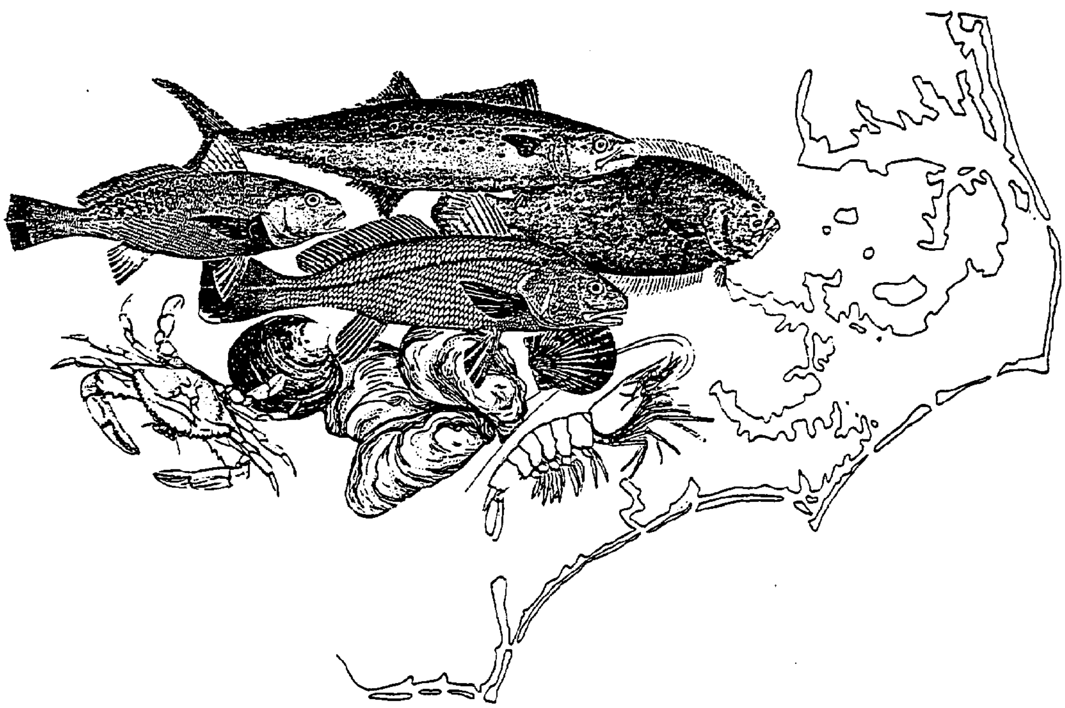
ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES



North Carolina Department of Environment,
Health, and Natural Resources

Division of Marine Fisheries
Morehead City, NC 28557

May 1992

ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES

By

North Carolina Division of Marine Fisheries

North Carolina Department of Environment, Health,
and Natural Resources

Division of Marine Fisheries
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Completion Report for Project 2-IJ-16

May 1992

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TABLE OF CONTENTS

JOB 3: WINTER TRAWL FISHERY ASSESSMENT

ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES

Completion Report for Project 2-IJ-16

May 1992

JOB 1

LONG HAUL SEINE

FISHERY ASSESSMENT

By

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ABSTRACT

The North Carolina long haul/swipe seine fishery is active from March-April until early November throughout much of the estuarine waters of North Carolina. Data from the 1988 through 1990 fishing seasons were collected and examined to determine: species and size composition of the catches; age composition of target species Atlantic croaker (Micropogonias undulatus), spot (Leiostomus xanthurus), weakfish (Cynoscion regalis), and bluefish (Pomatomus saltatrix); catch size; and proportion and species composition of the scrap component from catches. A total of 148, 114, and 103 samples were collected from culled and unculled catches for 1988, 1989, 1990, respectively. Results, in most cases, are reported by area (north, south and combined) of Bluff Shoal, a natural geographic bisector of Pamlico Sound. Averaged combined CPUEs for the long haul fishery were 3,143 kg/trip (1988), 2,552 kg/trip (1989), and 3,667 kg/trip (1990). Atlantic croaker, spot, weakfish, and occasionally bluefish and spotted seatrout (Cynoscion nebulosus) dominated the marketable portion of the catches each year. Percent contributions of scrap fish to the total landings were 36%, 41%, and 35% for 1988 to 1990, respectively. The magnitude of unmarketable edible finfish in the scrap component from long haul catches was a management concern. Options for reducing the catch of these fish are being investigated by a Scrap Fish Committee formed by the North Carolina Marine Fisheries Commission. Gear restrictions (mesh sizes), culling devices, and area/season restrictions are being considered.

TABLE OF CONTENTS

INTRODUCTION

The North Carolina long haul seine fishery (including swipe nets) operates throughout much of estuarine North Carolina from Bogue Sound to northern Pamlico Sound and in most tributaries of Pamlico and Core sounds (Figure 1). The fishing season is March-April through early November, and the principle target species are Atlantic croaker (Micropogonias undulatus), spot (Leiostomus xanthurus), and weakfish (Cynoscion regalis), and occasionally bluefish (Pomatomus saltatrix) and spotted seatrout (Cynoscion nebulosus). The long haul fishery that operates in Pamlico Sound has two major areas of activity, one in northern Pamlico Sound and, the other in southern Pamlico Sound. These areas are divided geographically by Bluff Shoal, a 2.7-3.4 m deep shoal which bisects the Sound north to south and is surrounded by water 5.2-6.4 m deep (Figure 1). The two deep basins of Pamlico Sound on either side of Bluff Shoal have differences in species and size composition of their fish populations (Ross and Moye 1989).

The long haul seine fishery technology has changed little since 1925 (Higgins and Pearson 1928). Nets averaging 1,006-1,372 m long, 3.7 m deep, and with 10.2-15.2 cm stretch wing net mesh are towed between two engine-powered boats. At the end of the fishing operation the net is generally pulled up onto shoals and brought together around a stake. This is called "footing up". The circle of netting enclosing the fish is slowly made smaller by alternately pulling one side at a time past the stake ("cutting out"), thus, gathering or "bunting" the net. When the net has been bunted as much as possible for a given catch, a heavier bunt net with smaller stretch mesh (about 2.5 cm) is drawn around the catch. The bunt net is constructed so that its lead line can be drawn together without distorting the float line. The catch is enclosed, hardened up, and subsequently dipped into an insulated run-boat for transport to the fish house. The whole operation of setting, pulling, and bunting the net often takes a full day, with fishing usually beginning before sunrise; rarely are two hauls made in one day. Guthrie et al. (1973) describes the long hauling operation in detail.

Long hauling techniques do vary between different fishing areas. Along the Outer Banks, in southwestern Pamlico Sound, Core Sound, and their major tributaries the fishery depends on shoal areas (usually 1.5-3.0 m deep) with a firm bottom for bunting. Fishermen usually have to go overboard to "cut out" the net. Northern Pamlico Sound fishermen generally set and pull their nets the same way, but utilize deeper nets (3.7-6.4 m) to fish in deeper water. They do not depend on shoals to "bunt up" their catches, instead using a longer footing stake and a bunt net that can be gathered so they do not need to go overboard. In the Pamlico County area short hauls are made with swipe nets (where only one boat is used), using techniques common to the shallow haul seine fishery. These rigs are occasionally used in other areas during the fall or winter for spotted seatrout.

The greatest concentration of long haul fishing activity occurs in northern Pamlico Sound and Croatan Sound from Long Shoal northward. During 1988-1990, 10-23 rigs have worked regularly during April-September in this area. This total includes four deep water rigs and two shallow water rigs from Wanchese, NC. Stumpy Point, NC had four deep water rigs. A single deep water rig operated out of Manns Harbor, NC. Three to six crews from Englehard, NC, including one shallow and 3-5 deep water rigs, generally fish north of Bluff Shoal during April-August and both north and south of Bluff Shoal during September and October. On the Outer Banks, three rigs operate out of Avon, NC, and three rigs from Hatteras, NC. Prior to 1987, these crews were half deep water and half shallow water rigs, but by 1987, all of the Outer Banks rigs were shallow water rigs.

A second center of long hauling activity is in southern Pamlico Sound and Core Sound. Five to eight full-time crews based in Atlantic, Sea Level, and Davis, NC fish this area from April through early November. Royal Shoal, West Bay, Point of Marsh, northern Core Sound and the adjacent bays are fished early in the season with effort shifting to Core Sound, during late summer through early November. During this period four to eight crews from Harkers Island enter the fishery, working in southern Core Sound, North River, Back Sound, and Cape Lookout Bight. Pamlico County has one deepwater rig and one swipe net rig fishing in that area.

This study, covering the 1988-1990 fishing seasons, was a continuation of a study and monitoring program begun by the North Carolina Division of Marine Fisheries (DMF) in 1978 (Sholar 1979, DeVries 1981, Ross et al., 1986, Ross and Moye 1989). The objectives of this program are to 1) collect information on areas fished, fishing methods, seasonality, and gear used in the long haul seine fishery, and 2) determine species and size composition of the catches, age composition of the target species (Atlantic croaker, spot, weakfish and bluefish), catch size, proportion of scrap fish in the catches, and species composition of the scrap component. The information collected is used by DMF and other fishery management agencies to reach management decisions.

METHODS AND MATERIALS

During the fishing season, long haul catches were sampled at the fish house where the catch was landed. Samples were primarily taken from unculled catches, with some samples taken from culled catches (sorted by market category). In unculled samples, at least one (though usually more) fish basket (22.7 kg) was randomly taken from each catch. All species in the sample were identified (excluding jellyfish) and measured to the nearest millimeter (mm) using fork length (FL), total length (TL), disc width (DW) or carapace width (CW). Each species group was weighed to the nearest 0.1 kg. Species observed in the catch but not present in the sample were noted. The total weight of the sampled catch was obtained from the dealer or fisherman. Trip ticket information was recorded when available. The crew or boat captain provided information on area fished and gear used.

In culled samples, for each marketed species, as many random samples (usually cartons 22.7 kg) as possible were obtained from each market category (small, medium, large, etc.). More cartons of the larger grades were sampled to compensate for the fewer fish contained in them. Each sample was weighed to the nearest 0.1 kg, the individuals measured to the nearest mm (TL or FL), and the total number of individuals recorded. The total weight of each size category of each species was obtained from the actual trip ticket, or if not available, then from the fisherman.

Scrap fish were sampled in both culled and unculled samples by taking at least one-half fish basket samples of the scrap fish from each catch. Scrap fish were defined as those species not marketed for human consumption. It was either sold for bait or other uses, or discarded. In the scrapfish samples, lengths and bulk weights were taken on the marketable species (excluding Atlantic menhaden

(Brevoortia tyrannus)- enumerated and bulk weight only). Other miscellaneous species were enumerated and weighed by species. The weight of the scrap fish component was obtained from the trip ticket or estimated.

The number of individuals, weight, and length frequency of each species in a subsample were expanded to represent the species quantities in the total catch. For example, the total length frequency of a species within a catch was derived by expanding the length frequency of the individuals measured in the subsample to the total weight of that species in the catch, i.e. the length distribution was weighted by the magnitude of the catch. Total weight of a species in the scrap fish samples, was calculated by determining the proportion of a species in the sample, and expanding that to the respective species proportional weight in the total scrap fish. The number of individuals/species in the scrap fish component was calculated by expanding the number of individuals in the sample to represent the total weight of the species in the scrap.

Catch per unit effort (CPUE) was defined as the average catch per one day trip. Landings refer to commercial landings (kg) data derived from the North Carolina General Canvas Data collected through the DMF and the National Marine Fisheries Service Cooperative Commercial Statistics program.

The long haul fishery that operates in Pamlico Sound has two major areas of activity, one in northeastern Pamlico Sound and one in southwestern Pamlico Sound. These areas are naturally divided by Bluff Shoal (The Bluff). The Bluff runs north from Royal Shoal inside Ocracoke Inlet to North Bluff Point which is south of Wysocking Bay on the mainland. North and south of The Bluff were analyzed separately because species compositions differ in the two areas and the percentage of scrap differs greatly in the two areas. Commercial landings data were partitioned by grouping county landings of long haul catches (including swipe nets) as follows:

North = Dare County + Hyde County (April-August)

South = Carteret, Craven, Pamlico, and Beaufort Counties + Hyde County (September-October)

The seasonal splitting of Hyde County landings both north and south of The Bluff was based on predominant fishing patterns observed by the fleet during the study period.

Scale samples (30-60), when available, were taken each month for Atlantic croaker, spot, weakfish, and bluefish over the entire range of individuals sampled. Length (mm FL, or TL) and weight (kg) data were taken for each fish sampled. Aging criteria for determining annuli formation and age assignments was given by Ross (1988) for Atlantic croaker, DeVries (1981) for spot, Massmann (1963), Merriner (1973), and Hawkins (1988) for weakfish, and Wilk (1977) for bluefish. Length intervals of 20 mm were used to produce the age-length keys. Smaller intervals resulted in data gaps due to a lack of fish samples across the entire spectrum of sizes. Pooled age-length keys (combined years) were favored over annual keys, with the exception of bluefish, because the relatively small sample size of larger fish caused variation in proportion at age across years.

Quarterly age length keys were produced for Atlantic croaker using monthly groupings of December-March, April-June, July-September, and October-November. Age assignments were made for scales collected from 1988 through March 1991. Historical age data (1979-1981) and study data were pooled in the following manners to generate age compositions from 1982 through 1990: 1982-1985 length frequencies (1979-1981 pooled age key); 1986-1987 length frequencies (1979-1981 and 1988-1991 pooled age key); and 1988-1990 length frequencies (1988-1990 pooled age key). Spot age length keys were produced using monthly groupings of September-December, June-August, April-May. Age assignments were made for scales collected from 1988 through March 1991. Historical spot age data (1979-1987) and study data were pooled to generate age compositions from 1982 through 1990 length frequencies. Semi-annual age length keys for weakfish were produced using monthly groupings of October-March of the following year and April-September. Age assignments were made for scales collected from 1988 through March 1991. Historical age data (1982-1984) and study data were pooled for keys in the following manners to generate weakfish age compositions from 1982 through 1990 length frequencies: 1982-1984 length frequencies (1982-1984 pooled age data); 1985-1987 length frequencies (1982-1984 and 1988-1990 pooled age data); and 1988-

1990 length frequencies (1988-1990 pooled age data). Annual age length keys (1982-1990) were produced for bluefish by using monthly groupings of April-October and merged with annual length frequency data to produce age composition.

RESULTS AND DISCUSSION

Seasonality and Catch Composition

From April 1988 through October 1990, 448 long haul seine catches were sampled, with 193 catches from north of Bluff Shoal and 255 catches from south of Bluff Shoal (Table 1). Long haul seine landings were reported from April through November each year and December landings were also reported in 1988 (Table 2a-c). Peak landing months were from May through October, accounting for at least 98% of the landings each year. There was no single dominant month for landings or CPUEs; rather during the peak time frame, landings and CPUEs were generally evenly dispersed through the months. Higher landings and CPUEs (total catch and marketable portion) were reported from April through August north of Bluff Shoal, compared to south of Bluff Shoal. The reverse was true during September through November, with catches south of Bluff Shoal consistently higher (Tables 1-3). April and May were the only months where scrapfish landings and CPUEs were higher north of Bluff Shoal than south of Bluff Shoal (Tables 2a-c and 3). Species compositions by year are given in Tables 4a-c.

In 1988, 148 long haul seine catches were sampled from April through October. Trip tickets only were obtained for an additional 21 catches. Total catch weights ranged from 47 to 26,624 kg/trip and averaged 3,143 kg/trip (Table 1). Marketable catch weights averaged 1,995 kg/trip. Comparing the Bluff Shoal areas, north to south, total catch weights averaged 3,843 versus 2,610 kg/trip and marketable catch weights averaged 2,791 versus 1,390 kg/trip (Table 3). Overall, the dominant species were Atlantic croaker, Atlantic menhaden, spot and weakfish, accounting for 91% and 92% of the sampled catches by weight and number, respectively (Table 4a). The dominant species group was the same both north and south of Bluff Shoal, although their relative contribution in each area differed (Table 5). The same was true on a monthly basis (Tables 6a and 7a).

In 1989, 114 long haul seine catches were sampled from April through October. Trip tickets only were obtained from an additional 25 catches. Total catch weights ranged from 5 to 18,010 kg/trip and averaged 2,552 kg/trip (Table 1). Marketable catch weights averaged 1,520 kg/trip. Average total catch and marketable weights were 2,692 and 1,893 kg/trip north of Bluff Shoal and 2,468 and 1,297 kg/trip south of Bluff Shoal (Table 3). Atlantic croaker, spot, Atlantic menhaden, pinfish (*Lagodon rhomboides*), bluefish, and weakfish accounted for 94% and 95% of the sampled catches by weight and number, respectively (Table 4b). Pigfish (*Orthopristis chrysoptera*) was also a significant contributor to the catch weight north of Bluff Shoal (4%) and to a lesser degree south of Bluff Shoal (3%) (Table 5). All these species were also the dominant group on a monthly basis (Tables 6b and 7b).

In 1990, 103 long haul seine catches were sampled from April through October. Trip tickets only were obtained from an additional 37 catches. Total catch weights ranged from 40 to 39,828 kg/trip and averaged 3,667 kg/trip (Table 1). Marketable catch weights averaged 2,328 kg/trip. Average total catch and marketable weights for north and south of Bluff Shoal were 3,645 versus 3,687 and 2,549 versus 2,120 kg/trip, respectively (Table 3). Dominant species in 1990 were Atlantic croaker, spot, Atlantic menhaden, weakfish, and bluefish, accounting for 94% and 91% by weight and number, respectively (Table 4c). These species were also dominant for both areas, north and south of Bluff Shoal, as well as on a monthly basis (Tables 5, 6c, and 7c).

Species Landings, CPUE, Size and Age Composition

Atlantic croaker has long been the dominant species in the long haul fishery. This was also true from 1988 to 1990 when it was the top species by weight each year, accounting for 31%, 41%, and 57% of the sampled catches, respectively (Tables 4a-c). Atlantic croaker contributed 27%, 35%, and 33% to the long haul landings each year (Tables 2a-c). During the study the long haul fishery contribution to annual state Atlantic croaker landings was 37%, 51%, and 68% (Appendix A). Atlantic croaker consistently ranked first or second by weight each month from April through August in sampled long haul catches. It dropped in rank to 4th during September and 7th in October (Tables 6a-c). North of Bluff Shoal yearly CPUEs and landings (unweighted average) were three and six times higher than those from south of Bluff Shoal (Tables 2a-c, 5).

Of the long haul scrap fish sampled from 1988 to 1990 Atlantic croaker contributed annually by weight 30%, 41%, and 57%, respectively. Atlantic croaker was the top contributor to scrap fish in 1989 and 1990 (424 and 902 kg/trip) and ranked second in 1988 (370 kg/trip) (Tables 8a-c). On average 36% by weight and 56% by number of Atlantic croaker landed were scrap fish.

Atlantic croaker annual landings and CPUEs from 1982 to 1990 are shown in Figure 2. These values by area are shown in Appendix B. The two lines generally track one another since 1984. There is no significant upward or downward trend in either parameter.

The length frequencies (TL) for Atlantic croaker (Figure 3, Appendix C) ranged from 115 mm to 375 mm with a modal peak at 225 mm to 245 mm and a less distinct peak at 145 mm in 1988. The lengths shifted slightly towards smaller fish in 1989 when fish ranged from 115 mm to 325 mm with a modal peak of 215 mm to 235 mm. Movement toward smaller fish also occurred in 1990, when lengths ranged from 105 mm to 305 mm, with a modal peak at 225 mm to 235 mm and a less distinct peak at 145 mm to 155 mm.

Atlantic croaker in samples exhibited six age classes from 1982 through 1990 (Figure 4). Three age classes dominated catches annually. Age 1 fish consistently represented approximately 60% of the fish sampled, while age 0 and age 2 fish represented 12% and 22%, respectively. During the study period ages 0 and 1 fish dominated, comprising 28.9% and 53.4% (1988), 27.2% and 53.4% (1989), and 24.2% and 55.9% (1990). Ages 0 and 1 fish averaged 26.5% and 53.3% for 1988 through 1990. Although Atlantic croaker lengths have been shifting to smaller sized fish in recent years, the age composition has remained relatively constant within samples.

Spot has generally been the next most important component of the long haul fishery. It was ranked second by weight in 1989 and 1990 and third in 1988, accounting for 23%, 26%, and 13% of the sampled catches by year from 1988 to 1990 (Tables 4a-c). Spot contributed 21%, 22%, and 21% to the long haul landings each year (Tables 2a-c). During the study the fishery contribution to annual state spot landings was 65%, 62%, and 69% (Appendix A). Each year spot ranked first by weight in sampled catches during the months of September and October and was generally one of the top three in other months (Tables 6a-c). South of Bluff Shoal yearly CPUEs and landings were two and four times those north of Bluff Shoal (Tables 2a-c, 5).

Spot annual landings and CPUEs from 1982 to 1990 are shown in Figure 2 and Appendix B. During 1989-1990, CPUEs declined and landings remained relatively constant. Between 1984 and 1988, the trends were generally similar. Through the nine year period there was no pronounced upward or downward trend.

Spot contributed annually by weight 31%, 19%, and 14% to the long haul scrap fish sampled during the study. Spot was the top contributor to scrap fish in 1988 (386 kg/trip) and ranked second in 1989 and 1990 (199 and 229 kg/trip) (Tables 8a-c). Yearly CPUEs for spot from scrap fish catches south of Bluff Shoal were consistently higher than those north of Bluff Shoal (328 versus 227 kg/trip). However, the average percent contribution of spot to overall scrap fish was the same for each area, 22% (Table 9a-b). On average 37% by weight and 58% by number of the spot landed were scrap fish.

The length frequencies (FL) for spot (Figure 5, Appendix D) ranged from 95 mm to 255 mm with a modal peak at 195 mm to 205 mm and a less distinct peak at 95 mm in 1988. The lengths remained stable in 1989 where fish ranged from 85 mm to 245 mm with a modal peak at 195 mm to 205 mm. A movement toward smaller fish occurred in 1990 where lengths ranged from 55 mm to 225 mm with a distinct modal peak at 185 mm to 195 mm and a peak at 95 mm.

Five age classes of spot were present in samples from 1982 through 1990 (Figure 6). Three age classes dominated catches annually. Age 1 fish consistently represented approximately 63% of the fish sampled while age 0 and age 2 fish represented 16% and 20%, respectively. During the study period ages 0, 1 and 2 spot dominated samples comprising 9%, 62%, and 27% (1988), 8%, 66%, and 25% (1989), and 34%, 54%, and 12% (1990). Ages 0, 1, and 2 spot averaged 17%, 61% and, 21.5% for 1988 through 1990.

During 1988-1990, weakfish accounted for 11%, 4%, and 8% of the sampled catches by year (Table 4a-c). Weakfish contributed 14%, 6%, and 9% to the long haul landings each year (Tables 2a-c). The fishery contribution to annual state weakfish landings was 11%, 8%, and 18% (Appendix A). During the study weakfish ranked from first to seventh (average of fourth) on a monthly basis by weight and there was no pattern of predominance by either area or season (Tables 6a-c). Yearly CPUEs and landings both showed a similar pattern by area: higher values north of Bluff Shoal in 1988; about equal in 1989; and higher south of Bluff Shoal in 1990 (Tables 2a-c, 5).

Weakfish annual landings and CPUEs from 1982 to 1990 are shown in Figure 2 and Appendix B. There was a marked decrease in the CPUEs from a high of 587 kg/trip in 1985 to a low of 109 kg/trip in 1989. In 1990 the CPUE rebounded to 301 kg/trip. Landings also showed a similar trend.

Weakfish ranked fifth each year as a component of the scrap fish samples (78, 33, and 49 kg/trip from 1988 to 1990). They accounted for 6%, 3%, and 3% of the scrap fish sample weights by year (Tables 8a-c). Yearly CPUEs for weakfish from south of Bluff Shoal scrap fish catches were consistently higher than those north of Bluff Shoal (study unweighted average 77 versus 32 kg/trip). The percent contribution of weakfish in the scrap fish samples was also higher south than north (Tables 9a-b). On average 21% by weight and 37% by number of the weakfish landed in long haul fishery were scrap fish.

The length frequencies (FL) for weakfish (Figure 7, Appendix E) ranged from 165 mm to 505 mm with modal peaks at 205 mm to 215 mm and 235 mm to 255 mm in 1988. The lengths shifted to slightly smaller fish in 1989 when fish ranged from 135 mm to 555 mm with modal peaks at 185 mm and 215 mm to 225 mm. Smaller fish also occurred in 1990 when lengths ranged from 125 mm to 395 mm with a modal peak at 215 mm to 265 mm.

Weakfish in samples exhibited ten age classes from 1982 through 1990 (Figure 8). Ages 1 and 2 weakfish dominated age composition all years. Age 1 fish comprised approximately 56% of the fish from 1982 through 1987 while age 2 fish represented 36% of the fish from 1982 through 1988. During the study period ages 1 and 2 weakfish have dominated catches, comprising 34% and 35% (1988), 51% and 41% (1989), and 48% and 48% (1990). Age 0 fish peaked in 1988 at 19% but returned to low levels in 1989. Ages 0 and 1 weakfish averaged 56% and 38% for 1988 through 1990.

Bluefish accounted for 2%, 5%, and 3% of the sampled catches by year (Tables 4a-c). Bluefish contributed 4%, 3%, and 3% to the long haul landings each year (Tables 2a-c). The fishery contribution to annual state bluefish landings was 12%, 8%, and 7% (Appendix A). Bluefish ranked from third to ninth by weight of the sampled catches on a monthly basis, for an overall average of fifth. Monthly CPUEs peaked in July 1988 and 1989, due to large catches south of Bluff Shoal. In 1990 October was the peak month, due to large catches north of Bluff Shoal. At other times bluefish CPUEs were relatively stable by month and area (Tables 6a-c, 7a-c).

Bluefish annual landings and CPUEs from 1982 to 1990 are shown in Figure 9 and Appendix B. On a yearly basis the two lines show dissimilar trends. This could be due to misreported landings or an inadequate sample size to produce valid CPUEs. However, neither line shows a pronounced up or down trend throughout the nine year period. On average 12% by weight and 31% by number of the bluefish landed were scrap fish.

Bluefish contributed by weight 1% each year of the scrap fish catches sampled, and it ranked eighth, seventh, and sixth each year, respectively. Annual bluefish CPUEs from the scrap fish samples ranged from 6 to 23 kg/trip and were generally slightly higher south of Bluff Shoal than north of Bluff Shoal (Tables 8a-c, 9a-b).

The length frequencies (FL) for bluefish (Figure 10, Appendix F) ranged from 105 mm to 545 mm with pronounced modal peaks at 205 mm to 295 mm and 365 mm to 395 mm in 1988. The fish ranged from 135 mm to 605 mm with a modal peak at 275 mm in 1989. Smaller fish occurred in 1990 when lengths ranged from 115 mm to 485 mm with a modal peak at 215 mm to 225 mm and at 265 mm.

Bluefish in samples exhibited ten age classes from 1982 through 1990 (Figure 11). Ages 0 and 1 bluefish dominated age composition all years. Age 0 fish comprised approximately 42% of the fish from 1982 through 1990, while age 1 fish represented 54% of the fish from 1982 through 1990. For the nine year period age 1 bluefish was the dominant age with the exception of 1985 and 1988 (dominated by age 0 fish). During the study period ages 0 and 1 fish have dominated age composition, comprising 52% and 34% (1988), 38% and 57% (1989), and 43% and 52% (1990). Ages 0 and 1 fish averaged 56% and 38% for 1988 through 1990.

Spotted seatrout, accounted for up to 1% of the sampled catches each year of the study period (Tables 4a-c) and less than 1% of the long haul landings (Tables 2a-c). The fishery contribution to annual state spotted seatrout landings was significant, accounting for 21%, 19%, and 18% by year, respectively (Appendix A). Spotted seatrout ranked from second to twelfth by weight of the sampled catches on a monthly basis, with a study average of eighth (Tables 6a-c). CPUEs by month and area were relatively stable throughout each year (Tables 7a-c).

Spotted seatrout annual landings and CPUEs from 1982 to 1990 are shown in Figure 9 and Appendix B. Both parameters show a general decline to 1985, an increase to peak values in 1987/1988, and a decline in 1990. Spotted seatrout were 0.1% or less of the scrap fish samples each year (Tables 8a-c)

Long haul seine catches of southern flounder, Paralichthys lethostigma, and summer flounder, Paralichthys dentatus, were minor, accounting for approximately 0.1% by weight of the sampled catches each year (Table 2a-c). Most of the flounder came from samples south of Bluff Shoal. The fishery contributed approximately 1% each year of the study to the annual state flounder landings (Appendix A). Annual CPUEs and landings from 1982 to 1990 displayed contradictory trends (Figure 9). Possible reasons for this were described in the previous discussion for bluefish. Flounders were less than 0.1% of the scrap fish sampled each year (Tables 8a-c).

The length frequencies (TL) for summer flounder (Figure 12, Appendix G) ranged from 105 mm to 435 mm in 1988, from 85 mm to 275 mm in 1989, and from 125 mm to 445 mm in 1990. During the study period the legal size limit for flounder was 330 mm. Legal sized summer flounder in the samples ranged from none to 33% during the study period.

Long haul seine catches of Spanish mackerel, Scomberomorus maculatus, were minor, accounting for 0.1%-0.2% by weight of the sampled catches each year. The fishery contributed 9%, 12% and 3% each year from 1988 to 1990 to the annual Spanish mackerel landings (Appendix A). Annual CPUEs and landings from 1982 to 1990, shown in Figure 13, track well with one another; both steadily increased to a peak in 1989 (32,850 kg and 5.4 kg/trip) and dropped by about half in 1990. Spanish mackerel were approximately 0.1% of the scrap fish sampled each year (Tables 8a-c).

Harvestfish, Peprilus alepidotus, and butterfish, Peprilus triacanthus, were another minor marketable component of the long haul fishery, each accounting for up to 0.1% by weight of the catches sampled each year (Tables 2a-c). The fishery contributed 14%, 6%, and 9% each year to the harvestfish landings. Long hauls contributed 5%, 5%, and 17% each year to the butterfish landings (Appendix A). Annual CPUEs and landings from 1982 to 1990 for each species are shown in Figure 13 and Appendix B. Both parameters show a general downward trend during the nine year period for harvestfish. Values for butterfish were highly variable for both CPUEs and landings. On a yearly basis harvestfish were 0.1% or less by weight of the scrap fish sampled and butterfish were from 0.0 to 0.2% by weight of the scrap fish (Tables 8a-c).

Atlantic menhaden were not targeted by the fishery but still accounted for 26%, 10%, and 12% by weight of the catches sampled each year (Tables 4a-c). Atlantic menhaden ranked second by weight in 1988 and third in both 1989 and 1990. Atlantic menhaden were strictly a component of the bait in the long haul fishery . In North Carolina commercial landings Atlantic menhaden was reported in the grouped category "unclassified for industrial/bait" and therefore, the specific contribution of Atlantic menhaden to the reported long haul landings is not available. Atlantic menhaden contributed annually by weight 20%, 15%, and

14% each year to the long haul scraip fish. It ranked second in 1988 and third in 1989 and 1990 (Tables 8a-c). Yearly CPUEs for Atlantic menhaden were consistently higher south than north of Bluff Shoal (1,058 versus 185 kg/trip) (Tables 9a-b).

The length frequencies (FL) for Atlantic menhaden (Figure 14, Appendix H) ranged from 75 mm to 275 mm with bimodal peaks at 115 mm and 195 mm in 1988. In 1989 fish ranged in size from 105 mm to 255 mm with a modal peak at 135 mm to 145 mm. In 1990 lengths ranged from 95 mm to 225 mm with a modal peak at 175 mm

Pinfish, Lagodon rhomboides, also was not targeted by the fishery but still accounted for 3% in 1988 and 1990, and 7% in 1989 of the sampled catches by weight in 1989 (Tables 4a-c). Pinfish also was strictly a bait component and was not normally reported as a species in the commercial landings, rather being one of the species grouped in the "unclassified for industrial/bait" category. Of the long haul scrap fish sampled during the study, pinfish contributed annually by weight 7%, 14%, and 7% each year and ranked fourth each year (Tables 8a-c). Yearly CPUEs for pinfish were consistently higher south than north of Bluff Shoal (181 versus 82 kg/trip).

Total Biomass and Scrap Fish

The long haul fishery contribution to annual state total marketable finfish landings (weight) was 14% in 1988 and 16% in 1989 and 1990. Its contribution has ranged from 7% to 17% since 1982 (Appendix A). As a contributor to marketable finfish in the state, it ranked third behind the gill net fishery (estuarine and oceanic) and the trawl fishery. Total landings and value in 1988 were 4,309 mt and $2.9 million; 4,112 mt and $3.0 million in 1989; and 5,299 mt and $3.5 million in 1990. Comparison of catches north and south of Bluff Shoal showed higher annual mean weight CPUEs for total and marketable finfish (study average of 3,394 versus 2,923 kg/trip for total finfish and 2,410 versus 1,603 kg/trip for marketable finfish) (Table 3). Annual landings and CPUEs for the long haul fishery from 1982 to 1990 are shown in Figure 15 and in Appendix B. Landings generally declined from 1982/1983 to a low in 1989 and increased slightly in 1990. CPUEs, on the other hand, rose to a high of 4,033 kg/trip in 1986, declined from 1987 to 1989, and then rebounded to 3,667 kg/trip in 1990. Total finfish landings were 27.6% (1988), 31% (1989), and 11% (1990) below the nine year mean (1982-1990).

During the study scrap fish from 330 long haul catches were sampled. The dominant species each year were Atlantic croaker, spot, Atlantic menhaden, pinfish and weakfish, accounting for 95% (unweighted study average) of the sampled scrap fish catches by weight and number (Tables 8a-c). The same species were dominant north and south of Bluff Shoal, although their relative contribution in each area differed (Tables 9a-b). The proportion of the scrap fish to the total catch each year was 36%, 41%, and 35%, respectively. This percent was consistently higher south versus north of Bluff Shoal (unweighted study average of 46% versus 26%) (Table 3).

The scrap fish percentage was relatively constant on a monthly basis (Figure 16). Scrap fish from the long haul commercial landings appear under-reported. Except for April, the percent of scrap fish in the sampled catches was consistently higher than the percent of scrap fish in the reported long haul landings (Figure 16 and Tables 2a-c, 3). Scrap fish annual landings and CPUEs from 1982 to 1990 for the long haul fishery are shown in Figure 15 and Appendix B. Landings showed a general decline, while the CPUEs were stable. Under-reporting is one possible reason for the discrepancy in the trends. Scrap fish landings were 28.7% (1988), 33.6% (1989), and 5.7% (1990) below the nine year mean.

<u>Management</u>

The sciaenids (Atlantic croaker, spot and weakfish), which constitute the bulk of the long haul targeted catches, have experienced a coastwide decline in abundance since the peak landing years of the early 1980's. The specific causes of this decline are not known but probably include increases in fishing mortality, variable climatic conditions affecting spawning success, and changes in habitat and water quality. As a major fishery for these species, the long haul fishery will be impacted by management actions taken to address the recent decline. Historically the long haul fishery has been targeted for regulations because of the nonselective nature of the gear and the high scrap fish component of the catches. Until recently, very few rules have been implemented because the target species stocks appeared to be healthy.

The enactment of minimum size limits for weakfish (10 in), spotted seatrout (12 in), flounder (13 in), and red drum (18 in) has major implications for the fishery. Strict enforcement of the size limits at the fishing site would result in numerous violations and for all practical purposes close the fishery (the current practice of bulk loading the fish precludes individual culling). On the other hand enforcement only at the fish house defeats the purpose of the rule which is reduced mortality. Law enforcement should be at a level sufficient to bring about changes in fishing practices that result in reduced mortality. Changes in fishing practices might include the total release of catches with high portions of undersized fish or innovations in gear that release undersized fish.

The magnitude of the scrap fish catch in the long haul fishery is a management concern. Gear changes such as minimum mesh sizes and culling panels, and season/area restrictions such as eliminating the fishery in secondary nursery areas are some management options. The North Carolina Marine Fisheries Commission has formed a Scrap Fish Committee to fully investigate all options through a series of public meetings and make recommendations to the full Commission. Data collected during this study will be critical to their analysis of the issue.

Conflicts over space occur between long haul fishermen and crab potters, as well as other fishing practices. Rules have been enacted (designated crab pot areas) to spatially separate the competing users. However, with the decline in the number of long haul gears the ability to allow crab potting in certain traditional long haul areas has been accomplished through proclamations issued by the DMF Director.

The following recommendations concerning the study and the long haul fishery are presented for consideration:

1) Continued biological monitoring of the fishery is required to assess the fishery and the status of the stocks comprising the fishery. Mandatory access to biological sampling may be required in the future as stricter management rules erode the

current voluntary cooperation of the fishermen and seafood dealers.

2) An increase in the number of hard parts collected by size and season for age determination is required. Currently, one cannot determine if yearly shifts in proportion at age are an artifact of a small sample size or a true response of the population to biological factors.

3) Variations in catch and size composition by area, gear type, and season must be considered when formulating management strategies for the long haul fishery.

4) The scrap fish component of the long haul fishery should be significantly reduced. An interactive combination of regulations (size limits, area restriction, etc.) and gear improvements could reduce juvenile mortality. DMF should actively pursue development of more selective gear in cooperation with the fishing industry.

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Table 1. Monthly summary of sampling long haul seine catches north and south of Bluff Shoal, and combined areas, Pamlico Sound area, April-October 1988-1990; n=number of catches sampled (including trip ticket only information), sn = number of samples that contain biological information.

					Catch weight (kg)		Sample weight (kg)	
Year	Month	Area	n	sn	Mean	Range	Mean	Range
1988	Apr	North	6	6	2,413.6	197.4- 3,722.8	51.0	30.6- 83.1
		South	0	0	-	-	-	-
		Combined	6	6	2,413.6	197.4- 3,722.8	51.0	30.6- 83.1
	May	North	17	15	5,161.1	492.2-15,875.0	54.7	16.6-112.5
		South	13	9	2,262.5	46.8- 6,403.9	97.6	30.2-154.0
		Combined	30	24	3,905.0	46.8-15,875.0	70.8	16.6-154.0
	Jun	North	14	14	2,287.9	694.2- 4,683.8	53.4	40.4- 82.3
		South	14	14	2,866.6	468.2-13,885.0	59.6	17.9-252.5
		Combined	28	28	2,577.2	468.2-13,885.0	56.5	17.9 252.5
	Jul	North	13	12	2,918.0	454.1- 9,071.9	46.3	23.2- 77.3
		South	19	13	1,680.5	195.5- 7,917.1	36.6	18.4-138.2
		Combined	32	25	2,183.2	195.5- 9,071.9	41.3	18.4-138.2
	Aug	North	13	12	6,423.1	70.2-19,490.0	55.7	45.3- 77.9
		South	24	20	2,054.7	529.0- 6,804.3	35.3	12.1-131.5
		Combined	37	32	3,589.5	70.2-19,490.0	42.9	12.1-131.5
	Sep	North	5	4	2,982.9	439.6- 7,699.3	57.7	33.1- 78.2
		South	18	17	2,479.8	189.1- 8,132.8	46.6	21.6-104.5
		Combined	23	21	2,589.2	189.1- 8,132.8	48.7	21.6-104.5
	Oct	North	5	5	1,989.7	341.8- 4,309.1	45.3	27.3- 60.9
		South	8	7	6,891.8	206.0-26,624.0	38.3	15.4-113.2
		Combined	13	12	5,006.4	206.0-26,624.0	41.2	15.4-113.2
1989	Apr	North	5	5	1,578.5	5.5- 3,864.1	47.3	5.5- 83.8
		South	0	0	-	-	-	-
		Combined	5	5	1,578.5	5.5- 3,864.1	47.3	5.5- 83.8
	May	North	8	8	1,582.7	491.6- 4,535.9	38.9	16.5- 93.8
		South	3	3	1,532.5	67.0- 3,822.0	45.1	23.7- 73.8
		Combined	11	11	1,569.0	67.0- 4,535.9	40.6	16.5- 98.8
	Jun	North	10	10	2,591.8	849.3- 5,941.8	48.8	22.8- 84.3
		South	19	17	2,386.5	532.4- 7,509.5	58.8	11.8-171.8
		Combined	29	27	2,457.3	532.4- 7,509.5	55.1	11.8-171.8
	Jul	North	9	9	4,775.9	718.2-13,676.0	45.5	24.8- 61.4
		South	20	15	3,927.4	232.6-18,010.0	51.2	13.0-129.8
		Combined	29	24	4,190.7	232.6-18,010.0	49.1	13.0-129.8
	Aug	North	14	12	2,822.5	377.9-14,842.0	50.1	24.4-123.6
		South	21	14	2,042.7	442.2-10,346.0	49.5	14.2-107.6
		Combined	35	26	2,354.6	377.9-14,842.0	49.8	14.2-123.6

Table 1. (Continued).

Year	Month	Area	n	sn	Catch weight (kg) Mean	Catch weight (kg) Range	Sample weight (kg) Mean	Sample weight (kg) Range
	Sep	North	6	6	1,837.2	454.0-3,120.5	58.1	26.1- 95.8
		South	11	7	1,629.8	64.4-7,246.6	45.1	16.9-166.8
		Combined	17	13	1,703.0	64.4-7,246.6	51.1	16.9-166.8
	Oct	North	0	0	-	-	-	-
		South	13	8	1,956.7	24.5-5,937.2	37.5	22.2- 59.9
		Combined	13	8	1,956.7	24.5-5,937.2	37.5	22.2- 59.9
1990	Apr	North	5	5	215.1	106.2- 391.9	65.1	26.5-140.6
		South	4	1	5,336.8	1,926.9-9,329.7	89.0	-
		Combined	9	6	2,491.4	106.2-9,329.7	69.1	26.5-140.6
	May	North	13	12	5,246.1	39.9-20,292.0	36.5	12.8- 57.2
		South	12	9	1,555.4	116.6-5,421.3	86.7	14.3-200.2
		Combined	25	21	3,474.6	39.9-20,292.0	58.0	12.8-200.2
	Jun	North	12	12	7,914.4	223.6-39,828.0	63.6	25.9- 94.6
		South	11	9	4,356.4	857.3-14,427.2	98.6	45.1-152.8
		Combined	23	21	6,212.7	223.6-39,828.0	78.6	25.9-152.8
	Jul	North	12	12	2,015.6	612.3- 5,895.8	57.0	26.4- 88.0
		South	19	7	2,290.9	164.0- 9,863.1	112.3	21.1-166.3
		Combined	31	19	2,184.4	164.0- 9,863.1	77.4	21.1-166.3
	Aug	North	12	10	2,963.2	288.7- 8,843.7	76.7	28.0-176.5
		South	12	8	3,954.0	458.3- 6,533.6	93.2	15.1-198.1
		Combined	24	18	3,458.6	288.7- 8,843.7	84.0	15.1-198.1
	Sep	North	10	10	1,623.6	939.5- 2,846.9	52.8	28.1- 63.6
		South	10	3	6,435.2	884.9-37,494.4	114.0	76.3-145.2
		Combined	20	13	4,029.4	884.9-37,494.4	66.9	28.1-145.2
	Oct	North	4	3	1,914.9	304.4- 3,880.5	52.4	28.2- 78.6
		South	4	2	5,551.5	2,047.7- 9,706.1	121.7	86.0-157.3
		Combined	8	5	3,733.2	304.4- 9,706.1	80.1	28.2-157.3
1988	Total (annual)	North	73	68	3,843.1	70.2-19,490.0	52.3	16.6-112.5
		South	96	80	2,610.0	46.8-26,624.0	49.4	12.1-252.5
		Combined	169	148	3,142.6	46.8-26,624.0	50.7	12.1-252.5
1989	Total (annual)	North	52	50	2,692.2	5.5-14,842.0	48.0	5.5-123.6
		South	87	64	2,468.4	24.5-18,010.0	50.2	11.8-171.8
		Combined	139	114	2,552.1	5.5-18,010.0	49.2	5.5-171.8
1990	Total (annual)	North	68	64	3,645.4	39.9-39,828.0	57.3	12.8-176.5
		South	72	39	3,687.0	116.6-37,494.4	99.3	14.3-200.2
		Combined	140	103	3,666.8	39.9-39,828.0	73.2	12.8-200.2

Table 2a. Monthly and total commercial landings (kg) of selected species captured by long haul seines north (N) and south (S) of Bluff Shoal and combined (C), including the percent each species contributed to the overall long haul landing: north; south; and combined, 1988.

Species	Area	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Percent total
Atlantic croaker	N	15,340	144,517	179,887	317,831	235,956	55,365	249	36	3	949,184	54.6
	S	659	19,213	39,318	47,903	42,083	38,438	29,357	10,582	-	227,53	8.9
	C	15,999	163,730	219,205	365,734	278,039	93,803	29,606	10,618	3	1,176,737	27.3
Weakfish	N	23,505	35,970	24,636	44,639	106,416	96,034	26,687	8,632	1,017	367,536	21.1
	S	1,118	17,043	28,615	22,642	12,535	67,146	60,450	31,853	-	241,402	9.4
	C	24,623	53,013	53,251	67,281	118,951	163,180	87,137	40,485	1,017	608,938	14.1
Bluefish	N	989	4,267	12,268	4,852	1,315	3,530	732	84	6	28,043	1.6
	S	3,370	4,949	26,279	34,239	18,574	24,086	20,195	4,363	-	136,055	5.3
	C	4,359	9,216	38,547	39,091	19,889	27,616	20,927	4,447	6	164,098	3.8
Spot	N	3,037	15,504	36,931	40,991	37,341	52,996	1,485	84	-	188,369	10.8
	S	2,103	10,268	47,820	96,107	57,865	132,917	339,335	20,919	-	707,334	27.5
	C	5,140	25,772	84,751	137,098	95,207	185,913	340,820	21,003	-	895,703	20.8
Flounder	N	20	28	220	355	2,508	466	30	47	-	3,674	0.2
	S	50	757	1,940	6,304	7,182	10,095	7,498	375	-	34,201	1.3
	C	70	785	2,160	6,659	9,690	10,551	7,528	422	-	37,865	0.8
Butterfish	N	-	-	401	91	345	129	71	3	-	347	<.1
	S	-	-	-	2	-	345	-	-	-	1,040	<.1
	C	-	-	401	93	345	474	71	3	-	1,387	<.1
Harvestfish	N	-	231	912	344	237	298	1,818	-	-	3,840	0.2
	S	-	336	1,889	819	606	8,552	-	136	-	12,338	0.5
	C	-	567	2,801	1,163	843	8,850	1,818	136	-	16,178	0.3
Spanish mackerel	N	-	391	750	554	420	302	33	-	-	2,450	0.1
	S	-	281	2,323	2,222	2,275	1,425	4,573	2,127	-	15,226	0.6
	C	-	672	3,073	2,776	2,695	1,727	4,606	2,127	-	17,676	0.4
Florida pompano	N	-	-	2	9	14	9	3	-	-	37	<.1
	S	-	-	8	45	247	358	25	-	-	683	<.1
	C	-	-	10	54	261	367	28	-	-	720	<.1

Table 2a. (Continued).

Species	Area	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Percent total
Black seabass	N	-	-	-	-	-	-	7	-	-	7	<.1
	S	-	-	-	-	-	-	-	-	-	-	<0.1
	C	-	-	-	-	-	-	7	-	-	7	<.1
Spotted seatrout	N	3,210	92	770	1,498	184	401	2,471	3,536	217	12,379	.7
	S	1	3,709	5,886	3,077	5,138	2,653	2,668	-	-	23,132	.9
	C	3,211	3,801	6,656	4,575	5,322	3,054	5,139	3,536	217	35,511	.8
Bait	N	25,692	13,744	46,515	24,807	27,029	10,658	-	-	-	148,445	8.5
	S	43,107	51,760	148,506	134,148	195,520	231,579	247,664	35,147	-	1,087,431	42.3
	C	68,799	65,504	195,021	158,955	222,549	242,237	247,664	35,147	-	1,235,876	28.7
Total	N	71,878	217,254	314,898	442,689	418,219	228,208	32,442	12,479	1,243	1,739,310	40.4*
	S	50,461	109,389	306,460	361,912	355,176	535,662	739,859	110,373	259	2,569,551	59.6*
	C	122,339	326,643	621,358	804,601	773,395	763,870	772,301	122,852	1,502	4,308,861	-
Total marketable	N	46,186	203,510	268,383	417,882	391,190	217,550	32,442	12,479	1,243	1,590,865	51.8*
	S	7,354	51,629	157,954	227,764	159,656	304,083	492,195	75,226	259	1,482,120	48.2*
	C	53,540	261,139	426,337	645,64	550,846	521,633	524,637	87,705	1,502	3,072,985	
Percent bait	N	35.7	6.3	14.8	5.6	6.5	4.7	<0.1	<0.1	<0.1	8.5	
	S	85.4	47.3	48.5	37.1	50.1	43.2	33.5	31.8	<0.1	42.3	
	C	56.2	20.1	31.4	19.8	28.8	31.7	32.1	28.6	<0.1	28.7	

* Percent contribution of north or south to the combined category.

Table 2b. Monthly and total commercial landings (kg) of selected species captured by long haul seines north (N) and south (S) of Bluff Shoal and combined (C), including the percent each species contributed to the overall long haul landing: north; south; and combined, 1989.

Species	Area	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total	Percent total
Atlantic croaker	N	16,709	141,484	443,418	475,949	173,559	29,525	261	-	1,280,905	57.1
	S	1,432	10,569	23,207	35,711	34,328	29,239	11,695	-	146,181	7.8
	C	18,141	152,053	466,625	511,660	207,887	58,764	11,956	-	1,427,086	34.7
Weakfish	N	5,926	12,086	6,438	21,673	59,803	10,415	5,554	8	121,903	5.4
	S	4,049	9,186	2,352	10,044	16,981	44,216	30,769	-	117,597	6.3
	C	9,975	21,272	8,790	31,717	76,784	54,631	36,323	8	239,500	5.8
Bluefish	N	19	701	5,030	8,126	24,765	2,093	1,005	73	41,812	1.9
	S	35	137	9,183	20,124	28,473	12,424	23,906	-	94,282	5.1
	C	54	838	14,213	28,250	53,238	14,517	24,911	73	136,094	3.3
Spot	N	245	12,010	42,281	57,409	75,677	23,699	9,436	-	220,757	9.8
	S	3,703	2,283	15,778	129,669	66,964	137,812	325,580	-	681,789	36.5
	C	3,948	14,293	58,059	187,078	142,641	161,511	335,016	-	902,546	22.0
Flounder	N	12	958	1,054	2,163	2,245	7,461	947	12	14,852	.7
	S	-	416	738	678	2,200	2,400	10,531	-	16,963	.9
	C	12	1,374	1,792	2,841	4,445	9,861	11,478	12	31,815	.8
Butterfish	N	-	140	81	294	-	-	-	-	515	<.1
	S	-	-	-	-	40	-	-	-	40	<.1
	C	-	140	81	294	40	-	-	-	555	<.1
Harvestfish	N	-	652	1,336	761	384	130	10	-	3,273	.2
	S	-	329	59	-	-	460	2,116	-	2,964	.2
	C	-	981	1,395	761	384	590	2,126	-	6,237	.2
Spanish mackerel	N	-	3,355	2,878	9,247	784	475	14	-	16,753	.8
	S	2	80	1,032	1,604	1,823	2,424	9,132	-	16,097	.9
	C	2	3,435	3,910	10,851	2,607	2,899	9,146	-	32,850	.8
Florida pompano	N	-	21	199	270	231	37	13	-	771	<.1
	S	-	-	-	354	1	5	625	-	985	.1
	C	-	21	199	624	232	42	638	-	1,756	<.1

Table 2b. (Continued).

Species	Area	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total	Percent total
Spotted seatrout	N	537	1,053	1,873	3,071	2,346	1,105	7,215	3,517	20,717	.9
	S	159	48	828	2,254	2,779	2,332	1,490	-	9,890	.5
	C	696	1,101	2,701	5,325	5,125	3,437	8,705	3,517	30,607	.7
Bait (scrap)	N	10,210	63,865	95,422	142,568	108,509	7,381	8,224	-	436,179	19.4
	S	18,195	46,213	58,517	89,081	58,782	165,337	277,975	-	714,100	38.3
	C	28,405	110,078	153,939	231,649	167,291	172,718	286,199	-	1,150,279	28.0
Total	N	33,685	242,993	615,055	737,973	471,093	94,960	45,611	3,665	2,245,035	54.6*
	S	27,753	70,216	112,945	294,087	228,290	405,960	727,395	-	1,866,646	45.4*
	C	61,438	313,209	728,000	1,032,060	699,383	500,920	773,006	3,665	4,111,681	
Total marketable	N	23,475	179,128	519,633	595,405	362,584	87,579	37,387	3,665	1,808,856	61.1*
	S	9,558	24,003	54,428	205,006	169,508	240,623	449,420	-	1,152,546	38.9*
	C	33,033	203,131	574,061	800,411	532,092	328,202	486,807	3,665	2,961,402	
Percent bait	N	30.3	26.3	15.5	19.3	23.0	7.7	18.0	0.0	19.4	
	S	65.6	65.8	51.8	30.3	25.8	40.7	38.2	0.0	38.3	
	C	46.2	35.2	21.1	22.5	23.9	34.5	37.0	0.0	28.0	

* Percent contribution of north or south to the combined category.

Table 2c. Monthly and total commercial landings (kg) of selected species captured by long haul seines north (N) and south (S) of Bluff Shoal and combined (C), including the percent each species contributed to the overall long haul landing: north; south; and combined, 1990.

Species	Area	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total	Percent total
Atlantic croaker	N	10,955	390,581	357,229	410,987	351,966	13,342	162	-	1,535,222	62.8
	S	11,368	36,623	41,691	31,202	46,515	43,606	18,151	4,535	233,691	8.2
	C	22,323	427,204	398,920	442,189	398,481	56,948	18,313	4,535	1,768,913	33.4
Weakfish	N	230	3,564	6,723	36,313	45,772	29,208	9,367	29	131,206	5.4
	S	21,712	36,358	83,341	21,189	49,371	59,205	77,921	374	349,471	12.2
	C	21,942	39,922	90,064	57,502	95,143	88,413	87,288	403	480,677	9.1
Bluefish	N	1,316	2,264	12,154	9,407	8,385	9,244	2,031	432	45,233	1.9
	S	1,518	2,293	14,351	16,696	25,137	16,085	16,554	1,153	93,787	3.3
	C	2,834	4,557	26,505	26,103	33,522	25,329	18,585	1,585	139,020	2.6
Spot	N	146	13,282	31,920	29,830	33,268	68,080	7,797	-	184,323	7.5
	S	1,426	19,320	78,848	31,539	48,751	376,375	361,093	2,697	920,049	32.2
	C	1,572	32,602	110,768	61,369	82,019	444,455	368,890	2,697	1,104,372	20.8
Flounder	N	62	497	147	516	1,620	813	543	5	4,203	.2
	S	30	89	1,034	1,166	4,048	3,196	4,914	-	14,477	.5
	C	92	586	1,181	1,682	5,668	4,009	5,457	5	18,680	.4
Butterfish	N	-	84	593	27	905	80	16	-	1,705	<.1
	S		-	1,859	816	363	4,102	12,221	-	19,361	6.8
	C	-	84	2,452	843	1,268	4,182	12,237	-	21,066	.4
Harvestfish	N	-	72	1,920	45	994	196	-	-	3,217	.1
	S	76	216	822	559	649	1,308	1,681	-	5,311	.2
	C	76	278	2,742	604	1,643	1,504	1,681	-	8,528	.2
Spanish mackerel	N	-	103	394	2,288	654	122	24	-	3,585	.2
	S	31	161	1,922	474	1,671	3,246	737	-	8,242	.3
	C	31	264	2,316	2,762	2,325	3,368	761	-	11,827	.2
Florida pompano	N	-	-	-	5	31	-	-	-	36	<.1
	S	-	-	1	-	87	896	324	-	1,308	.1
	C	-	-	1	5	118	896	324	-	1,344	<.1

Table 2c. (Continued).

Species	Area	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total	Percent total
Spotted seatrout	N	1,220	496	1,654	1,790	1,499	1,492	3,756	2,478	14,385	.6
	S	84	81	339	748	824	1,508	2,037	1,134	6,755	.2
	C	1,304	577	1,993	2,538	2,323	3,000	5,793	3,612	21,140	.4
Bait	N	-	70,124	114,771	143,002	127,689	41,347	2,902	-	499,835	20.5
	S	48,431	74,323	210,762	87,391	139,018	264,123	810,816	-	1,134,864	39.8
	C	48,431	144,447	325,533	230,393	266,707	305,470	313,718	-	1,634,699	30.9
Total	N	14,099	484,118	532,952	639,937	578,728	164,665	27,016	2,955	2,444,470	46.1*
	S	84,811	169,876	440,116	199,078	327,876	793,523	828,932	10,424	2,854,636	53.9*
	C	98,910	653,994	973,068	839,015	906,604	958,188	855,948	13,379	5,299,106	
Total marketable	N	14,099	413,994	418,181	496,935	451,039	123,318	24,114	2,955	1,944,635	53.1*
	S	36,380	95,553	229,354	111,687	188,858	529,400	518,166	10,424	1,719,772	46.9*
	C	50,479	509,547	647,535	608,622	639,897	652,718	542,230	13,379	3,664,407	
Percent bait	N	-	14.5	21.5	22.4	22.1	25.1	10.7	0.0	20.5	
	S	57.1	43.8	47.9	43.9	42.4	33.3	37.5	0.0	39.8	
	C	49.0	22.1	33.5	27.5	29.4	31.9	36.7	0.0	30.9	

* Percent contribution of north or south to the combined category.

Table 3. Monthly, areal, and overall mean weights for total catch, marketable, and scrap portions; range of percent scrap in long haul catches from Pamlico Sound area (N = north of Bluff Shoal, S = south of Bluff Shoal, C = combined areas), 1988-1990, n = number of catches sampled.

Month	Year	Area	n	Mean catch weight (kg)	Mean weight (kg) Marketable	Mean weight (kg) Scrap	Percent scrap Mean	Percent scrap Range
Apr	1988	N	6	2,413.6	1,440.6	973.0	33.3	0.0- 59.6
		S	0	-	-	-	-	-
		C	6	2,413.6	1,440.6	973.0	33.3	0.0- 59.6
	1989	N	5	1,578.5	1,232.0	346.5	10.5	0.0- 35.2
		S	0	-	-	-	-	-
		C	5	1,578.5	1,232.0	346.5	10.5	0.0- 35.2
	1990	N	5	215.1	215.1	0.0	0.0	0.0
		S	4	5,336.8	3,445.2	1,891.6	35.7	26.4- 39.4
		C	9	2,491.4	1,650.7	840.7	15.9	0.0- 39.4
May	1988	N	17	5,161.1	2,769.3	2,391.8	44.7	2.3- 97.5
		S	13	2,262.5	1,016.9	1,245.6	37.5	0.0- 89.2
		C	30	3,905.0	2,009.9	1,895.1	41.6	0- 97.5
	1989	N	8	1,582.7	719.9	862.8	50.2	2.3- 86.9
		S	3	1,532.5	353.1	1,179.4	44.8	0.0- 83.1
		C	11	1,569.0	619.9	949.2	48.7	0.0- 86.9
	1990	N	13	5,246.1	3,975.4	1,270.8	29.3	0.0-100.0
		S	12	1,555.4	946.6	608.8	35.2	7.3- 79.2
		C	25	3,474.6	2,521.6	953.0	32.1	0.0-100.0
Jun	1988	N	14	2,287.9	1,761.7	526.1	22.6	3.8- 39.2
		S	14	2,866.6	1,511.4	1,355.2	41.2	7.8- 72.6
		C	28	2,577.2	1,636.6	940.7	31.9	3.8- 72.6
	1989	N	10	2,591.8	2,216.4	375.4	16.9	2.1- 36.7
		S	19	2,386.5	1,180.7	1,205.8	48.6	24.8- 84.6
		C	29	2,457.3	1,537.8	919.5	37.7	2.1- 84.6
	1990	N	12	7,914.4	5,183.4	2,731.0	29.9	12.0- 68.2
		S	11	4,356.4	1,722.2	2,634.2	54.9	13.3- 93.3
		C	23	6,212.7	3,528.0	2,684.7	41.9	12.0- 93.3
Jul	1988	N	13	2,918.0	2,547.8	370.2	15.9	0.6- 35.1
		S	19	1,680.5	1,072.9	607.6	39.7	3.0- 88.0
		C	32	2,183.2	1,672.1	511.1	30.0	0.6- 88.0
	1989	N	9	4,775.9	3,032.1	1,743.8	33.4	15.9- 60.0
		S	20	3,927.4	1,927.1	2,000.3	51.2	4.7- 91.1
		C	29	4,190.7	2,270.0	1,920.7	45.7	4.7- 91.1
	1990	N	12	2,015.6	1,560.1	455.5	21.6	5.2- 56.3
		S	19	2,290.9	1,414.8	876.2	47.6	13.1- 91.8
		C	31	2,184.4	1,471.0	713.3	37.6	5.2- 91.8

Table 3. (Continued).

Month	Year	Area	n	Mean catch weight (kg)	Mean weight (kg)		Percent scrap	
					Marketable	Scrap	Mean	Range
Aug	1988	N	13	6,423.1	5,420.9	1,002.2	15.0	0.0- 37.7
		S	24	2,054.7	1,038.9	1,015.8	48.3	12.3- 88.5
		C	37	3,589.5	2,578.5	1,011.0	36.6	0.0- 88.5
	1989	N	14	2,822.5	2,030.1	792.3	31.4	4.0- 86.5
		S	21	2,042.7	1,154.9	887.8	53.1	0.0- 92.3
		C	35	2,354.6	1,505.0	849.6	44.4	0.0- 92.3
	1990	N	12	2,963.2	1,991.7	971.5	20.9	0.0- 76.2
		S	12	3,954.0	2,350.1	1,603.9	43.5	8.6- 79.2
		C	24	3,458.6	2,170.9	1,287.7	32.2	0.0- 79.2
Sep	1988	N	5	2,982.9	2,624.1	358.8	9.1	0.0- 26.2
		S	18	2,479.8	1,465.2	1,014.6	46.6	8.3- 87.0
		C	23	2,589.2	1,717.1	872.1	38.4	0.0- 87.0
	1989	N	6	1,837.2	1,439.5	397.7	17.0	1.8- 51.3
		S	11	1,629.8	911.1	718.8	49.3	21.1- 80.4
		C	17	1,703.0	1,097.6	605.4	37.9	1.8- 80.4
	1990	N	10	1,623.6	1,065.7	557.9	34.9	4.0- 66.6
		S	10	6,435.2	4,487.0	1,948.2	41.0	6.3- 88.5
		C	20	4,029.4	2,776.3	1,253.1	38.0	4.0- 88.5
Oct	1988	N	5	1,989.7	1,327.3	662.4	22.9	0.0- 69.3
		S	8	6,891.8	3,427.5	3,464.4	44.7	0.0- 88.1
		C	13	5,006.4	2,619.7	2,386.7	36.2	0.0- 88.1
	1989	N	0	-	-	-	-	-
		S	13	1,956.7	1,274.6	682.1	34.8	0.0- 74.6
		C	13	1,956.7	1,274.6	682.1	34.8	0.0- 74.6
	1990	N	4	1,914.9	1,262.8	652.1	21.8	0.0- 46.8
		S	4	5,551.5	2,149.5	3,402.0	58.8	50.7- 73.1
		C	8	3,733.2	1,706.2	2,027.0	40.3	0.0- 73.1
All	1988	N	73	3,843.1	2,790.9	1,052.2	25.2	0.0- 97.5
		S	96	2,610.0	1,390.5	1,219.5	43.5	0.0- 89.2
		C	169	3,142.6	1,995.4	1,147.2	35.6	0.0- 97.5
	1989	N	52	2,692.2	1,892.9	799.3	28.2	0.0- 86.9
		S	87	2,468.4	1,297.4	1,171.0	48.2	0.0- 92.3
		C	139	2,552.1	1,520.2	1,031.9	40.7	0.0- 92.3
	1990	N	68	3,645.4	2,548.3	1,097.1	24.8	0.0-100.0
		S	72	3,687.0	2,119.9	1,567.1	45.0	6.3- 93.3
		C	140	3,666.8	2,328.0	1,338.8	35.2	0.0-100.0

Table 4a. Overall species composition (148 catches) of long haul catches sampled in the Pamlico Sound area, April-October 1988.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Micropogonias undulatus	1,286.1	31.3	8,478	25.0	0.152	91.2
Brevoortia tyrannus	1,052.9	25.6	12,624	37.2	0.083	70.9
Leiostomus xanthurus	947.0	23.1	8,034	23.7	0.118	98.0
Cynoscion regalis	437.0	10.6	2,194	6.5	0.199	84.5
Lagodon rhomboides	106.4	2.6	1,467	4.3	0.073	60.1
Pomatomus saltatrix	97.3	2.4	222	0.7	0.439	73.0
Cynoscion nebulosus	48.8	1.2	106	0.3	0.461	54.1
Orthopristis chrysoptera	44.9	1.1	374	1.1	0.120	49.3
Menticirrhus americanus	18.3	0.4	62	0.2	0.297	37.8
Bairdiella chrysoura	13.2	0.3	149	0.4	0.088	47.3
Paralichthys lethostigma	4.1	0.1	14	<0.1	0.290	28.4
Callinectes sapidus	4.0	0.1	42	0.1	0.096	51.4
Mustelus canis	3.8	0.1	5	<0.1	0.752	6.1
Dasyatis americana	3.5	0.1	8	<0.1	0.463	10.1
Peprilus alepidotus	3.4	0.1	31	0.1	0.107	19.6
Archosargus probatocephalus	3.1	0.1	2	<0.1	1.837	12.8
Dasyatis sabina	2.9	0.1	3	<0.1	0.912	15.5
Dorosoma cepedianum	2.7	0.1	7	<0.1	0.378	12.2
Scomberomorus maculatus	2.5	0.1	11	<0.1	0.219	20.9
Chaetodipterus faber	1.8	<0.1	5	<0.1	0.368	12.2
Paralichthys dentatus	1.8	<0.1	16	<0.1	0.113	35.8
Rhizoprionodon terraenovae	1.2	<0.1	1	<0.1	0.875	0.7
Prionotus evolans	0.9	<0.1	3	<0.1	0.327	5.4
Sphoeroides maculatus	0.9	<0.1	4	<0.1	0.196	14.9
Sciaenops ocellatus	0.8	<0.1	1	<0.1	0.647	11.5
Chilomycterus schoepfi	0.8	<0.1	3	<0.1	0.256	17.6
Mugil cephalus	0.6	<0.1	2	<0.1	0.251	10.8
Caranx hippos	0.6	<0.1	2	<0.1	0.325	4.1
Opisthonema oglinum	0.6	<0.1	12	<0.1	0.046	12.2
Carcharhinus leucas	0.5	<0.1	<1	<0.1	34.950	2.0
Peprilus triacanthus	0.5	<0.1	1	<0.1	0.523	5.4
Hyporhamphus unifasciatus	0.5	<0.1	2	<0.1	0.300	0.7
Menticirrhus spp.	0.4	<0.1	2	<0.1	0.167	5.4
Larimus fasciatus	0.3	<0.1	2	<0.1	0.140	1.4
Menticirrhus saxatilis	0.3	<0.1	1	<0.1	0.302	1.4
Monacanthus hispidus	0.2	<0.1	12	<0.1	0.018	12.2
Opsanus tau	0.2	<0.1	2	<0.1	0.084	6.1
Alosa aestivalis	0.1	<0.1	1	<0.1	0.146	1.4
Rachycentron canadum	0.1	<0.1	<1	<0.1	7.267	3.4
Mycteroperca microlepis	0.1	<0.1	2	<0.1	0.080	2.0
Prionotus carolinus	0.1	<0.1	2	<0.1	0.058	4.1
Alosa pseudoharengus	0.1	<0.1	1	<0.1	0.160	0.7
Paralichthys spp.	0.1	<0.1	1	<0.1	0.137	4.7
Trachinotus carolinus	0.1	<0.1	<1	<0.1	0.334	2.7
Selene vomer	0.1	<0.1	3	<0.1	0.032	6.1
Prionotus spp.	0.1	<0.1	<1	<0.1	0.209	0.7
Synodus foetens	0.1	<0.1	<1	<0.1	0.160	2.7
Dasyatis spp.	0.1	<0.1	1	<0.1	0.050	0.7
Aluterus scripta	<0.1	<0.1	1	<0.1	0.038	2.7
Trinectes maculatus	<0.1	<0.1	2	<0.1	0.024	7.4
Citharichthys spp.	<0.1	<0.1	4	<0.1	0.011	0.7
Diplodus holbrooki	<0.1	<0.1	3	<0.1	0.012	2.7
Alectis ciliaris	<0.1	<0.1	1	<0.1	0.045	2.0
Lolliguncula brevis	<0.1	<0.1	1	<0.1	0.020	1.4
Paralichthys albigutta	<0.1	<0.1	<1	<0.1	0.121	6.8
Stenotomus caprinus	<0.1	<0.1	<1	<0.1	0.045	0.7
Aluterus schoepfi	<0.1	<0.1	1	<0.1	0.018	2.7
Pogonias cromis	<0.1	<0.1	<1	<0.1	2.300	2.0
Penaeus duorarum	<0.1	<0.1	1	<0.1	0.006	2.7
Eucinostomus gula	<0.1	<0.1	1	<0.1	0.010	0.7
Penaeus aztecus	<0.1	<0.1	1	<0.1	0.010	2.0

Table 4a. (Continued).

Species observed:

Loligo pealii	Anchoa mitchilli
Limulus polyphemus	Ariidae
Carcharhinus obscurus	Urophycis regia
Carcharhinus plumbeus	Tylosurus crocodilus
Carcharhinus limbatus	Prionotus tribuls
Aprionodon isodon	Caranx crysos
Squalus acanthias	Selene setapinnis
Raja spp.	Gerreidae
Raja eglanteria	Eucinostomus argenteus
Dasyatis sayi	Calamus calamus
Rhinoptera bonasus	Astroscopus guttatus
Elops saurus	Citharichthys spilopterus
Alosa sapidissima	Symphurus plagiusa

Table 4b. Overall species composition (114 catches) of long haul catches sampled in the Pamlico Sound area, April-October 1989.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Micropogonias undulatus	1,106.5	41.4	7,686	34.1	0.144	95.6
Leiostomus xanthurus	707.4	26.5	6,606	29.4	0.107	99.1
Brevoortia tyrannus	259.0	9.7	3,801	16.9	0.068	58.8
Lagodon rhomboides	180.3	6.8	2,256	10.0	0.080	81.6
Pomatomus saltatrix	135.9	5.1	315	1.4	0.431	78.9
Cynoscion regalis	109.0	4.1	657	2.9	0.166	66.7
Orthopristis chrysoptera	80.3	3.0	694	3.1	0.116	73.7
Cynoscion nebulosus	32.4	1.2	62	0.3	0.526	53.5
Bairdiella chrysoura	11.8	0.4	159	0.7	0.075	45.6
Caranx hippos	5.9	0.2	5	<0.1	1.091	7.9
Scomberomorus maculatus	5.4	0.2	20	0.1	0.276	38.6
Menticirrhus americanus	4.3	0.2	17	0.1	0.248	22.8
Paralichthys dentatus	4.1	0.2	19	0.1	0.211	28.1
Callinectes sapidus	3.4	0.1	34	0.2	0.100	38.6
Dasyatis sayi	2.4	0.1	1	<0.1	1.653	3.5
Paralichthys lethostigma	2.3	0.1	10	<0.1	0.238	27.2
Archosargus probatocephalus	2.1	0.1	4	<0.1	0.516	14.0
Mustelus canis	1.4	0.1	1	<0.1	1.125	5.3
Sphoeroides maculatus	1.4	0.1	8	<0.1	0.183	24.6
Dorosoma cepedianum	1.4	0.1	4	<0.1	0.379	6.1
Chilomycterus schoepfi	1.3	<0.1	7	<0.1	0.179	28.9
Monacanthus hispidus	1.2	<0.1	43	0.2	0.127	24.6
Sciaenops ocellatus	1.1	<0.1	<1	<0.1	5.375	14.0
Dasyatis sabina	1.1	<0.1	2	<0.1	0.582	19.3
Myliobatis freminvillei	0.9	<0.1	1	<0.1	1.400	2.6
Dasyatis americana	0.9	<0.1	3	<0.1	0.331	13.2
Tylosurus crocodilus	0.7	<0.1	1	<0.1	0.928	10.5
Mycteroperca microlepis	0.6	<0.1	5	<0.1	0.115	8.8
Opisthonema oglinum	0.6	<0.1	17	0.1	0.135	14.0
Opsanus tau	0.5	<0.1	3	<0.1	0.166	9.6
Chaetodipterus faber	0.4	<0.1	7	<0.1	0.067	7.0
Selene vomer	0.4	<0.1	16	0.1	0.025	18.4
Peprilus alepidotus	0.4	<0.1	6	<0.1	0.058	9.6
Paralichthys spp.	0.4	<0.1	1	<0.1	0.661	12.3
Trachinotus carolinus	0.3	<0.1	1	<0.1	0.564	8.8
Carcharhinidae	0.3	<0.1	<1	<0.1	30.800	0.9
Mugil cephalus	0.3	<0.1	1	<0.1	0.326	7.0
Alosa pseudoharengus	0.3	<0.1	2	<0.1	0.138	4.4
Ablennes hians	0.2	<0.1	<1	<0.1	0.560	1.8
Callinectes	0.2	<0.1	3	<0.1	0.092	0.9
Dasyatis spp.	0.2	<0.1	1	<0.1	0.181	4.4
Peprilus triacanthus	0.2	<0.1	3	<0.1	0.069	7.0
Prionotus carolinus	0.2	<0.1	4	<0.1	0.056	3.5
Larimus fasciatus	0.2	<0.1	2	<0.1	0.120	0.9
Prionotus scitulus	0.1	<0.1	2	<0.1	0.075	0.9
Prionotus evolans	0.1	<0.1	1	<0.1	0.099	7.0
Synodus foetens	0.1	<0.1	1	<0.1	0.121	4.4
Aluterus schoepfi	0.1	<0.1	2	<0.1	0.065	5.3
Citharichthys spp.	0.1	<0.1	6	<0.1	0.019	0.9
Pogonias cromis	0.1	<0.1	<1	<0.1	2.620	1.8
Menticirrhus spp.	0.1	<0.1	<1	<0.1	0.186	2.6
Diplodus holbrooki	0.1	<0.1	3	<0.1	0.022	5.3
Centropristis philadelphica	<0.1	<0.1	1	<0.1	0.070	0.9
Aluterus scripta	<0.1	<0.1	1	<0.1	0.032	1.8
Tautoga onitis	<0.1	<0.1	<1	<0.1	0.180	1.8
Lutjanus analis	<0.1	<0.1	1	<0.1	0.020	0.9
Rachycentron canadum	<0.1	<0.1	<1	<0.1	0.080	0.9
Alosa spp.	<0.1	<0.1	<1	<0.1	0.050	0.9
Chloroscombrus chrysurus	<0.1	<0.1	1	<0.1	0.010	0.9
Prionotus tribulus	<0.1	<0.1	1	<0.1	0.004	1.8
Selene setapinnis	<0.1	<0.1	1	<0.1	0.004	1.8
Penaeus duorarum	<0.1	<0.1	<1	<0.1	0.010	2.6

Table 4b. (Continued).

Species observed:	
Crassotrea virginica	*Alosa mediocris*
Penaeus aztecus	*Prionotus* spp.
Penaeus setiferus	*Centropristis striata*
Rhizoprionodon terraenovae	*Caranx crysos*
Carcharhinus spp.	*Menticirrhus saxatilis*
Carcharhinus limbatus	*Citharichthys spilopterus*
Aprionodon isodon	*Paralichthys albigutta*
Sphyrna tiburo	*Scophthalmus aquosus*
Rajiformes	*Trinectes maculatus*
Rhinoptera bonasus	*Monacanthus* spp.
Elops saurus	*Monacanthus ciliatus*
Megalops atlanticus	

Table 4c. Overall species composition (103 catches) of long haul catches sampled in the Pamlico Sound area, April-October 1990.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Micropogonias undulatus	2,291.5	57.5	19,689	50.0	0.116	92.2
Leiostomus xanthurus	527.1	13.2	7,813	19.8	0.067	97.1
Brevoortia tyrannus	489.1	12.3	6,201	15.7	0.079	46.6
Cynoscion regalis	301.4	7.6	1,976	5.0	0.153	75.7
Pomatomus saltatrix	130.9	3.3	376	1.0	0.348	88.3
Lagodon rhomboides	123.2	3.1	2,360	6.0	0.052	68.9
Orthopristis chrysoptera	43.7	1.1	419	1.1	0.104	63.1
Cynoscion nebulosus	18.6	0.5	28	0.1	0.664	60.2
Bairdiella chrysoura	11.0	0.3	197	0.5	0.056	45.6
Mustelus canis	9.3	0.2	8	<0.1	1.124	5.8
Peprilus triacanthus	3.6	0.1	68	0.2	0.053	23.3
Chaetodipterus faber	3.5	0.1	29	0.1	0.119	10.7
Scomberomorus maculatus	3.2	0.1	15	<0.1	0.209	40.8
Sciaenops ocellatus	3.1	0.1	2	<0.1	1.413	13.6
Menticirrhus americanus	2.6	0.1	14	<0.1	0.184	22.3
Peprilus alepidotus	2.4	0.1	46	0.1	0.052	22.3
Paralichthys dentatus	2.4	0.1	15	<0.1	0.160	41.7
Menticirrhus spp.	1.8	<0.1	8	<0.1	0.230	13.6
Archosargus probatocephalus	1.6	<0.1	2	<0.1	0.941	29.1
Callinectes sapidus	1.3	<0.1	28	0.1	0.048	38.8
Paralichthys lethostigma	1.3	<0.1	3	<0.1	0.462	19.4
Peprilus spp.	1.0	<0.1	10	<0.1	0.100	4.9
Monacanthus hispidus	0.8	<0.1	37	0.1	0.022	24.3
Mugil cephalus	0.7	<0.1	2	<0.1	0.298	5.8
Carcharhinus leucas	0.7	<0.1	<1	<0.1	24.333	3.9
Selene vomer	0.6	<0.1	16	<0.1	0.034	16.5
Prionotus evolans	0.5	<0.1	5	<0.1	0.108	7.8
Sphoeroides maculatus	0.5	<0.1	1	<0.1	0.442	17.5
Mycteroperca microlepis	0.4	<0.1	2	<0.1	0.185	5.8
Paralichthys spp.	0.2	<0.1	<1	<0.1	0.703	10.7
Trachinotus carolinus	0.2	<0.1	1	<0.1	0.170	8.7
Opsanus tau	0.2	<0.1	1	<0.1	0.155	5.8
Prionotus carolinus	0.2	<0.1	5	<0.1	0.034	9.7
Callinectes similis	0.2	<0.1	4	<0.1	0.041	1.9
Opisthonema oglinum	0.2	<0.1	8	<0.1	0.021	9.7
Citharichthys spilopterus	0.2	<0.1	9	<0.1	0.018	3.9
Caranx hippos	0.1	<0.1	1	<0.1	0.105	3.9
Prionotus tribulus	0.1	<0.1	3	<0.1	0.038	3.9
Rachycentron canadum	0.1	<0.1	<1	<0.1	10.500	1.9
Menticirrhus saxatilis	0.1	<0.1	2	<0.1	0.049	3.9
Dasyatis spp.	0.1	<0.1	1	<0.1	0.172	1.9
Tylosurus crocodilus	0.1	<0.1	<1	<0.1	0.620	7.8
Synodus foetens	0.1	<0.1	<1	<0.1	0.120	1.0
Dorosoma cepedianum	0.1	<0.1	<1	<0.1	0.190	1.0
Chilomycterus schoepfi	0.1	<0.1	<1	<0.1	0.255	25.2
Tautoga onitis	<0.1	<0.1	<1	<0.1	0.145	7.8
Prionotus spp.	<0.1	<0.1	<1	<0.1	0.140	2.9
Aluterus schoepfi	<0.1	<0.1	1	<0.1	0.038	3.9
Pogonias cromis	<0.1	<0.1	<1	<0.1	2.900	1.0
Trinectes maculatus	<0.1	<0.1	1	<0.1	0.020	1.0
Alosa sapidissima	<0.1	<0.1	<1	<0.1	1.900	1.9
Hyporhamphus unifasciatus	<0.1	<0.1	<1	<0.1	0.150	1.0
Eucinostomus argenteus	<0.1	<0.1	1	<0.1	0.022	1.0
Selene setapinnis	<0.1	<0.1	<1	<0.1	0.030	1.0
Alectis ciliaris	<0.1	<0.1	1	<0.1	0.001	1.9
Alosa aestivalis	<0.1	<0.1	2	<0.1	0.001	1.0
Urophycis regia	<0.1	<0.1	1	<0.1	0.001	1.9

Observed species:

Cnidaria
Penaeus aztecus
Penaeus duorarum
Rhizoprionodon terraenovae
Carcharhinus obscurus
Sphyrna tiburo
Raja eglanteria
Dasyatis americana
Dasyatis sabina
Dasyatis sayi
Myliobatis freminvillei
Rhinoptera bonasus
Elops saurus
Ablennes hians
Strongylura marina
Caranx spp.
Eucinostomus spp.
Trichiurus lepturus

Table 5. Annual species composition (top 99% of weight) of long haul catches sampled in the Pamlico Sound area, north and south of Bluff Shoal, April-October 1988-1990, including mean catch/trip (kg) and mean number/trip; n = number of catches sampled.

	North				South			
		Weight (kg)		Mean number		Weight (kg)		Mean number
Year	Species	Mean	Percent	fish	Species	Mean	Percent	fish
1988	n=68				n=80			
	Micropogonias undulatus	2,146.9	52.5	11,638	_Brevoortia tyrannus_	1,629.3	39.6	20,482
	Leiostomus xanthurus	703.6	17.2	6,546	_Leiostomus xanthurus_	1,153.8	28.0	9,299
	Cynoscion regalis	670.8	16.4	2,943	_Micropogonias undualtus_	554.5	13.5	5,793
	Brevoortia tyrannus	374.7	9.2	3,379	_Cynoscion regalis_	238.2	5.8	1,557
	Pomatomus saltatrix	50.5	1.2	123	_Lagodon rhomboides_	172.5	4.2	2,482
	Orthopristis chrysoptera	41.2	1.0	269	_Pomatomus saltatrix_	137.1	3.3	306
	Cynoscion nebulosus	36.6	0.9	91	_Cynoscion nebulosus_	59.3	1.4	119
	Lagodon rhomboides	28.7	0.7	272	_Orthopristis chrysoptera_	48.0	1.2	464
					Menticirrhus americanus	30.2	0.7	100
					Bairdiella chrysoura	14.3	0.3	154
					Mustelus canis	7.0	0.2	9
					Dasyatis americana	6.4	0.2	14
					Peprilus alepidotus	6.1	0.1	57
					Dasyatis sabina	5.3	0.1	6
					Paralichthys lethostigma	5.0	0.1	18
					Callinectes sapidus	4.8	0.1	46
					Dorosoma cepedianum	4.6	0.1	12
					Scomberomorus maculatus	3.9	0.1	17
1989	n=50				n=64			
	Micropogonias undulatus	1,619.1	60.6	9,645	_Leiostomus xanthurus_	905.4	33.9	8,492
	Leiostomus xanthurus	453.9	17.0	4,193	_Micropogonias undulatus_	706.0	26.4	6,155
	Cynoscion regalis	121.0	4.5	690	_Brevoortia tyrannus_	375.6	14.1	5,274
	Brevoortia tyrannus	109.7	4.1	1,915	_Lagodon rhomboides_	244.5	9.2	3,208
	Lagodon rhomboides	98.2	3.7	1,037	_Pomatomus saltatrix_	169.7	6.4	400
	Orthopristis chrysoptera	95.8	3.6	770	_Cynoscion regalis_	99.6	3.7	630
	Pomatomus saltatrix	92.5	3.5	207	_Orthopristis chrysoptera_	68.2	2.6	636
	Cynoscion nebulosus	34.8	1.3	73	_Cynoscion nebulosus_	30.5	1.1	52
	Caranx hippos	12.7	0.5	5	_Bairdiella chrysoura_	17.1	0.6	239
	Callinectes sapidus	7.4	0.3	70	_Scomberomorus maculatus_	6.7	0.2	24
					Menticirrhus americanus	6.6	0.2	27
					Paralichthys dentatus	5.6	0.2	23
					Dasyatis sayi	4.3	0.2	3
					Archosargus probatocephalus	3.8	0.1	7
					Paralichthys lethostigma	3.1	0.1	11

Table 5. (Continued).

Year	North				South			
		Weight (kg)		Mean number fish		Weight (kg)		Mean number fish
	Species	Mean	Percent		Species	Mean	Percent	
1990	n=64				n=39			
	Micropogonias undulatus	2,946.7	77.2	22,995	*Micropogonias undulatus*	1,216.3	28.5	14,263
	Leiostomus xanthurus	307.6	8.1	4,263	*Brevoortia tyrannus*	1,170.3	27.5	14,217
	Pomatomus saltatrix	144.7	3.8	359	*Leiostomus xanthurus*	887.2	20.8	13,638
	Cynoscion regalis	123.9	3.2	865	*Cynoscion regalis*	592.8	13.9	3,800
	Lagodon rhomboides	119.8	3.1	2,363	*Lagodon rhomboides*	128.8	3.0	2,355
	Brevoortia tyrannus	74.0	1.9	1,316	*Pomatomus saltatrix*	108.1	2.5	403
	Orthopristis chrysoptera	44.8	1.2	368	*Orthopristis chrysoptera*	41.9	1.0	501
	Cynoscion nebulosus	21.8	0.6	31	*Mustelus canis*	23.3	0.5	12
					Bairdoella chrysoura	15.0	0.4	319
					Cynoscion nebulosus	13.3	0.3	23
					Peprilus triacanthus	7.2	0.2	127
					Chaetodipterus faber	6.6	0.2	9
					Menticirrhus americanus	5.2	0.1	29
					Peprilus alepidotus	4.6	0.1	83

Table 6a. Monthly species composition (top 99% of weight) of long haul catches sampled in the Pamlico Sound area April-October 1988, including mean catch/trip (Kg) and mean number/trip; n=number of catches sampled.

Month	Species	Weight (kg) Mean	Weight (kg) Percent	Mean number
April n=6	Cynoscion regalis	772.5	32.0	3,411
	Micropogonias undulatus	596.4	24.7	5,342
	Leiostomus xanthurus	491.1	20.3	6,216
	Brevoortia tyrannus	381.6	15.8	2,833
	Pomatomus saltatrix	76.0	3.2	108
	Cynoscion nebulosus	59.6	2.5	299
	Bairdiella chrysoura	23.7	1.0	275
May n=24	Micropogonias undulatus	1,693.6	36.4	10,399
	Leiostomus xanthurus	1,217.7	26.2	12,602
	Brevoortia tyrannus	989.9	21.3	11,403
	Cynoscion regalis	574.8	12.3	1,971
	Pomatomus saltatrix	61.5	1.3	160
	Cynoscion nebulosus	55.4	1.2	147
	Bairdiella chrysoura	25.7	0.6	269
Jun n=28	Micropogonias undulatus	1,199.2	48.3	8,640
	Leiostomus xanthurus	639.4	25.7	5,531
	Lagodon rhomboides	160.3	6.5	2,113
	Cynoscion regalis	123.6	5.0	652
	Brevoortia tyrannus	114.0	4.6	1,458
	Orthopristis chrysoptera	92.6	3.7	794
	Pomatomus saltatrix	52.1	2.1	166
	Cynoscion nebulosus	36.5	1.5	95
	Bairdiella chrysoura	12.9	0.5	145
	Chaetodipterus faber	7.7	0.3	2
	Rhizoprionodon terraenovae	6.5	0.3	7
	Dasyatis sabina	6.5	0.3	3
	Callinectes sapidus	5.0	0.2	64
Jul n=25	Brevoortia tyrannus	4,185.3	63.6	49,837
	Micropogonias undulatus	1,303.0	19.8	6,618
	Leiostomus xanthurus	401.6	6.1	2,915
	Pomatomus saltatrix	312.2	4.7	469
	Cynoscion regalis	138.2	2.1	752
	Lagodon rhomboides	95.8	1.5	947
	Orthopristis chrysoptera	43.2	0.7	253
	Cynoscion nebulosus	39.9	0.6	94
Aug n=32	Micropogonias undulatus	2,262.8	56.9	13,796
	Leiostomus xanthurus	621.8	15.6	6,340
	Cynoscion regalis	538.0	13.5	2,581
	Brevoortia tyrannus	258.4	6.5	5,711
	Lagodon rhomboides	110.4	2.8	1,584
	Pomatomus saltatrix	46.0	1.2	180
	Cynoscion nebulosus	32.9	0.8	60
	Orthopristis chrysoptera	27.5	0.7	225
	Bairdiella chrysoura	13.7	0.3	179
	Mustelus canis	11.8	0.3	17
	Menticirrhus americanus	10.3	0.3	35
	Callinectes sapidus	9.8	0.2	89
Sep n=21	Leiostomus xanthurus	1,247.9	44.5	8,924
	Cynoscion regalis	471.7	16.8	2,312
	Brevoortia tyrannus	333.9	11.9	2,854
	Micropogonias undulatus	270.8	9.7	4,641
	Lagodon rhomboides	145.9	5.2	2,385
	Pomatomus saltatrix	70.9	2.5	248
	Cynoscion nebulosus	60.3	2.2	72
	Orthopristis chrysoptera	48.8	1.7	581
	Menticirrhus americanus	18.8	0.7	60
	Peprilus alepidotus	16.4	0.6	130
	Archosargus probatocephalus	6.9	0.2	2
	Bairdiella chrysoura	6.3	0.2	65

Table 6a. (Continued).

Month	Species	Weight (kg)		Mean
		Mean	Percent	number
Sep (Continued)	*Dasyatis americana*	4.8	0.2	18
	Paralichthys lethostigma	4.1	0.1	12
	Mustelus canis	3.2	0.1	5
	Larimus fasciatus	2.1	0.1	15
	Dasyatis sabina	2.0	0.1	1
	Sciaenops ocellatus	1.9	0.1	1
	Menticirrhus saxatilis	1.7	0.1	5
	Menticirrhus spp.	1.7	0.1	10
	Sphoeroides maculatus	1.6	0.1	7
	Callinectes sapidus	1.5	0.1	10
	Chilomycterus schoepfi	1.3	<0.1	7
	Caranx hippos	1.3	<0.1	11
	Dorosoma cepedianum	1.0	<0.1	2
	Paralichthys dentatus	0.8	<0.1	8
	Scomberomorus maculatus	0.7	<0.1	5
	Chaetodipterus faber	0.7	<0.1	5
	Trachinotus carolinus	0.7	<0.1	2
	Prionotus spp.	0.6	<0.1	3
	Paralichthys spp.	0.6	<0.1	2
	Selene vomer	0.4	<0.1	10
	Opisthonema oglinum	0.3	<0.1	10
	Opsanus tau	0.1	<0.1	3
	Prionotus evolans	<0.1	<0.1	6
Oct n=12	*Leiostomus xanthurus*	2,827.6	55.2	19,273
	Cynoscion regalis	1,017.2	19.9	7,399
	Brevoortia tyrannus	556.1	10.9	4,023
	Lagodon rhomboides	168.1	3.3	2,530
	Micropogonias undulatus	155.8	3.0	2,242
	Menticirrhus americanus	128.7	2.5	393
	Cynoscion nebulosus	100.3	2.0	157
	Orthopristis chrysoptera	86.8	1.7	601
	Pomatomus saltatrix	20.4	0.4	84
	Dasyatis americana	14.0	0.3	8

Table 6b. Monthly species composition (top 99% of weight) of long haul catches sampled in the Pamlico Sound area April-October 1989, including mean catch/trip (Kg) and mean number/trip; n=number of catches sampled.

Month	Species	Weight (kg) Mean	Weight (kg) Percent	Mean number
April	Micropogonias undulatus	1,245.8	78.9	6,255
n=5	Leiostomus xanthurus	226.5	14.3	2,953
	Cynoscion regalis	36.7	2.3	90
	Brevoortia tyrannus	32.0	2.0	278
	Cynoscion nebulosus	25.2	1.6	29
May	Micropogonias undulatus	459.7	30.4	3,838
n=11	Brevoortia tyrannus	421.8	27.9	5,687
	Leiostomus xanthurus	377.2	24.9	5,356
	Cynoscion regalis	134.4	8.9	544
	Cynoscion nebulosus	41.5	2.7	130
	Lagodon rhomboides	29.1	1.9	387
	Pomatomus saltatrix	16.1	1.1	53
	Callinectes sapidus	10.8	0.7	89
	Bairdiella chrysoura	6.8	0.5	95
Jun	Micropogonias undulatus	1,415.4	55.3	9,349
n=27	Leiostomus xanthuru	537.2	21.0	5,605
	Lagodon rhomboides	152.9	6.0	2,014
	Brevoortia tyrannus	119.5	4.7	1,813
	Pomatomus saltatrix	118.8	4.6	323
	Orthopristis chrysoptera	79.7	3.1	707
	Cynoscion regalis	39.5	1.5	407
	Cynoscion nebulosus	26.3	1.0	48
	Bairdiella chrysoura	13.5	0.5	209
	Paralichthys dentatus	10.8	0.4	15
	Scomberomorus maculatus	10.2	0.4	30
	Archosargus probatocephalus	6.7	0.3	4
	Callinectes sapidus	4.5	0.2	46
Jul	Micropogonias undulatus	2,077.9	49.3	15,456
n=24	Leiostomus xanthurus	1,027.0	24.3	9,478
	Brevoortia tyrannus	346.4	8.2	5,760
	Pomatomus saltatrix	312.9	7.4	676
	Lagodon rhomboides	187.1	4.4	2,145
	Orthopristis chrysoptera	86.7	2.1	797
	Cynoscion regalis	77.9	1.8	460
	Cynoscion nebulosus	34.1	0.8	67
	Bairdiella chrysoura	16.4	0.4	220
	Menticirrhus americanus	9.7	0.2	25
	Mustelus canis	6.8	0.2	6
Aug	Micropogonias undulatus	968.1	37.3	6,332
n=26	Leiostomus xanthurus	661.9	25.5	6,042
	Brevoortia tyrannus	362.9	14.0	5,067
	Cynoscion regalis	217.7	8.4	1,444
	Lagodon rhomboides	154.7	6.0	1,913
	Pomatomus saltatrix	70.9	2.7	218
	Orthopristis chrysoptera	66.2	2.5	564
	Cynoscion nebulosus	27.8	1.1	47
	Caranx hippos	25.0	1.0	17
	Bairdiella chrysoura	12.3	0.5	144
Sep	Leiostomus xanthurus	524.2	33.2	4,999
n=13	Lagodon rhomboides	301.5	19.1	3,696
	Pomatomus saltatrix	210.0	13.3	362
	Brevoortia tyrannus	131.8	8.3	1,903
	Micropogonias undulatus	91.3	5.8	905
	Cynoscion regalis	90.6	5.7	486
	Orthopristis chrysoptera	85.2	5.4	758
	Cynoscion nebulosus	64.1	4.1	88
	Dasyatis sayi	13.7	0.9	5
	Bairdiella chrysoura	10.5	0.7	112
	Sciaenops ocellatus	8.2	0.5	1

Table 6b. (Continued).

Month	Species	Weight (kg) Mean	Percent	Mean number
Sep (Continued)	Paralichthys lethostigma	6.1	0.4	35
	Monacanthus hispidus	4.9	0.3	144
	Dasyatis americana	4.8	0.3	16
	Myoteroperca microlepis	4.4	0.3	34
	Dorosoma cepedianum	4.0	0.3	22
	Chaetodipterus faber	3.8	0.2	52
	Paralichthys dentatus	3.4	0.2	30
Oct n=8	Leiostomus xanthurus	1,522.8	56.4	9,825
	Lagodon rhomboides	458.6	17.0	6,145
	Orthopristis chrysoptera	257.1	9.5	2,000
	Brevoortia tyrannus	254.7	9.4	3,211
	Cynoscion regalis	123.0	4.6	318
	Micropogonias undulatus	51.4	1.9	364
	Bairdiella chrysoura	7.3	0.3	111

Table 6c. Monthly species composition (top 99% of weight) of long haul catches sampled in the Pamlico Sound area April-October 1990, including mean catch/trip (Kg) and mean number/trip; n=number of catches sampled.

Month	Species	Weight (kg) Mean	Weight (kg) Percent	Mean number
April n=6	Micropogonias undulatus	226.6	49.0	2,421
	Cynoscion nebulosus	95.5	20.6	94
	Pomatomus saltatrix	74.6	16.1	71
	Cynoscion regalis	52.3	11.3	321
	Archosargus probatocephalus	5.4	1.2	5
	Leiostomus xanthurus	4.9	1.1	72
May n=21	Micropogonias undulatus	3,097.0	75.7	20,802
	Leiostomus xanthurus	515.0	12.6	6,855
	Cynoscion regalis	261.5	6.4	2,079
	Brevoortia tyrannus	108.4	2.7	2,347
	Lagodon rhomboides	35.9	0.9	674
	Pomatomus saltatrix	13.7	0.3	56
	Orthopristis chrysoptera	10.2	0.3	104
	Peprilus triacanthus	9.3	0.2	160
Jun n=21	Micropogonias undulatus	5,367.5	66.7	42,127
	Brevoortia tyrannus	1,500.5	18.6	18,227
	Cynoscion regalis	474.6	5.9	3,266
	Leiostomus xanthurus	457.3	5.7	5,955
	Lagodon rhomboides	73.6	0.9	1,246
	Orthopristis chrysoptera	46.0	0.6	600
	Mustelus canis	43.2	0.5	22
	Pomatomus saltatrix	39.8	0.5	195
Jul n=19	Micropogonias undulatus	1,313.0	60.0	9,707
	Leiostomus xanthurus	221.5	10.1	2,744
	Brevoortia tyrannus	220.2	10.1	4,426
	Pomatomus saltatrix	166.2	7.6	621
	Cynoscion regalis	143.7	6.6	875
	Lagodon rhomboides	52.3	2.4	622
	Orthopristis chrysoptera	23.9	1.1	203
	Chaetodipterus faber	13.1	0.6	9
	Bairdiella chrysoura	9.3	0.4	159
	Scomberomorus maculatus	6.1	0.3	13
Aug n=18	Micropogonias undulatus	1,446.1	42.7	24,148
	Leiostomus xanthurus	588.6	17.4	16,394
	Cynoscion regalis	492.7	14.6	3,210
	Brevoortia tyrannus	303.3	9.0	3,389
	Lagodon rhomboides	217.1	6.4	4,591
	Pomatomus saltatrix	177.2	5.2	558
	Orthopristis chrysoptera	54.1	1.6	514
	Cynoscion nebulosus	21.7	0.6	44
	Bairdiella chrysoura	8.7	0.3	130
	Menticirrhus americanus	7.4	0.2	42
	Scomberomorus maculatus	7.0	0.2	56
	Sciaenops ocellatus	4.2	0.1	2
	Menticirrhus spp.	3.3	0.1	14
	Archosargus probatocephalus	3.0	0.1	2
	Peprilus alepidotus	1.9	0.1	20
	Callinectes sapidus	1.7	0.1	28
	Paralichthys lethostigma	1.7	<0.1	3
	Selene vomer	1.6	<0.1	29
	Paralichthys dentatus	1.4	<0.1	5
Sep n=13	Leiostomus xanthurus	1,179.9	46.1	11,787
	Micropogonias undulatus	421.9	16.5	4,821
	Lagodon rhomboides	248.4	9.7	5,766
	Cynoscion regalis	214.1	8.4	936
	Pomatomus saltatrix	164.3	6.4	470
	Brevoortia tyrannus	146.8	5.7	1,398
	Orthopristis chrysoptera	95.4	3.7	820
	Cynoscion nebulosus	23.9	0.9	29

Table 6c. (Continued).

Month	Species	Weight (kg) Mean	Weight (kg) Percent	Mean number
Sep (continued)	Bairdiella chrysoura	17.0	0.7	304
	Chaetodipterus faber	7.7	0.3	208
	Monacanthus hispidus	5.3	0.2	227
	Carcharhinus leucas	4.7	0.2	<1
	Menticirrhus spp.	4.5	0.2	20
Oct n=5	Brevoortia tyrannus	1,007.5	29.3	8,672
	Leiostomus xanthurus	739.2	21.5	6,966
	Pomatomus saltatrix	684.6	19.9	1,004
	Lagodon rhomboides	449.7	13.1	6,628
	Cynoscion regalis	178.7	5.2	562
	Orthopristis chrysoptera	130.5	3.8	915
	Micropogonias undulatus	89.4	2.6	2,033
	Cynoscion nebulosus	69.5	2.0	72
	Sciaenops ocellatus	29.9	0.9	30
	Prionotus evolans	10.3	0.3	79
	Mycteroperca microlepis	6.4	0.2	32
	Menticirrhus spp.	6.2	0.2	27

Table 7a. Monthly species composition (top 99% of weight) of long haul catches sampled in the Pamlico Sound area, north and south of Bluff Shoal, April-October 1988, including mean catch/trip (kg) and mean number/trip; n = number of catches sampled.

		NORTH				SOUTH			
			Weight (kg)		Mean number		Weight (kg)		Mean number
Year	Month	Species	Mean	Percent	fish	Species	Mean	Percent	fish
1988	Apr	n=6				n=0			
		Cynoscion regalis	772.5	32.0	3,411	No samples			
		Micropogonias undulatus	596.4	24.7	5,342				
		Leiostomus xanthurus	491.1	20.3	6,216				
		Brevoortia tyrannus	381.6	15.8	2,833				
		Pomatomus saltatrix	76.0	3.2	108				
		Cynoscion nebulosus	59.6	2.5	299				
		Bairdiella chrysoura	23.7	1.0	275				
	May	n=15				n=9			
		Micropogonias undulatus	2,260.9	38.9	12,491	Micropogonias undulatus	748.1	27.4	6,911
		Leiostomus xanthurus	1,526.7	26.3	16,123	Leiostomus xanthurus	702.7	25.7	6,734
		Brevoortia tyrannus	1,215.3	20.9	11,609	Brevoortia tryannus	614.1	22.5	11,058
		Cynoscion regalis	712.1	12.3	2,177	Cynoscion regalis	345.9	12.6	1,628
		Pomatomus saltatrix	42.9	0.7	53	Cynoscion nebulosus	109.2	4.0	243
						Pomatomus saltatrix	92.5	3.4	339
						Bairdiella chrysoura	52.0	1.9	519
						Lagodon rhomboides	28.1	1.0	343
						Menticirrhus americanus	15.4	0.6	76
	Jun	n=14				n=14			
		Micropogonias undulatus	1,296.2	56.7	7,450	Micropogonias undulatus	1,102.3	41.1	9,830
		Leiostomus xanthurus	488.9	21.4	4,371	Leiostomus xanthurus	790.0	29.5	6,690
		Cynoscion regalis	191.1	8.4	966	Lagodon rhomboides	274.0	10.2	3,776
		Orthopristis chrysoptera	80.4	3.5	682	Brevoortia tyrannus	176.2	6.6	2,475
		Pomatomus saltatrix	56.4	2.5	190	Orthopristis chrysoptera	104.8	3.9	905
		Brevoortia tyrannus	51.9	2.3	440	Cynoscion nebulosus	56.8	2.1	133
		Lagodon rhomboides	46.7	2.0	449	Cynoscion regalis	56.2	2.1	338
		Cynoscion nebulosus	16.2	0.7	57	Pomatomus saltatrix	47.9	1.8	142
		Chaetodipterus faber	15.1	0.7	4	Bairdiella chrysoura	13.4	0.5	141
		Bairdiella chrysoura	12.4	0.5	149	Rhizoprionodon terraenovae	13.0	0.5	15
		Callinectes sapidus	8.4	0.4	101	Dasyatis sabina	12.9	0.5	6
						Scomberomorus maculatus	7.0	0.3	21
	Jul	n=12				n=13			
		Micropogonias undulatus	2,304.9	75.4	10,747	Brevoortia tyrannus	8,006.5	81.4	95,445
		Leiostomus xanthurus	311.3	10.2	2,143	Pomatomus saltatrix	560.0	5.7	805
		Cynoscion regalis	218.2	7.1	1,185	Leiostomus xanthurus	485.0	4.9	3,629
		Orthopristis chrysoptera	51.1	1.7	273	Micropogonias undulatus	378.2	3.8	2,807
		Brevoortia tyrannus	45.7	1.5	428	Lagodon rhomboides	167.9	1.7	1,683
		Pomatomus saltatrix	43.7	1.4	105	Cynoscion regalis	64.4	0.7	352
		Cynoscion nebulosus	25.6	0.8	72	Cynoscion nebulosus	53.1	0.5	115
		Archosargus probatocephalus	18.8	0.6	7	Orthopristis chrysoptera	35.9	0.4	235
		Lagodon rhomboides	17.7	0.6	149				

Table 7a. (Continued).

		NORTH				SOUTH			
			Weight (kg)		Mean number fish		Weight (kg)		Mean number fish
Year	Month	Species	Mean	Percent		Species	Mean	Percent	
1988	Aug	n=12				n=20			
		Micropogonias undualtus	5,058.9	72.7	26,559	Leiostomus xanthurus	726.3	33.3	8,329
		Cynoscion regalis	1,270.7	18.3	6,098	Micropogonias undulatus	585.2	26.8	6,138
		Leiostomus xanthurus	447.5	6.4	3,025	Brevoortia tyrannus	366.6	16.8	8,628
		Brevoortia tyrannus	77.9	1.1	849	Lagodon rhomboides	160.0	7.3	2,348
		Lagodon rhomboides	27.6	0.4	311	Cynoscion regalis	98.5	4.5	471
		Bairdiella chrysoura	26.9	0.4	336	Pomatomus saltatrix	62.2	2.8	230
						Cynoscion nebulosus	51.6	2.4	93
						Orthopristis chrysoptera	33.2	1.5	296
						Mustelus canis	18.8	0.9	27
						Menticirrhus americanus	16.1	0.7	54
						Callinectes sapidus	15.3	0.7	131
						Dasyatis americana	12.4	0.6	32
						Dorosoma cepedianum	7.1	0.3	19
						Bairdiella chrysoura	5.8	0.3	84
						Paralichthys lethostigma	4.5	0.2	15
	Sep	n=4				n=17			
		Cynoscion regalis	1,721.3	47.6	9,566	Leiostomus xanthurus	1,307.1	50.0	9,251
		Leiostomus xanthurus	996.2	27.5	7,534	Brevoortia tyrannus	393.9	15.1	3,373
		Micropogonias undualtus	417.1	11.5	4,301	Micropogonias undualtus	236.3	9.0	4,721
		Pomatomus saltatrix	179.5	5.0	372	Cynoscion regalis	177.7	6.8	605
		Cynoscion nebulosus	92.4	2.6	97	Lagodon rhomboides	164.2	6.3	2,800
		Brevoortia tyrannus	78.7	2.2	648	Cynoscion nebulosus	52.8	2.0	65
		Lagodon rhomboides	68.1	1.9	621	Orthopristis chrysoptera	51.0	2.0	662
		Orthopristis chrysoptera	39.3	1.1	236	Pomatomus saltatrix	45.4	1.7	218
						Menticirrhus americanus	21.9	0.8	66
						Peprilus alepidotus	20.2	0.8	161
						Archosargus probatocephalus	8.6	0.3	3
						Bairdiella chrysoura	7.3	0.3	76
						Dasyatis americana	5.9	0.2	22
						Mustelus canis	3.9	0.2	6
						Paralichthys lethostigma	3.4	0.1	8
						Larimus fasciatus	2.6	0.1	19
						Dasyatis sabina	2.4	0.1	1
						Sciaenops ocellatus	2.4	0.1	1
						Menticirrhus saxatilis	2.1	0.1	6
						Menticirrhus spp.	2.0	0.1	12
						Sphoeroides maculatus	1.9	0.1	9
						Chilomycetrus schoepfi	1.7	0.1	9
						Caranx hippos	1.6	0.1	13
						Dorosoma cepedianum	1.2	<0.1	2
						Scomberomorus maculatus	0.9	<0.1	6
						Trachinotus carolinus	0.9	<0.1	3
						Prionotus spp.	0.8	<0.1	4
						Paralichthys spp.	0.7	<0.1	3
						Selene vomer	0.5	<0.1	12
						Callinectes sapidus	0.5	<0.1	6

Table 7a. (Continued).

Year	Month	NORTH Species	NORTH Weight (kg) Mean	NORTH Weight (kg) Percent	NORTH Mean number fish	SOUTH Species	SOUTH Weight (kg) Mean	SOUTH Weight (kg) Percent	SOUTH Mean number fish
1988	Sep (continued)					_Opisthonema oglinum_	0.3	<0.1	12
						Paralichthys dentatus	0.3	<0.1	2
						Chaetodipterus faber	0.2	<0.1	5
						Opsanus tau	0.1	<0.1	3
	Oct	n=5				n=17			
		Cynoscion regalis	574.7	28.9	1,572	_Leiostomus xanthurus_	4,552.5	61.9	31,235
		Brevoortia tyrannus	487.3	24.5	2,917	_Cynoscion regalis_	1,333.2	18.1	11,561
		Leiostomus xanthurus	412.9	20.8	2,526	_Brevoortia tyrannus_	605.2	8.2	4,813
		Cynoscion nebulosus	171.5	8.6	182	_Micropogonias undulatus_	221.9	3.0	3,447
		Orthopristis chrysoptera	137.8	6.9	647	_Lagodon rhomboides_	219.4	3.0	3,742
		Lagodon rhomboides	96.2	4.8	834	_Menticirrhus americanus_	216.6	2.9	660
		Micropogonias undulatus	63.2	3.2	556	_Orthopristis chrysoptera_	50.4	0.7	567
		Pomatomus saltatrix	14.6	0.7	70	_Cynoscion nebulosus_	49.5	0.7	140
		Sphoeroides maculatus	6.8	0.3	22	_Pomatomus saltatrix_	24.5	0.3	94
		Menticirrhus americanus	5.6	0.3	20	_Dasyatis americana_	24.0	0.3	14

Table 7b. Monthly species composition (top 99% of weight) of long haul catches sampled in the Pamlico Sound area, north and south of Bluff Shoal, April-October 1989, including mean catch/trip (kg) and mean number/trip; n = number of catches sampled.

		NORTH				SOUTH			
			Weight (kg)		Mean number		Weight (kg)		Mean number
Year	Month	Species	Mean	Percent	fish	Species	Mean	Percent	fish
1989	Apr	n=5				n=0			
		Micropogonias undulatus	1,245.8	78.9	6,255	(No samples)			
		Leiostomus xanthurus	226.5	14.3	2,953				
		Cynoscion regalis	36.7	2.3	90				
		Brevoortia tyrannus	32.0	2.0	278				
		Cynoscion nebulosus	25.2	1.6	29				
	May	n=8				n=3			
		Micropogonias undulatus	486.1	32.3	3,184	Brevoortia tyrannus	671.9	43.8	6,504
		Leiostomus xanthurus	421.9	28.0	5,804	Micropogonias undulatus	389.4	25.4	5,584
		Brevoortia tyrannus	328.0	21.8	5,380	Leiostomus xanthurus	258.1	16.8	4,160
		Cynoscion regalis	152.3	10.1	499	Cynoscion regalis	86.8	5.7	662
		Cynoscion nebulosus	55.8	3.7	176	Lagodon rhomboides	38.4	2.5	571
		Lagodon rhomboides	25.6	1.7	318	Pomatomus saltatrix	36.0	2.3	81
		Callinectes sapidus	14.8	1.0	123	Bairdiella chrysoura	20.1	1.3	311
		Pomatomus saltatrix	8.7	0.6	42	Paralichthys dentatus	12.8	0.8	108
						Orthopristis chrysoptera	9.7	0.6	121
	Jun	n=10				n=17			
		Micropogonias undulatus	1,844.7	71.2	9,029	Micropogonias undulatus	1,162.9	45.8	9,538
		Leiostomus xanthurus	410.5	15.8	3,766	Leiostomus xanthurus	611.7	24.1	6,686
		Orthopristis chrysoptera	123.1	4.7	956	Lagodon rhomboides	194.5	7.7	2,755
		Lagodon rhomboides	82.1	3.2	755	Brevoortia tyrannus	189.4	7.5	2,876
		Pomatomus saltatrix	48.0	1.9	155	Pomatomus saltatrix	160.5	6.3	422
		Cynoscion nebulosus	36.6	1.4	83	Cynoscion regalis	59.4	2.3	629
		Callinectes sapidus	12.2	0.5	125	Orthopristis chrysoptera	54.2	2.1	560
		Scomberomorus maculatus	6.1	0.2	18	Bairdiella chrysoura	21.3	0.8	328
		Cynoscion regalis	5.9	0.2	28	Cynoscion nebulosus	20.3	0.8	28
						Paralichthys dentatus	14.6	0.6	12
						Scomberomorus maculatus	12.6	0.5	38
						Archosargus probatocephalus	10.6	0.4	7
						Tylosurus crocodilus	5.0	0.2	5
	Jul	n=9				n=15			
		Micropogonias undulatus	3,883.7	81.3	24,927	Leiostomus xanthurus	1,388.5	35.8	12,919
		Leiostomus xanthurus	424.4	8.9	3,743	Micropogonias undulatus	994.5	25.6	9,774
		Orthopristis chrysoptera	130.4	2.7	1,110	Brevoortia tyrannus	504.5	13.0	8,445
		Lagodon rhomboides	93.1	1.9	880	Pomatomus saltatrix	471.3	12.1	973
		Brevoortia tyrannus	82.8	1.7	1,284	Lagodon rhomboides	243.5	6.3	2,904
		Cynoscion regalis	62.7	1.3	394	Cynoscion regalis	87.1	2.2	499
		Pomatomus saltatrix	49.0	1.0	181	Orthopristis chrysoptera	60.4	1.6	608
		Cynoscion nebulosus	23.6	0.5	59	Cynoscion nebulosus	40.4	1.0	72
						Bairdiella chrysoura	25.7	0.7	347
						Menticirrhus americanus	14.0	0.4	35
						Mustelus canis	10.9	0.3	10
	Aug	n=12				n=14			
		Micropogonias undulatus	1,401.9	50.0	8,887	Leiostomus xanthurus	763.8	31.6	7,686
		Leiostomus xanthurus	543.0	19.4	4,124	Micropogonias undulatus	596.2	24.7	4,142
		Cynoscion regalis	278.1	9.9	1,890	Brevoortia tyrannus	[illegible]	[illegible]	7,311

Table 7b. (Continued).

		NORTH				SOUTH			
			Weight (kg)		Mean number fish		Weight (kg)		Mean number fish
Year	Month	Species	Mean	Percent		Species	Mean	Percent	
1989	Aug (continued)	Orthopristis chrysoptera	121.2	4.3	989	Lagodon rhomboides	187.4	7.8	2,370
		Pomatomus saltatrix	118.3	4.2	310	Cynoscion regalis	165.9	6.9	1,061
		Lagodon rhomboides	116.5	4.2	1,380	Cynoscion nebulosus	30.5	1.3	58
		Brevoortia tyrannus	114.8	4.1	2,448	Pomatomus saltatrix	30.2	1.3	139
		Caranx hippos	51.6	1.8	11	Orthopristis chrysoptera	19.0	0.8	200
		Cynoscion nebulosus	24.6	0.9	34	Bairdiella chrysoura	15.5	0.6	184
		Bairdiella chrysoura	8.7	0.3	99	Menticirrhus americanus	11.7	0.5	72
	Sep	n=6				n=7			
		Leiostomus xanthurus	624.5	34.0	4,606	Leiostomus xanthurus	438.1	32.2	5,336
		Pomatomus saltatrix	368.5	20.1	518	Lagodon rhomboides	325.8	23.9	4,407
		Lagodon rhomboides	273.1	14.9	2,866	Brevoortia tyrannus	163.1	12.0	2,056
		Orthopristis chrysoptera	153.7	8.4	1,165	Micropogonias undulatus	81.9	6.0	1,076
		Cynoscion regalis	114.3	6.2	594	Cynoscion nebulosus	76.9	5.6	114
		Micropogonias undulatus	102.3	5.6	705	Pomatomus saltatrix	74.2	5.5	227
		Brevoortia tyrannus	95.3	5.2	1,724	Cynoscion regalis	70.3	5.2	393
		Cynoscion nebulosus	49.1	2.7	58	Orthopristis chrysopterus	26.4	1.9	410
		Bairdiella chrysoura	20.6	1.1	219	Dasyatis sayi	25.4	1.9	8
		Mycteroperca microlepis	7.1	0.4	51	Sciaenops ocellatus	13.3	1.0	1
		Callinectes sapidus	4.8	0.3	70	Paralichthys lethostigma	11.4	0.8	65
		Chaetodipterus faber	3.8	0.2	9	Dasyatis americana	9.0	0.7	29
						Dorosoma cepedianum	6.7	0.5	26
						Paralichthys dentatus	6.4	0.5	56
						Monacanthus hispidus	6.2	0.5	225
						Dasyatis sabina	4.5	0.3	16
						Callinectes spp.	3.9	0.3	42
						Chaetodipterus faber	3.8	0.3	89
	Oct	n=0				n=8			
		(No samples)				Leiostomus xanthurus	1,522.8	56.4	9,825
						Lagodon rhomboides	458.6	17.0	6,145
						Orthopristis chrysoptera	257.1	9.5	2,000
						Brevoortia tyrannus	254.7	9.4	3,211
						Cynoscion regalis	123.0	4.6	318
						Micropogonias undulatus	51.4	1.9	364
						Bairdiella chrysoura	7.3	0.3	111

Table 7c. Monthly species composition (top 99% of weight) of long haul catches sampled in the Pamlico Sound area, north and south of Bluff Shoal, April-October 1990, including mean catch/trip (kg) and mean number/trip; n = number of catches sampled.

		NORTH				SOUTH			
			Weight (kg)		Mean		Weight (kg)		Mean
Year	Month	Species	Mean	Percent	number fish	Species	Mean	Percent	number fish
1990	Apr	n=5				n=1			
		Cynoscion nebulosus	114.6	53.3	113	Micropogonias undulatus	1,354.3	79.6	14,510
		Pomatomus saltatrix	89.5	41.6	85	Cynoscion regalis	313.7	18.4	1,924
		Archosargus probatocephalus	6.5	3.0	6	Leiostomus xanthurus	21.6	1.3	369
		Leiostomus xanthurus	1.6	0.7	12				
		Lagodon rhomboides	1.2	0.5	19				
	May	n=12				n=9			
		Micropogonias undulatus	4,841.0	85.2	31,292	Micropogonias undulatus	771.6	39.2	6,816
		Leiostomus xanthurus	546.2	9.6	7,045	Cynoscion regalis	535.0	27.2	3,946
		Brevoortia tyrannus	165.6	2.9	3,823	Leiostomus xanthurus	473.5	24.1	6,601
		Cynoscion regalis	56.4	1.0	678	Lagodon rhomboides	49.1	2.5	896
		Lagodon rhomboides	26.1	0.5	508	Brevoortia tyrannus	32.1	1.6	379
						Pomatomus saltatrix	23.5	1.2	104
						Peprilus triacanthus	15.4	0.8	188
						Orthopristis chrysoptera	15.1	0.8	161
						Peprilus alepidotus	11.9	0.6	201
						Mugil cephalus	8.0	0.4	25
						Cynoscion nebulosus	7.7	0.4	18
						Bairdiella chrysoura	6.2	0.3	81
	Jun	n=12				n=9			
		Micropogonias undulatus	7,416.2	93.7	53,154	Brevoortia tyrannus	3,393.8	41.2	40,723
		Leiostomus xanthurus	197.3	2.5	1,879	Micropogonias undulatus	2,635.9	32.0	27,425
		Cynoscion regalis	91.7	1.2	583	Cynoscion regalis	985.1	12.0	6,844
		Brevoortia tyrannus	80.6	1.0	1,355	Leiostomus xanthurus	804.1	9.8	11,389
		Lagodon rhomboides	50.6	0.6	586	Lagodon rhomboides	104.3	1.3	2,124
						Mustelus canis	100.8	1.2	50
						Orthopristis chrysoptera	73.3	0.9	1,089
						Bairdiella chrysoura	46.9	0.6	986
	Jul	n=12				n=7			
		Micropogonias undulatus	1,330.8	72.0	9,206	Micropogonias undulatus	1,282.5	46.3	10,565
		Cynoscion regalis	118.6	6.4	841	Brevoortia tyrannus	468.9	16.9	10,440
		Pomatomus saltatrix	118.2	6.4	453	Leiostomus xanthurus	405.0	14.6	5,560
		Leiostomus xanthurus	114.5	6.2	1,101	Pomatomus saltatrix	248.5	9.0	909
		Brevoortia tyrannus	75.2	4.1	918	Cynoscion regalis	186.7	6.7	933
		Lagodon rhomboides	41.4	2.2	541	Lagodon rhomboides	71.0	2.6	760
		Orthopristis chrysoptera	27.1	1.5	222	Chaetodipterus faber	35.6	1.3	23
		Bairdiella chrysoura	9.1	0.5	145	Orthopristis chrysoptera	18.4	0.7	170
						Scomberomorus maculatus	14.9	0.5	30
						Bairdiella chrysoura	9.7	0.3	182
						Peprilus triacanthus	5.9	0.2	83

Table 7c. (Continued).

		NORTH				SOUTH			
			Weight (kg)		Mean number		Weight (kg)		Mean number
Year	Month	Species	Mean	Percent	fish	Species	Mean	Percent	fish
1990	Aug	n=10				n=8			
		Micropogonias undulatus	2,141.2	64.0	29,788	Leiostomus xanthurus	1,023.1	29.8	29,083
		Cynoscion regalis	365.4	10.9	2,562	Cynoscion regalis	651.8	19.0	4,021
		Leiostomus xanthurus	240.9	7.2	6,243	Brevoortia tyrannus	613.4	17.9	6,719
		Lagodon rhomboides	239.9	7.2	5,289	Micropogonias undulatus	577.3	16.8	17,098
		Pomatomus saltatrix	173.8	5.2	519	Lagodon rhomboides	188.5	5.5	3,717
		Brevoortia tyrannus	55.2	1.7	725	Pomatomus saltatrix	181.5	5.3	608
		Orthopristis chrysoptera	53.3	1.6	492	Orthopristis chrysoptera	55.1	1.6	541
		Cynoscion nebulosus	21.3	0.6	47	Cynoscion nebulosus	22.1	0.6	39
		Bairdiella chrysoura	13.9	0.4	195	Menticirrhus americanus	14.4	0.4	80
		Scomberomorus maculatus	11.2	0.3	90	Sciaenops ocellatus	8.0	0.2	1
						Menticirrhus spp.	7.4	0.2	32
						Selene vomer	3.1	0.1	48
						Bairdiella chrysoura	2.2	0.1	48
						Scomberomorus maculatus	1.7	<0.1	13
						Paralichthys lethostigma	1.4	<0.1	3
						Opisthonema oglinum	1.3	<0.1	32
						Paralichthys spp.	1.2	<0.1	2
						Paralichthys dentatus	0.5	<0.1	4
						Mugil cephalus	0.4	<0.1	3
						Peprilus triacanthus	0.3	<0.1	3
						Monacanthus hispidus	0.2	<0.1	16
	Sep	n=10				n=3			
		Leiostomus xanthurus	523.0	30.4	7,661	Leiostomus xanthurus	3,369.5	63.0	25,543
		Micropogonias undulatus	411.5	23.9	4,999	Cynoscion regalis	601.6	11.2	2,587
		Lagodon rhomboides	256.4	14.9	6,069	Brevoortia tyrannus	531.0	9.9	4,811
		Pomatomus saltatrix	195.8	11.4	526	Micropogonias undulatus	456.7	8.5	4,226
		Orthopristis chrysoptera	109.7	6.4	901	Lagodon rhomboides	221.5	4.1	4,755
		Cynoscion regalis	97.8	5.7	441	Pomatomus saltatrix	59.6	1.1	284
		Brevoortia tyrannus	31.6	1.8	374	Orthopristis chrysoptera	47.9	0.9	551
		Cynoscion nebulosus	30.3	1.8	37	Carcharhinus leucas	20.6	0.4	1
		Bairdiella chrysoura	21.5	1.3	302				
		Chaetodipterus faber	9.9	0.6	260				
		Monacanthus hispidus	6.7	0.4	263				
		Peprilus spp.	4.3	0.3	43				
		Menticirrhus americanus	4.1	0.2	17				
	Oct	n=3				n=2			
		Pomatomus saltatrix	1,068.9	43.6	1,551	Brevoortia tyrannus	2,513.8	51.2	21,653
		Leiostomus xanthurus	581.8	23.7	4,474	Leiostomus xanthurus	975.3	19.9	10,703
		Lagodon rhomboides	427.4	17.4	5,966	Lagodon rhomboides	483.0	9.8	7,621
		Orthopristis chrysoptera	176.0	7.2	1,148	Cynoscion regalis	399.1	8.1	1,352
		Cynoscion nebulosus	52.8	2.2	51	Micropogonias undulatus	223.6	4.6	5,081
		Sciaenops ocellatus	49.9	2.0	49	Pomatomus saltatrix	108.2	2.2	184
		Cynoscion regtalis	31.8	1.3	35	Cynoscion nebulosus	94.6	1.9	104
		Mycteroperca microlepis	10.7	0.4	53	Orthopristis chrysoptera	62.3	1.3	565
		Prionotus evolans	10.4	0.4	90				
		Paralichthys dentatus	9.8	0.4	18				
		Sphoeroides maculatus	9.5	0.4	18				

Table 8a. Species composition of scrap fish in 132 Pamlico Sound area long haul catches, 1988.

Species	Weight (kg)		Number		Mean fish weight (kg)
	Mean	Percent	Mean	Percent	
Leiostomus xanthurus	386.7	31.2	4,541	30.1	0.09
Micropogonias undulatus	370.0	29.8	4,324	28.7	0.09
Brevoortia tyrannus	245.2	19.8	3,052	20.2	0.08
Lagodon rhomboides	92.9	7.5	1,662	11.0	0.06
Cynoscion regalis	78.4	6.3	832	5.5	0.09
Orthopristis chrysoptera	19.0	1.5	247	1.6	0.08
Bairdiella chrysoura	13.8	1.1	162	1.1	0.09
Pomatomus saltatrix	12.9	1.0	77	0.5	0.17
Mustelus canis	4.1	0.3	8	0.1	0.53
Dorosoma cepedianum	2.2	0.2	6	<0.1	0.39
Dasyatis sayi	1.6	0.1	2	<0.1	0.89
Callinectes sapidus	1.4	0.1	13	0.1	0.10
Alosa sapidissima	1.0	0.1	3	<0.1	0.32
Scomberomorus maculatus	0.9	0.1	8	0.1	0.12
Paralichthys dentatus	0.9	0.1	15	0.1	0.06
Opisthonema oglinum	0.9	0.1	16	0.1	0.06
Menticirrhus americanus	0.7	0.1	7	<0.1	0.10
Peprilus alepidotus	0.7	0.1	13	0.1	0.05
Cynoscion nebulosus	0.6	<0.1	6	<0.1	0.10
Symphurus plagiusa	0.5	<0.1	3	<0.1	0.19
Monacanthus hispisus	0.5	<0.1	32	0.2	0.02
Hyporhmphus unifasciatus	0.5	<0.1	2	<0.1	0.30
Alosa pseudoharengus	0.5	<0.1	2	<0.1	0.24
Paralichthys lethostigma	0.5	<0.1	4	<0.1	0.12
Chaetodipterus faber	0.5	<0.1	7	<0.1	0.06
Mycteroperca microlepis	0.4	<0.1	4	<0.1	0.09
Sphoeroides maculatus	0.4	<0.1	1	<0.1	0.28
Alosa aestivalis	0.3	<0.1	2	<0.1	0.20
Prionotus carolinus	0.3	<0.1	3	<0.1	0.10
Chilomycterus schoepfi	0.3	<0.1	2	<0.1	0.17
Caranx hippos	0.2	<0.1	2	<0.1	0.12
Dasyatis americana	0.2	<0.1	1	<0.1	0.27
Larimus fasciatus	0.2	<0.1	1	<0.1	0.18
Synodus foetens	0.2	<0.1	1	<0.1	0.17
Elops saurus	0.1	<0.1	<1	<0.1	0.97
Prionotus spp.	0.1	<0.1	1	<0.1	0.21
Selene vomer	0.1	<0.1	2	<0.1	0.04
Citharichthys spp.	0.1	<0.1	5	<0.1	0.01
Prionotus evolans	0.1	<0.1	1	<0.1	0.11
Alectis ciliaris	0.1	<0.1	2	<0.1	0.03
Diplodus holbrooki	0.1	<0.1	2	<0.1	0.02
Aluterus scripta	0.1	<0.1	1	<0.1	0.04
Prionotus tribulus	<0.1	<0.1	1	<0.1	0.07
Trinectes maculatus	<0.1	<0.1	3	<0.1	0.01
Lolliguncula brevis	<0.1	<0.1	1	<0.1	0.05
Aluterus schoepfi	<0.1	<0.1	1	<0.1	0.05
Dasyatis sabina	<0.1	<0.1	<1	<0.1	0.47
Urophycis regia	<0.1	<0.1	<1	<0.1	0.10
Opsanus tau	<0.1	<0.1	<1	<0.1	0.06
Gerreidae	<0.1	<0.1	1	<0.1	0.02
Caranx crysos	<0.1	<0.1	1	<0.1	0.01
Eucinostomus argenteus	<0.1	<0.1	1	<0.1	0.02
Selene setapinnis	<0.1	<0.1	1	<0.1	0.01
Penaeus aztecus	<0.1	<0.1	<1	<0.1	0.02
Eucinostomus gula	<0.1	<0.1	<1	<0.1	0.01

Table 8b. Species composition of scrap fish in 107 Pamlico Sound area long haul catches, 1989.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)
Micropogonias undulatus	424.3	41.5	4,435	35.6	0.096
Leiostomus xanthurus	199.3	19.5	2,868	23.0	0.069
Brevoortia tyrannus	149.2	14.6	2,357	18.9	0.063
Lagodon rhomboides	143.3	14.0	1,750	14.1	0.082
Cynoscion regalis	33.0	3.2	270	2.2	0.123
Orthopristis chrysoptera	29.5	2.9	345	2.8	0.085
Pomatomus saltatrix	14.0	1.4	92	0.7	0.152
Bairdiella chrysoura	11.3	1.1	158	1.3	0.071
Callinectes sapidus	4.5	0.4	29	0.2	0.153
Paralichthys dentatus	1.6	0.2	17	0.1	0.097
Archosargus probatocephalus	1.5	0.1	2	<0.1	0.625
Dorosoma cepedianum	1.3	0.1	3	<0.1	0.400
Cynoscion nebulosus	1.0	0.1	7	0.1	0.149
Chilomycterus schoepfi	1.0	0.1	5	<0.1	0.224
Scomberomorus maculatus	0.9	0.1	9	0.1	0.109
Monacanthus hispidus	0.7	0.1	24	0.2	0.028
Mustelus canis	0.6	0.1	5	<0.1	0.127
Caranx hippos	0.6	0.1	6	<0.1	0.105
Opisthonema oglinum	0.6	0.1	15	0.1	0.041
Dasyatis sayi	0.4	<0.1	1	<0.1	0.719
Menticirrhus americanus	0.4	<0.1	4	<0.1	0.108
Selene vomer	0.4	<0.1	10	0.1	0.038
Paralichthys lethostigma	0.4	<0.1	5	0.1	0.078
Prionotus evolans	0.3	<0.1	3	<0.1	0.103
Dasyatis americana	0.3	<0.1	1	<0.1	0.500
Sphoeroides maculatus	0.2	<0.1	5	<0.1	0.045
Mycteroperca microlepis	0.2	<0.1	1	<0.1	0.124
Peprilus alepidotus	0.2	<0.1	3	<0.1	0.052
Citharichthys spp.	0.1	<0.1	6	<0.1	0.021
Alosa mediocris	0.1	<0.1	1	<0.1	0.180
Prionotus carolinus	0.1	<0.1	3	<0.1	0.040
Rajiformes	0.1	<0.1	<1	<0.1	0.610
Aluterus schoepfi	0.1	<0.1	1	<0.1	0.088
Chaetodipterus faber	0.1	<0.1	2	<0.1	0.045
Prionotus scitulus	0.1	<0.1	1	<0.1	0.092
Diplodus holbrooki	0.1	<0.1	3	<0.1	0.022
Trachinotus carolinus	0.1	<0.1	1	<0.1	0.092
Tautoga onitis	0.1	<0.1	<1	<0.1	0.145
Synodus foetens	0.1	<0.1	<1	<0.1	0.135
Peprilus triacanthus	<0.1	<0.1	1	<0.1	0.046
Caranx crysos	<0.1	<0.1	1	<0.1	0.050
Dasyatis spp.	<0.1	<0.1	<1	<0.1	0.200
Penaeus duorarum	<0.1	<0.1	1	<0.1	0.019
Monacanthus spp.	<0.1	<0.1	1	<0.1	0.025
Centropristis striata	<0.1	<0.1	<1	<0.1	0.060
Alosa pseudoharengus	<0.1	<0.1	<1	<0.1	0.222
Callinectes	<0.1	<0.1	1	<0.1	0.018
Selene setapinnis	<0.1	<0.1	1	<0.1	0.020
Monacanthus ciliatus	<0.1	<0.1	1	<0.1	0.014
Opsanus tau	<0.1	<0.1	<1	<0.1	0.050
Chloroscombrus chrysurus	<0.1	<0.1	1	<0.1	0.010
Penaeus aztecus	<0.1	<0.1	<1	<0.1	0.020
Prionotus spp.	<0.1	<0.1	<1	<0.1	0.010
Trinectes maculatus	<0.1	<0.1	<1	<0.1	0.010
Scophthalmus aquosus	<0.1	<0.1	<1	<0.1	0.020

Table 8c. Species composition of scrapfish in 91 Pamlico Sound area long haul catches, 1990.

Species	Weight (kg)		Number		Mean fish weight (kg)
	Mean	Percent	Mean	Percent	
Micropogonias undulatus	902.0	56.8	11,884	48.5	0.08
Leiostomus xanthurus	229.4	14.5	5,861	23.9	0.04
Brevoortia tyrannus	228.9	14.4	2,997	12.2	0.08
Lagodon rhomboides	119.5	7.5	2,274	9.3	0.05
Cynoscion regalis	49.3	3.1	617	2.5	0.08
Orthopristis chrysoptera	18.4	1.2	263	1.1	0.07
Pomatomus saltatrix	16.7	1.0	112	0.5	0.15
Bairdiella chrysoura	12.6	0.8	222	0.9	0.06
Peprilus triacanthus	3.1	0.2	50	0.2	0.06
Chaetodipterus faber	1.0	0.1	36	0.1	0.03
Peprilus alepidotus	1.0	0.1	33	0.1	0.03
Callinectes sapidus	1.0	0.1	11	<0.1	0.09
Monacanthus hispidus	0.9	0.1	39	0.2	0.02
Mustelus canis	0.7	<0.1	5	<0.1	0.14
Selene vomer	0.5	<0.1	15	0.1	0.03
Paralichthys dentatus	0.5	<0.1	6	<0.1	0.07
Scomberomorus maculatus	0.5	<0.1	4	<0.1	0.11
Opisthonema oglinum	0.2	<0.1	13	<0.1	0.02
Prionotus evolans	0.2	<0.1	1	<0.1	0.16
Menticirrhus americanus	0.2	<0.1	2	<0.1	0.10
Callinectes similis	0.2	<0.1	5	<0.1	0.04
Citharichthys spilopterus	0.2	<0.1	10	<0.1	0.02
Chilomycterus schoepfi	0.2	<0.1	1	<0.1	0.23
Caranx hippos	0.1	<0.1	2	<0.1	0.08
Menticirrhus saxatilis	0.1	<0.1	2	<0.1	0.05
Raja eglanteria	0.1	<0.1	1	<0.1	0.11
Prionotus carolinus	0.1	<0.1	4	<0.1	0.02
Prionotus tribulus	0.1	<0.1	1	<0.1	0.05
Eucinostomus spp.	0.1	<0.1	2	<0.1	0.03
Urophycis regia	<0.1	<0.1	2	<0.1	0.03
Mugil cephalus	<0.1	<0.1	<1	<0.1	0.14
Sphoeroides maculatus	<0.1	<0.1	<1	<0.1	0.25
Selene setapinnis	<0.1	<0.1	<1	<0.1	0.08
Eucinostomus argenteus	<0.1	<0.1	1	<0.1	0.02
Mycteroperca microlepis	<0.1	<0.1	<1	<0.1	0.09
Alectis ciliaris	<0.1	<0.1	1	<0.1	<0.01
Penaeus duorarum	<0.1	<0.1	<1	<0.1	0.01
Alosa aestivalis	<0.1	<0.1	2	<0.1	<0.01
Paralichthys lethostigma	<0.1	<0.1	<1	<0.1	0.02

Table 9a. Yearly species composition (top 99%) of scrap fish in long haul catches north of Bluff Shoal (Pamlico Sound), 1988-1990; n = number of scrap catches sampled.

			Percent weight			Percent number	
Year	Species	Mean weight (kg)	Within area	Statewide	Mean number	Within area	Statewide
1988	*Micropogonias undulatus*	400.7	39.2	14.9	3,797	35.3	11.6
n=61	*Leiostomus xanthurus*	360.9	35.3	13.5	4,340	40.4	13.3
	Brevoortia tyrannus	159.1	15.6	5.9	1,586	14.7	4.9
	Cynoscion regalis	47.4	4.6	1.8	476	4.4	1.5
	Lagodon rhomboides	17.8	1.7	0.7	194	1.8	0.6
	Bairdiella chrysoura	9.5	0.9	0.4	114	1.1	0.3
	Orthopristis chrysoptera	9.1	0.9	0.3	98	0.9	0.3
	Pomatomus saltatrix	6.6	0.6	0.2	41	0.4	0.1
	Alosa sapidissima	2.1	0.2	0.1	6	0.1	<0.1
1989	*Micropogonias undulatus*	420.6	50.2	17.7	4,153	42.7	14.3
n=46	*Leiostomus xanthurus*	183.8	21.9	7.7	2,425	24.9	8.4
	Brevoortia tyrannus	95.2	11.4	4.0	1,736	17.8	6.0
	Lagodon rhomboides	58.5	7.0	2.5	640	6.6	2.2
	Cynoscion regalis	25.2	3.0	1.1	228	2.3	0.8
	Orthopristis chrysoptera	24.0	2.9	1.0	265	2.7	0.9
	Pomatomus saltatrix	9.4	1.1	0.4	65	0.7	0.2
	Bairdiella chrysoura	5.3	0.6	0.2	57	0.6	0.2
	Callinedtes sapidus	3.6	0.4	0.2	34	0.3	0.1
	Chilomycterus schoepfi	1.8	0.2	0.1	8	0.1	<0.1
	Cysnocion nebulosus	1.8	0.2	0.1	9	0.1	<0.1
	Scomberomorus maculatus	1.3	0.2	0.1	11	0.1	<0.1
1990	*Micropogonias undulatus*	970.6	72.6	36.9	11,817	62.2	29.2
n=55	*Leiostomus xanthurus*	139.3	10.4	5.3	3,182	16.8	7.9
	Lagodon rhomboides	106.7	8.0	4.1	2,098	11.0	5.2
	Brevoortia tyrannus	55.1	4.1	2.1	949	5.0	2.3
	Cynoscion regalis	24.4	1.8	0.9	349	1.8	0.9
	Pomatomus saltatrix	12.5	0.9	0.5	74	0.4	0.2
	Bairdiella chrysoura	10.2	0.8	0.4	142	0.7	0.3
	Orthopristis chrysoptera	8.2	0.6	0.3	135	0.7	0.3

Table 9b. Yearly species composition (top 99%) of scrap fish in long haul catches south of Bluff Shoal (Pamlico Sound), 1988-1990; n = number of scrap catches sampled.

			Percent weight			Percent number	
Year	Species	Mean weight (kg)	Within area	Statewide	Mean number	Within area	Statewide
1988	Leiostomus xanthurus	408.8	28.6	17.7	4,714	25.1	16.8
n=71	Micropogonias undulatus	343.5	24.1	14.9	4,777	25.4	17.0
	Brevoortia tyrannus	319.3	22.4	13.8	4,313	22.9	15.4
	Lagodon rhomboides	157.5	11.0	6.8	2,924	15.6	10.4
	Cynoscion regalis	105.0	7.4	4.6	1,139	6.1	4.1
	Orthopristis chrysoptera	27.5	1.9	1.2	375	2.0	1.3
	Pomatomus saltatrix	18.3	1.3	0.8	108	0.6	0.4
	Bairdiella chrysoura	17.5	1.2	0.8	204	1.1	0.7
	Mustelus canis	7.7	0.5	0.3	14	0.1	0.1
	Dorosoma cepedianum	3.6	0.3	0.2	9	<0.1	<0.1
	Dasyatis sayi	3.0	0.2	0.1	3	<0.1	<0.1
	Scomberomorus maculatus	1.4	0.1	0.1	11	0.1	<0.1
1989	Micropogonias undulatus	427.1	36.8	23.8	4,648	32.0	21.3
n=61	Leiostomus xanthurus	211.0	18.2	11.8	3,202	22.1	14.7
	Lagodon rhomboides	207.4	17.9	11.6	2,587	17.8	11.8
	Brevoortia tyrannus	190.0	16.4	10.6	2,826	19.5	12.9
	Cynoscion regalis	39.0	3.4	2.2	302	2.1	1.4
	Orthopristis chrysoptera	33.6	2.9	1.9	406	2.8	1.9
	Pomatomus saltatrix	17.3	1.5	1.0	112	0.8	0.5
	Bairdiella chrysoura	15.8	1.4	0.9	234	1.6	1.1
	Callinectes sapidus	5.1	0.4	0.3	26	0.2	0.1
	Archosargus probatocephalus	2.6	0.2	0.1	4	<0.1	<0.1
1990	Micropogonias undulatus	797.2	40.5	19.9	11,986	36.5	19.4
n=36	Brevoortia tyrannus	494.3	25.1	12.3	6,127	18.6	9.9
	Leiostomus xanthurus	367.2	18.6	9.1	9,954	30.3	16.1
	Lagodon rhomboides	139.0	7.1	3.5	2,542	7.7	4.1
	Cynoscion regalis	87.4	4.4	2.2	1,027	3.1	1.7
	Orthopristis chrysoptera	33.8	1.7	0.8	459	1.4	0.7
	Pomatomus saltatrix	23.0	1.2	0.6	169	0.5	0.3
	Bairdiella chrysoura	16.2	0.8	0.4	345	1.0	0.6

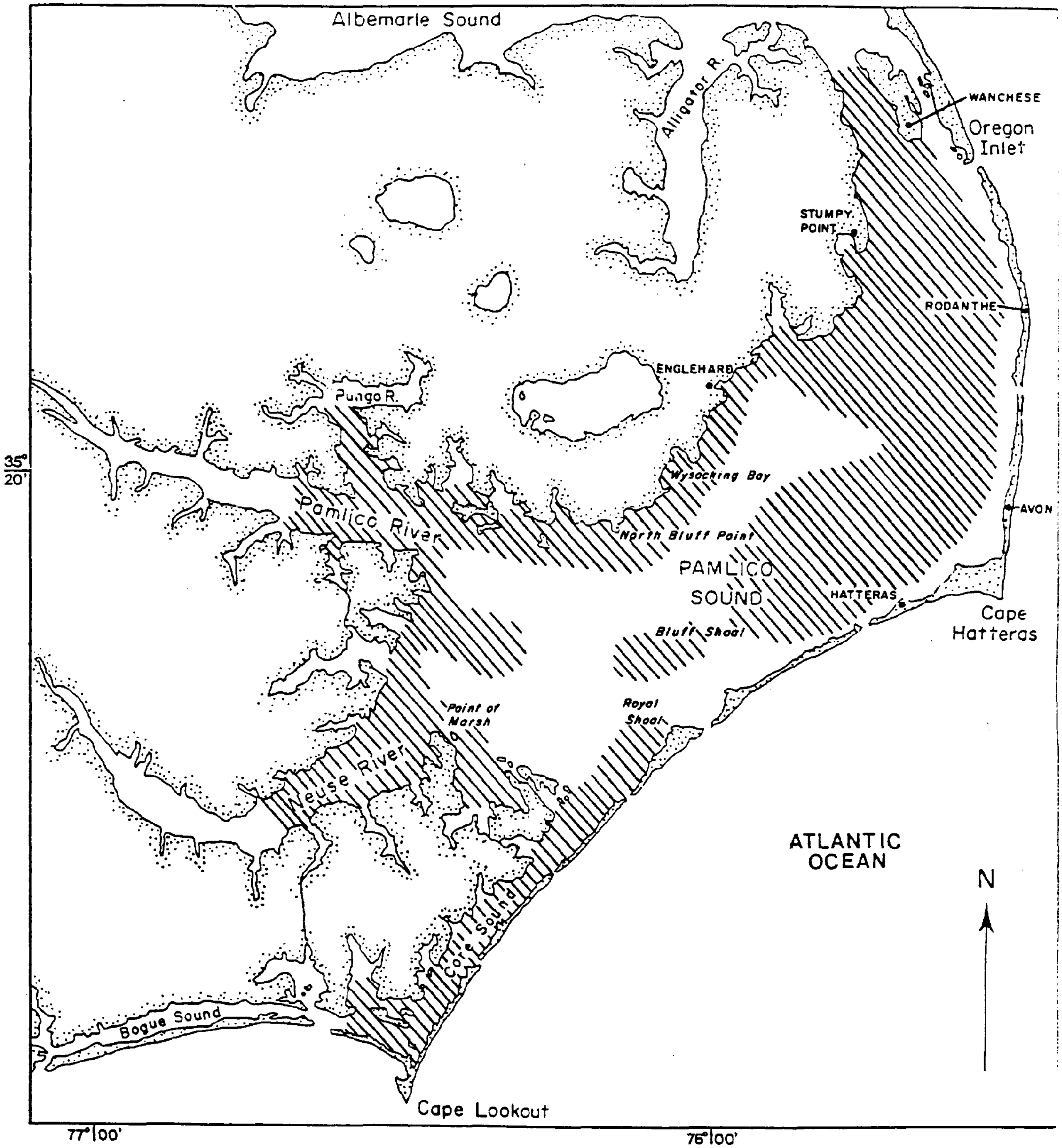

Figure 1. Fishing grounds (hatched areas) of North Carolina's long haul seine fishery.

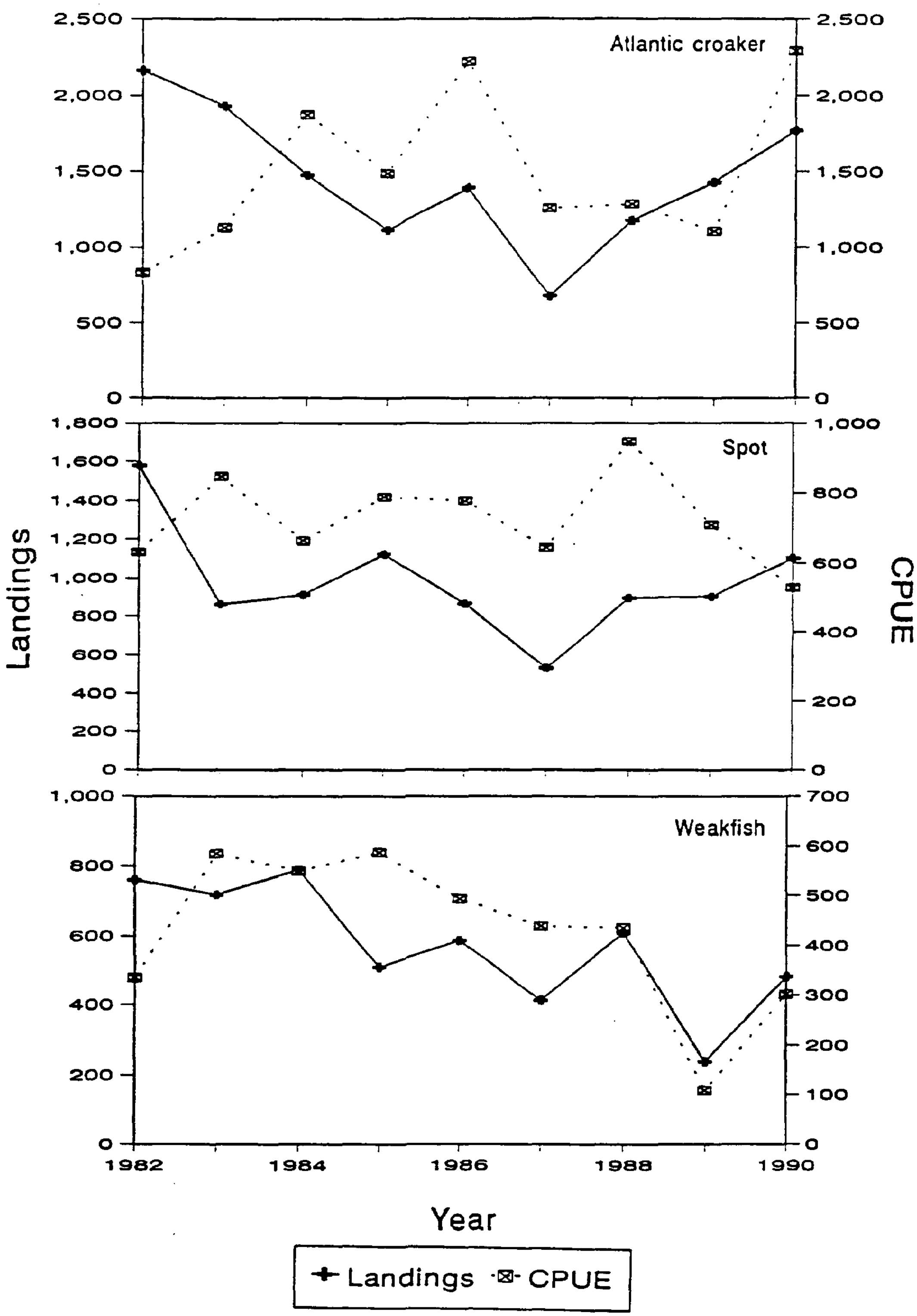

Figure 2. Commercial landings (kg x 1000) and CPUE (kg/trip) of Atlantic croaker (<u>Micropogonias undulatus</u>), spot (<u>Leiostomus xanthurus</u>), and weakfish (<u>Cynoscion regalis</u>) from North Carolina long haul fishery, 1982-1990.

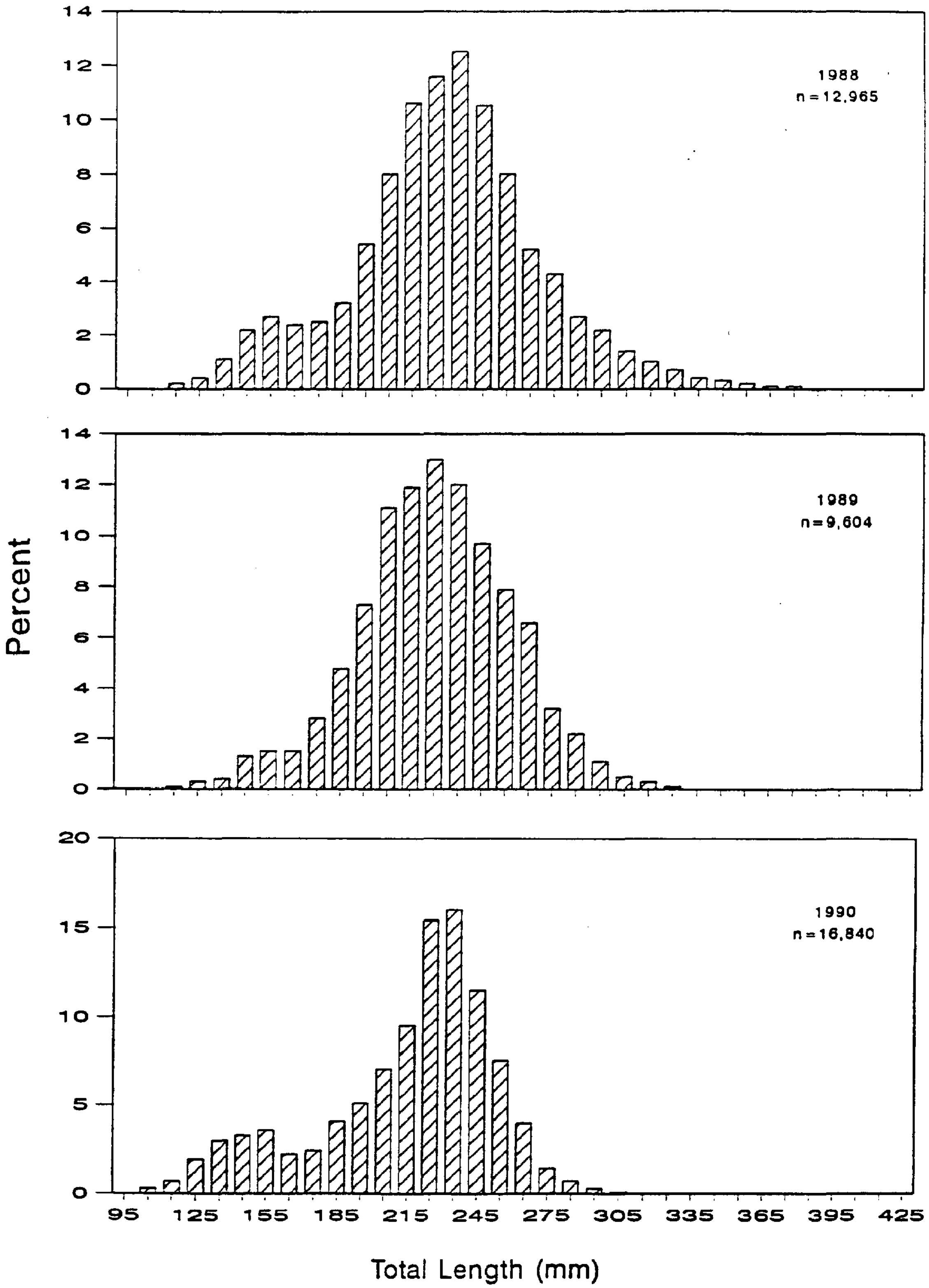

Figure 3. Expanded length frequencies of Atlantic croaker (<u>Micropogonias undulatus</u>) from North Carolina long haul fishery, 1988-1990.

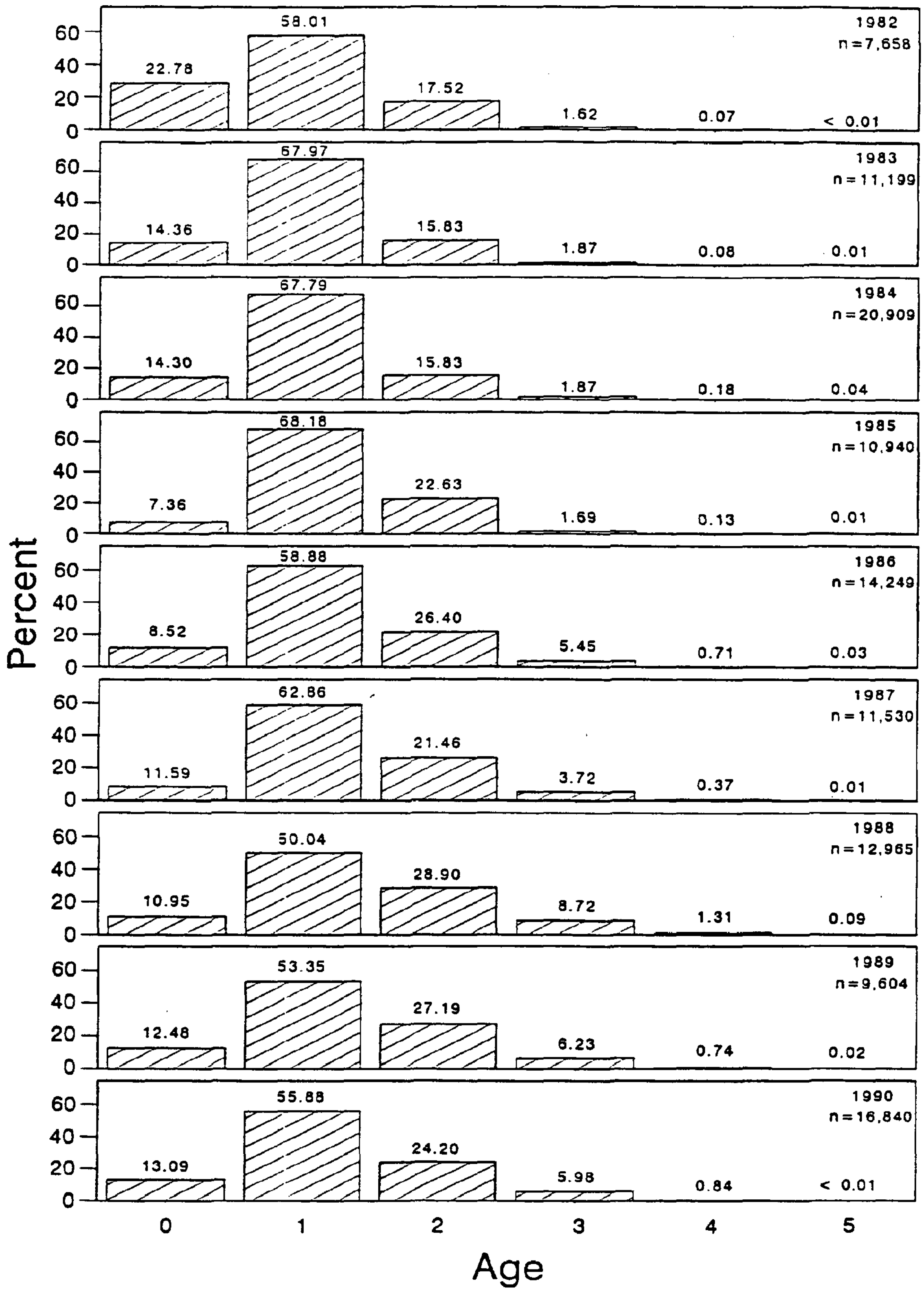

Figure 4. Age composition of Atlantic croaker (Micropogonias undulatus) from North Carolina long haul fishery, 1982-1990.

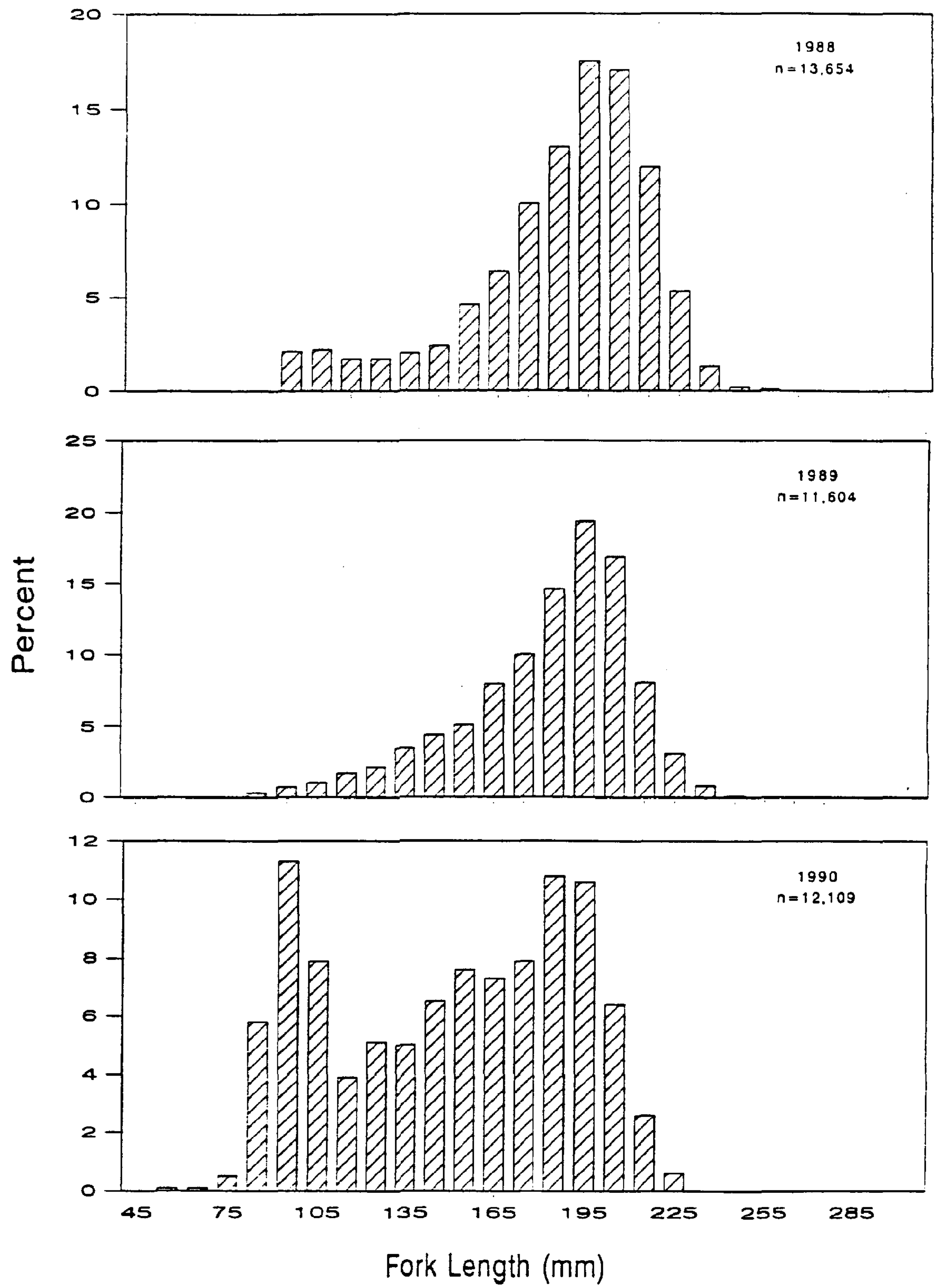

Figure 5. Expanded length frequencies of spot (<u>Leiostomus</u> <u>xanthurus</u>) from North Carolina long haul fishery, 1988-1990.

