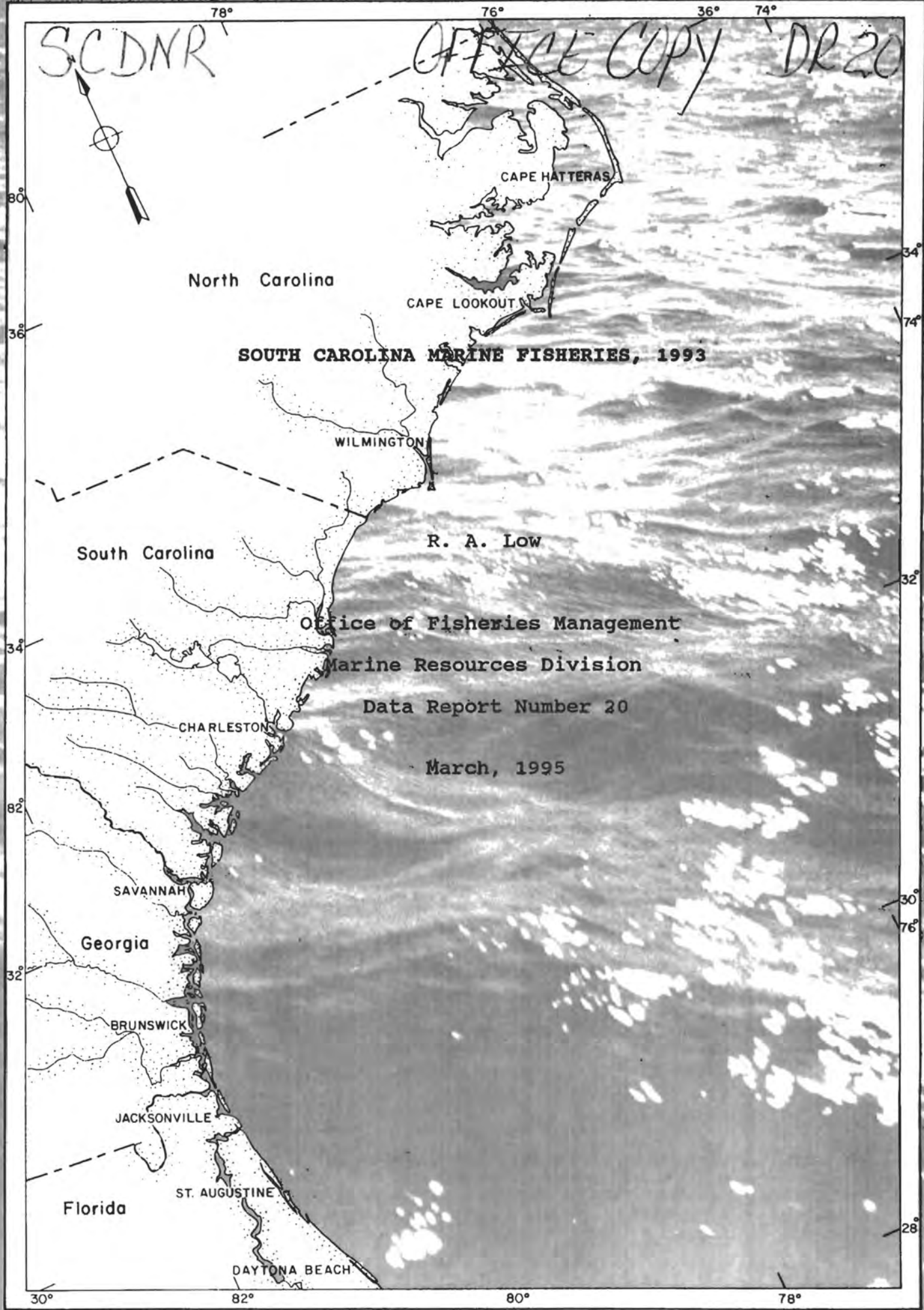


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North Carolina

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**SOUTH CAROLINA MARINE FISHERIES, 1993**

WILMINGTON

R. A. Low

South Carolina

Office of Fisheries Management

Marine Resources Division

Data Report Number 20

March, 1995

CHARLESTON

SAVANNAH

Georgia

BRUNSWICK

JACKSONVILLE

Florida

ST. AUGUSTINE

DAYTONA BEACH

36°

34°

32°

30°

28°

78°

76°

74°

72°

70°

30°

82°

80°

78°

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## INTRODUCTION

This report is a summary of significant events in South Carolina's marine fisheries during 1993. 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 generally represents consensus views of the supervisory staff of the management programs for the various fisheries. The information is intended for a general audience, makes some simplifications, and is not meant to be definitive in the scientific sense.

Publication of landings data for South Carolina's commercial fisheries began in January, 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. At that time, from 75 to 80 seafood dealers operated along the coast. Monthly production forms were mailed to these individuals during the last week of the month, on which they were asked to report their landings for the month. These data were then tabulated by the reporting agents and submitted to the USFWS office in Washington, D.C. Some data also were obtained from the South Carolina Division of Commercial Fisheries. The fisheries reporting specialists also prepared monthly narrative reports describing current conditions and trends. This series was discontinued at the end of 1979.

The current series of annual reports was initiated in 1987. The first issue contained a review of trends and events for 1977-1986. Individual annual reports began with the 1987 issue. The narrative is similar in format to that of the former monthly bulletins.

Data on 1993 commercial fisheries catch, effort, and landed value were obtained through 1) mandatory monthly reports by licensed primary wholesale seafood dealers, 2) mandatory shellfish harvest reports, 3) voluntarily submitted weekly shrimp tickets from dock operators, 4) voluntarily submitted offshore fish trip tickets from wholesalers, and 5) reports required in special permit fisheries. In most cases, annual fishing effort by gear type was estimated by dividing total landings compiled from all sources by the average catch per trip calculated from detailed reports such as fish tickets or special permit harvest reports. The percentage of total landings reported by such means, and thus the accuracy of the overall effort estimates, varied greatly according to gear type.

Commercial landings data were for wild stock fisheries only. South Carolina's mariculture industry, based primarily on Pacific white shrimp, expanded substantially in 1993 with a total volume of about 713,000 pounds of product worth \$2.1 M. Pacific white shrimp contributed about 689,000 pounds (heads-off) and \$2.05 M.

Commercial landings data were subject to confidentiality if

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

The reliability of commercial landings data was an obvious consideration given the widely held perception of significant incentives for under-reporting to avoid taxes, regulations, quota reductions, etc. The providers were assured that their records could not be accessed for tax assessment or related financial scrutiny. Most reporting was on an honor system, since routine verification was not feasible. Because of health-related considerations, shellfish landings were closely monitored and were considered very accurate. Most of the shrimp landings were reported on weekly tickets which provided detailed information and these data also were considered highly reliable. Landings in most fisheries were obtained primarily from monthly dealer reports and were considered to be reasonably accurate. The least reliable statistics presumably were for the blue crab and shad fisheries, where under-reporting and non-reporting appeared to be fairly common based on anecdotal information. It also was likely that incidental catches of fish, crab, etc. by shrimp trawlers were under-reported, since such landings were usually part of the crews' compensation and often distributed outside normal channels.

The major source of recreational fishery data was the Marine Recreational Fishery Statistics Survey (MRFSS) conducted under National Marine Fisheries Service (NMFS) oversight. This was a generalized survey of hook and line fishing from shore or shore-based facilities (piers, docks, bridges, etc.), charterboats, and private boats. A telephone survey of randomly selected coastal households was used to obtain information on participation and effort. An on-site intercept survey (creel census) provided data on catch composition, species catch rates, detailed effort data, and length composition of the catch. MRD personnel conducted the creel census. Results from both survey components were combined by the NMFS to generate estimates of total catch by species, fishing mode, season, and fishing area. Although the MRFSS design has remained basically unchanged since the survey's inception in 1979, many adjustments in calculation procedures periodically have been made.

In 1993, the NMFS implemented several new procedures for processing effort data obtained in the phone survey. The resulting effort data were statistically more accurate than those estimated using the previous methodology. The overall effect of the new procedures as applied to South Carolina data was an increase in effort compared to estimates obtained using the old methodology. Because catch estimates were obtained by multiplying catch per unit of effort (CPUE) by effort estimates, the new approach also increased the catch estimates.

The MRD conducted a State Finfish Survey (SFS) in conjunction with the MRFSS. Coverage was directed at private boat fishermen fishing in inland areas. The principal objectives were to expand the sample sizes for length measurements and CPUE observations of important recreational species such as red drum and spotted seatrout. In 1993, most of these data were provided by the SFS.

State law required operators of charterboats and headboats to obtain permits and submit monthly reports of their fishing activities. The charterboat report consisted of logbook sheets completed for each fishing trip, listing the date fished, number of anglers, hours fished, numbers of fish by species kept and released, and pounds of fish retained. Many operators also voluntarily provided information on location fished, method employed, and species targeted. Since headboats also were required by federal regulation to submit trip reports to the NMFS, their state obligation was satisfied by sending copies to the MRD. The information elements were essentially the same as those required of charterboat operators. Pier operators also were required to obtain permits and report the daily numbers of anglers using their facilities.

#### COMMERCIAL FISHERIES

Seafood categories were composed as follows. Shrimp landings included whole (heads-on) weights of all penaeid species (no rock shrimp were reported in 1993). Crab landings included whole weights of blue crab (hard and peeler or soft) and stone crab claws. Shellfish landings were expressed in weights of meats with the equivalent volumes in U.S. bushels (oysters and whelks) or 250-count bags (clams) of whole product noted where appropriate. Also included in aggregate shellfish meat landings were squid and octopus. Most fish landings were reported in round (whole) weights, although carcass weights applied for swordfish and larger sharks. The offshore category included wreckfish, king mackerel, cobia, oceanic pelagics (dolphin, wahoo, and tunas), swordfish, reef fish (primarily groupers, snappers, sea bass, porgies, and tilefish), and sharks caught with offshore gears (i.e., handline and longline). Coastal fish included mullet, inshore groundfish (mainly spot and kingfishes or whittings), and sharks taken with inshore gears (shrimp trawls and gill nets). Sharpnose sharks were included in the coastal shark landings regardless of gear type. River fish landings in 1993 consisted almost entirely of American shad.

South Carolina is not a major producer of seafood. In 1993, the state ranked 19th in landed volume and 20th in ex-vessel value among the 23 coastal states. Most of the landings were shipped out of state as raw or unprocessed products so that the state economy received little benefit from value added. There were 273 primary wholesale dealer licenses issued in 1993, a 6% decline from the previous year's total.

The majority of these operations were small and employed few people besides the dealer. Exclusive of the harvesting sector and the dealers, estimated average employment included approximately 329 management/office personnel, 96 dockworkers (e.g. lumpers and fuel/ice handlers), 10 oyster shuckers, 42 crab pickers, 16 fish cutters, and 163 shrimp headers. Much of this consisted of seasonal, part-time employment. The estimated maximum number of individuals employed in these categories was 758. With the exception of shrimp headers and oyster shuckers, employment levels were about the same as in 1992. Header and shucker employment in 1993 was far below the 1992 level.

It is difficult to accurately determine the number of commercial fishermen, since many individuals obtained several licenses (for various gears) and the totals were therefore not additive. Some participants, e.g. shrimp boat strikers and fishing boat crewmembers, did not need licenses. In order to legally land product, an individual had to have either a land and sell license or a trawler captain's license. In 1993, there were 497 land and sell licenses, 628 resident trawler captain's licenses, and 274 nonresident trawler captain's licenses. The number of land and sell licenses was considerably larger than in 1992, while there was little change in the overall number of trawler captain licenses. Numbers of other licenses issued are mentioned in the appropriate fisheries sections.

Overall volume of seafood landings from wild stocks (19.677 M pounds) was the highest since 1983 (Fig. 1) and 10% above the 15-year (1978-1992) average (Fig. 2). Compared to landings in the previous year, production increased for shellfish (+ 63%), coastal fish (+ 27%), and shrimp (+ 24%). Declines occurred for offshore fish (- 5%), blue crab (- 13%), and river fish (- 56%). In contrast to recent years, production in most categories was relatively good compared to the 15-year averages with only river fish landings being extremely poor by historical standards (Fig. 2).

The total ex-vessel value of 1993's landings was \$27.028 M, about average for the past six years (Fig. 3) after adjustment for inflation. Ex-vessel value has not kept pace with volume production in this period of relatively low inflation. Much of the increased volume has been attributable to shrimp during a period of low shrimp prices and fish (e.g. sharks, mullet, spot, and wreckfish) of relatively low unit value.

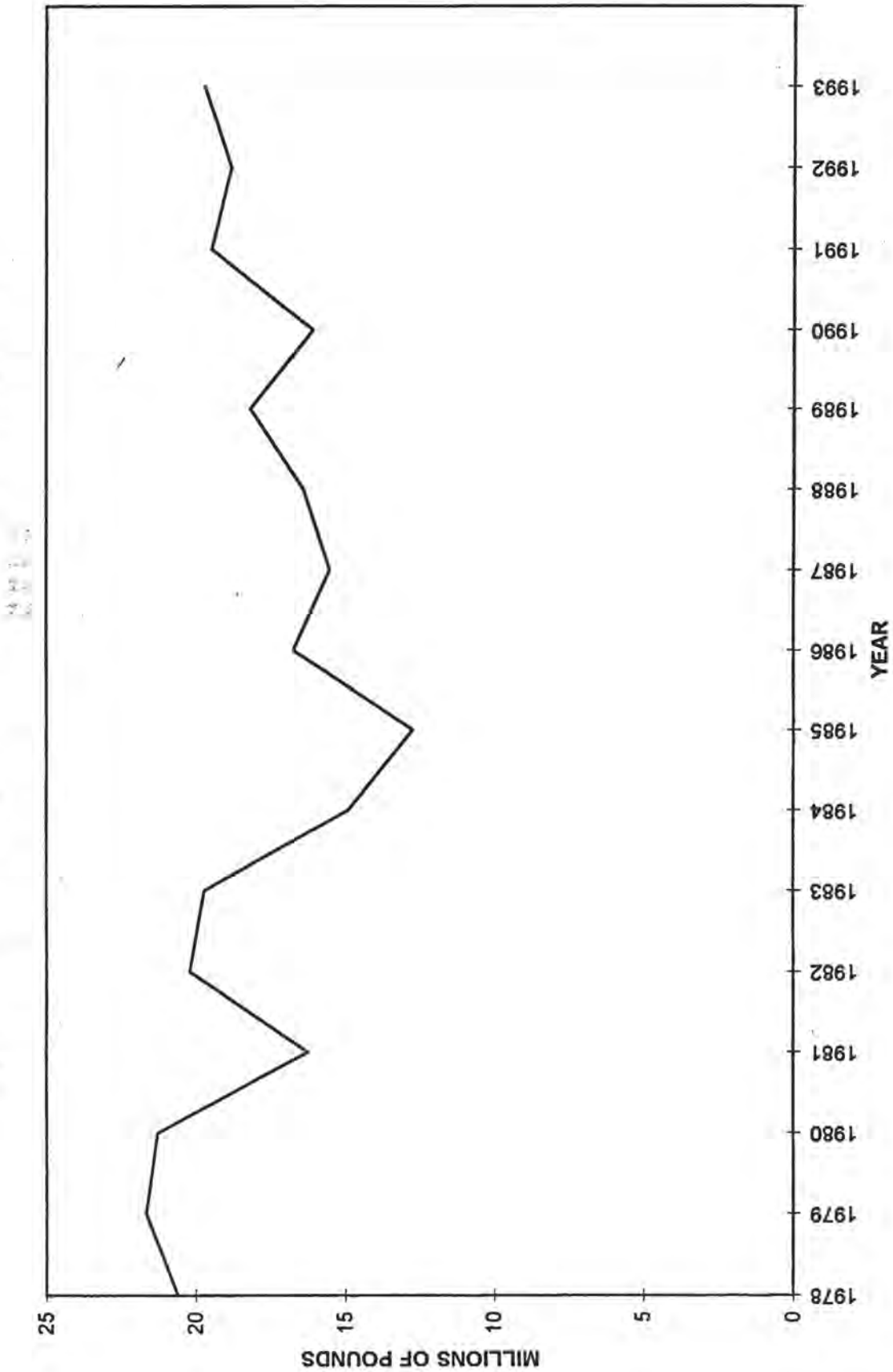
Shrimp was the leading volume contributor in 1993 (42% of all landed weight), followed by blue crab (32%) and offshore fish (17%)(Fig. 4). In terms of value, shrimp dominated with 58%. Offshore fish contributed 20% and blue crab 12%. The aggregate contribution of the other categories to both volume and value was about 10%.

South Carolina's commercial seafood production depends heavily



Chart1

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



**Fig. 2. Production compared to historical averages. Bars indicate percentages of the averages represented by the 1993 landings.**

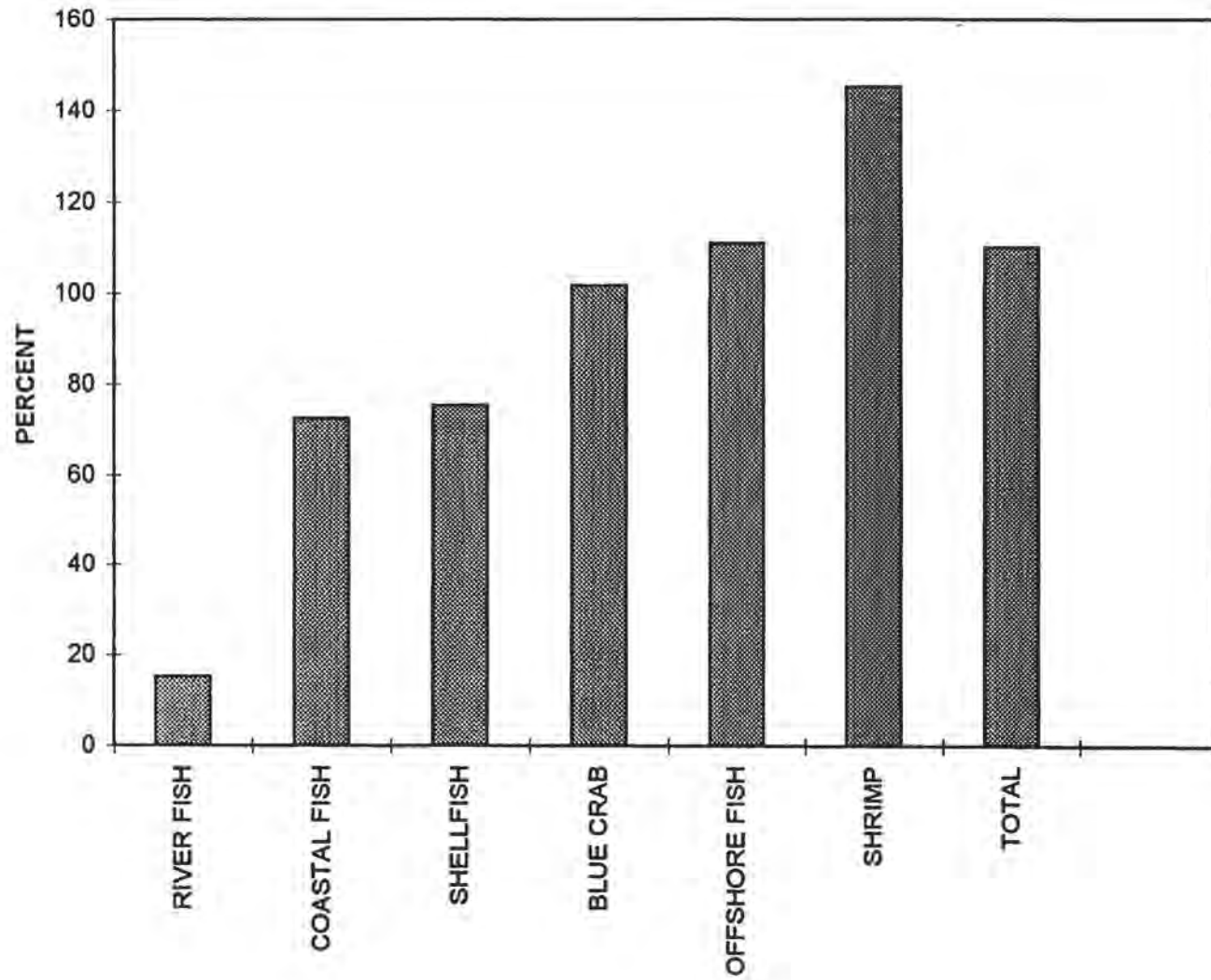


Chart1

FIG. 3. Total ex-vessel value of commercial landings adjusted for inflation in current dollars.

