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1973 Annual Summary

OYSTER SPATFALL ON SHELLSTRINGS IN VIRGINIA RIVERS

By
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Although oyster setting levels in most Virginia river systems are still far below those which commonly occurred prior to 1960, the 1973 season marked an improvement over the previous year when Tropical Storm Agnes raged through the Chesapeake Bay region, creating adverse environmental conditions which were largely responsible for the lowest setting levels on record. Data for 1972, as well as for 1970 and 1971 are included in this summary of the 1973 setting season for comparison.

Setting information is obtained through surveys conducted weekly by the Virginia Institute of Marine Science (VIMS), with assistance by personnel of the Virginia Marine Resources Commission, from June through early October. Spat counts are made from oyster shells strung on wire and suspended from stakes at collecting areas on public and private beds.

Using the number of spat counted on shells during each week of the spawning season, it is possible to determine the potential of a particular area for receiving a strike and to predict the weeks when the strikes will occur. This information is useful because 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 that a significant strike has also taken place on cultch of good quality. However, a good strike on shellstrings in some locations may not always be accompanied by good spatfall on shells on the natural 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 screwborers, which kill many small oysters soon after attachment, and blue crabs, which may eat the small spat.

The average number of spat which set in one week on the smooth side of 10 shells is tabulated. Set each week is arbitrarily rated as follows: fair, .1 to 1.0; moderate, 2 to 10; heavy, 11 to 100. In evaluating setting levels it should be recognized that certain rivers such as the Rappahannock and Potomac have always

been regions which have experienced a history of low setting levels. Other areas, including the Corrotoman, James, Piankatank and Great Wicomico rivers, typically have received a moderate set and often produce commercial quantities of seed oysters.

The following summary shows that some areas of Virginia still receive fair to moderate sets. Among these are the Piankatank River, Mobjack Bay area, the lower York River, the lower James and the Seaside of Eastern Shore.

If shells are planted in these regions, it is important to plant just prior to the advent of setting. If shells are planted too early, 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 of the Department of Applied Biology at VIMS.

Inspectors of the Virginia Marine Resources Commission aided in this study by changing shellstrings in many of the estuaries. Their assistance is gratefully acknowledged.

SUMMARY OF RIVER SYSTEMS

JAMES RIVER - The important public rocks in the James River which annually supply over 75 percent of the seed planted in Virginia received only about 10 percent as much set in 1973 as they did prior to 1960. In the early 1950's weekly sets as high as 50-100 spat/shellface were commonly observed in the mid-section of the system. The decline after 1960 is thought to be associated with MSX which has reduced the brood stock in the lower river. However, other factors such as pollution have not been ruled out.

The 1973 setting season was no exception to the past series of "poor" years. The limited set which did occur was highest downriver at the Tax Office, Hampton Flats, Brown Shoals and Miles Watch House. In this region setting began in late July and extended to early October. The peak set occurred in early to mid-September. Levels, however, were not high and a maximum weekly figure of 9.0 spat/shellface was observed at the Tax Office.

In the mid and upper parts of the James River seed area where most of the seed is harvested there was almost no set. Here the maximum number recorded for any week was only 0.3 spat/shellface.

The light sets at upriver stations were still higher than those observed in the same area during 1972 when Tropical Storm Agnes adversely affected setting. The sets in 1970 and 1971 were better at all stations than in 1973.

Studies conducted by VIMS since 1947 indicate that there has been about a 50 percent decline in density of seed oysters on the bottom in the lower James. If the present trend of low setting continues for several years more, a serious shortage of seed in this section will develop.

NANSEMOND RIVER - There was almost no set at the three stations in the Nansemond River in 1973. These low levels, which were similar to those observed in 1972,

are in strong contrast to those observed in 1970 and 1971 when the peak sets were rated moderate to heavy at Nansemond Ridge and light to heavy at the upriver stations. The set in 1970 and 1971 began late in the season and extended through September with a peak in mid-August. This pattern is typical of the system in years when it receives a strike.

YORK RIVER - In the York the highest set in 1973 was in the lower river at VIMS pier at Gloucester Point. Setting began in mid-August and extended to early October with a moderate peak in mid-September of 7.4 spat/shellface. Upriver from VIMS there was almost no set recorded.

The setting pattern and the abundance of set observed in 1973 were similar to levels observed in 1970, 1971 and 1972. That is, the set occurred late in the season (peaking in September) with the maximum occurring downriver at VIMS.

RAPPAHANNOCK RIVER - The Rappahannock has always been characterized by low setting levels with populations of adult oysters being maintained by occasional years (10 to 15 years apart) when a moderate set occurs.

The 1973 set in the Rappahannock was typical as shown by four stations located in the lower river. Only two of the four showed any set at all and the maximum observed was only 1.6 spat/shellface per week off Broad Creek.

The few spat recorded in the Rappahannock occurred late in the season in September. An oxygen deficiency often develops in this system in summer, and VIMS biologists believe that setting levels are associated with this.

MOBJACK BAY AREA - In this area in 1973 shellstrings were set out in the North and East rivers. In both systems the peak set ranged from light in some areas to heavy in others. Setting began in late June and lasted to early October. The time of peak set varied. In the North River it occurred at the head of the system in mid-July and was 2.1 spat/shellface per week; in the lower river it reached 7.5 spat/shellface per week in late August. In the upriver section of the East River the peak set of 7.3 spat/shellface per week occurred during early July. Downriver there were two periods of maximum set: one in mid-July and a second in mid-September.

In general the 1973 set in the Mobjack area was slightly lower than that observed in 1972.

NEW POINT COMFORT AREA - In this area the 1973 pattern of set in Pepper Creek, Winter Harbor, Horn Harbor and Dyer Creek was about the same. Setting began in early July and extended through early October. There were two periods of peak setting: the first occurred in mid-July; a second of greater magnitude occurred in mid-September. The peak sets in Pepper Creek and Winter Harbor were rated as heavy. In Pepper Creek weekly rates reached 13.6 spat/shellface in early September and in Winter Harbor they reached 18.0 spat/shellface in mid-September. Peak sets in Dyer Creek and Horn Harbor occurred in mid-September and were rated as light to moderate.

