

North Carolina

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# South Carolina Marine Fisheries 1990

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South Carolina Marine Fisheries  
Division of Fisheries Management  
Biological Services Program  
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**SOUTH CAROLINA MARINE FISHERIES**

**1990**

**R.A. Low**

**South Carolina Wildlife and Marine Resources Department**

**Marine Resources Division**

**Office of Fisheries Management**

**Fisheries Statistics Program**

**Data Report 8**

**February, 1992**

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## INTRODUCTION

This report is an information summary of significant events in South Carolina's marine fisheries during 1990 and continues the series that began with 1977 (see Marine Resources Center Technical Report 67, Data Report 6, and Data Report 7). Objectives are to 1) update and describe trends in the principal commercial and recreational fisheries and 2) provide explanatory information relevant to important developments. The contents are intended for a general audience and are not meant to be definitive in the scientific sense.

The format has been changed due to reorganization of the Office of Fisheries Management in 1990 and reassignment of program activities. The Fisheries Statistics Program has responsibility for the collection, processing, and distribution of fishery-dependent data for commercial and recreational marine fisheries. This report partially fulfills our obligation to provide such information to the public. Other fishery-related projects included in past versions were the shrimp baiting survey and summaries of artificial reef development, tournament activities, and recreational shellfish surveys. Since these subjects are now covered in individual detailed reports issued by other sections of OFM, they are not included in this edition.

Data on commercial fisheries catch and effort were obtained through 1) mandatory monthly reports by licensed primary wholesale 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. For most fisheries, annual fishing effort (e.g. the number of trips) by gear type must be estimated by dividing total landings compiled from all sources by the average catch per trip obtained from detailed reports such as trip tickets. The percentage of total landings reported by tickets, and thus the accuracy of effort estimates, varies greatly according to gear type. For most inshore fisheries (e.g. crab, river fish, coastal fish), it is impossible to derive valid effort estimates. Most offshore fish landings are reported through tickets and the effort calculations for these gears are somewhat reliable.

Commercial landings data were for wild stock fisheries only. South Carolina's mariculture industry, principally growing of Pacific white shrimp, has been steadily expanding with about a dozen shrimp farms in operation in 1990 or in the final stages of development. These growers produced about 700,000 pounds of shrimp worth \$2.9 million.

Commercial landings data were subject to confidentiality if less than three reporting sources were involved. In some instances, e.g. swordfish and wreckfish, the volume of product was very substantial but handled by only one or two wholesalers and these data must be treated as privileged information. These figures were included in total landings summaries for appropriate categories.

The reliability of commercial landings data is an obvious consideration when evaluating trends in the various fisheries.

Prior to 1977, there was little detailed reporting, data for individual species were frequently combined into broad groupings, and landings data for many fisheries must be considered approximate at best. This was the principal reason for initiating the report series with that year. Since then, the reporting system has steadily increased the extent of detailed coverage by gear type and the numbers of species and gear categories have been increasingly better defined.

With the exception of shellfish landings (which are a special case because of stringent health-related reporting standards), dealer/provider reports have seldom been verified by site inspections, cross-checking of records, etc. Based on dockside interviews, periodic catch sampling, observer programs aboard vessels, and continual interaction with the harvesting and selling sectors, program personnel have been able to assign qualitative judgments as to the levels of accuracy for reporting in the various fisheries. Our evaluations are indicated where appropriate. It should be emphasized that much of the information has been provided on a voluntary basis with no incentive for false reporting.

The major source of recreational fishery catch and effort data has been the Marine Recreational Fishery Statistics Survey (MRFSS) conducted annually under National Marine Fisheries Service oversight. The survey was begun in 1979 and MRD has been responsible for the creel census component since July of 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 creel census provides data on catch composition by species, catch rates, detailed effort data, and length composition. Results from both activities are combined to produce estimates of catch by species, fishing mode, time interval (two-month waves), fishing area, and residence of fishermen. The survey design has remained basically unchanged since its inception but many adjustments in calculation procedures have been introduced based on the annual results. Data for some years, notably 1982 and 1984, are considered highly suspect due to sampling error. 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 that for earlier years due to these factors.

Data on the headboat fishery are collected by the NMFS Beaufort (N.C.) Laboratory, which has conducted an annual survey since 1972. A headboat is a for-hire vessel carrying more than six fishermen.

## COMMERCIAL FISHERIES

The 1990 season followed a year in which South Carolina's commercial fisheries produced their largest volume since 1983. The fisheries were impacted by two major 1989 climatic events, 1) Hurricane Hugo and 2) the December snowstorm.

The hurricane caused substantial damage to commercial facilities from Charleston north, with McClellanville particularly

hard hit. The town has some of the state's largest shrimp, crab, and shellfish operations. As of March, 1990, most packing houses remained closed and 75% of the wharf was missing. About 40 boats moored there at the time of the storm were damaged, mostly shrimp trawlers. By the time of the opening of the 1990 shrimp trawling season, most of these vessels had been refloated with the aid of insurance. The state also contributed \$75,000 to the state fishing industry in fishermen's relief funding distributed by MRD.

The December snowstorm caused widespread fish and shrimp kills from North Carolina through Georgia. The fish kills appeared to have little effect on commercial landings in South Carolina. The major impact was on overwintering white shrimp, with up to 95% of them possibly killed. On the positive side, reduced availability of product from North Carolina temporarily increased prices for fish and clams.

There were 265 licensed primary wholesale dealers in 1990, five less than in the previous year. By state law, all landings of seafood must be received by a primary wholesale dealer prior to further distribution. Either a Trawler Captain license or a Land and Sell license are required in order to legally land product for sale. In 1990, individuals holding a Land and Sell license numbered 453 compared to 382 in 1989 (see Shrimp section for trawler licenses).

Commercial seafood categories were composed as follows. Shrimp landings included whole (heads-on) weights of all penaeid species (brown, white, and pink) and rock shrimp unless otherwise stated. Crab/lobster included whole weights of blue crab (hard and peeler or soft), stone crab claws, horseshoe crab, and slipper (bulldozer) lobster, although practically all of the 1990 landings were attributable to hard blue crab. Shellfish included meat weights of oysters, clams, whelks (conchs), squid, and octopus. Most fish landings were in whole (round) weights, although swordfish and larger sharks were landed as carcasses. The coastal fish category included mullet, inshore groundfish (primarily whittings, spot, and flounders), and sharks taken by inshore gear types (gill nets, fish trawl, and shrimp trawl). Sharks reported for offshore gear (handline and longlines) were included with offshore fish, which also consisted of snappers, groupers, porgies, grunts, sea bass, tilefishes, wreckfish, swordfish, king mackerel, and oceanic pelagics (bonitos, tunas, dolphin, wahoo, and cobia). River fish consisted of hickory and American (roe and buck) shad.

South Carolina's commercial fishing industry is heavily dependent on the productive capacity of the state's estuaries and total seafood production (Fig. 1) has closely reflected the contribution of estuarine-dependent resources (Fig. 2). In 1990, these categories (penaeid shrimp, blue crab, oysters, clams, and inshore fish such as spot, mullet, and flounders) accounted for at least 72% of the total seafood harvest by weight and 71% of the landed value. The trend in aggregate landings is somewhat disturbing but not unexpected given the extent of coastal development. Compared to the 1977-1989 averages, 1990 landings by weight were down appreciably in most categories: blue crab -17%, oysters -80%, clams -43%, spot -87%, mullet -78%, flounders -50%. The only increase was for penaeid shrimp, up 14%. The reasons for

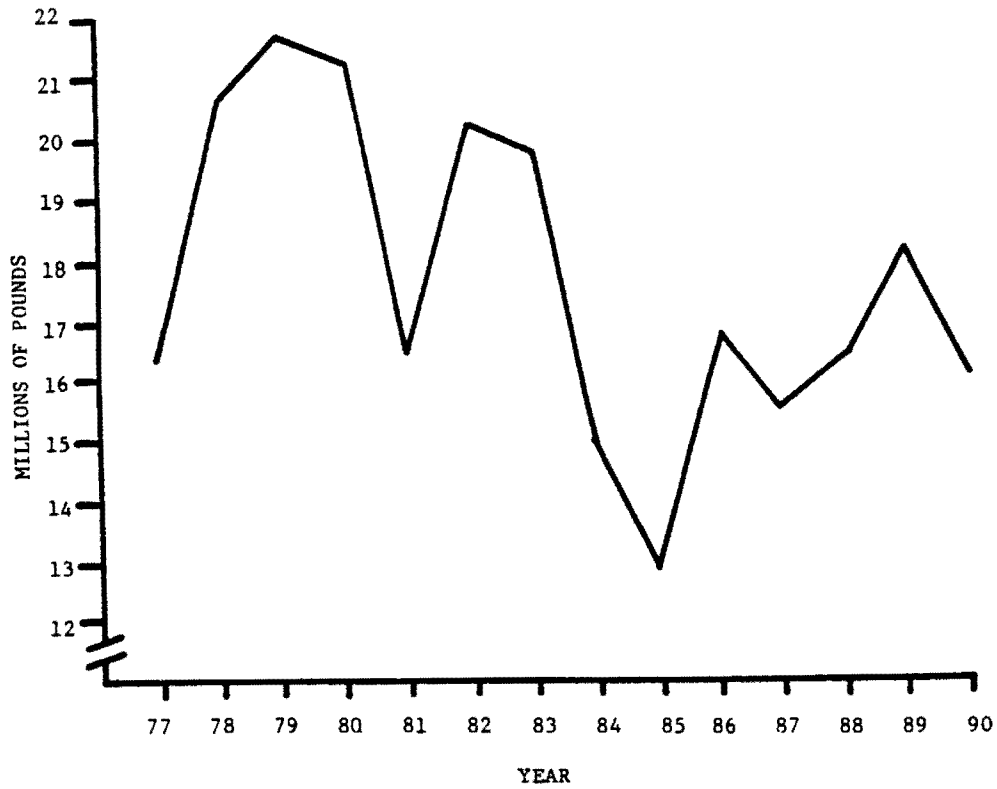


Fig. 1. Total landed weight of commercial marine fisheries products.

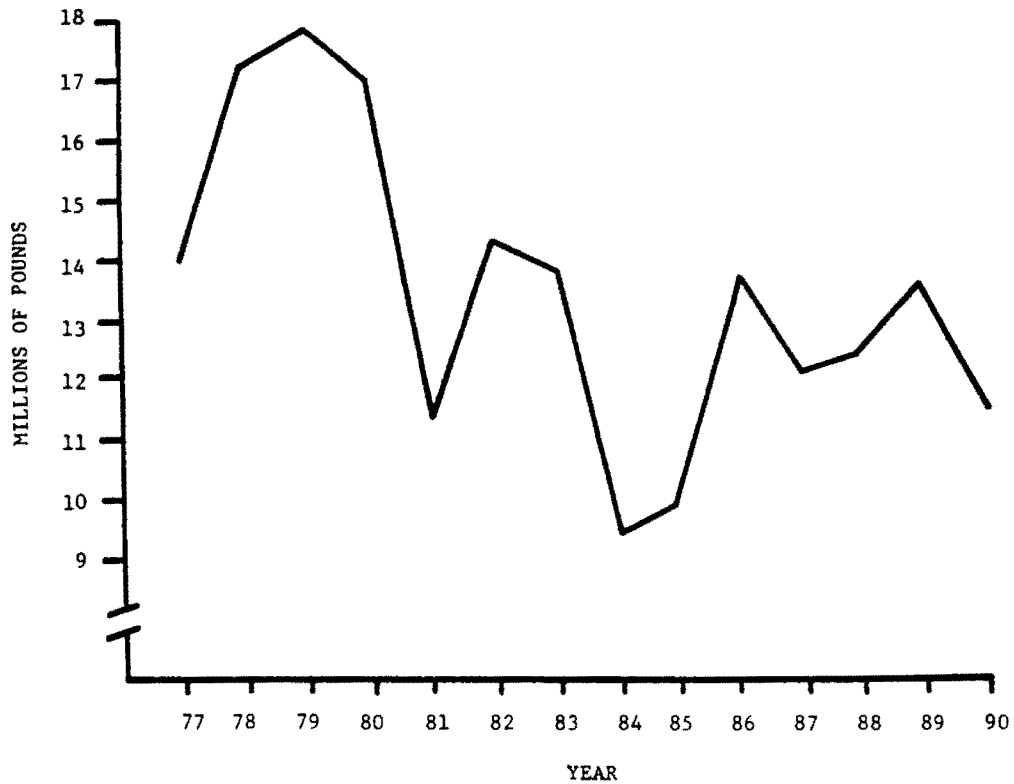


Fig. 2. Trend in production of estuarine-dependent resources.

decline vary between categories and are not all resource-related. When these are taken into account, the trend since the early 1980's is not as ominous as might be the case if the state did not have a conservative coastal zone management plan.

South Carolina is not a major producer of seafood, typically ranking 18th or 19th among the 22 coastal states in landed volume, and near the bottom of the Southeastern states (North Carolina to Texas) as well. In 1990, South Carolina's regional ranking was next to last (Georgia had that position) in both volume and value.

Overall volume of seafood products from wild stocks (16.064 million pounds) was 9% below the 1977-1989 average and also lower (-11%) than in the previous year. With the exception of offshore fish (+ 8%), there were declines from the 1989 figures in all major product categories, ranging from -3% (coastal fish) to -44% (river fish). Most of the poundage loss was attributable to shrimp, down 20%. Production also did not compare favorably to the long-term (1977-1989) averages (Fig. 3). Total ex-vessel value (\$24.961 M) increased 2.5% from that in 1989 with gains for shrimp (+4%), crab (+9%), and offshore fish (+10%) offsetting declines for shellfish (-22%) and inshore fish (-39%). Inflation - adjusted value (Fig. 4) showed little change from the preceding three years and was about 4% below the 1977-1989 average (with 1979 excluded).

Shrimp, blue crab, and offshore fish accounted for 94% of the 1990 landings in weight and 92% in value (Fig. 5). The relative importance of each product category was similar to that observed in recent years. The most significant change has been for shellfish, for which both the volume and value relative contributions have declined substantially, a trend that continued in 1990.

#### SHRIMP

Landings by weight of all species (brown, pink, white, and rock) combined were 10% above the 1977-1989 average, though down considerably from the exceptional 1989 level (Fig. 6). Landings of pink shrimp were negligible, in part because of restrictions on effort in the FCZ during the spring. Landings were down appreciably in neighboring states as well. Rock shrimp landings were also inconsequential and about the same as in 1989. There has been no directed fishery for this species since 1984. Because of low unit value, limited demand, high perishability, and substantial operating costs, most shrimpers do not target rock shrimp except as a last resort and relatively few operators pursue it even then.

Landings of brown shrimp (1.574 M pounds) were well below the 1977-1989 average (-23%). Browns represented about 27% of the annual penaeid landings, a lower percentage than normal.

The previous year produced an exceptional harvest of white shrimp and the 1990 catch (4.195 M pounds), while appreciably lower (-18%), was well above the 1977-1989 average (+39%). This was remarkable given conditions during the previous winter. During late December, the coastal area was subjected to a severe freeze with accompanying snow. Estuarine water temperatures registered as low as 36° F and for several days remained below the 47° F level associated with high mortality rates. This led Crustacean Management Program (CMP) personnel to assume that the entire

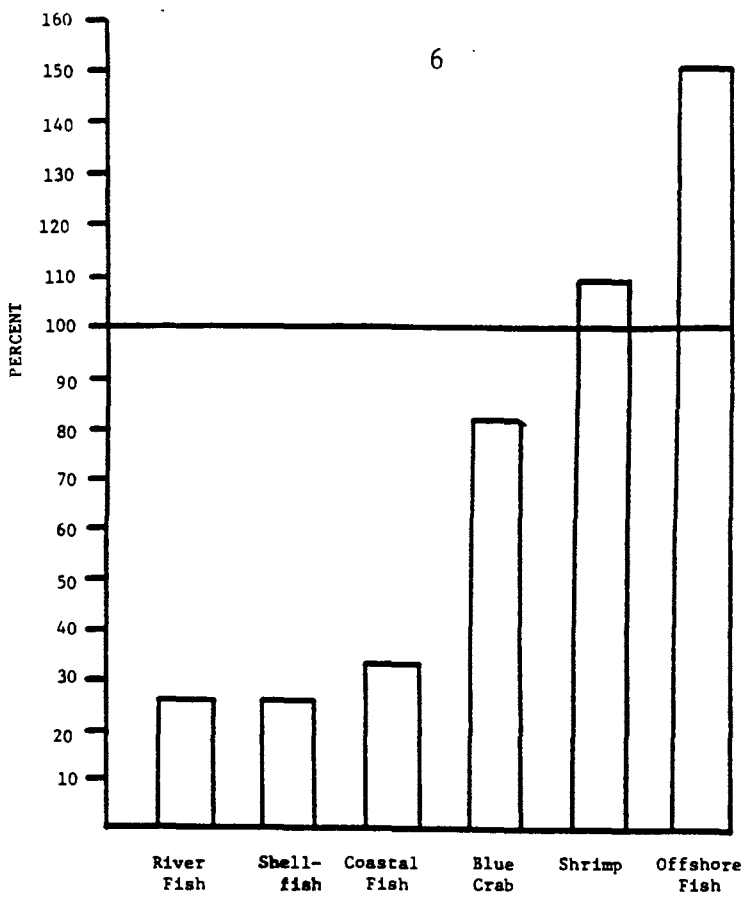


Fig. 3. Production in 1990 compared to 1977-1989 averages. Bars indicate percentage of the average represented by the 1990 landings.

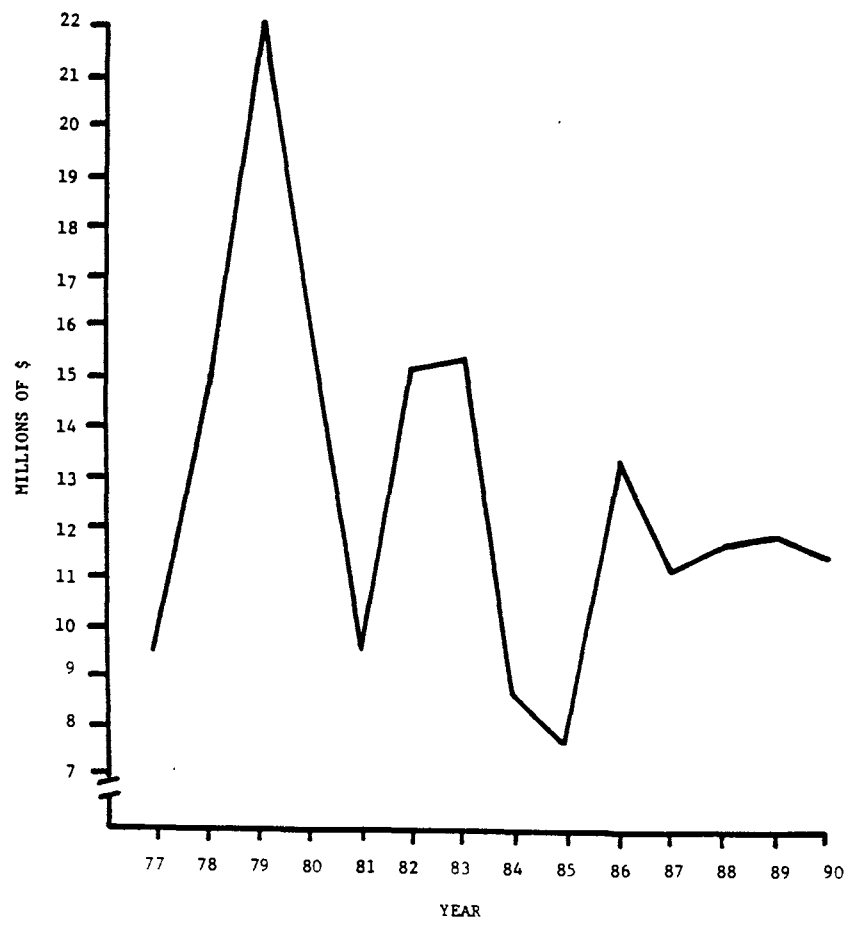


Fig. 4. Total ex-vessel value of commercial landings. Values are adjusted for inflation based on 1977 dollars.

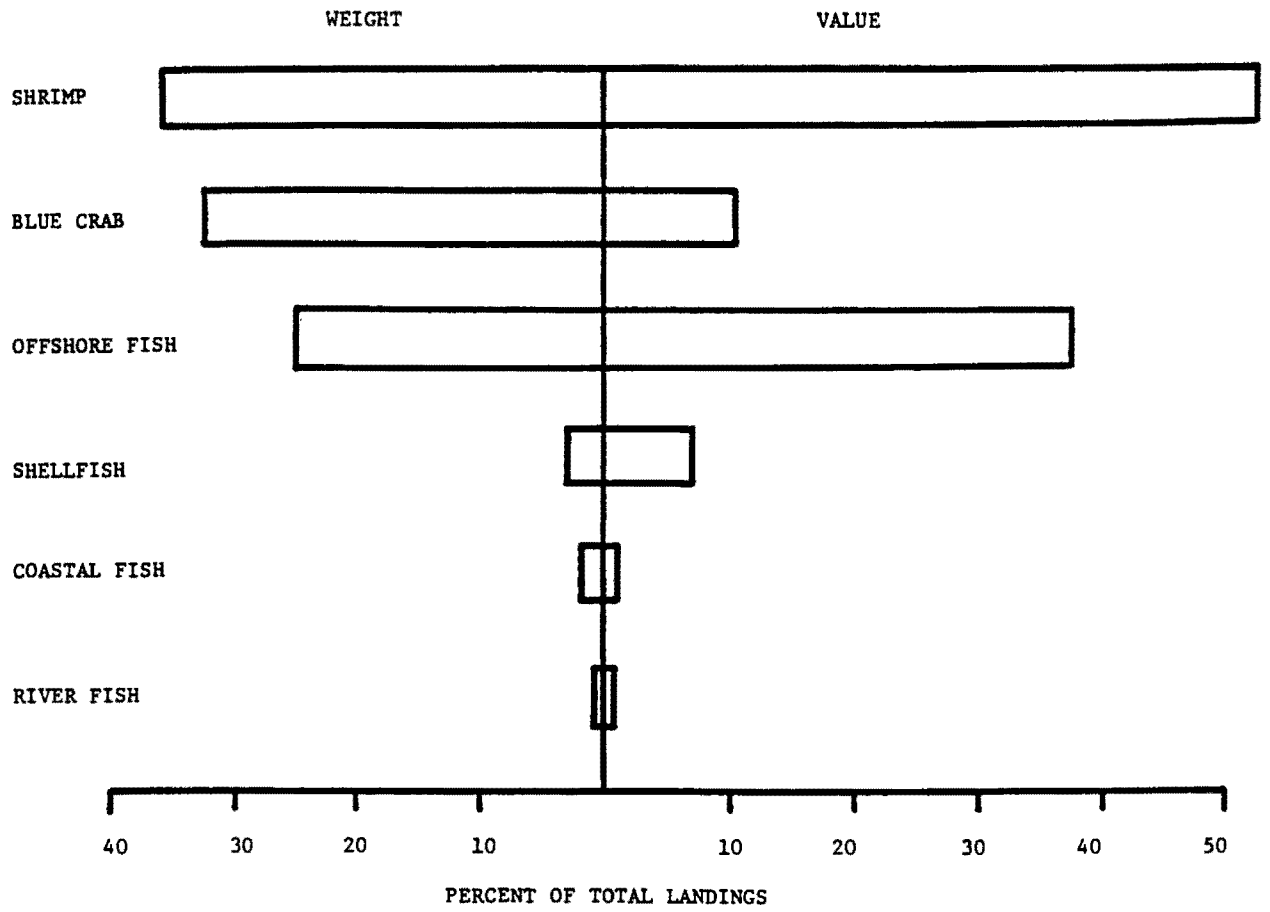


Fig. 5. Weight and value composition of commercial landings.