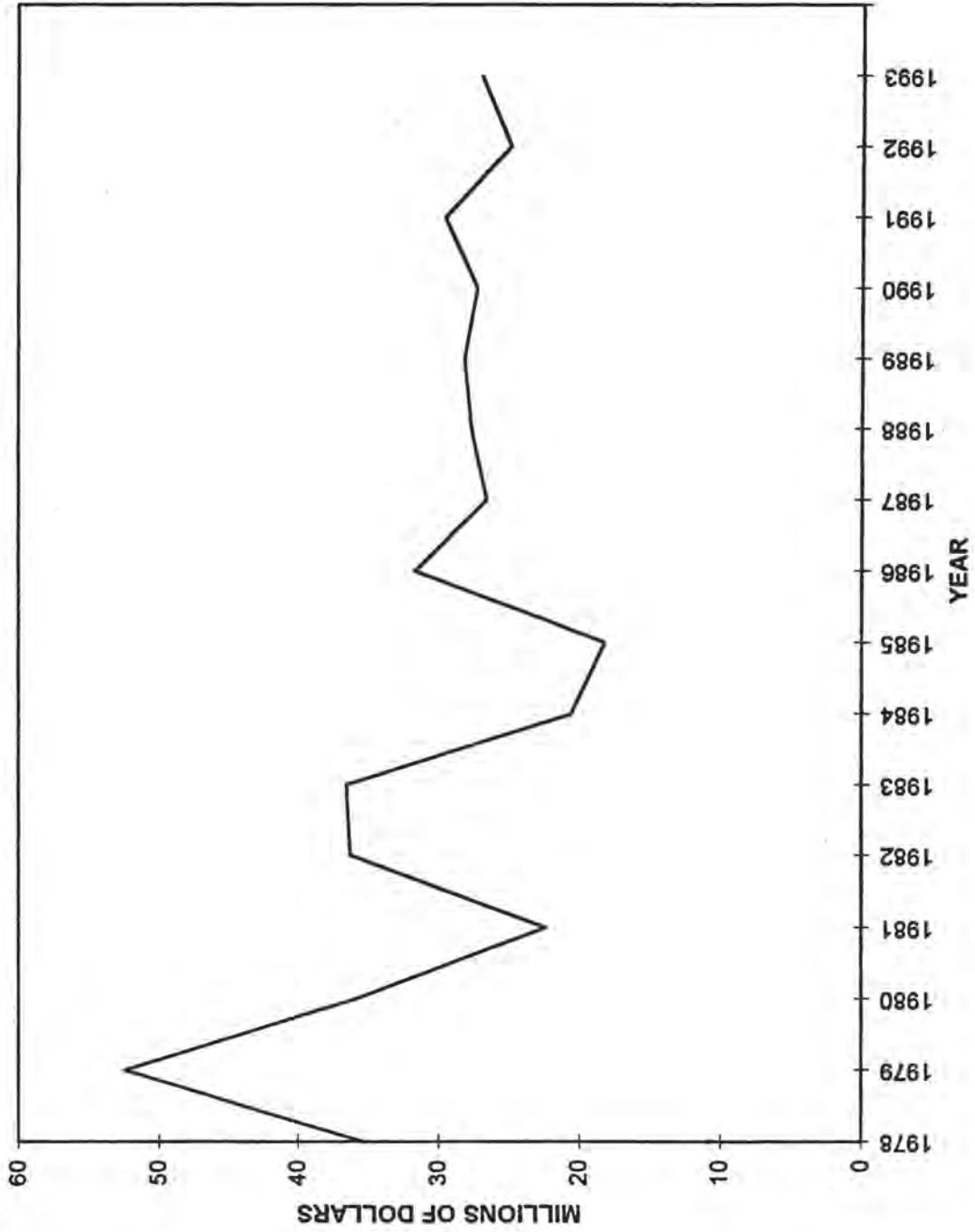
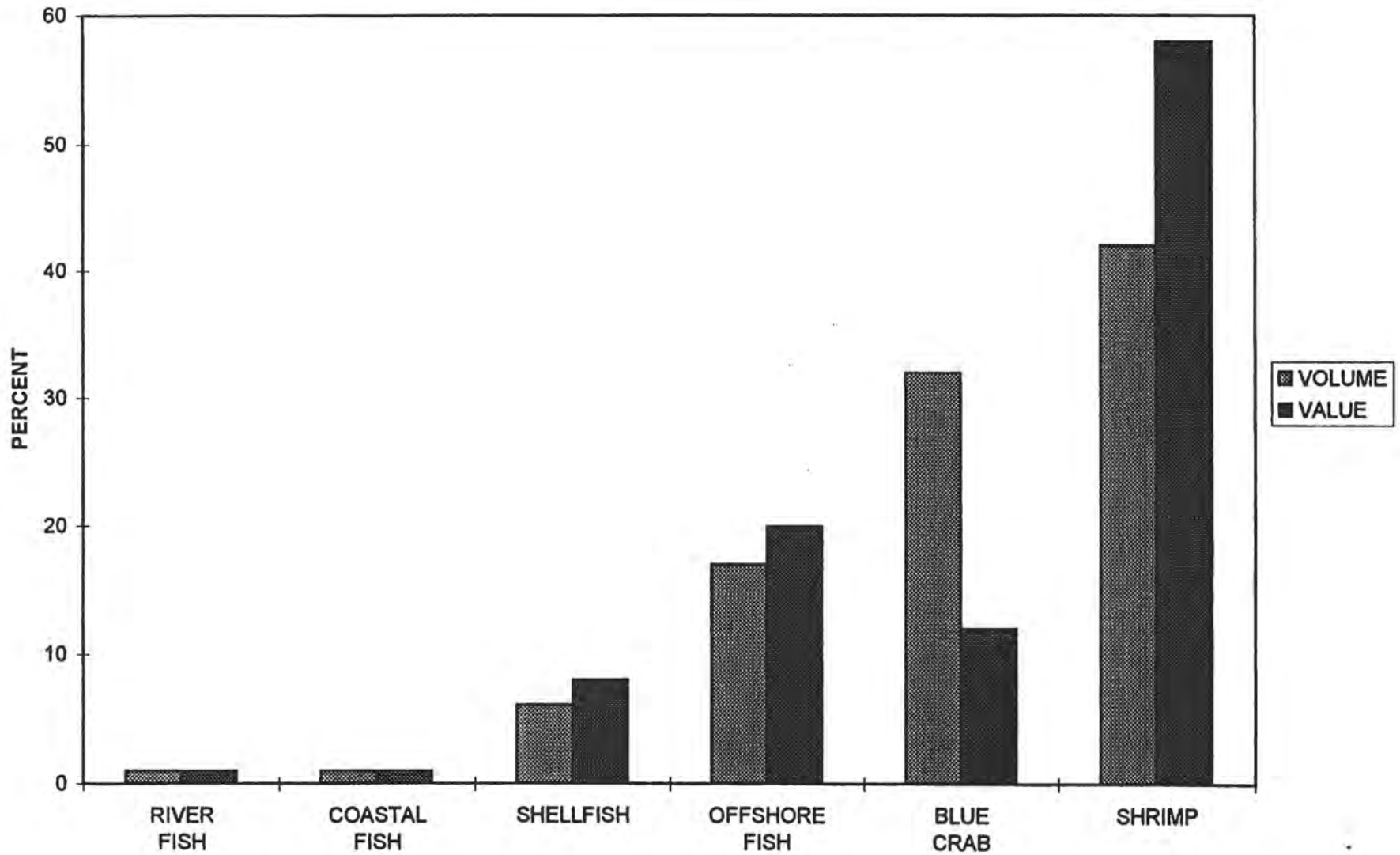


Fig. 4. Weight and value composition of commercial landings in 1993.



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on resources either obtained directly from estuaries or dependent upon these waters during a major phase of their life cycle. These include penaeid shrimp, blue crab, oysters, clams, and inshore fish such as spot, mullet, and flounder. (Some offshore species, such as gag grouper, also inhabit estuaries as juveniles, but the extent of their dependence on these areas is not well known.) Total seafood landings have closely reflected the contribution from these resources, which in 1993 was approximately 15.5 M pounds worth about \$21.3 M.

Charleston County dealers reported \$11.1 M worth of product, 41% of the state total. Shrimp was the leading contributor with 2.18 M pounds (heads-on) worth \$6.48 M. Fish (mostly offshore) landings were 1.07 M pounds worth \$1.79 M. The blue crab catch (2.35 M pounds) contributed \$1.30 M. Most of the state's shellfish were produced in Charleston County (63% each of the clams and oysters). About 70,400 bu. of oysters worth \$792,000 and 20,000 bags of hard clams worth \$467,000 were reported.

Beaufort County's landings were worth \$8.2 M (30% of the state total). The principal components were shrimp (1.77 M pounds, \$5.78 M) and blue crab (3.55 M pounds, \$1.82 M). Shellfish production increased slightly over the 1992 level with 7,400 bags of clams (\$182,000) and 33,800 bu. of oysters (\$372,000) landed.

Georgetown County dealers reported \$5.75 M worth of product (21% of the state total). Fish (1.85 M pounds worth \$2.76 M) and shrimp (1.05 M pounds, \$2.69 M) were the major contributors. About half of the state's offshore fish landings were at Georgetown County docks, as well as most of the shad catch.

Other counties accounted for minor amounts of product. Horry County's haul seine fishery contributed most of the state's production of coastal fish (primarily spot and mullet) and landings of offshore fish there were also appreciable. The county's total production consisted mostly of fish and was roughly 1.0 M pounds worth about \$1.0 M.

## **SHRIMP**

Total production (8.27 M pounds heads-on) continued the above-average trend (Fig. 5) of recent years and was second only to 1991's catch during the previous 15 years. Total ex-vessel value was \$15.79 M with an average overall unit value (trawl caught) of \$1.94/pound heads-on. When previous years' figures are adjusted for inflation, total value was a little above the average since production began to rise following the cold winters of the mid-1980's. The growth in value has not equalled that in production, due to generally declining unit value during the same period. The 1993 price/pound was the lowest to date after adjustment for inflation (Fig. 6). The price for brown shrimp was particularly low, \$1.37/pound (heads-on) compared to \$1.85 in the previous year.

Fig. 5. Annual commercial landings (heads-on) of shrimp.

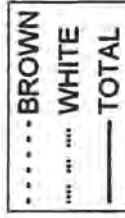
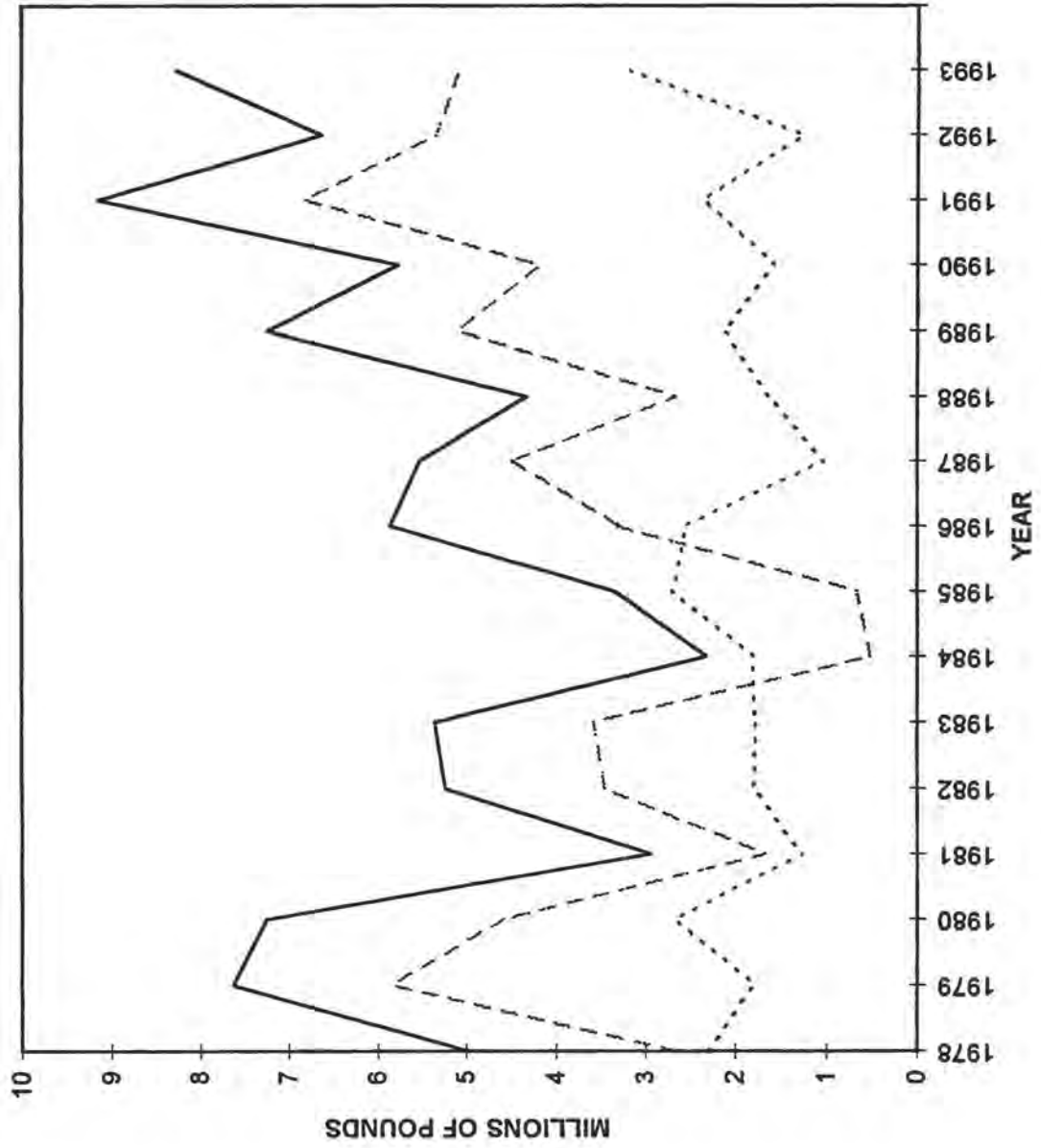
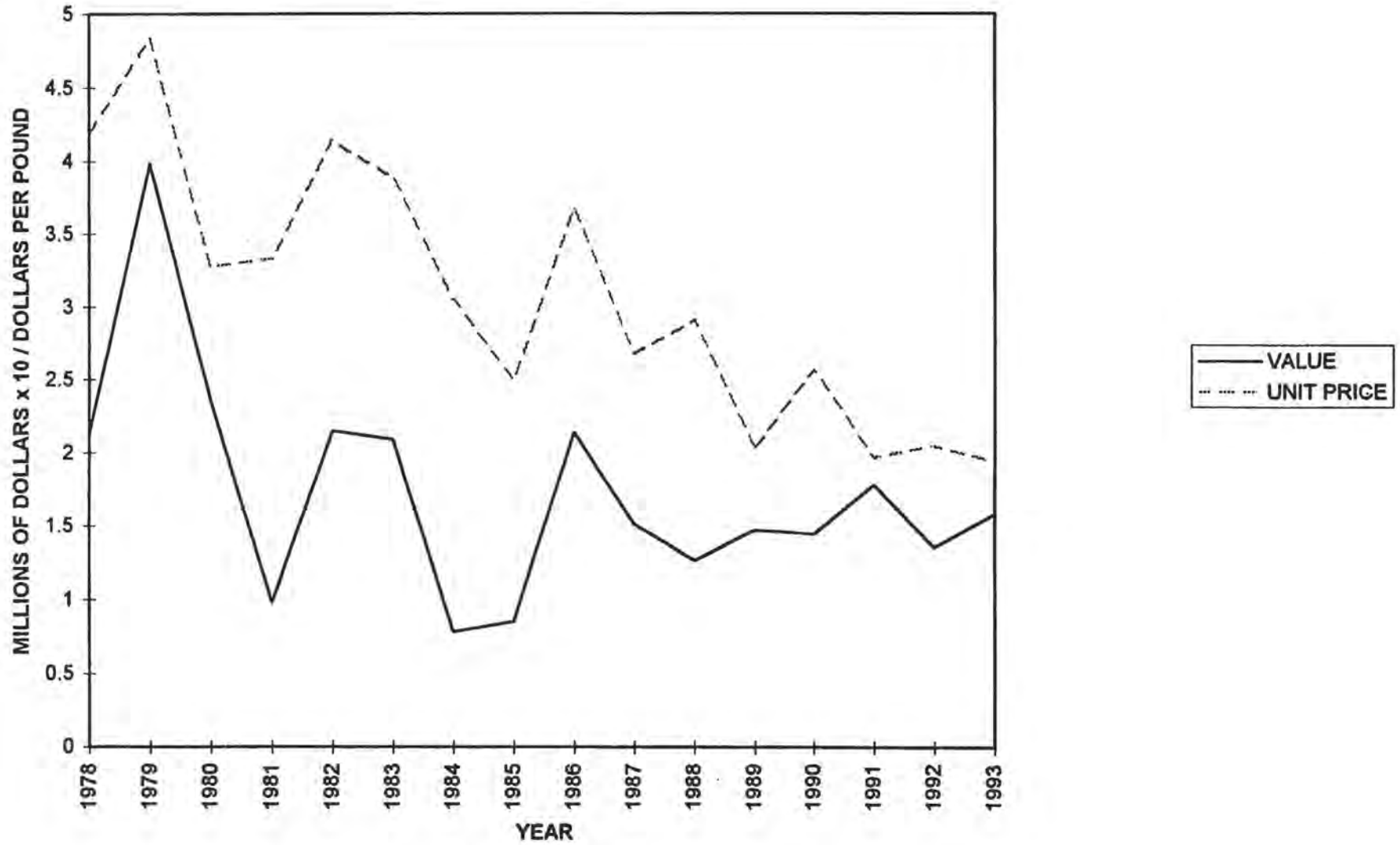


Fig. 6. Annual inflation-adjusted ex-vessel value and unit price of shrimp.



The relatively large annual fluctuations in value observed prior to 1986 have not occurred since then, due partly to the availability of imported pond-raised shrimp.

Initial overwintering abundance of white shrimp was relatively high. The weather in January was among the wettest for that month on record. February was slightly drier than normal, but March also was very wet. Water temperatures during late winter and early spring were relatively cool. Salinities also were generally somewhat lower than average, due to the wet weather.

When sampled in March and April, the abundance of white shrimp in estuarine areas was high, but average size was below normal because of climatic conditions. Ovarian development also was behind schedule due to these factors. Areas seaward of the old three-mile "radar line" were opened to trawling on April 20. Although very few shrimp were caught initially, approximately 360,000 pounds (heads-on) were taken during May. Total roe white shrimp landings were 1.35 M pounds (heads-on) worth \$3.8 M.

Due to the lagging maturation schedule, the spawning season was 2-3 weeks later than normal. Spawning appeared to be very successful. Sampling in July and August indicated relatively high abundance of juvenile white shrimp concentrated in upper estuarine areas. Because of the late spawning, the average size was below normal. Weather also was a contributing factor. The weather during June through August in coastal areas was the hottest on record and fifth driest in the last 99 years. The dry weather delayed movement into the coastal ocean waters.

September normally is the peak month for fall white shrimp. Approximately 1.12 M pounds (heads-on) were landed by commercial fishermen, a relatively low catch following a spawn of the apparent magnitude that occurred. Trawlers reported lower than expected catch rates during the latter half of September, a condition that persisted through October.

The baiting season opened on September 10 and closed on November 9. Participation and effort were the highest to date and the estimated catch was 2.72 M pounds (heads-on). Environmental conditions were favorable for the baiting fishery with the dry weather contributing to delayed movement of shrimp from estuarine areas. During the baiting season, baiters accounted for about 58% of the overall (recreational and commercial) white shrimp landings. For the entire fall, the estimated baiting catch was 44% of the total white shrimp harvest.

Following the closure of the baiting fishery, ocean catch rates improved somewhat. Mild weather conditions and availability of shrimp resulted in an extension of the trawling season until January 14.



The channel net season opened on September 7 and was extended until December 15, due to slow outmigration. Total reported landings were 329,000 pounds (heads-on), the best since 1990.

The cool winter-early spring water temperatures appeared to delay estuarine recruitment of brown shrimp postlarvae, which peaked in early April. Juvenile abundance was very high in late May and early June, although average size was somewhat below normal. Postlarval abundance during this period also was unusually high with the late recruitment presumably contributing to a high survival rate. The growth rate was very slow, however, and small shrimp persisted in the ocean throughout the season. The brown shrimp fishery extended later than normal with moderate landings through August. Total landings were the highest since 1977 with browns contributing 39% of the total shrimp production, the highest percentage since the weak white shrimp years of the mid-1980's.

In 1993, all trawlers operating seaward of the Colreg lines were required to use TEDs at all times. Vessels towing inside the lines also had to employ them with the exception of single-rig boats. Those towing with a headrope < 35 ft (44 ft for the footrope) could adhere to a seasonally variable maximum tow time in lieu of using a TED.