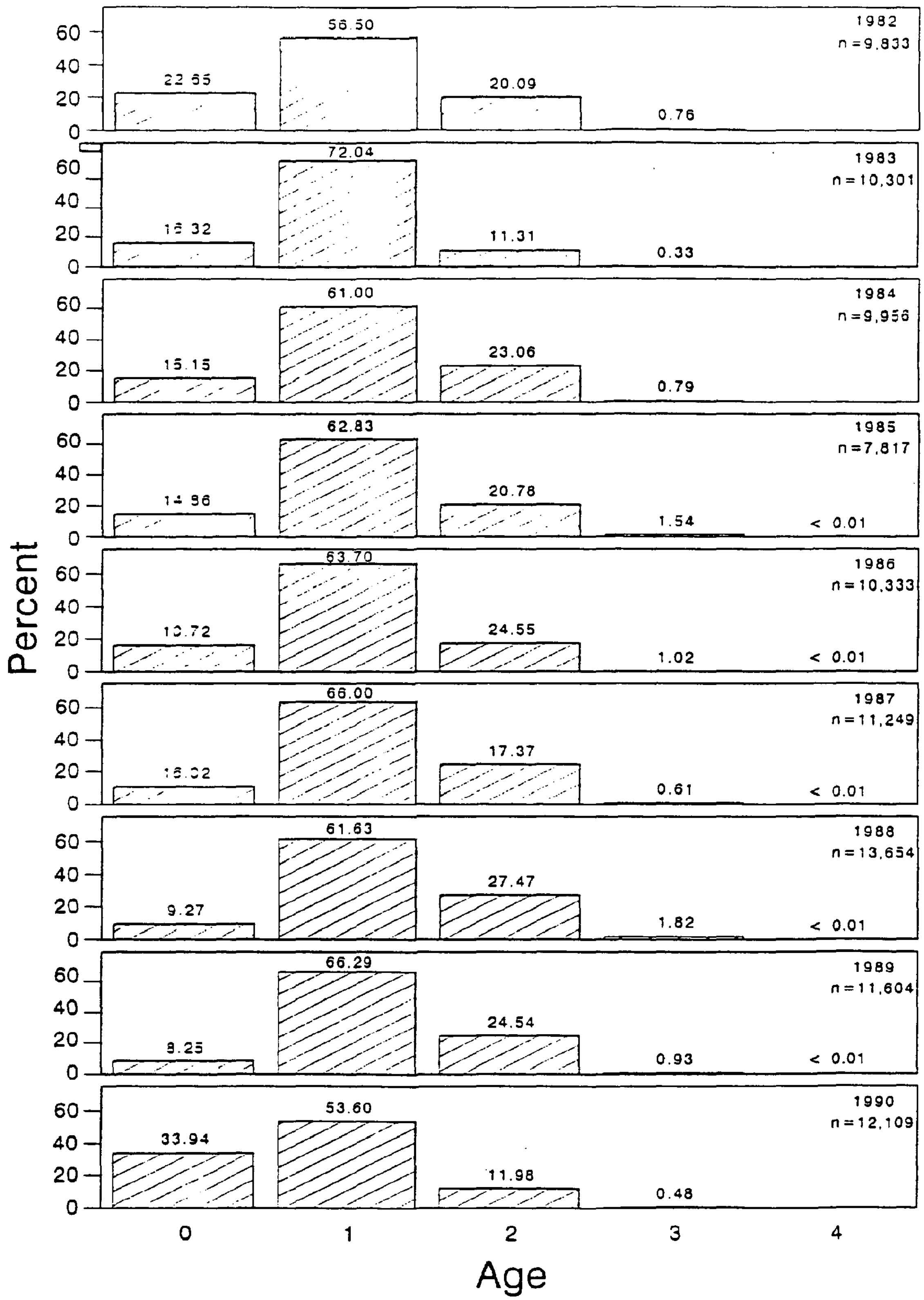

Figure 6. Age composition of spot (<u>Leiostomus</u> <u>xanthurus</u>) from North Carolina long haul fishery, 1982-1990.

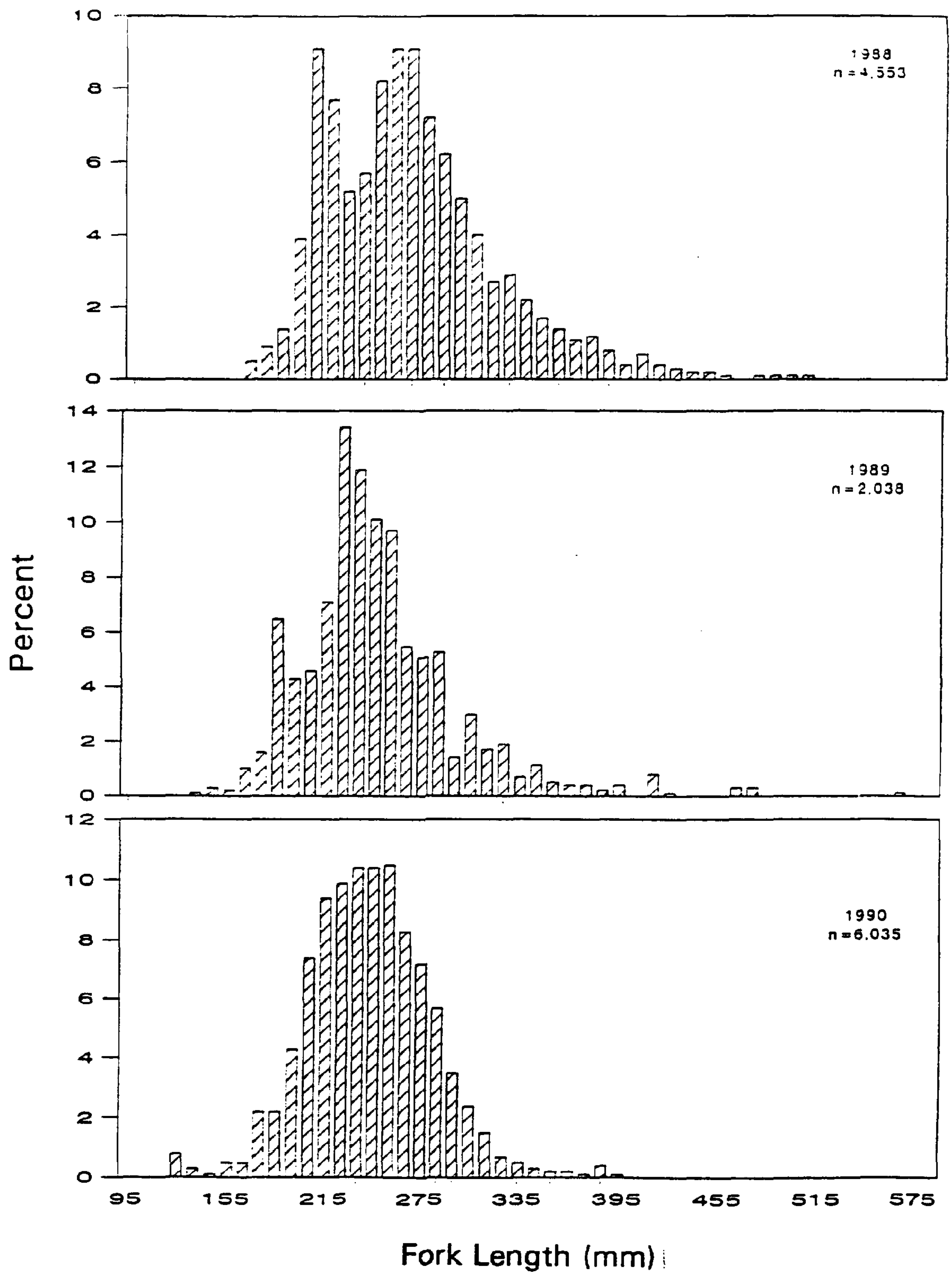

Figure 7. Expanded length frequencies of weakfish (Cynoscion regalis) from North Carolina long haul fishery, 1988-1990.

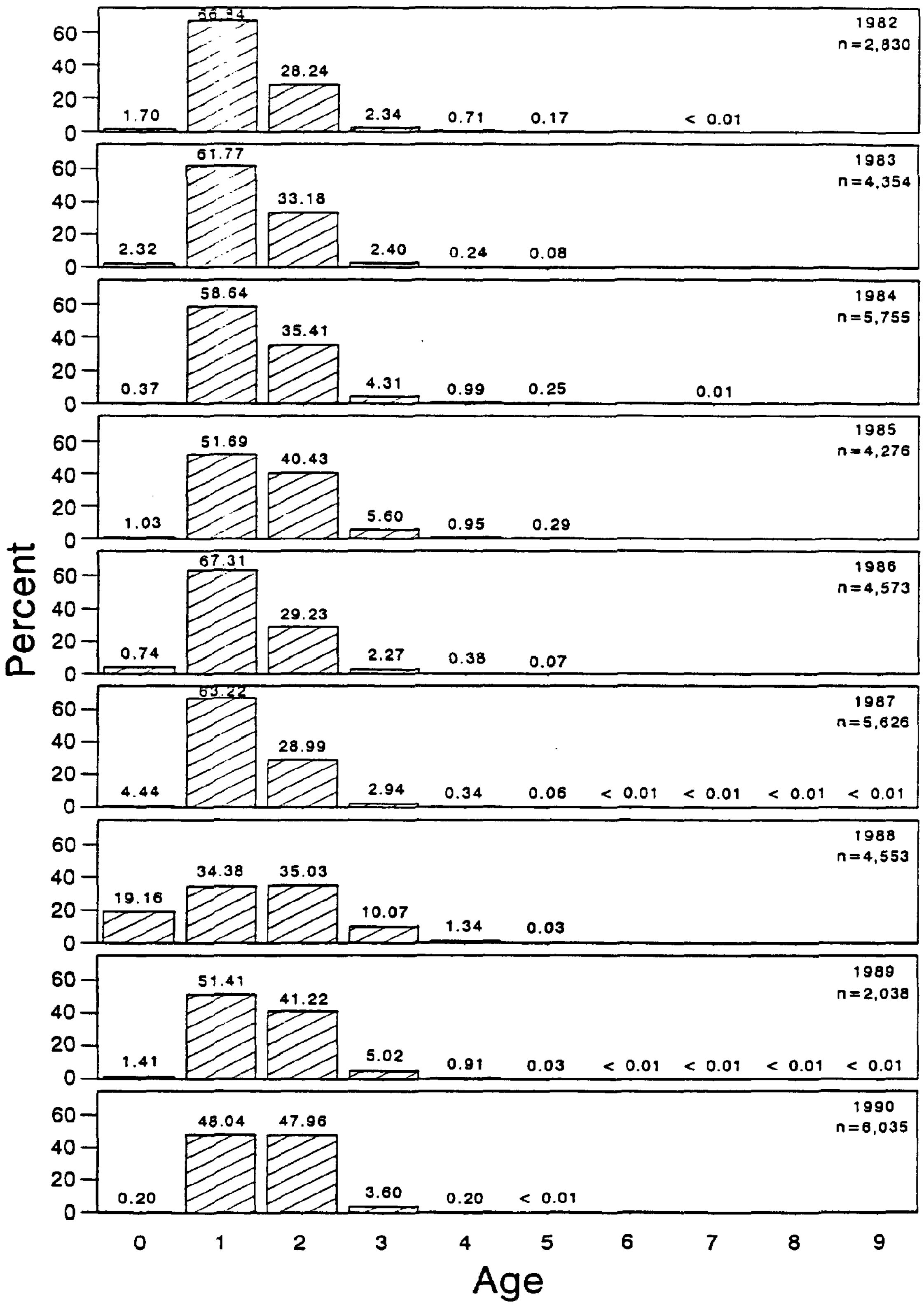

Figure 8. Age composition of weakfish (Cynoscion regalis) from North Carolina long haul fishery, 1982-1990.

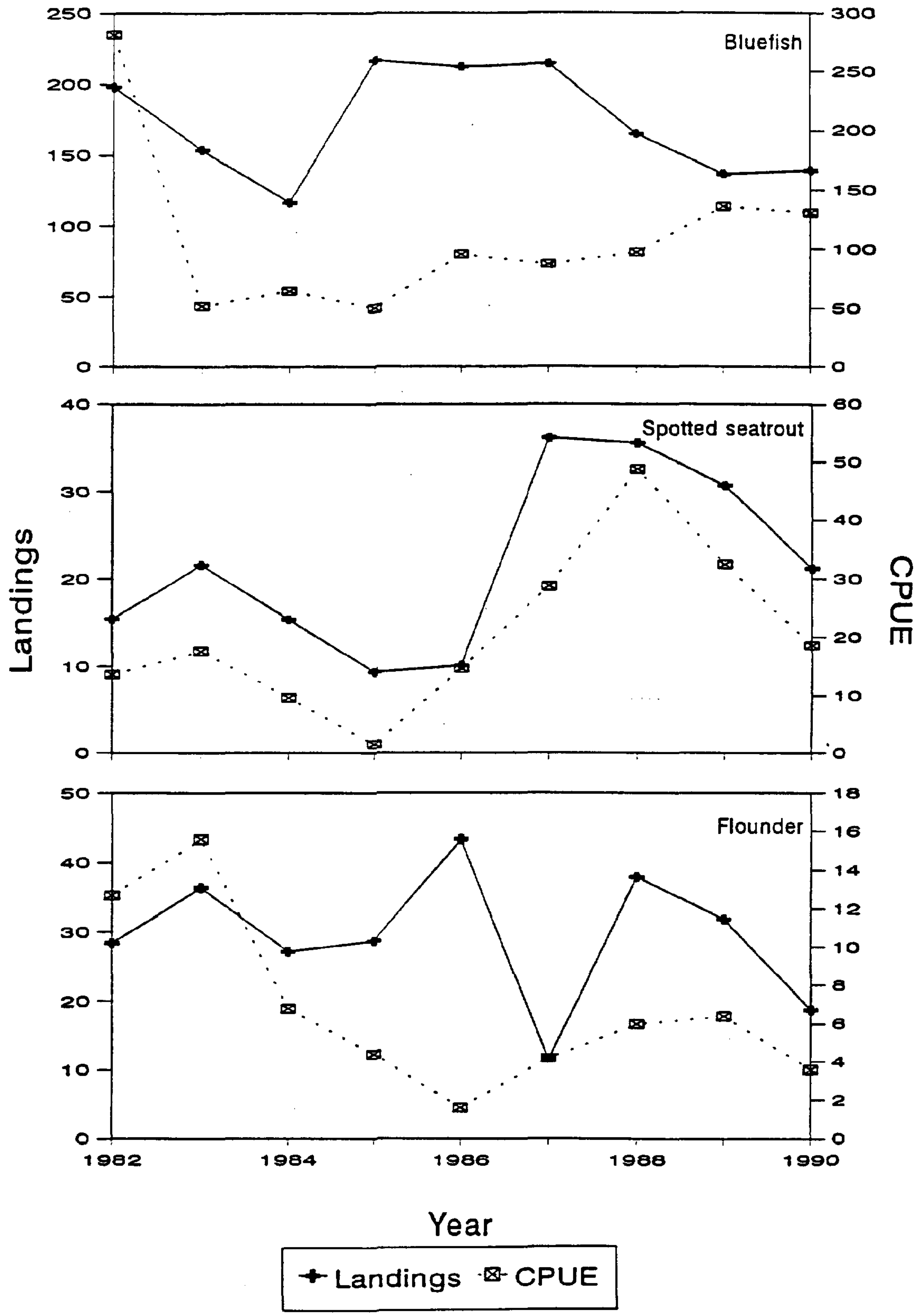

Figure 9. Commercial landings (kg x 1000) and CPUE (kg/trip) of bluefish (Pomatomus saltatrix), spotted seatrout (Cynoscion nebulosus), and flounders (Paralichthys sp.) from North Carolina long haul fishery, 1982-1990.

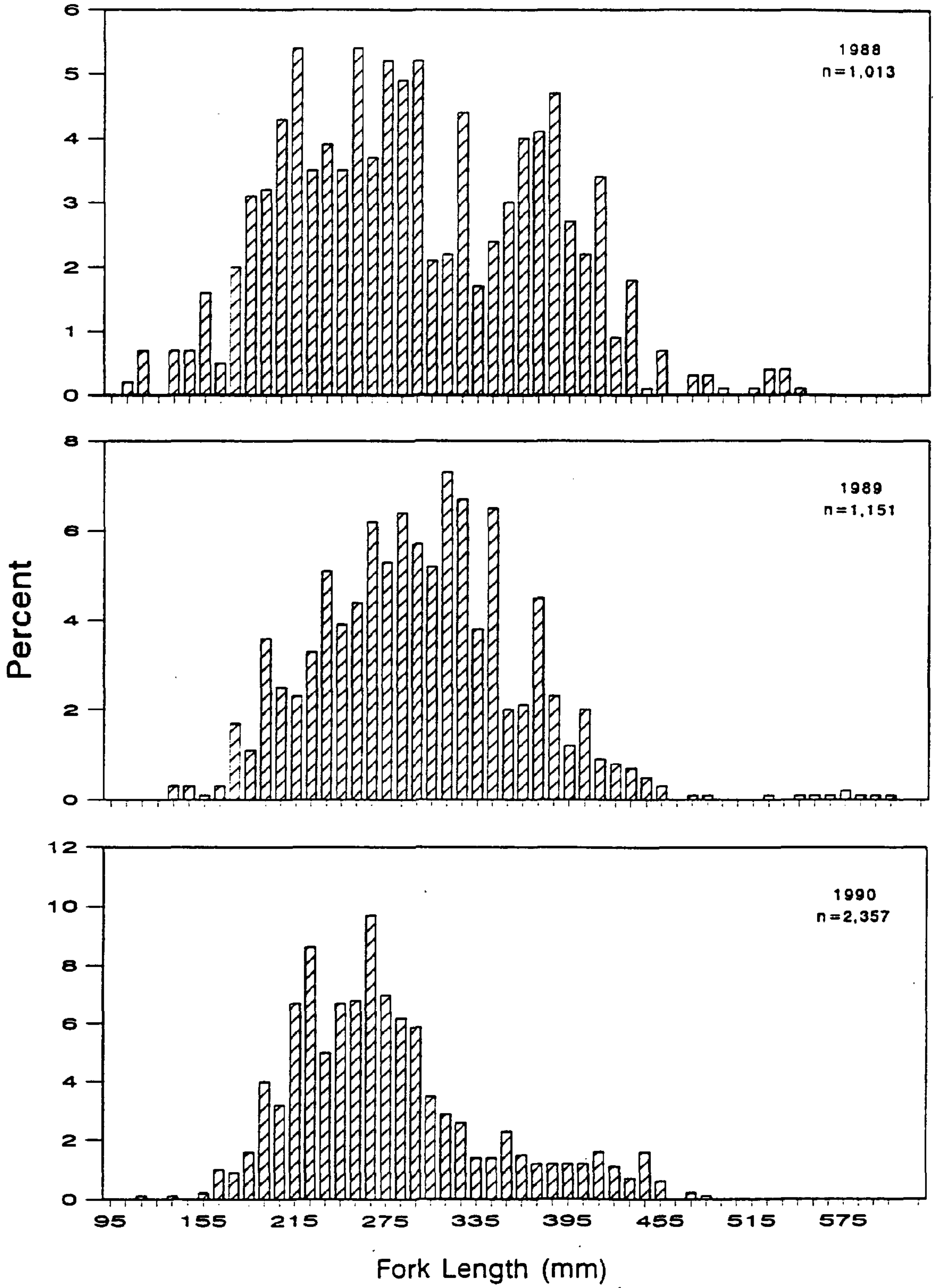

Figure 10. Expanded length frequencies of bluefish (Pomatomus saltatrix) from North Carolina long haul fishery, 1988-1990.

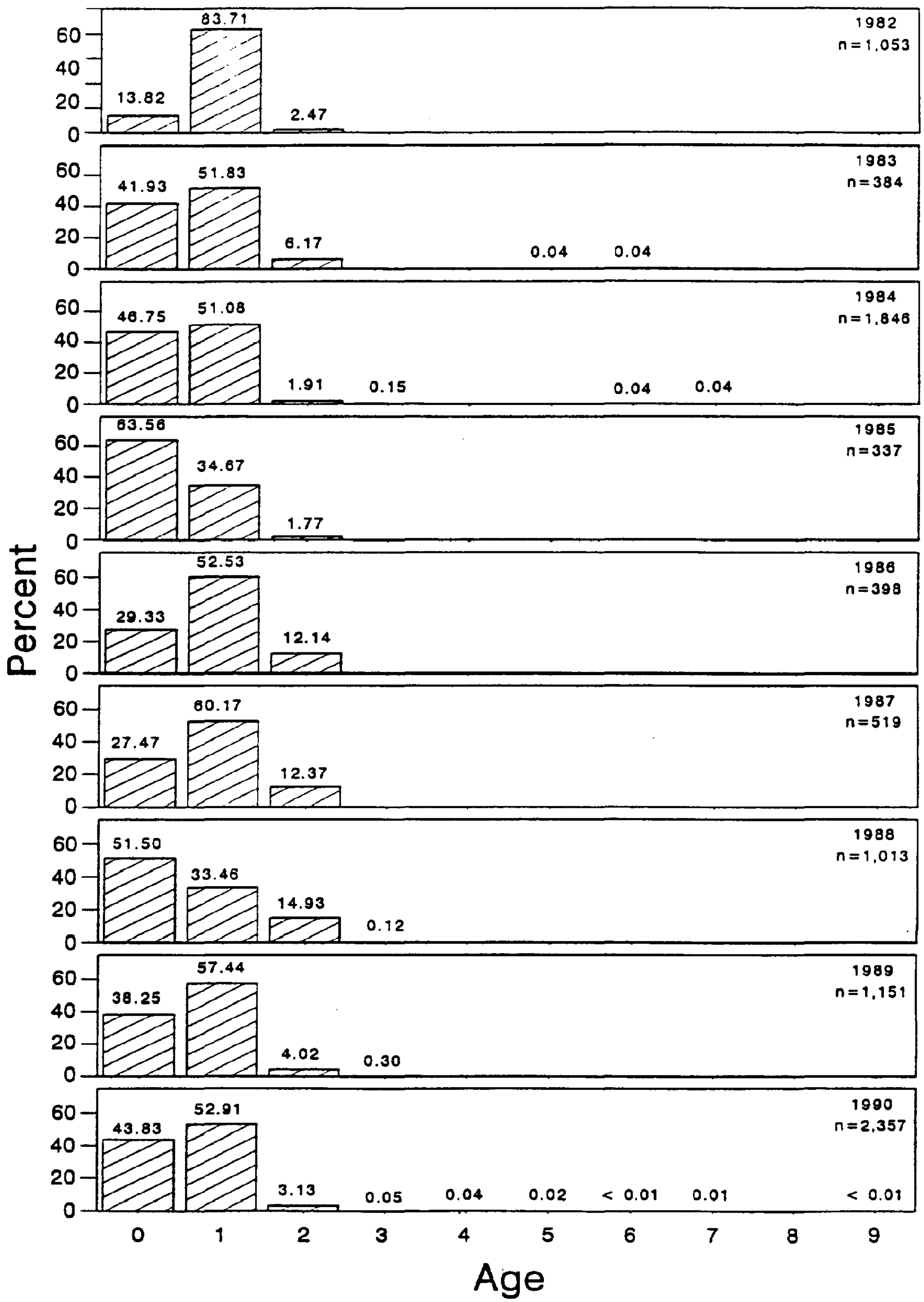

Figure 11. Age composition of bluefish (Pomatomus saltatrix) from North Carolina long haul fishery, 1982-1990.

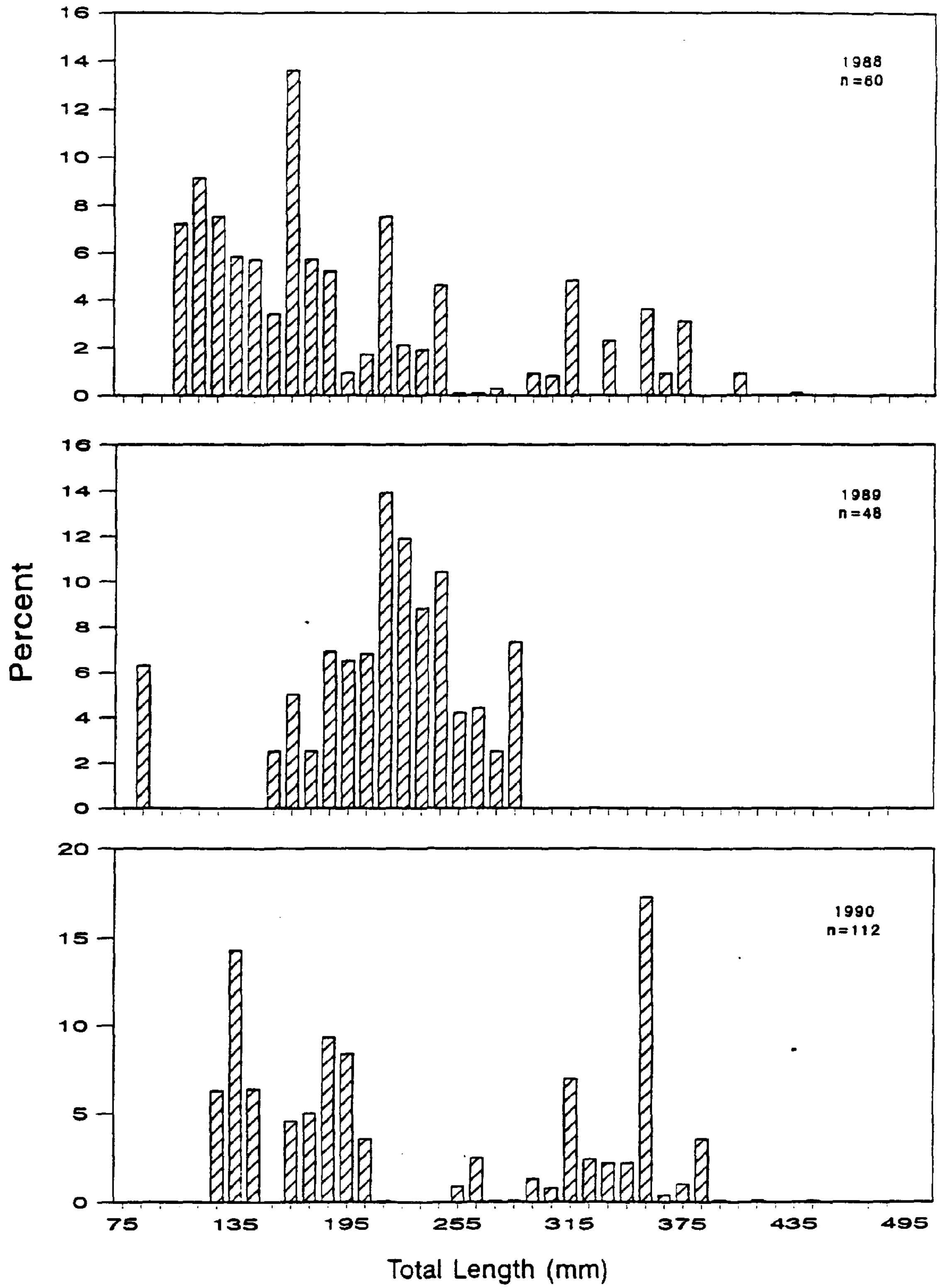

Figure 12. Expanded length frequencies of summer flounder (<u>Paralichthys dentatus</u>) from North Carolina long haul fishery, 1988-1990.

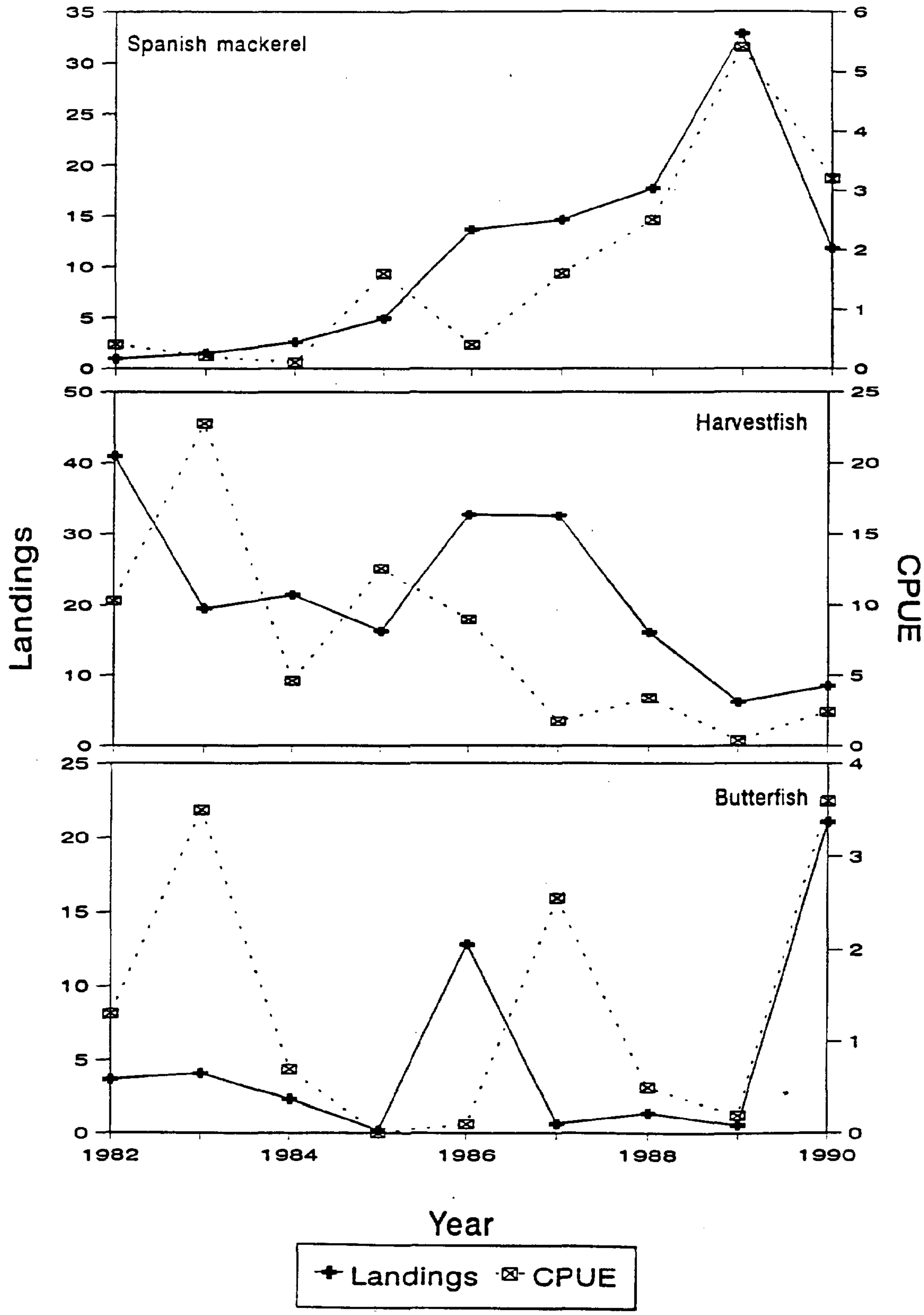

Figure 13. Commercial landings (kg x 1000) and CPUE (kg/trip) of Spanish mackerel (Scomberomorus maculatus), harvestfish (Peprilus alepidotus), and butterfish (Peprilus triacanthus) from North Carolina long haul fishery, 1982-1990.

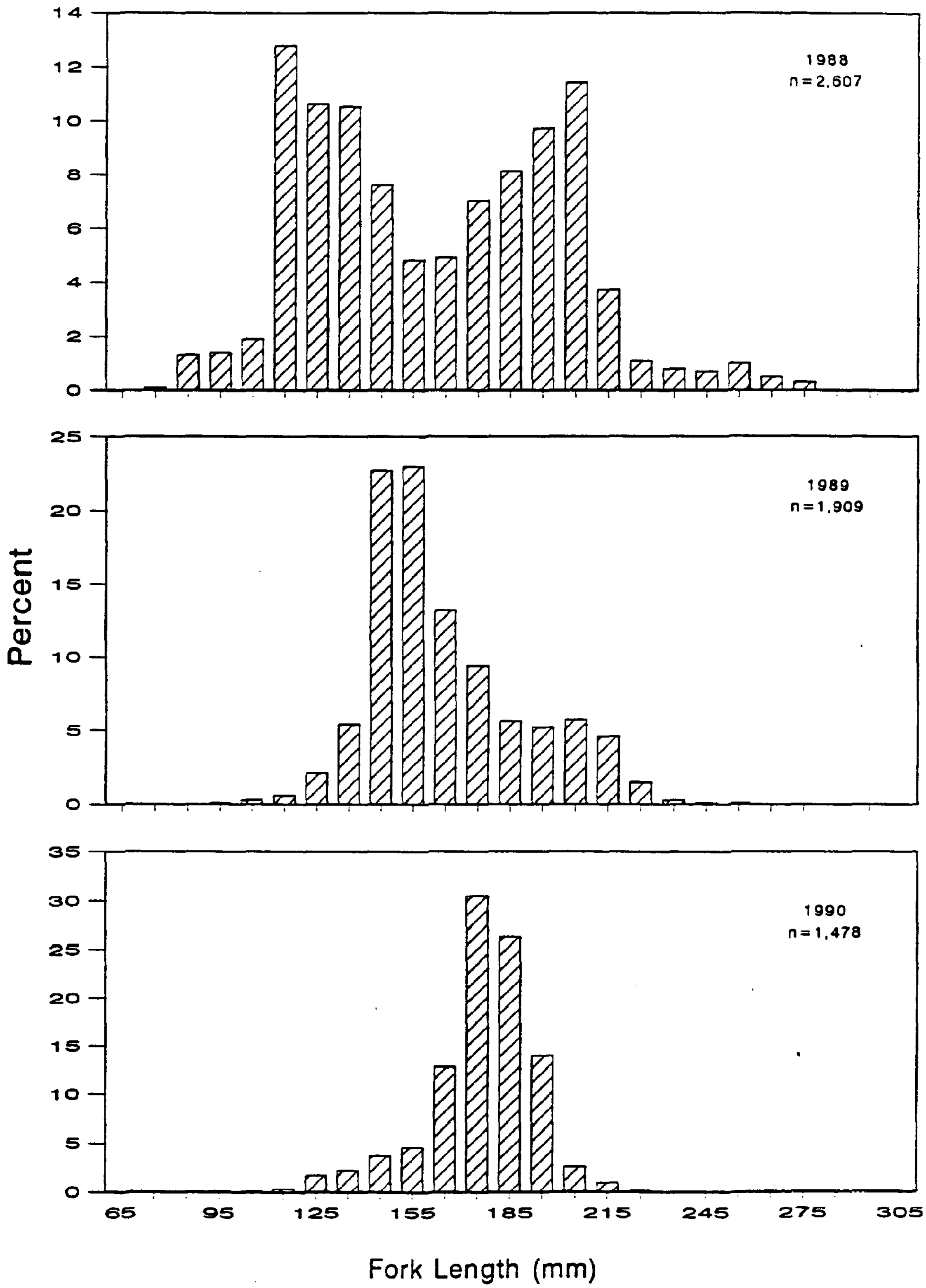

Figure 14. Expanded length frequencies of Atlantic menhaden (<u>Brevoortia tyrannus</u>) from North Carolina long haul fishery, 1988-1990.

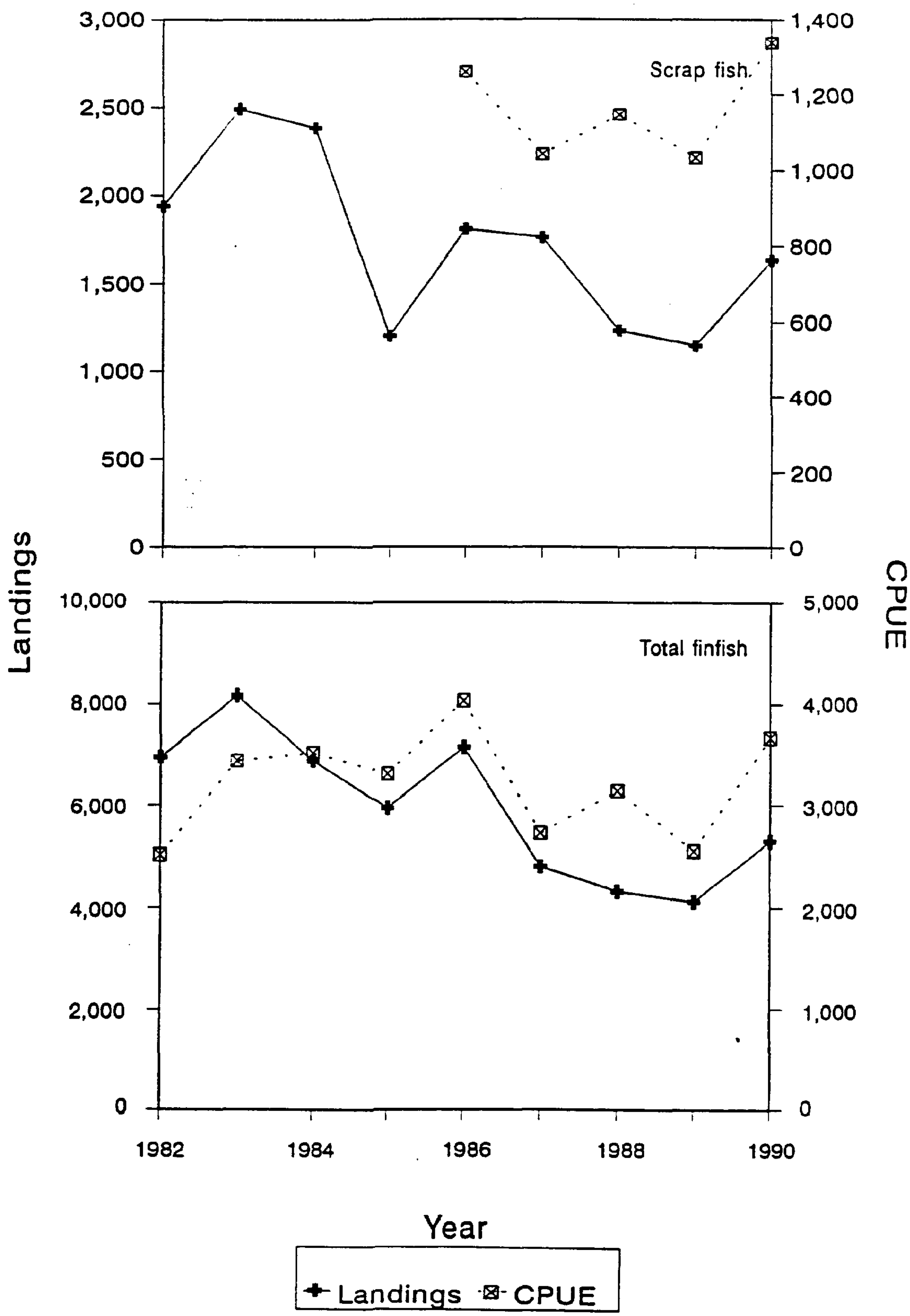

Figure 15. Commercial landings (kg x 1000) and CPUE (kg/trip) for scrap fish and total catch from North Carolina long haul fishery, 1982-1990.

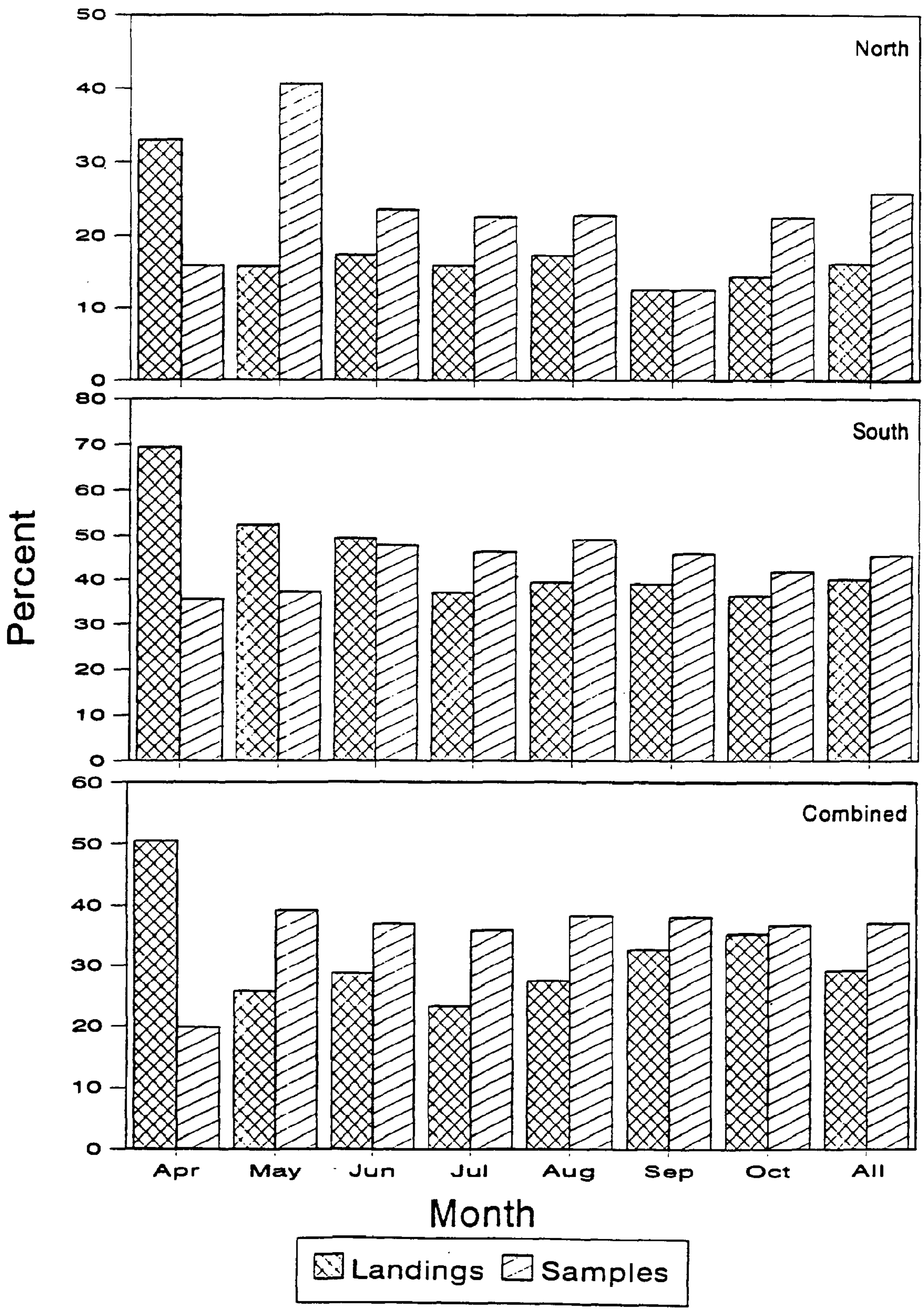

Figure 16. Monthly and total (All) percentage of scrap fish (mean 1988-1990) in reported commercial landings and individual catches sampled by area (north of Bluff Shoal and south of Bluff Shoal) and combined for the North Carolina long haul fishery.

APPENDIX

PPENDIX A. Seasonal commercial landings of sciaenid pound net [1], long haul [2], ocean gill net (gill net)[3], and winter trawl[4] fisheries in North Carolina for 1982-1990 fishing seasons (season = May-April), including total landings/species (mt), total value of state landings (value in 1000s of dollars) and relative contribution of the three fisheries/species (percent).

	May 82-Apr 83		May 83-Apr 84		May 84-Apr 85		May 85-Apr 86		May 86-Apr 87		May 87-Apr 88		May 88-Apr 89		May 89-Apr 90		May 90-Apr 91	
pecies	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent
tlantic croaker	4,475	$3,572	3,697	$3,099	4,707	$3,278	4,211	$3,204	3,757	$2,909	3,552	$3,133	3,164	$3,036	2,787	$3,201	2,550	$2,749
Pound net	863	19.3	292	7.9	443	9.4	567	13.5	234	6.2	579	16.3	451	14.2	244	8.8	218	8.5
Long haul	2,064	46.1	1,883	50.9	1,339	28.4	1,114	26.4	1,392	37.0	679	19.1	1,177	37.2	1,427	51.2	1,769	69.4
Trawler	547	12.2	478	12.9	1,359	28.9	1,069	25.4	721	19.2	761	21.4	653	20.7	436	15.7	154	6.1
Gill net	385	8.6	540	13.3	1,219	25.9	1,252	29.7	1,204	3.0	1,283	36.1	636	20.1	385	13.9	304	11.9
eakfish	5,163	$4,695	5,486	$3,936	4,728	$3,874	6,626	$4,458	5,276	$4,152	6,561	$4,717	5,298	$5,041	2,854	$3,320	2,759	$2,803
Pound net	126	2.5	73	1.3	167	3.5	192	2.9	88	1.7	199	3.0	232	4.4	58	2.0	74	2.7
Long haul	737	14.3	704	12.8	762	16.1	508	7.7	586	11.1	412	6.3	608	11.5	240	8.4	481	17.4
Trawler	3,054	59.5	2,740	49.9	1,760	37.2	2,570	38.8	1,971	37.4	2,364	36.0	1,590	30.0	1,168	41.1	1,220	44.4
Gill net	846	16.4	1,555	28.4	1,565	33.1	2,654	40.1	2,277	43.2	3,253	49.6	2,440	46.1	1,202	42.2	842	30.5
luefish	3,470	$914	1,618	$565	1,344	$509	1,734	$513	1,712	$732	2,603	$755	1,417	$538	1,761	$678	2,150	$ 740
Pound net	89	2.6	31	1.9	38	2.9	51	3.0	30	1.8	41	1.6	35	2.5	14	0.8	14	0.7
Long haul	194	5.6	153	9.5	111	11.7	216	12.5	212	12.4	214	8.2	164	11.6	136	7.7	139	6.5
Trawler	1,776	51.2	465	28.7	359	26.7	353	20.3	185	10.8	564	21.7	234	16.5	206	11.7	124	5.6
Gill net	970	28.0	637	39.4	561	41.8	744	42.9	979	57.2	1,357	52.1	683	48.2	1,193	67.8	1,293	60.1
pot	2,214	$1,063	1,388	$699	1,562	$809	1,843	$900	1,473	$742	1,296	$663	1,378	$666	1,464	$785	1,590	$ 805
Pound net	150	6.8	30	2.1	89	5.7	56	3.1	22	1.5	51	3.9	33	2.4	33	0.2	19	1.2
Long haul	1,556	70.3	885	62.3	938	60.1	1,126	61.1	865	58.8	529	40.8	896	65.0	903	61.7	1,104	69.4
Trawler	36	1.6	69	5.0	50	3.2	75	4.1	38	2.6	37	2.8	37	2.7	63	4.3	33	2.1
Gill net	37	1.7	65	4.7	131	8.4	150	8.2	213	14.5	268	20.7	142	10.3	232	15.9	113	7.1
lounders	3,970	$5,486	6,027	$7,293	6,403	$10,132	4,231	$9,304	3,256	$7,993	4,571	$10,957	3,927	$9,649	2,637	$9,685	3,003	$9,554
Pound net	55	1.4	34	0.6	53	0.8	34	0.8	99	3.0	163	3.6	257	6.5	150	5.7	76	2.5
Long haul	28	0.7	36	0.6	27	0.4	29	0.7	43	1.3	12	0.3	38	1.0	32	1.2	19	0.6
Trawler	2,888	72.8	4,769	79.1	5,185	81.0	2,891	68.3	1,825	56.1	3,219	70.4	2,326	59.2	1,105	41.9	1,686	56.2
Gill net	0.2	<0.1	6	<0.1	9	0.2	6	0.1	6	0.2	4	0.1	2	0.1	6	0.3	<0.1	<0.1
triped bass	110	$451	185	$356	211	$365	101	$170	135	297	54	$119	43	$96	77	$212	50	$ 156
Pound net	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	0	0
Long haul	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Trawler	2	1.5	6	3.3	-	-	-	-	-	-	-	-	-	-	10	<0.1	3	6.0
Gill net	22	20.3	0.3	0.2	-	-	-	-	-	-	-	-	-	-	34	0.1	0	0
utterfish[5]	135	$76	53	$43	80	$64	63	$47	79	$72	62	$53	26	$28	104	$67	122	$ 97
Pound net	11	8.1	1	2.7	7	8.6	14	22.2	10	12.6	5	7.3	7	26.9	0.9	0.9	15	1.2
Long haul	4	2.7	4	8.4	2	2.9	0.2	0.3	13	16.3	0.6	1.0	1	5.4	0.5	5.3	21	17.2
Trawler	74	55.0	38	71.7	52	64.6	34	53.6	39	49.3	32	51.6	10	38.5	71	69.3	41	33.6
Gill net	38	28.4	6	10.6	13	15.7	9	14.4	11	14.1	11	18.2	3	11.5	16	15.5	12	9.8

APPENDIX A. (Continued).

Species	May 82-Apr 83 Land-ings	May 82-Apr 83 Value/percent	May 83-Apr 84 Land-ings	May 83-Apr 84 Value/percent	May 84-Apr 85 Land-ings	May 84-Apr 85 Value/percent	May 85-Apr 86 Land-ings	May 85-Apr 86 Value/percent	May 86-Apr 87 Land-ings	May 86-Apr 87 Value/percent	May 87-Apr 88 Land-ings	May 87-Apr 88 Value/percent	May 88-Apr 89 Land-ings	May 88-Apr 89 Value/percent	May 89-Apr 90 Land-ings	May 89-Apr 90 Value/percent	May 90-Apr 91 Land-ings	May 90-Apr 91 Value/percent
Harvestfish[5]	199	$123	101	$60	110	$97	186	$200	137	$167	115	$158	114	$164	100	$129	98	$135
Pound net	34	17.2	17	16.8	32	28.9	86	46.5	34	24.6	38	32.7	34	29.8	18	18.0	24	24.5
Long haul	41	20.6	20	19.4	21	19.5	16	8.8	33	23.9	33	28.5	16	14.3	6	6.2	9	9.2
Trawler	34	17.2	7	7.1	5	4.7	43	23.0	7	4.8	6	4.8	8	7.1	22	22.0	13	13.3
Gill net	42	21.1	6	6.0	5	4.7	18	9.5	11	8.3	13	11.0	5	4.4	13	13.3	16	16.3
Spanish mackerel	86	$61	19	$15	58	$42	79	$67	105	$81	229	$145	199	$141	268	$215	380	$318
Pound net	3	3.6	3	14.2	6	10.9	10	12.4	16	15.2	81	35.6	75	37.7	71	26.5	22	5.8
Long haul	0.9	1.1	1	7.9	3	4.5	5	6.3	13	12.4	15	6.4	18	8.9	33	12.3	12	3.2
Trawler	0.4	0.4	-	-	-	-	0.3	0.4	0.3	0.3	0.1	<0.1	0.2	0.1	3	1.1	0.7	0.2
Gill net	30	34.7	4	20.3	14	24.4	27	34.1	41	38.9	50	21.9	43	21.6	114	42.5	143	37.6
Florida pompano	14	$33	2	$4	4	$11	11	$32	17	$41	9	$24	3	$9	9	$28	14	$24
Pound net	3	23.5	0.1	3.1	0.4	8.9	1	9.0	3	16.3	2	24.4	0.4	13.3	5	55.6	0.5	3.6
Long haul	6	38.9	0.4	18.7	2	56.6	5	48.4	4	24.3	2	19.7	0.7	18.9	2	18.6	1	7.2
Trawler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.002	<0.1	-	
Gill net	0.7	4.7	-	-	0.6	13.7	0.1	1.4	2	11.2	0.5	5.5	0.3	10.0			<0.1	<0.1
Spotted seatrout	42	$72	72	$120	68	$123	65	$171	85	$157	156	$277	167	$326	161	$345	110	$219
Pound net	5	11.6	5	6.8	4	6.0	0.2	0.4	0.3	0.3	2	1.5	0.2	0.1	-	-	0.3	0.3
Long haul	15	35.6	19	25.6	15	22.3	9	14.9	10	11.8	36	23.2	35	21.1	31	19.0	21	19.1
Trawler	0.4	1.0	0.3	0.4	0.4	0.6	2	2.8	6	6.7	2	1.4	0.7	0.4	8	4.8	<0.1	<0.1
Gill net	2	5.4	4	5.8	4	6.1	16	24.4	10	11.5	17	11.0	22	13.2	10	6.3	10	9.1
Red drum	22	$11	146	$81	91	$60	77	$113	104	$109	115	$149	99	$124	118	$164	82	$105
Pound net	0.3	1.5	2	1.1	0.8	0.9	0.4	0.5	0.5	0.5	19	16.4	4	4.0	5	4.2	1	1.2
Long haul	5	20.4	9	6.5	7	7.7	2	2.8	32	30.9	16	13.8	11	11.1	25	21.6	8	9.8
Trawler	6	27.7	13	9.0	6	7.1	2	2.1	2	1.5	1	1.3	2	1.9	1	1.1	0.2	0.3
Gill net	5	24.0	37	25.1	21	22.8	19	24.4	9	8.4	11	9.6	9	9.1	12	10.4	5	6.1
Black sea bass	213	$343	446	$619	544	$976	503	$1,002	267	$519	495	$979	452	$1,118	509	$1,384	285	$1,042
Trawler	71	33.5	266	59.7	363	71.4	296	58.9	95	35.7	315	63.6	206	45.7	205	40.3	60	21.1
Scup or porgies	658	$840	835	$997	505	$759	188	$212	111	$186	61	$65	15	$11	47	82	71	$60
Trawler	304	46.2	477	57.2	267	52.9	171	90.8	111	99.7	58	94.3	15	100.0	47	99.6	71	100.0
Bait	4,302	$354	4,430	$376	4,695	$381	3,437	$230	2,836	$201	4,084	$300	2,596	$168	2,167	$159	2,566	$177
Pound net	349	8.1	201	4.5	421	9.0	549	16.0	123	4.3	329	8.1	271	10.4	306	14.1	341	13.3
Long haul	1,879	43.7	1,901	42.9	1,884	40.1	1,148	33.4	1,386	48.9	1,474	36.1	1,078	41.5	1,112	51.8	1,635	63.7
Trawler	1,364	31.7	1,613	36.4	1,728	36.7	1,620	47.1	905	31.9	2,109	51.1	794	30.6	195	9.0	78	3.0
Gill net	62	1.5	44	1.0	100	2.1	13	0.4	23	0.8	7	0.2	127	4.9	6	0.3	1	

PPENDIX A. (Continued).

pecies	May 82-Apr 83 Land-ings	May 82-Apr 83 Value/percent	May 83-Apr 84 Land-ings	May 83-Apr 84 Value/percent	May 84-Apr 85 Land-ings	May 84-Apr 85 Value/percent	May 85-Apr 86 Land-ings	May 85-Apr 86 Value/percent	May 86-Apr 87 Land-ings	May 86-Apr 87 Value/percent	May 87-Apr 88 Land-ings	May 87-Apr 88 Value/percent	May 88-Apr 89 Land-ings	May 88-Apr 89 Value/percent	May 89-Apr 90 Land-ings	May 89-Apr 90 Value/percent	May 90-Apr 91 Land-ings	May 90-Apr 91 Value/percent
otal finfish																		
(w/out menhaden)	31,767	$23,406	32,776	$23,639	37,030	$28,220	32,319	$27,182	25,462	$25,399	31,772	$30,301	25,225	$29,622	20,905	$41,836	24,812	$28,731
Pound net	1,699	5.4	706	2.2	1,285	3.5	1,553	4.8	684	2.7	1,558	4.9	1,432	5.7	935	4.5	827	3.3
Long haul	6,579	20.7	5,649	17.2	5,175	14.0	4,250	13.2	4,714	18.5	3,353	10.6	4,308	17.1	4,112	19.7	5,299	21.4
Trawler	10,367	32.6	11,779	35.9	11,899	32.1	9,850	30.5	6,493	25.5	10,256	32.3	6,099	24.2	4,481	21.5	4,081	16.4
Gill net	2,671	8.4	3,071	9.4	3,825	10.3	5,157	16.0	5,067	19.9	6,698	21.1	4,430	17.6	3,555	17.0	3,548	14.3
otal marketable																		
(w/out menhaden)	27,465	$23,092	28,346	$18,994	32,336	$23,263	28,882	$26,952	22,626	$25,197	27,688	$29,884	22,629	$29,454	18,738	$41,677	22,246	$28,554
Pound net	1,350	4.9	505	1.8	864	2.7	1,003	3.5	561	2.5	1,229	4.4	1,161	5.1	630	3.3	468	2.1
Long haul	4,700	17.1	3,748	13.2	3,291	10.2	3,102	10.7	3,328	14.7	2,074	7.5	3,230	14.3	2,991	16.0	3,665	16.5
Trawler	9,003	32.8	10,166	35.9	10,177	31.5	8,230	28.5	5,588	24.7	8,147	29.4	5,304	23.4	4,285	22.9	4,056	18.2
Gill net	2,613	9.5	3,028	10.7	3,725	11.5	5,144	17.8	5,043	22.3	6,691	24.2	4,303	19.0	3,549	18.9	3,547	15.9

Pound net landings include Dare County (annual timeframe).
Long haul landings: Long haul landings include April through December from Dare, Hyde, Carteret, Craven, Pamlico and Beaufort counties (annual timeframe).
Winter trawl landings include: Dare, Hyde, Pamlico, Beaufort, Craven, Carteret, Brunswick and Onslow counties.
Ocean gill net landings include all state landings September through April.
North Carolina commercial landings combined harvestfish and butterfish landings in 1985 are harvestfish; for the purpose of this presentation, we extrapolated out butterfish landings based on monthly relative proportions of the two species in our samples.

APPENDIX B. Long haul seine total commercial landings (kg) and catch/trip (CPUE, kg) north (N), south (S) and combined (C) areas of Bluff Shoal, Pamlico Sound area for the predominant species, 1982-1990.

Species	Area		1982	1983	1984	1985	1986	1987	1988	1989	1990
Atlantic croaker	N	Landings	1,789,581	1,722,516	1,177,131	966,083	1,205,537	479,195	949,184	1,280,905	1,535,222
		CPUE	1,118.4	1,530.9	3,108.4	2,217.2	2,564.4	1,727.5	2,146.9	1,619.1	2,946.7
	S	Landings	376,405	206,589	296,977	147,892	186,364	199,472	227,553	146,181	233,691
		CPUE	628.3	791.2	702.0	614.1	895.1	716.7	554.5	706.0	1,216.3
	C	Landings	2,165,986	1,929,104	1,474,108	1,113,975	1,391,901	678,667	1,176,737	1,427,086	1,768,913
		CPUE	835.2	1,131.7	1,874.4	1,485.3	2,225.0	1,258.9	1,286.1	1,106.5	2,291.5
Bluefish	N	Landings	84,792	58,044	26,254	47,584	29,581	30,890	28,043	41,812	45,233
		CPUE	67.4	37.2	48.8	34.3	37.4	52.0	50.5	92.5	144.7
	S	Landings	113,254	95,349	89,900	168,629	182,088	183,041	136,055	94,282	93,787
		CPUE	439.3	61.2	79.8	69.0	282.7	128.3	137.1	169.7	108.1
	C	Landings	198,046	153,393	116,154	216,213	211,670	213,941	164,098	136,094	139,020
		CPUE	282.3	52.0	64.7	50.1	95.7	87.4	97.3	135.9	130.9
Spot	N	Landings	363,726	130,230	175,293	143,367	289,113	106,162	188,369	220,757	184,323
		CPUE	325.7	478.0	296.2	386.3	623.6	423.2	703.6	453.9	307.6
	S	Landings	1,214,852	731,952	737,278	982,436	576,360	422,411	707,334	681,789	920,049
		CPUE	854.2	1,345.3	1,011.6	1,266.0	1,222.1	897.4	1,153.8	905.4	887.2
	C	Landings	1,578,579	862,182	912,572	1,125,804	865,473	528,573	895,703	902,546	1,104,372
		CPUE	631.1	846.4	663.1	788.4	776.8	643.0	947.0	707.4	527.1
Flounders	N	Landings	6,293	6,058	5,280	4,438	16,874	2,076	3,674	14,852	4,203
		CPUE	1.0	10.6	2.5	4.4	3.8	3.7	4.8	3.5	9.2
	S	Landings	22,097	30,305	21,872	24,252	26,389	9,519	34,201	16,963	14,477
		CPUE	21.2	41.4	10.8	13.9	4.3	8.2	6.9	8.7	2.9
	C	Landings	28,390	36,363	27,152	28,690	43,263	11,595	37,865	31,815	18,680
		CPUE	12.7	15.6	6.8	4.4	1.6	4.2	6.0	6.4	3.6
Butterfish	N	LANDINGS	3,611	851	364	211	12,699	530	347	515	1,705
		CPUE	<0.1	<0.1	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	S	Landings	59	3,234	1,971	-	136	93	1,040	40	19,361
		CPUE	2.2	6.4	0.6	-	0.2	5.5	<0.1	<0.1	7.2
	C	Landings	3,670	4,085	2,335	210	12,835	623	1,387	555	21,066
		CPUE	1.3	3.5	0.7	<0.1	0.1	2.55	0.5	0.2	3.6
Harvestfish	N	Landings	8,627	3,803	2,985	3,456	13,104	4,338	3,840	3,273	3,217
		CPUE	1.4	3.2	0.5	6.9	3.0	<0.1	<0.1	<0.1	<0.1
	S	Landings	32,315	15,711	18,431	12,905	19,688	28,318	12,338	2,964	5,311
		CPUE	16.7	40.9	8.4	19.3	28.4	3.7	6.1	<0.1	4.6
	C	Landings	40,942	19,513	21,416	16,361	32,792	32,656	16,177	6,237	8,528
		CPUE	10.3	22.8	4.6	12.6	9.0	1.7	3.4	0.4	2.4
Spanish mackerel	N	Landings	628	9	179	1,366	6,786	2,242	2,450	16,753	3,585
		CPUE	0.5	<0.1	0.2	1.9	0.5	1.2	<0.1	<0.1	<0.1
	S	Landings	297	1,471	2,398	3,587	6,272	12,325	15,226	16,097	8,242
		CPUE	0.4	0.4	<0.1	1.1	<0.1	2.0	3.9	6.7	<0.1
	C	Landings	925	1,480	2,577	4,952	13,657	14,567	17,676	32,850	11,827
		CPUE	0.4	0.2	0.1	1.6	0.4	1.6	2.5	5.4	3.2

APPENDIX B. (Continued).

Species	Area		1982	1983	1984	1985	1986	1987	1988	1989	1990
Spotted seatrout	N	Landings	7,522	13,829	10,808	5,408	2,818	13,591	12,379	20,717	14,385
		CPUE	5.0	10.7	3.3	1.3	14.2	24.6	36.6	34.8	21.8
	S	Landings	7,865	7,702	4,526	3,944	7,261	22,514	23,132	9,890	6,755
		CPUE	19.9	22.5	15.6	1.6	14.6	33.4	59.3	30.5	13.3
	C	Landings	15,387	21,532	15,335	9,352	10,079	36,105	35,511	30,607	21,140
		CPUE	13.6	17.6	9.6	1.5	14.6	28.7	48.8	32.4	18.6
Weakfish	N	Landings	241,346	286,955	294,119	257,379	217,913	133,122	367,536	121,903	131,206
		CPUE	201.4	552.9	683.3	784.4	366.8	405.3	670.8	121.0	123.9
	S	Landings	518,049	430,088	494,388	250,429	368,348	278,956	241,402	117,597	349,471
		CPUE	431.9	625.3	422.5	351.9	873.3	478.8	238.2	99.6	592.8
	C	Landings	759,395	717,042	788,507	507,808	586,260	412,078	608,938	239,500	480,677
		CPUE	334.6	584.9	549.5	587.0	493.1	439.4	437.0	109.0	301.4
Bait*	N	Landings	286,632	1,312,279	876,022	283,494	503,573	338,365	148,445	436,179	499,835
		CPUE	-	-	-	-	1,026.6	705.3	1,052.2	799.3	1,097.1
	S	Landings	1,652,425	1,177,289	1,505,136	920,441	1,304,659	1,426,678	1,087,431	714,100	1,134,864
		CPUE	-	-	-	-	2,024.4	1,426.5	1,219.5	1,171.0	1,567.1
	C	Landings	1,939,057	2,489,568	2,381,158	1,203,935	1,808,232	1,760,043	1,235,876	1,150,279	1,634,699
		CPUE	-	-	-	-	1,260.7	1,039.7	1,147.2	1,031.9	1,338.8
Total fish	N	Landings	2,592,427	5,094,876	3,837,148	2,922,525	3,897,382	1,569,501	1,739,310	2,245,035	2,444,470
		CPUE	1,850.3	2,584.2	3,973.2	3,667.6	3,929.6	2,434.8	3,843.1	2,692.2	3,645.4
	S	Landings	4,362,433	3,071,921	3,036,761	3,019,109	3,247,497	3,221,927	2,569,551	1,866,646	2,854,636
		CPUE	2,977.8	4,166.0	3,003.7	2,918.7	4,368.7	3,057.77	2,610.0	2,468.4	3,687.0
	C	Landings	6,954,860	8,166,798	6,873,909	5,941,634	7,144,879	4,791,428	4,308,861	4,111,681	5,299,106
		CPUE	2,514.3	3,441.0	3,517.5	3,307.1	4,032.6	2,723.6	3,142.6	2,552.1	3,666.8

* Biological sampling of bait in long haul catches began in 1986.

APPENDIX C. Monthly (A; 1988-1990), areal (B; 1985-1990), and scrap (C; 1985-1990) expanded length frequencies of Atlantic croaker (Micropogonias undulatus) from long haul catches; n = number of individuals measured; en = expanded number of individuals.

					Percent frequency size class (TL, mm)											
	Year	Month	n	en	<151	151-175	176-200	201-225	226-250	251-275	276-300	301-325	326-350	351-375	376-400	>400
A.	1988	Apr	417	30,687	1.1	25.5	21.6	14.4	15.0	11.5	7.2	2.7	0.2	0.8		
		May	2,422	249,007	0.2	2.0	9.9	22.5	34.3	18.1	7.7	3.0	1.8	0.6	<0.1	
		Jun	3,537	249,288	0.3	0.6	14.4	42.1	24.8	10.9	4.4	1.9	0.5	0.1	<0.1	
		Jul	2,275	165,451	0.4	0.5	5.3	23.1	32.8	21.0	9.9	4.0	1.6	1.1	0.3	
		Aug	3,460	443,417	6.0	4.6	4.1	20.3	33.5	18.3	8.4	3.2	1.1	0.3		<0.1
		Sep	669	97,676	20.2	41.5	19.8	8.2	4.7	3.1	1.6	0.7	0.2	0.1		
		Oct	185	27,029	3.0	9.7	45.5	23.6	15.4	1.8		0.5	0.3		0.3	
	1989	Apr	807	31,276	<0.1	0.4	1.0	5.9	33.7	38.1	14.8	4.7	1.2	0.1		
		May	641	41,314	0.1	12.6	28.4	14.1	21.9	19.8	3.0	0.1	<0.1	0.0		
		Jun	3,788	251,220	<0.1	2.3	13.2	31.6	26.0	18.3	7.1	1.3	0.1	0.0		
		Jul	2,349	369,895	2.0	1.8	16.4	33.7	27.0	14.9	3.5	0.7	<0.1			
		Aug	1,725	164,612	6.7	8.1	4.7	29.8	34.7	12.4	3.3	0.2	0.1			
		Sep	184	11,716	4.9	31.9	30.1	8.9	11.3	8.5	1.5	2.6	0.1	0.2		
		Oct	110	5,452	<0.1	25.2	64.8	6.4		3.5						
	1990	Apr	346	14,109		22.2	32.5	30.6	12.8	0.0	0.0	0.0				
		May	2,762	433,432	0.7	2.8	6.0	17.3	45.9	23.9	3.3	0.1	<0.1			
		Jun	5,843	882,159	2.2	2.9	14.0	30.2	39.3	10.6	0.8	0.0				
		Jul	4,100	198,527	4.2	0.8	4.9	28.6	46.9	13.4	1.0	0.2	<0.1			
		Aug	2,810	372,658	38.5	14.7	10.3	16.9	14.3	4.4	0.8	0.1	<0.1	<0.1		
		Sep	805	62,436	10.9	51.0	8.0	5.0	15.0	7.8	1.9	0.4	0.1			
		Oct	174	10,133	13.8	83.8	1.9			0.2	0.2	0.2	0.1			

					Percent frequency size class (TL, mm)											
	Year	Month	n	en	<151	151-175	176-200	201-225	226-250	251-275	276-300	301-325	326-350	351-375	376-400	>400
B.	1985	North	7,766	617,470	0.4	1.4	1.7	17.9	48.3	23.9	5.6	0.8	0.1	<0.1	<0.1	
		South	3,174	234,425	1.8	25.2	45.6	17.4	8.0	1.6	0.2	0.1	0.1			
		Combined	10,940	851,895	0.8	7.9	13.8	17.8	37.2	17.8	4.1	0.6	0.1	<0.1	<0.1	
	1986	North	12,878	1,143,514	0.1	0.3	2.0	18.8	45.2	25.7	6.4	1.3	0.1	<0.1	<0.1	
		South	1,371	214,253	8.7	19.0	32.2	30.9	6.8	1.8	0.3	0.1	0.1		0.1	
		Combined	14,249	1,357,767	1.5	3.3	6.8	20.7	39.2	21.9	5.4	1.1	0.1	<0.1	<0.1	
	1987	North	8,109	661,520	0.8	3.8	4.7	20.2	42.9	22.2	4.5	0.7	0.1	<0.1		
		South	3,421	302,840		14.6	24.9	32.4	19.5	4.9	0.9	0.1		<0.1		
		Combined	11,530	964,360	1.4	7.2	11.1	24.0	35.5	16.8	3.4	0.5	0.1	<0.1		
	1988	North	8,350	790,135	1.0	2.1	3.9	19.4	34.2	22.2	10.6	4.2	1.7	0.6	0.1	
		South	4,615	472,417	8.7	13.1	20.2	32.8	19.7	4.3	0.9	0.3	0.0	<0.1		<0.1
		Combined	12,965	1,262,552	3.9	6.2	10.0	24.4	28.8	15.5	7.0	2.8	1.1	0.4	0.1	<0.1
	1989	North	4,873	482,269	0.7	1.0	3.5	22.3	36.0	26.7	8.2	1.5	0.2	<0.1		
		South	4,731	393,212	3.9	8.0	26.5	39.4	17.7	3.6	0.6	0.2	0.1	<0.1		
		Combined	9,604	875,481	2.2	4.1	13.8	30.0	27.8	16.3	4.8	0.9	0.1	<0.1		
	1990	North	11,067	1,428,276	7.7	4.2	5.3	22.6	42.3	16.0	1.8	0.1	<0.1	<0.1		
		South	5,773	545,169	13.3	14.2	24.3	26.7	18.0	3.2	0.3	0.0	<0.1			
		Combined	16,840	1,973,445	9.2	7.0	10.5	23.7	35.6	12.4	1.4	0.1	<0.1	<0.1		

APPENDIX C. (Continued).

	Year	Month	n	en	Percent frequency size class (TL, mm) <151	151-175	176-200	201-225	226-250	251-275	276-300	301-325	326-350	351-375	376-400	>400
C.	1985	North	923	923	1.5	6.6	6.0	51.1	34.5	0.3						
		South	479	479	1.5	34.2	48.4	15.2	0.6							
		Combined	1,402	1,402	1.5	16.0	20.5	38.9	22.9	0.2						
	1986	North	2,177	2,177	1.2	2.8	7.7	59.3	28.5	0.4						
		South	122	122		10.7	42.6	41.8	4.1	0.8						
		Combined	2,299	2,299	1.2	3.2	9.6	58.4	27.2	0.4						
	1987	North	1,748	24,646	5.8	46.7	28.3	15.3	3.9	0.1						
		South	1,104	13,544	8.5	48.4	19.8	22.0	1.3	<0.1	<0.1					
		Combined	2,852	38,190	6.8	47.3	25.3	17.7	2.9	<0.1	<0.1					
	1988	North	2,612	5,419	2.0	2.8	9.5	45.7	38.1	1.9						
		South	2,091	135,549	11.3	25.7	20.4	30.5	10.7	0.9	0.2	0.1				
		Combined	4,703	141,013	11.0	24.8	20.0	31.1	11.8	1.0	0.2	0.1				
	1989	North	1,278	5,543	0.5	49.0	36.6	7.5	2.9	3.6						
		South	1,854	139,691	4.9	7.7	36.3	43.8	7.2	0.1						
		Combined	3,132	145,234	4.7	9.3	36.3	42.4	7.1	0.2						
	1990	North	2,604	158,923	64.4	30.7	3.0	1.5	0.3	<0.1						
		South	2,125	419,793	17.2	18.2	27.7	29.3	7.5	0.1						
		Combined	4,729	578,716	30.2	21.6	20.9	21.7	5.5	0.1						

APPENDIX D. Monthly (A; 1988-1990), areal (B; 1985-1990), and scrap (C; 1985-1990) expanded length frequencies of spot (<u>Leiostomus xanthurus</u>) from long haul catches; n = number of individuals measured; en = expanded number of individuals.

					Percent frequency size class (FL, mm)									
	Year	Month	n	en	<121	121-135	136-150	151-165	166-180	181-195	196-210	211-225	226-240	>240
A.	1988	Apr	556	37,416	0.2	5.6	9.5	20.1	31.2	25.2	7.2	0.8	0.2	
		May	3,529	301,232	0.1	1.5	5.6	16.3	25.0	29.1	17.4	4.6	0.3	<0.1
		Jun	2,861	160,922		0.1	0.5	7.3	19.9	32.4	31.4	7.5	0.8	0.1
		Jul	1,493	72,885	2.2	1.8	1.3	1.4	5.8	23.4	41.3	21.5	1.2	<0.1
		Aug	2,283	205,085	25.1	5.4	4.2	3.8	4.2	12.6	26.1	14.1	3.5	0.9
		Sep	1,985	186,824	6.9	3.9	3.5	4.0	4.7	7.6	28.8	33.3	6.7	0.6
		Oct	947	144,270	3.3	2.0	0.5	1.1	4.3	20.8	32.4	28.0	7.3	0.4
	1989	Apr	217	14,955		9.0	12.8	11.3	29.8	29.1	7.6	0.5		
		May	1,242	58,288	2.7	13.3	22.4	16.3	17.7	19.5	7.6	0.5	<0.1	
		Jun	2,740	150,345	0.5	5.0	11.3	13.8	15.4	27.2	21.9	4.5	0.2	0.3
		Jul	2,660	227,291	2.5	0.8	2.4	9.1	19.5	28.0	31.5	6.2	<0.1	<0.1
		Aug	2,233	157,430	7.8	1.8	1.8	4.2	9.7	27.4	35.2	11.0	1.1	<0.1
		Sep	1,469	65,045	9.6	10.8	5.7	10.8	8.9	13.8	20.6	15.5	4.1	0.2
		Oct	1,043	78,586	2.1	2.8	1.4	1.8	3.4	9.2	31.5	34.4	12.7	0.7
	1990	Apr	21	419			42.3	30.3	2.9	16.0	6.7	1.9		
		May	2,658	143,055	0.5	7.2	19.5	23.5	25.1	20.3	3.6	0.2	<0.1	<0.1
		Jun	2,378	110,310	3.6	3.9	14.8	25.7	18.8	22.8	9.5	0.8	<0.1	<0.1
		Jul	1,837	50,125	9.9	7.4	10.5	10.7	21.5	23.4	13.8	2.7	0.1	<0.1
		Aug	2,174	292,243	67.9	7.4	3.4	4.6	5.0	6.9	3.6	1.2	0.1	
		Sep	2,249	153,236	12.2	11.1	6.4	4.6	4.5	22.1	29.5	9.2	0.5	<0.1
		Oct	792	35,471	15.9	4.1	4.1	2.6	3.8	26.6	31.5	11.0	0.3	

					Percent frequency size class (FL, mm)									
	Year	Area	n	en	<121	121-135	136-150	151-165	166-180	181-195	196-210	211-225	226-240	>240
B.	1985	North	2,629	187,135	2.8	5.6	8.3	11.2	19.1	28.9	18.9	4.8	0.4	0.1
		South	5,188	409,697	7.7	6.1	8.0	11.0	11.3	19.3	17.7	12.8	5.3	0.8
		Combined	7,817	596,832	6.1	5.9	8.1	11.1	13.8	22.3	18.0	10.3	3.8	0.6
	1986	North	8,264	440,404	0.7	2.4	5.2	8.2	15.6	30.6	26.5	9.5	1.3	0.1
		South	2,069	304,015	12.0	8.9	8.2	9.5	15.9	21.4	17.6	5.7	0.7	<0.1
		Combined	10,333	744,419	5.3	5.1	6.4	8.7	15.7	26.8	22.8	8.0	1.1	<0.1
	1987	North	6,164	311,205	0.4	3.9	9.1	16.5	21.0	24.4	18.2	6.0	0.5	
		South	5,085	442,432	6.2	11.3	9.1	9.6	17.2	22.4	19.0	4.4	0.7	0.1
		Combined	11,249	753,637	3.8	8.2	9.1	12.4	18.8	23.2	18.7	5.1	0.6	0.1
	1988	North	5,615	445,603	0.5	2.1	4.3	10.5	21.1	25.9	22.1	11.1	1.9	0.5
		South	8,039	663,034	10.4	3.0	2.9	6.0	8.0	18.2	28.9	18.7	3.8	0.2
		Combined	13,654	1,108,637	6.4	2.7	3.4	7.8	13.2	21.3	26.2	15.6	3.0	0.3
	1989	North	4,691	209,505	1.4	4.9	6.7	8.5	13.2	25.4	27.1	11.1	1.5	0.3
		South	6,913	542,437	4.7	3.7	5.7	9.2	14.4	23.3	27.1	9.7	2.1	0.1
		Combined	11,604	751,942	3.7	4.0	6.0	9.0	14.1	23.9	27.1	10.1	2.0	0.2

APPENDIX D. (Continued).

Year	Area	n	en	Percent frequency size class (FL, mm) <121	121-135	136-150	151-165	166-180	181-195	196-210	211-225	226-240	>240
1990	North	4,590	274,054	22.0	9.3	9.7	11.8	14.3	18.1	11.5	3.2	0.2	<0.1
	South	7,519	510,807	33.7	6.5	8.7	11.1	10.0	15.6	11.4	2.9	0.1	<0.1
	Combined	12,109	784,861	29.6	7.4	9.0	11.3	11.5	16.5	11.4	3.0	0.2	<0.1

	Year	Area	n	en	Percent frequency size class (FL, mm) <121	121-135	136-150	151-165	166-180	181-195	196-210	211-225	226-240	>240
C.	1985	North	477	477	1.5	7.1	14.5	20.1	29.4	24.3	3.1			
		South	775	775	9.9	4.5	12.3	26.3	23.9	18.5	4.3	0.4		
		Combined	1,252	1,252	6.8	5.5	13.1	24.0	26.0	20.7	3.8	0.2		
	1986	North	3,137	3,137	1.2	5.1	10.0	14.7	31.2	31.7	5.9	0.1		
		South	164	164	13.4	6.1	9.1	18.9	20.7	26.8	4.9			
		Combined	3,337	3,337	1.8	5.2	10.0	15.0	30.7	31.5	5.8	0.1		
	1987	North	2,443	16,962	<0.1	9.1	13.2	9.7	12.8	38.3	16.6	<0.1		
		South	1,265	15,455	3.5	10.7	28.2	14.5	5.4	21.8	16.0			
		Combined	3,708	32,417	1.6	9.9	20.4	12.0	9.3	30.4	16.3	<0.1		
	1988	North	2,458	4,152	0.7	1.8	2.7	5.0	24.9	54.7	9.9	0.3	<0.1	
		South	2,638	70,833	12.3	5.6	9.9	27.6	20.2	15.1	8.8	0.5		
		Combined	5,096	74,985	11.6	5.2	9.3	26.4	20.4	17.3	8.9	0.5	<0.1	
	1989	North	2,013	20,023	7.7	14.5	14.0	12.5	22.6	26.9	1.8	<0.1		
		South	2,003	57,271	8.4	3.6	11.3	26.8	28.2	14.3	6.5	0.9	0.1	
		Combined	4,016	77,294	8.1	6.4	12.0	23.1	26.8	17.6	5.3	0.7	0.1	
	1990	North	1,298	91,659	63.5	19.1	7.5	5.1	3.1	1.7	<0.1	<0.1		
		South	1,686	330,297	52.0	9.8	11.4	15.2	8.6	2.7	0.2			
		Combined	2,984	421,956	54.5	11.8	10.5	13.0	7.4	2.5	0.1	<0.1		

APPENDIX E. Monthly (A; 1988-1990), areaL (B; 1985-1990), and scrap (C; 1985-1990) expanded length frequencies of weakfish (Cynoscion regalis) from long haul catches; n = number of individuals measured; en = expanded number of individuals.

					Percent frequency size class (FL, mm)									
	Year	Month	n	en	<151	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	>550
A.	1988	Apr	448	20,462		1.5	22.3	50.3	18.8	5.9	1.0	0.2		
		May	1,090	47,153		1.2	12.8	37.6	28.8	15.3	3.5	0.5	0.2	0.2
		Jun	442	19,184		5.0	32.5	45.4	11.1	4.4	1.5	0.1		
		Jul	325	18,897		1.7	42.5	47.1	5.0	1.6	0.7	1.4	<0.1	<0.1
		Aug	1,002	82,808		2.2	31.3	46.3	13.4	4.2	2.2	0.3	0.1	
		Sep	868	48,954	0.3	16.6	12.7	49.9	15.7	3.5	1.1	0.1	0.1	
		Oct	378	87,577	<0.1	11.5	67.6	11.8	5.4	1.7	1.2	0.6	0.2	
	1989	Apr	12	448				31.7	31.7	31.7	0.8	1.7	2.5	
		May	143	5,957		12.8	37.2	16.1	22.1	4.4	4.8	1.3		1.3
		Jun	313	10,902	0.4	49.3	38.9	9.4	1.7	0.4				
		Jul	478	11,006	2.0	0.1	49.1	38.1	7.3	0.2	2.0	1.1	<0.1	
		Aug	730	37,400		9.1	55.9	27.9	5.9	0.9	0.4			
		Sep	207	6,405		9.1	29.5	47.9	12.9	0.5	0.1			
		Oct	155	1,894			7.3	16.4	38.5	27.3	0.3	10.2		
	1990	Apr	63	854		34.6	27.7	9.1	25.1	3.5				
		May	1,191	42,000	0.5	21.8	47.8	26.5	3.1	0.2	<0.1	<0.1		
		Jun	1,800	68,584	0.6	12.8	47.3	34.1	3.9	1.3	<0.1			
		Jul	607	16,701		3.6	54.6	31.0	6.9	2.8	0.9	0.1		
		Aug	1,334	57,543	2.9	0.1	54.4	37.8	4.5	0.3	0.1			
		Sep	748	11,546		2.3	14.8	66.2	15.8	0.9				
		Oct	292	2,991			5.7	44.7	35.5	7.3	2.2		4.6	

					Percent frequency size class (FL, mm)									
	Year	Area	n	en	<151	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	>550
B.	1985	North	3,527	190,660	0.1	10.4	31.1	40.5	13.2	3.1	1.1	0.3	0.2	
		South	749	56,256	0.1	6.3	34.4	33.2	16.9	8.2	0.7	0.2	0.1	
		Combined	4,276	246,915	0.1	9.4	31.9	38.8	14.1	4.2	1.0	0.3	0.2	
	1986	North	3,628	227,281	<0.1	13.3	66.2	14.2	4.5	0.8	0.4	0.5	<0.1	<0.1
		South	945	103,951	0.7	1.6	45.3	41.5	8.6	1.6	0.2	0.4	0.1	
		Combined	4,573	331,232	0.2	9.6	59.7	22.7	5.8	1.0	0.4	0.5	0.1	<0.1
	1987	North	3,520	193,879	<0.1	4.3	66.5	22.6	5.3	0.8	0.3	0.1	0.1	<0.1
		South	2,106	115,003	0.9	3.9	44.0	40.4	8.1	2.0	0.5	0.3		
		Combined	5,626	308,882	0.3	4.1	58.1	29.2	6.3	1.2	0.4	0.2	<0.1	<0.1
	1988	North	2,816	200,437	0.1	5.3	23.4	44.8	16.5	6.8	2.5	0.5	0.1	
		South	1,737	124,598		9.3	55.6	23.2	8.8	2.1	0.6	0.2	0.1	0.1
		Combined	4,553	325,035	<0.1	6.8	35.8	36.5	13.5	5.0	1.8	0.4	0.1	<0.1
	1989	North	855	34,708	0.8	1.2	56.5	26.5	11.3	1.7	1.5	0.2	<0.1	0.2
		South	1,183	39,302		24.7	38.6	27.8	5.8	1.9	0.4	0.8	<0.1	<0.1
		Combined	2,038	74,010	0.4	13.7	47.0	27.2	8.4	1.8	0.9	0.5	<0.1	0.1

APPENDIX E. (Continued).

Year	Area	n	en	Percent frequency size class (FL, mm) <151	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	>550
1990	North	1,009	55,636	0.1	11.3	55.8	26.4	3.7	2.1	0.2	<0.1	0.2	
	South	5,026	144,583	1.5	8.9	44.3	38.6	6.0	0.5	0.1	<0.1		
	Combined	6,035	200,219	1.2	9.6	47.5	35.2	5.4	1.0	0.1	<0.1	0.1	

	Year	Area	n	en	Percent frequency size class (FL, mm) <151	151-200	201-250	251-300	301-350
C.	1985	North	165	165	1.8	40.6	54.5	3.0	
		South	35	35		34.3	65.7		
		Combined	200	200	1.5	39.5	56.5	2.5	
	1986	North	1,085	1,085	0.1	23.2	75.3	1.2	0.2
		South	17	17		17.6	70.6	11.8	
		Combined	1,102	1,102	0.1	23.1	75.2	1.4	0.2
	1987	North	537	2,880		1.6	97.8	0.6	
		South	127	3,567	28.4	0.6	68.8	2.2	<0.1
		Combined	664	6,447	15.7	1.0	81.7	1.5	<0.1
	1988	North	529	529	0.4	31.2	59.2	8.9	0.4
		South	140	4,209		34.3	64.9	0.8	
		Combined	669	4,738	<0.1	44.0	64.3	1.7	<0.1
	1989	North	97	602		33.1	66.1	0.8	
		South	116	1,160	0.1	1.2	98.5	0.3	
		Combined	213	1,762	0.1	12.1	87.3	0.5	
	1990	North	175	175		41.7	54.9	3.4	
		South	205	36,163	6.1	33.8	56.5	3.5	
		Combined	380	36,338	6.1	33.9	56.5	3.5	

APPENDIX F. Monthly (A; 1988-1990), areal (B; 1985-1990), and scrap (C; 1985-1990) expanded length frequencies of Atlantic bluefish (Pomatomus saltatrix) from long haul catches; n = number of individuals measured; en = expanded number of individuals.

A. Year	Month	n	en	Percent frequency size class (FL, mm) <151	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	>550
1988	Apr	8	647					18.8	62.3	18.8			
	May	312	4,165			45.1	23.3	13.0	8.1	5.3	1.8	3.3	0.1
	Jun	249	5,775	1.1	10.9	23.0	49.1	9.4	3.7	1.5	0.5	0.6	0.1
	Jul	105	11,666	2.0	0.7	1.2	19.2	18.3	38.0	18.3	2.4		
	Aug	118	6,368	4.3	39.5	21.1	15.6	12.1	5.1	0.4		1.9	
	Sep	213	5,125	1.2	10.6	46.7	20.8	8.0	7.3	3.7	1.7		
	Oct	8	917	27.5	10.5	54.0	8.0						
1989	Apr	3	11						100.0				
	May	50	543			64.2	14.2	10.5	9.2	1.9			
	Jun	370	8,840		3.6	29.7	48.6	9.8	4.9	0.9	<0.1	0.2	2.3
	Jul	244	16,484	0.7	7.8	6.5	19.1	50.4	11.3	4.1			
	Aug	326	5,745	2.9	9.1	29.4	27.4	14.7	14.1	2.4			
	Sep	158	4,681		12.1	9.4	22.1	9.7	24.5	18.5	2.9	0.9	
1990	Apr	116	426				2.8	2.8	53.9	24.7	4.7	0.7	10.3
	May	200	1,150	0.3	44.7	26.5	14.8	8.3	2.6	1.2	0.5	0.3	0.7
	Jun	421	4,514		4.8	53.8	34.5	6.5	0.4				
	Jul	681	10,716	0.3	6.3	31.3	54.1	6.7	1.1	0.1	0.2		
	Aug	575	8,362	0.3	4.1	39.4	29.7	15.7	7.3	2.8	0.6		
	Sep	257	5,746		19.5	19.9	28.9	16.6	5.4	9.7			
	Oct	107	4,924			7.8	20.8	15.3	25.3	25.8	5.0		

B. Year	Area	n	en	Percent frequency size class (FL, mm) <151	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	>550
1985	North	147	7,327		24.6	40.3	21.9	8.3	4.3	0.5			
	South	190	9,622	0.3	10.5	31.0	39.8	14.1	3.5	0.9			
	Combined	337	16,949	0.2	16.6	35.0	32.1	11.6	3.9	0.7			
1986	North	300	13,302		17.0	28.4	23.1	24.0	6.7	0.8			
	South	98	11,331	0.9	8.2	4.6	16.6	28.7	26.0	9.0	2.4	3.5	
	Combined	398	24,633	0.4	13.0	17.5	20.1	26.2	15.6	4.6	1.1	1.6	
1987	North	349	13,076		8.7	31.2	38.9	10.5	7.3	2.9	0.5		
	South	170	12,657	2.3	8.9	14.7	31.8	17.1	11.1	13.1	0.8		
	Combined	519	25,733	1.2	8.8	23.1	35.4	13.8	9.2	7.9	0.7		
1988	North	238	10,123	2.5	12.5	17.6	31.7	17.4	10.6	4.4	1.7	1.6	
	South	775	24,542	2.6	10.6	23.6	20.3	11.2	20.4	9.5	1.2	0.5	<0.1
	Combined	1,013	34,665	2.6	11.2	21.9	23.6	13.0	17.6	8.0	1.4	0.8	<0.1
1989	North	327	10,925	1.5	8.1	19.8	27.5	13.8	17.6	10.1	1.2	0.4	
	South	824	25,379	0.5	7.1	15.8	28.1	35.6	9.4	2.6	0.0	0.1	0.8
	Combined	1,151	36,304	0.8	7.4	17.0	27.9	29.0	11.9	4.9	0.4	0.2	0.6

APPENDIX F. (Continued).

B. Year	Area	n	en	Percent frequency size class (FL, mm) <151	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	>550
1990	North	1,184	23,461		6.6	23.2	36.5	13.4	9.6	9.0	1.4	<0.1	0.2
	South	1,173	12,377	0.5	10.6	44.2	33.4	8.0	2.4	0.7	0.1	<0.1	<0.1
	Combined	2,357	35,838	0.2	8.0	30.4	35.5	11.6	7.1	6.1	1.0	<0.1	0.1

C. Year	Area	n	en	Percent frequency size class (FL, mm) <151	151-200	201-250	251-300	301-350	351-400
1985	North	24	24		50.0	50.0			
	South	21	21			52.4	47.6		
	Combined	45	45		26.7	51.1	22.2		
1986	North	166	166	1.8	37.3	52.4	7.8	0.6	
	South	12	12	16.7	8.3	25.0	50.0		
	Combined	178	178	2.8	35.4	50.6	10.7	0.6	
1987	North	131	1,811		14.3	14.3	28.6	14.3	28.6
	South	42	157	3.8	1.3	8.9	86.0		
	Combined	173	1,968	0.3	13.3	13.9	33.1	13.2	26.3
1988	North	66	66		24.2	47.0	27.3	1.5	
	South	191	3,261	3.2	15.5	64.7	16.1	0.5	
	Combined	257	3,327	3.1	15.7	64.3	16.3	0.5	
1989	North	122	319	0.3	6.6	62.1	31.0		
	South	101	2,003	1.0	11.1	77.0	8.6	0.1	2.3
	Combined	223	2,322	0.9	10.5	74.9	11.7	<0.1	2.0
1990	North	213	215	0.5	18.1	71.6	9.8		
	South	81	6,034	0.4	19.6	78.7	0.5	0.7	
	Combined	294	6,249	0.4	19.6	78.5	0.8	0.6	

APPENDIX G. Monthly (A; 1988-1990), areal (B; 1985-1990), and scrap (C; 1985-1990) expanded length frequencies of summer flounder (<u>Paralichthys dentatus</u>) from long haul catches; n = number of individuals measured; en = expanded number of individuals.

					Percent frequency size class (TL, mm)							
	Year	Month	n	en	<151	151-200	201-250	251-300	301-350	351-400	401-450	>450
A.	1988	May	9	74		40.6	40.6	14.5			2.9	1.3
		Jun	17	697	64.1	8.2	6.1	0.4	4.8	16.4		
		Jul	14	519	28.5	31.9	14.1	6.4		12.7	6.4	
		Aug	13	1,059	27.0	44.9	7.8		20.3			
		Sep	3	157			99.4			0.6		
		Oct	4	141			47.5			52.5		
	1989	Apr	1	140		100.0						
		May	4	390			90.2	9.8				
		Jun	5	545			36.7	63.3				
		Jul	19	481		58.8	7.1	34.1				
		Aug	7	465	29.9	35.6	34.4					
		Sep	48	2,416			100.0					
	1990	May	4	217		37.2		18.1	44.2	0.5		
		Jun	58	610		0.2		3.9	15.0	80.1	0.8	
		Jul	24	833	80.3	10.5		1.5	4.2	3.6		
		Aug	13	178	0.6	0.6	14.1	2.8	11.0	71.0		
		Sep	12	336		89.6	9.8		0.3	0.3		
		Oct	1	110						100.0		
					Percent frequency size class (TL, mm)							
	Year	Area	n	en	<151	151-200	201-250	251-300	301-350	351-400	401-450	>450
B.	1985	North	31	1,805	18.7	76.7	2.5		2.1			
		South	26	1,698		11.2	43.5	25.7	18.5	1.1		
		Combined	57	3,503	9.6	44.9	22.4	12.5	10.1	0.5		
	1986	North	57	2,920	40.8	50.7	3.4	0.7	1.3	3.1		
		South	22	1,073	59.1	36.4			4.5			
		Combined	79	3,993	45.7	46.8	2.5	0.5	2.2	2.3		
	1987	North	20	1,281	31.1	46.4		21.7	0.1	0.7		
		South	21	978	33.4	20.4	21.6	24.6				
		Combined	41	2,259	32.1	35.1	9.3	23.0	<0.1	0.4		
	1988	North	27	1,318	43.6	13.8	22.4	2.5	10.1	5.0	2.5	
		South	33	1,330	23.0	41.2	11.6	1.0	8.7	14.3	0.2	0.1
		Combined	60	2,648	33.3	27.5	17.0	1.8	9.4	9.7	1.3	<0.1
	1989	North	15	929		21.6	19.5	58.9				
		South	33	1,487	9.4	26.1	64.6					
		Combined	48	2,416	5.8	24.4	47.2	22.6				
	1990	North	34	2,122	31.5	22.1	1.6	3.3	6.6	35.0		
		South	78	160	0.6	1.5	15.7	7.2	64.0	8.0	3.0	
		Combined	112	2,282	29.3	20.6	2.5	3.6	10.6	33.1	0.2	

APPENDIX G. (Continued).

	Year	Area	n	en	Percent frequency size class (TL, mm) <151	151-200	201-250	251-300
C.	1985	North	17	17	17.6	70.6	5.9	5.9
		South	0	0				
		Combined	17	17	17.6	70.6	5.9	5.9
	1986	North	88	88	46.6	45.5	6.8	1.1
		South	1	1			100.0	
		Combined	89	89	46.1	44.9	7.9	1.1
	1987	North	32	619	49.0	49.0	1.0	0.8
		South	7	89	1.1	97.8	1.1	
		Combined	39	708	43.1	55.2	1.0	0.7
	1988	North	19	19	26.3	52.6	10.5	10.5
		South	39	58	17.2	22.4	56.9	3.5
		Combined	58	77	19.5	29.9	45.5	5.2
	1989	North	20	172	0.6	25.6	68.0	5.8
		South	20	359		88.0	12.0	
		Combined	40	531	0.2	67.8	30.1	1.9
	1990	North	10	10	50.0	20.0		30.0
		South	1	24			100.0	
		Combined	11	34	14.7	5.9	70.6	8.8

APPENDIX H. Monthly (A; 1988-1990) and areal (B; 1985-1990) expanded length frequencies of Atlantic menhaden (<u>Brevoortia tyrannus</u>) from long haul catches; n = number of individuals measured; en = expanded number of individuals.

A. Year	Month	n	en	<91	91-120	121-150	151-180	181-210	211-240	241-270	271-300	>300
				Percent frequency size class (FL, mm)								
1988	Apr	189	16,519		0.7	6.2	8.1	50.6	14.4	16.1	3.6	0.3
	May	758	261,799	3.0	5.6	25.3	18.6	36.4	7.6	3.1	0.3	<0.1
	Jun	134	27,519		7.0	60.4	21.3	8.1	1.6	1.6		
	Jul	314	44,526		10.5	8.4	19.8	57.8	2.7	0.4	0.3	
	Aug	708	189,988		36.7	39.0	12.5	10.3	1.2	0.1	0.2	
	Sep	354	16,578		3.8	13.2	30.6	45.1	5.4	1.3	0.6	
	Oct	150	15,781			0.3	13.0	52.0	30.2	4.5		
1989	Apr	20	1,360			13.4	10.5	52.3	23.9			
	May	492	59,618		2.4	25.3	62.5	7.2	2.2	0.3	<0.1	
	Jun	129	32,887			52.5	38.9	8.6				
	Jul	178	33,039			16.9	20.8	50.1	12.2			
	Aug	591	75,373			26.1	49.5	13.6	10.3	0.4		
	Sep	246	10,758			36.0	51.2	12.5	0.4			
	Oct	253	16,071		4.8	46.9	28.5	12.6	7.2			
1990	May	141	18,260		3.7	68.5	21.8	6.1				
	Jun	282	46,635			9.2	52.8	38.0				
	Jul	561	83,585	0.1	0.5	1.7	67.3	30.3	<0.1			
	Aug	276	47,698			1.0	54.8	42.1	2.0			
	Sep	32	2,083			3.1	71.9	25.0				
	Oct	186	42,845				6.5	89.8	3.8			

B. Year	Area	n	en	<91	91-120	121-150	151-180	181-210	211-240	241-270	271-300	>300
				Percent frequency size class (FL, mm)								
1985	North	1,050	80,993		12.2	54.8	25.5	7.2	0.2	0.1		
	South	1,697	168,345		5.0	20.5	59.9	13.6	0.9			
	Combined	2,747	249,338		7.4	31.7	48.8	11.5	0.7	<0.1		
1986	North	1,072	109,961		5.5	34.8	33.1	24.7	1.4	0.4	0.1	
	South	558	65,695			10.6	30.2	56.7	2.5			
	Combined	1,630	175,656		3.4	25.7	32.1	36.7	1.8	0.2	0.1	
1987	North	1,105	77,629		9.5	43.3	18.0	23.3	5.7	0.1	<0.1	
	South	1,048	77,506		0.7	8.3	47.0	38.9	5.0	0.1		
	Combined	2,153	155,135		5.1	25.8	32.5	31.1	5.3	0.1	<0.1	
1988	North	932	204,307	3.9	6.0	5.5	14.5	50.7	13.0	5.7	0.8	0.1
	South	1,675	368,402		21.6	41.5	17.9	17.2	1.5	0.3	0.1	
	Combined	2,607	572,709	1.4	16.0	28.6	16.7	29.2	5.6	2.2	0.3	<0.1
1989	North	599	62,083		2.3	34.1	50.7	9.2	3.3	0.3	<0.1	
	South	1,310	167,021		0.5	28.8	43.7	19.3	7.6	0.2		
	Combined	1,909	229,104		1.0	30.2	45.6	16.6	6.4	0.2	<0.1	
1990	North	528	50,628		1.3	33.2	53.9	11.1	0.4			
	South	950	190,476	<0.1	0.2	1.0	46.2	51.3	1.3			
	Combined	1,478	241,104	<0.1	0.5	7.8	47.8	42.8	1.1			

ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES

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SCIAENID POUND NET FISHERY

By

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ABSTRACT

The sciaenid pound net fishery is active along the Outer Banks of North Carolina from May through October. The fishery targets Atlantic croaker (Micropogonias undulatus) and weakfish (Cynoscion regalis), but harvests a diversity of species including spot (Leiostomus xanthurus), bluefish (Pomatomus saltatrix), harvestfish (Peprilus alepidotus), butterfish (Peprilus triacanthus), summer flounder (Paralichthys dentatus), southern flounder (Paralichthys lethostigma), and Spanish mackerel (Scomberomorus maculatus). Catch per unit effort, size-age composition of the catches, and commercial landings were assessed for 1988-1990, and compared with catches from 1982 to 1987.

Atlantic croaker has been the primary species, but their relative abundance has declined in recent years. The CPUEs and landings reached their lowest values in 1990 and 1988, respectively. Age 1 fish dominated catches. Length frequency distributions indicate that growth overfishing has occurred. Croaker was the dominant species in the scrap.

Weakfish was the second most important species caught by sciaenid pound nets. Catches and landings were less during 1988-1990 than during 1982-1987. Age 1 and age 2 weakfish dominated catches. The relative abundance of weakfish in the bait decreased from 11% in 1987 to 2% in 1990.

Spot were abundant in sciaenid pound net catches. The CPUEs remained stable, but landings have declined since 1982. Unmarketable-sized and age 1 spot dominated catches. Spot was the third most abundant species in the scrap, and accounted for as much as 12% of the scrap weight.

Total fish biomass, marketable fish, and bait captured and landed by sciaenid pound nets fluctuated from 1982 to 1987. Since 1987, landings of total and marketable fish decreased, but landings and CPUEs of bait increased. During 1988-1990, sciaenid pound nets landed 827-1,432 mt of finfish, accounted for only 3-6% of the total marketable finfish but 10-14% of the reported bait landed in North Carolina.

TABLE OF CONTENTS

INTRODUCTION

Pound nets harvest fish which inhabit inshore waters along the middle Atlantic coast. These nets were first introduced in Chesapeake Bay in 1858 (True 1887) as they revolutionized Virginia's fisheries by increased landings and diversity of species. Pound nets have been utilized in North Carolina since 1870 with effort concentrated in Pamlico, Core, and Albemarle sounds and the Pamlico and Neuse rivers (Higgins and Pearson 1927; McDonald 1887). In recent years, the number of pound nets decreased and no longer exist in historically noted areas. During the mid-1970s, effort concentrated in the Hatteras area, and that area has remained the center of the North Carolina sciaenid pound net fishery. No other areas of the state have ongoing pound net fisheries that are directed towards sciaenids, as pound nets fished in other regions concentrate on other species: Albemarle Sound (river herring, perch, catfish), Croatan Sound (bait, flounder), lower Pamlico Sound (flounder), and Core Sound (flounder) (Ross 1986).

Pound nets are stationary gear that direct fish into enclosures or pounds by means of leads. A typical sciaenid pound net consists of lead, heart, and pound. A crew (2-3 men) generally sets three or four pounds, attached to gum stakes, and interconnected by leads (300-500 yards). The nets are nylon and dipped in a copper solution annually to prevent fouling. The mesh sizes are usually 6-inch stretched mesh for leads, 2-inch stretched mesh in the tunnel and heart, and 1 3/4-inch stretched mesh in the pound.

Sciaenid pound nets are currently fished along the Outer Banks of North Carolina between Ocracoke Island and Rodanthe, with the majority of the nets northeast of Hatteras Inlet in Pamlico Sound (Figure 1). The season typically begins in May and continues into late September or early October, depending on weather conditions. Sciaenid pound netting occurs in depths of 16-20 feet and over muddy bottoms.

The sciaenid pound net fishery along the Outer Banks is one of North Carolina's major estuarine fisheries. In recent years (1982-1990), the fishery has accounted for 6-19% of the total state landings of Atlantic croaker (<u>Micropogonias</u> <u>undulatus</u>), and sizeable catches of weakfish (<u>Cynoscion</u> <u>regalis</u>), bluefish (<u>Pomatomus</u> <u>saltatrix</u>), spot (<u>Leiostomus</u> <u>xanthurus</u>), Spanish mackerel (<u>Scomberomorus</u> <u>maculatus</u>), harvestfish (<u>Peprilus</u> <u>alepidotus</u>), butterfish

(*Peprilus triacanthus*), summer flounder (*Paralichthys dentatus*), and southern flounder (*Paralichthys lethostigma*). Over the study period, at least 55 species of fish and 6 species of invertebrates were captured by sciaenid pound nets.

In 1982, the North Carolina Division of Marine Fisheries (DMF) initiated a statewide sampling program of the dominant commercial finfisheries (winter trawl, sink net, long haul seine, sciaenid pound net). The overall objective was to obtain biological and fisheries data on economically important fishes for use in management decisions. The sciaenid pound net fishery was included and is described herein. Catch per unit effort, size-age composition of the catches, and commercial landings were assessed for 1988-1990, and compared with catches from 1982 to 1987 (Ross 1986, 1989).

METHODS AND MATERIALS

Sciaenid pound net catches were sampled during the May through October fishing season at fish packing houses while the catches were being offloaded. A sample consisted of at least one (though usually more) random, unculled fish basket (22.7 kgs) per pound net catch. All fishes and invertebrates (excluding jellyfish) in the sample were identified and measured (FL or TL; mm). Species observed in the catch but not present in the sample were noted. Total weight for the sample as well as individual species component weights were taken. The total weight of the catches sampled were obtained by copying the trip ticket. The bait weight was obtained from the trip ticket, or if not available, it was estimated. Bait was defined as the portion of scrap that was marketed. Crews were interviewed to obtain information concerning area fished and gear parameters which included the number of nets fished and the total length of the lead of the nets fished.

Species specific length frequencies for each catch were derived by expanding the sample length frequencies by a raising factor to represent the total weight of the species in the respective catch. Total weight of the species in a catch was calculated by determining the proportion of a species in the samples and expanding that to the respective species' proportional weight in the total catch. The total weight of the catch was obtained from the trip ticket. The number of individuals per species in a catch was calculated by expanding the number of individuals/species in the samples to represent the total weight of the species in the total catch.

Approximately 30-40 scale samples per month were taken for age and growth analyses from Atlantic croaker, bluefish, spot, weakfish. A range of size classes representative of the fishery were collected. Scales were aged using criteria for determining annuli given by Ross (1988) for Atlantic croaker, Wilk (1977) for bluefish, DeVries (1981) for spot, and Massman (1963), Merriner (1973) and Hawkins (1988) for weakfish.

Species specific semi-annual or quarterly age length keys were developed and merged with expanded length frequency data for the same period to produce the overall annual age composition.

Atlantic croaker age composition for 1982 to 1987 was determined using age length keys from 1979 to 1981. Age composition for 1988-1990 was determined from annual age length keys for 1988-1990. Quarterly age length keys were utilized (December-March; April-June; July-September; October-November).

Weakfish age length data for 1982-1984 was pooled and integrated into 1982-1987 length frequency data. Weakfish aging data from 1988 to 1990 was merged with the length frequency data for the respective seasons. Age length keys were based on fish caught from April through September.

Bluefish annual age length keys were developed by pooling all bluefish aged from estuarine waters/fisheries from April through October. Bluefish age composition was determined by merging annual length frequency data for the sciaenid pound net fishery from 1982 to 1990 with annual age length keys.

Spot age length data from 1979 to 1990 was pooled, partitioned into trimesters (September-December, January-April, May-August) and integrated into 1982-1990 annual length frequency data.

Average catches and landings are discussed throughout the report. Species specific catches were determined two ways: catch/trip (CPUE; kg/trip), a trip consisted of one or more pounds fished per day, and catch/pound (CPP; kg/pound), catch per pound net fished. Landings data (kg) are derived from the North Carolina General Commercial Fisheries Canvas compiled through the North Carolina/National Marine Fisheries Service Cooperative Regional Statistical Program.

RESULTS AND DISCUSSION

Seasonal Catch Composition

A total of 54 catches was sampled from May through October 1988. Catch weights (CPUEs) ranged from 134 kg/trip to 2,781 kg/trip and averaged 1,067 kg/trip (Table 1). Atlantic croaker dominated the catches by weight (35%) and number (33%). Atlantic menhaden accounted for 19% of the weight and 25% of the number of fish in the catches. Together with weakfish, Spanish mackerel, harvestfish, spot, bluefish, and Atlantic threadfin herring (*Opisthonema oglinum*), these species accounted for 92% of the catches (Table 2; Appendix A). Croaker were the dominant species during July through September, but weakfish predominated in May and October, and menhaden dominated June catches (Table 3).

A total of 53 sciaenid pound net catches was sampled from May through October 1989. Catch weights ranged from 123 to 3,677 kg/trip and averaged 1,340 kg/trip (Table 1). Atlantic croaker was the dominant species by weight (44%) and number (38%), and was followed by Atlantic menhaden which constituted 23% of the catch weight and 31% of the number. Together with Spanish mackerel, spot, weakfish, bluefish, and harvestfish, these species accounted for 94% of the catches (Table 2; Appendix B). Croaker dominated catches during June through September, and menhaden was the dominant species by weight in May and October (Table 4).

A total of 61 sciaenid pound net catches was sampled from May through October 1990. Catch weights ranged from 95 to 5,462 kg/trip and averaged 1,428 kg/trip (Table 1). Croaker dominated the catch by weight (37%), and menhaden dominated by number (33%). Together with weakfish, bluefish, spot, Spanish mackerel, harvestfish, and butterfish, these species accounted for 92% of the catches (Table 2; Appendix C). Croaker dominated catches during July through September, and menhaden were dominant in May, June, and October (Table 5).

Trends in Catch Composition 1982-1990

Species composition of sciaenid pound net catches was consistent from 1988 through 1990 as well as since 1982. Atlantic croaker was the dominant species each year followed by Atlantic menhaden and weakfish. Spot, Spanish mackerel, bluefish, butterfish, and harvestfish were all relatively abundant each year, and together with croaker, weakfish and menhaden, these eight species accounted for 92-94% of the catches during 1988-1990, and 92-98% of the catches during 1982-1987 (Table 2, Appendices A, B, C, G, and H).

Although the species composition of the sciaenid pound net fishery has been consistent since 1982, changes occurred in the relative abundances of dominant species. The relative abundance of croaker decreased from 45-66% of the 1982-1987 samples to only 35-44% since 1988. Menhaden increased from 9% of the catch weight in 1982 to 28% in 1990. Weakfish accounted for 8-16% of the 1982-1988 catches but only 6% in 1989 and 1990, and for the first time weakfish were not ranked third by weight. Interestingly, the relative abundance of Spanish mackerel increased from 0.4% of 1983 catch weights to 5-8% during 1988 and 1989, and ranked third and fourth during these years.

Total catch weights for the top three target species (croaker, weakfish, spot) declined from 63-78% of the 1982-1987 catches to 49-58% of the 1988-1990 catches. The unweighted three-season CPUE for these species combined during 1988-1990 (646 kg/trip) was 40% less than during 1982-1987 (1,071 kg/trip), and reflected reduced catches of croaker and weakfish.

Atlantic Croaker--CPUE, Landings and Size/Age Composition

Atlantic croaker was the primary target species in the sciaenid pound net fishery. Annually, they accounted for 35-44% of the catches and averaged 376-594 kg/catch during 1988-1990 (Table 2). Monthly catches and landings increased through the summer then declined in October (Tables 3, 4, 5, 7, 8, 9; Appendices D, E, F).

Sciaenid pound net catches of croaker increased from 1982 to 1985 but have since declined, with 1988-1990 catches the lowest recorded over the study period (Table 6; Figure 2). Unweighted three-year mean CPUEs (501 kg/trip) and CPPs

(208 kg/pound) for 1988-1990 were 41% and 50% lower than the 1982-1987 six-year means (839 kg/trip; 417 kg/pound), respectively.

Commercial landings of croaker fluctuated from 1982 to 1987, but declined since 1987 (Table 6; Figure 2). The 1990 landings reached a low of 218 mt; 75% lower than the high of 863 mt in 1982. Average landings for 1988-1990 (304 mt) were 34% less than in 1985-1987 (460 mt) and 43% less than in 1982-1984 (533 mt).

Seasonal length frequency distributions for croaker indicated continuing growth overfishing. The size composition was more compressed during 1989 and 1990 than in 1988 (Figure 3; Appendix I and J). Atlantic croaker ranged from 100-421 mm TL during 1988 to 117-395 mm TL in 1989 and 115-361 mm TL in 1990. Length frequency distributions were unimodal during all three years, with 78% 191-256 mm TL in 1988, and 67% and 64% 196-241 mm TL in 1989 and 1990, respectively. Growth overfishing was evident by the reduced contribution of fish >250 mm TL throughout the study period. The relative abundance of croaker >250 mm TL accounted for 49% and 53% of 1982 and 1984 catches, but declined to 23%, 13%, and 10% from 1988 to 1990. Correspondingly, catch per trip of croaker >250 mm TL declined from 1,628 fish/trip in 1982-84, to 1,033 fish/trip in 1985-87, to only 562 fish/trip in 1988-90. The contribution of unmarketable croaker (<250 mm TL) increased from 16% in 1982 to 58% and 56% in 1989 and 1990, but catches were highest in 1985, at 5,274 fish/trip.

Age 1 croaker dominated sciaenid pound net catches (50-73%) (Figure 4; Appendix K). However in 1990, the relative abundance of age 1 fish was the lowest and age 0 fish the highest for the 1982-1990 period.

<u>Weakfish--CPUE, Landings and Size/Age Composition</u>

Weakfish was the second most important foodfish caught by sciaenid pound nets in most years, but declined to fourth in 1989. Annually, they constituted 6-16% of the catches and averaged 80-172 kg/catch during 1988-1990 (Table 2). Monthly catches and landings were generally highest during July through September (Tables 3, 4, 5, 7, 8, 9; Appendices D, E, F).

Catches of weakfish increased steadily from 1982 to 1987, but have since declined sharply (Table 6; Figure 5). Three year unweighted means for 1988-1990 (115 kg/trip; 49 kg/pound) were 32% and 44% less than the six year mean for 1982-1987 (168 kg/trip; 87 kg/pound).

Weakfish landings peaked in 1988 (232 mt), but declined 75% from 1988 to 1989 (58 mt) (Table 6; Figure 5). Nonetheless, weakfish landings have fluctuated since 1982, with 1988-1990 mean landings (122 mt) nearly identical to the 1982-1984 mean (121 mt), and only slightly less than the nine-year mean (141 mt).

The size composition of weakfish catches remained fairly stable from 1988 to 1990 as well as since 1982. Small weakfish predominated in sciaenid pound net catches (Figure 6; Appendix L and M). Weakfish ranged seasonally from 151 to 521 mm TL in 1988, to 118 to 458 mm TL in 1989, and 71 to 401 mm TL in 1990. Weakfish length frequency distributions were unimodal with modes of 251-260 mm TL in 1988 and 231-240 mm TL in 1989 and 1990; 74-80% were 211-300 mm TL annually. Since 1982, the relative abundance of unmarketable-sized weakfish (<250 mm TL) ranged from 35 to 78% (1990), and actual catches of undersized weakfish were highest in 1987 (1,034 fish/trip). The relative abundance as well as catches of weakfish >301 mm TL were highest in 1985 and 1988 (24% and 18%; 195 and 157 fish/trip, respectively) and corresponded with peak landings (Figure 6; Appendix M).

Sciaenid pound nets typically harvest young weakfish, and weakfish captured ranged from age 0 to age 5 (Figure 7; Appendix N). Age 1 and age 2 weakfish were the dominant ages represented during 1988-1990 (88-93%), as well as during 1982-1987 (94-97%). Age 0 weakfish accounted for only 0.08-2.9%, while age 3 and older weakfish comprised 3.8-10%. With the exception of decreased catches of age 1 fish in 1990, 1988-1990 age composition compares closely with 1982-1987.

<u>Spot--CPUE, Landings and Size/Age Composition</u>

Spot was among the four most abundant species occurring in sciaenid pound nets. Spot accounted for 5-8% of the catches by weight and comprised 50-101 kg/catch for 1988-1990 (Table 2). Monthly CPUEs were largest July through

September, and landings were highest July through October of 1990 (Tables 3, 4, 5, 7, 8, 9; Appendices D, E, F).

Spot catches fluctuated since 1982 with more elevated catches during 1982, 1983, 1989, and 1990 (Table 6; Figure 8). However, catches fluctuated so much that the three-year unweighted means during 1982-1984, 1985-1987, and 1988-1990 were nearly identical to the nine-year mean (30 kg/pound).

Landings of spot declined from 1988 to 1990, and declined as well since 1982 (Table 6; Figure 8). Landings were highest in 1982 at 150 mt, but declined 80% from 1982 to 1983; this decline was likely attributable to the decreased number of crews fishing between 1982 (22-25) and 1983-1990 (12-15). Landings continued to decline, and landings in 1990 were the lowest of the nine years. Average landings steadily declined from 89 mt (1982-1984), to 43 mt (1985-1987), and to 28 mt (1988-1990).

Unmarketable-sized spot (<196 mm FL) dominated catches each season (Figure 9; Appendices O and P). Spot ranged from 86 to 266 mm FL, 86 to 241 mm FL, and 91 to 236 mm FL from 1988 to 1990. Size distribution was bimodal in 1988, unimodal in 1989, and trimodal in 1990. Unmarketable-sized spot comprised 86-92% of the 1988-90 catches and 84-95% of the 1982-1987 catches. Annual mean catch per trip of unmarketable-sized spot for 1988-1990 ranged from 574 fish/trip to 1,377 fish/trip (1989); the increased catches of unmarketable spot in 1989 were similar to those in 1982 (1,130 fish/trip) and 1983 (1,357 fish/trip).

The age composition of spot caught by sciaenid pound nets has been relatively constant since 1982, with age 1 fish dominant throughout. During 1988-1990, age 1 spot accounted for 65-76%, age 0 spot accounted for 15-26%, and age 2 and older for 9-11% (Figure 10; Appendix Q). The contribution of age 0 fish increased to 26% in 1990; the highest relative abundance of age 0 fish recorded over the study period, yet comparable to 1984 composition.

Bluefish--CPUE, Landings and Size/Age Composition

Bluefish was an important incidental catch by sciaenid pound nets for 1988-1990. Bluefish accounted for 3-6% of the catches and averaged 41-88 kg/catch

(Table 2). Monthly bluefish catches and landings generally were highest in August 1988, July 1989, and June 1990 (Tables 3, 4, 5, 7, 8, 9; Appendices D, E, F).

Bluefish CPUEs have been relatively stable since 1982 with higher catches in 1985 and 1990 (Table 6; Figure 11). Catches ranged from 41 to 88 kg/trip and 14-39 kg/pound.

Annual landings of bluefish by sciaenid pound nets fluctuated since 1982, but generally declined since 1985 (Table 6; Figure 11). Landings declined from 35 mt in 1988 to 14 mt in 1989 and 1990. The unweighted three-year mean for 1988-1990 (21 mt) was 56% lower than the 1982-1987 mean (47 mt).

Predominantly small bluefish were captured by sciaenid pound nets (Figure 12; Appendices R and S). Bluefish ranged from 152 to 394 mm FL, 116 to 400 mm FL, and 147 to 500 mm FL, during 1988-1990, respectively, with most fish (88-98%) <301 mm FL. Unmarketable-sized bluefish accounted for 49-89% of 1988-1990 catches and 79-97% of 1982-1987 catches. The relative abundance of unmarketable bluefish was highest in 1982 with as many as 97% and 470 fish/trip unmarketable. Catches of bluefish >301 mm FL were small but highest in 1985 (21% or 58 fish/trip) and 1990 (13% or 43 fish/trip).

Sciaenid pound nets harvest primarily young bluefish. Age 0 and age 1 fish accounted for 97-100% of the 1988-1990 catches, and 94-100% in 1982-1987. The oldest bluefish sampled were age 2 and accounted for <6% of any year.

<u>Harvestfish--CPUE, Landings and Size Composition</u>

Harvestfish was never a dominant species but was a valuable component of the catches. Harvestfish accounted for 3-6% of the catches and averaged 33-60 kg/catch (Table 2). Average catches and monthly landings were generally highest in June (1988 and 1989), yet highs occurred during September and October in 1990 (Tables 3, 4, 5, 7, 8, 9; Appendices D, E, F.

Harvestfish catches fluctuated from 1988 to 1990, but declined steadily since a peak in 1986 (Table 6; Figure 14). Unweighted three-year mean CPUEs and

CPPs for 1982-1984 (43 kg/trip; 17 kg/pound) and 1988-1990 (44 kg/trip; 19 kg/pound) were nearly equal, but only half as much as during 1985-1987 (84 kg/trip; 51 kg/pound).

Harvestfish landings peaked in 1985, but showed little variation during the remaining eight years (Table 6; Figure 14). The 1985 high (86 mt) was 146% higher than the nine-year mean (35 mt); however, the three-year unweighted mean during 1988-1990 (25 mt) was only slightly less than during 1982-1984 (28 mt).

Annual harvestfish length frequency distributions were similar in 1988 and 1989, but shifted to a broader distribution in 1990 (Figure 15). Harvestfish ranged from 81 to 204 mm FL, 84 to 208 mm FL, and 72 to 216 mm FL from 1988 to 1990, with modes of 151-175 and 151-165 mm FL in 1988 and 1989, respectively. In 1990, bimodal length frequency distribution occurred at 106-110 mm FL and 136-160 mm Fl, and the relative abundance of unmarketable harvestfish (<126 mm FL) increased from 3% (1988 and 1989) to 28% (1990). Since 1982, the size distribution of harvestfish fluctuated with no apparent trend; the relative abundance of unmarketable harvestfish (<126 mm FL) was lowest in 1987 at 2% but high in 1982, 1985, and 1990 at 43%, 48% and 28%, respectively (Appendices U and V). Catches of unmarketable harvestfish per trip was highest in 1985 at 458 fish/trip.

Butterfish--CPUE, Landings and Size Composition

Butterfish was never a dominant species in sciaenid pound net catches but was occasionally a profitable incidental catch. Annually, butterfish averaged 0.6-2% of the catches by weight and averaged 8-30 kg/catch in 1988-1990 (Table 2). Mean catch per trip and monthly landings of butterfish were highest in July 1988 and June 1989 and 1990 (Tables 3, 4, 5, 7, 8, 9; Appendices D, E, F).

Trends in butterfish catches and landings during 1988-1990 were very similar to those fluctuations which occurred from 1982 to 1985, with corresponding extremely low values succeeded by notably high values (Table 6; Figure 16). The CPUEs ranged from 8 to 30 kg/trip and 3 to 13 kg/pound from 1988-1990. Landings increased 1,567% from a low of 0.9 mt in 1989 to a high of 15.0 mt in 1990. Landings trends have generally paralleled trends in CPUEs.

Butterfish ranged from 84 to 198 mm FL in 1988, 68 to 205 mm FL in 1989, and 71 to 190 mm Fl in 1990 (Figure 17). Length frequency distributions were unimodal in 1988 (156-160 mm FL) and 1990 (146-150 mm FL), but trimodal in 1989 at 86-95 mm FL and 156-165 mm FL. It is likely that the three modes distributed in 1989 were merged in 1990 due to sample size. The relative abundance of butterfish <126 mm FL increased from 8% to 29% from 1988 to 1990 and CPUEs increased from 8 fish/trip in 1988 to 150 fish/trip in 1990. From 1982 to 1987, the relative abundance of unmarketable butterfish was highest in 1983 (25%); however catches of butterfish was so small that the highest catch was 25 fish/trip in 1986. The highest catch of marketable and unmarketable butterfish over the nine-year period occurred in 1990.

Spanish Mackerel--CPUE, Landings and Size Composition

The abundance of Spanish mackerel in sciaenid pound net catches has increased in recent years. During 1988-1989, they were among the top four species by weight, accounted for 7.5-7.8% of the catches, and averaged 80-105 kg/catch (Table 2). However, in 1990, they accounted for 5% of the catch (70 kg/catch). Largest catches of Spanish mackerel occurred from June through August in 1988 and 1989, and July through September in 1990 (Tables 3, 4, 5).

Spanish mackerel catches generally increased from 1983 to 1989, then declined in 1990 (Table 6; Figure 18). The CPUEs peaked at 105 kg/trip in 1989. Catch per pound was highest in 1987 and has decreased since then. Unweighted three year mean catches increased from 18 kg/trip and 6 kg/pound in 1982-84 to 85 kg/trip and 35 kg/trip in 1988-90; this represents 380% and 488% increases in CPUEs and CPPs from 1982-84 to 1988-90.

Annual sciaenid pound net landings of Spanish mackerel increased steadily from 1982 to 1987, but declines were exhibited from 1987 to 1990 (Table 6; Figure 18). Spanish mackerel landings increased 3,035% from 1983 (3 mt) to 1987 (82 mt), followed by a 73% decrease from 1987 (82 mt) to 1990 (22 mt).

From 1988 to 1990, catches of marketable Spanish mackerel decreased while catches of unmarketable sized Spanish mackerel increased (Figure 19; Appendix Y and Z). Spanish mackerel ranged from 174 to 600 mm FL, 189 to 580 mm FL, and 115 to 619 mm FL from 1988 to 1990. Length frequencies were bimodal. The relative abundance of marketable-sized Spanish mackerel declined from 1988 (58%) to 1990 (25%), and catch per trip correspondingly decreased from 149 fish/trip to 88 fish/trip. The relative abundance of marketable fish was high in 1982, 1986, and 1987, but catch per trip was comparable to the 1988-1990 only in 1987 (125 fish/trip). The relative abundance of unmarketable-sized Spanish mackerel increased from 42% in 1988 to 76% in 1990, and catches correspondingly increased from 108 to 270 fish/trip. Since 1982, catches of unmarketable Spanish mackerel were comparable to 1990 only in 1985 (93%; 257 fish/trip).

Flounder--CPUE, Landings and Size Composition

Summer flounder catches by sciaenid pound nets remained low from 1988 through 1990. Summer flounder constituted 0.3-0.6% of the catches and averaged 4-6 kg/catch (Table 2).

Sciaenid pound net catches of southern flounder were small but increased late in the season. Annually, southern flounder accounted for 0.4-0.6% of the catches and averaged 6-8 kg/catch (Table 2). Average monthly catches were highest in October and September (Tables 3, 4, 5).

Commercial landings included both species, but were driven by southern flounder. Monthly flounder landings increased through the summer with highs in September and October (Table 6; Figure 20). Elevated flounder landings late in the season were attributable to the fact that much of the flounder reported during the fall months were landed from flounder pound nets and not from sciaenid pound nets.

Sciaenid pound nets captured predominantly undersized summer flounder (Figure 21; Appendix AA and BB). Annually, summer flounder ranged from 111 to 411 mm TL, 111 to 371 mm TL, and 91 to 421 mm TL from 1988 to 1990, respectively. A shift in the size composition towards smaller summer flounder occurred during the period. The relative abundance of marketable summer flounder (>300 mm TL/1982-1987; >330 mm TL/1988-1990) increased to 39% and 25% in 1989 and 1990, but catches of marketable summer flounder remained so low that this is equivalent to only 8-10 fish/trip.

Atlantic Menhaden--CPUE and Size Composition

Atlantic menhaden was one of the most abundant fish caught by sciaenid pound nets yet was landed incidentally and only utilized as scrap. Annually, their relative abundance increased from 25% to 43% (1990) of the number of fish and 18 to 28% of the weight of the catches sampled (Table 2). Menhaden averaged 198-393 kg/catch, with highest catches recorded in May, June, and September (Tables 3, 4, 5).

Because menhaden were often bailed out of the nets in order to ease fishing and to reduce the volume of scrap, these average catch data are minimal estimates of menhaden catches. From 1988 to 1990, menhaden catches increased from 198 to 393 kg/trip and 89 to 173 kg/pound (Table 6). Menhaden catches fluctuated from 1982 to 1985, but increased steadily from 1985 to 1990. Catches for 1990 were the highest recorded over the study period with CPUEs (393 kg/trip) and CPPs (173 kg/pound) 74% and 66% higher than the 9 year unweighted mean catch (226 kg/trip; 104 kg/pound), respectively.

The size composition of menhaden was more compressed in 1990 than in 1988 and 1989 (Figure 22; Appendices CC and DD). However, the relative abundance of menhaden >165 mm FL increased to a high of 84% and 4,059 fish/trip in 1990. Menhaden ranged from 102 to 280 mm FL, 100 to 278 mm FL, and 117 to 264 mm FL for 1988-1990, respectively. Larger menhaden were caught from 1986 to 1990 (55-84%, >165 mm FL), but during 1982-1985, 71-93% annually were <165 mm FL (Appendix CC and DD).

AGGREGATE RESOURCE TRENDS

There is increasing recognition of the need to consider information on fishery resource abundance on an aggregated level to fully understand the dynamics of the fishery as a whole (NMFS 1990) since indices of aggregate abundance for species groups may reflect major changes in fishery resources (NEFC 1988). Data for these indices were derived from CPUE data from sciaenid pound net components, including the eight dominant species which comprise 92-97% of the sciaenid pound net fishery catches (Table 6; Figure 23).

Total biomass caught in the sciaenid pound net fishery fluctuated since 1982, reached a low in 1988, but proceeded to increase from 1988 to 1990. The CPUEs were slightly lower during 1988-1990 than in previous seasons with unweighted three season mean CPUEs during 1988-1990 (1,211 kg/trip; 507 kg/pound) 15% and 28% lower than the unweighted mean for 1982-1987 (1,419 kg/trip; 708 kg/pound). The reduced CPUEs primarily reflect reduced catches of weakfish and harvestfish, but CPUEs did proceed to increase 24% and 22% from 1988 to 1990, respectively.

Total biomass landed by sciaenid pound nets coincided with catches during 1982-1987, but trends in catches and landings were inversely related during 1988 to 1990 (Figure 24a; Tables 10 and 12). Combined landings decreased 55% from 1988 (866 mt) to 1990 (385 mt); this was the lowest landing recorded over the nine year study period. Landings of croaker, spot, weakfish, bluefish, and Spanish mackerel have all declined during the past three fishing seasons. Increasing CPUEs and declining landings may be interpreted as increased catches of unmarketable-sized fish.

Landings of marketable fish by sciaenid pound nets paralleled trends in total biomass with fluctuations since 1982 and decreased landings since 1987. Catch per unit effort of marketable fish has steadily declined since 1984 (Figure 24b; Tables 10 and 12). Marketable fish landings by sciaenid pound nets fluctuated so much that although landings did decrease 62% from 1987 to 1990, the unweighted three year mean for 1988 to 1990 (753 mt) was only 21% lower than the 1982-1987 six year mean (919 mt). Three year unweighted mean catches decreased from 981 kg/trip (1982-1984) to 848 kg/trip (1985-1987) to 606 kg/trip (1988-1990), but catches remained steady during 1988 to 1990 (601-610 kg/trip).

The recent decline in landings and catches of marketable finfish by sciaenid pound nets paralleled declines of total edible finfish landings for all North Carolina finfisheries combined (Table 11). Total edible finfish landings for North Carolina exceeded 28,000 mt from 1977 through 1985, with highs in 1980 (41,517 mt); however, 1989 and 1990 landings (20,501 mt and 21,684 mt) were 30% less than the mean for the previous ten years (1979-1988). Overall landings of seven species that dominate sciaenid pound net landings peaked in 1980 (24,735 mt), but accounted for only 11,106 mt and 9,476 mt in 1989 and 1990, respectively; 29% and 40% lower than the annual mean for the previous ten years, and the lowest since 1974.

SCRAP/BAIT

Monthly catches of scrap and landings of bait were highest in June, July, and August and were driven by catches of Atlantic croaker and Atlantic menhaden (Tables 7, 8, 9, 12). From 1988 to 1990, monthly catches of scrap were highest in June and July and annually averaged 45-610 kg/catch, 363-905 kg/catch, and 186-1,412 kg/catch. Monthly landings of bait were highest in June and reached 68 mt, 128 mt, and 112 mt, respectively. Menhaden, croaker, and spot collectively accounted for 81% and 83% of the scrapfish catches in 1988 and 1989, but in 1990, menhaden and croaker constituted 77% of the scrapfish catch. Potentially marketable foodfish accounted for at least 51-60% of the scrapfish samples.

Scrapfish catches were sampled from 1986 to 1990 with catches primarily driven by menhaden and croaker; however, there was a shift in the relative abundance of menhaden, croaker, weakfish and spot over the period. The relative abundance of menhaden in the scrap increased from a low of 24% in 1986 to a high of 44% in 1990 (Table 12, 14, 15; Appendices EE and FF). Conversely, the relative abundance of croaker decreased steadily from 46% in 1986 to 34% in 1990, and the relative abundance of weakfish decreased from 10% and 11% in 1986 and 1987 to 4% (1988) and 2% (1990). The relative abundance of spot increased to 12% in 1989, but their abundance in 1990 (5%) was similar to catch composition sampled in 1986 (6%) and 1987 (6%).

Annual catches of scrap in sciaenid pound net samples and reported landings of bait by sciaenid pound nets exhibited parallel increases from 1988 to 1990 (Tables 7, 8, 9, 10, 12). From 1988 to 1990, mean catches of bait by sciaenid pound nets increased from 456 kg/catch to 822 kg/catch, and landings of bait correspondingly increased from 271 mt to 341 mt. The relative abundance of scrap in the catches likewise increased annually from 43% in 1988 to 55% in 1989 and 58% in 1990. The 1990 values represent the second largest mean scrap weight (822 kg) and the highest relative abundance of scrap (58%) captured in the sciaenid pound net fishery during the nine year study period. Catches of bait were higher only in 1985 when they reached 1,049 kg/catch. Trends in sciaenid pound net landings of bait generally paralleled catches, but landings were highest in 1982, 1984, and 1985. Bait landings fluctuated from 1982 to 1986, but recently increased such that the unweighted four year mean for 1987-1990 (312 mt) was very similar to the 1982-1986 five year mean (329 mt). This trend of higher bait composition in the samples than depicted in landings is a more reliable estimate of bait since much of the scrap sampled is not reported in landings.

SPECIES SYNOPSIS

Atlantic Croaker

Atlantic croaker was the most important target species in the sciaenid pound net fishery. Since 1982, sciaenid pound nets accounted for 6-19% of the croaker landed in North Carolina. Croaker accounted for as much as 51% of the total pound net landings in 1982, but only 32 to 26% from 1988 to 1990 (Table 10). Sciaenid pound net catches (Dare County) annually landed 88-94% of croaker caught in North Carolina pound nets (1982-1990).

North Carolina has dominated commercial landings of Atlantic croaker since 1966 and accounted for 69-97% of the 1982-1987 east coast landings (Mercer 1989a), and 80-85% of the 1988-1990 landings. Total landings of croaker in North Carolina have notably declined since 1980 (Figure 25). Trawlers accounted for most croaker landed prior to 1973 in North Carolina, and trawls and long haul seines have been the dominant gear since then (Ross 1989). Landings of croaker by sciaenid pound nets corresponded to state landings with highs in 1980, followed by declines, with landings in 1990 (232 mt) 80% less than in 1980 (1,142 mt). Except for contributions by the long haul seine fishery, all other croaker fisheries declined from 1988 to 1990.

Catch per unit effort of croaker has declined in recent years, and sciaenid pound net CPUEs during 1988-1990 reached the lowest values recorded since the projects' inception (1982). However, croaker catches did proceed to increase from 1988 to 1990.

Age 1 croaker continue to dominate sciaenid pound net catches. Although catch per unit effort data for the sciaenid pound net fishery has declined, the relative abundance of age 0 croaker in 1990 was the highest for the 1982-1990 period, and together may indicate stable stock age composition. However, the DMF juvenile abundance indices (JAIs) declined steadily from 1987 to 1991 (Tangedal 1991), with 1991 CPUEs (9 individuals/tow) 78% lower than the 13 year mean (39 individuals/tow).

Growth overfishing continues to be a major dilemma of the sciaenid pound net fishery. Increased numbers of unmarketable fish and decreased numbers of large fish have been the trend over the study period. The contribution of unmarketable sized croaker increased from 16% in 1982 to a high of 58% in 1989. Catch per trip of unmarketable croaker was also high in 1989 (2,712 fish/trip), but peaked in 1985 (5,274 fish/trip). The relative abundance of "medium-large" croaker (>275 mm TL) constituted as much as 15% and 20% of 1982 and 1984 catches, but only 1.5% in 1990. The proposed APES bycatch reduction studies of the sciaenid pound nets and long haul seines to be implemented during the 1992 fishing seasons will hopefully result in constructive measures to reduce bycatch and scrapfish landings by these estuarine fisheries.

Weakfish

Weakfish was the second most important species targeted by sciaenid pound nets. Pound net landings peaked in 1988 (232 mt) then declined to 58 mt and 74 mt in 1989 and 1990. Since 1982, weakfish accounted for 9-20% of the marketable finfish landed by sciaenid pound nets, but sciaenid pound nets produced only 1-4% of the weakfish landed commercially in North Carolina (Table 10).

Commercial landings of weakfish have declined in recent years. North Carolina trawlers landed most of the weakfish along the east coast, except for 1985-1989 when sink net catches exceeded trawlers (Table 10; Figure 26). In 1990, North Carolina landings fell to their lowest level since 1971 (Figure 26).

Sciaenid pound net catches of weakfish declined markedly from 1987 to 1989, and paralleled 1988 to 1989 declines in landings; but both proceeded to increase in 1990. The 1987 to 1989 decline in catches and the 1988 to 1989 decline in landings were especially dramatic since they represent both the highest and lowest values recorded for weakfish over the nine year study period.

Small weakfish predominated sciaenid pound net catches, with little noticeable change in size composition. Catch composition of marketable-sized weakfish was small, but increased catches of marketable-sized fish in 1985 and 1988 were evident in weakfish landings.

Sciaenid pound net catches of weakfish were dominated by age 1 and 2 weakfish, and the relative abundance of age 1 weakfish declined notably in 1990. Length frequency data appears to be stable, but catch per unit effort and landings data have declined in recent years. The DMF juvenile survey JAIs declined since 1986, and the 1991 value was the lowest since the inception of the program (1979). Recruitment overfishing may be occurring in early stages.

The Atlantic States Marine Fisheries Commission has determined that weakfish were being overfished (Vaughan et al. 1991). Growth overfishing has been evidenced for several years based on commercial catches (Ross 1991), but is not apparent in the sciaenid pound net fishery. Current management strategies include measures to reduce landings by imposing a minimum size limit (10"/April 1992), seasonal closures, and net mesh size restrictions. Further measures need to be taken to reduce bycatch of juvenile weakfish, but await results of bycatch reduction studies.

Spot

Total landing of spot in North Carolina have fluctuated but generally declined since 1980 (3 mt) (Figure 27). Since 1982, spot landings contributed as much as 11% (1982) and 10% (1983) of the total marketable pound net landings, but only 3-6% during the remaining years.

Long haul seines have historically landed most of the marketable spot in North Carolina (Figure 27). Total landings of spot and long haul seine landings of spot declined sharply (52% and 51%) from 1979 to 1981, but have since fluctuated with an overall general decline.

Size composition of spot captured by sciaenid pound nets remained fairly uniform over the study period. The relative abundance of unmarketable-sized spot was highest in 1989, but similar to 1982 and 1983.

Age 1 spot continue to dominate catches of all North Carolina fisheries that harvest spot. This is expected since spot are short-lived species (Mercer 1989b) and thus this is possibly close to the optimum time to harvest them. Catch per unit effort data for the pound net fishery appears to be stable and together with stable stock age composition may indicate continuing recruitment stability. However, JAIs have generally declined since 1987, with the 1991 value the lowest recorded since 1979 at 82 individuals/tow; 52% less than the 13 year mean (171 individuals/tow) (Tangedal 1991).

The combined incidental bycatch and discard mortality of small spot in fisheries such as the shrimp, pound net, long haul, trawl fisheries have been cited as potentially having significant impacts on spot stocks (Mercer 1989b). Yield per recruit analyses may suggest a more optimum harvesting strategy, but incorporation into current fishing practices may be difficult since spot comprise a large portion of the discarded bycatch in both the estuarine and ocean waters.

Bluefish

Bluefish was an important incidental component of the sciaenid pound net fishery, but catch composition was predominantly small fish. Bluefish constituted as much as 7% of marketable pound net landings in 1982, but accounted for only 2-3% during the 1988-1990 fishing seasons.

North Carolina dominated total Atlantic coast commercial bluefish landings (27-43%) from 1979 to 1985 (ASMFC 1987). North Carolina bluefish landings have generally increased during the past twenty years reaching record levels in 1981 and 1983 at 3.0 and 3.1 mt (Figure 28). A shift in the most productive commercial gear for bluefish in North Carolina occurred over the past two decades from long haul seines until 1977 to sink nets from 1984 to 1990 (Figure 28; Table 10). Sciaenid pound nets accounted for only 1-3% of the state's bluefish landings.

Catch per unit effort of bluefish by sciaenid pound nets remained fairly stable since 1982, although bluefish landings did decline over the period.

Small bluefish continue to dominate sciaenid pound net catches. Since age 0 and 1 bluefish dominate catches each year, continued monitoring of these catches may provide information on annual fluctuations in year class strength. The Northeast Fisheries Center (NMFS) indices indicate that no strong bluefish year classes have been produced since 1984, and that low values were recorded in both 1986 and 1987, and the 1988 value was the lowest on record (ASMFC 1989). Nevertheless, the sciaenid pound net bluefish age data shows no signs of declines in the relative abundance of age 0 and 1 bluefish from 1982 to 1990.

Spanish Mackerel

Since 1982, North Carolina landings of Spanish mackerel were as low as 19 mt in 1983, but increased steadily to 380 mt in 1990. Sciaenid pound net landings correspondingly increased to highs in 1987-1989 (71-81 mt), but decreased in 1990 (22 mt). During 1987-1989, landings of Spanish mackerel accounted for 27-38% North Carolina's Spanish mackerel landings, and 7-11% of marketable sciaenid pound net landings.

North Carolina commercial catches of Spanish mackerel were landed by sink nets along the beaches or by pound net and long haul seines within the sounds. The gill net and pound net fisheries have particularly had marked increased landings of Spanish mackerel since 1982 (Figure 29, Table 10).

No juvenile abundance index is available for Spanish mackerel, however, since sciaenid pound net catches are dominated by young-of-the-year (Ross 1989) and age 0 Spanish mackerel (Noble 1992), continued monitoring of these catches may provide information on Spanish mackerel year class strength. Catches of unmarketable-sized Spanish mackerel increased throughout the study period, and together with recent peaks in catches and landings, infers stable recruitment.

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Table 1. Monthly summary of sampling Pamlico Sound pound net catches, May through October, 1988-1990; n = number of catches sampled.

Year	Month	n	Catch wt (kg)		Sample wt (kg)	
			Mean	Range	Mean	Range
1988	May	1	234.9	-	34.9	-
	Jun	15	1,035.7	303.0-2,268.0	50.4	15.3-76.7
	Jul	12	1,262.5	205.5-2,296.5	53.0	27.9-79.2
	Aug	13	1,165.5	133.9-2,781.4	47.0	25.8-60.5
	Sep	8	1,114.9	501.2-2,543.8	42.2	21.5-57.2
	Oct	5	522.2	175.6- 701.9	42.8	25.2-56.7
1989	May	7	988.4	484.0-1,787.3	43.3	23.9-72.0
	Jun	12	1,769.3	780.6-3,677.3	39.7	22.4-73.6
	Jul	14	1,468.1	239.5-2,656.7	47.4	23.5-81.7
	Aug	11	1,012.6	122.6-3,107.6	39.2	22.8-55.9
	Sep	8	1,342.6	465.8-2,501.5	51.6	25.8-62.8
	Oct	1	422.6	-	27.1	-
1990	May	7	1,475.1	400.9-3,245.0	50.1	27.1-79.2
	Jun	11	2,165.1	1,148.9-3,808.8	57.4	29.2-89.3
	Jul	15	1,240.8	286.7-2,073.8	56.0	26.6-83.7
	Aug	12	1,490.8	235.0-5,462.1	54.8	22.2-83.4
	Sep	11	1,362.4	443.2-2,987.3	56.7	27.6-86.7
	Oct	5	299.7	94.8- 596.9	24.5	19.4-28.7

Table 2. Annual species composition, mean weight (kg) and number of fish (Mean no. fish) per catch for the top 99% (by weight) of pound net catches for 1988-1990, including number of catches sampled (n) and the percent of the total weight of the catches sampled.

	1988 (n=54)				1989 (n=53)				1990 (n=61)		
Species	Weight (kg) Mean	Weight (kg) %	Mean no. fish	Species	Weight (kg) Mean	Weight (kg) %	Mean no. fish	Species	Weight (kg) Mean	Weight (kg) %	Mean no. fish
Micropogonias undulatus	375.9	35.2	2,655	Micropogonias undulatus	594.0	44.3	4,676	Micropogonias undulatus	531.6	37.2	4,629
Brevoortia tyrannus	198.4	18.6	1,980	Brevoortia tyrannus	300.9	22.4	3,894	Brevoortia tyrannus	393.1	27.5	4,833
Cynoscion regalis	172.3	16.1	861	Scomberomorus maculatus	105.0	7.8	437	Cynoscion regalis	91.8	6.4	605
Scomberomorus maculatus	80.4	7.5	257	Leiostomus xanthurus	100.5	7.5	1,490	Pomatomas saltatrix	87.9	6.2	343
Peprilus alepidotus	59.8	5.6	405	Cynoscion regalis	79.5	5.9	459	Leiostomus xanthurus	74.3	5.2	1,001
Leiostomus xanthurus	50.1	4.7	642	Pomatomus saltatrix	40.9	3.0	296	Scomberomorus maculatus	69.7	4.9	358
Pomatomus saltatrix	41.0	3.8	182	Peprilus alepidotus	33.5	2.5	231	Peprilus alepidotus	37.7	2.6	348
Opisthonema oglinum	27.9	2.6	572	Callinectes sapidus	17.3	1.3	122	Peprilus triacanthus	29.7	2.1	514
Peprilus triacanthus	8.8	0.8	106	Opisthonema oglinum	12.2	0.9	311	Callinectes sapidus	24.9	1.7	216
Chaetodipterus faber	8.6	0.8	32	Chaetodipterus faber	8.8	0.7	36	Opisthonema oglinum	23.1	1.6	747
Callinectes sapidus	7.4	0.7	69	Peprilus triacanthus	8.2	0.6	111	Lagodon rhomboides	9.4	0.6	247
Bairdiella chrysoura	6.7	0.6	83	Paralichthys lethostigma	7.8	0.6	15	Caranx faber	7.0	0.5	84
Paralichthys lethostigma	6.4	0.6	13	Bairdiella chrysoura	5.8	0.4	73	Paralichthys lethostigma	6.4	0.4	12
Paralichthys dentatus	6.2	0.6	35	Paralichthys dentatus	3.7	0.3	26	Penaeus aztecus	5.9	0.4	250
Caranx hippos	4.7	0.4	12	Prionotus carolinus	3.3	0.3	12	Bairdiella chrysoura	5.4	0.4	89
Sphoeroides macualtus	2.3	0.2	11	Tylosurus crocodilus	3.3	0.3	4	Paralichthys dentatus	5.2	0.4	31
Lagodon rhomboides	2.0	0.2	32	Caranx hippos	3.1	0.2	31	Trichiurus lepturus	4.4	0.3	19
								Tylosurus crocodilus	4.3	0.3	6
								Scomberomorus maculatus	2.5	0.2	15
								Aluterus schoepfi	2.2	0.2	18

Table 3. Monthly species composition (top 99% of weight) of pound net catches sampled in Pamlico Sound May-October 1988, including mean catch/trip (kg) and mean number/trip; n = number of catches sampled.

	May			June			July			August			September			October		
	Weight		Mean	Weight		Mean	Weight		Mean	Weight		Mean	Weight		Mean	Weight		Mean
Species	Mean	%	num	Mean	%	num	Mean	%	num	Mean	%	num	Mean	%	num	Mean	%	num
Micropogonias undulatus	53.6	22.8	464	254.6	24.7	1,765	503.6	39.9	3,802	398.9	33.9	3,271	623.9	55.9	3,199	40.8	7.8	532
Cynoscion regalis	111.0	47.2	437	91.5	8.9	520	114.8	9.1	645	231.8	19.7	1,266	237.3	21.2	913	306.2	58.6	1,354
Bairdiella chrysoura	19.1	8.1	229	6.9	0.7	93	8.6	0.7	113				2.4	0.2	26	16.4	3.1	176
Opisthonema oglinum	13.6	5.8	209	74.5	7.2	1,648	8.5	0.7	145	17.9	1.5	287				5.6	1.1	71
Brevoortia tyrannus	12.6	5.4	350	296.7	28.8	2,644	298.6	23.6	3,213	131.0	11.1	1,363	105.7	9.5	1,168	24.0	4.6	253
Leiostomus xanthurus	8.2	3.5	135	21.7	2.1	291	92.9	7.4	1,110	63.5	5.4	970	42.1	3.8	441	18.7	3.6	140
Peprilus triacanthus	6.5	2.8	87	4.3	0.4	46	8.8	0.7	120	19.0	1.6	226				7.4	1.4	88
Peprilus alepidotus	5.5	2.3	40	120.7	11.7	791	77.5	6.1	544	14.0	1.2	89	17.6	1.6	106	31.5	6.0	283
Chilomycterus schoepfi	3.7	1.6	13															
Scomberomorus maculatus				76.0	7.4	220	72.1	5.7	166	161.1	13.7	552	23.9	2.1	153	10.4	2.0	39
Pomatomus saltatrix				22.3	2.2	66	28.2	2.2	169	104.7	8.9	483	20.6	1.8	59	2.7	0.5	13
Chaetodipterus faber				20.2	2.0	10			12	7.2	0.6	34	4.3	0.4	84	1.8	0.3	59
Paralichthys dentatus				10.7	1.0	67	3.0	0.2	24	6.7	0.6	32	4.7	0.4	18	2.8	0.5	8
Callinectes sapidus				9.9	1.0	97	13.4	1.1	123	4.5	0.4	40				3.3	0.6	24
Sphoeroides maculatus				5.7	0.5	28	2.4	0.2	9									
Paralichthys lethostigma				3.7	0.1	10	3.4	0.3	7	4.2	0.4	16	7.9	0.7	16	26.2	5.0	32
Tylosurus crocodilus				2.9	0.3	5												
Caranx hippos							15.7	1.2	6				7.1	0.6	59			
Penaeus aztecus													3.2	0.3	81	2.3	0.4	78
Selene vomer													3.0	0.3	53			
Lagodon rhomboides													2.7	0.2	50	6.4	1.2	108
Orthopristis chrysoptera																3.5	0.7	42
Aluterus schoepfi																2.5	0.5	24
Trichiurus lepturus																2.3	0.4	11
Morone americana																1.6	0.3	6
Monacanthus hispidus																1.2	0.2	31

Table 4. Monthly species composition (top 99% of weight) of sciaenid pound net catches sampled in Pamlico Sound, May-October 1989, including mean weight/trip (kg) and mean number/trip.

	May			June			July			August			September			October		
	Weight		Mean	Weight		Mean	Weight		Mean	Weight		Mean	Weight		Mean	Weight		Mean
Species	Mean	%	num.	Mean	%	num.	Mean	%	num.	Mean	%	num.	Mean	%	num.	Mean	%	num.
Micropogonias undulatus	338.6	34.2	3,174	1,119.2	63.2	8,156	557.7	38.0	5,127	319.0	31.5	2,421	542.6	40.4	3,630	21.4	5.06	312
Brevoortia tyrannus	460.6	46.6	5,238	308.8	17.4	3,889	212.8	14.5	3,356	228.8	22.6	2,021	411.0	30.6	6,369	235.4	55.7	2,917
Leiostomus xanthurus	70.3	7.1	1,330	99.6	5.6	1,702	124.7	8.5	2,049	125.0	12.4	1,325	151.1	11.3	672	10.9	2.6	109
Cynoscion regalis	47.1	4.8	210	14.2	0.8	115	103.5	7.1	627	92.2	9.1	645	63.5	4.7	730	38.2	9.0	218
Peprilus alepidotus	20.5	2.1	125	48.0	2.7	332	63.8	4.3	453	4.6	0.5	28	13.2	1.0	82	9.4	2.2	62
Scomberomorus maculatus	5.1	0.5	33	78.3	4.4	245	216.8	14.8	642	119.0	11.8	828	33.4	2.5	255			
Pomatomus saltatrix	6.3	0.6	37	14.1	0.8	114	77.3	5.3	620	44.7	4.4	283	47.0	3.5	275	7.0	1.7	47
Bairdiella chrysoura	12.6	1.3	148	9.3	0.5	137							5.3	0.4	57			
Chaetodipterus faber				20.9	1.2	15	10.9	0.7	8				4.8	0.4	126	3.1	0.7	140
Callinectes sapidus	10.4	1.1	65	8.7	0.5	72	30.5	2.1	211	22.9	2.3	159	6.1	0.5	48	9.7	2.3	62
Peprilus triacanthus	5.5	0.6	84	17.1	<0.1	203	9.2	0.6	160	2.2	0.2	26	4.5	0.3	40			
Opisthonema oglinum	4.3	0.4	47	16.0	0.9	431	22.0	1.5	646	9.0	0.9	162						
Lagodon rhomboides				4.0	0.2	47												
Tylosurus crocodilus							11.3	0.8	14									
Paralichthys dentatus							8.8	0.6	55	3.6	0.4	29						
Trachinotus carolinus							6.1	0.4	12	3.2	0.3	15	4.5	0.3	30			
Paralichthys lethostigma										12.2	1.2	18	21.3	1.6	45	69.6	16.5	94
Caranx hippos										4.4	0.4	44	13.7	1.0	128			
Penaeus aztecus										3.6	0.4	107	9.3	0.7	202			
Caranx spp.										2.9	0.3	23						
Selene vomer										2.7	0.3	62				1.6	0.4	31
Orthopristis chrysoptera										2.2	0.2	28				5.9	1.4	94
Penaeus duorarum																3.9	0.9	109
Prionotus carolinus																2.8	0.7	47

Table 5. Monthly species composition (top 99% of weight) of sciaenid pound net catches sampled in Pamlico Sound May-October 1990, including mean catch/trip (kg) and mean number/trip.

Species	May Weight Mean	May Weight %	May Mean no.	June Weight Mean	June Weight %	June Mean no.	July Weight Mean	July Weight %	July Mean no.	August Weight Mean	August Weight %	August Mean no.	September Weight Mean	September Weight %	September Mean no.	October Weight Mean	October Weight %	October Mean no.
Micropogonias undulatus	481.5	32.6	9,755	688.2	31.8	6,680	529.8	42.7	4,731	837.2	56.2	6,568	315.6	23.6	2,737	4.7	1.6	50
Brevoortia tyrannus	780.3	52.8	4,105	832.1	38.4	10,187	290.4	23.4	3,720	140.1	9.4	1,639	250.9	18.4	2,953	113.9	38.0	1,311
Leiostomus xanthurus	41.2	2.8	865	39.1	1.8	874	25.2	2.0	681	108.8	7.3	1,294	191.8	14.1	1,763	4.0	1.4	47
Cynoscion regalis	66.5	4.5	409	78.7	3.6	579	60.6	4.9	473	161.9	10.9	1,126	119.6	8.8	593	20.3	6.8	115
Peprilus alepidotus	21.2	1.4	139	69.6	3.2	545	35.9	2.9	288	7.8	0.5	65	39.1	2.9	416	64.2	21.4	925
Scomberomorus maculatus				45.0	2.1	129	85.0	6.9	295	70.3	4.7	593	147.5	10.8	798	3.1	1.0	18
Pomatomus saltatrix	11.4	0.8	47	140.3	6.5	676	87.5	7.1	432	68.8	4.6	224	139.2	10.2	345	14.5	4.8	40
Bairdiella chrysoura	14.6	1.0	260	11.1	0.5	201	2.5	0.2	36				3.8	0.3	50	1.6	0.5	24
Chaetodipterus faber	6.0	0.4	3	8.8	0.4	15	7.8	0.6	20	4.8	0.3	128	9.3	0.7	258	2.0	0.7	55
Callinectes sapidus	14.2	1.0	148	24.8	1.2	259	45.0	3.6	380	28.6	1.9	215	11.8	0.9	90			
Peprilus triacanthus	24.9	1.7	804	77.6	3.6	1,282	28.6	2.3	469	19.0	1.3	274	9.7	0.7	102	4.0	1.3	38
Opisthonema oglinum				100.4	4.6	3,148	4.9	0.4	136	6.7	0.4	153	2.0	0.2	75	24.6	8.2	1,242
Lagodon rhomboides										8.9	0.6	262	35.6	2.6	942	7.3	2.4	218
Tylosurus crocodilus				18.9	0.9	19												
Sphoeroides maculatus				7.4	0.3	45												
Chilomycterus schoepfi				4.7	0.2	17												
Paralichthys dentatus							4.9	0.4	39	7.5	0.5	24	7.8	0.6	31	6.6	2.2	19
Trachinotus carolinus										4.0	0.3	28				2.2	0.7	8
Paralichthys lethostigma										3.7	0.3	4	20.7	1.5	25	11.4	3.8	19
Caranx hippos													7.7	0.6	67	1.3	0.4	24
Penaeus aztecus							19.7	1.6	860				4.0	0.3	144			
Selene vomer													3.5	0.3	64	2.2	0.7	30
Orthopristis chrysoptera													1.9	0.1	35			
Trichiurus lepturus							3.4	0.3	25				14.0	1.0	44	2.7	0.9	8
Aluterus schoepfi													11.5	0.8	92	1.2	0.4	9
Monacanthus hispidus													2.2	0.2	53			
Archosargus probatocephalus																3.2	1.1	5
Synodus foetens																1.1	0.4	4
Alectis ciliaris																0.7	0.2	10

Table 6. Seasonal landings (mt), catch effort (kg/trip, kg/pound) for the dominant species captured in the 1982-90 Pamlico Sound sciaenid pound net fishery, including the species percent (%) of the total weight of the catches sampled.

Species		Season									9-year
		1982	1983	1984	1985	1986	1987	1988	1989	1990	mean
Micropogonias undulatus	landings	862.8	292.4	442.6	567.3	234.4	578.6	451.3	243.6	218.4	432.4
	kg/trip	747.4	607.7	1,135.3	1,290.3	607.2	649.1	375.9	594.0	531.6	726.7
	kg/pound	264.5	269.4	486.6	781.0	390.7	417.8	168.4	221.7	233.3	359.3
	%	54.4	45.4	65.0	65.6	48.5	46.0	35.2	44.3	37.2	
Cynoscion regalis	landings	126.3	73.2	167.1	191.7	87.8	199.4	231.7	57.7	73.5	134.3
	kg/trip	128.2	152.0	174.6	158.4	171.8	220.1	172.3	79.5	91.8	149.9
	kg/pound	41.3	67.4	74.8	83.9	114.6	141.6	77.2	29.7	40.3	74.5
	%	9.3	4.3	10.0	8.1	13.7	15.8	5.9	6.4		
Leiostomus xanthurus	landings	150.0	29.7	88.8	56.3	22.0	51.0	32.6	32.9	18.9	53.6
	kg/trip	99.2	83.3	46.1	63.4	47.3	45.2	50.1	100.5	74.3	67.7
	kg/pound	29.8	36.9	19.8	33.0	30.4	29.1	22.4	37.5	32.6	30.2
	%	7.2	6.2	2.6	3.2	3.8	3.2	4.7	7.5	5.2	
Pomatomus saltatrix	landings	88.7	31.4	38.5	51.4	30.2	41.1	34.7	13.6	13.9	38.2
	kg/trip	52.3	51.4	43.6	71.0	32.5	32.2	41.0	40.9	87.9	50.3
	kg/pound	15.3	22.8	18.7	36.9	12.7	20.7	18.4	15.3	38.6	22.2
	%	3.8	3.9	2.5	3.6	2.6	2.3	3.8	3.0	6.2	
Peprilus triacanthus	landings	10.9	1.4	6.9	13.9*	10.0	4.5	7.3	0.9	15.2	87.9
	kg/trip	17.7	2.3	10.0	32.5	19.4	10.7	8.8	8.2	29.7	15.5
	kg/pound	6.0	1.0	4.3	16.9	13.0	6.9	3.9	3.0	13.0	7.6
	%	1.3	0.2	0.6	1.7	1.5	0.8	0.8	0.6	2.1	
Peprilus alepidotus	landings	34.1	16.8	31.8	86.3*	33.8	37.5	33.6	18.4	24.0	35.1
	kg/trip	27.5	60.0	40.3	90.3	96.1	64.4	59.8	33.5	37.7	56.6
	kg/pound	8.6	26.2	17.3	47.2	64.2	41.5	26.8	12.5	16.5	28.9
	%	2.1	4.5	2.3	4.6	7.7	4.6	5.6	2.5	2.6	
Scomberomorus maculatus	landings	3.1	2.6	6.3	9.8	16.0	81.5	74.8	71.2	21.5	31.9
	kg/trip	36.9	5.8	10.4	45.2	22.3	68.8	80.4	105.0	69.7	49.4
	kg/pound	11.2	2.6	4.4	23.5	14.9	44.3	36.0	39.2	30.6	23.0
	%	2.8	0.5	0.6	2.4	1.9	5.2	7.5	7.8	4.9	

Table 6. (Continued).

Species		Season 1982	1983	1984	1985	1986	1987	1988	1989	1990	9-year mean
Brevoortia tyrannus	landings	-	-	-	-	-	-	-	-		
	kg/trip	212.1	267.2	156.2	122.3	172.2	215.9	198.4	300.9	393.1	226.4
	kg/pound	59.8	118.5	67.0	63.6	113.5	139.0	88.9	112.3	172.5	103.9
	%	15.9	21.3	9.2	6.5	14.6	16.3	18.6	22.4	27.5	
Total finfish	landings***	1,275.9	447.5	782.0	976.7	434.2	993.6	866.0	438.3	385.4	733.3
	kg/trip	1,321.3	1,229.7	1,616.5	1,873.4	1,168.8	1,306.4	1,054.1	1,262.5	1,315.8	1,349.8
	kg/pound	436.5	544.8	692.9	976.0	754.0	840.9	472.7	276.5	577.4	640.7
	%	96.8	93.7	92.8	95.7	94.3	94.2	92.3	94.0	92.1	

* North Carolina commercial landings combined harvestfish and butterfish landings in 1985 as harvestfish, herein, we extrapolated out butterfish landings based on monthly relative proportions of the two species in our samples.

** CPUE and landings combine *Paralichthys dentatus* and *P. lethostigma* catches.

*** Excludes Atlantic menhaden landings.

Table 7. Monthly and total commercial landings of dominant or selected species captured by Dare County pound nets in 1988, including total North Carolina pound net landings (State) and the percent of those landings accounted for by Dare County (% Dare).

	Commercial landings (kg)								
	May	Jun	Jul	Aug	Sep	Oct	Total	State	% Dare
Bluefish	3,316	4,342	3,274	9,458	11,318	3,020	34,728	38,482	90.2
Butterfish	-	2,007	2,057	1,509	1,299	423	7,295	9,507	76.7
Atlantic croaker	5,383	99,932	108,193	121,517	104,978	11,307	451,310	503,896	89.6
Red drum	8	-	-	43	1,294	2,910	4,255	6,375	66.7
Flounders	688	1,208	380	1,029	148,244	105,894	257,443	628,159	41.0
Harvestfish	460	13,058	11,169	2,838	4,210	1,877	33,612	70,334	47.8
Florida pompano	-	21	44	211	102	39	417	2,436	17.1
Weakfish	9,471	16,888	21,577	54,268	94,093	35,434	231,731	270,908	85.5
Spotted seatrout	34	42	-	-	15	80	171	354	48.3
Spanish mackerel	706	14,080	37,732	12,144	8,527	1,633	74,822	79,974	93.6
Spot	193	3,078	2,702	7,803	15,365	3,487	32,628	57,913	56.3
Bait (scrap)	11,451	67,567	58,231	64,966	52,313	16,678	271,206	335,483	80.8
Total	37,919	226,090	259,539	281,643	446,622	189.196	1,432,009	2,003,821	69.8
Total marketable	26,468	158,523	192,308	216,677	394,309	172,518	1,160,803	1,668,338	67.6
Percent bait (scrap)	30.2	29.9	23.2	23.1	11.7	8.8	18.9	16.7	-

Table 8. Monthly and total commercial landings of dominant or selected species captured by Dare County sciaenid pound nets in 1989, including total North Carolina pound net landings (State) and the percent of those landings accounted for by Dare County (% Dare).

