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ACKNOWLEDGMENTS

Robert Wiggers obtained fish measurements and trip interview data from commercial finfish landings. Nan Jenkins and Paige Wilkins collected data on shrimp and shellfish commercial landings. Bryan Stone, Billy Glenn, and Pam Roy conducted the state creel census of recreational anglers that generated catch per unit of effort and length data. Joanna Walling entered and edited charterboat data and provided clerical assistance. Joe Moran supervised data processing operations.

Commercial fisheries data collection was funded in part by a Cooperative Statistics Agreement with the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA). The views expressed herein are those of the author and do not necessarily reflect the views of NOAA or any of its subagencies. Recreational fisheries data were collected with funding support by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K). The NMFS Laboratory at Beaufort, North Carolina provided data on the headboat fishery.

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INTRODUCTION

This report is a summary of significant events in South Carolina's marine fisheries during 1996. Its objectives are to 1) update and describe trends in the principal fisheries and 2) provide explanatory information relevant to important developments. The discussion is somewhat subjective in interpretive content, but represents consensus views of the supervisory staff of the management programs for the various fisheries. The presentation is directed at a general audience, makes some simplifications, and is not meant to be definitive in the scientific sense.

Publication of landings data for commercial fisheries began in 1957 and was based on a monthly reporting system established by the U.S. Fish and Wildlife Service (USFWS). Distribution of information was in the form of monthly bulletins.

Forms were mailed to seafood dealers, on which they were asked to report their landings for that month. Reporting specialists compiled this information and submitted it to the USFWS office in Washington, D.C. The S.C. Division of Commercial Fisheries also provided data. The specialists issued monthly narratives describing conditions and trends, the last in December, 1979.

The current series of annual reports prepared by the Marine Resources Division (MRD) began with an issue that reviewed trends and events for 1977-1986. Individual annual reports commenced with the 1987 issue. The context is similar to that of the USFWS monthly bulletins.

Data on commercial fisheries statistics were obtained through 1) mandatory monthly dealer reports, 2) mandatory shellfish harvest reports, 3) weekly shrimp tickets submitted voluntarily by dock operators, 4) trip tickets for offshore fishing boats submitted voluntarily by fish houses, and 5) reports provided by harvesters in special permit fisheries.

Annual fishing effort by gear type was usually estimated by dividing total landings compiled from all sources by the average catch per unit of effort (CPUE) calculated from tickets or harvest reports. The percentages of total landings so reported, and thus the accuracy of the overall effort estimates, varied considerably by gear type.

Commercial landings statistics applied to wild stock fisheries only. The mariculture industry suffered significant setbacks during 1996 and produced <\$500,000 worth of product. A virus caused heavy mortalities at shrimp farms with their production only 110,000 pounds worth \$375,000. The largest clam operation was restructured, due to financial problems, with curtailed production.

Commercial landings data were subject to confidentiality if less than three sources provided information. Appreciable volumes were involved in some categories. If three or four dealers handled an item, but only one accounted for most of the volume, this information was also treated as confidential. Confidential data were included in the summaries of total landings.

Reliability of commercial landings data is subject to the perception of under-reporting. State law restricts the use of this information to fishery management purposes only. It has been assumed that providers, particularly in a voluntary situation, have little incentive to submit falsified records. Verification was therefore seldom attempted, except where obvious anomalies were evident.

Health concerns dictated that shellfish landings were reported in detail and closely monitored. This information is considered to be very accurate. Most of the shrimp statistics were obtained from voluntary weekly tickets and were also considered quite reliable.

Federal reporting requirements have been implemented for most offshore finfish fisheries with the percentages of total landings accounted for by the MRD trip ticket system being much reduced as a result. This has made estimation of effort (based on ticket data) speculative for most of these fisheries.

Landings for 1996 in most product categories other than shrimp and shellfish were obtained primarily from monthly dealer reports. An increasing amount of the blue crab production has been channeled into the "basket trade" by individual fishermen and under-reporting is suspected. Upriver shad landings have been largely undocumented with the reported shad catches (mostly from dealers handling ocean and lower river fish) representing an unknown percentage of the total harvest. It was probable that incidental catches of (coastal) fish attributable to shrimp trawlers were under-reported. These customarily were part of the crews' compensation and were not handled by wholesale dealers.

The major source of recreational fishery data was the Marine Recreational Fishery Statistics Survey (MRFSS), conducted for the National Marine Fisheries Service (NMFS). This survey applied to hook and line fishing from shore or shore-based facilities, charterboats, and private boats (headboats were not included). MRD participation (in the creel census portion) terminated at the end of May. Work during the remainder of the year was completed by the NMFS contractor.

The MRD continued the State Finfish Survey independently of the MRFSS. Coverage was directed at private boat fishermen fishing inland (estuarine) waters. The principal objectives were to obtain length measurements and CPUE data for important inshore sport fish such as red drum, spotted seatrout, and flounders.

Because the MRD did not conduct any field work during most of the 1996 MRFSS, detailed information on that sampling was not readily accessible. In previous years, a separate report addressing the MRFSS and State Finfish Survey has been prepared and has served as the principal documentation of the recreational finfish fishery. For 1996, the results from both surveys were included in the present report and a separate marine recreational fishery survey report was not compiled.

State law required operators of piers, charterboats, and headboats to obtain permits and submit monthly reports of their fishing activities. Pier operators reported the numbers of anglers using their facilities each day on a monthly calendar. Charterboat captains completed logsheets for each fishing trip, listing the date, number of anglers, hours fished, and catch data.

Headboat operators were required by federal regulation to submit trip reports to the NMFS (their state obligation was met by providing copies to the MRD). Information elements were similar to those on the charterboat reports. The NMFS Beaufort Laboratory had the federal responsibility for processing these data. To avoid duplication of effort, the MRD relied on summary information provided by their staff.

No directed effort was made to monitor recreational shellfish gathering. Results of a 1994 survey of buyers of the marine fishing stamp (required for shellfish harvest) indicated that rough estimates of recreational landings could be based on percentages of the commercial production. These are therefore noted under Commercial Fisheries in the Shellfish section.

A similar survey was conducted during 1996 and included a section on recreational crabbing. Results permitted some rough estimates of statistics for this activity and they are contained in the discussion of the commercial blue crab fishery to facilitate comparison of utilization by each sector.

A survey of the shrimp baiting fishery has been conducted each year since 1987. Results of the 1996 survey are described in Data Report Number 25. A brief summary is included with the discussion of the commercial shrimp fishery, again because of the emphasis on comparative harvests.

COMMERCIAL FISHERIES

Product categories were composed as follows. Shrimp landings included whole (heads-on) weights of all penaeid species (rock shrimp landings were negligible). Crab landings included live weight of blue crab and pounds of stone crab claws. Shellfish volumes were expressed as meat weights with other units (bushels of oysters and whelks, 250-count bags of clams) noted where appropriate.

Most fish landings were converted into round (whole) weights. Shark landings taken on offshore gear were categorized as "offshore" and those by inshore gear (almost entirely shrimp trawl) were designated "inshore." "Offshore fish" included wreckfish, king mackerel, oceanic pelagics (dolphin, wahoo, tunas), swordfish, and reef fish (e.g. groupers, snappers, sea bass, porgies, and tilefishes). "Coastal fish" consisted of mullet, inshore groundfishes, e.g. spot, whiting (kingfish), and flounders. Riverine fish were mainly river (blueback) herring and American shad.

Except where noted otherwise, all value figures refer to ex-vessel value, i.e., the amount paid to the harvester. For trend analyses, these have been adjusted by weighting factors based on the annual Consumer Price Index (CPI). All figures shown are expressed in 1996 dollars.

South Carolina is not a major producer of seafood. In 1996, the state ranked 20th in volume and value of overall production (including mariculture) among the coastal states (Fig. 1). In Fig. 1, the data for Alaska are not included. Most of the landings were shipped out of state as raw or unprocessed product.

The state's seafood industry consists largely of harvesting with little processing to add value to the raw product. In FY 1995/1996, there were 293 licensed wholesale seafood dealers. A detailed description of operating characteristics is contained in the 1994 report; there have been few changes since then.

Processing was largely limited to initial handling, such as shrimp heading, oyster shucking, crab picking, and fish filleting. An annual survey has been conducted to obtain approximate employment figures. The 1996 survey was limited to the large wholesale dealers only. Many other operations were limited to the dealer himself and one or two part-time employees. Complete figures for 1996 were not available at the time this report was prepared, but probably were not substantially different from those in the previous year (see Data Report Number 26).

The number of commercial fishermen was unknown, but presumably was between 1,500 and 2,000. In order to legally land product, an individual had to possess either a trawler captain's license or a land and sell license. In FY 1995/1996, there were 902 trawler captain and 665 land and sell licenses issued. Additional licenses were required for units of gear and/or participation in various fisheries; for example, 292 shellfish harvester and 429 crabber licenses were sold. Since some persons obtained several of these gear licenses in addition to the land and sell or trawler's captain licenses, the totals were not additive. Crew in most fisheries were not required to have any type of license and could therefore not be documented.

Total landed weight from wild stocks was 15.894 M pounds,

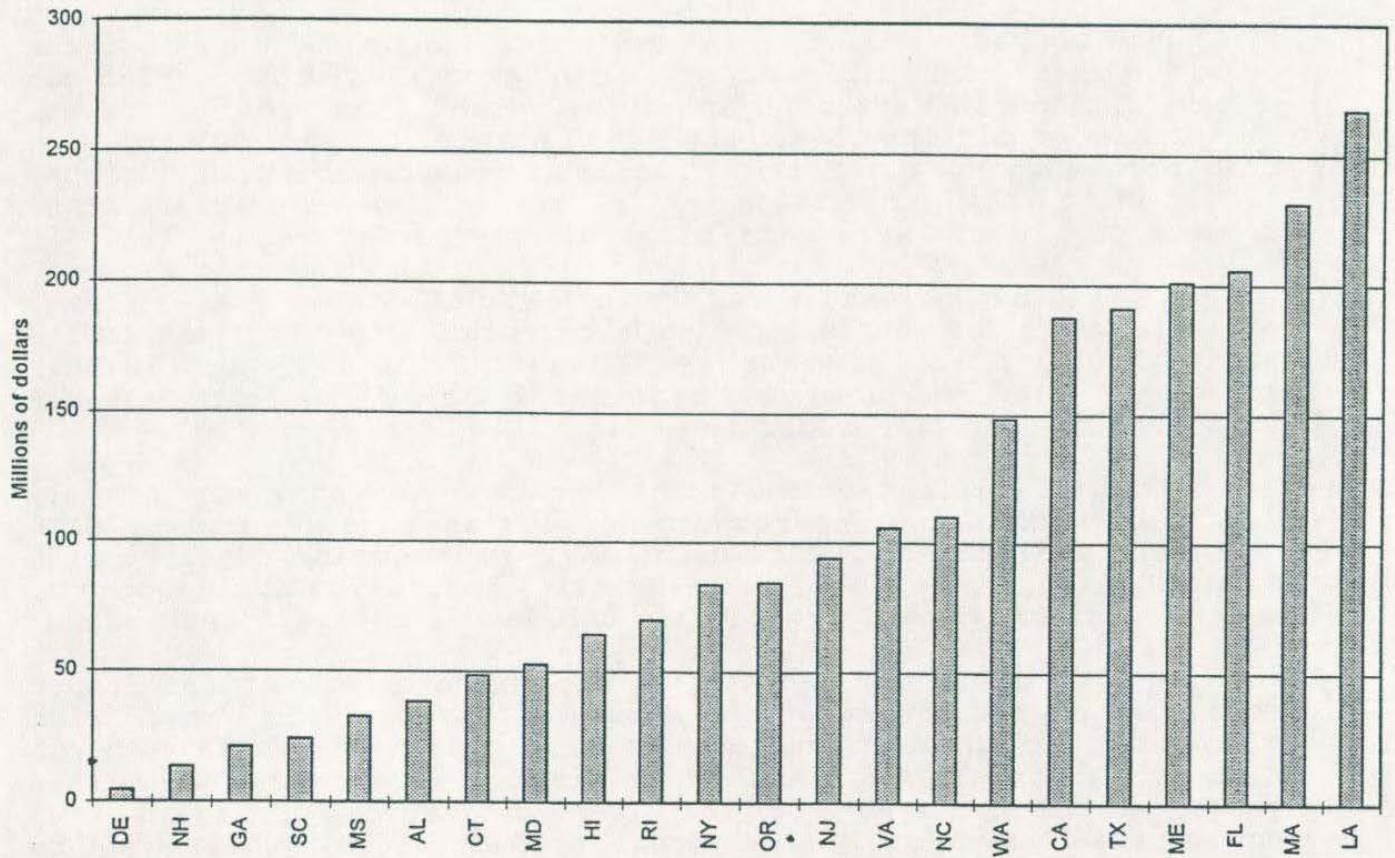


Fig. 1. Landed value of seafood production in 1996 by state.

about 90% of the 15-year average and the biggest one-year decline in recent years (Fig. 2). Decreased production occurred in every category except riverine fish (up 50%). The most significant drop was in shrimp landings, only about half those reported in the record year of 1995.

When comparing landings in the other groups to those from the previous year, it should be kept in mind that 1995's production was unusually good in most categories (by recent standards). Coastal fish landings declined 59%. Shellfish harvest dropped 23% and blue crab production was off 18%. Landings of offshore fish declined 14%. With the exceptions of riverine fish and blue crab, production levels were also below the 15-year averages (Fig. 3).

Total landings were worth \$23.876 M, well below average (Fig. 4). Nearly all of the decline was attributable to decreased shrimp production with landed value >\$9 M less than in 1995 just in this category. Shrimp, however, remained by far the most valuable component of overall production (Fig. 5).

South Carolina's commercial seafood industry is heavily dependent upon estuarine resources, such as penaeid shrimp, blue crab, and shellfish. Juveniles of several important offshore fish species, e.g. gag grouper, also inhabit the estuaries, although the extent of their dependence on this habitat is not well understood.

In a rough sense, the status of aggregate harvest from these resources reflects that of the habitat from which they came (with allowances for effects due to short-term conditions, such as harsh winters, severe storms, and acute disease outbreaks). The 1996 yield, while only 90% of the 15-year average, followed five consecutive years of above-average productivity. This suggests that the productive capacity of the state's estuaries has held up relatively well despite well-publicized concerns about increased coastal development.

Charleston County was the leading producer with 43% (\$10.88 M) of the total landed value, including mariculture (Fig. 6). Value was about two-thirds of that in 1995 with most of the decline attributable to reduced shrimp landings (mariculture production was also sharply curtailed due to viral outbreaks). The county led in shrimp landings with 1.25 M pounds heads-off of wild production worth \$4.60 M. Total fish landings were 1.35 M pounds worth \$1.98 M. Nearly all of the wreckfish catch was landed here. Blue crab production (all categories) was 2.82 M pounds valued at \$2.14 M. The county was the leading shellfish producer with \$1.95 M in landed value. Charleston County operations accounted for practically all of the state's mariculture production.

Beaufort County produced \$6.57 M, also down appreciably from the exceptional 1995 level. The leading contributors were shrimp (1.10 M pounds heads-off worth \$4.20 M) and blue crab (2.70 M

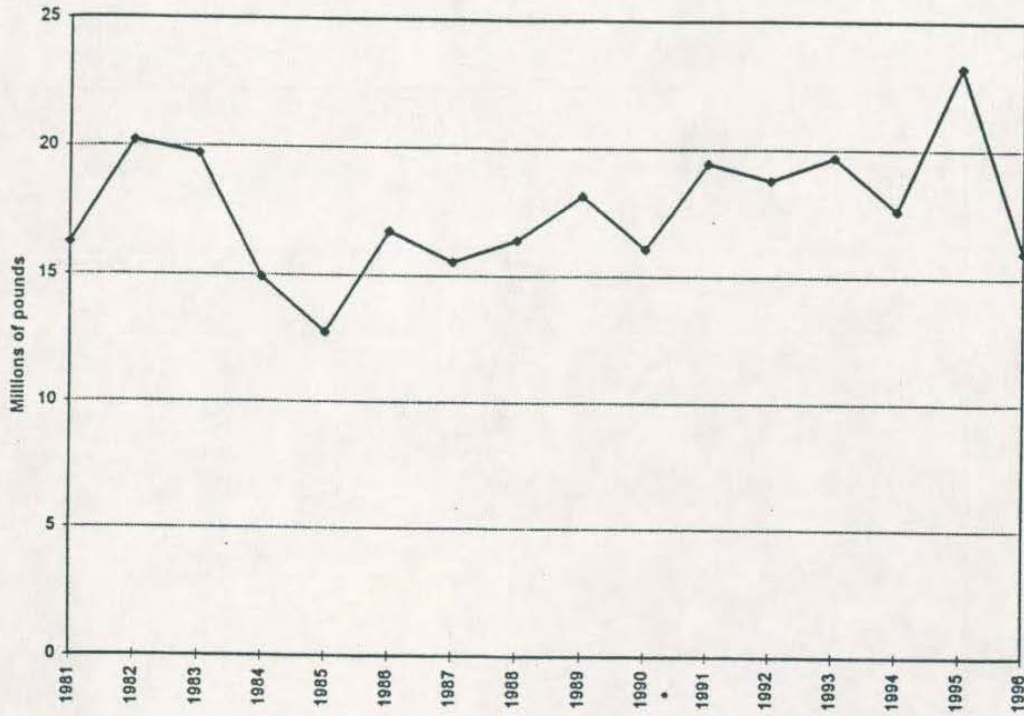


Fig. 2. Total weight of commercial marine fisheries products.

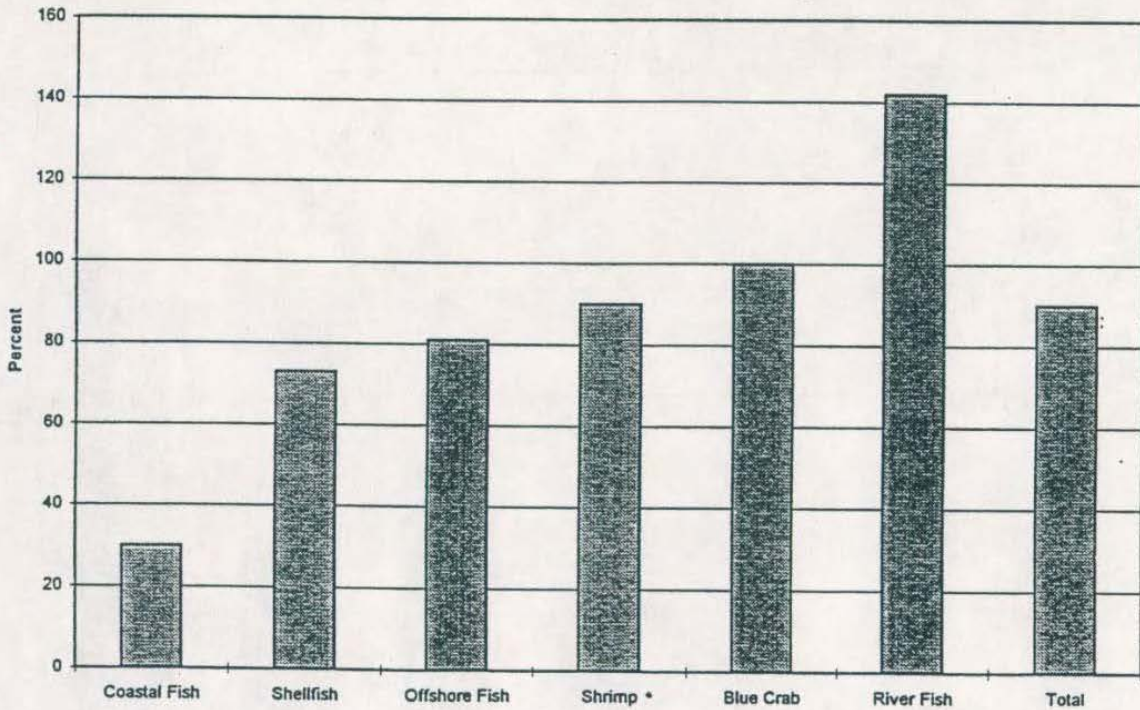


Fig. 3. Production (volume) compared to 15-year averages.

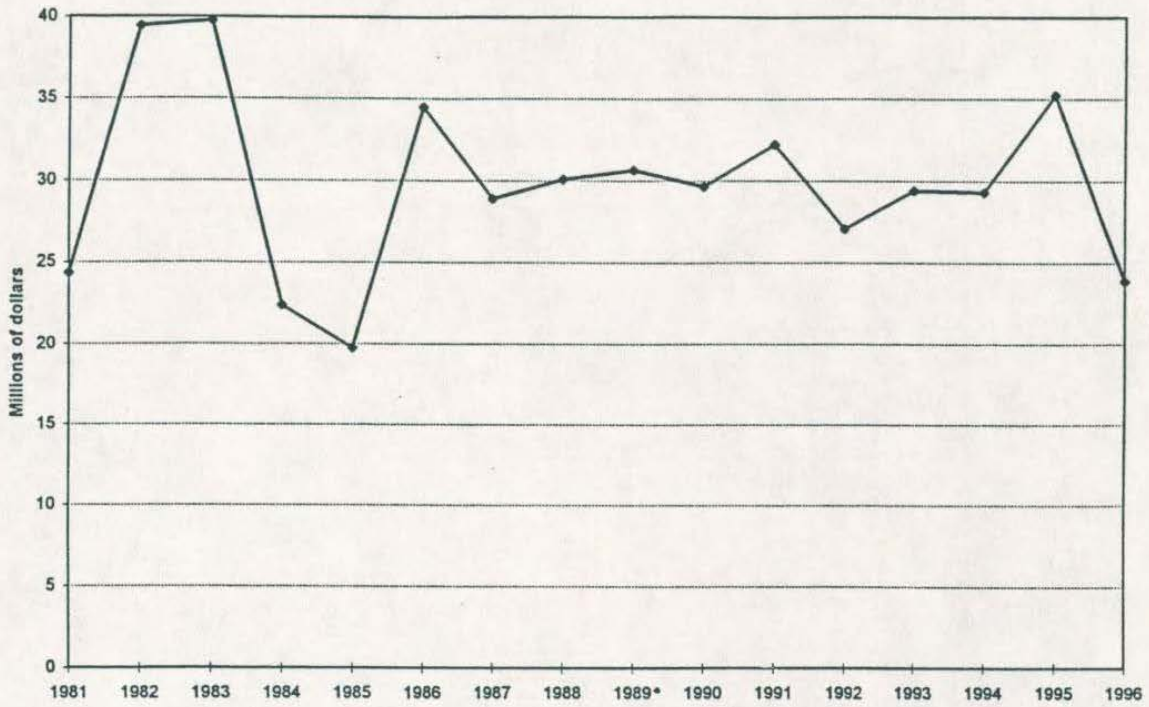


Fig. 4. Total ex-vessel value adjusted for inflation in current dollars.

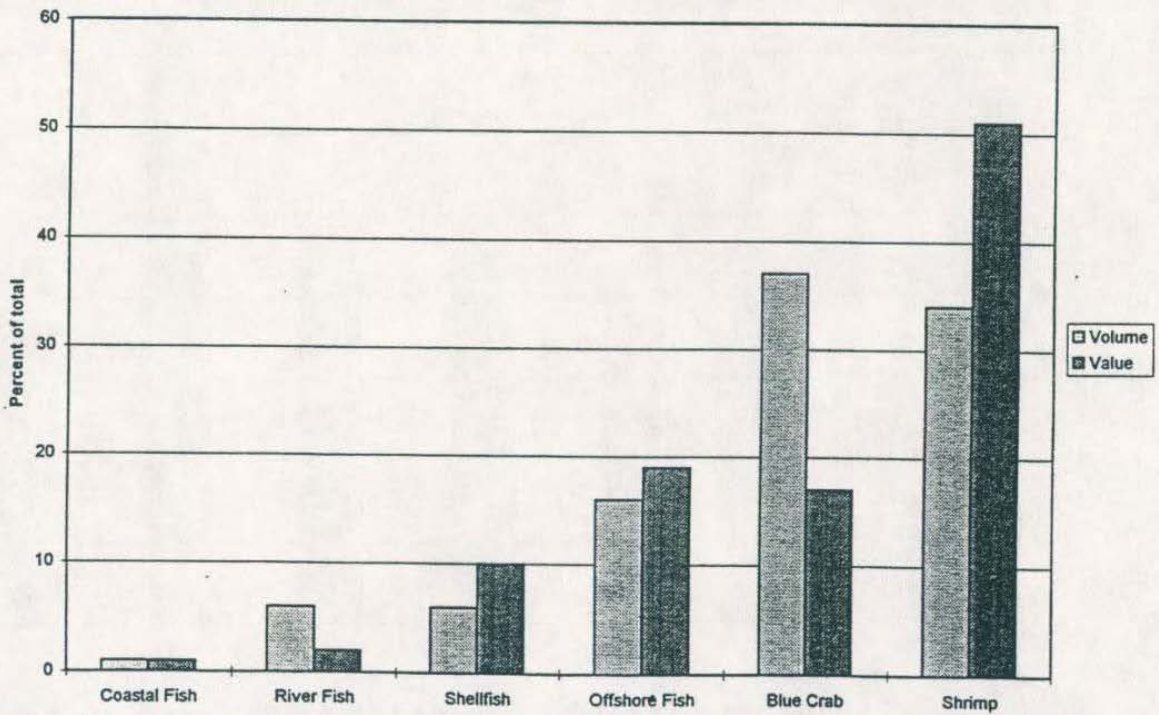


Fig. 5. Weight and value composition of commercial landings.

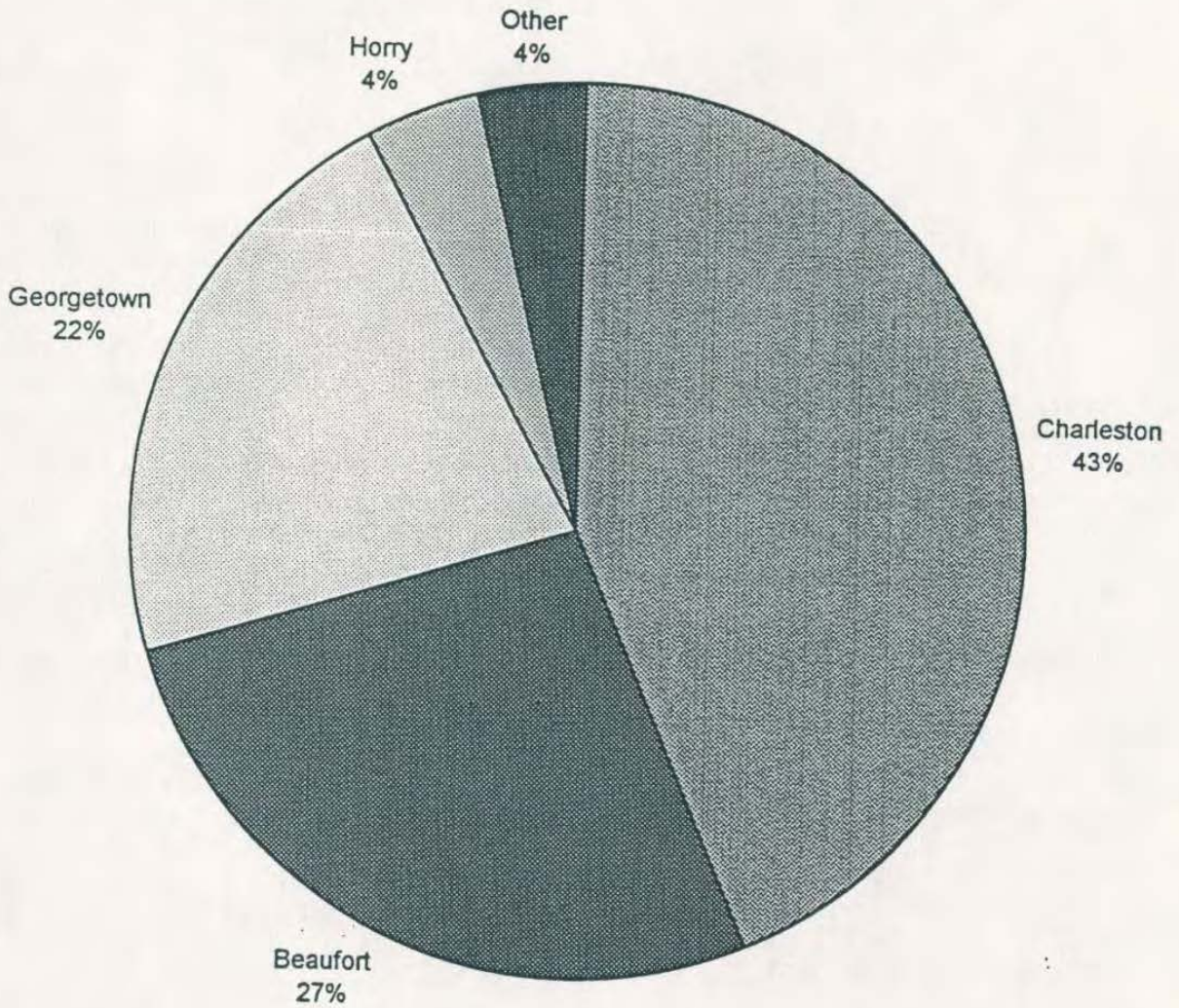


Fig. 6. County distribution of landed value.

pounds at \$1.59 M). Shellfish landings included 26,725 bushels of oysters (\$350,000) and 6,215 bags (250-count) of clams (\$167,000).

Georgetown County fishermen accounted for \$5.39 M in landings with shrimp (\$2.50 M) and fish (\$2.43 M) the major components. Horry County harvesters contributed \$0.89 M in landings, mostly of offshore fish.

SHRIMP

Penaeid shrimp landings were 5.37 M pounds worth \$12.19 M. Nearly all of the steep decline from the record production of the previous year was attributable to white shrimp (Fig. 7).

A total of 793 trawler licenses was issued for FY 1995/1996. Although the number of resident licences (540) remained comparable to that in the previous three years, the number of nonresident licenses was the lowest in ten years.

The winter was considerably colder than those in recent years with an extended period of water temperatures below the 47 degree F threshold level of significant mortality to overwintering white shrimp. Relatively few local shrimp survived to comprise the spring "roe" stock, although spawning success appeared to be fair. As a result, there was no appreciable fishery for these large, valuable shrimp.

Outmigration of brown shrimp was relatively late, which usually contributes to relatively large size. Although brown shrimp were not especially abundant, particularly in the Charleston area, the statewide harvest (1.875 M pounds) nearly equalled both that in 1995 and the 15-year average. Average size was good with landings running about 70% 55 count or larger, resulting in a unit price appreciably higher than that in 1995. Total value of brown shrimp landings was \$3.676 M (Fig. 8).

Based on the small spawning stock, fall white shrimp landings were expected to be below-average. The August emigration rate appeared to be comparable to that in 1993 and was not as affected by heavy rainfall as in 1991 and 1995. Hurricane Fran passed close to the coast during the first week of September, however, with heavy rains. Another major storm (Josephine) caused heavy rainfall in mid-October. Both events disrupted the fishery during periods of normally peak production. Total white shrimp landings were 3.485 M pounds, the lowest since 1988 and about 88% of the 15-year average. Landed value (\$8.495 M), after adjustment for inflation, was the lowest since the severe winter-kill year of 1985 (Fig. 8).

The channel net/trawl season in Winyah and North Santee Bays was opened on September 6. Small shrimp predominated during the season, resulting in a very low unit price. Channel net landings

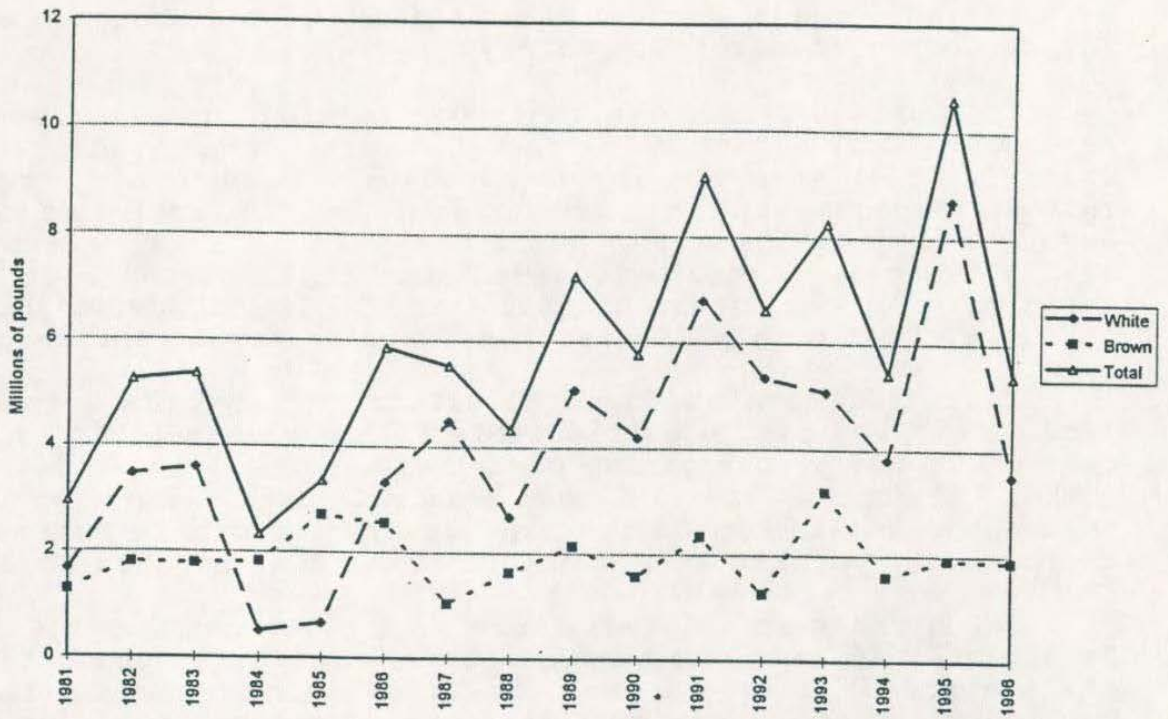


Fig. 7. Annual commercial landings (heads-on) of shrimp.

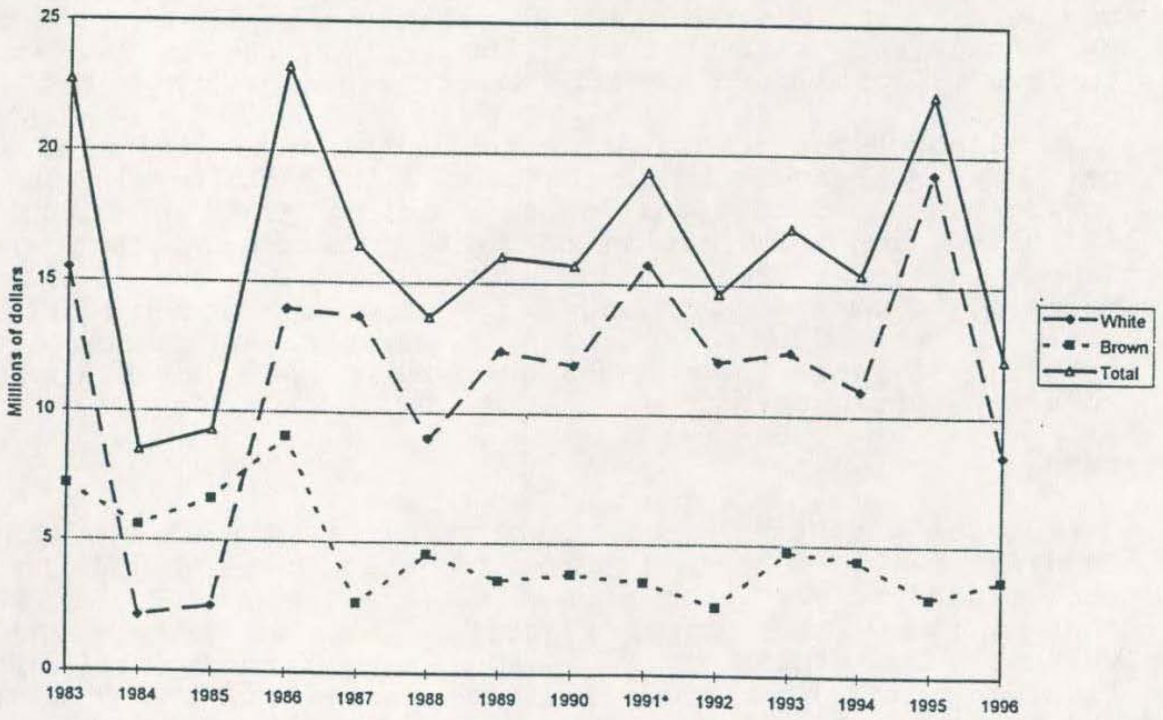


Fig. 8. Annual value of shrimp landings.

were 131,000 pounds worth only \$114,000. TEDs were again required in the deeper areas of Winyah Bay.

