1987

# Abundance of Virginia Shellfish and Finfish

Herb Austin

# STATE OF THE CHESAPEAKE BAY
# SECOND ANNUAL MONITORING REPORT

# COMPENDIUM

**Maurice P. Lynch**
Scientific Editor

**Elizabeth C. Krome**
Technical Editor

April 1987

Prepared for the Chesapeake Bay Program
Monitoring Subcommittee
by
Chesapeake Research Consortium, Inc.
P. O. Box 1120
Gloucester Point, Virginia 23062
as
CRC Publication No. 125

# TABLE OF CONTENTS

# INTRODUCTION

The second report from the Chesapeake Bay Program Monitoring Subcommittee summarizes data collected from June 1984 through September 1985 at over 165 stations Bay-wide for the new coordinated monitoring program. This initial effort represents the baseline for a large, complex, and rapidly growing store of information.

This Compendium volume is intended to accompany the State of Chesapeake Bay summary report, amplifying the contribution of each group involved in this complex overall monitoring effort. Weaving these discrete and more technically oriented documents together has been the job of the summary report.

Like the summary report, this report is organized so the reader can follow discussion of the Bay's problems and progress in a logical sequence. First, the physical and chemical observations characterize the Bay system and its major tributaries. These physical and chemical characteristics underly the movement and transformation of materials we're concerned about in the water column.

Chapters on sediments and toxics discuss the current understanding of how materials enter and leave the sediments and outline the distribution of toxic materials we have been monitoring in the Bay.

In logical sequence, the chapters on living resources appear next, because we believe the Bay's living resources rely on the habitat quality, which is often limited by what is in the waters and sediments.

We follow the food chain: the phytoplankton, which synthesize nutrients into algal biomass; the zooplankton, which are primary consumers; and the benthic (bottom-dwelling) organisms and submerged aquatic vegetation that are also vital elements of the Bay's food base. Another step up the food chain brings us to fisheries and waterfowl.

Much interest has surrounded the Patuxent River, which served as a catalyst in focusing attention on many of the Bay's problems. As in the summary report, the Patuxent Story is developed as a case history.

This Compendium demands more of the reader than does its summary report, because the constituent chapters cover topics in greater technical detail. Still, these chapters are themselves simplifications, as we approximate an understanding of the Bay's complex systems. We hope this understanding will be broadened and deepened as monitoring progresses over its intended course of 10 to 15 years.

# Abundance of Virginia Shellfish and Finfish

**Herb Austin**
Virginia Institute of Marine Science
Gloucester Point, Virginia

## CLIMATE

Water temperature, which has been measured from the pier at the Virginia Institute of Marine Science (VIMS) since 1946, has shown a steady upward trend since 1975-1976. This trend has been most dramatic during the fall-winter period, with October and November of 1984 and 1985 being two of the warmest periods in the 30-year record. The fall of 1985 was the warmest in 30 years. Winter (January-March) temperatures have also shown a steady rise since the record cold January-February of 1977-1978.

Streamflow during 1984 was similar to the "wet" period of 1972-1980, whereas 1985 was similar to the drought of the mid-1960s. The spring of 1985 was particularly dry, with the normal peak period of spring run-off absent. Annual rainfall averages can be misleading, as an "average year" may be the result of significant rainfall during only one season, the other three being bound in a drought. Such was the case in 1985 when hurricanes Gloria and Juan and the subsequent November northeaster produced heavy autumn run-off that raised the annual total during an otherwise drought year. Furthermore, the fall rains and subsequent run-off did not occur during biologically significant times.

Winds and resultant surface transport at the Bay mouth during 1985 were generally not favorable for larval recruitment during May-July, as southwest winds produced extended periods of offshore transport. Late summer winds were variable and provided no significant transport onshore or offshore. Fall winds and resultant surface transport on the shelf were favorable during both 1984 and 1985 for recruitment to the Bay by shelf-spawned fish including spot, croaker, and flounder. Conditions are favorable when northerly winds produce a southwesterly flow of coastal waters capable of transporting the larvae of the shelf-spawning species to the mouth of the Bay.