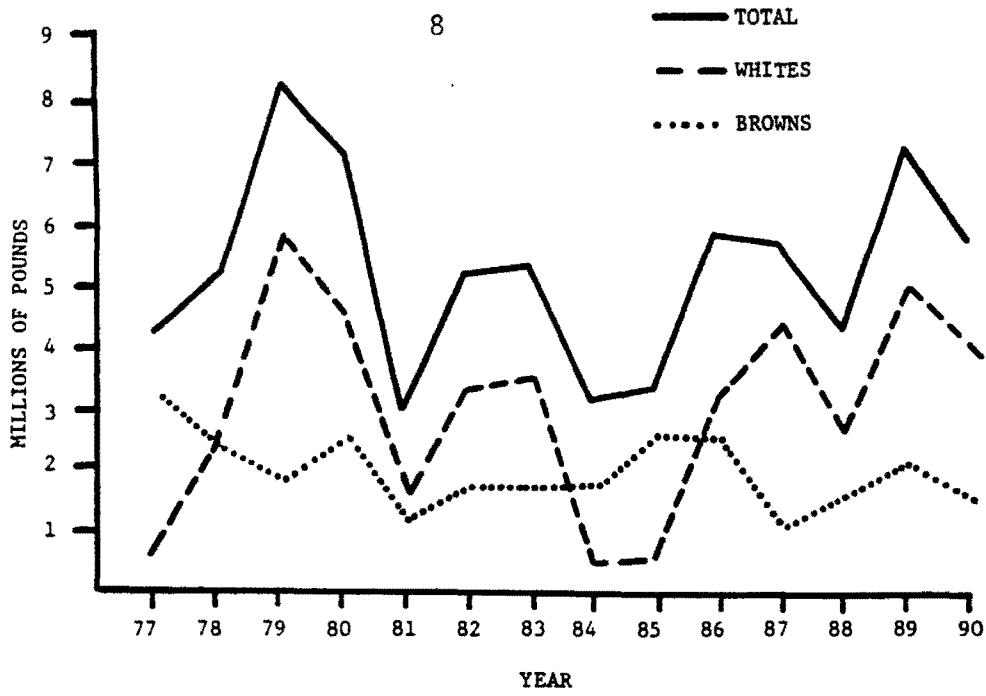


Fig. 6. Annual commercial landings of (heads-on) shrimp.

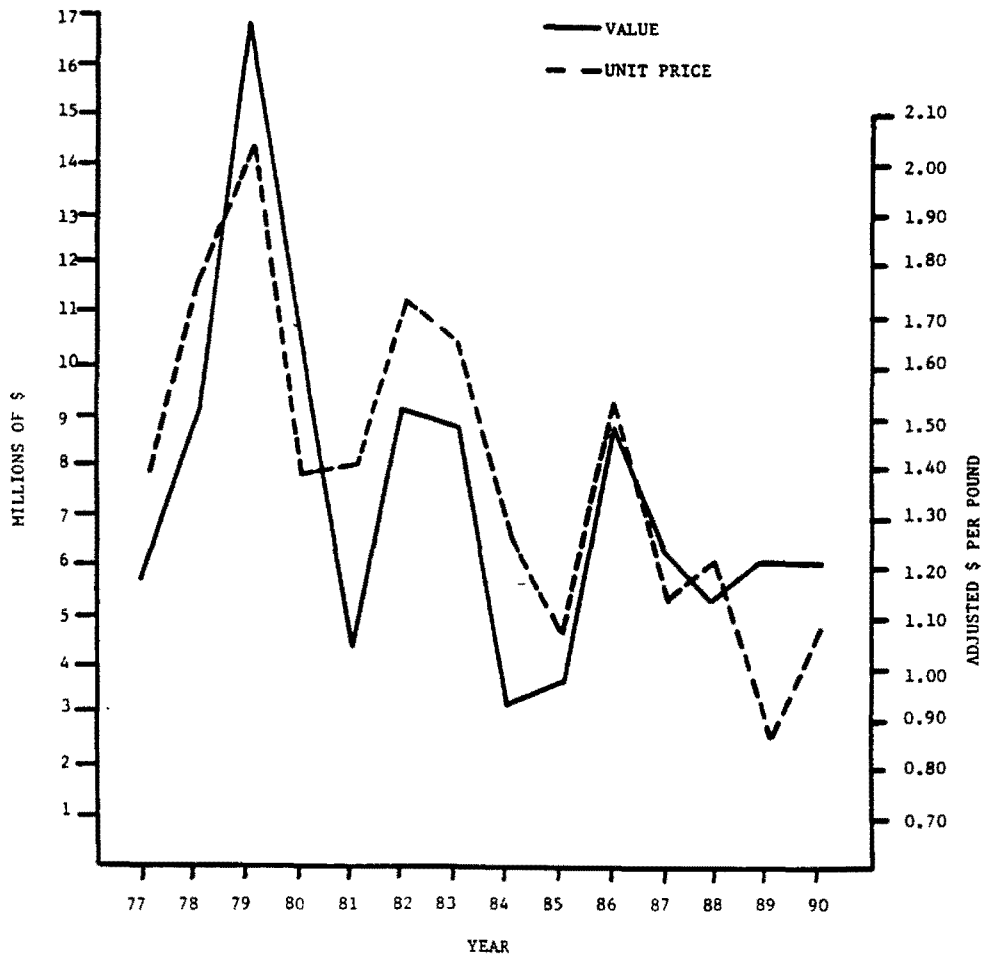


Fig. 7. Annual adjusted ex-vessel value and unit price of shrimp.



overwintering population of white shrimp had been killed.

January sampling in Charleston Harbor found a few shrimp in all areas with fair numbers in the outer harbor. CMP staff revised their kill estimate to 95% and offered several explanations for the survival of at least some shrimp. The hurricane in the previous fall had driven shrimp farther offshore than normal. This contingent may have remained in warmer coastal ocean waters during the cold spell and subsequently moved back into the estuaries as water temperatures increased. Cold weather in early December may have allowed those shrimp that remained in inside areas to acclimate to colder than normal water, reducing the impact of the freeze. Also, since very large numbers had been present in the estuaries at the time of the freeze, survival of only a few percent would have resulted in fair numbers being present to go on.

Water temperatures during January and February were above normal and facilitated survival of the remaining population. CMP sampling in March produced an abundance index about 25% of the March 1989 value (which was extremely high). Biologists therefore concluded that there would be an adequate supply of spawning shrimp in the southern part of the state but not off the northern coast. They considered it imperative, however, to continue protection of the pre-spawning population from exploitation when it moved into the ocean (state waters had been closed after the storm).

Georgia and South Carolina officials asked the South Atlantic Fishery Management Council (SAFMC) for an emergency closure of federal waters, which was imposed on 3 April. Trawling for rock shrimp was permitted with a 10% allowance for pink shrimp. The South Carolina Shrimpers Association opposed the closure on the basis that it was unnecessary to provide protection for white shrimp in offshore waters and would unduly restrict their operations. The Georgia association initially supported the closure but eventually opposed it also. South Carolina representatives estimated that about two dozen of that state's boats depended upon a mixed fishery for pink shrimp, rock shrimp, flounders, and whiting in the area affected by the closure. They argued that the permitted rock shrimp fishery would result in excessive wastage of small, unmarketable rock shrimp as boats targeted pink shrimp.

The closure ended when state waters opened on 1 June after most shrimp had spawned. Estimated June landings of about 38,000 pounds (heads-off) of roe shrimp confirmed the belief that adequate numbers of roe shrimp were available to produce a reasonable fall crop. Fall landings bore out that assumption. The coastal trawling season remained open until 28 January, 1991, the latest closing date on record, as water temperatures remained warm and shrimp continued to move into the ocean.

Trawling and channel net fisheries in North Santee and Winyah Bays were opened on 10 September. After several years of very low landings and severely restricted opportunity, the channel netters enjoyed a productive season (about 260,000 pounds of whole shrimp). This exacerbated the latent animosity between channel netters and trawlers. Channel nets were once also used in Beaufort and Charleston Counties. Shrimp trawlers, recreational boaters, and sportsfishermen opposed their use and the General Assembly limited their use to Georgetown County by 60 permit holders. Most nets are

set off South Island inland of the legal trawling area. Trawlers complain that the channel netters intercept shrimp that would otherwise move onto their fishing grounds. The channel netters counter that their method is more energy-efficient and less destructive environmentally. The legislature was most concerned about the impact on the shrimp resource. MRD sets season dates based on the size and abundance of shrimp and thus is able to protect the resource; the central issue is allocation. The fisheries were closed on 15 November.

Production of penaeids in 1989 and 1990 compared favorably to average landings during 1981-1988. The same could not be said for total ex-vessel value after adjustment for inflation (Fig. 7). Landed value in 1989 barely equalled the 1981/1988 average while that in 1990 was about 2% below it. The principal reason was the continued decline in unit value (after adjustment for inflation), due primarily to massive imports of inexpensive pond-raised shrimp.

After dropping sharply in the low production years of 1984 and 1985, the number of licensed trawlers has levelled off (Fig. 8). The numbers of resident licenses in 1989 and 1990 were about the same as in 1977, although the number of licenses held by nonresidents was appreciably higher. Average production per licensed vessel, though down sharply in 1990, has been generally trending upward since the mid-1980's. It has remained well below the levels in the 1960's when there were appreciably fewer boats. (It should be kept in mind that many licensed vessels do not have significant levels of participation in some years, although we have no means of adjusting for this since the percentages are unknown). The general implication is that the average production per fulltime participant could be increased through a reduction in fleet size without decreasing the overall landings.

#### CRAB

Practically all of the product in this category was hard blue crab landed by pot fishermen. Participation has remained practically constant in recent years (Fig. 9). Total blue crab production (5.209 M pounds) was about 17% less than the 1977-1989 average. Although commercial landings tend to be regarded as indicative of abundance, they somewhat reflect the number of crabbers (and probably their level of effort) and are influenced by short-term abiotic factors such as market conditions. The principal resource-related condition impacting abundance appears to be summer/early fall rainfall during the later juvenile stages. There is some indication of cyclical fluctuation, with one or two years of low production occurring every six or seven years. Based on this pattern, the 1989 annual report projected lower landings in 1990 and that decline did materialize.

The real (i.e., inflation-adjusted) value of the landings has increased in recent years after a lengthy decline (Fig. 10). Northern buyers have offered substantially higher prices for graded crab (particularly no. 1s) when availability of Chesapeake Bay product was low. There has been less incentive to supply local picking houses and more product has been sourced to the "basket" trade. This trend continued in 1990 and at least half of the processors in the state reportedly purchased all of their raw

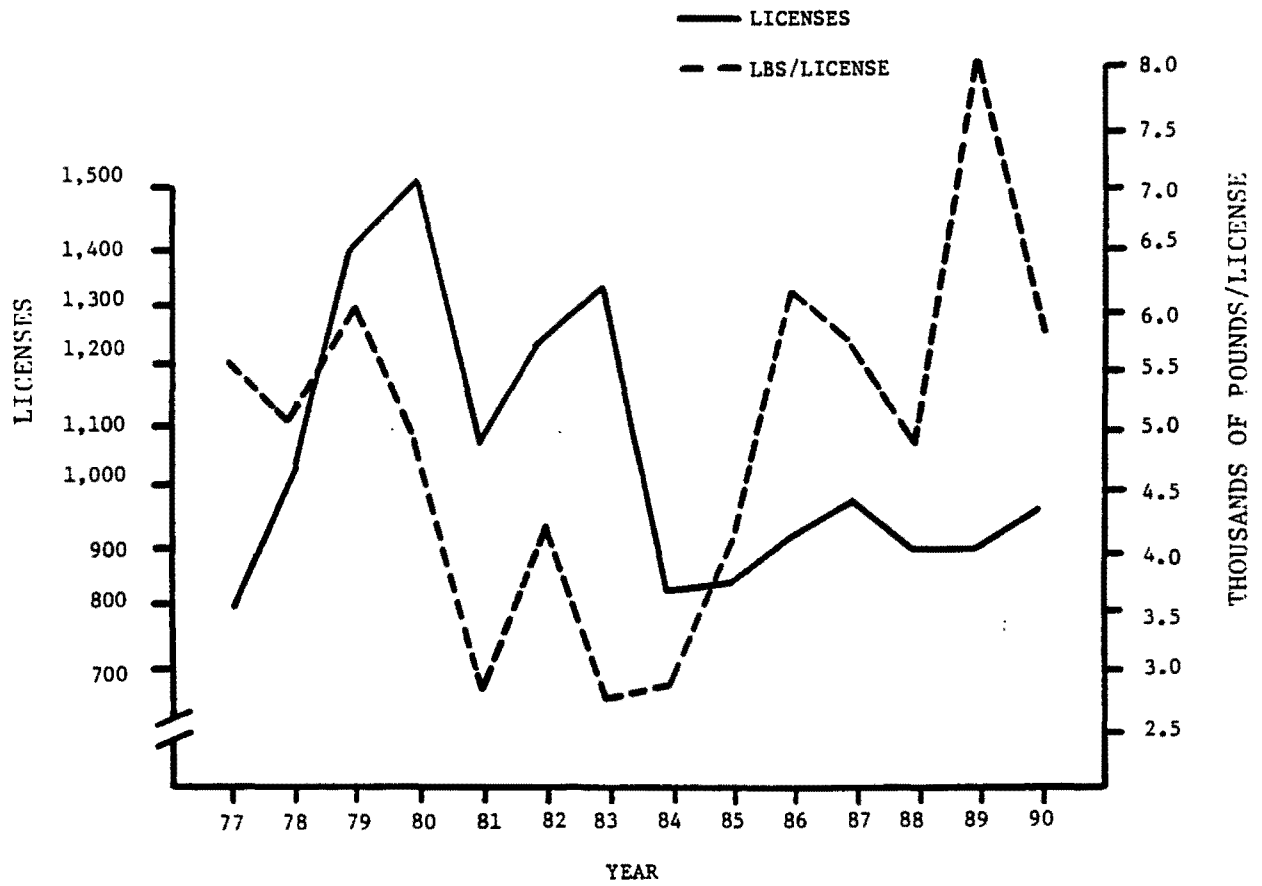


Fig. 8. Number of licensed trawlers and average production per vessel.

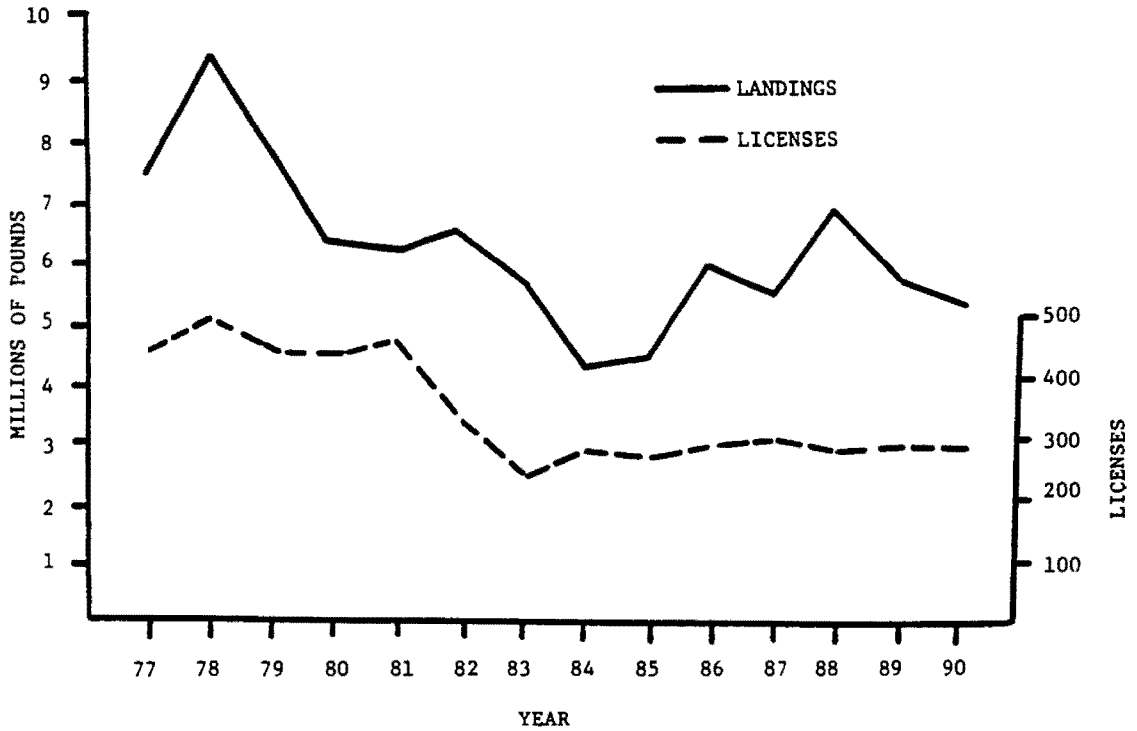


Fig. 9. Annual commercial landings of blue crab and number of crab pot licenses.

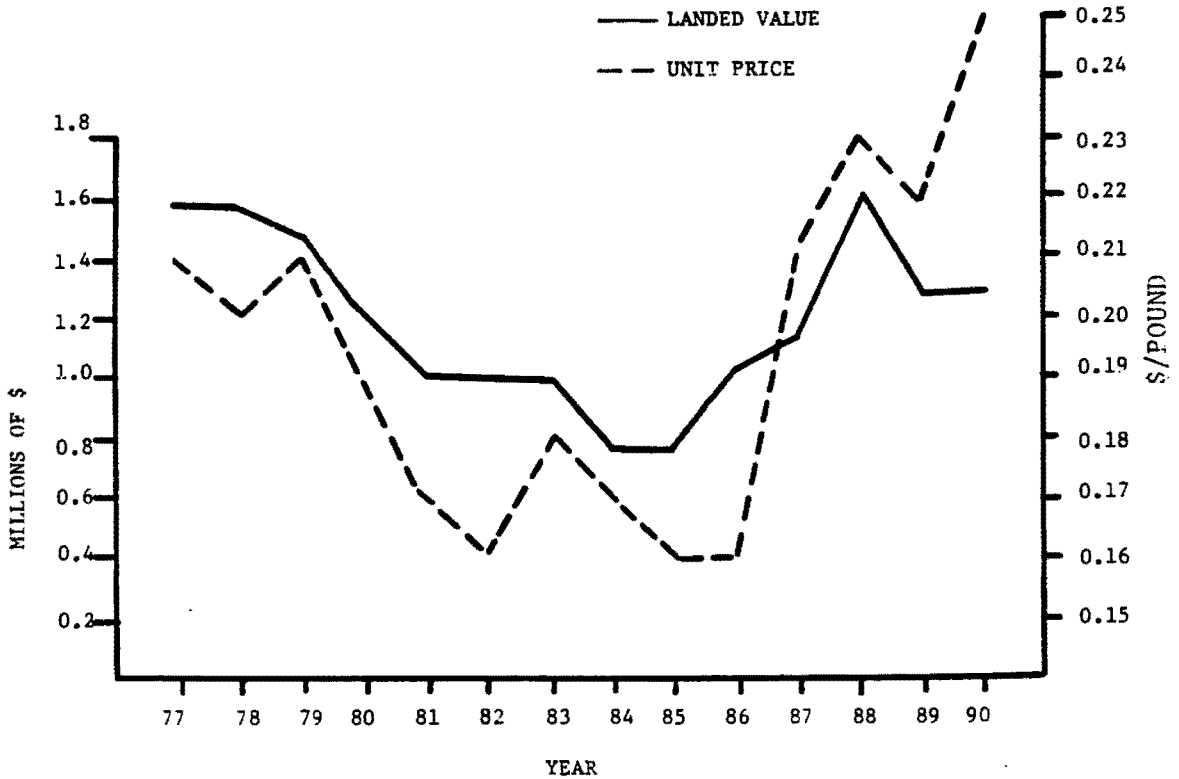


Fig. 10. Adjusted ex-vessel value and unit price of commercial blue crab landings.

material from out of state. There has been a significant increase in adjusted unit value since the mid-1980's that has been largely attributable to the change in distribution of landings.

In earlier years when most crab was sold ungraded to the few large processors in the state, 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 well have been under-reported.

