



MARINE RESOURCE SPECIAL REPORT



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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.

VIRGINIA INSTITUTE OF MARINE SCIENCE
AND
SCHOOL OF MARINE SCIENCE,
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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	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 19-25	--	--	--	--	--	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	--	} 1.0	0.0	--	--	--	} 0.0	0.0	--	0.0	} 0.0	0.0
Jul 9-16	0.2		0.0	0.7	--	0.3		0.1	0.4	--		0.0
Jul 16-23	0.3	} 0.2	} 0.0	} 4.0	0.0	0.0	} 0.0	0.1	--	0.4	} 0.3	0.1
Jul 23-30	0.3				0.0	0.0		0.0	--	0.0		0.2
Jul 30-Aug 6	0.1	0.6	0.1	0.4	0.0	0.1	0.0	--	0.2	0.7	0.0	0.0
Aug 6-13	0.3	0.8	0.0	3.6	--	0.0	0.8	3.1	0.4	--	0.0	0.6
Aug 13-20	} 1.7	0.7	0.1	7.6	--	0.1	0.2	3.3	1.0	0.6	0.0	1.1
Aug 20-27		0.5	0.3	1.7	--	} 1.6	0.9	0.4	0.0	0.4	} 0.1	--
Aug 27-Sep 3	2.5	1.3	0.0	0.4	0.1		0.1	0.1	1.8	1.3		0.2
Sep 3-10	1.1	0.2	0.7	1.3	0.4	0.2	0.9	} 0.1	2.5	} 0.5	0.0	0.8
Sep 10-17	1.3	} 2.7	0.0	2.5	--	0.1	0.0		0.3		9.5	0.0
Sep 17-24	} 4.4		1.2	0.8	1.1	0.1	0.4	--	--	0.1	1.0	0.1
Sep 24-Oct 1		--	--	--	--	--	--	--	0.8	1.0	--	} 0.2
Oct 1-8	--	--	1.5	--	--	--	0.0	--	--	--		
Oct 8-15	--	--	--	--	--	--	--	--	--	--	--	
TOTALS	9.7	9.2	5.2	22.6	1.9	2.5	3.3	7.4	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 Watch House				White Shoal			
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 19-25	--	} 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	0.1	--	--	0.0	0.0	0.0	--	0.1	0.0
Jul 9-16	0.9	--	0.0	0.3	0.0	--	0.0	0.5	0.0	0.1	0.0	0.0
Jul 16-23	0.3	0.0	0.0	0.5	0.1	0.0	0.0	0.1	0.1	--	0.0	0.1
Jul 23-30	0.2	0.1	0.0	0.4	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7
Jul 30-Aug 6	0.0	0.0	0.1	0.4	0.0	0.0	0.1	0.2	0.0	0.1	0.0	1.6
Aug 6-13	0.0	0.5	0.2	0.2	0.0	0.5	0.3	0.4	0.1	3.0	0.1	2.7
Aug 13-20	0.8	0.7	0.2	2.0	0.2	0.5	0.1	2.9	1.3	0.6	} 0.0	2.0
Aug 20-27	0.5	0.3	0.1	0.0	0.1	0.5	0.2	0.0	0.2	6.0		0.5
Aug 27-Sep 3	0.8	0.6	0.1	0.4	0.1	0.2	--	0.1	0.5	4.1	0.2	0.2
Sep 3-10	3.9	0.5	0.0	0.5	0.1	} 0.2	0.9	0.2	1.7	0.4	0.3	0.3
Sep 10-17	6.7	0.4	0.5	1.5	0.4		0.3	0.0	2.6	0.0	0.2	0.1
Sep 17-24	3.2	0.5	0.7	1.3	0.6	--	1.0	0.8	2.3	0.7	0.9	0.8
Sep 24-Oct 1	0.3	0.1	0.3	0.0	0.0	0.0	0.7	0.0	0.0	0.8	0.6	0.0
Oct 1-8	--	--	--	} 0.0	--	--	0.0	} 0.0	--	--	0.0	} 0.0
Oct 8-15	--	--	--		--	--	--		--	--	--	
TOTALS	17.6	3.7	2.2	7.6	1.6	1.9	3.6	5.9	8.8	15.8	2.4	9.0