	Commercial landings (kg)								
	May	Jun	Jul	Aug	Sep	Oct	Total	State	% Dare
Bluefish	934	1,821	3,719	3,032	1,973	2,080	13,560	17,580	77.1
Butterfish	178	721	-	-	-	-	899	978	91.9
Atlantic croaker	12,189	57,057	65,109	65,807	41,595	1,872	243,628	276,525	88.1
Red drum	-	-	138	17	1,961	3,326	5,442	14,423	37.7
Flounders	129	578	1,130	3,463	48,066	96,927	150,293	497,357	30.2
Harvestfish	1,594	9,075	4,740	1,302	1,404	252	18,367	40,527	45.3
Florida pompano	28	274	4,329	240	114	117	5,103	6,298	81.0
Weakfish	4,985	6,367	10,568	18,946	13,171	3,675	57,712	64,616	89.3
Spotted seatrout	2	24	-	32	-	45	103	180	57.2
Spanish mackerel	2,152	22,377	39,200	5,954	1,361	115	71,158	73,896	96.3
Spot	178	2,486	3,018	6,231	15,699	5,252	32,863	45,855	71.7
Bait (scrap)	17,710	127,814	67,846	34,785	50,000	7,662	305,819	391,583	78.1
Total	41,681	235,834	208,091	142,348	179,905	127,626	935,484	1,429,818	63.3
Total marketable	23,971	108,020	140,245	107,563	129,905	119,964	629,665	1,038,235	57.7
Percent bait (scrap)	42.5	54.2	32.6	24.4	27.8	6.0	32.7	27.4	-

Table 9. Monthly and total commercial landings of dominant or selected species captured by Dare County sciaenid pound nets in 1990, including total North Carolina pound net landings (State) and the percent of those landings accounted for by Dare County (% Dare).

	Commercial landings (kg)								
Species	May	Jun	Jul	Aug	Sep	Oct	Total	State	% Dare
Bluefish	147	3,128	2,754	1,984	2,355	3,553	13,921	26,375	52.8
Butterfish	806	4,789	3,681	2,374	1,618	1,984	15,252	38,978	39.1
Atlantic croaker	3,389	67,737	61,766	42,249	38,375	4,906	218,422	232,182	94.1
Red drum				21	899	611	1,531	11,386	13.4
Flounders	58	679	406	607	23,283	50,540	75,573	636,449	11.9
Harvestfish	648	5,078	5,471	925	6,168	5,684	23,974	40,411	59.3
Florida pompano	5	25	42	11	194	176	453	7,322	6.2
Weakfish	1,153	16,502	13,923	13,103	17,779	11,055	73,515	87,982	83.6
Spotted seatrout	-	4	6	-	14	227	251	404	62.2
Spanish mackerel	1,159	8,681	9,055	690	1,808	125	21,518	25,411	84.7
Spot	252	789	1,188	5,301	5,349	5,982	18,861	28,872	65.3
Bait (scrap)	15,536	112,121	68,293	42,898	77,167	24,562	340,577	681,341	50.0
Total	24,497	226,261	168,334	111,581	180,399	115,524	826,597	1,817,113	44.2
Total marketable	8,961	114,140	100,041	68,683	103,232	90,962	486,020	1,135,772	40.8
Percent bait (scrap)	63.4	49.6	40.6	38.4	42.8	21.3	41.2	37.5	-

Table 10. Seasonal commercial landings of sciaenid pound net [1], long haul [2], ocean gill net (gill net)[3], and winter trawler[4] fisheries in North Carolina for 1982-1990 fishing seasons (season = May-April), including total landings/species (mt), total value of state landings (value in 1000s of dollars) and relative contribution of the three fisheries/species (percent).

Species	May 82-Apr 83		May 83-Apr 84		May 84-Apr 85		May 85-Apr 86		May 86-Apr 87		May 87-Apr 88		May 88-Apr 89		May 89-Apr 90		May 90-Apr 91	
	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent
Atlantic croaker	4,475	$3,572	3,697	$3,099	4,707	$3,278	4,211	$3,204	3,757	$2,909	3,552	$3,133	3,164	$3,036	2,787	$3,201	2,550	$2,749
Pound net	863	19.3	292	7.9	443	9.4	567	13.5	234	6.2	579	16.3	451	14.2	244	8.8	218	8.5
Long haul	2,064	46.1	1,883	50.9	1,339	28.4	1,114	26.4	1,392	37.0	679	19.1	1,177	37.2	1,427	51.2	1,769	69.4
Trawler	547	12.2	478	12.9	1,359	28.9	1,069	25.4	721	19.2	761	21.4	653	20.7	436	15.7	154	6.1
Gill net	385	8.6	540	13.3	1,219	25.9	1,252	29.7	1,204	3.0	1,283	36.1	636	20.1	385	13.9	304	11.9
Weakfish	5,163	$4,695	5,486	$3,936	4,728	$3,874	6,626	$4,458	5,276	$4,152	6,561	$4,717	5,298	$5,041	2,854	$3,320	2,759	$2,803
Pound net	126	2.5	73	1.3	167	3.5	192	2.9	88	1.7	199	3.0	232	4.4	58	2.0	74	2.7
Long haul	737	14.3	704	12.8	762	16.1	508	7.7	586	11.1	412	6.3	608	11.5	240	8.4	481	17.4
Trawler	3,054	59.5	2,740	49.9	1,760	37.2	2,570	38.8	1,971	37.4	2,364	36.0	1,590	30.0	1,168	41.1	1,220	44.4
Gill net	846	16.4	1,555	28.4	1,565	33.1	2,654	40.1	2,277	43.2	3,253	49.6	2,440	46.1	1,202	42.2	842	30.5
Bluefish	3,470	$914	1,618	$565	1,344	$509	1,734	$513	1,712	$732	2,603	$755	1,417	$538	1,761	$678	2,150	$ 740
Pound net	89	2.6	31	1.9	38	2.9	51	3.0	30	1.8	41	1.6	35	2.5	14	0.8	14	0.7
Long haul	194	5.6	153	9.5	111	11.7	216	12.5	212	12.4	214	8.2	164	11.6	136	7.7	139	6.5
Trawler	1,776	51.2	465	28.7	359	26.7	353	20.3	185	10.8	564	21.7	234	16.5	206	11.7	124	5.6
Gill net	970	28.0	637	39.4	561	41.8	744	42.9	979	57.2	1,357	52.1	683	48.2	1,193	67.8	1,293	60.1
Spot	2,214	$1,063	1,388	$699	1,562	$809	1,843	$900	1,473	$742	1,296	$663	1,378	$666	1,464	$785	1,590	$ 805
Pound net	150	6.8	30	2.1	89	5.7	56	3.1	22	1.5	51	3.9	33	2.4	33	0.2	19	1.2
Long haul	1,556	70.3	885	62.3	938	60.1	1,126	61.1	865	58.8	529	40.8	896	65.0	903	61.7	1,104	69.4
Trawler	36	1.6	69	5.0	50	3.2	75	4.1	38	2.6	37	2.8	37	2.7	63	4.3	33	2.1
Gill net	37	1.7	65	4.7	131	8.4	150	8.2	213	14.5	268	20.7	142	10.3	232	15.9	113	7.1
Flounders	3,970	$5,486	6,027	$7,293	6,403	$10,132	4,231	$9,304	3,256	$7,993	4,571	$10,957	3,927	$9,649	2,637	$9,685	3,003	$9,554
Pound net	55	1.4	34	0.6	53	0.8	34	0.8	99	3.0	163	3.6	257	6.5	150	5.7	76	2.5
Long haul	28	0.7	36	0.6	27	0.4	29	0.7	43	1.3	12	0.3	38	1.0	32	1.2	19	0.6
Trawler	2,888	72.8	4,769	79.1	5,185	81.0	2,891	68.3	1,825	56.1	3,219	70.4	2,326	59.2	1,105	41.9	1,686	56.2
Gill net	0.2	<0.1	6	<0.1	9	0.2	6	0.1	6	0.2	4	0.1	2	0.1	6	0.3	<0.1	<0.1
Striped bass	110	$451	185	$356	211	$365	101	$170	135	297	54	$119	43	$96	77	$212	50	$ 156
Pound net	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	0	0
Long haul	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Trawler	2	1.5	6	3.3	-	-	-	-	-	-	-	-	-	-	10	<0.1	3	6.0
Gill net	22	20.3	0.3	0.2	-	-	-	-	-	-	-	-	-	-	34	0.1	0	0
Butterfish[5]	135	$76	53	$43	80	$64	63	$47	79	$72	62	$53	26	$28	104	$67	122	$ 97
Pound net	11	8.1	1	2.7	7	8.6	14	22.2	10	12.6	5	7.3	7	26.9	0.9	0.9	15	1.2
Long haul	4	2.7	4	8.4	2	2.9	0.2	0.3	13	16.3	0.6	1.0	1	5.4	0.5	5.3	21	17.2
Trawler	74	55.0	38	71.7	52	64.6	34	53.6	39	49.3	32	51.6	10	38.5	71	69.3	41	33.6
Gill net	38	28.4	6	10.6	13	15.7	9	14.4	11	14.1	11	18.2	3	11.5	16	15.5	12	9.8

Table 10. (Continued).

Species	May 82-Apr 83 Land-ings	May 82-Apr 83 Value/percent	May 83-Apr 84 Land-ings	May 83-Apr 84 Value/percent	May 84-Apr 85 Land-ings	May 84-Apr 85 Value/percent	May 85-Apr 86 Land-ings	May 85-Apr 86 Value/percent	May 86-Apr 87 Land-ings	May 86-Apr 87 Value/percent	May 87-Apr 88 Land-ings	May 87-Apr 88 Value/percent	May 88-Apr 89 Land-ings	May 88-Apr 89 Value/percent	May 89-Apr 90 Land-ings	May 89-Apr 90 Value/percent	May 90-Apr 91 Land-ings	May 90-Apr 91 Value/percent
Harvestfish[5]	199	$123	101	$60	110	$97	186	$200	137	$167	115	$158	114	$164	100	$129	98	$135
Pound net	34	17.2	17	16.8	32	28.9	86	46.5	34	24.6	38	32.7	34	29.8	18	18.0	24	24.5
Long haul	41	20.6	20	19.4	21	19.5	16	8.8	33	23.9	33	28.5	16	14.3	6	6.2	9	9.2
Trawler	34	17.2	7	7.1	5	4.7	43	23.0	7	4.8	6	4.8	8	7.1	22	22.0	13	13.3
Gill net	42	21.1	6	6.0	5	4.7	18	9.5	11	8.3	13	11.0	5	4.4	13	13.3	16	16.3
Spanish mackerel	86	$61	19	$15	58	$42	79	$67	105	$81	229	$145	199	$141	268	$215	380	$318
Pound net	3	3.6	3	14.2	6	10.9	10	12.4	16	15.2	81	35.6	75	37.7	71	26.5	22	5.8
Long haul	0.9	1.1	1	7.9	3	4.5	5	6.3	13	12.4	15	6.4	18	8.9	33	12.3	12	3.2
Trawler	0.4	0.4	-	-	-	-	0.3	0.4	0.3	0.3	0.1	<0.1	0.2	0.1	3	1.1	0.7	0.2
Gill net	30	34.7	4	20.3	14	24.4	27	34.1	41	38.9	50	21.9	43	21.6	114	42.5	143	37.6
Florida pompano	14	$33	2	$4	4	$11	11	$32	17	$41	9	$24	3	$9	9	$28	14	$24
Pound net	3	23.5	0.1	3.1	0.4	8.9	1	9.0	3	16.3	2	24.4	0.4	13.3	5	55.6	0.5	3.6
Long haul	6	38.9	0.4	18.7	2	56.6	5	48.4	4	24.3	2	19.7	0.7	18.9	2	18.6	1	7.2
Trawler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.002	<0.1	-	
Gill net	0.7	4.7	-	-	0.6	13.7	0.1	1.4	2	11.2	0.5	5.5	0.3	10.0			<0.1	<0.1
Spotted seatrout	42	$72	72	$120	68	$123	65	$171	85	$157	156	$277	167	$326	161	$345	110	$219
Pound net	5	11.6	5	6.8	4	6.0	0.2	0.4	0.3	0.3	2	1.5	0.2	0.1	-	-	0.3	0.3
Long haul	15	35.6	19	25.6	15	22.3	9	14.9	10	11.8	36	23.2	35	21.1	31	19.0	21	19.1
Trawler	0.4	1.0	0.3	0.4	0.4	0.6	2	2.8	6	6.7	2	1.4	0.7	0.4	8	4.8	<0.1	<0.1
Gill net	2	5.4	4	5.8	4	6.1	16	24.4	10	11.5	17	11.0	22	13.2	10	6.3	10	9.1
Red drum	22	$11	146	$81	91	$60	77	$113	104	$109	115	$149	99	$124	118	$164	82	$105
Pound net	0.3	1.5	2	1.1	0.8	0.9	0.4	0.5	0.5	0.5	19	16.4	4	4.0	5	4.2	1	1.2
Long haul	5	20.4	9	6.5	7	7.7	2	2.8	32	30.9	16	13.8	11	11.1	25	21.6	8	9.8
Trawler	6	27.7	13	9.0	6	7.1	2	2.1	2	1.5	1	1.3	2	1.9	1	1.1	0.2	0.3
Gill net	5	24.0	37	25.1	21	22.8	19	24.4	9	8.4	11	9.6	9	9.1	12	10.4	5	6.1
Black sea bass	213	$343	446	$619	544	$976	503	$1,002	267	$519	495	$979	452	$1,118	509	$1,384	285	$1,042
Trawler	71	33.5	266	59.7	363	71.4	296	58.9	95	35.7	315	63.6	206	45.7	205	40.3	60	21.1
Scup or porgies	658	$840	835	$997	505	$759	188	$212	111	$186	61	$65	15	$11	47	82	71	$60
Trawler	304	46.2	477	57.2	267	52.9	171	90.8	111	99.7	58	94.3	15	100.0	47	99.6	71	100.0
Bait	4,302	$354	4,430	$376	4,695	$381	3,437	$230	2,836	$201	4,084	$300	2,596	$168	2,167	$159	2,566	$177
Pound net	349	8.1	201	4.5	421	9.0	549	16.0	123	4.3	329	8.1	271	10.4	306	14.1	341	13.3
Long haul	1,879	43.7	1,901	42.9	1,884	40.1	1,148	33.4	1,386	48.9	1,474	36.1	1,078	41.5	1,112	51.8	1,635	63.7
Trawler	1,364	31.7	1,613	36.4	1,728	36.7	1,620	47.1	905	31.9	2,109	51.1	794	30.6	195	9.0	78	3.0
Gill net	62	1.5	44	1.0	100	2.1	13	0.4	23	0.8	7	0.2	127	4.9	6	0.3	1	

Table 10. (Continued).

Species	May 82-Apr 83		May 83-Apr 84		May 84-Apr 85		May 85-Apr 86		May 86-Apr 87		May 87-Apr 88		May 88-Apr 89		May 89-Apr 90		May 90-Apr 91	
	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent	Land-ings	Value/ percent
Total finfish																		
(w/out menhaden)	31,767	$23,406	32,776	$23,639	37,030	$28,220	32,319	$27,182	25,462	$25,399	31,772	$30,301	25,225	$29,622	20,905	$41,836	24,812	$28,731
Pound net	1,699	5.4	706	2.2	1,285	3.5	1,553	4.8	684	2.7	1,558	4.9	1,432	5.7	935	4.5	827	3.3
Long haul	6,579	20.7	5,649	17.2	5,175	14.0	4,250	13.2	4,714	18.5	3,353	10.6	4,308	17.1	4,112	19.7	5,299	21.4
Trawler	10,367	32.6	11,779	35.9	11,899	32.1	9,850	30.5	6,493	25.5	10,256	32.3	6,099	24.2	4,481	21.5	4,081	16.4
Gill net	2,671	8.4	3,071	9.4	3,825	10.3	5,157	16.0	5,067	19.9	6,698	21.1	4,430	17.6	3,555	17.0	3,548	14.3
Total marketable																		
(w/out menhaden)	27,465	$23,092	28,346	$18,994	32,336	$23,263	28,882	$26,952	22,626	$25,197	27,688	$29,884	22,629	$29,454	18,738	$41,677	22,246	$28,554
Pound net	1,350	4.9	505	1.8	864	2.7	1,003	3.5	561	2.5	1,229	4.4	1,161	5.1	630	3.3	468	2.1
Long haul	4,700	17.1	3,748	13.2	3,291	10.2	3,102	10.7	3,328	14.7	2,074	7.5	3,230	14.3	2,991	16.0	3,665	16.5
Trawler	9,003	32.8	10,166	35.9	10,177	31.5	8,230	28.5	5,588	24.7	8,147	29.4	5,304	23.4	4,285	22.9	4,056	18.2
Gill net	2,613	9.5	3,028	10.7	3,725	11.5	5,144	17.8	5,043	22.3	6,691	24.2	4,303	19.0	3,549	18.9	3,547	15.9

1 Pound net landings include Dare County (annual timeframe).
2 Long haul landings: Long haul landings include April through December from Dare, Hyde, Carteret, Craven, Pamlico and Beaufort counties (annual timeframe).
3 Winter trawl landings include: Dare, Hyde, Pamlico, Beaufort, Craven, Carteret, Brunswick and Onslow counties.
4 Ocean gill net landings include all state landings September through April.
5 North Carolina commercial landings combined harvestfish and butterfish landings in 1985 are harvestfish; for the purpose of this presentation, we extrapolated out butterfish landings based on monthly relative proportions of the two species in our samples.

Table 11. Landings (mt) of major commercial finfish (including menhaden) in N.C. that are important components of the sciaenid pound net fishery, with total weights of seven species and their combined percentage of the State's total edible finfish landings.

Year	Total edible finfish	Atlantic croaker	Weakfish	Spot	Butterfish	Harvestfish	Bluefish	Spanish mackerel	Total wt (mt) of dominant species	Percent of total state finfish landed
1965	15,258	795	889	414	167	57	319	53	2,694	17.7
1966	14,772	575	860	495	228	32	372	35	2,597	17.6
1967	18,543	582	802	1,383	174	66	403	33	3,443	18.6
1968	15,140	545	1,037	714	48	32	396	31	2,803	18.5
1969	16,628	621	698	675	59	11	395	44	2,499	15.0
1970	13,532	366	1,107	693	60	12	225	29	2,492	18.4
1971	14,234	430	1,653	540	26	21	262	43	2,975	20.9
1972	18,476	1,864	3,344	1,730	40	23	530	44	7,575	41.0
1973	18,613	1,961	2,822	2,448	18	29	911	29	8,218	44.0
1974	21,428	2,759	2,747	2,543	34	7	990	33	9,113	42.5
1975	24,349	4,650	3,051	3,765	58	18	896	22	12,460	51.2
1976	24,390	6,821	3,952	1,213	24	11	615	14	12,650	51.9
1977	28,012	8,616	3,933	1,726	22	22	1,057	21	15,397	55.0
1978	30,424	9,047	4,927	2,213	50	43	883	18	17,181	56.5
1979	37,307	9,325	6,695	3,313	83	14	1,545	6	20,980	56.2
1980	41,517	9,592	9,228	3,220	67	125	2,469	34	24,735	59.6
1981	31,219	5,083	7,662	1,593	128	68	2,998	23	17,555	56.2
1982	28,989	4,910	5,467	2,231	120	207	1,946	86	14,967	51.6
1983	28,864	3,289	4,642	1,339	49	111	3,061	19	12,509	43.3
1984	29,350	4,160	5,892	1,579	78	105	1,615	58	13,487	45.9
1985	29,243	3,953	4,457	1,834	72	159	1,635	79	12,189	41.7
1986	27,570	4,275	6,491	1,521	85	176	1,565	05	14,219	51.6
1987	24,064	3,306	5,390	1,273	63	121	2,069	229	11,651	48.4
1988	27,830	3,826	6,846	1,397	30	114	2,286	199	14,698	52.6
1989	20,501	3,095	4,588	1,476	87	100	1,493	267	11,106	54.2
1990	21,684	2,617	2,632	1,567	115	87	2,077	381	9,476	43.7

*Includes all <u>Paralichthys</u>, sp.

Table 12. Monthly and overall total catch weight ranges, mean weights of marketable (for human consumption) and scrap portions, and mean and range of percent scrap/catch in Pamlico Sound sciaenid pound net catches, 1982-1990.

Month	Year	N	Range of total catch weights (kg)	Mean weight (kg) Marketable	Mean weight (kg) Scrap	Percent scrap Mean	Percent scrap Range
May	1982	4	367.9- 721.7	149.9	399.7	72.7	61.6-79.0
	1983	6	277.1-1,914.6	140.8	685.7	82.9	59.8-97.1
	1985	4	496.4- 984.3	283.2	470.6	62.4	39.2-77.7
	1986	5	76.0- 741.2	86.6	224.2	72.1	18.6-91.8
	1987	3	129.8- 451.1	355.0	111.9	24.0	17.5-33.2
	1988	1	234.9	189.5	45.4	19.3	-
	1989	7	484.0-1,787.3	278.8	709.6	73.2	61.4-94.3
	1990	7	400.9-3,245.0	435.1	1,040.0	70.5	43.3-95.4
Jun	1982	3	699.9-2,025.8	488.2	854.3	63.7	25.9-77.2
	1983	6	921.2-2,920.7	686.5	986.6	59.0	43.6-91.1
	1984	12	243.1-3,306.7	592.0	567.0	53.4	24.5-77.2
	1985	7	209.1-4,714.2	611.7	1,176.1	65.7	26.4-88.5
	1986	15	167.8-2,683.8	690.7	302.4	30.4	9.3-67.6
	1987	14	515.1-2,807.3	663.0	627.7	48.6	11.0-71.3
	1988	15	303.0-2,268.0	486.7	549.0	51.2	14.1-88.3
	1989	12	780.6-3,677.3	864.0	905.3	50.9	15.9-76.5
	1990	11	1,148.9-3,808.8	752.8	1,412.3	65.2	51.9-79.0
Jul	1982	16	307.5-3,777.1	972.8	484.6	33.3	2.7-81.1
	1983	9	377.9-1,768.3	507.9	544.3	51.8	19.2-66.0
	1984	15	607.5-3,507.6	1,425.5	700.1	32.9	12.3-65.3
	1985	11	1,267.2-4,888.8	920.9	1,271.1	57.9	31.2-83.7
	1986	16	481.0-3,701.1	854.3	850.7	49.9	16.3-90.0
	1987	13	696.4-2,366.0	775.9	725.8	48.3	24.6-71.7
	1988	12	205.5-2,296.5	652.3	610.2	46.3	15.8-79.3
	1989	14	239.5-2,656.7	654.9	815.8	58.4	26.7-85.2
	1990	15	286.7-2,073.8	558.9	681.9	55.0	22.4-82.5
Aug	1982	12	475.8-3,504.5	1,403.2	389.3	22.6	6.9-42.8
	1983	8	745.3-2,988.6	837.9	522.2	38.4	9.0-57.4
	1984	13	813.3-4,178.9	1,594.0	1,035.8	39.4	24.3-57.6
	1985	11	1,060.5-4,838.1	1,531.7	1,144.3	42.7	19.3-62.7
	1986	7	768.9-3,627.4	1,290.1	700.1	35.2	19.6-60.8
	1987	12	722.1-2,078.8	840.1	436.6	34.2	22.6-56.5
	1988	13	133.9-2,781.4	674.6	491.0	38.4	0-69.7
	1989	11	122.6-3,107.6	471.6	541.0	57.8	44.7-76.1
	1990	12	235.0-5,462.1	693.2	797.6	53.5	22.4-84.1
Sep	1982	10	1,025.1-3,791.2	1,758.6	342.5	16.2	26.2-35.4
	1983	8	527.2-3,624.0	1,578.6	481.9	23.4	13.2-32.4
	1984	6	417.3-1,803.5	721.8	306.2	29.8	16.4-38.9
	1985	6	452.2-1,997.2	567.0	703.9	55.3	21.3-79.5
	1986	10	76.6-1,492.3	536.8	279.1	34.2	21.0-69.4
	1987	12	408.2-3,916.6	1,801.7	429.0	24.5	3.5-52.4
	1988	8	501.2-2,543.8	854.1	260.8	24.6	6.6-46.7
	1989	8	465.8-2,501.5	771.4	696.3	52.9	20.2-87.6
	1990	11	443.2-2,987.3	760.4	602.0	44.2	17.6-77.3

Table 12. (Continued)

Month	Year	N	Range of total catch weights (kg)	Mean weight (kg) Marketable	Scrap	Percent scrap Mean	Range
Oct	1982	1	271.0	103.6	113.4	52.5	
	1983	4	63.1-1,219.1	330.5	241.9	42.3	0-44.7
	1984	3	377.4-1,108.0	510.2	151.1	22.8	9.1-28.7
	1986	2	327.5-2,827.7	1,090.0	487.6	30.9	24.1-41.5
	1987	2	868.2-1,893.3	1,085.9	294.9	21.3	16.8-31.4
	1988	5	175.6- 701.9	408.8	113.4	24.2	7.9-38.7
	1989	1	422.6	59.7	362.9	85.9	-
	1990	5	94.8-596.9	113.7	186.0	62.1	23.9-86.2
			Mean total weight	Mean market	Mean sample	Mean % scrap	
Totals	1982	46	1,571.4	1,133.8	437.5	27.8	
	1983	41	1,224.5	686.1	538.4	44.0	
	1984	49	1,798.6	1,123.9	675.7	37.5	
	1985	39	1,966.7	917.8	1,048.9	53.3	
	1986	55	1,254.1	749.1	505.0	40.3	
	1987	56	1,405.3	877.9	527.4	37.5	
	1988	54	1,066.7	610.4	456.3	42.8	
	1989	53	1,339.7	601.3	738.4	55.1	
	1990	61	1,428.3	605.9	822.4	57.6	

Table 13. Species composition of scrapfish (discard or bait) in 54 Pamlico Sound pound net catches sampled in 1988.

Species	Weight Mean	Weight Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Brevoortia tyrannus	136.2	38.1	1,351	36.7	0.10	100.0
Micropogonias undulatus	127.8	35.8	1,157	31.4	0.11	96.3
Leiostomus xanthurus	25.9	7.3	352	9.6	0.07	92.6
Opisthonema oglinum	18.0	5.1	324	8.8	0.06	79.6
Cynoscion regalis	13.6	3.8	139	3.8	0.10	100.0
Pomatomus saltatrix	11.5	3.2	72	2.0	0.16	85.2
Scomberomorus maculatus	7.8	2.2	74	2.0	0.11	83.3
Bairdiella chrysoura	3.3	0.9	46	1.2	0.07	75.9
Paralichthys dentatus	1.8	0.5	18	0.5	0.10	55.6
Callinectes sapidus	1.5	0.4	15	0.4	0.10	74.1
Chaetodipterus faber	1.5	0.4	22	0.6	0.07	48.1
Orthopristis chrysoptera	1.3	0.4	19	0.5	0.07	59.3
Peprilus triacanthus	1.0	0.3	15	0.4	0.07	70.4
Lagodon rhomboides	1.0	0.3	17	0.5	0.06	53.7
Selene vomer	0.8	0.2	15	0.4	0.05	22.2
Chilomycterus schoepfi	0.6	0.2	2	<0.1	0.27	18.5
Paralichthys lethostigma	0.4	0.1	4	0.1	0.11	42.6
Porichthys plectrodon	0.4	0.1	<1	<0.1	1.15	1.9
Peprilus alepidotus	0.4	0.1	8	0.2	0.05	77.8
Caranx hippos	0.3	<0.1	4	0.1	0.09	20.4
Monacanthus hispidus	0.3	<0.1	10	0.3	0.03	31.5
Prionotus carolinus	0.3	<0.1	4	0.1	0.08	16.7
Alosa sapidissima	0.2	<0.1	1	<0.1	0.15	3.7
Pogonias cromis	0.2	<0.1	1	<0.1	0.13	1.9
Evorthodus lyricus	0.2	<0.1	2	<0.1	0.11	1.9
Aluterus schoepfi	0.2	<0.1	1	<0.1	0.13	9.3
Urophycis regia	0.1	<0.1	3	<0.1	0.05	9.3
Larimus fasciatus	0.1	<0.1	1	<0.1	0.15	3.7
Trinectes maculatus	<0.1	<0.1	1	<0.1	0.07	18.5
Sphoeroides maculatus	<0.1	<0.1	1	<0.1	0.06	33.3
Elops saurus	<0.1	<0.1	<1	<0.1	0.20	1.9
Menticirrhus americanus	<0.1	<0.1	<1	<0.1	0.11	13.0
Stenotomus spp.	<0.1	<0.1	<1	<0.1	0.07	1.9
Prionotus evolans	<0.1	<0.1	<1	<0.1	0.08	7.4
Prionotus scitulus	<0.1	<0.1	<1	<0.1	0.05	5.6
Trichiurus lepturus	<0.1	<0.1	<1	<0.1	0.27	11.1
Scomberomorus cavalla	<0.1	<0.1	<1	<0.1	0.06	1.9
Penaeus aztecus	<0.1	<0.1	<1	<0.1	0.01	18.5
Opsanus tau	<0.1	<0.1	<1	<0.1	0.08	3.7
Diplodus holbrooki	<0.1	<0.1	<1	<0.1	0.05	3.7
Selene setapinnis	<0.1	<0.1	<1	<0.1	<0.01	1.9

Observed species

Lolliguncula brevis	Prionotus tribulus	Archosargus probatocephalus	Paralichthys spp.
Penaeus duorarum	Centropristis striata	Menticirrhus spp.	Paralichthys albigutta
Penaeus setiferus	Rachycentron canadum	Menticirrhus saxatilis	Scophthalmus aquosus
Portunus spinimanus	Chloroscombrus chrysurus	Sciaenops ocellatus	Symphurus plagiusa
Tylosurus crocodilus	Oligoplites saurus	Citharichthys spilopterus	Monacanthus ciliatus
Prionotus spp.	Trachinotus carolinus		

Table 14. Species composition of scrapfish (discard or bait) in 53 Pamlico Sound sciaenid pound net catches sampled in 1989.

Species	Weight Mean	Weight Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Micropogonias undulatus	251.3	35.9	2,684	31.0	0.09	100.0
Brevoortia tyrannus	247.0	35.3	3,173	36.7	0.08	100.0
Leiostomus xanthurus	82.6	11.8	1,428	16.5	0.06	100.0
Pomatomus saltatrix	34.3	4.9	284	3.3	0.12	98.1
Scomberomorus maculatus	32.2	4.6	277	3.2	0.12	81.1
Cynoscion regalis	12.0	1.7	128	1.5	0.09	96.2
Opisthonema oglinum	10.1	1.4	198	2.3	0.05	79.2
Bairdiella chrysoura	8.5	1.2	104	1.2	0.08	75.5
Chloroscombrus chrysurus	4.9	0.7	40	0.5	0.12	1.9
Monacanthus hispidus	2.6	0.4	69	0.8	0.04	47.2
Orthopristis chrysoptera	2.0	0.3	39	0.4	0.05	60.4
Caranx hippos	2.0	0.3	23	0.3	0.08	39.6
Chaetodipterus faber	1.9	0.3	49	0.6	0.04	58.5
Peprilus triacanthus	1.3	0.2	37	0.4	0.03	83.0
Lagodon rhomboides	1.2	0.2	13	0.2	0.09	20.8
Selene vomer	1.1	0.2	30	0.4	0.04	39.6
Caranx spp.	0.9	0.1	9	0.1	0.10	1.9
Callinectes sapidus	0.9	0.1	7	<0.1	0.12	86.8
Paralichthys lethostigma	0.5	0.1	3	<0.1	0.18	34.0
Aluterus schoepfi	0.5	0.1	5	0.1	0.10	15.1
Prionotus tribulus	0.4	<0.1	2	<0.1	0.17	7.5
Peprilus alepidotus	0.3	<0.1	7	<0.1	0.05	84.9
Sphoeroides maculatus	0.3	<0.1	3	<0.1	0.09	47.2
Mugil cephalus	0.3	<0.1	2	<0.1	0.17	5.7
Opsanus tau	0.2	<0.1	2	<0.1	0.10	3.8
Trachinotus carolinus	0.2	<0.1	3	<0.1	0.06	47.2
Urophycis regia	0.2	<0.1	2	<0.1	0.09	3.8
Paralichthys dentatus	0.2	<0.1	7	0.1	0.02	54.7
Chilomycterus schoepfi	0.1	<0.1	1	<0.1	0.14	15.1
Prionotus carolinus	0.1	<0.1	4	<0.1	0.04	13.2
Menticirrhus americanus	0.1	<0.1	1	<0.1	0.10	15.1
Trichiurus lepturus	0.1	<0.1	1	<0.1	0.11	17.0
Callinectes marginatus	<0.1	<0.1	1	<0.1	0.08	1.9
Prionotus spp.	<0.1	<0.1	2	<0.1	0.04	1.9
Penaeus duorarum	<0.1	<0.1	<1	<0.1	0.08	11.3
Mycteroperca microlepis	<0.1	<0.1	<1	<0.1	0.07	3.8
Archosargus probatocephalus	<0.1	<0.1	<1	<0.1	0.29	3.8
Centropristis striata	<0.1	<0.1	1	<0.1	0.04	13.2
Caranx crysos	<0.1	<0.1	<1	<0.1	0.10	1.9
Trinectes maculatus	<0.1	<0.1	2	<0.1	0.02	13.2
Lolliguncula brevis	<0.1	<0.1	1	<0.1	0.02	5.7
Penaeus aztecus	<0.1	<0.1	1	<0.1	0.02	39.7
Citharichthys spilopterus	<0.1	<0.1	<1	<0.1	0.02	9.4

Observed species

Callinectes similis	Synodus foetens	Rachycentron canadum	Pogonias cromis
Portunus spinimanus	Tylosurus crocodilus	Alectis ciliaris	Sciaenops ocellatus
Squilla empusa	Prionotus evolans	Lobotes surinamensis	Sphyraena borealis
Elops saurus	Prionotus scitulus	Cynoscion nebulosus	Tautoga onitis
Alosa mediocris	Centropristis philadelphica	Menticirrhus spp.	Paralichthys spp.

Table 15. Species composition and mean catch/trip of scrap fish (bait) in 61 pound net catches sampled in Pamlico Sound from May through October 1990.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Brevoortia tyrannus	349.1	43.6	4,369	42.5	0.08	96.7
Micropogonias undulatus	267.8	33.5	2,969	28.9	0.09	100.0
Leiostomus xanthurus	43.0	5.4	790	7.7	0.05	98.4
Pomatomus saltatrix	37.9	4.7	208	2.0	0.18	98.4
Scomberomorus maculatus	27.4	3.4	206	2.0	0.13	86.9
Opisthonema oglinum	19.8	2.5	734	7.1	0.03	59.0
Cynoscion regalis	17.0	2.1	184	1.8	0.09	98.4
Peprilus triacanthus	8.7	1.1	262	2.6	0.03	88.5
Lagodon rhomboides	7.0	0.9	189	1.8	0.04	67.2
Bairdiella chrysoura	5.7	0.7	98	0.9	0.06	75.4
Peprilus alepidotus	2.1	0.3	51	0.5	0.04	95.1
Aluterus schoepfi	1.9	0.2	13	0.1	0.14	18.0
Monacanthus hispidus	1.7	0.2	18	0.2	0.09	42.6
Chaetodipterus faber	1.5	0.2	45	0.4	0.03	75.4
Caranx hippos	1.3	0.2	12	0.1	0.11	29.5
Paralichthys dentatus	1.2	0.2	11	0.1	0.11	63.9
Callinectes sapidus	1.2	0.2	18	0.2	0.07	83.6
Orthopristis chrysoptera	1.2	0.2	14	0.1	0.08	41.0
Selene vomer	0.7	0.1	13	0.1	0.06	36.1
Urophycis regia	0.7	0.1	6	0.1	0.11	16.1
Prionotus evolans	0.7	0.1	11	0.1	0.06	18.0
Chilomycterus schoepfi	0.4	<0.1	2	<0.1	0.22	13.1
Rachycentron canadum	0.3	<0.1	<1	<0.1	0.40	3.3
Chloroscombrus chrysurus	0.3	<0.1	14	0.1	0.02	18.0
Prionotus tribulus	0.2	<0.1	9	<0.1	0.03	6.6
Trinectes maculatus	0.2	<0.1	7	<0.1	0.03	27.9
Prionotus carolinus	0.2	<0.1	2	<0.1	0.07	14.7
Sphoeroides macualtus	0.1	<0.1	2	<0.1	0.07	50.8
Trachinotus carolinus	0.1	<0.1	1	<0.1	0.12	49.2
Caranx chrysos	0.1	<0.1	2	<0.1	0.06	11.5
Menticirrhus americanus	0.1	<0.1	1	<0.1	0.12	18.0
Mugil cephalus	0.1	<0.1	2	<0.1	0.05	6.6
Paralichthys lethostigma	<0.1	<0.1	2	<0.1	0.03	29.5
Menticirrhus saxatilis	<0.1	<0.1	1	<0.1	0.07	1.6
Synodus foetens	<0.1	<0.1	<1	<0.1	0.23	4.9
Citharichthys spilopterus	<0.1	<0.1	3	<0.1	0.02	11.5
Lolliguncula brevis	<0.1	<0.1	2	<0.1	0.03	18.0
Prionotus scitulus	<0.1	<0.1	<1	<0.1	0.03	4.9
Eucinostomus spp.	<0.1	<0.1	<1	<0.1	0.02	4.9
Alosa aestivalis	<0.1	<0.1	<1	<0.1	0.02	1.6

observed species

Penaeus aztecus
Penaeus duorarum
Penaeus setiferus
Callinectes marginatus
Portunus spinimanus
Mustelus canis
Elops saurus
Alosa mediocris
Tylosurus crocodilus
Mycteroperca microlepis
Alectis ciliaris
Caranx spp
Oligoplites saurus
Archosargus probatocephalus
Cynoscion nebulosus
Menticirrhus spp.
Pogonias cromis
Sciaenops ocellatus
Trichiurus lepturus
Scomberomorus cavalla
Paralichthys spp.
Scophthalmus aquosus

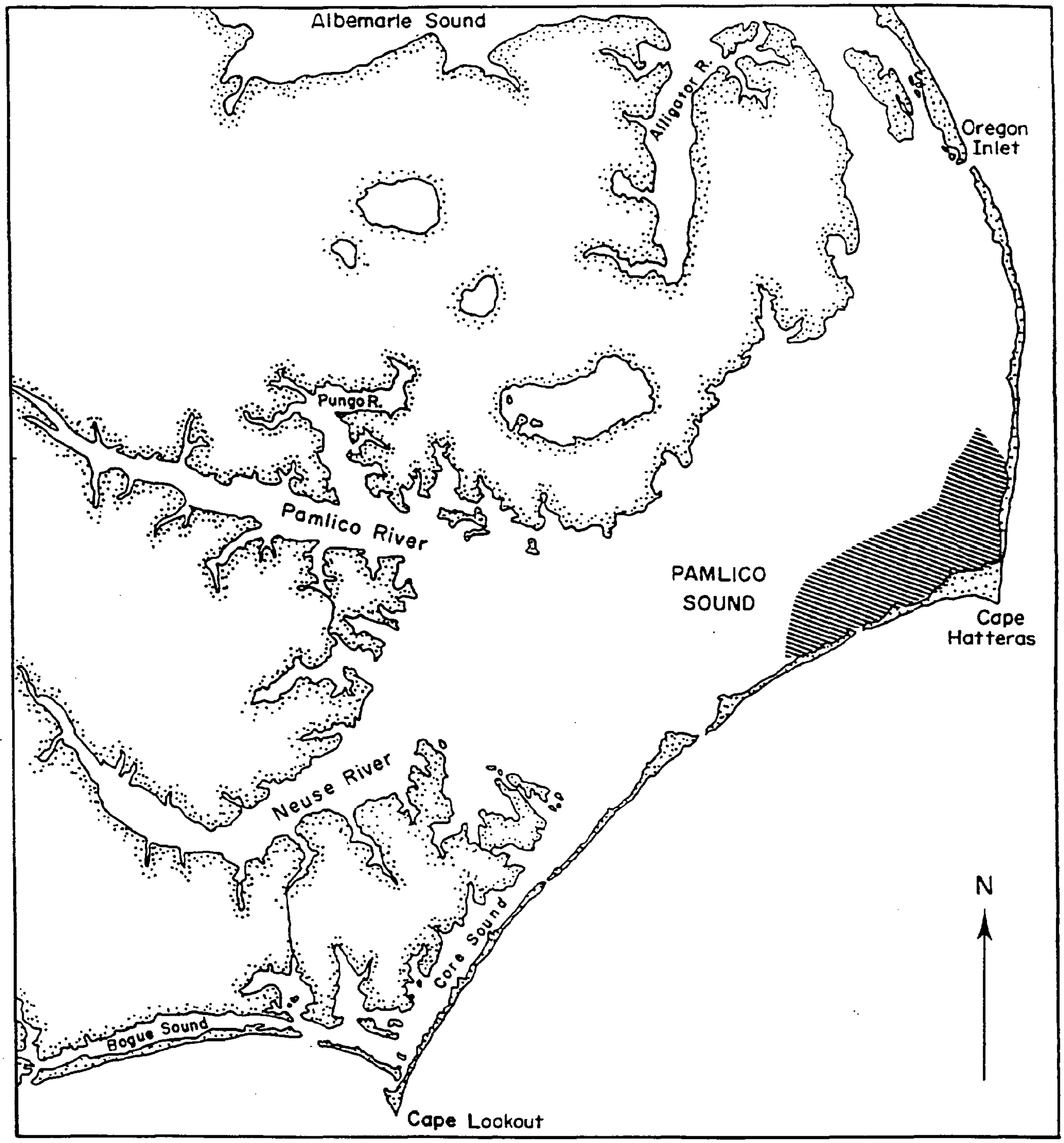


Figure 1. Location of sciaenid pound net fishing grounds in Pamlico Sound, NC.

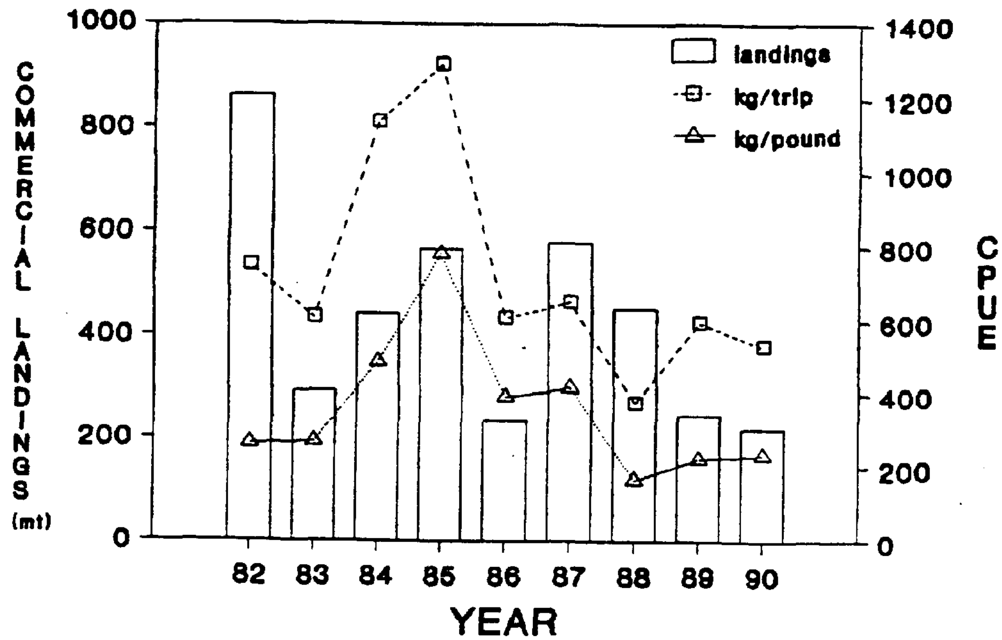


Figure 2. Commercial landings and catch/effort of Atlantic croaker (<u>Micropogonias</u> <u>undulatus</u>) in sciaenid pound nets, 1982-1990.

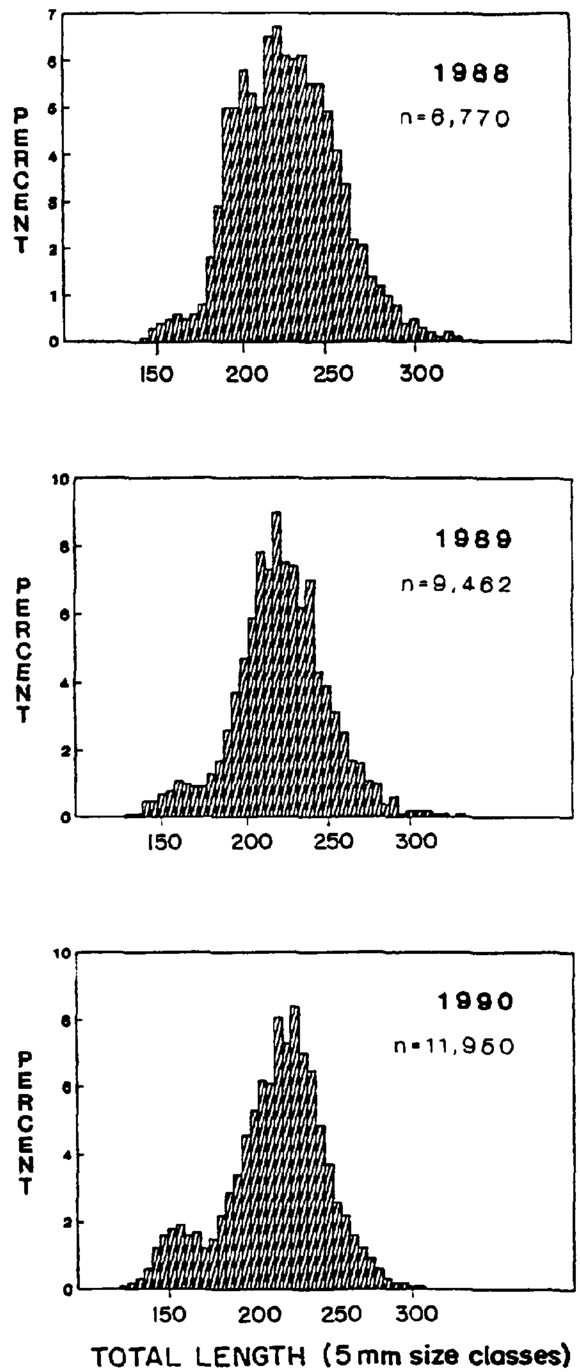


Figure 3. Expanded annual length frequencies of Atlantic croaker (*Micropogonias undulatus*) from sciaenid pound net samples, 1988-1990.

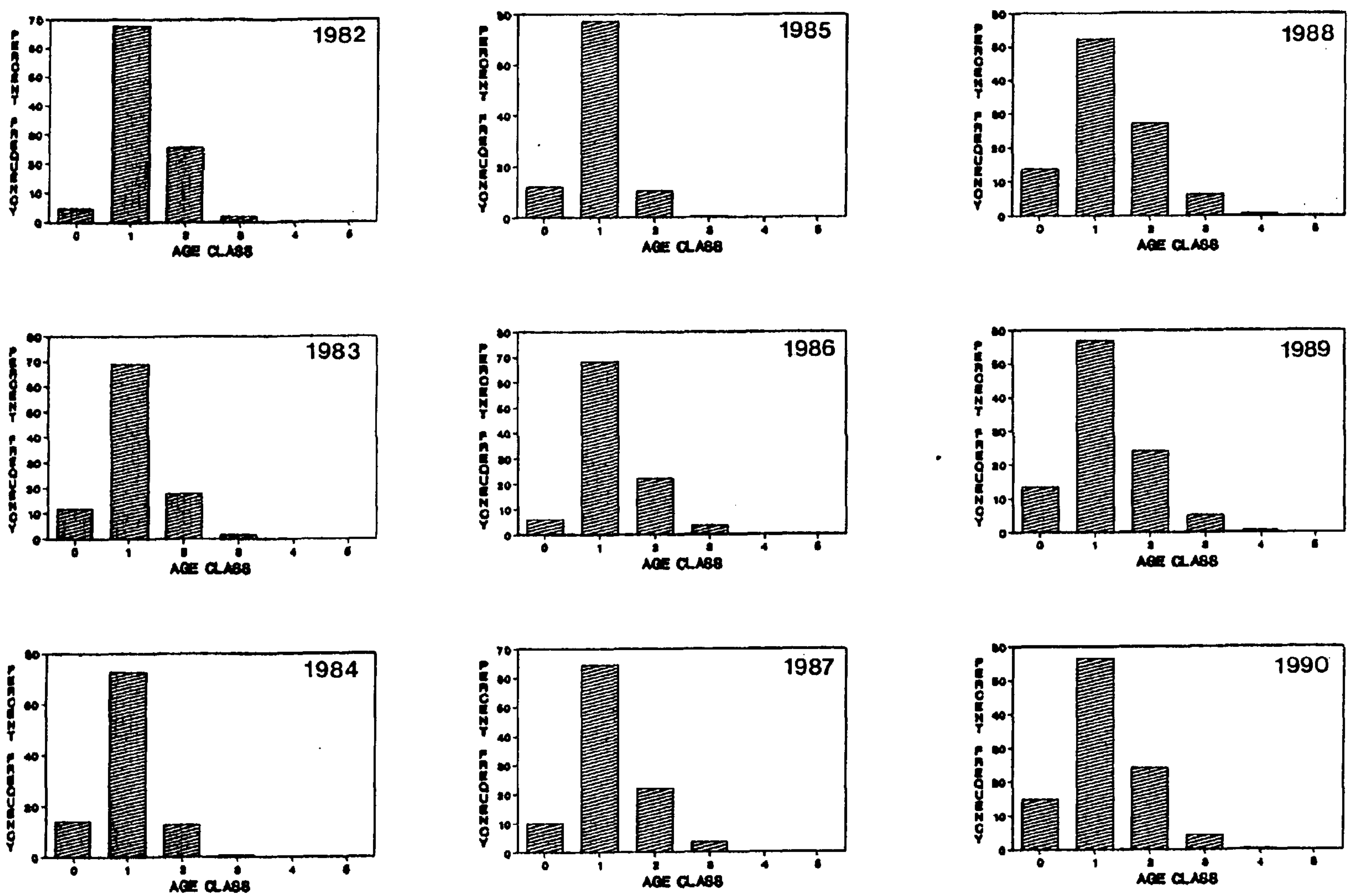


Figure 4. Expanded age composition of Atlantic croaker (<u>Micropogonias undulatus</u>) in pound net samples, 1982–1990.

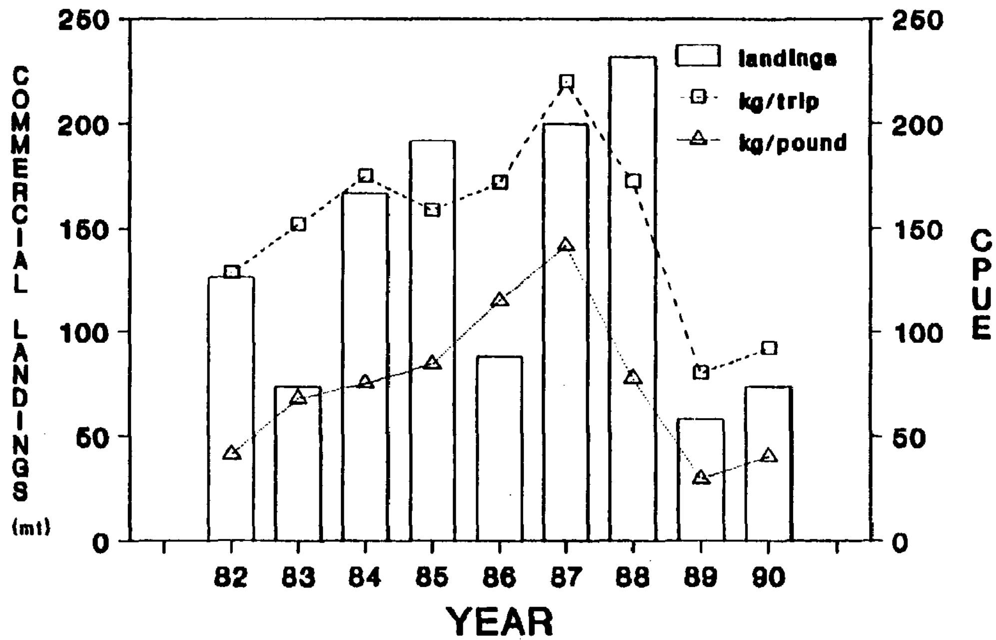
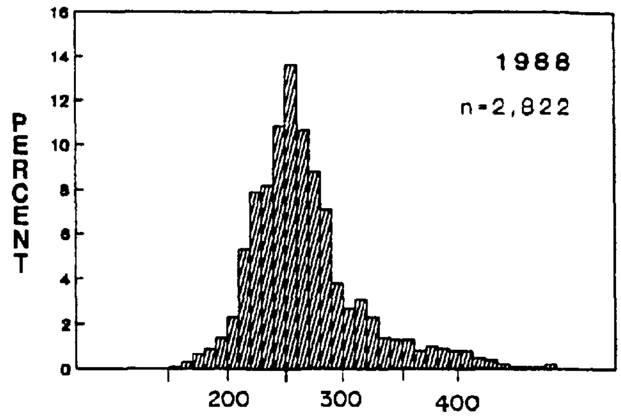
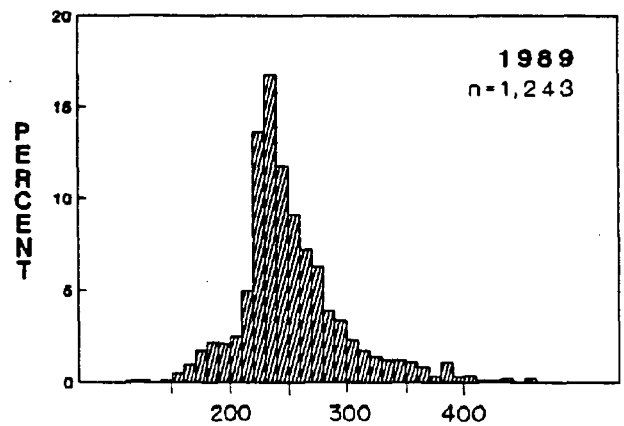


Figure 5. Commercial landings and catch/effort of weakfish (Cynoscion regalis) from sciaenid pound nets, 1982-1990.





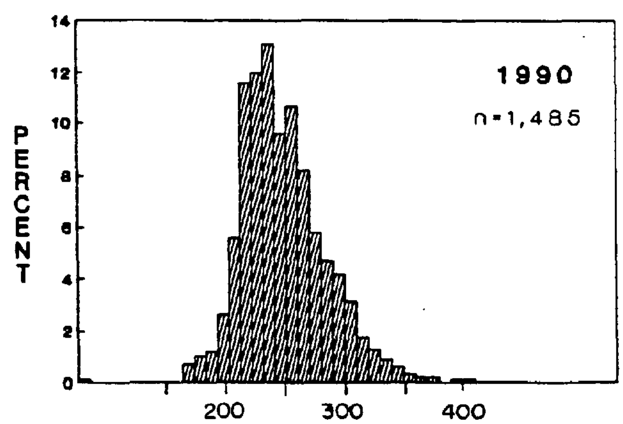


Figure 6. Expanded annual length frequencies of weakfish (<u>Cynoscion</u> <u>regalis</u>) from sciaenid pound net samples, 1988-1990.

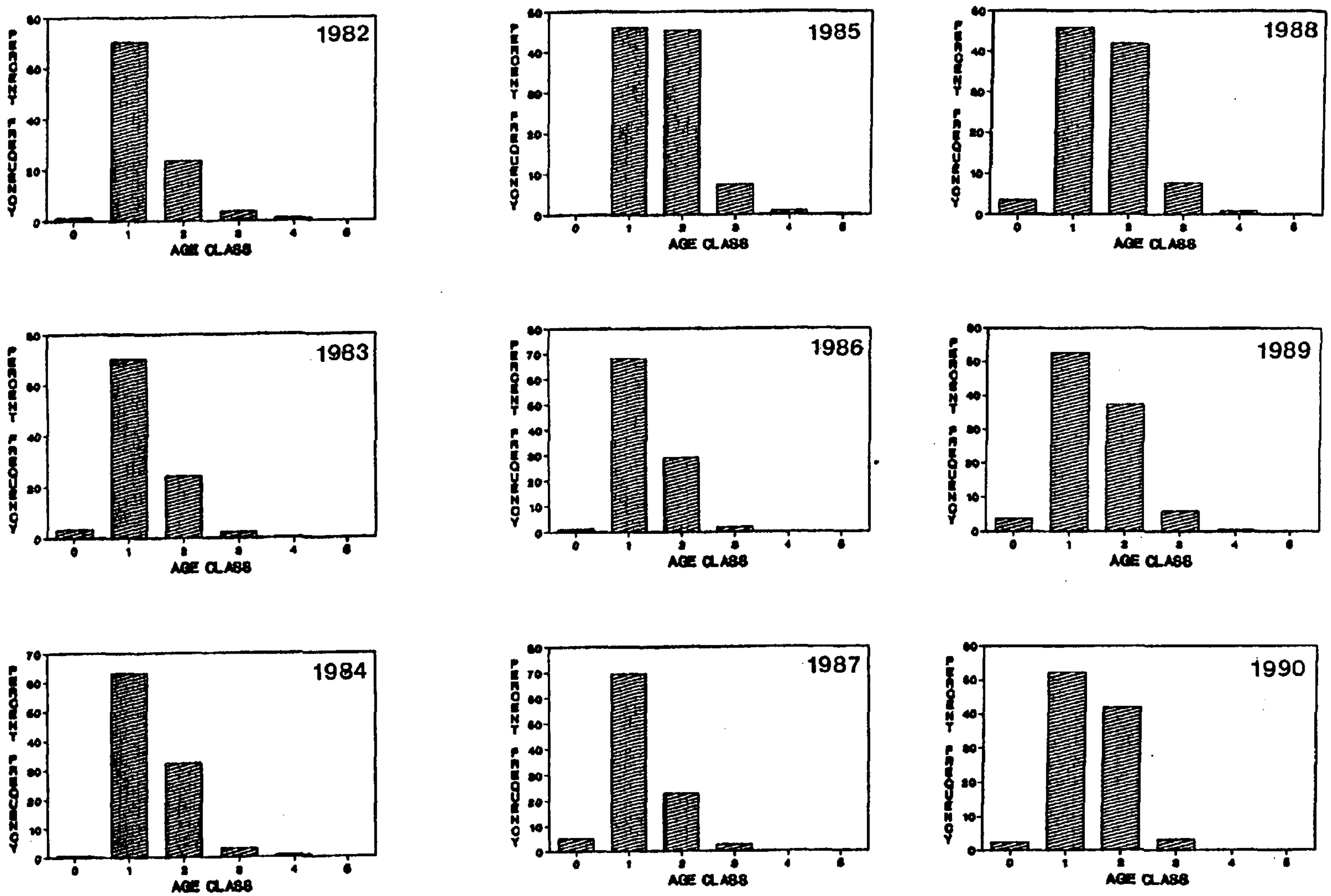


Figure 7. Expanded age composition of weakfish (Cynoscion regalis) in pound net samples, 1982-1990.

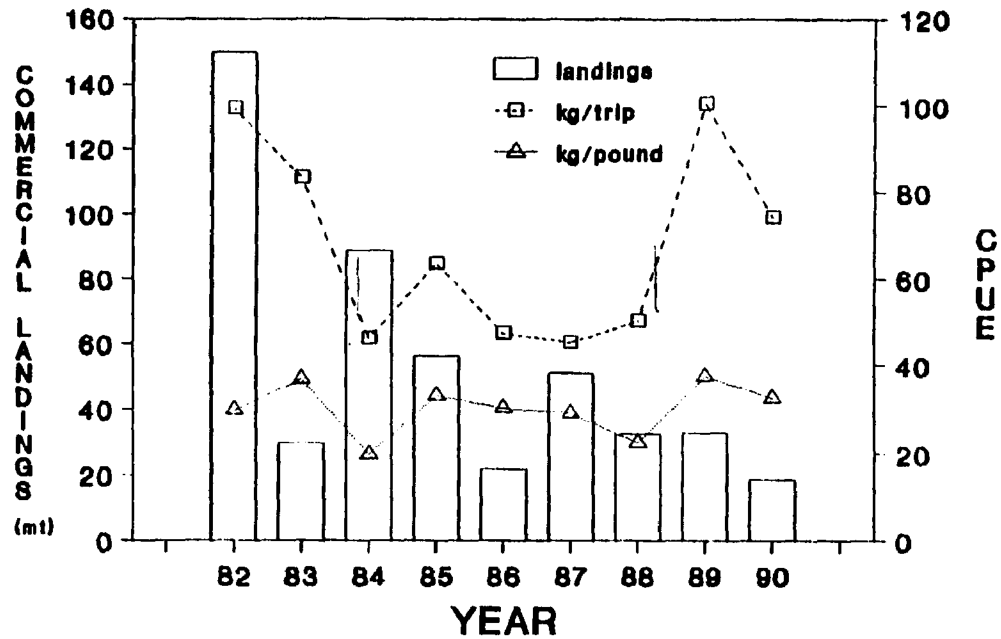


Figure 8. Commercial landings and catch/effort of spot (<u>Leiostomus xanthurus</u>) in sciaenid pound net samples, 1982-1990.

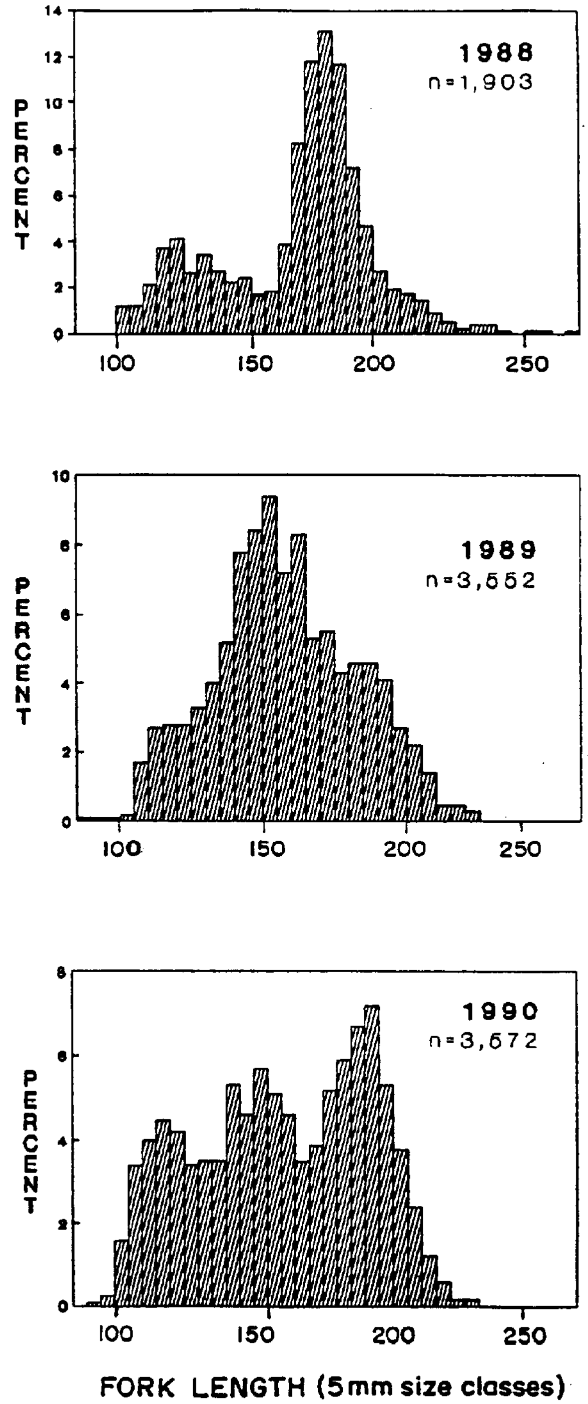


Figure 9. Expanded annual length frequencies of spot (Leiostomus xanthurus) from sciaenid pound net samples, 1988-1990.

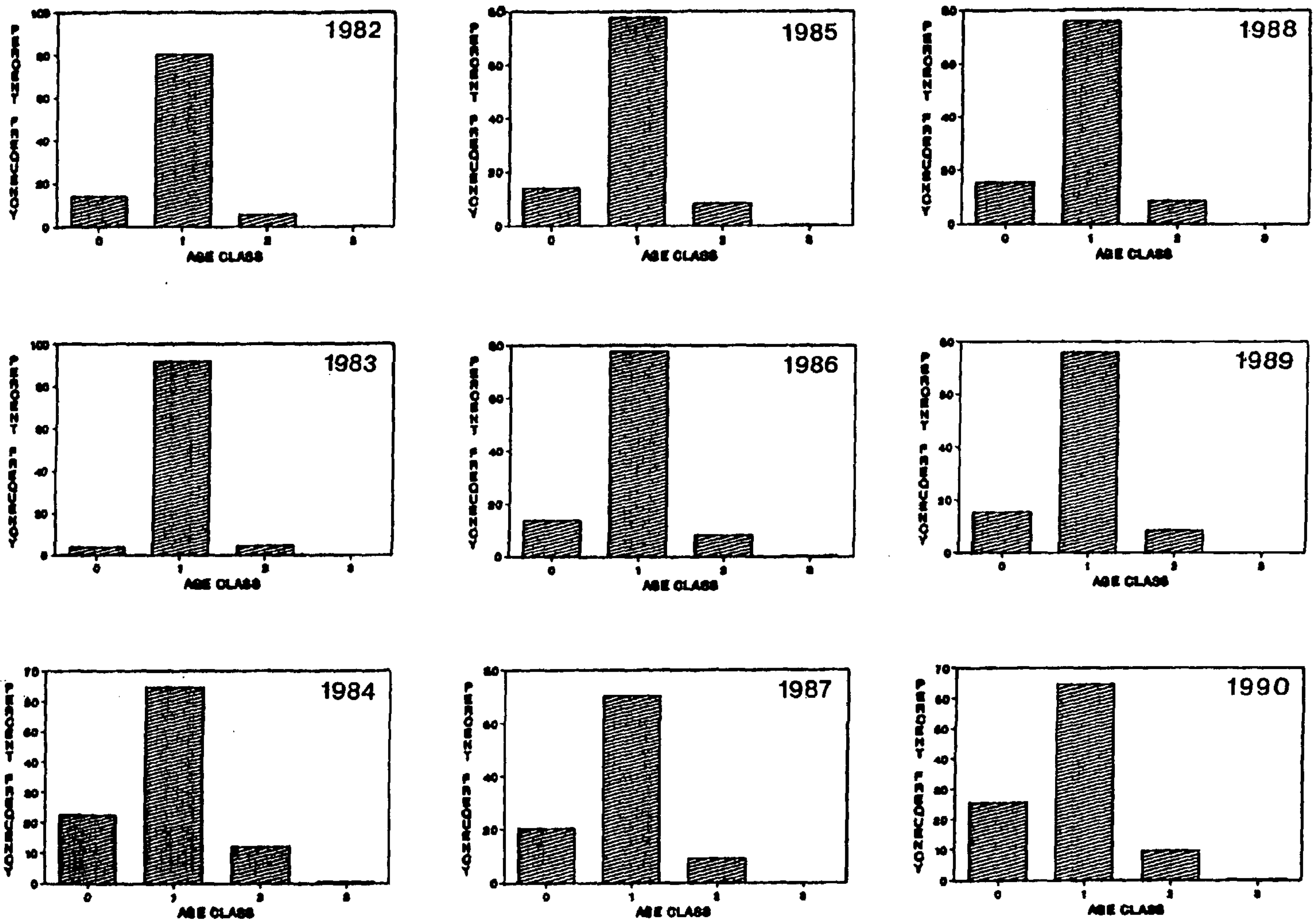


Figure 10. Expanded age composition of spot (Leiostomus xanthurus) in pound net samples, 1982-1990.

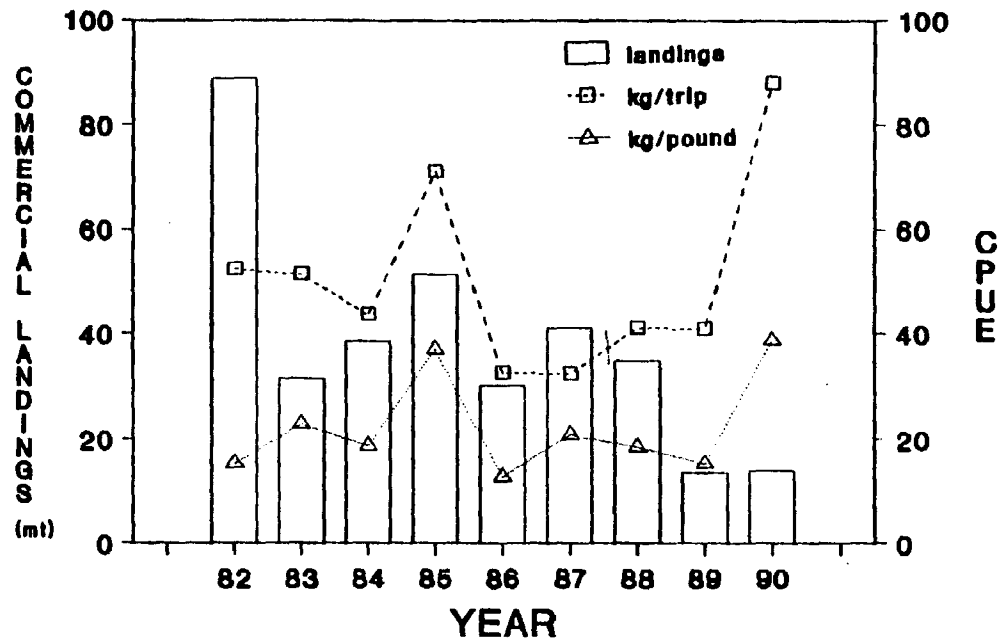


Figure 11. Commercial landings and catch/effort of bluefish (Pomatomus saltatrix) in sciaenid pound nets, 1982-1990.

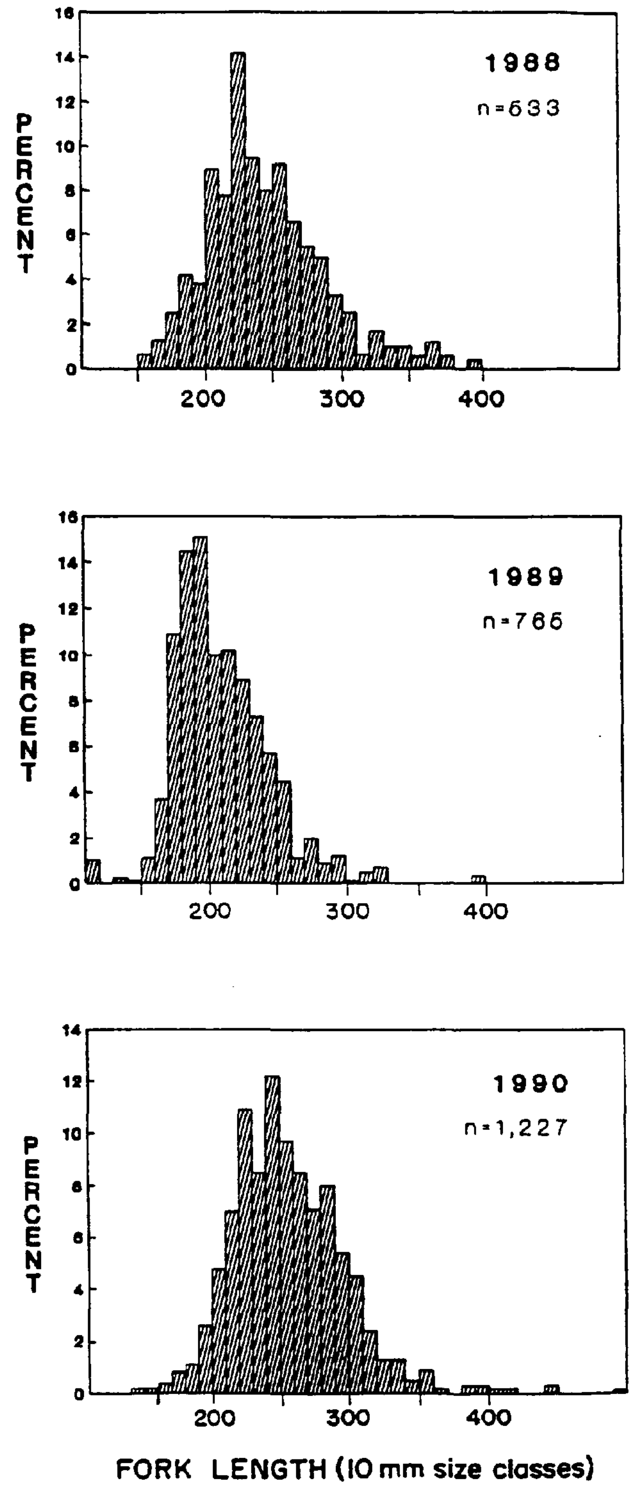


Figure 12. Expanded annual length frequencies of bluefish (Pomatomus saltatrix) from sciaenid pound net samples, 1988-1990.

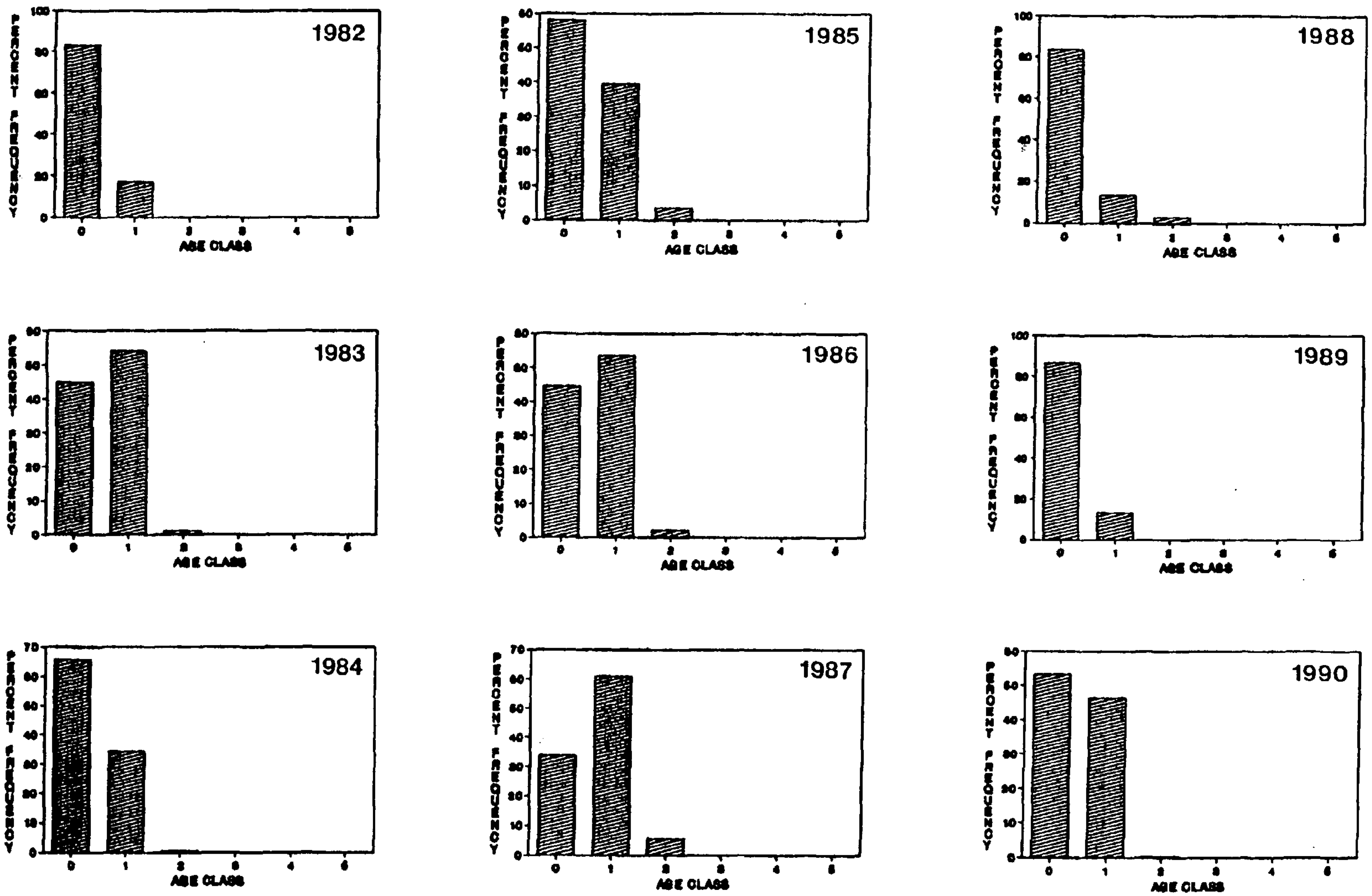


Figure 13. Expanded age composition of bluefish (Pomatomus saltatrix) in pound net samples, 1982-1990.

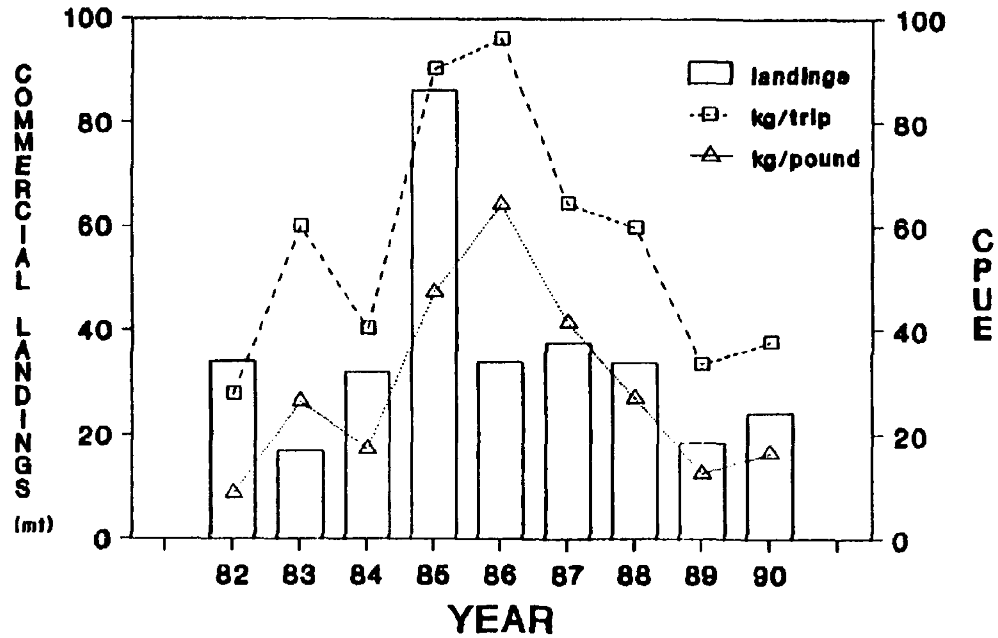


Figure 14. Commercial landings and catch/effort of harvestfish (<u>Peprilus alepidotus</u>) in sciaenid pound nets, 1982-1990.

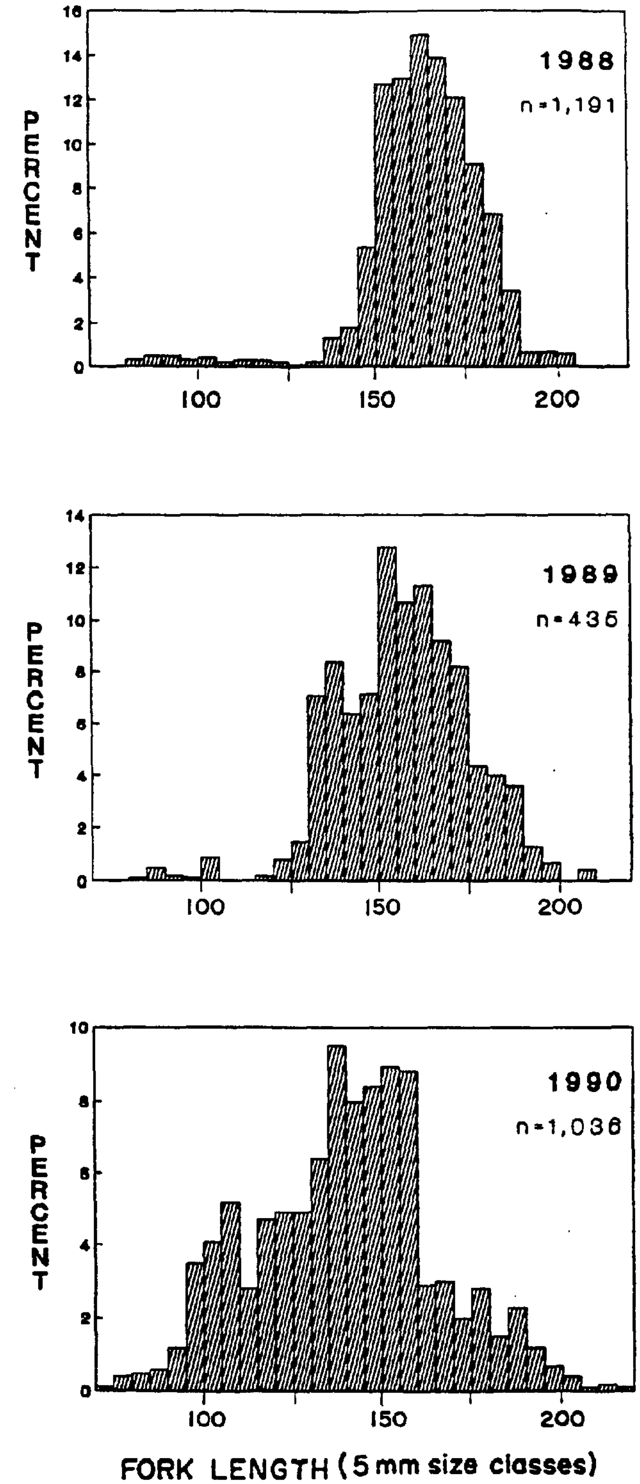


Figure 15. Expanded annual length frequencies of harvestfish (Peprilus alepidotus) from sciaenid pound net samples, 1988-1990.

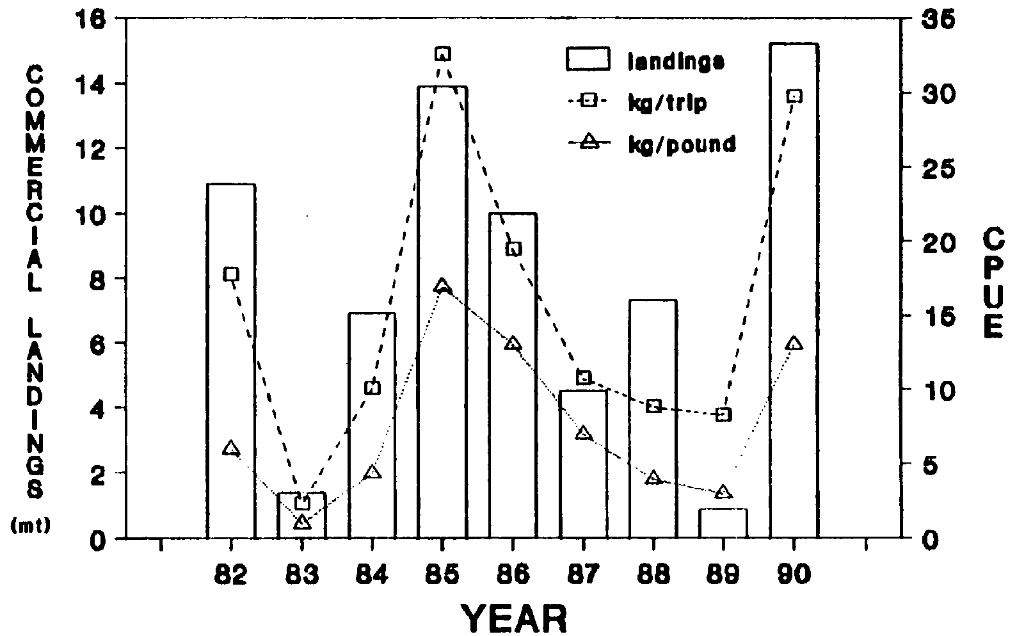


Figure 16. Commercial landings and catch/effort of butterfish (<u>Peprilus triacanthus</u>) in sciaenid pound nets, 1982-1990.

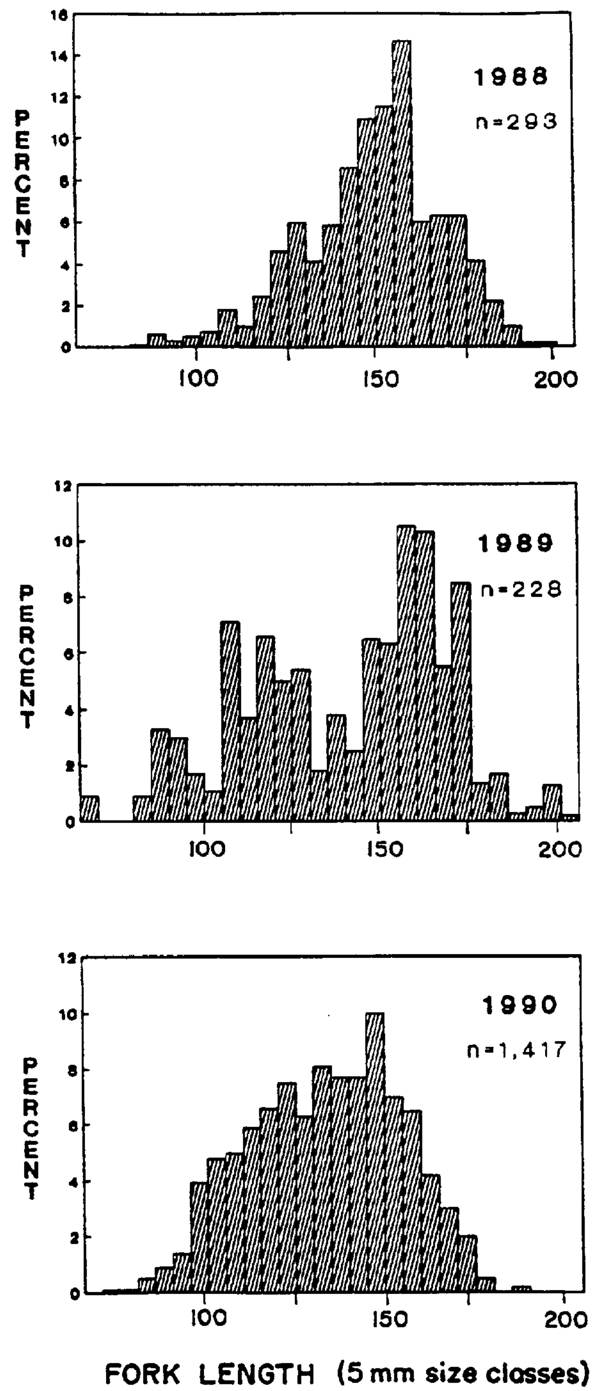


Figure 17. Expanded annual length frequencies of butterfish (_Peprilus triacanthus_) from sciaenid pound net samples, 1988-1990.

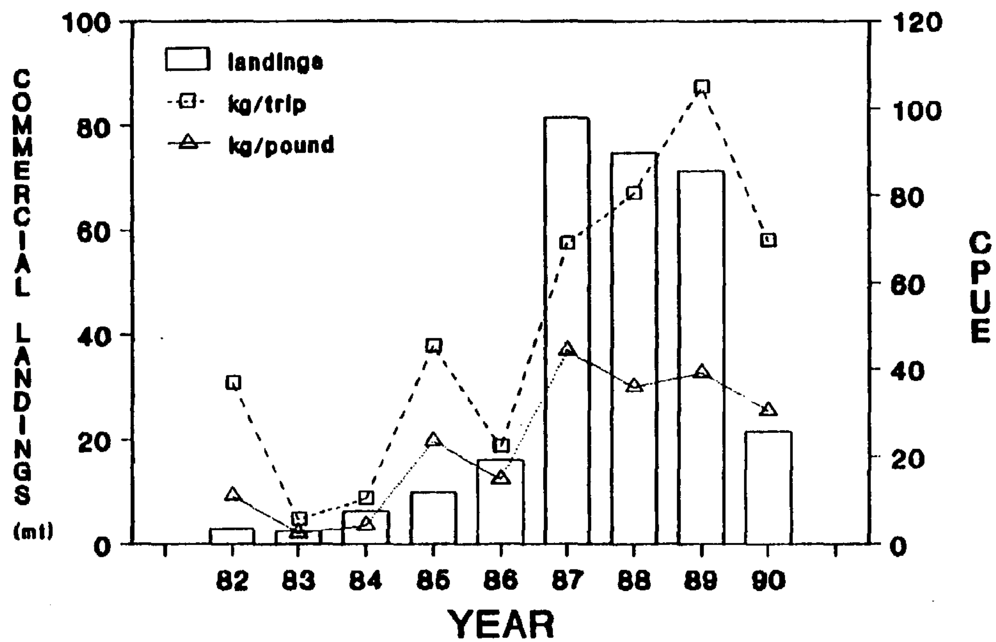


Figure 18. Commercial landings and catch/effort of Spanish mackerel (Scomberomorus maculatus) in sciaenid pound nets, 1982-1990.

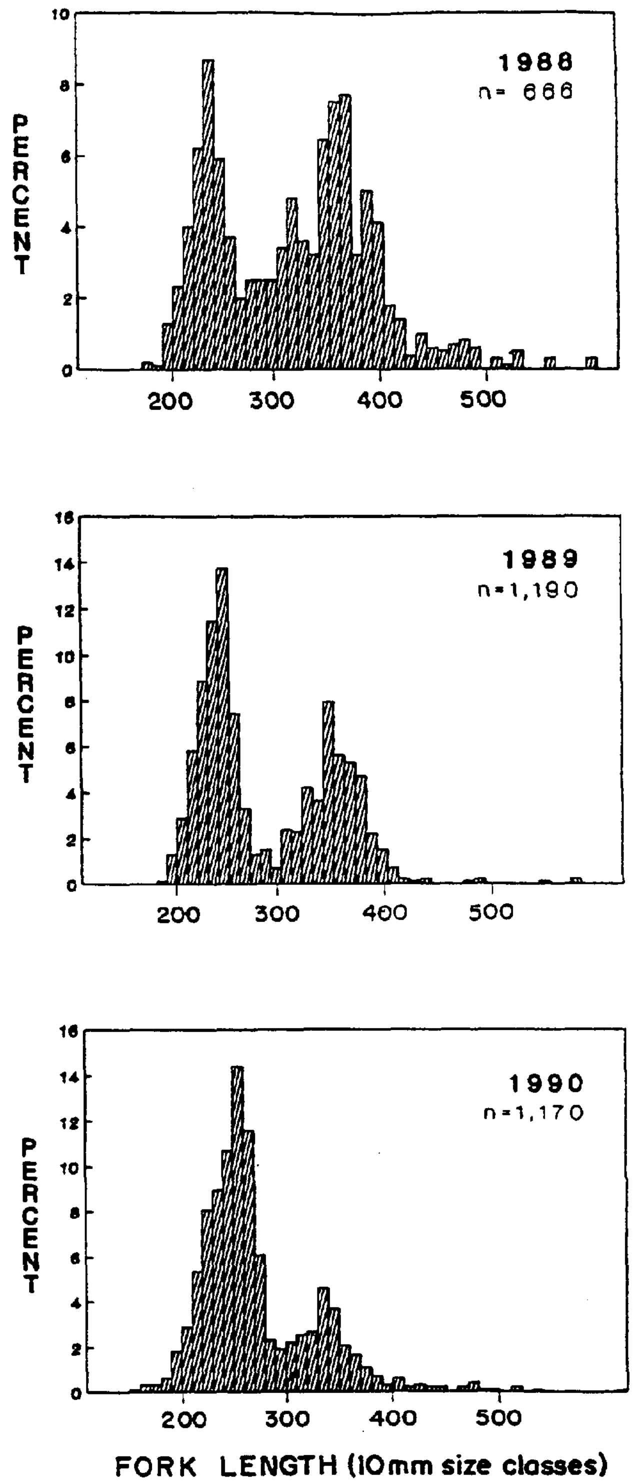


Figure 19. Expanded annual length frequencies of Spanish mackerel (<u>Scomberomorus</u> <u>maculatus</u>) from sciaenid pound net samples, 1988-1990.

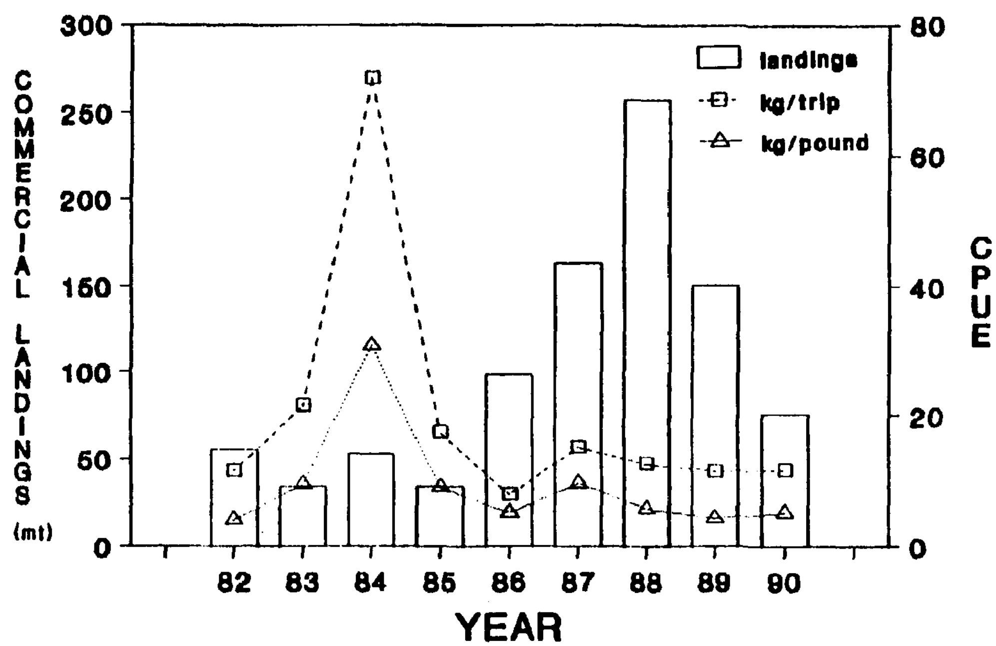


Figure 20. Commercial landings and catch/effort of flounder (Paralichthys sp.) in Dare County pound nets, 1982-1990.

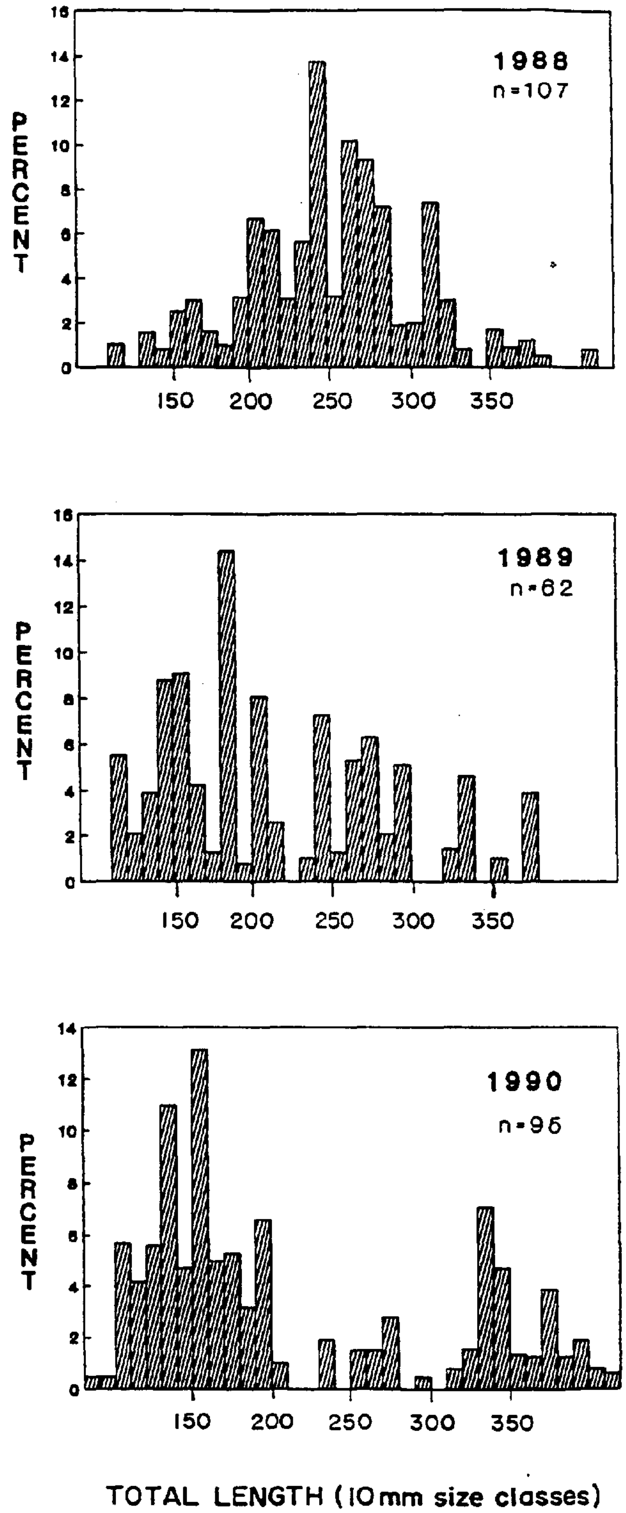


Figure 21. Expanded annual length frequencies of summer flounder (*Paralichthys dentatus*) from sciaenid pound net samples, 1988-1990.

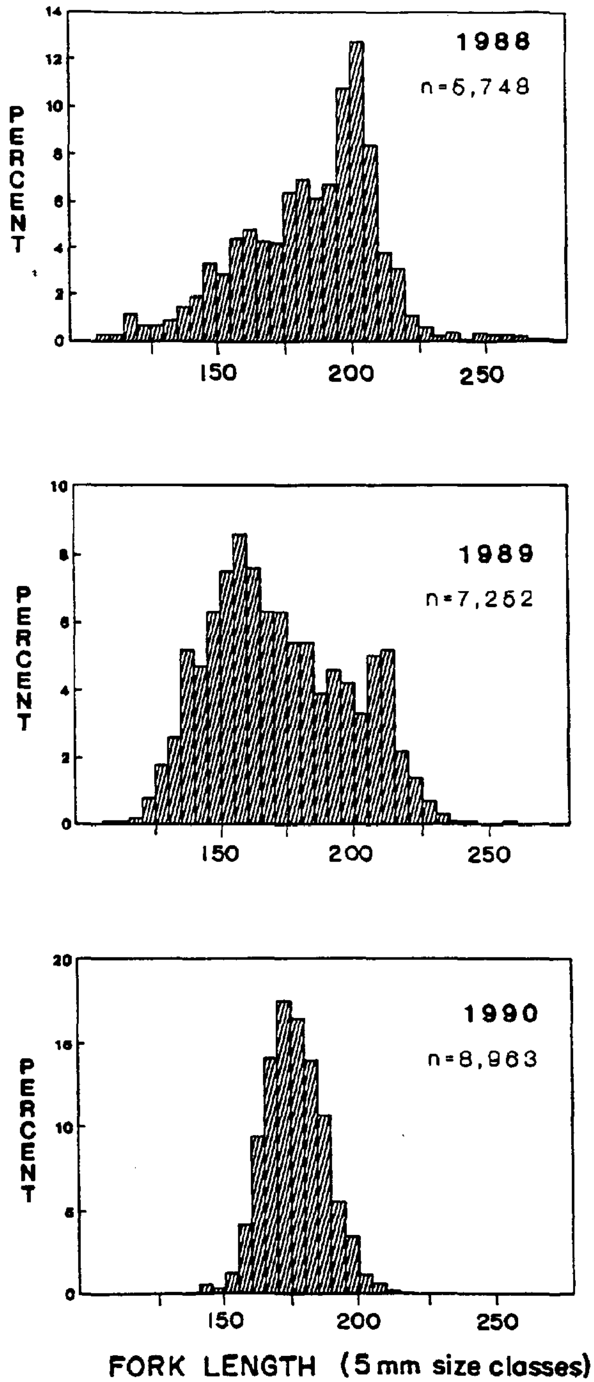


Figure 22. Expanded annual length frequencies of Atlantic menhaden (<u>Brevoortia tyrannus</u>) from sciaenid pound net samples, 1988-1990.

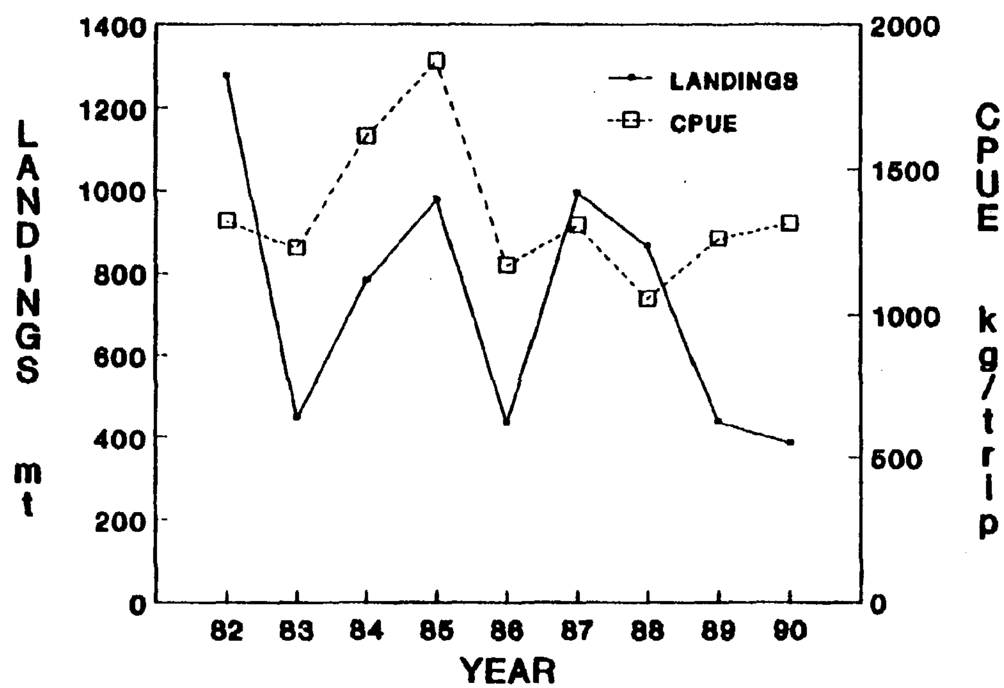


Figure 23. Trends in sciaenid pound net landings (mt) and catches (kg/trip) since 1982, reflecting changes in aggregate resource abundance.

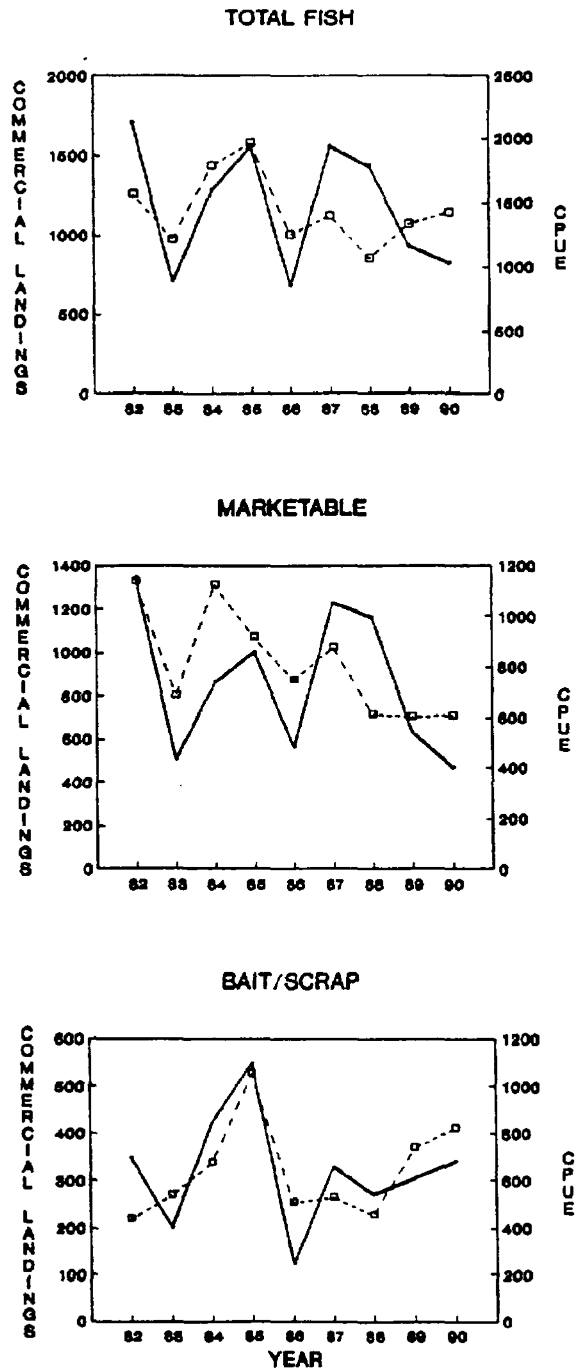


Figure 24. Commercial landings and catch/effort (CPUE) of total fish, marketable fish, bait (scrapfish) and percent bait in sciaenid pound net catches, 1982-1990.

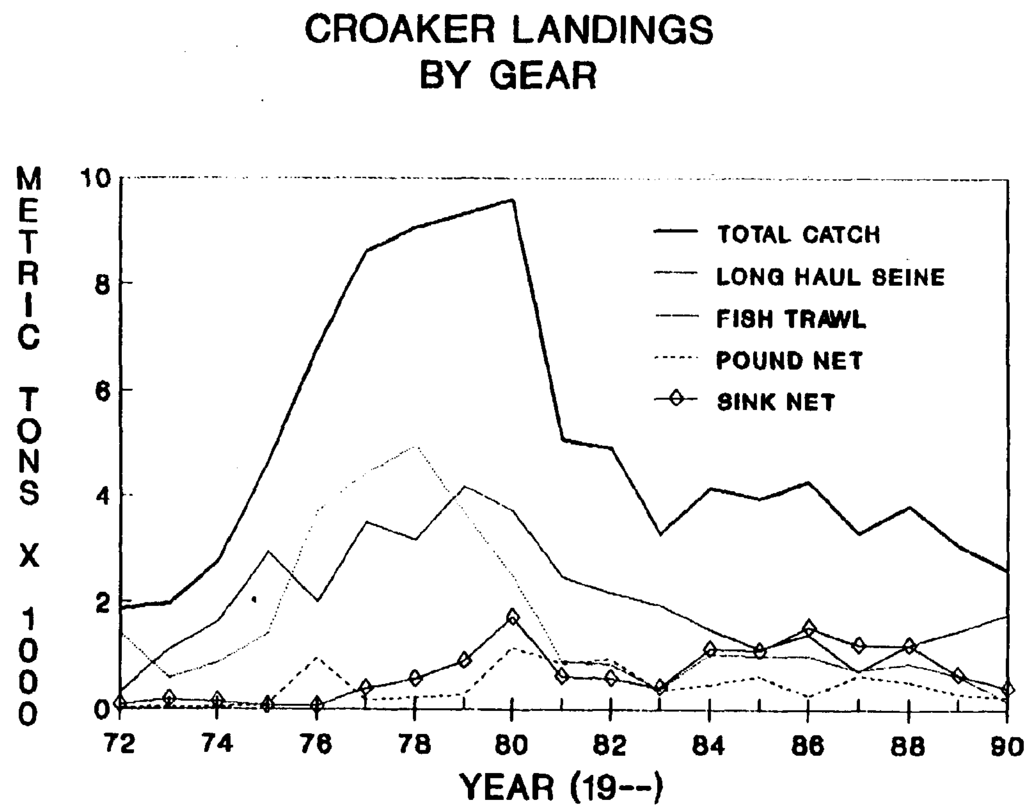


Figure 25. Commercial landings of Atlantic croaker (Micropogonias undulatus) caught in North Carolina, 1972-1990.

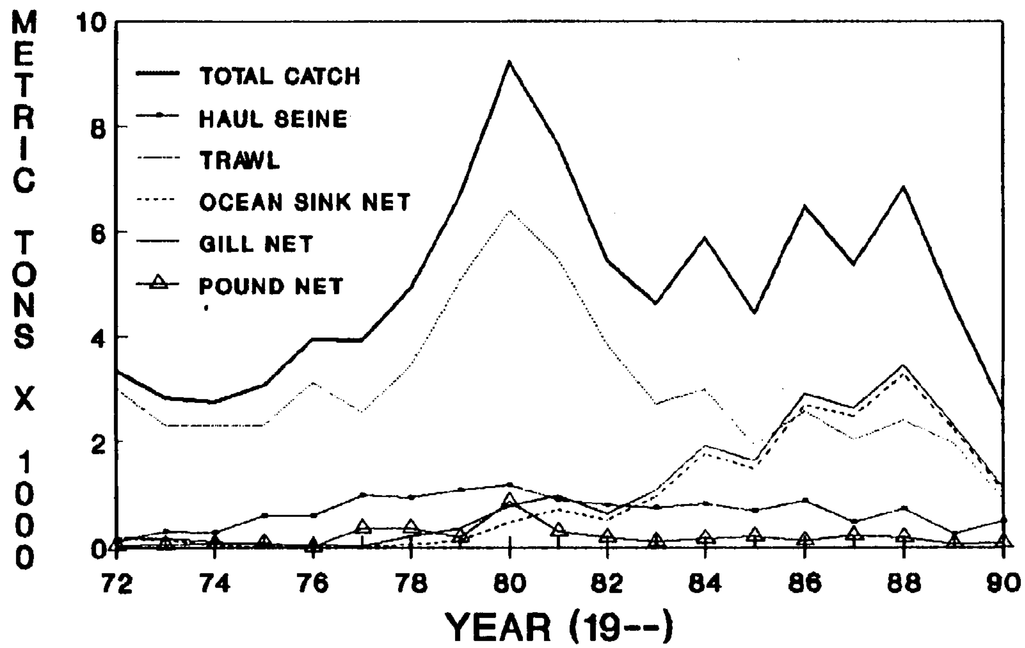


Figure 26. Commercial landings of weakfish (<u>Cynoscion regalis</u>) caught in North Carolina, 1972-1990.

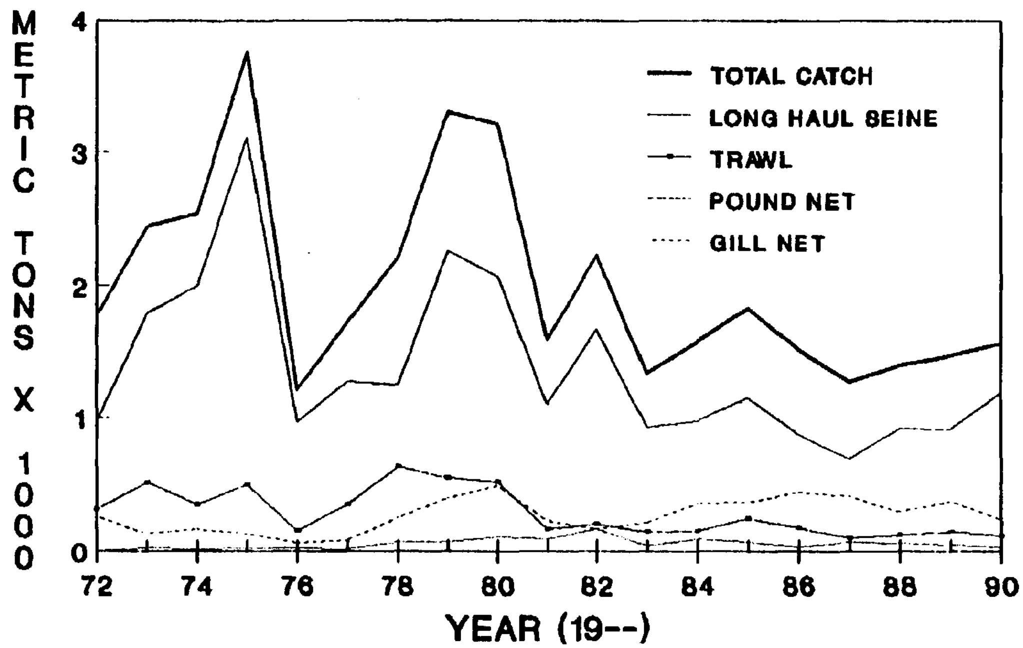


Figure 27. Commercial landings of spot (Leiostomus xanthurus) caught in North Carolina, 1972-1990.

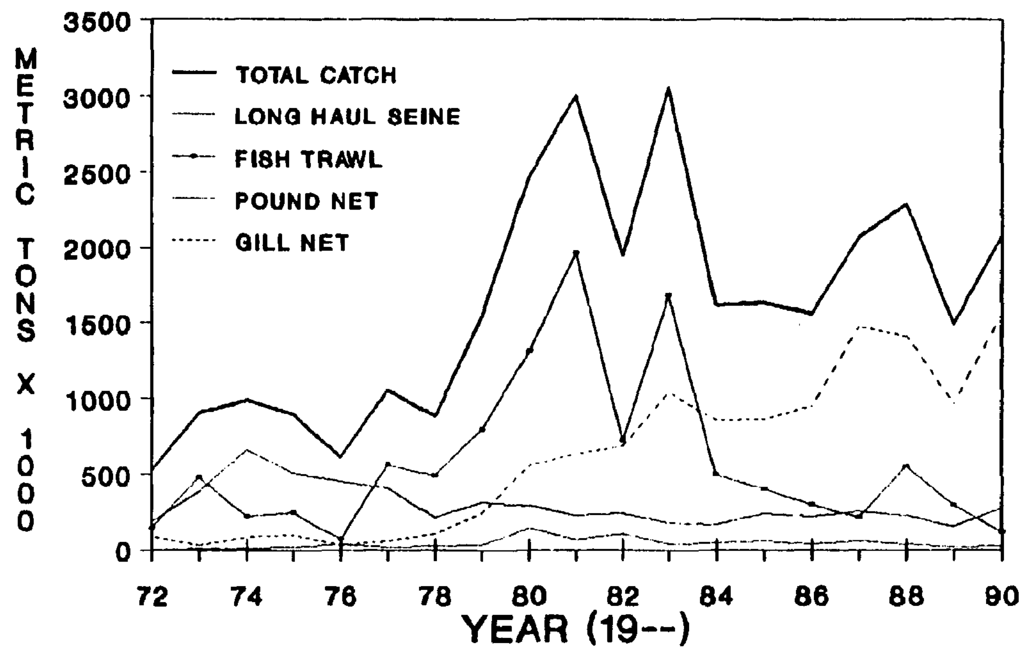


Figure 28. Commercial landings of bluefish (Pomatomus saltatrix) caught in North Carolina, 1972-1990.

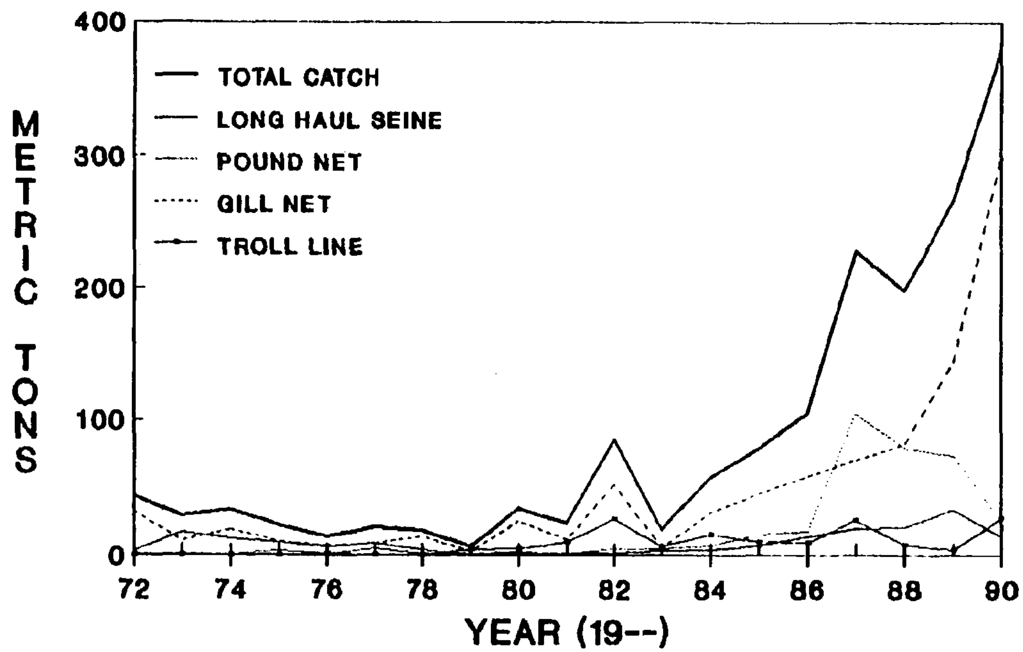


Figure 29. Commercial landings of Spanish mackerel (Scomberomorus maculatus) caught in North carolina, 1972-1990.

APPENDIX

APPENDIX A. Overall species composition and mean catch/trip of 54 pound net catches sampled in Pamlico Sound from May through October 1988.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Micropogonias undulatus	375.9	35.19	2,655	32.94	0.14	96.4
Brevoortia tyrannus	198.4	18.58	1,980	24.57	0.10	100.0
Cynoscion regalis	172.3	16.13	861	10.69	0.20	100.0
Scomberomorus maculatus	80.4	7.53	257	3.19	0.31	83.3
Peprilus alepidotus	59.8	5.59	405	5.02	0.15	77.8
Leiostomus xanthurus	50.1	4.69	642	7.97	0.08	92.6
Pomatomus saltatrix	41.0	3.84	182	2.26	0.23	85.2
Opisthonema oglinum	27.9	2.62	572	7.10	0.05	79.6
Peprilus triacanthus	8.8	0.82	106	1.31	0.08	70.4
Chaetodipterus faber	8.6	0.80	32	0.39	0.27	48.1
Callinectes sapidus	7.4	0.69	69	0.86	0.11	74.1
Bairdiella chrysoura	6.7	0.63	83	1.03	0.08	75.9
Paralichthys lethostigma	6.4	0.60	13	0.16	0.48	42.6
Paralichthys dentatus	6.2	0.58	35	0.44	0.18	55.6
Caranx hippos	4.7	0.44	12	0.14	0.41	20.4
Sphoeroides maculatus	2.3	0.21	11	0.14	0.20	33.3
Lagodon rhomboides	2.0	0.18	32	0.40	0.06	53.7
Orthopristis chrysoptera	1.7	0.16	19	0.23	0.09	59.3
Trichiurus lepturus	1.0	0.09	3	0.04	0.29	11.1
Penaeus aztecus	0.8	0.08	24	0.30	0.04	18.5
Tylosurus crocodilus	0.8	0.08	1	0.02	0.56	9.3
Menticirrhus americanus	0.7	0.07	3	0.04	0.21	13.0
Selene vomer	0.6	0.05	10	0.12	0.06	22.2
Chilomycterus schoepfi	0.6	0.05	2	0.03	0.26	18.5
Prionotus carolinus	0.6	0.05	7	0.08	0.08	16.7
Lolliguncula brevis	0.5	0.04	5	0.06	0.10	20.4
Monacanthus hispidus	0.3	0.03	11	0.14	0.03	31.5
Aluterus schoepfi	0.3	0.03	3	0.03	0.11	9.3
Urophycis regia	0.2	0.02	3	0.04	0.07	9.3
Prionotus evolans	0.2	0.02	1	0.02	0.13	7.4
Trachinotus carolinus	0.2	0.02	1	0.01	0.29	3.7
Prionotus spp.	0.2	0.02	1	0.01	0.13	5.6
Trinectes maculatus	0.1	0.01	4	0.05	0.03	18.5
Penaeus duorarum	0.1	0.01	3	0.04	0.03	14.8
Penaeus setiferus	0.1	0.01	2	0.02	0.05	5.6
Opsanus tau	0.1	0.01	<1	<0.01	0.20	3.7
Monacanthus ciliatus	0.1	0.01	1	0.01	0.14	1.9
Paralichthys albigutta	0.1	0.01	<1	<0.01	0.75	1.9
Centropristis striata	0.1	0.01	1	0.01	0.07	3.7
Menticirrhus saxatilis	0.1	0.01	<1	<0.01	0.16	1.9
Prionotus tribulus	<0.1	<0.01	<1	<0.01	0.16	3.7
Archosargus probatocephalus	<0.1	<0.01	1	0.01	0.05	3.7
Diplodus holbrooki	<0.1	<0.01	1	0.01	0.03	3.7
Symphurus plagiusa	<0.1	<0.01	1	0.01	0.03	11.1
Scophthalmus aquosus	<0.1	<0.01	1	0.01	0.03	3.7
Larimus fasciatus	<0.1	<0.01	<1	0.01	0.03	3.7
Portunus spinimanus	<0.1	<0.01	<1	<0.01	0.10	1.9
Selene setapinnis	<0.1	<0.01	<1	<0.01	0.05	1.9
Citharichthys spilopterus	<0.1	<0.01	<1	<0.01	0.03	3.7
Sciaenops ocellatus	<0.1	<0.01	<1	<0.01	0.04	1.9
Prionotus scitulus	<0.1	<0.01	<1	<0.01	0.02	5.6

Observed species

Elops saurus	Stenotomus spp.
Alosa sapidissima	Menticirrhus spp.
Porichthys plectrodon	Pogonias cromis
Rachycentron canadum	Evorthoduslyricus
Chloroscombrus chrysurus	Scomberomorus cavalla
Oligoplites saurus	Paralichthys spp.

APPENDIX B. Overall species composition and mean catch/trip of 53 sciaenid pound net catches sampled in Pamlico Sound, May-October 1989.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Micropogonias undulatus	594.0	44.3	4,676	37.6	0.13	100.0
Brevoortia tyrannus	300.9	22.5	3,894	31.3	0.08	100.0
Scomberomorus maculatus	105.0	7.8	437	3.5	0.24	81.1
Leiostomus xanthurus	100.5	7.5	1,490	12.0	0.07	100.0
Cynoscion regalis	79.5	5.9	459	3.7	0.17	96.2
Pomatomus saltatrix	40.9	3.1	296	2.4	0.14	98.1
Peprilus alepidotus	33.5	2.5	231	1.9	0.15	84.9
Callinectes sapidus	17.3	1.3	122	1.0	0.14	86.8
Opisthonema oglinum	12.2	0.9	311	2.5	0.04	79.2
Chaetodipterus faber	8.8	0.7	36	0.3	0.24	58.5
Peprilus triacanthus	8.2	0.6	111	0.9	0.07	83.0
Paralichthys lethostigma	7.8	0.6	15	0.1	0.54	34.0
Bairdiella chrysoura	5.8	0.4	73	0.6	0.08	75.5
Paralichthys dentatus	3.7	0.3	26	0.2	0.14	54.7
Prionotus carolinus	3.3	0.3	12	0.1	0.28	47.2
Tylosurus crocodilus	3.3	0.3	4	<0.1	0.77	24.5
Caranx hippos	3.1	0.2	31	0.3	0.10	39.6
Penaeus aztecus	2.4	0.2	65	0.5	0.04	39.6
Orthopristis chrysoptera	2.0	0.2	33	0.3	0.06	60.4
Sphoeroides maculatus	1.8	0.1	12	0.1	0.16	47.2
Lagodon rhomboides	1.2	0.1	14	0.1	0.08	20.7
Selene vomer	0.9	0.1	22	0.2	0.04	39.6
Monacanthus hispidus	0.7	0.1	24	0.2	0.03	47.2
Caranx spp.	0.6	0.1	5	<0.1	0.13	1.9
Chilomycterus schoepfi	0.5	<0.1	2	<0.1	0.23	15.1
Aluterus schoepfi	0.4	<0.1	4	<0.1	0.10	15.1
Menticirrhus americanus	0.3	<0.1	4	<0.1	0.09	15.1
Prionotus tribulus	0.3	<0.1	3	<0.1	0.10	7.5
Prionotus carolinus	0.2	<0.1	5	<0.1	0.04	13.2
Mugil cephalus	0.2	<0.1	1	<0.1	0.15	5.7
Trinectes maculatus	0.2	<0.1	3	<0.1	0.05	13.2
Trichiurus lepturus	0.1	<0.1	1	<0.1	0.12	17.0
Sphyraena borealis	0.1	<0.1	<1	<0.1	0.32	1.9
Penaeus duorarum	0.1	<0.1	4	<0.1	0.03	3.8
Centropristis striata	0.1	<0.1	3	<0.1	0.04	9.4
Centropristis philadelphica	0.1	<0.1	1	<0.1	0.07	3.8
Opsanus tau	0.1	<0.1	<1	<0.1	0.25	3.8
Citharichthys spilopterus	0.1	<0.1	3	<0.1	0.02	9.4
Mycteroperca microlepis	0.1	<0.1	1	<0.1	0.11	3.8
Synodus foetens	0.1	<0.1	1	<0.1	0.06	1.9
Prionotus evolans	<0.1	<0.1	1	<0.1	0.04	3.8
Urophycis regia	<0.1	<0.1	<1	<0.1	0.16	3.8
Alosa mediocris	<0.1	<0.1	<1	<0.1	0.12	3.8
Squilla empusa	<0.1	<0.1	<1	<0.1	0.05	1.9
Prionotus scitulus	<0.1	<0.1	1	<0.1	0.02	3.8
Portunus spinimanus	<0.1	<0.1	1	<0.1	0.01	1.9
Caranx crysos	<0.1	<0.1	<1	<0.1	0.06	1.9
Lolliguncula brevis	<0.1	<0.1	1	<0.1	0.01	5.7
Alectis ciliaris	<0.1	<0.1	<1	<0.1	0.01	1.9
Callinectes similis	<0.1	<0.1	<1	<0.1	0.01	1.9

Observed species

Callinectes marginatus	Lobotes surinamensis	Pogonias cromis
Elops saurus	Archosargus probatocephalus	Sciaenops ocellatus
Prionotus spp.	Cynoscion nebulosus	Tautoga onitis
Rachycentron canadum	Menticirrhus spp.	Paralichthys sp.

APPENDIX C. Overall species composition and mean catch/trip of 61 pound net catches sampled in Pamlico Sound from May through October 1990.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Micropogonias undulatus	531.6	37.2	4,629	31.8	0.12	100.0
Brevoortia tyrannus	393.1	27.5	4,833	33.3	0.08	96.7
Cynoscion regalis	91.8	6.4	605	4.2	0.15	98.4
Pomatomus saltatrix	87.9	6.2	343	2.4	0.26	98.4
Leiostomus xanthurus	74.3	5.2	1,001	6.9	0.07	98.4
Scomberomorus maculatus	69.7	4.9	358	2.5	0.20	86.9
Peprilus alepidotus	37.7	2.6	348	2.4	0.11	95.1
Peprilus triacanthus	29.7	2.1	514	3.5	0.06	88.5
Callinectes sapidus	24.9	1.7	216	1.5	0.12	83.6
Opisthonema oglinum	23.1	1.6	747	5.1	0.03	59.0
Lagodon rhomboides	9.4	0.6	247	1.7	0.04	67.2
Chaetocipterus faber	7.0	0.5	84	0.6	0.08	75.4
Paralichthys lethostigma	6.4	0.4	12	0.1	0.55	29.5
Penaeus aztecus	5.9	0.4	250	1.7	0.02	45.9
Bairdiella chrysoura	5.4	0.4	89	0.2	0.06	75.4
Paralichthys dentatus	5.2	0.4	31	0.1	0.17	63.9
Trichiurus lepturus	4.4	0.3	19	<0.1	0.23	77.0
Tylosurus crocodilus	4.3	0.3	6	0.1	0.70	32.8
Sphoeroides macualtus	2.5	0.2	15	0.1	0.17	50.8
Aluterus schoepfi	2.2	0.2	18	0.1	0.12	18.0
Trachinotus carolinus	1.9	0.1	9	<0.1	0.20	49.2
Caranx hoppos	1.6	0.1	15	0.1	0.11	29.5
Chilomycterus schoepfi	1.1	0.1	4	<0.1	0.27	13.1
Orthopristis chrysoptera	0.9	0.1	14	0.1	0.07	41.0
Menticirrhus americanus	0.9	0.1	5	<0.1	0.19	18.0
Selene vomer	0.7	<0.1	17	0.1	0.05	36.1
Urophycis regia	0.6	<0.1	11	<0.1	0.06	16.4
Prionotus carolinus	0.6	<0.1	6	<0.1	0.10	14.7
Monacanthus hispidus	0.5	<0.1	20	0.1	0.03	42.6
Trinectes maculatus	0.3	<0.1	12	<0.1	0.04	27.9
Chloroscombrus chrysurus	0.3	<0.1	27	0.2	0.01	18.0
Mugil cephalus	0.3	<0.1	2	<0.1	0.13	6.6
Archosargus probatocephalus	0.2	<0.1	0	<0.1	0.66	16.4
Lolliguncula brevis	0.2	<0.1	6	<0.1	0.04	18.0
Prionotus evolans	0.2	<0.1	3	<0.1	0.07	18.0
Caranx crysos	0.2	<0.1	2	<0.1	0.09	11.5
Synodus foetens	0.1	<0.1	1	<0.1	0.18	4.9
Mycteroperca microlepis	0.1	<0.1	1	<0.1	0.16	6.6
Elops saurus	8.3	<0.1	1	<0.1	0.24	4.9
Prionotus scitulus	7.6	<0.1	2	<0.1	0.06	4.9
Prionotus tribulus	7.1	<0.1	4	<0.1	0.03	6.6
Oligoplites saurus	4.7	<0.1	1	<0.1	0.12	1.6
Alectis ciliaris	3.6	<0.1	1	<0.1	0.08	1.6
Penaeus setiferus	3.4	<0.1	2	<0.1	0.03	4.9
Citharichthys spilopterus	3.2	<0.1	4	<0.1	0.01	11.5
Eucinostomus spp.	1.7	<0.1	1	<0.1	0.03	4.9
Alosa mediocris	1.3	<0.1	0	<0.1	0.13	1.6
Scophthalmus aquosus	0.9	<0.1	0	<0.1	0.03	3.3
Mustelus canis	0.8	<0.1	0	<0.1	0.09	1.6
Penaeus duorarum	0.5	<0.1	0	<0.1	0.02	3.3
Callinectes marginatus	0.2	<0.1	0	<0.1	0.02	1.6
Caranx spp.	0.1	<0.1	0	<0.1	0.02	3.3
Portunus spinimanus	<0.1	<0.1	0	<0.1	0.01	1.0

Observed species

Alosa aestivalis
Rachcentron canadum
Cynoscion nebulosus
Menticirrhus spp.
Menticirrhus saxatilis
Pogonias cromis
Sciaenops ocellatus
Scomberomorus cavalla
Paralichthys spp.

APPENDIX D. Monthly and total commercial landings of dominant or selected species captured by Dare County pound nets in 1985, including total North Carolina pound nets landings (State) and the percent of those landings accounted for by Dare County (% Dare).

	Commercial landings (kg)								Percent
	May	Jun	Jul	Aug	Sep	Oct	Total	State	Dare
Bluefish	5,777	3,191	4,383	14,602	19,354	4,082	51,389	60,356	85.1
Butterfish*	302	3,177	8,549	1,172	950		13,950		
Atlantic croaker	51,582	76,395	118,139	183,625	136,364	1,207	567,313	615,203	92.2
Red drum	20	0	0	0	298	19	328	1,273	25.6
Flounder	263	619	1,187	1,502	20,916	9,684	34,173	242,513	14.0
Harvestfish*	2,985	15,083	10,064	4,655	7,109	68	86,325	90,235	60.8
Pompano	9	31	138	396	389	38	1,001	4,633	21.6
Seatrout, gray	24,639	35,869	46,854	41,958	50,638	1,785	191,742	214,477	89.4
Seatrout, speckled	39	0	45	11	1	0	97	193	50.2
Spanish mackerel	0	612	1,176	5,036	2,092	844	9,759	14,931	65.3
Spot	17,528	9,402	9,766	9,915	6,921	2,788	56,319	66,889	84.1
Bait (scrap)	43,015	117,471	162,525	121,587	101,559	3,171	549,328	634,107	86.6
Total	148,052	265,732	372,772	397,134	344,689	24,177	1,552,555	6,888,675	22.5
Total marketable	105,037	148,261	210,247	275,546	243,130	21,006	1,003,227	6,254,568	16.09
Percent bait (scrap)	29.0	44.2	43.6	30.6	39.5	13.1	35.4	9.2	

* North Carolina commercial landings combined harvestfish and butterfish landings in 1985 as harvestfish; for the purpose of this report, we extrapolated out butterfish landings based on our monthly relative proportions of the two species in our samples.

APPENDIX E. Monthly and total commercial landings of dominant or selected species captured by Dare County pound nets in 1986, including total North Carolina pound nets landings (State) and the percent of those landings accounted for by Dare County (% Dare).

	Commercial landings (kg)								Percent
	May	Jun	Jul	Aug	Sep	Oct	Total	State	Dare
Bluefish	1,590	1,563	8,191	9,210	7,354	3,764	30,272	35,887	84.4
Butterfish			4,159	2,727	2,541	543	9,970	10,898	91.5
Atlantic croaker	6,160	47,568	90,273	74,685	11,309	4,425	234,421	250,813	93.5
Red drum				9	23	476	508	3,263	15.6
Flounder	334	743	1,500	2,369	25,453	12,867	98,730	504,052	19.6
Harvestfish	3,545	14,601	5,851	4,724	3,002	2,048	33,771	68,85	49.0
Pompano	5	25	293	191	347	1,701	2,463	6,632	38.6
Seatrout, gray	6,851	3,447	22,480	11,820	29,154	14,034	87,773	114,671	76.6
Seatrout, spotted	2	10	91	4	153		260	587	44.3
Spanish mackerel	334	517	3,602	6,683	3,066	1,826	16,028	17,189	93.2
Spot	864	3,976	7,312	3,536	3,402	2,923	22,013	26,001	84.7
Bait (scrap)	8,913	3,901	43,354	43,214	6,101	17,690	123,091	234,418	52.5
Total	29,493	77,460	190,395	168,409	94,845	123,477	684,081	4,161,969	16.4
Total marketable	20,580	73,559	147,042	125,194	88,745	105,787	460,989	3,927,551	14.3
Percent bait (scrap)	30.2	5.0	22.8	25.7	6.4	14.3	18.0	5.6	

APPENDIX F. Monthly and total commercial landings of dominant or selected species captured by Dare County pound nets in 1987, including total North Carolina pound nets landings (State) and the percent of those landings accounted for by Dare County (% Dare).

	Commercial landings (kg)								Percent
	May	Jun	Jul	Aug	Sep	Oct	Total	State	Dare
Bluefish	1,538	6,392	6,279	6,628	17,725	2,541	41,103	53,881	76.3
Butterfish	8	201	1,715	1,336	1,140	138	4,538	5,023	90.0
Atlantic croaker	3,254	67,761	107,256	94,086	205,440	100,814	578,611	634,460	91.2
Red drum	-	6	-	236	2,434	16,168	18,844	24,166	78.0
Flounder	698	685	2,072	29,852	56,079	73,856	163,242	412,072	39.6
Harvestfish	68	13,982	8,790	5,590	7,149	1,937	37,515	52,911	70.9
Pompano	4	367	630	474	597	234	2,305	4,960	46.5
Seatrout, gray	2,472	17,726	34,921	49,145	70,171	25,003	199,437	229,709	86.8
Seatrout, speckled	-	63	30	28	0	2,268	2,389	2,680	89.1
Spanish mackerel	532	28,996	15,385	21,203	13,693	1,666	81,475	104,840	77.7
Spot	102	10,449	13,781	6,811	15,091	4,771	51,005	65,576	77.8
Bait (scrap)	12,406	73,245	99,137	64,671	54,952	24,707	329,117	407,620	80.7
Total	22,601	231,961	297,478	286,235	453,033	266,7811	1,558,019	2,845,305	54.8
Total marketable	10,194	158,716	198,341	221,564	398,081	242,004	1,228,902	2,437,685	50.4
Percent bait (scrap)	54.9	31.6	33.3	22.6	12.1	9.3	21.1	14.3	

APPENDIX G. Annual species composition, mean weight (kg) and number of fish (Mean no. fish) per ctch for the top 99% (by weight) of pound net catches for 1985-87, including number of catches sampled (n) and the percent of the total weight of the catches sampled (% TW).

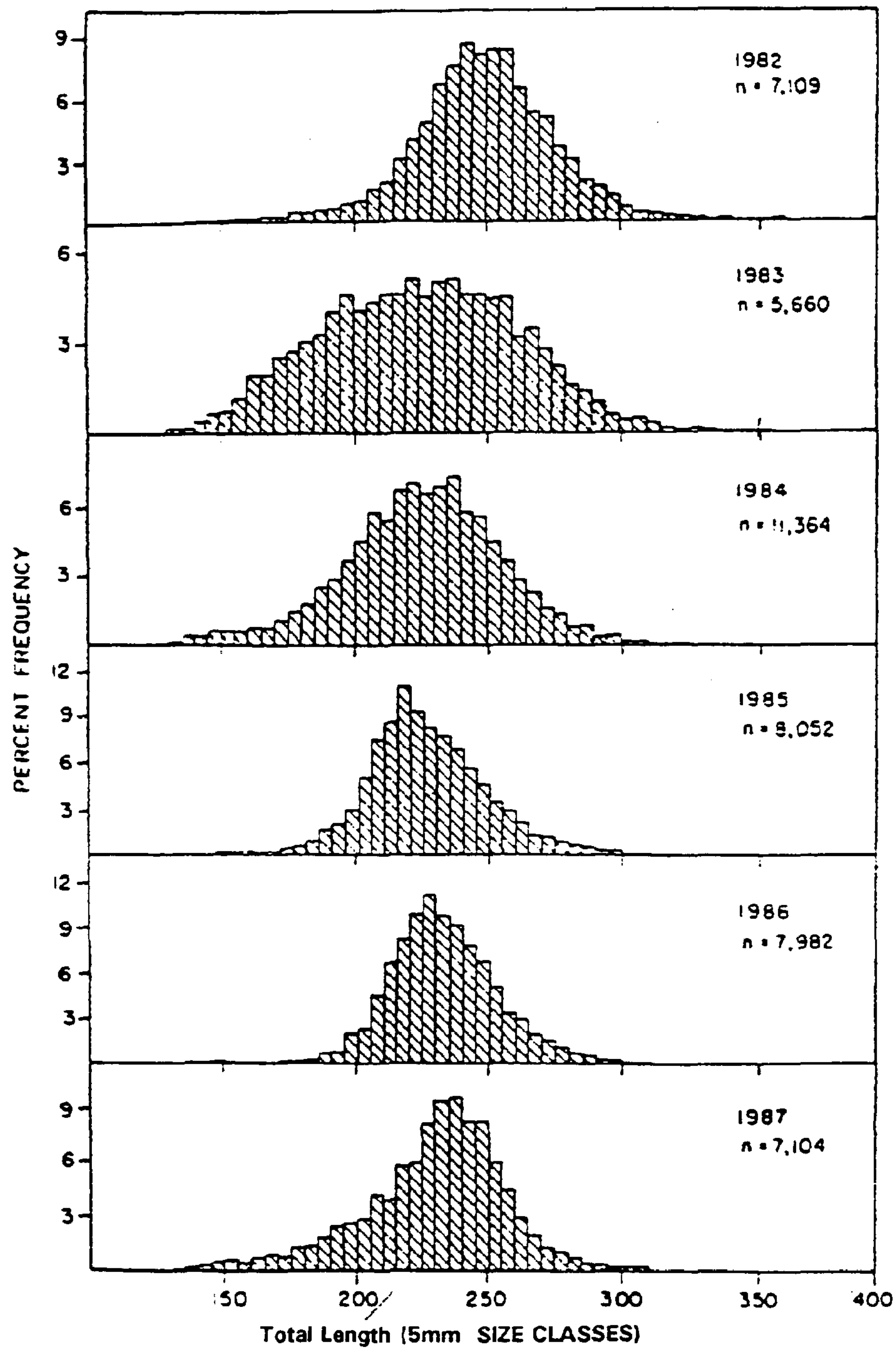
Species	Weight (kg)		Mean no. fish	Species	Weight (kg)		Mean no. fish	Species	Weight (kg)		Mean no. fish
	Mean	Percent			Mean	Percent			Mean	Percent	
1985 (n=39)				1986 (n=55)				1987 (n=56)			
Micropogonias undulatus	1,290.3	65.6	10,142	Micropogonias undulatus	706.2	48.5	4,080	Micropogonias undulatus	649.8	46.0	4,414
Cynoscion regalis	158.4	8.1	821	Brevoortia tyrannus	172.2	13.7	2,062	Cynoscion regalis	222.9	15.8	1,495
Brevoortia tyrannus	122.3	6.2	2,176	Cynoscion regalis	171.8	13.7	1,203	Brevoortia tyrannus	219.4	15.4	2,212
Peprilus alepidotus	90.3	4.6	964	Peprilus alepidotus	96.1	7.7	834	Scomberomorus maculatus	69.0	4.9	252
Pomatomus saltatrix	71.0	3.6	279	Leiostomus xanthurus	47.3	3.8	519	Peprilus alepidotus	65.7	4.6	265
Leiostomus xanthurus	63.4	3.2	969	Pomatomus saltatrix	32.5	2.6	149	Leiostomus xanthurus	45.7	3.2	561
Scomberomorus maculatus	45.2	2.3	276	Opisthonema oglinum	23.0	1.8	357	Pomatomus saltatrix	33.7	2.3	172
Peprilus triacanthus	32.5	1.7	391	Scomberomorus maculatus	22.3	1.8	71	Opisthonema oglinum	13.7	1.0	210
Lagodon rhomboides	16.1	0.8	214	Lagodon rhomboides	19.6	1.6	255	Callinectes sapidus	10.9	0.8	70
Caranx hippos	12.5	0.6	65	Peprilus triacanthus	19.4	1.5	249	Peprilus triacanthus	10.7	0.8	121
Trichiurus lepthurus	11.1	0.6	48	Paralichthys lethostigma	6.6	0.5	12	Caranx hippos	10.4	0.7	32
Paralichthys lethostigma	9.7	0.5	14	Chaetodipterus faber	6.6	0.5	31	Rachycentron canadum	10.3	0.7	1
Chaetodipterus faber	7.9	0.4	42	Bairdiella chrysoura	4.6	0.4	59	Paralichthys lethosigma	9.4	0.7	19
Paralichthys dentatus	7.7	0.4	59	Caranx hoppos	4.4	0.3	31	Bairdiella chrysoura	6.7	0.5	86
Bairdiella chrysoura	5.2	0.3	30	Trachinotus carolinus	3.3	0.3	13	Paralichthys dentatus	5.7	0.4	51
Callinectes sapidus	5.2	0.3	51	Tylosurus crocodilus	3.3	0.3	6	Lagodon rhomboides	5.4	0.4	47
				Trichiurus lepturus	2.3	0.2	11	Chaetodipterus faber	4.3	0.3	23
								Trichiurus lepturus	3.5	0.2	17
								Selene vomer	3.0	0.2	55

APPENDIX H. Annual age composition of bluefish, *Pomatomus saltatrix*, captured by North Carolina sciaenid pound nets, 1982-90.

Age composition	AGE 0	AGE 1	AGE 2
1982	92.88	17.09	0.03
1983	47.79	54.03	1.80
1984	65.57	34.09	0.35
1985	58.05	39.30	3.65
1986	44.39	53.42	2.18
1987	33.70	60.90	5.40
1988	83.55	13.52	2.93
1989	86.60	13.36	0.04
1990	53.32	46.43	0.25

APPENDIX I. Monthly (A; 1990), annual (B; 1990) and scrap (C; 1990) expanded length frequencies of Atlantic croaker, Micropogonias undulatus, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

			Percent frequency/size class (TL, mm)									
		n	<151	151-175	176-200	201-225	226-250	251-275	276-300	301-325	326-350	>350
A. Month	Year						--------------------Marketable					----------------
May	1988	69		1.4	14.5	47.9	26.1	5.8	4.3			
Jun		1,506	0.1	0.5	13.3	31.2	28.0	19.9	5.5	1.4	0.1	
Jul		2,301	0.1	0.9	18.4	26.4	38.0	13.8	1.6	0.4	0.3	0.1
Aug		1,778	0.6	2.3	20.2	40.1	23.5	9.7	2.7	0.5	0.3	0.1
Sep		943	0.3	3.4	6.0	14.2	26.4	31.7	13.8	4.1	0.2	0.2
Oct		173	4.2	54.5	4.1	23.6	11.4	1.5	0.3	0.4		
May	1989	1,028	-	4.1	24.7	41.2	22.5	6.1	1.3	0.1		
Jun		2,773	0.2	0.8	10.2	34.4	36.6	13.5	3.6	0.7		
Jul		3,253	2.6	2.1	21.3	51.2	19.5	2.8	0.4	0.1	-	
Aug		1,130	6.3	7.8	5.7	33.1	32.5	11.0	2.0	0.8	0.8	
Sep		1,252	3.2	20.8	7.5	15.6	27.3	18.6	4.5	2.0	0.4	0.1
Oct		26	-	60.0	30.0	5.0	5.0					
May	1990	934	2.7	2.4	14.5	42.7	30.7	6.7	0.3			
Jun		2,397	4.8	4.4	24.0	37.1	24.2	4.3	1.1	0.1		
Jul		3,807	5.3	10.7	12.9	29.7	29.1	10.6	1.5	0.2		
Aug		3,246	2.5	4.8	7.2	35.8	38.5	9.7	1.4	0.1		
Sep		1,529	4.4	25.6	13.5	14.4	27.6	12.1	1.7	0.5	0.1	0.1
Oct		37	16.5	44.7	11.7	9.7	-	-	17.4			
B. Annual	1982	7,109	0.2	1.1	3.0	11.2	35.7	33.9	11.7	2.2	0.5	0.5
	1983	5,660	1.4	8.0	17.5	22.5	23.5	18.2	7.2	1.1	0.3	0.2
	1984	11,364	0.1	1.8	3.9	12.3	29.8	32.4	15.0	3.9	0.7	0.1
	1985	8,232	0.4	1.4	8.4	41.8	33.5	11.3	2.7	0.4	<0.1	0.1
	1986	7,982	0.5	0.7	4.0	31.7	44.6	15.0	2.9	0.5	0.1	<0.1
	1987	7,104	1.3	3.6	9.5	22.4	43.4	16.5	2.7	0.5	0.1	
	1988	6,770	0.4	2.6	15.5	29.2	29.2	16.7	4.8	1.3	0.2	0.1
	1989	9,462	1.9	4.6	14.0	37.5	28.8	10.1	2.3	0.6	0.2	
	1990	11,950	4.1	8.1	14.5	33.0	30.4	8.4	1.3	0.2	-	-
C. Scrap	1986	1,807	1.3	1.1	7.7	55.3	34.6					
	1987	1,677	2.3	5.6	23.4	45.5	23.0	0.2				
	1988	1,204	0.5	3.3	26.5	43.5	25.7	0.5				
	1989	2,043	2.4	5.7	20.3	54.8	16.5	0.2	0.1			
	1990	2,665	6.5	11.4	20.2	44.9	16.7	0.3				



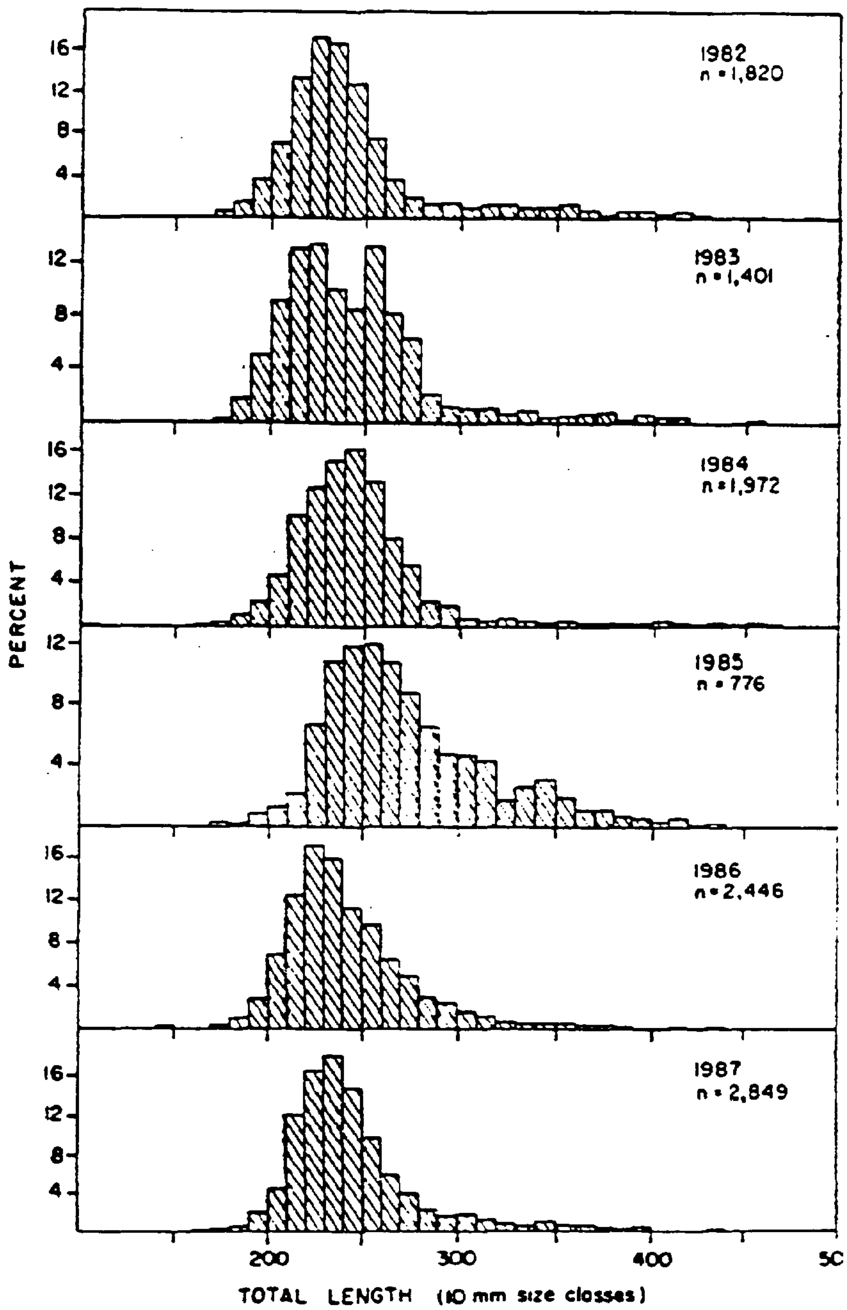
Appendix J. Expanded annual length frequencies of Atlantic croaker (Micropogonias undulatus) from sciaenid pound net samples, 1982-1987.

Appendix K. Annual age composition of Atlantic croaker, *Micropogonias undulatus*, captured by North Carolina sciaenid pound nets, 1982-90.

Age composition	AGE 0	1	2	3	4	5
1982	4.59	63.12	30.03	2.16	0.09	0.01
1983	12.57	65.62	20.14	1.57	0.10	0.01
1984	13.87	69.07	16.35	0.69	0.03	0.03
1985	13.10	72.59	13.79	6.49	0.03	0.00
1986	7.71	71.29	20.11	0.84	0.04	0.01
1987	10.50	70.00	18.67	0.80	0.03	0.00
1988	6.08	61.57	28.41	3.84	0.06	0.05
1989	11.30	65.68	17.19	4.69	1.09	0.05
1990	17.04	49.65	27.72	5.47	0.12	

APPENDIX L. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of weakfish, Cynoscion regalis, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

			Percent frequency size class (FL, mm)							
		n	<201	201-250	251-300	301-350	351-400	401-450	451-500	>500
A. Month	Year									
May	1988	65		10.8	47.7	36.9	4.6			
Jun		469	1.4	39.6	44.1	10.8	3.5	0.6		
Jul		366	1.0	44.6	41.2	8.4	2.0	2.4	0.3	0.1
Aug		769		45.3	42.3	6.5	3.8	1.6	0.5	
Sep		427	0.5	14.1	53.8	18.5	8.5	4.4	0.2	
Oct		726	19.5	15.0	40.0	13.6	8.9	1.7	1.2	0.1
May	1989	72	1.3	19.7	57.8	13.8	7.4			
Jun		50	14.2	54.2	27.1	4.5				
Jul		364	0.8	60.7	28.7	6.8	2.1	0.9		
Aug		363	14.5	55.3	23.1	4.9	2.0	0.2		
Sep		379	11.2	31.9	32.3	13.2	8.7	1.8	0.9	
Oct		15	-	42.9	50.0	7.1				
May	1990	111	12.1	44.6	32.0	9.0	1.2	1.0		
Jun		199	12.3	54.9	22.9	9.9				
Jul		436	4.5	69.0	22.4	3.3	0.8			
Aug		400	1.4	56.4	37.0	4.9	0.2	0.1		
Sep		307	7.1	26.4	48.0	15.8	2.6			
Oct		32	10.1	25.2	59.2	5.5				
B. Annual	1982	1,820	5.8	67.2	15.7	5.6	3.6	1.6	0.4	0.1
	1983	1,401	7.2	53.8	30.8	4.1	2.9	0.8	0.4	
	1984	1,972	4.0	58.6	30.9	2.8	2.0	1.2	0.5	
	1985	776	1.2	33.4	41.6	18.5	3.6	1.5	0.1	0.1
	1986	2,446	4.3	63.2	26.5	4.3	1.3	0.3	0.1	
	1987	2,849	3.2	66.0	23.3	5.1	1.9	0.4	0.1	
	1988	2,822	3.3	34.6	43.9	10.8	4.9	2.0	0.5	
	1989	1,234	7.9	49.7	29.7	8.0	3.7	0.8	0.2	
	1990	1,485	5.9	51.8	33.7	7.7	0.8	0.1		
C. Scrap	1986	589	7.2	91.2	1.6					
	1987	651	10.6	86.2	3.2					
	1988	262	21.9	73.2	4.9					
	1989	141	39.1	59.1	0.3	1.5				
	1990	171	15.2	84.4	0.4					



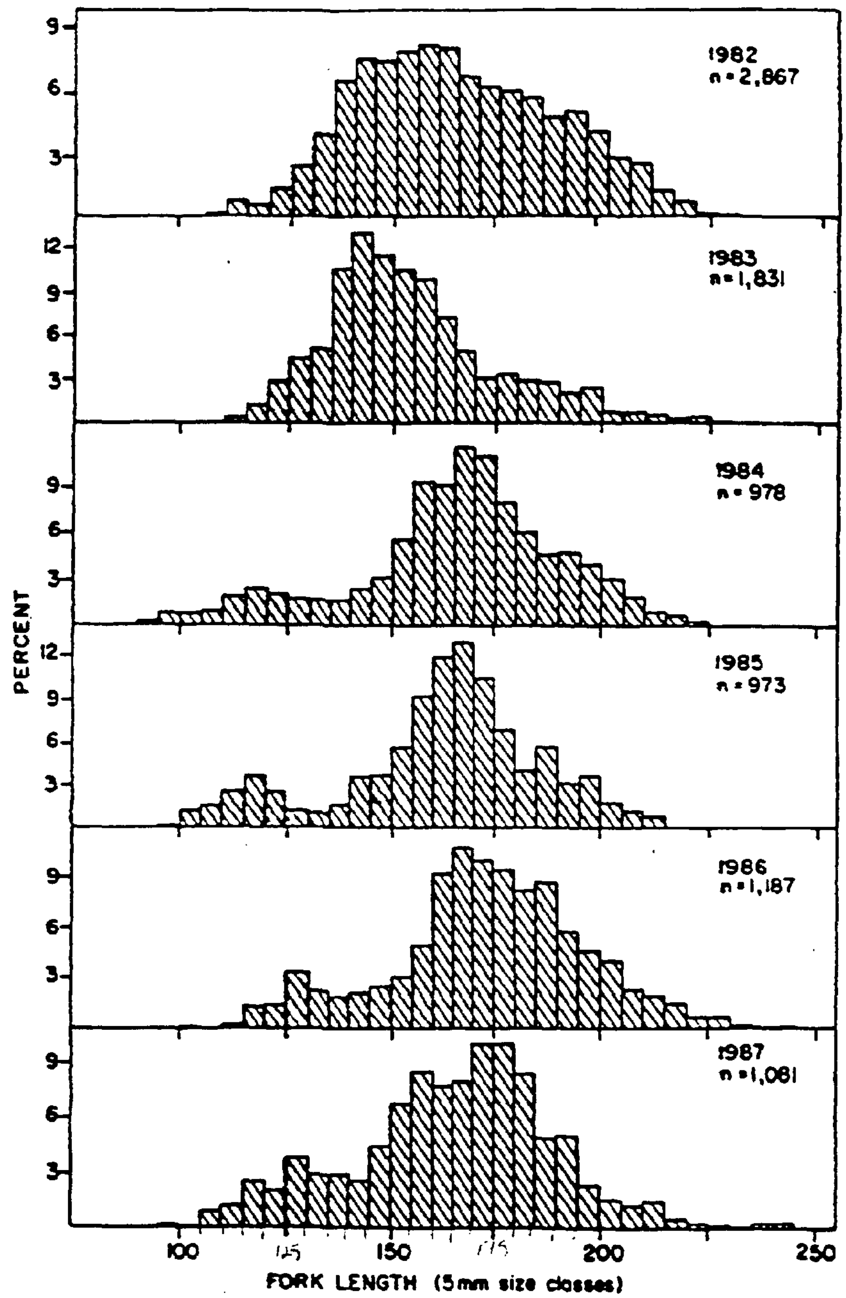
Appendix M. Expanded annual length frequencies of weakfish (Cynoscion regalis) from sciaenid pound net samples, 1982-1987.

Appendix N. Annual age composition of weakfish, *Cynoscion regalis*, captured by North Carolina sciaenid pound nets, 1982-90.

Age composition	AGE 0	1	2	3	4	5
1982	1.02	70.43	24.21	3.43	0.84	0.08
1983	1.10	69.20	26.50	2.63	0.52	0.05
1984	0.73	68.81	27.17	2.57	0.62	0.09
1985	0.18	51.07	42.47	5.49	0.77	0.03
1986	0.97	71.15	25.96	1.69	0.20	0.02
1987	0.84	70.76	26.04	2.06	0.27	0.04
1988	0.08	45.82	46.92	6.36	0.82	
1989	1.63	48.78	39.56	8.61	1.33	0.08
1990	2.92	26.51	66.77	3.48	0.33	

APPENDIX O. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of spot Leiostomus xanthurus, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

			Percent frequency size class (FL, mm)									
		n	<120	121-135	136-150	151-165	166-180	181-195	196-210	211-225	226-240	>240
A. Month	Year								-----------Marketable--------			
May	1988	20			25.0	40.0	15.0	20.0				
Jun		310	1.9	1.4	2.6	25.5	56.4	10.6	1.6			
Jul		657	4.6	1.9	0.3	3.1	52.7	31.3	4.5	1.6		
Aug		604	15.6	20.5	13.7	3.8	13.3	22.4	6.8	2.0	1.1	0.8
Sep		250	2.8	15.7	15.3	12.4	6.8	17.4	15.4	9.7	4.2	0.3
Oct		62	8.7	7.7	8.0	7.9	5.9	7.2	18.8	26.0	7.0	2.8
May	1989	430	0.6	14.1	41.9	25.2	13.0	3.8	1.4			
Jun		705	1.7	12.8	38.0	25.4	12.3	8.9	0.9			
Jul		1,309	11.5	6.2	14.6	39.6	20.0	6.4	1.7			
Aug		740	13.8	7.5	2.7	4.3	11.8	30.4	23.1	6.2	0.2	
Sep		361	5.7	18.8	10.4	2.4	13.4	33.5	14.1	1.0	0.4	0.3
Oct		7	-	14.3	14.3	14.3	-	28.5	28.6			
May	1990	303	5.4	9.3	42.0	38.7	4.3	0.3				
Jun		374	19.6	16.7	20.4	32.7	8.2	2.1	0.3			
Jul		694	37.6	21.7	18.5	9.9	8.2	4.0	0.1			
Aug		1,103	11.1	8.7	7.4	11.9	16.4	29.3	13.0	2.1	0.1	
Sep		1,061	3.3	5.3	3.5	5.3	16.5	35.7	25.3	4.5	0.6	
Oct		37	8.2	16.3	6.1	20.4	26.4	-	16.5	-	6.1	
B. Annual	1982	2,867	1.5	7.9	21.5	23.7	18.8	15.2	9.1	2.1	0.2	
	1983	1,831	1.8	12.1	34.8	27.4	11.2	7.5	3.7	1.3	0.2	
	1984	978	7.5	5.3	7.1	24.2	30.5	14.6	8.9	1.8	0.1	
	1985	973	8.8	4.9	11.5	24.3	30.1	12.9	6.6	0.9		
	1986	1,187	1.5	6.8	6.4	17.2	30.0	22.6	10.6	3.9	1.0	0.1
	1987	1,081	4.9	8.6	9.9	22.9	27.8	18.2	5.0	2.2	0.3	0.2
	1988	1,903	8.1	10.1	7.3	7.4	33.0	23.5	6.4	2.8	1.0	0.4
	1989	3,552	7.6	10.1	21.3	25.0	15.1	13.2	6.4	1.2	0.1	
	1990	3,572	13.8	11.2	13.5	15.4	12.6	19.8	11.5	1.9	0.3	
C. Scrap	1986	432	3.3	7.5	7.3	19.6	39.5	20.2	2.6			
	1987	437	5.9	7.5	11.5	33.4	29.5	11.3	0.8	-	-	0.1
	1988	430	6.7	11.2	6.0	9.2	37.0	26.9	3.0			
	1989	1,091	7.6	12.3	27.6	30.5	15.6	6.0	0.4			
	1990	886	22.6	12.5	17.9	18.8	12.2	13.6	2.1	0.1	0.2	



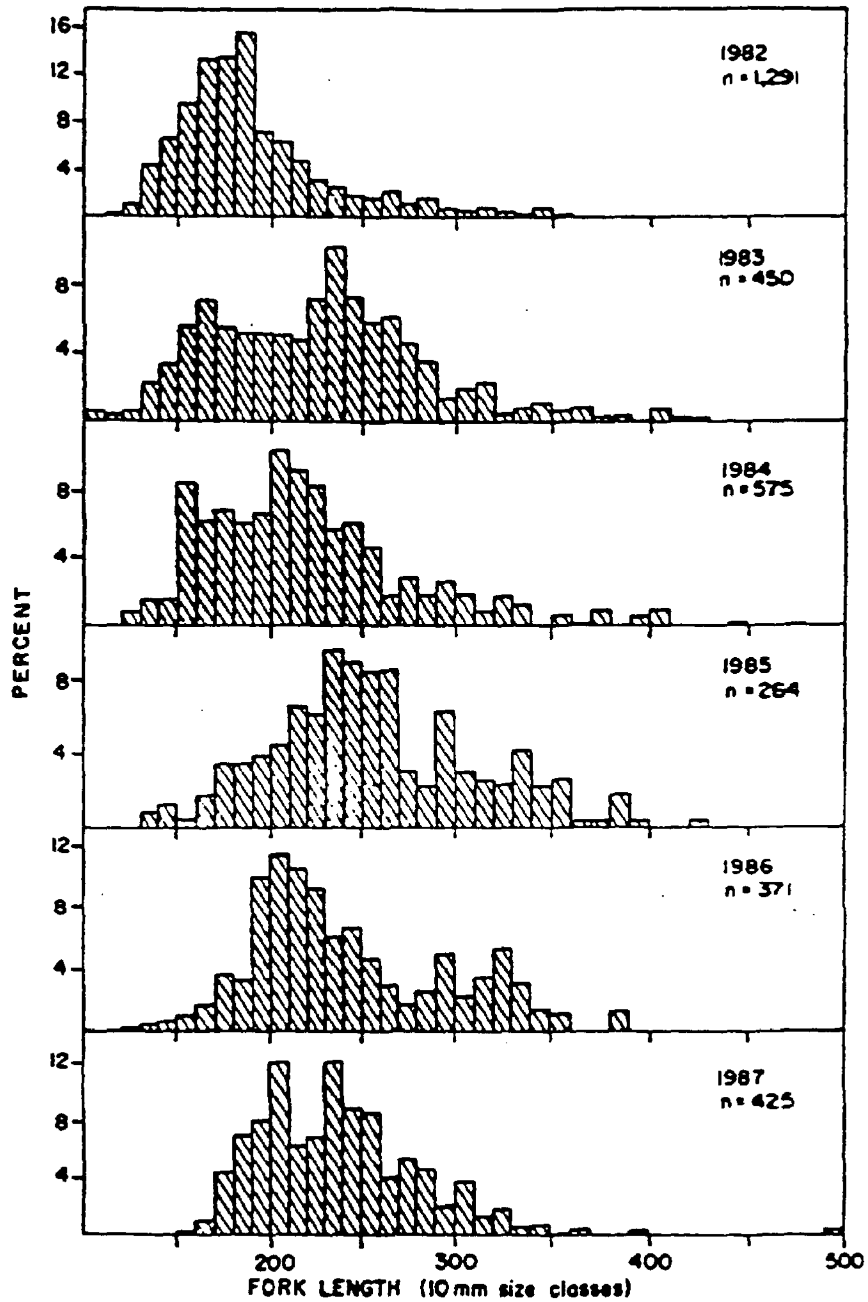
Appendix P. Expanded annual length frequencies of spot (Leiostomus xanthurus) from sciaenid pound net samples, 1982-1987.

