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OYSTER SPATFALL IN VIRGINIA WATERS 1989 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 by this effort is valuable to the Virginia Marine Resources Commission (VMRC) for its shell repletion program, and to private oyster growers, both of whom are interested in maximizing the timing of shell planting. To assist in that area, a biweekly report of spatfall data to date is provided to interested parties throughout the summer. This report is a summary of the entire 1989 setting season.

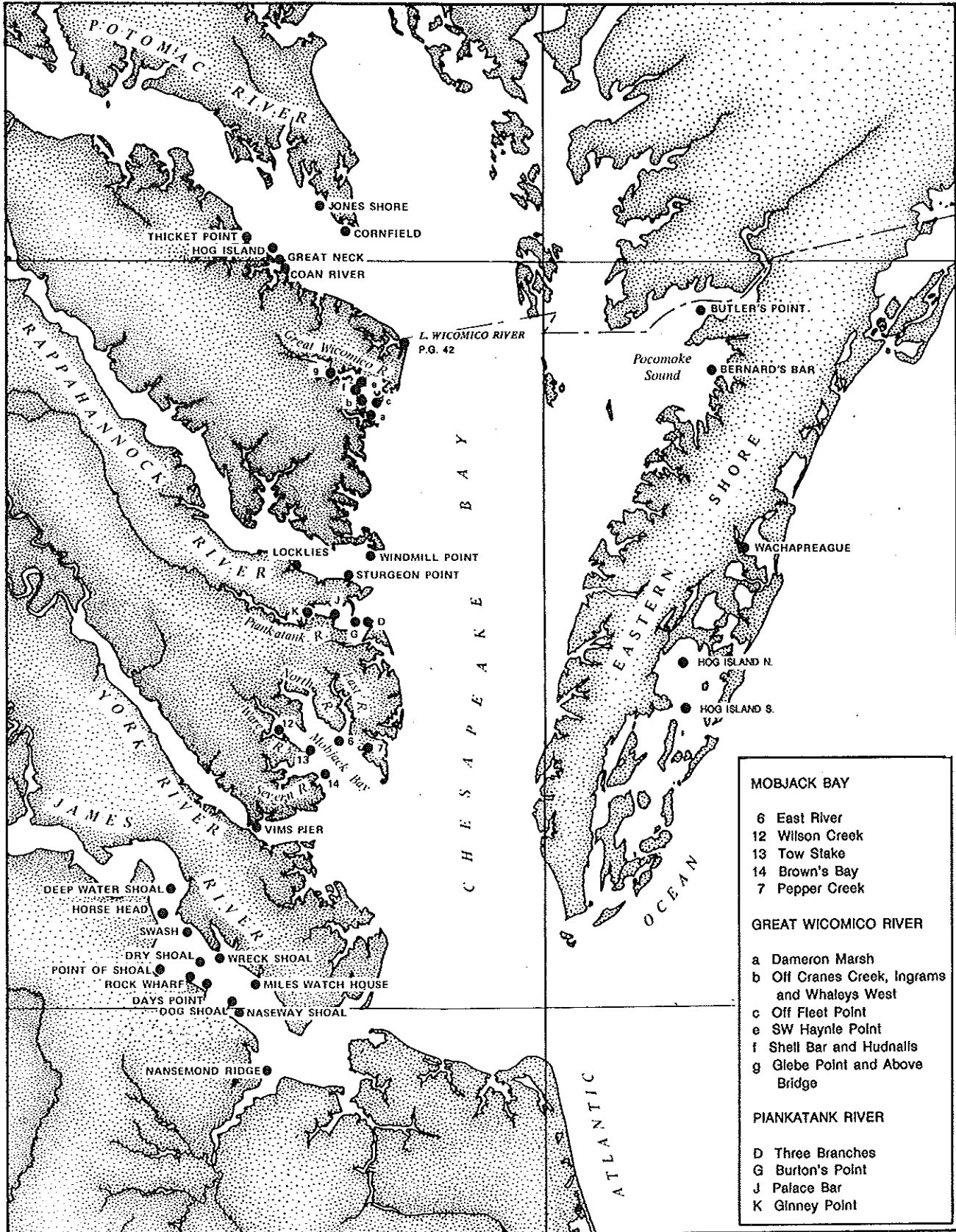
METHODS

Spatfall in 1989 was monitored from June through October at a total of 41 stations (Figure 1). Throughout this period shellstrings were deployed at each station (0.5m off the bottom) on a weekly basis. A shellstring consisted of 12 oyster shells of similar size (about 3") drilled through the center and strung on a piece of heavy gauge wire. After a one-week exposure, 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, "None"; 0.1-1.0, "Light"; 1.1-10.0 "Moderate"; and 10.1-100, "Heavy".