Date Exposed**	Wreck Shoal				Warwick River Mouth				Point of Shoal			
	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	--
Jul 2-9	--	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	0.3	--	--	0.0	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	0.0	0.0	0.0	0.0	0.0
Jul 23-30	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Jul 30-Aug 6	0.0	0.0	0.2	1.2	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.4
Aug 6-13	0.1	0.4	0.6	1.8	0.1	2.2	0.0	0.3	0.2	5.7	0.0	0.4
Aug 13-20	0.2	0.7	0.0	} 1.5	0.3	0.3	} 0.1	--	0.0	2.6	} 0.2	1.0
Aug 20-27	0.0	0.5	0.0		0.1	0.2		--	0.1	3.5		0.0
Aug 27-Sep 3	--	1.1	0.1	0.2	0.0	0.2	0.1	--	0.0	1.6	0.3	0.1
Sep 3-10	0.0	0.1	0.1	0.1	0.0	0.0	0.4	--	0.0	0.8	0.0	0.0
Sep 10-17	0.7	0.1	0.2	0.5	0.1	0.0	0.3	0.0	0.0	0.1	--	0.0
Sep 17-24	1.1	0.0	0.1	0.7	0.1	0.0	--	0.0	0.2	0.1	0.2	0.2
Sep 24-Oct 1	0.1	0.2	0.4	0.0	0.2	0.0	--	0.0	0.0	0.1	0.0	0.0
Oct 1-8	--	0.0	0.2	} 0.1	--	} 0.1	--	} --	--	--	0.2	} 0.0
Oct 8-15	--	--	--		--		--		--	--	--	
TOTALS	2.2	4.1	1.9	6.9	1.1	3.0	0.9	0.3	0.5	14.9	0.9	2.2

Dates Exposed**	Mulberry Swash				Horsehead Shoal				Deepwater Shoal			
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	--	--	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	0.0	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	0.1	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	0.0
Jul 30-Aug 6	0.0	0.2	0.0	0.6	0.0	0.0	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	0.0	0.6	0.0	0.3
Aug 13-20	0.1	0.0		1.2	0.1	0.5	0.0	0.7	0.0	0.4	0.0	0.7
Aug 20-27	0.0	1.7	0.4	0.5	0.0	2.3	0.1	0.0	0.0	1.5	0.6	0.3
Aug 27-Sep 3	0.0	2.4	0.3	0.3	0.0	0.4	0.0	0.2	0.0	0.4	0.0	0.4
Sep 3-10	0.4	0.1	1.1	0.0	0.1	0.2	0.5	0.0	1.1	0.2	0.4	0.4
Sep 10-17	0.2	0.0	0.7	0.1	0.7	0.1	--	0.0	0.2	0.3	0.0	0.0
Sep 17-24	0.0	0.1	0.4	0.0	0.2	0.0	0.1	0.0	0.2	0.1	0.3	0.0
Sep 24-Oct 1	0.0	0.0	0.7	0.0	0.1	0.0	0.2	0.0	0.3	0.0	0.3	0.0
Oct 1- 8	--	--	0.2	}0.0	--	--	--	}0.0	--	--	0.2	}0.0
Oct 8-15	--	--	--		--	--	--		--	--	--	
TOTALS	0.7	8.5	3.9	4.0	1.5	4.6	1.0	3.0	0.8	3.5	2.2	2.6

YORK RIVER

Dates Exposed**	VIMS Ferry Pier				Aberdeen Rock				Off Foxes Creek			
	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
June 25-Jul 2	0.0	}1.0	0.0	0.0	}0.0		--	0.0	--	--	0.0	0.0
Jul 2- 9	0.2		0.0	0.0		0.0	0.0	--	0.0	--	0.1	0.0
Jul 9-16	--	1.2	0.0	0.0	0.0	--	0.1		--	0.0	0.0	0.0
Jul 16-23	0.7	0.0	0.1	0.3	1.1	--	0.0		0.0	0.0	0.0	0.1
Jul 23-30	--	1.0	0.1	1.0	0.0	0.0	0.0		--	0.0	0.0	0.0
Jul 30-Aug 6	0.0	0.0	0.3	0.6		0.0	0.2		0.0	0.0	0.0	0.0
Aug 6-13	0.2	}0.4	0.1	0.0	}0.3	0.2	0.1		0.0		0.0	0.0
Aug 13-20	--		0.6	0.3		0.3	1.0	0.0	0.3		0.0	}0.5
Aug 20-27	0.1	0.3	0.9	}1.3	0.5		0.2		0.0	0.2	0.0	
Aug 27-Sep 3	0.0	0.9	0.4		0.0			0.0		0.0	0.5	0.0
Sep 3-10	0.3	6.7	0.1	0.0	}7.0	}0.0	0.0		0.0	0.1	0.0	0.0
Sep 10-17	0.4	6.6	0.3	1.6					0.2		0.0	0.4
Sep 17-24	0.1	3.8	0.1	0.0	--		0.2		0.0	0.4	0.2	0.0
Sep 24-Oct 1	0.1	1.0	0.1	}0.1	--		0.1	--	0.0	--	--	}0.0
Oct 1- 8	0.0	--	--		--	--		0.1	--	0.0	--	
Oct 8-19	--	--	--		--		--	--	--	--	--	
TOT	2.1	22.9	3.1	5.2	9.9	0.4	1.3		0.0	3.2	0.3	0.2

