

Maryland Oyster Population Status Report 2007 Fall Survey



Photo: A.L. Bolinger

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EXECUTIVE SUMMARY

This document presents the results of the Maryland Department of Natural Resources 2007 Fall Oyster Survey in an abbreviated version. The dredge-based survey was conducted between early October and mid-November. A total of 382 samples were obtained to examine 275 natural oyster bars, including 53 Key Bars (which generates the Spat Index) and 43 Disease Bars, as well as contemporary seed oyster planting sites, shell planting locations, and seed production areas.

Salinity, which is affected by freshwater discharge, is a key influence on oyster populations. Annual streamflow into Chesapeake Bay was only slightly below average during 2007, marking the third consecutive year that flows were within the normal range. Despite the near normal annual streamflow, the individual monthly discharges showed strong deviations from the monthly means over two distinct periods. Beginning in the autumn of 2006, streamflows were generally above average through the winter, but fell below normal during a summer/fall dry spell. The timing of these wet/dry episodes may explain, at least in part, the poor spatset, increased disease levels, and low mortalities observed during the 2007 Fall Survey.

Throughout most of the bay, Maryland oyster spatfall was generally poor in 2007. The spat index of 16 was significantly lower than the 2006 index (35), and well below the 23-year average. The distribution of highest spatfall was confined primarily to Tangier Sound and adjacent waters along with the St. Mary's River. The paucity of spat outside of these regions was despite elevated salinities in the second half of the year which can enhance recruitment. The higher streamflows of late 2006/early 2007 may have been a factor contributing to the poor spatfall in 2007.

After a four-year lull, oyster disease levels increased appreciably in 2007. This rise is associated with lower streamflows/higher salinities during the extended dry period from May through November. *Perkinsus marinus*, the parasite that causes dermo disease, was found on most (93%) of the oyster bars tested for the disease. Both measures of the disease, prevalence and intensity, rose in 2007. The three power-dredge zone oyster sanctuaries in southern Maryland experienced high levels of dermo disease. MSX disease, caused by the oyster parasite *Haplosporidium nelsoni*, has spread throughout the southern portion of the bay and its tributaries. However, prevalences on the infected bars remained low.

Despite the increase in disease levels, especially the spread of MSX disease, observed mortalities in 2007 declined for the fifth consecutive year. Many areas were at mortality levels typically observed prior to the disease epizootics of the mid-1980's. The highest mortalities were in Eastern Bay and the western Wicomico River, a tributary of the Potomac River. The higher streamflows of late 2006/early 2007 may have delayed the development of disease enough so that lethal levels generally were not reached in 2007. Two of the three power-dredge sanctuaries suffered elevated mortalities.

Oyster landings during the 2006-07 season increased slightly over the previous year, to 165,059 bu. The fishery benefited from good recruitment in 2002, coupled with low disease levels and high survivorship. About 40% of the harvest came from the Choptank River region, primarily from Broad Creek. Other important harvest regions included Eastern Bay and the middle and upper mainstem of the bay. Tangier Sound, which two years previously had provided more than half of the reported landings in Maryland, experienced a sharp (83%) decline in harvesting activity.

2007 MARYLAND OYSTER POPULATION SURVEY SUMMARY of RESULTS

INTRODUCTION

This document presents the results of the Maryland Department of Natural Resources (MDNR) 2007 Fall Oyster Survey in an abbreviated version. As in earlier reports, the complete set of figures and tables are provided for comparison with previous years. For a general overview of the project and a description of the methods employed, see Tarnowski (2007)¹.

The dredge-based survey was conducted by MDNR Shellfish Program staff between early October and mid-November. [Table 1](#) lists the field data collected during the survey. Oyster parasite diagnostic tests were performed by MDNR staff of the Cooperative Oxford Laboratory (COL). A total of 382 samples were obtained to examine 275 natural oyster bars, including 53 Key Bars (which generates the Spat Index) and 43 Disease Bars (from which samples are sent to COL), as well as contemporary seed oyster planting sites, shell planting locations, and seed production areas ([Figures 1a](#) and [1b](#)). Data on seed and shell plantings are provided in Hess (2007)².



Chesapeake Bay puny historically used for dredging oysters.

¹ Tarnowski, M. (ed.). 2007. Maryland Oyster Population Status Report: 2006 Fall Survey. MDNR Publ. No. 17-7272007-233. Annapolis, Md. 41 pp.

² Hess, J. 2007. DNR Shellfish Oyster Propagation Activity. MDNR Shellfish Prog., Annapolis, Md. 6 pp.

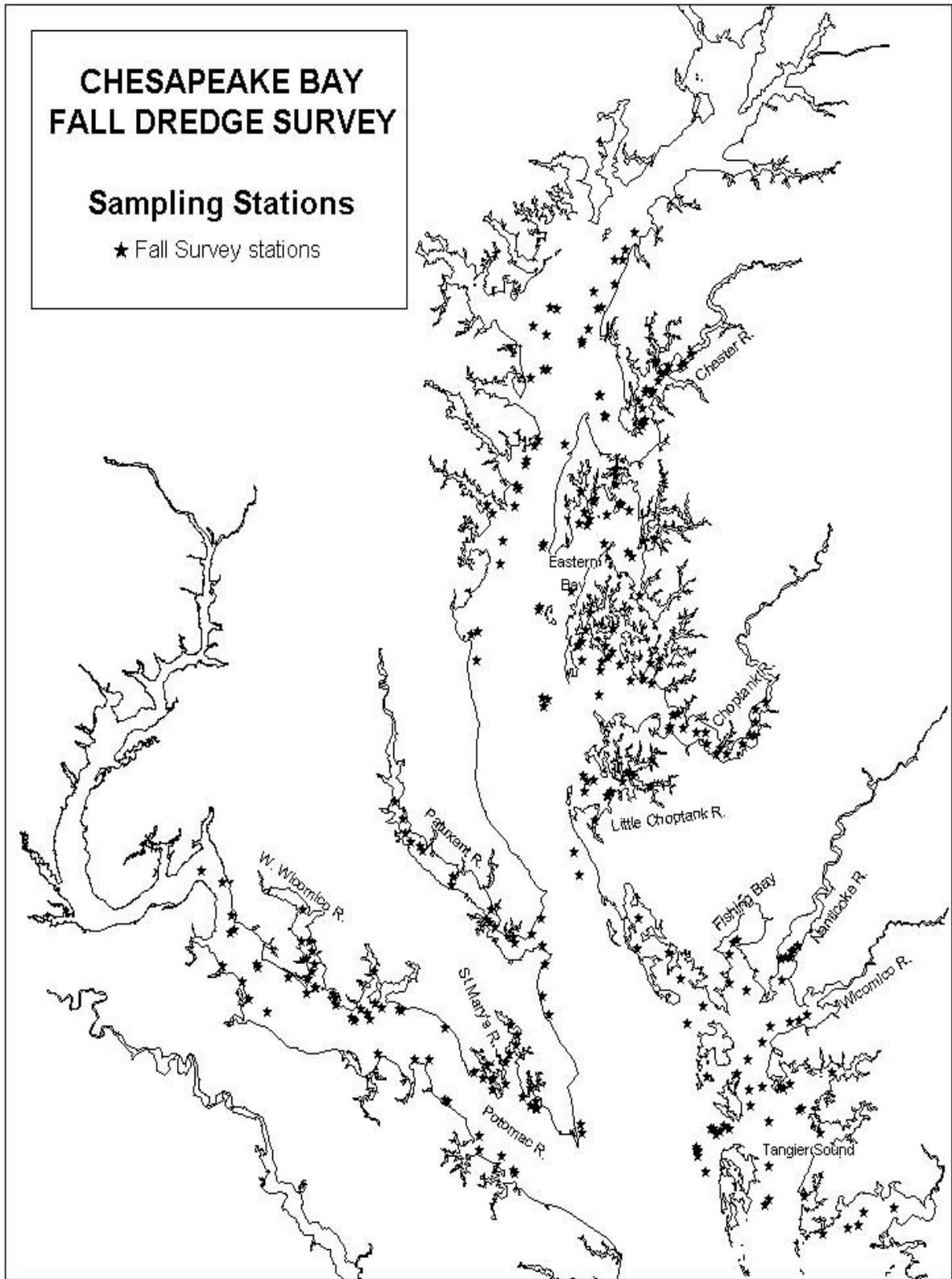


Figure 1a. Annual Maryland Fall Oyster Survey station locations, all bar types (standard, Key, Disease) included.

