Saltwater Angling and its Economic Importance to Virginia

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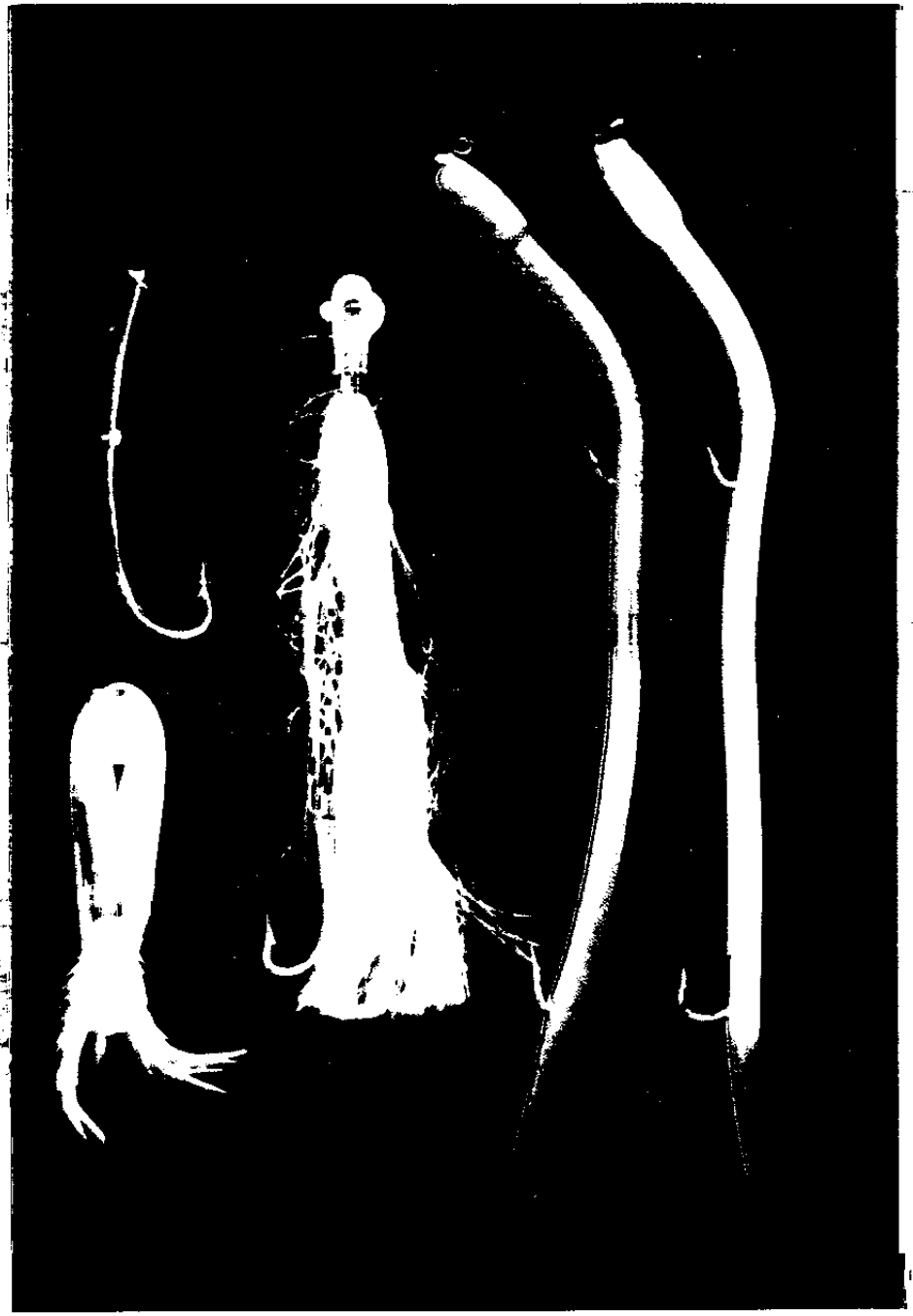

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Saltwater Angling And Its Economic Importance to Virginia

Recreational Angling: Leisure and Business

The U.S. Fish and Wildlife Service estimates that there are more than 36 million anglers in the United States. Of the total 36 million anglers, approximately 75 percent engage in freshwater angling and 25 percent engage in saltwater angling. In 1993, there were approximately nine million saltwater anglers and 31 million freshwater anglers.

The Americas brought a new feeling of freedom and wilderness exploration into the sport of recreational angling. Unencumbered by the European restrictions of private waters, angling became a sport of the masses. Anyone with a hook and line could easily catch a number of large fish in a day's outing.

In general, the fishing of the New World incorporated the romanticism of the unexplored territory, and of pitting man against beast. The wilderness for the first time was seen as an adventure in itself, of which fishing was just one part. This tradition survives today in the dedication of many anglers to find the tiny, remote, and untouched streams of native brook trout, the remote cove with a legendary largemouth bass, or the barren salt flats of the tarpon.

The familiar sign *Gone Fishing*, posted at numerous businesses on the opening day of fishing season, is but one reminder of the social and economic importance of modern recreational angling. An angler has consciously decided to forgo sales and income in order to go fishing. The angler, however, not only decided to forgo income, but also to spend dollars for bait, equipment, a license, and other goods and services. If the angler had to drive to the fishing site or dock, it was necessary to purchase gasoline. If a boat was used, the boat operator had to purchase fuel, safety equipment, and pay for the boat and the boat insurance. Adding to this is the fact that people had to be employed to provide fishing related goods and services. For example, there had to be someone to sell the fishing license, bait, and fuel. Insurance agents were required to process the boat insurance. Going fishing may just be worth a lot of money to an economy.

Then, of course, there are the social aspects of angling. What child has not been excited when he or she caught a fish? Remember the pleasure of that first fishing trip with mom or dad. . .what an experience! And as you got older, what about the pleasure and fun from the fishing trips with family members or buddies?

You woke at five in the morning, ate a big breakfast, and were on the water by six. You caught a lot of fish and were tired. You returned to the cottage and took a nap. That night you ate fish and swapped stories with your buddies about the day. Like the commercial says, "It doesn't get any better than this."

The U.S. Fish and Wildlife Service estimates that there are more than 36 million anglers in the United States. Of the total 36 million anglers, approximately 75 percent engage in freshwater angling and 25 percent engage in saltwater angling. In 1993, there were approximately nine million saltwater anglers and 31 million freshwater anglers. Saltwater anglers fished about 75 million days and freshwater anglers had about 466 million days. In terms of economic importance, the 36 million anglers spent more than $412 million just for fishing licenses. Total expenditures by the 36 million anglers exceeded $24 billion in 1993. Of the total expenditures by anglers, freshwater and saltwater fishing, respectively, accounted for approximately 75 and 25 percent.

In comparison, total consumer expenditures on books were about $23 billion in 1993. Consumers purchased $10 billion for sound recordings in 1993. Total expenditures by consumers at motion picture theaters were $5.5 billion in 1993. Relative to commercial participant amusements—billiard parlors, bowling alleys, dancing, riding, shooting, skating, swimming places, amusement devices and parks, golf courses, sightseeing buses and guides, private flying operations, casino gambling, and other commercial participant amusements—consumers spent approximately $29 billion in 1993.

There should be no doubt that recreational angling is big business and of immense social importance. Just how important recreational angling is to the national and state economies, however, is unknown. The paucity of information about the economic importance of recreational angling, unfortunately, poses serious problems for resource managers who not only must manage and regulate natural resource use, but also must often allocate resources among competing user groups.

The Virginia saltwater fisheries management agency, the Virginia Marine Resources Commission (VMRC), has recently become extremely concerned about the economic importance to Virginia of saltwater angling. The VMRC must make many management and regulatory decisions about numerous saltwater species and has had little economic information upon which to make decisions. For example, if Virginia were to reduce the recreational season for striped bass, how many jobs and how much income would be lost? Alternatively, would a reduced season differentially affect the economies of the various counties?

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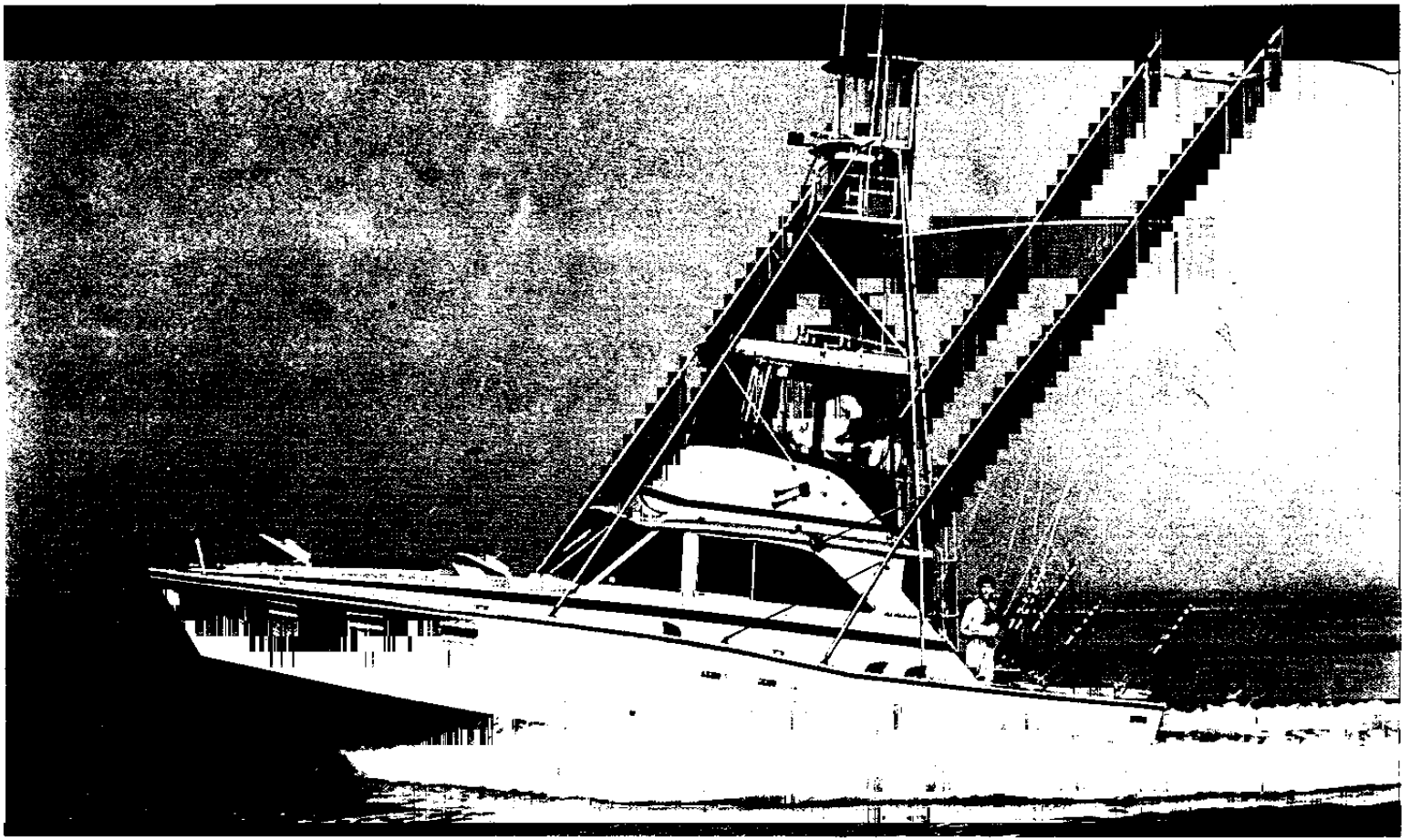
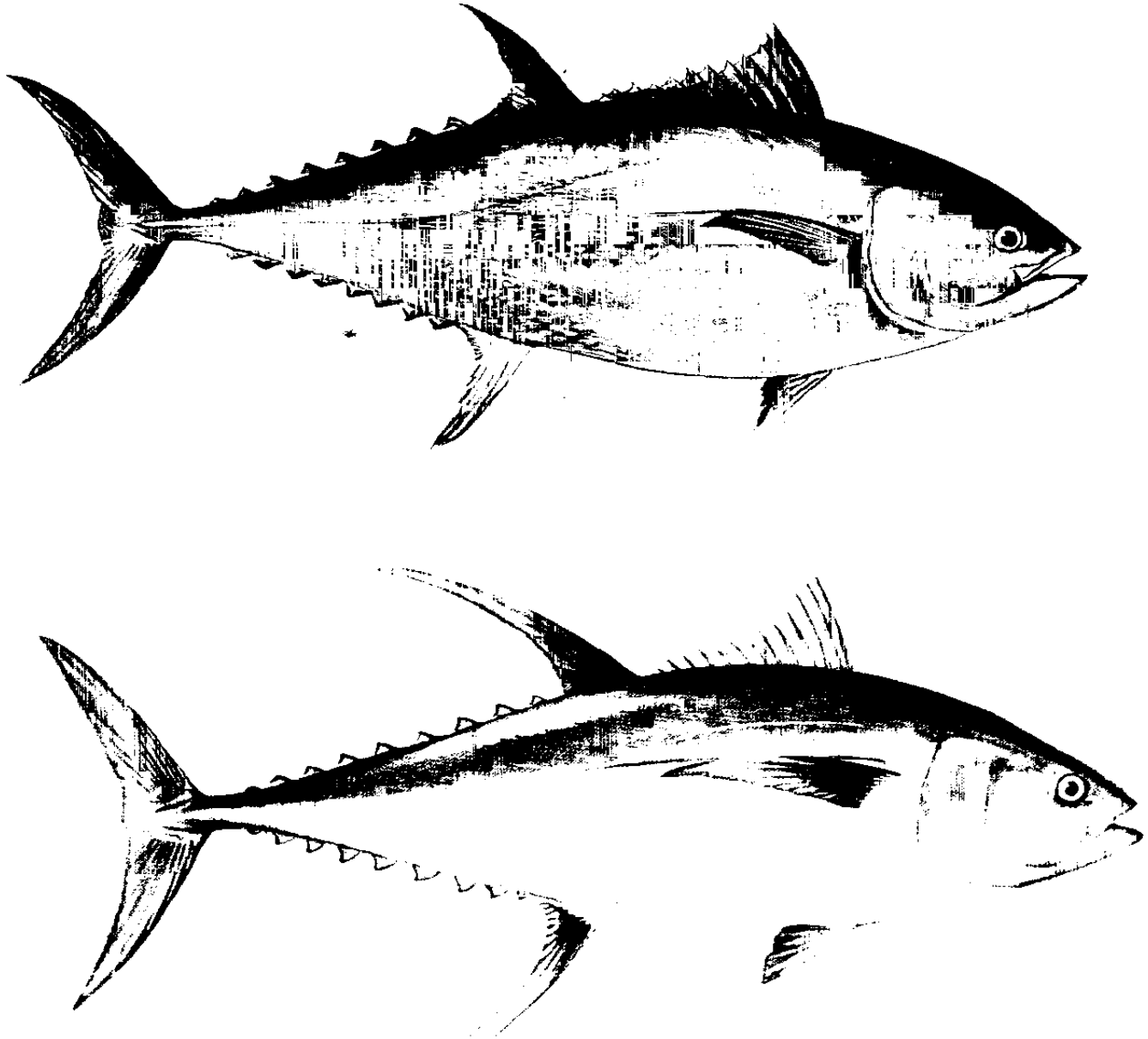


To address these types of questions, as well as numerous other questions relating to the economics of saltwater angling in Virginia, the Virginia Marine Resources Commission, with the recommendation and approval of the Recreational Advisory Board, funded this study to determine the economic importance to Virginia of recreational saltwater angling in the state. This report presents an examination and assessment of the economic role and importance, contributions, and impacts of saltwater recreational angling to Virginia.

Although the significance of saltwater angling extends well beyond economics and the current time, the primary measures used in this report to assess the importance of recreational angling include expenditures by anglers, number of anglers, number of trips, output or production, employment, and taxes generated by recreational angling. Excluded from the assessment are important things such as social and family relationships which may be attributable to recreational angling. A point stressed is that saltwater angling is not just a leisure activity—it also is big business and is quite important to the economy of Virginia and numerous coastal communities.



Virginia's Recreational Species

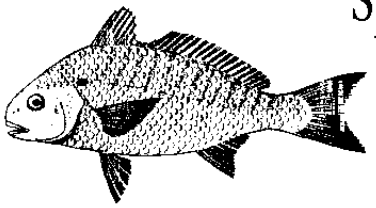
Diversity of Species

The National Marine Fisheries Service survey of recreational angling lists 60 species or groups of species caught by Virginia anglers.

The number of species of fish available to Virginia saltwater anglers is staggering. The National Marine Fisheries Service survey of recreational angling lists 60 species or groups of species caught by Virginia anglers. Inshore or within the territorial limits of Virginia (all water out to three miles), species such as spot, croaker, bluefish, striped bass, skates, rays, gray trout or weakfish, speckled trout, tarpon, cobia, summer flounder, sea bass, tautog or blackfish, butterfish, spadefish, scup, Atlantic mackerel, king mackerel, Spanish mackerel, black and red drum, sheepshead, whiting, amberjack, and numerous sharks are regularly caught during the year. Numerous gamefish are also caught offshore (all water from three miles off the coast out to 200 miles) by private and charter boats. The popular recreational species profiled here include spot, croaker, striped bass, bluefish, summer flounder, black sea bass, black drum, red drum, weakfish, king mackerel, Spanish mackerel, dolphin (often called "mahi-mahi" to distinguish it from the completely unrelated marine mammal), tautog, bonito, bluefin and yellowfin tuna, blue and white marlin, and sharks.

In the following section, various species available to Virginia saltwater anglers are profiled. Each species profile provides a discussion of the distribution, availability, and basic biology of the species and information, when available, about world and Virginia recreational records. Information presented in the following section is available in greater detail in the following publications: (1) Robins, C.R., G.C. Ray, and J. Douglas (1986). A Field Guide to Atlantic Coast Fishes of North America. Boston, Houghton Mifflin Company; (2) Goldstein, R.J. (1986). Coastal Fishing in the Carolinas: From Surf, Pier, and Jetty. Winston-Salem, North Carolina, John F. Blair, Publisher; (3) Gooch, B. (1988). Virginia: Fishing Guide. Charlottesville, University Press of Virginia; (4) Manooch, C.S. (1984). Fisherman's Guide: Fishes of the Southeastern United States. Raleigh, North Carolina, North Carolina State Museum of Natural History. World records are from International Game Fish Association (IGFA) publications, and represent all-tackle records.

Profiles of Recreational Species



Spot

Spot, *Leiostomus xanthurus*, or Norfolk spot, have been among the most popular species for not only Virginia anglers, but anglers along the mid-Atlantic and southeastern United States. Spot are one of the most abundant and popular panfish species of the region, and are a relative of the red drum. Spot are typically available in estuarine and coastal waters from Massachusetts to Mexico. Their availability and abundance follow known seasonal patterns. Spot are most available in Delaware Bay to Georgia during the summer and fall, and then move offshore to the shelf edge between Cape Hatteras to Central Florida during the winter. Spot are primarily caught by anglers in the inshore waters.

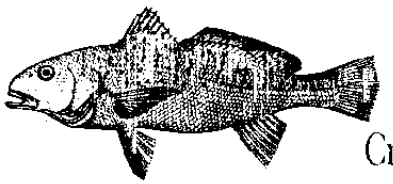
The population of spot is known to be highly susceptible to environmental change. While spot can tolerate a wide range of water temperatures and salinities, extensive mortalities have occurred during severe winters. Long periods of offshore winds or unfavorable currents have also been responsible for drastic reductions in the number of juvenile spot. Because of the susceptibility of spot to environmental change, it is quite common for anglers to experience extremely high catches during some years and very low catches during other years.

Spot are typically caught bottom-fishing with bait. Spot is one of the few species that a recreational angler can easily catch without a boat. Spot are caught in large quantities from boats, piers, docks, and the shore and surf. The most common baits used by anglers are bloodworms, peeler crabs, and clam strips. The most common weight of spot caught by anglers is between eight and 12 ounces.

Growth, Age, Length, and Weight: During the first year, the growth of spot is usually quite rapid. Spot may grow to 5.5 inches during their first year and up to 13.5 inches by their average maximum age of five years. Lengths for age one through age five are about 5.5, 8.5, 9.5, 11.5, and 13.5 inches. The typical size caught by anglers is about a third of a pound but may average three-fourths of a pound during the fall, when the "yellowbellies" become available, or spawning begins.

Virginia Record: Two pounds, six ounces, off Poquoson, in 1986.

World Record: None reported by the IGFA.



Croaker

Croaker, *Micropogon undulatus*, or hardhead, is another species frequently caught by recreational anglers along the Atlantic coast. Although the distribution of croaker is from Massachusetts to Texas in North America, the majority of the catches are from the mid-Atlantic region. Virginia anglers catch more Atlantic croaker than those anglers from all other states. Like spot, croaker is a highly prized panfish. It is one of the few species which actually makes a sound when caught; its common name is derived from the deep croaking sounds made by the fish. Croaker are typically plentiful, fun and easy to catch, and judged to be quite tasty by anglers. Croaker are principally caught in the inshore waters.

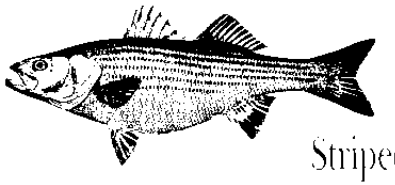
Atlantic croaker are tolerant of a wide range of temperatures (35 to 85° Fahrenheit) and salinities (0 to 35 parts per thousand). Croakers are caught in large numbers between March and October with the peak catches occurring between June and September. Spawning extends from late August off Chesapeake Bay, to March off Cape Canaveral. Peak spawning months are September, October, and November.

Croaker are regularly caught by recreational anglers bottomfishing from boats, piers, docks, shore, and the surf. Croaker apparently are not as fussy as spot when it comes to bait. Widely used baits include peeler crab, bloodworms, cut bait (fish), squid, and shrimp. The weight of the typical catch is between one-half and two pounds.

Growth, Age, Length, and Weight: Age and growth information on croaker is quite limited. Although croaker may attain a weight of as much as five pounds, the typical catch is under one pound. A two and four year old fish are thought to be about six and ten inches in length, although croaker may reach a length of 20 inches. The life span of croakers is about five years.

Virginia Record: Five pounds, 13 ounces, near "The Cell" in the Chesapeake Bay, in 1982.

World Record: None reported by the IGFA.



Striped Bass

Striped Bass, *Morone saxatilis*, rock, rockfish, or striper has traditionally been the most popular gamefish of Virginia and the Chesapeake Bay region. Striped bass are anadromous, moving from the ocean up rivers to spawn in fresh water, and are widely distributed in North America. Their range includes coastal and estuarine areas and riverine habitats along the east coast of North America, from the St. Lawrence River in Quebec, to the S. Johns River in Florida, and are available in some coastal tributaries of the Gulf of Mexico. The species was also introduced along the Pacific Coast in 1879 and is available from British Columbia to Mexico. Striped bass have also been introduced to various river and reservoir systems throughout the continental United States.

Striped bass are typically most available in Virginia during spring and fall. During the spring, striped bass are returning to the rivers and tributaries to spawn. It is during the spring when school fish are typically most available. In fall, striped bass typically move offshore, although not in response to spawning. The monsters, or very larger stripers, are usually available between November and December. Striped bass are sensitive to changes in temperature and salinity. Adult stripers seem to prefer cooler water temperatures than juveniles. Tolerance to salinity also varies considerably with age. Spawning in the Maryland and North Carolina region usually occurs during late spring or between April and June; spawning may occur as early as February in Florida and as late as July in New England. Males reach sexual maturity during the second or third year while females attain maturity between the fourth and fifth years. Males as small as seven inches and females as small as 14 inches have been observed spawning.