Appendix Q. Annual age composition of spot, *Leiostomus xanthurus*, captured by North Carolina sciaenid pound nets, 1982-90.

Age composition	AGE 0	1	2	3
1982	13.91	80.26	5.63	0.20
1983	3.79	91.64	4.53	0.04
1984	22.83	64.62	12.01	0.54
1985	13.91	77.54	8.29	0.25
1986	12.66	73.48	13.49	0.38
1987	20.31	70.43	9.07	0.20
1988	17.37	71.52	10.74	0.37
1989	15.46	75.91	8.50	0.13
1990	25.50	64.68	9.54	0.28

APPENDIX R. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of bluefish, Pomatomus saltatrix, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

			Percent frequency size class (FL, mm)							
		n	<101	101-150	151-200	201-250	251-300	301-350	351-400	>400
A. Month	Year					--------Marketable--------				
May	1988									
Jun		55			1.0	45.1	32.0	4.4	17.5	
Jul		119			41.7	30.4	23.3	4.7		
Aug		301			5.9	56.3	29.2	7.9	0.7	
Sep		33				23.2	59.2	6.7	10.9	
Oct		25			16.0	84.0				
May	1989	27	-	-	45.2	35.9	18.9			
Jun		42		13.2	42.8	38.3	4.5	1.2		
Jul		353		0.2	59.8	28.7	9.4	1.9		
Aug		204			27.1	63.7	7.7	0.2	1.3	
Sep		134			17.0	66.4	15.5	1.1		
Oct		5				100.0				
May	1990	18			18.0	58.2	4.5	9.7	9.6	
Jun		247		0.5	3.9	58.9	34.0	2.7		
Jul		540			9.7	52.1	35.6	2.2	0.1	0.3
Aug		189			0.9	22.4	52.8	20.6	3.3	
Sep		196			1.4	11.9	46.8	30.3	6.0	3.6
Oct		37				45.7	34.9	9.7	2.4	7.3
B. Annual	1982	1,291	12.7	58.7	18.2	7.3	3.1			
	1983	450	7.2	27.9	34.4	21.3	6.2	1.9	1.1	
	1984	575	4.1	34.2	40.2	13.9	4.6	2.1	0.9	
	1985	264	2.1	12.1	36.5	28.5	14.5	5.8	0.5	
	1986	371	1.3	20.7	42.1	17.3	16.0	2.6	<0.1	
	1987	425		21.0	45.9	24.9	7.2	0.7	0.3	
	1988	533			12.5	48.5	29.5	6.8	2.7	
	1989	765		1.4	45.3	42.1	9.6	1.3	0.3	
	1990	1,227		0.2	5.0	43.5	38.8	10.0	1.7	0.8
C. Scrap	1986	172	2.0	35.0	62.2	0.8				
	1987	103	-	33.2	66.2	0.6				
	1988	121		1.0	14.2	70.9	12.2	1.7		
	1989	228		-	42.6	54.6	2.8			
	1990	269			7.9	65.0	26.6	0.5		



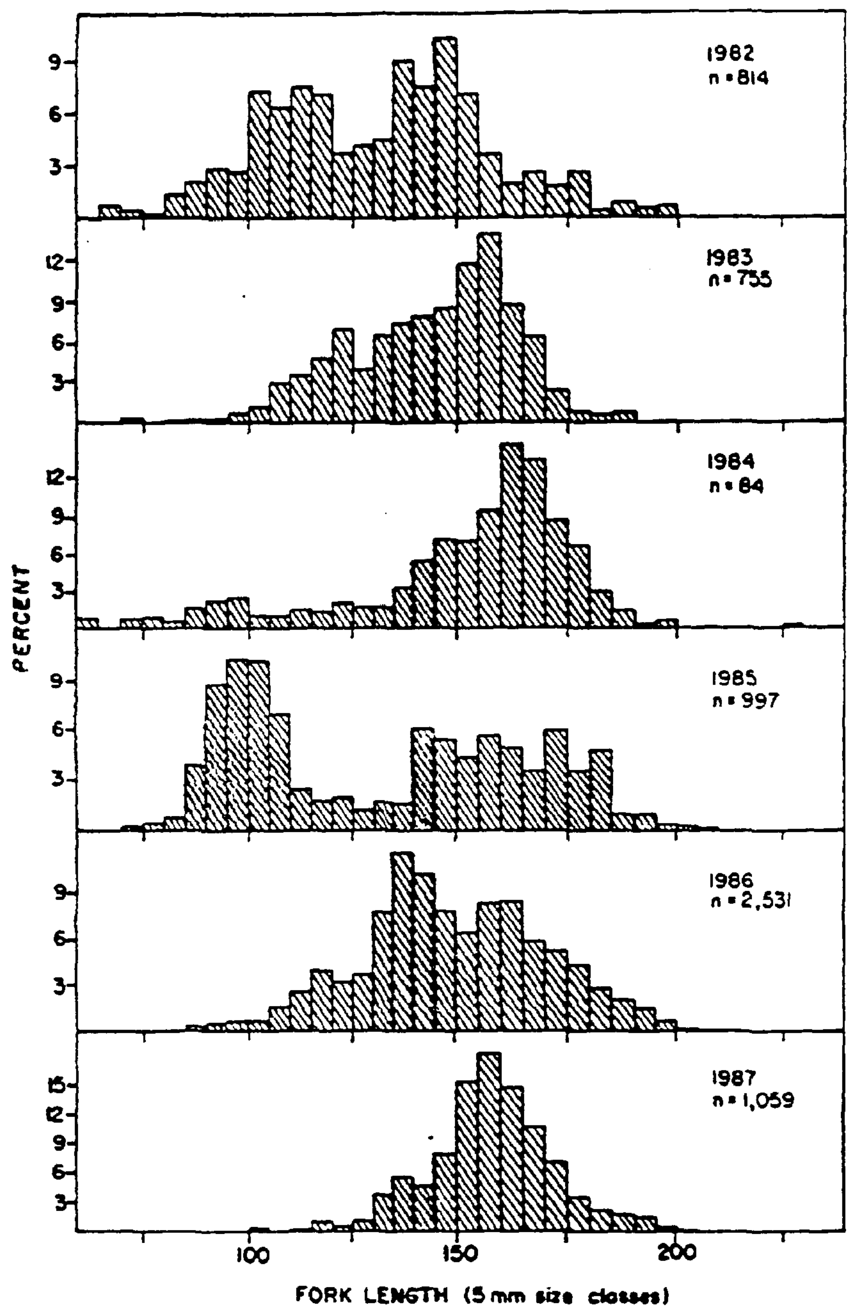
Appendix S. Expanded annual length frequencies of bluefish (Pomatomus saltatrix) from sciaenid pound net samples, 1982-1987.

APPENDIX T. Annual age composition of bluefish, _Pomatomus saltatrix_, captured by North Carolina sciaenid pound nets, 1982-90.

Age composition	AGE		
	0	1	2
1982	92.88	17.09	0.03
1983	47.79	54.03	1.80
1984	65.57	34.09	0.35
1985	58.05	39.30	3.65
1986	44.39	53.42	2.18
1987	33.70	60.90	5.40
1988	83.55	13.52	2.93
1989	86.60	13.36	0.04
1990	53.32	46.43	0.25

APPENDIX U. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of harvestfish, Peprilus alepidotus, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

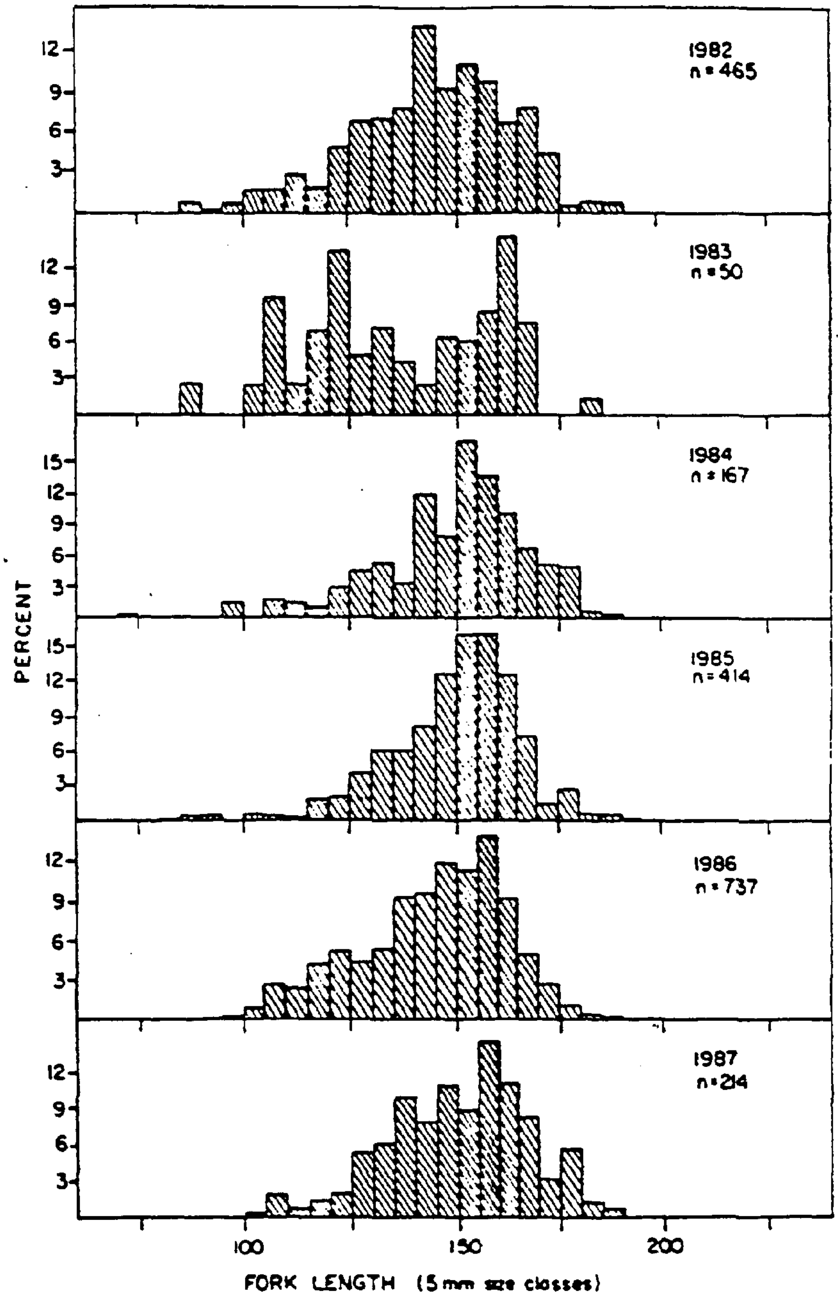
				Percent frequency/size class (FL, mm)					
			n	<90	91-120	121-150	151-180	181-210	>210
A.	Month	Year				---------Marketable---------			
	May	1988	6			16.7	83.3		
	Jun		640			8.9	75.0	16.1	
	Jul		301			10.0	83.7	6.3	
	Aug		45			14.5	77.2	8.3	
	Sep		45	1.4	6.8		76.0	15.8	
	Oct		154	12.2	27.0	6.3	45.1	9.4	
	May	1989	27	-	-	15.3	76.2	8.5	
	Jun		110	1.6	2.4	27.0	55.2	13.8	
	Jul		225	-	0.7	38.5	54.4	6.4	
	Aug		31	-	-	7.9	82.6	9.5	
	Sep		38	2.7	3.6	23.0	44.8	25.9	
	Oct		4	-	25.0	25.0	50.0		
	May	1990	48	-	-	33.5	43.1	21.5	1.9
	Jun		166	-	1.4	47.0	41.8	8.9	0.9
	Jul		207	-	0.4	66.7	23.8	9.1	
	Aug		41	-	3.8	73.3	20.7	2.2	
	Sep		268	6.4	31.6	32.9	26.8	2.3	
	Oct		306	0.6	65.2	18.6	14.6	1.0	
B.	Annual	1982	814	4.5	34.8	39.5	18.9	2.3	
		1983	755	0.8	12.4	41.0	44.3	1.5	
		1984	556	4.4	9.9	21.7	58.5	5.3	0.2
		1985	997	5.4	40.5	18.2	28.2	7.7	
		1986	2,531	0.3	9.9	44.0	38.5	7.2	0.1
		1987	1,059		1.6	23.6	69.0	5.8	
		1988	1,191	0.8	2.1	9.0	75.8	12.3	
		1989	435	0.7	1.4	31.4	56.5	10.0	
		1990	1,036	1.5	21.5	42.2	28.3	6.2	0.3
C.	Scrap	1986	71	3.7	83.3	13.0			
		1987	3	86.8	13.3				
		1988	49	13.2	75.9	9.4	1.5		
		1989	5	-	43.2	56.8			
		1990	70	22.6	67.4	10.0			



Appendix V. Expanded annual length frequencies of harvestfish (<u>Peprilus</u> <u>alepitotus</u>) from sciaenid pound net samples, 1982-1987.

APPENDIX W. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of butterfish, <u>Peprilus</u> <u>triacanthus</u>, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

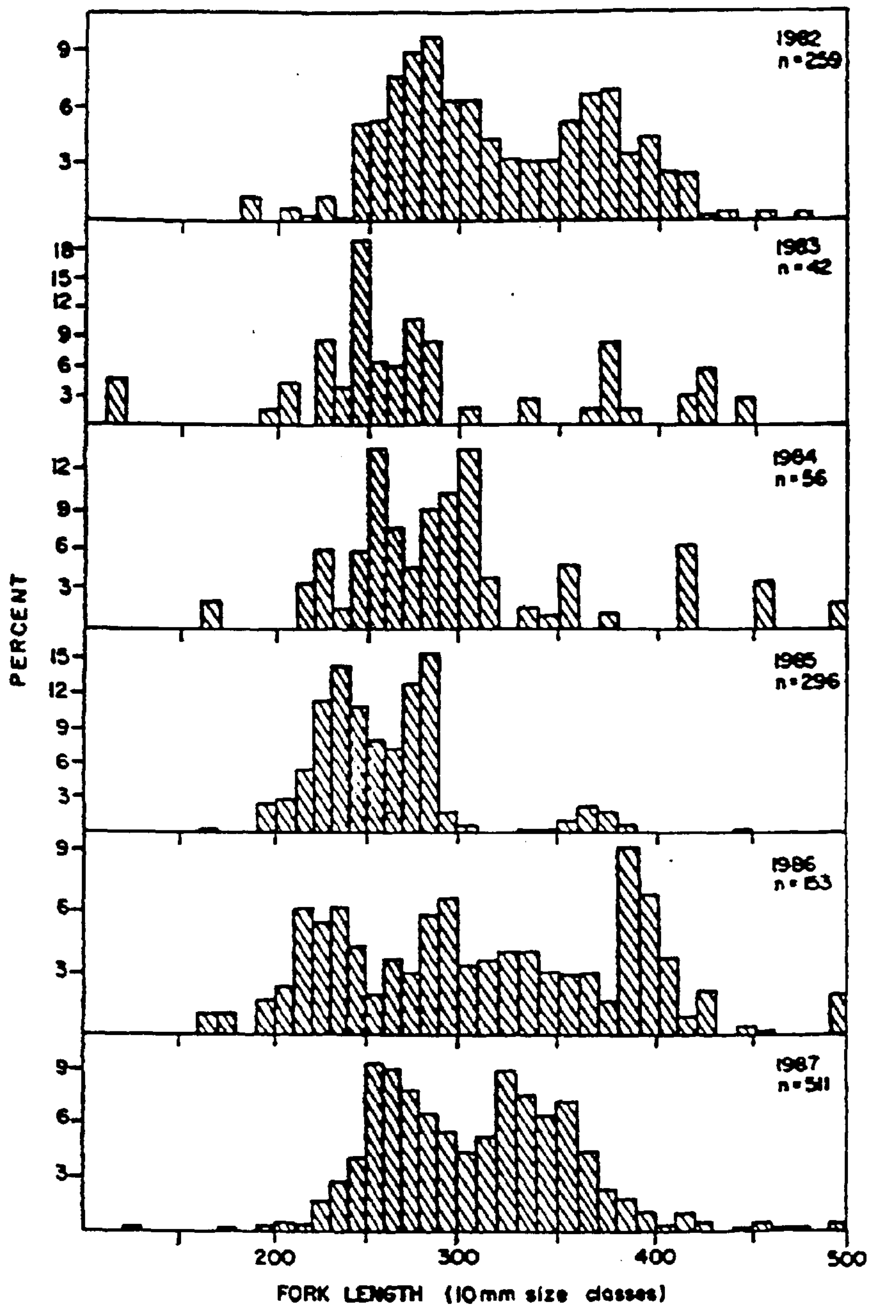
				Percent frequency/size class (FL, mm)				
			n	<90	91-120	121-150	151-180	181-210
A.	Month	Year				------------Marketable-----------		
	May	1988	13			38.5	53.8	7.7
	Jun		35		5.3	15.5	76.1	3.1
	Jul		59	1.9	13.0	52.9	26.8	5.4
	Aug		139		3.4	41.1	53.8	1.7
	Sep		10			40.2	50.0	9.8
	Oct		37	2.6	15.3	30.2	43.2	8.7
	May	1989	39		12.1	50.5	35.0	2.4
	Jun		71	5.7	19.8	13.2	56.1	5.2
	Jul		82	7.3	35.2	30.8	23.7	3.0
	Aug		19	-	8.1	43.7	46.0	2.2
	Sep		17	-	-	11.8	80.8	7.4
	Oct							
	May	1990	318	6.8	70.2	18.4	4.6	
	Jun		479	0.2	27.0	43.9	28.7	0.2
	Jul		375	1.1	11.9	67.3	19.3	0.4
	Aug		185	0.4	2.1	78.1	19.4	
	Sep		43	-	-	29.8	70.2	
	Oct		17			3.9	96.1	
B.	Annual	1982	465	0.6	9.4	48.9	39.9	1.2
		1983	50	1.7	23.6	34.4	38.5	1.8
		1984	167	0.4	5.7	36.0	56.6	1.3
		1985	414	0.6	3.9	39.4	54.7	1.4
		1986	737	-	10.2	45.1	43.9	0.8
		1987	241	-	4.8	43.5	50.3	1.4
		1988	293	0.7	6.8	40.0	48.9	3.6
		1989	228	5.2	23.2	25.0	42.6	4.0
		1990	1,417	1.6	27.6	47.4	23.2	0.2
C.	Scrap	1986	63	0.1	40.5	55.9	3.5	
		1987	12	-	23.2	70.7	6.1	
		1988	20		20.3	61.7	18.0	
		1989	28	13.1	67.6	19.3		
		1990	177	1.8	65.7	31.1	0.8	0.6



Appendix X. Expanded annual length frequencies of butterfish (<u>Peprilus triacanthus</u>) from sciaenid pound net samples, 1982-1987.

APPENDIX Y. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of Spanish mackerel, Scomberomorus maculatus, from Pamlico Sound sciaenid pound net samples; *n* = number of individuals measured.

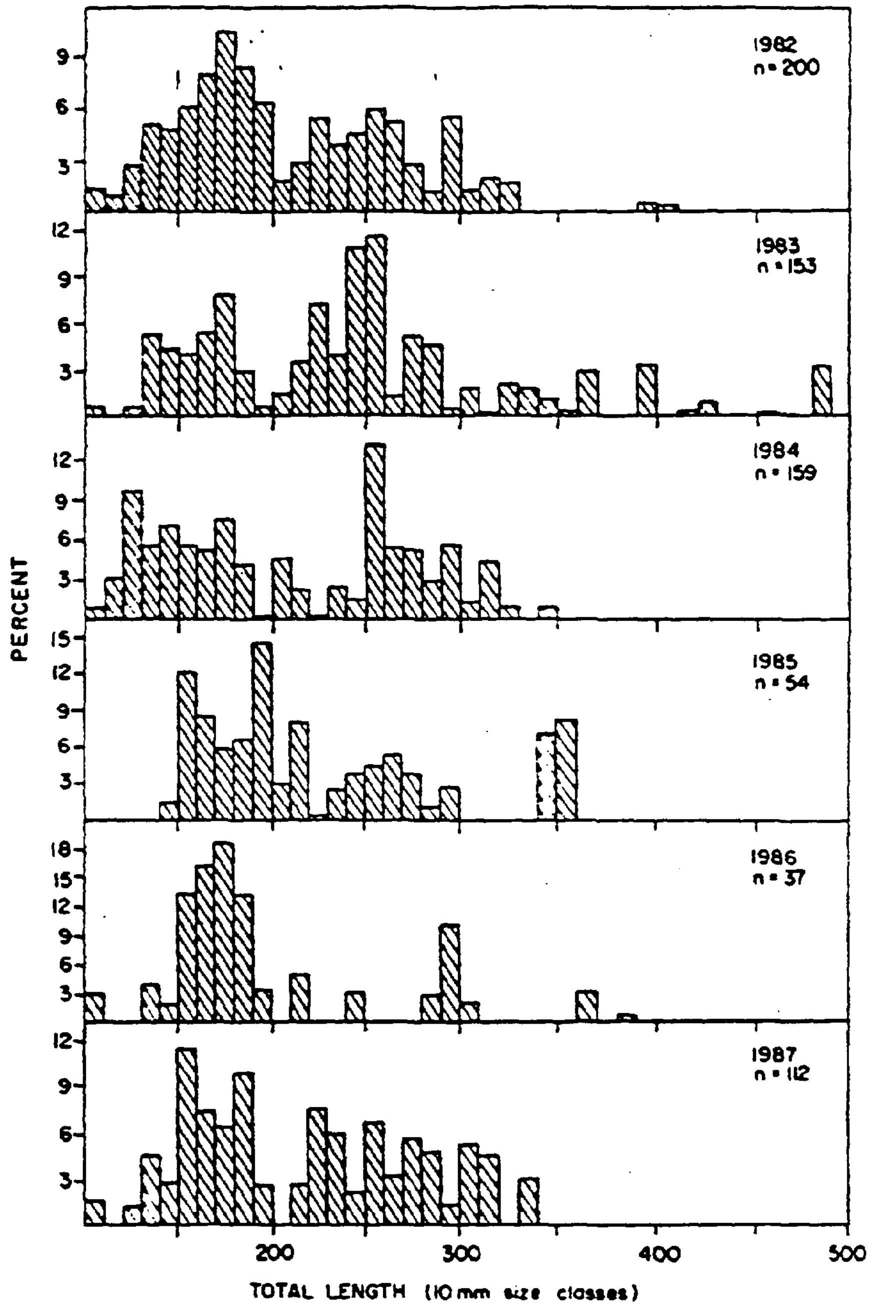
			Percent frequency size class (FL, mm)							
		n	<150	151-200	201-250	251-300	301-350	351-400	401-450	>450
A. Month	Year						------------Marketable-----------			
May	1988									
Jun		111				24.1	49.3	15.9	6.6	4.1
Jul		105		0.9		1.5	33.0	55.5		9.1
Aug		334		2.8	43.1	5.2	8.8	30.1	6.2	3.8
Sep		86			54.5	37.8	3.9	1.9	0.9	1.0
Oct		30		6.8	5.1	83.0				5.1
	1989									
May		2	-	-	100.0					
Jun		119	-	-	0.8	8.9	76.4	12.5	0.8	0.6
Jul		280	-	3.6	22.7	3.1	26.5	41.5	1.8	0.8
Aug		631	-	0.1	76.8	16.5	0.9	4.2	0.9	0.6
Sep		158	-	-	42.4	57.6	-	-	-	-
Oct										
May	1990									
Jun		48		2.9	-	15.6	58.1	16.5	5.2	1.7
Jul		205	0.2	10.0	11.1	1.0	50.4	22.4	3.6	1.3
Aug		392		2.2	81.1	15.7	-	-	0.8	0.2
Sep		514		0.3	18.2	73.8	4.5	0.8	0.5	1.9
Oct		11			21.0	79.0				
B. Annual	1982	259		1.3	7.8	37.6	25.4	21.2	5.8	0.9
	1983	42	4.6	1.6	35.7	31.4	4.2	11.2	11.3	
	1984	56		2.0	16.7	44.7	19.5	5.6	6.3	5.2
	1985	296		2.9	44.9	45.3	1.1	5.6	0.2	
	1986	153		3.8	24.4	21.0	18.1	23.4	7.2	2.1
	1987	511	0.3	0.6	9.8	39.5	30.3	16.4	1.8	1.3
	1988	666		1.7	27.1	13.2	21.3	27.4	5.3	4.0
	1989	1,190	-	1.4	42.9	14.2	20.4	19.3	1.2	0.6
	1990	1,170	-	3.1	36.1	36.3	15.8	5.9	1.6	1.2
C. Scrap	1986	28		4.5	92.0	3.5				
	1987	44		4.5	37.5	58.0				
	1988	127	0.2	8.0	78.7	13.1				
	1989	275		-	1.9	73.9	24.2	-		
	1990	261	0.5	8.2	45.5	45.6	0.2			



Appendix Z. Expanded annual length frequencies of Spanish mackerel (Scomberomorus maculatus) from sciaenid pound net samples, 1982-1987.

APPENDIX AA. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of summer flounder, Paralichthys dentatus, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

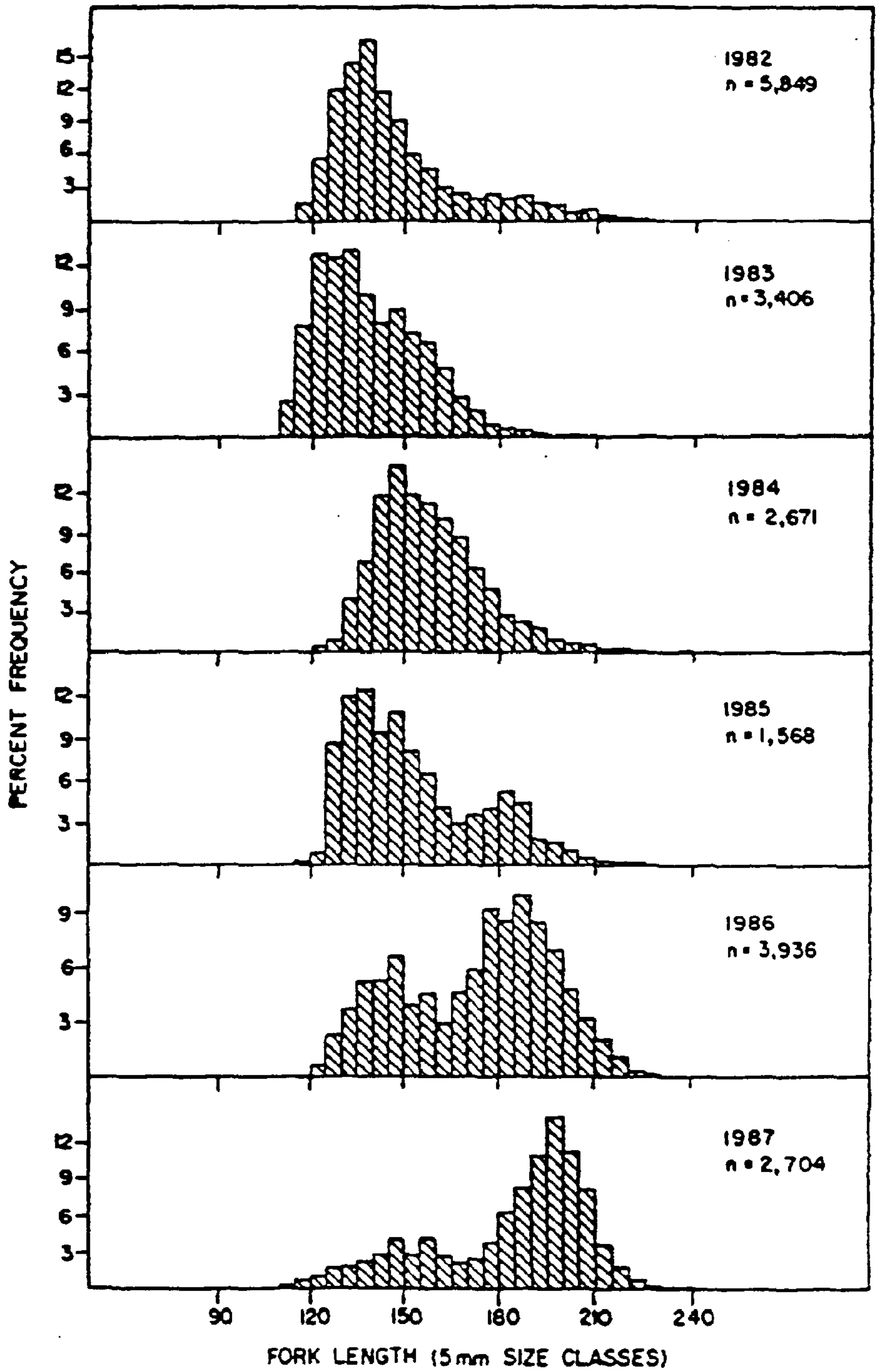
			Percent frequency/size class (TL, mm)						
		n	<151	151-200	201-250	251-300	301-350	351-400	>401
A. Month	Year						---------Marketable-------		
May									
Jun	1988	55	4.7	1.7	50.8	32.2	9.6	1.0	
Jul		16	5.7	52.7	7.5	27.9	-	6.2	
Aug		22		10.5	28.5	32.3	21.7	3.5	3.5
Sep		8				44.2	44.2	11.6	
Oct		6			45.1			54.9	
May	1989	4	-	-	50.0	50.0			
Jun		8	9.7	9.8	40.7	39.8			
Jul		26	30.8	36.2	3.9	11.9	8.0	9.2	
Aug		22	5.9	29.6	35.6	21.4	7.5		
Sep		2	33.8	66.2					
Oct									
May	1990	13	90.4	9.6					
Jun		10	25.8	47.0	18.7			8.5	
Jul		29	20.2	44.9	15.5	6.3	5.3	3.3	4.5
Aug		16	13.0	11.0	10.2	-	28.3	33.2	4.3
Sep		19	7.9	32.9	10.1	5.7	12.3	26.7	4.4
Oct		8	-	20.0	-	25.0	35.0	10.0	10.0
B. Annual	1982	200	14.2	40.0	20.8	18.0	5.9	0.8	0.3
	1983	153	12.5	22.7	22.9	24.9	9.4	4.2	3.4
	1984	159	25.3	23.4	12.3	33.4	5.5		
	1985	54	2.0	45.6	19.4	23.2	4.3	5.5	
	1986	37	8.9	67.1	5.8	13.0	5.2		
	1987	112	10.4	39.5	21.0	19.9	9.0	0.1	0.1
	1988	107	3.3	11.2	35.4	31.8	13.2	4.3	0.8
	1989	62	20.3	29.8	19.0	20.0	6.0	4.9	
	1990	95	27.5	31.3	9.5	5.8	9.9	12.7	3.3
C. Scrap	1986	12	8.4	69.9	21.7				
	1987	30	4.6	44.0	33.6	17.8			
	1988	22	5.0	24.2	51.9	18.9			
	1989	6	77.3	22.7					
	1990	8	87.2	12.8					



Appendix BB. Expanded annual length frequencies of summer flounder (Paralichthys dentatus) from pound net samples, 1982-1987.

APPENDIX CC. Monthly (A; 1988-90), annual (B; 1982-90) and scrap (C; 1986-90) expanded length frequencies of Atlantic menhaden, Brevoortia tyrannus, from Pamlico Sound sciaenid pound net samples; n = number of individuals measured.

			Percent frequency/size class (FL, mm)				
		n	<120	121-150	151-180	181-210	>210
A. Month	Year						
May	1988	52			28.9	63.2	7.9
Jun		1,834	1.7	6.8	14.4	68.0	9.1
Jul		2,182	4.2	12.9	23.2	46.1	13.6
Aug		922		12.5	32.1	42.3	13.1
Sep		599		1.2	60.2	34.0	4.6
Oct		159		3.6	55.5	24.8	16.1
May	1989	956	-	12.8	40.3	36.3	10.6
Jun		944	0.9	29.5	35.4	23.7	10.5
Jul		2,106	0.5	34.8	40.8	15.0	8.9
Aug		1,126	-	3.8	26.2	49.6	20.4
Sep		1,809	-	18.3	67.5	12.0	2.2
Oct		311	-	7.0	67.3	23.0	2.7
May	1990	1,548	-	0.7	73.9	25.1	0.3
Jun		2,419	-	1.5	52.7	45.3	0.5
Jul		2,351	-	1.3	72.1	26.5	0.1
Aug		698	-	0.2	66.6	32.9	0.3
Sep		1,463		0.3	58.8	40.6	0.3
Oct		484		0.4	58.5	41.1	-
B. Year	1982	5,849	1.5	67.4	21.1	8.9	1.0
	1983	3,406	10.3	64.6	23.7	1.4	<0.1
	1984	2,671	0.1	37.6	52.6	9.0	0.7
	1985	1,568	0.3	52.8	29.7	14.8	2.4
	1986	3,936	0.1	23.4	30.9	41.8	3.8
	1987	2,704	1.2	14.6	17.3	59.6	7.3
	1988	5,748	1.8	8.9	27.0	51.6	10.7
	1989	7,252	0.4	21.4	41.7	26.4	10.1
	1990	8,963		1.1	63.0	35.6	0.3
C. Scrap	1986	3,936	0.1	23.4	30.9	41.8	3.8
	1987	2,704	1.2	14.6	17.3	59.6	7.3
	1988	1,597			50.4	49.6	
	1989	2,574	-	45.8	50.8	3.4	
	1990	3,326			41.7	58.3	



Appendix DD. Expanded annual length frequencies of Atlantic menhaden (Brevoortia tyrannus) from pound net samples, 1982-1987.

Appendix EE. Species composition of scrapfish (discard or bait) in 54 pound net catches sampled in 1986.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Micropogonias undulatus	222.0	46.01	1,857	36.44	0.120	100.0
Brevoortia tyrannus	116.3	24.12	1,456	28.57	0.080	96.3
Cynoscion regalis	50.0	10.36	491	9.63	0.102	100.0
Leiostomus xanthurus	27.9	5.79	362	7.10	0.077	98.2
Lagodon rhomboides	18.0	3.74	259	5.09	0.069	81.5
Opisthonema oglinum	11.3	2.34	169	3.31	0.067	64.8
Pomatomus saltatrix	7.8	1.61	68	1.34	0.114	96.3
Chaetodipterus faber	6.6	1.36	199	1.97	0.066	48.1
Bairdiella chrysoura	3.9	0.81	57	1.12	0.068	68.5
Scomberomorus maculatus	3.7	0.76	38	0.74	0.098	74.1
Peprilus alepidotus	3.7	0.76	75	1.47	0.049	98.2
Caranx hippos	3.0	0.63	30	0.59	0.101	25.9
Peprilus triacanthus	2.2	0.45	47	0.92	0.047	90.7
Selene vomer	1.4	0.30	24	0.47	0.059	25.9
Orthopristis chrysoptera	1.3	0.26	21	0.42	0.059	48.1
Callinectes sapidus	0.8	0.16	4	0.09	0.175	38.9
Mugil cephalus	0.4	0.09	10	0.19	0.043	1.9
Paralichthys dentatus	0.4	0.08	6	0.11	0.067	35.2
Aluterus schoepfi	0.3	0.06	1	0.03	0.195	5.6
Menticirrhus americanus	0.2	0.05	2	0.04	0.118	20.4
Sphoeroides maculatus	0.2	0.04	2	0.04	0.098	20.4
Paralichthys lethostigma	0.2	0.04	2	0.04	0.090	38.9
Larimus fasciatus	0.1	0.03	1	0.02	0.145	11.1
Caranx spp.	0.1	0.03	2	0.03	0.082	7.4
Monacanthus hispidus	0.1	0.03	3	0.06	0.042	18.5
Prionotus scitulus	0.1	0.02	3	0.05	0.030	7.4
Synodus foetens	0.1	0.02	<1	0.01	0.230	1.9
Prionotus evolans	0.1	0.02	1	0.01	0.115	14.8
Mycteroperca microlepis	0.1	0.02	1	0.01	0.120	5.6
Trichiurus lepturus	<0.1	0.01	<1	0.00	0.180	51.9
Chilomycterus schoepfi	<0.1	0.01	<1	0.00	0.207	9.3
Callinectes similis	<0.1	0.01	1	0.01	0.040	5.6
Caranx crysos	<0.1	0.00	<1	0.01	0.070	1.9
Trinectes maculatus	<0.1	0.00	<1	0.01	0.046	9.3
Chloroscombrus chrysurus	<0.1	0.00	0	0.01	0.020	1.9
Lolliguncula brevis	<0.1	0.00	2	0.03	0.003	9.3
Prionotus tribulus	<0.1	0.00	<1	0.00	0.060	7.4
Prionotus carolinus	<0.1	0.00	<1	0.00	0.050	1.9
Scophthalmus aquosus	<0.1	0.00	<1	0.00	0.020	1.9

Appendix FF. Species composition of scrapfish (discard or bait) in 56 pound net catches sampled in 1987.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Micropogonias undulatus	156.3	37.37	1,524	34.96	0.103	100.0
Brevoortia tyrannus	152.2	36.41	1,557	35.73	0.098	98.2
Cynoscion regalis	44.2	10.57	432	9.90	0.102	100.0
Leiostomus xanthurus	24.1	5.76	357	8.18	0.068	96.4
Pomatomus saltatrix	9.1	2.17	71	1.64	0.127	92.9
Opisthonema oglinum	9.0	2.15	151	3.46	0.060	75.0
Bairdiella chrysoura	4.9	1.17	63	1.44	0.078	76.8
Scomberomorus maculatus	4.3	1.04	31	0.71	0.141	96.4
Lagodon rhomboides	4.3	1.03	35	0.80	0.124	42.9
Paralichthys dentatus	1.7	0.41	20	0.45	0.087	58.9
Selene vomer	1.7	0.40	30	0.68	0.056	32.1
Orthopristis chrysoptera	1.6	0.38	23	0.52	0.071	48.2
Chaetodipterus faber	1.0	0.25	18	0.41	0.057	50.0
Caranx hippos	1.0	0.24	8	0.17	0.130	57.1
Paralichthys lethostigma	0.7	0.17	9	0.20	0.082	35.7
Peprilus triacanthus	0.5	0.12	9	0.20	0.058	75.0
Callinectes sapidus	0.3	0.07	5	0.11	0.062	71.4
Monacanthus hispidus	0.3	0.06	6	0.13	0.045	21.4
Chilomycterus schoepfi	0.2	0.05	1	0.02	0.220	10.7
Menticirrhus americanus	0.2	0.04	2	0.04	0.090	35.7
Peprilus alepidotus	<0.1	0.02	2	0.04	0.050	96.4
Elops saurus	<0.1	0.01	<1	0.01	0.120	8.9
Aluterus schoepfi	<0.1	0.01	<1	0.01	0.290	5.4
Citharichthys spilopterus	<0.1	0.01	2	0.05	0.026	1.8
Prionotus scitulus	<0.1	0.01	<1	0.01	0.120	5.4
Larimus fasciatus	<0.1	0.01	<1	0.01	0.120	3.6
Prionotus tribulus	<0.1	0.01	1	0.03	0.040	1.8
Mycteroperca microlepis	<0.1	0.01	<1	<0.01	0.230	3.6
Scophthalmus aquosus	<0.1	0.01	1	0.02	0.041	5.4
Symphurus plagiusa	<0.1	0.01	<1	0.02	0.050	5.4
Prionotus evolans	<0.1	0.01	<1	0.01	0.080	5.4
Trinectes maculatus	<0.1	0.01	1	0.03	0.026	8.9
Urophycis regia	<0.1	0.01	<1	0.01	0.070	1.8
Selene setapinnis	<0.1	0.00	<1	0.01	0.060	5.4
Prionotus carolinus	<0.1	0.00	<1	0.01	0.010	5.4

Species observed

Lolliguncula brevis	Rachycentron canadum	Chaetodon sp.
Limulus polyphemus	Caranx sp.	Mugil cephalus
Penaeus aztecus	Trachinotus carolinus	Sphyraena borealis
Penaeus duorarum	Cynoscion sp.	Tautoga onitis
Alosa mediocris	Cynoscion nebulosus	Trichiurus lepturus
Tylosurus crocodilus	Menticirrhus sp.	Scomberomorus scombrus
Prionotus sp.	Menticirrhus saxatilis	Paralichthys sp.
Centropristis striata	Sciaenops ocellatus	Sphoeroides maculatus

ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES

Completion Report for Project 2-IJ-16

May 1992

JOB 3

WINTER TRAWL FISHERY ASSESSMENT

By

Jeffrey L. Ross

ABSTRACT

The North Carolina winter trawl fishery is a multispecies-multigear fishery conducted from mid-September through April from offshore Long Island, New York to west of Cape Lookout, North Carolina. The fishery has three main components: the nearshore flounder, deepwater, and flynet fisheries. Species-specific CPUEs, size-age composition of the catches, and landings were assessed for the 1988-91 fishing seasons and compared with the 1982-88 seasons.

Summer flounder (Paralichtys dentatus) dominated nearshore flounder and deepwater catches. During 1988-91, mean seasonal CPUEs in nearshore fishery catches were 47-76% of the mean for the 1982-91 seasons. CPUEs in deepwater catches during 1989-91 were the lowest since 1982-83 (only 60-76% of the nine season mean). Landings during 1989-91 were only 38-59% of the nine season mean. The age composition of summer flounder catches was truncated with 85-98% of the fish less than 4 years old. Recent regulation changes have reduced the relative abundance of age 0 and 1 fish in the catches.

Scup (Stenotomus chrysops) were an important component and frequent target species of deepwater trips. CPUEs and landings during 1988-90 were the lowest for the period and only 4-17% and 9-29% of the nine season averages respectively. Catches and landings increased during the 1990-91 season. Scup length frequency distributions remained unimodal and compressed towards smaller size classes, although the relative abundance of larger fish increased slightly during 1989-91.

Black sea bass (Centropristis striata) were the third dominant species in deepwater catches. Seasonal mean CPUEs ranged from 68% to only 9% of the nine season mean. Landings were average during 1988-90, but only 29% of the nine season mean, and the lowest for the period, during 1990-91. The size composition of black sea bass has been relatively stable throughout the nine seasons, although a gradual reduction in large sea bass has occurred and the fishery harvests primarily small fish.

Weakfish (Cynoscion regalis) were the dominant species of the flynet fishery. The CPUEs increased from 62 to 102% of the nine season mean during the last three seasons, but seasonal landings fell from 78% to only 57-60% of the nine season mean. The size and age composition has become increasingly compressed towards small, young fish, with age 0 and 1 fish making up 90% of the catches during 1989-91.

Bluefish (Pomatomus saltatrix) were ubiquitous in catches by all gears, but the largest catches were made with flynets when large fish were targeted. The CPUEs in flynets have fluctuated without trend during the last nine seasons, largely due to the sporadic market demand. Landings fell from 49% to 26% of the nine season mean. All sizes and ages of bluefish continued to be represented in winter trawl catches.

Atlantic croaker (Micropogonias undulatus) were an abundant component and occasional target species of flynet trips. Seasonal mean CPUEs and landings for 1988-91 were all lower than the nine season means, with 1990-91 CPUEs and landings 33% and 23% of the nine season means respectively. The size and age

composition of 1988-91 catches was compressed towards smaller younger fish. An increased percent were unmarketable-sized for human consumption.

Flynets continued to produce the bulk of the scrap fish landed by winter trawlers. Weakfish, croaker and spot were the principal components of the scrap fish. Scrap fish have made up 33-39% of the flynet catches since 1984-85. Minimal amounts of unmarketable size fish were landed by the nearshore flounder and deepwater fisheries.

Aggregate resource trend analyses indicated overall reduced CPUEs and landings of the dominant species by the nearshore flounder, deepwater, and 'sciaenid-bluefish' flynet fisheries, as well as the overall winter trawl fishery, since the projects inception. This corresponded with the overall reduced size of all dominant species harvested except bluefish.

TABLE OF CONTENTS

INTRODUCTION

The North Carolina winter trawl fishery is a multispecies-multigear fishery that lands fish in North Carolina from September through April. Fishing effort shifts to one of several target species depending on seasonal distribution, availability, catchability and marketability and can also vary between fishing ports. Fishing grounds extend from the Hudson Canyon off New York to south and west of Cape Lookout, North Carolina, and from the beach to the 50 fathom curve (Figure 1).

The winter trawl fishery accounted for 18-23% (4,056-5,304 mt) of all edible finfish landed in North Carolina during the 1988-91 fishing seasons. In one or more of the last three fishing seasons, the fishery accounted for greater than 20% of North Carolina's landings of weakfish (*Cynoscion regalis*), summer flounder (*Paralichthys dentatus*), butterfish (*Peprilus triacanthus*), harvestfish (*P. alepidotus*), Atlantic croaker (*Micropogonias undulatus*), black sea bass (*Centropristis striata*), scup (*Stenotomus chrysops*), and scrap fish for industrial uses or bait.

In North Carolina, winter trawl catches are landed at ports from Wanchese to Morehead City-Beaufort. The primary processing facilities are located in Wanchese, where 30-40 vessels offload at six fish houses. Morehead City-Beaufort is the second largest processing center with 5-6 fish houses servicing 10-15 trawlers. The ports of Lowland, Vandemere, Bayboro, Englehard, Wrights Creek, and Oriental offload fish for 26-32 trawlers. Due to the extensive geographic range of fishing grounds utilized by the trawler fleet, catches are often landed in other states, particularly Hampton, VA and New Bedford, MA.

The history of the North Carolina winter trawl fishery was reviewed by Ross et al. (1986), together with a discussion of the justification for partitioning the fishery into three components: nearshore flounder, sciaenid-bluefish flynet, and deepwater fisheries. Although some spatial and temporal overlap occurs between these components, the partitioned catches are characterized by a constancy and fidelity in species composition. The partitioning facilitates the generation of species-specific catch-per-unit-of-effort data to reflect abundance levels and not trends in fishing effort.

The nearshore flounder fishery is the southern, and November through January, extension of the mid-Atlantic flounder trawl fishery. Virtually all vessels that enter the North Carolina winter trawl fishery participate in this component. A portion of the North Carolina fleet fishes for summer flounder off New England during the summer, follows the fish south during the fall and offshore during the winter. Vessels begin landing fish caught off Delaware and Virginia in North Carolina ports by October or November. By mid-November or December, most of the fleet is fishing off the Outer Banks of North Carolina.

The predominant gear used in the nearshore flounder fishery is the flounder trawl, which has a 16.8-19.8m (55-65 ft) headrope with 12-15 cm (5-6 in) mesh in the wings, and 11.4-14.0 cm (4.5-5.5 in) mesh in the tailbag (5.5 in diamond or 6.0 in square mesh is required in flounder nets fished in state waters). Long groundlines, which include up to 91.4 m (300 ft) of cookies, 22.9 m (75 ft) of chain, and 30.5 m (100 ft) of cable, act as leads directing fish into the relatively small net. Combination nets are higher profile nets, with 20-25 cm (8-10 in) mesh in the wings tapering to 5-7 cm (2-3 in) mesh in the tailbags, used when seeking summer flounder as well as weakfish, butterfish, and squid (Loligo pealii).

The deepwater component of the winter trawl fishery is prosecuted primarily by vessels from Wanchese when nearshore flounder fishing declines in late December or early January. Fishing occurs from the Cigar to Norfolk Canyon and north along the shelf edge for summer flounder, scup, and black sea bass. Different trawl gear is used depending on the species targeted. Flounder trawls or combination nets are used for all three species, and flynets are employed when scup are schooled up in the water column.

The flynet fishery encompasses North Carolina trawlers fishing for weakfish, Atlantic croaker, bluefish, butterfish, and industrial (scrap) fish. Flynet fishing generally takes place in depths less than 36 m (20 fathoms) from Oregon Inlet to west of Cape Lookout from late September through April. Flynets are high profile trawls used for fish that school higher in the water column than typical groundfish. Flynets fish 3-3.7 m (10-12 ft) off the bottom, and range from 24.4 to 36.6 m (80-120 ft) across, with wing mesh sizes of 41-163 cm (16-64 in), tapering to 5 cm (2 in) in the tailbag.

In 1982, the North Carolina Division of Marine Fisheries (DMF) initiated a statewide sampling program for the dominant commercial finfisheries. The objective was to obtain biological and fisheries data on economically important fishes for use in reaching management decisions. The winter trawl fishery was included, and is herein described for the 1988-91 fishing seasons, after portioning the fishery into its three components (nearshore flounder, deepwater, and flynet). Species composition, relative abundance, distribution, seasonality are presented. Catch-per-effort and the age and/or size frequency distributions of the dominant species are presented and compared with species and fishery specific data from the 1982-88 fishing seasons.

METHODS AND MATERIALS

Winter trawl catches were sampled while being offloaded at fish packing houses in Wanchese and Morehead City-Beaufort, and to a lesser extent in Oriental, Bayboro, Lowlands, Wrights Creek, and Englehard. Crew members were interviewed, when available, to obtain information on area and depth fished, number and duration of tows, days on the fishing grounds, and gear(s) used including size of headrope and cod-end mesh. When possible, eight or more catches were sampled per month.

To insure adequate coverage of all sizes and species in the catches, and since culling occurs offshore, stratified random samples of the graded catch were taken. This process involved randomly sampling one or more 50 lb (22.7 kg) cartons of each species' market category or grade (small, medium, large, jumbo, etc.). More cartons of the larger grades were sampled since they contained fewer fish. Each sample was weighed to the nearest 0.1 kg, individual fish measured to the nearest millimeter (FL or TL), and the total number of individuals recorded. If the individuals in a carton were too numerous to measure, at least 30 were measured, and the remainder counted. The total catch weight of each market category for each species was obtained from the fish dealer's records.

In cases where the weight of a particular species' market grades were included on the trip ticket, but were not sampled, an estimate of the number of fish landed for the grade was made using mean weight/individual from a sample of that species and grade from another recent catch, and usually from the same area.

Total length-frequencies for each catch were derived by expanding the sample length-frequencies for each market category (grade) by an expansion factor to represent the species market grade weight. Species market grade weight was obtained from trip tickets and species length-frequencies were a combination of those expanded for the respective species market grades. Species numerical abundance/catch was calculated similarly by determining the number of individuals/market grade and then summing all market grades/species.

Scrap fish are herein defined as the part of the catch not marketed for human consumption, but rather sold for bait or industrial uses, or discarded. At least half of a fish basket (about 12 kg) of scrap fish was sampled when it was a significant (>50 kg) component of the catch. If the scrap fish comprised <50 kg, it was considered negligible and not sampled, although the component species were noted.

Samples of scrap fish were sorted and weighed (kg) by species, and all individuals measured to the nearest millimeter (TL or FL). If a particular species was too numerous, a random subsample of at least 30 individuals was measured, and the remaining fish counted. However, if a species had two or more distinct size classes, then each size class was treated as a separate species when subsampled. The total weight of the scrap was obtained, preferably from the trip ticket, and if not, it was estimated.

Length-frequencies for scrap fish were derived by expanding the sample length-frequencies to represent the total weight of the species in the scrap. Total weight of a species in the scrap was calculated by determining the proportion of a species in the sample, and expanding that to the respective species proportional weight in the scrap. The number of individuals/species in the scrap was calculated by expanding the number of individuals in the sample to represent the total weight of the species in the scrap.

Winter trawl catches were analyzed by "fishing seasons," that is, October 1988-April 1989 (1988-89), October 1989-April 1990 (1989-90), and October 1990-April 1991 (1990-91). Analyses of catches and trends in the winter trawl fishery were also facilitated by partitioning the fishery into the three component fisheries described in Ross et al. (1986). These included the nearshore directed flounder fishery, the flynet fishery, and the deepwater fishery.

Average catches and landings were determined and compared throughout the report. Average catch/trip (CPUE; kg) was defined as the total catch or total catch/species/one day trip; a trip may consist of one or more days and sets of the trawl gear. Average catch/day (CPD) was calculated based on days on the fishing grounds; this included days spent searching for fish but not days enroute to and from the grounds. Landings refer to commercial landings (kg) data derived from the North Carolina General Canvas Data compiled through the North Carolina Divisions of Marine Fisheries and the National Marine Fisheries Service cooperative data collection program. Three-year means and six-year means for landings and catches are presented. These values are equally weighted means of seasonal totals or seasonal means and are utilized only to illustrate fishery trends.

Scale samples from summer flounder, weakfish, Atlantic croaker, bluefish, and spot (Leiostomus xanthurus) (30-60 individuals/species) were taken monthly when available and represented the entire size range of individuals captured. Both length (mm, FL or TL) and weight (kg) data were taken for each fish sampled. Ageing was done using criteria for determining annuli given by Smith et al. (1981) for summer flounder, Wilk (1977) for bluefish, Ross (1988) for croaker, DeVries (1981) for spot, and Massman (1963), Merriner (1973) and Hawkins (1988) for weakfish. Species-specific semi-annual or quarterly age-length keys were developed and merged with expanded length-frequency data to produce the overall annual age composition.

Spot age-length data from 1979-91 was pooled, partitioned into September-December and January-April seasonal keys, and integrated into 1982-91 winter trawl length frequency data.

Bluefish seasonal age-length keys were developed by pooling all fish aged from oceanic waters/fisheries during September through April, and merged with the respective season's winter trawl length frequency data.

Atlantic croaker age-length data for 1979-82 was pooled and integrated into 1982-86 seasonal length frequency data. Age-length data for 1988-91 data was pooled and integrated into 1988-91 seasonal length frequency data. Ageing data from the two periods (1979-82 and 1988-81) was pooled and integrated into 1986-88 seasonal length frequency data. Quarterly keys were used with the monthly groupings: December-March, April-June, July-September, and October-November (Ross 1988).

Weakfish age-length data from January 1982-December 1983 was pooled and integrated into 1982-86 seasonal length frequency data. Weakfish ageing data for September 1988-april 1991 was pooled and integrated into 1988-91 seasonal length frequency data. ageing data from the two periods (1983-82 and 1988-91) was pooled and merged with 1986-88 seasonal length frequency data. The age-length keys were partitioned for winter (October through March) and summer (April through September).

Summer flounder age-length data from 1988-91 was integrated into 1988-91 length frequency data for respective seasons on a quarterly basis. Summer flounder age-length data for 1982-87 from the Northeast Fisheries Center, NMFS weigh-out data was merged into 1982-87 length frequency data for respective seasons on a quarterly basis. The quarters used were the first (January-March) and the fourth (October-December).

RESULTS AND DISCUSSION

NEARSHORE FLOUNDER FISHERY

From October 1988 through March 1991, 103 nearshore flounder catches from depths of 8-40 m from Cape Henelopen to Beaufort Inlet were sampled. Overall, 82% of the catches were from waters between Cape Henry and Wimble Shoals, 8% from Cape Charles to Cape Henelopen, 8% from Cape Hatteras to Cape Lookout, and 2% west of Cape Lookout. Most of the catches sampled (70%) were from waters off

North Carolina, while 22% were from both Virginia and North Carolina waters, and 8% were exclusively from waters north of North Carolina.

Seasonal Catch Composition

Twenty-nine nearshore flounder catches were sampled between October 1988 and March 1989, with all but two from north of Cape Hatteras (Table 1). Total catch weights ranged from 288 to 9,685 kg/trip and averaged 3,417 kg/trip. Catches were greater north (3,410 kg/trip) than south of Cape Hatteras (3,053 kg/trip). Summer flounder dominated the overall catch weight (92%), and together with Loligo squid and black sea bass accounted for 95% of the catches (Table 2, Appendix C). Summer flounder dominated catches both north and south of Cape Hatteras (Table 3) and every month except December, when only one small catch was sampled. Catches generally declined through the season (Table 4.)

Twenty-six nearshore flounder catches were sampled between October 1989 and April 1990, including eight from south of Cape Hatteras (Table 1). Total catch weights ranged from 480 to 8,361 kg/trip and averaged 3,330 kg/trip. Summer flounder, northern puffers (Sphoeroides maculatus), squid, weakfish, and Atlantic croaker accounted for 91% of the catches (Table 2, Appendix D). Total catch weights were greatest west of Cape Lookout (5,355 kg/trip), although summer flounder catches were largest north of Cape Hatteras (Table 3). Summer flounder, squid and weakfish dominated catches north of Cape Hatteras (94%), between Cape Hatteras and Lookout (78%) (Table 3) and overall catches October through February (Table 4). Northern puffers, summer flounder, and croaker dominated catches west of Cape Lookout in March and April.

All but one of the 48 nearshore flounder catches sampled October 1990-March 1991 were from north of Cape Hatteras. Total catch weights ranged from 443 to 11,085 kg/trip and averaged 4,320 kg/trip (Table 1). Summer flounder, whelks (Busycon sp.), and squid accounted for 92% of the catches (Table 2, Appendix E). Summer flounder accounted for >80% of the catch weights in all months (Table 4) and both north and south of Cape Hatteras (Table 3).

Trends in Catch Composition 1982-1991

Summer flounder was the dominant species in the nearshore flounder fishery (68-92%) during the 1988-91 seasons as during 1982-88 (62-94%) (Ross 1991). Smaller catches of summer flounder have increased its fluctuations in relative abundance compared to incidental species during the last six seasons when compared to catches from 1982-85 (Table 5). The eleven species cited as dominant species, including weakfish, squid, and bluefish (Table 5) accounted for 87-97% of the nearshore flounder catches during the 1988-91 fishing seasons, whereas they accounted for 95-100% of the catches during 1982-88. The lower values during 1988-91 also reflected increased catches of northern puffers (particularly 1989-90) and reduced catches of weakfish and bluefish.

Summer Flounder- CPUE, Landings and Size/Age Composition

Summer flounder catches by the nearshore flounder fishery during the 1988-91 fishing seasons continued the decline noted during the preceding three seasons (Ross 91). Seasonal mean catch/trip ranged from 2,285 to 3,679 kg/trip during 1988-91 (Table 5, Figure 2). The unweighed three-season mean (3,032 kg/trip) was 14% less than for 1985-88 and 62% less than for 1982-85. Correspondingly, mean catch/day, which ranged from 526 kg/day (1989-90) to 713 kg/day (1988-89) continued to decline (Table 5, Figure 2). The unweighed three-season mean (650 kg/day) was 14% less than for 1985-88 and 68% less than for 1982-85. Summer flounder CPUEs were lower in 1989-90 than in any season since 1982-83, although catches did improve in 1990-91.

Summer flounder landings by the winter trawl fleet (all gears combined) in North Carolina declined during the 1988-91 fishing seasons and paralleled the declining CPUEs. Landings ranged from 1,105 to 2,326 mt during 1988-91 (Figure 2, Appendix A). The unweighted three-season mean for 1988-91 (1,706 mt) was 41% less than the 9-season mean, 36% less than for 1985-88, and 60% less than for 1982-85. Landings for 1989-90 and 1990-91 were the lowest seasonal totals since 1982-83. The northern ports, including Wanchese, dominated (78-91%) winter trawler landings of flounder during 1988-91 as they did from 1985 to 1988 (Appendix B.)

The size composition of summer flounder in nearshore catches reflected the combined effects of growth overfishing and the observance of the 13" TL minimum size limit. The overall size range, 271-760 mm TL in 1988-89, 294-710 mm TL in 1989-90, and 267-728 mm TL in 1990-91, was similar throughout the period (Figure 3, Appendix F). Most of the summer flounder were 331-460 mm TL (84%) in 1988-89 and 331-470 mm TL (83%) in 1989-90, but slightly smaller (84% were 321-440 mm TL) in 1990-91. The relative abundance of fish 401-500 mm TL (market grade=large) declined from 46% to 39% to 34%, and 500+ mm TL (market grade=jumbo) from 5% to 7% to 2% during 1988-91. Undersized summer flounder (<330 mm TL) encompassed 4.5-6% of the catches in 1988-90 and 8% in 1990-91.

Comparing the relative abundance of various size classes of summer flounder during the last three seasons with previous years could be misleading due to the imposition of the 13" size limit. However, comparison of the 1988-91 unweighted three-season mean number of fish/trip/size class (= market grade) illustrates the level of reduced catches since the 1982-85 fishing seasons. The size limit has reduced catches of dabs (<300 mm FL) - from 1,714 to 4 fish/trip - and significantly reduced the number of small (351-400 mm TL) - from 5,551 to 883 fish/trip. Nevertheless, catches of larger grades were also notably less than during 1982-85, with only 39% as many medium (350-400 mm TL), 53% as many large (401-500 mm TL), and 41% as many jumbo flounder (>500 mm TL) landed. However, in 1990-91 the catch/trip of medium summer flounder (350-400 mm TL) was the highest of the last three seasons and second highest in six seasons; the catch of large (401-500 mm TL) was the highest in six seasons; however, catches of jumbo summer flounder (>500 mm TL) were the lowest for the entire period.

The age composition of summer flounder was extremely truncated, with greater than 90% of the fish less than four years old (Figure 4). The impact of the 13" size limit was apparent during the 1989-91 seasons, when one year old fish made up only 6% of the catch, whereas in previous years they accounted for 33-55% of the fish caught (Appendix G). Interestingly, the percent of three year old fish increased during the 1989-91 seasons. The apparent shift to the right in age composition was probably an artifact caused by the loss of one year old fish.

DEEPWATER FISHERY

During the 1988-91 winter trawl seasons, 91 deepwater catches from offshore of Wimble Shoals to Cape May, NJ in depths of 38 to 128 m were sampled. The most frequently fished area was Norfolk Canyon (25%), while 33% of the catches were from Cape Hatteras to Cape Henry (including 15% from the Cigar), and 42% from north of Norfolk Canyon to off Cape May, NJ.

Seasonal Catch Composition

The 33 deepwater catches sampled during the 1988-89 season ranged from 1,653-17,598 kg/trip and averaged 5,633 kg/trip (Table 1). Summer flounder (72%) dominated the catches and together with squid and black sea bass accounted for 95% of the total weight of the catches sampled (Table 6, Appendix H). Summer flounder dominated catches from December through March, although their average catch/trip and relative abundance were highest in December and January and declined through April (Table 7). Black sea bass, squid, scup and summer flounder were nearly equally abundant in April catches (Table 7).

The 45 deepwater catches sampled during the 1989-90 season ranged from 1,057 to 12,935 kg/trip and averaged 4,269 kg/trip (Table 1). Summer flounder (39%) and black sea bass (25%) dominated catches and together with squid and scup accounted for 95% of the weight of the catches sampled (Table 6, Appendix I). Summer flounder and squid dominated catches in December and January (Table 7). The CPUE and relative abundance of summer flounder steadily declined through April. Black sea bass catches were largest in February and April and scup catches were largest in March.

The 13 deepwater catches sampled during the 1990-91 fishing season ranged from 4,239 to 20,388 kg/trip and averaged 9,070 kg/trip (Table 1). Scup, summer flounder and Atlantic mackerel (Scomber scombrus) dominated the catches and together with squid accounted for 91% of the catches (Table 6, Appendix J). Summer flounder dominated catches in January and February, after which CPUE and relative abundance steadily declined through April. Scup dominated catches sampled in March, and Atlantic mackerel and scup dominated catches in April (Table 7).

Trends in Catch Composition 1982-1991

The species composition of deepwater catches from the 1988-91 fishing seasons was very similar to catches from 1982-88, with the exception of a few catches sampled in 1990-91 (Tables 6 and 8). Scup, black sea bass and summer flounder were the target species and together dominated deepwater catches (78-93%) from 1982-90. Although the relative abundance of each species fluctuated seasonally, the three fish species, together with squid accounted for 92-98% of the deepwater catches. During the 1990-91, black sea bass CPUEs reached their lowest level since 1982, while several catches (100+ boxes) of Atlantic mackerel were caught with deepwater flynets in March and April. Atlantic mackerel together with the 4 dominant species (including squid) in 1990-91 accounted for nearly 93% of the catches sampled.

Although the species composition of the deepwater catches was consistent, the total catch weights during the last three seasons continued the decline noted during the 1985-88 seasons (Ross 1991). The target species combined--black sea bass, summer flounder, and scup--ranged from 8,319 to 12,400 kg/trip during 1982-85, 5,785 to 8,659 kg/trip during 1985-88, and only 3,321 to 5,859 kg/trip during 1988-91. The unweighted three-season CPUE for the three target finfish species during 1988-91 was 33% less than during 1985-88 and 65% less than during 1982-85. Catches during 1990-91 were higher than during the previous three fishing seasons.

Scup-CPUE, Landings and Size Composition

Scup CPUEs steadily declined from 1982-83 (9,709 kg/trip) to a nine-season low during 1988-89 (107 kg/trip), but have increased during the 1989-91 fishing seasons (Table 8, Figure 5). Improved summer flounder catches could have resulted in a shift of effort during the 1988-89 fishing season. Nevertheless, unweighted three-season mean CPUEs for 1988-91 (1,436 kg/trip and 219 kg/day) were 30% less/trip and 50% less/day than during 1985-88, and 73% less/trip and 85% less/day than during the 1982-85 fishing seasons.

Commercial landings of scup by the winter trawl fishery paralleled trends in CPUE. Landings reached the nine season low during 1988-89 and rebounded slightly thereafter (Figure 5, Appendix A). The three-season mean for landings during 1988-91 (44 mt) was 38% of the landings during 1985-88 and only 13% of the 1982-85 landings. The increased landings (71 mt) in 1990-91 were still only 20% of the three-season mean for 1982-85 (349 mt). Virtually all scup landed in North Carolina came from trawlers packing in the northern counties (95-98%), primarily in the port of Wanchese (Appendix B)

Scup length frequency distributions were unimodal and reflected continuing signs of growth overfishing during 1988-91. Scup ranged from 130 to 360 mm FL in 1988-89, 124 to 420 mm FL in 1989-90, and 99 to 356 mm FL in 1990-91 (Figure 6, Appendix K). The largest fish caught during each of the 1985-88 seasons exceeded 420 mm FL (Ross 1991). Most (90-93% seasonally) of the scup caught during 1988-91 were 151-250 mm FL. Growth overfishing was evidenced by the decline of fish >250 mm FL (market grades = medium-large and large). Seasonally, these fish accounted for 3-18% of the scup sampled during 1982-85, and 12-32% during 1985-88 but only 2-10% of the 1988-91 catches. Correspondingly, the number of scup >250 mm FL/deepwater trip declined from an unweighted three-season mean of 2,982 fish/trip in 1982-85 to 1,623 fish/trip in 1985-88 to only 313 fish/trip in 1989-91. Catches of larger fish have increased during the last two seasons from the low point in 1988-89; however, the mean catch for the best of the two seasons (739 large fish/trip - 1990-91) was only 33% of the unweighted mean catch/trip for the 1982-88 seasons (Ross 1991).

Black Sea Bass - CPUE, Landings and Size Composition

Black sea bass CPUEs were dramatically lower during the 1988-91 season than during the previous six fishing seasons (Table 8, Figure 7). Seasonal mean CPUEs during 1988-91 ranged from 142-1,044 kg/trip, and were less than both the unweighted mean CPUE for the 1982-91 fishing seasons and the mean catch/trip for any individual fishing season. The unweighted three-season mean (557 kg/trip) during 1988-91 was only 27% of the unweighted 1982-88 mean catch/trip/season. The seasonal trends in mean catch/day for black sea bass corresponded with those for mean catch/trip. The unweighted mean catch/day/season for 1988-91 was only 13% of the mean catch/day/season for 1982-88.

Commercial landings of black sea bass declined during the last three seasons (Figure 7, Appendix A) with landings during 1990-91 the lowest since

1982-83. Seasonal landings ranged from 60 (1990-91) to 206 mt (1988-89). The average landings/season for 1988-91 was 33% less than for 1982-88. Most (78-81%) of the black sea bass caught by trawlers in North Carolina were landed in northern Pamlico Sound ports, and in particular, Wanchese (Appendix B).

Black sea bass length-frequency distributions for the 1988-91 fishing seasons were unimodal and generally similar to catches from 1982-88 (Figure 8, Appendix L). Black sea bass ranged from 136-567 mm TL in 1988-89, 162-610 mm TL in 1989-90, and 113-521 mm TL in 1990-91. Most (72-79% seasonally) of the black sea bass were 201-300 mm TL (market grades=small and medium). The relative abundance of large black sea bass (>350 mm TL; market grades=large and jumbo) was less than during the previous three-season periods. Whereas these fish accounted for 5.9-11.9% and 6.8-15.3% of the overall catches during the 1982-85 and 1985-88 fishing seasons, respectively, during 1988-91 black sea bass >350 mm FL accounted for only 4.4-7.1% of the catches sampled (Ross 1991).

Summer Flounder - CPUE, Landings, and Size Composition

Summer flounder catches in deepwater continued to parallel nearshore catch trends, with low CPUEs during two of the last three fishing seasons (Figure 2, Table 8). The CPUE of summer flounder in deepwater catches fell from 4,053 kg/trip during the 1988-89 season to 1,674 and 2,118 kg/trip during the next two seasons. Overall, the mean catch/trip of summer flounder during the 1989-91 seasons were less than the nine-season mean, 38% less than the unweighted seasonal mean for 1982-89, and were the two lowest seasonal means since 1982-83. Similarly, mean catch/day of summer flounder fell from 789 kg/day during 1988-89 (the highest value for the nine seasons) to 275 and 399 kg/day during the 1989-91 fishing seasons. Catch/day values during 1989-91 were the lowest seasonal means recorded since 1982, and 44% less than the unweighted mean for the 1982-88 fishing seasons.

Summer flounder length frequency distributions for deepwater catches during the 1988-91 fishing seasons were unimodal and similar to nearshore catches (Figure 3, Appendix F). Summer flounder ranged from 258-738 mm FL, 251-734 mm FL, and 295-730 mm FL during the respective seasons, the minimums were greater and the maximums similar to those during 1985-88. Most (80%) of the summer flounder were encompassed by the size ranges 321-440 mm TL in 1988-89, 321-460 mm TL in 1989-90, and 321-420 mm TL in 1990-91. The contribution of undersized flounder increased from 8.4%-9.3%-11.6% of the catches during the three seasons. The contribution of market grades 'large' (400-500 mm TL) and 'jumbo' (>500 mm TL) fell from 35 to 37% and 3 to 12%, respectively, during the 1988-90 seasons to only 27% and 2% of the 1990-91 catches. The relative abundance of large fish in deepwater catches, while fluctuating seasonally, has not changed dramatically since 1982. The seasonal mean catch/trip of large (401-500 mm TL) and jumbo (>500 mm TL) summer flounder ranged from 677 to 2,165 and 71 to 222 fish/trip, respectively during the 1988-91 seasons and for two of the three seasons exceeded the unweighted mean for the previous six fishing seasons (781 large and 108 jumbo fish/trip) (Ross 1991).

FLYNET FISHERY

From October 1988 through April 1991, 120 flynet catches (excluding deepwater flynet catches targeting scup) were sampled (Table 1). Fishing grounds ranged from off Chesapeake Bay to Frying Pan Shoals, although all but three of the catches were taken predominantly off North Carolina. Overall, 53% of the catches sampled were made between Chesapeake Bay and Wimble Shoals, 36% between Cape Hatteras and Cape Lookout, and 11% between Cape Lookout and Frying Pan Shoals. The inception of the flynet season off North Carolina was late September-early October in waters between False Cape and Oregon Inlet.

Seasonal Catch Composition - All Areas Combined

Thirty-eight flynet catches sampled October 1988 through March 1989 included 23 catches from Wimble Shoals to north of Chesapeake Bay, nine catches between Cape Hatteras and Cape Lookout, and six catches between Beaufort Inlet and Cape Lookout Shoals (Table 1). Total catch weights ranged from 1,370 to 31,770 kg/trip and averaged 10,142 kg/trip. Weakfish (39%), Atlantic croaker (27%), and spot (13%) dominated catches, and together with bluefish and butterfish accounted for 91% of the catches (Table 9, Appendix M).

Forty-two flynet catches sampled October 1989 through April 1990 included 29 catches from off the mouth of Chesapeake Bay to Wimble Shoals, nine catches from Cape Lookout to Cape Hatteras, and four catches from Frying Pan Shoals to

Cape Lookout Shoals (Table 1). Total catch weights ranged from 761 to 47,287 kg/trip and averaged 12,576 kg/trip. Weakfish (36%), Atlantic mackerel (21%) and Atlantic croaker (21%) dominated the catches, and together with bluefish and spot accounted for 93% of the catches (Table 9, Appendix N).

Forty flynet catches sampled October 1990 through April 1991 included 12 catches from taken from Cape Henry to Wimble Shoals, 25 catches from Cape Hatteras to Cape Lookout, and three catches from Beaufort Inlet to Cape Lookout (Table 1). Total catch weights ranged from 1,040 to 39,381 kg/trip and averaged 11,340 kg/trip. Weakfish dominated the catches (57%), and together with spot, Atlantic croaker, bluefish and butterfish accounted for 85% of the catches (Table 9, Appendix O).

Flynet catch composition during 1988-91 was similar among seasons, and when compared to previous seasons. Weakfish were dominant during 1988-91, as well as five of the previous six seasons (Table 9; Ross 1990, 91). Weakfish, Atlantic croaker, bluefish, spot and butterfish were the top five species during 1988-89 and 1990-91, and during five of the previous six seasons; in those seven fishing seasons they accounted for 85-96% of the catches. Atlantic mackerel were abundant in the catches sampled during the remaining two seasons, and when included with the other five species (=top six) accounted for 90-94% of the catch weights.

<u>North of Cape Hatteras</u>

Most of the flynet fishing north of Cape Hatteras occurred around Wimble Shoals and north to Oregon Inlet. The catches sampled from these waters were primarily from trawlers fishing out of Oregon Inlet and packing out in Wanchese. Overall, 53% of the flynet catches sampled during 1988-91 were made north of Cape Hatteras, including 60%, 69% and 24% during respective seasons. Mean catch weights ranged from 11,268 kg/trip in 1988-89 to 13,637 kg/trip in 1989-90. The unweighted three-season mean (12,212 kg/trip) was 25% less than the mean for the 1985-88 fishing seasons (Ross 1991) (Table 1).

Weakfish dominated (30-50%) flynet catches north of Cape Hatteras, and together with croaker, bluefish, spot, butterfish and Atlantic mackerel accounted for 89-95% of the catches each season (Table 10). Whereas catches of weakfish and croaker generally included a wide variety of species, catches of Atlantic mackerel and large bluefish were often essentially single species catches. Catches of croaker, spot and butterfish were generally largest in October and November. Weakfish were prevalent in October catches, but the largest catches occurred November through February. Catches of large bluefish occurred from December through March, while sizeable catches of Atlantic mackerel were sampled January through March (Table 11).

Cape Hatteras to Cape Lookout

Trawlers flynet fishing between Cape Hatteras and Cape Lookout were typically from western Pamlico Sound fishing villages or the Beaufort-Morehead City fleet. Fishing generally began in November or December, with greatest fishing effort developing after nearshore flounder fishing declined. Overall, 36% of the flynet catches sampled during the 1988-91 seasons were from between the Capes, including 24%, 21% and 50% of the catches during respective seasons. Seasonal mean total catch weights ranged from 4,524 (1988-89) to 12,530 kg/trip (1989-90). The unweighted three-season mean (10,718 kg/trip) was 10% less than for 1985-88 (11,894 kg/trip) (Ross 1991) (Table 1).

Weakfish dominated flynet catches between Cape Lookout and Cape Hatteras each fishing season and accounted for 55-74% of the catches annually (Table 10). Weakfish, croaker, bluefish, and spot accounted for 81-91% of the catches sampled from 1988-91. Weakfish generally dominated catches from December through March, with the largest catches occurring December through February (Table 11). Croaker catches were typically largest in November and December, although one large catch was sampled in April 1991. Spot and butterfish catches were largest in November and December.

West of Cape Lookout

Flynet catches made west of Cape Lookout were only sampled during November through February, although the flynetting season in those waters was more protracted. Since much of the fishing effort produces large quantities of unmarketable-size foodfish for industrial uses (Ross 1990,1991), the legality of which is questionable (NC Marine Fisheries Commission 1991), sampling these catches was not always possible. Overall, catches west of Cape Lookout accounted for 11% of the flynet samples, or 6-16% of the flynets sampled annually (Table 1). Since 1982, catches sampled west of Cape Lookout were usually made between Bogue Inlet and Cape Lookout; however, two catches sampled in 1990 were made between Topsail Inlet and Cape Fear. Seasonal mean total catch weights ranged from 5,031 (1989-90) to 15,966 kg/trip (1990-91). The unweighted 3-season mean of 14,329 kg/trip was 10% less than the mean for the 1985-88 fishing seasons.

The dominance of weakfish in flynet catches west of Cape Lookout increased from 36-73% of the catches sampled during the 1988-91 fishing seasons (Table 10). Weakfish, croaker, and spot accounted for 82-90% of the 1988-90 catches. During 1990-91, weakfish, spot and menhaden accounted for 96% of the three catches sampled, and croaker catches were small. Discerning any seasonal trends in these waters was impossible since the number of catches sampled monthly was small (Table 11).

Catch Composition 1982-91

The species composition of flynet catches from 1988-91 was predictable and consistent spatially and temporally, although the relative abundance of the species varied with both aspects (Tables 9, 10, and 11). Weakfish dominated flynet catches from off Chesapeake Bay to Cape Fear, and were abundant if not the dominant species in the catches from October through April. Atlantic croaker, spot and bluefish were occasionally dominant and consistently abundant in catches north of Cape Lookout, while croaker and spot were occasionally dominant and/or abundant in catches from west of Cape Lookout. Large bluefish and croaker occasionally dominated catches north of Cape Lookout and large catches of Atlantic mackerel were made north of Cape Hatteras. Butterfish, and northern and southern kingfish (Menticirrhus saxatilus and M. americanus) regularly occurred in flynet catches in all areas.

The species composition of flynet catches during 1988-91 were very similar to those sampled from 1982-88 (Ross 1990,1991). Weakfish and croaker dominated catches throughout the period, although croaker were subject to greater fluctuations in relative abundance within areas and between years. Croaker occasionally dominated catches north of Cape Hatteras during October and

November; bluefish occasionally dominated catches December through April north of Cape Lookout, as did Atlantic mackerel north of Cape Hatteras. The relatively abundant incidental species including butterfish, spot and kingfishes, together with pinfish (Lagodon rhomboides) and silver perch (Bairdiella chrysoura) occurred in catches throughout the period. Excluding catches that were directed towards and exclusively Atlantic mackerel or spiny dogfish (Squalus acanthias), ten species accounted for 95% of the weight of the flynet catches each season from 1988-91 and 96-98% of the catches sampled from 1982-91 (Table 12).

To represent trends in CPUE of weakfish, Atlantic croaker, bluefish, and spot, the following sections present overall flynet catch data, and also CPUE data for flynet trips which did not target spiny dogfish, Atlantic mackerel or striped bass. These catches are defined as "sciaenid-bluefish" flynet trips (Table 12) (Ross 1991).

Weakfish - CPUE, Landings and Size Composition

Weakfish dominated overall flynet catches during the 1988-91 fishing seasons, accounting for 36-57% of the catches seasonally (Table 9) as well as throughout the spatial range of the flynet fleet (Table 10). Weakfish catches were largest north of Cape Hatteras November through February, between Cape Hatteras and Cape Lookout December through March, and west of Cape Lookout November through February (Table 11). Seasonally, the largest mean CPUEs occurred west of Cape Lookout during 1988-89 (5,174 kg/trip) and 1990-91 (11,634 kg/trip) and between Cape Lookout and Cape Hatteras during 1989-90 (6,845 kg/trip) (Table 10).

The overall mean catch/trip of weakfish in sciaenid-bluefish flynet catches increased during successive fishing seasons from 1988-89 (3,394 kg) to 1990-91 (6,576 kg), although CPUEs were generally less than during the 1982-88 seasons (Table 12, Figure 9). The mean catch/trip during two of the three seasons was less than the nine-season mean, and the unweighted three-season mean for 1988-91 (5,273 kg/trip) was 25% less than the mean for 1982-88 (7,043 kg/trip). Similarly, mean catch/day during the 1988-90 fishing seasons (2,303 and 3,200 kg/day) was lower than the unweighted nine-season mean, although the mean for 1990-91 (4,665 kg/day) mean was the third highest seasonal mean since 1982-83.

The unweighted three-season mean (3,389 kg/day) was 11% less than for 1982-88.

Commercial landings of weakfish by the winter trawl fleet ranged from 1,168 to 1,590 mt/season from 1988-91, and were the lowest seasonal totals since 1982 (Figure 8, Appendix A). Mean weakfish landings during 1988-91 (1,326 mt/season) were only 44% of the mean landings/season from 1982-88. As in previous years, most of the weakfish (56-80% seasonally) were landed in the southern ports of Craven, Carteret, Brunswick and Onslow counties (Appendix B).

The size of weakfish captured by all winter trawl gears (virtually all from flynets) combined decreased during the 1988 through 1991 fishing seasons. Weakfish ranged from 121 to 800 and 135 to 895 mm TL during the 1988-90 seasons, respectively, but only 106 to 662 mm TL during 1990-91 (Figure 10, Appendix P). The percent of fish <300 mm TL (market grades = scrap and small (pan)) increased from 73% to 93% to 94%, and the percent of fish >300 mm TL (market grades = medium and large) decreased from 27% to 7% to 6% during successive fishing seasons. Catches of weakfish >300mm TL during 1990-91 were significantly reduced in catches by all winter trawl gears when compared with previous seasons.

The size composition of weakfish differed between fishing grounds, with larger fish caught in more northern waters (Figure 10, Appendix P). A smaller percentage of unmarketable sized (<220 mm TL) weakfish were caught north of Cape Hatteras (1.8-16%) than between Capes Hatteras and Lookout (33-64%) and west of Cape Lookout (22-39%). The relative abundance of weakfish >300 mm TL declined from 44% to 16% north of Cape Hatteras, 24% to 1.2% and 3.6% between Capes Hatteras and Lookout, and 11% to 0.4% west of Cape Lookout. Weakfish >500 mm TL were only landed north of Cape Hatteras. These spatial patterns in the size composition of weakfish in flynet catches paralleled patterns noted in catches during previous fishing seasons (Ross 1990,1991).

The size composition of weakfish has shifted towards smaller fish, continuing a trend noted in catches during 1985-88 (Ross 91). Weakfish 201-300 mm TL dominated catches during 1988-91 (53-75%) as well as from 1982-88 (60-78%) (Figure 10, Appendix P). However, the relative abundance of unmarketable sized

(<220 mm TL) weakfish has increased from 12-16% (1982-85) to 31-47% (1985-91). Weakfish >301 mm TL (market grades medium and large) accounted for 9-27% of the fish from 1982-89 but only 5-6% during 1989-91. Mean catch/trip/size class data confirms the decline of large weakfish in flynet catches. The range of CPUEs of weakfish 201-300 mm TL (8,077-34,546 fish/trip/fishing season) during 1982-89 encompassed the 12,337-32,578 fish/trip during 1989-91, and the mean for 1989-91 (22,457 fish/trip) was within 1% of the seven-season mean (22,457 fish/trip). However, catch/trip/season of fish >300 mm TL during 1989-91 (1,882 fish) was 66% less than for 1982-89 (5,542 fish).

Weakfish age 0-11 were represented in winter trawl catches (all gears combined) during the 1988-91 fishing seasons, but the overall age composition was compressed towards younger fish (Figure 11, Appendix Q). Age 0 and 1 fish accounted for 70% of the weakfish sampled during 1988-89, and 87-88% of the 1989-91 catches. Age 0 weakfish made up 4-5% of the catches during the 1982-86 seasons, 17-28% during the 1986-89 seasons, and 31-49% of the 1989-91 catches. conversely, weakfish age 2 and older accounted for 20-30% of the catches during 1982-89, but only 12-13% during 1989-91. During 1989-90, one vessel had two large catches of large weakfish, thus, the 4% 3+ year old fish, whereas during 1990-91, only 0.5% of the fish were 3+ years old.

Atlantic Croaker - CPUE, Landings and Size/Age Composition

Atlantic croaker was the second most important species in flynet catches during 1988-89, and third behind Atlantic mackerel in 1989-90 and spot in 1990-91 (Table 9). Catches of croaker were generally largest north of Cape Hatteras during the 1988-91 (Table 10), whereas from 1982-88 catches were largest west of Cape Lookout (Ross 1990, 1991). North of Cape Hatteras, croaker catches were largest during October and November; the mean catch/trip (3,353 to 1,531 kg) and relative abundance (29% to 13%) declined during successive seasons (Table 11). Between Cape Lookout and Cape Hatteras, croaker catches were generally small (259-1,502 kg/trip/season) (Table 10), the largest of which were sampled November through March (Table 11). West of Cape Lookout, croaker catches declined from 4,101 to 1,370 to 141 kg/trip during successive seasons (Table 10).

The CPUE of croaker in sciaenid-bluefish flynet trips was comparatively low during the 1988-91 fishing seasons (Table 12, Figure 12). The mean catch/trip (708 kg) during 1990-91 was the lowest CPUE for the nine seasons, and the unweighed three-season mean (2,290 kg/trip) for 1988-91 was 40% less than for 1982-88 (3,744 kg/trip/season). The catch/day during 1990-91 (708 kg) was also the lowest seasonal mean, and the unweighted 1988-91 mean (1,410 kg/day) was 32% less than for 1982-88 (2,085 kg/day).

Landings of croaker by the winter trawl fleet have declined and during the 1989-91 fishing seasons were the lowest since 1982-83 (Figure 12, Appendix A). Mean landings/season for 1988-91 (414 mt) were 50% less than for 1982-88. Landings of croaker were generally greater in Morehead City-Beaufort and southern Pamlico Sound ports (54%, 37% and 76% during successive seasons), but declined throughout (Appendix B).

Seasonal length frequency distributions were increasingly bimodal and continued to reflect a growth overfished population (Figure 13). During 1988-91, croaker ranged from 116-382 mm TL which was similar to the range for 1985-88 (124-385 mm TL). However, the dominant mode encompassed smaller fish each year, shifting from 206-265 mm TL (69%) in 1988-89 to 185-240 mm TL (69%) by 1990-91 (Appendix P). Correspondingly, the relative abundance of fish <175 mm TL increased from 9.1% to 21.2% during the period while fish >250 mm TL decreased from 27% to 2.7%.

Small croaker were more abundant in central and southern waters, although the central tendency of the length-frequency distributions was similar in all areas during the 1988-91 fishing seasons (Figure 13, Appendix R). Unmarketable-sized croaker (<225 mm TL) dominated catches in all waters, accounting for 50-84% north of Cape Hatteras, 73-90% between the Capes, and 60-97% west of Cape Lookout. Croaker 175-250 mm TL generally dominated all catches except that fish 125-175 mm TL dominated catches between the Capes during 1989-90 and west of Cape Lookout during 1990-91.

The size composition of croaker during the 1988-90 fishing seasons was similar to catches from 1983-88, but the smallest fish noted during this project occurred in 1990-91 (Appendix R). The central tendency of the length-frequency distributions has shifted towards smaller fish since 1982. Croaker 225-275 mm TL accounted for 60% of the catches during 1982-83, 200-250 mm TL fish accounted for 56-75% from 1983-90 and 175-225 mm TL fish accounted for 60% during 1990-91. Unmarketable-sized croaker (<225 mm TL) accounted for 25% of the catches in 1982-83, 40-64% from 1983-90 and 81% from 1990-91 while fish >275 mm TL accounted 15% in 1982-83, 1-7% from 1983-90 and 0.2% during 1990-91.

The age composition of atlantic croaker (all gears combined) was compressed towards younger fish during the 1988-91 fishing seasons, particularly when compared with 1982-88 catches (Figure 14, Appendix S). Age 1 fish have dominated catches since the 1983-84 season, but their relative abundance during 1988-91 increased from 76% to 96%, and was higher than preceding seasons (27-69%). Age 2 fish made up 39%-59% of the 1982-86 catches, 15-27% of the 1986-90 catches, and only 4% of the 1990-91 catches.

Bluefish - CPUE, Landings and Size-Age Composition

Bluefish were ubiquitous in winter trawl catches by all gears and in all areas during 1988-91. Bluefish were caught incidentally in flynet, nearshore flounder, and deepwater trawls. Large bluefish were occasionally targeted with flynets when market prices were favorable (2-4 samples/year). Bluefish generally ranked in the top five species of finfish (kg/trip) each season for each gear (Tables 2, 6, and 9), as in previous seasons (Ross 1990, 1991). However, CPUEs of bluefish in flynets (605-879 kg/trip) exceeded those of nearshore flounder (24-56 kg/trip) and deepwater (31-65 kg/trip) catches.

Bluefish catches increased from south to north (Table 10). The largest catches (1,091-1341 kg/trip/season) sampled were made north of Cape Hatteras, and during December, January and March (Table 11). Bluefish catches between Cape Hatteras and Cape Lookout ranged from 237 to 899 kg/trip/season, and sizeable catches occurred in January and February. West of Cape Lookout, bluefish were strictly an incidental catch (69-113 kg/trip/season).

Bluefish CPUEs from flynet catches have fluctuated since the 1982-83 seasons with no trend evident. Mean CPUEs/season during 1988-91 were intermediate for the nine seasons (Table 12, Figure 15). The unweighted mean catch/trip for the 1988-91 seasons (875 kg/trip) was 22% less than for 1982-88 (1,123 kg/trip). Since catches of large bluefish are landed sporadically, sampling error could explain the lack of trend. However, the unweighted three-season mean catch/trip of bluefish during 1988-91 was 70% less in nearshore summer flounder catches and 77% less in deepwater catches than during 1982-88 (Tables 5 and 8).

Bluefish captured by winter trawls encompassed a broad size range, reflecting the importance of North Carolina waters as a wintering grounds (Figure 16). Larger bluefish were caught in more northern waters. West of Cape Lookout, 99-100% were <300 mm FL whereas large fish (>500 mm FL) accounted for 17-44% of the bluefish north of Cape Hatteras, and 0.2-20% between Cape Hatteras and Lookout (Appendix T). This same differential distribution with size was noted during 1982-88 (Ross 1990,1991).

Bluefish length frequency distributions (all gears combined) during 1988-91 were multimodal and encompassed the full size range sampled since 1982 (Figure 16). Bluefish ranged from 184 to 842 mm FL, 156 to 825 mm FL, and 100 to 827 mm FL during the respective 1988-91 seasons, and 153 to 830 mm FL from 1982-88 (Ross 1991). During the 1988-89 and 1990-91 seasons, bluefish size frequency distribution had three modes: two modes (160-300 mm FL and 300-420 mm FL) which combined accounted for 72% and 94% of the fish during respective seasons; and large bluefish (>500 mm FL) which accounted for 25% and 4%. During 1989-90, bluefish <420 mm FL accounted for 73% of the catches, and fish >500 mm FL accounted for 22% Although the percent large bluefish (>500 mm FL) has declined from 51% during 1987-88 to 4% of the 1990-91 catches (Appendix T), growth overfishing is not necessarily indicated since this range of fluctuation was also observed from 1982 to 1987 and likely reflects the sporadic pattern of landings and marketing of large bluefish rather than availability.

The overall age composition of bluefish in winter trawl catches during 1988 to 1991 (all gears combined) included ages 0-9 each season and was similar to previous years' catches (Figure 17, Appendix U). Age 1 fish dominated the catches during 1988-91 (56-82%) as they did from 1982 to 1988 (34-80%).

Nevertheless, older fish continue to be well represented most seasons, although their relative abundance varied seasonally without trend. Age 3+ fish accounted for 0.6-44% of the catches 1982-88 and 4-23% during 1988-91, while age 7+ bluefish made up 0.1-6% of the 1982-88 catches and 0.4-1.2% of 1988-91 catches.

Spot - CPUE, Landings, and Size-Age Composition

Spot were ubiquitous in flynet catches in all areas, but were never targeted and most were too small to be marketed for human consumption. Seasonally, spot made up 7-13% of all flynet catches and averaged 927 kg (1989-90) to 1,325 kg/trip (1988-89) (Table 9). Mean CPUEs/season and the relative contribution of spot to total catch weight increased from north to south during 1988-91 (Table 10) as well as during 1985-91 (Ross 1991). The largest catches of spot occurred north of Cape Hatteras in October and November, between Hatteras and Lookout in December, and west of Cape Lookout November through January (Table 11).

Mean CPUEs of spot in sciaenid-bluefish flynet catches have fluctuated with no trend since 1982 (Figure 18). The CPUEs ranged from 1,082 to 1,325 kg/trip and 657 to 795 kg/day during 1988-91, and each exceeded the nine-season mean (Table 12). The unweighted three-season mean CPUEs for 1988-91 (1175 kg/trip and 740 kg/day) were 32 and 37%, respectively, greater than for 1982-88.

Commercial landings of spot by the winter trawl fleet have fluctuated since 1982 with no trend (Figure 18). The range (33-63 mt) and mean (44 mt) of landings/season for 1988-91 was slightly smaller than for 1982-88 (range=36-75 mt; mean=51 mt) (Appendix A). More spot (79-96%) were landed by trawlers which offloaded in southern fishing ports, as was the case in previous seasons (Appendix B, Ross 1991).

Small, unmarketable spot dominated flynet catches every season. During 1988-91, spot size frequency distributions were unimodal with the majority of the fish 135-180 mm FL (Figure 19). Although they ranged from 93 to 263 mm FL, only 0.6-1.7% were marketable-sized spot (>195 mm TL). The 1988-91 spot size frequency distributions were analogous to those from 1982 to 1988 in which 95-97% were unmarketable (<195 mm TL; Ross 1991). Marketable spot (>195 mm TL) accounted for 1.7-6.8% of the fish north of Cape Hatteras, and 0.1-1.2% of the fish south of Cape Hatteras (Appendix V).

The age composition of spot in trawler catches has remained basically the same since 1982-83 (Figure 20, Appendix W). Ages 0 and 1 spot continued to dominate catches during 1988-91 (93-97%) as during 1982-88 (85-90%). However, the relative abundance of age 2+ fish declined from 12 to 15% during 1982-88 to only 3 to 7% during 1988-91.

SCRAP FISH

Sciaenid-Bluefish Flynet Fishery

Flynets continued to produce the largest quantities of scrap fish landed by the trawl fishery (Ross 1991). To describe scrap fish trends in flynet catches, trips that targeted Atlantic mackerel or dogfish (Squalus acanthias or Mustelus canis) were excluded from analyses since they were essentially single species catches and/or contained no sciaenids. Seasonally, flynet trips north of Cape Hatteras averaged 3,064-5,232 kg/trip of scrap fish which accounted for 24-44% of those catches during 1988-91; between Cape Hatteras to Cape Lookout scrap fish averaged 1,115-7,446 kg/trip and constituted 25-59% of the catches; and west of Cape Lookout scrap fish averaged 2,302-8,776 kg/trip and constituted 35-56% of the catches (Table 13).

The species composition of the scrap was similar between areas and seasons. Weakfish, croaker and spot accounted for 75-81% of weight of scrap fish north of Cape Hatteras, 76-88% between the Capes, and 64-88% west of Cape Lookout during the 1988-91 seasons (Tables 14-16). Since 1982, weakfish, croaker, and spot together with bluefish and butterfish have dominated (77-95%) the weight of the scrap fish sampled from all flynet catches combined (Table 17). However, the relative abundance of these five species declined from 93 to 95% of the scrap during the 1982-85 to 89-91% during 1985-88 to 77-87% during 1988-91. The relative abundance of menhaden and pinfish (Lagodon rhomboides) in the scrap increased south of Cape Hatteras during 1989-91.

Scrap fish remained a large component of sciaenid-bluefish flynet catches, particularly since the 1984-85 season. Scrap fish accounted for 33-39% of the flynet catches sampled during the 1984-91 seasons, but only 13-17% of the 1982-84 catches (Figure 21a). CPUEs of scrap increased from 1,834 to 2,410 kg/trip/season from 1982-84 to 3,983-5,910 kg/trip/season from 1984-88 and 3,562-4,393 kg/trip/season during 1988-91 (Figure 21b).

Whereas the relative abundance of scrap fish in flynet catches corresponded with reported landings of scrap fish through the 1988-89 fishing season, the two sets of data for 1989-91 produced contradictory trends due to non-reporting of scrap fish landings. The percent of scrap fish in the 'sciaenid-bluefish' flynet catches sampled and in the reported flynet landings (=winter trawl landings of weakfish, croaker, spot, bluefish, and butterfish) increased between the 1982-83 and 1984-85 fishing seasons and was greater than 30% of the catches through the 1988-89 season (Figure 22). However, while the percent of scrap in flynet catches sampled during the 1989-91 seasons remained between 35-39%, the percent of scrap fish to total landings declined to only 5-10% of 1989-91 landings (Figure 22, Appendix A). Most reported landings of scrap fish have come from Morehead City-Beaufort, where it is marketed for bait and industrial uses. During the 1982-89 fishing seasons, scrap fish accounted for 28-42% of the total winter trawler landings from southern Pamlico Sound ports (dominated by Beaufort-Morehead City trawlers), but only 1-9% of the landings in northern Pamlico Sound ports (Appendix B, Ross 1990, Ross 1991). During 1989-91, scrap fish accounted for only 7% and 1% of the reported landings in southern ports, whereas the percent of scrap fish in northern ports remained within the historical range. During 1990-91, the weight of scrap fish in the catches sampled in southern ports exceeded the reported landings.

<u>Nearshore Flounder Fishery</u>

Insignificant quantities of scrap fish were landed by the nearshore flounder fishery. During the 1988-91 fishing seasons, scrap fish accounted for <1% of the nearshore flounder catches north of Cape Lookout, and 11% (605 kg/trip) of the catches 0 west of Cape Lookout (Table 13). Croaker and spot were the main components of the scrap fish (Tables 14-16). The small amount landed by the nearshore flounder fishery was due to the use of large mesh tailbags (4 1/2 to 5-1/2 inch stretched mesh), low profile trawls, and greater culling at sea since catches were small compared to flynet catches. This corresponded with findings from 1982-88 (Ross 1991).

Deepwater Fishery

The amount of scrap fish in the deepwater catches was generally not excessive. During the 1988-91 seasons, scrap fish accounted for 0.2-7.6% and 9-688 kg/trip of the deepwater catches seasonally (Table 13). Increased scrap fish in 1990-91 catches was related to increased catches of scup in deepwater flynets, which historically have produced large catches of unmarketable-sized scup (Ross 1990). Nevertheless, only four of 13 deepwater catches had >50 kg volumes of scrap. Scup have generally dominated the scrap fish landed by the deepwater fishery since 1982 (Table 14-16, Ross 1991).

The small quantities of scrap fish landed in deepwater catches during 1988-91 corresponded with findings during 1982-88 (Ross 1991). Minimal amounts of scrap fish were landed due to culling at sea and the use of large mesh tailbags when targeting summer flounder. Also, small scup (pin porgies) and 'mice' black sea bass are marketable, thus reducing the amount of discarded fish.

AGGREGATE RESOURCE TRENDS

Indices of aggregate abundance for species groups may reflect major changes in fishery resources (NEFC 1988). Data for these indices were derived from CPUE data (mean catch/trip and mean catch/day) from winter trawl fishery components including:

1. the 11 dominant species, including squid, which comprised 87-99% of the nearshore flounder fishery catches (Table 5);
2. the 8 dominant species, including squid, that comprised 98-100% of the deepwater fishery catches (Table 8);
3. the 11 dominant species in the sciaenid-bluefish flynet catches that comprised 95-98% of the flynet catches (this grouping excluded catches that targeted dogfish, striped bass (*Morone saxatilis*), and Atlantic mackerel) (Table 12); and
4. all finfish (and squid) in the winter trawl fishery by merging all catches sampled seasonally.

Total biomass caught on nearshore flounder fishery trips has declined since the 1984-85 fishing season (Figure 23a). Mean CPUEs were lower during the 1988-91 seasons than during any previous season. The unweighted seasonal mean catch/trip for 1988-91 (3,394 kg/trip) was 28% less than for 1985-88 and 61% less than for 1982-85. Similarly, unweighted mean catch/day during 1988-91 (718 kg/day) was 36% and 67% less than during the 1985-88 and 1982-85 seasons respectively. The reduced CPUEs reflect primarily reduced catches of summer flounder, and secondarily, of weakfish and bluefish. The imposition of a 5 1/2 inch mesh tailbag regulation in state waters during the 1990-91 fishing season reduced the landings of dab and small flounder, as well as incidental groundfish and squid. However, the relative abundance and CPUE of summer flounder increased during 1990-91.

Total biomass caught in deepwater trawls has generally declined since the projects inception. Mean CPUEs during the last four seasons were all lower than the first five seasons (Figure 23b). The unweighted seasonal catch/trip for 1988-91 (5,845 kg/trip) was 29% less than during 1985-88 and 52% less than during 1982-85 (11,440 kg/trip). The decline in catch/day was even more dramatic, as catches during 1988-91 (962 kg/day) were 40% less than during 1985-88 and 63% less than 1982-85 fishing seasons. During each of the last three seasons, black sea bass and bluefish CPUEs were lower than the species-specific nine-season means while summer flounder and scup were lower two of the three seasons. Fishing effort in deepwater was reduced during the 1990-91 fishing season because summer flounder were more concentrated in shallower, mid-shelf waters than along the shelf-edge. Thus, while CPUEs increased for virtually all species during 1990-91, fishing effort in deepwater was reduced and overall landings of the three dominant species was the second lowest total for the last nine fishing seasons (Figure 23b).

Total biomass caught on sciaenid-bluefish flynet trips has declined during recent fishing seasons. Whereas CPUEs and landing were relatively stable through the 1987-88 season, both CPUEs and landings have recently declined (Figure 24a). The unweighted three-season means for 1988-91 (10,264 kg/trip and 6,473 kg/day) were 21% lower/trip and 11% lower/day than for the 1982-88 seasons. Croaker catches were lower all three seasons, and weakfish, bluefish and butterfish catches were lower two of the three seasons compared with the species specific nine-season mean CPUEs. Combined landings of weakfish, croaker, spot, bluefish, and butterfish have steadily declined during the last three fishing seasons (Figure 24a).

Total biomass caught by the winter trawl fleet, all gears combined, declined during the 1988-91 fishing seasons. Mean CPUEs and landings were lower than during any of the previous six seasons (Figure 24b). Unweighted three-season mean CPUEs during 1988-91 (7,147 kg/trip and 1,969 kg/day) were 22% and 27%, respectively, lower than for catches during 1985-88 and 37% and 45%, respectively, lower than for the 1982-85 seasons. Declining CPUEs translated into reduced overall landings of all species by the winter trawl fishery (Figure 24b). The winter trawl fleet landed 9,000-10,177 mt seasonally during 1982-85, but only 4,056-5,304 mt during 1988-91 seasons.

The decline in the winter trawl fishery catches and landings paralleled marketable finfish landings in North Carolina from all fisheries combined (Table 18). Total edible finfish landings for all fisheries combined peaked in 1980 (41,000 mt), exceeded 28,000 mt from 1977 through 1985, but have fallen since 1985. Overall landings in 1989 and 1990 (20,501 and 21,684 mt) were 30% less than the mean for the previous ten years (1979-88), and the lowest since 1974. Even more dramatic has been the decline in overall landings (all fisheries combined) of the eight species that dominate winter trawl fishery landings (Table 18). The eight species produced peak landings of 30,527-33,526 mt during 1979-80, but accounted for only 11,970-14,627 mt during 1989 and 1990, a 39% reduction in landings from the annual mean for the previous ten years.

SPECIES SYNOPSES

SUMMER FLOUNDER

Summer flounder has traditionally been the most valuable component of the winter trawl fishery. During the last three seasons, summer flounder landings by the trawl fleet were valued at $4.1-5.7 million (Appendix B). This accounted for 28-44% of the poundage and 59-75% of the value of the marketable finfish landed by the fleet seasonally. The fishery produced 42-59% of all flounder (three species combined) landed commercially in North Carolina (Appendix A).

Landings of summer flounder by trawlers in North Carolina accounted for 23-44% of the east coast landings of between 1980-85 and 18-25% between 1986-90.

Summer flounder landings during 1989-90 fell to the lowest levels since the early 1970s (Figure 25). Annual Atlantic coast commercial landings ranged from 9,904 to 19,004 from 1974 to 1988, but declined to 9,701 and 5,000 mt during 1989 and 1990, respectively. Annual North Carolina trawler landings of summer flounder, which ranged from 2,325 to 7,295 mt from 1973-1988, fell to 1,909 and 1,238 mt during 1989 and 1990, respectively. Landings during 1989 and 1990 were only 26% and 17% of landings during 1979 (7,295 mt).

Catch per unit effort of summer flounder by North Carolina winter trawlers participating in the nearshore fishery remained low while deepwater CPUEs fluctuated. Continuing the trend noted for the 1985-88 fishing seasons, nearshore summer flounder CPUEs during 1988-91 declined 14% from the previous three years and were 62-68% lower than during 1982-88. Deepwater catches of summer flounder have not shown the same persistent decline, with seasonal mean CPUEs during 1988-89 among the highest, but 1989-91 the lowest CPUEs since 1982-83.

Age composition of summer flounder in North Carolina and along the east coast is severely truncated with over 90% of the catch age 4 or younger. Older age classes should be represented in the catch since this species lives to at least 15 years old (Dery 1988).

Recent stock assessment information indicates that the summer flounder stock is over-exploited and the stock level is low (NOAA 1992). Recruitment has declined sharply over the last decade. The fishing mortality rate on fully recruited summer flounder was 1.1 in 1990. Thus, there is a five-fold difference between the F_{max} and the current F. In order to reach the definition of overfishing in the fishery management plan (F_{max}=0.23), the Mid-Atlantic Fishery Management Council (MAFMC) recommended that current exploitation rates would have to be reduced by 73%. In the current draft of Amendment 2 to the Fishery Management Plan for the summer flounder fishery, the MAFMC proposes to meet this reduction by the 13" size limit, enacting a 5 1/2 minimum mesh size in the tailbag, and reducing harvest by implementing a quota management system.

WEAKFISH

Weakfish was the dominant species harvested with flynets during the 1988-91 seasons. Most were caught from Oregon Inlet to Beaufort Inlet, with smaller fish caught in more southern waters. During the last three seasons, weakfish landed by winter trawlers were valued at $0.8-$1.3 million, accounted for 27-30% of the weight, and 13-17% of the value of marketable finfish landed by the fleet. Trawlers produced 30-44% of the weakfish landed commercially in North Carolina. The 1990-91 season was the first since 1983-84 that trawlers landed more weakfish than ocean gill nets (primarily sink nets) (Appendix A).

Commercial landings of weakfish have declined in recent years. Winter trawler landings and Atlantic coast commercial landings fell to the their lowest levels since 1970, while North Carolina landings were at their lowest level since 1971 (Figure 26).

Although CPUEs of weakfish increased during 1988-91, catches were still 25% less than during the 1982-88 seasons. Conversely, the CPUE of weakfish in sink nets, which steadily increased from 1982 through 1987, declined precipitously through the 1990-91 season (Ross 1992). The contradictory trends reflected less frequent, but still sizeable catches of weakfish, coupled with declining effort by trawlers using flynets and instead shifting to other fisheries, ie. flounder fishing or scalloping.

The size composition of weakfish in trawl catches continued the shift towards smaller fish noted in 1985-88 catches (Ross 1991). This was also noted in sink net catches, where the reduced availability of larger fish has necessitated the use of smaller mesh gill net to maintain productivity (Ross 1992). The size of weakfish recruiting to the recreational fishery in the mid-Atlantic has also decreased (ASMFC 1991).

The age composition of weakfish in flynet catches was severely truncated, with over 87% of the catch during 1989-91 age 0 or 1. Older (6-10 years old) age classes were represented during only one of the last three seasons. This trend was apparent in sink net catches during the last three seasons (Ross 1992).

Weakfish continued to account for a significant component of the scrap fish landed by trawlers. During the 1988-91 fishing seasons, the average number of weakfish in the scrap increased from 8,900-18,900 fish/trip, which was in the range of catches during 1982-86, but less than during the 1986-88 fishing seasons.

The Atlantic States Marine Fisheries Commission has determined that weakfish were being overfished (Vaughn et al. 1991). Fishing mortality (F) is currently between 0.9 and 1.2, and has increased in recent years, even as landings have declined. Growth overfishing has been evidenced for several years based on commercial catches (Ross 1991). Recruitment overfishing may be showing early stages based on DMF juvenile survey data since CPUEs were lower during 1987-91 than 1981-86, and 1991 CPUEs were the lowest of the 13 years sampled (Tangedal 1992). Measures to reduce mortality by imposing minimum size limits and/or net mesh sizes, seasonal closures, and reductions in bycatch of juvenile weakfish are currently being considered for North Carolina fisheries.

BLACK SEA BASS

Black sea bass has traditionally been one of three dominant species in the deepwater component of the winter trawl fishery. However, they accounted for <2% of the deepwater catches sampled during 1990-91 as catches were greatly reduced. Overall, black sea bass were worth $153,000-$461,000, and accounted for 2-5% of the marketable fish landed by winter trawl fleet in North Carolina during the 1988-91 seasons. Trawlers accounted for 21-46% of the black sea bass landed in North Carolina and 12-17% of those landed from North Carolina to Maine (Appendix A).

Commercial landings of black sea bass north of Cape Hatteras were highest during 1952 (9,900 mt) and declined steadily to 600 mt by 1971 (Figure 27). During the 1980s landings ranged from 1,100-1,900 mt and fluctuated without trend. Recreational landings account for a large percent of the black sea bass caught annually. Annual winter trawl landings of black sea bass ranged from 71-370 mt from 1980-1990. However, landings during the 1990-91 were only 30% of the previous two seasons, and the lowest seasonal total since the projects inception in 1982.

Catch-per-unit-effort of black sea bass by winter trawlers has steadily declined since the 1984-85 fishing season. Reported CPUE data for the Mid-Atlantic trawl fishery in 1990 and the NEFC spring offshore bottom trawl survey during 1991 indicated comparatively small catches (NEFC 1991).

The size composition of black sea bass in trawl catches has remained relatively constant since 1982. There has been a slight decline in jumbo (>350 mm TL) fish in recent years, but generally the harvest remained primarily small and medium (200-300 mm TL) fish. These primarily 2-3 year old fish dominated commercial landings north of Cape Hatteras (NEFC 1991). The biologically optimum age of first harvest for black sea bass is six years, to account for their hermaphroditic reproductive biology. Consequently, high pre-recruit indices from the NEFC survey corresponded to higher commercial landings two years later, but periods of high landings were brief. This suggests the incoming year classes are reduced rapidly by the fishery (NEFC 1991).

Currently, the assessment information is insufficient to allow definitive understanding of the status of this stock, but the stock would appear to be fully exploited (NEFC 1991). Development of a stock assessment for black sea bass north of Cape Hatteras by Atlantic States Marine Fisheries Commission (ASMFC)-MAFMC will begin in 1992.

SCUP

Scup is one of the three dominant finfish species in the deepwater trawl catches which are landed primarily from January through April. Virtually all are landed in the northern ports, particularly Wanchese. Scup landings were low during the last three seasons and valued at only $20,300-$82,300, which was 0.2%-1.2% of the value of marketable fish landed by the trawlers. Scup accounted for only 0.3-1.8% of the marketable finfish landed by trawlers during 1988-91, down from 3.3-4.7% of the 1982-84 landings. Trawlers produced all of the scup landed in North Carolina (Appendix A).

Commercial landings of scup have steadily declined in recent years (Figure 28). Annual landings in North Carolina during 1988-90 (8-57 mt) were lower than any year since 1977 and less than 10% of the landings from 1979-1984. Commercial landings of scup from Virginia to Maine have also declined, with annual landings in 1987-89 the lowest since 1973. East coast landings of scup since 1967 were 50-80% less than during 1950 to 1964. The Virginia winter trawl fishery, which produced in excess of 5,000 mt during the early 1960s, has averaged less than 350 mt during the 1980s (NEFC 1991). Recreational catches, which represent 20-50% of the landings during the 1980s, in 1990 were 40% below the 1980-89 mean (NEFC 1991).

Catch per unit effort of North Carolina trawlers declined to their lowest level in 1988-89, than rebounded slightly the next two seasons. This paralleled CPUEs of New England otter trawlers which also approached record lows during the 1989 fishing season and only rebounded slightly during 1990. Juvenile indices since 1981 have fluctuated widely, but appear to be trending downward (NEFC 1991).

The size composition of scup in winter trawl catches continued to reflect signs of growth overfishing. The relative abundance and catch/trip of large (>250 mm FL) scup were lower during 1988-91 than during the previous six fishing seasons and much lower than were reported from catches during the 1930s (Ross 1991). Scup length frequencies from commercial and recreational fisheries from southern New England to New Jersey also have shifted to smaller fish, although the reported modes (24 cm) were slightly larger than fish landed in North Carolina (18-21 cm).

The low CPUEs, reduced landings and truncated length frequency distributions evidenced in North Carolina trawler catches of scup in recent years confirm trends observed from Virginia to southern New England. Throughout the range, the fishery continues to direct harvest on increasingly young fish. The

NEFC considers the status of scup exploitation to be overexploited (NEFC 1991). The ASMFC-MAFMC will initiate a stock assessment of scup during 1992.

BLUEFISH

Bluefish were ubiquitous in all trawl catches, and large bluefish were occasionally the target species in flynet catches. Bluefish accounted for 3-5% of the marketable finfish landed by the winter trawlers during the 1988-91 seasons; they were valued at $44,000-$78,000, or approximately 1% of the total value of the marketable fish landed by trawlers, which produced 6-16% of the bluefish landed in North Carolina. The production of bluefish by trawlers in North Carolina compared to other fisheries has been low since 1984 (Appendix A), particularly in comparison with 1977 through 1983, largely because of the expansion of the sink net fleet (Ross 1990).

Atlantic coast annual commercial landings of bluefish have exceeded 40,000 mt since 1973, whereas from 1950-1973 landings were less than 30,000 mt. North Carolina trawlers produced 10-26% (0.8-2.0 million mt) of the bluefish landed along the east coast during 1980-84, but only 2-8% (0.1-0.5 million mt) during 1988-90 (Figure 29). North Carolina has dominated bluefish commercial landings in recent years, although sink nets replaced otter trawls as the most productive gear.

Catch-per-unit-effort of bluefish by trawlers declined during the 1988-91 fishing seasons. Bluefish catches by flynets during 1988-91 were intermediate in comparison to the 1982-91 seasons. Although flynets catches were only 22% less, deepwater and nearshore flounder catches of bluefish were 70-77% less than the 1982-88 mean. Recreational fishery CPUEs have been declining since 1982 (MAFMC 1989, NEFC 1991). Sink net CPUEs of large bluefish have increased while CPUEs of small bluefish have been stable since 1982 (Ross 1992).

All sizes and ages of bluefish continue to be represented in trawler catches off North Carolina. Bluefish continues to be the only species that has not shown a systematic decline in the relative abundance of large/old fish in commercial catches. The size composition of bluefish in sink net catches has been similar to trawler catches since 1982.

Recent stock assessment of bluefish found the stock to be fully exploited (MAFMC 1989, NEFC 1991). There was no evidence of a systematic decline in year class strength since three strong year classes were produced during the 1980s. However, recreational CPUEs and landings have declined since 1981. Off North Carolina there has been evidence of a shift offshore and north of the main body of large bluefish, based on fishing patterns of the fishing fleet. This may be the result of progressively warmer winters and may have some bearing on reduced recreational catches, particularly spring catches around North Carolina and Virginia.

ATLANTIC CROAKER

Atlantic croaker was second to weakfish in importance to the flynet fishery off North Carolina. Since 1982, trawlers had accounted for 12-29% of the croaker landed in North Carolina, but during 1990-91 trawlers produced only 6% (Appendix A). Correspondingly, during the 1988-91 seasons, croaker accounted for a diminishing percent of the total trawler landings in terms of volume (12% to 10% to 4%) and value (6% to 6% to 2%).

Commercial landings of croaker have exhibited two periods of high landings since 1950, with record landings during the late 1970s (Figure 30). Landings during the 1980s have generally been intermediate in range, but have declined in recent years. North Carolina has dominated Atlantic coast landings since 1962 and accounted for 68-98% during the 1980s. However, North Carolina annual landings during 1990 were the lowest since 1973, and 1987-90 landings were roughly one-third of peak landings during 1977-1980. Similarly , winter trawl landings in 1990 were the lowest recorded since 1950. Sink net landings during the 1990-91 season were the lowest since 1981 (Ross 1992.

Catch per unit effort of croaker has generally declined. Flynet CPUEs during 1990-91 were the lowest recorded since the projects inception (1982). Similarly, sink net CPUEs of croaker have declined with 1989-91 catches lower than the previous six seasons (Ross 1992).

Growth overfishing continued to plague the winter trawl fishery. Roughly 80% of the croaker landed were unmarketable size fish during the 1990-91 season, an increase in small fish from the previous seven seasons when 40-64% were undersized. The relative abundance of 'medium-large' croaker continued to decline and accounted for less than 1% of the 1990-91 catches. The compressed age composition of croaker confirms this. The relative abundance of age 1 fish has increased while age 2 and older fish have decreased in recent years.

Croaker have been growth overfished and may be undergoing recruitment overfishing as well. Declining numbers of large fish and the steadily increasing dominance of unmarketable sized fish in the catches has been noted in the recent past (Ross 1991) and continued during the last three years. Signs of recruitment overfishing may be inferred from DMF juvenile survey data. Juvenile croaker CPUEs fluctuated with several high peaks from 1979 (first year of sampling) through 1987, after which CPUEs have declined, no strong year class was evidenced, and 1991 values were the lowest for the entire period (Tangedal 1992). Management measures to reduce bycatch and scrap fish landings of weakfish, particularly by shrimp and fish trawls, and long hauls could reduce fishing pressure on the co-occurring croaker during the next few years.

MANAGEMENT IMPLICATIONS AND RECOMMENDATIONS

The overall assessment of the winter trawl fishery at the end of the 1990-91 fishing season was the same as at the end of the 1987-88 fishing season (Ross 1991). All principal species components of the fishery, except for bluefish, were characterized by reduced CPUEs, reduced landings, and compressed size/age composition compressed towards smaller/younger fish.

All principal components of the winter trawl fishery have been assessed as overfished by MAFMC and/or ASMFC. Weakfish and summer flounder, the two most important species harvested by the fishery, have been assessed as severely overfished and the initial phases of regulations implemented. Black sea bass and scup have recently been assessed to be overfished and FMPs will soon be implemented with regulatory action pending. Bluefish have been assessed to be fully exploited, regulatory action has been recommended to the states, and most states have complied with the plan. Atlantic croaker has been growth overfished, but no regulatory action is pending.

Increased size limits and gear restrictions (minimum mesh size tailbags) have been the initial regulatory thrust of the FMPs currently in place (summer flounder and weakfish) and for those proposed, but not yet approved (black sea bass and scup). The most critical need for this fishery is to increase the size of the fish harvested. These regulations should ultimately reduce the volume of undersized food fish discarded or marketed as industrial fish or crab bait. Benefits to the fishermen could be realized in the near future by increased yield per recruit if recruitment levels are not below average.

The second phase of the FMPs, not yet instituted, are aimed at reducing fishing mortality (F) on the fully-recruited age classes. This is to be accomplished by reductions in effort or landings through quotas and/or closed seasons. This could cause extreme hardships on the fleet. Closed seasons could result in increased fishing pressure on other fully exploited stocks (i.e., bluefish and croaker). The sink net fleet, due to the reduced availability of weakfish during the 1990-92 fishing seasons, shifted to other fisheries (bluefish, dogfish, tuna, and king mackerel). The winter trawl fleet has less flexibility. The bluefish market is easily glutted, dogfish is an alternative for some, but beyond these two species, the options are very limited.

Since alternative species are unavailable to the winter trawl fleet, a reassessment of the weakfish, summer flounder, scup, and black sea bass stocks could be made after several years of enforced size limits and mesh size restrictions. Seasonal closures, based on quotas, could then be considered based on the updated assessments rather than projected levels of stock size based on 1980s data. The possibility exists that stock recovery could be faster than expected due to interactive effects of the various mesh size restrictions put in place on non-target species that are not fully accounted for in stock assessments. In other words, the 5-1/2" mesh size tailbag used in the summer flounder fishery will result in increased escapement of weakfish, bluefish, scup and black sea bass previously harvested incidentally during this fishery. A three in square mesh tailbag, likely to be imposed on the flynet fishery for weakfish, will increase the escapement of small croaker and spot.

Limited entry to the winter trawl fishery by recent participants only should be evaluated. This would ensure that those who suffer through periods of hardship imposed by FMP regulations will ultimately bear the fruits of improved fish stocks. This would also ensure that vessels from other fisheries that are currently in similar phases of overfishing and strict management measures being instituted (i.e., New England groundfish and scallop fisheries) do not shift into this fishery).

Management of the fish stocks harvested by the fleet must be flexible enough to ensure fleet viability through the current period of strict regulations. Within the last five years and during the next several years, a previously unregulated fleet will suddenly have to deal with severe restrictions on virtually every species harvested and every net used. Long term stock rebuilding could minimize the loss of income to the fleet while allowing gradual increased biomass of adult fish due to mesh and fish size restrictions.

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Table 1. Monthly summary of sampling of winter trawl fishery from October 1988 to April 1991, by area fished (N = north of Cape Hatteras; C = Cape Hatteras to Cape Lookout; S = west of Cape Lookout) and gear (Flounder = flounder or combination nets fishing in depths generally <20 fathoms; Deepwater includes flounder nets, flynets and combination nets used in waters >20 fathoms; Flynet denotes use of flynet; Crab denotes use of crab trawl); n = number of catches sampled.

					Catch weight (kg)		Sample weight (kg)	
Year	Month	Area	Gear	n	Mean	Range	Mean	Range
1988	Oct	N	Flynet	3	16,521.8	11,007-27,215	257.6	105-514
		N	Flounder	3	867.0	2,601- 9,685	354.1	340-368
	Nov	N	Flynet	5	20,725.2	9,072-36,299	188.4	91-298
		S	Flynet	1	31,770.0		85.7	
		N	Flounder	10	3,767.3	288- 7,588	221.5	86-363
	Dec	N	Flynet	1	4,010.3		226.7	
		C	Flynet	1	1,369.9		78.0	
		S	Flynet	3	10,186.5	3,220-14,169	112.1	95-125
		N	Flounder	1	431.0		126.5	
		N	Deepwater	7	6,591.2	2,848-17,598	244.8	160-349
1989	Jan	N	Flynet	6	8,680.0	3,036-21,526	173.5	79-238
		S	Flynet	1	18,261.6		123.2	
		N	Flounder	3	3,813.4	1,108- 6,750	272.6	204-357
		C	Flounder	2	3,055.0	1,346- 4,764	249.2	227-272
		N	Deepwater	8	7,654.0	2,106-15,021	232.1	130-347
	Feb	N	Flynet	1	7,082.0		226.7	
		C	Flynet	1	9,989.4		155.5	
		S	Flynet	1	12,602.9		155.6	
		N	Flounder	9	2,616.0	1,287- 4,570	228.7	183-319
		N	Deepwater	9	5,165.7	2,030-11,974	345.6	145-568
	Mar	N	Flynet	7	6,115.6	243-12,843	286.5	97-591
		C	Flynet	7	4,187.0	1,536-11,796	173.3	50-397
		N	Flounder	1	1,969.5		436.8	
		N	Deepwater	7	2,954.8	1,653-4,528	349.0	206-518
	Apr	N	Deepwater	2	5,562.6	2,942-8,183	281.6	131-433
1989	Oct	N	Flynet	4	14,429.2	8,241-23,385	125.5	92-178
		N	Flounder	1	2,954.1		362.9	
	Nov	N	Flynet	6	18,318.0	10,859-22,839	147.2	78-300
		N	Flounder	8	4,575.7	480- 7,165	253.7	0-385
	Dec	N	Flynet	4	13,673.3	1,370-37,761	265.1	40-612
		C	Flynet	1	27,935.0		88.5	
		S	Flynet	2	2,744.2	761- 4,727	65.2	52-78
		N	Flounder	8	2,137.2	923- 3,363	191.4	0-370
		C	Flounder	3	2,557.5	941- 4,719	135.0	68-171
		N	Deepwater	4	3,145.3	2,179- 4,762	284.7	204-359
1990	Jan	N	Flynet	5	15,602.3	6,217-47,287	249.0	68-639
		C	Flynet	1	7,485.5		272.2	
		S	Flynet	1	8,585.8		109.4	
		N	Deepwater	20	3,979.6	1,289-10,522	275.6	0-502
	Feb	N	Flynet	6	6,858.4	2,022-28,415	225.9	91-431
		C	Flynet	3	15,738.7	6,015-26,203	105.6	65-136
		S	Flynet	1	6,053.0		57.7	
		N	Flounder	1	2,415.0		136.0	
		C	Flounder	2	1,957.9	739- 3,177	157.1	132-182
		N	Deepwater	9	4,783.7	1,135-12,935	271.4	111-375
	Mar	N	Flynet	3	18,329.5	6,808-41,246	238.7	88-493
		C	Flynet	4	7,560.5	5,087-12,347	88.8	27-141
		S	Flounder	1	4,152.2		250.5	
		N	Deepwater	8	4,860.4	1,057-10,344	259.2	13-514
		C	Crab	2	993.0	975- 1,010	108.3	90-126

Table 1. (Continued).

Year	Month	Area	Gear	n	Catch weight (kg) Mean	Catch weight (kg) Range	Sample weight (kg) Mean	Sample weight (kg) Range
	Apr	N	Flynet	1	1,165.8		106.2	
		S	Flounder	2	5,959.3	3,557- 8,361	186.9	174-200
		N	Deepwater	4	4,488.1	3,428- 5,411	326.1	287-363
1990	Oct	N	Flynet	3	8,303.4	6,805-10,162	179.1	145-198
		N	Flounder	1	7,724.0		385.2	
	Nov	N	Flynet	5	14,155.8	6,628-22,710	150.6	140-168
		C	Flynet	2	13,274.5	10,481-16,067	183.2	179-187
		N	Flounder	12	5,387.5	548-11,085	298.0	0-585
	Dec	C	Flynet	3	21,793.2	8,234-39,381	131.5	43-218
		N	Flounder	15	3,088.4	443- 6,472	274.6	142-381
		C	Flounder	1	1,357.2		222.8	
1991	Jan	N	Flynet	2	17,341.6	10,477-24,206	277.7	91-465
		C	Flynet	3	12,760.5	9,755-17,448	115.6	83-164
		S	Flynet	2	22,408.1	4,531-11,340	149.5	147-152
		N	Flounder	7	4,855.3	461- 9,151	320.5	204-539
		N	Deepwater	2	5,638.2	4,674- 6,603	408.4	317-499
	Feb	N	Flynet	1	1,039.7		0	
		C	Flynet	8	7,273.8	2,504-15,682	123.9	54-246
		S	Flynet	1	3,084.5		66.6	
		N	Flounder	10	4,826.9	2,650- 8,814	278.1	179-431
		N	Deepwater	2	5,778.0	5,478- 6,078	328.0	296-360
	Mar	N	Flynet	1	16,374.6		64.3	
		C	Flynet	8	7,355.2	2,644-14,429	112.4	50-162
		N	Flounder	2	2,440.0	1,803- 3,077	341.9	227-457
		N	Deepwater	3	10,642.6	4,239-16,940	208.3	68-390
	Apr	C	Flynet	1	16,740.0		51.9	
		N	Deepwater	6	10,525.0	5,566-20,388	230.1	123-401

Table 2. Species composition, mean weight (kg) and mean number of fish per trip for the top 99% (by weight) of the nearshore flounder catches by season for October 1988 through April 1991, including numbers of catches sampled (n) and the percent of the total weight of the catches sampled.

Species	Weight (kg)		Mean no. fish	Species	Weight (kg)		Mean no. fish	Species	Weight (kg)		Mean no. fish
	Mean	Percent			Mean	Percent			Mean	Percent	
1988-89 (n=29)				1989-90 (n=26)				1990-91 (n=48)			
Paralichthys dentatus	3,133.7	91.7	3,731	Paralichthys dentatus	2,284.6	68.5	2,956	Paralichthys dentatus	3,679.1	85.2	5,399
Loligo pealii	74.4	2.2	-	Sphoeroides maculatus	265.0	8.0	100	Busycon sp.	171.2	4.0	
Centropristis striata	39.0	1.1	93	Loligo pealii	235.5	7.1		Loligo pealii	109.1	2.5	
Pomatomus saltatrix	25.1	0.7	4	Cynoscion regalis	148.7	4.5	263	Lophius americanus	64.6	1.5	
Pogonias cromis	21.9	0.6	-	Micropogonias undulatus	51.4	2.4	582	Sphoeroides maculatus	58.2	1.3	48
Cynoscion regalis	17.8	0.5	21	Pomatomus saltatrix	55.8	1.7	34	Pomatomus saltatrix	47.2	1.0	10
Mustelus canis	14.4	0.4	-	Archosargus probatocephalus	50.9	1.5	8	Centropristis striata	27.7	0.6	98
Lophius americanus	14.0	0.4	6	Leiostomus xanthurus	34.1	1.0	542	Menticirrhus americanus	24.2	0.6	89
Micropogonias undulatus	14.0	0.4	71	Busycon sp.	28.1	0.8		Cynoscion regalis	20.4	0.5	43
				Menticirrhus sp.	24.4	0.7	6	Morone saxatilis	17.5	0.4	3
				Centropristis striata	24.1	0.7	48	Menticirrhus saxatilis	16.9	0.4	48
				Peprilus triacanthus	20.3	0.6	270	Paralichthys lethostigma	14.0	0.3	16
				Lophius americanus	14.6	0.4		Carcharhinidae	13.5	0.3	
				Menticirrhus saxatilis	13.8	0.4	71	Peprilus triacanthus	9.2	0.2	18
								Acipenser oxyrhynchus	8.4	0.2	<1

Table 3. Species composition of nearshore flounder catches (top 99% by weight) partitioned by area fished from October 1988 through April 1991; n = number of catches sampled.

Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish
NORTH OF CAPE HATTERAS				CAPE HATTERAS TO CAPE LOOKOUT				WEST OF CAPE LOOKOUT			
1988-89 (n=27)				1988-89 (n=2)				1988-89 (n=0)			
Paralichthys dentatus	3,157.3	92.6	3,738	Paralichthys dentatus	2,815.6	92.2	3,644				
Loligo pealii	78.3	2.3	-	Squaliformes	167.1	5.5					
Centropristis striata	41.8	1.2	100	Lophius americanus	28.1	0.9	38				
Pomatomus saltatrix	26.9	0.8	5	Loligo pealii	21.5	0.7					
Pogonias cromis	23.6	0.7	-	Cynoscion regalis	10.2	0.3	12				
Cynoscion regalis	18.3	0.5	21	Peprilus triacanthus	9.5	0.3	66				
Mustelus canis	15.5	0.5	-								
Micropogonias undulatus	15.1	0.4	76								
Lophius americanus	12.9	0.4	-								
1989-90 (n=18)				1989-90 (n=5)				1989-90 (n=3)			
Paralichthys dentatus	2,740.4	83.6	3,372	Paralichthys dentatus	1,201.3	51.9	1,895	Sphoeroides maculatus	1,935.1	36.1	-
Loligo pealii	221.2	6.7		Loligo pealii	328.1	14.2		Paralichthys dentatus	1,355.0	25.3	2,224
Cynoscion regalis	128.1	3.9	168	Cynoscion regalis	277.6	12.0	543	Micropogonias undulatus	683.4	12.8	4,987
Pomatomus saltatrix	60.8	1.9	29	Sphoeroides maculatus	162.0	7.0	433	Archosargus probotocephalus	404.8	7.6	
Busycon sp.	45.6	1.4		Menticirrhus spp.	104.3	4.5		Leiostomus xanthurus	295.6	5.5	4,694
Centropristis striata	19.9	0.6	69	Pomatomus saltatrix	68.3	2.9	69	Loligo pealii	166.4	3.1	
Lophius americanus	17.6	0.5		Centropristis striata	29.7	1.3	1	Peprilus triacanthus	129.5	2.4	1,947
Sphoeroides maculatus	15.2	0.5		Sicyonia brevirostris	27.2	1.2	-	Menticirrhus saxatilis	76.3	1.4	450
Peprilus triacanthus	6.9	0.2	59	Seriola dumerili	19.1	0.8	1	Mustelus canis	68.0	1.3	-
				Acipenser oxyrhynchus	17.2	0.7	<1	Menticirrhus americanus	58.0	1.1	318
				Paralichthys albigutta	14.3	0.6	24	Cynoscion regalis	56.9	1.1	368
				Micropogonias undulatus	12.2	0.5	27	Centropristis striata	40.1	0.7	-
				Archosargus probotocephalus	10.1	0.4	4				
				Menticirrhus saxatilis	8.4	0.4	51				
				Sciaenops ocellatus	6.8	0.3	<1				
1990-91 (n=47)				1990-91 (n=1)							
Paralichthys dentatus	3,730.8	85.1	5,475	Paralichthys dentatus	1,250.4	89.4	1,838				
Busycon sp.	174.8	4.0		Paralichthys lethostigma	84.4	6.0	141				
Loligo pealii	102.2	2.3		Sphoeroides maculatus	54.4	3.9	-				
Lophius americanus	65.9	1.5									
Sphoeroides maculatus	58.3	1.3	49								
Pomatomus saltatrix	48.2	1.1	10								
Centropristis striata	28.3	0.6	100								
Menticirrhus americanus	24.8	0.6	91								
Cynoscion regalis	20.9	0.5	44								
Morone saxatilis	17.9	0.4	3								
Menticirrhus saxatilis	17.3	0.4	49								
Squaliformes	13.7	0.3									
Paralichthys lethostigma	12.5	0.3	13								
Peprilus triacanthus	9.4	0.2	18								

Table 4. Monthly species composition (top 99%) and mean catch/trip of nearshore flounder catches sampled from October 1988 through March 1991; n = number of catches sampled.

Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish	Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish	Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish
1988-89				1989-90				1990-91			
Oct (n=3)				Oct (n=1)				Oct (n=1)			
Paralichthys dentatus	5,637.6	94.3	7,045	Paralichthys dentatus	2,869.3	97.1	3,597	Paralichthys dentatus	6,756.5	87.5	8,861
Pogonias cromis	212.1	3.6	-	Raychycentron canadum	52.6	1.8	3	Cynoscion regalis	272.2	3.5	1,007
Centropristis striata	38.0	0.6	150	Pomatomus saltatrix	25.9	0.9	7	Sphoeroides maculatus	181.4	2.3	-
Cynoscion regalis	36.0	0.6	72					Peprilus triacanthus	147.4	1.9	-
Pomatomus saltatrix	27.7	0.5	7					Menticirrhus saxatilis	144.8	1.9	366
								Pomatomus saltatrix	73.5	0.9	5
								Loligo pealii	56.7	0.7	
								Centropristis striata	43.1	0.6	155
Nov (n=10)				Nov (n=8)				Nov (n=12)			
Paralichthys dentatus	3,553.7	94.3	4,400	Paralichthys dentatus	4,308.1	94.2	5,457	Paralichthys dentatus	4,351.1	80.8	6,001
Loligo pealii	98.3	2.4	-	Loligo pealii	63.7	1.4		Busycon sp.	394.0	7.3	
Pomatomus saltatrix	38.8	1.0	5	Cynoscion regalis	40.7	0.9	80	Sphoeroides maculatus	158.3	2.9	193
Cynoscion regalis	36.3	1.0	35	Centropristis striata	40.0	0.9	139	Loligo pealii	92.5	1.7	
Busycon sp.	15.8	0.4	-	Busycon sp.	38.9	0.9		Menticirrhus americanus	55.3	1.0	155
				Sphoeroides maculatus	27.5	0.6		Paralichthys dentatus	45.3	0.8	46
				Pomatomus saltatrix	26.6	0.6	9	Pomatomus saltatrix	42.9	0.8	14
								Theuthidida myopsida	35.9	0.7	
								Cynoscion regalis	35.9	0.7	74
								Centropristis striata	34.0	0.6	113
								Menticirrhus saxatilis	33.7	0.6	71
								Pogonias cromis	21.3	0.4	1
								Carcharhinus spp.	17.9	0.3	
								Acipenser oxyrhynchus	17.5	0.3	<1
Dec (n=1)				Dec (n=12)				Dec (n=16)			
Micropogonias undulatus	336.1	78.0	1,756	Paralichthys dentatus	1,254.9	55.8	1,484	Paralichthys dentatus	2,523.5	84.2	2,978
Paralichthys dentatus	64.8	15.1	87	Loligo pealii	364.3	16.2		Busycon spp.	123.8	4.1	-
Leiostomus xanthurus	7.8	1.8	70	Cynoscion regalis	297.3	13.2	459	Pomatomus saltatrix	85.5	2.8	13
Loligo pealii	7.7	1.8	-	Pomatomus saltatrix	108.2	4.8	73	Loligo pealii	81.0	2.7	-
Sphoeroides maculatus	5.0	1.2	-	Sphoeroides maculatus	70.4	3.1	197	Morone saxatilis	52.2	1.7	9
Cynoscion regalis	3.6	0.8	-	Busycon spp.	46.3	2.1	-	Sphoeroides maculatus	39.9	1.3	-
Menticirrhus spp.	3.2	0.7	-	Menticirrhus sp.	46.0	2.0	-	Menticirrhus americanus	16.4	0.5	88
				Acipenser oxyrhynchus	10.3	0.5	<1	Sciaenops ocellatus	10.0	0.3	1
				Centropristis striata	10.0	0.5	4	Peprilus triacanthus	9.1	0.3	7
				Seriola dumerili	8.7	0.4	<1	Menticirrhus spp.	8.0	0.3	7
				Menticirrhus saxatilis	8.0	0.4	21	Cynoscion regalis	7.5	0.2	6
				Peprilus triacanthus	6.8	0.3	53	Centropristis striata	7.3	0.2	14

Table 4. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish	Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish	Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish
Jan (n=5)	Jan (no samples)			Jan (n=7)							
Paralichthys dentatus	3,247.6	92.5	3,899					Paralichthys dentatus	4,407.5	90.8	7,854
Loligo pealii	105.6	3.0						Loligo pealii	220.5	4.5	146
Carcharhinus sp.	66.9	1.9						Unidentified scrapfish	50.9	1.0	
Busycon sp.	27.2	0.8						Menticirrhus americanus	30.1	0.6	137
Pomatomus saltatrix	22.2	0.6	4					Menticirrhus saxatilis	29.5	0.6	123
Lophius americanus	19.0	0.5	17					Busycon spp.	23.3	0.5	
								Octopus	20.4	0.4	
								Pomatomus saltatrix	18.2	0.4	6
								Cynoscion regalis	15.5	0.3	12
Feb (n=9)				Feb (n=3)				Feb (n=10)			
Paralichthys dentatus	2,239.5	85.6	2,317	Paralichthys dentatus	1,398.6	66.3	2,199	Paralichthys dentatus	4,241.3	87.9	6,877
Loligo pealii	171.7	6.6	13	Loligo pealii	368.8	17.5		Lophius americanus	287.8	6.0	-
Centropristis striata	98.8	3.8	210	Lophius americanus	113.4	5.4		Busycon sp.	134.5	2.8	
Mustelus canis	46.5	1.8		Sicyonia brevirostris	45.4	2.2		Loligo pealii	60.9	1.3	-
Lophius americanus	34.5	1.3	10	Cynoscion regalis	31.8	1.5	17	Carcharhinidae	43.1	0.9	-
Pomatomus saltatrix	16.2	0.6	4	Sphoeroides maculatus	30.2	1.4		Centropristis striata	34.3	0.7	74
				Centropristis striata	24.3	1.2	5				
				Paralichthys albigutta	23.8	1.1	40				
				Micropogonias undulatus	14.0	0.9	36				
				Menticirrhus saxatilis	13.2	0.7	86				
				Archosargus probatocephalus	7.6	0.6	5				
				Menticirrhus sp.	7.2	0.4	-				
				Menticirrhus americanus	5.2	0.3	22				
Mar (n=1)				Mar (n=1)				Mar (n=2)			
Paralichthys dentatus	1,969.5	100.0	2,643	Sphaeroides maculatus	2,211.3	53.3	-	Paralichthys dentatus	1,993.3	81.7	3,452
				Paralichthys dentatus	1,064.4	25.6	1,675	Centropristis striata	158.7	6.5	983
				Archosargus probatocephalus	408.2	9.8	127	Lophius americanus	108.2	4.4	
				Micropogonias undulatus	219.1	5.3	918	Loligo pealii	95.3	3.9	
				Menticirrhus saxatilis	98.8	2.4		Pomatomus saltatrix	78.1	3.2	21
				Menticirrhus sp.	54.4	1.3	2				
				Acipenser oxyrhynchus	50.3	1.2					
Apr (no samples)				Apr (n=2)				Apr (n=1)			
				Sphoeroides maculatus	1,797.0	30.2	2,498	Paralichthys dentatus	6,756.5	87.5	8,861
				Paralichthys dentatus	1,500.3	25.2	7,481	Cynoscion regalis	272.2	3.5	1,007
				Micropogonias undulatus	915.5	15.4	7,041	Sphoeroides maculatus	181.4	2.4	
				Leiostomus xanthurus	443.4	7.4		Peprilus triacanthus	147.4	1.9	
				Archosargus probatocephalus	403.0	6.8		Menticirrhus saxatilis	144.8	1.9	366
				Loligo pealii	249.6	4.2	2,739	Pomatomus saltatrix	73.5	0.9	
				Peprilus triacanthus	182.9	3.1	35	Loligo pealii	56.7	0.7	
				Mustelus canis	102.0	1.7	553	Centropristis striata	43.1	0.6	155
				Cynoscion regalis	85.3	1.4	447				
				Menticirrhus americanus	79.6	1.3	216				
				Menticirrhus saxatilis	65.1	1.1					
				Centropristis striata	60.1	1.0					

Table 5. Seasonal mean catch/trip (kg/trip) and catch/day (kg/day) for the dominant species in the 1982-91 nearshore flounder trawl fishery, including the species percent of the total weight of the catches sampled.

Species		Season 1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	9-season mean CPUE
Paralichthys dentatus	kg/trip	5,584	9,867	8,312	3,359	3,101	4,137	3,134	2,285	3,679	4,829
	kg/day	2,261	2,219	1,652	762	787	996	713	526	711	1,180
	%	93.7	93.3	88.6	74.2	62.0	81.5	91.7	68.5	85.2	
Cynoscion regalis	kg/trip	203	248	345	504	1,213	355	18	149	20	340
	kg/day	85	57	56	114	305	85	4	30	4	82
	%	3.4	2.4	3.7	11.1	24.3	7.0	0.5	4.5	0.5	
Loligo pealii	kg/trip	85	131	209	106	128	78	74	236	100	129
	kg/day	35	30	40	26	33	19	1	49	19	30
	%	1.4	1.3	2.3	2.4	2.6	1.5	2.2	7.1	2.3	
Pomatomus saltatrix	kg/trip	30	125	202	118	153	220	25	56	47	109
	kg/day	13	29	24	27	36	53	6	13	9	23
	%	0.5	1.2	2.1	2.6	3.1	4.3	0.7	1.7	1.1	
Menticirrhus saxatilis	kg/trip	29	8	5	43	17	7	<1	30	24	18
	kg/day	8	2	1	9	8	2	<	7	3	5
	%	0.5	0.1	0.1	1.0	0.3	0.1	0.1	0.9	0.6	
Menticirrhus americanus	kg/trip	<1	3	5	41	14	18	<1	17	27	14
	kg/day	<1	1	1	8	7	5	<1	2	5	4
	%	<0.1	<0.1	0.1	1.0	0.3	0.4	0.1	0.5	0.6	
Peprilus triacanthus	kg/trip	4	30	8	21	36	13	1	20	19	17
	kg/day	1	7	1	5	8	3	<1	1	2	3
	%	0.1	0.3	0.1	0.5	0.7	0.3	0.3	0.6	0.4	
Acipenser oxyrhynchus	kg/trip	7	7	17	7	7	6	1	6	8	7
	kg/day	3	2	2	2	2	1	<1	1	2	2
	%	0.1	0.1	0.2	0.2	0.1	0.1	0.3	0.2	0.2	
Lophius americanus	kg/trip	1	100	91	18	20	24	14	15	65	38
	kg/day	<1	23	5	4	5	6	3	3	13	8
	%	<0.1	1.0	1.0	0.4	0.4	0.5	0.4	0.4	1.5	
Paralichthys lethostigma	kg/trip	12	0	12	2	7	49	1	1	14	10
	kg/day	5		3	<1	2	12	<1	<1	3	3
	%	0.2		0.2	<0.1	0.1	1.0	0.3	<0.1	0.3	
Micropogonias undulatus	kg/trip	2	4	8	59	165	32	14	81	2	41
	kg/day	<1	1	1	13	24	8	3	3	<1	6
	%	<0.1	<0.1	0.1	1.3	3.3	0.6	0.4	2.4	<0.1	
Totals (11 species)	kg/trip	5,957	10,523	9,214	4,278	4,861	4,939	3,282	2,896	4,005	5,551
	kg/day	2,411	2,371	1,786	970	1,217	1,190	747	635	771	1,346
	%	99.9	99.7	98.5	94.7	97.2	97.3	96.9	86.8	92.7	

Table 6. Species composition, mean weight (kg), and mean number of fish (Mean no. fish) per catch for the top 99% by weight of the deepwater catches for October 1985 through April 1988, including number of catches sampled (n).

Species	Weight (kg)		Mean no. fish	Species	Weight (kg)		Mean no. fish	Species	Weight (kg)		Mean no. fish
	Mean	%			Mean	%			Mean	%	
1988-89 (n=33)				1989-1990 (n=45)				1990-91 (n=13)			
Paralichthys dentatus	4,052.7	72.0	5,803	*Paralichthys dentatus*	1,674.2	39.2	1,920	*Stenotomus chrysops*	3,598.9	39.7	17,606
Loligo pealii	813.8	14.4		*Centropristis striata*	1,044.5	24.5	3,606	*Paralichthys dentatus*	2,118.0	23.3	3,551
Centropristis striata	485.0	8.6	1,345	*Loligo pealii*	712.4	16.7	-	*Scomber scombrus*	2,095.6	23.1	4,985
Stenotomus chrysops	107.3	1.9	628	*Stenotomus chrysops*	603.0	14.1	2,382	*Loligo pealii*	419.9	4.6	
Pomatomus saltatrix	61.1	1.1	24	*Lophius americanus*	59.5	1.4	16	*Centropristis striata*	142.2	1.6	233
Scomber scombrus	32.0	0.6	90	*Pomatomus saltatrix*	31.4	0.7	21	*Lophius americanus*	139.4	1.5	95
Lophius americanus	27.6	0.5	16	*Peprilus triacanthus*	29.9	0.7	203	*Peprilus triacanthus*	126.9	1.4	1,187
				Cynoscion regalis	27.2	0.6	21	*Merluccius bilinearis*	104.7	1.1	241
				Merluccius bilinearis	26.8	0.6	40	Unidentified scrapfish	87.2	1.0	
				Carcharhinus spp.	14.4	0.3	-	*Clupea harengus*	65.6	0.7	430
								Pomatomus saltatrix	64.6	0.7	68

Table 7. Monthly species composition (top 99%) and mean catch/trip of deepwater catches sampled December 1988 through April 1991; n = number of catches sampled.

Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish
Dec 1988			
(n=7)			
Paralichthys dentatus	4,999.4	75.9	7,316
Loligo pealii	1,207.5	18.3	-
Pomatomus saltatrix	164.1	2.5	51
Centropristis striata	137.0	2.1	131
Cynoscion regalis	40.2	0.6	30
Jan 1989			
(n=8)			
Paralichthys dentatus	6,690.6	87.2	9,557
Loligo pealii	646.9	8.4	-
Centropristis striata	176.1	2.3	208
Pomatomus saltatrix	54.4	0.7	12
Lophius americanus	28.0	0.4	24
Stenotomus chrysops	26.4	0.3	36
Feb			
(n=9)			
Paralichthys dentatus	3,683.3	71.3	4,681
Loligo pealii	651.3	12.6	-
Centropristis striata	628.7	12.2	1,700
Stenotomus chrysops	97.6	1.9	480
Lophius americanus	43.3	0.8	16
Pomatomus saltatrix	29.7	0.6	17
Mar			
(n=7)			
Paralichthys dentatus	1,420.4	48.1	2,634
Centropristis striata	748.2	25.3	2,377
Loligo pealii	716.5	24.3	-
Stenotomus chrysops	29.0	1.0	90
Lophius americanus	28.0	1.0	13

Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish
Dec 1989			
(n=4)			
Paralichthys dentatus	2,060.8	65.5	2,500
Loligo pealii	817.8	26.0	
Cynoscion regalis	77.5	2.5	79
Pomatomus saltatrix	52.7	1.7	9
Centropristis striata	48.5	1.5	57
Acipenser oxyrhynchus	20.4	0.7	1
Stenotomus chrysops	12.6	0.4	
Menticirrhus spp.	9.9	0.3	
Seriola dumerili	8.4	0.3	<1
Jan 1990			
(n=20)			
Paralichthys dentatus	2,308.8	58.0	2,663
Loligo pealii	869.9	21.9	
Centropristis striata	552.5	13.9	1,478
Stenotomus chrysops	62.1	1.6	159
Lophius americanus	52.6	1.3	
Merluccius bilinearis	28.2	0.7	
Menidia beryllina	23.9	0.6	
Cynoscion regalis	19.9	0.5	14
Peprilus triacanthus	18.4	0.5	34
Pomatomus saltatrix	14.0	0.4	2
Feb			
(n=9)			
Centropristis striata	2,596.2	54.3	8,929
Paralichthys dentatus	1,573.2	32.9	1,686
Loligo pealii	241.6	5.0	
Stenotomus chrysops	151.8	3.2	636
Lophius americanus	110.4	2.3	61
Peprilus triacanthus	67.7	1.4	545
Mar			
(n=8)			
Stenotomus chrysops	2,538.5	52.2	9,958
Centropristis striata	775.7	16.0	3,749
Paralichthys dentatus	702.8	14.5	861
Loligo pealii	573.0	11.8	
Lophius americanus	57.0	1.2	
Cynoscion regalis	47.6	1.0	29
Merluccius bilinearis	46.6	1.0	197
Peprilus triacanthus	43.7	0.9	433

Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish
Jan 1990			
(n=2)			
Paralichthys dentatus	4,941,8	87.6	8,416
Loligo pealii	232.5	4.1	-
Centropristis striata	213.2	3.8	202
Lophius americanus	157.9	2.8	-
Merluccius bilinearis	47.7	0.8	-
Stenotomus chrysops	23.8	0.4	96
Feb			
(n=2)			
Paralichthys dentatus	4,577.3	79.2	7,372
Loligo pealii	467.2	8.1	
Lophius americanus	449.5	7.8	402
Centropristis striata	215.0	3.7	646
Busycon spp.	57.2	1.0	
Mar			
(n=3)			
Stenotomus chrysops	8,642.3	81.2	38,410
Paralichthys dentatus	1,171.7	11.0	2,181
Peprilus triacanthus	306.8	2.9	2,389
Scomber scombrus	179.9	1.7	
Lophius americanus	131.1	1.2	142
Loligo pealii	80.6	0.8	
Centropristis striata	65.1	0.6	99

Table 7. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Mean no. fish	Species	Mean	Percent	Mean no. fish	Species	Mean	Percent	Mean no. fish
Apr (n=2)				Apr (n=4)				Apr (n=6)			
Centropristis striata	1,371.2	24.7	4,932	Centropristis striata	1,546.9	34.5	5,532	Scomber scombrus	4,450.6	42.3	10,800
Loligo pealii	1,125.9	20.2	-	Loligo pealii	1,157.5	25.8		Stenotomus chrysops	3,468.6	33.0	18,909
Stenotomus chrysops	1,117.8	20.1	7,813	Stenotomus chrysops	1,054.5	23.5	4,661	Paralichthys dentatus	828.7	7.9	1,341
Paralichthys dentatus	1,063.0	19.8	1,660	Paralichthys dentatus	284.8	6.4	276	Loligo pealii	636.3	6.1	-
Scomber scombrus	528.2	9.5	1,489	Carcharhinus sp.	162.4	3.6		Merluccius bilinearis	209.1	2.0	521
Prionotus sp.	96.4	1.7	1,501	Pomatomus saltatrix	155.8	3.5	163	Unidentified scrapfish	189.0	1.8	-
Pomatomus saltatrix	75.7	1.4	82	Merluccius bilinearis	37.2	0.8		Clupea harengus	142.2	1.3	932
Merluccius bilinearis	46.9	0.8	120	Lophius americanus	36.2	0.8		Pomatomus saltatrix	135.5	1.3	147
Lophius americanus	34.7	0.6	25					Centropristis striata	132.8	1.3	173
								Peprilus triacanthus	121.0	1.1	1,372

Table 8. Seasonal mean catch/trip (kg/trip) and catch/day (kg/day) for the dominant species in the 1982-91 deepwater trawl fishery, including the species percent (%) of the total weight of the catches sampled.

Species		Season 1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	9-season mean CPUE
Stenotomus chrysops	kg/trip	9,709	3,970	2,003	1,638	3,736	707	107	603	3,599	2,897
	kg/day	2,836	1,232	397	282	852	149	21	100	535	712
	%	72.8	40.5	17.3	22.7	38.3	10.8	1.9	14.1	39.7	
Paralichthys dentatus	kg/trip	1,377	2,862	4,434	2,527	2,357	3,680	4,053	1,674	2,118	2,786
	kg/day	408	492	749	434	537	778	789	275	399	540
	%	10.3	29.2	38.2	35.0	24.2	56.2	72.0	39.2	23.4	
Centropristis striata	kg/trip	1,314	1,487	3,449	1,888	2,566	1,398	485	1,044	142	1,530
	kg/day	199	334	563	324	585	296	94	179	27	288
	%	9.9	15.2	29.7	26.2	26.3	21.4	8.6	24.5	1.6	
Loligo pealii	kg/trip	669	889	1,043	591	489	268	814	712	420	655
	kg/day	78	137	177	101	112	57	158	118	79	113
	%	5.0	9.1	9.0	8.2	5.0	4.1	14.4	16.7	4.6	
Pomatomus saltatrix	kg/trip	184	116	193	317	185	346	61	31	65	166
	kg/day	35	40	13	54	42	73	12	5	12	32
	%	1.4	1.2	1.7	4.4	1.9	5.3	1.1	0.7	0.7	
Lophius americanus	kg/trip	31	25	132	55	75	56	28	59	139	66
	kg/day	9	3	23	9	17	12	5	10	26	13
	%	0.2	0.3	1.1	0.8	0.8	0.9	0.5	1.4	1.5	
Peprilus triacanthus	kg/trip	21	255	55	27	70	4	21	31	127	67
	kg/day	4	85	12	5	16	1	1	5	12	16
	%	0.2	2.6	0.5	0.4	0.7	0.1	<0.1	0.7	1.4	
Merluccius bilinearis	kg/trip	17	62	23	13	63	21	8	27	105	37
	kg/day	5	19	1	2	14	4	2	5	20	8
	%	0.1	0.6	0.2	0.2	0.6	0.3	0.1	0.6	1.1	
Totals (8 species)	kg/trip	13,322	9,666	11,332	7,056	9,541	6,480	5,558	4,181	6,715	8,205
	kg/day	3,574	2,342	1,935	1,211	2,175	1,370	1,082	693	1,110	1,721
	%	99.9	98.7	97.7	97.9	97.8	99.1	98.7	97.9	74.0	

Table 9. Species composition, mean weight (kg) and mean number of fish per trip, of the top 99% (by weight) of flynet catches sampled from October 1988 through April 1991, including number of catches sampled (n).

Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish
1988-89 (n=38)				1988-89 (n=42)				1990-91 (n=40)			
Cynoscion regalis	3,999.4	39.4	15,355	Cynoscion regalis	4,502.7	35.8	16,397	Cynoscion regalis	6,412.1	56.6	42,238
Micropogonias undulatus	2,738.4	27.0	19,230	Scomber scombrus	2,660.0	21.2	9,131	Leiostomus xanthurus	1,088.7	9.6	19,825
Leiostomus xanthurus	1,325.5	13.1	21,449	Micropogonias undulatus	2,602.8	20.7	19,514	Micropogonias undulatus	1,068.2	9.4	11,269
Pomatomus saltatrix	878.6	8.7	743	Pomatomus saltatrix	971.6	7.7	1,069	Pomatomus saltatrix	605.0	5.3	1,545
Peprilus triacanthus	250.5	2.5	4,705	Leiostomus xanthurus	927.1	7.4	12,994	Peprilus triacanthus	490.0	4.3	8,361
Lagodon rhomboides	187.3	1.8	1,260	Peprilus triacanthus	189.7	1.5	3,529	Brevoortia tyrannus	338.5	3.0	2,498
Menticirrhus americanus	115.2	1.1	501	Stenotomus caprinus	89.1	0.7	2,393	Lagodon rhomboides	285.4	2.5	8,797
Stenotomus sp.	109.2	1.1	2,753	Bairdiella chrysoura	78.2	0.6	1,778	Scomber scombrus	187.9	1.7	470
Loligo pealii	73.8	0.7	16	Loligo pealii	69.2	0.6	118	Menticirrhus saxatilis	151.4	1.3	1,052
Pogonias cromis	63.9	0.6	-	Urophycis regia	65.8	0.5	718	Menticirrhus americanus	94.1	0.8	529
Carcharhinus sp.	48.8	0.5	-	Lagodon rhomboides	51.7	0.4	1,278	Scomberomorus maculatus	84.3	0.7	410
Paralichthys dentatus	40.3	0.4	84	Brevoortia tyrannus	38.8	0.3	175	Peprilus alepidotus	82.6	0.7	1,894
Menticirrhus saxatilis	40.4	0.4	262	Carcharhinus sp.	36.2	0.3		Stenotomus caprinus	82.4	0.7	1,645
Bairdiella chrysoura	36.4	0.4	530	Menticirrhus saxatilis	32.0	0.3	268	Anchoa hepsetus	43.5	0.4	3,133
Brevoortia tyrannus	33.1	0.3	241	Menticirrhus americanus	30.4	0.2	308	Unidentified scrapfish	40.9	0.4	
Orthopristis chrysoptera	25.0	0.3	643	Orthopristis chrysoptera	29.5	0.2	564	Sphoeroides maculatus	39.1	0.3	81
Archosargus probatocephalus	18.4	0.2	4	Scomberomorus maculatus	18.6	0.2	35	Bairdiella chrysoura	37.3	0.3	761
Stenotomus chrysops	18.2	0.2	499	Prionotus evolans	15.6	0.1	296	Menticirrhus spp.	22.8	0.2	
Galaocerdo cuvieri	17.9	0.2		Peprilus alepidotus	15.5	0.1	330	Orthopristis chrysoptera	21.2	0.2	493
Centropristis striata	12.5	0.1	59	Stenotomus chrysops	14.2	0.1	308	Clupea harengus	20.9	0.2	1,960
Cephalopoda	12.3	0.1	28	Scomberomorus cavalla	12.7	0.1	5	Lophius americanus	18.7	0.2	12
Rachycentron canadum	9.2	0.1	1								

Table 10. Species composition, mean weight (kg), and mean number of fish per trip of the top 99% (by weight) of the flynet catches partitioned by area fished, from October 1988 through April 1991, including number of catches sampled (n).

Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish
				NORTH OF CAPE HATTERAS							
1988-89 (n=23)				1989-90 (n=29)				1990-91 (n=12)			
Cynoscion regalis	3,947.3	35.0	9,510	Cynoscion regalis	4,081.2	29.9	7,855	Cynoscion regalis	5,809.2	49.5	30,162
Micropogonias undulatus	3,353.2	29.8	19,851	Scomber scombrus	3,841.5	28.2	13,224	Micropogonias undulatus	1,530.6	13.1	13,352
Leiostomus xanthurus	1,432.4	12.7	20,195	Micropogonias undulatus	3,114.2	22.8	21,175	Pomatomus saltatrix	1,091.0	9.3	620
Pomatomus saltatrix	1,340.9	11.9	837	Pomatomus saltatrix	1,112.4	8.2	952	Leiostomus xanthurus	962.1	8.3	11,260
Peprilus triacanthus	351.7	3.1	6,701	Leiostomus xanthurus	574.1	4.2	5,775	Scomber scombrus	626.2	5.3	1,568
Stenotomus sp.	180.4	1.6	4,549	Peprilus triacanthus	197.9	1.4	3,506	Peprilus triacanthus	409.8	3.5	7,319
Loligo pealii	121.9	1.1	-	Stenotomus caprinus	129.1	0.9	3,466	Scomberomorus maculatus	252.8	2.1	1,218
Menticirrhus americanus	87.8	0.8	359	Loligo pealii	94.3	0.7	94	Peprilus alepidotus	210.9	1.8	5,009
Carcharhinus sp.	80.6	0.7	-	Carcharhinus sp.	70.3	0.5	628	Stenotomus caprinus	158.2	1.4	2,878
Pogonias cromis	64.5	0.6	-	Orthopristis chrysoptera	51.9	0.4	-	Menticirrhus americanus	80.8	0.7	419
Paralichthys dentatus	63.8	0.6	133	Scomberomorus maculatus	41.6	0.3	790	Clupea harengus	69.7	0.6	6,535
Stenotomus chrysops	30.1	0.3	825	Peprilus alepidotus	26.9	0.2	51	Lophius americanus	61.8	0.5	40
Galeocerdo cuvieri	29.6	0.3	<1	Prionotus evolans	22.4	0.2	477	Orthopristis chrysoptera	61.8	0.5	1,413
Orthopristis chrysoptera	29.3	0.3	590	Menticirrhus saxatilis	20.7	0.2	421	Brevoortia tyrannus	38.9	0.3	144
Centropristis striata	20.5	0.2	88	Scomber sp.	19.6	0.2	161	Loligo pealii	37.4	0.3	113
Rachycentron canadum	15.1	0.1	1	Scomberomorus cavalla	18.3	0.1	-	Merluccius bilinearis	33.7	0.3	160
Scomberomorus cavalla	14.0	0.1	4	Menticirrhus americanus	17.9	0.1	7	Anchoa hepsetus	31.3	0.3	3,446
				Sphaeroides maculatus	16.7	0.1	99	Chaetodipterus faber	29.4	0.3	510
				Centropristis striata	16.5	0.1	384	Menticirrhus saxatilis	27.3	0.2	146
				Stenotomus chrysops	13.9	0.1	147	Carcharhinidae	24.0	0.2	<1
								Opisthonema oglinum	22.0	0.2	887
								Bairdiella chrysoura	19.2	0.2	213
				CAPE HATTERAS TO CAPE LOOKOUT							
(n=9)				(n=9)				(n=25)			
Cynoscion regalis	3,349.0	74.1	17,735	Cynoscion regalis	6,845.3	54.6	43,517	Cynoscion regalis	6,074.7	57.4	46,144
Leiostomus xanthurus	272.3	6.0	9,711	Leiostomus xanthurus	2,092.8	16.7	35,026	Leiostomus xanthurus	1,078.3	10.2	22,604
Micropogonias undulatus	258.9	5.7	4,635	Micropogonias undulatus	1,502.6	12.0	17,113	Micropogonias undulatus	957.6	9.1	11,287
Pomatomus saltatrix	236.8	5.2	620	Pomatomus saltatrix	899.4	7.2	1,266	Peprilus triacanthus	578.6	5.4	9,708
Pogonias cromis	105.1	2.3	<1	Bairdiella chrysoura	347.4	2.8	8,035	Pomatomus saltatrix	434.0	4.1	2,089
Archosargus probatocephalus	52.4	1.2	160	Peprilus triacanthus	229.2	1.8	5,048	Lagodon rhomboides	425.4	4.0	13,037
Menticirrhus americanus	43.3	1.0	1,332	Brevoortia tyrannus	173.6	1.4	756	Brevoortia tyrannus	283.5	2.7	2,617
Lagodon rhomboides	36.0	0.8	4,069	Lagodon rhomboides	117.3	0.9	3,316	Menticirrhus saxatilis	229.2	2.2	1,612
Peprilus triacanthus	33.1	0.7	2,836	Menticirrhus americanus	84.0	0.7	1,118	Menticirrhus americanus	111.8	1.1	645
Bairdiella chrysoura	32.5	0.7	4,247	Menticirrhus saxatilis	82.6	0.7	731	Unidentified scrapfish	58.1	0.5	-
Brevoortia tyrannus	23.9	0.5	1,633	Urophycis regia	80.4	0.6	1,328	Sphoeroides maculatus	57.6	0.5	60
Acipenser oxyrhynchus	16.9	0.4	3					Stenotomus caprinus	55.9	0.5	1,251
Sciaenops ocellatus	16.4	0.4	11					Anchoa hepsetus	54.1	0.5	3,327
								Bairdiella chrysoura	42.4	0.4	874
								Menticirrhus spp.	32.6	0.3	-

Table 10. (Continued).

Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish	Species	Mean catch weight (kg)	% TW	Mean no. fish
				WEST OF CAPE LOOKOUT							
1988-89 (n=6)				1989-90 (n=4)				1990-91 (n=3)			
Cynoscion regalis	5,174.7	36.2	34,190	Cynoscion regalis	2,287.8	45.5	17,306	Cynoscion regalis	11,634.3	72.9	57,986
Micropogonias undulatus	4,100.9	28.6	38,783	Micropogonias undulatus	1,369.8	27.2	12,880	Brevoortia tyrannus	1,995.0	12.5	10,917
Leiostomus xanthurus	2,495.4	17.4	43,864	Leiostomus xanthurus	863.5	17.2	15,763	Leiostomus xanthurus	1,681.8	10.5	30,932
Lagodon rhomboides	1,124.2	7.8	7,120	Lagodon rhomboides	248.1	4.9	5,619	Lagodon rhomboides	255.2	1.6	8,518
Menticirrhus americanus	309.2	2.2	1,518	Pomatomus saltatrix	112.9	2.3	1,466	Micropogonias undulatus	140.9	0.9	2,788
Menticirrhus saxatilis	215.7	1.5	1,459	Peprilus triacanthus	41.1	0.8	281	Pomatomus saltatrix	86.0	0.5	707
Peprilus triacanthus	188.4	1.3	3,638	Bairdiella chrysoura	39.3	0.8	590	Peprilus triacanthus	72.8	0.5	1,309
Brevoortia tyrannus	170.6	1.2	1,235	Menticirrhus sp.	34.0	0.7	0				
Bairdiella chrysoura	170.0	1.2	2,540								
Pomatomus saltatrix	69.0	0.5	564								
Loligo sp.	66.4	0.5	175								
Orthopristis chrysoptera	45.8	0.3	1,814								
Odontapsis taurus	45.4	0.3	-								
Archosargus probatocephalus	36.6	0.3	-								

Table 11. Monthly species composition and mean catch/trip of dominant species (top 99% by weight) in flynet catches from October 1988 through April 1991, by area; n=number of catches sampled.

Species	Weight Mean	Weight %	Species	Weight Mean	Weight %	Species	Weight Mean	Weight %
NORTH OF CAPE HATTERAS			CAPE HATTERAS TO CAPE LOOKOUT			WEST OF CAPE LOOKOUT		
October 1988 (n=3)								
Micropogonias undulatus	6,828.2	41.3						
Leiostomus xanthurus	3,308.5	20.0						
Cynoscion regalis	2,421.7	14.7						
Peprilus triacanthus	1,334.4	8.1						
Stenotomus sp.	1,260.5	7.6						
Pogonias cromis	267.5	1.6						
Pomatomus saltatrix	260.0	1.6						
November (n=5)						(n=1)		
Micropogonias undulatus	11,172.6	53.9				Leiostomus xanthurus	9,944.8	[illegible]
Leiostomus xanthurus	4,349.3	21.0				Cynoscion regalis	7,535.2	34.6
Cynoscion regalis	3,296.3	15.9				Micropogonias undulatus	2,040.4	[illegible]
Peprilus triacanthus	476.3	2.3				Lagodon rhomboides	1,139.4	[illegible]
Menticirrhus americanus	396.7	1.9				Menticirrhus americanus	725.8	3.3
Pomatomus saltatrix	204.9	1.0						
Paralichthys dentatus	184.4	0.9						
December (n=1)			(n=1)			(n=3)		
Cynoscion regalis	2,812.7	70.1	Cynoscion regalis	1,219.3	88.8	Cynoscion regalis	5,929.0	[illegible]
Pomatomus saltatrix	1,152.2	28.7	Leiostomus xanthurus	55.5	4.0	Micropogonias undulatus	3,767.6	[illegible]
Paralichthys dentatus	34.9	0.9	Paralichthys dentatus	51.9	3.8	Lagodon rhomboides	1,849.7	13.7
			Cynoscion nebulosus	7.7	0.6	Leiostomus xanthurus	1,372.7	[illegible]
						Bairdiella chrysoura	264.5	[illegible]
						Menticirrhus americanus	177.9	1.3
January 1989 (n=6)						(n=1)		
Cynoscion regalis	8,109.3	93.6				Micropogonias undulatus	4,871.3	[illegible]
Leiostomus xanthurus	212.1	2.4				Cynoscion regalis	4,055.7	37.2
Loligo pealii	151.6	1.7				Brevoortia tyrannus	996.3	[illegible]
Paralichthys dentatus	63.6	0.7				Leiostomus xanthurus	556.6	[illegible]
Pomatomus saltatrix	43.4	0.5				Menticirrhus americanus	217.7	2.0
February (n=1)			(n=1)			(n=1)		
Cynoscion regalis	4,115.0	58.1	Cynoscion regalis	8,283.2	82.9	Micropogonias undulatus	6,390.9	50.7
Peprilus triacanthus	1,664.7	23.5	Micropogonias undulatus	625.8	6.3	Cynoscion regalis	1,670.7	[illegible]
Loligo pealii	1,224.7	17.3	Pomatomus saltatrix	235.2	2.4	Menticirrhus saxatilis	1,293.8	[illegible]
Pomatomus saltatrix	22.7	0.3	Brevoortia tyrannus	184.1	1.8	Peprilus triacanthus	1,078.7	8.6
Paralichthus dentatus	21.3	0.3	Bairdiella chrysoura	164.6	1.7	Loligo sp.	398.2	3.2
			Menticirrhus americanus	159.6	1.6	Menticirrhus americanus	377.9	[illegible]
			Leiostomus xanthurus	141.6	1.4	Leiostomus xanthurus	352.9	[illegible]
			Peprilus triacanthus	133.4	1.3			

Table 11. (Continued).

Species	Weight Mean	Weight %	Species	Weight Mean	Weight %	Species	Weight Mean	Weight %
NORTH OF CAPE HATTERAS			CAPE HATTERAS TO CAPE LOOKOUT			WEST OF CAPE LOOKOUT		
March (n=7)			(n=7)					
Pomatomus saltatrix	3,943.1	64.5	*Cynoscion regalis*	2,948.4	70.4			
Cynoscion regalis	1,636.8	26.8	*Leiostomus xanthurus*	321.9	7.7			
Carcharhinus spp.	175.0	2.9	*Pomatomus saltatrix*	270.9	6.5			
Micropogonias undulatus	108.8	1.8	*Micropogonias undulatus*	243.2	5.8			
Pogonias cromis	97.2	1.6	*Pogonias cromis*	131.2	3.1			
Loligo pealii	66.6	1.1	*Archosargus probatocephalus*	67.3	1.6			
			Lagodon rhomboides	46.3	1.1			
October 1989 (n=4)								
Micropogonias undulatus	8,396.4	60.3						
Leiostomus xanthurus	3,118.2	22.4						
Peprilus triacanthus	1,101.8	7.9						
Pomatomus saltatrix	432.2	3.1						
Stenotomus caprinus	249.8	1.8						
Scomberomorus maculatus	165.1	1.2						
Cynoscion regalis	119.0	0.8						
Carcharhinus sp.	92.6	0.7						
November (n=6)								
Micropogonias undulatus	9,454.6	51.7						
Cynoscion regalis	5,038.2	27.3						
Leiostomus xanthurus	695.9	3.8						
Pomatomus saltatrix	567.2	3.1						
Stenotomus caprinus	457.3	2.5						
Urophycis regia	324.2	1.8						
Loligo pealii	288.1	1.6						
Peprilus triacanthus	201.9	1.1						
Orthopristis chrysoptera	200.8	1.1						
December (n=4)			(n=1)			(n=1)		
Cynoscion regalis	9,404.4	69.0	*Leiostomus xanthurus*	11,758.0	42.1	*Micropogonias undulatus*	1,093.7	39.9
Pomatomus saltatrix	4,231.9	30.9	*Cynoscion regalis*	6,372.2	22.8	*Leiostomus xanthurus*	599.3	21.8
			Micropogonias undulatus	5,404.6	19.3	*Cynoscion regalis*	540.0	19.7
			Bairdiella chrysoura	2,601.3	9.3	*Lagodon rhomboides*	158.1	5.8
			Pomatomus saltatrix	729.3	2.6	*Pomatomus saltatrix*	97.6	3.6
			Peprilus triacanthus	483.3	1.7	*Peprilus triacanthus*	68.3	2.5
						Menticirrhus sp.	68.0	2.5
						Bairdiella chrysoura	57.5	2.1
January 1990 (n=5)			(n=1)			(n=1)		
Scomber scombrus	11,577.0	74.2	*Pomatomus saltatrix*	7,296.0	97.5	*Micropogonias undulatus*	3,292.0	38.3
Cynoscion regalis	3,290.3	21.1	*Squalus acanthias*	147.4	2.0	*Cynoscion regalis*	2,905.3	33.8
Pomatomus saltatrix	572.1	3.7				*Leiostomus xanthurus*	1,562.4	18.2
						Lagodon rhomboides	512.5	6.0
						Pomatomus saltatrix	256.6	3.0

Table 11. (Continued).

Species	Weight Mean	Weight %	Species	Weight Mean	Weight %	Species	Weight Mean	Weight %
NORTH OF CAPE HATTERAS			CAPE HATTERAS TO CAPE LOOKOUT			WEST OF CAPE LOOKOUT		
February (n=6)			(n=3)			(n=1)		
Cynoscion regalis	5,431.9	79.2	*Cynoscion regalis*	13,955.7	88.7	*Cynoscion regalis*	5,166.0	85.5
Scomber scombrus	840.7	12.3	*Leiostomus xanthurus*	862.6	5.5	*Leiostomus xanthurus*	693.0	[illegible].5
Pomatomus saltatrix	497.3	7.2	*Micropogonias undulatus*	364.1	2.3	*Lagodon rhomboides*	163.9	[illegible].7
Loligo pealii	70.8	1.0	*Bairdiella chrysoura*	147.6	0.9			
			Urophycis regia	137.5	0.9			
March (n=3)			(n=4)					
Scomber scombrus	16,339.7	89.1	*Cynoscion regalis*	3,342.2	44.1			
Pomatomus saltatrix	1,444.8	7.9	*Micropogonias undulatus*	1,756.7	23.2			
Squaliformes	293.0	1.6	*Leiostomus xanthurus*	1,122.4	14.8			
			Peprilus triacanthus	365.0	4.8			
			Brevoortia tyrannus	358.5	4.7			
			Menticirrhus saxatilis	184.3	2.4			
			Menticirrhus americanus	134.2	1.8			
April (n=1)								
Cynoscion regalis	734.4	63.0						
Centropristis striata	262.7	22.5						
Loligo pealii	68.0	5.8						
Scomber scombrus	22.7	1.9						
Pomatomus saltatrix	21.8	1.9						
Paralichthys dentatus	20.9	1.8						
October 1990 (n=3)								
Leiostomus xanthurus	3,042.6	36.6						
Micropogonias undulatus	1,585.2	19.1						
Cynoscion regalis	1,398.6	16.8						
Peprilus alepidotus	293.1	9.5						
Scomberomorus maculatus	313.8	3.8						
Peprilus triacanthus	276.0	3.3						
Stenotomus caprinus	262.5	3.2						
Chaetodipterus faber	98.5	1.2						
Pomatomus saltatrix	88.8	1.1						
November (n=5)			November (n=2)					
Cynoscion regalis	8,194.6	57.9	*Peprilus triacanthus*	4,161.1	30.6			
Micropogonias undulatus	2,722.2	19.2	*Micropogonias undulatus*	2,408.5	17.7			
Peprilus triacanthus	7,665	5.4	*Cynoscion regalis*	2,353.4	17.3			
Leiostomus xanthurus	483.6	3.4	*Lagodon rhomboides*	748.3	5.5			
Pomatomus saltatrix	442.3	3.1	*Stenotomus caprinus*	698.3	5.1			
Scomberomorus maculatus	418.5	3.0	*Sphoeroides maculatus*	695.9	5.1			
Stenotomus caprinus	222.1	1.6	*Anchoa hepsetus*	538.2	4.0			
Menticirrhus americanus	163.9	1.2	*Leiostomus xanthurus*	472.6	3.5			
			Menticirrhus americanus	430.3	3.2			
			Peprilus alepidotus	331.8	2.4			
			Pomatomus saltatrix	322.7	2.4			

Table 11. (Continued).

Species	Weight Mean	Weight %
NORTH OF CAPE HATTERAS		
January 1991 (n=2)		
Cynoscion regalis	12,015.0	69.3
Pomatomus saltatrix	5,250.5	30.3
Loligo pealii	40.2	0.2
Acipenser oxyrhynchus	24.7	0.1
February (n=1)		
Cynoscion regalis	512.1	49.2
Lophius americanus	414.6	39.9
Pomatomus saltatrix	113.0	10.9
March (n=1)		
Scomber scombrus	7,413.3	80.2
Clupea harengus	836.3	8.9
Merluccius bilinearis	403.8	4.3
Lophius americanus	326.9	3.5
Peprilus triacanthus	254.8	2.7
Loligo pealii	38.5	0.4

Species	Weight Mean	Weight %
CAPE HATTERAS TO CAPE LOOKOUT		
December (n=3)		
Cynoscion regalis	17,282.4	79.4
Leiostomus xanthurus	2,230.0	10.3
Micropogonias undulatus	688.3	3.2
Lagodon rhomboides	424.8	1.9
Pomatomus saltatrix	390.2	1.8
Peprilus triacanthus	242.4	1.1
Menticirrhus americanus	171.8	0.8
January 1991 (n=3)		
Cynoscion regalis	9,575.7	75.0
Leiostomus xanthurus	1,485.6	11.6
Lagodon rhomboides	530.7	4.2
Pomatomus saltatrix	431.6	3.4
Peprilus triacanthus	296.4	2.3
Brevoortia tyrannus	132.6	1.0
Menticirrhus americanus	124.8	1.0
February (n=8)		
Cynoscion regalis	3,670.8	50.5
Leiostomus xanthurus	876.8	12.1
Pomatomus saltatrix	859.7	11.8
Menticirrhus saxatilis	567.5	7.8
Lagodon rhomboides	536.7	7.4
Micropogonias undulatus	269.9	3.7
Peprilus triacanthus	240.8	3.3
(March (n=8)		
Cynoscion regalis	4,613.1	62.7
Leiostomus xanthurus	938.8	12.8
Brevoortia tyrannus	639.6	8.7
Peprilus triacantnus	325.1	4.4
Lagodon rhomboides	240.6	3.3
Menticirrhus saxatilis	130.4	1.8
Pomatomus saltatrix	107.7	1.5
Menticirrhus americanus	102.2	1.4
Menticirrhus sp.	98.9	1.3
Micropogonias undulatus	46.2	0.6
April (n=1)		
Micropogonias undulatus	14,491.0	86.6
Unidentified scrapfish	1,360.8	8.1
Leiostomus xanthurus	340.6	2.0
Cynoscion regalis	316.5	1.9

Species	Weight Mean	Weight %
WEST OF CAPE LOOKOUT		
January 1991 (n=20)		
Cynoscion regalis	15,949.8	71.2
Brevoortia tyrannus	2,978.2	13.3
Leiostomus xanthurus	2,520.1	11.2
Lagodon rhomboides	371.5	1.7
Micropogonias undulatus	211.4	0.9
Pomatomus saltatrix	129.0	0.6
Peprilus triacanthus	107.4	0.5
February (n=1)		
Cynoscion regalis	3,003.3	97.4
Brevoortia tyrannus	28.7	0.9
Lagodon rhomboides	22.7	0.7
Peprilus alepidotus	9.8	0.3

Table 12. Seasonal mean catch/trip (kg/trip) and catch/day (kg/day) for the dominant species in the 1982-91 flynet fishery, including the species percent (%) of the total weight of the catches sampled.

Species		Season 1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	9-season mean CPUE
Cynoscion regalis	kg/trip	6,782	9,384	4,780	6,696	7,818	6,800	3,994	5,250	6,576	6,453
	kg/day	3,229	5,640	2,061	3,224	4,771	4,246	2,303	3,200	4,665	3,704
	%	52.8	69.0	35.6	44.2	52.8	56.9	39.4	45.3	57.8	
Micropogonias undulatus	kg/trip	2,344	2,612	5,191	5,868	4,685	1,944	2,738	3,037	1,096	3,279
	kg/day	824	1,338	3,441	2,826	2,856	1,230	1,610	1,913	708	1,861
	%	18.2	19.2	38.6	38.7	31.6	16.3	27.0	26.2	9.6	
Leiostomus xanthurus	kg/trip	369	606	1,391	903	1,059	488	1,325	1,082	1,117	927
	kg/day	191	353	878	435	646	308	768	657	795	560
	%	2.9	4.5	10.4	6.0	7.2	4.1	13.1	9.3	9.8	
Pomatomus saltatrix	kg/trip	2,635	244	1,367	441	271	1,783	879	1,127	620	1,040
	kg/day	1,334	141	626	214	165	1,128	516	369	440	549
	%	20.5	1.8	10.2	2.9	1.8	14.9	8.7	9.7	5.4	
Peprilus triacanthus	kg/trip	202	48	248	361	160	382	250	220	496	263
	kg/day	42	10	77	174	97	241	147	122	204	124
	%	1.6	0.3	1.8	2.4	1.1	3.2	2.5	1.9	4.4	
Brevoortia tyrannus	kg/trip	6	18	26	176	43	89	33	43	347	87
	kg/day	3	10	11	85	26	53	19	8	253	52
	%	<0.1	0.1	0.2	1.2	0.3	0.7	0.3	0.4	3.0	
Menticirrhus americanus	kg/trip	16	47	45	128	99	56	115	38	105	72
	kg/day	5	28	29	63	63	34	67	16	54	40
	%	0.2	0.4	0.3	0.8	0.7	0.4	1.1	0.3	0.9	
Lagodon rhomboides	kg/trip	1	3	36	98	62	73	187	60	293	90
	kg/day	1	2	26	47	37	46	110	34	185	54
	%	<0.1	0.2	0.3	0.6	0.4	0.6	1.8	0.5	2.6	
Menticirrhus saxatilis	kg/trip	16	12	16	48	23	12	40	40	170	42
	kg/day	3	7	10	24	15	7	24	14	111	24
	%	0.2	0.1	0.1	0.3	0.2	0.1	0.4	0.3	1.5	
Bairdiella chrysoura	kg/trip	7	23	40	44	28	40	36	91	38	39
	kg/day	3	14	26	21	17	25	21	57	27	24
	%	0.1	0.2	0.3	0.3	0.2	0.3	0.4	0.8	0.3	
Totals (10 species)	kg/trip	12,378	12,997	13,140	14,763	14,248	11,667	9,543	10,988	10,861	12,292
	kg/day	5,635	7,543	7,185	7,113	8,693	7,318	5,586	6,390	7,442	6,992
	%	96.5	95.8	97.8	97.4	96.3	97.5	94.7	94.7	95.3	

Table 13. Scrap component of winter trawl catches from October 1988 through April 1991 by gear and area fished (North=north of Cape Hatteras; Central=Cape Hatteras to Cape Lookout; South=west of Cape Lookout), including: number of catches in which scrap weight was obtained (n), mean total weight ($\bar{x}$ TW), mean weight of marketed fish ($\bar{x}$ market), mean total weight of scrap ($\bar{x}$ scrap) and percent of scrap (% scrap) in these catches. All weights are in kg.

Year	Area	n	$\bar{x}$ TW	$\bar{x}$ Market	$\bar{x}$ Scrap	% scrap
FLYNETS						
1988-89	North	23	11,268	8,109	3,160	28.0
	Central	9	4,519	3,403	1,115	24.7
	South	6	15,532	6,756	8,776	56.5
	Total	38	10,343	6,780	3,562	34.5
1989-90	North	29	13,643	11,198	2,445	17.9
	Central	9	12,542	5,096	7,446	59.4
	South	4	5,032	2,730	2,302	45.7
	Total	42	12,587	9,084	3,503	27.9
1990-91	North	12	12,315	6,763	5,553	45.1
	Central	25	10,559	6,679	3,880	36.8
	South	3	15,967	10,374	5,593	35.1
	Total	40	11,491	6,981	4,510	39.3
NEARSHORE FLOUNDER						
1988-89	North	27	3,409	3,404	5	0.2
	Central	2	3,055	3,055	0	0.0
	Total	29	3,385	3,380	5	0.2
1989-90	North	20	2,956	2,956	0	0
	Central	5	2,318	2,318	0	0
	South	3	5,357	4,752	605	11.3
	Total	28	3,099	3,034	65	2.1
1990-91	North	47	4,380	4,380	0	0
	Central	1	1,357	1,357	0	0
	Total	48	4,317	4,317	0	0
DEEPWATER						
1988-89	North	33	5,626	5,603	23	0.4
1989-90	North	44	4,268	4,259	9	0.2
1990-91	North	13	9,070	8,382	688	7.6

Table 14. Species composition (top 99%) and mean catch/trip of scrap fish in flynet, deepwater, and nearshore flounder trawl catches sampled from October 1988 through April 1989; n=number of catches in which scrap was sampled.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)
FLYNET: NORTH OF CAPE HATTERAS (n=12)					
Leiostomus xanthurus	2,719.5	46.22	38,550	47.22	0.071
Micropogonias undulatus	1,538.2	26.14	12,909	15.81	0.119
Cynoscion regalis	503.6	8.56	5,498	6.74	0.092
Peprilus triacanthus	493.4	8.39	11,422	13.99	0.043
Stenotomus spp.	345.8	5.88	8,719	10.68	0.040
Stenotomus chrysops	57.8	0.98	1,581	1.94	0.037
Orthopristis chrysoptera	56.2	0.95	1,130	1.38	0.050
Pomatomus saltatrix	53.9	0.92	409	0.50	0.132
Synodus foetens	16.3	0.28	127	0.16	0.128
Sphyraena borealis	14.6	0.25	162	0.20	0.090
Urophycis regia	12.8	0.22	89	0.11	0.145
Sphoeroides maculatus	12.3	0.21	157	0.19	0.078
Peprilus alepidotus	8.7	0.15	266	0.33	0.032
FLYNET: CAPE HATTERAS TO CAPE LOOKOUT (n=7)					
Cynoscion regalis	646.8	45.10	9,024	31.17	0.072
Leiostomus xanthurus	321.2	22.40	12,210	42.18	0.026
Micropogonias undulatus	193.4	13.49	5,261	18.17	0.037
Pomatomus saltatrix	86.6	6.04	741	2.56	0.117
Lagodon rhomboides	46.3	3.23	581	2.01	0.080
Bairdiella chrysoura	41.8	2.91	607	2.10	0.069
Brevoortia tyrannus	30.7	2.14	233	0.81	0.132
Menticirrhus americanus	27.8	1.94	48	0.16	0.582
Peprilus triacanthus	16.0	1.12	142	0.49	0.113
Paralichthys dentatus	8.4	0.59	19	0.06	0.450
Urophycis regia	5.3	0.37	9	0.03	0.569
Alosa aestivalis	3.0	0.21	22	0.08	0.140
FLYNET: WEST OF CAPE LOOKOUT (n=6)					
Leiostomus xanthurus	2,482.6	32.88	43,772	43.20	0.057
Micropogonias undulatus	2,000.4	26.50	23,875	23.56	0.084
Cynoscion regalis	1,234.8	16.36	15,589	15.39	0.079
Lagodon rhomboides	1,124.2	14.89	7,120	7.03	0.158
Brevoortia tyrannus	170.6	2.26	1,235	1.22	0.138
Bairdiella chrysoura	170.0	2.25	2,540	2.51	0.067
Peprilus triacanthus	97.7	1.29	2,718	2.68	0.036
Cephalopoda	66.4	0.88	175	0.17	0.380
Pomatomus saltatrix	54.3	0.72	525	0.52	0.103
Menticirrhus saxatilis	48.0	0.64	524	0.52	0.092
Orthopristis chrysoptera	45.8	0.61	1,814	1.79	0.025
NEARSHORE FLOUNDER: ALL AREAS (n=2)					
Micropogonias undulatus	64.1	94.27	393	91.82	0.163
Leiostomus xanthurus	3.9	5.73	35	8.18	0.111
DEEPWATER: ALL AREAS (n=3)					
Stenotomus chrysops	141.1	52.56	1,661	55.15	0.085
Prionotus spp.	64.3	23.96	1,000	33.22	0.064
Centropristis striata	24.5	9.12	184	6.11	0.133
Paralichthys dentatus	18.9	7.04	59	1.96	0.320
Urophycis regia	14.3	5.33	72	2.38	0.200
Loligo pealii	5.4	2.00	36	1.18	0.150

Table 15. Species composition (top 99%) and mean catch/trip of scrap fish in flynet, deepwater, and nearshore flounder trawl catches in which scrap was sampled during October 1989 through April 1990; n=number of catches in which scrap was sampled.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)
FLYNET: NORTH OF CAPE HATTERAS (n=13)					
Micropogonias undulatus	3,350.4	47.53	28,438	33.88	0.118
Leiostomus xanthurus	1,541.6	21.87	15,855	18.89	0.097
Cynoscion regalis	441.5	6.26	2,940	3.50	0.150
Stenotomus caprinus	374.3	5.31	10,050	11.97	0.037
Peprilus triacanthus	255.8	3.63	6,926	8.25	0.037
Pomatomus saltatrix	230.8	3.27	1,186	1.41	0.195
Urophycis regia	197.0	2.79	1,801	2.15	0.109
Orthopristis chrysoptera	120.5	1.71	2,291	2.73	0.053
Prionotus evolans	64.9	0.92	1,221	1.45	0.053
Peprilus alepidotus	64.6	0.92	1,380	1.64	0.047
Menticirrhus saxatilis	56.2	0.80	452	0.54	0.124
Sphoeroides maculatus	48.3	0.69	1,113	1.33	0.043
Synodus foetens	39.5	0.56	701	0.84	0.056
Prionotus scitulus	37.4	0.53	1,127	1.34	0.033
Anchoa hepsetus	33.4	0.47	3,215	3.83	0.010
Callinectes larvatus	33.1	0.47	828	0.99	0.040
Stenotomus chrysops	27.1	0.39	937	1.12	0.029
Prionotus tribulus	25.9	0.37	579	0.69	0.045
Loligo pealii	20.4	0.29	273	0.32	0.075
Centropristis striata	19.2	0.27	270	0.32	0.071
Prionotus carolinus	19.2	0.27	581	0.69	0.033
Lagodon rhomboides	12.2	0.17	135	0.16	0.090
Portunus sp.	8.3	0.12	828	0.99	0.010
Monacanthus hispidus	7.1	0.10	232	0.28	0.031
Menticirrhus americanus	4.7	0.07	36	0.04	0.130
FLYNET: CAPE HATTERAS TO CAPE LOOKOUT (n=8)					
Cynoscion regalis	4,036.5	48.2	22,839	23.1	0.177
Leiostomus xanthurus	2,286.7	27.3	38,798	39.2	0.059
Micropogonias undulatus	1,013.9	12.1	14,137	14.3	0.072
Bairdiella chrysoura	381.8	4.6	9,040	9.1	0.042
Peprilus triacanthus	191.8	2.3	4,781	4.8	0.040
Lagodon rhomboides	132.0	1.6	3,730	3.8	0.035
Pomatomus saltatrix	99.2	1.2	1,122	1.1	0.088
Urophycis regia	86.2	1.0	1,469	1.5	0.059
Menticirrhus americanus	48.4	0.6	1,039	1.1	0.047
Menticirrhus saxatilis	33.7	0.4	393	0.4	0.086
Brevoortia tyrannus	32.0	0.4	851	0.8	0.038
Stenotomus chrysops	24.2	0.3	403	0.4	0.060
FLYNET: WEST OF CAPE LOOKOUT (n=4)					
Leiostomus xanthurus	793.0	34.5	15,389	41.8	0.052
Cynoscion regalis	600.1	26.1	6,402	17.4	0.094
Micropogonias undulatus	493.1	21.4	6,752	18.3	0.073
Lagodon rhomboides	248.1	10.8	5,619	15.3	0.044
Pomatomus saltatrix	88.3	3.8	1,466	4.0	0.060
Bairdiella chrysoura	39.3	1.7	590	1.6	0.067
Brevoortia tyrannus	16.4	0.7	133	0.4	0.124
Peprilus triacanthus	12.2	0.5	281	0.8	0.043
Orthopristis chrysoptera	8.5	0.4	200	0.5	0.043
Peprilus alepidotus	0.4	<0.1	12	<0.1	0.035

Table 15. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)
NEARSHORE FLOUNDER: ALL AREAS (n=1)					
Leiostomus xanthurus	886.8	48.9	14,081	52.6	0.063
Micropogonias undulatus	333.2	18.4	4,084	15.3	0.082
Peprilus triacanthus	275.2	15.2	5,478	20.5	0.050
Loligo pealii	150.5	8.3			0.050
Menticirrhus americanus	35.5	2.0	322	1.2	0.110
Orthopristis chrysoptera	30.1	1.7	430	1.6	0.070
Cynoscion regalis	26.9	1.5	322	1.2	0.083
Sphoeroides maculatus	21.5	1.2	430	1.6	0.050
Urophycis regia	18.3	1.0	322	1.2	0.057
Lagodon rhomboides	15.0	0.8	430	1.6	0.035
Prionotus evolans	9.7	0.5	107	0.4	0.090
Prionotus scitulus	3.2	0.2	215	0.8	0.015
Decapterus punctatus	3.2	0.2	107	0.4	0.030
Citharichthys spp.	3.2	0.2	215	0.8	0.015
Anchoa mitchilli	2.1	0.1	215	0.8	0.010
DEEPWATER: ALL AREAS (n=1)					
Merluccius bilinearis	227.8	55.8	1,427	40.5	0.160
Stenotomus chrysops	69.3	17.0	729	20.7	0.095
Urophycis chuss	48.0	11.8	516	14.7	0.093
Squalus acanthias	33.1	8.1	547	15.5	0.061
Loligo pealii	8.5	2.1	121	3.4	0.070
Prionotus carolinus	7.6	1.9	121	3.4	0.063
Alosa pseudoharengus	7.3	1.8	30	0.9	0.243
Scomber scombrus	6.7	1.6	30	0.9	0.223

Table 16. Species composition (top 99%) and mean catch/trip of scrap fish in flynet, and deepwater trawl catches in which scrap was sampled during October 1990 through April 1991; n=number of catches from which scrap was sampled.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)
FLYNET: NORTH OF CAPE HATTERAS (n=9)					
Cynoscion regalis	2,734.0	38.00	20,023	23.96	0.137
Micropogonias undulatus	1,525.5	21.20	15,930	19.06	0.096
Leiostomus xanthurus	1,102.8	15.33	14,219	17.01	0.078
Peprilus triacanthus	367.8	5.11	8.055	9.64	0.046
Scomberomorus maculatus	317.5	4.41	1,673	2.00	0.190
Peprilus alepidotus	270.2	3.76	7,017	8.40	0.039
Stenotomus caprinus	237.3	3.30	4,316	5.16	0.055
Pomatomus saltatrix	186.2	2.59	379	0.45	0.492
Orthopristis chrysoptera	92.7	1.29	2,119	2.54	0.044
Brevoortia tyrannus	58.3	0.81	216	0.26	0.270
Anchoa hepsetus	47.0	0.65	3,169	6.19	0.009
Chaetodipterus faber	44.0	0.61	765	0.91	0.058
Opisthonema oglinum	33.0	0.46	1,330	1.59	0.025
Bairdiella chrysoura	28.7	0.40	320	0.38	0.090
Synodus foetens	28.6	0.40	316	0.38	0.090
Urophycis regia	20.8	0.29	173	0.21	0.120
Menticirrhus saxatilis	19.6	0.27	115	0.14	0.170
Menticirrhus americanus	18.1	0.25	161	0.19	0.112
FLYNET: CAPE HATTERAS TO CAPE LOOKOUT (n=25)					
Cynoscion regalis	1,261.8	32.04	16,599	23.08	0.076
Leiostomus xanthurus	804.4	20.43	18,344	25.51	0.044
Micropogonias undulatus	4554.6	14.08	8,254	11.48	0.067
Lagodon rhomboides	394.1	10.01	12,067	16.78	0.033
Brevoortia tyrannus	281.1	7.14	2,589	3.60	0.109
Peprilus triacanthus	208.5	5.29	5,387	7.49	0.039
Pomatomus saltatrix	172.0	4.37	1,601	2.23	0.107
Stenotomus caprinus	55.9	1.42	1,251	1.74	0.045
Anchoa hepsetus	54.1	1.37	3,327	4.63	0.016
Bairdiella chrysoura	31.7	0.81	710	0.99	0.045
Peprilus alepidotus	29.3	0.74	580	0.81	0.051
Menticirrhus saxatilis	24.7	0.63	337	0.47	0.073
Menticirrhus americanus	18.5	0.47	144	0.20	0.128
FLYNET: WEST OF CAPE LOOKOUT (n=3)					
Cynoscion regalis	2,784.3	39.80	35,591	38.53	0.078
Brevoortia tyrannus	1,995.0	28.52	10.917	11.82	0.183
Leiostomus xanthurus	1,611.3	23.03	30,018	32.50	0.054
Lagodon rhomboides	255.2	3.65	8,518	9.22	0.030
Micropogonias undulatus	108.1	1.55	2,490	2.70	0.043
Pomatomus saltatrix	86.0	1.23	707	0.77	0.122
Bairdiella chrysoura	67.5	0.96	2,005	2.17	0.034
Peprilus triacanthus	55.4	0.79	1,085	1.17	0.051
DEEPWATER: ALL AREAS (n=4)					
Stenotomus chrysops	1,407.1	62.96	12,995	77.94	0.108
Gnathosomata	283.5	12.68	-	-	-
Clupea harengus	213.3	9.55	1,397	8.38	0.153
Merluccius bilinearis	134.1	6.00	768	4.60	0.175
Loligo pealii	60.8	2.72	-	-	-
Peprilus triacanthus	52.7	2.36	1,071	6.43	0.049
Urophycis regia	34.6	1.55	190	1.14	0.182
Scomber scombrus	26.8	1.20	108	0.65	0.249

Table 17. Dominant species in scrapfish from sciaenid-bluefish flynet catches sampled during 1982-91 fishing seasons.

Species	Mean	%		Species	Mean	%		Species	Mean	%	
1982-83 (n=14)				1985-86 (n-22)				1988-89 (n=25)			
Micropogonias undulatus	1,314.7	40.2	9,097	Micropogonias undulatus	2,500.7	41.9	28,157	Leiostomus xanthurus	1,991.1	39.5	32,428
Cynoscion regalis	801.5	24.5	10,594	Cynoscion regalis	1,449.1	24.3	17,166	Micropogonias undulatus	1,272.6	25.3	13,400
Leiostomus xanthurus	624.9	19.1	9,761	Leiostomus xanthurus	1,014.0	17.0	14,704	Cynoscion regalis	719.2	14.3	8,907
Pomatomus saltatrix	290.7	8.9	1,849	Peprilus triacanthus	228.1	3.8	4,916	Lagodon rhomboides	284.7	5.6	1,916
Peprilus triacanthus	56.2	1.7	1,056	Brevoortia tyrannus	208.1	3.5	2,483	Peprilus triacanthus	264.8	5.3	6,175
				Pomatomus saltatrix	156.9	2.6	1,800	Stenotomus sp.	166.0	3.3	4,185
								Pomatomus saltatrix	63.2	1.2	530
1983-84 (n=14)				1986-87 (n-29)				1989-90 (n=22)			
Micropogonias undulatus	1,212.8	44.1	13,353	Cynoscion regalis	2,486.3	39.9	28,069	Micropogonias undulatus	1,981.2	29.7	19,295
Cynoscion regalis	769.2	28.0	8,548	Micropogonias undulatus	1,762.3	28.3	19,835	Cynoscion regalis	1,777.6	26.7	10,805
Leiostomus xanthurus	551.1	20.0	8,048	Leiostomus xanthurus	1,127.1	18.1	16,842	Leiostomus xanthurus	1,676.4	25.1	24,113
Menticirrhus americanus	38.5	1.4	358	Unidentified scrapfish	336.3	5.4	-	Peprilus triacanthus	188.3	2.8	4,938
Peprilus triacanthus	36.6	1.3	879	Pomatomus saltatrix	106.9	1.7	805	Stenotomus caprinus	170.1	2.5	4,568
Pomatomus saltatrix	30.0	1.1	320	Lagodon rhomboides	76.3	1.2	2,252	Pomatomus saltatrix	157.1	2.4	1,214
				Peprilus triacanthus	65.2	1.1	1,014	Bairdiella chrysoura	146.0	2.2	3,394
1984-85 (n=33)				1987-88 (n-23)				1990-91 (n=36)			
Micropogonias undulatus	2,385.9	46.7	24,827	Cynoscion regalis	2,920.8	55.5	30,556	Cynoscion regalis	1,715.8	34.9	18,943
Leiostomus xanthurus	1,528.8	29.9	22,160	Micropogonias undulatus	880.0	16.7	9,688	Leiostomus xanthurus	938.0	19.1	18,400
Cynoscion regalis	804.3	15.7	7,400	Leiostomus xanthurus	621.3	11.8	6,874	Micropogonias undulatus	733.2	14.9	9,480
Pomatomus saltatrix	79.8	1.6	450	Peprilus triacanthus	279.9	5.3	5,830	Brevoortia tyrannus	374.4	7.6	2,756
Peprilus triacanthus	74.6	1.5	1,685	Brevoortia tyrannus	119.7	2.3	1,424	Lagodon rhomboides	295.4	6.0	9,101
				Lagodon rhomboides	98.7	1.9	2,307	Peprilus triacanthus	231.1	4.7	5,622
				Pomatomus saltatrix	69.1	1.3	567	Pomatomus saltatrix	168.0	3.4	1,255

Table 18. Total landings (mt) of commercial finfish (excluding menhaden) in North Carolina (by all gears) that are important components of the winter trawl fishery, with total weights of the nine species and their combined percentage of the state's total edible finfish landings.

Year	Total edible finfish	Croaker	Flounder*	Weakfish	Bluefish	Spot	Black sea bass	Scup++	Butterfish	Total weight of dominant species	Percent of total state finfish landings
1965	15,258	795	2,141	889	319	414	494	442	167	5,661	37.1
1966	14,772	575	1,822	860	372	495	574	872	228	5,798	39.3
1967	18,543	582	1,992	802	403	1,383	905	205	174	6,406	34.6
1968	15,140	545	1,181	1,037	396	714	541	77	48	4,539	30.0
1969	16,628	621	1,255	698	395	675	475	114	59	4,292	25.9
1970	13,532	366	1,435	1,107	225	693	534	90	60	4,510	33.4
1971	14,234	430	1,819	1,653	262	540	339	92	26	5,161	36.3
1972	18,476	1,864	2,112	3,334	530	1,770	288	17	40	9,965	54.0
1973	18,613	1,961	3,341	2,822	911	2,448	310	7	18	11,818	63.5
1974	21,428	2,759	5,358	2,747	990	2,543	597	15	34	15,043	70.2
1975	24,349	4,650	5,221	3,051	896	3,765	520	51	58	18,212	74.8
1976	24,390	6,821	5,195	3,952	615	1,213	260	92	24	18,172	74.5
1977	28,012	8,616	5,052	3,933	1,057	1,726	665	53	22	21,123	75.4
1978	30,424	9,047	5,584	4,927	883	2,213	521	478	50	23,703	77.9
1979	37,307	9,325	8,355	6,695	1,545	3,313	624	588	82	30,527	81.9
1980	41,517	9,592	7,657	9,228	2,469	3,220	694	599	67	33,526	80.8
1981	31,219	5,083	4,430	7,662	2,998	1,593	543	581	128	23,118	74.1
1982	28,989	4,910	3,828	5,467	1,946	2,231	368	668	120	19,538	67.4
1983	28,864	3,288	4,451	4,642	3,061	1,339	242	302	49	17,374	60.2
1984	29,350	4,160	6,843	5,892	1,615	1,579	449	476	78	21,092	71.9
1985	29,243	3,953	4,973	4,457	1,635	1,834	553	269	72	17,746	60.7
1986	27,570	4,276	4,012	6,491	1,565	1,521	498	172	85	18,620	67.6
1987	24,064	3,306	3,621	5,390	2,069	1,273	243	113	63	16,078	66.9
1988	27,930	3,826	4,656	6,846	2,286	1,397	558	57	30	19,656	70.4
1989	20,501	3,095	3,427	4,588	1,493	1,476	452	8	87	14,627	71.4
1990	21,684	2,617	2,445	2,632	2,077	1,567	470	47	115	11,970	55.2

* Includes all _Paralichthys_, not just _P_. _dentatus_. Actual landings of _P_. _dentatus_ would be approximately 15-20% lower.

++ Includes only scup landings for winter trawler fisehry to preclude the inclusion of a significant amount of _Pagrus_ spp. landings together with _Stenotomus chrysops_.

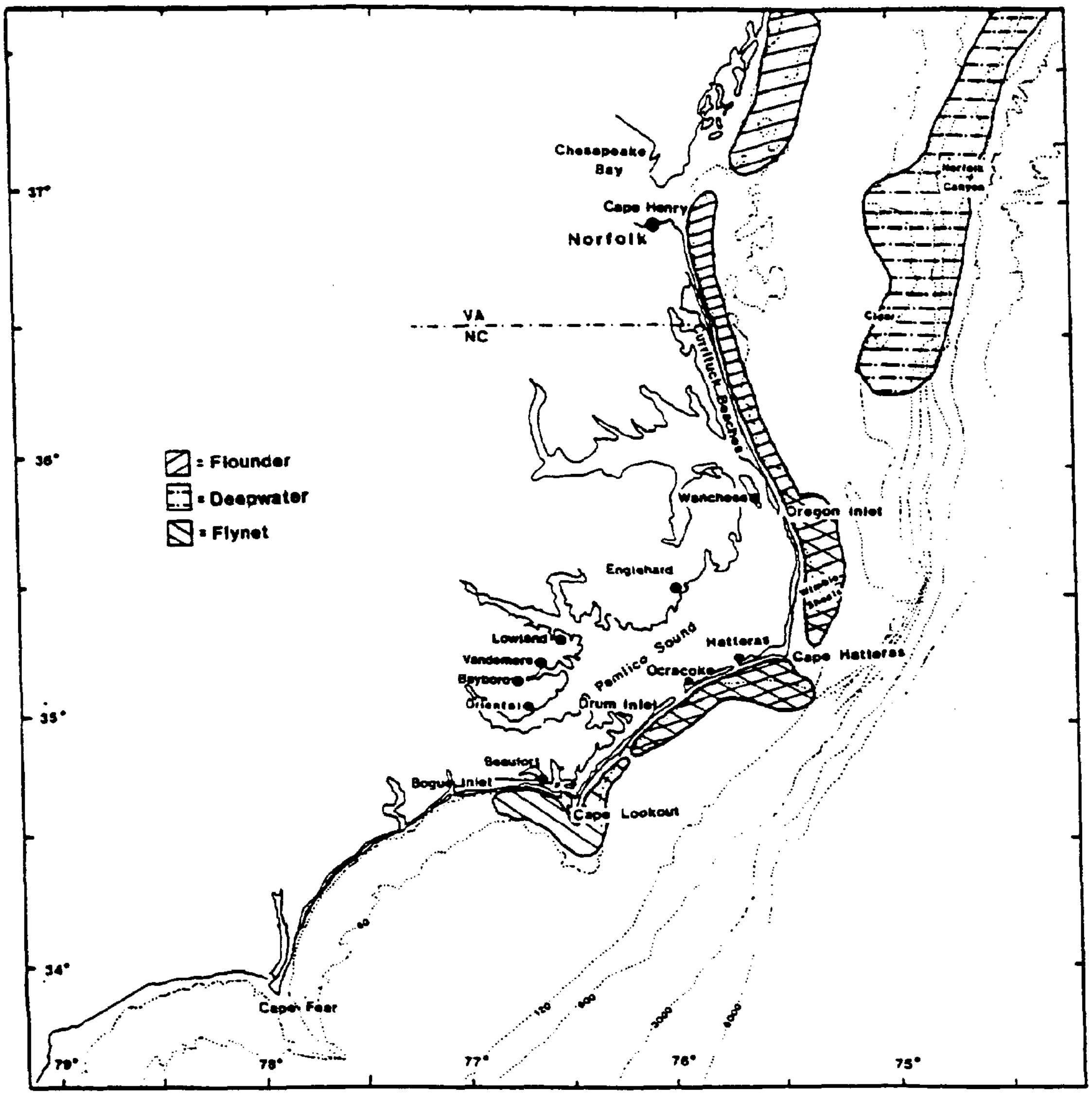

Figure 1. Fishing grounds of North Carolina winter trawl fishery; depth in feet.

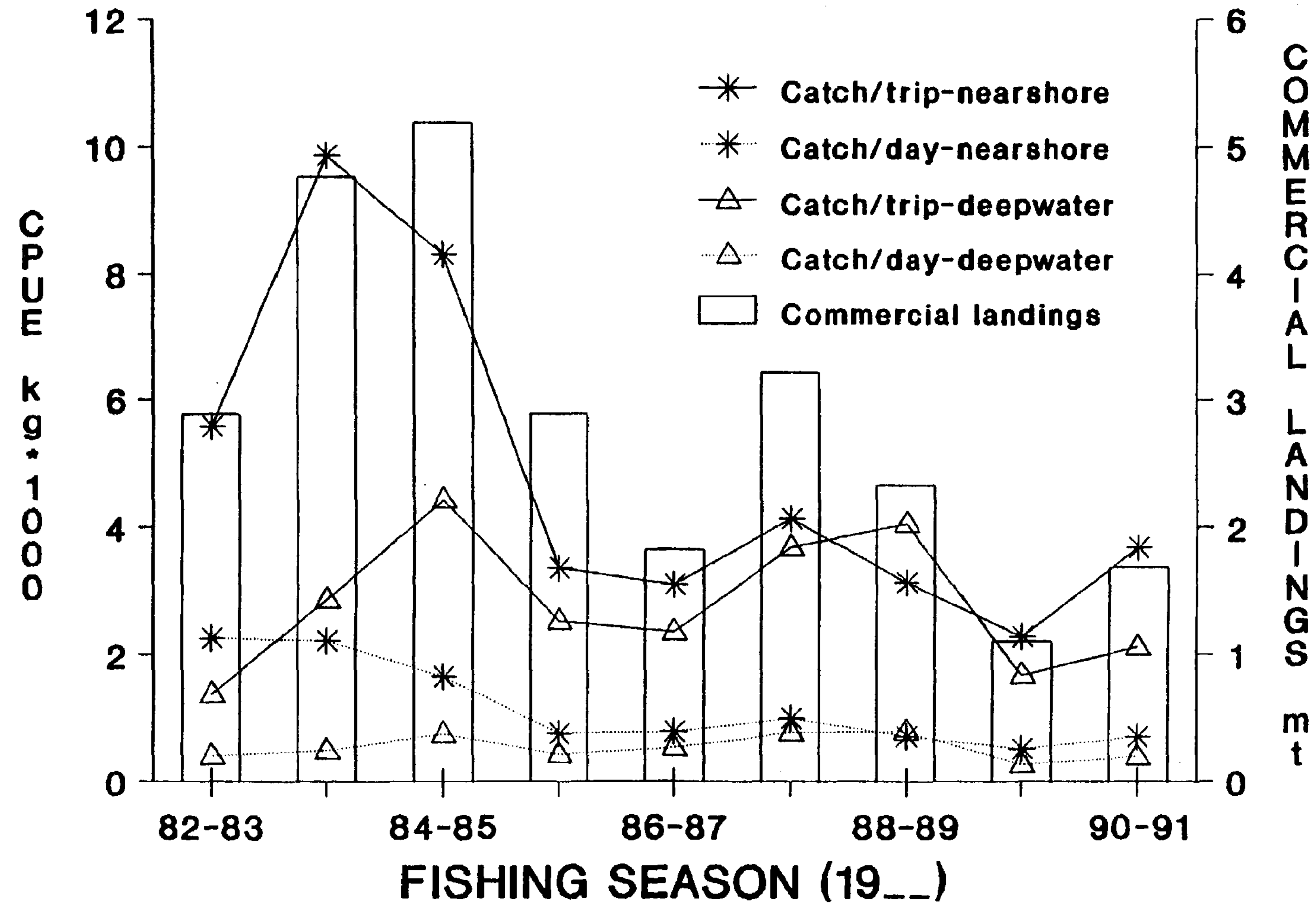

Figure 2. Commercial landings and mean CPUE of summer flounder (<u>Paralichthys dentatus</u>) from 1982-1991 winter trawl fishery.

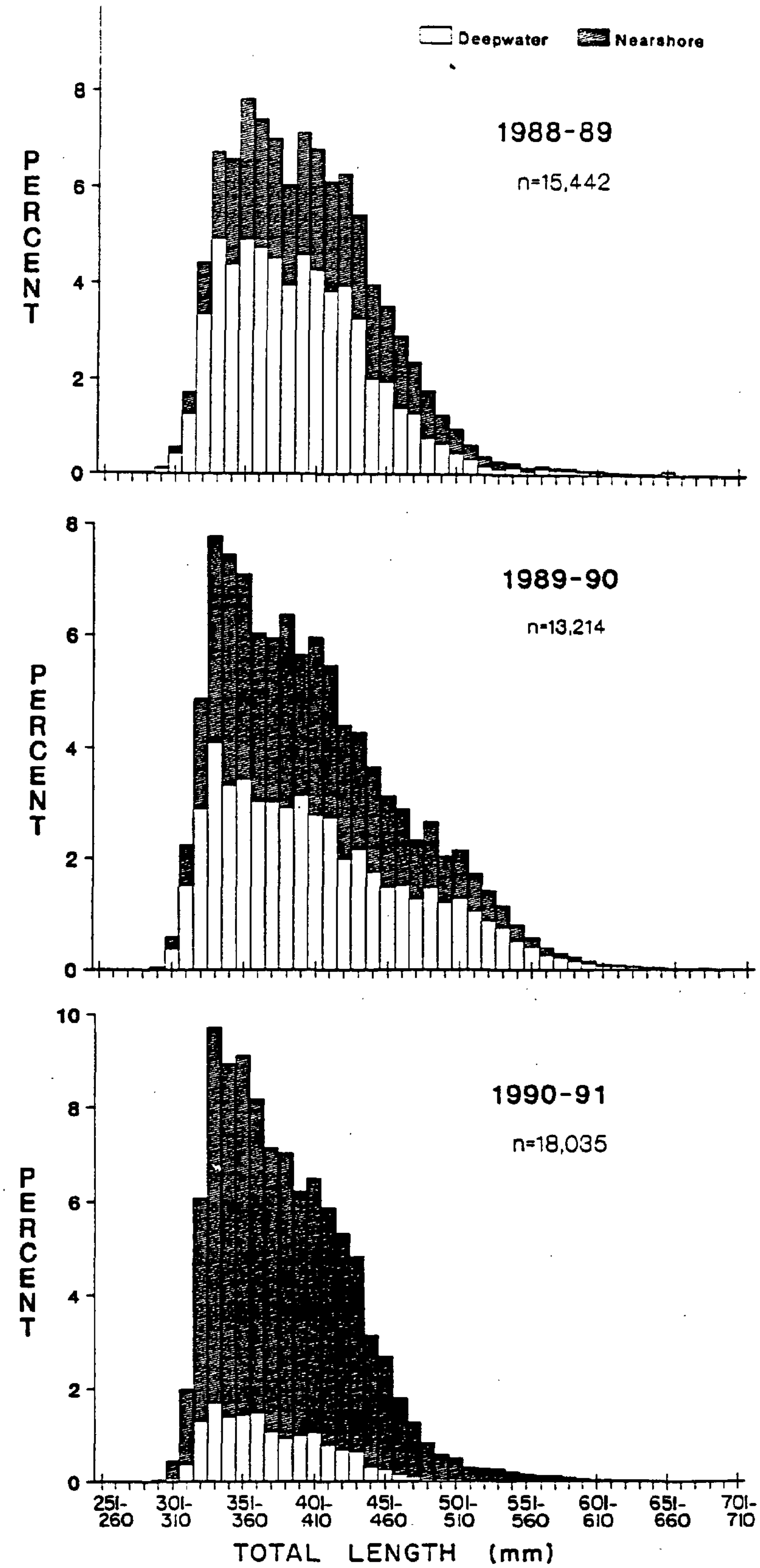

Figure 3. Length-frequency distribution (10 mm size classes) of summer flounder (Paralichthys dentatus) in 1988-1991 winter trawl catches.

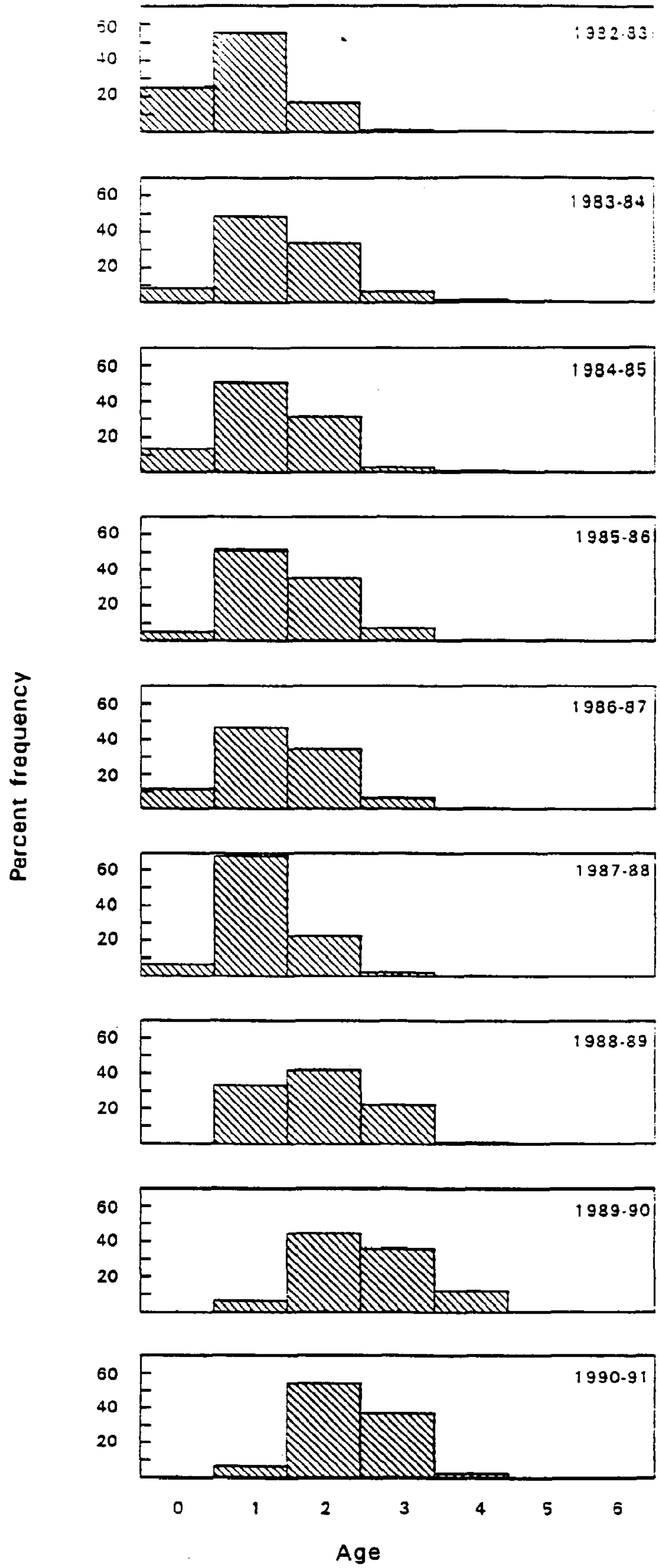

Figure 4. Annual expanded age composition of summer flounder (Paralichthys dentatus) in the North Carolina winter trawl fishery, 1982-1991.

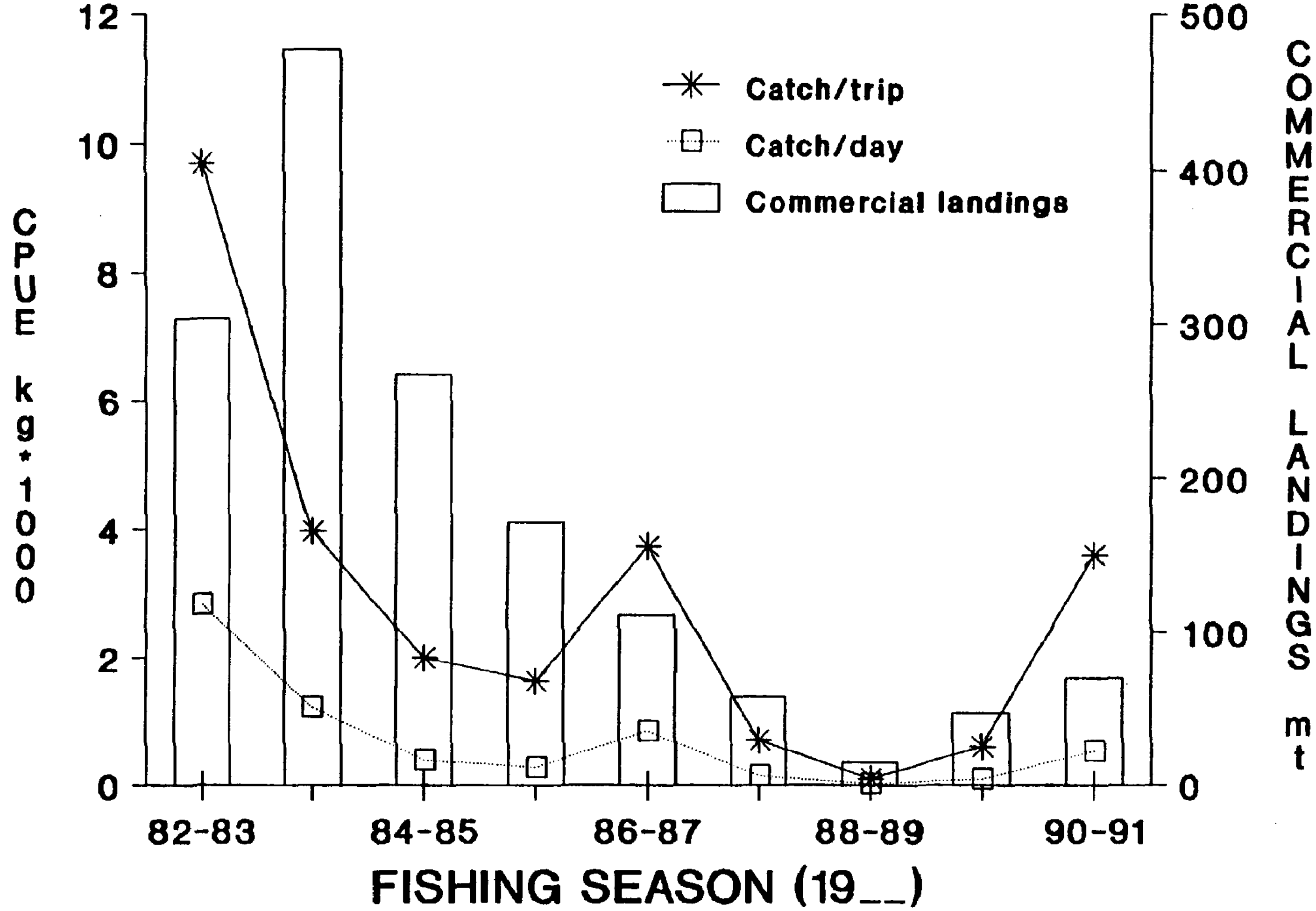

Figure 5. Commercial landings and mean CPUE of scup (Stenotomus chrysops) from 1982-1991 winter trawl fishery.

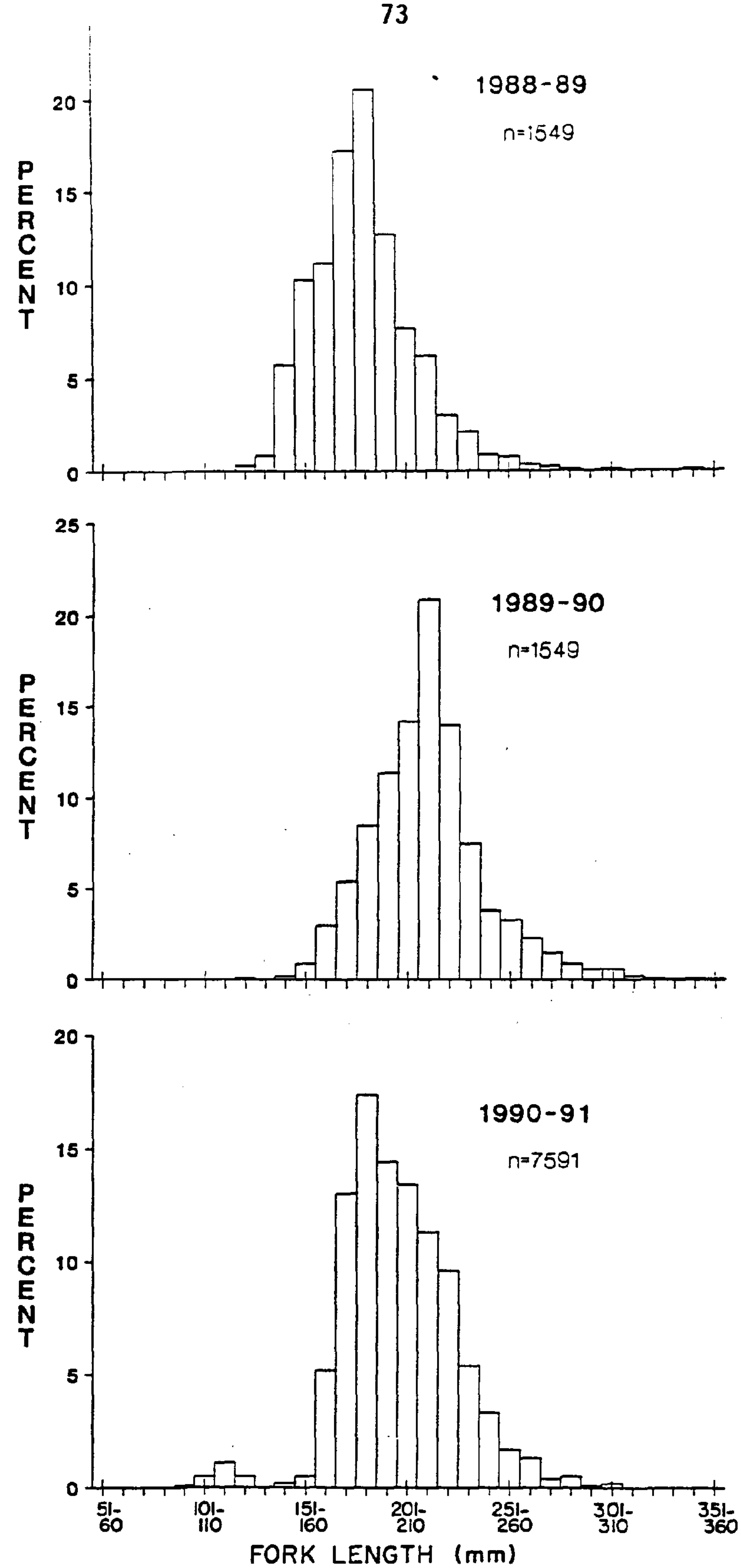

Figure 6. Length-frequency distribution (10 mm size classes) of scup (Stenotomus chrysops) in 1988-1991 winter trawl catches.

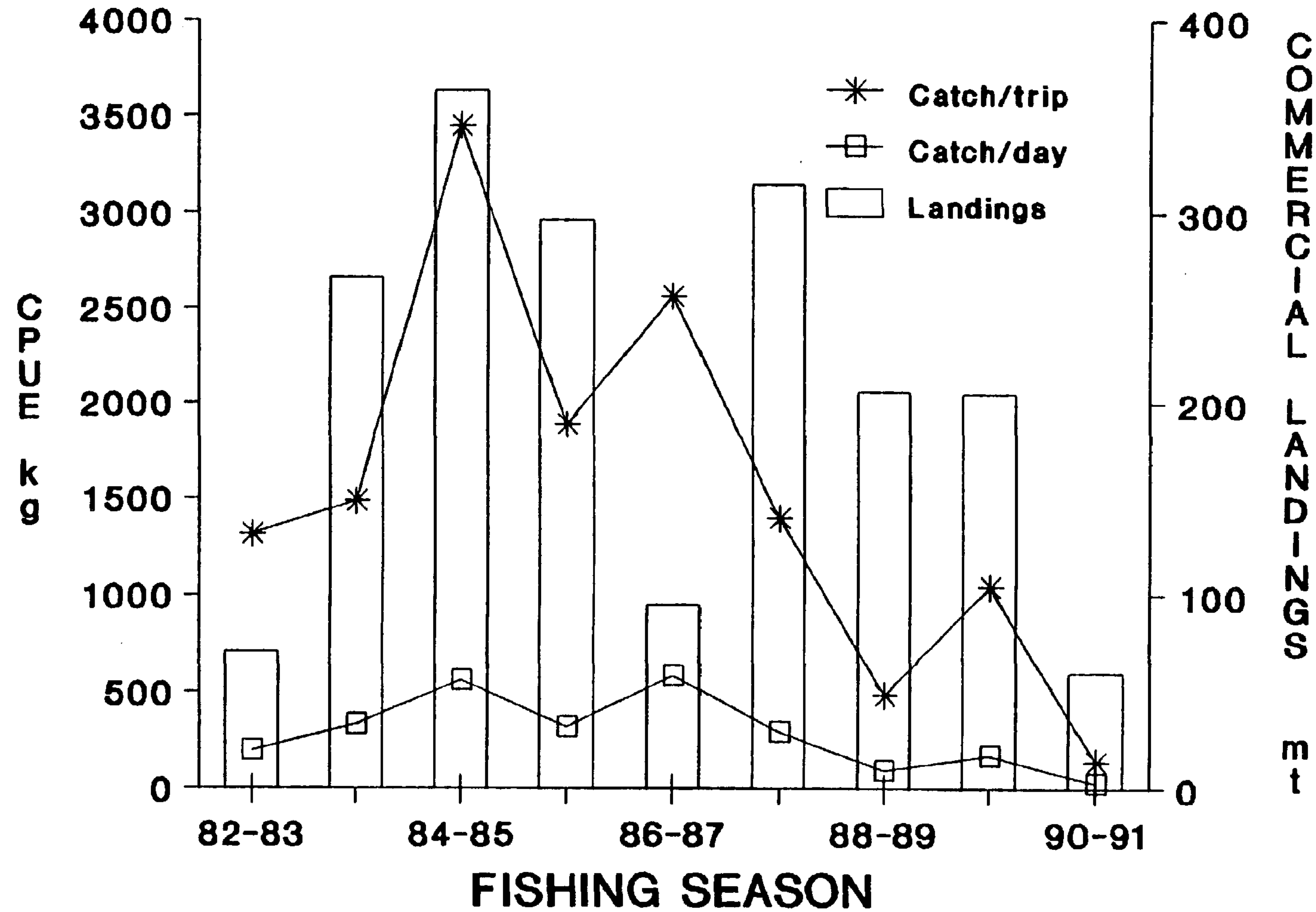

Figure 7. Commercial landings and mean CPUE of black sea bass (Centropristis philadelphica) from 1982-1991 winter trawl fishery.

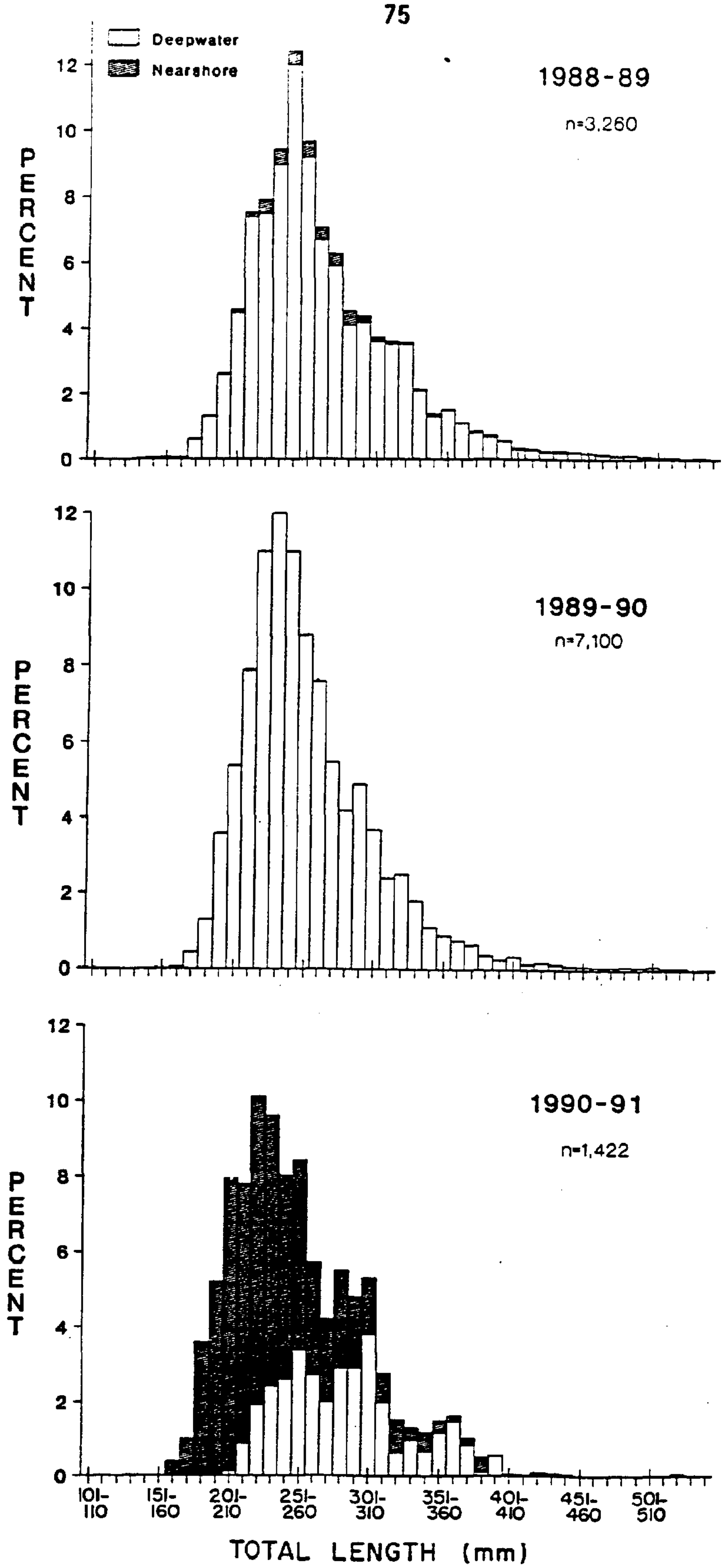

Figure 8. Length-frequency distribution (10 mm size classes) of black sea bass (Centropristis striata) in 1988-1991 winter trawl catches.

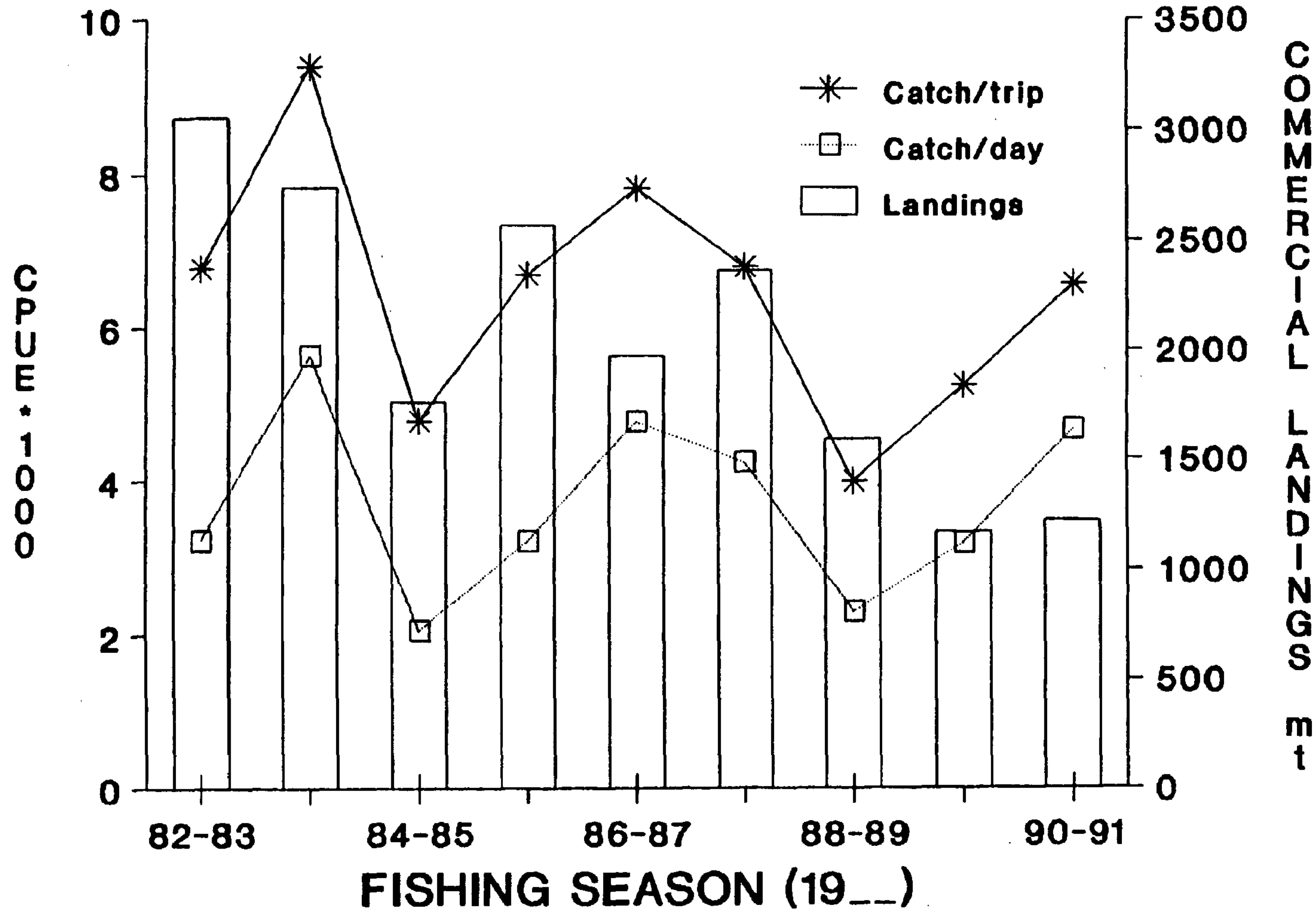

Figure 9. Commercial landings and mean CPUE of weakfish (Cynoscion regalis) from 1982-1991 winter trawl fishery.

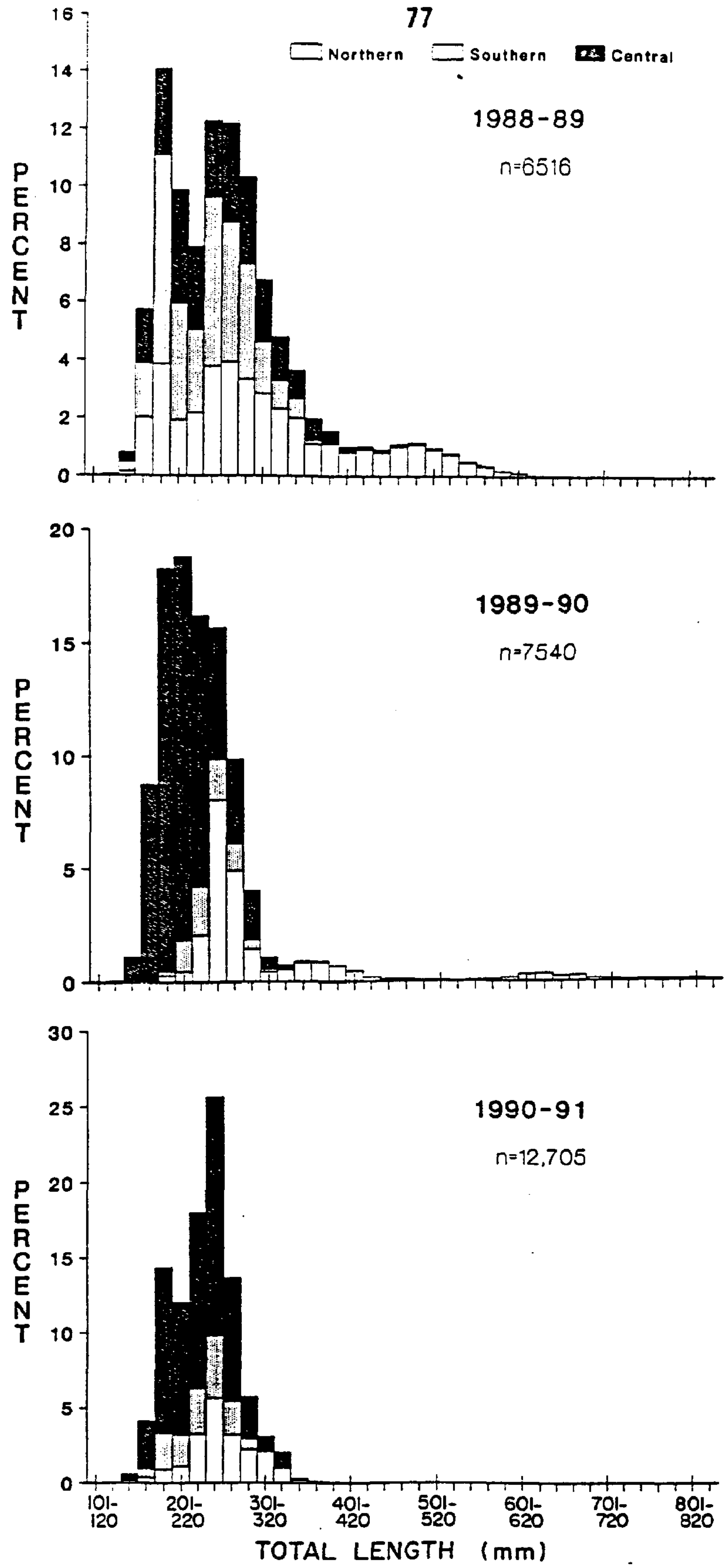

Figure 10. Length-frequency distribution (20 mm size classes) of weakfish (Cynoscion regalis) in 1988-1991 winter trawl catches.

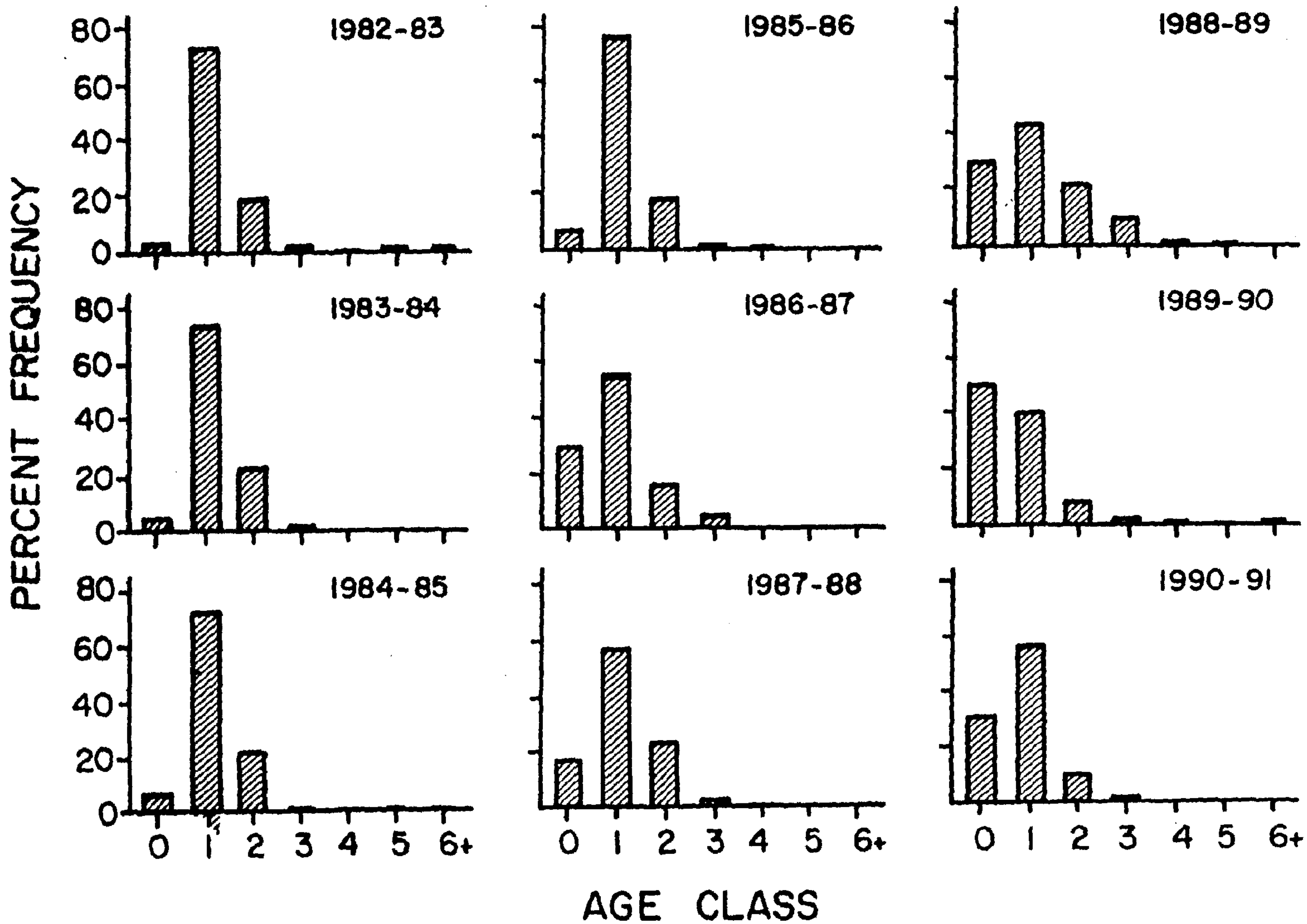

Figure 11. Age composition of weakfish (<u>Cynoscion regalis</u>) in winter trawl catches during 1982-91 fishing seasons.

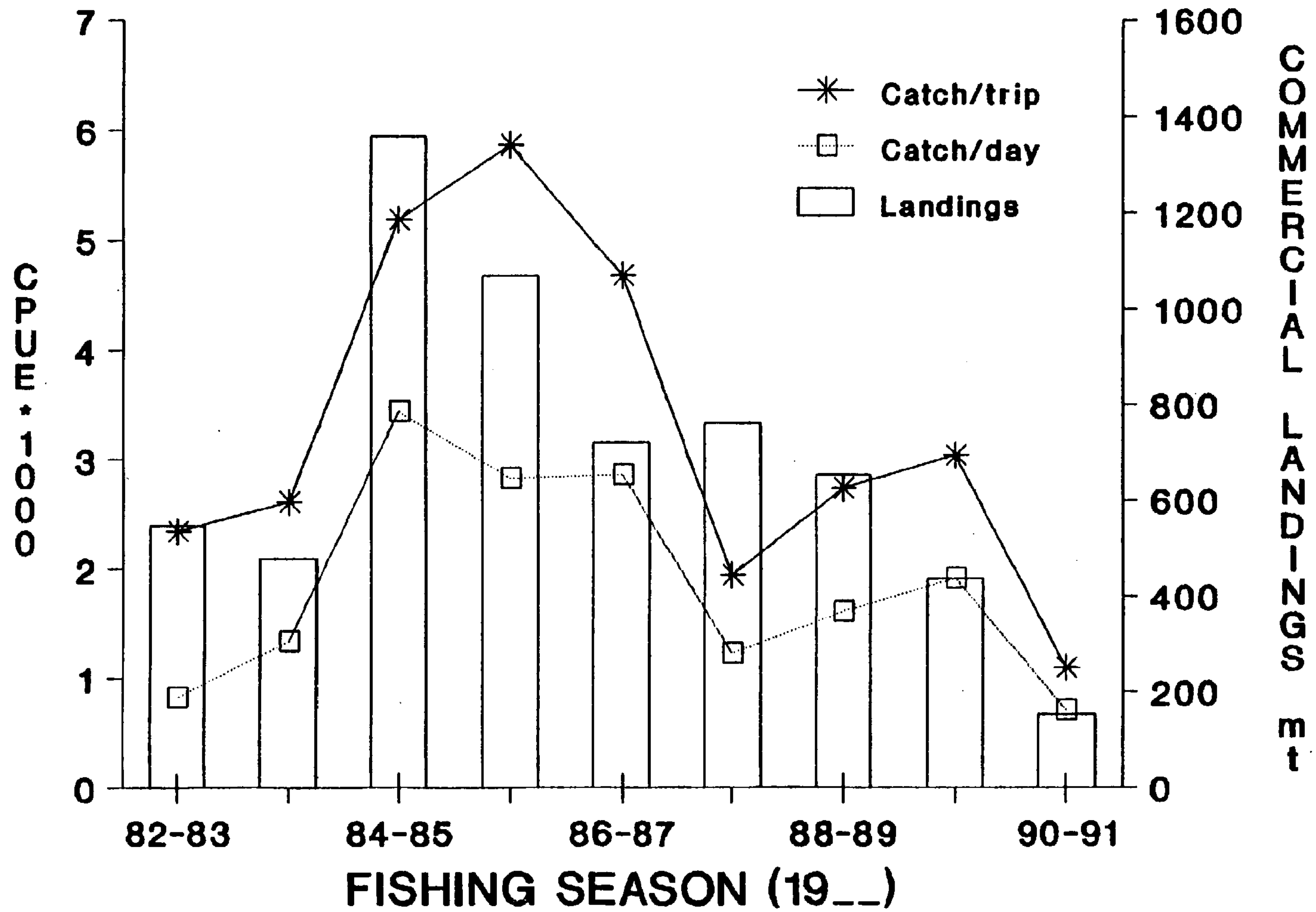

Figure 12. Commercial landings and mean CPUE of Atlantic croaker (Micropogonias undulatus) from 1982-1991 winter trawl fishery.

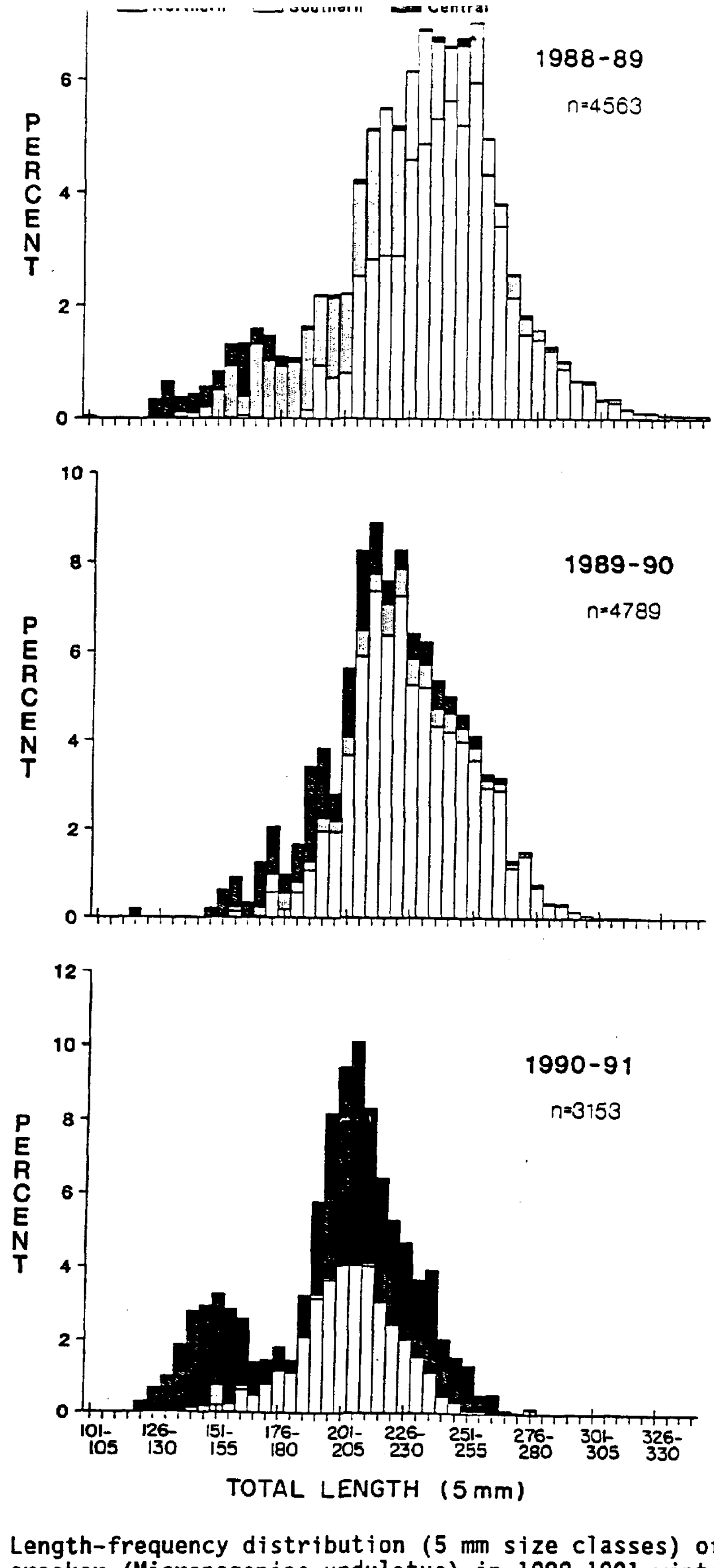

Figure 13. Length-frequency distribution (5 mm size classes) of Atlantic croaker (Micropogonias undulatus) in 1988-1991 winter trawl catches.

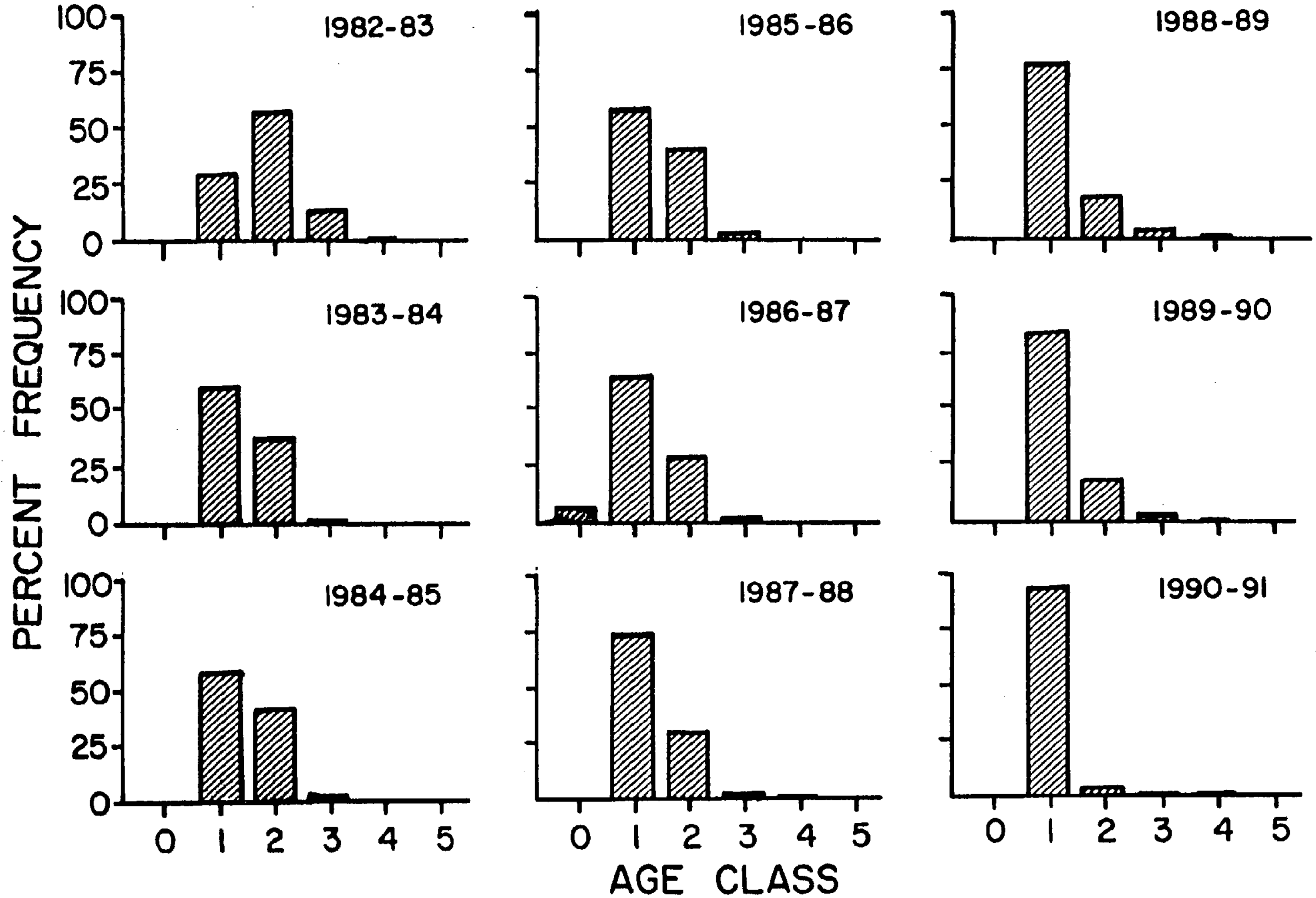

Figure 14. Age composition of Atlantic croaker (Micropogonias undulatus) in winter trawl catches during 1982-91 fishing seasons.

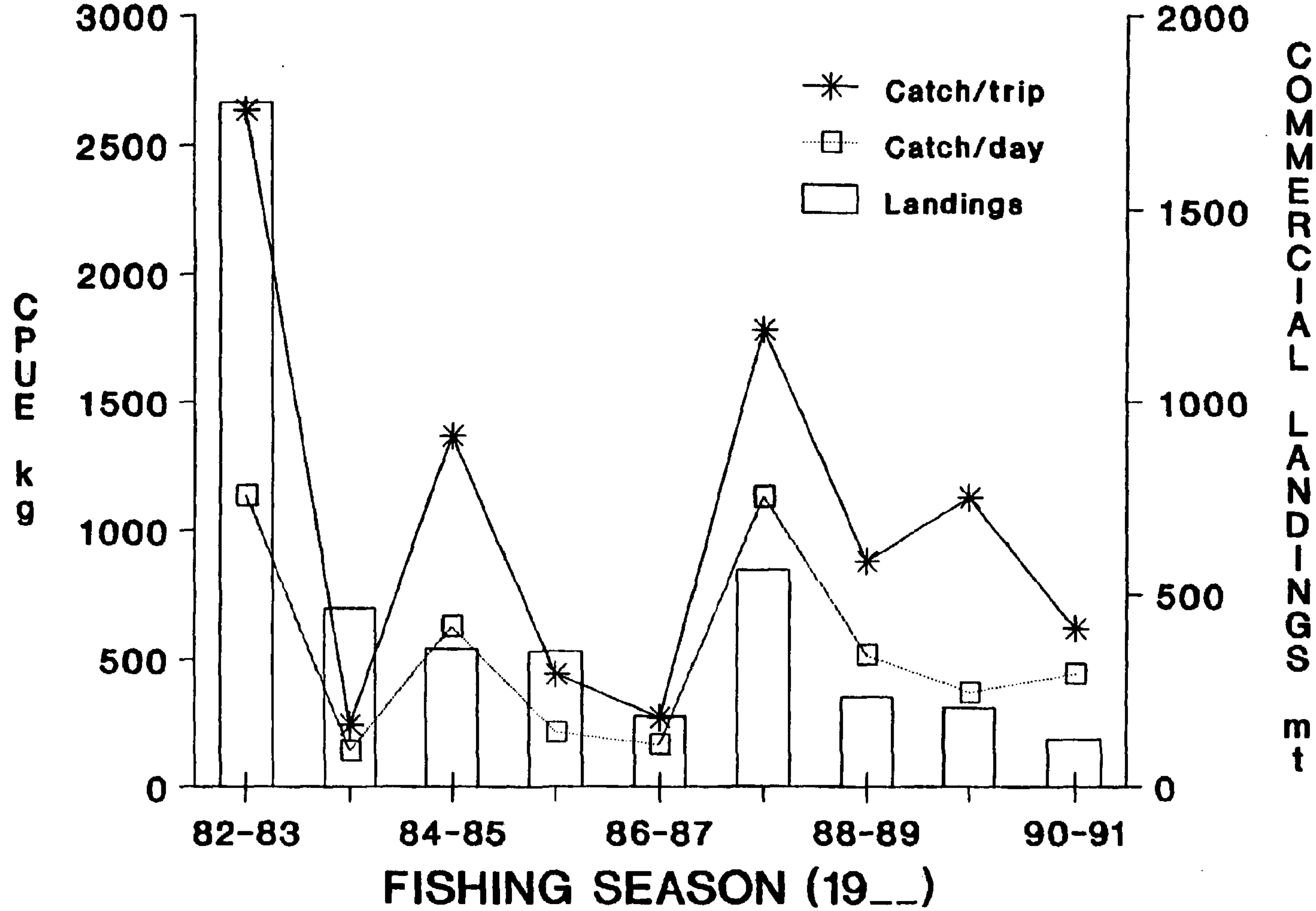

Figure 15. Commercial landings and mean CPUE of bluefish (<u>Pomatomus saltatrix</u>) from 1982-1991 winter trawl fishery.

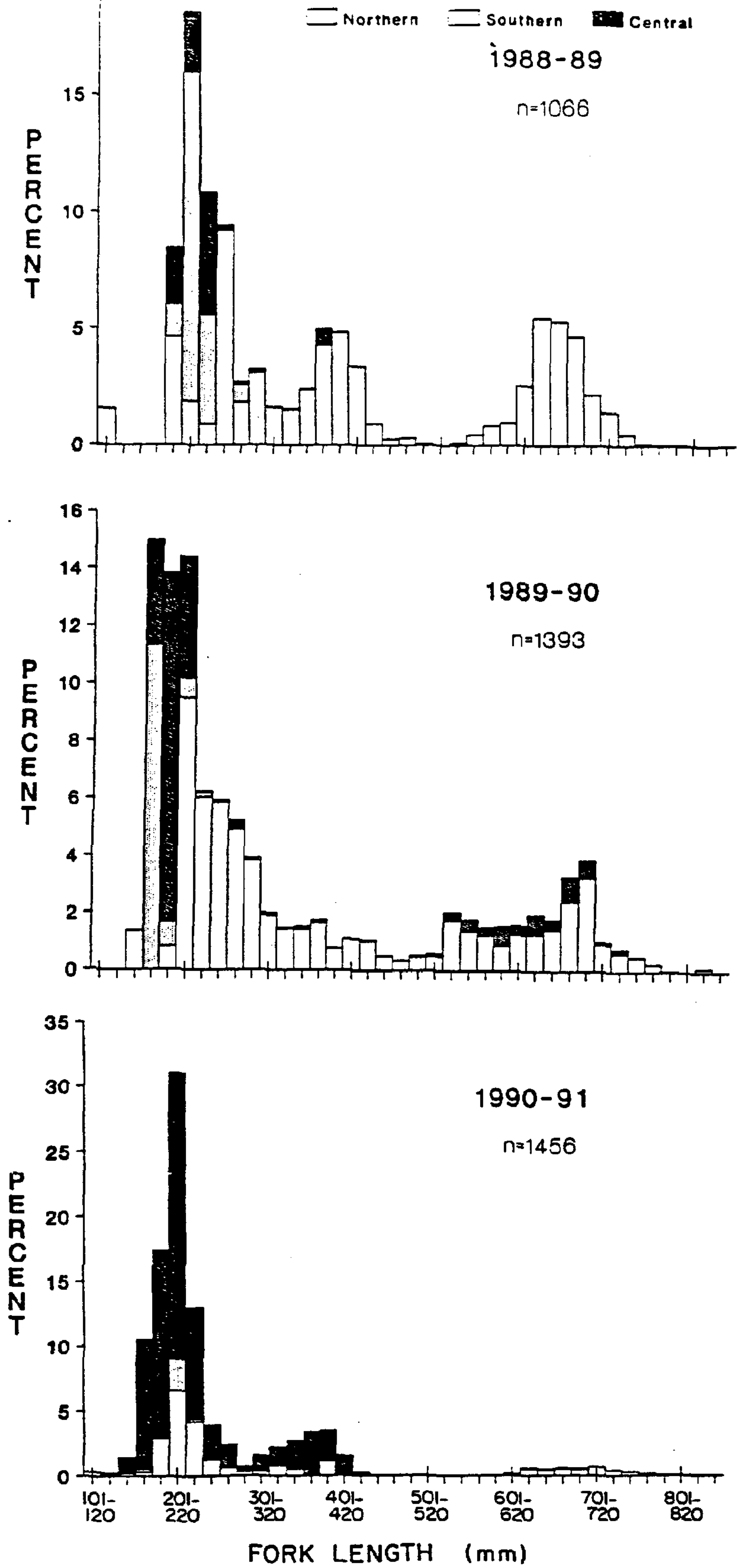

Figure 16. Length-frequency distribution (20 mm size classes) of bluefish (<u>Pomatomus</u> <u>saltatrix</u>) in 1988-1991 winter trawl catches.

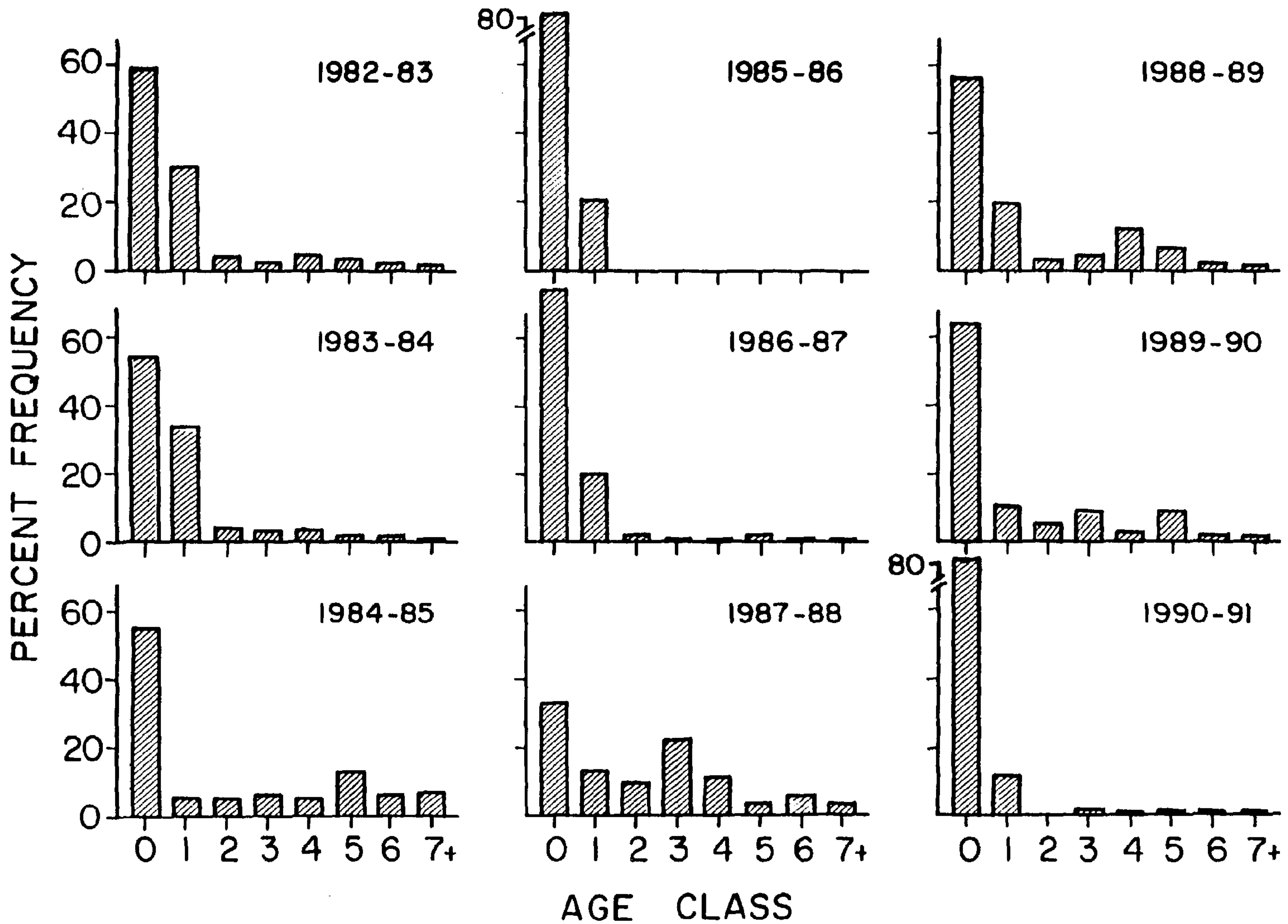

Figure 17. Age composition of bluefish (<u>Pomatomus saltatrix</u>) in winter trawl catches during 1982-91 fishing seasons.

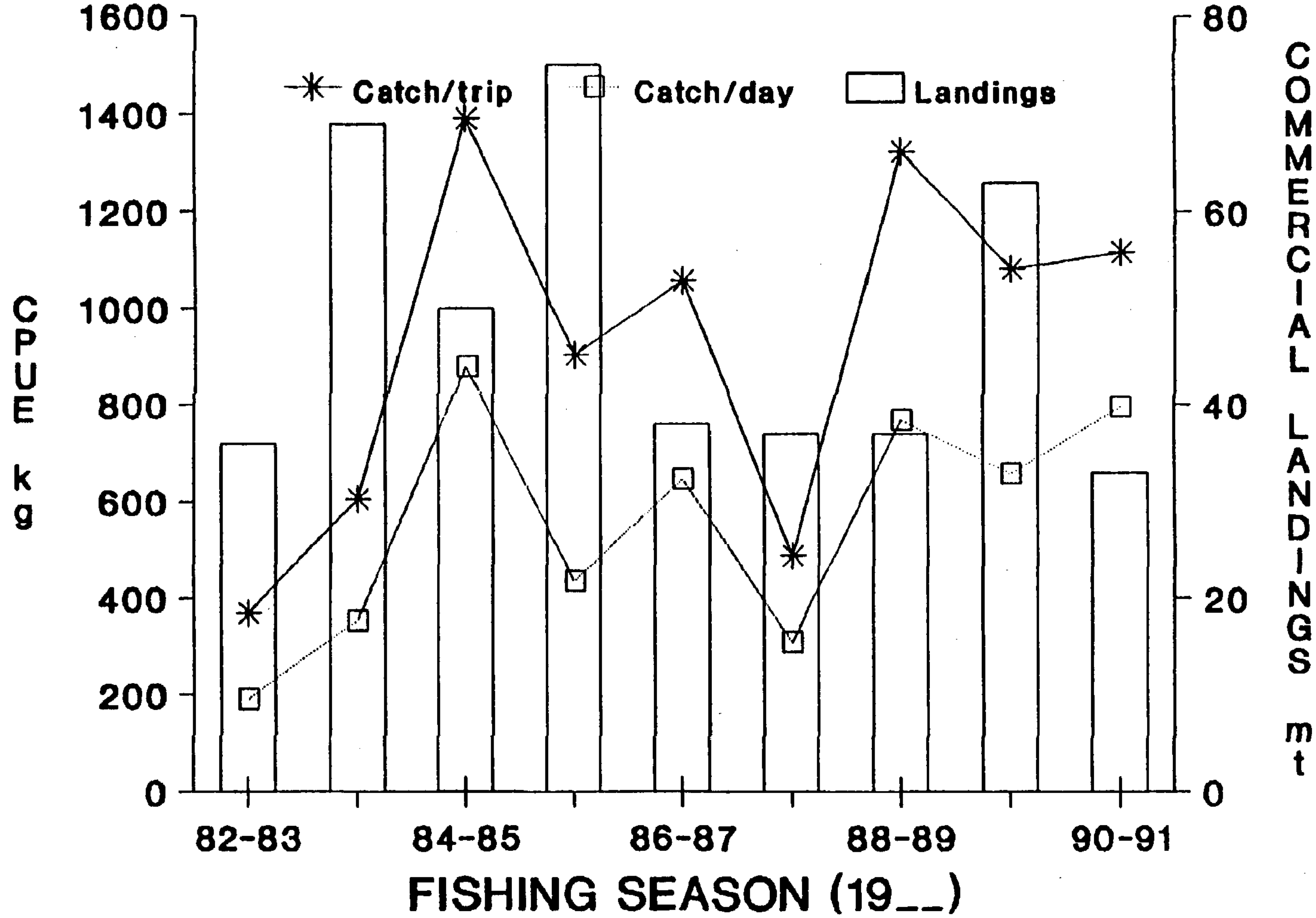

Figure 18. Commercial landings and mean CPUE of spot (Leiostomus xanthurus) from 1982-1991 winter trawl fishery.

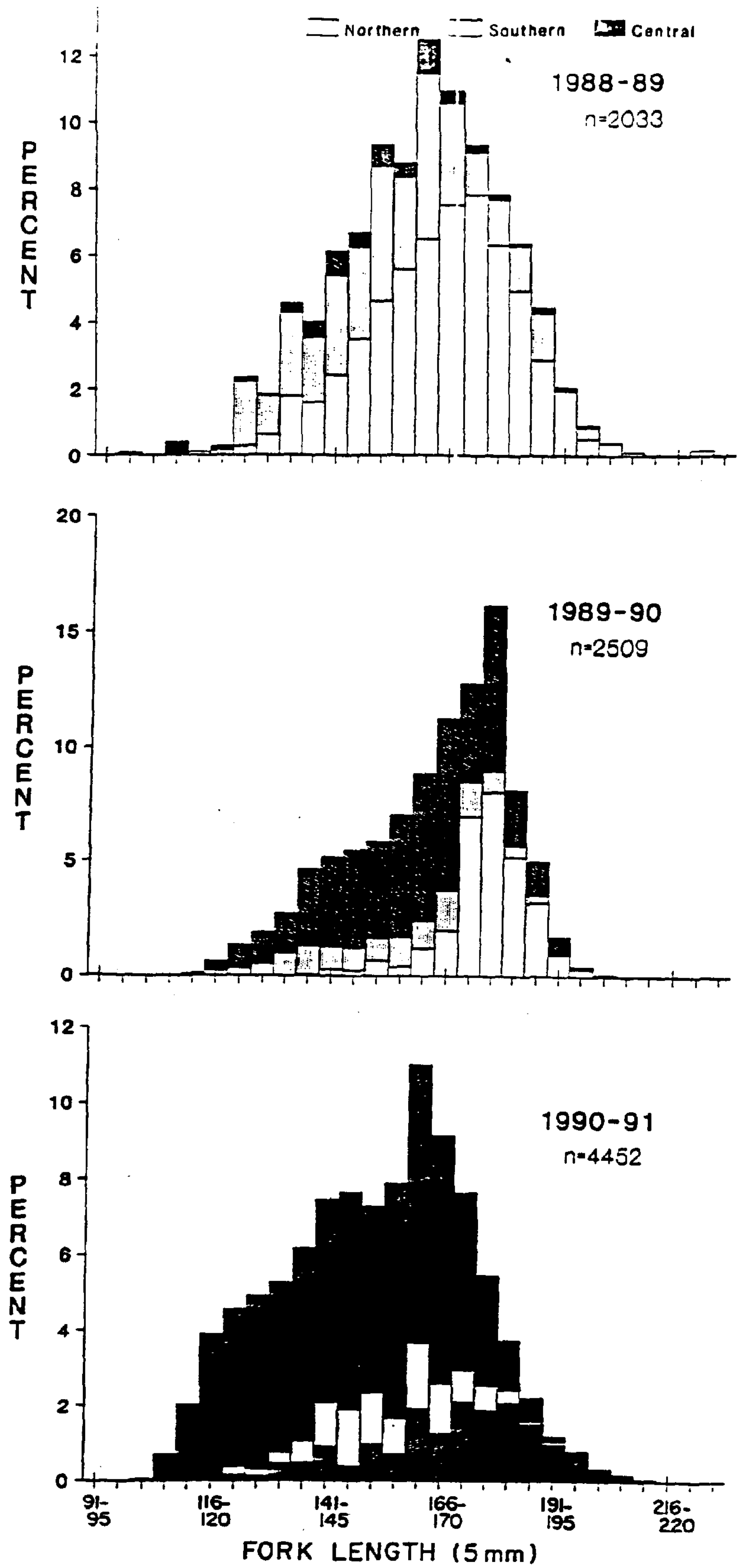

Figure 19. Length-frequency distribution (5 mm size classes) of spot (Leiostomus xanthurus) in 1988-1991 winter trawl catches.

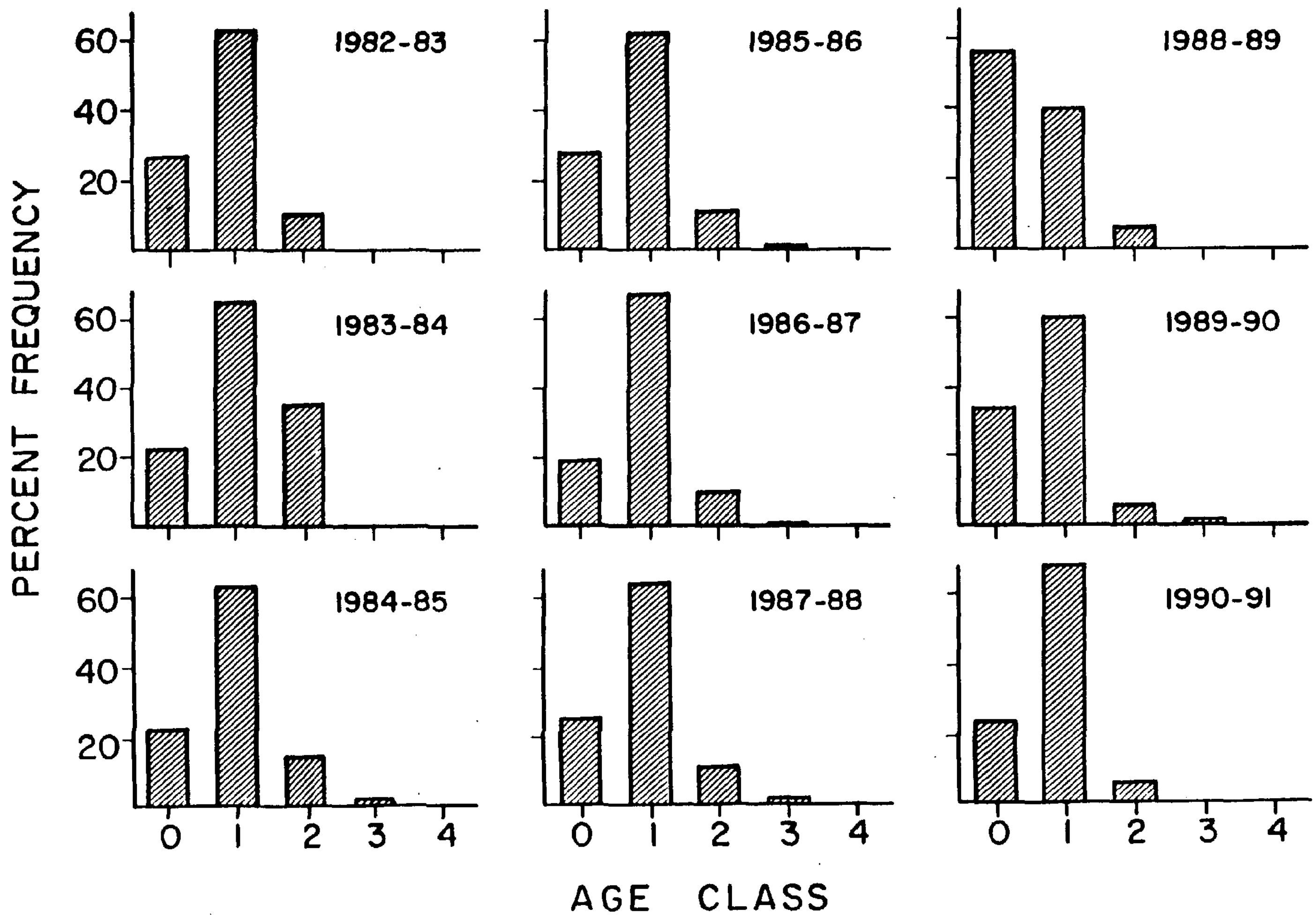

Figure 20. Age composition of spot (Leiostomus xanthurus) in winter trawl catches during 1982-91 fishing seasons.

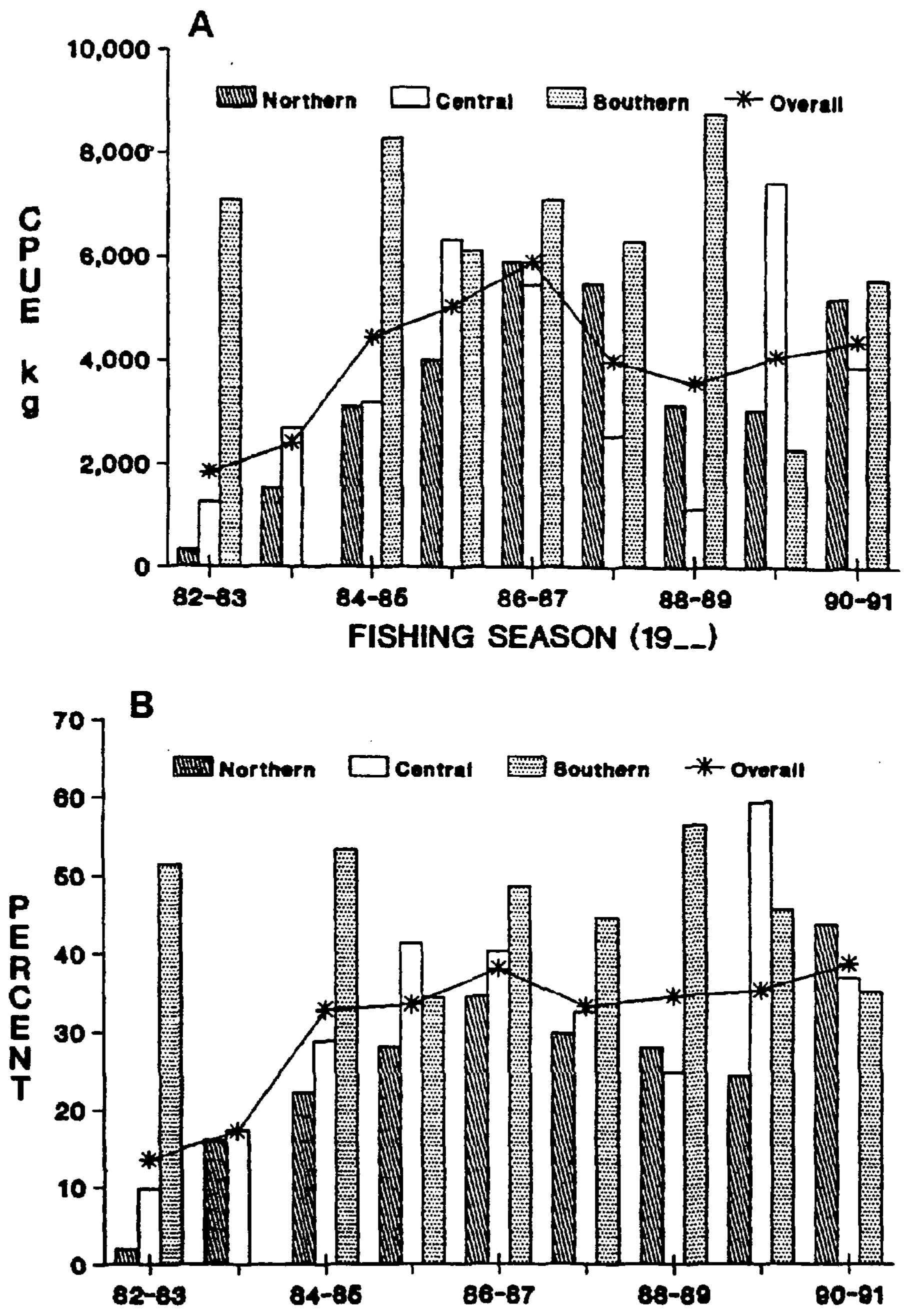

Figure 21. Catch per trip (A) and percent of the total weight (B) of scrap fish in all flynet catches sampled during the 1982-1991 fishing seasons.

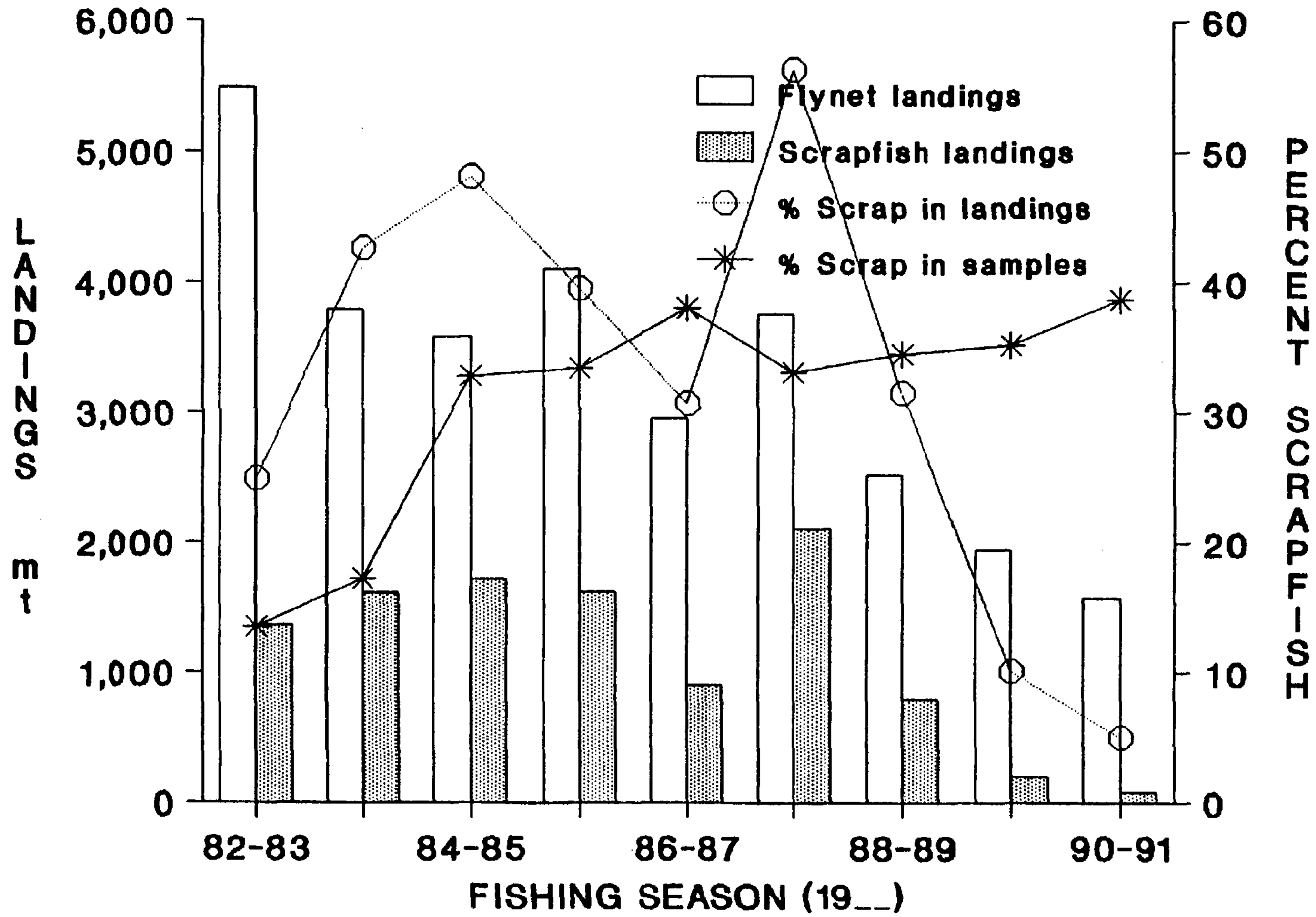

Figure 22. Weight and percent of scrapfish in flynet landings (=total landings of dominant species in flynet catches) compared with percent of scrapfish in flynet catches sampled during 1982-1991 fishing seasons.

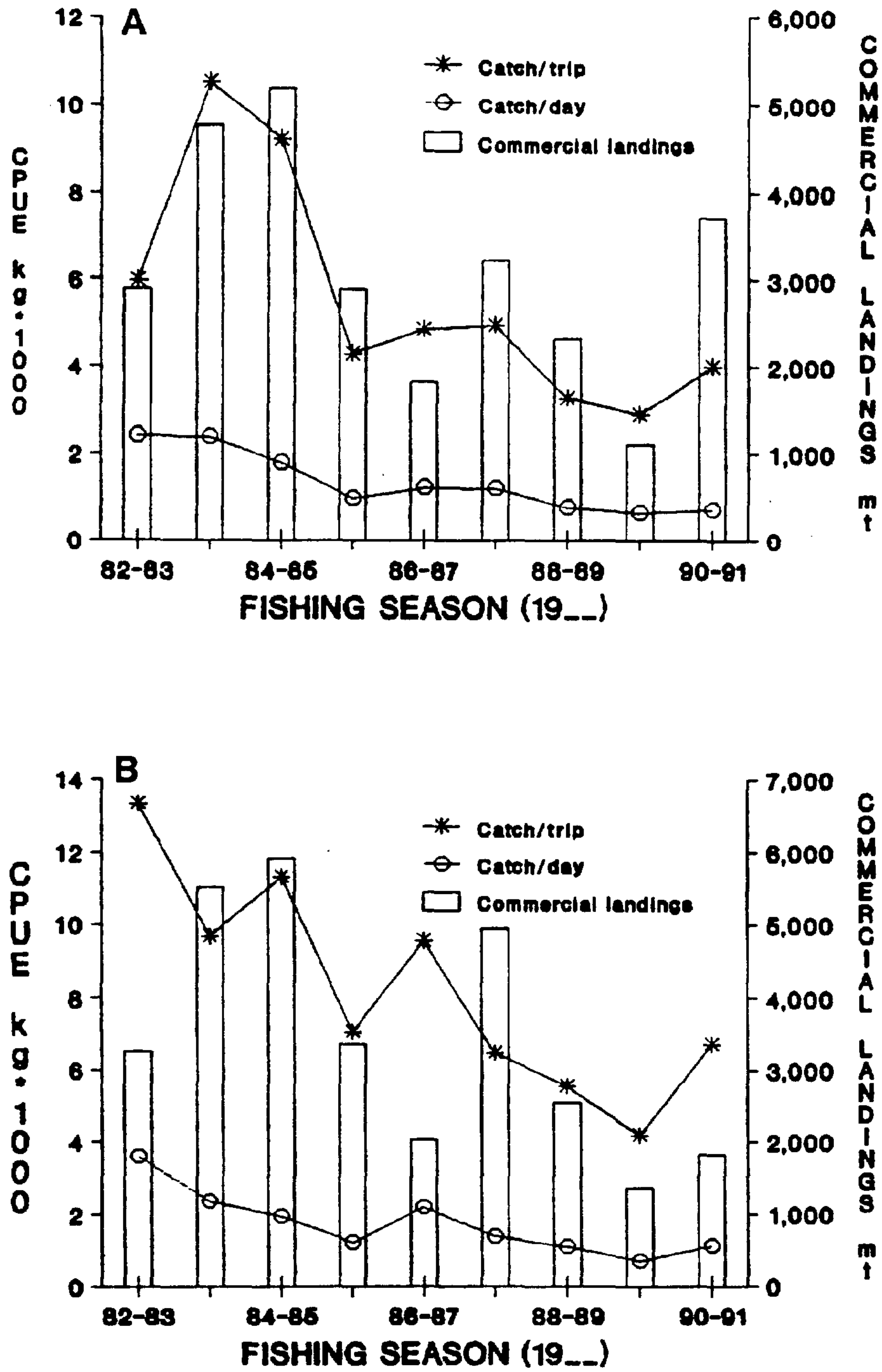

Figure 23. Aggregate resource trends for A) nearshore flounder and B) deepwater fishery for the 1982-1991 fishing seasons.

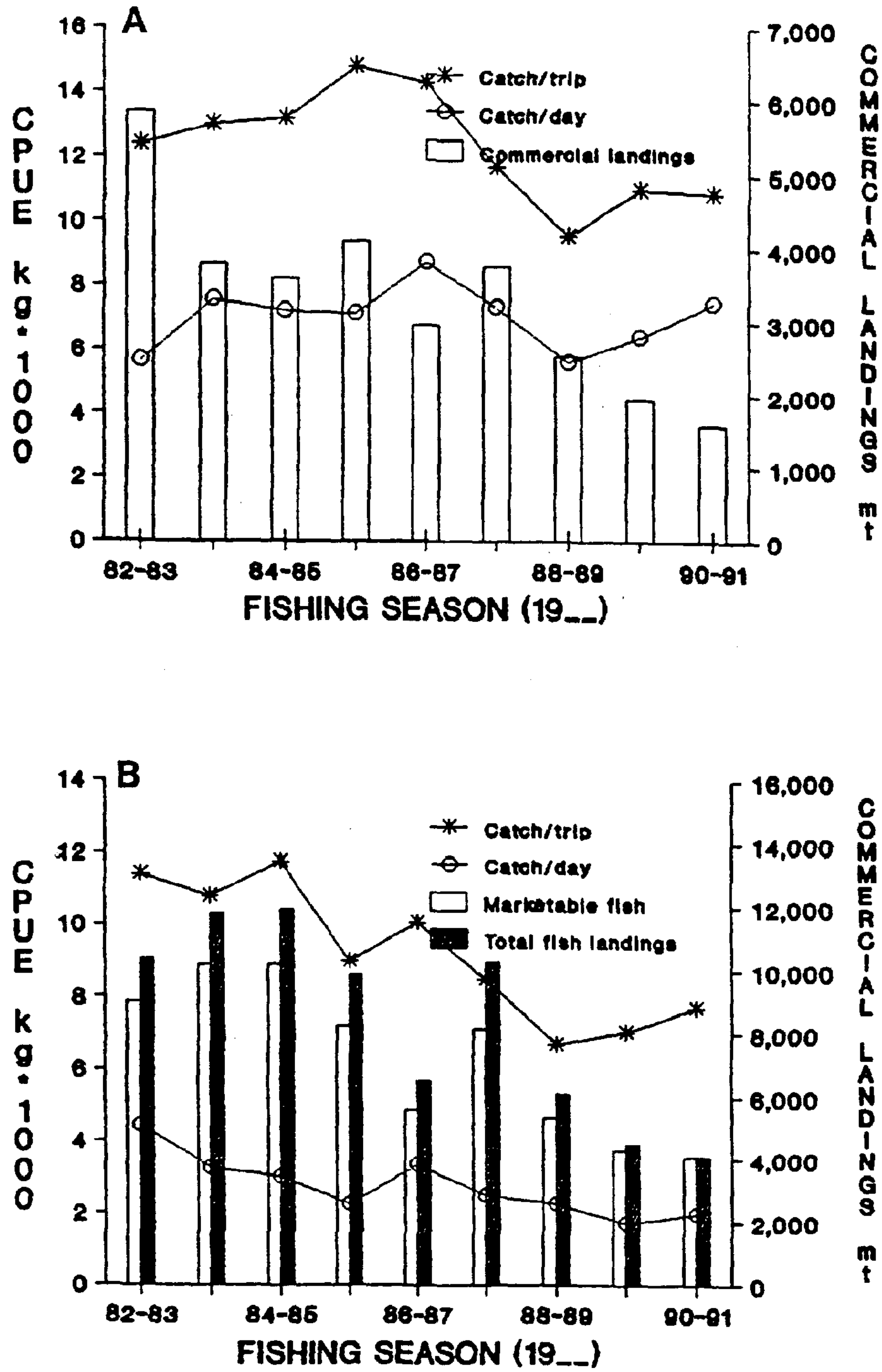

Figure 24. Aggregate resource trends for A) flynet and B) all trawl catches combined for the 1982-1991 fishing seasons.

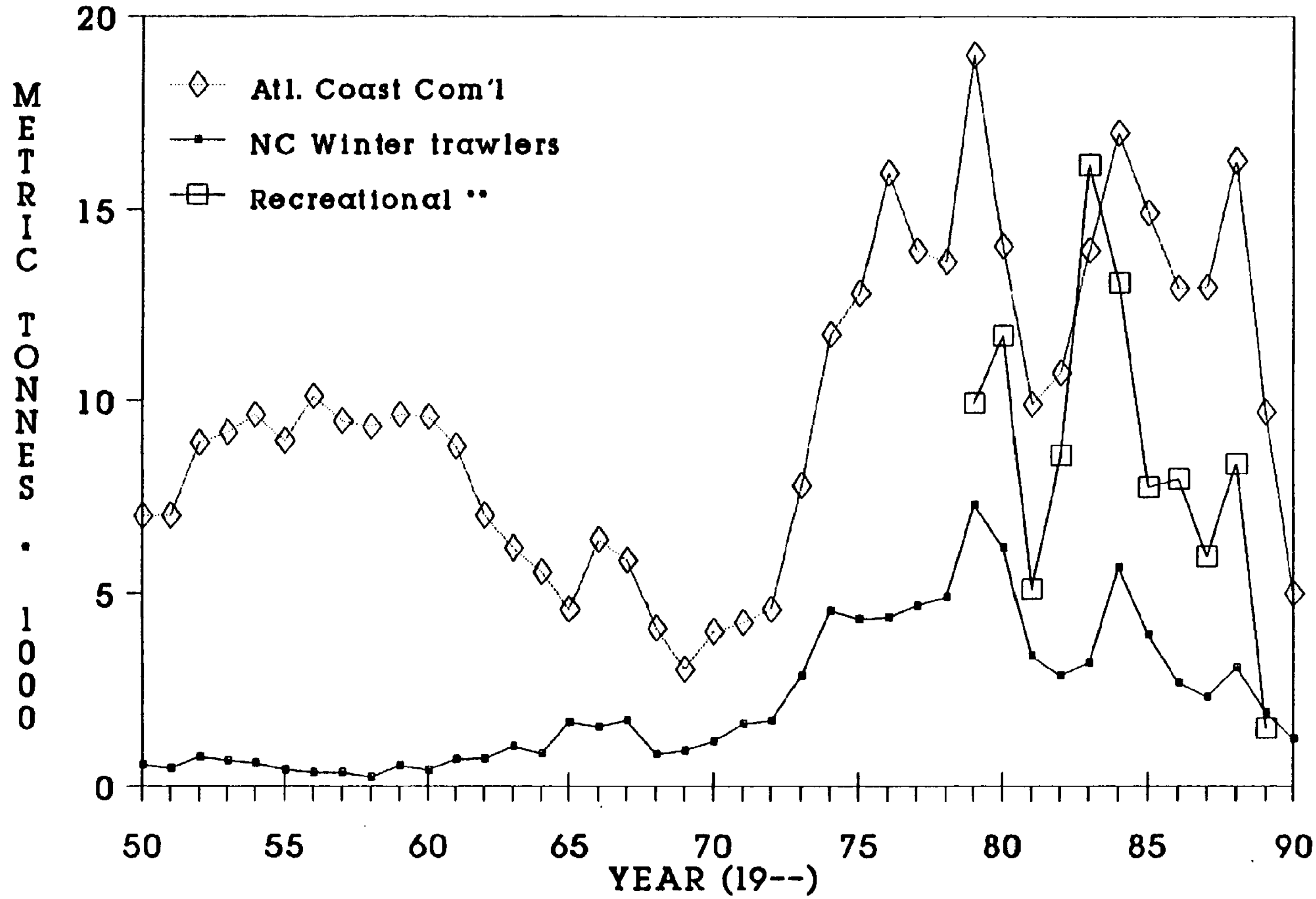

Figure 25. Annual commercial and recreational landings of summer flounder from Maine to North Carolina from 1950-1990.

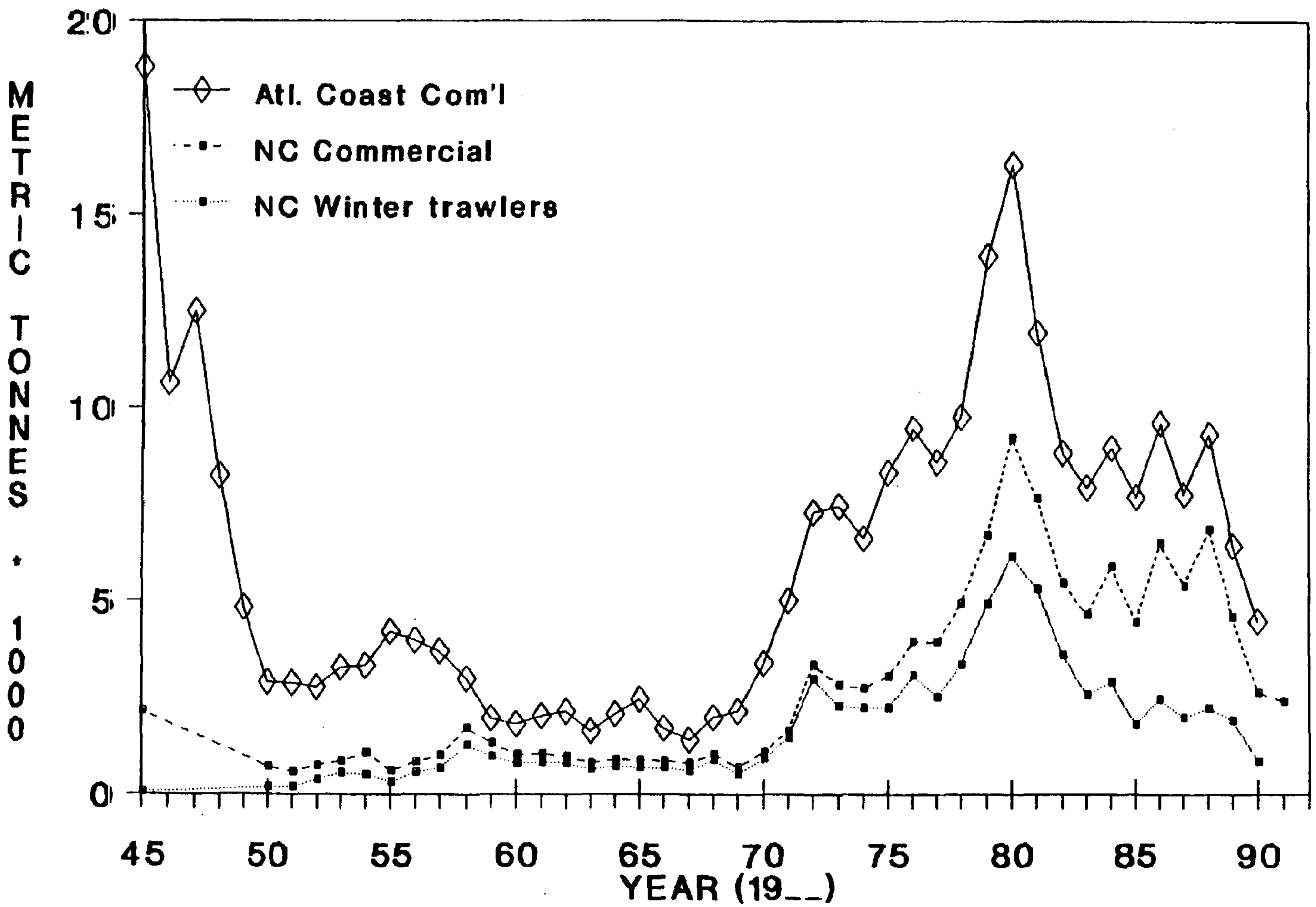

Figure 26. Annual commercial landings of weakfish from 1945-1991.

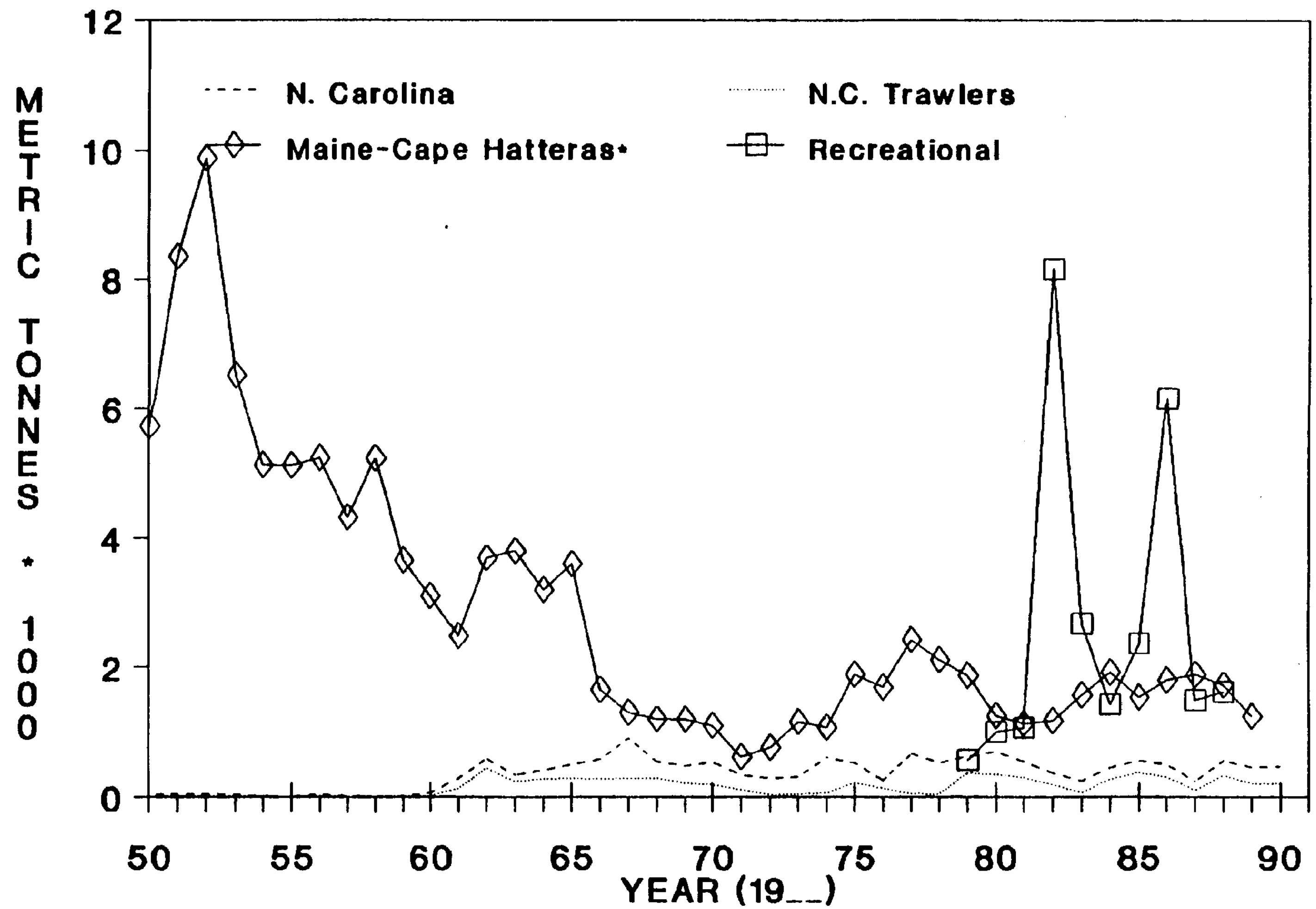

Figure 27. Annual commercial and recreational landings of black sea bass (*commercial landings from Maine-Cape Hatteras landings include North Carolina landings from northern counties only).

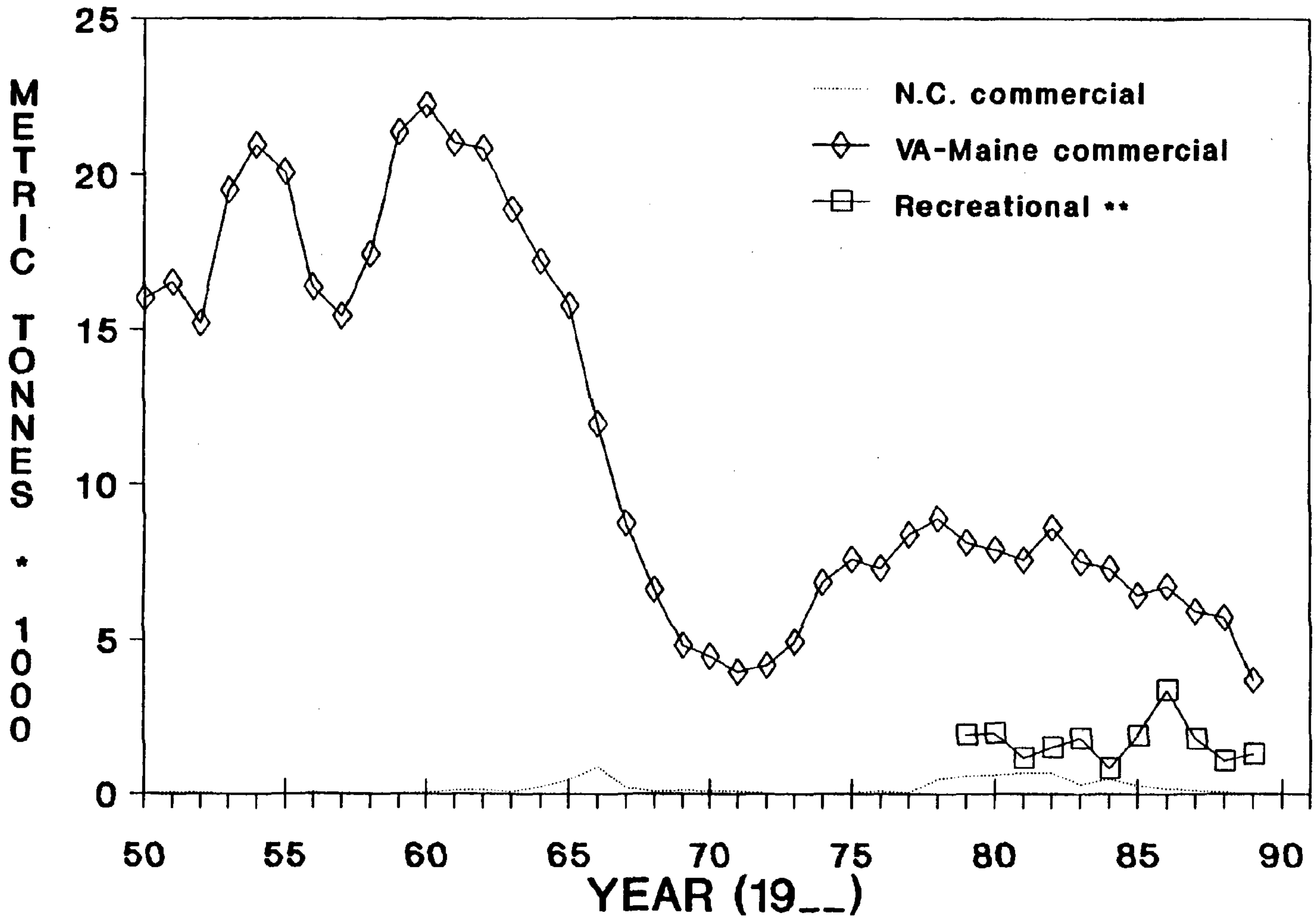

Figure 28. Annual commercial and recreational landings of scup from Maine to North Carolina from 1950-1990.

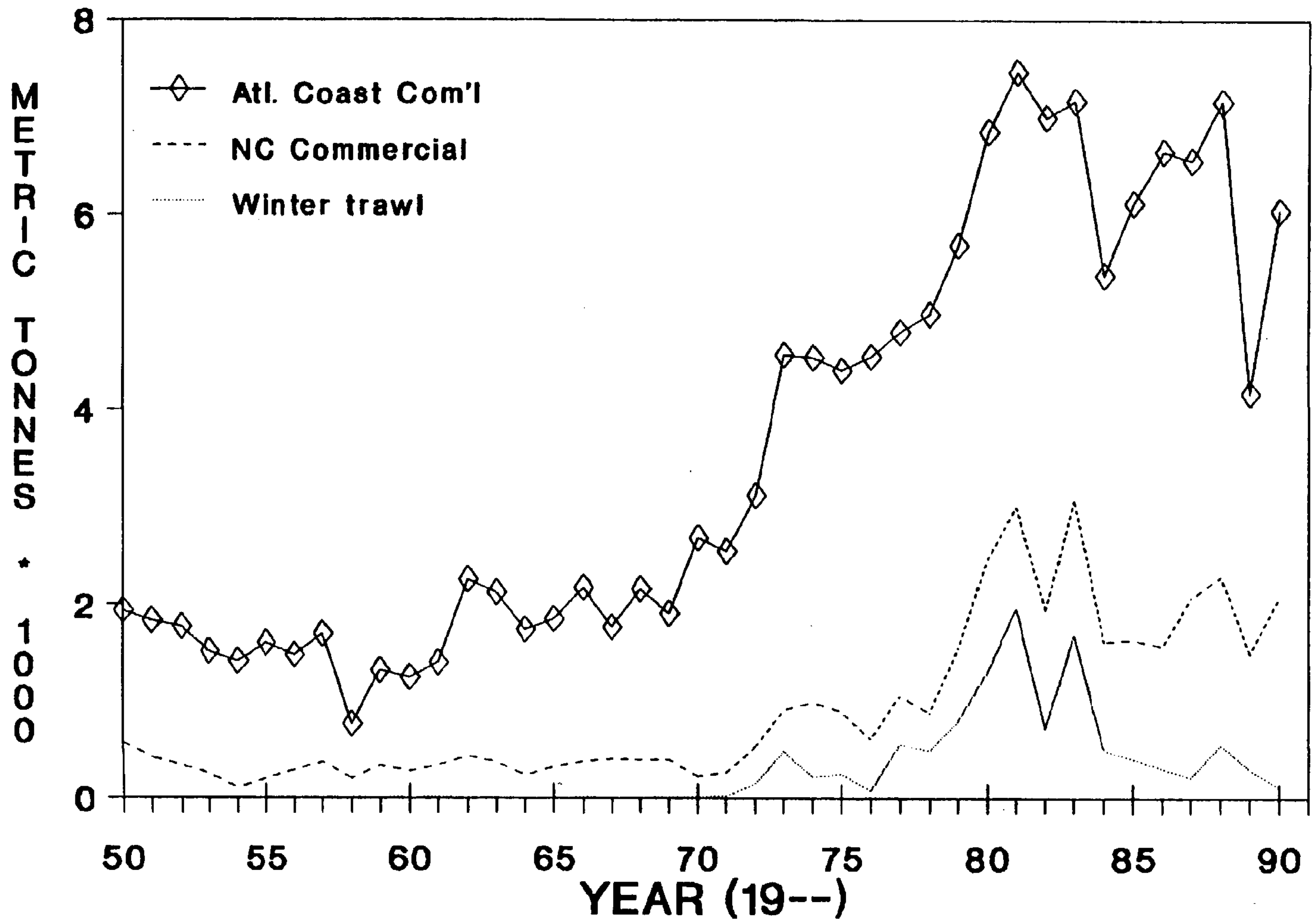

Figure 29. Annual commercial landings of bluefish from 1950-1990.

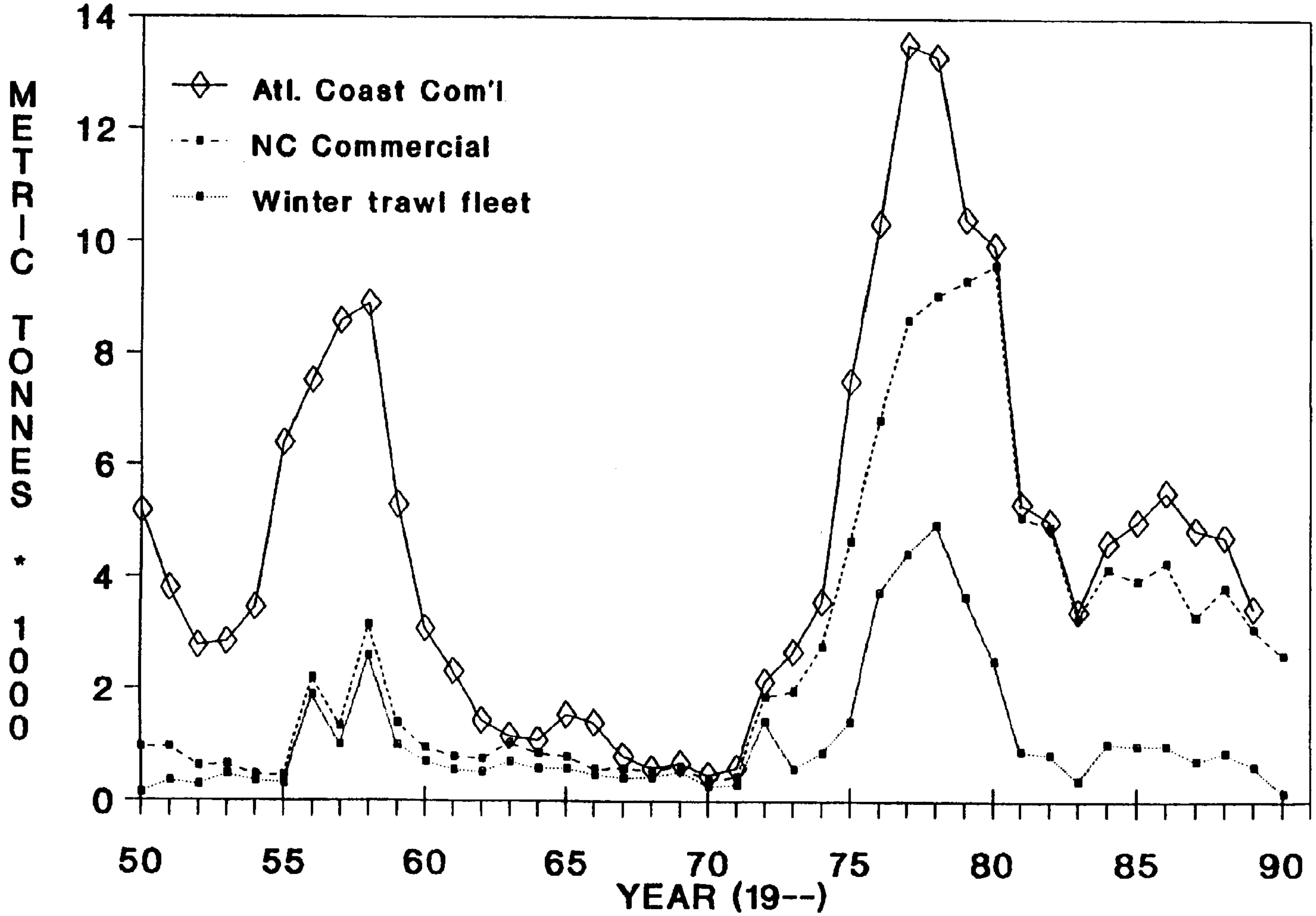

Figure 30. Annual commercial landings of Atlantic croaker from 1950-1990.

APPENDIX

APPENDIX A. Seasonal commercial landings of sciaenid pound net [1], long haul [2], ocean gill net (gill net)[3], and winter trawler[4] fisheries in North Carolina for 1982-1990 fishing seasons (season = May-April), including total landings/species (mt), total value of state landings (value in 1000s of dollars) and relative contribution of the three fisheries/species (percent).

Species	May 82-Apr 83 Land-ings	May 82-Apr 83 Value/percent	May 83-Apr 84 Land-ings	May 83-Apr 84 Value/percent	May 84-Apr 85 Land-ings	May 84-Apr 85 Value/percent	May 85-Apr 86 Land-ings	May 85-Apr 86 Value/percent	May 86-Apr 87 Land-ings	May 86-Apr 87 Value/percent	May 87-Apr 88 Land-ings	May 87-Apr 88 Value/percent	May 88-Apr 89 Land-ings	May 88-Apr 89 Value/percent	May 89-Apr 90 Land-ings	May 89-Apr 90 Value/percent	May 90-Apr 91 Land-ings	May 90-Apr 91 Value/percent
Atlantic croaker	4,475	$3,572	3,697	$3,099	4,707	$3,278	4,211	$3,204	3,757	$2,909	3,552	$3,133	3,164	$3,036	2,787	$3,201	2,550	$2,749
Pound net	863	19.3	292	7.9	443	9.4	567	13.5	234	6.2	579	16.3	451	14.2	244	8.8	218	8.5
Long haul	2,064	46.1	1,883	50.9	1,339	28.4	1,114	26.4	1,392	37.0	679	19.1	1,177	37.2	1,427	51.2	1,769	69.4
Trawler	547	12.2	478	12.9	1,359	28.9	1,069	25.4	721	19.2	761	21.4	653	20.7	436	15.7	154	6.1
Gill net	385	8.6	540	13.3	1,219	25.9	1,252	29.7	1,204	32.1	1,283	36.1	636	20.1	385	13.9	304	11.9
Weakfish	5,163	$4,695	5,486	$3,936	4,728	$3,874	6,626	$4,458	5,276	$4,152	6,561	$4,717	5,298	$5,041	2,854	$3,320	2,759	$2,803
Pound net	126	2.5	73	1.3	167	3.5	192	2.9	88	1.7	199	3.0	232	4.4	58	2.0	74	2.7
Long haul	737	14.3	704	12.8	762	16.1	508	7.7	586	11.1	412	6.3	608	11.5	240	8.4	481	17.4
Trawler	3,054	59.5	2,740	49.9	1,760	37.2	2,570	38.8	1,971	37.4	2,364	36.0	1,590	30.0	1,168	41.1	1,220	44.4
Gill net	846	16.4	1,555	28.4	1,565	33.1	2,654	40.1	2,277	43.2	3,253	49.6	2,440	46.1	1,202	42.2	842	30.5
Bluefish	3,470	$914	1,618	$565	1,344	$509	1,734	$513	1,712	$732	2,603	$755	1,417	$538	1,761	$678	2,150	$ 740
Pound net	89	2.6	31	1.9	38	2.9	51	3.0	30	1.8	41	1.6	35	2.5	14	0.8	14	0.7
Long haul	194	5.6	153	9.5	111	11.7	216	12.5	212	12.4	214	8.2	164	11.6	136	7.7	139	6.5
Trawler	1,776	51.2	465	28.7	359	26.7	353	20.3	185	10.8	564	21.7	234	16.5	206	11.7	124	5.6
Gill net	970	28.0	637	39.4	561	41.8	744	42.9	979	57.2	1,357	52.1	683	48.2	1,193	67.8	1,293	60.1
Spot	2,214	$1,063	1,388	$699	1,562	$809	1,843	$900	1,473	$742	1,296	$663	1,378	$666	1,464	$785	1,590	$ 805
Pound net	150	6.8	30	2.1	89	5.7	56	3.1	22	1.5	51	3.9	33	2.4	33	0.2	19	1.2
Long haul	1,556	70.3	885	62.3	938	60.1	1,126	61.1	865	58.8	529	40.8	896	65.0	903	61.7	1,104	69.4
Trawler	36	1.6	69	5.0	50	3.2	75	4.1	38	2.6	37	2.8	37	2.7	63	4.3	33	2.1
Gill net	37	1.7	65	4.7	131	8.4	150	8.2	213	14.5	268	20.7	142	10.3	232	15.9	113	7.1
Flounders	3,970	$5,486	6,027	$7,293	6,403	$10,132	4,231	$9,304	3,256	$7,993	4,571	$10,957	3,927	$9,649	2,637	$9,685	3,003	$9,554
Pound net	55	1.4	34	0.6	53	0.8	34	0.8	99	3.0	163	3.6	257	6.5	150	5.7	76	2.5
Long haul	28	0.7	36	0.6	27	0.4	29	0.7	43	1.3	12	0.3	38	1.0	32	1.2	19	0.6
Trawler	2,888	72.8	4,769	79.1	5,185	81.0	2,891	68.3	1,825	56.1	3,219	70.4	2,326	59.2	1,105	41.9	1,686	56.2
Gill net	0.2	<0.1	6	<0.1	9	0.2	6	0.1	6	0.2	4	0.1	2	0.1	6	0.3	<0.1	<0.1
Striped bass	110	$451	185	$356	211	$365	101	$170	135	297	54	$119	43	$96	77	$212	50	$ 156
Pound net	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	0	0
Long haul	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Trawler	2	1.5	6	3.3	-	-	-	-	-	-	-	-	-	-	10	<0.1	3	6.0
Gill net	22	20.3	0.3	0.2	-	-	-	-	-	-	-	-	-	-	34	0.1	0	0
Butterfish[5]	135	$76	53	$43	80	$64	63	$47	79	$72	62	$53	26	$28	104	$67	122	$ 97
Pound net	11	8.1	1	2.7	7	8.6	14	22.2	10	12.6	5	7.3	7	26.9	0.9	0.9	15	1.2
Long haul	4	2.7	4	8.4	2	2.9	0.2	0.3	13	16.3	0.6	1.0	1	5.4	0.5	5.3	21	17.2
Trawler	74	55.0	38	71.7	52	64.6	34	53.6	39	49.3	32	51.6	10	38.5	71	69.3	41	33.6
Gill net	38	28.4	6	10.6	13	15.7	9	14.4	11	14.1	11	18.2	3	11.5	16	15.5	12	9.8

APPENDIX A. (Continued).