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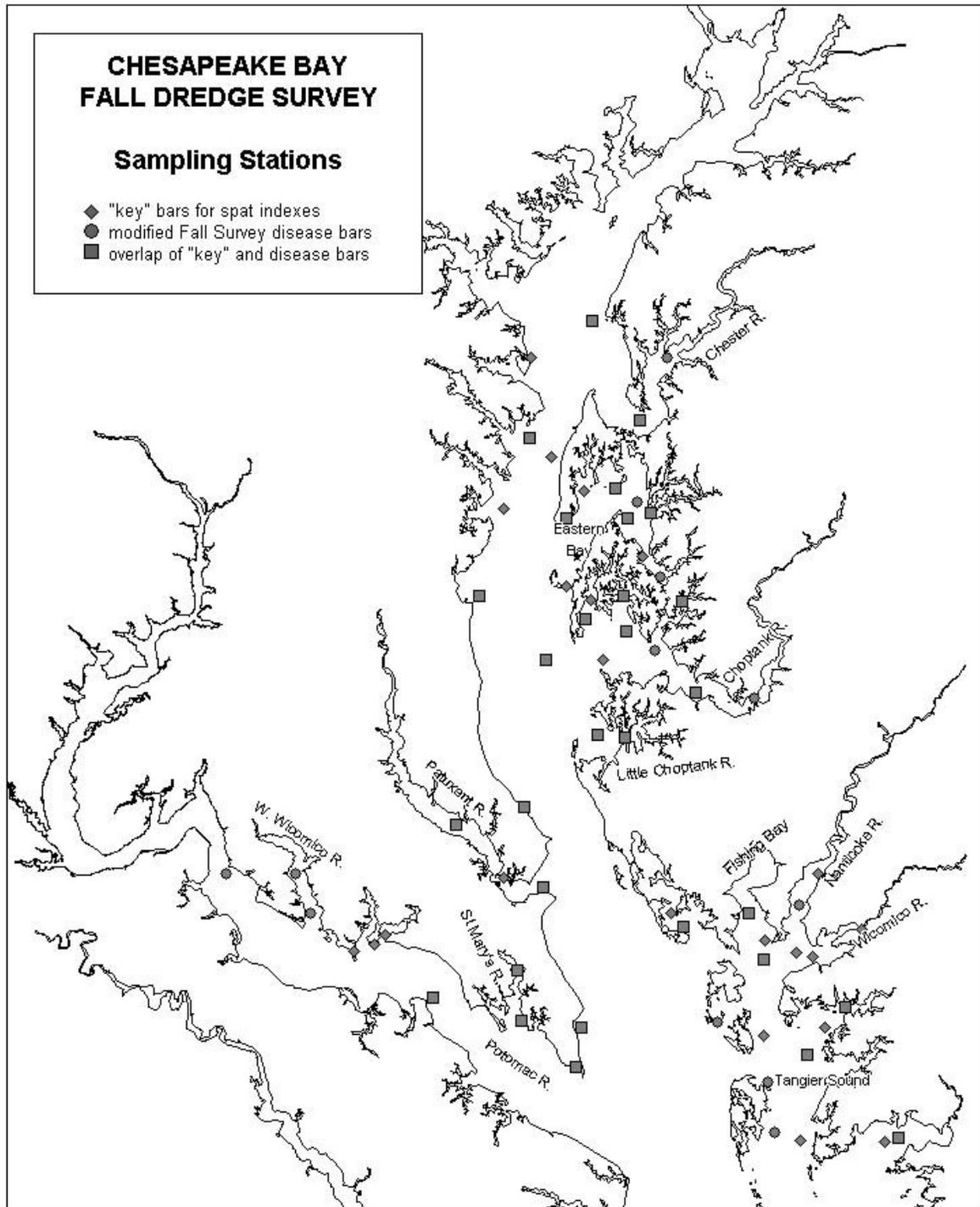


Figure 1b. Annual Maryland Fall Oyster Survey station locations for Key and Disease bars.

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FRESHWATER DISCHARGE CONDITIONS

Salinity is a key quantifiable factor influencing oyster reproduction and recruitment, disease, and mortality. Whereas salinity is a site-specific measurement which varies widely throughout the Maryland oyster grounds, freshwater flow, which affects salinity, provides a more synoptic view of baywide conditions and is therefore used as a surrogate for salinity.

The annual streamflow was only slightly below average during 2007 (Sec. "C" in Bue 1968; USGS 2007), marking the third consecutive year that flows were within the normal range. This is in contrast to the wide fluctuations between wet and dry years³ over the previous decade and a half (Figure 2a).

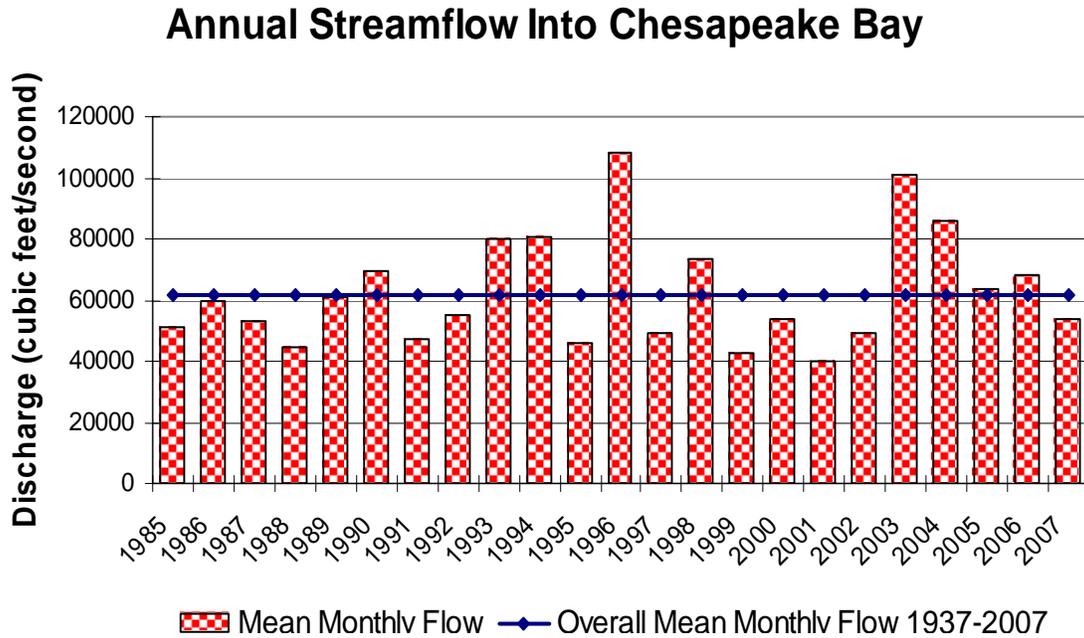


Figure 2a. Time series of annual mean monthly freshwater into Chesapeake Bay. Section C: all Maryland tributaries and the Potomac River.

³ Categorized by the U.S. Geological Survey as freshwater flows above the 75th percentile or below the 25th percentile of mean monthly flows for the 1937-2003 period, respectively.

FRESHWATER DISCHARGE CONDITIONS (cont'd)

Despite the near normal annual streamflow, the individual monthly discharges showed strong deviations from the monthly means over two distinct periods (Figure 2b). Beginning in the autumn of 2006, streamflows were generally above average through the winter, peaking at about 140% above the mean during November, 2006. By April, flows had returned to normal, but soon dropped during a summer/fall dry spell when four of the months experienced discharges approximately 50% below the monthly mean.

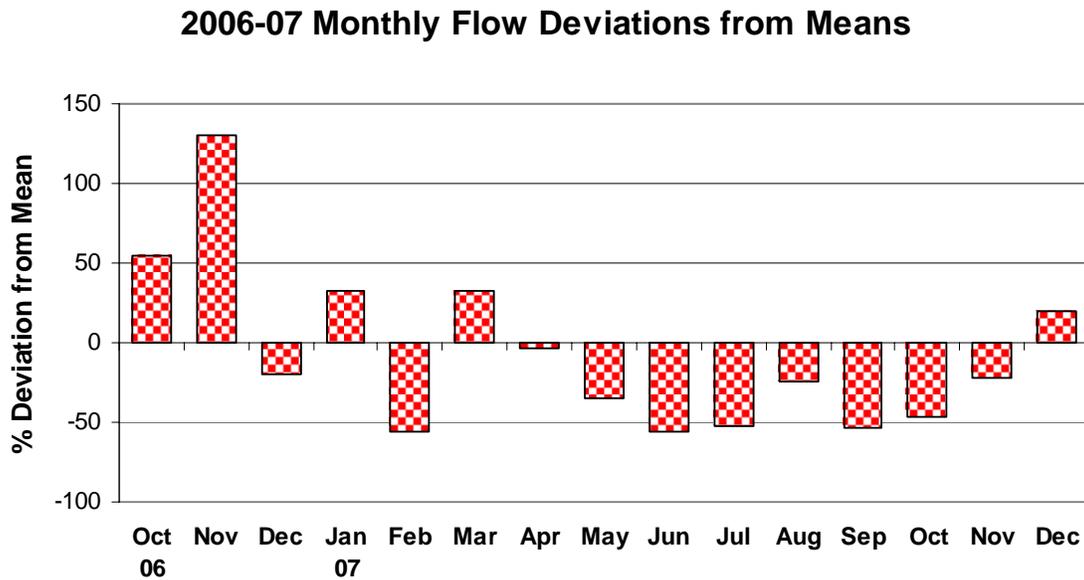


Figure 2b. Percent deviation from mean monthly freshwater flow into Chesapeake Bay at Section C during Fall 2006 and 2007.

