

Spot Stock Monitoring Reports

2007

A report to the South Atlantic State-Federal Fisheries Management Board
from the Spot Plan Review Team

Prepared by:

Harry Rickabaugh and Harley Speir, Maryland Department of Natural Resources

Joe Grist, Virginia Marine Resources Commission

John Schoolfield, North Carolina Division of Marine Fisheries

Nichola Meserve, Atlantic States Marine Fisheries Commission, Chair

May 2007



Martin O'Malley, Governor
Anthony G. Brown, Lt. Governor
John R. Griffin, Secretary
Eric Schwaab, Deputy Secretary

Development and Evaluation of Maryland Commercial and Recreational CPUE and Juvenile Indices for Spot

By Harry Rickabaugh

**MD DNR Fisheries Service
March 2007**

The South Atlantic State/Federal Fisheries Management Board requested that the ASMFC Spot Plan Review Team compile and summarize catch per unit effort (CPUE) data for spot. The relationship between landings and abundance is not clear and before an amended spot plan is prepared, it should be determined if CPUE is actually declining. Participating states were to prepare reports using state specific data.

Spot commercial CPUE indices have not been generated in the past due to limitations in Maryland's commercial catch data. This document explores the feasibility of generating CPUEs using catch data by making some assumptions and applying some spatial and temporal limitations. Recreational CPUEs were generated using the Marine Recreational Fishery Statistics Survey (MRFSS) estimates and Maryland's charter boat log data. Juvenile indices (JI) were also generated by existing surveys conducted by MD DNR. These can be used to track recruitment and evaluate the validity of CPUE estimates.

Methods

Four JIs were used in this evaluation, two from the Chesapeake Bays and two from Maryland's coastal bays. The first is derived from the MD DNR Blue Crab Trawl Survey (BCS). The survey uses a 16ft bottom trawl at fixed stations in six areas of Maryland's Chesapeake Bay. Mowrer (2004) describes the survey in more detail and the derivation of the index. The index is a log mean and was updated through 2006 (Mowrer personal communication) for this report. The second JI was derived from the Striped Bass Juvenile Seine Survey (JSS). This survey uses a 100ft beach seine at fixed stations in five areas of Maryland's Chesapeake Bay. Durell and Weedon (2005) describe the survey methods and index calculation in detail. The index is a geometric mean and is

available from 1959 -2006. When comparing the JI's to the spot CPUEs, the JSS was truncated to 1980.

The two coastal bay JIs are from a trawl and seine survey conducted by MD DNR Fisheries Service's Atlantic Program. The trawl survey uses the same type of trawl as the blue crab survey at 20 fixed stations once a month from April through October (Luisi et al, 2005). The Coastal Trawl Index (CTI) was calculated using all sites to calculate an annual geometric mean. The seine survey used a seine similar to the JSS, except it was 6ft deep as opposed to 4ft deep. Nineteen fixed stations were sampled once a month from June through September. The Coastal Seine Index (CSI) was calculated using all sites to calculate an annual geometric mean. Both coastal surveys have been conducted since 1972, but sites and frequency were not standardized until 1989 (Angel Bolinger personal communication, 2007); therefore, only 1989-2006 data was used for most analysis.

Data for commercial CPUEs was from the Maryland catch reporting system. Effort data was only available for 1980-1984, 1990 and 1992 to 2005, so those are the only years commercial CPUEs were generated. Data exploration indicated pound nets and gill nets were the primary gear used to harvest spot, so an index was attempted for both gears. The majority of fishermen did not indicate a target species when using either gear, so other criteria had to be developed to determine which fishermen to include for each index.

Pound net CPUE was limited to two regions that consistently produced spot annually, the main stem of Chesapeake Bay from the route 50 bridge south to the Maryland border with Virginia and the Maryland Potomac River tributaries. Any pound net set in either of these regions was included in the analysis. Only pound nets fished from May through October were included. Maryland reporting for most of the time period does not provide daily catch and effort data. Pound net data was reported monthly as the average number of nets fished, the hours fished in a day and the number of days fished. We do not know the number of days the nets were in the water. However, it was assumed the net fished all month, which is consistent with the manner the nets are observed to be routinely fished. Due to the limitations in the data, pound net effort for each fishermen is the number of net months (average number of nets*months fished) for each year. Since neither actual daily catch nor daily net catch was available, the CPUE for each year was the total catch in pounds divided by the total net months.

Gill net catches were more sporadic and widely distributed than pound net catches making the area method impractical. In order to be able to make comparisons between the indices, Atlantic Ocean catches were excluded. Only fishermen that caught at least 100 pounds of spot in a given month were included. Effort for gill nets was reported as average length of net in yards, hours fished and days fished. CPUE effort was calculated by multiplying the average net length by hours fished multiplied by number of days (yards of net*hours fished*days fished). As with pound nets, CPUE was the total effort for each year divided into the total catch in pounds for the year.

The first recreational index was derived from MRFSS estimates of numbers of spot harvested and trips directed at spot and/or Atlantic croaker (Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division). Directed trips are from anglers that reported catching or targeting either species. Both croaker and spot were used since methods of fishing and areas fished for both species are very similar.

Modes of fishing were limited to the private/rental boat and shore components and area fished was limited to Maryland inland waters. Catches within these area and mode restrictions were analyzed. Annual CPUE was calculated for each year from 1981 to 2005.

The second recreational index was derived from the Maryland charter boat log data base. Charter captains are required to maintain daily logs of where they fish, how many fish of each species they catch and how many anglers participated. No indication of target species is recorded, so the CPUE includes only trips in which spot were captured. The number of anglers was used as effort and the number of spot captured was used as catch. The annual number of spot per angler was calculated for 1993-2006.

Maryland anglers who catch spot of a minimum length may apply for a citation. The minimum length required was 10 inches until 2003, and then was raised to 12 inches in 2004. Lengths of submitted entries were available from 1994 through 2006, excluding 2000, so only 12 inch and greater spot were included for each year. The 2000 data should be available in archives but could not be found in time for inclusion in this report.

The different indices were compared to each other and to Maryland commercial landings, from the Maryland reporting system, when appropriate. Linear regression was used where appropriate and any regression with P values of 0.01 or less was considered significant. Juvenile indices were lagged one year when compared to landings and commercial and recreational CPUEs. For example, the 1990 landings would be compared to the 1989 BCS index. The juvenile indices lagged one year should be comparable to harvest since the majority of harvested spot are age one and few fish reach older ages (Piner and Jones 2004).

Results and Discussion

Both Chesapeake Bay JIs have generally declined, with a few spikes in abundance, since 1980 (Table 1; Figure 1). The JSS and BCS indices were significantly correlated ($P = 0.0014$, $R^2 = 0.34$) from 1980 to 2006 (Figure 2). The two indices track each other much better from 1989 – 2006, both visually and statistically ($P < 0.0001$, $R^2 = 0.68$; Figures 1 and 3), than from 1980 – 1988 which showed no statistical correlation ($R^2 = 0.002$; Figure 4). The differences between time periods could be from changes in sampling in one or both surveys. This possibility will be explored at a later time. The significant agreement between the JIs is encouraging, especially since they use different gears in different habitats and neither was designed to capture spot.

The Maryland Coastal Bays JIs also indicate a slight downward trend in abundance (Table 1, Figure 5), for the 1989 to 2006 time period, the standardized years of the surveys. The CTI and CSI were significantly correlated for all years ($P = 0.0059$, $R^2 = 0.23$; Figure 6), excluding 1983-1986 when one or both indices were not generated. The indices were much more similar for the standardized years from 1989 to 2006 ($P < 0.0001$, $R^2 = 0.94$; Figure 7). Neither of the Coastal Bay JIs were significantly correlated to either of the Chesapeake Bay JIs.

Maryland spot landings increased through much of the 1930's and 1940's and peaked in the mid 1950's, before crashing in the early 1960's. Landings remained low, except for a few high years, until the late 1980's. Commercial landings have been variable at a relatively moderate level since 1989 (Table 2; Figure 8).

MRFSS recreational estimates of spot harvest in Maryland were highly variable early in the time series, fairly stable and around the mean from 1989-1995 and fairly stable below the mean from 1996-2002. The past few years have gone from the second highest in 2003, to below average in 2004 and back above average in 2005 (Figure 9). The majority of recreational spot catch is from inland waters (Figure 9).

The lagged BCS and JSS spot indices were not significantly correlated with MD spot landings from 1980-2005 (Figures 10 and 11), but were when years were limited to 1990-2005, the years where the two indices were positively correlated (Figures 12 -13). The JSS lagged one year compared to commercial landings from 1960-2005 reveal a large disparity in indications of abundance for most years from 1974-1985 (Figure 14). During this time period landings were very low while the JSS index was the highest of the time series. The two coastal JIs lagged one year were not significantly correlated to landings when all years were included, but the standardized years 1990-2005 did produce a significant relationship (Figures 15 and 16).

The success of the Maryland commercial spot fishery appears dependant upon age one fish, since all four JIs lagged one year were positively correlated to landings from 1990 -2005. However none of the indices, using all years or the 1990-2005 time period, were significantly correlated to MRFSS landings, for Maryland inland waters or all Maryland waters. The disparity in landings and the JSS is also contradictory to the more recent relationships. Spot are not generally targeted in Maryland but are part of the mixed species fishery from pound nets. When more profitable species are available, or if only smaller spot are available, it is possible fishermen were discarding or avoiding spot during this time period.

Both the pound net and gill net commercial CPUE indices generally increased over the time series (Table 3, Figure 17). Some years the pound net index visually follows the BCS and others it follows the BCS index lagged one year (Figures 18 and 19). The other JIs follow a similar pattern when compared to the pound net CPUE. The pound net CPUE was zero for 1980 and 1981. It would appear that strong year classes begin to appear in the pound net fishery at age zero, influencing the composition of the catch. However, none of the JIs, lagged or not, are significantly correlated to the pound net CPUE.

The gill net CPUE tracks the trend of one year lagged BCS (Figure 20), as well as the other JIs, fairly well from 1990 to 2001, but then increases while the JIs remain low. The gill net CPUE also had zero values for 1980-1984. None of the lagged JIs had a significant relationship to the gill net CPUE, and the two commercial CPUEs were not statistically correlated.

The MRFSS CPUE generally decreased through time, with a few spikes and a small amount of potential recovery from 2003 to 2005 (Table 3, Figure 21). The MRFSS index also was not significantly correlated to any of the JIs or commercial CPUEs, but more closely tracked the trends of the one year lagged JIs then the commercial indices. The MRFSS also indicates higher catch in the early part of the time series when JIs were generally higher (Figure 22); where the commercial CPUEs either indicated zero catch or were missing values.

The Maryland charter boat CPUE declined slightly from 1993 to 2004, before rebounding slightly in 2005 and 2006 (Table 2, Figure 23). Both the MRFSS and charter boat indices did appear to follow a similar trend of general decline over time with some

recovery in the past couple of years (Figure 23), but were not significantly correlated. The charter boat CPUE was significantly correlated to the one year lagged BCS JI ($R^2 = 0.57$, $p=0.0017$; Figure 24), but not any of the other juvenile indices. Submissions of 12 inch or greater spot to the Maryland citation program were very low (0-3 fish) from 1994 to 1998, increased rapidly to 141 in 2002, and then decreased rapidly from 130 fish in 2003 to 8 fish in 2006 (Table 2). Interestingly, the highest years of citation submissions correspond to years of low catch in the charter boat CPUE. It may be that anglers keep fewer spot when larger spot are available.

Commercial CPUE in the 1980s could have been low for several reasons. Neither pound or gill net, or any other gear, are used to target spot in Maryland. The majority of spot landings are by-catch or are selected from a mixed catch when more desirable species are unavailable. A unit of effort for gill net most likely is not the same from year to year, as mesh sizes set locations, etc. change as watermen target more profitable species. Pound net caught spot may also be landed as bait, either mixed with Atlantic menhaden or sold live to recreational fishermen. It is unclear how or if watermen report these landings. It is possible they are reported as menhaden when sold dead as bait. Spot may be targeted when more profitable, but dockside value adjusted to 2005 dollars has generally decreased in Maryland (Figure 25). Spot sold live as bait often command much higher prices, but may be going unreported, since they may not be sold through a dealer.

References

Durell, E.Q., and C. Weedon, 2005. Striped Bass Seine Survey Juvenile Index Web Page. <http://www.dnr.state.md.us/fisheries/juvindex/index.html>. Maryland Department of Natural Resources, Fisheries Service.

Mowrer, J. 2004. Resident and migratory juvenile finfish recruitment survey. *In* Stock assessment of selected resident and migratory recreational finfish species within Maryland's Chesapeake Bay. Maryland Department of Natural Resources, Report F-54-R. Annapolis, Maryland.

Luisi, M., Docotor, S. and Staff of the MDDNR Atlantic Program. 2005. Investigation of Maryland's Coastal Bays and Atlantic Ocean Finfish Stocks. Maryland Department of Natural Resources, Report F-50-R-14. Annapolis, Maryland.

Piner, K.R. and C.M. Jones, 2004. Age growth and the potential for growth of spot (*Leiostomus xanthurus*) from the Chesapeake Bay, eastern USA. *Marine and Freshwater Research*. 55(6) 553-560.

Table 1. Maryland juvenile spot indices, 1959-2006.

| Year | Chesapeake Bay | | Coastal Bays | |
|------|----------------|----------------|----------------|----------------|
| | JSS (Seine) | BCS (Trawl) | CTI (Trawl) | CSI (Seine) |
| 1959 | 0.4 | | | |
| 1960 | 0.2 | | | |
| 1961 | 0.1 | | | |
| 1962 | 0.6 | | | |
| 1963 | 0.7 | | | |
| 1964 | 0.2 | | | |
| 1965 | 0.0 | | | |
| 1966 | 0.7 | | | |
| 1967 | 0.0 | | | |
| 1968 | 0.9 | | | |
| 1969 | 1.7 | | | |
| 1970 | 0.1 | | | |
| 1971 | 1.2 | | | |
| 1972 | 1.6 | | 1437.9 | 80.4 |
| 1973 | 4.6 | | 139.5 | 83.3 |
| 1974 | 3.2 | | 347.6 | 25.6 |
| 1975 | 6.3 | | 24.8 | 51.0 |
| 1976 | 4.3 | | 110.0 | 152.9 |
| 1977 | 9.4 | | 27.4 | 44.4 |
| 1978 | 4.7 | | 48.8 | 13.0 |
| 1979 | 3.6 | | 62.3 | 28.4 |
| 1980 | 3.3 | 2.5 | 36.9 | 19.8 |
| 1981 | 2.3 | 2.5 | 257.5 | 186.5 |
| 1982 | 3.1 | 3.3 | 182.8 | 133.9 |
| 1983 | 1.5 | 1.9 | | |
| 1984 | 4.8 | 1.3 | 24.2 | |
| 1985 | 2.0 | 3.3 | 4.6 | |
| 1986 | 2.4 | 2.9 | 824.4 | |
| 1987 | 1.6 | 1.9 | 1.4 | 2.4 |
| 1988 | 6.3 | 2.7 | 726.8 | 177.8 |
| 1989 | 1.0 | 2.4 | 23.1 | 13.1 |
| 1990 | 1.4 | 2.9 | 19.0 | 17.9 |
| 1991 | 1.1 | 2.5 | 14.1 | 8.1 |
| 1992 | 0.7 | 0.5 | 0.9 | 1.4 |
| 1993 | 2.0 | 2.3 | 4.2 | 5.5 |
| 1994 | 2.1 | 3.2 | 148.4 | 97.9 |
| 1995 | 0.2 | 0.3 | 2.0 | 3.3 |
| 1996 | 0.4 | 1.0 | 1.2 | 1.9 |
| 1997 | 1.9 | 2.7 | 58.0 | 46.5 |
| 1998 | 0.7 | 1.2 | 2.9 | 2.6 |
| 1999 | 0.8 | 1.8 | 6.4 | 8.1 |
| 2000 | 1.2 | 2.1 | 26.8 | 14.1 |
| 2001 | 0.5 | 1.1 | 1.8 | 1.7 |
| 2002 | 0.5 | 0.9 | 57.2 | 19.7 |
| 2003 | 0.5 | 0.8 | 2.2 | 2.9 |
| 2004 | 1.1 | 0.9 | 4.2 | 4.3 |
| 2005 | 4.8 | 4.2 | 39.0 | 16.2 |
| 2006 | 0.5 | 2.2 | 5.4 | 4.4 |

Table 2. Maryland spot commercial landings in pounds, 1929-2005, and recreational numbers harvested and released, 1981-2005.

