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Virginia's Commercial Fishing Industry: Its Economic Performance and Contributions

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Kirkley, J. (1997) Virginia's Commercial Fishing Industry: Its Economic Performance and Contributions. Special Report in Applied Marine Science and Ocean Engineering; no. 337. Virginia sea grant publication ; no. VSG-97-02.. Virginia Institute of Marine Science, College of William and Mary. <https://doi.org/10.21220/V5JS55>

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Virginia's Commercial Fishing Industry:

Its Economic Performance and Contributions





Funding for this report was provided by . . .

- Virginia Institute of Marine Science
- Virginia Polytechnic Institute and State University, Commercial Fisheries and Shellfish Technologies Program (C/FAST)
- Virginia Sea Grant Marine Advisory Program
- Virginia Marine Resources Commission, Commercial Fisheries Improvement Fund
- Virginia Marine Products Board
- Virginia Seafood Council

Editor and Designer: Susan Christine Waters

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Virginia Institute of Marine Science, College of William & Mary

Virginia Sea Grant Program

Special Report in Applied Marine Science and Ocean Engineering No. 337. Virginia Sea Grant Advisory __.

Virginia's Commercial Fishing Industry:

Its Economic Performance and Contributions

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Virginia's Commercial Fishing Industry: Its Economic Performance and Contributions

For four months of the year, February, March, April and May, there are plenty of sturgeon; and also in the same months of herrings, some of the ordinary bigness as ours in England, but the most part far greater, of eighteen, twenty inches, and some two feet in length and better; both these kinds of fish in these months are most plentiful and in best season which we found to be most delicate and pleasant meat.

There are also trouts, porpoises, rays, oldwives, mullets, plaice, and very many other sorts of excellent good fish, which we have taken and eaten.—Thomas Hariot

When the first English colonies were established in Virginia, the bounty of the Chesapeake region provided some subsistence and commercial opportunities. It was not until after the Revolutionary War, with the enactment of the Potomac River Compact of 1785, that commercial fishing became an important industry in Virginia. The Compact created the stability necessary for industrial expansion by allowing Virginia fishermen to freely fish all portions of the Potomac River, which was owned by Maryland to the Virginia shoreline, in exchange for free entry of Maryland ships through the Virginia Capes.

By the early 1800s, Virginia fishermen were shipping fishery products around the world but were primarily dependent on domestic markets in Virginia and Maryland, the Northeast, and as far west as California. Sturgeon, salted herring, oysters, rockfish, shad, croaker, trout, and blue crabs were the major species or products during this time period. Fresh fish and shellfish were mostly locally consumed since methods of preservation were inadequate to prevent spoilage.

The commercial fishing industry through most of the 1800s was relatively unimportant in terms of economic importance and contributions to the state's economy. The commercial fisheries were not substantially developed until the mid 1800s and it was primarily for oysters (Quittmeyer 1957). By 1840, the value of products of all Virginia fisheries, including whalebone, but not oysters, was only \$4,000.

By 1900, the animal that helped support the early colonization of Virginia had all but disappeared. Sturgeon had become nearly extinct and replaced by more abundant species of finfish and shellfish. In the 1928 *Report of the Commission to Investigate and Survey The Seafood Industry of Virginia*, the primary species of commercial importance were listed as oysters, shad, menhaden, blue crabs, hard clams, and bay scallops. The

three most valuable species between 1900 and 1927 were oysters, white shad, and blue crabs.

Oyster and finfish contributed substantially to the building of many coastal cities, towns, and communities. The 1928 *Report of the Commission to Investigate and Survey The Seafood Industry of Virginia* stated that there were approximately 100,000 persons that secured their livelihood, or a part of their livelihood, in some way through commercial fisheries. More than 30,000 individuals were entirely dependent upon the seafood industry, and the other two-thirds, dependent to a lesser degree.

These important commercial fisheries, however, were not without problems in the early 1900s. Between 1901 and 1925, landings of oysters in Virginia declined from 6,067,669 bushels to 4,356,416 bushels. The number of individuals earning a living from tonging for oysters declined from 14,000 to 5,000 individuals, or 64 percent between 1903 and 1927. In contrast, shad landings remained nearly constant between 1901 and 1925. In 1901, shad landings were 6,927,212 pounds; landings were 6,103,704 pounds in 1925. The value of shad landings increased by 275 percent during the same period. The landings and landed value of blue crabs also experienced a substantial increase between 1901 and 1925. In 1901, landings and landed value for blue crabs were 6,113,277 pounds and \$52,863. In 1925, landings and landed value had increased to 18,531,994 pounds and \$523,733.

By the late 1930s, Virginia seafood products were being shipped all over the United States as well as being exported to numerous foreign countries. Because of perishability problems, Virginia could not easily expand its limited foreign market. Yet, Virginia was shipping fresh and frozen products, on a regular basis, to Boston, Massachusetts; Omaha and Lincoln, Nebraska; Birmingham, Alabama; Jacksonville, Florida; Minneapolis, Minnesota; and places in between. Most of the demand for Virginia seafood was for oysters, and to a lesser extent, for croaker. Approximately 75 percent of Virginia's seafood production was shipped out of Virginia.

Between 1935 and 1948, the fifteen top commercial species were croaker, sea trout, shad, porgy, alewife or river herring, flounder, rockfish (striped bass), sea bass, butterfish, spot, Boston mackerel, catfish, oysters, blue crabs, and hard clams. Croaker was the most important in terms of landed value of finfish, and oysters dominated the landed value of shellfish. In 1935 and 1946, croaker ranked first in landed value and poundage. In 1948, alewife had the greatest landings, but croaker maintained its leadership relative to the landed value of finfish. Throughout the entire period and relative to all species of finfish and shellfish, oysters had the highest landed value.

The number of individuals earning a living from tonging for oysters declined from 14,000 to 5,000 individuals, or 64 percent between 1903 and 1927.



After World War II, the commercial fisheries, although only marginally contributing to the economy of Virginia, contributed substantially to coastal economies. In 1950, the total value of agricultural production was 21 times the landed value of all fish, except menhaden, in Virginia. When we examine the county and city level, however, the picture changes. Out of 27 Virginia counties or cities with some coastal access or linkages, 12 counties or cities had landed values in

excess of 25 percent of the value of agricultural production. The counties or cities with landed values in excess of \$400,000 were Accomack, Elizabeth City, Gloucester, Lancaster, Mathews, Middlesex, Norfolk, Northampton, Northumberland, Westmoreland, and York.

Virginia fisheries also did not contribute much to employment opportunities at the state level. In 1950, the number of

fishermen employed accounted for 0.84 percent of total employment in Virginia. At the county and city level, particularly among coastal communities, commercial fishing was often a major source of employment. In counties like Northumberland, the number of fishermen accounted for more than 30 percent of all employment.

To assess the impacts solely by the number of people employed in harvesting

and processing is very misleading. The Virginia seafood industry contributes more to employment than just the number of fishermen and employees of processing and wholesaling businesses. Boat design, construction, sales and repair, as well as gear sales and repair are part of the economic picture. Included too are truck drivers, owners and sales clerks at wholesale and retail outlets, restaurant owners and workers, lawyers, doctors, college professors, and fishery scientists and managers. Companies which benefit range from stores which sell groceries to the fishing crew and manufacturers of processing equipment, to firms which produce and sell ice and ones which sell fuel.

Even though the industry has a demonstrated value, resource managers and legislators were and are concerned about the industry. Almost half a century ago, in 1951, the Virginia Marine Advisory Legislative Council responded to concerns about decreasing catches and declining economic opportunities in coastal communities. The report issued by the Council, *The Seafood Statutes and the Rehabilitation of the Seafood Industry*, was presented to the Commonwealth's General Assembly. Of particular concern were the declines in oysters, crabs, and shad. It was also noted that many of the important finfish species such as rockfish, seatrout, croaker, and spot were subject to violent fluctuations in resource abundance and availability. Presently, there is no commercial shad fishery. The rockfish catch, while allowed to increase in recent years, is restricted.

Seatrout is being increasingly regulated since resource levels are declining. The blue crab resource appears to be in a state of decline, and scientists are concerned about resource levels. On the other hand, croaker appears to be highly abundant.

It is important to remember that even though natural stocks are imposing limits on harvest levels, American consumers are increasingly demanding more healthy protein which presently means fish. Between 1909 and 1994, consumers increased consumption from eleven pounds per individual to more than 15.2 pounds per individual. A substantial amount of the increase occurred between 1970 and 1994 when per capita consumption increased from 11.8 to 15.2 pounds per person. In addition, the U.S. population increased from 202 to 259 million between 1970 and 1994. In contrast, the per capita consumption of red meat, while being much higher than the consumption of fish, decreased from 131.7 to 114.1 pounds per person between 1970 and 1994. On the other hand, per capita consumption of poultry products nearly doubled; poultry demand increased from 34 to slightly over 60 pounds per person between 1970 and 1994.

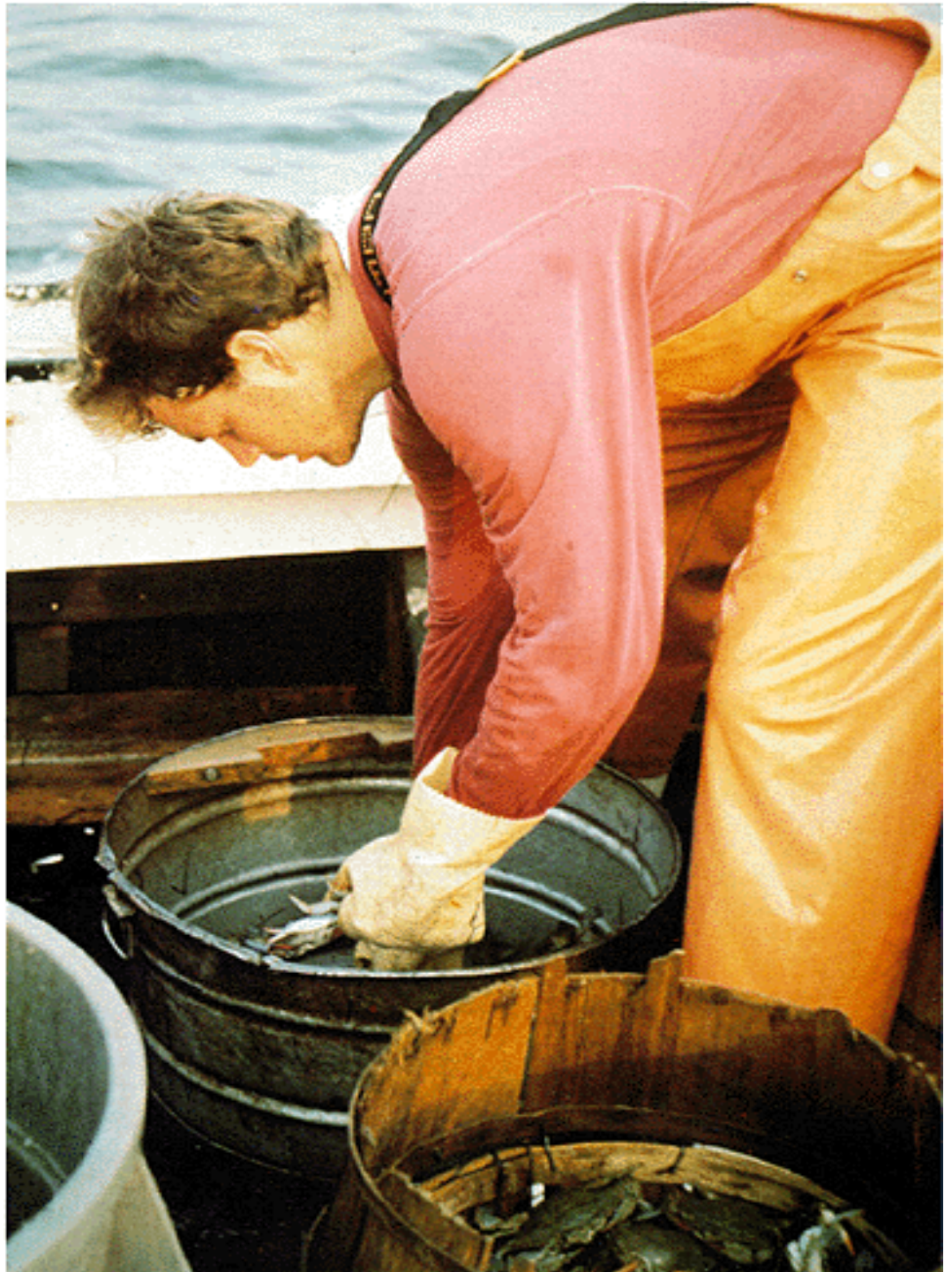
The American appetite for seafood has far outstripped the supply of domestic seafood. In 1976, American consumers demanded 7.4 billion pounds of seafood. The U.S. fishing industry could only supply 37.5 percent of U.S. demand; 62.5 percent of the demand was satisfied with

imports. In 1994, U.S. residents consumed 13.7 billion pounds of seafood, and imports accounted for 42.1 percent of the domestic supply available for domestic consumption. Most of the increase in demand occurred between 1988 and 1990 when consumption increased from 10 billion pounds to over 13 billion pounds. While the growing appetite for seafood has been partly satisfied by increased domestic production and increased volume of imports, aquaculture has also helped satisfy consumer demand. In 1983, reported U.S. aquaculture products contributed approximately 308 million pounds to total domestic supply; in 1993, aquaculture production exceeded 700 million pounds. These aquaculture statistics pertain only to catfish, salmon, trout, and selected shellfish. Species like rockfish and tilapia are not included; reported U.S. production of tilapia exceeded 16 million pounds in 1994.

The Commonwealth of Virginia has substantial economic opportunities in fisheries even though resource levels of many species are fully exploited or over-exploited. Value-added production and increased marketing can all contribute to enhancing the value of Virginia seafood. Export opportunities are expanding for species landed in Virginia. The Asian market appears to offer considerable expansion opportunities. Aquaculture offers substantial opportunities for satisfying a growing world demand for seafood.

Out of concerns about the welfare of the industry and resource levels, and in recognition of the need to improve resource utilization, the Virginia Marine Resources Commission and the Commercial Fishing Advisory Board commissioned this study to determine the economic importance and contributions of the commercial fishing industry of Virginia. This study presents an examination of the economic role, contributions, and impacts of commercial fishing relative to the economies of the state and coastal communities of Virginia.

The primary focus is on sales or revenue, output or production, employment, and income generated by the industry. A simple summary of the numbers, however, can in no way do justice to demonstrating just how important the industry is. Lest we forget, the commercial fishing industry is an industry of opportunities. The industry is sometimes good and sometimes not so good, but when the resource is appropriately nurtured, men and women of all backgrounds and ages can earn a good living through hard work. It is an industry that can last forever if the resource and the marine environment are reasonably maintained. Last, but possibly most important, the fishing industry provides a high-quality source of protein for personal consumption.





Virginia's Commercial Fisheries

The Wild Fisheries and Species

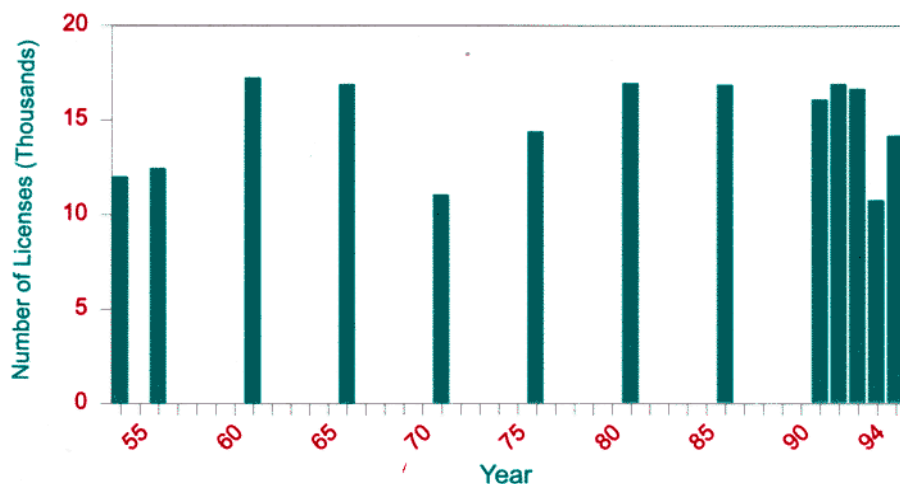
Although the number of fisheries and gear types used to harvest finfish and shellfish within Virginia waters and the exclusive economic zone are substantial, a limited number of gear types account for the majority of the landings.

It would take an exhaustive survey just to determine the number of different fisheries in Virginia. Numerous gear are employed by vessels and boats of different types and configurations. The Virginia Marine Resources Commission (VMRC), the state agency assigned the responsibility of carrying out the state's marine resource management, issues approximately 78 different types of commercial fishing licenses based on gear type, number of gear, and species. The state does not issue licenses, however, for all Virginia-based fisheries. Fisheries harvested in the exclusive economic zone (EEZ) must be permitted by the federal government. A fishery is not defined only in terms of the gear used to harvest the resource, but also in terms of product form, area caught, area landed, and market sold in. In addition, there are concerns about whether or not the fishery is a full-time, part-time, or occasional fishery. Recent concerns are about whether or not aquaculture comprises a fishery, or whether it should be viewed as agriculture and not a fishery.

Although the number of fisheries and gear types used to harvest finfish and shellfish within Virginia waters and the exclusive economic zone are substantial, a limited number of gear types account for the majority of the landings. The major gear types used within Virginia waters are oyster hand tong, crab dredge, crab trap, crab pot, ordinary clam tong, various types of gill nets, conch dredge, fyke net, and purse seines. The major gear types for the offshore fisheries are scallop dredge, surf clam and ocean quahog dredge, trawls, and long-lines. In terms of landed value, purse seines typically account for the highest landed value. The scallop dredge, however, has frequently accounted for slightly more landed value than purse seines. Crab pots are responsible for the third highest landed value in the state. Haul seines, pound nets, and patent tongs for clams, although few in number, also greatly contribute to Virginia landings.

The VMRC does not maintain data by commercial fishing vessel that can be easily used to determine the number of fishing boats. The agency does maintain very detailed information about licenses. In 1994, the numbers of licenses issued for

Figure 1. Number of Commercial Fishing Licenses Issued by Virginia Marine Resources Commission, 1953-1994



commercial fishing activities exceeded 14,000. One individual, however, may have more than one license; thus, the number of licenses does not indicate the number of individuals engaged in commercial fishing. In retrospect, the number of licenses in 1953, 1960, 1970, 1980, 1990, and 1993 were 12,030; 17,259; 11,020; 16,963; 16,102; 10,769; and 14,172 (Figure 1).

Although the number of licenses is not necessarily indicative of the number of individuals involved in the industry, it does provide an indication of activity. In 1953, 3,203 licenses were issued for hand tonging oysters. Today, with the decline of the oyster resource in Virginia, less than

400 licenses have been issued for hand tonging oysters. The majority of the licenses issued are for crab gear and gillnets.

Virginia also has a relatively large offshore fleet. In 1994, there were more than 250 documented vessels fishing out of Virginia. These were mostly trawl, scallop dredge, and long-line vessels; prior to 1990, there was also a large offshore surf clam and ocean quahog dredge fleet. This count is not indicative of all offshore activity occurring from Virginia ports. Numerous vessels which regularly operate from Virginia facilities are registered in other states. It is not an uncommon sight to observe a New

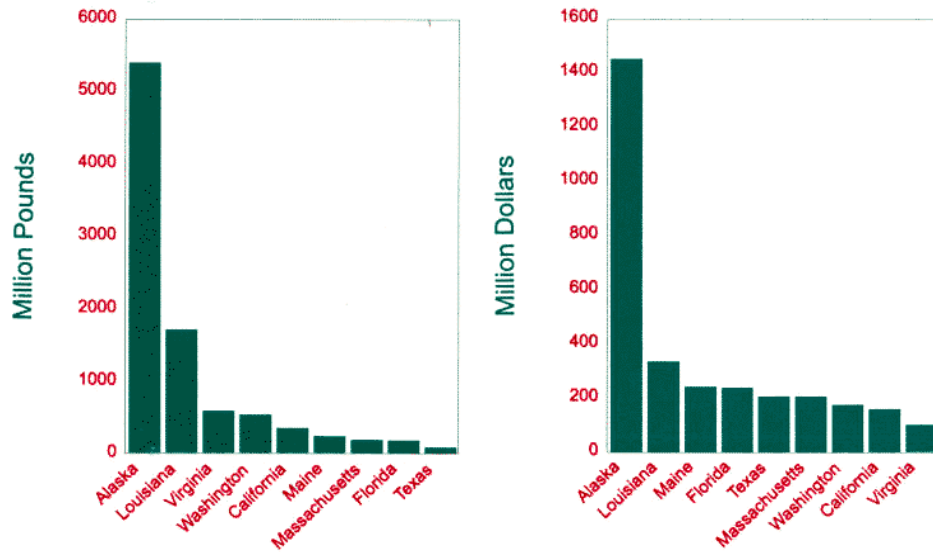
Bedford, Massachusetts vessel offloading finfish or shellfish at a Virginia port.

In 1994, there were 3,062 individuals registered to commercially fish within Virginia waters or the Territorial Sea (all inshore waters out to three miles offshore). Considering crew who work for the license holders and the offshore vessels, which do not have to be licensed by Virginia, approximately 7,100 individuals were directly engaged in harvesting activities in 1994.

Relative to the total number of individuals employed in Virginia—3.2 million—7,100 individuals engaged in commercial fishing does not seem very important. Fishermen account for only 0.21 percent of the total employment in Virginia. Employment in all sectors of agriculture, forestry, and fisheries combined accounted for 7.65 percent of the total employment in Virginia in 1994. Virginia's Workforce 2000 study projects the employment in agriculture, forestry, and fisheries will account for only 0.67 percent of total employment in the year 2000.

Even if the total number of individuals engaged in fishing seems low, the commercial industry generates employment in other sectors of the economy. Hotels, motels, eating and drinking establishments, and grocery stores are businesses in which seafood is sold. These industries are projected to have high growth in employment opportunities in the future.

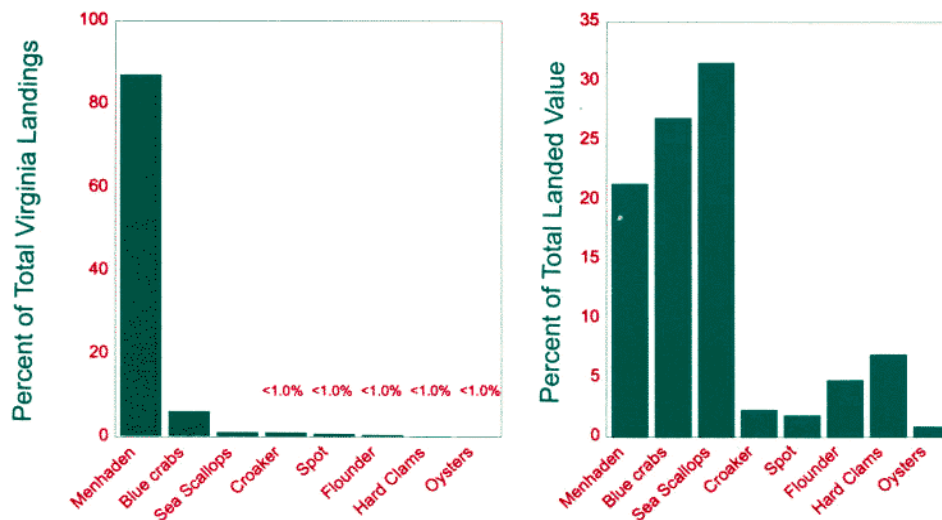
Figure 2. Commercial Seafood Production, By State, 1994



Relative to 1994 U.S. fisheries landings, Virginia ranked third (Figure 2). Virginia followed Alaska and Louisiana in quantity of landings, the result of large landings of menhaden. In value terms, Virginia landings were the ninth highest. Virginia followed California—not bad for a coastal state with a population equal to 21 percent of California’s population.