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FRESHWATER DISCHARGE CONDITIONS (cont'd)

A representative station in southern Tangier Sound illustrates the influence of streamflows on salinity (Figure 2c). The contrast in salinity deviations between the wet winter/spring of 2007 and the dry summer/fall of 2007 is striking. Also, whereas monthly shifts in freshwater discharges can be volatile and extreme, the changes in salinity are more subdued (compare y-axis ranges between Figures 2b and 2c). There was a time lag in salinity shifts, so that below average salinities persisted into the spring, well after streamflows had dropped below normal. The timing of these wet/dry episodes may explain, at least in part, the poor spatset, increased disease levels, and low mortalities observed during the 2007 Fall Survey as described in the following sections.

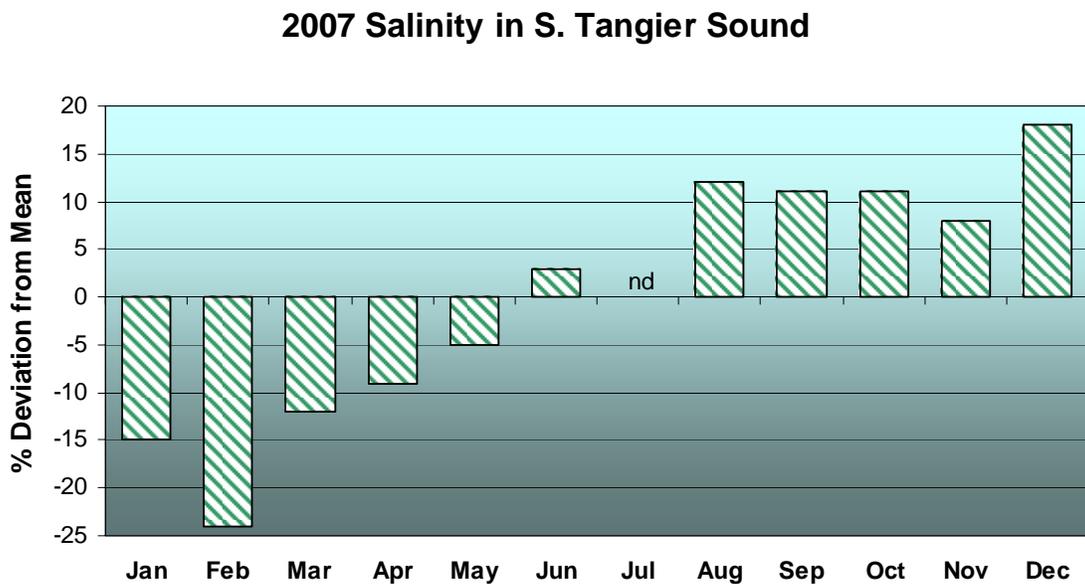


Figure 2c. Deviations from monthly average salinities at a station in southern Tangier Sound during 2007.

SPATFALL INTENSITY

Throughout most of the bay, Maryland oyster spatfall, measured as number of spat per bushel of shell, was generally poor in 2007. The spat index of 16 was significantly lower than the 2006 index (35), and well below the 23-year average, ranking it in the bottom statistical tier (grouping) for that time period (Figure 3). One site, *Pagan* in the St. Mary's River, accounted for 75% of the index (Table 2). Excluding that bar, the spat index was a dismal 4. Aside from the St. Mary's River, the distribution of highest spatfall on all bars surveyed (not just "Key bars") was confined primarily to Tangier Sound and adjacent waters (Figure 4). Other traditional spatfall areas such as the Little Choptank River, Broad Creek, and Eastern Bay had little or no spat, and spat were completely absent from large portions of the bay and tributaries. This paucity of spat outside of the Tangier Sound/St. Mary's River regions was despite elevated salinities in the second half of the year which can enhance recruitment. The higher streamflows of late 2006/early 2007 (Figure 2b) may have been a factor contributing to the poor spatfall in 2007.

Spatfall Intensity Index, 1985-2007

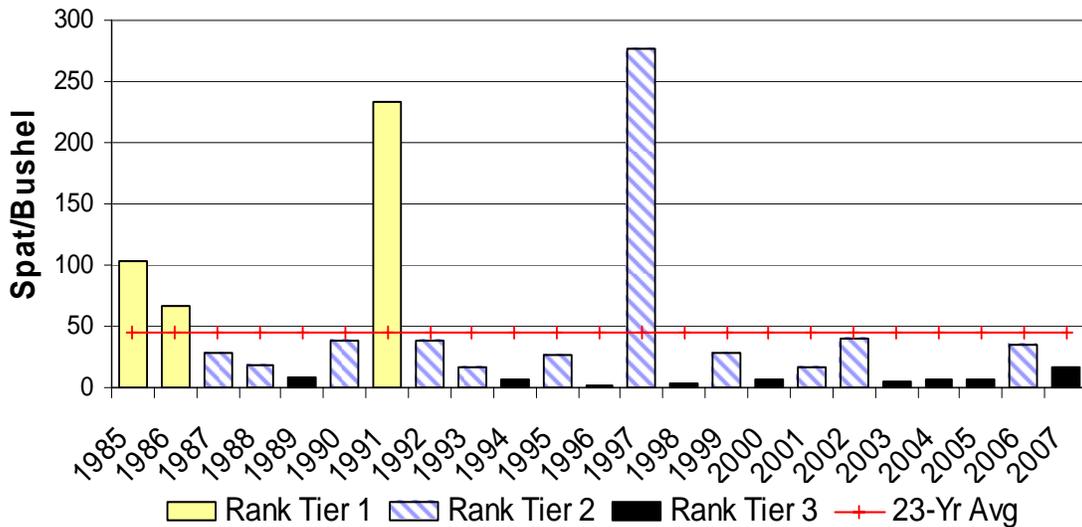


Figure 3. Spatfall intensity (average number of spat per bushel of cultch) on Maryland's 53 "Key Bars" for spat monitoring.

SPATFALL INTENSITY (cont'd)

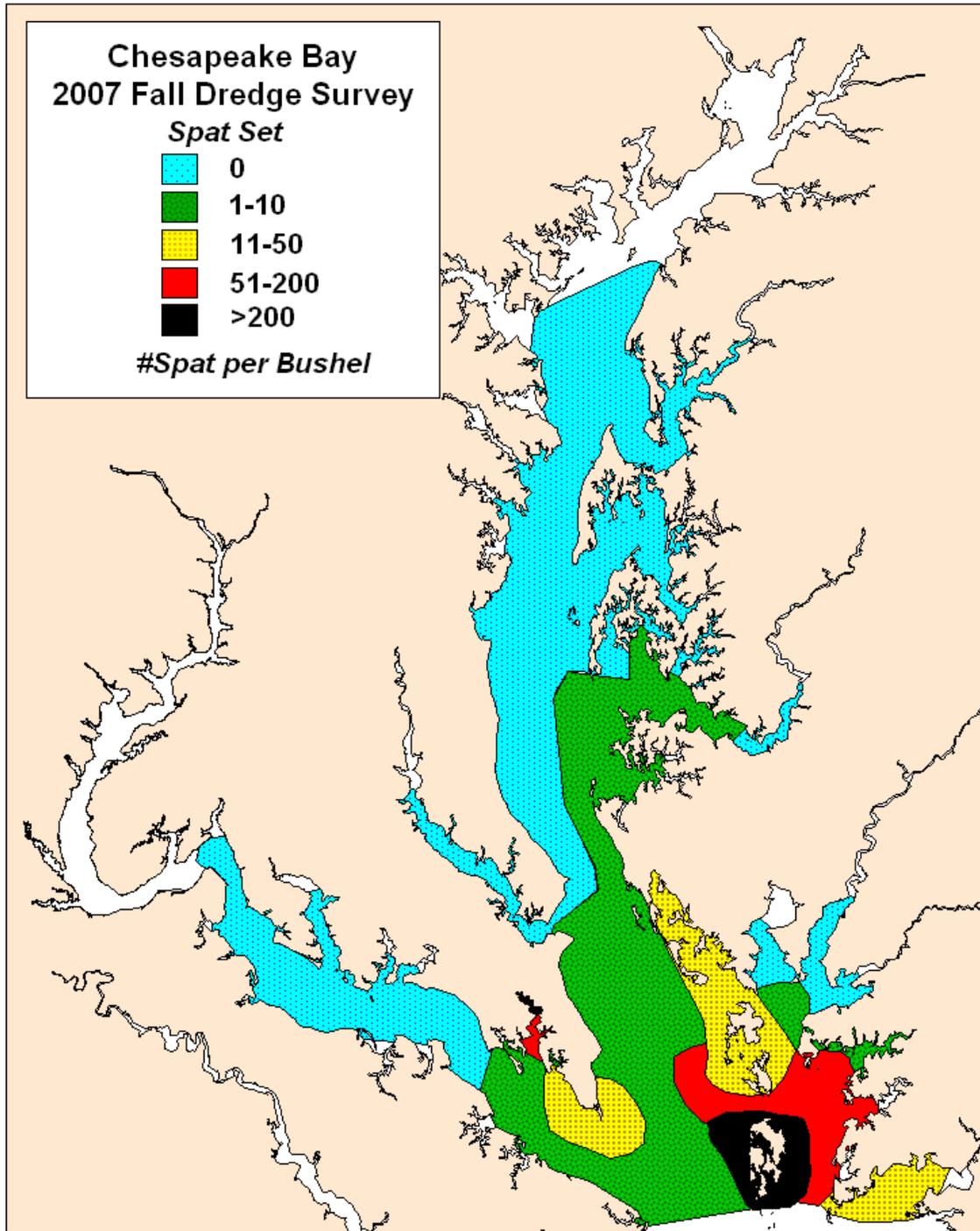


Figure 4. Spatfall intensity ranges and distribution on all surveyed bars, 2007.