In the last decade, recreational baiting has developed into a major competitive factor in the fall white shrimp fishery. Permit sales (14,156) were the highest to date, although the incremental rate of increase was the lowest in four years. Participation rates were the lowest since the hurricane year of 1989. Compared to 1995's figures, participation declined in all areas with that by residents of the southern coastal area (Beaufort County, primarily) unusually low, perhaps reflecting the scarcity of shrimp there.

Estimated total effort (68,927 trips) was the lowest since 1992. This was partly attributable to bad weather, but reports of poor shrimping probably also contributed. The largest decrease in number of trips was in the Beaufort area with the biggest percentage decline in Georgetown County. Effort in Bulls Bay, an increasingly popular area, was down 31% from the 1995 level.

Catch rates in all areas were well below both the record high levels of 1995 and long-term averages. The estimated total catch (1.73 M pounds heads-on) was the lowest since that in 1989 (the Hugo year) and only about half of the record catch of 1995.

The baiters' share of the total fall harvest was 35%. There has been no obvious trend in the relationship between the baiters' percentage and total landings. Abundance of shrimp does not appear to have affected the recreational/commercial division of landings.

Although there has been a tendency for the baiters' share to be slightly larger in conjunction with high levels of effort, environmental conditions appear to be the principal factor affecting the distribution of fall white shrimp landings. The lowest baiting shares have occurred during seasons in which heavy rains moved substantial quantities of shrimp seaward prior to or early in the (baiting) season. The highest shares have been obtained in years when in-season weather was favorable and tended to delay outmigration.

CRAB

Total blue crab production was 5.936 M pounds with potters landing 5.824 M pounds of hard crab and 72,000 pounds of peeler/soft crab. Minor quantities were taken as incidental catch and in the winter trawl fishery. Because of prolonged cold weather, the winter trawl season was extended until April 10. Although total blue crab landings dropped sharply from those in 1995 (Fig. 9), they equalled the 15-year average. The number of licensed crabbers continued the upward trend of recent years.

Landed value of blue crab remained relatively high (\$4.033 M), as did unit price (Fig. 10).

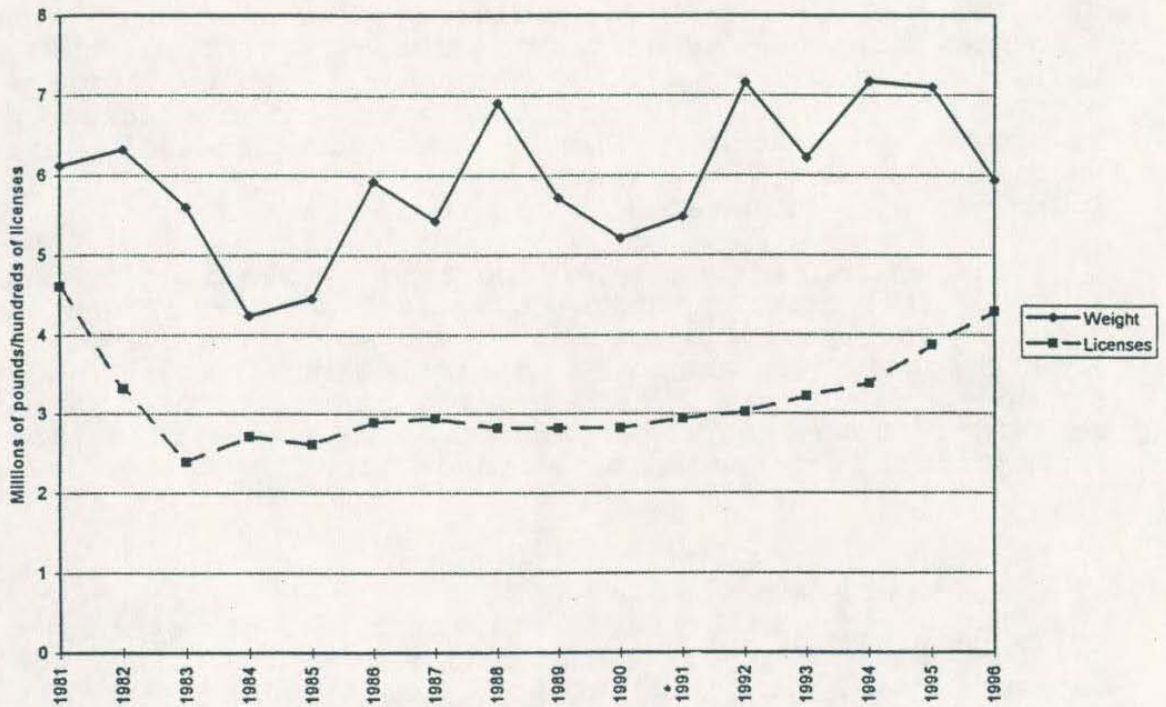


Fig. 9. Annual commercial landings of blue crab and number of crab pot licenses.

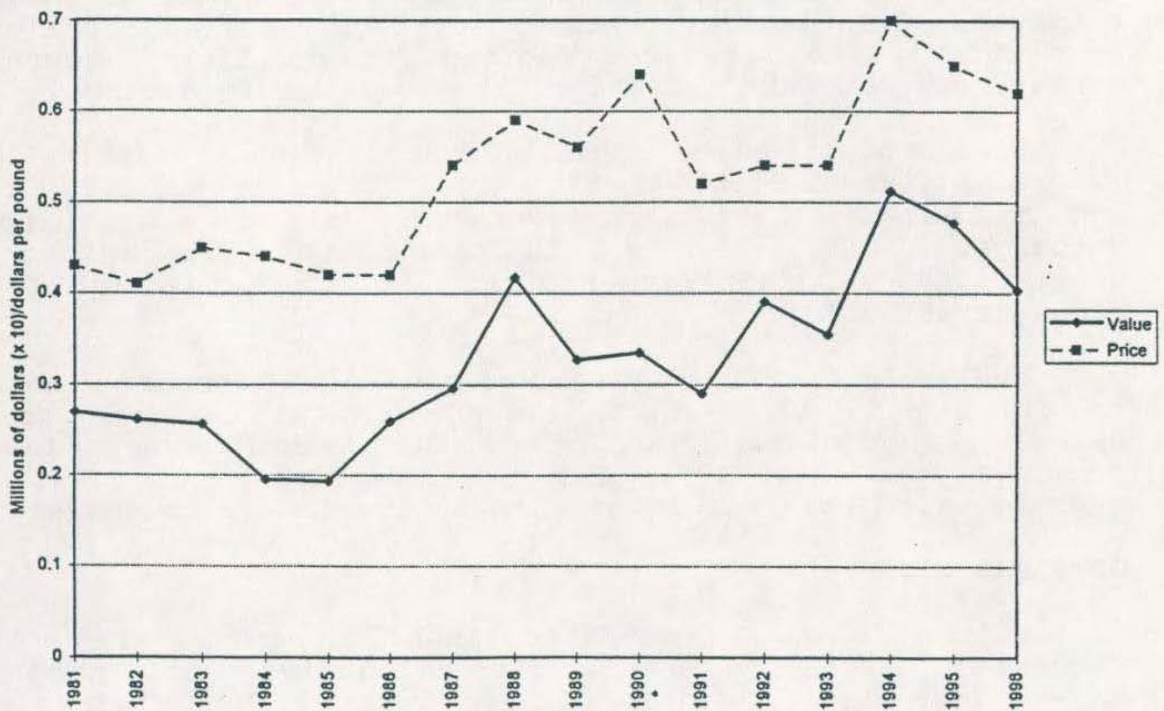


Fig. 10. Annual value and unit price of blue crab.

In 1996, a survey of holders of the marine recreational fisheries stamp was conducted, including a section about crabbing activity. This group consisted primarily of individuals who did most of their crabbing from private boats and the results therefore do not apply to shore crabbers. Recreational crabbing appeared to be most popular in the southern coastal area with progressively lower participation rates to the north.

The estimated number of boating recreational crabbers was 43,000. This group spent about 581,000 days of effort (averaging about 13 days/year) to catch 11.0 M crab. This was equivalent to 4.400 M pounds, compared to a commercial harvest (in 1995) of 6.986 M pounds. Given that the shore-based crabber population appears to be large, it therefore is reasonable to assume that total annual recreational landings may have approximated the commercial harvest.

SHELLFISH

The spring shellfish season was closed for oysters on May 14 and for clams on May 31. The fall season was opened for both on September 16. Landings data are for calendar year 1996. Most production came from culture permit areas.

Oyster production was 81,352 bushels, close to the record low level of 1990 (Fig. 11). Value was \$1.036 M. Most of the harvest consisted of intertidal "cluster" oysters retailed locally. Only four shucking houses were reported in operation. Recreational harvest was estimated at 43% of the commercial landings.

Clam production was improved over that in 1995 at 38,187 bags (250-count) worth \$1.046 M (Fig. 12). Both escalator (10,014 bags) and hand harvest (28,173 bags) were up. Unit price was essentially unchanged with littlenecks in the 11-12 cents apiece range. Recreational landings were estimated at approximately 30% of the hand harvest.

The whelk trawling season was opened on February 9 and closed on May 3 with 109 permits issued. Total harvest was 23,553 bushels, appreciably lower than the record amount taken the previous year (Fig. 13). The catch was valued at \$244,000. The average catch rate was lower than in 1995 at 7.8 bushels/drag.

OFFSHORE FISH

Volume (2.623 M pounds) continued to decline (Fig. 14) with decreases in most species and gear categories. Only porgies (9%) showed increased landings, compared to the 1995 figures. Shark landings were unchanged. Decreases for other groups were as follows: tilefish 57%, wreckfish 41%, sea bass 24%, snappers 20%, pelagics 14%, and groupers 5%. Total value was \$4.634 M, low by historical standards.

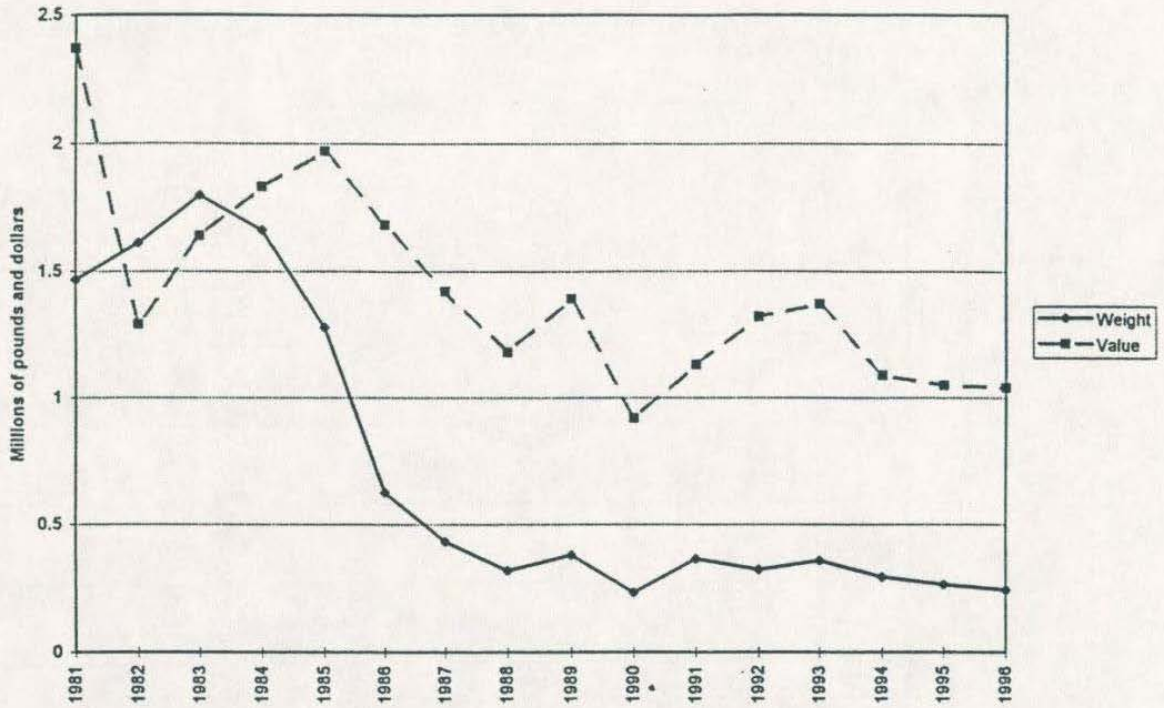


Fig. 11. Annual commercial production of oysters.

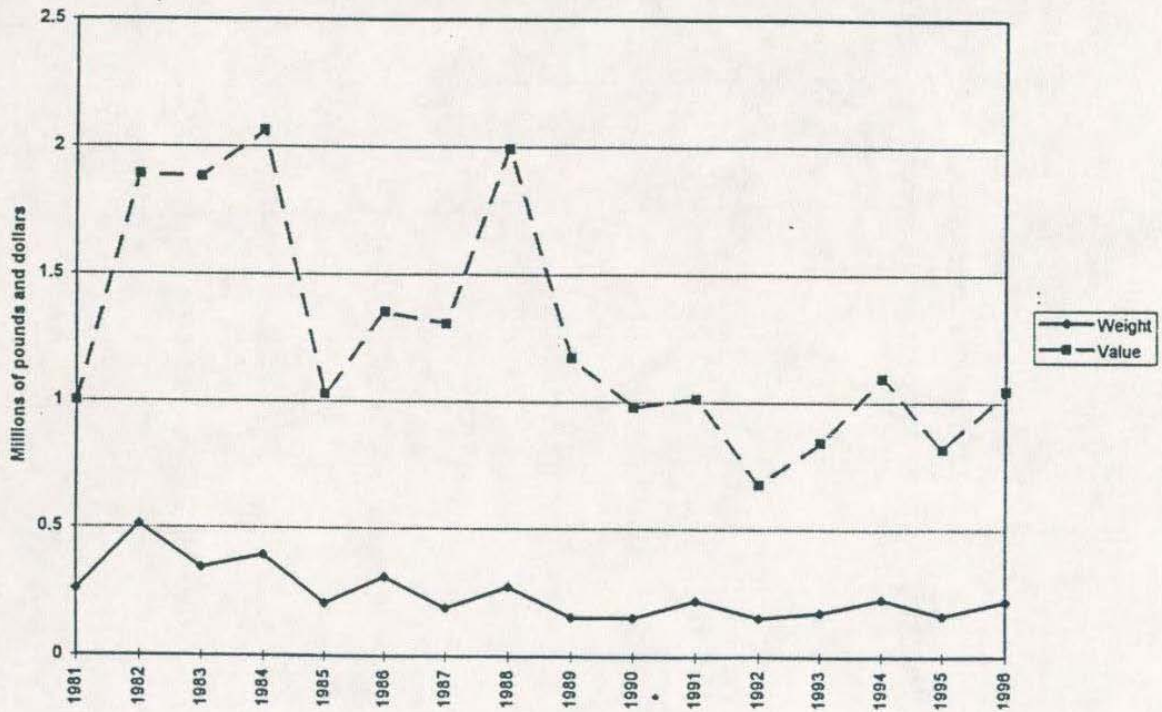


Fig. 12. Annual commercial production of clams.

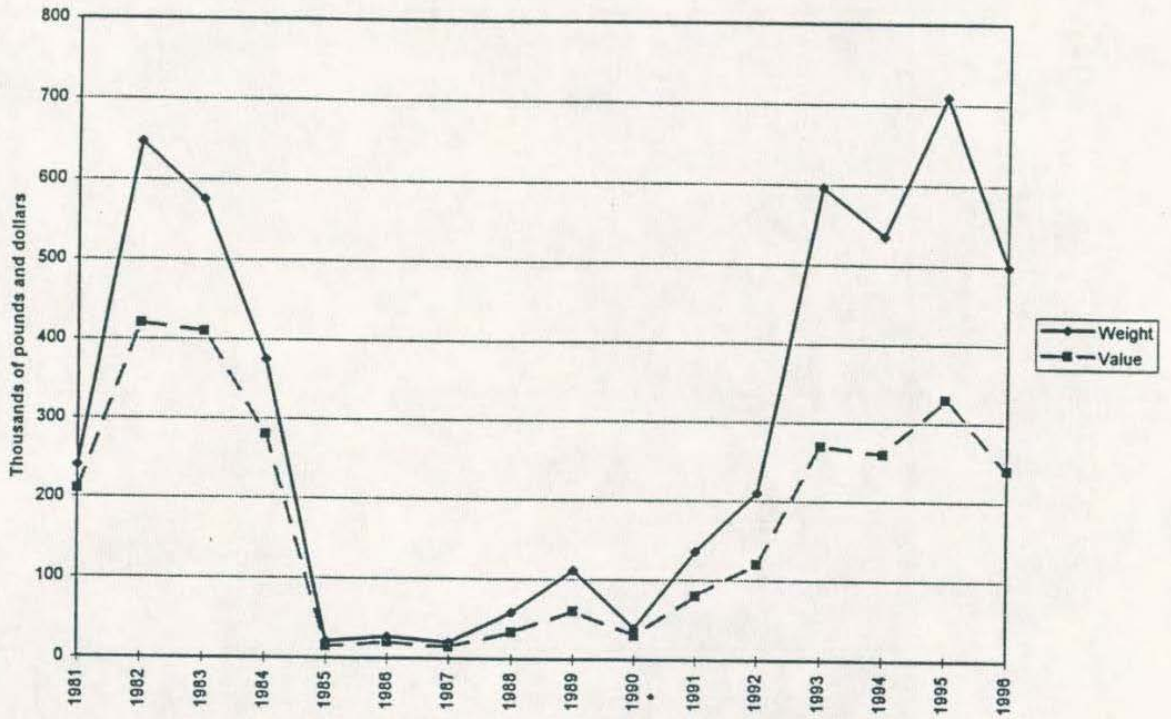


Fig. 13. Annual commercial production of whelks.

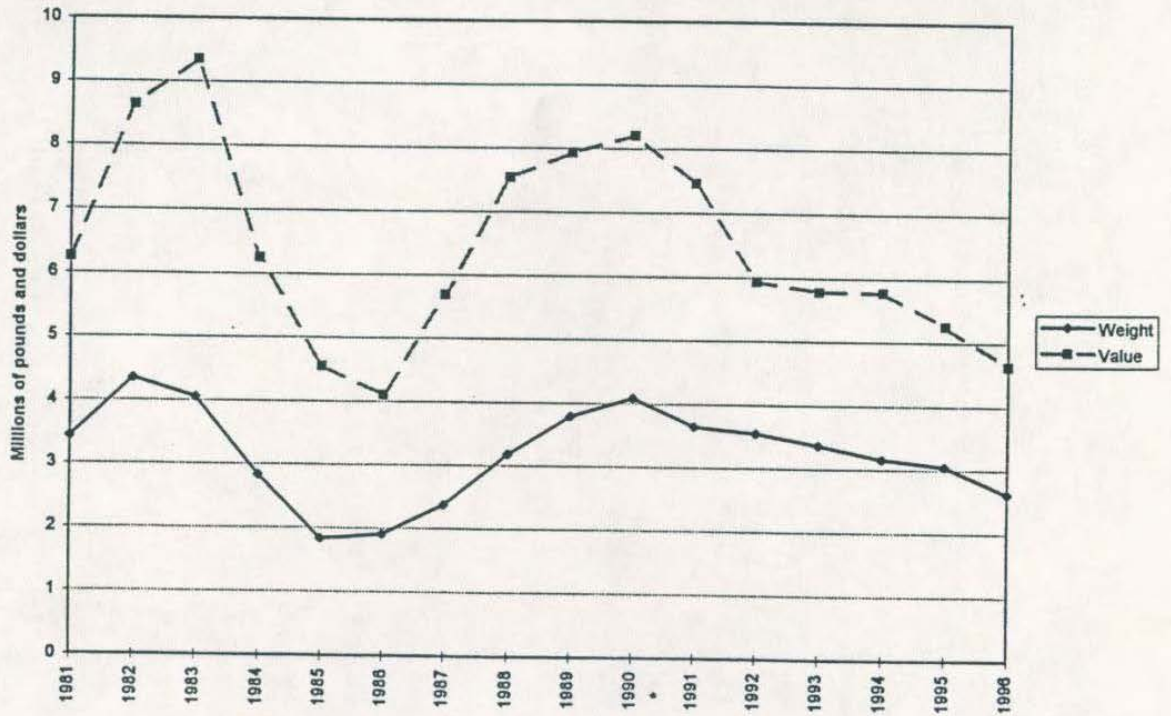


Fig. 14. Annual commercial production of offshore fish.

Landings of groupers and pelagics were nearly identical and comprised the largest volume components (Fig. 15). These were by far the leading value contributors as well. Sharks, although appreciable in volume, remained a minor component in terms of value. Wreckfish landings declined appreciably, but remained a significant single-species contributor, accounting for 10% of both weight and value. Historically important groups such as porgies, sea bass, and tilefish were minor elements at <5% in 1996.

The principal source of product was the handline fishery. Its two components were 1) a deepwater reel fishery for wreckfish and 2) a snapper reel fishery directed at reef species.

Wreckfish landings (confidential) continued a steep downward trend (Fig. 16) and comprised less than a third of the maximum volume produced in 1990. The fishery was closed from January 15-April 15 to protect spawning stocks. Six boats reported 51 trips through the ticket system; they averaged 4,649 pounds per trip. Both reported effort and CPUE were substantially below the levels of previous years. Length distribution (Fig. 17) was similar to that in prior years, although the average size (97.6 cm) declined slightly and was the smallest to date.

The snapper reel fishery historically has been the largest offshore fishery in terms of landings and participation. Landings (1.300 M pounds valued at \$2.347 M) continued the decline evident in recent years (Fig. 18). Reef fish comprised the bulk of the landings (1.132 M pounds worth \$2.123 M).

Aggregate grouper landings were 578,000 pounds, about 9% below the 15-year average. Value was \$1.396 M. Groupers accounted for 40% of the total volume of reef fish (the highest percentage since 1978). The leading contributors were gag (302,000 pounds) and scamp (147,000 pounds), both landed almost entirely by snapper reel. Gag landings have fluctuated moderately during the last decade with no directional trend, while scamp landings have been nearly constant in the last five years (Fig. 19).

Length distribution of gag is shown in Fig. 20. Although the relative scarcity of large (>90 cm) fish (i.e., mature males) continued to be cause for concern about potential recruitment overfishing, the average length (78.4 cm) continued to increase (Fig. 21). In 1996, 11.4% of the fish measured exceeded 90 cm, compared to 6.8% in 1995. In contrast, however, 58.4% of the gag sampled in 1977 were >90 cm.

The length distribution of scamp (Fig. 22) was in marked contrast with a high proportion of the total catch close to the minimum size limit (50 cm or 20 in total length, or about 45 cm fork length). The average length was 53.5 cm fork length and comparable to that in recent years (Fig. 23).

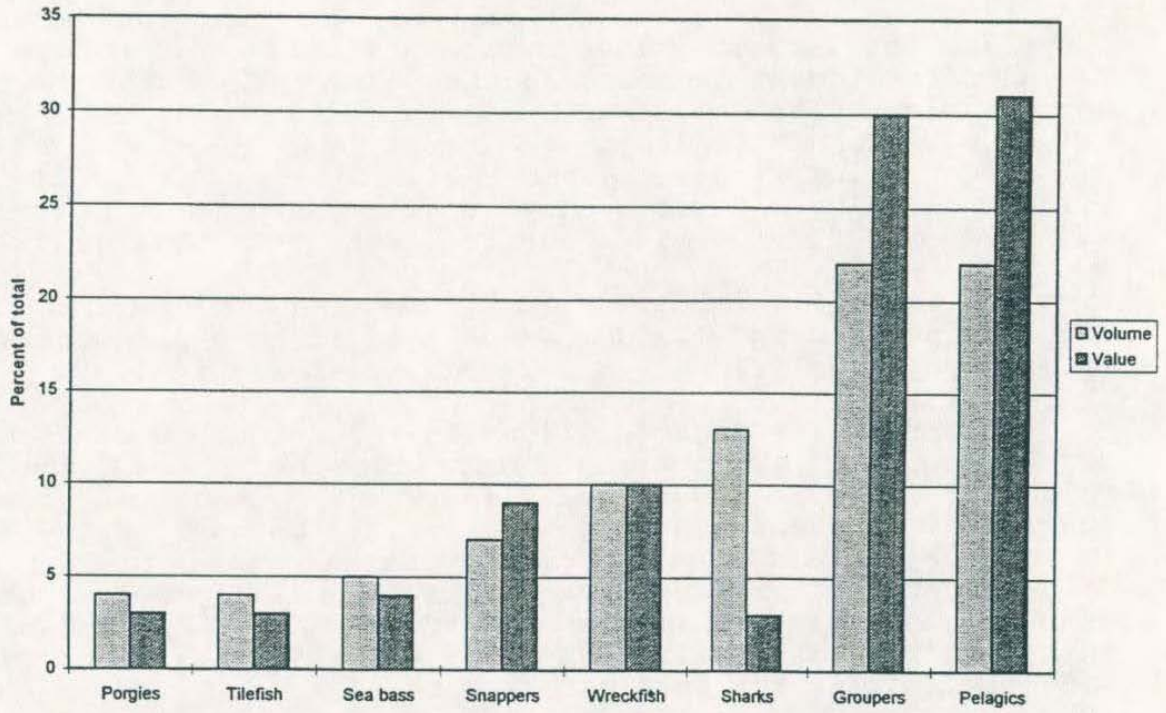


Fig. 15. Landings of major offshore fish groups.

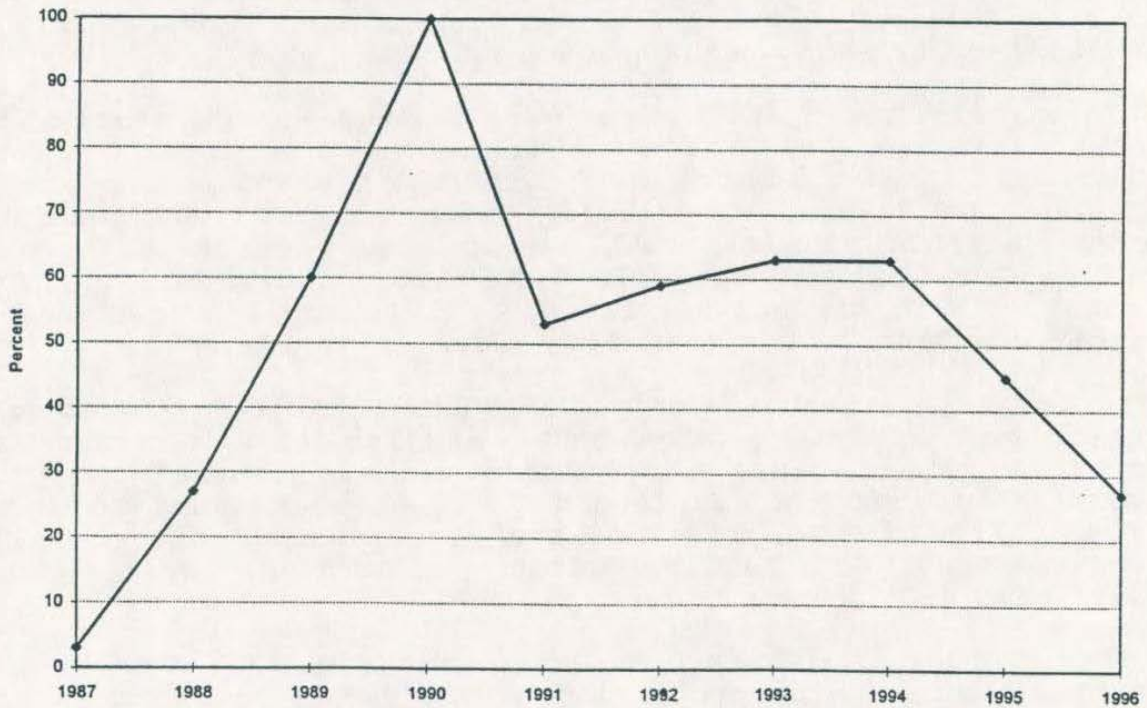


Fig. 16. Annual landings of wreckfish, in percentage of peak year's production.

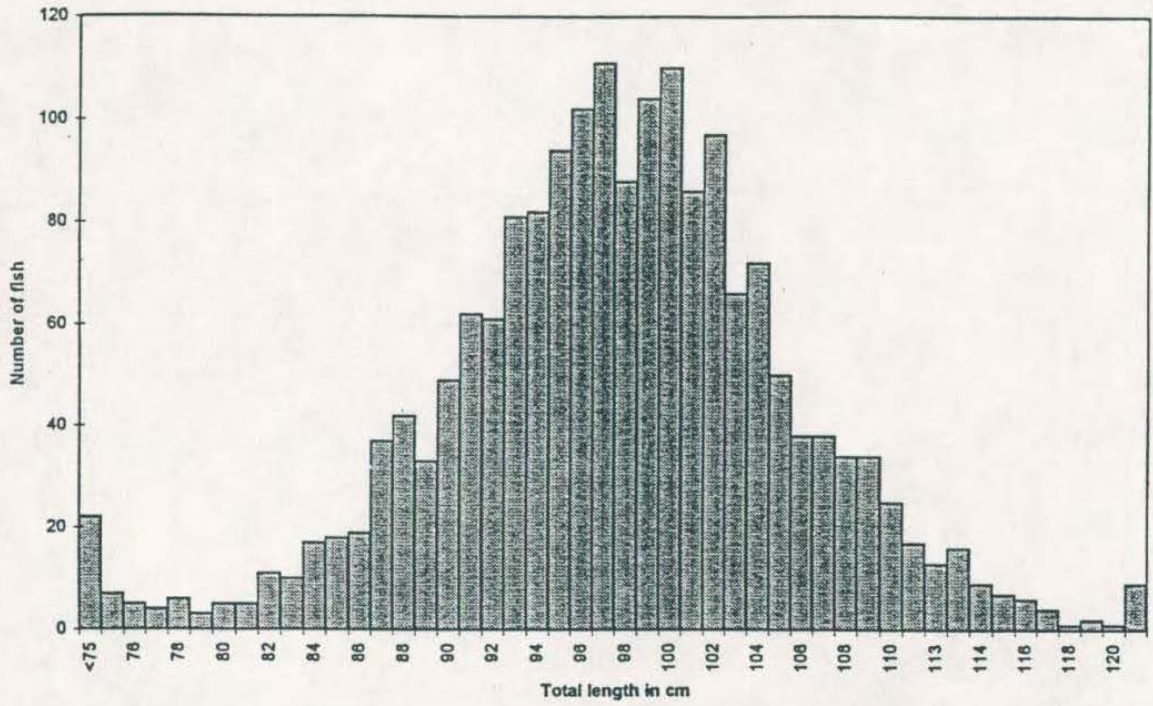


Fig. 17. Length distribution of wreckfish.

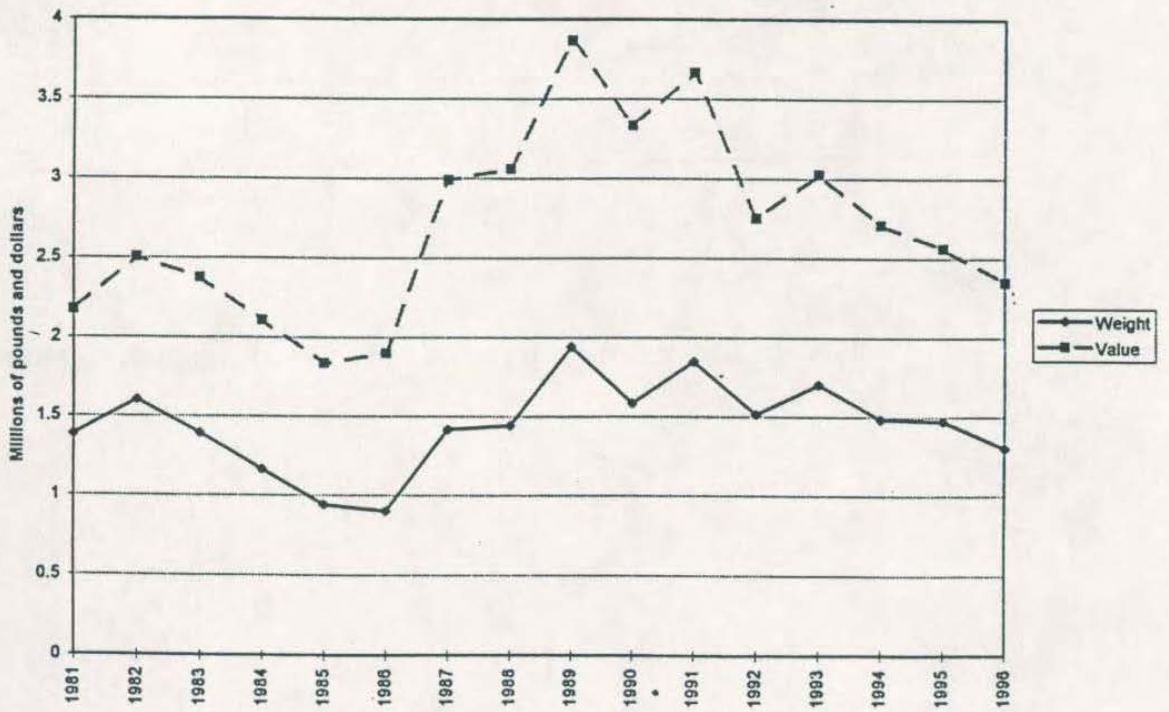


Fig. 18. Annual production of the snapper reel fishery.