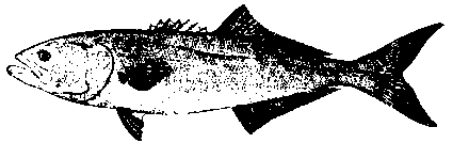
Stripers are available along all coastal inshore and Chesapeake Bay waters; one very popular fishing area is the Chesapeake Bay Bridge-Tunnel. They are also taken from various Bay tributary rivers and bayside creeks. Stripers are seasonally abundant in the Assateague surf in late fall and early spring.

Stripers are caught by numerous methods. Trolling with artificial lures is perhaps the most popular method of catching striped bass. Casting artificial lures from boats, piers, jetties, and beaches are other popular methods for catching striped bass. Bloodworms, peeler crabs, and eels are baits commonly used to catch rockfish. The typical size range of the recreational catch is between five and 25 pounds.

Growth, Age, Length, and Weight: Males do not usually attain lengths and weights as large as females. Most fish larger than 39 inches are females. Average lengths of fish aged one, five, 10, and 13 years are seven, 22, 35, and 45 inches. An 18 inch striper is likely to be between three and five years of age. Striped bass have allegedly been as large as six feet long and as heavy as 125 pounds.

Virginia Record: 61 pounds, 12 ounces, near Buoy 42 in the Chesapeake Bay, in 1996.

World Record: 78 pounds, eight ounces, off Atlantic City, New Jersey, in 1982.



Bluefish

Bluefish, *Pomatomus saltatrix*, also called snapper, tailor, elf, fatback, snap mackerel, skipjack, skip mackerel, horse mackerel, greenfish, and chopper—like striped bass—has been an important game fish of the Chesapeake region. It has even been suggested that big bluefish are the most popular game fish of the Atlantic coast. Unlike striped bass, bluefish is strictly a saltwater species; small blues, though, are available in low-salinity waters. Bluefish are distributed around the world. In North America, bluefish are seasonally available from Nova Scotia all the way to northern Mexico. They are also available in Bermuda, the Bahamas, Cuba, Venezuela, Brazil, Uruguay, the Azores, the Mediterranean Sea, the Black Sea, northwest and southern Africa, Madagascar, the Malay Peninsula, and the entire coast of Australia. Bluefish is truly an international species.

Unlike many other game fish species, bluefish are voracious predators. It is hard to imagine an angler that has not observed bluefish in a feeding frenzy. It seems they will eat anything available; they have even been known to strike swimmers. There are probably few anglers that have also not experienced a bite by a bluefish. Bluefish are also the prey of many other fish. Common predators of adults are sharks, tuna, and swordfish.

It is thought that temperature is the single most important environmental parameter determining bluefish distribution, migration, feeding, spawning, and recruitment. The temperature for minimum cruising speed is between 64 and 72° Fahrenheit. At higher or lower temperatures, bluefish tend to swim at an increased speed. Bluefish school by size and migrate north in the spring and south in the winter. The larger bluefish tend to be more abundant off New England.

In Virginia waters, bluefish are typically available between April and November, but with seasons varying for different size fish. The large "choppers" are usually available between April and July and October and November, while the smaller "tailor" and "snapper" blues are more abundant between May and October.

The spawning behavior and patterns for this species are complicated by an apparent separation of the stock into northern and southern components. Scientists have identified two Atlantic spawning stocks—a south-Atlantic spring stock and a mid-Atlantic summer stock. The summer spawning stock typically spawns off New England between June and August. The spring spawning stock usually spawns at the continental slope/Gulf Stream interface between April and June.

About the only things an angler needs to catch bluefish are strong arms, a heavy rod and wire leader, and a bright, colored lure. Bluefish are regularly caught while trolling; casting from a boat, pier, jetty, or beach; or chumming with cut bait. There is a wide assortment of popular lures such as surgical eels, popping plus, diving plugs, and heavy casting plugs. Menhaden and mullet are popular baits for catching blues. Just about any type of cut bait can be used to catch a bluefish.

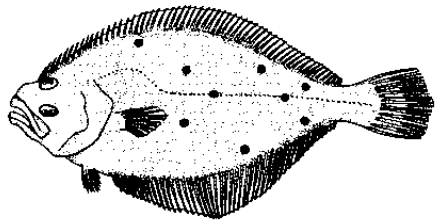
Bluefish are available inshore and offshore. The Chesapeake Bay and Eastern Shore barrier island surf are two popular locations for catching large bluefish. Smaller blues are usually available in the Chesapeake Bay, coastal ocean waters, ocean surf, and numerous inlets.

Growth, Age, Length, and Weight: The growth of bluefish is phenomenal. At age one to two months, they are already between one and two inches. At age six months, bluefish are between

seven and eight inches. At age one, bluefish are approximately ten inches in length. A five year old fish may be as large as 26 to 28 inches and weigh between six and 8 pounds. A ten year old is about 32 inches in length and weighs about 15 pounds. A fourteen year old blue, which is a chopper blue, is approximately 34 inches with a weight of 19 pounds.

Virginia Record: 25 pounds, four ounces, off Bluefish Rock, in 1986.

World Record: 31 pounds, 12 ounces, in Hatteras Inlet, in 1972.



Summer Flounder

Summer flounder, *Paralichthys dentatus*, fluke, long-toothed flounder, flounder of New York, and common flounder are left-eyed flatfishes. That is, if the fish is positioned such that its mouth is on the left side, the eyes are above the mouth; flatfish with both eyes on the right side of the body are right-eyed flatfish. Summer flounder is a popular Virginia recreational species because of its ease of capture and delicious taste.

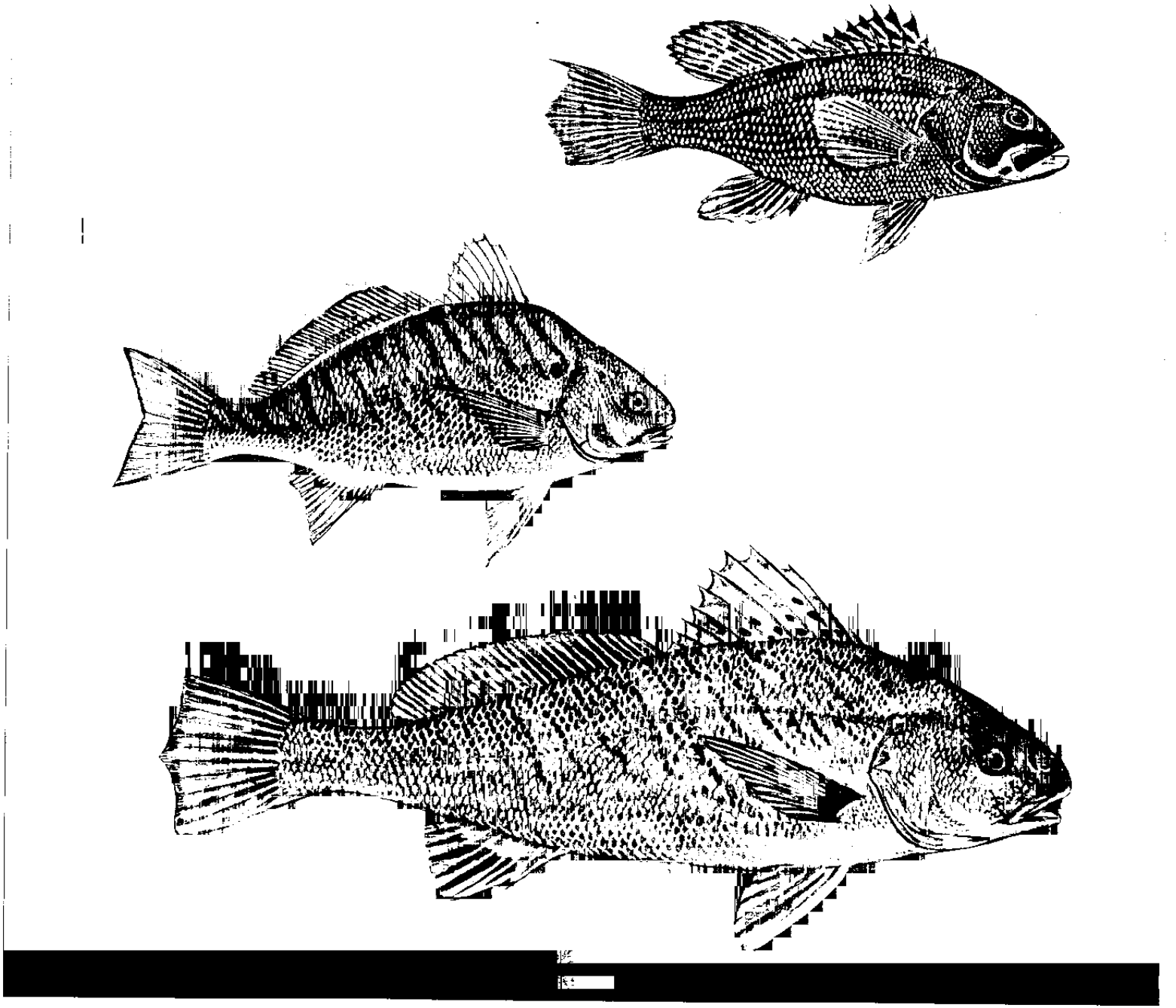
Summer flounder have a large geographical distribution; they are found from Nova Scotia to Florida, and occasionally may be found in the Gulf of Mexico. The greatest abundance, however, is from Delaware Bay to Cape Lookout, North Carolina. In Virginia, summer flounder are most abundant in the seaside inlets of the Eastern Shore, near the Chesapeake Bay Bridge-Tunnel, the lower Chesapeake Bay, and Rudee Inlet. Summer flounder primarily occupy the shallow coastal and estuarine waters in the spring and summer. They move offshore to the deeper water, 120 to 600 feet, during the colder weather. It is strictly a saltwater species, but has been found from brackish to ocean waters. They tolerate a wide range of temperatures and salinities.

Spawning typically occurs at sea during fall, winter, or early spring when water temperatures are between 54 and 66° Fahrenheit. For the waters of Virginia, the major spawning period is between November and January. Currents and wind transport larvae to coastal and estuarine nursery areas. Researchers have found some evidence to indicate that summer flounder are serial spawners. They continuously shed mature eggs during a protracted spawning season. Flounder are sexually mature at age three, with males being about 12 inches in length and females being 14 inches.

Since summer flounder are relatively small and relatively dormant on the bottom, one would not likely think of them as top predators, but flounders may chase schools of small fish to the surface. The favorite foods of summer flounder are menhaden, silversides, sand lances, herrings, anchovies, weakfish, squids, shrimps, and crabs.

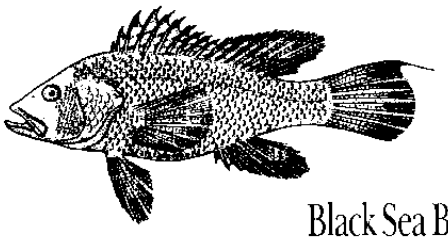
Summer flounder are regularly caught by anglers between April and May. The peak fishing season is between May and July on the Eastern Shore, and July and October in the Chesapeake Bay. Flounder are frequently caught by drift fishing with live or dead natural baits fished on the bottom, very slow trolling natural baits near or on the bottom, casting from beaches and piers, and even trolling small bucktails dressed with strip baits. Live minnows appear to be the preferred bait. Other baits include frozen minnows and fresh strip baits such as shark belly and squid. The most common size of flounder caught is between one and three pounds.

Growth, Age, Length, and Weight: Summer flounder may live as long as 10 years and obtain sizes between 35 and 40 inches and a weight of about 30 pounds. Females usually live longer and are larger than the males. Average lengths for fish from one to nine years are 8.5, 11.3, 14.9, 16.9, 19.3, 20.2, 21., 22.3, and 23.6 inches.



Virginia Record: 17 pounds, eight ounces, in the Baltimore Channel, in 1971.

World Record: 22 pounds, seven ounces, off Montauk, New York, in 1975.



Black Sea Bass

Black Sea Bass, *Centropristis striata*, also called blackfish or black bass, have become an important recreational species due in part to its preferences for underwater structures and hence, its availability to the headboat fishery. Black sea bass are found seasonally along the Atlantic coast from Massachusetts to Florida, with populations south of Cape Hatteras remaining inshore year-round. Adults in Virginia waters typically migrate in fall and winter to the southern edge of the continental shelf. Most black sea bass in Virginia waters are caught inshore around underwater structures such as wrecks and reefs. This species is an opportunistic carnivore, feeding primarily on crustaceans such as crabs and shrimp.

Black sea bass are called "protogynous hermaphrodites," meaning that some individuals function as females until two or three years of age when they undergo sexual succession and become males. Spawning occurs between January and June offshore. Eggs and larvae are pelagic, although these stages are relatively short. Juveniles move inshore in May and June and congregate around underwater structures. Black sea bass may live up to 15 years and attain a length of over two feet.

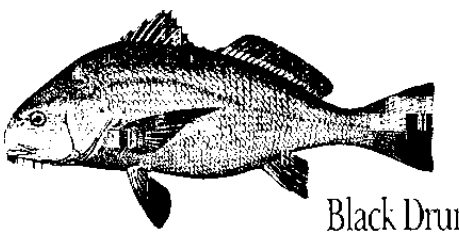
Environmental parameters for black sea bass are not as strict as many other species. Black sea bass have been found in salinities ranging between one and 38 parts per thousand, although they prefer salinities greater than 14. Temperature requirements are similarly broad, with this species tolerating a range between 42 and 72° Fahrenheit. Juveniles can tolerate a broader range of salinities and temperatures during their growth in estuaries. Little work has been done regarding the effects of pollutants on this species, although one researcher found that individuals collected from artificial reefs constructed from old tires showed no significant levels of pollutants in their bodies from the old tires.

Owing to their affinity to structures, black sea bass are most often caught near pilings and wrecks using live or cut bait. Headboats often use a standard bottom rig baited with cut squid, clams, or small minnows. Some anglers prefer small spoons and jigs in shallower waters. Most black sea bass caught in Virginia waters average around one to one-and-a-half pounds.

Growth, Age, Length, and Weight: Despite the short time as eggs and larvae, black sea bass grow slowly. Total length after the first year may only be five inches, with an eight-year-old fish only attaining 15 inches in length. Typically, black sea bass between one and two pounds are caught in Virginia waters.

Virginia Record: Nine pounds, eight ounces (tie) in 1987 and 1990, off Virginia Beach.

World Record: Same as above.



Black Drum

Black Drum, *Pogonias cromis*, also called banded drum or simply drum, is the largest member of the Sciaenid family of fishes which includes croaker and red drum. This species ranges from northern Argentina to New England, with the population separated into Gulf of Mexico and Atlantic coast groups. A commercial fishery exists for black drum in the mid-Atlantic states, although most catches are from the recreational anglers. Some of the

largest black drum caught in the world are from the mid-Atlantic region. Virginia catches are typically older fish, averaging around 50 pounds and 26 years of age.

The recreational black drum fishery is localized and seasonal, with most catches between May and September. This coincides with the species' seasonal migration north and inshore during the spring, and south and offshore in fall. Spawning occurs in late spring at sea, but near bays and estuaries, as far north as Delaware Bay. The Chesapeake Bay is believed to be an important spawning area for this species due to the important estuarine-dependent larval and juvenile stages. Adult drum can tolerate a vast range of salinities up to 80 parts per thousand, although generally preferring higher salinities than the juveniles. However, black drum are sensitive to temperature fluctuations and cannot survive for long in waters lower than 40° Fahrenheit.

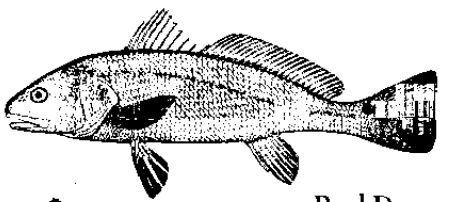
Adult black drum are bottom feeders which use their many barbels to feel along the bottom for crustaceans and mollusks. This species has unusually strong teeth in their throats which can crush the shells of crabs and oysters, making them more easily digested. One worker reported finding as much as two pounds of broken shells in many large black drum. Juveniles feed on small invertebrates such as amphipods as well as small fish.

Recreational anglers often fish with crabs, shrimp or cut fish for natural bait, although bucktails and sinking spoons are also used. Black drum often are found near breakwalls, jetties, channels, and on oyster and clam beds. Common fishing methods include slow trolling and bottom fishing.

Growth, Age, Length, and Weight: Age and growth data on black drum are limited due to difficulties in aging the caught fish with scales or otoliths (ear bones). Estimates indicate that although this species can attain over six pounds and 22 inches in three years, growth after the fourth year is far slower. The fishery is apparently driven by a few dominant year-classes, and most catches in Virginia are of older fish weighing around 50 pounds. Black drum may live for over 35 years.

Virginia Record: 111 pounds, caught off Cape Charles, in 1973.

World Record: 113 pounds, one ounce, caught off Cape Henlopen, Delaware, in 1975.



Red Drum

Red Drum, *Sciaenops ocellata*, is commonly called puppy drum or channel bass in the mid-Atlantic region. This species shares roughly the same geographic region as the black drum, although it is far less common north of Delaware. Red drum can be distinguished from black drum by its more elongated body and lack of barbels. It is also the only member of the Sciaenid family with one or more large, conspicuous spots near its tail. It is commonly caught surf fishing along the Atlantic coasts of Virginia and North Carolina.

Information on the biology of the red drum is limited, although it is believed to be similar to the black drum. Spawning occurs in coastal waters near bays and estuaries between September and February. Eggs hatch at sea, and the larvae and juveniles move into estuaries for up to eight months. Red drum school, and are found in widely varying salinities over muddy or sandy bottoms. Small red drum feed on small crustaceans and fish, while adults feed on larger fish and crabs.

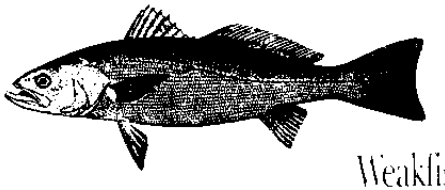
Recreational anglers often surf fish for red drum, although other methods include slow trolling and still fishing. Popular baits include cut mullet, crabs, clams, as well as a variety of artificial baits such as streamer flies, bucktails, and spoons.

Growth, Age, Length, and Weight: Data on red drum growth and age are extremely limited. Red drum may reach over 90 pounds, but most recreational catches average around 20 pounds. Average age-length relationships have

been determined for only up to 10 years, with a five year old fish at 33 inches and a 10 year old fish at 37 inches. Red drum may live up to 30 years.

Virginia Record: 85 pounds, four ounces, off Wreck Island, Eastern Shore, in 1981.

World Record: 94 pounds, two ounces, off Avon, North Carolina, in 1984.



Weakfish

Weakfish, *Cynscion regalis*, is also called gray seatrout or squeteague. Not a true trout, this species is instead a member of the Sciaenid family of drums and croaker, with similar accessory muscles which produce a loud "drumming" with their air bladders. Weakfish are found seasonally along the Atlantic coast between Maine and Florida, undergoing major migrations in spring and fall. Although they may reach 12 years of age, one and two year old fish dominate the population, with fish over four years old rare. Most weakfish are sexually mature after one year and spawn every year.

This species is highly seasonally migratory, with the extremes in its range reflecting age stratification between adults. The warming of coastal waters in the spring prompts a migration inshore and north of adults into bays and estuaries, with the oldest fish congregating at the northern edge of the range. After spawning during the summer months, weakfish generally redisperse along the inshore waters. Colder weather congregates the fish into dense schools that move offshore and southward into wintering grounds over the continental shelf off North Carolina. Weakfish generally avoid water temperatures lower than 45° Fahrenheit.

Spawning occurs in nearshore and estuarine waters between March and September, peaking in April, May, and June. Eggs are pelagic and hatch in under two days. Juveniles then move into estuaries and congregate in areas with sand or sand-grass bottoms. Weakfish juveniles also prefer higher salinities than many other fish species during initial growth. Around December, juveniles leave estuaries and move south along the shore to their overwintering grounds off Florida.

The weakfish is a common and important member of Virginia for both recreational angling and ecological reasons. Combined recreational and commercial harvests of weakfish for the Atlantic coast were over 40 million pounds in 1980, with current landings declining throughout its range. Overfishing is believed to be one cause for the decline, resulting in increasingly strict regulations for both the commercial and recreational fisheries, although new evidence indicates that the catch of juveniles as by-catch in the south Atlantic shrimp fishery may be far more damaging. Weakfish feed on crabs, shrimp, and small fishes like bay anchovy and menhaden. Ecologically, weakfish are considered the top carnivores in eelgrass habitats such as those common in the Chesapeake Bay.

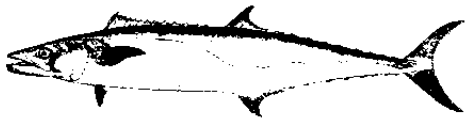
Recreational anglers often catch weakfish from both boats and shore areas using a variety of techniques, including still fishing, jigging, and surf casting. Common natural baits include shrimp, crabs, bloodworms, and minnows, while common artificial lures are spoons and bucktail jigs.

Growth, Age, Length, and Weight: Weakfish grow extremely fast, reaching seven or eight inches and around one-half pound in weight during their first year of development. Three year old fish may reach over 12 inches and over two pounds. Maximum age is believed to be 12 years, although current levels of recreational and commercial fishing reduce the average age in the population down to three or four years.

Virginia Record: 19 pounds, near the Chesapeake Bay Bridge-Tunnel, in 1979.

World Record: 19 pounds, two ounces, in the Jones Beach Inlet of

Long Island, New York, in 1984 and in Delaware Bay, in 1989.



King Mackerel

King Mackerel, *Scomberomorus cavalla*, is sometimes called kingfish or serrucho, and is part of the offshore charter boat fishery in Virginia. It is the largest mackerel in the western Atlantic, reaching a maximum size of over five feet and 100 pounds. The size of king mackerel is reflected in its scientific species name *cavalla*, which was derived from the word for "horse" in Spanish.

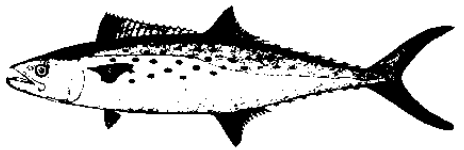
Although this species strays north to the Gulf of Maine, it prefers warm waters above 68° Fahrenheit and is therefore rarely found north of Virginia. King mackerel engage in large spring migrations along the coast between summering grounds along the mid-Atlantic coast and the south Florida wintering areas. These fish spawn multiple times over the year, and the spawning season is unusually long. The spawning season is affected by their geographic location, with individuals in Florida spawning from April to November, and more northern fish only from May to September. Juveniles are found in nearshore ocean areas, often near bays a estuaries.

King mackerel is an important commercial fish in the southern parts of the Atlantic coast, with the fishery using larger seines and pound nets. Most recreational fishing, however, is done with silver spoons or live rigs while trolling. Popular baits include menhaden and mullet on wire leaders with large hooks. The peak fishing period in Virginia waters is between May and October. Small king mackerel tend to travel in schools, while larger fish travel in small groups or individually. These fish are also attracted to the schools of bait fish often found around midwater artificial structures.

Growth, Age, Length, and Weight: Little data are available for king mackerel, although the females are believed to grow more quickly and larger than the males. This species may live for 14 years, but individuals over seven years old are rare. One year old fish are around 22 inches long and weigh about four pounds, while five year old fish are 35 inches long and weigh 14 pounds.

Virginia Record: 51 pounds, three ounces, caught in 1991 off Virginia Beach.

World Record: 90 pounds, caught in 1976 near Key West, Florida.



