Hatteras through South Carolina into four districts: Cape Hatteras, Cape Lookout, Cape Fear, and Cape Romain (Fig.1). Cape Hatteras vessels fish in the northern part of Raleigh Bay; Cape Lookout vessels, in the southern part of Raleigh Bay,and the northern half of Onslow Bay; Cape Fear vessels, in southern Onslow Bay and the northern third of Long Bay; and Cape Romain vessels, in southern Long Bay and south to Savannah. Within each of the four districts, we designated inshore and offshore subdistricts. We divided the fishing season into five time units: Spring (March-May), June, July, August, and Autumn (September-November). There is little fishing from December through February. The catches are presented by year, district, subdistrict, and time unit (Tables 5-10).

Catch and Effort

In 1972, 48,989 angler-days provided a catch, exclusive of black sea bass, of 489,570 fish weighing 1,313,247 pounds. 3/ In 1973, 59,515 angler-days produced 513,174 fish,weighing 1,595,229 pounds; and in 1974, 85,608 angler-days produced 531,414 fish,weighing 1,345,423 pounds. Angler effort is not completely comparable for 1972, 1973, and 1974, because in 1973 we had incomplete coverage of Cape Romain inshore head boats and in 1974 we included, for the first time, many Cape Romain 3/4-and 1/2-day head boats that specialize in catching black sea bass.

We did not estimate the black sea bass catch in 1972. When we began this study, we were primarily interested in the tropical offshore species (grunts, snappers, groupers, and porgies) and, therefore, did not ask mates to keep records of black sea bass catches. It was evident after one season, however, that the black sea bass was an important member of the ecosystem at the

3/ An angler-day is a unit of fishing effort representing the involvement of one rod-and-reel angler in the head boat fishery for an entire 10- to 14-hour fishing trip. Some Cape Romain sea bass boats make trips of less than a full day. Effort for these vessels is prorated on the basis of the length of the fishing trip (i. e., two half-day trips equal one full trip).