| Year | Recreational Harvested | Recreational Released | Commercial Pounds |
|------|------------------------|-----------------------|-------------------|
| 1929 | | | 117,557 |
| 1930 | | | 126,295 |
| 1931 | | | 100,526 |
| 1932 | | | 47,877 |
| 1933 | | | 30,527 |
| 1934 | | | 62,100 |
| 1935 | | | 18,000 |
| 1936 | | | 36,700 |
| 1937 | | | 27,600 |
| 1938 | | | 59,900 |
| 1939 | | | 171,200 |
| 1940 | | | 141,000 |
| 1941 | | | 141,000 |
| 1942 | | | 138,000 |
| 1943 | | | |
| 1944 | | | 186,803 |
| 1945 | | | 208,827 |
| 1946 | | | 129,328 |
| 1947 | | | 120,630 |
| 1948 | | | 111,950 |
| 1949 | | | 248,713 |
| 1950 | | | 100,725 |
| 1951 | | | 128,554 |
| 1952 | | | 420,098 |
| 1953 | | | 283,817 |
| 1954 | | | 258,178 |
| 1955 | | | 407,699 |
| 1956 | | | 300,502 |
| 1957 | | | 589,001 |
| 1958 | | | 593,120 |
| 1959 | | | 84,904 |
| 1960 | | | 498,376 |
| 1961 | | | 10,519 |
| 1962 | | | 26,900 |
| 1963 | | | 15,200 |
| 1964 | | | 33,900 |
| 1965 | | | 600 |
| 1966 | | | 4,100 |
| 1967 | | | 248,300 |

| Year | Recreational Harvested | Recreational Released | Commercial Pounds |
|------|------------------------|-----------------------|-------------------|
| 1968 | | | 45,600 |
| 1969 | | | 20,700 |
| 1970 | | | 572,600 |
| 1971 | | | 20,300 |
| 1972 | | | 73,700 |
| 1973 | | | 27,100 |
| 1974 | | | 37,000 |
| 1975 | | | 102,900 |
| 1976 | | | 16,400 |
| 1977 | | | 16,400 |
| 1978 | | | 31,300 |
| 1979 | | | 10,600 |
| 1980 | | | 6,265 |
| 1981 | 948,931 | 1,331,316 | 14,214 |
| 1982 | 2,864,603 | 1,677,415 | 6,154 |
| 1983 | 1,600,362 | 1,114,795 | 129,377 |
| 1984 | 904,793 | 1,150,599 | 43,318 |
| 1985 | 1,028,391 | 735,873 | 7,640 |
| 1986 | 3,789,796 | 2,720,343 | 104,373 |
| 1987 | 3,180,704 | 248,973 | 252,152 |
| 1988 | 277,964 | 716,258 | 57,975 |
| 1989 | 1,154,314 | 730,580 | 116,043 |
| 1990 | 2,120,655 | 1,811,434 | 103,991 |
| 1991 | 1,841,555 | 2,123,582 | 216,035 |
| 1992 | 1,671,897 | 493,597 | 255,010 |
| 1993 | 1,880,043 | 1,573,486 | 183,357 |
| 1994 | 1,761,701 | 1,037,498 | 149,889 |
| 1995 | 1,099,658 | 253,827 | 330,021 |
| 1996 | 591,300 | 208,897 | 89,149 |
| 1997 | 713,657 | 1,316,341 | 76,193 |
| 1998 | 1,327,259 | 633,914 | 261,523 |
| 1999 | 655,289 | 618,742 | 214,656 |
| 2000 | 1,389,505 | 1,080,310 | 137,438 |
| 2001 | 1,088,997 | 577,417 | 220,072 |
| 2002 | 690,515 | 501,111 | 127,914 |
| 2003 | 3,300,594 | 670,382 | 169,298 |
| 2004 | 1,517,831 | 600,827 | 177,914 |
| 2005 | 2,044,600 | 2,220,833 | 84,254 |

Table 3. Maryland spot CPUE indices and number of 12 inch plus spot submissions to the citation program, 1980-2006.

| Year | Pound Net | Gill Net | MRFSS | Citations | Charter CPUE |
|------|-----------|----------|-------|-----------|--------------|
| 1980 | 0.0 | 0.000 | | | |
| 1981 | 0.0 | 0.000 | 3.9 | | |
| 1982 | 27.7 | 0.000 | 6.1 | | |
| 1983 | 15.2 | 0.000 | 3.7 | | |
| 1984 | 29.4 | 0.000 | 2.8 | | |
| 1985 | | | 3.9 | | |
| 1986 | | | 6.2 | | |
| 1987 | | | 9.1 | | |
| 1988 | | | 2.4 | | |
| 1989 | | | 4.0 | | |
| 1990 | 10.2 | 0.001 | 3.7 | | |
| 1991 | | | 2.5 | | |
| 1992 | 6.1 | 0.031 | 5.0 | | |
| 1993 | 46.5 | 0.014 | 2.5 | | 17.2 |
| 1994 | 115.1 | 0.019 | 2.7 | 0 | 24.3 |
| 1995 | 99.2 | 0.025 | 3.0 | 3 | 23.5 |
| 1996 | 50.8 | 0.011 | 2.8 | 2 | 13.1 |
| 1997 | 31.6 | 0.013 | 1.3 | 3 | 19.1 |
| 1998 | 46.2 | 0.022 | 2.0 | 1 | 22.0 |
| 1999 | 45.4 | 0.016 | 1.1 | 35 | 17.5 |
| 2000 | 45.6 | 0.024 | 1.3 | | 18.9 |
| 2001 | 65.3 | 0.040 | 1.5 | 101 | 14.6 |
| 2002 | 58.0 | 0.055 | 1.4 | 141 | 16.4 |
| 2003 | 68.3 | 0.031 | 3.9 | 130 | 18.1 |
| 2004 | 43.2 | 0.050 | 2.3 | 70 | 15.1 |
| 2005 | 101.4 | 0.025 | 2.7 | 10 | 19.1 |
| 2006 | | | | 8 | 23.4 |

| | |
|--------------|-----------------------------|
| <u>Index</u> | <u>Units</u> |
| Pound Net | Pounds per Net Month |
| Gill Net | Pounds per Yard Hour of Net |
| MRFSS | Fish per Trip |
| Charter Boat | Catch per Angler |

Figure 1. Comparison of Maryland Chesapeake Bay juvenile spot indices, 1980-2006. JSS is a geometric mean and BCS is a LN mean.

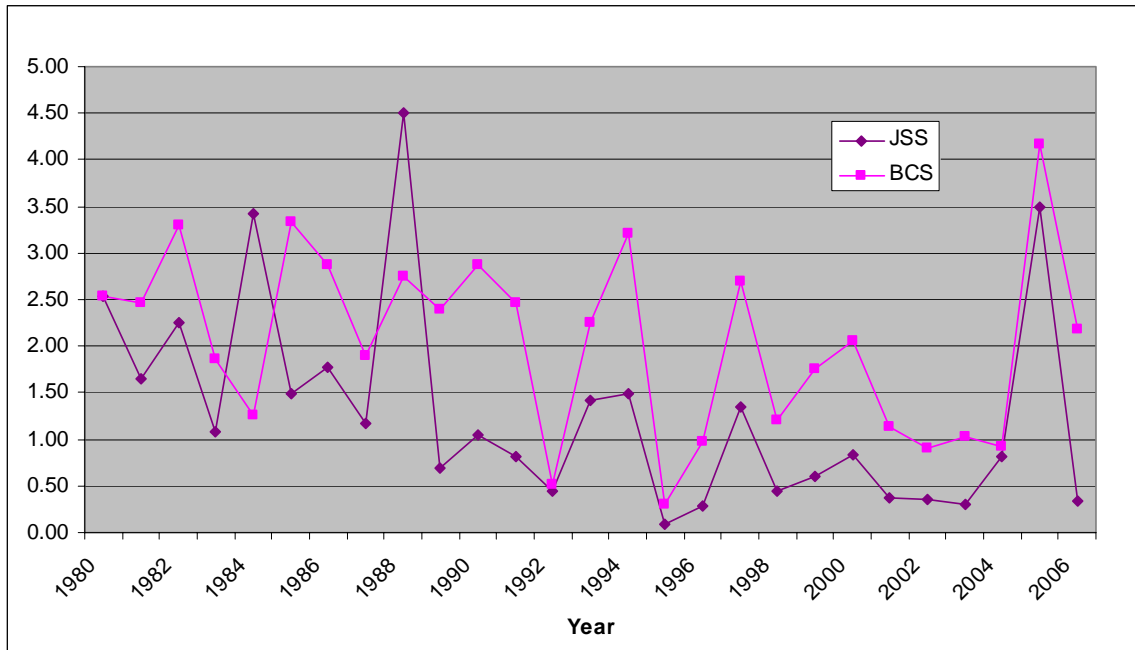


Figure 2. Comparison of JSS and BCS using linear regression, 1980 - 2006.

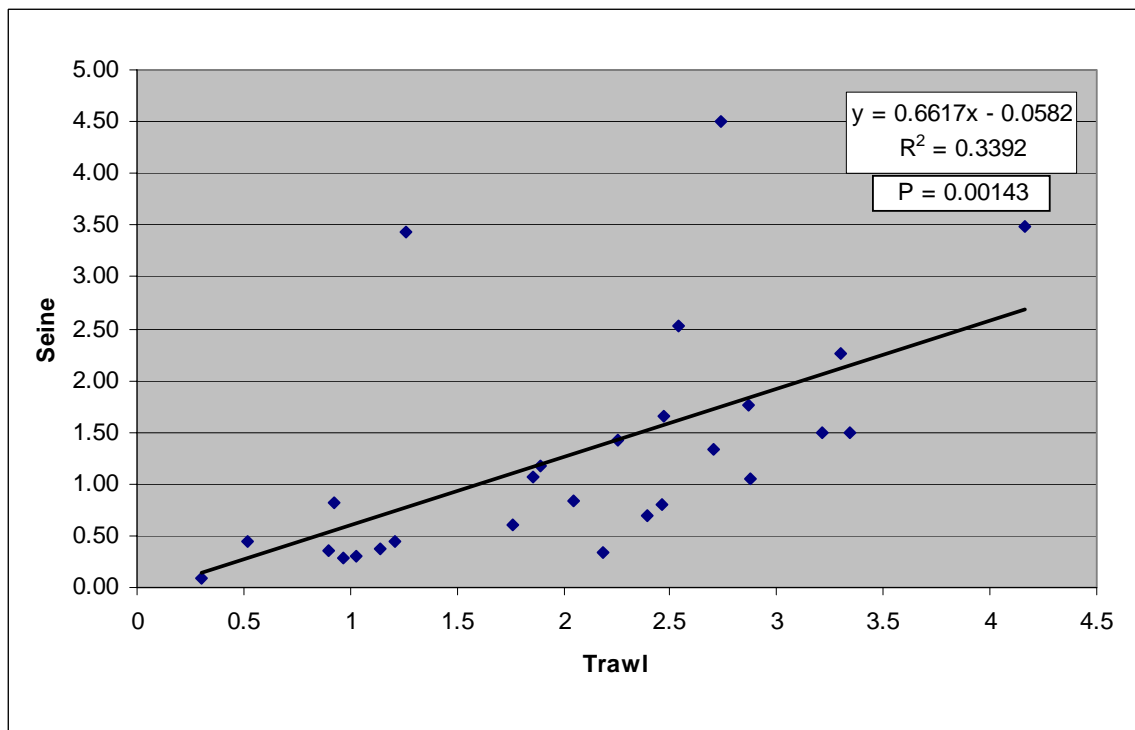


Figure 3. Comparison of JSS and BCS using linear regression, 1989 - 2006.

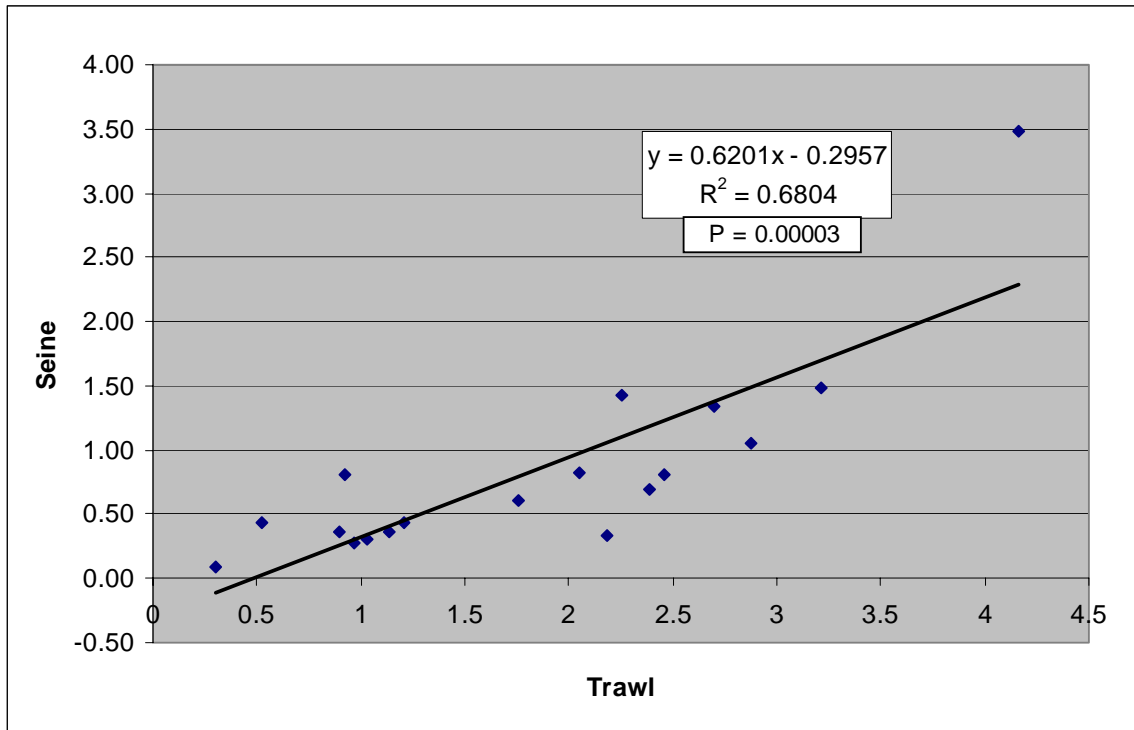


Figure 4. Comparison of JSS and BCS using linear regression, 1980 - 1988.

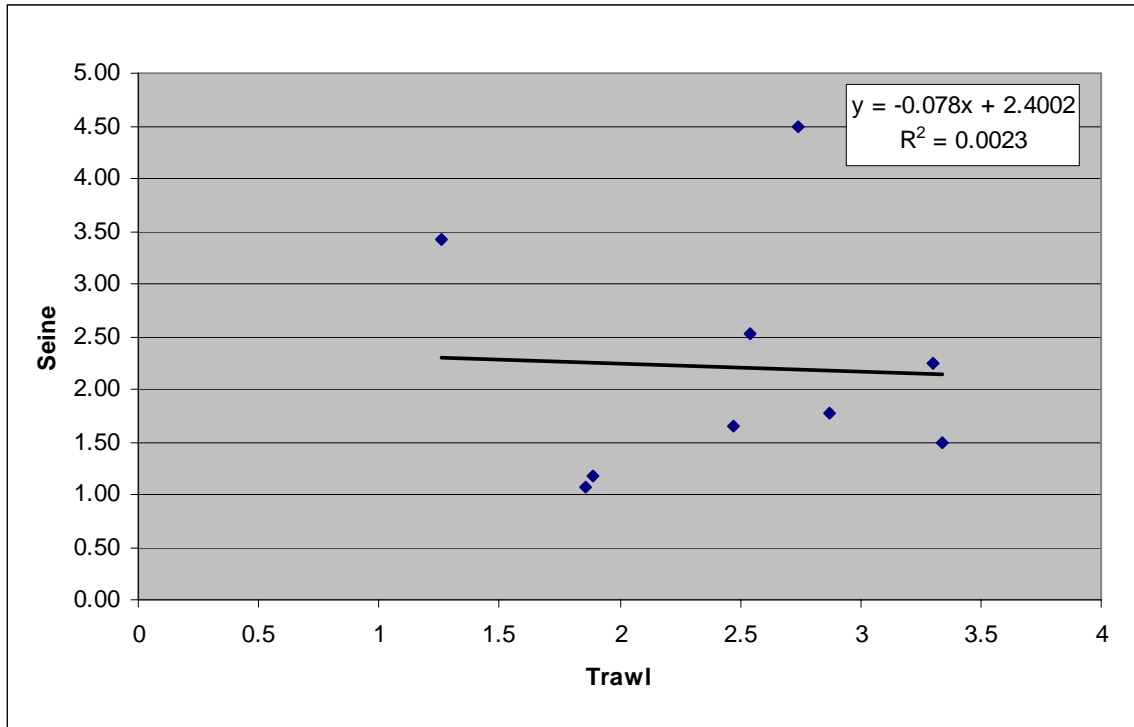


Figure 5. Comparison of Maryland Coastal Bay juvenile spot indices, 1972-2006. Both indices are geometric means (neither survey was standardized until 1989).

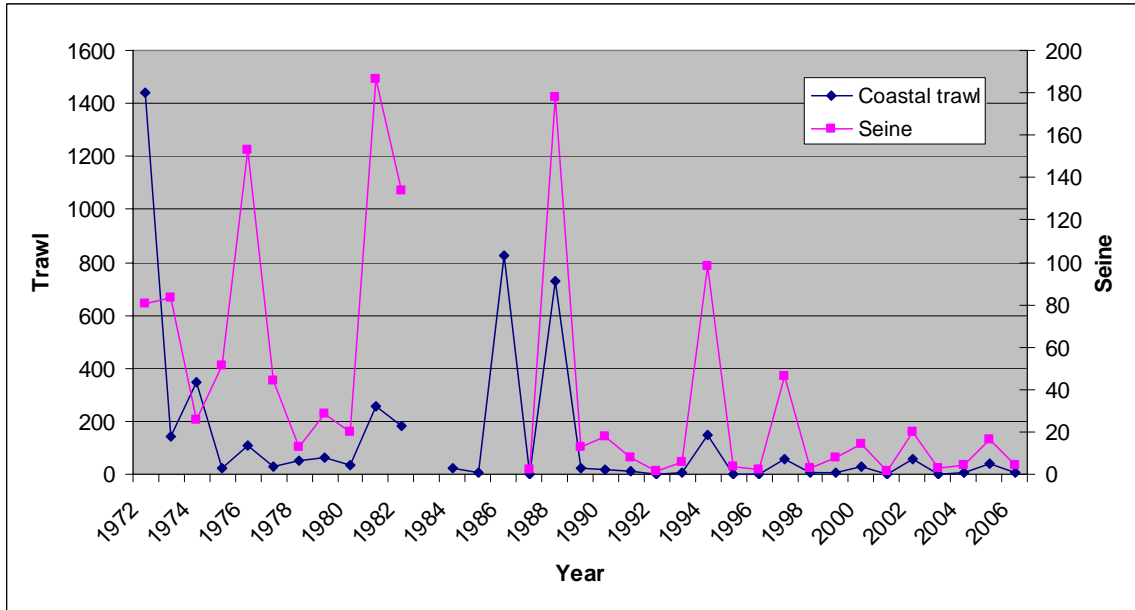


Figure 6. Comparison of spot CSI and CTI using linear regression, 1972 – 1982 and 1987-2006.

