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Oyster Spatfall In Virginia Waters

❖ *1992 Annual Summary* ❖

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Introduction

The Virginia Institute of Marine Science (VIMS) conducts surveys of oyster spatfall (or "setting") in Virginia waters throughout the summer reproductive period. This survey provides an estimate of the **potential** of a particular area for receiving a "strike" or set of oysters on the bottom and helps define the timing of setting events. Information obtained from this effort is valuable to the Virginia Marine Resources Commission (VMRC) for its shell repletion program, and to private oyster growers, both of which are interested in maximizing the timing of shell planting. In addition, by maintaining a long-term data base, trends in spatfall throughout the lower Chesapeake Bay can be monitored. This, in turn, provides an index of the general health of the Bay.

Bi-weekly updates of spatfall data are provided to interested parties throughout the summer. This report summarizes data collected during the entire 1992 setting season.

Methods

Spatfall in 1992 was monitored from June through the first week of October at a total of 44 stations (Figure 1). Four stations were added this year in the Potomac River-Nomini Bay, Currioman Bay, Lower Machodoc River, and Ragged Point. Throughout this period shellstrings were deployed 0.5 m off the bottom at each station. A shellstring consisted of 12 oyster shells of similar size (about 3") drilled through the center and strung (inside of shell down) on a piece of heavy gauge wire. Shellstrings were replaced after a one week exposure, and the number of spat that attached to the smooth surface (underside) of the center 10 shells was counted with the aid of a dissecting microscope. This number was then divided by 10 to get the number of spat per shell for that time interval. A computer program was used to calculate the number of spat per shell per week. These values were interpreted as follows: <0.1, "none"; 0.1-1.0, "light"; 1.1-10.0, "moderate"; and 10.1, "heavy."

Weekly sampling allowed setting trends over the course of the summer to be compared between the various locations. Comparisons of setting intensity between years were made by adding the weekly values of spat per shell for the entire setting season.

Results

Weekly spat/shell values and annual spatfall totals (sums of weekly values) are given in Table I.

❖ *James River*

Eleven stations were monitored in the James River. Spat settlement began the week of July 6 and continued through the week of September 21. "Moderate" spatfall occurred at all stations except Deepwater from the week of July 27 to the week of August 24. No "heavy" spatfall occurred in the James River in 1992.

For the year, spatfall totals ranged from 0.7 spat/shell at Deepwater Shoal to 15.7 spat/shell at at Days Point. Dog Shoal, Dry Shoal, and Days Point were the stations that received the greatest spatfall. Most spatfall in the James River occurred in August.

❖ *Mobjack Bay*

Spat settlement was followed at five locations in Mobjack Bay. Setting began the week of June 22 and continued through the week of September 21. "Moderate" setting began at Wilson Creek the week of June 22 and continued for four weeks. "Moderate" setting was seen as late as the week of July 27 at Tow Stake and Pepper Creek. "Heavy" spatfall did not occurr in Mobjack Bay in 1992.

Over the course of the setting season, spatfall was highest at Wilson Creek (29.7 spat/shell) and lowest at Pepper Creek (4.0 spat/shell). Most spat settlement took place in July.

❖ *York River*

The VIMS oyster pier was the only shellstring station located on the York River. Settlement there began the week of July 6 and continued through the week of August 31. Setting was "light" throughout the course of the 1992 reproductive season.

Total spatfall for the year was 2.2 spat/shell, most of which occurred in July.

❖ *Piankatank River*

Spatfall was seen at two of four stations in the Piankatank River beginning the week of June 22 and continued into September at three of the stations. Settlement was "moderate" at all locations the first three weeks of July and "heavy" at Palace Bar the weeks of July 6 and 13.

For the year, spatfall ranged from 4.3 spat/shell at Burton Point, to 24.9 spat/shell at Palace Bar, concentrated primarily in July.

❖ *Great Wicomico River*

Six stations were monitored in the Great Wicomico River. Spat

settlement was first seen at Hudnall's Dock the week of June 15 and continued through the week of August 3 at Hudnall's Dock and Glebe Point. "Moderate" settlement occurred only at Fleeton Point the weeks of July 6 and 13. No "heavy" spatfall was recorded in the Great Wicomico River in 1992.

Total spatfall for the year was lowest at Cranes Creek (0.3 spat/shell) and greatest at Fleeton Point (7.4 spat/shell). Most spatfall in the Great Wicomico River occurred in July.