The 1973 set was superior to that observed in 1972.

PIANKATANK RIVER & MILFORD HAVEN - In the Milford Haven area shellstrings were placed at Lilly's Neck, Point Breeze and Stutt's Creek. Here the 1973 peak sets were rated light, moderate and heavy, depending on the location. Setting began in early July and extended through early October with one peak in mid-July and a second in mid-September. In general the 1973 set was superior to that in 1972. The 1970 and 1971 sets were about at the same level as that observed in 1973.

The Piankatank River received moderate to heavy peak sets in 1973 with most of the setting occurring in the mid-section of the system. As was the case in the Milford Haven area, setting began in early July and extended through October. There were two peak setting periods: one from early to mid-July and a second in late August. The maximum weekly set observed was at Island Bar when 40.6 spat/shellface were observed.

GREAT WICOMICO RIVER - Setting was far below normal for the 1973 season in the Great Wicomico River. There was practically no set at any station until early September when the peak set was rated light at all but one station where weekly peak set was 8.3 spat/shellface. Set at the upriver stations was nearly zero.

Set was nearly zero in 1972 due to Tropical Storm Agnes. In 1971 set began very late and it was not until late fall that any significant set was observed. In 1970 nearly all stations received a moderate to heavy peak set and the setting period extended over most of the season.

Past records indicate that from 1964 to 1971 the Great Wicomico had a consistent record of a moderate to heavy setting with average weekly sets ranging from 4 to 250 spat/shellface per week. Beginning in 1971, however, the set declined drastically. Surveys by VIMS biologists showed that oxygen was deficient in the deeper waters from mid-July to September in 1971, 1972 and 1973; laboratory tests indicate that waters with low dissolved oxygen do not support oyster larvae. Since tests were not made for oxygen prior to 1971, it is not known when this condition developed. However, the observed condition of low oxygen is believed to be associated with the low sets over the past three years.

EASTERN SHORE - The single station sampled on the Bayside of the Eastern Shore in Pocomoke Sound showed no set in 1973. A similar situation was observed in 1972.

Records for 1973 indicate a light to moderate set in Bogue Bay, Burtons Bay and Upshur Bay, and a moderate to heavy peak set in Poles Channel of Outlet Bay. Reports from watermen and from Mike Castagna at the VIMS' Wachapreague laboratory indicate that moderate to heavy sets were widespread at other stations on the Seaside in 1973.

POTOMAC RIVER - No spat were observed on shellstrings from the Potomac River in 1973, except at Great Neck where 10 spat were counted on 10 shellfaces (for an average of 1 spat/shellface) during the last week of the survey. Studies conducted by the Potomac River Fisheries Commission, the Chesapeake Biological Laboratory and the Virginia Institute of Marine Science in February 1974 confirmed that spatfall had been very light. A light set ranging from 8 to 50 spat/bushel occurred, probably late in the season, on shells planted by the Potomac River Fisheries Commission at Thicket Point, Upper Jones Bar, Jones Shore and Great Neck.

VIRGINIA INSTITUTE OF MARINE SCIENCE
SPATFALL ON SHELLSTRINGS*
ANNUAL SUMMARY
1970-1973

James River

1973 Date Exposed**	1970	Hampton Flats		1973	Newport News Tax Office			1973
		1971	1972		1970	1971	1972	
June 11-18	0	--	0	0	--	--	--	--
June 18-25	Lost	0	0	0	--	--	0	--
June 25-July 2	0	--	--	0	--	--	0	--
July 2-9	0	0.1	--	0	--	--	0	--
July 9-16	0.4	--	0	0	--	--	0	0
July 16-23	0	0	0	Lost	0	0	0	0
July 23-30	0.4	0	0	0	0.1	0	0	0.4
July 30-Aug. 6	11.1	1.2	--	0	3.3	0.5	0	0
Aug. 6-13	0.6	10.9	0	0	0.4	3.2	0	0.2
Aug. 13-20	5.2	7.3	0	0	1.5	18.3	0	1.1
Aug. 20-27	8.6	Lost	0	0.4	2.3	10.9	0	0.8
Aug. 27-Sept. 4	1.6	6.5	0	0.7	1.3	33.2	0.5	4.3
Sept. 4-10	0.6	Lost	0.2	0.4	0.2	2.2	--	0
Sept. 10-17	Lost	4.0	0.7	1.2	0.9	11.7	0.3	9.0
Sept. 17-24	0.2	2.2	0.2	2.6	0.2	5.2	0.3	0.6
Sept. 24-Oct. 1	0	--	0.2	Lost	0.1	1.4	0.2	2.0

1973 Date Exposed**	1970	Brown Shoals		1973	Miles Watch House			1973
		1971	1972		1970	1971	1972	
June 11-18	0	--	0	0	--	--	0	0
June 18-25	0	0.1	0	0	--	--	0	0
June 25-July 2	0	0	0	Lost	--	0	0	0
July 2-9	0	0	--	0	--	0	0	0
July 9-16	0	0	0	0	--	0	0	0
July 16-23	0	0	0	0.2	--	--	0	0
July 23-30	0.3	0.2	0	0.5	--	0	0	0.1
July 30-Aug. 6	6.0	0.7	0.1	0.2	--	0.5	0	0
Aug. 6-13	2.8	2.0	--	0.2	--	2.3	0	0
Aug. 13-20	3.1	2.7	0	0.2	0.8	0.1	0	0
Aug. 20-27	5.6	17.0	0	1.4	0.6	1.3	0	0.1
Aug. 27-Sept. 4	1.6	6.1	0	1.2	0.6	0.1	0	0.2
Sept. 4-10	0.1	1.5	0.3	8.5	0.1	0	0	0.5
Sept. 10-17	0.4	0.4	0.3	4.7	0.1	0	0.6	4.6
Sept. 17-24	1.0	0.4	Lost	4.1	0.3	--	0	0.4
Sept. 24-Oct. 1	0	Lost	0	1.6	--	--	0	0.7