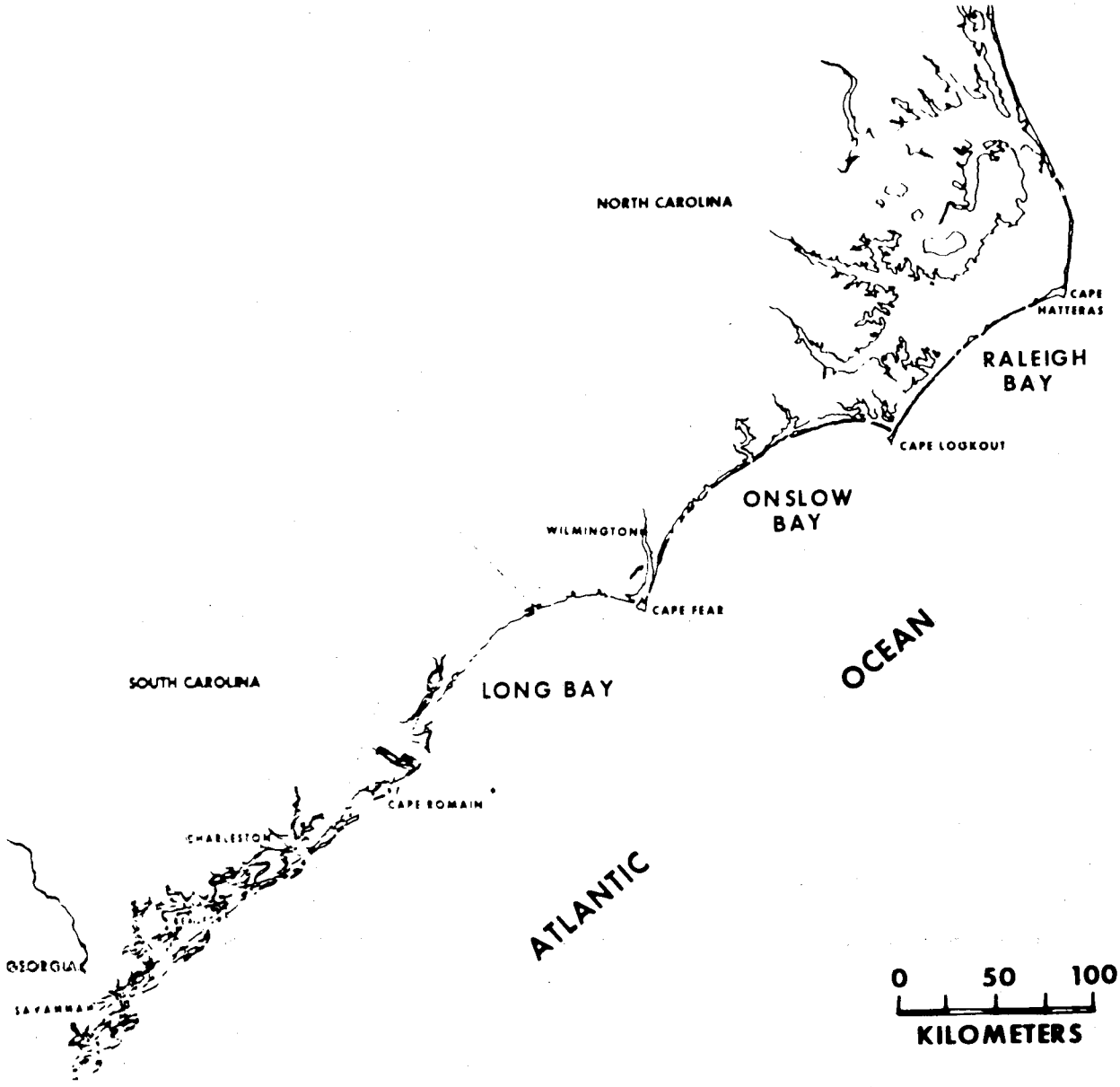

Figure 1. Areas fished by Carolina head boats.

Table 5. Catches by Carolina Head Boats during the 1972 Fishing Season. 1/ 2/

Species	Cape Lookout, N. C.				Cape Fear, N. C.				Cape Romain, S.C.				TOTAL				GRAND TOTAL	
	Inshore	%	Offshore	%	Inshore	%	Offshore	%	Inshore	%	Offshore	%	Inshore	%	Offshore	%	(Inshore and Offshore)	%
Porgies	No. 10,431 Wt 21,052	33.2 28.9	No. 31,055 Wt 94,878	55.9 32.6	No. 44,459 Wt 80,688	32.4 35.3	No. 5,087 Wt 11,399	37.4 22.8	No. 4,605 Wt 10,135	8.0 14.3	No. 120,321 Wt 300,706	62.0 50.1	No. 79,495 Wt 111,875	26.3 30.0	No. 156,463 Wt 406,983	59.4 43.3	No. 215,958 Wt 518,857	44.1 39.5
Grunts	No. 11,752 Wt 19,646	37.4 27.0	No. 664 Wt 1,498	1.2 0.5	No. 54,739 Wt 88,159	39.9 38.5	No. 3,273 Wt 7,252	24.1 14.5	No. 23,566 Wt 36,148	40.8 51.0	No. 42,144 Wt 75,510	21.7 12.6	No. 90,057 Wt 143,953	39.8 38.6	No. 46,081 Wt 84,260	17.5 9.0	No. 136,138 Wt 228,213	27.8 17.4
Vermilion Snapper	No. 5,828 Wt 9,371	18.6 12.9	No. 11,126 Wt 33,735	20.0 11.6	No. 22,966 Wt 21,916	16.7 9.6	No. 1,245 Wt 1,795	9.2 3.6	No. 29,108 Wt 23,219	50.4 32.7	No. 10,571 Wt 17,054	5.4 2.8	No. 57,902 Wt 54,506	25.6 14.6	No. 22,942 Wt 52,584	8.7 5.6	No. 80,844 Wt 107,090	16.5 8.2
Groupers: Epinephelus	No. 859 Wt 11,236	2.7 15.4	No. 2,323 Wt 28,395	4.2 9.8	No. 537 Wt 4,573	0.4 2.0	No. 1,154 Wt 11,564	8.5 23.2	No. 9 Wt 34	0.1 0.1	No. 2,908 Wt 36,168	1.5 6.0	No. 1,405 Wt 15,843	0.6 4.3	No. 6,385 Wt 76,127	2.4 8.1	No. 7,790 Wt 91,970	1.6 7.0
Groupers: Mycteroperca	No. 402 Wt 1,997	1.3 2.7	No. 5,223 Wt 96,654	9.4 33.2	No. 623 Wt 4,771	0.5 2.1	No. 1,991 Wt 15,803	14.7 31.7	No. 118 Wt 528	0.2 0.7	No. 10,764 Wt 118,345	5.5 19.7	No. 1,143 Wt 7,296	0.5 2.0	No. 17,978 Wt 230,802	6.8 24.5	No. 19,121 Wt 238,098	3.9 18.1
"Red" Snapper 3/	No. 155 Wt 2,553	0.5 3.5	No. 816 Wt 14,801	1.5 5.1	No. 218 Wt 4,352	0.2 1.9	No. 33 Wt 291	0.2 0.6	No. 16 Wt 118	0.1 0.2	No. 949 Wt 18,754	0.5 3.1	No. 389 Wt 7,023	0.2 1.9	No. 1,798 Wt 33,846	0.7 3.6	No. 2,187 Wt 40,869	0.4 3.1
Others	No. 1,955 Wt 6,963	6.2 9.6	No. 4,330 Wt 20,941	7.8 7.2	No. 13,696 Wt 24,412	10.0 10.7	No. 804 Wt 1,815	5.9 3.6	No. 317 Wt 760	0.5 1.1	No. 6,430 Wt 33,259	3.3 5.5	No. 15,968 Wt 32,135	7.1 8.6	No. 11,564 Wt 56,015	4.4 6.0	No. 27,532 Wt 88,150	5.6 6.7
TOTAL Number	31,382	99.9	55,537	100.00	137,238	100.1	13,587	100.0	57,739	99.9	194,087	99.9	226,359	100.1	263,211	99.9	489,570	99.0
TOTAL Weight	72,818	100.0	290,902	100.00	228,871	100.1	49,919	100.0	70,942	100.0	599,796	99.8	372,631	100.0	940,617	100.1	1,313,247	100.0

1/ No vessels operated in the Cape Hatteras District in 1972.
2/ Weight (Wt) is in pounds.
3/ Includes other species of snappers, as well as red snapper.