Spanish Mackerel

Spanish Mackerel, *Scomberomorus maculatus*, differs in many ways from its larger mackerel relative. They are schooling fish, often forming tight circles around their fish prey, and are much smaller when fully grown, averaging three to four pounds in weight. Another easily distinguishable difference is their greenish-blue coloring with striking bronze or yellow spots along their sides. Oftentimes, when fishermen detect a school, they set multiple rigs, using bucktail jigs to give the illusion of a school of prey. Anglers also catch this species from piers, bridges, and jetties because the animals' migratory patterns bring them close to shore. Primary food species include herring, menhaden, anchovies, squid, and shrimp.

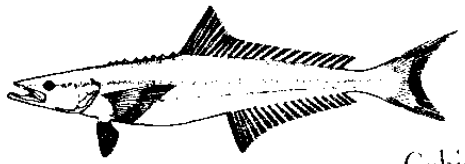
Spanish mackerel follow a similar migration pattern as king mackerel, although ranging farther north as a population in New York waters. They also migrate as large schools rather than as individuals or in small groups. Spawning is limited to early June to late August, although it is extended in the most southern parts of their range. Juveniles enter the lower reaches of estuaries, where the salinity is higher,

and remain until the start of the winter. The juvenile Spanish mackerel subsequently migrate south.

Growth, Age, Length, and Weight: The same lack of data that is found in king mackerel is also found with Spanish mackerel. Some age-length-weight data are available from piecing together different sources, and indicate a rapid growth rate throughout life. Fish one year old may grow to 12 to 15 inches, and weigh up to three pounds. These fish may live for eight years, although around 90 percent of all fish caught are three years old or younger.

Virginia Record: Nine pounds, 13 ounces, caught in 1993 off Virginia Beach.

World Record: 13 pounds, caught in 1987 in Ocracoke Inlet, North Carolina.



Cobia

Cobia, *Rachycentron canadum*, is called many different names such as ling, cabio, and crab-eater due, in part, to its circumtropical distribution. The largest specimen ever caught was in Australian waters. This is one of Virginia's few fisheries that is almost completely recreational, although there are large commercial fisheries in tropical waters for this delicious species. Individuals, or small schools called pods, migrate seasonally along the Atlantic coast. Adults apparently use the estuaries for spawning and feeding during the summer months. Cobia are frequently found near structures, such as wrecks and buoys, and swimming with sharks and other large species. They show a feeding preference for crustaceans, such as crabs and shrimp, but also eat some fish species.

Little is known about the cobia habitat and spawning requirements. Although they are found in many eastern estuaries, catch records seem to indicate a preference for higher salinities. Adults with "ripe," or full gonads are caught within the Chesapeake Bay every year, suggesting that a breeding population exists within Bay waters. Additionally, juvenile cobia are often seen in late summer months in marinas and other areas with dense structures. Cobia are thought to mature between two and three years of age.

Cobia are caught by a variety of methods, including sight casting and trolling with cut baits. Structures are favorite targets for cobia, especially in late afternoon on a rising tide. The height of the fishing season is between late May and June, although individuals remain in the Bay until late August or September.

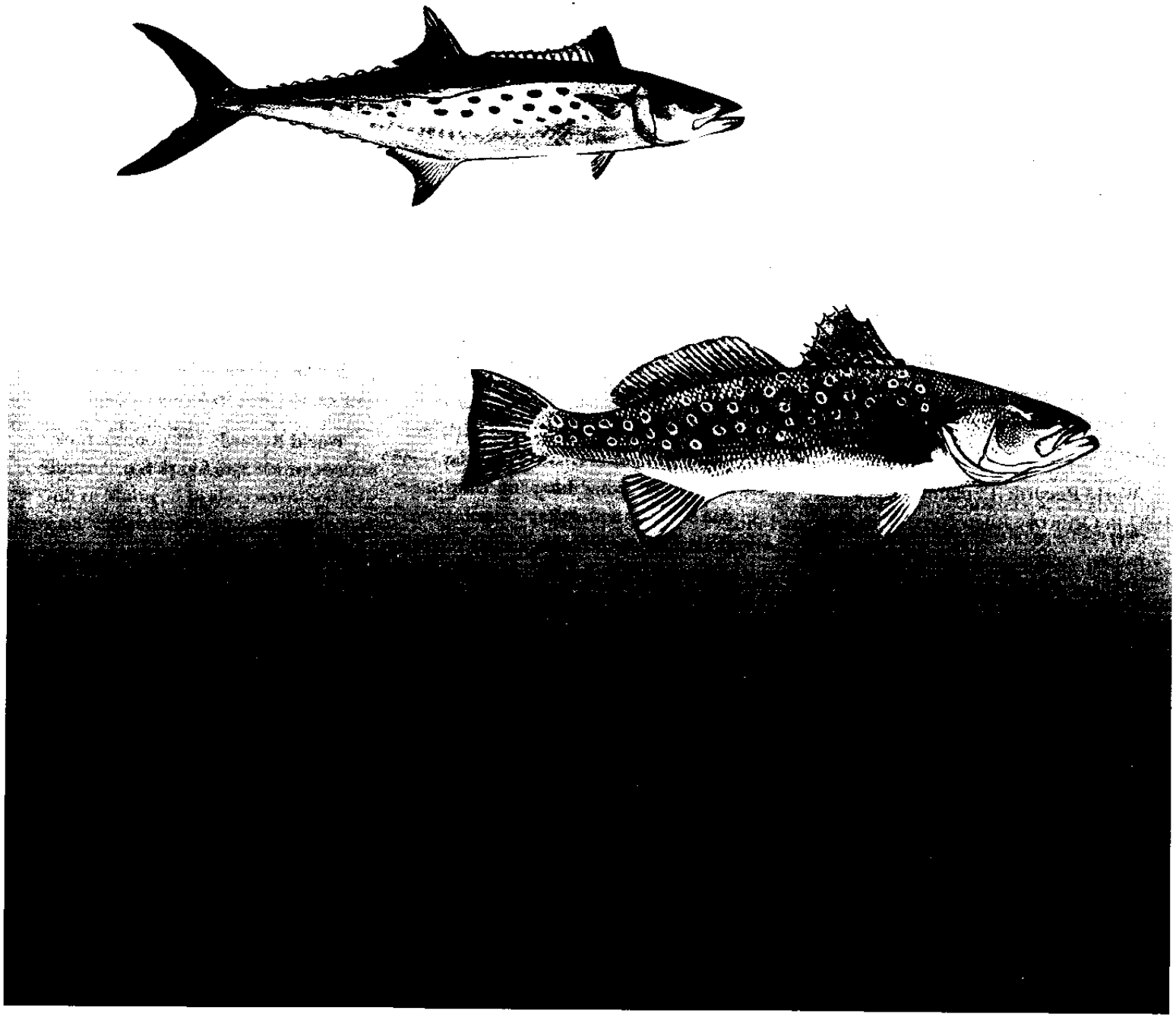
Growth, Age, Length, and Weight: Data on cobia are extremely limited. Data which are available have usually been based on studies of populations in tropical waters with typically different growth rates than those in temperate climates. Cobia may live to 15 years, reaching over 100 pounds and six feet in length. Growth as juveniles is rapid, with a one year old fish reaching 16 inches and slightly over one pound in weight, and a five year old fish reaching 49 inches and 36 pounds. A large eight year old fish may be five feet long and 70 pounds.

Virginia Record: 103 pounds, eight ounces, in 1980, in Mobjack Bay.

World Record: 135 pounds, nine ounces, in 1985, in Shark Bay, Australia.

Dolphin

Dolphin, *Coryphaena hippurus*, are often called mahi-mahi or dolphinfish in restaurants to avoid confusion with the marine mammal of the same name. This is a purely deepwater species, rarely reaching Virginia waters except within the Gulf Stream and during very warm summer months. Dolphin are a favorite target of charter boat anglers because of the animal's fighting abilities, the excellence of the meat, and the sheer



beauty of the live fish. The dolphin has been called the most beautifully colored saltwater fish, although the distinctive blue-green, turquoise, and gold coloring fades quickly after death. Males are easily distinguished by their high forehead.

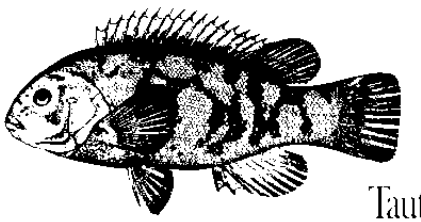
Recreational anglers often search for floating objects, heeding the dolphin attraction to anything afloat in the water, a phenomenon perhaps due to an object's resemblance to floating *Sargassum* mats. This species feeds primarily on flying fish and squid, although occasionally eating small crustaceans and human trash. One account describes lightbulbs, rope, and plastic wrappers all being found in various dolphin stomachs. Dolphin travel in schools of varying size. Spawning seasons depend strongly upon latitude, with Florida dolphin spawning between November and July, and North Carolina dolphin only in June and July. Juvenile stages are unknown, but presumably they are also attracted to *Sargassum* mats and other floating structures for protection from predators.

Dolphin are usually caught trolling from large boats, using large lures baited with cut fish. Other methods include direct casting near floating objects using live bait. If the first dolphin caught is kept in the water, the school will reportedly remain near the area.

Growth, Age, Length, and Weight: Dolphin are similar to many other open-water species in their fast growth and limited average life span of only five years. Males generally grow faster than females. Weight data are limited, but length after one year is about 34 inches, with three years at 50 inches.

Virginia Record: 71 pounds, eight ounces, in 1991 off Virginia Beach.

World Record: 87 pounds in 1976 in the Papagallo Gulf, Costa Rica.



Tautog

Tautog, *Tautoga onitis*, are often simply called tog or blackfish. They are one of only two species of wrasses caught along the temperate mid-Atlantic coast. The other closely related species is the cunner, which is generally farther north than the tautog, although there is some overlap of their ranges. Tautog are found from Nova Scotia to South Carolina in nearshore and estuarine systems with high salinities. Like tropical wrasses, tautog are structure dependent, requiring shelter areas during periods of inactivity at night. Individuals apparently move no more than a few hundred yards from their shelter site to feed on mussels and small invertebrates such as soft shell clams and shrimp. The number of available shelter sites in a particular area may ultimately determine the size of the tautog population in that area.

Tautog are seasonally migratory between perennial habitats during winter, and seasonal shelter such as eelgrass and mussel beds during summer. There are no significant habitat differences between the seasonal and perennial sites, and it is believed that seasonal habitats simply spread out the available food resources during warmer months when the fish are active. Tautog are "temperature debilitated," or inactive due to cold (torpid), during winter months. As the winter approaches, tautog move from seasonal to perennial sites where they can congregate in sheltered areas until spring. During this period, the fish very rarely feed, and larger fish become inactive before smaller ones. Generally, the larger and older the tautog, the deeper the water and habitat it will choose as a perennial shelter site.

Spawning for tautog occurs between mid-May and mid-August. They may spawn either in pairs or in small groups depending on the size of individuals. Males compete aggressively for females. Eggs and larvae are buoyant and generally confined to inshore coastal waters. Juveniles live in the same

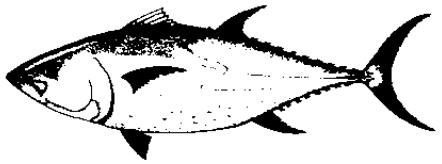
habitat as adults, although their smaller size allows for additional shelter sites within a given area. Tautog are sexually mature at three years, although they are generally a slow growing species. This characteristic makes the species very susceptible to overfishing, although few signs of this have been seen to date in Virginia.

There is a small, but dedicated, recreational fishery for tautog in Virginia. Evidence of this lies in the production of two world-record tautog from Virginia waters off the Eastern Shore. Anglers often use cut crab or mussels for bait, dangling the baited lines over likely tautog habitat such as oyster reefs, shipwrecks, rock piles, and artificial reefs. Tautog are also taken from jetties and bridge pilings where they frequently go to feed during the day. Due to their often large size, heavy rods and lines are recommended. A larger commercial fishery exists north of Virginia, using handlines and baited traps.

Growth, Age, Length, and Weight: Tautog are exceptionally slow growing, but very long lived, occasionally reaching over 30 years old and 25 pounds in weight. A one year old fish may reach 3 inches, a 10 year old fish 17 inches, a 20 year old fish 21 inches, and a 30 year old fish may reach over 36 inches.

Virginia Record: 24 pounds in 1987 off Wachapreague, Eastern Shore.

World Record: Same as Virginia record.



Tuna

Bluefin, *Thunnus thynnus*, and **Yellowfin**, *Thunnus abacares*, **Tuna** are both a highly migratory, schooling pelagic species found seasonally in Virginia offshore waters. Migrations for these species are staggering; tagging studies have indicated distances of 5,000 miles in 30 days. Both bluefin and yellowfin tunas are targets of highly intensive commercial and recreational fisheries, with hundreds of tons harvested per year from the various oceans. This intense harvesting led to the creation of an international organization known as ICCAT (the International Convention for the Conservation of Atlantic Tuna) that monitors harvests taken by the various world nations. The organization attempts to set international regulations. ICCAT programs have met with some success, although much work still is to be done.

The bluefin tuna is the largest tuna in the world, reaching over 11 feet long and 1,400 pounds. Yellowfin tuna are smaller, but still of large size and reaching into the hundreds of pounds. Diets consist of squid, eels, flying fish, and pelagic fish such as mackerels. The body forms of both species are designed for speed, with powerful, tapered bodies, upper and lower sets of finlets, and a deeply lunate (crescent-shaped) tail. Tunas also have the rare ability to keep a nearly-constant internal temperature due to special blood vessels which prevent heat loss to the surrounding water. Due to this system, however, they are generally restricted to waters above 50° Fahrenheit.

Spawning for these tunas is in the open ocean waters during the warmer months of summer when water temperatures reach 78° Fahrenheit. Most fish do not sexually mature until their second or third year. Both species have incredible reproductive potential; a 65 inch tuna may contain as many as eight million eggs. Spawning occurs at staggered intervals during the season.

Recreational angling for these species is generally done by trolling with large plastic lures with cut bait. Other methods include using live mullet or mackerel behind other lures to simulate schools of bait fish. Both tunas are only available seasonally for Virginia anglers.

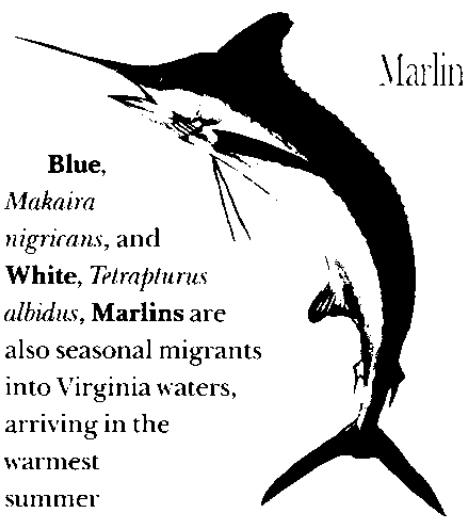
Growth, Age, Length, and Weight: These species grow very quickly, reaching 20 inches in their first year. Yellowfin tuna are over four feet long in four years, reaching over six feet and 400 pounds in their maximum age of

around eight years. Bluefin tuna reach around five feet in their fifth year, reaching over seven feet in 10 years. Unlike yellowfin tuna, bluefin tuna may live more than 20 years and attain 11 feet at 1,400 pounds.

Virginia Records: Bluefin tuna: 344 pounds in 1995 off Virginia Beach. Yellowfin tuna: 203 pounds, 12 ounces, in 1981 at the Norfolk Canyon.

World Records: Bluefin tuna: 1,496 pounds in 1979 off Nova Scotia, Canada. Yellowfin tuna: 388 pounds, 12 ounces, in 1977 off Isla San Benedicto, the Revillagigedo Islands, Mexico.

Marlin



Blue, *Makaira nigricans*, and **White**, *Tetrapturus albidus*, **Marlins** are also seasonal migrants into Virginia waters, arriving in the warmest summer months through the Gulf Stream. Distinguishing characteristics include the larger size, faint vertical stripes, and pointed fins of the blue marlin, with the white marlin generally being smaller and traveling in small groups of less than 10 individuals. The range of the blue marlin is limited to the warmer latitudes of the Atlantic, and they occasionally travel with the Gulf Stream north into Maryland and New Jersey waters. White marlin are more widely distributed in the Atlantic, and may be found between Nova Scotia and Argentina. Optimum water temperatures for these species is around 75° Fahrenheit, although they tolerate water down to 66° Fahrenheit. Both are found in the upper 100 feet of the water column and feed during daylight hours.

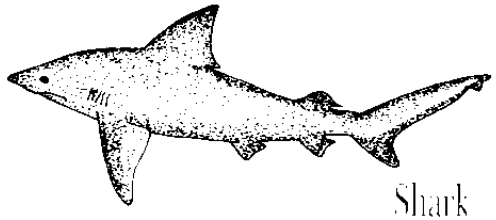
Life history information on these marlins is scarce, and little is known about spawning habits. Males generally mature faster than females, and spawning is believed to occur in the north Atlantic between July and September for the blue marlin, and during the spring months for the white marlin. Eggs and larvae are free floating. Blue marlin feed on numerous fish such as flying fish, dolphin, and mackerels, while the diet of white marlin also includes squids, triggerfish, and crabs.

Recreational anglers usually catch these species by trolling artificial and cut baits, including squid and ballyhoo. "Teaser sets" of hookless lures are often pulled in the wake to attract these fish. Heavy fishing gear is recommended, as blue marlins often weigh over 300 pounds. Handlines and longlines are occasionally used by the commercial fishery in Caribbean waters.

Growth, Age, Length, and Weight: Little is known about the growth patterns of either species. Like many other pelagic species, both marlin are fast growing, although age-weight data are unavailable. Maximum size for the blue marlin is over 13 feet and 1,300 pounds, and they are believed to live over 15 years. The white marlin is much smaller at a nine feet maximum length and 165 pound maximum weight. White marlin also only reach about six years of age.

Virginia Record: Blue marlin: 1,093 pounds, 12 ounces, in 1978 at the Norfolk Canyon. White marlin: 131 pounds, 10 ounces, in 1978 off Virginia Beach.

World Record: Blue marlin: 1,402 pounds, two ounces, in 1992 off Vitoria, Brazil. White marlin: 181 pounds, 14 ounces, in 1979 off Vitoria, Brazil.



Shark

Sharks, were long considered trash fish until the late 1970s, when the motion picture *Jaws* began to focus public attention on these fish. All sharks are elasmobranchs, with cartilage instead of true bone, and are related to skates and rays. A common misconception is that sharks are scavengers or indiscriminate killers. Actually, most shark species are selective, efficient predators with highly specialized teeth and jaw structures. Sensationalism about sharks had an unfortunate side effect of allowing and even encouraging a widespread, uncontrolled recreational harvest of all the shark species.

A commercial shark fishery has developed in the past decade which targets smaller sharks in Virginia Bay waters. This fishery uses nets or a "longline" or mile-long heavy line with baited hooks every 15 feet or so. In addition to the sharks, this method also catches skates, rays, and other large fish. The effects of removing these animals from their ecosystems are not well understood, but may affect the whole ecosystem in many coastal areas.

The Chesapeake Bay and barrier island lagoons on the Eastern Shore are major "pupping" grounds for some shark species which have very few young per year but deliver them live instead of as eggs. New regulations by the VMRC are being proposed to limit the harvest of sharks in Virginia's Chesapeake Bay waters.

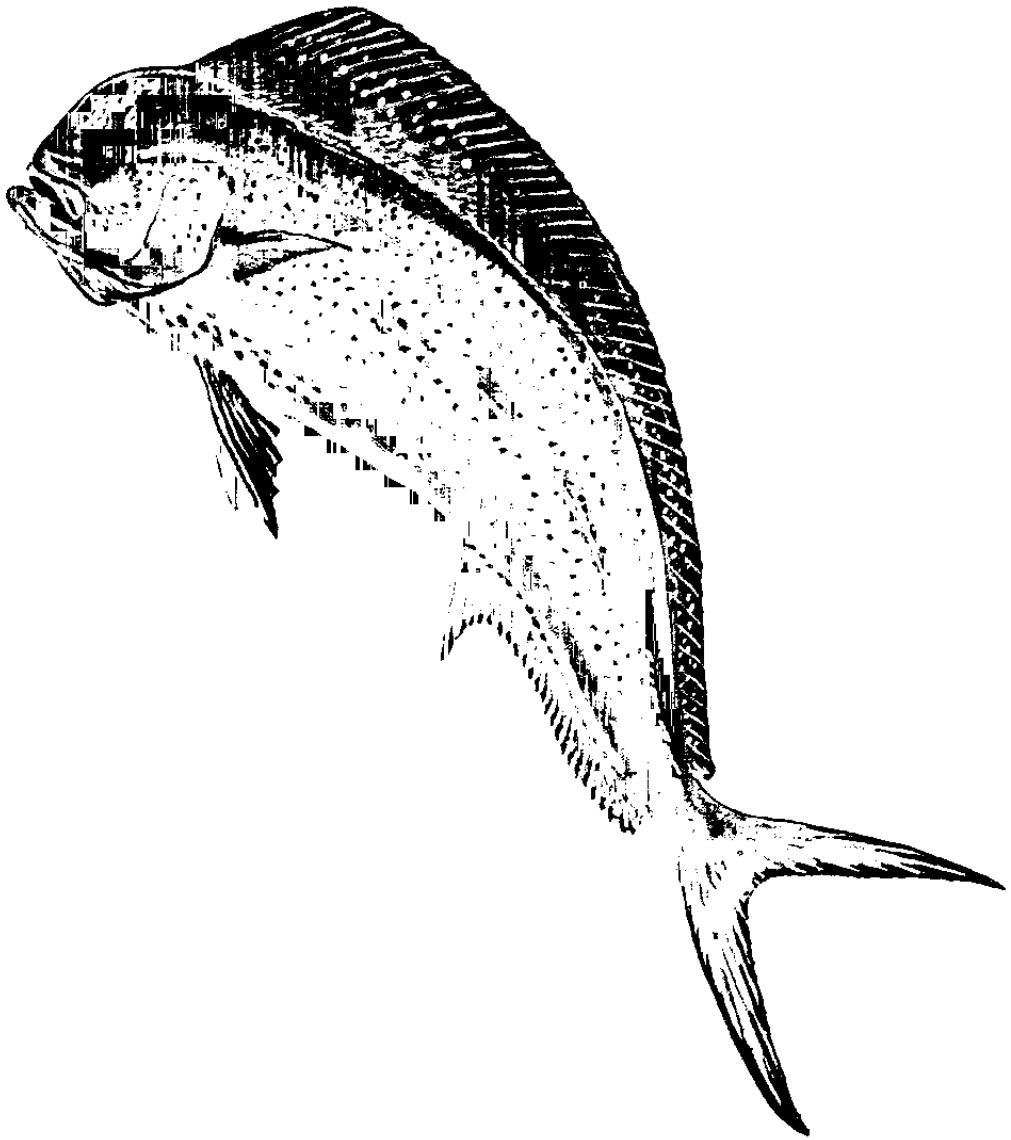
The recreational shark fishery in Virginia is centered on the coast, as most sharks are exclusively salt water species. The major species sought-after by anglers include: blue, dusky, mako, tiger, and white. For a time, major shark tournaments were held in the Virginia Beach/ Norfolk area, although declines in the numbers of trophy-sized sharks have caused the contests to be discontinued in recent years. When hooked, many sharks are reported to put up as much—if not more—of a fight than billfish or tuna.

