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Oyster Spatfall In Virginia Waters 1988 Annual Summary December 1, 1988

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The Virginia Institute of Marine Science (VIMS) conducts annual surveys of oyster spatfall (or "setting") in Virginia waters. This survey provides an estimate of the potential of a particular area for receiving a "strike" or set of oysters and helps define the timing of setting events.

In 1988 spatfall was monitored from June 6 to October 16 at a total of forty-two stations (Figure 1). During this period shellstrings were deployed at each station (0.5m off the bottom) on a weekly basis. A shellstring consists of 12 oyster shells drilled through the center and strung on a piece of wire. The number of spat that settle on 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 evaluated as follows: 0, none; 0.1 - 1.0, fair; 1.1 - 10.0, moderate; 10.1 - 100, heavy.

Frequent sampling allowed setting trends to be compared over the course of the summer between the various locations. By adding the weekly values of spat per shell for the entire setting season, comparisons were made between years.

Results

No shellstrings were obtained from the four Piankatank River stations after August 21, and all the shellstrings from the two Pocomoke Sound stations were lost. Weekly spat per shell values, 1985-1988, and annual spatfall totals (sums of weekly values) are given in Table 1.

Weekly Summary

In the James River, setting was fair to moderate for most of the setting period (July-September) at all 14 stations. In ad-

dition, setting was heavy at Day's Point for the week of August 8-14 and at Rock Wharf from August 1-14.

In the York River, setting was fair to moderate from June 27 - October 2.

Setting in the Ware River was also fair to moderate from June 6 to September 4.

The East River station had fair to moderate setting from June 6 to September 18.

The three stations in Mobjack Bay had fair to moderate setting from June 20 to October 2.

In the Piankatank River, fair to moderate setting at all four stations began in early July and extended into August, when the last shellstring was collected.

Setting at the three stations in the Rappahannock River was fair from late June-early July to the end of September.

Setting in the Great Wicomico River extended from June 6 to September 25. For the entire period, setting was fair to moderate at Fleet Point and Crane's Creek. At the other stations, setting was fair to moderate except for the following periods of heavy setting: Dameron Marsh, July 11 to July 24; Haynie Point, July 11 to July 24; Hudnall's, July 4 to July 24; Glebe Point, July 4 to July 10.

In the Potomac River, the setting period was from June 20 to September 25. Setting was fair at five of the six stations, and zero at Hog Island.

No data was obtained from the Eastern Shore - Bayside (Pocomoke Sound).

At the Eastern Shore - Seaside, setting was fair to moderate from June 3 to October 2, except for the week of August 8 to August 14, when setting was heavy.

Annual Summary

Overall, setting activity in 1988 was below that in 1987. The sum of weekly spat per shell values (over the entire setting

period) was lower in 1988 than 1987 for 30 of the 38 stations for which data was obtained. Of those 30, many were considerably lower. This was especially apparent in the James River (Naseway Shoal had 296 spat/shell in 1987 but only 18 spat/shell in 1988; Dog Shoal went from 357 spat/shell in 1987 to 27 in 1988; Day's Point fell from 482 spat/shell in 1987 to 17 in 1988; Rock Wharf had 286 spat/shell in 1987 and 41 in 1988; setting on Dry Shoal was reduced from 241 spat/shell in 1987 to 13 spat/shell in 1988; and on Horsehead Bar, spat/shell fell from 100 in 1987 to 4 in 1988) and the Piankatank River (Palace Bar had 244 spat/shell in 1987 and 9 in 1988; Ginney Point had 133 spat/shell in 1987 and 6 in 1988). Of the 8 stations where setting was greater in 1988 than 1987, most were only slightly greater than 1987 values and 3 were moderately greater (Dameron Marsh and Haynie Point in the Great Wicomico River and the Eastern Shore - Seaside).

Trends

Setting trends obtained using the methods employed in this survey are generally reflective of actual setting on bottom cultch. A moderate to heavy strike on shellstrings usually indicates a noteworthy strike on exposed bottom cultch. This is especially true for cultch planted a week or two prior to peak setting. However, a good strike on shellstrings may not be accompanied by a good set on bottom shell if it is not clean enough to attract the metamorphosing oyster larvae. Conversely, for unknown reasons, good setting on bottom material 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. At best, shellstrings are reflective of the potential for recruitment to occur. Actual recruitment is best measured from spat counts on bottom cultch.

The shellstring data indicated that setting of oysters in 1988 was at best only slightly greater in a few locations (Great Wicomico River and Eastern Shore - Seaside), but for the most part, considerably below 1987 levels (especially the James River and Piankatank River). It might be argued that setting was generally lower in 1988 as the result of the effects of heavy disease mortalities to broodstock oysters. In the upper James River, disease is not presently a factor, but heavy fishing pressure in recent years may be having the same effect. Possible "pollution" effects are also suspected of having an impact, but are difficult to quantify.

However, when the shellstring data in the James River is viewed over a longer period (Table 2), two facts emerge. The first is that annual sums of weekly spatfall data are highly variable from year to year. Thus, a year of poor setting, as in 1988, does not necessarily reflect what will occur in subsequent years. Bivalve recruitment is notoriously erratic, with entire fisheries being based on one or two year classes. The second observation based on the long-term data set is that overall, setting in the James River has been higher in the 1980's than in the 1970's. This has occurred in spite of high disease mortalities at Wreck Shoal and points downriver where the bulk of larval production was thought to originate. This might indicate that the source of larval production is gradually moving upriver, perhaps as the result of increased disease pressure and increasing salinity.