1973 Date Exposed**	1970	Wreck Shoals		1973	Point of Shoals			1973
		1971	1972		1970	1971	1972	
June 11-18	0	0.2	0	0	0	0	0	0
June 18-25	0	0	0	0	0	0	0	0
June 25-July 2	0	0	0	0	0	0	0	0
July 2-9	0	0	0	0.1	0	0	0	0
July 9-16	Lost	0	0	0.3	0	0	0	0
July 16-23	0	0	0	0	0.4	0	0	0
July 23-30	0.2	0.1	0	0	0.1	0	0	0
July 30-Aug. 6	9.2	3.4	0.2	0.3	8.4	4.4	0	0
Aug. 6-13	1.5	2.6	0	0	1.5	1.0	0	0
Aug. 13-20	0.4	0.3	0	0	3.8	0.5	0	0
Aug. 20-27	2.2	2.2	0.8	0.1	0.9	0.7	0.6	0.1
Aug. 27-Sept. 4	0.8	0.4	0	0	1.1	0	0	0.2
Sept. 4-10	0	0	0	0	0	0	0.3	0.1
Sept. 10-17	0	0.1	1.2	0.3	0.2	0	1.1	0.1
Sept. 17-24	0.3	0	0.6	0	0	0	0.3	0
Sept. 24-Oct. 1	0.1	0.4	0.2	Lost	0	--	0.2	0

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

James River

1973 Date Exposed**	1970	Horsehead			1970	Deepwater Shoals		1973
		1971	1972	1973		1971	1972	
June 11-18	0	0	0	0	0	0	0	0
June 18-25	0	0	0	0	0	0	0	0
June 25-July 2	0	0	0	0	0	0	0	0
July 2-9	0	0	0	0	0	0	0	0
July 9-16	0	0	0	0.2	0	0	0	0
July 16-23	0.2	0	0	0	0	0	0	0
July 23-30	0.3	0	0	0	0.2	0	0	0
July 30-Aug. 6	7.6	7.7	0	0	2.8	3.2	0	0
Aug. 6-13	3.8	2.5	0	0	0.8	2.6	0	0
Aug. 13-20	1.6	0.2	0	0	0.4	0.2	0	0
Aug. 20-27	0.9	1.1	0.6	0.1	0	1.0	0	0
Aug. 27-Sept. 4	0.3	0.1	0.3	0.1	0.3	0	Lost	0
Sept. 4-10	0.2	0	0.1	0.1	0	0.1	0	0.3
Sept. 10-17	0.1	0.2	1.1	0	0.1	0	0.2	0
Sept. 17-24	0.1	0.2	0.7	0	0.1	Lost	0.5	0
Sept. 24-Oct. 1	0	0	0.5	0	0	0	0.2	0

York River

1973 Date Exposed**	1970	Foxes Creek			1970	Claybank		1973
		1971	1972	1973		1971	1972	
June 8-15	} 0	} 0	} --	} 0	} 0	} 0	} --	} 0
June 15-21								
June 21-29	0	0	0	0	0	0	0	0
June 29-July 6	0	0	0	0	0	0	0	0
July 6-13	0	0	0	0	0	0	0	0
July 13-19	0	0	0	Lost	0	0	0	Lost
July 19-26	0	0	0	0	0	0	0	0
July 26-Aug. 2	0	0	0	0	0	0	0	0
Aug. 2-10	0	0	0	0	0.6	0.3	0	0
Aug. 10-17	0	0.1	0	--	0	0.6	0	0
Aug. 17-24	0	0	MSG	--	0	0.2	MSG	0
Aug. 24-31	0	0	0	0	0.1	0.1	0.2	0
Aug. 31-Sept. 6	0	0	} 0.1	} 0.1	0.2	0.4	} 0	} 0
Sept. 6-12								
Sept. 12-20	0	0	0	--	0	1.2	0.1	0.2
Sept. 20-27	0	0	0	0.4	0	1.4	0	--
Sept. 27-Oct. 4	0.2	--	--	0	0.5	--	--	0.8

1973 Date Exposed**	1970	VIMS PIER		1973
		1971	1972	
June 8-15	0	0	--	--
June 15-21				
June 21-29	0	0	0	0
June 29-July 6	0	0	0	--
July 6-13	0	0	0	Lost
July 13-19	0	0	0	Lost
July 19-26	0	0.1	0	0.1
July 26-Aug. 2	0	0.2	0	0
Aug. 2-10	1.0	1.9	0	--
Aug. 10-17	0.1	0.6	0	0.1
Aug. 17-24	5.0	0.9	MSG	1.3
Aug. 24-31	1.5	3.9	0	0
Aug. 31-Sept. 6	1.4	17.2	0.3	1.2
Sept. 6-12	2.9	53.2		
Sept. 12-20	5.1	1.6	Lost	6.4
Sept. 20-27	0.4	7.4	0	7.4
Sept. 27-Oct. 4	1.3	--	--	1.6

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

Piankatank River and Milford Haven

1973 Date Exposed**	Lilly's Neck - Station 2				Point Breeze - Station 3			
	1970	1971	1972	1973	1970	1971	1972	1973
June 12-19	0	0	--	0	0	0	--	--
June 19-26	0	0	0	0	0	0	0	0
June 26-July 3	1.0	0.7	0	0	0.6	0.8	0	0
July 3-10	1.4	0	0.1	0	11.4	0	0.1	1.0
July 10-17	0.6	0.2	0	2.0	0.4	0	0	1.2
July 17-24	0.1	0	0	3.4	0.1	0	0	4.5
July 24-31	0.9	0	0	0.7	2.7	0.1	0	0.8
July 31-Aug. 6	0.7	0	0	0.9	0.5	0	0	0.4
Aug. 6-14	0.7	0	0	1.5	7.2	0.3	0	0.3
Aug. 14-21	1.3	0.1	0	0	1.9	0	0	0.3
Aug. 21-28	0.2	2.4	0	0.1	Lost	0	0	0.6
Aug. 28-Sept. 4	1.5	12.3	0	1.1	3.5	0.8	0	0.7
Sept. 4-11	0.2	1.6	Lost	11.6	3.6	0.8	0	2.8
Sept. 11-18	0.5	4.4	0	5.0	3.1	0.4	0	3.6
Sept. 18-25	1.1	0.2	0	3.2	0.9	0	Lost	1.0
Sept. 25-Oct. 2	1.5	0	0	2.0	1.5	0	0	Lost