#### SHELLFISH

Shellfish production (Fig. 11) has trended sharply downward since the mid-1980's following a major outbreak of "dermo" (Perkinsus) disease among oyster stocks. The decline continued in 1990 with oyster production (234,000 pounds of meats) at 20% of the 1977-1989 average. Clam landings (152,000 pounds of meats) were nearly identical to those in 1989 and equalled 57% of the long-term mean. Adjusted (for inflation) value of oyster landings was the lowest to date while that of clams was 27% below the 1977-1989 average (Fig. 12). The number of licenses (244) issued for harvesting state shellfish grounds was about the same as in 1989.

South Carolina's principal shellfish product has been intertidal cluster oysters. The major commercial utilization was for canning and years ago numerous processors operated as vegetable packers in summer and oyster canners during the cooler months. Reduced demand for canned oysters and labor shortages, contributed to a steady attrition of canners and the last major operation shut down after the most recent "dermo" outbreak. Since this packer purchased as much as half of the annual cluster oyster production, the loss of this market had an appreciable impact on landings. The only other outlet for cluster oysters is local consumers for home processing and oyster roasts. This market is limited and many consumers are able to meet their needs through personal harvesting.

Production of high-valued, exportable shell stock (selects and singles) has been primarily limited to Bulls Bay and the Santee delta. The redirection project (completed in 1985) greatly increased the flow of fresh water into the latter area and it has ceased to be a productive region. Effects of Hurricane Hugo were particularly severe around Awendaw and reduced the availability of Bulls Bay oysters in 1990. Of the 57 state shellfish grounds, 14 were closed during 1990. Most of these were on the northern half of the state's coast.

The year's oyster population was healthy with no evidence of disease. Prior to 1985, the spring oyster harvest consistently accounted for about two-thirds of the annual production. Since then, its relative contribution has been somewhat greater due to a high incidence of fall closures. In 1990, although the spring shellfish season was extended through May 31, the percentage of annual oyster production attributable to the spring season was the lowest (about 61%) since 1983. About 16% of the annual production came from public grounds, compared to 25% in 1989.

The fall season opened on September 17 for clams and October 1 for oysters. Because of heavy rainfall in early October, DHEC closed all shellfish areas on October 12. Harvesting resumed on the

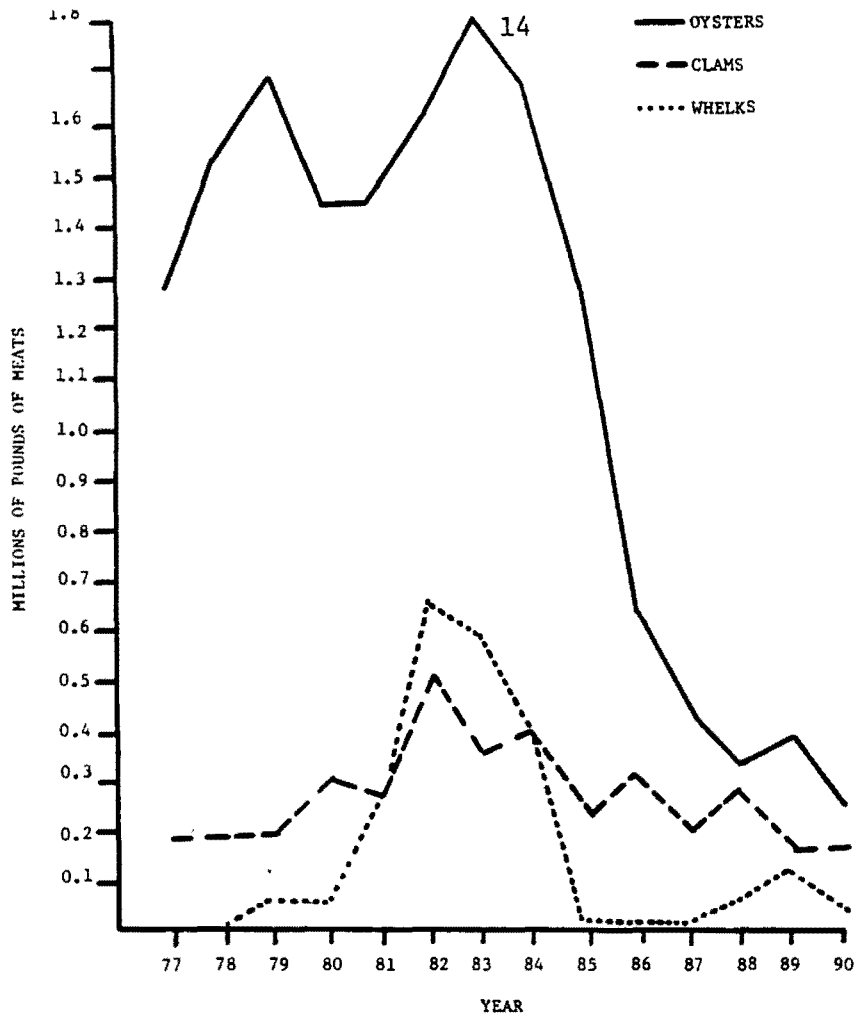
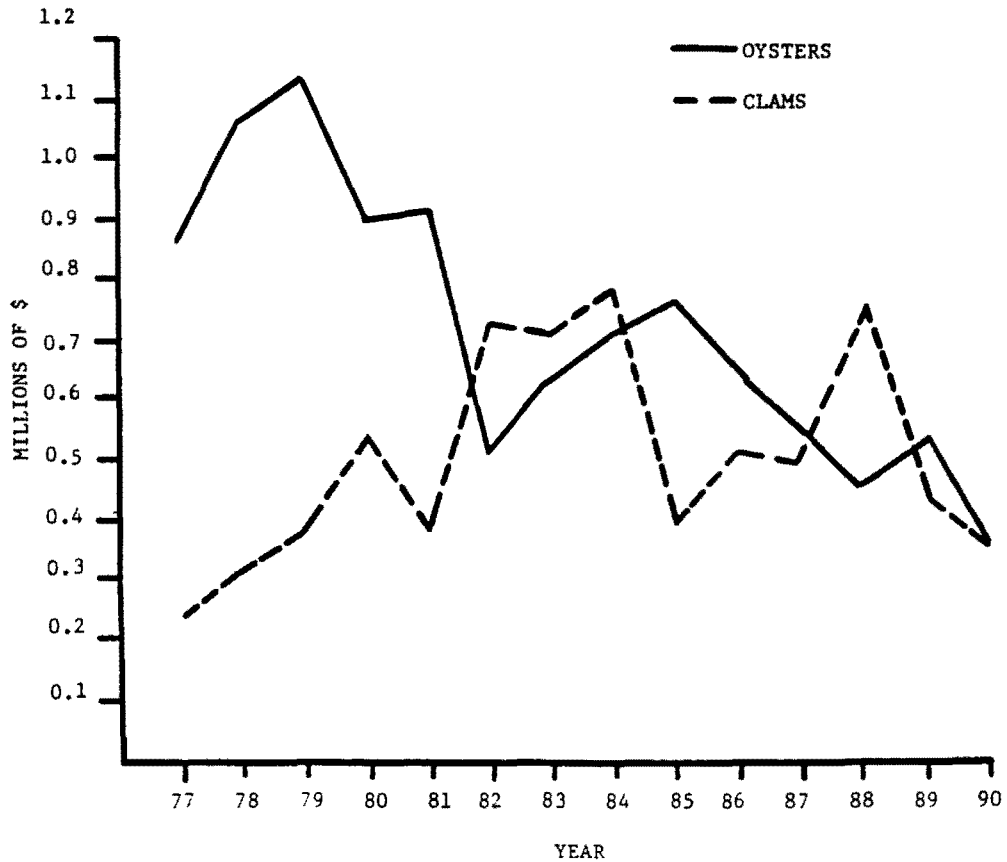


Fig. 11. Annual commercial shellfish landings.



26th of that month. Demand was heavy during the winter holiday season but prices dropped \$1 to \$2 a bushel because of availability of Texas product. The average unit value of fall oysters (\$3.13/pound of meat) was lower than that of the spring harvest (a reversal of the normal pattern) and well below the fall 1989 level (\$3.60/pound of meat).

Clam landings were well below the levels of recent years. Of the ten escalator boats in the state, six were seriously damaged by the hurricane, three beyond use. Plans to reopen grounds in Dunn Sound and Little River met with local objections that precluded harvesting. A four-day opening of the Santee delta in April produced less than expected landings. For the year, production by the escalators was only about 34% of the 1977-1989 average although the number of dredge licenses increased from 12 in 1989 to 18. Clam landings by other means were higher than in 1989 and offset the decrease in mechanical harvest, so that the overall clam harvests for the two years were virtually identical.

After a resurgence in 1989, whelk production (39,000 pounds of meat) declined again. Instate processing capacity is limited and there is virtually no local consumer demand. Most of the product is sourced to a New Jersey cannery and has a low unit value in the raw state.

Octopus and squid (primarily the brief squid) were landed in small amounts as incidental catches in the fish trap and shrimp trawl fisheries, respectively. Some years ago, MRD demonstrated the feasibility of a small-scale directed fishery for octopus but one has never materialized.

#### OFFSHORE FISH

Most of the offshore fish landings were reported by trip ticket. The numbers of boats per gear type listed were those that reported their landings on tickets and do not include boats landing at dealers not on the ticket system. The figures provided therefore represent minimum estimates of vessel participation.

Landings continued the improving trend that began in 1986 (Fig. 13), with three of the four gear groups recording increased production (Fig. 14). Compared to the 1989 totals, gains in weight landings were reported for wreckfish (+ 67%), sea bass (+ 40%), tilefishes (+ 23%), and groupers (+ 4%) with losses for porgies (- 1%), king mackerel (- 9%), snappers (- 12%), and swordfish (- 30%). Wreckfish replaced swordfish as the most important individual species in value contribution and was also the leading volume component (Fig. 15). Overall offshore fish landings were up 8% in weight and 10% in current value. The total number of offshore fishing trips (all gear types) was estimated at 2,077, a 6% decrease from the 1989 level.

The handline (power-assisted reel and troll) fishery maintained its status as the dominant producer in both landed weight and value (Fig. 16), with landings of 2.67 M pounds worth about \$4.13 M. The leading component in both volume and value was wreckfish. Other major volume contributors were groupers (23% of the total), snappers (12%), and porgies (8%). Total landings increased about 3% in weight and 7% in contemporary value compared to 1989's figures. Forty boats plus 26 individual fishermen (mostly operators of small

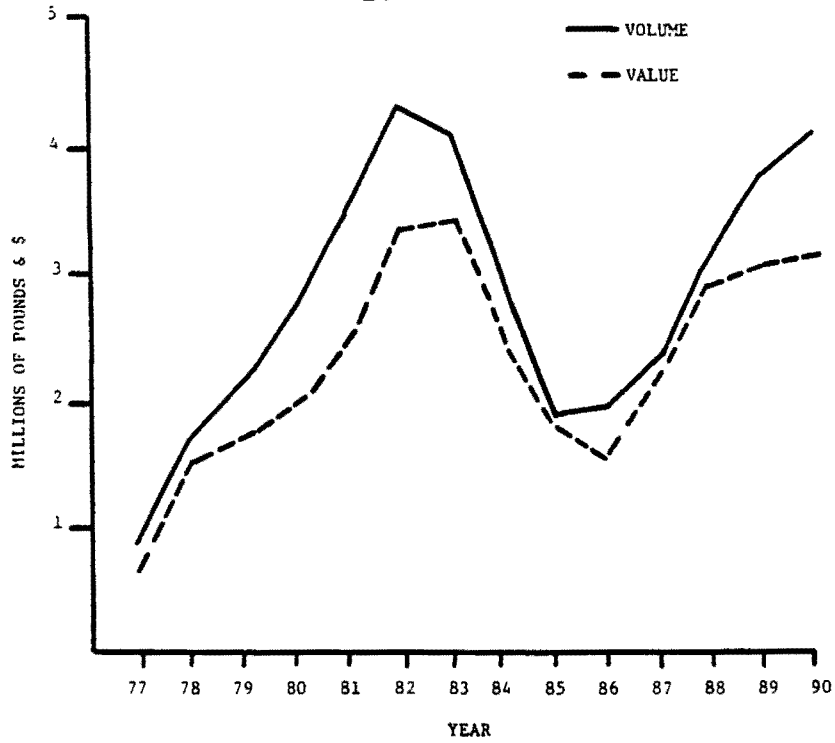


Fig. 13. Annual commercial landings and adjusted ex-vessel value of offshore fish.

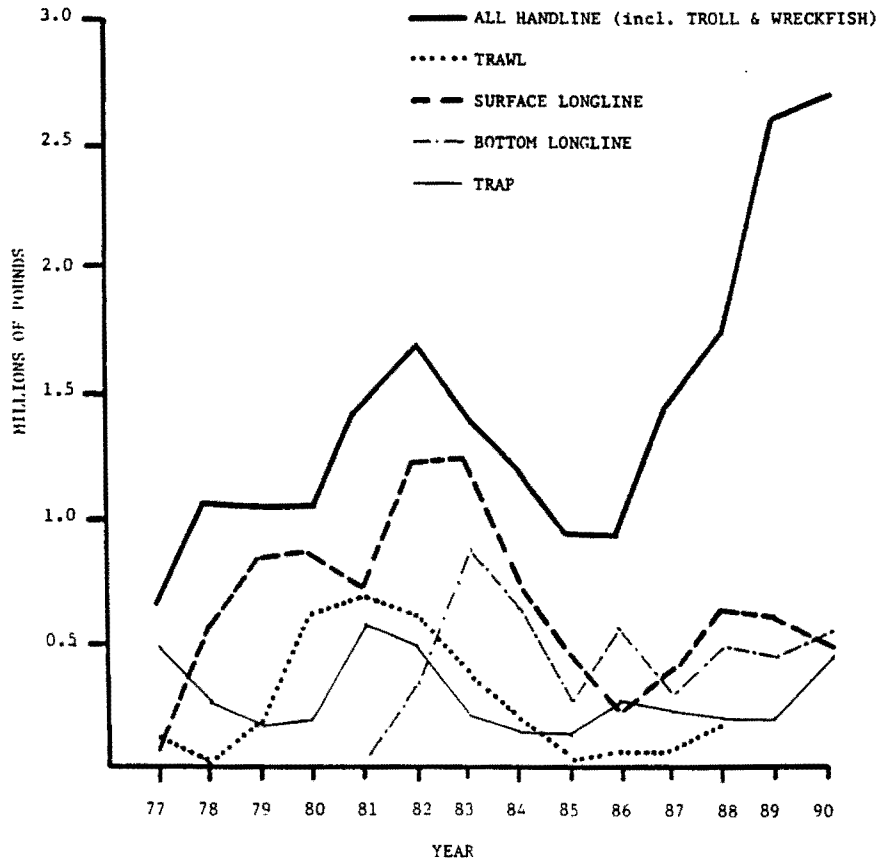
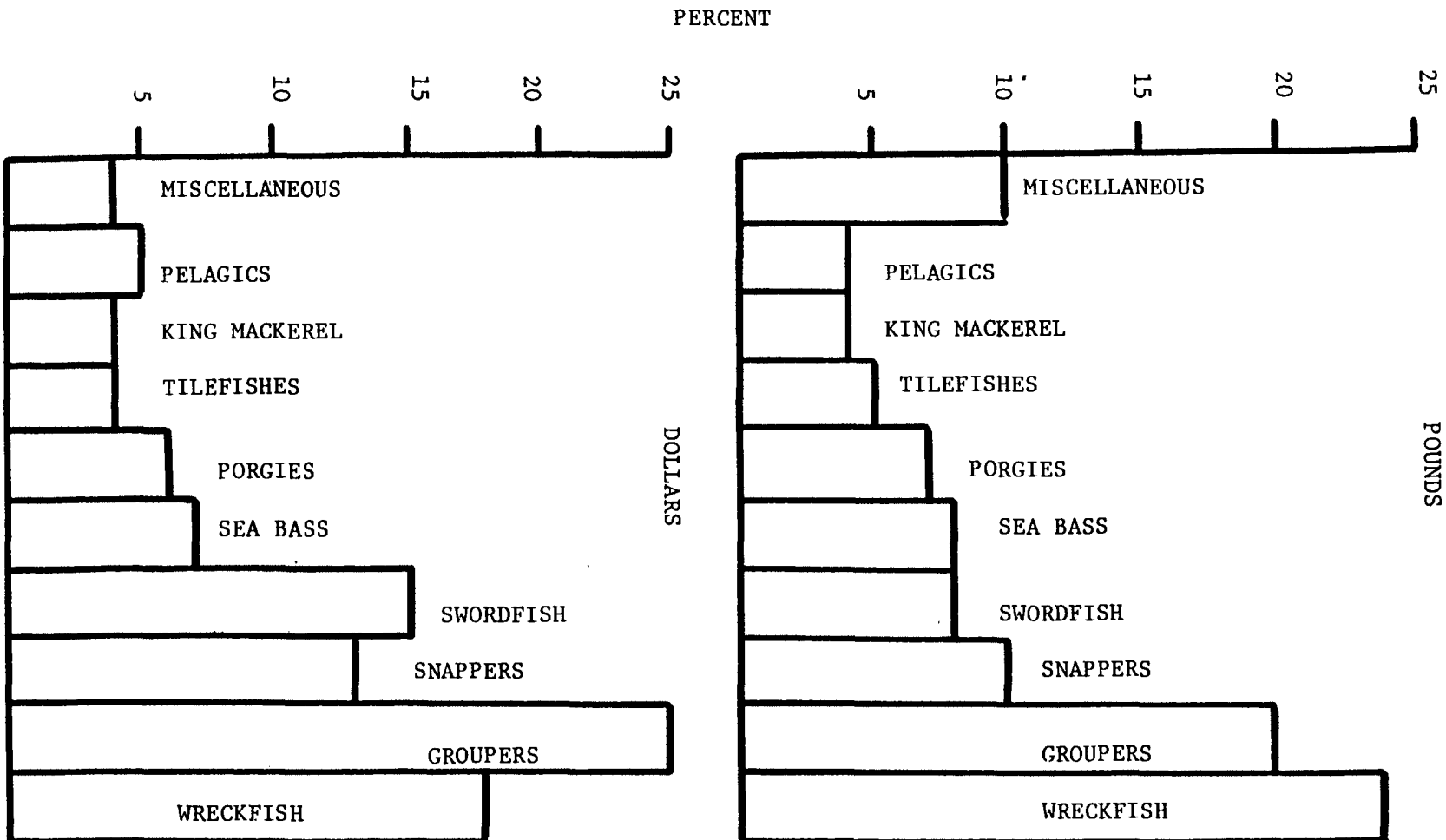


Fig. 14. Annual commercial landings of offshore fish by gear type.



Fig. 15. Composition of commercial landings of offshore fish in 1990.



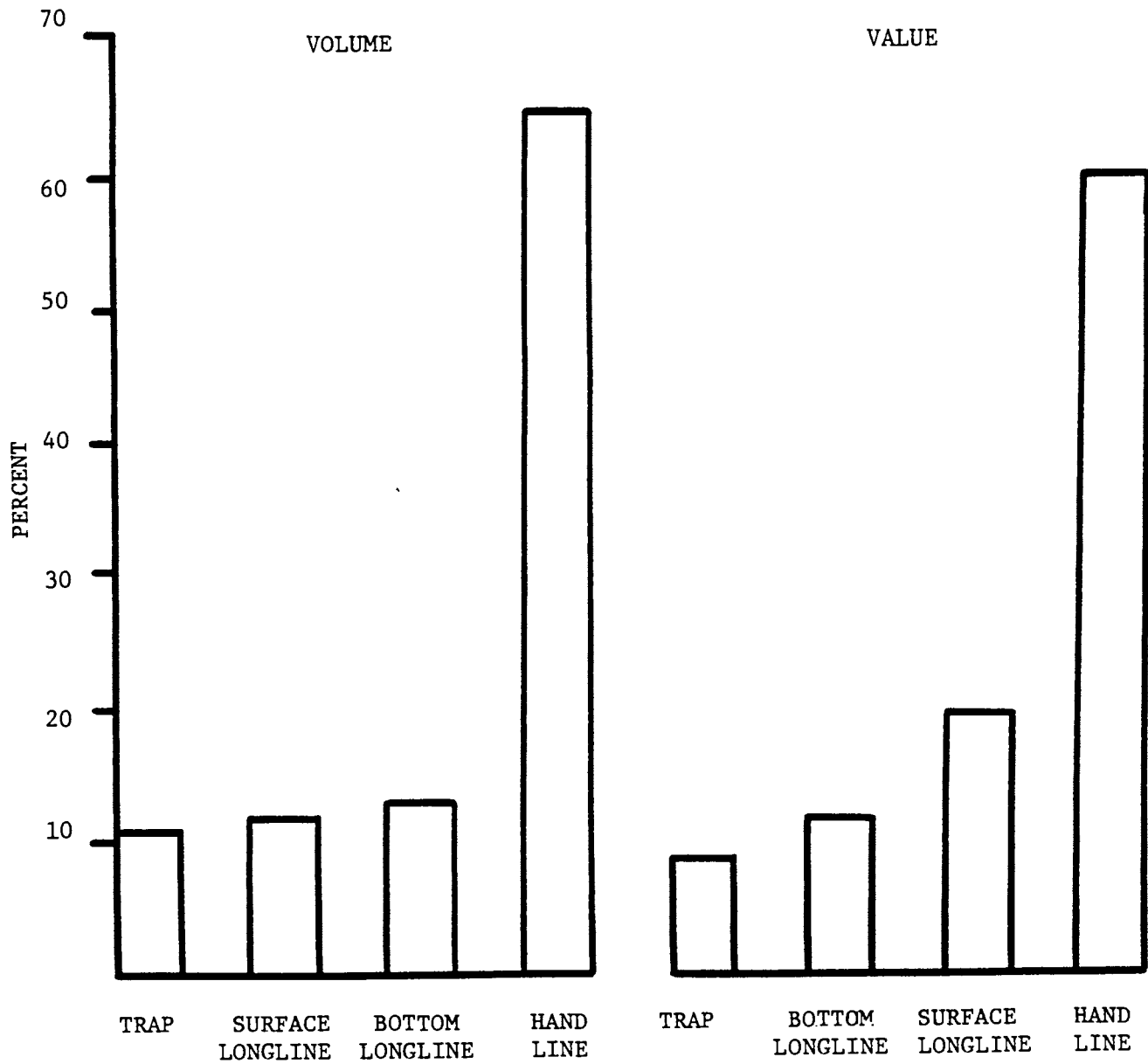


Fig. 16. Contribution to 1990 commercial landings of offshore fish by gear type.

boats making day trips) reported handline landings. Seven fishermen and/or boats reported troll landings. Power reel effort was estimated at 1,428 trips and troll effort (targeted at king mackerel) at 46 trips. Power reel effort was down 10% from that in the previous year. A reliable figure for total troll effort was not available.