What sets Virginia’s seafood industry apart from many other states is the diversity of species and product forms. Approximately fifty different species of finfish and shellfish are landed each year at Virginia ports. It is the blue crab and oyster which remain supreme in the consumer’s mind. Virginia blue crabs and oysters are the best, so people say. It is a toss-up as to whether or not Virginia, Maryland, or Louisiana is the nation’s top producer of blue crabs. Relative to total landed value in Virginia, blue crabs, flounder, oysters, hard clams, sea scallops, and menhaden typically account for more than 90 percent of the landed value of all marine finfish and shellfish. In 1994, the above-mentioned species accounted for 89.4 percent of the value of finfish and shellfish landed in Virginia (Figure 3). These same species accounted for slightly more than 94 percent of the total quantity landed in 1994.

Figure 3. Major Species of Virginia's Commercial Fishing Industry



Nearly all of the landings of blue crab, oysters, hard clams, and menhaden come from the Chesapeake Bay. Blue crabs are primarily harvested by crab pots; oysters

are mostly taken by hand tong; hard clams are harvested principally by hand and patent tongs and dredge; menhaden are harvested mostly by purse seine (Table 1). Sea scallops are taken exclusively in the offshore waters or Atlantic Ocean by dredge. Flounder and menhaden are harvested both in the Chesapeake Bay and in the offshore waters of the Atlantic. Flounder are harvested primarily by trawl in the offshore waters. Most of the menhaden catch comes from the Chesapeake Bay purse seine fishery.

Like other fisheries throughout the world, many of Virginia's fisheries appear to be fully utilized. There are simply few or little growth opportunities relative to increasing total production. Total landings in Virginia exhibited a slight upward trend between 1970 and 1994 (Figure 4). In fact, landings increased 6.2 percent between 1970 and 1994. In comparison, landed value increased by nearly 500 percent between 1970 and 1994. The increase in value of landings was primarily the result of increased harvests of sea scallops, hard clams, soft-shell crab, emerging fisheries such as the conch fishery, and our ever-present economic inflation. Fishermen also focused on higher-value species during this period, and consumers substantially increased their desire for seafood as they attempted to eat more healthy foods.

Table 1. Primary Fishing Areas and Gear Types of Virginia's Fisheries.

Species	Primary Gear	Primary Area
River herring	Gill net	Inshore
Shad	Gill net	Inshore
Gray trout	Gill net	Inshore
Spotted trout	Gill net	Inshore
Menhaden	Purse seine	Inshore
Spot	Gill net	Inshore
Croaker	Gill net	Inshore
Striped bass	Gill net	Inshore
Black drum	Gill net	Inshore
Eel	Eel pot	Inshore
Fluke	Trawl	Offshore
Mackerel-Boston	Trawl	Offshore
Mackerel-Spanish	Pound net	Inshore
Bluefish	Gill net	Inshore
Scup	Trawl	Offshore
Black sea bass	Trawl	Offshore
Tuna	Longline	Offshore
Dolphin	Longline	Offshore
Sharks	Longline	Offshore
King mackerel	Gill net	Inshore
Hard clams	Patent tong	Inshore
Conchs	Dredge (pots offshore)	Inshore
Hard blue crabs	Crab pots	Inshore
Blue crabs-Peelers	Peeler pots	Inshore
Oysters-market	Hand tong	Inshore
Sea scallops	Scallop dredge	Offshore
Surf clams	Hydraulic dredge	Offshore
Ocean quahogs	Hydraulic dredge	Offshore

Finfish

Dating back to the 1600s on up to today, Virginia watermen have harvested finfish. In the early times, sturgeon and river herring were heavily harvested and were the major commercial fisheries of Virginia. As consumers' tastes and preferences became different, and as technology changed over time, so did the species being harvested. In 1994, total finfish landings in Virginia were 536.5 million pounds with a landed or dockside value of \$45.2 million. Relative to 1970, finfish landings have increased by a modest 8 percent (Figure 5). In 1970, finfish landings equaled 495.4 million pounds. Value, on the other hand, has risen by 289 percent since 1970. There has been, though, a substantial change in the species composition as watermen have shifted fishing effort to those fisheries with higher expected earnings.

Since 1935, thirteen species have traditionally accounted for more than 98 percent of finfish landings. In general, the thirteen species may be thought of in terms of industrial and edible finfish species. Menhaden is the major industrial species and croaker, seatrout, shad, porgy, alewife, flounder, rockfish (striped bass), sea bass, butterfish, spot, Boston mackerel, and catfish are the major edible finfish. Some species, like alewives, are both edible and industrial.

Figure 4. Fishery Production in Virginia, 1970-1994

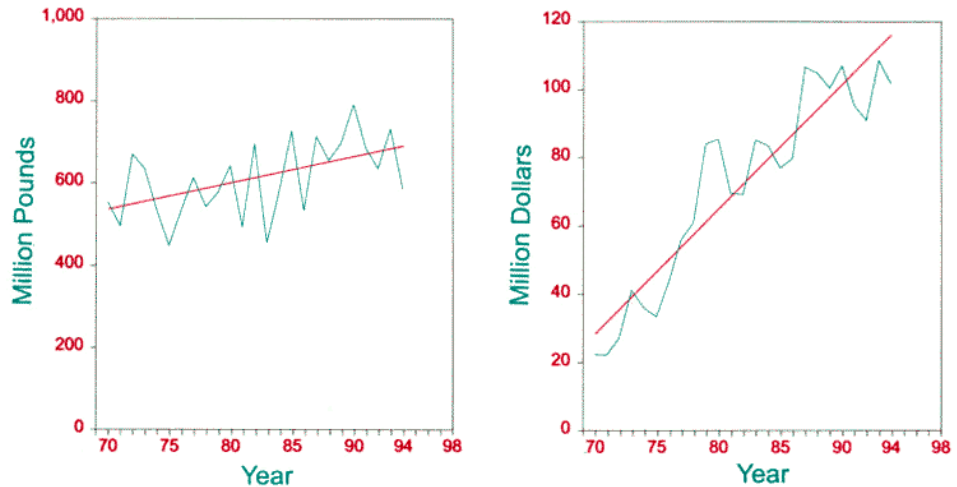
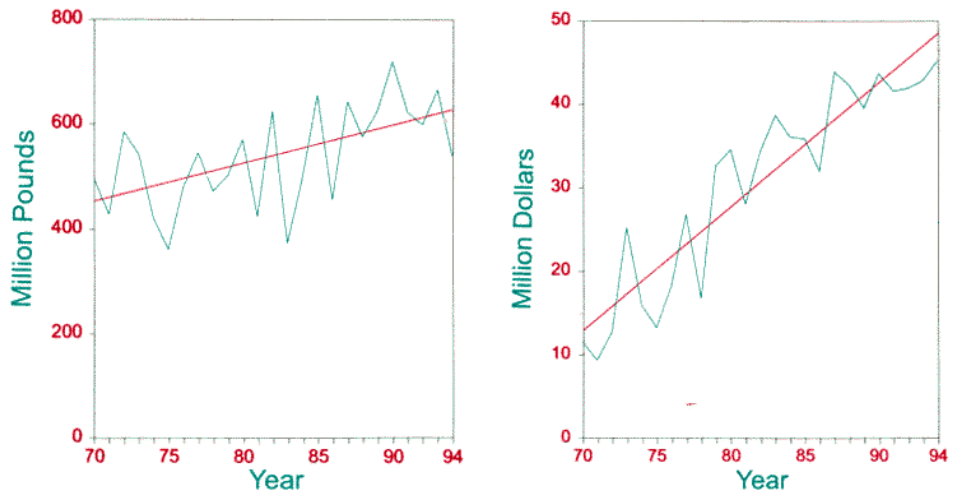
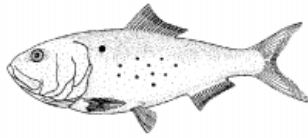


Figure 5. Virginia Finfish Landings and Value, 1970-1994



In Virginia, menhaden, which is not normally consumed as food, has accounted for about 92 percent of finfish landings in Virginia. The second most important species in recent years, relative to landed value, is summer flounder; flounder, on average, accounts for less than 1 percent of total commercial finfish landings but nearly 10 percent of the landed value of all species. There are, however, growing fisheries or expansion opportunities for eels. And in recent years, there has been a resurgence of croaker, spot, seatrout, and striped bass—all of which were once major finfish species landed in Virginia.

In comparison, the twelve edible species have historically accounted for more than 90 percent of the landings of edible finfish. Species landed in Virginia are no longer only those available in the Chesapeake Bay. Today, it is commonplace to find tuna, dolphin (mahi-mahi), shark, cobia, and various mackerels available in the local markets and restaurants. All these species are available either in the Bay, nearshore, or offshore waters of Virginia. It is not uncommon to even have the more northern species such as cod and haddock landed in Virginia as Virginia vessels return home from fishing the north Atlantic.



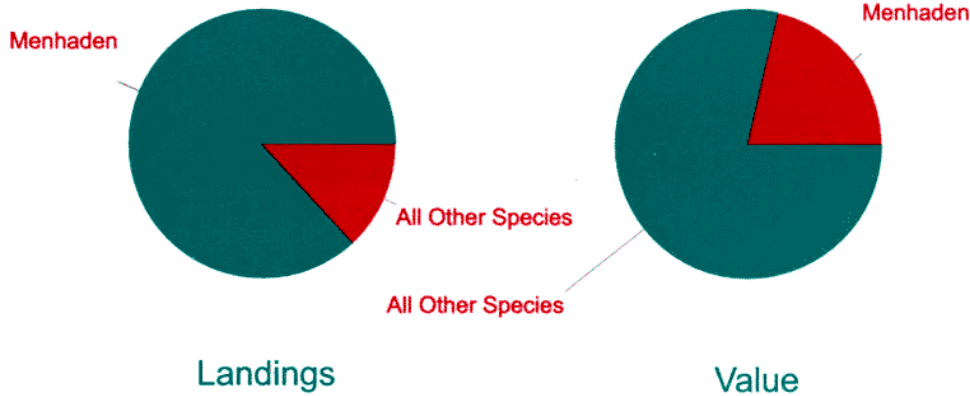
Atlantic Menhaden

Atlantic menhaden, fatback, moss-bunker, bunker or *Brevoortia tyrannus*, is by far the largest finfish fishery in Virginia in terms of quantity landed and value of landings. The menhaden fishery is an industrial fishery rather than the usual seafood fishery. Menhaden is a small oily fish of the herring family and is highly valued for its oil and use as fish meal. Menhaden is also used as bait by commercial watermen and recreational anglers. The fishery is one of the oldest and largest in North America. Menhaden are distributed from Nova Scotia to Florida and move north and south with the seasons. Menhaden spawn in the Atlantic shelf waters in late fall and winter, with young menhaden or juveniles appearing in the Chesapeake Bay during early spring and summer. Menhaden are filter feeders and feed on planktonic plants.

The Atlantic menhaden occur in large schools, sometimes appearing over several square acres, and are thus highly vulnerable to harvesting by purse seine, the major gear. Menhaden are, to a much lesser degree, also harvested by snapper rigs. A very small quantity of menhaden are caught by pound nets.



Figure 6. Menhaden's Share of Total Virginia Landings and Value



Relative to the total quantity of finfish and shellfish landed in Virginia, menhaden have accounted for slightly more than 87 percent (Figure 6). In value terms, menhaden landings have been responsible for 21 percent of the landed value of all species landed in Virginia.

The primary gear accounting for the majority of menhaden landings is the purse seine. There are only a few companies engaged in the purse seine fishery. In 1994, eighteen purse seine vessels landed 502,361,980 pounds of menhaden with an ex-vessel value of \$17,502,418 (Table 2). Snapper rigs and pound nets harvested an additional 5,664,625 pounds worth \$550,182 in 1994.

Although the number of companies engaged in the purse seine fishery are relatively few, the fishery is of considerable economic importance to the local community of Reedville in Northumberland County. In 1994, the local companies had a total payroll in excess of \$10 million. They employed 296 individuals aboard the purse vessels and 274 individuals in

shore-side support operations. They spent more than \$2 million on utilities in 1994 just to support shoreside activities.

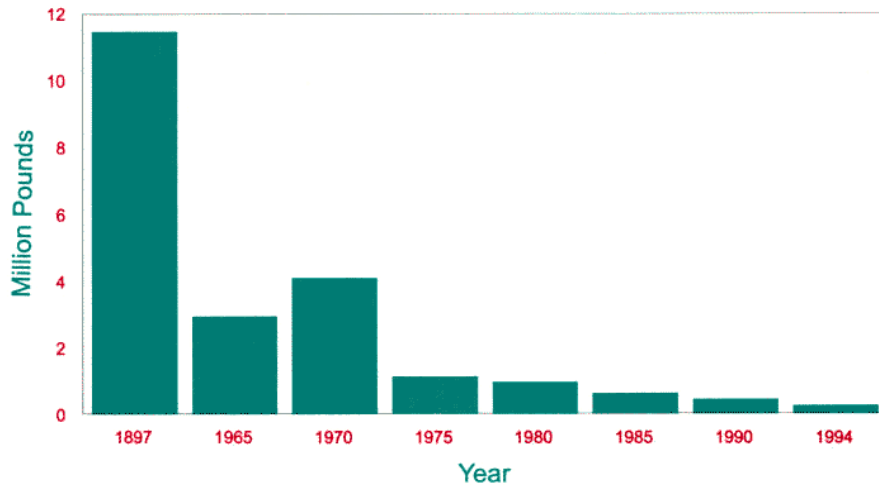
The menhaden firms had total sales in excess of \$30 million in 1994. More than \$20 million in sales were for fish meal. The menhaden companies spent more than \$17 million just on harvesting menhaden in 1994. Fishing crew earned \$7.4 million or an average salary of \$25,000 per person per fishing season (typically between May and November or 8 months when vessel maintenance and gear are considered).

Shore based production and sales activities generated more than \$3.5 million in direct payments to employees. More than 500,000 hours of manpower was necessary to support shore-based activities. In terms of full-time employment (2,080 hours per employee per year), shoreside activities provided an average annual salary of \$14,300 per employee.

Table 2. Virginia Dockside Landings, Value, and Prices, Menhaden, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	N/A		
1965	351,613,000	5,249,000	0.015
1975	315,783,000	7,717,000	0.024
1985	633,010,000	25,360,000	0.040
1994	508,026,605	18,052,600	0.036

Figure 7. Virginia Landings of American Shad, Selected Years



In addition, the menhaden companies paid approximately \$2,600 in support of benefits for each full-time equivalent employee.



American Shad

Shad, *Alosa sapidissima*, is an anadromous species which seasonally returns to freshwater to spawn. Spawning occurs in late winter and early spring. Shad have long been a delicacy of Virginia's waters. In fact, shad planking parties are still important to Virginia politics. The preferred product by consumers, however, is the roe of the shad. The flesh is primarily used as bait or simply discarded.

Table 3. Virginia Dockside Landings, Value, and Prices, American Shad, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	2,883,000	275,000	0.095
1965	2,955,000	307,000	0.104
1975	1,137,000	309,000	0.272
1985	633,000	216,000	0.341
1994	237,657	244,908	1.031

Unfortunately, the shad fishery has fallen on hard times. Landings have plummeted from a high of 11.5 million pounds in 1897 to less than 300,000 pounds in 1994 (Figure 7). In 1935, landings of shad were 2.9 million pounds with a landed value of \$275,000; landings and the landed value were 2.96 million pounds and \$307,000 in 1965 (Table 3). The landed value in 1994 was less than \$251,000. Between 1935 and 1965, the nominal, unadjusted for inflation, average price increased by only \$0.01, from \$0.09 to \$0.10 per pound. From 1965 to 1994, however, the average price per pound increased by 857 percent to \$0.96 per pound. When adjusted for inflation, the price of shad still increased between 1965 and 1994, from \$0.10 to \$0.35 per pound.

Table 4. Virginia Dockside Landings, Value, and Prices, Alewives, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	10,973,000	65,000	0.006
1965	36,200,000	520,000	0.014
1975	11,360,000	408,000	0.036
1985	432,000	20,000	0.046
1994	178,119	26,249	0.147



Alewives

Alewives, *Alosa*, or river herrings, actually consist of two different species which are typically not distinguished by commercial watermen. Alewife and blueblack herring are both anadromous, migrating from the sea into freshwater to spawn in late winter or early spring. The primary gear was historically the pound net. The predominant gear of today is the gill net.

The alewife, like menhaden, is an oily-fleshed fish which is rarely eaten fresh. George Washington operated one of the early American Colonial fisheries for alewives. At that time, alewives were used for fertilizer and food. Salt herring, the primary product of alewives during the late 1700s, sold for about \$7 a barrel. During the 1940s and 1950s, the major alewife or herring products were canned, salted, and cured; these are still the

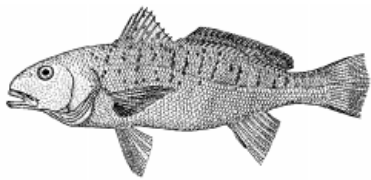
major product forms of today. Herring is also used for bait in other Virginia commercial and recreational fisheries.

In 1935, landings of alewives in Virginia were approximately

11 million pounds with an estimated ex-vessel or dockside value of \$65,000 (Table 4). In 1965, landings were 36 million pounds with a dockside value of \$520,000. In 1994, only 178,000 pounds were landed; the estimated dockside value was \$26,000.

Nominal or unadjusted for inflation prices substantially increased between 1935 and 1994. In 1935, the dockside price per pound received by fishermen was a meager \$0.006. The price received in 1965 was \$0.01 per pound. Between 1965 and 1992, the nominal price increased to \$0.07 or by more than 400 percent. If the price is adjusted for general inflation, fishermen received \$0.053 per pound in 1994 for river herring in terms of 1965 value.





Atlantic Croaker

Another major finfish species of Virginia with substantial significance to the commercial fisheries is Atlantic Croaker, *Micropogonias undulatus*, also called crocus, hardhead, or King Billy. The species is as highly valued by recreational anglers as it is by commercial anglers.

Croaker are distributed along the Atlantic coastal areas, from Massachusetts to Florida and even in the Gulf of Mexico. Many landed croaker are typically less than one pound, yet the species may grow to over four pounds and reach an age of four to five years old.

Croaker has been one of the major finfish species of Virginia. The primary commercial gear used to harvest croaker is the gill net. In 1935, croaker landings

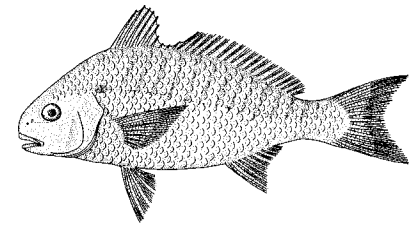
totaled 23 million pounds and accounted for 38 percent of all edible finfish landed in Virginia (Table 5). In comparison, landings of croaker accounted for only 2 percent of edible finfish species landed in Virginia in 1994. In 1945, croaker landings reached a historical high of over 55 million pounds. Between 1965 and 1994, croaker landings increased from 1.5 to 5.7 million pounds.

The level of landings of croaker may be quite misleading about the importance of the species to the seafood industry. Landings of croaker, like many finfish species of Virginia, have been extremely variable over time. For example, landings increased from 1.5 million in 1965 to 4.7 million in 1975. Between 1976 and 1977, landings increased by more than 45 percent to 8.6 million pounds. Subsequently, landings of croaker plummeted to 119,000 pounds in 1982 and increased to 2.7 million pounds in 1985.

In 1935, the landed value of croaker in Virginia was \$293,000. In contrast to many Virginia species, the landed value of croaker decreased between 1935 and 1965, going from \$293,000 to \$154,000. The landed value of croaker in 1994 was \$2 million.

The nominal average price per pound for croaker

increased from \$0.01 in 1935 to over \$0.10 in 1965. Between 1965 and 1994, the nominal price per pound increased from \$0.10 to over \$0.35 per pound. When adjusted for inflation, the average price per pound increased by \$0.03 per pound between 1965 and 1994.



Spot

Spot, *Leiostomus xanthurus*, or silver gudgeon or lafayette, is another very popular finfish species, harvested by both commercial and recreational anglers in Virginia. Spot, although notoriously known for being boney, is also prized for its sweet tasting flesh, particularly pan fried. Like croaker, Spot has traditionally been one of the major finfish species landed in Virginia.

Spot are distributed from Massachusetts to the Bay of Campeche, Mexico. They typically start showing up in the Chesapeake Bay in April and remain until early fall. Spot have traditionally been harvested by haul seines, but gill nets and pound nets are now responsible for most of the catch.

Spot, like many of the other species of finfish harvested in the Bay, are extremely sensitive to environmental conditions. Landings may be low in one year and eight times as high in the next year. For

Table 5. Virginia Dockside Landings, Value, and Prices, Atlantic Croaker, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	23,038,000	293,000	0.013
1965	1,532,000	154,000	0.101
1975	4,721,000	513,000	0.109
1985	2,769,000	553,000	0.200
1994	5,712,329	2,001,229	0.350



example, landings were only 116,000 pounds in 1968 but increased to over 1,000,000 pounds in 1969.

In 1935, reported commercial landings of spot were 407,000 pounds with a dockside value of \$14,000 (Table 6).

The nominal price per pound was \$0.03. Landings increased to nearly 1.8 million pounds in 1965 and 4.3 million pounds in 1994. In 1935 and 1965, spot accounted for 0.6 and 2 percent, respectively, of the total landings of edible finfish. Spot accounted for more than 13 percent of the edible finfish landed in Virginia in 1994.

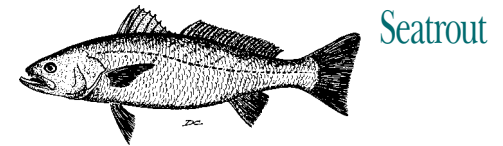
The nominal price per pound increased from \$0.03 per pound in 1935 to \$0.14 and \$0.38 per pound in 1965 and 1994, respectively. After adjusting for inflation, the price per pound actually decreased between 1965 and 1994; real or adjusted price decreased from \$0.14 to \$0.13 between 1965 and 1994.

Changes in the price per pound for spot perhaps best illustrate a major problem confronting watermen. In good resource years, commercial harvesters experience significant price reductions. In poor resource years, harvesters usually enjoy high prices but little supply. The

Table 6. Virginia Dockside Landings, Value, and Prices, Spot, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	407,000	14,000	0.034
1965	1,751,000	248,000	0.142
1975	1,918,000	276,000	0.144
1985	1,539,000	564,000	0.366
1994	4,259,830	1,625,753	0.382

bottom line is that the harvester is always at the mercy of the market and natural resource.



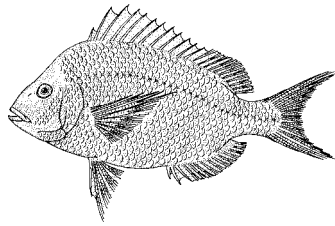
Seatrout, *Cynoscion regalis*, or gray seatrout, weakfish, trout, or gray trout as it is commonly known, is another finfish that is important to both recreational and commercial anglers. Seatrout is closely related to croaker, spot, and black drum. The seatrout is found from Massachusetts to Florida, infrequently off Nova Scotia, and in the Gulf of Mexico. It is highly prized by consumers. The major market forms for locally harvested seatrout are fresh whole and filleted. The primary commercial gear used to harvest gray trout in Virginia is the gill net.