Species	May 82-Apr 83 Land-ings	May 82-Apr 83 Value/percent	May 83-Apr 84 Land-ings	May 83-Apr 84 Value/percent	May 84-Apr 85 Land-ings	May 84-Apr 85 Value/percent	May 85-Apr 86 Land-ings	May 85-Apr 86 Value/percent	May 86-Apr 87 Land-ings	May 86-Apr 87 Value/percent	May 87-Apr 88 Land-ings	May 87-Apr 88 Value/percent	May 88-Apr 89 Land-ings	May 88-Apr 89 Value/percent	May 89-Apr 90 Land-ings	May 89-Apr 90 Value/percent	May 90-Apr 9 Land-ings	May 90-Apr 9 Value/percen
Harvestfish[5]	199	$123	101	$60	110	$97	186	$200	137	$167	115	$158	114	$164	100	$129	98	$135
Pound net	34	17.2	17	16.8	32	28.9	86	46.5	34	24.6	38	32.7	34	29.8	18	18.0	24	24.5
Long haul	41	20.6	20	19.4	21	19.5	16	8.8	33	23.9	33	28.5	16	14.3	6	6.2	9	9.2
Trawler	34	17.2	7	7.1	5	4.7	43	23.0	7	4.8	6	4.8	8	7.1	22	22.0	13	13.3
Gill net	42	21.1	6	6.0	5	4.7	18	9.5	11	8.3	13	11.0	5	4.4	13	13.3	16	16.3
Spanish mackerel	86	$61	19	$15	58	$42	79	$67	105	$81	229	$145	199	$141	268	$215	380	$318
Pound net	3	3.6	3	14.2	6	10.9	10	12.4	16	15.2	81	35.6	75	37.7	71	26.5	22	5.8
Long haul	0.9	1.1	1	7.9	3	4.5	5	6.3	13	12.4	15	6.4	18	8.9	33	12.3	12	3.2
Trawler	0.4	0.4	-	-	-	-	0.3	0.4	0.3	0.3	0.1	<0.1	0.2	0.1	3	1.1	0.7	0.2
Gill net	30	34.7	4	20.3	14	24.4	27	34.1	41	38.9	50	21.9	43	21.6	114	42.5	143	37.6
Florida pompano	14	$33	2	$4	4	$11	11	$32	17	$41	9	$24	3	$9	9	$28	14	$24
Pound net	3	23.5	0.1	3.1	0.4	8.9	1	9.0	3	16.3	2	24.4	0.4	13.3	5	55.6	0.5	3.6
Long haul	6	38.9	0.4	18.7	2	56.6	5	48.4	4	24.3	2	19.7	0.7	18.9	2	18.6	1	7.2
Trawler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.002	<0.1	-	
Gill net	0.7	4.7	-	-	0.6	13.7	0.1	1.4	2	11.2	0.5	5.5	0.3	10.0			<0.1	<0.1
Spotted seatrout	42	$72	72	$120	68	$123	65	$171	85	$157	156	$277	167	$326	161	$345	110	$219
Pound net	5	11.6	5	6.8	4	6.0	0.2	0.4	0.3	0.3	2	1.5	0.2	0.1	-	-	0.3	0.3
Long haul	15	35.6	19	25.6	15	22.3	9	14.9	10	11.8	36	23.2	35	21.1	31	19.0	21	19.1
Trawler	0.4	1.0	0.3	0.4	0.4	0.6	2	2.8	6	6.7	2	1.4	0.7	0.4	8	4.8	<0.1	<0.1
Gill net	2	5.4	4	5.8	4	6.1	16	24.4	10	11.5	17	11.0	22	13.2	10	6.3	10	9.1
Red drum	22	$11	146	$81	91	$60	77	$113	104	$109	115	$149	99	$124	118	$164	82	$105
Pound net	0.3	1.5	2	1.1	0.8	0.9	0.4	0.5	0.5	0.5	19	16.4	4	4.0	5	4.2	1	1.2
Long haul	5	20.4	9	6.5	7	7.7	2	2.8	32	30.9	16	13.8	11	11.1	25	21.6	8	9.8
Trawler	6	27.7	13	9.0	6	7.1	2	2.1	2	1.5	1	1.3	2	1.9	1	1.1	0.2	0.3
Gill net	5	24.0	37	25.1	21	22.8	19	24.4	9	8.4	11	9.6	9	9.1	12	10.4	5	6.1
Black sea bass	213	$343	446	$619	544	$976	503	$1,002	267	$519	495	$979	452	$1,118	509	$1,384	285	$1,042
Trawler	71	33.5	266	59.7	363	71.4	296	58.9	95	35.7	315	63.6	206	45.7	205	40.3	60	21.1
Scup or porgies	658	$840	835	$997	505	$759	188	$212	111	$186	61	$65	15	$11	47	82	71	$60
Trawler	304	46.2	477	57.2	267	52.9	171	90.8	111	99.7	58	94.3	15	100.0	47	99.6	71	100.0
Bait	4,302	$354	4,430	$376	4,695	$381	3,437	$230	2,836	$201	4,084	$300	2,596	$168	2,167	$159	2,566	$177
Pound net	349	8.1	201	4.5	421	9.0	549	16.0	123	4.3	329	8.1	271	10.4	306	14.1	341	13.3
Long haul	1,879	43.7	1,901	42.9	1,884	40.1	1,148	33.4	1,386	48.9	1,474	36.1	1,078	41.5	1,112	51.8	1,635	63.7
Trawler	1,364	31.7	1,613	36.4	1,728	36.7	1,620	47.1	905	31.9	2,109	51.1	794	30.6	195	9.0	78	3.0
Gill net	62	1.5	44	1.0	100	2.1	13	0.4	23	0.8	7	0.2	127	4.9	6	0.3	1	

APPENDIX A. (Continued).

Species	May 82-Apr 83		May 83-Apr 84		May 84-Apr 85		May 85-Apr 86		May 86-Apr 87		May 87-Apr 88		May 88-Apr 89		May 89-Apr 90		May 90-Apr 91	
	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent	Land-ings	Value/percent
Total finfish																		
(w/out menhaden)	31,767	$23,406	32,776	$23,639	37,030	$28,220	32,319	$27,182	25,462	$25,399	31,772	$30,301	25,225	$29,622	20,905	$41,836	24,812	$28,731
Pound net	1,699	5.4	706	2.2	1,285	3.5	1,553	4.8	684	2.7	1,558	4.9	1,432	5.7	935	4.5	827	3.3
Long haul	6,579	20.7	5,649	17.2	5,175	14.0	4,250	13.2	4,714	18.5	3,353	10.6	4,308	17.1	4,112	19.7	5,299	21.4
Trawler	10,367	32.6	11,779	35.9	11,899	32.1	9,850	30.5	6,493	25.5	10,256	32.3	6,099	24.2	4,481	21.5	4,081	16.4
Gill net	2,671	8.4	3,071	9.4	3,825	10.3	5,157	16.0	5,067	19.9	6,698	21.1	4,430	17.6	3,555	17.0	3,548	14.3
Total marketable																		
(w/out menhaden)	27,465	$23,092	28,346	$18,994	32,336	$23,263	28,882	$26,952	22,626	$25,197	27,688	$29,884	22,629	$29,454	18,738	$41,677	22,246	$28,554
Pound net	1,350	4.9	505	1.8	864	2.7	1,003	3.5	561	2.5	1,229	4.4	1,161	5.1	630	3.3	468	2.1
Long haul	4,700	17.1	3,748	13.2	3,291	10.2	3,102	10.7	3,328	14.7	2,074	7.5	3,230	14.3	2,991	16.0	3,665	16.5
Trawler	9,003	32.8	10,166	35.9	10,177	31.5	8,230	28.5	5,588	24.7	8,147	29.4	5,304	23.4	4,285	22.9	4,056	18.0
Gill net	2,613	9.5	3,028	10.7	3,725	11.5	5,144	17.8	5,043	22.3	6,691	24.2	4,303	19.0	3,549	18.9	3,547	15.9

1 Pound net landings include Dare County.
2 Long haul landings: Long haul landings include April through December from Dare, Hyde, Carteret, Craven, Pamlico and Beaufort counties.
3 Winter trawl landings include: Dare, Hyde, Pamlico, Beaufort, Craven, Carteret, Brunswick and Onslow counties.
4 Ocean gill net landings include all state landings September through April.
5 North Carolina commercial landings combined harvestfish and butterfish landings in 1985 are harvestfish; for the purpose of this presentation, we extrapolated out butterfish landings based on monthly relative proportions of the two species in our samples.

APPENDIX B. Predominant marketed fish captured in the 1988-1991 winter trawl fishery including total landings (Total, kg), percent of total state landings/species (Percent), and value in dollars (Value). This data was partitioned by areas where fish were landed: North includes Dare (Wanchese), Hyde (Englehard), Beaufort (Belhaven), and Pamlico (Bayboro) counties; South includes Craven, Carteret (Beaufort-Morehead), Brunswick and Onslow counties.

Species		1988-89			1989-90			1990-91		
		Total	Percent	Value	Total	Percent	Value	Total	Percent	Value
Atlantic croaker	North	303,101	9.58	$ 221,891	276,556	10.0	$ 271,506	37,674	1,48	$ 35,633
	South	350,298	11.08	287,041	159,746	5.8	144,008	116,528	4.57	93,641
	Total	653,400	20.66	$ 508,932	436,302	15.7	$ 415,514	154,202	6.05	$ 129,274
Spot	North	1,506	0.11	$ 679	9,940	0.7	$ 4,428	6,883	0.44	$ 3,047
	South	35,800	2.60	14,852	52,595	3.6	27,825	26,139	1.65	13,822
	Total	37,306	2.71	$ 15,531	62,535	4.3	$ 32,253	33,022	2.08	$ 16,869
Weakfish	North	495,306	9.35	$ 410,083	517,398	18.2	$ 623,907	252,354	9.15	$ 291,859
	South	1,094,260	20.66	868,015	650,978	22.9	527,228	967,917	35.09	584,423
	Total	1,589,566	30.01	$1,278,098	1,168,376	41.1	$1,151,135	1,220,271	44.24	$ 873,282
Bluefish	North	163,330	11.53	$ 54,577	159,410	9.1	$ 52,576	79,233	3.69	$ 29,890
	South	70,344	4.97	23,713	46,606	2.7	12,352	45,079	2.10	14,257
	Total	233,674	16.50	$ 78,290	206,016	11.7	$ 64,928	124,312	5.79	$ 44,147
Flounders	North	1,879,958	47.87	$4,630,802	864,361	32.8	$3,135,492	1,333,670	44.42	$4,002,724
	South	446,266	11.37	1,131,962	240,871	9.2	962,224	352,386	11.74	1,020,885
	Total	2,326,224	59.23	$5,762,764	1,105,235	41.9	$4,097,736	1,686,055	56.15	$5,023,609
King whiting	North	10,351	4.45	$ 7,741	8,486	2.8	$ 7,388	28,427	7.20	$ 24,477
	South	48,534	20.85	47,842	52,457	17.3	70,265	33,032	8.37	38,139
	Total	58,885	25.30	$ 55,583	60,942	20.1	$ 77,653	61,459	15.56	$ 62;616
Black sea bass	North	191,847	42.45	$ 439,855	186,557	36.7	$ 418,409	47,846	16.79	$ 122,519
	South	14,535	3.22	28,472	18,568	3.7	43,382	12,351	4.34	31,178
	Total	206,383	45.67	$ 468,327	205,125	40.3	$ 461,791	60,197	21.12	$ 153,197
Scup	North	14,301	95.18	$ 19,500	46,180	97.7	$ 81,559	69,295	97.67	$ 58,583
	South	725	4.82	788	902	1.9	805	1,658	2.34	739
	Total	15,026	100.0	$ 20,288	47,082	99.6	$ 82,364	70,953	100.00	$ 59,921
Squid	North	277,577	71.87	$ 128,766	208,100	54.8	$ 89,396	91,277	81.29	$ 45,057
	South	44,991	11.65	22,716	84,122	22.2	37,903	15,446	13.76	9,764
	Total	322,568	83.52	$ 151,482	292,222	77.0	$ 127,299	106,722	95.05	$ 54,821
Butterfish	North	8,671	33.56	$ 10,403	58,766	57.3	$ 38,995	19,371	15.87	17,212
	South	1,268	4.91	1,389	12,247	12.0	5,209	22,089	18.10	12,395
	Total	9,938	38.46	$ 11,792	71,013	69.3	$ 44,204	41,459	33.97	$ 29,607
Harvestfish	North	620	0.55	$ 751	-	-	$ -	282	0.29	$ 579
	South	7,532	6.64	8,712	21,939	22.0	20,027	13,022	13.33	6,008
	Total	8,152	7.18	$ 9,463	21,939	22.0	$ 20,027	13,305	13.61	$ 6,587

APPENDIX B. Continued).

Species		1988-89 Total	1988-89 Percent	1988-89 Value	1989-90 Total	1989-90 Percent	1989-90 Value	1990-91 Total	1990-91 Percent	1990-91 Value
Atlantic mackerel	North	1,750	100.0	$ 536	394,724	99.8	$ 85,891	65,087	100.00	$ 15,078
	South	0	0	-		-		0	-	0
	Total	1,750	100.0	$ 536	394,724	99.8	$ 85,891	65,087	100.00	$ 15,078
Scrap/bait	North	28,367	1.10	$ 1,251	43,139	2.0	$ 2,368	28,899	1.13	$ 4,084
	South	765,787	29.51	47,155	151,925	7.1	10,052	49,451	1.93	5,452
	Total	794,154	30.60	$ 48,406	195,064	9.0	$ 12,420	78,350	3.06	$ 9,536
Total	North	3,477,262	13.79	$6,061,791	2,921,890	14.0	$5,038,850	2,248,715	9.28	$4,835,996
	South	2,621,407	10.40	2,498,455	1,558,588	7.5	1,925,109	1,832,598	7.56	1,869,313
	Total	6,098,669	24.18	$8,559,246	4,480,478	21.5	$6,963,959	4,081,313	16.84	$6,705,309
Total marketable	North	3,448,895	15.24	$6,060,540	2,878,751	14.5	$5,036,482	2,219,816	9.98	$4,831,912
	South	1,855,620	8.20	2,451,300	1,406,663	7.1	1,915,057	1,783,147	8.02	1,863,861
	Total	5,304,515	23.45	$8,511,840	4,285,414	21.6	$6,951,539	4,002,963	18.00	$6,695,773

APPENDIX C. Overall species composition and mean catch/trip of 29 nearshore flounder trawl catches sampled from October 1988 through April 1989.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Paralichthys dentatus	3,133.7	91.7	3,731	94.5	0.840	100.0
Loligo pealii	74.4	2.2	-	-	-	41.4
Centropristis striata	39.0	1.1	93	2.4	0.417	72.4
Pomatomus saltatrix	25.1	0.7	4	0.1	5.867	62.1
Pogonias cromis	21.9	0.6	-	-	-	3.4
Cynoscion regalis	17.8	0.5	21	0.5	0.863	37.9
Mustelus canis	14.4	0.4	-	-	-	3.4
Micropogonias undulatus	14.0	0.4	71	1.8	0.197	17.2
Lophius americanus	14.0	0.4	6	0.2		41.4
Carcharhinus sp.	11.9	0.4	<1	<0.1	345.6	6.9
Busycon sp.	10.2	0.3	-	-	-	13.8
Paralichthys lethostigma	1.1	<0.1	1	<0.1	0.867	10.3
Sphoeroides maculatus	1.1	<0.1	-	-	-	10.3
Peprilus triacanthus	0.9	<0.1	6	0.2	0.145	6.9
Sciaenops ocellatus	0.8	<0.1	<1	<0.1	11.350	3.4
Tautoga onitis	0.8	<0.1	<1	<0.1	-	6.9
Conger oceanicus	0.7	<0.1	-	-	-	3.4
Acipenser oxyrhynchus	0.7	<0.1	<1	<0.1	19.500	3.4
Menticirrhus sp.	0.7	<0.1	2	0.1	0.292	17.2
Placopecten magellanicus	0.5	<0.1	-	-	-	3.4
Cephalopoda	0.5	<0.1	-	-	-	6.9
Leiostomus xanthurus	0.4	<0.1	9	0.2	0.046	10.3
Octopus vulgaris	0.4	<0.1	-	-	-	10.3
Scyliorhinus retifer	0.3	<0.1	<1	<0.1	9.100	3.4
Cynoscion spp.	0.1	<0.1	-	-	-	3.4
Caulolatilus microps	0.1	<0.1	<1	<0.1	0.967	3.4
Archosargus probatocephalus	0.1	<0.1	<1	<0.1	2.620	3.4
Cynoscion nebulosus	<0.1	<0.1	<1	<0.1	0.700	6.9
Chaetodipterus faber	<0.1	<0.1	-	-	-	3.4

Observed species

Callinectes sapidus	*Prionotus* spp.	*Raja eglanteria*
Ovalipes ocellatus	*Prionotus carolinus*	*Dasyatis sabina*
Ovalipes stephensoni	*Prionotus evolans*	*Dasyatis sayi*
Portunus gibbessi	*Stenotomus chrysops*	*Rhinoptera bonasus*
Asteroidea	*Menticirrhus americanus*	*Raja* spp.
Astropecten articulatus	*Etropus crossotus*	*Paralichthys oblongus*
Urophycis regia	*Persephona* sp.	*Scophthalmus aquosus*
Merluccius bilinearis	*Libinia emarginata*	*Squalus acanthias*

APPENDIX D. Overall species composition and mean catch/trip of 26 nearshore flounder trawl catches sampled from October 1989 through April 1990.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Paralichthys dentatus	2,284.6	68.5	2,956	59.0	0.773	100.0
Sphoeroides maculatus	265.0	8.0	100	2.0	2.657	46.2
Loligo pealii	235.5	7.1				80.8
Cynoscion regalis	148.7	4.5	263	5.3	0.565	92.3
Micropogonias undulatus	81.4	2.4	582	11.6	0.140	30.8
Pomatomus saltatrix	55.8	1.7	34	0.7	1.655	61.5
Archosargus probatocephalus	50.9	1.5	8	0.2	6.153	38.5
Leiostomus xanthurus	34.1	1.0	542	10.8	0.063	15.4
Busycon spp.	28.1	0.8				19.2
Menticirrhus sp.	24.4	0.7	6	0.1	3.913	38.5
Centropristis striata	24.1	0.7	48	1.0	0.504	65.4
Peprilus triacanthus	20.3	0.6	270	5.4	0.075	65.4
Lophius americanus	14.6	0.4				15.4
Menticirrhus saxatilis	13.8	0.4	71	1.4	0.196	26.9
Menticirrhus americanus	8.0	0.2	41	0.8	0.197	26.9
Mustelus canis	7.8	0.2	3	0.1	2.916	3.8
Acipenser oxyrhynchus	6.3	0.2	<1	<0.1	27.347	15.4
Sicyonia brevirostris	5.2	0.2				3.8
Seriola dumerili	3.7	0.1	<1	<0.1	23.815	3.8
Busycon canaliculatum	3.5	0.1				3.8
Paralichthys albigutta	2.7	0.1	5	0.1	0.594	3.8
Sciaenops ocellatus	2.2	0.1	<1	0.1	7.140	19.2
Rachycentron canadum	2.0	0.1	<1	<0.1	17.533	3.8
Cynoscion nebulosus	1.8	0.1	1	<0.1	2.355	26.9
Pogonias cromis	1.3	<0.1	<1	<0.1	33.110	3.8
Carcharhinus limbatus	1.3	<0.1				3.8
Busycon carica	1.2	<0.1				3.8
Orthopristis chrysoptera	1.2	<0.1	17	0.3	0.070	7.7
Paralichthys lethostigma	0.9	<0.1	1	<0.1	0.831	7.7
Urophycis regia	0.7	<0.1	12	0.3	0.057	15.4
Lagodon rhomboides	0.6	<0.1	17	0.3	0.035	3.8
Stenotomus spp.	0.4	<0.1				3.8
Urophycis spp.	0.4	<0.1				7.7
Prionotus evolans	0.4	<0.1	4	0.1	0.090	11.5
Octopus	0.3	<0.1				3.8
Carcharhinus sp.	0.2	<0.1	<1	<0.1	4.540	3.8
Conger oceanicus	0.2	<0.1	<1	<0.1	4.100	3.8
Stenotomus chrysops	0.1	<0.1	1	<0.1	0.200	11.5
Prionotus scitulus	0.1	<0.1	8	0.2	0.015	7.7
Decapterus punctatus	0.1	<0.1	4	0.1	0.030	3.8
Citharichthys spp.	0.1	<0.1	8	0.2	0.015	3.8
Tautoga onitis	0.1	<0.1	<1	<0.1	1.350	11.5
Anchoa mitchilli	0.1	<0.1	8	0.2	0.010	3.8

Observed species

Argopecten gibbus	Brevoortia tyrannus	Citharichthys spilopterus
Penaeus duorarum	Etrumeus teres	Paralichthys oblongus
Calappa flammea	Merluccius bilinearis	Scophthalmus aquosus
Hepatus epheliticus	Ophidion spp.	Ancylopsetta quadrocellata
Callinectes sapidus	Scophthalmus aquosus	Glyptocephalus cynoglossus
Ovalipes spp.	Priacanthus arenatus	Symphurus plagiusa
Ovalipes ocellatus	Stenotomus caprinus	Balistes capriscus
Ovalipes stephensoni	Euthynnus alletteratus	Lactophrys quadricornis

APPENDIX E. Overall species composition and mean catch/trip of 48 nearshore flounder trawl catches sampled from October 1990 through April 1991.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Paralichthys dentatus	3,679.1	85.2	5,399	93.0	0.681	100.0
Busycon spp.	171.2	4.0	-	-	-	43.8
Loligo pealii	109.1	2.5	-	-	-	68.8
Lophius americanus	64.6	1.5	-	-	-	25.0
Sphoeroides maculatus	58.2	1.3	48	0.8	1.208	39.6
Pomatomus saltatrix	47.2	1.0	10	0.2	4.669	60.4
Centropristis striata	27.7	0.6	98	1.7	0.282	79.2
Menticirrhus americanus	24.2	0.6	89	1.5	0.272	12.5
Cynoscion regalis	20.4	0.5	43	0.7	0.473	58.3
Morone saxatilis	17.5	0.4	3	0.1	5.872	14.6
Menticirrhus saxatilis	16.9	0.4	48	0.8	0.356	20.8
Paralichthys lethostigma	14.0	0.3	16	0.3	0.903	12.5
Carcharhinidae	13.5	0.3	-	-	-	8.3
Peprilus triacanthus	9.2	0.2	18	0.3	0.521	41.7
Acipenser oxyrhynchus	8.4	0.2	<1	<0.1	57.924	16.7
Unidentified scrapfish	7.6	0.2	-	-	-	6.3
Pogonias cromis	6.8	0.2	<1	<0.1	32.790	10.4
Archosargus probatocephalus	5.3	0.1	1	<0.1	4.883	25.0
Octopus	5.3	0.1	1	<0.1	7.042	22.9
Menticirrhus spp.	4.7	0.1	7	<0.1	0.687	29.2
Sciaenops ocellatus	3.9	0.1	<1	<0.1	15.483	6.3
Micropogonias undulatus	1.9	<0.1	-	-	-	10.4
Tautoga onitis	1.0	<0.1	<1	<0.1	2.181	18.8
Limanda ferruginea	0.7	<0.1	-	-	-	2.1
Leiostomus xanthurus	0.6	<0.1	4	<0.1	0.158	6.3
Euthynnus alletteratus	0.5	<0.1	<1	<0.1	3.783	2.1
Seriola dumerili	0.5	<0.1	<1	<0.1	22.200	2.1
Stenotomus chrysops	0.3	<0.1	2	<0.1	0.207	18.8
Sarda sarda	0.1	<0.1	-	-	-	2.1
Cynoscion nebulosus	<0.1	<0.1	<1	<0.1	2.300	8.3
Paralichthys albigutta	<0.1	<0.1	<1	<0.1	0.420	2.1
Peprilus spp.	<0.1	<0.1	-	-	-	2.1

Observed species

Busycon canaliculatum	Portunus spp.	Prionotus scitulus
Penaeus duorarum	Mustelus canis	Centropristis ocyurus
Homarus americanus	Squatina dumerili	Orthopristis chrysoptera
Libinia spp.	Raja eglanteria	Scomberomorus maculatus
Cancer spp.	Conger spp.	Citharichthys spilopterus
Cancer borealis	Urophycis spp.	Scophthalmus aquosus
Cancer irroratus	Urophycis regia	Glyptocephalus cynoglossus
Arenaeus cribarius	Urophycis earlii	Pseudopleuronectes americanus
Callinectes sapidus	Holocentridae	Gymnachirus melas
Callinectes similis	Prionotus carolinus	Symphurus spp.
Ovalipes ocellatus	Prionotus evolans	Balistes capriscus
Ovalipes stephensoni		

APPENDIX F. Size composition of summer flounder (Paralichthys dentatus) captured by North Carolina winter trawlers during 1988-91 partitioned by gear (A), area (B), and season (C); n=number of individuals measured.

	Season	n	Percent frequency/size class (TL, mm) Undersize-<330	<300	301-350	351-400	401-450	451-500	501-600	601 700	>700
A. GEAR											
Flynet	1988-89	208	58.1	51.1	14.4	13.9	15.0	5.1	0.5		
Deepwater		8,610	8.4	0.3	22.9	36.2	27.6	9.7	2.8	0.5	<0.1
Flounder		6,823	4.5	0.1	15.2	34.3	30.4	15.5	4.1	0.4	<0.1
Flynet	1989-90	1	100.0	100.0							
Deepwater		7,571	9.3	<0.1	23.4	29.7	21.9	13.4	11.0	0.6	<0.1
Flounder		5,320	6.1	0.1	22.3	32.6	25.7	12.6	6.7	0.1	<0.1
Crab trawl		327	3.5		15.2	35.8	32.9	11.3	4.2	0.6	
Flynet	1990-91	8	97.7	97.7	1.3	0.7	0.3				
Deepwater		3,074	11.6	0.1	31.8	38.9	23.0	4.1	1.7	0.3	<0.1
Flounder		14,961	8.0	<0.1	26.4	37.5	26.1	7.7	2.2	0.1	<0.1
B. AREA											
Northern	1988-89	15,091	7.4	0.6	20.1	35.1	28.6	11.9	3.3	0.4	<0.1
Central		549	8.6	2.5	17.4	42.0	25.2	9.4	3.5	0.2	
Northern	1989-90	11,578	7.8	0.1	22.0	30.5	23.7	13.7	9.6	0.4	<0.1
Central		1,106	11.9	0.6	35.8	33.4	21.5	6.3	2.4	0.1	
Southern		550	2.8		20.8	39.4	28.0	9.1	2.6	<0.1	<0.1
Northern	1990-91	17,753	8.6	<0.1	27.2	37.7	25.7	7.1	1.2	0.1	<0.1
Central		290	21.2	14.1	23.5	34.4	17.7	9.2	1.0	<0.1	
C. SEASON											
1982-83		5,027		16.7	40.3	24.4	12.7	3.8	1.9	0.1	<0.1
1983-84		14,844		16.7	39.1	25.7	12.3	4.4	1.7	0.1	<0.1
1984-85		15,185		9.9	43.3	24.3	13.9	4.9	2.4	0.3	<0.1
1985-86		14,477		15.4	32.8	26.4	15.4	7.0	2.6	0.3	<0.1
1986-87		11,350		7.8	31.6	31.6	20.1	5.8	2.9	0.2	<0.1
1987-88		15,395		18.0	38.8	31.7	7.1	3.1	1.1	0.2	<0.1
1988-89		15,641		0.7	20.0	35.3	28.5	11.8	3.3	0.4	<0.1
1989-90		13,214		0.2	22.8	31.0	23.7	13.0	8.9	0.4	<0.1
1990-91		18,043		0.1	27.2	37.7	25.6	7.1	2.1	0.1	<0.1

APPENDIX G. Age composition of summer flounder (Paralichthys dentatus) captured by North Carolina winter trawl, 1982-1991.

Season	Percent/age class 0	1	2	3	4	5	6	7	8
1982-83	25.5	55.2	16.8	1.7	0.6	0.2	0	0	0
1983-84	8.5	48.9	33.8	6.4	1.8	0.5	0	0	0
1984-85	13.5	51.0	31.4	2.9	1.0	0.2	0	0	0
1985-86	5.0	51.4	35.4	7.3	0.4	0.4	0	0	0
1986-87	11.5	46.8	34.5	6.5	0.5	0.1	0	0	0
1987-88	6.6	68.3	22.4	2.2	0.4	0.1	0	0	0
1988-89	0.4	33.3	41.9	22.1	1.3	0.6	0.4	0	0
1989-90	0.1	6.5	44.3	36.0	12.0	0.8	0.3	0	0
1990-91	0.0	6.6	54.3	36.7	2.3	0.1	0	0	0

APPENDIX H. Overall species composition and mean catch/trip of 33 deepwater trawl catches sampled from October 1988 through April 1989.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Paralichthys dentatus	4,052.7	72.0	5,803	72.0	0.698	97.0
Loligo pealii	813.8	14.4	-	-	-	87.8
Centropristis striata	485.0	8.6	1,345	16.7	0.361	97.0
Stenotomus chrysops	107.3	1.9	628	7.8	0.171	63.6
Pomatomus saltatrix	61.1	1.1	24	0.3	2.568	63.6
Scomber scombrus	32.0	0.6	90	1.1	0.355	3.0
Lophius americanus	27.6	0.5	16	0.2	1.776	48.5
Cynoscion regalis	11.9	0.2	8	0.1	1.490	42.4
Merluccius bilinearis	8.1	0.1	7	0.1	1.116	27.3
Placopecten magellanicus	6.8	0.1	-	-	-	33.3
Prionotus spp.	5.8	0.1	91	1.1	0.064	9.1
Busycon sp.	4.9	0.1	-	-	-	3.0
Glyptocephalus cynoglossus	3.9	0.1	10	0.1	0.377	24.2
Paralichthys spp.	2.5	<0.1	2	<0.1	1.042	3.0
Peprilus triacanthus	2.1	<0.1	19	0.2	0.111	30.3
Acipenser oxyrhynchus	1.9	<0.1	<1	<0.1	20.833	6.1
Urophycis regia	1.4	<0.1	7	0.1	0.208	18.2
Stenotomus spp.	0.8	<0.1	-	-	-	3.0
Conger oceanicus	0.7	<0.1	<1	<0.1	1.808	12.1
Centropristis philadelphica	0.5	<0.1	-	-	-	6.1
Tautoga onitis	0.1	<0.1	-	-	-	3.0
Paralichthys oblongus	0.1	<0.1	<1	<0.1	0.337	18.2
Menticirrhus spp.	0.1	<0.1	<1	<0.1	0.230	3.0
Sparidae	0.1	<0.1	-	-	-	3.0
Archosargus probatocephalus	0.1	<0.1	<1	<0.1	1.800	3.0

Observed species

Cancer irroratus
Callinectes sapidus
Ovalipes sp.
Ovalipes ocellatus
Ovalipes stephensoni
Portunus spp.
Portunus gibbessi
Asteroidea
Astropecten articulatus
Urophycis spp.
Scomberesox saurus
Holocentrus ascensionis
Prionotus carolinus
Prionotus evolans
Prionotus scitulus
Epinephelus drummondhayi
Caulolatilus microps
Cynoscion nebulosus
Menticirrhus saxatilis
Etropus crossotus
Persephona punctatus
Cancer borealis
Scophthalmus aquosus
Symphurus plagiusa
Squalus acanthias
Raja eglanteria
Raja radiata
Dasyatis sabina

APPENDIX I. Overall species composition and mean catch/trip of 45 deepwater catches sampled during October through April 1990.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Paralichthys dentatus	1,674.2	39.2	1,920	23.2	0.872	88.9
Centropristis striata	1,044.5	24.5	3,606	43.5	0.290	97.8
Loligo pealii	712.4	16.7				91.1
Stenotomus chrysops	603.0	14.1	2,382	28.7	0.253	64.4
Lophius americanus	59.5	1.4	16	0.2	3.823	80.0
Pomatomus saltatrix	31.4	0.7	21	0.3	1.530	64.4
Peprilus triacanthus	29.9	0.7	203	2.5	0.147	51.1
Cynoscion regalis	27.2	0.6	21	0.3	1.274	68.9
Merluccius bilinearis	26.8	0.6	40	0.5	0.667	35.6
Carcharhinus spp.	14.4	0.3				2.2
Menidia beryllina	10.6	0.3				4.4
Glyptocephalus cynoglossus	6.9	0.2	21	0.3	0.323	24.4
Placopecten magellanicus	5.2	0.1				15.6
Centropristis ocyurus	2.9	0.1	15	0.2	0.188	2.2
Menticirrhus spp.	2.6	0.1	4	0.1	0.599	6.7
Sparidae	2.1	0.1				6.7
Acipenser oxyrhynchus	1.8	<0.1	<1	<0.1	40.800	4.4
Urophycis spp.	1.6	<0.1				2.2
Scomber scombrus	1.2	<0.1	4	0.1	0.318	11.1
Urophycis regia	1.1	<0.1	3	<0.1	0.345	22.2
Conger oceanicus	1.1	<0.1				8.9
Urophycis chuss	1.1	<0.1	11	0.1	0.093	4.4
Cynoscion nebulosus	0.8	<0.1	<1	0.1	1.994	6.7
Seriola dumerili	0.7	<0.1	<1	<0.1	33.600	2.2
Squalus acanthias	0.7	<0.1	12	0.2	0.061	2.2
Busycon canalicalatum	0.7	<0.1				2.2
Mycteroperca spp.	0.7	<0.1	<1	<0.1	30.400	4.4
Lopholatilus chamaeleonticeps	0.7	<0.1				2.2
Busycon carica	0.5	<0.1				2.2
Busycon spp.	0.4	<0.1				2.2
Caulolatilus microps	0.4	<0.1	<1	<0.1	8.650	6.7
Tautoga onitis	0.3	<0.1	<1	<0.1	7.550	13.3
Archosargus probatocephalus	0.3	<0.1				6.7
Micropogonias undulatus	0.2	<0.1	<1	<0.1	1.355	8.9
Paralichthys lethostigma	0.2	<0.1	<1	<0.1	1.298	2.2
Prionotus carolinus	0.2	<0.1	3	<0.1	0.063	8.9
Alosa pseudoharengus	0.2	<0.1	1	<0.1	0.243	2.2
Octopus	0.2	<0.1				2.2
Caulolatilus spp.	0.1	<0.1				2.2
Alosa sapidissima	0.1	<0.1				2.2
Euthynnus alletteratus	0.1	<0.1	<1	<0.1	4.500	2.2
Congridae	0.1	<0.1				2.2
Pollachius virens	<0.1	<0.1	<1	<0.1	1.400	2.2
Sciaenops ocellatus	<0.1	<0.1	<1	<0.1	0.900	2.2

Observed species

Ilex illecebrosus	Ovalipes stephensoni	Prionotus scitulus
Hepatus epheliticus	Portunus sp.	Paralichthys albigutta
Cancer borealis	Alosa aestivalis	Paralichthys oblongus
Cancer irroratus	Clupea harengus	Scophthalmus aquosus
Callinectes sapidus	Brevoortia tyrannus	Symphurus plagiusa
Ovalipes	Prionotus spp.	Sphoeroides maculatus
Ovalipes ocellatus	Prionotus evolans	Mustelus spp.
		Raja eglanteria

APPENDIX J. Overall species composition and mean catch/trip of 13 deepwater trawl catches sampled from January through April 1991.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Stenotomus chrysops	3,598.9	39.7	17,606	61.7	0.204	100.0
Paralichthys dentatus	2,118.0	23.3	3,551	12.4	0.596	84.6
Scomber scombrus	2,095.6	23.1	4,985	17.5	0.420	46.2
Loligo pealii	219.9	4.6	-	-	-	76.9
Centropristis striata	142.2	1.6	233	0.8	0.610	100.0
Lophius americanus	139.4	1.5	95	0.3	1.475	53.8
Peprilus triacanthus	126.9	1.4	1,187	4.2	0.107	69.2
Merluccius bilinearis	104.7	1.1	241	0.8	0.435	46.2
Unidentified scrapfish	87.2	1.0				7.7
Clupea harengus	65.6	0.7	430	1.5	0.153	23.1
Pomatomus saltatrix	64.6	0.7	68	0.2	0.950	38.5
Prionotus spp.	26.3	0.3	21	0.1	1.270	15.4
Menticirrhus spp.	24.4	0.3	24	0.1	1.005	23.1
Placopecten magellanicus	13.3	0.1	-	-	-	23.1
Urophycis regia	11.8	0.1	62	0.2	0.190	15.4
Busycon spp.	8.8	0.1	-	-	-	7.7
Urophycis spp.	8.6	0.1	-	-	-	15.4
Acipenser oxyrhynchus	5.6	0.1	-	-	-	7.7
Prionotus carolinus	4.6	0.1	23	0.1	0.195	7.7
Homarus americanus	2.2	<0.1	-	-	-	23.1
Cynoscion regalis	0.9	<0.1	1	<0.1	1.425	38.5
Glyptocephalus cynoglossus	0.3	<0.1	1	<0.1	0.667	15.4
Alosa sapidissima	0.2	<0.1	-	-	-	7.7
Sarda sarda	0.1	<0.1	<1	<0.1	0.900	7.7

Observed species

Cancer irroratus	Ophidiidae	*Tautoga onitis*
Mustelus canis	*Prionotus scitulus*	*Sphoeroides maculatus*
Raja eglanteria	*Bellator militaris*	

Table K. Size composition of scup (Stenotomus chrysops) captured by North Carolina winter trawlers during 1988-91 fishing seasons partitioned by season (A), and scrap (B); n=number of individuals measured.

	n	Percent frequency/size class (FL, mm) <150	151-200	201-250	251-300	301-350	>350
A. SEASON							
1982-83	3,613	0.2	41.3	40.9	13.2	3.8	0.6
1983-84	6,349	0.7	42.4	41.1	11.9	3.2	0.7
1984-85	1,525	4.6	76.6	15.9	2.6	0.2	0.1
1985-86	4,090	1.1	27.1	44.8	14.6	6.2	1.2
1986-87	2,962	16.0	15.6	36.5	23.2	7.6	0.8
1987-88	2,371	16.8	16.8	48.5	6.7	3.6	1.6
1988-89	1,549	6.7	71.9	19.8	1.3	0.3	<0.1
1989-90	4,648	14.6	25.1	51.7	7.4	1.0	0.2
1990-91	7,591	2.4	50.5	42.9	3.9	0.2	<0.1
B: SCRAP							
1988-89	117	84.8	15.2				
1989-90	55	95.0	5.0				
1990-91	293	10.4	89.6				

APPENDIX L. Size composition of black sea bass (Centropristis striata) captured by North Carolina winter trawlers October 1988 through April 1991 partitioned by gear (A), season (B), and scrap samples (C); n = number of individuals measured.

		n	Percent frequency/size class (TL, mm) <200	201-250	251-300	301-350	351-400	401-450	451-500	>500
A. GEAR										
Deepwater	1988-89	2,790	5.0	42.1	31.4	14.6	4.8	1.3	0.6	0.2
Flounder		270	1.2	35.2	44.2	9.8	3.0	4.2	1.5	0.9
Deepwater	1889-90	7,097	5.4	47.7	31.1	11.5	2.9	0.9	0.4	0.2
Flounder		3							33.3	66.7
Deepwater	1990-91	396	0.1	23.2	40.5	23.5	12.2	0.2		0.3
Flounder		1,026	15.4	54.0	22.5	6.1	1.6	0.4		
B. SEASON										
1982-83		1,328	3.1	45.3	32.7	12.9	3.9	1.4	0.4	0.2
1983-84		4,573	2.2	36.3	37.1	18.3	5.0	0.9	0.2	0.1
1984-85		5,078	8.9	32.2	28.3	18.8	8.3	2.7	0.7	0.2
1985-86		6,170	10.9	42.7	22.8	8.3	6.5	4.7	2.8	1.3
1986-87		2,982	3.9	48.2	29.4	11.2	5.1	1.6	0.5	0.1
1987-88		4,243	9.5	50.0	21.7	11.9	3.9	2.0	0.7	0.2
1988-89		3,260	4.8	41.8	32.0	14.4	4.8	1.4	0.7	0.2
1989-90		7,100	5.4	47.7	31.1	11.5	2.9	0.9	0.4	0.2
1990-91		1,422	10.2	43.5	28.7	12.1	5.2	0.3		0.1
C. SCRAP										
	1988-89	62	74.8	25.2						
	1989-90	6	100.0							
	1990-91	3	100.0							

APPENDIX M. Overall species composition and mean catch/trip of 38 flynet catches sampled from October 1988 through April 1989.

Species	Weight (kg)		Number		Mean fish weight (kg)	% freq. occur.
	Mean	Percent	Mean	Percent		
Cynoscion regalis	3,999.4	39.4	15,355	22.3	0.260	94.7
Micropogonias undulatus	2,738.4	27.0	19,230	27.9	0.142	71.1
Leiostomus xanthurus	1,325.5	13.1	21,449	31.1	0.062	65.8
Pomatomus saltatrix	878.6	8.7	743	1.1	1.183	76.3
Peprilus triacanthus	250.5	2.5	4,705	6.8	0.053	71.1
Lagodon rhomboides	187.3	1.9	1,260	1.8	0.149	23.7
Menticirrhus americanus	115.2	1.1	501	0.7	0.228	60.6
Stenotomus spp.	109.2	1.1	2,753	4.0	0.040	7.9
Loligo pealii	73.8	0.7	16	0.0	4.479	39.5
Pogonias cromis	63.9	0.6				10.5
Carcharhinus sp.	48.8	0.5				21.1
Paralichthys dentatus	40.3	0.4	84	0.1	0.478	47.4
Menticirrhus saxatilis	40.4	0.4	262	0.4	0.152	31.6
Bairdiella chrysoura	36.4	0.4	530	0.8	0.069	31.6
Brevoortia tyrannus	33.1	0.3	241	0.4	0.137	28.9
Orthopristis chrysoptera	25.0	0.3	643	0.9	0.039	23.7
Archosargus probatocephalus	18.4	0.2	4	<0.1	4.369	15.8
Stenotomus chrysops	18.2	0.2	499	0.7	0.037	7.9
Galeocerdo cuvieri	17.9	0.2				2.6
Centropristis striata	12.5	0.1	59	0.1	0.212	21.1
Cephalopoda	12.3	0.1	28	<0.1	0.388	7.9
Rachycentron canadum	9.2	0.1	1	<0.1	16.586	5.3
Scomberomorus cavalla	8.5	0.1	2	<0.1	3.750	15.8
Odontaspis taurus	7.2	0.1				2.6
Urophycis regia	7.1	0.1	71	0.1	0.100	28.9
Acipenser oxyrhynchus	5.7	0.1	<1	<0.1	54.100	10.5
Synodus foetens	5.5	0.1	45	0.1	0.124	15.8
Sphoeroides maculatus	4.6	0.1	53	0.1	0.088	28.9
Sphyraena borealis	4.6	0.1	51	0.1	0.090	2.6
Paralichthys spp.	4.5	<0.1	3	<0.1	1.485	10.5
Lophius americanus	4.0	<0.1	<1	<0.1	10.073	21.1
Sciaenops ocellatus	3.9	<0.1	<1	<0.1	13.379	5.3
Cynoscion nebulosus	3.8	<0.1	12	<0.1	0.313	15.8
Scomberomorus maculatus	3.6	<0.1	9	<0.1	0.404	15.8
Seriola spp.	3.6	<0.1				2.6
Scomber scombrus	3.6	<0.1	4	0.1	0.958	5.3
Seriola dumerili	3.2	<0.1	<1	<0.1		7.9
Peprilus alepidotus	2.7	<0.1	84	0.1	0.032	2.6
Scyliorhinus retifer	2.6	<0.1				2.6
Chaetodipterus faber	2.4	<0.1	14	<0.1	0.168	5.3
Prionotus evolans	1.8	<0.1	30	<0.1	0.059	13.2
Alosa aestivalis	1.6	<0.1	9	0.1	0.173	7.9
Lolliguncula brevis	1.6	<0.1	21	<0.1	0.075	2.6
Larimus fasciatus	1.6	<0.1	19	<0.1	0.084	7.9
Argentina striata	1.1	<0.1	71	0.1	0.016	2.6
Prionotus scitulus	1.0	<0.1	24	<0.1	0.043	7.9

APPENDIX M. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Scophthalmus aquosus	0.8	<0.1	10	<0.1	0.081	10.5
Paralichthys lethostigma	0.7	<0.1	1	<0.1	0.973	2.6
Anchoa hepsetus	0.5	<0.1	41	0.1	0.013	5.3
Diplodus holbrooki	0.5	<0.1	18	<0.1	0.028	2.6
Prionotus spp.	0.3	<0.1	1	<0.1	0.184	10.5
Libinia dubia	0.2	<0.1	<1	<0.1	1.000	2.6
Sarda sarda	0.2	<0.1	<1	<0.1	1.360	2.6
Mustelus canis	0.2	<0.1	<1	<0.1	0.656	13.2
Tautoga onitis	0.1	<0.1	<1	<0.1	1.733	5.3
Alosa sapidissima	0.1	<0.1	<1	<0.1	0.683	2.6
Euthynnus alletteratus	0.1	<0.1	<1	<0.1	3.200	2.6
Arenaeus cribarius	0.1	<0.1	1	<0.1	0.086	2.6
Callinectes sapidus	0.1	<0.1	1	<0.1	0.116	5.3
Penaeus duorarum	<0.1	<0.1	5	<0.1	0.011	2.6
Monacanthus hispidus	<0.1	<0.1	2	<0.1	0.020	2.6
Ovalipes stephensoni	<0.1	<0.1	1	<0.1	0.043	2.6
Squilla neglecta	<0.1	<0.1	1	<0.1	0.052	2.6
Citharichthys macrops	<0.1	<0.1	1	<0.1	0.022	2.6
Centropristis philadelphica	<0.1	<0.1	<1	<0.1	0.167	5.3
Persephona sp.	<0.1	<0.1	<1	<0.1	0.036	2.6
Placopecten magellanicus	<0.1	<0.1				2.6

Observed species

Sicyonia sp.	Merluccius bilinearis	Mustelus sp.
Persephona punctata	Rissola marginatum	Squalus acanthias
Libinia sp.	Prionotus carolinus	Squatina dumerili
Cancer borealis	Priacanthus sp.	Raja sp.
Portunus sp.	Mullus auratus	Raja eglanteria
Ovalipes ocellatus	Trichiurus lepturus	Dasyatis sp.
Alosa sp.	Synogyrys spp.	Myliobatis freminvillei
Clupea harengus	Chilomycterus schoepfi	Rhinoptera bonasus

APPENDIX N. Overall species composition and mean catch/trip of 42 flynet catches sampled during October 1989 through April 1990.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Cynoscion regalis	4,502.7	35.8	16,397	22.3	0.275	81.0
Scomber scombrus	2,652.5	21.1	9,131	12.4	0.290	19.0
Micropogonias undulatus	2,602.8	20.7	19,514	26.5	0.133	47.6
Pomatomus saltatrix	971.6	7.7	1,069	1.5	0.909	81.0
Leiostomus xanthurus	927.1	7.4	12,994	17.6	0.071	54.8
Peprilus triacanthus	189.7	1.5	3,529	4.8	0.054	59.5
Stenotomus caprinus	89.1	0.7	2,393	3.3	0.037	16.7
Bairdiella chrysoura	78.2	0.6	1,778	2.4	0.044	31.0
Loligo pealii	69.2	0.6	118	0.2	0.588	59.5
Urophycis regia	65.8	0.5	718	1.0	0.092	38.1
Lagodon rhomboides	51.7	0.4	1,278	1.7	0.040	28.6
Brevoortia tyrannus	38.8	0.3	175	0.2	0.222	26.2
Carcharhinus sp.	36.2	0.3				7.1
Menticirrhus saxatilis	32.0	0.3	268	0.4	0.119	23.8
Menticirrhus americanus	30.4	0.2	308	0.4	0.099	31.0
Orthopristis chrysoptera	29.5	0.2	564	0.8	0.052	11.9
Scomberomorus maculatus	18.6	0.2	35	0.1	0.529	16.7
Prionotus evolans	15.6	0.1	296	0.4	0.053	19.0
Peprilus alepidotus	15.5	0.1	330	0.5	0.047	7.1
Stenotomus chrysops	14.2	0.1	308	0.4	0.046	9.5
Scomber spp.	13.5	0.1				2.4
Scomberomorus cavalla	12.7	0.1	5	<0.1	2.645	11.9
Centropristis striata	11.7	0.1	108	0.2	0.109	19.0
Sphoeroides maculatus	11.5	0.1	265	0.4	0.043	21.4
Synodus foetens	9.6	0.1	170	0.2	0.056	11.9
Prionotus scitulus	8.9	0.1	268	0.4	0.033	11.9
Carcharhinus spp.	8.8	0.1				2.4
Anchoa hepsetus	8.0	0.1	765	1.0	0.010	7.1
Callinectes marginatus	7.9	0.1	197	0.3	0.040	2.4
Archosargus probatocephalus	6.9	0.1				14.3
Mustelus canis	6.8	0.1	2	<0.1	4.344	14.3
Prionotus tribulus	6.2	0.1	138	0.2	0.045	4.8
Menticirrhus spp.	4.6	<0.1	4	<0.1	1.219	14.3
Prionotus carolinus	4.6	<0.1				19.0
Seriola dumerili	4.3	<0.1				4.8
Squalus acanthias	3.9	<0.1	138	0.2	0.033	23.8
Paralichthys dentatus	2.4	<0.1	6	<0.1	0.401	28.6
Urophycis spp.	2.2	<0.1				4.8
Portunus spp.	2.0	<0.1	197	0.3	0.010	4.8
Cynoscion nebulosus	1.8	<0.1	4	<0.1	0.467	19.0
Monacanthus hispidus	1.7	<0.1	55	0.1	0.031	7.1
Rachycentron canadum	1.6	<0.1	<1	<0.1	22.200	11.9
Acipenser oxyrhynchus	1.4	<0.1	<1	<0.1	60.300	4.8
Alopias vulpinus	1.4	<0.1	<1	<0.1	57.200	4.8
Clupea harengus	0.9	<0.1	6	<0.1	0.143	4.8
Sicyonia brevirostris	0.8	<0.1	28	<0.1	0.030	7.1
Euthynnus alletteratus	0.8	<0.1	<1	<0.1	6.440	2.4

APPENDIX N. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Priacanthus arenatus	0.8	<0.1	12	<0.1	0.062	4.8
Alosa aestivalis	0.8	<0.1	7	<0.1	0.102	7.1
Lophius americanus	0.7	<0.1				7.1
Carcharhinus leucas	0.6	<0.1	<1	<0.1	27.200	2.4
Portunus spinimanus	0.6	<0.1	18	<0.1	0.032	4.8
Caulolatilus microps	0.5	<0.1				2.4
Seriola spp.	0.5	<0.1				2.4
Chaetodipterus faber	0.4	<0.1	9	<0.1	0.050	2.4
Penaeus duorarum	0.3	<0.1	32	<0.1	0.010	11.9
Sciaenops ocellatus	0.3	<0.1				2.4
Conger oceanicus	0.3	<0.1				2.4
Alosa pseudoharengus	0.2	<0.1	1	<0.1	0.300	2.4
Alosa sapidissima	0.2	<0.1				4.8
Etrumeus teres	0.2	<0.1	8	<0.1	0.020	4.8
Merluccius bilinearis	0.1	<0.1				14.3
Larimus fasciatus	0.1	<0.1	9	<0.1	0.013	4.8
Sicyonia brevirostris	0.1	<0.1	11	<0.1	0.010	4.8
Centropristis philadelphica	0.1	<0.1	9	<0.1	0.010	2.4
Anchoa mitchilli	<0.1	<0.1	14	<0.1	0.002	2.4
Alectis ciliaris	<0.1	<0.1	<1	<0.1	0.157	2.4
Balistes capriscus	<0.1	<0.1	<1	<0.1	0.900	2.4
Argentina striata	<0.1	<0.1	<1	<0.1	0.018	2.4

Observed species

Limulus polyphemus
Penaeus aztecus
Cancer borealis
Callinectes sapidus
Ovalipes spp.
Ovalipes ocellatus
Squilla empusa
Porichthys plectrodon

Macrorhamphosus scolopax
Prionotus spp.
Diplectrum formosum
Uraspis secunda
Haemulon aurolineatum
Calamus leucosteus
Equetus lanceolatus
Mullus auratus

Tautoga onitis
Trichiurus lepturus
Scophthalmus aquosus
Symphurus plagiusa
Odontaspis taurus
Squatina dumerili
Raja eglanteria
Dasyatis spp.
Rhinoptera bonasus

APPENDIX O. Overall species composition and mean catch/trip of 40 flynet catches sampled during October 1990 through April 1991.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Cynoscion regalis	6,412.1	56.6	42,238	39.0	0.152	95.0
Leiostomus xanthurus	1,088.7	9.6	19,825	18.3	0.055	90.0
Micropogonias undulatus	1,068.2	9.4	11,269	10.4	0.095	82.5
Pomatomus saltatrix	605.0	5.3	1,545	1.4	0.392	90.0
Peprilus triacanthus	490.0	4.3	8,361	7.7	0.059	92.5
Brevoortia tyrannus	338.5	3.0	2,498	2.3	0.136	62.5
Lagodon rhomboides	285.4	2.5	8,797	8.1	0.032	72.5
Scomber scombrus	187.9	1.7	470	0.4	0.399	2.5
Menticirrhus saxatilis	151.4	1.3	1,052	1.0	0.144	60.0
Menticirrhus americanus	94.1	0.8	529	0.5	0.178	75.0
Scomberomorus maculatus	84.3	0.7	410	0.4	0.206	37.5
Peprilus alepidotus	82.6	0.7	1,894	1.7	0.044	42.5
Stenotomus caprinus	82.4	0.7	1,645	1.5	0.050	12.5
Anchoa hepsetus	43.5	0.4	3,133	2.9	0.014	50.0
Unidentified scrapfish	40.9	0.4				7.5
Sphoeroides maculatus	39.1	0.3	81	0.1	0.482	45.0
Bairdiella chrysoura	37.3	0.3	761	0.7	0.049	45.0
Menticirrhus spp.	22.8	0.2	2	<0.1	9.621	10.0
Orthopristis chrysoptera	21.2	0.2	493	0.5	0.043	37.5
Clupea harengus	20.9	0.1	1,960	1.8	0.011	2.5
Lophius americanus	18.7	0.1	12	<0.1	1.551	7.5
Loligo pealii	12.0	0.1	45	<0.1	0.267	45.0
Prionotus evolans	11.6	0.1	152	0.1	0.076	20.0
Merluccius bilinearis	10.1	0.1	48	0.1	0.210	2.5
Archosargus probatocephalus	9.0	0.1	2	<0.1	4.500	25.0
Chaetodipterus faber	8.8	0.1	153	0.1	0.058	7.5
Synodus foetens	8.7	0.1	93	0.1	0.094	27.5
Carcharhinidae	7.2	0.1	0	<0.1	57.600	7.5
Opisthonema oglinum	6.6	0.1	266	0.2	0.025	5.0
Urophycis regia	6.0	0.1	86	0.1	0.070	22.5
Alosa mediocris	5.7	0.1	23	<0.1	0.246	10.0
Scomberomorus cavalla	4.7	<0.1	2	<0.1	2.195	12.5
Rachycentron canadum	3.3	<0.1	0	<0.1	8.860	10.0
Paralichthys dentatus	3.3	<0.1	12	<0.1	0.275	35.0
Alosa aestivalis	3.3	<0.1	52	<0.1	0.062	32.5
Cynoscion nebulosus	2.3	<0.1	14	<0.1	0.164	10.0
Centropristis striata	2.3	<0.1	17	<0.1	0.134	22.5
Callinectes sapidus	1.6	<0.1	31	<0.1	0.051	10.0
Lolliguncula brevis	1.4	<0.1	49	<0.1	0.029	7.5
Acipenser oxyrhynchus	1.2	<0.1				2.5
Seriola zonata	1.1	<0.1	6	<0.1	1.188	2.5
Prionotus scitulus	1.0	<0.1	25	<0.1	0.039	12.5
Ovalipes	0.9	<0.1	18	<0.1	0.050	2.5
Centropristis philadelphica	0.9	<0.1	14	<0.1	0.060	2.5
Pogonias cromis	0.6	<0.1	0	<0.1	24.900	2.5
Trichiurus lepturus	0.5	<0.1	14	<0.1	0.035	12.5

APPENDIX O. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	% freq. occur.
Theuthidida myopsida	0.3	<0.1				2.5
Prionotus spp.	0.3	<0.1	7	<0.1	0.050	2.5
Caranx crysos	0.3	<0.1	6	<0.1	0.050	2.5
Urophycis spp.	0.3	<0.1				2.5
Portunus spp.	0.2	<0.1	12	<0.1	0.020	15.0
Urophycis earlii	0.2	<0.1	14	<0.1	0.012	2.5
Larimus fasciatus	0.1	<0.1	7	<0.1	0.020	5.0
Peprilus spp.	0.1	<0.1	3	<0.1	0.040	2.5
Prionotus tribulus	0.1	<0.1	2	<0.1	0.040	2.5
Monacanthus hispidus	0.1	<0.1	6	<0.1	0.010	2.5
Sarda sarda	0.1	<0.1	0	<0.1	2.300	2.5
Selene vomer	0.1	<0.1	6	<0.1	0.010	2.5
Prionotus carolinus	0.0	<0.1	1	<0.1	0.026	5.0
Paralichthys lethostigma	0.0	<0.1	0	<0.1	0.550	2.5

Observed species

Ilex illecebrosus
Limulus polyphemus
Penaeus aztecus
Penaeus duorarum
Penaeus setiferus
Sicyonia brevirostris
Portunus spinimanus
Squilla empusa
Rhizoprionodon terraenovae
Mustelus canis
Carcharhinus leucas
Carcharhinus plumbeus
Negaprion brevirostris
Squalus acanthias
Raja eglanteria
Dasyatis sayi
Myliobatis freminvillei
Rhinoptera bonasus
Ophichthus ocellatus
Alosa sapidissima
Mullus auratus
Euthynnus alletteratus

APPENDIX P. Size composition of weakfish (Cynoscion regalis) captured by North Carolina winter trawlers during 1988-91 fishing seasons partitioned by gear (A), area (B), season (C), and scrap (D); n=number of individuals measured.

		n	Percent of scrap (<220 mm)	Percent frequency/size class (TL, mm) <200	201-250	251-300	301-350	351-400	401-500	501-600	601-700	>700
A. GEAR												
Flynet	1988-89	6,363	30.5	20.7	24.2	28.3	13.8	5.0	5.1	2.7	0.2	<0.1
Deepwater		12	0.0			8.3	17.3	16.7	50.0	8.3		
Flounder		138	0.0		0.5	20.8	17.0	20.1	32.2	8.5	0.4	0.5
Flynet	1989-90	6,494	47.3	28.4	42.0	22.6	2.0	2.0	0.8	0.3	1.2	0.7
Deepwater		269	0		0.2	16.0	34.6	21.3	7.2	9.5	10.7	0.5
Flounder		777	2.3	1.7	8.9	33.1	28.4	15.4	10.8	0.7	0.6	0.3
Flynet	1990-91	12,418	31.3	19.2	43.3	31.9	5.4	0.2	<0.1			
Deepwater		3	25.0		25.0				25.0		50.0	
Flounder		284	0.0		3.1	54.1	38.3	4.0	0.6			
B. AREA												
Northern	1988-89	3,663	21.1	16.0	16.4	23.6	16.9	7.8	12.1	6.8	0.4	<0.1
Central		1,890	33.2	18.9	28.9	28.7	15.1	5.7	2.1	0.6	<0.1	
Southern		963	38.7	27.1	28.9	33.3	9.4	1.2	0.1	<0.1		
Northern	1989-90	3,969	3.6	1.8	23.1	48.4	5.5	8.3	3.7	1.4	5.2	2.7
Central		2,637	64.4	29.9	46.1	12.7	1.1	0.1	<0.1			
Southern		934	21.8	2.7	61.8	33.5	1.9	0.1	<0.1			
Northern	1990-91	8,234	12.6	7.1	34.4	42.1	15.8	0.6	<0.1		<0.1	
Central		2,742	36.5	22.7	45.0	28.8	3.4	0.2				
Southern		1,729	33.6	20.2	47.6	31.8	0.4					
C. SEASON												
1982-83		6,816	16.0	9.4	34.0	36.7	8.4	6.3	2.9	0.2	0.8	1.3
1983-84		7,956	12.0	6.7	32.3	34.6	18.2	5.7	2.0	0.4	<0.1	0.1
1984-85		9,613	16.0	4.4	35.9	42.7	13.9	2.0	0.7	0.2	0.1	0.1
1985-86		9,608	31.9	17.2	32.5	32.7	7.8	1.4	2.0	1.2	0.2	
1986-87		14,103	32.8	24.3	31.8	28.2	9.8	4.3	1.5	0.1	<0.1	<0.1
1987-88		9,358	31.2	16.5	40.0	34.1	7.0	1.8	0.4	0.2	<0.1	<0.1
1988-89		6,513	30.5	20.6	24.2	28.4	13.8	4.9	5.2	2.7	0.2	<0.1
1989-90		7,540	47.0	28.2	41.8	22.7	2.2	2.1	0.9	0.3	1.2	0.6
1990-91		12,705	31.2	19.1	43.2	32.0	5.4	0.2	<0.1		<0.1	
D. SCRAP												
	1988-89	676		53.5	46.5							
	1989-90	960		52.4	45.1	2.5						
	1990-91	3,086		45.8	47.3	6.9						

APPENDIX Q. Age composition of weakfish (Cynoscion regalis) captured by North Carolina winter trawls, 1982-88.

Year	Age 0	1	2	3	4	5	6	7	8	9	10	11
1982-83	4.20	72.29	19.38	1.67	0.60	0.78	0.57	0.22	0.14	0.11	0.04	0.01
1983-84	3.81	71.84	22.65	1.47	0.15	0.04	0.03	0.01	0.01	0.01	<0.01	<0.01
1984-85	4.34	72.94	21.53	0.94	0.11	0.05	0.03	0.02	0.02	0.02	0.01	<0.01
1985-86	4.87	75.07	18.64	1.07	0.30	0.03	0.02	0.01	0.01	<0.01	<0.01	<0.01
1986-87	27.05	53.35	16.97	2.48	0.14	0.01	<0.01	<0.01				
1987-88	17.43	58.51	21.85	2.09	0.10	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
1988-89	28.10	42.25	20.79	7.92	0.79	0.15	<0.01	<0.01	<0.01			
1989-90	49.01	39.42	8.03	2.09	0.62	0.23	0.16	0.17	0.14	0.07	0.03	0.04
1990-91	31.29	56.15	11.22	1.33	0.01							

APPENDIX R. Size composition of Atlantic croaker (Micropogonias undulatus) captured by North Carolina winter trawlers during 1988-91 partitioned by gear (A), area (B), season (C), and scrap (D) samples; n=number of individuals measured.

	Season	n	Percent frequency/size class (TL, mm) <150	151-175	176-200	201-225	226-250	251-275	276-300	301 325	<325
A. GEAR											
Flynets	1988-89	4,375	2.5	6.6	8.3	22.4	33.1	20.3	5.3	1.1	0.4
Flounder		188				16.9	52.0	29.7	1.1	0.3	
Flynet	1989-90	4,429	0.4	5.3	12.9	38.6	27.5	13.5	1.6	0.1	<0.1
Flounder		359		1.4	6.5	42.8	34.6	11.2	2.9	0.5	<0.1
Flynet	1990-91	3,153	9.6	11.6	20.5	39.6	15.9	2.5	0.2	<0.1	<0.1
B. AREA											
Northern	1988-89	3,217	0.1	3.1	19.0	40.6	27.6	7.6	1.6	0.4	
Central		373	35.7	42.8	7.0	4.5	5.5	3.1	1.1		0.3
Southern		973	1.3	13.1	19.3	32.4	23.1	8.8	1.3	0.2	0.5
Northern	1989-90	2,918		1.0	7.8	41.5	31.2	16.2	2.0	0.1	<0.1
Central		976	2.3	20.3	30.6	29.7	13.0	3.8	0.3	<0.1	<0.1
Southern		892		9.3	17.1	33.7	28.5	9.9	1.3	0.2	
Northern	1990-91	1,427		5.7	30.4	48.1	14.8	0.6	0.4	<0.1	<0.1
Central		1,565	15.1	13.9	14.9	35.4	16.9	3.7	0.1		
Southern		161	18.9	55.8	12.1	10.4	2.7	0.1			
C. SEASON											
1982-83		2,985	0.1	1.1	10.3	13.6	29.0	31.2	11.7	2.3	0.7
1983-84		3,458	0.4	1.8	16.9	45.1	27.9	6.8	1.0	0.1	
1984-85		10,935	0.6	5.2	13.9	38.9	33.3	7.1	0.9	0.1	
1985-86		9,097	2.2	8.2	17.9	31.8	25.8	9.6	1.3	0.3	0.2
1986-87		8,470	1.8	8.1	16.8	26.7	36.0	7.6	2.3	0.5	0.2
1987-88		3,607	0.2	8.1	14.6	29.6	34.1	10.2	2.5	0.6	0.1
1988-89		4,563	2.5	6.6	8.3	22.4	33.1	20.3	5.3	1.1	0.4
1989-90		4,788	0.4	5.2	12.7	38.7	27.6	13.4	1.7	0.1	<0.1
1990-91		3,153	9.6	11.6	20.5	39.6	15.9	2.5	0.2	<0.1	<0.1
D. SCRAP											
	1988-89	783	5.3	14.3	17.8	40.2	21.7	0.7			
	1989-90	841	0.8	10.1	23.6	50.7	14.1	0.7			
	1990-91	839	12.9	14.3	26.5	41.6	4.5	0.2			

APPENDIX S. Age composition of croaker, (Micropogonias undulatus), captured by North Carolina winter trawlers, 1982-1991.

Season	Percent frequency/age class 0	1	2	3	4	5
1982-83		28.43	59.44	11.70	0.43	<0.01
1983-84		60.11	38.83	1.06		
1984-85	0.11	59.45	39.40	1.04	0.1	
1985-86		58.85	39.19	1.86	10.07	0.03
1986-87	5.70	64.12	26.53	3.38	0.27	0.01
1987-88		69.93	27.01	2.56	0.43	<0.01
1988-89		76.00	19.02	3.94	1.02	0.02
1989-90		81.74	15.47	2.04	0.76	<0.01
1990-91		95.98	3.81	0.15	0.06	

APPENDIX T. Size composition of bluefish (<u>Pomatomus</u> <u>saltatrix</u>) captured by North Carolina winter trawlers during 1988-91 fishing seasons partitioned by gear (A), area (B), season (C), and scrap (D); n=number of individuals measured.

	Season	n	Percent frequency/size class (FL, mm) 101-200	201-300	301-400	401-500	501-600	601-700	701-800	>800
A. GEAR										
Flynet	1988-89	1,001	10.2	45.6	14.3	5.0	2.4	20.5	2.0	
Flounder		23					2.3	33.4	59.4	
Deepwater		31			81.1	4.7	1.1	6.6	5.4	1.1
Flynet	1989-90	1,164	31.3	36.0	6.6	1.9	7.8	13.0	2.6	0.1
Flounder		82		26.0	47.4	21.9		1.0	3.6	
Deepwater		147			25.0	71.1	1.1	2.1	0.6	0.1
Flynet	1990-91	1,335	30.4	51.7	12.5	1.8		2.1	1.4	0.1
Flounder		117		4.3	28.3	23.7		12.1	31.7	
Deepwater		4			99.5	0.1			0.4	
B. AREA										
Northern	1988-89	930	9.2	25.1	21.7	7.3	3.5	30.0	3.2	<0.1
Central		39	6.8	93.0	0.1			0.1	0.1	
Southern		97	22.2	77.0	0.7				0.1	
Northern	1989-90	1,217	3.6	49.6	11.9	5.6	9.4	15.9	3.8	0.2
Central		139	60.8	18.0	1.3	0.3	7.0	11.4	1.1	
Southern		37	92.7	7.3						
Northern	1990-91	477	15.4	55.8	12.0	0.4		9.3	6.6	0.4
Central		973	35.2	48.0	14.4	2.3			<0.1	<0.1
Southern		6	12.4	87.6						
C. SEASON										
1982-83		3,506	2.2	49.7	32.5	3.0	3.9	4.0	4.7	
1983-84		1,274	31.8	20.5	26.9	11.3	1.5	5.3	2.7	
1984-85		1,594	8.9	45.3	6.0	1.2	7.9	8.0	22.7	
1985-86		1,889	45.5	26.7	25.1	1.9	0.2	0.3	0.3	
1986-87		1,134	31.7	42.1	16.2	7.3	0.2	0.9	1.6	
1987-88		1,382	9.3	23.9	6.1	10.2	24.9	18.7	6.9	
1988-89		1,055	10.1	45.1	14.9	4.9	2.4	20.4	2.2	<0.1
1989-90		1,393	30.2	25.7	7.6	3.5	7.6	12.6	2.6	0.1
1990-91		1,456	29.9	51.0	13.4	1.8		2.1	1.6	0.1
D. SCRAP										
	1988-89	31	20.8	79.2						
	1989-90	75	50.6	49.4						
	1990-91	232	38.0	62.0						

APPENDIX U. Age composition of bluefish (<u>Pomatomus</u> <u>saltatrix</u>) captured by North Carolina winter trawlers, 1982-1991.

Season	Percent frequency/age class 0	1	2	3	4	5	6	7	8	9	10	11
1982-83	58.12	29.32	3.90	1.46	3.19	2.48	1.13	0.32	0.08			
1983-84	53.91	33.58	3.82	2.32	3.31	1.52	0.89	0.34	0.20	0.06		0.06
1984-85	55.68	4.66	4.46	5.93	4.26	13.36	5.66	4.69	0.66	0.15	0.34	0.15
1985-86	79.67	19.66	0.07	0.13	0.13	0.11	0.14	0.07	0.02	0.01		
1986-87	75.23	20.97	1.14	0.25	0.34	0.93	0.61	0.37	0.14	0.04		
1987-88	33.77	12.32	10.26	21.61	11.14	3.71	5.46	0.60	0.38	0.74		
1988-89	56.21	17.82	2.81	3.55	11.35	6.22	1.61	0.37	0.02	0.02		
1989-90	64.36	9.14	5.75	7.64	3.03	7.89	0.99	0.90	0.28	0.03		
1990-91	81.69	14.47	0.17	1.03	0.37	1.15	0.60	0.39	0.10	0.04		

APPENDIX V. Size composition of spot (Leiostomus xanthurus) captured by North Carolina winter trawlers during 1988-91 partitioned by gear (A), area (B), season (C), and scrap (D) samples; n = number of individuals measured.

	Season	n	Percent frequency/size class								
			<121	121-135	136-150	151-165	166-180	181-195	196-210	211-225	>225
A. GEAR											
Flynet	1988-89	2,029	0.9	8.8	16.9	30.7	28.1	12.9	1.4	0.2	0.1
Flounder		4				25.0		75.0			
Flynet	1989-90	2,378	0.8	6.1	15.6	21.6	40.1	15.1	0.6	<0.1	<0.1
Flounder		131		0.8	5.3	32.8	53.4	7.6			
Flynet	1990-91	4,451	6.7	14.8	21.3	26.2	22.3	7.2	1.3	0.1	<0.1
Flounder		41						9.8	43.9	41.5	4.9
B. AREA											
Northern	1988-89	1,156	0.4	4.5	12.5	28.0	36.2	16.3	1.7	0.3	0.1
Central		425	10.8	7.6	27.4	35.1	12.7	5.2	1.1	0.1	
Southern		452		16.6	22.3	35.6	16.7	8.3	1.1	<0.1	<0.1
Northern	1989-90	808			1.9	7.6	57.3	31.6	1.5	0.2	<0.1
Central		984	0.8	7.5	20.7	28.7	34.0	8.2	0.2	<0.1	
Southern		717	2.2	12.8	22.5	24.9	30.5	6.5	0.6		
Northern	1990-91	1,139	0.2	4.1	10.3	21.1	30.9	26.7	6.2	0.6	<0.1
Central		2,612	9.2	18.8	22.8	26.0	19.9	2.9	0.4		
Southern		741	0.8	5.9	28.5	35.3	24.5	4.9	0.1		
C. SEASON											
1982-83		942		1.7	11.5	39.5	34.8	11.5	0.7	0.2	0.1
1983-84		1,306	0.1	0.2	4.3	22.6	42.6	27.1	2.8	0.3	
1984-85		3,635	1.1	2.2	10.7	29.5	38.3	16.4	1.5	0.3	
1985-86		2,005	3.4	5.3	7.4	21.2	39.6	20.5	2.4	0.1	0.2
1986-87		2,228	0.5	2.8	13.7	29.2	36.7	14.6	2.1	0.3	0.1
1987-88		1,057	0.1	5.2	11.5	13.6	32.4	32.0	5.0	0.2	<0.1
1988-89		2,033	0.9	8.8	16.9	30.7	28.1	12.9	1.4	0.2	0.1
1989-90		2,509	0.8	6.0	15.4	21.9	40.4	14.9	0.6	<0.1	<0.1
1990-91		4,492	6.7	14.8	21.3	26.2	22.3	7.2	1.3	0.1	<0.1
D. SCRAP											
	1988-89	1,357	0.9	8.9	17.0	30.8	28.2	12.8	1.3	0.1	
	1989-90	1,292	0.8	6.1	15.8	22.4	41.0	13.7	0.2		
	1990-91	2,074	8.0	17.0	22.,1	26.6	10.6	5.2	0.5		

APPENDIX W. Age composition of spot (Leiostomus xanthurus) captured by North Carolina winter trawlers, 1982-1991.

Season	Percent frequency/age class				
	0	1	2	3	4
1982-83	25.33	62.39	12.17	0.10	
1983-84	21.78	63.07	15.02	0.14	
1984-85	22.14	63.69	13.57	0.58	0.01
1985-86	26.85	61.24	11.29	0.62	<0.01
1986-87	18.82	67.29	13.48	0.40	0.01
1987-88	25.54	64.60	10.98	0.87	0.01
1988-89	56.51	40.13	3.31	0.06	
1989-90	34.40	59.71	5.81	0.09	<0.01
1990-91	24.17	69.12	6.61	0.10	

ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES

Completion Report for Project 2-IJ-16

May 1992

JOB 4

SINK NET FISHERY ASSESSMENT

By

Jeffrey L. Ross

ABSTRACT

The ocean gill net fishery produced 19-24% of the marketable finfish landed in North Carolina from Fall 1987 through Spring 1991. The fishery is composed of two principal gears. The most productive gear and extensive fishery was the Outer Banks sink net fishery. Sink nets are tended gill nets fished and retrieved the same day. They are principal ocean gill net used from Oregon Inlet to Beaufort Inlet, and dominate weakfish and bluefish landings. Anchored gill nets are left overnight and fished daily between Bogue Inlet and Carolina beach and dominated croaker landings in recent years.

Weakfish and bluefish dominated sink net catches and landings north of Cape Lookout during 1987-91, with the relative abundance of weakfish declining and bluefish increasing through the period. Fishing effort gradually shifted from waters between Cape Hatteras and Cape Lookout to waters north of Cape Hatteras for the Outer Banks fleet. Croaker, weakfish and spot dominated catches and landings of sink nets west of Cape Lookout. Weakfish, croaker, king whiting (kingfishes) and bluefish were the primary components of anchored gill net catches between Bogue Inlet and Carolina Beach.

Sink net landings and CPUEs of weakfish declined sharply during the period north of Cape Lookout. The size composition of the catches shifted towards smaller fish which were primarily age 1 and 2. Large weakfish age 4 and older became increasingly rare in the catches. Growth overfishing was clearly a factor.

Sink net landings and CPUEs of bluefish were comparatively high during the 1988-91 seasons as they became increasingly targeted due to declining weakfish catches. Landings during the period and since 1982-83 have fluctuated with no clear trend. The size and age composition of bluefish catches encompassed a broad range of sizes and ages (0-9) with no evidence of reduced availability due to overfishing.

Sink net catches and landings of Atlantic croaker were greatly reduced during the 1989-91 seasons. The size and age composition of the catches was compressed towards smaller and younger fish, with age 1 dominating the catches, and age 3+ fish becoming increasingly rare, suggesting growth overfishing has occurred.

The Outer Banks sink net fishery continued to dominate ocean gill net landings, although the dominance has declined in recent seasons due to declining weakfish catches. The decline in weakfish catches necessitated a gradual shift in effort to bluefish which remained regionally abundant. Due to moderate winters and shifting concentrations of weakfish and bluefish, fishing effort the Outer Banks fleet was increasingly concentrated north, rather than south of Cape Hatteras.

TABLE OF CONTENTS

INTRODUCTION

The sink (or drop) net fishery is a multispecies gill net fishery that harvests fish off North Carolina from November through April. The primary species targeted by this fishery are weakfish (*Cynoscion regalis*), bluefish (*Pomatomus saltatrix*) and Atlantic croaker (*Micropogonias undulatus*). Fishing grounds extend from the Virginia/North Carolina line to Beaufort Inlet (Figure 1). Most of the weakfish and croaker are caught in 5-20 fathoms, whereas bluefish are caught from the beach out to 40 fathoms.

Gill nets fished in the ocean produced 16-24% of the edible finfish (3,547-6,691 mt) landed in North Carolina during the 1987-91 fishing season. This included 30-50% of the weakfish, 48-68% of the bluefish, and 12-36% of the Atlantic croaker landed annually in the state. Anchored gill nets fished in the ocean are included with sink net landings in the category ocean fished gill nets. In recent years, sink nets have produced more finfish, particularly weakfish and bluefish, than anchored gill nets.

Sink net catches are landed in ports from Wanchese to Morehead City-Beaufort. Most of the vessels fish from the villages of Wanchese, Hatteras, Harkers Island and Beaufort and depart out of Oregon, Hatteras, Bardens and Beaufort Inlets respectively. Anchored gill net fishing occurs in ports west of Morehead City to Cape Fear and thus landings can be roughly separated by the respective counties.

Fishing grounds utilized by the sink net fleet ranged from north of Oregon Inlet to off Bogue Inlet. Vessels fishing out of Oregon Inlet targeted weakfish and croaker primarily around Avon Rocks, secondarily around Wimble Shoals, and in depths ranging from 5-27 meters. Vessels looking for bluefish covered a much broader area, including from just off Hatteras Island beaches to Wimble Shoals, up to 18 miles offshore of Oregon Inlet, and as far north and offshore as the Cigar, covering depths from 2 to 75 meters. Vessels out of Hatteras Inlet fished for weakfish, bluefish and croaker in depths of 3-27 meters primarily in the Hatteras Bight, but frequently as far north as Avon Rocks and south to Ocracoke Inlet. Vessels from Bardens and Beaufort Inlets fished for weakfish, croaker and spot (*Leiostomus xanthurus*) from Drum Inlet south to Cape Lookout shoals and west to Bogue Inlet in depths of 7-16 meters.

A review of the history of the sink net fleet, vessel and gear types and a description of day to day fishing operations were discussed by Ross (1989). These aspects have not changed significantly through the spring of 1991.

The North Carolina Division of Marine Fisheries (DMF) initiated a statewide sampling program covering the dominant commercial finfisheries in 1982. The objective was to obtain biological and fisheries data on economically important fishes for use in reaching management decisions. The objectives of this report are to present the species composition, relative abundance, distribution, seasonality of 1987-91 sink net catches Catch-per-unit-effort, age/size composition of the catches, and landings data are presented and compared with species and fishery specific data from the 1982-87 fishing seasons.

METHODS AND MATERIALS

Sink net fishery catches were sampled monthly and analyzed on a seasonal basis (December through April) from 1987 through 1991. Anchored gill net catches were sampled from September through April. Samples were taken at fish packing houses while the catches were being offloaded. For all gear types, captain or crew members were interviewed, when available, to obtain information including: area and depth fished, days at sea, and gear(s) used including mesh size and length of gill nets. Two or more sink net catches were sampled each week when available.

To insure adequate coverage of all sizes and species in the catches, stratified random samples of culled catches were taken. This process involved randomly sampling one or more 50 lb (22.7 kg) cartons of each species' market category or grade (small, medium, large, jumbo, etc.). More cartons of the larger grades were sampled since they contained fewer fish. Each sample was weighed to the nearest 0.1 kg, individual fish measured to the nearest millimeter (FL or TL), and the total number of fish recorded. If the individuals in a carton were too numerous to measure, at least 30 were measured, and the remainder counted. The total catch weight of each market category for each species was obtained from the fish dealer's records.

In cases where the weight of a particular species' market grades were included on the trip ticket, but were not sampled, an estimate of the number of fish landed for the grade was made using mean weight/individual from a sample of that species and grade from another recent catch from the same area.

Total length-frequencies for each catch were derived by expanding the sample length-frequencies for each market category (grade) by an expansion factor to represent the species market grade weight. Species market grade weight was obtained from trip tickets and species length-frequencies were a combination of those expanded for the respective species market grades. Species numerical abundance/catch was calculated similarly by determining the number of individuals/market grade and then summing all market grades/species.

Sink net catches were analyzed by "fishing seasons," that is, December 1987-April 1988 (1988-89), December 1988-April 1989 (1989-90), December 1989-April 1990 (1989-90) and December 1990-April 1991 (1990-91).

Average catches and landings were determined for trend analysis. Average catch(kg)/trip (CPUE) was defined as the total catch/species/one day trip; a trip may consist of one or more gill net sets. CPUE trend analyses were based on catches north of Cape Lookout, since sampling of catches west of Lookout was inconsistent and the sample size small. This followed analyses for the 1982-87 fishing seasons (Ross 1989). Landings refer to commercial landings (kg) derived from the North Carolina General Canvas Data File compiled through the DMF and the National Marine Fisheries Service (NMFS) cooperative data collection program.

To better define trends in CPUE for weakfish, bluefish, and croaker, CPUE analyses were partitioned by mesh size used by the commercial fishermen. 'Big mesh' refers to sink nets of 5.0-6.0 inch stretched mesh, which were used for large bluefish and weakfish (sow trout). 'Small mesh' refers to sink nets of <=4.0 inch stretched mesh, which were used for weakfish, croaker and small and medium bluefish.

Scale samples from weakfish, Atlantic croaker, and bluefish (30-60 individuals/species) were taken monthly when available and represented the entire size range of individuals captured. Both length (mm, FL or TL) and weight (kg) data were taken for each fish sampled. Aging was done using criteria for determining annuli given by Wilk (1977) for bluefish, Ross (1988) for croaker, and Massman (1963), Merriner (1973) and Hawkins (1988) for weakfish. Species-specific semi-annual or quarterly age-length keys were developed and merged with expanded length-frequency data to produce the overall annual age composition.

Weakfish age-length data from January 1982 to December 1983 were pooled and integrated into 1982-86 seasonal length frequency data. Weakfish aging data for September 1988-April 1991 were pooled and merged with 1988-91 seasonal length frequency data. Aging data from the two periods (1982-83 and 1988-91) were pooled and merged with 1986-88 seasonal length frequency data. The age-length keys were partitioned for winter (October through March) and summer (April through September).

Bluefish seasonal age-length keys were developed by pooling all fish aged from oceanic waters/fisheries during September through April, and merged with the respective season's length frequency data.

Atlantic croaker age-length data for 1979-82 were pooled and integrated into 1982-86 seasonal length frequency data. Age-length data for 1988-91 were integrated into 1988-91 seasonal length frequency data. Aging data from the two periods (1979-82 and 1988-91) were pooled and integrated into 1986-88 seasonal length frequency data. Quarterly keys were used with the monthly groupings: December-March, April-June, July-September, and October-November (Ross 1988).

RESULTS AND DISCUSSION

Overall Seasonal Catch Composition

A total of 81 sink net catches was sampled between December 1987 and April 1988, of which 65% (n=53) were from Cape Lookout to Cape Hatteras (Table 1). Catches ranged from 92 to 7,000 kg and averaged 1,657 kg/trip. Weakfish and bluefish accounted for 91% of the weight, and weakfish and croaker for 90% of the number, of fish in the catches sampled (Table 2a).

A total of 107 sink net catches was sampled October 1988 to April 1989, of which 43% were from north of Cape Hatteras and 33% from west of Cape Lookout (Table 1). Catches ranged from 15 to 5,946 kg and averaged 1,420 kg/trip. Weakfish and bluefish accounted for 87% of the weight, and weakfish and croaker for 86% of the number, of fish in the catches sampled (Table 2b).

A total of 71 sink net catches was sampled from October 1989 to April 1990, of which 86% were from catches north of Cape Hatteras (Table 1). Catches ranged from 33 to 7,544 kg and averaged 1,784 kg/trip. Bluefish and weakfish accounted for 98% of the weight, and 93% of the number, of fish in the catches sampled (Table 2c).

A total of 103 sink net catches was sampled from December 1990 through April 1991, of which 49% were catches from north of Cape Hatteras (Table 1). Catches ranged from 14 to 6,078 kg and averaged 948 kg/trip. Bluefish and weakfish accounted for 89% of the weight, and 82% of the number, of fish in the catches sampled (Table 2d.)

Trends in Overall Seasonal Catch Composition

Weakfish was the dominant species in sink net catches during the 1987-89 seasons as they were during 1983-87 (Ross 1989). However, bluefish became the dominant species in catches sampled during the 1989-91 seasons and in overall fisheries landings during 1990-91 (Appendix A). Reductions in availability of weakfish, evidenced by reduced CPUEs, forced the sink net fleet fishing north of Cape Lookout to increase effort on large bluefish. Nevertheless, bluefish and weakfish were the dominant species by weight (86-99% seasonally) throughout the nine seasons the fishery has been sampled. Croaker was the next most important species by weight (0.1-8%) during most seasons, and in seven of nine seasons were the second or third most numerous species in the catches sampled. Spot (*Leiostomus xanthurus*), little tunny (*Euthynnus alleteratus*), butterfish (*Peprilus triacanthus*), menhaden (*Brevoortia tyrannus*) and kingfishes (*Menticirrhus* spp.) have remained common incidental species throughout, but always accounted for less than 2% of the weight.

Sink Net Catches by Area Fished

Catches north of Cape Hatteras during the 1987-91 seasons were predominantly (86-99% seasonally) weakfish and bluefish although notable changes in relative abundance occurred (Table 3). Weakfish dominated (62%) and croaker were an important component during the 1987-88. During the next three seasons, the relative abundance of bluefish increased due primarily to reduced catches of weakfish, while croaker virtually disappeared from sink net catches. Seasonally, total catch weights north of Cape Hatteras averaged 1,293 kg/trip (1990-91) to 2,319 kg/trip (1988-89) and ranged from 10 to 7,544 kg (Table 1).

Catches between Cape Hatteras and Lookout during the 1987-91 fishing seasons were predominantly (75-99% seasonally) of weakfish and bluefish but changes in relative abundance occurred in these waters as well (Table 3). Weakfish declined from 58% (1987-88) to only 10% (1990-91) of the catches while bluefish increased from 32-36% (1987-89) to 83-87% (1989-91). Reduced CPUEs of weakfish drove this trend (Table 3). The relative abundance of croaker also declined due to reduced CPUEs. Seasonally, individual catches between Cape Hatteras and Cape Lookout averaged 883 kg/trip (1990-91) to 2,388 kg/trip (1989-90) and ranged from 15 to 7,000 kg

Catches from west of Cape Lookout were sampled with some regularity during 1987-88 and 1990-91 (Table 3). Croaker, weakfish, spot, and menhaden accounted for 88% and 85% of the catches during the respective seasons. Seasonally, individual catches averaged 390-464 kg/trip and ranged from 14 to 3,840 kg.

Comparisons of Sink Net Catches by Area Fished between Seasons

Sink net catches north of Hatteras and between Hatteras and Lookout were very similar during the 1987-91 fishing seasons (Table 3). Weakfish during the 1987-89 seasons and bluefish during the 1989-91 seasons dominated catches in both areas. Catch/trip for weakfish declined precipitously in both areas. Croaker catches declined in both areas, and little tunny was the dominant incidental species by weight in the overall catches. Seasonal mean total catch weights were similar, with catches north of Hatteras averaging 1,293-2,319 kg/trip and catches between Hatteras and Lookout averaging 883-2,388 kg/trip.

Fishing effort has gradually shifted in waters north of Cape Hatteras during the last eight fishing seasons. Sampling since 1983 approximated sink net fishing effort in waters north of Cape Lookout (Table 1). Based on the percent of catches sampled seasonally during 1983-90 (7% to 13% to 17% to 22% to 34% to 35% to 64% to 87%), effort north of Cape Hatteras increased, and remained high (66%) in 1990-91. There may be some sampling bias, but the trend was real, corresponded with personal observations, and related to several factors. Fishermen attributed milder winters and more moderate water temperatures to weakfish remaining in waters north of Cape Hatteras rather than migrating into the Hatteras Bight. The reduced abundance of weakfish may also be a factor; during 1990-91 the only fishable concentration remained around the shelter of Avon Rocks. Whereas during 1983-87 most of the fleet spent January to March fishing out of Hatteras Inlet on weakfish wintering in the Hatteras Bight, recently more have fished out of Oregon Inlet, or from Hatteras Inlet but crossing Diamond Shoals to fish Avon Rocks. Reduced weakfish CPUEs led to increased effort on bluefish north of Cape Hatteras. Bluefish concentrations have also shifted further offshore and to more northern waters in recent years, with good catches occurring throughout the winter as far north as the Cigar.

Although infrequently sampled, sink net catches west of Cape Lookout were different in terms of relative abundance of dominant species and overall catch size (Tables 1 and 3). As in northern waters, weakfish was the dominant species (30-40%). However, croaker (26-37%) replaced bluefish (1-3%) as the other dominant species and spot was more prevalent in southern catches. Menhaden was prevalent in southern catches; they regularly occurred in catches north of Cape Lookout, but were typically discarded at sea. Total catch weights were much smaller west (390-465 kg/trip) than in either area north of Cape Lookout.

<u>Spatial-Temporal Patterns in Sink Net Catches</u>

Sink net catches north of Cape Hatteras during 1987-91 showed no recurring temporal pattern between seasons in species catch composition or CPUEs (Table 4). Weakfish and bluefish were relatively abundant in catches during each particular month at least two or three of the four seasons and the dominant species during each month (except January for bluefish) during at least two of the seasons. CPUEs for both species exhibited no consistent monthly pattern over the four seasons, with species specific peak CPUEs occurring during virtually every month through the four seasons. The relative abundance of croaker was greatest during March and April but they never dominated catches.

Sink net catches between Cape Hatteras and Cape Lookout during 1987-91 seasons also showed no clear pattern between seasons in species catch composition or CPUEs (Table 4). Weakfish and bluefish were the dominant species, and croaker were relatively abundant in the catches sampled during each month (December-March) at least one of the four seasons. CPUEs of weakfish were relatively large during December through April during the 1987-88 season, after which largest mean CPUEs/month occurred either in January or February but were progressively smaller during succeeding years. Large catches of bluefish occurred during December-February and April, while croaker catches were largest during December and March, and much smaller during the last two seasons.

Whereas spatial-temporal patterns in sink net fishing seemed in a state of flux during 1987-91, patterns in fishing activity and catches were predictable and recurrent seasonally during 1982-87 (Ross 1989). Most fishing effort was concentrated south of Cape Hatteras from December through March. Weakfish were initially harvested south of Cape Hatteras during December although in later years (1985-87) they were also harvested north of Hatteras through early January. The fleet most often targeted weakfish, which were more dominant in small mesh gill net catches, and CPUEs largest south of Hatteras from January through March or April. Effort shifted north of Hatteras following migrating weakfish in April. Sink netting for bluefish occurred from Oregon Inlet to Cape Hatteras during December, south of Hatteras from December through March, and north of Hatteras again in March and April.

During the last four fishing seasons, the species composition of sink net catches has not changed, but bluefish became increasingly dominant both north and south of Cape Hatteras. Fishing effort has gradually shifted from south to north of Cape Hatteras compared to the 1982-87 seasons. Paralleling annual species catch composition, monthly catches in both areas remained dominated by weakfish or bluefish, with sizable catches of Atlantic croaker during the beginning or end of several seasons. These generalizations characterized the fishery from 1982-87 as well, which would be expected since they were the targeted species, and croaker a common incidental component occasionally were targeted when concentrations were located.

West of Cape Lookout, catches were sampled to infrequently to discern any temporal trends. Spot were relatively abundant in October catches, croaker were relatively abundant in November, weakfish catches were largest during December and January, then croaker catches increased in January and February (Table 4).

Catch per unit effort data from north of Cape Lookout were the basis for the succeeding discussion on seasonal trends in abundance for weakfish, croaker and bluefish.

Weakfish CPUEs, Landings and Size/Age Composition

Sink net catches of weakfish during 1989-91 reversed a seven season trend of increasing catches. Mean CPUEs north of Cape Lookout during 1989-91 (331 and 319 kg/trip/season) were only 33% of the CPUEs for 1982-89 seasons (Table 5, Figure 2). CPUEs both north and south of Cape Hatteras during the 1989-91 seasons were dramatically lower than the 1987-89 seasons (Table 3) as well as from 1982-87 (Ross 1989). Monthly catches were also smaller than previous seasons (Table 4; Ross 1989). Catches south of Cape Hatteras during 1989-91 were smaller than north of Cape Hatteras, reflecting both reduced abundance and the more northern distribution of wintering weakfish. CPUEs west of Cape Lookout were less than north of Lookout, except during 1990-91 when they exceeded catches south of Cape Hatteras but were still less than half those north of Cape Hatteras (Table 6). Weakfish accounted for 47-63% of all sink net catches sampled north of Cape Lookout from 1983-89 but only 18-28% during 1989-91 (Table 5).

Weakfish CPUEs have declined dramatically in both large and small mesh sink nets employed by the fleet. In small mesh nets (2 1/2-4" stretched; the standard weakfish nets), CPUEs increased from 1982-83 through 1986-87, remained high through 1989-90 and then declined sharply (Tables 5 and 6; Figure 2). Catches in large mesh (5-6" stretched) sink nets, used only when targeting large weakfish (sow trout) and bluefish, were highest during 1982-84, fluctuated at reduced levels the next four seasons, and were non-existent in 1988-91 catches. CPUEs of weakfish in small mesh gill net north of Cape Lookout were much larger than west of Cape Lookout (Table 6).

Landings of weakfish by ocean gill nets in North Carolina, and particularly Dare County, declined sharply during the last three seasons (Figure 2 and 3, Appendix A). Ocean gill net landings had increased since 1982-83, peaked in 1987-88 (3,252 mt), and subsequently steadily declined. Landings during 1990-91 were only 45% of the 9-season mean and 26% of 1987-88 landings. Dare County sink net landings paralleled and essentially drove state ocean gill net landings of weakfish throughout the period (Figure 3). Dare County sink net landings during 1990-91 were only 27% of the 9-season mean and 14% of peak landings (1987-88). Carteret County sink net landings declined, but not as sharply as Dare County, while anchored gill net landings south of Bogue Inlet were higher during 1988-91 than the previous six seasons. Dare County sink nets produced 69-83% of the ocean gill net landings of weakfish from 1982-83 through 1988-89, but only 44% during 1990-91.

The size composition of weakfish in overall sink net catches was greatly compressed during 1990-91 compared with previous seasons. During 1987-90, the mean size of weakfish/season fell from 430 to 410 mm TL. Fish 350-550 mm TL (market grade=medium) made up 68-90% of the catches, fish >550 mm TL (market grade=large) made up 1.4-2.6%, and the largest fish/season was 762-865 mm TL (Figure 4, Appendix C). During 1990-91, the average length of weakfish was only 317 mm; fish 350-550 mm made up only 10% of the catch, fish >550 mm TL made up <0.1%, and the largest fish was 709 mm TL. Catches from 1983 to 1987 seasons were similar to 1987-90, with 59-73% of the fish 350-550 mm TL, mean fish length/season between 364-430 mm TL, and the largest fish/season 819-930 mm TL. Most dramatic was the fact that weakfish 201-350 mm TL (pan trout) accounted for 7-41% of the catches from 1982 to 1990 but 90% in 1990-91. These trends were particularly evident north of Cape Lookout (Appendix C).

The age composition of weakfish in sink net catches has become increasingly truncated towards smaller fish (Figure 5, Appendix F). The percent of age 1 fish in the catches increased from 7%-13% during 1987-88 to 40-49% during 1989-91. The relative abundance of age 3 and older fish concurrently declined from 39-44%

to 18% and 11% during last four seasons. During the 1990-91 season, the percent of age 1 fish was the highest while age 4 and older fish the lowest, compared with the previous eight seasons. The 1990-91 season was also the first season in which no weakfish older than age 4 were represented in the sampled catches.

Bluefish CPUEs, Landings and Size/Age Composition

Sink net catches of bluefish during 1988-91 were generally larger than previous seasons. Overall mean CPUEs north of Cape Lookout ranged from 541 kg/trip during 1987-88 to 1,448 kg/trip during 1989-90. Mean CPUE/season from 1988 to 1991 exceeded the 9-season mean, and 1989-90 CPUEs/season were the highest for the period (Table 5 and 6; Figure 6). Seasonally from 1987 to 1991, CPUEs ranged from 328 to 1,357 kg/trip north of Cape Hatteras and 355-2,065 kg/trip between Hatteras and Lookout (Table 3). Bluefish catches were much smaller (4-12 kg/trip) south of Cape Lookout (Table 3 and 6).

Catches of bluefish in small and large mesh sink nets north of Cape Lookout were high during 1990-91 (Table 5, Figure 6). CPUEs in small mesh nets since 1982-83 ranged from 48 to 325 kg/trip/season with no trend evident. Catches in large mesh nets during 1987-91 (2,820-3,424 kg/trip/season) consistently exceeded the 9-season mean. Catches during 1990-91 for both small and large mesh sink nets were the largest for the period, and reflected increased emphasis on bluefish as weakfish catches declined.

Landings of bluefish by ocean gill nets since 1982-83 have fluctuated with no trend evident. Overall landings ranged from 683 to 1,357 mt from 1987 to 1991, and three of the four seasons exceeded the nine season mean (953 mt) (Figure 7; Appendix B). Dare County sink net landings have accounted for 78-89% of the bluefish caught by ocean gill nets since 1982-83, thus driving trends in overall landings. Carteret County landings ranged from 27 to 118 mt and fluctuated with no trend, while landings south of Bogue Inlet increased from 17-40 mt/season during 1982-89 to 72-94 mt during 1989-91.

A broad size range of bluefish continued to be captured in sink nets north of Cape Lookout (Figure 8). Large fish were relatively more abundant in catches during 1987-90 than 1990-91, but seasonal differences may, in part, reflect sampling effort. Bluefish caught north of Cape Lookout during 1987-90 ranged from 197 to 856 mm FL and during 1990-91 from 175 to 828 mm FL. During 1987-90 large bluefish (>600 mm TL) accounted for 81-84% of the catches seasonally but only 16.3% in 1990-91. Bluefish 250-400 mm FL dominated (80%) catches during 1990-91, reflecting, in part, increased effort on small bluefish in lieu of reduced weakfish catches. Also, due to 'bans on biologists' by several fish houses in Wanchese, sampling effort was limited on catches of large bluefish, which occurred more frequently in waters north of Cape Hatteras by boats fishing out of Oregon Inlet. Overall, the size composition of bluefish caught north of Cape Lookout has generally remained consistent since 1982-83, with similar size range and modes throughout, and the greater percentage of large fish being captured north of Cape Hatteras (Appendix E).

A full range of age classes continued to be represented in sink net catches of bluefish during the last four seasons (Figure 9, Appendix F). Bluefish ranged from 0 to 9 years old during each season. Fish age 4-9 accounted for 77-83% of the 1987-90 catches, reflecting no decline in relative abundance compared with 1982-87 catches (50-66%). Ages 4-6 have been the dominant class of age 2-11 bluefish since 1982-83. During 1990-91, age 1 fish accounted for 74% of the fish sampled. This shift towards younger fish reflected by the increased catches of small bluefish south of Cape Hatteras and restricted sampling of catches of large bluefish (due to bans from sampling at Wanchese fish packing houses) and not reduced relative abundance of large bluefish.

Atlantic Croaker CPUEs, Landings and Size/Age Composition

Atlantic croaker catches in sink nets north of Cape Lookout, though comparatively small on a seasonal basis, were markedly reduced during 1989-91. CPUEs fell from 120 kg/trip/season during 1986-88 to less than 4 kg/trip during 1989-91 (Table 5, Figure 10). In small mesh gill nets, CPUEs during five of the six seasons from 1984 through 1990 exceeded 100 kg/trip, but were less than 4 kg/trip during 1989-91. Sizable catches of croaker, which usually occurred early or late in the season (Ross 1989), were virtually non-existent during the 1989-91 seasons (Table 4). Croaker were a more important component of catches west of Cape Lookout, where CPUEs ranged from 102 to 140 kg/trip in small mesh gill nets during 1988-89 and 1990-91 (Table 6).

Landings of croaker by ocean gill nets declined during the 1988-91 seasons (Figure 11, Appendix A). Landings were stable during 1984-88 but declined 70% in 1989-91. Sink net crews fishing west of Cape Lookout (Carteret County) dominated ocean gill net landings from 1982 to 1988 but produced only 18-25% of their nine-season mean in 1989-91, and only 32-36% of the total. Dare County sink nets produced 9-27% of the landings (115-199 mt/season) from 1984 to 1989 but only 4-6 mt/season during 1989-91 or less than 2% of the total. The only area where croaker landings were stable was south of Bogue Inlet. During 1989-91, landings (241 and 199 mt) peaked for the 9-season period, and the area became the dominant (65-70%) producer of ocean gill net landings (Figure 11).

Coincident with reduced catches and landings, the size composition of croaker captured in sink nets during 1989-91 was compressed towards smaller size classes (Figure 12). Compared with 1987-89 catches, the size range of croaker fell from 216-395 mm TL to 191-310 mm, and the mean size/season from 287-290 mm TL to 240-248 mm TL. Whereas 88-91% were 251-325 mm TL during 1987-89, 96-97% were 201-275 mm TL during 1989-91. The larger croaker captured during 1987-89 were comparable to the fish from 1982 to 1987 which ranged from 211 to 405 mm TL, averaged 270-302 mm TL seasonally, and except for one season, >90% were larger than 250 mm TL (Appendix G, Ross 1989).

The age composition of Atlantic croaker in sink net catches during 1989-91 shifted towards younger fish compared with earlier seasons (Figure 13). Age 0 and 1 fish accounted for 91-98% of 1989-91 catches whereas age 2 and 3 fish dominated catches during 1987-89 (80-84%). The relative abundance of age 1 croaker during 1989-91 was much higher (63-83%) than any of the previous seven seasons. Age 3 croaker comprises 15-37% of the 1982-89 catches, but only 2-10% in 1989-91 fish. Age 4 and 5 croaker were not present in catches sampled during 1990-91 as they had been through 1989 (Appendix H).

<u>Anchored Gill Net Catches South of Bogue Inlet to Cape Fear</u>

Twenty anchored gill net catches were sampled from December 1986 through January 1990 from the months of December through May (Table 7). Fishing occurred off New River during 1986-88 seasons and between Masonboro Inlet and Carolina Beach during the 1989-91 seasons. The nets were left overnight and fished once a day. Crews used between 61 m (200 ft) and 1097 m (3600 ft) of 2.5-2.75 in stretched mesh gill nets and fished in 9-15 meters.

Unlike sink net catches north of Cape Lookout which were clearly dominated by weakfish and less frequently by bluefish, anchored gill nets between Bogue Inlet and Carolina beach produced a more even mix of species. Weakfish accounted for the largest component of the catches sampled each year, but except for 1987-88 when only 2 catches were sampled, made up only 24-28% of the catches (Table 8). During at least one of the seasons, bluefish, northern (*Menticirrhus saxatilis*) and southern kingfish (*M. americanus*--sea mullet), croaker, and spot accounted for greater than 10% of the catches. Only during 1987-88 did any one species comprise greater than 30% of the catches.

SUMMARY

The Outer Banks sink net fishery has gone from a growth and boom phase during the late 1970s through the late 1980s to sharp declines in landings and participation during the 1989-91 fishing seasons. After ten years of increasing total landings of finfish by ocean gill nets, annual landings declined during 1988-91 net and anchored gill net catches, the increased annual landings from 1979 through 1988 were driven by sink net landings from Dare and secondarily Carteret counties (Appendix I). Dare County landings increased from 3 mt in 1977 to 4,023 mt in 1988 and from 3% to 65% of the state's ocean gill net landings. Annual landings have since declined nearly 50% to 2,100 mt (53% of the landings) in 1991. Carteret County ocean gill net landings, which were primarily from sink nets, were much higher from 1984 to 1988 (1,389-2,324 mt annually) than from 1989 to 1991 (354-809 mt). Dare and Carteret counties together accounted for 89-100% of the reported ocean gill net landings in North Carolina from 1972 to 1988 but only 67-70% during 1990-91. Anchored gill net landings in ports south of Bogue Inlet have increased from 4 mt in 1979 to 1,200 mt in 1991 and produced 20-30% of the ocean gill net landings in 1989-91.

Although shifts in landings occurred recently, Dare County and the waters north of Cape Lookout remained the dominant producers of ocean-caught gill net fish in North Carolina (Figure 14, Appendix I). The emphasis of sampling effort and ultimately comparative trends in species-specific CPUEs for the ocean gill net fisheries was thus on vessels fishing out of Oregon and Hatteras Inlets. This was due to their dominance in landings and the fact that the fleet fished every day, weather permitting, from December through mid-April.

Sink net landings of weakfish have declined and paralleled trends along the Atlantic coast (Figure 15). North Carolina ocean gill net landings and winter trawl landings in 1991 were the lowest since 1971 and 1969 respectively. Weakfish landings along the east coast during 1990 were the lowest since 1970. Nevertheless, the sink net fishery continued to be the primary producer of weakfish along the east coast, accounting for 12-20% from 1983 to 1985, 28-35% from 1986 to 1989, and 23% in 1990. The Hatteras/Oregon Inlet sink net fleet fishing north of Cape Lookout continued to dominate ocean gill net landings of weakfish but also suffered the greatest decline in landings during the 1989-91 seasons.

Trends in CPUE and size/age composition of the catches indicated growth overfishing has occurred on the weakfish population. CPUEs of large weakfish were highest in 1982-84, intermediate from 1984 to 1988, and essentially non-existent from 1988 to 1991. CPUEs of weakfish in small mesh nets, after high catches from 1985 to 1989, declined dramatically during the 1989-91 seasons. The age and size composition of the catches since 1982 verify the disappearance of very old, large weakfish ("sow trout") in recent years, and the compression of the age and size composition of the catches to small, young weakfish ("pan trout") during 1990-91.

The recent ASMFC stock assessment of weakfish indicated the species was overfished (Vaughan et al. 1991). Trends in catches of weakfish by the sink net fishery, particularly reduced CPUEs and compressed size/age composition of the catches, confirm their findings for the east coast. To reduce current fishing mortality levels to facilitate the rebuilding of the stock, the ASMFC management plan calls for states to implement size limits and controls on fishing effort.

Sink net landings of bluefish have steadily increased since 1980 and were a large component of both North Carolina and the entire east coast's landings (Figure 16). Ocean gill net landings of bluefish, which were less than 80 mt during the 1960s and 1970s, have ranged from 881 to 1,455 mt from 1987 through 1991. Ocean gill nets produced 51-70% of the bluefish landed in North Carolina during those five years, with Dare County generally accounting for more than 80% and sink nets more than 90%. North Carolina ocean gill nets produced 16-21% of the east coast commercial landings of bluefish from 1987 to 1989 and 24% in 1990.

Recent stock assessment of bluefish found the stock to be fully exploited (MAFMC 1989, NEFC 1991). There was no evidence of declining stock size based on sink net catches in recent years. Trends in CPUEs and the size/age composition of bluefish catches by sink nets in North Carolina indicate the stock's population was comparatively stable. CPUEs have shown no sign of persistent decline, even with recent increases in fishing effort. Catches continued to contain the full range of sizes and ages of bluefish represented in catches since 1982.

Nearly all major components of commercial landings of croaker have declined in recent years. Atlantic coast annual landings of croaker have been dominated by North Carolina landings since the early 1960s> Annual North Carolina landings in 1991 were the lowest since 1971 (Figure 17). Seasonal landings of Atlantic croaker by ocean gill nets, trawlers, and pound nets were all lower during the 1990-91 season than any of the previous nine fishing seasons, although long haul landings increased during 1989 and 1990 (Appendix A).

Ocean gill net landings of croaker fell from the highest to the lowest seasonal totals between 1987-88 and 1990-91 since the 1982-83 season (Appendix A, Figure 11). Croaker had dominated Carteret County sink net catches which had been the greatest producer of croaker; the decline there was most dramatic. Croaker became virtually insignificant in Dare County landings. Only in anchored gill net catches west of Bogue Inlet did landings increase during the last four seasons.

Croaker have been growth overfished and may be showing signs of failure as well. CPUEs in sink net as well as winter trawl (Ross 1992) catches have declined and size frequency distributions of catches were compressed towards smaller, younger fish noted in sink net catches were also observed in trawl occurring since juvenile croaker CPUEs having declined since 1987, and 1991 CPUEs were the lowest recorded for the 1979-91 sampling period. However, since croaker are short-lived species with historical fluctuations in abundance,r educed recruitment indices could be due to natural causes or cyclical fluctuation in abundance.

MANAGEMENT IMPLICATIONS AND RECOMMENDATIONS

Declining catches and compressed size composition of weakfish and Atlantic croaker evidenced in sink net catches corresponded with trends observed in North Carolina as well as other east coast fisheries (Vaughan et al. 1991; Mercer 1989). Growth overfishing was clearly evidenced and management regulations are needed to stabilize these two stocks and increase yield from all fisheries.

Management plans exist for bluefish, weakfish, and Atlantic croaker. The bluefish stock has been assessed to be fully exploited (MAFMC 1989). Since commercial catches have been relatively stable, no restrictions on commercial fishing have been imposed. The croaker FMP recommended research needs and ways to increase yield per recruit and stock stability, but no regulations were required nor instituted by the Atlantic coast states (Mercer 1989). Weakfish have been assessed to be overfished (Vaughan et al. 1991). The FMP amendment recommended size limits to reduce the harvest of small weakfish, and reductions in effort to reduce the rate of fishing mortality on fully recruited ages.

The imposition of size limits on the entire weakfish fishery will be most effective on the sink net fleet in terms of escapement of undersized weakfish. Gill nets are implicitly a very size selective gear. Since all fish are handled, undersized fish are quickly released and generally in survivable shape (at least 75% based on personal observation) due to the cold water temperatures and minimal damage to the fish. Less selective gears such as long hauls and trawls will have higher release mortalities.

Whereas mesh size restrictions or gear modifications may be necessary for some fisheries to ensure the escapement of undersized weakfish before they are boated, they may not be necessary for the sink net fishery. With specified size limits, the sink net fleet will select mesh sizes that exclude undersized weakfish to reduce excessive work picking fish that cannot be marketed. The sink net fleet has historically produced virtually no marketable-size weakfish that were discarded or sold as crab bait compared with other North Carolina fisheries (Ross and Moye 1989). However, since the sink net fleet also targets other species when the opportunity arises, management regulations must allow the fishermen some flexibility to harvest sea mullet (Menticirrhus spp.), spot, bluefish, dogfish (Squalus acanthias), croaker, and others when available.

Management options currently being considered include periodic closures to limit fishing effort. However, this may have already been accomplished by the fleet. An enumeration of ocean gill netters participating in the weakfish, dogfish, and bluefish fisheries was done by Captains Jeff Oden and Rom Whitaker, Hatteras, North Carolina, in May 1992 (Pers. commun.). Whereas 74-75 Hatteras vessels fished for weakfish during the 1988-89 and 1989-90 seasons, only 55 and 27 vessels fished for weakfish during the 1990-91 and 1991-92 seasons. Due to the declining weakfish catches, crews left the fishery to fish for bluefish, king mackerel, tuna, or dogfish. During the 1991-92 season, a number of sink net crews made commitments to harvest dogfish off the Outer Banks. Since this market has been established, it should insure the fisheries continuation in the near future. In turn, this will ensure that fishing effort directed at weakfish will be reduced from the levels found during the late 1980s.

The ASMFC FMP objective to reduce sink net fishing effort on weakfish stocks has already been accomplished by the shifting of a large percentage of vessels into alternative fisheries. As long as this shift to alternative fisheries persists, with its accompanying reduction in fishing effort, no further regulation, such as temporal closures, should be necessary. However, the level of participation in these fisheries should be monitored to determine if future shifting back into the weakfish fishery occurs.

Before imposing temporal closures on sink net and other fishing fleets, gear modification/selectivity work should be completed for less selective gears such as trawls, long hauls, and pound nets. Reduction in the catch of undersized fish through modification in the non-selective fisheries offers significant opportunity for increased escapement of fish to maturity, will increase yield per recruit of marketably more valuable fish, and may be sufficient to stabilize and rebuild the weakfish stock. The impacts and contribution to the spawning stock should be assessed after several years of implementation and effective enforcement of regulations for gear modifications.

There will also be secondary effects on other species as a result of reduced weakfish catches and recently imposed management regulations. Due to declining catches of weakfish, which was the mainstay of the 100 vessel Dare County sink net fleet during the late 1980s, there has been and will continue to be increased effort on bluefish. However, due to the market's inability to handle continuous large volumes of bluefish, it is unlikely that landings will increase dramatically. Atlantic croaker should benefit by the weakfish regulations, since fishermen targeting legal sized weakfish will employ larger mesh nets to reduce excessive picking of small weakfish, and thus reduce the number of small croaker captured incidentally.

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Table 1. Monthly summary of sampling of sink nets during December 1987 through April 1991, by area fished (N = north of Cape Hatteras; C [central] = Cape Hatteras to Cape Lookout; S [south] = west of Cape Lookout; n = number of catches sampled).

				Catch weight (kg)		Sample weight (kg)	
Season	Month	Area	n	Mean	Range	Mean	Range
1987-88	Dec	N	8	1,969.3	1,326-2,730	139.0	94-184
		C	10	1,140.7	92-2,807	98.8	19-208
	Jan	N	2	693.3	354-1,033	102.0	91-113
		C	9	2,110.1	272-4,639	156.0	68-224
	Feb	N	5	1,899.0	158-3,288	209.8	170-249
		C	9	2,823.0	1,155-7,000	212.2	136-310
	Mar	N	5	661.1	356-1,136	166.8	68-298
		C	21	1,470.1	301-4,129	135.1	42-239
	Apr	N	8	956.6	313-3,298	94.9	47-182
		C	4	2,491.4	766-5,906	162.2	91-322
Total		N	28	1,342.6	158-3,288		
		C	53	1,823.5	92-7,000		
		Overall	81	1,657.3	92-7,000		
1988-89	Oct	S	7	376.9	167-1,096	78.9	66-106
	Nov	S	4	268.1	133- 366	58.3	57- 59
	Dec	N	11	2,086.5	182-5,460	177.7	51-454
		C	2	529.3	302- 756	60.8	0-121
		S	7	203.3	82- 429	69.8	54- 99
	Jan	N	15	1,899.7	370-4,642	133.9	45-223
		C	4	2,029.0	812-3,299	159.5	68-230
		S	12	807.9	59-3,840	-	-
	Feb	N	11	2,699.8	665-5,946	251.0	124-378
		C	13	1,101.3	288-2,024	105.1	38-260
		S	5	286.1	15- 674	42.1	15- 75
	Mar	N	6	2,378.5	717-4,239	178.2	181-275
		C	7	782.6	106-1,250	102.2	52-212
	Apr	N	3	3,760.3	2,222-4,699	356.9	181-275
Total		N	46	2,319.4	182-5,946		
		C	26	1,114.2	106-3,299		
		S	35	464.5	15-3,840		
		Overall	107	1,419.8	15-5,946		

Table 1. (Continued).

Season	Month	Area	n	Catch weight (kg) Mean	Catch weight (kg) Range	Sample weight (kg) Mean	Sample weight (kg) Range
1989-90	Oct	S	1	411.4	-	68.2	
	Nov	N	2	1,830.7	1,548-2,113	120.7	0-241
	Dec	N	3	4,007.4	682-7,544	369.1	147-554
		C	7	2,905.9	723-5,481	232.1	0-555
	Jan	N	22	827.2	130-2,998	128.2	0-323
		C	1	465.4		83.1	
	Feb	N	13	1,678.8	14-5,029	104.0	0-414
	Mar	N	17	2,399.6	33-5,779	181.8	0-454
		C	1	685.4	-	95.7	-
	Apr	N	4	2,073.5	625-5,264	230.5	181-272
Total		N	61	1,717.9	33-7,544		
		C	9	2,388.0	465-5,481		
		S	1	411.4	-		
		Overall	71	1,784.4	33-7,544		
1990-91	Dec	N	9	2,906.0	114-6,078	302.4	32-544
		C	6	856.8	124-2,860	55.4	23- 71
		S	11	263.9	18- 774	84.6	45-192
	Jan	N	12	420.3	10-1,546	54.0	9-101
		C	4	3,056.6	589-4,813	84.2	68-100
		S	17	471.3	14-1,116	60.7	3-186
	Feb	N	10	692.0	238-1,094	77.9	41- 98
		C	10	211.3	15- 446	54.9	15- 68
	Mar	N	14	1,613.5	502-5,532	123.7	45-466
		C	5	519.1	207- 830	71.0	59- 85
	Apr	N	5	788.7	65-1,470	54.1	43- 62
Total		N	50	1,293.0	10-6,078		
		C	25	883.1	15-4,813		
		S	28	389.8	14-1,116		
		Overall	103	948.0	10-6,078		

Table 2. Species composition of sink net catches sampled from December 1987 through April 1991; n=number of catches sampled; Obs = species observed in catches but not occurring in samples.

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
a) 1987-88 (n=81)						
Cynoscion regalis	976.2	58.88	1,207	65.94	0.809	92.6
Pomatomus saltatrix	540.9	32.62	156	8.51	3.471	70.4
Micropogonias undulatus	119.8	7.23	446	24.35	0.269	64.2
Euthynnus alletteratus	16.0	0.97	3	0.18	4.779	40.7
Peprilus triacanthus	1.4	0.09	14	0.77	0.100	54.3
Carcharhinus spp.	0.6	0.03				2.5
Leiostomus xanthurus	0.5	0.03	3	0.15	0.185	21.0
Alopias vulpinus	0.4	0.02	<1	<0.01	15.400	2.5
Isurus oxyrinchus	0.3	0.02	<1	<0.01	27.200	1.2
Cynoscion nebulosus	0.3	0.02	<1	0.01	1.252	9.9
Menticirrhus americanus	0.3	0.02	1	0.03	0.480	21.0
Scomberomorus cavalla	0.2	0.01				1.2
Mustelus canis	0.2	0.01				6.2
Alosa sapidissima	0.2	0.01	<1	<0.01	2.112	11.1
Menticirrhus spp.	0.2	0.01	<1	0.01	0.493	11.1
Alosa mediocris	0.1	0.01	<1	0.02	3.025	12.3
Sphyrnidae	0.1	0.01	<1	<0.01	11.800	1.2
Lophius americanus	0.1	0.01	<1	<0.01	1.233	4.9
Acipenser oxyrhynchus	0.1	<0.01	<1	<0.01	5.000	1.2
Urophycis regia	<0.1	<0.01	<1	<0.01	0.232	2.5
Alosa spp.	<0.1	<0.01				2.5
Paralichthys dentatus	<0.1	<0.01	<1	<0.01	0.333	2.5
Centropristis striata	<0.1	<0.01				1.2
Alosa aestivalis	<0.1	<0.01	<1	<0.01	0.167	1.2
Urophycis spp.	<0.1	<0.01	<1	<0.01	0.500	1.2
Pogonias cromis	<0.1	<0.01	<1	<0.01	0.500	1.2
Paralichthys spp.	<0.1	<0.01	<1	<0.01	0.250	1.2
Brevoortia tyrannus	Obs					
b) 1988-89 (n=107)						
Cynoscion regalis	719.7	50.82	921	56.79	0.781	79.0
Pomatomus saltatrix	518.5	36.62	153	9.44	3.381	49.0
Micropogonias undulatus	116.1	8.20	466	28.73	0.249	54.0
Brevoortia tyrannus	20.3	1.43				20.0
Euthynnus alletteratus	12.2	0.86	3	0.19	3.651	33.0
Leiostomus xanthurus	10.4	0.73	53	3.27	0.195	13.0
Clupeidae	4.1	0.29				1.0
Carcharhinidae	3.8	0.27	<1	0.01	55.843	4.0
Scomberomorus maculatus	2.7	0.19	4	0.25	0.594	7.0
Menticirrhus spp.	2.2	0.15	4	0.25	0.547	17.0
Peprilus triacanthus	1.8	0.13	14	0.87	0.128	34.0
Menticirrhus americanus	1.4	0.10	3	0.19	0.414	8.0
Unidentified fish	1.3	0.09				3.0
Cynoscion nebulosus	0.7	0.05	1	0.07	0.818	21.0
Scomberomorus cavalla	0.2	0.02	<1	0.01	3.850	2.0
Alosa sapidissima	0.1	0.01	<1	0.01	1.067	4.0
Lophius americanus	0.1	0.01	<1	0.01	6.800	3.0
Mugil cephalus	0.1	0.01	<1	0.01	0.922	1.0
Centropristis striata	0.1	0.01	<1	0.01	0.513	3.0
Menticirrhus littoralis	0.1	<0.01	<1	0.01	0.376	2.0
Menticirrhus saxatilis	0.1	<0.01	<1	0.01	0.432	6.0
Sciaenops ocellatus	<0.1	<0.01	<1	0.01	0.607	1.0
Orthopristis chrysoptera	<0.1	<0.01	<1	0.01	0.190	2.0
Urophycis spp.	<0.1	<0.01	<1	0.01	0.900	1.0
Alosa mediocris	<0.1	<0.01	<1	0.01	0.700	1.0
Paralichthys spp.	<0.1	<0.01	<1	0.01	0.500	2.0
Pollachius virens	<0.1	<0.01	<1	0.01	0.900	2.0
Caranx hippos	<0.1	<0.01	<1	0.01	0.500	1.0
Tautoga onitis	<0.1	<0.01	<1	0.01	0.500	1.0
Peprilus alepidotus	<0.1	<0.01	<1	<0.01	0.057	1.0
Mustelus canis	<0.1	<0.01	<1	<0.01	<0.001	3.0
Prionotus evolans	<0.1	<0.01	<1	<0.01	<0.001	1.0

Table 2. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
c) 1989-90 (n=71)						
Pomatomus saltatrix	1,428.1	80.04	393	41.76	3.636	76.1
Cynoscion regalis	326.9	18.32	486	51.67	0.673	54.9
Euthynnus alletteratus	8.1	0.45	2	0.22	3.836	18.3
Squalus acanthias	5.1	0.28				8.5
Leiostomus xanthurus	3.7	0.21	19	2.03	0.194	2.8
Squaliformes	3.4	0.29				7.0
Alosa mediocris	2.2	0.12	5	0.49	0.473	4.2
Micropogonias undulatus	1.9	0.11	13	1.33	0.155	7.0
Brevoortia tyrannus	1.5	0.08	8	0.89	0.177	8.5
Peprilus triacanthus	1.4	0.08	13	1.40	0.103	23.9
Bairdiella chrysoura	0.7	0.04	<1	0.01	7.722	1.4
Menticirrhus spp.	0.5	0.03	<1	0.03	1.655	4.2
Scomberomorus cavalla	0.1	0.01	<1	<0.01	3.167	1.4
Cynoscion nebulosus	0.1	0.01	<1	0.01	0.856	4.2
Menticirrhus americanus	0.1	0.01	<1	0.03	0.382	5.6
Alopias vulpinus	0.1	0.01				1.4
Alosa sapidissima	0.1	<0.01	<1	0.01	0.857	7.0
Orthopristis chrysoptera	0.1	<0.01	<1	0.01	1.080	1.4
Menticirrhus saxatilis	0.1	<0.01	<1	0.01	0.460	2.8
Rhizoprionodon terraenovae	0.1	<0.01	<1	0.01	0.760	1.4
Synodus foetens	0.1	<0.01	<1	0.01	0.740	1.4
Lophius americanus	0.1	<0.01	<1	<0.01	1.800	1.4
Scomber scombrus	<0.1	<0.01	<1	0.01	0.700	2.8
Tautoga onitis	<0.1	<0.01				1.4
Urophycis regia	<0.1	<0.01	<1	0.01	0.207	4.2
Centropristis striata	<0.1	<0.01	<1	0.01	0.233	1.4
Lagodon rhomboides	<0.1	<0.01	<1	0.01	0.098	2.8
Prionotus carolinus	<0.1	<0.01	<1	0.01	0.180	1.4
Arenaeus cribarius	<0.1	<0.01	<1	0.01	0.100	1.4
Callinectes sapidus	<0.1	<0.01	<1	0.01	0.120	1.4
Peprilus alepidotus	<0.1	<0.01	<1		0.050	1.4
d) 1990-91 (n=103)						
Pomatomus saltatrix	568.8	60.03	453	27.87	1,255	69.0
Cynoscion regalis	274.1	28.93	884	53.75	0.310	84.0
Micropogonias undulatus	29.8	3.15	171	5.73	0.174	48.0
Brevoortia tyrannus	16.9	1.78	76	4.47	0.222	22.0
Euthynnus alletteratus	16.7	1.76	3	0.22	5.059	36.0
Unidentified fish	7.0	0.74				7.0
Carcharhinidae	6.1	0.65				5.0
Leiostomus xanthurus	5.5	0.58	53	3.28	0.103	32.0
Menticirrhus americanus	5.5	0.58	19	1.25	0.282	37.0
Peprilus triacanthus	4.4	0.46	50	2.67	0.088	67.0
Squalus acanthias	4.1	0.43				8.0
Mustelus canis	2.7	0.29	<1	<0.01	<0.001	6.0
Menticirrhus spp.	1.9	0.20	4	0.25	0.556	24.0
Menticirrhus saxatilis	0.8	0.08	2	0.13	0.375	17.0
Alosa mediocris	0.5	0.05	<1	<0.01	1.468	27.0
Odontaspis taurus	0.4	0.04	<1	0.01	20.650	2.0
Centropristis striata	0.2	0.02	1	0.05	0.251	16.0
Evorthodus lyricus	0.2	0.02				1.0
Lophius americanus	0.2	0.02	<1	<0.01	9.800	6.0
Alosa spp.	0.2	0.02	<1	0.02	0.616	7.0
Urophycis regia	0.1	0.01	<1	0.02	0.394	12.0
Bairdiella chrysoura	0.1	0.01	<1	0.03	0.211	6.0
Orthopristis chrysoptera	0.1	0.01	<1	0.01	0.302	11.0
Alosa sapidissima	0.1	0.01	<1	<0.01	1.100	4.0
Urophycis spp.	0.1	0.01	<1	0.01	0.680	9.0
Cynoscion nebulosus	<0.1	0.01	<1	<0.01	0.248	5.0
Tautoga onitis	<0.1	0.01	<1	<0.01	0.660	6.0

Table 2. (Continued).

Species	Weight (kg) Mean	Weight (kg) Percent	Number Mean	Number Percent	Mean fish weight (kg)	Percent freq. occur
Scomberomorus maculatus	<0.1	0.01				3.0
Gadidae	<0.1	0.01	<1	<0.01	1.400	3.0
Clupeidae	<0.1	0.01	<1	<0.01	1.400	1.0
Clupea harengus	<0.1	0.01	<1	<0.01	0.500	2.0
Prionotus spp.	<0.1	0.01				2.0
Peprilus spp.	<0.1	0.01				1.0
Caranx spp.	<0.1	0.01				1.0
Paralichthys spp.	<0.1	0.01				1.0
Peprilus alepidotus	<0.1	0.01	<1	<0.01	0.023	3.0
Prionotus evolans	Obs					

Table 3. Species composition, mean weight (kg) and mean number of fish per trip of the top 99% (by weight) of the sink net catches, partitioned by area fished, from December 1987 through April 1991; n = number of catches sampled.

Species	Mean	%	Mean no. fish	Mean fish weight (kg)	Species	Mean	%	Mean no. fish	Mean fish weight (kg)	Species	Mean	%	Mean no. fish	Mean fish weight (kg)
	NORTH OF CAPE HATTERAS					CAPE HATTERAS TO CAPE LOOKOUT					WEST OF CAPE LOOKOUT			
1987-88 (n=28)					(n=53)									
Cynoscion regalis	832.2	61.9	1,016	0.819	Cynoscion regalis	1,052.3	57.7	1,038	0.805					
Pomatomus saltatrix	328.8	24.5	96	3.427	Pomatomus saltatrix	652.9	35.8	187	3.483					
Micropogonias undulatus	162.9	12.1	657	0.248	Micropogonias undulatus	97.0	5.3	334	0.291					
Eutynnus alletteratus	14.6	1.1	3	4.795	Euthynnus alletteratus	16.8	0.9	4	4.772					
1988-89 (n=46)					(n=26)					(n=35)				
Cynoscion regalis	1,296.2	56.1	1,570	0.825	Cynoscion regalis	480.6	43.1	835	0.575	Micropogonias undulatus	173.8	37.4	815	0.213
Pomatomus saltatrix	994.7	43.0	264	3.769	Pomatomus saltatrix	355.3	31.9	139	2.555	Cynoscion regalis	139.7	30.1	293	0.476
Euthynnus alletteratus	11.3	0.5	9	0.279	Micropogonias undulatus	26.2	2.3	8	3.171	Brevoortia tyrannus	61.9	13.3		-
Micropogonias undulatus	2.5	0.1	2	4.617	Euthynnus alletteratus	239.4	21.5	888	0.270	Leiostomus xanthurus	31.7	6.8	163	0.195
										Pomatomus saltatrix	14.0	3.0	22	0.630
										Alosa spp.	12.4	2.7	-	-
										Scomberomorus maculatus	8.1	1.7	14	0.579
										Menticirrhus sp.	6.0	1.3	9	0.640
										Peprilus triacanthus	3.9	0.8	34	0.113
										Menticirrhus americanus	3.9	0.8	10	0.406
1989-90 (n=61)					(n=9)					(n=1)				
Pomatomus saltatrix	1,357.3	79.1	374	3.632	Pomatomus saltatrix	2,065.5	86.5	561	3.679	Leiostomus xanthurus	246.5	59.9	1,288	0.191
Cynoscion regalis	336.9	17.6	468	0.719	Cynoscion regalis	294.7	12.3	658	0.448	Peprilus triacanthus	55.0	13.4	588	0.094
Euthynnus alletteratus	9.3	0.5	2	3.828	Micropogonias undulatus	11.5	0.5	87	0.131	Brevoortia tyrannus	38.6	9.4	188	0.205
Squalus acanthias	5.9	0.3	-							Menticirrhus americanus	27.7	6.7	-	
										Pomatomus saltatrix	12.3	3.0	38	0.322
										Micropogonias undulatus	8.6	2.1	41	0.210
										Cynoscion regalis	6.7	1.6	14	0.479
1990-91 (n=50)					(n=25)					(n=28)				
Pomatomus saltatrix	803.8	62.2	270	2.981	Pomatomus saltatrix	731.8	83.1	1,230	0.595	Cynoscion regalis	155.0	39.8	562	0.276
Cynoscion regalis	432.1	33.4	1,357	0.319	Cynoscion regalis	91.5	10.4	261	0.351	Micropogonias undulatus	101.6	26.1	584	0.174
Euthynnus alletteratus	19.0	1.5	4	4.433	Euthynnus alletteratus	19.0	2.2	4	4.394	Brevoortia tyrannus	55.0	14.1	256	0.215
Carcharhinus spp.	16.2	1.0	<1	-	Micropogonias undulatus	8.4	8.0	43	0.194	Unidentified fish	25.9	6.7	-	-
Squalus acanthias	6.5	0.5	-	-	Menticirrhus americanus	7.0	0.8	24	0.295	Leiostomus xanthurus	19.1	4.9	185	0.103
Menticirrhus americanus	4.9	0.4	18	0.275	Brevoortia tyrannus	6.1	0.7	-	-	Euthynnus alleteratus	10.2	2.6	-	-
Mustelus canis	4.0	0.3	<1	-	Peprilus triacanthus	5.1	0.6	61	0.084	Peprilus triacanthus	6.7	1.7	77	0.087
										Menticirrhus americanus	5.2	1.3	19	0.280
										Pomatomus saltatrix	3.6	0.9	11	0.314

Table 4. Monthly comparison of dominant species (top 99% by weight) and mean catch/trip, partitioned by area for sink nets from December 1987 through April 1991; n = number of catches sampled, % wt = percent of total catch weight.

Species	CPUE	Percent weight	Species	CPUE	Percent weight	Species	CPUE	Percent weight
NORTH OF CAPE HATTERAS			CAPE HATTERAS TO CAPE LOOKOUT			WEST OF CAPE LOOKOUT		
Dec 1987 (n=8)			(n=10)					
C. regalis	1,547.8	78.4	*C. regalis*	1,016.3	89.1			
P. saltatrix	396.9	20.1	*P. saltatrix*	84.7	7.4			
E. alletteratus	22.6	1.2	*M. undulatus*	22.4	2.0			
Jan 1988 (n=2)			(n=9)					
C. regalis	689.1	99.4	*P. saltatrix*	1,209.6	57.3			
P. saltatrix	3.4	0.5	*C. regalis*	891.5	42.2			
Feb 1988 (n=5)			(n=9)					
C. regalis	920.0	48.4	*P. saltatrix*	1,882.3	66.7			
P. saltatrix	908.5	47.8	*C. regalis*	879.1	31.1			
M. undulatus	39.1	2.1	*E. alletteratus*	61.2	2.2			
E. alletteratus	27.2	1.4						
Mar 1988 (n=5)			(n=21)					
P. saltatrix	229.2	34.7	*C. regalis*	1,226.9	83.4			
M. undulatus	216.4	32.7	*M. undulatus*	228.8	15.4			
C. regalis	202.9	30.7	*E. alletteratus*	9.9	0.7			
Apr 1988 (n=8)			(n=4)					
C. regalis	490.7	51.3	*P. saltatrix*	1,474.2	59.2			
M. undulatus	407.3	42.7	*C. regalis*	977.5	39.2			
P. saltatrix	42.1	4.4	*M. undulatus*	27.4	1.1			
						Oct 1988 (n=7)		
						L. xanthurus	157.1	41.7
						M. undulatus	136.2	36.2
						S. macualtus	40.4	10.7
						P. saltatrix	27.4	7.3
						M. americanus	6.4	1.7
						P. triacanthus	2.8	0.8
						Menticirrhus spp.	1.2	0.3
						Nov 1988 (n=4)		
						M. undulatus	182.7	68.2
						B. tyrannus	45.4	16.9
						Unidentified fish	28.3	10.6
						C. regalis	7.9	2.9
						L. xanthurus	1.8	0.7
Dec 1988 (n=11)			(n=2)			(n=7)		
C. regalis	1,086.3	53.0	*C. regalis*	274.7	51.9	*C. regalis*	132.0	64.9
P. saltatrix	941.3	45.9	*M. undulatus*	207.1	39.1	*M. undulatus*	21.6	10.6
M. undulatus	10.5	0.5	*P. saltatrix*	32.4	6.1	*Menticirrhus* spp.	18.7	9.2
			Menticirrhus sp.	7.5	1.4	*P. triacanthus*	11.9	5.8
			M. americanus	3.5	0.7	*M. americanus*	11.8	5.8
						Unidentified fish	3.2	1.6
						C. nebulosus	2.3	1.1
Jan 1989 (n=15)			(n=4)			(n=12)		
C. regalis	1,890.9	99.5	*P. saltatrix*	1,927.8	95.0	*C. regalis*	320.0	39.6
			Carcharhinus spp.	51.3	2.5	*M. undulatus*	258.1	31.9
			E. alletteratus	40.0	2.0	*B. tyrannus*	153.3	19.0
						Alosa sp.	36.3	4.5
						P. saltatrix	24.6	3.0
						E. alletteratus	7.9	1.0

Table 4. (Continued).

Species	CPUE	Percent weight	Species	CPUE	Percent weight	Species	CPUE	Percent weight
NORTH OF CAPE HATTERAS			CAPE HATTERAS TO CAPE LOOKOUT			WEST OF CAPE LOOKOUT		
Feb 1989 (n=11)			(n=13)			(n=5)		
P. saltatrix	1,759.2	65.2	*C. regalis*	888.6	80.7	*M. undulatus*	230.4	80.5
C. regalis	909.1	33.7	*M. undulatus*	176.8	16.1	*B. tyrannus*	29.4	10.3
E. alletteratus	30.3	1.1	*E. alletteratus*	31.1	2.8	*C. regalis*	17.6	6.2
						P. triacanthus	6.4	2.2
Mar 1989 (n=6)			(n=7)					
C. regalis	1,551.6	65.2	*M. undulatus*	501.7	64.1			
P. saltatrix	795.7	33.5	*P. saltatrix*	206.6	26.4			
Carcharhinus spp.	30.2	1.3	*C. regalis*	55.6	7.1			
			E. alletteratus	16.1	2.1			
Apr 1989 (n=3)								
P. saltatrix	3,757.3	99.9						
						Oct 1989 (n=1)		
						L. xanthurus	246.5	59.9
						P. triacanthus	55.0	13.4
						B. tryannus	38.6	9.4
						Menticirrhus spp.	27.7	6.7
						P. saltatrix	12.3	3.0
						M. undulatus	8.6	2.1
						C. regalis	6.7	1.6
Nov 1989 (n=2)								
C. regalis	919.8	50.2						
P. saltatrix	895.8	48.9						
Dec 1989 (n=3)			(n=7)					
P. saltatrix	3,922.0	97.9	*P. saltatrix*	2,558.5	88.0			
A. mediocris	50.2	1.3	*C. regalis*	345.0	11.9			
Jan 1990 (n=22)			(n=1)					
C. regalis	567.8	68.8	*C. regalis*	237.2	50.9			
P. saltatrix	237.5	28.7	*M. undulatus*	96.5	20.7			
S. acanthias	13.5	1.6	*B. tyrannus*	66.5	14.3			
			B. chrysoura	46.3	9.9			
			L. xanthurus	16.3	3.5			
Feb 1990 (n=13)								
P. saltatrix	1,217.0	72.5						
C. regalis	449.0	26.7						
Mar 1990 (n=17)			(n=1)					
P. saltatrix	2,349.1	97.9	*P. saltatrix*	680.4	99.3			
C. alletteratus	19.5	0.8						
C. regalis	16.8	0.7						
Apr 1990 (n=4)								
P. saltatrix	2,064.5	99.6						

Table 4. (Continued).

Species	CPUE	Percent weight	Species	CPUE	Percent weight	Species	CPUE	Percent weight
NORTH OF CAPE HATTERAS			CAPE HATTERAS TO CAPE LOOKOUT			WEST OF CAPE LOOKOUT		
Dec 1990 (n=9)			(n=6)			(n=11)		
P. saltatrix	2,857.3	98.3	*P. saltatrix*	783.0	91.4	*M. undulatus*	93.8	35.6
C. regalis	35.0	1.2	*C. regalis*	57.4	6.7	*B. tyrannus*	70.9	26.9
			E. alletteratus	12.0	1.4	*C. regalis*	27.6	10.5
						E. alletteratus	15.5	5.9
						L. xanthurus	13.8	5.2
						M. americanus	11.4	4.3
						P. triacanthus	7.4	2.8
						P. saltatrix	6.2	2.3
						M. saxatilus	5.8	2.2
Jan 1991 (n=12)			(n=4)			Jan 1991 (n=17)		
C. regalis	387.8	92.4	*P. saltatrix*	2,818.4	92.2	*C. regalis*	237.4	50.4
E. alletteratus	12.5	3.0	*C. regalis*	101.2	3.3	*M. undulatus*	106.6	22.6
S. acanthias	8.1	1.9	*E. alletteratus*	92.8	3.0	*B. tyrannus*	44.6	9.5
P. triacanthus	3.6	0.9	*M. americanus*	29.3	1.0	Unidentified fish	42.7	9.1
A. mediocris	2.1	0.5				*L. xanthurus*	22.6	4.8
P. saltatrix	1.7	0.4				*E. alletteratus*	6.8	1.4
M. americanus	1.7	0.4				*P. triacanthus*	6.2	1.3
Feb 1991 (n=10)			(n=10)					
C. regalis	569.5	82.3	*C. regalis*	152.9	72.3			
E. alletteratus	59.5	8.6	*M. undulatus*	19.5	9.2			
P. saltatrix	19.0	2.7	*B. tyrannus*	15.2	7.2			
Menticirrhus spp.	12.3	1.8	*S. acanthias*	9.0	4.2			
S. acanthias	11.3	1.6	*Menticirrhus* spp.	4.3	2.0			
Carcharhinus spp.	10.4	1.5	*P. triacanthus*	3.1	1.5			
M. canis	2.5	0.4	*L. xanthurus*	2.4	1.1			
P. triacanthus	2.4	0.3						
Mar 1991 (n=14)			(n=5)					
P. saltatrix	1,018.7	63.1	*P. saltatrix*	463.2	91.2			
C. regalis	508.7	31.5	*M. canis*	16.1	3.2			
Carcharhinus spp.	36.3	2.3	*P. triacanthus*	13.3	2.6			
M. canis	12.6	0.8	*M. americanus*	9.8	1.9			
M. americanus	9.7	0.6						
E. alletteratus	8.3	0.5						
Apr 1991 (n=5)								
C. regalis	764.1	96.9						
M. americanus	14.0	1.8						
P. triacanthus	4.5	0.6						

Table 5. Mean catch/trip (CPUE, kg) and percent of catches sampled (%) for sink net catches from north of Cape Lookout, partitioned by small (≤4" stretched), and large (5-6" stretched) mesh gill nets, and all catches combined. Ocean gill net landings for Dare County during the period September through April are included, together with the percent of total state ocean gill net landings they accounted for during the 1982-1991 fishing seasons.

		Fishing season									
		1982-1983	1983-1984	1984-1985	1985-1986	1986-1987	1987-1988	1988-1989	1989-1990	1990-1991	9 season mean
Weakfish	CPUE - Overall	558.3	716.5	730.5	1,003.7	1,094.4	976.2	1,001.7	331.5	318.6	747.9
	(%)	(39.4)	(62.2)	(46.9)	(61.2)	(63.4)	(58.9)	(53.3)	(18.4)	(27.6)	
	CPUE - Big mesh	750.0	673.9	295.6	73.8	140.2	351.7	0.0	81	0.0	327.6
	(%)	(27.5)	(41.8)	(11.2)	(3.6)	(6.0)	(10.9)	(0.0)	(0.3)	(0.0)	
	CPUE - Small mesh	444.5	745.6	896.2	1,289.8	1,352.3	1,095.6	1,265.3	654.8	373.3	901.9
	(%)	(68.8)	(88.8)	(78.6)	(84.7)	(86.6)	(80.7)	(81.7)	(87.0)	(49.7)	
	Landings - Dare (mt)	673.9	1,159.3	1,138.6	1,830.2	1,871.0	2,692.1	1,813.4	681.2	373.5	1,359.2
	(% of state)	(79.6)	(74.5)	(72.8)	(69.0)	(82.2)	(82.8)	(74.3)	(56.7)	(44.3)	
Bluefish	CPUE - Overall	848.4	399.7	726.2	539.6	479.0	540.9	763.8	1,448.4	779.8	725.1
	(%)	(59.8)	(34.7)	(46.8)	(32.9)	(27.7)	(32.6)	(40.6)	(80.3)	(67.5)	
	CPUE - Big mesh	1,979.1	914.5	2,346.8	1,914.2	2,148.7	2,874.3	3,119.7	2,819.8	3,424.5	2,393.5
	(%)	(72.5)	(56.8)	(88.7)	(94.5)	(92.0)	(88.9)	(99.5)	(98.8)	(97.6)	
	CPUE - Small mesh	183.3	48.0	108.9	116.6	27.7	94.8	143.8	77.0	325.2	125.0
	(%)	(28.3)	(5.7)	(9.5)	(7.7)	(1.8)	(7.0)	(9.3)	(10.2)	(43.3)	
	Landings - Dare (mt)	845.9	550.4	493.7	577.8	876.1	1,206.9	564.4	940.0	1,079.7	792.8
	(% of state)	(87.2)	(86.4)	(87.9)	(77.6)	(89.5)	(88.9)	(82.6)	(78.8)	(83.5)	
Croaker	CPUE - Overall	0.2	11.6	84.3	37.4	120.7	119.8	88.1	1.8	3.5	51.9
	(%)	(<0.1)	(1.0)	(5.4)	(2.3)	(7.0)	(7.2)	(4.7)	(0.1)	(0.3)	
	CPUE - Small mesh	0.3	19.4	115.9	48.5	151.6	142.7	111.2	3.7	3.5	66.3
	(%)	(<0.1)	(2.3)	(10.2)	(3.2)	(9.7)	(10.5)	(7.2)	(0.5)	(0.5)	
	Landings - Dare (mt)	8.8	35.7	199.3	114.9	161.0	340.8	108.8	4.5	5.6	109.9
	(% of state)	(2.3)	(6.6)	(16.4)	(9.2)	(13.4)	(26.6)	(18.7)	(1.2)	(1.9)	

Table 6. Mean catch/trip (CPUE, kg), percentage of the total catch (% wt), mean number of fish/trip and mean fish weight of weakfish, bluefish, and Atlantic croaker in sink net catches, partitioned by season, area, and mesh size of sink nets.

		1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91
SMALL MESH (<=4.0" STRETCHED) CATCHES NORTH OF CAPE LOOKOUT										
		(n=17)	(n=41)	(n=42)	(n=52)	(n=74)	(n=68)	(n=57)	(n=35)	(n=64)
Cynoscion regalis	CPUE	444.5	745.6	896.2	1,289.8	1,352.3	1,095.6	1,265.3	654.8	373.3
	% wt	68.8	88.8	78.6	84.7	86.6	80.7	81.7	87.0	49.7
	Num/trip	968	1,189	1,607	2,186	2,678	1,366	1,608	954	1,178
	Mean fish wt.	0.460	0.627	0.558	0.590	0.505	0.802	0.787	0.686	0.317
Micropogonias undulatus	CPUE	0.3	19.4	115.9	48.5	151.6	142.7	111.2	3.7	3.5
	% wt	<0.1	2.3	10.2	3.2	9.7	10.5	7.2	0.5	0.5
	Num/trip	1	85	484	212	576	525	412	24	19
	Mean fish wt.	0.354	0.229	0.240	0.229	0.263	0.272	0.270	0.152	0.186
Pomatomus saltatrix	CPUE	183.3	48.0	108.9	116.6	27.7	94.8	143.8	77.0	325.2
	% wt	28.3	5.7	9.5	7.7	1.8	7.0	9.3	10.2	43.3
	Num/trip	304	76	149	112	26	49	68	58	549
	Mean fish wt.	0.603	0.629	0.730	1.038	1.070	1.942	2.117	1.317	0.592
	% of total catch weight	(97.1)	(96.8)	(98.3)	(95.6)	(98.1)	(97.2)	(98.2)	(97.5)	(93.5)
SMALL MESH (<=4.0" STRETCHED) CATCHES SOUTH OF CAPE LOOKOUT										
		(n=0)	(n=0)	(n=0)	(n=0)	(n=0)	(n=0)	(n=35)	(n=1)	(n=28)
Cynoscion regalis	CPUE							173.8	6.7	155.0
	% wt							37.4	1.6	39.8
	Num/trip							365	14	562
	Mean fish wt.							0.476	0.479	0.276
Micropogonias undulatus	CPUE							139.7	8.6	101.6
	% wt							30.1	2.1	26.1
	Num/trip							656	27	584
	Mean fish wt.							0.213	0.322	0.174
Leiostomus xanthurus	CPUE							31.7	246.5	19.1
	% wt							6.8	59.9	4.9
	Num/trip							163	1.291	185
	Mean fish wt.							0.195	0.191	0.103
	% of total catch weight							(4.3)	(3.6)	(0.8)
LARGE MESH (<=4.0" STRETCHED) CATCHES NORTH OF CAPE LOOKOUT										
		(n=10)	(n=28)	(n=16)	(n=16)	(n=20)	(n=13)	(n=15)	(n=35)	(n=11)
Pomatomus saltatrix	CPUE	1,979.1	914.5	2,346.8	1,914.2	2,148.7	2,874.3	3,119.7	2,819.8	3,424.5
	% wt	72.5	56.8	88.7	94.5	92.0	88.9	99.5	98.8	97.6
	Num/trip	500	232	568	474	640	709	798	744	789
	Mean fish wt.	3.958	3.946	4.130	4.043	3.358	4.053	3.910	3.790	4.340
Cynoscion regalis	CPUE	750.0	673.9	295.6	73.8	140.2	351.7		8.1	
	% wt	27.5	41.8	11.2	3.6	6.0	10.9		0.3	
	Num/trip	788	259	140	70	227	387		2	
	Mean fish wt	0.940	2.602	2.106	1.059	0.616	0.909		4.734	
	% of total catch weight	(100.0)	(98.6)	(99.9)	(98.1)	(98.0)	(99.8)	(99.5)	(91.2)	(97.6)

Table 7. Monthly summary of sampling of anchored gill nets fished between Bogue Inlet and Carolina Beach from December 1986 through January 1991; n = number of catches sampled.

Season	Month	n	Catch weight (kg) Mean	Catch weight (kg) Range	Sample weight (kg) Mean	Sample weight (kg) Range
1986-87	Dec	2	258.2	211-305	134.5	131-138
	Jan	2	294.7	231-358	119.1	116-121
	Apr	2	410.5	361-459	188.1	128-248
	May	2	587.0	442-732	219.8	211-228
Total		8	387.6	211-732		
1987-88	Dec	2	133.3	110-156	99.3	93-105
Total		2	133.3	110-156		
1989-90	Dec	3	343.7	150-485	148.6	104-219
	Feb	1	231.9		46.2	
Total		4	315.8	150-485		
1990-91	Dec	4	448.7	311-575	60.4	43- 79
	Jan	2	239.2	131-347	35.3	32- 38
Total		6	378.9	131-575		

Table 8. Species composition, mean weight (kg) and mean number of fish/trip of the top 99% (by weight) of the anchored gill net catches from west of Bogue Inlet to Cape Fear sampled from 1986-1991; n = number of catches sampled.

Species	Weight (kg) Mean	Weight (kg) Percent	Mean number	Mean fish weight (kg)	Species	Weight (kg) Mean	Weight (kg) Percent	Mean number	Mean fish weight (kg)
1986-87 (n=8)					1989-90 (n=4)				
Cynoscion regalis	74.3	24.4	218	0.341	*Cynoscion regalis*	83.4	28.3	289	0.288
Pomatomus saltatrix	72.1	23.7	197	0.365	*Leiostomus xanthurus*	83.4	28.3	728	0.115
Menticirrhus americanus	69.7	22.9	316	0.222	Unidentified fish	40.3	13.7		
Micropogonias undulatus	51.1	16.8	347	0.147	*Micropogonias undulatus*	38.9	13.2	320	0.122
Menticirrhus saxatilus	29.0	9.5	109	0.267	*Menticirrhus americanus*	15.9	5.4	57	0.281
Scomberomorus maculatus	3.7	1.2	16	0.235	*Pomatomus saltatrix*	13.7	4.7	57	0.242
Acipenser oxyrhynchus	1.4	0.5	1	1.883	*Brevoortia tyrannus*	11.2	3.8	-	
Centropristis striata	1.4	0.5	11	0.133	*Peprilus triacanthus*	7.5	2.5	110	0.068
1987-88 (n=2)					1990-91 (n=6)				
Cynoscion regalis	59.8	58.5	160	0.375	*Cynoscion regalis*	96.3	25.4	340	0.283
Menticirrhus saxatilus	11.7	11.4	34	0.349	*Leiostomus xanthurus*	70.3	18.6	657	0.107
Menticirrhus americanus	11.0	10.8	39	0.286	*Micropogonias undulatus*	47.2	12.5	314	0.150
Micropogonias undulatus	11.0	10.8	87	0.126	*Menticirrhus americanus*	44.3	11.7	168	0.265
Leiostomus xanthurus	2.6	2.5	22	0.121	*Brevoortia tyrannus*	42.0	11.1	353	0.119
Cynoscion nebulosus	2.3	2.2	8	0.281	Unidentified fish	36.1	9.5		
Centropristis striata	1.8	1.8	9	0.206	*Pomatomus saltatrix*	20.7	5.5	38	0.545
Acipenses oxyrhynchus	1.1	1.1	1	2.300	*Orthopristis chrysopteria*	8.6	2.3	34	0.250
					Menticirrhus saxatilus	8.1	2.1	30	0.270

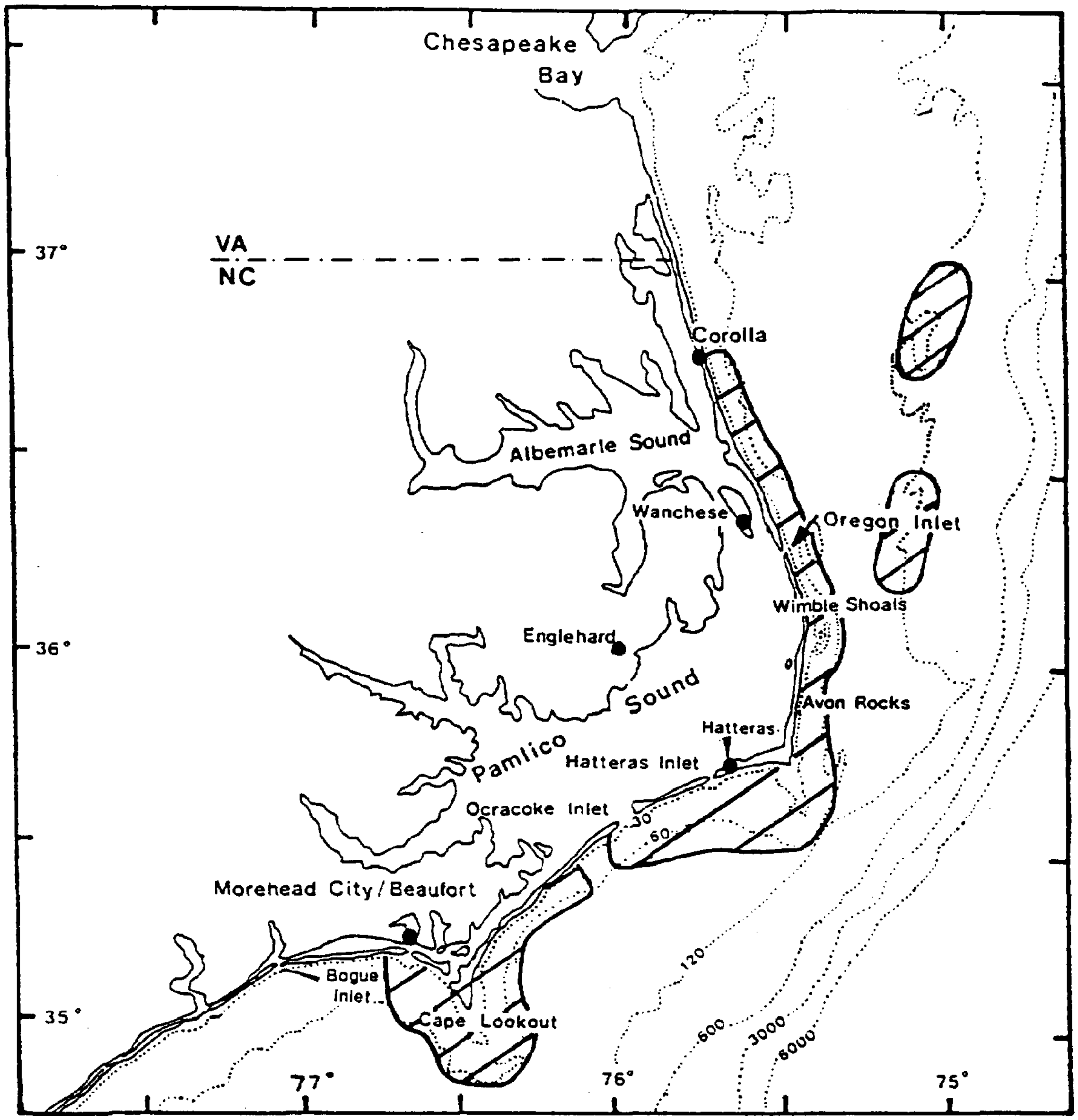

Figure 1. Sink net fishing grounds off the Outer Banks of North Carolina.

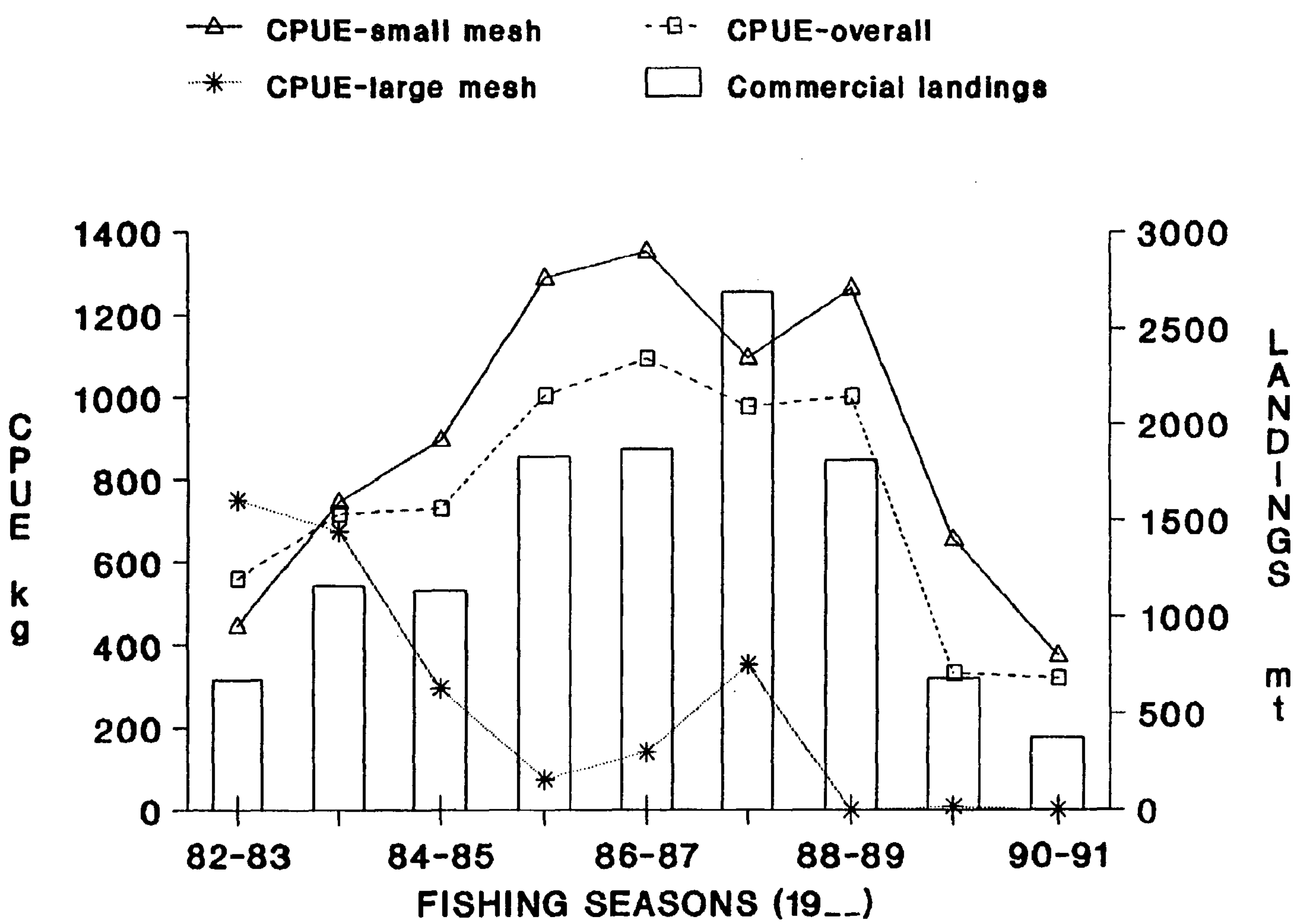

Figure 2. Commercial landings and mean CPUE of weakfish (Cynoscion regalis) from 1982-1991 sink net fishery in waters north of Cape Lookout.

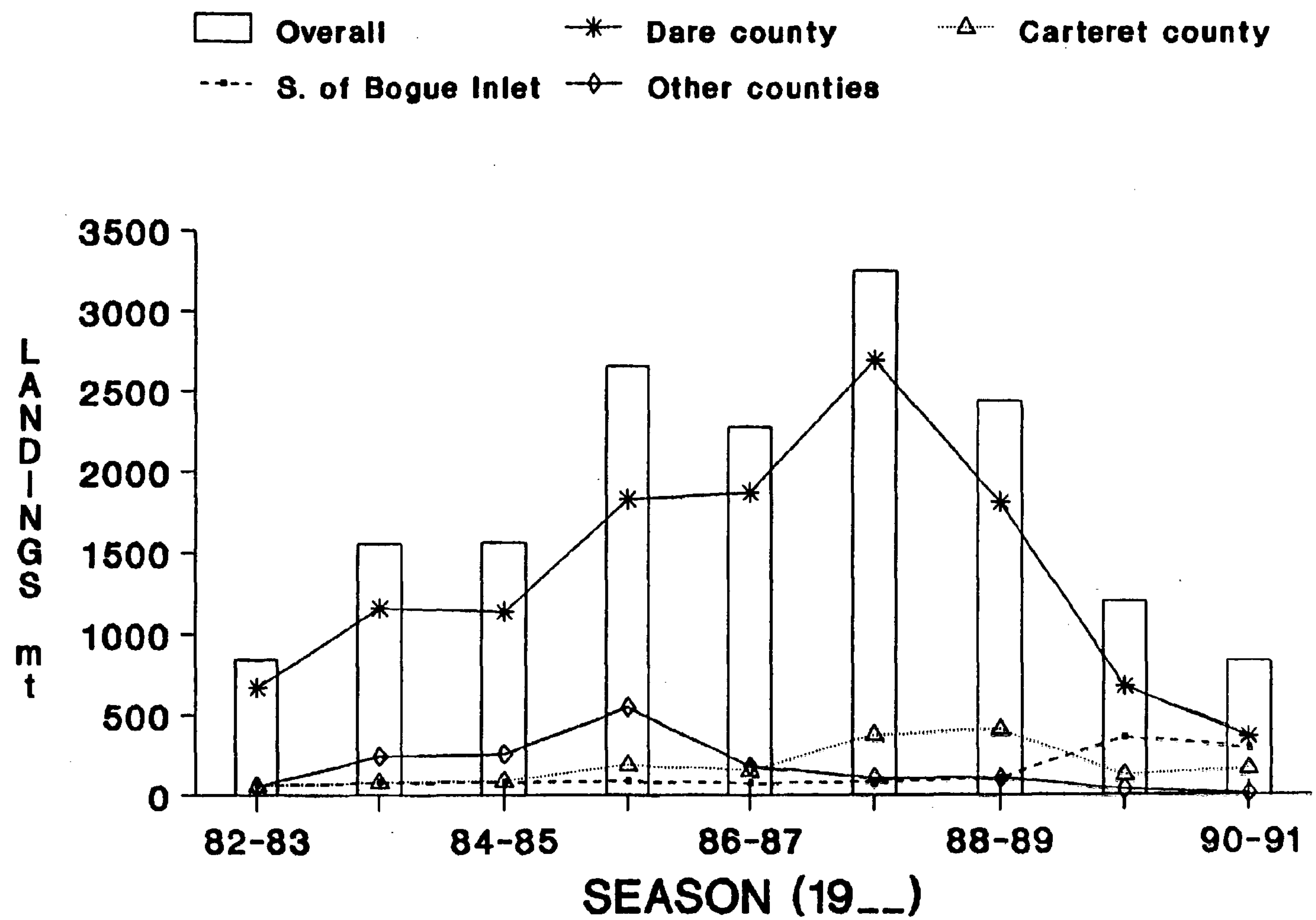

Figure 3. Commercial landings of weakfish (Cynoscion regalis) from the sink net fishery during the 1982-1991 fishing seasons.