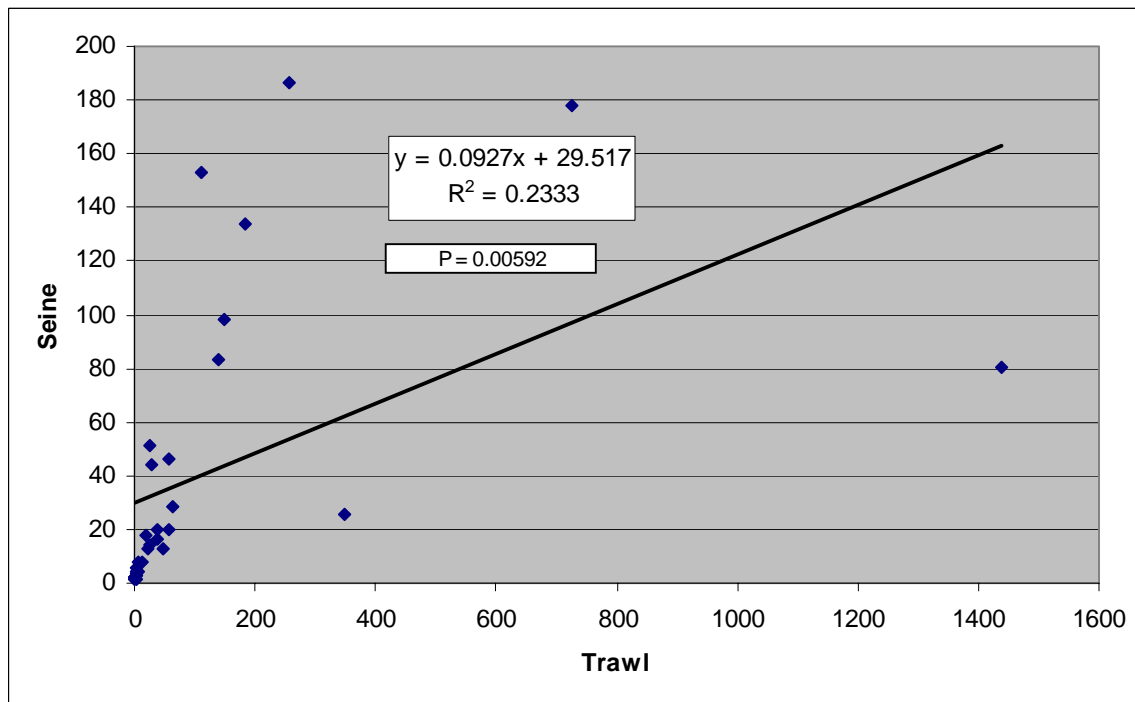


Figure 7. Comparison of spot CSI and CTI using linear regression, 1989-2006.

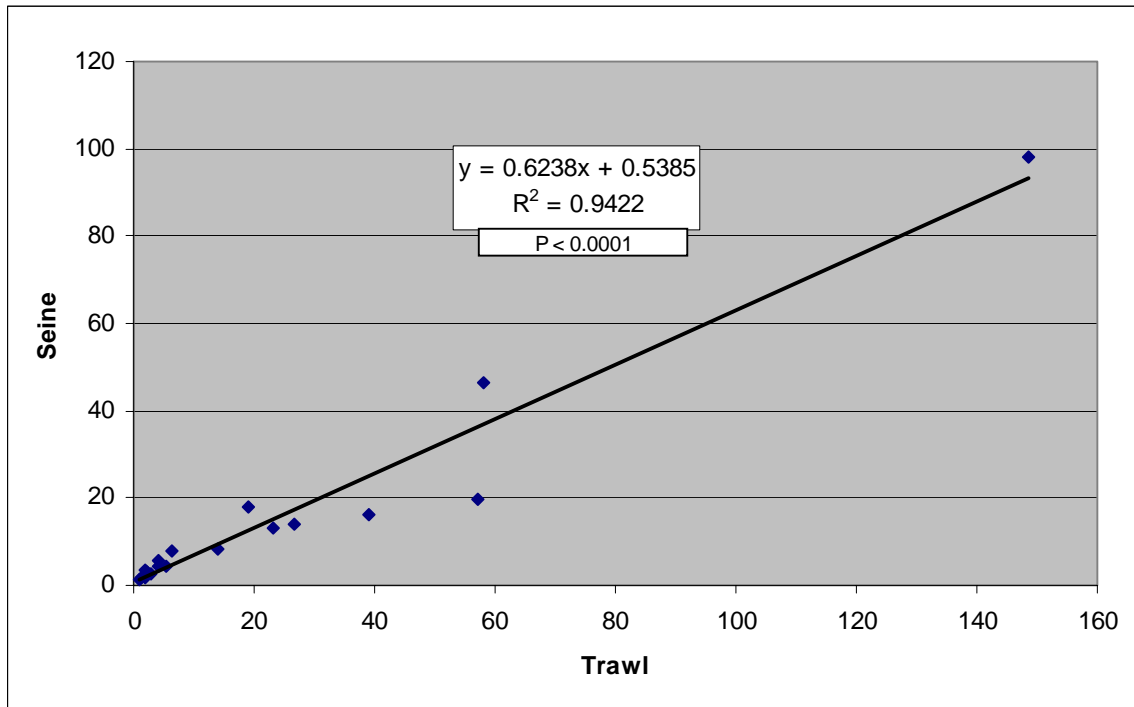


Figure 8. Maryland's spot commercial landings in pounds, 1929-2005.

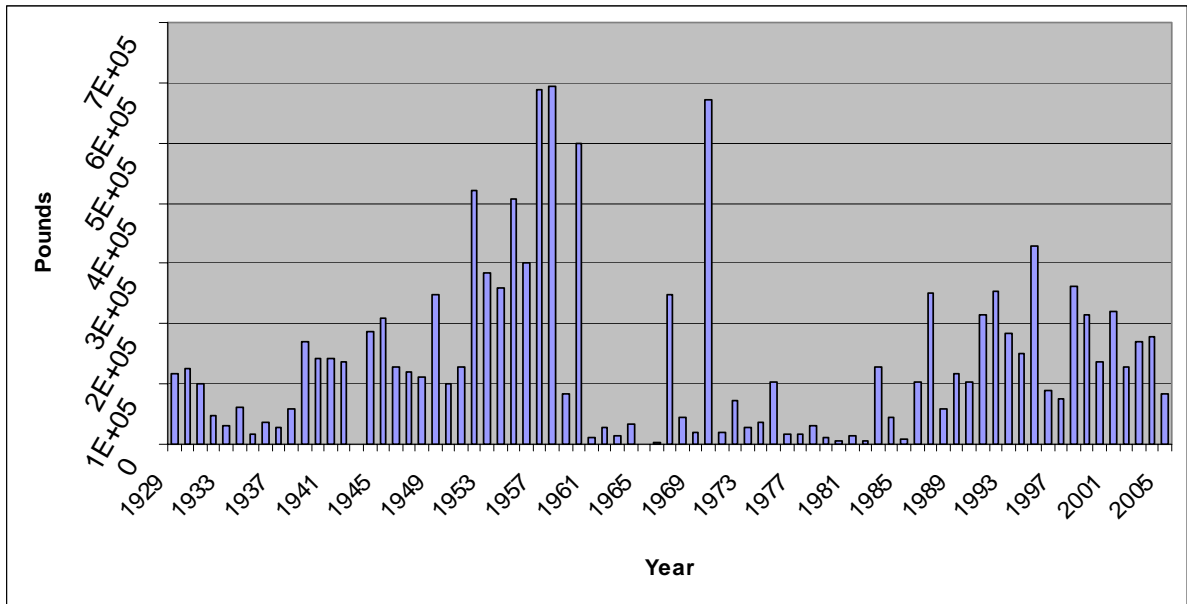


Figure 9. MRFSS estimates of Maryland spot harvest for all areas and inland waters. 1981-2005.

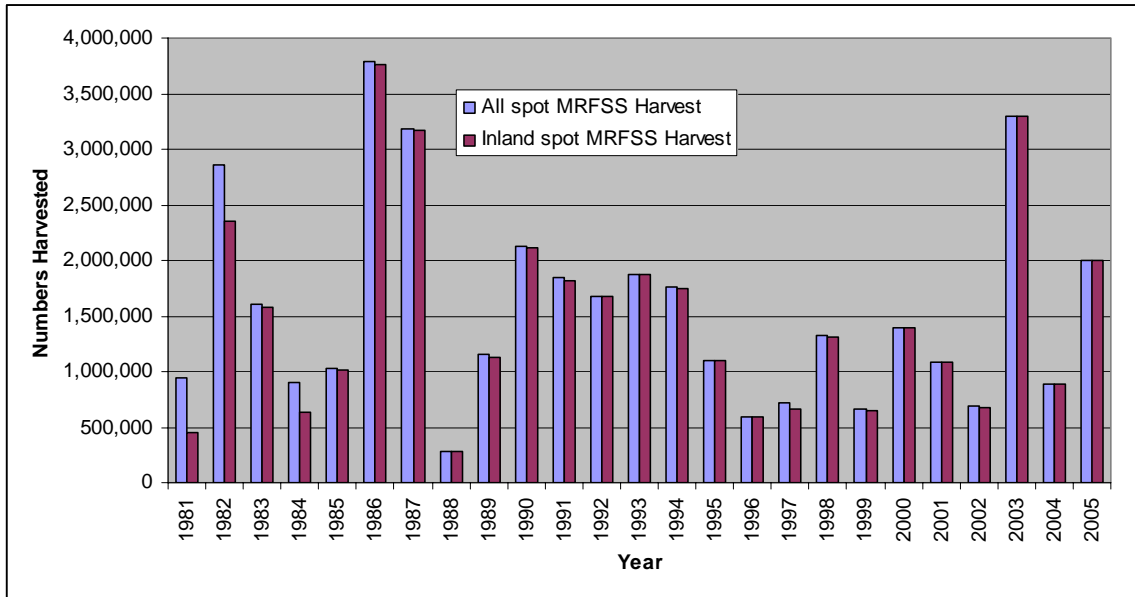


Figure 10. Comparison of spot JSS lagged one year and Maryland commercial spot landings using linear regression, 1980-2005.

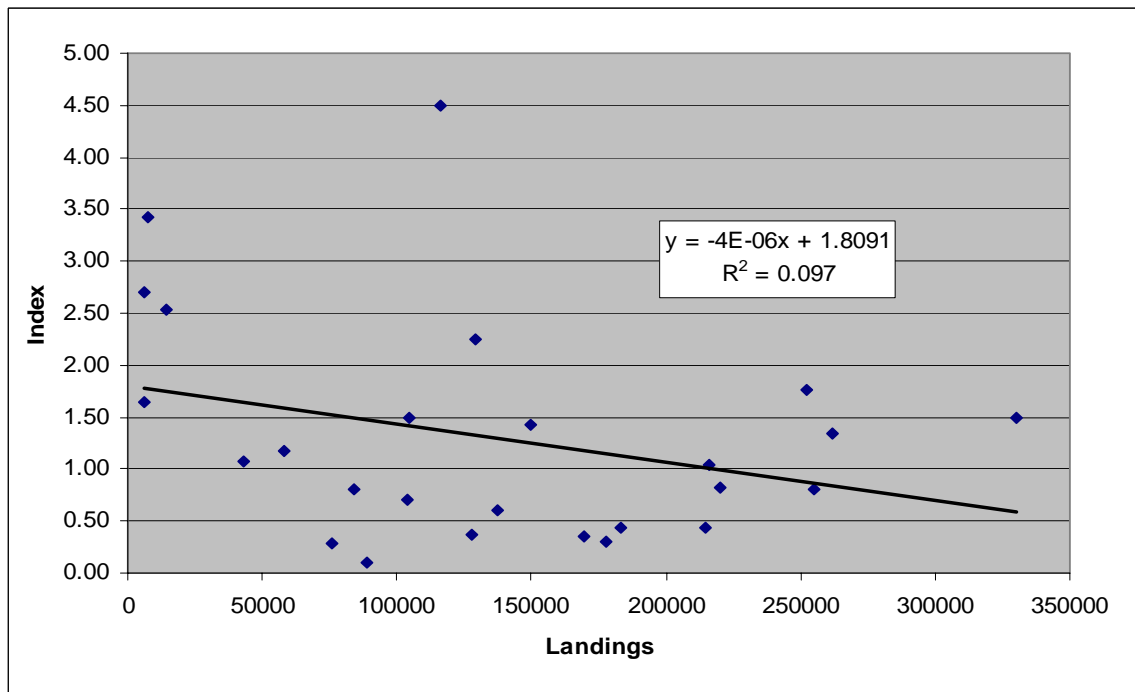


Figure 11. Comparison of spot BCS lagged one year and Maryland commercial spot landings using linear regression, 1980-2005.

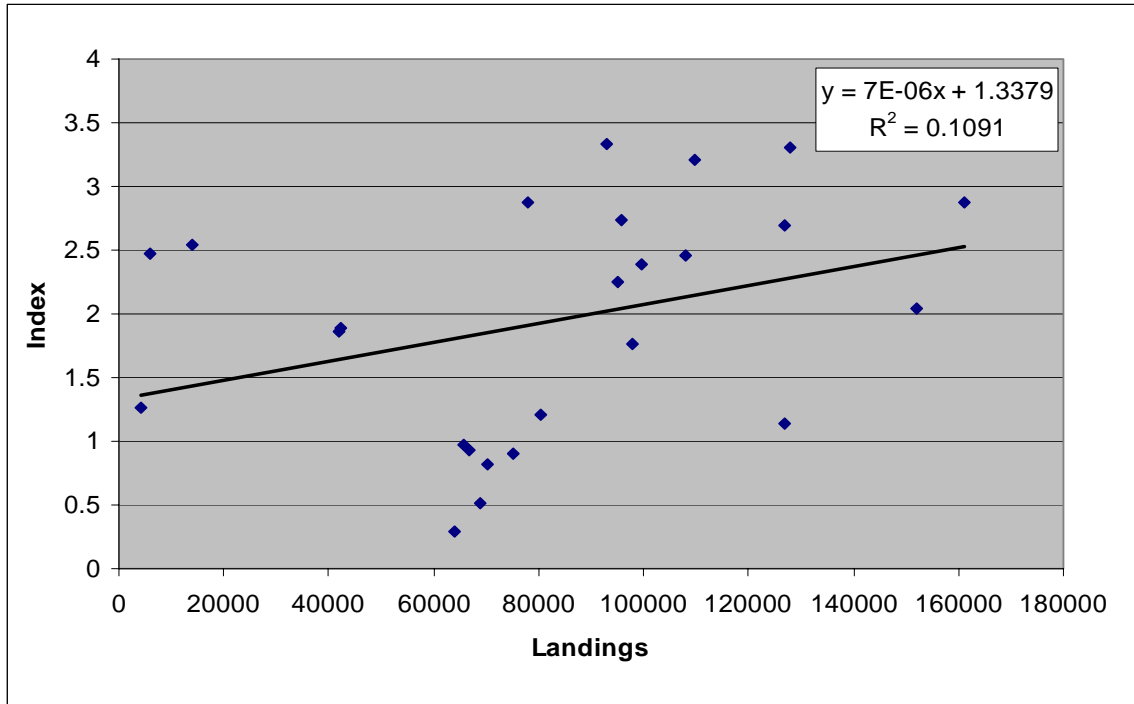


Figure 12. Comparison of spot JSS lagged one year and Maryland commercial spot landings using linear regression, 1990-2005.

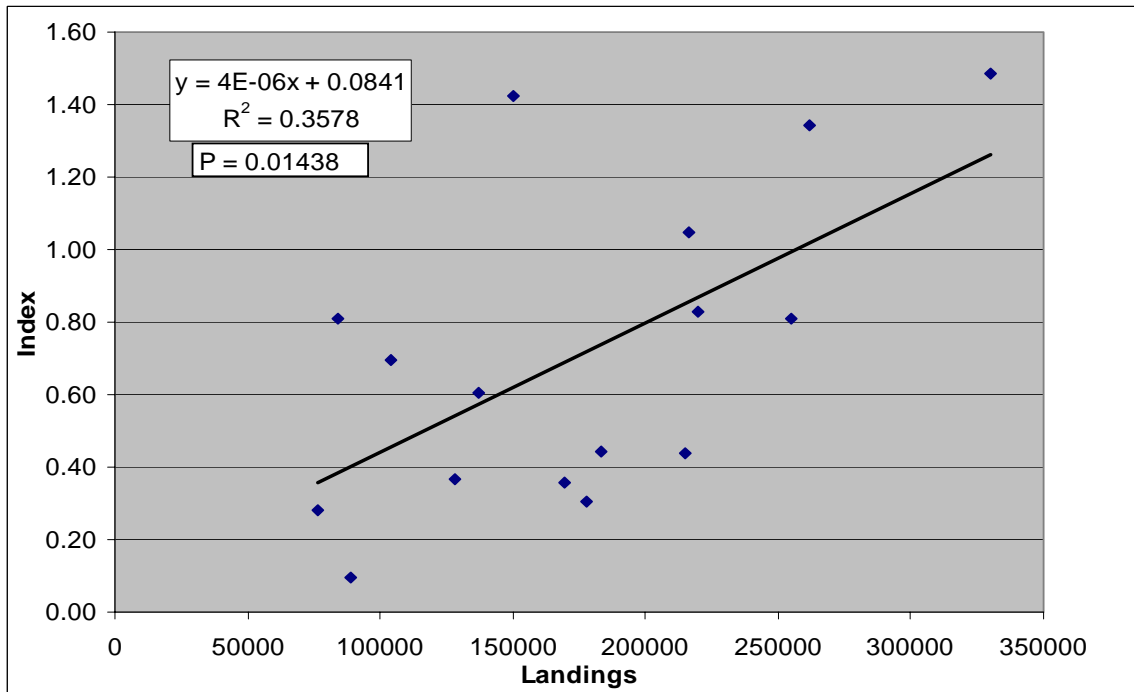


Figure 13. Comparison of spot BCS lagged one year and Maryland commercial spot landings using linear regression, 1990-2005.

