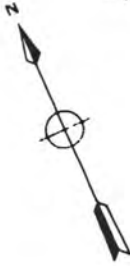


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South Carolina Marine Fisheries, 1991

WILMINGTON

South Carolina

R. A. Low

CHARLESTON

Marine Resources Division
Office of Fisheries Management
Fisheries Statistics Section
Data Report Number 13
June, 1992

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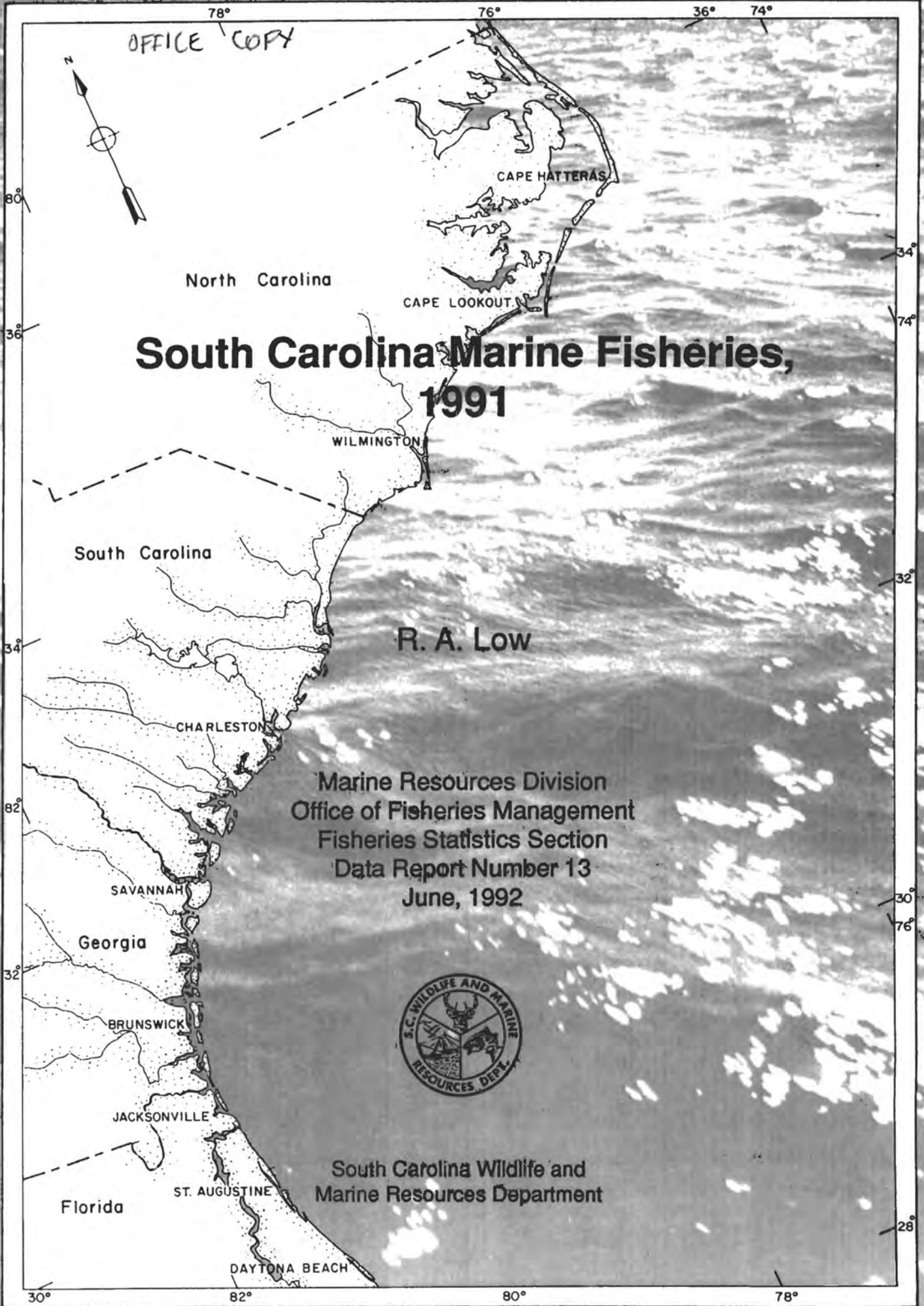
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South Carolina Wildlife and
Marine Resources Department



SOUTH CAROLINA MARINE FISHERIES, 1991

R.A. LOW

FISHERIES STATISTICS PROGRAM
OFFICE OF FISHERIES MANAGEMENT
MARINE RESOURCES DIVISION

SOUTH CAROLINA WILDLIFE AND MARINE RESOURCES DEPARTMENT

DATA REPORT 13

JUNE, 1992

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INTRODUCTION

This report is a summary of significant events in South Carolina's marine fisheries during 1991. Its objectives are to 1) update and describe trends in the principal commercial and recreational fisheries and 2) provide explanatory information relevant to important developments. While obviously somewhat subjective in interpretive content, the discussion represents consensus views of supervisory staff in the management programs for the various fisheries. This information is intended for a general audience and is not meant to be definitive in the scientific sense.

Publication of landings data for the state's commercial marine fisheries began in January, 1957, based on a monthly reporting system set up by the U.S. Fish and Wildlife Service. Distribution of information was in the form of monthly bulletins. At that time, from 75 to 80 seafood dealers operated along the coast. Monthly production forms were mailed to these individuals during the last week of the month, on which they were asked to report their landings for the month. These data were then tabulated by the reporting agents and submitted to the service's Washington, D.C. office. Some data were also obtained from South Carolina's Division of Commercial Fisheries. The fisheries reporting specialists also prepared monthly narrative reports describing current conditions and trends. This series was discontinued at the end of 1979. The current series of annual reports started with 1977 and its narrative is structured on the same format as that in the former monthly bulletins.

Data on 1991 commercial fisheries catch and effort were obtained through 1) mandatory monthly reports by licensed primary wholesale seafood dealers, 2) mandatory shellfish harvest reports, 3) voluntarily submitted shrimp trip tickets from dock operators, and 4) voluntarily submitted fish trip tickets from wholesalers or individual fishermen. In most cases, annual fishing effort by gear type was estimated by dividing total landings compiled from all sources by the average catch per trip obtained from detailed reports such as fish tickets or special permit harvest reports. The percentage of total landings reported by such means, and thus the accuracy of the overall effort estimates, varied greatly according to gear type. For most inshore fisheries, e.g. those for blue crab, shad, and coastal fish, it is very difficult to derive reliable effort estimates. Most offshore fish landings were reported on fish trip tickets and the effort calculations were relatively dependable.

Commercial landings data were for wild stock fisheries only. The state's mariculture industry consisted largely of pond-rearing of Pacific white shrimp in 1991 with reported production of just under 400,000 pounds (heads-off) worth \$1.1 M. Volume and aggregate value were substantially less than in 1990.

Commercial landings data were subject to confidentiality if less than three sources provided information. Appreciable volumes of product were involved in some cases. If three or four dealers handled it but only one contributed most of the volume, this

information was also treated as confidential though not technically subject to classification. Confidential data were included in total landings summaries for appropriate categories.

The reliability of landings data is an obvious consideration when evaluating trends in the various commercial fisheries, particularly with the widely held perception of under-reporting to reduce taxes, etc. Contributors are assured that their records cannot be accessed for tax assessments, etc. and there is little incentive for them to falsify reports. Although dealer/provider reports have seldom been verified by site inspections, cross-checking of records, etc., routine contact with providers through port sampling and dockside interviews suggests that most of the landings data provided through tickets and wholesale dealer reports are reliable. For health reasons, shellfish landings are closely monitored and are considered very accurate. The principal fisheries in which the data are considered suspect are blue crab, shad, shrimp trawl incidental catch landings, and some special permit fisheries such as channel net.

The major source of recreational fishery data has been the Marine Recreational Fishery Statistics Survey (MRFSS) conducted annually under National Marine Fisheries Service (NMFS) oversight. The survey was begun in 1979 and MRD has been responsible for the on-site intercept component since mid-1987. This is a generalized survey of hook and line fishing from shore or shore-based facilities (piers, docks, bridges, etc), charterboats, and private boats. A charterboat is a vessel carrying six or fewer anglers on a pay-per-trip basis. A telephone survey of randomly selected coastal households is used to obtain information on participation and effort. The on-site intercept survey (creel census) provides data on catch composition by species, catch rates, detailed effort data, and length composition. Results from both survey components are combined to produce estimates of catch by species, fishing mode, time interval, fishing area, and residence of fishermen.

The MRFSS design has remained basically unchanged since its inception but many adjustments in calculation procedures have been introduced. Data for some years, notably 1982 and 1984, are considered highly unreliable. Data for early years included results from headboat fishermen and the method of estimating effort was significantly altered in the mid-1980's. We consider data for 1987 to the present to be more reliable than those for earlier years due to these factors.

In 1991, sampling effort in the MRFSS was reduced and additional coverage was devoted to the State Finfish Survey. This is also a creel census that employs procedures similar to those of the MRFSS. The principal difference is that private boat anglers fishing in inland (estuarine) waters are targeted and the site list is modified accordingly. In 1991, most of the catch rate and length composition data for inland species were provided by this activity.

The Beaufort, North Carolina Laboratory of NMFS has conducted

a survey of headboats in the Carolinas since 1973. Landings statistics for the South Carolina headboat fishery were obtained from this source.

COMMERCIAL FISHERIES

Seafood categories are composed as follows. Shrimp landings included whole (heads-on) weights of all penaeid species (brown, white, and pink). Crab landings included whole weights of blue crab (hard and peeler or soft) and stone crab claws. Shellfish landings are expressed in weights of meats, although the equivalent volumes in U.S. bushels (oysters, whelks) or 250-count bags (clams) of whole product are also noted. This category includes oysters, clams, whelks (conchs), squid, and octopus. Most fish landings are in whole (round) weights, although swordfish and larger sharks are carcass weights primarily (some sharks were landed whole and swordfish landings included chunks). Coastal fish includes mullet, inshore groundfish (mostly kingfishes or whittings, spot, and flounders), and sharks taken by inshore gears (gill nets and shrimp trawls). Offshore fish includes sharks taken with offshore gear, swordfish, wreckfish, king mackerel, oceanic pelagics, and reef fish. Oceanic pelagics include dolphin, tunas, wahoo, bonito, and cobia. Reef fish include groupers, snappers, porgies, sea basses, grunts, tilefishes, and minor amounts of associated other species. River fish consist of American and hickory shad, river herring, catfishes, and carp.

South Carolina is not a major producer of seafood, typically ranking 18th or 19th among the 22 coastal states in landed volume. Most of the landings are shipped out of state as raw or unprocessed products so that the state's economy also receives little benefit in the form of value added. There were 280 instate wholesale seafood dealers licensed in 1991, 88 of whom reported no business. The majority of the operations were small and employed few people besides the dealer. Exclusive of the harvesting sector and the dealers, estimated employment included approximately 245 management and office personnel, 160 dock workers (e.g. unloaders and fuel/ice handlers), 20 crab pickers, 19 fish cleaners, and 18 shellfish shuckers. In recent years, 250-290 shrimp headers have been employed. In 1991, no dealers reported any of these workers.

It is difficult to accurately determine the number of commercial fishermen since many individuals hold several types of licenses and the totals are therefore not additive. Some participants, e.g. shrimp boat strikers and fish boat crewmembers, do not need licenses. In order to legally land a catch, a fisherman must have either a land-and-sell license or a trawler captain's license. In 1991, there were 458 land-and-sell, 575 resident trawler, and 347 nonresident trawler licenses issued. A shrimp boat typically carries one or two strikers in addition to the captain so the shrimp trawl fleet probably employed 1,000-1,500 crew in addition to the vessel operators. Offshore fishing boats (e.g. snapper reel boats and longline vessels) usually employ two or three crewmembers in addition to the captain. There probably were 100 to

200 individuals thus employed. There were 281 licensed shellfishermen and 294 crabbers. Employment in seasonal inshore net fisheries, e.g. the spring shad and fall haul seine fisheries, was unknown. Many employees in the various fisheries were part-time participants.

Overall volume of seafood landings from wild stocks (19.321 M pounds) continued the generally upward trend since the mid-1980's (Fig. 1) and was above the 1977-1990 average (Fig. 2). Compared to 1990, volume was up in all major categories except coastal and offshore fish. The highest landings of penaeid shrimp since the mid-1970's largely accounted for the good production. Because of unusually low unit value, however, the economic contribution of these landings was disproportionately low. As a result, total landed ex-vessel value (Fig. 3) after adjustment for inflation barely exceeded (by 4%) the 1977-1990 average (excluding 1979).

South Carolina's commercial seafood production consists primarily of resources either obtained directly from the estuaries or dependent upon these waters during some stage of their life history. Such resources include penaeid shrimp, blue crab, oysters, clams, spot, mullet, and flounders. The total seafood harvest has therefore closely reflected the contribution of these resources (Fig. 4), which in 1991 comprised 79% of total landings by weight and 76% of the ex-vessel value.

The percentage contribution of penaeid shrimp to total seafood production was the highest since the mid-1970's and the relative value contribution the greatest since 1986 (Fig. 5). Both shellfish and crab remained below average in percentage contribution to both volume and value. The share held by offshore fish was about average in both categories, while coastal and river fish were even smaller components than in recent years.

Charleston County continued as the most productive coastal area with landings of 8.3 M pounds worth \$11.7 M. Compared to 1990's figures, total volume landed in the county increased by 35% but value remained nearly the same (+1%). Most of the production increase was attributable to shrimp, particularly white shrimp, but unit value was substantially lower (e.g. \$2.08/pound for whole white shrimp vs \$2.52 in 1990). Overall shrimp landings were worth \$7.8 M in 1991. Blue crab landings were about 2.6 M pounds, a 20% increase, but ex-vessel value (1.2 M) was down slightly due to lower unit value (\$0.47/pound compared to \$0.59 in 1990). Oyster production (about 84,000 bu) increased but the clam harvest (11,000 bags) declined. Combined shellfish value was about \$0.95 M, virtually the same as in the previous year. Fish production (1.1 M pounds) was down 21% due mainly to lower offshore fish landings and was worth \$2.0 M less than in 1990.

About 5.3 M pounds of seafood worth \$6.9 M were landed in Beaufort County, representing increases of 30% in volume and 26% in value over 1990's figures. The leading component was white shrimp (2.2 M pounds whole weight) worth about \$4.6 M. Landings of blue

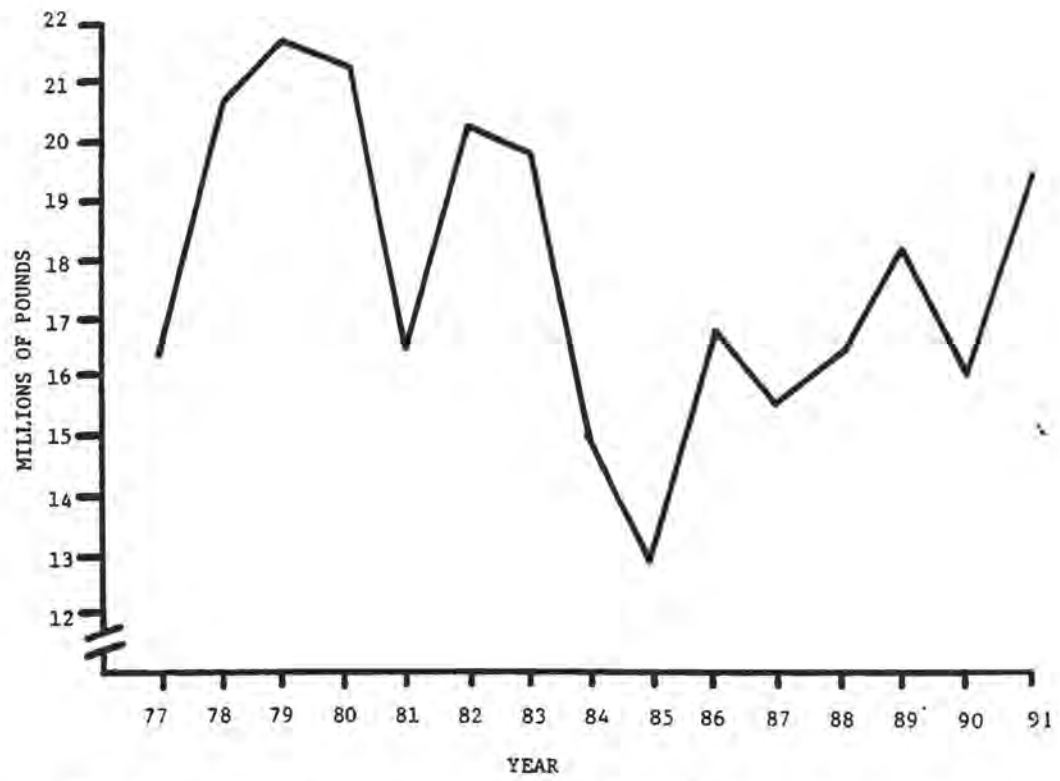


Fig. 1. Total landed weight of commercial marine fisheries products.

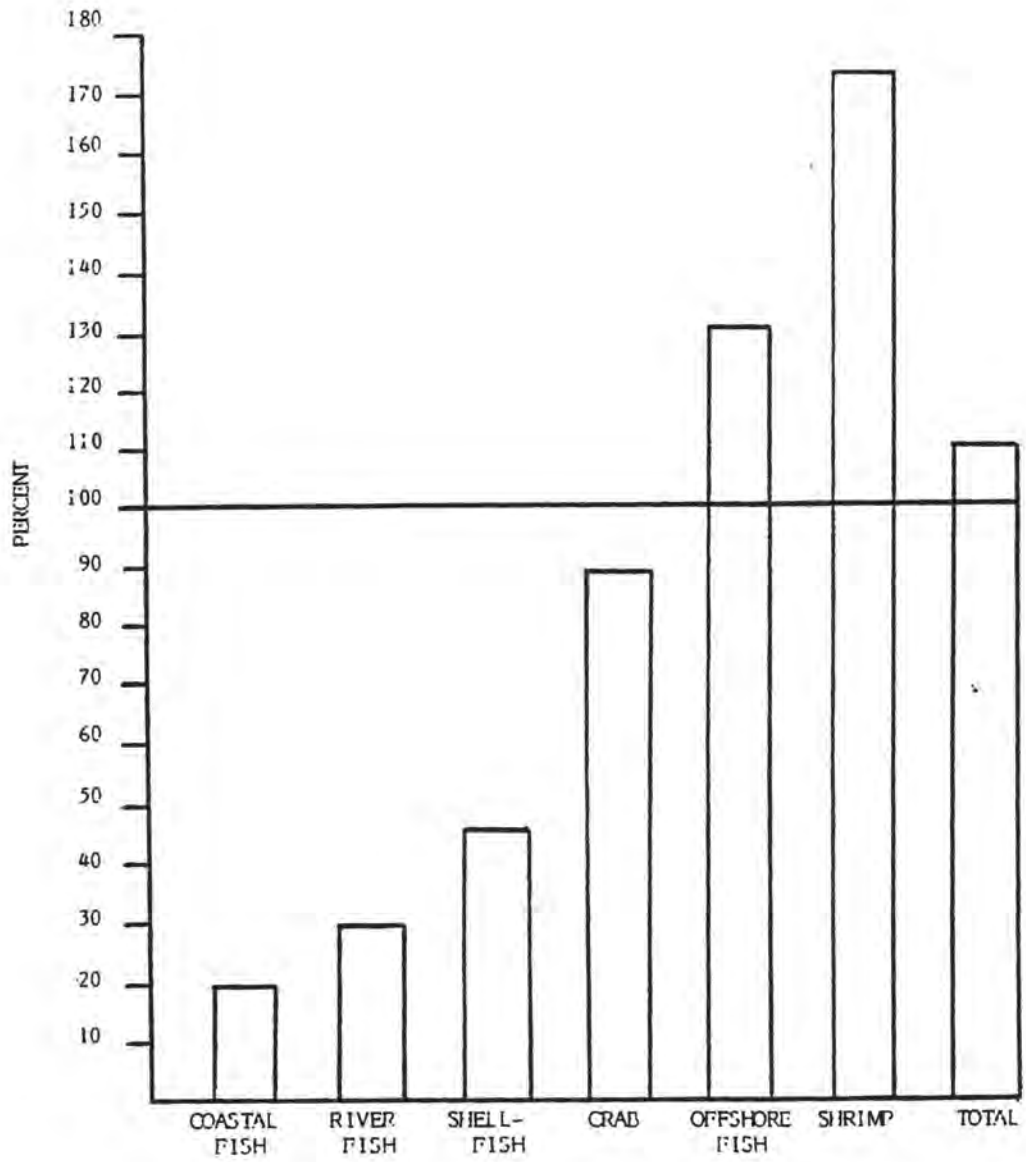


Fig. 2. Production in 1991 compared to 1977-1990 averages. Bars indicate percentages of the averages represented by the 1991 landings.

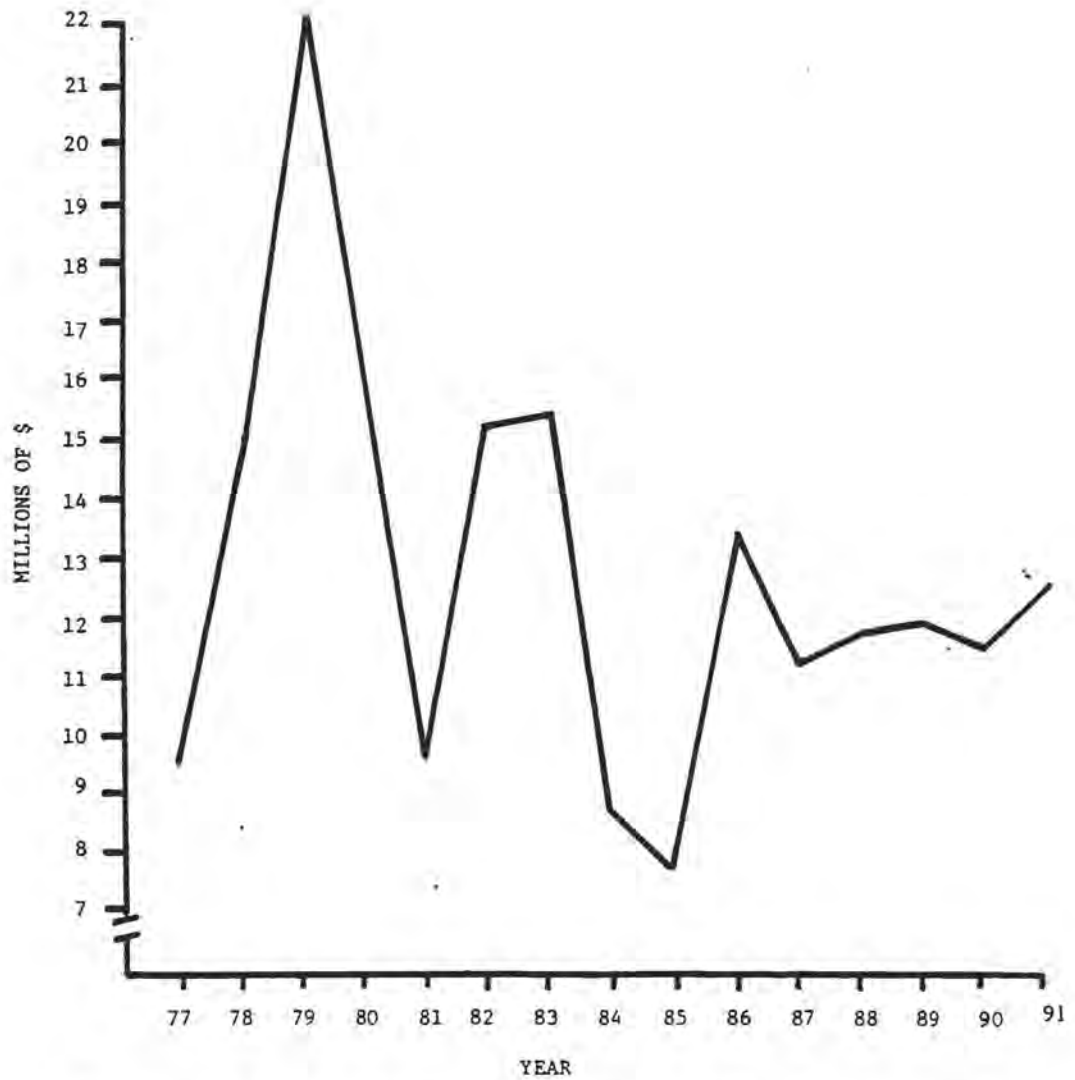


Fig. 3. Total ex-vessel value of commercial landings. Values are adjusted for inflation based on 1977 dollars.

