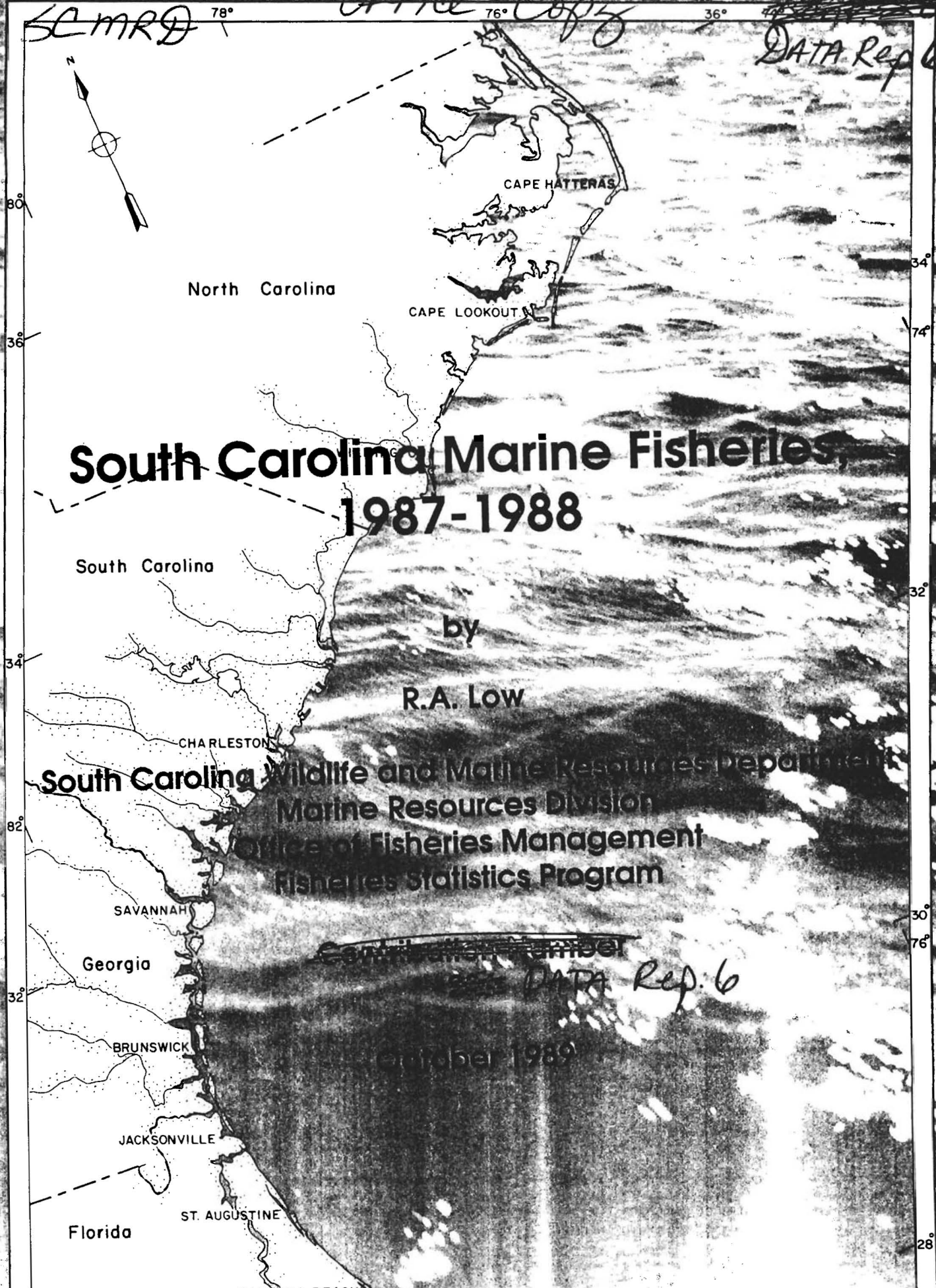


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South Carolina Marine Fisheries 1987-1988

by

R.A. Low

South Carolina Wildlife and Marine Resources Department
 Marine Resources Division
 Office of Fisheries Management
 Fisheries Statistics Program

Statistical Summary

DATA Rep. 6

October 1989

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SOUTH CAROLINA MARINE FISHERIES, 1987-1988

R.A. Low

South Carolina Wildlife and Marine Resources Department

Marine Resources Division

Office of Fisheries Management

Fisheries Statistics Program



October, 1989

TABLE OF CONTENTS

	Page
LIST OF FIGURES.....	ii
LIST OF TABLES.....	iii
ACKNOWLEDGMENTS.....	iv
INTRODUCTION.....	1
COMMERCIAL FISHERIES.....	1
Shrimp.....	2
Crab.....	8
Shellfish.....	11
Offshore Fish.....	17
Swordfish.....	17
Reef Fish.....	17
Tilefishes.....	17
Pelagics.....	17
Sharks.....	24
Wreckfish.....	24
Handline Fishery.....	24
Trawl Fishery.....	24
Trap Fishery.....	32
Bottom Longline Fishery.....	32
Surface Longline Fishery.....	32
Coastal Fish.....	32
River Fish.....	32
RECREATIONAL FISHERIES.....	36
Headboat Fishery.....	42
Gill Net Fishery.....	42
Shellfish Gathering.....	42
Shrimp Baiting Fishery.....	48
Tail Race Shad Fishery.....	48
Artificial Reef Program.....	48
Tournaments.....	49
SUGGESTED REFERENCES.....	49

LIST OF FIGURES

	Page
1. Total landed weight of commercial marine fisheries products.....	3
2. Total ex-vessel value of commercial landings.....	4
3. Percentage weight composition of commercial landings.....	5
4. Percentage ex-vessel value composition of commercial landings.....	6
5. Annual commercial landings of heads-on shrimp.....	7
6. Percentage of brown shrimp in total penaeid shrimp commercial landings.....	7
7. CPI-adjusted ex-vessel value of commercial shrimp landings.....	9
8. Number of trawler licenses sold and average pounds of shrimp landed per license.....	9
9. Number of crab pot licenses sold and commercial landings of blue crab.....	10
10. Ex-vessel value of commercial blue crab landings.....	12
11. Ex-vessel value of commercial shellfish landings.....	13
12. Landed weight of commercially harvested oyster meats.....	13
13. Landed weight of commercially harvested clam meats.....	14
14. Ex-vessel value of commercially harvested clams and oysters, in contemporary dollars.....	15
15. Landed weight of whelks and number of permits issued.....	16
16. Landed weight of commercially produced offshore fish.....	18
17. Percent contribution by gear to landed weight of commercially produced offshore fish.....	19
18. Landed weight of offshore fish by gear type, 1987-1988.....	20
19. Landed weight of offshore fish by species group.....	21
20. Landed weight of commercially produced swordfish.....	22
21. Landed weight of commercially produced groupers.....	23
22. Species composition of commercial handline landings.....	23
23. Landed weight of commercially produced snapper.....	25
24. Landed weight of commercially produced porgies.....	25
25. Landed weight of commercially produced sea bass and percentage of smalls in trap landings...	26
26. Landed weight of commercially produced tilefishes.....	27
27. Landed weight of commercially produced king mackerel.....	28
28. Landed weight of commercially produced offshore pelagic fishes (excluding mackerels and swordfish).....	28
29. Percent contribution of various gears to commercial shark landings.....	29
30. Landed weight of commercially produced sharks.....	29
31. Source of commercially produced shark catches.....	30
32. Landings of reef fish (excluding wreckfish) by commercial gear type.....	31

	Page
33. Landed weight of commercially produced coastal fish.....	33
34. Landed weight of commercially produced spot and mullet.....	34
35. Landed weight of commercially produced kingfishes (whitings) and flounder.....	35
36. Landed weight of commercially produced shad.....	37
37. Estimated number of anglers in the South Carolina marine recreational hook-and-line fishery.....	38
38. Estimated number of trips in the South Carolina marine recreational hook-and-line fishery (excluding headboats).....	39
39. Estimated annual headboat catch and effort.....	43
40. Landed weight of principal species in the South Carolina headboat catch.....	44
41. Catch rates of inshore and offshore headboat anglers.....	45
42. Average catch composition of offshore headboat landings.....	46
43. Number of gill net licenses sold per fiscal year.....	47

LIST OF TABLES

1. Estimated catch of South Carolina marine recreational anglers (excluding headboat fishermen), in thousands of fish.....	40
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Andy Applegate of the Fisheries Statistics Program provided most of the data used to prepare the figures on commercial landings. Regional Biologist Dean Cain supplied facts pertaining to the Grand Strand area gill net and haul seine fisheries. Other data on the gill net fishery were from a survey conducted by Glenn Ulrich of the Finfish Management Program. Billy McCord, also of the Finfish Management Program, provided information on the commercial shad fishery. Data for the headboat account were obtained from program leader Gene Huntsman of the Beaufort, North Carolina laboratory of the National Marine Fisheries Service. Wayne Waltz contributed significantly to the description of recreational fisheries. Mel Bell provided the artificial reef account and Don Hammond furnished information on recreational tournaments. Waltz is with the Office of Fisheries Management and Bell and Hammond are in the Finfish Management Program.

This report is an information summary of significant events in South Carolina's marine fisheries during 1987 and 1988. It follows the editorial guidelines and format used in Technical Report 67, which described the fisheries during 1977-1986. Readers desiring information on general characteristics of South Carolina's fisheries and their development during this period should refer to this source.

Data on commercial fisheries catch and effort were obtained through 1) mandatory monthly reports by licensed dealers, 2) mandatory shellfish harvest reports, 3) voluntarily submitted shrimp trip tickets from dock operators, and 4) voluntarily submitted fish trip tickets from wholesalers or individual fishermen. Annual fishing effort (e.g. the number of trips or landings) by gear was estimated by dividing total landings from monthly dealer summaries by average catch per unit of effort (CPUE) from the trip tickets. The percentage of total landings covered by trip tickets varied considerably by gear type.

Commercial landings data were subject to confidentiality requirements, depending on the number of reporting sources. In some fisheries, the number of reporting participants in 1987 and/or 1988 was too small to reveal gear or species-specific data without violating confidentiality. These figures were included, however, in the total landings for the appropriate general categories.

The major source of recreational fishery catch and effort data was the Marine Recreational Fishery Statistics Survey (MRFSS), conducted annually under National Marine Fisheries Service (NMFS) administration since 1979. This is a generalized survey of rod-and-reel fishing from shore, charterboats, and private boats. A creel census provided catch data, while a telephone survey of randomly selected coastal households collected information on participation and effort. In July, 1987, MRD took over the creel census under a cooperative agreement, while the telephone survey was conducted by a NMFS subcontractor. Results from the two activities were combined to produce estimates of catch by species or species group according to fishing mode (shore-based, charterboat, or private boat), season, and area (inland, 0-3 miles offshore, and 3-200 miles offshore). Technical Report 68 describes the 1987 survey methodology.

Data on the headboat fishery were obtained from the NMFS Beaufort (N.C.) Laboratory, which has conducted an annual survey since 1972.

MRD has conducted short-term surveys directed at specific fisheries not included in the MRFSS or those which employ gears other than rod-and-reel. These included surveys of recreational shellfish harvest on public grounds, licensed gill netters, and the cast net fishery over bait for white shrimp. Information on these activities was

obtained from these MRD studies.

During 1987 and 1988, no major fisheries resource in state waters showed clear indications of significant decline, although the sturgeon fishery remained closed due to depressed stock status. The recovery of the oyster fishery from previous Dermo outbreaks was hampered by adverse natural conditions and some beds remained in poor condition. The whelk (conch) population in coastal ocean waters appeared to be depressed. At least two formerly important offshore stocks, swordfish and tilefish (golden), appeared to be seriously depleted and there was concern regarding the status of several reef fish species. Rapid recovery of the fisheries for sturgeon, swordfish, and tilefish is not anticipated in the near future.

As predicted in the initial report on the 1977-1986 fisheries, competition between commercial and recreational users continued to increase, with additional controls being imposed on both sectors. The use of gill nets was greatly restricted. Shrimp trawlers were required to use turtle excluders (TEDS) during part of the season. Finfish species such as red drum, spotted seatrout, and billfishes were reserved exclusively for recreational harvest through prohibition of their possession and/or sale by commercial fishermen. Recreational shrimp cast netters using bait were subject to licensing, gear restrictions, and tighter limits. In the king and Spanish mackerel fisheries, recreational and/or commercial users were subjected to closures of their fisheries as quotas were met.

COMMERCIAL FISHERIES

As in much of the Southeast, the burden of increased restrictions has tended to bear most heavily on the commercial sector. Many recreational fishermen and conservationists favor even greater limitations on commercial harvests and fishing methods. Although both the numbers of recreational users and their aggregate economic contribution clearly exceed those of the commercial sector, South Carolina's commercial fishing industry is important to coastal communities with a long tradition of participation. In 1988, an estimated 4,500 people were actively involved in commercial fishing, including 2,500 shrimpers, 250 crabbers, about 250 shellfishermen, and over 100 offshore finfish harvesters. In addition to these producers, there were about 300 wholesale dealers and at least 1,100 dockside workers who handled their product.¹ Because of multipliers, the overall economic contribution of the seafood industry to the state's economy was at least twice the ex-vessel value of the landings. It should be noted, though, that South Carolina continued to receive relatively little benefit in the form of value added to its raw production due to lack of in-state processing operations.

As elsewhere along the Eastern Seaboard,

¹ B. Thompson. The News & Courier/Evening Post, December 6, 1988, Business Review, p. 1.

pollution was much publicized in relation to seafood production during 1987 and 1988. Red tides caused the closure of shellfish grounds in the northern part of the state and may have caused toxicity in some fish that was linked to dolphin (porpoise) deaths. Man-made pollution from urban run-off, industrial discharge, and sewage also received considerable media coverage, much of which was devoted to possible pollution problems in the Sampit River, Charleston Harbor, and Savannah River. The most significant threat of pollution is to estuarine-dependent resources, e.g. shellfish, shrimp, crab, and many inshore fish. In 1988, about 79% of the state's total commercial production was contributed by estuarine-dependent resources. These landings represented 77% of the overall value of South Carolina's seafood landings. Virtually 100% of the value contribution from shrimp, crab, and shellfish was taken directly from estuarine and adjacent coastal waters.

Overall commercial volume harvested from wild stocks in 1987 and 1988 was below the ten-year average (Fig. 1), although substantially higher than in 1985. The 1988 harvest was 6.5% below average. Mariculture production was not included in any of the commercial landings discussed below. In terms of value as measured in contemporary dollars, the 1988 landings (Fig. 2) were slightly above average. In adjusted dollars, however, 1988 value was 10% below the ten-year average. Adjusted values of crab, coastal fish, and offshore fish were above average, while those of shrimp, river fish, and shellfish were below average. Ranking of the relative contribution of most product categories (Fig. 3, 4) remained unchanged from that in recent years. The most significant shift was for shellfish, which dropped below crab in relative contribution to land value and continued to decline in importance as a volume contributor. Conversely, both volume production and value contribution of crab increased substantially. The contribution of offshore fish also regained its early 1980's level of relative importance.

Shrimp

Total shrimp landings in 1986 were the highest in recent years. In 1987, the best white shrimp harvest since 1980 did not offset a sharp decline in brown shrimp landings (Fig. 5) and the overall wild shrimp catch was slightly less than that reported in 1986. During 1988, brown shrimp landings recovered somewhat (but were less than the ten-year average), while the white shrimp harvest dropped about 300,000 pounds below the ten-year average. Consequently, the total 1988 catch of penaeid shrimp was about 14% less than the 1978-1987 average. Landings of other species (pink and rock shrimp) were insignificant in both years. There has been no appreciable catch of rock shrimp since 1984.

Brown shrimp spawn and their larvae overwinter in nearshore ocean waters. The postlarvae move into the estuaries in March. Postlarval abundance has been monitored by MRD, but has not shown a strong correlation with subsequent landings. Spring estuarine water temperature and spring-early summer rainfall appear to be the major factors affecting brown shrimp landings. In 1987, springtime environmental conditions were marginal for recruitment and the low landings appeared to

reflect this. In 1988, postlarval catch rates were lower than those in 1987 and cool spring water temperature was reflected in a relatively slow growth rate. Outmigration typically occurs during June through mid-August. Management of brown shrimp has been based primarily on size composition.

Historically, brown shrimp have accounted for approximately 30% of the state's annual shrimp harvest. During the mid-1980's, their contribution to overall landings was much greater (Fig. 6), reflecting moderately high levels of abundance and depressed white shrimp catches. During 1987-1988, the relative contribution of brown shrimp was more typical. During the last 12 years, there has been a weak inverse relationship between brown and white shrimp landings.

White shrimp spawn in coastal ocean waters during late April through mid-June. A portion of the spawning (roe) population consists of shrimp that overwintered in local estuarine and coastal waters. Following unusually cold winters, the percentage of local shrimp in the spawning stock is small and the entire spawning population is usually reduced. A conservative management approach designed to maximize the spawning potential of the roe stock has been employed, which has frequently delayed openings in recent years because of relatively low (and/or late spawning) populations. The winter of 1986-1987 was mild, with no significant mortality of overwintering white shrimp, and the 1987 season opened on 4 June. A large portion of the local 1988 overwintering stock was lost during a brief cold spell and the season opening was delayed until 28 June, in part to compensate for this.

The policy of affording maximum protection to reduced populations of spawning roe shrimp has generally been well accepted by shrimpers. This is partly a reflection of economic reality, since catches during periods of low abundance seldom justify the cost of obtaining them. The policy is most controversial during years when roe shrimp are fairly abundant. Then there is pressure from the shrimpers to open the season early in order to permit a significant harvest of these large, high-valued shrimp. The argument in favor of this is that the roe shrimp will quickly migrate south out of state waters and therefore be lost to the local fishery. MRD tagging has shown that roe shrimp, upon entering the ocean, have shown little longshore movement. A delay in opening therefore should result in minimal loss to the fishery through migration. The MRD strategy to delay opening until the majority of the roe shrimp has spawned is also based on the assumption that the shrimpers can quickly harvest a substantial portion of the population. High tag return rates immediately after opening days have suggested that the fishermen can quickly deplete the stock.

In addition to protecting spawning stocks, the other cornerstone of MRD's management of the white shrimp fishery has been the maximization of the gross economic yield from total landings. The objective has been to harvest shrimp at the largest size practical given conditions of growth and mortality. Under most circumstances, this has been achieved by delaying the harvest and restricting

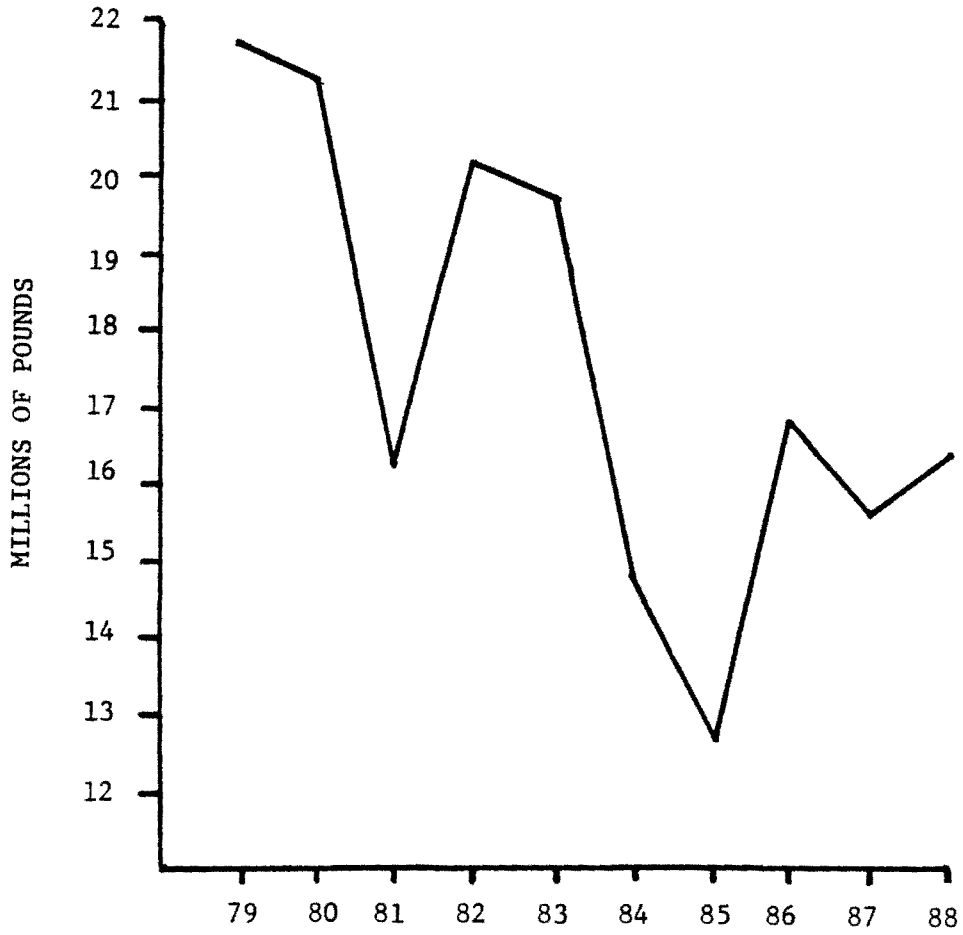


Fig. 1. Total landed weight of commercial marine fisheries products.

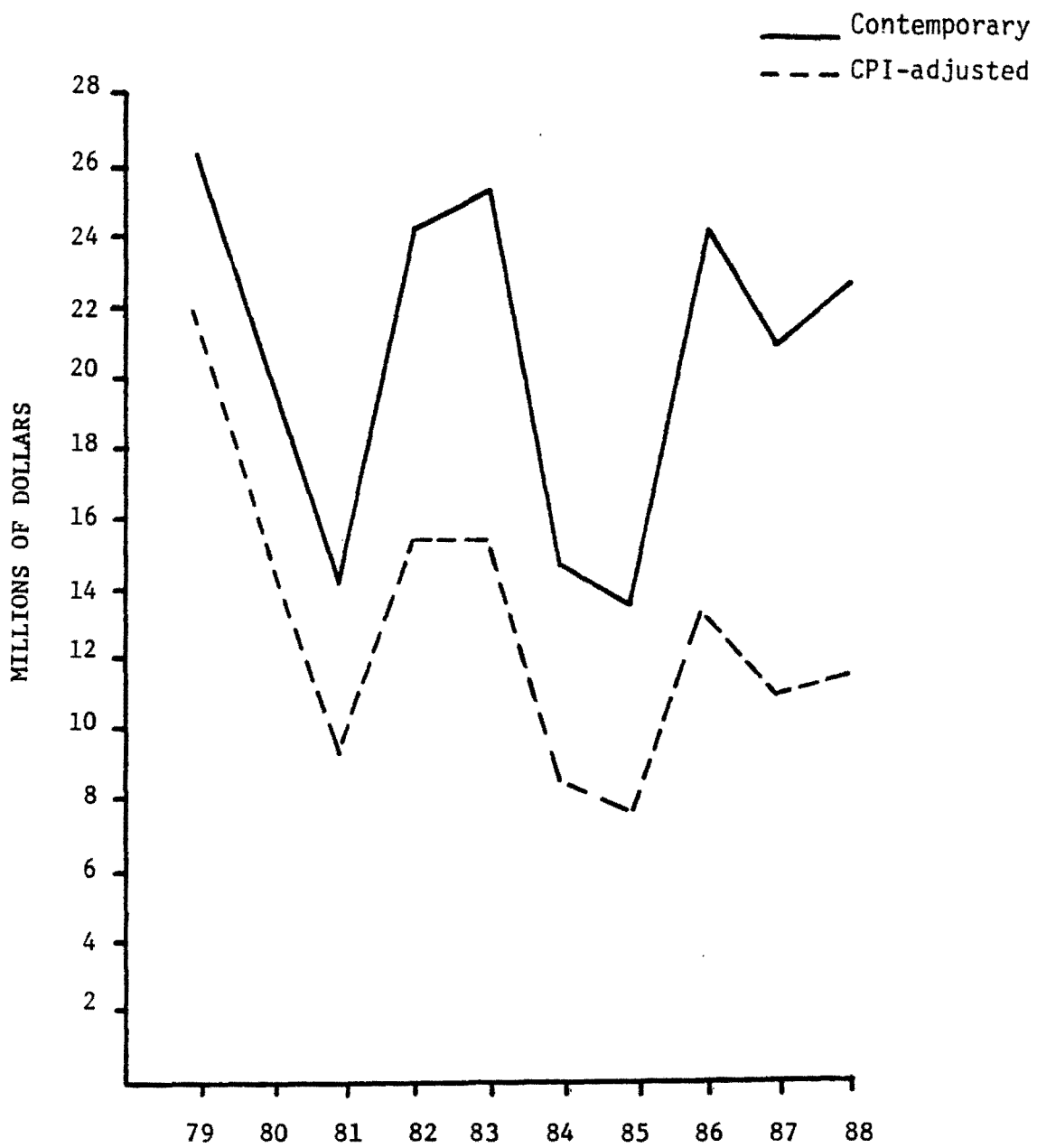


Fig. 2. Total ex-vessel value of commercial landings.