Landings of gray trout have been erratic but considerably less erratic than

the landings of other finfish species in Virginia. In 1935, commercial harvesters landed 13.6 million pounds of gray seatrout, and in 1945, harvesters experienced record landings of 22.5 million pounds. Between 1965 and 1986, landings remained virtually unchanged, although experiencing considerable variation between the two years. Landings during both time periods were 2 million pounds. Unfortunately, landings of gray trout declined to a low of 1.3 million pounds in 1994. Similar low landings were observed between 1967 and 1969 but substantially increased in 1970.

The landed value of seatrout in 1935 was nearly equal to the landed value of seatrout in 1965 (Table 7). Between these periods, however, landed value greatly fluctuated. In 1935, the landed value was \$171,000. By 1945, the landed value increased to \$2.4 million. In 1965, the landed value was down to \$180,000 and slowly increased to over \$1 million by 1979. In 1994, the landed value of seatrout was \$729,000.

In 1935, watermen received approximately \$0.01 per pound. In 1965, they received about \$0.09 per pound. The price received per pound in 1994 for seatrout was \$0.56 which, even after adjusted for inflation, equaled a 125 percent increase that is indicative of the value consumers have increasingly placed on seatrout.



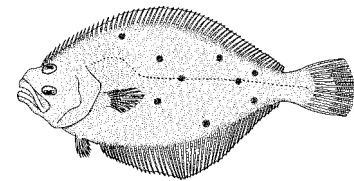
Scup

Scup or porgy, *Stenotomus chrysops*, has been another popular Virginia finfish. Porgy are available in coastal waters, from the Gulf of Mexico to Cape Hatteras, North Carolina. During the winter months, porgy are available offshore between New Jersey and North Carolina. Porgy are also frequently caught by Massachusetts recreational anglers. Porgy is typically a pan sized fish but does become large enough for filleting. Most of the scup landed in Virginia are harvested by the offshore trawlers.

Scup is particularly subject to large fluctuations in resource abundance. Landings have ranged from a low of 184,000 pounds in 1985 to over 13 million in 1960. Between 1935 and 1948, landings increased from 1.9 million pounds to 6 million pounds (Table 8). In 1965, landings were only 479,000 pounds. Landings further decreased to 202,749 pounds in 1994.

Between 1982 and 1986, the landed value of scup averaged \$412,000 per year. In 1994, the landed value was down to \$91,000. The landed value of scup, however, has been as high as \$800,000, which occurred in 1966.

Like most finfish species of Virginia, the landed value of scup in 1935 was quite low. Virginia watermen received \$0.01 per pound in 1935. In 1965, the average dockside price per pound was \$0.08. In 1994, the nominal dockside price was \$0.45 per pound. After adjusting for inflation, the price of scup was \$0.16 per pound in 1994, or 104 percent higher than it was in 1965.



Summer Flounder

Although other types of flounder are landed in Virginia, the summer flounder, *Paralichthys dentatus*, or fluke, flounder, and plaice, as it is commonly known, is the premier flounder of Virginia. It is highly desired by commercial and recreational anglers and diners throughout the United States. The summer flounder is a usually abundant flatfish of the Middle Atlantic Bight. It is found in the Chesapeake Bay, in nearshore coastal waters, and offshore in the Atlantic Ocean. The primary gear used to harvest summer flounder is the trawl. Incidental harvests, however, are also made by Virginia's large scallop fleet.

Summer flounder is marketed in a variety of forms. These include fresh whole, filleted, stuffed, and frozen. A common favorite of restaurant diners is

Table 7. Virginia Dockside Landings, Value, and Prices, Seatrout, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	13,555,000	171,000	0.013
1965	2,007,000	180,000	0.089
1975	4,090,000	554,000	0.135
1985	2,052,000	1,083,000	0.528
1994	1,336,862	760,652	0.569

Table 8. Virginia Dockside Landings, Value, and Prices, Scup, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	1,935,000	28,000	0.014
1965	6,277,000	479,000	0.076
1975	409,000	71,000	0.174
1985	164,000	52,000	0.317
1994	202,749	91,190	0.450

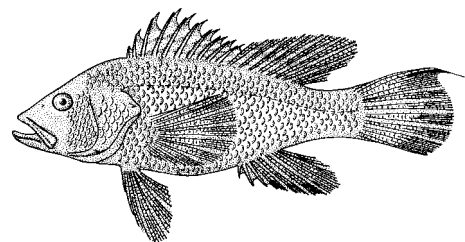
Table 9. Virginia Dockside Landings, Value, and Prices, Flounder, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	672,000	34,000	0.051
1965	1,977,000	363,000	0.184
1975	3,418,000	958,000	0.280
1985	5,063,000	4,384,000	0.866
1994	3,035,186	4,097,396	1.350

flounder stuffed with crab meat. Baked and broiled fillets have also become a popular product form of summer flounder.

In general, landings of summer flounder have increased since 1935, but there have been several periods of dramatic ups and downs (Table 9). In 1935, landings were only 672,000 pounds but increased to over one million pounds in 1939. In 1965, landings of summer flounder equaled 1.9 million pounds. Between 1978 and 1979, landings increased from 5.9 million to over 10 million pounds. In 1994, landings of summer flounder were down to only 3 million pounds, a result of stringent management quotas placed on the species.

The value of landings has also dramatically changed since 1935. In 1935, the value received by Virginia watermen for summer flounder was \$34,000 or \$0.05 per pound. In 1965, Virginia watermen received \$0.18 per pound for a total landed value of \$363 thousand. In 1994, Virginia fishermen received \$1.35 per pound; the total landed or dockside value of summer flounder was \$4.1 million in 1994. Even after adjusting for inflation, fishermen realized a 172 percent increase in the dockside price of summer flounder between 1965 and 1994. The large increase in prices paid to fishermen for flounder indicates how the American consumer has truly come to prefer flounder relative to many other species of finfish.



Black
Sea Bass

The black sea bass, *Centropristis striata*, also called sea bass and blackfish, has been one of the most popular species of Virginia finfish since the 1930s. The sea bass is quite common to the coastal and offshore waters between Massachusetts and Florida. Most of the commercial landings in Virginia come from the fall and winter offshore trawl fishery. There is also a small pot fishery

which operates between spring and fall in the Chesapeake Bay and territorial waters.

Sea bass is typically sold whole and in fresh fillet form. Fillets, however, have been relatively few during the past few years. The sea bass may live as long as twenty years but bass older than nine years are thought to be quite rare. The maximum size attained is approximately 24 inches or about six pounds. Most black

sea bass presently being marketed are typically under three pounds.

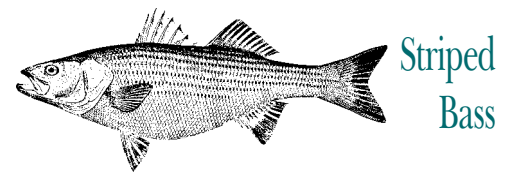
The sea bass has been a very popular species in Virginia but only during the past 50 years. Between 1935 and 1942, landings were typically below 250,000 pounds (Table 10). During the late 1940s, annual landings substantially increased to 2 to 4 million pounds. All through the 1960s, 1970s, and 1980s, annual landings were regularly in excess of 1 million

pounds. Landings in 1994 were only 371,000 pounds.

The value received by fishermen for sea bass has been quite high, even during the 1940s. In 1935, landed value was only \$8,000 but had increased to more than \$297 thousand in 1948. In 1965, black sea bass were worth \$368,000 at the dock. In 1986, the dockside value was \$943,000. The landed value in 1994 was \$436,000. In relation to the last five years, the value of sea bass was the third highest relative to edible finfish;

only summer flounder and seatrout had annual landed values higher than black sea bass.

Between 1935 and 1994, the nominal dockside price for sea bass increased, from \$0.04 to \$1.17 per pound. In 1965, fishermen received \$0.07 per pound for sea bass. In terms of the real rate of increase, the dockside price of sea bass increased at an annual rate of 16.9 percent per year between 1965 and 1994.



Striped Bass

Striped bass, *Morone saxatilis*, rock, rockfish, or striper, has historically been an important commercial and gamefish species. It is a popular anadromous fish of North America. The range of striped bass is from the St. Lawrence River to Florida, and in the Gulf of Mexico. It is highly prized by consumers for its flavor and size. In recent years, striped bass have been produced quite successfully by aquaculture producers. It is not uncommon for striped bass to be more than 50 pounds.

In 1935, striped bass was one of the less popular commercial species. Landings were only 375,000 pounds (Table 11). By the 1940s, however, annual landings regularly exceeded 2 million pounds. The record high level of landings was 2.9

Table 10. Virginia Dockside Landings, Value, and Prices, Sea Bass, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	211,000	8,000	0.038
1965	4,771,000	368,000	0.077
1975	1,546,000	367,000	0.237
1985	603,000	506,000	0.839
1994	295,867	295,375	0.998

Table 11. Virginia Dockside Landings, Value, and Prices, Striped Bass, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	375,000	39,000	0.104
1965	2,213,000	433,000	0.196
1975	1,331,000	642,000	0.482
1985	241,000	259,000	1.075
1994	281,581	460,839	1.637

million pounds in 1973. During the 1980s, stringent regulations by the Virginia Marine Resources Commission for the purpose of rebuilding this important commercial and recreational fish species restricted landings to very low levels. In 1986, only 27,000 pounds of striped bass were landed in Virginia. In 1994, the relaxation of the very restrictive regulations allowed an annual harvest of slightly more than 281,000 pounds.

Throughout the 1930s, 1940s, and 1950s, the landed value of striped bass was typically less than \$350,000. During the 1960s, the landed value per year frequently exceeded \$400,000. Landed value reached a high of more than \$770,000 in 1973. In 1994, the landed value of striped bass was \$460,000.

Like nearly all Virginia finfish species, the ex-vessel or dockside price of striped bass has widely fluctuated. In 1935, fishermen received \$0.10 per pound. By 1965, Virginia watermen received nearly double the 1935 price—\$0.19 per pound. In 1994, the price received at the dock for striped bass was \$1.64. After adjusting for inflation, Virginia watermen enjoyed a price of \$0.59 per pound relative to the 1965 price of \$0.19 per pound.

Shellfish

The shellfish fisheries of Virginia are extremely important to local economies, and the fisheries for which the economic importance of fisheries is, perhaps, best illustrated. Numerous types of shellfish are exploited within Virginia waters or landed at Virginia ports, but the blue crab, sea scallop, and hard clam reign supreme. In 1994, these three species accounted for more than 94 percent of the landed value of shellfish, and 70 percent of the landed value of edible finfish and shellfish. During the 1970s, particularly before 1976, oysters and blue crabs were the major shellfish species harvested by Virginia commercial fishermen. In the 1940s, oysters typically accounted for more than 50 percent of the landed value of all edible finfish and shellfish.

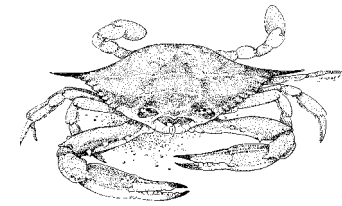
Blue crabs, sea scallops, hard clams, and oysters are not the only shellfish species caught or landed in Virginia. Surf clams and ocean quahogs were previously



harvested offshore and regularly landed by Virginia vessels; the surf clam and ocean quahog fisheries no longer operate out of Virginia. The conch fishery, having little economic importance in prior years, has become an expanding Virginia fishery of late.

In 1935, the total landings and landed value of shellfish in Virginia were 37 million pounds and \$2 million (Figure 8). By 1947, the total landings and landed value increased to 60 million pounds and nearly \$11 million. By the late 1980s, Virginia watermen landed in excess of 74

million pounds of shellfish and received more than \$47 million for their efforts. Unfortunately, there has been a relative decline in recent years. In 1994, Virginia commercial fishermen landed 44 million pounds of shellfish and received, before expenses and taxes, slightly more than \$56 million. Most of the reduction in landings between the 1970s and today was the result of declining landings of surf clams and oysters and stringent state and federal regulations on harvesting blue crabs and sea scallops.



Blue Crabs

Possibly the most prized species of Virginia seafood, *Callinectes sapidus* is highly desired by consumers around the world. The preferred product forms are whole hard crabs, crab meat, and soft-shelled crabs which are cleaned and eaten whole. Blue crabs are quite common in coastal waters, rivers, and estuaries, from New Jersey to Florida and along the Gulf Coast to Texas. The blue crab is even available in Massachusetts' waters, its northern extreme. The major gear type used to harvest crabs in Virginia is the crab pot. However, crab traps, scrapes, and trotlines are also used to harvest blue crabs.

The blue crab was not always the preferred choice of Virginia consumers. During the 1930s and 1940s, landings seldom exceeded 20 million pounds per year (Table 12). From 1947 on, it appeared that Virginians and American consumers had a love affair with blue crabs. A receptive market responded to advances in pasteurization which allowed consumers the opportunity to purchase crab meat on a year-round basis. An increasing preference for hard crabs and picked crab meat propelled the blue crab to the number one Bay shellfish species in terms of landed value. Annual landings

Figure 8. Virginia Shellfish Landings And Value, 1935-1994.

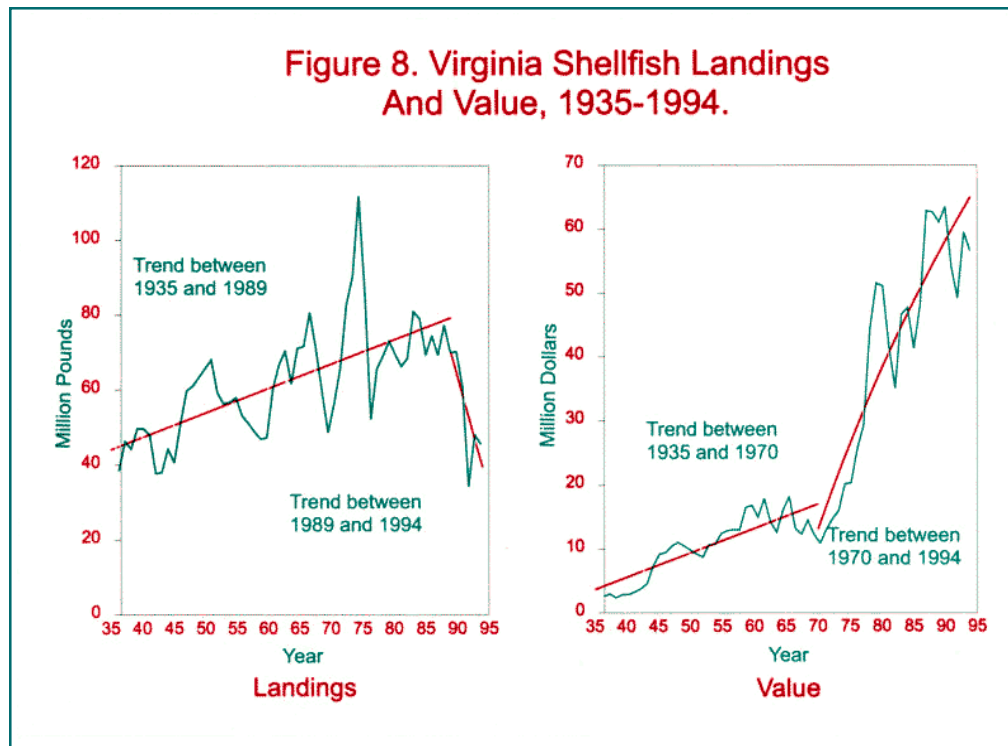


Table 12. Virginia Dockside Landings, Value, and Prices, Blue Crab, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	21,211,000	645,000	0.030
1965	51,642,000	4,169,000	0.081
1975	35,573,000	5,366,000	0.151
1985	38,884,000	9,119,000	0.235
1994	35,239,292	22,697,976	0.644

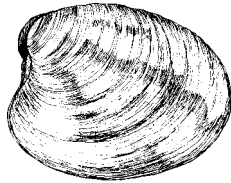
increased to over 32 million pounds in the late 1940s and regularly exceeded 40 million pounds between 1965 and 1990.

Difficult times were ahead for blue crabs during the early 1990s. In 1994, landings declined to slightly less than 35 million pounds, which is below the long-run average of 40 million pounds per year. The state legislature is considering various options for managing and regulating the blue crab fishery in conjunction with regulatory strategies by Maryland.

The landed value of blue crabs was typically quite low relative to the landed value of Virginia oysters. Between 1935 and 1949, the dockside value of blue crabs was less than \$2 million per year; the landed value of market oysters regularly exceeded \$2 million per year. From about 1981 on, the landed value of blue crabs exceeded the landed value of oysters. In 1993, the landed value of hard blue crabs exceeded \$26 million. Unfortunately, the dockside value declined to \$22.7 million in 1994.



The price received by fishermen for blue crabs has been extremely variable over time. In 1940, the dockside prices received by fishermen for hard and soft crabs were \$0.02 and \$0.07 per pound, respectively. In 1994, the nominal prices (unadjusted for inflation) for hard and soft crab prices were, respectively, \$0.58 and \$4.22 per pound. The obvious disparity in the prices of hard and soft crabs has been brought about by an increasing U.S. and world demand for soft crabs. A large quantity of soft crabs are regularly shipped to the Japanese market.



Hard
Clams

The hard clam, *Mercenaria mercenaria*, quahog, littleneck, top neck, cherrystone, or chowder, is another one of Virginia's valued species. The terms littleneck, top neck, cherrystone, and chowder all indicate different market categories. The most common name for the hard clam is quahog. The hard clam, highly desired by consumers, has experienced substantial growth over the past fifty years.

The hard clam is distributed along the Atlantic Coast, from the Gulf of St. Lawrence to Florida and along the Gulf Coast to the Yucatan Peninsula. It is commonly found in shallow, high salinity waters over a diverse range of bottom types. The primary harvesting areas in

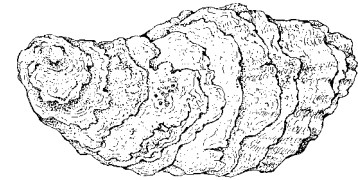
Virginia are the lower James River, the York River, and seaside of the Eastern shore. The primary gear is the patent tong.

The hard clam fishery has traditionally been a mainstay of Virginia's fisheries, although it did not significantly contribute to the earnings of fishermen until after World War II. Between 1935 and 1949, landings of hard clams were typically less than 2 million pounds with a dockside value usually less than \$500,000 (Table 13). Even through the 1980s, landings of hard clams were about the same as they were during the 1930s and 1940s; landings typically averaged less than 1.0 million pounds of meats per year.

On the other hand, there have been substantial increases in the landed value and price per pound. In 1976, 893 thousand pounds of hard clams generated \$868,000 for watermen; the dockside price was \$0.97 per pound. In 1994, 1.1 million pounds of hard clams generated a dockside value of \$6 million; the price had substantially increased to \$5.12 per pound. After adjusting for inflation, the dockside price of hard clams experienced a real increase of 245 percent between 1965 and 1994.

Table 13. Virginia Dockside Landings, Value, and Prices, Hard Clams, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	1,644,000	371,000	0.226
1965	2,487,000	1,337,000	0.538
1975	1,088,000	1,022,000	0.939
1985	613,000	1,519,000	2.478



Oysters

Until the past ten years, the prima donna species of Virginia was the oyster, *Crassostrea virginica*. The oyster fishery was once *the* fishery of Virginia. It supported thousands of people. Oysters were a staple for soldiers during the Revolutionary and Civil Wars. Prior to 1900, landings regularly exceeded 40 million pounds of meats per year. After 1900 and on up through the early 1960s, landings were typically in excess of 15 million pounds. Since 1965, landings per year have been well below 2 million pounds. Landings in 1994 were a meager 301,000 pounds.

The American, or Eastern, oyster is the most abundant oyster species available in U.S. waters. It is found in brackish waters of bays and inlets along the Atlantic and Gulf coasts. In Virginia, oysters are harvested from public and private

grounds. The public areas are known as Baylor Grounds and consist of approximately 250,000 acres.

Traditionally, landings from private grounds exceeded the harvests from the public areas. From about 1975 on, harvests from public areas have exceeded harvest levels from private grounds. The major gear type for oysters is the hand tong.

In 1935, the dockside value of market oysters was \$997,000 (Table 14). In 1965, the value had increased to \$10.3 million. Between 1965 and 1986, the average annual landed value was \$5.1 million. In 1994, oysters provided only \$812,000 in income to fishermen. The equivalent price in 1994 was \$2.70 per pound; the price in 1965 was \$0.82 per pound. Relative to 1965, the real price of oysters increased only 19 percent while production costs increased by nearly 300 percent.

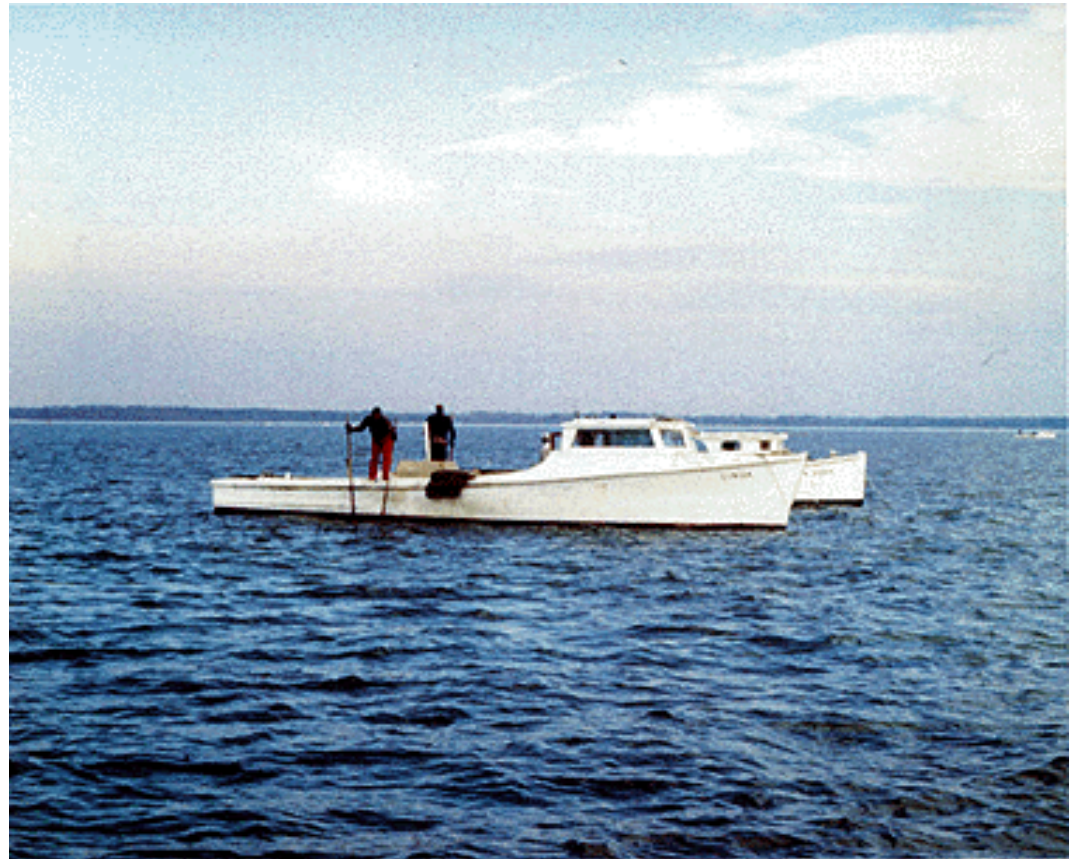
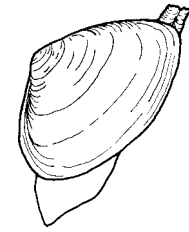


Table 14. Virginia Dockside Landings, Value, and Prices, Oysters, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	14,317,000	997,000	0.069
1965	12,568,000	10,291,000	0.819
1975	6,237,000	4,999,000	0.802
1985	4,721,000	7,141,000	1.513
1994	300,292	812,387	2.703



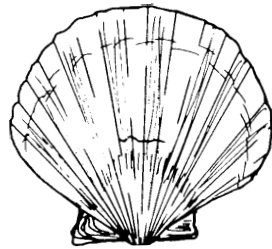
Surf Clam

The surf or sea clam, *Spisula solidissima*, is a relative newcomer to Virginia. Although surf clams have been available off the Atlantic coast for a long time, it was not until the 1940s that the fishery began off the New Jersey Coast. Rumor has it that the fishery really expanded in the early 1970s in response to Howard Johnson restaurants' serving of breaded clam strips in their restaurants. In Virginia, the fishery has displayed a roller coaster pattern of ups and downs and did not actually begin until about 1968.