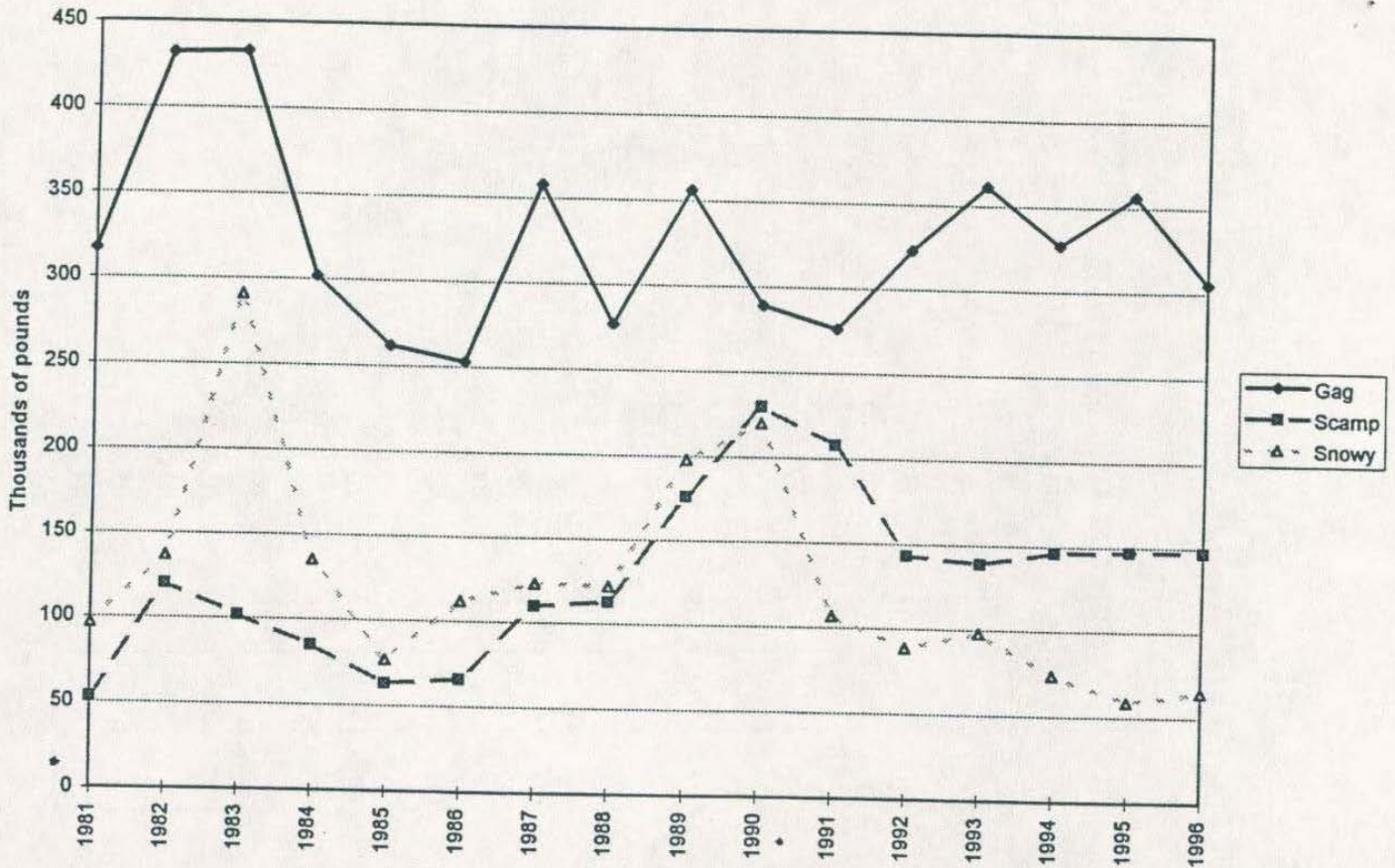


Fig. 19. Annual commercial landings of groupers.

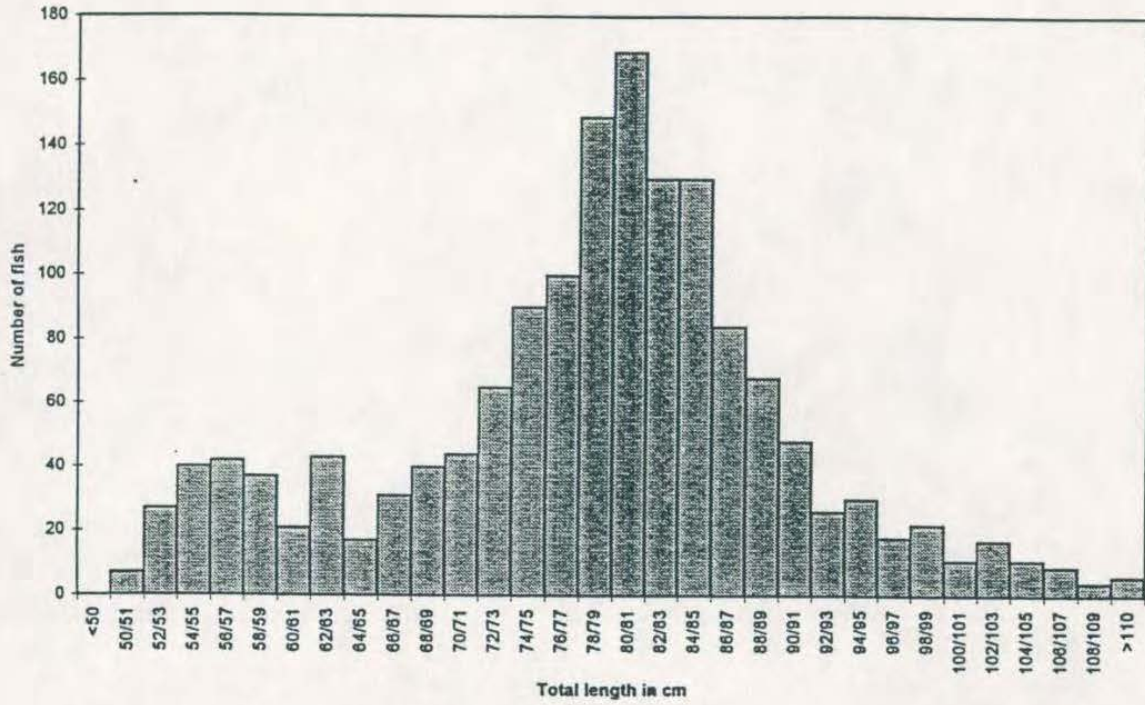


Fig. 20. Length distribution of commercially landed gag.

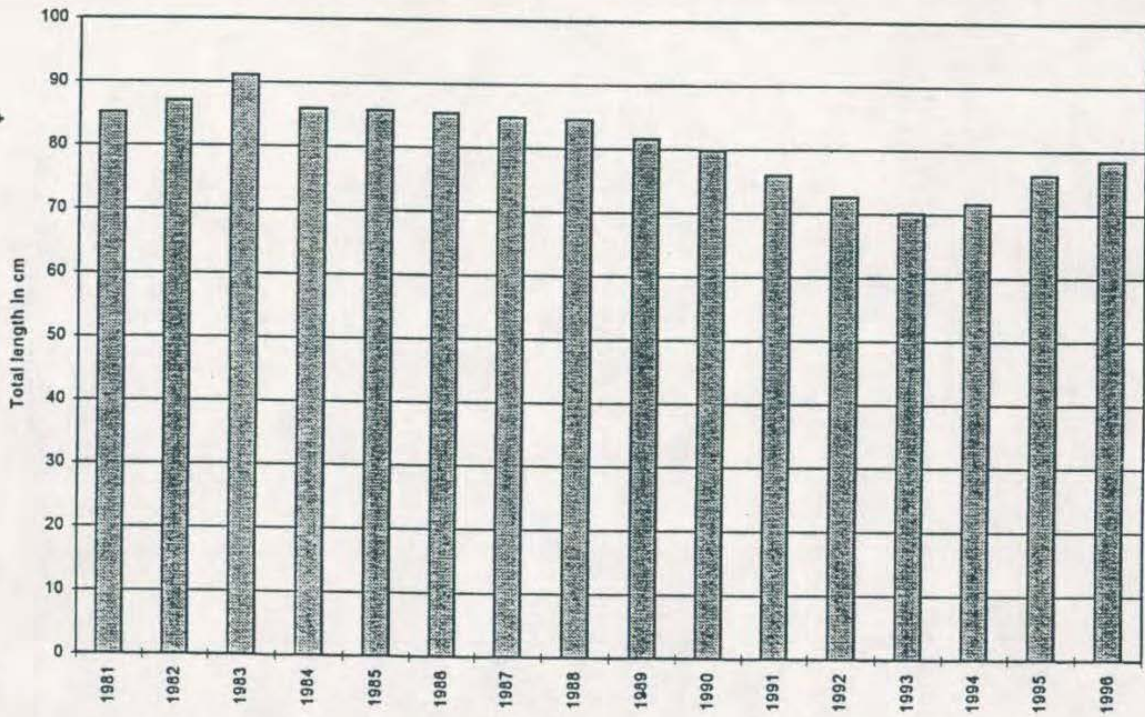


Fig. 21. Average length of commercially landed gag.

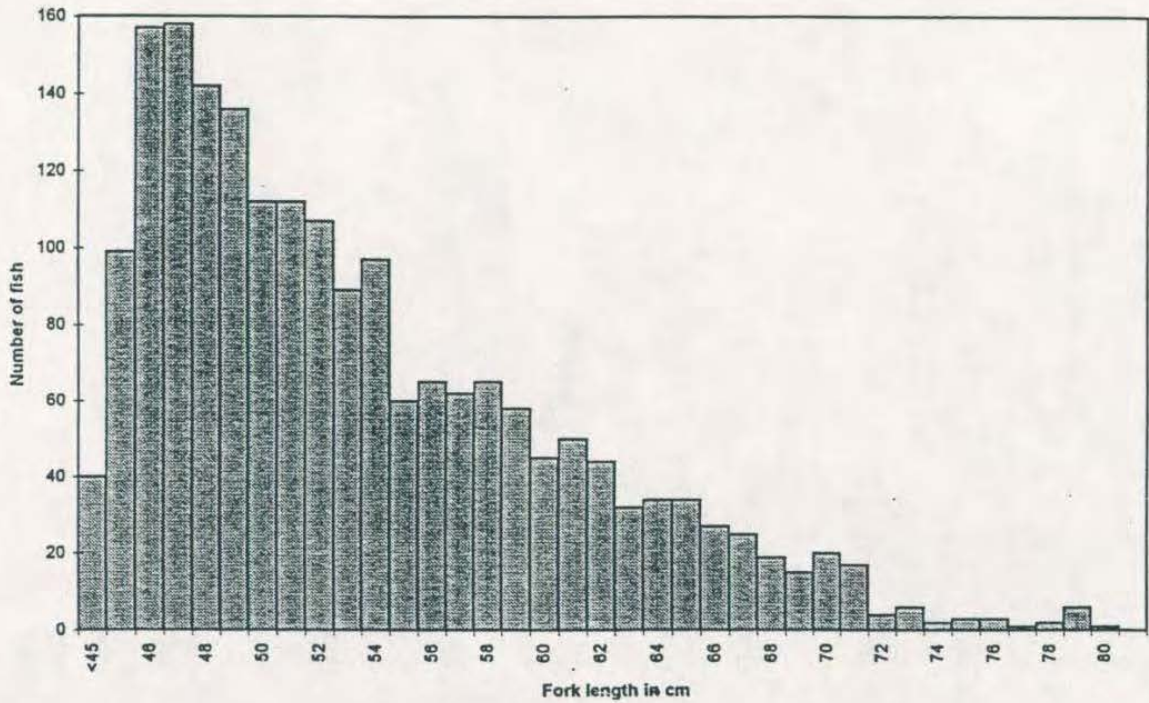


Fig. 22. Length distribution of commercially landed scamp.

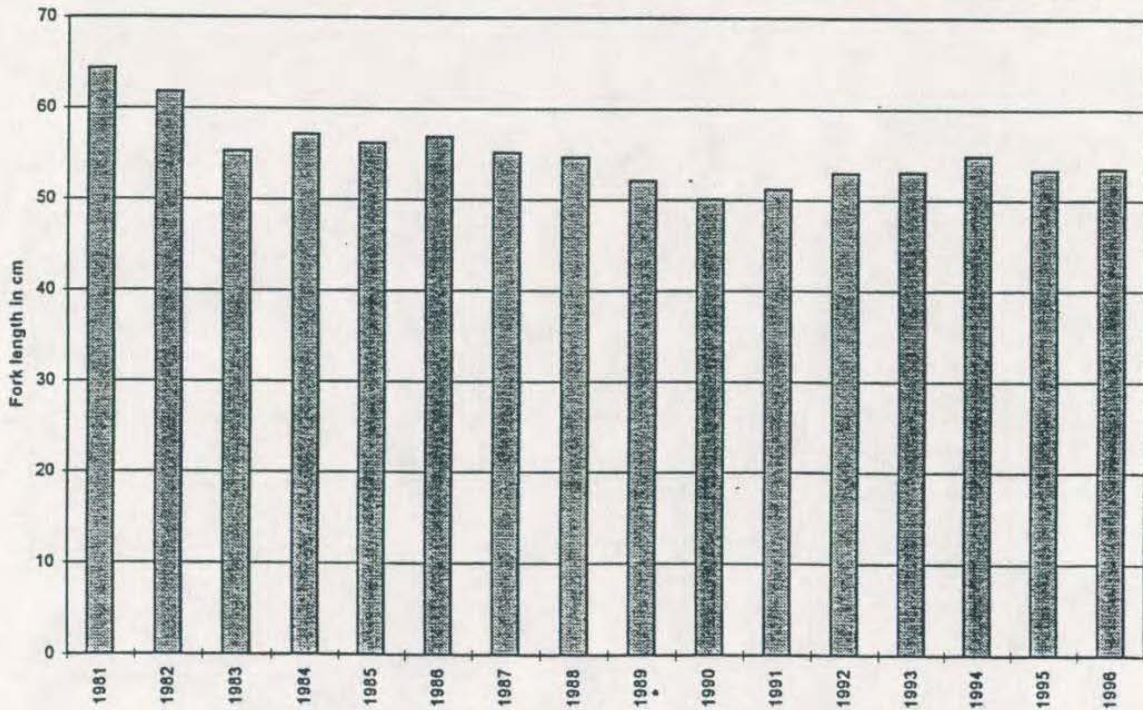


Fig. 23. Average length of commercially landed scamp.

The quota-controlled snowy grouper catch remained near the record low level set the previous year with snapper reel landings again exceeding those by bottom longline. Length distribution (Fig. 24) was dominated by very small fish and the average size, 47.6 cm, was the smallest to date (Fig. 25). This was to some extent attributable to the contribution of snapper reel landings taken as incidental catch.

Snapper landings (Fig. 26) continued to decline with those of vermilion snapper (154,000 pounds) the lowest since 1979. Most of the sampled vermilion snapper were close to the 30 cm (12 in) minimum size limit (Fig. 27) and there was virtually no change in the average length (35.5 cm) from the previous year (Fig. 28).

Red snapper landings were among the lowest recorded, but consisted of relatively large fish (Fig. 29). In years of high production, much of the catch has been composed of new recruitment, i.e., small fish. Average length was 63.8 cm, the largest since 1980, and reflected the absence of a recent strong year class (Fig. 30).

Following six consecutive years of decline, landings of red porgy improved slightly (96,000 pounds total) (Fig. 31). Both length distribution (Fig. 32) and average size (Fig. 33) remained essentially unchanged from recent years.

Bottom longline production (Fig. 34) was well below average at 306,000 pounds worth only \$295,000. The low value reflected the large contribution of fish with low unit prices, e.g. sharks (111,000 pounds) and rosefish (46,000 pounds). High-priced golden tilefish (70,000 pounds) and snowy grouper (27,000 pounds) comprised only 32% of the volume. Landings of golden tilefish continued to consist mainly of small fish (Fig. 35) and the average length (56.0 cm) remained small by historical standards (Fig. 36).

Total shark landings were 263,000 pounds worth \$166,000 (Fig. 37). For most of the last ten years, the bottom longline fishery has been the principal source of shark landings, particularly after the ban on the inshore gill net fishery. The bottom longline fishery targets the large coastal group (e.g. sandbar and tiger sharks), managed under semiannual, regional quotas. In 1996, the second half quota was quickly harvested and the fishery for this group was closed on August 31 for the rest of the year.

The fishery for the pelagic species group remained open and pelagic (surface) longliners landing in South Carolina took a much larger catch from this group than previously. During 1989-1995, annual landings of sharks by pelagic longliners ranged from 21,000-49,000 pounds, but the 1996 catch was 117,000 pounds.

The pelagic longline fishery landed 555,000 pounds of product worth \$1.357 M in 1996, continuing the modest upward trend of the

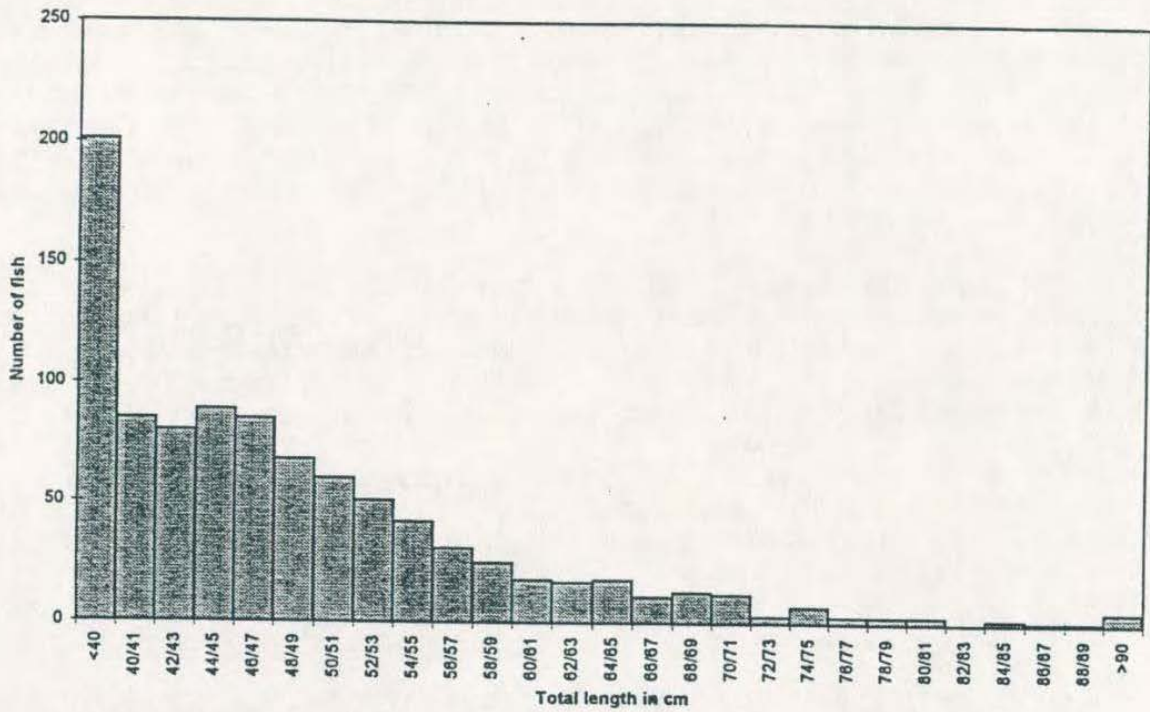


Fig. 24. Length distribution of commercially landed snowy grouper.

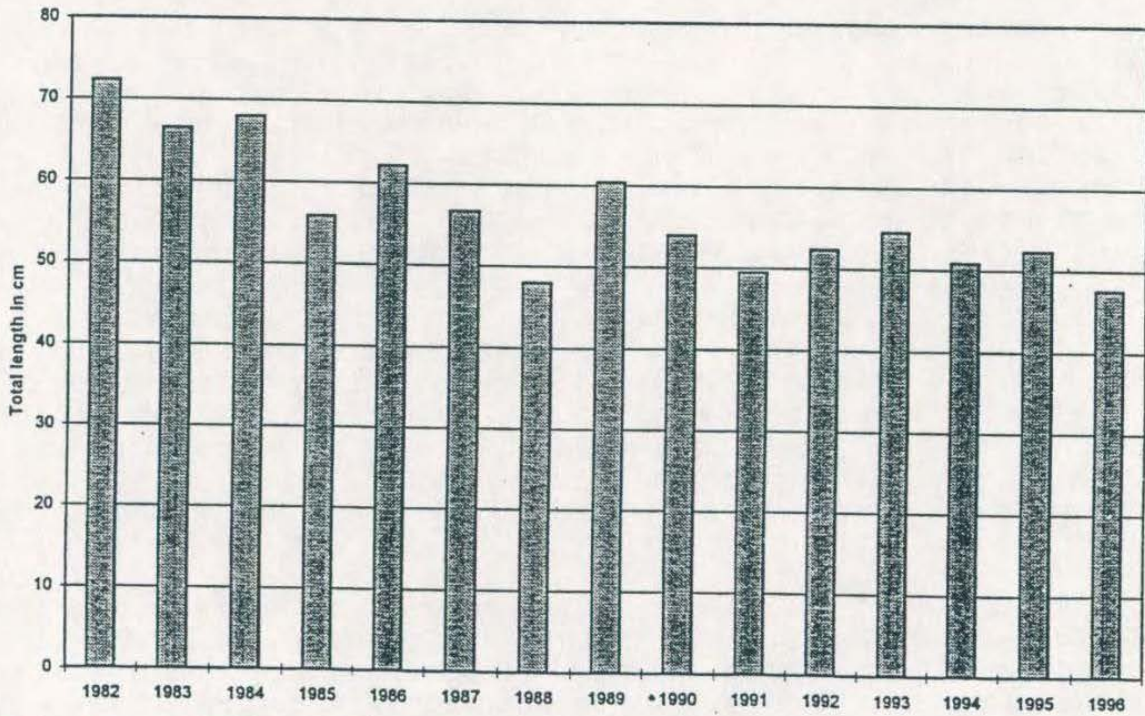


Fig. 25. Average length of commercially landed snowy grouper.

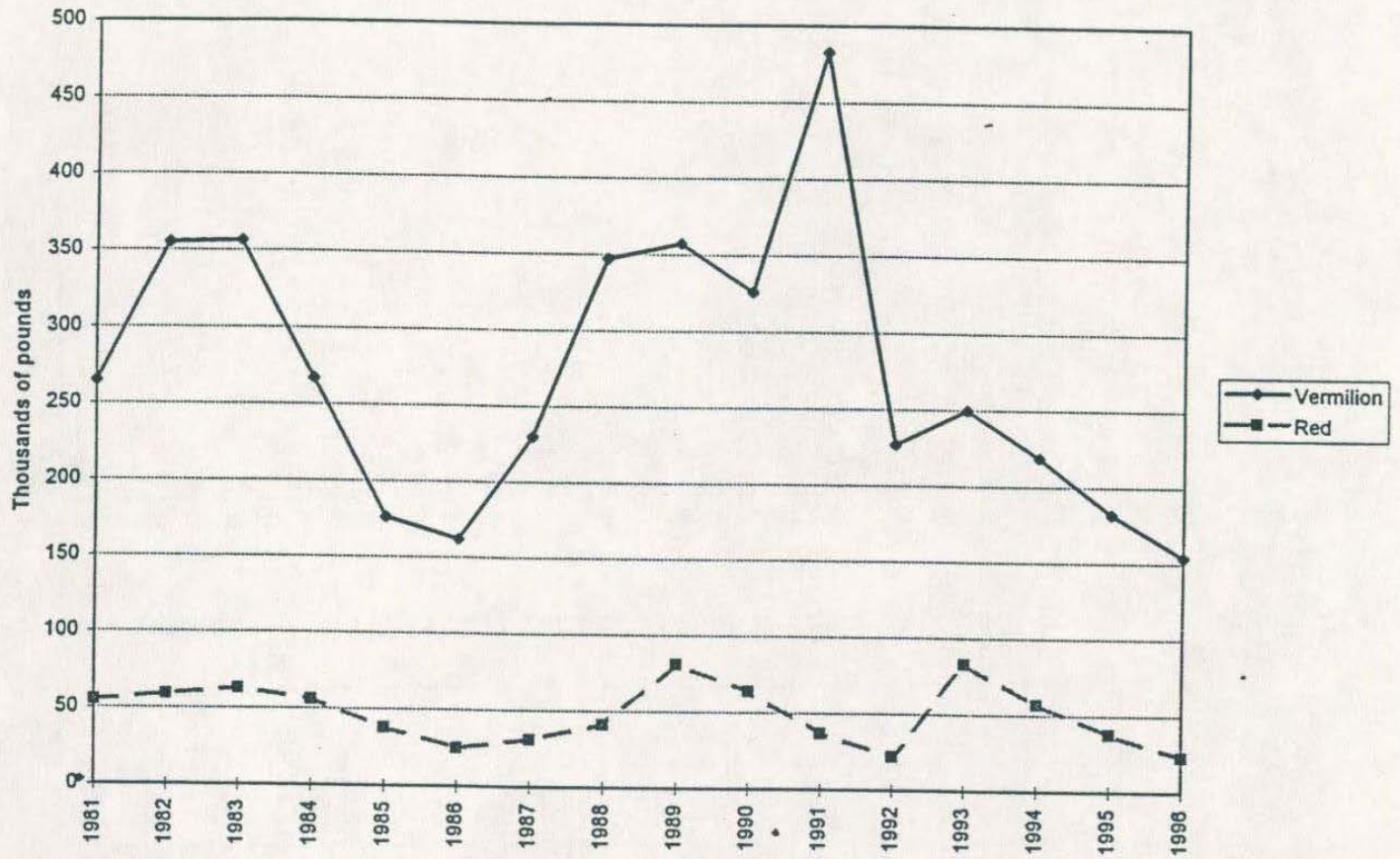


Fig. 26. Annual commercial landings of snappers.

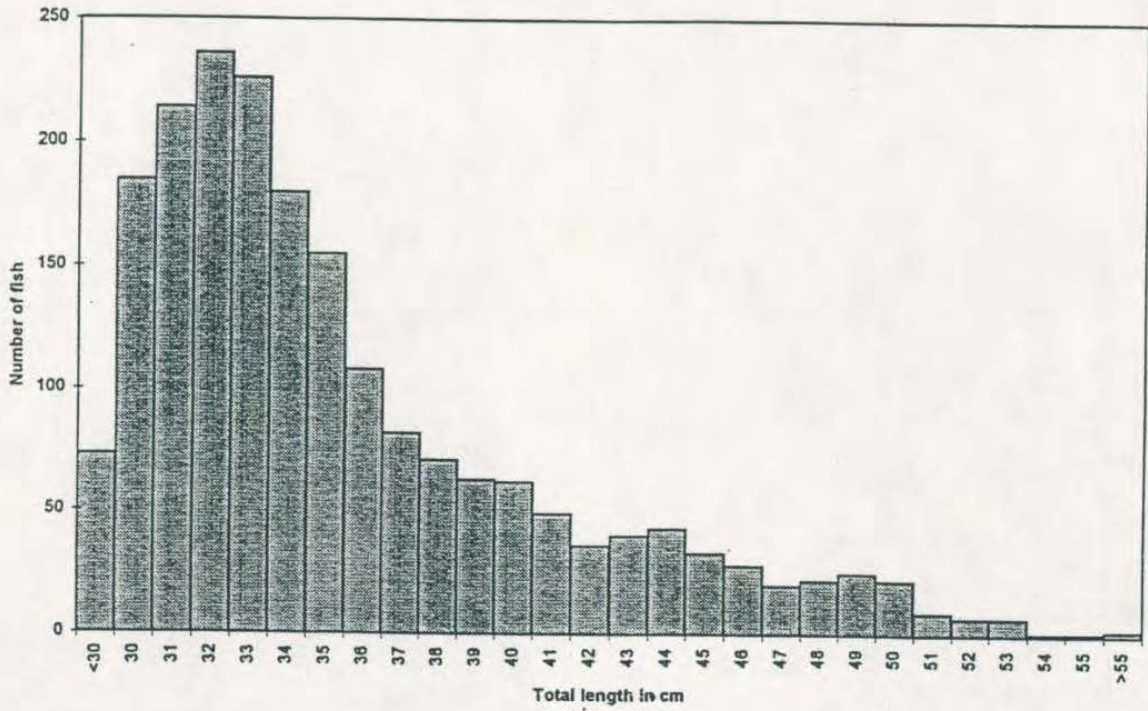


Fig. 27. Length distribution of commercially landed vermilion snapper.

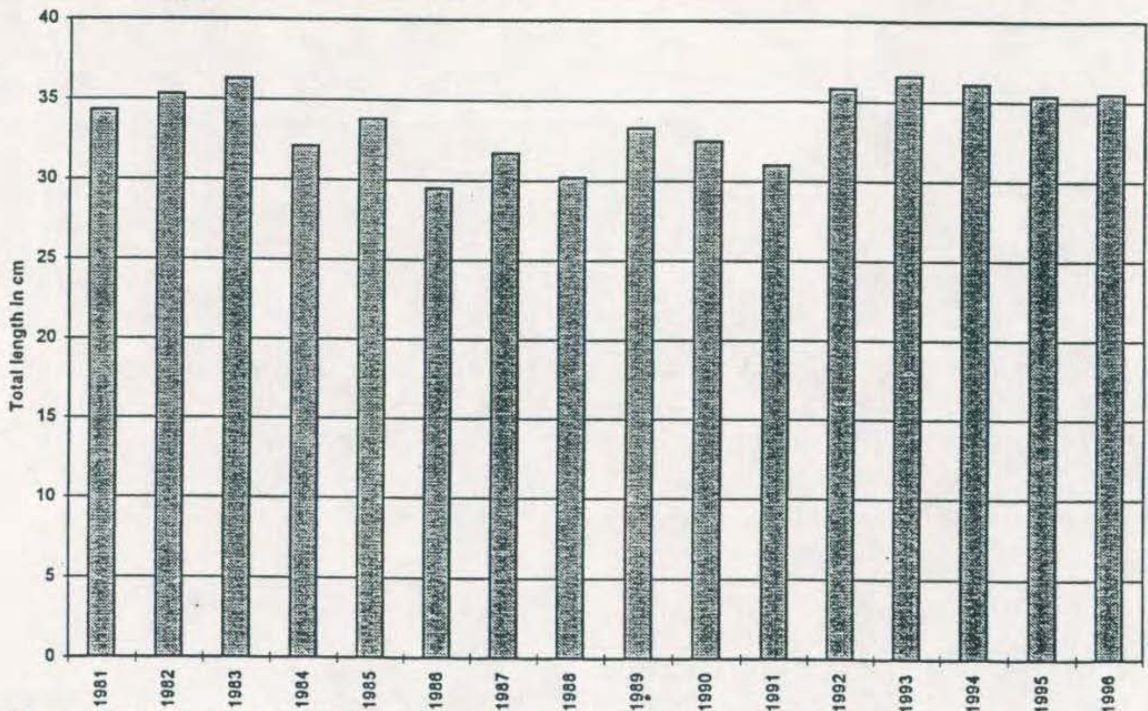


Fig.28. Average length of commercially landed vermilion snapper.

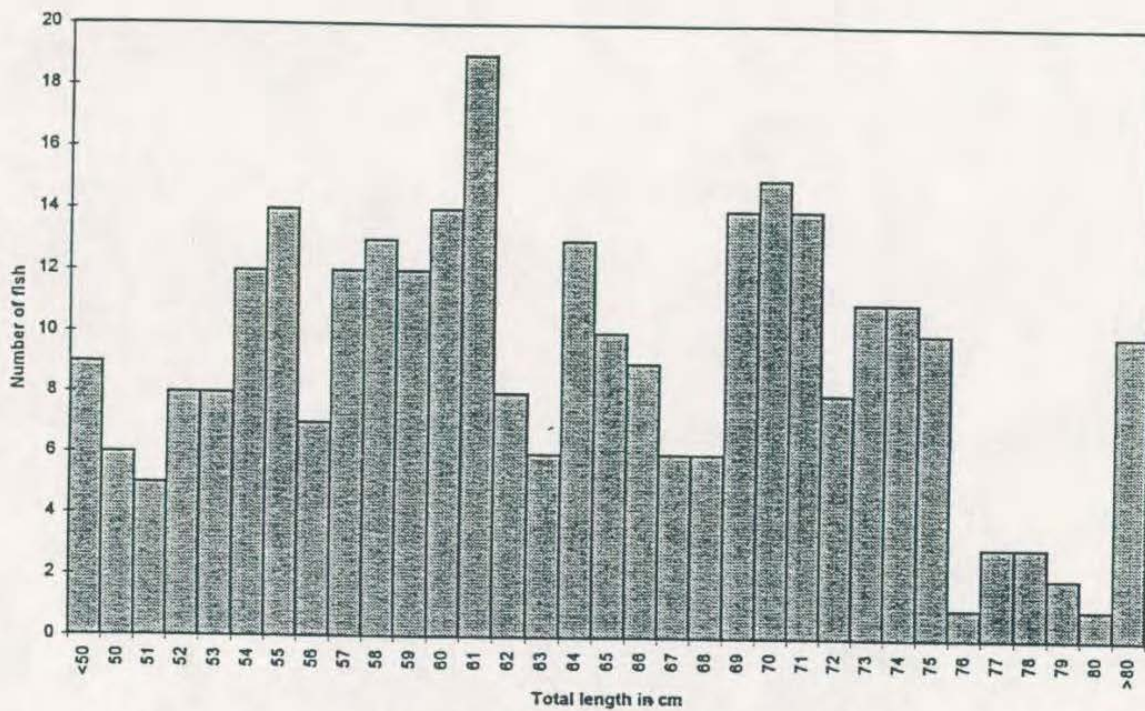


Fig. 29. Length distribution of commercially landed red snapper.

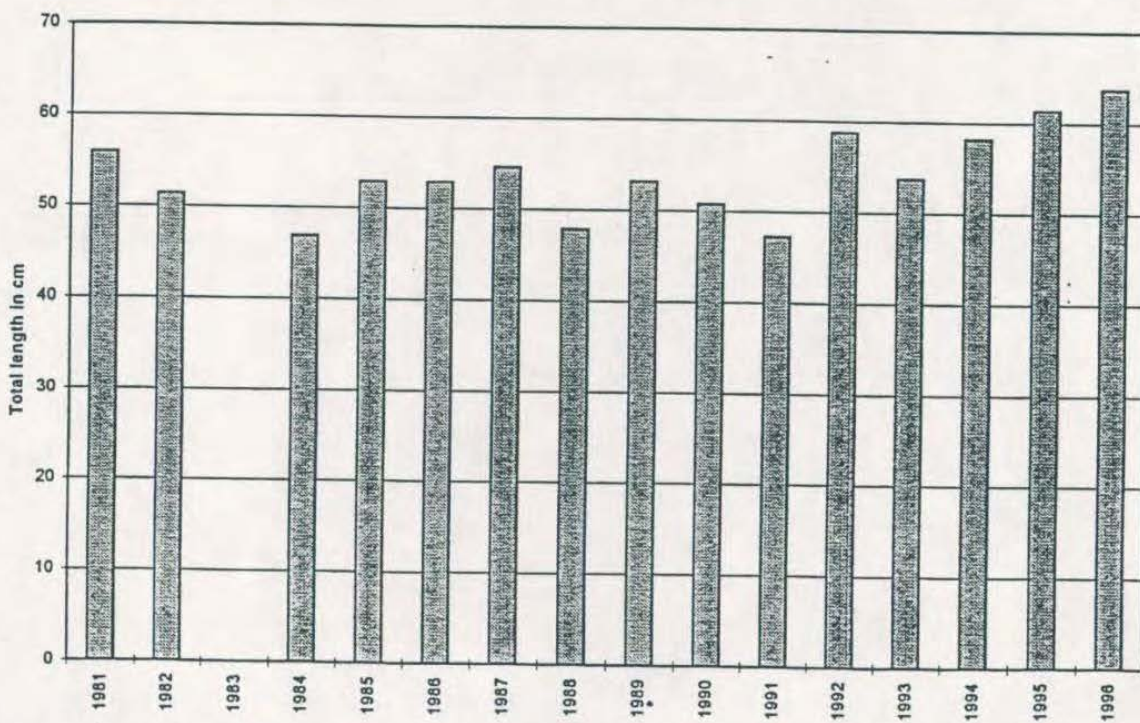


Fig. 30. Average length of commercially landed red snapper.