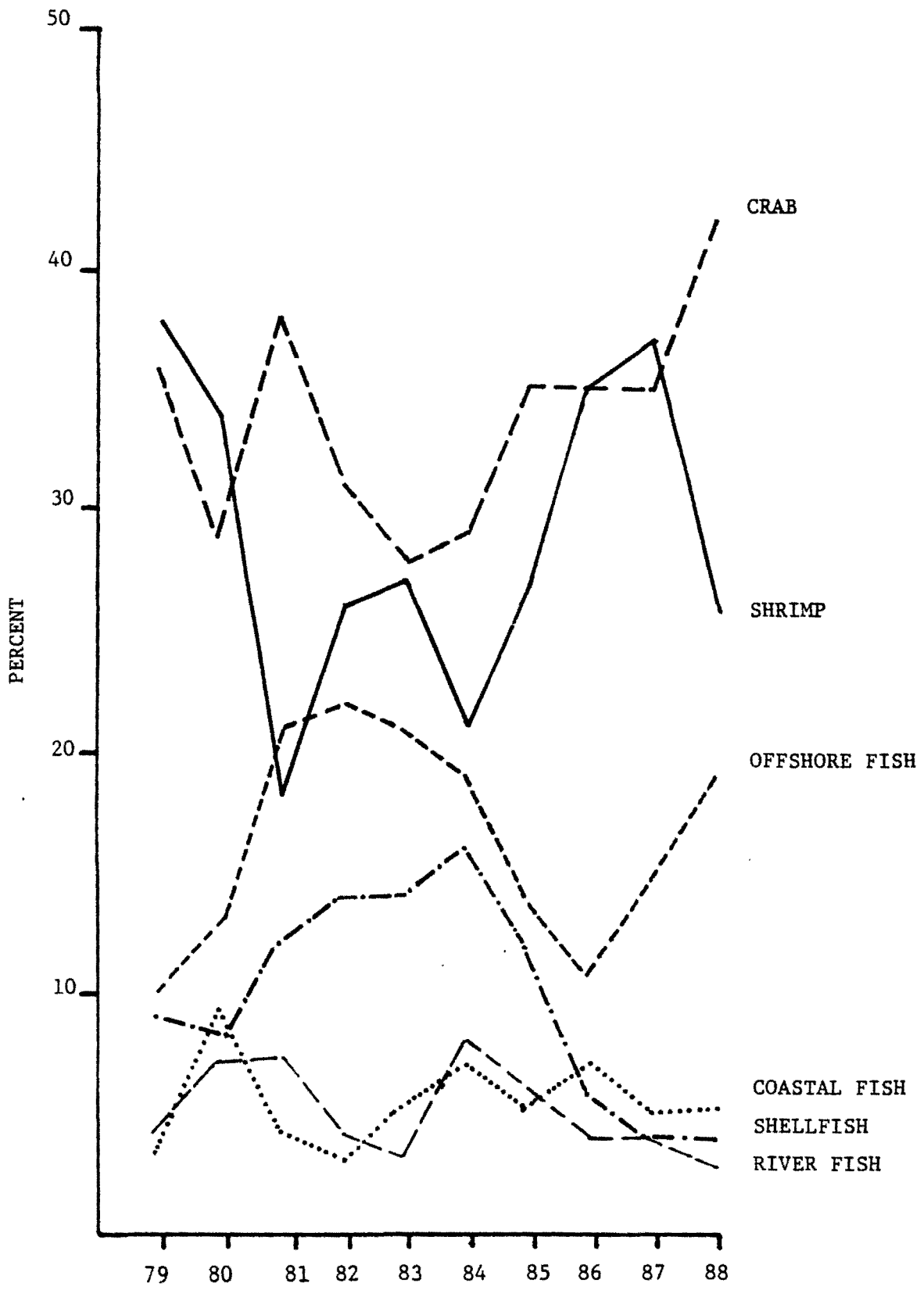


Fig. 3. Percentage weight composition of commercial landings.

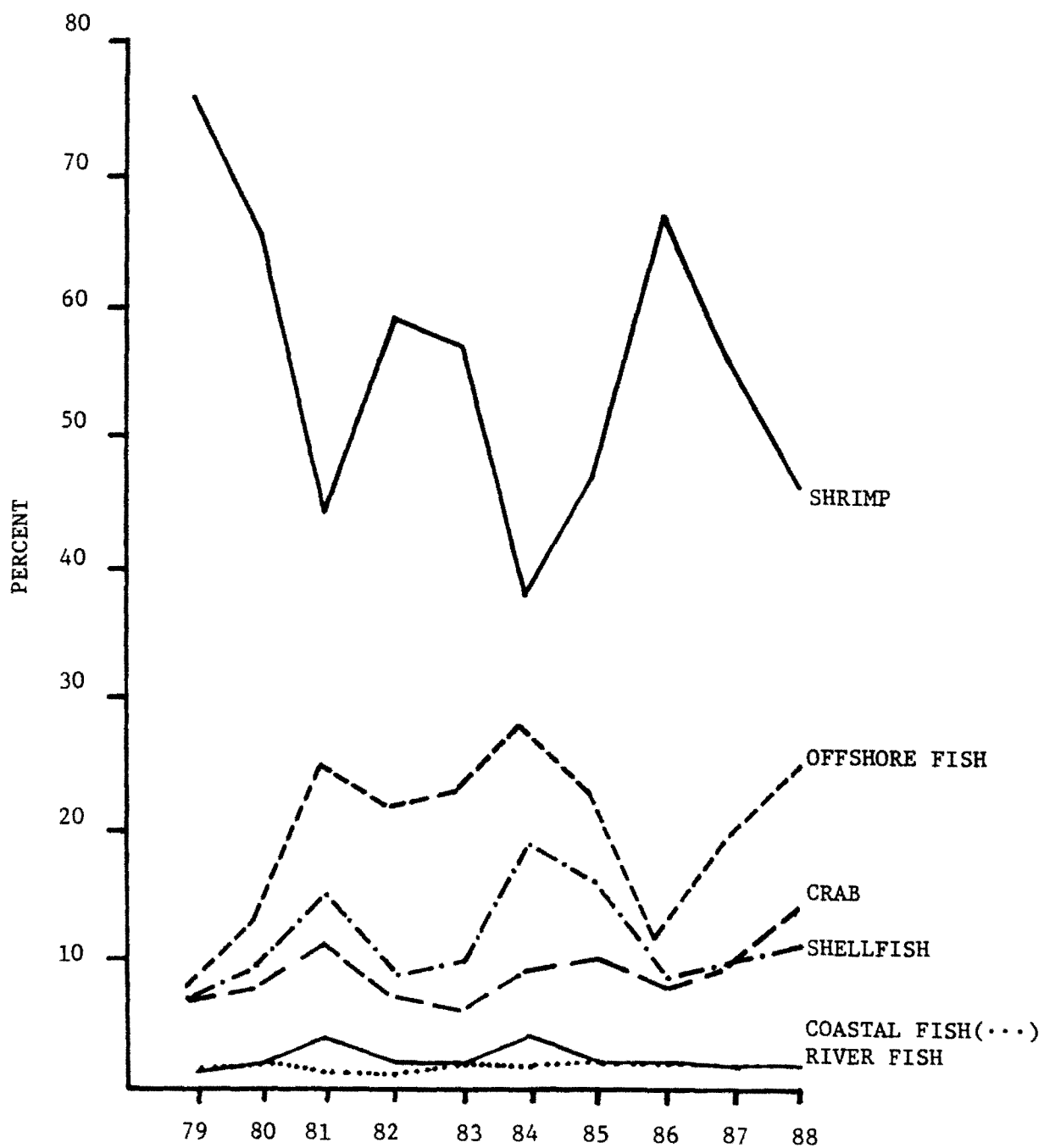


Fig. 4. Percentage ex-vessel value composition of commercial landings.

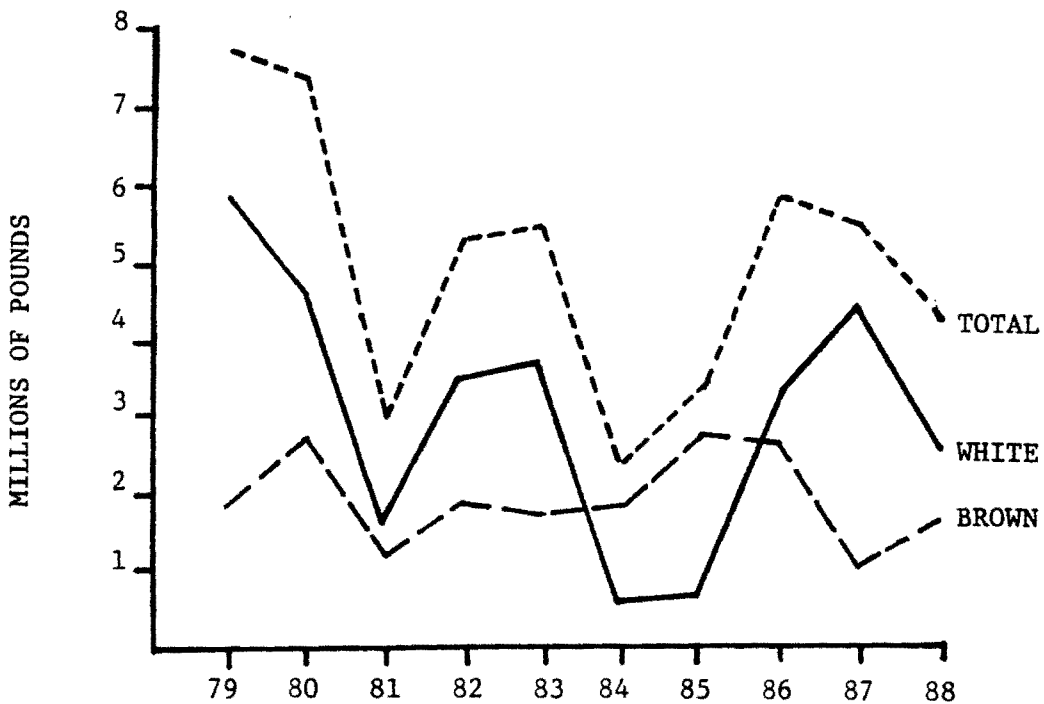


Fig. 5. Annual commercial landings of heads-on shrimp.

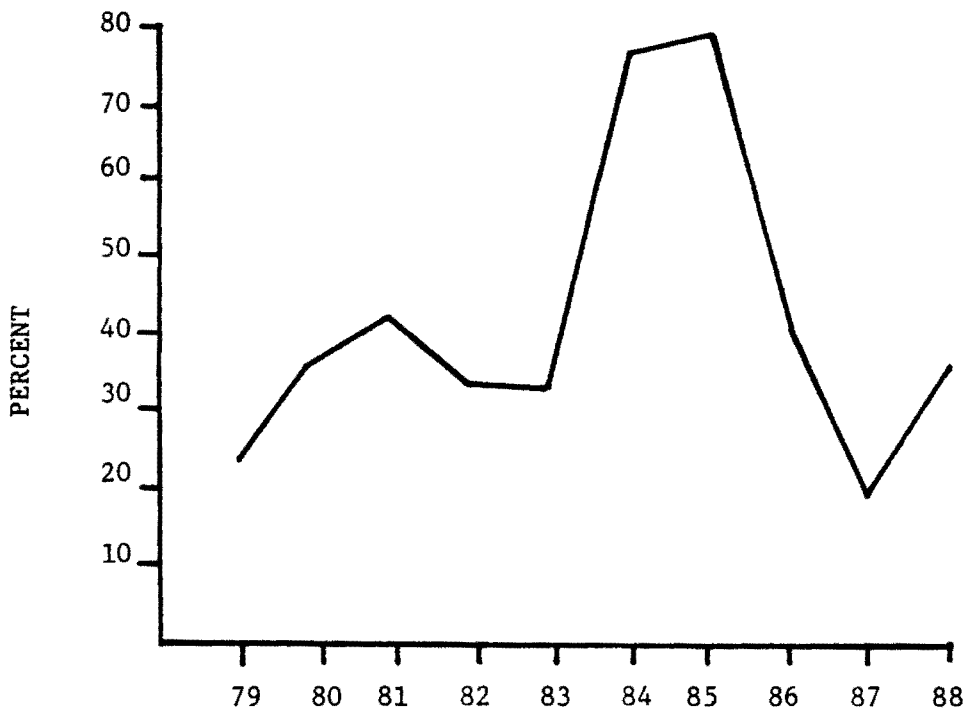


Fig. 6. Percentage of brown shrimp in total penaeid shrimp commercial landings.

the catch of shrimp in estuarine areas, where they have been smaller. In 1987, the channel net fishery in Winyah and North Santee Bays was not opened because of the small size of the white shrimp available to it. The 1988 channel net fishery was also restricted and its catch was insignificant. In 1986, the southern sounds and Bulls Bay were closed to shrimp trawling by a resolution of the General Assembly, a move generally favored by the operators of larger boats in the belief that it increased the size of the shrimp caught and therefore the value of the overall harvest. This closure continued during the 1987 and 1988 seasons. An MRD evaluation of the closure's effects concluded that it had no significant impact on the landed value of the white shrimp harvest.

Two new developments may have affected commercial shrimp landings adversely during 1987-1988. One was the enforced use of turtle excluder devices (TEDS) during brown shrimp season, which was required of most shrimpers at intermittent intervals during 1988. These devices consist of several types of grids or net panels installed near the tail bag to deflect turtles out of the net through an opening in the mesh. Also deflected to varying degrees are jelly balls, debris, fish, crabs - and shrimp. The percentage of shrimp deflected, and thus lost to the fishermen, varies greatly depending on the type of TED and type and amount of trash. Average weight loss to South Carolina shrimpers has been estimated at 7% by NMFS based on onboard observations, although many shrimpers believe it is much higher.

Another development that may have reduced reported commercial landings of white shrimp was the expanding cast net fishery over bait. The sale of shrimp so taken was prohibited in 1983, but recreational harvest (including an illegal commercial component) continued to increase. MRD observations indicated that this activity grew substantially during 1986. In 1987, MRD conducted a survey of this fishery by interviewing participants at boat landings and mailing a questionnaire to a sample of registered boat owners. Survey results indicated that the catch in this fishery from mid-August through mid-December was about 40% of the season's commercial trawl catch. In 1988, a license was required to cast net shrimp over bait and a 60-day season was set. A postseason mail-out survey of license holders indicated that the fishery's harvest was about 46% of the commercial trawl landings reported for the fall 1988 season.

In 1987, the unit value of commercial landings was substantially lower than in 1986 and this contributed to the reduced value of the overall harvest (Fig. 7). The total shrimp catch in 1988, in CPI-adjusted dollars, was 30% lower in value than the ten-year average. The 1986 white shrimp landings largely consisted of good-sized shrimp (26-30's), while the 1987 landings were smaller (31-40's). The 1988 catch contained larger shrimp, but prices for the dominant counts (e.g. 31-35's) were relatively low. Prices were independent of local production or costs and appeared to be depressed by large volumes of imported medium-size shrimp.

The maximum production potential of South Carolina's wild shrimp fishery appears to have been reached in the 1950's. The lack of a significant sustained increase in landings in recent years, in spite of the greatly increased fishing capacity of the fleet, indicates that the wild shrimp resource is being fully exploited. The carrying capacity of the natural habitat is the major determinant of the average magnitude of the shrimp resources. Continued development of coastal areas, even subject to the state's rigorous coastal zone management provisions, is likely to continually erode their productive capacity. It is therefore unlikely that any sustained increase in wild production can be expected.

Recent declines in shrimp prices have aggravated the impact of overcapitalization and increased operating costs for many shrimpers. Further price declines, reflecting increased availability of low-cost (in terms of production) imports from Asia, can be anticipated. Although the state has addressed economic performance only through the indirect effect of control over the size of shrimp caught, a more direct approach to the maximization of economic yield may be warranted. There is a substantial negative relationship between the number of shrimpers and their average individual production (Fig. 8). This is a classic characteristic of a fully developed (or over-developed) fishery. It indicates that increased participation can only be achieved at the expense of reduced returns to other participants and that total production cannot be increased at all. It therefore follows that any improvement in individual production is likely to be attained only through a reduction in the number of participants. In South Carolina, this reduction is occurring, although gradually, as a result of economic conditions.

Crab

Prior to 1987, most of South Carolina's reported production of hard blue crab was sold for picking and packing by instate processors. During 1987-1988, there were four major processors that purchased about half of the landings. These plants also imported crab from other states when necessary to stabilize their production.

In the last few years, a lucrative "basket" trade for graded hard crab has developed in response to strong demand in northern markets. These crabs have not gone through the major processors, but have been handled by individual crabbers and small wholesalers. Much of this production, which has been greatest during mild winters and spring, has probably been unreported. Market conditions also have influenced landings, with effort typically falling off in response to low prices. Summer prices have been low and many crabbers have either found alternative employment or cut back on the amount of gear fished. The relationship between annual landings and abundance of blue crab has thus been speculative.

Reported landings have been cyclic, with years of very low production occurring every six or seven years. The underlying cause is unknown. In 1984 and 1985, production was low. Part of this may have been attributable to "gray crab" disease

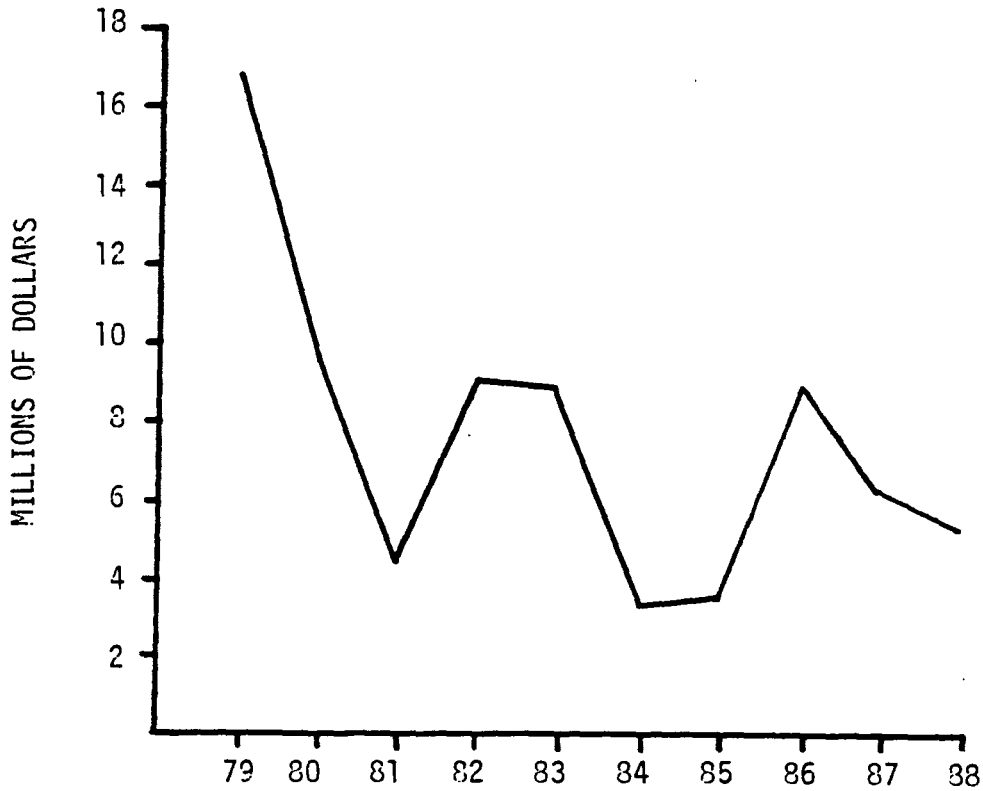


Fig. 7. CPI-adjusted ex-vessel value of commercial shrimp landings.

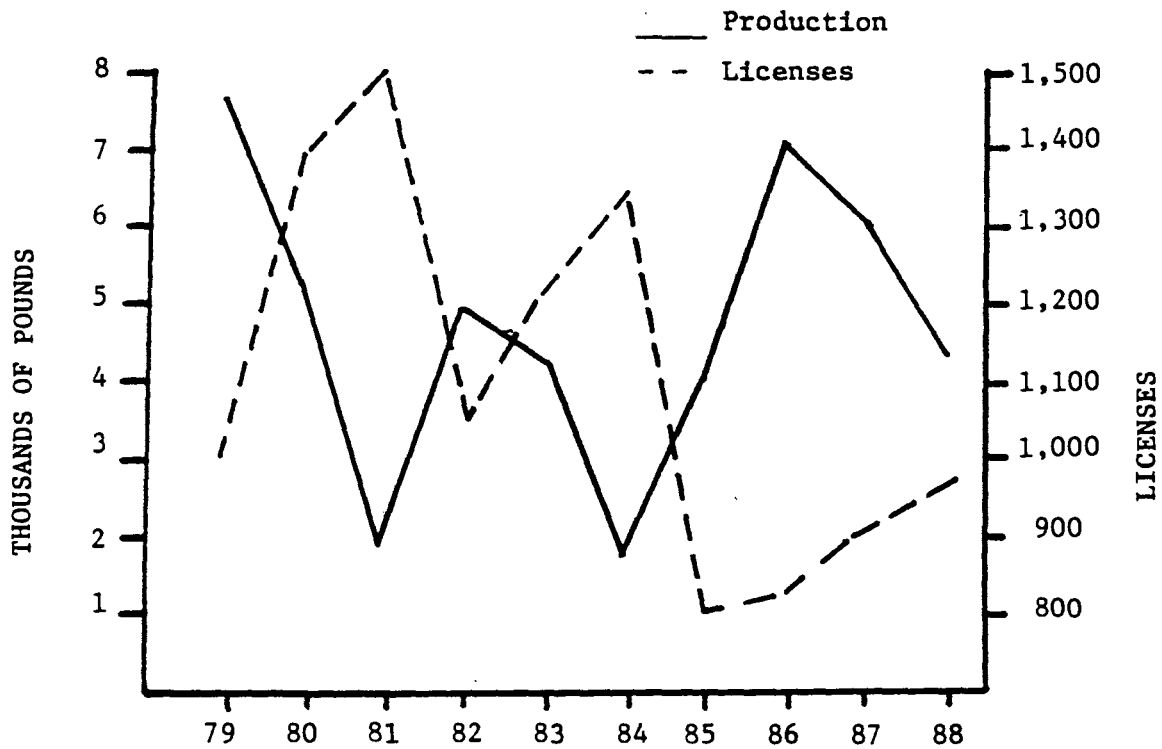


Fig. 8. Number of trawler licenses sold and average pounds of shrimp landed per license.



Fig. 9. Number of crab pot licenses sold and commercial landings of bluecrab.

in the southern part of the state, but the number of crabbers was also reduced (Fig. 9). Landings increased substantially in 1986 and this recovery would probably have continued in 1987 if it had not been for low prices during summer and early fall, which resulted in reduced effort. At a Marine Advisory Board meeting in October 1987, crabbers reported that crabs were very abundant, but were not being fished heavily because of low prices. Reported landings rose again in 1988 and were about 10% above the ten-year average. Trawl landings during the winter and spring were very low in 1987, but increased substantially in 1988 in response to strong demand for "basket" crab.

Total reported production has been rather strongly correlated with the number of license (Fig. 9). This relationship suggests that the blue crab resource has not been fully exploited and that landings could be increased with additional participation. One negative aspect of increased harvest could be that the availability of additional product would seasonally depress prices, particularly those paid by instate processors. This could largely negate the benefits of increased volume.

Ex-vessel value of hard crab landings has risen at a greater rate than has production, with the 1988 average unit value of potted hard crab (\$0.45 per pound) being 55% higher than in 1986 (Fig. 10). Increased grading of hard crab and diversion of landings into the basket trade contributed to this increase. The CPI-adjusted value of the 1988 catch was the highest since 1978 and 46% above the ten-year average.