Surf clams occur in the offshore areas, from the Gulf of St. Lawrence to the northern Gulf of Mexico. Commercial concentrations are primarily found off New Jersey and the Delmarva Peninsula (Delaware/Maryland/Virginia). Surf clams are most abundant between New York and Cape Henry, Virginia. The surf clam has a life span of 17 to 20 years and can grow to be quite large. The maximum size of the surf clam, in shell width, is about nine inches, although clams larger than 8 inches appear to be quite rare. The primary gear used to harvest surf clams is a dredge.

In 1968, the first year in which surf clam landings were reported for Virginia, fishermen landed 17,000 pounds of surf clam meats (Table 15). Landings in 1973 and 1974 were 43 and 58 million pounds of meats. Between 1975 and 1986, landings were relatively stable and typically between 12 and 15 million pounds. By 1991, landings of surf clams in Virginia had dropped to zero as surf clam companies folded or left the state. There remain, still, surf clam processing activities within Virginia.

An interesting aspect of the surf clam is that it is the first U.S. fishery in the exclusive economic zone (EEZ) managed by individual transferable quotas or ITQs. Under this regime, harvesters are allocated a certain quantity of surf clams that they may harvest in a year. Holders of these ITQs can sell, loan, lease, give-away, or simply not use their ITQs. This is one of the few fisheries in the United States in which privatization of harvesting rights has been attempted.



Sea Scallops

Sea scallops, *Placopecten magellanicus*, is another relative newcomer to Virginia fisheries. Although widely distributed and available off the coast of Virginia, the species was not regularly harvested by Virginia vessels until the late 1940s and early 1950s. In 1950, for example, vessels fishing for sea scallops landed only 92,500 pounds of scallop meats (Table 16). In 1994, scallop landings in Virginia were nearly 6 million pounds or 6,476 percent higher than they were in 1950.

Unlike oysters, hard clams, and blue crabs, which are landed whole or live, only the muscle of the sea scallop is typically landed. The primary gear is the dredge, although small quantities are harvested by trawl. At sea, crew shuck or remove the muscle from the whole scallop and then place the meats in linen cloth bags which are stowed on ice until offloaded at the dock. A relatively small quantity of sea scallops is landed whole, as shellstock.

Table 15. Virginia Dockside Landings, Value, and Prices, Surf Clams, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	0	0	
1965	0	0	
1975	39,089,000	5,682,000	0.145
1985	13,393,000	7,403,000	0.553
1994	0	0	

Table 16. Virginia Dockside Landings, Value, and Prices, Sea Scallops, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	0		
1965	2,830,000	1,725,000	0.610
1975	1,266,000	2,324,000	1.836
1985	2,868,000	13,355,000	4.657
1994	6,083,224	26,622,000	4.376



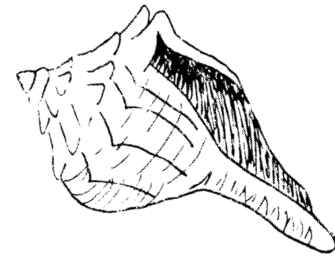
The sea scallop is distributed from the Gulf of St. Lawrence to Cape Hatteras, North Carolina. Large concentrations of sea scallops are typically found on Georges Bank off New England, in the mid-Atlantic areas off New Jersey, and right off of Chincoteague, Virginia. Virginia vessels, although working mostly on the mid-Atlantic resource areas, also exploit the New England Georges Bank resource area. In addition, New England vessels frequently exploit the mid-Atlantic areas and land scallops at Virginia ports. The scallop fishery has become the state's most important fishery in terms of dockside value.

More than 60 scallop dredge vessels based in Virginia harvested about 6.1 million pounds of scallop meats in 1994. Between 1965 and 1986, landings exceeded 5 million pounds in only three years—1978, 1979, and 1980. The 20 year average annual landings between 1965 and 1986 was 2.8 million pounds.

The sea scallop fishery has been regulated by the New England Fishery Management Council (NEFMC) since 1983. Between 1983 and 1994, landings were subject to restrictions on the number of meats per pound which could be landed. Since March 1994, fishing of scallops has been regulated by restrictions on the number of days at sea a vessel may fish, the number of crew allowed per vessel, and the size of the fishing gear.

More important than landings to the economies of the state and coastal communities is the landed value. In 1994, the dockside value was \$26.6 million. The largest dockside value ever observed between 1965 and 1993 was \$24 million, which occurred in 1979. Even after adjusting for inflation, the landed value in 1994 was 467 percent higher than it was in 1965.

Like nearly all wild species fisheries, the dockside price of sea scallops has been extremely variable. Between 1965 and 1994, prices received by scallop fishermen varied between \$0.60 and to over \$5.50 per pound of scallop meat on a trip basis. Traditionally, prices have been very responsive to changes in landings. In the case of sea scallops there are numerous resource areas, port of landings, different types of scallops harvested, and imports from Canada and other nations which affect the dockside price. For example, the total landings of sea scallops in the United States was 18 million pounds in 1994; total imports of all types of scallops exceeded 57 million pounds which exceeded imports in all years between 1985 and 1994. In 1994, scallop fishermen landing in Virginia received, on average, just under \$5.00 per pound.



Conch

The conch, *Busycon spp.*, fishery has become increasingly important to Virginia watermen during the past five years. Three types of conch are harvested within Virginia waters: (1) knobbed whelk, *Busycon carica*; (2) channeled whelk, *Busycon canaliculatum*; and (3) lightning whelk, *Busycon contrarium*. In Virginia, the whelk or conch fishery is primarily an inshore fishery with the majority of the harvest being taken by conch dredge. Conchs are also taken in large quantities by clam and crab dredges; however, harvests by clam dredges have been nonexistent since 1988.

In 1965, only 232,000 pounds of conch were landed in Virginia (Table 17).

Table 17. Virginia Dockside Landings, Value, and Prices, Conch, Selected Years, 1935-1994.

Year	Dockside Landings Pounds	Dockside Value Dollars	Dockside Price Dollars Per Pound
1935	0		
1965	232,000	25,000	0.108
1975	1,085,000	115,000	0.106
1985	84,000	142,000	1.690
1994	1,249,774	456,452	0.365

More than 1 million pounds were landed in 1975. Landings substantially declined between 1975 and 1992 and increased in 1993 and 1994. Landings averaged just under 350,000 pounds a year between 1975 and 1994. Landings in 1994 equaled 1.2 million pounds, which was the highest observed level of landings between 1965 and 1994.

Conch has never accounted for a significant portion of total dockside value of shellfish. This does not mean it is not of significance. To those fishermen dependent upon revenues from the fishery, the conch resource is quite important. In 1965, conch accounted for 0.1 percent of the total dockside value of shellfish. In 1986, conch still accounted for less than 1.0 percent of the total

landed value of shellfish. In 1994, conch accounted for only 0.82 percent of the total landed value of all shellfish. Although conch has not been a major contributor to dockside value, it is an animal that is being increasingly demanded throughout the world, and one which offers additional export opportunities for Virginia watermen.



Commercial Aquaculture

Although aquaculture—the human intervention and control of the growth and production processes—has long been performed around the world, it has only been in the past 10 years that aquaculture has taken off in the United States. In 1980, the U.S. Bureau of Census and the U.S. Department of Agriculture considered aquaculture to be of such little consequence that they did not even report statistics on aquaculture production in the U.S. In 1985, farmers reported receiving \$205 million for aquacultured products, and in 1992, farmers received slightly more than one-half billion dollars for aquacultured products. In 1994, just catfish and trout farmers received more than \$400 million.

In the past, aquaculture focused mainly on catfish, trout, ornamental fish, and gamefish for restocking purposes; today, there is a myriad of different species. Tilapia and salmon have become the success stories of the 1990s. Crawfish have been successfully cultured for numerous years. Several mollusks—oysters, hard clams, mussels, and bay scallops—are being increasingly produced via culture. Even alligator is farm raised now. Several marine finfish species, such as cod and winter and summer flounder, are currently the focus of extensive research.

In Virginia, numerous products are raised or produced by aquaculture methods. The largest product in terms of sales is hard clams. The value paid in 1995 to growers of hard clams exceeded the value paid to all aquaculture producers of all freshwater species in Virginia

(Table 18). In 1993, the latest year for which detailed information is available, clam culture operators produced over 72 million clams at a price of \$0.16 per clam. In comparison, the wild fishery had a total dockside value of \$4 million in 1994. Soft-shell crabs followed clams with a

Table 18. Production and Sales of Selected Virginia Aquaculture Products, 1995

Species	Production Units ^a	Gross Sales Dollars
Clams, mature	50,200,000	8,032,000
Oysters, mature	259,000	62,160
Soft-shell Crabs	417,705	4,840,142
Other Species	–	1,502,000
All Salt Water	–	14,436,302
Trout	1,193,730	2,255,044
Catfish	14,870	28,329
Striped Bass	11,750	41,986
Other Fresh	–	2,897,944
All Fresh Water	–	5,223,303

^aProduction of clams and oysters is in terms of number of units; soft-shell crab production is in dozens of crabs; the production of trout, catfish, and hybrid striped bass is in terms of pounds.

In Virginia, numerous products are raised or produced by aquaculture methods. The largest product in terms of sales is hard clams.



reported sales value of nearly \$5 million. This amount does not even include the value of the wild captured soft crabs.

Other species or products raised in Virginia include tilapia, hybrid striped bass or rockfish, trout, catfish, oysters, bay scallops, crawfish, goldfish, koi carp, ornamental fish, and aquatic plants.

Numerous trade and industry publications frequently state that aquaculture is the fastest growing agricultural industry in the United States. This particularly appears to be the case relative to livestock and related products or protein sources. Since 1985, aquaculture production has

increased by 145 percent. The product with the second highest rate of growth is broilers.

Even if aquaculture appears to have promise, it is not without problems. Prices of aquaculture production are particularly susceptible to increased landings and imports of the same or competing species. For example, if Virginia watermen were allowed to harvest more striped bass, the prices received by hybrid striped bass producers might decline. Individuals with large capital investments would not be able to compete. Alternatively, if the U.S. market were

flooded with inexpensive imports that were nearly perfect substitutes, hybrid producers could be in trouble.

Although aquaculture may be sensitive to changes in the wild fisheries and imports, it is of growing importance to Virginia. Thacker (1994), in an analysis of the economic impacts of aquaculture on the Eastern Shore of Virginia, estimated that clam aquaculture in 1992 generated full-time employment for 45 individuals. Soft shell crab aquaculture was estimated to generate employment for more than 200 individuals in Virginia's Eastern Shore soft-shell crab businesses.



The Industry, The People, And The Communities

The total ex-vessel or dockside value of fisheries, including the menhaden fishery, exceeded \$100 million in 1994.

Virginia's Workforce

Overall, Virginia's workforce is a relatively well-educated and diverse group. Slightly more than 3.0 million individuals are employed in Virginia and just under one-half are females. The unemployment rate is a little less than 4.5 percent. There is also a large number of military bases in Virginia; more than 182,000 active military personnel and 84,000 civilian employees work on military installations in Virginia. The average annual pay in Virginia is about \$25,000 per year. Relative to the approximately 4 million individuals 25 years of age and older and living in Virginia, nearly 75 percent graduated from high school and approximately 25 percent graduated from college.

The median annual family income, the level at which about 50 percent of the families have higher family incomes and 50 percent of the families have lower incomes, is \$38,283. Approximately 12 percent of Virginia households have incomes in excess of \$75,000, and nearly 40 percent of the households have family incomes below \$25,000 per year. The per capita personal income was \$19,701 (personal income equals the total value of all goods and services produced in the state plus income from other nations and personal interest income less payments to other nations, consumption of fixed capital, indirect business taxes, corporate profits, interest payments, and social insurance).

Excluding government agencies and employees, railroad workers, and self-employed individuals, Virginia has a total of approximately 156,000 business establishments. About 2.4 million individuals were employed by the 156,000 businesses in 1994. There was a total annual payroll of nearly \$60 billion; this translates into an average pay per person of \$24,000 per year.

Relative to major industry groupings for Virginia—agriculture, manufacturing, wholesale and retail trade, finance and insurance and real estate, health services, public

administration—manufacturing, wholesale and retail trade, and public administration accounted for 44 percent of all employment in 1994. Agriculture, which also includes some sectors of forestry and fisheries, accounted for slightly more than two percent of total statewide employment in 1994.

Overall, approximately 31 full-time jobs are generated per million dollars of landed finfish and shellfish in Virginia. Thus, Virginia's harvesting sector provided full-time employment opportunities for an estimated 2,724 individuals in 1994. If all markets and economic sectors are considered, the fishing industry of Virginia provided 10,798 person-years of employment in 1994.

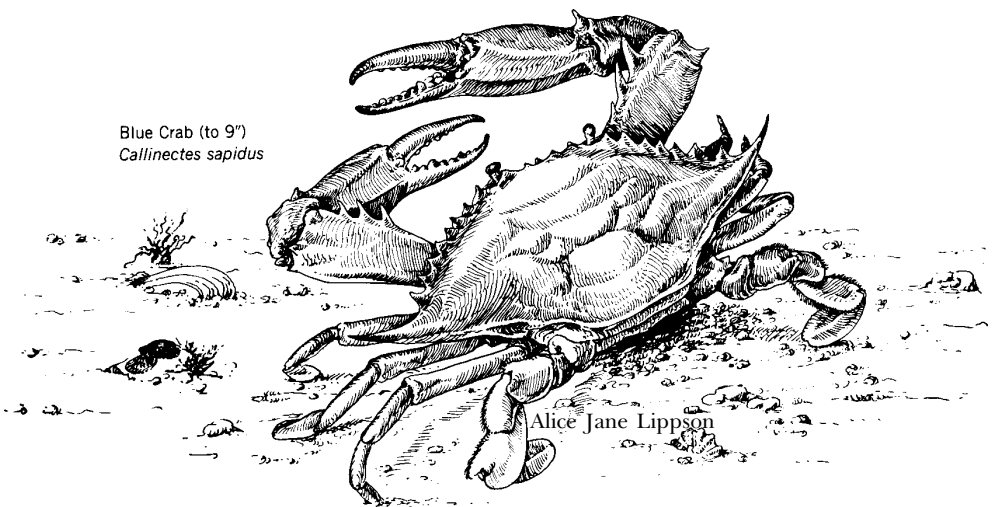
The total value of goods and services produced by Virginia exceeded \$142 billion in 1994. Four basic industry groups—manufacturing, finance and insurance and real estate, services, and government—were responsible for 70 percent of the total value of production. Agriculture accounted for about 1.5 percent of the total value of all goods and services produced in Virginia in 1994.

Virginia agriculture, a major source of protein production, had total sales in excess of \$1.6 billion in 1994. The

average value of product sold per Virginia farm was slightly more than \$36,000. The total ex-vessel or dockside value of fisheries, including the menhaden fishery, exceeded \$85 million in 1994. It should be remembered that there were more than 44,000 farms in Virginia in 1994; less than 15,000 different licenses were issued to fishermen in 1994 and many fishermen were required to obtain more than one license.

Virginia has 105 counties and independent cities or places called city. Every Virginia county and city has some type of reported agriculture, but not all counties have forestry and fisheries production. The Virginia Marine Resources Commission maintains information on fishery landings and dockside values for approximately 45 Virginia counties or cities.

Relative to the 45 counties and cities, only one county had the landed value of fish exceeding the value of agricultural products sold in 1987 (the most current data available on agriculture). York County, which for agricultural reporting purposes also includes the cities of Hampton, Poquoson, and Newport News, had landings with a higher value than agricultural products sold in 1987. Counties with significant landed value relative to the value of agricultural products sold in 1987 included Chesapeake, Norfolk, Portsmouth, Gloucester, Lancaster, Mathews, and Northumberland.



The Fisheries Workforce

The workforce dependent upon the Virginia seafood industry is a diverse lot. The education level ranges from individuals with less than a sixth grade education to ones possessing a doctorate. Numerous individuals work part-time and full time at fishing. In recent years, there has been an influx of individuals pursuing fishing as a second career. Commercial fishing also provides supplemental income for many retired individuals; for many, commercial fishing is an activity that offers some income without a substantial capital outlay or large investment.

The Virginia waterman is older than the typical Virginia worker. The average age for a Virginia fisherman is 51 years; the typical age of a worker in the overall workforce of Virginia is between 25 and 44 years. Most Virginia watermen are between 40 and 69 years old, with some individuals being over ninety years of age (Figure 9). In contrast, some fishermen are in their teens; the minimum age is about thirteen years old.

The average number of years of experience for a working waterman is 25 years. Approximately ten percent of the fishermen have more than 50 years of experience working the water. Seven percent of the watermen were relatively new to fishing in 1994 and thus had less

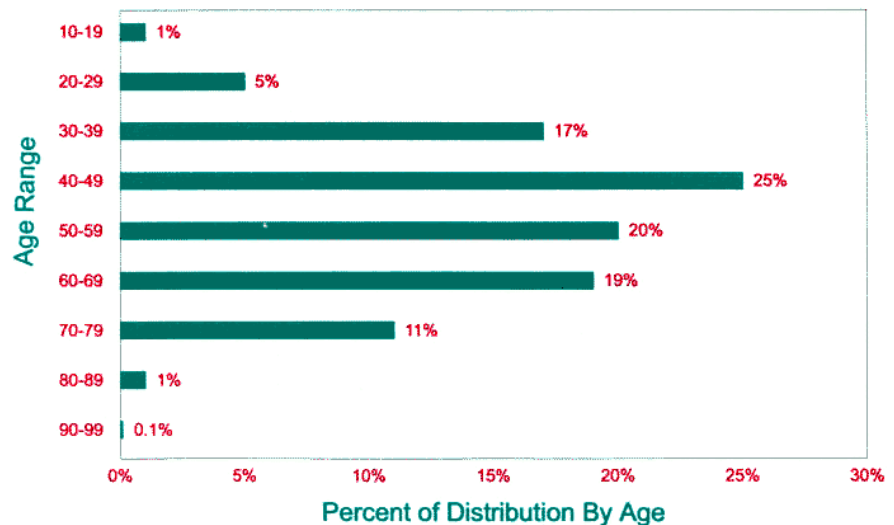
than one year of experience as commercial fishermen (Figure 10). Sixty-four percent of Virginia's commercial fishermen had less than twenty years of experience.

Individuals earning a living from commercial fishing in Virginia are relatively well educated. Nearly 70 percent of the commercial fishermen have a high-school education or higher (Figure 11). Ten percent of the fishermen graduated from college. Relative to the state population of individuals 25 years or older, 75

percent of the individuals graduated from high school; thus, the education attainment by watermen is comparable to that for the state workforce.

For the interested individuals, there are female commercial harvesters within the Commonwealth. Approximately 2 percent of commercial harvesters are female while 98 percent are male (Figure 12). The female harvesters mostly work the inshore or Bay fisheries of Virginia.

Figure 9. Age Distribution of Virginia Watermen



A majority of the harvesters are white or Caucasian. Only two percent of Virginia watermen are black or African American. Approximately one percent of the harvesters are Asian American and American Indian (Figure 13). These

statistics could, though, reflect a bias in the sampling scheme. In mail surveys, the sample strategy used to obtain information for this report, there tends to be a disproportionate rate of non-response by minorities.

Nearly 75 percent of commercial harvesters are married or supporting dependents (Figure 14). Approximately 46 percent of the harvesters have 2 or more dependents. Overall, the number of individuals in a household with

Figure 10. Years of Experience of Virginia Watermen

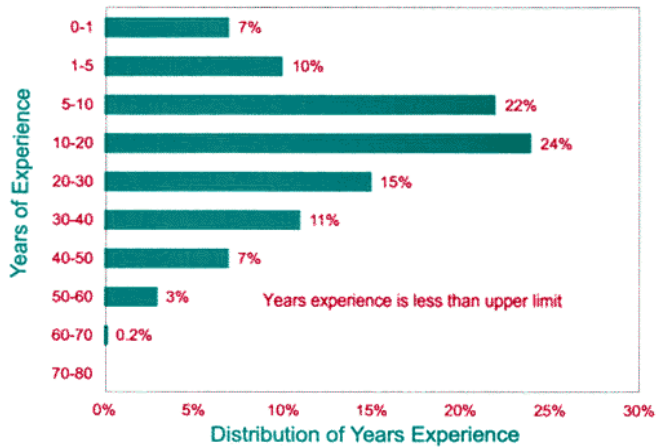


Figure 11. Educational Levels Obtained By Virginia Watermen

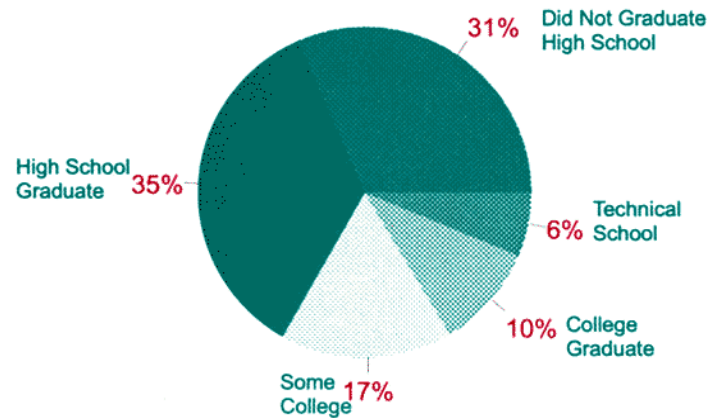


Figure 12. Percent Distribution of Male and Female Fishers

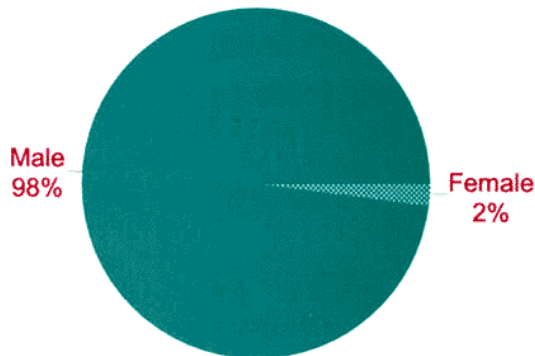
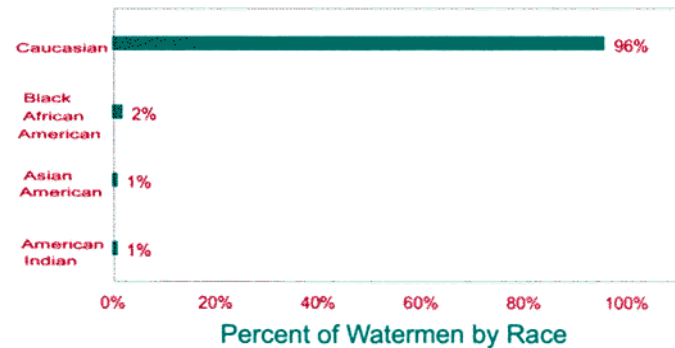


Figure 13. Percent Distribution of Virginia Watermen by Race



commercial harvesters is about equal to that for the state. The average household size for commercial fishermen is 2.68 while that for the state is 2.61.

