

MARINE RESOURCE SPECIAL REPORT



A SEA GRANT ADVISORY SERVICE

Virginia Institute of Marine Science Gloucester Point, Virginia 23062

1979 Annual Summary

OYSTER SPATFALL IN VIRGINIA RIVERS

BY

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The Virginia Institute of Marine Science (VIMS) conducts weekly surveys from June through early October to obtain oyster spatfall information. Spat counts are made from oyster shells strung on wire and suspended from stakes on public and private beds. The number of spat on shells are counted each week of the spawning season to determine the potential of a particular area for receiving a strike and to predict the most likely period the strikes will occur. Shells planted just before the period of maximum set have the best chance of getting a good strike.

A moderate or heavy strike on shellstrings usually indicates a significant strike on exposed bottom cultch. However, a good strike on shellstrings in some locations may not always be accompanied by good spatfall on shells on the bottom. Bottom shells are sometimes so fouled by other marine life that no room is left for small spat to attach. Even with a reasonable spatfall, survival on the bottom in saltier waters may be extremely low due to predators such as drills and blue crabs which eat the small spat.

Usually a light set of spat on shellstrings indicates a poor set on bottom cultch. During certain exceptional years, for reasons only partially understood, a light set on our shellstrings results in an exceptional set on the natural bottom.

The average number of spat which set in one week on the smooth side of 10 shells is tabulated in this report; it is reported as spat-per-shell-per-week. Weekly set is arbitrarily rated as follows: fair, 0.1 to 1.0; moderate, 1.1 to 10; heavy, 11 to 100. As an index of total seasonal spatfall, the weekly sets are summed in this report for each station. In evaluating setting levels, it should be

recognized that in certain rivers, such as the Rappahannock and Potomac, the set is typically zero in many sections and only fair in others. Other systems, including the lower James and Piankatank rivers, Mobjack Bay and Seaside of the Eastern Shore, typically receive a moderate or heavy set and, as a result, often produce quantities of seed oysters or market oysters.

The shellstring study is supplemented each year by counts of spat on natural bottom cultch. This study is made after seasonal setting has stopped and it indicates how many spat have survived. Half-bushel samples of bottom cultch were collected from selected locations with a dredge during the fall and winter of 1979-80. Numbers of oyster spat setting on cultch were counted. The data are expressed as number of spat per bushel.

If shells are to be planted in any region, it is important to plant a week or two prior to peak setting. If shells are planted much earlier, they may become so fouled with marine organisms that larvae will not set. For further information on setting seasons and time to plant shells, contact Dexter Haven, Head, Department of Applied Biology, VIMS.

SUMMARY OF SETTING IN 1979

General Summary for the Individual Systems

Setting in 1979 was exceptionally good in many regions, and this resulted in above average counts of spat on bottom cultch in late fall in the James, Piankatank, Great Wicomico rivers and in regions of Mobjack Bay.

James River - Setting began in the James during July and lasted through September. At most stations there were, as is typical, two peak setting periods. One occurred during the second or third week of August; the second was observed during mid-September. The levels of peak set ranged from light to moderate with the highest weekly set (7.6 spat) being observed during mid-August on Hampton Flats.

At the individual stations, the total seasonal set (the sum of the weekly sets) ranged from 22.6 spat at

Hampton Flats to only 0.3 spat at the mouth of the Warwick River. These totals were substantially higher than those observed in 1978.

Samples of oysters dredged from public rocks adjacent to shellstring stations in mid-September indicated that spat survival was exceptionally good in 1979. However, freshwater due to excessive rainfall during September and October killed from 71 to 89% of the small spat at Deepwater Shoal, Horsehead and Point of Shoals; downriver mortalities were zero to light. Few if any of the larger oysters were killed in any location.

Surveys made after the mortality ended during February 1980 still showed in many areas above average spat counts. At present the number of spat per bushel of bottom cultch are: Deepwater Shoal, 42; Horsehead, 51; Point of Shoals, 85; Wreck Shoal, 462; White Shoal, 190; Gun Rock, 142, Naseway Shoal, 361; Thomas Rock, 262; and Nansemond Ridge, 46.

York River - Setting was monitored at three stations in the York. At the lowermost station at VIMS, setting occurred from July through September with no peak setting period; weekly levels were only fair. Upriver at Aberdeen Rock levels were lower, and off Foxes Creek setting was nearly zero for the season.

Numbers of spat per bushel of bottom cultch dredged in November were low as follows: Bell Rock, 56; Aberdeen Rock, 18; Pages Rock, 30; and Green Rock, 8.

Mobjack Bay - At Tow Stake there was a good set which exceeded levels observed during the preceding three years. It lasted from July to October with two heavy peak setting periods - one occurred in mid-July, the second in late August. Total seasonal set was 22.2 spat for the whole season. Partial records for the Brown's Bay station indicated that a similar set had occurred there.

Ware River - An exceptionally good set occurred off Wilson's Creek. There were two peak setting periods - one in late July which reached 102.2 spat per week, and a second in early August which reached 27.6 spat per week. Total set for the season was 165.2 spat. This level was much higher than has been recorded during the past three years.

North River - Three stations were monitored in this system. At the two upriver stations setting lasted from early July through early September with only one heavy peak setting

period during the week of July 16-23. Total seasonal sets for both areas ranged from 28.7 to 41.6 spat which was higher than values observed during the preceding three years.

At the single station at the mouth of the North River (Cedar Point) setting extended over the same period but there were two heavy peak setting periods, one in early July and the second in late August. The total seasonal set was 38.9 spat, which was many times higher than had been recorded during the preceding three years.