❖ *Little Wicomico River*

There was no settlement recorded at P.G. 42 in the Little Wicomico River in 1992.

❖ *Rappahannock River*

Three stations were monitored in the Rappahannock River. At Sturgeon Creek, settlement extended from the week of July 6 to the week of August 3; at Locklies Creek, spat were seen only during the weeks of August 17, 24, and 31; at Windmill Point, settlement occurred the from week of July 27 through the week of August 31. All settlement in the Rappahannock River in 1992 was "light."

Yearly spatfall totals ranged from 0.3 spat/shell at Locklies Creek to 0.4 spat/shell at both Sturgeon Creek and Windmill Point. Settlement in the Rappahannock River was very light and sporadic throughout the summer.

❖ *Potomac River*

Spatfall was monitored at 10 stations in the Potomac River in 1992. Settlement began as early as the week of June 15 at Hog Island and extended to the week of September 14 at Thicket Point. "Light" settlement was seen at only 5 of the 10 stations (Jones Shore, Hog Island, Great Neck, Thicket Point). No spatfall was recorded at the other 5 stations (Coan River, Nomini Bay, Currioman Bay, Ragged Point, Lower Machodoc).

Spatfall totals for the year (stations for which spatfall was recorded) ranged from 0.1 spat/shell (Hog Island, Great Neck, Thicket Point) to 0.3 spat/shell at Jones Shore and Cornfield. With so little spatfall, no peak settlement periods were discernible.

❖ *Eastern Shore*

Three stations were monitored for spatfall on the seaside of the Eastern Shore. Spatfall generally extended from the week of June 22 through the week of September 28. At Wachapreague, spatfall was "heavy" the weeks of August 31 and September 7, and "moderate" the weeks of September 14 and 21. In Hog Island Bay, only "light" settlement was recorded, although no data was collected for four weeks in July and August.

For the year, spatfall totals were 61.1 spat/shell at Wachapreague, 0.4 spat/shell at Hog Island North, and 1.7 spat/shell at Hog Island South. At Wachapreague, settlement peaked the first two weeks of August. There were no settlement peaks in Hog Island Bay.

Discussion

Overall, spatfall potential in Virginia in 1992 was very poor (Tables I and II). Of the 40 locations for which comparisons could be made, 39 had lower spat/shell totals in 1992 than in 1991. The only location for which total spatfall in 1992 exceeded that in 1991 was Wilson Creek in Mobjack Bay.

In spite of the low overall potential, some recruitment undoubtedly occurred. The areas having the greatest likelihood for recruitment in 1992 based on the shellstring survey were:

1. James River—
   Dog Shoal, Dry Shoal, Days Point, and Rock Wharf
2. Mobjack Bay—
   Wilson Creek
3. Piankatank River—
   Palace Bar
4. Great Wicomico River—
   Fleeton Point
5. Eastern Shore—
   Wachapreague

As previously mentioned, spatfall on shellstrings is an indicator of relative numbers of larvae (ready to set) in a particular location at a particular time. Subsequent spat settlement and survival on nearby shoal areas is variable and dependent on a number of factors. High spat counts on shellstrings may not be accompanied by a good set on bottom shell if it is not plentiful or clean enough to attract the metamorphosing larvae. Conversely, for unknown reasons, good setting on bottom shell may occur even though setting on shellstrings was light. It is not known what level of setting on shellstrings is indicative of good setting on bottom cultch, if conditions on the bottom are optimal. Also, it is not known whether recruitment is more readily effected by continuous, light setting or intense setting of short duration.

Subsequent survival of oysters that do set on the bottom is controlled to a great extent by environmental conditions, predators, and disease. Results from the shellstring surveys are reflective of the abundance of oyster larvae present in an area, and thus an indication of reproductive activity and the **potential** for recruitment, depending on prevailing conditions.

Spat/shell totals for 1992 were also lower than the long-term average (up to 10 years) at all but one station (Table II). The only location that exceeded the long term average in 1992 was Wilson Creek in Mobjack Bay (and this was not particularly high). Although 1990 and 1991 were generally above average in terms of spatfall potential, 1992 was considerably below.