Continued heavy fishing pressure on market oysters in the upper James River will most likely have a detrimental effect on larval production in this area.

Acknowledgements

We would like to thank Virginia Marine Resources Commission personnel and their supervisors for their generous assistance with this sampling program in Mobjack Bay, the Piankatank River, the Little and Great Wicomico Rivers, the Rappahannock River, the Potomac River, and Pocomoke Sound. Thanks to VIMS personnel at Wachapreague for maintaining that station. Thanks are also due to Kenneth Walker, Chris Horner, and Julia Rainer for their work on the James River.

FIGURE 1

SHELLSTRING SURVEY STATIONS

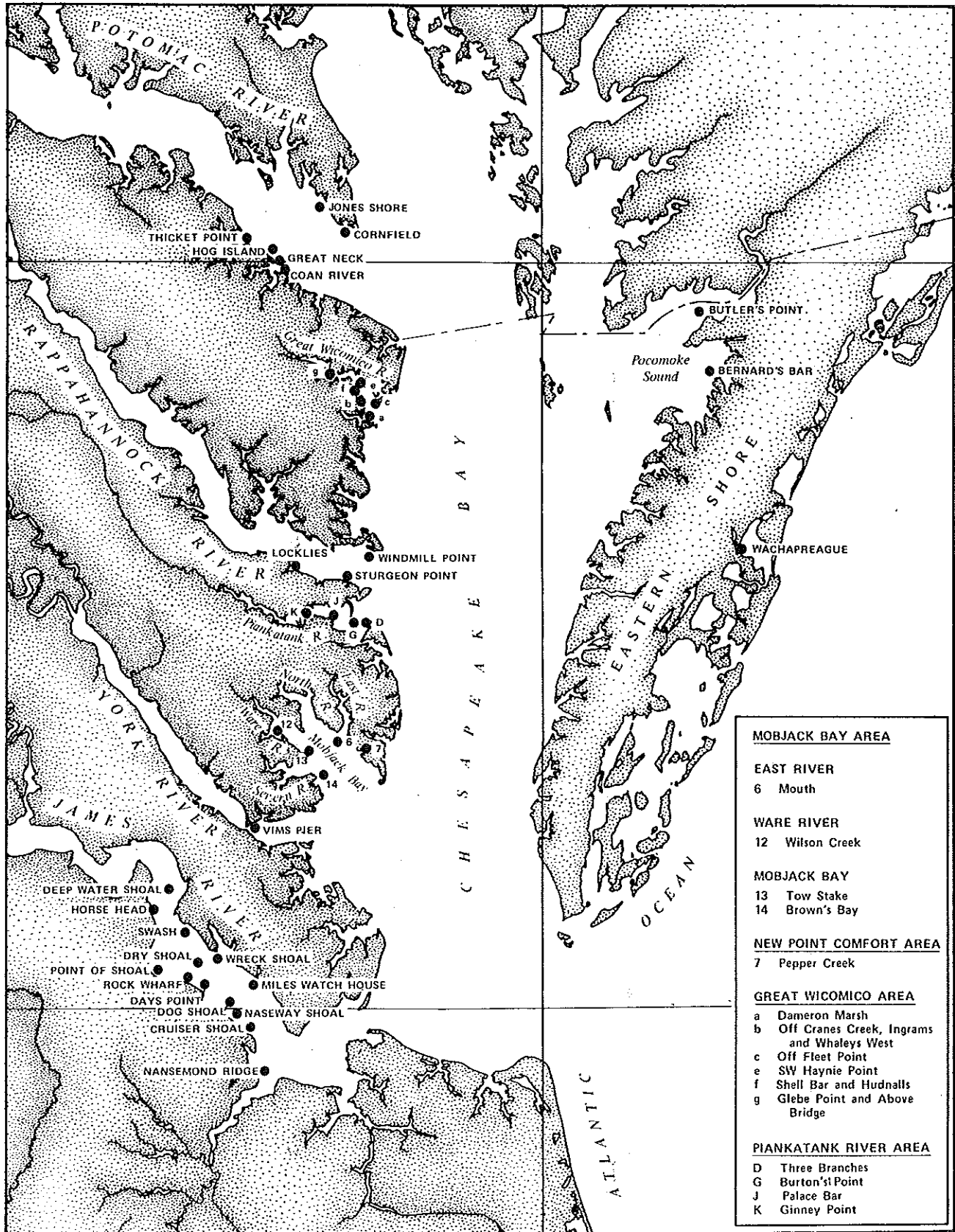


TABLE 1

Spatfall on Shellstrings*
Annual Summary
1985-1988

JAMES RIVER

Dates Exposed**	Nansemond Ridge		Cruiser Shoal		Naseway Shoal	
	1985	1987	1986	1987	1985	1986
Jun 6-12	--	--	--	0.0	--	--
Jun 13-19	0.0	0.0	0.0	0.0	0.0	0.0
Jun 20-26	0.0	0.0	0.0	0.0	0.0	0.0
Jun 27-Jul 3	0.0	0.5	0.0	0.1	0.0	0.0
Jul 4-10	5.1	0.8	0.6	0.1	1.3	0.0
Jul 11-17	50.9	3.4	1.0	0.1	29.8	0.1
Jul 18-24	2.5	1.8	0.7	23.2	292.3	0.2
Jul 25-31	2.5	3.3	0.3	7.6	104.6	0.6
Aug 1-7	0.9	3.3	0.4	13.1	10.8	0.0
Aug 8-14	0.6	2.7	1.2	10.6	0.0	7.8
Aug 15-21	0.1	1.5	4.2	3.7	2.2	2.2
Aug 22-28	0.0	0.6	4.0	2.5	0.0	0.3
Aug 29-Sep 4	5.5	0.1	0.7	1.2	2.2	0.8
Sep 5-11	0.3	0.0	1.5	8.5	15.9	2.6
Sep 12-18	0.1	1.4	0.9	3.4	3.1	2.4
Sep 19-25	0.1	0.9	0.1	2.5	0.3	1.0
Sep 26-Oct 2	0.3	0.2	0.3	1.7	0.1	0.3
Oct 3-9	0.2	0.1	0.0	0.4	0.1	0.1
Oct 10-16	0.3	0.0	0.0	0.1	0.4	0.0
Oct 17-23	0.2	--	0.0	0.0	2.6	0.0
Oct 24-30	0.1	--	--	--	0.1	--
Oct 31-Nov 6	--	--	--	--	0.1	--
TOTALS	69.7	8.8	16.9	78.8	465.9	296.6
		18.4		12.9		18.5

* Shows spat per shell (smooth side only).
** Dates shown are for 1988. Dates in other years were approximately the same.
-- Data not received.

General Guide to Setting:
0.1 to 1.0 spat per shell = fair
1.1 to 10.0 spat per shell = moderate