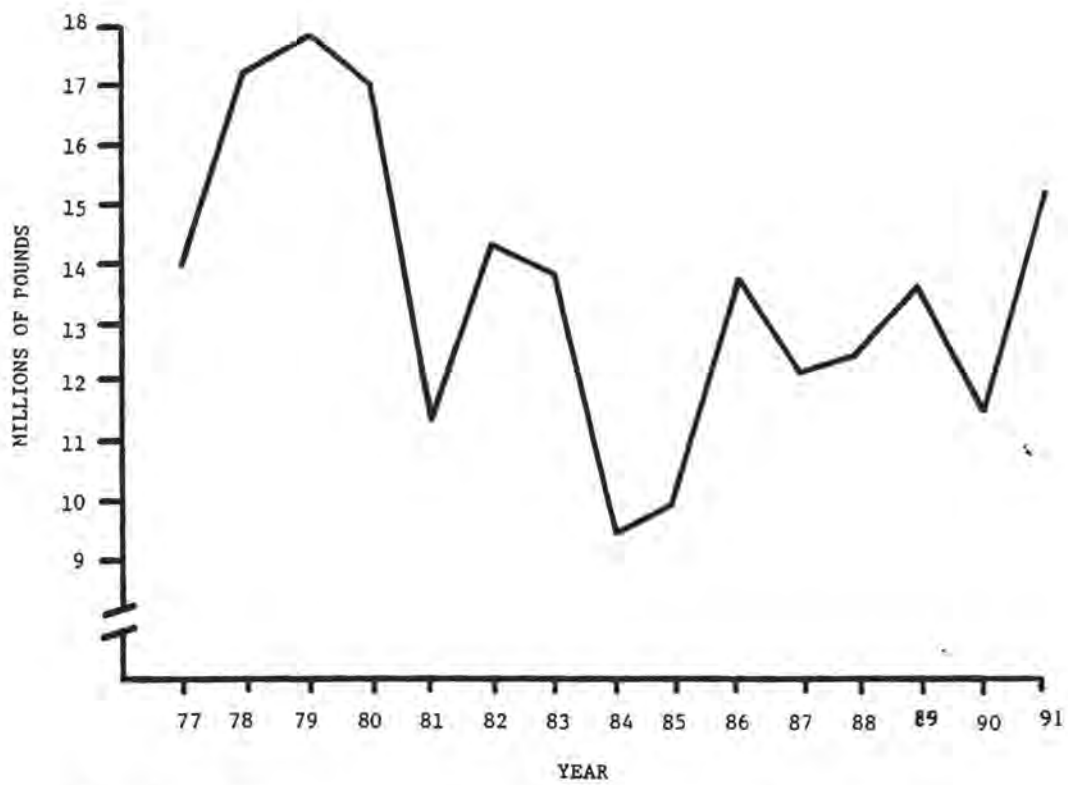


Fig. 4. Trend in production of estuarine-dependent resources.

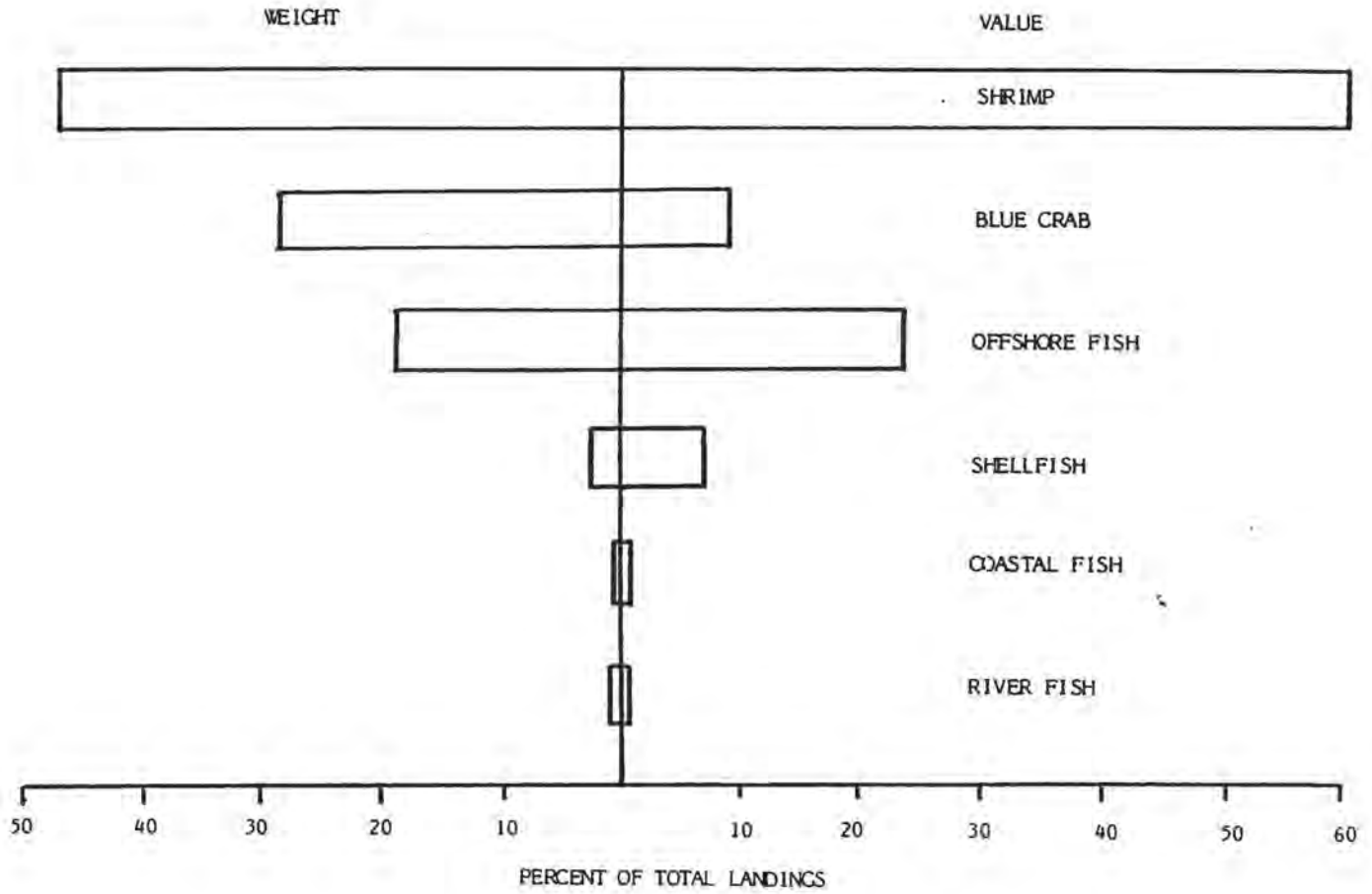


Fig. 5. Weight and value composition of commercial landings in 1991.

crab (2.3 M pounds) were down slightly in both weight and value (\$1.0 M) from the previous year's levels. Clam production (9,129 bags) was almost unchanged while the oyster harvest (23,214 bu) increased about 44%. Fish landings (70,000 pounds) were only half of the 1990 level due to a substantial decline in offshore production.

Landings in Georgetown County (4.1 M pounds) increased slightly but were worth about 4% less than in 1990 at about \$6.6 M. Offshore fish were the leading contributor to both volume and value at 1.77 M pounds worth \$3.44 M, both modest increases from the 1990 figures. Shrimp production (1.6 M pounds of whole product) was up slightly but value (\$2.57 M) was off about \$0.5 M from the previous year. The clam harvest (5,527 bags) was down appreciably while there was virtually no change in oyster landings (2,839 bu). Landings of shad nearly doubled. There were no significant changes in production in other categories compared to 1990.

The total value (\$2.6 M) of product landed in the other counties was slightly lower than in 1990. Fish was the leading category with about 0.9 M pounds worth \$1.3 M, although both figures were modest decreases from 1990 levels. Shrimp comprised most of the remaining production.

SHRIMP

Overall penaeid production was the second highest in 30 years due to unusually high abundance of both roe and fall white shrimp and above average catches of brown shrimp (Fig. 6). Pink shrimp landings were negligible and no rock shrimp were reported. Since the low production years of 1984 and 1985, total landings have closely reflected the contribution of white shrimp and trended upward. After adjustment for inflation there was only a modest increase in total ex-vessel value (Fig. 7). Adjusted unit value was a record low, reflecting both weak prices for shrimp and the small average size of shrimp landed in 1991.

Brown shrimp landings were 17% above the 1977-1990 average with record landings during June. Exceptionally heavy rainfall during April through June and competition from large numbers of white shrimp contributed to a slow growth rate. The reduced salinity also prompted early outmigration. As a result, the landings peaked in June instead of July and the brown shrimp available to trawlers were smaller (60 count heads-off) than normal. This resulted in low unit value (\$2.12/pounds heads-off) and overall value (\$3.08 M) of the brown shrimp landings.

It was a highly atypical year for white shrimp landings as well. White shrimp were abundant in late fall in 1990 and were available in coastal ocean waters for an extended period due to mild water temperatures. The trawl season remained open until January 28 (1991), the latest closing date on record. Water temperatures remained above 50°F during the rest of the winter and a large population of shrimp began emigrating into the ocean in April. The

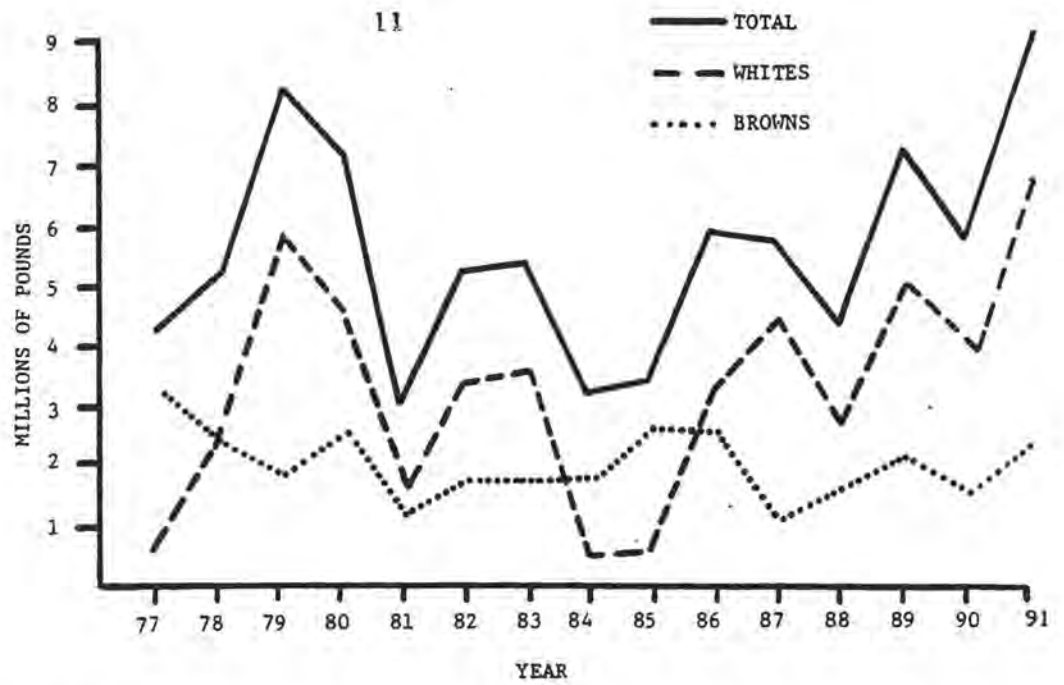


Fig. 6. Annual commercial landings of (heads-on) shrimp.

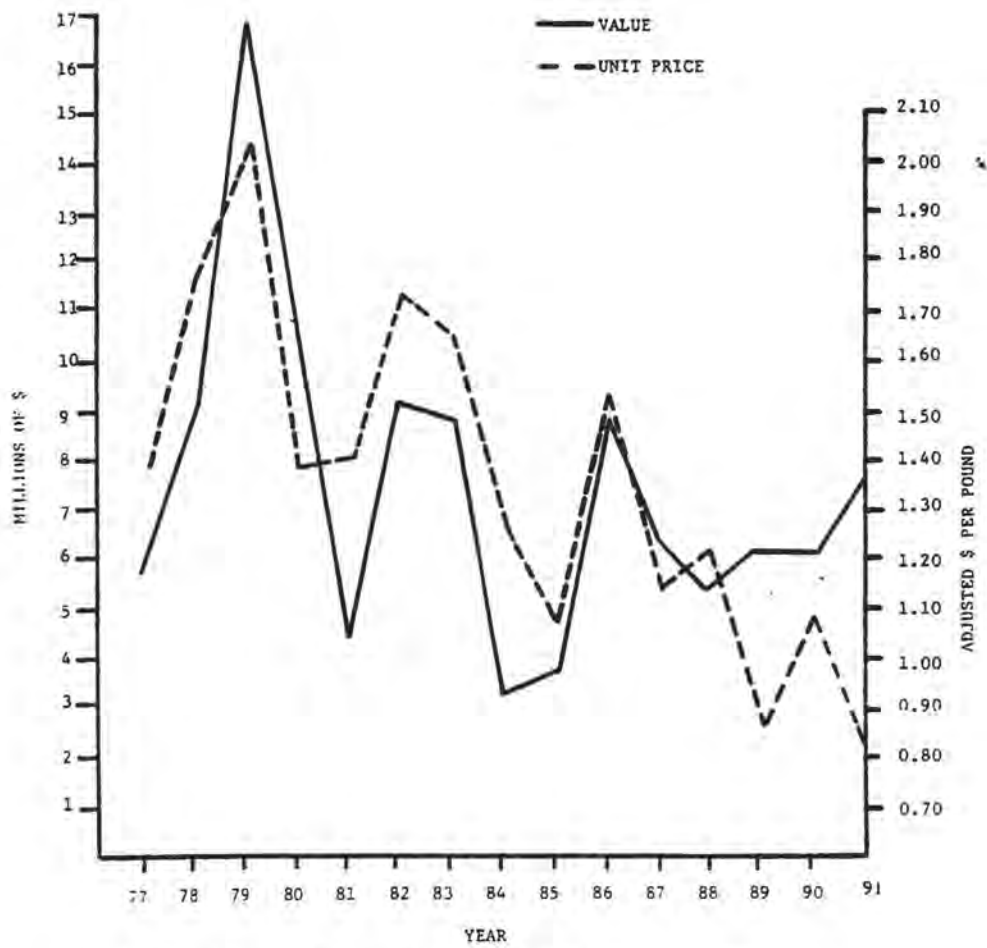


Fig. 7. Annual adjusted ex-vessel value and unit price of shrimp.

FCZ remained open to trawling and April landings were a record. Peak spawning activity was somewhat earlier than normal and the season began on May 15, the earliest opening of state waters since 1981. Record landings of roe shrimp occurred during May and overall volume (about 1.32 M pounds heads-on) was the greatest since 1972, contributing about \$3.85 M to the year's ex-vessel value.

Exceptionally wet weather continued during June and July. This caused many shrimp to leave inland estuarine areas well before normal and at a small size. August landings were the highest on record and composed of small (51-55 count heads-off) shrimp. September landings were also high and composed of shrimp substantially smaller than average. October catches were small but landings increased in November.

The bulk of the fall white shrimp harvest was taken a month earlier than usual and average size (41-45 count heads-off) was smaller than normal as a result. The unit value was therefore low and the overall value of the landings (about \$9 M) was appreciably less than it could potentially have been. Fall shrimping was most affected in areas receiving high river discharge (Winyah/Santee Bays and around Charleston).

These conditions appear to have had a significant negative impact on the channel net fishery; however, given the unreliability of landings reports any observations are speculative. Channel netting (and trawling) in North Santee and Winyah Bays opened on September 27. Normally, the season would have been closed in mid-November but it was extended due to low landings which were predominantly 41-50 count heads-on.

Several items of concern to shrimp trawlers in 1990 remained issues in 1991. At least one escapement of Pacific white shrimp from a mariculture operation occurred in October, although the number of shrimp involved appeared to be small. Compared to 1990, few Pacific shrimp were found during sampling of commercial landings.

During the last few years, turtle excluder devices (TEDs) have been required on boats 25 feet or longer during May 1 through August 31 under federal regulations. In 1991, TEDs were required during the fall also (in 1990, 56 dead turtles were counted in South Carolina between September 1 and December 1). Since South Carolina law requires TEDs to be used under the same conditions required by federal regulations, TEDs were employed by most trawlers during the entire 1991 season.

CRAB

Practically all of the product in this category was hard blue crab landed by pot fishermen. Although commercial landings often are regarded as indicative of abundance, they also reflect the number of crabbers and (presumably) levels of effort. Market conditions also influence effort and landings on a short-term basis.

The principal resource-related factor affecting abundance appears to be summer/early fall rainfall during the later juvenile stages. There has been some speculation about cyclical fluctuation, since one or two years of relatively low production have occurred every six or seven years (Fig.8).

Any interpretation of landings data is dependent upon their reliability. In earlier years, most crab was sold ungraded to a few instate picking houses and their reports probably reflected total production rather accurately. With the growth of the "basket" trade, many crabbers have graded and distributed much of their product independently and overall landings may have been under-reported.

Total production of blue crab increased about 5% in 1991 from that of the previous year. Research trawl sampling results in March suggested high abundance in inland areas prior to the heavy rains of April through July. Any effects of reduced salinity on distribution and/or abundance are difficult to assess. In 1991, shrimp trawler landings of blue crab were about 28,500 pounds vs around 4,200 pounds in 1990, while total landings by all gears were roughly comparable. This suggests that a larger percentage of the crab population remained in the ocean in 1991.

In recent years, product has been increasingly sourced as "basket" crab to take advantage of relatively high prices for number 1 crab in northern markets, particularly during spring and late fall. As a result, landed value after adjustment for inflation (Fig. 9) has been about the same as a decade ago despite a lower level of production. This has been attributable to a sharp rise in adjusted unit value (Fig. 9). In 1991, however, the average ex-vessel price declined substantially even though three-fourths of the hard crab catch was sold as graded product. The average price of graded crab (\$0.49) was a nickel a pound lower than the overall average in 1990 and ungraded product sold for only \$0.34/pound.

A directed trawl fishery for crab was operated under permit during December (1990) through March. Because of the late closure of the shrimp fishery, there was very little effort in January. During the season, 32 boats made 196 trips. Most boats also held whelk permits but about 70% of the effort appeared to have been targeted at crab. Most of the crab trawling effort was in Calibogue Sound, off the south end of Hilton Head Island, and in southern St. Helena Sound. About 72,000 pounds of blue crab were landed, of which about one-third was number 1 product (large males).

The South Carolina chapter of the Atlantic Coast Conservation Association asked MRD to monitor this fishery because of concerns about incidental catches of white shrimp and fish and potential impacts on populations of female blue crab. Reported fish landings were very low (about 700 pounds of flounders and 200 pounds of kingfishes). No white shrimp were reported and very few sponge crab were seen during onboard sampling of catches. Although most of the landings consisted of mature female crab, the total amount harvested

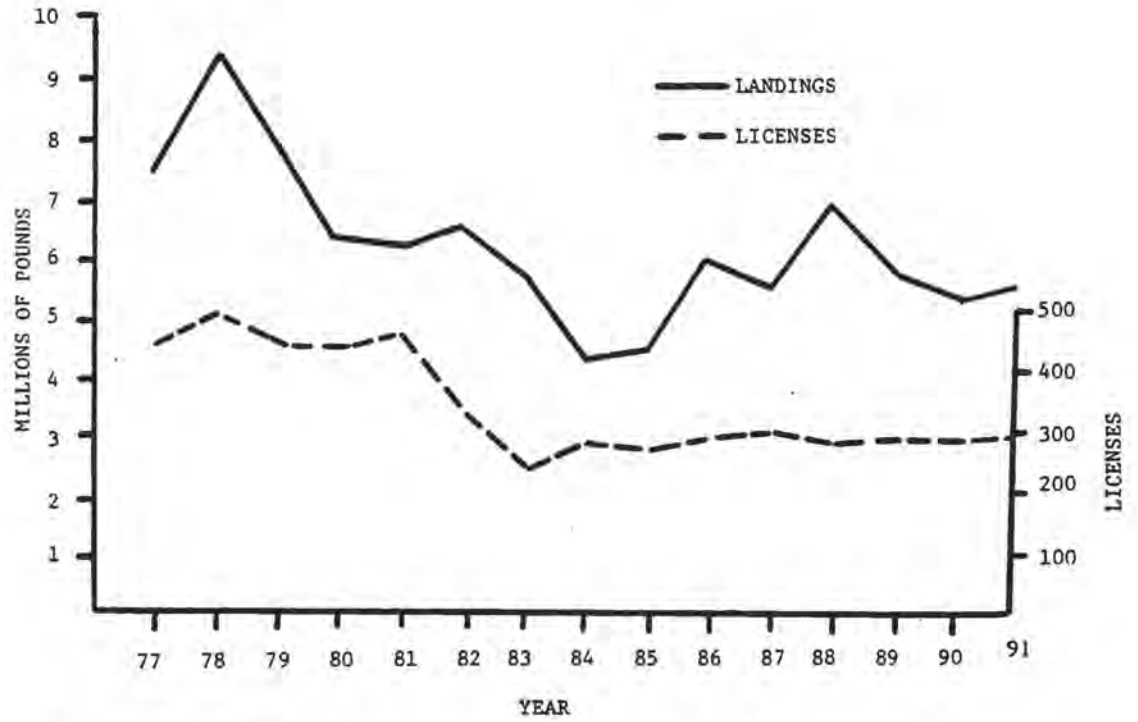


Fig. 8. Annual commercial landings of blue crab and number of crab pot licenses.