1973 Date Exposed**	Stutts Creek - Station 11				Three Branches - Station 4			
	1970	1971	1972	1973	1970	1971	1972	1973
June 12-19	0.3	0	--	0	0	0	--	0
June 19-26	0	0.1	0	0	0	Lost	0	--
June 26-July 3	0	0.3	0	0.4	2.0	--	0	0
July 3-10	0.2	0	0	0.2	0.1	0.8	0	0
July 10-17	3.8	0	0.1	1.3	0.1	0.1	0	0.4
July 17-24	0	0	0	0.9	0.1	0	0	2.0
July 24-31	0.3	0	0	0.6	0.2	0.5	0	3.0
July 31-Aug. 6	0.1	0	0	0	0.7	0	0	1.2
Aug. 6-14	2.3	0	0	0.7	3.9	0.1	0	3.3
Aug. 14-21	0.8	0.1	0	0.6	0.3	0	0	0
Aug. 21-28	0.5	0.3	0	0	0.1	12.8	0	0.2
Aug. 28-Sept. 4	0.5	1.8	0	0	1.1	14.8	0	0.8
Sept. 4-11	5.8	1.4	Lost	0.2	1.3	Lost	0	2.2
Sept. 11-18	0	1.0	0	0	0.3	Lost	0	1.2
Sept. 18-25	0	0.2	0	0	0.2	Lost	0	0.8
Sept. 25-Oct. 2	0.1	0	0	0.2	0.2	Lost	0	0.4

1973 Date Exposed**	Hills Bay - Station 1				Burton Point - Station 5			
	1970	1971	1972	1973	1970	1971	1972	1973
June 12-19	0	0	--	0	Lost	0	--	--
June 19-26	0	0	0	0	Lost	0	0	0
June 26-July 3	2.8	0.4	0	0	1.7	0.2	0	0
July 3-10	0	0	0.2	0.8	7.3	0	0	0.1
July 10-17	0.2	0.5	0	0.4	2.6	0.3	0	3.4
July 17-24	0.2	0	0	3.0	1.4	0	0	3.7
July 24-31	0.1	0.1	0	3.7	1.8	0.9	0	2.3
July 31-Aug. 6	0	0	0	0.7	1.7	0.1	0	3.4
Aug. 6-14	0.8	0	0	13.5	0.3	0.3	0	15.4
Aug. 14-21	0	0	0	0.2	0.3	0.8	0	0.4
Aug. 21-28	0.5	0.1	0	1.8	0.7	2.1	0	1.0
Aug. 28-Sept. 4	0.4	1.0	0	0.1	0.6	3.2	0	0.9
Sept. 4-11	0.7	0	0	6.8	0.2	0.2	0	4.6
Sept. 11-18	0	0.4	0	2.8	0.2	0.6	0	Lost
Sept. 18-25	0.3	0	0	1.0	0.5	0	0	Lost
Sept. 25-Oct. 2	0.1	0	0.2	0.4	0.5	Lost	0	0.4

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

Piankatank River and Milford Haven

1973 Date Exposed**	Island Bar - Station 7				Palace Bar - Station 6			
	1970	1971	1972	1973	1970	1971	1972	1973
June 12-19	0	0	--	--	0	0	--	0
June 19-26	0	0	0.1	0.4	0	0	0.1	0.2
June 26-July 3	13.1	0.3	0	0	10.6	4.1	0	0
July 3-10	17.2	5.0	0	10.0	4.5	4.1	0	4.7
July 10-17	0.4	2.3	0.2	3.5	0.5	4.5	0	2.5
July 17-24	2.8	0.7	0	11.2	2.4	0.6	0	3.3
July 24-31	0.1	2.2	0	5.9	0.5	4.5	0	2.4
July 31-Aug. 6	0.4	0.1	0	10.2	0	0	0	3.7
Aug. 6-14	0.3	5.8	0	8.6	Lost	0	0	3.2
Aug. 14-21	0.2	0	0	5.3	0.2	2.8	0	3.7
Aug. 21-28	0.2	4.5	0	40.6	0	4.7	0	6.5
Aug. 28-Sept. 4	Lost	3.2	0	2.8	0.7	5.1	0	1.0
Sept. 4-11	Lost	0.4	0	7.6	1.6	0.4	0	Lost
Sept. 11-18	0.6	0.8	0	1.6	0	0.8	0	0
Sept. 18-25	0.2	Lost	0	Lost	Lost	0.2	0	2.6
Sept. 25-Oct. 2	0.2	0	0	Lost	1.2	0	0	0.6

1973 Date Exposed**	Ginney Point - Station 8				Twig Branch - Station 9			
	1970	1971	1972	1973	1970	1971	1972	1973
June 12-19	0	0	--	0	0	0	--	0
June 19-26	0	0	0.1	0	0	0	0	0.2
June 26-July 3	11.5	1.3	0	0	0.5	--	0	0
July 3-10	29.7	25.9	0.8	0	3.3	0	0.4	5.5
July 10-17	2.3	1.3	0.1	0.4	1.4	1.9	0	1.7
July 17-24	11.2	1.8	0	5.3	12.7	0.7	0	7.0
July 24-31	1.8	3.4	0	1.9	0.7	0.7	0	2.3
July 31-Aug. 6	0.1	0.1	0	3.4	0.4	0.1	0.6	Lost
Aug. 6-14	0.1	13.5	0	0	1.8	19.6	0	0
Aug. 14-21	1.0	12.2	0	3.3	1.0	7.9	0	1.4
Aug. 21-28	0.8	1.1	0	11.7	0.4	11.9	0	20.2
Aug. 28-Sept. 4	0.8	4.6	0	--	1.9	0.6	0	1.5
Sept. 4-11	0.7	3.2	0	5.8	0.3	2.8	0	2.8
Sept. 11-18	0	2.8	0	2.8	0	0.8	0	Lost
Sept. 18-25	0.1	Lost	0	3.8	0.3	0	Lost	1.0
Sept. 25-Oct. 2	0.4	0	0.2	0.8	0.5	0	0	3.2