10.1 to 100 spat per shell = heavy

JAMES RIVER (CONTINUED)

Dates Exposed**	Dog Shoal		Miles Watch House		Day's Point	
	1985	1986	1985	1986	1985	1986
Jun 6-12	--	--	--	--	--	--
Jun 13-19	0.2	0.0	0.0	0.0	0.0	0.0
Jun 20-26	0.1	0.0	0.0	0.1	0.0	0.0
Jun 27-Jul 3	3.2	0.9	0.1	0.1	0.1	0.0
Jul 4-10	11.9	4.0	0.2	0.1	3.7	0.0
Jul 11-17	276.0	5.6	66.7	0.3	2.6	108.2
Jul 18-24	225.3	2.2	136.3	2.6	7.3	140.5
Jul 25-31	16.3	0.5	89.7	0.1	9.4	150.8
Aug 1-7	0.6	1.8	35.6	2.0	1.7	47.2
Aug 8-14	3.4	4.4	9.4	1.2	0.6	15.1
Aug 15-21	0.0	3.2	5.4	1.4	0.6	3.5
Aug 22-28	5.8	1.5	2.0	2.2	0.0	6.2
Aug 29-Sep 4	9.4	4.0	2.0	7.8	3.6	1.8
Sep 5-11	3.3	2.6	0.9	5.9	5.9	4.2
Sep 12-18	0.4	0.1	5.6	2.1	0.8	4.9
Sep 19-25	0.3	0.6	2.6	0.2	0.2	1.9
Sep 26-Oct 2	0.7	0.5	0.3	0.1	0.1	0.7
Oct 3-9	1.5	0.1	0.1	0.1	0.6	0.1
Oct 10-16	5.4	0.1	0.0	0.0	2.4	0.0
Oct 17-23	2.5	--	--	--	--	--
Oct 24-30	2.5	--	--	--	0.0	--
Oct 31-Nov 6	0.0	--	--	--	0.0	--
TOTALS	568.8	32.1	356.9	27.5	120.3	481.6
					22.3	17.3

JAMES RIVER (CONTINUED)

Dates Exposed**	Rock Wharf Shoals		Wreck Shoal Offshore		Wreck Shoal Inshore	
	1985	1986	1985	1986	1985	1986
Jun 6-12	--	0.0	--	0.0	--	0.0
Jun 13-19	0.0	0.0	0.0	0.1	0.0	0.0
Jun 20-26	0.0	0.0	0.0	0.1	0.0	0.0
Jun 27-Jul 3	--	0.1	0.7	0.0	0.3	0.0
Jul 4-10	--	1.1	3.9	0.2	8.6	0.7
Jul 11-17	138.2	63.0	10.0	0.2	10.2	4.0
Jul 18-24	14.3	119.7	3.9	1.7	2.9	39.2
Jul 25-31	7.7	56.1	0.6	11.5	1.0	30.0
Aug 1-7	0.6	18.6	0.1	11.0	0.7	8.2
Aug 8-14	0.9	14.9	0.4	5.8	0.5	1.6
Aug 15-21	0.0	7.2	0.1	1.7	0.0	0.5
Aug 22-28	0.2	1.4	0.1	2.0	0.0	2.6
Aug 29-Sep 4	0.1	1.2	0.1	1.2	0.7	2.2
Sep 5-11	0.0	0.1	3.6	1.0	1.4	0.4
Sep 12-18	0.2	0.2	1.1	0.3	0.0	0.0
Sep 19-25	0.2	0.8	0.1	0.0	0.0	0.0
Sep 26-Oct 2	0.0	0.3	0.1	0.2	0.0	0.1
Oct 3-9	0.0	0.1	1.6	0.2	0.0	0.1
Oct 10-16	0.6	0.0	0.0	0.0	--	--
Oct 17-23	0.5	--	0.0	0.0	0.0	0.0
Oct 24-30	0.0	--	0.0	--	0.0	--
Oct 31-Nov 6	0.0	--	--	--	0.1	--
TOTALS	163.5	11.4	26.3	7.9	26.5	8.7
			35.1	10.0	87.1	6.6