Fishing for sharks is varied, owing to the many different species of sharks and habitats. Surf fishing attracts some of the more daring souls, and one guide even recommended wading out into the surf at night to lay out freshly-baited hooks on wire lines for large hammerheads. Regardless of the method used to lay out the bait, heavy lines with large reels and thick rods are recommended. Another guide noted that some of the Outer Banks "regulars" who fish for sharks have taken to bolting a fighting chair to the beds of their four-wheel-drive vehicles and driving almost to the water's edge. Pier fishing and charter fishing anglers also use freshly cut bait and wire leaders. Many shark species are now included in national tagging programs, and release is encouraged.

Growth, Age, Length, and Weight: Growth of most shark species is extremely slow, taking on average over 15 years to mature. In addition to the slow growth rates, many sharks only mate every other year, bear their young alive and may hold their pups internally for about one year. Finally, many species only produce eight to ten young at a time. (These characteristics are actually more similar to animals such as whales and elephants than other fish.) Sharks are generally long-lived species, and may reach weights into the hundreds of pounds when fully-grown.

Virginia Records: Blue—266 pounds off The Cigar formation, in 1987. Dusky—673 pounds off the S.E. Lumps, in 1982. Mako—728 pounds off the Chesapeake Light Tower, in 1983. Tiger—1,099 pounds, 12 ounces, off the S.E. Lumps, in 1981. White—131 pounds off the S.E. Lumps, in 1981.

World Records: Blue—437 pounds in 1976 in Catherine Bay, N.S.W., Australia. Shortfin Mako—1,115 pounds in 1988 in the Black River, Mauritius. Tiger—1,780 pounds in 1964 off Cherry Grove, South Carolina. White—2,664 pounds in 1959 off Ceduna, Australia. Dusky records are not kept by the IGFA.



Saltwater Angling in Virginia

Participation and Avidity

Coastal residents typically account for about 56 percent of Virginia's saltwater anglers. Residents from other states account for approximately 36 percent of all Virginia saltwater anglers. Only about eight percent of the total number of saltwater anglers are non-coastal residents of Virginia.

How many saltwater anglers are there in Virginia and how many trips did they take? In 1981, the National Marine Fisheries Service determined that 811,900 individuals went saltwater angling in Virginia. The next year, 1982, nearly 1.1 million individuals participated in saltwater angling in Virginia [Figure 1]. Since 1982, the number of individuals angling in Virginia ranged between 720,000 in 1986, to 380,300 in 1992. The number of individuals saltwater angling in Virginia in 1994 and 1995 was, respectively, 565,900 and 555,400.

Given the continued population increase in Virginia, it is surprising that the number of saltwater anglers has not consistently increased over time. Recreational angling, like many other leisure activities, is likely to be sensitive to changes in the population, the economy, resource availability, and fishery regulations. In 1983, a total of 1.4 million anglers engaged in saltwater fishing in Virginia. In 1984, the number of anglers declined to 559,000. The sudden and large decline is thought to be related to increased regulations on the recreational catching of striped bass.

For the purposes of economic development and determining the importance of recreational angling to the state's economy, it is important to know whether or not the anglers are coastal residents, non-coastal residents, or residents of other states. Knowing the residence of anglers permits various state tourism and economic development boards to better target potential markets. By and large, most of the saltwater anglers are coastal residents; this should not be too surprising since coastal residents typically have greater access to angling and are likely to be more interested in saltwater angling. Coastal residents typically account for about 56 percent of Virginia's saltwater anglers [Figure 2]. Residents from other states account for approximately 36 percent of all Virginia saltwater anglers. Only about eight percent of the total number of saltwater anglers are non-coastal residents of Virginia.

Figure 1. Number of Individuals Participating in Saltwater Angling in Virginia, 1981-1995

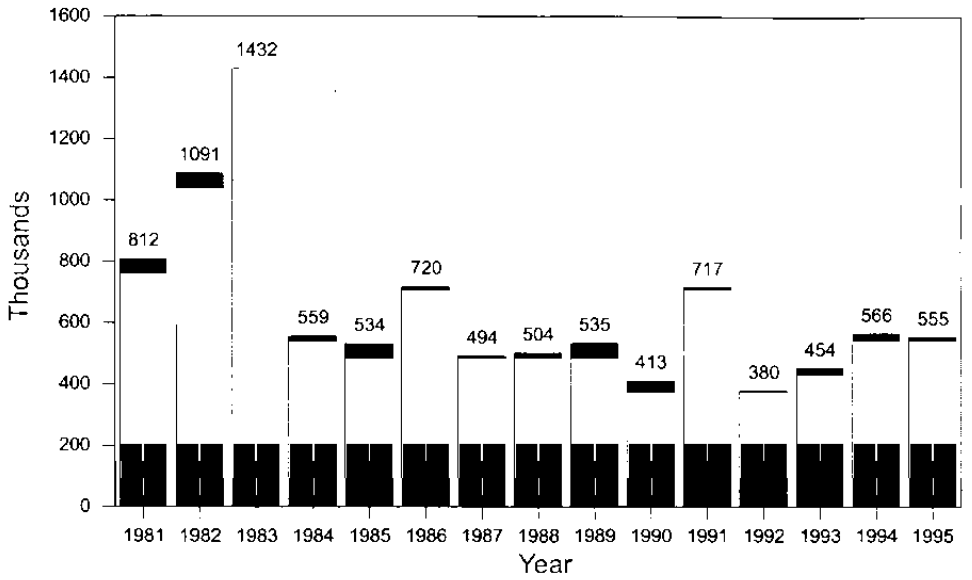
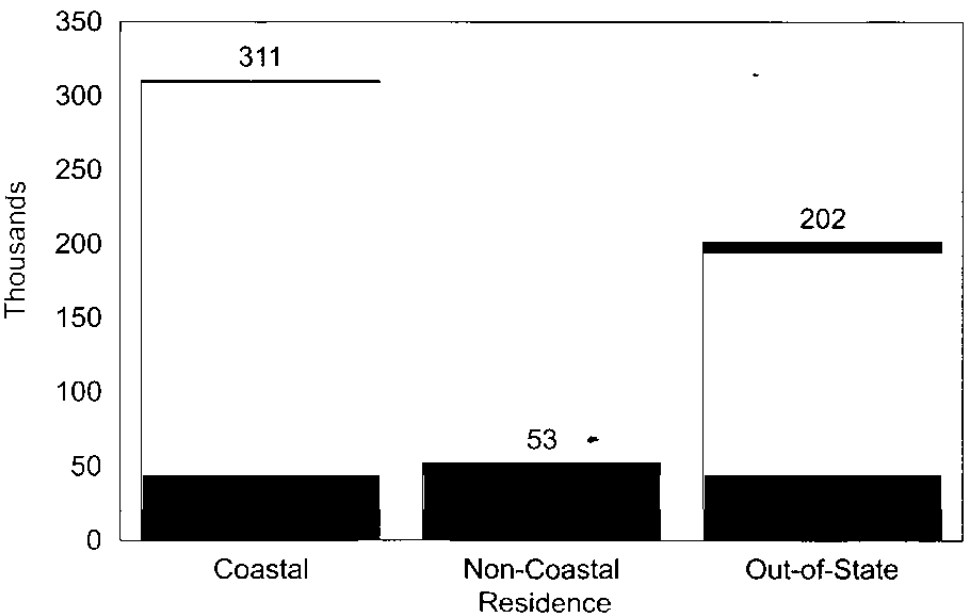


Figure 2. Distribution of Virginia Saltwater Anglers by Residence, 1994



Over time, there have been changes in the number of anglers and in the number of saltwater angling trips. In 1981, saltwater anglers made 2.8 million trips in Virginia [Figure 3]. Alternatively, the average number of trips per angler was 3.5 in 1981. In 1983, the year in which there was the larger number of anglers, saltwater anglers made nearly four million trips, and the average number of trips per angler was 2.8. Anglers made 2.6 and 2.9 million trips, respectively, in 1994 and 1995. The number of trips per saltwater angler, however, increased to 4.7 and 5.2 in 1994 and 1995. Overall, the number of trips per angler increased at the rate of 3.5 percent per year between 1981 and 1995 [Figure 4].

Fishing Mode

In determining the contributions which recreational angling makes to the economy of Virginia, it is imperative that the number of trips by mode of fishing be known. Different modes of angling typically imply different types and levels of trip expenditures. There are at least three basic modes of saltwater angling: (1) shore fishing which includes fishing from man-made facilities such as piers and bridges, and natural structures such as beaches and banks, (2) party and charter boats, and (3) private and rental boats.

In Virginia, a clear majority of saltwater trips have been made from

Figure 3. Number of Saltwater Angling Trips in Virginia, 1981-1995

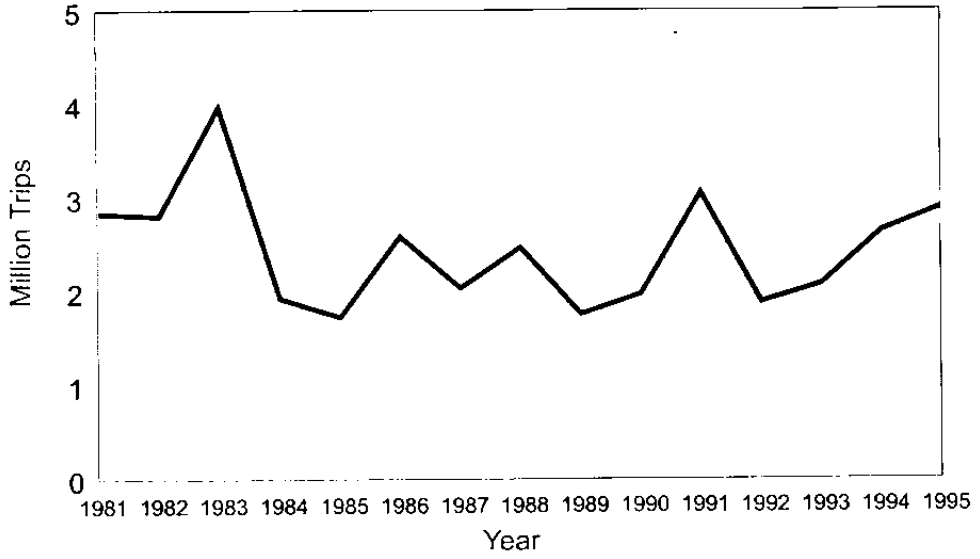
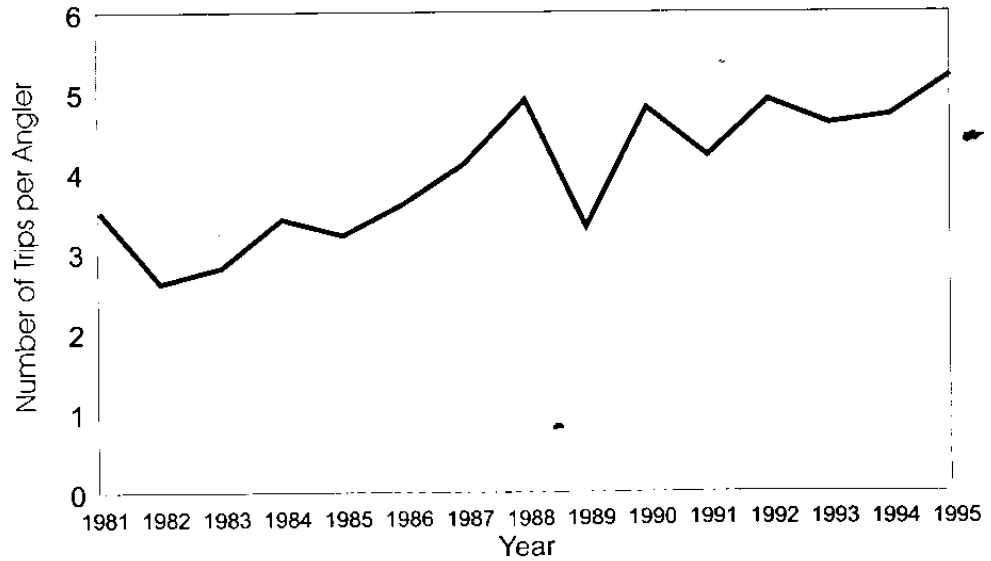


Figure 4. Number of Virginia Saltwater Trips Per Angler, 1981-1994



private and rental boats. Historically, trips taken aboard private and rental boats have accounted for about 54.5 percent of all saltwater trips [Figure 5]. Fishing trips from the beach and various man-made facilities have been responsible for approximately 31.9 percent of all trips. Trips on party and charter boats have made up about 13.7 percent of all saltwater fishing trips in Virginia.

Over time, however, there have been major changes in the anglers' modes of fishing. Typically, party and charter boat trips have accounted for less than 10 percent of all trips. In 1982, 1986, and 1987, trips taken from party and charter boats were responsible for more than 40 percent of all saltwater trips. In those years, the number of trips taken aboard party boats was considerably higher than in the other years [Figure 6].

In those same years in which party and charter boat trips accounted for more than 40 percent of all trips, there was a change in the number of trips made aboard private and rental boats [Figure 7]. Between 1981 and 1987, the number of trips taken with private and rental boats was typically fewer than 1.3 million trips. Trips aboard private and rental boats, though, increased to 1.7 million in 1986. Since 1988, the average number of trips taken aboard private and rental boats has been 1.5 million per year; the average number of trips

Figure 5. Historical Percentage of Trips by Fishing Mode, 1981-1995

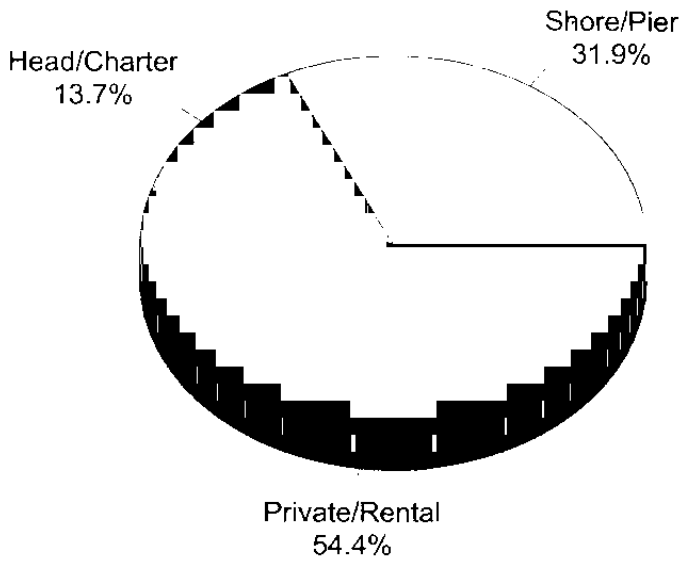
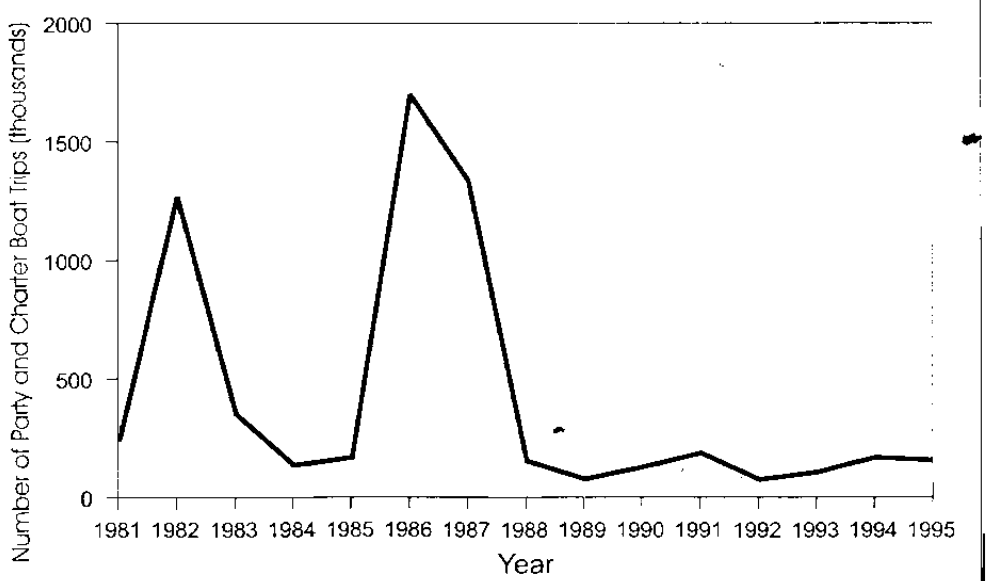


Figure 6. Number of Angling Trips on Party and Charter Boats, 1981-1995



per year aboard private and rental boats between 1981 and 1987 was 1.2 million.

Shore fishing, like private and rental boat fishing, largely depends upon access. Shore fishing, in fact, depends substantially more on access than does fishing aboard private and rental boats. Since 1981, and except for the years 1981, 1983, 1991, and 1995, there has not been a substantial change in the number of fishing trips taken from the shore [Figure 8]. The number of shore-based trips, in fact, has varied little. The mean number of trips per year in all years except 1981, 1983, 1991, and 1995 was 623,000; the variation relative to the mean was only 14.7 percent. The mean number of shore-based trips for the years 1981, 1983, 1991, 1995 was 1.4 million.

Species and Catches

In 1982 and 1995, the total number of fish caught by recreational anglers was relatively unchanged—slightly more than 25 million in each year. Between the years, however, the number of fish caught widely varied. In 1983, anglers caught approximately 42 million fish, and in 1989, anglers caught slightly less than 15 million fish [Figure 9].

Over the years, there has been substantial variation in the composition of the various species caught by anglers [Figure 10]. In the early 1980s, bluefish was the major recreational species. From 1992, bluefish failed to be one of

the top five fish caught by recreational anglers. Croaker and spot have traditionally been the major species caught in terms of number of fish caught.

The top five species, in terms of number of fish caught, have traditionally been croaker, spot, summer flounder, black sea bass, and seatrout. Numerous factors have been responsible for changes in the number of fish caught, such as the need for specialized equipment or tackle, fishery regulations, and the availability and abundance of species.

The predominant or preferred recreational species, as indicated by number of fish caught, have slightly changed in the past 15 years. Although there are occasional intrusions into the list, as noted above, the main species are black sea bass, summer flounder, spot, croaker, bluefish, and weakfish. Of these, bluefish and weakfish are the most variable, with both species occasionally barely missing inclusion. Overall trends indicate a nearly ten-fold increase in croaker landings, a decrease in spot, and small increases in the catches of summer flounder and black sea bass. The catch of striped bass is included for comparison purposes in Figure 11 because of its widespread popularity and likely increased emphasis by anglers. Although still small by comparison, striped bass landings went from 11,997 fish in 1983 to 518,319 fish in 1995.

Figure 7. Number of Angling Trips From Private and Rental Boats, 1981-1995

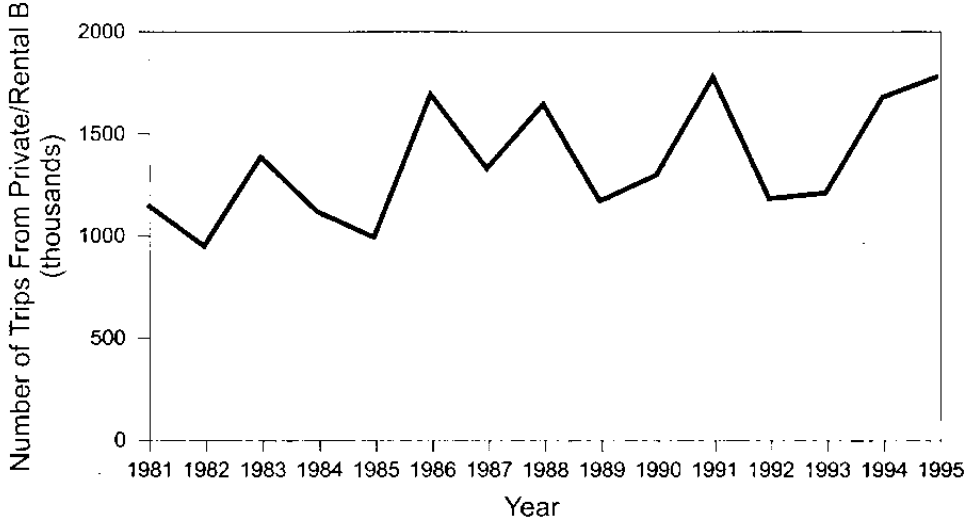
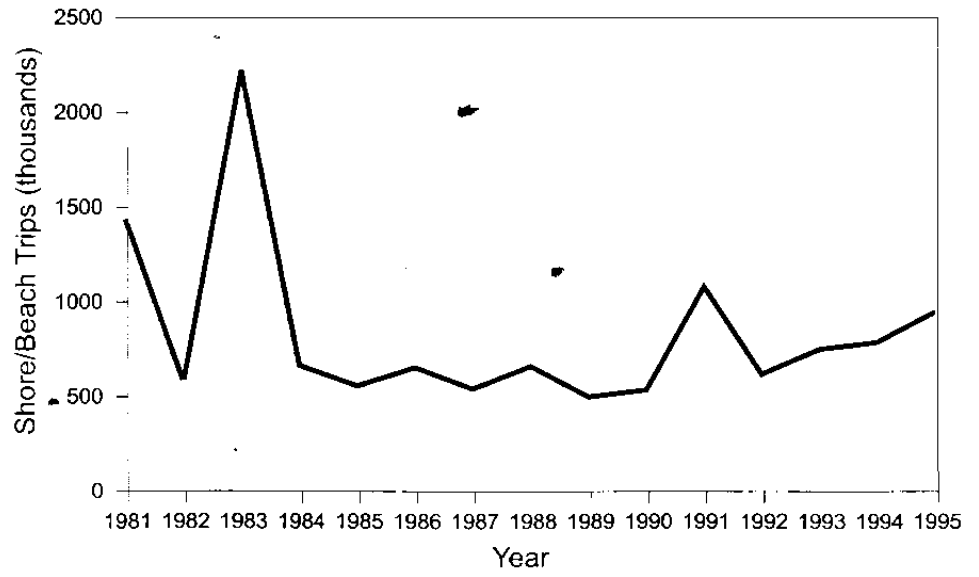


Figure 8. Number of Angling Trips From Shore and Piers, 1981-1995



Of the various species caught by anglers, Atlantic croaker and striped bass have shown the most consistent upward trend in terms of number of fish caught [Figure 11]. In 1982, the total number of croaker caught was slightly more than 1.5 million; in 1995, saltwater anglers caught approximately 11 million croaker. In 1983, the number of striped bass caught was less than 10,000 fish; in 1995, anglers took about 550,000 striped bass—a 5,400 percent increase. The recreational catch of striped bass, however, has been tightly regulated, and only during the past few years have anglers been allowed to increase their take of striped bass.

There is also an occasional large catch of some species such as Atlantic mackerel or pigfish, which may be a reflection of an extremely strong year-class or simply unusually favorable fishing conditions, such as a change in migratory routes closer to shore. These are not indicative of major changes within the recreational angling public, although they are often in the top ten. In this study, the occasional species are collapsed or aggregated into an "Other Species" category.