Table 6. Catches by Carolina Head Boats during the 1973 Fishing Season. 1/

Species	Cape Hatteras, N. C.			Cape Lookout, N. C.						Cape Fear, N. C.						Cape Romain, S. C.		GRAND TOTAL (Inshore and Offshore)	
	Offshore		%	Inshore		%	Offshore		%	Inshore		%	Offshore		%	Offshore	%		
Porgies	No.	2,727	28.6	No.	18,900	33.9	No.	25,272	43.5	No.	51,834	46.7	No.	56,257	78.5	No. 142,764	68.9	No. 297,754	58.0
	Wt	9,060.1	21.1	Wt	34,020.0	31.8	Wt	78,121.4	22.8	Wt	94,204.2	46.2	Wt	173,690.2	65.5	Wt 356,576.8	55.1	Wt 745,672.7	46.4
Grunts	No.	562	5.9	No.	19,064	34.2	No.	1,208	2.1	No.	40,681	36.7	No.	8,389	11.7	No. 9,520	4.6	No. 79,424	15.5
	Wt	1,240.0	2.9	Wt	32,408.8	30.3	Wt	3,176.1	0.1	Wt	64,149.2	31.4	Wt	19,220.3	7.2	Wt 22,658	3.5	Wt 142,852.6	8.9
Vermilion Snapper	No.	2,498	26.2	No.	14,718	26.4	No.	18,241	31.4	No.	15,641	14.1	No.	512	0.7	No. 32,030	15.5	No. 83,640	16.3
	Wt	7,450.8	17.4	Wt	19,672.8	18.4	Wt	60,056.7	17.5	Wt	24,091.2	11.8	Wt	1,721.7	0.6	Wt 43,844.7	6.8	Wt 156,837.9	9.7
Groupers: Mycteroperca	No.	34	0.4	No.	1,048	1.8	No.	6,217	10.7	No.	1,415	1.2	No.	2,475	3.5	No. 6,373	3.1	No. 17,562	3.4
	Wt	834.7	1.9	Wt	8,677.7	8.1	Wt	127,449.8	37.2	Wt	12,944.9	6.3	Wt	27,432.7	10.3	Wt 85,547.8	13.2	Wt 262,887.6	16.3
Groupers: Epinephelus	No.	44	5.7	No.	228	0.4	No.	2,099	3.6	No.	206	0.2	No.	1,321	1.8	No. 6,218	3.0	No. 10,616	2.1
	Wt	5,381.3	12.5	Wt	1,451.0	1.4	Wt	26,803.3	7.8	Wt	1,975.4	1.0	Wt	11,167.4	4.2	Wt 52,692.7	8.1	Wt 99,471.1	6.2
"Red" Snapper 2/	No.	100	1.1	No.	9	0.1	No.	1,886	3.2	No.	101	0.1	No.	271	0.4	No. 1,615	0.8	No. 3,982	0.8
	Wt	1,452.8	3.6	Wt	135.2	0.1	Wt	27,023.4	7.9	Wt	830.3	0.4	Wt	3,018.6	1.1	Wt 27,762.5	4.3	Wt 60,222.8	3.7
Others	No.	3,054	32.1	No.	1,801	3.2	No.	3,146	5.4	No.	1,038	0.9	No.	2,431	3.4	No. 8,726	4.2	No. 20,196	3.9
	Wt	17,413.3	40.0	Wt	10,682.2	10.0	Wt	20,217.0	5.9	Wt	5,896.4	2.9	Wt	15,592.6	10.9	Wt 57,483.2	8.9	Wt 127,284.7	8.7
TOTAL Number		9,519	100.0		55,768	99.9		58,069	99.9		110,916	99.9		71,656	100.0	207,246	100.1	513,174	100.0
TOTAL Weight		42,833.0	100.0		107,047.7	100.1		342,847.7	99.2		204,091.6	100.0		251,843.5	99.8	646,565.9	99.9	1,595,229.4	99.9

1/ Weight (Wt) is in pounds.
2/ Includes other species of snappers, as well as red snapper.