The surface longline fishery targeted high-valued species (swordfish and tunas) and was second in value (\$1.348 M) despite the substantial drop in swordfish production. Total landings by weight (474,000 pounds) were down 17% from those in 1989. Overall value was 20% less due to the relatively lower contribution of swordfish. In 1990, tunas, dolphin, and wahoo represented about 29% of the catch compared to 17% in 1989. Eight boats reported landings. Effort was estimated at 102 trips, down 23% from the previous year. Average trip production (4,643 pounds) increased about 7%.

Bottom longline volume (516,000 pounds) increased by 20%. Value (\$828,000) was up 60% due to changes in species composition; sharks were 34% of the 1989 landings but only 10% of 1990's production. Landings of (mainly) snowy grouper, the highest valued component, were the highest since the record year of 1983. Tilefish (mostly northern or golden) volume was the greatest since 1986. Bottom longliners made an estimated 192 trips, an 18% increase in effort compared to 1989. The average catch per trip (2,691 pounds) increased 2%.

The trap fishery historically has targeted black sea bass during the winter and spring with negligible landings of other species until 1989. In that year, about 23% of the catch consisted of other species, mainly red porgies and vermilion snappers. In 1990, there was substantial effort directed year round at groupers and snappers. Black sea bass represented only 55% of the total trap landings (441,000 pounds). Total value was about \$601,000. Twelve boats reported landings. Overall trap effort was estimated at 309 trips, a 31% increase from 1989 effort. The average catch per trip (1,427 pounds) increased 75% due to the contribution of porgies, groupers, and snappers.

### Swordfish

This species is believed to be overexploited in the western North Atlantic and South Carolina's 1990 landings were only 29% of those in the peak year of the state's fishery. Waters off the state historically have produced predominantly small fish and one of the objectives of management has been to reduce these landings of immature (mostly male) fish. In 1990, the average (carcass) weight was 43.9 pounds, barely above the 41 pound minimum size limit in the ICCAT regulatory recommendations. In 1989, the average weight was 43.6 pounds.

### Reef Fish

In aggregate, reef fish have been the dominant component of offshore fish landings in both volume and value. Not including wreckfish, landings in 1990 were about 2.34 M pounds worth about \$3.935 M. Snapper/grouper species have been primarily targeted by the traditional handline fishery (i.e., that component not directed at wreckfish). In 1990, overall species composition (Fig. 17) in

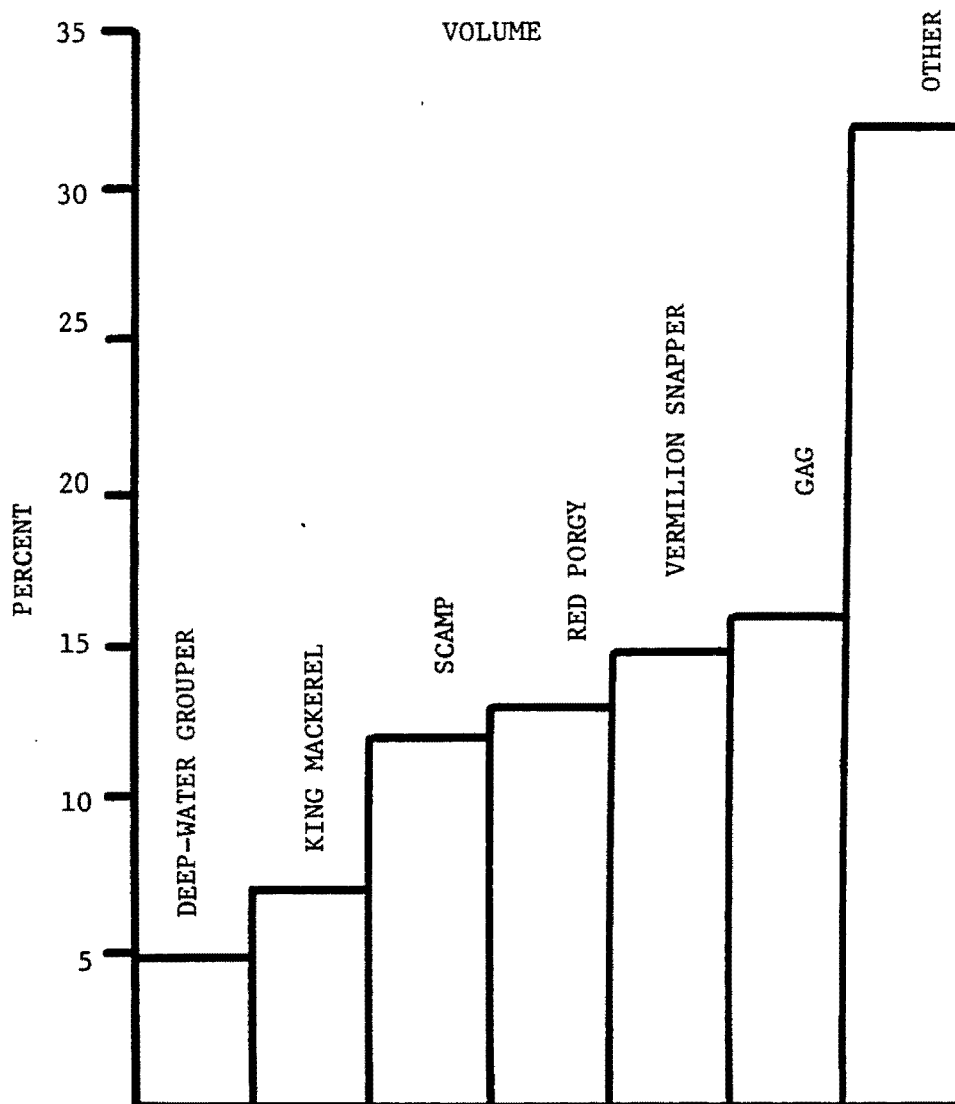


Fig. 17. Composition of 1990 handline landings (not including wreckfish).

this fishery was similar to that in recent years. In 1981, bottom longline gear was introduced in this area, initially for tilefish over mud bottom. The bottom longliners also began to target deep-water groupers (snowy and yellowedge) over rocky grounds soon thereafter. A limited amount of effort was also expended for mid-depth groupers (gag and scamp). The directed trawl fishery was prohibited by the SAFMC in 1989 because of concerns about habitat damage and large landings of very small vermilion snappers. In 1990, a directed fishery for snapper/grouper using chevron traps began and the trap fishery accounted for 19% of total reef fish production (including black sea bass). Longliners took 20% and the handliners accounted for 61%.

Groupers historically have been the most important reef fish in terms of landed weight, with most of the production attributable to handliners (Fig. 18). The principal species have been gag, snowy, and scamp. Gag has been the dominant grouper component of handline landings, averaging about a quarter of the total handline catch by weight until 1988. In 1990, this species represented 16% of this gear's production, the lowest contribution to date. Ex-vessel value of gag landed by all gears was about \$635,000. Recently, overall landings (Fig. 19) have fluctuated considerably but have generally been lower than in the early 1980's. The average size of commercially landed gag has trended gradually downward since the reef fish fishery expanded in the late 1970's. In 1980, the average total length was 92 cm, whereas in 1990 it was about 80 cm (Fig. 20).

Snowy groupers have been the principal species taken by longliners working deep water rough bottom. During the first few years of deep-water fishing (by handliners and then longliners), a limited amount of yellowedge grouper (the major deep-water species in the Gulf fishery) was taken but landings quickly declined to virtually nothing. Production of snowies peaked in 1983 at the height of the longline fishery, then declined drastically as longlining activity decreased then shifted to other species (mainly sharks). Since 1988, landings (primarily by bottom longline) have increased sharply. In 1990, the ex-vessel value of total snowy landings was about \$403,000.

Average size of snowy groupers has tended to reflect the relative contributions by gear type and depth of capture. Fish from deeper water (>100 fathoms), taken mainly by longline, have been somewhat larger. Handliners fishing for red porgies in 40-70 fathoms have caught large numbers of immature snowies. In 1990, the average size landed by all gears was 54 cm (Fig. 21) compared to 63 cm in the previous year. The skewed distribution strongly implies overexploitation.

Until 1990, scamp had been caught almost exclusively with handline gear. The increased use of chevron traps in 1990 contributed to the increasing trend in landings, since this is the principal species of grouper taken in traps. Overall scamp production in 1990 was worth about \$498,000. The downside has been the trend in average size, which has been enhanced by trap landings of small fish. In the late 1970's, scamp landed by handliners averaged about 75 cm total length. In 1990, the average size landed by all gears (but primarily handline) was just under 50 cm (Fig. 22)

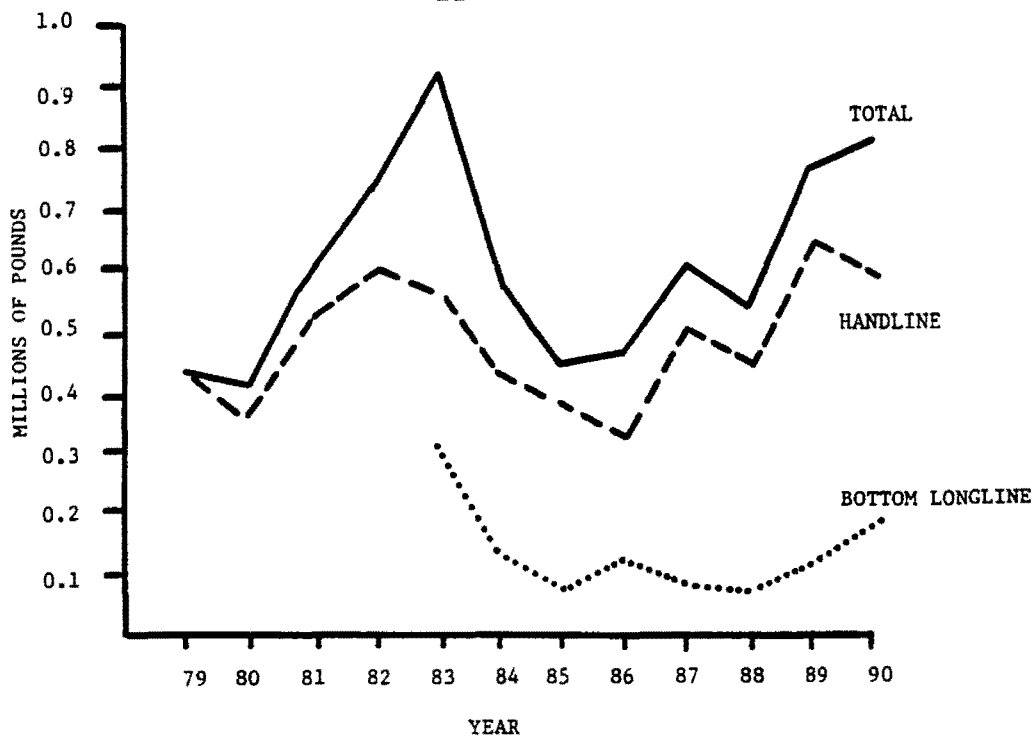


Fig. 18. Annual commercial landings of groupers by gear type.

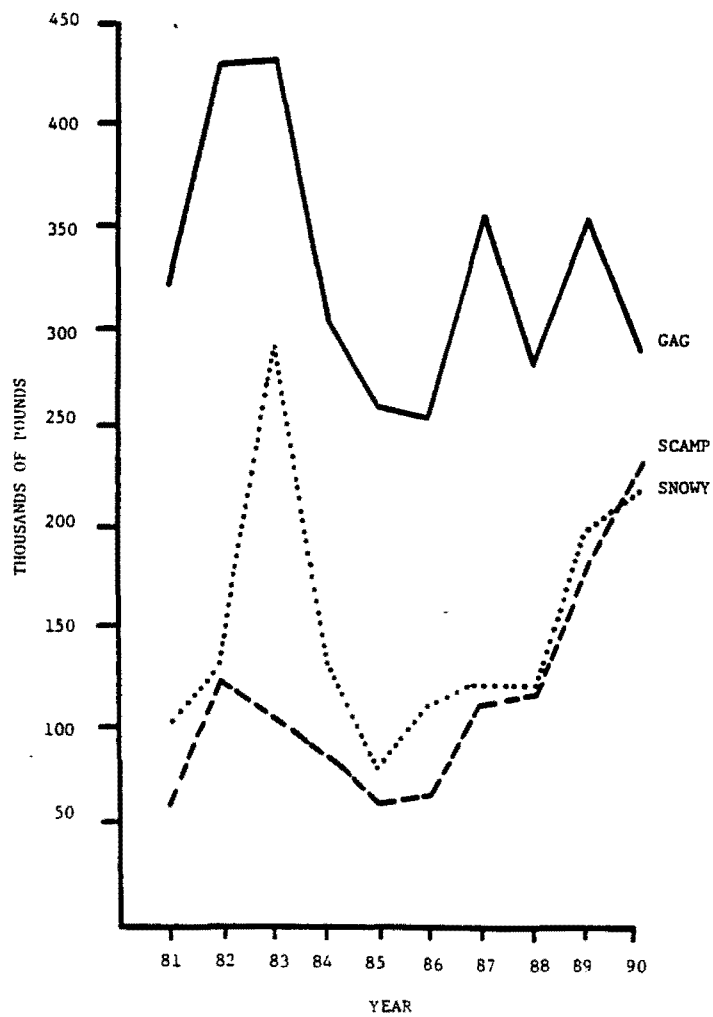


Fig. 19. Annual commercial landings of gag, scamp, and snowy groupers.

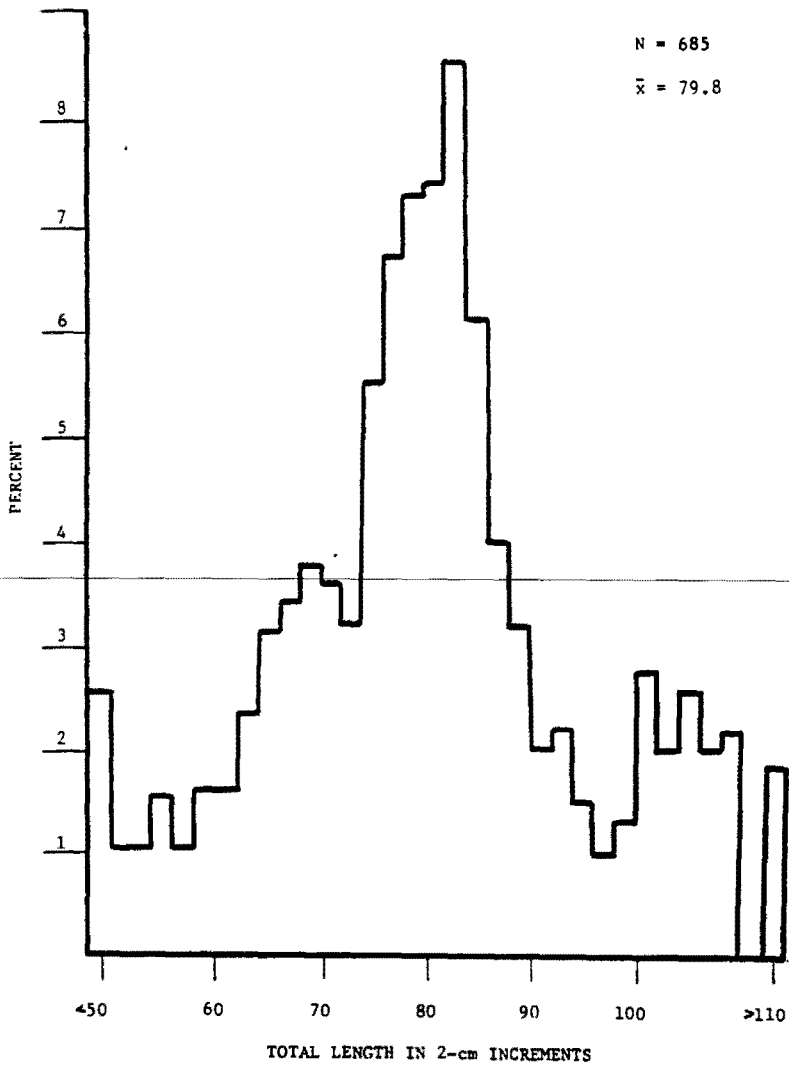


Fig. 20. Length composition of commercial landings of gag in 1990.

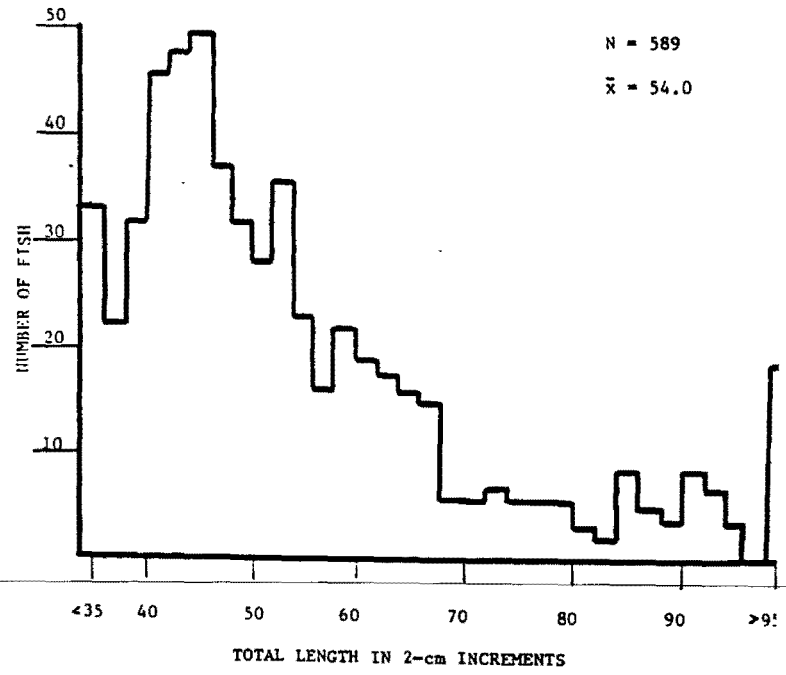
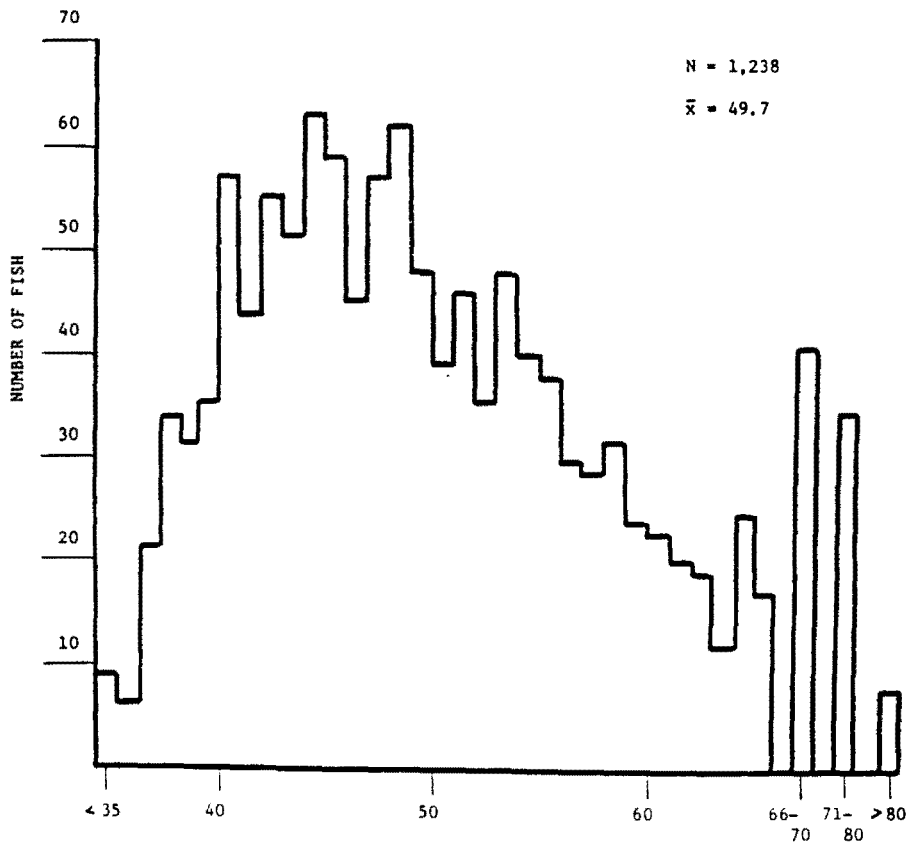


Fig. 21. Length composition of commercial landings of snowy grouper in 1990.



compared to 51 cm in 1989 and the distribution was more strongly skewed toward small sizes than in the past. This implies that this species is also being overfished.

After groupers, the most important reef species in recent years has been vermilion snapper, the dominant component of snapper landings (Fig. 23). Landings increased dramatically during the expansion of the trawl fishery in the early 1980's, then plunged following imposition of a 4-inch minimum mesh regulation. Handline production also dropped off sharply in the mid-1980's, then recovered rapidly to the previous high level. In 1990, vermilion snapper represented 15% of the overall handline production by weight, down slightly from the relative contribution in the previous two years. Total ex-vessel value of the landings by all gears was about \$676,000.