East River - Moderate to heavy setting occurred on shellstrings at two stations from the first of July to mid-August. Fair levels were observed through September. The total seasonal set for both stations was high, but not as high as during 1978.

New Point Comfort Area - At Pepper Creek and Winter Harbor setting began the second week in July and ended in early October. During this period weekly sets ranged from fair to heavy with peak sets occurring in mid-August. Total seasonal sets were exceptionally good and ranged from 33.1 to 28.0 spat. This was higher than values observed during the preceding three years.

Milford Haven - At Point Breeze setting began in early July and lasted through September. The moderate peak set of 9.6 spat per week occurred in mid-July. The total seasonal set was 32.8 spat which was much higher than the preceding three years.

Piankatank River - Setting began in early July and extended into late September. At all stations there were exceptionally heavy weekly setting periods during July, with lesser secondary peaks during mid to late-August. The total seasonal set for the four stations ranged from 28.7 to 183.4 spat which is exceptionally high, and was equal to or higher than that recorded over the past three years.

On natural cultch dredged from rocks adjacent to the shellstring stations survival was exceptionally high. The following numbers of spat per bushel were recorded: Three Branches, 103; Burton Point, 350; Palace Bar, 680; Cape Tune, 394, Island Bar, 418 and Ginney Point, 1106.

Rappahannock River - As is typical of the Rappahannock River setting was light and sporadic during 1979. It lasted from July through September. There was no well defined peak setting period except at Smokey Point when the peak set occurred in

early September. The total seasonal set ranged from 15.6 spat at Lawson's Bay to 0.7 spat at Greenvale. Levels were about the same or higher than values seen in 1978.

Bushel samples of bottom cultch dredged in late October showed a light to zero set at most of the natural rocks. There were as follows: Parrot's Rock, 50; Drumming Ground, 79; Hogg House, 4; Smokey Point, 2; Morattico Bar, 0; and Bowlers Rock, 0.

Great Wicomico River - Setting began at most stations during mid to late-July and lasted through September. At three stations in the upper river heavy weekly peaks occurred in mid to late-July. In this upriver area total seasonal set ranged from 6.5 to 16.1 spat which was much higher than for the preceding three years. At the downriver stations total seasonal set was low. This was similar to the situations observed during the last three years.

Numbers of spat per bushel of bottom cultch dredged from the natural rocks showed moderate to heavy survival rates. Levels observed were: Dameron Marsh, 200; Whaley's West, 278; Fleet Point, 430; Cranes Creek, 438; Haynie Point, 220; and Rogue Point, 126.

Potomac River - As is typical of the Potomac River setting on shellstrings was low. Scattered sets were noted, however, on Jones Shore, Great Neck, Hog Island, Thicket Point, and Yeocomico. The total seasonal set for all eight stations ranged from 0 to 1.0 spat.

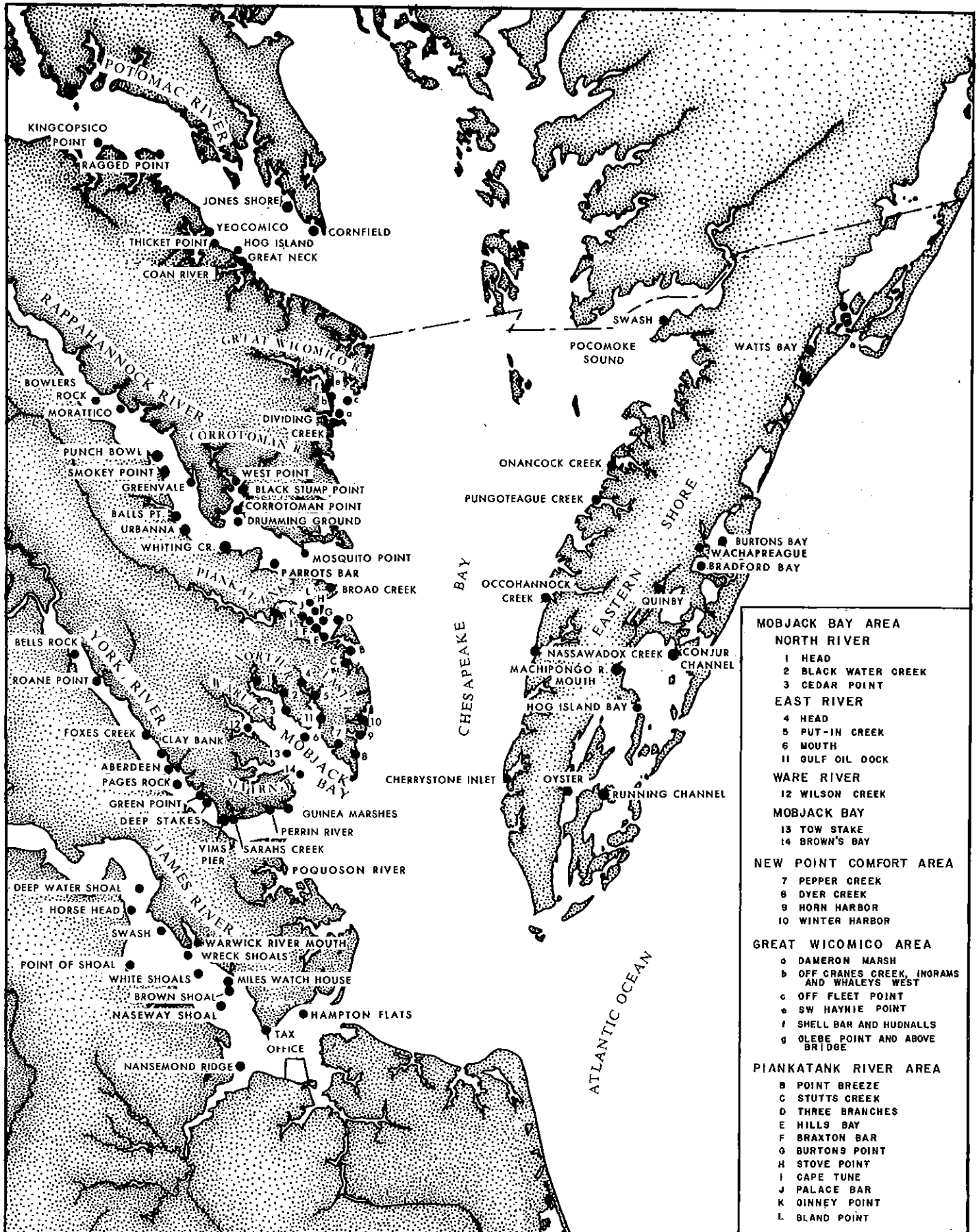
Samples of bottom material dredged in late September showed the following numbers of spat per bushel: King Copsico, 0; Ragged Point (east), 4; Ragged Point (west), 0; Thicket Point, 0; Great Neck, 12; Jones Shore (5 samples), 104, 60, 64, 144, 64; and Cornfield (3 samples), 228, 300, 24.