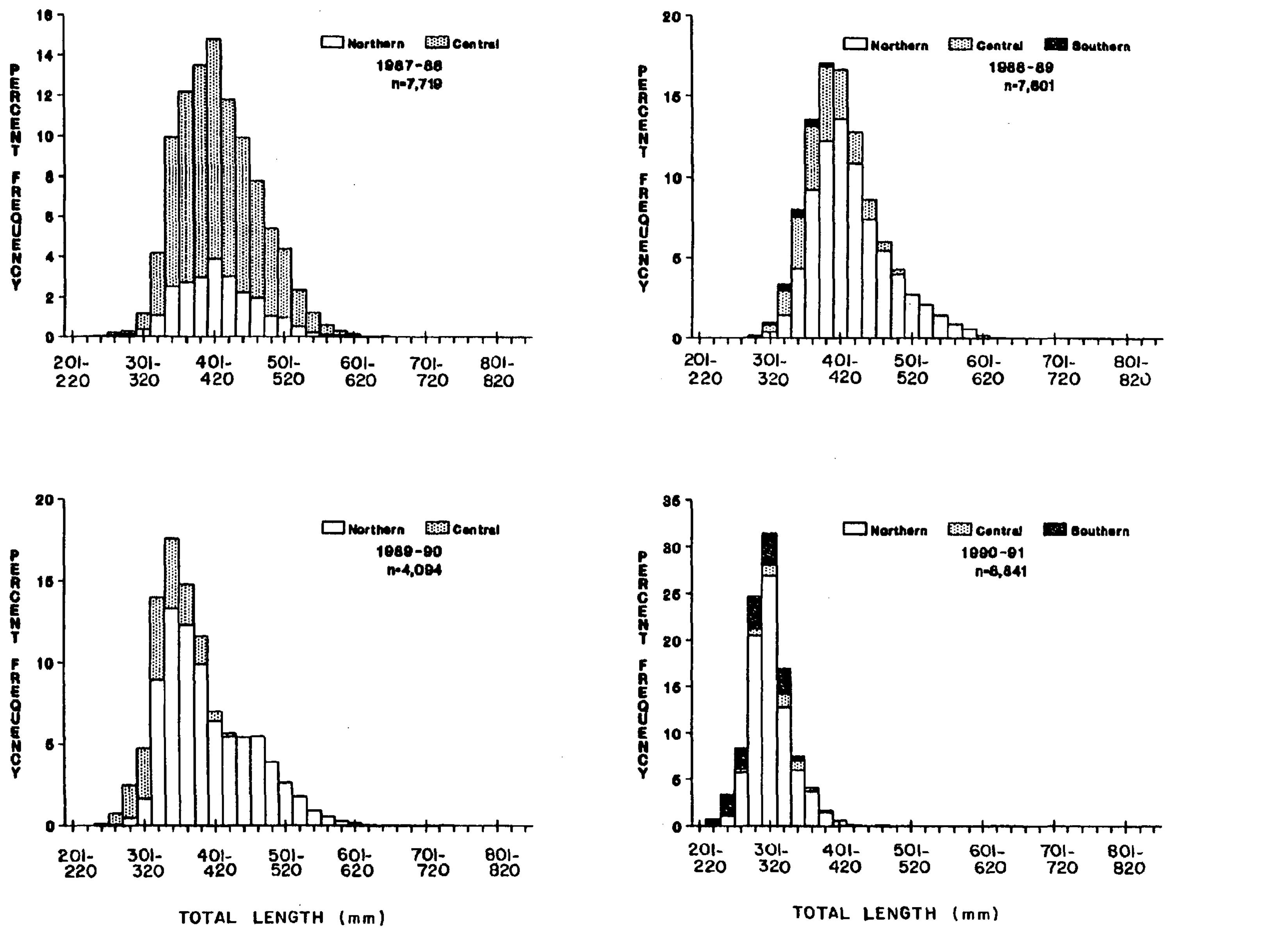

Figure 4. Length-frequency distribution (20 mm size classes) of weakfish (*Cynoscion regalis*) in 1987-1991 sink net catches.

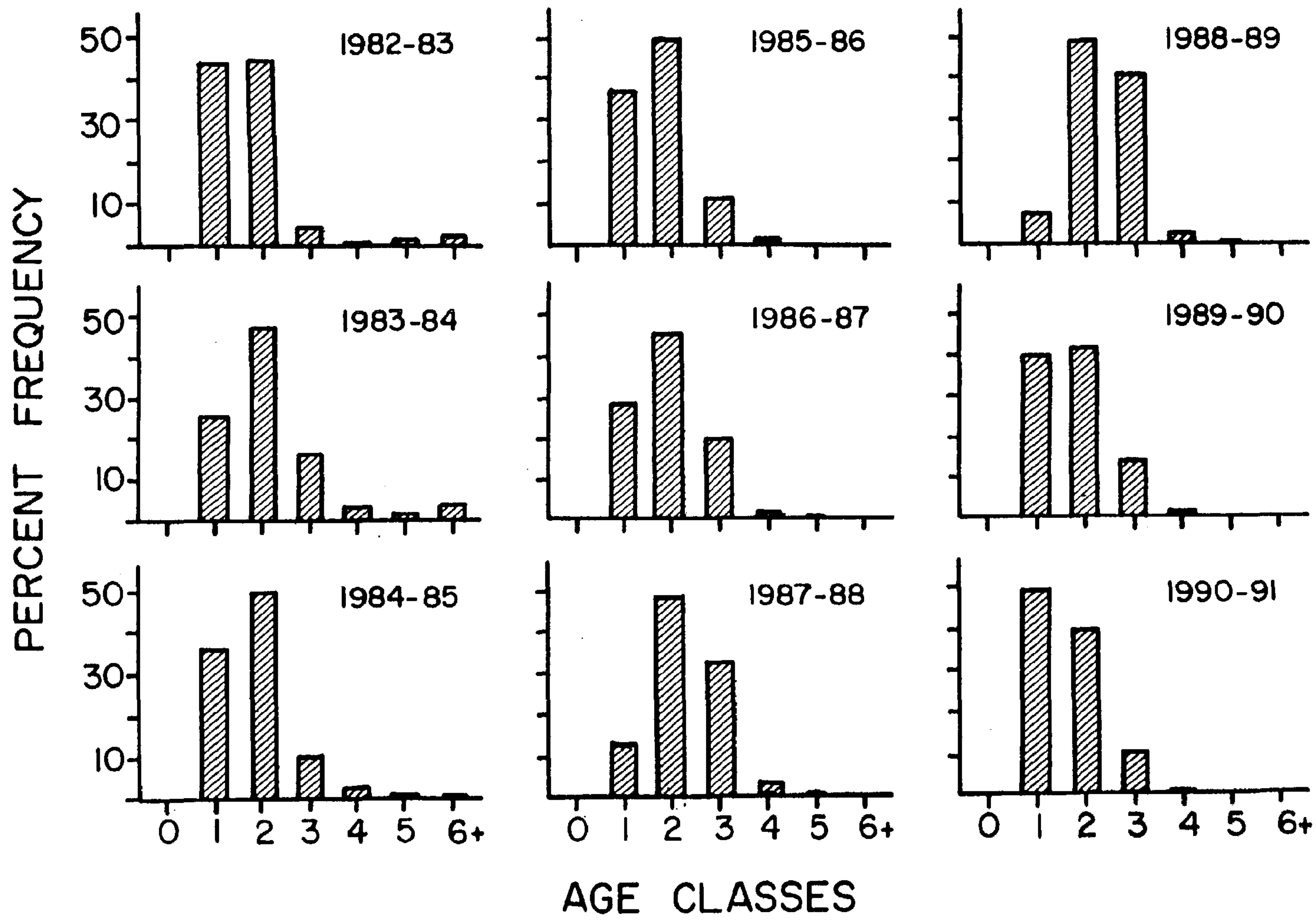

Figure 5. Age composition of weakfish (Cynoscion regalis) in sink net catches during 1982–1991 fishing seasons.

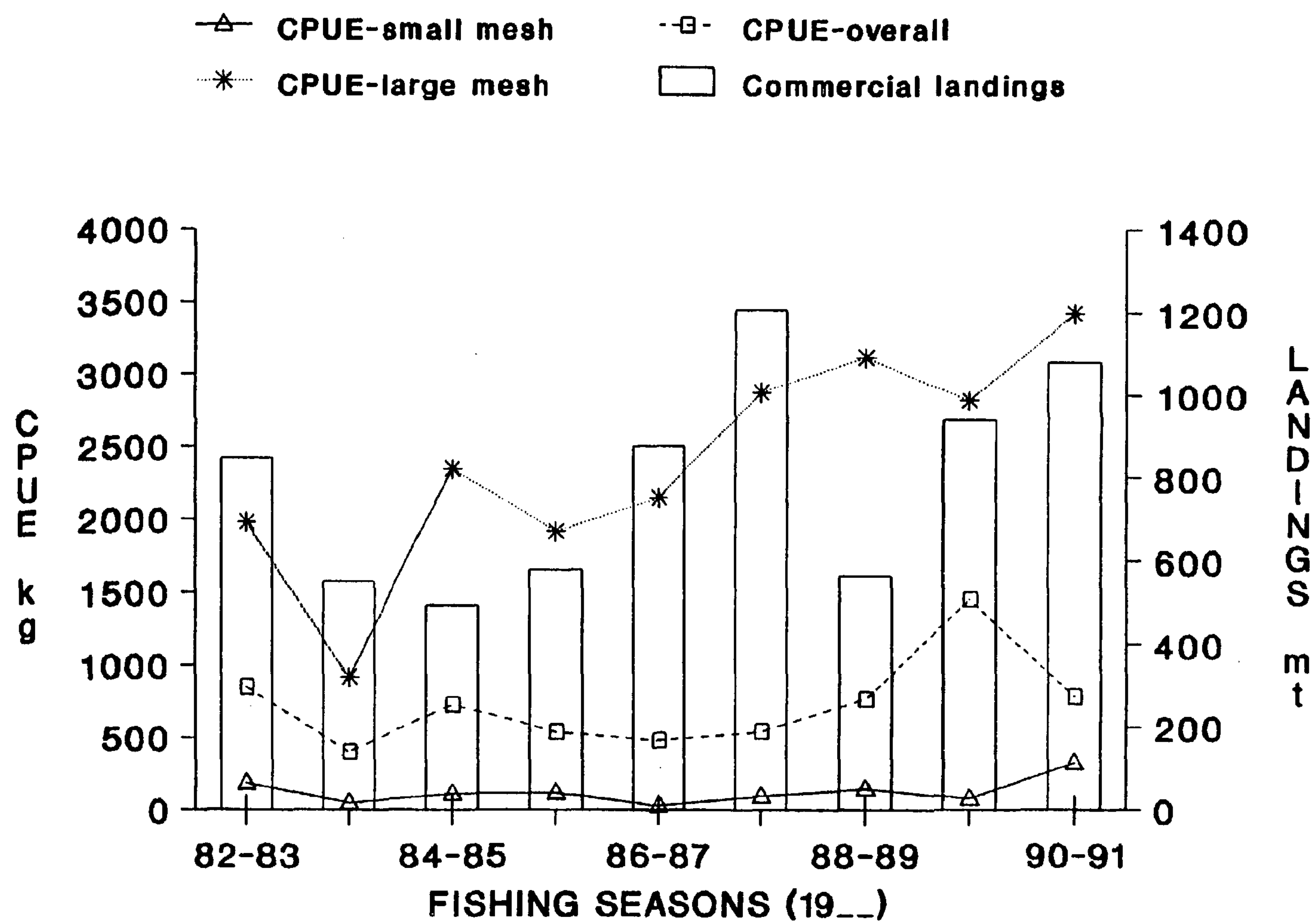

Figure 6. Commercial landings and mean CPUE of bluefish (<u>Pomatomus</u> <u>saltatrix</u>) from 1982-1991 sink net fishery in waters north of Cape Lookout.

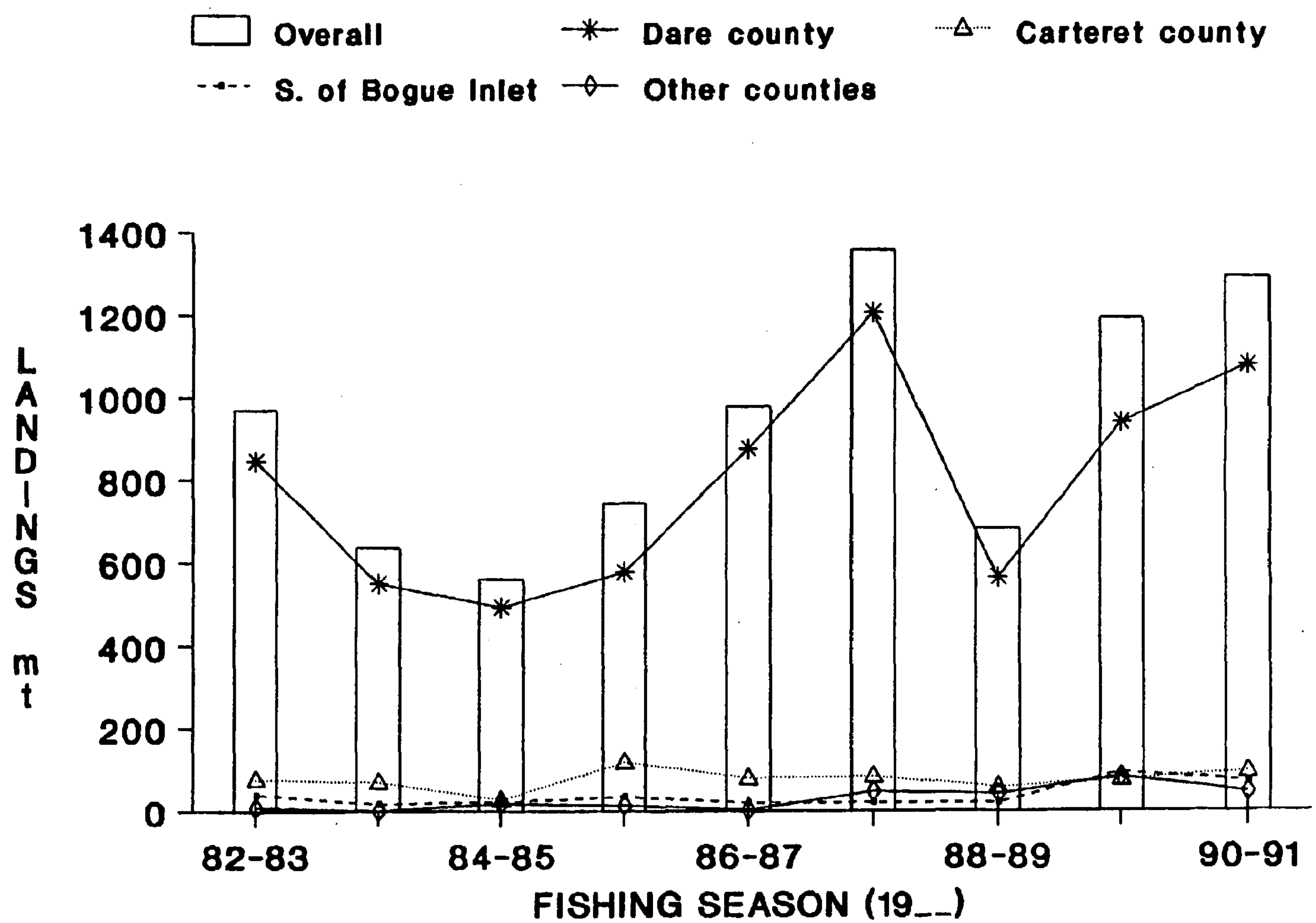

Figure 7. Commercial landings of bluefish (<u>Pomatomus saltatrix</u>) from the sink net fishery during the 1982-1991 fishing seasons.

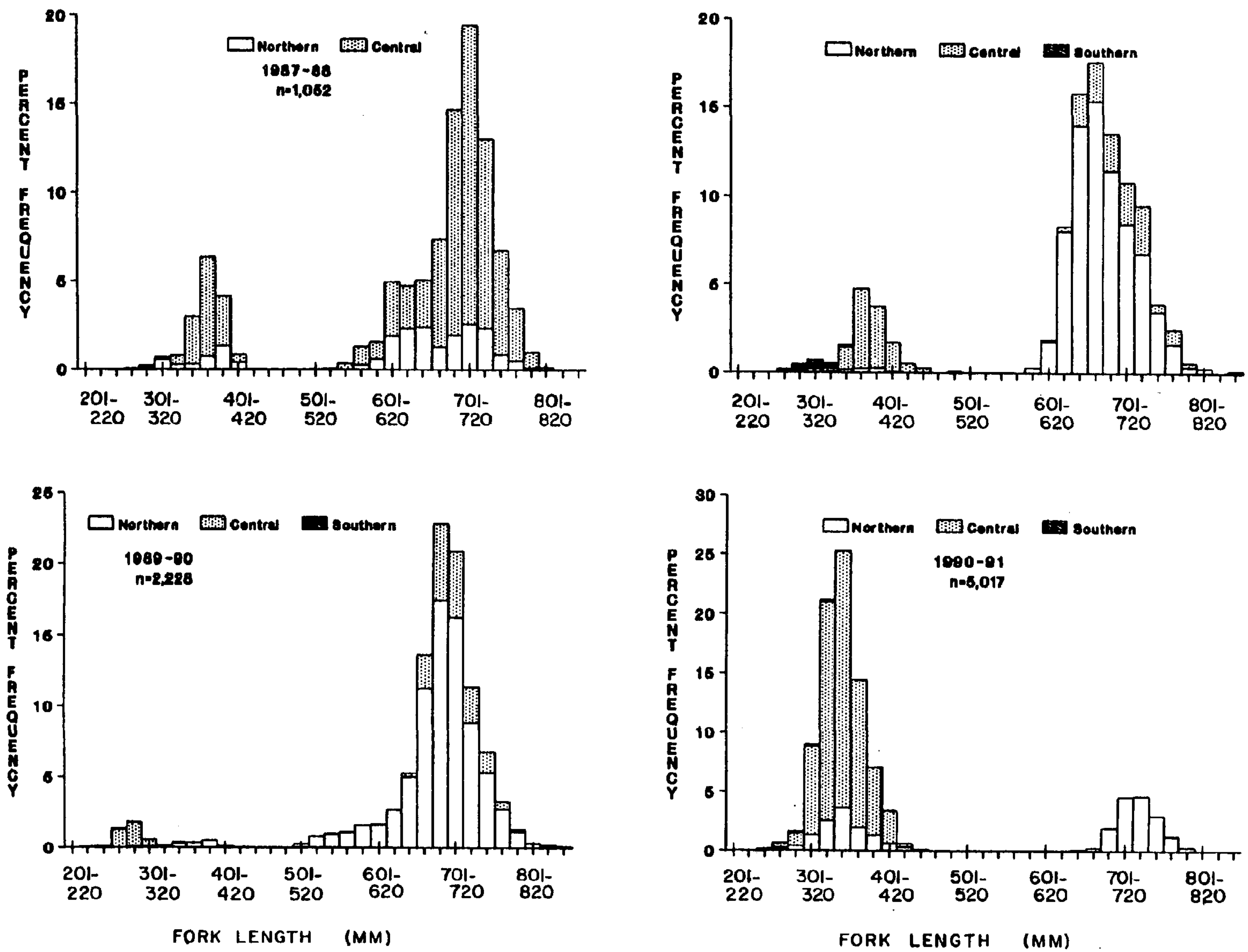

Figure 8. Length-frequency distribution (20 mm size classes) of bluefish (Pomatomus saltatrix) in 1987-1991 sink net catches.

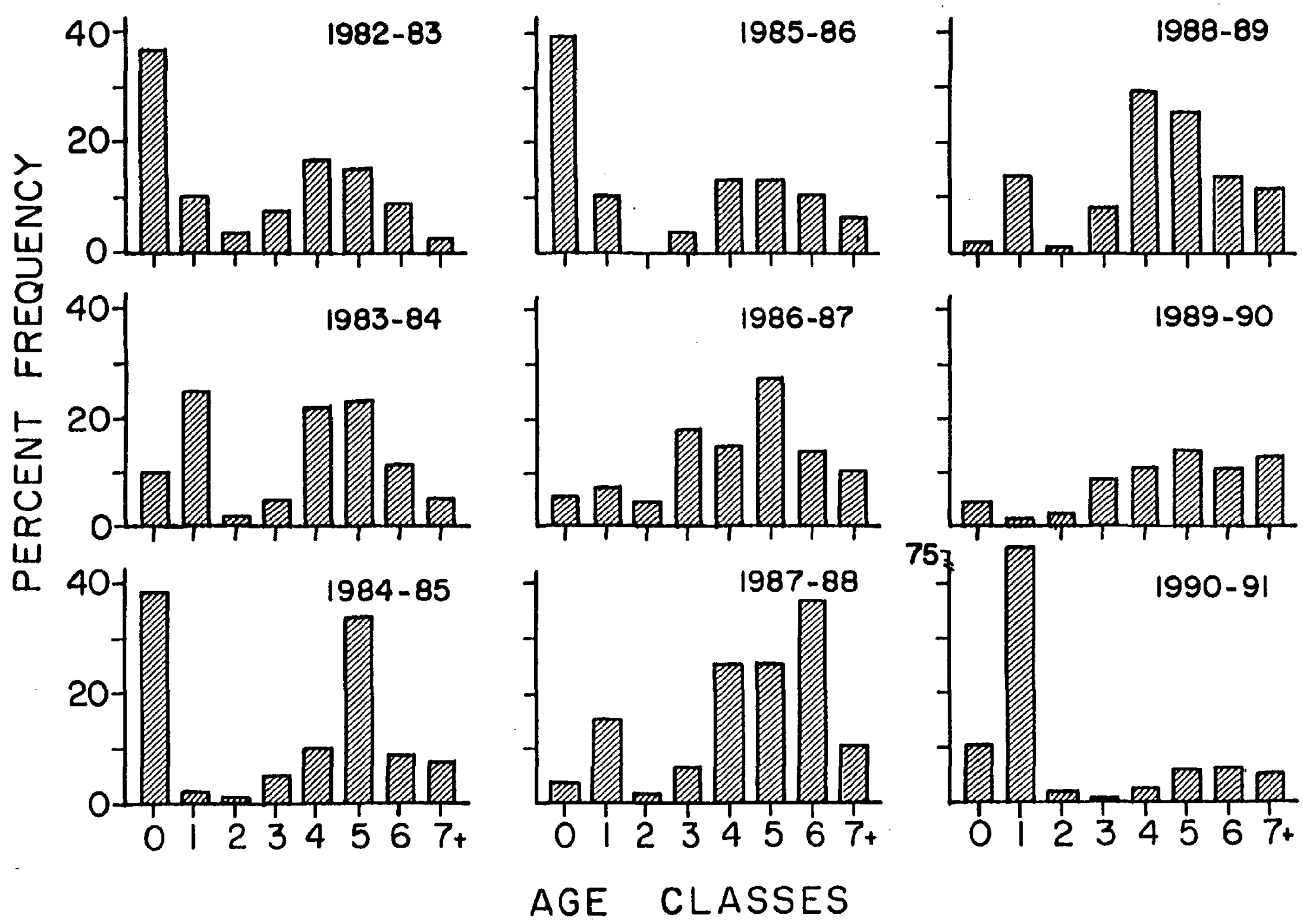

Figure 9. Age composition of bluefish (<u>Pomatomus saltatrix</u>) in sink net catches during 1982-1991 fishing seasons.

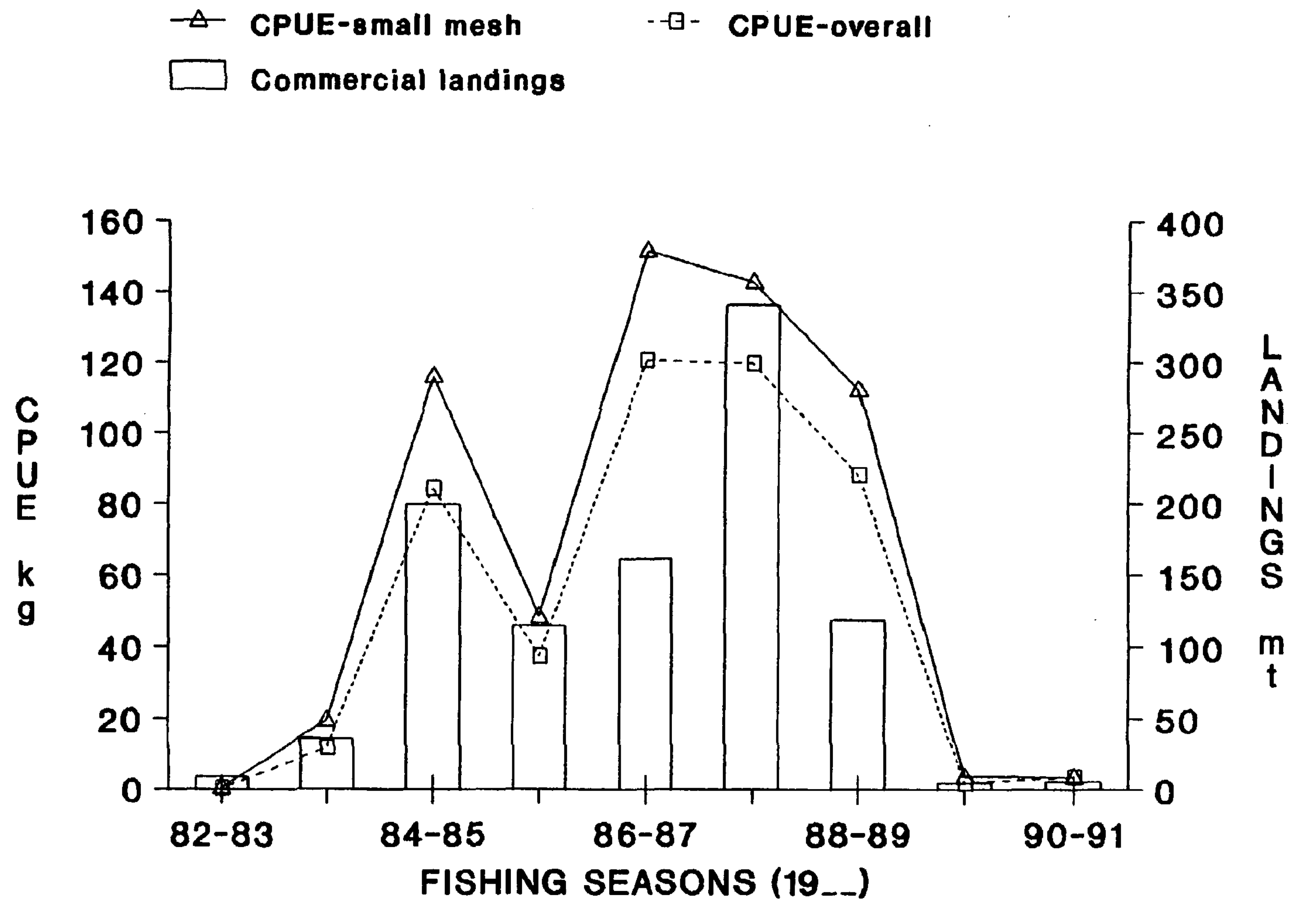

Figure 10. Commercial landings and mean CPUE of Atlantic croaker (<u>Micropogonias</u> <u>undulatus</u>) from 1982-1991 sink net fishery in waters north of Cape Lookout.

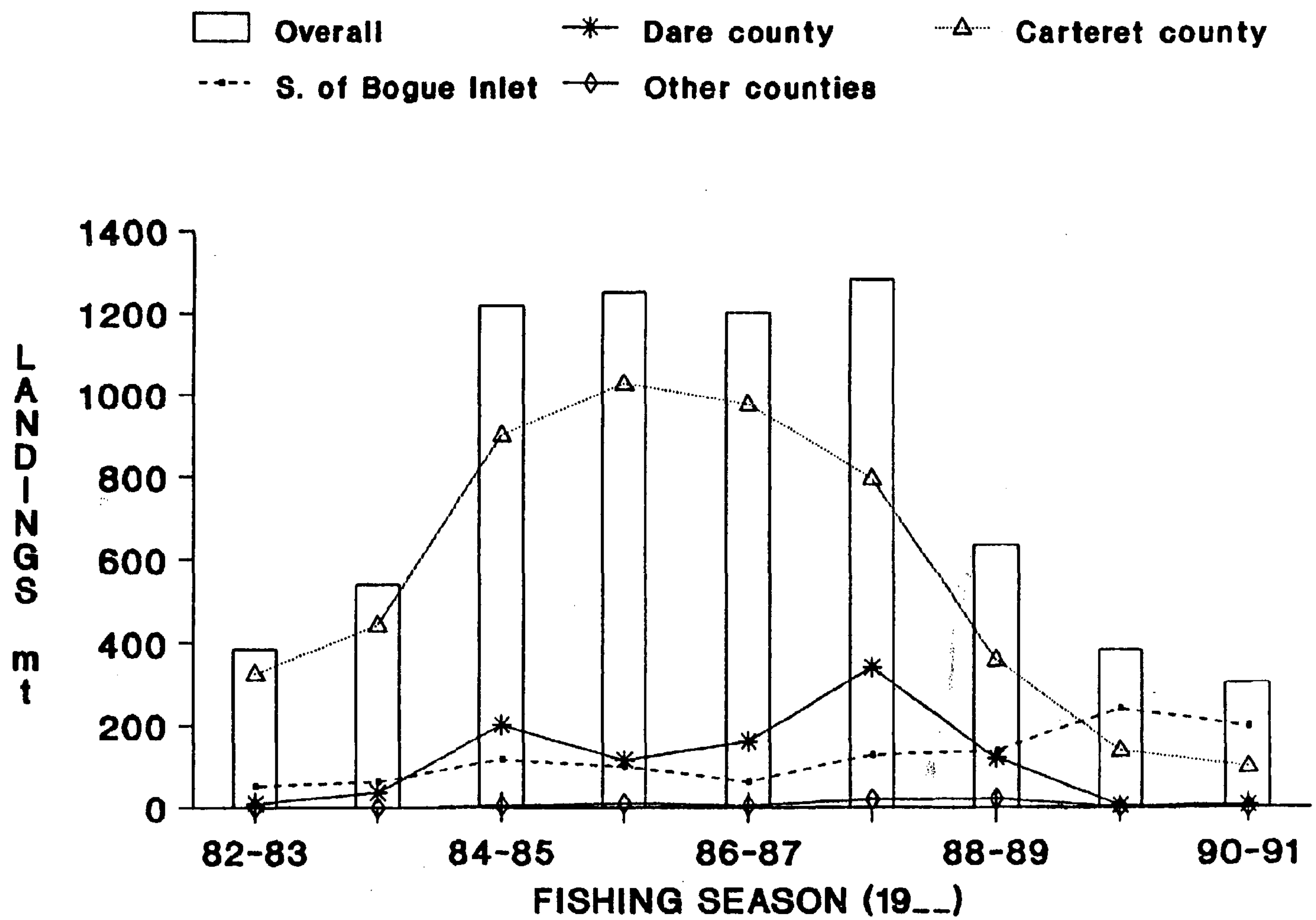

Figure 11. Commercial landings of croaker (<u>Micropogonias</u> <u>undulatus</u>) from the sink net fishery during the 1982-1991 fishing seasons.

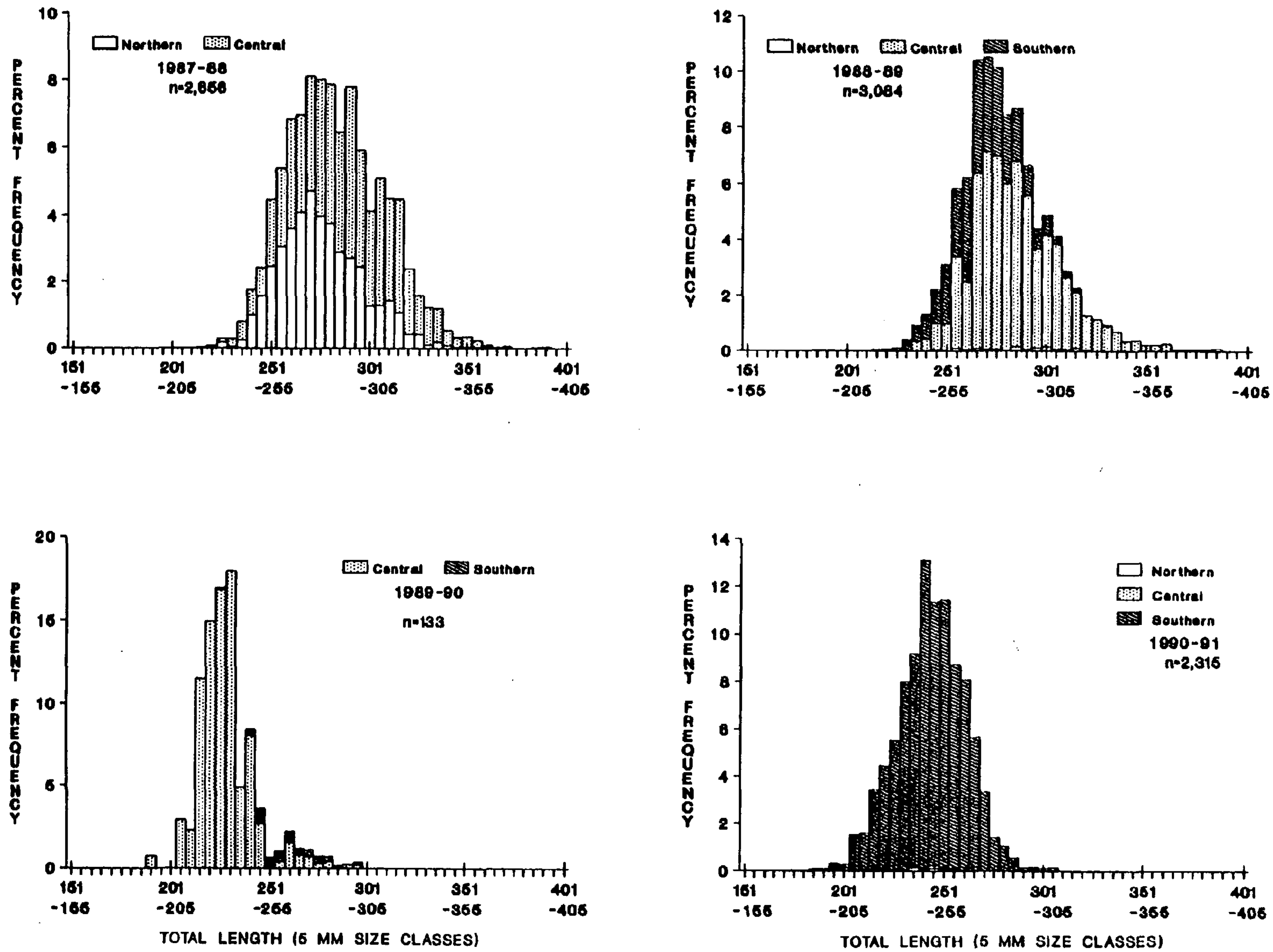

Figure 12. Length-frequency distribution (5 mm size classes) of Atlantic croaker (<u>Micropogonias undulatus</u>) in 1987-1991 sink net catches.

Figure 13. Age composition of Atlantic croaker (*Micropogonias undulatus*) in sink net catches during 1982-1991 fishing seasons.

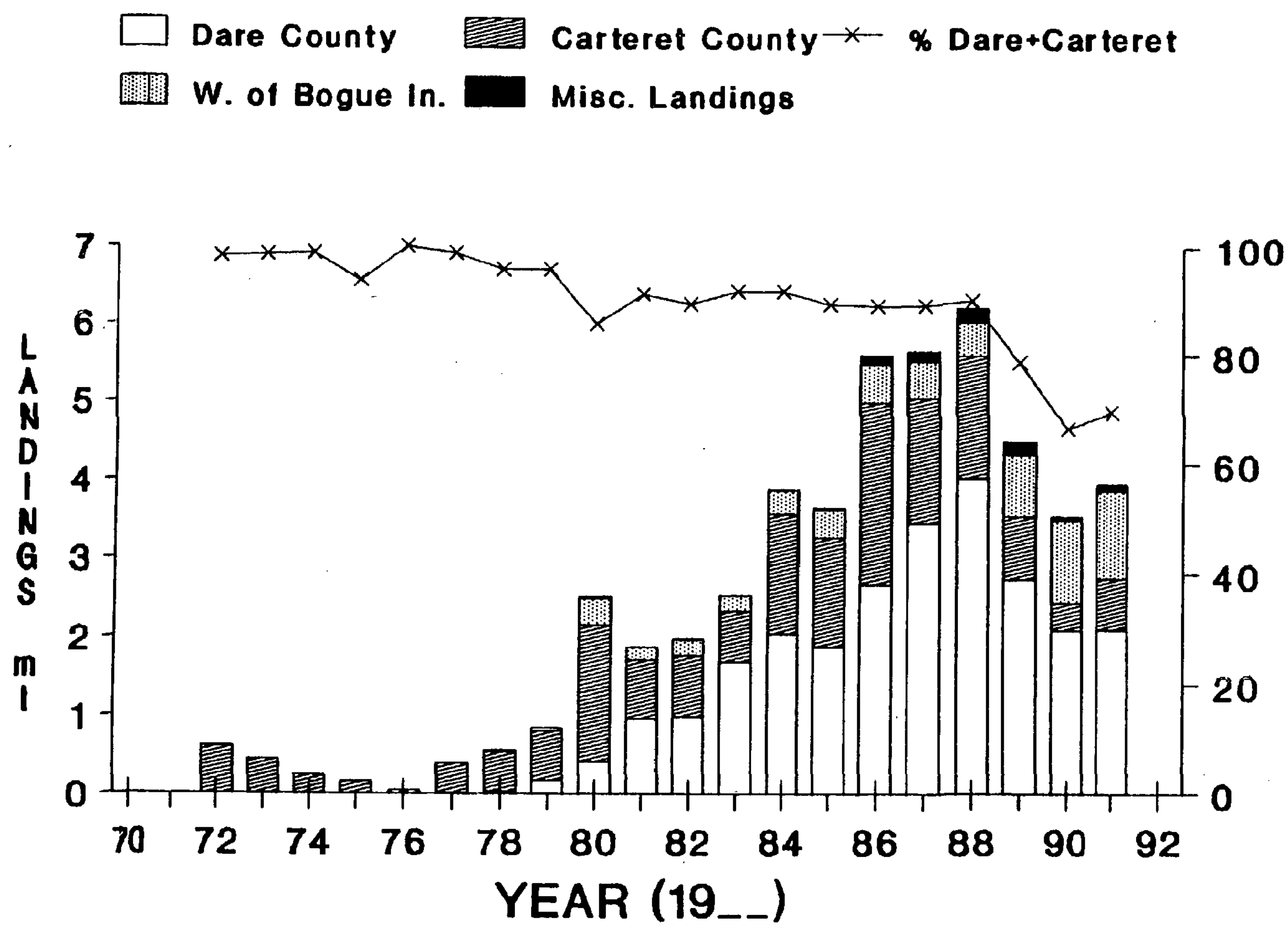

Figure 14. Total commercial landings of marketable finfish by the ocean gill net fisheries from 1972 through 1991, including the percent of the landings produced by Dare and Carteret counties.

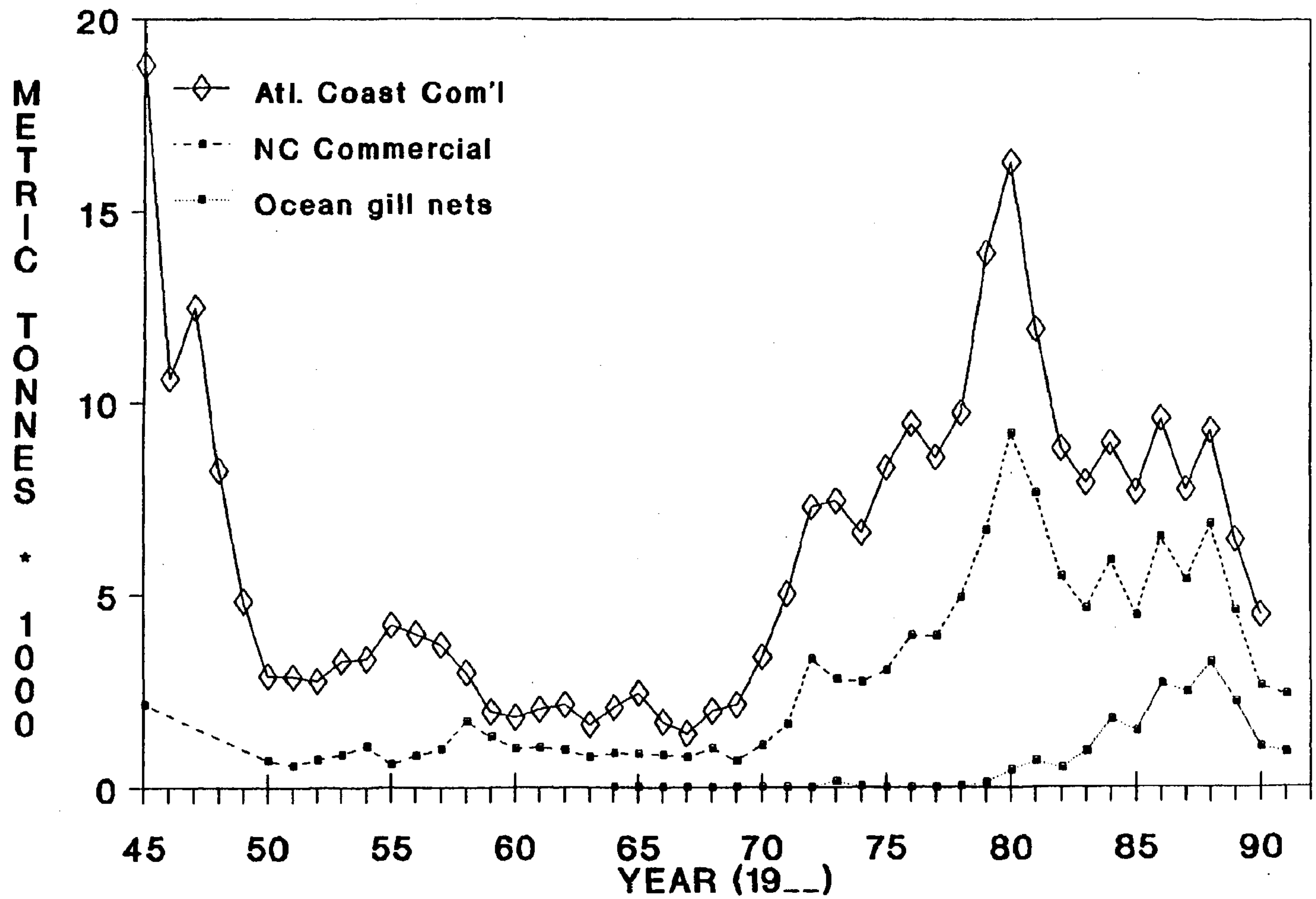

Figure 15. Annual commercial landings of weakfish from 1945-1991.

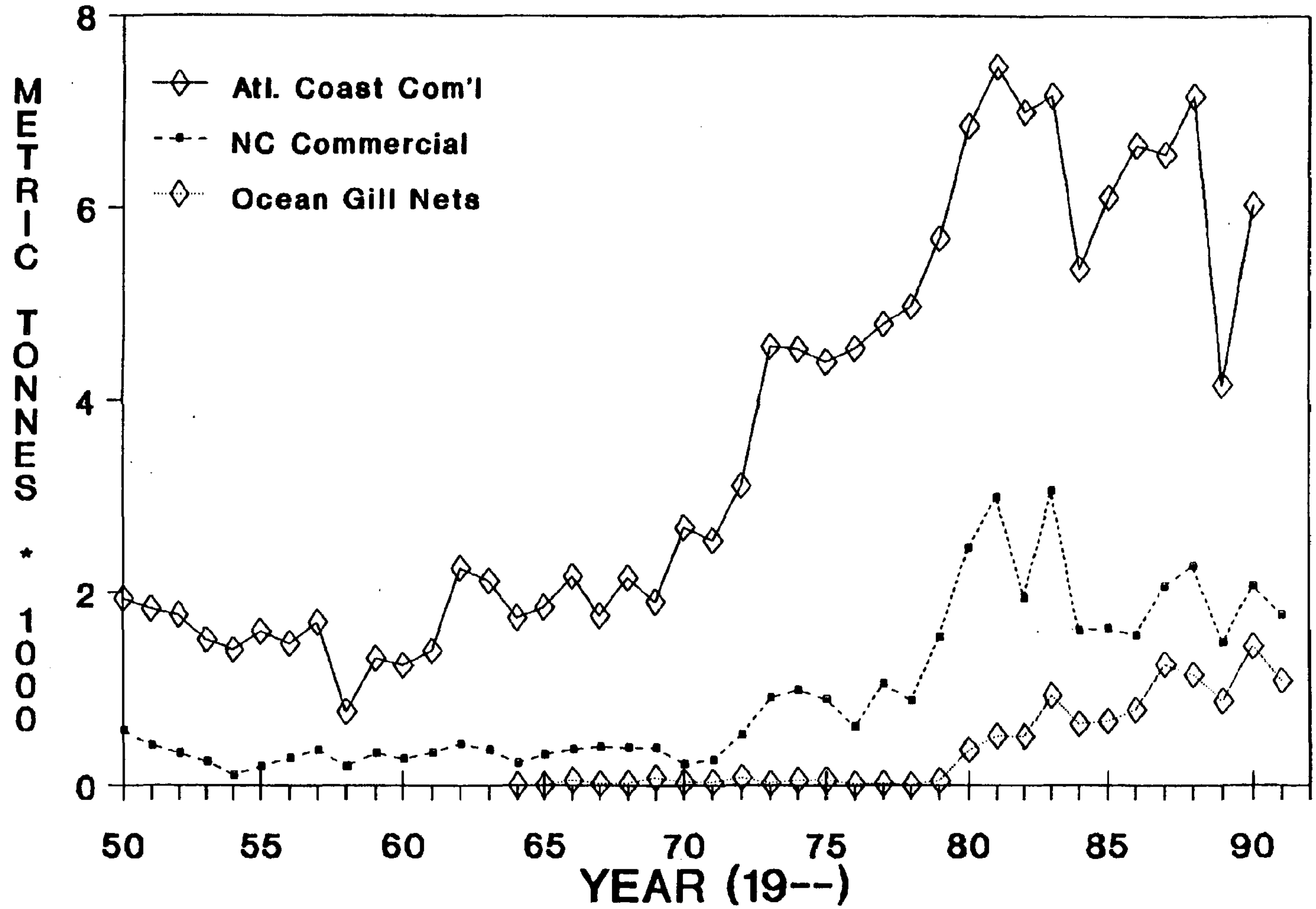

Figure 16. Annual commercial landings of bluefish from 1950-1991.

APPENDIX

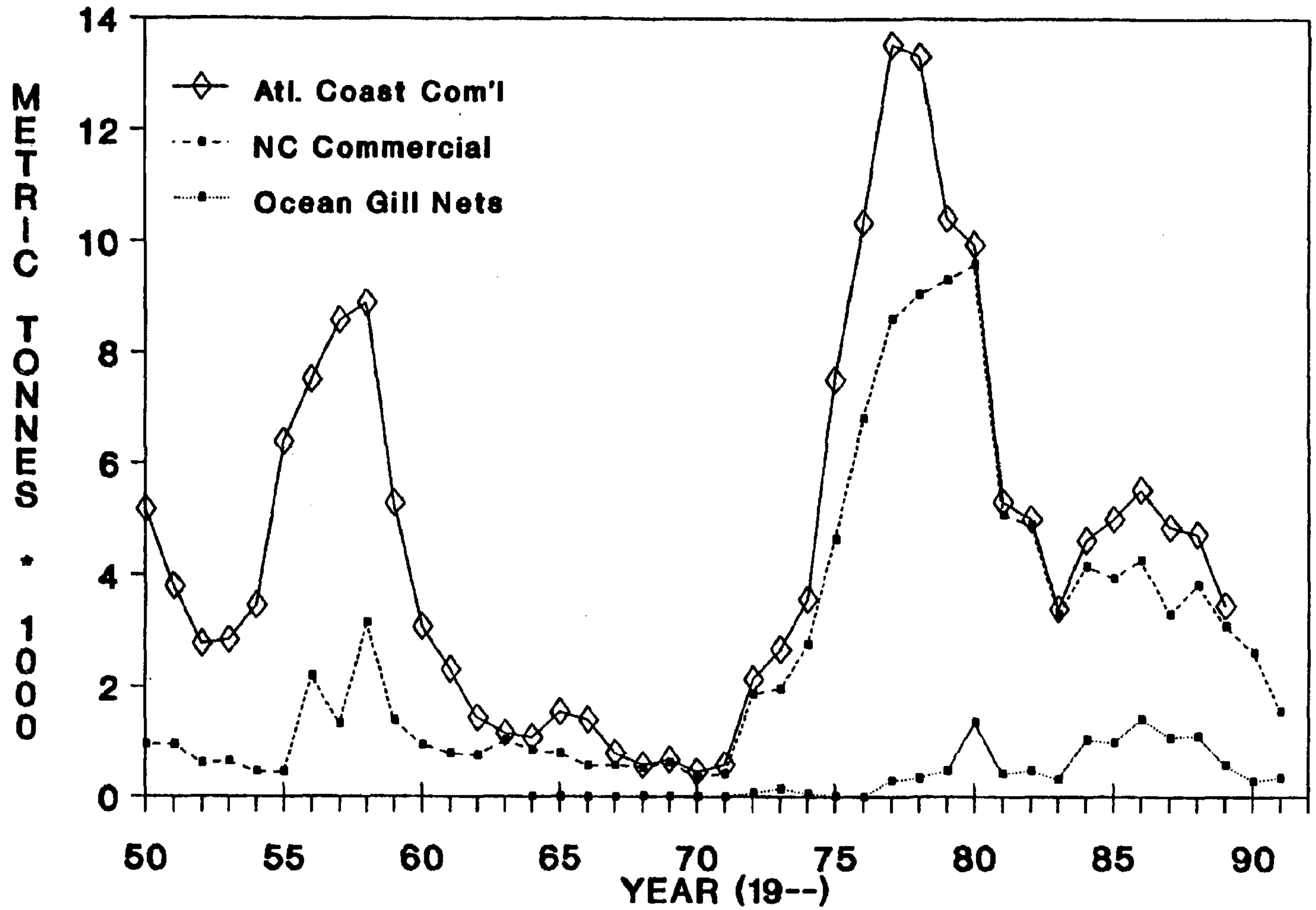

Figure 17. Annual commercial landings of Atlantic croaker from 1950–1991.

APPENDIX A. Seasonal commercial landings of sciaenid pound net [1], long haul [2], ocean gill net (gill net)[3], and winter trawler[4] fisheries in North Carolina for 1982-1990 fishing seasons (season = May-April), including total landings/species (mt), total value of state landings (value in 1000s of dollars) and relative contribution of the three fisheries/species (percent).

Species	May 82-Apr 83 Landings	May 82-Apr 83 Value/percent	May 83-Apr 84 Landings	May 83-Apr 84 Value/percent	May 84-Apr 85 Landings	May 84-Apr 85 Value/percent	May 85-Apr 86 Landings	May 85-Apr 86 Value/percent	May 86-Apr 87 Landings	May 86-Apr 87 Value/percent	May 87-Apr 88 Landings	May 87-Apr 88 Value/percent	May 88-Apr 89 Landings	May 88-Apr 89 Value/percent	May 89-Apr 90 Landings	May 89-Apr 90 Value/percent	May 90-Apr 91 Landings	May 90-Apr 91 Value/percent
Atlantic croaker	4,475	$3,572	3,697	$3,099	4,707	$3,278	4,211	$3,204	3,757	$2,909	3,552	$3,133	3,164	$3,036	2,787	$3,201	2,550	$2,749
Pound net	863	19.3	292	7.9	443	9.4	567	13.5	234	6.2	579	16.3	451	14.2	244	8.8	218	8.5
Long haul	2,064	46.1	1,883	50.9	1,339	28.4	1,114	26.4	1,392	37.0	679	19.1	1,177	37.2	1,427	51.2	1,769	69.4
Trawler	547	12.2	478	12.9	1,359	28.9	1,069	25.4	721	19.2	761	21.4	653	20.7	436	15.7	154	6.1
Gill net	385	8.6	540	13.3	1,219	25.9	1,252	29.7	1,204	32.1	1,283	36.1	636	20.1	385	13.9	304	11.9
Weakfish	5,163	$4,695	5,486	$3,936	4,728	$3,874	6,626	$4,458	5,276	$4,152	6,561	$4,717	5,298	$5,041	2,854	$3,320	2,759	$2,803
Pound net	126	2.5	73	1.3	167	3.5	192	2.9	88	1.7	199	3.0	232	4.4	58	2.0	74	2.7
Long haul	737	14.3	704	12.8	762	16.1	508	7.7	586	11.1	412	6.3	608	11.5	240	8.4	481	17.4
Trawler	3,054	59.5	2,740	49.9	1,760	37.2	2,570	38.8	1,971	37.4	2,364	36.0	1,590	30.0	1,168	41.1	1,220	44.4
Gill net	846	16.4	1,555	28.4	1,565	33.1	2,654	40.1	2,277	43.2	3,253	49.6	2,440	46.1	1,202	42.2	842	30.5
Bluefish	3,470	$914	1,618	$565	1,344	$509	1,734	$513	1,712	$732	2,603	$755	1,417	$538	1,761	$678	2,150	$ 740
Pound net	89	2.6	31	1.9	38	2.9	51	3.0	30	1.8	41	1.6	35	2.5	14	0.8	14	0.7
Long haul	194	5.6	153	9.5	111	11.7	216	12.5	212	12.4	214	8.2	164	11.6	136	7.7	139	6.5
Trawler	1,776	51.2	465	28.7	359	26.7	353	20.3	185	10.8	564	21.7	234	16.5	206	11.7	124	5.6
Gill net	970	28.0	637	39.4	561	41.8	744	42.9	979	57.2	1,357	52.1	683	48.2	1,193	67.8	1,293	60.1
Spot	2,214	$1,063	1,388	$699	1,562	$809	1,843	$900	1,473	$742	1,296	$663	1,378	$666	1,464	$785	1,590	$ 805
Pound net	150	6.8	30	2.1	89	5.7	56	3.1	22	1.5	51	3.9	33	2.4	33	0.2	19	1.2
Long haul	1,556	70.3	885	62.3	938	60.1	1,126	61.1	865	58.8	529	40.8	896	65.0	903	61.7	1,104	69.4
Trawler	36	1.6	69	5.0	50	3.2	75	4.1	38	2.6	37	2.8	37	2.7	63	4.3	33	2.1
Gill net	37	1.7	65	4.7	131	8.4	150	8.2	213	14.5	268	20.7	142	10.3	232	15.9	113	7.1
Flounders	3,970	$5,486	6,027	$7,293	6,403	$10,132	4,231	$9,304	3,256	$7,993	4,571	$10,957	3,927	$9,649	2,637	$9,685	3,003	$9,554
Pound net	55	1.4	34	0.6	53	0.8	34	0.8	99	3.0	163	3.6	257	6.5	150	5.7	76	2.5
Long haul	28	0.7	36	0.6	27	0.4	29	0.7	43	1.3	12	0.3	38	1.0	32	1.2	19	0.6
Trawler	2,888	72.8	4,769	79.1	5,185	81.0	2,891	68.3	1,825	56.1	3,219	70.4	2,326	59.2	1,105	41.9	1,686	56.2
Gill net	0.2	<0.1	6	<0.1	9	0.2	6	0.1	6	0.2	4	0.1	2	0.1	6	0.3	<0.1	<0.1
Striped bass	110	$451	185	$356	211	$365	101	$170	135	297	54	$119	43	$96	77	$212	50	$ 156
Pound net	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	0	0
Long haul	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Trawler	2	1.5	6	3.3	-	-	-	-	-	-	-	-	-	-	10	<0.1	3	6.0
Gill net	22	20.3	0.3	0.2	-	-	-	-	-	-	-	-	-	-	34	0.1	0	0
Butterfish[5]	135	$76	53	$43	80	$64	63	$47	79	$72	62	$53	26	$28	104	$67	122	$ 97
Pound net	11	8.1	1	2.7	7	8.6	14	22.2	10	12.6	5	7.3	7	26.9	0.9	0.9	15	1.2
Long haul	4	2.7	4	8.4	2	2.9	0.2	0.3	13	16.3	0.6	1.0	1	5.4	0.5	5.3	21	17.2
Trawler	74	55.0	38	71.7	52	64.6	34	53.6	39	49.3	32	51.6	10	38.5	71	69.3	41	33.6
Gill net	38	28.4	6	10.6	13	15.7	9	14.4	11	14.1	11	18.2	3	11.5	16	15.5	12	9.8

APPENDIX A. (Continued).

Species	May 82-Apr 83 Land-ings	May 82-Apr 83 Value/percent	May 83-Apr 84 Land-ings	May 83-Apr 84 Value/percent	May 84-Apr 85 Land-ings	May 84-Apr 85 Value/percent	May 85-Apr 86 Land-ings	May 85-Apr 86 Value/percent	May 86-Apr 87 Land-ings	May 86-Apr 87 Value/percent	May 87-Apr 88 Land-ings	May 87-Apr 88 Value/percent	May 88-Apr 89 Land-ings	May 88-Apr 89 Value/percent	May 89-Apr 90 Land-ings	May 89-Apr 90 Value/percent	May 90-Apr 9 Land-ings	May 90-Apr 9 Value/percen
Harvestfish[5]	199	$123	101	$60	110	$97	186	$200	137	$167	115	$158	114	$164	100	$129	98	$135
Pound net	34	17.2	17	16.8	32	28.9	86	46.5	34	24.6	38	32.7	34	29.8	18	18.0	24	24.5
Long haul	41	20.6	20	19.4	21	19.5	16	8.8	33	23.9	33	28.5	16	14.3	6	6.2	9	9.2
Trawler	34	17.2	7	7.1	5	4.7	43	23.0	7	4.8	6	4.8	8	7.1	22	22.0	13	13.3
Gill net	42	21.1	6	6.0	5	4.7	18	9.5	11	8.3	13	11.0	5	4.4	13	13.3	16	16.3
Spanish mackerel	86	$61	19	$15	58	$42	79	$67	105	$81	229	$145	199	$141	268	$215	380	$318
Pound net	3	3.6	3	14.2	6	10.9	10	12.4	16	15.2	81	35.6	75	37.7	71	26.5	22	5.8
Long haul	0.9	1.1	1	7.9	3	4.5	5	6.3	13	12.4	15	6.4	18	8.9	33	12.3	12	3.2
Trawler	0.4	0.4	-	-	-	-	0.3	0.4	0.3	0.3	0.1	<0.1	0.2	0.1	3	1.1	0.7	0.2
Gill net	30	34.7	4	20.3	14	24.4	27	34.1	41	38.9	50	21.9	43	21.6	114	42.5	143	37.6
Florida pompano	14	$33	2	$4	4	$11	11	$32	17	$41	9	$24	3	$9	9	$28	14	$24
Pound net	3	23.5	0.1	3.1	0.4	8.9	1	9.0	3	16.3	2	24.4	0.4	13.3	5	55.6	0.5	3.6
Long haul	6	38.9	0.4	18.7	2	56.6	5	48.4	4	24.3	2	19.7	0.7	18.9	2	18.6	1	7.2
Trawler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.002	<0.1	-	
Gill net	0.7	4.7	-	-	0.6	13.7	0.1	1.4	2	11.2	0.5	5.5	0.3	10.0			<0.1	<0.1
Spotted seatrout	42	$72	72	$120	68	$123	65	$171	85	$157	156	$277	167	$326	161	$345	110	$219
Pound net	5	11.6	5	6.8	4	6.0	0.2	0.4	0.3	0.3	2	1.5	0.2	0.1	-	-	0.3	0.3
Long haul	15	35.6	19	25.6	15	22.3	9	14.9	10	11.8	36	23.2	35	21.1	31	19.0	21	19.1
Trawler	0.4	1.0	0.3	0.4	0.4	0.6	2	2.8	6	6.7	2	1.4	0.7	0.4	8	4.8	<0.1	<0.1
Gill net	2	5.4	4	5.8	4	6.1	16	24.4	10	11.5	17	11.0	22	13.2	10	6.3	10	9.1
Red drum	22	$11	146	$81	91	$60	77	$113	104	$109	115	$149	99	$124	118	$164	82	$105
Pound net	0.3	1.5	2	1.1	0.8	0.9	0.4	0.5	0.5	0.5	19	16.4	4	4.0	5	4.2	1	1.2
Long haul	5	20.4	9	6.5	7	7.7	2	2.8	32	30.9	16	13.8	11	11.1	25	21.6	8	9.8
Trawler	6	27.7	13	9.0	6	7.1	2	2.1	2	1.5	1	1.3	2	1.9	1	1.1	0.2	0.3
Gill net	5	24.0	37	25.1	21	22.8	19	24.4	9	8.4	11	9.6	9	9.1	12	10.4	5	6.1
Black sea bass	213	$343	446	$619	544	$976	503	$1,002	267	$519	495	$979	452	$1,118	509	$1,384	285	$1,042
Trawler	71	33.5	266	59.7	363	71.4	296	58.9	95	35.7	315	63.6	206	45.7	205	40.3	60	21.1
Scup or porgies	658	$840	835	$997	505	$759	188	$212	111	$186	61	$65	15	$11	47	82	71	$60
Trawler	304	46.2	477	57.2	267	52.9	171	90.8	111	99.7	58	94.3	15	100.0	47	99.6	71	100.0
Bait	4,302	$354	4,430	$376	4,695	$381	3,437	$230	2,836	$201	4,084	$300	2,596	$168	2,167	$159	2,566	$177
Pound net	349	8.1	201	4.5	421	9.0	549	16.0	123	4.3	329	8.1	271	10.4	306	14.1	341	13.3
Long haul	1,879	43.7	1,901	42.9	1,884	40.1	1,148	33.4	1,386	48.9	1,474	36.1	1,078	41.5	1,112	51.8	1,635	63.7
Trawler	1,364	31.7	1,613	36.4	1,728	36.7	1,620	47.1	905	31.9	2,109	51.1	794	30.6	195	9.0	78	3.0
Gill net	62	1.5	44	1.0	100	2.1	13	0.4	23	0.8	7	0.2	127	4.9	6	0.3	1	

APPENDIX A. (Continued).

Species	May 82-Apr 83		May 83-Apr 84		May 84-Apr 85		May 85-Apr 86		May 86-Apr 87		May 87-Apr 88		May 88-Apr 89		May 89-Apr 90		May 90-Apr 91	
	Landings	Value/percent	Landings	Value/percent	Landings	Value/percent	Landings	Value/percent	Landings	Value/percent	Landings	Value/percent	Landings	Value/percent	Landings	Value/percent	Landings	Value/percent
Total finfish																		
(w/out menhaden)	31,767	$23,406	32,776	$23,639	37,030	$28,220	32,319	$27,182	25,462	$25,399	31,772	$30,301	25,225	$29,622	20,905	$41,836	24,812	$28,731
Pound net	1,699	5.4	706	2.2	1,285	3.5	1,553	4.8	684	2.7	1,558	4.9	1,432	5.7	935	4.5	827	3.3
Long haul	6,579	20.7	5,649	17.2	5,175	14.0	4,250	13.2	4,714	18.5	3,353	10.6	4,308	17.1	4,112	19.7	5,299	21.4
Trawler	10,367	32.6	11,779	35.9	11,899	32.1	9,850	30.5	6,493	25.5	10,256	32.3	6,099	24.2	4,481	21.5	4,081	16.4
Gill net	2,671	8.4	3,071	9.4	3,825	10.3	5,157	16.0	5,067	19.9	6,698	21.1	4,430	17.6	3,555	17.0	3,548	14.3
Total marketable																		
(w/out menhaden)	27,465	$23,092	28,346	$18,994	32,336	$23,263	28,882	$26,952	22,626	$25,197	27,688	$29,884	22,629	$29,454	18,738	$41,677	22,246	$28,554
Pound net	1,350	4.9	505	1.8	864	2.7	1,003	3.5	561	2.5	1,229	4.4	1,161	5.1	630	3.3	468	2.1
Long haul	4,700	17.1	3,748	13.2	3,291	10.2	3,102	10.7	3,328	14.7	2,074	7.5	3,230	14.3	2,991	16.0	3,665	16.5
Trawler	9,003	32.8	10,166	35.9	10,177	31.5	8,230	28.5	5,588	24.7	8,147	29.4	5,304	23.4	4,285	22.9	4,056	18.2
Gill net	2,613	9.5	3,028	10.7	3,725	11.5	5,144	17.8	5,043	22.3	6,691	24.2	4,303	19.0	3,549	18.9	3,547	15.9

1 Pound net landings include Dare County (annual timeframe).
2 Long haul landings: Long haul landings include April through December from Dare, Hyde, Carteret, Craven, Pamlico and Beaufort counties (annual timeframe).
3 Winter trawl landings include: Dare, Hyde, Pamlico, Beaufort, Craven, Carteret, Brunswick and Onslow counties.
4 Ocean gill net landings include all state landings September through April.
5 North Carolina commercial landings combined harvestfish and butterfish landings in 1985 are harvestfish; for the purpose of this presentation, we extrapolated out butterfish landings based on monthly relative proportions of the two species in our samples.

APPENDIX B. Seasonal commercial landings (weight; kg) in North Carolina from gill nets fished in the ocean for 1987-91 (season = September-April) for North Carolina, Dare County, Carteret County, and other areas combined, including the total value of the landings and relative contribution of each area grouping (percent).

	September 1987-April 1988		September 1988-April 1989		September 1989-April 1990		September 1990-April 1991	
	Weight	Value/percent	Weight	Value/percent	Weight	Value/percent	Weight	Value/percent
Bluefish	1,357,166	$ 342,466	683,399	$ 300,439	1,192,829	$ 456,168	1,292,845	$ 455,159
Dare	1,206,901	88.9	564,459	82.6	940,049	78.8	1,079,702	83.5
Carteret	83,888	6.2	58,098	8.5	77,039	6.5	95,298	7.4
Others	66,377	4.9	60,842	8.9	175,751	14.7	117,845	9.1
Weakfish	3,252,545	$2,472,318	2,440,237	$2,287,497	1,201,856	$1,559,978	842,277	$1,108,307
Dare	2,692,175	82.8	1,813,420	74.3	681,210	56.7	373,507	44.3
Carteret	376,600	11.6	415,454	17.0	123,329	10.3	164,305	19.5
Others	183,770	5.6	211,363	8.7	397,317	33.1	304,465	36.2
Atlantic croaker	1,283,319	$1,202,406	636,080	$ 632,897	385,153	$ 467,414	304,071	$ 322,766
Dare	340,791	26.6	118,822	18.7	4,510	1.2	5,671	1.9
Carteret	796,482	62.1	359,211	56.5	138,877	36.1	98,978	32.5
Others	146,046	11.3	158,047	24.8	241,766	62.8	199,422	65.6
Red drum	11,058	$ 14,521	9,347	$ 10,390	12,192	$ 16,618	4,919	$ 5,881
Dare	216	2.0	871	9.3	3,632	29.8	90	1.8
Carteret	8,260	74.7	5,721	61.2	7,289	59.8	2,568	52.2
Others	2,582	23.3	2,755	29.5	1,271	10.4	2,261	46.0
King mackerel	15,338	$ 29,023	33,355	$ 86,227	5,400	$ 13,566	13,514	$ 23,068
Dare	11,658	76.0	33,098	99.2	5,183	96.0	12,928	95.7
Carteret	1,911	12.5	67	0.2	82	1.5	206	1.5
Others	1,769	11.5	190	0.6	135	2.5	380	2.8
King whiting	201,381	$ 201,830	91,068	$ 102,716	183,317	$ 262,372	217,392	$ 274,026
Dare	3,675	1.8	829	9.1	2,985	1.6	15,161	7.0
Carteret	108,008	53.6	41,299	45.3	19,434	10.6	18,164	8.3
Others	89,698	44.6	48,940	53.7	160,898	87.8	184,067	84.7
Butterfish	11,306	$ 8,927	2,999	$ 2,708	15,913	$ 11,969	12,173	$ 11,049
Dare	5,190	45.9	2,312	77.1	5,755	36.2	9,270	76.2
Carteret	1,178	10.4			2,640	16.6	430	3.5
Others	4,938	43.7	687	22.9	7,518	47.2	2,473	20.3
Spotted seatrout	17,081	$ 29,421	21,701	$ 45,246	10,029	$ 20,501	10,712	$ 19,600
Dare	1,035	6.1	15,623	72.0	836	8.3	1,388	13.0
Carteret	12,701	74.4	3,367	15.5	5,745	57.3	7,457	69.6
Others	3,345	19.6	2,711	12.5	3,448	34.4	1,867	17.4
Spanish mackerel	50,095	$ 36,566	42,795	$ 31,916	113,649	$ 108,879	143,104	$ 120,860
Dare	7,293	14.6	16,653	38.9	78,470	69.0	77,948	54.5
Carteret	37,418	74.7	17,719	41.4	12,211	10.8	29,718	20.8
Others	5,384	10.7	8,423	19.7	22,958	20.2	35,438	24.8
Spot	267,993	$ 152,840	142,308	$ 77,860	232,305	$ 136,654	113,468	$ 53,447
Dare	4,910	1.8	6,959	4.9	35,071	15.1	4,609	4.1
Carteret	153,755	57.4	65,077	43.6	79,148	34.1	24,442	21.5
Others	109,328	40.8	70,272	49.4	118,086	50.8	84,417	74.4

APPENDIX B. (Continued)

	September 1987-April 1988		September 1988-April 1989		September 1989-April 1990		September 1990-April 1991	
	Weight	Value/percent	Weight	Value/percent	Weight	Value/percent	Weight	Value/percent
Dogfish					17,167	$ 3,144	364,989	$ 65,930
Dare					16,955	98.8	355,852	97.5
Carteret					212	1.2	5,080	1.4
Bait	6,775	$ 653	126,627	$ 10,170	6,293	$ 635	1,191	$ 113
Dare	6,775	100.0	7,528	5.9	-	-	1,191	100.0
Carteret	-	-	119,138	94.1	-	-	-	0.0
Others	-	-	39	<0.1	6,293	100.0	0	0.0
Marketable finfish	6,691,159	$4,614,240	4,302,981	$3,766,229	3,549,152	$3,271,541	3,547,210	$2,567,978
Dare	4,344,559	64.9	2,635,142	61.2	1,826,043	51.4	2,039,497	57.5
Carteret	1,658,635	24.8	1,000,794	23.3	524,011	14.8	490,066	13.8
Others	687,965	10.3	667,045	15.5	1,199,198	33.8	1,017,747	28.7
Total finfish	6,697,934	$4,614,893	4,429,608	$3,776,399	3,555,545	$3,270,906	3,548,401	$2,568,091
Dare	4,351,334	65.0	2,642,670	59.7	1,826,043	51.4	2,040,688	57.5
Carteret	1,658,635	24.8	1,119,932	25.3	524,011	14.7	490,066	13.8
Others	687,965	10.2	667,006	15.0	1,205,491	33.9	1,017,647	28.7

APPENDIX C. Size composition of weakfish (Cynoscion regalis) captured in sink nets by season (1982-91) and area (1987-91); n = number of fish measured.

		Percent frequency/size class (TL, mm)												
	n	201-250	251-300	301-350	351-400	401-450	451-500	501-550	551-600	601-650	651-700	701-750	751-800	>800
SEASON														
1982-83	2,243	0.4	7.1	40.3	41.8	5.2	0.7	0.2	<0.1	0.3	1.3	1.5	0.8	0.3
1983-84	6,449		0.9	14.0	39.4	24.7	8.9	2.9	1.3	0.3	1.2	3.7	2.4	0.4
1984-85	4,902	0.4	3.4	27.3	37.7	20.2	8.5	1.2	0.2	<0.1	0.2	0.7	0.3	<0.1
1985-86	5,522	0.4	6.6	28.4	31.0	21.9	9.5	1.8	0.3	0.1	<0.1	<0.1	<0.1	<0.1
1986-87	6,652	0.1	3.1	37.5	44.2	12.6	2.0	0.4	<0.1	<0.1		<0.1	<0.1	<0.1
1987-88	7,719	<0.1	0.5	9.7	31.1	31.8	17.8	7.4	1.4	1.2	<0.1	<0.1		
1988-89	7,601	<0.1	0.2	7.3	35.8	34.0	14.6	5.8	2.1	0.2	<0.1	<0.1		
1989-90	4,094	<0.1	3.3	26.7	36.1	15.3	12.2	4.9	1.2	0.2	<0.1	<0.1	<0.1	<0.1
1990-91	8,841	2.3	35.0	52.6	9.1	0.8	0.1	<0.1	<0.1					
AREA														
1987-88														
Northern	1,913	<0.1	0.7	11.1	29.3	34.0	16.8	6.5	1.3	0.3				
Central	5,806	<0.1	0.4	9.3	31.7	31.1	18.2	7.7	1.5	0.2	<0.1	<0.1		
1988-89														
Northern	5,507		<0.1	4.2	31.7	36.6	17.1	7.3	2.7	0.3	<0.1		<0.1	
Central	1,554	<0.1	0.5	15.4	49.9	26.8	6.6	0.7	<0.1					
Southern	540	0.1	3.6	42.8	44.7	5.7	2.4	0.8						
1989-90														
Northern	3,408		0.6	20.2	37.7	18.1	15.3	6.1	1.5	0.3	<0.1	<0.1	<0.1	<0.1
Central	672	0.2	13.7	52.5	29.7	4.0								
Southern	14			57.1	42.9									
1990-91														
Northern	5,481	1.0	33.9	54.2	9.9	0.9	0.1	<0.1	<0.1					
Central	1,435	2.1	20.7	56.7	18.9	1.6								
Southern	1,925	9.4	46.5	42.9	1.2	<0.1			<0.1					

APPENDIX D. Age composition of weakfish (Cynoscion regalis) captured by North Carolina sink nets, 1982-91.

	Percent frequency/age class											
Seasons	0	1	2	3	4	5	6	7	8	9	10	[illegible]
1982-83	0.04	44.36	44.99	6.07	0.62	1.70	0.92	0.52	0.30	0.41	0.07	
1983-84	0.00	24.29	46.89	16.81	4.35	2.69	1.84	1.36	0.84	0.75	0.17	0.03
1984-85	0.04	36.52	49.47	11.21	1.61	0.38	0.32	0.24	0.10	0.10	0.01	
1985-86	0.02	36.78	50.02	11.44	1.69	0.03	0.01	<0.01	<0.01	<0.01	<0.01	
1986-87	0.01	28.73	48.31	20.38	2.31	0.27	0.001	0.001	0.00	0.001		
1987-88	0.00	13.12	47.58	34.21	4.56	0.52	<0.01	<0.01				
1988-89	0.00	7.32	49.03	39.67	3.59	0.40	<0.01		<0.01			
1989-90	0.06	40.03	41.77	16.80	1.17	0.13	0.01	<0.01	0.02	0.01	<0.01	<0.01
1990-91	0.05	48.62	40.40	10.34	0.58							

APPENDIX E. Size composition of bluefish (Pomatomus saltatrix) captured in sink nets by season (1982-91) and area (1987-91); n = number of fish measured.

	n	Percent frequency/size class (FL, mm) 201-250	251-300	301-350	351-400	401-450	451-500	501-550	551-600	601-650	651-700	701-750	751-800	>800
SEASON														
1982-83	1,319	1.4	28.6	16.3	1.0	<0.1		0.4	2.4	8.0	11.2	20.0	10.0	0.6
1983-84	1,553	0.4	6.0	5.5	20.2	3.3	0.2	0.3	0.1	4.2	18.9	28.3	11.2	1.2
1984-85	2,086	0.3	25.6	12.5	0.4	<0.1	<0.1	0.1	1.2	2.5	14.3	32.2	10.3	0.5
1985-86	1,374	1.7	34.3	10.3	1.5	0.2			0.1	7.2	17.8	17.6	8.3	1.0
1986-87	1,202	<0.1	2.2	1.2	4.0	2.1	2.3	6.9	12.6	11.3	22.9	20.3	13.2	1.1
1987-88	1,052	<0.1	0.3	2.6	12.3	0.8		0.1	3.2	12.3	24.7	36.1	7.5	0.2
1988-89	1,348		0.7	2.0	9.5	2.5	0.1	<0.1	0.3	17.1	40.0	23.0	4.4	0.4
1989-90	2,228	0.1	3.2	0.8	1.1	0.2	<0.1	1.5	3.1	5.8	40.1	35.8	7.7	0.5
1990-91	5,017	0.2	2.7	42.4	34.3	4.2				<0.1	2.3	11.1	2.8	0.1
AREA														
1987-88														
Northern	416		0.8	4.7	10.4	1.8		0.1	4.2	26.2	20.9	25.8	5.0	0.1
Central	636	<0.1	0.1	2.1	12.8	0.6		0.1	3.0	8.4	25.7	38.8	8.2	0.2
1988-89														
Northern	877		0.2	0.4	0.8	0.1			0.4	22.2	47.2	24.1	4.3	<0.1
Central	399			3.1	34.6	9.9	0.3	<0.1		3.7	21.7	21.4	4.9	0.4
Southern	72		35.4	54.6	10.1									
1989-90														
Northern	1,797		0.1	0.2	1.3	0.2	<0.1	1.9	4.0	7.3	40.9	35.4	8.0	0.6
Central	410		14.7	3.0	0.2					0.3	37.7	37.3	6.6	0.2
Southern	21	27.3	48.7	21.4	2.7									
1990-91														
Northern	3,473	<0.1	2.7	18.5	19.1	3.4				0.2	8.0	38.4	9.6	0.2
Central	2,301	<0.1	2.1	52.4	40.8	4.5						0.1	<0.1	
Southern	243	20.9	66.4	12.3	0.4									

APPENDIX F. Age composition of bluefish (Pomatomus saltatrix) captured by North Carolina sink nets, 1982-91.

Season	Percent frequency/age class 0	1	2	3	4	5	6	7	8	9	10	11
1982-83	36.98	10.43	2.73	6.79	16.67	15.42	8.59	2.01	0.38			
1983-84	9.71	25.02	1.24	5.22	20.47	22.24	10.87	3.46	1.20	0.44		0.13
1984-85	37.73	1.17	0.61	3.35	9.15	32.65	8.72	5.89	0.57	0.03	0.11	0.03
1985-86	38.36	9.74	0.02	1.51	15.55	15.30	12.49	5.49	1.10	0.41		
1986-87	4.80	6.78	3.93	17.98	14.06	27.91	15.44	6.78	1.80	0.58		
1987-88	1.64	14.42	0.84	5.93	18.36	14.70	33.72	4.24	1.84	4.31		
1988-89	1.65	12.55	0.77	7.26	28.97	24.29	13.32	10.26	0.65	0.28		
1989-90	3.87	1.55	2.22	8.28	11.90	45.46	11.81	11.51	2.11	1.29		
1990-91	9.47	73.66	0.68	0.21	1.48	4.93	5.62	3.56	0.06	0.33		

APPENDIX G. Size composition of Atlantic croaker (Micropogonias undulatus) captured in sink nets by season (1982-91) and area (1987-91); n = number of fish measured.

	n	Percent frequency/size class 150-175	176-200	201-225	226-250	251-275	276-300	301-325	326-350	>350
SEASON										
1982-83	12					16.0	40.0	16.0	8.0	20.0
1983-84	723		0.1	2.0	7.9	41.8	38.7	8.1	1.2	0.2
1984-85	1,568			0.4	7.8	40.4	41.0	10.0	0.4	<0.1
1985-86	1,593			0.7	21.4	49.2	23.8	4.5	0.3	0.1
1986-87	2,000			0.1	6.5	32.4	36.1	18.7	5.3	0.9
1987-88	2,656			0.1	5.6	31.8	36.0	20.6	4.9	0.9
1988-89	3,084			0.1	5.0	36.2	38.5	15.5	3.6	1.0
1989-90	198		0.8	34.1	56.1	6.8	2.1			
1990-91	2,315	<0.1	0.5	11.3	47.2	37.3	3.4	0.3		
AREA										
1987-88										
Northern	946			<0.1	7.1	41.4	36.4	12.8	2.0	0.3
Central	1,710			0.1	4.4	24.4	35.8	26.6	7.2	1.3
1988-89										
Northern	101				6.8	25.1	35.2	32.7		0.2
Central	1,401				2.6	29.3	41.7	19.9	5.1	1.5
Southern	1,582			0.4	10.7	52.8	31.2	4.8	0.2	
1989-90										
Central	98		0.8	36.1	57.6	4.1	1.4			
Southern	37				29.7	54.1	16.2			
1990-91										
Northern	62	1.3	23.8	49.7	22.7	2.6				
Central	56		1.5	17.5	48.1	26.3	6.6			
Southern	2,197	<0.1	0.5	11.1	47.2	37.5	3.4	0.3		

APPENDIX H. Age composition of Atlantic croaker (Micropogonias undulatus) by North Carolina sink nets, 1982-91.

Season	Percent frequency/age class 0	1	2	3	4	5	6
1982-83		10.27	47.61	34.73	4.93	2.46	
1983-84		3.97	60.88	35.02	0.07	0.06	0.04
1984-85		2.02	61.37	36.60	0.01	<0.01	
1985-86		3.79	73.55	22.58	0.06	0.02	
1986-87		33.48	49.98	14.96	1.57	0.02	
1987-88		14.26	51.96	31.56	2.03	0.20	
1988-89		19.41	54.34	25.67	0.55	0.02	0.01
1989-90		82.66	15.37	1.96	0.01		
1990-91		63.41	28.08	8.51			

APPENDIX I. Total landings of marketable finfish landings by ocean gill nets in North Carolina; counties west of Bogue Inlet = Onslow, Pender, New Hanover, and Brunswick.

	Ocean gill net landings (mt)					
Year	Dare	Carteret	Counties west of Bogue Inlet	Other counties	Total state	Percent Dare and Carteret
1972		599.1	11.4		610.5	98.1
1973		441.0	6.5		447.9	98.5
1974		237.8	2.9		240.7	98.8
1975	5.6	149.3	10.2		165.0	93.8
1976		48.5			48.5	100.0
1977	12.7	376.0	<0.1	4.6	393.3	98.8
1978	35.2	503.4	21.8	1.9	562.3	95.8
1979	174.4	630.9	34.5	0.9	840.7	95.8
1980	413.6	1,740.3	329.6	29.6	2,513.1	85.7
1981	964.5	748.4	162.4	2.9	1,878.2	91.2
1982	985.9	787.0	193.8	15.6	1,982.3	89.4
1983	1,686.5	641.8	197.2	11.7	2,537.2	91.8
1984	2,046.6	1,516.8	305.0	14.2	3,882.6	91.8
1985	1,876.5	1,389.2	356.0	33.6	3,655.3	89.4
1986	2,666.1	2,324.0	495.1	115.9	5,601.1	89.1
1987	3,448.1	1,601.8	478.3	133.7	5,661.9	89.2
1988	4,023.6	1,573.1	439.6	176.4	6,212.7	90.1
1989	2,733.1	809.5	784.6	168.5	4,495.7	78.8
1990	2,008.6	354.1	1,049.0	55.5	3,545.2	66.6
1991	2,100.5	651.4	1,111.8	88.8	3,952.5	69.6

ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES

Completion Report for Project 2-IJ-16

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JOB 5

REEF FISH AND COASTAL PELAGIC FISHERIES ASSESSMENT

By

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ABSTRACT

Commercial vessels from the North Carolina reef fish fishery were sampled monthly to determine species composition, size distribution, and related trip information, such as catch-per-unit-effort (CPUE). Approximately 50-60 vessels fished on a full-time basis in North Carolina. One hundred fifty-nine trips were sampled in Year 1 (July 1988-June 1989); 147 in Year 2 (July 1989- June 1990); and 191 in Year 3 (July 1990-June 1991). Three types of gear were used: handlines (hydraulic or electric "bandit" reels), longlines, and fish traps. Handlines were also fished near the surface for coastal pelagic fishes. The number of reef fish handline reels per boat ranged from 2 to 6 (mean 3.5); longline lengths ranged from 1600 to 9656 m; number of hooks ranged from 250 to 1200; and number of sets per trip ranged from 43 to 105. The CPUEs for handline vessels were higher for those vessels landing in Morehead City/Beaufort than for those landing in Southport. The CPUEs for wreckfish boats fluctuated between months and years, but were much higher than those for handline vessels. Longline CPUEs were lowest in Year 1 and almost doubled the two subsequent years. Catches for sea bass traps varied with Year 2, having the highest average. Sea basses (Serranidae) were generally the dominant reef fish family in the landings, followed by snappers (Lutjanidae), porgies (Sparidae), wreckfish (Percichthyidae), and tilefishes (Malacanthidae). Ninety-eight species in 28 reef fish families were caught. Black sea bass and vermilion snapper were the two most abundant species in both numbers and weight. Some 19 pelagic and shark species were also landed and sold. Over the three year study period, annual mean lengths decreased for some fishes (black sea bass, speckled hind, silk snapper, red porgy, knobbed porgy, gray triggerfish, white snapper, tilefish, wreckfish). In some fishes, the annual mean length remained constant (gag, scamp, vermilion snapper) while in the blueline tilefish and red grouper, it fluctuated among the years.

Most of the coastal pelagic species landings were from the area near Cape Hatteras (Manteo, Wanchese, etc). Statewide, the landings increased each year. King mackerel dominated the landings followed by yellowfin tuna and dolphin. Annual mean length of king mackerel decreased during the three years, which is partially attributable to sampling effort.

TABLE OF CONTENTS

INTRODUCTION

The reef fish communities of the outer continental shelf of the southeastern United States consist of demersal tropical and subtropical species of snappers (Lutjanidae), sea basses and groupers (Serranidae), porgies (Sparidae), tilefishes (Malacanthidae), grunts (Haemulidae), triggerfishes (Balistidae), wrasses (Labridae), and jacks (Carangidae). These communities inhabit the sparse and patchily distributed, nearshore sponge-coral ("live bottom") habitats or the offshore rocky outcrop habitats. Fish populations of these types of habitats are difficult to inventory because of obstructions to trawling and the secretive behavior of the fish. Recent descriptions of these communities have been based on analyses of headboat catch records, exploratory hook and line, trawl, and trap fishing, and underwater television, diver, and submersible observations (Struhsaker 1969; Miller and Richards 1980; Powles and Barans 1980; Grimes et al. 1982; Wenner 1983; Barans and Henry 1984; Chester et al. 1984; Sedberry and Van Dolah 1984; Parker and Ross 1986). This rich fauna supports a thriving recreational headboat fishery and a commercial fishery off North Carolina.

In addition to the reef fishes, there are several species of recreationally and commercially important coastal pelagic fishes, including Spanish mackerel (*Scomberomorus maculatus*), king mackerel (*S. cavalla*), dolphin (*Coryphaena hippurus*), and cobia (*Rachycentron canadum*) which occur seasonally along the North Carolina coast.

The purpose of this project was to collect biological and fisheries data from the commercial fisheries for reef fishes and coastal pelagic species for use in reaching management decisions.

METHODS AND MATERIALS

Reef fish catches were sampled monthly and analyzed by "fiscal seasons": July 1988 - June 1989 (Year 1), July 1989 - June 1990 (Year 2), and July 1990 - June 1991 (Year 3).

Sampling was conducted at fish houses while the catches were being unloaded. Most samples were obtained in Southport and Morehead City-Beaufort; some catches landed at Carolina Beach, Wrightsville Beach and Wanchese were also examined. Captains were interviewed to obtain information on general fishing location, type and quantity of gear, number of days out and days fished and other miscellaneous information. For each year of the study, personnel sampled at least 40 of the commercial trips. Sampling effort was distributed throughout each month and the actual number of trips sampled was dependent on availability of fish, weather conditions, and the cooperation of fishermen and seafood dealers.

All species in an individual trip were identified. For each market category, as many random samples (22.7 or 45.4 kg fish boxes) as possible were obtained from each market size category, e.g. small, medium, large. The individual fish packed in a fish box were identified to species and the total number of individuals by species was counted. The total weight for each market category was obtained from the trip ticket supplied by the fisherman or fish house dealer. In addition, as time and fish house packing procedures allowed, a random sample of individuals by species was measured for lengths (mm TL for all species except scamp (<u>Mycteroperca</u> <u>phenax</u>), gray triggerfish (<u>Balistes</u> <u>capriscus</u>), hogfish (<u>Lachnolaimus</u> <u>maximus</u>) and coastal pelagic species - mm FL). Weight (whole or gutted in kg) and sex were also recorded if the data were available and time permitted. The number of fish measured was spread out over the study period. In cases where only partial data sets were obtained, estimates based on means calculated from recent catches were used to fill in missing values if deemed statistically and biologically reasonable.

Species numerical abundance/catch was calculated by first calculating the number of fish per grade by simple proportions and then summing the various grades/species.

Length-frequencies were derived by expanding the sample length-frequencies for each market category by an expansion factor to represent the species market grade weight.

Monthly species-specific commercial landings were obtained by first determining the percent composition of each species in the monthly samples by district and landings category such as groupers, snappers, porgies and multiplying each species' percentage by the total reported monthly commercial landings of the appropriate category and district. When no bioprofile sample was taken for a particular sampling cell (district, category, month), the market category reported in the commercial landings statistics was used.

Average catch/trip (CPUE in kg) for handlines was defined as the total catch/number of days fished x number of fishermen. CPUE for longlines was total catch/total number of hooks fished and CPUE for fish traps (including sea bass) was total catch/number of traps set.

RESULTS AND DISCUSSION

There are six primary North Carolina ports where reef fishes are landed: Southport, Carolina Beach, and Wrightsville Beach in the southern district; Beaufort and Morehead City in the central district, and Hatteras in the northern district (Figure 1). The central and southern districts together accounted for >92% of the reef fish landings in all 3 years (Table 1).

There have been 122 vessels identified as commercially landing reef fishes at North Carolina ports from July 1983 through June 1991. Approximately 50-60 vessels fished on a full-time basis in North Carolina waters; the others fished only part-time or often landed at South Carolina or Florida ports, depending on weather and market prices. One-hundred fifty-nine trips were sampled in Year 1 (1988-89), 147 in Year 2 (1989-90), and 191 in Year 3 (1990-91).

Three types of gear were used: handlines, (hydraulic or electric "bandit" reels), long lines, and fish traps. Most fish were caught on handlines (Table 1). This gear type also includes the heavy duty, hydraulic reels used in the wreckfish fishery. Handlines were usually fished near the bottom with two hooks per line, but occasionally a rally or "pinky" rig with up to five smaller hooks was used to target vermilion snapper and red porgy. Wreckfish reels used up to eight hooks per line. Handlines were also fished near the surface for coastal pelagic species such as king mackerel, dolphin, bluefish, wahoo, cobia, and tunas (*Thunnus* spp.). The number of reels per boat ranged from 2 to 6 with an average of 3.5. Bottom longlines were also used over the offshore "live bottom" habitat, particularly in the deeper waters (>183m) for snowy grouper (*Epinephelus* niveatus) and tilefish (Lopholatilus chamaeleonticeps). Most of these catches were landed at Southport. Yearly mean longline lengths ranged from 4305.0 to 6269.1 m with an average of 612.5-662.6 hooks per set (Table 2). Duration of the set ranged from 30 minutes up to several hours. Mean number of sets per trip ranged from 22.0 to 27.1. Bait used for both handlines and longlines included round scad or cigar minnows (Decapterus punctatus), Atlantic or Boston mackerel (Scomber scombrus), and squid. Some of the smaller or economically less important fishes caught were also used for bait.

While the other gears are used year-round, the sea bass trap fishery operates predominantly from November through March. Participating in this fishery are persons who are otherwise in the snapper/grouper, shrimp, or charterboat fisheries during April through October. Several reasons account for this switching fishery interest. Primarily, the winter weather allows only short trips and only one day is needed to pull and reset traps. The shrimp fishery is non-existent during this period and fishing boat charters are low due to a decrease in tourism during the winter. The sea bass grounds are 16 to 48 km offshore, with bass moving offshore as the season progresses. The number of traps set ranged from 43 to 105 (Table 2). In addition to sea bass traps, several fishermen (approximately four boats) experimented with the larger fish traps such as those used off Florida to catch snappers and groupers. The number of larger traps used ranged from 7 to 13.

Four depth strata were typically fished by reef fish vessels landing in North Carolina: <55 m, 73-101 m, 119-146 m and >165 m. Vessels fishing for wreckfish (Polyprion americanus) fished on the Blake Plateau in depths ranging from 450 to 600 m. Vessels in the southern district (Southport, Wrightsville Beach) were generally large, 13-15 m, fished in the shallow waters (<66 m) of Long Bay and southern Onslow Bay, and usually fished an average of five days per trip (Table 3). Vessels in the central district (Morehead City-Beaufort) were smaller, 9-13 m, and fished in the deeper waters in Onslow and Raleigh bays an average of two days per trip. Fishing in the northern district was exclusively in deep water, particularly in Raleigh Bay and trips were usually for one to three days.

Catches by handline vessels (n=463) reflected the trip duration (Table 3). Vessels in the southern district landed over twice as many kilograms of fish per trip than did vessels in the central district but the days fished in the southern district were also twice as much. To some degree, CPUEs reflect these differences. Annual mean CPUEs in the central district was higher each year than those in the southern district (Table 3), but there were wide monthly variations (Figure 2). Annual CPUEs have risen in the past three years in the central district while those in the southern district have fluctuated.

Wreckfish catches (n=33) were high, ranging from 388.2 to 8219.7 kg/trip (Table 4). Fishing effort in Year 3 was cut short by a fishing moratorium imposed in August when the South Atlantic quota of 908,000 kg was reached. Catch per unit effort fluctuated between the months and years but were much higher than those of regular handline vessels.

Longline catches (n=41) generally averaged higher than the handline catches. Mean catches were low in Year 1 (mean 1947.6 kg/trip) while those in Years 2 and 3 were 1.6 times greater (3145.8 kg/trip and 3145.9 kg/trip, respectively) (Table 2). The CPUEs also reflected the higher catch - 0.12 vs. 0.34 and 0.33. Length of the longlines, number of hook sets, and number of sets per trip were relatively consistent between the years.

Catches with the sea bass traps (n=14) varied with Year 2 having the highest average (Table 2). Similarly, CPUE was high in Year 2. Four fish traps were sampled in Year 3. Catches were high (736.4-1333.4 kg/trip) and so was the CPUE, compared to sea bass traps.

The sea basses (Serranidae) were generally the dominant reef fish family in all three years, both overall and within each district, followed by snappers (Lutjanidae), porgies (Sparidae), wreckfish (Percichthyidae), and tilefishes (Malacanthidae) (Table 5). Numerous other reef and non-reef families are generally of minor importance in the reef fish catches. Ninety-eight species in 28 reef fish families were caught during the three years. Some 19 species of coastal pelagic fishes and sharks were also landed.

In the northern district, sea basses (mainly black sea bass, Centropristis striata) dominated the landings, followed by tilefishes (blueline tilefish, Caulolatilus microps), snappers (vermilion snapper, Rhomboplites aurorubens) and porgies (red porgy, Pagrus pagrus) (Tables 6-8). Rankings in the other two districts varied each year, but generally sea basses, snappers, porgies and grunts were the important families. Large catches of sharks in the central district in Years 1 and 2 boosted this group up to third place in Year 1 and first in Year 2. Large landings of wreckfish in the southern district in Years 2 and 3 raised their places up to first and third, respectively.

Southern district catches were most diverse (often up to 18 species) and consisted primarily of red porgy, vermilion snapper, black sea bass, gag (Mycteroperca microlepis), scamp, snowy grouper, other groupers, and white grunt (Haemulon plumieri). Central district catches were less diverse (usually 6 to 10 species) and consisted primarily of red porgy, vermilion snapper, snowy grouper, gag, scamp, and gray triggerfish.

Several species, including black sea bass, vermilion snapper, red snapper (Lutjanus campechanus), red porgy, tilefish, and groupers were marketed by size grades (Table 9).

Serranidae

Four species of sea basses, black sea bass, gag, snowy grouper and scamp, accounted for the majority of the serranid biomass landed (Table 5). Winter landings were dominated by black sea bass while landings of the other three species showed no definite patterns. Black sea bass accounted for 76-96% of the serranid catches in the northern district in the three years (Tables 6-8). Snowy grouper, specked hind (Epinephelus drummondhayi) and yellowedge grouper (E. flavolimbatus) were of minor importance. Highest landings of serranids in the northern district occurred in the summer. Central district serranid catches during the three years were composed primarily of black sea bass (7-38% of the yearly total), gag (13-50%), snowy grouper (23-27%) and scamp (5-12%) with additional 11-15 species accounting for <16% of the catch (Tables 6-8). Although catches were high in most months, they were generally higher in the winter and spring. Twenty-four species of serranids were marketed in the southern district but only four species, black sea bass (35-40%), gag (19-23%), snowy grouper (10-

17%) and scamp (13-16%) dominated the landings (Tables 6-8). Southern district landings were highest in winter, reflecting the abundance of black sea bass. By Year 3 as catches of some fishes declined, fish traditionally not marketed were being landed and sold. These include bank sea bass (Centropristis ocyurus), sand perch (Diplectrum formosum) and tattler (Serranus phoebe).

Centropristis striata

Black sea bass were seasonally important in all three districts but most were landed in the southern district (Tables 6-8). Highest landings occurred from November through March in the central and southern districts and in the summer in the northern district. Highest yearly landings occurred in Year 2 when the species accounted for 44% of serranid landings (Table 5). Black sea bass ranged in length from 165 to 515 mm TL (Figure 5.3). Yearly mean size declined from 317.9 mm in Year 1 to 306.3 mm in Year 3. State and federal minimum size limit is 8 in (203 mm TL); 25 of the 2054 fish measured (1.2%) were under this minimum size.

Epinephelus niveatus

Snowy grouper landings were highest in Year 2 but were not substantially greater than those in the other two years (Table 5). Each year, landings were highest in the southern district but overall snowy grouper contributed more to the central district landings (approximately 23% of the serranid biomass) than it did to the southern district (12-17%) (Tables 6-8). Catches were spread fairly evenly throughout the year with some higher landings occurring in April of each year. Snowy grouper ranged in length from 210 to 1130 mm TL with most between 300-700 mm TL (Figure 4). The smaller fish were typically caught in shallower waters by handline fishermen while larger specimens were usually caught in waters greater than 165 m, either by handline or longline. Annual mean size increased from 478.1 mm in Year 1 to 541.9 mm in Year 3. This may reflect increased effort by deep water fishermen.

Epinephelus drummondhayi

Speckled hind landings declined substantially from Year 1 to Year 3 (18,587 kg to 5758 kg)(Table 5). Most were landed in the southern district (Tables 6-8). Speckled hind ranged in size from 200 to 940 mm TL with most between 300 and 600 mm TL (Figure 5). Mean annual size decreased from 449.0 mm in Year 1 to 427.4 mm in Year 3.

Epinephelus morio

Red grouper landings have increased in each of the three years in both weight and percent composition (Table 5). Most red grouper were landed in the southern district (Table 6). Sizes ranged from 230 to 890 mm TL with most fish between 450 and 650 mm (Figure 6) A substantial number of fish larger than 650 mm were also caught. Ten of the 1395 fish measured (0.7%) were under the state and federal size limit of 12 in (305 mm). Effective 1 Jan 1992, the federal minimum size will be 20 in (508 mm TL); 377 of 1395 fish measured (27.0%) would have been under this minimum size.

Mycteroperca microlepis

Gag ranked first in grouper landings in the first two years but it ranked second behind snowy grouper in Year 3 when gag landings were 50% lower (Table 5). Yearly landings of gag were always greater in the southern district than in the central district (Tables 6-8). Gag made up 19-27% of the yearly serranid landings in the southern district while in the central district they comprised 50% of the landings in Year 1 and declined to only 13% in Year 3 when substantially fewer fish were landed. Gag ranged in size from 210 to 1240 mm TL (Figure 7). Although catches declined, annual mean size remained constant. A minimum size of 20 in (508 mm) was established by the Division of Marine Fisheries in January 1991. Ten of the 221 fish (4.5%) measured in 1991 were under this minimum size. Effective 1 Jan 1992 the federal minimum size will also be 20 in.

Mycteroperca phenax

Scamp landings remained relatively steady in the three years and accounted for 10-13% of the serranid landings (Table 5). Most scamp (84.2% of the total) were landed in the southern district (Tables 6-8). Scamp ranged in length from 210 to 850 mm FL (Figure 8). Yearly mean size was constant between Years 1 and 2 and increased in Year 3. Effective 1 Jan 1992, the federal minimum size for scamp will be 20 in (508 mm TL). If this is converted to 475 mm FL, 2257 of the 5132 scamp measured (44.0%) in this study would be under the limit.

Lutjanidae

As a family, snappers were second in importance to the sea basses (Serranidae), particularly in the central and southern districts (Table 5-8). A single species, vermilion snapper accounted for >86% of the snapper catch in all three years. In Year 3, it accounted for about 96% of the catch. Red snapper and silk snapper (Lutjanus vivanus) also contributed significantly to snapper landings with seven other species of minor importance (Table 5). Records of the Carribean red snapper (L. purpureus) in the North Carolina commercial catches were the first records of this species from United States waters. Snapper landings were highest in the summer in the southern district and in the winter in the central district (Tables 6-8). Most species were graded by size (Table 9) and fishermen were paid more for the larger grades. The vermilion snapper (beeliner) was targeted by the fishermen because of its high price and abundance.

Lutjanus campechanus

Red snapper landings were high in Year 2 and dropped significantly by Year 3 (Table 5). Most red snapper (73% of the total) were landed in the southern district (Tables 6-8). Red snapper ranged in size from 235 to 995 mm TL (Figure 9). Annual mean size increased from Year 1 to Year 3 with a slight drop in Year 2. Nine of the 1193 fish measured (0.8%) were under the federal size limit of 12 in. Effective 1 Jan 1992, the federal minimum size limit will be 20 in. Based on this size, 508 (42.6%) would have been under the minimum.

Lutjanus vivanus

Silk snapper landings have declined drastically during the last three years from a high in Year 1 of 15,727 kg to 3,286 kg in Year 3 (Table 5). In Year 1, they comprised 6.4% of the snapper landings while in Year 3 it was only 1.1%. Most silk snapper (68%) of the total) were landed in the central district (Tables 6-8). Sizes ranged from 220 to 940 mm TL (Figure 10). Annual mean size decreased from 417.8 mm in Year 2 to 384.0 mm in Year 3. One major reason for the decrease in size was there were no fish larger than 580 mm caught in Year 3. Effective 1 Jan 1992, the federal minimum size limit will be 20 in; 72 of the 1113 fish measured (6.5%) would have been under this limit. Silk snapper are usually captured when fishing for vermilion snapper and are referred to by fishermen as "yelloweye red snapper".

Rhomboplites aurorubens

Vermilion snapper are the most abundant fish caught by handlines (Table 5). They are landed in all three districts but highest landings occur in the central and southern districts (Tables 6-8); over 67% of the catch is landed in the southern district. Fish are sorted in five size categories (Table 9). Vermilion snapper ranged in length from 180 to 610 mm TL (Figure 11). Annual mean sizes were approximately the same in all three years. Effective 1 Jan 1992, the federal minimum size limit will be 12 in; 1,218 of the 6,332 fish measured (19.2%) would have been under this limit.

Sparidae

Although nine species of sparids or porgies are landed, only two are of importance - red porgy and knobbed porgy (Calamus nodosus). With the exception of the red porgy, these species do not command a high price and are considered a "trash" fish. Red porgy is marketed as "pink snapper" and is graded into size categories similar to those of the vermilion snapper (Table 9).

Pagrus pagrus

Red porgy landings were relatively constant during the three years and they were important components of the total reef fish landings with rankings from third to fifth (Table 5). Although red porgy landings were important in both the central and southern districts, over 75% were landed in the southern district (Tables 6-8). Red porgy ranged in length from 205 to 690 mm TL (Figure 12). Annual mean size decreased from 386.7 mm in Year 1 to 358.1 mm in Year 3. Effective 1 Jan 1992, the federal minimum size limit for red porgy will be 12 in; 857 of the 4617 fish measured (18.6%) would have been under this minimum size.

Calamus nodosus

Knobbed porgy landings ranged from 22,700 to 27,248 kg and comprised from 12.6 to 16.8% of the sparid landings (Table 5). Most (89.5%) were landed in the southern district (Tables 6-8). The market name is "jolthead" or "margate."

Knobbed porgy ranged in size from 235 to 580 mm TL; annual mean size decreased from a high of 379.5 mm in Year 1 to 365.7 mm in Year 3 (Figure 13).

Malacanthidae

Two species of tilefish were major components of the reef fish landings - blueline tilefish and tilefish. Three other species were of minor importance. Malacanthids were second in importance to serranids in the northern district (Tables 6-8). Blueline tilefish, along with blackline tilefish (C. cyanops) and goldface tilefish (C. chrysops), are marketed as "gray tile". Lopholatilus is sold as "gold tile" while the sand tilefish (Malacanthus plumieri) is sold as "rainbow tile".

Caulolatilus microps

Blueline tilefish landings increased each year from 9241 kg in Year 1 to 28,746 kg in Year 3 (Table 5). Most (58.6%) were landed in the northern district with 31.3% landed in the southern district (Tables 6-8). Highest landings were in the late spring and summer. Fish ranged in size from 275 to 875 mm TL (Figure 14); annual mean size fluctuated between 544.5 mm in Year 1 to 502.6 mm in Year 2 and back to 518.0 mm in Year 3.

Lopholatilus chamaeleonticeps

Tilefish were almost exclusively landed in the southern district (Tables 6-8) and all were taken on bottom longlines sets made primarily in Long Bay off South Carolina (Figure 1). Landings increased each year (Table 5). Landings fluctuated with the fishing effort of those vessels targeting this species. Vessels would switch back and forth between this fishery and that for wreckfish. Some of the largest monthly landings occurred when the wreckfish fishery was closed in September and October 1990 (Table 8). Tilefish were separated into three market or size categories (Table 9). Fish ranged in size from 290 to 1150 mm TL (Figure 15). Annual mean size increased from 594.1 mm in Year 1 to 691.6 mm in Year 3.

Balistidae

Although five species of triggerfish were landed, only the gray triggerfish was of importance (Table 5). Landings of this species rose sharply from 19,000 kg in Years 1 and 2 to over 46,000 kg in Year 3. Landings of gray triggerfish were relatively equal between the central district (41.4% of the total) and the southern district (54.0%) (Tables 6-8). Gray triggerfish ranged in size from 240 to 590 mm FL (Figure 16); annual mean size declined gradually from 416.7 mm in Year 1 to 397.0 mm in Year 3.

Haemulidae

Three species of grunt were landed, but only the white grunt was of importance and accounted for over 95% of the grunt landings (Table 5). Most white grunt (92.8%) were landed in the southern district (Tables 6-8). They are considered a "trash" fish and fishermen do not receive a high price for them. Fish ranged in size from 195 to 595 mm TL (Figure 17). Annual mean size decreased from 380.7 mm in Year 1 to 342.1 mm in Year 3.

Percichthyidae

Wreckfish landings, which were nonexistent prior to Year 1, rose from 16,011 kg in Year 1 to over 242,000 kg by Year 3 (Table 5). All but 7,969 kg were landed in the southern district (Tables 6-8). Landings were high in most months but were particularly high in June and July 1990. The fishery was shut down mid-August 1990 when the 1990 quota of 908,000 kg was reached. The fishery reopened 16 April 1991 after the mandatory spawning closure. Wreckfish ranged in size from 680 to 1400 mm TL (Figure 18). Annual mean size increased from 967.6 mm in Year 1 to 983.3 mm in Year 3.

COASTAL PELAGIC COMPONENT OF THE REEF FISH FISHERY

The major coastal pelagic species caught in the reef fish and directed pelagics species fishery are king mackerel, yellowfin tuna, dolphin, and bluefish. Additional coastal pelagic species caught but of lesser importance are wahoo, cobia, and bigeye and blackfin tunas.

Coastal pelagic species are taken in a directed effort or incidentally while bottom fishing. The directed effort targets king mackerel and tunas during the fall and spring, by trolling artificial baits, drifting natural baits, and with surface longlines. Incidental catches of all coastal pelagic species mentioned above are taken by surface handlines, one or two per boat, baited with squid, Spanish sardine (Sardinella aurita) or round scad (Decapterus punctatus) "cigar minnow" while bottom fishing over reef structures. Sometimes a special "king rig" will be used on the bandit reel for king mackerel and dolphin where aggregations of these species occur around the boat. Pelagic species other than tuna are also taken while bottom fishing with bandit reels for snappers and groupers. Bottom longlining for snapper and grouper will often produce considerable catches of cobia; however, federal and state regulations now prohibit more than two cobia per person per trip or day.

The largest portion of the pelagic landings was from the northern district (Table 10). Fifty-nine percent in Year 1, 77% in Year 2, and 69% in Year 3 of the state's landings occurred in the northern district. The southern district landed the next largest amount of coastal pelagics with 27% in Year 1, 14% in Year 2, and 19% in Year 3 of the state's overall landings.

The statewide landings increased each year. From Year 1 to Year 2, the increase was 49.8%; however, landings increased only 1.4% from Year 2 to Year 3. The yearly landings by district fluctuated with Year 2 being highest for the northern district and the lowest for the central and southern district.

King mackerel ranked first for each year and district. Yellowfin tuna ranked second each year and landings were highest in the northern district. Dolphin was third in rank by year and district except for the central and southern districts in Year 1. Wahoo, cobia, blackfin and bigeye tuna occurred intermittently during the study without any pattern on gear type or year.

Length frequencies of king mackerel, dolphin, bluefish, wahoo and cobia are presented in Figures 19-23. Table 10 presents total landings for pelagic species by year, district, and gear for the period July 1988 through June 1991.

Scomberomorus cavalla

King mackerel landings were highest in Year 3 by 41% over Year 1 and 13% over Year 2. The northern district had the highest landings of 56.3% in Year 1, 75.4% in Year 2, and 66.3% in 3. The lowest landings were from the central district with 10.2% in Year 1, 10.0% in Year 2, and 9.6 % in Year 3 (Table 10).

Length ranges were 325-1525 mm for all years with an annual mean length of 806 mm in Year 1, 787 mm in Year 2, and 737 mm in Year 3 (Figure 19). This decrease in length is partly or completely due to increased sampling in the northern district. The northern district king mackerel fishery is almost entirely a trolling effort, which has a tendency to take fish that are smaller than those caught by lightlining while bottom fishing for snappers and groupers.

Coryphaena hippurus

Dolphin landings were highest in Year 3 by 30% over Year 1 and 59% over Year 2. For each year the northern district had the highest landings. Northern district landings were 53.3% in Year 1, 49.5% in Year 2, and 43.3% in Year 3 of the state's landings. The central district had the lowest landings of 18.0% in Year 1, 14.3% in Year 2, and 25.4% in Year 3 (Table 10). Dolphin ranged in length from 250 to 1300 mm with mean lengths of 639 mm in Year 1, 651 mm in Year 2, and 634 mm in Year 3 (Figure 20).

Pomatomus saltatrix

Bluefish landings were highest in Year 1 by 104% over Year 2 and by 24% over Year 3. The central district had the highest landings of 66.4% in Year 1 and 46.9% in Year 3. The northern district had the highest landings in Year 2 with 40.3% of the landings (Table 10). Bluefish landings were highest in Year 1 due to high troll year catches in the central and southern districts. Each district had its turn at having the lowest landings. Landings were lowest for the northern district in Year 1, the central district in Year 2, and the southern district in Year 3. Bluefish is the only species in the study that was sampled from both gill net and hook-and-line catches. Length ranges are 225-475 mm for gill net caught fish and 525-900 mm for hook-and-line caught fish. Gill net caught fish mean lengths are 375 mm in Year 1, 385 mm in Year 2, and 292 mm in Year 3. Mean lengths for hook-and-line caught fish are 743 mm in Year 1, 703 mm in Year 2, and 775 mm in Year 3. The two gears account for the bimodal distribution of length frequencies (Figure 21).

Acanthocybium solanderi

Wahoo landings were highest in Year 3 by 22% over Year 1 and by 53 % over Year 2. The southern district had the highest landings with 52.6% in Year 2 and

45.7% in Year 3. The central district had the highest landings for Year 1 with 51.1 % of the state's landings. The lowest landings occurred in the northern district each year of the study accounting for 22.1% in Year 1, 0.0% in Year 2, and 16.3% in Year 3 (Table 10). The length range for wahoo was 400-1825 mm with a mean length of 1318 mm, 1348 mm and 1133 mm for Years 1, 2, and 3 (Figure 22).

Rachycentron canadum

Cobia landings were highest in Year 3 by 92 % over Year 1 and 9 % over Year 2. The southern district had the highest landings with 49.6% in Year 1 and 55.8% in Year 2. The central district had the highest landings during Year 3 with 51.9 % of the state's landings. The lowest landings were from the northern district for each year of the study with landings accounting for 12.8% in Year 1, 3.4% in Year 2, and 0.8 % in Year 3 (Table 10). The range of lengths was 325-1350 mm with mean lengths of 945 mm in Year 1, 991 mm in Year 2, and 989 mm in Year 3 (Figure 23). The southern and central district produced the highest and nearly equal amounts of cobia during the study period. The landings indicate that trolling was the predominant gear with handline adding to the landings in the central district and bottom longline in the southern (Table 10).

Thunnus albacares

Yellowfin tuna landings were highest in Year 2 of the study by 180 % over Year 1 and 42% over Year 3. The northern district had the highest landings for each year with 96.3% in Year 1, 94.4% in Year 2, and 97.4% in Year 3. The central district did not have any reported yellowfin tuna landings for the 3-year study period (Table 10). This zero landing is in part due to dealers' preference to place yellowfin tuna in an unclassified market category and nonspecific reporting by dealers to port agents. This accounts for the relatively high (to other districts) unclassified tuna landing weight. The length range was 425-1275 mm with a mean of 923 mm in Year 1, 996 mm Year 2, and 700 mm in Year 3. The yellowfin tuna sample size was small (n=20) due to the infrequent occurrence of specimens in the snapper/grouper fishery where sampling takes place and also that often only cores (carcasses with heads removed) are landed.

Thunnus atlanticus

Blackfin tuna landings were highest in Year 3 by 138% over Year 1 and 128% over Year 2 (Table 10). The southern district had the highest reported landings with 57.0% in Year 1 and 100.0% in Year 2. The northern district had the highest reported landings for Year 3 with 78.5% of the landings (Table 10). There were not any reported landings for the central district for Years 1, 2, and 3 nor any landings in the northern district for Year 2. Blackfin tuna had a length range of 400-1450 mm (n=20) with mean lengths of 788 mm in Year 1, 690 mm in Year 2, and 767 mm in Year 3.

Thunnus obesus

Bigeye tuna landings were highest in Year 2 by 65% over Year 1 and 107% over Year 3. The northern district had the highest landings with 99.9% in Year 1, 95.2% in Year 2, and 85.7% in Year 3. The central district reported no landings for Year 1, 2.5% of the landings for Year 2, snf 22.8% of the landings for Year 3 (Table 10). The southern district did not have any reported landings of bigeye tuna during the study period. The length for bigeye tuna sampled ranged between 750 and 1,250 mm (n=5).

Thunnus spp. unclassified

Tuna in the unclassified category had the highest landings in Year 3 by 56% over Year 1 and 22% over Year 2. The highest landings were in the central district with 96.6% in Year 1, 65.5% in Year 2, and 95.4% in Year 3. The lowest landings occurred in the northern district with 0.2% in Year 1, 2.5% in Year 2, and 0.0% in Year 3 (Table 10). The highest percentage of unclassified tuna occurring in the central district landings is due to dealers' disinterest in classifying tuna with proper names.

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Table 1. North Carolina commercial reef fish landings in kilograms by district and method of capture.

Year	District	Bottom handlines	Bottom longlines	Fish traps	Total
7/88-6/89	Northern	81,130	-	4,882	86,012
(Year 1)	Central	276,672	47,933	1,631	326,236
	Southern	609,626	116,851	172,953	899,429
	Total	967,428	164,784	179,466	1,311,677
7/90-6/90	Northern	71,196	-	4,252	75,447
(Year 2)	Central	322,829	189,910	52,987	671,726
	Southern	915,363	78,081	184,313	1,177,756
	Total	1,309,388	367,991	247,552	1,924,929
7/90-6/91	Northern	111,081	-	564	111,645
(Year 3)	Central	256,689	3,568	38,263	298,520
	Southern	744,996	137,155	151,652	1,033,804
	Total	1,112,766	140,723	190,479	1,443,969

Table 2. Summary of reef fish catches by longlines and sea bass traps.

		Jul 88- Jun 89 (Year 1)	Jul 89- Jun 90 (Year 2)	Jul 90- Jun 91 (Year 3)
LONG LINES				
No. of samples		18	12	15
Catch	- mean	1947.6	3145.8	3145.9
	range	77.6-3656.0	1681.6-5056.6	556.3-4809.1
CPUE	- mean	0.12	0.34	0.33
	range	0.05-0.21	0.12-1.35	0.12-1.01
Length	- mean	5285.1	5980.0	4170.0
	range	3219-9656	2784-8047	1600-5633
Hooks	- mean	662.6	612.5	650.0
	range	500-1000	400-1000	250-1200
Sets	- mean	27.1	23.4	22.0
	range	10-44	5-42	6-42
SEA BASS TRAPS				
No. of samples		1	9	4
Catch	- mean	162.5	274.9	177.0
	range	-	113.0-401.0	84.4-286.5
CPUE	- mean	5.8	3.7	2.3
	range	-	1.4-6.1	0.5-6.4
No. pots	- mean	14	67.5	89.5
	range	-	43-100	45-105
FISH TRAPS				
No. of samples		0	0	4
Catch	- mean			1068.4
	range	-	-	736.4-1333.4
Days fished	- mean	-	-	3.6
	- range			1.5-7
No. traps	- mean	-	-	10
	range			7-13

Table 3. Summary of reef fish catches per trip, days fished, catch per unit effort (CPUE) and number of boats sampled by district (excluding sea bass trap, longline, and wreckfish catches).

	Catches		Days fished		CPUE		Number boats sampled
	Mean	Range	Mean	Range	Mean	Range	
			CENTRAL				
Jul 1988	490.3	45.6-1144.5	2.6	1.0-7.0	43.8	15.2- 63.4	7
Aug	272.7	-	1.0	-	90.9	-	1
Sep	481.7	-	3.0	-	53.5	-	1
Oct	504.8	146.7- 880.7	1.9	1.0-3.0	78.9	46.6-107.7	7
Nov	288.7	94.6- 964.4	1.4	0.1-3.0	91.1	24.6-270.0	10
Dec	326.2	31.3- 818.8	1.9	0.5-3.0	42.4	25.2- 68.2	4
Jan 1989	379.4	13.6- 862.3	1.8	0.5-3.0	67.9	6.8-137.7	6
Feb	472.1	142.0- 850.2	2.9	2.5-3.0	46.4	28.4- 70.8	4
Mar	542.2	273.5- 928.8	1.5	1.0-2.0	165.6	59.3-305.3	4
Apr	497.7	201.3- 762.5	1.4	0.5-2.5	164.2	67.1-379.5	6
May	388.6	126.5-1145.3	1.6	0.3-4.0	91.8	46.7-131.1	5
Jun	755.5	348.8-1340.3	2.5	2.0-3.0	80.5	43.6-117.2	7
Total	459.1	13.6-1340.3	1.9	0.1-7.0	86.2	6.8-379.5	62
			SOUTHERN				
Jul 1988	1144.4	115.6-2821.9	4.2	1.0-6.0	63.8	23.0-141.1	8
Aug	1044.2	335.8-2051.7	5.8	2.5-9.0	56.8	33.6- 68.9	7
Sep	1110.3	205.0-1783.7	4.2	3.0-7.0	65.7	14.6-108.6	8
Oct	1298.5	229.6-2787.5	4.0	1.0-7.0	91.4	48.6-130.9	6
Nov	1109.0	696.8-2115.3	4.9	2.5-8.0	66.2	50.8- 76.9	5
Dec	1346.0	367.8-2171.6	4.8	2.0-7.0	72.6	59.2- 99.5	6
Jan 1989	1093.2	261.1-2317.1	4.1	2.0-7.0	65.7	36.3- 92.7	9
Feb	755.6	209.4-1258.1	5.5	3.0-8.0	54.0	44.9- 61.0	4
Mar	1402.6	340.2-3250.4	4.5	2.0-7.0	82.1	49.4-130.0	12
Apr	1267.7	517.9-2017.1	5.1	2.0-7.0	64.8	51.4- 81.0	12
May	1471.8	208.4-1979.8	5.4	3.0-7.0	62.4	34.7- 78.0	7
Jun	1074.0	275.5-2271.8	4.8	3.0-7.0	65.0	29.2- 90.9	11
Total	1197.7	115.6-3250.4	4.7	1.0-9.0	68.1	14.6-141.1	95
			CENTRAL				
Jul 1989	280.0	212.7- 347.3	1.5	1.0-2.0	64.4	57.9- 70.9	2
Aug	1151.8	660.4-1845.4	3.9	3.5-4.0	76.9	55.0- 92.3	4
Sep	406.4	45.4- 830.1	2.2	0.2-3.0	165.3	23.7-567.5	5
Oct	822.9	-	3.0	-	68.6	-	1
Nov	700.2	479.8- 885.5	1.8	1.5-2.0	94.3	67.2-143.8	5
Dec	302.1	-	1.5	-	50.4	-	1
Jan 1990	537.6	106.5-1138.1	1.9	0.3-3.5	86.6	46.2-161.4	13
Feb	328.2	132.1- 714.1	1.5	1.0-2.0	58.8	40.2- 81.3	5
Mar	611.6	233.7-1301.9	2.4	1.5-5.0	71.9	39.0-130.2	8
Apr	705.4	257.2-1464.1	2.4	0.6-4.0	84.1	48.3-107.2	6
May	631.7	434.2-1105.9	2.1	0.4-2.5	126.5	57.9-398.8	6
Jun	769.0	233.8-1341.8	2.6	1.5-3.5	82.3	35.8-136.1	9
Total	619.9	45.4-1845.4	2.2	0.2-5.0	90.0	23.7-567.5	65
			SOUTHERN				
Jul 1989	952.9	172.0-1861.6	3.4	1.5-6.0	75.6	43.0-138.5	9
Aug	1756.6	186.6-6285.2	6.0	1.0-8.0	70.6	19.5-196.4	11
Sep	1343.8	747.3-2108.7	4.6	1.5-7.0	80.6	63.1-100.3	4
Oct	1244.8	524.4-2453.8	3.9	3.0-6.0	84.9	58.3-109.0	6
Nov	1216.7	303.3-2386.1	5.4	3.0-9.0	74.9	43.9-130.1	7
Dec	1398.7	-	3.5	-	79.9	-	1
			SOUTHERN				
Jan 1990	2603.1	456.3-8083.9	5.1	2.0-7.0	109.7	45.6-336.8	7
Feb	1508.1	102.2-1808.4	5.4	1.0-8.0	47.6	25.6- 75.4	5
Mar	1236.5	544.2-2604.0	5.2	3.0-7.5	54.3	33.8- 79.8	7
Apr	1318.5	172.0-2635.0	5.7	1.5-8.0	61.4	35.0-114.7	8
May	1496.7	1000.1-2546.2	5.1	4.0-6.5	83.3	62.5-115.9	5
Jun	1263.0	350.5-2297.5	5.3	2.0-8.0	65.6	39.7-117.3	12
Total	1442.2	102.2-8083.9	5.0	1.0-9.0	72.8	19.5-336.8	82

Table 3. (Continued).

	Catches		Days fished		CPUE		Number boats sampled
	Mean	Range	Mean	Range	Mean	Range	
			NORTHERN				
Aug 1990	306.9	-	2.0	-	76.7	-	1
			CENTRAL				
Jul 1990	-	-	-	-	-	-	-
Aug	568.6	250.8-1268.5	2.6	1.5- 6.0	69.8	31.6-137.1	7
Sep	551.9	237.5- 885.8	2.7	2.0- 3.0	63.2	19.8-110.7	3
Oct	382.7	57.5- 620.9	1.5	0.3- 2.0	80.4	43.6-129.9	10
Nov	1184.0	549.5-1815.0	3.0	0.4- 7.0	222.4	51.9-529.2	4
Dec	221.3	45.4- 486.6	0.5	0.2- 0.8	142.3	28.1-389.3	5
Jan 1991	403.0	120.9- 599.2	0.8	0.5- 1.0	148.2	67.4-278.0	8
Feb	624.0	203.6- 908.1	1.6	0.5- 2.5	111.0	84.8-139.3	6
Mar	344.0	105.7- 865.5	1.5	0.5- 7.0	94.8	5.0-193.4	13
Apr	268.2	202.6- 333.7	1.1	1.0- 1.2	58.7	50.6- 66.7	2
May	418.0	94.3- 567.5	1.6	0.4- 2.0	89.7	65.7-117.9	4
Jun	506.0	266.6-1004.3	4.2	2.0- 7.0	41.6	27.9- 52.2	4
Total	469.4	45.4-1815.0	1.8	0.3- 7.0	103.2	5.0-529.2	66
			SOUTHERN				
Jul 1990	896.4	409.8-1756.5	5.0	3.0- 7.0	56.5	22.8-108.0	14
Aug	1471.6	802.2-1979.3	5.3	3.5- 7.0	76.1	50.7-96.2	5
Sep	2095.5	-	5.0	-	83.8	-	1
Oct	1437.2	507.5-2886.4	5.2	2.0-10.0	75.0	25.4-115.4	11
Nov	1400.0	217.3-2615.4	4.8	2.0- 7.0	69.8	36.2-127.5	10
Dec	1056.9	359.2-2404.9	4.5	1.5- 7.0	60.7	5.8-129.7	8
Jan 1991	1092.8	225.6-3014.5	5.1	3.0- 9.0	52.0	32.3- 86.1	8
Feb	976.4	347.3-2070.2	5.2	4.0- 7.0	45.9	12.4- 82.8	4
Mar	720.7	93.5-1563.9	4.8	1.0- 8.0	41.5	31.2- 52.1	6
Apr	1097.5	269.7-1830.6	5.6	2.0- 8.0	65.1	37.7-114.0	10
May	1023.4	338.7-1943.6	4.4	2.0- 6.0	59.1	37.6- 77.0	10
Jun	641.2	451.1- 787.6	4.3	3.0- 6.0	57.3	46.1- 65.6	3
Total	1115.2	93.5-3014.5	4.8	1.0-10.0	61.4	5.8-129.7	90
			NORTHERN				
Aug 1990	306.9	-	2.0	-	76.7	-	1
Feb 1991	241.4	-	1.5	-	40.2	-	1
Total	274.2	241.4- 306.9	1.8	1.5- 2.0	58.4	40.2- 76.7	2

Table 4. Summary of wreckfish catches per trip, days fished, catch per unit effort (CPUE) and number of boats sampled.

	Catches		Days fished		CPUE		Number boats sampled
	Mean	Range	Mean	Range	Mean	Range	
Apr 1989	849.0	-	1	-	424.5	-	1
Jun	3342.3	-	8	-	208.9	-	1
Total	2095.6	849.0-3342.3	4.5	1 - 8	316.7	208.9-424.5	2
Aug 1989	6285.2	-	8	-	392.8	-	1
Jan 1990	8083.9	-	6	-	673.6	-	1
Apr	1725.2	-	3	-	287.5	-	1
May	2807.8	1372.0-4243.5	4.5	4 - 5	333.8	137.2-530.4	2
Jun	5292.7	2415.7-8099.8	6.9	6 - 8	388.1	201.3-623.1	4
Total	4764.5	1725.2-8099.8	5.9	3 - 8	397.1	201.3-673.6	9
Jul 1990	6506.6	3761.4-8219.7	8.3	7 -10	415.5	188.1-587.1	3
Aug	5547.8	4578.1-6517.6	5.5	5 - 6	500.4	457.8-543.1	2
Apr 1991	2944.7	388.2-4513.7	4.4	1 - 8	315.8	49.6-564.2	8
May	2989.3	1657.9-4537.7	4.8	2.5- 7	302.2	132.6-560.0	6
Jun	3839.6	2994.6-4496.9	4.2	3 - 6	274.4	166.4-335.6	3
Total	3801.2	388.2-8219.7	5.1	1 -10	336.8	132.6-587.1	22

Table 5. Summary of species composition for the North Carolina commercial reef fish by year. Year 1 = July 1988-June 1989. Year 2 = July 1989-June 1990. Year 3 = July 1990-June 1991.

	Year 1		Year 2		Year 3	
	Kilograms	% comp.	Kilograms	% comp.	Kilograms	% comp.
Serranidae	611,262	100.0	695,934	100.0	511,174	100.0
Centropristis ocyurus	-	-	-	-	348	0.1
Centropristis striata	224,707	37.6	301,474	44.2	208,671	41.8
Diplectrum formosum	-	-	-	-	364	0.1
Epinephelus adscensionis	4,537	0.8	5,696	0.8	9,384	1.9
Epinephelus afer	-	-	6	<0.1	13	<0.1
Epinephelus cruentatus	84	<0.1	197	<0.1	217	<0.1
Epinephelus drummondhayi	18,587	3.1	9,193	1.3	5,758	1.2
Epinephelus flavolimbatus	4,414	0.7	2,137	0.3	2,072	0.4
Epinephelus fulvus	697	0.1	1,229	0.2	1,173	0.2
Epinephelus guttatus	4,149	0.7	7,225	1.1	5,598	1.1
Epinephelus inermis	197	<0.1	60	<0.1	-	-
Epinephelus morio	15,748	2.8	21,962	3.2	31,813	6.4
Epinephelus mystacinus	18	<0.1	5	<0.1	18	<0.1
Epinephelus nigritus	2,310	0.4	673	0.1	458	0.1
Epinephelus niveatus	76,899	12.9	100,003	14.6	84,954	17.0
Epinephelus striata	-	-	6	<0.1	-	-
Epinephelus spp.	162	<0.1	-	-	-	-
Gonioplectrus hispanus	-	-	-	-	5	<0.1
Hemanthias leptus	49	<0.1	16	<0.1	-	-
Mycteroperca bonaci	40	<0.1	220	<0.1	43	<0.1
Mycteroperca interstitialis	4,503	0.8	4,050	0.6	1,948	0.4
Mycteroperca microlepis	158,625	26.6	158,552	23.2	78,896	15.8
Mycteroperca phenax	78,398	13.1	68,791	10.1	66,694	13.3
Mycteroperca venenosa	527	0.1	2,079	0.3	939	0.2
Paranthias furcifer	1,433	0.2	828	0.1	336	0.1
Rypticus saponicus	-	-	-	-	28	<0.1
Serranus phoebe	-	-	-	-	36	<0.1
Lutjanidae	250,720	100.0	271,796	100.0	291,039	100.0
Lutjanus analis	2,101	0.8	2,294	0.8	664	0.2
Lutjanus buccanella	364	0.1	283	0.1	215	0.1
Lutjanus campechanus	13,565	5.5	18,782	7.0	7,639	2.6
Lutjanus cyanopterus	2,321	0.9	447	0.2	92	<0.1
Lutjanus griseus	107	<0.1	76	<0.1	149	<0.1
Lutjanus jocu	18	<0.1	-	-	-	-
Lutjanus purpureus	14	<0.1	34	<0.1	-	-
Lutjanus vivanus	15,727	6.4	11,039	4.1	3,286	1.1
Ocyurus chrysurus	7	<0.1	5	<0.1	2	<0.1
Rhomboplites aurorubens	212,605	86.1	237,017	87.8	276,233	95.8

Table 5. (Continued).

	Year 1		Year 2		Year 3	
	Kilograms	% comp.	Kilograms	% comp.	Kilograms	% comp.
Sparidae	164,925	100.0	211,768	100.0	184,326	100.0
Calamus bajonado	-	-	-	-	11	<0.1
Calamus calamus	4	<0.1	-	-	-	-
Calamus leucosteus	2,031	1.2	936	0.4	561	0.3
Calamus nodosus	27,248	16.8	26,177	12.6	22,750	12.6
Calamus proridens	11	<0.1	-	-	4	<0.1
Diplodus holbrooki	854	0.5	1,255	0.6	1,301	0.7
Lagodon rhomboides	-	-	35	<0.1	3	<0.1
Pagrus pagrus	131,876	81.4	179,328	86.3	155,686	86.3
Stenotomus caprinus/chrysops	45	<0.1	29	<0.1	36	<0.1
Malacanthidae	50,005	100.0	62,207	100.0	96,775	100.0
Caulolatilus chrysops	471	1.3	1,338	2.7	661	1.0
Caulolatilus cyanops	257	0.7	4	<0.1	340	0.5
Caulolatilus microps	9,241	25.8	14,969	29.8	28,746	41.5
Lopholatilus chamaeleonticeps	25,847	72.2	33,826	67.4	39,263	56.6
Malacanthus plumieri	-	-	40	0.1	317	0.4
Balistidae	23,085	100.0	20,947	100.00	49,586	100.0
Aluterus monocenos	-	-	-	-	10	<0.1
Balistes capriscus	19,737	95.7	19,732	97.6	46,642	98.5
Balistes vetula	888	4.3	465	2.3	627	1.3
Canthidermis sufflamen	-	-	-	-	46	<0.1
Monocanthus hispidus	-	-	15	0.1	10	<0.1
Haemulidae	74,539	100.0	81,177	100.0	82,234	100.0
Haemulon aurolineatum	2,008	2.7	3,925	4.8	2,503	3.2
Haemulon plumieri	72,157	97.3	77,252	95.2	75,292	96.8
Orthopristis chrysoptera	-	-	-	-	5	<0.1
Percichthyidae	16,011	100.00	242,072	100.0	118,587	100.0
Polyprion americanus	16,011	100.00	242,072	100.0	118,587	100.0
Scorpaenidae	354	100.0	3,437	100.0	8,414	100.0
Helicolenus dactylopterus	354	100.0	3,437	100.0	8,407	99.9
Neomerinthe hemingwayi	-	-	-	-	7	0.1
Scombridae	6,844	100.0	5,000	100.0	4,064	100.0
Acanthocybium solanderi	621	14.3	767	15.3	638	16.2
Euthynnus alleteratus	1	<0.1	-	-	26	0.6
Scomberomorus cavalla	2,976	68.6	3,098	62.0	2,735	69.4
Scomberomorus maculatus	4	0.1	-	-	17	0.4
Thunnus albacares	544	12.5	191	3.8	244	6.2

Table 5. (Continued).

	Year 1		Year 2		Year 3	
	Kilograms	% comp.	Kilograms	% comp.	Kilograms	% comp.
Thunnus atlanticus	127	2.9	50	1.0	142	3.6
Thunnus obesus	-	-	85	1.7	-	-
Thunnus spp.	63	1.4	809	16.2	141	3.6
Carangidae	16,928	100.0	12,226	100.0	33,152	100.0
Alectis ciliaris	-	-	-	-	385	1.2
Caranx crysos	-	-	17	0.2	39	0.1
Seriola dumerili	4,984	41.9	4,489	44.0	13,604	43.0
Seriola fasciata	95	0.8	13	0.1	1	<0.1
Seriola rivoliana	6,801	57.2	4,586	44.9	11,507	36.4
Seriola zonata	1	<0.1	697	6.8	682	2.2
Seriola spp.	-	-	401	3.9	5,420	17.1
Coryphaenidae	1,234	100.0	2,291	100.0	4,320	100.0
Coryphaena hippurus	1,234	100.0	2,291	100.0	4,320	100.0
Rachycentridae	606	100.0	2,551	100.0	2,796	100.0
Rachycentron canadum	606	100.0	2,551	100.0	2,796	100.0
Pomatomidae	1,448	100.0	3,409	100.0	140	100.0
Pomatomus saltatrix	1,448	100.0	3,409	100.0	140	100.0
Labridae	3,974	100.0	5,245	100.0	12,185	100.0
Bodianus pulchellus	7	0.2	5	0.1	172	1.4
Lachnolaimus maximus	3,967	99.8	5,211	99.9	11,982	98.4
Halichoeres garnoti	-	-	-	-	8	<0.1
Halichoeres cyanocephalus	-	-	-	-	20	0.2
Priacanthidae	31	100.0	107	100.0	483	100.0
Cookeolus boops	-	-	1	<0.1	14	4.9
Priacanthus arenatus	30	96.8	100	93.4	237	82.9
Pristigenys alta	1	3.2	6	5.6	35	12.2
Sciaenidae	15	100.0	14	100.0	5	100.0
Equetus iwamotoi	13	86.7	14	100.0	6	85.7
Equetus umbrosus	2	13.3	-	-	1	14.3
Sphyraenidae	41	100.0	16	100.0	76	100.0
Sphyraena barracuda	41	100.0	16	100.0	76	100.0
Gadidae	11	100.0	127	100.0	44	100.0

Table 5. (Continued).

	Year 1		Year 2		Year 3	
	Kilograms	% comp.	Kilograms	% comp.	Kilograms	% comp.
Stromateidae	53	100.0	644	100.0	5,355	100.0
Hyperoglyphe perciformis	53	100.0	644	100.0	5,355	100.0
Congridae	71	100.0	996	100.0	1,688	100.0
Muraenidae	-	-	-	-	11	100.0
Tetraodontidae	926	100.0	84	100.0	438	100.0
Pomacanthidae	-	-	-	-	536	100.0
Holocentridae	-	-	-	-	46	100.0
Holocentrus ascensionis	-	-	-	-	5	100.0
Xiphiidae	44	100.0	-	-	223	100.0
Xiphias gladius	44	100.0	-	-	223	100.0
Istiophoridae	19	100.0	-	-	-	-
Istiophorus platypterus	19	100.0	-	-	-	-
Squaliformes	100,562	100.0	324,229	100.0	37,144	100.0
Mollusca	16,436	100.0	7,370	100.0	11,803	100.0

Table 6. Species composition in kilograms for the North Carolina commercial reef fish landings by district, based on catches for the fishery, July 1988-June 1989. n = number of boats sampled.

NORTHERN DISTRICT

Species	Jul n=0	Aug n=0	Sep n=0	Oct n=0	Nov n=0	Dec n=0	Jan n=0	Feb n=0	Mar n=0	Apr n=0	May n=0	Jun n=0	Total n=0	Percent of species composition within major categories
Serranidae	14,008	9,915	7,435	2,022	164		1,467	912	913	11,665	9,220	940	58,661	100.0
Centropristis striata	13,748	8,647	5,695	1,897	159		1,446	890	774	7,805	3,422		44,483	75.8
Lutjanidae	28	176	196	1,481	6				892	222	766	124	3,891	100.0
Sparidae	445	346	331	468	5				98	439	565	163	2,860	100.0
Malacanthidae	928	1,259	591	20			19	89	24	971	7,258	1,720	12,879	100.0
Balistidae	118	58	173	171	11		22		35	198	266	100	1,152	100.0
Scombridae	14	6			870								890	100.0
Carangidae	586	187	425	225	97				463	304	472	14	3,663	100.0
Coryphaenidae	182												182	100.0
Squaliformes				110								48	158	100.0

CENTRAL DISTRICT

Species	Jul n=7	Aug n=1	Sep n=1	Oct n=7	Nov n=10	Dec n=4	Jan n=6	Feb n=4	Mar n=4	Apr n=7	May n=5	Jun n=7	Total n=63	Percent of species composition within major categories
Serranidae	8,212	19,996	7,340	11,430	20,054	11,042	11,469	5,320	4,581	10,462	9,304	7,305	126,515	100.0
Centropristis striata	1,207	555	273	1,264	306	506	311	1,988	112	1,010	201	849	8,582	6.8
Epinephelus adscensionis	172			2				42		21	9	6	252	0.2
Epinephelus drummondhayi	334		1,246	91	361	594	384	218	442	98		192	3,960	3.1
Epinephelus flavolimbatus	2					153	79				24	10	268	0.2
Epinephelus fulvus	14							5			8	4	31	<0.1
Epinephelus guttatus	106							5		6	20	3	140	0.1
Epinephelus inermis					35			30					65	<0.1
Epinephelus morio	247			71	30	81	199	286	152	33	80	452	1,631	1.3
Epinephelus mystacinus												4	4	<0.1
Epinephelus nigritus				114		408	419		283			95	1,319	1.0
Epinephelus niveatus	490		2,356	982	6,354	4,919	6,928	1,936	1,073	4,456	1,801	2,326	33,621	26.6
Mycteroperca interstitialis	34		1,976			66		16				19	2,111	1.7
Mycteroperca microlepis	4,300	17,307		7,687	12,529	3,153	2,374	397	1,709	3,667	6,939	2,926	62,988	49.8
Mycteroperca phenax	1,296	2,134	1,489	1,213	425	1,096	775	397	810	1,171	204	387	11,397	9.0
Paranthias furcifer	10			6	14	66					18	32	146	0.1

Table 6. (Continued).

Species	Jul n=7	Aug n=1	Sep n=1	Oct n=7	Nov n=10	Dec n=4	Jan n=6	Feb n=4	Mar n=4	Apr n=7	May n=5	Jun n=7	Total n=63	Percent of species composition within major categories
					CENTRAL DISTRICT									
Lutjanidae	5,155	4,636	2,050	4,066	6,280	11,934	9,957	5,806	4,401	7,363	6,388	6,845	74,881	100.0
Lutjanus buccanella	4						28	81	8	1		3	125	0.2
Lutjanus campechanus	307	800		10	165	72	409	248	252	482	498	199	3,442	4.6
Lutjanus cyanopterus					70		71						141	0.2
Lutjanus vivanus	268		1,954	41	156	1,136	119	3,054	46	623	2,102	795	10,294	13.7
Rhomboplites aurorubens	4,576	3,836	96	4,015	5,889	10,726	9,330	2,423	4,095	6,247	3,788	5,848	60,879	81.3
Sparidae	3,470	1,363	1,674	3,094	5,577	2,435	3,064	2,068	1,642	2,574	3,110	3,017	33,088	100.0
Calamus calamus		4											4	<0.1
Calamus leucosteus	33			165	79	21	15		3	79	92	8	495	1.5
Calamus nodosus	224	20	752	298	703	365	43	79		50	266	22	2,822	8.5
Diplodus holbrooki	81	25	83	24	39	79			14	184	147	142	818	2.5
Pagrus pagrus	3,132	1,318	835	2,607	4,747	1,970	3,006	1,989	1,625	2,239	2,605	2,845	28,918	87.4
Stenotomus caprinus					9								9	<0.1
Stenotomus chrysops										22			22	0.1
Malacanthidae	972	561	347	1,103	788	225	644	6	6	81	112	261	5,106	100.0
Caulolatilus chrysops	184						112		2	70	6	7	381	10.0
Caulolatilus cyanops							34		4				38	1.0
Caulolatilus microps	788			1,103	788	225	498	6		11	106	254	3,379	89.0
Balistidae	1,366	591	717	1,160	2,122	1,343	549	1,037	592	462	563	1,019	11,521	100.0
Balistes capriscus	1,272			1,160	2,122	1,343	549	1,037	592	462	563	1,019	10,119	99.1
Balistes vetula	94												94	0.9
Haemulidae	742	384	1,393	1,180	3,056	1,221	1,481	283	300	432	676	580	11,728	100.0
Haemulon aurolineatum	2			168	123	290	953		267	191		7	2,001	17.6
Haemulon plumieri	750		1,393	1,012	2,933	931	528	283	33	241	676	573	9,353	82.4
Scombridae	398	544	65	343	553	1,618	96	80		205	201	126	4,229	100.0
Acanthocybium solanderi	91	168	30								53		342	13.1
Scomberomorus cavalla	307	376	35	144	472		33	37		134	128	126	1,792	68.6
Scomberomorus maculatus										2			2	0.1
Thunnus albacares				199	81			33		69	20		402	15.4
Thunnus atlanticus								10					10	0.4
Thunnus spp.							63						63	2.4
Carangidae	377	395	945	493	6,196	1,237	348	130	121	300	517	416	11,475	100.0
Seriola dumerili	216			253	2,168	429	248	40	58	87	228	136	3,863	37.9
Seriola fasciata							19	8		64			91	0.9
Seriola rivoliana	207			240	4,033	809	81	82	63	149	289	280	6,233	61.2
Coryphaenidae	225	115					8			51	108	144	651	100.0
Coryphaena hippurus	225	115					8			51	108	144	651	100.0
Rachycentridae	16				11				27	40		107	201	100.0
Rachycentron canadum	16				11				27	40		107	201	100.0

Table 6. (Continued).

Species	Jul n=7	Aug n=1	Sep n=1	Oct n=7	Nov n=10	Dec n=4	Jan n=6	Feb n=4	Mar n=4	Apr n=7	May n=5	Jun n=7	Total n=63	Percent of species composition within major categories
CENTRAL DISTRICT														
Pomatomidae						1,069			5	156	10		1,240	100.0
Pomatomus saltatrix						1,069			5	156	10		1,240	100.0
Labridae	23									40		5	68	100.0
Lachnolaimus maximus	23									40		5	68	100.0
Priacanthidae										1			1	100.0
Priacanthus arenatus										1			1	100.0
Sphyraenidae	41								12		4	8	65	100.0
Sphyraena barracuda	41								12		4	8	65	100.0
Congridae							1		16	5	3	6	31	100.0
Squaliformes	589	690	1,564	8,861	4,397	3,711	5,304	9,686	4,436	21,299		5,848	66,385	100.0
Mollusca										3	11	5	19	100.0

Species	Jul n=8	Aug n=7	Sep n=8	Oct n=6	Nov n=5	Dec n=6	Jan n=9	Feb n=5	Mar n=12	Apr n=12	May n=7	Jun n=11	Total n=96	Percent of species composition within major categories
SOUTHERN DISTRICT														
Serranidae	40,114	28,118	30,706	22,244	24,157	70,973	61,870	35,466	32,912	25,847	33,361	20,318	426,086	100.0
Centropristis striata	5,230	1,136	1,010	1,802	6,205	55,810	46,543	20,924	9,748	8,714	10,186	4,334	171,642	40.3
Epinephelus adscensionis	76	187	200	486	680	480	437	246	464	328	537	164	4,285	1.0
Epinephelus cruentatus		3	10	5	2	13			9	16	21	5	84	<0.1
Epinephelus drummondhayi	1,650	708	3,519	1,154	628	571	1,207	605	2,002	675	1,572	336	14,627	3.4
Epinephelus flavolimbatus	1,450	2,050	29	20	93	112	8	124	39	56	152	13	4,146	1.0
Epinephelus fulvus	32	8	20	40	61	95	124	22	102	59	77	26	666	0.2
Epinephelus guttatus	11	96	70	499	637	257	1,495	165	253	220	250	56	4,009	0.9
Epinephelus inermis		9			50	26	34		13				132	<0.1
Epinephelus morio	1,323	813	4,529	2,083	747	467	69	32	2,089	614	1,765	586	15,117	3.5
Epinephelus mystacinus										13		1	14	<0.1
Epinephelus nigritus	37	54	58		460			52			301	29	991	0.2
Epinephelus niveatus	8,420	7,571	7,104	1,711	1,170	1,992	1,364	2,943	3,015	4,004	2,537	1,447	43,278	10.2
Epinephelus spp.							117	45					162	<0.1
Hemanthias leptus	14	24										11	49	<0.1
Mycteroperca bonaci					3			37					40	<0.1
Mycteroperca interstitialis	69	58	343	41	522	182	584	32	215	135	194	17	2,392	0.6
Mycteroperca microlepis	13,520	9,253	8,620	7,239	8,121	6,596	5,193	6,738	5,337	6,743	9,286	8,991	95,637	22.4
Mycteroperca phenax	8,204	6,138	5,058	6,411	4,556	4,227	4,570	3,433	9,585	4,153	6,385	4,281	67,001	15.7
Mycteroperca venenosa				10	204	117	91	14	24	64		3	527	0.1
Paranthias furcifer	78	10	136	743	18	308	54	17	53	98	18	1,287	0.3	

Table 6. (Continued).

Species	Jul n=8	Aug n=7	Sep n=8	Oct n=6	Nov n=5	Dec n=6	Jan n=9	Feb n=5	Mar n=12	Apr n=12	May n=7	Jun n=11	Total n=96	Percent of species composition within major categories
	SOUTHERN DISTRICT													
Lutjanidae	22,037	19,245	18,962	20,742	11,817	11,740	14,720	7,285	8,265	12,268	14,012	10,855	171,948	100.0
Lutjanus analis	13	390	65	64	385	368	401	128	39	86	8	154	2,101	1.2
Lutjanus buccanella	14		10	10	15	5	14	7	34	20	110		239	0.1
Lutjanus campechanus	457	581	341	416	650	576	1,146	1,449	1,104	843	1,649	911	10,123	5.9
Lutjanus cyanopterus	65	16	616	831	45	49	112	333	15	52	46		2,180	1.3
Lutjanus griseus			16		30	5	17	13	5		9	12	107	0.1
Lutjanus jocu									18				18	<0.1
Lutjanus purpureus							8					6	14	<0.1
Lutjanus vivanus	992	156	442	479	561	794	354	104	601	692	95	163	5,433	3.2
Ocyurus chrysurus	2							5					7	<0.1
Rhomboplites aurorubens	20,494	18,102	17,472	18,942	10,131	9,943	12,668	5,246	6,449	10,575	12,095	9,609	151,726	88.2
Sparidae	10,614	10,556	16,299	9,173	7,574	8,040	9,302	6,820	12,507	12,548	13,363	12,181	128,977	100.0
Calamus leucosteus	32	65	60	358	188	226	76	101	315	23	61	31	1,536	1.2
Calamus nodosus	1,806	2,335	3,873	2,818	1,039	1,852	2,034	1,946	2,305	2,579	940	896	24,423	18.9
Calamus proridens										4	4	3	11	<0.1
Diplodus holbrooki						21				14			36	<0.1
Pagrus pagrus	8,776	8,156	12,366	5,997	6,347	5,941	7,192	4,773	9,887	9,924	12,348	11,251	102,958	79.8
Stenotomus caprinus										4	10		14	<0.1
Malacanthidae	1,640	1,850	5,292	3,874	2,842	3,651	3,817	811	367	953	1,646	5,277	32,020	100.0
Caulolatilus chrysops			85							2		3	90	0.3
Calolatilus cyanops		1					209			7		2	219	0.7
Caulolatilus microps	942	1,125	276	241	376	402	796	131	319	340	829	85	5,862	18.3
Lopholatilus chamaeleonticeps	698	724	4,931	3,633	2,466	3,249	2,812	680	48	602	817	5,187	25,847	80.7
Balistidae	813	785	1,557	1,730	985	724	927	482	828	622	535	424	10,412	100.0
Balistes capriscus	813	785	1,543	1,717	590	557	781	456	828	589	535	424	9,618	92.4
Balistes vetula			14	13	395	167	146	26		33			794	7.6
Haemulidae	6,993	5,170	5,544	5,335	4,612	4,174	5,134	2,973	4,128	5,126	7,938	5,684	62,811	100.0
Haemulon aurolineatum										7			7	<0.1
Haemulon plumieri	6,993	5,170	5,544	5,335	4,612	4,174	5,134	2,973	4,128	5,119	7,938	5,684	62,804	99.9
Percichthyidae										2,907	8,934	4,170	16,011	100.0
Polyprion americanus										2,907	8,934	4,170	16,011	100.0
Scorpaenidae		116							14		213	11	354	100.0
Helicolenus dactylopterus		116							14		213	11	354	100.0
Scombridae	104	69	82	5	178	189	145	16	45	16	451	425	1,725	100.0
Acanthocybium solanderi	4	3			52	15	13	16	14		61	101	279	16.2
Euthynnus alleteratus		1											1	0.1
Scomberomorus cavalla	90	56	80	4	99	115	103			16	299	322	1,184	68.6
Scomberomorus maculatus												2	2	0.1
Thunnus albacares	10	9	2		9		8		22		82		142	8.2
Thunnus atlanticus				1	18	59	21		9		9		117	6.8

Table 6. (Continued).

Species	Jul n=8	Aug n=7	Sep n=8	Oct n=6	Nov n=5	Dec n=6	Jan n=9	Feb n=5	Mar n=12	Apr n=12	May n=7	Jun n=11	Total n=96	Percent of species composition within major categories
	SOUTHERN DISTRICT													
Carangidae	155	127	101	96	286	102	579	258	30	15		41	1,790	100.0
Seriola dumerili	155	26	88		261	98	348	129	6	1		9	1,121	66.2
Seriola fasciata									1	2		1	4	0.2
Seriola rivoliana		101	13		25	4	231	129	22	12		31	568	33.5
Seriola zonata									1				1	0.1
Coryphaenidae	64	15	28	67	12	15	9	29	4	106	27	25	401	100.0
Coryphaena hippurus	64	15	28	67	12	15	9	29	4	106	27	25	401	100.0
Rachycentridae	87	44	35	11	24	4	12	97	10	32	31	18	405	100.0
Rachycentron canadum	87	44	35	11	24	4	12	97	10	32	31	18	405	100.0
Pomatomidae								194	9	5			208	100.0
Pomatomus saltatrix								194	9	5			208	100.0
Labridae	209	107	383	445	715	556	308	259	306	276	184	158	3,906	100.0
Bodianus pulchellus										1		6	7	0.2
Lachnolaimus maximus	209	107	383	445	715	556	308	259	306	275	184	152	3,899	99.8
Priacanthidae			1	12			14				3		30	100.0
Pristigenys alta							1						1	3.3
Priacanthus arenatus			1	12			13				3		29	96.7
Sciaenidae		1		2		3	2		1	1	5		15	100.0
Equetus iwamotoi		1		1		3	1		1	1	5		13	86.7
Equetus umbrosus				1			1						2	13.3
Gadidae		10							1				11	100.0
Stromateidae		22						17				14	53	100.0
Hyperoglyphe perciformis		22						17				14	53	100.0
Congridae								4	5	31			40	100.0
Tetraodontidae					35	162	642	87					926	100.0
Squaliformes	1,568	1,129	1,028	1,928	1,676	6,143	4,616	986	1,935	5,257	5,653	2,100	34,019	100.0
Xiphiidae		44											44	100.0
Xiphias gladius		44											44	100.0
Istiophoridae		19											19	100.0
Istiophorus platypterus		19											19	100.0
Mollusca	78			24	512	5,802	7,484	1,765	655	98	54	42	16,436	100.0

Table 7. Species composition in kilograms for the North Carolina commercial reef fish landings by district, based on catches for the fishery, July 1989-June 1990. n = number of boats sampled.

NORTHERN DISTRICT

Species	Jul n=0	Aug n=0	Sep n=0	Oct n=0	Nov n=0	Dec n=0	Jan n=0	Feb n=0	Mar n=0	Apr n=0	May n=0	Jun n=0	Total n=0	Percent of species composition within major categories
Serranidae	8,948	9,897	6,866	2,861	889	69	5,594	1,258	2,826	4,475	8,354	1,762	53,799	100.0
Centropristis striata	5,357	9,238	6,756	2,832	875	69	5,575	1,244	2,761	4,309	3,558	193	42,767	79.5
Lutjanidae	144	141	422	442	6	7	1		11	161	467	17	1,819	100.0
Sparidae	245	1,570	1,309	781	38	8				5	296	26	4,278	100.0
Malacanthidae	1,447	1,977	1,416		19		156	421	128	600	3,873	1,978	12,015	100.0
Balistidae	26	41	69	256	28	4	4		8	182	58	59	735	100.0
Carangidae	85	425		32	7						252	51	852	100.0
Labridae									29		2		29	100.0
Congridae							7	212	33		2		254	100.0
Gadidae							13	8	25		2		48	100.0
Mollusca			2										2	100.0

CENTRAL DISTRICT

Specis	Jul n=3	Aug n=4	Sep n=5	Oct n=1	Nov n=5	Dec n=1	Jan n=13	Feb n=5	Mar n=8	Apr n=6	May n=6	Jun n=9	Total n=66	Percent of species composition within major categories
Serranidae	8,453	11,252	7,674	12,733	11,280	11,839	15,424	19,488	28,032	9,498	19,799	20,314	175,786	100.0
Centropristis striata	1,073	429	5	213	1,092	2,448	7,084	10,218	22,844	4,595	12,085	3,197	65,283	37.1
Epinephelus adscensionis	11	158	161	102	97		14		45	32	7	64	691	0.4
Epinephelus cruentatus		14			11								25	<0.1
Epinephelus drummondhayi	33	111	203	26	368		338	508	315	106	12	260	2,280	1.3
Epinephelus flavolimbatus	44	6					14			40		16	120	0.1
Epinephelus fulvus		14	68		21		11			3		16	133	0.1
Epinephelus guttatus		113	209		98		8		15	20		243	706	0.4
Epinephelus inermis									18				18	<0.1
Epinephelus morio	68	701	554	42	714		147		460	66	80	735	3,567	2.0
Epinephelus mystacinus											5		5	<0.1
Epinephelus nigritus							13		119	13			145	0.1
Epinephelus niveatus	5,429	4,351	1,617	4,701	1,420	1,432	3,027	2,441	1,963	3,640	6,929	4,995	41,945	23.9
Epinephelus striata												6	6	<0.1
Mycteroperca bonaci									95			28	123	0.1
Mycteroperca interstitialis		90			58		43		30	57		183	461	0.3
Mycteroperca microlepis	1,721	4,214	4,151	6,543	6,138	6,000	4,144	5,853	1,185	681	515	9,709	50,854	28.9
Mycteroperca phenax	68	886	618	1,106	1,176	1,959	581	468	937	205	156	676	8,836	5.0
Mycteroperca venenosa		36	32							20		184	272	0.2
Paranthias furcifer	6	129	56		87				6	20	10	2	316	0.2

Table 7. (Continued).

Species	Jul n=3	Aug n=4	Sep n=5	Oct n=1	Nov n=5	Dec n=1	Jan n=13	Feb n=5	Mar n=8	Apr n=6	May n=6	Jun n=9	Total n=66	Percent of species composition within major categories
					CENTRAL DISTRICT									
Lutjanidae	9,106	12,337	11,871	14,518	17,603	3,491	13,456	4,478	5,197	5,818	3,568	7,464	108,907	100.0
Lutjanus analis	939		108		60				23			391	1,521	1.4
Lutjanus buccanella		8			82		6	12		8	3	105	224	0.2
Lutjanus campechanus	548	111	169	73	311		1,917	117	675	284	203	443	4,851	4.4
Lutjanus cyanopterus												275	275	0.3
Lutjanus vivanus	564	309	1,144		4,149	384	240	255	100	108	184	1,323	8,760	8.0
Rhomboplites aurorubens	7,055	11,909	10,450	14,445	13,001	3,107	11,293	4,094	4,399	5,418	3,178	4,927	93,276	85.7
Sparidae	3,394	4,491	2,884	3,562	4,679	2,390	2,868	2,174	1,034	1,558	4,293	18,317	51,644	100.0
Calamus leucosteus	14		38	14			15					12	93	0.2
Calamus nodosus	28	331	311	567	858	182	167	8	5	29	14	1,160	3,660	7.1
Diplodus holbrooki			13		65		2			10		45	135	0.3
Lagodon rhomboides							8						8	<0.1
Pagrus pagrus	3,352	4,160	2,522	2,981	3,756	2,208	2,676	2,166	1,029	1,519	4,279	17,100	47,748	92.4
Malacanthidae	203	421	53	52	69	138	279	157	242	377	335	786	3,112	100.0
Caulolatilus chrysops	13	27		3	27	138	6	32	53	24	32		355	11.4
Caulolatilus microps	190	394	53	49	42		262	125	169	353	296	786	2,719	87.4
Malacanthus plumieri					2		11		20		7		40	1.2
Balistidae	305	413	626	913	880	288	500	494	598	321	945	1,100	7,383	100.0
Balistes capriscus	305	371	626	913	880	288	477	494	571	316	936	1,100	7,277	98.6
Balistes vetula		42					23		27	5	9		106	1.4
Haemulidae	678	677	1,650	1,629	2,089	295	901	662	273	656	360	346	10,216	100.0
Haemulon aurolineatum	678		75	1,629	720		282		5	71	360		3,820	37.4
Haemulon plumieri		677	1,575		1,369	295	619	662	268	585		346	6,396	62.6
Percichthyidae											1,895	3,464	5,359	100.0
Polyprion americanus											1,895	3,464	5,359	100.0
Scombridae	6	263	15	60	2		324	206	538	90	4	1,101	2,609	100.0
Acanthocybium solanderi			12						48			427	487	18.7
Scomberomorus cavalla	6	178	3	60	2		146	206	426	74	4	122	1,227	47.0
Thunnus albacares							1						1	<0.1
Thunnus obesus		85											85	3.2
Thunnus spp.							177		64	16		552	809	31.0
Carangidae	44	267	999	1,429	358	300	1,089	1,244	1,117	770	659	1,262	9,538	100.0
Caranx crysos							17						17	0.2
Seriola dumerili		87			60	154	256	875	582	468	211	868	3,561	42.2
Seriola fasciata	2												2	<0.1
Seriola rivoliana	42	148	634	339	265	146	682	336	456	302	448	394	4,192	49.6
Seriola zonata		32	365		33		28	33	79				570	6.7
Seriola spp.							106						106	1.2
Coryphaenidae	63	41	2	31						15	92	786	1,030	100.0
Coryphaena hippurus	63	41	2	31						15	92	786	1,030	100.0

Table 7. (Continued).

CENTRAL DISTRICT

Species	Jul n=3	Aug n=4	Sep n=5	Oct n=1	Nov n=5	Dec n=1	Jan n=13	Feb n=5	Mar n=8	Apr n=6	May n=6	Jun n=9	Total n=66	Percent of species composition within major categories
Rachycentridae	54	20	179	64	27		4	33	34		366	89	870	100.0
Rachycentron canadum	54	20	179	64	27		4	33	34		366	89	870	100.0
Pomatomidae									386	1,067	504		2,827	100.0
Pomatomus saltatrix									386	1,067	504		2,827	100.0
Labridae		31		71	116							9	227	100.0
Lachnolaimus maximus		31		71	116							9	227	100.0
Sphyraena		3										16	19	100.0
Sphyraena barracuda		3										16	19	100.0
Priacanthidae					16	6		2	9	1	10	4	48	100.0
Priacanthus arenatus					16	6		2	8	1	9	3	45	94.0
Pristigenys alta									1		1	1	3	6.0
Sciaenidae					1		6						7	100.0
Equetus iwamotoi					1		6						7	100.0
Stromateidae											14		14	100.0
Hyperoglyphe perciformis											14		14	100.0
Congridae	13	1			2	45	70	421	62	26	53	10	703	100.0
Tetraodontidae						8							8	100.0
Squaliformes		1,565	19,134	44,209	166,247	52,161	5,315	5,332	1,757	763	5,454	3,810	305,747	100.0
Mollusca	5				5	2	1						13	100.0

SOUTHERN DISTRICT

Species	Jul n=9	Aug n=11	Sep n=4	Oct n=6	Nov n=7	Dec n=1	Jan n=6	Feb n=5	Mar n=7	Apr n=8	May n=5	Jun n=12	Total n=81	Percent of species composition within major categories
Serranidae	25,783	29,494	19,406	30,882	46,143	63,657	92,263	42,069	29,933	32,903	31,004	22,812	466,349	100.0
Centropristis striata	4,547	2,398	2,516	7,267	20,503	51,661	58,331	20,197	8,387	7,359	5,118	5,140	193,424	41.5
Epinephelus adscensionis	492	350	156	305	1,259	112	462	65	346	127	898	433	5,005	1.1
Epinephelus afer											6		6	<0.1
Epinephelus cruentatus	9	2	32	20	9				5	8	33	54	172	<0.1
Epinephelus drummondhayi	669	273	760	603	280	216	750	1,046	811	266	497	742	6,913	1.5
Epinephelus flavolimbatus	266	548	172			235	59	463	95	179			2,017	0.4
Epinephelus fulvus	110	18	5	32	121		41	18	164	12	435	140	1,096	0.2
Epinephelus guttatus	432	418	465	245	2,861	196	503	32	302	2	1,335	528	7,019	1.5
Epinephelus inermis			21		4				13			4	42	<0.1
Epinephelus morio	1,698	1,805	1,731	3,319	2,155	245	1,019	147	1,146	534	2,639	1,957	18,395	3.9

Table 7. (Continued).