JAMES RIVER (CONTINUED)

Dates Exposed**	Dry Shoal		Point of Shoals		Mulberry Swash	
	1985	1986	1985	1986	1985	1986
Jun 6-12	--	0.0	--	0.0	--	0.0
Jun 13-19	0.0	0.1	0.0	0.0	0.0	0.0
Jun 20-26	0.0	0.1	0.0	0.0	0.0	0.0
Jun 27-Jul 3	2.8	0.2	1.7	0.1	0.5	0.2
Jul 4-10	5.0	0.8	6.1	0.3	1.7	1.2
Jul 11-17	50.7	1.1	14.7	0.4	27.1	1.4
Jul 18-24	5.4	0.4	3.9	0.1	0.9	0.5
Jul 25-31	7.3	0.6	2.7	0.0	3.2	0.6
Aug 1-7	0.3	1.7	0.1	0.4	2.2	0.8
Aug 8-14	1.3	2.7	0.5	1.2	2.2	1.9
Aug 15-21	0.0	3.4	0.0	1.4	0.0	1.4
Aug 22-28	2.9	3.8	0.3	0.1	0.0	0.7
Aug 29-Sep 4	3.6	1.8	0.6	0.2	0.0	0.3
Sep 5-11	1.1	0.2	0.1	0.1	0.0	0.0
Sep 12-18	0.1	0.1	0.0	0.1	0.0	0.0
Sep 19-25	0.1	0.0	0.0	0.1	0.1	0.1
Sep 26-Oct 2	0.1	0.0	0.0	0.1	0.0	0.1
Oct 3-9	6.1	0.0	0.5	0.0	0.1	0.0
Oct 10-16	0.2	0.0	0.0	0.0	0.1	0.0
Oct 17-23	0.1	--	0.0	--	0.0	--
Oct 24-30	0.0	--	0.0	--	0.0	--
TOTALS	87.1	16.8	31.2	4.6	38.1	9.2
		241.5	75.4		79.5	
		13.2	9.9		7.6	

JAMES RIVER (CONTINUED)

Dates Exposed**	Horsehead Bar			Deepwater Shoal			
	1985	1986	1987	1985	1986	1987	1988
Jun 6-12	---	---	0.0	---	---	---	0.0
Jun 13-19	0.0	0.0	0.0	0.0	0.0	---	0.0
Jun 20-26	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 27-Jul 3	1.0	0.1	0.0	0.2	0.1	0.0	0.0
Jul 4-10	2.4	1.0	11.3	---	0.4	0.0	0.0
Jul 11-17	17.7	1.4	15.8	---	0.5	---	0.0
Jul 18-24	9.1	0.2	4.9	0.5	0.0	0.2	0.4
Jul 25-31	2.5	0.1	29.5	---	---	10.6	0.0
Aug 1-7	0.3	0.3	24.1	0.1	0.2	9.0	0.2
Aug 8-14	0.3	0.7	7.8	0.0	0.2	5.8	0.6
Aug 15-21	0.0	1.1	2.7	0.0	0.3	2.8	0.1
Aug 22-28	0.0	1.4	0.9	0.0	---	0.4	1.4
Aug 29-Sep 4	1.1	0.7	0.2	0.0	0.2	0.6	1.2
Sep 5-11	0.3	0.1	0.0	0.0	0.1	0.2	0.1
Sep 12-18	0.0	0.1	1.9	0.0	0.0	0.7	0.3
Sep 19-25	0.2	0.1	0.8	---	0.0	0.3	0.0
Sep 26-Oct 2	0.2	0.0	0.1	0.0	---	0.0	0.0
Oct 3-9	0.9	0.0	0.0	0.3	---	0.0	0.0
Oct 10-16	0.0	0.0	0.0	---	---	---	0.0
Oct 17-23	0.0	---	---	---	---	---	---
Oct 24-30	0.0	---	---	---	---	---	---
TOTALS	36.0	7.3	100.0	1.1	2.0	30.6	4.3