Landings of other crab products remained insignificant during 1987-1988. Despite continued strong demand for soft blue crab in the Middle Atlantic market, production remained low. Minor quantities of stone crab claws were landed as an incidental catch of the hard crab pot fishery, but limited abundance precluded a directed fishery. A projected fishery for golden crab, a large offshore species, never materialized. One northern boat (from the New England offshore lobster fleet) made a few trips, then discontinued its effort.

Shellfish

Shellfish production remained depressed in 1987 and 1988, although landed value in 1988 posted a slight gain (Fig. 11). In adjusted dollars, the value of the 1988 harvest was 3% below the ten-year average.

Historically, intertidal oysters have accounted for most of the state's shellfish harvest. The 1986-1987 shellfish season opened on 1 October and ended in mid-May. The only oyster cannery (L.P. Maggioni Co.) was closed. Since this firm normally used more than half of the state's commercial oyster harvest, loss of the market provided by this operation had an appreciable impact on landings. As in the previous year, mortality due to Dermo (Perkinsus marinus) was substantial in the southern part of the state, which further depressed landings in that region.

Effects from previous Dermo mortality

persisted into the 1987-1988 season, with many beds dominated by small oysters. Closures due to red tide significantly reduced oyster landings in the northern counties. In January 1988, the grounds in Dunn Sound and at Cherry Grove were shut down (until May), while those at Murrells Inlet were closed from 1 February-11 March. The fall 1988 season opened a month late because of hot weather and heavy rains. State shellfish grounds remained closed for oyster harvesting until January 1989. The net effect of these events was a further decline in the statewide oyster harvest during 1988 (Fig. 12).

Clam landings also declined from those in 1986 (Fig. 13), with the 1987 hydraulic escalator landings being the lowest in ten years. In 1988, however, the value of clam landings was the highest to date (Fig. 14). MRD manages eight escalator fisheries. Six of these operate in polluted (restricted) areas and their product requires depuration. One of these, Winyah Bay, was not opened in 1987 and Charleston Harbor has been closed permanently. Nine permits were issued for a five-day season in March on the newly opened Ashepoo River state shellfish ground. Dunn Sound and the Ashepoo River ground were closed during the fall 1987-spring 1988 season to permit recovery. Winyah Bay was reopened to escalators in 1988, but the Santee estuary was kept closed due to high bacteria counts. Hot weather, heavy rains, and the redirection probably contributed to this problem. In February 1988, the estuary was reclassified by DNEC for restricted shellfish harvesting.

In 1987, there were 80 active permits for shellfish culture, representing about 2,526 acres. Shellfish culture permits (formerly leases), which have supplied most of the oyster harvest, were held by 44 individuals or companies. Public use shellfish grounds in 1988 included about double the acreage available before the 1986 reorganization of the shellfish leasing system, with about 20% of the total state grounds open to public commercial harvesting. There were 37 state shellfish grounds containing about 218 acres. In 1988, a new inspection and assessment system was initiated, with openings based in part on its evaluations.

Although the number of vessels licensed for the whelk fishery (Fig. 15) increased since 1986, landings continued to be very limited in 1987 and 1988. MRD tagging has shown that whelks grow slowly and show little movement. They are therefore susceptible to overexploitation and this appeared to have occurred during the mid-1980's. The value contribution of the whelk fishery to the state's shellfish landings currently is insignificant.

The contribution of other shellfish was negligible during 1987 and 1988. Calico scallops occur on the continental shelf off South Carolina, but there seldom has been any effort to locate fishable quantities. The last appreciable landings were made in 1978. Squid (primarily short-finned) occur in offshore waters also, but not in sufficient availability to permit a directed fishery. Shrimp trawlers landed small amounts of brief squid each year as an incidental catch. Octopus are fairly common in both coastal and offshore live bottom areas and a few thousand

— Contemporary
- - - CPI-adjusted

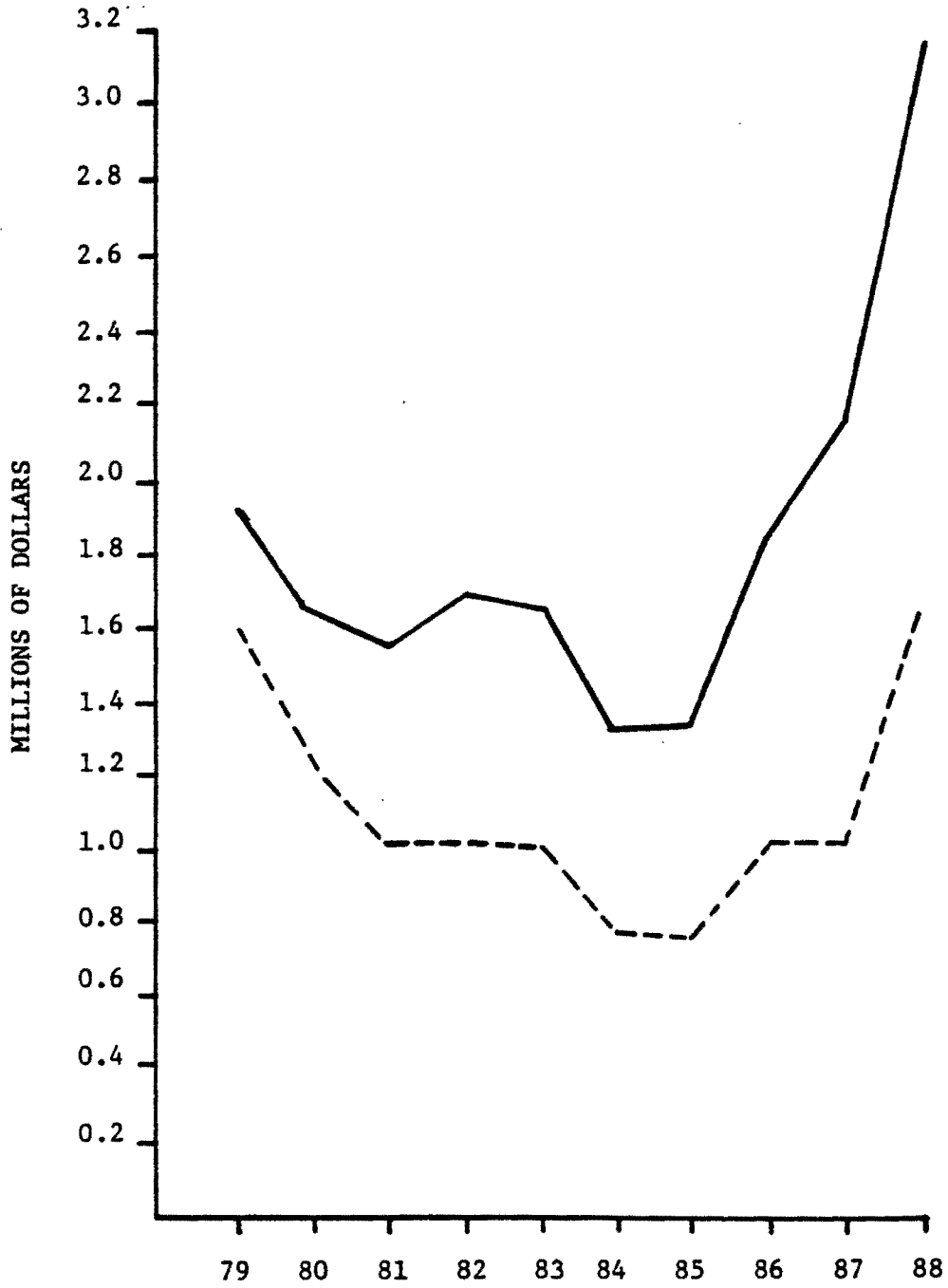


Fig. 10. Ex-vessel value of commercial blue crab landings.

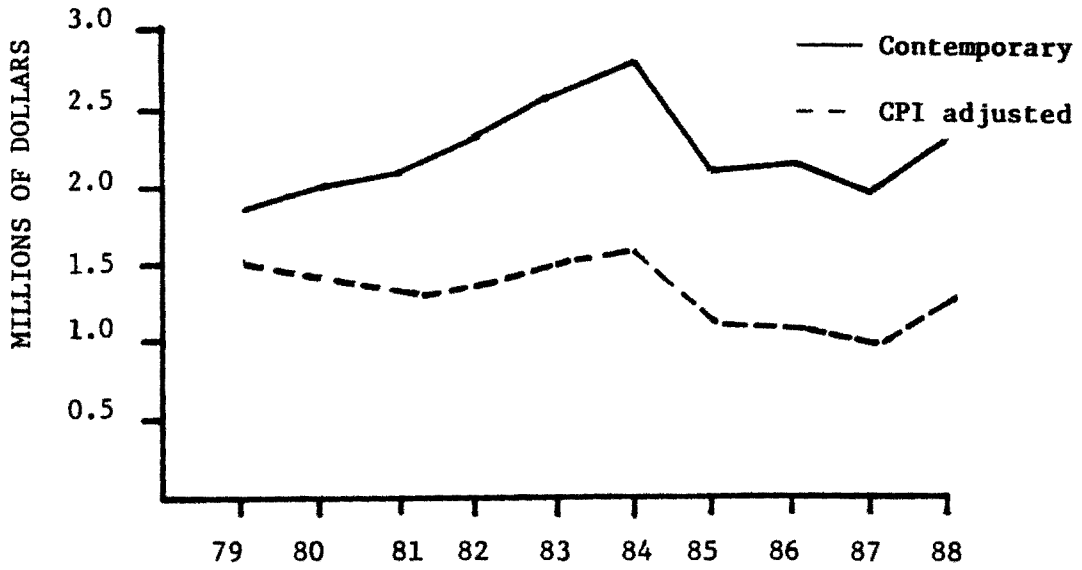


Fig. 11. Ex-vessel value of commercial shellfish landings.

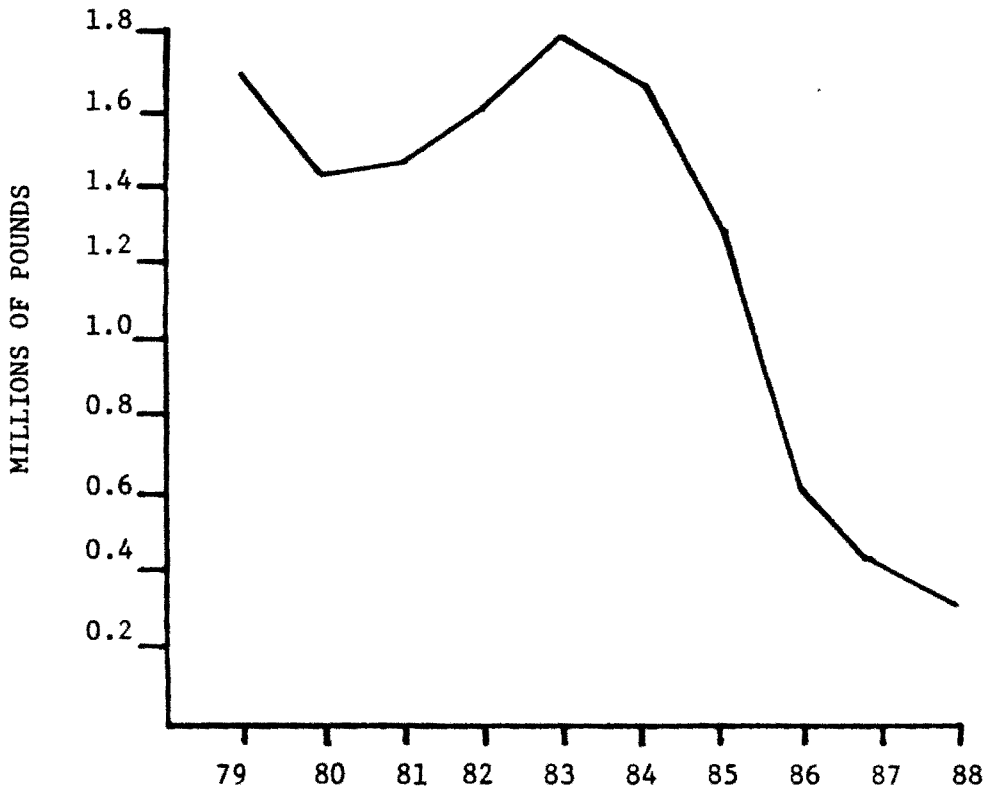


Fig. 12. Landed weight of commercially harvested oyster meats.

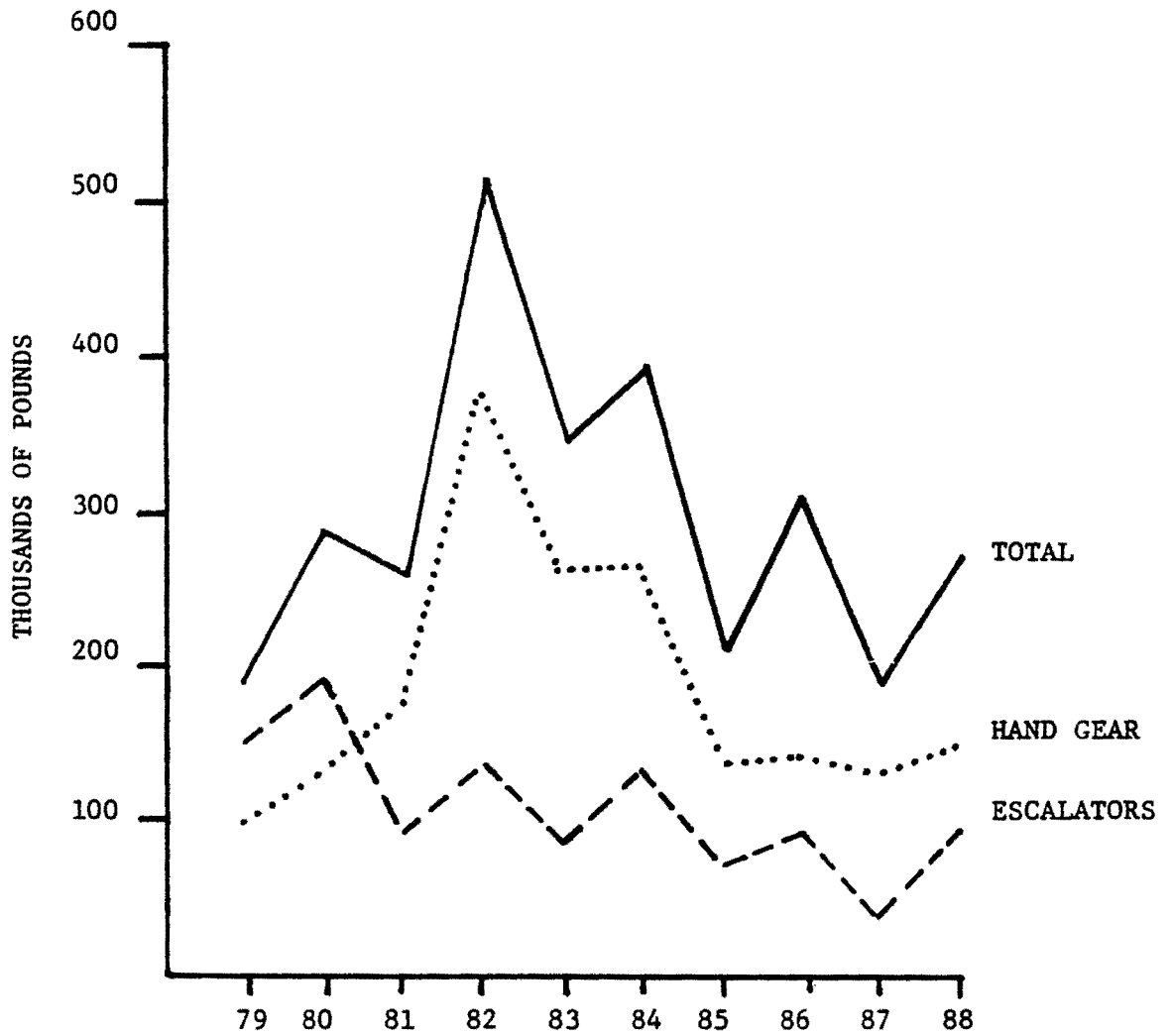


Fig. 13. Landed weight of commercially harvested clam meats.

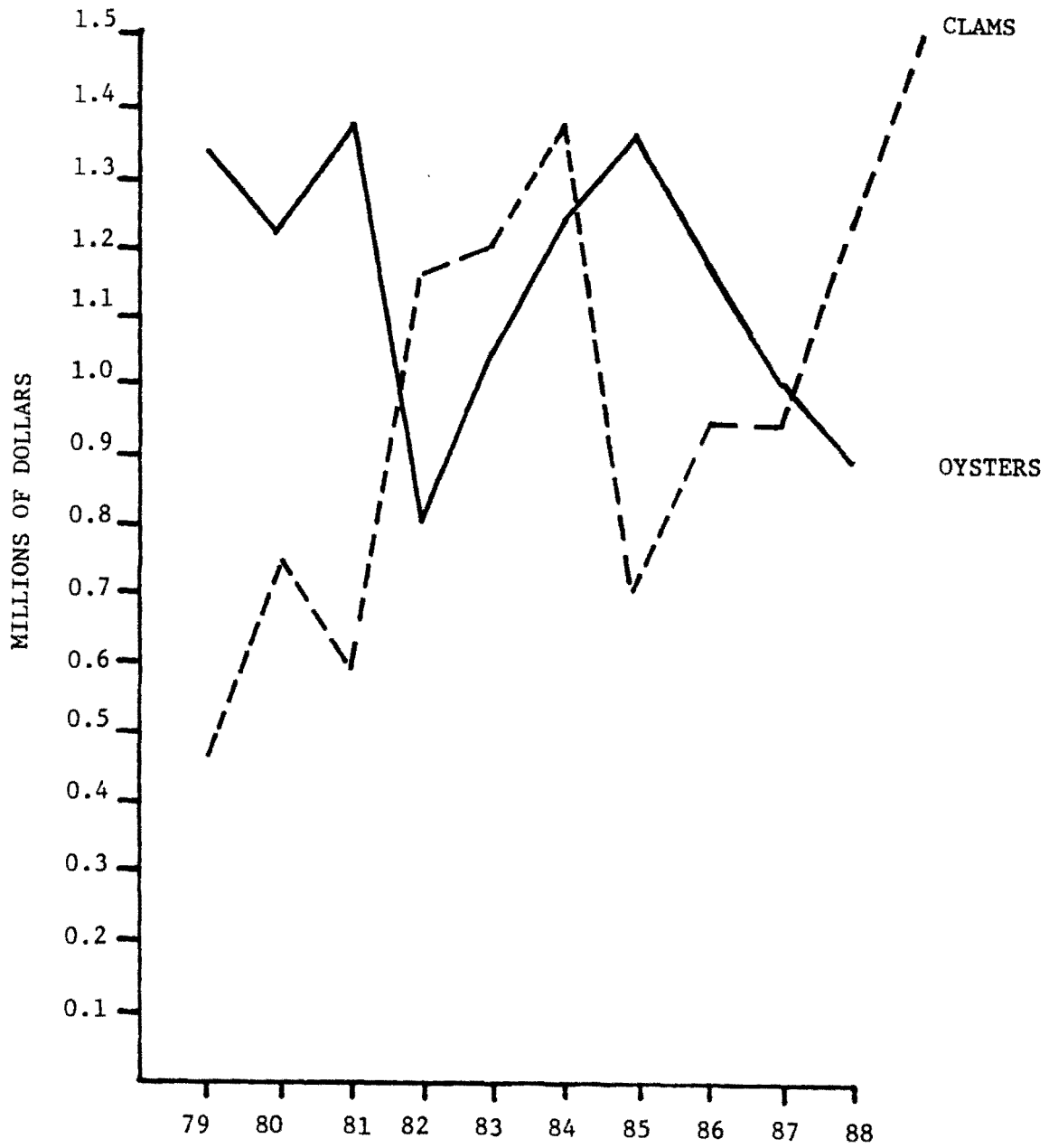


Fig. 14. Ex-vessel value of commercially harvested clams and oysters, in contemporary dollars.

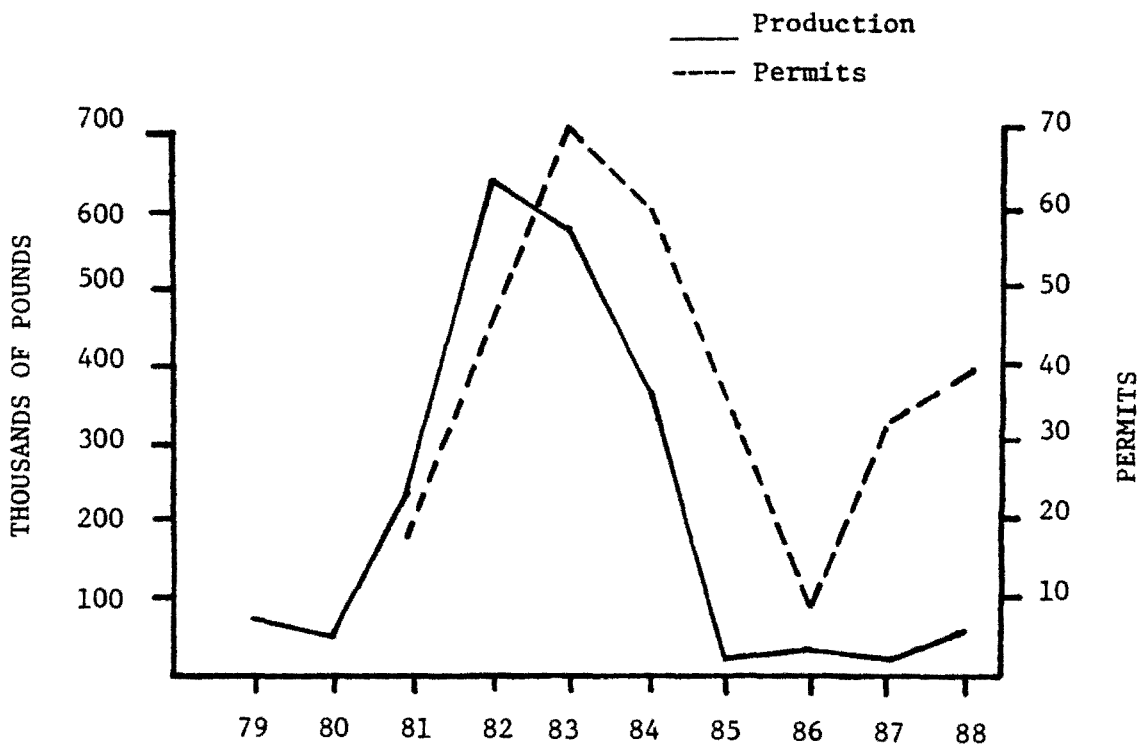


Fig. 15. Landed weight of whelks and number of permits issued.

pounds were landed each year by black sea bass trap fishermen. MRD exploratory fishing trials have indicated that this resource could support a limited fishery.

OFFSHORE FISH

Following sharp declines in production in 1984-1985, landings of offshore fish during 1987 and 1988 continued to recover (Fig. 16). The handline (power-assisted reel) fishery, which accounted for most of the production (Fig. 17), posted good gains in both years. The next most important contributor in terms of volume was the surface longline fishery, which showed a large increase in 1988 landings (Fig. 18). Bottom longline production, which had declined significantly in 1987, also rose sharply in 1988. The trawl fishery, which declined greatly in participation after the imposition of a minimum mesh regulation in 1984, also rebounded in 1988. The trap fishery, which targeted black sea bass, declined moderately in both 1987 and 1988.

In terms of value, the handline fishery accounted for about one half of the total offshore production, while the surface longline fishery contributed about one-third. The other fisheries were minor contributors. In 1988, swordfish was the most significant species in value, followed by groupers and snappers. Overall landed value in 1988, as measured in CPI-adjusted dollars, was 22% above the ten-year average.

In terms of relative volume, reef fishes (groupers, snappers, porgies, and black sea bass) were the major components (Fig. 19), although swordfish was the most important individual species. Production of swordfish, porgies, and snappers increased in 1988, while landings of groupers and tilefishes decreased. Landings of black sea bass and king mackerel remained stable.

Swordfish

In terms of landed value, swordfish has been the most important individual species of fish in the South Carolina fishery over the last ten years. It is a migratory species within a wide area of the western North Atlantic, Gulf of Mexico, and Caribbean Sea. Although stock identity has not been defined, the population available to mainland domestic fishermen is believed to be severely overexploited. The precipitous decline in the mainland-based fishery has been reflected in the South Carolina landings (Fig. 20). Although U.S. domestic landings increased in 1988 (as did landings in South Carolina), much of the total U.S. catch was made outside the Exclusive Economic Zone (EEZ, from 3 to 200 miles offshore) and a very substantial reduction in overall harvest is believed necessary to rebuild the stock.