In the late 1970's, vermilion snappers landed by handliners averaged 40 cm and less than 15% of the annual landings was below 30 cm. In 1990, most of the fish measured in port sampling were also landed by handliners. The average length was about 32 cm and 38% of the fish were below 30 cm (Fig. 24).

The other snapper species landed in any quantity has been the red snapper, although volume has been far below that of vermilion snapper. Though not a significant weight contributor, this species is the most highly valued component (other than swordfish) of the offshore finfish catch. Although down 21% from the 1989 figure, landings in 1990 were the highest (excluding those in 1989) since the late 1970's. Total ex-vessel value was about \$186,000. The average size was about 51 cm (Fig. 25), considerably lower than the 66-68 cm averages observed during 1978-1980 but nearly the same as in 1989.

In the late 1970's, red porgies typically represented 25%-30% of the handline landings. They accounted for 13% of the 1990 catch, the lowest relative contribution to date. In the early 1980's, the trawl fishery contributed significantly to overall porgy landings (Fig. 26). Most of the trawl catch also consisted of red porgies with minor amounts of whitebone porgy (scup) and knobbed (Key West) porgies. After cessation of this fishery, handliners again accounted for practically all of the annual landings until 1990, when trap-caught fish (principally red porgies) represented 24% of the aggregate volume. Total porgy landings were worth about \$418,000 with virtually all attributable to red porgies. During 1976-1980, the average size of red porgies caught by handline was rather consistently about 44 cm. In 1990, most of the fish measured were also from handline landings and the mean length was about 35 cm (Fig. 27) compared to 37 cm in the previous year.

The other major reef species exploited off South Carolina is the black sea bass. Historically, the directed trap fishery accounted for about 90% of annual production but the relative contribution of trap landings has steadily declined. In 1990, both trap and overall production were the highest since 1982 (Fig. 28) and trappers accounted for 74% of the total landings. Overall production was valued at about \$450,000. The percentage composition of trap-caught fish is important from an economic perspective because large sea bass (>1.25 pounds) command a premium price (\$2.50/pound in 1990 compared to \$1.31 for mediums and \$0.64 for



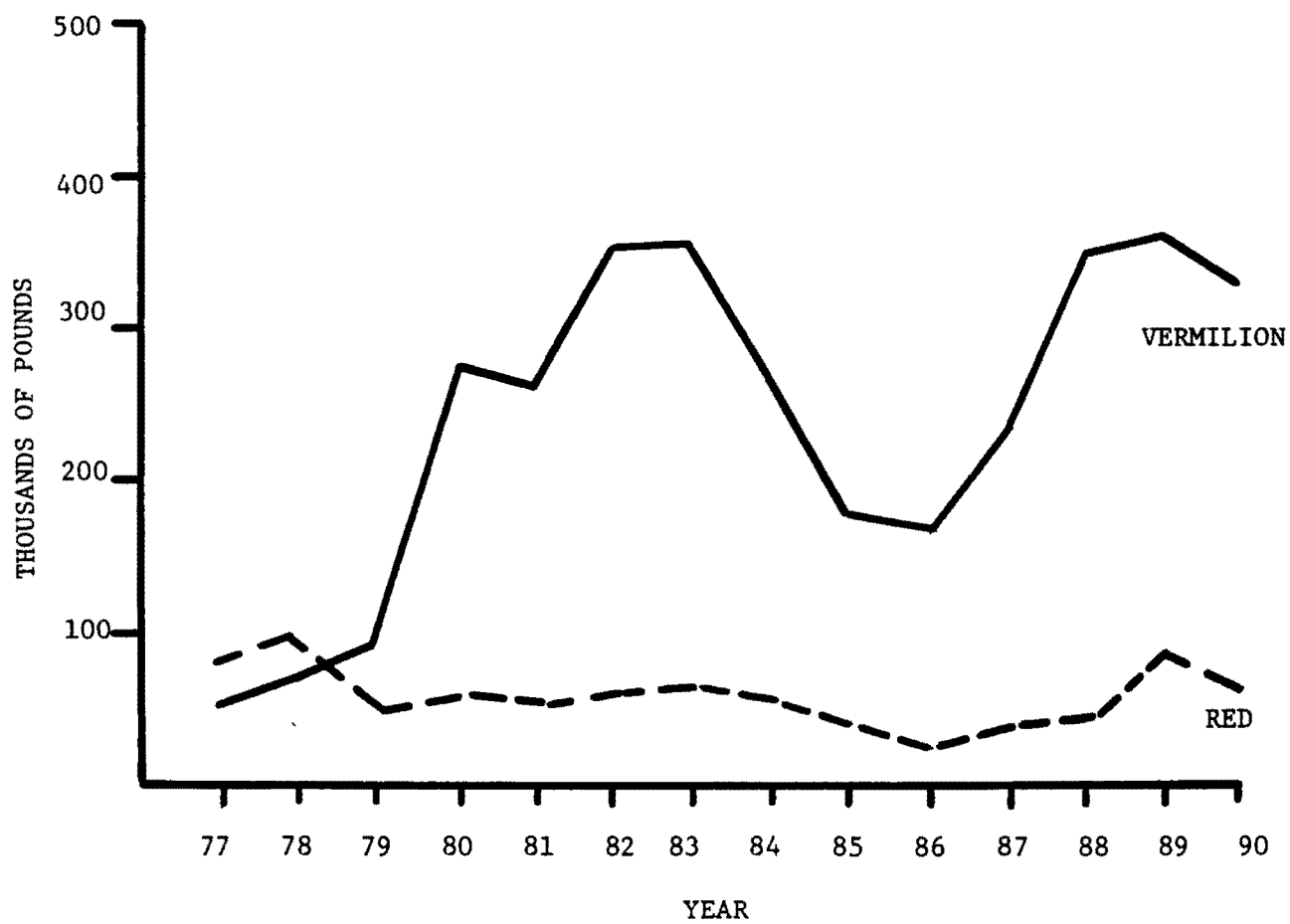


Fig. 23. Annual commercial landings of snappers.

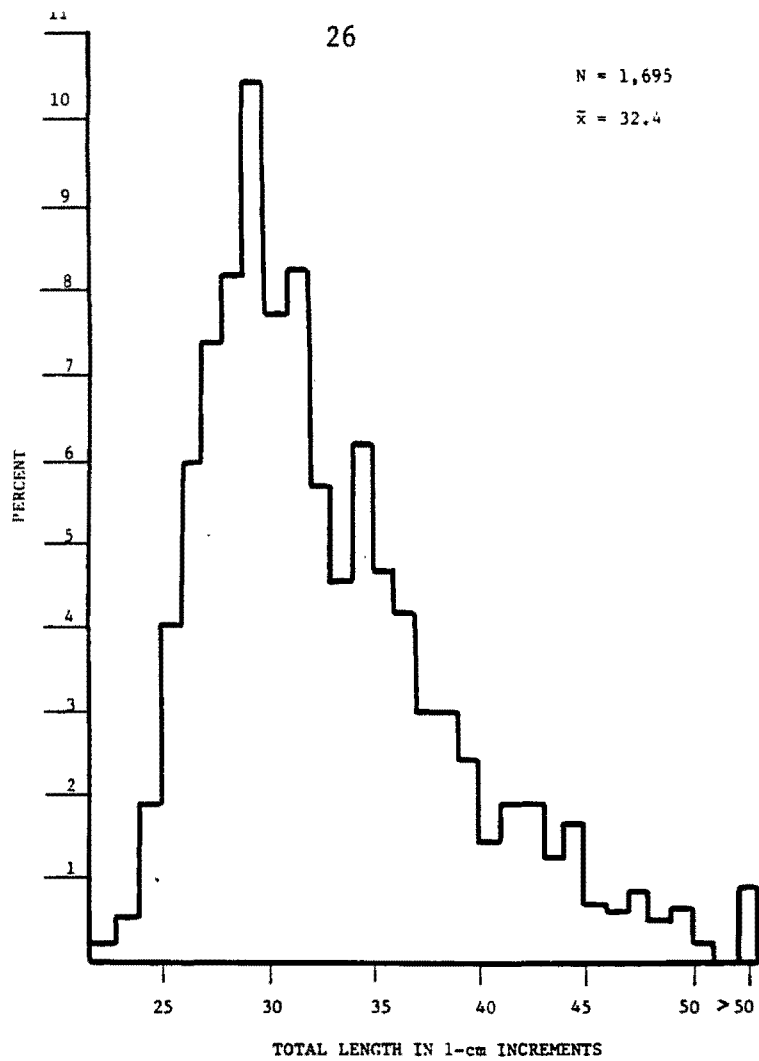


Fig. 24. Length composition of commercial landings of vermilion snappers in 1990.

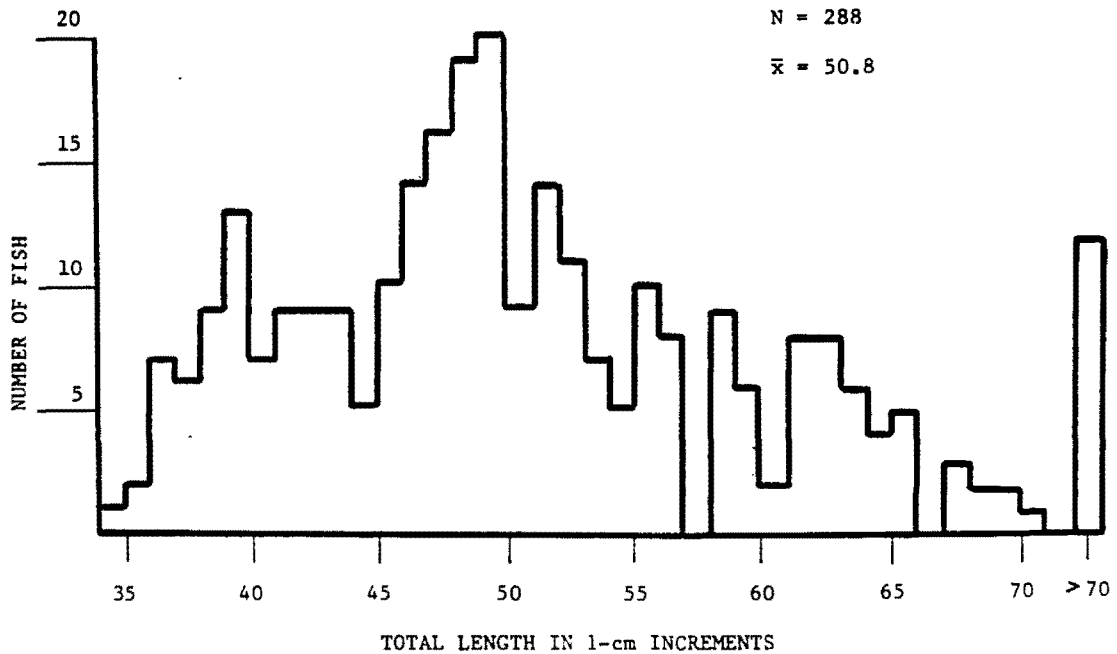


Fig. 25. Length composition of commercial landings of red snappers in 1990.

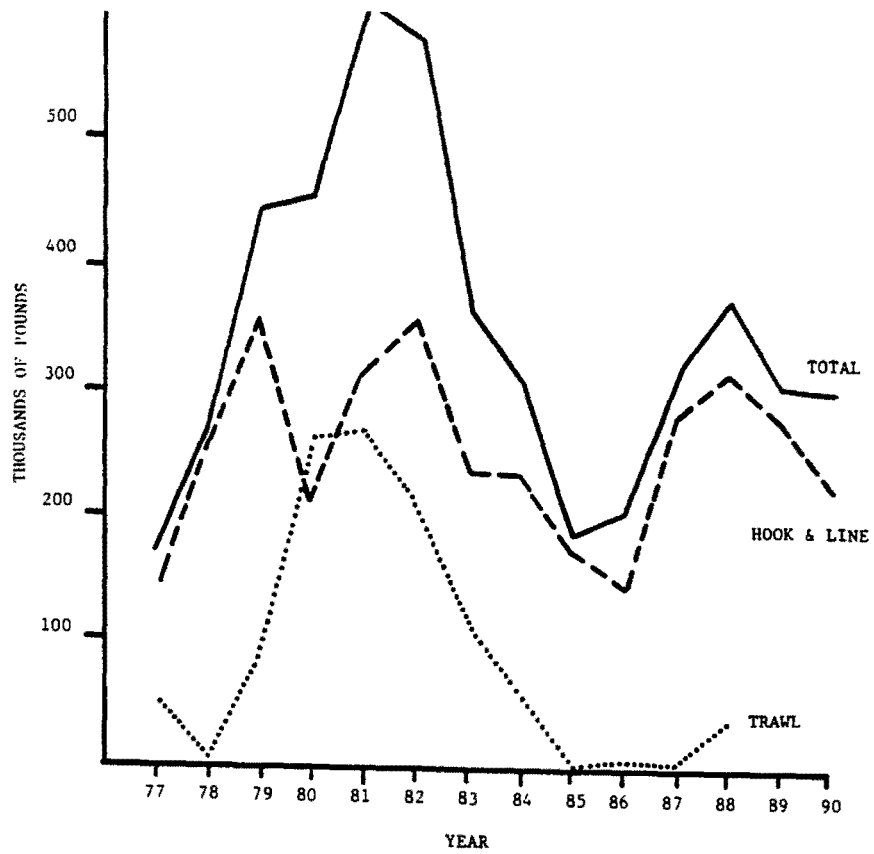


Fig. 26. Annual commercial landings of porgies.

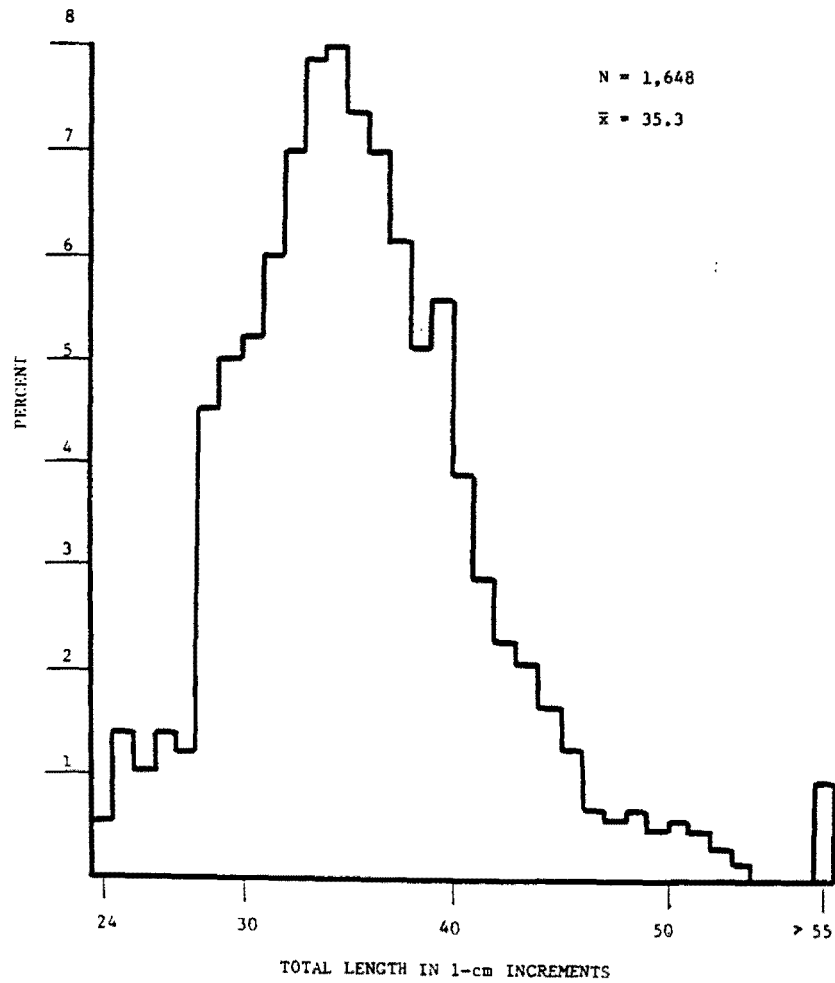


Fig. 27. Length composition of commercial landings of red porgies in 1990.

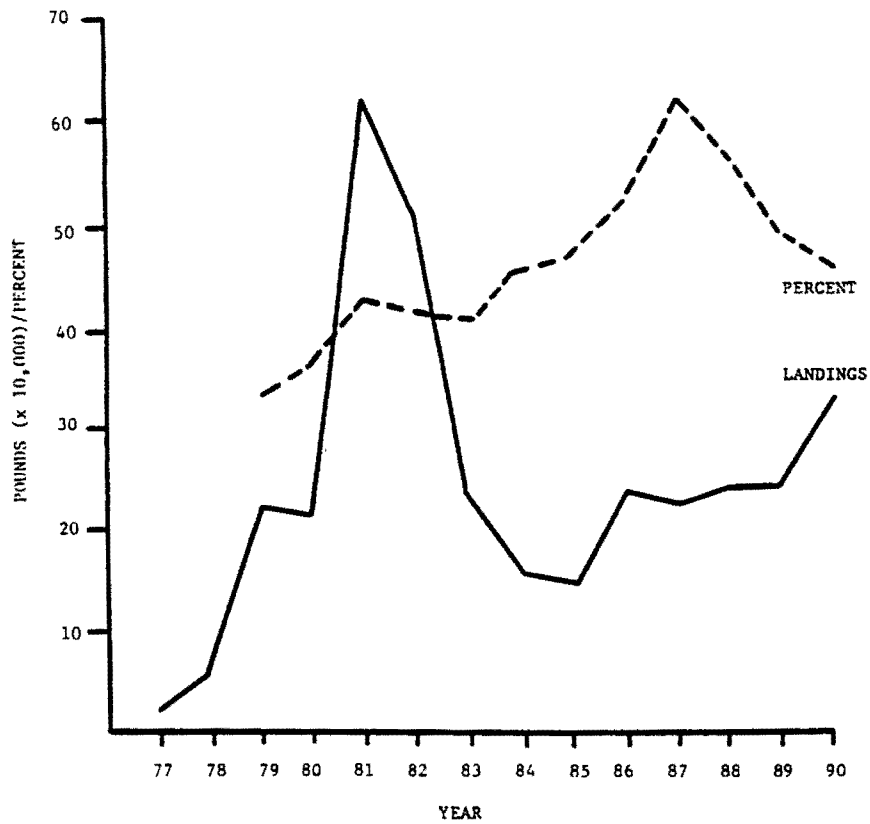


Fig. 28. Annual commercial landings of black sea bass and percentage of small fish in graded trap landings.

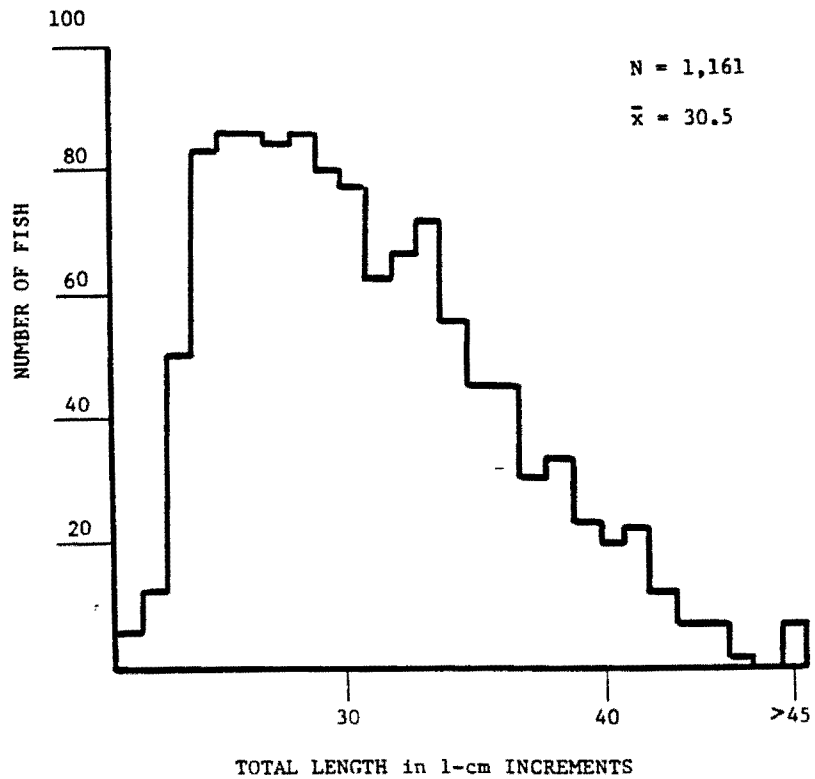


Fig. 29. Length composition of commercial black sea bass landings in 1990.

small fish). In the last few years, the percentage of small sea bass has declined, a positive trend continued in 1990. The overall size of the fish landed by all gears, however, was rather small (30.5 cm compared to 32.6 cm in the previous year) and length distribution (Fig. 29) was somewhat suggestive of high exploitation.

### Tilefishes

Two species, the northern or golden tilefish and the blue-line (gray) tilefish, were represented in the landings. The blue-line was largely an incidental catch of the bottom longline fishery targeted at snowy grouper. In the mid 1980's, landings of blue-line tilefish typically were about one-third of the volume of snowies. The percentage has steadily declined and in 1990 the blue-line landings equalled only 12% of the overall snowy catch.

The golden tilefish is more highly valued and the target of a directed longline fishery over mud bottom. The species is habitat-restricted in its distribution and was severely overfished in the mid-1980's. Landings increased in 1990 (Fig. 26) but remained far below those in the peak years of the fishery. Total value of golden tilefish was about \$262,000. The average size of fish landed in 1990 compared to that in 1981 (the first year of significant exploitation) indicated the degree of overexploitation. In 1981, the average size of fish caught by handline ranged from 80-86 cm and that of longline-caught fish between 78 and 82 cm. Overall commercial landings included about 21% by number of fish less than 70 cm; 32% of the longline catch was in this category. In 1990, about 77% of the longline catch was less than 70 cm (Fig. 27). About 21% of the 1981 longline catch consisted of fish larger than 90 cm, compared to 2% in 1990.