Dates Exposed**	YORK RIVER VIMS Ferry Pier			WARE RIVER Off Wilson's Creek Station 12			EAST RIVER Mouth Station 6			
	1985	1986	1987	1985	1986	1987	1985	1986	1987	
	1988	1988	1988	1988	1988	1988	1988	1988	1988	
Jun 6-12	--	--	0.0	--	--	0.0	--	--	0.0	0.3
Jun 13-19	0.0	0.1	0.1	0.3	0.4	0.1	0.1	0.9	0.0	0.3
Jun 20-26	0.0	0.1	0.2	0.0	0.1	0.0	0.1	0.2	0.0	0.3
Jun 27-Jul 3	0.0	0.1	0.5	0.0	0.3	0.0	0.0	0.2	0.1	0.5
Jul 4-10	0.1	0.4	3.0	0.0	0.2	0.3	0.7	1.2	1.6	1.1
Jul 11-17	0.1	3.8	7.0	0.1	0.5	0.3	0.4	1.1	2.2	2.7
Jul 18-24	0.1	16.6	5.2	0.2	0.5	0.7	0.3	0.8	3.7	6.0
Jul 25-31	0.1	56.5	2.8	0.1	1.1	0.3	0.1	14.2	0.5	0.3
Aug 1-7	0.2	52.9	1.6	0.0	0.8	--	0.5	6.4	0.2	0.3
Aug 8-14	0.0	26.8	0.9	1.0	0.8	0.6	0.3	2.4	0.5	0.5
Aug 15-21	3.2	4.2	1.5	0.0	0.7	0.3	0.1	1.6	0.1	0.1
Aug 22-28	4.2	2.4	0.7	0.0	0.1	0.0	0.1	0.2	0.0	0.1
Aug 29-Sep 4	4.1	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.2
Sep 5-11	0.5	0.5	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Sep 12-18	1.7	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Sep 19-25	3.2	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep 26-Oct 2	1.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct 3-9	1.1	0.1	0.2	0.0	0.0	--	0.0	0.0	--	--
Oct 10-16	0.3	0.1	0.1	--	--	--	--	--	--	--
Oct 17-23	0.2	--	--	--	--	--	--	--	--	--
Oct 24-30	0.1	--	--	--	--	--	--	--	--	--
Oct 31-Nov 6	0.1	--	--	--	--	--	--	--	--	--
TOTALS	20.5	165.2	25.0	1.7	5.7	2.6	4.8	29.2	8.9	13.1

MOBJACK BAY

PEPPER CREEK

Mouth

Station 7

Dates Exposed**	Station 7		1988
	1986	1987	
Jun 6-12	--	0.0	0.0
Jun 13-19	0.0	0.0	0.0
Jun 20-26	0.0	0.1	0.2
Jun 27-Jul 3	0.0	0.4	1.1
Jul 4-10	0.0	0.1	0.1
Jul 11-17	5.5	3.8	0.3
Jul 18-24	8.9	6.1	11.5
Jul 25-31	19.6	184.4	4.6
Aug 1-7	36.1	59.0	16.0
Aug 8-14	2.6	5.6	4.8
Aug 15-21	3.7	3.3	1.4
Aug 22-28	5.4	1.3	0.0
Aug 29-Sep 4	21.0	0.3	0.0
Sep 5-11	2.7	0.1	0.2
Sep 12-18	1.7	0.0	0.0
Sep 19-25	1.9	0.0	0.1
Sep 26-Oct 2	3.4	0.1	--
Oct 3-9	0.0	0.1	--
Oct 10-16	--	--	--
TOTALS	112.5	264.6	40.7

Off Brown's Bay

Station 14

Dates Exposed**	Station 14		1988
	1986	1987	
Jun 6-12	--	0.0	0.0
Jun 13-19	0.0	0.0	0.0
Jun 20-26	0.0	0.0	0.1
Jun 27-Jul 3	0.1	0.3	0.9
Jul 4-10	0.0	1.4	0.3
Jul 11-17	1.0	4.2	2.2
Jul 18-24	0.5	10.2	2.5
Jul 25-31	1.2	83.3	--
Aug 1-7	0.3	95.3	2.4
Aug 8-14	0.1	28.1	0.3
Aug 15-21	0.2	17.1	0.1
Aug 22-28	0.3	0.6	0.1
Aug 29-Sep 4	2.1	0.2	0.1
Sep 5-11	0.3	0.1	0.0
Sep 12-18	0.4	0.0	0.0
Sep 19-25	0.2	0.1	0.0
Sep 26-Oct 2	0.2	0.1	--
Oct 3-9	0.2	0.1	--
Oct 10-16	--	--	--
TOTALS	7.1	241.1	8.0

Tow Stake

Station 13

Dates Exposed**	Station 13		1988
	1986	1987	
Jun 6-12	--	0.0	0.0
Jun 13-19	0.3	1.8	0.0
Jun 20-26	0.0	2.6	0.1
Jun 27-Jul 3	0.0	0.7	0.3
Jul 4-10	0.0	0.4	0.6
Jul 11-17	0.3	0.8	0.9
Jul 18-24	0.1	0.5	2.0
Jul 25-31	0.0	0.6	0.2
Aug 1-7	0.0	1.5	0.1
Aug 8-14	0.0	4.0	0.4
Aug 15-21	0.0	2.7	0.1
Aug 22-28	1.1	0.1	0.2
Aug 29-Sep 4	0.6	0.0	0.2
Sep 5-11	0.0	0.0	0.1
Sep 12-18	0.0	0.0	0.2
Sep 19-25	0.0	0.0	0.1
Sep 26-Oct 2	0.0	0.0	0.1
Oct 3-9	0.0	0.0	0.0
Oct 10-16	--	--	--
TOTALS	2.5	15.7	1.9

TOTALS

112.5	264.6	40.7	4.7	7.1	241.1	8.0	2.2	2.5	15.7	1.9	5.3
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PIANKATANK RIVER