Reef Fish

Groupers, snappers, and porgies have been the mainstay of the handline fishery. Most of the grouper production has been accounted for by the handline boats (Fig. 21), although bottom longliners have caught most of the deep-water species (snowy and yellowedge). Gag groupers have traditionally been the major component of the

handline catch (Fig. 22), but their percentage contribution has been declining. The 1988 landings were only 68% of those reported in the peak year of 1982. The relative contribution of scamp has remained very stable, with a sizeable increase in landings in 1987-1988. Landings of deep-water groupers, almost exclusively snowies, remained nearly constant during 1987 and 1988, down slightly (9%) from the 1986 catch. The catch by bottom longliners was lower, but increased handline landings made up the difference.

Snapper landings, primarily of vermilion snappers, increased very substantially in both 1987 and 1988 (Fig. 23). In 1988, trawl landings of vermilion snappers accounted for 27% of the total catch of this species. The percentage contribution of vermilion snappers to handline landings has trended upward during most of the last ten years (Fig. 22) and the 1987 and 1988 catches were the largest ever reported for this gear. Total red snapper landings increased in both years, but remained a small component of the overall snapper catch.

Porgy landings also continued to recover substantially (Fig. 24). Although trawl landings were low, the handline catch of red porgies in 1988 was the largest since 1982. The relative contribution of this species to the handline catch was also the highest since 1982.

The other major reef species exploited commercially off South Carolina has been the black sea bass. Although taken as an incidental catch in the handline fishery, most of the black sea bass landings were accounted for by trap fishermen. Sea bass landings have fluctuated widely in a somewhat cyclical pattern, tending to be higher when large fish were more abundant. Based on past production trends, sea bass landings would have been expected to continue the recovery that began in 1986. Instead, they levelled off (Fig. 25). This may have reflected the size composition of the catches, which were dominated by small fish of low unit value.

Tilefishes

Two species, the (golden) tilefish and the blueline (gray) tilefish, have been represented in the landings, although the former has dominated. The blueline tilefish has been an incidental catch of both the handline and bottom longline fisheries, while the golden tilefish has been targeted by bottom longliners. The latter species is limited in its distribution by habitat preferences and was overexploited by the rapidly expanding bottom longline fishery of the mid-1980's. Landings of golden tilefish in 1987 and 1988 were much depressed (Fig. 26) and composed mostly of small fish. Even these relatively low landings probably exceeded the annual level of sustainable long-term yield, based on a recent stock assessment.

Pelagics

The principal offshore pelagic species (other than swordfish) harvested commercially has been the king mackerel. Although handline boats fished primarily for reef species, they also targeted king mackerel on an opportunistic basis.

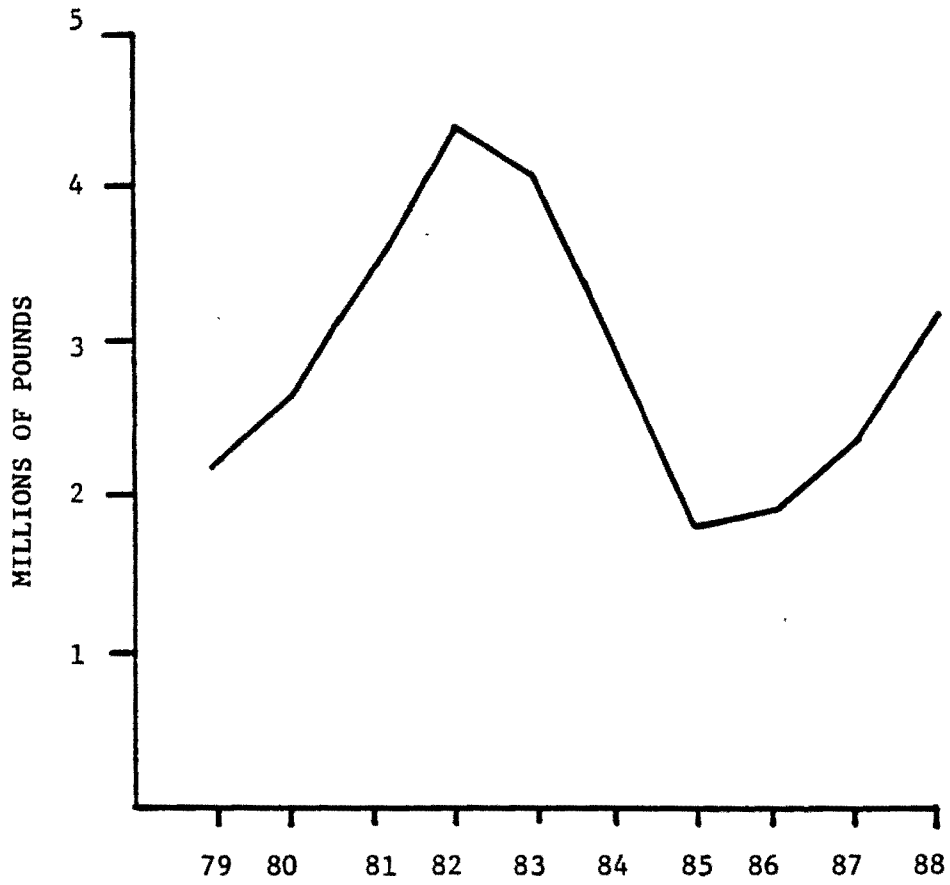


Fig. 16. Landed weight of commercially produced offshore fish.

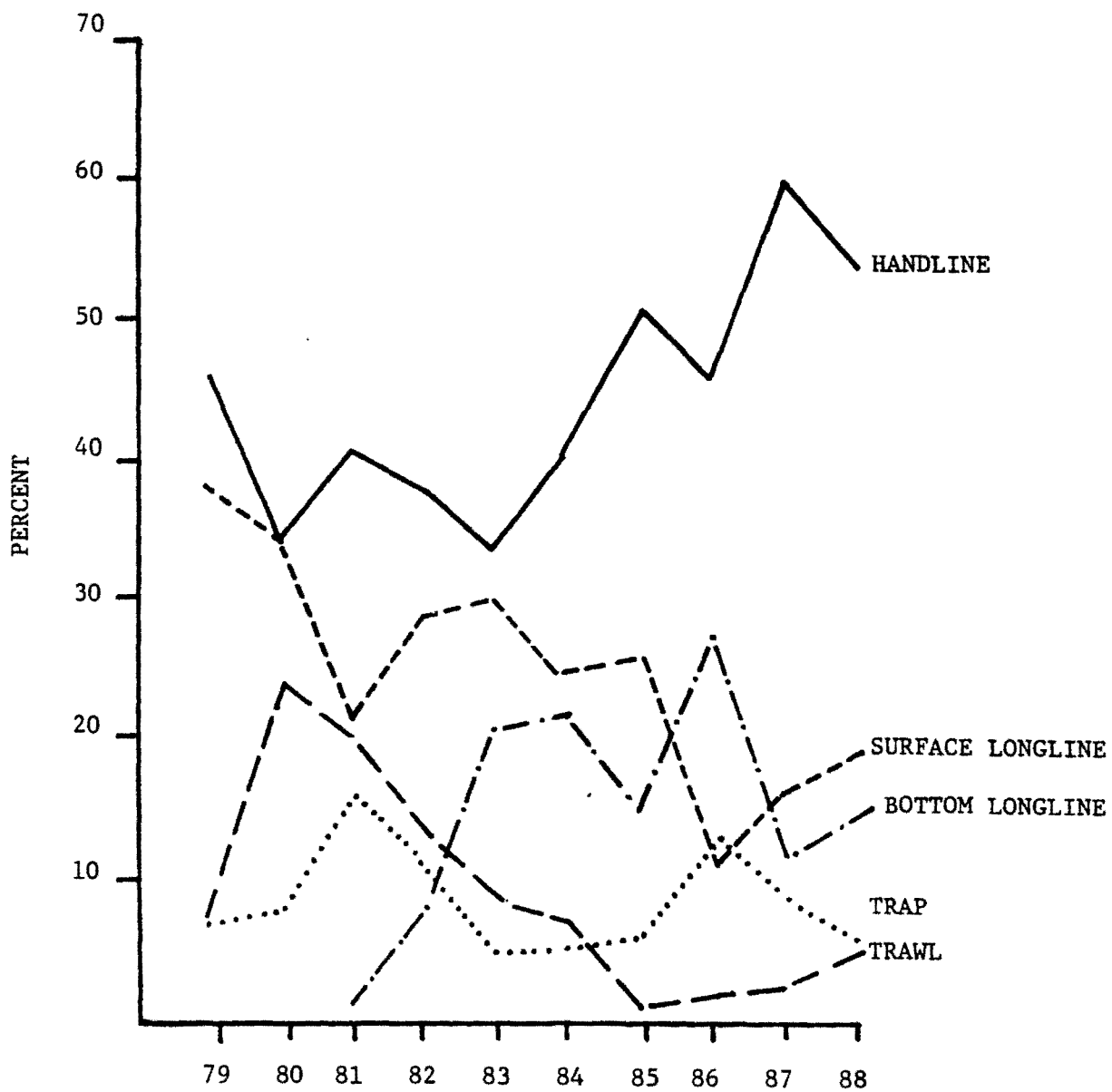


Fig. 17. Percent contribution by gear to landed weight of commercially produced offshore fish.

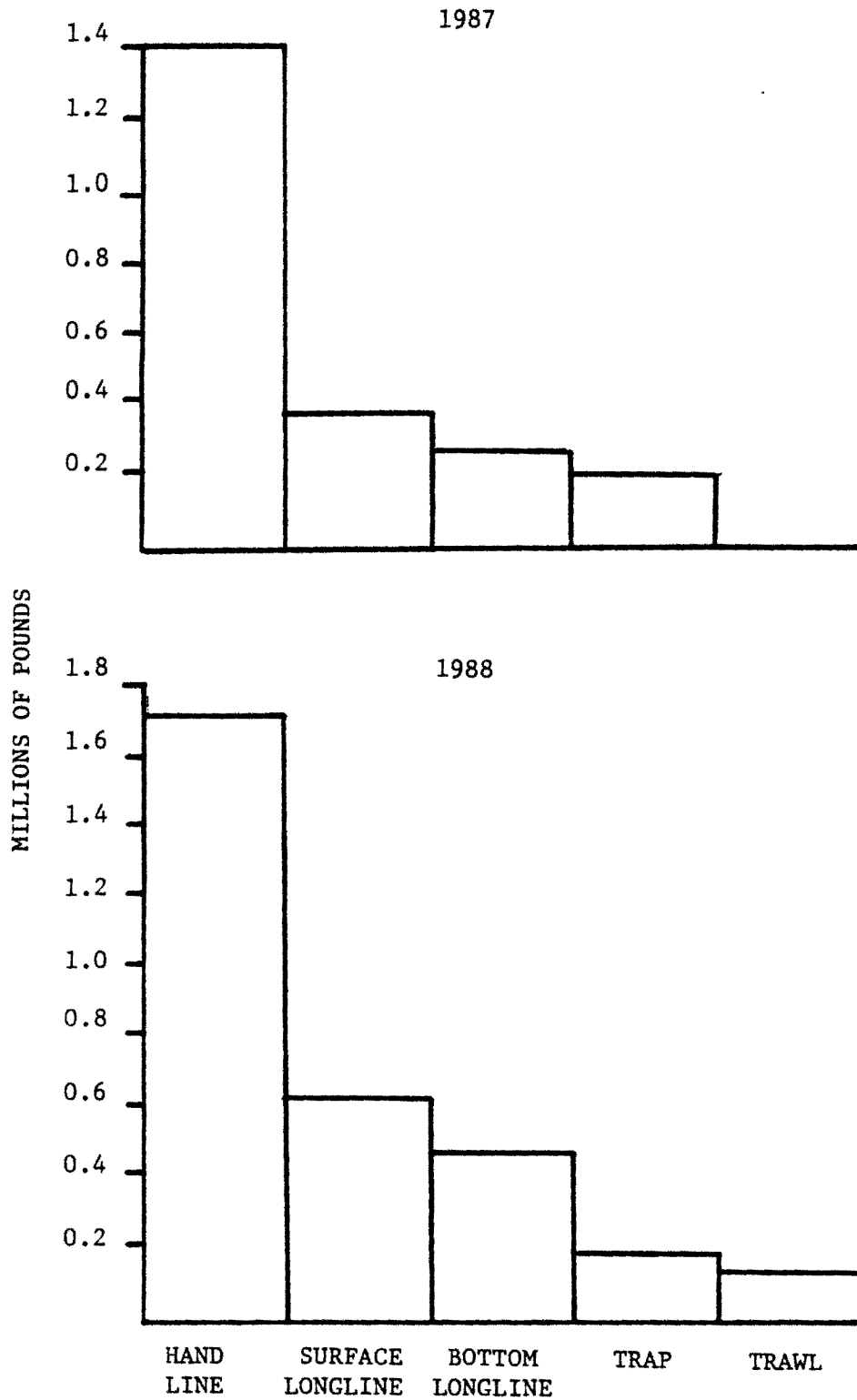


Fig. 18. Landed weight of offshore fish by gear type, 1987-1988 (1987 trawl landings are confidential).

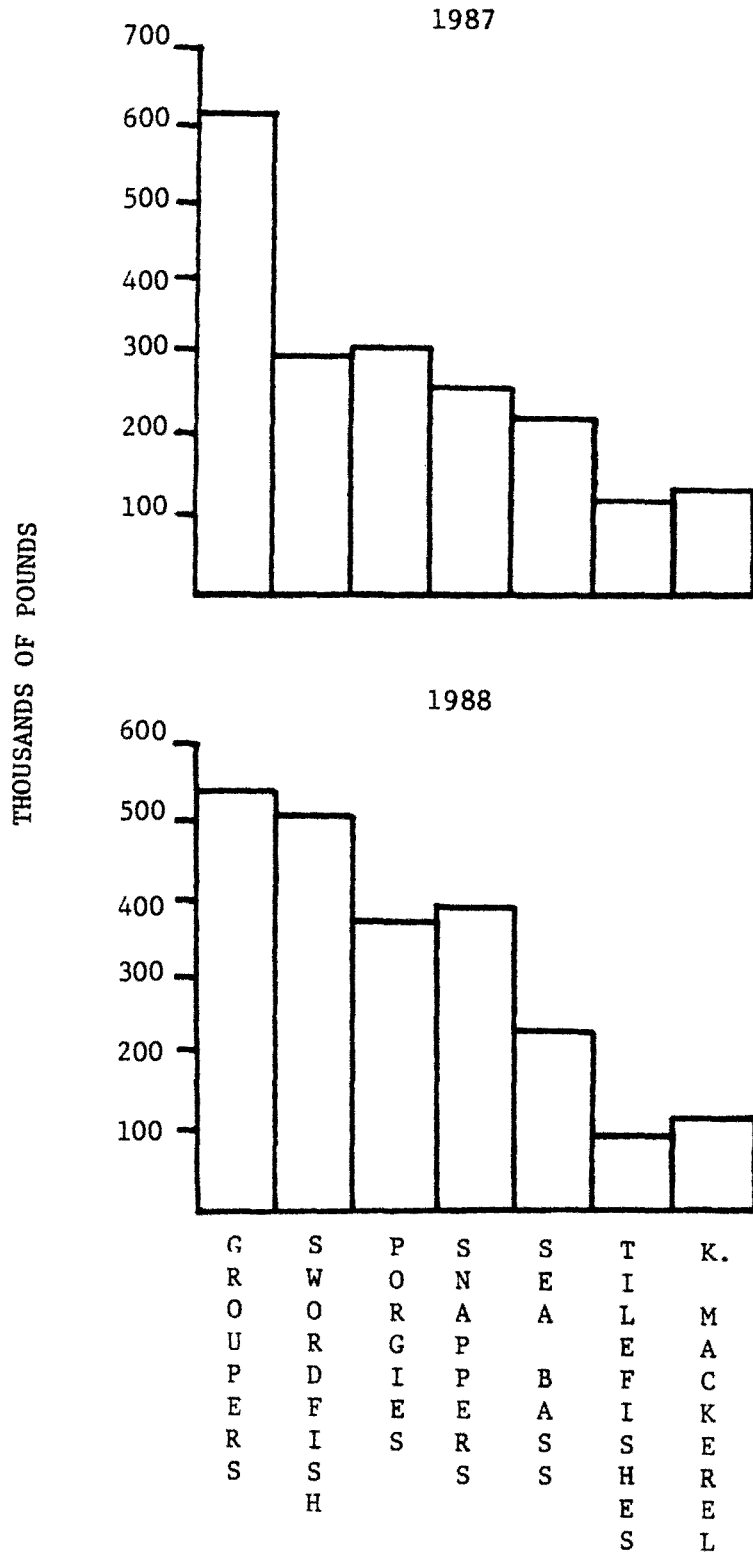


Fig. 19. Landed weight of offshore fish by species group.

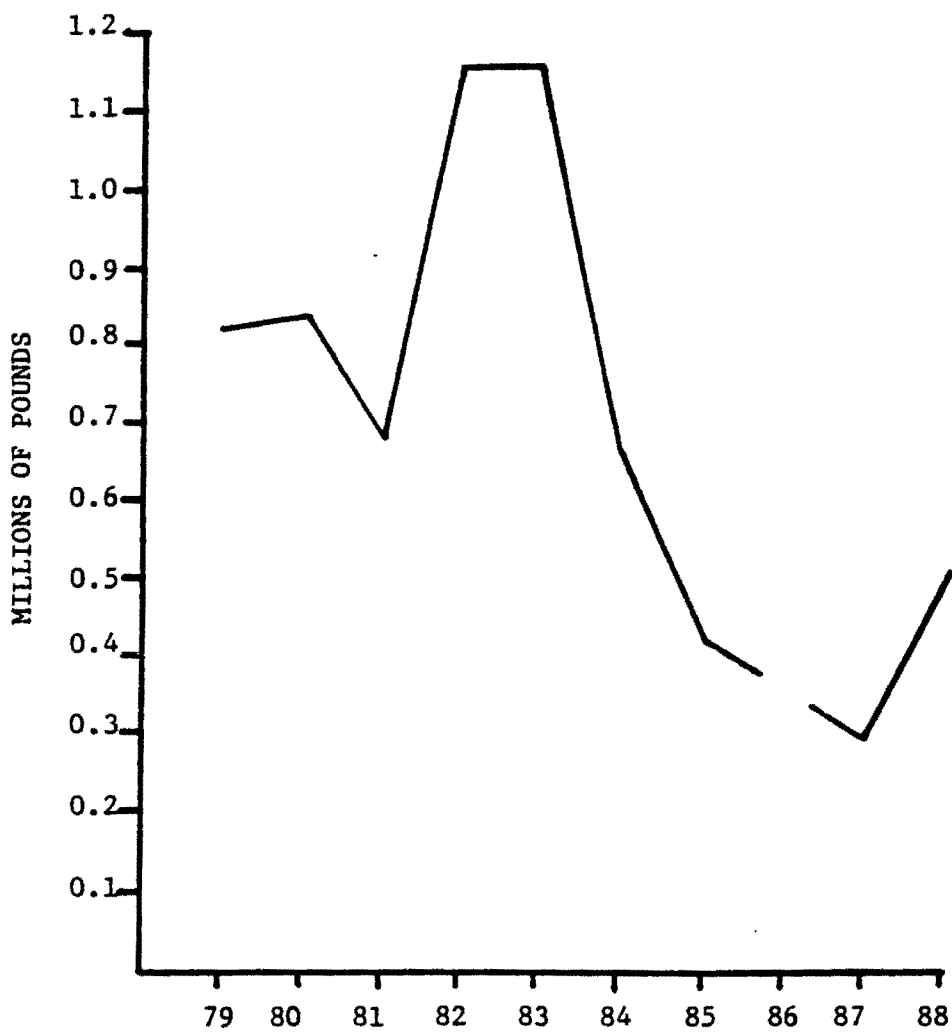


Fig. 20. Landed weight of commercially produced swordfish. The 1986 figure is not shown because of confidentiality.

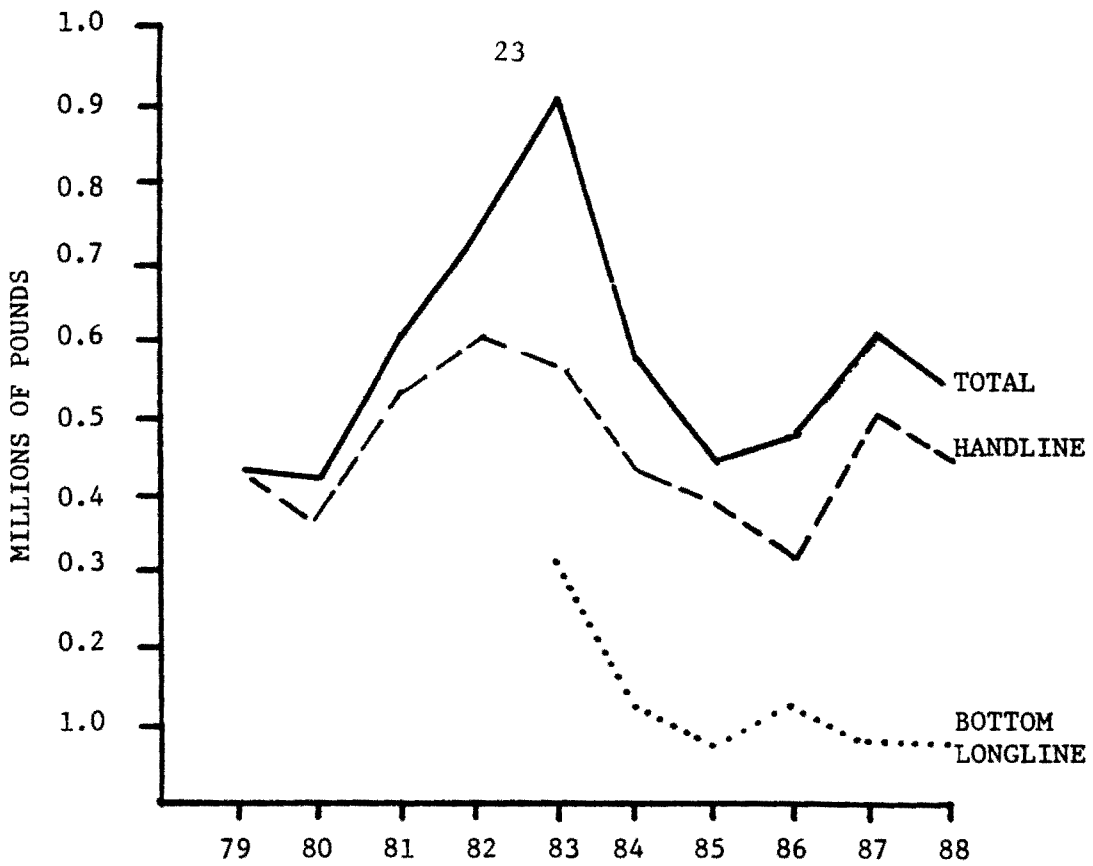


Fig. 21. Landed weight of commercially produced groupers.