## RESOURCES

### Oyster

The warm fall of 1984 and the warmer fall of 1985 held the oyster in spawning condition through the end of October. Spatfall continued through October, particularly in 1985, and the early-season harvests of market oyster were poor, as most oyster were in a recently spent condition. Virginia oyster landings have been generally stable since 1972, fluctuating between $4.0 \times 10^6$ and $6.0 \times 10^6$ pounds of shucked meat ($0.65\text{-}1.00 \times 10^6$ bushels), except for 1978-1980 when landings jumped to $8.1\text{-}8.4 \times 10^6$ pounds as a result of unrestricted dredging in the Pocomoke-Tangier Sounds. Landings totalled $4.3 \times 10^6$ pounds ($0.70 \times 10^6$ bushels) in 1984 and $4.7 \times 10^6$ pounds ($0.76 \times 10^6$ bushels) in 1985 (Figure 1 top).

Oyster spat. Since 1946 spatfall has been monitored at VIMS during the fall on oyster shell dredged from the public oyster bars, and the data set provides documentation of the catastrophic decline in recruitment after the introduction of MSX during the late 1950s. A summer shellstring survey was initiated in 1963. These data also show the degree of interannual variation in recruitment potential. During the 1940s and 1950s a rate of 1000-2000 spat/shell from the fall survey was normal. This rate dropped to 0-100 during the late 1960s and 1970s. From 1981 through 1983 the "strike" improved to 400-800 spat/shell. Some oyster bars even showed levels exceeding the pre-1960s decline. This heavy set, in spite of smaller brood stock, demonstrates the lack of parent-progeny dependence (density-dependent) and the importance of local environmental variability (density-independent) in the determination of year-class strength. Note, however (Figure 1 bottom), in 1968-1971 the summer shellstring count was up, but the fall shell bag count was down. This suggests that despite a good initial set, subsequent survival was poor.

Virginia has generally experienced unusually dry summers since 1980, and these conditions, which have raised the salinities over the James River seed beds, may in part be the cause of the improved summer set on the shellstrings.

The summer spatfall on shellstring averaged over the season for 1984 and 1985 was moderate to heavy in most of Virginia's rivers (1-20 spat/shell is considered poor; 20-200 moderate; and 200-2000, heavy). However, there was considerable variability both temporally and spatially (Figure 1 bottom). Wreck Shoal in the James River is considered a "typical" oyster bar and so is presented here as an example of setting patterns. Generally, 1985 was better than 1984, with 1984 being more representative of the low recruitment of the 1970s. The James River seed beds received a heavy but variable set during 1985, possibly because of the higher salinities.

Although summer shellstring spatfall counts are a good index of potential recruitment, survival through the first season is generally poor, and subsequent fall or spring counts of spat on shell on the bottom, which indicate the degree of survival, are more realistic. Survival of the spat through the first summer was excellent in 1981-1983, but was low in 1984 and 1985. Current research on the effects of fouling and predation on the James River seed beds suggests that predation, particularly by blue crabs, may be a contributing factor, but it probably does not account for the state-wide poor survival.

MSX. During the drought of 1980-81 there was no appreciable intrusion of MSX (*Haplosporidium nelsoni)* or other oyster pathogens upriver in Virginia. Normally May-June is the peak period of MSX infection, with the pathogen appearing in samples during July. Oyster become most susceptible during