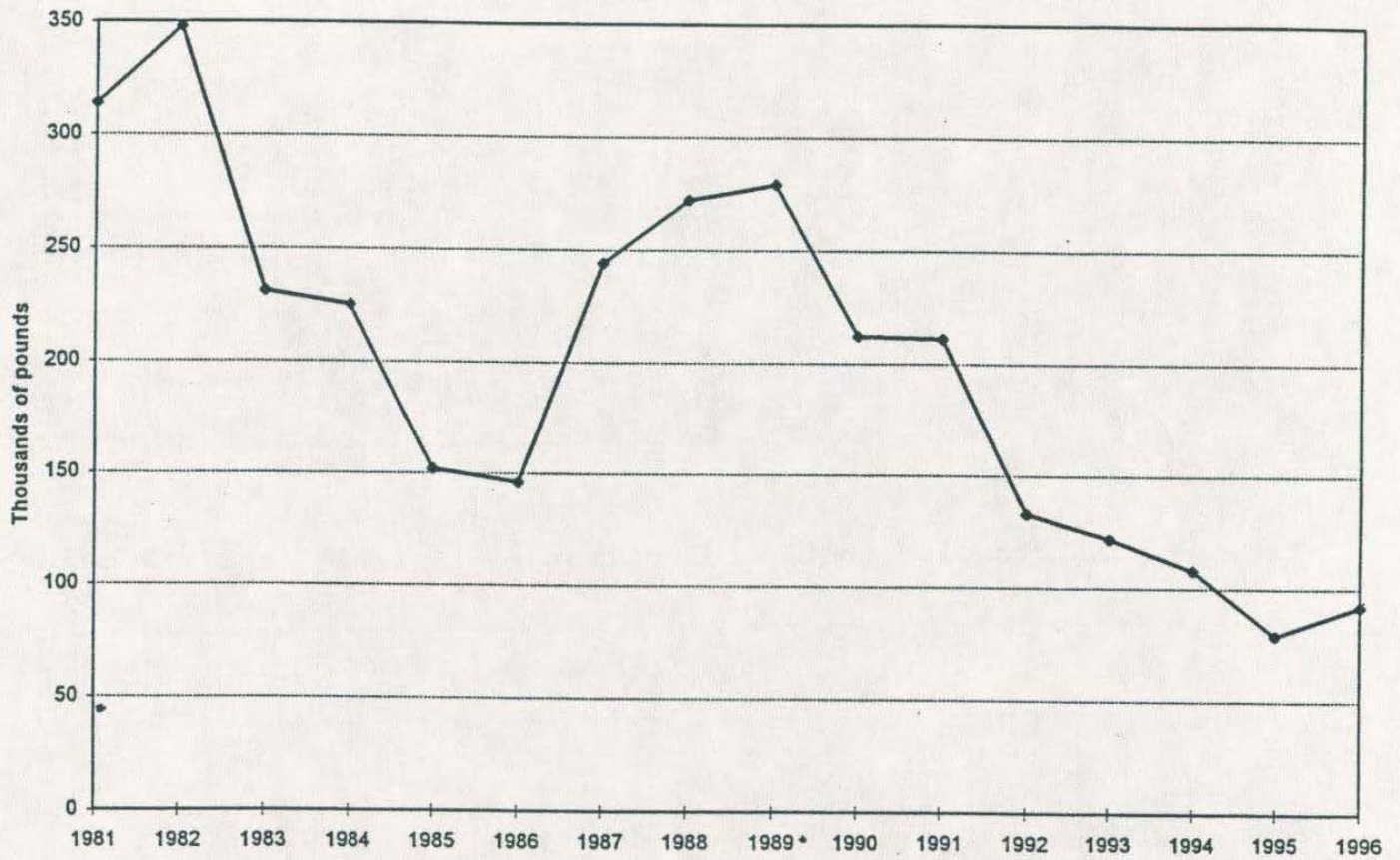


Fig. 31. Annual snapper reel landings of red porgy.

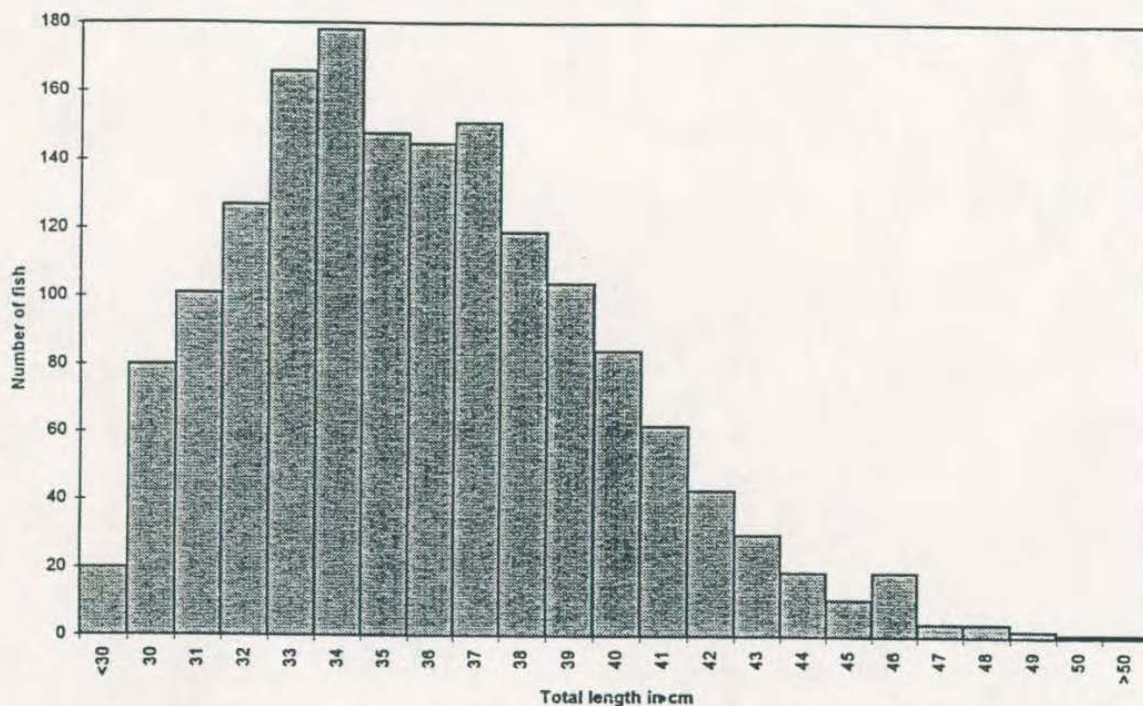


Fig. 32. Length distribution of commercially landed red porgy.

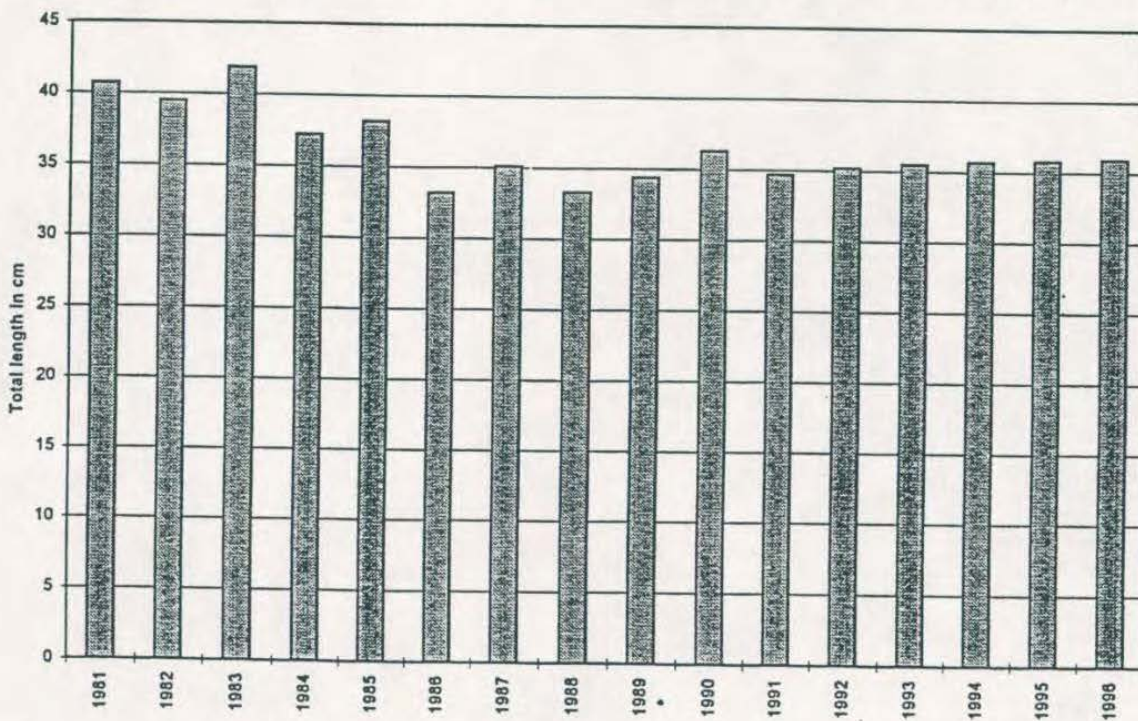


Fig. 33. Average length of red porgy caught on snapper reels.

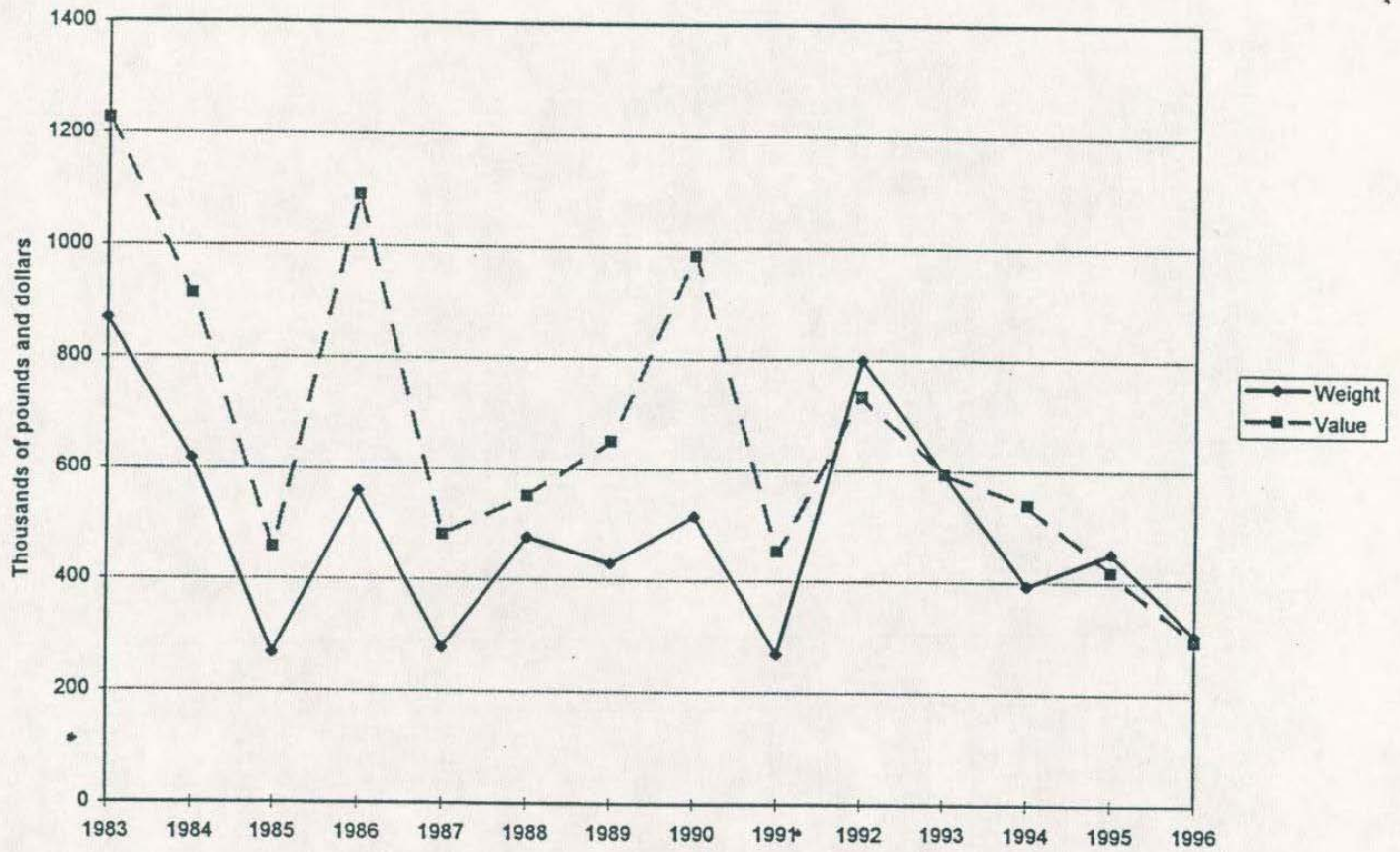


Fig. 34. Annual production of the bottom longline fishery.

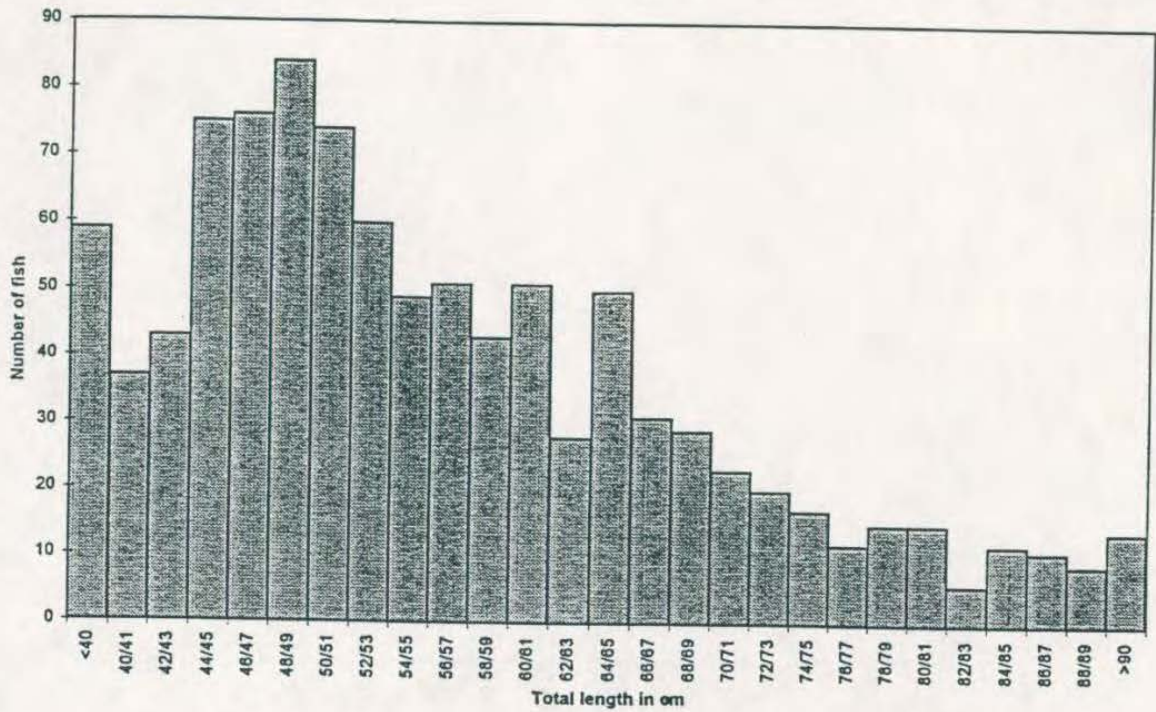


Fig. 35. Length distribution of golden tilefish.

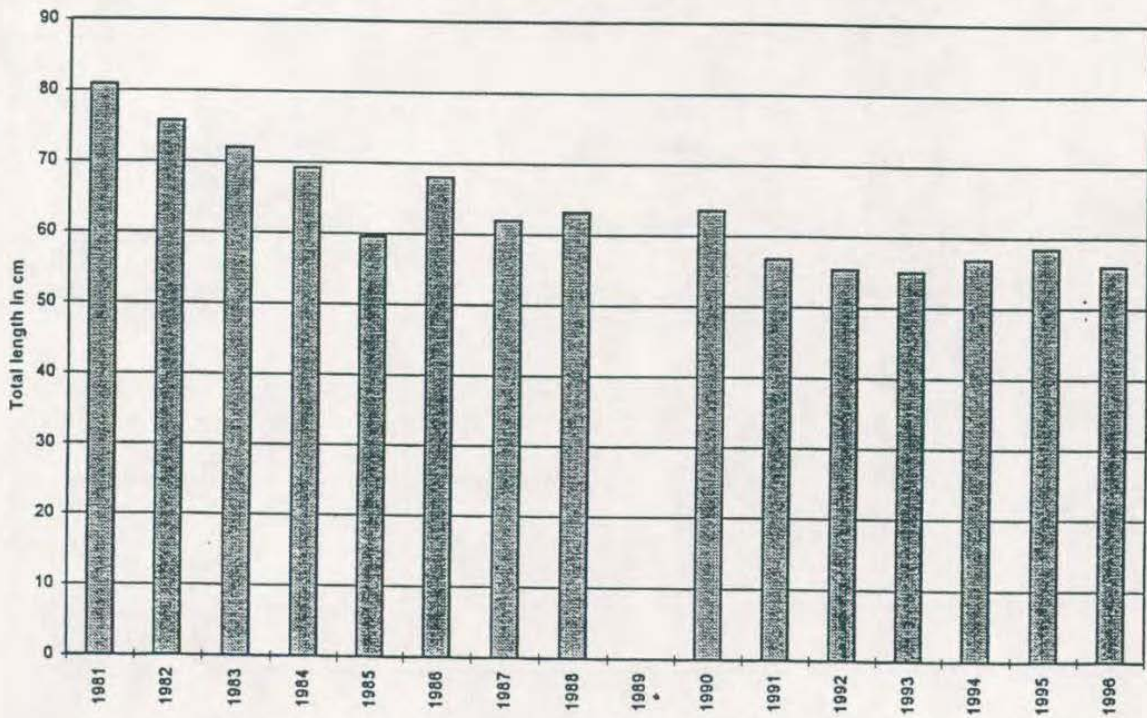


Fig. 36. Average length of golden tilefish.

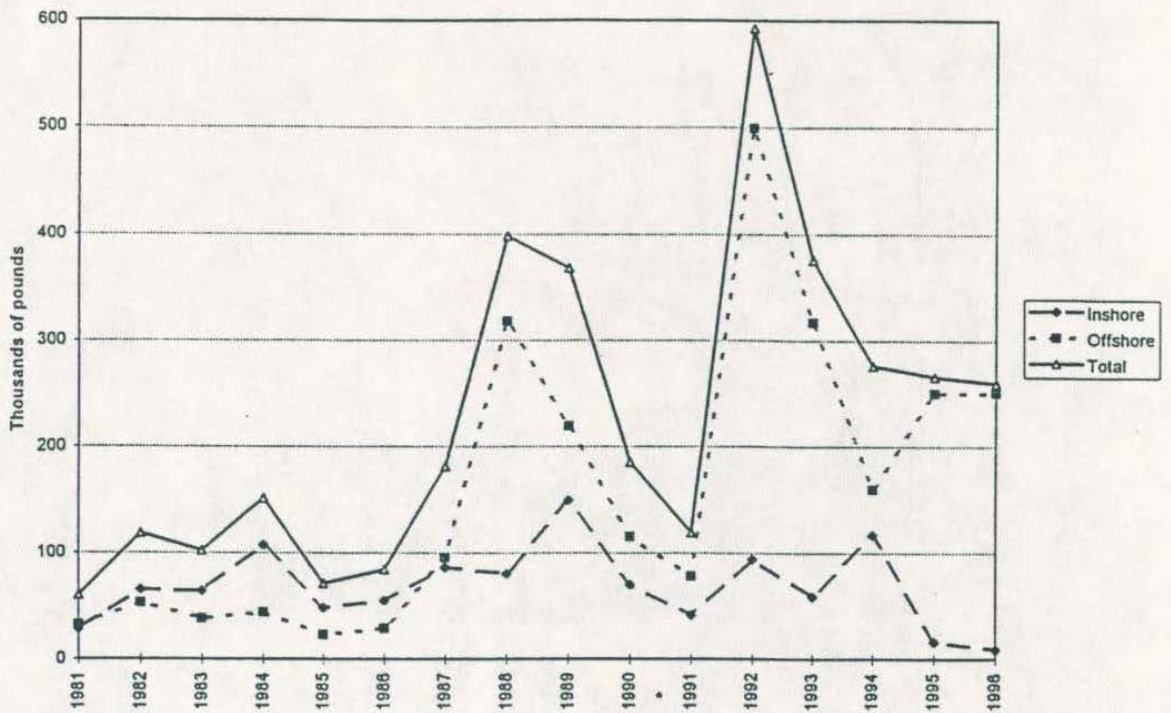


Fig. 37. Annual commercial landings of sharks.

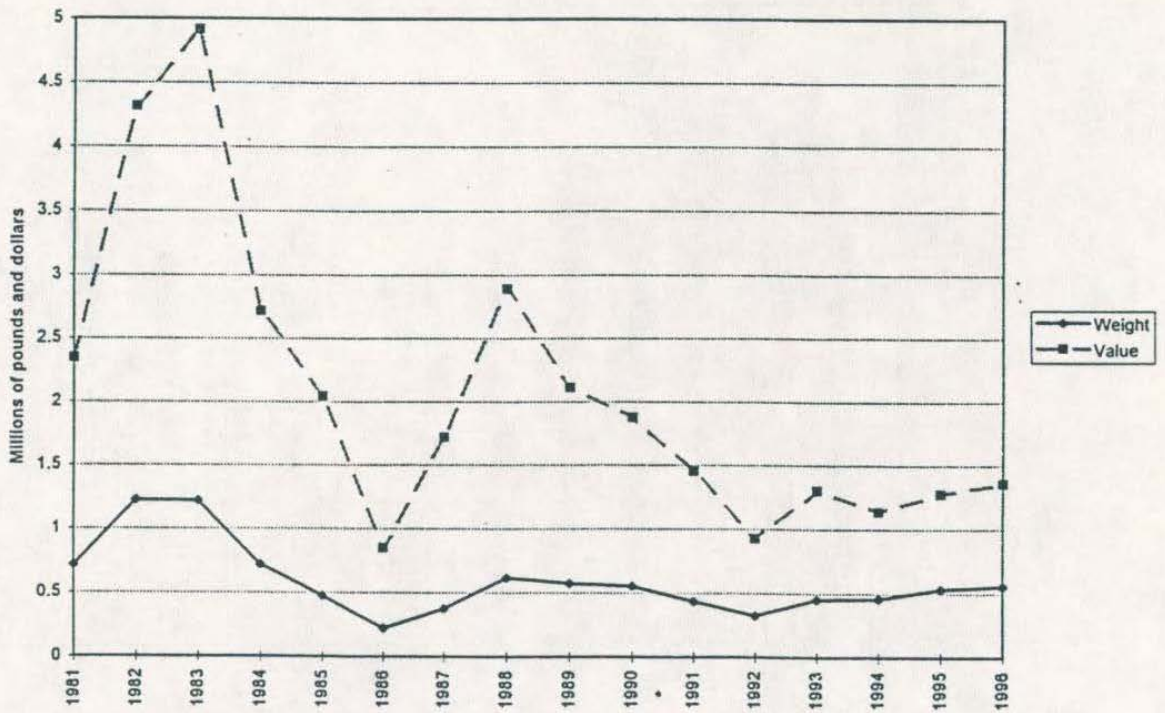


Fig. 38. Annual production of the pelagic longline fishery.

past few years (Fig. 38). Although swordfish (277,000 pounds and \$990,000) have remained the preferred target by virtue of their high unit value, the percentage contribution of other species has been steadily increasing (Fig. 39).

The major components of this bycatch are dolphin, sharks, and tunas (mainly yellowfin). Landings of all three have increased sharply in recent years (Fig. 40), while swordfish landings have not. Their "incidental catch" status has therefore become both controversial and conjectural. A major industry group now acknowledges the importance of the "bycatch" in terms of overall landed value. With the continuing decline in swordfish abundance, this fishery has evolved from one directed at a single species with associated incidental landings into a multispecies targeted fishery.

Swordfish are fished at night and the accompanying shark catches have always been considerable. Previously, these were largely discarded, due to handling problems, low value, and space constraints. Growing demand for fins and quota fulfillments for the large coastal group appear to have produced a much higher retention rate of this bycatch. These factors, rather than increased directed effort for pelagic sharks (with 1996 perhaps an exception), presumably explain the increased shark landings.

Dolphin landings have been relatively high during 1995 and 1996 in other fisheries besides the pelagic longline fishery. Commercial handline landings have increased substantially and charterboat CPUE has been unusually high. Other recreational catches also reportedly have been much better than previously. Longliners maintain that dolphin have been much more abundant in their customary fishing areas and that they therefore have had higher incidental landings. Concurrent success in other fisheries tends to support this assertion.

The daytime fishery for yellowfin tuna could be expected to take large numbers of dolphin when they are abundant. Directed interest in yellowfin tuna appears to have increased and this probably has contributed to the higher dolphin landings as well as those of tunas, following several years of apparent decline in yellowfin regional abundance. There was also increased directed effort for dolphin.

King mackerel landings continued a five-year decline (Fig. 41) with 75,000 pounds worth \$115,000, all taken by snapper reel boats. These landings were the lowest since 1978. The length distribution is shown in Fig. 42. Average length has been variable, but has increased in recent years (Fig. 43): in 1996, it was 85.4 cm. The landings decline off South Carolina in recent years somewhat reflects the regional trend in abundance, which last peaked in the early 1990's, although the stock is not considered to be overexploited by the NMFS.

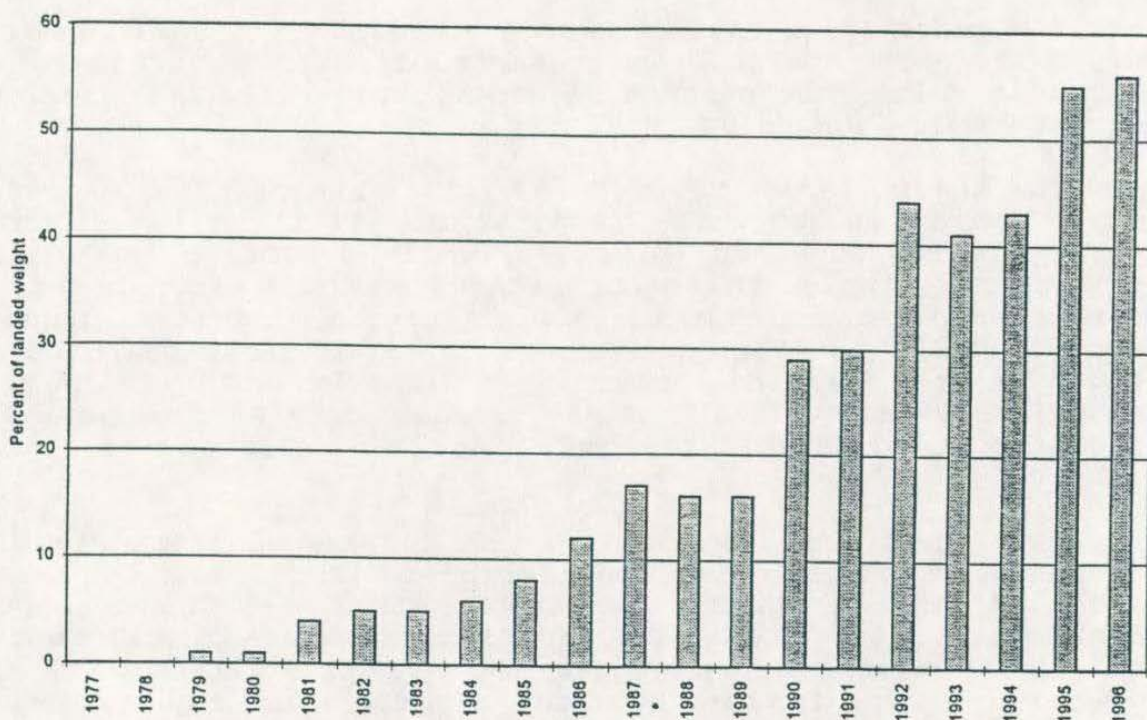


Fig. 39. Annual incidental catch of pelagic longliners.

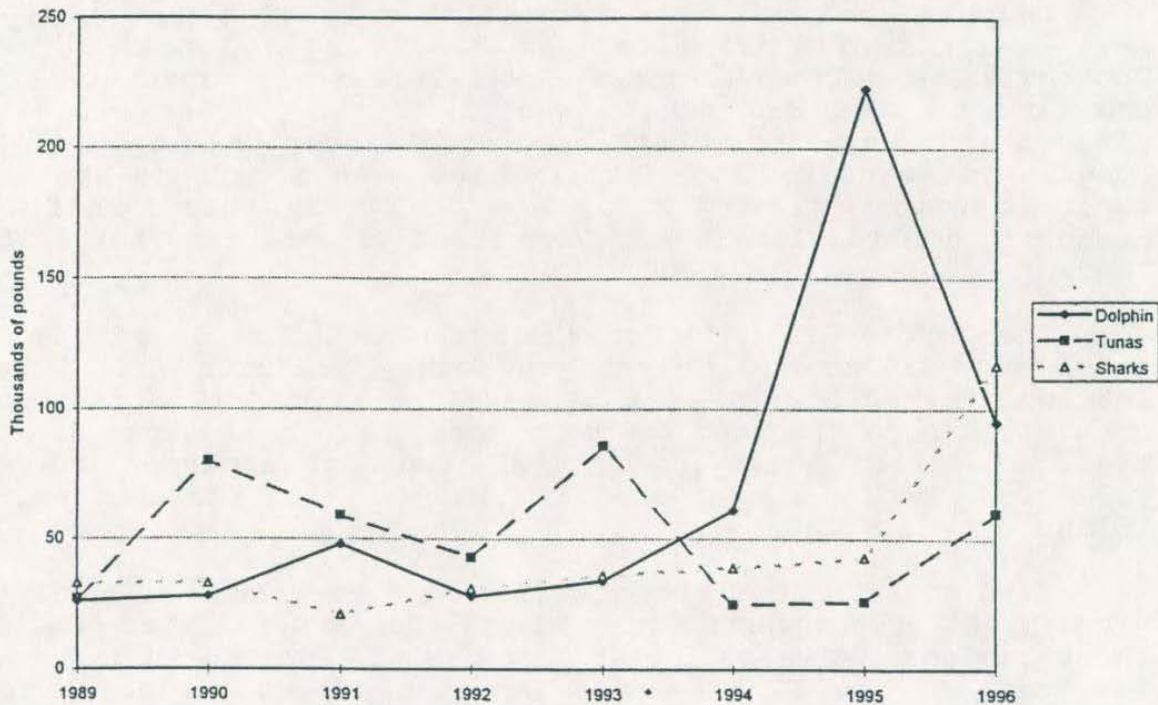


Fig. 40. Annual incidental species landings in the pelagic longline fishery.

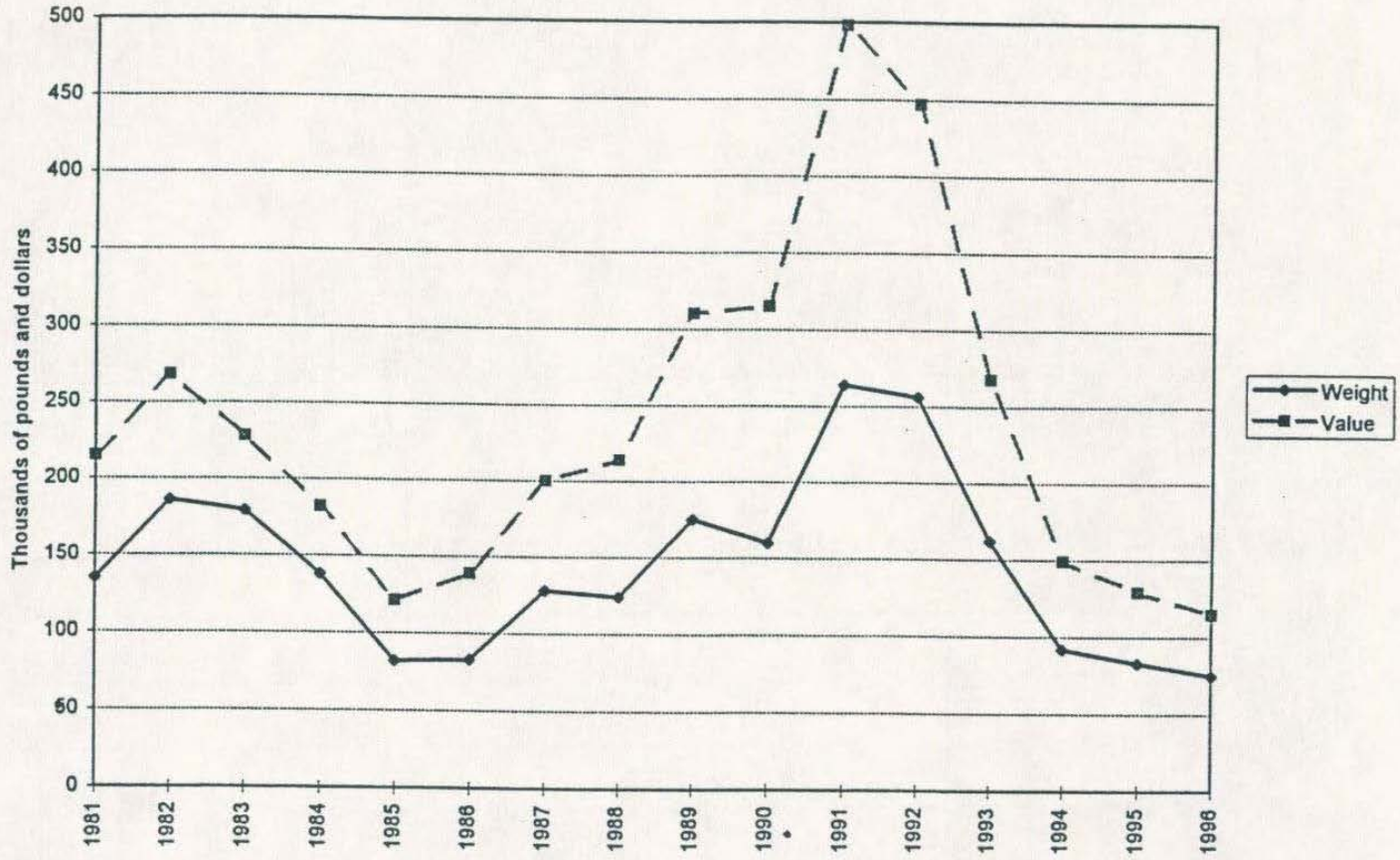


Fig. 41. Annual commercial production of king mackerel.

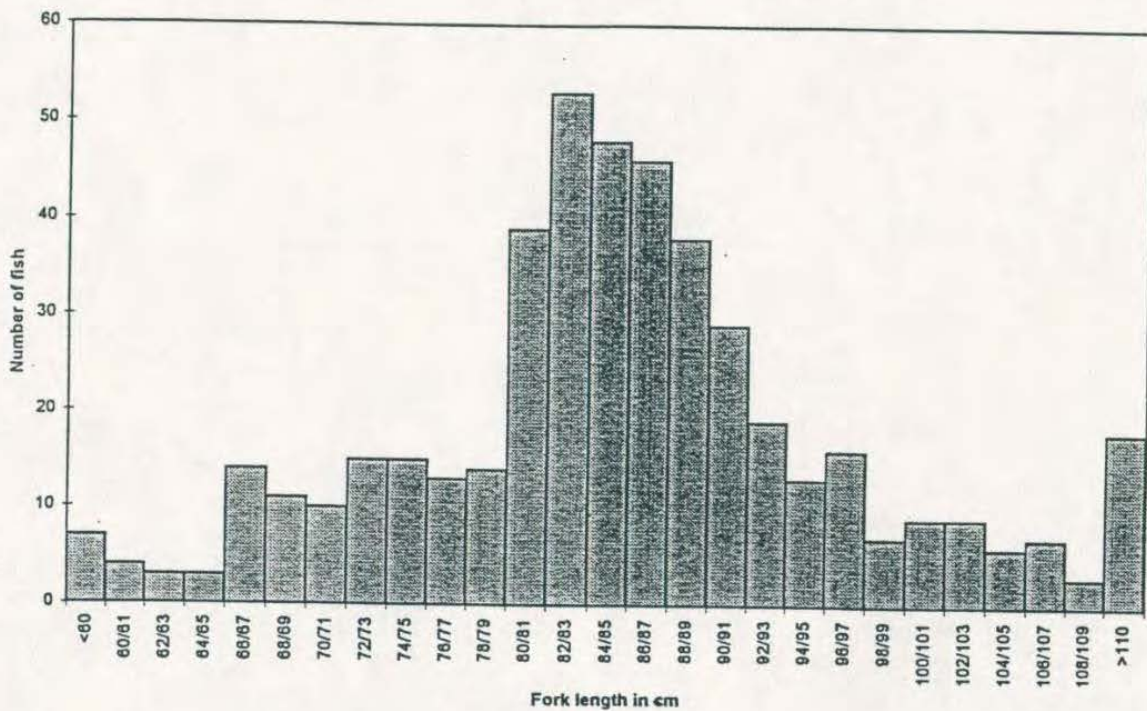


Fig. 42. Length distribution of commercially landed king mackerel.