Bayside of the Eastern Shore - Only one station was occupied in 1979 on the Bayside of the Eastern Shore. This was at the Swash near Saxis. The set was essentially zero at this location. However, information supplied by the VMRC indicates that there has been at least a light set on bottom cultch over some of the areas in Tangier and Pocomoke Sounds.

Seaside of the Eastern Shore - Spatfall on shellstrings in two locations showed roughly twice the number of spat counted in 1978. The peak weekly set was heavy for the stations and occurred near the same time - in the early part of August. Reports from many other areas indicate similar levels.

Acknowledgments - Much of the work of putting out and collecting the shellstrings and shellbags was done by Inspectors, Police Boat Captains and Mates of the Virginia Marine Resources Commission. Their cooperation and the assistance of their supervisors is gratefully acknowledged.

SHELLSTRING SURVEY STATIONS



- MOBJACK BAY AREA**
- NORTH RIVER**
- 1 HEAD
- 2 BLACK WATER CREEK
- 3 CEDAR POINT
- EAST RIVER**
- 4 HEAD
- 5 PUT-IN CREEK
- 6 MOUTH
- 11 GULF OIL DOCK
- WARE RIVER**
- 12 WILSON CREEK
- MOBJACK BAY**
- 13 TOW STAKE
- 14 BROWN'S BAY
- NEW POINT COMFORT AREA**
- 7 PEPPER CREEK
- 8 DYER CREEK
- 9 HORN HARBOR
- 10 WINTER HARBOR
- GREAT WICOMICO AREA**
- a DAMERON MARSH
- b OFF GRANES CREEK, INGRAMS AND WHALEYS WEST
- c OFF FLEET POINT
- d SW HAYNIE POINT
- e SHELL BAR AND HUDNALLS
- f OLEBE POINT AND ABOVE BRIDGE
- PIANKATANK RIVER AREA**
- B POINT BREEZE
- C STUTTS CREEK
- D THREE BRANCHES
- E HILLS BAY
- F BRAXTON BAR
- G BURTONS POINT
- H STOVE POINT
- I CAPE TUNE
- J PALACE BAR
- K QUINNEY POINT
- L BLAND POINT

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Spatfall on Shellstrings*
Annual Summary
1976-1979

JAMES RIVER

Dates Exposed**	Hampton Flats			Nansemond Ridge			Newport News Tax Office			
	1976	1977	1978	1976	1977	1978	1976	1977	1978	1979
Jun 19-25	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	--	1.0	0.0	--	--	0.0	--	0.0	0.0	0.0
Jul 9-16	0.2	0.0	0.7	--	0.3	0.0	0.4	--	0.0	0.0
Jul 16-23	0.3	0.0	4.0	0.0	0.0	0.1	--	0.4	0.0	0.1
Jul 23-30	0.3	0.2	0.0	0.0	--	0.0	0.2	0.3	0.0	0.0
Jul 30-Aug 6	0.1	0.6	0.1	0.0	0.1	0.0	0.2	0.7	0.0	0.0
Aug 6-13	0.3	0.8	0.0	--	0.0	0.8	0.4	--	0.0	0.6
Aug 13-20	1.7	0.7	0.1	--	0.1	0.2	1.0	0.6	0.0	1.1
Aug 20-27	1.1	0.5	0.3	--	1.6	0.9	0.0	0.4	0.1	--
Aug 27-Sep 3	1.1	2.5	1.3	0.4	0.2	0.1	1.8	1.3	0.2	--
Sep 3-10	1.3	0.2	0.7	0.4	0.1	0.9	2.5	0.5	0.0	0.8
Sep 10-17	4.4	2.7	0.0	1.1	0.1	0.4	9.5	1.0	0.1	0.2
Sep 17-24	--	--	1.2	--	--	--	0.1	1.0	--	0.2
Sep 24-Oct 1	--	--	1.5	--	--	0.0	0.8	1.0	--	0.2
Oct 1-8	--	--	--	--	--	--	--	--	--	--
Oct 8-15	--	--	--	--	--	--	--	--	--	--
TOTALS	9.7	9.2	5.2	1.9	2.5	3.3	16.9	6.2	0.7	3.5

* Shows spat per shell (smooth side only).