The number of fish caught is not necessarily indicative of the species targeted by anglers. For example, large numbers of toadfishes were caught in 1981 and 1985. While this fish is said to be good eating, very few people—if any—actually take recreational fishing

Figure 9. Total Number of Fish Caught by Saltwater Anglers, 1981-1995

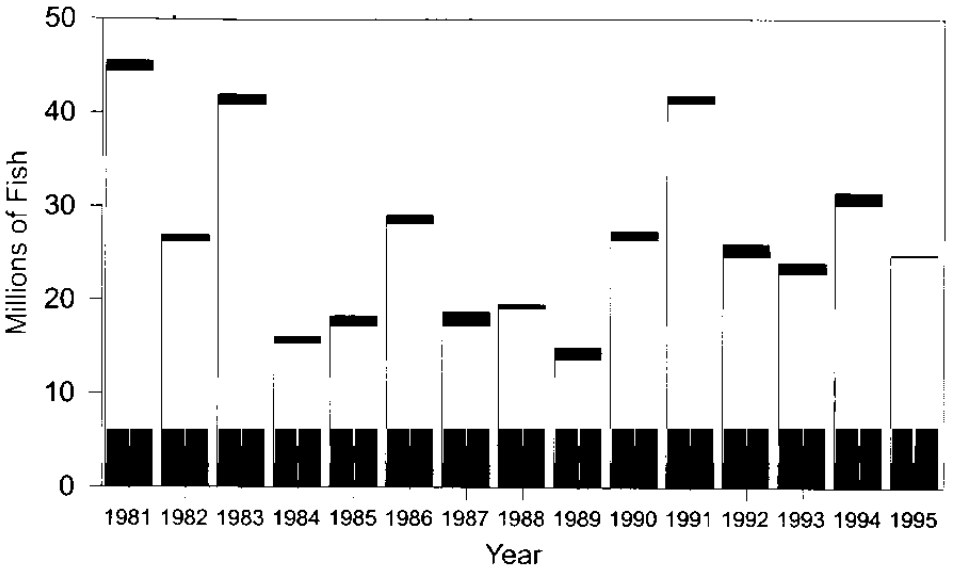


Figure 10. Percentage of Total Catch of Top Five Recreational Species, 1981-1995

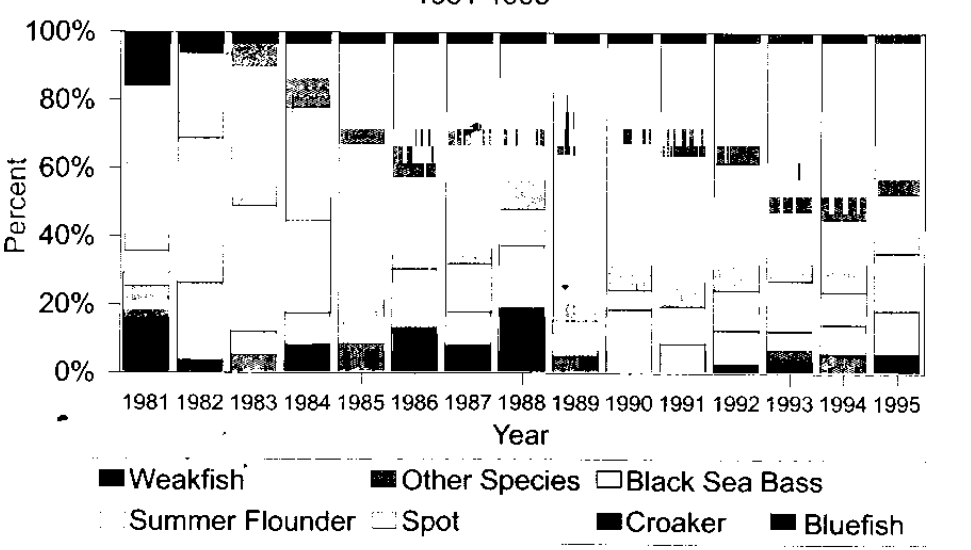


Figure 11. Number of Fish Caught by Recreational Anglers, Selected Species, 1981-1995.

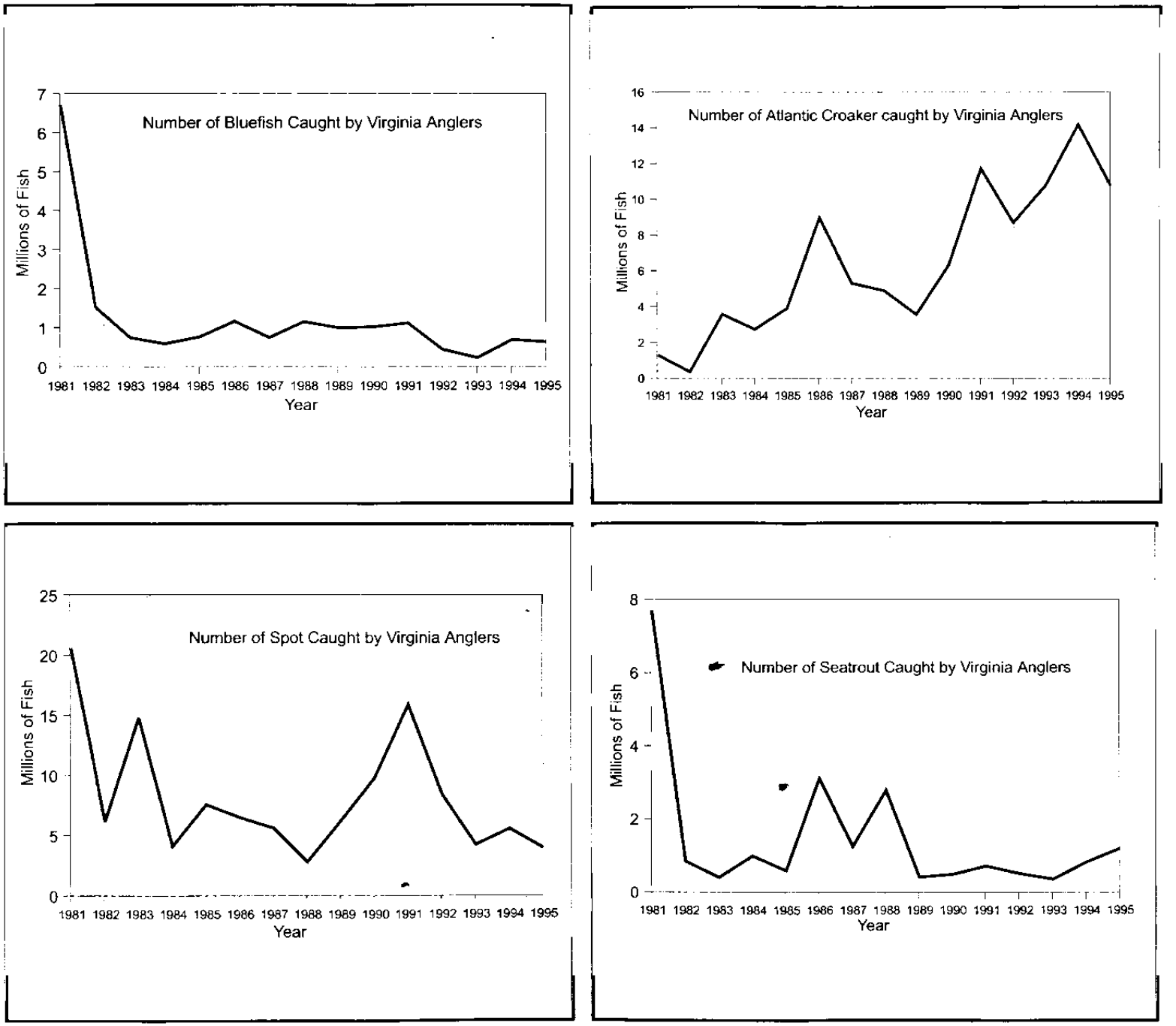
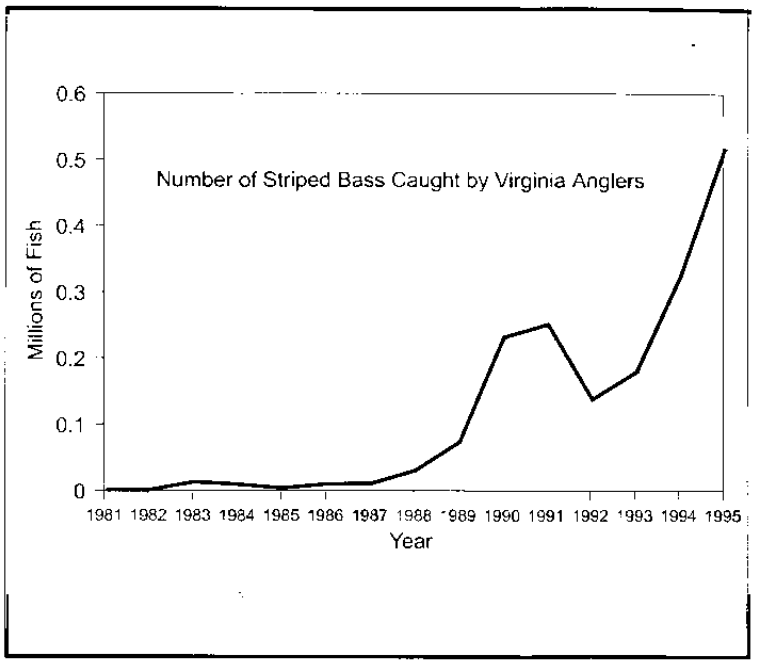
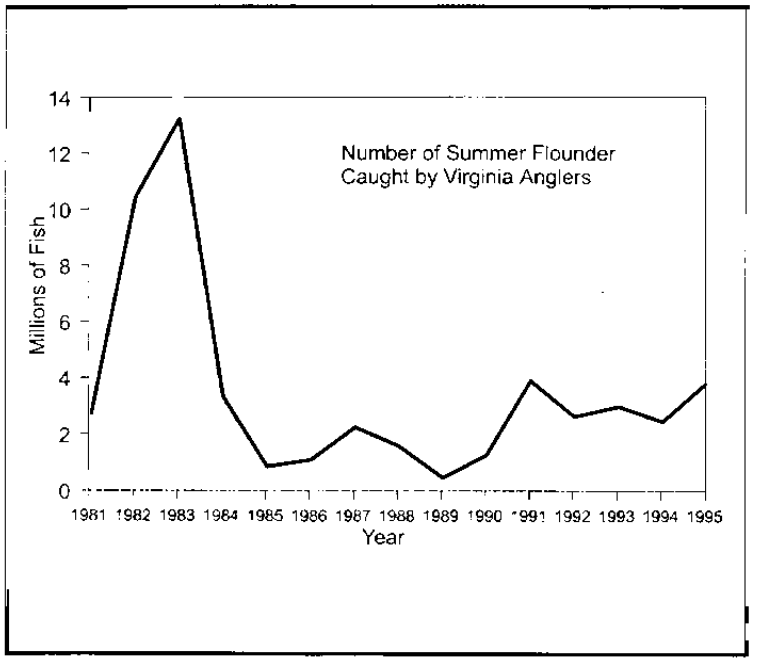
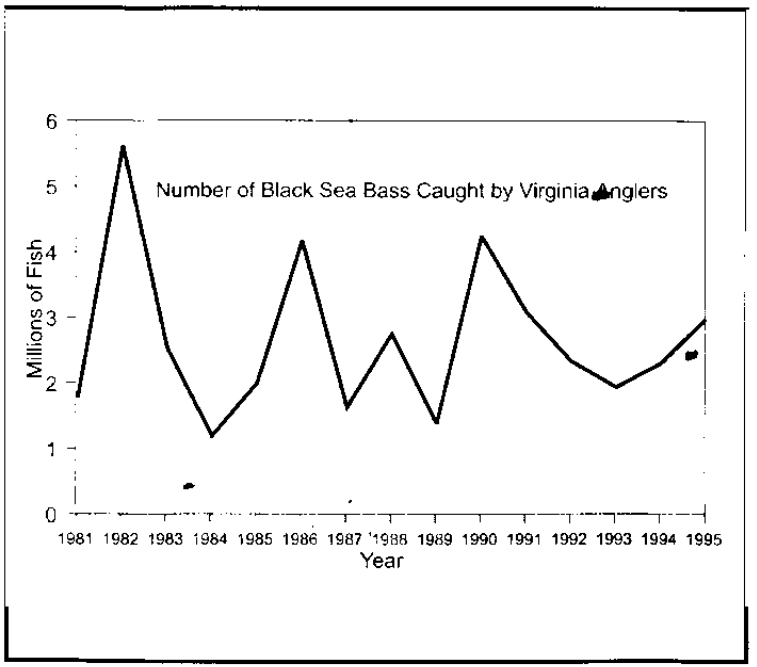


Figure 11. Number of Fish Caught by Recreational Anglers, Selected Species, 1981-1995 (continued).







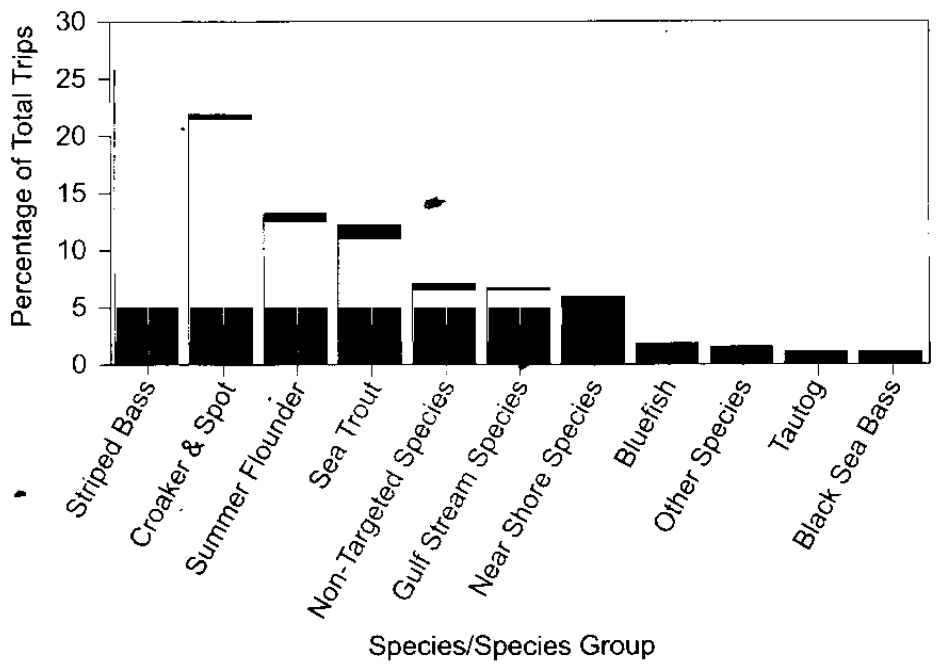
trips specifically to catch toadfishes. The composition of the top five caught fish species is also subject to what the respondents claim to have caught. For example, anglers may go on a trip to catch flounder, and in the process of catching three very large flounder, they also catch three or four small oyster toadfish. These respondents, when asked to describe the fish caught, will most likely only retain a fleeting memory of these toadfish when contrasted with the large flounder.

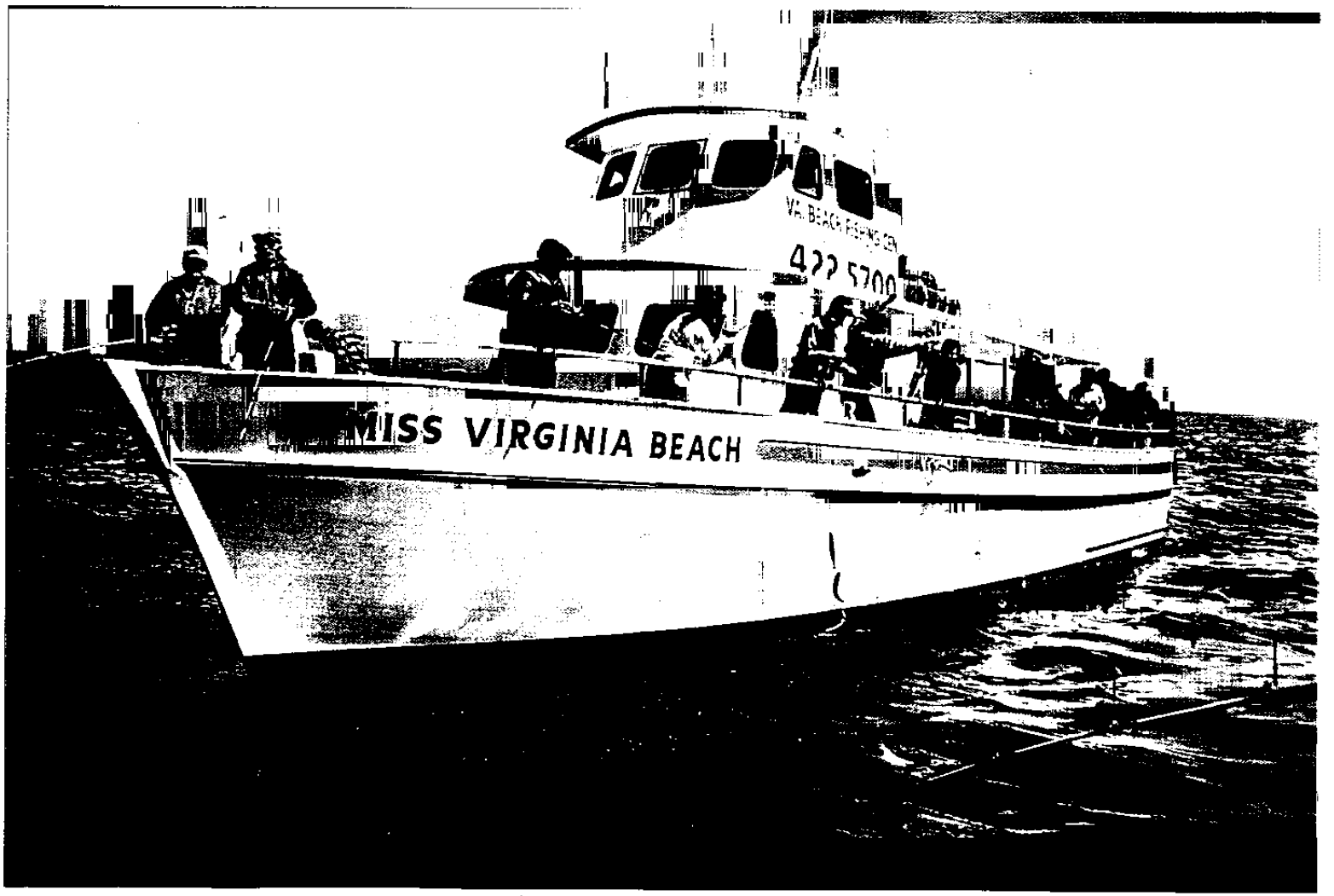
Directed Fishing Activities

The term "directed fishing activities" refers to trips whose sole purpose was fishing for a specific species. This is a fairly specific criteria, and is often difficult to directly measure. The National Marine Fisheries Service does not maintain historical data on directed trips by species, although it does maintain other data on recreational angling. Due to this lack of data, it was necessary for this study to develop estimates of these directed activities using returned response forms.

Of the specific targeted species in 1994, striped bass clearly comes out on top, especially considering that "Croaker, Spot, and Scup," the next closest group, includes three species. Summer flounder and sea trout also have high numbers of directed trips attributed to them [Figure 12]. There are many suggested reasons for these species being predominant, such as their ease of capture and widespread availability within Virginia waters. There are also categories for "Other Species" and "Non-targeted Species" to account for other species which are targeted by only a few anglers or those who do not target distinct species (i.e., the angler may not care what type of fish is caught).

Figure 12. Percentage of Species-Specific Directed Virginia Angling Trips, 1994




MISS VIRGINIA BEACH

The Economic Importance Of Saltwater Angling

The National Marine Fisheries Service estimates that approximately 565,871 individual anglers made 2.6 million saltwater fishing trips in Virginia waters, or from Virginia ports in 1994. Recreational anglers spent more than $303 million in 1994. Expenditures generated full-time employment opportunities for more than 10,900 individuals.

Assessing the Economic Importance

Although it is widely accepted that saltwater angling is an important leisure outlet for many individuals, it is less well understood that saltwater angling is important to the economies of numerous Virginia counties and the state. Individuals purchase goods and services in order to engage in recreational angling. For example, anglers purchase bait, food, groceries, beverages, boats, fishing tackle, and rods and reels. Anglers also often dine at restaurants and stay at motels and hotels. Virginia anglers who own fishing boats have to regularly pay personal property taxes on their boats. Some anglers keep their boats at marinas, either in dry storage or in a slip. Many anglers charter boats to go fishing. Other anglers may make trips aboard party or head boats.

All the businesses which provide goods and services to anglers also must purchase goods and services and hire labor. In turn, labor spends household income on living expenses which generates more sales, income, and employment in the economy. In this report, the importance of angling is depicted in terms of output or sales, income, and employment. The importance of saltwater angling, however, is not just the amount of sales, income, and employment generated by angling, but it is also the economic benefit derived from angling. That is, anglers receive benefits well in excess of their expenditures.

In this report, the importance of saltwater angling is determined via an input/output (I/O) analysis. An I/O analysis facilitates the tracking of expenditures by anglers, support businesses, and individuals employed in support businesses, and the subsequent calculation of total sales, income, and employment generated by angler expenditures and households deriving income from angling. The economic importance or impacts are assessed at the state level relative to all species and types of recreational angling, individual species or species groupings, modes or types of angling, and various counties or groupings of counties and municipalities.

The species or species groupings are as follows: (1) rockfish or striped bass; (2) spot, croaker, and scup; (3) bluefish; (4) flounder; (5) tautog; (6) black sea bass; (7) weakfish and gray trout, and speckled or spotted seatrout; (8) near shore species which include cobia, dolphin, wahoo, king mackerel, and sharks; (9) Gulf Stream species which include marlin, sailfish, tuna, dolphin, and shark; (10) no particular species, or random; and (11) all other species. The modes or types of fishing examined are as follows: (1) charter boat; (2) head boat; (3) rental boat; (4) shore, pier, beach, and bank; and (5) privately-owned boat. Although there are 25 county and municipality possible groupings, the following groupings are used: (1) Chesapeake and Virginia Beach; (2) Hampton, Norfolk, Suffolk, and York; (3) Gloucester, Mathews, and Middlesex; (4) Accomack and Northampton; (5) Charles City, Isle of Wight, James City, Newport News, Prince George, and Surry; (6) Essex, King George, Richmond, and Westmoreland; (7) Lancaster and Northumberland; and (8) all other Virginia counties and cities.

Three levels of impacts are considered for the input/output analysis: (1) direct impacts, (2) indirect impacts, and (3) induced impacts. The direct impacts reflect the sales, income, and employment generated directly by anglers purchasing goods and services (e.g., grocery store clerk selling groceries to angler). The indirect impacts reflect the sales, income, and employment generated by the support businesses buying goods and services (e.g., the grocery store must purchase groceries from wholesalers and electricity from the power company). The induced impacts indicate the sales, income, and employment generated by workers in the direct and indirect sectors buying goods and services (e.g., the grocery store clerk buys groceries and pays a utility bill).

All impacts reflect the sales, income, and person-years of employment generated for the Virginia economy. Sales or output is a measure of the total dollar sales generated because of recreational angling in Virginia. Income is a measure of wages, salaries, bonuses, and profit generated by angler expenditures to engage in saltwater angling. Employment is measured in terms of person-years of employment; this is essential in order to provide some standardization of individuals employed because of saltwater angling in Virginia.

Data used to assess the economic impacts were obtained from several sources. First, a mail survey was used to collect information about angling expenditures, boat ownership and use, and fishing patterns. A direct intercept survey was also used to obtain information about expenditures and species sought. In addition, a telephone survey of individuals contacted in the intercept survey was used to obtain more detailed information on recreational fishing expenditures and patterns.

The mail survey required mailing a questionnaire to about 14,000 individuals in state and out of state. The list of names and addresses for about 12,000 in-state and out-of-state anglers was obtained from the list of saltwater license holders, which was available from the Virginia Marine Resources Commission. In addition, the names and addresses of about 2,000 individuals were obtained from the Virginia Citation program. The response rate to the mail survey was about 40 percent. The intercept and telephone survey obtained information from about 5,000 individuals. Last, several charter boat and head boat companies were surveyed to obtain additional information about costs and revenues related to charter and head boat operations.