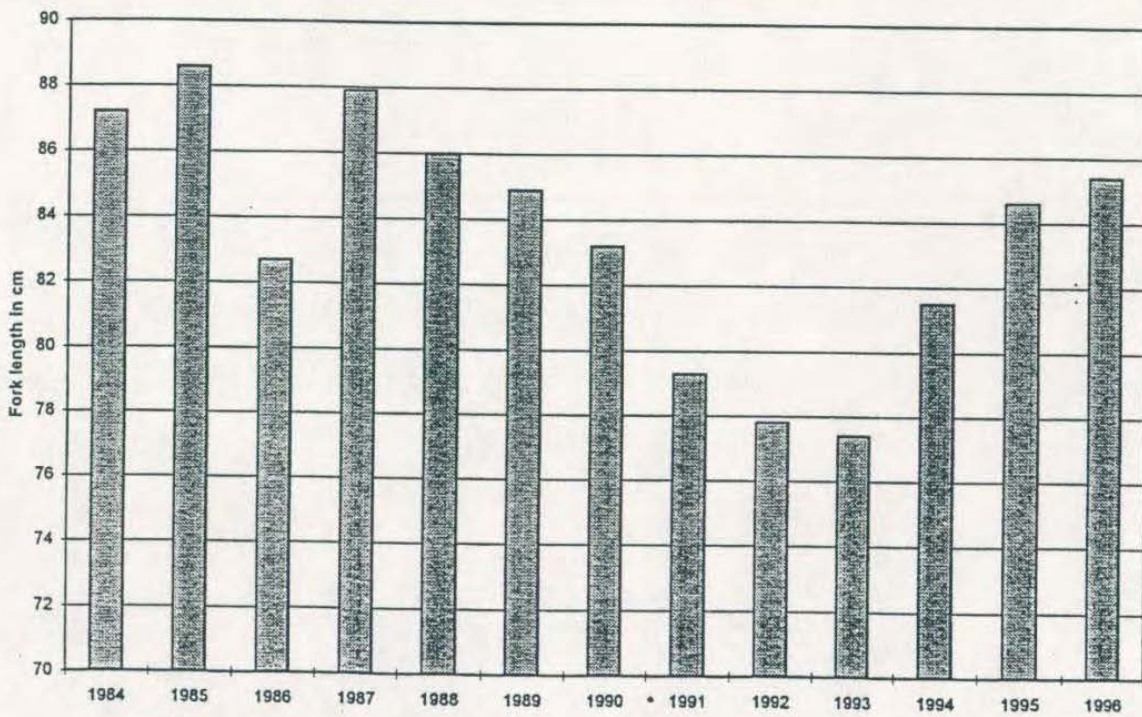


Fig. 43. Average length of commercially landed king mackerel.

The offshore trap fishery was directed at black sea bass. Landings (116,000 pounds valued at \$144,000) matched the previous low set in 1985. The trend in trap landings of black sea bass has paralleled that of overall trap production (Fig. 44), although appreciable quantities of other reef species were also landed during 1990-1991.

The total catch of black sea bass was only 133,000 pounds (\$173,000), the lowest since 1978. Vessels on the ticket system reported an average of 479 pounds per trip, the lowest CPUE to date except for that in 1985. Length distribution of trap-caught sea bass is shown in Fig. 45. The contribution of small (<0.75 pound) fish was above average at 54% (of graded landings by weight).

COASTAL FISH

Most of the species in this category have low unit value. The total 1996 catch was only 185,000 pounds worth \$91,000, among the lowest on record (Fig. 46). Both haul seine and shrimp trawl landings were severely depressed with declines in all species. The passage of Josephine in mid-October probably contributed to the greatly reduced haul seine production.

RIVERINE FISH

Perhaps the most positive aspect of the 1996 commercial fishery in state waters was the marked improvement in landings of river fish, principally American shad. The shad catch was the largest since that in 1984 with substantial increases in landings in both the ocean and riverine fisheries (Fig. 47). The improvement was almost entirely attributable to Santee River fish. After five years of closure, the river herring fishery improved in the second year of its renewal. Landings (confidential) were close to the annual average during 1977-1987, prior to the sharp curtailment of effort.

RECREATIONAL FINFISH FISHERIES

Total participation (excluding headboat fishermen) was estimated by the NMFS at 471,318 fishermen. Out of state residents (299,443) comprised the largest group (64%). Coastal residents (110,956) represented 24% and noncoastal residents (60,919) accounted for 12%. This distribution is very similar to that reported for 1995.

The trends in total participation and that by coastal residents are shown in Fig. 48. A poll of the 1995/1996 purchasers of the marine recreational fisheries stamp, required of all private boat fishermen, indicated that the state's marine anglers are an aging group (average age 46 years) with relatively few young fishermen. The demographic pattern is typical of that associated with the "baby-boom generation" and reflects that group's contribution.

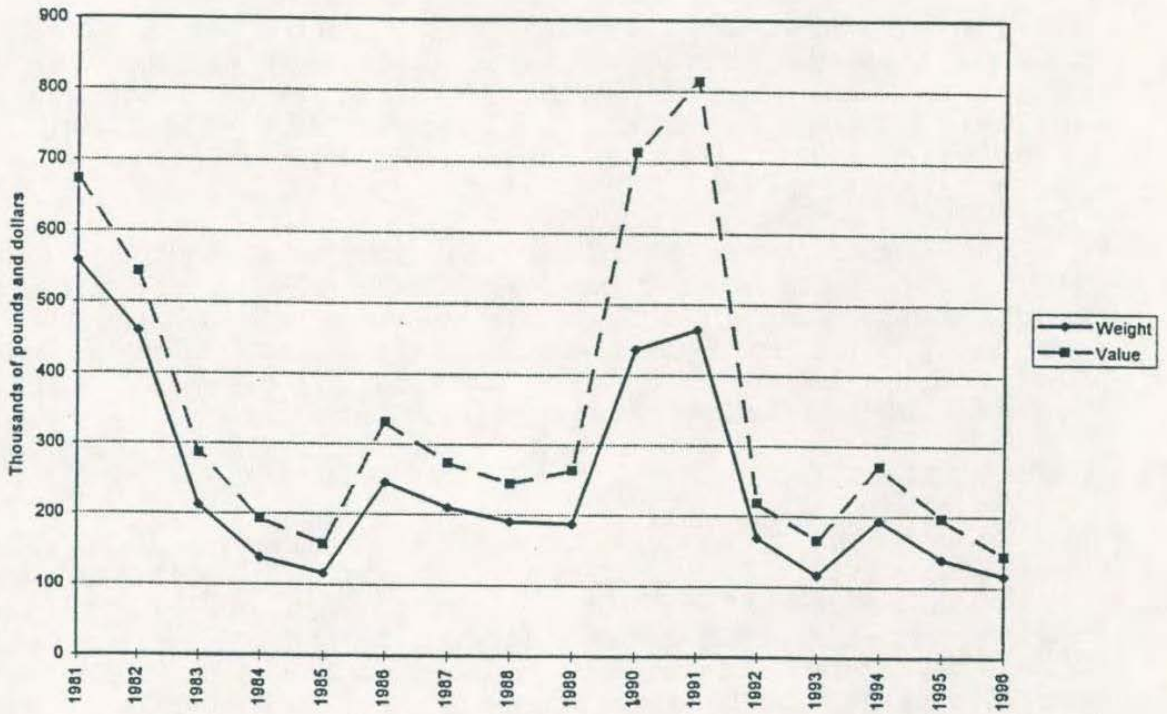


Fig. 44. Annual production of the trap fishery.

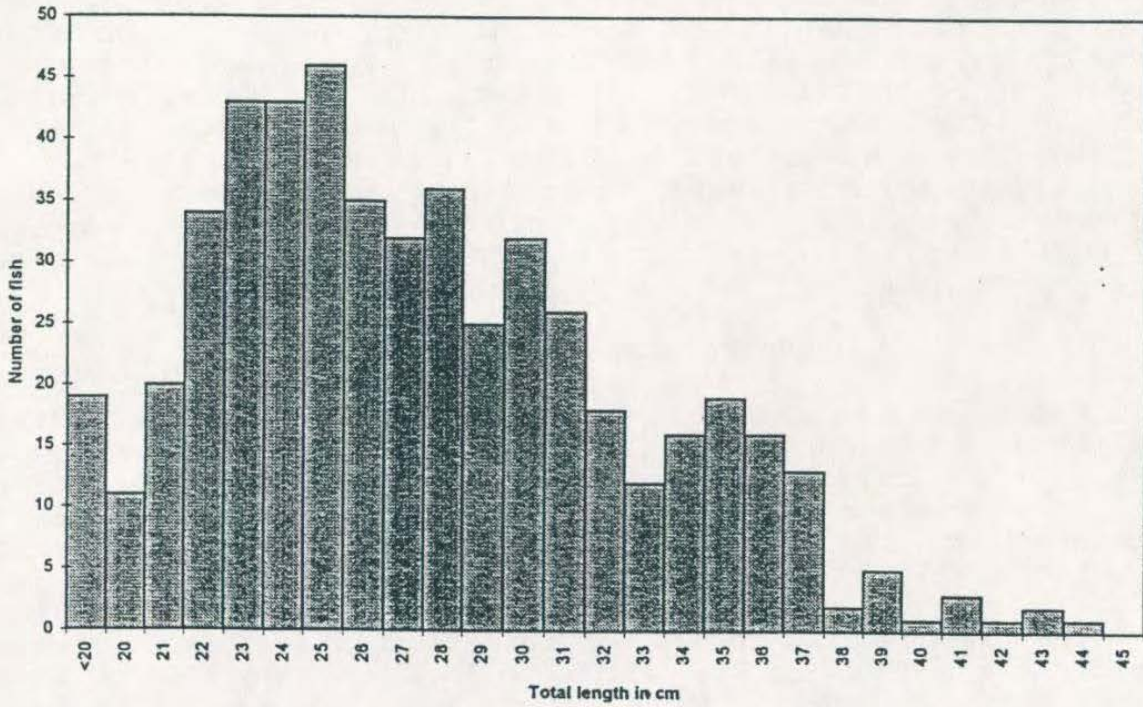


Fig. 45. Length distribution of trap-caught black sea bass.

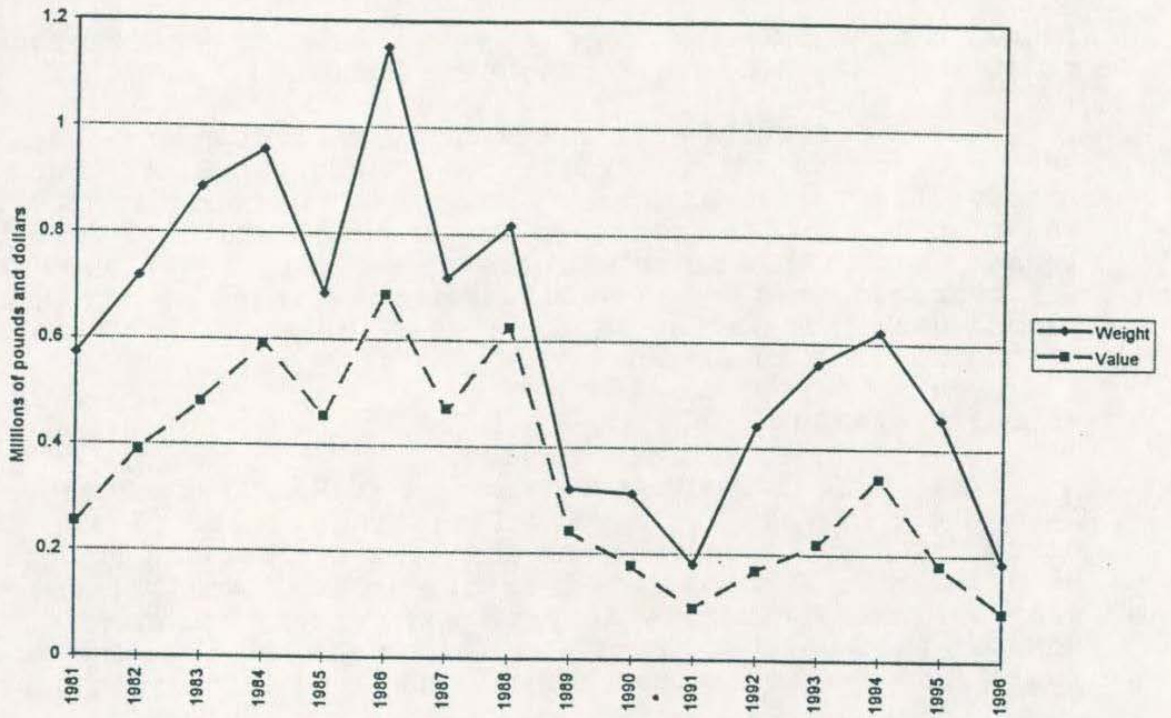


Fig. 46. Annual commercial production of coastal fish.

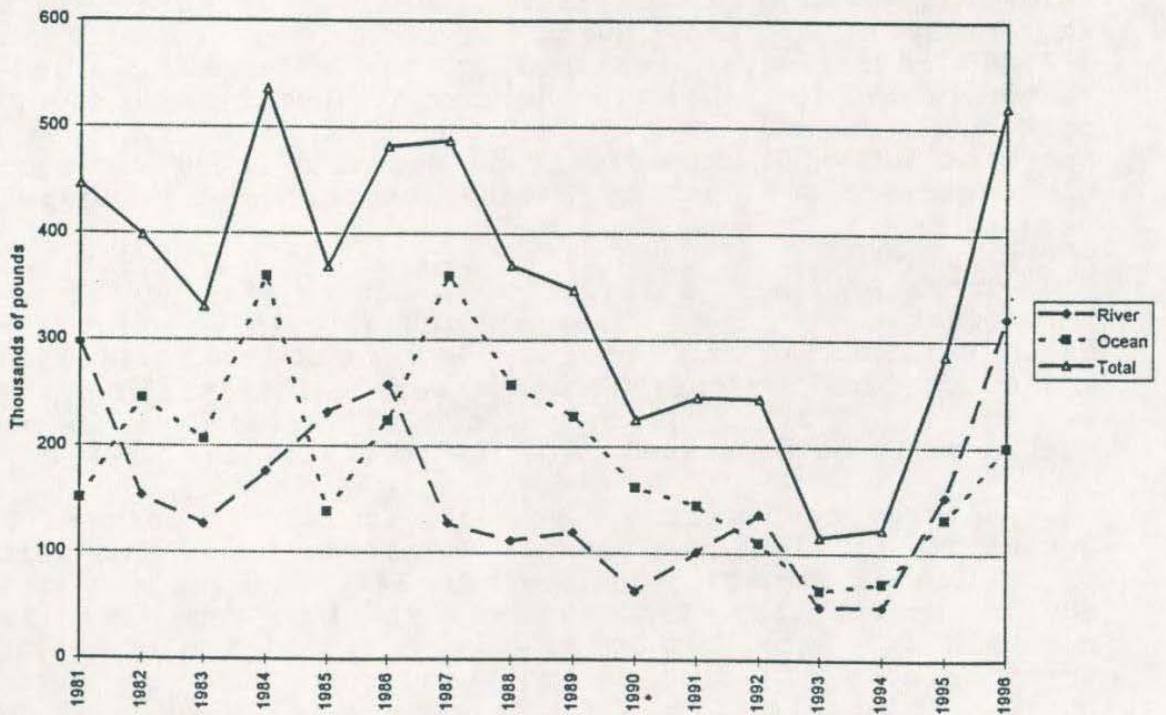


Fig. 47. Annual commercial landings of American shad.

Thus, the trends in recent years are to be expected, i.e., relatively stable with a slight decline.

Total effort in angler-trips was estimated at 1,390,326 by the NMFS, distributed by residence classification and two-month interval (wave) as shown in Table 1. The trends in overall effort and that by coastal residents are shown in Fig. 49. Effort was the lowest since the hurricane/recovery years of 1989/1990. The summer was characterized by unusually severe weather as three hurricanes passed within 100 miles of the state. Presumably, this contributed to the decline in effort.

HEADBOAT FISHERY

The NMFS classified 14 vessels as headboats during 1996, one less than in 1995. Three sailed from Little River, three from Murrells Inlet, four from the Charleston area, and four from Hilton Head Island. Six operated mainly in offshore waters, while the others fished primarily inshore and/or were relatively inactive. None of the boats south of Charleston fished offshore on a regular basis and several limited their operations largely to state waters.

Catch and effort data are summarized in Table 2. Total effort was 54,929 angler-days, the lowest reported since 1974 and well below the average of the last 15 years. Inshore effort (26,861 angler-days) was the lowest on record, while offshore effort (28,068 angler-days) remained at the relatively high level of recent years (Fig. 50). The decline in inshore effort reflected in part the removal of most of the inshore boats that formerly operated out of Little River and Murrells Inlet. Overall effort was curtailed somewhat by several storms during the peak summer season.

Total landings (511,442 fish weighing 580,292 lbs) were among the lowest reported to date, particularly in weight. The inshore catch remained at the severely depressed level of recent years, while offshore (weight) landings were slightly above the 15-year average (Fig. 51). Catch rates (lbs/angler-day) in both areas continued to be depressed relative to historical levels (Fig. 52).

Species composition remained virtually unchanged from that during the previous two years. Vermilion snapper contributed 27% of the landed weight, black sea bass 14%, and groupers (principally gag and scamp) 11%. Fig. 53 shows the long-term trend in species composition. The "Other" category included a wide variety of species, none of which contributed appreciably on an individual basis. Historically, black sea bass (inshore) and red porgy (offshore) were the dominant species with vermilion snapper a minor component. The relative importance of both black sea bass and red porgy has declined at a rapid rate, while that of vermilion snapper has increased. The significance of *Mycteroperca* ("M") groupers has increased substantially due to increased landings of scamp. The

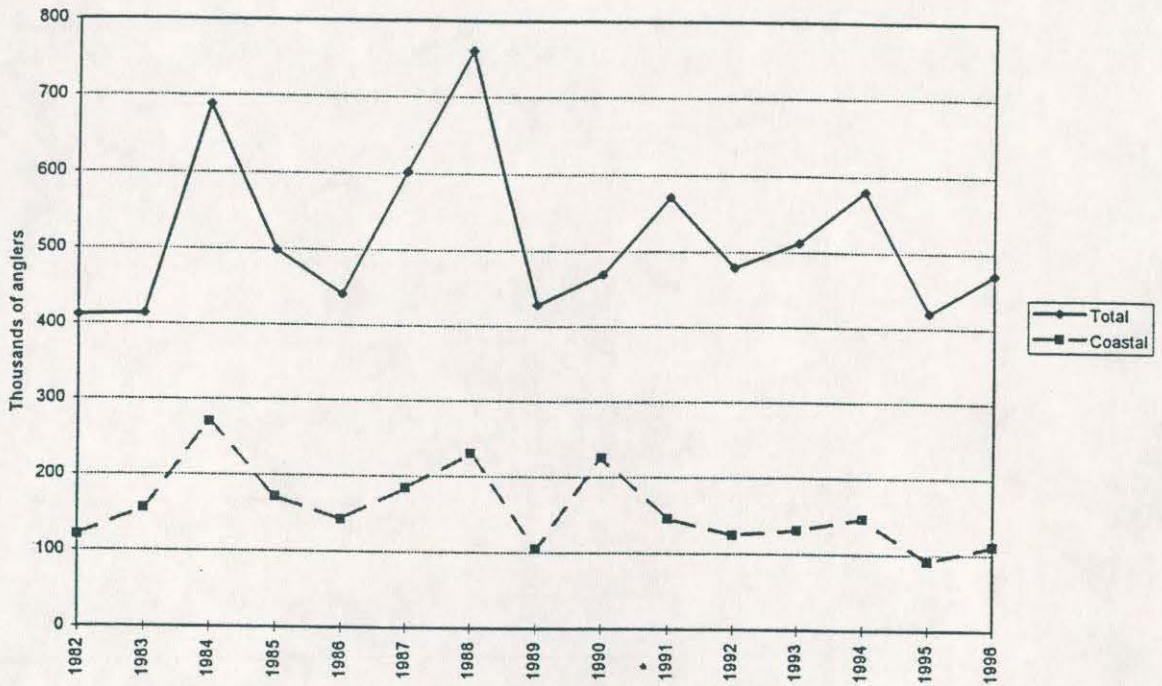


Fig. 48. Estimated participation in the recreational hook and line fishery (excluding headboat anglers).

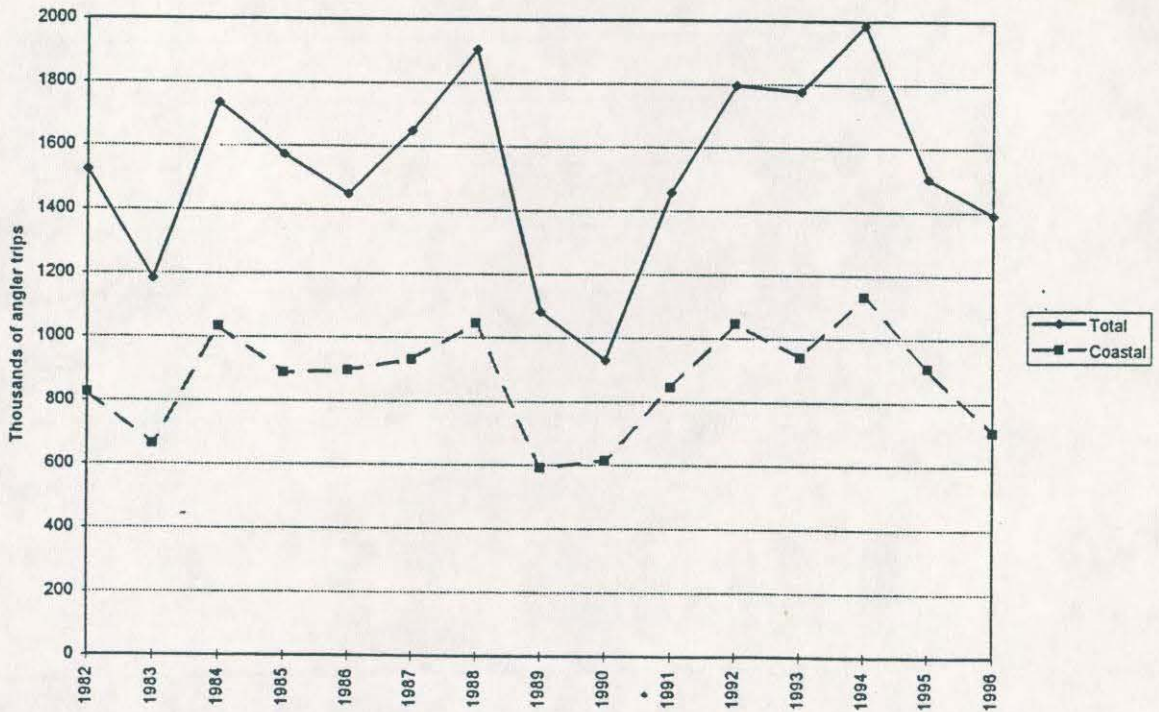


Fig. 49. Estimated effort in the recreational hook and line fishery (excluding headboat trips).

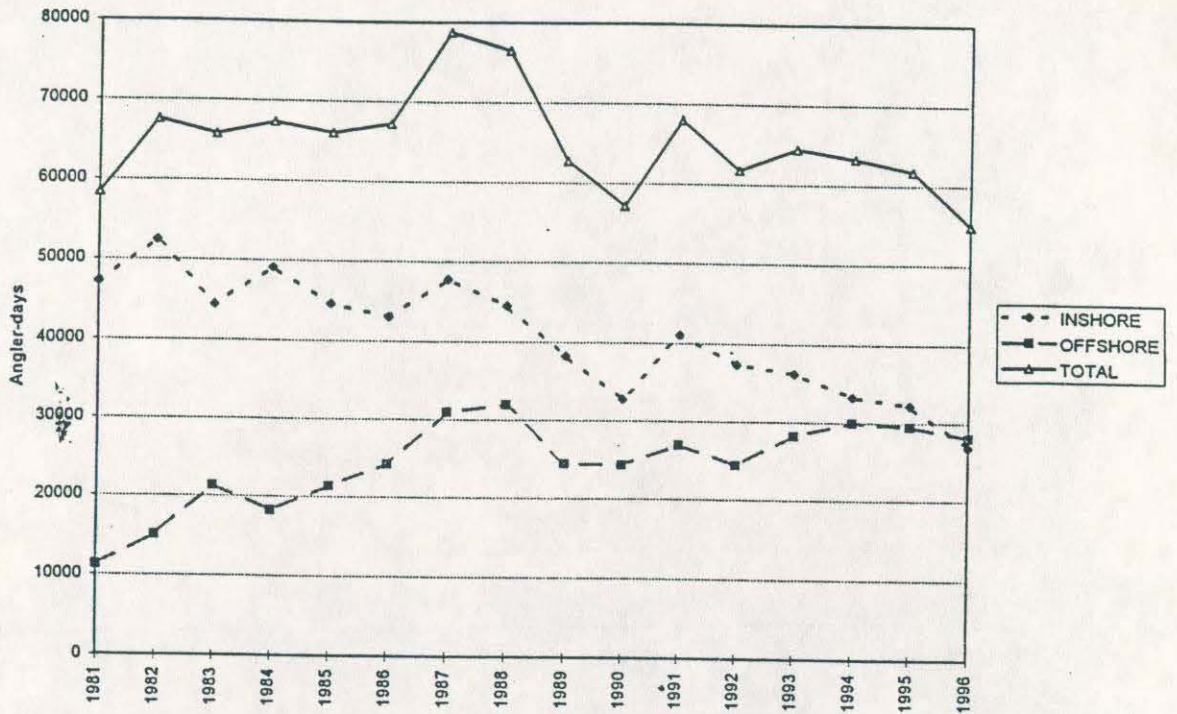


Fig. 50. Estimated effort in the headboat fishery.

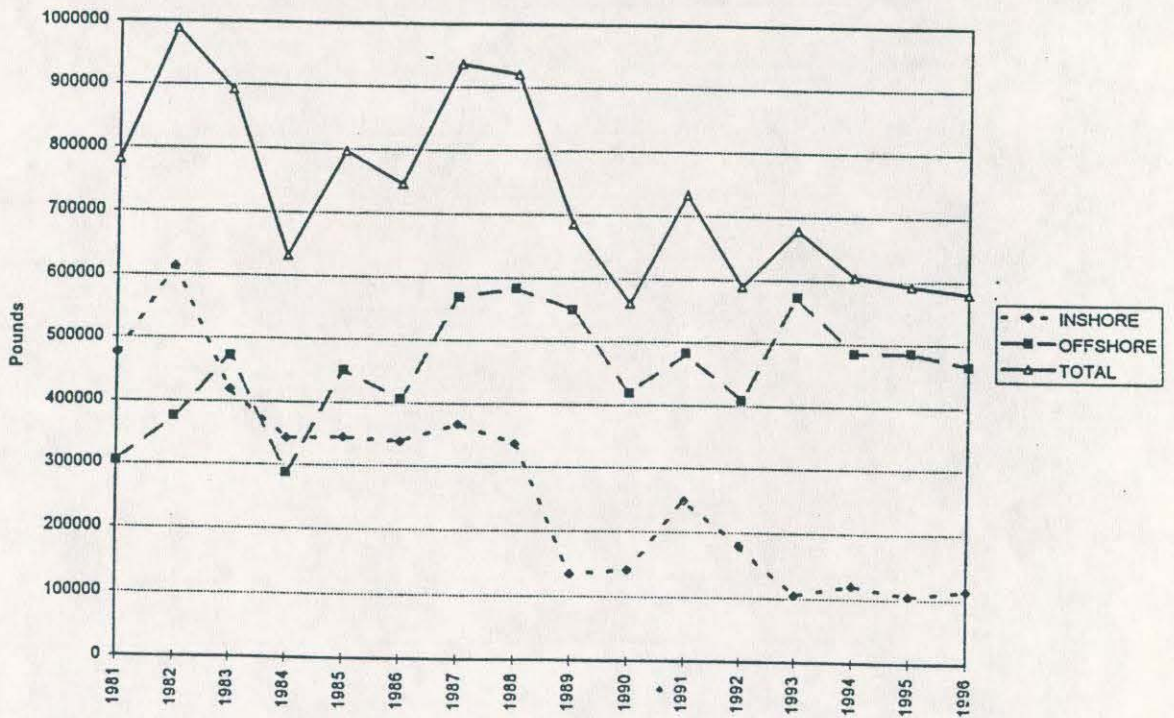


Fig. 51. Estimated catch in the headboat fishery.

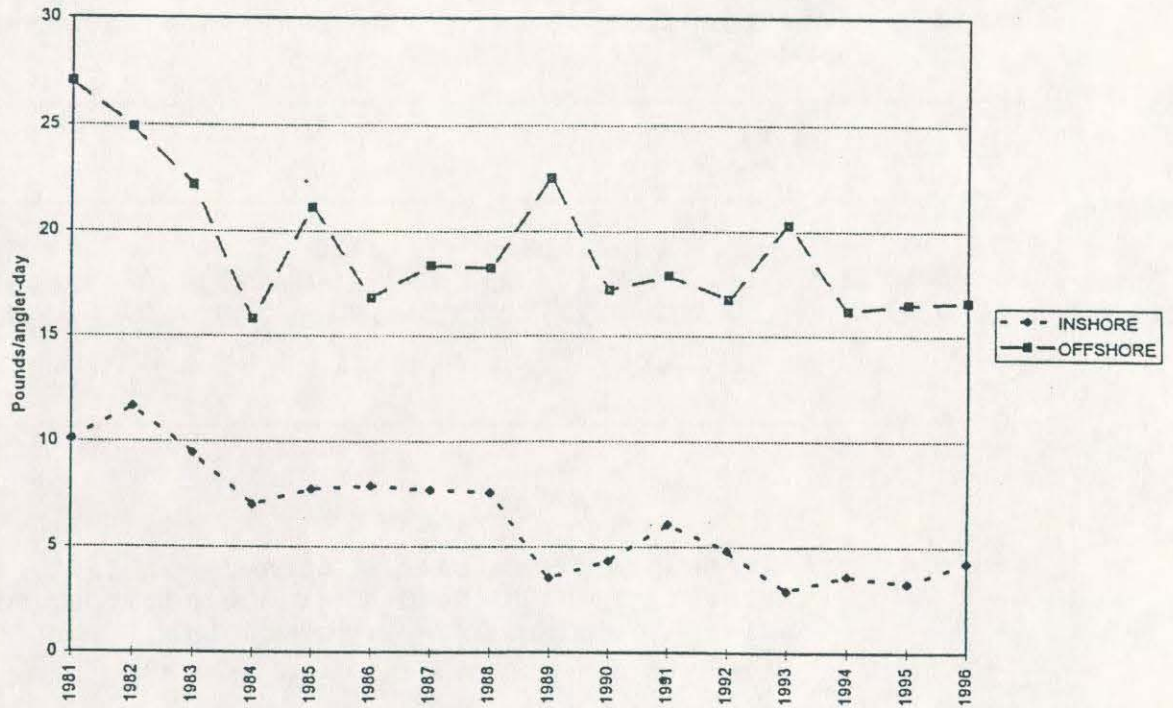


Fig. 52. Average catch rates in the headboat fishery.

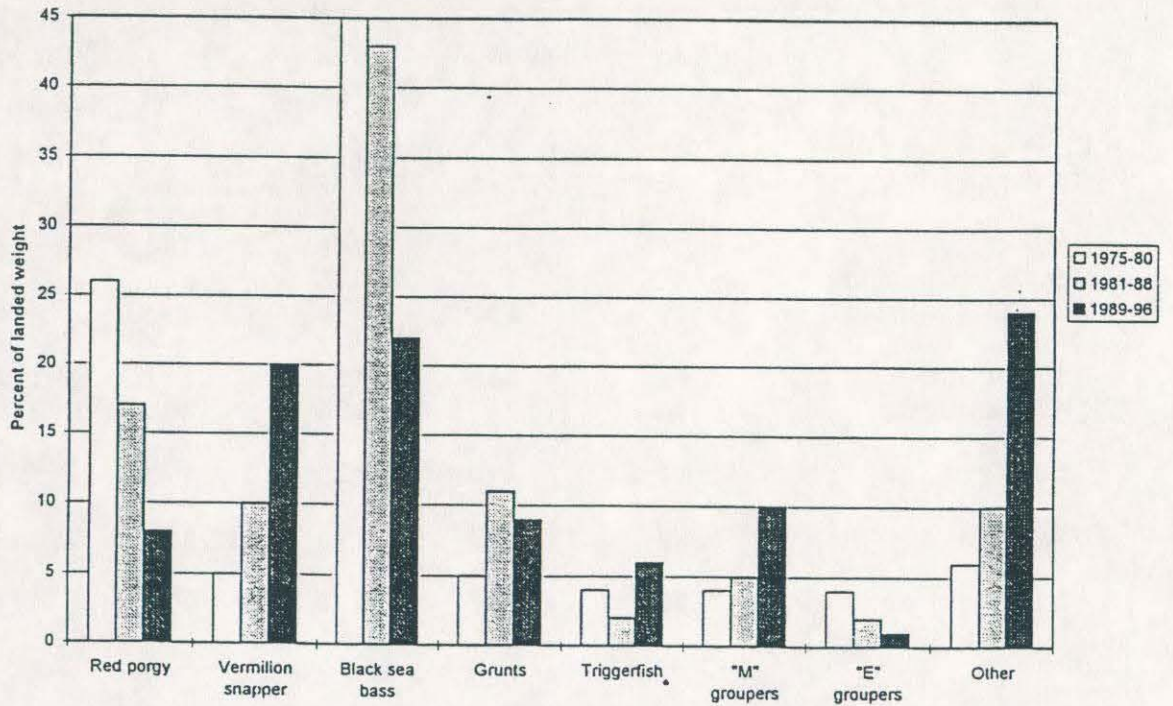


Fig. 53. Species composition of the headboat catch.

Table 1. Distribution of effort by residence and wave.
Source: NMFS MRFSS.

Residence	Wave					Total
	2	3	4	5	6	
Coastal	99,529	224,680	161,113	139,769	81,541	706,631
Noncoastal	19,304	62,091	51,709	25,779	24,939	183,822
Out of state	72,001	119,920	142,971	100,289	64,691	499,873
All	190,832	406,692	355,795	265,837	171,170	1,390,326

Table 2. Estimated headboat catch (numbers of fish) and effort (angler-days). "Other" includes numerous minor species. Source: NMFS Beaufort Lab.

Category	JAN-MAY		JUN-AUG		SEP-DEC	
	Ins.	Off.	Ins.	Off.	Ins.	Off.
Red porgy	522	7,089	524	13,331	191	6,076
Other porgies	1,547	2,542	7,089	5,800	1,543	3,535
White grunt	741	1,714	2,576	5,466	1,536	2,662
Other grunts	1,326	5,275	19,797	14,633	2,912	7,409
Red snapper	4	82	849	984	0	455
Vermilion snapper	1,480	57,111	7,915	87,001	4,172	40,608
Other snappers	0	507	3	2,031	0	35
"E" grouper	168	606	755	1,371	178	632
"M" grouper	110	1,357	394	3,394	238	2,591
Triggerfish	258	2,845	718	15,472	591	5,105
Black sea bass	27,588	19,025	50,913	20,924	9,069	8,056
King mackerel	25	136	120	238	76	192
Sharks	167	540	551	668	124	1,064
Other	460	5,314	1,274	6,579	267	2,224
Angler-days	5,567	8,568	17,869	14,125	3,425	5,375

contribution of large **Epinephelus** ("E") groupers, e.g. speckled hind and snowy grouper, has declined with red and rock hinds now more numerous.

Landings of black sea bass, formerly the mainstay of the fishery, have declined almost continuously since the late 1970's and the 1996 landings barely exceeded those in 1995, the worst year on record (Fig. 54). Part of the decline has been attributable to the reduction in inshore effort with headboat operators complaining of poor fishing year after year. Many fishermen have speculated that the 1989 hurricane adversely affected inshore fishing off Charleston and in Long Bay. Average size remained about the same (0.59 lb/fish).

Landings of red porgy also remained near the lowest level recorded to date (Fig. 55). This species represented 6% of the total landings by weight in 1996. Average size (1.25 lb/fish) was slightly below that of the preceding three years.