** Dates shown are for 1979. Dates in other years were approximately the same.

● Not sampled in previous years.

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

Dates Exposed**	Brown Shoal		Miles Match House		White Shoal	
	1976	1977	1976	1977	1976	1977
Jun 19-25	--	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	--	0.0	0.0	0.0	0.0	0.0
Jul 9-16	0.9	--	0.0	0.0	0.0	0.1
Jul 16-23	0.3	0.0	0.1	0.0	0.0	0.0
Jul 23-30	0.2	0.1	0.0	0.0	0.1	0.0
Jul 30-Aug 6	0.0	0.0	0.0	0.0	0.0	0.0
Aug 6-13	0.0	0.5	0.0	0.1	0.0	0.1
Aug 13-20	0.8	0.7	0.2	0.5	0.1	3.0
Aug 20-27	0.5	0.3	0.1	0.5	0.2	0.6
Aug 27-Sep 3	0.8	0.6	0.1	0.2	0.2	4.1
Sep 3-10	3.9	0.5	0.1	0.2	0.9	0.4
Sep 10-17	6.7	0.4	0.4	0.2	0.3	0.3
Sep 17-24	3.2	0.5	0.6	--	1.0	0.2
Sep 24-Oct 1	0.3	0.1	0.0	0.0	0.7	0.9
Oct 1-8	--	--	0.0	0.0	0.0	0.8
Oct 8-15	--	--	--	--	0.0	0.0
TOTALS	17.6	3.7	1.6	1.9	3.6	15.8

Date Exposed**	Wreck Shoal		Warwick River Mouth		Point of Shoal	
	1976	1977	1976	1977	1976	1977
Jun 18-25	0.0	0.0	--	0.0	--	0.0
Jun 25-Jul 2	0.0	0.0	--	0.0	0.0	0.0
Jul 2-9	--	0.0	--	0.0	--	0.0
Jul 9-16	0.0	0.0	--	0.0	0.0	0.1
Jul 16-23	0.0	0.0	0.0	0.0	0.0	0.0
Jul 23-30	0.0	0.0	0.0	0.0	0.0	0.0
Jul 30-Aug 6	0.0	0.0	0.2	0.0	0.0	0.0
Aug 6-13	0.1	0.4	0.1	2.2	0.2	5.7
Aug 13-20	0.2	0.7	0.3	0.3	0.0	2.6
Aug 20-27	0.0	0.5	0.1	0.2	0.1	3.5
Aug 27-Sep 3	--	1.1	0.0	0.2	0.0	1.6
Sep 3-10	0.0	0.1	0.0	0.0	0.0	0.8
Sep 10-17	0.7	0.1	0.1	0.0	0.0	0.1
Sep 17-24	1.1	0.0	0.1	0.0	0.2	0.1
Sep 24-Oct 1	0.1	0.2	0.2	0.0	0.0	0.1
Oct 1-8	--	0.0	--	0.0	--	0.0
Oct 8-15	--	--	--	0.1	--	0.2
TOTALS	2.2	4.1	1.1	3.0	0.9	14.9

TOTALS

2.2

Dates Exposed**	Mulberry Swash		Horsehead Shoal		Deepwater Shoal			
	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	--	--	0.0	--	--	--	0.0	--
Jun 25-Jul 2	0.0	0.0	0.0	--	0.0	0.0	0.0	--
Jul 2-9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 9-16	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Jul 16-23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 23-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 30-Aug 6	0.0	0.2	0.0	0.6	0.0	0.0	0.4	0.5
Aug 6-13	0.0	4.0	0.1	0.7	0.3	1.1	0.1	1.4
Aug 13-20	0.1	0.0	0.4	1.2	0.1	0.5	0.0	0.7
Aug 20-27	0.0	1.7	0.3	0.5	0.0	2.3	0.1	0.0
Aug 27-Sep 3	0.0	2.4	0.3	0.3	0.0	0.4	0.0	0.2
Sep 3-10	0.4	0.1	1.1	0.0	0.1	0.2	0.5	0.0
Sep 10-17	0.2	0.0	0.7	0.1	0.7	0.1	--	0.0
Sep 17-24	0.0	0.1	0.4	0.0	0.2	0.0	0.1	0.0
Sep 24-Oct 1	0.0	0.0	0.7	0.0	0.1	0.0	0.2	0.0
Oct 1-8	--	--	0.2	0.0	--	--	--	0.0
Oct 8-15	--	--	--	0.0	--	--	--	0.0
TOTALS	0.7	8.5	3.9	4.0	1.5	4.6	1.0	3.0