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OYSTER DISEASES

After a four-year lull, oyster disease levels increased appreciably in 2007. This rise is associated with lower streamflows/higher salinities during the extended dry period from May through November.

Perkinsus marinus, the parasite that causes **dermo disease**, was found on most (93%) of the oyster bars tested for the disease (Table 3). Both measures of the disease, prevalence and intensity, rose in 2007. Only the increase in prevalence was statistically significant, although it remained below the 18-year average (Figure 5). High prevalences occurred throughout the mainstem of the bay and its tributaries, with the notable exceptions of the upper bay, Honga River, and portions of the Choptank River (Figure 6). The mean infection intensity, though not significantly different from the previous four years, was the highest since 2002 (Figure 7). The frequency distribution of infection intensities showed nearly a doubling of the most severe intensity range, with nearly 40% of the tested oysters falling into the 3.0-7.0 category (on a scale of 0-7) (Figure 8).

Power-Dredge Zone Sanctuaries

Two of the southernmost oyster sanctuaries mentioned in previous reports continued to be hotbeds of dermo disease. The *Point Lookout* sanctuary near the mouth of the Potomac River had a prevalence of 97% and an extremely high intensity of 4.6. Similarly, the *Piney Island East Addition* sanctuary in Tangier Sound had 100% prevalence with an intensity of 3.8. A third sanctuary, *Northwest Middleground* in the lower eastern mainstem of the bay, also developed elevated dermo disease levels of 97% prevalence with an intensity of 4.3, despite having a young oyster population and a relatively remote location with no other oyster bars nearby as sources of disease.

Dermo Disease Prevalence

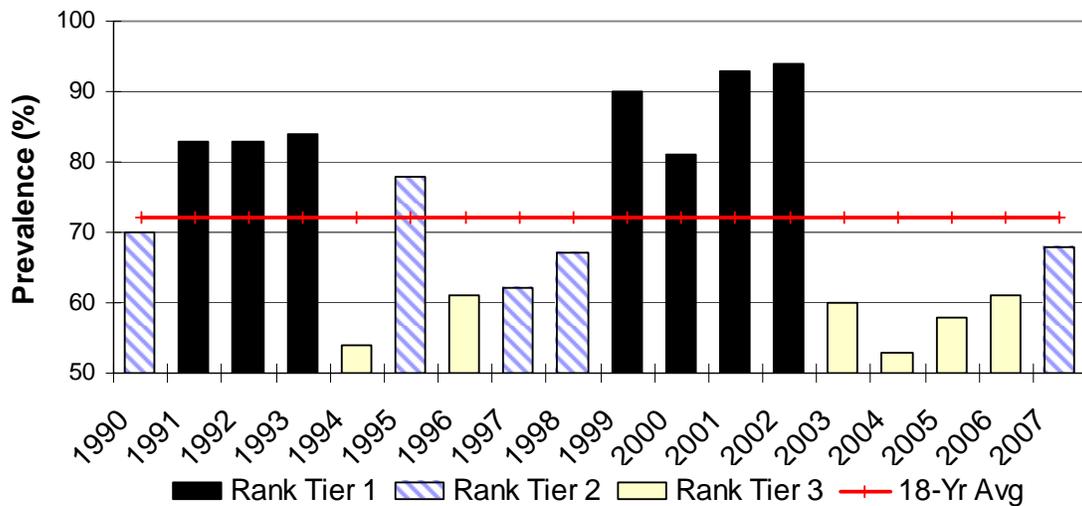


Figure 5. Statistical ranking and 18-year mean of *P. marinus* prevalence on the 43 Disease Bars. Years within each rank tier are statistically similar.

OYSTER DISEASES (cont'd)

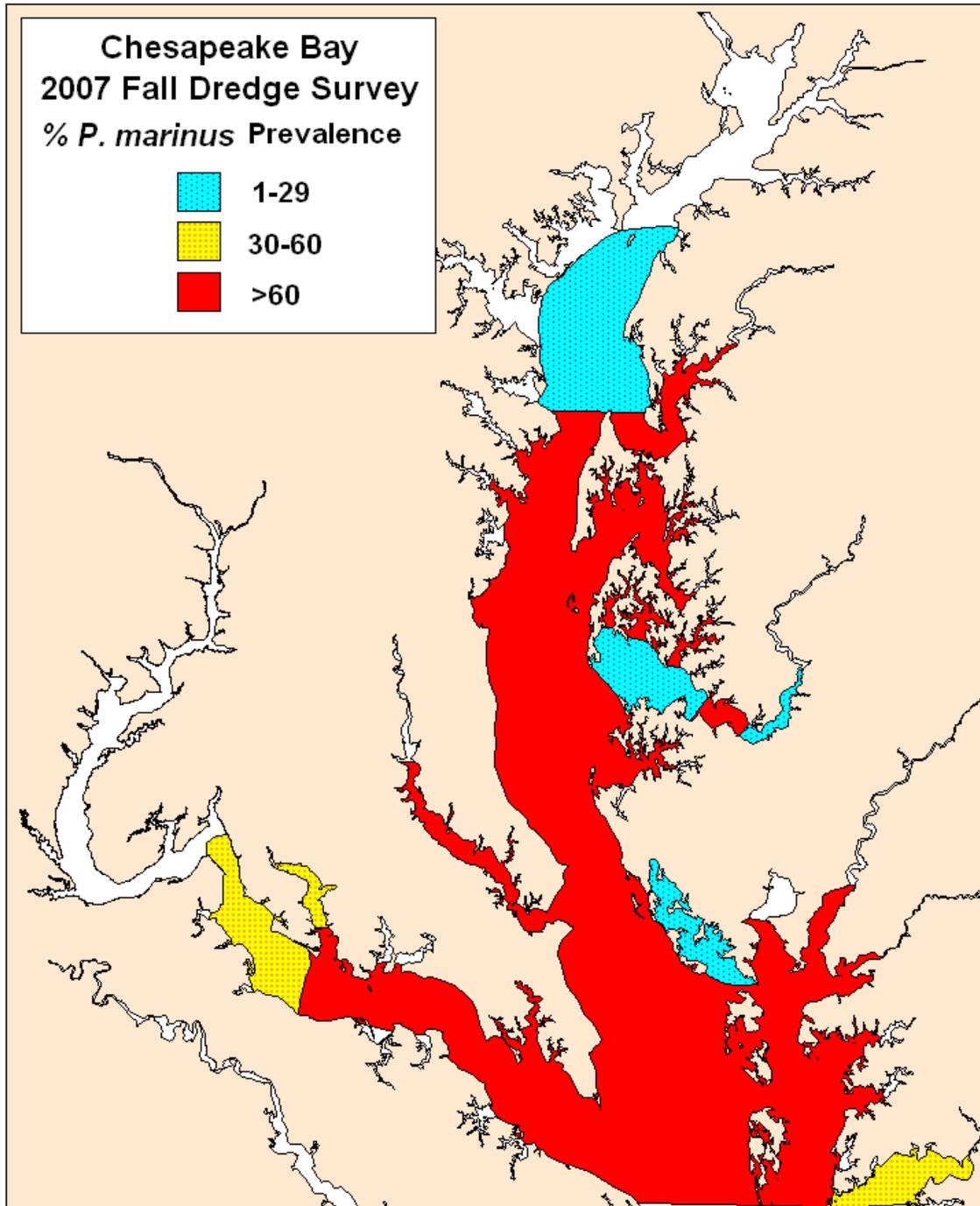


Figure 6. Geographic extent and prevalence of dermo disease in 2007.