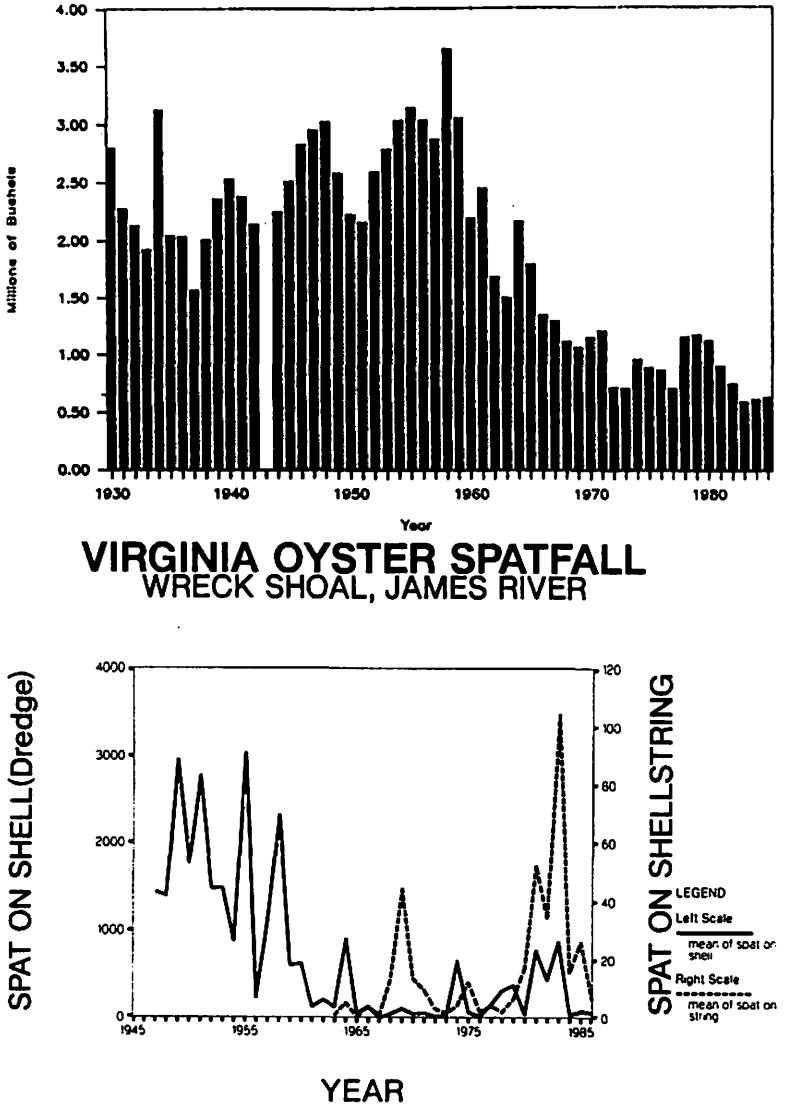



**Figure 1.** Virginia landings of market oysters, 1930-1985 (top); and spat set of James River oyster on shellstrings (bottom).

years with a dry spring, as the low salinities that normally prevent the spread are not present. Dry conditions early in spring 1985 were conducive to the upriver spread of pathogens.

**Striped Bass**

Young-of-the-year striped bass are taken in the VIMS river trawl survey, usually during the winter when the juveniles are eight to nine months old. The