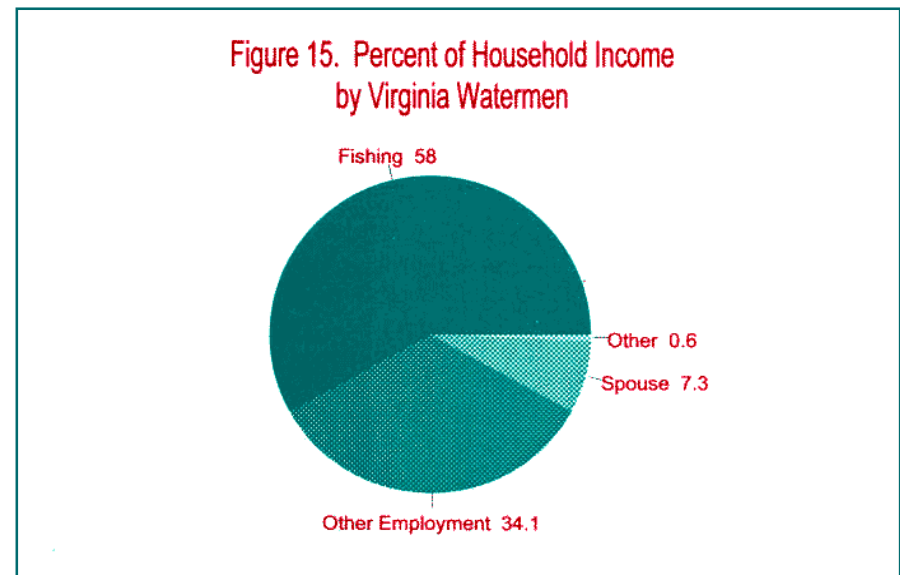
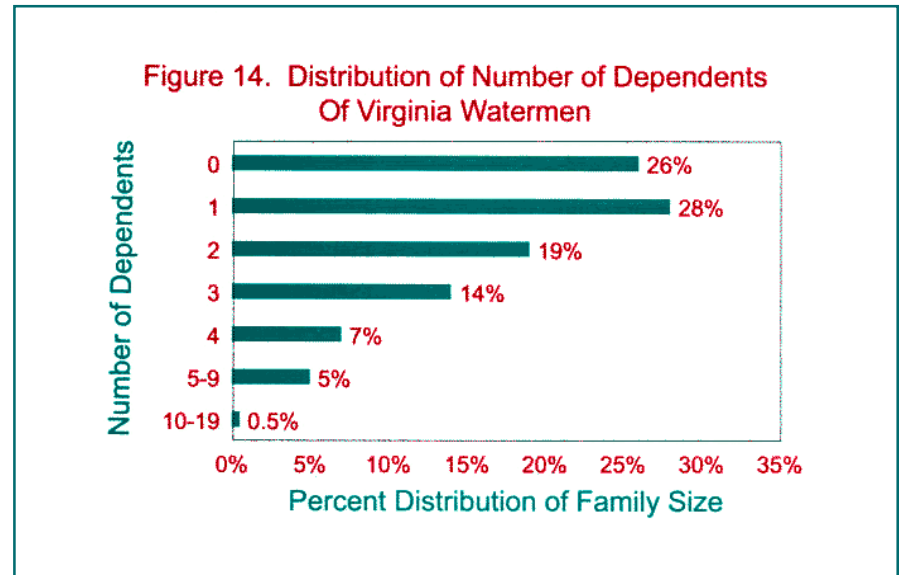
What about the sources of household income? Not all household income comes from commercial fishing. Thirty-two percent of commercial fishing households depend exclusively on commercial fishing for household income. Sixty-eight percent of Virginia harvesters work other jobs to support themselves and their families. Approximately 27 percent of the fishing households have spouses that work and help support the family. On average, about 58 percent of the total household income comes from fishing, 7 percent comes from a spouse working, 34 percent is derived from a second job, and less than one percent comes from other sources (Figure 15).

The fact that watermen households do not receive 100 percent of the household income from fishing should not be surprising. In our society, more than one family member, particularly husband and wife, both work. In the inshore or Bay fisheries of Virginia, approximately 32 percent of Virginia commercial fishing license holders are full time; 68 percent of the license holders obtain income by working other jobs during a year. In the offshore fisheries, nearly all income earned by a fisherman is derived from commercial fishing.

A question that is often of interest to individuals is what kind of money does a

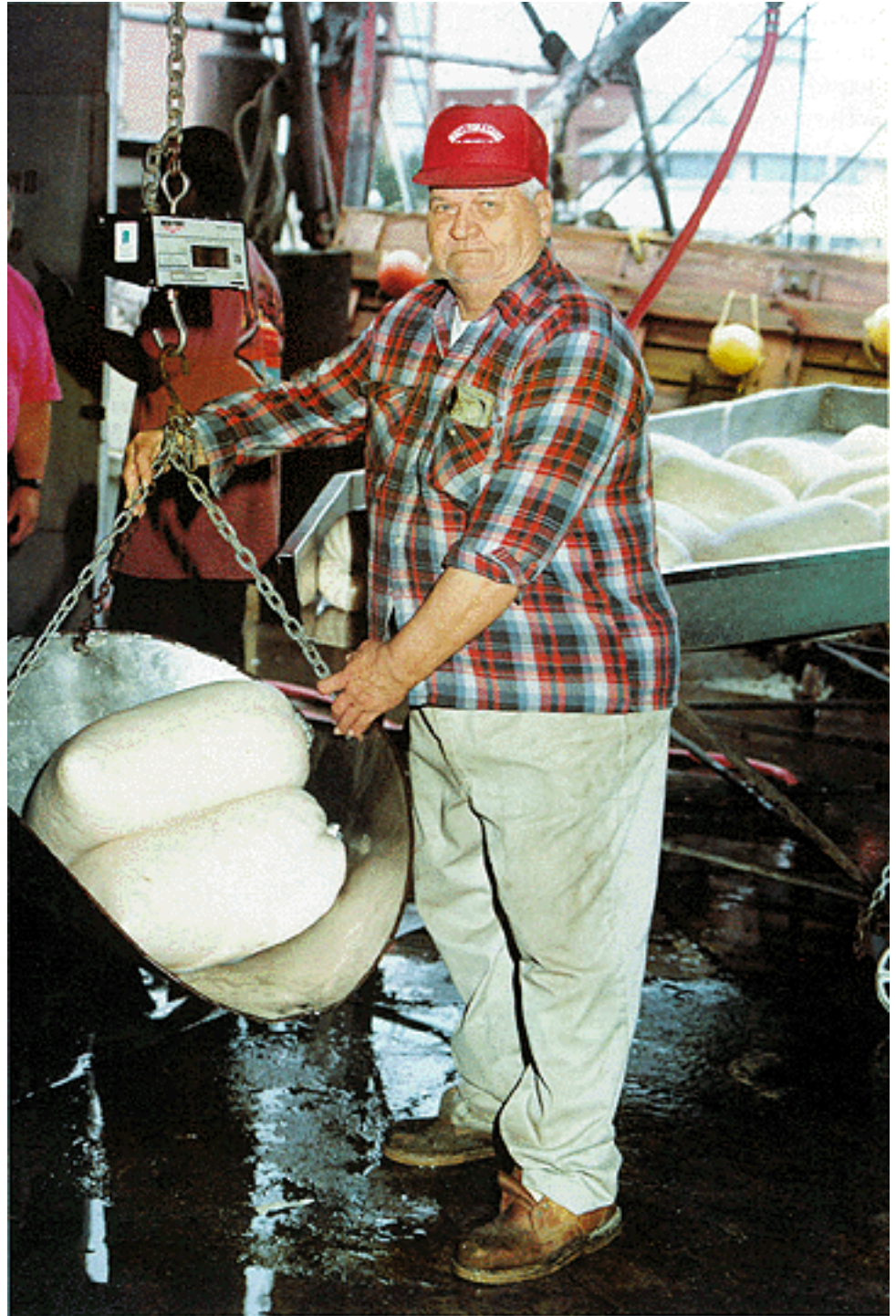
fisherman make. In order to address this question, it is necessary to consider three broad groups: (1) the owner/operator, (2) the hired or self-employed captain, and (3) the crew member or deck hand. It also

is important to realize that fishing, like farming, is a business in which productivity and good luck are reflected in the paycheck.



Most commercial fisheries distribute earnings according to a lay-system or formula. The formula typically varies by fishery and often by vessel. Under a lay-system, captain and crew often receive a percentage of total value of the product sold. In some fisheries, the captain and crew must pay all or most trip-related costs. In other fisheries, the captain and crew may be guaranteed a minimum amount per day or per trip or a percentage of the quantity caught.

In 1994, the average return to an owner/operator (captain who also owns the fishing boat) was about \$31,000. Yet, earnings for some owner/operators exceeded \$550,000 per year. Captains earned an average \$19,451 in 1994, and crew received an average of \$17,860 per year. The range of captain's income was \$80 to over \$100,000, while the range for crew was \$75 to \$87,032 per year in 1994. Total average earnings or earnings per Virginia worker in all jobs in 1994 was \$20,624.



The Fishing Communities

All too often, the communities dependent upon commercial fishing are overlooked. It is comfortable to assess the economic importance of fishing relative to the big picture or economic impacts at the state level. With this type of assessment, the commercial fishing industry does not appear to be very important. Total earnings at the state level are approximately \$100 billion. Total earnings for self-employed fishermen, miners, and other self-employed individuals are less than \$7 billion. Total employment at the state level is 3.2 million individuals, with all self-employed individuals contributing less than 45,000 jobs.

The real picture, of course, is how many jobs and how much income does fisheries contribute. In general, \$1 million of landed product generates full-time employment for about 31 individuals per year in harvesting or supporting sectors. In addition, \$1 million of landed product generates approximately \$2.17 million in total community value. For some coastal communities, the number of jobs and income generated from commercial fishing is quite important because there are few alternative employment opportunities.

The Virginia Marine Resources Commission monitors fishing activity at 45 counties, cities, or communities (Table 19). The major Virginia fishing communi-

ties relative to value of landed product are the cities of Hampton and Newport News, and York County. Excluding the value of menhaden, Hampton, Newport News, and York County account for 70 percent of the ex-vessel value of all species landed in Virginia.

Hampton, Newport News, and York County all have fishing fleets which harvest scallops. In 1994, sea scallops were responsible for 74, 69, and 60 percent of the landed value at Hampton, Newport News, and York County, respectively. These three areas, alone, generated full-time employment opportunities for about 4,730 individuals in Virginia.

The three major fishing port areas are all mostly urban areas, although York County does have some rural areas. Total employee or worker earnings paid in Hampton, Newport News, and York County were, respectively, \$468 million, \$2.8 billion, and \$1.9 billion. All three areas have some economic dependency on manufacturing, businesses that mechanically or chemically transform substances or materials into new products, which includes fish processing. Government and services account for 58 and 69 percent of total earnings in York County and Hampton, Virginia. Manufacturing and government account for 62 percent of total earnings in Newport News.

In comparison, the smaller and more rural fishing counties and communities have less dependency on government and more on manufacturing, agriculture, forestry, and fisheries. Accomack, which has a large fishing community and lands 63 different species, realizes about 34 percent of total earnings from manufacturing; services account for 66 percent of total earnings. In Northumberland, home of the menhaden processors, manufacturing accounts for 46 percent of total earnings received by workers.

Communities like Gloucester and Mathews have relatively large Bay-based fisheries but only have a modest dependency on manufacturing. About 82 and 70 percent of total earnings received by workers in Gloucester and Mathews, respectively, was earned from service-based industries or employment opportunities.

Even though the commercial fisheries do not appear to have large contributions to overall employment and earnings opportunities, it should be realized that Virginia fisheries do contribute to the state economy and are of substantial importance to the economies of some coastal communities. A small county like Accomack, which has a population of only 32,200 individuals, has fishing activities which generate full-time employment for 848 individuals throughout the state in fishing, restaurants, wholesaling, process-

Table 19. Economic Characteristics of Selected Virginia Fishing Communities, 1994

County/ Community	Population (thousands)	Major Industry In Terms of Earnings	Total Employment (thousands)	Average Earnings Per Worker	No. of Species Landed	Major Species in Terms of Value	Landed Value	Full-time Virginia Employment Generated by Fishing
Accomack	32.2	Manufacturing	16.1	\$19,154	63	Blue crab	6,882,110	848
Charles	6.6	Government	1.5	17,170	6	Catfish	8,498	1
Norfolk	246.3	Military	89.6	26,694	48	Summer Flounder	1,461,447	180
Chesapeake	173.5	Services	72.4	21,399	2	Blue crab	30,716	4
Essex	9.1	Services	5.1	16,837	3	Blue crab	89,856	11
Fairfax	896.8	Services	554.4	34,312	5	Catfish	69,617	9
Hampton	138.9	Government	74.6	24,888	69	Scallops	17,059,928	2103
Gloucester	32.3	Services	10.6	15,964	30	Blue crab	4,853,196	599
James	50.2	Services	39.1	21,289	5	Blue crab	218,002	27
King George	14.9	Government	9.5	30,099	8	Blue crab	242,893	30
King William	11.9	Manufacturing	4.8	25,229	3	Blue crab	68,393	8
Lancaster	11.0	Services	5.7	17,080	27	Blue crab	1,489,908	184
Mathews	8.6	Services	2.3	14,797	32	Blue crab	4,104,513	506
Middlesex	9.1	Services	3.7	15,852	13	Blue crab	1,031,988	127
New Kent	11.1	Services	2.9	18,276	3	Gizzard shad	108,398	13
Northampton	13.0	Services	5.7	18,740	52	Blue crab	2,692,177	332
Northumberland	11.0	Manufacturing	3.9	18,300	28	Menhaden	20,436,975	2,520
Prince George	51.2	Government	28.7	28,439	1	Catfish	56,269	6
Virginia Beach	425.4	Services	197.5	21,002	42	Blue crab	1,323,772	163
Prince William	273.1	Retail	107.5	24,170	5	Blue crab	51,477	6
Richmond	7.4	Government	3.5	19,325	15	Eel	392,694	48
Stafford	73.3	Services	20.4	21,274	14	Blue crab	418,845	52
Westmoreland	16.1	Services	4.8	14,179	20	Blue crab	1,527,922	188
York	61.6	Services	21.1	22,163	33	Scallops	7,668,129	945
Newport News	176.9	Manufacturing	105.3	26,280	57	Scallops	13,639,243	1,682
Chesterfield	209.3	Manufacturing	113.7	19,765	1	Catfish	38,829	5
Portsmouth	104.0	Government	42.1	na	2	Blue crab	140,332	17
Isle of Wight	25.1	Manufacturing	11.7	25,477	5	Blue crab	266,536	33
King & Queen	6.3	Manufacturing	2.9	7,810	2	Blue crab	27,345	3
Suffolk	52.1	Services	22.5	na	2	Blue crab	395,745	49
Surry	6.1	NA	2.7	na	2	Catfish	27,148	3
Virginia	6,473.0	Services	3734.0	26,409	75+	Scallops	101,245,000 ^a	10,798 ^b

a - Landed value reported by National Marine Fisheries Service

b - Based on Virginia Marine Resources reported landed value of \$87,584,647

ing, retail sales, and support industries. A community like Hampton relies on service-based industries for nearly 90 percent of total earnings and has fishing activities which generate full-time employ-

ment opportunities for about 2,103 individuals in the harvesting sector.

Each of the three major fishing communities also has many species

landed as compared to some fishing communities which have few species landed. Hampton leads the state in terms of number of different species landed; approximately 69 different species are

regularly landed in Hampton. Accomack County is second with 63 different species landed. Newport News has the third highest number of different species landed. Other communities or counties with a diverse number of species regularly landed include Norfolk, Gloucester, Lancaster, Mathews, Northampton, Northumberland, and Virginia Beach.

Yet, when the various communities are compared to each other, there are substantial differences. For example, Hampton and Newport News are primarily urban areas while Accomack and numerous other communities are largely rural. Then there are the in-between communities such as Gloucester and Mathews, which are neither rural or urban.

Accomack, like many of the other fishing communities, is quite different in terms of fisheries and economic structure than either Hampton or Newport News. In Accomack, blue crabs account for about 55 percent of the total landed value. Blue crabs, quahogs, spot, and croaker account for 79 percent of the landed value. Spot contribute more than 6 percent to total ex-vessel, landed, or first-sale value in Accomack. Gray seatrout account for about 1.5 percent of the total landed value in Accomack. In Hampton, 83 percent of the total landed value is due to sea scallops and five species of flounder which are harvested mostly in the offshore fisheries. Blue crab, which is primarily harvested inshore, accounts for 5.2 percent of the total landed value in

Hampton; yet, Hampton is home to the major crab picking and processing facilities of Virginia. Newport News is similar to Hampton; sea scallops and mixed flounder account for 79 percent of the total landed value and blue crabs make up 6.9 percent of the total landed value.

Between 1986 and 1988, Accomack and numerous other communities were major fishing communities in Virginia. Total landed value at Accomack County was \$10 and \$9 million in 1986 and 1988. The total landed value in Hampton and Newport News in 1986 was \$10.9 million and \$9.0 million, respectively. Landed values for the two communities of Hampton and Newport News in 1988 were, respectively, \$15.4 million and \$11.4 million.

What eventually happened to Accomack to cause such a large decline in landed value? In 1990, the large, offshore, surf clam fleet left Accomack. Prior to 1990, surf clams and ocean quahogs accounted for about 36 percent of the total annual landed value. Sea scallops and blue crabs also accounted for a large share of total landed value in Accomack. In 1994, surf clam landings in Accomack were 0.0 pounds. Blue crabs accounted for 55 percent of the total landed value. Sea scallops accounted for only 0.02 percent of total landed value in 1994; in 1988, scallops were responsible for 6 percent of the total ex-vessel value in Accomack.

During the early 1970s, Northampton County was a major fishing community in the state. In 1974, Northampton accounted for 21.4 percent of the state wide landed value of finfish and shellfish (Table 20). In 1994, Northampton contributed a meager 2.6 percent to total landed value. Northampton, like Accomack, suffered from the exit of the surf clam and ocean quahog fishing vessels and processors. In 1974, surf clams accounted for 81 percent of the total landed value at Northampton. In 1994, croaker, spot, blue crabs, and hard clams accounted for 83 percent of the landed value at Northampton. Yet, 52 different species were landed at Northampton in 1994.

Northumberland is another major fishing community of Virginia. The county is relatively rural with a population of only 11,000. In terms of commercial fishing activities, one might think of the county as having limited fishing opportunities. This is because the primary fishery operating out of the county is menhaden and there are only two companies which regularly land menhaden.

In 1974, the landed value of all finfish and shellfish, excluding menhaden, was \$1,839,459 for Northumberland. If menhaden landings are included, the total landed value increases to \$13 million which equals nearly 37 percent of the total landed value in Virginia in 1974. In 1994, the total landed value equaled \$21 million or 21 percent of the total landed value in Virginia.

Table 20. Dockside Value of Selected Virginia Fishing Communities

County/Community	1974	1980	1985	1994
Accomack	1,900,210	9,841,711	8,924,234	6,882,110
Charles	56,183	0	0	8,498
Norfolk	1,514,916	271,669	2,433,363	1,461,447
Chesapeake	0	1,218	0	30,716
Essex	78,625	7,151	17,205	89,856
Fairfax	164	13,441	8,447	69,617
Hampton	2,506,609	19,351,585	8,006,231	17,059,928
Gloucester	1,409,121	3,006,614	2,191,581	4,853,196
James	391,767	122,762	92,367	218,002
King Georges	108,346	266,250	122,214	242,893
King William	24,465	12,913	42,564	68,393
Lancaster	1,898,501	2,807,135	2,523,784	1,489,908
Mathews	1,263,194	1,622,213	2,334,015	4,104,513
Middlesex	686,877	1,365,326	918,378	1,031,988
New Kent	0	276,584	11,508	108,398
Northampton	7,627,292	3,710,501	4,751,060	2,692,177
Northumberland	12,785,747	27,294,635	27,771,511	20,436,975
Prince George	0	0	0	56,269
Virginia Beach	214,871	1,079,187	782,813	1,323,772
Richmond	657,096	393,106	329,058	392,694
Stafford	53,766	232,640	126,978	418,845
Westmoreland	1,055,915	2,185,300	1,654,112	1,527,922
York	502,469	4,907,075	8,910,301	7,668,129
Newport News	1,226,055	7,585,245	4,553,335	13,639,243
Prince William	1,616	108,005	117,890	51,477
Chesterfield	0	0	0	38,829
Portsmouth	825	521,987	69,266	140,332
Isle of Wight	97,090	231,145	207,663	266,536
King & Queen	14,727	0	0	27,345
Suffolk	66,703	33,052	4,160	395,745
Surry	0	0	0	27,148
Virginia	35,667,000	84,993,000	76,535,000	101,245,000

The major species landed at Northumberland, excluding menhaden, are quahogs, blue crabs, striped bass, spot, sea trout, flounder, and croaker. The landed value of all these species combined account for 96 percent of the landed value of all species other than menhaden.

After counties like Accomack, Northampton, and Northumberland,

there is a real hodgepodge of fishing communities. For example, Chesterfield County reported total landings worth \$28 thousand and consisting solely of catfish. Some fishing communities, like Portsmouth, have exhibited extreme variation in the number and value of species landed since 1973. In 1973, blue crabs and oysters were the only species landed in

Portsmouth; the total landed value was \$14,021. In 1980, 23 different species were landed with a total ex-vessel value of \$521,987; no oysters or blue crabs were landed in 1980 in the city of Portsmouth. In 1994, eleven species were landed in Portsmouth; the total landed value was \$104,339 with blue crabs accounting for 91 percent of the landed value. Then, there are the fishing communities like those of Gloucester County in which a diverse number of species are regularly landed, but the landed values are relatively stable and low; the landed value in Gloucester has traditionally been between \$2 and \$3 million per year since 1973.

As previously indicated, there are a limited number of species which account for a majority of the landed value of finfish and shellfish in Virginia. Blue crabs, menhaden, spot, croaker, summer flounder, hard clams, oysters, and sea scallops are the primary species in terms of value. Blue crabs and sea scallops, alone, account for 56 percent of the total landed value. Summer flounder accounts for approximately 5 percent of the total landed value. Combined, all of the above species account for 93 percent of the total state-wide ex-vessel value.

Value is not a constant; it is dependent upon demand and supply conditions throughout the world, resource and climatic conditions, fisheries management and regulation, and prevailing economic conditions. A large influx or supply of close substitutes for any one species can

quickly depress the prices and values received by fishermen. For example, the price received by fishermen for blue crabs declined 14 percent between 1990 and 1992 but increased 46 percent between 1992 and 1994. The supply of potential substitute products increased by 55 percent between 1992 and 1994.

How are each of the fishing communities dependent upon the various species? Alternatively, what might happen to the potential source of fishermen's income if for some reason fishermen could no longer harvest a particular species? In some communities, loss of the ability to harvest certain species would nearly shut down the local fishing industry.

Loss of access to blue crab could have a significant impact on employment opportunities for fishermen in several communities. In 1994, total landed value in Accomack was \$6.8 million; blue crabs accounted for 55 percent of the total landed value. Coincidentally, full-time employment opportunities for approximately 585 individuals in Virginia would be lost. Alternately, approximately 77 person years of employment in harvesting would be lost. In communities like Mathews and Gloucester, loss of harvesting opportunities for blue crabs would generate short-term unemployment for about 69 and 60 percent of the working watermen. In Northampton, Northumberland, and York counties, full-time employment opportunities in harvesting would be decreased by 60, 8.5, and 26 percent,

respectively, if blue crabs could not be harvested.

In some communities, loss of access to blue crabs would have a minimal impact on the harvesting sector but possible significant impacts on processing and wholesaling. Hampton would lose about six percent of its watermen if the blue crab catch declined to zero. On the other hand, several companies which process and depend on blue crabs for all of their business would be substantially affected.