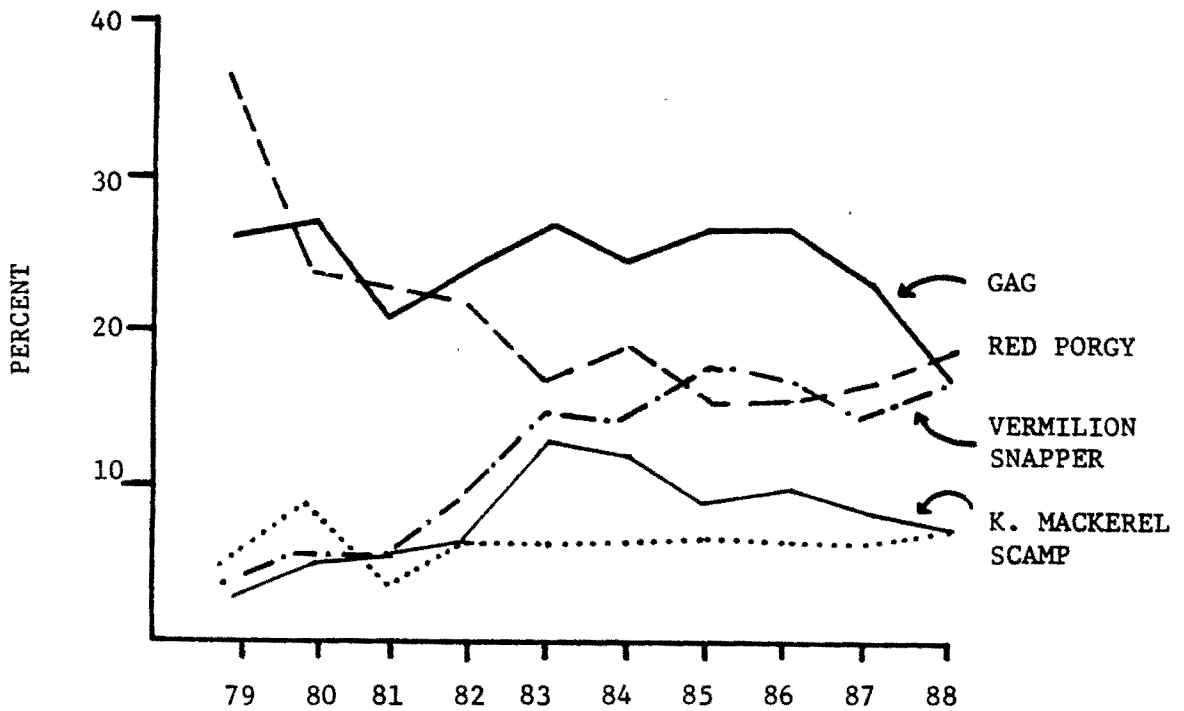


Fig. 22. Species composition of commercial handline landings.

Perhaps because of this characteristic, landings (Fig. 27) have not fluctuated as widely as have those of some reef species and the relative contribution to the handline catch has remained fairly constant (Fig. 22).

There has been increasing concern about the status of the Atlantic stock in recent years and annual quotas have been in effect. In 1988, the commercial quota was filled by late November and the fishery was to have been closed. A North Carolina judge's injunction kept it open the remainder of the year.

Other pelagic species (cobia, wahoo, dolphin, billfishes, and tunas) harvested by commercial fishermen were primarily taken as incidental catches of the surface longline fishery or by handliners as occasional targets of opportunity. The principal exception was yellowfin tuna, which has increasingly been targeted by surface longliners as swordfish catch rates have declined. Although not shown because of confidentiality requirements, yellowfin landings have increased substantially in the last two years.

Offshore recreational anglers have expressed concern over the greatly increased landings of these species during the 1980's (Fig. 28) as the surface longline fishery expanded rapidly. The longline fishery for tunas operates mostly in daytime and has a higher incidental catch rate of other pelagics than does the nighttime swordfish fishery. Concurrent regional declines in recreational billfish fishing success contributed to the controversy over allowance of commercial billfish landings. As part of the billfish management plan prepared by the South Atlantic Fishery Management Council, a federal regulation signed on 1 September, 1988 prohibited retention of billfish (except swordfish) by commercial fishermen.

Sharks

Shrimp trawlers have supplied a local demand for small sharks for many years and were the major source of production prior to 1981 (Fig. 29). Since then, landings by other gears have generally increased in response to the growing demand for an economical, nutritious product. As a result, overall landings of sharks (Fig. 30) have increased substantially. During the mid-1980's, inshore nets (gill, drift) accounted for most of the annual landings as the relative contribution from the shrimp trawl fishery remained stable. As swordfish landings declined and the unit value of sharks improved, pelagic longliners landed greater quantities of offshore pelagic sharks. Since 1986, the bottom longline fishery, faced with declining abundance of its former principal species (tilefish), has increasingly targeted sharks. As a result of the redirection of bottom longline effort, landings of offshore sharks rose dramatically in 1988 (Fig. 31) and replaced those of the smaller inshore species as the main source of supply. The actual extent of increased shark landings has been obscured by the practice of finning, since some fishermen landed only the fins from part of their catch and discarded the carcasses at sea. A 1984 MRD study demonstrated the feasibility of an expanded longline shark

fishery off South Carolina, but emphasized the need for carefully controlled development because of the vulnerability of the resource to overfishing. There is now widespread concern regarding the level of exploitation that can be supported by Atlantic shark stocks and a regional management plan in preparation proposes commercial quotas, recreational bag limits, and restrictions on finning.

Wreckfish

This is a large grouper-like fish found in very deep water (>175 fathoms) far offshore of the traditional bottom fishing grounds. A bottom fish (as an adult), it has been mainly taken by boats using heavy-duty handline gear. Because of strong currents and weather limitations, the boats can only operate effectively under favorable conditions. The fishery began in 1987. In 1988, about five vessels participated. Although their production figures were confidential, landings were several hundred thousands of pounds. Although only a small area has been fished to date, there appears to be extensive habitat suitable to this species. Restricted habitat has been a major limiting factor in the development of the state's other deep-water fisheries. Whether or not this apparently extensive habitat can be fished effectively has yet to be established, as does the distribution of the fish. Very little is known about this species and its productive potential.

Handline

"Handline" refers to a vertically fished hook-and-line rig retrieved by a power-assisted reel, often referred to as a "snapper reel." This fishery has consistently been South Carolina's major offshore fishery in terms of volume production, as well as a major value contributor. In 1988, an estimated 30 boats participated and made about 1,330 trips. This was about half the number of boats that fished five years ago, although the number of trips doubled. There were fewer transient boats and most vessels made shorter trips than in earlier years (and therefore more of them). Average trip production in 1988 (1,283 pounds) was considerably less than that during 1981-1984. There is considerable concern about the status of most of the reef fish stocks supporting the fishery, despite the fact that aggregate landings have increased appreciably since 1985 (Fig. 32). At present, the fishery operates free of restrictions except for size limits on a few species.

Trawl Fishery

During the years of peak production, this fishery landed large quantities of very small (<0.75 pound) vermilion snappers and some operators using small mesh net liners targeted these fish. These catches were very controversial, both with other fishermen and management agencies. By 1984, many vessels had left the fishery for economic reasons. In the fall of that year, a 4-inch minimum mesh regulation was imposed after consideration of a number of options, including a total ban on the gear. Both participation and landings continued to decline and the 1985-1987 landings were confidential because so few boats and

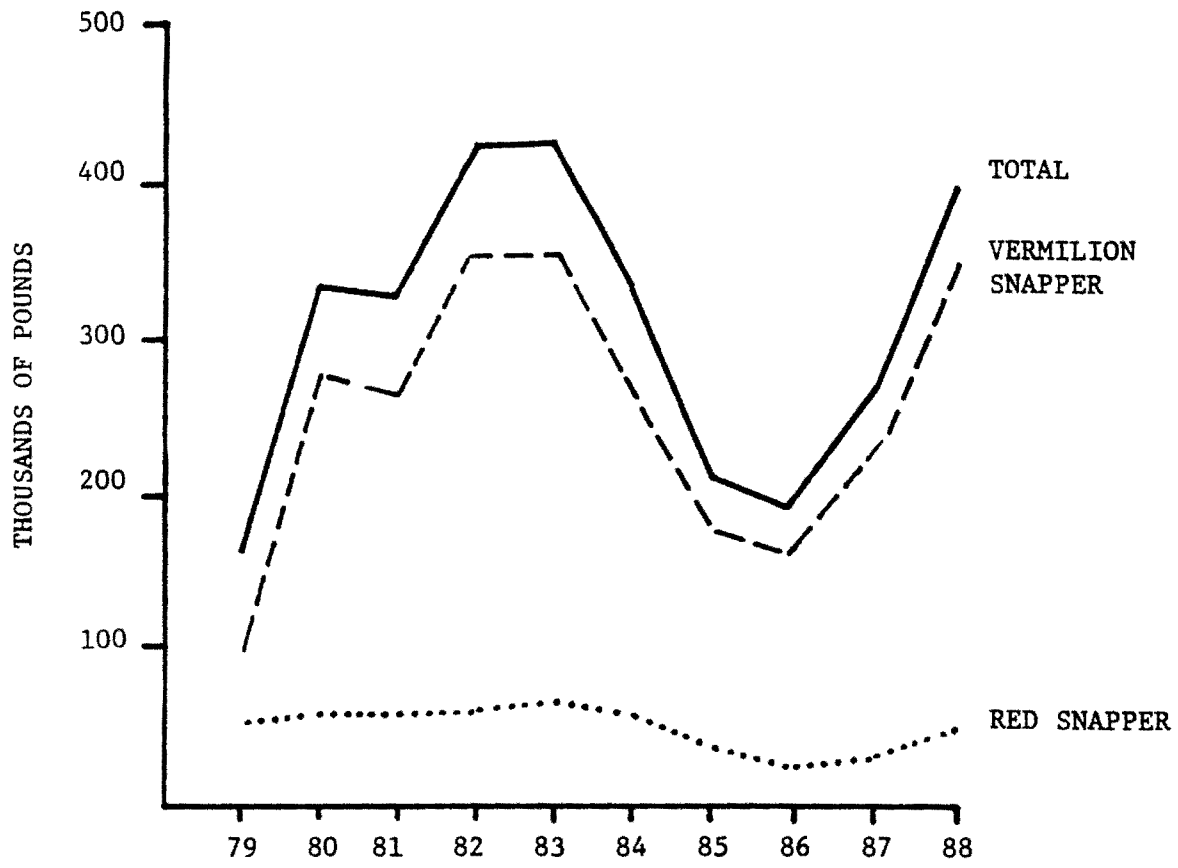


Fig. 23. Landed weight of commercially produced snappers.

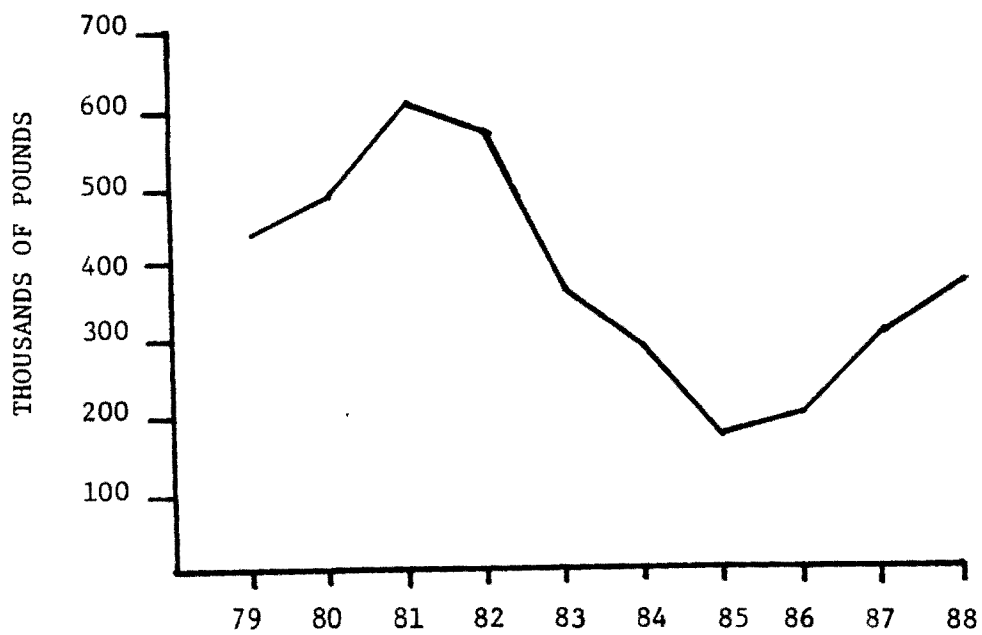


Fig. 24. Landed weight of commercially produced porgies.

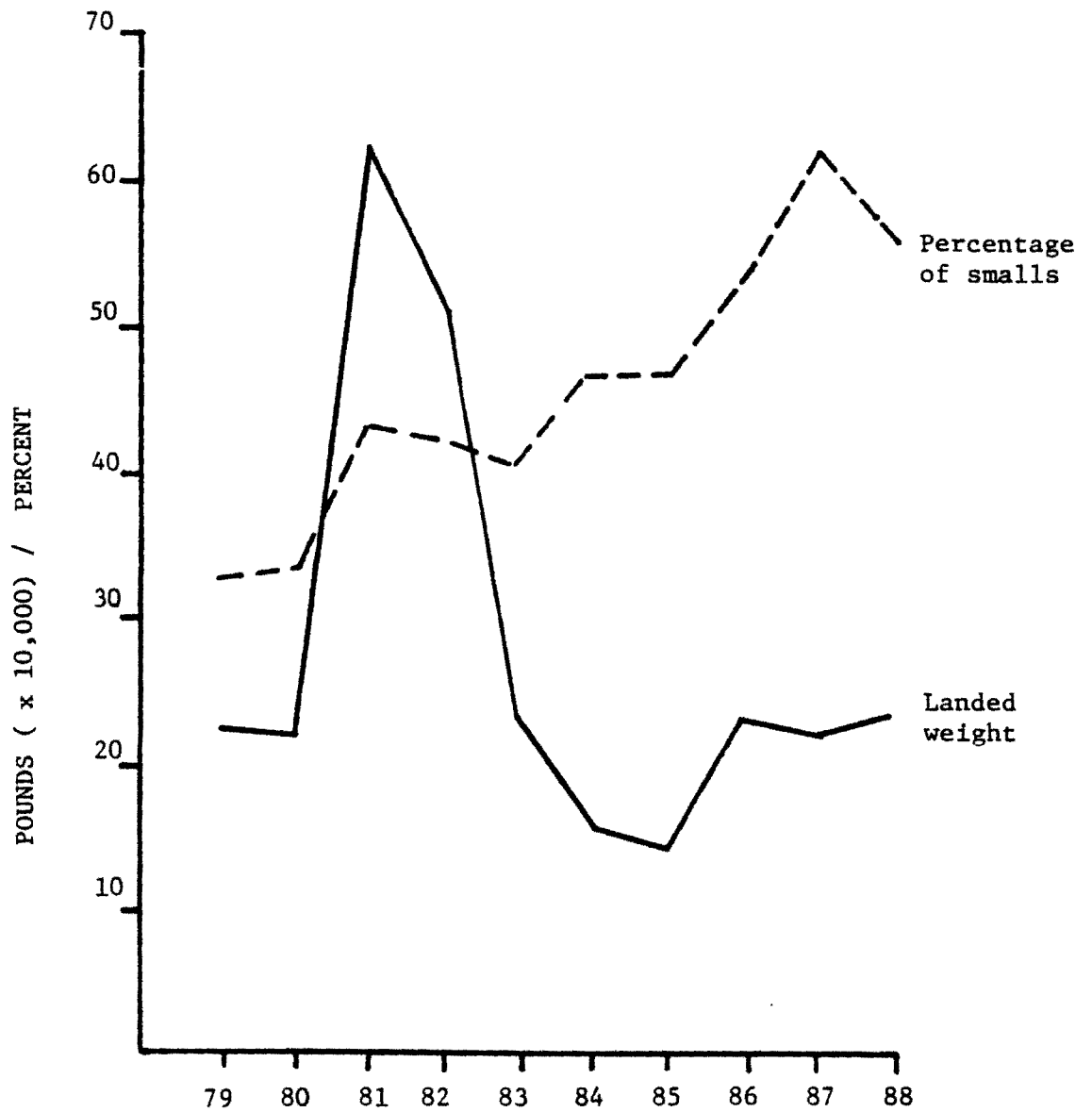


Fig. 25. Landed weight of commercially produced black sea bass and percentage of smalls in trap landings.

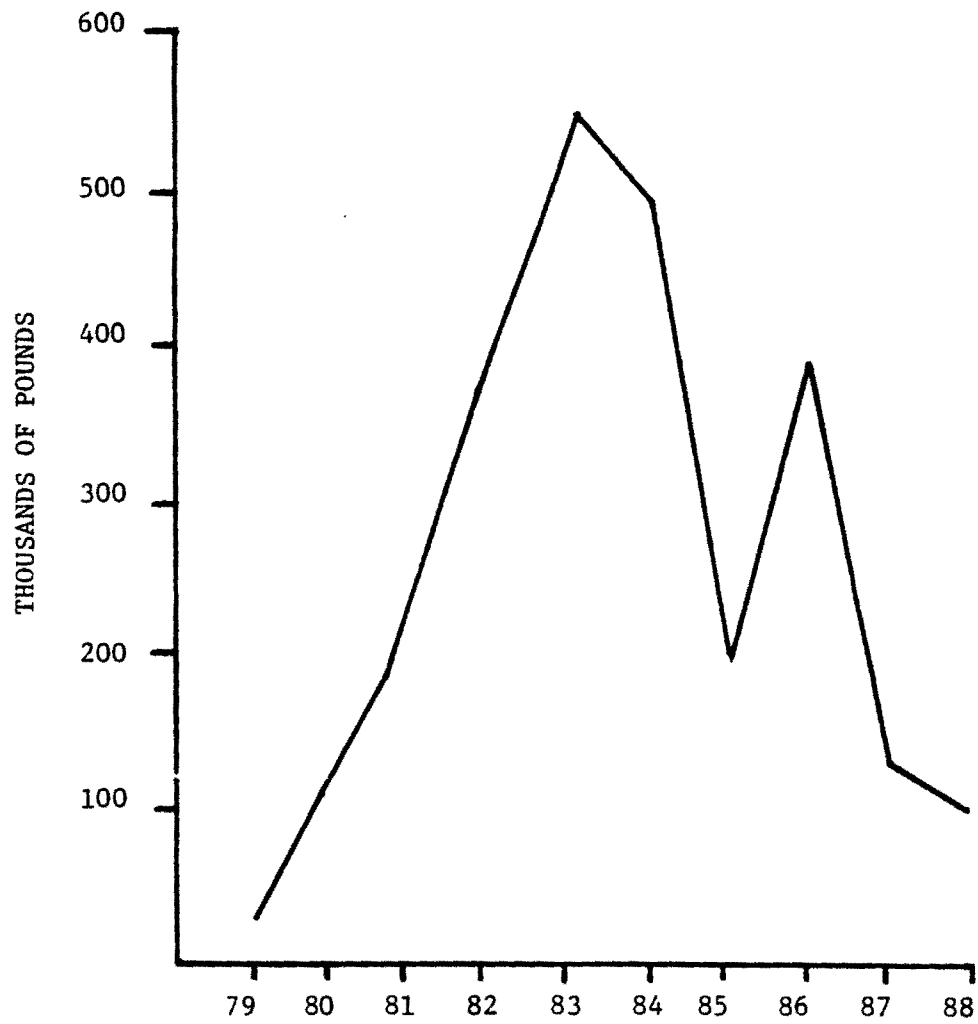


Fig. 26. Landed weight of commercially produced tilefishes.

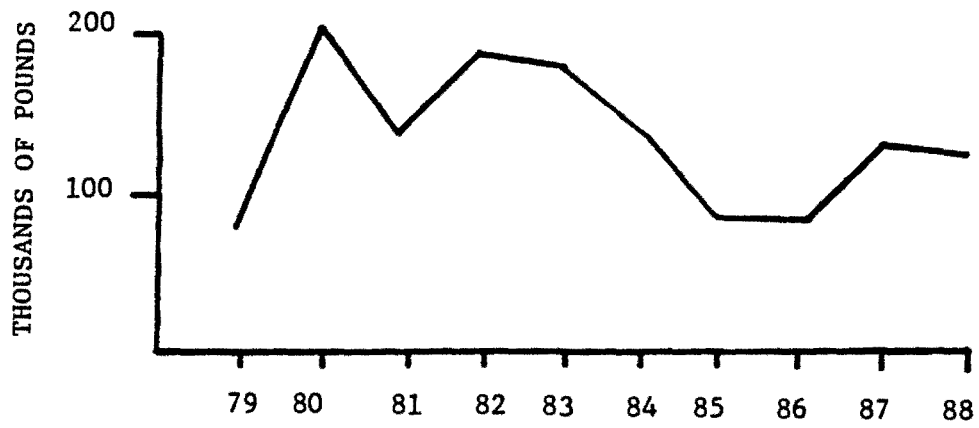


Fig. 27. Landed weight of commercially produced king mackerel.

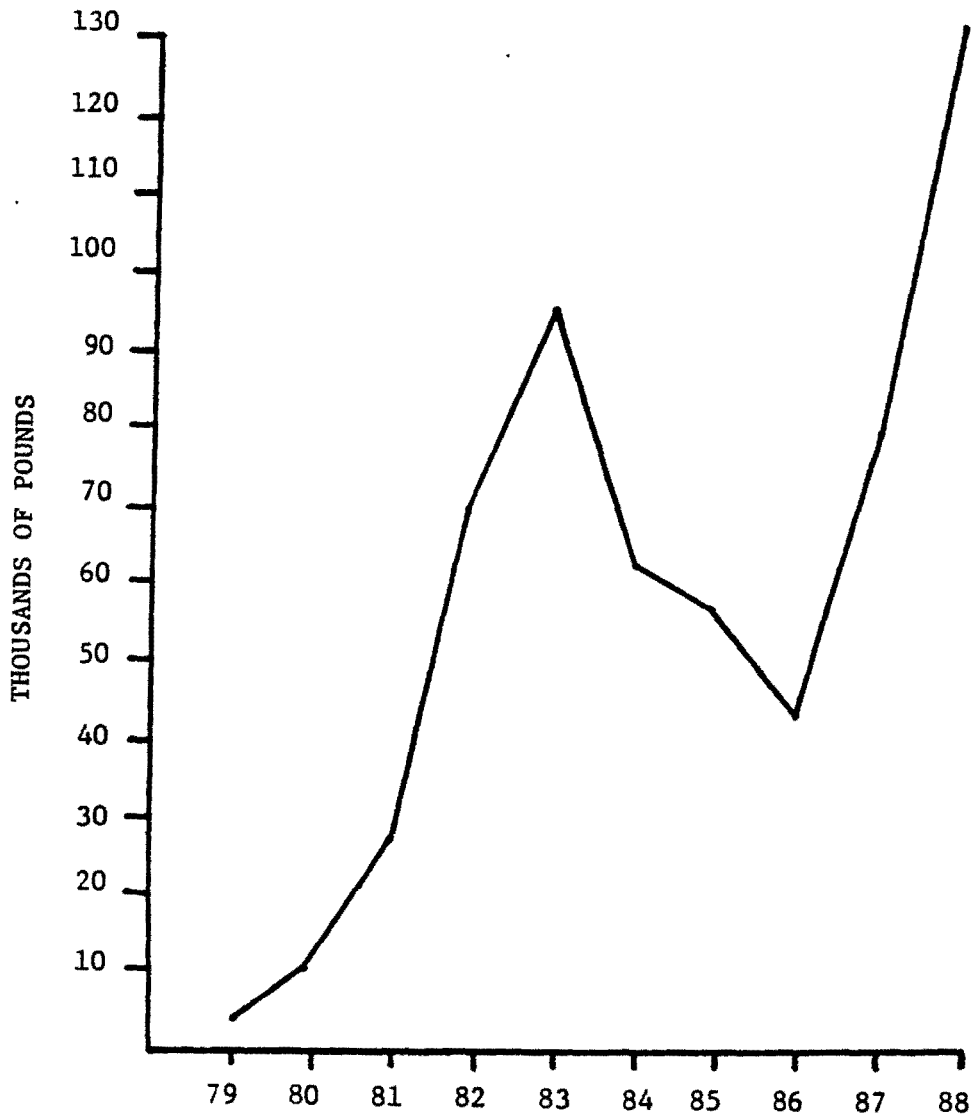


Fig. 28. Landed weight of commercially produced offshore

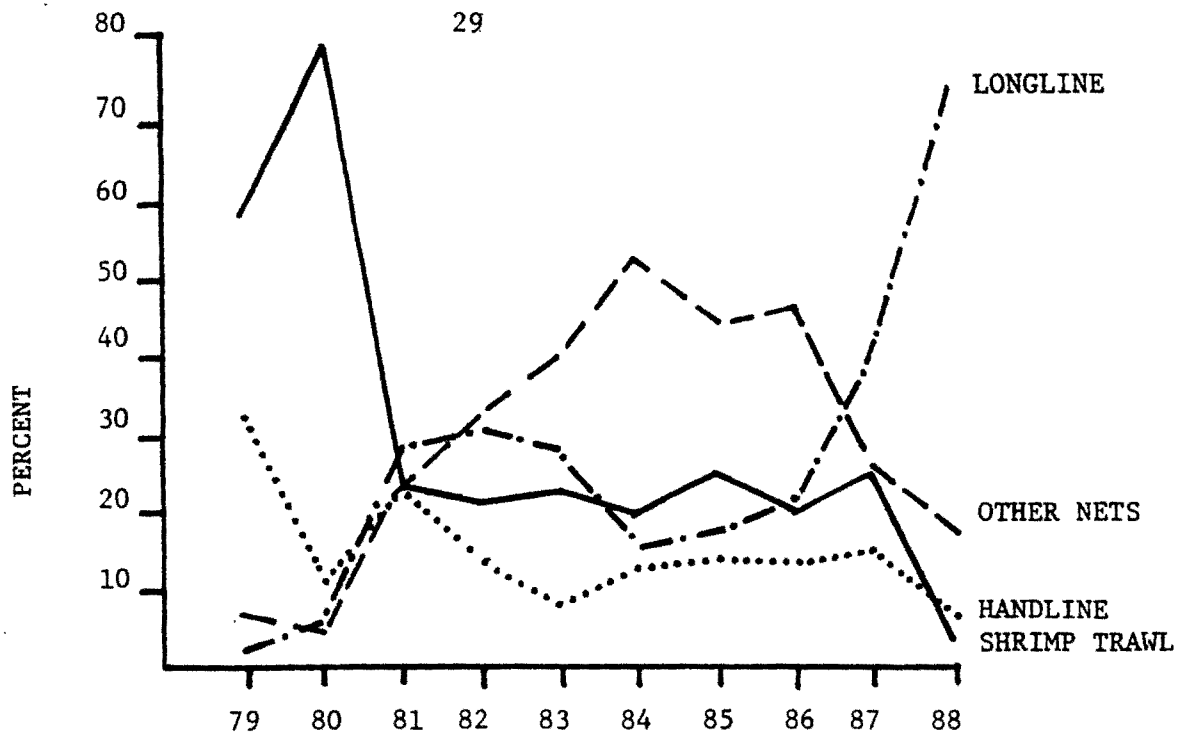


Fig. 29. Percent contribution of various gears to commercial shark landings.