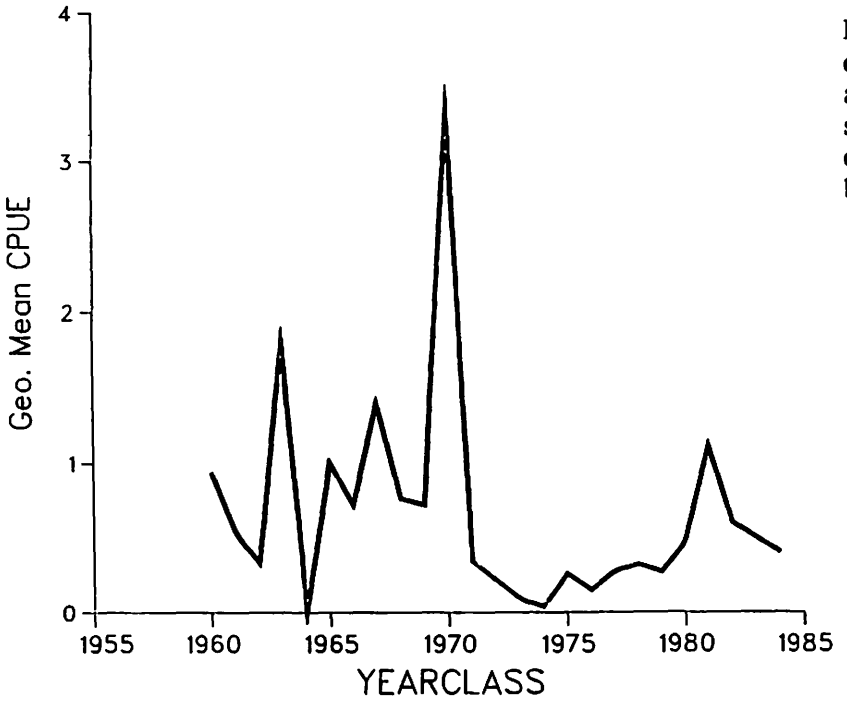
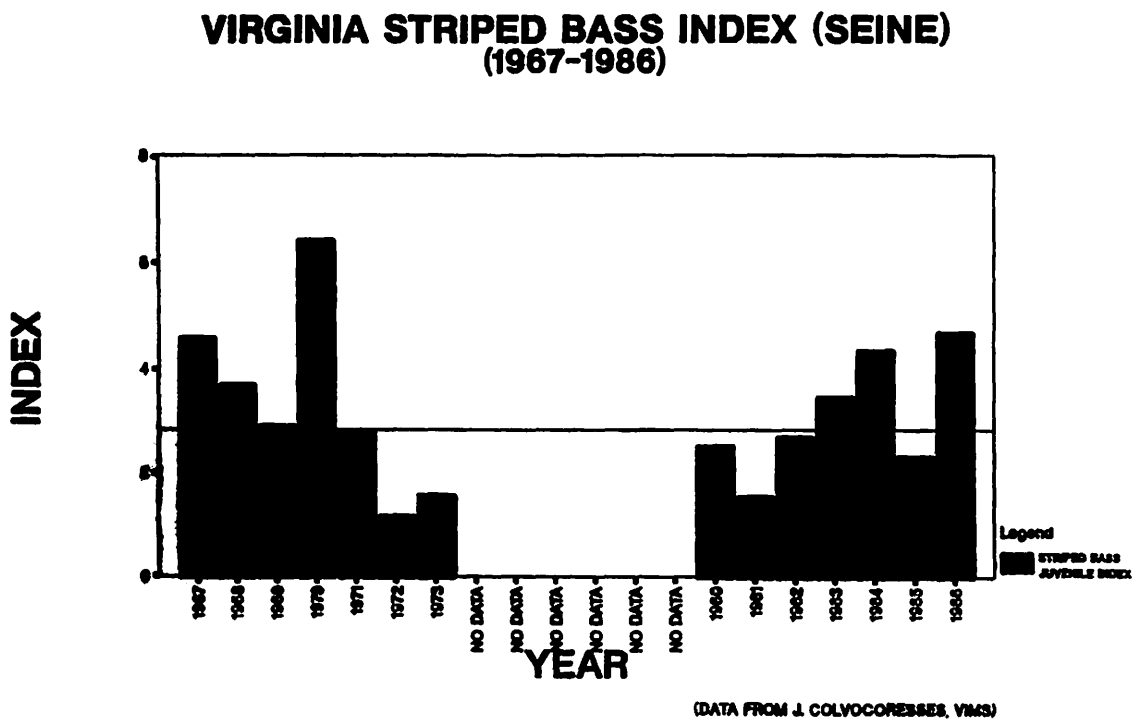



**Figure 2.** York River index and commercial landings for striped bass as determined by the VIMS trawl survey (top); and adjusted mean catch per haul as determined by beach seine (bottom).



trawl data have shown that over the years both dominant and failure year-classes can be monitored, and that success or failure of recruitment in one river is not necessarily reflected in the other rivers (Figure 2 top). Winter trawl catches are very sensitive to temperatures, with more fish being taken during colder years, often regardless of year-class strength. The beach seine data (Figure 2 bottom) are a better index of year-class strength. From 1967 through 1973 and from 1980 to the present, beach seine surveys have also been conducted in the summer, coinciding with the first appearance of the young-of-the-year.