Weekly sampling allowed setting trends over the course of the summer to be compared between the various locations. Comparisons between years were made by adding the weekly values of spat per shell for the entire 19 week setting season.

FIGURE 1

SHELLSTRING SURVEY STATIONS



RESULTS

The following changes in station locations (from previous years) were made in 1989. In the James River, the Cruiser Shoal station was not monitored. In Pokomoke Sound, the Butler's Point and Bernard's Bar stations were not monitored. On the seaside of the Eastern Shore, two stations in Hog Island Bay were added.

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

James River

In the James River, 12 stations were monitored. Spat settlement was seen between June 22 and September 28, with "moderate" and "heavy" spatfall occurring from July 20 through the week of September 7. Maximum setting occurred the week of August 24 when 3 stations received "heavy" spatfall and another 7 received "moderate" spatfall.

For the year, spatfall totals ranged from 1.5 spat/shell (Horsehead) to 73.0 (Dog Shoal). Spatfall was lowest at the upriver stations (Horsehead, Point of Shoals, Deepwater Shoal) and highest at Dog Shoal and Naseway Shoal.

York River

The VIMS oyster pier was the only shellstring station located on the York River. Spatfall was observed from the week of July 6 through the week of October 5. Spatfall was "moderate" the weeks of July 27 and August 3 and "light" for the rest of the period.

Total spatfall for the year was 5.4 spat/shell.

Mobjack Bay

Setting in Mobjack Bay began in June and extended into September at all locations except Tow Stake, where "light" spatfall continued into October. Peak spatfall ("moderate" to "heavy") occurred at all stations between July 20 and August 10.

Spatfall for the year ranged from 18.0 spat/shell at Pepper Creek to 42.8 spat/shell at Wilson Creek.

Plankatank River

For the 4 stations located in the Plankatank River, spatfall was seen from June 8 to the week of September 14. Two periods of "moderate" to "heavy" spatfall occurred at all stations within this period. The first of these was during the weeks of June 29 and July 6. The second was during the weeks of August 3 and 10.

For the year, total spat/shell ranged from 22.5 at Three Branches to 42.3 at Palace Bar.

Great Wicomico

Six spatfall stations were located in the Great Wicomico River. Setting began after June 22 and continued through the week of September 14, with two peaks in setting activity. During the week of June 29, 5 of the 6 stations monitored had a "moderate" spatfall. In addition, 4 of the 6 stations had "moderate" spatfall during the weeks of August 3 and August 10.

Over the entire setting season, the number of spat/shell was lowest at Dameron Marsh (6.1) and highest at Hudnall's Dock (28.4).

Little Wicomico River

Very "light" setting occurred at the one station (P.G. 42) in the Little Wicomico River from July 13 to the week beginning August 17.

The total for the year at the P.G. 42 station was 0.2 spat/shell.

Rappahannock River

All three stations in the lower Rappahannock River received "light" settlement beginning the week of June 22. At Windmill Point spatfall ceased after the week of August 3. At the Sturgeon Point and Locklies Creek stations, spatfall continued through the week of August 31 when data collection ended.

Yearly totals were lowest at Windmill Point (1.0 spat/shell) and greatest at Locklies Creek (2.4 spat/shell).

Potomac River

Six locations were monitored for spatfall on the Potomac River. "Light" spatfall was seen at 3 of the 6 stations (Jones Shore, Hog Island, and Cornfield). The other three stations (Coan, Great Neck, and Thicket Point) had no spatfall.

For the year, settlement was greatest at the Cornfield station (1.8 spat/shell).

Eastern Shore

Setting on the seaside of the eastern shore began the week of July 6 and ended in late September in Hog Island Bay, but continued into October at Wachapreague. At all three stations, spatfall was "moderate" from July 13 through the week of September 7. "Heavy" spatfall occurred the weeks of July 27 and August 17, 24, and 31 at Wachapreague and the week of July 27 at the Hog Island South station. The greatest weekly spatfall occurring anywhere in the state in 1989 (66.6 spat/shell) was seen at Wachapreague the week of August 31.