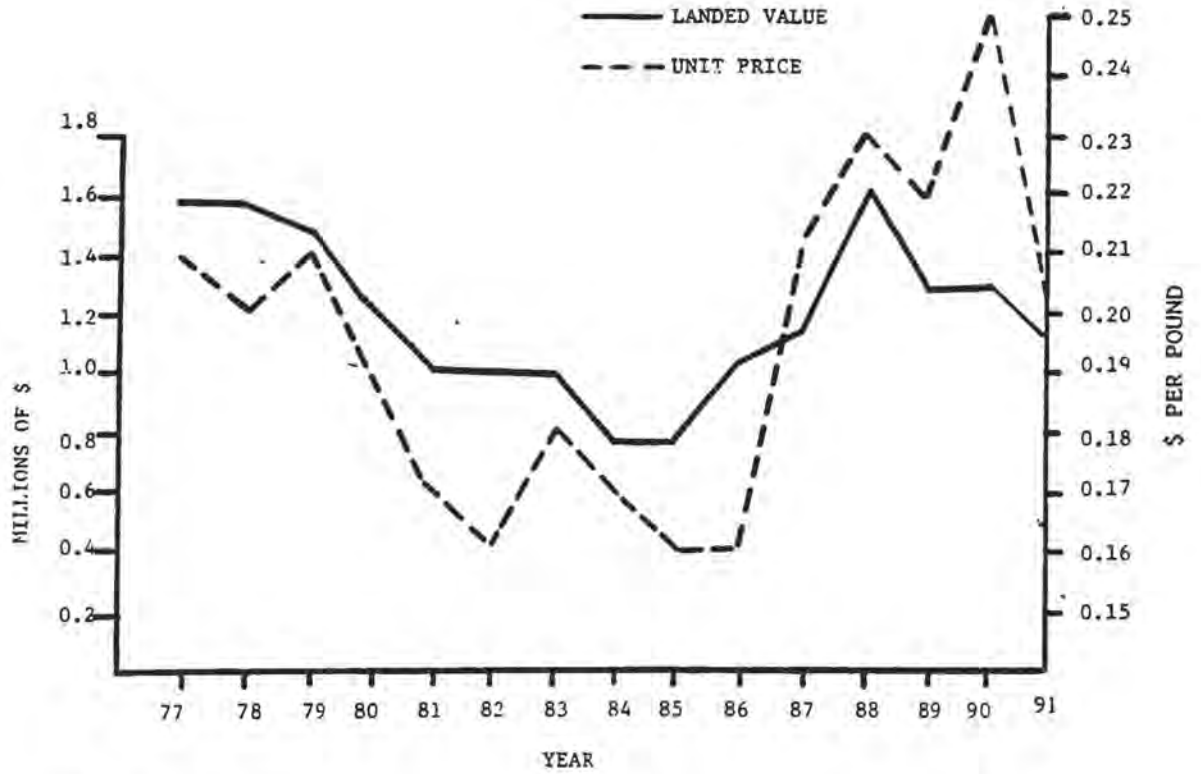


Fig. 9. Adjusted ex-vessel value and unit price of commercial blue crab landings.

was so small that it presumably represented no biological problem.

SHELLFISH

The winter/spring shellfish season closed for oysters on May 14 and for clams on May 31. Fall openings were September 16 for clams and September 30 for oysters.

Annual oyster production improved substantially from 1990 but remained extremely low compared to historical levels (Fig. 10). The percentage (25%) attributable to spring harvest was very low and the spring landings (29,082 bu) were the lowest to date, due in part to the wet weather. Most of the spring product was from private grounds. Fall landings (89,197 bu) were the highest since 1984 and most was from culture permit areas. The average price was \$7.90/bu compared to \$9.38/bu in 1990. Landed value of the annual oyster harvest increased 27% from 1990 but remained well below average (Fig. 11).

Clam landings were about 44% above the 1989 and 1990 levels but relatively low compared to production in the early 1980's (Fig. 10). The adjusted ex-vessel value was also below average (Fig. 11). Prices for littlenecks averaged 11.5 cents each, a fairly low unit value. Most of the hard clams (22,481 bags of 250 count) were reported as ungraded. Of the amount that was graded, 59% (9,309 bags) were littlenecks, 34% (5,350 bags) were cherrystones, and the remainder (1,120 bags) were chowders. The mechanical escalator harvest was about the same as in 1990 but landings from other sources increased appreciably.

The whelk trawl season opened on January 15 and closed on April 19. There was very little effort until February because of the extended shrimp season. Targeted effort for whelks appeared to be around 60-65 trips. A total of 6,401 bu (128,020 pounds of meats) were reported on special permit daily reports although dealers reported handling less than 10% of this amount. Many dealers thought that they did not have to report product because the fishermen had to submit landings via special permit reports. Since the dealer reports have been the source of the official landings statistics in recent years, it is probable that whelk production has been significantly under-reported in official statistics the past few years.

OFFSHORE FISH

After five years of increasing production, offshore fish landings declined 11% in 1991 (Fig. 12). Only the trap fishery posted an increase (6%) in production (Fig. 13). The bottom longline fishery was down 48% in volume from the previous year. Surface longline and handline (including troll and wreckfish) production declined by 8% and 7%, respectively. The handline (power-assisted reel and troll) fishery maintained its usual status as the leading offshore fishery in both production and value (Fig. 14). The trap fishery moved from last place in both categories in

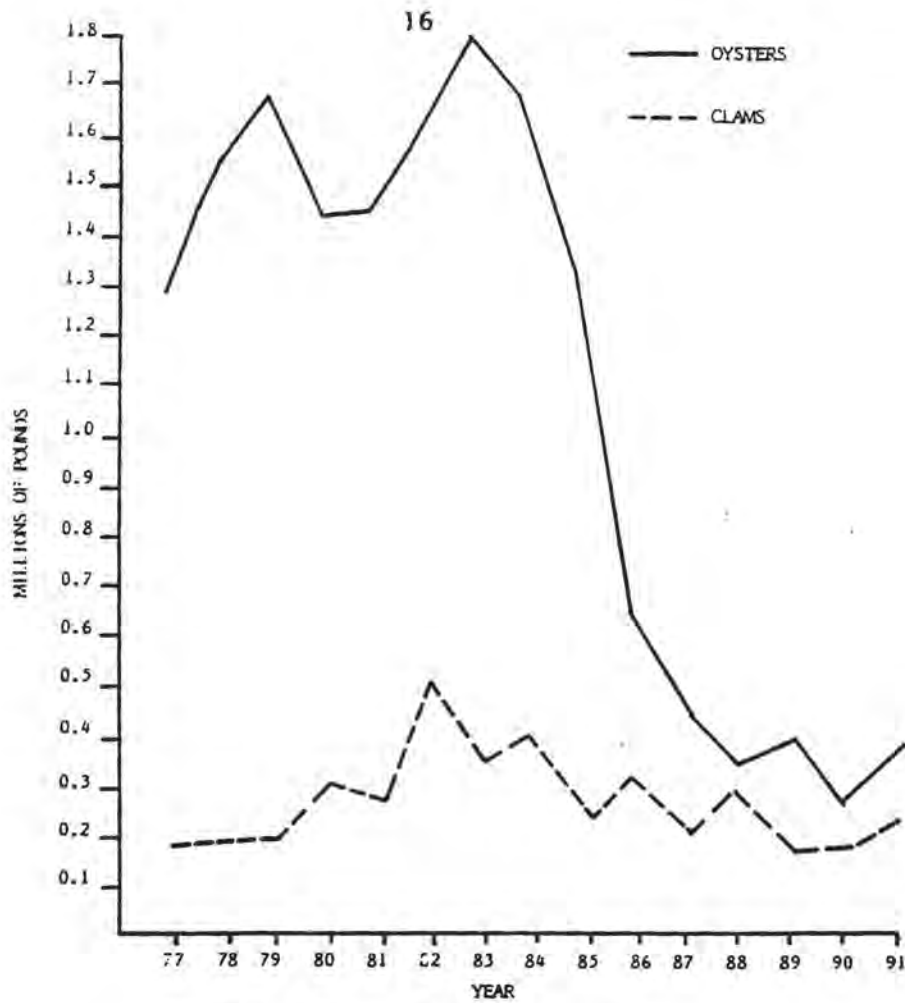


Fig. 10. Annual commercial shellfish landings.

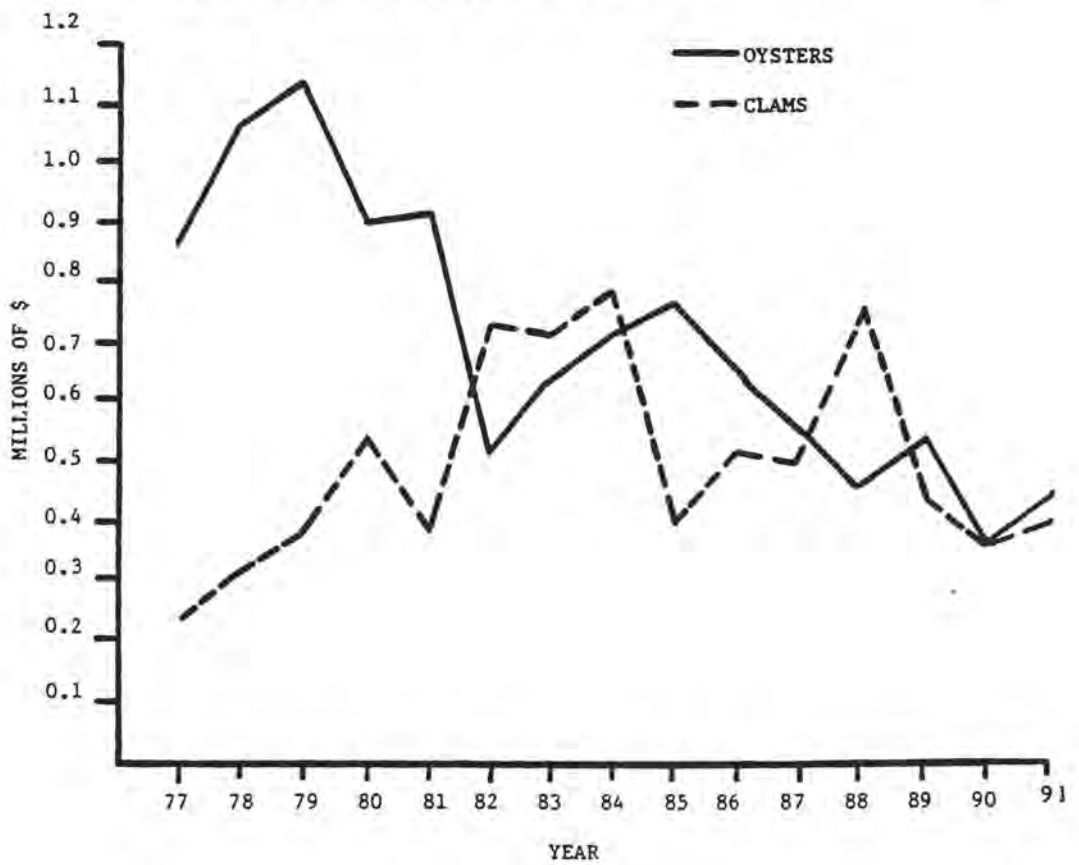


Fig. 11 Adjusted value of shellfish landings.

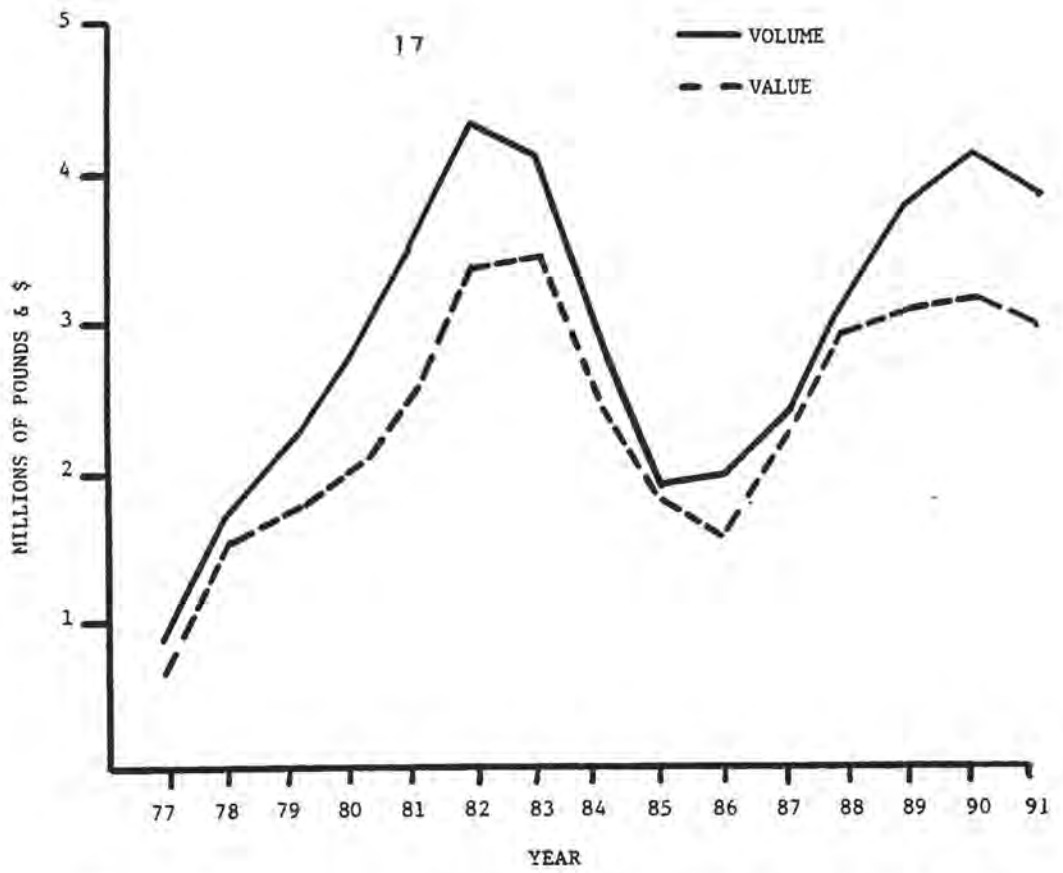


Fig. 12. Annual commercial landings and adjusted ex-vessel value of offshore fish.

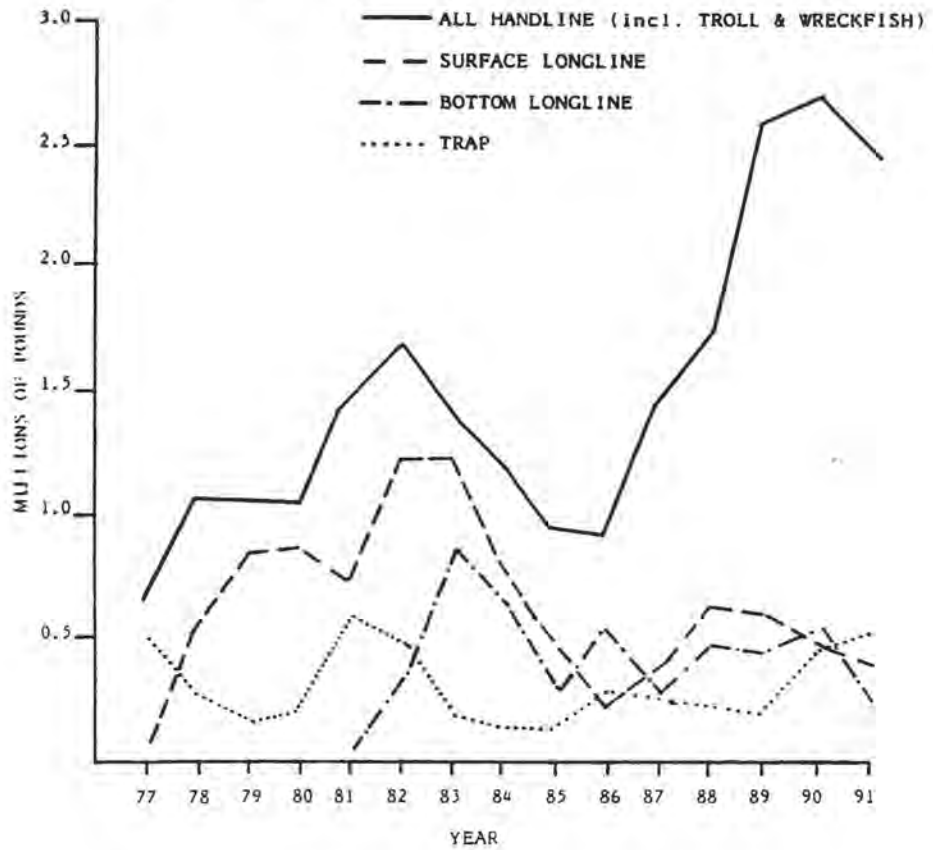


Fig. 13. Annual commercial landings of offshore fish by gear type.

1990 to second in volume production and third in landed value in 1991 while the surface longline fishery maintained its 1990 position in both categories.

Among the principal species components, significant gains were recorded for king mackerel (+65%) and snappers (+34%) in landed weight. The biggest volume declines were for wreckfish (-47%) and groupers (-23%). Smaller declines in landings were reported for tilefishes (-13%) and swordfish (-9%) while there was little change for black sea bass (-2%) and porgies (-1%). Groupers displaced wreckfish as the leading volume component in 1991 and retained their position as the largest value contributor (Fig. 15). Snappers moved up to second in both categories. Swordfish remained the third highest component in value despite a decline in landings. Despite the large decline in landings, wreckfish remained the leading individual species in volume contribution while swordfish was the individual species value leader. Vermilion snapper was a close second in both categories (482,841 pounds worth \$980,479).

The handline fishery has two major components: 1) a deep-water hydraulic reel fishery for wreckfish, 2) a snapper (primarily electric) reel fishery for reef fish (snapper, groupers, etc.). The estimated total number of trips was 2,024 with an average catch per trip of 1,056 pounds (gutted weight).

The largest component in terms of participation and production was the snapper reel fishery. In 1991, it landed 1,848M pounds worth \$3.181 M, second only to 1989 in both production and (adjusted) landed value. Reef fish comprised 86% of this volume with most of the remainder attributable to king mackerel. Reef fish contributed 88% of the ex-vessel value. The most important single species was vermilion snapper (24% of the landings and 29% of the value). Groupers (primarily gag and scamp) contributed 25% of the landings and red porgy 11%. King mackerel provided 9% and amberjacks, formerly discarded or used for bait, represented 7%.

In 1991, the deep-water fishery for wreckfish was managed under seasonal quotas with a total allowable catch of 3.0 M pounds released in 1.0 M pound increments (the third was not put in effect). South Carolina's landings statistics are confidential because one dealer handled most of the fish but landings were barely half of those in 1990. Regionally, about 80 boats were issued permits and 44 actually fished for wreckfish, landing 2.006M pounds. Only 14 boats made more than ten trips. South Carolina vessels contributed roughly 25% of the effort and landings, North Carolina boats about the same percentage, and Florida vessels accounted for about half. The season was closed until mid-April to protect spawning fish.

The other handline component was the troll fishery. In South Carolina, this is a relatively small fishery landing almost exclusively king mackerel. The 1991 troll landings of kings (100,509 pounds) were more than double those of the previous year and were worth \$173,263. Estimated total effort was 110 trips with

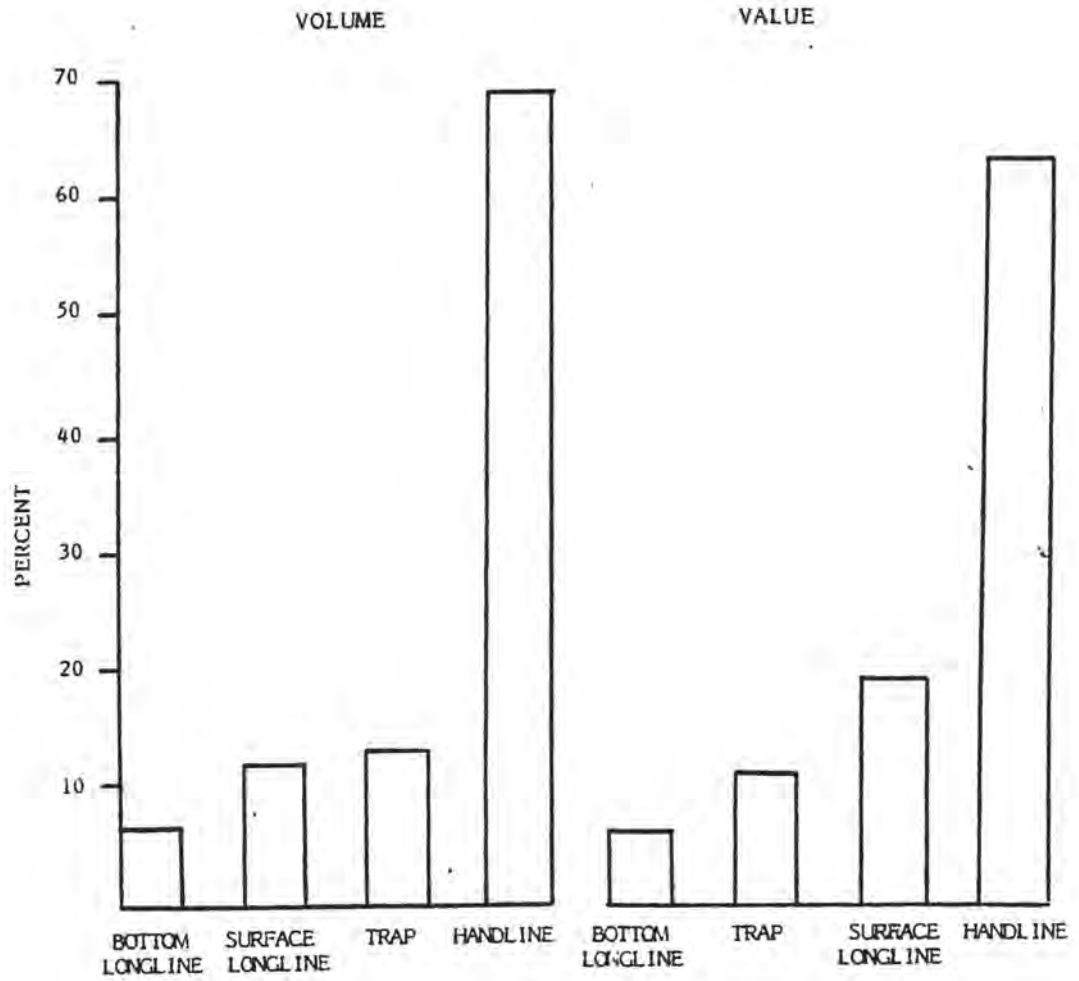


Fig. 14. Contribution to 1591 commercial landings of offshore fish by gear type.