1973 Date Exposed**	Ferry Creek - Station 10			
	1970	1971	1972	1973
June 12-19	0	0	--	0
June 19-26	0	0	0	0
June 26-July 3	7.0	0.6	0	0
July 3-10	6.3	1.6	0	0
July 10-17	Lost	0.8	0	0.1
July 17-24	23.9	0.8	0	0.6
July 24-31	0	0	0	0.8
July 31-Aug. 6	0	0	0	0.3
Aug. 6-14	0.1	8.9	0	0
Aug. 14-21	1.9	3.9	0	0.5
Aug. 21-28	0.2	10.4	0	0
Aug. 28-Sept. 4	0.5	Lost	0	3.4
Sept. 4-11	0	0.8	0	0.2
Sept. 11-18	0	0	0	0.2
Sept. 18-25	0	0.2	0	0
Sept. 25-Oct. 2	0	0	0	0.6

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

Rappahannock River

1973 Date Exposed**	Broad Creek - Inshore			Broad Creek - Offshore				
	1970	1971	1972	1973	1970	1971	1972	1973
June 11-18			--	--			--	--
June 18-25			--	--			--	--
June 25-July 2			0	--			0	--
July 2-9			0	--			0	--
July 9-16			0	--			0	--
July 16-23	Stations	Stations	0	0	Stations	Stations	--	--
July 23-30			--	0			--	--
July 30-Aug. 6	Not	Not	0	--	Not	Not	--	0
Aug. 6-13			0	0			--	0
Aug. 13-20	Sampled	Sampled	0	--	Sampled	Sampled	--	--
Aug. 20-27			0	--			0	--
Aug. 27-Sept. 6			Lost	--			0	0
Sept. 6-13			0	Lost			Lost	1.0
Sept. 13-19			Lost	--			Lost	1.0
Sept. 19-24			Lost	Lost			Lost	Lost
Sept. 24-Oct. 1			Lost	--			Lost	--

1973 Date Exposed**	Corrotoman			Greenvale				
	1970	1971	1972	1973	1970	1971	1972	1973
June 11-18			--	0			--	0
June 18-25			--	0			--	0
June 25-July 2			0	0			0	0
July 2-9			0	0			0	0
July 9-16			0	--			0	--
July 16-23	Stations	Stations	0	0	Stations	Stations	0	0
July 25-30			0	0			0	0
July 30-Aug. 6	Not	Not	0	0	Not	Not	0	0
Aug. 6-13			0	0			0	--
Aug. 13-20	Sampled	Sampled	0	0	Sampled	Sampled	0	0
Aug. 20-27			0	0			0	0
Aug. 27-Sept. 6			0	--			0	--
Sept. 6-13			0	Lost			0	Lost
Sept. 13-19			0	0			0	Lost
Sept. 19-24			0	0			0	Lost
Sept. 24-Oct. 1			0	0.4			0	0

Mobjack Bay

1973 Date Exposed**	North River Head - Station 1				North River Black Water Creek - Station 2			
	1970	1971	1972	1973	1970	1971	1972	1973
June 7-13	9.9	--	0.1	0	0	--	0	0
June 13-20	8.2	3.2	0	0	1.4	0.3	0	0
June 20-27	0	9.8	0	0	0	0	0	0
June 27-July 5	0	1.9	0.8	1.1	0	0	0.4	0
July 5-11	38.1	0	24.3	0.6	0	0	9.2	0.8
July 11-18	0.5	1.8	7.3	0	0.3	0	3.5	0
July 18-25	2.2	0.1	0.7	2.1	0	0	0	0
July 25-31	0	0.1	0.6	0.3	0	0	0.5	0
July 31-Aug. 8	3.5	1.0	0.1	0	0.4	0.9	0	0
Aug. 8-15	0	0.1	0.6	0	0.1	Lost	0	0.9
Aug. 15-22	0	0	0	1.1	0	Lost	0	0
Aug. 22-29	0.1	0	0	0	0	Lost	0.1	0.2
Aug. 29-Sept. 5	0.4	0	0.4	0.3	0	Lost	0.9	0.2
Sept. 5-12	0	0	0.1	Lost	0	0	0	0
Sept. 12-19	0	0.6	0.1	0.4	0	0.8	0	0.2
Sept. 19-26	Lost	0	0	0.4	0.1	0	0	0.4
Sept. 26-Oct. 3	0.1	0	0	0	0	0.2	0	0.2

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell - fair set
2 to 10 spat per shell - moderate set
11 to 100 spat per shell - heavy set

Mobjack Bay

1973 Date Exposed**	North River - Cedar Point Station #3				East River Head Station #4			
	1970	1971	1972	1973	1970	1971	1972	1973
June 7-13	0	--	0	0	0.4	--	0	0
June 13-20	0	0.6	0	0	1.2	2.8	0	0
June 20-27	0	0	0	0	26.7	5.6	0	0
June 27-July 5	0	0	0	0	0.1	0.5	0.1	7.3
July 5-11	0	0	0	0	33.8	2.2	10.8	4.5
July 11-18	0.2	0	0	0	0.8	0.9	5.0	1.4
July 18-25	0	0	0.2	0.3	0.2	0.1	7.5	0
July 25-31	0	0	0	0	0	0	1.7	4.8
July 31-Aug. 8	0.2	0.2	0	0.2	0.5	0.2	0	Lost
Aug. 8-15	0.1	0.1	0	0.4	19.9	0.1	0	Lost
Aug. 15-22	0	0	0	2.1	1.0	0	0.7	0.7
Aug. 22-29	0	0	0.1	7.5	0	0	0	0
Aug. 29-Sept. 5	0.1	0.2	0.8	0.2	0	0	0.9	0.1
Sept. 5-12	0.2	0	0.3	2.2	0	0	0	0
Sept. 12-19	0.1	1.0	0	0	0	0.4	0	0.2
Sept. 19-26	0	0.2	0	3.2	1.0	0	0	0.6
Sept. 26-Oct. 3	0	0	0	0	0	--	0	0.2