MOBJACK BAY

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		0.2	2.3	0.3	--	--	2.4	0.9
Aug 6-13	--	0.0	0.7	1.3		0.0	0.6	0.4	--	--	0.7	0.0
Aug 13-20	--	--	--	5.7		2.4	0.0	4.3	--	--	1.0	27.6
Aug 20-27	--	--	0.9	--			0.0	7.4	--	--	5.1	0.2
Aug 27-Sep 3	--	--	2.2	--			0.1		--	--	12.0	0.2
Sep 3-10	--	--	0.9	--				0.0	--	--	0.0	0.0
Sep 10-17	--	--	0.6	--	0.6			0.2	--	--	6.4	0.2
Sep 17-24	--	--	--	--	--		0.0	0.1	0.3		0.0	0.0
Sep 24-Oct 1	--	--	--	--	--		0.0		--	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

NORTH RIVER

Dates Exposed**	Cedar Point Station 3				Blackwater Creek Station 2				Head Station 1 (wc 15)			
	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		0.9	0.0	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	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	0.0	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

Dates Exposed**	Mouth Station 6 (Puffin B)				Gulf Oil Dock Station 11				Point Breeze Station B			
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Jun 18-25	--	--	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 25-Jul 2	2.6	--	1.2	0.0	4.1	0.0	6.8	0.4	0.0	--	0.0	0.0
Jul 2-9	2.3	--		0.0	4.3	0.0	69.4	1.6	0.0	0.0	0.0	0.0
Jul 9-16	5.6	0.0	0.5	1.3	1.3		31.5	15.6	--	--	0.0	5.2
Jul 16-23	0.8	3.0		1.3	--	12.0	2.0	14.6	--	--	0.5	9.6
Jul 23-30			2.2	5.9	0.0	10.0	17.7	--	--	0.1	6.7	
Jul 30-Aug 6	0.1	4.5	1.6	4.6	--	0.0	9.2	13.4	--	0.1	--	0.2
Aug 6-13				1.3	0.0	2.8	112.2	2.0	--	0.5	--	1.4
Aug 13-20	3.0	4.5	26.6	8.4	0.0	11.6	48.8	12.1	0.5	0.2	--	0.4
Aug 20-27				0.2	0.0	1.6	62.7	0.8	0.0		--	2.9
Aug 27-Sep 3	1.2	7.6	1.2	0.1	0.0	0.2	0.7	0.7	0.0	0.1	--	2.9
Sep 3-10	1.1			2.8	0.2	0.2	1.7	0.7	0.7	0.0	0.0	--
Sep 10-17		0.0	--	1.6	0.0	1.6	2.0	0.8	0.0	0.6	--	0.4
Sep 17-24	0.0		--	0.6	0.0	3.6	0.1	0.0	0.0	0.0	0.1	--
Sep 24-Oct 1		--	--	0.3	0.0	--	0.0	0.0	--	--	--	0.0
Oct 1-8	--	--	--		--	--	0.0	0.0	--	--	--	--
Oct 8-15	--	--	--	--	--	--	--	--	--	--	--	
TOTALS	16.8	15.1	39.5	22.1	17.6	35.1	356.1	80.4	0.5	1.5	0.7	32.8