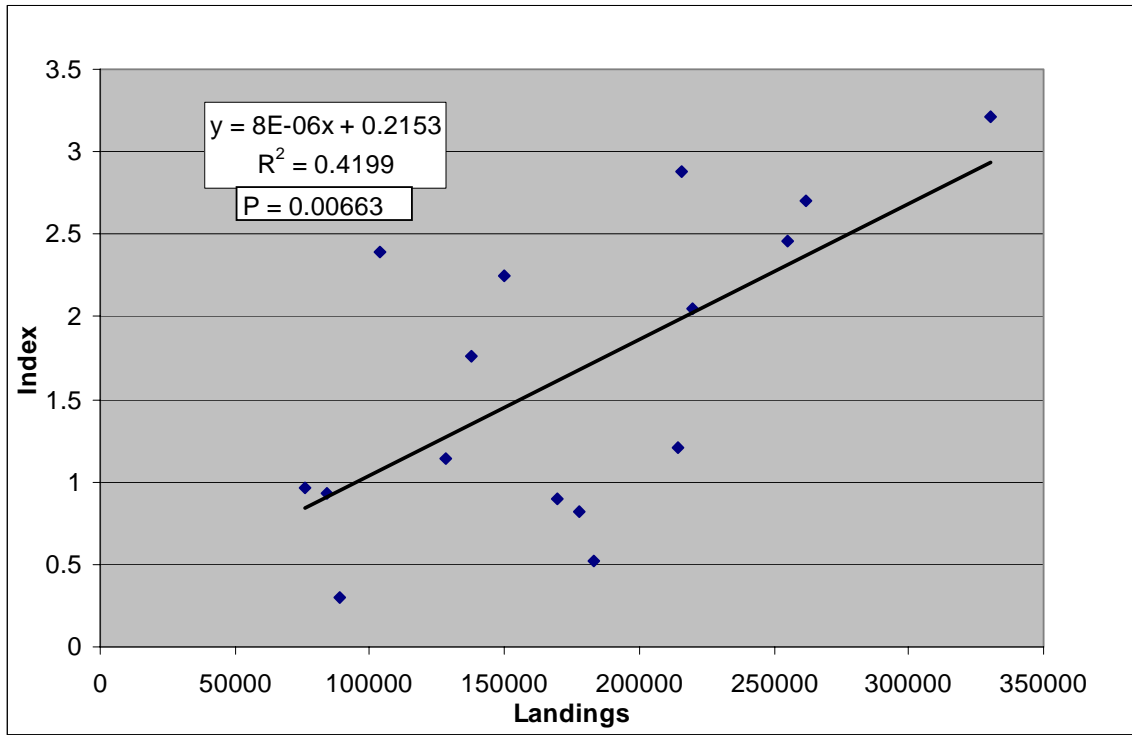


Figure 14. Maryland commercial spot landings and the JSS spot index lagged one year, 1960-2005.

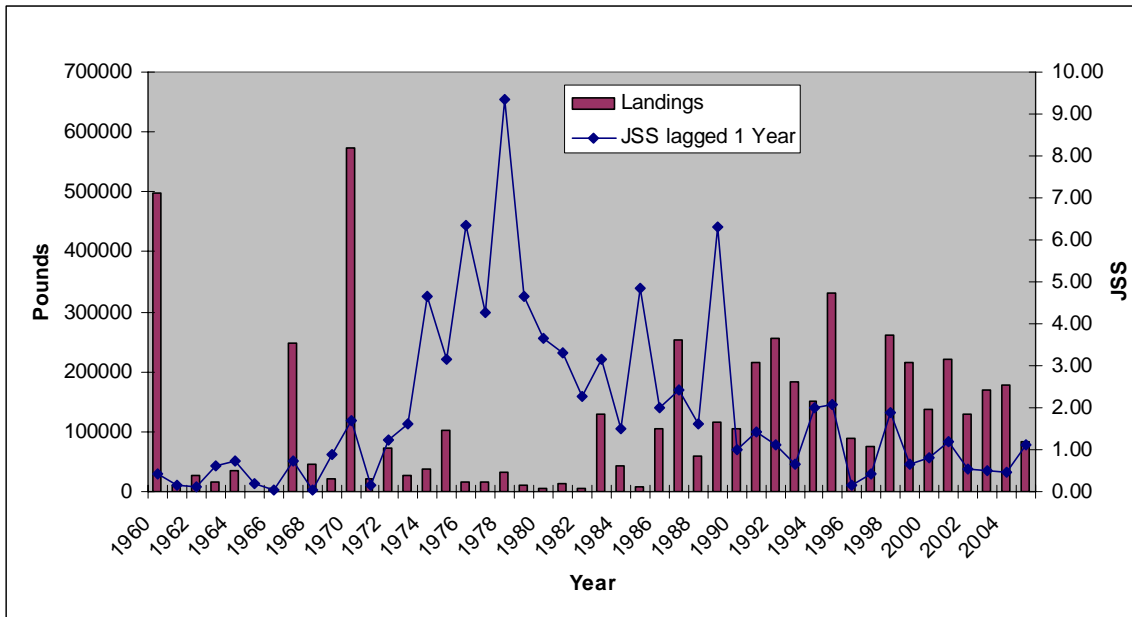


Figure 15. Comparison of spot CTI lagged one year and Maryland commercial spot landings using linear regression, 1990-2005.

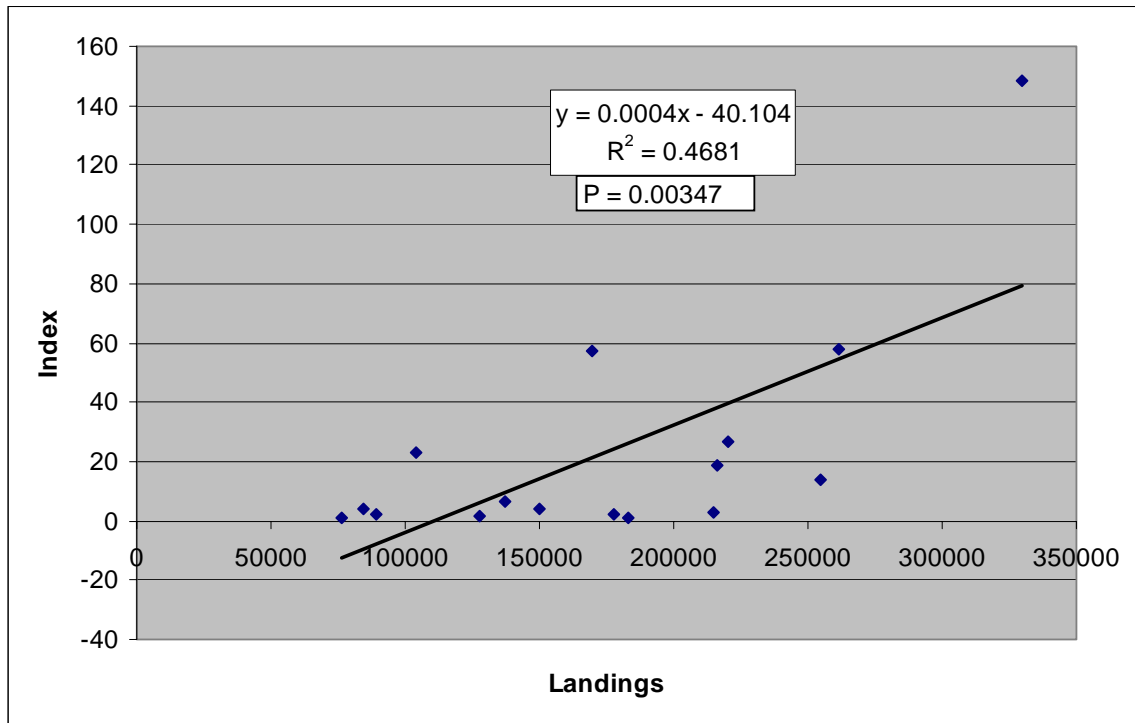


Figure 16. Comparison of spot CSI lagged one year and Maryland commercial spot landings using linear regression, 1990-2005.

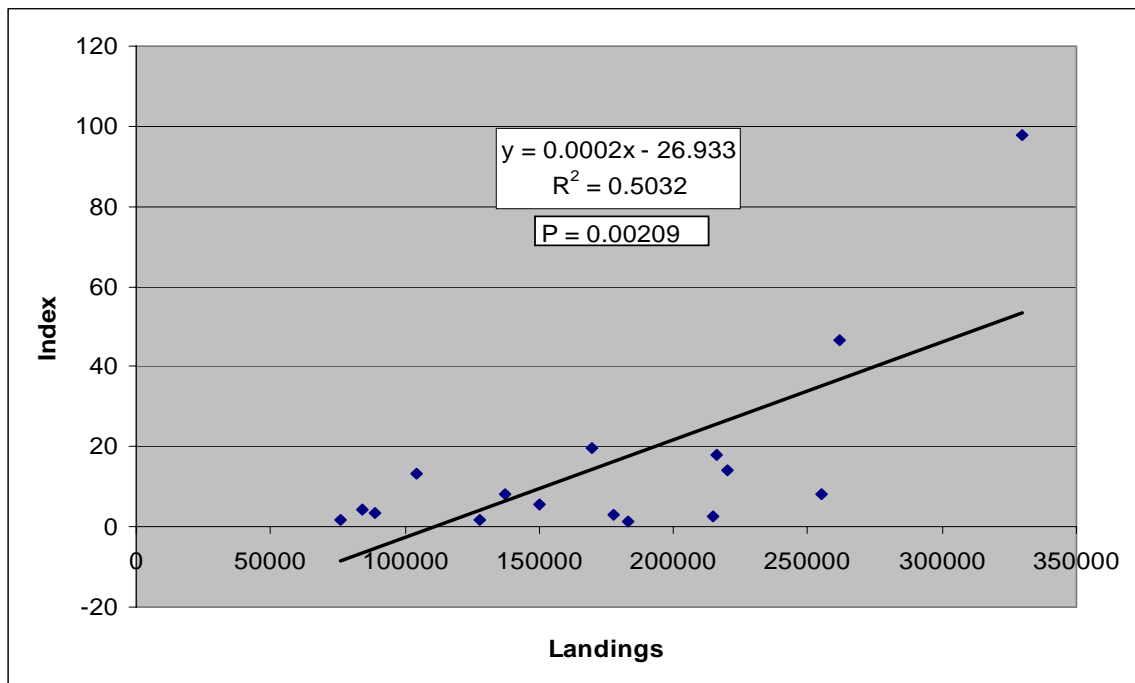


Figure 17. Maryland commercial spot pound net and gill net CPUE indices, 1980-2005, excluding years where effort was unavailable.

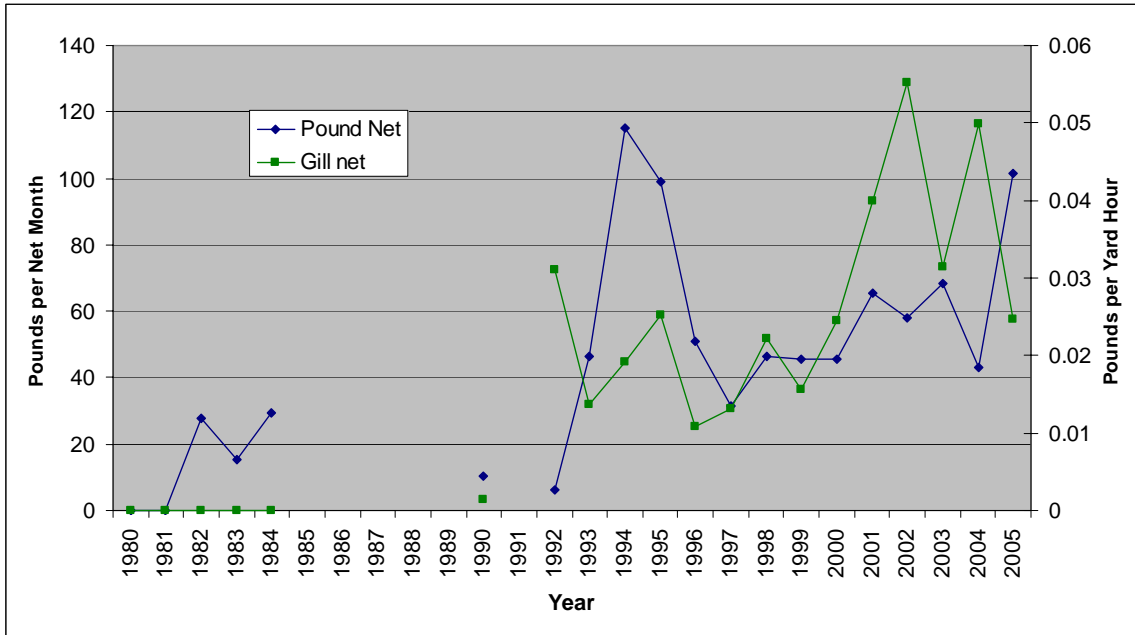


Figure 18. Maryland Pound net CPUE and BCS JI 1980-2005, excluding 1985-1989 and 1991 for the Pound net CPUE.

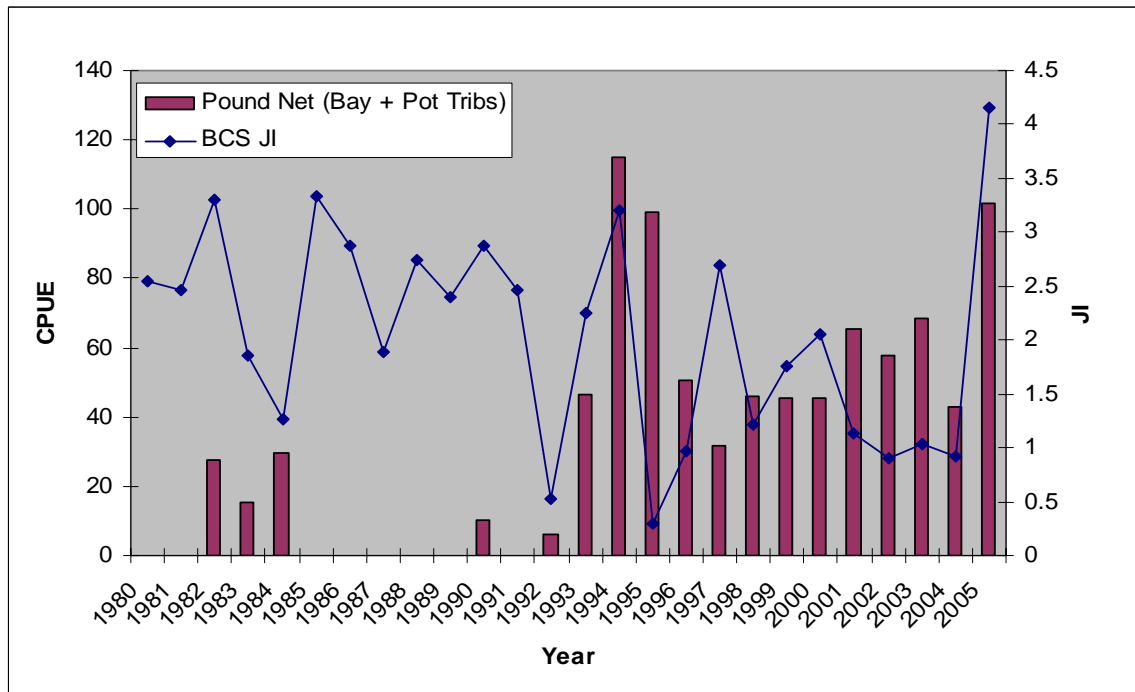


Figure 19. Maryland Pound net CPUE and BCS JI lagged one year 1980-2005, excluding 1985-1989 and 1991 for the Pound net CPUE.

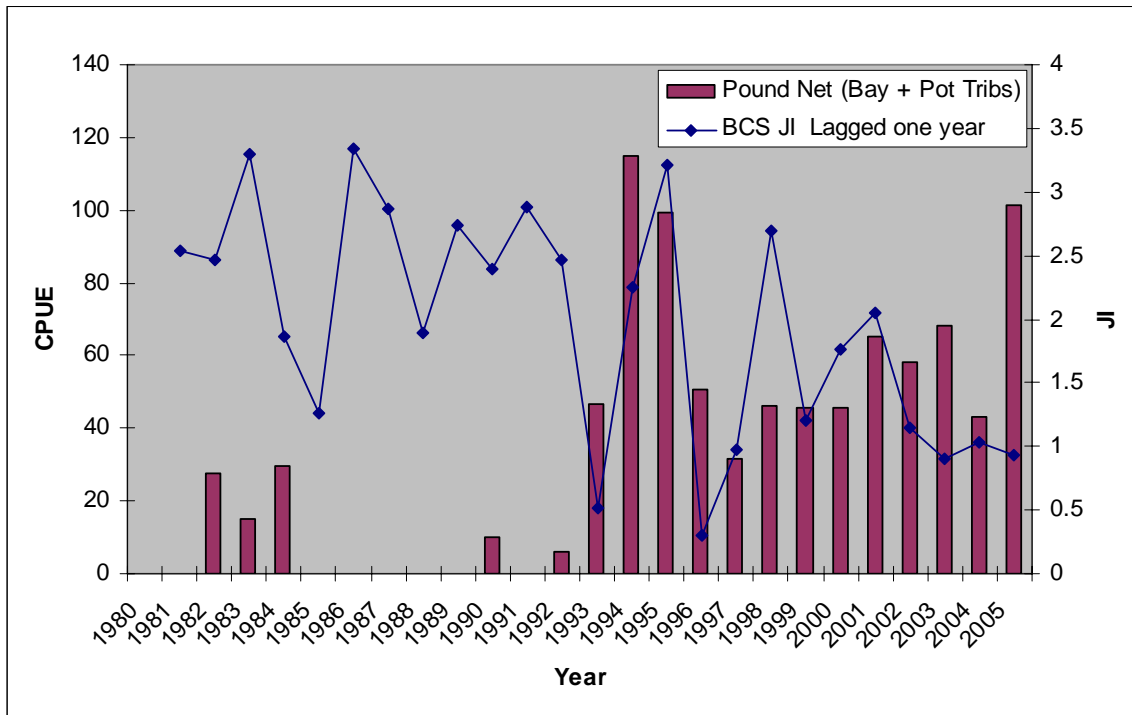


Figure 20. Gill net CPUE and BCS JI lagged one year. 1980-2005, excluding 1985-1989 and 1991.