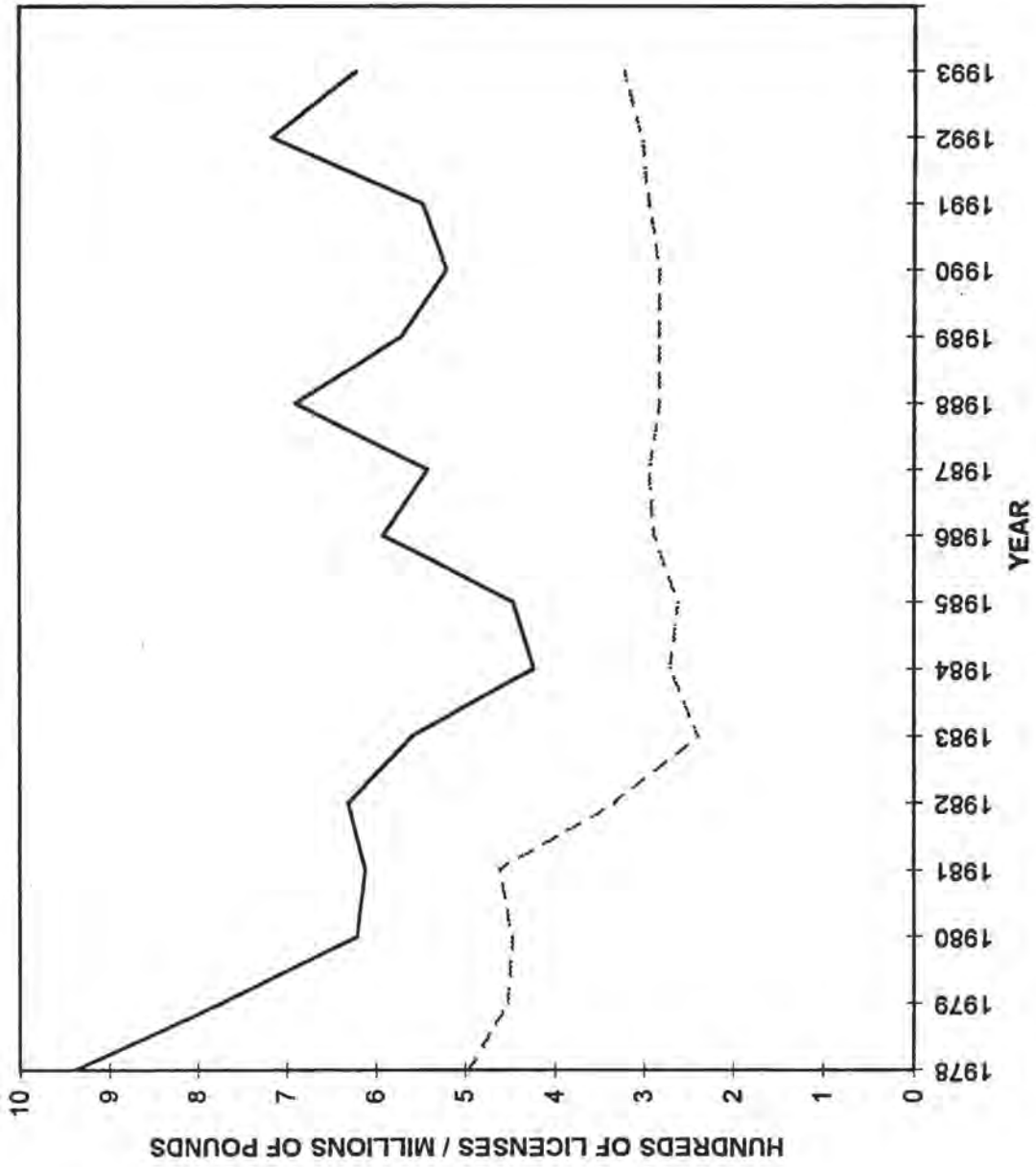
The number of trawler licenses sold in 1993 continued the long-term decline in participation. The number of resident licenses (N = 525) was less than half that in 1980. Nonresident license sales have varied widely depending on anticipated abundance here compared to opportunities elsewhere and were the lowest since the poor white shrimp years of 1984 and 1985.

#### **CRAB**

Pot fishermen landed 5.91 M pounds of hard blue crab worth \$2.91 M. Total blue crab landings (including peeler or soft crab) were 6.21 M pounds valued at \$3.27 M. Both production and value were relatively high compared to levels in recent years (Fig. 7 and 8). The unit price - \$0.49/pound in 1993 - has changed little in the last three years after adjustment for inflation. Licenses were issued to 304 crabbers, about the same number as in recent years.

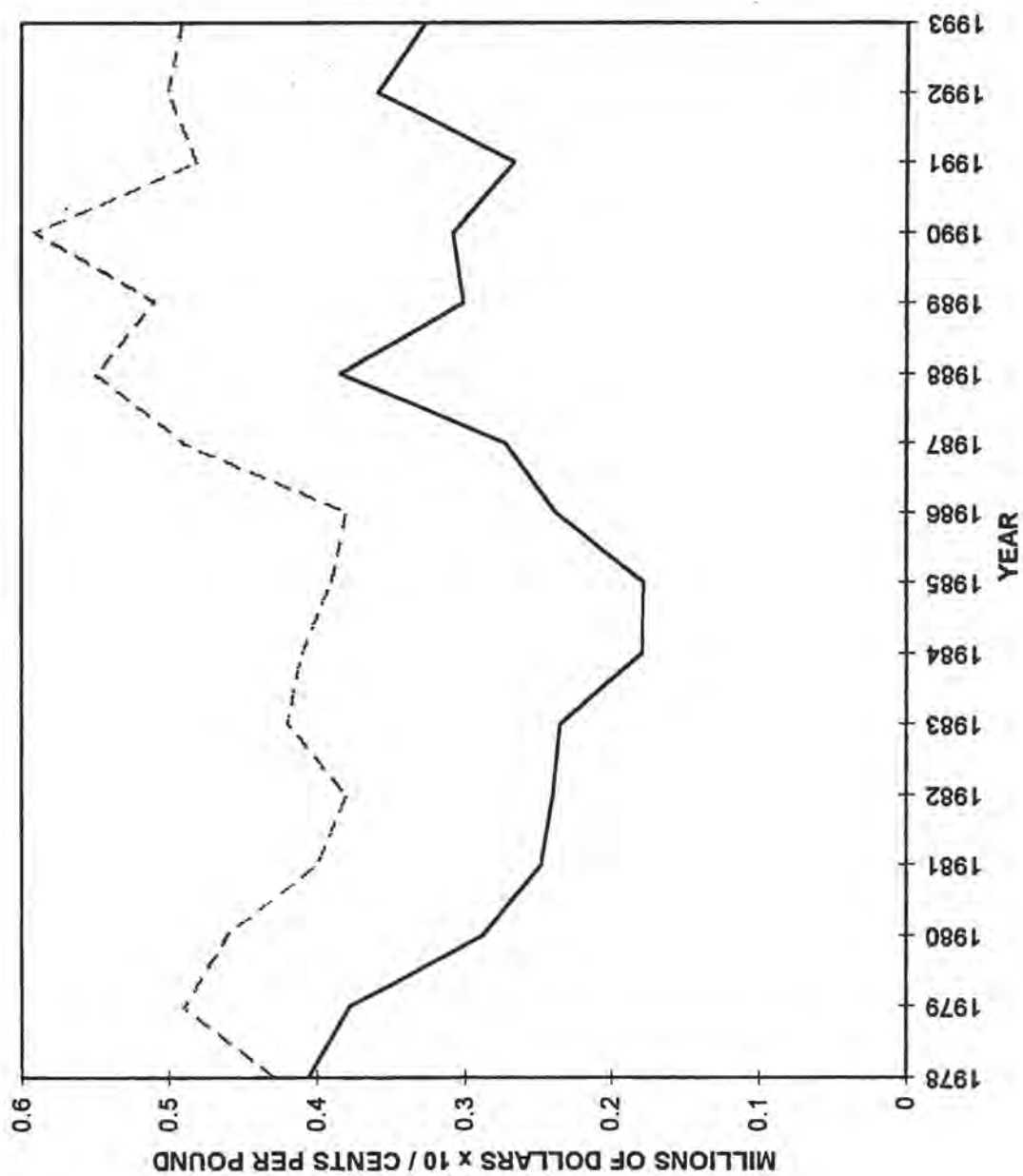
Studies in South Carolina and Georgia have suggested that the principal factor affecting abundance of legal crab is summer/early fall rainfall in the previous year. Sponge crab were extremely abundant in lower Charleston Harbor in June, 1992 and the weather in August and September was wet. These factors indicated that legal crab would be relatively abundant during 1993, which was the case; landings were the third highest in eleven years. The dry weather in summer and early fall of 1993 may contribute to lower landings in 1994.

Fig. 7. Annual commercial landings of blue crab and number of crab pot licenses.



POUNDS  
LINES  
LINES  
LINES

Fig. 8. Annual inflation-adjusted ex-vessel value and unit price of blue crab.



— VALUE  
- - - UNIT PRICE

**SHELLFISH**

The winter/spring season closed for oysters on May 14 and clams on May 31. Spring oyster production was 58,000 bu. worth \$697,000. Despite abnormally high rainfall, particularly during January, there were no major closures. The fall season opened for clams on September 16 and for oysters on October 1. Fall oyster landings were 54,000 bu. valued at \$560,000. Both total volume and value of oysters improved slightly from the previous year's levels (Fig. 9). About 35% of the total oyster production came from public grounds. The average price per bushel, \$11.20, was virtually unchanged from that in 1992.

Clam production improved moderately over the 1992 landings, as did value (Fig. 10). The increased production was attributable to higher escalator landings. The unit value of littlenecks (\$0.108 each) was slightly lower than that in 1992.

Whelk trawling was opened on January 22 and closed on May 4. The directed fishery was the largest in years with 113 permits issued and nearly 30,000 bu. worth \$245,000 landed. The unit value (\$8.26/bu.), however, was well below that (\$10.00) in 1992.

**OFFSHORE FISH**

Offshore finfish fisheries are managed under several South Atlantic Fishery Management Council (SAFMC) regional plans. Boats landing some species (e.g. swordfish and wreckfish) are required to submit detailed trip information and/or landings data to the NMFS. The state has a voluntary trip ticket system to monitor landings of other species and a port sampling program to measure fish of priority species. In 1993, 11 wholesale dealers were on the trip ticket system and port sampling was conducted at 11 fish houses.

Total landings of offshore fish (3.370 M pounds) continued to decline and were 5% less than in 1992 (Fig. 11). After adjustment for inflation, total ex-vessel value (\$5.314 M) was 9% below the 15-year average. The principal volume components were groupers, wreckfish, and pelagics (swordfish, king mackerel, dolphin, wahoo, and tunas), which in aggregate accounted for half of the total landings. These three groups were also the leading value contributors with 65% of the overall value (Fig. 12).

The principal offshore fishery was the handline fishery, which had three main components: 1) a snapper reel fishery for reef demersals (e.g. groupers, snappers, and porgies), 2) a deepwater hydraulic reel fishery targeted at wreckfish, and 3) a troll fishery directed at king mackerel. Aggregate landings in the three were 2.38 M pounds worth \$3.86 M.

The snapper reel fishery was the largest offshore fishery in participation, volume, and value landed. Participants included full-time commercial boats, opportunistic charterboats, and

Fig. 9. Annual commercial landings and inflation-adjusted ex-vessel value of oysters.

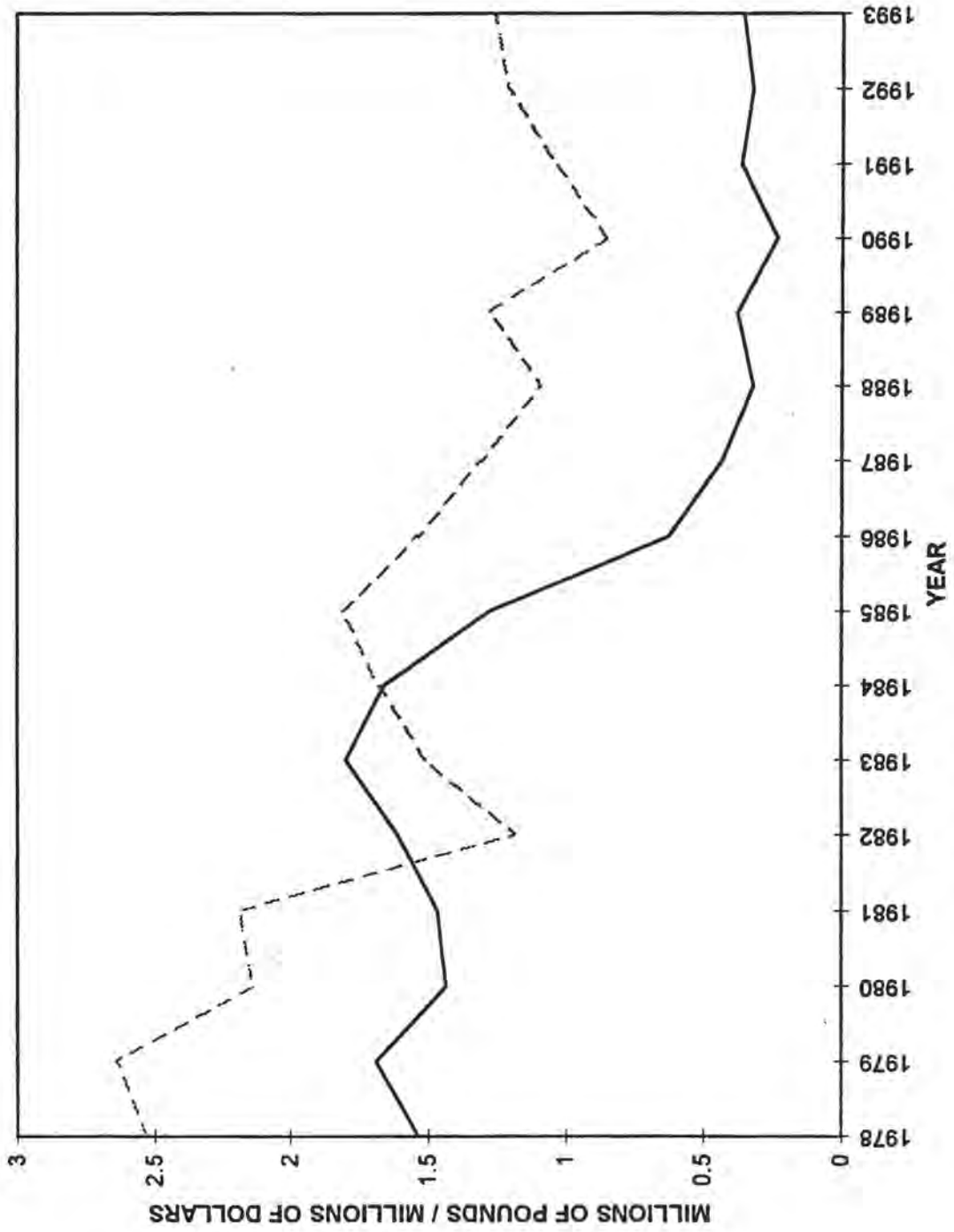


Fig. 10. Annual commercial landings and inflation-adjusted ex-vessel value of clams.

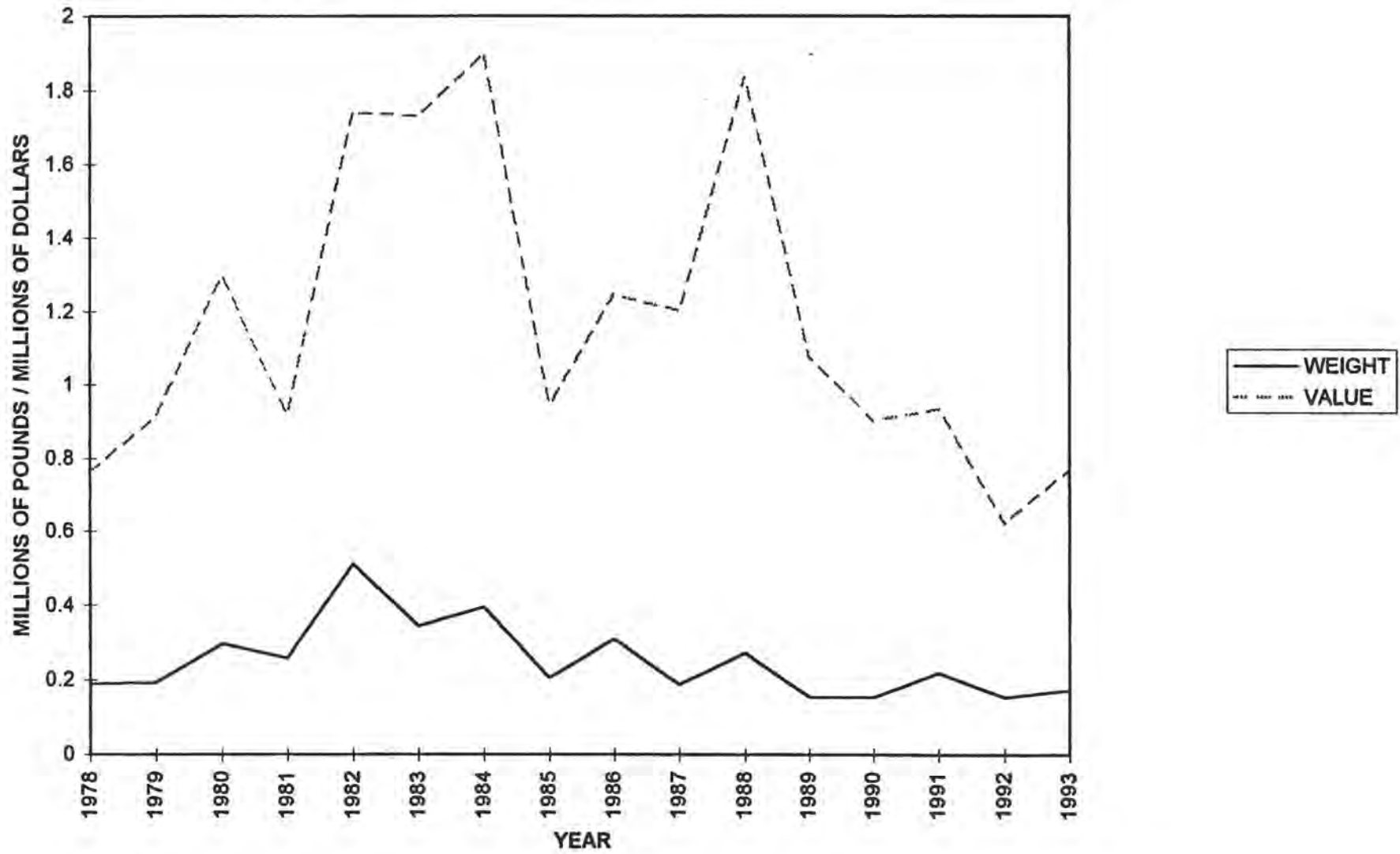


Fig. 11. Annual commercial landings and inflation-adjusted ex-vessel value of offshore fish.

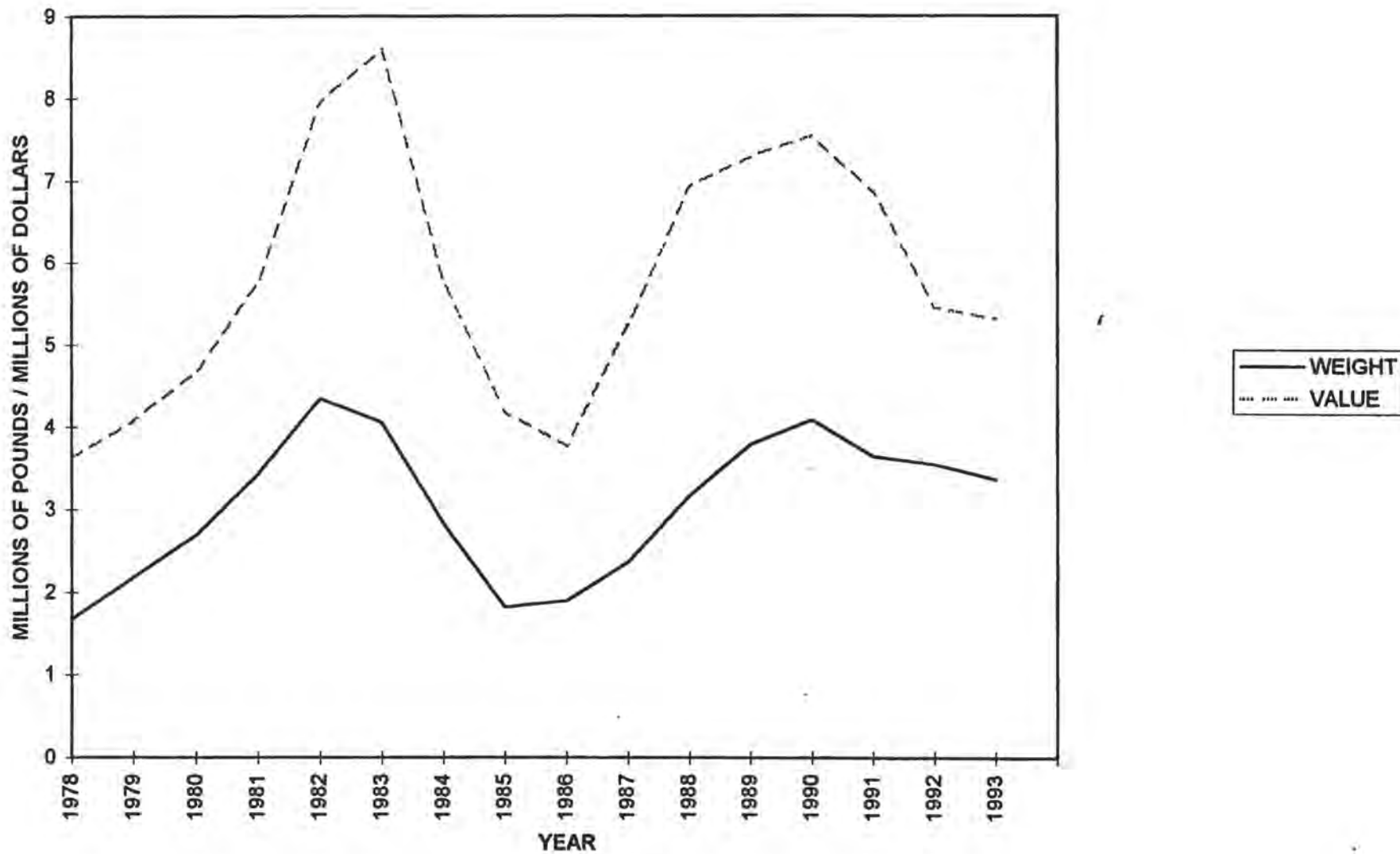
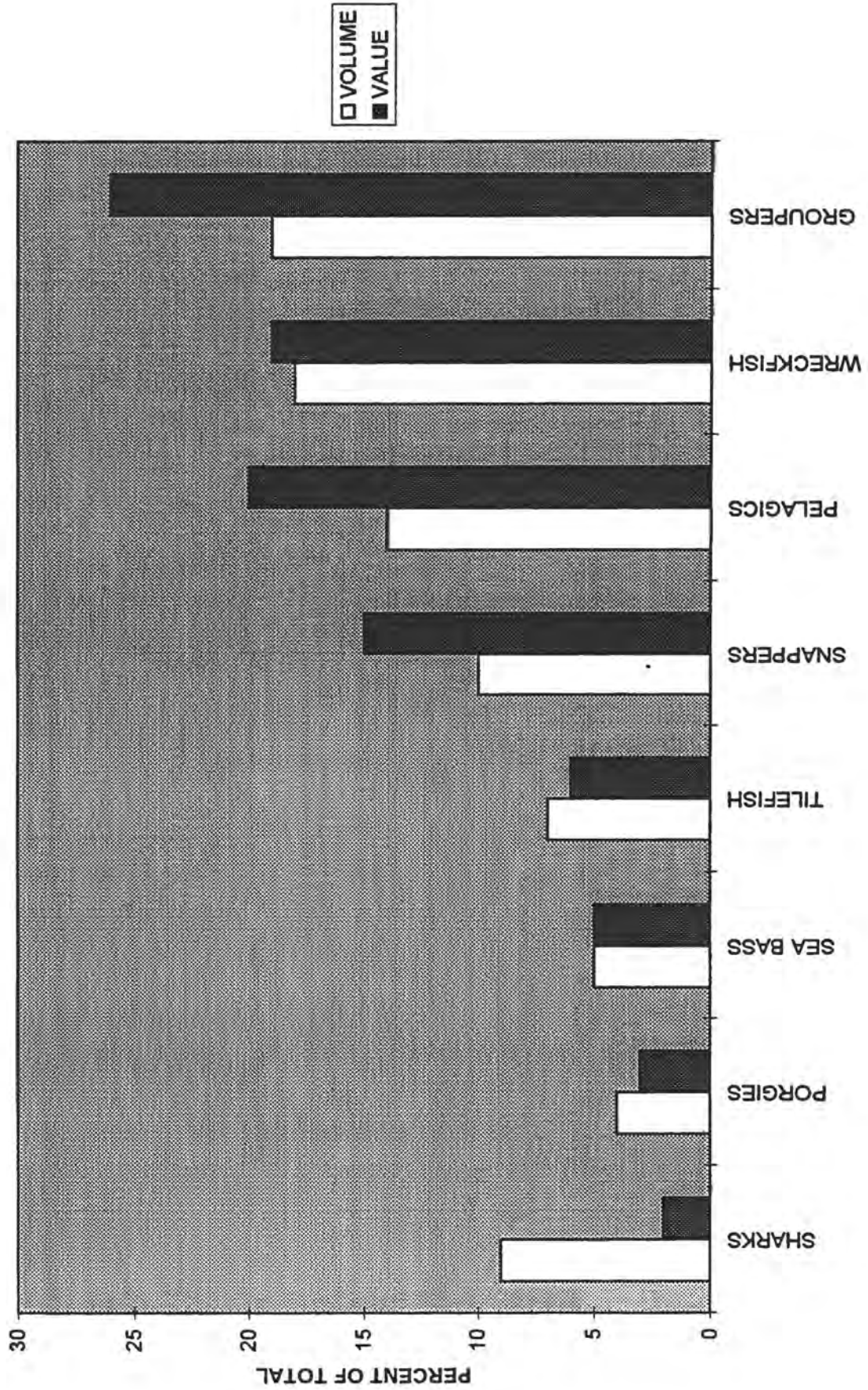