NEW POINT COMFORT AREA

PIANKATANK RIVER

Dates Exposed**	Winter Harbor - Public Landing - Station 10				Pepper Creek Station 7				Three Branches Station D			
	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	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	0.0	0.1		0.0	0.0	0.0	0.0	0.0	0.0
Jul 2-9	0.0	0.0	0.1	0.0	0.0			0.0	--	0.0	0.0	0.0
Jul 9-16	0.2		0.0	0.1	0.0	0.0		0.1	--	0.2	0.0	7.1
Jul 16-23	0.1	0.1	0.1	3.2	0.2	INCOMPLETE DATA	0.0	2.9	--	0.0	0.0	7.8
Jul 23-30	--	7.0	1.5	0.5				0.9	3.2	0.0	0.1	0.0
Jul 30-Aug 6	0.2	--	0.3	0.2	2.1	INCOMPLETE DATA	1.4	0.3	--	0.0	0.0	1.7
Aug 6-13	0.0	3.8	0.9	0.0				0.2	8.1	0.3	4.3	0.0
Aug 13-20	7.6	2.0		3.4	4.5	INCOMPLETE DATA	0.2	8.1	0.0	0.1	0.0	2.5
Aug 20-27	1.1	3.7	6.3	10.9				2.7		2.3		
Aug 27-Sep 3	0.0	4.2	2.4	2.3	4.5	3.1	2.3	0.0	0.0	0.0	1.0	
Sep 3-10	0.1	3.6	0.5	6.2	0.1		0.0	2.1	0.0	0.0	0.0	0.1
Sep 10-17	0.0	2.8	0.4	2.4	0.5	INCOMPLETE DATA	4.9	0.0	0.7	2.2	0.4	
Sep 17-24	0.0	7.8	0.2	3.7			0.0		--			--
Sep 24-Oct 1	--	--	4.3	0.2	0.0		0.1	0.6	--	--	0.0	
Oct 1-8	--	--	8.2	0.0	--		--		--	--	--	
Oct 8-15	--	--	--	--	--		--	--	--	--		
ALS	9.3	35.0	25.2	33.1	7.		4.9	28.0	0.3	5.4	2.2	7

Dates Exposed**	Burton Point Station F				Palace Bar Station J				Ginney Point Station K			
	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	0.0	0.0	0.0	0.0
Jun 25-Jul 2	0.0	0.0	0.0	--	0.1	0.0	0.0	0.3	0.0	--	0.0	0.0
Jul 2-9	--	0.0	0.0	0.0	0.0	6.9	0.0	0.0	0.1	--	0.0	0.0
Jul 9-16	--	--	0.0	7.9	0.0	0.4	0.0	9.9	0.0	--	0.0	48.0
Jul 16-23	0.2	--	0.1	9.9	3.0	0.3	1.0	145.1	0.7	0.0	0.0	--
Jul 23-30	0.7	--	0.2	12.9	--	22.8	0.1	11.6	1.9	0.8	0.3	30.6
Jul 30-Aug 6	0.0	--	0.1	0.5	0.0	5.6	0.0	0.6	1.0	1.5	0.0	0.1
Aug 6-13	} 0.0	64.0	0.2	0.9	} 0.3	23.1	0.0	3.5	} 0.0	28.5	0.0	0.0
Aug 13-20		0.4	} 0.5	0.5		0.3	} 0.8	0.0		5.5	--	20.1
Aug 20-27	} 0.0	0.0		29.5	} 0.0	0.0		0.0	1.4	} 0.0	} 0.0	--
Aug 27-Sep 3		0.0	} 0.0	1.3		0.0	0.0	3.0	0.0			--
Sep 3-10	0.0	} 0.0		0.6	} 0.0	0.0	0.0	1.9	} 0.0	} 0.2	--	1.6
Sep 10-17	0.0		} 0.0	0.0		0.0	0.1	0.6			0.0	--
Sep 17-24	0.0	} 0.0		--	} 0.0	0.0	0.1	--	0.0	0.0	--	--
Sep 24-Oct 1	--		--	0.0		--	--	--	0.0	--	--	--
TOTALS	0.9	64.4	6.3	64.0	3.4	59.6	5.3	183.4	3.7	30.7	0.3	100.8