What about the species dependency over time? How has the species composition and quantity of landings changed over time relative to the various fishing communities?

Relative to 1974, the quantity of landings has declined in most communities (Table 20). Exceptions include Hampton, New Kent, Stafford, York, Newport News, Portsmouth, Prince George, Chesterfield, Chesapeake, Fairfax, Hanover, Isle of Wight, and Suffolk. Hampton, Newport News, and York experienced substantial growth in the offshore sea scallop and summer flounder fisheries. All of the other communities, except New Kent, which had increased landings experienced growth in the blue crab fishery. New Kent has increased landings, of gizzard shad. In recent years, all the counties have experienced substantial declines in the landings of blue crabs.

Over time, there has been a shift in the diversity of species. In 1974, blue

crab was the primary species landed in seven Virginia fishing communities. Sea scallops was not a major species for any fishing community. In 1994, blue crab was the major species of 18 fishing communities and sea scallops accounted for the majority of landed value in three communities—Newport News, York, and Hampton.

Overall, sea scallops, menhaden, and blue crabs contribute the greatest value to the state and to the coastal fishing communities. Relative to the landed value of all species, except menhaden, blue crabs and sea scallops accounted for 77 percent of the state's ex-vessel or landed value in 1994. Eighteen Virginia fishing communities derived a plurality of ex-vessel value from blue crabs. Three communities depended primarily on sea scallops. The catfish fishery, a relatively small state fishery, was the most important species in ex-vessel value terms to four communities in 1994.

Virginia's fishing communities are quite diverse. Even though a limited number of species support the bulk of the commercial fisheries, more than 75 species are regularly landed among the various fishing communities of Virginia. Over time, as some resources have declined or experienced problems, Virginia's fishermen have found alternative species to harvest and thus provided an important and highly desired source of protein—Virginia seafood.



Virginia Seafood Processing and Wholesaling

More than 35 species available from local fisheries are regularly marketed in Virginia. It is not uncommon for a medium to large-size processor to carry more than 30 different species of local finfish and shellfish.

When individuals think of the commercial seafood industry, they typically only think about the harvesting sector, the fishermen, and the fish being caught. Rarely do they consider processing, wholesaling, restaurants, grocery stores, and other retail sales. Yet, it is these sectors in which the bulk of the income is derived and jobs are created.

The National Marine Fisheries Service (NMFS) reports that there were approximately 108 processors or wholesalers in Virginia in 1994. In actuality, there were probably considerably more; a survey conducted for this study found more than 300, actually 348, wholesalers and primary processors in Virginia.

Unfortunately, the NMFS data on processed products and wholesalers are incomplete. The data reporting system is purely voluntary, and NMFS is unable to obtain data from all processors and wholesalers.

The 108 processing plants and wholesalers reported by NMFS employed approximately 2,300 individuals in 1994. Average annual earnings per full-time worker was approximately \$14,351.20. Processing and wholesaling, alone, generated a payroll well in excess of \$30 million in 1994.

The products and species available from Virginia dealers and processors are quite diverse, and perhaps, too numerous to determine. From a Virginia dealer, you can obtain King crab from Alaska or Russia, shrimp from Thailand, mahi-mahi and sea scallops from the Atlantic ocean, and blue crabs and oysters from the Chesapeake Bay; more than 98 species of finfish and shellfish are harvested in Virginia waters or areas near the Virginia coastline.

More than 35 species available from local fisheries are regularly marketed in Virginia. It is not uncommon for a medium to large-size processor to carry more than 30 different

Table 21. Production, Sales, and Employment for Virginia Processors, 1994

Product Form/Species	Number of Companies	Employment	Pounds of Processed Product	Sales of Processed Product-\$	Price Per Pound
Blue Crab	22	685	5,220,839	23,566,863	4.51
Hard Clams	8	414	36,063,696	34,827,514	0.97
Oysters	26	484	3,969,118	15,543,013	3.92
Edible Finfish	5	92	667,830	1,934,093	2.90
Edible Shellfish	49	1,516	44,154,078	75,937,626	1.72
Industrial	7	688	191,788,082 ^a	56,347,018	0.13 ^a
All Products ^a	58	2,207	236,609,990	134,220,737	0.44 ^a

^aProcessed products with and without menhaden. All price per pound and pounds of processed product information excludes processed menhaden. Sales value or the value of processed products and the number of companies engaged in processing, however, include processed menhaden. In 1994, menhaden processors produced approximately \$24.2 million (73 thousand short tons) of fish meal, \$5.5 million (18.8 thousand metric tons) of fish oil, \$1.1 million (6.9 thousand short tons) of solubles, and \$0.36 million (quantity is unavailable) of other products.

Data Source: National Marine Fisheries Service. Data obtained on processing activities in Virginia by NMFS are based on a voluntary data collection program. Data available on number of companies, employment, production, and value are, therefore, considerably lower than actual numbers.

species of local finfish and shellfish. Typical product forms include live, fresh, frozen, canned, tray/vacuum pack, pasteurized, prepared, partially prepared, breaded, and individual quick frozen.

Data available from NMFS indicates that there were 56 processing companies in 1994. The 56 companies employed 1,933 individuals and produced 236,609,990 pounds of product, exclusive of processed menhaden, worth \$103,040,994. These 56 processing companies produced 35 individual product forms. The average price received per pound of processed product was \$0.44. If menhaden products are included, Virginia processors produced

\$134.2 million of processed products in 1994.

In terms of edible seafood products, the value of processed shellfish products exceeded the value of processed finfish products by \$74 million in 1994 (Table 21). NMFS reports only five companies engaged in processing edible finfish and 49 companies processing edible shellfish in 1994.

The five companies processing edible finfish produced 667,830 pounds of processed product in 1994. The average price per pound received by these processors was \$2.90; total revenue received for processed edible finfish products was \$1.9

million. The five companies employed 92 individuals in 1994.

The 49 companies which processed edible shellfish in 1994 produced 44,154,078 pounds of processed products with a total value of \$75,937,626. The average price received for processed edible shellfish products was \$1.72. The 46 companies employed 1,516 individuals.

The third category of processed products is industrial products. NMFS reports that five companies were engaged in processing industrial products in 1994. These statistics, however, omit two other companies which process fish and shellfish for industrial purposes. All total, the seven companies produced more than 200

million pounds of product and received \$54 million in sales revenue. Products produced by these seven companies include fish meal, oil, solubles, bait, and numerous other products. The seven industrial processors employed 688 individuals in 1994.

Excluding menhaden, the three major species processed in Virginia are blue crabs, hard clams, and oysters. Sea scallops likely have the highest processed product value but are excluded from the NMFS reporting system because of confidentiality; NMFS will not release data on three or less companies.

Blue crabs, hard clams, and oysters accounted for 55 percent—\$73.9 million—of the value of all reported processed products in Virginia during 1994. Processors produced 45.2 million pounds of products from the three species. Total employment generated directly from processing the three species was 1,588 individuals.

In 1994, approximately 22 companies processed blue crab in Virginia. The 22 companies produced 5.2 million pounds of processed products worth \$23.6 million. The 22 companies

employed 685 individuals. The average price received per pound for processed blue crab products was \$4.51.

Only eight companies reported processing hard clams in Virginia in 1994. Clam processors produced 36 million pounds of product with a total sales value of \$34.8 million. Processors of clams employed 414 individuals in 1994. The average price received for processed clam products was \$0.97 per pound.

Even though the wild oyster fishery of Virginia has been negligible for the past five years, processors produced 3,969,118 pounds of oyster products in 1994. They received slightly more than \$15.5 million in sales revenue. Processors of oysters allowed employment opportunities for 484 individuals. The average price received for processed oyster products was \$3.92 per pound.





International Seafood Trade and Virginia

The World of Seafood

In the past ten years, Virginia has become a major player on the international seafood trading scene.

With the introduction of improved packaging and transportation, seafood has truly become an international commodity. Today, the shrimp you eat at a restaurant may have been shipped from Thailand, Ecuador, China, Mexico, or a host of other nations. The shrimp may have been grown on a farm in another country. If it is scallops you want, the chance is good that you will buy scallops produced in Canada, China, Peru, or Japan. Nearly 80 percent of tilapia in the U.S. market, an increasingly popular species, is obtained from one farm in Columbia and one farm in Costa Rica. Trade has allowed American consumers to have a readily available supply of an extremely diverse number of products, usually at reasonable prices.

The National Marine Fisheries Service provides regular production reports on the world catch of fish, crustaceans, and mollusks for 39 foreign nations. The leading international producer is China, followed by Peru and Japan. The United States ranks fifth in world production. Between 1989 and 1993, the world catch increased from 100,115,000 to 101,418,000 metric tons. On a continent basis, Asia is the world leader in seafood production. The commercial catch by Asia was 51,429,000 metric tons in 1993, a number which equaled 51 percent of the world's catch. South America and Europe are the 2nd and 3rd leading producers of seafood. North America ranks 4th and accounts for 8.7 percent of the world's production of seafood.

The U.S. Balance of Trade

In 1994, the United States imported seafood and related products from more than 200 nations. The total value of the imports was almost \$12 billion, a 79.5 percent increase over the value of imports in 1985 (\$6.6 billion) (Table 22). The United States collected \$243 million in duties assessed against the 1994 imports. The average annual rate of growth in imports was 6.9 percent between 1985 and 1994. The top three nations from which the U.S. imported seafood were Thailand (\$1.7 billion), Canada (\$1.6 billion), and Italy (\$1.3 billion). For all the ballyhoo about China, the United States imported only \$358 million worth of seafood from China in 1994.

The single, edible, seafood product having the highest value among imports in 1994 was shrimp; the U.S. imported 621 million pounds with an imported value of \$2.65 billion. The leading fishery commodity imported by the United States was nonedible fishery products such as industrial-based products and pet food. In 1994, the U.S. imported \$5.25 billion worth of nonedible fishery products.

The United States has consistently had a deficit balance of trade (the value of U.S. exports to foreign nations is less than the value of imports into the United States).

Table 22. Value of U.S. Imports and Exports, \$1,000s.

Year	Value of Imports	Value of Exports
1985	6,678,586	1,139,177
1986	7,626,293	1,393,808
1987	8,817,697	1,722,110
1988	8,871,997	2,338,387
1989	9,604,356	4,938,141
1990	9,047,680	5,965,939
1991	9,435,060	6,541,808
1992	9,871,262	7,119,632
1993	10,622,387	6,924,724
1994	11,986,879	7,380,861

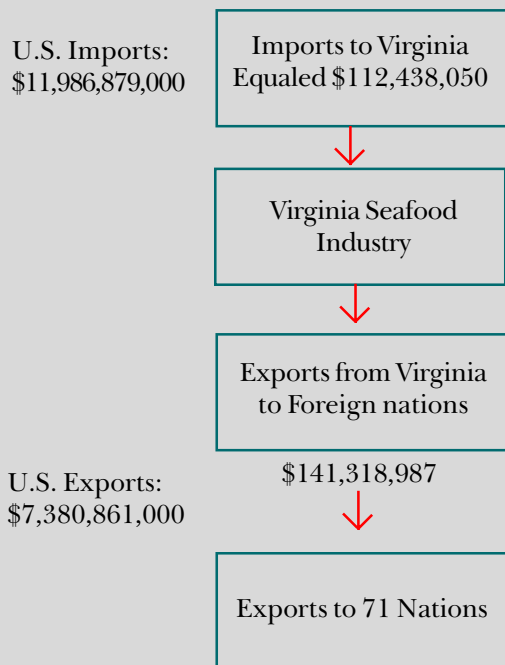
In 1994, the U.S. exported \$7,380,861,000 worth of seafood products to foreign nations or \$4.6 billion less than the U.S. imported. Japan and Canada received \$3.8 billion of U.S. exports, nearly 52 percent of the total U.S. exports.

Virginia and Foreign Trade

The major edible product exported by the United States was salmon. In 1994, the U.S. exported \$523 million worth of salmon. Nonedible fishery product exports, however, were valued at \$4.2 billion in 1994 and accounted for 57 percent of the total U.S. exports.

Figure 16. Virginia Foreign Trade in Seafood, 1994.

In 1994, Virginia received imports from 48 nations



Virginia is the only state with surplus balance of trade in seafood and related; U.S. had a deficit balance of trade in seafood.

Table 23. Virginia Foreign Trade in Fishery Products, 1985-1994

-----Dollars-----			
Year	Imports	Exports	Trade Balance
1985	61,126,981	6,634,254	-54,492,727
1986	46,270,211	3,713,227	-42,556,984
1987	65,554,926	6,498,394	-59,056,532
1988	71,198,140	15,866,736	-55,331,404
1989	93,669,466	56,002,613	-37,666,853
1990	114,644,297	68,233,061	-46,411,236
1991	116,622,521	86,445,652	-30,176,869
1992	129,595,717	121,120,919	-8,474,798
1993	110,138,886	128,118,753	17,979,867
1994	112,438,050	141,318,987	28,880,937

In the past ten years, Virginia has become a major player on the international seafood trading scene. In slightly less than a decade, the value of exports has increased to 21 times its value in 1985. In 1985, Virginia imported \$61 million worth of seafood and related products from 38 foreign nations and exported \$6.6 million

to 15 foreign nations (Table 23). In 1994, Virginia imported \$112.4 million from 48 nations while exporting \$141.3 million to 71 nations around the world (Figure 16). Virginia is the only state to have a surplus balance of trade in seafood and related products.

Which nations are major trading partners with Virginia? In 1985, twelve nations exported more than \$1,000,000 per nation worth of fishery products to Virginia (Table 24). In 1990, 14 nations exported more than \$1,000,000 worth of fishery products to Virginia. In 1994, the number of nations whose export value to Virginia exceeded \$1 million increased to 19. The top three nations

Table 24. Nations Exporting \$1,000,000 or More to Virginia

Nation	-----Value of Imports-----Dollars-----		
	1985	1990	1994
Ecuador	1,436,225		
Chile	1,825,012		2,061,181
Brazil	20,888,270	27,317,048	17,162,100
Uruguay	1,044,628		5,529,654
Argentina	1,286,711	20,325,150	20,395,594
Iceland	19,210,210	2,119,501	1,475,048
Norway	1,176,400		
Denmark	2,685,976		4,740,917
Netherlands	1,170,882		
France	2,517,787	2,093,007	1,470,045
Germany	2,274,945	24,905,913	27,547,683
Japan	1,854,539		1,115,291
United Kingdom		1,247,309	1,513,243
Belgium		6,187,558	4,605,427
Switzerland		1,886,462	
India		4,289,109	2,618,348
Bangladesh		1,719,327	
Thailand		6,555,382	2,984,234
Philippines		2,485,970	1,181,564
China		4,162,099	5,248,723
South Korea		1,385,838	
Peru			2,372,240
Faroe Island			1,652,008
Ireland			2,732,566
Italy			1,152,147

in terms of value of seafood products from which Virginia imported in 1994 were Germany, Argentina, and Brazil (Figure 17). The top three nations which Virginia exported seafood and related products to were Germany, Italy, and Japan.

What were the major products imported from other nations between 1985 and 1994? In 1985, 13 products whose values exceeded \$1 million were imported by Virginia. The number of \$1 million products imported by Virginia in 1990 was

17. In 1994, the number of imported products whose values exceeded \$1 million was 13.

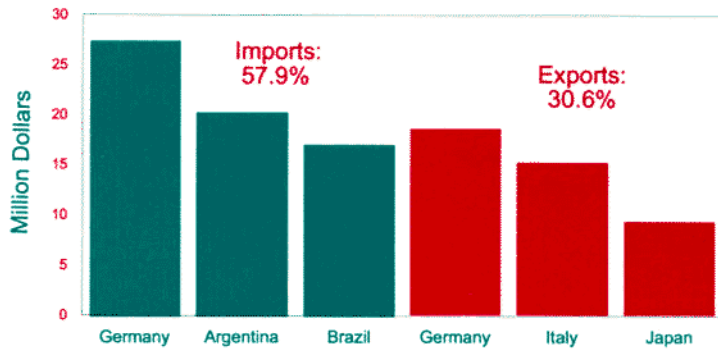
In 1985, the majority of major products imported by Virginia from other nations were for human consumption (e.g., fresh and frozen cod fillets, rock lobster tails, and shrimp). The five highest-valued import commodities in 1985 were rock lobster tails (\$10.8 million), groundfish fillets (\$14.9 million), raw peeled and prepared shrimp (\$8.7

million), seaweed (\$687,234), and perfumes and toilet water with alcohol (\$4 million).

During the 1990s, there was a change in the type of products Virginia imported from foreign nations. Rock lobster and shrimp were still imported in 1994, but increasing amounts of flatfish were imported. There was a mix of groundfish species imported in fillet form. Scallops and canned tuna were also imported. Pet food, however, was the highest valued commodity imported in 1994. The five highest-valued commodities in 1994 were (1) pet food (\$16 million), (2) flatfish fillets (\$13 million), (3) rock lobster tails (\$11 million), (4) fillets made from numerous marine species (\$10.8 million), and (5) seaweed (\$7 million).

What about the nations to which Virginia exports? In 1985, Virginia exported to 15 nations. In 1990, the number of nations to which Virginia exported increased to 59. Virginia exported to 71 nations in 1994. In 1985, however, only the Netherlands imported more than \$1 million of fish products from Virginia (Table 25). In 1990, there were 15 nations which purchased \$1 million or more of fish products from Virginia, and in 1994, 28 nations purchased \$1 million or more of fish products from Virginia. In 1994, 11 nations purchased \$5 million or more in fish products from Virginia (Figure 18).

Figure 17. Top Three Trading Nations With Respect to Imports and Exports, Virginia 1994



Virginia imported from 48 nations and exported to 71 nations in 1994.

Figure 18. Nations Importing \$5 Million or More From Virginia, 1994

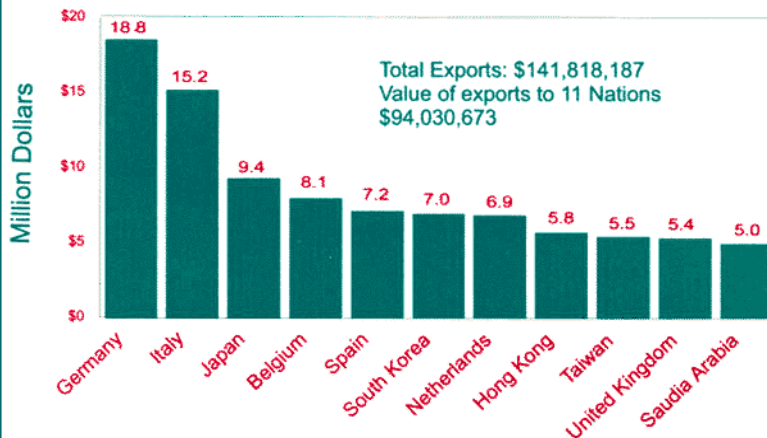


Table 25. Nations Importing \$1 Million or More From Virginia

Nation	Value of Exports		
	1985	1990	1994
-----Dollars-----			
Netherlands	5,010,736	15,139,033	6,906,380
Sweden		4,271,134	2,578,444
United Kingdom			3,973,029
			5,384,210
Belgium		4,882,719	8,053,833
France		3,679,985	3,988,619
Spain		1,602,841	7,189,397
Italy		1,944,947	15,244,665
Israel		1,119,667	1,677,104
Saudi Arabia		1,960,626	5,012,295
Thailand		2,869,098	2,437,018
South Korea		2,040,587	6,999,964
Taiwan		1,843,138	5,486,990
Japan		7,905,591	9,387,126
Australia		3,223,057	4,325,389
New Zealand		1,235,017	
Brazil			2,472,993
Argentina			2,198,580
Norway			1,036,853
Denmark			1,250,330
Ireland			1,534,037
Germany			18,600,305
Austria			1,154,104
Switzerland			3,456,943
United Arab Emirates			1,981,881
Malaysia			1,216,441
Singapore			2,317,644
Philippines			1,658,047
Hong Kong			5,765,508
South Africa			1,716,558

Who were the major nations and what did they purchase from Virginia? Major nations, in terms of value of products purchased from Virginia, were the United Kingdom, the Netherlands, Belgium, Germany, Spain, Italy, Saudi Arabia, South Korea, Hong Kong, Taiwan, and Japan; in 1994, these nations each purchased \$5 million or more in fish products. Eight other nations purchased \$2 million or more in fish products from Virginia.

Of the \$94 million spent by the 11 foreign nations on fish products from Virginia in 1994, the major purchases were for cat and dog food. The 11 nations spent \$26.8 million to obtain cat and dog food from Virginia in 1994. They spent \$16.3 million on saturated, acyclic, monocarboxylic acid, a substance used to make margarine in some countries. Other major products obtained from the 11 nations included organic surface, active agents, fish leather, paints and varnishes of polymers, protein isolates, menhaden oil, prepared livestock feed, and perfumes and toilet waters. Of the 11 nations, Japan was the only nation which purchased more than \$1 million of an edible seafood product from Virginia; the Japanese obtained \$2.1 million of frozen crab in 1994.

Unfortunately, export statistics provided by the United States Department of Commerce may be misleading. Exports are attributed to the state from which the product is actually exported or shipped to a foreign nation. Many Virginia fish products (e.g., soft-shelled crabs, sea scallops, flounder fillets, and mollusks) are shipped to other states because of cost

savings. In this latter case, Virginia foreign shipments are credited to the state from which the product was shipped to a foreign nation.



The Economic Importance of Virginia's Fishing Industry

In 1994, approximately 6,433 individuals derived some level of income from harvesting activities in Virginia (i.e., catching fish and shellfish).

Economic Impact Measures

In 1994, approximately 6,433 individuals derived some level of income directly from commercial harvesting activities in Virginia. In addition, more than 2,300 individuals were employed in wholesaling and processing activities. The menhaden industry alone employed 274 people to support shore-based activities. All in all, more than 9,000 individuals were involved in the harvesting, processing, and wholesaling of finfish, shellfish, and related products in Virginia.

A strict count of the number of people employed in harvesting, processing and wholesaling, and in harvesting-related shoreside support activities, is quite misleading in terms of the number of jobs which are, in some measure, dependent upon the fisheries. The commercial industry produces employment in restaurants, grocery stores and fish markets. In the case of a seafood restaurant, waiters, waitresses, chefs, and busboys are needed in the operation. The impact goes further: energy is used to prepare meals, and dinnerware and cookware must be purchased. Similarly, commercial fishing not only employs captains and crew; workers are needed to service the boats, the engines, and individuals are required for the maintenance of the extensive array of electronic equipment which can often be found on many vessels. Grocery stores routinely include a seafood section, and that area employs personnel. The extent to which a commercial fishing industry can have an impact on a community is far-reaching. Here are just two examples: specialized insurance agents are employed to meet the needs of vessel owners; accountants are required to maintain financial records.

Less obvious than the jobs created in restaurants and groceries, are those found in some other sectors: in advertising, law, construction, oil refining, and marine research. Then, there is the even less obvious, next round of impacts: all sectors providing

goods and services to the harvesting sector or related market chains (e.g., processors and restaurants) must purchase goods and services from other businesses. This, in turn, generates more sales, employments, and income. People who earn income from fishing—as well as the ones serving fish and customers from restaurants—buy homes, purchase life insurance, go grocery shopping, take vacations, and pay utility bills. These expenditures generate more output, more income, and more employment.

Measures of the economic impacts of Virginia's commercial fishing industry include total sales or output, income, and full-time employment generated because of commercial fishing and related activities within the state. Total output is a gross measure of economic activity which equates to the total margin of businesses. For example, for a fishery product, the margin is the difference between the price paid for the product by the consumer or wholesale dealer and the dockside or wholesale value for an equivalent weight of the product. Employment is simply person years of employment. Income includes all income (e.g., wages, salaries, bonuses, profits, commissions, and other income) earned by employees and owners at the various market levels.