1973 Date Exposed**	East River - Put-In-Creek Station #5				East River - Williams Wharf Station #11			
	1970	1971	1972	1973	1970	1971	1972	1973
June 7-13	0.7	--	0	0.5	0.1	--	0	0.8
June 13-20	1.2	0.5	0	0	0.5	0.4	0	0
June 20-27	0.3	6.6	0	0	2.6	1.8	0	0
June 27-July 5	0	0.6	0	1.3	0	0.1	0	19.4
July 5-11	0	0	12.2	0.7	1.1	0	7.3	2.7
July 11-18	0	0.3	4.5	3.5	0	0.1	2.8	2.9
July 18-25	0	0	2.3	0.4	0	0	8.6	0.9
July 25-31	21.5	0.4	1.5	Lost	1.5	0.2	0.9	0.5
July 31-Aug. 8	1.1	0.6	0	0.3	0.2	0.2	0	2.5
Aug. 8-15	10.8	0	0	0.2	8.6	0	0	0.3
Aug. 15-22	0.3	0	0	4.7	0.4	0	0	1.6
Aug. 22-29	0	0	0	0	0	0	0	0
Aug. 29-Sept. 5	0	0.3	0.7	0.3	0.1	3.5	0.1	1.8
Sept. 5-12	0	0	0	0.2	0	0.4	0.1	3.4
Sept. 12-19	0	0.8	0.1	3.6	0.1	0.6	0	2.6
Sept. 19-26	0.5	0.4	0	1.4	0.5	0	0	2.6
Sept. 26-Oct. 3	0.4	--	0	0	0	--	0	0

1973 Date Exposed**	East River Mouth Station #6		
	1970	1971	1972
June 7-13	0	0	--
June 13-20	0	--	--
June 20-27	0	0.1	0
June 27-July 5	0	0	--
July 5-11	0	0	0.3
July 11-18	0	0.1	0.7
July 18-25	0	0	0.2
July 25-31	0.5	0	0.5
July 31-Aug. 8	0.3	0.1	0.3
Aug. 8-15	0.6	0.1	0
Aug. 15-22	10.9	0.4	0
Aug. 22-29	8.0	0.8	0
Aug. 29-Sept. 5	4.2	5.2	0.4
Sept. 5-12	3.9	8.2	0.1
Sept. 12-19	2.2	2.4	0
Sept. 19-26	7.4	3.6	0
Sept. 26-Oct. 3	4.9	1.0	0

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

New Point Comfort Area

1973 Date Exposed**	1970	Pepper Creek			1973	1970	Dyer Creek			1973
		1971	1972				1971	1972		
June 7-13	0.5	0.1			0	0			0	
June 13-20	0	0.2			0	0.3			0	
June 20-27	0.1	0.1	0	0	0	0.2	0	0	0	
June 27-July 5	0	0	0	0	2.1	0.1	0	0	0	
July 5-11	0	0.2	0	1.2	3.7	0	0	0	0	
July 11-18	0	0.2	0	3.3	1.0	0.1	0	0	0	
July 18-25	0	0	0.3	3.7	1.3	0.6	0.1	0.1	0.1	
July 25-31	0.3	0.6	0	0.4	1.3	1.3	0.2	0.2	0.1	
July 31-Aug. 8	0.8	0.1	0	0.2	0.1	0.2	0	0	0	
Aug. 8-15	21.7	0.3	0.4	0.1	2.1	0	0	0	0	
Aug. 15-22	1.6	10.4	0.1	0	1.7	0.1	0	0	0	
Aug. 22-29	1.1	37.0	0.1	0.7	3.7	0.2	0.2	0	0	
Aug. 29-Sept. 5	1.8	4.9	0.9	3.6	0.5	0.2	0	1.3	0	
Sept. 5-12	2.0	5.6	0	13.6	0.2	1.6	0	0.6	0	
Sept. 12-19	0.8	2.4	0	9.8	0.7	0	0.1	1.6	0	
Sept. 19-26	1.9	1.0	0	8.4	0.3	--	0	0.2	0	
Sept. 26-Oct. 3	0.1	--	0	3.2	0.1	0.2	0	0.6	0	

1973 Date Exposed**	1970	Winter Harbor Public Landing			1973	1970	Horn Harbor Old Barge			1973
		1971	1972				1971	1972		
June 7-20	0	0	0	0	0	0	0	0	0	
June 20-27	0	0	0	0	0	0.6	0	0	0	
June 27-July 5	0.4	0.6	0	0	0	0.6	0	0	0	
July 5-11	0.4	0	0	1.8	0	0	0	0.1	0	
July 11-18	0.1	0	0	0.6	0.4	0	0.2	0	0	
July 18-25	0.1	0.1	0	2.9	0.2	0	0	0.1	0	
July 25-31	0.2	0	0	0.6	0	0	0	0.2	0	
July 31-Aug. 8	0.6	1.0	0	0	0.1	3.2	0	0	0	
Aug. 8-15	3.9	0.4	0	0	0.2	0	0	0	0	
Aug. 15-22	18.1	0.6	0	0	2.2	0.5	0	0	0	
Aug. 22-29	10.5	4.4	0.1	0.1	0.1	0.4	1.0	0	0	
Aug. 29-Sept. 5	5.4	11.6	0	Lost	0.8	0.5	0.8	0.6	0	
Sept. 5-12	7.5	0.8	0.1	7.6	0.1	0	0	0.4	0	
Sept. 12-19	1.4	13.8	0	18.0	0	0.2	0.2	2.2	0	
Sept. 19-26	9.6	0.2	0	--	0.9	0	0.5	--	0	
Sept. 26-Oct. 3	1.3	1.2	0	2.8	0.2	0	0.1	0.2	0	