RAPPAHANNOCK RIVER

Dates Exposed**	Lawson's Bay, near Mosquito Point				Corrotoman Point				Greenvale			
	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	0.0	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	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	0.0
Jul 9-16	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.3	--	0.0	0.0	0.0
Jul 16-23	0.0	0.2	0.0	5.4	0.0	0.0	0.0	0.2	0.0	} 0.0	0.0	0.4
Jul 23-30	0.0	0.0	0.0	0.5	0.3	0.0	--	0.0	0.0		--	0.0
Jul 30-Aug 6	0.2	0.1	0.0	0.4	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Aug 6-13	0.7	2.0	0.0	0.0	1.3	18.9	0.0	0.2	0.1	0.2	0.0	0.0
Aug 13-20	0.2	1.8	0.0	0.6	0.1	14.7	0.0	0.2	0.1	0.0	0.0	--
Aug 20-27	0.1	1.2	3.1	2.6	0.4	3.9	0.5	0.3	--	0.2	0.0	--
Aug 27-Sep 3	0.0	} 3.0	4.5	2.7	0.5	} 3.0	1.4	0.7	0.2	} 0.7	0.0	0.3
Sep 3-10	0.2		} 0.7	} 1.6	0.0		0.0	} 0.0	0.0		0.0	0.2
Sep 10-17	0.0	} 0.4			} 0.0	0.0	0.0		} 0.0	0.0	0.0	0.1
Sep 17-24	0.0		} 0.0	} 0.0		0.0	0.4	} 0.0		0.0	0.0	0.0
Sep 24-Oct 1	0.1	--			0.0	0.0	0.0		--	0.0	0.0	0.1
Oct 1-8	--	--	0.2	0.0	--	--	0.0	0.0	--	--	0.2	--
TOTALS	1.5	8.7	8.5	15.6	2.7	41.0	1.9	1.9	0.9	1.3	0.2	0.7

Dates Exposed**	Punch Bowl				Smokey Point			Parrot's Bar	
	1976	1977	1978	1979	1977	1978	1979	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	0.0
Jul 2-9	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	0.0	0.0	0.1	0.0	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	0.0	0.5
Jul 30-Aug 6	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	0.0	0.8
Aug 20-27	0.0	0.3	0.0	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	0.3	0.0	1.1
Sep 3-10	--	0.0	0.0	0.2	0.6	0.0	1.3	} 0.0	0.5
Sep 10-17	0.0	7.0	0.0	0.2	1.3	0.0	0.6		0.0
Sep 17-24	0.0	--	--	--	0.2	--	0.0	5.6	0.0
Sep 24-Oct 1	--	--	--	--	--	--	0.0	--	0.0
TOTALS	0.1	7.7	0.0	0.9	2.3	0.0	2.2	5.6	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	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	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	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	0.0	0.0
Jul 9-16	0.0	0.0	0.0	0.0	0.0	0.1	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	0.0	0.0	0.0	0.0	0.2	0.0	0.5
Jul 23-30	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0
Aug 6-13	0.0	0.1	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0
Aug 20-27	0.0	0.4	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.7	0.1	--
Aug 27-Sep 3	--	--	--	0.1	0.0	0.4	0.1	0.0	0.0	0.2	0.5	0.0
Sep 3-10	0.1	0.0	0.4	0.3	0.1	1.6	0.0	0.0	0.0	0.5	--	0.0
Sep 10-17	0.0	0.0	--	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.1
Sep 17-24	0.0	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	--	0.8	0.1
Sep 24-Oct 1	--	--	--	0.0	--	--	0.0	0.0	--	--	0.2	0.0
TOTALS	0.1	0.7	0.7	1.0	0.2	2.2	0.1	0.1	0.0	1.8	2.2	1.4

Dates Exposed**	Haynie Point Station e				Hudnall's Dock Station f				Glebe Point Station g			
	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	0.0	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	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	--
Jul 9-16	0.0	0.0	0.0	0.8	--	0.0	0.0	0.5	0.0	0.0	--	0.0
Jul 16-23	0.0	0.2	0.1	0.0	0.0	0.0	--	1.8	0.0	0.0	0.0	0.0
Jul 23-30	0.1	0.1	0.0	0.6	0.0	0.0	0.0	10.5	0.9	0.0	--	6.3
Jul 30-Aug 6	0.0	0.0	0.0	0.5	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0
Aug 6-13	0.0	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	0.0	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	0.3	0.2	0.0
Aug 27-Sep 3	0.0	0.2	0.7	0.1	0.2	0.7	0.7	0.0	--	0.1	0.4	0.1
Sep 3-10	0.0	0.4	0.0	--	0.0	1.1	0.5	0.0	0.0	0.5	0.1	0.1
Sep 10-17	0.0	0.2	0.2	0.0	0.0	0.6	0.0	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	0.0	0.0	0.4	0.0
Sep 24-Oct 1	--	--	0.0	0.1	--	--	0.0	0.0	--	--	0.4	0.0
TOTALS	0.2	1.1	1.1	2.1	0.6	3.8	1.4	13.0	0.9	1.0	1.9	6.5