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OYSTER DISEASES (cont'd)

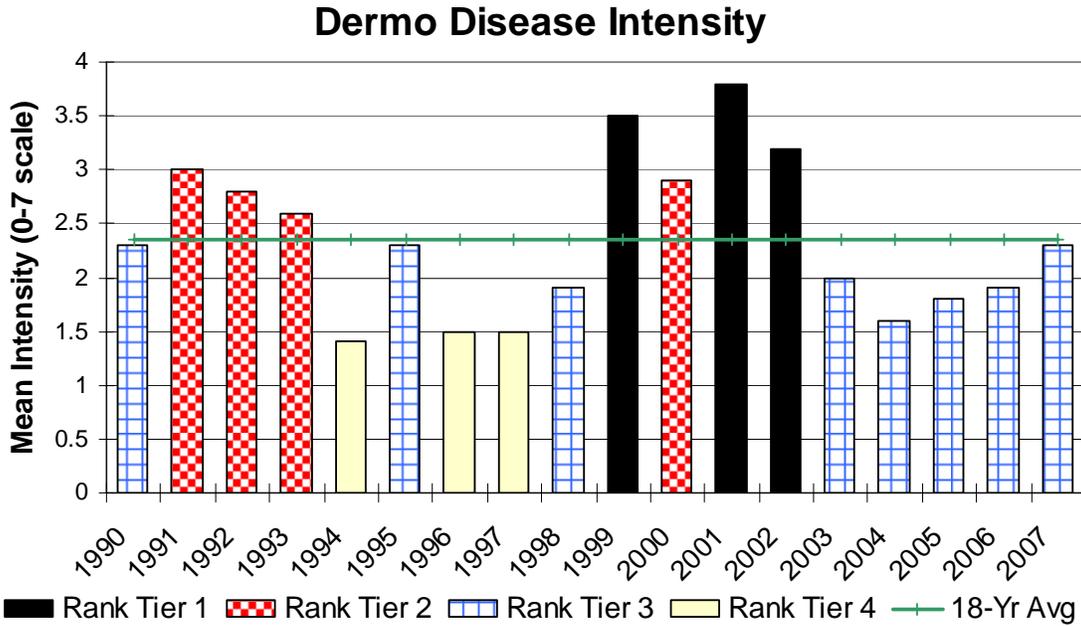


Figure 7. Annual mean *P. marinus* infection intensity on a scale of 0-7 in oysters from Maryland's 43 disease monitoring bars. Years within each rank tier are statistically similar.

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Dermo Disease Infections by Intensity Range

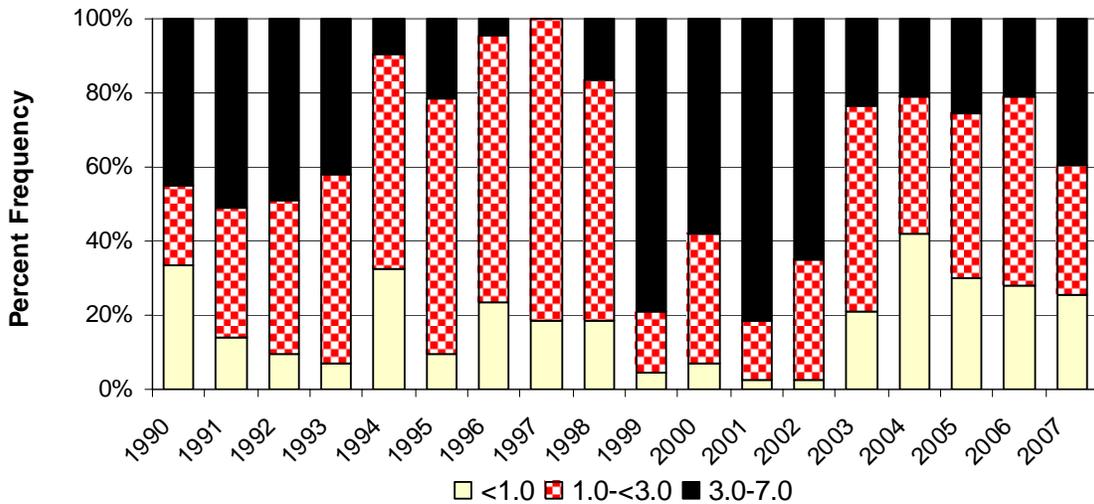


Figure 8. *Perkinsus marinus* infection intensity ranges, percent frequency by year and range.

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OYSTER DISEASES (cont'd)

MSX disease, caused by the oyster parasite *Haplosporidium nelsoni*, has spread throughout the southern portion of the bay and its tributaries (Figure 9). The number of bars with MSX increased to 30% of those sampled for the disease, more than triple the previous year (Figure 10). However, prevalences on those bars remained low (Table 4).

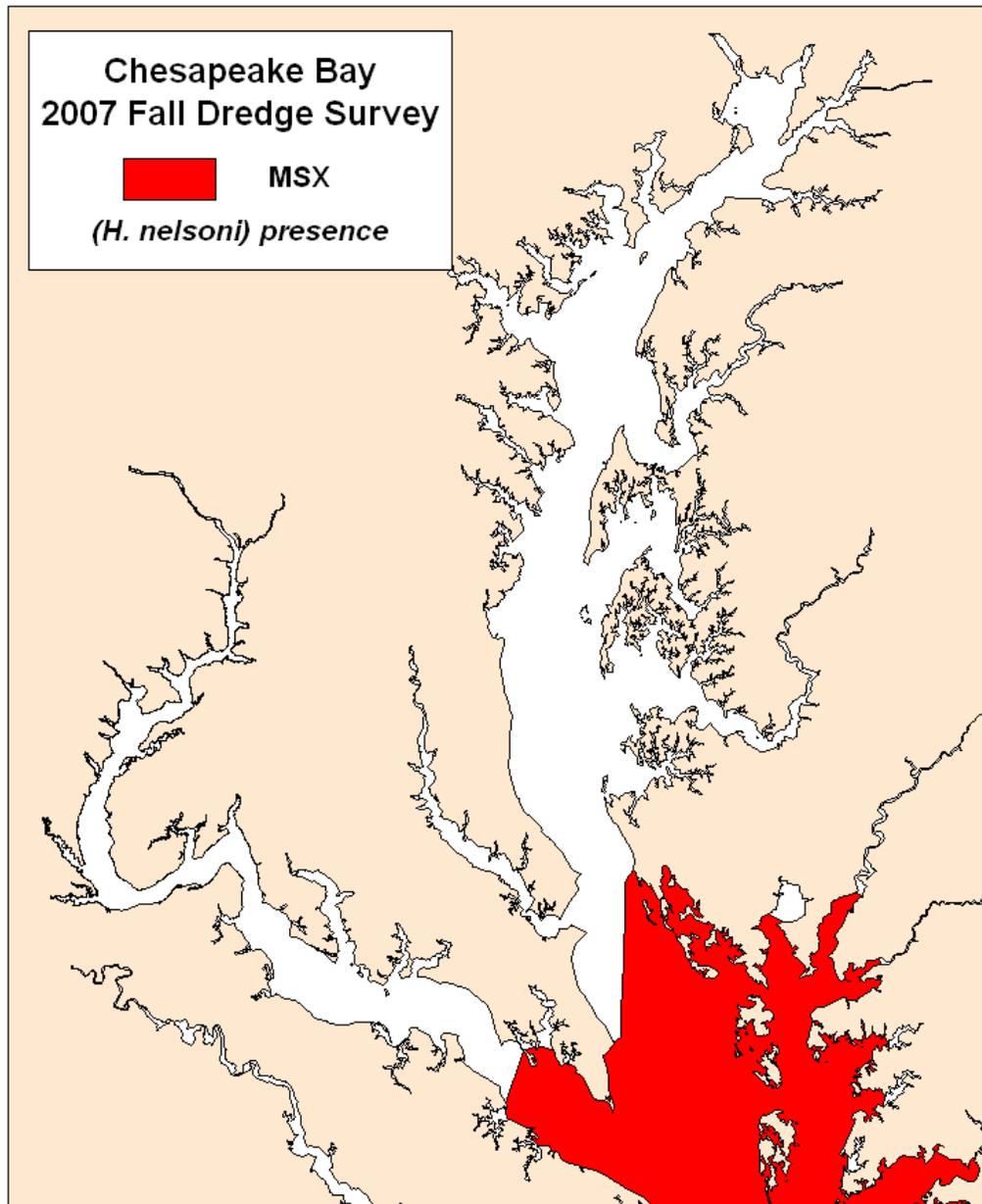


Figure 9. Geographic extent of MSX disease in Maryland waters, 2008.

OBSERVED MORTALITY

Despite the increase in disease levels, especially the spread of MSX disease, observed mortalities in 2007 declined for the fifth consecutive year (Table 5, Figure 10). The observed mortality of 15 % was the lowest since 1989, ranking 2007 in the lowest statistical grouping over a 23-year period (Figure 11). The highest mortalities were in Eastern Bay and the western Wicomico River, a tributary of the Potomac River (Figure 12). Many areas were at mortality levels typically observed prior to the disease epizootics of the mid-1980's. The higher streamflows of late 2006/early 2007 may have delayed the development of disease enough so that lethal levels generally were not reached in 2007.