The beach seine index has shown a positive trend since 1981, with 1984 the highest since the record 1970 year-class was produced (Figure 2 bottom). The 1985 year-class was considered average, as was the 1982 year-class. Monitoring during 1985-1986 of commercial (>18") and sub-legal catches suggests that these strong year-classes (1982-1984) have survived. Although the 1985 index was only average, the numbers may have been biased downward, as the higher salinities from the drought displaced the juveniles further upriver than normal, where the sampling sites were not conducive to seining.

Initial surveys for 1986 young-of-the-year show a very wide range in sizes (20-80 mm) with an estimated modal size around 50 mm. Normally the range is around 30-50 mm with a 40 mm mode. Estimates made on the spawning ground during April and May suggest that the fish spawned earlier, more briefly, farther upstream, and in a more compressed area than usual. Preliminary indications are that the 1986 year-class will be strong.

**Alosines**

During 1985 the spring spawning run was interrupted by a cold freshet. Juvenile indices from a pushnet survey in the Mattaponi and Pamunkey, however, did not seem to be affected, as the indices for American shad, blueback, and alewife were generally higher in 1985 than in 1984. The trawl survey indices show poor recruitment for shad and alewife, but excellent recruitment during 1984 and 1985 for the blueback herring (Figure 3).

Commercial landings were lower in 1985 than 1984 for all three species. Alewife and blueback herring stocks show no signs of recovery as indicated by commercial landings. American shad shows some