The general decline in spatfall that has occurred in Virginia in recent years can be attributed to several potential causes. First of all, there are fewer adult oysters available for reproduction. The oyster diseases MSX (*Haplo-*

sporidium nelsoni) and Dermo (*Perkinsus marinus)* have caused widespread mortality in many areas of the state since 1959, particularly in the higher salinity (lower) portions of the rivers. Even though MSX has been eliminated from many areas due to a recent return to "normal" rainfall and salinity, *P. marinus* continues to be prevalent and cause mortality. In areas such as the upper James River where disease has caused less oyster mortality than other areas, harvesting pressure—by selectively removing larger oysters—may be having the same effect. 1992 is the fifth year in a row that spat/shell totals in the upper James River (Point of Shoals, Horsehead, Deepwater Shoal) have been below the 10 year average. Secondly, a decline in overall water quality can reduce the reproductive capability of oysters and affect larval survival. The extent to which a reduction in water quality is affecting oyster recruitment, however, is difficult to quantify.

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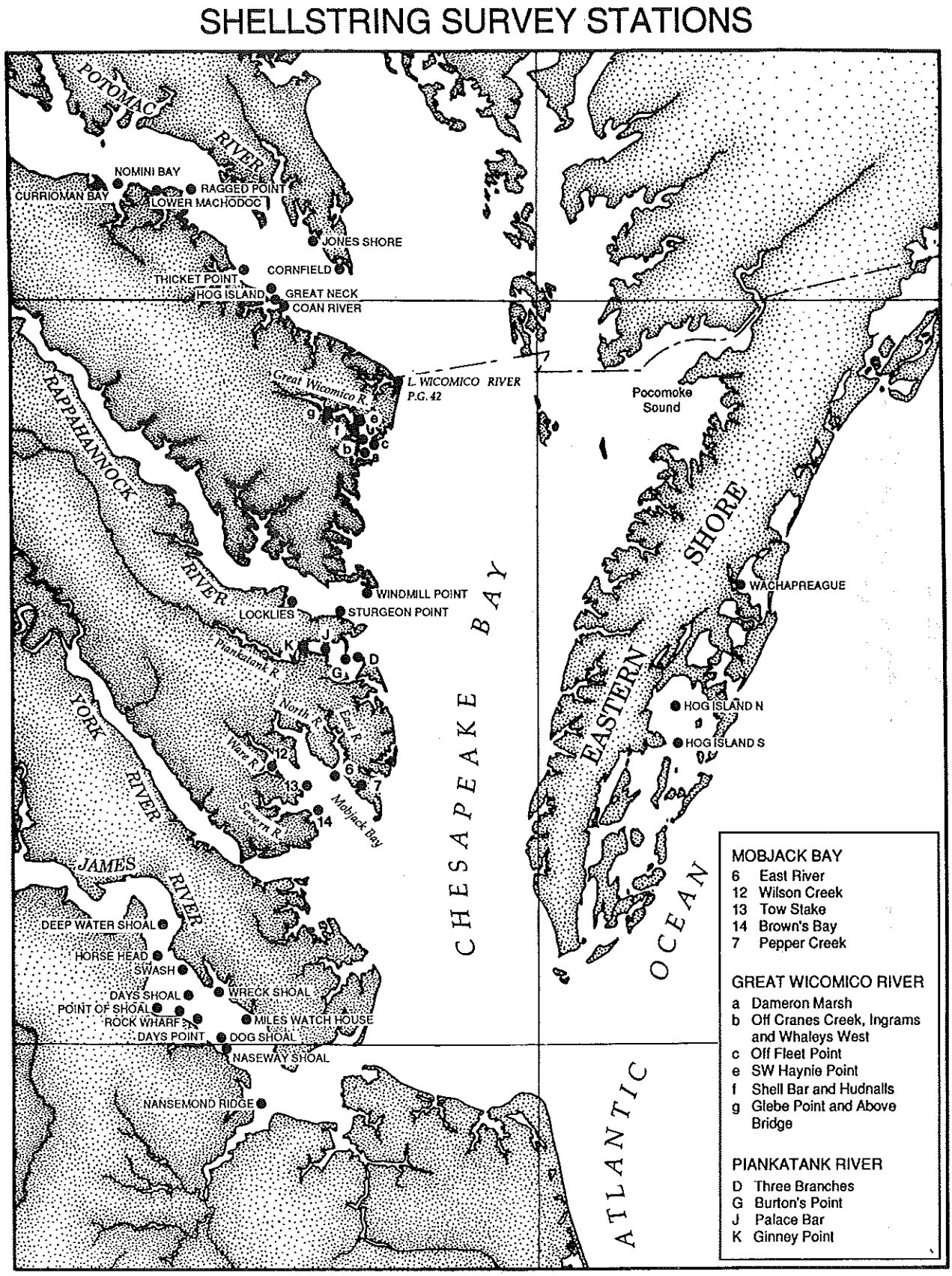

Figure 1. Location of shellstring stations.