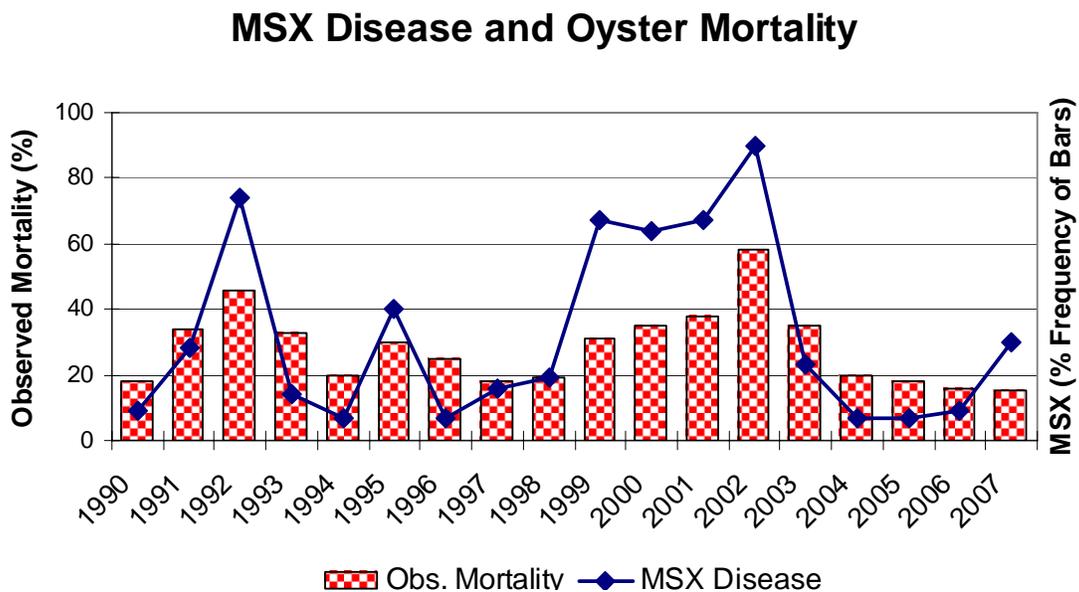


Figure 10. Changes in total observed oyster mortalities and *H. nelsoni* prevalence.

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OBSERVED MORTALITY (cont'd)

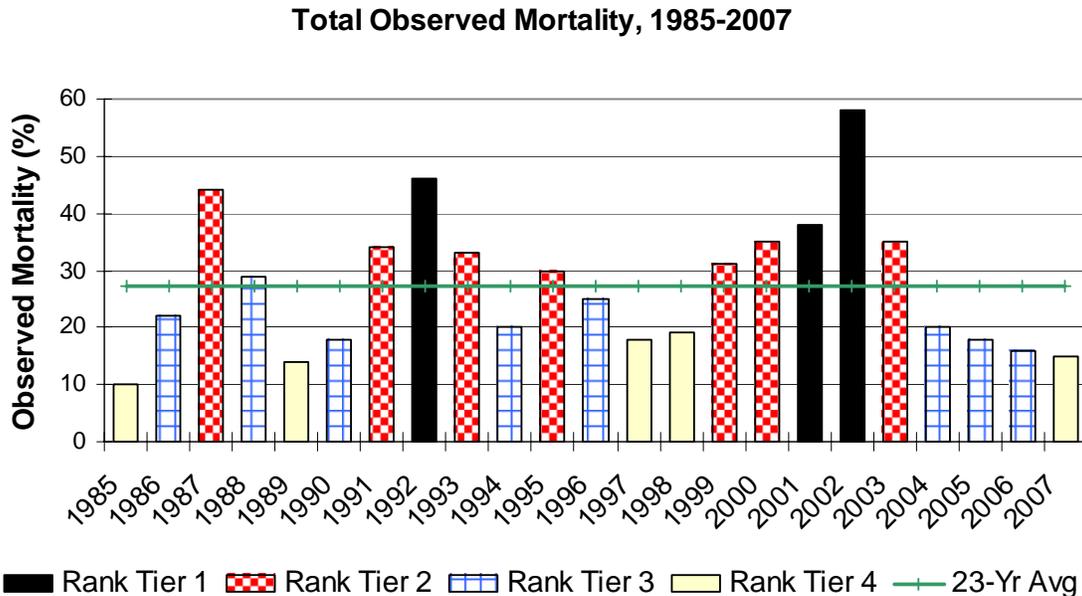


Figure 11. Mean annual total observed mortality, small and market oysters combined. Years within each rank tier are statistically similar.

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Power-Dredge Zone Sanctuaries

The formerly thriving oyster population on the *Point Lookout* sanctuary (PtL) has been hit hard, with an observed mortality of 39%. In contrast, the observed mortality on the *Piney Island East Addition* sanctuary (PIE) was only 19%. This may in part be explained by differences in oyster demographics between the two locations. The PtL population was older, with a market:small ratio of 2:1, compared with a market:small ratio of 1:4 on PIE. The observed mortality of market oysters was about twice as high as for small oysters at both sites. Also, dermo disease intensity was higher at PtL. Demographics may not be as strong a factor at *Northwest Middleground* sanctuary (NWM), which had a 42% observed mortality despite having a relatively young population with a market:small ratio of 1:5. The observed mortality of small oysters was 38%, while markets suffered 58% mortality. Although the differential mortality between size classes suggests some dermo disease effect, the higher mortalities than observed at PtL (24% smalls, 44% markets) hint that other factors may be involved. In fact, NWM had a 27% prevalence of MSX, compared to 17% at PIE and only 7% at PtL. In addition, at 26 ft., NWM is one of the deeper oyster bars, which, along with its close proximity to the main channel, leaves it vulnerable to incursions of anoxic/hypoxic water.

OBSERVED MORTALITY (cont'd)

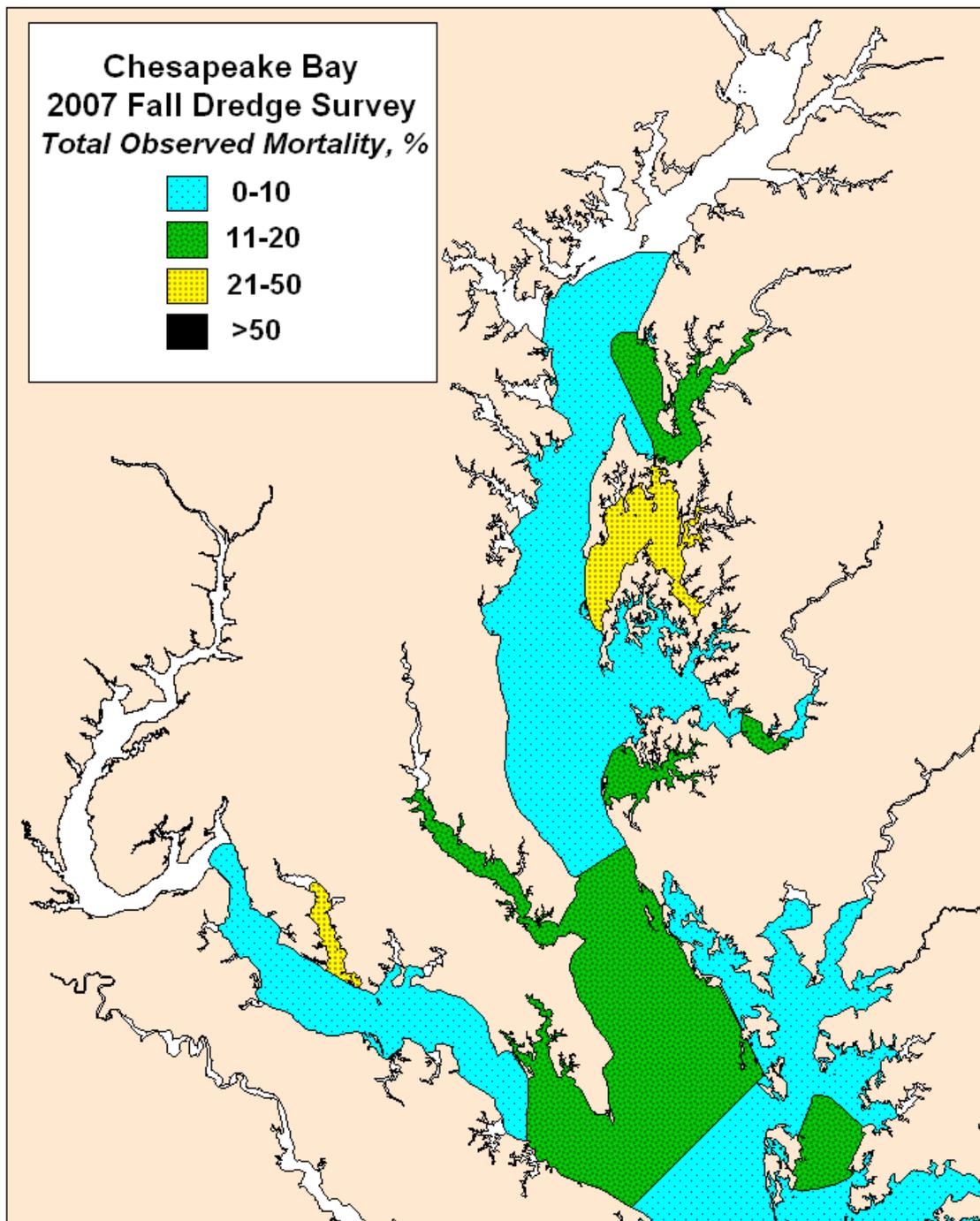


Figure 12. Total observed oyster mortality, 2008.