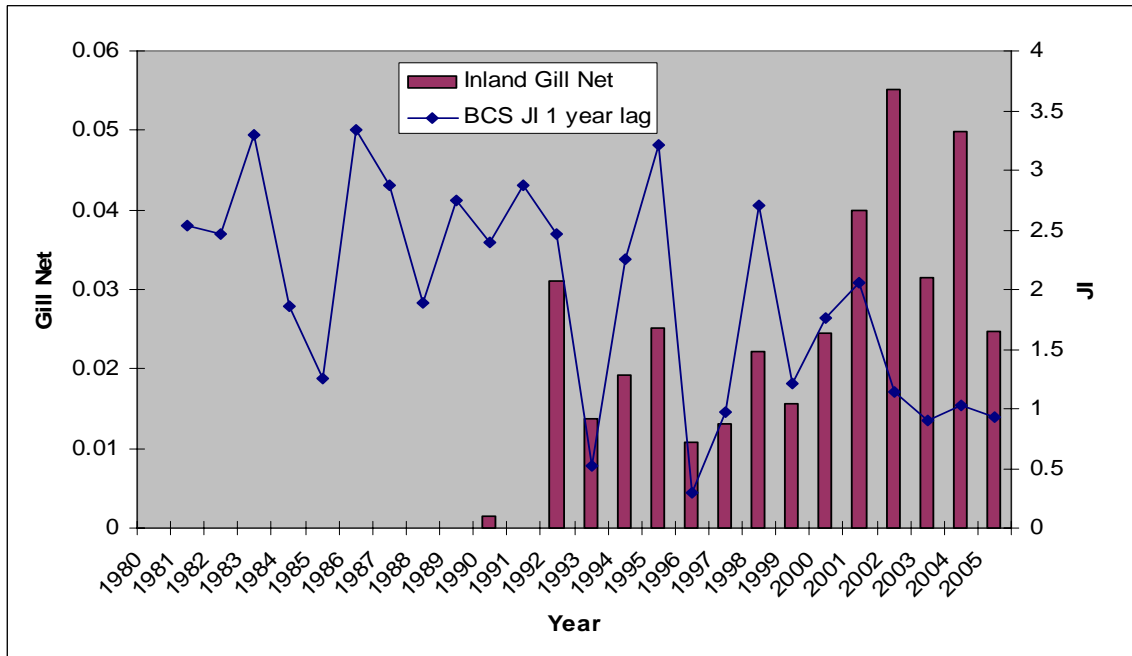


Figure 21. Maryland inland and shore angler MRFSS CPUE, 1981-2005.

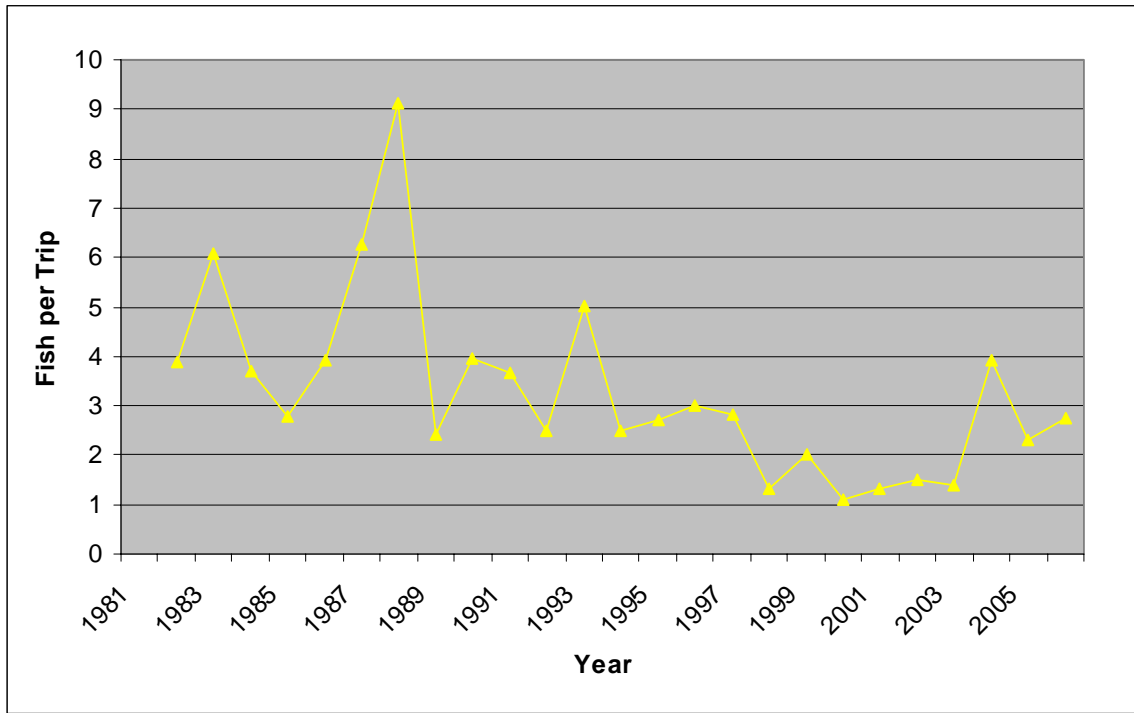


Figure 22. MRFSS index and JSS index lagged one year, 1981- 2005.

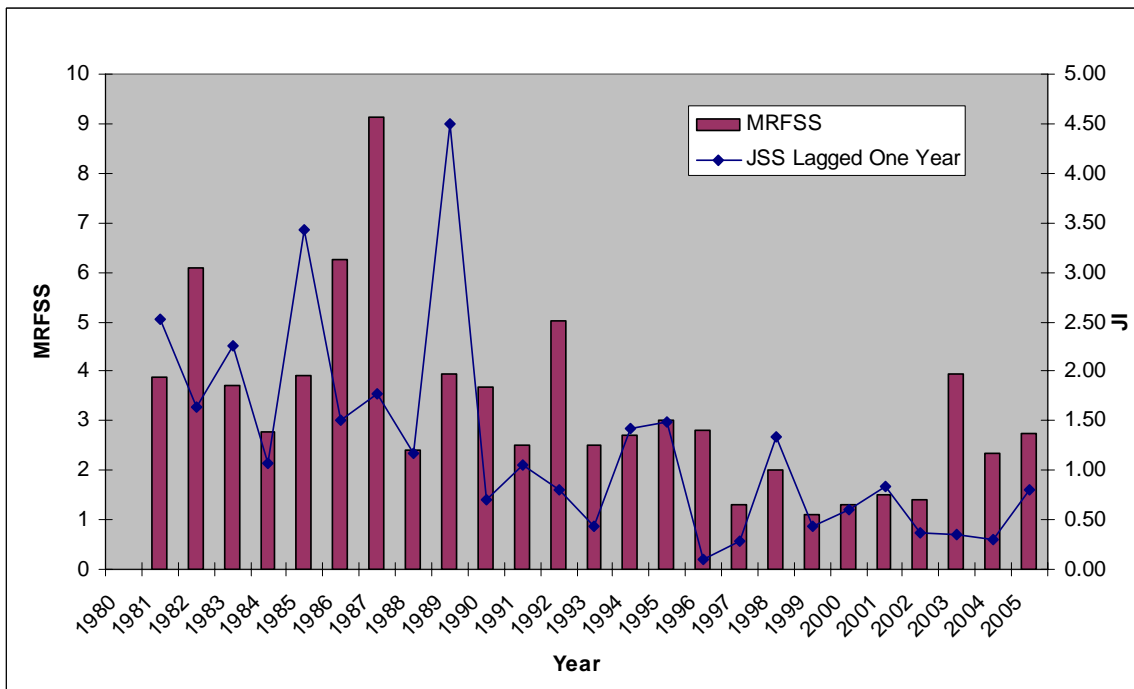


Figure 23. Maryland charter boat CPUE and inland MRFSS CPUEs, 1993-2006.

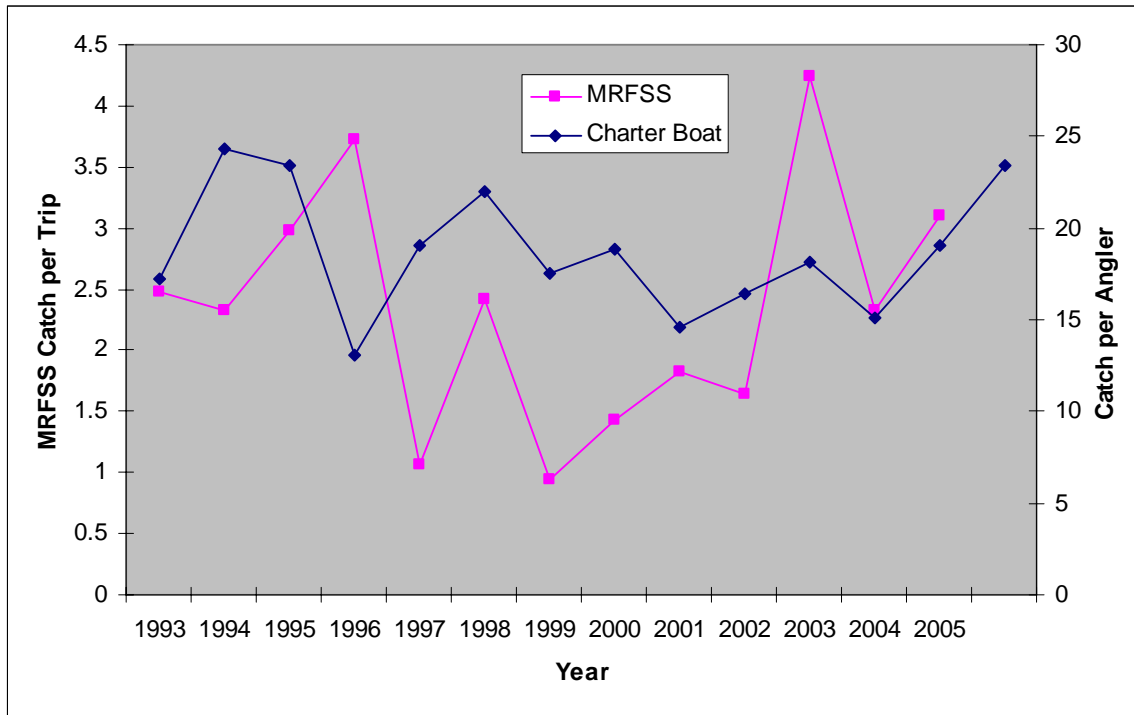


Figure 24. Comparison of spot BCS lagged one year and Maryland charter boat spot CPUE using linear regression, 1993-2006.

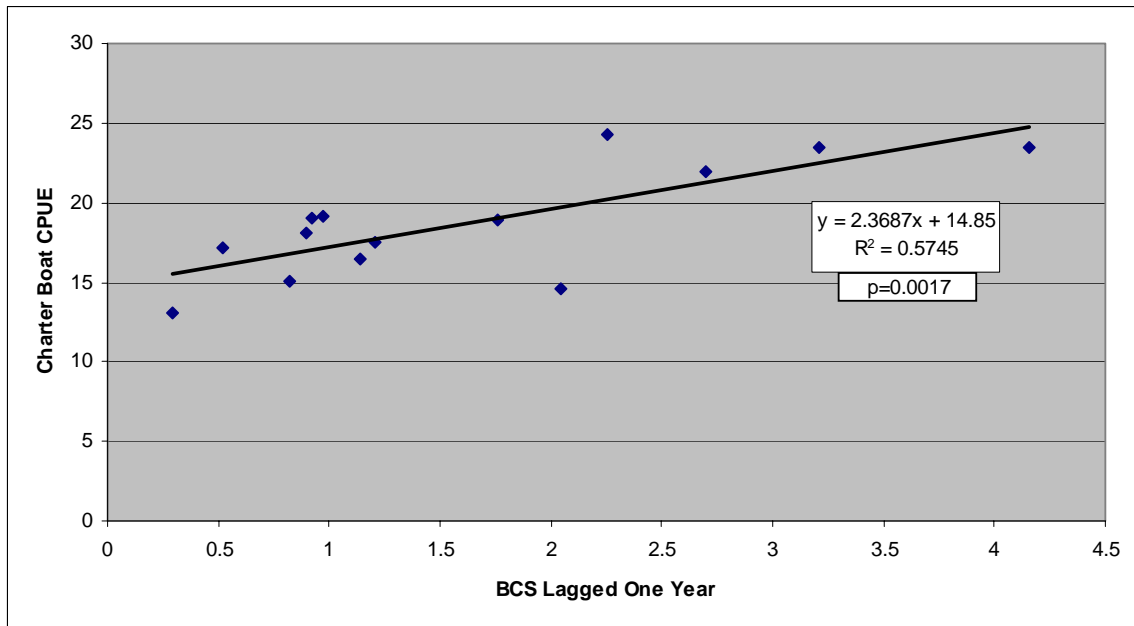
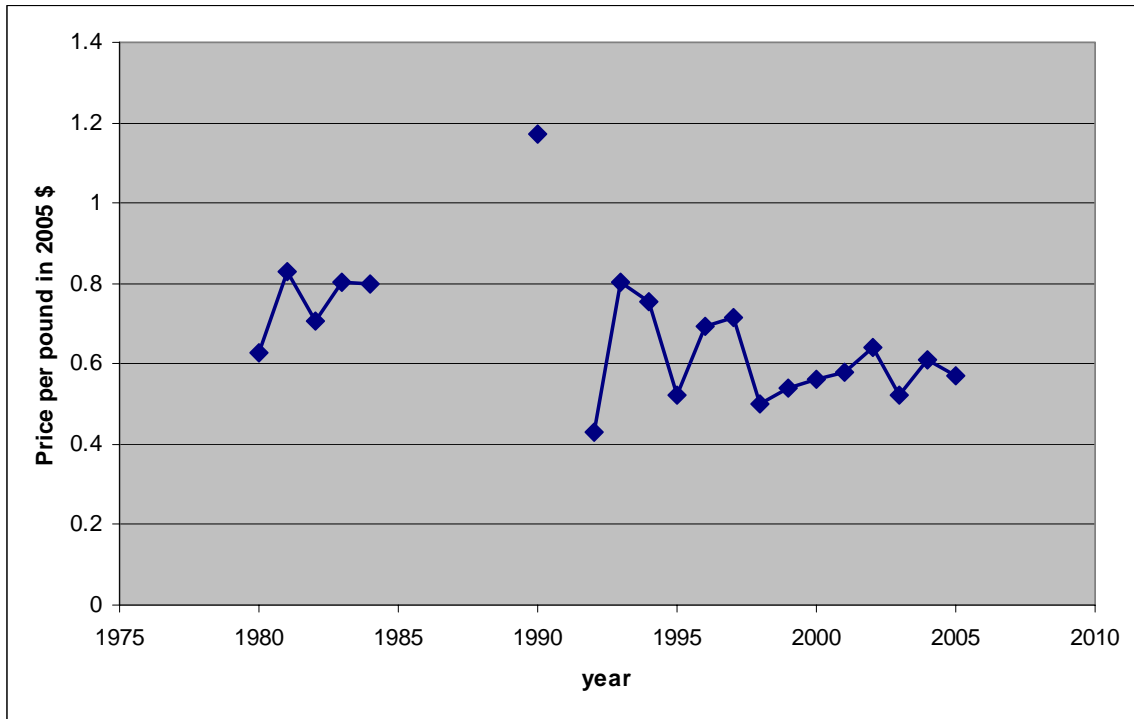


Figure 25. Price per pound, in 2005 dollars, for spot sold in Maryland, 1980-2005.



**SPOT HARVEST AND INDEX REPORT
For VIRGINIA**

A Report to the Atlantic States Marine Fisheries Commission

March 19, 2007

**Fisheries Management Division
Virginia Marine Resources Commission
2600 Washington Avenue
Newport News, VA 23607**

I. Introduction

During the October 2006 meeting of the Atlantic States Marine Fisheries Commission, the South Atlantic Board requested that the Spot Plan Review Team (PRT) compile and summarize catch-per-unit effort indices for spot. This report is the first-part of a multi-part project that the Spot PRT has developed to provide guidance to the South Atlantic Board as they consider possible amendments to the Spot Fisheries Management Plan. The Spot PRT is comprised of members representing the Maryland Department of Natural Resources, the Virginia Marine Resources Commission, and the North Carolina Division of Marine Fisheries. The Spot PRT plans to follow up their state specific reports on harvest and index information with additional work and a report on age-length-keys and catch-at-age matrices from the three states during Summer 2007 and recommendations for any further analysis or assessment if necessary.

II. Regulations

Virginia Marine Resources Division currently does not have regulations concerning recreational or commercial harvest of spot in Virginia coastal waters.

III. Harvest

Total commercial harvest of spot in Virginia waters has averaged 3,312,681 pounds from 1994 through 2006 (Table 1). Harvest data for 2006 is considered preliminary and will be finalized by May 2006. Total commercial harvest has ranged from a high of 4,269,420 pounds in 1994 to a low of 1,804,735 pounds in 2006. The low harvest in 2006 represents the third year of declining commercial harvest for spot.