TABLE I

Average number of spat/shell (10 shells) for a 7 day period starting with the date shown.
(--- indicates that no data was obtained for the week)

Week of:	June					July				August					September				October		Total
	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	
JAMES RIVER																					
Nansemond Rdg.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	1.0	1.0	1.7	0.9	0.1	0.1	0.1	<0.1	0.0	0.0		7.0
Naseway Shoal	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.0	0.4	0.1	0.3	0.1	0.1	0.2	0.1	0.0	0.0	0.0		1.9
Dog Shoal	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	<0.1	2.4	2.6	4.4	1.5	0.0	0.0	0.1	0.1	0.0	0.0		11.6
Miles W. H.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	---	1.1	1.1	0.5	0.1	0.0	---	---		3.5
Days Point	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	2.0	5.5	3.2	2.0	2.1	0.0	0.1	0.1	<0.1	0.1	0.1		15.7
Wreck Shoal	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.4	0.6	0.2	0.3	0.3	0.1	0.3	0.5	0.2	0.0	0.0		3.2
Dry Shoal	0.0	0.0	0.0	0.0	0.0	0.0	0.1	<0.1	3.9	3.4	2.2	1.9	1.5	0.5	<0.1	0.5	0.2	0.0	0.0		14.2
Pt. of Shoals	0.0	0.0	0.0	0.0	0.0	0.0	0.1	<0.1	1.3	1.1	1.5	1.1	0.3	<0.1	0.0	0.0	0.0	0.0	0.0		5.4
Horsehead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.6	1.1	0.9	0.2	0.0	0.0	0.2	0.1	0.0	0.0		3.6
Deepwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.7
Rock Wharf	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	1.7	1.8	2.9	2.2	1.3	0.3	0.2	0.4	0.5	---	---		11.7
MOBJACK BAY																					
Brown's Bay	0.0	0.0	0.0	0.1	0.1	1.8	2.1	1.0	1.0	0.0	0.0	0.0	<0.1	0.1	0.0	0.1	<0.1	0.0	0.0		6.3
Tow Stake	0.0	0.0	0.0	0.1	0.1	2.2	2.5	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		7.7
Wilson Creek	0.0	0.0	0.0	1.9	1.9	8.4	9.5	0.0	0.0	0.1	0.1	0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0		29.7
East River	0.0	0.0	0.0	<0.1	<0.1	2.9	3.3	0.1	0.1	0.1	0.1	<0.1	0.2	0.4	0.0	0.0	0.0	0.0	0.0		7.2
Pepper Creek	0.0	0.0	0.0	0.0	0.0	0.3	0.4	1.5	1.5	0.1	0.1	0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0		4.0
YORK RIVER																					
VIMS Pier	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.3	0.1	<0.1	0.1	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0		2.2

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Week of:	June					July				August					September				October		Total
	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	
PIANKATANK RIVER																					
Three Branches	---	0.0	0.0	0.1	<0.1	2.2	1.7	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.1	0.1		4.6
Burton Point	0.0	0.0	0.0	0.0	0.2	0.4	1.6	1.4	0.5	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0		4.3
Palace Bar	0.0	0.0	0.0	0.2	0.6	12.0	9.9	1.6	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0		24.9
Ginney Point	0.0	0.0	0.0	0.0	0.1	4.8	4.6	1.0	0.2	0.4	---	0.3	0.2	0.2	0.1	<0.1	0.0	0.0	0.0		11.9
GREAT WICOMICO RIVER																					
Dameron Marsh	---	---	0.0	0.0	0.1	0.2	0.2	0.2	---	0.0	0.0	0.0	0.0	0.0	0.0	---	---	---	---		0.7
Cranes Creek	---	---	0.0	0.0	0.1	0.1	0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	---	---	---		0.3
Hudnall's Dock	---	---	<0.1	<0.1	0.2	0.3	0.3	0.3	0.1	<0.1	0.0	0.0	0.0	0.0	0.0	---	---	---	---		1.2
Haynie Point	---	---	0.0	0.0	0.2	0.6	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	---	---	---		1.5
Glebe Point	---	---	0.0	0.0	0.1	0.3	0.3	<0.1	0.2	<0.1	0.0	0.0	0.0	0.0	0.0	---	---	---	---		0.9
Fleeton Point	---	---	0.0	0.0	1.2	2.9	2.9	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	---	---	---		7.4
LITTLE WICOMICO RIVER																					
P.G. No. 42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---		0.0
RAPPAHANNOCK RIVER																					
Sturgeon Creek	---	0.0	0.0	0.0	<0.1	0.1	0.1	0.1	0.1	<0.1	0.0	0.0	0.0	0.0	---	---	---	---	---		0.4
Locklies Creek	---	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	---	---	---	---	---		0.3
Windmill Point	---	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	<0.1	0.0	0.1	0.1	0.1	---	---	---	---	---		0.4