Fig. 12. Landings of major offshore fish groups in volume and value.





casual participants who landed small amounts on an occasional basis. Given this diversity, total fleet size was difficult to estimate. At least 47 boats reported landings through the trip ticket system with aggregate landings of about 405,000 pounds round weight. Ticket landings accounted for 24% of the total reported landings. Many of the ticket boats landed only a few pounds of fish on a very irregular basis. Based on boats docking at various fish houses, the estimated bona fide commercial fleet was about 31 vessels.

The average CPUE reported on tickets was 597 pounds (gutted weight)/trip. Based on this, estimated total effort was 2,593 trips. This probably was an overestimate because several docks servicing high-production boats were not on the ticket system. Nearly 36% of the ticket landings were for < 200 pounds and only 20% of the trips reported landed > 1,000 pounds. Of the 46 identified vessels reporting landings, only 20 reported > 10 trips. Eight vessels averaged > 1,000 pounds/trip.

Total landings in the snapper reel fishery were 1.703 M pounds, up slightly from the 1992 level (Fig. 13). Ex-vessel value was \$2.78 M. The principal volume components were groupers (33%), snappers (20%), and amberjacks (10%). Porgies accounted for 8% and king mackerel 7%. Triggerfish, sea bass, grunts, and miscellaneous species comprised the remainder. Aggregate reef fish landings were 1.495 M pounds, the lowest since 1986, worth about \$2.51 M.

Total grouper landings were 637,000 pounds, of which 89% were attributable to the snapper reel fishery. The principal species were gag (361,000 pounds) and scamp (139,000 pounds), nearly all of which were caught with snapper reels. Gag landings were the highest since the record year of 1983. Length distribution is shown in Fig. 14 with the average size (70.1 cm) being the smallest to date. The scamp catch, while slightly below that in 1992 and continuing to decline from the record level in 1990, was still well above historical standards. The length distribution is indicated in Fig. 15 and continued to be severely truncated. Average size (53.1 cm) was virtually identical to that in 1992.

The most important snapper species was the vermilion snapper with 250,000 pounds worth \$526,000 landed, virtually all by the snapper reel fishery. Length distribution is shown in Fig. 16. The average size (36.6 cm) continued to increase and was the largest since 1979 (Fig. 17); fish < 12 in. could not be legally landed. Landings of red snapper historically have been highly variable (Fig. 18) and the 1993 catch (83,000 pounds worth \$228,000) was the largest since 1978. Length distribution is shown in Fig. 19. Nearly 79% of the fish measured were within 2 in. of the legal minimum size (20 in.). Mean length was 53.8 cm.

Historically, the red porgy was one of the most important offshore species and represented over 25% of the snapper reel landings during the late 1970's. In 1993, this species'

Fig. 13. Annual landings and inflation-adjusted ex-vessel value of the handline fishery.

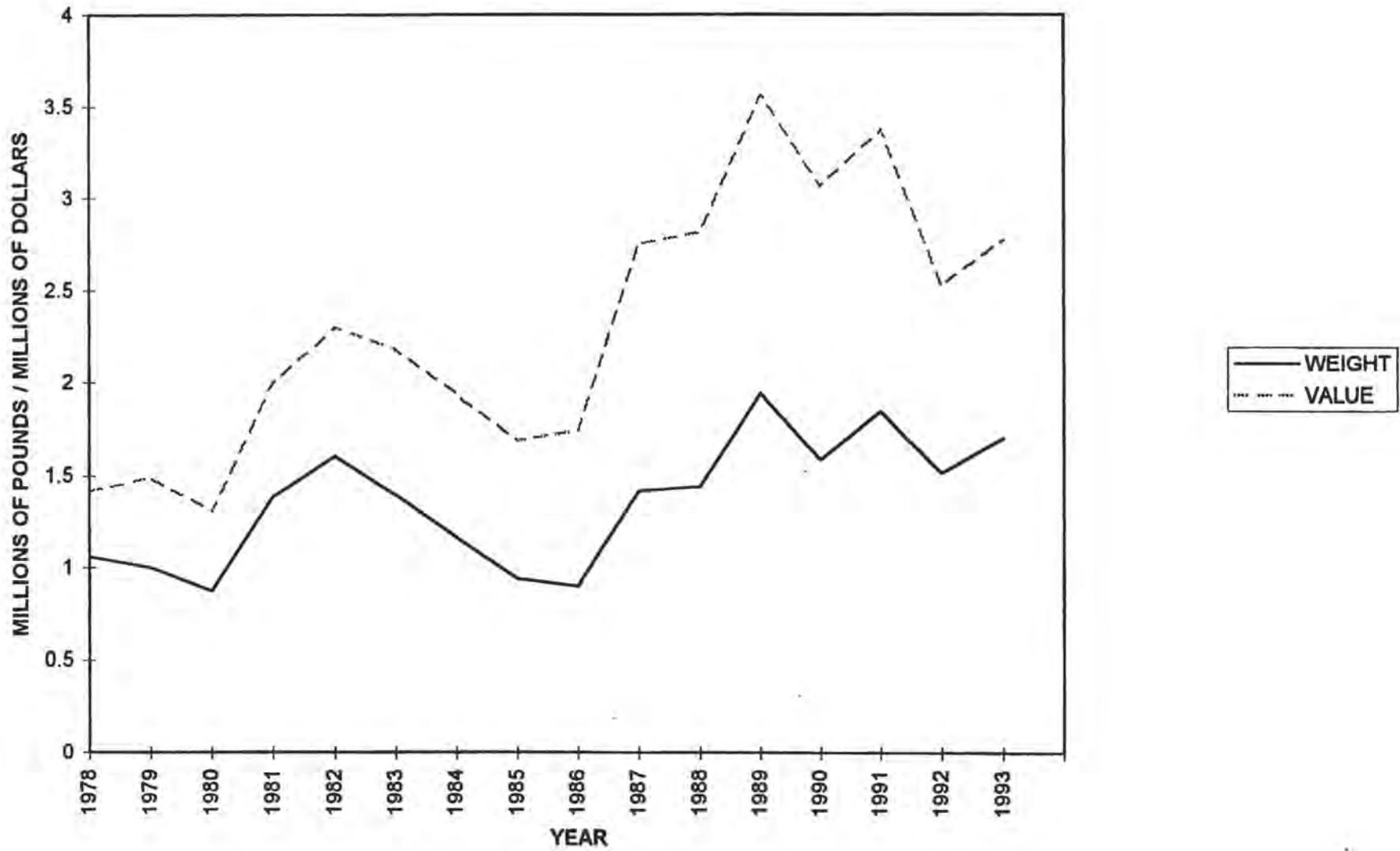


Fig. 14. Length distribution of commercially landed gag in 1993.

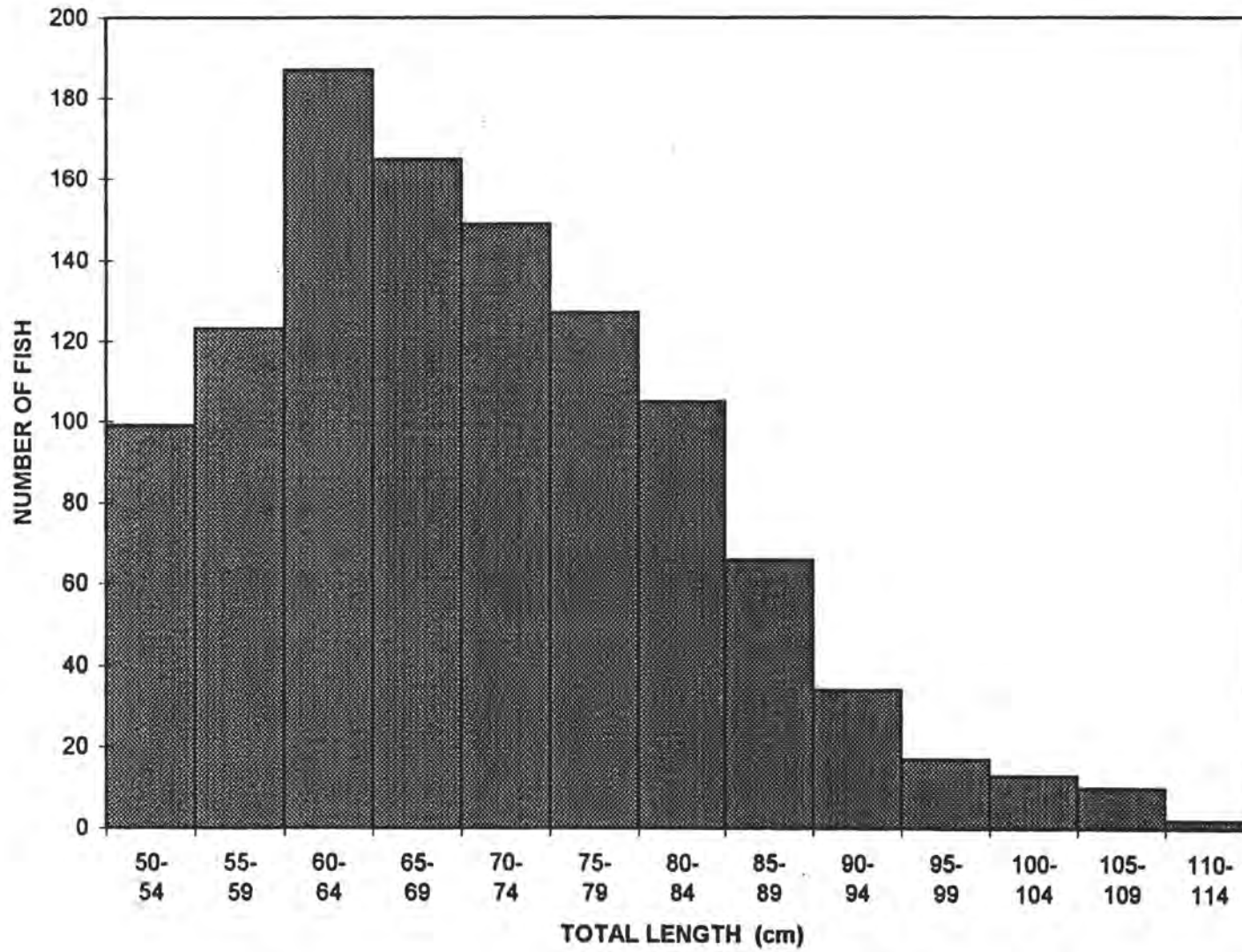


Fig. 15. Length distribution of commercially landed scamp in 1993.

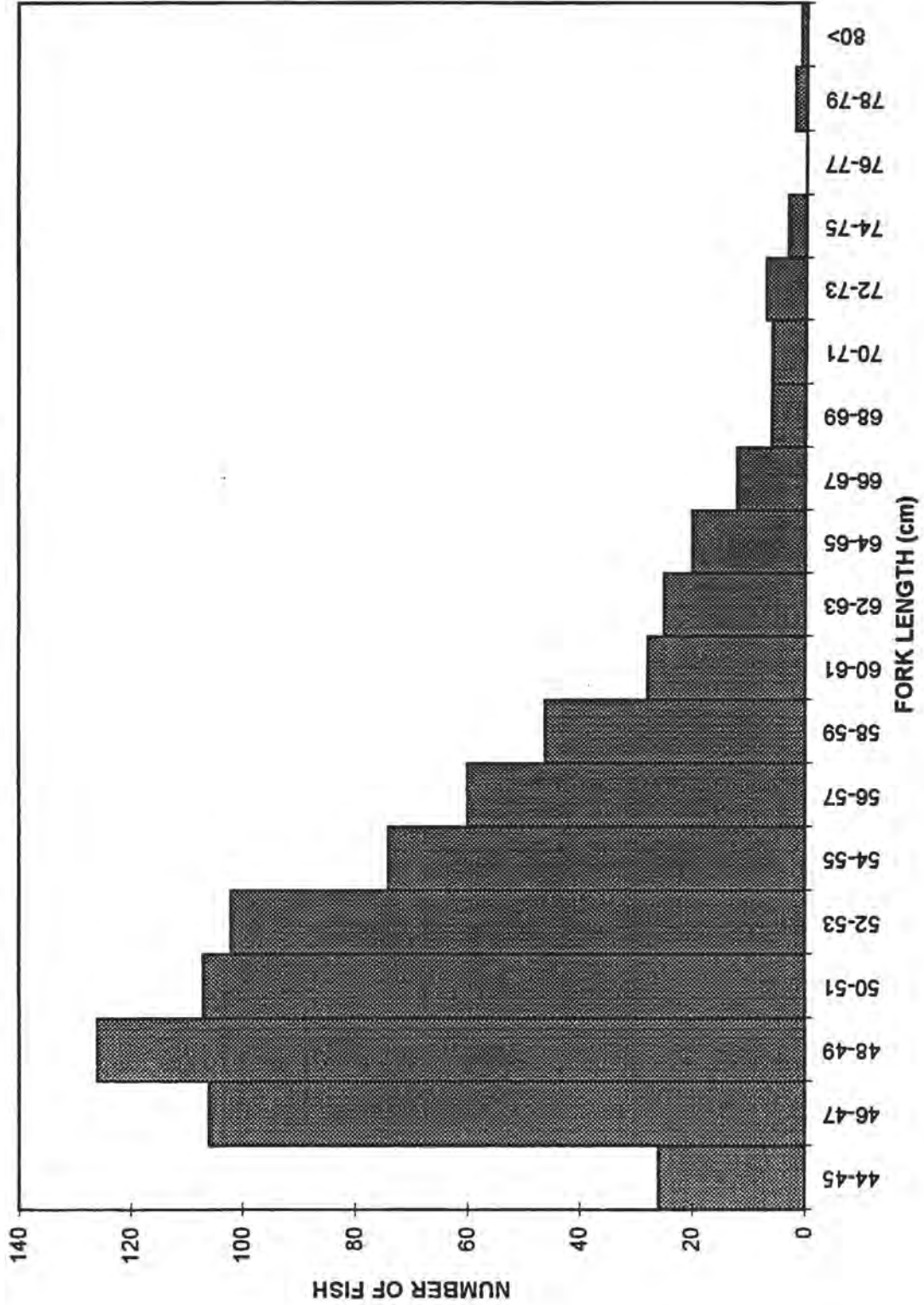


Chart1

Fig. 16. Length distribution of commercially landed vermilion snapper in 1993.

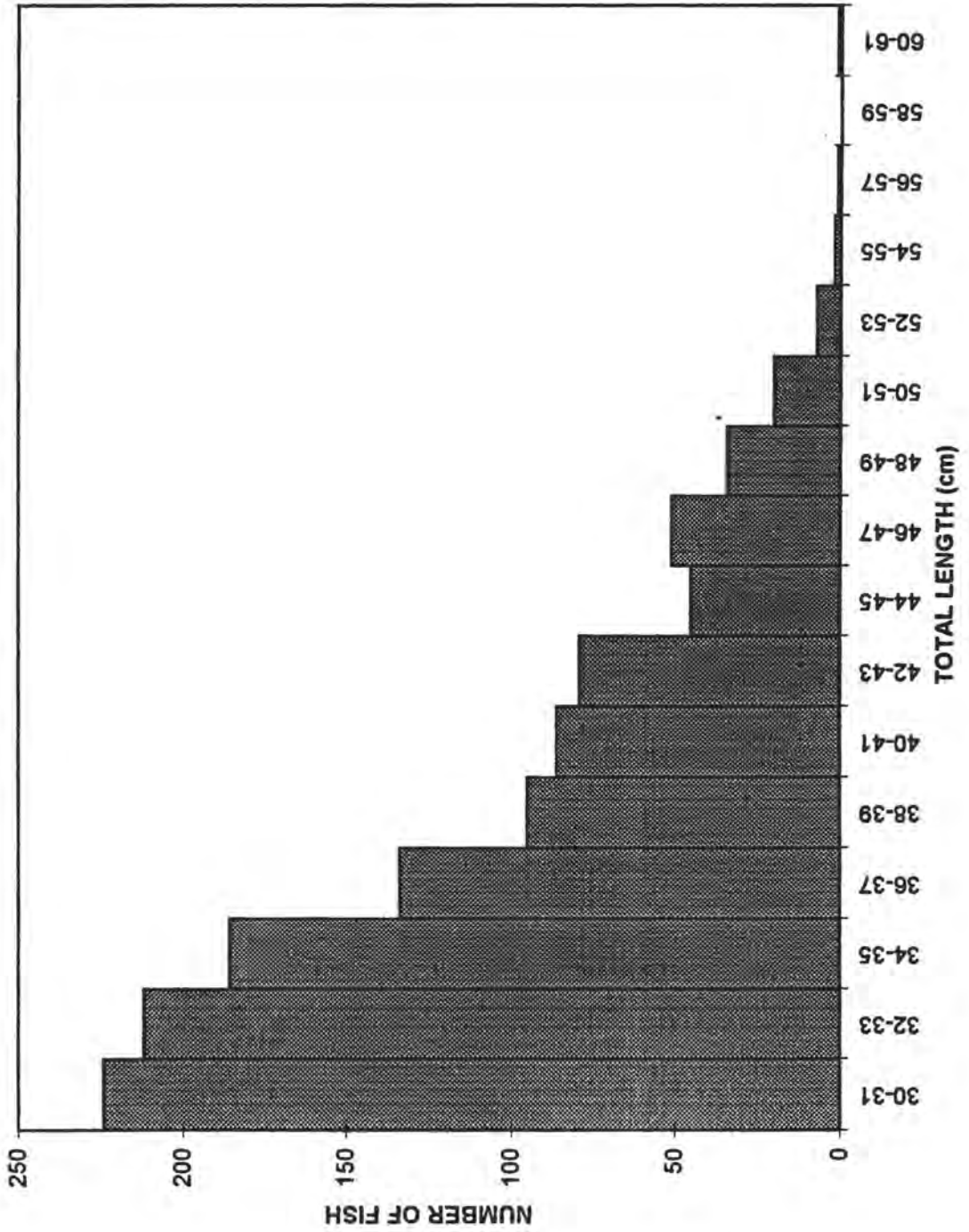


Chart3

Fig. 17. Average total length of commercially landed vermilion snapper in South Carolina.