Dates Exposed**	Three Branches Station			Burton Point Station G			
	1985	1986	1987	1985	1986	1987	1988
Jun 6-12	--	--	--	--	--	--	0.0
Jun 13-19	--	0.0	--	0.0	0.7	--	0.0
Jun 20-26	--	0.0	--	0.1	0.1	--	--
Jun 27-Jul 3	--	14.1	0.0	1.5	60.6	1.7	--
Jul 4-10	--	58.0	0.3	3.9	124.2	8.4	0.7
Jul 11-17	--	14.1	61.2	66.0	29.7	29.9	0.7
Jul 18-24	--	5.1	3.0	--	14.5	2.4	0.8
Jul 25-31	--	2.7	0.4	12.7	15.3	0.4	0.8
Aug 1-7	--	1.5	0.0	0.9	4.5	0.3	0.7
Aug 8-14	--	1.2	0.0	0.2	1.8	0.1	0.5
Aug 15-21	--	0.9	0.0	0.0	1.1	0.3	0.5
Aug 22-28	--	0.2	0.0	0.4	0.2	0.4	--
Aug 29-Sep 4	--	0.1	--	0.0	0.1	--	--
Sep 5-11	--	0.0	--	0.0	0.0	--	--
Sep 12-18	--	0.0	--	0.0	0.0	--	--
Sep 19-25	--	0.0	--	0.0	0.0	--	--
Sep 26-Oct 2	--	0.0	--	0.0	0.0	--	--
Oct 3-9	--	0.0	--	0.0	0.0	--	--
TOTALS	--	97.6	64.9	85.7	252.8	43.9	4.7

PIANKATANK RIVER (CONTINUED)

Dates Exposed**	Palace Bar Station J			Ginny Point Station K		
	1985	1986	1987	1985	1986	1987
Jun 6-12	--	--	--	--	--	--
Jun 13-19	0.2	0.1	--	0.1	0.0	0.0
Jun 20-26	0.6	0.1	--	0.6	0.2	--
Jun 27-Jul 3	4.5	108.0	10.4	3.0	7.4	2.3
Jul 4-10	16.0	169.5	35.7	29.7	46.2	11.5
Jul 11-17	87.8	57.0	146.9	27.8	117.3	76.9
Jul 18-24	--	21.2	31.2	--	24.8	16.9
Jul 25-31	5.5	10.4	9.4	12.7	3.0	17.2
Aug 1-7	7.1	2.7	2.6	2.1	2.7	4.4
Aug 8-14	0.3	3.2	2.5	0.4	1.7	0.9
Aug 15-21	0.2	3.7	2.6	0.0	0.8	3.1
Aug 22-28	0.5	0.4	2.6	0.2	0.1	1.5
Aug 29-Sep 4	0.0	0.1	--	0.1	0.0	1.7
Sep 5-11	0.0	0.1	--	0.0	0.0	--
Sep 12-18	1.5	0.0	--	3.4	0.0	--
Sep 19-25	0.3	0.0	--	2.6	0.0	--
Sep 26-Oct 2	0.0	0.0	--	0.0	0.0	--
Oct 3-9	0.0	0.0	--	0.0	0.0	--
TOTALS	124.5	376.5	243.9	82.7	204.2	133.3
			9.1			5.6

RAPPAHANNOCK RIVER

Dates Exposed**	Windmill Point		Sturgeon Point		Locklies	
	1987	1988	1986	1987	1986	1987
Jun 13-19	--	0.0	0.1	--	0.0	--
Jun 20-26	--	0.0	0.3	--	0.0	--
Jun 27-Jul 3	0.2	0.0	0.3	0.0	0.1	0.1
Jul 4-10	3.2	0.0	9.7	0.4	2.1	0.4
Jul 11-17	4.4	0.1	11.2	0.3	5.4	0.6
Jul 18-24	23.6	0.5	--	0.0	6.0	0.8
Jul 25-31	8.2	0.1	--	0.1	5.9	0.2
Aug 1-7	2.0	0.1	--	0.1	5.9	0.1
Aug 8-14	2.0	0.1	--	0.1	1.4	0.1
Aug 15-21	2.0	0.0	--	0.1	0.5	0.1
Aug 22-28	0.3	0.2	--	0.0	0.2	0.1
Aug 29-Sep 4	0.0	0.2	--	0.0	0.1	0.1
Sep 5-11	0.0	0.1	--	0.0	0.0	0.1
Sep 12-18	0.0	0.0	--	0.0	0.0	0.1
Sep 19-25	0.0	0.0	--	0.0	0.0	0.0
Sep 26-Oct 2	--	--	--	--	0.0	--
Oct 3-9	--	--	--	--	0.0	--
TOTAL	45.9	1.4	21.6	1.1	27.7	2.8
						3.3