Table 7. Catches by Carolina Head Boats during the 1974 Fishing Season. 1/

Species	Cape Hatteras, N. C.			Cape Lookout, N. C.				Cape Fear, N. C.				Cape Romain, S. C.				GRAND TOTAL (Inshore and Offshore)	
	Offshore		%	Inshore		%	Offshore		%	Inshore		%	Offshore		%	Inshore		%	Offshore		%		
Porgies	No.	2,758	12.1	No.	11,548	31.2	No.	16,505	44.6	No.	39,624	47.3	No.	31,063	48.7	No.	62,860	36.4	No.	72,002	62.0	No.	236,360	44.5
	Wt	9,155.4	17.9	Wt	13,418.6	22.5	Wt	51,483.6	25.9	Wt	86,622.3	43.6	Wt	85,486.3	37.1	Wt	98,418.6	43.1	Wt	179,188.3	47.4	Wt	523,773.1	38.9
Grunts	No.	0	0	No.	10,515	28.4	No.	1,438	3.9	No.	30,295	36.2	No.	16,906	26.5	No.	60,816	35.3	No.	4,518	3.9	No.	124,488	23.4
	Wt	0	0	Wt	20,514.8	34.3	Wt	3,396.0	1.7	Wt	56,655.7	28.5	Wt	36,418.1	15.8	Wt	41,980.0	18.4	Wt	11,390.0	3.0	Wt	170,354.6	12.6
Vermilion Snapper	No.	16,731	73.5	No.	12,206	33.0	No.	9,268	25.0	No.	9,105	10.9	No.	4,351	6.8	No.	38,174	22.1	No.	18,120	15.8	No.	107,955	20.3
	Wt	14,215.7	27.8	Wt	7,509.6	12.6	Wt	22,979.6	11.6	Wt	11,406.8	5.7	Wt	7,791.7	3.4	Wt	31,110.1	13.6	Wt	24,332.1	6.4	Wt	119,345.6	8.8
Grouper: Epinephelus	No.	653	2.9	No.	159	0.4	No.	962	2.6	No.	618	0.7	No.	619	1.0	No.	768	0.4	No.	5,070	4.4	No.	8,849	1.7
	Wt	3,375.0	6.6	Wt	731.4	1.2	Wt	10,409.1	5.2	Wt	5,066.9	2.6	Wt	3,092.8	1.3	Wt	6,071.2	2.7	Wt	54,332.7	14.4	Wt	83,079.1	6.1
Grouper: Mycteroperca	No.	8	0.1	No.	793	2.1	No.	4,515	12.2	No.	2,297	2.7	No.	7,201	11.3	No.	751	0.4	No.	3,608	3.2	No.	19,173	3.6
	Wt	161.2	0.3	Wt	9,902.1	16.6	Wt	81,049.8	40.7	Wt	28,404.3	14.3	Wt	76,218.0	33.1	Wt	9,750.7	4.3	Wt	47,751.4	12.6	Wt	253,237.5	18.8
"Red" Snapper 2/	No.	446	2.0	No.	78	0.2	No.	795	2.1	No.	348	0.4	No.	218	0.3	No.	243	0.1	No.	1,268	1.1	No.	3,396	0.6
	Wt	6,407.8	12.5	Wt	365.6	0.6	Wt	11,586.0	5.8	Wt	2,401.2	1.2	Wt	1,971.5	0.9	Wt	2,624.4	1.1	Wt	11,457.2	3.0	Wt	36,813.7	2.7
Gray Triggerfish	No.	1,693	7.4	No.	1,701	4.6	No.	2,949	8.0	No.	1,433	1.7	No.	2,799	4.4	No.	8,899	5.2	No.	7,617	6.7	No.	27,091	5.1
	Wt	10,421.2	20.4	Wt	6,541.9	11.0	Wt	15,840.5	8.0	Wt	7,766.4	3.9	Wt	17,685.7	7.7	Wt	38,589.2	16.9	Wt	35,160.8	9.3	Wt	132,005.7	9.8
Blackline Tilefish	No.	44	0.2	No.	0	0	No.	569	1.5	No.	8	0.1	No.	0	0	No.	4	0.1	No.	2,153	1.9	No.	2,778	0.5
	Wt	166.4	0.3	Wt	0	0	Wt	2,128.0	1.1	Wt	29.5	0.1	Wt	0	0	Wt	31.2	0.1	Wt	12,628.5	3.3	Wt	14,985.7	0.8
Others	No.	436	1.9	No.	40	0.1	No.	2	0.1	No.	72	0.1	No.	627	1.0	No.	0	0	No.	147	0.1	No.	1,324	0.2
	Wt	7,237.3	14.2	Wt	740.0	1.2	Wt	42.0	0.1	Wt	307.0	0.2	Wt	1,900.3	0.8	Wt	0	0	Wt	1,601.3	0.4	Wt	11,827.9	0.8
TOTAL Number		22,769	100.0		37,040	100.0		37,003	99.9		83,800	100.0		63,784	100.0		172,515	99.9		114,503	100.0		531,414	99.9
TOTAL Weight		51,142.0	100.0		59,724.0	100.0		198,914.6	100.0		198,660.1	100.0		230,564.4	100.1		228,575.4	100.1		377,842.2	99.8		1,345,422.9	99.6

1/ Weight (Wt) is in pounds.
2/ Includes other species of snappers, as well as red snapper.