At the same time that all levels of impact are included, we must deduct all economic activity occurring out of state (e.g., the value of processed products may include raw materials purchased from out

of state). Any value exported out of state or produced out of state and which does not have a discernible impact upon Virginia's economy must be excluded from our measures of the economic impacts on Virginia's economy.

It should also be noted that at the same time commercial fishing engenders work opportunities, the nature of that employment may not be as straightforward as it might be in other sectors. For example, many jobs are part-time or seasonal, and many watermen and offshore fishermen work second jobs. Even though the loss of one job may seem significant, an individual losing his or her job in fishing may actually only lose one or two weeks of employment. Yet, for other people, losing a job in fishing may be the equivalent of losing a career. For this reason, it is necessary in this report to consider employment in terms of full-time equivalent units (person years of employment per year).

Determining Impacts

The determination of economic impacts or the importance of the fishing industry to the economy of Virginia is quite complicated. In economic terms, three levels of impacts are considered based on what is called an input/output model.

The input/output model is simply a method for measuring or describing, in quantitative terms, the links among

industries, final expenditures by consumers, and primary inputs, such as labor, in an economy. For example, fishermen land \$1 million of fish. In order to land that \$1 million, however, they had to purchase fuel, food, groceries, insurance, and pay income to crew. In turn, the company which sold the fuel to the vessel had to purchase fuel from a refinery which had to purchase oil from an oil company. Each level of production—fishermen, fuel dealer, refinery, and oil driller—also had to purchase goods and services from numerous other sectors of the economy. The input/output model allows the flow of the transactions to be assessed in terms of value of output, income generated, and employment.

We formally measure output, income, and employment as follows: (1) output is the gross receipts of businesses in harvesting, (2) output for wholesale and retail trade businesses is the gross margin or gross receipts less the cost of goods sold; (3) income is payroll or earnings of households and businesses, but excludes the value of benefits; (4) employment is actually the number of annual average jobs employed in a given business sector and is close to the concept of full-time-equivalent employment.

There are three levels of impacts which are of concern: (1) direct, (2) indirect, and (3) induced. Direct impacts reflect output, income, and expenditures which occur directly from initial expenditures by

businesses. Indirect impacts reflect the output, income, and employment generated throughout the economy of Virginia because businesses—while selling to fishermen, processors, and retailers—must also acquire goods and services. The induced impacts reflect the output, income, and employment generated in Virginia's economy by the spending of household income by individuals employed in fishing, wholesaling, retailing, and the various support industries.

Direct impacts reflect expenditures which are made solely in Virginia and are thus exclusive of expenditures made on goods and services produced in other states. For example, Virginia fishermen spent, excluding wages and profit, \$56.8 million on goods and services in Virginia to produce \$87.6 million worth of finfish and shellfish in 1994. When wages, returns on investment, and profit are included, total expenditures were the dockside value of \$87.6 million. Expenditures, exclusive of wages and profit, by commercial fishermen which actually generated economic impacts for the Virginia economy totaled \$31.3 million. If wages and profit are included, total expenditures which affected the Virginia economy were \$55.3 million.

In the case of retail and wholesale trades, the value of products manufactured outside of Virginia are also excluded from the impacts expenditures. As an example, the direct impacts on employment reflect employment in Virginia generated directly

by initial expenditures (e.g., number of fishermen, number of individuals in processing plants, or number of people employed in a retail store because of selling fish to consumers).

Indirect impacts are a bit more difficult to understand than direct impacts. In simple terms, indirect impacts may be thought of as those impacts from businesses which support the direct producing sectors. For example, a company which makes and sells fishing gear in Virginia requires raw materials and accounting services for their business; the output, income, and employment generated to the raw materials and accounting service businesses are measures of the indirect impacts.

The induced impacts are perhaps the most complex to understand. An example of an induced impact would be the level of output, income, and employment generated by a fisherman having a house constructed or by purchasing groceries for at-home consumption. Alternatively, induced impacts reflect output, income, and employment generated in Virginia by households receiving income for any fishing related expenditures.

For the purposes of this report, the harvesting sector direct output is measured in terms of the output of the primary and direct sectors which include the ex-vessel value of finfish and shellfish and the value of output related to expenditures in the harvesting sector. Two levels of impacts are combined to reflect the direct impacts

of the harvesting sector: (1) the output or landed value of the primary sector; and (2) the in-state impacts related to expenditures on harvesting activities. Alternatively, we follow the conventional definition of direct impacts and define direct output for the harvesting sector as the sum of the value of output, payroll, and expenditures resulting directly from initial expenditures by the harvesting sector. Purchases of goods and services from out of state suppliers are subtracted from the measure of direct output.

Relative to the other sectors, the value of output is excluded; for example, the output impacts related to processing reflect only the outputs generated by suppliers of goods and services to support processing. Alternatively, output for the other sectors is defined as a gross margin. The reason for excluding the value of output from the other sectors is to avoid double-counting the value of landed finfish and shellfish. For example, if the value of output of processors was included, the measure of output would include not only the value of processed product but also all expenditures on finfish and shellfish.

Assessing or understanding the income impacts may also be confusing. This is because wages, salaries, compensation, and profits are combined into one income measure and generate no impacts until they are spent by households. As an example, consider wages and compensation for the harvesting sector. In 1994,

captains, crew, and vessel owners received \$30.8 million in the form of wages, profit, and other income. The payment to crew and vessel owners has no direct economic impacts; it is only after crew and owners make purchases of goods and services that impacts are generated. Thus, the direct and indirect impacts of wages, salaries, and profits equal zero; there are, however, induced impacts once households make expenditures on goods and services.

Another confusing aspect of income is that for some sectors and level of impacts, income impacts exceed the value of output impacts. The fact that in some cases income exceeds output does not mean that a particular sector is losing money. Remember that output for each impact level and sector, other than the harvest sector, is a margin and not the total value of output. For example, Virginia processors had total sales of \$223.2 million and total expenditures on finfish and shellfish from Virginia harvesters and other wholesalers and processors equal to \$87.5 million. The direct Virginia output equals the value added or margin which is \$223.2 million less \$87.5 million which equals \$135.7 million less out-of-state expenditures (\$17.8 million) and all wages, profit, and other compensation (\$61.1 million). The total direct Virginia output thus equals \$48.0 million.

In contrast, total direct Virginia processor income was \$86.9 million in 1994, which did exceed the value of direct output. In this instance, processors,

which are primary producers, must pay wages and returns to sectors providing goods and services to processors. There is thus a direct income component for the processing sector and the other sectors. The value of the output of the primary sectors is excluded from the output measure of each sector.

Economic Impacts: Industry

Virginia's fisheries are numerous and complex—too numerous and complex, in fact, to present detailed analyses of the economic impacts on a fishery by fishery or species by species basis. The examination of the economic importance of Virginia's commercial fisheries are thus limited to the major species and fisheries or to aggregations of species and fisheries. Economic impacts are examined relative to the following species or species groupings: (1) blue crabs, (2) oysters, (3) cultured hard clams, (4) hard clams, (5) sea scallops, (6) flounder, (7) industrial, and (8) other finfish, and (9) other shellfish. In order to simplify the analysis and avoid an extensive replication of numbers, we initially present the impacts relative to the total commercial fishing industry of Virginia. We then present the impacts relative to each of the above listed species or species groupings.

The economic impact assessment is thus very limited and must be viewed as extremely conservative. Excluded from

the analysis are cultured finfish and surf clam processing. Also excluded from the analysis is the sale of species caught by recreational anglers. Certain products or species were excluded because appropriate data could not be obtained or the research did not require an assessment of certain products.

State Impacts

In 1994, the commercial harvesting sector landed \$87.6 million worth of finfish and shellfish in Virginia. In order to produce \$87.6 million worth of finfish and shellfish, harvesters spent, exclusive of wages and profit, \$56.8 million in Virginia. The major expenditure or cost categories were fuel and oil, and maintenance and repair (Table 26). Expenditures on gear and supplies were the third highest cost category. Profits, wages, and compensation to crew, captain, and boat owners equaled \$30.8 million; in-state expenditures on wages, profits, and compensation equaled \$24 million.

Of the total cost, excluding wages and profit, of \$56.8 million, only \$31.3 million generated economic impacts for the economy of Virginia. Including wages and profits, the total expenditures by the harvesting sector which affected the Virginia economy in 1994 equaled \$55.3 million. The low in-state expenditure was primarily because of fuel, gear, and supplies, which are manufactured mostly out of state. For example, Virginia fishermen spent \$12.6 million on fuel, but

Table 26. Harvesting Sector Expenditures, 1994

Expenditure or Cost Category	Direct In-State or Local Expenses Dollars	Expenditures . Affecting Virginia Economy Dollars
Fuel and Oil	12,582,971	2,305,440
Ice	1,691,180	
Bait	2,578,344	
Food	2,300,782	1,260,901
Repair and Maintenance	10,903,103	10,903,103
Gear and Supplies	8,124,749	1,813,162
Other Miscellaneous Purchases	4,890,125	3,687,063
License and Permit Fees	1,662,816	1,662,816
Docking Fees	693,772	693,772
Insurance	3,793,444	2,986,416
Interest Payments	2,986,416	2,636,747
Depreciation	4,570,190	67,456
Wages, Compensation, and Profit	24,029,270	24,029,270
Total	80,807,161	55,336,473

after adjusting the fuel expenditure for fuel supplies originating from out of state, only \$2.3 million remained in state.

Processors purchased \$48.8 million worth of fish products from Virginia harvesters and \$38.7 million worth of products from other Virginia suppliers of finfish and shellfish. Virginia processors added \$135.8 million in value to the \$87.5 million worth of purchased products. Total sales by Virginia processors were \$223.2 million in 1994. Virginia processors spent slightly more than \$109 million to process products in Virginia in 1994. After deducting for goods and services purchased outside of Virginia, the

total economic output of processing activities on Virginia's economy was \$191.6 million in 1994.

Distributors purchased \$65.8 million of product from Virginia harvesters and other Virginia suppliers. They generated \$9.2 million in value added, and had total sales of \$75 million. After deducting for all out of state expenditures, distributors had a total economic impact on output of \$14.5 million on the Virginia state economy.

Retail operations, which include restaurants and grocery stores, had total sales of \$78.1 million. Restaurants acquired \$18.9 million in seafood prod-

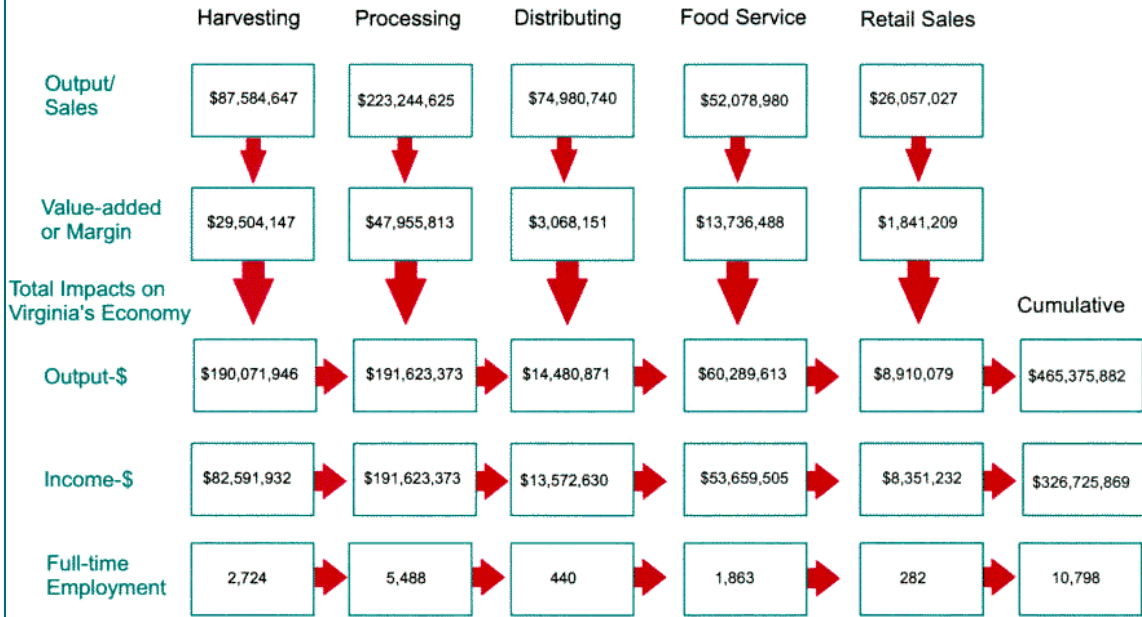
ucts and had total sales of \$52.1 million in seafood products. The total economic output for the Virginia economy generated by restaurants serving seafood was \$60.3 million in 1994. Total sales by retail operations, exclusive of restaurants, were \$26.1 million in 1994. Excluding all out of state purchases of goods and services, the economic output for the Virginia economy generated by seafood sales by retail food markets was \$8.9 million in 1994.

In 1994, the commercial fishing industry of Virginia generated a total output in Virginia of \$465.4 million, a total income of \$326.7 million, and a total employment of 10,798 full-time jobs or person-years of employment for the economy of Virginia (Figure 19). As might be expected, most of the jobs were generated from processing, wholesaling, and harvesting activities (Table 27).

Restaurant activities provided the third highest source of employment. Of the total 10,798 person years of employment generated by the fishing industry, harvesting activities generated 2,724 person-years, processing and wholesaling were responsible for 5,488 person-years of employment, distributing generated 440 person-years, restaurant activities provided 1,863 person years, and retail food sales contributed 282 person-years of employment to the Virginia economy.

The total direct output, employment, and income in Virginia associated with the commercial fishing industry in 1994

Figure 19. Output and Sales, Value Added and Margin, and Economic Impacts of Virginia's Fishing Industry



activities, the economy of Virginia has an output of approximately \$5.3 million. There is a total payroll and profit of \$3.7 million, and total employment generated in Virginia is 123.3 person-years of employment.

Impacts: Species and Fisheries

Although approximately 50 different species of finfish and shellfish are regularly landed by Virginia fishermen, only a limited number are important in terms of dockside or landed value (Table 28). Blue crabs, menhaden, and sea scallops account for 77 percent of the total landed value. If hard clams and summer flounder

amounted to, respectively, \$183.7 million, 5,497 person years of employment, and \$166.7 million in income. Induced impacts, which are typically the largest economic impacts, in terms of output, employment, and income were \$253.4 million, 4,805 person years, and \$143.2 million in income. Indirect impacts, which are typically lower than the direct and indirect impacts equaled \$28.3 million in output, 496 in person years of employment, and \$16.9 million in income.

As is typical of the fishing industry, the largest contributions to Virginia's economy by the fishing industry were generated by harvesting and processing activities. In 1994, harvesting and processing activities, respectively, accounted for 82%, 77%, and 76% of total output, income, and full-time employment generated by the commercial fishing industry.

In somewhat simpler and perhaps more useful terms, for every \$1 million in expenditures by commercial fishing

dockside revenues are considered, the five species account for about 89 percent of the total landed value of finfish and shellfish.

When the economic impacts are considered, a different story emerges. For example, oysters, which have been in a serious state of decline for several years, are the fourth most important species when total output is considered. Oysters also generate the third highest level of income and employment relative to all species landed in Virginia. Low-valued finfish is the fifth most important fishery

in terms of total output, total income, and person-years of employment. Low-value finfish include species such as spot and croaker and have an average dockside price per pound of \$0.34. On the other hand, the high-value finfish, such as striped bass, trout, and seabass, are the eighth most important in terms of output, income, and employment. The average dockside price per pound for the high-value species is \$0.75.

Blue Crabs

Blue crab is recognized as the foremost seafood by Virginia consumers. The total landed value of hard, soft, and peeler blue crabs was \$22.7 million in 1994. Virginia watermen paid \$15.2 million or 67 percent of total dockside value just for fuel and crew to harvest blue crabs in 1994. Of the total \$22.7 million landed value in Virginia, Virginia processors purchased only \$12.6 million of product from Virginia suppliers. Total sales of blue crabs and related products in Virginia totaled \$79.1 million in 1994.

Table 27. Economic Impacts of Virginia's Commercial Fishing Industry

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	117,088,794	47,955,813	3,068,151	13,736,488	1,841,209	183,690,455
Income-\$ ^c	41,214,616	86,895,954	7,054,333	27,185,078	4,334,154	166,684,136
Employment-Person Years	1,366	2,793	223	967	147	5,497
Indirect:						
Output-\$	8,700,932	14,559,883	1,000,164	3,550,181	483,617	28,294,728
Income-\$	5,062,618	8,713,867	635,536	2,179,852	296,650	16,888,524
Employment-Person Years	159	244	20	65	9	496
Induced:						
Output-\$	64,282,220	129,107,084	10,412,580	43,002,945	6,585,253	253,390,081
Income-\$	36,314,933	72,940,620	5,882,820	24,294,664	3,720,432	143,154,470
Employment-Person Years	1,200	2,451	197	830	126	4,805
Total-Direct+Indirect+Induced						
Output-\$	190,071,946	191,623,373	14,480,871	60,289,613	8,910,079	465,375,882
Income-\$	82,591,932	168,550,570	13,572,630	53,659,505	8,351,232	326,725,869
Employment-Person Years	2,724	5,488	440	1,863	282	10,798

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

Table 28. Total Virginia State Impacts by Species: All Sectors^a

Species/Fishery	Ex-vessel or Dockside Value Dollars	Output Dollars	Income Dollars	Person-Years of Employment
Blue Crabs	22,697,976	110,412,672	75,557,461	2,533
Industrial	18,411,902	98,875,398	66,420,320	2,180
Sea Scallops	26,621,774	94,028,650	57,556,335	1,908
Oysters	812,387	73,144,605	67,104,118	2,203
Low-value Finfish	6,878,953	30,241,003	19,156,927	620
Hard Clams	5,934,974	26,851,536	18,657,533	618
Flounder	4,116,796	19,575,592	13,155,050	434
Moderate to High Value Finfish	1,221,491	6,579,099	4,858,330	160
Other Shellfish	755,574	5,009,437	3,810,569	127
Sharks and Tuna, Longline	132,820	657,890	449,227	15
Total Virginia	87,584,647	465,375,882	326,725,869	10,798

^aTotal impacts equals the sum of direct, indirect, and induced impacts over all sectors.

Table 29. Economic Impacts of Virginia's Commercial Fishing Industry, Blue Crabs

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	29,460,896	8,450,095	370,023	5,765,912	776,224	44,823,150
Income-\$ ^c	9,621,819	14,622,985	850,761	11,410,979	1,827,209	38,333,753
Employment- Person Years	332	468	27	406	62	1,294
Indirect:						
Output-\$	1,922,260	2,728,595	120,621	1,490,194	203,885	6,465,556
Income-\$	1,093,762	1,611,415	76,646	914,996	125,063	3,821,882
Employment- Person Years	34	46	2	27	4	113
Induced:						
Output-\$	15,287,492	21,753,849	1,255,769	18,050,553	2,776,235	59,123,899
Income-\$	8,636,435	12,290,132	709,475	10,197,723	1,568,474	33,402,239
Employment- Person Years	286	414	24	348	53	1,125
Total-Direct + Indirect + Induced						
Output-\$	46,670,648	32,932,610	1,746,410	23,306,659	3,756,344	110,412,672
Income-\$	19,351,714	28,524,467	1,636,875	22,523,364	3,520,744	75,557,461
Employment- Person Years	651	927	53	782	119	2,533

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

After adding the direct harvesting sector impacts to the dockside value, the total direct output of the harvesting sector amounted to \$29.5 million (Table 29). The direct person-years of employment generated by the harvesting of blue crabs was 332. Relative to average annual income per person-year in 1994, the harvesting sector generated \$28,981.

After deducting for product either shipped out of state or purchased out of state, the total output over all sectors was \$110.4 million. The corresponding total

income and total employment generated within Virginia equaled, respectively, \$75.6 million and 2,533 person-years of employment. Total average per person-year of income generated from the crab fishery was \$29,829.

As is typical of most industries, the majority of the economic impacts are generated by household expenditures by individuals employed in the direct and indirect sectors. For example, the total cumulative output of all direct sectors—harvesting, processing, distributing,

restaurants, and retail markets—was \$44.8 million in 1994. The total cumulative output of the indirect or supporting sectors was only \$6.5 million. The output generated by household expenditures by individuals employed in the direct and indirect sectors, however, equaled \$59.1 million or nearly 54 percent of the total output of all sectors and levels of impact (i.e., direct+indirect +induced).

Although household expenditures by individuals employed in the direct and indirect sectors generated the largest output, the greatest income was generated by the direct sectors (\$38.3 million vs. \$33.4 million). The direct sectors also generated the highest level of employment. Out of the 1,294 person-years of employment generated by the direct sectors, harvesting and processing activities were responsible for 800 person-years or 61 percent of total employment generated by the direct sectors. Relative to total employment over all sectors, direct harvesting and processing activities

accounted for 32 percent of the total employment generated by blue crabs. If the total of direct, indirect, and induced is considered, the harvesting, processing and restaurant sectors accounted for 93 percent of the total employment.

Industrial Fish

Industrial species, primarily menhaden, account for approximately 88 percent of total landings of all species by Virginia watermen but only 21 percent of the total dockside value. In 1994, Virginia watermen spent approximately \$9.4 million or 51 percent of dockside value on fuel and crew to harvest \$18.4 million worth of industrial species. Virginia processors of industrial products utilized only \$11.7 million worth of dockside landings in Virginia; the rest of the \$18.4 million of product landed in Virginia was either sold as bait or shipped out of state for additional processing. Total sales of industrial species and related products in Virginia were \$80.1 million in 1994.

The total direct harvesting sector output equaled \$24.6 million (Table 30). Total direct income generated by the harvesting sector was \$9.6 million and the

number of person-years of employment was 329. The average annual income for the direct sectors was \$29,040 in 1994.

Deducting for out of state purchases and sales, the total output for the Virginia economy generated by the industrial fishery was \$98.9 million in 1994. The corresponding total income and employment were, respectively, \$66.4 million and 2,180 person-years. The average per person-year of income amounted to \$30,468.

There is no food service or retail market components for the industrial species. All impacts are generated only by harvesting, processing, and distributing

activities. The cumulative or total direct output, income, and employment generated by industrial species equaled, respectively, \$41 million, \$33.5 million, and 1,094 person-years.

In comparison, the total output, income, and employment generated by the indirect sectors were, respectively, \$6.9 million, \$4.1 million, and 118 person-years. Of the total indirect output, income, and employment, processing activities, respectively, accounted for 62, 64, and 61 percent.

Expenditures by households employed in the direct and indirect sectors generated the highest output but not the

Table 30. Economic Impacts of Virginia's Commercial Fishing Industry, Industrial Species

Impact ^a	Harvesting	Processing	Distributing	Cumulative
Direct:				
Output-\$ ^b	24,628,640	14,789,099	1,539,024	40,956,762
Income-\$ ^c	9,554,213	20,452,314	3,538,544	33,545,070
Employment-Person years	329	653	112	1,094
Indirect:				
Output-\$	2,149,110	4,271,200	501,695	6,922,005
Income-\$	1,127,699	2,618,554	318,793	4,065,046
Employment-Person years	35	73	10	118
Induced:				
Output-\$	15,492,151	30,281,113	5,223,083	50,096,346
Income-\$	8,751,909	17,107,160	2,950,898	28,809,966
Employment-Person years	288	581	99	967
Total-Direct + Indirect + Induced				
Output-\$	42,269,900	49,341,708	7,263,789	98,875,398
Income-\$	19,433,875	40,178,241	6,808,204	66,420,320
Employment-Person years	652	1,307	220	2,180

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

highest income or employment. Total induced output was \$50.1 million; total income and employment generated by the industrial fishery were \$28.8 million and 967 person-years. Induced employment accounted for 44 percent of the total employment generated by the industrial fishery and related activities, and direct employment was 50 percent of the total person-years of employment.