### Pelagics

The principal pelagic species fished commercially (other than swordfish) has been the king mackerel. Although targeted by a small troll fishery, the volume so landed in South Carolina has been small relative to landings by handline boats. In 1990, the troll catch was about 28% of the total species production. Total ex-vessel value was about \$265,000. Overall landings (Fig. 32) have shown no pronounced long-term trend and the size distribution (Fig. 33) suggested a relatively healthy stock. The average size has changed relatively little in recent years and was up slightly in 1990 (83.7 cm compared to 82.6 cm in 1989).

Other pelagic species landed included cobia, dolphin, and wahoo taken incidentally by trollers, handliners, and surface longliners. The principal targeted species was yellowfin tuna, largely responsible for the increased landings in recent years (Fig. 34).

### Sharks

Small sharks have traditionally been popular with coastal South Carolina consumers, although much of the demand has been met through recreational angling for personal use. Landings (Fig. 35) began to increase in the early 1980's, accelerating greatly at the end of the decade due mainly to production by bottom longliners. Part of the growth was attributable to increased consumer demand and concurrent improvement in unit value. Some of the increase also probably

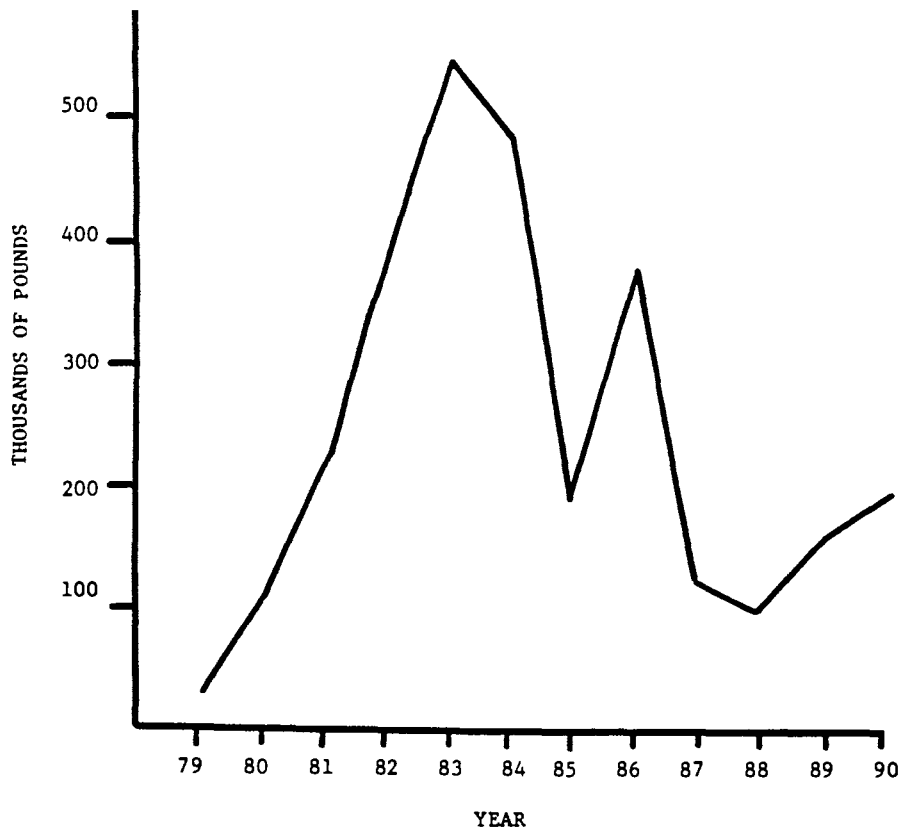
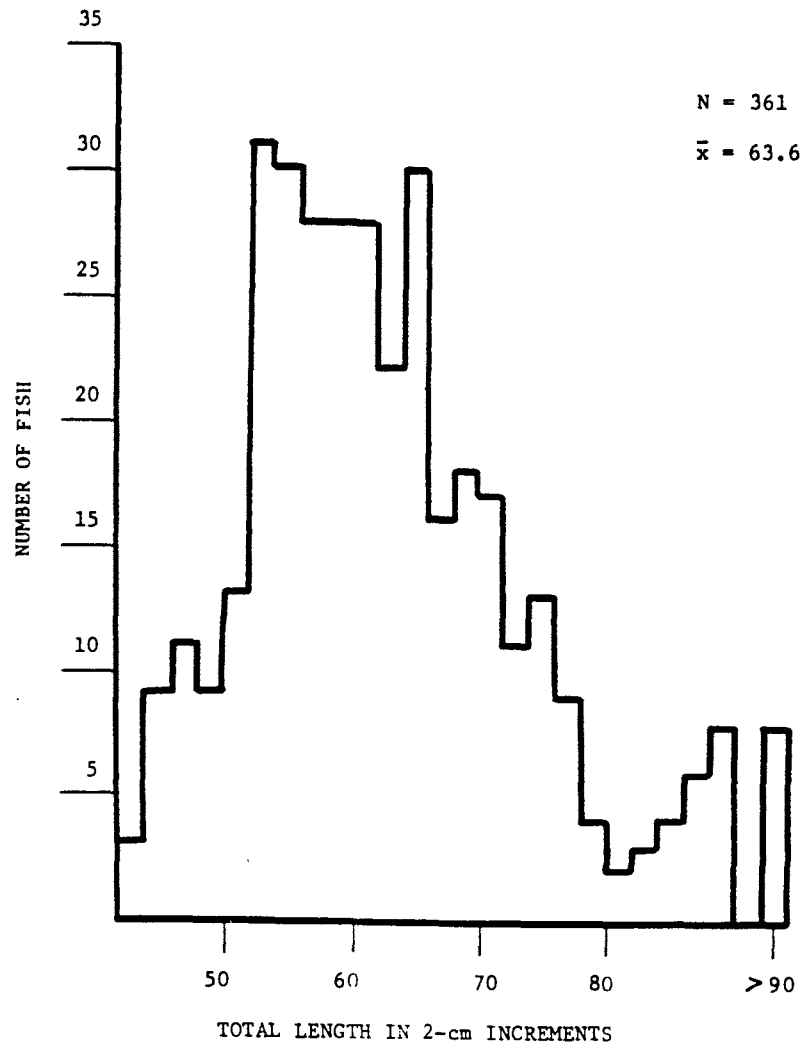


Fig. 30. Annual commercial landings of tilefishes.



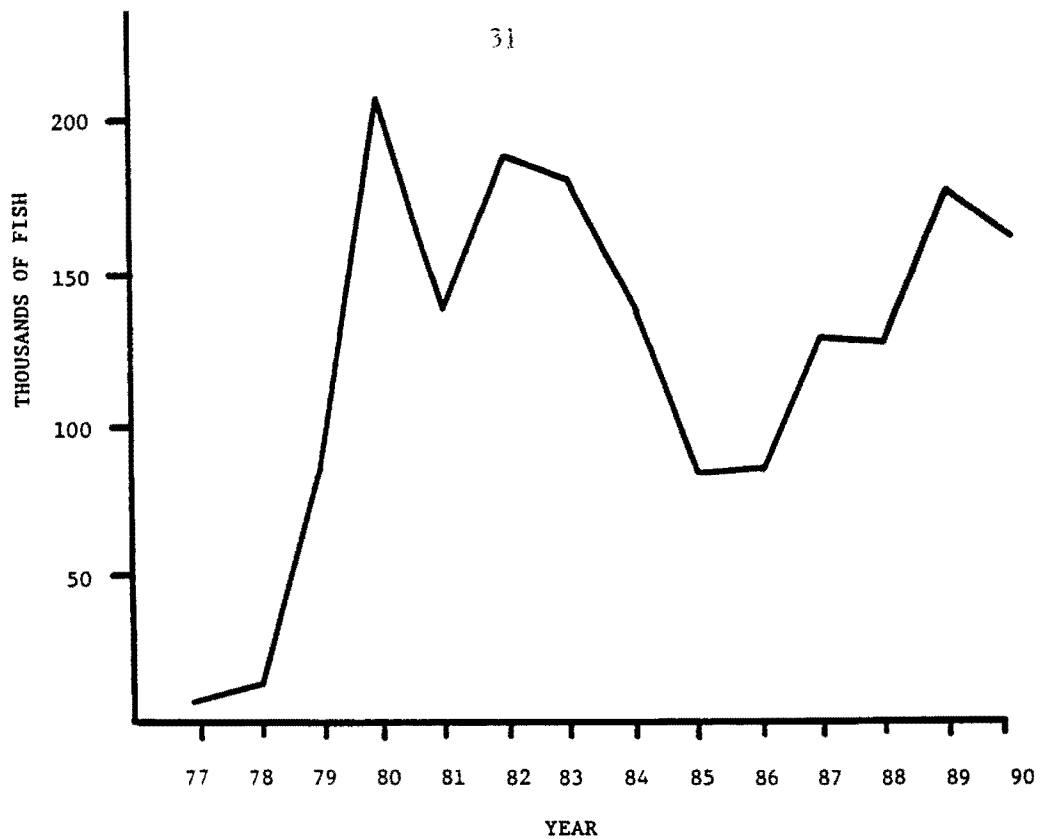


Fig. 32. Annual commercial landings of king mackerel.

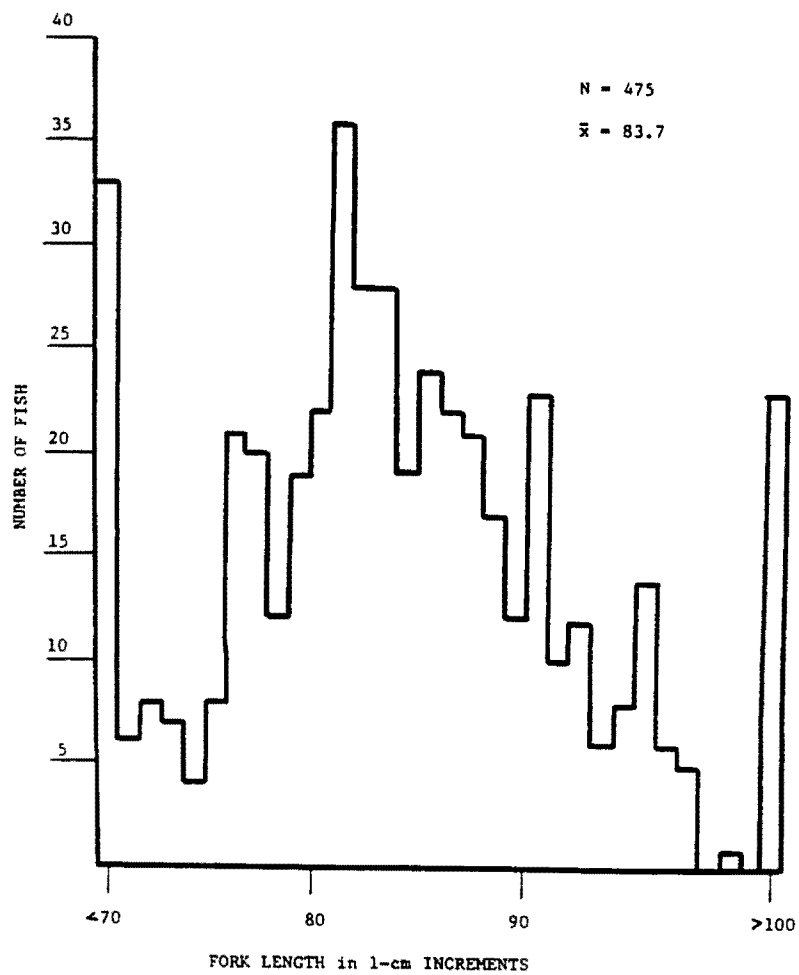


Fig. 33. Length composition of commercial landings of king mackerel in 1990.

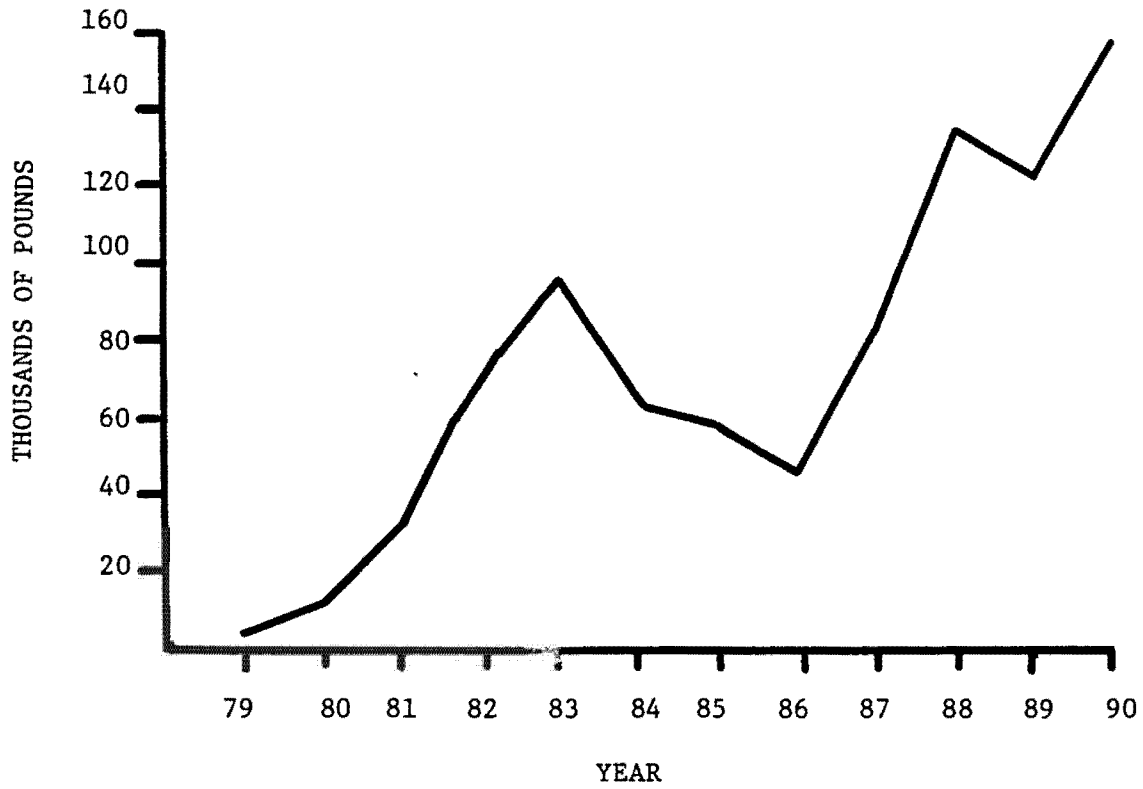


Fig. 34. Annual commercial landings of pelagic species.



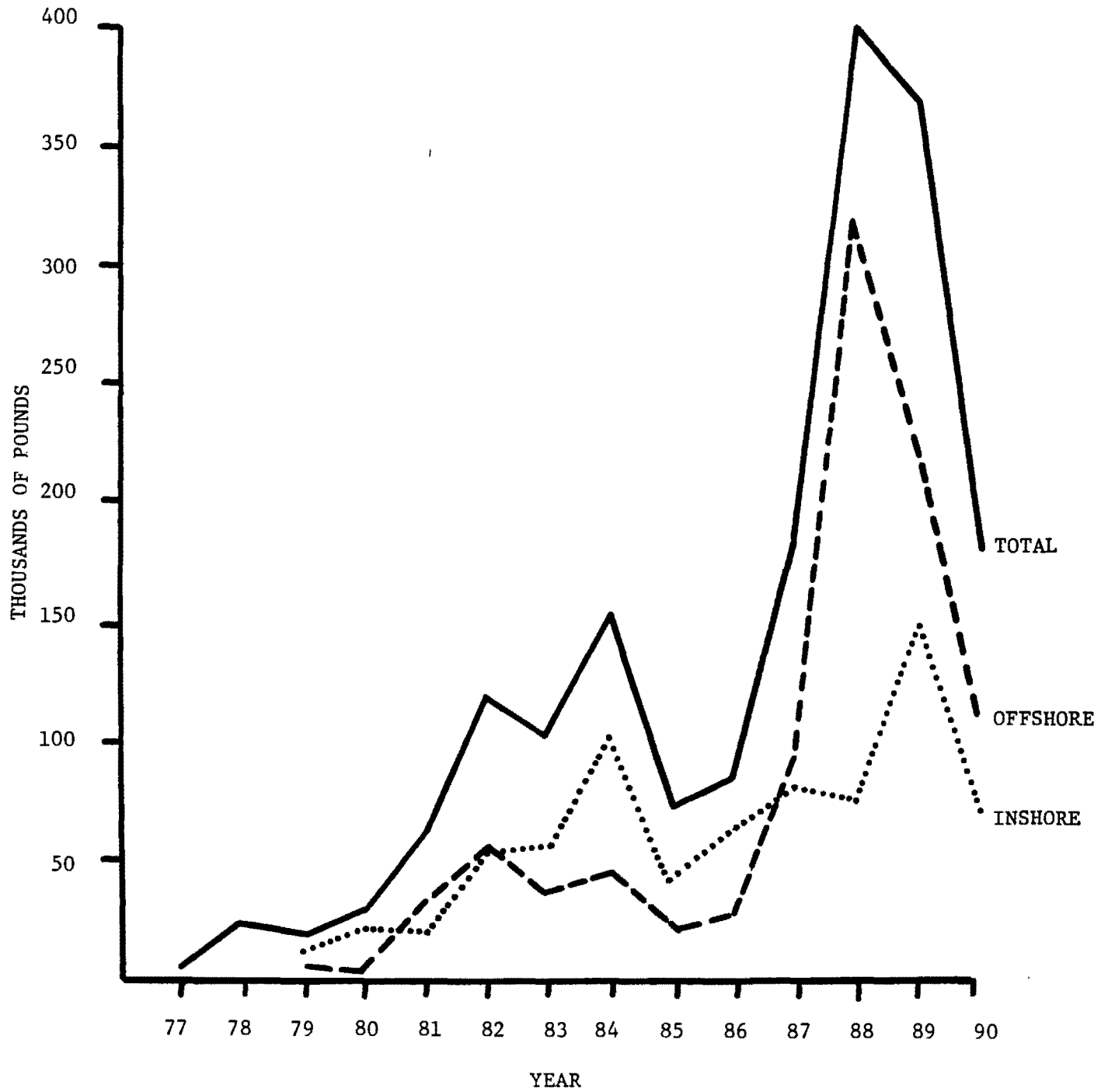


Fig. 35. Annual commercial landings of sharks.

reflected reduced abundance of other species. Unit value increased from \$0.46/pound in 1987 to \$0.59/pound in 1989. In 1990, however, the average price for all species dropped to \$0.54. Landings declined greatly to about 181,000 pounds, about 45% of the 1988 level. Total ex-vessel value was about \$98,000.

### Wreckfish

In 1990 state landings were confidential so little direct information regarding them can be provided.

Regional participation increased from about 20 boats in 1989 to at least 40 in 1990. Concern over the rapid increase in numbers of boats, effort, and landings caused the SAFMC to set controls on the fishery in June, 1990. An overall quota of 2 M pounds for the fishing year (mid-April through mid-January) and a 10,000 pound limit per trip were prescribed. The quota was nearly filled by the end of July and the regional fishery was closed on August 8. No fishing was allowed for the remainder of 1990

### COASTAL FISH

Included in this category are species taken in state waters (primarily mullet, sciaenids, sharks, and flounders). Overall landings in 1990 (about 312,000 pounds worth \$149,000) were slightly below 1989's and about one-third of the 1977-1988 average. Traditionally, mullet and spot have been the major components. Landings (Fig. 36) of both species have been insignificant the past few years.

Mullet was the leading volume contributor, representing 31% of the categorical landings. Historically, the Grand Strand fall haul seine fishery has been the major producer of this species and spot, the other traditionally dominant component of coastal fish landings. Landings in this fishery have fluctuated widely due to availability of migrating mullet, weather, and economic conditions. Both species are mostly consumed by low income groups and have a low unit value. In years of plentiful supplies, market demand has frequently limited the level of effort and landings. Beach access has become progressively more restricted and the number of working crews has steadily declined. In 1989, the hurricane struck just before the usual opening, fouled some of the customary beaches, and there was no fishing. Activity in 1990 was limited and the haul seine landings were the lowest in many years, only 20% of the 1977-1988 average.

Sharks represented 22% of the coastal fish catch by weight, although the amount landed was a little less than half of the 1989 production. Most of the inshore catch was taken with gill nets. The inshore component comprised 38% of the total shark catch, a slightly lower share than in the previous year. Unit value of the inshore landings was \$0.40/pound, well below the 1989 price of \$0.55/pound.