Table 8. Catch and Effort by Carolina Head Boats during the 1972 Fishing Season. 1/ 2/

Time	Cape Lookout, N. C.		Cape Fear, N. C.		Cape Romain, S. C.		TOTAL	
	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore
Spring:								
Angler-days	754	1,192	1,536	110	352	736	2,642	2,038
Fish/day	3.3	6.7	14.9	6.4	14.5	14.0	11.6	9.3
Wt/day	10.87	30.92	22.94	26.36	15.16	49.74	18.46	37.47
Wt/fish	3.2	4.6	1.5	4.1	1.0	3.5	1.6	4.0
June:								
Angler-days	767	1,757	3,162	379	1,137	3,186	5,066	5,322
Fish/day	4.6	5.3	10.6	7.8	12.8	15.7	10.2	11.7
Wt/day	9.98	31.49	17.3	32.73	12.9[illegible]	46.92	15.11	40.82
Wt/fish	2.2	6.0	1.6	4.2	..	3.0	1.5	3.5
July:								
Angler-days	1,346	2,566	3,743	518	1,590	3,451	6,679	6,535
Fish/day	4.4	4.7	5.7	7.7	15.6	13.3	7.8	9.5
Wt/day	10.66	25.23	10.30	32.05	20.50	39.60	12.80	33.36
Wt/fish	2.4	5.4	1.8	4.2	1.3	3.0	1.6	3.5
August:								
Angler-days	1,449	2,582	2,640	402	2,007	3,080	6,096	6,064
Fish/day	8.1	6.4	9.0	7.8	6.6	12.9	8.0	9.8
Wt/day	18.38	32.37	14.59	24.94	9.09	43.38	13.68	37.47
Wt/fish	2.3	5.1	1.6	3.2	1.4	3.4	1.7	3.8
Autumn:								
Angler-days	964	1,857	2,462	473	- - -	2,791	3,426	5,121
Fish/day	8.0	5.3	14.5	5.9	- - -	17.2	12.7	11.8
Wt/day	16.56	27.11	25.32	16.86	- - -	51.37	22.86	39.38
Wt/fish	2.1	5.1	1.7	2.9	- - -	3.0	1.8	3.3
Season TOTAL:								
Angler-days	5,280	9,954	13,543	1,882	5,086	13,244	23,909	25,080
Fish/day	5.9	5.6	10.1	7.2	11.4	14.7	9.5	10.5
Wt/day	13.79	29.22	16.89	26.52	13.94	45.28	15.58	37.50
Wt/fish	2.3	5.2	1.7	3.7	1.2	3.1	1.6	3.6

1/ Weight (Wt) is in pounds.
2/ Excludes black sea bass.
3/ Angler-days (see footnote 2 in text).

Table 9. Catch and Effort by Carolina Head Boats during the 1973 Fishing Season. 1/ 2/

Time	Cape Hatteras, N. C.	Cape Lookout, N. C.		Cape Fear, N. C.		Cape Romain, S. C.		TOTAL	
	Offshore	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore
Spring:									
Angler-days 3/	---	1,494	2,741	2,041	452	---	3,422	3,535	6,615
Fish/day	---	8.1	5.0	15.5	9.6	---	9.9	12.3	7.9
Wt/day	---	14.8	29.8	30.5	27.4	---	34.2	23.8	31.9
Wt/fish	---	1.8	5.9	2.0	2.9	---	3.5	1.9	4.1
June:									
Angler-days	---	1,516	2,341	2,251	501	---	3,638	3,767	6,480
Fish/day	---	8.0	4.5	11.81	9.6	---	11.3	10.3	8.7
Wt/day	---	14.4	23.9	21.2	35.6	---	33.1	18.5	29.9
Wt/fish	---	1.8	5.3	1.8	3.7	---	2.9	1.8	3.4
July:									
Angler-days	560	1,924	2,459	2,102	1,826	---	4,489	4,026	9,334
Fish/day	5.4	7.6	4.5	10.8	8.3	---	10.4	9.3	8.4
Wt/day	24.9	16.7	25.4	20.0	34.0	---	34.7	18.6	32.5
Wt/fish	4.7	2.2	5.6	1.9	4.1	---	3.3	2.0	3.9
August:									
Angler-days	695	1,140	2,107	948	1,815	---	3,666	2,088	8,283
Fish/day	5.4	5.3	4.8	14.2	9.6	---	9.3	9.3	7.9
Wt/day	22.3	8.8	27.7	23.1	33.1	---	30.4	15.3	29.6
Wt/fish	4.2	1.7	5.8	1.6	3.5	---	3.3	1.6	3.8
Autumn:									
Angler-days	343	1,721	3,694	1,108	2,899	---	5,622	2,829	12,558
Fish/day	8.2	6.4	3.4	15.0	9.6	---	9.1	9.8	7.5
Wt/day	40.0	11.9	22.9	27.2	31.1	---	25.3	17.9	26.3
Wt/fish	4.8	1.9	6.8	1.8	3.3	---	2.8	1.8	3.5
Season TOTAL:									
Angler-days	1,598	7,795	13,342	8,450	7,493	---	20,837	16,245	43,270
Fish/day	6.0	7.2	4.4	13.1	9.6	---	10.0	10.3	8.0
Wt/day	26.9	13.7	25.7	24.2	35.4	---	31.0	19.2	29.7
Wt/fish	4.9	1.9	5.9	1.8	3.7	---	3.1	1.9	3.7

1/ Weight (Wt) is in pounds.
2/ Excluding sea bass.
3/ Angler-days (see footnote 2 in text).