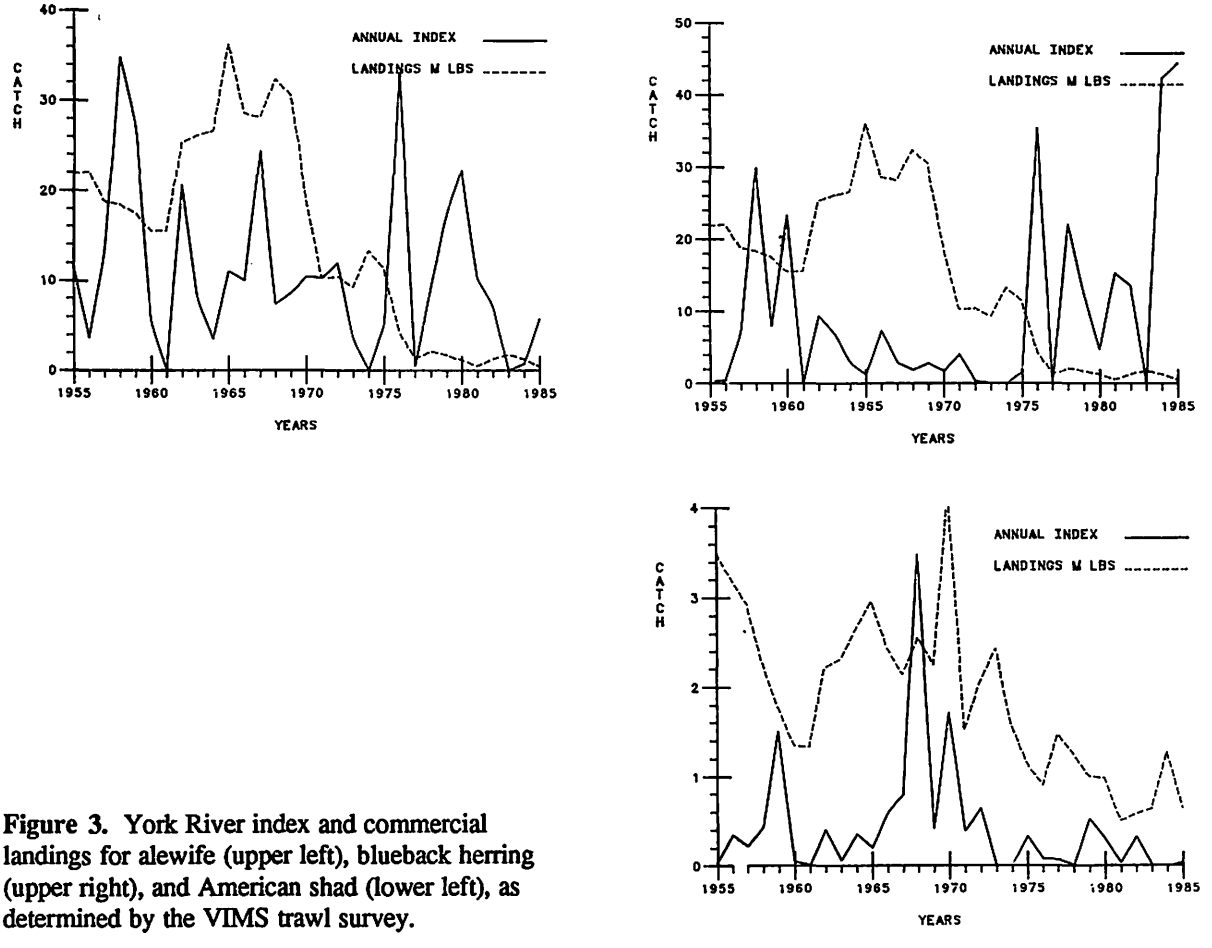



Figure 3. York River index and commercial landings for alewife (upper left), blueback herring (upper right), and American shad (lower left), as determined by the VIMS trawl survey.

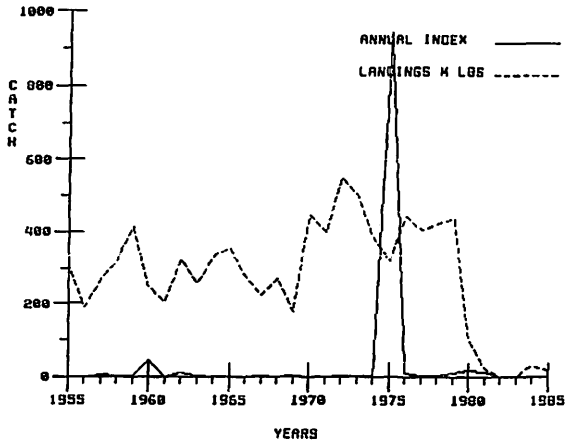



Figure 4. York River index and commercial landings for menhaden, as determined by the VIMS trawl survey.

signs of recovery, as catch has shown an upward trend since 1981.

**Menhaden**

Observations suggest that the number of small menhaden in the Bay has increased in recent years. Neither the beach seine nor trawl surveys sample the young-of-the-year menhaden.

Virginia menhaden landings, which have averaged over 300 x $10^6$ pounds annually since 1950, dropped abruptly from 501 x $10^6$ pounds in 1977 to 34 x $10^6$ pounds in 1978, and have averaged 25-35 x $10^6$ pounds since (Figure 4). This drop was the result of a combination of reduced biomass, interstate fishery regulations, and a reduction in effort (number of vessels) in the mid-Atlantic fishery that landed fish in Virginia. Most significant was the reduction in Chesapeake Bay landings, from 439.3 x $10^6$ pounds in 1977 to 9.3 x $10^6$ pounds in 1978.