GREAT WICOMICO RIVER

Dates Exposed**	Fleet Point Station a			Dameron Marsh Station b			Cranes Creek Station c			
	1985	1986	1987	1985	1986	1987	1985	1986	1987	1988
Jun 6-12	--	0.0	0.0	--	0.0	0.0	--	--	0.0	0.0
Jun 13-19	0.0	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 20-26	0.0	0.0	--	0.0	0.0	0.4	--	0.0	0.0	0.0
Jun 27-Jul 3	0.1	2.1	2.2	0.0	1.5	1.4	0.0	4.7	7.0	0.8
Jul 4-10	0.1	2.1	2.2	0.1	20.4	9.2	0.4	50.4	9.8	4.6
Jul 11-17	0.1	1.1	76.7	1.3	4.0	8.2	0.2	21.0	6.5	3.7
Jul 18-24	9.2	4.5	67.7	1.5	2.5	4.5	0.8	8.1	2.3	3.1
Jul 25-31	68.3	10.7	7.8	3.1	6.1	1.9	2.8	19.9	1.1	0.1
Aug 1-7	0.2	12.0	0.0	2.4	6.6	0.3	1.5	5.9	0.0	0.4
Aug 8-14	0.0	7.0	0.1	0.0	1.6	1.8	--	3.4	1.7	1.5
Aug 15-21	0.2	2.6	0.5	0.0	0.5	0.8	0.0	6.0	1.5	1.9
Aug 22-28	0.0	0.6	0.5	0.2	0.1	0.8	0.6	2.1	0.3	0.9
Aug 29-Sep 4	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Sep 5-11	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Sep 12-18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Sep 19-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Sep 26-Oct 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct 3-9	--	0.0	0.0	--	0.0	0.0	0.0	--	0.0	0.0
TOTALS	78.4	42.8	158.0	8.6	43.3	29.1	6.3	121.6	30.5	17.4

GREAT WICOMICO RIVER (CONTINUED)

Dates Exposed**	Haynie Point Station e		Hudnall's Dock Station f		Glebe Point Station g	
	1985	1987	1985	1987	1985	1987
Jun 6-12	--	0.0	--	0.0	--	0.0
Jun 13-19	0.0	0.0	0.0	0.1	0.0	0.0
Jun 20-26	0.0	0.5	0.0	0.0	0.0	0.0
Jun 27-Jul 3	0.0	0.1	0.0	13.2	0.0	3.1
Jul 4-10	1.8	1.9	33.9	14.2	24.0	2.6
Jul 11-17	0.2	3.2	73.2	13.5	3.3	1.6
Jul 18-24	0.4	0.6	30.8	1.5	84.2	1.0
Jul 25-31	3.8	0.7	20.1	0.2	94.5	3.9
Aug 1-7	1.1	0.7	146.1	1.2	45.1	0.4
Aug 8-14	0.0	2.1	16.2	3.6	79.0	1.8
Aug 15-21	0.0	0.2	7.6	1.0	19.6	5.7
Aug 22-28	0.2	0.4	7.0	1.5	2.8	0.0
Aug 29-Sep 4	0.1	0.1	2.5	0.4	9.0	1.1
Sep 5-11	0.0	--	0.2	0.0	5.5	1.0
Sep 12-18	0.0	--	0.1	0.0	0.8	0.8
Sep 19-25	0.0	0.0	0.0	0.2	0.1	0.5
Sep 26-Oct 2	0.0	--	0.0	0.0	0.0	0.1
Oct 3-9	--	--	--	0.0	0.0	0.0
TOTALS	7.6	170.8	14.2	237.6	10.9	364.6
		10.5		50.8		23.6
		57.4		61.8		27.1

POTOMAC RIVER

Dates Exposed**	Cornfield			Jones Shore			Great Neck			
	1985	1986	1987	1985	1986	1987	1985	1986	1987	1988
Jun 6-12	--	--	0.0	--	--	0.0	--	--	0.0	0.0
Jun 13-19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Jun 20-26	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Jun 27-Jul 3	0.0	0.2	1.1	0.0	0.0	0.5	0.0	0.5	0.0	0.1
Jul 4-10	0.0	0.3	0.1	0.1	0.6	0.5	0.0	0.4	0.0	0.1
Jul 11-17	0.1	0.5	23.6	0.2	2.4	12.9	0.1	0.5	0.3	0.1
Jul 18-24	15.8	0.3	23.6	5.8	0.6	12.9	0.2	0.8	0.3	0.0
Jul 25-31	12.1	0.3	1.1	5.4	1.3	0.5	0.2	0.4	0.1	0.0
Aug 1-7	0.6	0.6	0.6	7.2	3.4	0.5	0.2	2.3	0.1	0.0
Aug 8-14	0.0	0.6	0.1	0.0	2.8	--	0.0	0.4	0.2	0.0
Aug 15-21	0.0	0.6	0.1	0.0	1.5	0.1	0.3	0.3	0.5	0.1
Aug 22-28	0.8	0.2	1.0	1.1	2.4	0.1	0.9	0.3	0.2	0.1
Aug 29-Sep 4	0.0	0.0	0.9	0.0	1.2	0.1	0.3	0.1	0.1	0.2
Sep 5-11	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2
Sep 12-18	0.0	0.0	0.6	0.0	0.0	0.0	0.2	0.0	0.0	0.2
Sep 19-25	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.2
Sep 26-Oct 2	0.1	0.0	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0
Oct 3-9	0.0	0.0	--	--	0.0	0.0	--	0.0	0.0	--
Oct 10-16	--	--	0.0	--	--	0.0	--	--	0.0	--
TOTALS	29.5	3.6	49.6	20.6	16.2	27.2	5.2	6.4	1.9	1.4