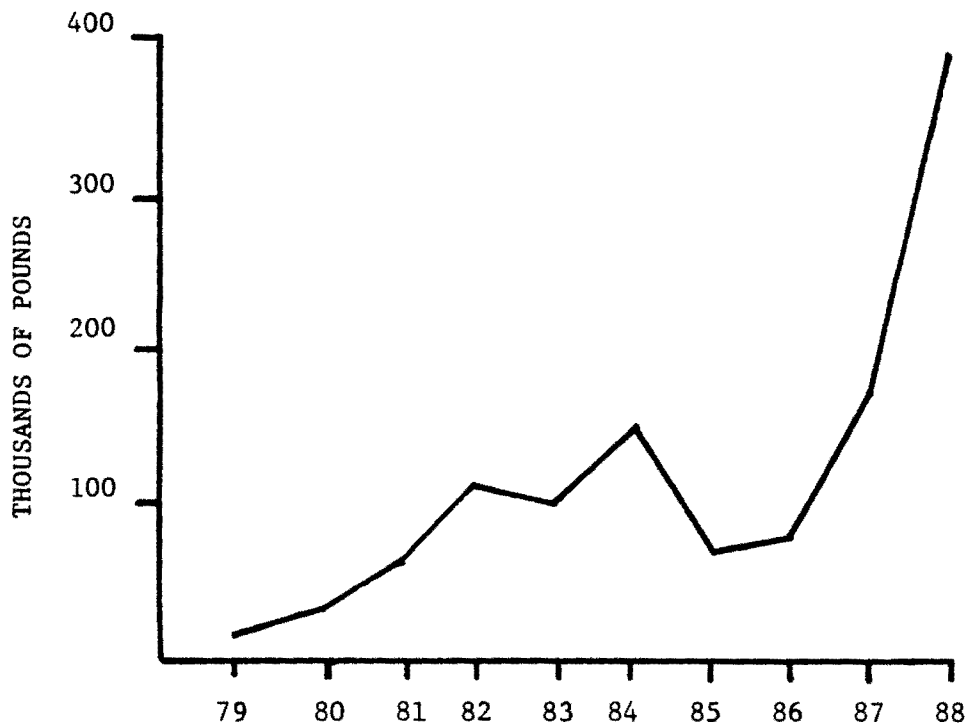


Fig. 30. Landed weight of commercially produced sharks.



Fig. 31. Source of commercially produced shark catches.

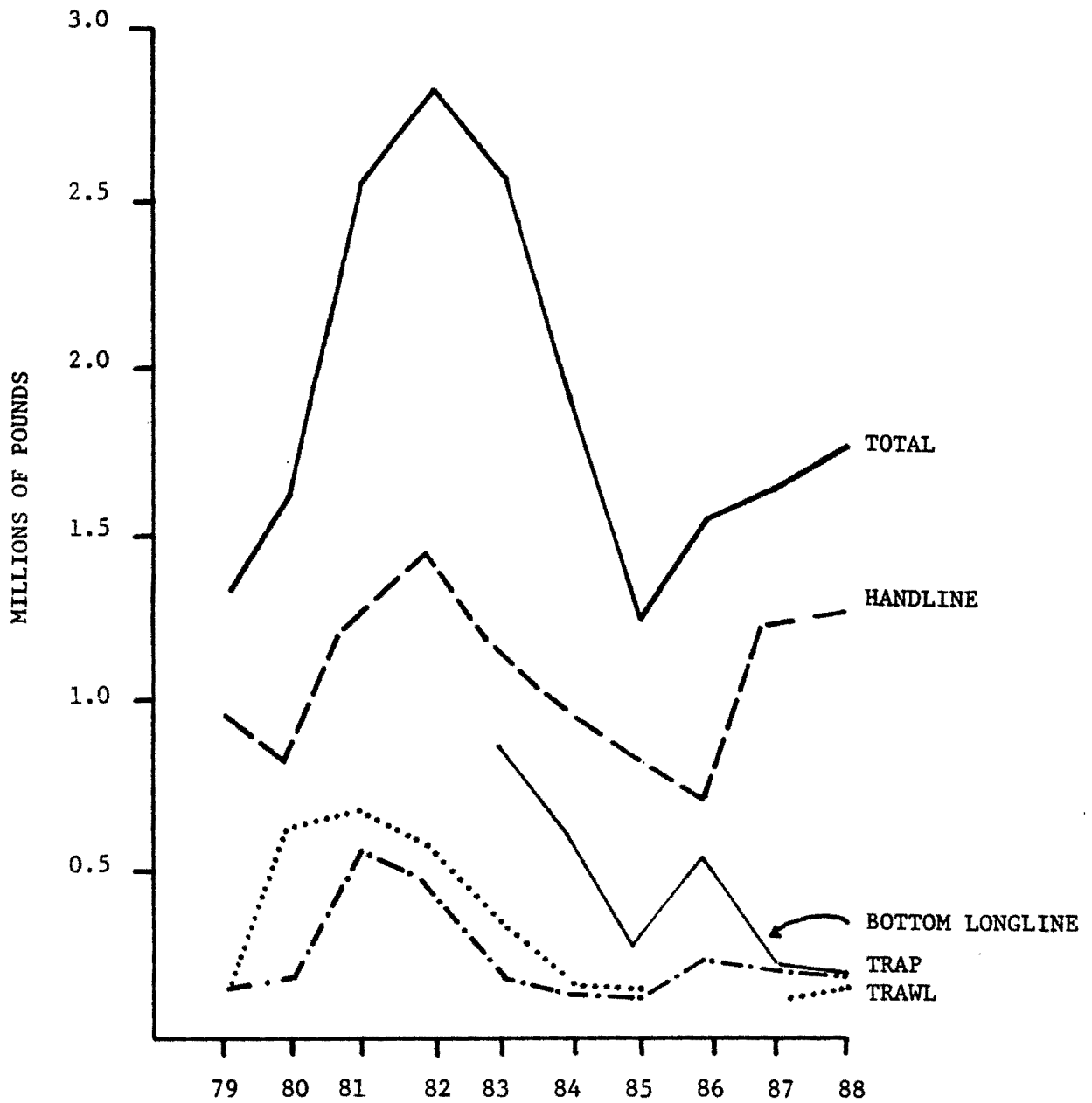


Fig. 32. Landings of reef fish (excluding wreckfish) by commercial gear type. The 1985, 1986, and 1987 trawl landings are confidential.

dealers were involved. In 1988, there was increased activity, with an estimated 50 trips being made compared to about 65 in 1984, the last year of substantial fishing. Most of the catch consisted of vermilion snappers. Average overall production was about 3,000 pounds per trip, virtually the same as in 1984. In January 1989, an amendment to the South Atlantic Fishery Management Council's snapper-grouper plan prohibited the use of trawl gear in the directed snapper-grouper (reef fish) fishery. This step was taken in response to concerns about physical damage to the live bottom habitat and continued landings of very small vermilion snappers.

Trap Fishery

This fishery, which targets black sea bass, has operated mainly between January and April. Although trap designs have been tried over the years, most have not proved to be consistently effective in commercial application locally on other reef species. Virtually any type catches black sea bass, but the standard gear has been the wire crab trap. The minimum retention size of the mesh in this gear corresponds to the minimum size limit of 8 inches. Since March 1987, the use of traps on 11 of South Carolina's permitted artificial reefs has been prohibited. Neither of these regulations is believed to have had any appreciable impact on the commercial trap landings. Estimated average trip production in 1988 (1,096 pounds) was only slightly below that during the most recent years (1981-1982) of peak production.

The level of participation and effort has depended largely on the relative abundance of large sea bass (>1.25 pounds) and market conditions. In 1988, the estimated number of trips (173) was slightly greater than in 1984, but only about half of the 1981-1983 level despite comparable trip CPUE. Large landings of small fish probably depressed effort. Many operators do not fish unless the large valuable fish comprise at least 30% of their catch and few like to land large quantities of small fish because of limited demand and low prices. The percentage of smalls in trap landings has steadily increased over the last ten years (Fig. 25) and has been at unprofitable levels the last few years.

Bottom Longline Fishery

Until recently, the bottom longline fishery has mainly targeted (golden) tilefish and snowy grouper in moderately deep (70-140 fathoms) water. Landings of deep-water grouper have declined moderately since 1986, while tilefish landings have decreased to 25% of the 1986 catch. In 1988, the estimated number of trips (101) was a little over half of the 1984 level of effort. By far the major component of the 1988 landings was sharks.

Surface Longline Fishery

This fishery targeted swordfish exclusively until very recently. In 1988, there were about 15 boats still making occasional landings in South Carolina, down appreciable from the fleet of a few years ago. Estimated effort was 156 trips. Because of the greatly reduced abundance of

swordfish in the South Atlantic Bight, many vessels left to fish elsewhere. Others shifted their main effort to other species. Because of the high costs associated with swordfishing, many operators limited their swordfishing trips to periods of peak catchability.

COASTAL FISH

This category includes species taken in state waters (out to three miles from the beach), except for anadromous fish. Unlike for offshore fish, the unit value of most species has been typically low.

In 1987 and 1988, coastal fish represented 5% of the state's total commercial seafood landings by weight and 2% by value. Overall landings (Fig. 33) showed no significant variation from the levels of recent years. The 1987 haul seine landings were confidential. As is normally the case, the haul seine fishery on the Grand Strand accounted for most of the production in 1988. This fishery has usually lasted about two months and targeted the fall migrations of mullet and spot. Production has been heavily dependent on weather, movements of the fish, and market conditions. Landings of mullet have trended downward (Fig. 34), while those of spot have been fairly high. Landings in earlier years, however, may have been overestimated because of questionable reporting.

Both species have also been harvested with gill nets. Although the use of gill nets has been severely restricted since 1987, relatively large catches of spot and mullet were reported for gill net gear in both 1987 and 1988. The principal coastal species landed was spot.

Most of the remaining volume of coastal fish (excluding sharks) consisted of kingfishes (whiting) and flounders landed by trawlers. Although most of the landings were bycatch of the shrimp fishery, a few boats were permitted for a coastal trawl fishery off the Grand Strand during January through April. The principal finfish targeted by these vessels was summer flounder, although the 1988 landings were only a few thousand pounds. The annual catch (Fig. 35) of both kingfishes and flounders has varied similarly and has probably reflected the level of effort by shrimp trawlers more than any other factor. During 1987-1988, landings of kingfishes were higher than those of flounders. A recent bycatch study indicated that most of the flounders retained by shrimp trawlers were southern flounder and this was also the species most likely to have been caught in inshore gears. Although the reported landings have not been broken down by species, it is probable that most of the recent commercial landings of flounders have consisted of southern flounder.

RIVER FISH

This category includes shads (hickory and American), blueback or river herring, eels, and catfishes. The sturgeon fishery has been closed since 1985 due to the depressed stock status of Atlantic sturgeon. Scientists have projected that recovery of Atlantic sturgeon populations will take many years.

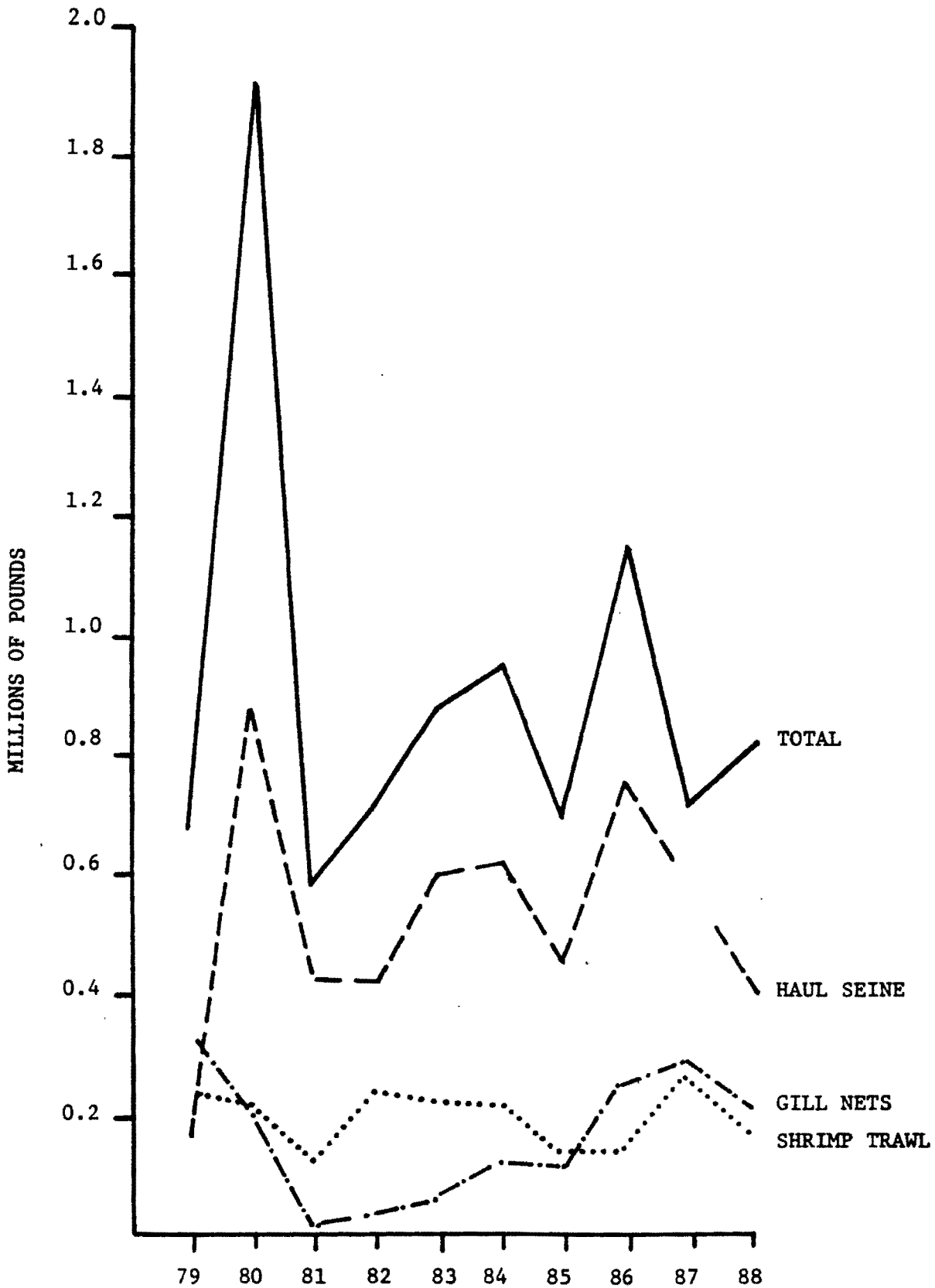


Fig. 33. Landed weight of commercially produced coastal fish.
The 1987 haul seine landings are confidential.

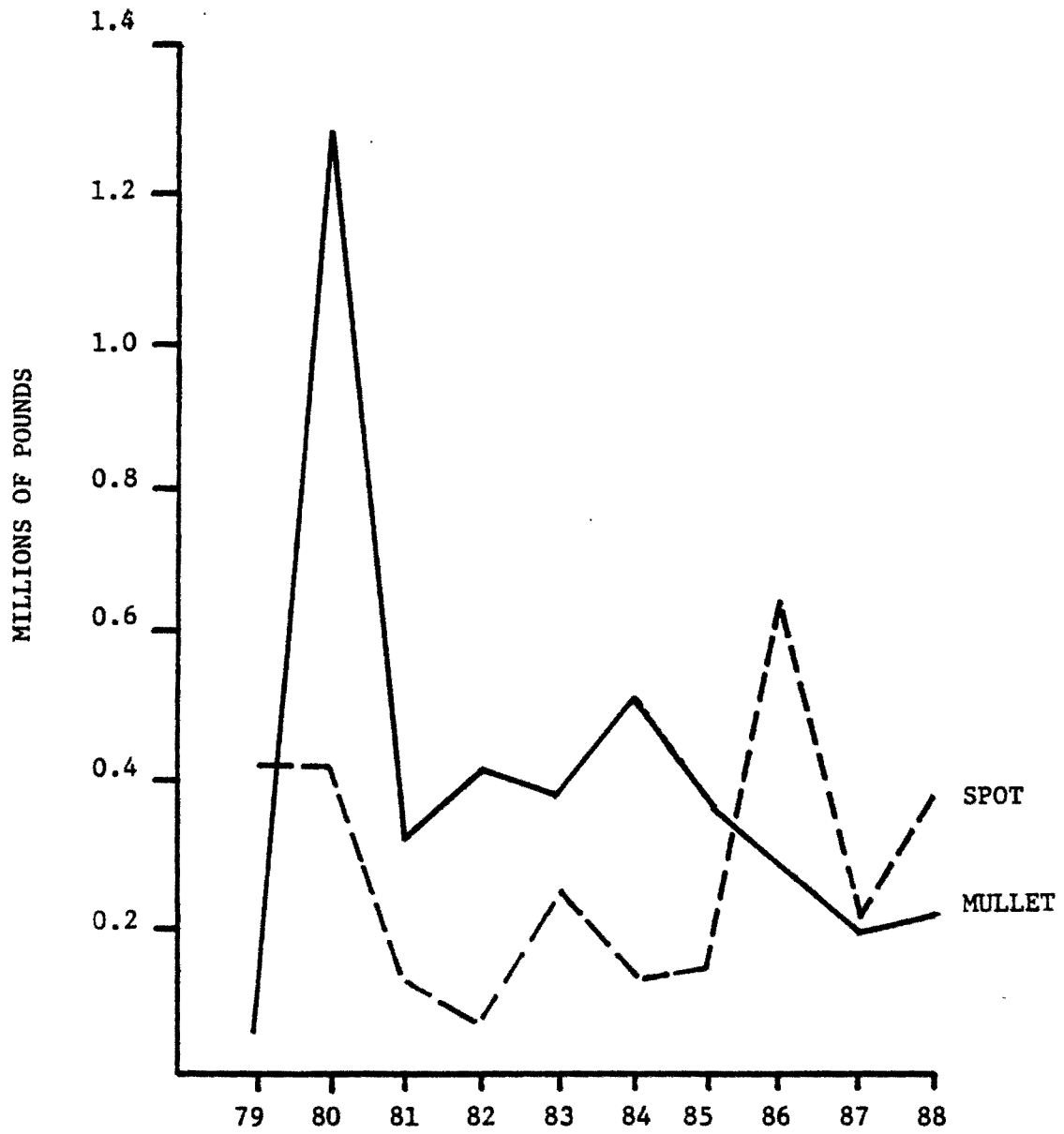


Fig. 34. Landed weight of commercially produced spot and mullet.

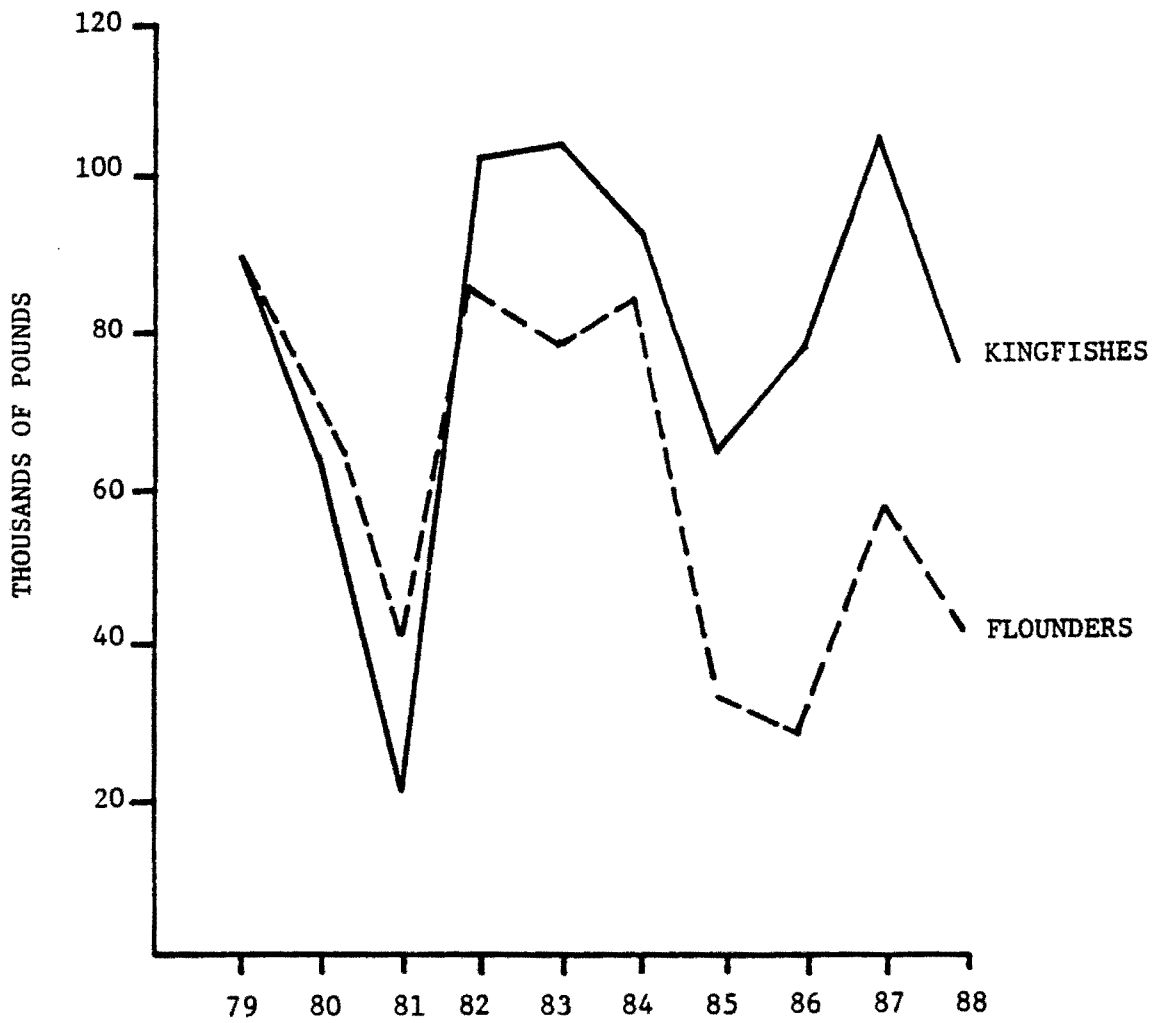


Fig. 35. Landed weight of commercially produced kingfishes (whitings) and flounders.

Landings of catfishes and blueback herring have been confidential in recent years. Catfish production has declined greatly, in part because of competition from farm production. Blueback herring have been taken by small fisheries operating on the Cooper and Santee Rivers during a February-April season. Production, which has been highly variable, has been used mostly for crab bait.