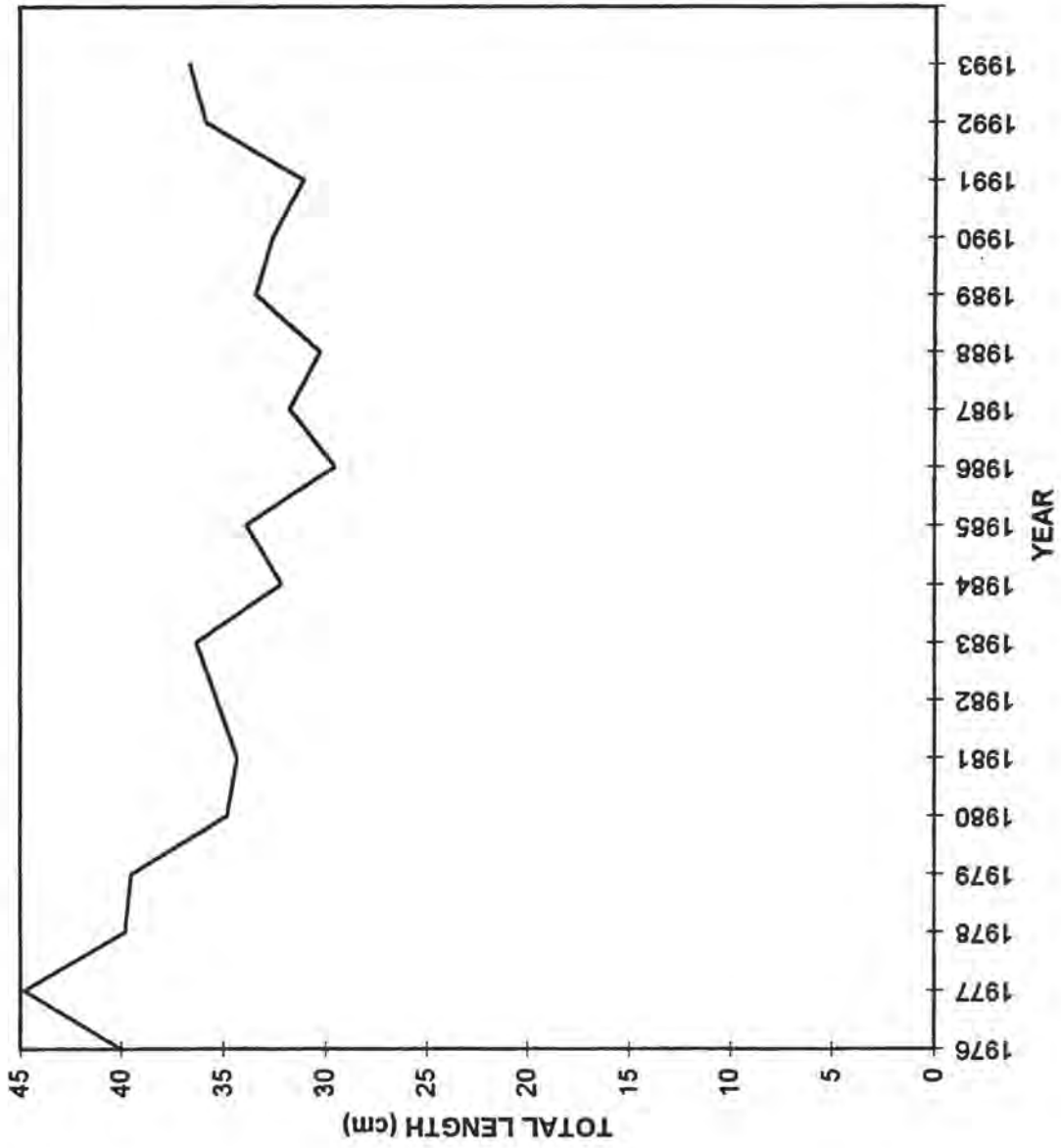


Chart2

Fig. 18. Annual commercial landings of red snapper.

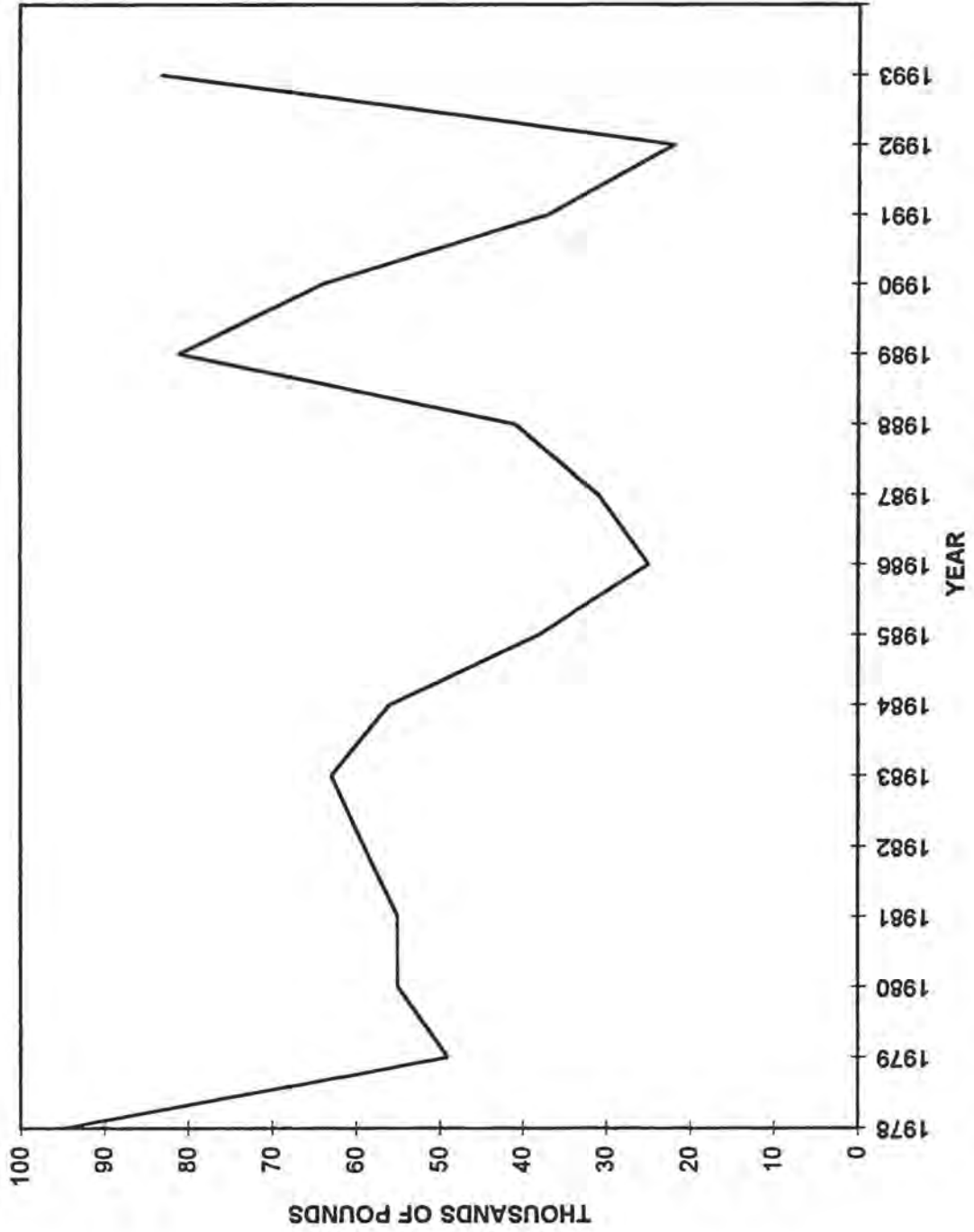
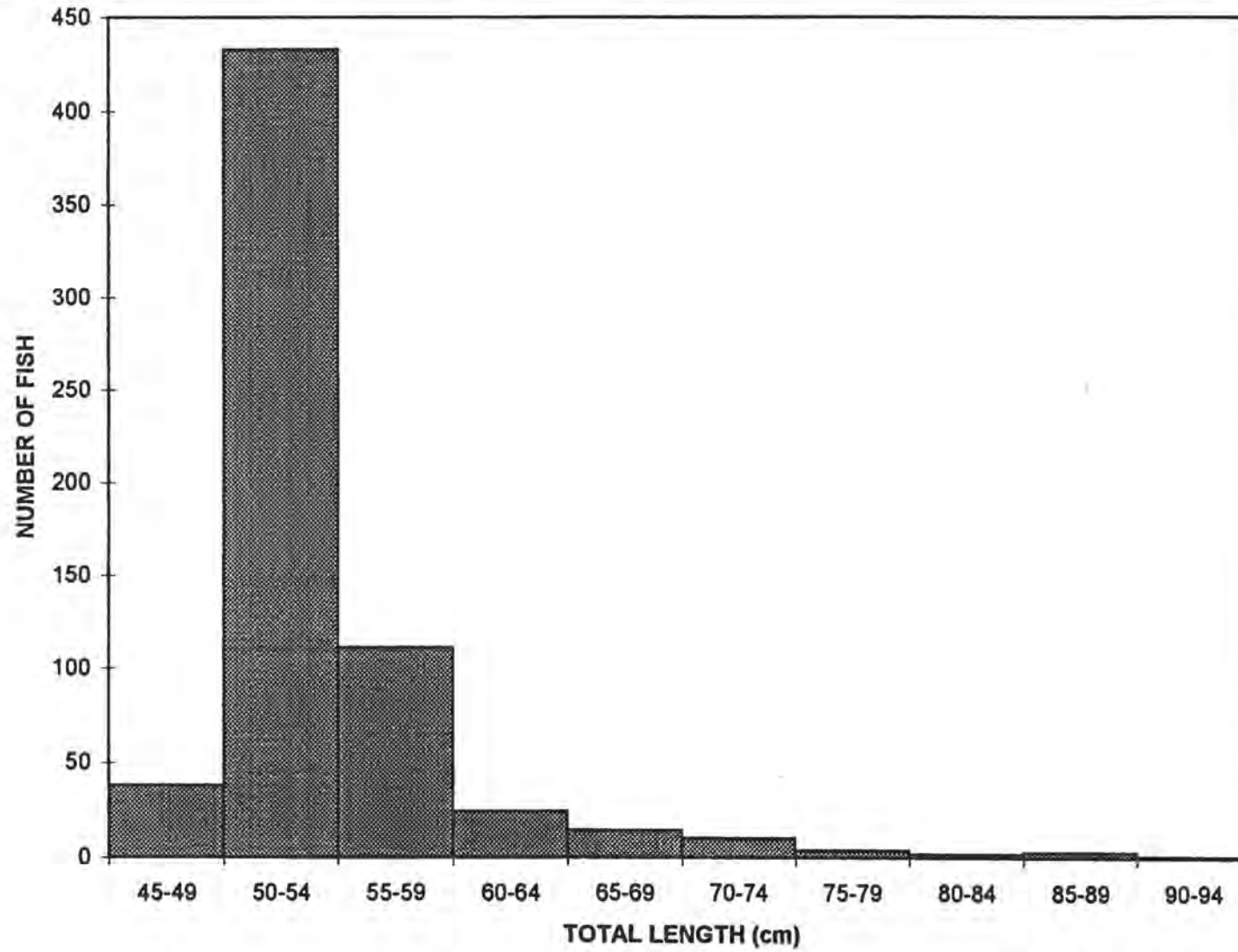


Fig. 19. Length distribution of commercially landed red snapper in 1993.





contribution was just 7% and the landings were the lowest to date (Fig. 20). Length distribution is shown in Fig. 21. There has been little change in average size (35.5 cm) in the last five years, although a 12 in. minimum size was imposed in 1992.

The regional wreckfish fishery was managed under an individual transferable quota (ITQ) system in 1993, wherein the number of participants was limited and each had a quota composed of shares. Because only two dealers handled landings in South Carolina, the landings data were confidential. Six boats participated with an average catch rate of 6,800 pounds/trip, slightly less than in 1992. Effort was comparable to that in 1992 and the season was again closed during the January 15-April 15 spawning period. Length distribution is shown in Fig. 22. There has been practically no change in either mean size (98.7 cm) or size distribution since the fishery began in 1987.

At least 14 boats reported troll landings and most were either moonlighting charterboats or vessels which fished primarily in other fisheries. Very few boats in South Carolina expended significant effort in a directed troll fishery and none were on the ticket system in 1993. About 57% of the total troll catch was reported by tickets with the average CPUE being 601 pounds/trip. King mackerel was the principal species, although troll landings represented only 28% of the total mackerel catch. Overall king mackerel landings were 162,000 pounds worth \$246,000. Length distribution is shown in Fig. 23. In both 1992 and 1993, the fish averaged about 10% smaller than in previous years.

Most of the landings of pelagic species other than king mackerel were accounted for by the surface longline fishery. Formerly directed exclusively at swordfish, the local fishery has also targeted yellowfin tuna in recent years. Swordfish landings were confidential because only two dealers handled product. The local fishery has been in a long-term decline and the 1993 swordfish landings were the lowest since it began 15 years ago. Roughly equal quantities of yellowfin tuna, dolphin, and sharks made up the rest of the catch. Aggregate total volume was 239,000 pounds worth \$743,000. Fourteen boats reported landings through the ticket system, averaging 3,109 pounds/trip. Estimated total effort was 94 trips.

Sharks comprised 43% of the landings of the bottom longline fishery. Eight boats reported shark landings through the ticket system, which accounted for about 47% of the total reported offshore catch. Their average CPUE was 1,909 pounds/trip. Based on this, the estimated total directed effort for sharks was 133 trips. Both CPUE and effort were lower than in 1992.

The total offshore catch of sharks was 315,000 pounds. About 59,000 pounds were taken in shrimp trawls and gill nets. The ex-vessel value of the overall shark catch was \$137,000. A

Chart1

Fig. 20. Annual handline landings of red porgy.

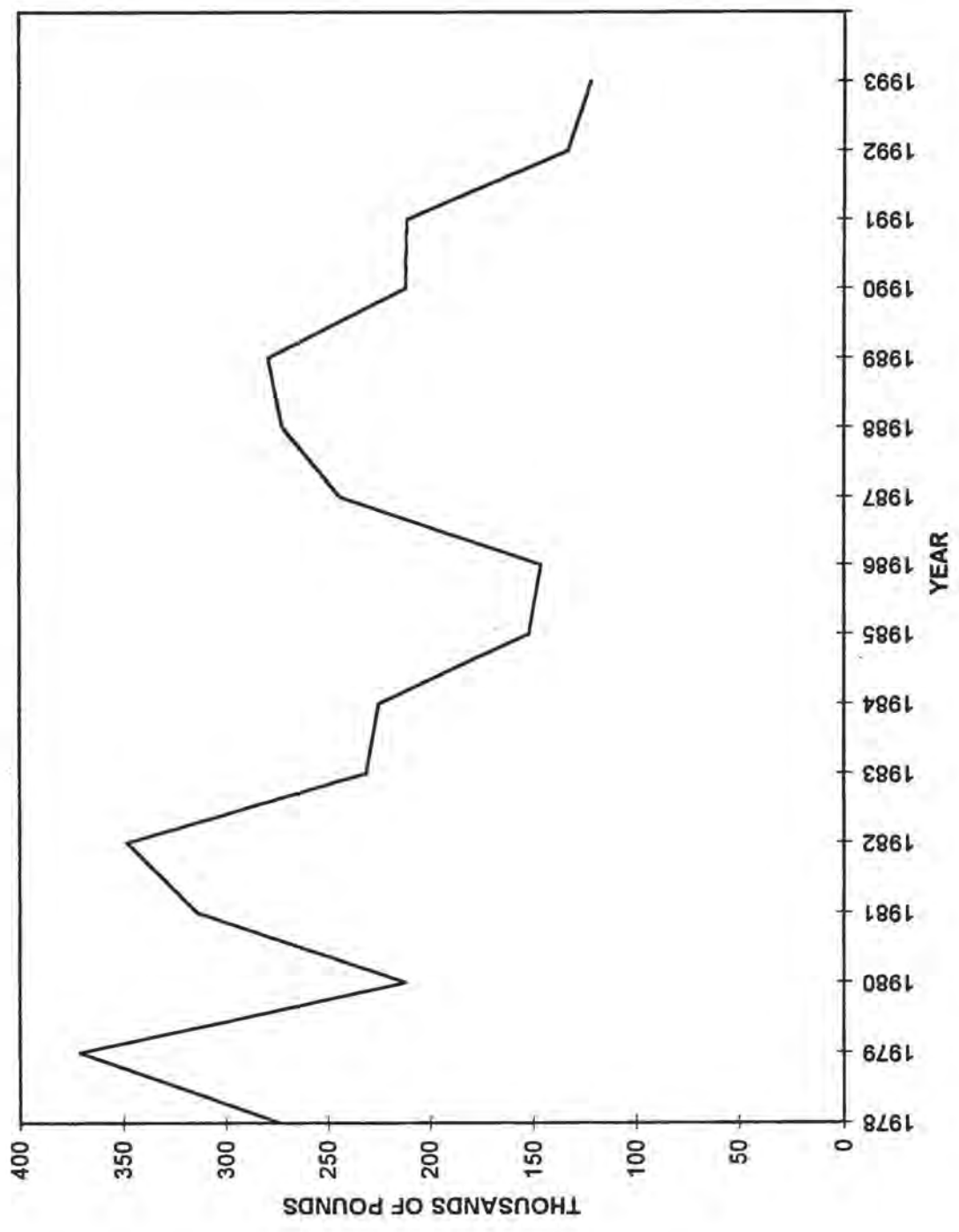


Fig. 21. Length distribution of commercially landed red porgy in 1993.

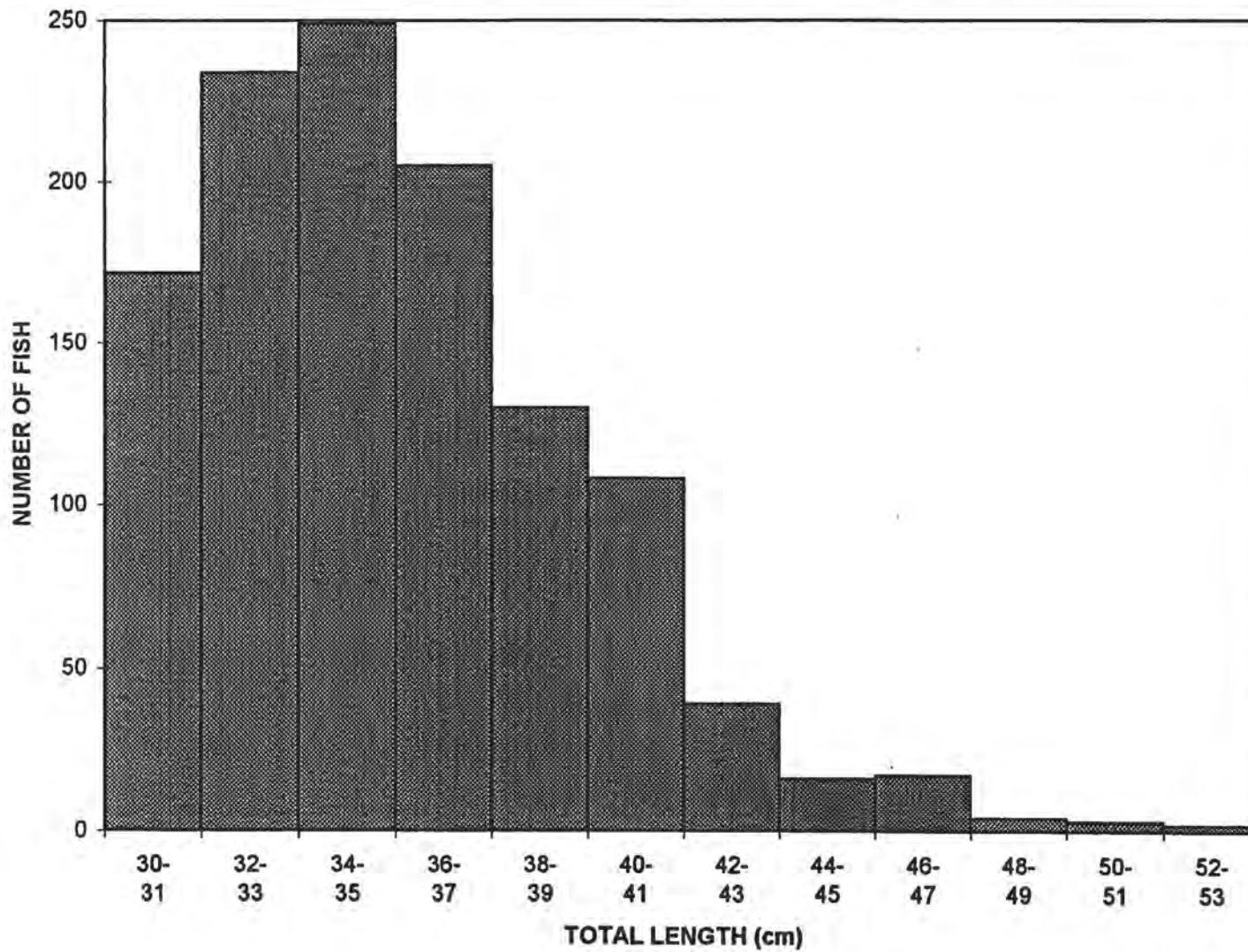


Fig. 22. Length distribution of wreckfish in 1993.