Great Wicomico

1973 Date Exposed**	1970	Dameron East & West Station 1&2			1973	1970	Mill Creek Station 3			1973
		1971	1972				1971	1972		
June 5-12	0	0	0	--	0.2	0	0	--	0	
June 12-18	0.7	0	0	0	0	0	0	0	0	
June 18-26	34.4	0.1	0	0	48.7	0	0	0	0	
June 26-July 2	10.2	0	0	0	17.8	0.5	0	0	0	
July 2-9	1.9	0	0	0	0	0	0	0	0	
July 9-17	0.2	0	0	0	0.3	0	0	0	0	
July 17-23	0.4	0	0	0	0.5	0	0	0	0	
July 23-30	0.1	0	0	0	0.3	0	0	0	0	
July 30-Aug. 6	10.2	0	0	0	1.4	0	0	0	0	
Aug. 6-13	0	0.4	0	0	0.4	0.2	0	0	0	
Aug. 13-20	0	0.4	0	0	0	0.5	0	0	0	
Aug. 20-27	0.4	3.1	0	0	0.1	1.4	0	0	0	
Aug. 27-Sept. 4	1.1	0.2	0	0	0.4	0.3	0	0	0	
Sept. 4-10	--	0	0	0.5	--	0	0	0	0	
Sept. 10-17	--	0	0	1.8	--	0	0	8.2	0	
Sept. 17-24	--	0	0	0.4	--	0	0	0.6	0	
Sept. 24-Oct. 1	--	--	--	0	--	--	--	0	0	

* Shows spat per shell (smooth side only),

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

Great Wicomico

1973 Date Exposed**	1970	Crane's Creek Station 7		1973	1970	Fleets Point Station 8		1973
		1971	1972			1971	1972	
June 5-12	1.9	0	--	--	0.2	0	0	--
June 12-18	8.7	0	0	0	0.3	0	0	--
June 18-26	132.7	0	0	0	26.6	0	0	0
June 26-July 2	9.9	0.2	0	0	0.9	0	0	Lost
July 2-9	2.1	0.5	0	0	0.5	0	Lost	0
July 9-17	2.3	0	0	0	0	0	0	Lost
July 17-23	2.6	0	0	0	0	0	0	0
July 23-30	0.5	0	0	Lost	0	0	0	0
July 30-Aug. 6	2.6	0	0	0	0.3	Lost	0	0
Aug. 6-13	0.6	0.9	Lost	0	0.6	0.1	0	Lost
Aug. 13-20	0	1.0	0	0	0	0.3	0	0
Aug. 20-27	2.3	1.4	0	0	0.1	0.6	0	0
Aug. 27-Sept. 4	1.2	0	0	0	0.3	0.8	0	0
Sept. 4-10	0.3	0	0	0	--	0	0	0.2
Sept. 10-17	0.1	0	0	0.6	--	0	0	0
Sept. 17-24	0.9	0	0	0.2	--	0.2	0	0.8
Sept. 24-Oct. 1	--	--	--	0	--	0	--	0

1973 Date Exposed**	1970	Cockrell's Creek Station 9		1973	1970	Haynie Point Station 10		1973
		1971	1972			1971	1972	
June 5-12	0.1	0	0	--	4.0	0	0	--
June 12-18	0	0	0	0	9.1	0	0	--
June 18-26	44.5	0	0	0	283.3	0.3	0	0
June 26-July 2	7.8	0	0	0	112.5	0.2	0	0
July 2-9	0	0.2	0	0	12.1	0	0	0
July 9-17	0.2	0	0	0	0	0.2	0	0
July 17-23	1.7	0	0	0	2.9	0	0	0
July 23-30	0.1	0.2	0	0	0.6	0	0	0
July 30-Aug. 6	0.3	0	0	Lost	1.9	0	0	0
Aug. 6-13	0.1	0	0	Lost	0.3	2.3	0	0
Aug. 13-20	0	1.3	0	0	0.3	1.2	0	0
Aug. 20-27	0	Lost	0	0	1.1	3.5	0	0
Aug. 27-Sept. 4	0.2	0	0	0.2	0.1	0.2	0	0
Sept. 4-10	--	0	0.1	0	--	0	0	0
Sept. 10-17	--	0	0	0.2	--	0	0	2.2
Sept. 17-24	--	0	0	0.6	--	0.2	0	0.2
Sept. 24-Oct. 1	--	0	--	0	--	0	--	0

1973 Date Exposed	1970	Shell Bar Station 11		1973	1970	Hudnall Dock Station 12		1973
		1971	1972			1971	1972	
June 5-12	7.3	0	0	--	4.4	0	0	--
June 12-18	42.7	0	0	0	0.3	0	0	--
June 18-26	290.2	0	0.3	0	373.5	0.3	0.4	0
June 26-July 2	57.2	5.3	0.2	0.1	116.3	9.8	0	0
July 2-9	43.8	2.6	0	0	4.6	1.4	0	0
July 9-17	2.5	0.4	0	0	0.1	0.1	0	0
July 17-23	4.2	0	0	0	3.4	0	0	0
July 23-30	3.9	0	0	0	4.4	0	0	0
July 30-Aug. 6	1.8	0.1	0	0	1.0	0	0	0
Aug. 6-13	0.2	0.8	0	0	1.2	1.1	0	0.1
Aug. 13-20	0.1	1.3	0	0	0	2.2	0	0
Aug. 20-27	Lost	1.0	0	0	0.2	1.7	0	0
Aug. 27-Sept. 4	Lost	0	0	0.2	0.7	0.2	0	0
Sept. 4-10	--	0.2	0	0	0.3	0.2	0	0
Sept. 10-17	--	0	0	0	0.2	0.4	0	0
Sept. 17-24	--	0	0	0	2.2	0	0	1.0
Sept. 24-Oct. 1	--	--	--	0.2	--	0	--	0

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell - fair set
2 to 10 spat per shell - moderate set
11 to 100 spat per shell - heavy set