POTOMAC RIVER (CONTINUED)

Dates Exposed**	Coan		Hog Island		Thicket Point	
	1985	1986	1985	1986	1985	1986
Jun 6-12	--	--	--	--	--	--
Jun 13-19	0.0	0.0	0.0	0.0	0.0	0.0
Jun 20-26	0.0	0.0	0.0	0.0	0.0	0.0
Jun 27-Jul 3	0.0	0.2	0.0	0.1	0.0	0.1
Jul 4-10	0.0	0.1	0.0	0.1	0.0	0.0
Jul 11-17	0.0	0.3	0.0	0.4	0.0	0.4
Jul 18-24	0.0	6.0	0.0	0.3	0.0	0.7
Jul 25-31	0.0	3.1	0.0	0.1	0.0	1.4
Aug 1-7	0.0	0.5	0.0	0.1	0.0	0.2
Aug 8-14	0.0	0.1	0.0	1.2	0.0	0.5
Aug 15-21	0.0	0.2	0.0	2.1	0.1	0.9
Aug 22-28	0.0	0.1	0.0	0.4	0.0	0.2
Aug 29-Sep 4	0.0	0.1	0.0	0.1	0.0	0.1
Sep 5-11	0.0	0.1	0.0	0.1	0.0	0.1
Sep 12-18	0.0	0.0	0.0	0.0	0.0	0.0
Sep 19-25	0.0	0.0	0.0	0.0	0.1	0.0
Sep 26-Oct 2	0.0	0.0	0.0	0.0	0.0	0.0
Oct 3-9	0.0	0.0	0.0	0.0	0.0	0.0
Oct 10-16	--	--	--	--	--	--
TOTALS	0.0	10.8	1.7	4.8	0.2	4.9
				1.8		0.3
				0.0		0.6

EASTERN SHORE BAYSIDE
POCOMOKE

EASTERN SHORE, SEASIDE

Dates Exposed	Butler's Point		Bernard's Bar		Dates Exposed**	VIMS Pier at Machapreague			
	1987	1988	1987	1988		1985	1986	1987	1988
Jun 6-12	--	--	0.0	--	Jun 13-19	0.0	0.1	0.2	0.1
Jun 13-19	0.0	--	--	--	Jun 20-26	0.0	0.1	0.4	0.3
Jun 20-26	0.0	--	0.0	--	Jun 27-Jul 3	0.0	0.2	2.9	0.1
Jun 27-Jul 3	0.0	--	0.0	--	Jul 4-10	0.2	0.5	0.1	0.2
Jul 4-10	0.0	--	0.0	--	Jul 11-17	0.2	1.0	1.2	1.0
Jul 11-17	0.0	--	0.1	--	Jul 18-24	0.1	8.7	1.0	2.1
Jul 18-24	0.0	--	0.1	--	Jul 25-31	0.5	21.8	3.1	0.2
Jul 25-31	0.0	--	0.6	--	Aug 1-7	0.5	19.4	2.0	8.4
Aug 1-7	0.0	--	0.5	--	Aug 8-14	0.4	10.8	1.5	22.3
Aug 8-14	0.0	--	0.3	--	Aug 15-21	5.5	2.0	3.2	5.4
Aug 15-21	0.0	--	0.2	--	Aug 22-28	2.6	0.7	3.5	2.4
Aug 22-28	--	--	0.1	--	Aug 29-Sep 4	13.0	0.2	0.2	1.6
Aug 29-Sep 4	--	--	0.0	--	Sep 5-11	2.7	0.2	1.6	0.3
Sep 5-11	0.0	--	0.0	--	Sep 12-18	5.3	0.1	3.4	0.9
Sep 12-18	0.0	--	0.0	--	Sep 19-25	0.0	0.7	4.2	0.9
Sep 19-25	0.0	--	0.0	--	Sep 26-Oct 2	0.4	0.2	1.2	0.9
Sep 26-Oct 2	--	--	0.0	--	Oct 3-9	0.3	0.0	0.0	0.0
Oct 3-9	--	--	0.0	--	Oct 10-16	0.2	0.0	--	0.0
Oct 10-16	--	--	0.0	--	Oct 17-23	--	--	--	0.0
					Oct 24-30	--	--	--	--
TOTALS	0.0	--	1.9	--	TOTALS	31.9	66.7	29.7	47.1

Table 2. Sum of Weekly Spatfall - James River

Year	Wreck Shoal	Horsehead Shoal	Deepwater Shoal
1970	14.8	15.1	4.7
1971	9.7	12.0	7.1
1972	3.0	3.3	0.9
1973	1.1	1.3	0.5
1974	4.1	3.2	2.2
1975	12.1	2.3	2.1
1976	2.2	1.5	0.8
1977	4.1	4.6	3.5
1978	1.9	1.0	2.2
1979	6.9	3.0	2.6
Ave.(1970-79)	6.0	4.7	2.7
1980	16.4	20.7	5.2
1981	51.9	71.9	65.0
1982	36.7	16.3	12.8
1983	104.8	96.6	62.0
1984	21.2	28.1	2.7
1985	26.3	36.0	1.1
1986	7.9	7.3	2.0
1987	35.1	100.0	30.6
1988	10.0	3.7	4.3
Ave.(1980-88)	34.5	42.3	20.6

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