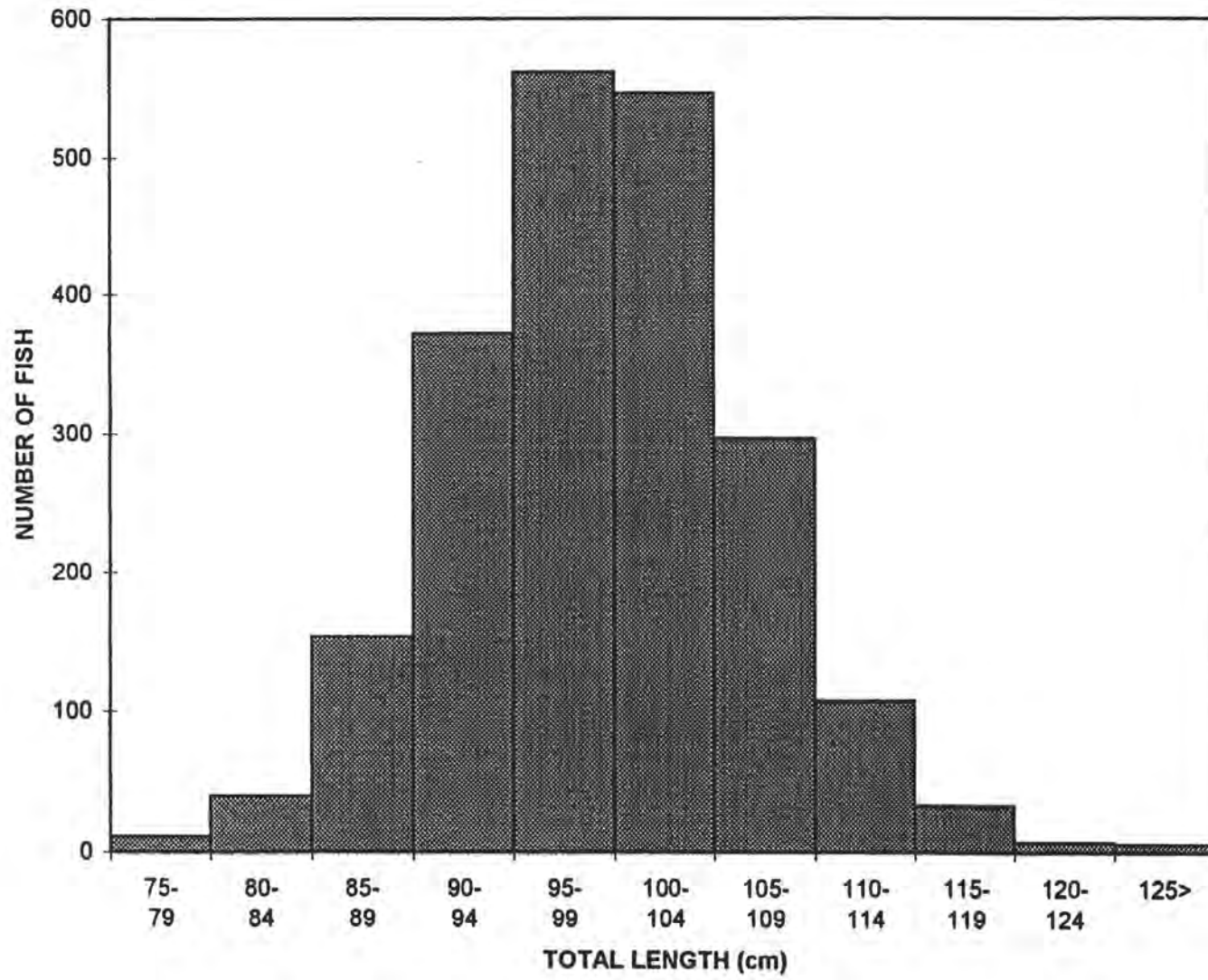
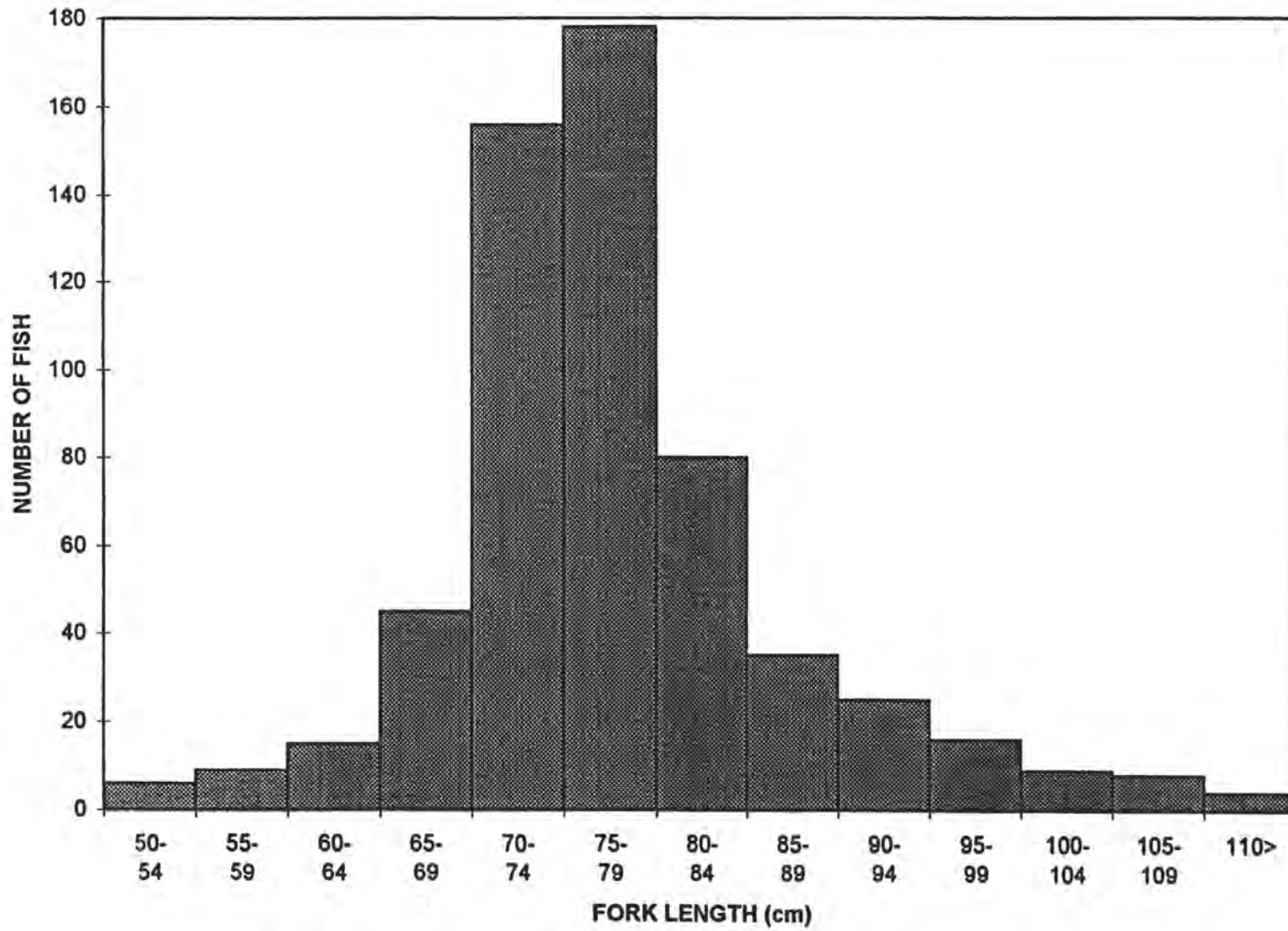


Fig. 23. Length distribution of commercially landed king mackerel in 1993.



prohibition on landings of most species was in effect from May 15 to July 1, as the fishery was managed under catch quotas for the first time.

The deepwater bottom longline fishery primarily targeted golden tilefish with 195,000 pounds of this species valued at \$293,000 being landed. The length distribution is shown in Fig. 24. The average size (55.1 cm) was slightly below that in 1992 and was the smallest recorded to date. Landings of snowy grouper (59,000 pounds) remained depressed by historical standards. Length distribution of snowies taken by snapper reel and longline is shown in Fig. 25 (there was little difference in the average size by gear type). The average size (54.6 cm) was slightly larger than those observed in the last three years.

Eleven boats reported bottom longline landings of grouper and/or tilefish in 1993 on fish tickets, averaging 1,767 pounds (of all species combined)/trip. This CPUE was substantially less than that reported in 1992. Estimated total effort was 193 trips. Ticket landings represented about 27% of the total landings.

The other significant offshore fishery was the trap fishery directed at black sea bass. Although boats were limited to the use of sea bass pots, they could retain other species in 1993. At least nine boats reported landings on tickets, averaging 718 pounds/trip. Ticket landings represented 23% of the gear total. Estimated total effort was 163 trips. Both CPUE and total effort appeared to be substantially lower than in 1992.

Black sea bass contributed 87% of the trap catch with small fish representing 49% of the graded landings. The length distribution of trapped fish is shown in Fig. 26; the average size (30.0 cm) was the same as in 1992. Hook and line caught fish represented 44% of the total sea bass catch and were of slightly larger average size. The aggregate sea bass landings for all gears were the lowest since 1985 (Fig. 27).

#### COASTAL FISH

Total landings (including inshore shark catches) were 561,000 pounds valued at \$201,000. Volume was the highest since 1988 (Fig. 28) and was mainly attributable to the haul seine fishery. Haul seiners landed 405,000 pounds, shrimp trawlers 95,000 pounds, and gill netters 40,000 pounds. The remainder was attributable to several gears. Spot (251,000 pounds) and mullet (163,000 pounds) were the principal species.

Landings from the incidental catch of shrimp trawlers were the lowest since 1977. The principal species were kingfishes (whitings) and flounders. The volume of kingfishes (56,000 pounds) was the lowest since 1981. Flounder landings (14,000 pounds) were also low compared to historical levels. TED usage and a 12 in.

Fig. 24. Length distribution of golden tilefish in 1993.

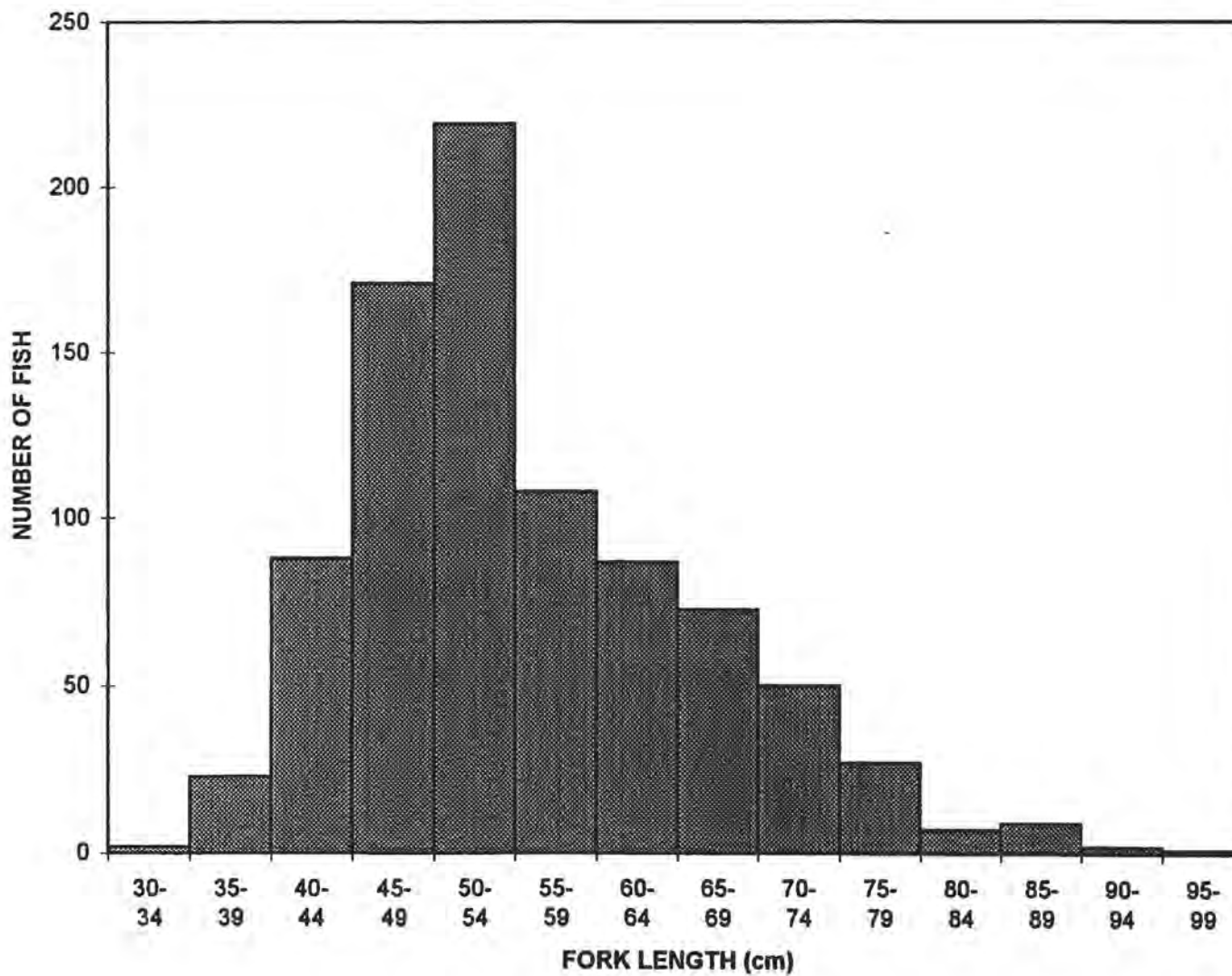


Fig. 25. Length distribution of snowy grouper in 1993.

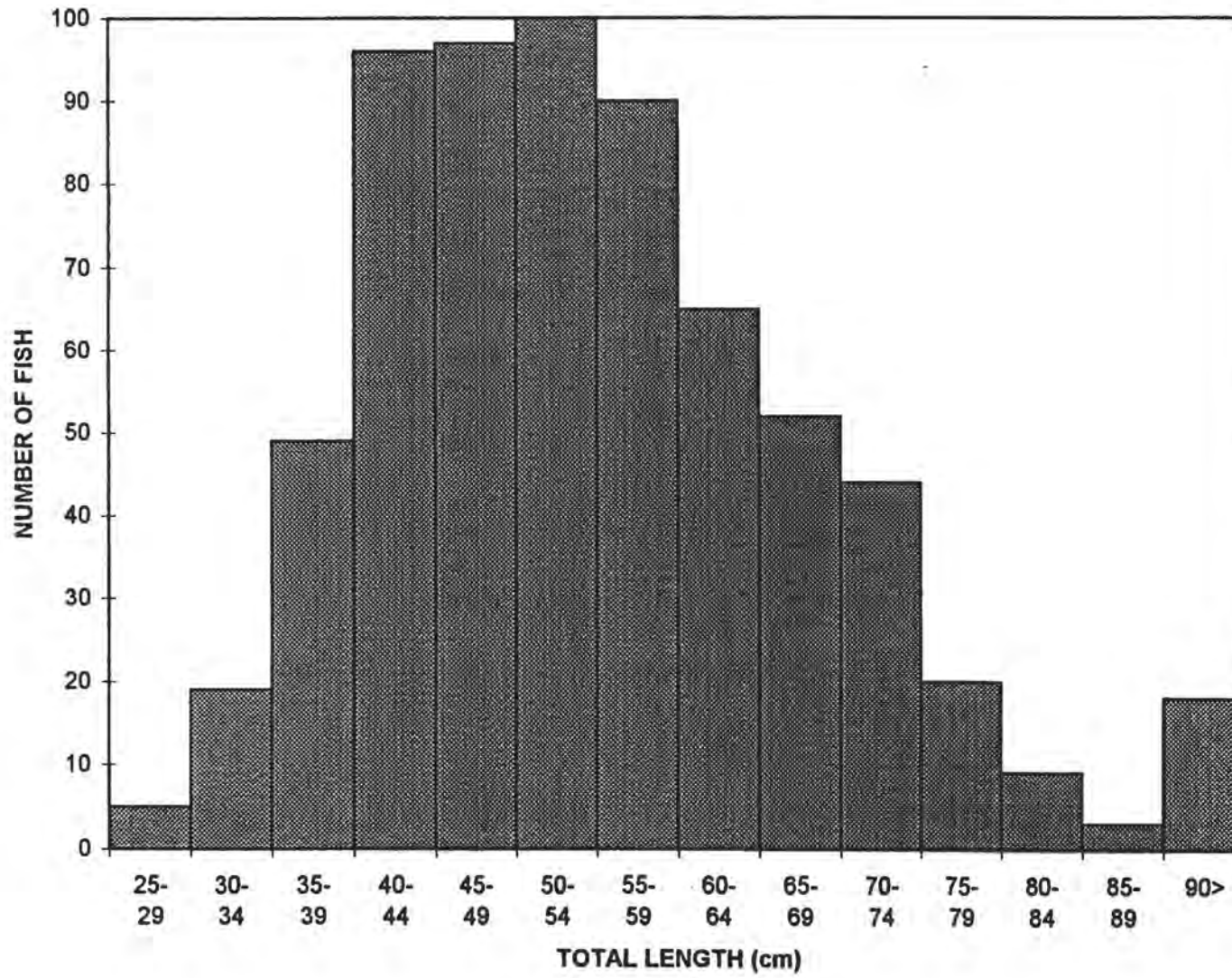




Fig. 26. Length distribution of trap-caught black sea bass in 1993.

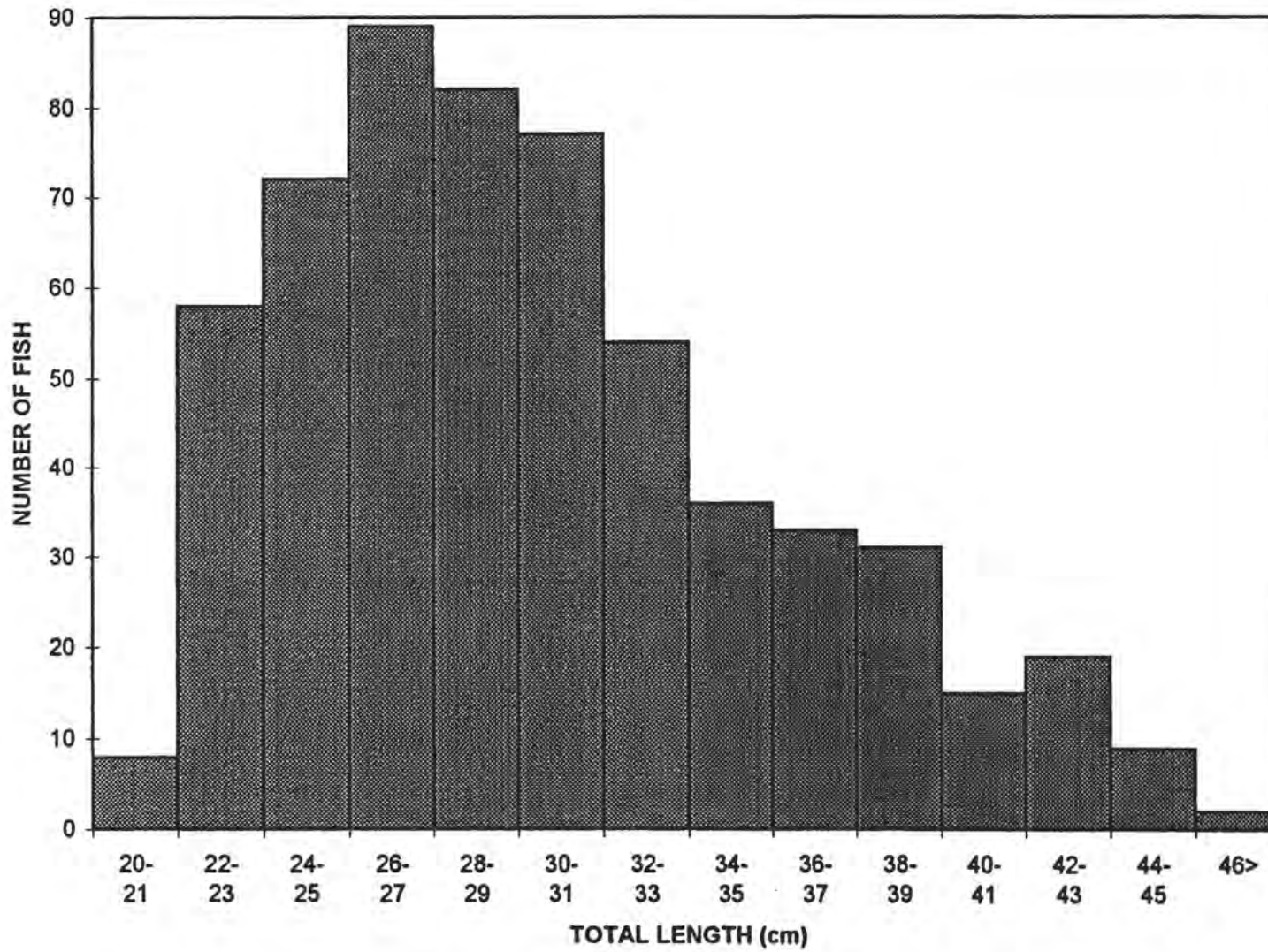


Fig. 27. Annual commercial landings of black sea bass.