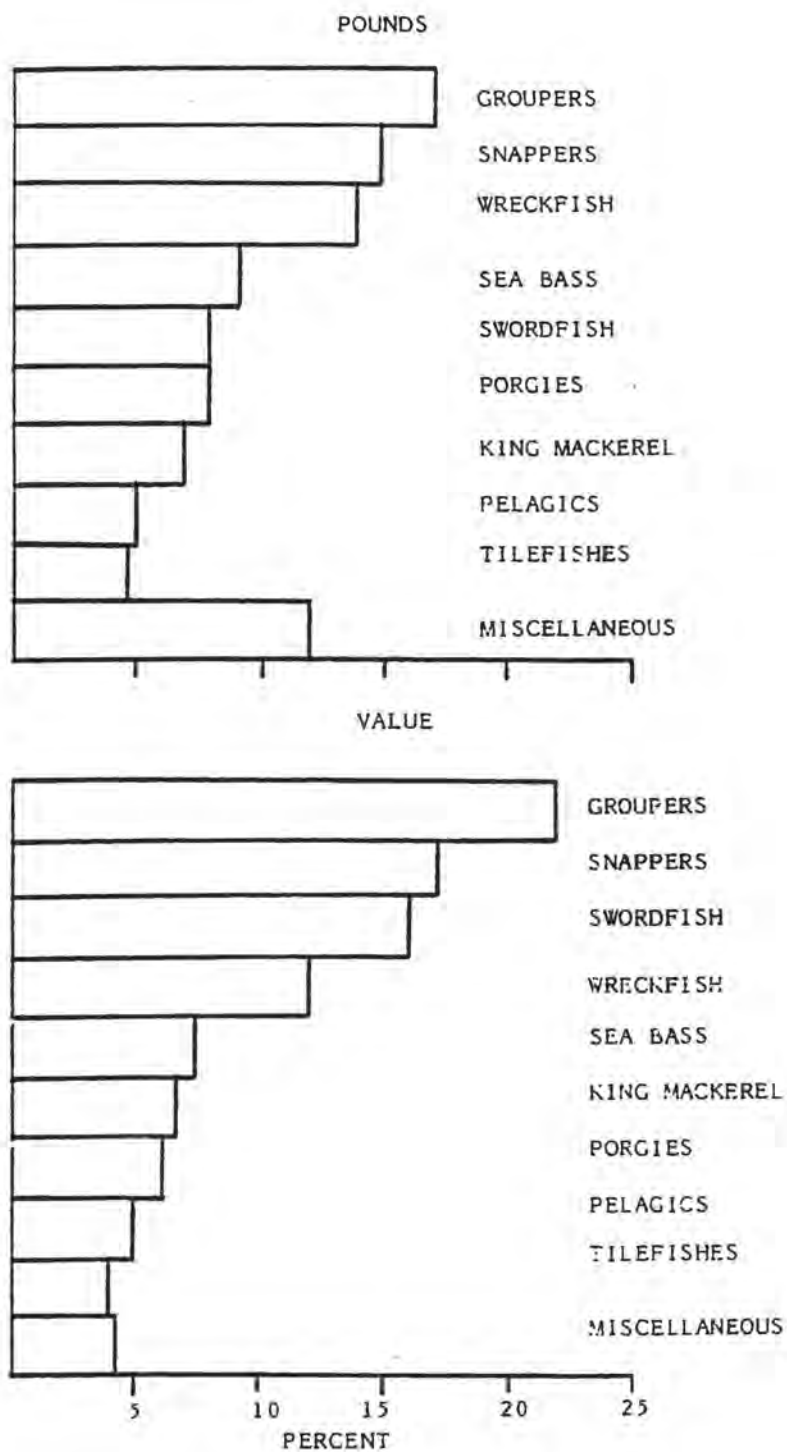


Fig. 15. Composition of commercial landings of offshore fish in 1991.

an average catch of 832 pounds (gutted) per trip.

The troll component was 38% of the total king mackerel catch, larger than usual. Overall king mackerel landings posted a sharp increase to a record high of 264,000 pounds. Although average size of kings landed in 1991 was a little smaller than in 1990, the length distribution (Fig.16) was typical of that for a relatively healthy stock.

The surface longline fishery targeted swordfish although 30% of the 1991 landings consisted of other species. Tunas (principally yellowfin) represented 13%, dolphin 11%, and sharks 5%. Swordfish landings data are confidential but landings declined for the third consecutive year. Of fish that were graded, 11% were less than 25 pounds carcass weight and one-third were in the 26-49 pound market category (by weight). Although relatively small in terms of weight contribution, the fishery landed about \$1.25 M worth of product due to high unit value. Because of very limited sampling coverage, estimates of 1991 effort and catch per trip are not available.

Bottom longline landings (269,283 pounds) were only 52% of the previous year's and value (\$393,229) was only 48% (in contemporary dollars). Volume of the principal component, golden tilefish, was down 30% and snowy grouper landings dropped from about 144,000 pounds to 63,000. As in the previous year, sharks represented a relatively small part of the catch (35,520 pounds). This may have partly reflected their price (\$0.47/pound), down a nickel from the previous year and a dime less than in 1989, when the fishery landed nearly 150,000 pounds. Total effort was estimated at 102 trips, only 53% of the previous year's and the average catch per trip (2,371 pounds) was down 12%.

The trap fishery achieved a small increase in overall fish production (461,577 pounds worth \$705,939), although landings of black sea bass (239,294 pounds) remained almost constant. Red porgies represented about 19% of the catch and vermilion snapper 8%. Groupers, primarily scamp, comprised 10%. Value was up 18% because of the contribution of these relatively high valued species. Total estimated effort was 328 trips, a slight increase (6%) from that in 1990. The average catch per trip was 1,283 pounds, down 10% from that in the previous year.

Reef Fish

In aggregate, reef fish continued to be the dominant component of offshore fish landings in both volume and value. Not including wreckfish, the 1991 landings were about 2.3 M pounds worth about \$3.9 M (Fig. 17). After adjustment for inflation, they were exceeded only by 1990's value. About 70% of the 1991 landings were attributable to handline boats. Trappers landed 20% and bottom longliners 10%. The trappers' percentage was almost the same as in 1990.

Groupers have been the largest component of reef fish landings

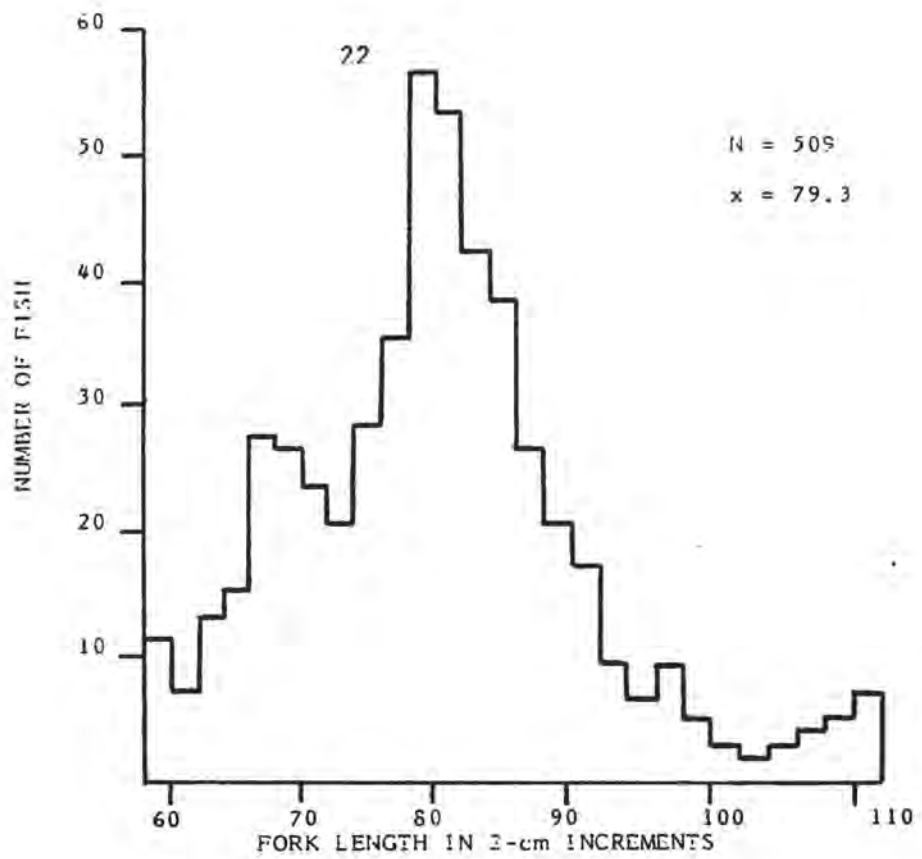


Fig. 16. Length distribution of commercially landed king mackerel in 1991.

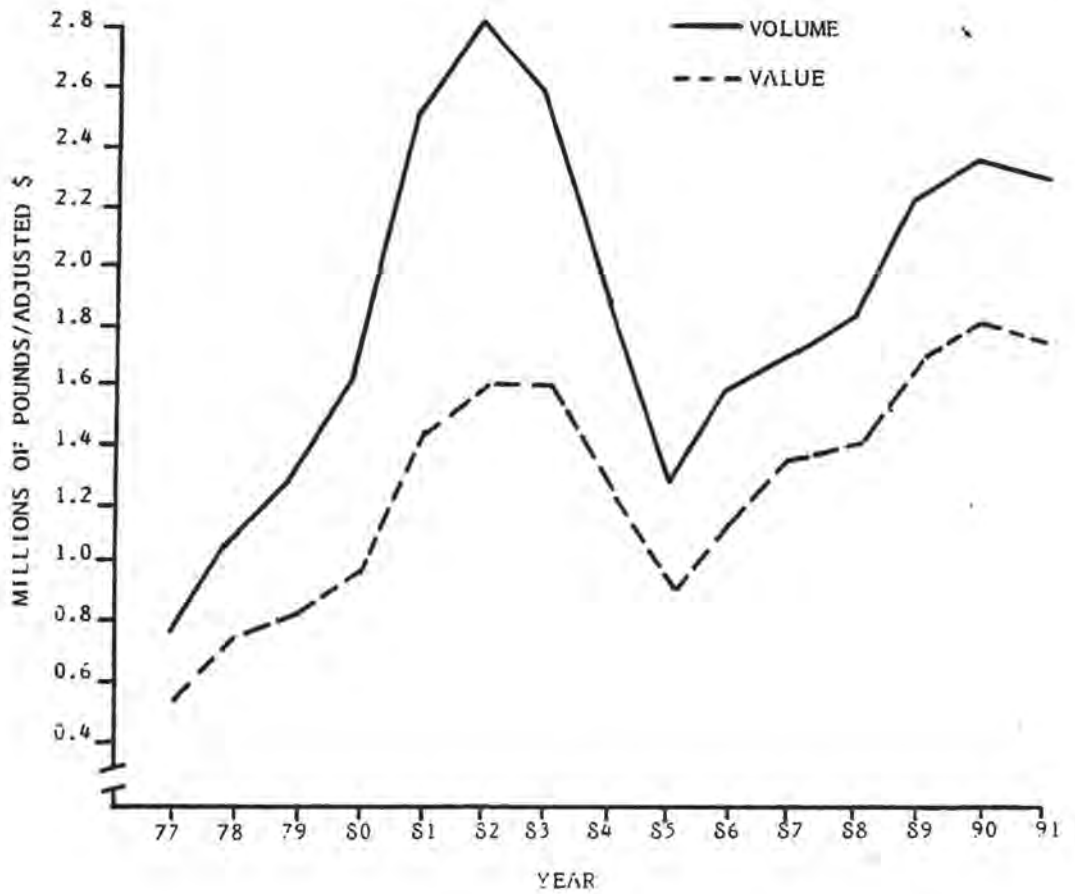


Fig. 17. Commercial landings of reef fish (excluding wreckfish).

over the last ten years with gag the largest volume contributor (Fig. 18). Production of this species has fluctuated considerably over the last eight years. The handline fishery has been the principal producer. The percentage of this fishery's landings accounted for by gag has been generally declining and in 1991 was the lowest to date (14%). Total gag landings were worth about \$657,000. Length distribution is shown in Fig. 19 and was similar to that in 1990, although the mean size declined slightly.

Scamp have been the other major grouper landed by handliners, accounting for between 7 to 12% of the fishery's total annual production over the last ten years. This has been the principal grouper landed by trap fishermen. Total scamp landings have been increasing sharply since 1985 and were at historical high levels in 1990 and 1991 (Fig. 18). The 1991 catch brought \$486,000. The length distribution (Fig. 20) was rather heavily skewed toward small fish and the mean size, though slightly larger than in 1990, continued to be small by historical standards.

Snowy groupers were prominent in handline landings in the late 1970's, peaking at 210,000 pounds in 1978. Snapper reel catches then plummeted in the mid-1980's as the bottom longline fishery expanded. Bottom longline landings of snowies peaked in 1983 (253,000 pounds), also the year of greatest total production (about 290,000 pounds). Landings then crashed to a low of about 77,000 pounds in 1985. Since then, production in both fisheries has trended upward through 1990. In 1991, handline landings declined 46% and longline production dropped 56%. The 1991 overall catch was worth about \$208,000. The length distribution (Fig. 21) continued to be strongly skewed (suggestive of overexploitation) and mean size declined by 8%.

The most important individual reef species in recent years has been the vermilion snapper. Landings increased greatly during the peak years of the trawl fishery (which targeted extra small fish), then declined rapidly following its closure (Fig. 22). In recent years, landings (primarily by the handline fishery) have again risen sharply to a record high in 1991. Vermilion snapper comprised 24% of the handline landings, by far the largest contribution of any species and close to the aggregate share represented by groupers. The length distribution in 1991 (Fig. 23) was dominated by very small fish. The average size was slightly less than in 1990 and about 49% of the fish measured were below the minimum size set to take effect in 1992. About 60% (by weight) of the graded catch consisted of extra smalls (0.5 - 0.75 pounds) worth \$1.87/pound. Mediums brought an average of \$2.15/pound. Given this price differential, it clearly is economically inefficient to harvest a large percentage of the fish at a small size assuming a reasonable survival rate.

Landings of the other principal snapper, red snapper, continued to decline and were only 46% of the 1989 level. The 1991 red snapper catch (about 37,000 pounds) was worth about \$111,000. Small fish dominated the landings (Fig. 24).

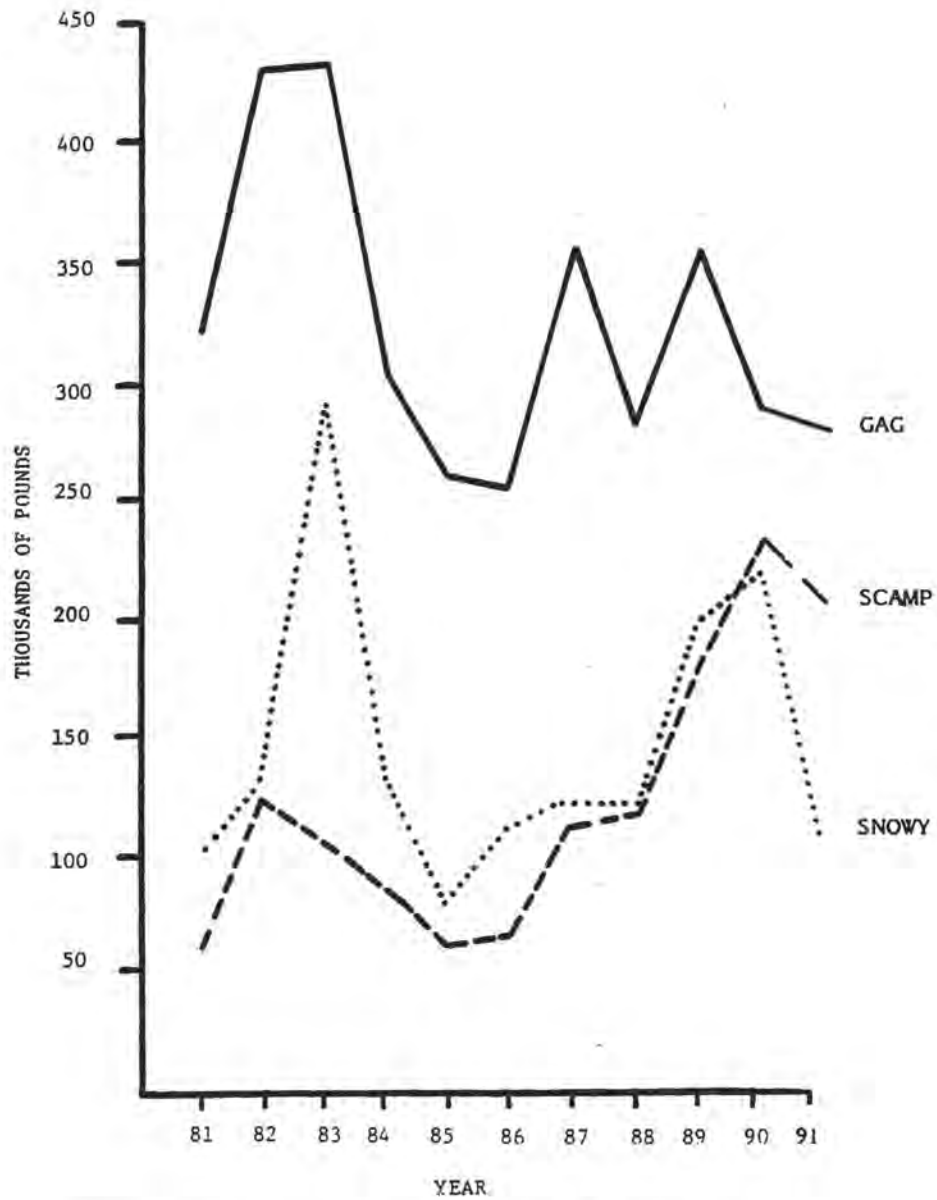


Fig. 18. Annual commercial landings of gag, scamp, and snowy groupers.

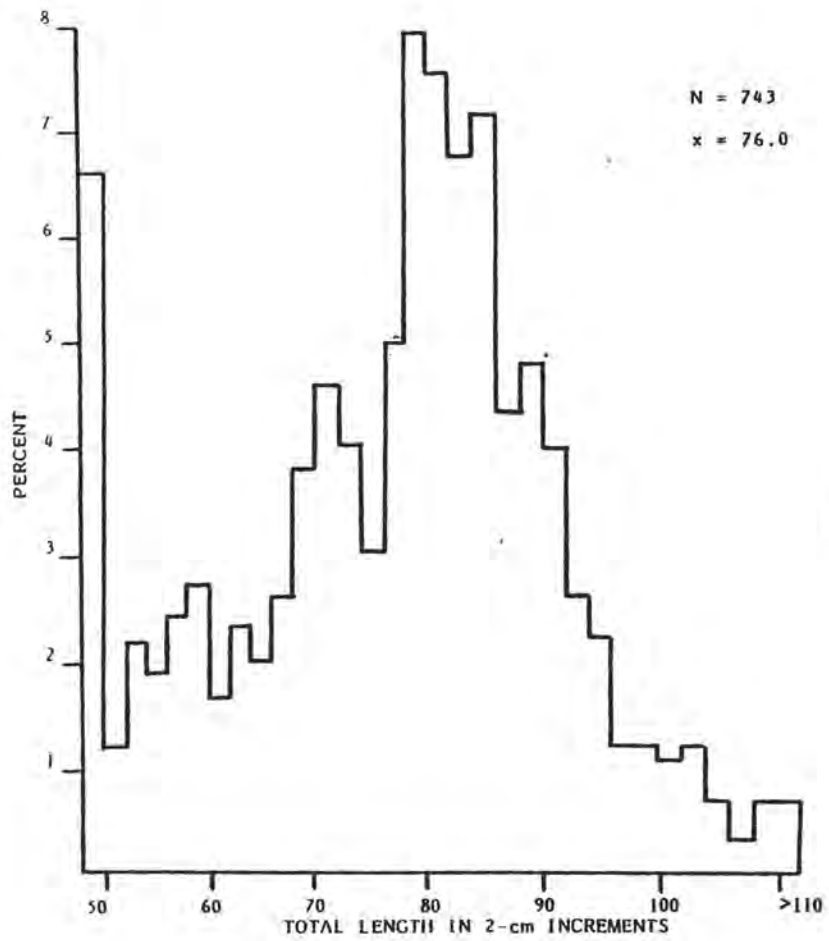


Fig. 19. Length distribution of commercially landed gag groupers in 1991.

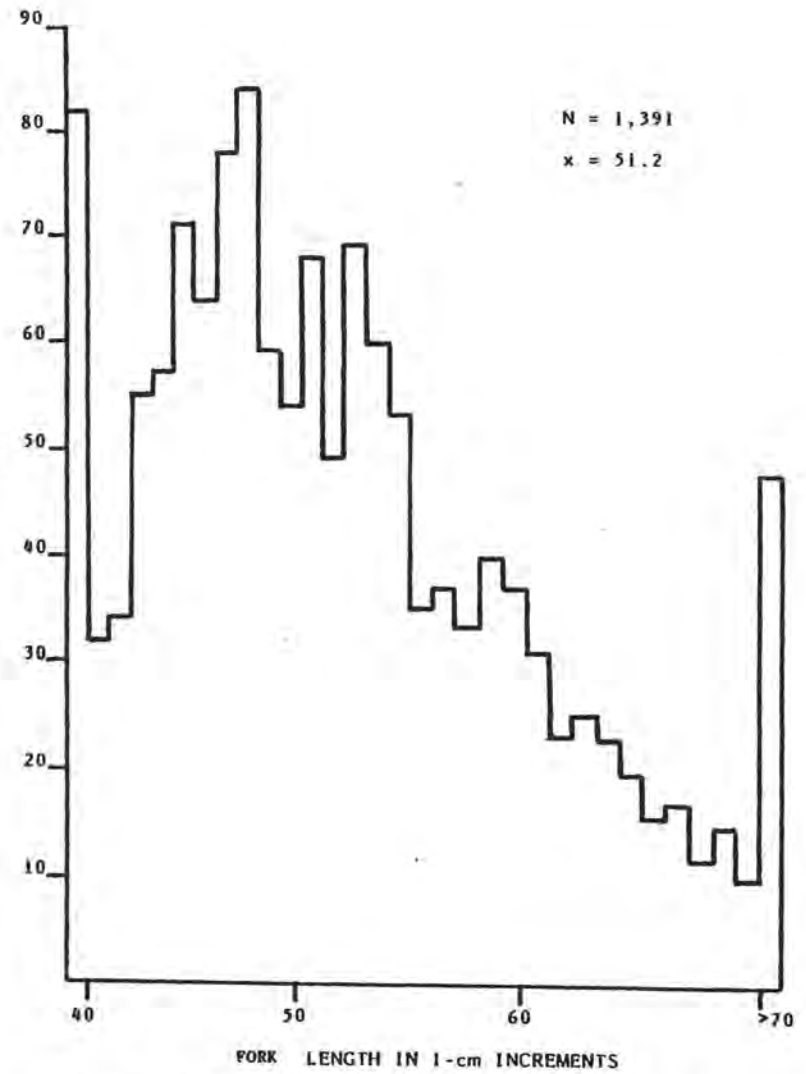


Fig. 20. Length distribution of commercially landed scamp groupers in 1991.