Each impact assessment involves 31 expenditure categories. Given that there are 31 expenditure categories, the impact assessment for any one species, geographical area, or mode of fishing is seven pages long. Because of the length of each impact assessment, it was necessary to condense the presentation of the analysis. Thus, direct, indirect, and induced impacts are presented only for the state level of aggregation; they are not presented for other aggregations of the saltwater fishery of Virginia (e.g., fishing mode, species, and geographical area). To do so would require more than 1,600 pages.

The Economic Importance of Angling

Expenditures by Anglers

The National Marine Fisheries Service (NMFS) estimates that approximately 565,871 individual anglers made 2.6 million saltwater fishing trips in Virginia waters, or from Virginia ports in 1994. Of the total number of anglers, about 311,112 individuals were coastal residents, 53,131 individuals were non-coastal residents, and 201,628 individuals were residents of other states. Relative to the 2.6 million trips, NMFS estimates that 788,387 trips were on-shore or from piers, 163,523 trips were aboard party and charter boats, and 1.7 million trips were on private or rental boats.

In 1994, anglers spent approximately $303.5 million on saltwater sport fishing in Virginia [Figure 13]. The largest expenditure items—restaurant meals, groceries, lodging, private automobile, fishing tackle, boat fuel and oil, and boat loans and purchases—accounted for 64.4 percent of total expenditures. Unfortunately, many of the dollars spent on the major expenditure categories actually leave the state. For example, expenditures on boat and fuel oil equaled $19.6 million but only $5.9 million remained in state or affected the Virginia economy in 1994; most petroleum products are produced outside the state of Virginia. A similar situation characterizes the sale of new boats. In 1994, saltwater anglers spent $46.9 million to purchase new boats for saltwater angling. Of the total dollar value of new boat purchases, only $7.4 million affected the Virginia economy; the remaining balance affected the economies of other states and nations. Out of the total $303.5 million worth of expenditures by saltwater anglers, $191.5 million directly affected the economy of Virginia in 1994 [Table 1].

Figure 13. Expenditures by Saltwater Anglers

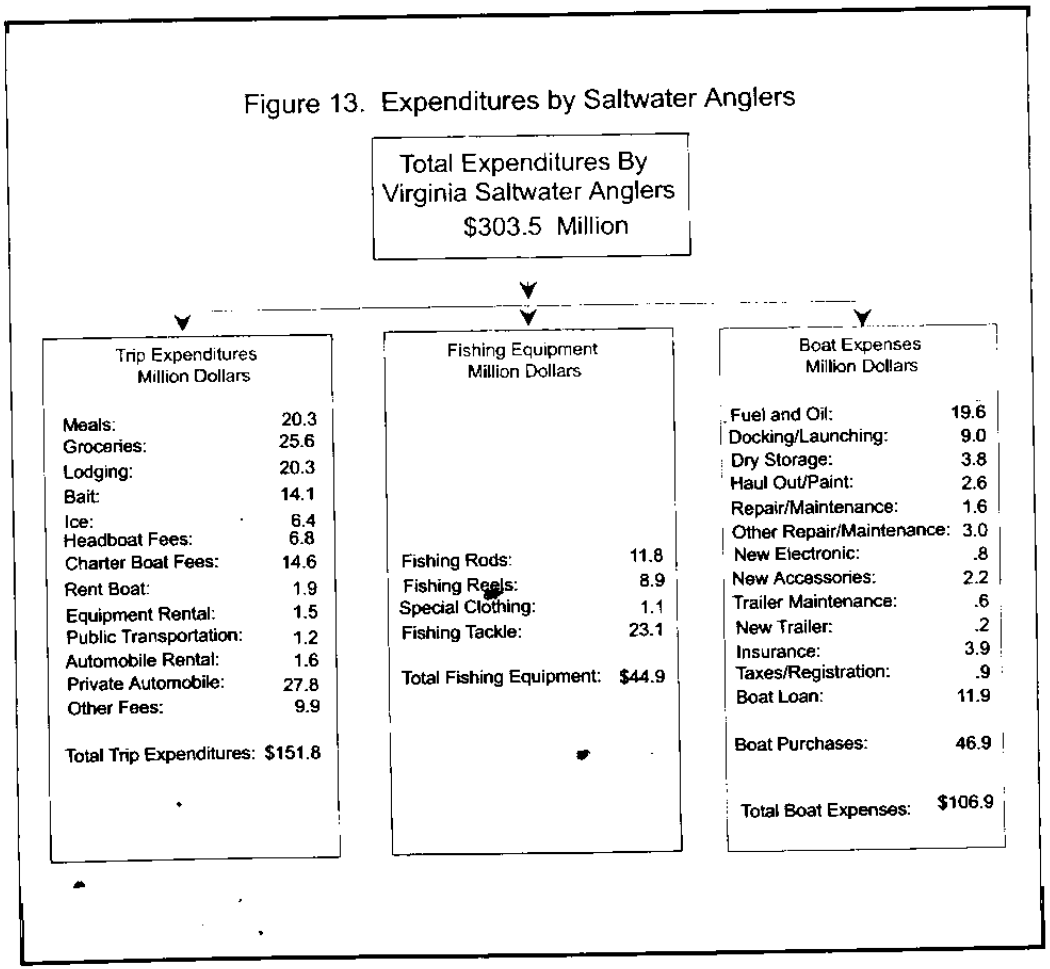


Table 1. Expenditures by Saltwater Recreational Anglers, 1994
(Thousand Dollars)

Expenditure Category	Expenditures	Direct/In-State
Meals	20,314	20,314
Groceries	25,611	16,674
Lodging	20,323	20,323
Bait	14,093	6,158
Ice	6,117	6,041
Head Boat	6,761	6,761
Charter Boat	14,567	14,567
Rental Boat	1,904	1,904
Equipment Rental	1,511	1,511
Public Transportation	1,196	726
Rental Automobile	1,596	1,119
Private Automobile	27,835	12,694
Other Fees	9,940	9,940
Total Fishing Trip Expenses:	151,768	118,733
Fishing Rods	11,799	5,768
Fishing Reels	8,850	4,327
Special Clothing	1,118	946
Tackle	23,102	11,296
Total Equipment/Clothes:	44,869	22,337
Boat Fuel and Oil	19,589	5,913
Docking/Launching Fees	8,957	8,957
Dry Storage	3,796	3,796
Haul Out/Bottom Paint	2,584	2,584
Engine Repair/Maintenance	1,591	1,414
Other Hull/Electronic R&M	3,005	2,856
New Electronic Equipment	810	349
New Accessories/Equipment	2,257	1,143
Trailer Maintenance	576	511
New Trailer	183	64
Insurance	3,899	2,710
Taxes/Registration	893	782
Boat Loan	11,903	11,913
Boat Purchases	46,861	7,437
Total Boat Expenses:	106,904	50,420
Total All Activity:	303,541	191,491

Expenditure categories in which nearly 100 percent or most of the expenditure remained in state include restaurant meals, lodging, ice, head and charter boat fees, boat and equipment rental fees, docking and launching fees, dry storage fees, repair and maintenance charges, taxes and registration fees, and payments on boat loans. Total expenditures on these items totaled $104.2 million in 1994 and equaled approximately 34.3 percent of all saltwater angling related expenditures.

Impacts of All Angling On State Economy

Saltwater anglers spent a total of $303.5 million on saltwater angling in Virginia in 1994. Of the total $303.5 million, $191.5 million directly affected the economy of Virginia [Table 2]. Total sales generated for the indirect sectors equaled $55.8 million, and total sales generated by households providing goods and services for recreational angling equaled $229.9 million. All total, the $303.5 million in recreational angler expenditures generated total sales of $477.2 million in Virginia in 1994.

Expenditures responsible for the largest impacts on total sales or output in Virginia were on restaurant meals ($62.7 million), lodging ($54.2 million), groceries ($41.9 million), and charter boat fees ($35.7 million). Other expenditure categories with significant impacts on total sales in Virginia included private automobile expenses, purchases of fishing tackle, docking and launching fees, monthly boat payments, and taxes and various registration fees.

Income generated by recreational angling totaled $269.4 million in Virginia in 1994 [Table 3]. Of the total income, $106 million in income was received by the direct sectors (e.g., the income earned by a motel clerk renting rooms to recreational anglers). Workers and business owners in indirect sectors received $33.4 million in income and profit. Expenditures by households earning income related to saltwater angling generated $129.9 million of income in Virginia.

Expense categories responsible for generating large levels of income include restaurant meals ($33.3 million), lodging ($35.3 million), groceries ($23.5 million), charter boat trips ($17.8 million), fishing tackle purchases ($17.4 million), docking and launching fees ($13.1 million), and servicing boat loans ($15.0 million). Significant levels of income were also generated by expenditures on private automobiles, other fees and expenses, head boat fees, and boat and engine repair and maintenance.

The $303.5 million in total expenditures by saltwater anglers generated 10,944 person years of employment in Virginia in 1994 [Table 4]. Approximately 5,290 person years of employment were generated for the direct sectors, 1,071 person years were generated for the indirect businesses, and 4,583 person years were generated by households spending their income received because of recreational anglers purchases of goods and services (e.g., individual who sells bait uses income to pay utility bills and rent).

The single expenditure category with the largest impact on employment was restaurant meals. Expenditures on meals in restaurants by saltwater anglers generated 1,592 person years of employment for the economy of Virginia in 1994. Lodging was the second most important expenditure category in terms of generating employment. In 1994, saltwater anglers spent $20.3 million on lodging which, in turn, generated 1,460 person years of employment in Virginia. Other expenditures having considerable impacts on employment in Virginia include purchases of groceries, charter boat fees, private automobile expenses, head boat trips, purchases of fishing rods, docking and launching expenses, and servicing boat loans.

Table 2. Sales/Output Generated In Virginia from Marine Recreational Fishing, 1994
(Thousand Dollars)

Expenditure Category	Expenditures	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Meals	20,314	20,314	7,110	35,202	62,727
Groceries	25,611	16,674	4,225	20,991	41,890
Lodging	20,323	20,323	1,471	32,395	54,190
Bait	14,093	6,158	1,137	9,275	16,571
Ice	6,117	6,041	1,301	7,178	14,520
Head Boat	6,761	6,761	2,550	7,480	16,791
Charter Boat	14,567	14,567	6,934	14,191	35,692
Rental Boat	1,904	1,904	778	1,335	4,017
Equipment Rental	1,511	1,511	618	1,059	3,188
Public Transportation	1,196	726	279	433	1,438
Rental Automobile	1,596	1,119	293	863	2,275
Private Automobile	27,835	12,694	3,254	10,722	26,670
Other Fees	9,940	9,940	2,485	7,654	20,078
Total Fishing Trip Expenses:	151,768	118,733	32,434	148,879	300,047
Fishing Rods	11,799	5,768	1,028	8,071	14,869
Fishing Reels	8,850	4,327	771	6,054	11,152
Special Clothing	1,118	946	331	1,247	2,523
Tackle	23,102	11,296	1,011	15,803	29,112
Total Equipment/Clothes:	44,869	22,337	4,142	31,177	57,656
Boat Fuel and Oil	19,589	5,913	775	4,868	11,556
Docking/Launching Fees	8,957	8,957	5,460	9,905	24,322
Dry Storage	3,796	3,796	2,314	4,198	10,308
Haul Out/Bottom Paint	2,584	2,584	860	3,110	6,554
Engine Repair/Maintenance	1,591	1,414	548	1,160	3,122
Other Hull/Electronic R&M	3,005	2,856	1,310	2,189	6,356
New Electronic Equipment	810	349	34	633	1,014
New Accessories/Equipment	2,257	1,143	185	1,846	3,173
Trailer Maintenance	576	511	198	420	1,129
New Trailer	183	64	14	72	151
Insurance	3,899	2,710	1,285	2,719	6,714
Taxes/Registration	893	782	0	1,060	1,842
Boat Loan	11,903	11,903	4,722	9,745	26,370
Boat Purchases	46,861	7,437	1,512	7,964	16,914
Total Boat Expenses:	106,904	50,420	19,217	49,890	119,527
Total All Activity:	303,541	191,491	55,793	229,945	477,230

Table 3. Income Generated In Virginia from Marine Recreational Fishing, 1994
(Thousand Dollars)

Expenditure Category	Expenditures	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Meals	20,314	9,438	3,898	19,941	33,275
Groceries	25,611	9,479	2,190	11,857	23,526
Lodging	20,323	16,116	890	18,299	35,306
Bait	14,093	3,615	662	5,240	9,517
Ice	6,117	3,676	749	4,054	8,479
Head Boat	6,761	3,651	1,534	4,226	9,411
Charter Boat	14,567	5,796	4,025	8,017	17,838
Rental Boat	1,904	1,032	531	754	2,317
Equipment Rental	1,511	819	421	598	1,839
Public Transportation	1,196	250	155	245	650
Rental Automobile	1,596	596	166	487	1,250
Private Automobile	27,835	5,963	1,891	6,056	13,911
Other Fees	9,940	5,298	1,481	4,324	11,103
Total Fishing Trip Expenses:	151,768	65,730	18,596	84,098	168,424
Fishing Rods	11,799	3,719	609	4,559	8,887
Fishing Reels	8,850	2,789	458	3,420	6,667
Special Clothing	1,118	461	153	704	1,318
Tackle	23,102	7,280	1,193	8,927	17,400
Total Equipment/Clothes:	44,869	14,248	2,144	17,610	34,269
Boat Fuel and Oil	19,589	3,378	465	2,750	6,593
Docking/Launching Fees	8,957	3,869	3,643	5,596	13,108
Dry Storage	3,796	1,640	1,544	2,371	5,555
Haul Out/Bottom Paint	2,584	1,716	535	1,757	4,008
Engine Repair/Maintenance	1,591	483	314	655	1,453
Other Hull/Electronic R&M	3,005	981	711	1,236	2,929
New Electronic Equipment	810	264	20	357	641
New Accessories/Equipment	2,257	698	99	1,042	1,839
Trailer Maintenance	576	175	114	237	526
New Trailer	183	38	8	41	87
Insurance	3,899	1,072	938	1,536	3,546
Taxes/Registration	893	782	0	599	1,381
Boat Loan	11,903	6,374	3,114	5,504	14,992
Boat Purchases	46,861	4,647	897	4,499	10,043
Total Boat Expenses:	106,904	26,118	12,400	28,182	66,700
Total All Activity:	303,541	106,096	33,408	129,889	269,393

Table 4. Employment Generated in Virginia from Marine Recreational Fishing, 1994
(Person-years)

Expenditure Category	Expenditures Thousand Dollars	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Meals	20,314	777	122	693	1,592
Groceries	25,611	472	68	416	956
Lodging	20,323	797	27	635	1,460
Bait	14,093	222	19	186	427
Ice	6,117	164	17	139	320
Head Boat	6,761	169	59	142	367
Charter Boat	14,567	364	153	270	787
Rental Boat	1,904	21	17	29	66
Equipment Rental	1,511	16	13	23	52
Public Transportation	1,196	7	5	9	20
Rental Automobile	1,596	20	5	19	45
Private Automobile	27,835	228	69	226	523
Other Fees	9,940	213	46	154	413
Total Fishing Trip Expenses:	151,768	3,472	617	2,940	7,030
Fishing Rods	11,799	200	18	167	385
Fishing Reels	8,850	150	13	125	288
Special Clothing	1,118	27	5	25	57
Tackle	23,102	393	34	329	756
Total Equipment/Clothes:	44,869	770	70	646	1,486
Boat Fuel and Oil	19,589	119	13	100	232
Docking/Launching Fees	8,957	224	118	195	536
Dry Storage	3,796	95	50	83	227
Haul Out/Bottom Paint	2,584	65	16	59	140
Engine Repair/Maintenance	1,591	20	12	25	58
Other Hull/Electronic R&M	3,005	39	16	42	97
New Electronic Equipment	810	17	0	13	30
New Accessories/Equipment	2,257	46	2	38	86
Trailer Maintenance	576	7	4	9	21
New Trailer	183	2	0	1	3
Insurance	3,899	31	33	49	113
Taxes/Registration	893	32	0	24	56
Boat Loan	11,903	161	92	193	446
Boat Purchases	46,861	191	25	164	380
Total Boat Expenses:	106,904	1,048	384	997	2,429
Total All Activity:	303,541	5,290	1,071	4,583	10,944

Directed Fisheries and Economic Impacts

In 1994, saltwater anglers spent considerable amounts of money targeting certain species in Virginia. Anglers spent $63.7 million catching or trying to catch striped bass from Virginia waters [Figure 14]. Relative to catching or pursuing Gulf Stream species such as tuna, marlin, sailfish, dolphin, and shark, anglers spent $54 million in 1994. Species having the third highest expenditures included spot, croaker, and scup ($44.5 million). Saltwater anglers spent $38.2 million catching or trying to catch flounder in 1994. Anglers with no expressed target species spent $24.2 million catching or trying to catch fish.

In terms of trip expenses, purchases of fishing equipment, and boat expenditures, saltwater anglers spent, respectively, $151.8 million, $44.9 million, and $106.9 million in Virginia in 1994 [Table 5]. Trip expenditures on Gulf Stream species accounted for 21 percent of all trip expenditures. Anglers targeting striped bass generated the highest fishing equipment purchases and boat expenses. The second highest equipment purchases were made to target the Gulf Stream species. Relative to boat expenses, targeting spot, croaker, and scup generated the second highest boat expenses, The third highest boat expenses were associated with targeting flounder. Pursuing the Gulf Stream species generated the fourth highest level of boat expenditures by saltwater anglers in Virginia.

In terms of economic impacts generated by targeting species, expenditures on catching or trying to catch the Gulf Stream species generated the highest sales or output, income, and person-years of employment. Expenditures on Gulf Stream species generated $104.3 million in sales, $58.7 million in income, and 2,466 person years of employment in Virginia. Anglers seeking striped bass generated the second highest level of impacts in terms of sales ($91.6 million), income ($51.6 million), and person years of employment (2,113). Bluefish, once a major targeted recreational species, generated only $11.7 million in total sales, $6.7 million in income, and 275 person years of employment in Virginia in 1994.

Overall, the ranking of the species or groups of species in terms of magnitude of impacts were as follows: (1) Gulf Stream species, (2) striped bass or rockfish, (3) spot, croaker, and scup, (4) flounder, (5) near shore species such as cobia, dolphin, wahoo, king mackerel,

Figure 14. Expenditures by Saltwater Anglers on Targeted Species, 1994

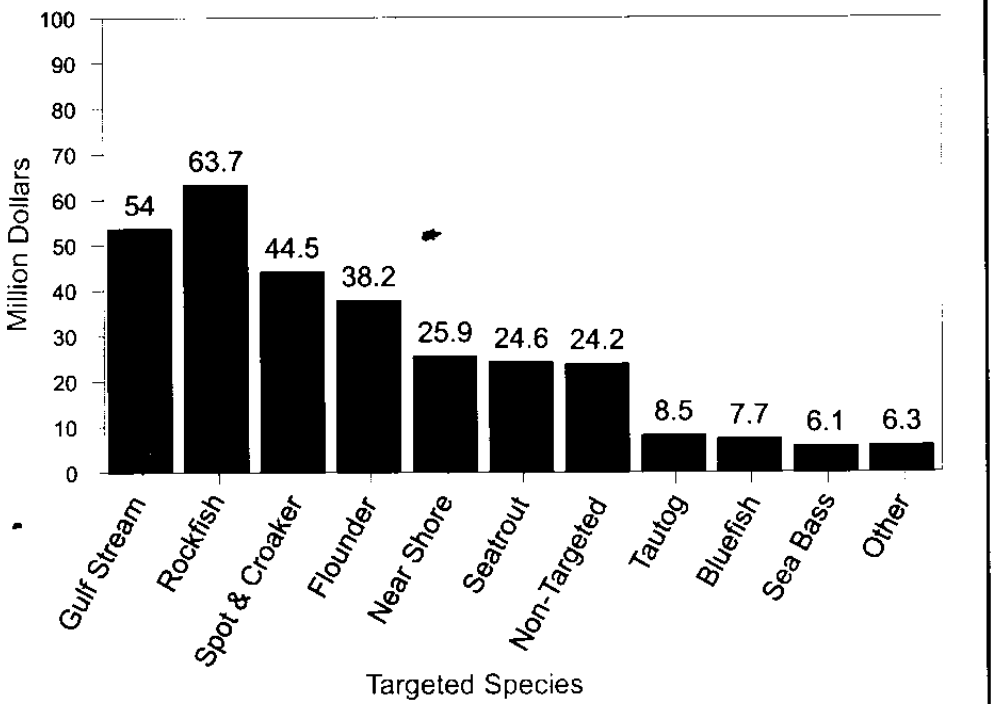


Table 5. Expenditures and Economic Impacts of Angler Expenditures on Target Species, 1994[a]

Expenditure Category	Expenditures Dollars	Sales/Output Dollars	Income Dollars	Employment Person-Years
Gulf Stream (e.g., marlin, sailfish, tuna, dolphin, and shark)				
Trip Expenses	31,216,523	72,387,000	40,666,000	1,748
Equipment Purchases	9,015,855	11,585,383	6,866,016	299
Boat Expenses	13,792,077	20,373,134	11,193,437	419
Total	54,024,455	104,346,000	58,745,000	2,466
Rock/Striper				
Trip Expenses	27,491,411	53,176,000	29,600,000	1,246
Equipment Purchases	10,720,763	13,766,182	8,188,165	355
Boat Expenses	25,437,882	24,645,377	13,778,476	512
Total	63,650,056	91,598,000	51,566,000	2,113
Spot/Croaker/Scup				
Trip Expenses	26,735,025	42,543,000	24,002,000	978
Equipment Purchases	4,527,646	5,818,028	3,458,068	150
Boat Expenses	16,279,776	13,399,976	7,502,145	283
Total	44,542,447	61,761,000	34,962,000	1,411
Flounder				
Trip Expenses	17,552,119	31,142,000	17,456,000	714
Equipment Purchases	4,982,865	6,402,983	3,805,748	165
Boat Expenses	15,633,817	17,103,799	9,604,128	341
Total	38,188,801	54,649,000	30,866,000	1,220
Near Shore (e.g., cobia, dolphin, wahoo, king mackerel, and shark)				
Trip Expenses	13,661,093	26,094,000	14,699,000	611
Equipment Purchases	4,168,555	5,356,593	3,183,804	138
Boat Expenses	8,096,458	12,421,687	6,949,313	240
Total	25,866,106	43,873,000	24,833,000	990
Seatrout				
Trip Expenses	13,365,802	25,236,000	14,220,000	593
Equipment Purchases	4,147,925	5,330,088	3,168,050	137
Boat Expenses	7,047,796	7,762,850	4,325,510	163
Total	24,561,523	38,329,000	21,714,000	893

Table 5. Expenditures and Economic Impacts of Angler Expenditures on Target Species, 1994[a] (continued)

Expenditure Category	Expenditures Dollars	Sales/Output Dollars	Income Dollars	Employment Person-Years
Non-Targeted Species				
Trip Expenses	10,340,773	19,880,000	11,109,000	452
Equipment Purchases	1,162,725	1,494,102	888,051	39
Boat Expenses	12,699,438	15,494,353	8,730,153	298
Total	24,202,936	36,869,000	20,727,000	789
Tautog				
Trip Expenses	3,450,075	6,597,000	3,723,000	153
Equipment Purchases	2,596,427	3,336,410	1,983,065	86
Boat Expenses	2,453,186	3,104,254	1,709,297	64
Total	8,499,688	13,038,000	7,416,000	303
Bluefish				
Trip Expenses	4,327,780	9,067,000	5,160,000	215
Equipment Purchases	689,875	886,490	526,904	23
Boat Expenses	2,682,163	1,746,454	988,691	37
Total	7,699,818	11,700,000	6,676,000	275
Sea Bass				
Trip Expenses	3,487,804	7,490,000	4,161,000	171
Equipment Purchases	1,173,624	1,508,108	896,376	39
Boat Expenses	1,406,974	1,595,110	887,364	33
Total	6,067,402	10,593,000	5,945,000	243
Other Species				
Trip Expenses	3,139,579	6,432,000	3,626,000	149
Equipment Purchases	1,682,567	2,162,074	1,285,079	56
Boat Expenses	1,434,976	1,879,848	1,031,024	38
Total	6,257,122	10,474,000	5,942,000	243
All Species				
Trip Expenses	151,764,984	300,047,000	168,424,000	7,030
Equipment Purchases	44,868,827	57,656,442	34,269,325	1,486
Boat Expenses	106,903,545	119,526,842	66,699,536	2,429
Total	303,540,356	477,230,000	269,393,000	10,944

[a] Numbers may not add to totals because of round-off error.

and shark, (6) weakfish and speckled trout, (7) random or no target species, (8) tautog, (9) bluefish, (10) black sea bass, and (11) all other species [Figure 15]. Gulf Stream expenditures, although lower than striped bass expenditures, generated greater economic impacts on the economy of Virginia because trip level expenditures on Gulf Stream species were higher than trip related expenditures on striped bass.