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COMMERCIAL HARVEST

Oyster landings during the 2006-07 season increased slightly over the previous year, to 165,059 bu. (Figure 13). The fishery benefited from good recruitment in 2002, coupled with low disease levels and high survivorship. About 40% of the harvest came from the Choptank River region, primarily from Broad Creek (Table 6). Other important harvest regions included Eastern Bay and the middle and upper mainstem of the bay. Tangier Sound, which two years previously had provided more than half of the reported landings in Maryland, experienced a sharp (83%) decline in harvesting activity.

As a result in the change in geographic distribution of harvestable oysters, there has been a dramatic shift in landings by gear type. During the 2006-07 season, 34% of the harvest was by hand tonging, up from 8% just two years earlier (Table 7). In contrast, the share of landings from power dredging was 21%, down from 52% two years ago. This change occurred as harvesters shifted their effort from Tangier Sound to Broad Creek and Eastern Bay. The actual harvest from power dredging remained about the same, but other gear types caught more oysters.

Maryland Oyster Harvest

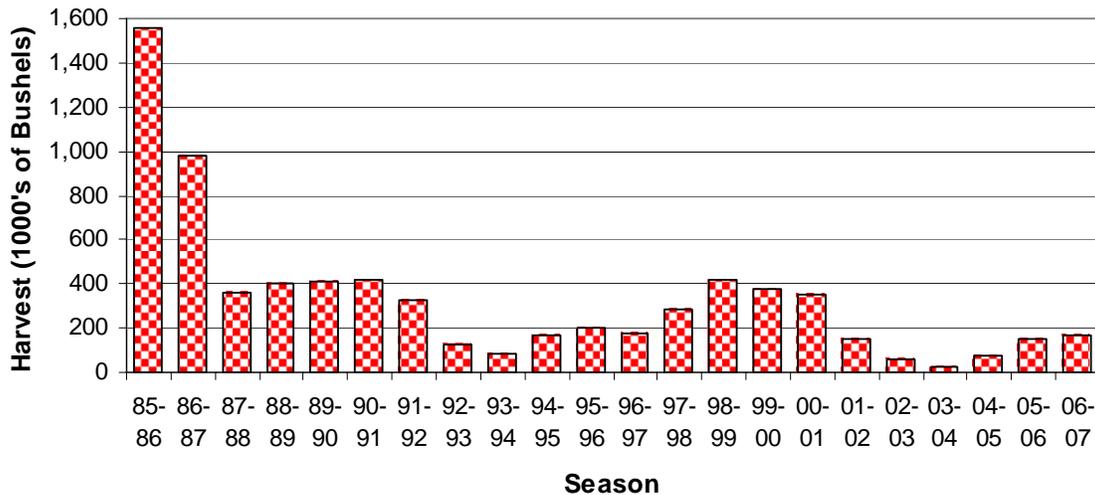


Figure 13. Maryland seasonal oyster landings 1985-86 to 2006-07.

TABLES

Table 1. Listing of data recorded during the Annual Fall Dredge Survey.

Physical Parameters

- Latitude and longitude
- Bottom type
- Depth
- Temperature
- Salinity
- Tow distance (2005-present)

Biological Parameters

- Total volume of material in dredge (2005-present)
- Counts of live and dead oysters by age/size classes (spat, smalls, markets) per bushel of material
- Stage of oyster boxes (recent, old)
- Average and range of shell heights of live and dead oysters by age/size classes
- Shell heights of oysters grouped into 5 mm intervals (Disease Bar sites, 1990-present)
- Oyster condition index and meat quality
- Type and relative index of fouling and other associated organisms
- Type of sample and year of activity (e.g. 1997 seed planting, natural oyster bar, 1990 fresh shell planting, etc.)

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Table 2. Spatfall intensity (spat per bushel of cultch) from the 53 “Key” spat monitoring bars, 1985-2007.

Region	Oyster Bar	Spatfall Intensity, Number per Bushel					
		1985	1986	1987	1988	1989	1990
Upper Bay	Mountain Point	6	0	0	0	0	0
	Swan Point	4	0	2	2	0	0
Middle Bay	Brick House	78	0	4	8	0	3
	Hackett Point	0	4	0	0	0	0
	Tolly Point	2	2	2	0	0	0
	Three Sisters	10	2	8	0	0	0
	Holland Point	6	5	0	0	0	0
	Stone Rock	136	20	0	50	22	37
	Flag Pond	52	144	128	0	0	4
Lower Bay	Hog Island	116	32	58	29	4	7
	Butler	nd	197	142	16	2	24
Chester River	Buoy Rock	16	0	6	0	0	1
Eastern Bay	Parsons Island	78	4	4	2	0	7
	Wild Ground	46	8	4	8	0	18
	Hollicutt Noose	24	8	12	6	0	2
Wye River	Bruffs Island	82	0	0	2	0	2
Miles River	Ash Craft	10	2	0	10	0	2
	Turtle Back	382	40	12	52	6	11
Poplar I. Narrows	Shell Hill	50	6	0	6	0	48
Choptank River	Sandy Hill	74	16	2	0	0	28
	Royston	440	8	8	0	0	57
	Cook Point	66	82	4	28	0	17
	Eagle Pt./Mill Pt.	258	92	2	6	6	18
Harris Creek	Tilghman Wharf	156	28	38	4	4	109
	Deep Neck	566	114	6	22	4	48
Tred Avon River	Double Mills	332	24	2	0	0	1
Little Choptank R.	Ragged Point	134	82	34	112	0	65
	Cason	102	24	46	50	0	143
Honga River	Windmill	34	112	28	22	16	155
	Norman Addition	56	214	38	17	34	82
Fishing Bay	Goose Creek	34	97	16	18	4	4
	Clay Island	4	78	14	48	18	19
Nanticoke River	Wetipquin	34	10	0	0	0	3
	Middleground	8	12	26	9	16	40
	Evans	18	10	12	17	2	13
Wicomico River	Mt. Vernon Wharf	nd	0	0	0	0	0
Manokin River	Georges	26	98	14	4	16	4
	Drum Point	48	186	48	90	78	16
Tangier Sound	Sharkfin Shoal	18	44	22	24	2	16
	Turtle Egg Island	154	90	12	26	26	204
	Piney Island East	182	192	194	160	82	64
	Great Rock	2	6	4	6	10	66
Pocomoke Sound	Gunby	124	24	50	4	8	21
	Marumsco	26	50	18	5	12	6
Patuxent River	Broome Island	15	0	0	0	0	3
	Back of Island	42	0	8	4	4	15
St. Mary’s River	Chicken Cock	620	298	96	62	18	29
	Pagan	140	34	52	36	6	613
Breton Bay	Black Walnut	16	12	0	0	0	1
	Blue Sow	55	40	0	0	0	1
St. Clement Bay	Dukehart Channel	20	7	0	0	0	1
Potomac River	Ragged Point	69	35	4	0	0	2
	Cornfield Harbor	383	908	362	28	14	36
Spat Index		103.8	66.1	29.1	18.7	7.8	39.0

Table 2 (continued).