Landings of vermilion snapper declined slightly from the record level of the previous two years (Fig. 56). Captains of several boats consistently reported limit catches (10 fish/angler) with many additional fish released. The average size (0.80 lb/fish) was among the largest in the last ten years.

Grouper landings, particularly of **Mycteroperca** spp., have been quite variable in recent years (Fig. 57). The **Epinephelus** catch consisted of small fish (mainly hinds and little snowies) with an average weight of only 2.3 lbs. Scamp comprised most of the **Mycteroperca** catch: captains reported releasing many undersized fish.

Fig. 58 illustrates trends in catch rates of the most abundant species. CPUEs for red porgy and black sea bass have been in a long-term decline, presumably indicative of decreasing abundance. The trend in CPUE of vermilion snappers has appeared to level off following a lengthy period of rather steady increase. This may be due to the capping effect of the 10-fish limit. The species appears to be very abundant, based on anecdotal information provided by captains.

CHARTERBOAT FISHERY

During the calendar year, permits were issued to 201 vessels (excluding those designated as headboats by the NMFS). Nearly all of these boats were licensed for six passengers or less. A total of 166 reported making at least one trip. During the winter quarter (January-March), 52 boats reported fishing. During the rest of the year, the number operating in each quarter ranged from 111 to 135. Participation during each quarter was the highest recorded since mandatory reporting went into effect in July, 1992. The largest relative increase has occurred during the winter

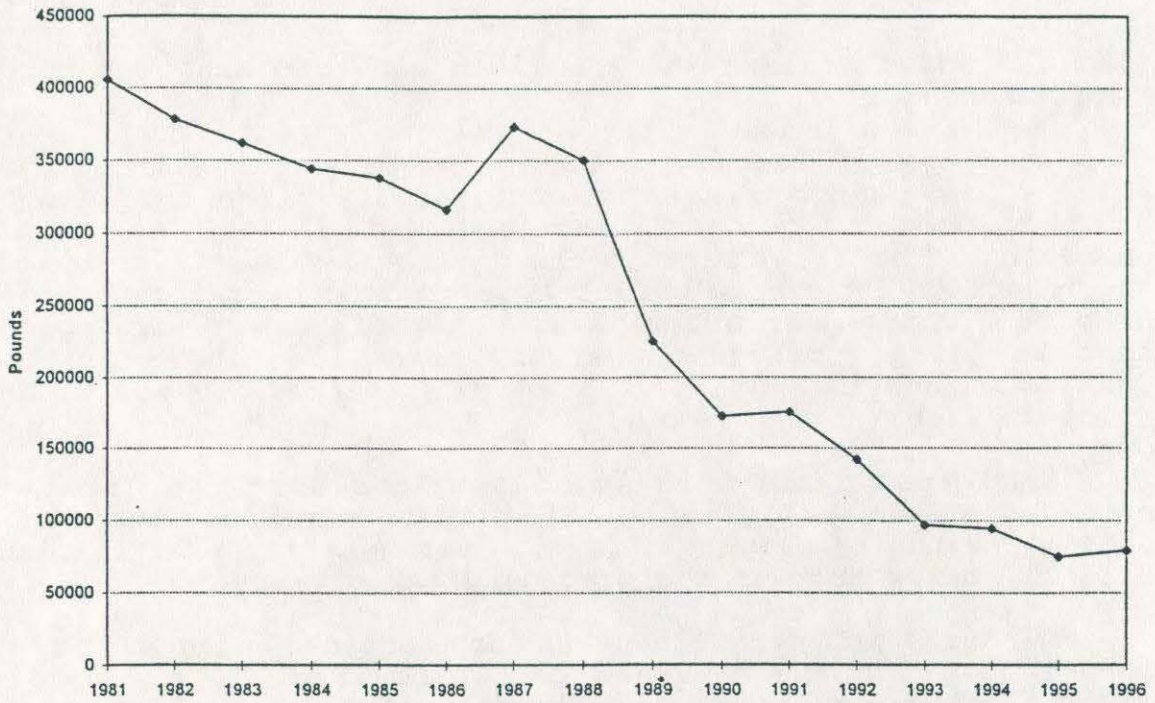


Fig. 54. Headboat landings of black sea bass.

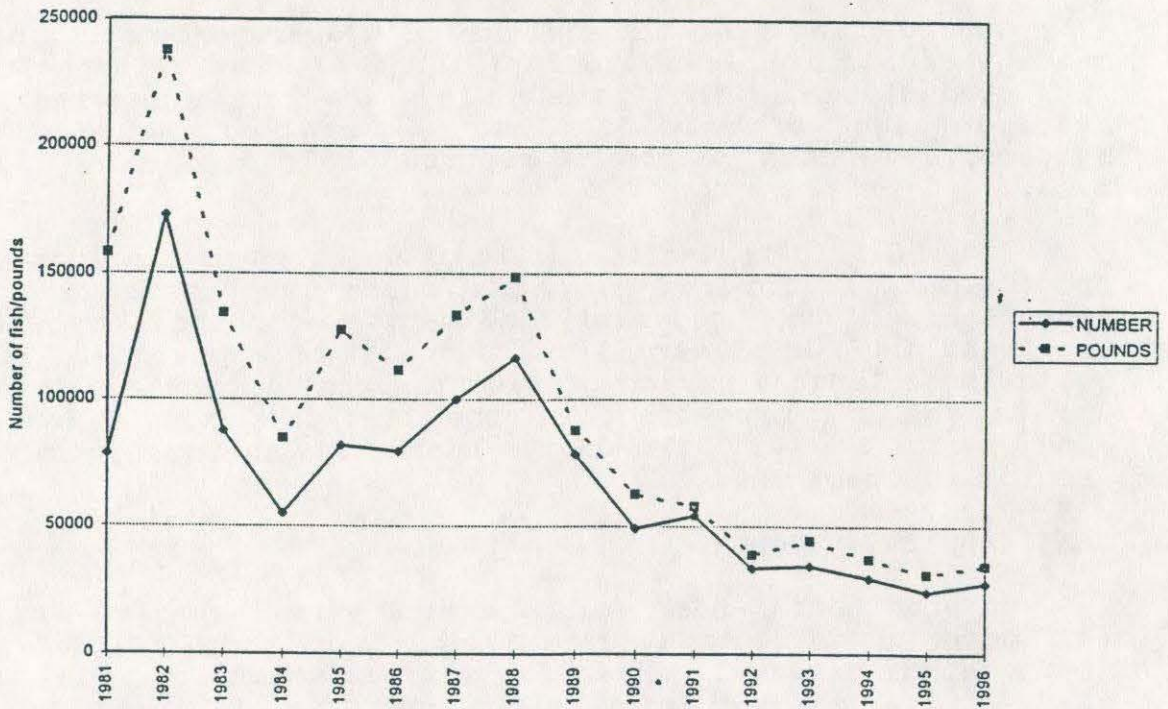


Fig. 55. Headboat landings of red porgy.

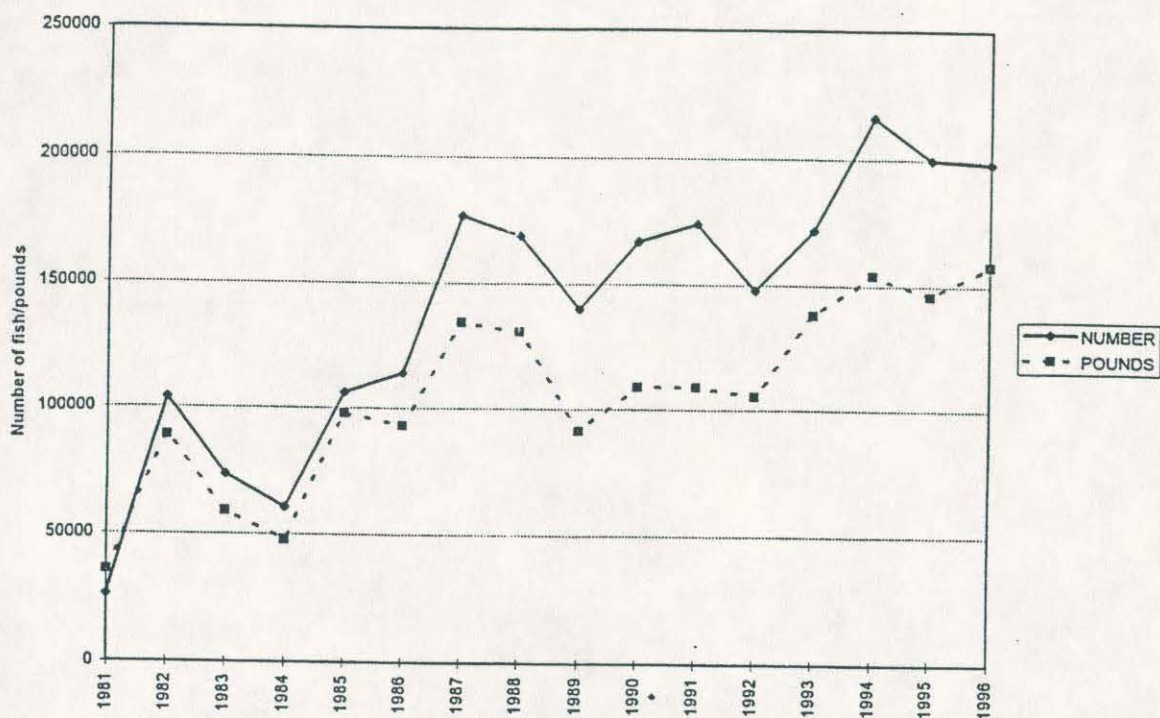


Fig. 56. Headboat landings of vermilion snapper.

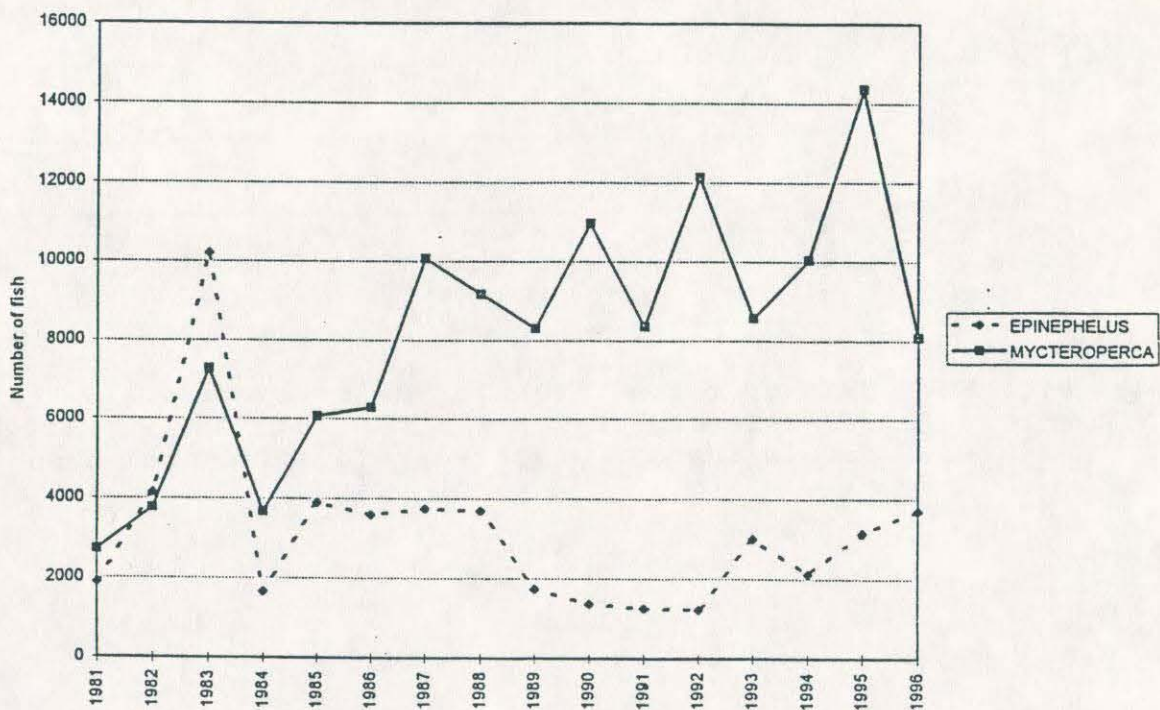


Fig. 57. Headboat landings of groupers.

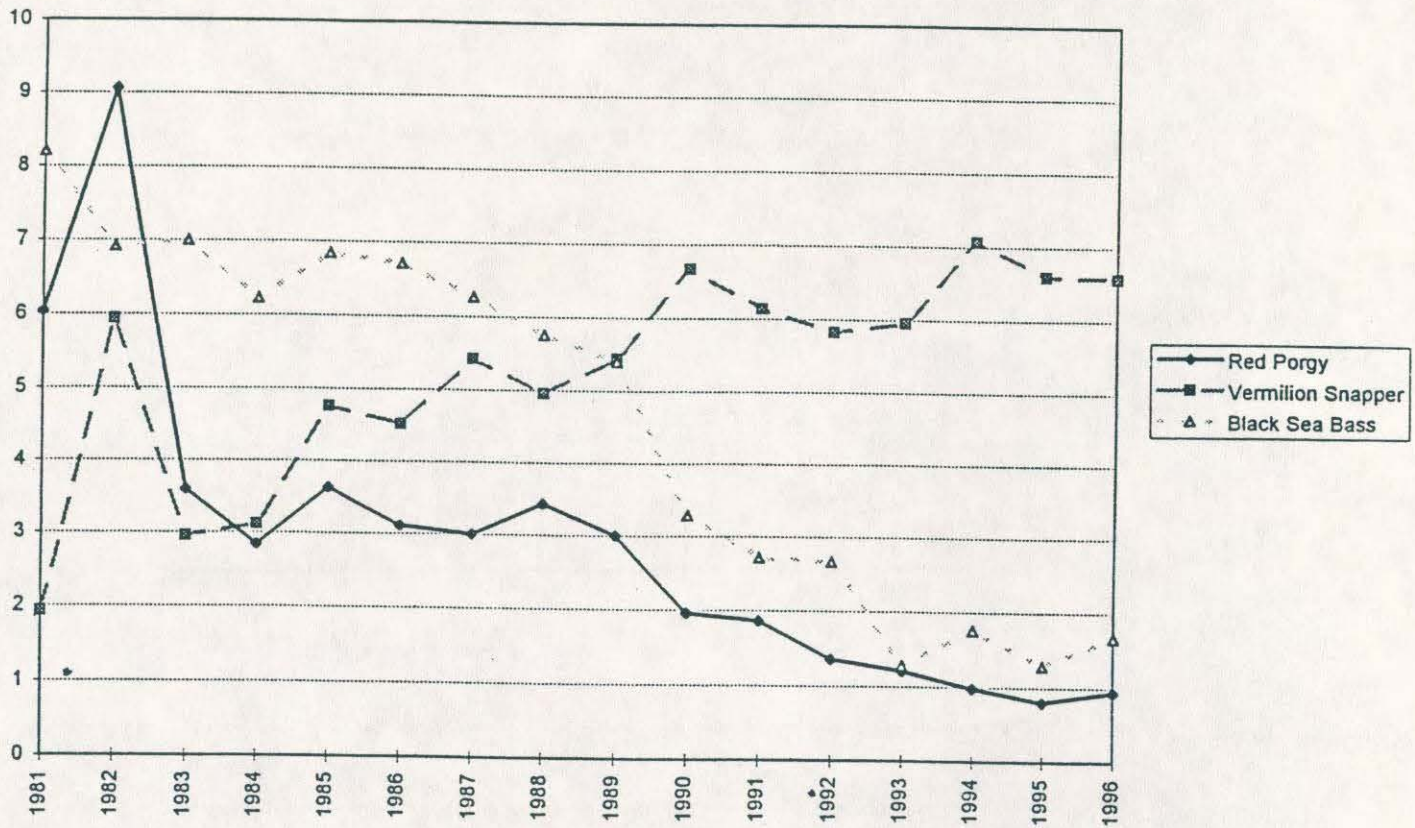


Fig. 58. Average catch rates for major species. No. of fish/offshore angler-day for red pogy and vermilion snapper, pounds/inshore angler-day for black sea bass.

quarter, primarily due to an expanding small boat fleet targeting red drum in inland waters.

Fleet distribution by boat length and location (in numbers of boats) was as follows:

Location (County)	Length (ft)					All
	<20	20-26	27-31	32-40	>40	
Beaufort/Colleton	6	23	8	13	5	55
Charleston/Berkeley	21	15	14	8	30	88
Georgetown	4	5	4	9	7	29
Horry	0	0	8	14	7	29
Total	31	43	34	44	49	201

Nearly all of the recent fleet growth has been in Charleston County. Relative expansion has been greatest in the smallest (<20 ft) and largest (>40 ft) length classifications. Most of the increased vessel participation has been on inland waters. The number of boats fishing on artificial reefs has remained nearly constant. There has been a minor increase in fleet size fishing over natural ocean habitat.

Charter captains reported making 6,055 boat trips with increased numbers during each quarter compared to last year, except during the summer (July-September). Severe weather (three hurricanes passed within 100 mi.) presumably curtailed effort then. Trips on inland waters have consistently increased, while trends have been variable for other areas. The average numbers of trips/boat and inactivity rates for vessel length categories were as shown below:

Length(ft)	% of total trips	mean trips/boat	% inactive
<20	16	32	3
20-26	28	39	19
27-31	14	25	24
32-40	27	37	21
>40	15	18	16

About 60% of the permitted vessels made <25 trips during the year (the same activity rate observed in 1995). Of the active boats, 29% reported making >50 trips. Distribution of boat trips by location (in percents of total effort) was as follows:

County	1993	1994	1995	1996
Beaufort/Colleton	53	54	51	47
Charleston/Berkeley	22	23	26	30
Georgetown	15	8	7	8
Horry	10	15	16	14

The reported number of charterboat anglers declined for the second consecutive year. The number of anglers reported by boat captains was equivalent to the number of angler trips estimated by the NMFS MRFSS. As noted for all years since mandatory reporting

began, the number of angler trips reported to the MRD was a great deal less than estimated from the MRFSS:

Source	Estimated angler trips by wave						All
	1	2	3	4	5	6	
MRFSS							
Coastal		2,271	4,444	3,634	2,857	3,388	16,594
Noncoastal		2,271	6,868	7,827	3,463	2,635	23,064
Out of state		34,873	30,704	55,906	19,481	14,117	155,082
Total	0	39,414	42,017	67,367	25,802	20,140	194,740
MRD	327	2,264	8,485	8,854	3,151	835	23,916

Table 3 summarizes the distribution of annual effort by fishing area, method, and target species. Trends in directed effort are indicated in Table 4. These have obviously been variable, depending on species group. The large increase in red drum effort partly reflects new participation and increased effort during the winter quarter. The decline in offshore trolling effort has largely occurred during the summer with bad weather in 1996 a significant factor. The large drop in inland shark effort partly reflects the departure from the fishery of several large vessels that typically carried >10 anglers per trip.

Landings data reported to the MRD are summarized in Table 5. Based on these data, the following comments apply to the indicated major species groupings.

Oceanic pelagics- Spring landings of dolphin were well below the exceptional level in 1995, despite a 10% increase in effort. CPUE (0.89 fish/trolling boat-hour) also was well below last year's (1.31), but slightly above the 1993 (0.76) and 1994 (0.85) figures. Wahoo and yellowfin tuna landings were also down, the latter apparently reflective of a continuing decline in regional abundance.

Reef fish- The total catch of black sea bass was appreciably larger than in recent years, despite indications of a continuing stock decline. Aggregate grouper landings also increased with scamp remaining the most numerous species. Much (73%) of the scamp catch was released, due to being undersized. Red porgy landings were substantially higher than in previous years, although this stock also is considered depleted. Catches of other species showed mixed trends. It should be noted that the charterboat catch of this complex is small compared to the headboat landings.

Coastal pelagics- The most targeted offshore species of the South Carolina fleet is the king mackerel. Landings of kings were considerably below those in 1995, despite a comparable level of directed effort. Seasonal CPUE (Fig. 59) therefore was generally below the level of recent years. Directed effort for Spanish mackerel was divided rather evenly between ocean coastal and offshore areas. This effort increased substantially from the 1995

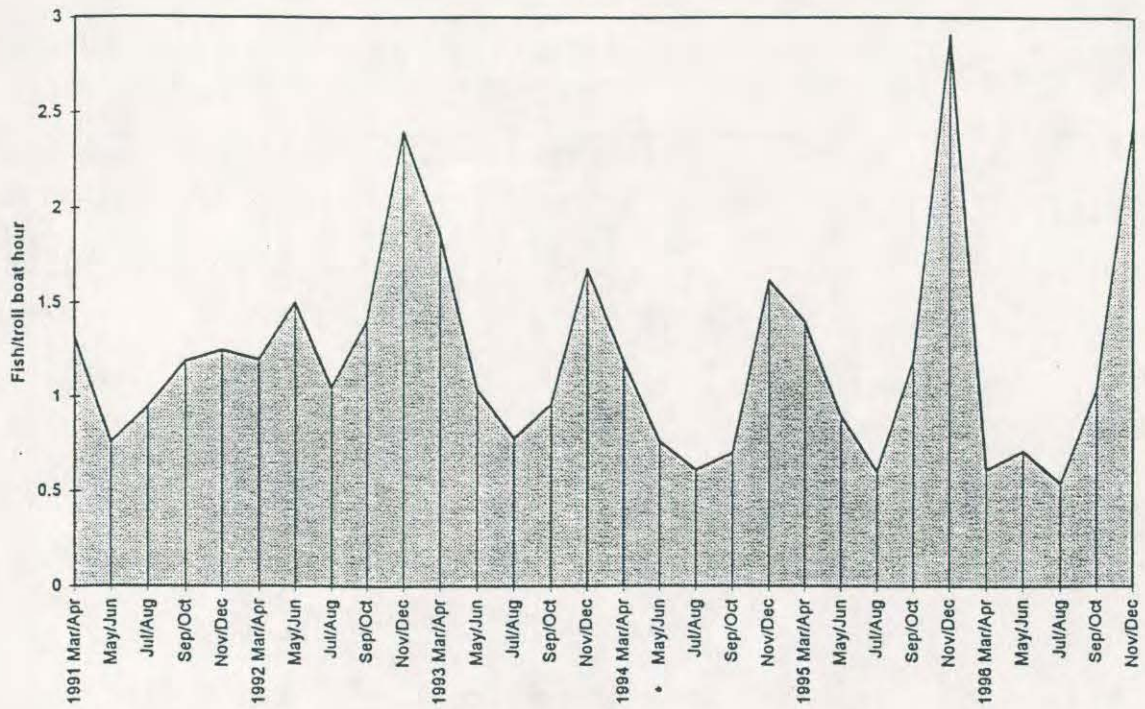


Fig. 59. Charterboat king mackerel CPUE.

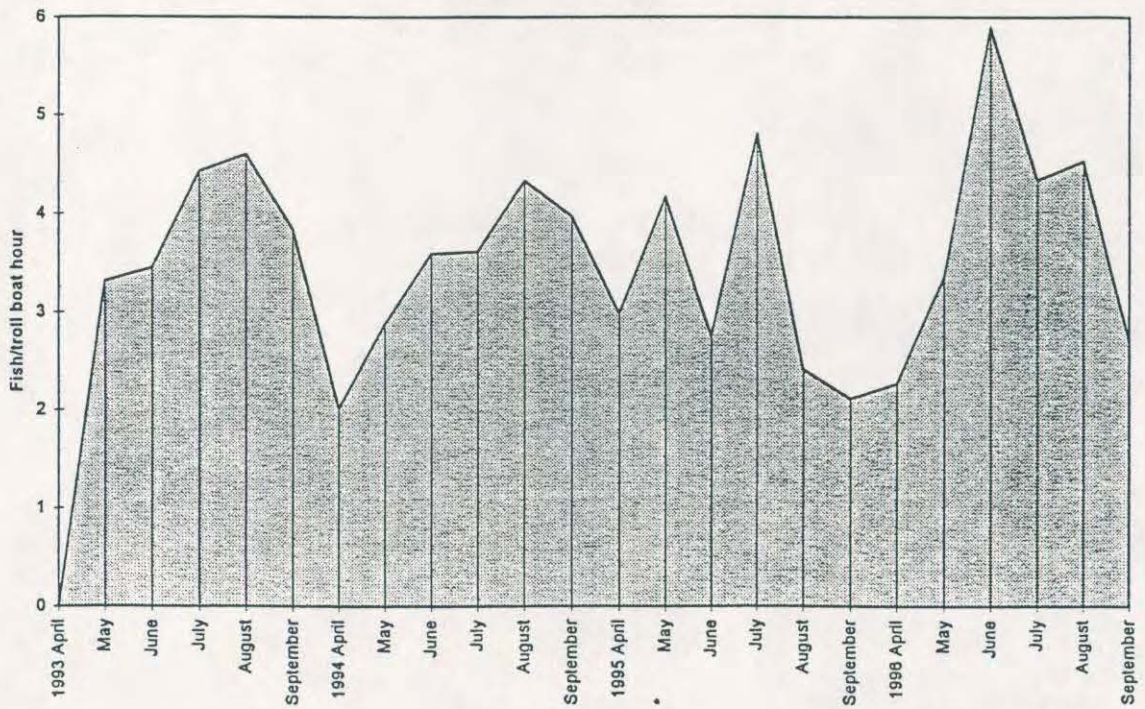


Fig. 60. Charterboat Spanish mackerel CPUE.

Table 3. Charterboat participation and effort (angler-hours inland, boat-hours ocean). Source: MRD trip logsheets.

Area	Method	Target species	Boat trips	Anglers	Hours
Inland	Any	Red drum	1,067	2,144	9,122
		Spotted seatrout	109	248	1,004
		Sharks	108	393	1,236
		Tarpon	101	274	1,596
		Cobia	16	35	141
		Flounder	9	30	179
		Spanish mackerel	8	20	75
		Sheepshead	7	17	52
		Bluefish	5	14	45
		Crevalle jack	4	8	31
		Spot	4	19	91
		Striped bass	1	2	6
		Any	207	853	3,362
		Total	1,646	4,057	16,940
Ocean, 0-3 mi. natural	Troll	Spanish mackerel	192	815	702
		King mackerel	108	400	440
		Cobia	1	2	6
		Bluefish	1	2	4
		Crevalle jack	1	1	4
		Any	2	8	4
		Total	305	1,228	1,160
	Non-troll	Sharks	461	2,076	1,628
		Tarpon	67	201	311
		Red drum	39	136	131
Black sea bass		22	128	86	
Sheepshead		13	54	43	
Spotted seatrout		13	26	66	
Cobia		11	36	49	
Spot		7	19	30	
Black drum		3	9	11	
Crevalle jack		3	5	11	
Bluefish		2	10	8	
Spanish mackerel		1	2	5	
King mackerel		1	4	3	
Weakfish	1	2	5		
Rays	1	6	3		
Any	154	530	587		
Total	799	3,244	2,977		
Ocean, 0-3 mi. manmade	Troll	Spanish mackerel	22	83	65
		King mackerel	11	48	37
		Total	33	131	102
Non-troll	Sheepshead	102	389	296	
	Red drum	21	87	48	

		Sharks	3	11	8		
		Black drum	3	7	8		
		Tarpon	2	4	14		
		Any	40	125	111		
		Total	171	623	485		
Ocean, > 3 mi. natural	Troll	King mackerel	1,007	4,559	4,487		
		Spanish mackerel	246	1,188	709		
		Billfish	84	382	586		
		Dolphin/wahoo/tuna	79	355	540		
		Barracuda	19	95	48		
		Little tunny	7	39	35		
		Amberjack	5	41	33		
		Cobia	1	6	3		
		Any	506	2,521	3,401		
		Total	1,954	9,186	9,845		
		Non-troll		Sharks	107	537	301
				Grouper	102	475	527
				Black sea bass	102	517	399
Sheepshead	23			100	66		
Tarpon	21			81	70		
Spadefish	16			68	65		
Amberjack	7			40	36		
Red drum	5			18	15		
Cobia	2			8	12		
Dolphin	1			3	6		
King mackerel	1			5	5		
Any	415			2,149	2,037		
Total	802			4,001	3,539		
Ocean, > 3 mi. manmade	Troll	King mackerel	200	865	871		
		Spanish mackerel	63	254	212		
		Cobia	2	6	12		
		Bluefish	2	7	4		
		Barracuda	1	4	3		
		Any	3	12	8		
		Total	271	1,148	1,110		
Non-troll		Sheepshead	19	79	53		
		Black sea bass	10	42	33		
		Grouper	5	15	16		
		Spadefish	2	7	6		
		Black drum	1	4	3		
		Red drum	1	2	5		
		Cobia	1	2	6		
		Tarpon	1	2	6		
		Sharks	1	3	4		
		Amberjack	1	13	3		
		Red porgy	1	4	10		
		Any	31	125	147		
		Total	74	298	292		

Table 4. Directed charterboat effort for principal species.
Source: MRD trip logsheets.

Category	Effort units	1993	1994	1995	1996
Red drum	Angler-hours	1,996	3,793	8,167	9,779
Spotted seatrout	Angler-hours	1,591	1,356	1,454	1,128
Sheepshead	Angler-hours	1,106	1,647	1,554	1,870
Tarpon	Angler-hours	989	3,397	2,687	2,794
Sharks (inland)	Angler-hours	2,403	2,987	1,033	1,236
(ocean)	Boat-hours	1,317	2,134	2,593	1,941
Offshore troll	Boat-hours	12,032	12,308	10,337	10,955
Dolphin/wahoo/ tunas	Boat-hours	1,029	1,272	749	546
Billfish	Boat-hours	516	337	400	586
Unspecified	Boat-hours	5,706	3,584	2,934	3,409
King mackerel (ocean troll)	Boat-hours	4,222	6,295	5,770	5,843
Spanish mackerel (ocean troll)	Boat-hours	1,247	1,772	1,210	1,693
Offshore non-troll	Boat-hours	3,619	4,051	3,470	3,831

Table 5. Charterboat catch (numbers of fish) as reported to the MRD by vessel operators.

Group/species	Retained	Released	Inland	0-3 mi.	>3 mi.
Oceanic pelagics					
Dolphin	3,462	259	-	-	3,721
Wahoo	394	9	-	-	403
Yellowfin tuna	552	14	-	-	566
Blackfin tuna	93	9	-	-	102
Skipjack tuna	4	2	-	-	6
Bonito	29	9	-	-	38
Blue marlin	6	24	-	-	30
White marlin	1	14	-	-	15
Sailfish	6	87	-	-	93
Reef fish					
Black sea bass	25,552	11,282	5	4,080	32,749
Bank sea bass	2	27	2	6	21
Gag	1,356	341	-	4	1,693
Scamp	569	1,530	-	-	2,099
Red grouper	40	12	-	-	52
Snowy grouper	49	-	-	-	49
Speckled hind	25	1	-	-	26
Grouper, unclassified	9	1	-	1	9
Red snapper	207	53	-	-	260
Vermilion snapper	6,367	2,515	-	-	8,882
Red porgy	4,211	388	-	1	4,598
Whitebone porgy	449	9	-	3	455
Porgy, unclassified	276	12	-	1	287
White grunt	1,961	114	-	4	2,071
Grunt, unclassified	1,371	364	88	368	1,279
Triggerfish	1,646	181	-	3	1,824
Spottail pinfish	893	578	-	13	1,458
Spadefish	307	76	-	3	380
Amberjacks	562	519	-	11	1,070
Coastal pelagics					
King mackerel	4,680	587	1	276	4,990
Spanish mackerel	9,255	2,626	63	4,784	7,034
Bluefish	388	877	169	870	226
Crevalle jack	30	919	174	421	354
Blue runner	22	49	27	10	34
Banded rudderfish	32	10	-	-	42
Barracuda	199	1,767	-	29	1,937
Cobia	120	48	19	24	125
Little tunny	440	478	1	15	902
Inshore sportfish					
Red drum	944	6,823	7,326	378	63
Spotted seatrout	908	1,337	2,085	160	-
Weakfish	171	123	185	100	9
Flounders	129	123	314	22	4
Sheepshead	1,063	742	92	995	718
Tarpon	-	182	77	65	40

Group/species	Retained	Released	Inland	0-3 mi.	> 3 mi.
Striped bass	4	1	5	-	-
Inshore bottomfish					
Kingfish	236	192	154	272	2
Spot	1,163	66	762	467	-
Croaker	51	98	53	96	-
Black drum	208	290	101	352	45
Sharks					
Shark, unclassified	933	2,416	1,074	1,300	975
Blacktip	534	1,361	391	1,063	342
Sharpnose	746	2,015	825	956	991
Other					
Rays	-	138	92	29	17
Catfishes	-	201	179	22	-
Toadfish	-	54	41	3	10
Pinfish	52	112	131	33	-
Unclassified	59	717	242	391	143

level, as did landings. CPUE (Fig. 60) was relatively high as well. Spring cobia landings remained depressed, partly in response to a large decline in directed effort, although CPUE was much higher than in 1995.

Inshore sportfish- Directed effort for red drum increased substantially with a corresponding large increase in total catch. About 88% of the fish were released, reflecting the contribution of adult fish above the maximum size limit. The highest catch rates, about one fish per angler-hour, were observed during the winter quarter. Sheepshead continued to be a popular and rewarding target of a small spring fishery on the artificial reefs. There was little change in the status of the summer tarpon fishery with CPUE remaining comparable to that during the past four years. Both directed effort and catches declined in the fall fishery for spotted seatrout. Following the cold winter, abundance presumably was lower than in recent years.

Landings estimated by the NMFS from the MRFSS are compared in Table 6. As in previous years, there are enormous differences between the MRD figures and MRFSS estimates for several important species, e.g. dolphin, black sea bass, king and Spanish mackerels, red drum, spotted seatrout, and sheepshead.

It is therefore relevant to briefly consider the potential impacts of inaccurate South Carolina charterboat catch estimates on stock assessments. In most cases, the MRFSS estimates are much larger than the catches reported to the MRD. Under-reporting, estimated to be 20-25%, does occur in the MRD system. Even if the MRD totals were adjusted upward by this factor, the catches would still be far lower than the MRFSS estimates.

The potential impact on probable accuracy of catch estimates varies considerably by species, depending primarily on distribution of the annual catch by fishing mode as estimated in the MRFSS. This in turn is quite dependent on the allocation of wave sampling within modes by site.

Potential impacts were evaluated for king mackerel, red drum, spotted seatrout, and sheepshead. Table 7 shows the changes that result from replacing the MRFSS estimates of charterboat catch with the MRD reported figures. The adjusted totals were calculated as:

$$(\text{MRFSS total} - \text{MRFSS CB}) + \text{MRD CB} = \text{adjusted total}$$

The percentage changes (all negative) were calculated as:

$$[(\text{MRFSS total} - \text{adjusted total}) / \text{MRFSS total}] \times 100$$

The problem of overestimated charterboat catch is least substantial for spotted seatrout. This species is targeted by a small number of boats during a limited period (mostly in the fall).

Table 6. Charterboat catches as estimated from the MRFSS vs those reported to the MRD.