Trip-related expenditures typically generate higher in-state impacts than expenditures on fishing equipment and boats; the in-state impacts were thus higher for the Gulf Stream species. Expenditures on catching or trying to catch striped bass were higher than expenditures on all other species. The major expenditures, however, were for new or used boats. Most of the expenditures on new boats leave the state economy. Anglers spent approximately $14 million on new boats in order to pursue striped bass in 1994; only $2.2 million affected the economy of Virginia [Table 6].

In comparison, anglers targeting Gulf Stream species spent only $1.5 million on new boats in 1994. In part, the low expenditures may reflect various federal tax policies on luxury goods. The boats which can regularly fish offshore and target the Gulf Stream species tend to be quite large and expensive. In comparison, nearly any small boat can be used to target striped bass and numerous other Virginia species. Gulf Stream anglers spent more on restaurant meals ($6.2 versus $4.4 million) but less on groceries ($3.0 versus $5.3 million) than did anglers targeting striped bass. Gulf Stream anglers also spent more than double on lodging ($6.9 versus $3.1 million) than did striped bass anglers.

Expenditures on other species generated the lowest economic impacts on sales, income, and person years of employment in Virginia. Anglers spent approximately $6.3 million catching or trying to catch other species in Virginia in 1994. The expenditures on other species generated $10.5 million in sales, $5.9 million in income, and 243 person years of employment for Virginia in 1994. Expenditures on lodging by anglers targeting other species equaled only $631,900 in 1994. These anglers spent $230,500 on dining in restaurants in Virginia. They spent nearly $800,000 to fish from head and charter boats in 1994.

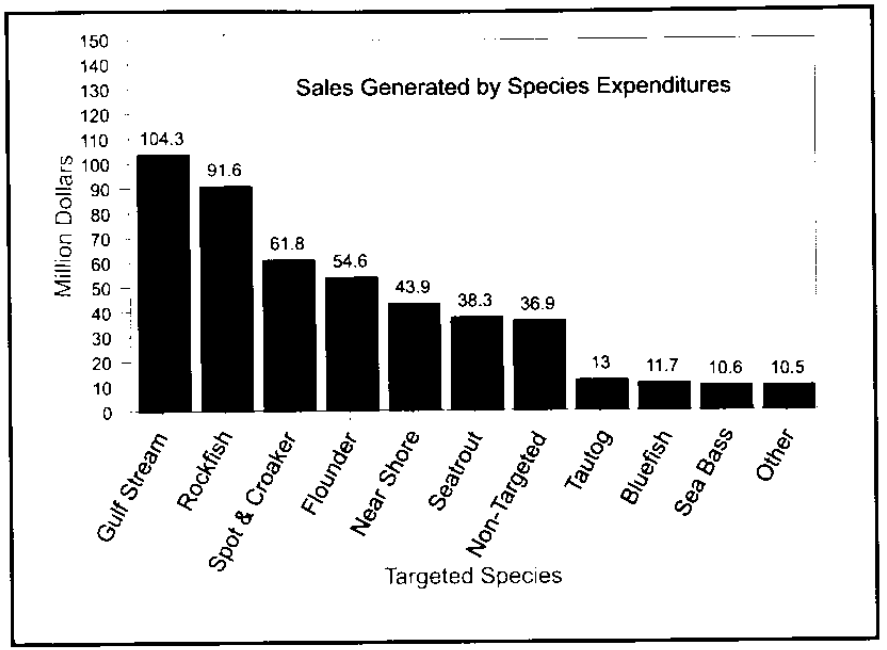
Fishing Mode and Economic Impacts

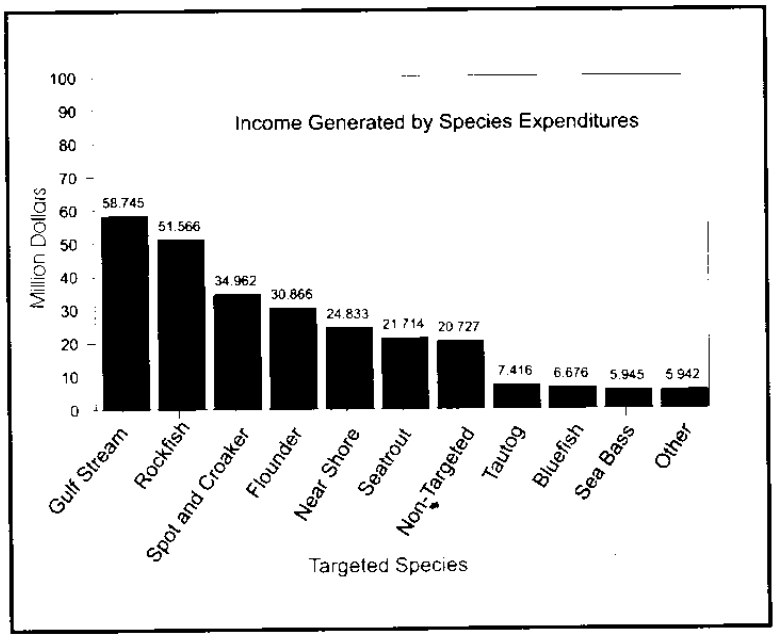
Although there are a variety of modes or types of saltwater angling in Virginia, this report considers five modes or grouping of types of sport fishing: (1) private boat, (2) charter boat, (3) head/party boat, (4) rental boat, and (5) shore, pier, beach, and bank. Of the various modes, it should not be surprising that expenditures by anglers fishing from private boats were the highest in 1994. In 1994, anglers fishing from private boats spent $201.8 million in Virginia to fish [Figure 16]. Individuals making trips from charter boats had the second highest level of total expenditures ($38.2 million). Shore based anglers spent $37.0 million to fish. Anglers aboard head or party boats spent $23.4 million. Expenditures by anglers fishing from rental boats totaled $3.2 million.

What were the major expenditures by anglers from each mode of fishing? After purchases of new boats ($46.9 million) in 1994, anglers fishing from privately-owned boats spent most of their angling dollars on groceries ($15.6 million), fuel and oil ($15.1 million), private automobile usage ($15.8 million), lodging ($13.7 million), and meals ($10.4 million) [Table 7]. Expenditures on these same categories by anglers making trips aboard charter boats were as follows: (1) groceries ($4.3 million), (2) private automobile usage ($3.2 million), (3) lodging ($2.6 million), and (4) meals ($4.2 million). Expenditures on boat fuel and oil are factored into charter fees and thus are not directly included for charter boats or head boats. Charter boat fees totaled $14.6 million in Virginia in 1994.

The shore and pier anglers had the third highest level of expenditures. In 1994, these anglers spent $4.2 million

Figure 15. Economic Impacts Associated with Species-specific Expenditures, 1994.





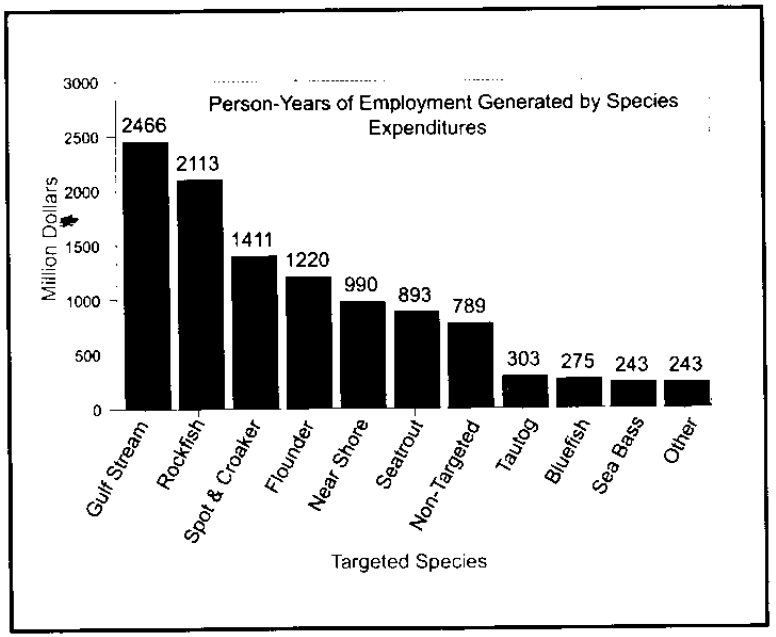


Table 6. Actual and Direct Expenditures on Selected Expenditure Categories, Targeted Species, 1994*

Species	Thousand Dollars											
	Boat Purchases		Restaurant Meals		Groceries		Lodging		Fuel and Oil		Total	
	Actual	Direct	Actual	Direct	Actual	Direct	Actual	Direct	Actual	Direct	Actual	Direct
Gulf Stream	1,544	245	6,167	6,167	3,044	1,982	6,976	6,976	4,830	1,457	54,024	40,752
Striped Bass	14,056	2,230	4,369	4,369	5,286	3,442	3,113	3,113	3,636	1,098	63,650	36,704
Spot and Croaker	10,172	1,615	2,642	2,642	4,591	2,989	2,487	2,487	2,417	729	4,4542	24,993
Flounder	6,819	1,082	1,791	1,791	3,751	2,442	1,587	1,587	3,116	941	38,169	22,406
Near Shore	1,965	312	1,200	1,200	2,076	1,351	1,575	1,575	1,113	335	25,866	17,717
Sea Trout	2,745	435	1,758	1,758	3,360	2,187	1,420	1,420	1,739	525	24,562	15,244
Non-Targeted	5,358	851	1,016	1,016	1,229	800	945	945	1,889	574	24,203	15,401
Tautog	858	136	299	299	1,061	691	351	351	402	121	8,500	5,205
Bluefish	2,063	328	264	264	356	232	1,035	1035	218	66	7,700	4700
Black Sea Bass	705	112	576	576	603	393	182	182	130	39	6,067	4,179
Other	575	91	231	231	254	166	632	632	98	29	6,257	4,201

*Actual expenditures represent the dollar amount that anglers spent targeting various species. The direct dollar amount indicates the amount of the expenditures which remained in state and affected the economy of Virginia.

on meals, $4.3 million on groceries, $2.2 million on lodging, and $7.0 million for angling-related usage of a private automobile. The shore and pier anglers accounted for 61.3 percent of all equipment rental in 1994. Oddly, the shore and pier angler reported expenditures on boat fuel and oil; apparently, some anglers use their boats to travel to various beach areas for the purpose of recreational fishing.

Head boat anglers also spent considerable money in 1994. Total expenditures by anglers fishing from head boats totaled $23.3 million. Expenditures on restaurant meals, groceries, lodging, and usage of private automobiles were, respectively, $1.4 million, $1.4 million, $1.8 million, and $1.7 million. Head boat anglers spent approximately $6.8 million on head boat fees in Virginia in 1994.

What about expenditures on rods, reels, tackle, and special clothing in Virginia in 1994? Anglers fishing from private boats spent $24.1 million on

fishing equipment. Anglers taking trips aboard charter boats spent $4.8 million. Shore and pier anglers spent $6.8 million on fishing equipment. Head boat anglers spent $8.9 million. Anglers fishing from rental boats spent $1 million on fishing equipment.

Who spends the most on bait? In 1994, anglers making trips aboard privately-owned boats spent $8.6 million on bait. Shore and pier anglers had the second highest level of expenditures on bait—$2.9 million. Expenditures by charter boat anglers, unfortunately, may be quite misleading since bait is often included in the charter fee; nevertheless, anglers fishing from charter boats spent $1.2 million on bait in addition to their $14.6 million on charter boat fees.

Expenditures by anglers fishing from private boats generated the greatest economic impacts for the Virginia economy relative to all other modes of fishing [Table 8]. Total expenditures of $201.8 million by anglers fishing from private boats generated $289.9 million in total sales, $165.1 million in total income, and 6,577 person years of employment in Virginia in 1994. Charter boat expenditures generated $80.5 million in total sales, $43.3 million in income, and 1,871 person years of employment. Trips by shore and pier anglers generated $57.7 million in total sales, $32.6 million in income, and 1,351 person years of employment. Headboat trips contributed $43.4 million in sales, $25.0 million in income, and 1,033 person years to the state economy in 1994. Fishing trips by anglers renting boats had the lowest economic impacts on the state economy: (1) $5.9 million in total sales, (2) $3.4 million in income, and (3) 112 person years of employment.

Trip-related expenditures for all modes of fishing generated the larger economic impacts. For example, shore and pier anglers spent $25.7 million on trip related categories such as groceries, bait, and dining out. Of the $57.7 million in total sales generated by shore and pier anglers, trip-related expenses accounted for 80 percent of total sales. Boat expenses on charter and head boats are excluded because they are included in the fees paid to charter and head boat operators. In comparison, boat expenditures of $4.7 million by shore anglers were strictly for fuel and oil.

Anglers fishing from privately-owned boats spent $75.3 million on trips in 1994. The $75.3 million in trip expenditures generated $142 million in total

Figure 16. Total Angler Expenditures by Mode of Fishing, 1994

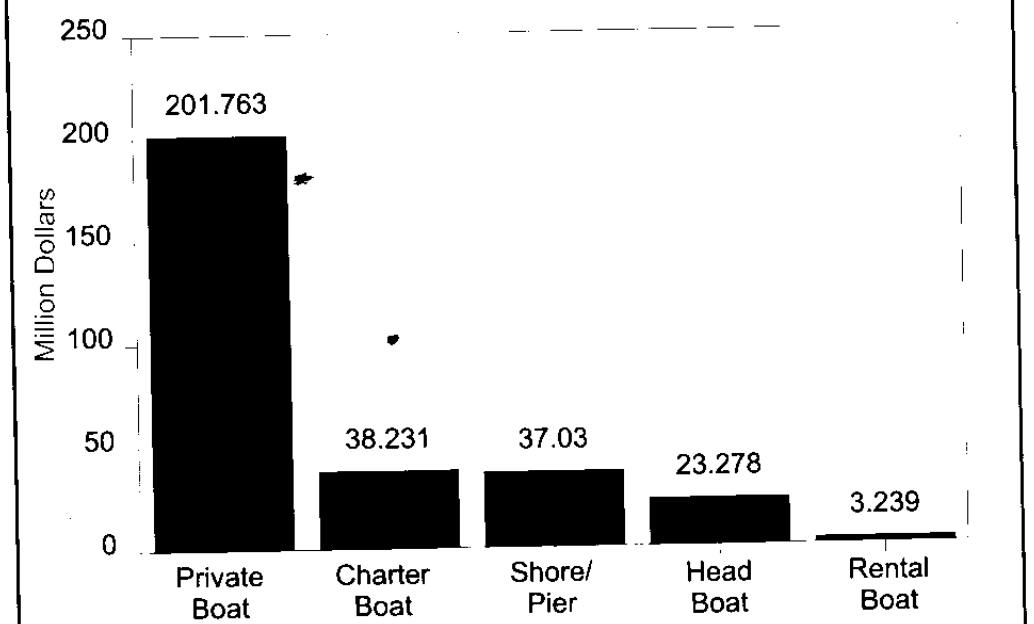


Table 7. Expenditures on Selected Categories by Fishing Mode, 1994[a]

Expenditure Category	Private Boat	Charter Boat	Shore/Pier Boat	Headboat Boat	Rental Boat
	Thousand Dollars				
Boat Purchases	46,861	0	0	0	0
Groceries	15,589	4,255	4,291	1,443	33
Fuel and Oil	15,091	0	4,466	0	32
Private Auto	15,845	3,168	7,031	1,698	93
Lodging	13,669	2,559	2,200	1,823	72
Meals	10,434	4,228	4,225	1,393	34
Charter Fees	0	14,567	0	0	0
Head Boat Fees	0	0	0	6,761	0

[a] Zero entries indicate either no expenditure or inclusion of expenditure in other expense category (e.g., fuel is included in charter fee for charterboat).

sales, $81.5 million in income, and 3,404 person years of employment for Virginia in 1994. Trip related expenditures by charter boat anglers generated $74.3 million in total sales, $39.7 million in income, and 1,713 person years of employment. Trip expenses by shore and pier anglers generated $46.2 million in total sales, $25.9 million in income, and 1,071 person years of employment. Head boat anglers spent $15.1 million on various trip related items and generated $32.8 million in sales, $18.7 million in income, and 761 person years of employment. Rental boat anglers spent only $2.2 million on trip related expenses but generated $4.6 million in sales, $2.7 million in income, and 80 person years of employment for Virginia in 1994.

What were the impacts associated with expenditures on fishing equipment in 1994? Anglers fishing from privately-owned boats spent $24.1 million on fishing equipment. These expenditures generated $30.9 million in total sales, $18.4 million in income, and 797 person years of employment for Virginia in 1994. Expenditures on fishing equipment by charter boat anglers generated $6.2 million in sales, $3.7 million in income, and 158 person years of employment. Shore and pier anglers spent $6.8 million on fishing equipment in 1994. The total sales generated from the $6.8 million equaled $8.8 million. Total income and person years of employment generated from equipment purchases by shore and pier anglers equaled, respectively, $5.2 million and 227 person-years of employment. Anglers taking trips aboard head boats generated total sales of $10.5 million, total income of $6.3 million, and employment of 271 person years.

Table 8. Economic Impacts of Saltwater Angling in Virginia by Mode of Fishing, 1994

Expenditure Category	Expenses	Sales/Output	Income	Employment
		Dollars		
Private Boat:				
Trip Expenses	75,281,000	142,016,000	81,540,000	3,404
Equipment Purchases	24,076,000	30,937,511	18,388,401	797
Boat Expenses	102,406,426	116,874,216	65,186,125	2,376
Total Expenses	201,763,000	289,828,000	165,114,000	6,577
Charter Boat:				
Trip Expenses	33,445,000	74,329,000	39,659,000	1,713
Equipment Purchases	4,786,000	6,150,656	3,665,754	158
Boat Expenses				
Total Expenses	38,231,000	80,479,000	43,315,000	1,871
Shore/Pier:				
Trip Expenses	25,719,000	46,237,000	25,866,000	1,071
Equipment Purchases	6,845,000	8,795,772	5,227,951	227
Boat Expenses	4,465,555	2,634,520	1,502,877	53
Total Expenses	37,030,000	57,668,000	32,596,000	1,351
Head Boat:				
Trip Expenses	15,079,000	32,849,000	18,697,000	761
Equipment Purchases	6,845,000	10,535,413	6,291,914	271
Boat Expenses				
Total Expenses	23,278,000	43,384,000	24,959,000	1,033
Rental Boat:				
Trip Expenses	2,244,000	4,614,000	2,662,000	80
Equipment Purchases	963,000	1,237,399	735,474	32
Boat Expenses	32,000	18,890	10,776	
Total Expenses	3,239,000	5,871,000	3,408,000	112
Virginia-All Modes:				
Trip Expenses	151,764,984	300,047,000	168,424,000	7,030
Equipment Purchases	44,868,827	57,656,442	34,269,325	1,486
Boat Expenses	106,903,545	119,526,842	66,669,536	2,429
Total Expenses	303,540,356	477,230,000	269,393,000	10,944

Fuel expenditures and other boat expenditures are not included under boat expenses because they are reflected in head, charter, and rental boat fees. A stand alone module is used to assess the economic impacts associated with fees paid.

Table 9. Expenditures and Economic Impacts of Saltwater Angling in Virginia by Region, 1994

Expenditure Category	Expenses	Sales/Output	Income	Employment in Person Years of Employment
	Dollars			
Atlantic Coast: Chesapeake and Virginia Beach				
Trip Expenses	45,085,000	100,492,000	57,147,000	2,411
Equipment Purchases	22,609,000	29,052,070	17,267,712	749
Boat Expenses	35,348,940	44,711,803	24,858,096	897
Total	103,043,000	174,256,000	99,273,000	4,057
Hampton Roads: Hampton, Norfolk, Suffolk, and York				
Trip Expenses	36,142,000	68,594,000	38,290,000	1,576
Equipment Purchases	9,447,000	12,139,938	7,215,629	313
Boat Expenses	24,983,300	28,918,105	16,146,621	579
Total	70,572,000	109,652,000	61,652,000	2,468
Middle Peninsula: Gloucester, Mathews, and Middlesex				
Trip Expenses	23,913,000	42,134,000	23,477,000	981
Equipment Purchases	4,647,000	5,970,878	3,458,918	154
Boat Expenses	15,366,040	18,428,125	9,842,438	350
Total	43,926,000	66,533,000	36,869,000	1,485
Eastern Shore: Accomack and Northampton				
Trip Expenses	15,331,000	28,534,000	15,930,000	642
Equipment Purchases	2,181,000	3,265,439	1,940,883	84
Boat Expenses	3,833,562	7,763,584	2,484,821	163
Total	23,036,000	39,563,000	22,152,000	889
James River Basin: Charles City, Isle of Wight, James City, Newport News, Prince George, and Surry				
Trip Expenses	11,544,000	24,625,000	13,877,000	586
Equipment Purchases	2,181,000	3,190,560	1,831,418	79
Boat Expenses	3,833,562	4,320,660	2,484,821	89
Total	17,558,000	32,136,000	18,193,000	754
Northern Neck Inland: Essex, King George, Richmond, and Westmoreland				
Trip Expenses	11,479,000	21,152,000	11,688,000	478
Equipment Purchases	1,393,000	1,790,448	1,064,191	46
Boat Expenses	7,470,783	9,105,735	5,025,551	196
Total	20,343,000	32,048,000	17,778,000	721

Table 9. Expenditures and Economic Impacts of Saltwater Angling in Virginia by Region, 1994 (continued)

Expenditure Category	Expenses	Sales/Output Dollars	Income	Employment in Person Years of Employment
Northern Neck Bay: Lancaster and Northumberland				
Trip Expenses	7,775,000	12,472,000	6,712,000	278
Equipment Purchases	1,665,000	2,139,991	1,271,949	55
Boat Expenses	16,533,210	10,747,321	6,137,416	221
Total	25,974,000	25,359,000	14,121,000	554
Other Virginia Counties and Cities				
Trip Expenses	5,590,000	11,924,000	6,980,000	291
Equipment Purchases	785,000	1,008,634	599,503	26
Boat Expenses	737,773	1,197,962	659,104	24
Total	7,112,000	14,130,000	8,238,000	341
All Counties, Towns, and Cities: Virginia				
Trip Expenses	151,764,984	300,047,000	168,424,000	7,030
Equipment Purchases	44,868,827	57,656,442	34,269,325	1,486
Boat Expenses	106,903,545	119,526,842	66,699,536	2,429
Total	303,540,356	477,230,000	269,393,000	10,944

Geographical Areas and Economic Impacts: The Cities, Counties, and Towns

Although there are numerous counties, towns, and cities from which individuals engage in saltwater angling, spareness in survey responses from some areas required grouping several areas together as one geographical area. For the purposes of assessing the economic importance of saltwater angling, the following groupings were used in this study: (1) the Atlantic Coast area, which is composed of Chesapeake and Virginia Beach; (2) Hampton Roads, which includes Hampton, Norfolk, Suffolk, and York; (3) Middle Peninsula, which includes Gloucester, Mathews, and Middlesex; (4) Eastern Shore, which is made up of the counties of Accomack and Northampton; (5) James River Basin, which consists of Charles City, Isle of Wight, James City, Newport News, Prince George, and Surry; (6) Northern Neck Inland, which is composed of Essex, King George, Richmond, and Westmoreland; (7) Northern Neck Bay, which includes the counties of Lancaster and Northumberland; and (8) all other Virginia counties and cities.