Total Virginia landings were 31.6 x $10^6$ pounds in 1984, and 17.3 x $10^6$ pounds in 1985, the lowest year on record. This reduction is due to all three factors mentioned above. Landings in 1986 probably will be even lower, as Standard Products, the largest Virginia harvester, will not fish. The number of fish is increasing, although the biomass remains low, as these fish are still juveniles.

Currently, the most significant menhaden fishery in the bay is the pound-net fishery for crab bait.

The incidence of the fungal disease (ulcerative mycosis) in menhaden in the Chesapeake Bay has been increasing over the last two years. Very high incidences have been reported from Pamlico Sound already this summer (1986), and biologists are alert for evidence this summer in the Bay.

**Flounder**

Juvenile flounder are normally very scarce in samples taken by the VIMS trawling survey from the Bay and tributaries. Juveniles were collected during the period 1979-1983 when flounder landings reached record highs (Figure 5). Current understanding of flounder stocks suggests that fish >12" in the Bay are from the "southern stock", those spawned in North Carolina waters; and that the juveniles in the Bay (the "Virginia stock") upon reaching 12" migrate north into the Mid-Atlantic Bight, and are generally not taken by Virginian fishermen. A new survey, starting in the summer of 1986 and combining seine and a small trawl, has shown the Virginian Eastern Shore creeks and sounds to be a productive post-larval nursery ground. Recent concerns about the "demise" of the flounder stock are due in part to its return to average conditions. Although 1984 landings were 9.7 x $10^6$ pounds, and 1985 only 5.0 x $10^6$ pounds, these figures are still well above the 1.5-3.5 x $10^6$ pounds per year taken during 1955-1975. A very significant fraction of the Virginia landings is taken in the territorial sea, and much of the increase since the mid-1970s results from the development of the territorial ocean trawl fishery.

**Croaker**

Croaker have been abundant in the Bay and tributaries since 1984, a result of the excellent 1982-1985 recruitment. Commercial landings have reflected this abundance, climbing from 0.1 x $10^6$ pounds in 1983 to 2.1 x $10^6$ pounds in 1985 (Figure 6). The 1985 index of 18 is the highest in the 30-year period of the survey. This abundance reflects the favorable fall winds on the shelf and good over-winter survival

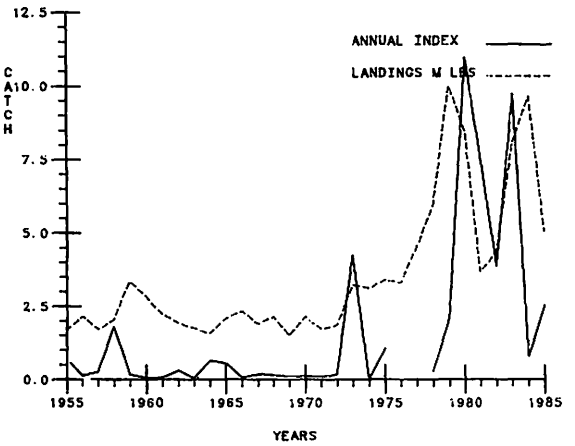



Figure 5. York River index and commercial landings for flounder, as determined by the VIMS trawl survey.

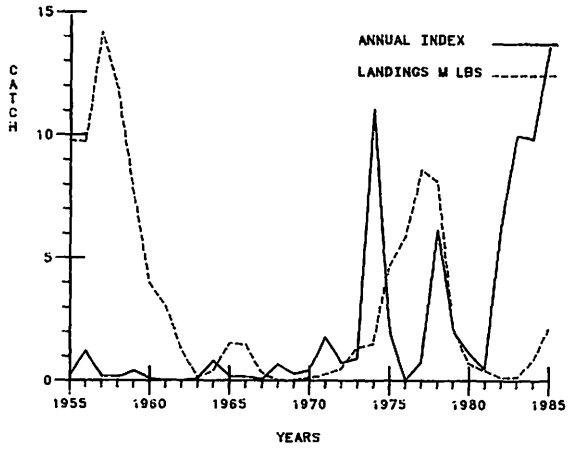



**Figure 6.** York River index and commercial landings for Atlantic croaker, as determined by the VIMS trawl survey.

---

of juvenile croaker in the Bay due to the warmer winters.