Yearly spatfall totals were similar at Hog Island North (49.9 spat/shell) and Hog Island South (48.7 spat/shell). Total for the year at Wachapreague was 144.1 spat/shell.

DISCUSSION

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. 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 the potential for recruitment.

The areas having the greatest likelihood for recruitment in 1989 based on the shellstring survey are:

James River - Naseway Shoal, Dog Shoal
Mobjack Bay - Wilson Creek, East River
Piankatank River - Palace Bar, Burton Point
Great Wicomico - Hudnalls's Dock
Eastern Shore - Wachapreague, Hog Island

Overall, spatfall in 1989 was similar to that in 1988, based on the shellstring survey. Table II presents annual spat/shell totals for the shellstring stations used in 1989 for which historical data exists. Of these 32 locations, 17 had a lower spat/shell total in 1989 than in 1988 while 15 had greater or equal spat/shell totals. Spatfall on shellstrings was markedly higher in Mobjack Bay, the Piankatank River, and the Eastern Shore (Wachapreague) in 1989 than in 1988. In the Great Wicomico River, spatfall totals were lower in 1989 than in 1988. In the James River, spatfall was greater at the down-river stations (Naseway Shoal and Nansemond Ridge), but lower at the up-river stations (Point of Shoals, Horsehead, and Deepwater Shoal).

Spat/shell totals in 1989 were lower than the mean for the 10 year period 1980-1989 at twenty-six of the 32 stations represented in Table II. In only 3 cases (Nansemond Ridge in the James River, Wilson Creek in Mobjack Bay, and Wachapreague on the Eastern Shore) was the 1989 spat/shell total greater than the 10 year mean. (Lack of data prevented calculation of 10 year means for the 3 stations in the Rappahannock River.) This is indicative of the general decline in spatfall (and recruitment) that has been occurring in the public oyster fishery in Virginia in recent years. There are several factors that may be contributing to this observed decline in spatfall. First of all, there are fewer adult oysters available for reproduction. Oyster diseases (MSX and Perkinsus) have caused widespread mortality in many areas of the state, particularly the higher salinity (lower) portions of the rivers. Salinity was generally lower in 1989 than previous years and this probably helped to prevent intensification of Perkinsus and actually eliminate MSX in some regions. However, fishing pressure, by removing larger oysters, may be having the same effect. For example, 1989 is the third year in a row that spat/shell totals in the upper James River (Point of Shoals, Horsehead, and Deepwater Shoal) have declined

in conjunction with a harvest of market-sized oysters from this area that represents 90% of the state total. Secondly, a decline in water quality can reduce the reproductive capability of oysters and affect larval survival. However, the extent to which a reduction in water quality is affecting oyster recruitment is difficult to quantify.

ACKNOWLEDGEMENTS

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THESE ARE THE RESULTS OF THE ANALYSES MADE BY THE LABORATORY OF THE U.S. GEOLOGICAL SURVEY, WASHINGTON, D.C., ON THE SAMPLES OF WATER TAKEN AT THE PLACES INDICATED ON THE MAP.

No.	Date		Locality		Temperature		Specific Gravity		Total Solids		Calcium		Magnesium		Total Hardness		Remarks
	Year	Month	Station	Section	Surface	Bottom	40° F.	60° F.	40° F.	60° F.	Grains per Gallon	Parts per Million	Grains per Gallon	Parts per Million	Grains per Gallon	Parts per Million	

1	1906	July	1	1	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
2	1906	July	2	2	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
3	1906	July	3	3	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
4	1906	July	4	4	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
5	1906	July	5	5	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
6	1906	July	6	6	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
7	1906	July	7	7	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
8	1906	July	8	8	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
9	1906	July	9	9	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
10	1906	July	10	10	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water

11	1906	July	11	11	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
12	1906	July	12	12	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
13	1906	July	13	13	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
14	1906	July	14	14	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
15	1906	July	15	15	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
16	1906	July	16	16	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
17	1906	July	17	17	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
18	1906	July	18	18	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
19	1906	July	19	19	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water
20	1906	July	20	20	58.0	58.0	1.0000	1.0000	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	Hard water