YORK RIVER

Dates Exposed**	VIMS Ferry Pier		Aberdeen Rock		Off Foxes Creek			
	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	0.0	0.0	0.0	0.0	--	0.0	--	0.0
June 25-Jul 2	0.0	0.0	0.0	0.0	--	--	0.0	0.0
Jul 2-9	0.2	1.0	0.0	0.0	--	0.1	0.0	0.0
Jul 9-16	--	1.2	0.0	0.0	--	0.0	0.0	0.0
Jul 16-23	0.7	0.0	0.1	0.3	--	0.0	0.0	0.1
Jul 23-30	--	1.0	0.1	1.0	--	0.0	0.0	0.0
Jul 30-Aug 6	0.0	0.0	0.3	0.6	0.0	0.0	0.0	0.0
Aug 6-13	0.2	0.4	0.1	0.0	0.3	0.2	0.0	0.0
Aug 13-20	--	0.4	0.6	0.3	1.0	0.5	0.0	0.0
Aug 20-27	0.1	0.3	0.9	1.3	0.5	0.2	0.0	0.1
Aug 27-Sep 3	0.0	0.9	0.4	0.0	0.0	0.5	0.0	--
Sep 3-10	0.3	6.7	0.1	0.0	0.0	0.1	0.0	0.0
Sep 10-17	0.4	6.6	0.3	1.6	0.0	0.4	0.1	0.0
Sep 17-24	0.1	3.8	0.1	0.0	0.0	0.4	0.2	0.0
Sep 24-Oct 1	0.1	1.0	0.1	0.1	0.0	0.4	0.2	0.0
Oct 1-8	0.0	--	--	0.1	0.0	--	--	0.0
Oct 8-19	--	--	--	0.1	0.0	--	--	0.0
TOTALS	2.1	22.9	3.1	5.2	0.0	3.2	0.3	3.2

WARE RIVER

Dates Exposed**	Off Brown's Bay Station 14			Tow Stake Station 13			Off Wilson's Creek Station 12					
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	0.0	0.0	0.0	0.0	0.2	--	0.0	0.0	2.7	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	--	0.0	0.1	0.0	0.0	0.0	1.6	--	0.2	0.0
Jul 2-9	--	0.0	--	0.0	--	8.8	1.7	0.1	3.7	0.0	11.5	1.7
Jul 9-16	0.0	2.3	1.0	0.0	8.5	0.1	1.0	0.0	2.8	0.7	30.8	6.5
Jul 16-23	0.1	0.2	0.1	0.1	2.1	1.3	0.1	6.0	7.9	1.5	3.0	25.6
Jul 23-30	0.1	0.7	1.1	1.0	0.3	0.0	1.0	3.2	--	5.8	0.4	102.2
Jul 30-Aug 6	--	0.0	2.8	1.3	}			0.3	--	--	2.4	0.9
Aug 6-13	--	0.0	0.7	1.3	}			0.4	--	--	0.7	0.0
Aug 13-20	--	--	--	5.7				4.3	--	--	1.0	27.6
Aug 20-27	--	--	0.9	--	}			7.4	--	--	5.1	0.2
Aug 27-Sep 3	--	--	2.2	--				0.2	--	--	12.0	0.2
Sep 3-10	--	--	0.9	--	}			0.0	--	--	0.0	0.0
Sep 10-17	--	--	0.6	--				0.2	--	--	6.4	0.2
Sep 17-24	--	--	--	--	}			0.1	--	--	0.0	0.0
Sep 24-Oct 1	--	--	--	--				0.2	0.3	5.0	0.0	0.0
Oct 1-8	--	--	--	--	0.1	--	--	0.2	--	--	--	0.1
Oct 8-15	--	--	--	--	--	--	--	--	--	--	--	--
TOTALS	0.2	3.2	10.3	9.4	12.5	16.1	8.3	22.2	19.2	13.0	73.5	165.2

MOBJACK BAY

Dates Exposed**	Off Brown's Bay Station 14			Tow Stake Station 13			Off Wilson's Creek Station 12					
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	0.0	0.0	0.0	0.0	0.2	--	0.0	0.0	2.7	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	--	0.0	0.1	0.0	0.0	0.0	1.6	--	0.2	0.0
Jul 2-9	--	0.0	--	0.0	--	8.8	1.7	0.1	3.7	0.0	11.5	1.7
Jul 9-16	0.0	2.3	1.0	0.0	8.5	0.1	1.0	0.0	2.8	0.7	30.8	6.5
Jul 16-23	0.1	0.2	0.1	0.1	2.1	1.3	0.1	6.0	7.9	1.5	3.0	25.6
Jul 23-30	0.1	0.7	1.1	1.0	0.3	0.0	1.0	3.2	--	5.8	0.4	102.2
Jul 30-Aug 6	--	0.0	2.8	1.3	}			0.3	--	--	2.4	0.9
Aug 6-13	--	0.0	0.7	1.3				0.4	--	--	0.7	0.0
Aug 13-20	--	--	--	5.7	}			4.3	--	--	1.0	27.6
Aug 20-27	--	--	0.9	--				7.4	--	--	5.1	0.2
Aug 27-Sep 3	--	--	2.2	--	}			0.2	--	--	12.0	0.2
Sep 3-10	--	--	0.9	--				0.0	--	--	0.0	0.0
Sep 10-17	--	--	0.6	--	}			0.2	--	--	6.4	0.2
Sep 17-24	--	--	--	--				0.1	--	--	0.0	0.0
Sep 24-Oct 1	--	--	--	--	}			0.2	0.3	5.0	0.0	0.0
Oct 1-8	--	--	--	--				0.2	--	--	--	0.1
Oct 8-15	--	--	--	--	0.1	--	--	0.2	--	--	--	--
TOTALS	0.2	3.2	10.3	9.4	12.5	16.1	8.3	22.2	19.2	13.0	73.5	165.2