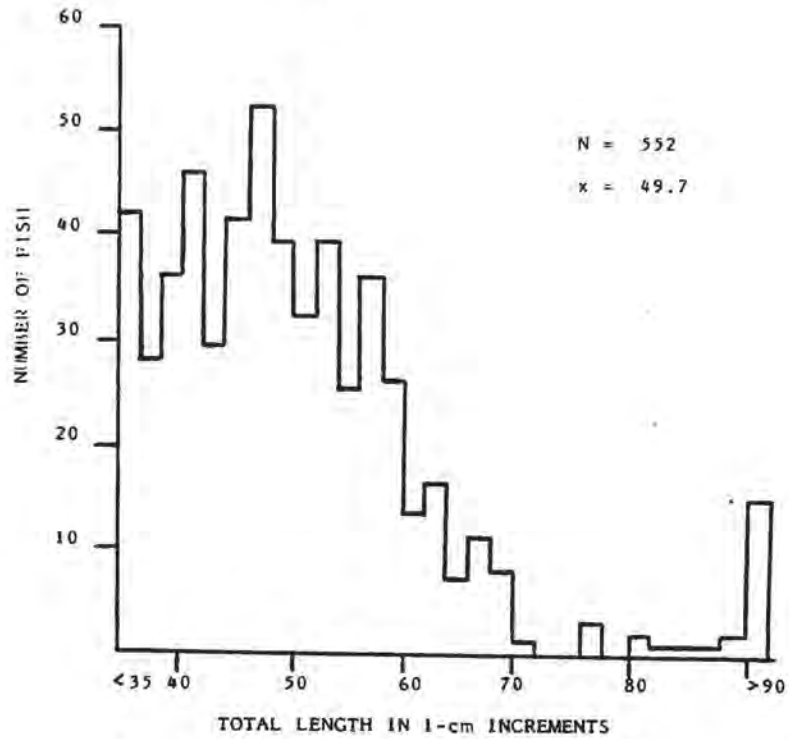


Fig. 21. Length distribution of commercially landed snowy groupers in 1991.

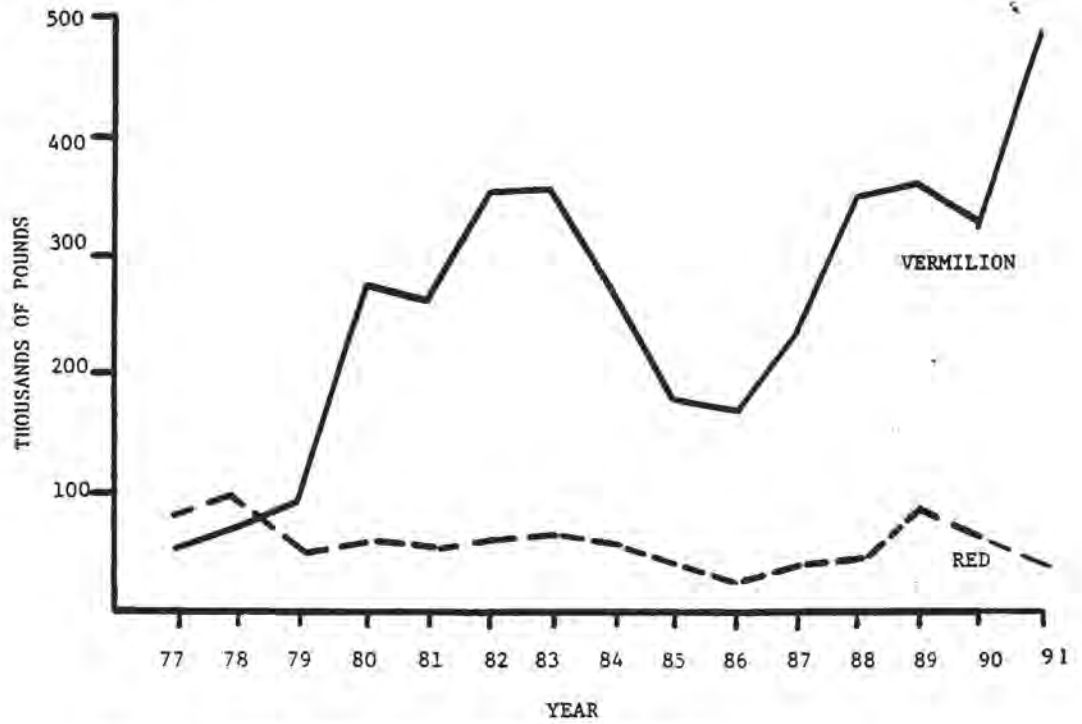


Fig. 22. Annual commercial landings of snappers.

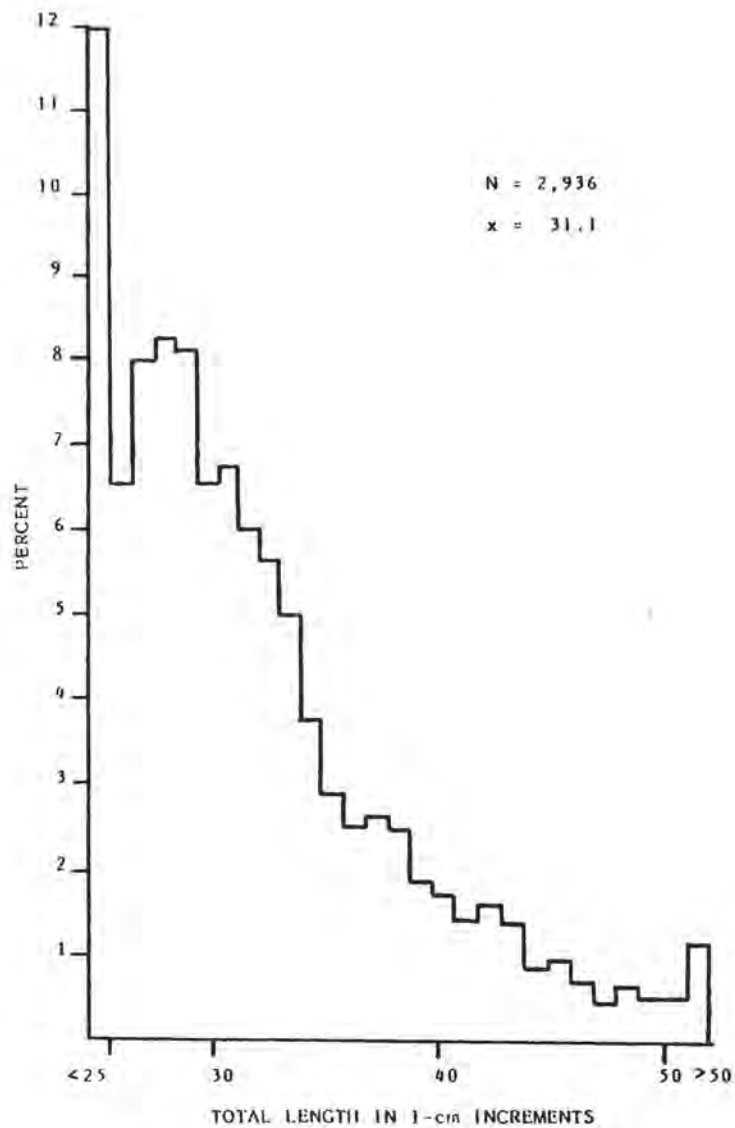


Fig. 23. Length distribution of commercially landed vermilion snapper in 1991.

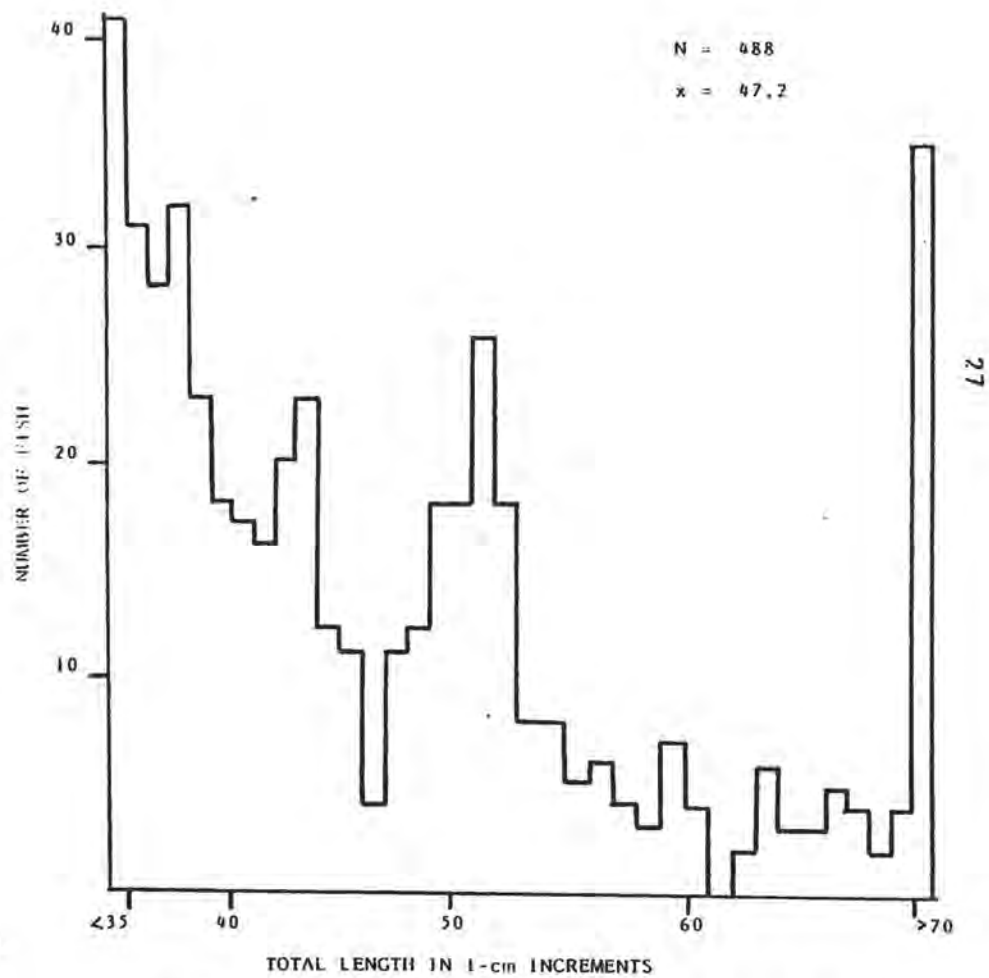


Fig. 24. Length distribution of commercially landed red snapper in 1991.

Red porgy typically represented 25-30% of the handline landings in the late 1970's. In 1991, this species comprised 11%, the lowest relative contribution to date. The total landings (about 296,000 pounds) were worth about \$412,000. Landings of all species combined (predominantly red porgy but including minor amounts of knobbed and whitebone porgy) have been practically constant for three years (Fig. 25), although handline catches have dropped considerably. Red porgies are the most important component of the trap fishery catch after black sea bass and trap landings have increased considerably. The average size of red porgies sampled in 1991 was lower than in 1990 and the length distribution (Fig. 26) was more skewed toward small fish.

Total black sea bass landings (322,000 pounds) dropped slightly in 1991 (Fig. 27) as did the trap catch (239,000 pounds). Value (\$485,000), however, increased about 8%. The percentage of small fish in graded trap landings continued to decline, a positive economic factor given the large unit value differential between small and large fish (\$0.75 vs \$2.59/pound in 1991). Length distribution (Fig. 28) and mean size in 1991 were similar to those in 1990.

Tilefishes

About 70% of the 1991 landings consisted of golden tilefish and 30% of blueline (gray) tilefish. Bottom longliners accounted for 93% of the catch. Combined landings (168,000 pounds) were down moderately (Fig. 29). The longline catch of goldens decreased 30% but that of blueline tilefish was up 148% and was the largest since 1986. In recent years, longline landings of blueline tile have been around 15-20% of those of snowy groupers, but the 1991 catch equalled nearly two-thirds of the snowy landings. The unit value of blue tilefish was down considerably (\$1.02/pound vs \$1.15 in 1990). In contrast, the price for golden tilefish was up slightly (\$1.61 vs \$1.57). The aggregate tilefish catch was worth about \$239,000. The 1991 landings of golden tilefish (Fig. 30) consisted largely of very small fish by historical standards and the average size was about 11% less than in 1990.

Pelagics (excluding swordfish and king mackerel)

Total landings have been increasing substantially since 1986 and the 1991 catch (173,000 pounds) was the highest to date (Fig. 31). Although pelagics are taken by the handline, troll, and surface longline fisheries, yellowfin tuna is the only species (other than king mackerel) that is regularly targeted. Surface longline boats have increasingly directed effort at tunas as swordfish landings have declined. The longline catch of yellowfin was down somewhat in 1991 while an unusually large amount of dolphin was landed.

Sharks

After a steep increase in landings beginning in 1987, shark

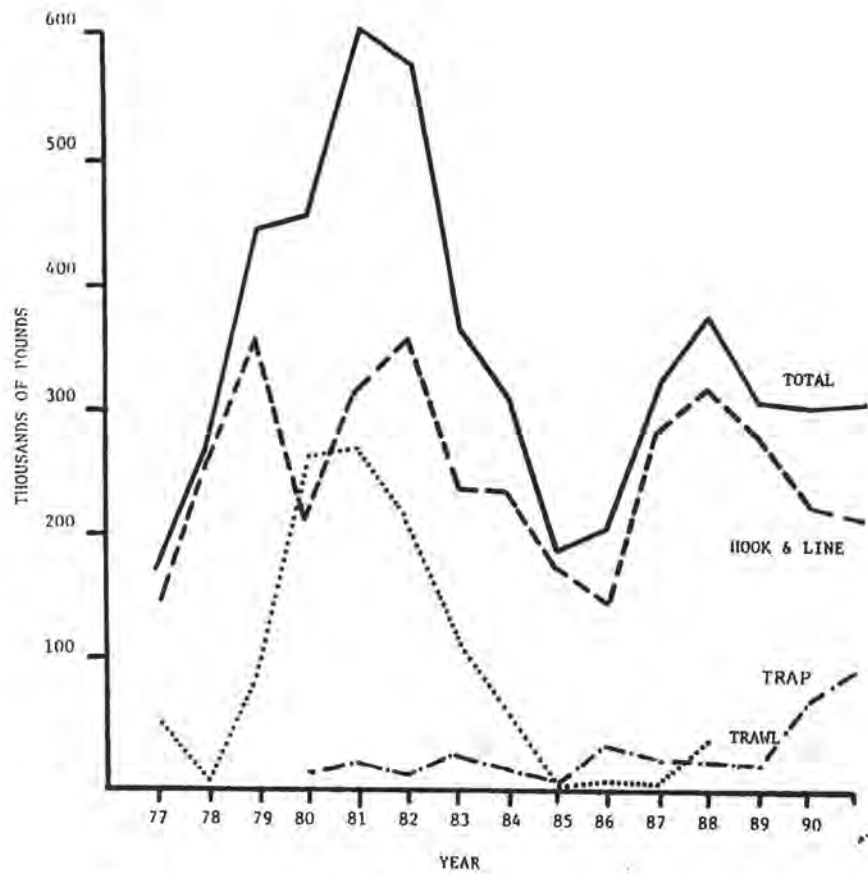


Fig. 25. Annual commercial landings of porgies.

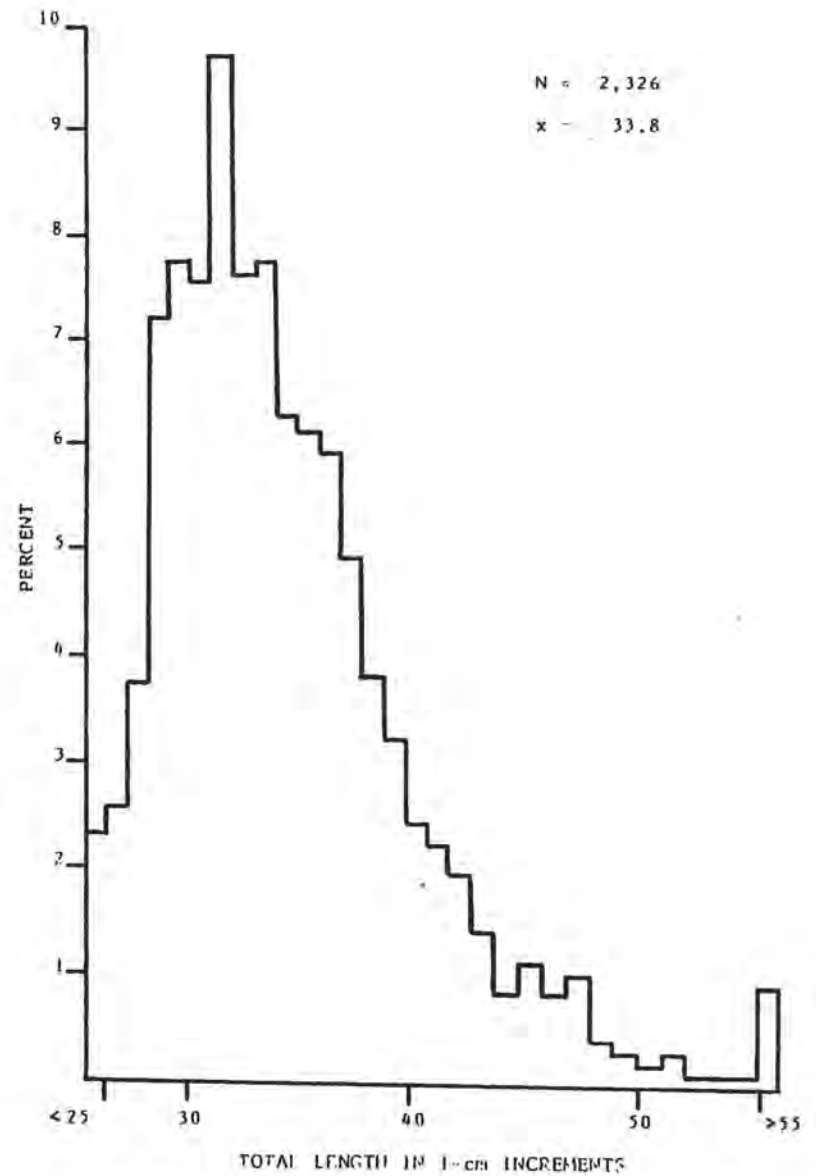


Fig. 26. Length distribution of commercially landed red porgies in 1991.

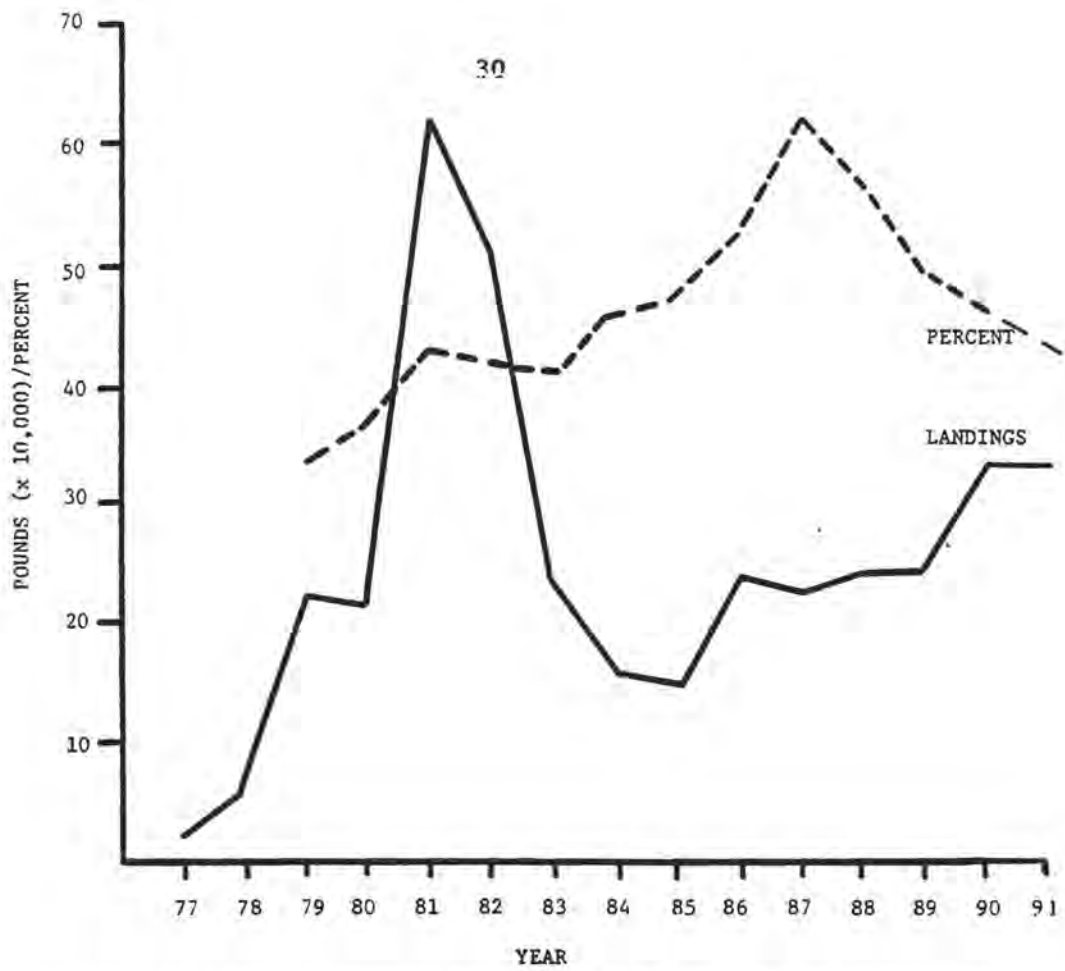


Fig. 27. Annual commercial landings of black sea bass and percentage of small fish in graded trap landings.