Gill nets (anchored, drift, and stacked) represent 80.6 % of all commercial harvest for spot from 1994 through 2006, with harvest averaging 2,670,558 pounds per year (Table 2). Pound nets represented 10.2 % (338,094 pounds per year), haul seines 8.8 %

(291,291 pounds per year), and all other gear 0.4 % (12,738 pounds per year). Gill net harvests have had several peaks over 3.0 million pounds (1994, 1998, and 2000), however since 2004, landings have decreased to a time-series low of 1,430,273.

Recreational hook-and-line harvest of spot for Virginia is available from the Marine Recreational Fisheries Statistics Survey (MRFSS). During the period of 1994 through 2006 Virginia recreational harvest have averaged 923,281 pounds, with a high of 1,540,815 in 2006 and a low of 244,499 in 1999. For the time-series, recreational harvest had represented 20% of the overall harvest of spot in Virginia. However, since 2003, the recreational component has increased, comprising 46% of the total landings in 2006 (Figure 1).

IV. Indices

Dependent indices, representing pounds per trip, were developed from the VMRC Mandatory Reporting database for inshore gill net and haul seine for 1994 through 2005. Working in cooperation with biologist John Schoolfield (North Carolina Division of Marine Fisheries) to develop comparable indices for Virginia and North Carolina, directed inshore gill net trips were classified as those trips that harvested 100 pounds of spot or greater. The inshore gill net index peaked in 1998 at 632 pounds per trip, and has been on an overall decline, to 328 pounds per trip in 2005 (Table 3, Figure 2). However, prior to 1998, the inshore gill net pounds per trip ranged 292 to 354 from 1994 through 1997, which are similar to recent ranges in values. Spot comprised an average of 7% of the total harvest by inshore gill net during the 1994 through 2005 time-series. The haul seine index has been more variable, with ranging from 1,020 pounds per trip in 1996 to 512 pounds per trip in 1997 (Table 4, Figure 3). Spot comprised an average of 96% of the total harvest for haul seines during the 1994 through 2005 time-series.

Virginia Institute of Marine Sciences (VIMS) has conducted an annual fisheries trawl survey since 1955 (Montane and Fabrizio 2006). The VIMS trawl survey provided ASMFC with the only spot young of the year (YOY) index available on the East Coast for the 2003 ASMFC Spot FMP. VIMS provides various YOY indices from the trawl survey (Table 5), including a Random Stratified Converted Index (RSCI) based on post-stratified gear and/or vessel converted index using all spatially appropriate data, and the original indices based on the present Bay strata and the fixed mid-channel tributary stations (Bay & River Index – BRI and River Only – RO). Montane and Fabrizio (2006) reported that spot had often been the most abundant of the recreational species caught by the survey, and spot distribution was still wide and consistent through out the sampling areas. Montane and Fabrizio (2006) also report the RSCI index for spot exhibited a significant negative slope when regressed against year and a consistent decline is evident from 1992 to present (Figure 4). However the RSCI, as well as the BRI and RO indices (Figure 5), all show index increased for 2005.

V. Summary

Spot harvest and index data indicate that in recent years the resource has been on an overall decline with a slight upturn in VIMS index values for 2005. However, the data

are still inconclusive as to the cause of the overall decline in values in recent years for Virginia. The overall decline may be due to some form of overfishing by one or more sectors of the commercial and recreational fishery, or it may be part of a larger issue of habitat degradation throughout the species range. The lower Chesapeake Bay has been well documented as a key nursery area of spot, as well as numerous other ecologically important finfish and invertebrates. The noted future work of the Spot PRT, to develop a catch-at-age matrix for spot, should be supplemented with additional information on life-history attributes and habitat requirements for spot, to provide the South Atlantic Board the best available science to base management decisions upon.

VI. Literature Cited

Montane, M.M. and M.C. Fabrizio. 2006. Estimating relative abundance of recreationally important finfish and crustaceans in the Virginia portion of Chesapeake Bay, Project # RF 05-15, June 2005-May 2006. Annual report to the Virginia Marine Resources Commission Marine Recreational Fishing Advisory Board. Virginia Institute of Marine Science, Gloucester Point, VA. 125 pp. (Revised December 7, 2006)

Table 1. Virginia recreational and commercial harvest for spot, 1994 through 2006*.

| YEAR | RECREATIONAL | COMMERCIAL | TOTAL |
|--------------|---------------------|-------------------|--------------|
| 1994 | 1,217,036 | 4,269,420 | 5,486,456 |
| 1995 | 1,067,637 | 3,622,654 | 4,690,291 |
| 1996 | 492,982 | 2,985,971 | 3,478,953 |
| 1997 | 1,263,447 | 3,524,636 | 4,788,083 |
| 1998 | 866,619 | 4,412,454 | 5,279,073 |
| 1999 | 244,499 | 2,975,624 | 3,220,123 |
| 2000 | 252,885 | 3,808,291 | 4,061,176 |
| 2001 | 523,202 | 3,249,111 | 3,772,313 |
| 2002 | 829,972 | 3,080,551 | 3,910,523 |
| 2003 | 875,729 | 3,492,429 | 4,368,158 |
| 2004 | 1,392,871 | 3,387,742 | 4,780,613 |
| 2005 | 1,434,965 | 2,451,234 | 3,886,199 |
| 2006* | 1,540,815 | 1,804,735 | 3,345,550 |

* 2006 Virginia harvest data preliminary

Table 2. Virginia commercial harvest for spot, by gear, 1994 through 2006*.

| Year | Gill Net** | Haul Seine | Other*** | Pound Net | Grand Total |
|--------------|-------------------|-------------------|-----------------|------------------|--------------------|
| 1994 | 3,548,883 | 299,903 | 3,942 | 416,692 | 4,269,420 |
| 1995 | 2,857,071 | 176,098 | 5,006 | 584,479 | 3,622,654 |
| 1996 | 2,351,153 | 339,417 | 760 | 294,641 | 2,985,971 |
| 1997 | 2,905,284 | 271,308 | 11,902 | 336,142 | 3,524,636 |
| 1998 | 3,517,806 | 463,791 | 40,073 | 390,784 | 4,412,454 |
| 1999 | 2,394,408 | 327,497 | 32,969 | 220,750 | 2,975,624 |
| 2000 | 3,206,855 | 337,626 | 11,261 | 252,549 | 3,808,291 |
| 2001 | 2,642,878 | 222,431 | 20,664 | 363,138 | 3,249,111 |
| 2002 | 2,493,702 | 227,978 | 4,494 | 354,377 | 3,080,551 |
| 2003 | 2,609,708 | 350,586 | 6,891 | 525,244 | 3,492,429 |
| 2004 | 2,809,532 | 246,556 | 7,140 | 324,514 | 3,387,742 |
| 2005 | 1,949,696 | 248,244 | 15,415 | 237,879 | 2,451,234 |
| 2006* | 1,430,273 | 275,344 | 5,079 | 94,039 | 1,804,735 |

* 2006 Virginia harvest data preliminary

** Gill nets included anchored, drift, and staked gill nets

*** Other includes pots, hand-line, and crab pound net

Table 3. Virginia directed inshore gill net pounds per trip for 1994 through 2005. Directed gill net trips were specified as any trips with 100 pounds of spot or greater.

| YEAR | POUNDS | TRIPS | POUNDS / TRIP |
|-------------|---------------|--------------|----------------------|
| 1994 | 168,982 | 494 | 342 |
| 1995 | 142,443 | 488 | 292 |
| 1996 | 162,275 | 459 | 354 |
| 1997 | 166,844 | 497 | 336 |
| 1998 | 418,933 | 663 | 632 |
| 1999 | 283,130 | 490 | 578 |
| 2000 | 337,490 | 625 | 540 |
| 2001 | 186,120 | 527 | 353 |
| 2002 | 219,617 | 516 | 426 |
| 2003 | 140,433 | 322 | 436 |
| 2004 | 179,128 | 435 | 412 |
| 2005 | 78,786 | 240 | 328 |

Table 4. Virginia haul seine pounds per trip for 1994 through 2005.

| YEAR | POUNDS | TRIPS | POUNDS / TRIP |
|-------------|---------------|--------------|----------------------|
| 1994 | 275,224 | 332 | 829 |
| 1995 | 174,435 | 285 | 612 |
| 1996 | 319,265 | 313 | 1,020 |
| 1997 | 215,588 | 421 | 512 |
| 1998 | 439,902 | 438 | 1,004 |
| 1999 | 311,594 | 409 | 762 |
| 2000 | 337,053 | 350 | 963 |
| 2001 | 220,118 | 362 | 608 |
| 2002 | 227,947 | 346 | 659 |
| 2003 | 346,646 | 378 | 917 |
| 2004 | 246,556 | 272 | 906 |
| 2005 | 243,459 | 352 | 692 |

Table 5. Virginia Institute of Marine Science YOY indices for spot, 1994 through 2005.

| Year | Converted Index (RSCI) | | | | Original Index | | | |
|------|------------------------|-------------------|-------------------|-------|----------------------|-----|------------|-----|
| | Geo Mean | 95% C.I. Lower | 95% C.I. Upper | C.V. | Bay & River (BRI) | N | River Only | N |
| 1955 | 1.58 | 1.27 | 1.92 | 6.61 | | | | |
| 1956 | 98.77 | 50.85 | 190.95 | 7.11 | | | | |
| 1957 | 24.87 | 6.38 | 89.67 | 19.28 | | | | |
| 1958 | 7.22 | 3.41 | 14.33 | 14.78 | | | | |
| 1959 | 13.01 | 5.14 | 30.97 | 15.63 | | | | |
| 1960 | 9.30 | 0.33 | 78.52 | 43.83 | | | | |
| 1961 | 8.81 | 2.03 | 30.81 | 25.75 | | | | |
| 1962 | 191.03 | 30.41 | 1172.08 | 17.22 | | | | |
| 1963 | 13.25 | 1.02 | 99.35 | 36.74 | | | | |
| 1964 | 37.85 | 17.32 | 81.36 | 10.27 | | | | |
| 1965 | 2.20 | 0.86 | 4.49 | 23.24 | | | | |
| 1966 | 37.96 | 15.86 | 89.01 | 11.43 | | | | |
| 1967 | 6.02 | 1.34 | 20.08 | 28.22 | | | | |
| 1968 | 143.77 | 58.12 | 353.49 | 9.00 | | | | |
| 1969 | 52.50 | 25.53 | 106.89 | 8.81 | | | | |
| 1970 | 5.59 | 0.10 | 38.52 | 47.51 | | | | |
| 1971 | 82.09 | 56.47 | 119.15 | 4.17 | | | | |
| 1972 | 98.08 | 91.85 | 104.73 | 0.71 | | | | |
| 1973 | 13.57 | 9.87 | 18.53 | 5.46 | | | | |
| 1974 | 15.62 | 6.85 | 34.21 | 13.35 | | | | |
| 1975 | 33.24 | 21.82 | 50.36 | 5.74 | | | | |
| 1976 | 14.03 | 10.06 | 19.42 | 5.65 | | | | |
| 1977 | 28.75 | 20.47 | 40.23 | 4.81 | | | | |
| 1978 | 9.79 | 6.40 | 14.71 | 7.91 | | | | |
| 1979 | 49.03 | 42.94 | 55.95 | 1.66 | 17.29 | 123 | | |
| 1980 | 16.46 | 10.92 | 24.60 | 6.68 | 8.94 | 146 | | |
| 1981 | 31.69 | 25.22 | 39.76 | 3.16 | 31.06 | 137 | | |
| 1982 | 58.50 | 30.94 | 109.84 | 7.61 | 36.52 | 151 | | |
| 1983 | 14.99 | 12.06 | 18.59 | 3.65 | 21.51 | 151 | | |
| 1984 | 41.62 | 22.86 | 75.15 | 7.73 | 50.28 | 132 | | |
| 1985 | 11.90 | 6.98 | 19.84 | 9.38 | 19.59 | 118 | | |
| 1986 | 21.07 | 16.10 | 27.48 | 4.12 | 26.32 | 144 | | |
| 1987 | 8.96 | 7.10 | 11.24 | 4.50 | 20.45 | 133 | | |
| 1988 | 50.91 | 35.51 | 72.80 | 4.45 | 67.45 | 231 | 50.2 | 84 |
| 1989 | 22.46 | 17.70 | 28.45 | 3.60 | 32.27 | 252 | 54.19 | 84 |
| 1990 | 33.88 | 24.63 | 46.46 | 4.34 | 45.28 | 248 | 53.06 | 81 |
| 1991 | 16.83 | 12.78 | 22.08 | 4.48 | 16.56 | 238 | 21.44 | 83 |
| 1992 | 2.02 | 1.54 | 2.58 | 7.78 | 1.96 | 238 | 4.39 | 82 |
| 1993 | 9.99 | 7.45 | 13.30 | 5.48 | 9.74 | 240 | 11.85 | 84 |
| 1994 | 9.68 | 7.28 | 12.79 | 5.38 | 9.07 | 240 | 8.88 | 84 |
| 1995 | 1.81 | 1.39 | 2.30 | 7.87 | 1.52 | 248 | 2.37 | 92 |
| 1996 | 5.26 | 4.15 | 6.60 | 5.30 | 4.52 | 244 | 4.84 | 88 |
| 1997 | 11.50 | 9.11 | 14.45 | 4.20 | 8.63 | 256 | 19.68 | 100 |
| 1998 | 2.51 | 1.92 | 3.23 | 7.36 | 1.88 | 214 | 3.04 | 96 |
| 1999 | 4.72 | 3.63 | 6.07 | 6.07 | 3.98 | 238 | 6.61 | 100 |
| 2000 | 3.32 | 2.57 | 4.23 | 6.51 | 2.70 | 253 | 4.94 | 97 |
| 2001 | 3.09 | 2.45 | 3.85 | 6.06 | 2.83 | 264 | 3.69 | 100 |
| 2002 | 2.89 | 2.10 | 3.88 | 8.38 | 2.09 | 196 | 3.12 | 100 |
| 2003 | 2.85 | 2.25 | 3.56 | 6.32 | 2.58 | 256 | 2.32 | 100 |
| 2004 | 3.96 | 3.14 | 4.95 | 5.68 | 3.21 | 255 | 6.91 | 99 |
| 2005 | 12.12 | 9.80 | 14.94 | 3.78 | 8.91 | 256 | 16.58 | 100 |

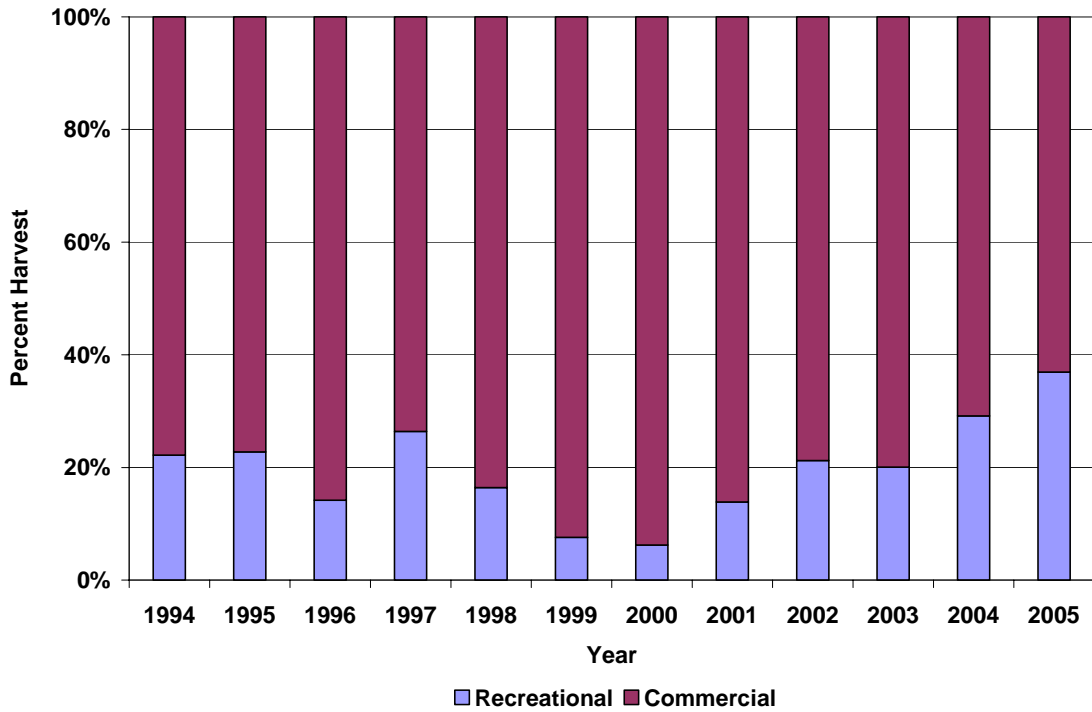


Figure 1. Percentage of spot harvest by the recreational and commercial fishery in Virginia, 1994 through 2005.