Whitings were the third most important component at about 21% of the group aggregate weight. Historically, landings have come mainly from the shrimp trawl fishery and have fluctuated widely (Fig. 37). The 1990 catch equalled the 1977-1989 average, though it was lower than in the most recent previous years. Part of the decline probably was attributable to reduced fishing effort in the

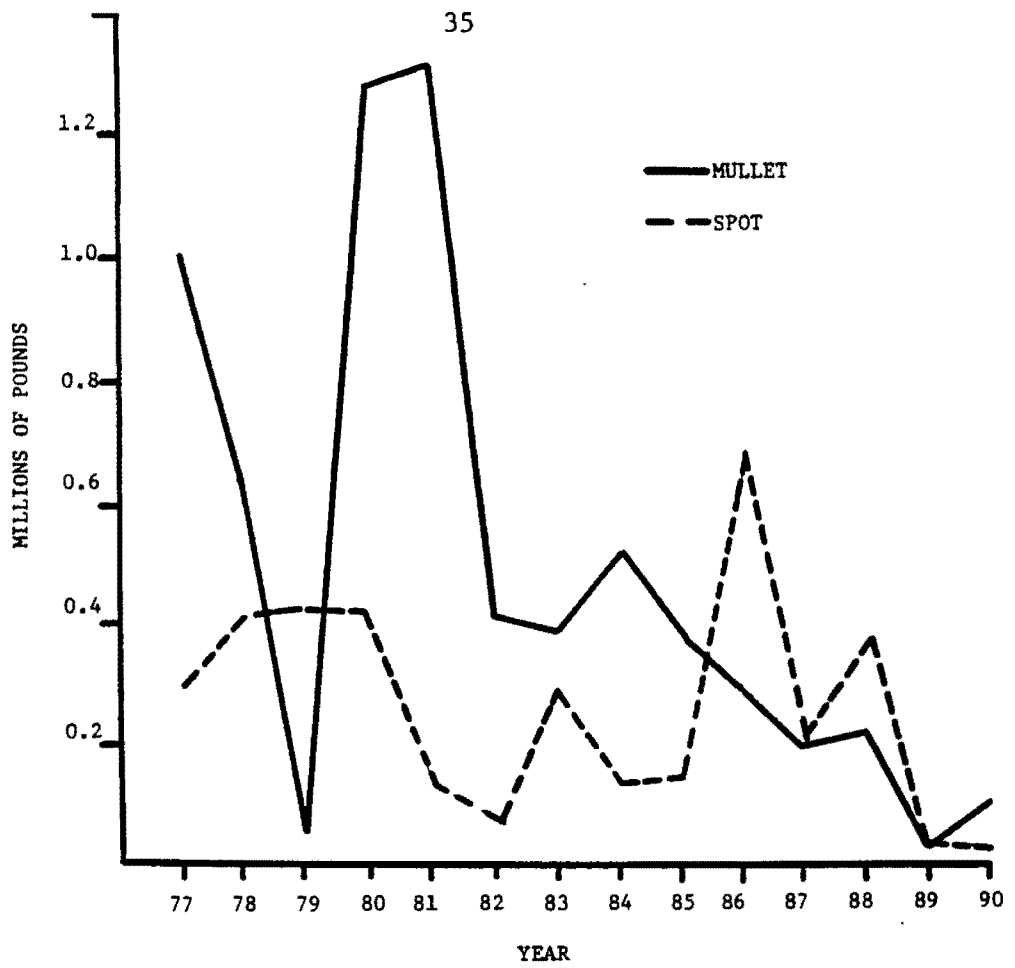


Fig. 36. Annual commercial landings of mullet and spot.

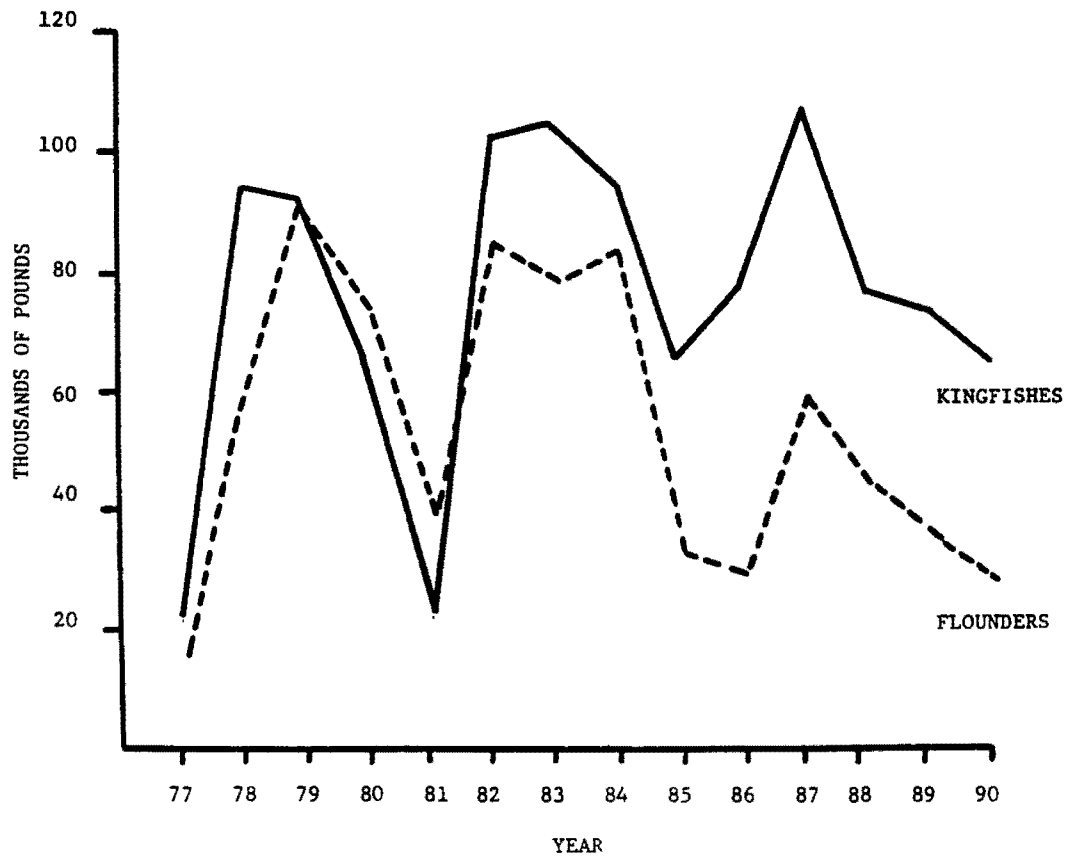


Fig. 37. Annual commercial landings of kingfishes (whitings) and flounders.

mixed-species trawl fishery during the spring FCZ closure.

Landings of spot were similar to those in 1989 and only 12% of the 1977-1988 average. Reductions in haul seine and gill net effort undoubtedly were primarily responsible, but abundance may also have been lower; the 1989 and 1990 recreational catches (mostly from the same area) were well below average as well.

Flounders have typically been a rather minor component of coastal fish landings but relatively important because of their much higher unit value. Most of the flounder have been produced by the shrimp trawl fishery. Catches have fluctuated widely (Fig. 37) but have been moderately well correlated ( $r = 0.67$ ) with those of whittings, suggesting some similar causative factor independent of abundance (unless that has varied similarly). The catches have not appeared to have been related to levels of trawl effort.

The overall trend in flounder landings has been one of gradual decline. An inshore finfish trawl fishery has been allowed under permit. This fishery operated off the Grand Strand beaches during January-April and targeted small flounders (and shrimp). In 1990, only eight trips were reported by one boat with negligible landings. Landings in previous years, however, were also inconsequential so the lack of activity in this fishery does not explain the recent decline.

The summer flounder stock has been in decline, particularly during the last few years. MRD onboard observations indicated, however, that this species was not the principal component of the catch retained by shrimpers; southern flounder was and stocks of this species are generally believed to be in good shape. TEDs were required during the summer of 1989 and all season in 1990. Results from an MRD by-catch study in 1989 indicated an appreciable reduction in the aggregate flounder catch of nets equipped with the Morrison TED (the most widely used device). If TEDs significantly reduced the catch of flounders, they also should have substantially reduced shark landings. The 1989/1990 average shark landings from shrimp trawlers were about 20,300 pounds compared to a pre-TED (1977-1987) average of 19,500 pounds. The effect of TEDs on recent flounder landings is therefore somewhat speculative, but there probably was some gear-related decrease.

Small flounders have been popular in local markets as pan-dressed fish. Although much of this fish was brought in from North Carolina, some also was provided by shrimp trawlers. Effective 6 June, a 12 inch total length minimum size limit for flounders landed in South Carolina was established. Since much of the incidental flounder catch of the trawlers observed in onboard by-catch studies in previous years had been below this size, it is reasonable to assume that the new regulation had an appreciable impact on landings during the remainder of the year.

#### RIVER FISH

Landings in this category (about 225,000 pounds) were the lowest in many years and consisted of American shad.

Historically, the major volume contributor has been blueback (river) herring, taken mostly in the Cooper River during the spring (March-May) migration to spawning grounds in lakes Moultrie and Marion. In addition to supporting a commercial fishery, bluebacks

are a major forage source for striped bass in the lakes and thus a primary concern of the Department's freshwater fisheries management section.

The Army Corps of Engineers rediversion project completed in 1985 directed most of the water flow from the lakes into the Santee River. To reduce silting in Charleston Harbor and lower its dredging requirements, the Corps negotiated an agreement with Santee Cooper to release an average water flow of 4,500 ft<sup>3</sup> per second into the Cooper River. This amount is insufficient to allow migration of herring up the river. Since the project's completion, the Department has documented a decline of about 72% in the spawning population, reflected in the decreasing commercial landings. Some relief was provided in March, 1990, when Santee Cooper announced that it would release a continuous flow of water during the spawning season rather than pulsing releases to meet power demands. There was, however, no fishery permitted in 1990 and the Department concluded that increased water flows would be necessary to restore the fishery.

Catfish also once represented a large component of the river fish catch. Landings have steadily declined since 1980 with none reported since 1987 and farm-raised product has captured the market. The sturgeon fishery has been closed since 1985 to permit stock recovery.

Shad landings (Fig. 38) typically have been 80-90% roe fish and have reflected a variety of factors, including river conditions at the time of upriver migration and market demand. Catch rates have appeared to reflect catchability (a function of river flow rate, turbidity, and water temperature) in addition to abundance. Shad have been exploited by 1) an ocean drift net fishery off the mouths of Winyah and Santee Bays, 2) an anchored gill net fishery, and 3) a drift gill net fishery. In 1990, the anchored net fishery accounted for about 24% of the reported landings. Upriver landings were made in late spring and were probably under-reported since much of the product was distributed locally. The overall ex-vessel value of shad landings in 1990 was about \$212,000.

Shad populations are discrete units. Those in most of the state's river systems appeared to be remaining stable. The Edisto stock may be an exception. Tagging studies suggested a fairly high rate of fishing mortality on Edisto fish and a more conservative management strategy for that system's fishery has been recommended by MRD.

## RECREATIONAL FISHERIES

Several significant regulatory changes were made during 1990 by the state legislature and federal agencies. On 31 May, a daily possession limit of 10 bluefish caught in waters 3 or more miles offshore went into effect. The Governor signed state legislation that, effective 6 June, extended the 14 inch total length minimum size limit for red drum to the entire year and established a 12 inch total length limit for flounders taken by all types of gear. On August 20, a 12 inch fork length (14 inch total length) minimum size limit was placed on king mackerel and a two-fish daily bag limit was

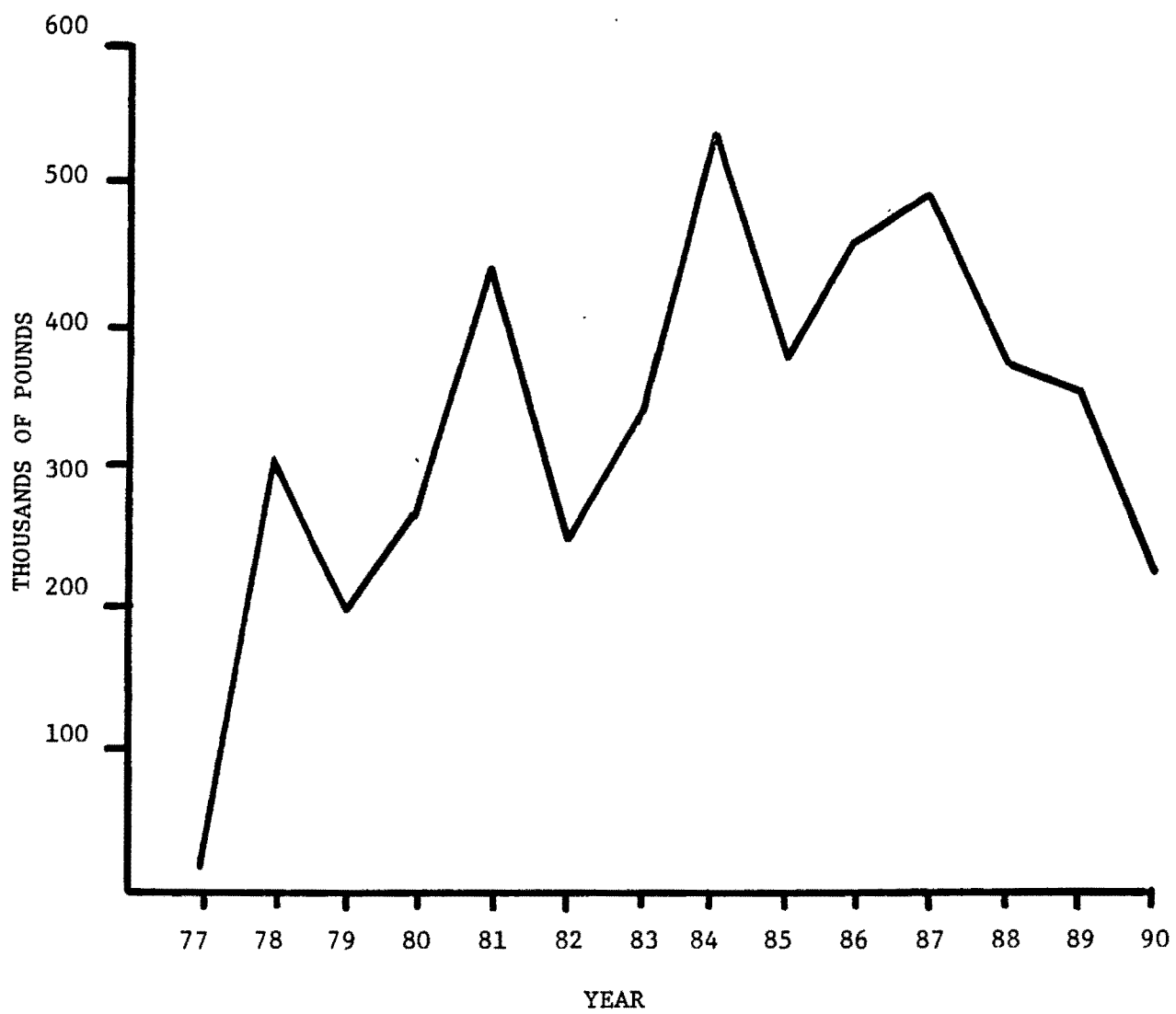


Fig. 38. Annual commercial landings of shad.

set for cobia.

#### PARTICIPATION AND EFFORT

The estimated total number of anglers in 1990 (408,000) was nearly identical to the 1979-1989 average (with 1982 and 1984 data omitted as outliers). With the hurricane year not included, however, only 1981 and 1986 had lower estimates (Fig. 39). Most of the apparent decline reflected a drop in the number of fishermen from out of state (33% below the 1979-1988 average).

From a management perspective, trends in levels of effort are more important than those in participation because of the relationship between fishing pressure and fishing mortality. Although the popular perception is that fishing effort has steadily increased, results from the MRFSS attest to the contrary. Estimated total effort in 1990 (about 900,000 trips) was down 18% from that in 1989 (Fig. 40). That by coastal residents was up slightly (1%) while effort by both non-coastal residents and out of state anglers declined appreciably. About 54% of all effort was attributable to private boat anglers. Shore fishing trips accounted for 36% and charterboat fishermen made 10% of the trips.

About 75% of the anglers interviewed in the MRFSS had fished in state waters (i.e., inland and out to 3 miles offshore). Of those who fished offshore of 3 miles, 79% were charterboat anglers. Only 11% of the charterboat anglers had made their trips in state waters. In contrast, 86% of the intercepted private boat effort had been directed at estuarine areas. About 5% had been expended in coastal ocean areas and the remaining 9% in the FCZ.

The percentage of South Carolina coastal households having a member who had fished in salt water during the previous two months declined and was the lowest in the South Atlantic region in 1990. The average number of marine fishermen per fishing household (1.47) was lower than in recent years. It also appeared that the average number of days fished per angler per year decreased.

Although lingering effects from the hurricane could have been contributing factors, this trend toward declining participation and effort is consistent with the reduced growth rate in marine angling reported nationally by the Sport Fishing Institute. Although coastal populations are steadily increasing, assumption of a proportional increase in recreational angling is unwarranted due to a "saturation effect." This occurs when the density of fishermen exceeds a certain threshold level and dissatisfaction attributable to the effects of crowding contribute to related declines in both participation and effort. Another contributing factor may be the generally unfavorable recent economic climate in the state. Working class residents comprised the majority of the marine recreational fishing population and 70% had gross annual household incomes below \$50,000 in 1989. Presumably, many in this group could have increased their worktime and have had less time and discretionary funds available for fishing.

#### CATCH AND CATCH RATES

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

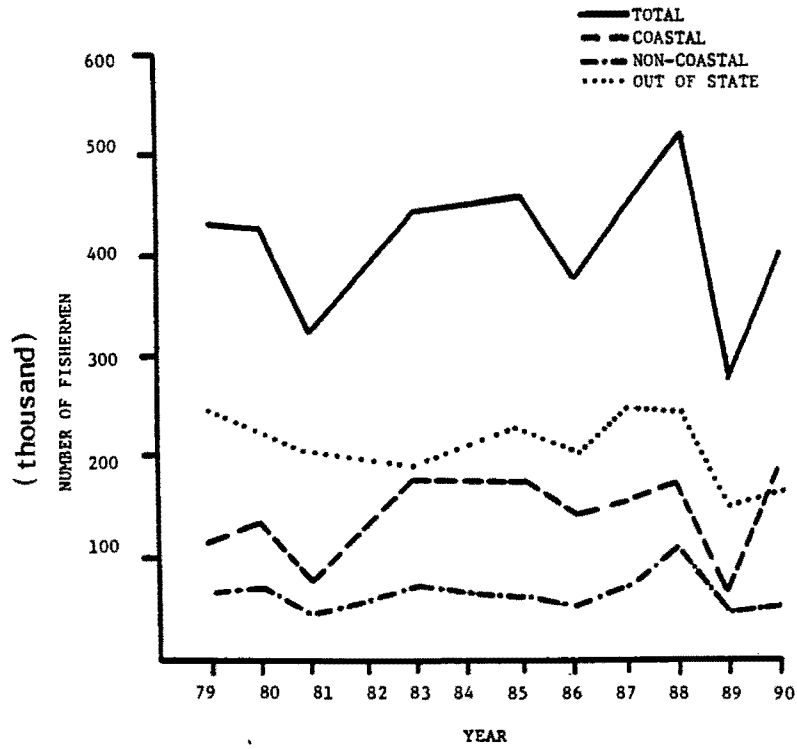


Fig. 39. Estimated participation in the marine recreational hook and line fishery.

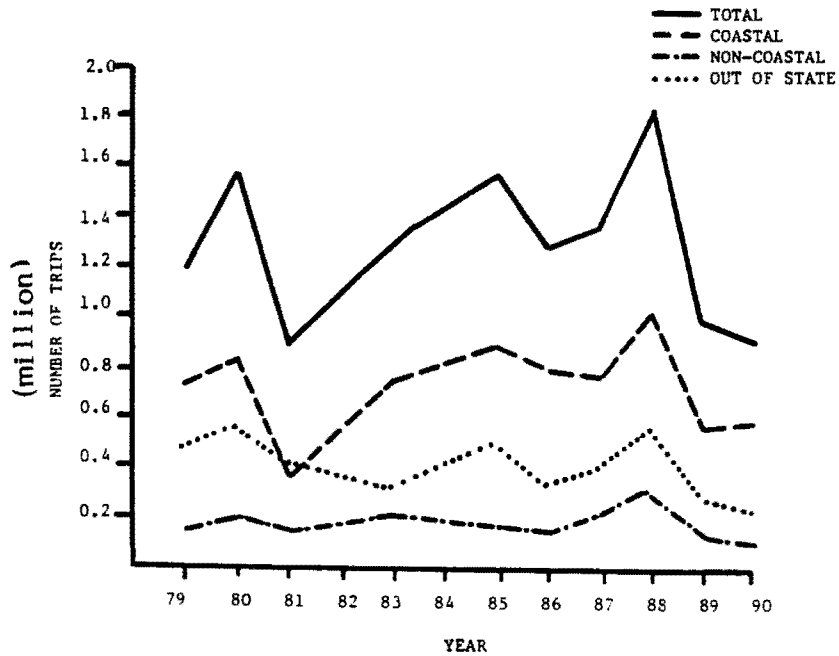


Fig. 40. Estimated effort in the marine recreational hook and line fishery.



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 well off the mark. Catches of some species, e.g. offshore pelagics were 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 in Table 1 are probably rather meaningless. For the most frequently caught fishes, the relative rankings and trends in catch appear to be reasonably reliable when considered in conjunction with commercial landings trends and anecdotal information.

Species preferences in 1990 were generally similar to those in recent years except for minor changes in relative ranking (Table 2). Perhaps the most notable change was a drop in the ranking of spot. This decline was probably attributable to the reduced number of pier anglers interviewed. The percentage of anglers targeting Spanish mackerel has increased considerably since the 1980's as its abundance has steadily improved. Sheepshead also appeared to be becoming more popular with private boat anglers, particularly during the first half of the year.

The estimated total catch in 1990 (2,133,000 fish) was the lowest since the MRFSS began (1979) and followed the second poorest year (1989). While the principal causative factor in both years appeared to be reduced effort, there were several instances where species catch rates also showed appreciable declines. Overall, however, there were no substantial changes in species composition within groups and declines were more or less evenly spread across all groups. This characteristic suggested that reduced effort was the main reason for the lower landings.

There was little change in the overall species composition (in numbers of fish) of the annual landings compared to that in 1989. In 1990, offshore pelagics comprised 1%, compared to 2% the previous year. Offshore bottomfish represented 10% of the 1990 catch vs 12% in 1989, although landings of the principal species - black sea bass were down nearly 68%. Regional sea bass landings have also been declining. The retention rate was somewhat lower also, suggesting a higher percentage of smaller fish (the length frequency sample was too small to evaluate). One possible explanation was that most of the 1989 catch was made during the cooler weather when the average size was larger, while a larger portion of the 1990 landings occurred during the warmer months.

Coastal pelagics were the principal targets of most ocean anglers and accounted for 14% of the 1990 landings compared to 12% in the previous year. Bluefish was the most numerous species as usual. Mackerel catches registered a substantial decline despite apparently healthy stock status.

Inshore sportfish comprised a somewhat larger portion of overall landings in 1990 (18% vs 10% in 1989). MRD biologists were seriously concerned about the impacts of the hurricane and December freeze in 1989 on recruitment of red drum and spotted seatrout to

Table 1 Total catches of South Carolina anglers during 1986-1990, in thousands of fish. NR indicates note reported. Source: NMFS.