Group/species	Total number		Pounds landed	
	MRFSS	MRD	MRFSS	MRD
Oceanic pelagics				
Dolphin	12,868	3,721	121,948	45,874
Wahoo	799	403	16,351	12,135
Yellowfin tuna	541	566	11,791	19,075
Other tunas	546	108	4,536	1,566
Bonito	1,726	38	0	166
Billfishes	NR	138	NR	2,445
Reef fish				
Black sea bass	63,853	36,834	45,431	22,483
Gag	5,710	1,697	31,018	13,409
Other groupers	307	2,236	0	5,483
Red snapper	1,052	260	5,850	1,622
Vermilion snapper	16,300	8,882	17,061	7,826
Other snappers	1,519	NR	3,342	NR
Red porgy	9,008	4,599	16,473	7,015
Whitebone porgy	506	458	836	558
Other porgies	1,699	288	5,169	392
White grunt	5,743	2,075	10,476	2,868
Other grunts	NR	1,735	NR	2,044
Triggerfish	3,326	1,827	7,934	2,894
Spottail pinfish	7,667	1,471	2,861	702
Amberjacks	2,743	1,081	6,796	11,938
Coastal pelagics				
King mackerel	52,913	5,267	486,357	53,247
Spanish mackerel	85,997	11,881	32,718	16,221
Snake mackerel	47,253	NR	0	NR
Bluefish	4,492	1,265	0	760
Crevalle jack	12,637	949	9,844	172
Other jacks	1,727	113	0	221
Barracudas	7,148	1,966	24,413	3,344
Cobia	1,399	168	29,412	3,974
Little tunny	3,318	918	4,958	2,712
Inshore sportfish				
Red drum	56,337	7,767	66,004	2,992
Spotted seatrout	58,485	2,245	34,406	1,602
Flounders	969	252	0	291
Sheepshead	60,304	1,805	185,044	4,721
Tarpon	4,546	182	0	0
Inshore bottomfish				
Kingfish	3,184	428	0	233
Spot	10,751	1,229	0	508
Croaker	614	149	0	26
Black drum	4,996	498	16,533	895

Group/species	Total number		Pounds landed	
	MRFSS	MRD	MRFSS	MRD
Sharks				
Blacktip	3,657	1,796	10,930	20,855
Sharpnose	NR	2,761	NR	5,493
Other sharks	22,437	3,349	0	15,318

Table 7. Comparison of charterboat (CB) total catches (numbers of fish) from the MRFSS and those reported to the MRD.

Year	CB	MRFSS Total	MRD CB	Adjusted total	Percent (-) change
King mackerel					
1993	38,522	56,141	7,730	25,349	55
1994	56,467	73,693	6,039	23,265	68
1995	56,064	58,644	6,151	8,731	85
1996	52,913	62,296	5,267	14,650	76
Mean	50,992	62,694	6,297	17,999	71
Red drum					
1993	62,405	265,513	2,658	205,766	23
1994	42,797	454,221	3,365	414,789	9
1995	157,930	597,566	6,156	445,792	25
1996	56,337	305,775	7,767	257,205	16
Mean	79,867	405,769	4,987	330,889	18
Sheepshead					
1993	15,028	78,153	1,362	64,487	17
1994	73,557	126,517	2,009	54,969	57
1995	58,346	126,818	1,311	69,783	45
1996	60,304	172,202	1,805	113,703	34
Mean	51,809	125,923	1,622	75,736	40
Spotted seatrout					
1993	6,170	314,246	2,814	310,890	1
1994	25,035	360,493	1,614	337,072	6
1995	94,090	442,284	3,570	351,764	20
1996	58,485	245,872	2,245	189,632	23
Mean	45,945	340,724	2,561	297,340	13

In most years examined, the amount of MRFSS catch therefore attributed to charterboat anglers was relatively small compared to the total catch, even though it greatly exceeded the probable catch as indicated by the MRD reporting system. In some years, however, the statewide total catch (i.e., MRFSS all modes) may be overestimated by as much as 30% due to inflated charterboat catch figures. Caution should therefore be exercised when utilizing the MRFSS data with screening for such obvious outliers as the anomalously large catches indicated for 1994-1996.

Although similar to spotted seatrout in popularity among private boat fishermen, the red drum is targeted much more frequently by charterboat anglers. The NMFS in recent years appears to have greatly overestimated the charterboat catch. As with the spotted seatrout, however, the contribution to overall landings by this mode is comparatively small (with private boat anglers the major source). During 1993-1996, the average annual catch appears to have been overestimated by about 22% due to inflated charterboat catch estimates from the MRFSS.

Sheepshead are a seasonal (late winter and spring) target of a small number of charterboat operators, who consistently report large catches for the few trips they make. Because of the site allocations mandated in the MRFSS, anglers from these boats have a rather high probability of being interviewed. Their interception rate appears to have markedly influenced the landings of sheepshead estimated from the MRFSS data. In contrast to the two preceding species, the charterboat component of the estimated MRFSS total catch is appreciable (45% during 1994-1996). The impact of an overestimated charterboat catch is therefore much greater: the annual average total catch appears to have been overestimated by two-thirds during the last four years.

The overall South Carolina NMFS estimated catch of king mackerel has been based largely on charterboat landings. Although a substantial portion of the offshore fleet effort is directed at this species and interception of anglers with catches is relatively common during the survey, there appears to be a high level of inaccuracy in the estimated catches. If the figures reported to the MRD are reliable, then the state's average, annual recreational catch has been overestimated by almost 250% during the past four years.

The practical significance of these discrepancies depends on whether the catch data are used on a regional vs state level. For species such as spotted seatrout and sheepshead, where the South Carolina contribution to the regional catch typically averages <15%, projected changes (i.e., corrected for inaccurate charterboat estimates) in regional landings would be insignificant (<5%). For species such as red drum and king mackerel with larger contributions (15-25%), the resultant changes (10% or more) could be important in some situations.

The conclusion is that the MRFSS is most reliable when used as designed, i.e., as a regional database. In this application, it is relatively insensitive to errors in a single state's estimates, unless that state is a major contributor. From South Carolina's perspective, the MRD should be wary of any stock assessments in which the state's contribution to the regional landings exceeds 15% and the charterboat component of the South Carolina catch is at least 20%, based on the MRFSS.

PRIVATE BOAT FISHERY

The NMFS estimated effort (in angler trips) as follows:

Residence	Wave					All
	2	3	4	5	6	
Coastal	58,409	133,091	112,735	94,335	51,738	450,307
Noncoastal	5,079	27,029	21,997	9,930	13,831	77,866
Out of state	11,428	18,475	31,621	14,233	27,149	102,906
Total	74,915	178,595	166,353	118,498	92,718	631,079

The trend in annual statewide effort (Fig. 61) has closely paralleled that of coastal resident anglers with considerable fluctuation and no unidirectional trend in the last decade. The total effort in 1996 was relatively low. Most of the private boat effort is expended inland. Fig. 62 illustrates the trends in effort for inland and ocean offshore fishing areas. In both cases, there has been substantial fluctuation in the annual estimates, but no long-term directional movement. Effort in both areas in 1996 was quite low. The stormy summer probably had a significant influence.

Catches as estimated by the NMFS from MRFSS data are listed in Table 8. These estimates were typical of those generated from the MRFSS in that they were vulnerable to large sampling errors for many species, due to low frequencies of intercepted catches and highly variable numbers of fish in them. Misidentifications and confusion over common names contributed to unreliability, particularly where a large percentage of total catch of a species was reported released. The correct identity of such fish obviously could not be verified. These figures must therefore be regarded as speculative for most species.

As indicated in Fig. 62, private boat effort expended offshore was relatively limited compared to that directed at inland waters. Comparatively few offshore anglers were intercepted in the MRFSS and catch estimates for species taken by them were very suspect. Identifications of bottomfish and sharks were particularly dubious.

The most popular target of offshore private boat anglers was the king mackerel. Fig. 63 compares the NMFS estimates of recreational harvest (fish retained or discarded dead) by private boat anglers and charterboat fishermen. During the last decade,

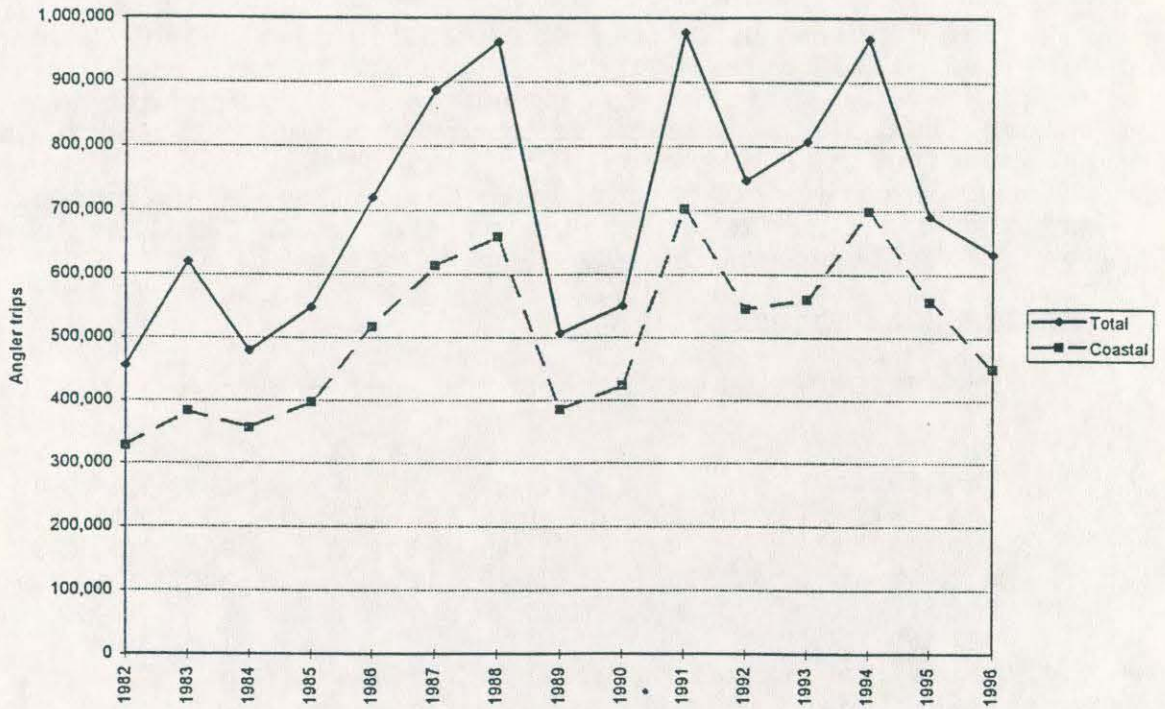


Fig. 61. Effort in the private boat mode by residence.

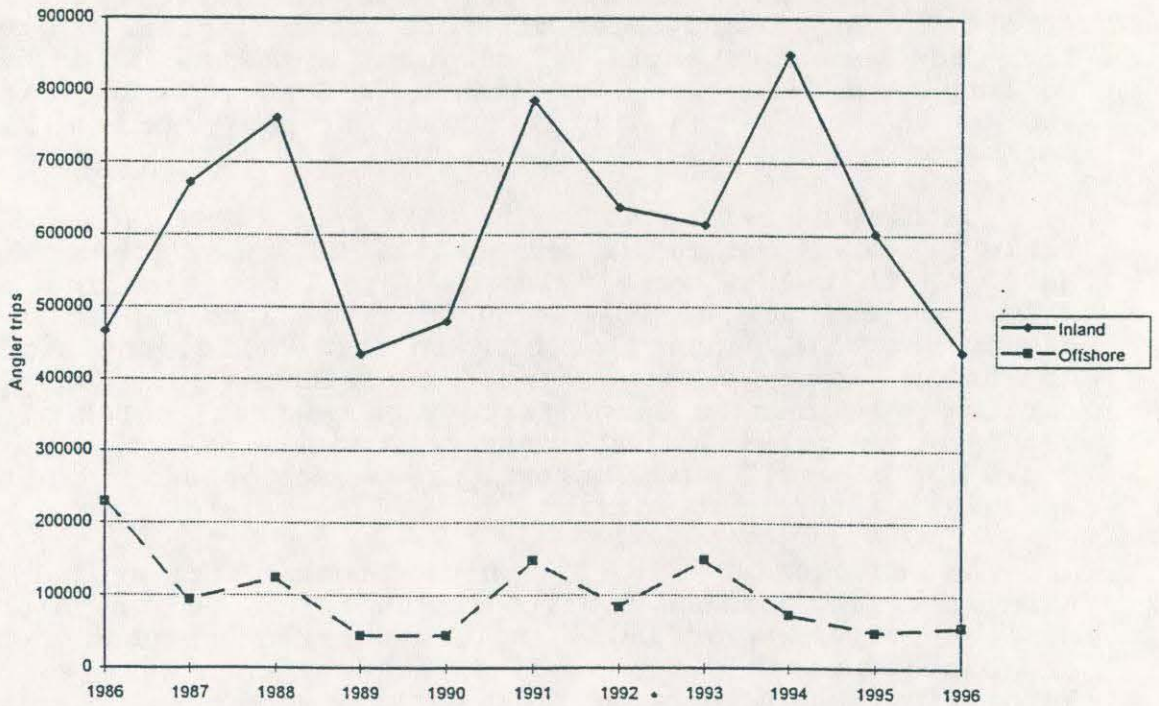


Fig. 62. Effort in the private boat mode by fishing zone.

Table 8. Private boat catch (in numbers of fish).
Source: NMFS MRFSS.

Group/species	Retained	Released	Inland	0-3 mi.	> 3 mi.
Oceanic pelagics					
Dolphin	3,310	0	0	0	3,310
Reef Fish					
Black sea bass	52,732	79,663	35,355	21,707	75,334
Other sea bass	1,611	8,798	3,999	655	5,756
Groupers	0	342	0	0	342
Snappers	0	9,427	3,928	0	5,499
Red porgy	31,744	5,079	0	0	36,823
Other porgies	1,003	0	0	0	1,003
White grunt	1,292	0	957	0	334
Triggerfish	2,134	0	1,006	0	1,127
Spottail pinfish	0	3,601	NA	NA	NA
Spadefish	7,744	8,049	NA	NA	NA
Amberjacks	0	1,353	1,353	0	0
Coastal pelagics					
King mackerel	7,783	1,601	678	0	8,706
Spanish mackerel	23,490	8,564	3,836	12,548	15,669
Bluefish	17,222	54,718	37,816	26,122	8,002
Crevalle jack	786	4,648	4,648	0	786
Other jacks	0	342	0	0	342
Barracuda	1,251	6,171	2,737	0	4,685
Cobia	2,198	1,244	NA	NA	NA
Little tunny	0	1,717	0	0	1,717
Inshore sportfish					
Red drum	100,278	140,548	219,272	20,558	997
Spotted seatrout	105,354	78,274	160,360	18,136	5,132
Weakfish	5,516	0	0	5,516	0
Other seatrouts	458	11,938	12,396	0	0
Southern flounder	55,011	12,378	64,931	2,458	0
Other flounders	29,547	45,201	65,842	8,244	661
Sheepshead	99,483	10,470	98,853	7,086	4,013
Striped bass	489	1,994	2,482	0	0
Inshore bottomfish					
Kingfish	87,081	28,358	84,687	18,390	12,362
Spot	240,889	43,355	104,912	164,386	14,946
Croaker	17,526	34,445	27,847	15,299	8,824
Black drum	12,195	327	10,230	2,292	0
Sharks					
Blacktip	8,634	31,294	NA	NA	NA
Sharpnose	4,213	0	NA	NA	NA
Other sharks	42,523	93,276	NA	NA	NA
All	55,370	124,570	142,772	22,207	14,960
Other					
Skates/rays	335	59,653	51,100	8,889	0
Sea catfishes	19,962	67,830	78,365	9,427	0
Pigfish	20,471	14,338	31,831	1,640	1,338
Pinfish	31,106	343,401	NA	NA	NA

Group/species	Retained	Released	Inland	0-3 mi.	> 3 mi.
Toadfish	342	50,582	28,550	15,289	7,085
Puffers	319	5,882	6,201	0	0
Searobins	335	1,928	1,594	327	342
Eels	8,134	6,832	6,774	2,590	5,602

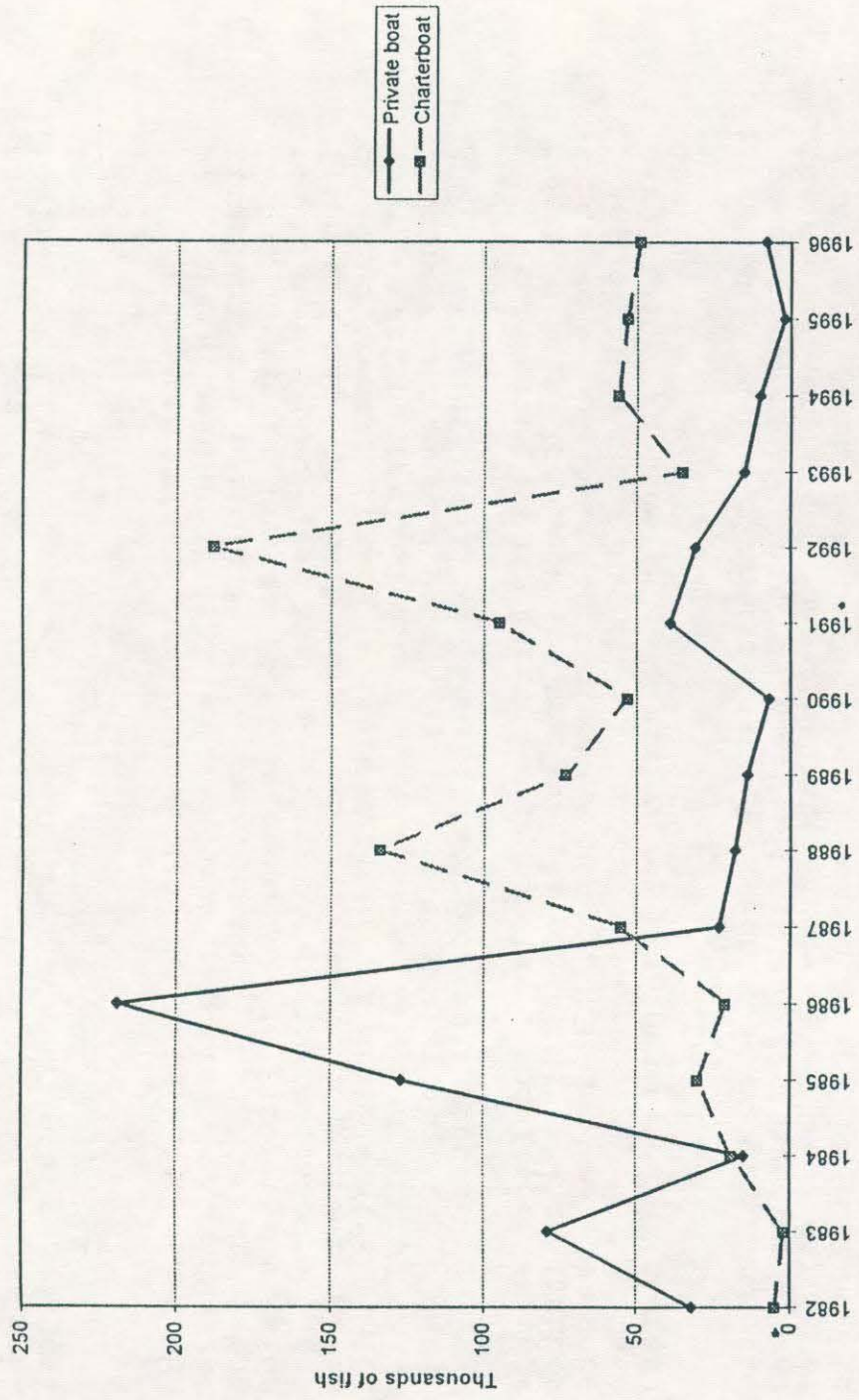


Fig. 63. Recreational harvest of king mackerel.

the NMFS figures indicate that the charterboat mode has accounted for most of the sport landings (headboat catches were negligible). Based on the charterboat landings reported during the last four years to the MRD, however, the private boat average annual catch has been higher (by roughly a 4:3 ratio). Perhaps the most realistic trend indicated is that the recreational landings, regardless of mode, have trended downward during the last five years.

Inshore sportfish were the dominant group targeted and taken by private boat anglers with red drum, spotted seatrout, and flounders the principal preferred species. Fig. 64 shows the trends in annual harvest for this mode. Since 1989, the take of red drum has been very stable. Harvest of spotted seatrout and flounders has been much more variable with no marked upward or downward trend. Since the implementation of minimum size limits (and a maximum for red drum), the release rates of all of these fish have increased appreciably in recent years (Fig. 65). Catch and release (of legal fish) has also become more popular.

Catch rates (CPUE) for the most popular inshore species were based on trips during which the species was either the designated target or at least one such fish was caught. The 1996 results were based on data for the State Finfish Survey only, since state participation in the MRFSS field survey was terminated at the end of wave 2.

CPUE (fish per angler-trip) for each species continued the upward trend of the last few years and, except for sheepshead, was the highest observed since the state survey began (Fig. 66). Red drum CPUE (fish per angler-hour) continued to be highest in Beaufort County (Fig. 67). CPUEs in Charleston and Georgetown Counties were the highest reported to date.

Catch rates for spotted seatrout were also relatively high (Fig. 68). As usual, CPUE was highest in Charleston County, although it declined slightly from the peak level of the previous two years. The sample from Georgetown County was small, but a marked improvement was indicated there. CPUE also improved in Beaufort County. The long-term trend in statewide CPUE has been sharply upward during the last two years (Fig. 69). The last year of exceptional abundance was 1986 and the average CPUEs in both 1995 and 1996 exceeded that year's level by a noticeable margin.

Results of the opinion poll of marine recreational fisheries stamp holders (the stamp is required for private boat fishing) suggested a relatively pessimistic attitude regarding trends in abundance of these fish during the last five years. Red drum was the only species receiving an overall assessment of increasing abundance. Relatively small percentages of respondents accorded that status to spotted seatrout, flounders, and sheepshead. About half of the respondents statewide indicated "no change" for

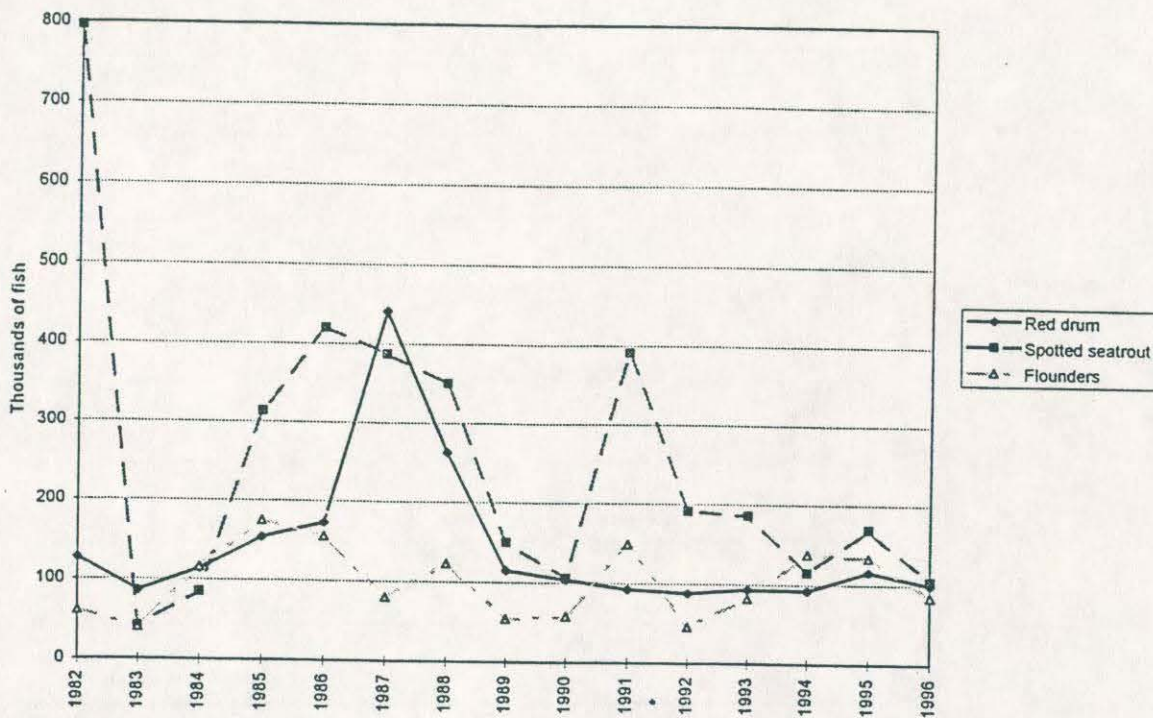


Fig. 64. Trends in annual private boat harvest of inshore sportfish.

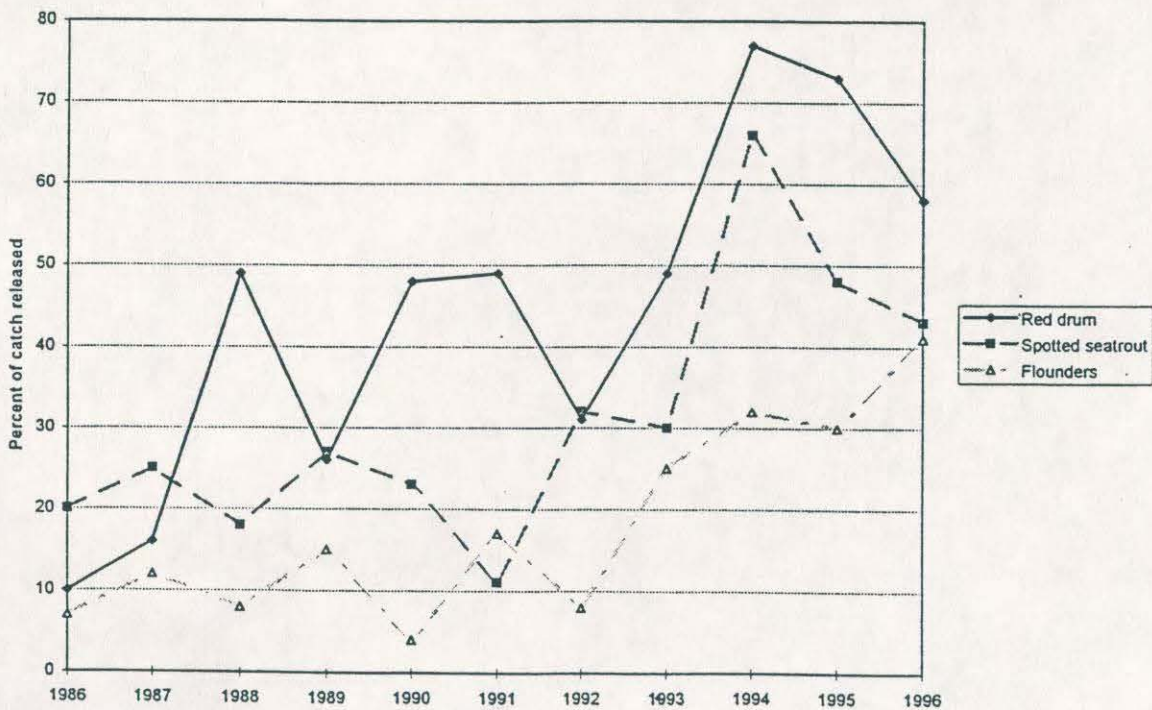


Fig. 65. Release rates of fish caught by private boat anglers.

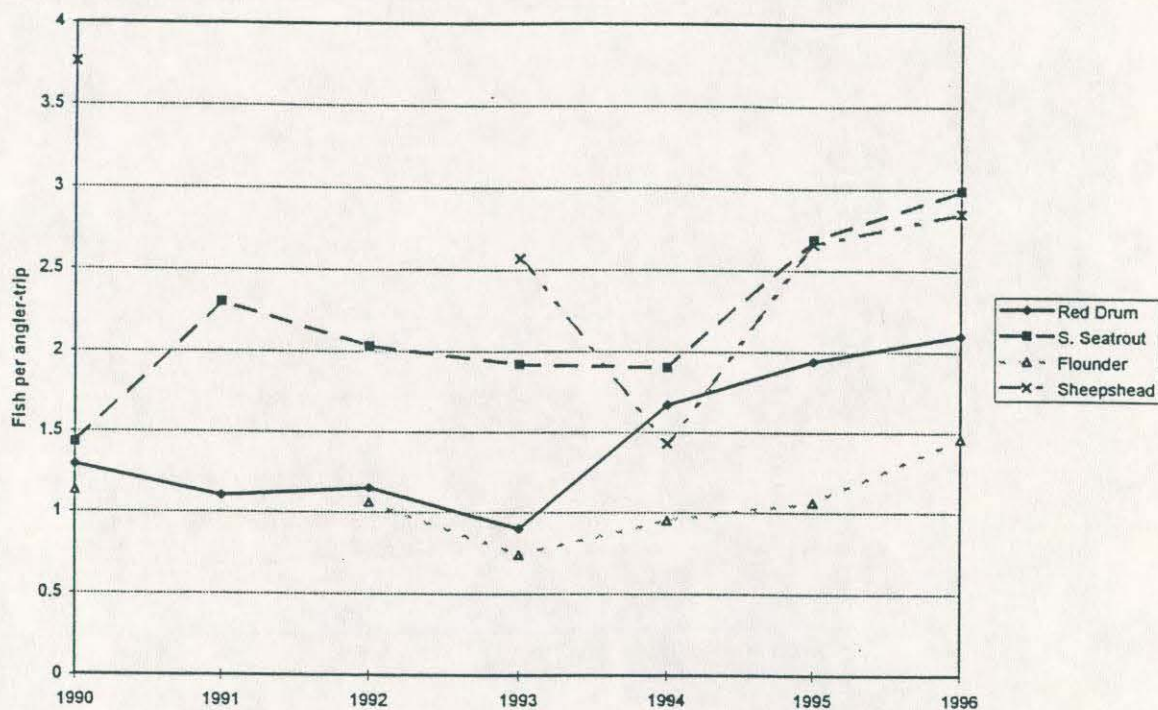


Fig. 66. Private boat mode CPUE for inshore sportfish.

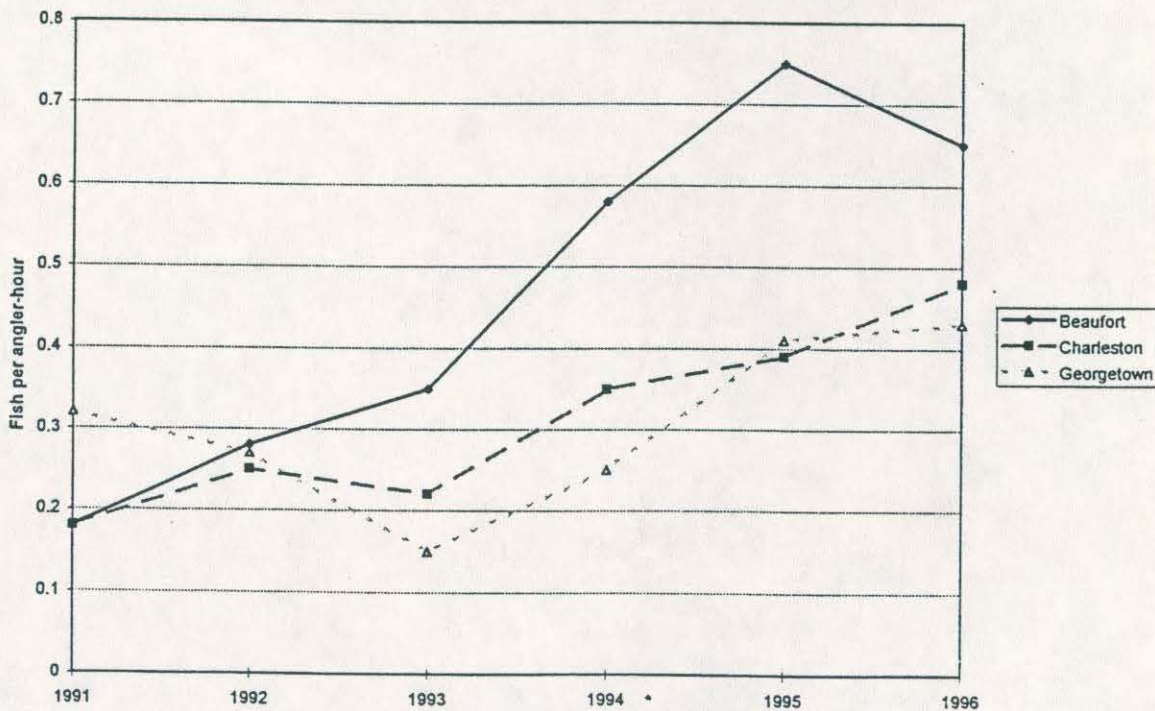


Fig. 67. Red drum private boat mode CPUE by county.

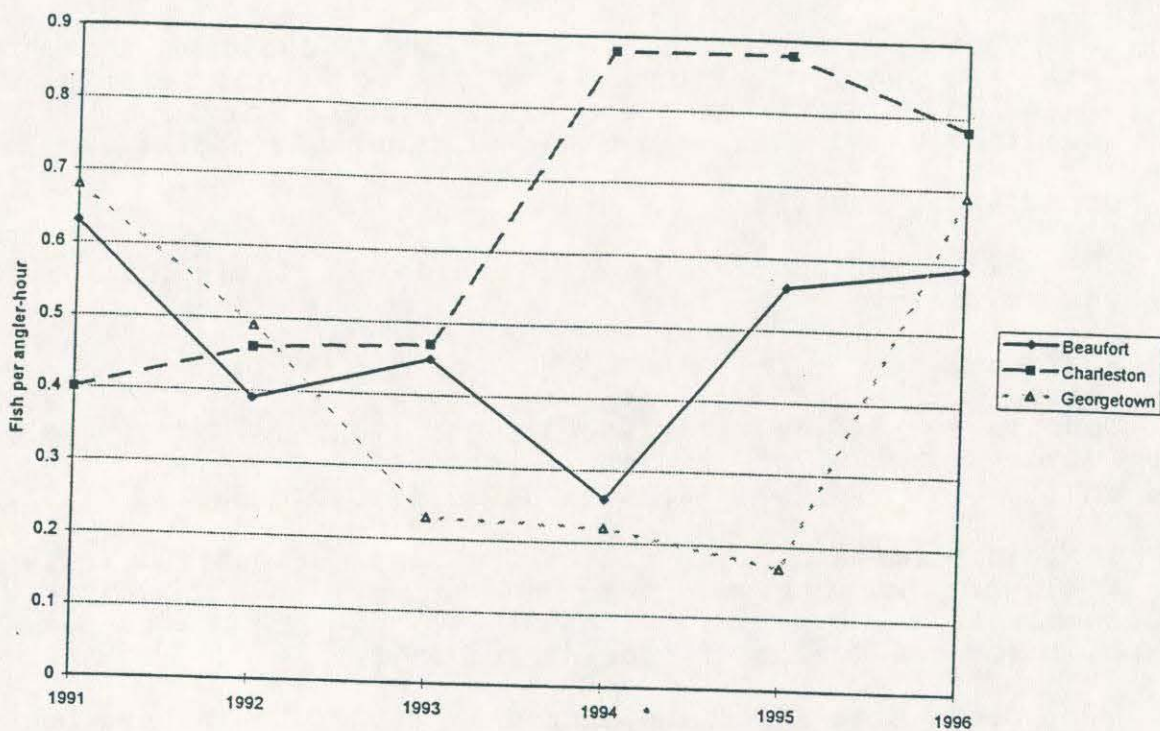


Fig. 68. Spotted seatrout private boat mode CPUE by county.