TABLE I, continued

	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	5			
PIANKATANK RIVER																							
Three Branches	0.0	0.0	<0.1	0.5	4.3	9.4	1.0	0.6	0.3	1.2	4.5	0.0	0.1	0.4	<0.1	0.2	0.0	--	--	22.5			
Burton Point	0.0	0.0	<0.1	1.5	9.2	10.5	0.5	0.3	0.2	1.9	6.0	0.1	0.5	0.8	<0.1	0.1	0.0	--	--	31.6			
Palace Bar	0.0	0.1	0.1	2.1	9.4	11.5	2.0	1.1	3.3	3.4	6.9	1.3	0.2	0.4	0.2	0.3	0.0	--	--	42.3			
Ginney Point	0.0	0.0	0.1	1.0	3.4	2.8	3.9	0.6	2.6	2.7	10.6	0.9	0.4	0.1	0.6	0.2	0.0	--	--	30.0			
GREAT WICOMICO RIVER																							
Dameron Marsh	0.0	0.0	0.0	0.3	2.1	1.0	0.9	0.1	0.1	0.5	0.3	0.1	0.5	0.0	<0.1	0.2	--	0.0	0.0	6.1			
Cranes Creek	0.0	0.0	0.0	0.5	2.8	0.6	0.6	0.0	0.4	2.9	2.5	0.1	0.3	0.4	0.4	0.2	0.0	0.0	0.0	11.7			
Hudnall's Dock	0.0	0.0	0.0	1.5	9.2	1.0	0.9	0.1	1.5	6.3	1.5	2.6	0.6	0.6	0.9	0.8	0.0	0.0	0.0	28.4			
Haynie Point	0.0	0.0	0.0	0.5	3.7	2.9	2.5	0.1	0.9	3.9	3.3	0.8	0.6	0.6	0.3	0.0	0.0	0.0	0.0	20.1			
Glebe Point	0.0	0.0	0.0	1.0	5.9	0.8	0.7	0.1	0.1	0.0	<0.1	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	9.1			
Fleet Point	0.0	0.0	0.0	0.0	0.6	0.6	0.5	0.0	0.4	2.5	1.6	0.8	0.5	0.5	0.8	0.2	0.0	0.0	0.0	9.0			
LITTLE WICOMICO RIVER																							
P.G. 42	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.1	0.0	0.0	<0.1	0.1	0.0	0.0	0.0	--	--	--	--	0.2			
RAPPAHANNOCK RIVER																							
Sturgeon Point	0.0	0.0	0.0	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.4	0.4	0.4	0.2	0.2	--	--	--	--	--	1.7			
Locklies Creek	0.0	0.0	0.0	0.0	0.0	0.2	1.0	0.4	0.4	0.2	0.1	0.1	<0.1	<0.1	--	--	--	--	--	2.4			
Windmill Point	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.1	0.1	<0.1	0.0	0.0	0.0	0.0	--	--	--	--	--	1.0			

TABLE I, continued

	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		
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	<0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	
Hog Island	0.0	0.0	0.0	0.0	0.0	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	0.1	
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	0.0	0.0
Great Neck	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	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0
Cornfield	0.0	0.0	0.0	0.0	<0.1	0.1	<0.1	0.1	0.0	<0.1	0.5	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8
EASTERN SHORE																						
Wachapreague	0.0	0.0	0.0	0.0	0.0	0.0	1.7	7.2	17.8	8.5	6.3	13.6	13.9	66.6	4.7	1.4	1.2	0.7	0.5	0.0	0.0	144.1
Hog Island North	0.0	0.0	0.0	0.0	0.0	0.0	2.4	1.6	4.1	2.1	3.4	3.6	6.5	12.2	12.2	1.8	<0.1	0.0	-	-	-	49.9
Hog Island South	0.0	0.0	0.0	0.0	0.0	0.1	4.8	2.3	16.2	4.1	4.3	4.8	3.5	4.0	4.0	0.6	0.0	0.0	-	-	-	48.7