The shad fishery (primarily for roe American shad) consists of an ocean fishery off Winyah Bay, a lower river fishery in a half dozen or so major rivers, and an upper river fishery. Fishery managers have expressed concern over ocean fisheries because of the unknown relative rates of interception of mixed stocks, i.e., fish from different geographic areas and natal rivers. During the 1986-1988 seasons, MRD conducted tagging studies to determine the identity of intermingled stocks that contribute to the South Carolina ocean fishery. Results indicated that the vast majority of the shad found in the Winyah Bay ocean fishing area are headed for South Carolina rivers. Most of these fish are bound for rivers in the Winyah Bay-Waccamaw-Pee Dee drainage. The general movement of shad along the South Carolina coast is southward and only fish from rivers in South Carolina, Georgia, and the St. John's River (Florida) appear to be impacted by the ocean fishery.

In most lower river areas, the season has been open during February-April, with upper areas remaining open for a few weeks after the lower areas have been closed. Landings figures are not comprehensive because an unknown portion of the catch is sold through illegal channels. Most of the late season (upper river) production has been sold directly to local consumers and has probably been underestimated in reported landings.

Market factors appear to have considerable impact on annual fishing effort and shad landings. River conditions have a significant impact on gear efficiency and catch rates may have reflected availability to a greater extent than abundance. The spring of 1987 was characterized by normal to above normal rainfall, resulting in full to high river levels. Otherwise, weather conditions were near normal with a spring warming trend. Such conditions are conducive to good shad runs and gear efficiency, thus these factors could have contributed to the relatively high landings in 1987 (Fig. 36). In contrast, near drought conditions in the spring of 1988 produced low river levels and there was a late cold spell that delayed the rise of coastal water temperatures. There was also a "red tide" bloom in coastal waters during late winter. All of these factors generally contribute to erratic shad runs and reduced gear efficiency and the lower 1988 landings could have resulted from these conditions.

The shad populations in most of the major rivers, while thought to be fairly stable, have probably been harvested at close to their maximum potential in recent years.

RECREATIONAL FISHERIES

About 8% of the coastal households contacted in the 1987 MRFSS survey contained a member who went salt water sport fishing. The trend in participation is shown in Fig. 37. In

1988, the figure was 7.5%. The 1982 and 1984 values are anomalously high, presumably due to sampling error, and should be disregarded. Overall participation increased in 1988 following three years of apparent decline, with moderate increases in each residential category. Effort (Fig. 38) also increased, reversing a three-year decline.

In 1988, fishing from private boats represented 51% of the total effort, 43% was accounted for by shore fishing, and 6% was attributable to charterboats. Coastal residents accounted for the largest portions of private boat (70%) and shore effort (49%), while 76% of the charterboat trips were made by out-of-state residents.

MRFSS catch estimates have been subject to significant sampling error, depending on such factors as the number of anglers interviewed and catches inspected (sample size), the range in numbers of fish in individual catches, and the frequency of their occurrence. When particular species are of interest, correct identification is essential. Misidentification can cause gross errors in the estimated catches of similar species (e.g. red snapper and red porgy, summer and southern flounder). These factors must be kept in mind when evaluating the results of the MRFSS. The absolute values shown for most of the species in Table 1 are probably rather meaningless. For the most frequently caught species, their relative ranking and long-term trends in catch are probably fairly realistic.

Given these limitations, some tentative conclusions for 1987 and 1988 can be drawn. Spot and black sea bass were the most numerous fishes caught, as well as among the most frequently reported. Landings of both in 1987 were relatively low compared to previous years. The 1987 king mackerel catch was down considerably from the long-term average, while the lower Spanish mackerel catch partly reflected the closure of the fishery on 19 September. Catches of red drum and spotted seatrout were both relatively high, with that of red drum being the largest reported to date. The total catch of all species was the lowest since 1979.

In 1988, landings of spot increased greatly and were the second-highest of the ten year period. Black sea bass landings remained at a relatively low level. The king mackerel catch rose substantially, but was still nearly 20% below the 1980-1987 average. Spanish mackerel landings also posted a considerable increase. Landings of the most popular inshore species, i.e., red drum, spotted seatrout, and flounders, were all above average. The red drum catch slightly exceeded that in 1987 and probably reflected continued strong recruitment as well as increased effort. Landings of spotted seatrout since 1984 have been higher and more stable than during the early 1980's, probably as a result of a succession of mild winters. The total recreational hook-and-line fish catch in 1988, while higher than in 1987, was relatively low for the ten year period. Overall landings, however, appear to be more stable in recent years, which raises the possibility of significant estimation errors as a source of the extreme fluctuation characteristic of earlier MRFSS

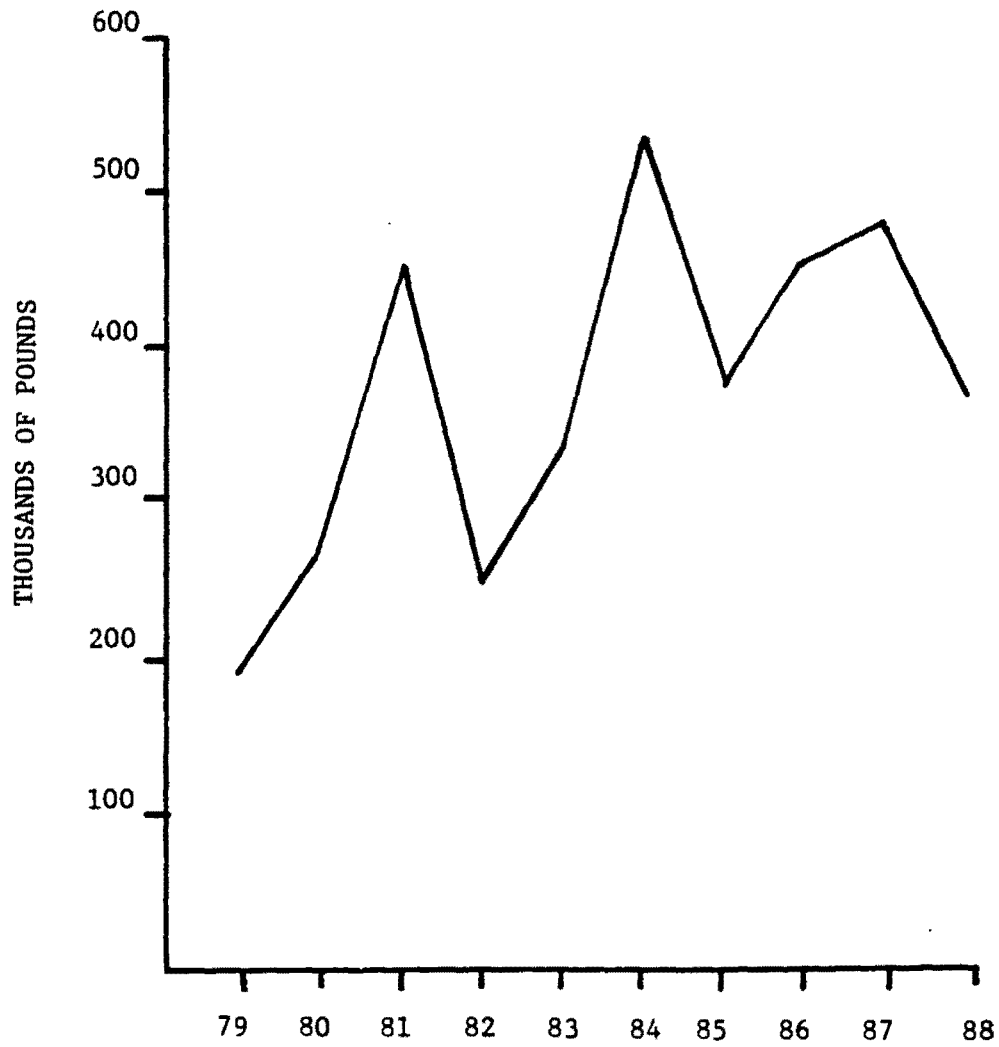


Fig. 36. Landed weight of commercially produced shad.

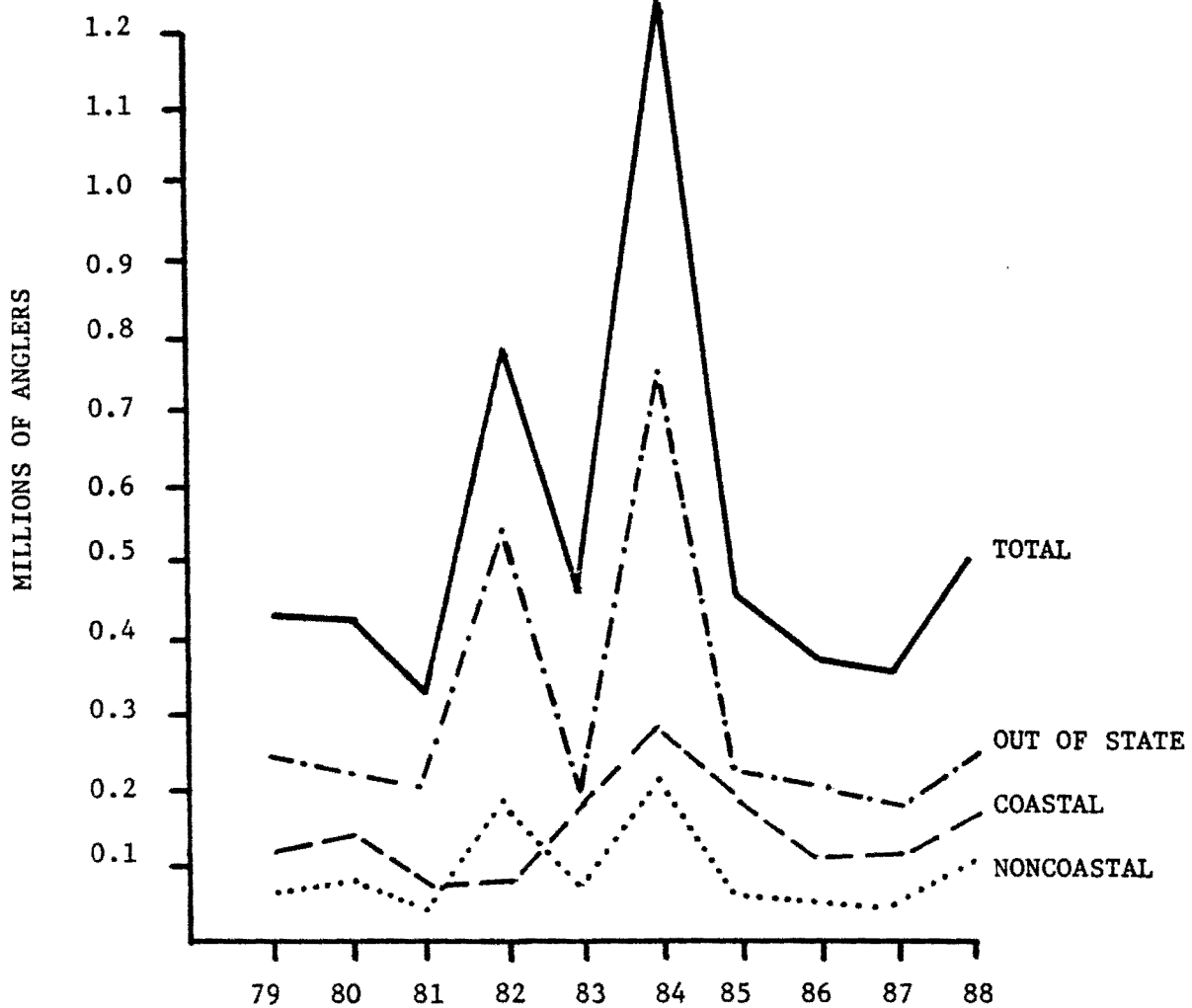


Fig. 37. Estimated number of anglers in the South Carolina marine recreational hook-and-line fishery.

(Data source: NMFS MRFSS)

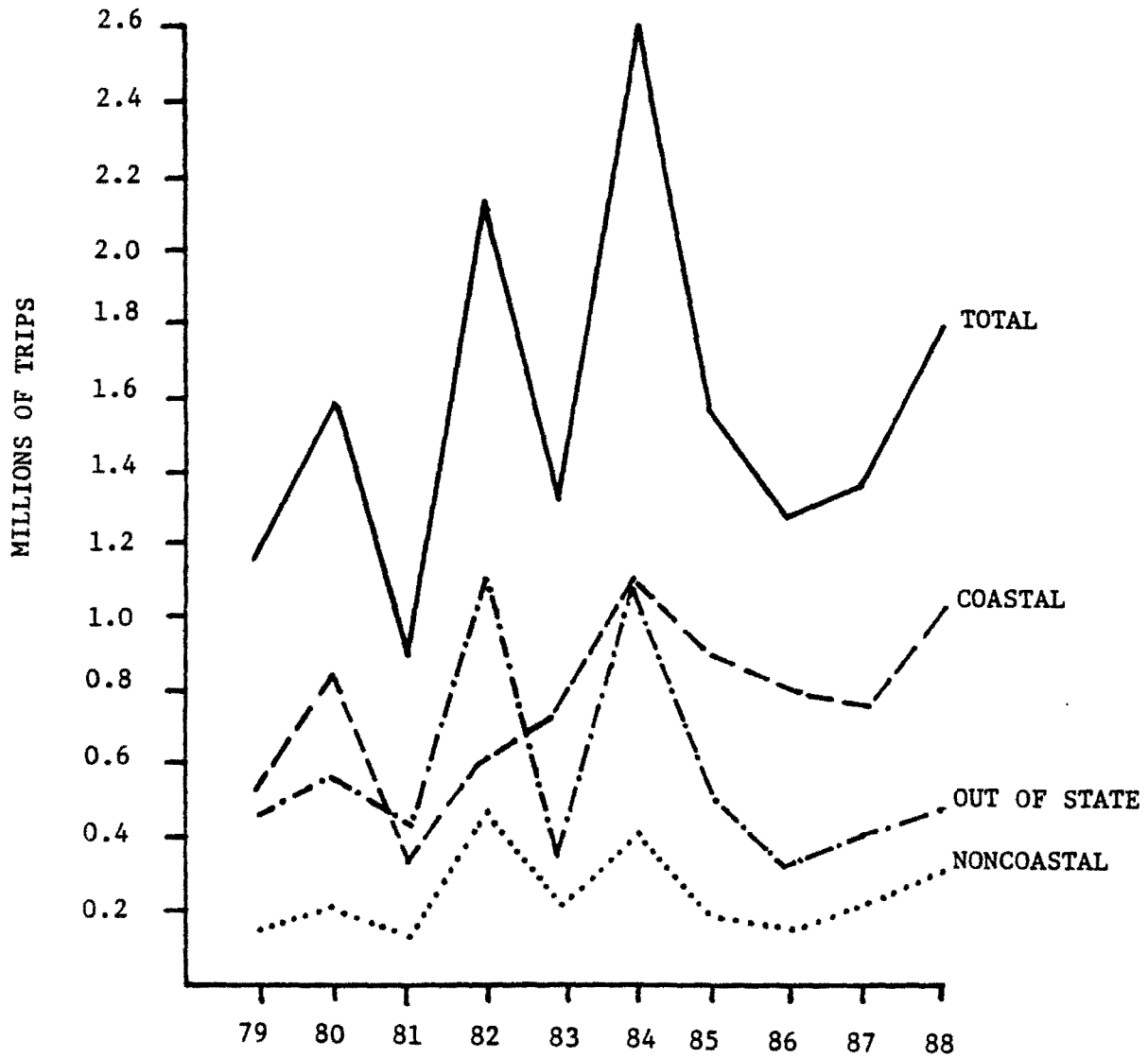


Fig. 38. Estimated number of trips in the South Carolina marine recreational hook-and-line fishery (excluding headboats).

(Data source: NMFS MRFSS)

Table 1. Estimated catch of South Carolina marine recreational anglers (excluding headboat fishermen), in thousands of fish. NR = not reported, # = less than 30,000 fish.

Category	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Offshore Pelagics										
Dolphin	#	36	NR	NR	NR	#	62	72	#	#
Little tunny/bonito	NR	#	#	NR	#	#	#	34	#	#
Tunas/mackerels	#	#	NR	#	NR	#	41	65	#	#
Offshore Bottomfish										
Black sea bass	) 456	2,415	3,108	3,106	860	4,683	1,231	531	732	750
Sea basses	)	#	#	610	60	392	43	#	#	#
Groupers	NR	NR	NR	NR	#	60	42	#	#	#
Vermillion snapper	#	NR	#	4,291	#	1,688	286	#	#	#
Other snappers	244	#	134	33	33	126	52	#	#	#
Red porgy	NR	NR	103	2,802	52	633	118	#	#	#
Other porgies	NR	#	44	39	#	171	34	NR	47	#
Grunts	#	#	84	1,577	60	523	387	NR	#	50
Triggerfish	#	#	#	230	#	62	#	#	#	#
Coastal Pelagics										
King mackerel	#	194	188	106	83	93	157	254	71	116
Spanish mackerel	#	104	515	128	#	212	57	163	69	101
Bluefish	233	458	50	494	215	355	571	159	177	139
Jack crevalle	NR	#	NR	#	48	#	#	69	63	#
Blue runner	NR	54	NR	31	#	81	#	NR	#	#
Amberjacks	NR	NR	#	#	#	40	#	33	#	#
Jacks	#	#	NR	NR	NR	#	#	#	#	NR
Barracuda	NR	#	NR	#	#	#	#	62	#	#
Inshore Game Fish										
Red drum	66	207	47	141	91	142	456	196	509	511
Spotted seatrout	36	502	30	711	181	163	325	576	444	365
Summer flounder	) 80	#	#	#	47	93	NR	NR	45	47
Southern flounder	)	119	#	48	#	54	225	206	65	102
Flounders	#	#	#	41	#	#	NR	NR	#	#
Weakfish	NR	81	#	#	#	#	59	78	#	#

Category	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Inshore Bottomfish										
Kingfishes	251	545	168	533	98	156	239	1,049	474	435
Spot	869	1,852	622	1,152	1,092	1,072	2,629	1,863	757	1,960
Croaker	51	625	274	228	167	1,236	440	616	227	251
Black drum	#	#	#	#	#	#	#	#	#	#
Sheepshead	300	54	#	#	73	51	96	70	#	75
Pompano	NR	208	44	45	#	76	70	159	98	56
Miscellaneous										
Sharks	71	215	42	170	364	188	134	207	391	161
Skates/rays	#	48	#	38	#	37	#	32	45	36
Eels	#	#	#	#	#	#	#	#	#	#
Herrings	#	456	139	#	392	576	#	57	#	NR
Catfishes	111	785	46	450	322	274	345	253	631	496
Toadfish	79	261	35	133	80	113	169	138	198	118
Sea robins	NR	63	57	#	#	#	NR	NR	#	#
Pigfish	NR	NR	73	123	54	#	#	#	95	117
Pinfish	#	50	75	83	259	416	305	173	677	510
Silver perch	#	165	#	#	98	#	51	#	60	33
Mulletts	NR	244	1,468	48	1,182	990	481	84	90	NR
Puffers	NR	#	#	#	#	#	32	70	#	#
Total	3,119	10,088	7,659	19,254	7,663	15,234	9,448	7,527	6,416	6,870

estimates.

Headboat Fishery

South Carolina headboats fished primarily for bottom-dwelling reef fish, with minor landings of pelagic species such as king mackerel and dolphin. Inshore boats fished within 20 miles of port and targeted black sea bass. Offshore or "Gulf Stream" boats fished from 30 to 70 miles out for porgies, snappers, and groupers. Numerous species contributed to the landings of both groups. Most of the headboats operated out of Little River and Murrells Inlets, although there were several in the Charleston area. Fleet size remained fairly stable over the last five years.

NMFS has conducted an annual survey of the Carolinas fishery since 1972. Landings and effort are shown in (Fig. 39). Data for 1988 are not yet available. After several years at a stable level, estimated effort increased by 17% in 1987 to the highest level ever reported. The estimated total catch also increased substantially and was the largest reported since 1982. The percentage of offshore effort (39% of all angler-days) was the highest to date.

Overall landings of each major species or species group (Fig. 40) were up in 1987, continuing the general trend since 1984. The increase in catch, however, was offset by the increase in effort. Fishing success (as measured in pounds of fish per angler-day) has fluctuated widely for offshore fishermen over the last ten years (Fig. 41). The 1987 figure was 11% below the 1977-1986 average. This reflected the changes in species and size composition of the offshore landings. The catch rate of the former major species, red porgy (Fig. 42), has declined considerably. The 1987 figure was 44% below the 1977-1986 average. Average individual size has also declined markedly, with the 1987 average weight being only 55% of that observed during 1977-1978. Vermilion snapper, a considerably smaller fish, has replaced red porgy as the principal species in the offshore landings.

Inshore fishing success has been more stable, but has also trended slightly downward. In 1987, the average inshore catch rate was 12% lower than the 1977-1986 average. This closely reflects the decline in average landings per angler of black sea bass, down 11% in 1987 from the ten year average. The 1987 inshore catch rate of this species was the second-lowest since reporting began.

Gill Net Fishery

The Commercial Finfish Management Section sent a mail-out survey to fishermen licensed for 1987. The survey addressed their activities during the season just prior to the 1987 restrictions. About 49% of the gill net fishermen responded. Of these, 92% were recreational fishermen. Following passage of the 1987 legislation, license sales dropped sharply (Fig. 43).

Most (59%) of the recreational netters fished in the ocean. About 24% had their nets in the bays or sounds and 17% fished in the creeks. The percentage of respondents fishing during a season was highest in the fall, followed by the

summer. Less than 20% of the respondents indicated that they fished nets during December through April.

The principal species harvested (based on the percentage of respondents catching them) were spots (70%) and mullet (66%). About 37% of the recreational netters reported catching spotted seatrout and red drum, while 6% reported catching flounders. Bluefish, kingfishes, croaker, and sharks were reported caught by at least 10% of the netters.

Gill net fishing has been a popular fall activity along the Grand Strand ocean beaches and was probably less impacted by the new restrictions than most other types of gill net fishing. The most numerous fish harvested has been spot, followed by menhaden and bluefish. The other species observed in catches (kingfishes, spotted seatrout, red drum, and pompano) have in aggregate represented less than one percent of the catch by number. Most of the oceanfront gill netting has taken place between the Springmaid Beach pier and 32nd Avenue North in Myrtle Beach. Other traditional fishing areas have been at Garden City Beach, Atlantic Beach, and Cherry Grove Beach. In addition to the growing opposition of many recreational fishermen to gill netting, this fishery has continued to experience problems associated with diminishing access to beaches, discarded by-catch on the beaches, and congestion of gear in more popular areas.

Shellfish Gathering

During January-March 1988, the Recreational Fisheries Section obtained harvest and effort data from recreational shellfish gatherers at 11 access sites, which provided potential access to 24 state and public shellfish grounds. Nearly all of the gatherers interviewed were from the coastal counties and they averaged two previous trips for the season.

About 90% of the intercepted gatherers indicated that the public or state grounds were the primary location where they had harvested their shellfish. The remaining people had either worked culture permit areas or didn't know the classification of the grounds. Nearly 88% of the gatherers went to grounds accessible only by boat.

Oysters were the target of 70% of the gatherers. Six percent sought clams, while the remainder had no preference. The average harvest was about 0.9 bushels of oysters and 0.06 bushels of clams per person per day. Most of the clams were taken incidental to oyster harvesting. These harvest rates were substantially lower than those reported during the 1980-1981 season, when the last shellfish survey was done.