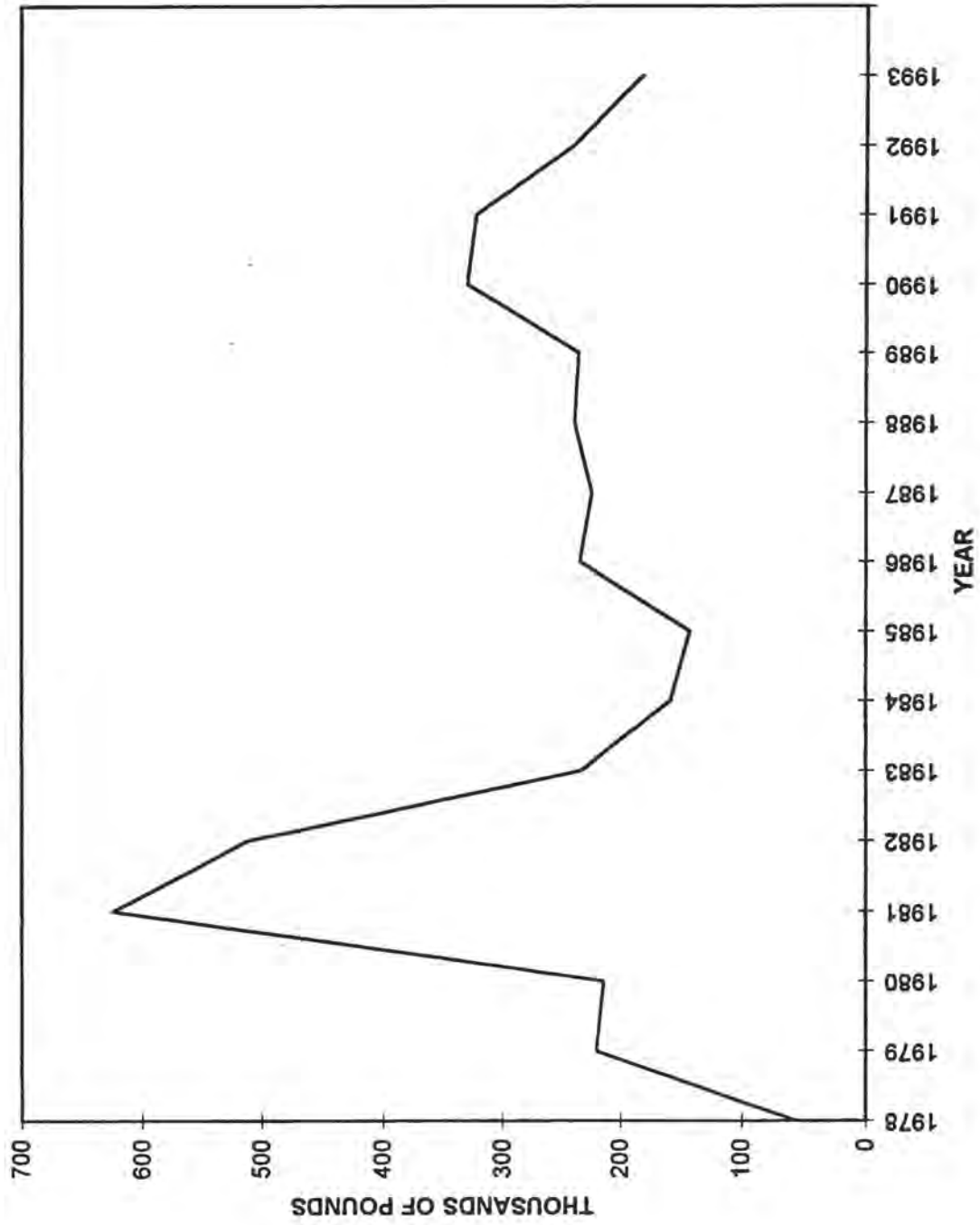
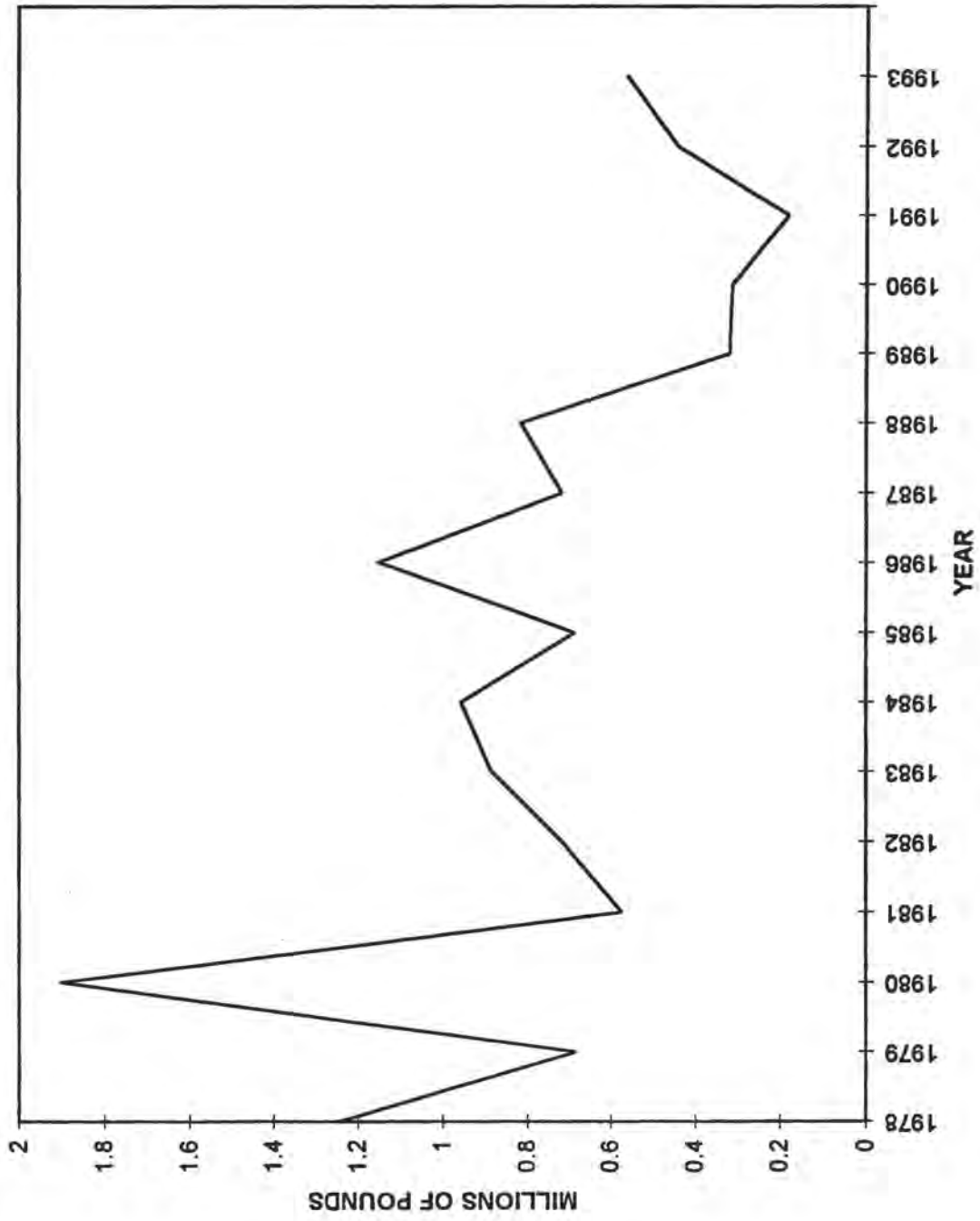


Fig. 28. Annual landings of coastal fish.



minimum size limit on flounder appeared to be the principal causative factors for reduced flounder landings.

#### RIVER FISH

Practically all of the 1993 catch consisted of American shad. Landings (113,000 pounds worth \$144,000) were the lowest since 1977 and continued the generally declining trend in recent years (Fig. 29). Overall east coast landings have exhibited a similar pattern, suggesting that unfavorable oceanographic conditions may be a contributing factor.

#### RECREATIONAL FISHERIES

There were few differences in regulations from those in 1992. Minimum size and daily bag limits for the principal species caught by South Carolina anglers were as follows:

Species	Size limit	Bag limit
Red drum	14 in. TL minimum 27 in. TL maximum	5 in state waters 0 in the EEZ
Spotted seatrout	12 in. TL minimum	15
Flounders	12 in. TL minimum	20
Black sea bass	8 in. TL minimum	none
Gag, scamp	20 in. TL minimum	5
Red snapper	20 in. TL minimum	2
Vermilion snapper	10 in. TL minimum	10
Red porgy	12 in. TL minimum	none
Amberjack	28 in. FL minimum	3
King mackerel	20 in. FL minimum	5
Spanish mackerel	12 in. FL (14 in. TL) minimum	10
Cobia	33 in. FL (37 in. TL) minimum	2

Catch and effort statistics for the headboat fishery were based on the independent NMFS survey and are discussed separately. The following sections refer to shore-based, charterboat, and private boat fishing activity. Unless otherwise specified, catch and effort figures for the charterboat fishery were those derived by the NMFS from the MRFSS.

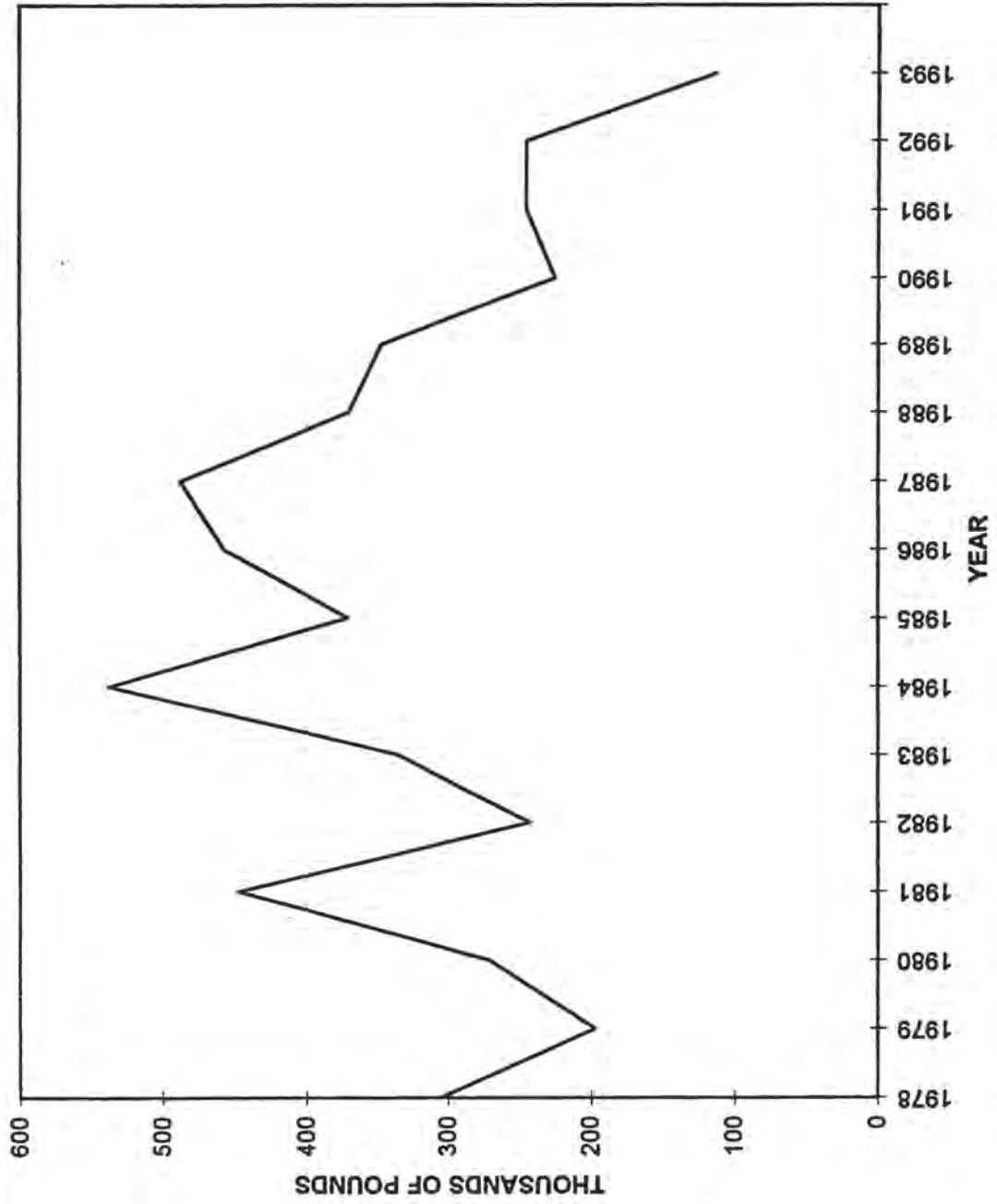
Because of the change in effort estimation procedures implemented in 1993, effort and catch data were not comparable to those from previous years. No between-years comparisons or trend analysis were performed. The 1993 figures included in this report were those obtained using the new methodology.

#### PARTICIPATION AND EFFORT

Total participation (exclusive of headboat fishermen) was estimated at 522,000 fishermen. Out of state anglers (N = 306,000) were the largest group (59%). There were 139,000 coastal resident

Chart1

Fig. 29. Annual commercial landings of shad.



anglers (27%) and 77,000 noncoastal resident fishermen (14%). Participation in the spring following the mid-March storm was unusually low. This storm did serious damage to several of the Grand Strand fishing piers, forcing one to remain closed for the rest of the year.

About 18% of the eligible coastal households contacted during the MRFSS phone survey contained at least one member who had gone salt water fishing during the year. Total effort was estimated at 1.686 M trips. Coastal residents made 890,000 trips, out of state anglers 549,000 and noncoastal residents 247,000 trips. Private boat fishermen were the most active, expending an average of 36 days of effort per angler during the year. During July-December, 73,462 anglers purchased salt water fishing stamps for private boat fishing. Shore fishermen fished about 11 days and charterboat anglers averaged 0.4 days. There were eight licensed piers, although one was closed all year. The others reported a total of 155,889 fishermen. A total of 155 charterboats held licenses for at least part of the year. Operators reported 5,020 boat trips carrying 22,936 fishermen.

#### CATCH AND CATCH RATES

MRFSS catch estimates were vulnerable to large sampling errors associated with the numbers of fishermen interviewed and catches inspected (sample size), the range in numbers of fish in individual catches (variability), and the frequency of occurrence of unusually large (or small) catches (probability). Misidentification and confusion over common names could cause substantial errors in the estimated landings of similar species. Only catches inspected by the creel clerks could be verified and, for species having large percentages of the catch either released or discarded, their estimated total landings could be quite inaccurate.

The total catch was estimated at 4.367 M fish (Table 1). Offshore pelagic species represented a little over 1% of the total numerical catch with dolphin the principal species. Offshore bottomfish comprised about 12% with black sea bass the dominant component.

The principal targets of ocean fishermen were mackerels. Coastal pelagics accounted for 7% of the total catch with bluefish and Spanish mackerel the most numerous species. The king mackerel was the most preferred species sought and the mainstay of the offshore charterboat fishery. In 1993, the average charterboat trolling catch rate was 0.95 king mackerel/boat hour, compared to 1.22 in 1992. The 1993 trolling catch rate for Spanish mackerel was 4.0 fish/boat hour vs 2.8 in 1992.

The inshore sportfish category included the state's two most popular gamefish, red drum and spotted seatrout, and represented 17% of the overall landings. The statewide private boat catch rate

Table 1. Estimated total catch (in thousands of fish) by South Carolina anglers in 1993 (excluding headboat landings). Source: NMFS.

Category	Retained or discarded dead	Released	Total
<b>Oceanic pelagics</b>			
Dolphin	29	4	33
Wahoo	4	0	4
Yellowfin tuna	12	0	12
<b>Reef fish</b>			
Black sea bass	192	188	379
Other sea basses	2	< 1	3
Groupers	6	10	16
Red snapper	0	5	5
Vermilion snapper	3	0	3
Red porgy	6	0	6
Other porgies	2	0	2
White grunt	14	0	14
Tomtate	44	< 1	45
Triggerfish	5	0	5
Spadefish	23	4	27
Spottail pinfish	< 1	5	6
Amberjacks	1	4	5
<b>Coastal pelagics</b>			
King mackerel	47	5	52
Spanish mackerel	86	15	101
Bluefish	74	53	127
Crevalle jack	0	4	4
Barracuda	1	7	8
Little tunny/bonito	4	20	24
<b>Inshore sportfish</b>			
Red drum	111	139	251
Spotted seatrout	212	88	300
Weakfish	7	0	7
Summer flounder	10	0	10
Southern flounder	82	6	88
Flounder, unclassified	5	24	29
Sheepshead	67	5	72
<b>Inshore bottomfish</b>			
Kingfishes	111	51	162
Spot	1,355	124	1,480
Croaker	30	17	47
Black drum	15	2	17
Pompano	57	7	64

Category	Retained or discarded dead	Released	Total
<b>Sharks</b>			
Unclassified	56	126	182
<b>Miscellaneous</b>			
Skates/rays	0	13	13
Catfishes	129	116	245
Toadfish	< 1	65	66
Searobins	0	12	12
Pigfish	15	0	15
Pinfish	182	156	339
Puffers	1	6	7
Other/unidentified	18	62	80



for red drum was 0.90 fish/angler trip in 1993 compared to 1.15 in 1992. For spotted seatrout, the respective CPUEs were 1.92 and 2.03.

Inshore bottomfish comprised the largest group, accounting for about 41% of the total catch. Spot, the dominant species, represented roughly one-third of the total 1993 recreational catch.

Sharks accounted for 4% of the overall landings. Because of identification problems, the species composition was not documented. Small coastal species such as the Atlantic sharpnose and bonnethead probably comprised most of the catch.

#### HEADBOAT FISHERY

In 1993, 21 headboats, as defined by the NMFS, operated from South Carolina ports (four from Little River, three from N. Myrtle Beach, five out of Murrells Inlet, three from Mt. Pleasant, two in Charleston, three on Hilton Head Island, and one operated by the Charleston Navy Base recreational services). These boats reported 414 trips during January-May, 1,093 during the peak season of June-August, and 364 during September-December (total = 1,871).

Fishermen expended 64,457 angler days of effort. An angler day represented the participation of one rod and reel angler for one full day (usually 10-12 hours, including travel to and from the fishing grounds).

The inshore fishery consisted of half-day and three-quarter day trips (usually to areas west of the Gulf Stream), while the offshore ("Gulf Stream") fishery consisted of all-day trips. Inshore trips usually targeted black sea bass, while offshore effort was directed at snappers and groupers.

Effort in the inshore fishery continued the overall declining trend of the last 15 years and was the second lowest to date (Fig. 30). In contrast, offshore effort followed a generally increasing trend. The distribution of inshore vs offshore effort in 1982 and 1989 was unavailable, accounting for the breaks in the trend lines in the figures.

Landings statistics refer to retained catches. The estimated total catch was 584,870 fish weighing 678,247 pounds, distributed by species group, fishing area, and season as shown in Table 2. "E" groupers were *Epinephelus* spp., including speckled hind, snowy grouper, red grouper, rock hind, and red hind. "M" groupers (*Mycteroperca* spp.) were mainly gag and scamp.

The inshore catch weight was the lowest to date (Fig. 31). This largely reflected the continued decline in black sea bass landings (Fig. 32). In numbers of fish, black sea bass represented 57% of the inshore catch. Miscellaneous grunts (primarily tomtates) were the other major component (23%).

**Table 2. Estimated catches (numbers of fish) and effort (angler days) by South Carolina headboat fishermen in 1993.**

Category	JAN-MAY		JUN-AUG		SEP-DEC	
	Ins.	Off.	Ins.	Off.	Ins.	Off.
Red porgy	50	16,185	222	13,485	167	4,608
Other porgies	1,595	4,026	7,226	9,904	2,529	3,583
White grunt	1,318	6,379	2,209	17,064	1,941	3,740
Other grunts	2,063	21,692	24,279	34,193	7,866	9,740
Verm. snapper	625	51,488	1,762	79,233	1,484	37,404
Red snapper	89	1,563	104	995	11	861
Other snapper	0	0	1	65	0	54
Groupers E	14	563	151	1,416	186	677
Groupers M	237	2,182	558	3,537	267	1,781
Triggerfish	137	6,453	867	12,375	610	5,081
Black s. bass	19,079	20,178	47,984	34,581	19,107	11,276
King mackerel	59	268	118	476	89	190
Sharks	273	587	990	136	97	332
Other	536	7,650	2,576	5,141	1,391	2,844
Total	26,075	139,231	89,047	212,601	35,745	82,171
Angler days	5,800	7,384	24,825	15,429	5,610	5,409

**Table 3. Total landings (in numbers of fish) by the South Carolina headboat fishery.**

Category	1989	1990	1991	1992	1993
Red porgy	78,151	49,214	54,223	33,805	34,717
Other porgies	23,478	8,385	21,274	22,660	28,863
White grunt	13,258	14,735	23,247	31,236	32,651
Other grunts	86,434	52,702	80,719	128,293	99,833
Verm. snapper	140,114	167,102	174,055	147,838	171,996
Red snapper	6,207	3,650	3,290	1,275	3,623
Other snapper	116	109	959	644	137
Groupers E	1,733	1,369	1,263	1,225	3,007
Groupers M	8,299	10,955	8,351	12,130	8,562
Triggerfish	3,284	3,838	10,019	19,775	25,523
Black sea bass	515,606	339,767	341,928	273,135	152,205
King mackerel	501	515	2,440	1,854	1,200
Sharks	1,018	709	1,162	3,019	2,415
Others	19,121	12,725	22,151	15,153	20,138
Total	877,571	665,855	745,160	692,108	584,870

Fig. 30. Estimated effort in the South Carolina headboat fishery.