Because of the selected groupings, it may be misleading to compare expenditures and economic impacts between communities. For example, total expenditures by anglers fishing out of Hampton Roads equaled $70.6 million in 1994, while total expenditures by anglers fishing from the Middle Peninsula counties totaled $43.9 million. Even though expenditures by anglers from the Hampton Roads area were considerably larger than the expenditures by anglers from the Middle Peninsula area, the Hampton Roads area includes two cities and larger

counties than those of the Middle Peninsula group.

It also is important to understand that the regional economic impacts presented in the following sections depict impacts on the state economy. The impacts are not specific to counties, cities or regions where anglers are engaged in recreational angling. The impacts instead provide indications of how recreational activity in a given county or community affected the economy of Virginia. For example, the first community or region considered is the Atlantic Coast, which is made up of Chesapeake and Virginia Beach. Anglers spent $103 million on saltwater angling in 1994. The expenditures generated $174.3 million in output, $99.3 million in income, and 4,057 person years of employment in 1994 [Table 9]. All of these impacts, however, are relative to the entire state of Virginia. Thus, the impacts presented do not equal the impacts generated for the economies of Chesapeake and Virginia Beach.

Atlantic Coast Area: Economic Impacts

The Atlantic Coast area is comprised of Chesapeake and Virginia Beach. This area also includes the Chesapeake Bay tunnel, which has a pier which is regularly fished. In addition, there are fishing piers and several beach/shore areas from which to fish in Virginia Beach. Virginia Beach is also home to a large offshore sportfishing fleet. Even non-anglers regularly visit the docks of the sportfishing vessels during fishing season just to watch the fish weigh-ins and to observe the fish caught.

In 1994, anglers from the Atlantic Coast area spent $103 million on saltwater angling in the Atlantic Coast areas of Chesapeake and Virginia Beach. There were no estimates of how much money tourists spent just to observe the weigh-ins of recreationally caught fish. Trip expenses accounted for 43.8 percent of total expenditures by anglers in the Atlantic Coast area [Table 10]. Fishing equipment purchases and boat expenses equaled, respectively, $22.6 million and $35.3 million.

Major trip related purchases by anglers from Chesapeake and Virginia Beach included restaurant meals ($8.0 million), groceries ($4.5 million), lodging ($10.6 million), and charter boat fees ($6.1 million). Anglers making trips from this area spent $5.9 million on rods, $4.5 million on fishing reels, and $11.6 million on fishing tackle. Relative to boat expenses, anglers from the Atlantic Coast region spent $5.5 million on fuel and oil in 1994, $3.4 million on docking and launching fees, $5.4 million on boat loans, and $13.3 million to purchase new boats.

Expenditures by anglers fishing out of the Atlantic Coast area generated $174.3 million in sales, $99.3 million in income, and 4,057 person years of employment for the economy of Virginia. Trip expenditures accounted for 57.7 percent of total sales and income and 59.4 percent of the total person years of employment. Expenditures on fishing equipment generated 16.7 percent of the total sales and income and 18.5 percent of the total employment generated by anglers from the Atlantic Coast area. Boat related expenditures were responsible, respectively, for 25.7, 25.0, and 22.1 percent of the total sales, income, and employment generated for Virginia by anglers from the Atlantic Coast region.

Hampton Roads: Economic Impacts

The second major fishing area is the Hampton Roads area, which includes the cities of Hampton and Norfolk and the two counties Suffolk and York. All of the areas are relatively urban, but York and Suffolk both have rural areas. Anglers from the Hampton Roads area spent $70.6 million on saltwater angling in Virginia in 1994. Trip expenses accounted for 51.2 percent of total expenditures by anglers from the Hampton Roads area [Table 11]. An-glers from this area also spent $9.4 million and $25.0 million, respectively, on fishing equipment purchases and boats.

The major trip-level expenditures were for restaurant meals ($3.5 million), groceries ($12.8 million), lodging ($2.9

Table 10. Economic Impacts of Atlantic Coast Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 45,085			
Impact on Virginia Economy:			
Direct:	39,046	22,317	1,207
Indirect:	10,324	5,953	198
Induced:	51,121	28,877	1,006
Total:	100,492	57,147	2,411
Fishing Equipment Purchases: 22,609			
Impact on Virginia Economy:			
Direct:	11,255	7,179	388
Indirect:	2,087	1,215	35
Induced:	15,709	8,873	326
Total:	29,052	17,268	749
Boat Expenses: 35,349			
Impact on Virginia Economy:			
Direct:	18,765	9,587	380
Indirect:	7,428	4,811	149
Induced:	18,519	10,461	368
Total:	44,712	24,858	897
Total Expenditures: 103,043			
Impact on Virginia Economy:			
Direct:	69,067	39,083	1,975
Indirect:	19,839	11,979	382
Induced:	85,349	48,211	1,700
Total:	174,256	99,273	4,057

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries). The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

million), bait ($2.8 million), and charter boat fees ($3.0 million). Anglers making trips from this area purchased $2.5 million worth of rods, $1.9 million worth of fishing reels, and $4.9 million worth of fishing tackle. Anglers from the Hampton Roads region also spent $6.1 million on fuel and oil in 1994, $809,000 on docking and launching fees, $1.5 million on dry storage fees, $3.0 million on boat loans, and $9.0 million to purchase new and used boats in 1994.

Expenditures by Hampton Roads area anglers generated $109.7 million in sales, $61.7 million in income, and 2,468 person years of employment for the economy of Virginia in 1994. Direct expenditures on trips accounted for 62.6 percent of total sales, 62.0 percent of income, and 63.9 percent of the total person years of employment. Angler purchases of fishing equipment generated 11.1 percent of the total sales, 11.7 percent of income, and 12.7 percent of the total employment generated by anglers from the Hampton Roads area. Expenditures on boats, strictly for the purpose of saltwater angling, were responsible, respectively, for 25.7, 25.0, and 22.1 percent of the total sales, income, and employment generated for Virginia by anglers from the Hampton Roads Coast region.

Middle Peninsula: Economic Impacts

Saltwater fishing angling expenditures by anglers making trips from the Middle Peninsula area—Gloucester, Mathews, and Middlesex—generated the third highest level of sales, income, and employment related to sport fishing for the Virginia economy in 1994. Anglers from the Middle Peninsula area spent $43.9 million on saltwater angling in 1994. Trip-specific expenses accounted for 54.4 percent of total expenditures by anglers in the Middle Peninsula area [Table 12]. Purchases of fishing equipment and expenditures of boats, just for saltwater angling from Middle Peninsula areas, equaled $4.6 million and $15.4 million, respectively.

Saltwater anglers taking trips from the Middle Peninsula counties spent $2.8 million on restaurant meals, $3.1 million on groceries, $1.5 million on lodging, and $1.2 million on charter boats in 1994. Anglers making trips from this area also purchased $1.2 million on rods, $900,000 on fishing reels, and $2.4 million on fishing tackle in the Middle Peninsula area. Relative to boat expenses, anglers from the Middle Peninsula region spent $2.0 million on fuel and oil in 1994, $861,000 on docking and launching fees, $1.5 million on boat loans, and $5.7 million to purchase new boats. These expenditures were all made in the Middle Peninsula counties.

Expenditures by anglers fishing out of the Middle Peninsula area generated $66.5 million in sales, $36.9 million in income, and 1,485 person years of employment for the economy of Virginia. Trip expenditures accounted for 63.3 percent of total sales, 63.8 percent income, and 66.0 percent of the total person years of employment. Expenditures on fishing equipment generated 9.0 percent of the total sales, 9.4 percent of income, and 12.7 percent of the total employment generated by anglers from the Middle Peninsula area. Boat related expenditures were responsible, respectively, for 27.7, 26.7, and 23.6 percent of the total sales, income, and employment generated for Virginia by anglers from the Middle Peninsula region.

Eastern Shore: Economic Impacts

The Eastern Shore area, composed of Accomack and Northampton, has traditionally been a major recreational fishing area. Many anglers trail their boats to this area and spend weeks fishing out of Accomack and Northampton. In 1994, anglers from the Eastern Shore area spent $23.0 million on saltwater angling. Trip expenses accounted for 66.6 percent of total expenditures by anglers in the Eastern Shore area [Table 13]. Fishing equipment purchases and boat expenses equaled, respectively, $2.5 million and $5.2 million.

Major trip related purchases by anglers from Eastern Shore communi-

Table 11. Economic Impacts of Hampton Roads Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 36,142			
Impact on Virginia Economy:			
Direct:	27,270	14,915	767
Indirect:	7,793	4,434	146
Induced:	33,531	18,941	663
Total:	68,594	38,290	1,576
Fishing Equipment Purchases: 9,447			
Impact on Virginia Economy:			
Direct:	4,703	3,000	162
Indirect:	872	508	1
Induced:	6,564	3,708	136
Total:	12,140	7,216	313
Boat Expenses: 24,983			
Impact on Virginia Economy:			
Direct:	12,415	6,498	251
Indirect:	4,492	2,864	88
Induced:	12,01	6,785	241
Total:	28,918	16,147	579
Total Expenditures: 70,572			
Impact on Virginia Economy:			
Direct:	44,388	24,413	1,180
Indirect:	13,157	7,806	249
Induced:	52,107	29,433	1,039
Total:	109,652	61,652	2,468

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries), The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

Table 12. Economic Impacts of Middle Peninsula Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 23,913			
Impact on Virginia Economy:			
Direct:	16,724	9,096	483
Indirect:	4,482	2,560	83
Induced:	20,927	11,821	415
Total:	42,134	23,477	981
Fishing Equipment Purchases: 4,647			
Impact on Virginia Economy:			
Direct:	2,313	1,475	80
Indirect:	429	250	7
Induced:	3,229	1,824	67
Total:	5,971	3,549	154
Boat Expenses: 15,366			
Impact on Virginia Economy:			
Direct:	7,976	3,790	150
Indirect:	3,119	1,910	55
Induced:	7,332	4,142	146
Total:	18,428	9,842	350
Total Expenditures: 43,926			
Impact on Virginia Economy:			
Direct:	27,014	14,362	713
Indirect:	8,031	4,720	145
Induced:	31,488	17,786	627
Total:	66,533	36,869	1,485

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries). The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

Table 13. Economic Impacts of Eastern Shore Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 15,331			
Impact on Virginia Economy:			
Direct:	11,841	6,475	318
Indirect:	3,067	1,758	54
Induced:	13,625	7,696	269
Total:	28,534	15,930	642
Fishing Equipment Purchases: 2,541			
Impact on Virginia Economy:			
Direct:	1,265	807	44
Indirect:	235	137	4
Induced:	1,766	997	37
Total:	3,265	1,941	84
Boat Expenses: 5,164			
Impact on Virginia Economy:			
Direct:	3,108	1,520	69
Indirect:	1,431	939	30
Induced:	3,225	1,822	64
Total:	7,764	4,281	163
Total Expenditures: 23,036			
Impact on Virginia Economy:			
Direct:	16,214	8,802	431
Indirect:	4,733	2,834	88
Induced:	18,616	10,516	370
Total:	39,563	22,152	889

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries). The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

ties included restaurant meals ($1.3 million), groceries ($1.3 million), lodging ($700,000), and charter boat fees ($1.1 million). The Eastern Shore area is well known for transient anglers—individuals who tow their boats to the Eastern Shore area. These anglers spent $3.9 million on ice and $4.4 million for private auto use. In addition, these anglers spent $1.6 million on marinas and other miscellaneous expenses.

Anglers making trips from this area had minimal expenditures on fishing tackle and equipment in the Eastern Shore areas. Anglers spent $600,000 on rods, $500,000 on reels, $63,000 on special fishing related clothing, and $1.3 million on fishing tackle. Relative to boat expenses, anglers from the Eastern Shore region spent $500,000 on fuel and oil in 1994, $1.4 million on docking and launching fees, $500,000 on boat loans, and $1.8 million to purchase new or used boats.

Expenditures by anglers fishing out of the Eastern Shore area generated $39.6 million in sales, $22.2 million in income, and 889 person years of employment for the economy of Virginia. Trip expenditures accounted for 72.1 percent of total sales, 71.9 percent of income, and 72.2 percent of the total person years of employment. Expenditures on fishing equipment generated 9.2 percent of the total sales, 8.8 percent of income, and 9.4 percent of the total employment generated by anglers from the Eastern Shore area. Boat related expenditures were responsible, respectively, for 21.6, 19.3, and 18.3 percent of the total sales, income, and employment generated for the economy of Virginia by anglers fishing or making trips from the Eastern Shore region.

James River Basin: Economic Impacts

The James River Basin area consists of Charles City, Isle of Wight county, James City, Newport News, Prince George, and Surry county. It is a diverse area with large urban and rural areas. In 1994, anglers from the James River Basin area spent $17.6 million on saltwater angling. Trip expenses accounted for 65.7 percent of total expenditures by anglers in the James River Basin area [Table 14]. Fishing equipment purchases and boat expenses equaled, respectively, $2.8 million and $3.8 million.

Anglers making trips from the James River Basin area spent $2.0 million on restaurant meals, $4.5 on groceries, $1.9 million on lodging, $1.6 on headboat trips, and $1.0 million on charter trips. These James River Basin anglers also spent $470,000 on rods, $351,000 on fishing reels, and $920,000 on fishing tackle. Relative to boat expenses, anglers from this region spent $484,000 on fuel and oil in 1994, $234,000 on docking and launching fees, $402,000 on boat loans, and $1.9 million to purchase new or used boats.

Angler expenditures from the James River Basin area generated $32.1 million in sales, $18.2 million in income, and 754 person years of employment for the economy of Virginia. Trip expenditures accounted for 76.6 percent of total sales, 40.9 percent of income, and 77.8 percent of the total person years of employment. Expenditures on fishing equipment generated 9.9 percent of the total sales, 5.4 percent income, and 10.5 percent of the total employment generated by anglers from the James River Basin area. Boat related expenditures were responsible, respectively, for 13.4, 53.7, and 11.8 percent of the total sales, income, and employment generated for Virginia by anglers from the James River Basin region.

Northern Neck Inland: Economic Impacts

Although Essex, King George, Richmond, and Westmoreland counties are not all inland areas, they were grouped in the area Northern Neck Inland. Anglers from all of these areas have access to saltwater recreational angling. In 1994, anglers from the Northern Neck Inland area spent $20.3 million on saltwater angling. Trip expenses accounted for 56.4 percent of total expenditures by these anglers [Table 15]. Angler expenditures on fishing equipment and boats totaled, respectively, $1.4 million and $7.5 million.

Table 14. Economic Impacts of James River Basin Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 11,544			
Impact on Virginia Economy:			
Direct:	9,487	5,303	290
Indirect:	2,661	1,526	52
Induced:	12,477	7,048	245
Total:	24,625	13,877	586
Fishing Equipment Purchases: 2,181			
Impact on Virginia Economy:			
Direct:	1,225	730	40
Indirect:	283	150	4
Induced:	1,683	950	34
Total:	3,191	1,831	79
Boat Expenses: 3,834			
Impact on Virginia Economy:			
Direct:	1,811	1,019	39
Indirect:	632	405	12
Induced:	1,878	1,061	37
Total:	4,321	2,485	89
Total Expenditures: 17,558			
Impact on Virginia Economy:			
Direct:	12,523	7,052	369
Indirect:	3,575	2,081	69
Induced:	16,038	9,060	316
Total:	32,136	18,193	754

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries). The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

Table 15. Economic Impacts of Northern Neck Inland Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 11,749			
Impact on Virginia Economy:			
Direct:	8,858	4,709	235
Indirect:	2,483	1,437	48
Induced:	9,811	5,542	194
Total:	21,152	11,688	478
Fishing Equipment Purchases: 1,393			
Impact on Virginia Economy:			
Direct:	694	442	24
Indirect:	129	75	2
Induced:	968	547	20
Total:	1,790	1,064	46
Boat Expenses: 7,471			
Impact on Virginia Economy:			
Direct:	3,662	1,760	85
Indirect:	1,675	1,103	35
Induced:	3,828	2,163	76
Total:	9,106	5,026	196
Total Expenditures: 20,343			
Impact on Virginia Economy:			
Direct:	13,153	6,911	344
Indirect:	4,287	2,615	86
Induced:	14,607	8,251	291
Total:	32,048	17,778	721

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries). The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

Major trip related purchases by anglers from the Inland Northern Neck counties included restaurant meals ($983,000), groceries ($961,000), lodging ($920,000), and other fees and expenses ($2.2 million). Anglers making trips from this area spent $366,000 on rods, $275,000 on fishing reels, and $717,000 on fishing tackle. Anglers from this area also spent $831,000 on fuel and oil in 1994, $1.9 million on docking and launching fees, $164,000 on boat loans, and $3.7 million to purchase boats.

Expenditures by anglers fishing out of the Northern Neck Inland area generated the following economic impacts for the Virginia state economic in 1994: (1) $32.0 million in sales, (2) $17.8 million in income, and (3) 721 person years of employment. Trip expenditures generated 66 percent of the total sales, 65.7 percent of income, and 66.4 percent of the total person years of employment. Expenditures on fishing equipment generated another 5.6 percent of the total sales, 6.0 percent of income, and 6.4 percent of the total employment generated by anglers from the Northern Neck Inland area. Boat related expenditures were responsible, respectively, for 28.4, 28.3, and 27.2 percent of the total sales, income, and employment generated for the economy of Virginia.

Northern Neck Bay: Economic Impacts

Lancaster and Northumberland offer significant saltwater fishing opportunities to anglers. Anglers from the Northern Neck Bay area spent $26 million on saltwater angling in 1994. Expenditures on trips accounted for 29.9 percent of the total expenditures by anglers in the Northern Neck Bay area [Table 16]. Purchases of fishing equipment and expenditures on boats equaled, respectively, $1.7 million and $16.5 million in 1994.

The major trip expenses were for restaurant meals ($808,000), groceries ($938,000), lodging ($155,000), and charter boat fees ($740,000). Anglers from this area also spent $438,000 on rods, $328,000 on fishing reels, and $857,000 on fishing tackle. Relative to boat expenses, anglers from the Northern Neck Bay region spent $2.85 million on fuel and oil in 1994, $252,000 on docking and launching fees, $903,000 on boat loans, and $11.4 million to purchase new and used boats.

In terms of economic impacts, angler expenditures by individuals fishing out of the Northern Neck Bay area generated $25.4 million in sales, $14.1 million in income, and 554 person years of employment for the economy of Virginia. Trip expenditures accounted for 49.2 percent of total sales, 47.5 percent of income, and 50.1 percent of the total person years of employment. Expenditures on fishing equipment generated 8.4 percent of the total sales, 9.0 income and 10.9 percent of the total employment generated by anglers from the Northern Neck Bay area. Angling related expenditures on boats were responsible, respectively, for 42.4, 43.5, and 39.8 percent of the total sales, income, and employment generated for Virginia by anglers from the Northern Neck Bay region.

Other Virginia Areas: Economic Impacts

In 1994, anglers from other Virginia cities and counties spent $7.1 million on saltwater angling. Trip expenses accounted for 78.6 percent of total expenditures by anglers in the Other Virginia area [Table 17]. Fishing equipment purchases and boat expenses equaled, respectively, $785,000 and $738,000.

Major trip related purchases by anglers from other Virginia cities and counties included restaurant meals ($936,000), groceries ($534,000), lodging ($1.8 million), and private automobile expenditures ($1.1 million). Anglers making trips from this area spent $206,000 on rods, $155,000 on fishing reels, and $404,000 on fishing tackle. Relative to boat expenses, anglers from other Virginia areas spent $244,000 on fuel and oil in 1994, $34,000 on docking

Table 16. Economic Impacts of Northern Neck Bay Coast Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 7,775			
Impact on Virginia Economy:			
Direct:	5,137	2,560	132
Indirect:	1,544	881	30
Induced:	5,791	3,271	116
Total:	12,472	6,712	278
Fishing Equipment Purchases: 1,665			
Impact on Virginia Economy:			
Direct:	829	529	29
Indirect:	154	90	3
Induced:	1,157	654	24
Total:	2,140	1,272	55
Boat Expenses: 16,533			
Impact on Virginia Economy:			
Direct:	4,745	2,656	101
Indirect:	1,373	866	26
Induced:	4,630	2,615	94
Total:	10,747	6,137	221
Total Expenditures: 25,974			
Impact on Virginia Economy:			
Direct:	10,711	5,745	262
Indirect:	3,070	1,836	59
Induced:	11,578	6,540	233
Total:	25,359	14,121	554

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries). The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

Table 17. Economic Impacts of Other Virginia Area Anglers, 1994

Expenditure/Impact[a]	Total Sales	Total Income	Employment
	Thousand Dollars		Person-Years
Trip Expenses: 5,590			
Impact on Virginia Economy:			
Direct:	4,570	2,811	147
Indirect:	1,012	587	19
Induced:	6,341	3,582	125
Total:	11,924	6,980	291
Fishing Equipment Purchases: 785			
Impact on Virginia Economy:			
Direct:	391	249	13
Indirect:	72	42	1
Induced:	545	308	11
Total:	1,009	600	26
Boat Expenses: 738			
Impact on Virginia Economy:			
Direct:	507	255	10
Indirect:	191	121	4
Induced:	500	282	10
Total:	1,198	659	24
Total Expenditures: 7,112			
Impact on Virginia Economy:			
Direct:	5,468	3,316	171
Indirect:	1,275	750	24
Induced:	7,387	4,172	147
Total:	14,130	8,238	341

[a]Trip expenditures, fishing equipment purchases, and boat expenses equal the dollar amounts actually expended by saltwater anglers in 1994. The numbers coinciding with direct equal the portion of the sales, income, and employment actually remaining within Virginia and affecting the Virginia economy. The indirect amounts reflect the impacts generated for businesses which directly support the businesses which provide goods and services to anglers (e.g., grocery store must buy groceries). The induced numbers provide measures of sales, income, and employment generated by households employed in the direct and indirect sectors, which provide goods and services directly in support of angling, spending their household income received from their work. Numbers may not add to totals because of round-off errors.

and launching fees, and $86,000 on boat loans. Individuals responding to the surveys that they fished from other Virginia areas indicated that they did not purchase any new or used boats in 1994.

Expenditures by anglers fishing from other Virginia cities and counties generated $14.1 million in sales, $8.2 million in income, and 341 person years of employment for the economy of Virginia. Trip expenditures accounted for 83.9 percent of total sales, 84.7 percent of income, and 85.3 percent of the total person years of employment. Expenditures on fishing equipment generated 7.7 percent of the total sales, 7.3 percent of income, and 7.6 percent of the total employment generated by anglers making trips from other Virginia cities and counties. Boat related expenditures were responsible, respectively, for 8.4, 8.0, and 7.0 percent of the total sales, income, and employment generated for Virginia by anglers from the Other Virginia region.