Most gatherers rated the quality of the state and public grounds as average in terms of the quantity and quality of oysters available. The Murrells Inlet area (which was closed during February due to red tide) received poor ratings in both categories. The southern area had mixed ratings between low and average, attributable to the 1986-1987 *Dermo* outbreak. The Charleston County grounds received the highest ratings for

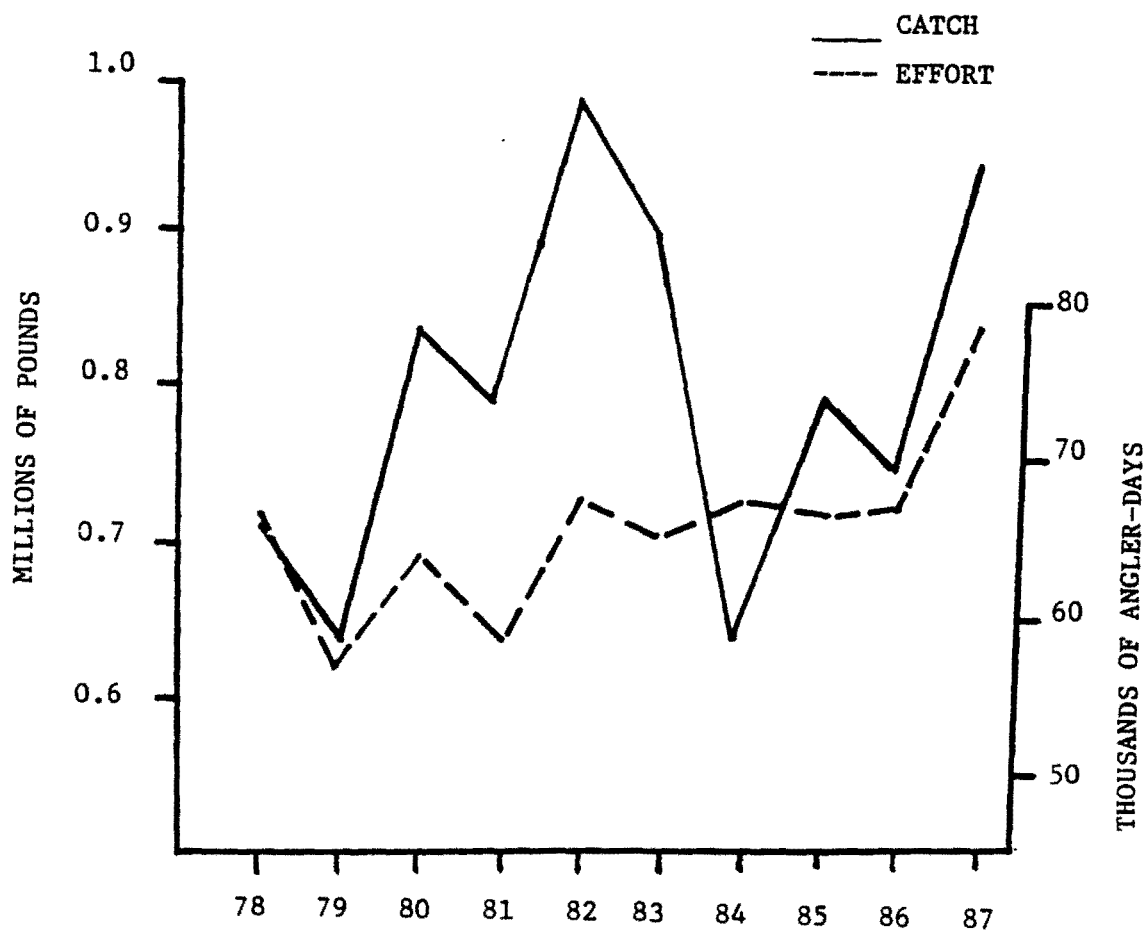


Fig. 39. Estimated annual headboat catch and effort.
(Data source: NMFS Beaufort, N.C. Lab.)

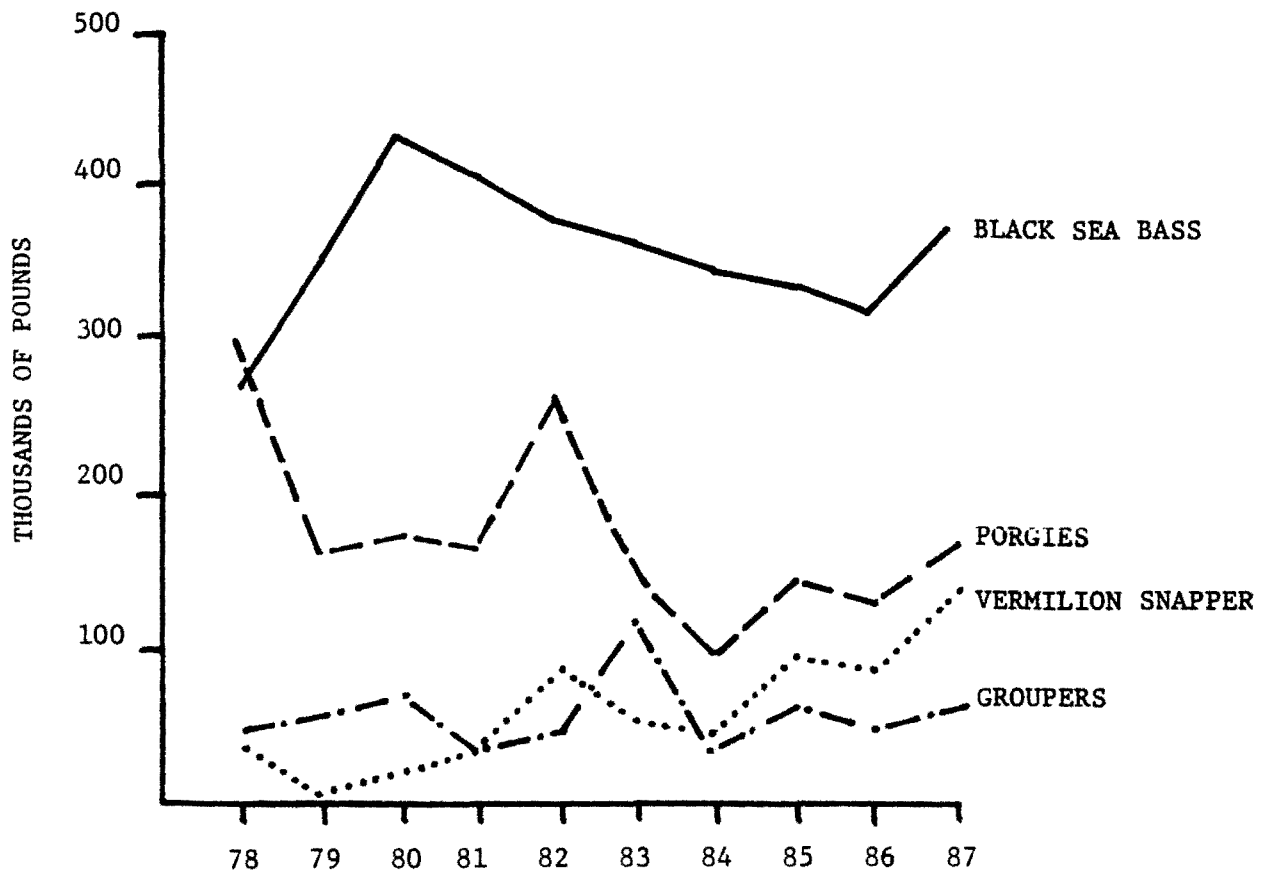


Fig. 40. Landed weight of principal species in the South Carolina headboat catch.

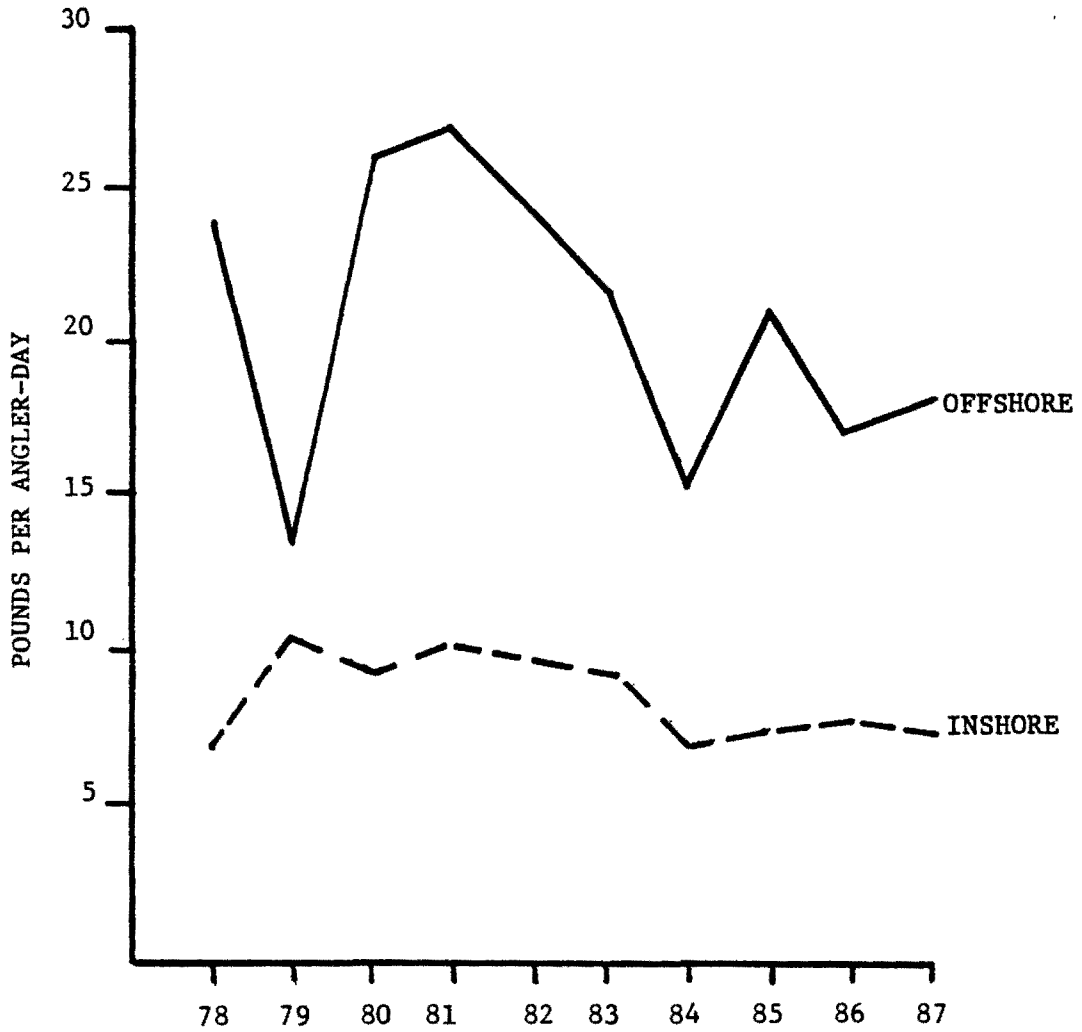


Fig. 41. Catch rates of inshore and offshore headboat anglers.

(Data source: NMFS Beaufort, N.C. Lab.)

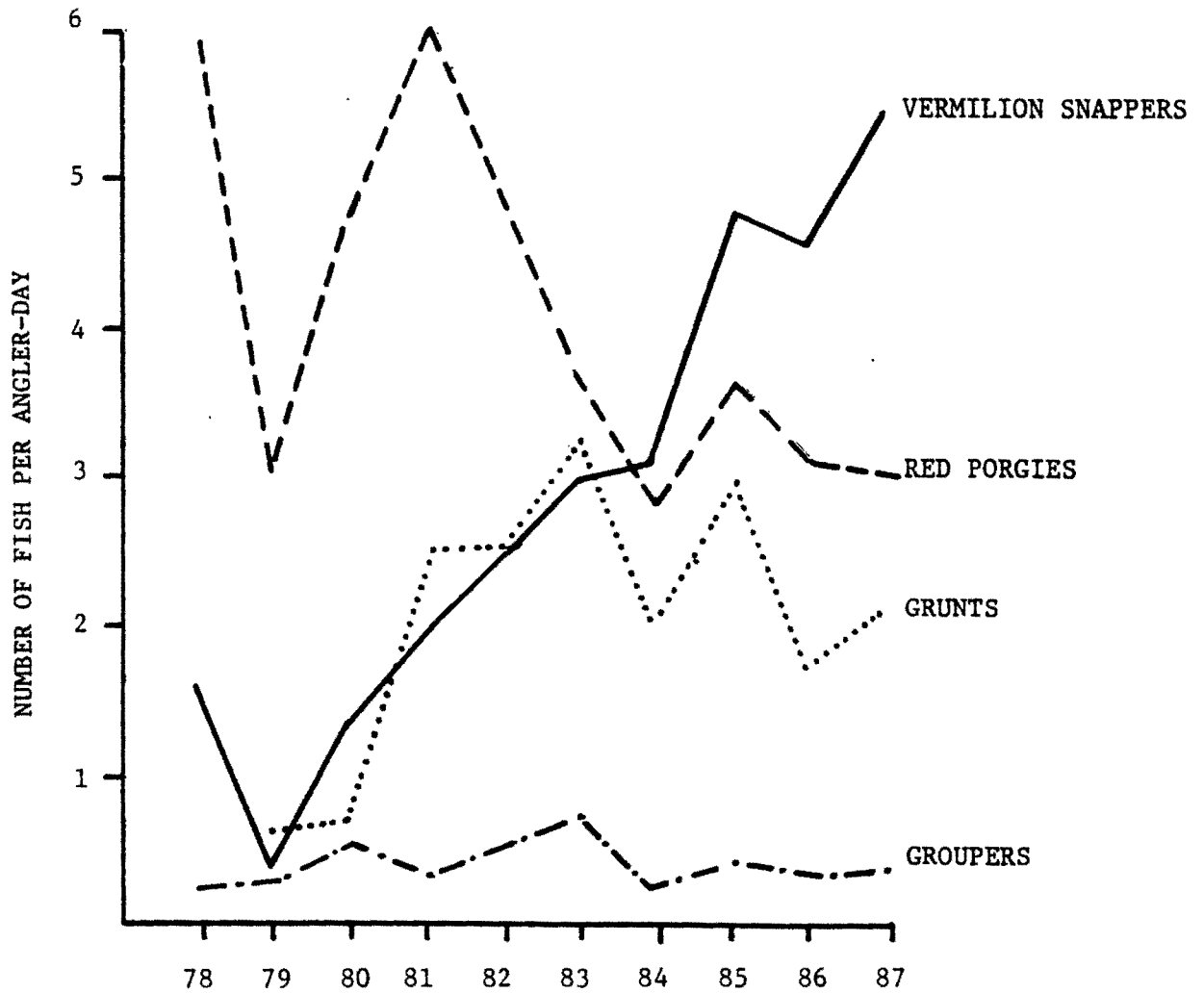


Fig. 42. Average catch composition of offshore headboat landings.

(Data source: NMFS Beaufort, N.C. Lab.)

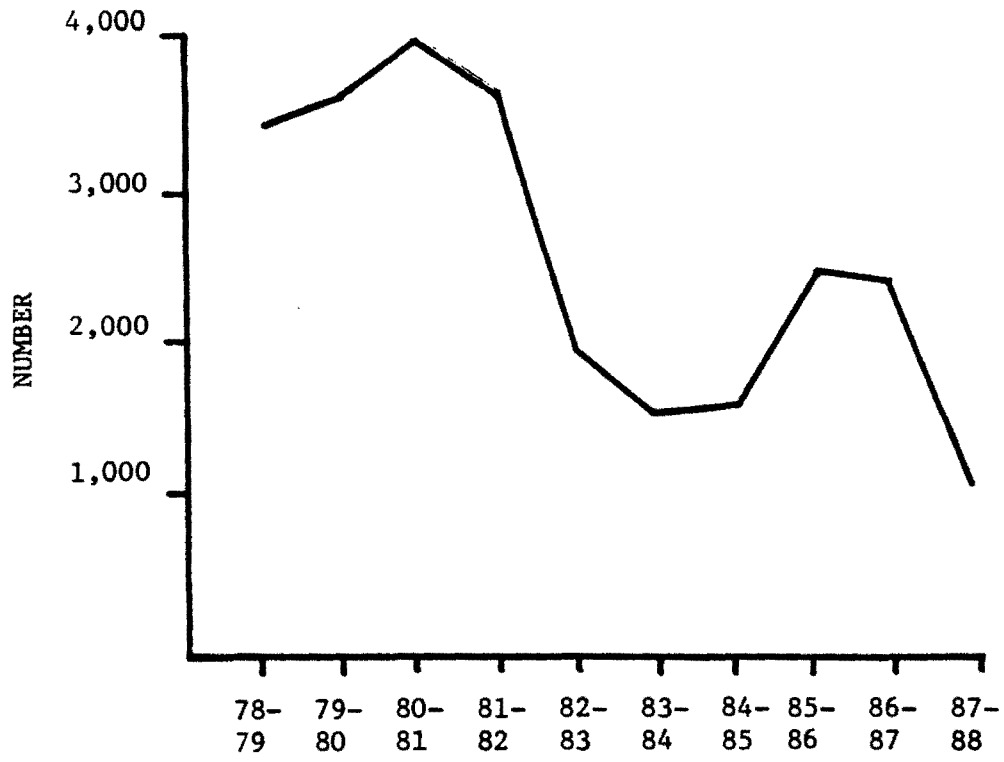


Fig. 43. Number of gill net licenses sold per fiscal year.

both quantity and quality.

Shrimp Baiting Fishery

The practice of cast netting for shrimp over bait became widespread during the 1986 season, possibly in response to a good crop of white shrimp. The 1986 and 1987 sessions of the General Assembly took no action, although numerous options for controlling this controversial fishery were presented. The only restriction in place (since 1983) was a prohibition on sale of shrimp taken over bait. Lack of accurate information on participation and harvest contributed to the absence of additional regulatory action. The Office of Fisheries Management conducted a survey of the 1987 fall (mid-August through mid-December) fishery to obtain such information. The survey combined a creel census at public access points (to obtain catch rate data) with a mail-out survey of randomly selected registered boat owners (to obtain participation and effort estimates).

The survey results indicated that about 21,700 people, using 6,400 boats, participated during the fall in the shrimp baiting fishery. Average catch rates were 30-35 quarts of whole shrimp per boat (two fishermen) per trip. The estimated total catch was 1.8 million pounds of whole white shrimp. This was equal to 40% of the commercial trawler white shrimp landings and represented 29% of the total reported white shrimp catch for 1987.

Many of the perceived problems associated with shrimp baiting received media attention during the 1987 season and commercial shrimpers renewed their criticism of this activity. During the 1988 legislative session, the General Assembly enacted the Shrimp Baiting Act (no. 301). A 60 day season (to be set by MRD between 1 September and 15 November) and a 48 quart (whole shrimp) per boat per day limit were established, along with limitations on the number of poles and their spacing. A \$25 permit and pole tags were required for at least one participant per boat.

With the license requirement in place, it was possible to directly address the specific user group. This permitted an accurate definition of the level of participation and effort through a postseason mail-out survey to all permit holders. No inseason creel census was conducted, so catch estimates were based on the permit holder's recollection of their season's average catch per trip.

A total of 5,509 permits was issued for 1988. During the 17 September to 15 November season, it was estimated that 17,749 people participated and caught 1.16 million pounds of whole shrimp. The average permit holder (with 2.5 assistants) caught a little over 22 quarts of whole shrimp per trip and made about seven trips. About 59% of the shrimp baiting activity occurred in Charleston County and 35% in Beaufort County. The shrimp baiters accounted for nearly 32% of the total reported 1988 harvest of white shrimp.

Tail Race Shad Fishery

Historically, the recreational shad fishery in South Carolina has been small compared to that in other east coast states. In recent years, however, anglers have shown increasing interest in the fishery in the Tail Race Canal at Moncks

Corner. This fishery is convenient to a large angling population, is somewhat protected from inclement weather, and offers an opportunity when other sportfishing alternatives are limited.

Little information is available regarding this fishery prior to the Santee-Cooper Rediversion Project, completed in March 1985. MRD was concerned about the potential impact of the projected decrease in water volume in the Tail Race and surveyed the shad fishery immediately prior to and following the rediversion in 1985 and during comparable periods in 1986 and 1987.

The fishery usually began in late February, peaked around the moon phase in the third week of March, and declined sharply thereafter. Many anglers retained only the roe shad, so catch estimates were conservative in regard to total catch. Fishing success typically was extremely variable over even very short times intervals, which also made it difficult to accurately estimate the harvest. The following estimates should therefore be considered rough.

In 1985, fishing was very good and the catch was estimated at about 10,000 fish, which by weight would have equalled 11% of the reported statewide commercial landings. Catch rates declined sharply after the rediversion, but this coincided with the normal period of decline following the third week of March.

In 1986, low water levels and weak flow rates prevailed during most of the season, due to reduced spring rainfall. Both the percentage of fishermen targeting shad and the overall number of anglers appeared to decline. Although the time trend in catch rates was similar to that in 1985, the overall average (3.0 fish per angler-trip) was below that (4.4) in 1985. The estimated total recreational catch in the Tail Race was also much lower, about 46% of the previous year's. In contrast, the 1986 statewide commercial catch increased substantially.

The 1987 season was largely a failure. Weather until mid-March was wet and windy, with little apparent effort. Unlike in the previous two years, there was no increase in catch rate as March progressed. Many anglers blamed weak, erratic flow rates and cold, dirty water for the poor fishing. Commercial fishing elsewhere was unusually slow during this period as well. The estimated Tail Race recreational catch was only 15% of that in 1985 and the overall catch rate (0.8 shad per angler-trip) was very low. About 51% of the boats with shad anglers reported no fish caught, compared to 13% in 1985 and 1986.

Artificial Reef Program

A significant amount of construction took place during 1987 and 1988, including the establishment of three new reefs and the addition of materials to a number of others. Reef construction was carried out chiefly through donations of materials and services from private contractors, although utilization of limited state funds and the receipt of federal support (Wallop-Breaux funds) made several other major reef projects possible.

During 1987, seven donated steel vessels ranging from 55 foot ex-Navy landing craft to a 300 foot long hopper barge were sunk on the Little River Offshore, Capers, Kiawah, and Edisto Offshore Reefs. A previously permitted but little utilized reef site 2.5 miles off Little River Inlet was also significantly upgraded through the addition of eight small steel barges, 65 experimental concrete and truck tire reef units, and 200 mid-water fish aggregation devices (FAD'S).

In August 1987, the state added a new artificial reef adjacent to the new Paradise Fishing Pier inside Fripp Inlet. The reef, constructed under state held permits by the pier owners and MRD, consisted of 200 pieces of concrete pipe and several barge loads of live oyster, and shell. Later in the year, two new mid-water trolling alleys were established off Murrells Inlet at the Paradise and Pawley's Reefs. Each consisted of 100 FAD's constructed by a local fishing club.

Research was continued during 1987 through two federal sponsored projects. Six additional designs of experimental manufactured reef units were deployed on test sites off Charleston for on-going evaluation of their stability, durability, and biological effectiveness. The designs employed a wide range of materials, including steel, concrete, and plastic. An additional research project involving the censusing of fish populations found on deep-water artificial reefs was also continued during 1987 and 1988.

Buoys were replaced on a number of reefs during 1987 and 1988. In all, 15 new or refurbished buoys were placed back on location during this period. By the end of 1988, four buoys were still missing due to lack of replacement funding.

In 1988, construction on existing sites continued with the addition of materials to the Cape Romain, Capers, Kiawah, Hunting Island, Fripp Island, and Little River offshore reefs. Most of these materials consisted of steel boats and barges. Two significant donations of ships also resulted in the establishment of two new reefs. In April, the ex-Army tanker Y-73 was sunk 28 miles off Charleston in 95 feet of water. In August, the state's largest and newest reef was completed with the sinking of the ex-Navy troop transport USS VERMILION 28 miles off the entrance to Winyah Bay in 110 feet of water. This brought the total number of reefs off South Carolina to 23.

Additional construction activities were begun at the end of 1988. These included the addition of several more donated steel vessels to at least four reefs. Research efforts continued throughout 1988. Additional designs of reef units manufactured from concrete and steel were added to the reef material study and work also continued on the quantification of fish populations on the two deep-water reefs examined during 1986 and 1987.

Plans were begun late in 1988 to develop a long-term state Marine Artificial Reef Management Plan. The plan will establish policy and guidelines for the continued use of artificial reefs off South Carolina, as well as define realistic goals and objectives for continued reef development and future utilization.

Tournaments

The sportfishing tournament industry continued the growth pattern initiated in the 1970's. In 1987, 88 tournaments were reported held, increasing to 95 in 1988. These ranged in size from six-eight boats in intra-club competitions to over 900 boats in a single king mackerel tournament. Participants per boat averaged two in inshore events and up to six for offshore and billfish competitions. The majority of the tournaments were one-day events, but some were scheduled for as much as three days within a five-day period.

Roughly 20% of each year's tournaments focused on inshore species (general), while Billfish were the target in 17% of the events, while king mackerel was the headliner in 20%. Miscellaneous individual species, e.g. tarpon, spotted seatrout, and spadefish, were featured in the remaining events.

The most prominent change has been the increase in the number of king mackerel tournaments. These events are growing steadily in both number and the value of prizes offered. Several offer purses as high as \$100,000 to \$500,000. The Arthur Smith remains the state's premiere event. A Forbes Magazine study estimated that 4,500 contestants spent \$3.9 million during the 1987 event, with a total economic impact of \$18.3 million.

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