Table 10. Catch and Effort by Carolina Head Boats during the 1974 Fishing Season. 1/ 2/

Time	Cape Hatteras, N. C.	Cape Lookout, N. C.		Cape Fear, N. C.		Cape Romain, S. C.		TOTAL	
	Offshore	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore
Spring:									
Angler-days 3/	14	929	1,954	1,698	888	4,488.5	2,253	7,115.5	5,109
Fish/day	35.2	4.7	3.2	8.7	10.5	4.1	11.9	5.3	8.4
Wt/day	138.2	8.1	19.0	15.0	30.9	3.9	38.0	7.1	29.8
Wt/fish	3.9	1.7	6.0	1.7	2.9	1.0	3.2	1.3	3.5
June:									
Angler-days	212	908	1,913	1,799	1,214	6,899.75	2,908	9,606.75	6,247
Fish/day	19.6	5.6	3.0	9.4	8.8	3.7	8.9	5.0	7.4
Wt/day	30.6	11.5	17.2	22.6	33.7	4.7	29.0	8.7	26.4
Wt/fish	1.6	2.1	5.7	2.4	3.8	1.3	3.3	1.8	3.5
July:									
Angler-days	408	1,354	2,187	2,783	1,409	10,917.75	2,706	15,054.75	6,710
Fish/day	24.7	7.2	3.1	7.7	10.7	4.2	7.6	5.1	7.8
Wt/day	35.4	11.6	16.8	19.5	37.8	5.4	27.0	8.6	26.5
Wt/fish	1.4	1.6	5 4	2.5	3.5	1.3	3.5	1.7	3.4
August:									
Angler-days	374	1,127	1,788	2,026	1,120	9,588.25	2,600	12,741.25	5,882
Fish/day	11.4	8.1	3.8	8.4	13.0	4.1	6.3	5.1	7.1
Wt/day	48.9	11.6	18.6	23.3	50.6	5.4	24.6	8.8	29.3
Wt/fish	4.3	1.4	4.9	2.8	3.9	1.3	3.9	1.7	4.1
Autumn:									
Angler-days	168	1,365	2,762	1,335	1,488	7,354.25	2,669	10,054.25	7,087
Fish/day	22.6	6.4	4.2	10.3	9.5	5.9	9.3	6.6	7.6
Wt/day	59.6	9.5	21.3	23.3	35.2	9.1	26.5	11.0	27.1
Wt/fish	2.6	1.5	5.1	2.3	3.7	1.5	2.9	1.7	3.5
Season TOTAL:									
Angler-days	1,176	5,683	10,604	9,641	6,119	39,248.5	13,136	54,572.5	31,035
Fish/day	19.4	6.4	3.5	8.7	10.4	4.4	8.7	5.4	7.7
Wt/day	43.5	10.5	18.8	20.6	37.7	5.8	28.8	8.9	27.7
Wt/fish	2.2	1.6	5.4	2.4	3.6	1.3	3.3	1.7	3.5

1/ Weight (Wt) is in pounds.
2/ Excludes black sea bass.
3/ Angler-days (see footnote 2 in text).

shoreward limit of distribution of the more tropical fishes and that the angling success on inshore boats could not be adequately represented without including black sea bass. The estimated black sea bass catch in 1973 was 211,000 pounds in North Carolina, and we believe an equal or greater amount was landed in South Carolina. In 1974, 150,904 pounds of black sea bass were landed by North Carolina head boats and 439,229 pounds by head boats in South Carolina, for a total catch of 590,133 pounds.

Angling Quality

Angling quality is a concept that relates to the satisfaction experienced by an angler as a result of his fishing trip. This satisfaction is derived from both objective components that relate to the catch, such as number and size of fish caught, and subjective components, such as the fellowship experienced and the pleasure of being at sea. For this discussion, we measured angling quality in terms of the number and weight of fish caught per angler and the average weight per fish caught (Tables 8, 9, and 10).

Anglers aboard offshore head boats took large catches and large fish. Weight of the catch per angler-day in 1972 averaged 37.5 pounds for offshore boats, and season averages for offshore subdistricts ranged from 26.5 to 45.3 pounds. In 1973 the overall offshore average was 29.7 pounds, and offshore subdistrict averages ranged from 25.7 to 35.4 pounds. Average offshore catch per angler-day was 27.7 pounds in 1974, and the range was from 18.8 to 43.5 pounds. For all offshore subdistricts, average weights of fish ranged from a high of 5.9 pounds at Cape Lookout in 1973 to a low of 2.2 pounds at Cape Hatteras in 1974.

Catches on the inshore boats consisted of more and smaller fish than those on offshore boats, although poundage per angler was about the same. For instance, in 1973 Cape Lookout and Cape Fear anglers averaged about 32 pounds (19.2 pounds, excluding black sea bass) per day on inshore vessels versus 28.5 pounds per day offshore, but the inshore catch was composed of much smaller fish than those offshore. Nearly half the inshore catch was of black sea bass, and these rarely exceeded 1 pound. In all inshore areas in 1972, 1973, and 1974, species other than black sea bass averaged 1.6, 1.9, and 1.7 pounds, respectively; in all offshore areas, they averaged 3.6, 3.7, and 3.6 pounds, respectively. The average size of inshore fish was smaller, not only because there were fewer large species available, but because fish of the same species were usually smaller inshore than offshore (Tables 5, 6, and 7).