NORTH RIVER

Dates Exposed**	Cedar Point Station 3			Blackwater Creek Station 2			Head Station 1 (w/c 1S)					
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	0.0	0.0	0.0	0.0	0.0	0.0	--	0.0	0.4	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.9	0.0	0.0	0.0	0.6	0.0	3.0	0.0	0.7	0.0
Jul 2-9	0.7	0.1	0.9	0.0	0.1	0.1	2.7	0.0	2.4	0.0	1.2	6.2
Jul 9-16	0.0	0.1	3.6	12.3	0.1	0.1	11.8	3.2	0.5	--	3.0	1.9
Jul 16-23	0.2	0.0	3.3	1.8	0.0	0.0	1.7	23.7	0.0	--	0.1	31.0
Jul 23-30	--	0.6	0.0	0.0	--	0.0	0.0	0.2	--	--	0.0	0.0
Jul 30-Aug 6	0.0	0.1	0.3	0.5	0.0	0.0	0.1	0.1	5.2	0.1	0.3	0.0
Aug 6-13	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.3	0.8	0.0	0.4	0.0
Aug 13-20	0.0	0.2	1.7	3.3	0.0	0.0	0.8	0.4	2.8	2.7	0.6	0.9
Aug 20-27	0.0	0.6	0.0	18.8	0.0	0.0	0.2	0.5	0.0	0.0	0.0	0.1
Aug 27-Sep 3	0.0	0.0	0.4	0.6	0.0	0.0	0.0	0.2	0.0	0.1	0.2	0.2
Sep 3-10	0.0	0.0	0.0	1.1	0.0	0.0	0.2	0.2	0.0	0.0	0.2	0.9
Sep 10-17	0.1	0.0	0.7	0.4	0.0	0.2	0.3	0.1	0.0	1.1	0.7	0.3
Sep 17-24	0.0	1.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0	1.2	0.1	0.0
Sep 24-Oct 1	--	--	0.0	0.1	--	--	0.0	0.0	--	--	0.0	0.0
Oct 1-8	--	--	0.4	0.0	--	--	0.0	0.0	--	--	0.0	0.1
TOTALS	1.0	3.2	12.4	38.9	0.2	0.7	18.4	28.7	15.2	5.2	7.5	41.6

EAST RIVER

MILFORD HAVEN

Gulf Oil Dock
Station 11

Point Breeze
Station B

Dates Exposed**

	Mouth Station 6		Gulf Oil Dock Station 11		Point Breeze Station B	
	1976	1977	1976	1977	1976	1977
Jun 18-25	---	0.0	1.8	0.0	0.0	0.0
Jun 25-Jul 2	2.6	0.0	4.1	0.0	0.0	0.0
Jul 2-9	2.3	1.2	4.3	0.0	0.0	0.0
Jul 9-16	5.6	0.0	1.3	0.0	0.0	0.0
Jul 16-23	0.8	0.5	1.3	12.0	0.5	0.5
Jul 23-30	0.1	3.0	5.9	0.0	0.1	0.1
Jul 30-Aug 6	0.1	5.4	0.0	0.0	0.1	0.2
Aug 6-13	3.0	1.6	0.0	2.8	0.5	1.4
Aug 13-20	1.2	26.6	0.0	11.6	0.2	0.4
Aug 20-27	1.2	4.5	0.0	1.6	0.2	2.9
Aug 27-Sep 3	1.1	2.8	0.2	0.2	0.1	2.9
Sep 3-10	1.1	---	0.2	1.7	0.0	3.1
Sep 10-17	0.0	7.6	0.0	1.6	0.0	0.4
Sep 17-24	0.0	---	0.0	3.6	0.0	0.4
Sep 24-Oct 1	0.0	0.3	0.0	0.0	0.0	0.0
Oct 1-8	---	---	---	---	---	---
Oct 8-15	---	---	---	---	---	---
TOTALS	16.8	15.1	17.6	35.1	1.5	0.7
						32.8

NEW POINT COMFORT AREA

PLANKATANK RIVER

Winter Harbor - Public
Landing - Station 10

Pepper Creek
Station 7

Three Branches
Station D

Dates Exposed**

	Winter Harbor - Public Landing - Station 10		Pepper Creek Station 7		Three Branches Station D	
	1976	1977	1976	1977	1976	1977
Jun 18-25	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.1	0.0	0.0	0.0
Jul 2-9	0.0	0.1	0.0	0.0	0.0	0.0
Jul 9-16	0.2	0.0	0.0	0.1	0.0	0.0
Jul 16-23	0.1	0.1	0.0	0.1	0.2	0.2
Jul 23-30	---	7.0	0.2	0.9	0.0	0.0
Jul 30-Aug 6	0.2	0.3	0.0	0.2	0.1	0.0
Aug 6-13	0.0	3.8	1.4	0.3	0.0	0.0
Aug 13-20	7.6	2.0	0.2	0.2	4.3	0.0
Aug 20-27	1.1	3.7	2.1	0.2	0.1	0.0
Aug 27-Sep 3	0.0	4.2	4.5	3.1	0.0	0.0
Sep 3-10	0.1	3.6	0.1	0.0	0.0	0.0
Sep 10-17	0.0	2.8	0.5	0.0	0.0	0.0
Sep 17-24	0.0	7.8	0.5	0.0	0.7	2.2
Sep 24-Oct 1	---	---	0.0	0.1	---	---
Oct 1-8	---	---	---	---	---	---
Oct 8-15	---	---	---	---	---	---
TOTALS	9.3	35.0	7.0	4.9	5.4	2.2
ALS						0.7