Week of:	June					July				August					September				October		Total
	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	
POTOMAC RIVER																					
Jones Shore	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0		0.3
Hog Island	0.0	0.0	0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.1
Coan River	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Great Neck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.1
Thicket Point	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0		0.1
Cornfield	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0		0.3
Nomini Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	---		0.0
Currioman Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	---		0.0
Ragged Point	0.0	0.0	---	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	---		0.0
Lower Machodoc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	---		0.0
EASTERN SHORE																					
Wachapreague	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.3	0.7	0.2	0.0	0.1	0.7	26.5	28.8	1.8	1.2	0.4	0.0		61.1
Hog Island No.	0.0	0.0	0.0	0.2	0.1	0.1	0.0	---	---	---	---	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---		0.4
Hog Island So.	0.0	0.0	0.0	0.1	0.1	0.1	0.0	---	---	---	---	0.0	0.3	0.7	0.1	0.3	<0.1	0.0	---		1.7

TABLE II

Spat/shell totals for years 1982-1991 (when available) and running mean (up to 10 years); (+ or - indicates relationship of 1992 total to 1991 total and running mean; - - indicates an absence of data for that year)

Location	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Running Mean	1992 (+/-, +/-)
JAMES RIVER												
Nansemond Ridge	19.7	46.7	15.1	69.7	8.8	18.4	8.9	26.0	40.6	56.5	31.0	7.0 (-, -)
Naseway Shoal	81.0	224.7	41.0	465.9	40.0	296.6	18.5	59.4	20.6	179.0	142.7	1.9 (-, -)
Dog Shoal	- -	- -	38.3	568.8	32.1	356.9	27.5	73.0	34.4	274.8	175.7	11.6 (-, -)
Miles W.H.	18.5	46.8	16.7	20.9	9.8	33.7	3.2	4.2	2.4	18.7	17.5	3.5 (-, -)
Days Point	- -	- -	24.4	120.3	22.3	481.6	17.3	25.9	28.6	146.6	108.4	15.7 (-, -)
Rock Wharf	- -	- -	38.7	163.5	11.4	285.7	40.9	3.5	17.1	- -	80.1	11.7 (-)
Wreck Shoal	36.7	104.8	21.2	26.3	7.9	35.1	10.0	10.5	5.9	35.4	29.4	3.2 (-, -)
Dry Shoal	- -	- -	24.0	87.1	16.8	241.5	13.2	10.1	45.8	217.2	82.0	14.2 (-, -)
Point of Shoals	18.1	77.4	23.5	31.2	4.6	75.4	9.9	2.1	2.9	21.4	26.6	5.4 (-, -)
Swash	55.6	333.8	37.2	38.1	9.2	79.5	7.6	3.8	3.9	68.6	63.7	- -
Horsehead	16.3	96.6	28.1	36.0	7.3	100.0	3.7	1.5	1.0	24.6	31.5	3.6 (-, -)
Deepwater Shoal	18.1	77.4	23.5	31.2	4.6	75.4	9.9	2.1	3.8	10.8	25.7	0.7 (-, -)
MOBJACK BAY												
Brown's Bay	36.0	71.1	4.6	7.1	241.1	8.0	2.2	29.9	44.7	40.2	48.5	6.3 (-, -)
Tow Stake	61.2	18.8	14.3	2.5	15.7	1.9	5.3	28.8	64.7	16.1	22.9	7.7 (-, -)
Wilson Creek	27.5	11.0	39.3	1.7	5.7	2.6	4.8	42.8	101.9	12.1	24.9	29.7 (+, +)
East River	33.3	26.8	14.1	9.4	29.2	8.9	13.1	37.8	64.0	32.0	26.9	7.2 (-, -)
Pepper Creek	46.1	87.5	18.3	112.5	264.6	40.7	4.7	18.0	74.2	70.1	73.7	4.0 (-, -)