Species	Jul n=9	Aug n=11	Sep n=4	Oct n=6	Nov n=7	Dec n=1	Jan n=6	Feb n=5	Mar n=7	Apr n=8	May n=5	Jun n=12	Total n=81	Percent of species composition within major categories
					SOUTHERN DISTRICT									
<u>Epinephelus nigritus</u>					33		118	73	232	17	55		528	0.1
<u>Epinephelus niveatus</u>	2,929	6,521	1,955	1,717	1,790	2,623	8,321	8,476	7,506	10,255	4,905	1,060	58,058	12.4
<u>Hemanthias leptus</u>		8								8			16	<0.1
<u>Mycteroperca bonaci</u>					4						93		97	<0.1
<u>Mycteroperca interstitialis</u>	351	23		38	340		214		150	26	2,374	73	3,589	0.8
<u>Mycteroperca microlepis</u>	8,850	10,772	9,258	12,498	9,866	4,735	16,353	6,386	5,767	8,749	8,098	6,366	107,698	23.1
<u>Mycteroperca phenax</u>	5,354	6,341	2,519	4,786	6,273	3,634	5,944	5,160	4,702	5,324	3,698	6,220	59,955	12.8
<u>Mycteroperca venenosa</u>	76	16		13	597		91	6	179	9	757	63	1,807	0.4
<u>Paranthias furcifer</u>		1	116	39	48		57		128	28	63	32	512	0.1
Lutjanidae	13,663	19,812	12,908	17,027	15,936	7,165	13,367	5,840	12,753	14,784	13,600	14,215	161,070	100.0
<u>Lutjanus analis</u>	63	41	107	65	96	11	20	4	19	35	295	17	773	0.5
<u>Lutjanus buccanella</u>	1						13		15	27		3	59	<0.1
<u>Lutjanus campechanus</u>	690	720	280	1,285	1,099	1,399	3,417	1,418	1,452	1,078	480	613	13,931	8.6
<u>Lutjanus cyanopterus</u>		5			25		64		29			49	172	0.1
<u>Lutjanus griseus</u>		10	11		11	6	10	17				11	76	<0.1
<u>Lutjanus purpureus</u>		22									12		34	<0.1
<u>Lutjanus vivanus</u>	786	8	182	78	165	12	465	44	71	224	64	180	2,279	1.4
<u>Ocyurus chrysurus</u>											5		5	<0.1
<u>Rhomboplites aurorubens</u>	12, 23	19,006	12,328	15,599	14,540	5,737	9,378	4,357	11,167	13,420	12,744	13,342	143,741	89.2
Sparidae	12,980	14,468	6,248	8,090	8,510	9,492	27,215	15,324	14,804	11,940	10,977	15,798	155,846	100.0
<u>Calamus leucosteus</u>	64	121		45	35	29	135	326	46			42	843	0.5
<u>Calamus nodosus</u>	1,867	795	1,649	1,351	2,360	1,225	4,040	1,013	2,709	1,515	2,594	1,129	22,517	14.4
<u>Diplodus holbrooki</u>							296	136	101	251	140	196	1,120	0.7
<u>Lagodon rhomboides</u>										27			27	<0.1
<u>Pagrus pagrus</u>	11,049	13,552	4,599	6,694	6,115	8,238	22,744	13,849	11,944	10,122	8,243	14,431	131,580	84.4
<u>Stenotomus caprinus</u>									3	25			28	<0.1
<u>Stenomus chrusops</u>									1				1	<0.1
Malacanthidae	2,866	3,575	9,434	4,110	4,707	2,332	4,268	2,128	3,866	2,539	1,188	6,067	47,080	100.0
<u>Caulolatilus chrysops</u>		3	863				116			1			983	2.1
<u>Caulolatilus cyanops</u>										4			4	<0.1
<u>Caulolatilus microps</u>	666	2,844	4,717	74	49	66	362	204	1,009	1,804	424	31	12,250	26.0
<u>Lopholatilus chamaeleonticeps</u>	2,200	728	3,854	4,036	4,658	2,266	3,790	1,924	2,840	730	764	6,036	33,826	71.8
Balistidae	479	893	704	1,370	1,488	884	1,225	699	1,553	970	1,338	1,226	12,829	100.0
<u>Balistes capriscus</u>	471	893	624	1,357	1,432	884	1,184	691	1,553	930	1,218	1,218	12,455	97.1
<u>Balistes vetula</u>	8		80	13	56		41	8		25	120	8	359	2.9
<u>Monocanthus hispidus</u>										15			15	<0.1
Haemulidae	6,742	8,054	5,236	7,259	7,079	3,164	5,686	3,831	4,982	4,621	6,339	7,968	70,961	100.0
<u>Haemulon aurolineatum</u>							10			95			105	0.1
<u>Haemulon plumieri</u>	6,742	8,054	5,236	7,259	7,079	3,164	5,676	3,831	4,982	4,526	6,339	7,968	70,856	99.9
Percichthyidae	2,302	13,776	14,521	17,027	19,945	17,414	25,021	15,499	22,248	24,499	13,259	51,022	236,713	100.0
<u>Polyprion americanus</u>	2,302	13,776	14,521	17,027	19,945	17,414	25,021	15,499	22,248	24,499	13,259	51,022	236,713	100.0

Table 7. (Continued).

Species	Jul n=9	Aug n=11	Sep n=4	Oct n=6	Nov n=7	Dec n=1	Jan n=6	Feb n=5	Mar n=7	Apr n=8	May n=5	Jun n=12	Total n=81	Percent of species composition within major categories
						SOUTHERN DISTRICT								
Scorpaenidae	236	693	75		45	279		309		160	468	1,172	3,437	100.0
Helicolenus dactylopterus	236	693	75		45	279		309		160	468	1,172	3,437	100.0
Scombridae	116	720	110	114	53	4	91	58	232	344	120	429	2,391	100.0
Acanthocybium solanderi	67	36	22	3			24	32	38	15	43	280	11.7	
Scomberomorus cavalla	116	653	74	48	41	4	35	26	167	249	72	386	1,871	78.2
Thunnus albacares				26	7		54		22	48	33		190	7.9
Thunnus atlanticus				18	2		2	8	11	9			50	2.1
Carangidae	315	135	65	101	16	8	123	209	760	54	4	46	1,836	100.0
Seriola dumerili		135					36		745			12	928	50.5
Seriola fasciata	11												11	0.6
Seriola rivoliana	293			20		1	57		15			8	394	21.4
Seriola zonata	11			81		7	26					2	127	6.9
Seriola spp.							4	209		54	4	24	295	16.1
Coryphaenidae	427	129	40	8	4	1	2			8	312	330	1,261	100.0
Coryphaena hippurus	427	129	40	8	4	1	2			8	312	330	1,261	100.0
Rachycentridae			60	88	6		1,149	12	15	345		6	1,681	100.0
Rachycentron canadum			60	88	6		1,149	12	15	345		6	1,681	100.0
Pomatomidae							268		274	40			582	100.0
Pomatomus saltatrix							268		274	40			582	100.0
Labridae	5	712	198	622	691	227	680	308	184	158	420	784	4,989	100.0
Bodianus pulchellus	1									4			5	0.1
Lachnolaimus maximus	4	712	198	622	691	227	680	308	184	154	420	784	4,984	99.9
Priacanthidae	6		1	2		1	2	1	22	23		1	59	100.0
Cookeolus boops	1												1	1.7
Priacanthus alta	2			1									3	5.1
Priacanthus arenatus	3		1	1		1	2	1	22	23		1	55	93.2
Sciaenidae							1		6				7	100.0
Equetus iwamotoi							1		6				7	100.0
Gadidae						10	15	40	12	2			79	100.0
Stromateidae		47								47		536	630	100.0
Hyperoglyphe perciformis		47								47		536	630	100.0
Congridae					17	16		6					39	100.0
Tetraodontidae						44	19	10	3				76	100.0
Squaliformes	1,773	820	861	1,298	1,539	1,224	4,022	2,392	1,693	1,874	624	362	18,482	100.0
Mollusca	45	7	25	137	1,077	3,319	1,187	866	369	154	84	85	7,355	100.0

Table 8. Species composition in kilograms for the North Carolina commercial reef fish landings by district, based on catches for the fishery, July 1990-June 1991. n = number of boats sampled.

	NORTHERN DISTRICT													
Species	Jul n=0	Aug n=1	Sep n=0	Oct n=0	Nov n=0	Dec n=0	Jan n=0	Feb n=1	Mar n=0	Apr n=0	May n=0	Jun n=0	Total n=2	Percent of species composition within major categories
Serranidae	4,178	12,885	2,279	1,435	1,324	2,272	2,951	9,956	5,211	9,827	5,056	4,640	62,014	100.0
Centropristis striata	3,412	10,928	1,435	1,101	1,165	2,239	2,951	9,549	4,247	5,112	3,444	836	46,419	96.0
Centropristis ocyurus		43											43	0.1
Epinephelus drummondhayi		332											332	0.7
Epinephelus fulvus		147											147	0.3
Epinephelus niveatus		1,435											1,435	2.9
Lutjanidae	237	907	118	211	402	6	21	13	110	339	975	327	3,666	100.0
Rhomboplites aurorubens		907											907	100.0
Sparidae	401	784	223	102	102		2	7	30	158	290	542	2,641	100.0
Pagrus pagrus		784											784	100.0
Malacanthidae	4,002	10,298	546	445	381	186	244	4,074	2,097	7,963	1,016	4,351	35,603	100.0
Caulolatilus microps		10,298											10,298	100.0
Balistidae	22	80	34	96	300	344	151	64	89	424	503	224	2,331	100.0
Balistes capriscus		80											80	100.0
Haemulidae										4			4	100.0
Scorpaenidae		1											1	100.0
Neomerinthe hemingwayi		1											1	100.0
Scombridae									104			18	122	100.0
Carangidae	480	1,061	152	131	60	4		159	176	606	110	280	2,158	100.0
Seriola rivoliana		1,061											1,061	100.0
Coryphaenidae												1,247	1,247	100.0
Rachycentridae		29											29	100.0
Pomatomidae		4											4	100.0
Labridae			3										3	100.0
Tetraodontidae			265										265	100.0
Squaliformes	92					3,965							4,057	
Mollusca		1											1	100.0

Table 8. (Continued).

Species	Jul n=0	Aug n=7	Sep n=4	Oct n=9	Nov n=4	Dec n=5	Jan n=8	Feb n=6	Mar n=13	Apr n=6	May n=5	Jun n=4	Total n=71	Percent of species composition within major categories
	CENTRAL DISTRICT													
Serranidae	11,385	6,550	4,547	4,301	7,879	7,481	13,737	11,341	10,636	14,121	6,730	10,612	109,320	100.0
Centropristis ocyurus														
Centropristis striata	526	633	336	692	2,581	3,873	10,348	7,383	6,808	7,134	1,220	596	42,130	38.5
Epinephelus adscensionis		248	90	21	43		103		27				532	0.5
Epinephelus cruentatus		50		2				6					58	<0.1
Epinephelus drummondhayi		149	141	103	152	27		563	186	142	633	48	2,144	2.0
Epinephelus flavolimbatus							7		13	52			72	0.1
Epinephelus fulvus		69	39	16	5	5	3	298	4		51		490	0.4
Epinephelus guttatus		371	142	22	7		25		34			62	663	0.6
Epinephelus inermis														
Epinephelus morio		556	1,189	335	408	36	56	78	308	34	1,923	845	5,768	5.3
Epinephelus mystacinus								9					9	<0.1
Epinephelus nigritus	34	101											135	0.1
Epinephelus niveatus	6,550	1,683	335	1,926	202	41	1,744	2,040	1,131	6,581	2,416	540	25,189	23.0
Mycteroperca bonaci		16					4					23	43	<0.1
Mycteroperca interstitialis		784	131	22	83	45	27	25	18			12	1,147	1.0
Mycteroperca microlepis	1,445	449	1,304	780	1,963	2,504	922	343	268	123		4,133	14,234	13.0
Mycteroperca phenax		1,154	821	370	2,383	950	492	602	1,832	55	487	4,306	13,452	12.3
Mycteroperca venenosa		283	19	6								47	355	0.3
Paranthias furcifer		4		6	24				7				41	<0.1
Rypticus saponicus					28								28	<0.1
Lutjanidae	5,813	11,112	7,026	7,593	13,578	3,899	4,744	4,811	6,161	5,158	10,651	6,655	87,201	100.0
Lutjanus analis		59											59	0.1
Lutjanus buccanella		14		20	64		24	22	28				172	0.2
Lutjanus campechanus	65	150	93	143	268	247	293	268	216	285		481	2,509	2.9
Lutjanus vivanus		921	36	92	91	58	46	10	160	50			1,464	1.7
Rhomboplites aurorubens	5,748	9,968	6,897	7,338	13,155	3,594	4,381	4,511	5,757	4,823	10,651	6,174	82,997	95.2
Sparidae	4,990	4,096	2,092	1,346	5,168	3,059	2,449	3,530	3,292	3,242	2,565	4,583	40,412	100.0
Calamus bajonado							11						11	<0.1
Calamus leucosteus		6	8		6	8	38	23		16		29	134	0.3
Calamus nodosus		62	52	164	331	80	310	46	156		28	257	1,486	3.9
Diplodus holbrooki		8		5	31	142	21	15				108	330	0.9
Pagrus pagrus	2,864	4,020	2,032	1,177	4,800	2,829	2,069	3,449	3,136	3,226	2,537	4,189	36,328	94.8
Stenotomus caprinus								2	4				6	<0.1
Malacanthidae	819	1,215	251	152	307	246	1,154	339	358	1,124	592	766	7,323	100.0
Caulolatilus chrysops		195		8			94	32	30	102	150		611	11.8
Caulolatilus cyanops							103		25				128	2.5
Caulolatilus microps		1,020		144		246	957	307	284	904	442		4,304	83.1
Lopholatilus chamaeleonticeps										118			118	2.2
Malacanthus plumieri									19				19	0.4
Balistidae	1,093	2,087	1,035	574	3,506	490	821	478	746	2,936	4,207	2,291	20,264	100.0
Balistes capriscus		1,869	1,035	568	3,487	490	808	478	746	2,936	4,207	2,225	19,942	98.3
Balistes vetula		218		6	19		13					66	322	1.7

Table 8. (Continued).

Species	Jul n=0	Aug n=7	Sep n=4	Oct n=9	Nov n=4	Dec n=5	Jan n=8	Feb n=6	Mar n=13	Apr n=6	May n=5	Jun n=4	Total n=71	Percent of species composition within major categories
					CENTRAL DISTRICT									
Haemulidae	395	668	463	524	841	169	856	230	285	396	481	692	6,000	100.0
Haemulon aurolineatum		50	42	6	6	5	180	3	2	396	346	41	1,077	18.0
Haemulon plumieri		618	421	518	835	164	676	227	283		135	651	493	82.0
Percichthyidae										2,610			2,610	100.0
Polyprion americanus										2,610			2,610	100.0
Scorpaenidae									8	122			130	100.0
Helicolenus dactylopterus									6	122			128	98.5
Neomerinthe hemingwayi									2				2	1.5
Scombridae		35	38	99	149	6	16	14	159	44	160	112	832	100.0
Acanthocybium solanderi		9			18								27	3.2
Euthynnus alleteratus					3				22				25	3.0
Scomberomorus cavalla		12	38	99	18	6	16	14	130	44	149	112	638	76.7
Scomberomorus maculatus		1							1				2	0.2
Thunnus spp.		14			110				6		11		141	16.9
Carangidae	425	603	323	1,189	2,255	1,084	815	2,182	1,440	1,597	978	2,572	15,463	100.0
Alectis ciliaris		18											18	0.1
Seriola dumerili		305		380	1,469	38	490	644	489	663	556	871	5,905	39.3
Seriola rivoliana		280	323	809	738	1,046	285	1,465	941	862	422	1,678	8,849	58.8
Seriola zonata					48			73	6	72		23	222	1.5
Seriola spp.							40						40	0.3
Caranx crysos				8					4				12	0.1
Coryphaenidae		52	6	67	12	1			13	108	932	646	1,837	100.0
Coryphaena hippurus		52	6	67	12	1			13	108	932	646	1,837	100.0
Rachycentridae			13	87	34	8	14		38		57	921	1,172	100.0
Rachycentron canadum			13	87	34	8	14		38		57	921	1,172	100.0
Pomatomidae							13		8				21	100.0
Pomatomus saltatrix							13		8				21	100.0
Labridae		43			75								118	100.0
Lachnolaimus maximus		43			75								118	100.0
Priacanthidae		28	1	24	50		4	33	29				169	100.0
Priacanthus arenatus		26	1	24	50		4	33	25				163	96.4
Pristigenys alta		2							4				6	3.6
Sciaenidae								1					1	100.0
Equetus iwamotoi								1					1	100.0
Sphyraenidae		23	6	5	23		8	3	8				76	100.0
Sphyraena barracuda		23	6	5	23		8	3	8				76	100.0

Table 8. (Continued).

Species	Jul n=0	Aug n=7	Sep n=4	Oct n=9	Nov n=4	Dec n=5	Jan n=8	Feb n=6	Mar n=13	Apr n=6	May n=5	Jun n=4	Total n=71	Percent of species composition within major categories
					CENTRAL DISTRICT									
Congridae		5		5	3	2	137	84	104	37			377	100.0
Squaliformes	16	271	260	181	2,103	264	408	149	270				3,922	100.0
Mollusca					23	11	345	158	40	68			645	100.0

Species	Jul n=18	Aug n=7	Sep n=2	Oct n=13	Nov n=10	Dec n=9	Jan n=9	Feb n=7	Mar n=8	Apr n=17	May n=15	Jun n=3	Total n=118	Percent of species composition within major categories
					SOUTHERN DISTRICT									
Serranidae	20,927	29,317	31,063	21,725	31,651	36,126	53,849	28,427	13,202	29,013	21,462	23,078	339,840	100.0
Centropristis ocyurus									6	73	226		305	0.1
Centropristis striata	3,163	5,265	4,071	3,459	12,092	19,851	36,352	11,629	5,919	7,747	7,943	2,631	120,122	35.3
Diplectrum formosum									26	180	109	49	364	0.1
Epinephelus adscensionis	577	372	277	138	278	315	166	332	164	316	453	464	8,852	1.1
Epinephelus afer											13		13	<0.1
Epinephelus cruentatus	28		60	5		2			15	27	18	4	159	<0.1
Epinephelus drummondhayi	710	502	331	94	63	158	186	64	349	377	224	224	3,282	1.0
Epinephelus flavolimbatus	54		223	607	34	88	4	135	12	325		518	2,000	0.6
Epinephelus fulvus	93		67	37	50	39	37	46	66	13	61	27	536	0.2
Epinephelus guttatus	283	904	947	112	290	226	439	301	588	284	168	393	4,935	1.4
Epinephelus inermis					3					4		5	12	<0.1
Epinephelus morio	1,521	2,992	3,911	2,234	2,028	2,748	4,838	2,052	411	476	907	1,927	26,045	7.7
Epinephelus nigritus	40		14		35	64				64	106		323	0.1
Epinephelus niveatus	2,499	5,026	10,230	7,557	4,305	2,823	1,728	4,155	652	10,030	4,054	5,271	58,330	17.2
Gonioplectrus hispanus			5										5	<0.1
Hemanthias leptus						8						19	28	<0.1
Mycteroperca interstitialis	138	38	24	12	161	7	28	27	164	30	172		801	0.2
Mycteroperca microlepis	5,712	8,217	4,997	3,572	8,045	6,401	5,997	5,769	2,507	5,275	3,658	4,422	64,572	19.0
Mycteroperca phenax	6,080	5,954	5,638	3,734	4,191	3,396	4,044	3,878	2,104	3,784	3,336	7,103	53,242	15.7
Mycteroperca venenosa	15		228	134				25	175		7		584	0.2
Paranthias furcifer	14	47	40	30	76		30	14	20		3	21	295	0.1
Serranus phoebe									24	8	4	19	36	<0.1
Lutjanidae	9,820	28,529	16,693	26,774	22,874	13,400	12,938	12,479	8,556	15,738	16,953	15,418	200,172	100.0
Lutjanus analis	26	25	67	22	71	46	58	23	44	56	52	115	605	0.3
Lutjanus buccanella	5		5	2			24			7			43	<0.1
Lutjanus campechanus	471	706	203	407	484	414	300	589	461	371	230	494	5,130	2.6
Lutjanus cyanopterus	19	5	6	20	13	23					6		92	<0.1
Lutjanus griseus	5	26	14			54	12	3		10	19	6	149	0.1
Lutjanus vivanus	55	7	794	24	287	45	87	77	15	8	19	404	1,822	0.9
Ocyurus chrysurus								2					2	<0.1

Table 8. (Continued).

Species	Jul n=18	Aug n=7	Sep n=2	Oct n=13	Nov n=10	Dec n=9	Jan n=9	Feb n=7	Mar n=8	Apr n=17	May n=15	Jun n=3	Total n=118	Percent of species composition within major categories
						SOUTHERN DISTRICT								
<u>Rhomboplites</u> <u>aurorubens</u>	9,239	27,760	15,604	26,299	22,019	12,818	12,457	11,785	8,036	15,286	16,627	14,399	192,329	96.1
Sparidae	15,546	18,563	15,325	8,925	11,988	7,882	10,130	11,531	8,872	11,575	10,232	10,704	141,273	100.0
<u>Calamus</u> <u>leucosteus</u>	13	64		36	14	6	62	76	56	100			427	0.3
<u>Calamus</u> <u>nodosus</u>	2,523	1,445	2,168	2,041	2,372	1,699	1,634	1,817	1,139	1,414	1,361	1,651	21,264	15.0
<u>Diplodus</u> <u>holbrooki</u>	21	69			4	64	190	259	95	97	112	60	971	0.7
<u>Pagrus</u> <u>pagrus</u>	12,989	16,985	13,157	6,828	9,598	6,113	8,244	9,365	7,582	9,964	8,756	8,993	118,574	83.9
<u>Calamus</u> <u>bajonado</u>														
<u>Calamus</u> <u>proridens</u>								4					4	<0.1
<u>Stenotomus</u> <u>caprinus</u>				20				10					30	<0.1
<u>Lagodon</u> <u>rhomboides</u>											3		3	<0.1
Malacanthidae	111	1,755	8,258	9,331	6,072	1,456	3,563	471	6,522	9,138	3,428	3,744	53,849	100.0
<u>Caulolatilus</u> <u>chrysops</u>										50			50	0.1
<u>Caulolatilus</u> <u>cyanops</u>		174									38		212	0.4
<u>Caulolatilus</u> <u>microps</u>	75	1,319	896	3,111	1,738	974	104	51	30	3,207	951	1,688	14,144	26.3
<u>Lopholatilus</u> <u>chamaeleonticeps</u>	36	262	7,362	6,220	4,321	459	3,445	388	6,484	5,866	2,345	1,957	39,145	72.7
<u>Malacanthus</u> <u>plumieri</u>					13	23	14	32	8	15	94	99	298	0.6
Balistidae	1,423	2,056	3,782	2,713	4,528	1,801	1,263	2,001	1,114	1,618	2,174	2,518	26,991	100.0
<u>Aluterus</u> <u>monocenos</u>						10							10	<0.1
<u>Balistes</u> <u>capriscus</u>	1,423	2,056	3,736	2,700	4,528	1,781	1,196	2,001	1,050	1,608	2,161	2,380	26,620	98.6
<u>Balistes</u> <u>vetula</u>				13		10	57		64	10	13	138	305	1.1
<u>Canthidermis</u> <u>sufflamen</u>			46										46	0.2
<u>Monocanthus</u> <u>hispidus</u>							10						10	<0.1
Haemulidae	7,049	12,465	9,070	5,254	9,006	4,518	5,199	4,459	3,210	4,340	5,495	6,165	76,230	100.0
<u>Haemulon</u> <u>aurolineatum</u>				4		23	14	304	265	300	413	103	1,426	1.9
<u>Haemulon</u> <u>plumieri</u>	7,049	12,465	9,070	5,250	9,006	4,495	5,180	4,155	2,945	4,040	5,082	6,062	74,799	98.1
<u>Orthopristis</u> <u>chrysoptera</u>							5						5	<0.1
Percichthyidae	37,046	14,194								23,979	19,158	21,600	115,977	100.0
<u>Polyprion</u> <u>americanus</u>	37,046	14,194								23,979	19,158	21,600	115,977	100.0
Scorpaenidae	1	75	355	264	648	452	568	8	456	2,753	2,369	334	8,283	100.0
<u>Helicolenus</u> <u>dactylopterus</u>	1	75	355	264	648	452	568	8	452	2,753	2,369	334	8,279	99.9
<u>Neomerinthe</u> <u>hemingwayi</u>									4				4	0.1
Scombridae	747	151	58	359	148	53	167	450	289	237	388	63	3,110	100.0
<u>Acanthocybium</u> <u>solanderi</u>	46		15			29		66	63	94	242	56	611	19.6
<u>Euthynnus</u> <u>alleteratus</u>						1							1	<0.1
<u>Scomberomorus</u> <u>cavalla</u>	643	151	26	353	140	23	25	288	192	103	146	7	2,097	67.4
<u>Scomberomorus</u> <u>maculatus</u>	9			6									15	0.5
<u>Thunnus</u> <u>albacares</u>	49						88	96	11				244	7.8
<u>Thunnus</u> <u>atlanticus</u>			17		8		54		23	40			142	4.6
<u>Thunnus</u> spp.														

Table 8. (Continued).

Species	Jul n=18	Aug n=7	Sep n=2	Oct n=13	Nov n=10	Dec n=9	Jan n=9	Feb n=7	Mar n=8	Apr n=17	May n=15	Jun n=3	Total n=118	Percent of species composition within major categories
	SOUTHERN DISTRICT													
Carangidae	136	187	207	66	510	2,849	2,071	4,223	1,500	1,263	1,069	1,450	15,531	100.0
Alectis ciliaris		51	12	18	36	4	189				50	7	367	2.4
Caranx crysos						15		12					27	0.2
Seriola dumerili				47		423	840	3,905	1,112		780	592	7,699	49.6
Seriola fasciata				1									1	<0.1
Seriola rivoliana						112		140	381	327	213	424	1,597	10.3
Seriola zonata									7		26	427	460	3.0
Seriola spp.	136	136	195		474	2,295	1,042	166		936			5,380	34.6
Coryphaenidae	404	61	23	27	85	54	18			340	32	192	1,236	100.0
Coryphaena hippurus	404	61	23	27	85	54	18			340	32	192	1,236	100.0
Rachycentridae					60	608	540	112	134	109	10	22	1,595	100.0
Rachycentron canadum					60	608	540	112	134	109	10	22	1,595	100.0
Pomatomidae							54	31	30				115	100.0
Pomatomus saltatrix							54	31	30				115	100.0
Labridae	1,290	1,776	3,068	714	1,039	498	297	229	298	645	908	1,302	12,064	100.0
Bodianus pulchellus	25		94			2	8	2	4	5	32		172	1.4
Lachnolaimus maximus	1,257	1,776	2,974	714	1,039	496	289	227	294	640	856	1,302	11,864	98.3
Halichoeres garnoti	8												8	0.1
Halichoeres cyanocephalus											20		20	0.2
Priacanthidae	26		11	73	45	10	32	66	25	22	1	3	314	100.0
Cookeolus boops	14												14	12.0
Priacanthus arenatus	12		11	3		5	7	16	13	3	1	3	74	63.2
Pristigenys alta						1	1	13	12	2			29	24.8
Sciaenidae								7	5		1		13	100.0
Equetus umbrosus											1		1	16.7
Equetus iwamotoi									5				5	83.3
Gadidae				12		27		5					44	100.0
Stromateidae	3,429	514	150	73	167	53	9		11	473	75	401	5,355	100.0
Hyperoglyphe perciformis	3,429	514	150	73	167	53	9		11	473	75	401	5,355	100.0
Congridae		5			42	5	703	278	126	72	36		1267	100.0
Muraenidae									11				11	100.0
Tetraodontidae							63	110					173	100.0
Pomacanthidae	218	318											536	100.0
Holocentridae						41	5						46	100.0
Holocentrus ascensionis							5						5	100.0

Table 8. (Continued).

Species	Jul n=18	Aug n=7	Sep n=2	Oct n=13	Nov n=10	Dec n=9	Jan n=9	Feb n=7	Mar n=8	Apr n=17	May n=15	Jun n=3	Total n=118	Percent of species composition within major categories
	SOUTHERN DISTRICT													
Xiphiidae									144	79			223	100.0
Xiphias gladius									144	79			223	100.0
Squaliformes	827	514	422	553	852	1,123	9,563	1,259	1,348	1,344	495	3,665	29,165	100.0
Mollusca	198	46	86	95	718	1,850	6,319	1,252	327	147	88	31	11,157	100.0

Table 9. Market size grades of black sea bass, vermilion snapper, red snapper, red porgy, and tilefish by district.

	DISTRICT	
Species	Central	Southern
C. striata	<0.340 ks (3/4 lb)	<0.227 kg (1/2 lb)
Black sea bass	0.340-0.681 kg (3/4-1-1/2lb)	0.227-0.454 kg (1/2-1 lb)
	0.681-0.908 kg (1-1/2-2lb)	>0.454 kg (1 lb)
	>0.908 kg (2 lb)	
R. aurorubens		<0.340 (<3/4 lb)
Vermilion snapper	<0.454 kg (1 lb)	0.340-0.454 kg (3/4-1 lb)
L. vivanus	0.454-0.908 kg (1-2 lb)	0.454-0.908 kg (1-2 lb)
Silk snapper	0.908-1.816 kg (2-4 lb)	0.908-1.816 kg (2-4 lb)
	>1.816 kg (4 lb)	>1.816 kg (4 lb)
L. campechanus	<1.362 kg (3lb)	<1.816 kg (4 lb)
Red snapper	1.362-2.724 kg (3-6 lb)	1.816-3.632 kg (4-8 lb)
	>2.724 kg (6 lb)	>3.632 kg (8 lb)
P. pagrus	<0.454 kg (1 lb)	<0.454 kg (1 lb)
Red porgy	0.454-0.908 kg (1-2 lb)	0.454-0.908 kg (1-2 lb)
	0.908-1.816 kg (2-4 lb)	0.908-1.816 kg (2-4 lb)
	>1.816 kg (4 lb)	>1.816 kg (4 lb)
L. chamaeleonticeps		<1.816 kg (4 lb)
Tilefish		1.816-3.632 kg (4-8 lb)
		>3.632 kg (8 lb)

Table 10. Pelagic species composition in kilograms for the North Carolina commercial trips for the periods July 1988-June 1989, July 1989-June 1990, and July 1990-June 1991, by district, by gear, based on landings.

	Northern District					Central District					Southern District					
		Hand-	Longline				Hand-	Longline				Hand-	Longline			
Species	Troll	line	Surface	Bottom	Total	Troll	line	Surface	Bottom	Total	Troll	line	Surface	Bottom	Total	Totals
July 1988 - June 1989																
Scomberomorus cavalla	192,877	-	-	-	192,877	35,016	-	-	-	35,016	114,625	50	-	-	114,675	342,568
Coryphaena hippurus	15,496	-	234	-	15,730	5,222	108	-	-	5,330	7,715	27	730	-	8,473	29,533
Pomatomus saltatrix	1,114	-	-	-	1,144	21,539	-	-	-	21,539	9,550	194	-	5	9,749	32,432
Acanthocybium solanderi	1,374	-	25	-	1,399	3.222	-	-	-	3,222	1,450	-	178	67	1,695	6,316
Rachycentron canadum	508	-	-	-	508	639	852	-	-	1,491	1,671	133	-	162	1,966	3,965
Thunnus albacares	85,109	-	4,019	-	89,128	-	-	-	-	-	2,376	-	1,048	40	3,464	92,592
T. atlanticus	543	-	18	-	561	-	-	-	-	-	737	-	7	-	744	1,305
T. obesus	6,256	-	1,916	-	8,172	-	-	-	-	-	9	-	-	-	9	8,181
Thunnus spp.	21	-	-	-	21	11,283	-	-	-	11,283	357	14	-	-	371	11,675
Total					309,540					77,881					141,146	528,567
July 1989 - June 1990																
Scomberomorus cavalla	321,717	-	-	-	321,717	42,862	-	-	-	42,862	62,077	-	-	-	62,077	426,656
Coryphaena hippurus	23,578	-	447	-	24,025	6,941	-	-	-	6,941	13,210	-	4,046	337	17,593	48,559
Pomatomus saltatrix	6,379	-	-	-	6,379	2,470	1,570	-	-	4,040	5,138	-	-	268	5,406	15,825
Acanthocybium solanderi	-	-	-	-	-	2,328	48	-	-	2,376	2,639	-	-	-	2,639	5,015
Rachycentron canadum	241	-	-	-	241	995	1,866	-	-	2,861	2,248	148	-	1,525	3,921	7,023
Thunnus albacares	236,352	-	8,122	-	244,474	-	-	-	-	-	3,182	-	11,428	-	14,610	259,084
T. atlanticus	-	487	-	-	487	-	-	-	-	-	846	-	28	-	875	1,362
T. obesus	12,372	-	501	-	12,873	601	-	-	-	601	43	-	-	-	43	13,517
Thunnus spp.	-	-	375	-	375	9,269	501	-	-	9,770	4,766	-	-	-	4,766	14,911
Total					610,571					69,451					111,930	791,952
July 1990 - June 1991																
Scomberomorus cavalla	319,430	18	-	-	319,448	45,431	879	-	-	46,310	116,396	-	-	5	116,401	482,159
Coryphaena hippurus	25,517	1,246	3,143	-	29,906	13,901	1,766	1,905	-	17,572	20,588	-	606	430	21,624	69,102
Pomatomus saltatrix	7,794	4	-	-	7,798	12,293	21	-	-	12,314	6,111	-	-	30	6,141	26,253
Acanthocybium solanderi	1,120	-	131	-	1,251	2,761	74	91	-	2,926	3,256	-	227	36	3,519	7,696
Rachycentron canadum	30	29	-	-	59	2,851	1,112	-	-	3,963	2,029	-	78	1,501	3,608	7,630
Thunnus albacares	168,855	-	9,200	-	178,055	-	-	-	-	-	1,305	-	3,426	-	4,731	182,786
T. atlanticus	2,394	-	48	-	2,442	-	-	-	-	-	601	-	69	-	670	3,112
T. obesus	1,413	-	4,189	-	5,602	59	105	-	-	164	-	-	770	-	770	6,536
Thunnus spp.	-	-	-	-	-	16,698	31	590	-	17,319	842	-	-	-	842	18,161
Totals					544,561					100,568					158,306	803,435

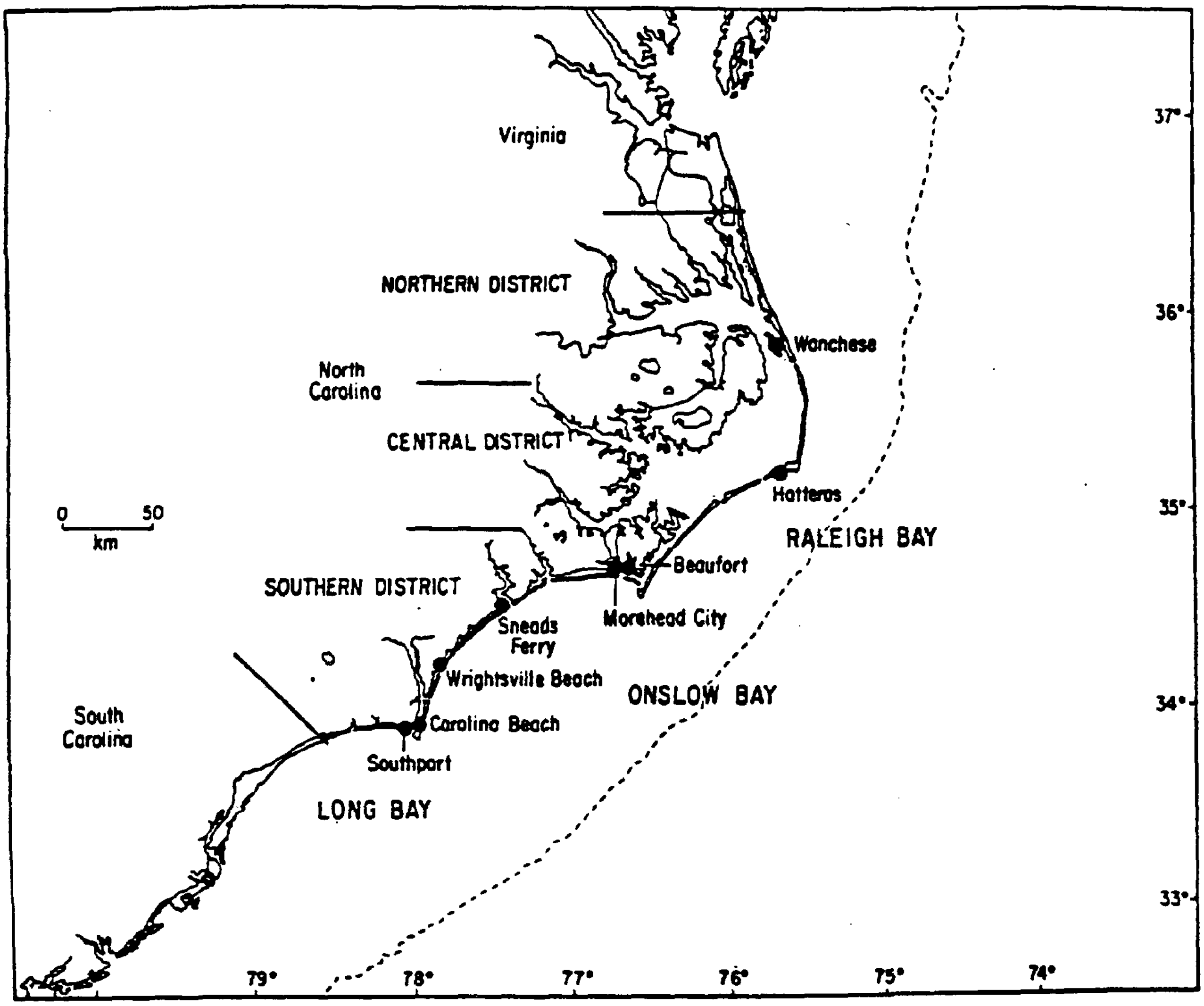

Figure 1. North Carolina ports handling reef fish landings.

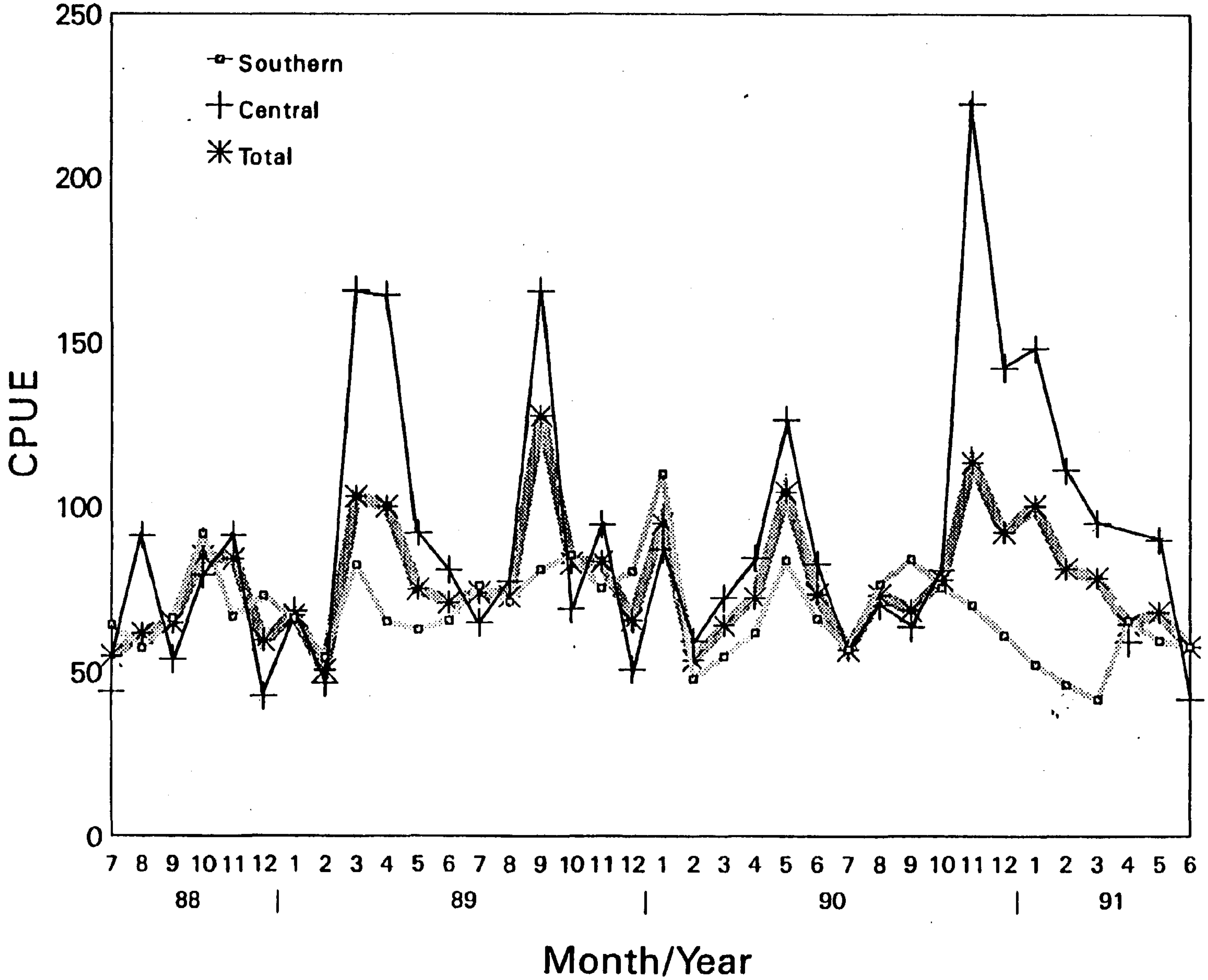

Figure 2. Monthly mean CPUE, by district and total, of handline vessels in the reef fish fishery, July 1988-June 1991.

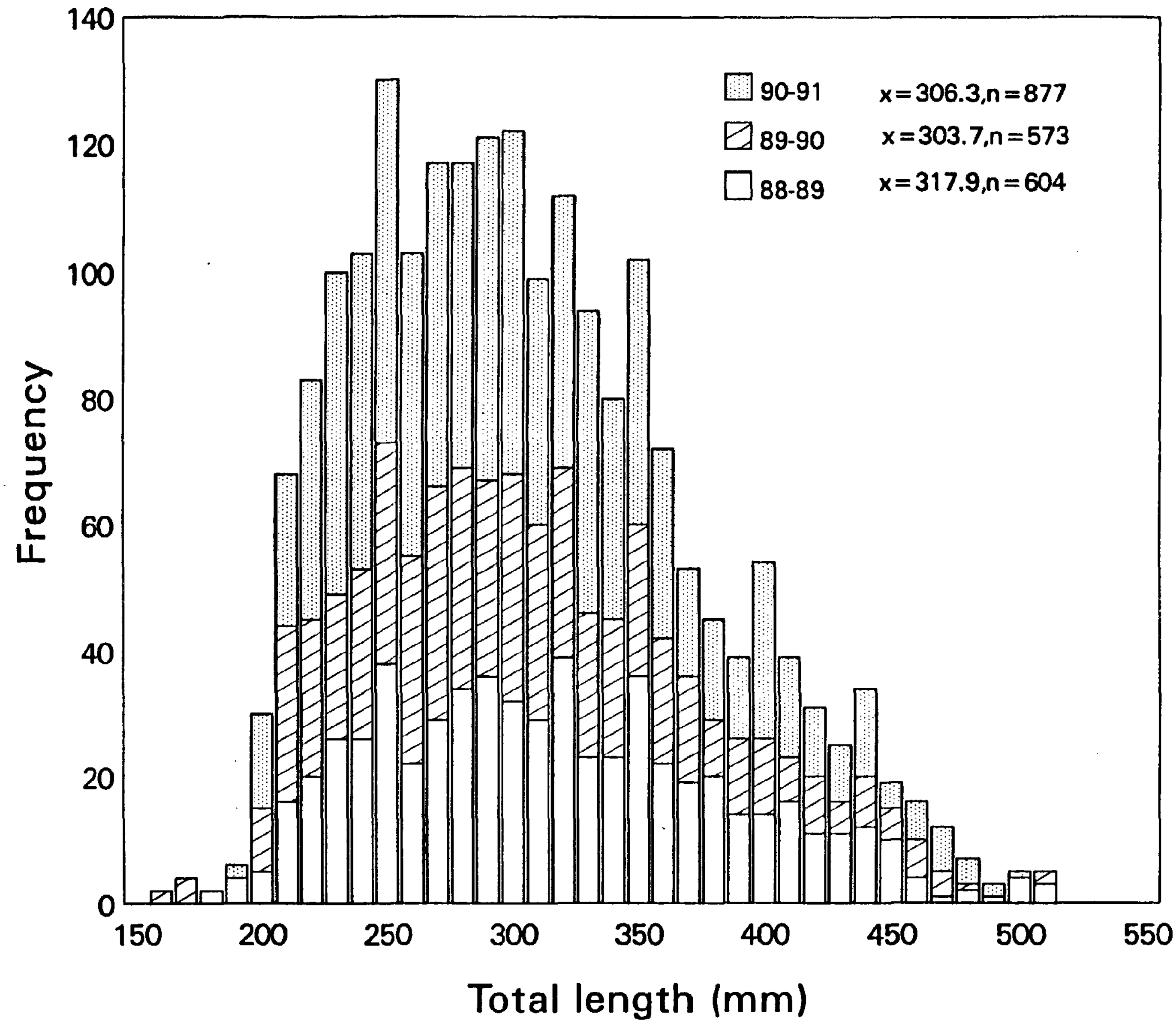

Figure 3. Length-frequency, mean size, and number measured for black seabass (<u>Centropristis striata</u>) in North Carolina, July 1988-June 1991.

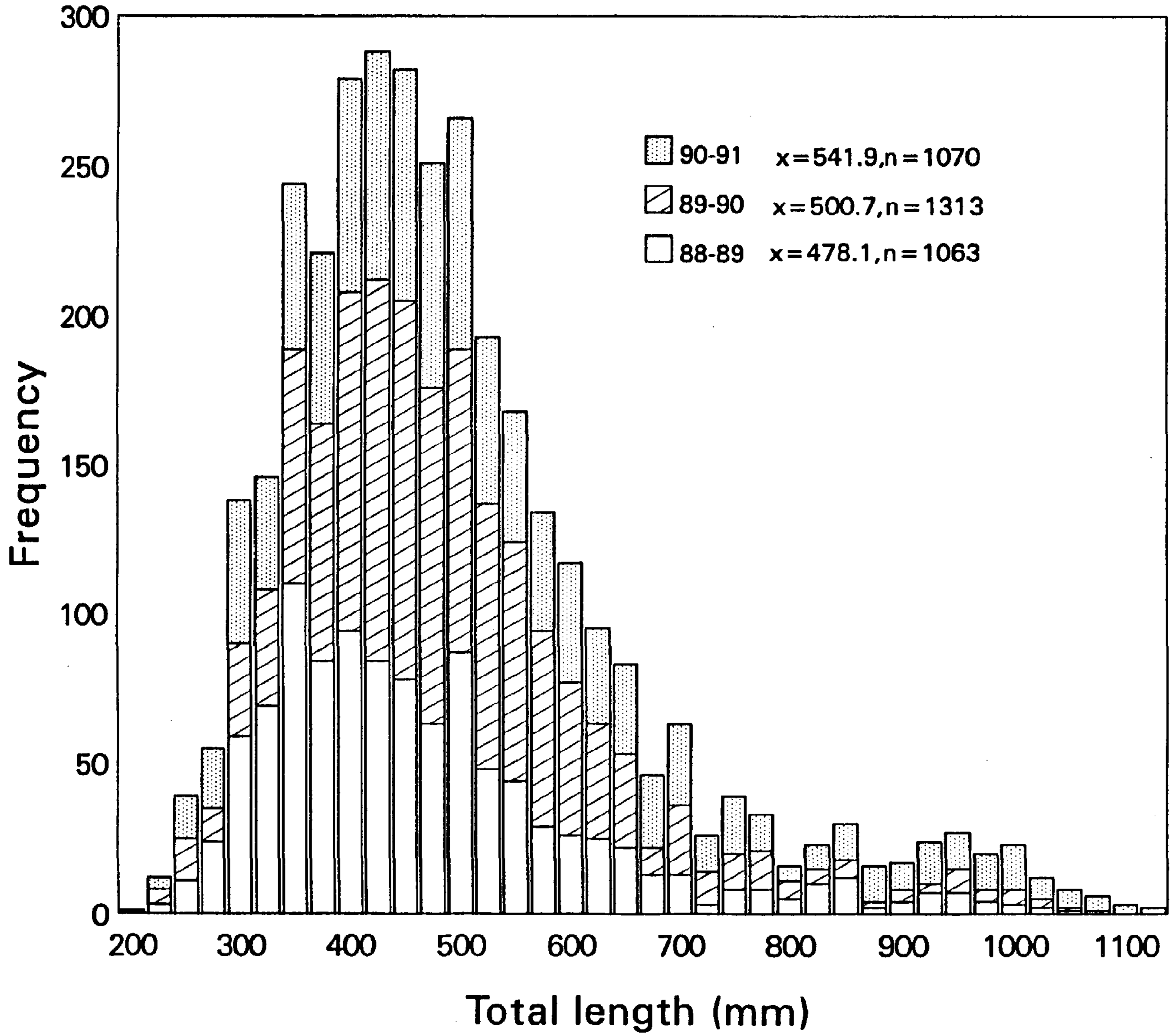

Figure 4. Length-frequency, mean size, and number measured for snowy grouper (<u>Epinephelus</u> <u>niveatus</u>) in North Carolina, July 1988-June 1991.

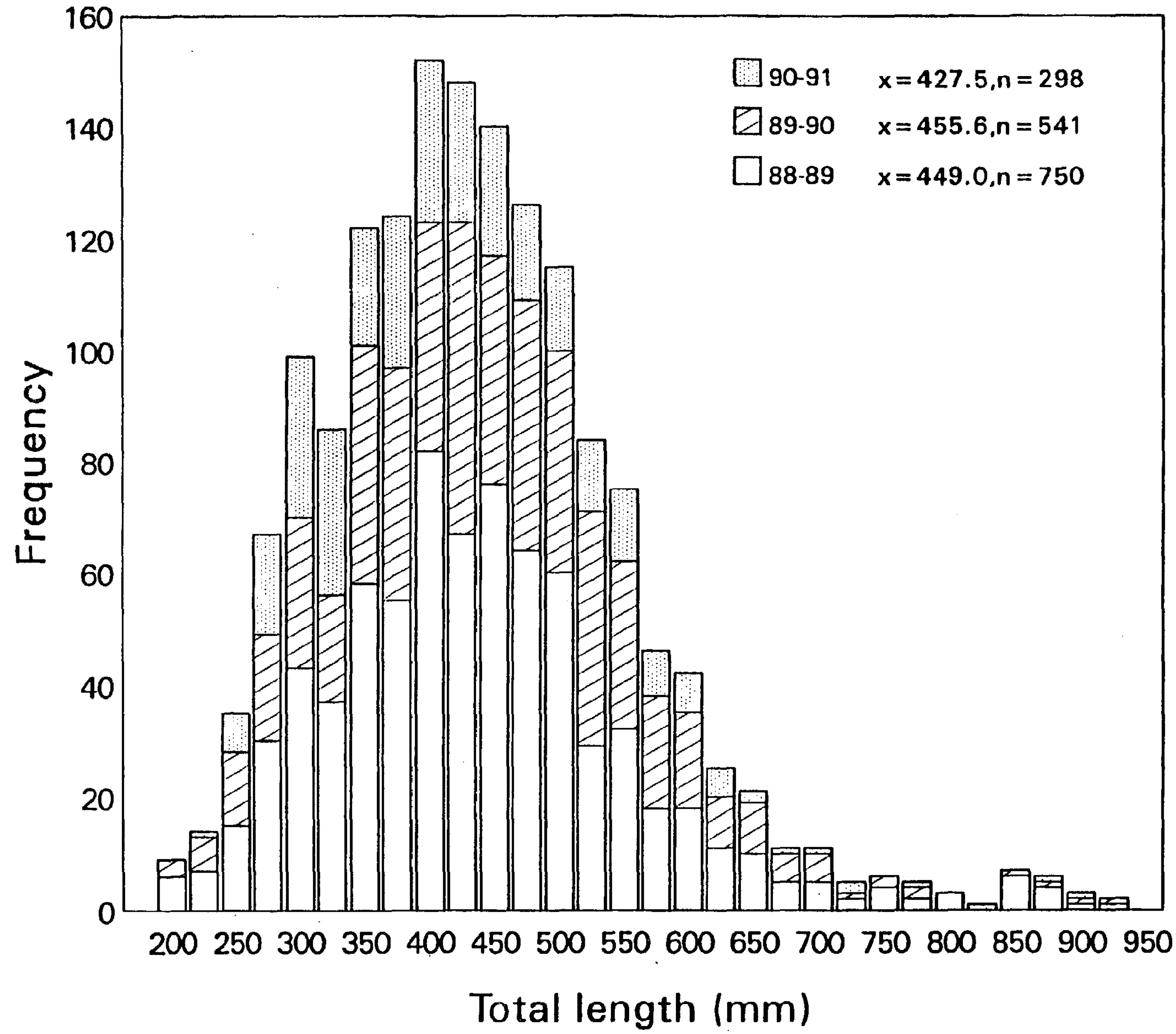

Figure 5. Length-frequency, mean size, and number measured for speckled hind (Epinephelus drymmondhayi) in North Carolina, July 1988-June 1991.

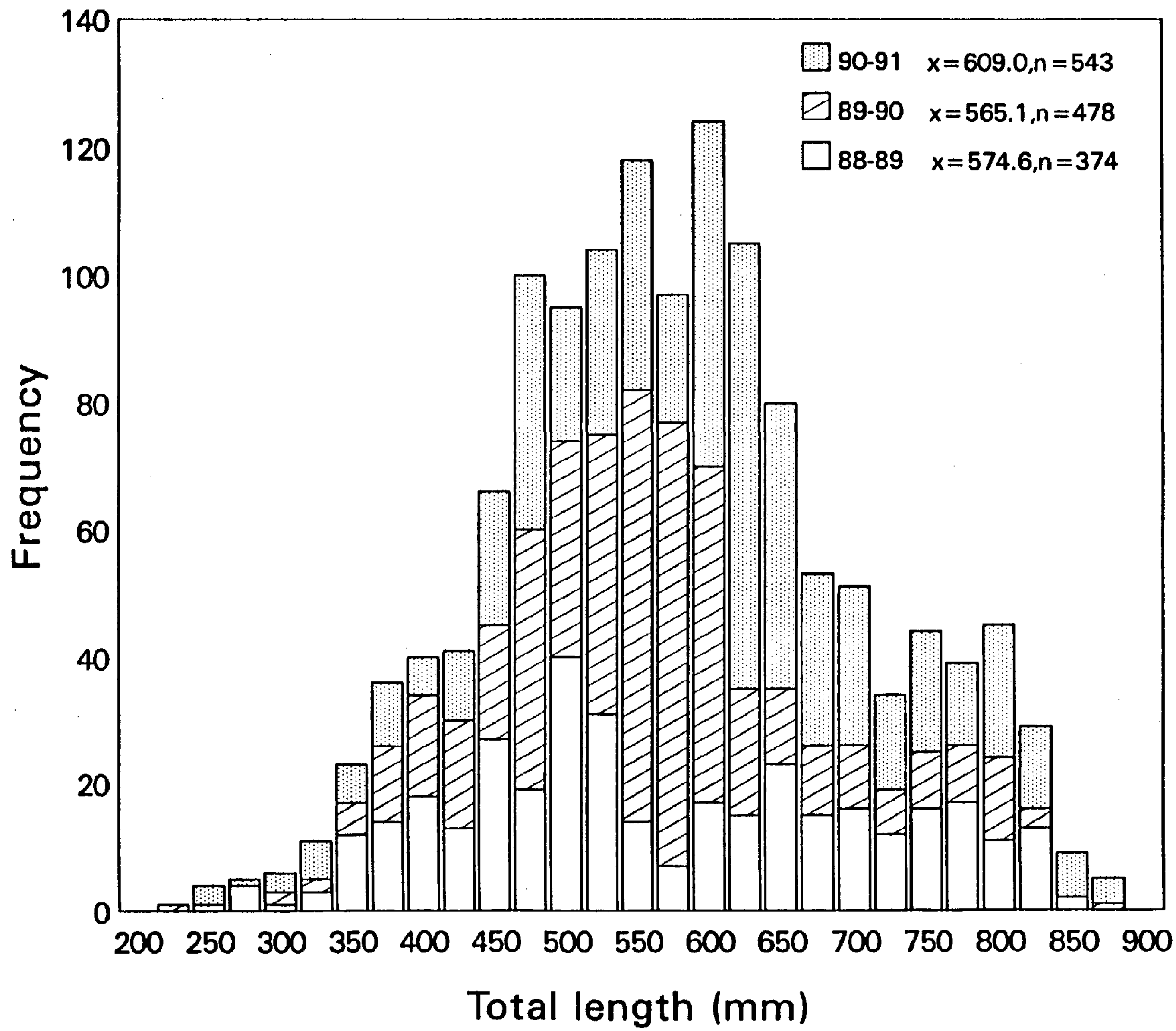

Figure 6. Length-frequency, mean size, and number measured for red grouper (*Epinephelus morio*) in North Carolina, July 1988-June 1991.

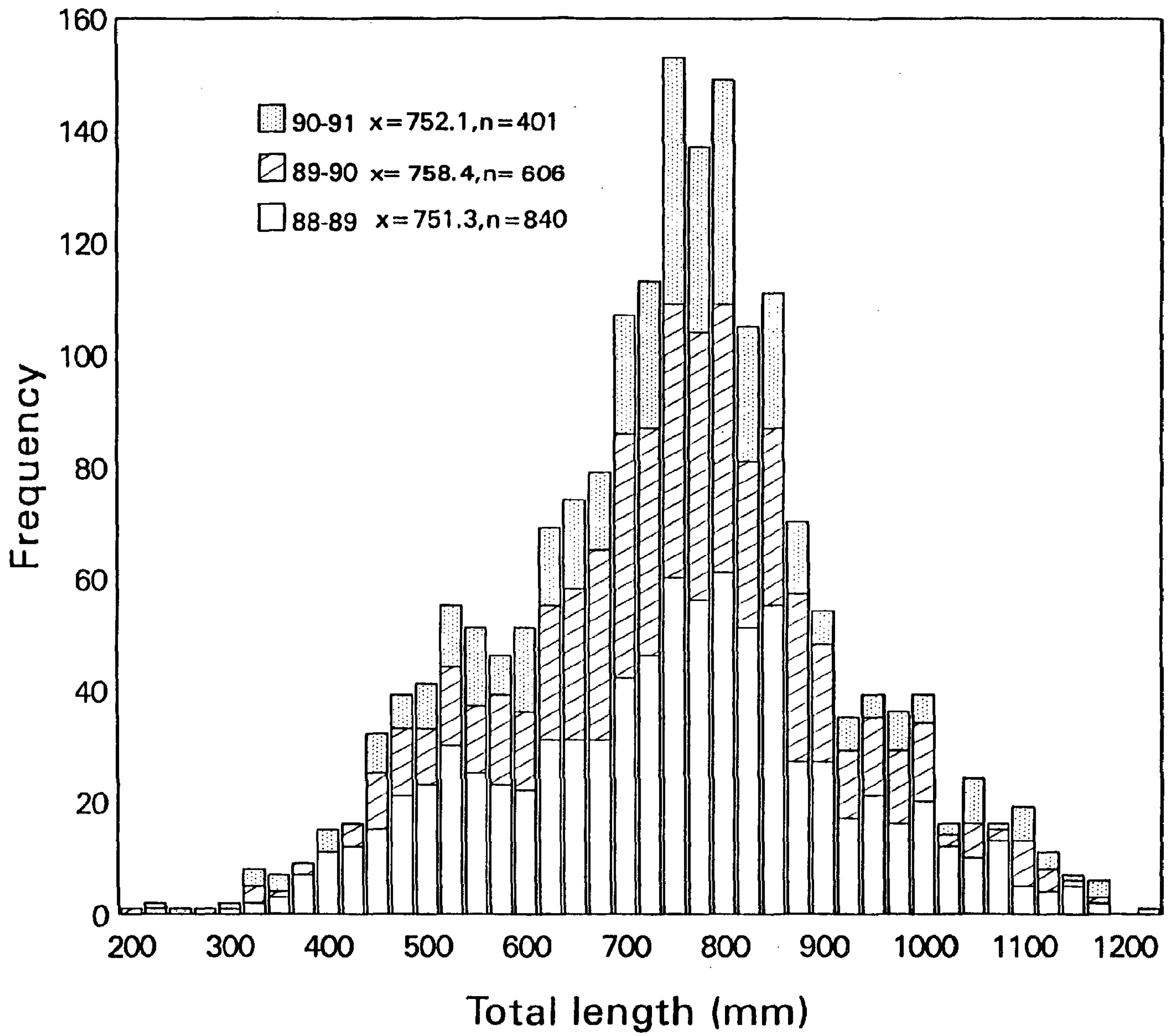

Figure 7. Length-frequency, mean size, and number measured for gag (<u>Mycteroperca microlepis</u>) in North Carolina, July 1988-June 1991.

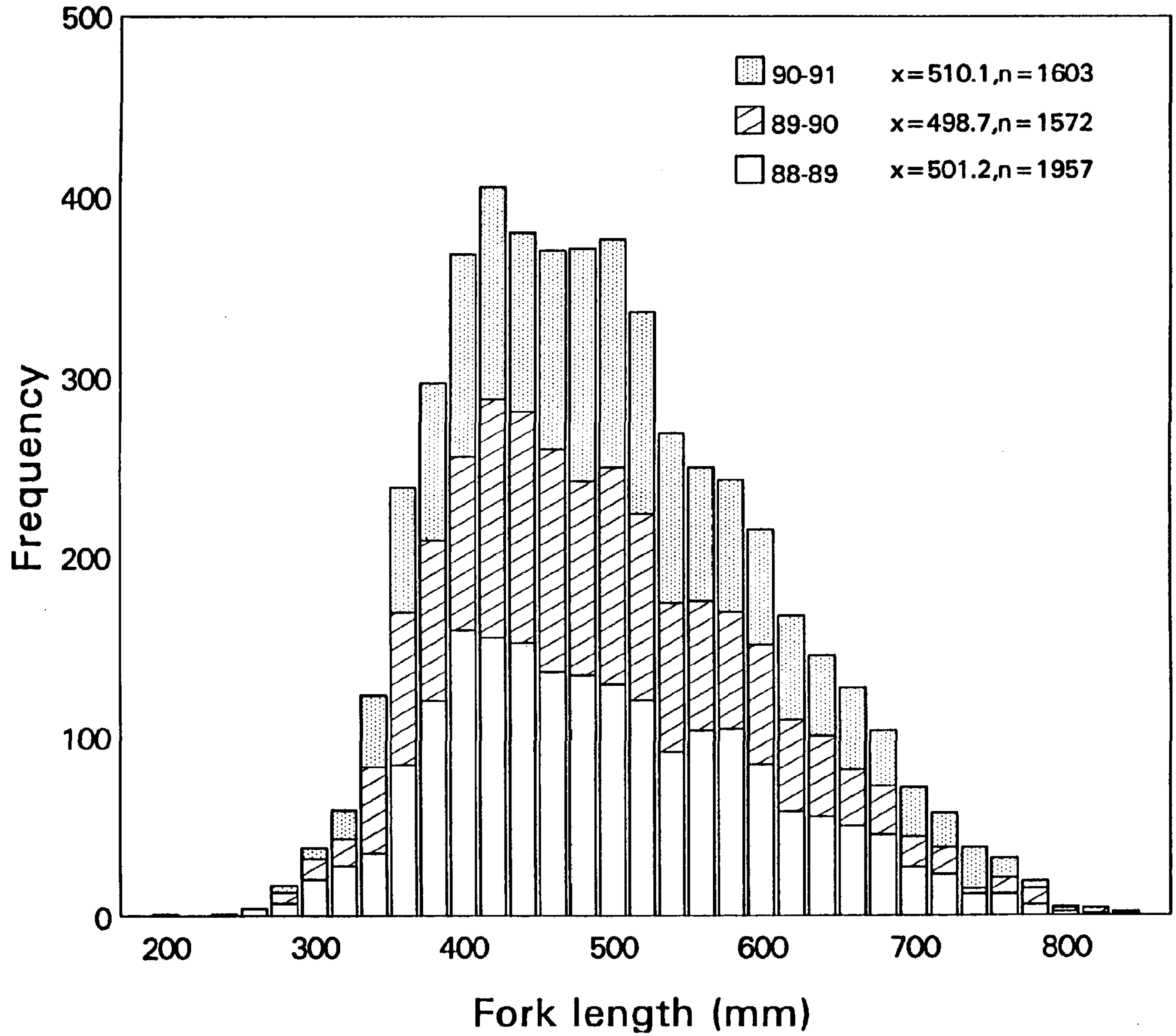

Figure 8. Length-frequency, mean size, and number measured for scamp (<u>Mycteroperca phenax</u>) in North Carolina, July 1988-June 1991.

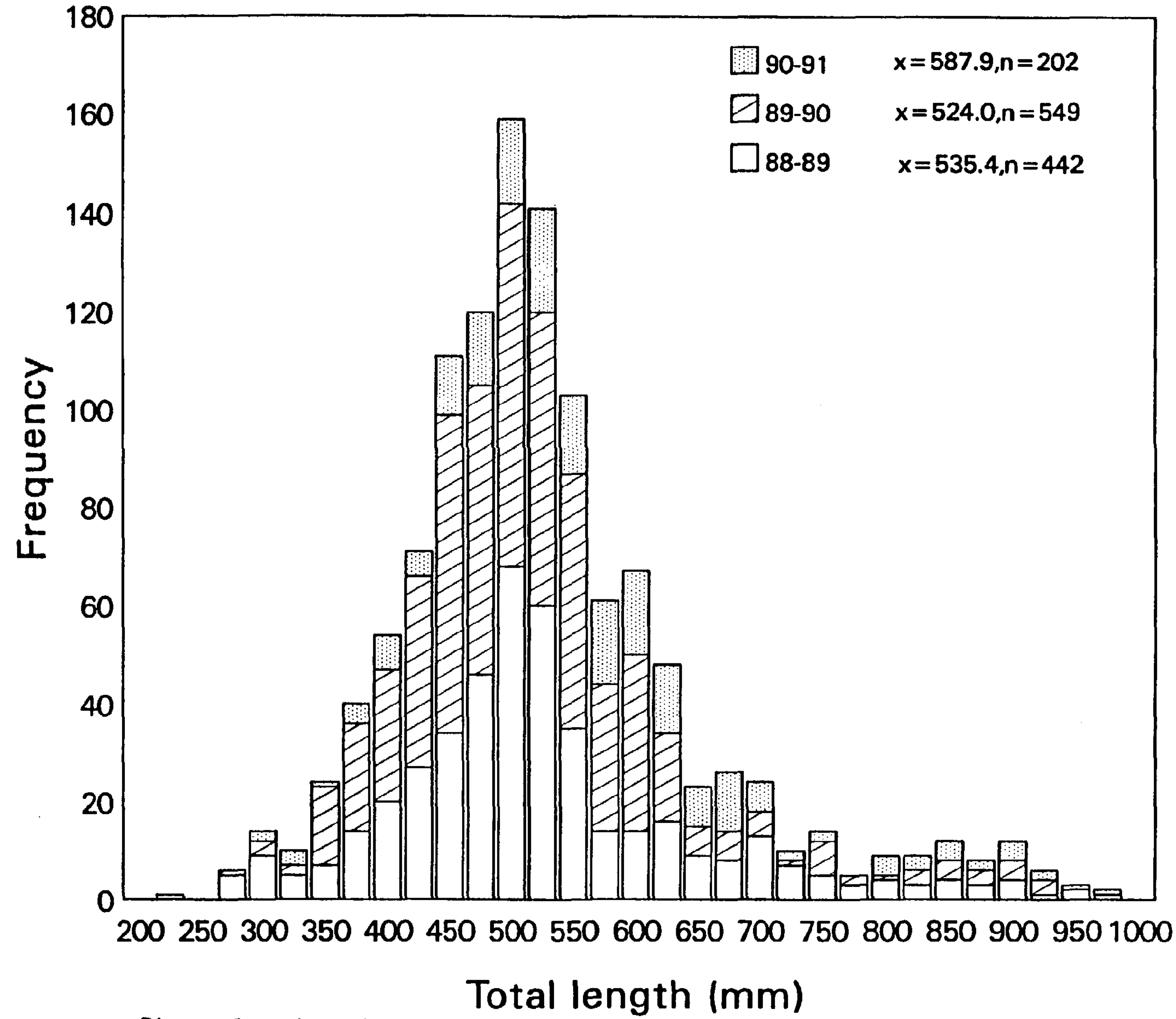

Figure 9. Length-frequency, mean size, and number measured for red snapper (<u>Lutjanus campechanus</u>) in North Carolina, July 1988-June 1991.

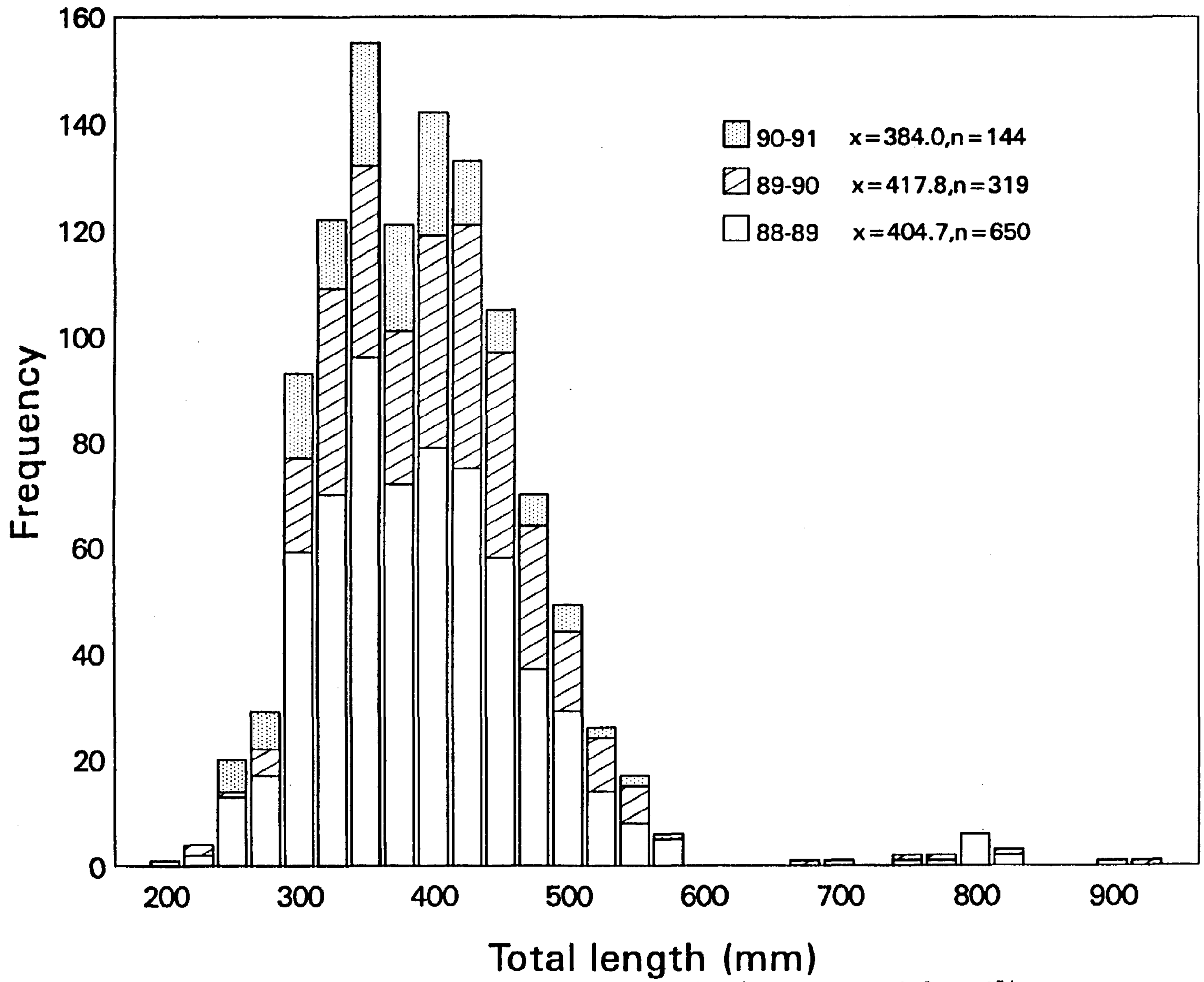

Figure 10. Length-frequency, mean size, and number measured for silk snapper (_Lutjanus vivanus_) in North Carolina, July 1988-June 1991.

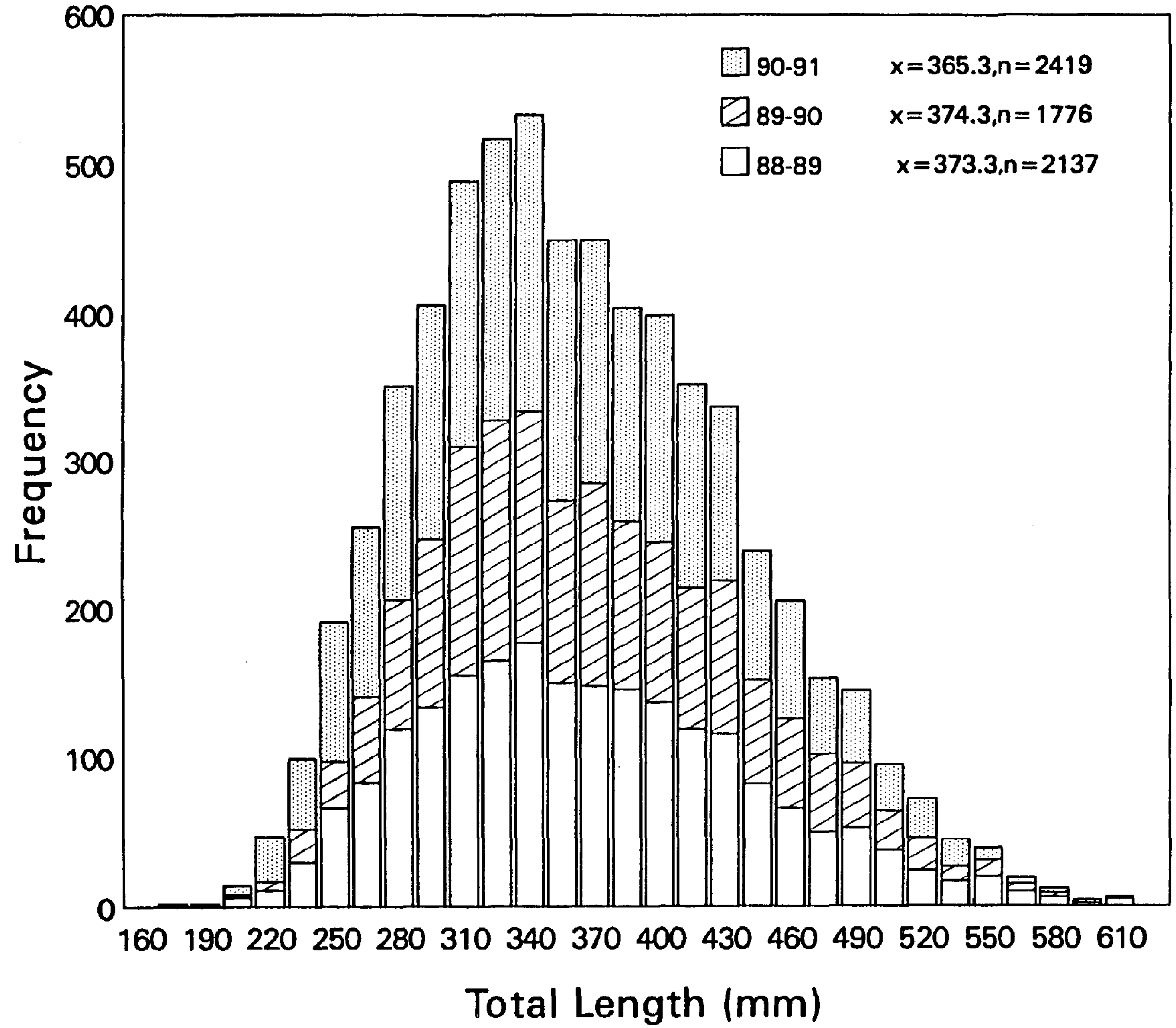

Figure 11. Length-frequency, mean size, and number measured for vermilion snapper (Rhomboplites aurorubens) in North Carolina, July 1988-June 1991.

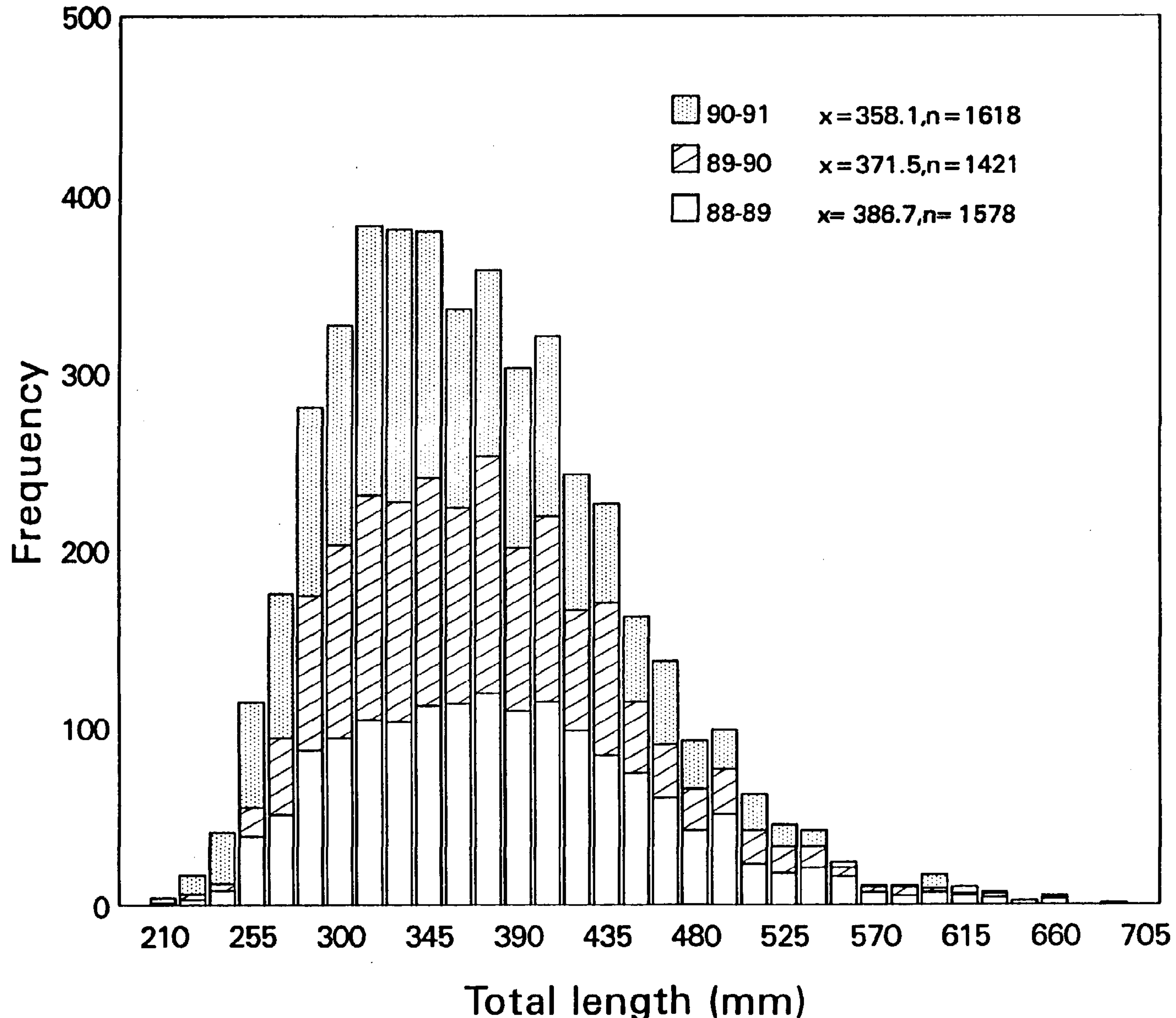

Figure 12. Length-frequency, mean size, and number measured for red porgy (<u>Pagrus pagrus</u>) in North Carolina, July 1988-June 1991.

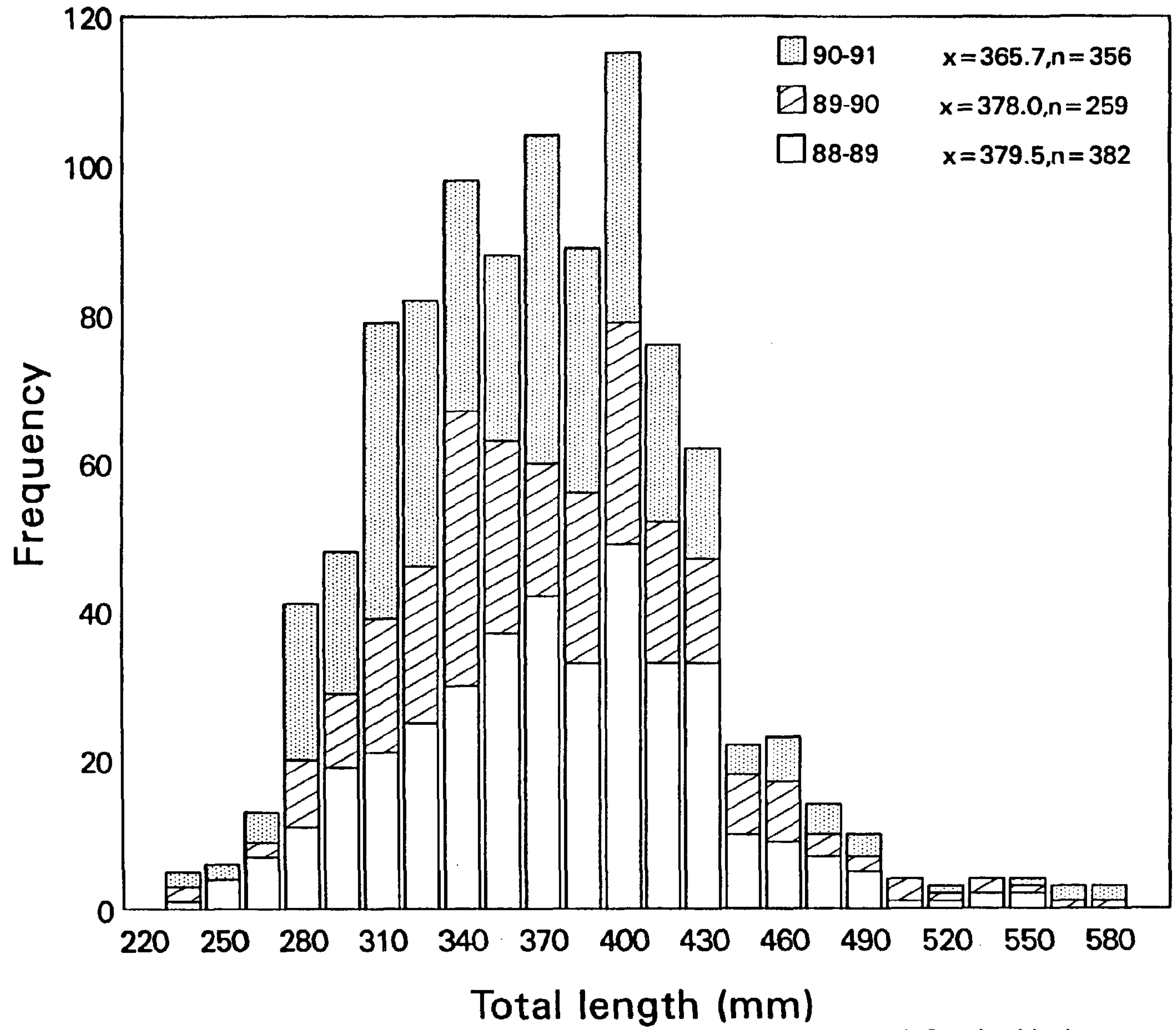

Figure 13. Length-frequency, mean size, and number measured for knobbed porgy (Calamus nodosus) in North Carolina, July 1988-June 1991.

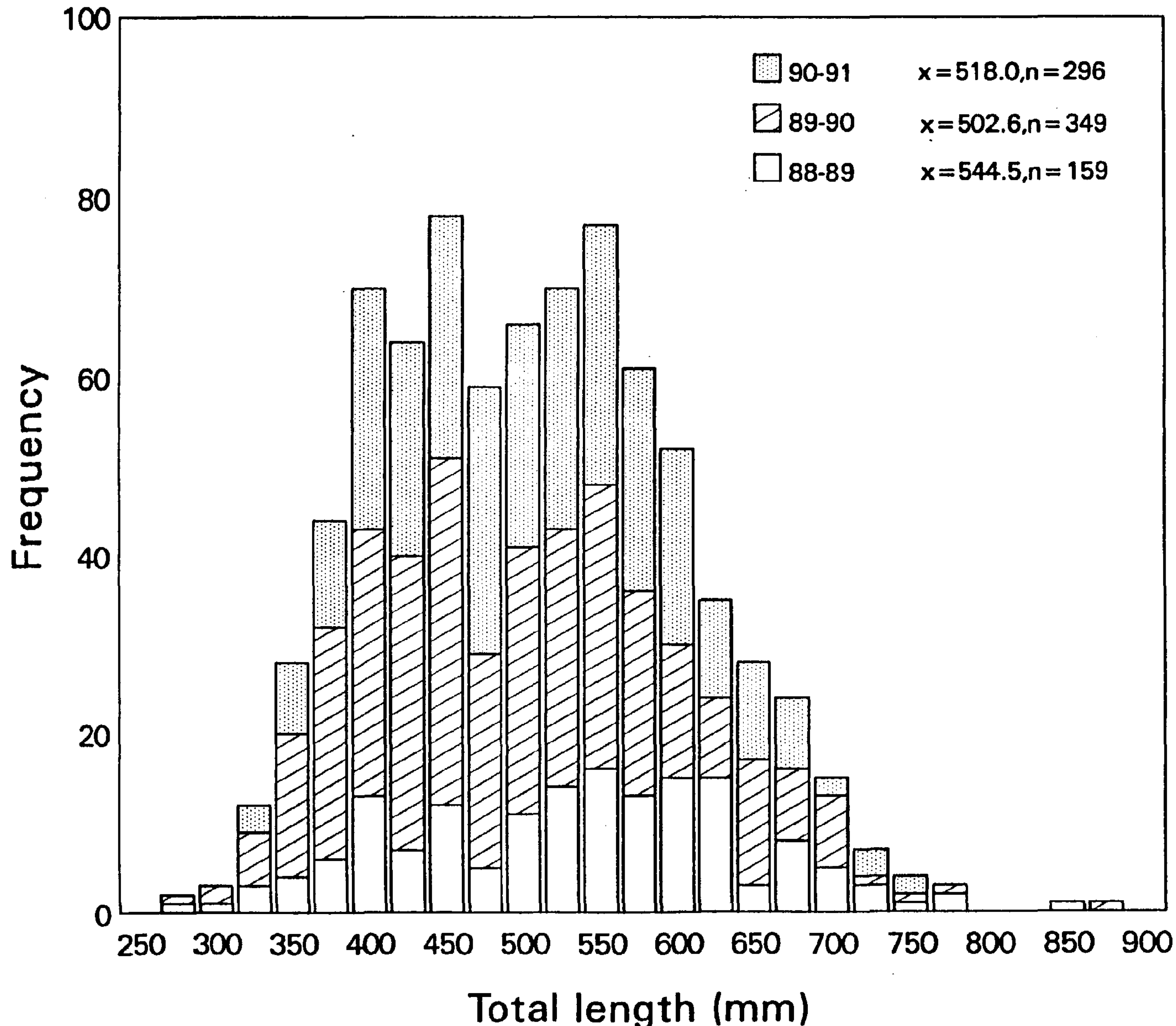

Figure 14. Length-frequency, mean size, and number measured for blueline tilefish (Caulolatilus microps) in North Carolina, July 1988-June 1991.

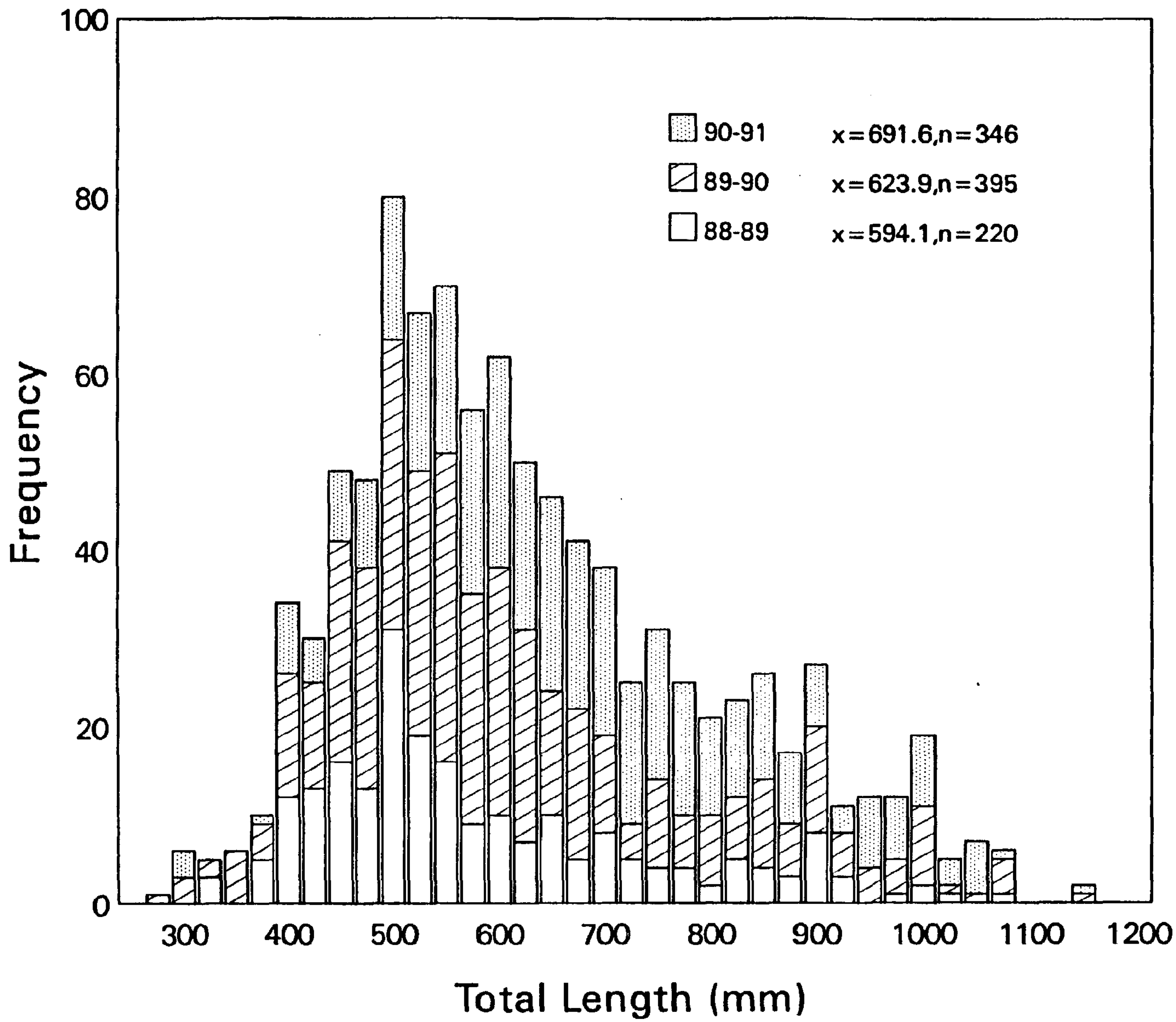

Figure 15. Length-frequency, mean size, and number measured for tilefish (<u>Lopholatilus</u> <u>chamaeleonticeps</u>) in North Carolina, July 1988-June 1991.

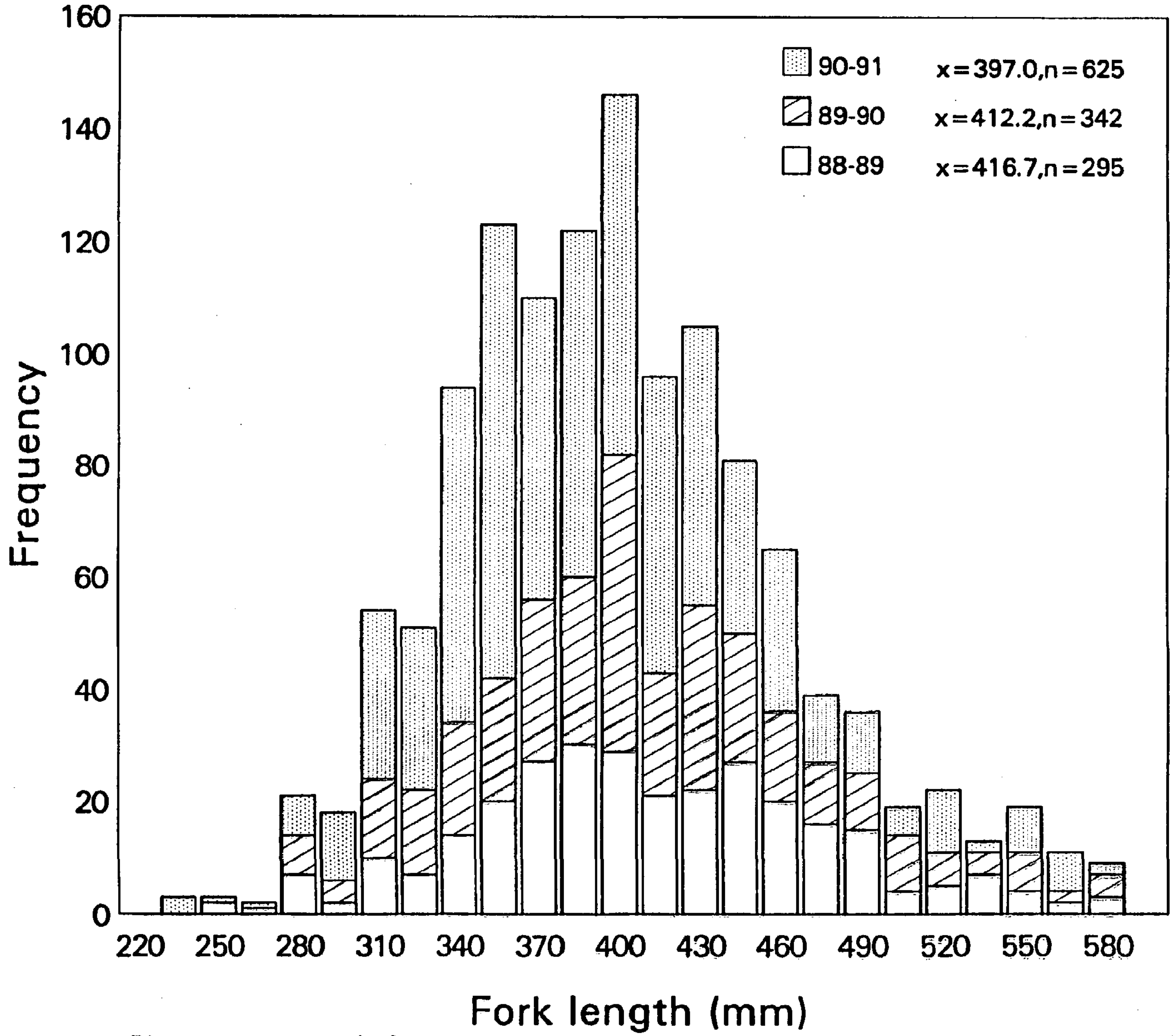

Figure 16. Length-frequency, mean size, and number measured for gray triggerfish, (*Balistes capriscus*) in North Carolina, July 1988-June 1991.

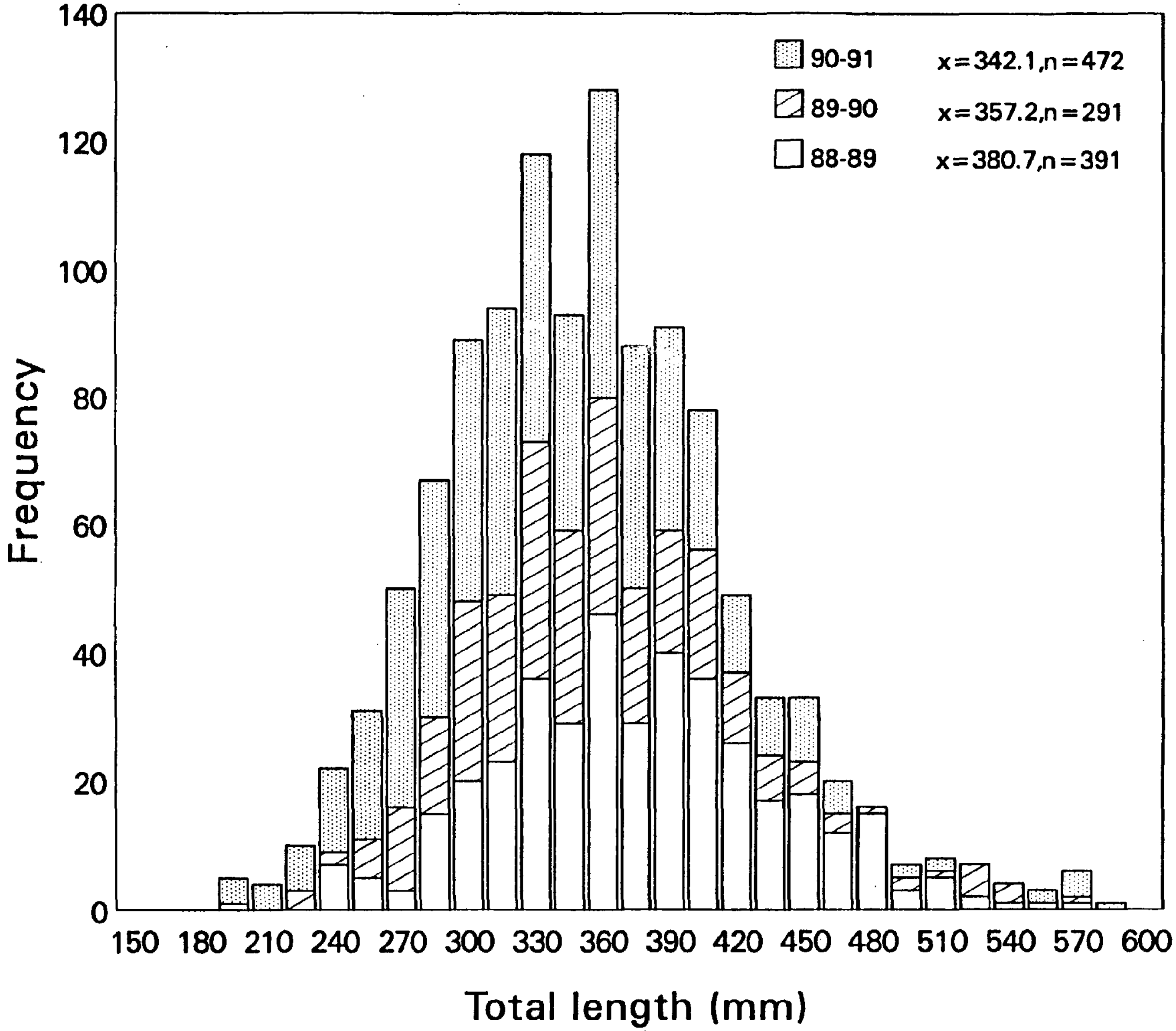

Figure 17. Length-frequency, mean size, and number measured for white grunt (Haemulon plumieri) in North Carolina, July 1988-June 1991.

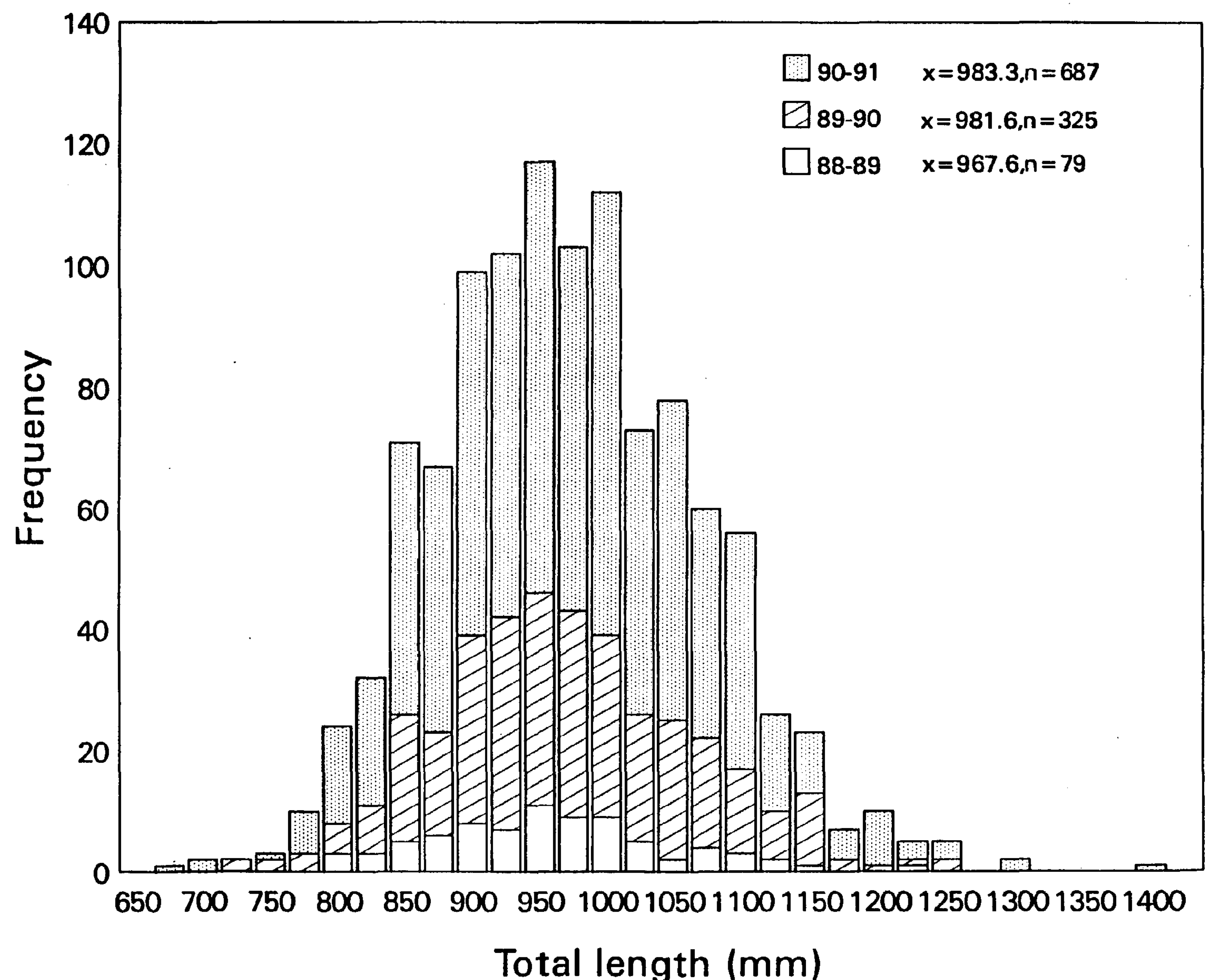

Figure 18. Length-frequency, mean size, and number measured for wreckfish (_Polyprion americanus_) in North Carolina, July 1988-June 1991.

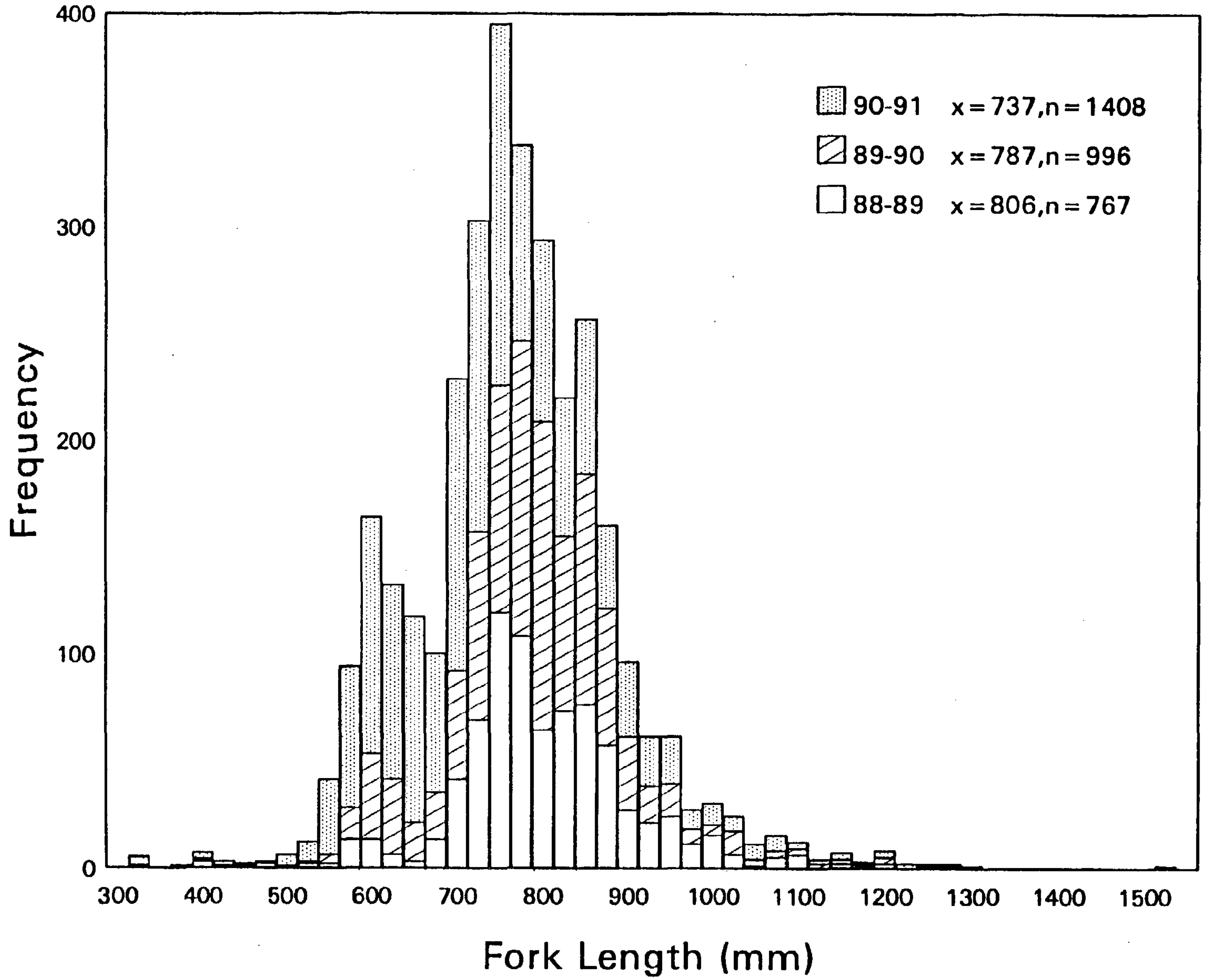

Figure 19. Length-frequency of king mackerel (Scomberomorus cavalla) sampled from the reef fish and coastal pelagic fisheries, July 1988-June 1991.

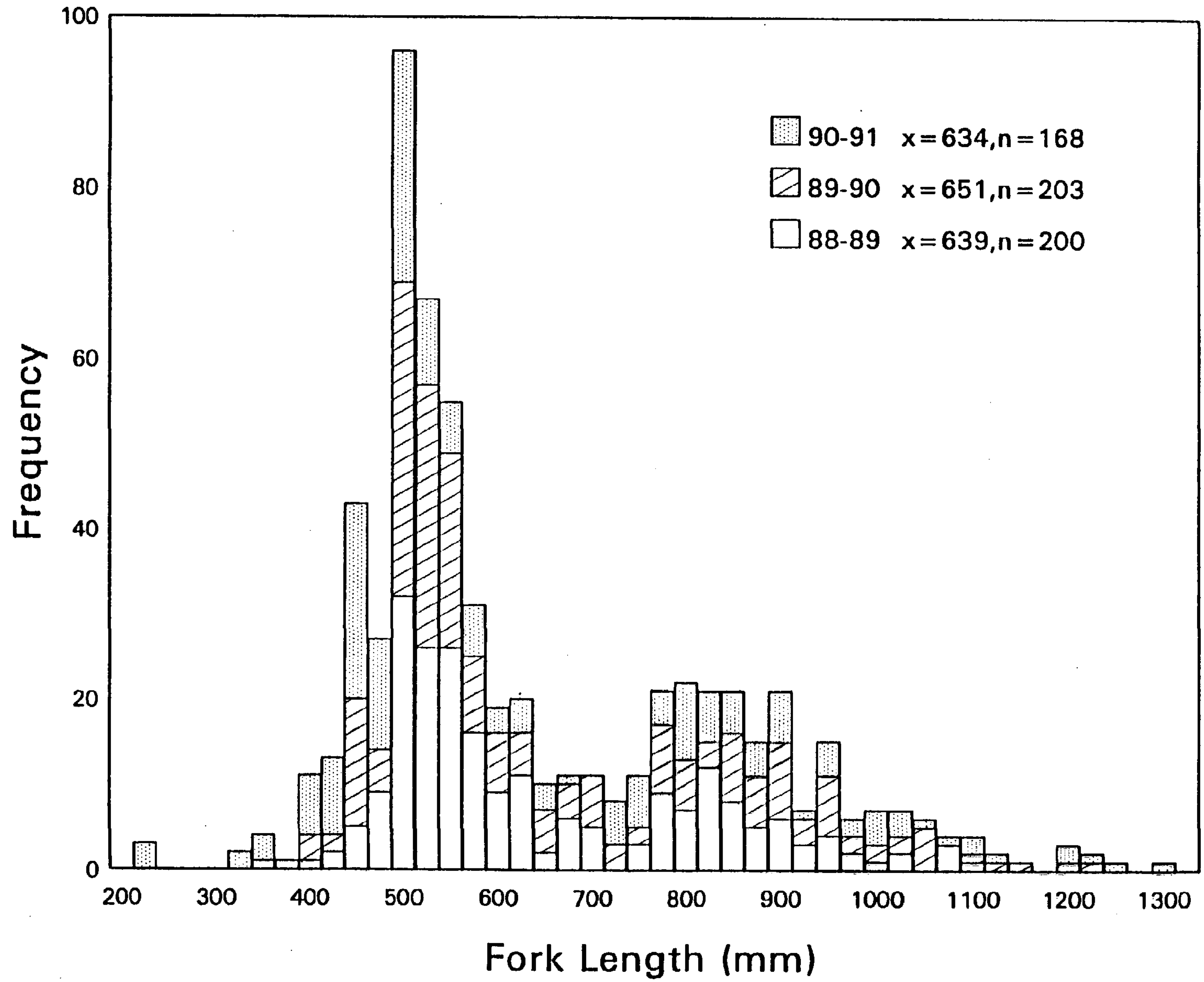

Figure 20. Length-frequency of dolphin (Coryphaena hippurus) sampled from the reef fish and coastal pelagic fisheries, July 1988-June 1991.

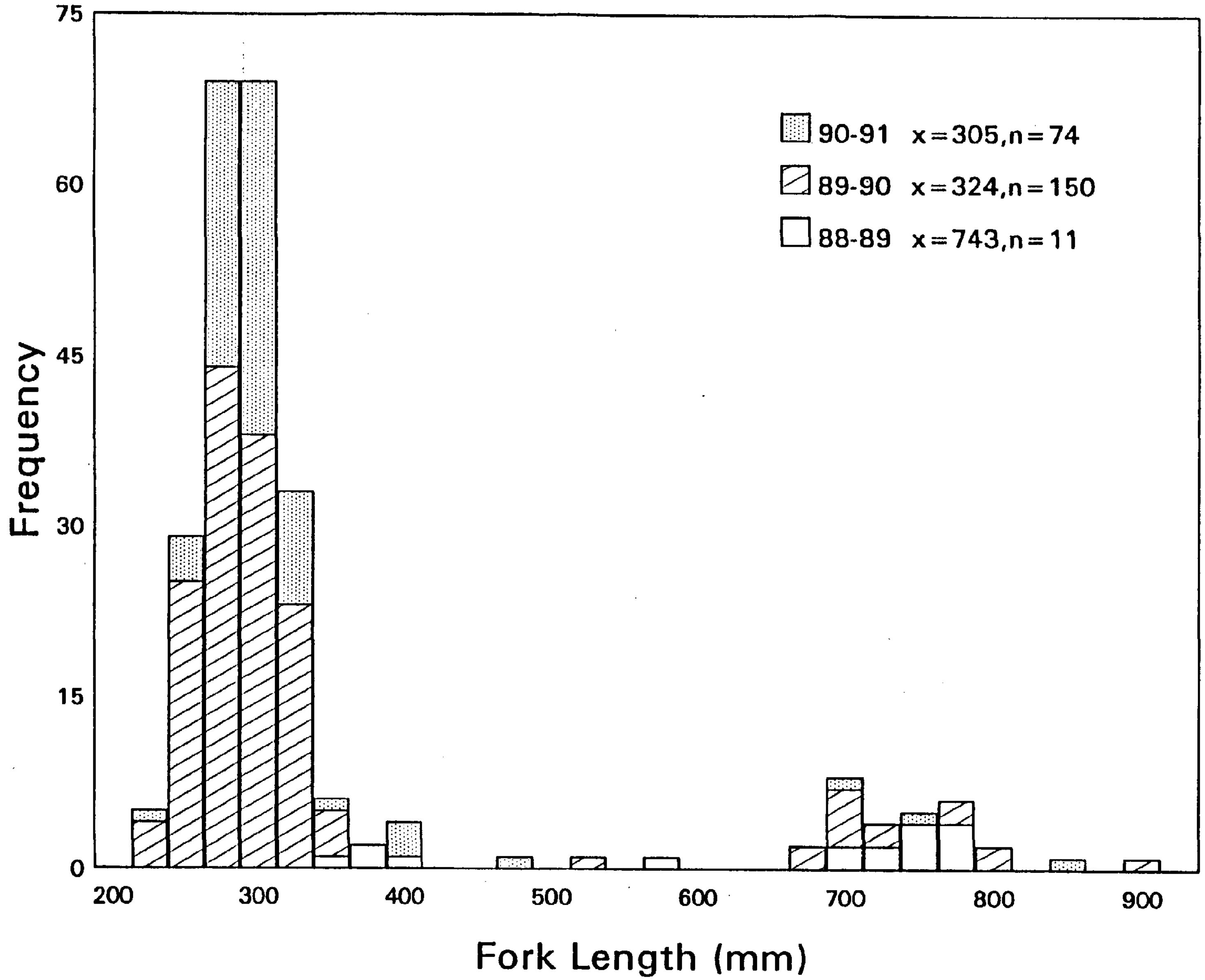

Figure 21. Length-frequency of bluefish (Pomatomus saltatrix) sampled from the reef fish and coastal pelagic fisheries, July 1988-June 1991.

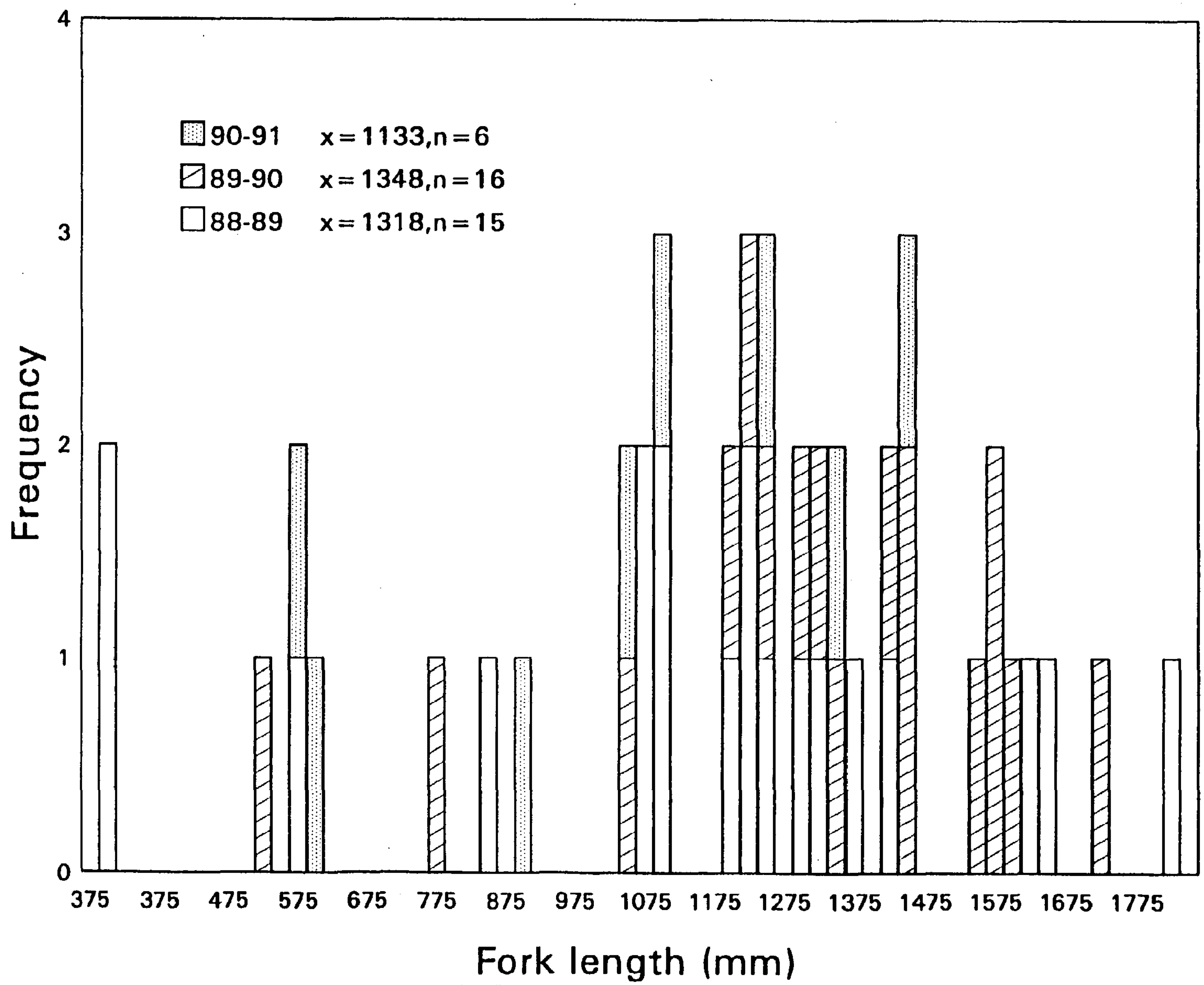

Figure 22. Length-frequency of wahoo (<u>Acanthocybium</u> <u>solanderi</u>) sampled from the reef fish and coastal pelagic fisheries, July 1988-June 1991.

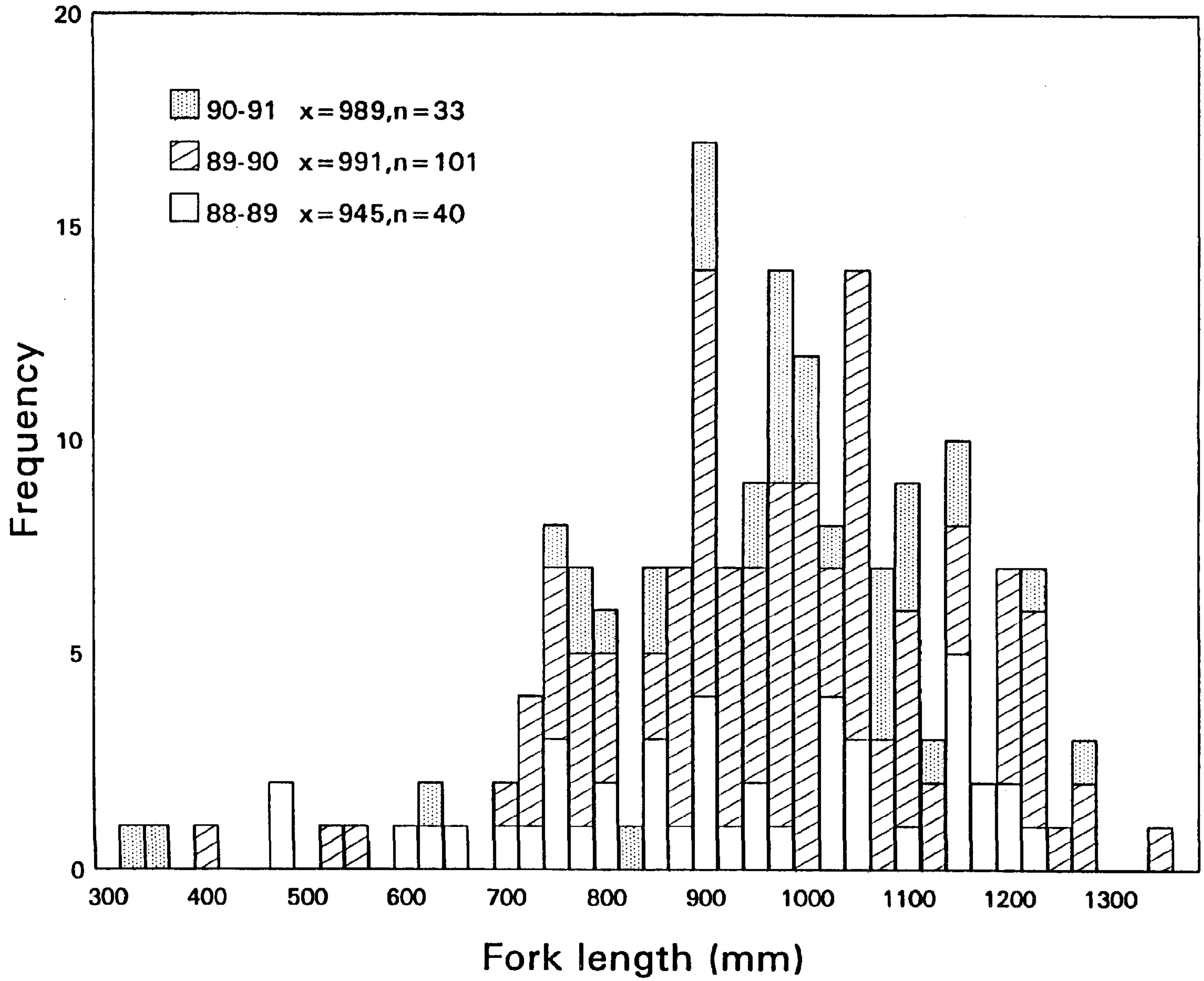

Figure 23. Length-frequency of cobia (Rachycentron canadum) sampled from the reef fish and coastal pelagic fisheries, July 1988-June 1991.

ASSESSMENT OF NORTH CAROLINA COMMERCIAL FINFISHERIES

Completion Report for Project 2-IJ-16

May 1992

JOB 6

FLOUNDER POUND NET

FISHERY ASSESSMENT

By

James P. Monaghan, Jr.

ABSTRACT

The North Carolina flounder pound net fishery was sampled in 1989 and 1990. Southern flounder (*Paralichthys lethostigma*) dominated the catches both years, representing 88% (1989) and 81% (1990) of the catch by weight. Summer flounder (*P. dentatus*) represented less than 1% of the sampled catches in 1989, but rose to 5% in 1990. Other frequently occurring species were Gulf flounder (*P. albigutta*), harvestfish (*Peprilus alepidotus*), butterfish (*P. triacanthus*), red drum (*Sciaenops ocellatus*), Atlantic menhaden (*Brevoortia tyrannus*), and striped mullet (*Mugil cephalus*). The population of southern flounder sustaining this fishery is probably stable considering that landings are primarily comprised of three age classes (2, 3, and 4) and that this species is a maximum age of 6 or 7 years old.

TABLE OF CONTENTS

INTRODUCTION

The North Carolina flounder pound net fishery targets on paralichthine flounders during their fall emigration from sounds and rivers. This fishery is very effective, landing 1.7 million pounds in 1989 and 1.4 million pounds in 1990 (NC DMF unpublished data). The pound net fishery is also very efficient in that only marketable fishes are killed and the unwanted bycatch is returned alive to the water.

The pound net fishery for flounder takes place in shallow waters (<2m) along the mainland and barrier island shorelines of sounds from Roanoke Island, in the north, south to Back Sound, near Cape Lookout (Figure 1). A detailed description of the fishery is provided by Wolff (1977) and DeVries (1981). Anecdotal information indicates the number of flounder pound nets increased dramatically during the 1980's. An aerial survey in 1990 yielded an estimated 704 flounder pounds in North Carolina.

The North Carolina Division of Marine Fisheries (DMF) resumed sampling of the flounder pound net fishery in 1989. The Core Sound component of this fishery was sampled between 1979 and 1982 and was reported on by DeVries (1981). This report presents statewide coverage of the fishery and includes information on species composition, relative abundance, age and size distribution and sampling effort for the 1989 and 1990 fishing seasons.

METHODS AND MATERIALS

Flounder pound net catches were sampled at fish houses during September through November (generally four or more samples/month). Since most flounder pound net catches were culled at the fishing site, most samples taken were random stratified (graded) samples. For each species, as many random samples (22.7 kg) as possible were obtained from each size category (large, medium, small, etc.), with more samples for larger fish. Additional species were noted. Each sample was weighed to the nearest 0.1 kg, all individuals measured (TL or FL; mm) and the total number recorded. If the individuals in a fish box were too numerous to measure, at least 30 were measured, and the remainder counted.

Some unculled samples were taken. An unculled sample consisted of at least one (though usually more) random, unculled fish basket sample (22.7 kg) per pound net catch. All fishes in the sample were identified and measured (fork length, FL or total length, TL; mm). Total weights for the sample, as well as individual species component weight, were taken. The total weight of each size category/species was obtained from the trip tickets.

Total length frequencies for each catch were derived by expanding the sample length frequencies for each market category (grade) by a raising factor to represent the species market grade weight. Species market grade weight was obtained from trip tickets and species length frequencies were a combination of those expanded for the respective species market grades. Species numerical abundance/catch was calculated similarly by determining the number of individuals/market grade and then merging all market grades/species.

Sagittal otoliths were collected monthly from southern flounder (Paralichthys lethostigma) representing all sizes available in this fishery. Otoliths were removed, cleaned, and stored in 70% ethanol. They were read from an image on a high resolution RGB monitor. The monitor was coupled with a chip video camera mounted in a stereo microscope set at 23.7X magnification. The otolith radius and distance to the annular mark were measured from whole sagittal otoliths as described by Wenner et al. (1990). These distances were calculated by a sonic digitizer coupled to a personal computer. The system was calibrated with an ocular micrometer before each reading session. Age-length keys were developed for southern flounder and age composition was calculated by resolving expanded length to age.

Fishing locations were partitioned into three areas: 1) Carteret, including Core Sound, Back Sound, and southeastern Pamlico Sound, 2) Ocracoke, including areas behind Cape Hatteras and Ocracoke Island; 3) Roanoke, including the waters around Roanoke Island (Figure 1).

RESULTS AND DISCUSSION

In 1989 twenty-eight catches were sampled. Catch weights averaged 492 kg and ranged from 58 to 1,577 kg, while sample weights ranged from 23 to 140 kg

(Table 1). Sampled catches increased to forty-nine in 1990 with a mean catch weight of 372 kg (range of 71-1,230 kg) and sample weights ranged from 23 to 178 kg. Southern flounder dominated catches in 1989 comprising 88% of the catches sampled in weight and 77% in number (Table 2). Southern flounder, harvestfish (Peprilus alepidotus), Gulf flounder (Paralichthys albigutta), red drum (Sciaenops ocellatus), and butterfish (Peprilus triacanthus) represented over 95% of the sampled weight. Southern flounder also dominated the catches in 1990, representing 81% of the catch by weight and 78% by number (Table 3). Summer flounder (Paralichthys dentatus) represented 5% of the catch in 1990 a tenfold increase from 1989. Southern flounder, summer flounder, red drum, Gulf flounder, Atlantic menhaden (Brevoortia tyrannus), harvestfish, and striped mullet (Mugil cephalus) represented over 95%, by weight, of the catches sampled in 1990.

Southern flounder also dominated the catches by area in both 1989 and 1990 (Tables 4 and 5). The Carteret and Ocracoke areas had similar species composition, although butterfish in the Carteret area were replaced in importance by red drum in the Ocracoke area. The relative increase of summer flounder in 1990 was due to increased occurrence in the Carteret and Ocracoke areas. An increase in the Roanoke area, an oligohaline environment, would not be expected due to the preference of summer flounder for salinities greater than 14‰ (Powell 1974).

Other mesohaline species present in the Ocracoke and Carteret areas were replaced by oligohaline and freshwater species such as gizzard shad (Dorosoma cepedianum), channel catfish (Ictalurus punctatus), and redear sunfish (Lepomis microlophus) in the Roanoke area (Tables 4 and 5). Monthly species composition data are presented in the Appendix.

Although length frequencies are presented for southern, summer and Gulf flounders, harvestfish, butterfish, and red drum, sufficient data were only available to comment on harvestfish (Figure 2) and southern flounder (Figure 3). Harvestfish ranged from 110 to 210 mm FL in 1989 with a similar range in 1990 (Figure 2). However, the distribution in 1989 had a mode between 160-190 mm FL while the dominant mode is 120 mm FL in 1990. These modes may represent dominant year classes passing through the fishery. Southern flounder were relatively evenly distributed across the length classes between 350 mm TL and 450 mm TL in 1989. These fish represent the 2 - 4 year old fish shown in Figure 4. However, in 1990, about 70% of the expanded lengths of southern flounder between 325 and 375 mm TL. This shift towards a smaller mode was probably due to a strong 1988 year class moving through the fishery. Almost 70% of the fish sampled in 1990 were age 2 fish (Figure 4).

Data from the two years of this study clearly show that southern flounder account for the bulk of the landings in the North Carolina pound net fishery for flounder. The population of southern flounder sustaining this fishery is probably stable considering that landings are primarily comprised of three age classes (2, 3, and 4) and that this species probably reaches a maximum age of 6 or 7 years old (Music and Pafford 1984; Wenner et al. 1991). However, the age composition of this species should be monitored annually to see if, in fact, an acceptable number of age classes ($\leq$ 3) remain in the fishery.

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Table 1. Monthly summary of sampling of the North Carolina flounder pound net fishery by area fished; n = number of catches sampled.

Year	Month	Area	n	Catch weight (kg) Mean	Catch weight (kg) Range	Sample weight (kg) Mean	Sample weight (kg) Range
1989	Sep	Carteret	6	544.9	58.3 - 1,577.0	75.4	42.1-100.4
		Ocracoke	3	513.5	350.2 - 662.2	91.0	83.2- 95.5
		Roanoke	5	635.3	141.5 - 1,200.3	94.5	69.1-140.2
		All areas	14	570.5	58.3 - 1,577.0	85.6	42.1-140.2
	Oct	Carteret	3	368.5	262.8 - 429.7	36.2	29.7- 45.6
		Ocracoke	2	649.1	601.9 - 696.3	83.8	63.2-104.4
		Roanoke	5	509.8	185.2 - 829.6	52.5	26.1- 84.4
		All areas	10	495.3	185.2 - 829.6	53.9	26.1-104.4
	Nov	Carteret	1	-	339.8	-	66.5
		Ocracoke	2	180.5	154.6 - 206.3	45.4	22.7- 68.1
		Roanoke	1	-	139.2	-	28.5
		All areas	4	210.0	139.2 - 339.8	46.4	22.7- 68.1
	All months and areas		28	492.1	58.3 - 1,577.0	68.6	22.7-140.2
1990	Sep	Carteret	4	273.2	110.4 - 584.3	83.4	60.0-123.5
		Ocracoke	2	570.2	178.7 - 961.6	-	69.8
		All areas	6	372.2	110.4 - 961.6	80.7	60.0-123.5
	Oct	Carteret	8	532.5	137.9 - 1,063.7	110.2	48.4-178.4
		Ocracoke	11	180.8	73.6 - 344.3	54.2	22.5-100.2
		Roanoke	2	370.0	322.3 - 417.8	47.8	31.6- 63.9
		All areas	21	332.8	73.6 - 1,063.7	76.0	22.5-178.4
	Nov	Carteret	9	387.9	189.1 - 922.2	106.0	55.3-168.8
		Ocracoke	3	259.5	70.8 - 371.9	56.4	48.2- 60.9
		Roanoke	2	512.6	249.5 - 775.6	74.3	68.2- 80.4
		All areas	14	378.2	70.8 - 922.2	90/8	48.2-168.8
	Dec	Carteret	8	462.0	193.0 - 1,229.6	78.7	46.5-104.8
		All areas	8	462.0	193.0 - 1,229.6	78.7	46.5-104.8
	All months and areas		49	371.7	70.8 - 1,229.6	81.4	22.5-178.4

Table 2. Overall species composition and mean catch/trip of 28 North Carolina flounder pound net catches sampled from September through November 1989.

Species	Weight (kg)		Number		Mean weight (kg)	% freq. occur
	Mean	Percent	Mean	Percent		
Paralichthys lethostigma	432.0	88.12	543	77.3	0.783	100
Peprilus alepidotus	10.6	2.16	53	7.5	0.201	29
Paralichthys albigutta	9.8	1.99	12	1.6	0.834	39
Sciaenops ocellatus	7.9	1.61	4	0.5	2.133	43
Peprilus triacanthus	6.7	1.36	34	4.8	0.199	7
Trachinotus carolinus	4.5	0.92	18	2.5	0.255	29
Dorosoma cepedianum	3.0	0.62	7	1.1	0.408	29
Archosargus probatocephalus	2.8	0.56	2	0.2	1.676	29
Micropogonias undulatus	2.3	0.47	4	0.6	0.582	39
Chaetodipterus faber	2.3	0.47	2	0.3	1.146	14
Pomatomus saltatrix	2.2	0.44	1	0.1	2.661	32
Mugil cephalus	1.5	0.30	0	<0.1	5.661	25
Callinectes sapidus	1.3	0.27	9	1.3	0.146	25
Aluterus schoepfi	1.1	0.23	7	1.0	0.154	11
Scomberomorus maculatus	0.6	0.12	<1	<0.1	1.767	7
Paralichthys dentatus	0.5	0.10	1	0.2	0.318	29
Ictalurus punctatus	0.3	0.07	<1	0.1	0.940	7
Sphoeroides maculatus	0.3	0.05	<1	0.1	0.793	14
Cynoscion regalis	0.2	0.04	1	0.1	0.292	14
Chilomycterus schoepfi	0.2	0.04	<1	0.1	0.350	4
Leiostomus xanthurus	0.1	0.03	1	0.2	0.102	4
Trachinotus falcatus	0.1	0.02	1	0.1	0.125	4
Brevoortia tyrannus	0.1	0.01	1	0.1	0.110	4
Selene setapinnis	<0.1	0.01	1	0.1	0.044	7
Trinectes maculatus	<0.1	<0.01	1	0.1	0.040	4
Lagodon rhomboides	<0.1	<0.01	<1	<0.1	0.070	4

Species observed

Pogonias cromis	Menticirrhus spp.
Cynoscion nebulosus	Lepomis microlophus
Mugil spp.	Lobotes surinamensis

Table 3. Overall species composition and mean catch/trip of 28 North Carolina flounder pound net catches sampled from September through December 1990.

Species	Weight (kg) Mean	Weight (kg) %	Number Mean	Number %	Mean weight (kg)	% freq. occur
Paralichthys lethostigma	287.4	81.2	427	78.3	0.671	98
Paralichthys dentatus	18.9	5.3	35	6.5	0.530	80
Sciaenops ocellatus	9.7	2.7	2	0.4	3.943	53
Paralichthys albigutta	8.5	2.4	13	2.4	0.643	41
Brevoortia tyrannus	5.6	1.6	1	0.1	0.067	6
Peprilus alepidotus	5.5	1.5	36	6.6	0.119	41
Mugil cephalus	3.3	0.9	2	0.4	0.996	37
Chaetodipterus faber	2.4	0.7	1	0.2	1.817	14
Archosargus probatocephalus	1.9	0.5	2	0.4	0.853	27
Trachinotus carolinus	1.5	0.4	7	1.2	0.229	31
Pomatomus saltatrix	1.5	0.4	1	0.2	1.025	39
Peprilus triacanthus	1.7	0.4	8	1.4	0.180	16
Cynoscion regalis	1.3	0.4	3	0.5	0.477	14
Scomberomorus maculatus	0.7	0.2	0	0.1	1.647	12
Cynoscion nebulosus	0.6	0.2	0	0.1	1.163	31
Pogonias cromis	0.6	0.2	0	0.0	8.500	10
Sphoeroides maculatus	0.4	0.1	1	0.2	0.353	31
Orthopristis chrysoptera	0.3	0.1	1	0.1	0.315	6
Dorosoma cepedianum	0.2	0.1	1	0.1	0.371	4
Micropogonias undulatus	0.2	0.1	1	0.1	0.316	24
Ictalurus punctatus	0.1	0.0	<1	<0.1	0.630	4
Selene vomer	0.1	<0.1	1	0.3	0.063	10
Callinectes sapidus	0.1	<0.1	<1	0.1	0.191	6
Trichiurus lepturus	<0.1	<0.1	<1	<0.1	0.380	2
Lagodon rhomboides	<0.1	<0.1	<1	<0.1	0.305	2
Chilomycterus schoepfi	<0.1	<0.1	<1	<0.1	0.350	2
Prionotus evolans	<0.1	<0.1	<1	<0.1	0.240	2
Scophthalmus aquosus	<0.1	<0.1	<1	<0.1	0.200	4
Menticirrhus saxatilis	<0.1	<0.1	<1	<0.1	0.500	2

Observed species

Sphyrna spp.	Menticirrhus spp.
Ictalurus spp.	Centropristis striata
Morone americana	Alosa aestivalis
Perca flavescens	Alosa mediocris
Leiostomus xanthurus	Euthynnus alletteratus
Aluterus schoepfi	Morone saxatilis

Table 4. Species composition, by area, of North Carolina flounder pound net catches sampled for 1989, including mean catch/trip (kg) and mean number/trip.

Species	Carteret Mean weight (kg)	Carteret Percent weight	Carteret Percent number	Ocracoke Mean weight (kg)	Ocracoke Percent weight	Ocracoke Percent number	Roanoke Mean weight (kg)	Roanoke Percent weight	Roanoke Percent number
Paralichthys lethostigma	357.5	77.4	56.4	413.2	94.2	83.0	511.8	96.0	91.8
Peprilus alepidotus	28.3	6.0	19.2	2.0	0.4	2.6	0	0	0
Paralichthys albigutta	26.3	5.7	4.2	1.4	0.3	0.5	0	0	0
Peprilus triacanthus	18.7	4.0	13.0	0	0	0	0	0	0
Trachinotus carolinus	12.7	2.7	6.8	<0.1	<0.1	<0.1	0	0	0
Sciaenops ocellatus	7.7	1.6	<0.1	15.5	3.4	1.3	3.3	0.6	0.7
Archosargus probatocephalus	5.6	1.2	<0.1	2.3	0.5	0.8	<0.1	0.1	0.2
Mugil cephalus	3.7	0.8	<0.1	0.9	0.2	0.2	<0.1	0.1	<1
Pomatomus saltatrix	2.9	0.6	<0.1	1.0	0.3	0.7	0	0	0
Scomberomorus maculatus	1.6	0.3	0.1	0	0	0	0	0	0
Micropogonias undulatus	1.0	0.2	<0.1	0.9	0.2	0.4	4.3	0.8	1.1
Paralichthys dentatus	0.8	0.2	0.3	0.5	0.1	0.2	0.2	<0.1	0.2
Pogonias cromis	0.5	0.1	<0.1	0	0	0	0	0	0
Cynoscion regalis	0.3	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2
Cynoscion nebulosus	0.3	0.1	<0.1	0	0	0	0	0	0
Chaetodipterus faber	<0.1	<0.1	<0.1	9.1	2.0	1.7	0	0	0
Aluterus schoepfi	0	0	0	4.5	1.0	6.3	0	0	0
Sphoeroides maculatus	0	0	0	1.1	0.2	0.3	0	0	0
Chilomycterus schoepfi	0	0	0	0.7	0.1	0.4	0	0	0
Trachinotus falcatus	0	0	0	0.3	0.1	0.6	0	0	0
Menticirrhus spp.	0	0	0	0.2	<0.1	<0.1	0	0	0
Selene setapinnis	0	0	0	0.2	<0.1	0.8	0	0	0
Dorosoma cepedianum	0	0	0	0	0	0	7.7	1.4	2.3
Callinectes sapidus	0	0	0	0	0	0	3.3	0.6	2.7
Ictalurus punctatus	0	0	0	0	0	0	0.8	0.2	0.1
Leiostomus xanthurus	0	0	0	0	0	0	0.3	0.1	0.4
Brevoortia tyrannus	0	0	0	0	0	0	0.2	<0.1	0.2
Trinectes maculatus	0	0	0	0	0	0	0.1	<0.1	0.2
Lagodon rhomboides	0	0	0	0	0	0	0.1	<0.1	0.1
Lepomis microlophus	0	0	0	0	0	0	<0.1	<0.1	<0.1

NA = not available

Table 5. Species composition, by area, of North Carolina flounder pound net catches sampled for 1990, including mean catch/trip (kg) and mean number/trip.

Species	Carteret			Ocracoke			Roanoke		
	Mean weight (kg)	Percent weight	Percent number	Mean weight (kg)	Percent weight	Percent number	Mean weight (kg)	Percent weight	Percent number
Paralichthys lethostigma	360.9	83.3	83.1	120.9	65.5	48.5	421.9	95.6	95.3
Paralichthys dentatus	20.0	4.6	5.7	21.2	11.5	13.6	0.9	0.2	0.4
Paralichthys albigutta	13.8	3.2	3.2	0	0	0	0	0	0
Brevoortia tyrannus	9.4	2.2	NA*	0	0	0	0.5	0.1	1.0
Sciaenops ocellatus	5.8	1.3	0.3	16.7	9.1	0.5	9.7	2.2	1.1
Mugil cephalus	5.1	1.2	0.5	0	0	0	3.5	0.8	0.3
Peprilus alepidotus	4.7	0.8	2.8	6.7	3.6	26.3	0	0	0
Archosargus probatocephalus	3.2	0.7	0.6	0	0	0	0	0	0
Peprilus triacanthus	3.1	0.5	2.0	0	0	0	0	0	0
Pomatomus saltatrix	1.9	0.4	0.2	1.0	0.5	0.4	0	0	0
Trachinotus carolinus	1.2	0.3	0.8	2.5	1.4	3.8	0	0	0
Cynoscion nebulosus	1.0	0.2	0.1	0.1	0.1	0.1	0	0	0
Cynoscion regalis	1.0	0.2	0.5	2.3	1.2	0.8	0	0	0
Pogonias cromis	0.9	0.2	<0.1	0.3	0.2	NA	0	0	0
Orthopristis chrysoptera	0.4	0.1	0.2	0	0	0	0	0	0
Morone saxatilis	0.3	0.1	<0.1	0	0	0	0	0	0
Euthynnus alletteratus	0.2	<0.1	<0.1	0	0	0	0	0	0
Micropogonias undulatus	0.2	<0.1	<0.1	0.3	0.2	0.3	0.1	<0.1	0.3
Sphoeroides maculatus	0.1	<0.1	<0.1	1.0	0.5	1.0	0	0	0
Scomberomorus maculatus	<0.1	<0.1	<0.1	2.1	1.2	0.4	0	0	0
Chaetodipterus faber	<0.1	<0.1	<0.1	7.3	4.0	1.3	0	0	0
Selene vomer	0	0	0	0.0	0.2	1.5	0	0	0
Trichiurus lepturus	0	0	0	0.1	0.1	0.1	0	0	0
Lagodon rhomboides	0	0	0	0.1	0.1	0.1	0	0	0
Chilomycterus shoepfi	0	0	0	0.1	0.1	0.1	0	0	0
Prionotus evolans	0	0	0	0.1	<0.1	0.1	0	0	0
Dorosoma cepedianum	0	0	0	0	0	0	2.7	0.6	1.1
Ictalurus punctatus	0	0	0	0	0	0	1.5	0.3	0.3
Scophthalmus aquosus	0	0	0	0	0	0	0.2	<0.1	0.1

NA = not available

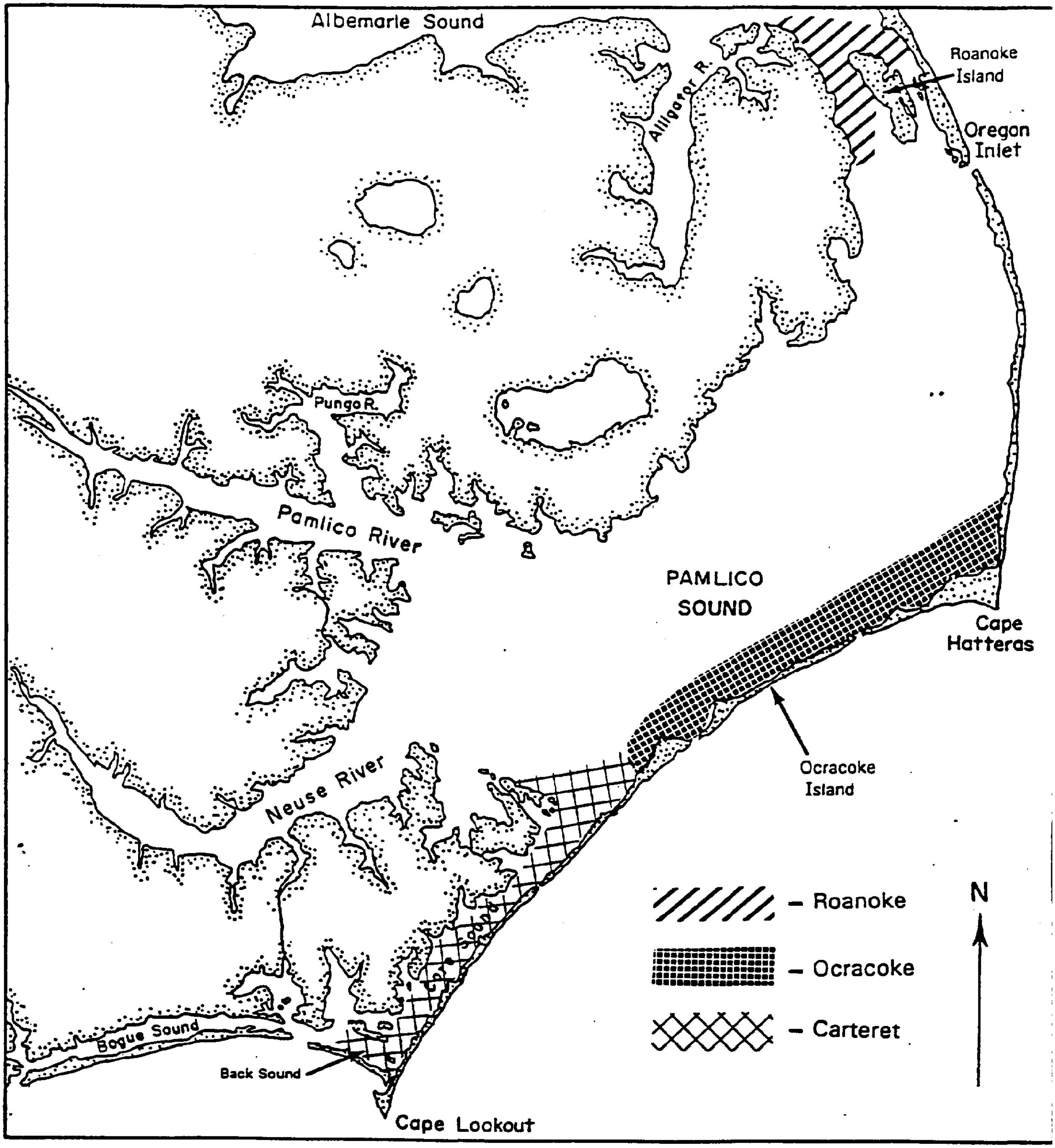


Figure 1. Flounder pound net fishing grounds in North Carolina, 1990.

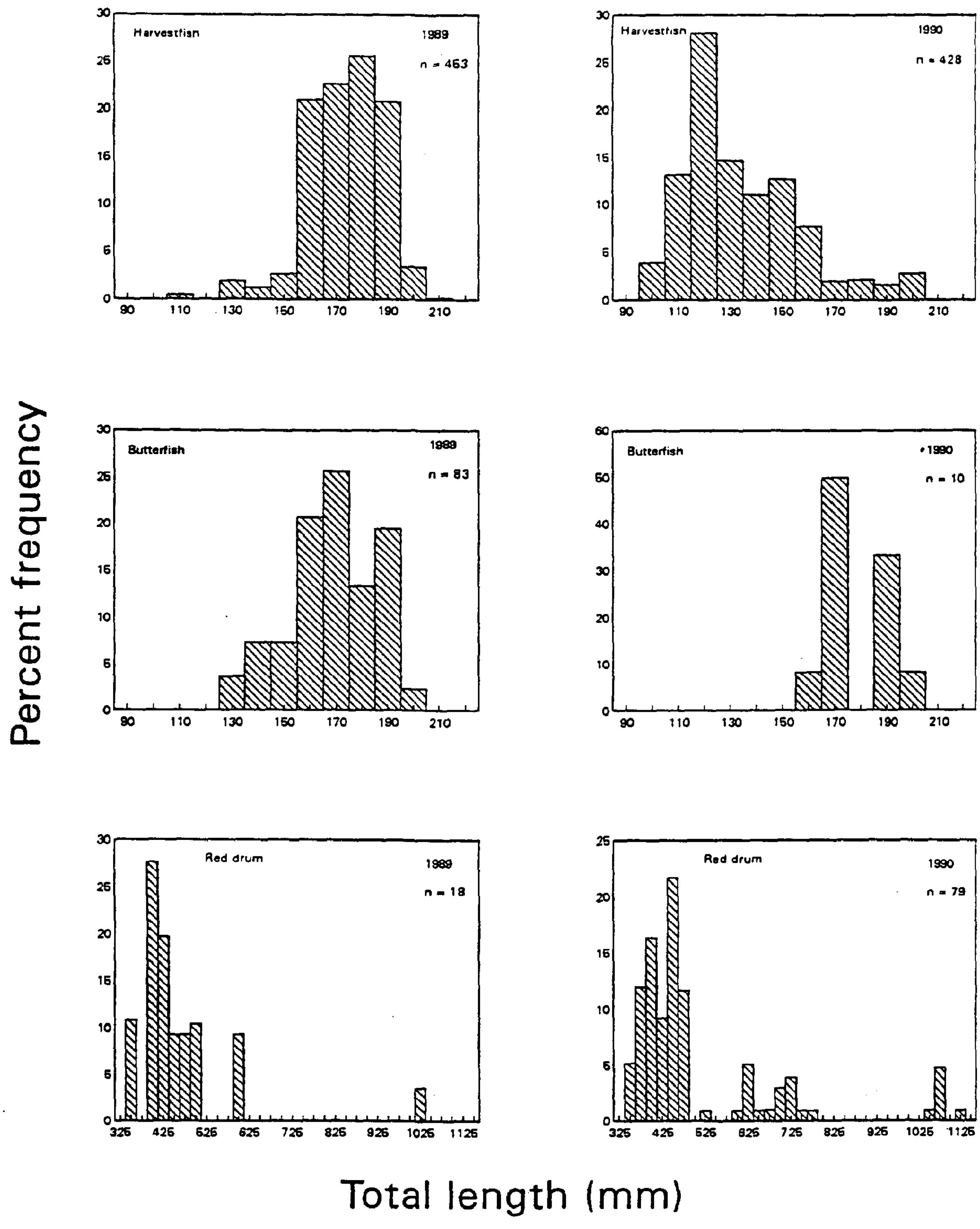


Figure 2. Annual expanded length frequencies for peprilids and red drum from the North Carolina pound net fishery for flounder, 1989-1990; n=number of individuals measured.

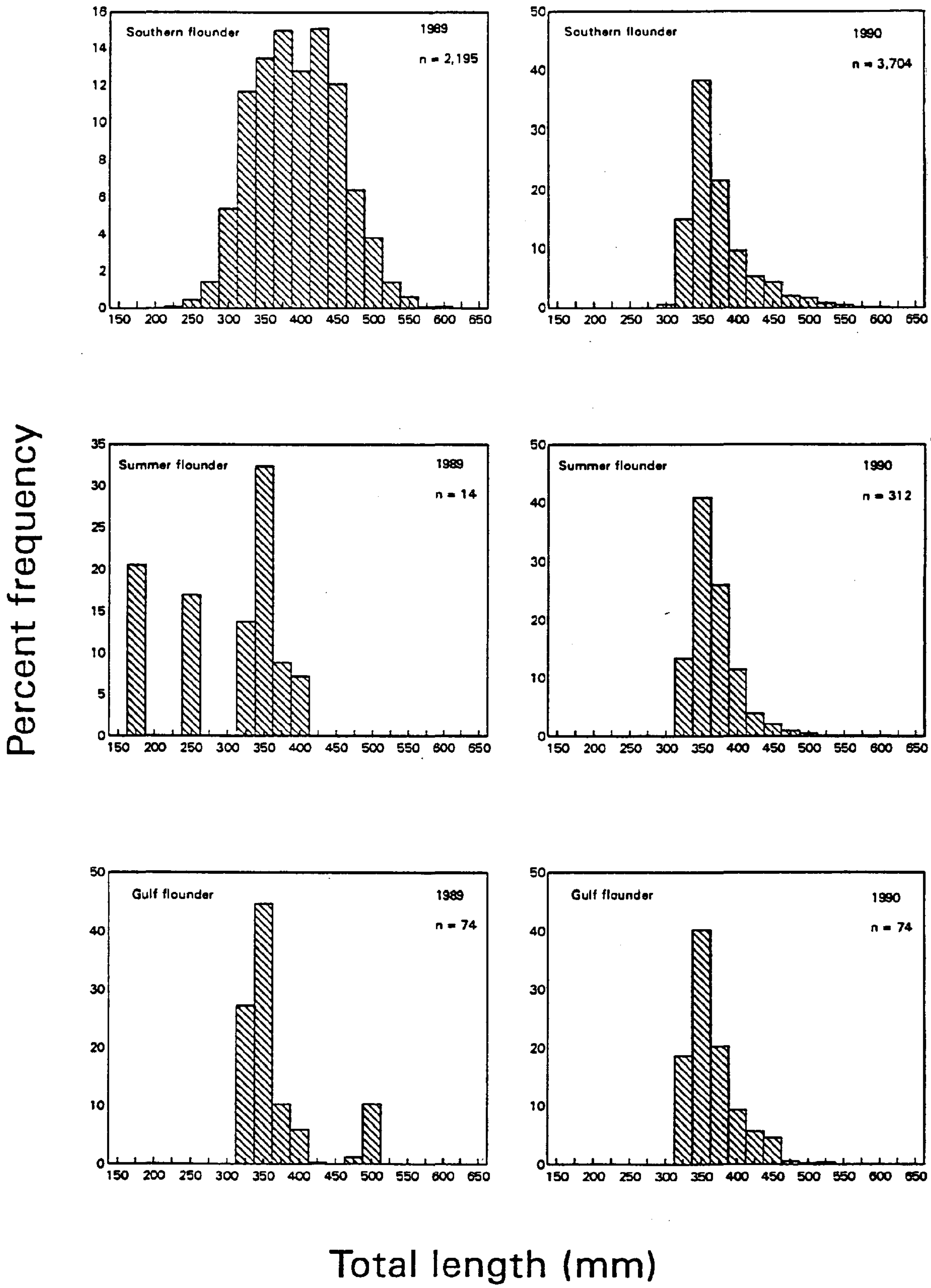
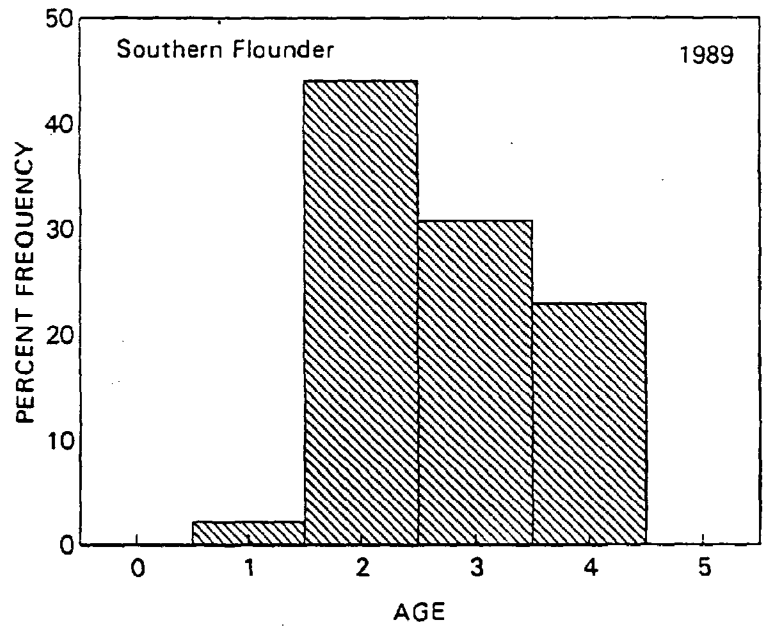


Figure 3. Annual expanded length-frequencies for paralichthine flounders from the North Crolina pound net fishery for flounder, 1989-1990; n=number of individuals measured.



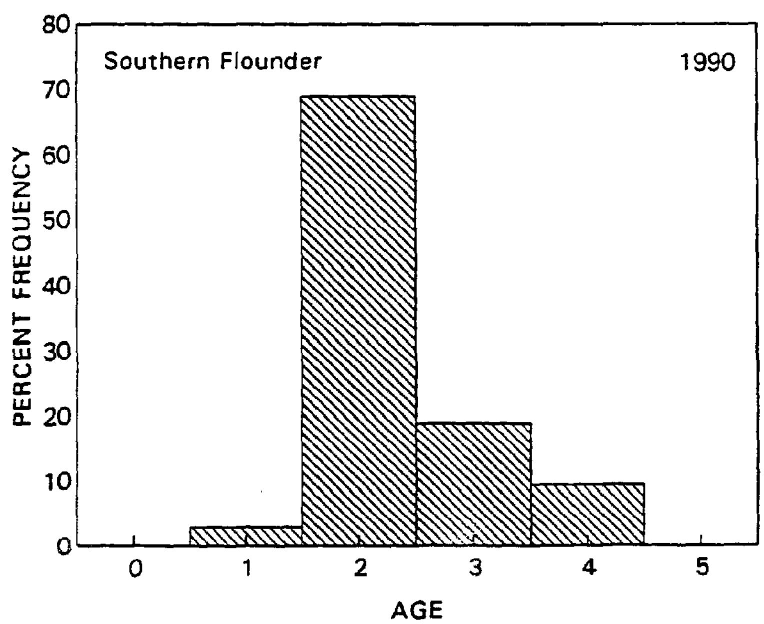


Figure 4. Annual age composition of southern flounder in the North Carolina pound net fishery for flounder, 1989-1990.

APPENDIX

APPENDIX

Monthly species composition (by weight and by number) for the top (99% by weight) species sampled from the North Carolina flounder pound net fishery, 1989-1990.

		1989				1990			
		Weight		Number		Weight		Number	
Month	Species	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent
Sep	Paralichthys lethostigma	478.8	84.2	644	69.5	121.4	57.3	212	51.2
	Peprilus alepidotus	21.2	3.7	105	11.4	4.8	2.3	22	5.3
	Peprilus triacanthus	13.3	2.3	67	7.2	15.2	7.1	63	15.2
	Paralichthys albigutta	9.9	1.7	14	1.5	49.7	23.5	75	18.1
	Trachinotus carolinus	9.1	1.6	35	3.8	4.5	2.1	21	5.1
	Sciaenops ocellatus	8.2	1.4	1	0.1	-	-	-	-
	Chaetodipterus faber	4.6	0.8	4	0.4	-	-	-	-
	Micropogonias undulatus	4.5	0.8	8	0.9	-	-	-	-
	Dorosoma cepedianum	4.3	0.8	10	1.1	-	-	-	-
	Pomatomus saltatrix	4.2	0.7	2	0.2	2.8	1.3	22	5.3
	Mugil cephalus	2.5	0.4	1	0.1	-	-	-	-
	Aluterus schoepfi	2.2	0.4	15	1.6	-	-	-	-
	Archosargus probatocephalus	1.4	0.2	3	0.3	0.8	0.4	<1	<0.1
	Paralichthys dentatus	-	-	-	-	4.9	2.3	11	2.6
	Scomberomorus maculatus	-	-	-	-	4.8	2.3	3	0.6
Oct	Paralichthys lethostigma	461.3	93.2	545	92.4	265.5	79.5	398	74.3
	Sciaenops ocellatus	10.3	2.1	9	1.5	19.6	5.9	3	0.6
	Paralichthys dentatus	-	-	-	-	14.7	4.4	25	4.8
	Peprilus alepidotus	-	-	-	-	9.2	2.8	69	12.9
	Chaetodipterus faber	-	-	-	-	5.6	1.7	3	0.6
	Mugil cephalus	-	-	-	-	4.2	1.2	2	0.4
	Archosargus probatocephalus	5.7	1.2	1	0.2	4.2	1.2	5	0.9
	Paralichthys albigutta	9.9	2.0	7	1.2	3.1	0.9	5	0.9
	Trachinotus carolinus	-	-	-	-	2.3	0.7	9	1.8
	Pomatomus saltatrix	-	-	-	-	1.9	0.6	2	0.4
	Cynoscion regalis	-	-	-	-	1.0	0.3	4	0.7
	Dorosoma cepedianum	2.5	0.5	6	1.0	-	-	-	-
	Callinectes sapidus	2.3	0.5	16	2.7	-	-	-	-
Nov	Paralichthys lethostigma	194.0	92.4	188	91.5	330.1	87.0	485	83.5
	Paralichthys dentatus	1.3	0.6	2	1.1	28.8	7.6	58	10.1
	Mugil cephalus	1.7	0.8	N/A	-	5.0	1.3	5	0.8
	Sciaenops ocellatus	-	-	-	-	3.9	1.0	3	0.5
	Cynoscion regalis	-	-	-	-	2.8	0.7	3	0.5
	Paralichthys albigutta	10.1	4.8	15	7.4	2.6	0.7	5	0.8
	Cynoscion nebulosus	-	-	-	-	1.4	0.4	1	0.1
	Peprilus alepidotus	-	-	-	-	1.1	0.3	13	2.3
	Sphoeroides maculatus	1.1	0.5	N/A	-	-	-	-	-
Dec	Paralichthys lethostigma	-	-	-	-	395.2	85.7	565	92.7
	Brevoortia tyrannus	-	-	-	-	34.0	7.4	N/A	-
	Paralichthys dentatus	-	-	-	-	22.9	4.9	40	6.5
	Paralichthys albigutta	-	-	-	-	2.5	0.5	4	0.6
	Pogonias cromis	-	-	-	-	1.8	0.4	<1	<0.1
	Pomatomus saltatrix	-	-	-	-	1.0	0.2	<1	<0.1