TABLE II

Yearly spat/shell totals for the years 1980 - 1989 at selected stations

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	10 Yr. Mean
JAMES RIVER											
Nansemond Ridge	5.7	31.7	19.7	46.7	15.1	69.7	8.8	18.4	8.9	26.0	25.4
Naseway Shoal	222.7	313.0	81.0	224.7	41.0	465.9	40.0	296.6	18.5	59.4	176.3
Miles W.H.	18.9	21.3	18.5	46.8	16.7	20.9	9.8	33.7	3.2	4.2	19.4
Wreck Shoal	16.4	51.9	36.7	104.8	21.2	26.3	7.9	35.1	10.0	10.5	32.1
Point of Shoals	55.8	74.3	18.1	77.4	23.5	31.2	4.6	75.4	9.9	2.1	37.2
HorseHead	20.7	71.9	16.3	96.6	28.1	36.0	7.3	100.0	3.7	1.5	38.2
Deep Water Shoal	55.8	74.3	18.1	77.4	23.5	31.2	4.6	75.4	9.9	2.1	37.2
YORK RIVER											
Oyster Pier	48.5	6.7	16.0	6.2	2.2	20.5	165.2	25.0	7.1	5.4	30.3
MOBJACK BAY											
Brown's Bay	332.6	10.8	36.0	71.1	4.6	7.1	241.1	8.0	2.2	29.9	74.3
Tow Stake	98.4	94.0	61.2	18.8	14.3	2.5	15.7	1.9	5.3	28.8	34.1
Wilson Creek	25.1	177.3	27.5	11.0	39.3	1.7	5.7	2.6	4.8	42.8	33.8
East River	135.6	99.3	33.3	26.8	14.1	9.4	29.2	8.9	13.1	37.8	40.8

TABLE II, continued

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	10 Yr. Mean
PIANKATANK RIVER											
Three Branches	84.2	36.2	45.0	27.2	17.6	--	97.9	64.9	1.7 ^a	22.5	44.1
Burton Point	57.9	34.6	23.3	27.1	38.8	85.7	252.8	43.9	4.7 ^a	31.6	60.0
Palace Bar	256.3	76.8	59.4	146.2	59.7	124.5	376.5	243.9	9.1 ^a	42.3	139.5
Ginney Point	175.1	34.5	60.0	171.7	126.6	82.7	204.2	133.3	5.6 ^a	30.0	102.4
GREAT WICOMICO RIVER											
Dameron Marsh	13.7	3.3	30.2	12.7	0.9	8.6	43.3	29.1	59.3	6.1	20.7
Cranes Creek	14.8	5.7	54.1	6.7	1.3	6.3	121.6	30.5	17.4	11.7	27.0
Hudhall's Dock	56.9	31.6	122.9	16.3	3.3	14.2	237.6	50.8	61.8	28.4	62.4
Haynie Point	12.7	25.9	74.9	12.9	0.7	7.6	170.8	10.5	57.4	20.1	39.4
Glebe Point	10.5	296.8	364.5	0.6	2.2	10.9	364.6	23.6	27.1	9.1	111.0
Fleet Point	9.0	2.3	50.8	42.7	1.7	78.4	42.8	157.9	10.1	9.0	40.5
RAPPAHANNOCK RIVER											
Sturgeon Point	--	--	--	--	--	--	--	1.1	1.7	1.7	1.7
Locklies Creek	--	--	--	--	--	--	27.7	2.8	3.3	2.4	2.4
Windmill Point	--	--	--	--	--	--	--	45.9	1.4	1.0	1.0

TABLE II, continued

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	10 Yr. Mean
POTOMAC RIVER											
Jones Shore	53.3	15.4	381.1	14.5	0.7	20.6	16.2	27.2	3.8	0.1	53.3
Hog Island	0.3	1.7	1.9	1.5	0.3	1.7	4.8	1.8	0.0	0.1	1.4
Coan River	1.3	0.3	4.2	0.9	0.0	0.0	10.8	0.0	0.4	0.0	1.8
Great Neck	1.2	0.5	3.1	1.9	0.0	5.2	6.4	1.9	1.4	0.0	2.2
Thicket Point	0.8	0.9	1.8	1.1	0.1	0.2	5.0	0.3	0.6	0.0	1.1
Cornfield	37.7	26.6	246.0	22.9	0.2	29.5	3.6	49.6	6.7	1.8	42.5
EASTERN SHORE											
Wachapreague	24.4	6.9	46.5	121.0	56.4	31.9	66.7	29.7	47.1	144.1	57.5

^a Total represents less than an entire setting season

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