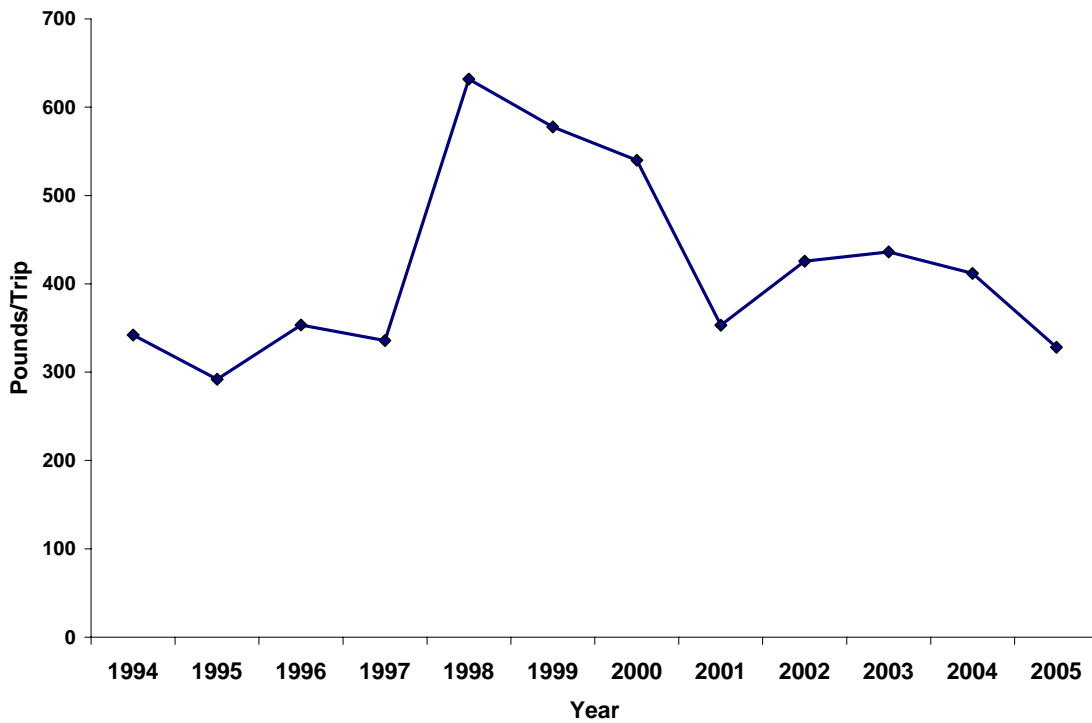


Figure 2. Virginia directed inshore gill net pounds per trip for 1994 through 2005. Directed gill net trips were specified as any trips with 100 pounds of spot or greater.

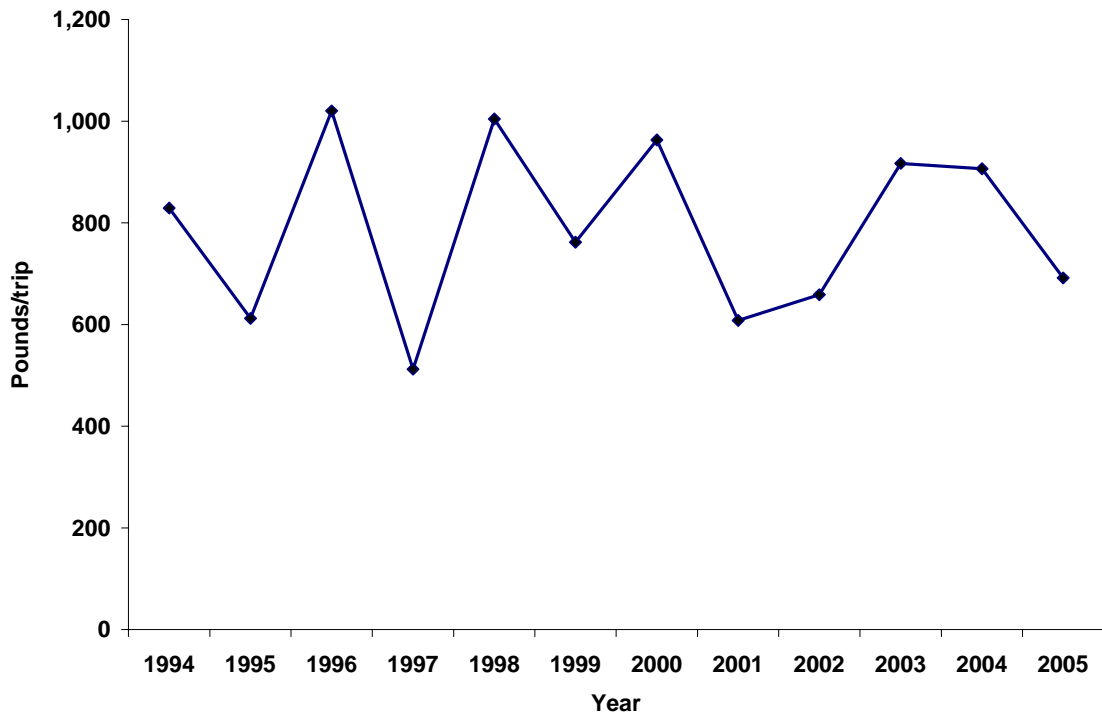


Figure 3. Virginia haul seine pounds per trip for 1994 through 2005.

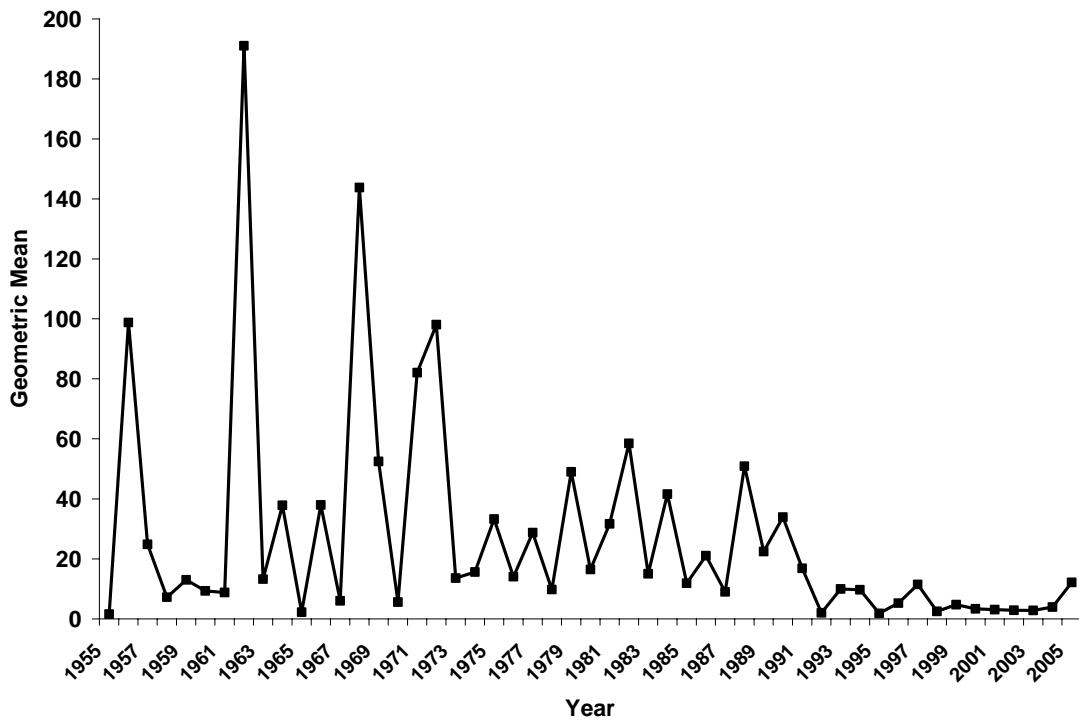


Figure 4. VIMS trawl survey YOY RSCI index, 1955 through 2005.

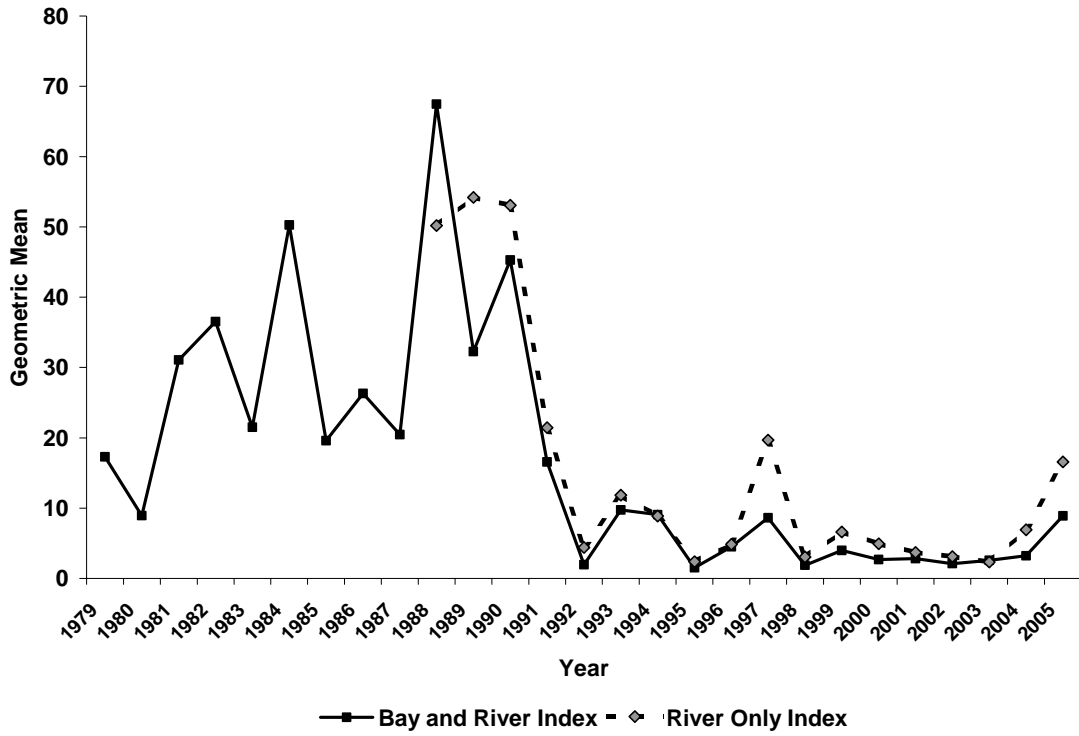


Figure 5. VIMS trawl survey YOY Bay and River Index and River Only Index, 1979 through 2005.

SPOT HARVEST AND INDEX REPORT For NORTH CAROLINA

A Report to the Atlantic States Marine Fisheries Commission

March 23, 2007
North Carolina Division of Marine Fisheries

Recent (1994-2005, some 2006) Trends in North Carolina Commercial, Recreational and Commercial Recreational Spot Fisheries

Dependent Data: (courtesy North Carolina Trip Ticket Program (NCTTP))

- Commercial Landings have averaged about 2.5 million pounds (Figure 1)
- Three major fisheries accounted for an average of 88.5% of landings, inshore gill net, ocean gill net and long haul (Figure 2)
- Declines > than 20% year to year occurred 3 of the 12 years, most recently in 2005 when harvest decreased 26%.
- Effort has declined in 2 of the 3 major fisheries harvesting spot: ocean gill net and longhaul and increased in the inshore gill net fishery. (Figure 3)
- Number of longhaul trips has been flat since 1999 but declined from 615 trips in 1994 to 327 trips in 2005, a decrease of 46.8%, ocean gill net trips catching at least 100 lb of spot steadily decreased from 952 trips in 1994 to 340 trips in 2005, a 64.3% decrease (Figure 3)
- NCTTP catch and effort data indicate CPUEs have been relatively stable in all three major fisheries (Figures 4 and 5).
- Hurricane Katrina in the fall of 2005 impacted the commercial spot fishery effort with huge escalations in fuel prices.
- 2005 Ocean gill net trips decreased 40.7% year to year, long haul trips decreased 5.2 % year to year, inside gill net trips increased 3.3% while total commercial landings hit 13-year and historical low, down 26% year to year.

Dependent Data: Marine Recreational Fishery Statistics Survey (MRFSS)

- Landings in the recreational fishery have averaged 1.2 million lb (Figure 1)
- Landings in 2005 were 10.5% below 1994-2005 mean.
- Fluctuations have been common, landings up > 100% in 2001 relative to 2000, down 45% in 2002
- High fuel prices from Hurricane Katrina may have impacted 2005 effort.

Dependent Data: Recreational Commercial Gear License (RCGL). Catch data from NC Marine Fisheries License and Statistics section

RCGL allows licensee the right to catch spot with commercial gear (mostly gill nets) but license does not allow sale of these fish.

- NCDMF began to gather data in 2002 on RCGL license holders and spot landings have averaged 260,000 lb since 2002.
- Both landings and trips declined 23% form 2004 to 2005 (Figure 6), possible Katrina influence.
- CPUEs increased in 2003, changed little in other three years (Figure 7)

Dependent Data: North Carolina Citation Program

North Carolina awards a citation to any spot caught by hook and line if weight exceeds 1 pound.

- 1994-1999, year with highest number citations was 1999 with 10
- Beginning in 2000, many more citation sized fish applications were processed, 19 in 2000, 249 in 2001 and 81 in 2005 (Figure 8)

Dependent Data: Marine Recreational Fisheries Statistics Survey (MRFSS)

The North Carolina mean catch per angler trip (CPUE) was examined from 1989 to 2006. This was calculated by summing Type A and Type B1 catch and divided by the number of contributing fishermen at the interview level. Mean catch is the mean of (A + B1) at the interview/trip level.

- CPUE has fluctuated between 4.2 and 10.2 since 1989, 2006 value was 6.6, slightly below the 18 year mean of 7.3 (Figure 9)
- Trend line has a positive slope since 1989 indicating a slight increase in CPUE during the 18 year period

Independent Data: Program 195, Pamlico Sound Survey

Fifty-two randomly selected stations (grids) are sampled in June and again in September. Stations are randomly selected from strata based upon depth and geographic location. Randomly selected stations are optimally allocated among the strata based upon all previous sampling in order to provide the most accurate abundance estimates (PSE <20). Tow duration is 20 minutes; utilizing double rigged demersal mongoose trawls (9.1-m headrope, 1.0-m X 0.6 m doors, 2.2 cm bar mesh body, 1.9 cm bar mesh cod end and a 100-mesh tailbag extension.

- Data from this survey were used to produce juvenile abundance indices (JAI) for spot (Figure 10)
- CPUEs have been extremely variable with no clear trend.
- Most recent year (2006) was lowest of the 13 years, slightly below 1994, 1997, 1998, and 2000

Independent Data: Program 120 Estuarine Monitoring

One hundred five estuarine core stations along the coast are sampled each year without deviation to produce the JAI. The gear used is a two-seam 10.5 foot headrope trawl with a ¼ " mesh in the body and 1/8" mesh in the tailbag. Tow duration is calibrated for 1 minute and a span of 75 yards.

- Data from this survey were used to produce JAIs for spot (Figure 11)
- These data also show wide fluctuations with no clear trend
- CPUE in 2006 was the 2nd lowest since 1994.

Independent Data: Independent Gill Net Survey, Pamlico Sound

This study that began in 2002 employs a stratified-random sampling design based on area and water depth. An array of nets consisting of 30-yard segments of 3, 3½, 4, 4½, 5, 5½, 6, and 6½ inch stretched mesh webbing is set. Catches from an array of gill nets comprise a single sample and two samples (one shallow, one deep), totaling 480 yards of gill nets fished, were completed in a trip. Within a month, 32 core samples were completed (8 areas x twice a month x 2 samples). Data are used to calculate annual indices of abundance for Pamlico Sound for the following target species: Atlantic croaker (*Micropogonias undulatus*), bluefish (*Pomatomus saltatrix*), red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*), spot (*Leiostomus xanthurus*), weakfish (*Cynoscion regalis*), spotted seatrout (*Cynoscion nebulosus*), and striped bass (*Morone saxatilis*).

- Adult spot CPUE trends have fluctuated little in the 5 years of the study (Figure 12).
- CPUE highest in 2001, lowest in 2005
- Number of spot captured ranged from 1,414 to 2,108 during 2001-2005

Discussion

Commercial landings in North Carolina's major fisheries (long haul and ocean gill net) declined in 2004 and 2005 but effort also declined proportionately. CPUEs in the long haul and ocean gill net fisheries indicated catch rates typical of the last twenty years. The commercial fishery that exhibited an expansion in landings and trips since 2002 was the estuarine gill net fishery. This fishery contributed 44% of the commercial spot landings in 2005, the largest percentage since the inception of the NCTTP in 1994. High fuel prices in the aftermath of Hurricane Katrina may have concentrated more fishermen in the estuarine waters during 2005.

Juvenile abundance indices fluctuated much over the study period, a trend that is not remarkable for short-lived species such as spot. CPUEs in the Pamlico Sound Survey and the Estuarine Trawl Survey decreased in 2005 and 2006, a trend similar to JAI dips between 1996 and 1998.

The CPUE values for the Pamlico Sound adult gill net survey have been less than the high in 2001 but stable over the last 4 years (2002-2005). Landings and trips in the RCGL fishery have decreased but the CPUE values have fluctuated little. The catch per angler trip since 1989 shows the same type of pattern as the juvenile and adult indices.

Recent decreases in the indices and the landings are disconcerting but don't seem unusual for this species. The life history of spot suggests that year class strength is often determined by environmental conditions that prevail on spawning grounds and nursery areas and fluctuations in year class strengths are to be expected. However, since spot are such an estuarine dependent species water quality/habitat degradation issues may also significantly affect year class strengths. An analysis of North Carolina spot catch at age data for the last six years is planned in 2007 and should provide more insight into the health of the stock.

Commercial Spot Landings by Year

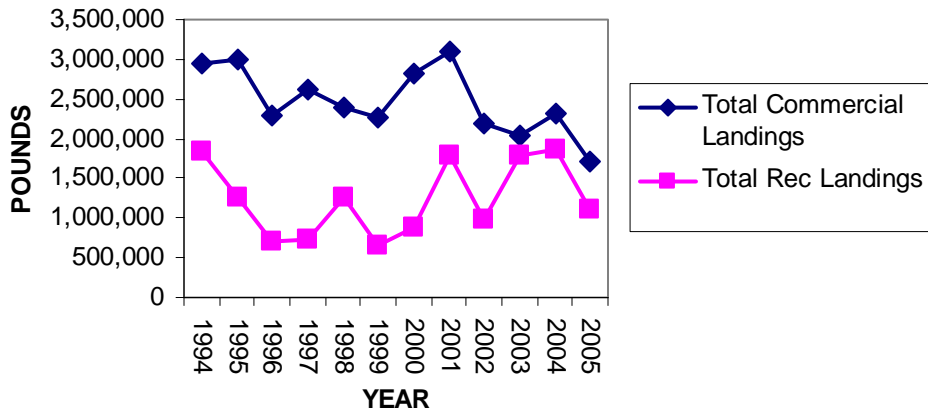


Figure 1. North Carolina commercial and recreational landings, 1994-2005.