Great Wicomico

1973 Date Exposed**		1970	Glebe Point Station 13		1973
			1971	1972	
June	5-12	1.8	0	0	--
June	12-18	31.0	0	0	0
June	18-26	227.8	0	2.0	0
June	26-July 2	530.7	0	0.8	0
July	2-9	27.7	20.0	0	0
July	9-17	1.6	0	0	0
July	17-23	9.8	0	0	0
July	23-30	Lost	0	0	0
July	30-Aug. 6	1.2	Lost	0	0
Aug.	6-13	1.4	0.4	0	0
Aug.	13-20	0.8	18.8	0	0
Aug.	20-27	0.1	3.3	0.2	0
Aug.	27-Sept. 4	0.4	0.2	0	0
Sept.	4-10	0.2	0	0	0
Sept.	10-17	0	0	0.1	0
Sept.	17-24	0	0	0	0.2
Sept.	24-Oct. 1	--	0	--	0

Nansemond River

1973 Date Exposed**		1970	Nansemond Ridge		1973	1970	Larkins Rock		1973
			1971	1972			1971	1972	
June	17-26	--	--	0	--	--	0	--	
June	26-July 3	--	--	0	--	--	0	--	
July	3-10	--	--	Lost	--	--	0	--	
July	10-17	--	--	0	--	--	0	--	
July	17-24	0.1	0	0	0	0.1	0	0	
July	24-31	0.2	0	0	0	0.2	0	0	
July	31-Aug. 7	1.2	0.6	Lost	0	1.4	9.2	Lost	
Aug.	7-14	1.8	11.2	0	0	0.8	7.5	0	
Aug.	14-21	0.4	2.9	0.2	0	0.2	1.5	0	
Aug.	21-28	0.5	2.9	0.1	0	0	0.9	0	
Aug.	28-Sept. 4	0.9	4.4	Lost	0	0.4	0.2	Lost	
Sept.	4-11	0.4	2.0	0	0	0.2	0.3	0	
Sept.	11-17	0.7	0.6	1.0	0	0	0.8	0.2	
Sept.	17-24	0.1	0.4	0	0.2	0	0	0	
Sept.	24-Oct. 1	0	--	--	0	0.1	--	--	

1973 Date Exposed**		1970	Half Pone		1973
			1971	1972	
June	17-26	--	--	0	--
June	26-July 3	--	--	0	--
July	3-10	--	--	Lost	--
July	10-17	--	--	0	--
July	17-24	0	0	0	Lost
July	24-31	0	0	Lost	0
July	31-Aug. 7	1.1	6.2	0	0
Aug.	7-14	1.5	22.7	0	0
Aug.	14-21	4.0	2.0	Lost	0
Aug.	21-28	1.8	7.5	0	0
Aug.	28-Sept. 4	0.9	Lost	Lost	0
Sept.	4-11	0.1	0.4	0	0
Sept.	11-17	0.3	0.6	0.1	0
Sept.	17-24	0.2	Lost	0	0
Sept.	24-Oct. 1	0	--	--	0

* Shows spat per shell (smooth side only).

** 1970, 1971, and 1972 exposure dates approximately the same.

.1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

Eastern Shore

1973 Date Exposed**	1970	Poles Channel		1973	1970	Upshur Bay		1973
		1971	1972			1971	1972	
June 25-July 2			0	--			0	--
July 2-10			--	0			--	0
July 10-17			0	0			0.1	0
July 17-23	Stations	Stations	14.1	0	Stations	Stations	34.3	0
July 23-30				--				
July 30-Aug. 7	Not	Not	9.5	0.5	Not	Not	37.5	0.1
Aug. 7-14				--				
Aug. 14-22	Sampled	Sampled	9.5	53.3	Sampled	Sampled	37.5	0.9
Aug. 22-Sept. 4	--	--	--	--	--	--	--	9.4
Sept. 4-11			--	38.4			--	--
Sept. 11-18			--	--			--	--

1973 Date Exposed**	1970	Bogues Bay		1973	1970	Burtons Bay		1973
		1971	1972			1971	1972	
June 25-July 2			0	--			0	--
July 2-10			--	0			--	0
July 10-17			--	0.1			0	0.1
July 17-23	Stations	Stations	13.6	0	Stations	Stations	38.3	0
July 23-30				--				
July 30-Aug. 7	Not	Not	Lost	0	Not	Not	46.4	0
Aug. 7-14				--				
Aug. 14-22	Sampled	Sampled	Lost	0.7	Sampled	Sampled	46.4	0.4
Aug. 22-Sept. 4	--	--	--	--	--	--	--	--
Sept. 4-11			--	--			--	--
Sept. 11-18			--	--			--	--

1973 Date Exposed**	1970	Congers Channel		1973	1970	Chincoteague		1973
		1971	1972			1971	1972	
June 25-July 2			0	--			--	--
July 2-10			--	0.3			--	--
July 10-17			1.0	0.3			--	--
July 17-23	Stations	Stations	12.8	--	Stations	Stations	149.0	--
July 23-30				--				
July 30-Aug. 7	Not	Not	9.5	--	Not	Not	19.7	--
Aug. 7-14				--				
Aug. 14-22	Sampled	Sampled	9.5	49.0	Sampled	Sampled	19.7	--
Aug. 22-Sept. 4	--	--	--	--	--	--	--	--
Sept. 4-11			--	20.6			--	--
Sept. 11-18			--	0			--	--

1973 Date Exposed**	1970	Pocomoke Sound		1973
		1971	1972	
June 25-July 2			--	--
July 2-10			0	0
July 10-17			0	0
July 17-23	Stations	Stations	0	0
July 23-30			0	0
July 30-Aug. 7	Not	Not	0	0
Aug. 7-14			0	--
Aug. 14-22	Sampled	Sampled	0	0
Aug. 22-Sept. 4	--	--	--	0
Sept. 4-11			--	0
Sept. 11-18			--	--

* Shows spat per shell (smooth side only).

** 1970, 1971 and 1972 exposure dates approximately the same.

1 to 1.0 spat per shell = fair set
2 to 10 spat per shell = moderate set
11 to 100 spat per shell = heavy set

SHELLSTRING SURVEY STATIONS