Species Caught

Like commercial handline fishermen head boat captains desire most to catch "red snapper" (including red, silk, and balckfin snappers) and groupers. Head boat captains state that in the early 1960's offshore catches were almost entirely snappers and groupers. This is not the situation today, even though most operators advertise snapper fishing trips. Now, red porgy, vermilion snapper, white grunt, and groupers are the most numerous fishes caught, other than black sea bass (Tables 5, 6, and 7).

Porgies, the most commonly caught being the red porgy (also called "silver snapper"), provided the largest catch in number and weight in all years, and is one of the most important recreational fishes of our Southeast Atlantic Coast. In the Carolinas alone, approximately 216,000 porgies, weighing nearly 519,000 pounds, were taken in 1972; 298,000, weighing 746,000 pounds, in 1973; and 236,000, weighing 524,000 pounds, in 1974. Red porgy are also taken off Georgia, the east coast of Florida, and in the eastern Gulf of Mexico.

The black sea bass, taken almost entirely by inshore boats, is by weight as important as the red porgy.

Groupers (including scamp, gag, and hinds) collectively by weight rank third in the catch, although their contribution in numbers is small. The species composition of the grouper catch varies over the Southeast Coast. Scamp occurred only irregularly north of central Onslow Bay but were extremely important to vessels fishing south of there. Gag were important throughout the fishery but were most abundant in the Cape Lookout catches. Snowy and yellowedge groupers seemed abundant in deep water (60 - 80 fathoms) throughout the area. The speckled hind, a large fish that has been caught as large as 45 pounds in South Carolina and 38 pounds in North Carolina, was common throughout the area and, with the gag, appears to have the most northern distribution. Warsaw grouper attain prodigious weights but were caught only occasionally. The records for Warsaw grouper are 245 pounds in North Carolina and 310 pounds in South Carolina. Several 100-pound Warsaw grouper are caught each year.

Vermilion snapper, often erroneously called "red snapper" aboard head boats, and grunts, principally white grunt, shared ranking as the fourth and fifth most productive species and were more numerous in the catch than groupers. More pounds of grunts were caught in 1972 and 1974 and more pounds of vermilion snapper in 1973. Vermilion snapper, caught from both offshore and inshore boats, were usually larger offshore. In 1972 those taken offshore averaged 2.3 pounds versus 0.9 pounds for those taken inshore.

Grunts were extremely important to inshore boats; but, they also commonly occurred in the catches of offshore boats in South Carolina and southern North Carolina, where the fishing subdistricts seem less distinct than in the north. White grunt were often found with scamp, on rocks in 18-25 fathoms southward from mid-Onslow Bay, and with black sea bass, porgies, and vermilion snapper, northward of this area.

Red, yelloweye (or silk), and blackfin snappers, all commonly known as "red" snapper, were not abundant even though head boats advertise "red snapper fishing." Only 2,187 "red" snapper were taken in 1972; 3,982, in 1973; and 3,396, in 1974. They are, however, usually large, averaging over 18 pounds per fish in 1972, over 15 pounds in 1973, and over 10 pounds in 1974. Because of their large size, relative scarcity, and fine tasting flesh, fishermen prize them highly.

Our category of "other fishes" includes greater amberjack, almaco jack,

gray tilefish, and gray triggerfish. Available from 25 to over 100 fathoms, both jacks are large, fierce fighters; the greater amberjack commonly attains a weight of 50 pounds and the almaco, 30 pounds. Although the flesh is good tasting, few people eat it, possibly because 75% or more of the amberjacks carry heavy infestations of tapeworms in the flesh.

Gray tilefish, a relatively recent addition to head boat catches, are regularly taken from water deeper than 30 fathoms. Although of equally good flavor, they do not attain the size of the tilefish (Lopholatilus chamaeleonticeps), a popular sport fish of the Northeast Coast that appears to be a colder water species. In the Southeast, L. chamaeleonticeps might occur farther offshore than the gray tilefish.

Gray triggerfish, which anglers formerly discarded but now accept with enthusiasm, are common from 10 to 30 fathoms. They are good fighters, but are clever at stealing bait and are difficult to hook. Their flesh is white, sweet, very firm, and makes excellent chowder. Because tilefishes and gray triggerfish are now significant to the catch, we list them separately in the summary of 1974 catches (Table 7).

COMPARISON OF COMMERCIAL AND RECREATIONAL CATCHES

Although complete records of commercial catches from the Carolina Continental Shelf are unavailable, it appears that the head boat fishery took at least three to five times as many pounds of groupers and snappers in 1972, 1973, and 1974. Commercial grouper and snapper landings for North Carolina and South Carolina averaged 111,414 pounds per year for 1972, 1973, and 1974. Head boat grouper and snapper catches averaged 516,641 pounds per year (388,883, excluding vermilion snapper) for the same period. It is unlikely that unreported catches made by transient commercial vessels are sufficient to equal the great difference between reported commercial and head boat landings each year.