INCOMPLETE DATA

Dates Exposed**	Burton Point Station F		Palace Bar Station J		Ginney Point Station K	
	1976	1977	1976	1977	1976	1977
Jun 18-25	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.1	0.0	0.0	0.0
Jul 2-9	--	0.0	0.0	6.9	0.1	0.0
Jul 9-16	--	--	0.0	0.4	0.0	0.0
Jul 16-23	0.2	--	3.0	0.3	0.7	0.0
Jul 23-30	0.7	--	--	22.8	1.9	0.8
Jul 30-Aug 6	0.0	--	0.0	5.6	1.0	0.3
Aug 6-13	0.0	64.0	0.0	23.1	1.9	0.3
Aug 13-20	0.0	0.4	0.3	0.3	1.0	0.8
Aug 20-27	0.0	0.0	0.0	0.0	0.0	0.0
Aug 27-Sep 3	0.0	0.0	0.0	0.0	0.0	0.0
Sep 3-10	0.0	0.0	0.0	0.0	0.0	0.0
Sep 10-17	0.0	0.0	0.0	0.1	0.0	0.2
Sep 17-24	0.0	0.0	0.0	0.1	0.0	0.0
Sep 24-Oct 1	--	--	--	--	--	--
TOTALS	0.9	64.4	3.4	59.6	3.7	30.7

RAPPAHANNOCK RIVER

Dates Exposed**	Lawson's Bay, near Mosquito Point		Corrotoman Point		Greenville	
	1976	1977	1976	1977	1976	1977
Jun 18-25	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	0.0	0.0	0.0	0.0	--	0.0
Jul 9-16	0.0	0.0	0.0	0.0	--	0.0
Jul 16-23	0.0	0.2	0.0	0.0	0.0	0.0
Jul 23-30	0.0	0.0	0.0	0.0	0.0	0.4
Jul 30-Aug 6	0.2	0.1	0.3	0.0	0.0	0.0
Aug 6-13	0.7	2.0	1.3	0.1	0.1	0.0
Aug 13-20	0.2	1.8	0.1	18.9	0.1	0.2
Aug 20-27	0.1	1.2	0.4	14.7	0.1	0.0
Aug 27-Sep 3	0.0	3.0	0.5	3.9	--	0.2
Sep 3-10	0.2	0.0	0.0	0.0	0.2	0.0
Sep 10-17	0.0	0.0	0.0	0.0	0.2	0.0
Sep 17-24	0.0	0.4	0.0	0.4	0.1	0.0
Sep 24-Oct 1	0.1	0.0	0.0	0.0	0.1	0.0
Oct 1-8	--	--	--	--	--	--
TOTALS	1.5	8.7	2.7	41.0	0.9	1.3

Dates Exposed**	Punch Bowl		Smokey Point		Parrot's Bar			
	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 9-16	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0
Jul 16-23	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.7
Jul 23-30	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.5
Jul 30-Aug 6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug 6-13	0.0	0.1	0.0	--	0.0	0.0	--	--
Aug 13-20	0.0	0.0	--	--	0.0	0.0	0.0	0.8
Aug 20-27	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.6
Aug 27-Sep 3	0.1	0.3	0.0	0.0	0.2	0.0	0.0	1.1
Sep 3-10	--	0.0	0.0	0.2	0.6	0.0	0.0	0.5
Sep 10-17	0.0	7.0	0.0	0.2	1.3	0.0	0.0	0.0
Sep 17-24	0.0	--	--	--	0.2	0.0	0.0	0.0
Sep 24-Oct 1	--	--	--	--	--	--	--	0.0
TOTALS	0.1	7.7	0.0	0.9	2.3	0.0	2.2	4.2

GREAT WICOMICO RIVER

Dates Exposed**	Dameron Marsh Station a		Cranes Creek Station b		Fleet Point Station c			
	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 9-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 16-23	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.5
Jul 23-30	0.0	0.0	0.0	0.5	0.0	0.2	--	0.7
Jul 30-Aug 6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Aug 6-13	0.0	0.1	0.0	0.0	0.0	0.0	0.4	0.0
Aug 13-20	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug 20-27	0.0	0.4	0.3	0.0	0.0	0.0	0.0	0.0
Aug 27-Sep 3	--	--	--	0.1	0.0	0.2	0.1	--
Sep 3-10	0.1	0.0	0.4	0.3	0.0	0.5	--	0.0
Sep 10-17	0.0	0.0	--	0.0	0.0	0.0	0.2	0.1
Sep 17-24	0.0	0.0	--	0.0	0.0	--	0.8	0.1
Sep 24-Oct 1	--	--	--	0.0	--	--	0.2	0.0
TOTALS	0.1	0.7	0.7	1.0	0.2	2.2	1.8	1.4

Dates Exposed**	Haynie Point Station e			Hudnall's Dock Station f			Glebe Point Station g			
	1976	1977	1978	1976	1977	1978	1976	1977	1978	1979
Jun 18-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Jul 9-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 16-23	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 23-30	0.1	0.1	0.0	0.0	0.0	0.0	0.9	0.0	0.0	6.3
Jul 30-Aug 6	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Aug 6-13	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.1	0.0
Aug 13-20	0.1	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Aug 20-27	0.0	0.0	0.1	0.0	0.6	0.2	0.0	0.0	0.2	0.0
Aug 27-Sep 3	0.0	0.2	0.7	0.2	0.7	0.7	0.0	0.3	0.4	0.1
Sep 3-10	0.0	0.4	0.0	0.0	1.1	0.5	0.0	0.5	0.1	0.1
Sep 10-17	0.0	0.2	0.2	0.0	0.6	0.0	0.0	0.1	0.1	0.0
Sep 17-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Sep 24-Oct 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
TOTALS	0.2	1.1	1.1	0.6	3.8	1.4	0.9	1.0	1.9	6.5