Major Commercial Fisheries, Spot

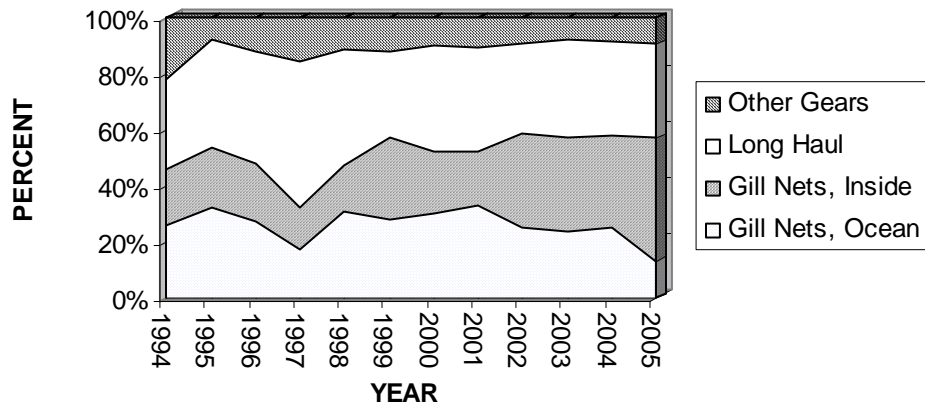


Figure 2. Major commercial gears capturing spot, 1994-2005.

Spot Trips in Major Fisheries

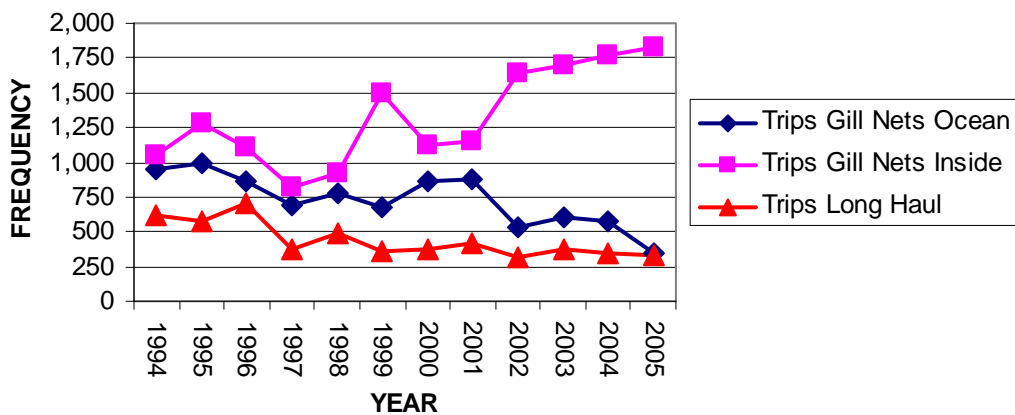


Figure 3. Targeted spot trips in major North Carolina commercial fisheries, 1994-2005. A targeted gill net trip was defined as a trip landing greater than 100 lb of spot.

Longhaul CPUE

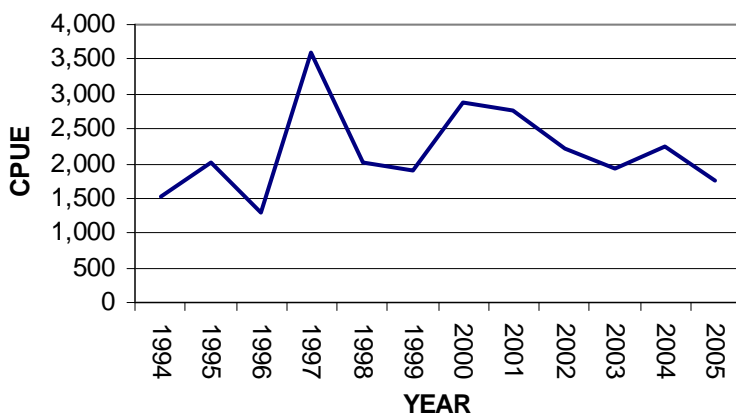


Figure 4. CPUE of longhaul fishery based on NCTTP trips and landings, 1994-2005.

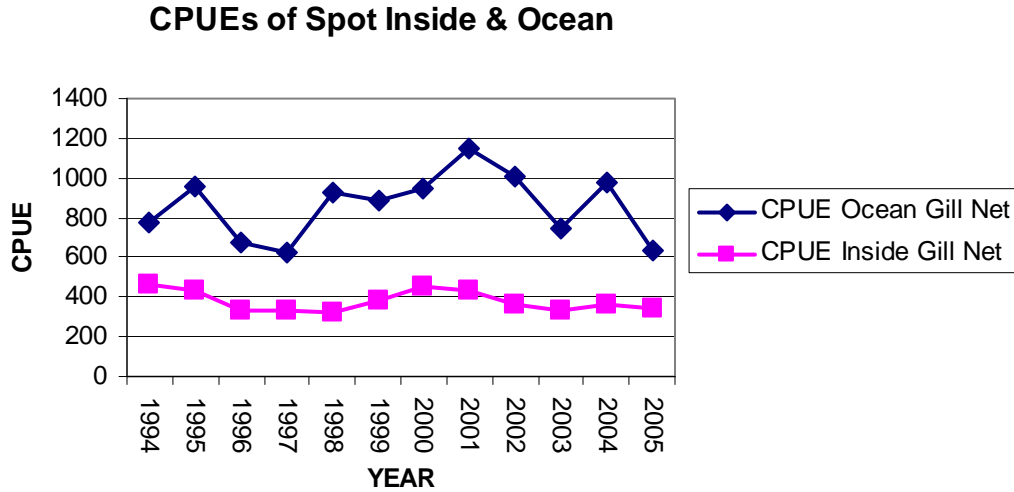


Figure 5. North Carolina ocean and estuarine spot CPUEs based on targeted gill net trips (trips greater than 100 lb of spot), 1994-2005.

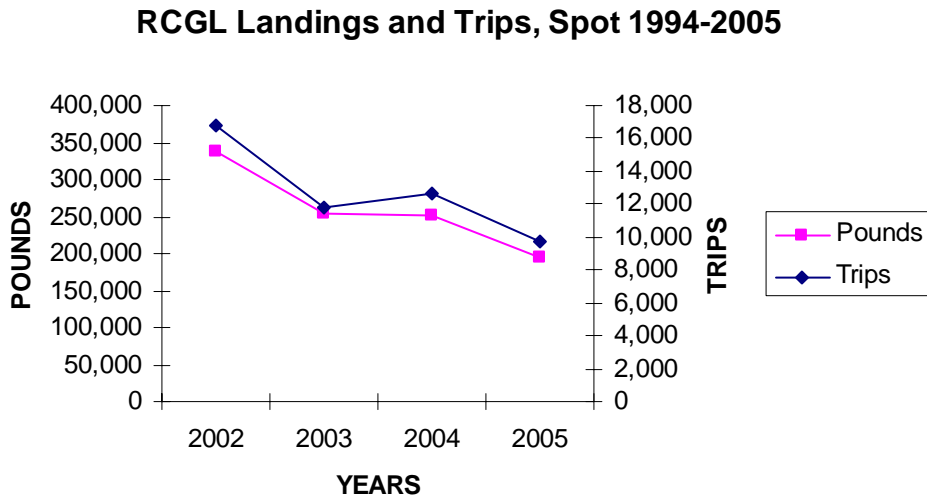


Figure 6. Spot landings from North Carolina Recreational Commercial Gear License holders, 2002-2005.

CPUE of Spot with RCGL

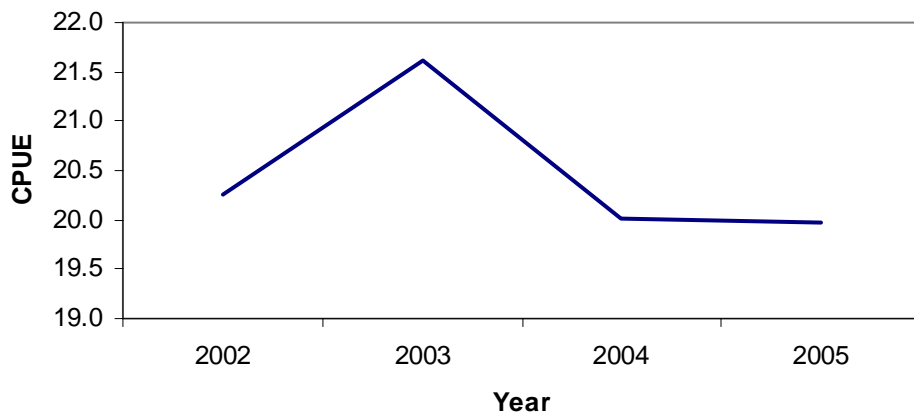


Figure 7. North Carolina spot CPUEs from RCGL license holders, 2002-2005.

NC Spot Citations (1 lb)

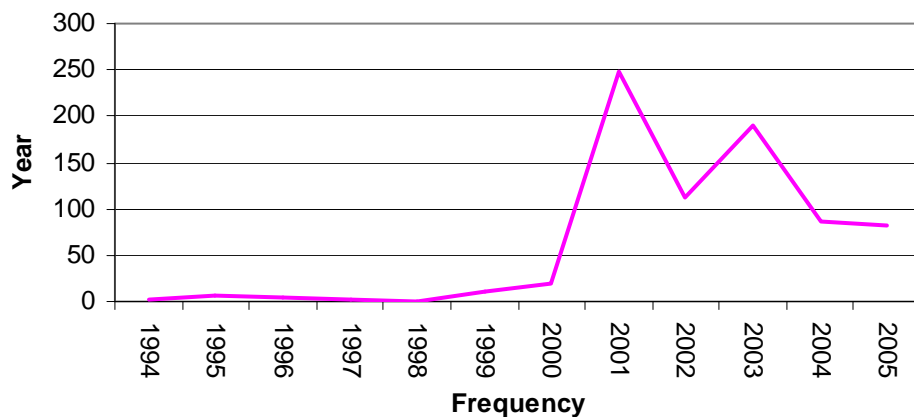


Figure 8. Number of spot citations (issued for recreational catches > 1 lb), 1994-2005.

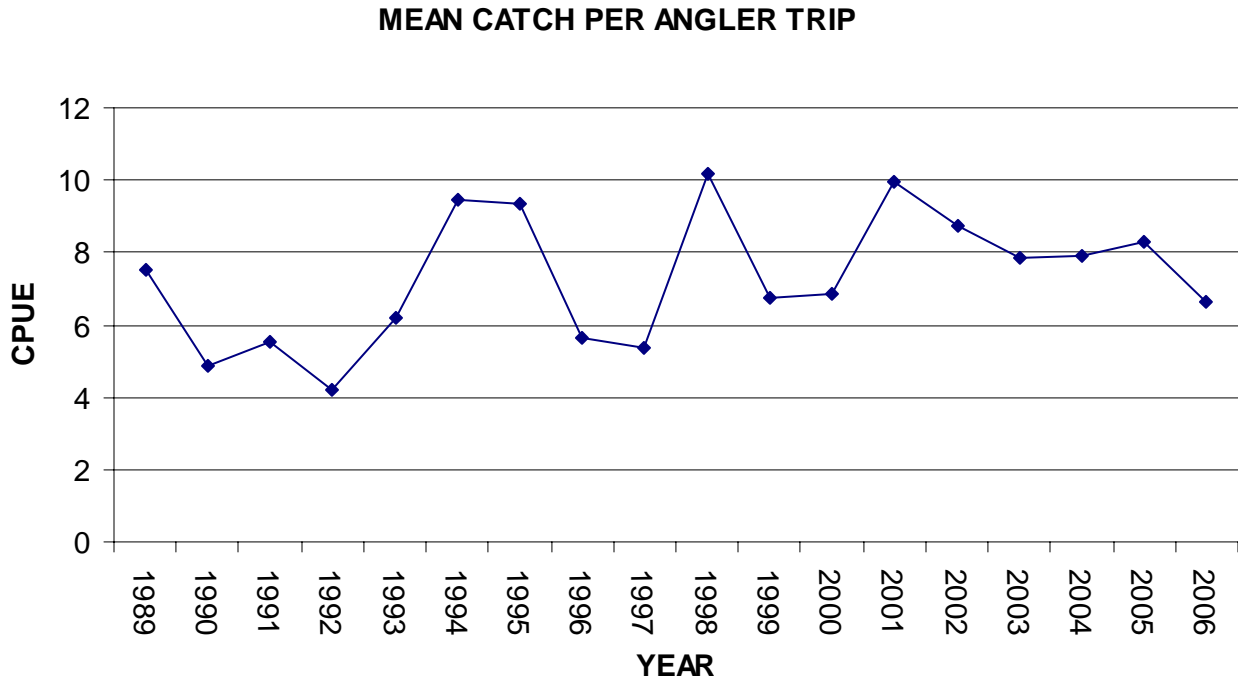


Figure 9. Mean Catch of spot per angler trip, MRFSS Survey, 1989-2006.

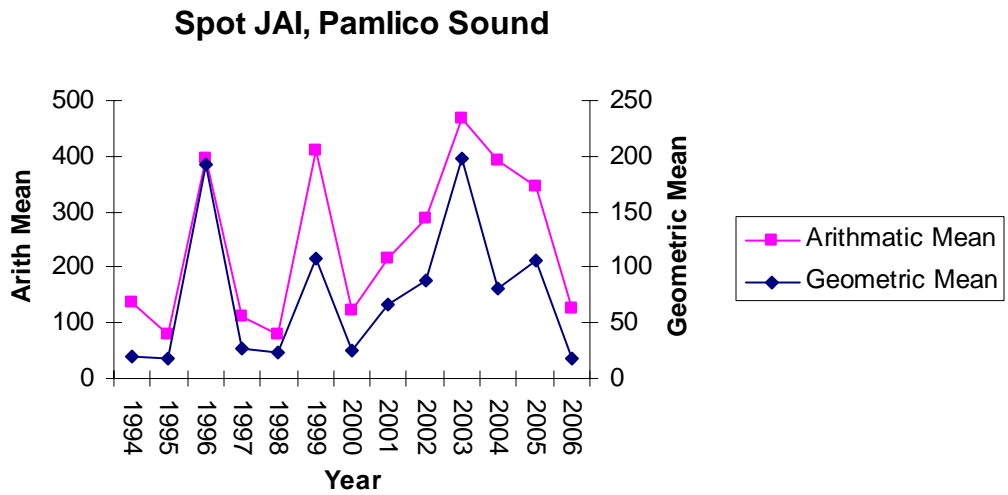


Figure 10. North Carolina Pamlico Sound Survey, juvenile indices for spot 1994-2006.

Spot JAI, Estuarine Monitoring Program

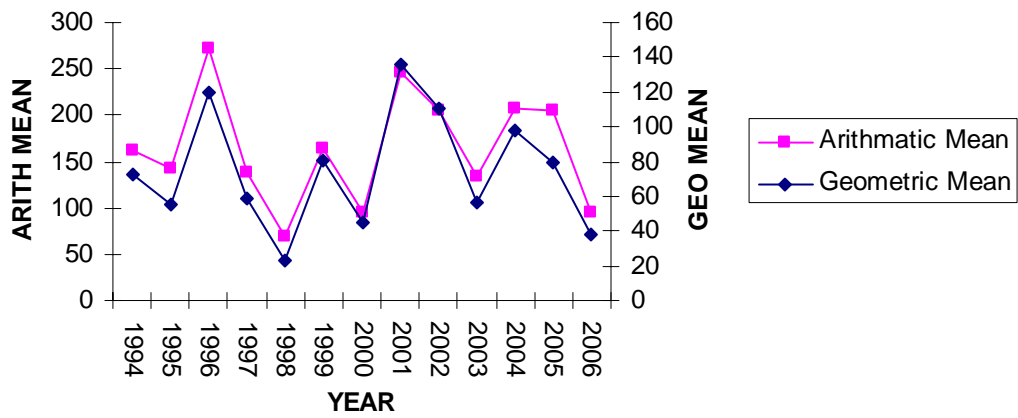


Figure 11. North Carolina Estuarine Trawl Survey juvenile indices for spot, 1994-2006.

NC Spot CPUEs, Pamlico Sound, Adults

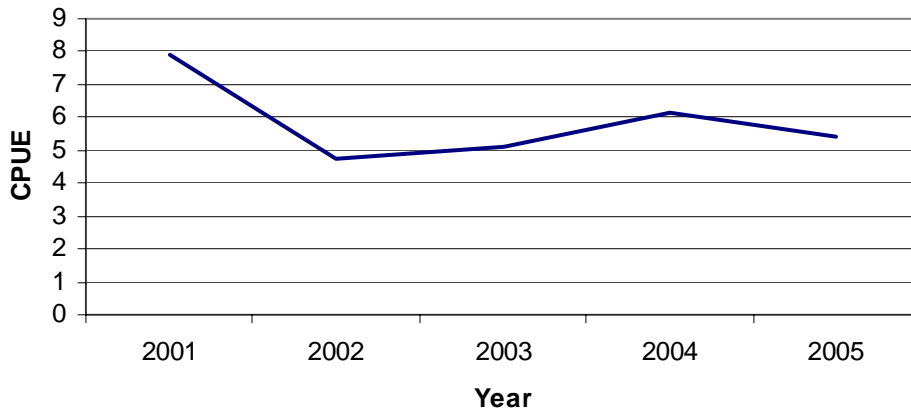


Figure 12. NC spot annual weighted CPUE from Pamlico Sound Independent Gill Net Survey, 2001-2005.