Relative to the total of direct, indirect, and induced impacts, harvesting and processing were responsible for 1,959 person-years of the 2,180 person-years of

employment generated by the industrial fishery. These two sectors accounted for 93 percent of the total output and 90 percent of the total income associated with the fishery.

Sea Scallops

The sea scallop fishery is an offshore fishery of Virginia. Of all the Virginia fisheries, the sea scallop fishery has the highest landed or dockside value. It also is probably the most labor intensive fishery because of the need to shuck scallop meats at sea. In 1994, the

dockside or ex-vessel value was \$26.6 million. In order to land 6.1 million pounds or \$26.6 million worth of scallop meats, Virginia scallop vessel owners spent \$12 million just on fuel and crew in 1994.

The economic contributions of sea scallops rank third among all the species landed in Virginia. In 1994, the total output, income, and person-years of employment generated by all activities in all sectors equaled, respectively, \$94 million, \$66.4 million, and 1,908 (Table 31). Unlike many of the other species in which sizeable quantities of Virginia

supplies were purchased from out of state suppliers, most of the sea scallops processed or sold in Virginia were landed in Virginia. In 1994, processors obtained \$24 million worth of scallop meats; distributors obtained \$11.2 million worth of product for distribution; restaurants purchased \$6.2 million of sea scallop meats from Virginia sources; and retail markets paid \$7.1 million for sea scallop product.

Table 31. Economic Impacts of Virginia's Commercial Fishing Industry, Sea Scallops

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	36,565,758	2,271,584	447,103	4,352,659	580,916	44,398,020
Income-\$ ^c	12,417,392	5,528,642	1,027,984	8,970,320	1,367,460	29,311,798
Employment- Person years	393	179	33	319	46	970
Indirect:						
Output-\$	2,719,760	704,566	145,748	1,171,461	152,585	4,894,119
Income-\$	1,652,265	413,005	92,613	719,291	93,596	2,970,769
Employment- Person Years	52	11	3	22	3	91
Induced:						
Output-\$	18,725,187	8,226,466	1,517,361	14,189,776	2,077,700	44,736,489
Income-\$	10,578,251	4,647,748	857,267	8,016,564	1,173,826	25,273,656
Employment- Person Years	350	155	29	274	40	847
Total-Direct+ Indirect+ Induced						
Output-\$	58,010,704	11,202,640	2,110,208	19,893,896	2,811,202	94,028,650
Income-\$	24,648,074	10,589,380	1,977,855	17,706,145	2,634,881	57,556,335
Employment- Person Years	795	345	64	615	89	1,908

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

Total sales of sea scallops and related products in Virginia in 1994 was \$70.3 million.

In terms of direct impacts, the output, income, and employment generated by the harvesting, processing, and selling sea scallops totaled, respectively, \$44.5 million, \$29.3 million, and 970 person-years of employment. Harvesting activities accounted for the majority of the output—82 percent. Harvesting, restaurant sales, and processing accounted for 92 percent of the direct income. Relative to total direct employment, harvesting and processing activities accounted for 59 percent of total person-years of employment and food service or restaurant sales accounted for 33 percent of the total 970 person-years of employment.

Of the total output, income, and person-years of employment generated by all sectors and impact levels, the induced impacts equaled, respectively, 48 percent, 44 percent, and 44 percent of the total output, income, and person-years of employment. In comparison, the indirect impacts on the Virginia economy were quite small. Total indirect output was only \$4.9 million. Total indirect income was \$3 million, and total employment was only 91 person-years of employment in Virginia in 1994.

Harvesting, processing, and food service sales accounted for the bulk of the total output, total income, and total employment relative to all impacts and

sectors. The sum of direct, indirect, and induced output for harvesting, processing, and retail food or restaurant sales was \$89.1 million or 95 percent of the total output. Similarly, the three sectors generated total income of \$52.9 million, which equaled 92 percent of the total income generated by harvesting, processing, distributing, and selling of sea scallops and related products in Virginia in 1994. The three sectors accounted for 1,755 or 92 percent of the 1,908 person-years of employment generated by production and sales activities of sea scallops in Virginia.

Oysters

Oysters, long a mainstay seafood product of Virginia, have been plagued with problems over the past two decades. Resource levels and harvests have drastically declined because of overfishing and disease. Moreover, there has been a significant downward decline in consumer demand for oysters. The commercial fishery during the past few years has been subject to very restrictive regulations and the focus of considerable research effort to restore the resource and fishery.

In 1994, total landings of oysters from Virginia waters were only 300,526 pounds, and the total landed value was only \$812,387. Harvesters spent approximately \$588,000 on fuel and crew to harvest oysters in 1994. Yet, total sales of oysters and related products in Virginia in 1994 were \$81 million. In fact, the total

sales of oysters and related products exceeded the sales of all other species in Virginia. It is estimated that processors, other dealers, restaurants, and retail markets obtained approximately \$31 million worth of oysters and oyster products from out of state in 1994.

In comparison to the other fisheries and species, the economic impacts of the harvesting sector are quite small. In 1994, the total direct output generated by the harvesting sector equaled \$1 million while the total direct output or value added of the processing sector was \$13.2 million (Table 32). Yet, when food service or restaurant sales and retail food market sales are examined, they also have relatively low outputs. The economic impacts derived from indirect activities are also quite small. Of the total of direct, indirect, and induced output, income, and employment, the indirect output, income, and person-years totaled, respectively, 6, 4, and 3 percent in 1994.

It is, in fact, the induced impacts of processing activities which generate the most significant impacts. Processing activities accounted for 86, 87, and 87 percent of total output, income, and person-years of employment in 1994. Oddly enough, it is the household expenditures by individuals employed in processing and related support businesses which generate the largest impacts on output, income, and employment. In 1994, household expenditures generated \$45.4 million in total output, \$25.7

Table 32. Economic Impacts of Virginia's Commercial Fishing Industry, Oysters

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	1,035,388	13,231,242	221,811	1,521,686	237,356	16,247,483
Income-\$ ^c	261,728	30,497,046	509,990	3,011,481	558,730	34,838,975
Employment-Person Years	9	988	16	107	19	1,139
Indirect:						
Output-\$	51,392	4,110,575	72,306	393,278	62,345	4,689,897
Income-\$	29,724	2,414,377	45,946	241,477	38,242	2,769,767
Employment-Person Years	1	67	1	7	1	78
Induced:						
Output-\$	397,883	45,443,796	752,773	4,763,736	848,927	52,207,115
Income-\$	224,774	25,674,492	425,296	2,691,289	479,614	29,495,465
Employment-Person Years	8	857	14	92	16	987
Total-Direct+Indirect+Induced						
Output-\$	1,484,662	62,785,725	1,046,888	6,678,700	1,148,629	73,144,605
Income-\$	516,224	58,585,813	981,227	5,944,237	1,076,586	67,104,118
Employment-Person Years	17	1,911	32	206	36	2,203

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

million in income, and 857 person-years of employment.

Low-Value Finfish

Low-value finfish represent a real hodgepodge of species. Included are those species in which the ex-vessel or dockside price is below \$0.50 per pound. Low-value finfish species include small trout, small to medium croaker, small to medium spot, whiting, Atlantic mackerel, smooth and spiny dogfish, gizzard shad, catfish, some sharks not taken by longline

gear, sheepshead, black drum, and skate. In 1994, the total landed value of low-value finfish was \$6.9 million. Of the total landed value, harvesters paid about \$3.5 million for fuel and labor or about 51 percent of the total landed value. Total sales of low-value finfish in Virginia were \$20.5 million in 1994. Of the total sales of low-value finfish in 1994, 100 percent of the raw material supply was obtained from Virginia sources.

Of all the fisheries, the low-value finfish ranked fifth in terms of impacts but

was considerably below the top four species. In 1994, total output from all sectors and relative to all impact levels was \$30.2 million (Table 33). In comparison, total output from oysters, the fourth ranked output, was \$73.1 million.

Low finfish production and sales activities generated a total income of \$19.2 million and total employment of 620 person-years in Virginia in 1994.

The contributions to Virginia's economy by the direct and induced production and sales activities were nearly equal. Total output, income, and employment by the direct sectors equaled, respectively, \$13.7 million, \$9.7 million, and 307 person years. Household expenditures by individuals employed in the direct and support sectors generated \$14.5 million in output, \$8.2 million in income, and 275 person years of employment in 1994.

Relative to all sectors, harvesting and

processing were responsible for most of the output, income, and employment generated by low-value finfish. Harvesting and processing accounted for 96 percent of the total output of \$30.2 million, 94 percent of the total income, and 94 percent of the total person-years of employment generated by direct, indirect, and induced activities.

Hard Clams

Hard clams or quahogs, while one of Virginia's major species in terms of consumer preferences, ranked only sixth

in terms of economic impacts. In 1994, the dockside value of hard clams was \$5.9 million. Hard clams have been increasingly produced via aquaculture. Hard clam culture operators reported total sales of \$8 million in 1995. Hard clam production numbers and sales are not available for 1994. A Virginia survey of culture operators revealed that production and sales of hard clams in 1995 were 50.2 million mature clams and \$8 million. Based on a survey of clam operators, it is estimated that total sales of cultured clams

in Virginia were approximately \$7.6 million.

Harvesters paid about \$5.2 million for fuel and crew to harvest clams in 1994. Alternatively, the cost and fuel and crew were about 87 percent of the total dockside value. A considerable amount of hard clams from harvesters and culture operators were shipped out of state in 1994. Oddly, a sizeable amount of hard clams were purchased out of state for in-state consumption. Of total in-state sales of \$19.2 million, approximately 33

percent of the hard clams and related products were obtained from out-of-state suppliers.

Hard clam production, processing, and sales activities generated a total output of \$26.9 million in Virginia in 1994 (Table 34). The corresponding total income amounted to \$18.7 million and total person-years was 620. Thus, hard clam production and sales, while possibly important to some local

Table 33. Economic Impacts of Virginia's Commercial Fishing Industry, Low-value Finfish

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	9,405,690	4,056,823	194,338	29,861	22,419	13,709,132
Income-\$ ^c	3,515,093	5,610,309	446,825	59,096	52,775	9,684,098
Employment-Person Years	110	179	14	2	2	307
Indirect:						
Output-\$	747,571	1,171,640	63,351	7,718	5,889	1,996,168
Income-\$	494,049	718,300	40,255	4,739	3,612	1,260,955
Employment-Person Years	16	20	1	0	0	37
Induced:						
Output-\$	5,395,955	8,306,463	659,538	93,482	80,185	14,535,623
Income-\$	3,048,401	4,692,694	372,621	52,813	45,312	8,211,830
Employment-Person Years	100	159	12	2	2	275
Total-Direct+Indirect+Induced						
Output-\$	15,549,216	13,535,007	917,226	131,061	108,493	30,241,003
Income-\$	7,057,532	11,021,361	859,697	116,648	101,689	19,156,927
Employment-Person Years	226	358	28	4	3	620

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

economies, are not very significant relative to total state-wide employment generated by the commercial fishing industry; hard clam activities account for only 0.07 percent of the total 10,798 person-years of employment generated by the fishing industry of Virginia.

Of the total \$26.9 million in total output, harvesting, culturing, and processing activities accounted for 93 percent. Relative to total income, these same sectors accounted for 91 percent. Harvesting, culturing, and processing contributed

562 person-years to employment in Virginia in 1994. Overall, employment generated directly by harvesting, culturing, and processing accounted for 47 percent of all employment generated by the production and sales of hard clams in Virginia in 1994.

Flounder

Although Virginia fishermen regularly land nine species of flounder, summer flounder is the most highly desired flounder in Virginia. In 1994, fishermen landed 3.1 million pounds of flounder.

The total dockside value of all flounder was \$4.1 million; 99 percent of the total value of flounder landings was attributable to summer flounder. The average price per pound of flounder paid to fishermen was approximately \$1.34 in 1994.

Virginia fishermen spent approximately \$2.3 million on fuel and wages to catch and land flounder in 1994. Total expenditures, excluding wages, accounted for approximately 63 percent of the dockside value. Including wages, the total cost of catching and landing flounder was 93 percent of the dockside value in 1994.

The total sales of all flounder in Virginia amounted to \$15.6 million in 1994. Relative to other species or species groups, flounder ranked seventh in terms of total sales in Virginia. Of the total Virginia sales of flounder, approximately 60 percent of product was obtained from Virginia sources while the remaining 40 percent was obtained from out of state sources.

Table 34. Economic Impacts of Virginia's Commercial Fishing Industry, Hard Clams

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	7,936,479	2,424,529	165,827	202,219	26,363	10,755,418
Income-\$ ^c	3,087,694	5,588,363	381,272	400,201	62,057	9,519,587
Employment-Person Years	107	181	12	14	2	31
Indirect:						
Output-\$	665,742	753,233	54,057	52,263	6,925	1,532,219
Income-\$	397,047	442,417	34,349	32,090	4,247	910,151
Employment-Person Years	12	12	1	1	0	27
Induced:						
Output-\$	4,946,505	8,327,246	562,778	633,061	94,289	14,563,880
Income-\$	2,794,459	4,704,665	317,954	357,650	53,270	8,227,998
Employment-Person Years	93	157	11	12	2	274
Total-Direct+Indirect+Induced						
Output-\$	13,548,726	11,505,029	782,661	887,544	127,576	26,851,536
Income-\$	6,279,015	10,735,432	733,573	789,939	119,574	18,657,532
Employment-Person Years	212	350	24	27	4	618

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

In terms of contributions to the Virginia economy, the total output, income, and person-years of employment generated by flounder-related producing and selling-related activities equaled, respectively, \$19.6 million, \$13.2 million, and 434 (Table 35). Direct harvesting activities and household expenditures by individuals employed in harvesting and processing were responsible for 61 percent of the total output in Virginia in 1994.

Of the total income generated by flounder-related production and sales activities, nearly 48 percent was derived from the direct harvesting, processing, and serving of meals in restaurants. Household expenditures by individuals employed in those same direct sectors generated almost 41 percent of the total income.

Table 35. Economic Impacts of Virginia's Commercial Fishing Industry, Flounder

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	5,366,031	1,785,649	74,387	951,623	120,205	8,297,894
Income-\$ ^c	1,922,840	2,469,431	171,031	1,883,300	282,959	6,729,561
Employment-Person Years	59	79	8	67	10	220
Indirect:						
Output-\$	320,653	515,709	24,249	245,946	31,573	1,138,130
Income-\$	195,159	316,167	15,408	151,014	19,367	697,115
Employment-Person Years	6	9	0	5	1	21
Induced:						
Output-\$	2,821,874	3,656,169	252,452	2,979,115	429,924	10,139,534
Income-\$	1,594,219	2,065,534	142,628	1,683,061	242,891	5,728,334
Employment-Person Years	53	70	5	58	8	193
Total-Direct+Indirect+Induced						
Output-\$	8,508,558	5,957,563	351,087	4,176,683	581,702	19,575,592
Income-\$	3,712,240	4,851,157	329,067	3,717,369	545,217	13,155,050
Employment-Person Years	118	158	11	129	18	434

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

Flounder production and sales activities generated 434 person-years of employment for the economy of Virginia in 1994. Of this total, only 59 person-years of employment were generated in the direct harvesting sector. Processing and serving meals in food service establishments generated another 146 person-years of employment for the Virginia economy. Total household expenditures by all individuals employed in the direct and support or indirect sectors generated 193 person-years of employment. Support

sectors or those sectors providing goods and services for harvesting, processing, distributing, and selling flounder generated only 21 person-years of employment.

Moderate to High-Value Finfish

The moderate to high-value finfish, like the low-value finfish, encompasses an extensive number of diverse species. For example, this category includes large croaker, large weakfish, striped bass, dolphin or mahi-mahi, tuna and albacore not harvested with longline, amberjack,

Table 36. Economic Impacts of Virginia's Commercial Fishing Industry, Moderate/High-value Finfish

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	,610,567	424,084	34,509	378,401	40,882	2,488,443
Income-\$ ^c	389,555	1,222,311	79,342	748,871	96,235	2,536,315
Employment- Person Years	12	38	3	27	3	83
Indirect:						
Output-\$	75,984	135,528	11,249	97,797	10,738	331,297
Income-\$	44,371	79,953	7,148	60,049	6,587	198,108
Employment- Person Years	1	2	0	2	0	6
Induced:						
Output-\$	545,098	1,766,325	117,114	1,184,608	146,218	3,759,362
Income-\$	307,922	997,948	66,166	669,248	82,608	2,123,893
Employment- Person Years	10	33	2	23	3	71
Total-Direct+Indirect+Induced						
Output-\$	2,231,650	2,325,934	162,871	1,660,806	197,838	6,579,099
Income-\$	741,865	2,300,213	152,656	1,478,166	185,430	4,858,330
Employment- Person Years	24	74	5	51	6	160

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

bonito, large butterfish, cobia, cod, red drum, and numerous other species. There is a mixture of numerous inshore and offshore species. In 1994, the total dockside value of all species in this category was only \$1.2 million. Total landings were only 1.6 million pounds. The average price per pound received by commercial fishermen relative to all species in this group was \$0.76 per pound.

Expenditures on fuel and payments made to labor to catch and land high-value finfish equaled only \$326,140 or 27

percent of the dockside value. If all expenditures except payments made to crew and profit are considered, Virginia fishermen spent approximately \$1.1 million or 86 percent of the dockside value to catch and land high-value finfish in 1994. Harvesting activities related to the moderate to high-value finfish generated only 12 person-years of employment for Virginia in 1994.

In terms of economic importance, the moderate to high-value finfish were the most important species or species grouping. In 1994, production and sales

activities generated \$2.5 million of output, \$2.5 million of income, and 83 person-years of employment for the Virginia economy (Table 36). Sectors providing supporting goods and services generated \$331,297 of output, \$198,108 of income, and only six person-years of employment. Household expenditures by individuals employed in the direct and support or indirect sectors generated \$3.8 million of output, \$2.1 million of income, and 71 person-years of employment.

All production and sales activities and household expenditures by individuals employed in all direct and indirect sectors generated a total output of \$6.6 million in 1994. Total income and person-years of employment were, respectively, \$4.9 million and 160. Relative to the total income generated in the economy, processing and food service sales accounted for 41 percent of the total income; expenditures by households employed in processing food service

services and related support businesses generated another 34 percent of the total income. Similarly, processing and food service sales and household expenditures by individuals employed in these sectors generated 76 percent of the total 160 person-years of employment generated by all activities related to moderate to high-value finfish.

Other Shellfish

In 1994, other shellfish species were not very important to the economy of Virginia or the commercial fishing industry. Yet, it is a case of every little bit helps.

Other shellfish include species such as conch, lobster, horseshoe crab, crabs other than blue crabs, and several other shellfish species. Total landings and landed or dockside value amounted to, respectively, 2 million pounds and \$755,574. The average price per pound received by fishermen was \$0.38. Harvesting activities generated only 13 person-years of employment for Virginia in 1994.

Total sales of other shellfish in Virginia in 1994 were \$4.4 million. Of the \$4.4 million in total sales, about 25 percent of the product was purchased by restaurants; 52 percent was purchased by processors for additional processing. Retail food markets purchased only 12 percent of the total product.

Total output, income, and person-years of employment generated by the production and sales of other shellfish and expenditures by individuals employed in the production and sales of other shellfish or related support industries equaled,

respectively, \$5 million, \$3.8 million, and 127 (Table 37). Of the total output, expenditures by households employed in the direct production and sales sectors accounted for 35 percent. In contrast, expenditures by individuals employed in the direct and indirect sectors generated 59 percent of the total output.

Relative to the total employment of 127 person-years generated by all sectors, the direct sectors accounted for 65 person-years or 51 percent of the total person-years of employment. Household expenditures generated another 57 person-years

Table 37. Economic Impacts of Virginia's Commercial Fishing Industry, Other Shellfish

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	899,686	502,904	18,286	290,991	34,154	1,746,021
Income-\$ ^c	388,948	870,281	42,044	575,882	80,398	1,957,553
Employment-Person Years	13	28	1	20	3	65
Indirect:						
Output-\$	35,650	162,391	5,961	75,206	8,971	288,179
Income-\$	20,759	95,903	3,788	46,177	5,503	172,130
Employment-Person Years	1	3	0	1	0	5
Induced:						
Output-\$	585,382	1,294,672	62,059	910,965	122,156	2,975,233
Income-\$	330,719	731,442	35,061	514,653	69,014	1,680,889
Employment-Person Years	11	25	1	18	2	57
Total-Direct+ Indirect+ Induced						
Output-\$	1,520,718	1,959,971	86,305	1,277,161	165,281	5,009,437
Income-\$	740,429	1,697,622	80,892	1,136,711	154,915	3,810,569
Employment-Person Years	24	55	3	39	5	127

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

of employment. The indirect or support industries generated only 5 person-years of employment.

Sharks and Tuna, Longline

Sharks and tunas, while highly desired by consumers, are relatively unimportant to the commercial seafood industry of Virginia. Total landings were only 69,484 pounds in 1994. The ex-vessel or dockside value was also low—\$132,820. Fuel expenditures and payment to crew were only \$53,580 in 1994. Total non-

labor expenses equaled only \$97,251. The total harvest of sharks and tuna by longline generated only two person-years of employment in the harvesting sector.

Total sales of sharks and tunas amounted to \$476,517 in 1994. Of the total \$476,517 million in sales, approximately 60 percent of the product was obtained from out of state sources. Restaurant and other food service sales accounted for 50 percent of the total sales. Retail market sales for at-home consump-

tion accounted for only 9 percent of the total sales in Virginia.

The total output of all production and sales activities and expenditures by individuals employed in the direct and indirect sectors was only \$657,890 in 1994 (Table 38). Total income and employment were \$449,227 and 15 person-years. The indirect or support sectors contributed only \$37,156, \$22,601, and 1 to total Virginia output, income, and person-years of employment.

The direct sectors and expenditures by individuals employed in the direct and indirect sectors generated a total output of \$620,734 or 94 percent of the total output. They also accounted for 95 and nearly 100 percent of the total income and person-years of employment. Food service sales accounted for 42, 55, and 60 percent of the total output, income, and person-years of employment generated by the production and sales of

Table 38. Economic Impacts of Virginia's Commercial Fishing Industry, Sharks and Tuna

Impact ^a	Harvesting	Processing	Distributing	Food Service	Retail Markets	Cumulative
Direct:						
Output-\$ ^b	179,659	19,805	2,845	63,136	2,689	268,134
Income-\$ ^c	55,335	34,272	6,540	124,948	6,330	227,425
Employment- Person Years	2	1	0	4	0	8
Indirect:						
Output-\$	12,810	6,395	927	16,317	706	37,156
Income-\$	7,783	3,777	589	10,019	433	22,601
Employment- Person Years	0	0	0	0	0	1
Induced:						
Output-\$	84,693	50,985	9,654	197,650	9,618	352,600
Income-\$	47,845	28,805	5,454	111,663	5,434	199,200
Employment- Person Years	2	1	0	4	0	7
Total-Direct + Indirect + Induced						
Output-\$	277,163	77,185	13,425	277,103	13,014	657,890
Income-\$	110,963	66,854	12,583	246,629	12,197	449,227
Employment- Person Years	4	2	0	9	0	15

^aNumbers may not add to totals because of rounding errors.

^bOutput for all sectors other than the harvesting sector excludes the value of output for that sector and instead measures the value added by that sector.

^cWages, compensation, and profit are included for all sectors except the harvesting sector. This is because the harvesting, processing, distributing, retailing, and restaurant businesses are actually primary sectors which do not generate an income impact until after they pay expenses which become direct sector impacts.

sharks and tunas in Virginia in 1994.

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