Dates Exposed**	Shell Bar Station F			Jones Shore			Coan			
	1976	1977	1978	1976	1977	1978	1976	1977	1978	1979
Jun 18-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 9-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 16-23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 23-30	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul 30-Aug 6	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug 6-13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug 13-20	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Aug 20-27	0.0	0.1	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
Aug 27-Sep 3	0.0	0.7	0.6	0.0	0.7	0.1	0.0	0.1	0.0	0.0
Sep 3-10	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Sep 10-17	0.0	0.2	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Sep 17-24	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Sep 24-Oct 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	0.4	1.5	1.0	0.0	1.5	0.8	0.0	0.1	0.0	0.0

POTOMAC RIVER

Dates Exposed	Great Neck			Hog Island			Thicket Point					
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	0.0	0.0	--	0.0	0.0	--	--	--	0.0	--	--	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.0	--	0.0	0.0	0.0	--	--	0.0
Jul 2-9	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	--	0.0
Jul 9-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	0.0
Jul 16-23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	0.0
Jul 23-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Jul 30-Aug 6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug 6-13	0.0	--	--	0.0	0.0	0.0	0.0	0.0	--	0.0	0.0	0.0
Aug 13-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug 20-27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	--
Aug 27-Sep 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Sep 3-10	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	--	0.2
Sep 10-17	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	--	0.0
Sep 17-24	0.0	0.0	0.0	0.0	0.0	0.0	2.0	--	0.0	0.0	0.0	--
Sep 24-Oct 1	--	--	0.0	--	--	--	0.0	--	--	--	0.0	--
Oct 1-8	--	--	--	--	--	--	--	--	--	--	--	--
TOTALS	0.0	0.1	0.0	0.2	0.0	0.0	2.1	0.2	0.1	0.7	0.0	0.3

Dates Exposed**	Yeocomico		Ragged Point		King Copsico Point	
	1979	1978	1978	1979	1978	1979
Jun 18-25	0.0	--	0.0	--	0.0	--
Jun 25-Jul 2	--	0.0	0.0	0.0	--	0.0
Jul 2-9	0.0	0.0	0.0	0.0	--	0.0
Jul 9-16	0.0	0.0	0.0	0.0	1976	0.0
Jul 16-23	0.0	0.0	0.0	0.0	1976	0.0
Jul 23-30	0.0	0.0	--	0.0	& 1977	0.0
Jul 30-Aug 6	0.0	0.0	0.0	0.0	& 1977	0.0
Aug 6-13	0.0	0.0	0.0	0.0	All	0.0
Aug 13-20	0.0	0.0	0.0	0.0	All	0.0
Aug 20-27	--	0.0	0.0	0.0	Zeros	0.0
Aug 27-Sep 3	0.1	0.0	0.0	0.0	Zeros	0.0
Sep 3-10	0.0	0.0	--	0.0	0.0	0.0
Sep 10-17	0.2	0.0	--	0.0	0.0	0.0
Sep 17-24	--	0.0	--	0.0	0.1	0.0
Sep 24-Oct 1	--	0.0	--	0.0	--	--
TOTALS	0.3	0.0	0.0	0.0	0.1	0.0

EASTERN SHORE, SEASIDE

EASTERN SHORE, BAYSIDE

VIMS, Wachapreague Pier
1978 1979

Quinby Bridge, Machipongo River
1977 1978 1979

Public Ground 9 Lower Swash
1976 1977 1978 1979

Dates Exposed**	Public Ground 9 Lower Swash				Quinby Bridge, Machipongo River			VIMS, Wachapreague Pier		
	1976	1977	1978	1979	1976	1977	1978	1979	1978	1979
Jun 18-25	0.0	0.0	0.0	--	--	0.0	--	--	0.0	--
Jun 25-Jul 2	0.0	0.0	0.0	0.0	--	44.1	0.0	0.0	0.0	0.0
Jul 2-9	0.0	--	0.0	0.0	--	0.0	0.0	0.0	0.0	0.0
Jul 9-16	0.0	--	0.0	0.0	1.5	2.7	0.0	1.5	0.0	66.4
Jul 16-23	0.0	0.0	0.0	0.0	0.0	41.6	0.2	6.2	0.0	42.4
Jul 23-30	0.0	0.1	0.0	--	12.5	0.6	0.3	3.9	6.4	59.2
Jul 30-Aug 6	0.1	0.0	0.0	--	4.7	0.7	1.3	44.2	72.4	1.2
Aug 6-13	0.4	0.2	0.0	0.0	14.8	0.0	3.0	1.4	21.6	180.2
Aug 13-20	5.1	0.3	0.0	0.1	0.1	8.4	12.3	0.5	4.1	13.1
Aug 20-27	0.0	0.1	0.1	0.1	3.2	2.4	8.4	0.1	0.5	5.5
Aug 27-Sep 3	0.0	--	0.0	--	0.0	1.8	1.0	0.0	0.2	0.3
Sep 3-10	0.1	1.4	0.0	--	0.0	0.1	0.0	0.0	14.3	0.2
Sep 10-17	--	0.2	0.0	0.0	0.0	0.0	0.1	0.1	2.0	0.2
Sep 17-24	0.3	--	0.0	--	0.0	0.0	0.1	0.1	1.2	0.0
Sep 24-Oct 1	0.2	--	--	--	--	--	0.0	0.1	--	--
Oct 1-8	--	--	--	--	--	--	--	--	--	--
TOTALS	6.2	2.3	0.1	0.1	36.8	102.4	26.6	58.0	122.7	368.5