Dates Exposed**	Shell Bar Station F				POTOMAC RIVER Jones Shore				Coan			
	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	0.0	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	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	0.6	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	4.5	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Jul 23-30	0.2	0.0	0.0	10.5	0.0	--	0.0	0.3	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	} 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	0.0	
Aug 13-20	0.2	0.0	0.0	0.1	0.0	0.1	} 0.0	0.0	0.0	0.0	0.0	0.0
Aug 20-27	0.0	0.1	0.0	0.3	0.0	0.6		--	0.0	0.0	0.0	--
Aug 27-Sep 3	0.0	0.7	0.6	0.0	0.0	0.7	0.1	0.0	0.0	0.1	0.0	0.0
Sep 3-10	0.0	0.0	0.1	0.0	0.0	} 0.1	0.0	0.5	0.0	0.0	0.0	0.0
Sep 10-17	0.0	0.2	0.3	0.1	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Sep 17-24	0.0	0.0	0.0	0.0	0.0	0.0	0.7	--	0.0	0.0	0.0	--
Sep 24-Oct 1	--	--	0.0	0.0	--	--	0.0	0.0	--	--	--	0.0
TOTALS	0.4	1.5	1.0	16.1	0.0	1.5	0.8	1.0	0.0	0.1	0.0	0.0

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	--	--	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
Jul 23-30	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
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	0.3	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	2.0	--	0.0	0.0	} 0.0	--
Sep 24-Oct 1	--	--	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	1979	1978	1979
Jun 18-25		0.0		0.0		0.0
Jun 25-Jul 2		--		} 0.0		0.0
Jul 2- 9		0.0			0.0	
Jul 9-16	1976,	0.0	1976	0.0	1976	0.0
Jul 16-23		0.0		--	--	0.0
Jul 23-30	1977,	0.0	& 1977	0.0	& 1977	0.0
Jul 30-Aug 6		} 0.0		0.0		0.0
Aug 6-13	& 1978		0.0	All	0.0	All
Aug 13-20		0.0		0.0		0.0
Aug 20-27	All	--	Zeros	0.0	Zeros	0.0
Aug 27-Sep 3		0.1		0.0		0.0
Sep 3-10	Zeros	0.0		--		0.0
Sep 10-17		0.2		--		0.1
Sep 17-24		--		--		--
Sep 24-Oct 1		--		--		0.0
TOTALS		0.3		0.0		0.0
						0.1
						0.0

EASTERN SHORE, BAYSIDE

EASTERN SHORE, SEASIDE

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	--	--	--	--
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		1.5		66.4
Jul 16-23	0.0	0.0	0.0		} 0.0	0.0	41.6	0.2	6.2	0.0
Jul 23-30	0.0	0.1	} 0.0	--		12.5	0.6	0.3	3.9	6.4
Jul 30-Aug 6	0.1	0.0		} 0.0	--	4.7	0.7	1.3	44.2	72.4
Aug 6-13	0.4	0.2	0.0		} 0.0	14.8	0.0	3.0	1.4	21.6
Aug 13-20	} 5.1	0.3	0.0	} 0.1		0.1	8.4	12.3	0.5	4.1
Aug 20-27		0.1	0.1		0.1	} 3.2	} 2.4	8.4	0.1	0.5
Aug 27-Sep 3	0.0	--	0.0	--	} 0.1			1.0	} 0.0	0.2
Sep 3-10	0.1	1.4	0.0	--		0.1	0.0	14.3		
Sep 10-17	--	0.2	} 0.0	0.0	} 0.0	} 0.1	} 0.1	} 2.0	} 0.2	
Sep 17-24	0.3	--		--						0.0
Sep 24-Oct 1	} 0.2	--	--	--	} 0.0	} 0.1	} 0.1	} 1.2	} 0.0	
Oct 1- 8		--	--	--						--
TOTALS	6.2	2.3	0.1	0.1	36.8	102.4	26.6	58.0	122.7	368.5