Category	1986	1987	1988	1989	1990
<u>Offshore Pelagics</u>					
Dolphin	72	<30	26	11	14
Little tunny/bonitos	34	<30	18	9	4
Tunas/other	65	<30	1	3	1
<u>Offshore Bottomfish</u>					
Black sea bass	531	732	798	444	148
Groupers	<30	<30	4	7	14
Red porgy	<30	<30	27	70	23
Other porgies	NR	47	17	3	4
Snappers	<30	<30	26	34	11
Grunts	NR	<30	55	49	4
<u>Coastal Pelagics</u>					
King mackerel	254	71	118	74	51
Spanish mackerel	163	69	103	170	114
Bluefish	159	177	147	297	126
Barracuda	62	<30	25	9	1
<u>Inshore Sportfish</u>					
Red drum	196	509	542	150	183
Spotted seatrout	576	444	345	203	126
Summer flounder	NR	45	47	17	13
Southern flounder	206	65	103	51	55
Weakfish	78	<30	1	7	7
<u>Inshore Bottomfish</u>					
Kingfishes	1,049	474	424	169	82
Spot	1,863	757	1,810	1,125	148
Croaker	616	227	254	287	385
Sheepshead	70	<30	75	54	93
<u>Other</u>					
Sharks	207	391	168	111	56
Miscellaneous	1,228	2,161	1,624	1,096	446

Table 2 Targeted species, all modes combined, of those anglers who designated a particular species.

Species	Percentage of 1990 anglers	Rank	1989 rank	1988 rank
Red drum	25	1	3	2
Spotted seatrout	17	(tie) 2	2	3
King mackerel	17	(tie) 2	1	1
Flounders	12	4	5	5
Spanish mackerel	8	5	6	7
Sheepshead	6	6	8	8
Cobia	6	7	10	10
Spot	4	8	4	4
Sharks	4	9	7	6
Croaker	2	10	14	-
Kingfishes	1	11	12	-
Black sea bass	1	12	11	9

the 1990 fishery. Prior to the hurricane, young red drum were abundant but the numbers observed in spring of 1990 were abnormally low. Landings for the year, while improved over those in 1989, were well below the levels of recent preceding years.

Spotted seatrout are particularly vulnerable to winter kills and historically catches have been low in years following cold winters. Immediately after the December freeze and snowstorm, MRD staff received reports of fish kills in the Charleston area and observed dead fish (primarily spotted seatrout) at several locations. As expected, landings in 1990 were well below average and probably reflected significant mortality associated with the low December water temperatures.

Flounders were the other popular targets of inshore fishermen. Landings of summer flounder continued to be depressed, reflecting the uniformly poor condition of the stock throughout its range. The annual catch of southern flounder continued to be well below average, despite an apparently healthy population.

As in 1989, inshore bottomfish represented the largest component of the landings; the percentages were very similar in both years. Croaker was the dominant species, with landings continuing the upward trend observed in the last three years. Landings of spot showed the opposite pattern and were down 87% from 1989's, the absence of a large pier fishery probably being a significant factor. In most years, a sizeable percentage of the catch is made in coastal ocean waters, but only about 7% of the 1990 landings were from there.

Shark landings also continued a steep rate of decline since the peak year of 1987, although most of the catch appeared to consist of Atlantic sharpnose, considered to be in relatively good shape. The retention rate of sharks continued to increase, obviously a contributing factor is abundance is in fact on the decline. About 84% of the annual total catch was taken in state waters, (72% in estuarine areas, 12% in nearshore ocean waters). The principal species in inland landings, in order of numerical abundance, were croaker (24%), red drum (12%), pinfish (9%), and spotted seatrout (8%). Catches in nearshore ocean waters were dominated by Spanish mackerel (18%), bluefish (15%), pinfish (14%), and kingfishes (10%). About 16% of the total catch was taken in the FCZ, where the major components were black sea bass (24%), Spanish mackerel (18%), and king mackerel (14%).

Shore based fishing success followed the usual pattern, being highest in the early fall and in the northern counties. Average catch per angler (1.34) was low and the failure rate (half of all anglers caught nothing) was high. Species composition of the shore catch was somewhat atypical due to low landings of spot, normally one of the most abundant components.

Charterboat fishing characteristics were generally consistent with those observed in recent years in terms of species preferences by area and season and species composition of the catches. The overall failure rate in 1990 (35% of the anglers caught nothing) was slightly higher than in the previous year (32%). As usual, pelagic species were the principal target. The average catch rate (1.2 pelagic fish per angler) was identical to that in 1989, although there were area-specific differences. Success was down appreciably

in Beaufort County and up moderately in other areas. Mackerels were the primary species specifically sought by charterboat anglers, with king mackerel the most preferred individual species. Fishing success for king mackerel was far greater in the Georgetown/Horry County area than elsewhere. In 1988 and 1989, fishing for king mackerel was generally better during the spring run, while in 1990 the fall fishing excelled. With the overall index of catch rate calculated simply as the total number of fish caught divided by the total numbers of anglers (regardless of species targeted), there was little difference between 1989 and 1990 (0.48 in 1989, 0.51 in 1990). In the most productive area (Georgetown/Horry), the annual catch rate index was 1.27 fish per angler, vs 0.96 in 1989. The higher 1990 figure was primarily attributable to substantially higher fall landings; the hurricane eliminated most of the 1989 fall fishery. In contrast, angling success for Spanish mackerel appeared to be somewhat better during 1989.

Private boat fishermen generally were not as successful during 1990 as in recent years, with the overall catch rate down in each part of the state. Statewide, the average number of fish per angler was 3.4 in 1990 compared to 5.6 in the previous year. The failure rate (i.e., anglers catching no fish) was appreciably higher in 1990, particularly in Beaufort County. Since the private boat mode accounted for most of the estimated overall catch after expansion of the creel census data, the decline in total landings was mostly attributable to the decline in catch rates in this mode.

The statewide annual catch rate for red drum was 1.4 fish per private boat angler trip. Nearly half of the fishermen caught no red drum on their trip. The annual catch rate was highest in Beaufort County but this appeared to be due to sampling artifacts. The catch rate was lowest but most consistent from season to season in Charleston County (where sample sizes were the largest and most uniform from season to season). Catch rates from season to season were highly variable in the northern counties. In both Beaufort and Charleston Counties, about 58% of the private boat fishermen failed to catch a red drum during their trip, whereas only 28% were unsuccessful in the Georgetown/Horry County area.

Most of the spotted seatrout catch was made in Charleston County and small sample sizes in the other areas prohibited meaningful comparisons. Statewide, about half of the private boat fishermen targeting this species failed to catch at least one fish during their trip. The average annual catch rate was 1.4 spotted seatrout per angler per trip.

In Beaufort County, the overall private boat catch rate has steadily declined in recent years. Success for the popular inshore sportfish during the productive fall season has dropped sharply. The percentage of unsuccessful anglers has increased, particularly during spring and summer.

In Charleston County, changes in private boat angler catch rates have been less pronounced. The overall catch rate has declined slightly but there has been relatively little change in success for inshore sportfish. The percentage of unsuccessful anglers has varied with no pronounced directional trend.

The situation appears to be most favorable in the northern counties, where the overall catch rate has remained comparatively

high. This should be considered in the context that inshore bottomfish (spot, croaker, etc.) comprised a larger percentage of inshore landings here than in the other counties with the contribution of inshore sportfish being correspondingly lower. The catch rate of the latter group appears to have trended upward, due primarily to improved landings of red drum. The failure rate, consistently lower than elsewhere in the state, also appears to have decreased.

#### LENGTH COMPOSITION

The minimum size limit for red drum was in effect during the second half of the year. During this time frame, the percentage of undersized fish (10%) observed was lower than during the size limit periods in 1988/1989 (16% in both years). This suggested that public awareness and compliance with the regulation improved. The statewide annual average size (Fig. 41) of retained fish in 1990 was 45.7 cm, (18.0 in) compared to 46.3 cm (18.25 in) in 1989. About 46% of the total red drum catch was released in 1990 compared to 23% in 1989. If 69 cm (27.0 in) is considered roughly equivalent to the size at first maturity, then only 3% of the 1990 landings consisted of mature fish.

The average size (Fig. 42) of retained spotted seatrout was 37.1 cm (14.6 in) in 1990, nearly identical to that observed each year since 1986. Compliance with the minimum size limit appeared to be very good with no undersized fish seen.

The average size of retained southern flounder for the entire year was 35.6 cm (14.0 in). The 12 in minimum size limit went into effect in June and probably reduced the retained catch by at least 20% thereafter.

Average fork lengths of Spanish (42.0 cm, 16.5 in) and king mackerels (Fig. 43) (76.2 cm, 30.0 in) were virtually identical to those observed in 1989 and 1988.

#### HEADBOAT FISHERY

Estimated effort was 57,151 angler days, the lowest total since 1979 and well below the 1980-1989 average of 67,432 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). The principal decline was in the inshore category, where effort (32,809 angler days) was the lowest since reporting began in 1973. Inshore effort has trended irregularly downward since the late 1970's. Offshore effort (24,342 angler days) was substantially lower than that reported during 1987 and 1988.

The estimated total catch was 665,825 fish weighing 560,705 pounds. Offshore landings represented 58% of the numerical total and 75% of the volume. The principal species by number in the overall landings were black sea bass (51%), vermilion snapper (25%), and red porgy (7%). Assorted grunts represented 10%. The average catch per angler day was 9.8 pounds, the second lowest on record (the lowest was 9.4 pounds in 1984).

The inshore catch consisted mainly of black sea bass (88% by number). These were predominately small with an average individual weight of 0.44 pound. The average catch of black sea bass was 3.3

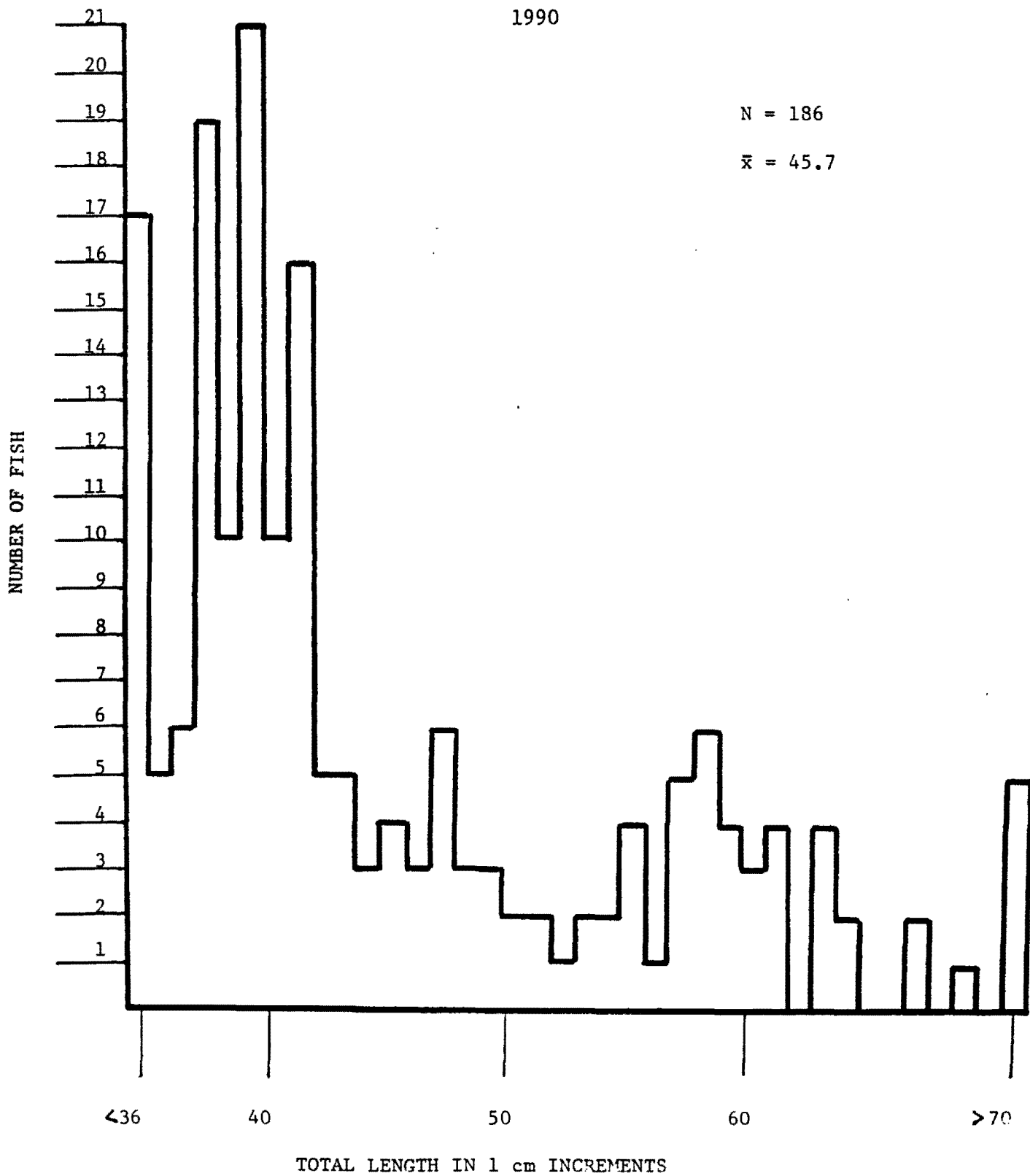


Fig. 41. Length composition of red drum.

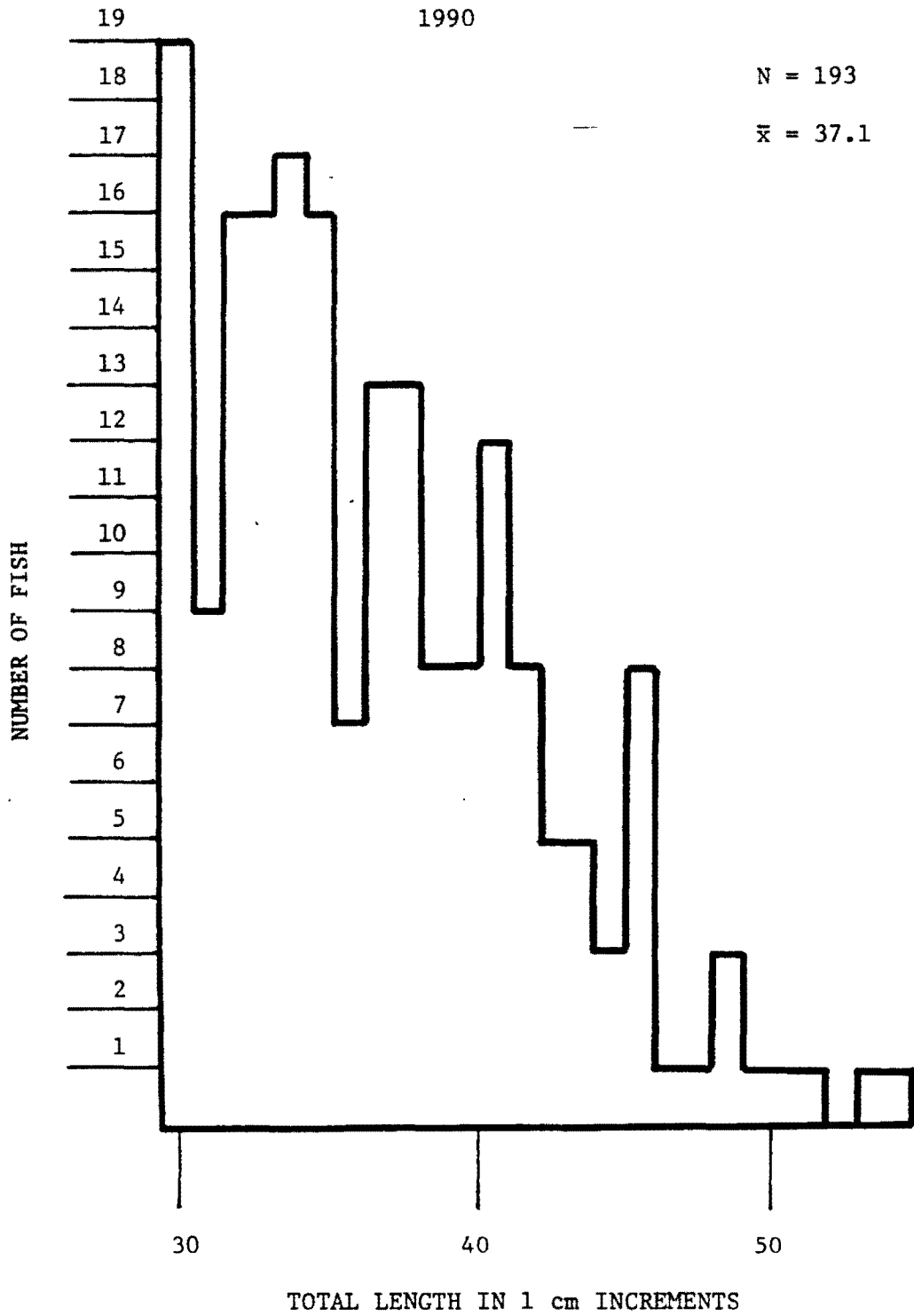


Fig. 42. Length composition of spotted seatrout.



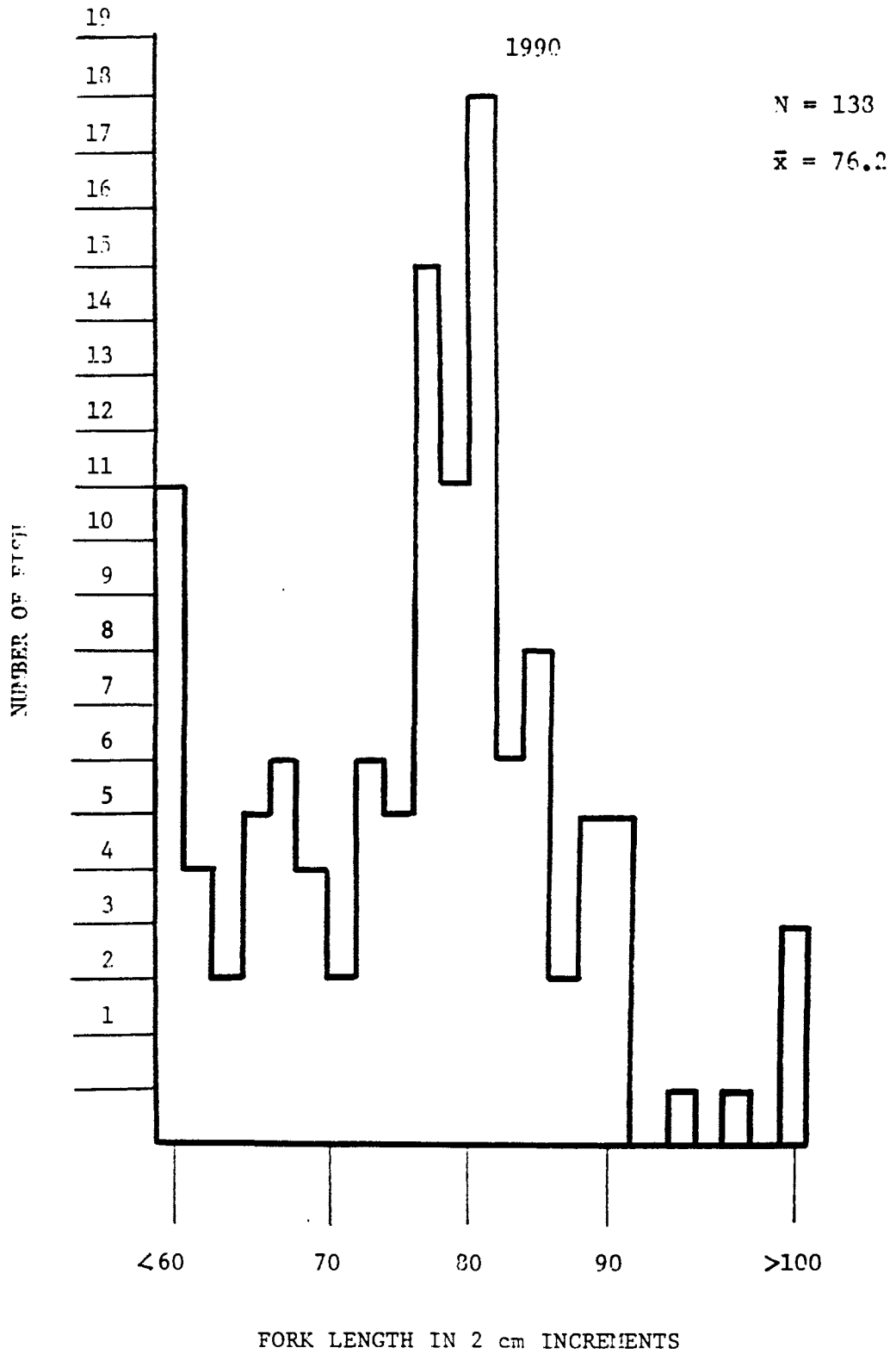


Fig. 43. Length composition of king mackerel.

pounds per angler day, the lowest to date. Grunts (primarily tom-tate) comprised most of the remaining inshore landings.

Vermilion snapper represented 42% by number of the offshore catch. The average weight was 0.65 pounds per fish, the same as in 1989. This species contributed 25% of the volume of the offshore landings. The next most numerous species was black sea bass (24%) and accounted for 15% of the volume. Red porgies contributed 14% of the landed weight and 12% by number. The average weight of red porgies was 1.27 pounds per fish, the same as in 1988 and close to the lowest yet recorded (1.12 pounds in 1989). Aggregate numerical landings of groupers (primarily by offshore fishermen) continued at the relatively high level of recent years and landed weight was second only to the 1983 catch. The percentage contribution of Mycteroperca (gag and scamp) groupers was the highest to date (89% by number, 95% by weight). The average weight of gag/scamp (6.8 pounds) was the highest since 1985 while that of Epinephelus groupers (mainly snowy) was the lowest to date (2.6 pounds).

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