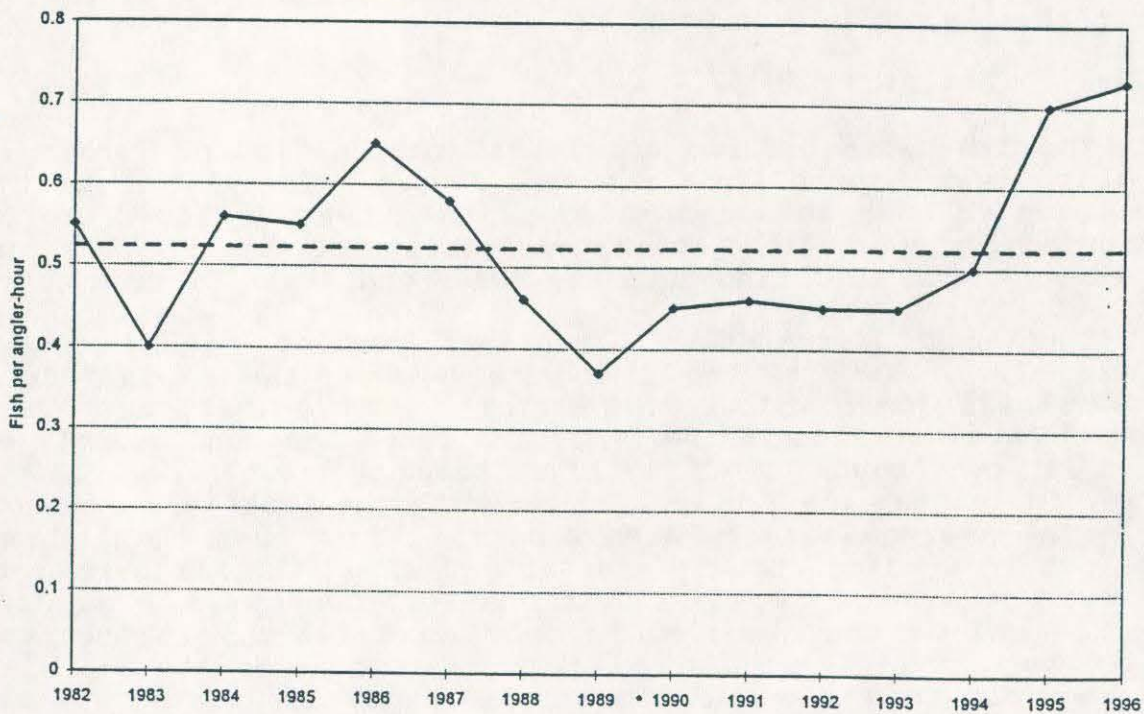


Fig. 69. Statewide spotted seatrout private boat mode CPUE. The dashed line indicates the 15-year average.

sheepshead. For spotted seatrout and flounders, those choosing this response and "decreasing" were about evenly divided. Statewide, 41% of the respondents thought that spotted seatrout abundance was declining and 44% elected this choice for flounder.

SHORE-BASED FISHERY

Distribution of effort by residence classification and wave was as follows:

Residence	Wave					
	2	3	4	5	6	All
Coastal	38,849	87,145	44,744	42,577	26,415	239,730
Noncoastal	11,954	28,194	21,886	12,386	8,473	82,892
Out of state	25,700	70,741	55,444	66,575	23,425	241,885
Total	76,503	186,080	122,075	121,537	58,312	564,507

The ten permitted piers reported a total of 209,134 angler-trips, a slight increase over the 1995 total. Due to stormy weather, summer attendance was down about 9%, but this was compensated for by increases during the spring and fall.

Catch statistics are listed in Table 9. Inshore bottomfish, primarily spot and kingfishes, were the most popular targets of shore-based anglers, especially those fishing from the ocean piers. Catches of both have been highly variable, as is typical for short-lived species.

LENGTH COMPOSITION

The MRD has monitored the length composition of landings of popular inshore sportfish for over a decade. The vast majority of fish sampled have been landed by private boat anglers, who have accounted for most of the estimated landings of each species. Data have been obtained during both the MRFSS and State Finfish Survey.

The length distribution of red drum from 1996 catches is shown in Fig. 70. Most of the fish were between the 14 in. (36 cm) minimum size limit and 20 in. (51 cm). Since 1988, the average size of retained fish in the 14-27 in. range has consistently been about 18 in. About 20% of the legal sampled catch (i.e., fish 14-27 in. in length) was >20 in., compared to the 1988-1995 average of 23%. The average size by area was typical in that the fish were smallest in Beaufort County and largest along the northern coast. The average size of legal fish in Beaufort County was 42.2 cm, at the low end of the observed range. Mean lengths in Charleston (45.8 cm) and Georgetown (48.0 cm) Counties were in the intermediate part of their historical range, as was the statewide average (45.1 cm). Anglers interviewed during the State Finfish Survey reported releasing 61% of their total catch with 19% consisting of legal-sized fish.

Length distribution of spotted seatrout is shown in Fig. 71.

Table 9. Shore-based catch (in numbers of fish). Source: NMFS MRFSS.

Group/species	Retained	Released	Inland	0-3 mi.
Reef fish				
Black sea bass	2,498	7,398	1,512	8,385
Other sea bass	0	2,218	0	2,218
Groupers	741	973	1,714	0
Snappers	0	513	0	513
Porgies	0	4,678	4,192	486
White grunt	0	997	0	997
Other grunts	15,379	16,351	973	30,757
Spottail pinfish	513	2,964	NA	NA
Spadefish	20,702	2,792	NA	NA
Coastal pelagics				
Spanish mackerel	37,793	60,042	0	97,836
Bluefish	34,225	26,805	4,678	56,352
Crevaille jack	513	2,710	486	2,736
Inshore sportfish				
Red drum	5,106	3,505	7,073	1,538
Spotted seatrout	2,759	999	0	3,758
Southern flounder	7,163	4,516	8,431	3,248
Other flounders	2,024	4,456	1,459	6,787
Sheepshead	0	1,945	0	1,945
Tarpon	0	741	NA	NA
Striped bass	0	5,126	0	5,126
Inshore bottomfish				
Kingfish	128,390	108,843	17,052	220,181
Spot	1,166,453	156,003	30,159	1,292,297
Croaker	18,991	27,841	10,749	36,083
Black drum	12,280	0	0	12,280
Pompano	14,299	20,034	0	34,333
Sharks				
Blacktip	513	12,233	NA	NA
Sharpnose	4,587	32,808	NA	NA
Other sharks	5,789	93,853	NA	NA
All	10,889	138,894	20,708	129,075
Other				
Skates/rays	3,419	39,562	13,314	29,667
Sea catfishes	486	13,785	11,052	3,220
Pigfish	10,802	4,446	13,710	1,538
Pinfish	155,987	206,171	NA	NA
Toadfish	741	20,480	5,100	16,122
Puffers	741	6,164	4,169	2,737
Searobins	0	7,427	999	6,428
Eels	0	6,354	1,740	4,614

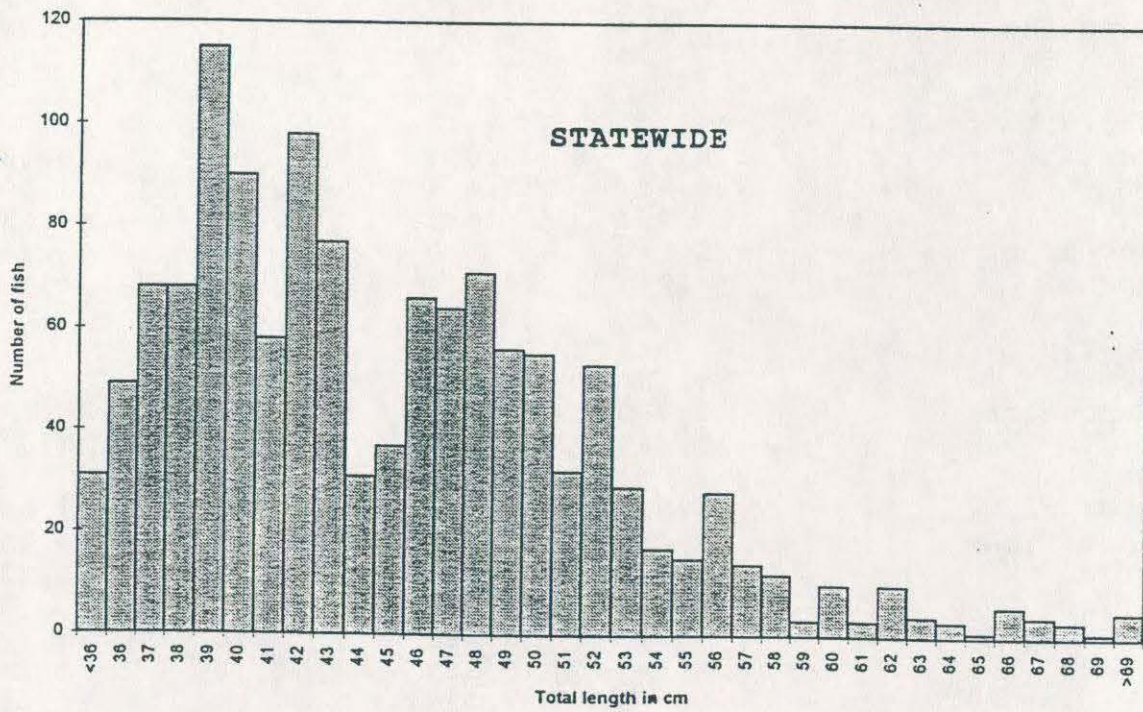
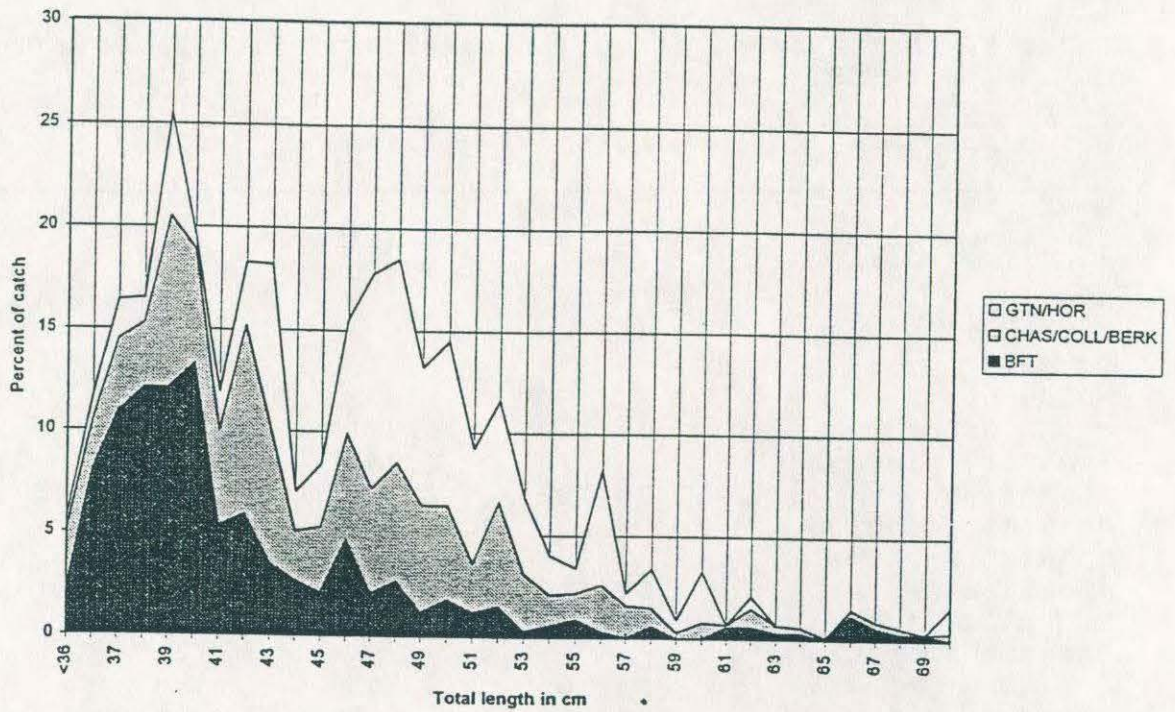


Fig. 70. Length distribution of red drum.

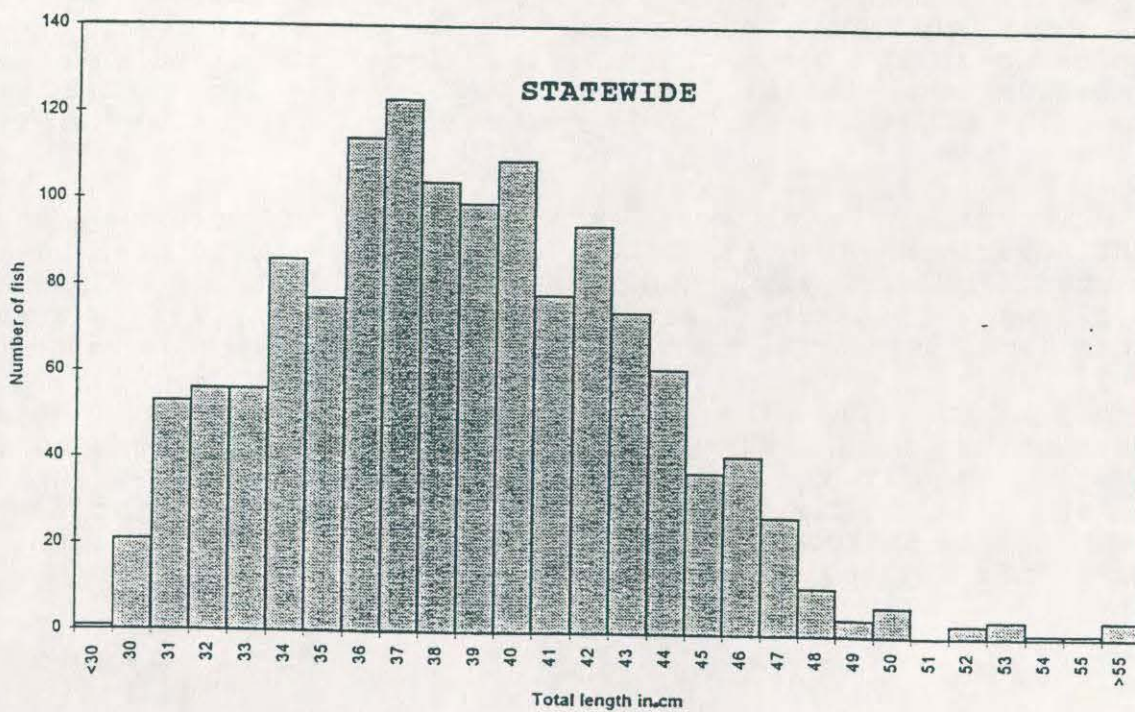
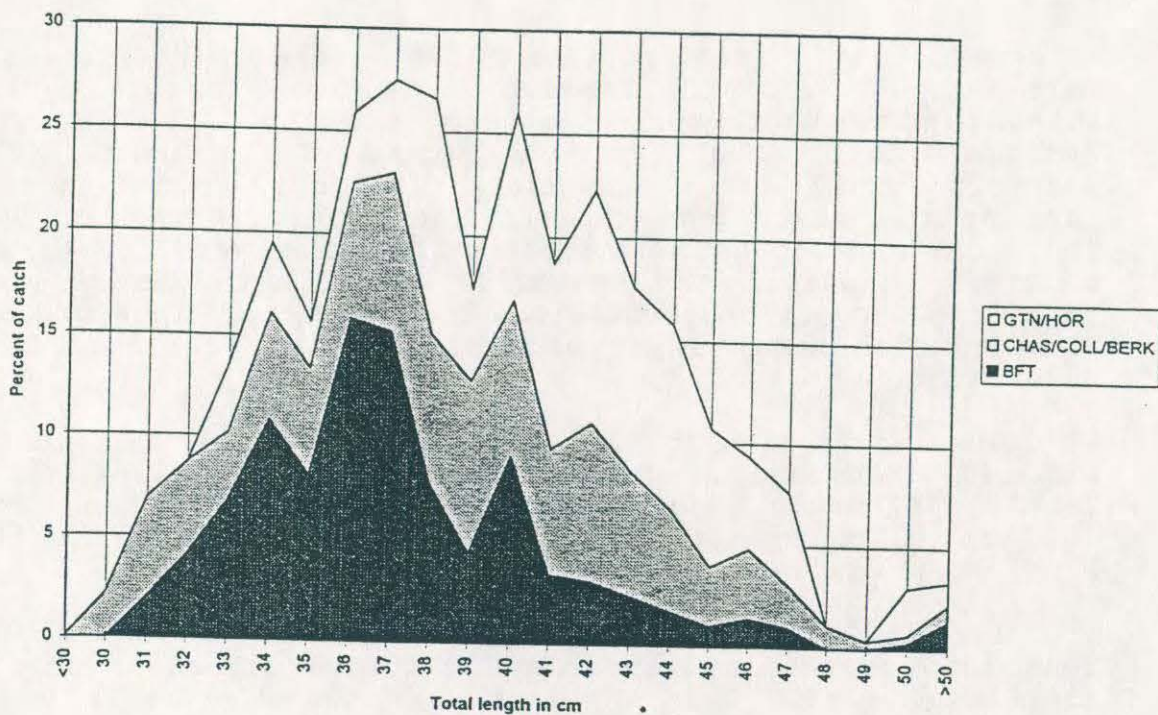


Fig. 71. Length distribution of spotted seatrout.

As usual, only a small portion (7.7%) exceeded 18 in. (45 cm). This was, however, the largest percentage since 1990 (Fig. 72). Although the south-north pattern was typical, differences in average size by area were more pronounced than usual. Fish from Beaufort County were the smallest (37.3 cm), in the intermediate part of the historical range. The average sizes in Charleston (38.8 cm) and Georgetown (41.2 cm) Counties were the largest observed to date. The statewide mean length was 38.6 cm (15.2 in.), the largest observed since 1985. Anglers interviewed in the State Finfish Survey reported releasing 38% of their catch with 33% undersized.

The length distribution of southern flounder is illustrated in Fig. 73. Average size in all areas was relatively large with little difference geographically. The statewide mean length was 38.5 cm. About 26% of the catch of anglers seen in the State Finfish Survey was reported released as undersized.

Length distribution of sheepshead is shown in Fig. 74. Size tended to be smallest in inland waters and largest on the ocean artificial reefs, thus the source of the samples influenced the distribution. For example, much of the Beaufort County MRFSS sample came from the ocean and its average size (44.2 cm) was appreciably larger than that of the State Finfish Survey sample (33.3 cm), which was obtained mainly from estuarine areas. Most of the catch in the other counties was also from inland waters. The statewide mean length (34.9 cm) was average for recent years. Virtually all of the catch reported during the State Finfish Survey was retained.

Trends in mean length are an indicator of stock status, particularly when compared to a minimum size limit that has been constant for some time. The minimum size limit for red drum was initiated on a seasonal basis in 1986: it has applied year-round since June, 1990. The mean length during 1988-1996 has ranged from 14-31% above the 14-in. minimum, averaging 18% with no directional trend (Fig. 75). The 12-in. minimum size limit for spotted seatrout has been unchanged since 1986. There has been no long-term change with the annual values ranging from 18-29% above the minimum size limit. The 12-in. minimum size limit for southern flounder was introduced in 1991. Mean length has been from 18-32% above this, averaging 26%.

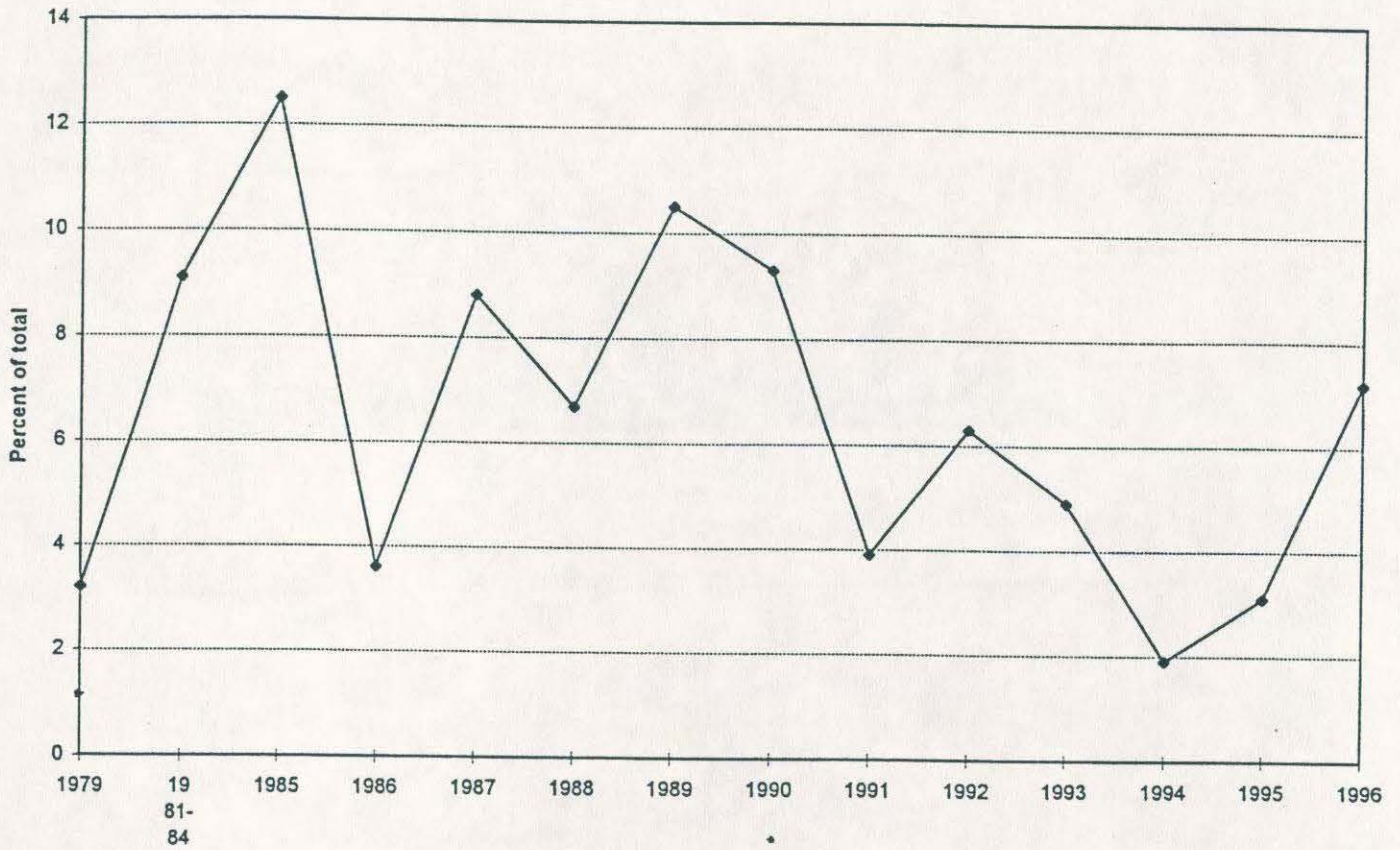


Fig. 72. Percentage of spotted seatrout catch 18 inches or larger.

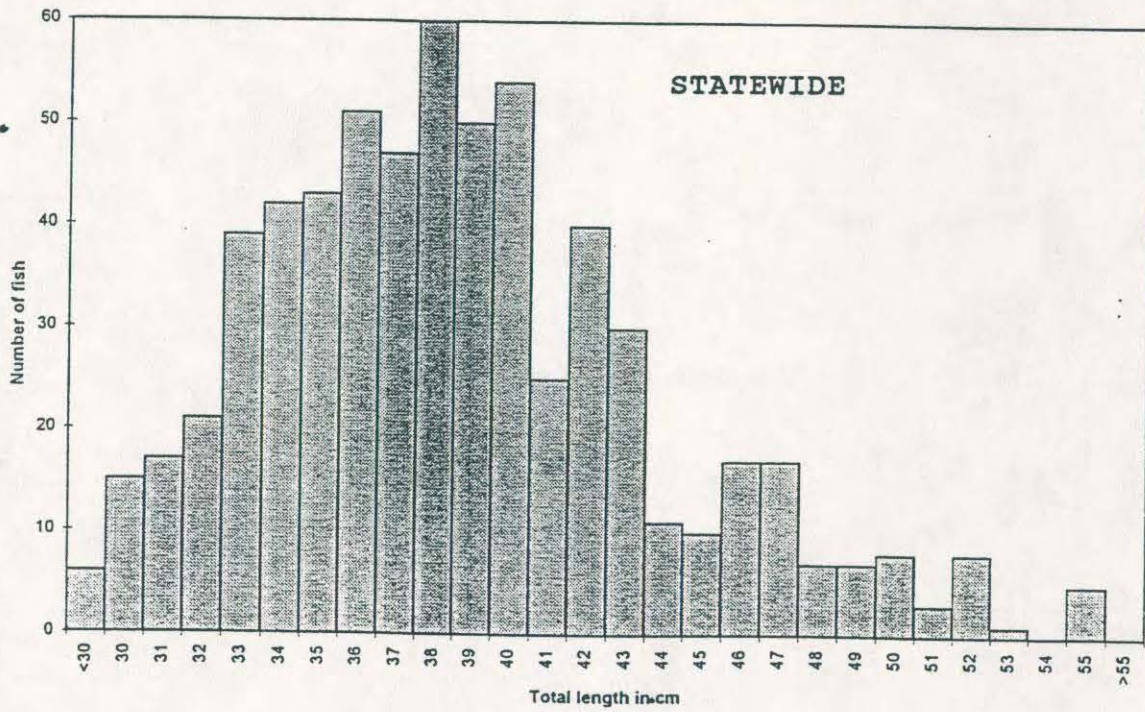
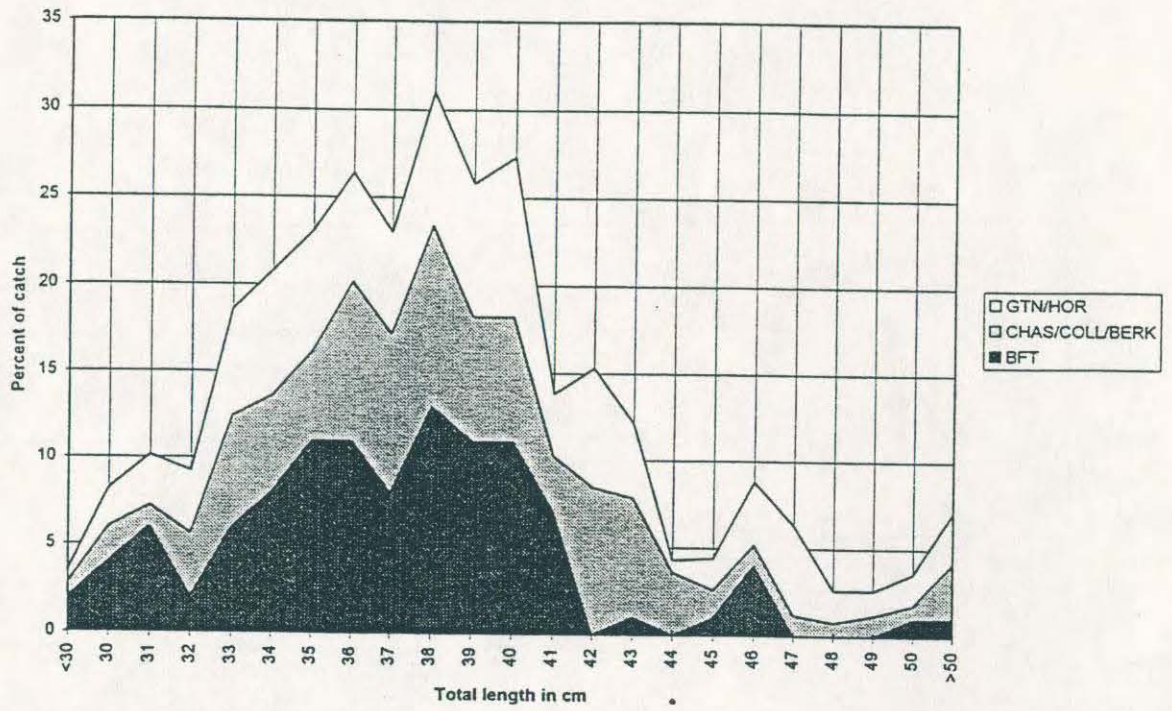


Fig. 73. Length distribution of southern flounder.

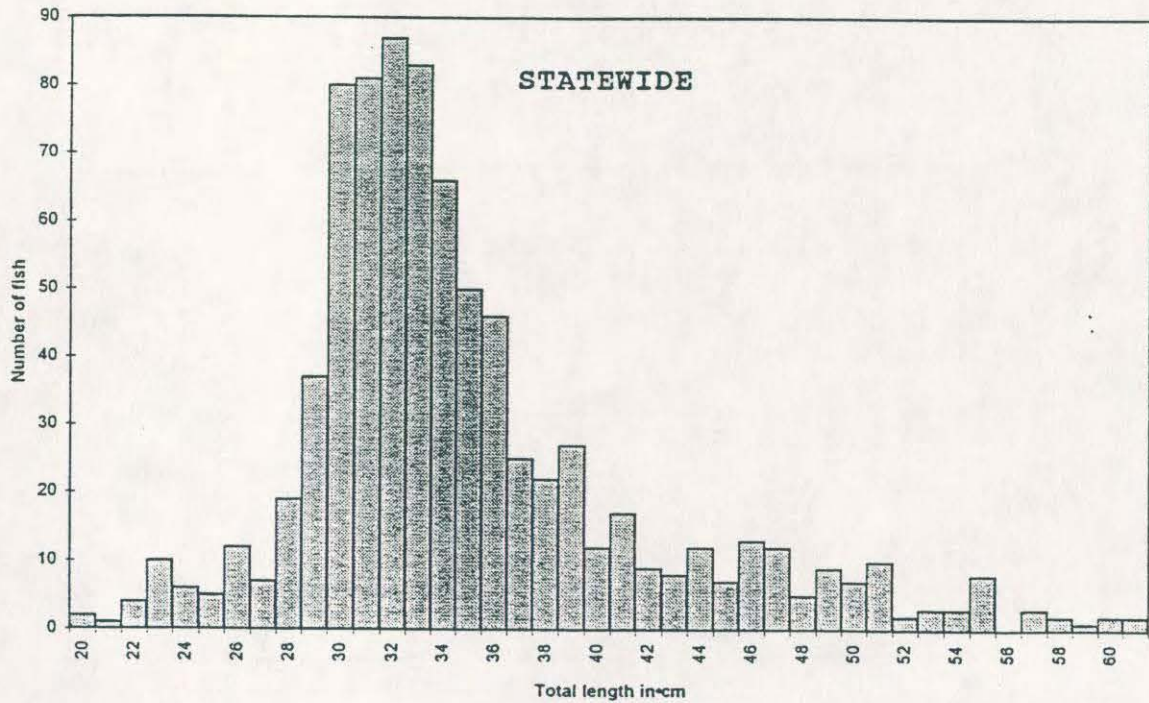
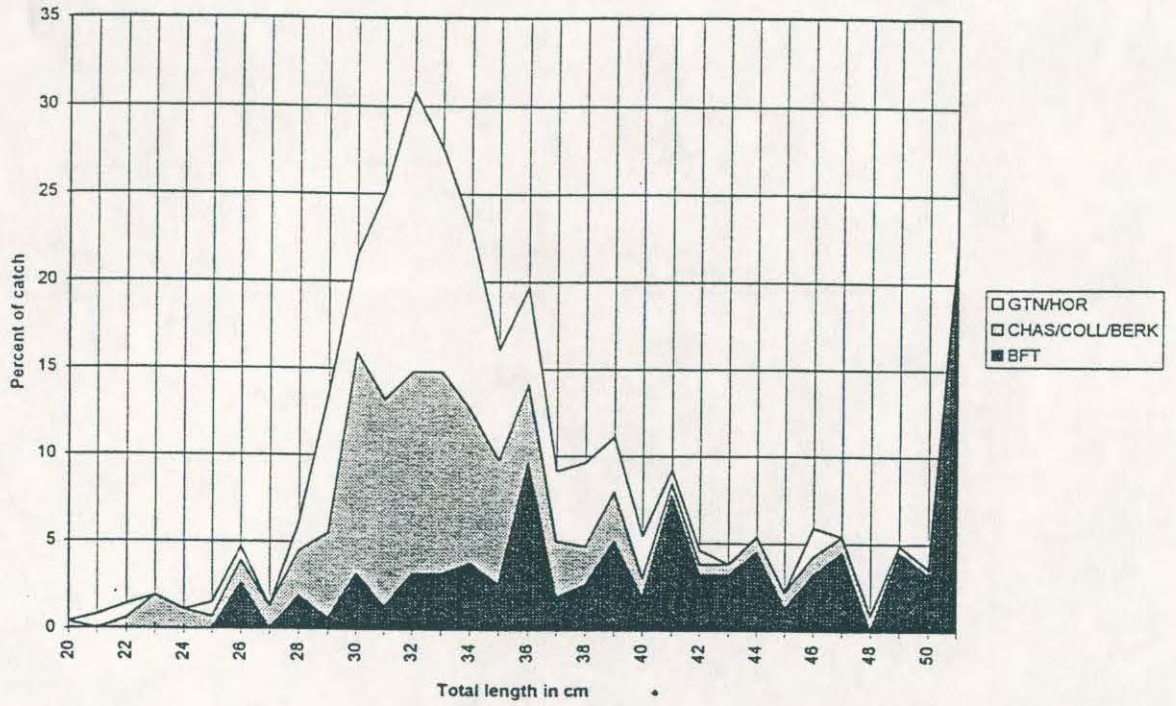


Fig. 74. Length distribution of sheephead.

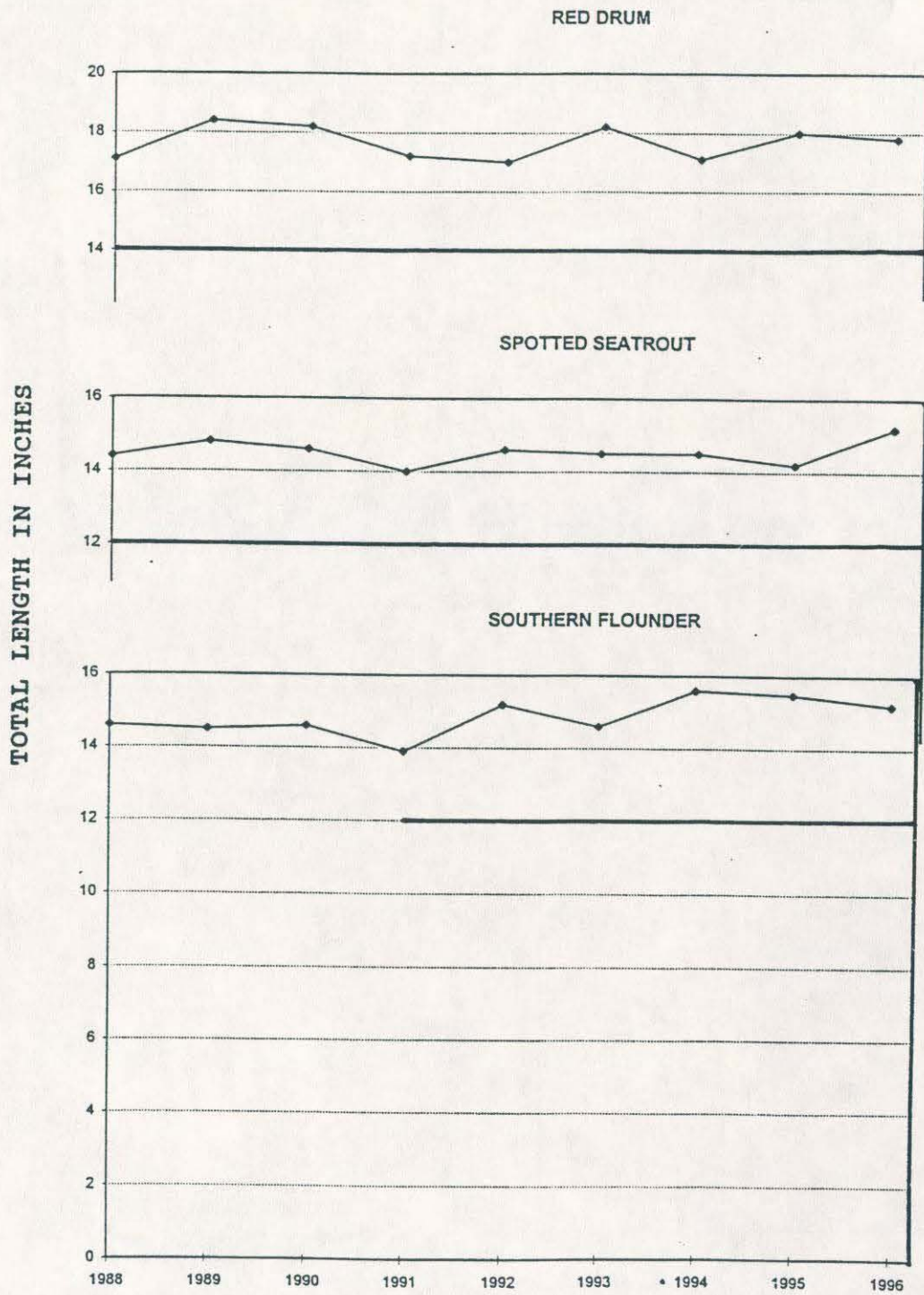


Fig. 75. Average size vs minimum size limits.