**Blue crab**

Spring and summer weather patterns often have a greater impact on crab catches in pots than does their relative abundance. When the rivers are cool and fresher in the spring, or particularly hot in the summer, crabs seek deeper water, where they are less available to pots. Furthermore, extended periods of southwest winds during summer can produce localized upwelling along the southern shores of the major Virginia tributaries such as the Rappahannock. When these conditions coincide with a stratified water column and low dissolved oxygen below the thermocline, the upwelling sometimes brings the low-oxygen waters closer to shore and kills crabs caught in pots and subsequently reduces the area available for fishing.

Virginia hard crab landings have been 36-40.4 x $10^6$ pounds in 1977-1985, with a slight upward trend through 1984. Landings in 1984 were 49.4 x $10^6$ pounds; in 1985, 37.7 x $10^6$ pounds (Figure 7).

Estimates of megalopae (post-late-larval stage blue crabs) during the summer of 1985 suggested a very small year-class; however, catches of juveniles in the fall trawl survey were average. Subsequent peeler catches during the spring and summer of 1986 (1985 year-class) were good during May, but dropped off during June and July, a normal pattern.

Warmer winters delay the date when temperatures drop to 8.3° C (47° F), the temperature at which crabs bury in the mud and become susceptible to the Virginia winter crab-dredge fishery. The current trend toward warmer Decembers may result in reductions in the winter dredge fishery; However, many of the female crabs migrate out of the Bay during warm winters and become susceptible to ocean trawlers along the Virginia Capes.

Considerable concern has been generated in Virginia during the 1985 fishing season as Maryland watermen, fishing for the first time in Virginia's waters, raised the overall catch, but because of problems documenting where the landings were reported, the size of the increase is not known. Efforts are currently under way in both states to document the level of catch and effort in the blue crab fishery.

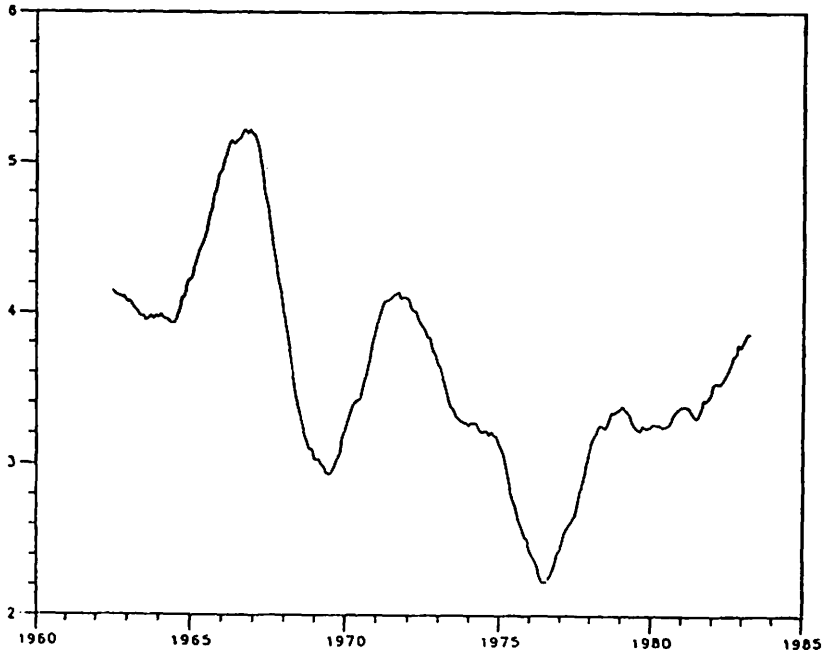



**Figure 7.** Virginia crab landings (millions of pounds), 1960-1985.