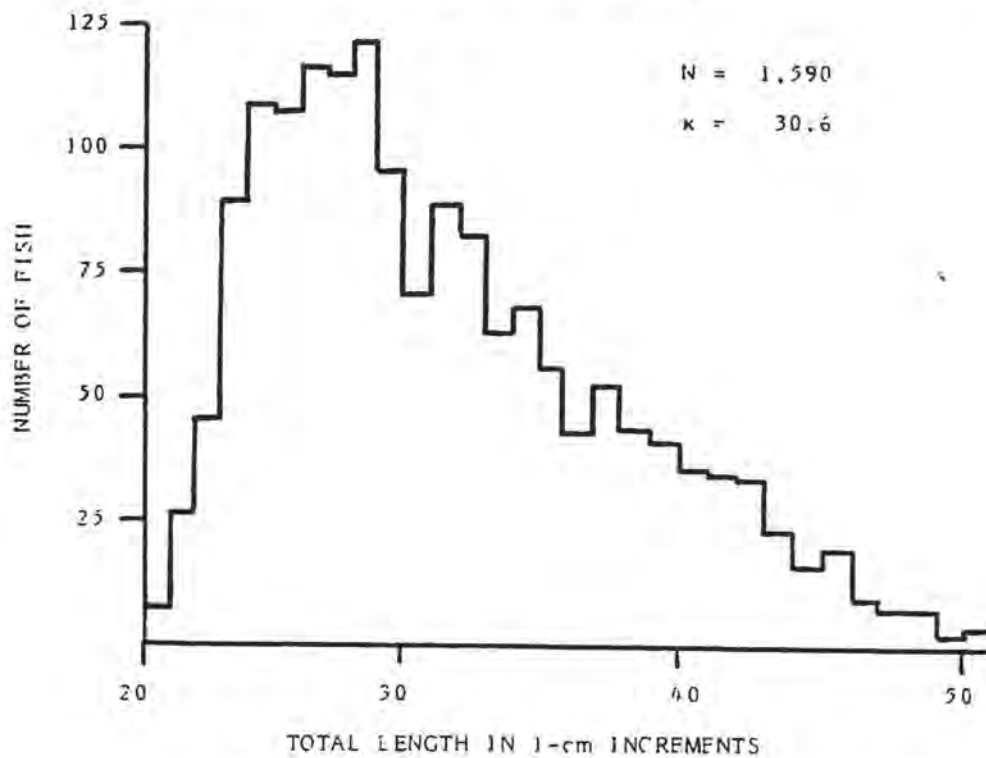


Fig. 28. Length distribution of commercially landed black sea bass in 1991.

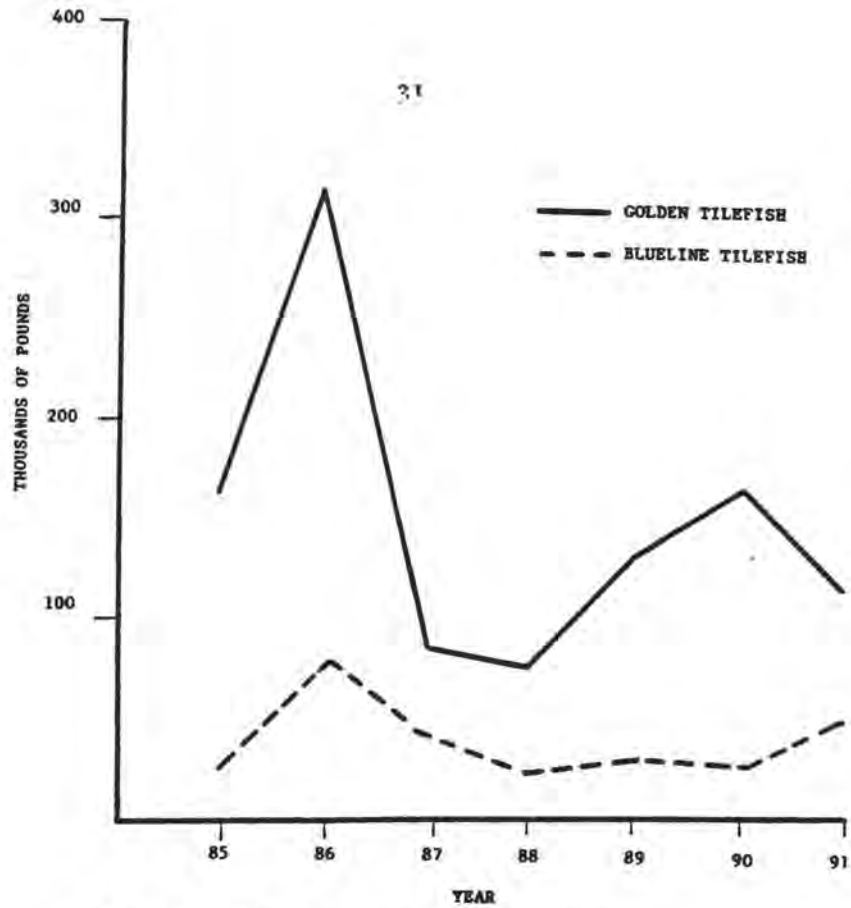


Fig. 29. Annual commercial landings of tilefishes.

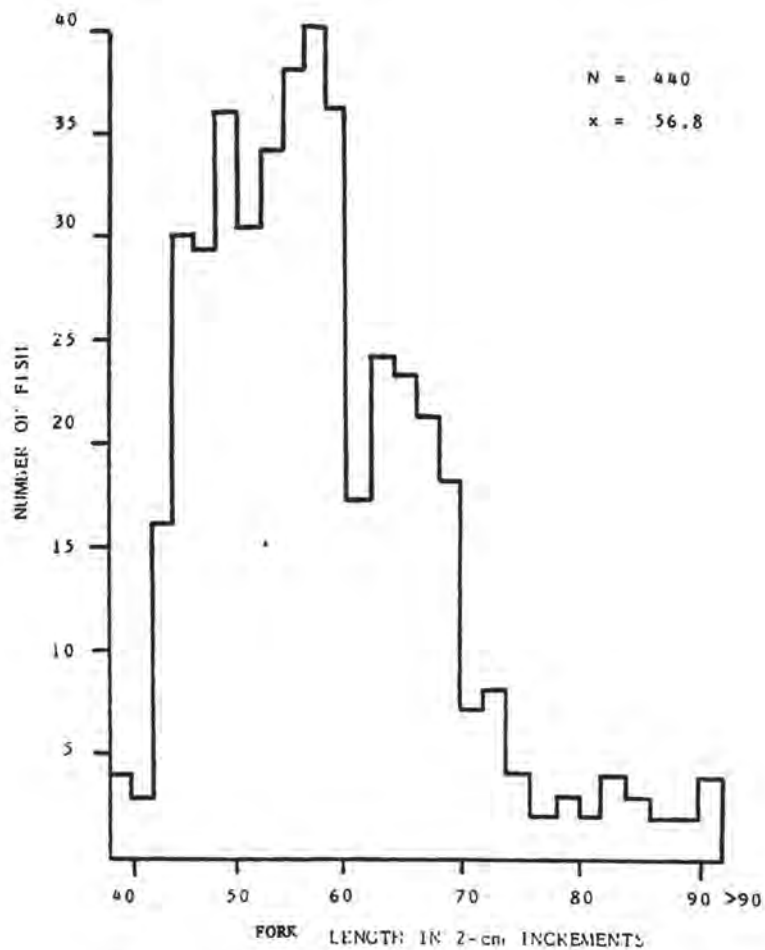


Fig. 30. Length distribution of commercially landed golden tilefish in 1991.

production has declined as rapidly, particularly in the offshore fishery (Fig. 32). The most pronounced changes have been in gill net (inshore) and bottom longline (offshore) landings. The 1991 gill net landings were only 22% of the 1989 catch. Increased restrictions on gill netting have probably had a significant impact on this sector's production. The bottom longline catch in 1991 was about 12% of that gear's 1988 landings. There is serious concern within NMFS about the status of shark stocks and part of the decline in landings may be attributable to lower abundance (particularly of offshore species).

Market conditions must also be considered because of their effect on directed effort. While prices for most fish have risen those for sharks have declined (and were never high). In 1991, the overall average unit value was \$0.53/pound, the same as in 1988, but the price for inshore landings declined from \$0.60/pound to \$0.41. The total 1991 catch (119,000 pounds) was valued at \$51,000.

COASTAL FISH

This includes species taken in state waters (primarily mullet, spot, kingfishes, flounders, and sharks). Overall landings in 1991 (180,000 pounds) were only 58% of the previous year's and by far the lowest to date. This largely reflected the demise of the fall haul seine fishery on the Grand Strand, which used to produce over a million pounds annually in the late 1970's. Beach access has been progressively more restricted, the number of net gangs has declined, and Hurricane Hugo fouled some of the traditional locations. Market demand for the low-priced mullet and spot produced apparently has been weakening as well. The 1991 haul seine landings (40,000 pounds worth \$14,000) were the lowest reported to date (except for 1989 when there was no fishery due to the storm). This was reflected in the landings of mullet and spot (Fig. 33).

Kingfishes (whittings) were the 1991 volume (63,000 pounds) and value (\$34,000) leader in this category. Landings, mostly from the shrimp trawl fishery, have fluctuated widely (Fig. 34). The 1991 catch was nearly the same as in the previous year and about average for the 1977-1990 interval. Flounders also were landed primarily by the shrimp trawlers. The 1991 catch was the lowest to date (Fig. 34). A 12 in. minimum size limit was in effect the entire year and presumably had a significant impact on the landings, particularly of summer flounder. Previous sampling indicated that most of the summer flounder caught by shrimp trawlers were smaller than 12 in. The use of TEDs may also have contributed to the decreased production. Shrimp trawl fish landings overall were down in 1991 and the reported aggregate catch (102,000 pounds) was the lowest since 1977. There is a tendency for many crews not to cull the catch thoroughly for fish when shrimp landings are good, as they were in 1991, and this may also have impacted the fish landings.

Gill nets formerly produced an appreciable volume of coastal species (e.g. spot, mullet, and sharks). Use of this gear has been severely restricted in recent years and landings have declined

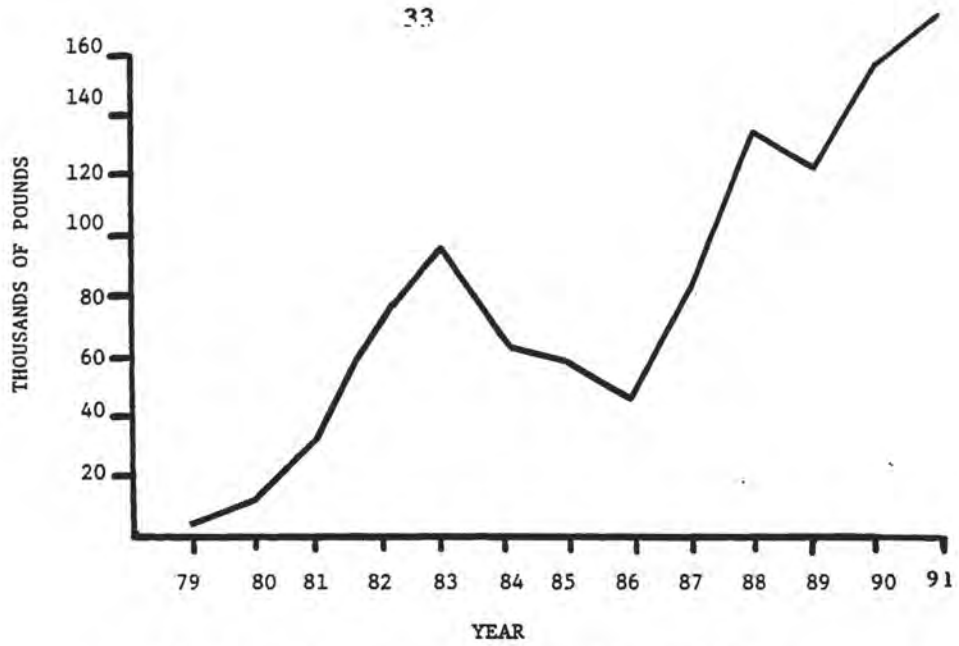


Fig. 31. Annual commercial landings of pelagic species.

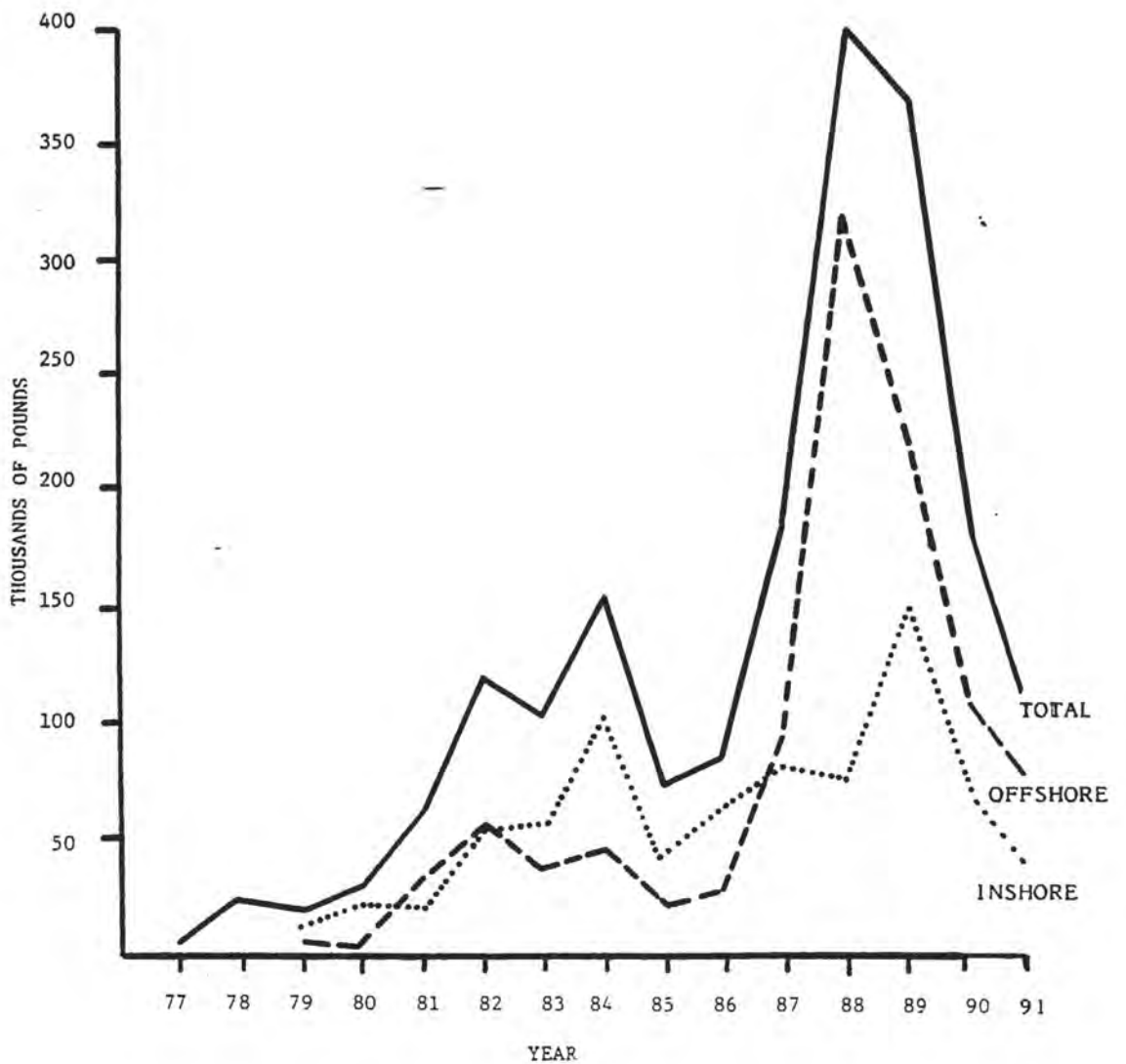


Fig. 32: Annual commercial landings of sharks.

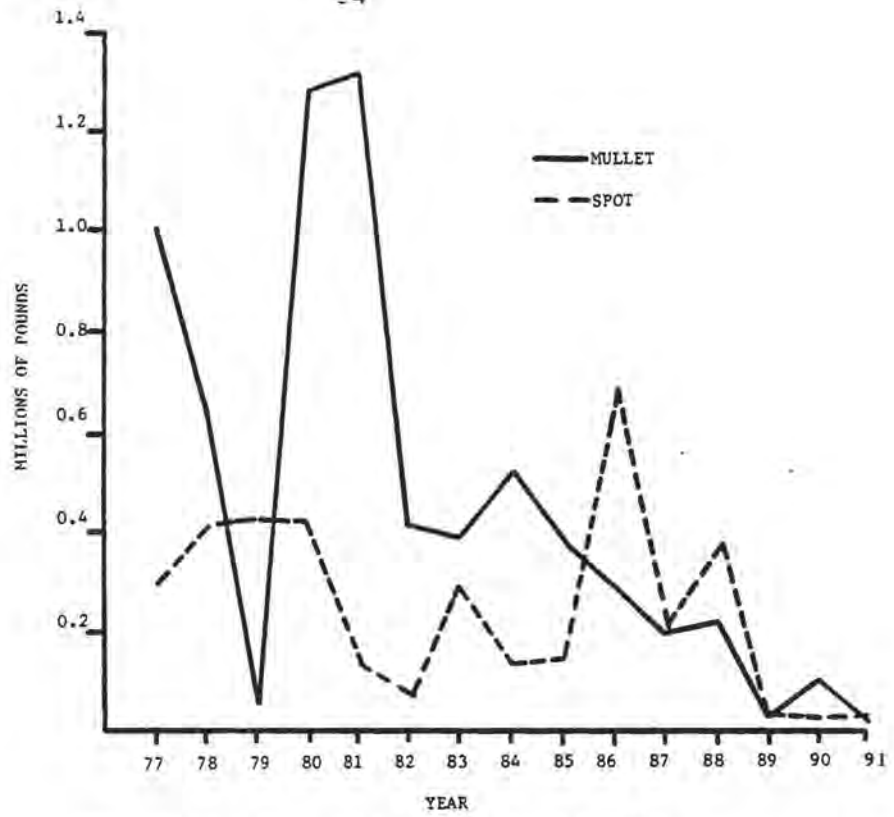


Fig. 33. Annual commercial landings of mullet and spot.

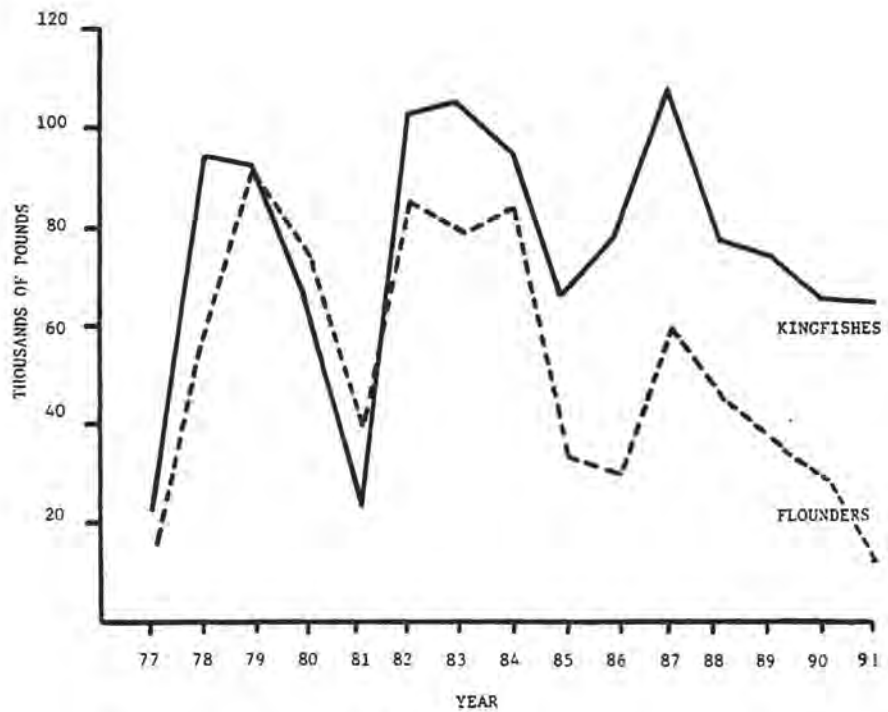


Fig. 34. Annual commercial landings of kingfishes (whiting) and flounders.

nearly 90% from those in 1987. The principal species landed in recent years have been sharks.

RIVER FISH

Landings consisted almost entirely of American shad. The directed fishery for river (blueback) herring remained closed for conservation purposes.

The shad season opened on February 1 and closed May 1. Landings continued to be depressed (Fig. 35) although up slightly from the 1990 level. Almost 97% of the catch were roe fish, a higher than usual percentage. The price for roes in 1991 (\$0.71/pound) was substantially lower than in 1990 (\$0.99/pound) and may have contributed to the relatively low production. Environmental conditions may also have reduced catchability in some rivers, since rainfall and river discharge rates were well above normal.

Shad populations in the major rivers are discrete units. MRD tagging studies the past few years have indicated that most of these are healthy, e.g. that in the Santee which was studied during the 1991 season. The Edisto stock appears to be the principal exception and a more restricted fishery has been recommended for it.

RECREATIONAL FISHERIES

Several major regulatory changes were made during 1991 by the state legislature and federal agencies. On April 29, the Governor signed legislation setting daily retention limits of five red drum, 15 spotted seatrout, and 20 flounders per angler. On September 4, the daily bag limit for king mackerel increased from three to five by federal action.

Statistics for the headboat fishery were based on the independent NMFS survey and are discussed in a separate section. The following sections refer to the shore-based, charterboat, and private boat modes.

PARTICIPATION AND EFFORT

Total participation in the shore, charterboat, and private boat modes was estimated at 439,000 fishermen. Out of state residents represented 55%, coastal residents 28%, and non-coastal residents 17%. Total participation in 1991 approximated the 1985-1990 (excluding 1989) average. Although participation by coastal residents was 20% below this period's average, this was largely offset by increased participation by non-coastal (+7%) and out of state (+11%) residents. During the 13 years of the MRFSS, there has been very little growth in either overall participation or that in the various residential categories (Fig. 36).