FACTORS AFFECTING CAROLINA OFFSHORE BOTTOM FISHERIES

Future development of both the commercial and recreational fisheries will depend foremost on the resource. Prospects for a larger commercial fishery are not good if it must depend only upon snappers and groupers. Red snapper are no longer abundant, and most important groupers (scamp, gag, snowy grouper, and speckled hind) have been rapidly reduced by fishing (Huntsman and Dixon, In press). Grouper and snapper populations have, historically, decreased quickly when fished intensely, and the fishery has been maintained primarily by shifts to new fishing areas (Carpenter, 1965; Bell et al., 1972; Moe, 1975). Thus, a large fishery for only snappers and groupers of the Carolina Shelf probably would be of short duration. On the other hand, snappers and groupers in this area could probably support less intense fisheries indefinitely, especially if fishermen also utilize other more abundant species, such as porgies and grunts. The current handline and head boat fisheries are of relatively low intensity, the former because there are few vessels, the latter because the time vessels spend on the fishing grounds is limited.

Also, both fisheries readily utilize all available species and seem to be in approximate equilibrium with the fish populations.

Weather influences both commercial and recreational fisheries. The Carolina Capes are notoriously windy, especially in winter. Strong winds are most prevalent off Cape Hatteras, where the Labrador Current and Gulf Stream meet, but are less frequent southward. Weather good enough for fishing may occur at any time, but it is infrequent from October through April off Cape Hatteras, November through March off Cape Lookout, and December through March off Cape Fear and Cape Romain. Even in summer it is usually far windier off Capes Hatteras and Lookout than in traditional snapper fishing areas of the Gulf of Mexico and Caribbean Sea. Commercial fishermen are most affected by weather because they need to make trips during all seasons and because they must stay at sea several days. Head boat operation is sufficiently lucrative that most vessels are tied up for the winter; but, because only one day of good weather is necessary for a trip, during any given month some operators will fish.

Currents are troublesome to fishermen, especially off Capes Hatteras and Lookout, where the Gulf Stream is nearest shore. On many days the strong and unpredictable currents completely preclude fishing in water deeper than 25 fathoms. Recreational fishermen probably are more inconvenienced by currents than commercial operators, because the latter can wait until currents cease or rig anchors; but head boats usually have neither the time nor the gear to successfully contend with currents.

Marketing is a problem to commercial fishermen in the Carolinas. Many dealers do not buy snappers and groupers, and, in general, prices for these fish are lower in the Carolinas than in the traditional marketing centers of the Gulf Coast. Thus, most transient fishermen ship or carry their catch back to their home port. On the other hand, Carolina dealers who do handle snappers and groupers will also buy other bottom fishes, allowing fishermen additional income.

Head boat and commercial operators currently face problems related to the energy crisis and economic recession. The number of head boat customers was obviously much smaller in 1975 than in earlier years, and fuel costs have doubled. Fuel is a major expense to head boat operators, to whom high speed and daily long runs are a necessity. Faced with lower business volume, several captains have reduced their scope of operations to cut fuel costs. Some off-shore boats have remained inshore, and some have switched from full- to half-day trips. Commercial operators, who can operate at more efficient speeds and stay at sea longer, are less troubled by fuel costs, and fish prices have remained generally high despite the economic recession.

RECREATIONAL-COMMERCIAL CONFLICTS

Relations between Carolina commercial fishermen and head boat operators are unusually cordial, but the differing modes of operation of the two fisheries engenders occasional conflict. Commercial snapper boats will often fish

on a productive site until the fish have ceased biting or are "all" caught. Often a year or more elapses before a site again provides acceptable fishing. To a commercial fisherman who is highly mobile, the consequence of "fishing out" several sites is slight. On the other hand, head boat operators are restricted to a single port and a rather stringent time schedule. They must find good fishing within a few hours of the home port. Although intensive fishing on one site probably has little effect on the population of fishes as a whole, it could handicap head boat fishermen by overexploiting accessible fishing spots.

CONCLUSIONS

If resource managers choose to preserve the present head boat fishery, they would do well to avoid the traditional management goal of maximum sustained yield and to seek instead a goal of maximum catch per unit effort. Maximum sustained yield is usually achieved at some average catch-per-unit effort that is much less (perhaps 50%) than in a virgin fishery. The success of the head boat fishery depends on a high catch-per-unit-effort of large fish that can only come from lightly exploited populations. Only if anglers are guaranteed a high quality reward, will they repeatedly pay $25 - $35 to undergo early morning departures, late returns, and a 6- to 8-hour pounding, monotonous ride for 4-6 hours of fishing. The catch-per-unit-effort of large fish is now sufficiently high to earn much repeat business for the head boats. Management to attain maximum sustained yield would probably drop the catch-per-unit-effort low enough to drive most of the sport fishermen to more rewarding and less demanding types of fishing. If managers choose to foster a commercial fishery, either in conjunction with or instead of a recreational fishery, they must recognize that intensive exploitation has brought rapid decline of snapper and grouper stocks in almost every instance. In the long run, a small fishery in balance with growth and recruitment of these fishes will furnish the greatest benefit to society.

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