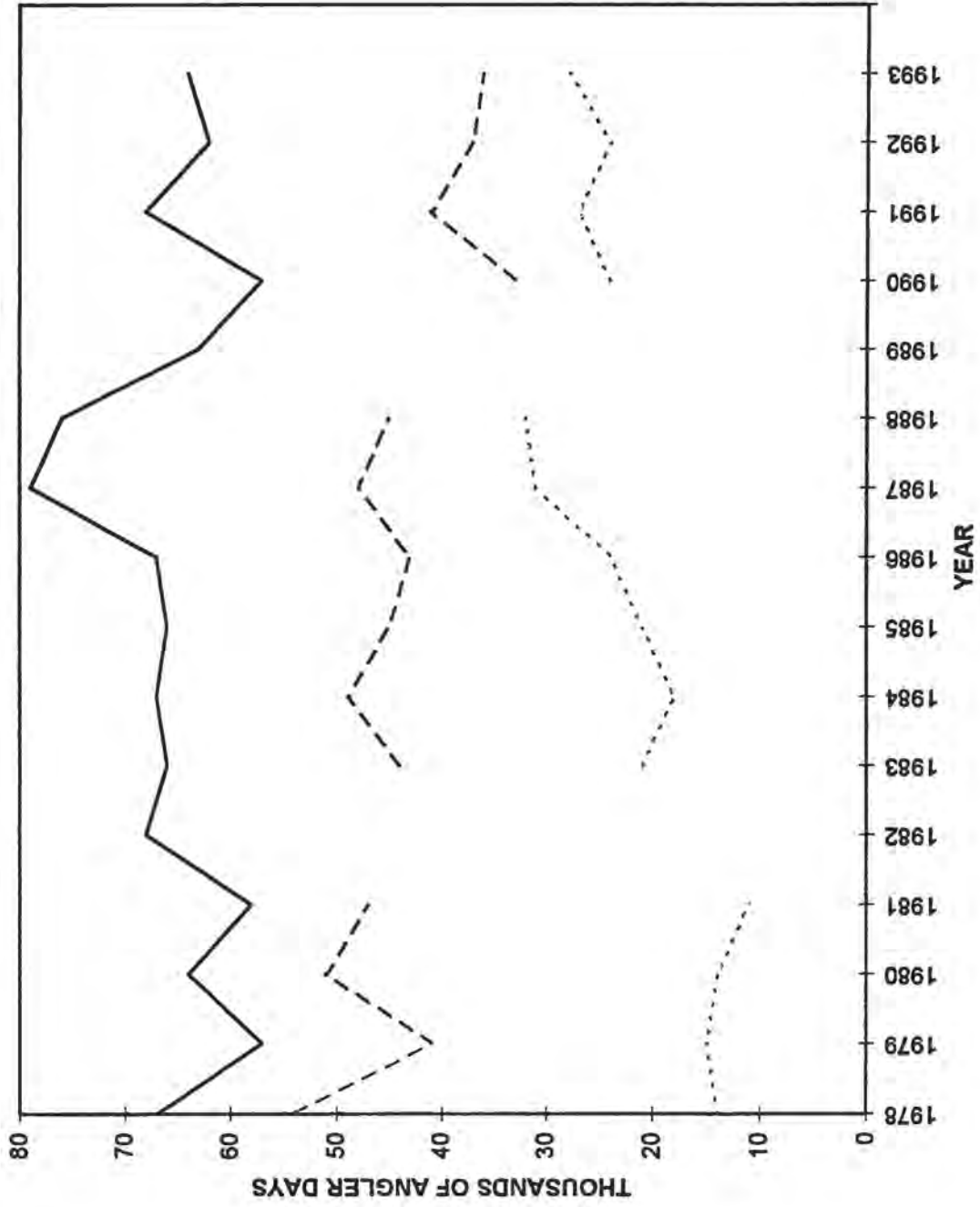


Fig. 31. Estimated catch of the South Carolina headboat fishery.

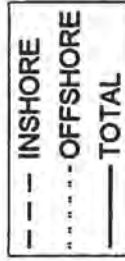
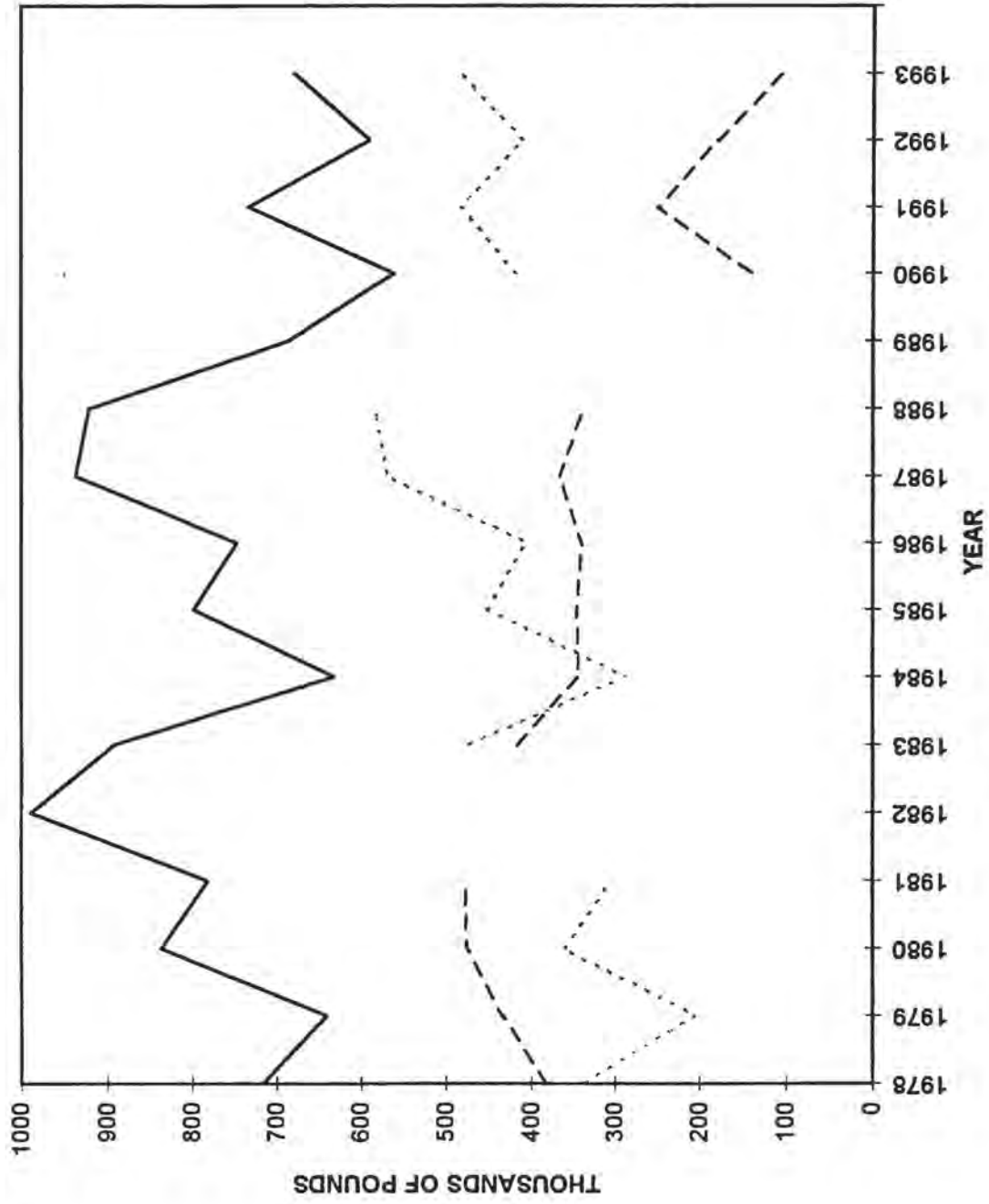
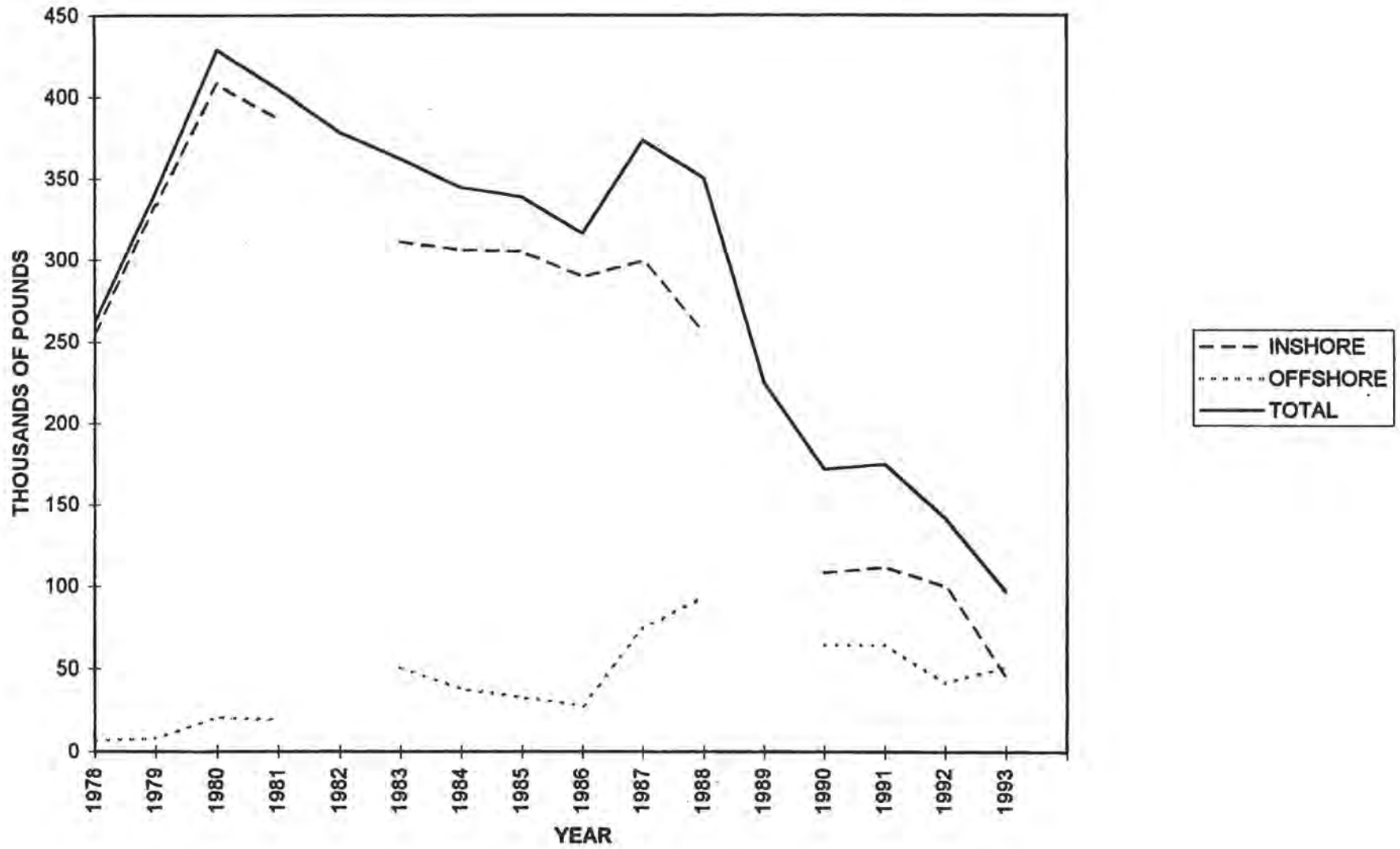


Fig. 32. Landings of black sea bass by the South Carolina headboat fishery.



The offshore catch was relatively high by historical standards in both numbers of fish and aggregate weight. The principal species in numbers of fish were vermilion snapper (39%), grunts (21%), and black sea bass (15%). In landed weight, the main contributors were vermilion snapper (24%), triggerfish (12%), and grunts (10%).

In numbers of fish, the overall headboat catch was the lowest in recent years. The most important component was vermilion snapper (29% by number and 20% by weight). The relative weight contribution of this species was the largest to date and continued the generally increasing catch trend of the last 15 years (Fig. 33). Its' contribution would have been even greater except for the 10-fish bag limit.

The second most important species was black sea bass (26% by number and 14% by weight), although its relative contribution and total number of fish landed were the lowest to date. Landings of triggerfish and white grunts have increased greatly in recent years (Table 3) with triggerfish being the third largest volume component (11%) in 1993.

Landings of several other significant components have fluctuated in recent years with no obvious directional trends, in part due to the influence of regulations. Numbers of gag, scamp and red snapper retained have been significantly reduced by size limits. Most of the *Epinephelus* ("E") groupers are species not covered by minimum size regulations, e.g. snowies and hinds.

Other than black sea bass, the species showing the greatest decline has been the red pogy. In the late 1970's, it respresented at least 30% of the annual landed volume, compared to 7% in 1993. Although the number of fish landed showed a slight improvement over the 1992 catch, it was the second lowest to date (Fig. 34).

Overall average catch rates are shown in Fig. 35 and species-specific CPUEs are listed in Table 4. The offshore catch rate improved moderately after seven years of comparative stability, while the inshore catch rate continued a long-term decline and was the lowest to date. This largely reflected the CPUE for the principal inshore species, black sea bass, which also was the lowest on record. The CPUE for red pogy, caught primarily by offshore fishermen, also was the lowest to date.

Average sizes also are listed in Table 4. All major species posted increases in 1993, presumably attributable to size limits.

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Chart1

Fig. 33. Landings of vermillion snapper by the South Carolina headboat fishery.

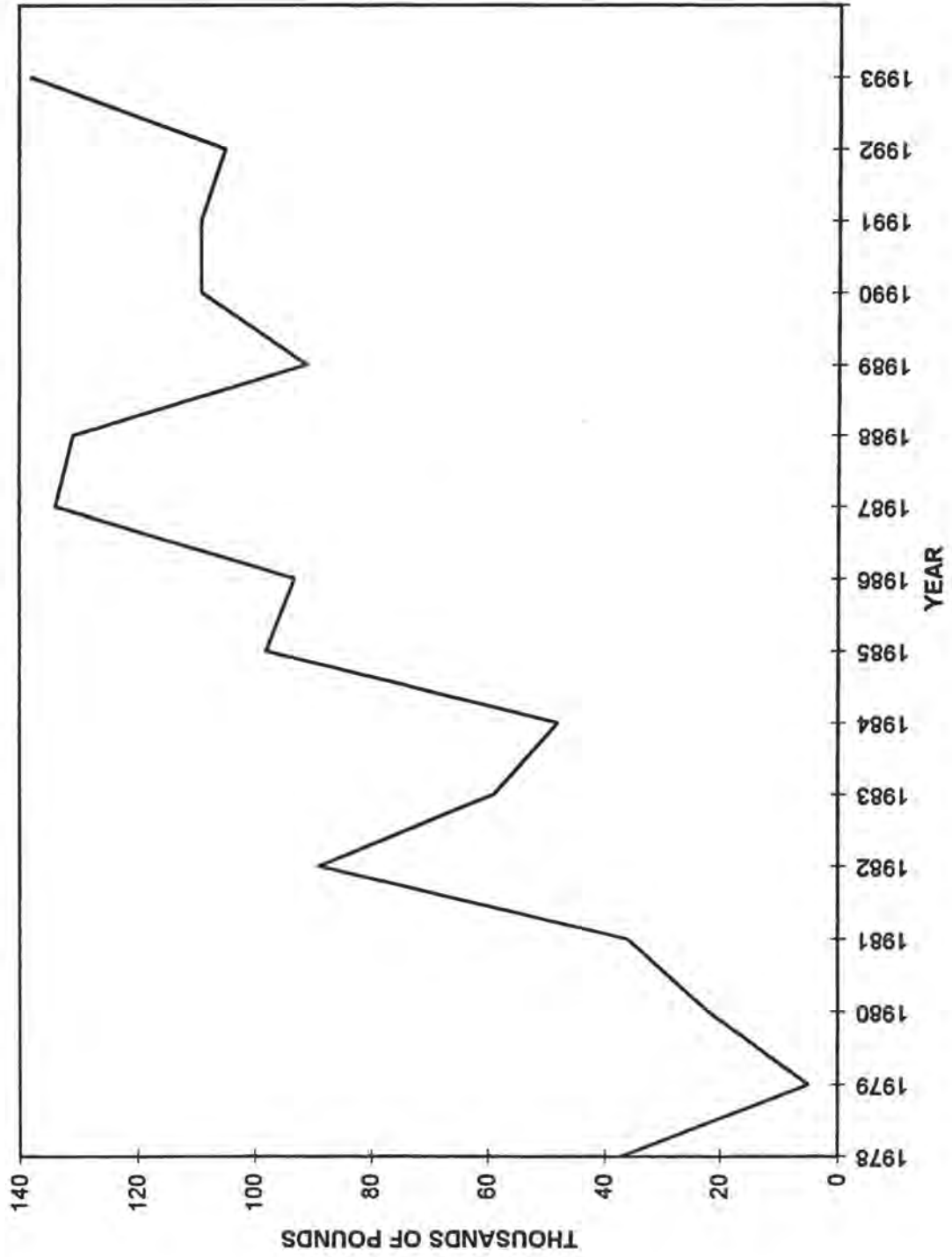


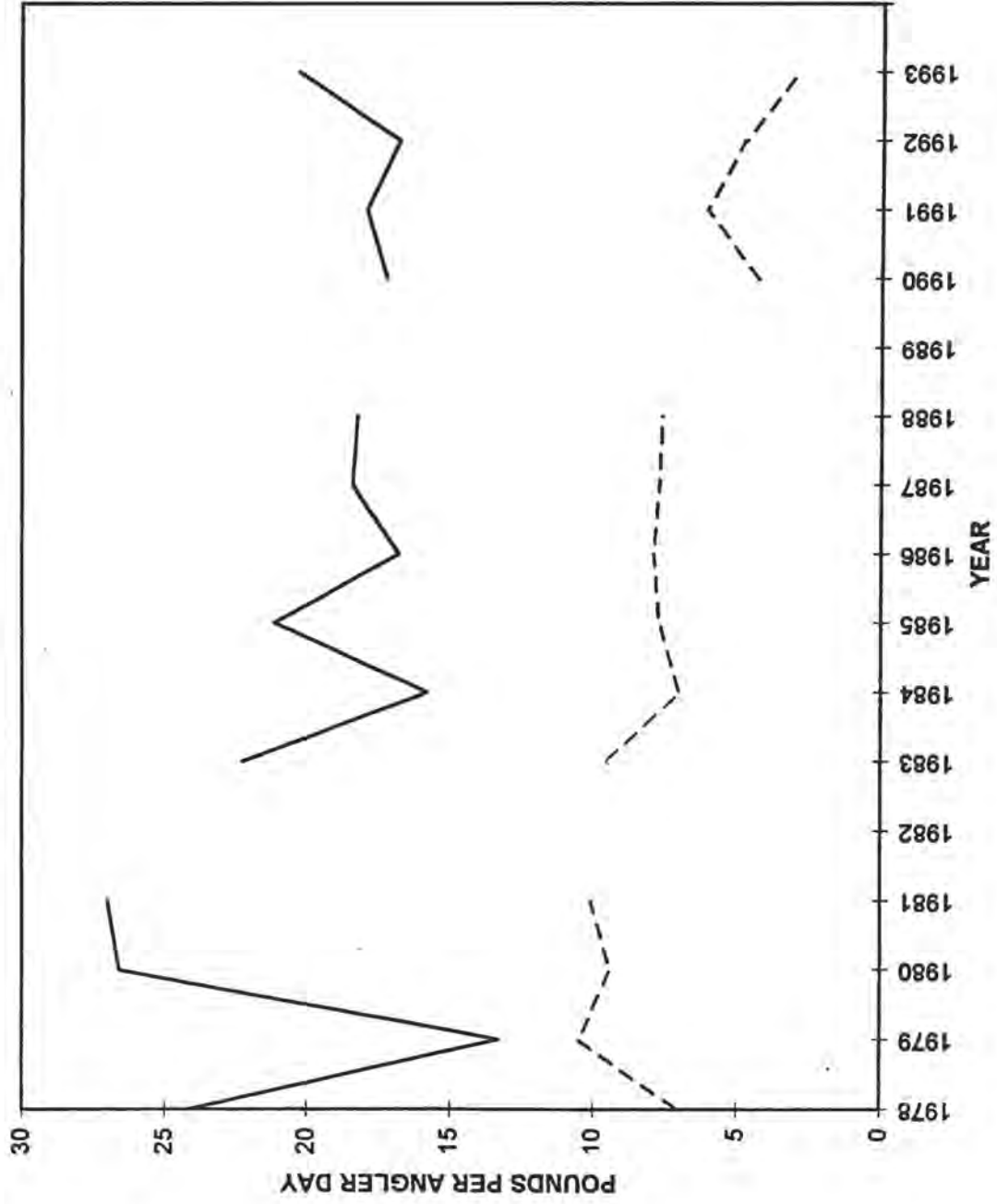
Chart1

Fig. 34. Landings of red porgy by the South Carolina headboat fishery.





Fig. 35. Average catch rates in the South Carolina headboat fishery.



**Table 4. Average sizes and catch per trip for major species in the South Carolina headboat catch.**

<b>Year</b>	<b>Red porgy</b>	<b>Vermilion snapper</b>	<b>Red snapper</b>	<b>"M" groupers</b>	<b>Black sea bass</b>
<b>Average weight in pounds</b>					
1978	2.42	1.34	7.17	11.74	NA
1979	2.18	0.93	13.63	10.71	NA
1980	2.04	1.08	4.02	10.38	NA
1981	2.02	1.37	6.38	7.16	NA
1982	1.38	0.85	9.00	5.91	NA
1983	1.54	0.80	5.51	7.46	NA
1984	1.54	0.79	3.73	8.31	NA
1985	1.56	0.92	5.38	8.05	NA
1986	1.41	0.82	5.11	6.52	NA
1987	1.34	0.76	3.26	5.25	NA
1988	1.27	0.77	2.91	5.79	NA
1989	1.12	0.65	4.25	6.19	0.44
1990	1.27	0.65	3.65	6.76	0.51
1991	1.07	0.63	6.61	7.80	0.51
1992	1.15	0.71	4.64	5.77	0.52
1993	1.28	0.80	5.47	6.22	0.64
<b>Average fish per angler day</b>					
1978	5.88	1.56	0.05	0.08	4.76
1979	3.02	0.32	0.03	0.11	8.05
1980	4.75	1.30	0.14	0.21	8.05
1981	6.04	1.93	0.08	0.19	8.21
1982	NA	NA	NA	NA	NA
1983	3.59	2.95	0.07	0.29	7.00
1984	2.82	3.12	0.10	0.17	6.23
1985	3.63	4.76	0.10	0.26	6.84
1986	3.11	4.52	0.03	0.21	6.71
1987	3.00	5.43	0.06	0.27	6.27
1988	3.43	4.96	0.15	0.23	5.76
1989	NA	NA	NA	NA	NA
1990	1.96	6.67	0.13	0.40	3.29
1991	1.86	6.14	0.11	0.26	2.72
1992	1.36	5.83	0.04	0.46	2.67
1993	1.21	5.96	0.12	0.27	1.28