The trend in total effort has closely paralleled that in effort by coastal residents (Fig. 37) and has also exhibited minimal growth

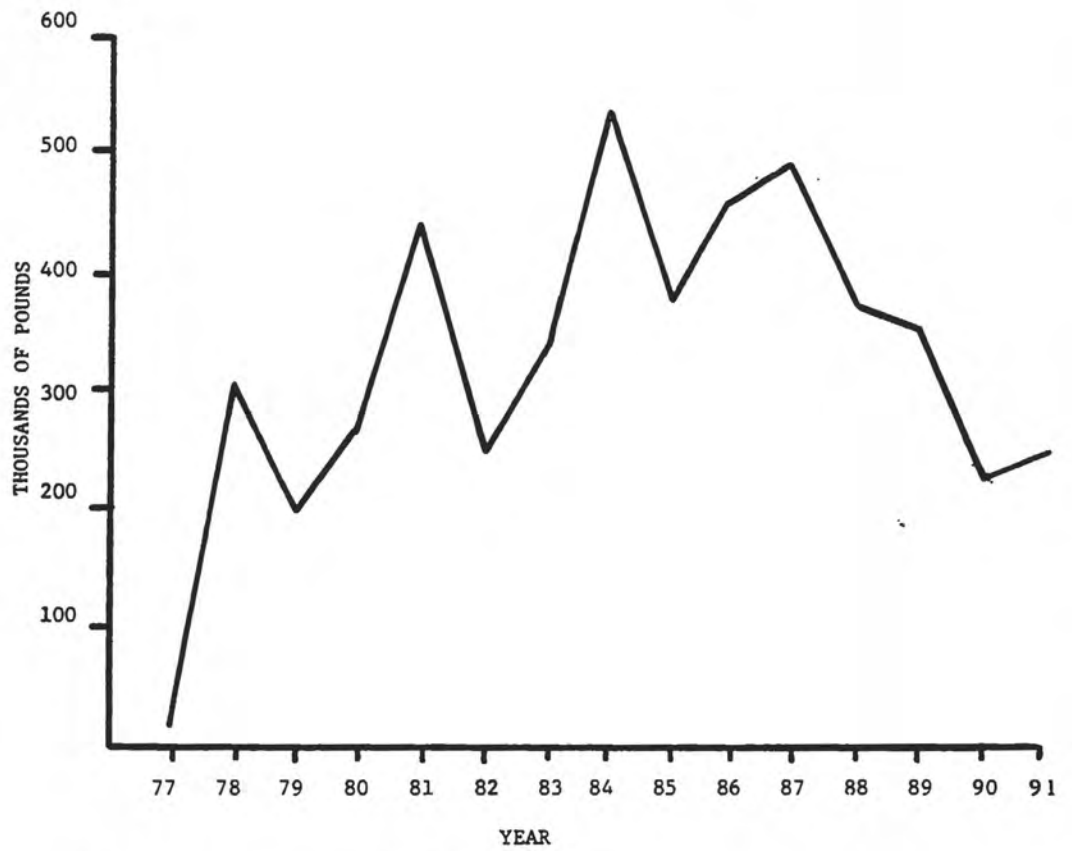


Fig. 35. Annual commercial landings of shad.

since 1979. Estimated total effort in 1991 was 1.469 M angler trips. Coastal residents made 888,000 trips, compared to 425,000 by out of state residents and 183,000 by non-coastal residents.

Results of the NMFS telephone survey indicated that private boat fishing was the dominant angling activity of state residents (69% of the respondents). Most of the shore fishing was done from piers or docks. There was very little use of charterboats and headboats by state residents; tourists supported the for-hire industry. About 73% of the fishermen interviewed during the creel census had fished in state waters (55% in inland areas and 18% in the ocean 0-3 miles from shore). Of the 27% who had fished in the FCZ, most (72%) were charterboat anglers. About 58% of the shore-based anglers had fished in the nearshore ocean area mostly from Grand Strand piers and the remainder inland. Practically all (88%) of the charterboat fishermen had fished in the FCZ with only 8% fishing in estuarine waters. About 80% of the private boat fishermen intercepted had fished in estuarine areas and 5% in the nearshore ocean zone. The remaining 15% had fished in the FCZ.

The percentages of coastal households contacted during the two-month interval telephone surveys were higher than in the previous two years and about the same as in 1987. The average number of fishermen per household was considerably higher than in recent years.

SPECIES PREFERENCES

About 29% of the total number of anglers interviewed during the MRFSS expressed no species preference. The percentage of nonselective anglers was highest (55%) in the shore mode. About 22% of the private boat fishermen and 16% of the charterboat respondents reported no particular species preference. Of the fishermen who did identify a target species, the most popular choice in 1991 was the king mackerel, ranked no lower than fourth in any fishing mode. This species was the overwhelming choice of charterboat anglers and those private boat fishermen who fished in the ocean. A surprisingly large number of pier fishermen also targeted it.

Inshore gamefish i.e., spotted seatrout and red drum (so designated by state law), ranked second and third, respectively, overall. The spotted seatrout was the most preferred target of private boat anglers by a substantial margin although sought by few anglers in the other modes. The red drum had more widespread appeal with these other groups in addition to being the third most popular species with private boat anglers. Flounders were targeted by substantial numbers of both private boat and shore fishermen. Spot was the dominant choice of shore (primarily pier) fishermen. These species have consistently been the most popular targets in the state's marine recreational fishery since the MRFSS was initiated in 1979.

CATCH AND CATCH RATES

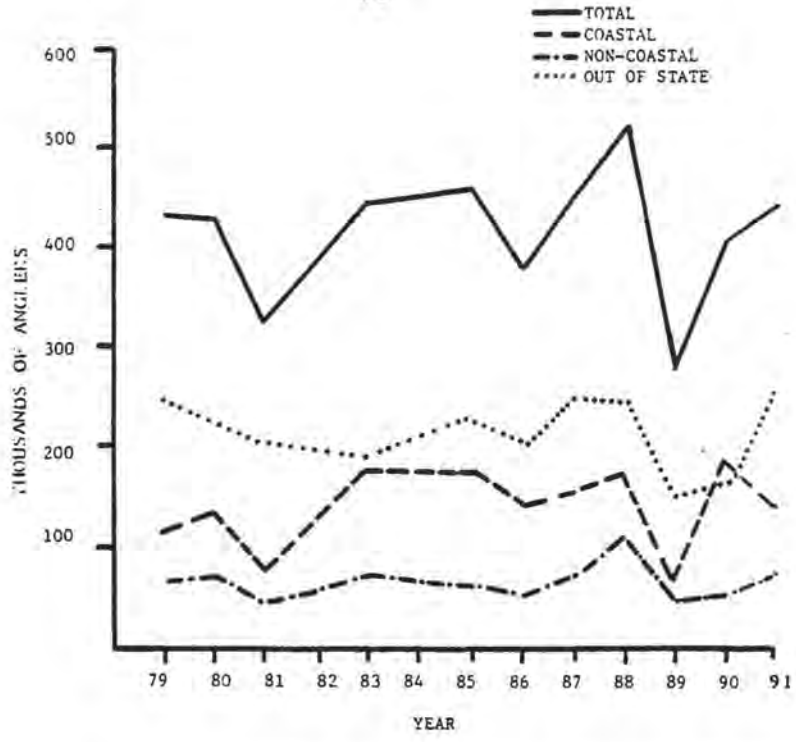


Fig. 36. Estimated participation in the South Carolina marine recreational fishery (shore, charterboat and private boat modes).

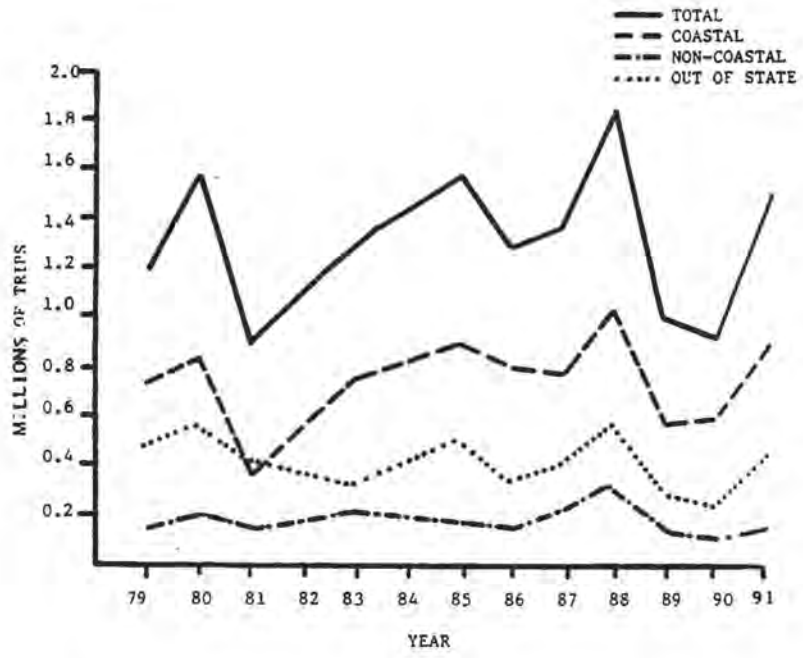


Fig. 37. Estimated effort in the South Carolina marine recreational fishery (shore, charterboat, and private boat modes).

MRFSS catch estimates are vulnerable to large sampling errors associated with the numbers of fishermen interviewed and catches inspected (sample size), the range in numbers of fish in individual catches, and the frequency of occurrence of unusually large catches. Misidentification and confusion over fish names can cause gross errors in the estimated landings of similar species. Only catches inspected by the creel clerks can be reliably verified and, for species having large percentages of the catch either released or discarded, the estimated total landings can be quite inaccurate. Catches of some species, e.g. offshore pelagic fish, were probably underestimated because they were targeted and/or caught primarily by anglers not likely to be intercepted during the MRFSS.

These factors should be considered when evaluating results from the MRFSS. The absolute catch estimates for many species or groups are probably rather meaningless. For the most frequently caught fish, the relative rankings and trends in catch appear to be reasonably reliable when considered in conjunction with commercial landings trends and anecdotal information.

The total catch in 1991 (Table 1) was estimated at 3.42 million fish, a 60% increase from the previous year but only 62% of the 1986-1990 average. Species composition was somewhat different from that observed in preceding years. Following a three-year sharp decline, black sea bass landings rebounded strongly. Bluefish landings dropped precipitously. Inshore sportfish made up nearly one-fourth of the total catch. Spotted seatrout and flounder catches were the best since 1986. Landings of spot, although low compared to historic levels, were up substantially from those in 1990. The sheepshead catch nearly doubled. In relative terms, the contribution of miscellaneous species was the lowest in recent years.

Offshore pelagic species represented less than 1% by number of the estimated overall landings. Landings of dolphin, the major contributor, were the lowest in recent years. This may have been a sampling artifact, however, since the annual commercial catch was relatively large and independent MRD surveys indicated above-average catch rates early in the season. Yellowfin tuna landings were below normal during the spring. Billfish catches were excellent with record highs reported for blue marlin and sailfish. The average size of blue marlin also was up.

Offshore bottomfish represented 17% of the total numerical catch. The dominant species was black sea bass, which accounted for 15% of the overall state landings of all species. Contribution of other species was rather minor.

Coastal pelagic species, particularly mackerels, were the principal targets of most ocean fishermen and accounted for 8% of the total landings. Inshore sportfish represented 24% of the 1991 catch. As is usually the case, inshore bottomfish comprised the largest component (33%). Spot, the principal species, represented 17% of the total state landings.

Table 1 . Estimated total catch (in thousands of fish) by South Carolina marine recreational anglers in 1991 (from preliminary data provided by NMFS). NR indicates none reported. Totals are not necessarily additive due to rounding.

Category	Retained/discarded dead	Released	Total
<u>Offshore Pelagics</u>			
Dolphin	8	NR	8
Little tunny	1	1	2
Tunas/other	2	NR	2
<u>Offshore Bottomfish</u>			
Black sea bass	455	51	506
Other sea basses	3	8	11
Groupers	8	NR	8
Vermilion snapper	9	NR	9
Other snappers	1	NR	1
Red porgy	16	NR	16
Other porgies	7	NR	7
Grunts	11	1	12
Triggerfish	3	1	4
<u>Coastal Pelagics</u>			
King mackerel	89	1	90
Spanish mackerel	105	18	123
Bluefish	32	14	46
Crevalle jack	4	2	6
Blue runner	NR	NR	NR
Amberjacks	3	1	4
Barracuda	2	1	3
<u>Inshore Sportfish</u>			
Red drum	103	79	182
Spotted seatrout	370	44	414
Weakfish	14	0	14
Flounders	146	33	179
<u>Inshore Bottomfish</u>			
Kingfishes	221	22	243
Spot	495	94	589
Croaker	84	19	103
Black drum	4	NR	5
Sheepshead	158	NR	158
Pompano	21	4	25
<u>Miscellaneous</u>			
Sharks	157	94	251
Skates/rays	NR	17	17
Catfishes	24	106	130
Toadfish	NR	35	35
Seabreams	NR	4	4
Pigfish	2	NR	2
Pinfish	19	42	61
Mullet	NR	NR	NR
Puffers	2	11	13
Other	80	30	110

Shore fishing was little changed from 1990 in terms of species sought and fishing success. Perhaps the most notable features were the increased pier footage available for anglers and higher landings of spot. The overall catch rate (1.5 fish per angler) was slightly higher than in 1990.

Charterboat fishermen fared appreciably better in 1991 with both the percentage of successful anglers and catch rate substantially higher in all geographic areas. King mackerel continued to be the most important species and success for it was considerably better than in 1990. The overall charterboat catch rate (1.56 kings per angler) was more than double the 1990 index and a far higher percentage (75%) of anglers was successful.

Relatively few private boat fishermen went offshore. Those that did targeted king mackerel primarily and did rather well in 1991. Private boat anglers fishing in estuarine waters were primarily seeking spotted seatrout and/or red drum, although flounders were popular targets in the northern counties in summer. Spot and spotted seatrout were the most abundant components of the catch. Fishermen in Georgetown and Horry Counties were the most successful in terms of the average number of fish caught overall and the numbers of flounders landed. Anglers fishing for red drum did not do as well in 1991 as in 1990 while those targeting spotted seatrout fared considerably better. The mild winter probably contributed to the apparent abundance of spotted seatrout throughout the coastal area.

LENGTH COMPOSITION

Average sizes of most important species were slightly smaller in 1991 compared to 1990's figures. The notable exceptions were mackerels, particularly king mackerel. For several years, the average fork length of this species had been about 76 cm. In 1991, it increased to 85 cm due to a strong showing of large fish (Fig. 38). In 1990, about 3% of the measured catch exceeded 100 cm whereas 21% of the 1991 fish did. Spanish mackerel in 1991 averaged nearly 46 cm (Fig. 39) compared to 42 cm in 1990. About 15% of the Spanish mackerel were released, presumably due to being undersized.

The mean size of red drum statewide was 42.0 cm (about 16.5 in.) vs 45.7 cm in 1990. The length frequency distribution is shown in Fig. 40. There was little difference in average size between seasons and areas. Perhaps the most notable aspect was the high incidence of undersized fish in inspected landings. Following imposition of the year round size limit in 1990, about 10% of the fish observed were undersized. During 1991, nearly 25% of the inspected catch was below the legal minimum - this largely accounted for the reduction in average size. The reported release rate, due mainly to small size, was 43% compared to 46% in 1990. About 77% of the retained catch were below the 45.7 cm (18.0 in) minimum size limit recommended by the Atlantic States Marine Fisheries Commission. Only about 3% were above the size at first maturity.

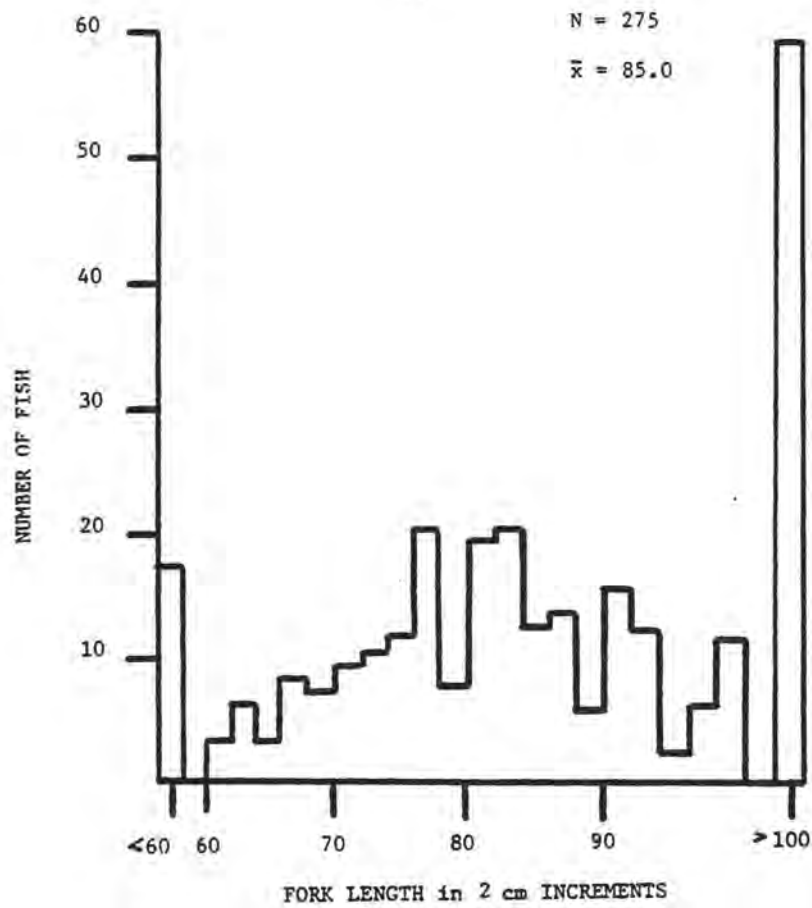


Fig. 38. Length distribution of king mackerel in 1991.

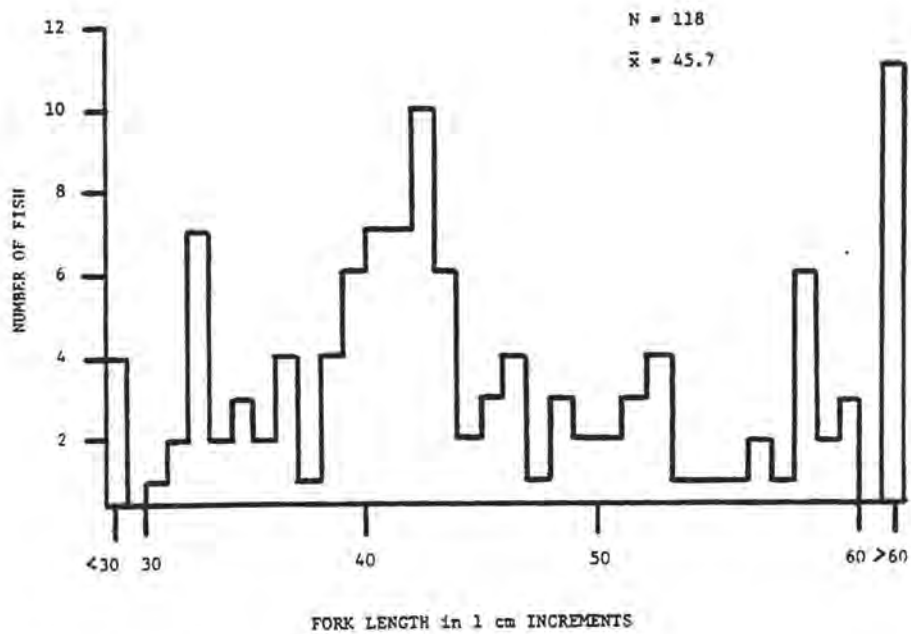


Fig. 39. Length distribution of Spanish mackerel in 1991.

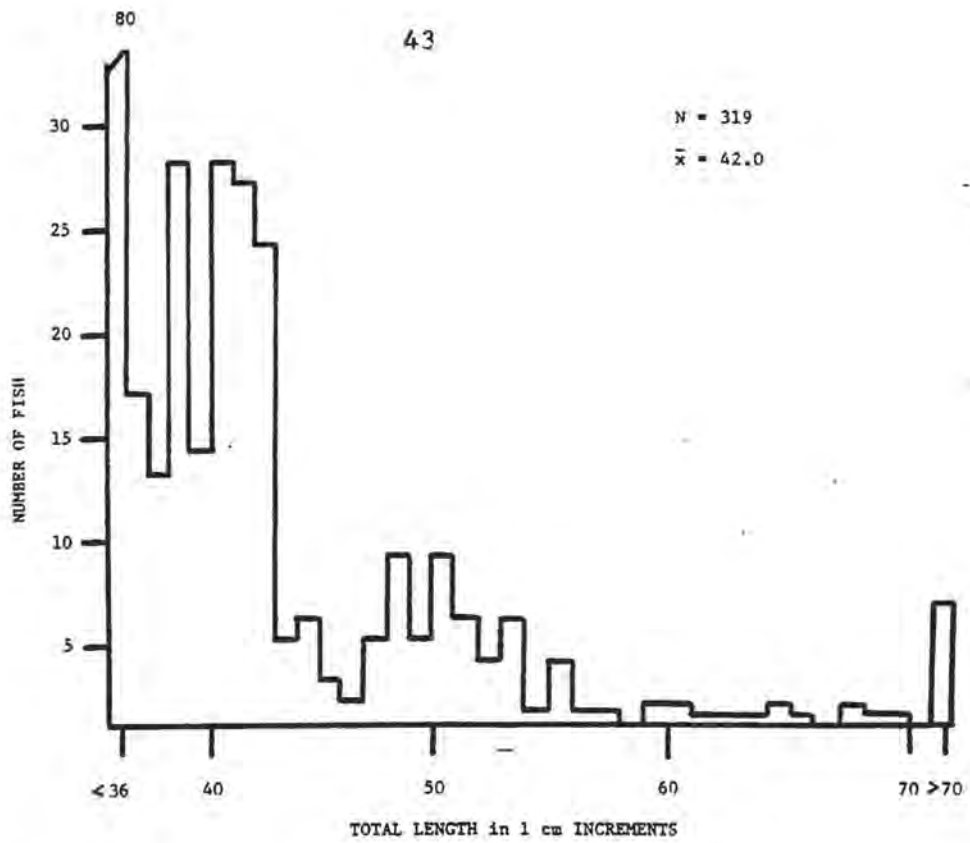


Fig. 40. Length distribution of red drum in 1991.

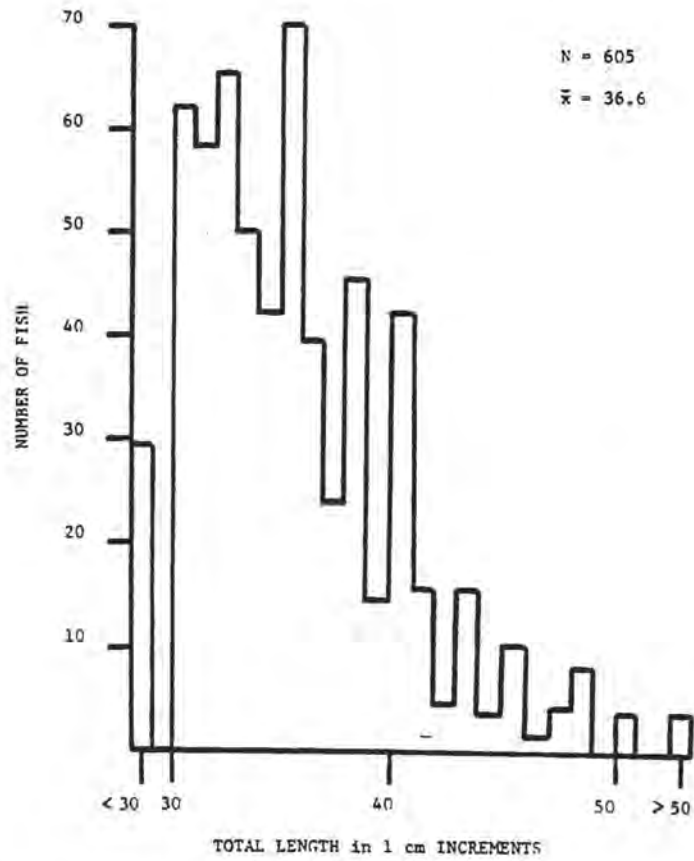


Fig. 41. Length distribution of spotted seatrout in 1991.