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	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Running Mean	1992 (+/-, +/-)
YORK RIVER												
VIMS Pier	16.0	6.2	2.2	20.5	165.2	25.0	7.1	5.4	14.4	18.7	28.1	2.2 (-, -)
PIANKATANK RIVER												
Three Branches	45.0	27.2	17.6	- -	97.9	64.9*	1.7	22.5	55.7	19.7	39.1	4.6 (-, -)
Burton Point	23.3	27.1	38.8	85.7	252.8	43.9*	4.7	31.6	102.1	16.3	62.6	4.3 (-, -)
Palace Bar	59.4	146.2	59.7	124.5	376.5	243.9*	9.1	42.3	139.9	39.1	124.1	24.9 (-, -)
Ginney Point	60.0	171.7	126.6	82.7	204.2	133.3*	5.6	30.0	85.6	25.2	92.5	11.9 (-, -)
GREAT WICOMICO RIVER												
Dameron Marsh	30.2	12.7	0.9	8.6	43.3	29.1	59.3	6.1	29.2	11.0	23.0	0.7 (-, -)
Cranes Creek	54.1	6.7	1.3	6.3	121.6	30.5	17.4	11.7	39.1	10.7	29.9	0.3 (-, -)
Hudnall's Dock	122.9	16.3	3.3	14.2	237.6	50.8	61.8	28.4	119.6	7.0	66.2	1.2 (-, -)
Haynie Point	74.9	12.9	0.7	7.6	170.8	10.5	57.4	20.1	67.9	13.6	43.6	1.5 (-, -)
Glebe Point	364.5	0.6	2.2	10.9	364.6	23.6	27.1	9.1	19.8	3.8	82.6	0.9 (-, -)
Fleeton Point	50.8	42.7	1.7	78.4	42.8	157.9	10.1	9.0	18.1	10.1	42.2	7.4 (-, -)
LITTLE WICOMICO RIVER												
P.G. No. 42	- -	- -	- -	- -	- -	- -	- -	0.2	5.2	4.8	3.4	0.0 (-, -)

TABLE II, Page 3

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Running Mean	1992 (+/-, +/-)
RAPPAHANNOCK RIVER												
Sturgeon Creek	- -	- -	- -	- -	21.6*	1.1	1.7	1.7	- -	12.7	7.8	0.4 (-, -)
Locklies Creek	- -	- -	- -	- -	27.7	2.8	3.3	2.4	4.6	25.5	11.1	0.3 (-, -)
Windmill Point	- -	- -	- -	- -	- -	45.9	1.4	1.0	98.5	23.4	34.0	0.4 (-, -)
POTOMAC RIVER												
Jones Shore	381.1	14.5	0.7	20.6	16.2	27.2	3.8	0.1	0.4	8.2	47.3	0.3 (-, -)
Hog Island	1.9	1.5	0.3	1.7	4.8	1.8	0.0	0.1	0.2	0.4	1.3	0.1 (-, -)
Coan River	4.2	0.9	0.0	0.0	10.8	0.0	0.4	0.0	0.1	0.3	1.7	0.0 (-, -)
Great Neck	3.1	1.9	0.0	5.2	6.4	1.9	1.4	0.0	0.2	1.1	2.1	0.1 (-, -)
Thicket Point	1.8	1.1	0.1	0.2	5.0	0.3	0.6	0.0	0.2	1.4	1.1	0.1 (-, -)
Cornfield	246.0	22.9	0.2	29.5	3.6	49.6	6.7	1.8	8.9	50.5	42.0	0.3 (-, -)
EASTERN SHORE												
Wachapreague	46.5	121.0	56.4	31.9	66.7	29.7	47.1	144.1	211.4	287.4	104.2	61.1 (-, -)
Hog Island N.	- -	- -	- -	- -	- -	- -	- -	49.9	21.2	109.7	60.3	0.4 (-, -)
Hog Island S.	- -	- -	- -	- -	- -	- -	- -	48.7	14.2	67.4	43.4	1.7 (-, -)

* -total is based on less than a full setting season, but is included in running mean

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