The mean size of spotted seatrout (36.6 cm) was slightly lower than in 1990. Distribution of lengths is shown in Fig. 41. There was very little difference in size between areas. As reported in the other southeastern states, there has been very little variation in the annual mean sizes in recent years. A substantially lower percentage (11%) of the 1991 catch was released compared to recent years (e.g. 23% in 1990). About 5% of the observed 1991 fish were undersized compared to 2% or less in previous years. Several states have a 35.6 cm (14.0 in.) minimum size limit. About 62% of the 1991 catch were below this standard.

The average size of flounders (primarily southern flounders) was 35.4 cm, nearly the same as in 1990 (Fig. 42). Compliance with the minimum size limit appeared to be very good with only a 3% incidence of undersized fish in inspected catches.

The length distribution of black sea bass is shown in Fig. 43. Average size was comparable to that observed in recent years. Only about 9% of the catch were released, a very low percentage compared to that in previous years.

HEADBOAT FISHERY

Estimated total effort in 1991 was 67,982 angler days. An angler day represented the participation of one rod and reel angler for one full day (usually 10-12 hours, including travel to and from the fishing grounds). Both inshore and offshore effort increased moderately from the previous year (Fig. 44).

The estimated total catch was 745,160 fish with an aggregate weight of 732,426 pounds (Table 2). Catches in both the inshore and offshore areas were up slightly from 1990's figures, (though well below the level of a few years ago (Fig. 45). The inshore landings were dominated by black sea bass (75% of the numerical total), primarily small fish averaging barely 0.5 pounds each. Offshore catches consisted mainly of vermilion snapper (39% by number), black sea bass (23%), and red porgy (12%). The average catch rate of black sea bass for inshore anglers continued the long-term decline while the catch rate (of all species) in the offshore fishery remained relatively stable (Fig. 46).

Landings of black sea bass in terms of volume were far below average and barely above the record low level of the previous year. Landings of red porgy were also substantially below normal levels. Although slightly improved numerically from the previous year, volume was the lowest to date due to a significant decrease in average size. The average catch rate was the lowest to date. Vermilion snapper landings increased and the numerical total was nearly that in the record year (1987). Landed weight was nearly identical to that in 1990. The average number of fish landed per angler day was the highest yet reported except for the record level in 1990. Aggregate grouper landings in numbers of fish were the lowest since 1984 although volume was relatively high due to increased average size. Mycteroperca groupers (gag and scamp)

Table 2. Estimated catches (in numbers of fish) by South Carolina headboat fishermen in 1991.

Group	January-May		June-August		September-December	
	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore
Red Porgy	905	18774	2362	23838	650	7694
Other Porgies	859	2631	4583	7999	1481	3721
White grunt	1945	1550	5584	10816	1770	1582
Other grunt	2723	12534	26494	22280	7802	8886
Vermilion snapper	1677	47711	4594	85458	2097	32518
Red snapper	34	475	283	1083	51	1364
Other snappers	59	0	314	73	472	41
Groupers (E)	63	341	274	433	45	107
Groupers (M)	162	2191	824	3552	269	1353
Triggerfish	61	1231	607	5647	331	2142
Gray tilefish	0	30	6	11	0	32
Black sea bass	31044	24509	160132	53283	51909	21051
King mackerel	39	222	539	669	631	340
Sharks	119	43	802	49	146	3
Other	953	5180	5612	5330	1733	3343
Total	40643	117422	213010	220521	69387	84177

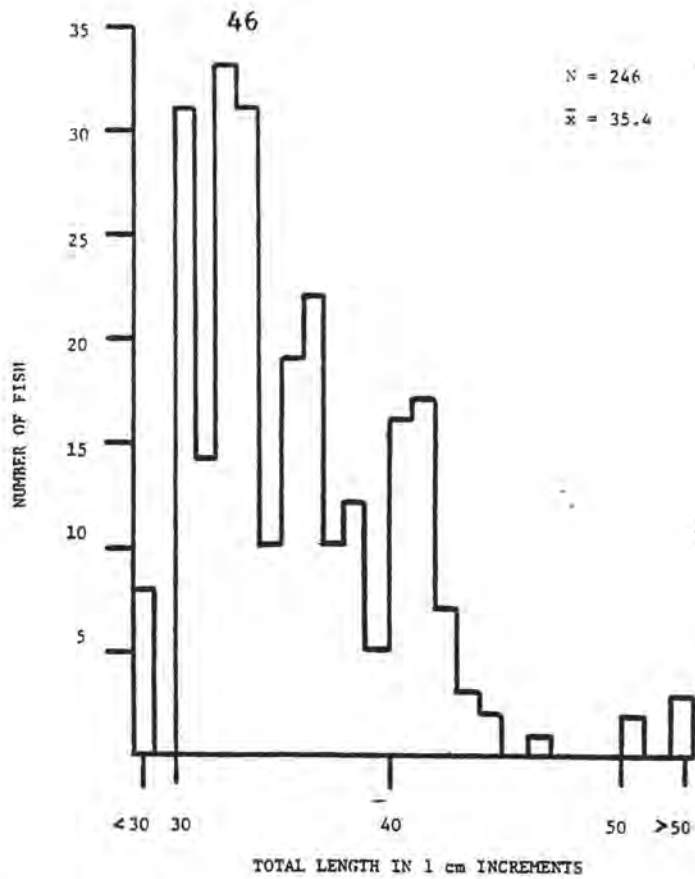


Fig. 42. Length distribution of flounders in 1991.

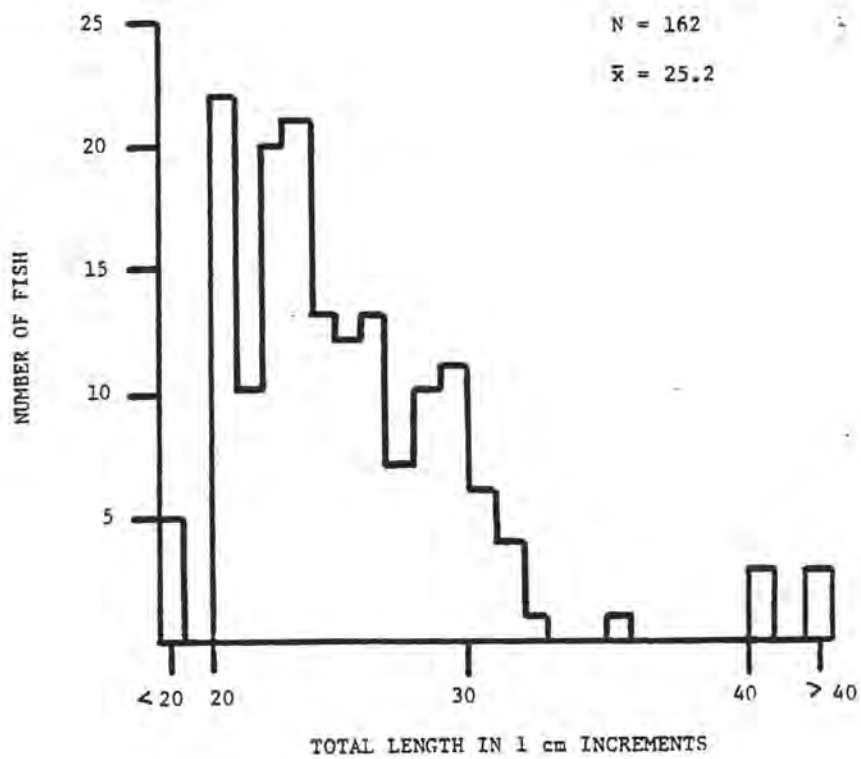


Fig. 43. Length distribution of black sea bass in 1991.

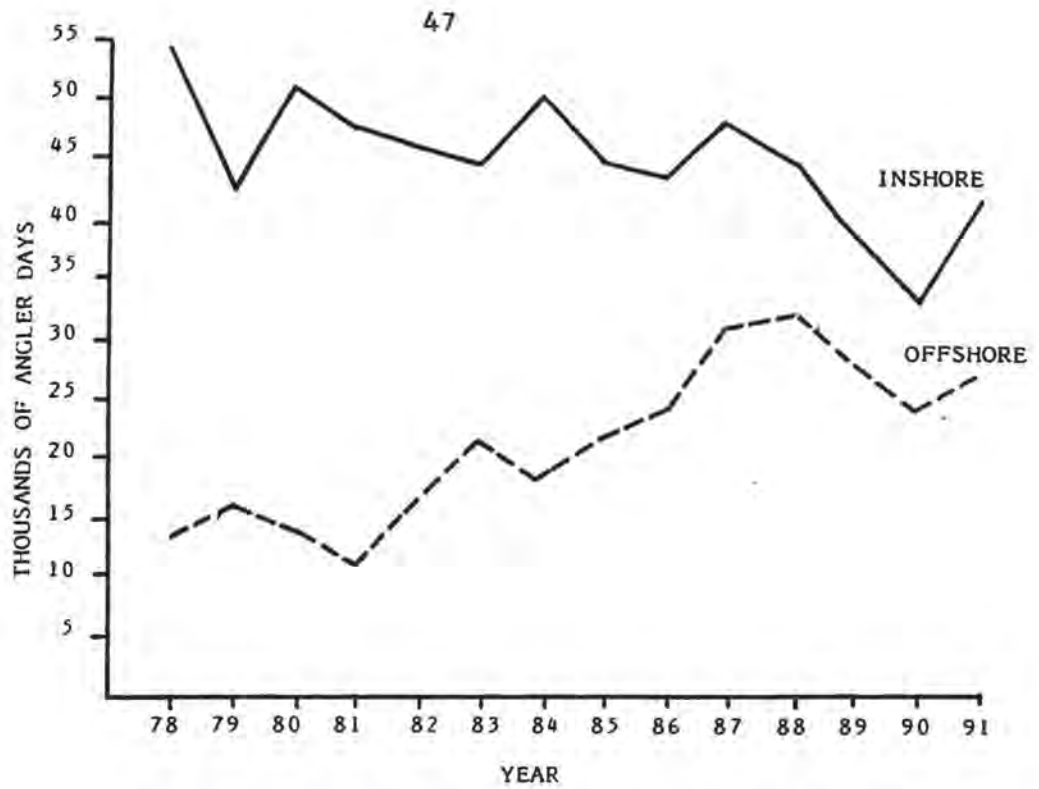


Fig. 44. Estimated effort in the South Carolina headboat fishery.

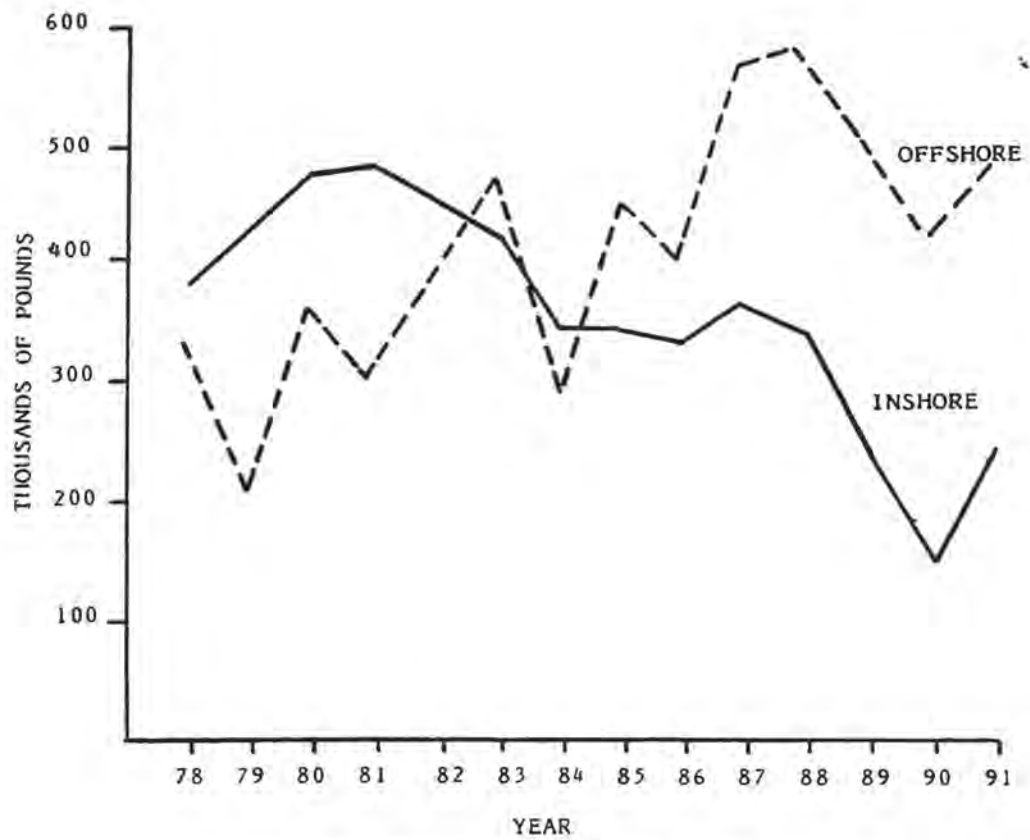


Fig. 45. Estimated catch in the South Carolina headboat fishery.

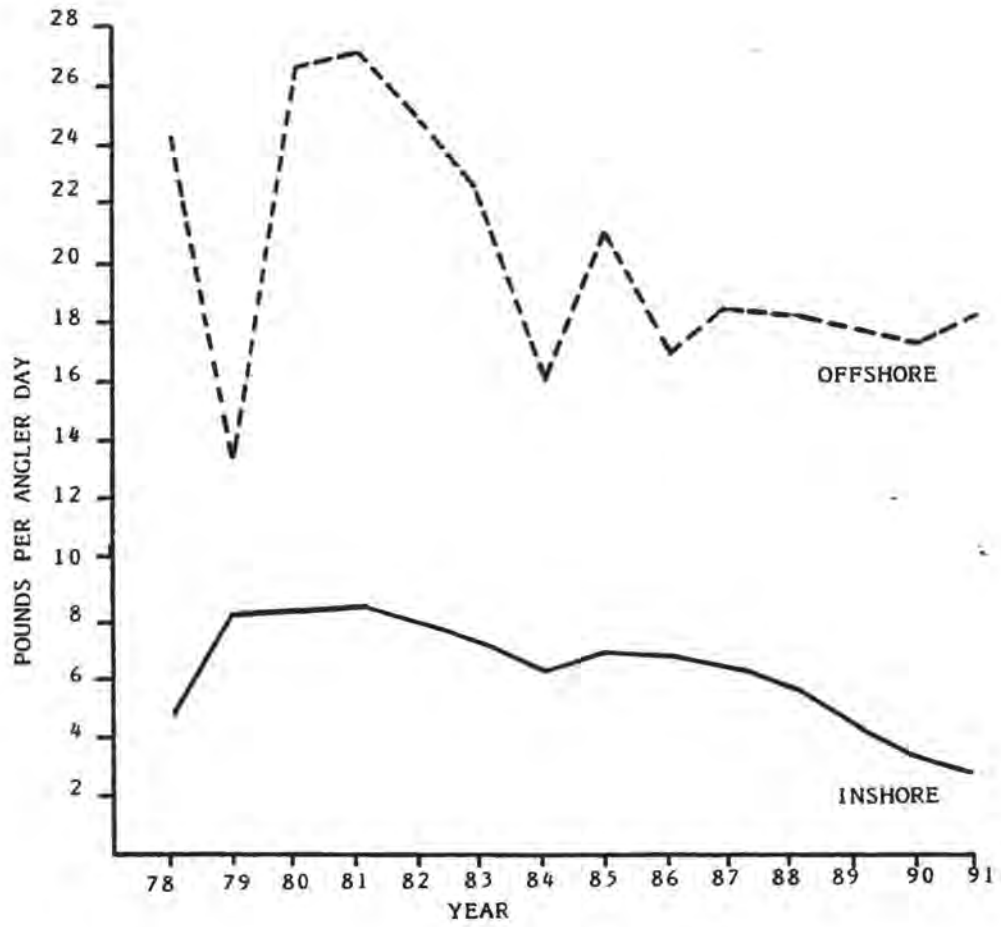


Fig. 46. Average catch rates in the South Carolina headboat fishery.

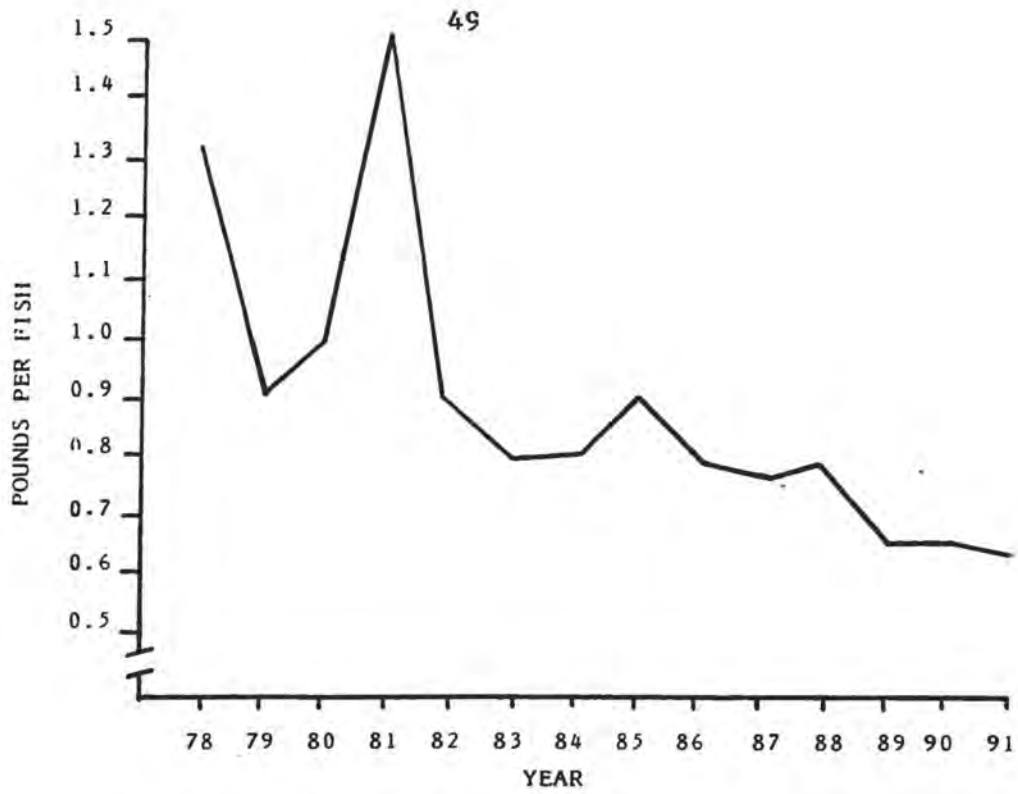


Fig. 47. Average weight of vermillion snapper landed by the South Carolina headboat fishery.

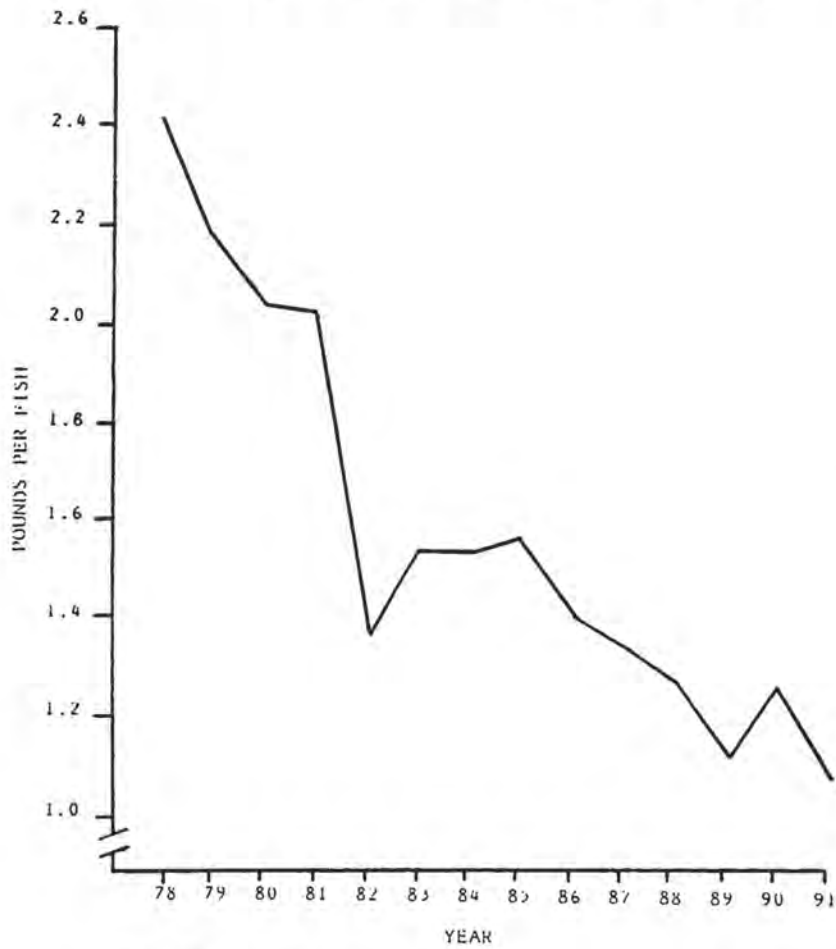


Fig. 48. Average weight of red porgies landed by the South Carolina headboat fishery.

represented 87% by number and 94% of the volume, comparable to the record highs recorded in 1990. The number of Epinephelus groupers (principally snowies) was the lowest to date. The average catch rate of gag/scamp was relatively high while that of the epinepheline group was the lowest ever reported.

Trends in average size were mixed. The average weight of vermilion snapper (0.63 pounds) was the lowest to date (Fig. 47) as was that of red porgy (1.07 pounds) (Fig. 48). The average size of Mycteroperca groupers (7.8 pounds) was up appreciably while that of Epinephelus groupers (3.3 pounds) was comparable to that in the last 7 years. The average weight of red snappers (6.6 pounds) was the highest since 1982.

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