Oyster Bar	Spatfall Intensity, Number per Bushel							
	1991	1992	1993	1994	1995	1996	1997	1998
Mountain Point	0	0	3	0	0	0	1	0
Swan Point	1	0	3	0	0	0	0	0
Brick House	0	0	0	0	5	0	0	0
Hackett Point	0	0	0	0	0	0	0	0
Tolly Point	0	0	0	0	0	0	0	0
Three Sisters	0	0	0	0	0	0	0	0
Holland Point	0	0	0	0	0	0	0	0
Stone Rock	355	9	4	4	16	0	18	0
Flag Pond	330	0	8	0	10	0	7	0
Hog Island	169	0	0	0	17	0	5	2
Butler	617	3	2	1	7	1	8	0
Buoy Rock	0	0	0	0	6	0	8	0
Parsons Island	127	18	2	0	44	0	3375	3
Wild Ground	205	8	2	0	54	0	990	0
Hollicutt Noose	11	1	0	0	7	0	56	0
Bruffs Island	12	8	0	0	15	0	741	4
Ash Craft	12	0	0	0	60	1	2248	0
Turtle Back	168	15	0	0	194	0	3368	5
Shell Hill	79	0	0	0	15	0	19	1
Sandy Hill	179	2	0	0	4	0	55	0
Royston	595	20	10	0	10	0	289	0
Cook Point	171	1	0	2	14	0	20	0
Eagle Pt./Mill Pt.	387	4	15	0	62	0	168	2
Tilghman Wharf	719	10	59	4	64	0	472	0
Deep Neck	468	22	94	12	294	3	788	1
Double Mills	129	0	13	0	15	0	40	0
Ragged Point	1036	53	9	1	25	0	106	0
Cason	1839	43	37	28	48	5	228	4
Windmill	740	46	22	19	13	2	5	1
Norman Addition	1159	53	33	17	25	0	8	0
Goose Creek	153	41	43	27	3	0	5	0
Clay Island	256	46	58	31	11	1	20	2
Wetipquin	3	6	1	4	1	0	0	10
Middleground	107	63	14	28	2	6	27	0
Evans	20	27	6	30	3	1	5	0
Mt. Vernon Wharf	15	0	18	0	3	0	0	1
Georges	52	42	19	9	5	0	8	6
Drum Point	140	185	45	13	14	10	16	11
Sharkfin Shoal	43	97	18	11	6	0	7	0
Turtle Egg Island	289	591	37	31	6	35	70	3
Piney Island East	429	329	22	25	23	25	45	16
Great Rock	208	44	27	11	3	7	0	1
Gunby	302	149	68	7	5	9	0	24
Marumsco	142	34	60	5	6	0	0	57
Broome Island	8	0	0	0	58	0	0	1
Back of Island	49	5	0	1	17	0	3	0
Chicken Cock	182	5	45	4	78	2	36	10
Pagan	190	62	15	7	54	0	1390	6
Black Walnut	6	0	1	0	1	0	2	0
Blue Sow	22	0	1	0	7	0	0	0
Dukehart Channel	19	0	3	0	0	0	0	0
Ragged Point	26	0	2	0	19	0	2	0
Cornfield Harbor	212	2	29	0	49	0	4	11
Spat Index	233.6	38.6	16.0	6.3	26.8	2.0	276.7	3.5

Table 2 (continued).

Oyster Bar	Spatfall Intensity, Number per Bushel							
	1999	2000	2001	2002	2003	2004	2005	2006
Mountain Point	0	0	0	1	0	0	0	0
Swan Point	0	0	0	0	0	0	0	0
Brick House	1	1	3	97	0	0	0	0
Hackett Point	0	1	0	13	0	0	0	0
Tolly Point	2	2	1	10	0	0	0	0
Three Sisters	0	0	1	0	0	0	0	0
Holland Point	0	0	1	4	0	0	0	0
Stone Rock	3	34	2	17	1	0	0	3
Flag Pond	1	5	5	7	0	0	0	4
Hog Island	6	1	28	10	5	1	6	1
Butler	6	1	27	33	3	0	3	7
Buoy Rock	0	0	2	1	1	1	0	0
Parsons Island	6	6	6	5	2	0	3	0
Wild Ground	2	5	5	6	4	0	1	0
Hollicutt Noose	6	2	1	15	3	0	0	0
Bruffs Island	5	9	6	0	4	0	0	0
Ash Craft	14	2	10	0	8	0	0	0
Turtle Back	13	4	45	9	72	1	5	0
Shell Hill	4	4	0	0	0	0	0	0
Sandy Hill	4	0	1	1	0	2	0	5
Royston	39	0	3	10	0	14	0	44
Cook Point	1	5	5	3	1	4	0	9
Eagle Pt./Mill Pt.	16	0	5	4	1	12	0	19
Tilghman Wharf	49	1	1	4	0	15	0	22
Deep Neck	211	3	11	31	1	167	0	30
Double Mills	1	0	0	0	0	3	0	3
Ragged Point	43	3	5	0	1	2	0	6
Cason	53	5	2	9	1	5	1	93
Windmill	37	0	21	9	0	0	0	21
Norman Addition	31	1	30	33	2	0	6	80
Goose Creek	0	0	0	1	0	0	0	73
Clay Island	5	4	8	16	0	0	0	139
Wetipquin	0	0	0	3	1	0	0	6
Middleground	9	1	0	14	0	0	1	54
Evans	1	0	0	12	0	1	0	13
Mt. Vernon Wharf	0	0	0	0	0	0	0	0
Georges	50	6	1	280	15	4	5	75
Drum Point	157	27	44	124	13	8	40	202
Sharkfin Shoal	9	5	0	57	0	2	4	63
Turtle Egg Island	180	33	33	207	25	7	90	181
Piney Island East	118	28	167	127	1	27	116	420
Great Rock	82	6	140	1	3	19	28	92
Gunby	54	32	6	108	0	29	24	36
Marumsc	27	27	4	89	0	14	11	22
Broome Island	7	0	1	15	1	0	3	4
Back of Island	22	9	44	27	11	0	0	1
Chicken Cock	132	16	12	151	56	2	2	6
Pagan	95	42	117	535	9	6	10	125
Black Walnut	3	0	1	2	0	0	0	0
Blue Sow	11	0	2	4	1	0	0	0
Dukehart Channel	1	0	0	1	0	0	0	1
Ragged Point	1	1	0	1	0	0	0	1
Cornfield Harbor	25	5	35	31	9	0	8	6
Spat Index	29.1	6.4	15.9	40.3	4.8	6.5	6.9	35.2

Table 2 (continued).

Oyster Bar	Spatfall Intensity, Number per Bushel	
	2007	
Mountain Point	0	
Swan Point	0	
Brick House	0	
Hackett Point	0	
Tolly Point	0	
Three Sisters	0	
Holland Point	0	
Stone Rock	0	
Flag Pond	0	
Hog Island	1	
Butler	1	
Buoy Rock	0	
Parsons Island	0	
Wild Ground	0	
Hollicutt Noose	0	
Bruffs Island	0	
Ash Craft	0	
Turtle Back	0	
Shell Hill	0	
Sandy Hill	3	
Royston	1	
Cook Point	1	
Eagle Pt./Mill Pt.	0	
Tilghman Wharf	0	
Deep Neck	1	
Double Mills	1	
Ragged Point	0	
Cason	0	
Windmill	4	
Norman Addition	0	
Goose Creek	0	
Clay Island	1	
Wetipquin	0	
Middleground	0	
Evans	0	
Mt. Vernon Wharf	0	
Georges	5	
Drum Point	56	
Sharkfin Shoal	1	
Turtle Egg Island	7	
Piney Island East	44	
Great Rock	64	
Gunby	4	
Marumsco	14	
Broome Island	0	
Back of Island	2	
Chicken Cock	9	
Pagan	616	
Black Walnut	0	
Blue Sow	0	
Dukehart Channel	0	
Ragged Point	2	
Cornfield Harbor	7	
Spat Index	15.9	

[\(Return to Text\)](#)

Table 3. *Perkinsus marinus* prevalence and intensity (scale of 0-7) in oysters from the 43 disease monitoring bars, 1990-2007. NA=insufficient quantity of oysters for analytical sample.

Region	Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Intensity (I)									
		1990		1991		1992		1993		1994	
		%	I	%	I	%	I	%	I	%	I
Upper Bay	Swan Point	7	0.1	27	0.7	23	0.4	37	0.8	3	0.1
Middle Bay	Hackett Point	0	0.0	27	0.8	57	1.2	97	3.2	23	0.5
	Holland Point	20	0.5	47	1.1	80	2.4	93	3.0	36	1.1
	Stone Rock	47	0.5	27	0.9	100	4.4	100	3.5	90	2.5
	Flag Pond	30	0.8	97	2.6	97	5.7	88	2.7	30	0.8
Lower Bay	Hog Island	90	3.0	97	4.5	100	4.2	93	2.4	37	1.0
	Butler	100	4.0	100	4.0	81	2.4	97	3.3	80	2.1
Chester River	Buoy Rock	23	0.5	80	2.5	97	2.8	93	3.3	10	0.3
	Old Field	17	0.2	20	0.5	37	0.9	83	2.4	20	0.6
Eastern Bay	Bugby	100	3.4	100	4.0	73	1.8	100	3.0	43	0.8
	Parsons Island	20	0.5	97	3.6	80	2.1	100	3.3	93	3.1
	Hollicutt Noose	30	0.3	73	2.0	82	2.1	97	2.7	70	1.7
Wye River	Bruffs Island	83	2.8	83	2.8	93	3.0	83	2.6	63	1.3
Miles River	Turtle Back	100	3.8	100	3.3	77	1.6	100	3.3	60	1.2
	Long Point	73	2.3	94	4.3	86	3.0	77	2.6	60	2.0
Choptank River	Cook Point	17	0.2	23	0.3	87	3.7	97	4.2	90	3.0
	Royston	--	---	100	4.5	97	4.8	100	3.3	80	2.0
	Lighthouse	90	2.3	100	4.0	100	4.6	93	3.2	47	1.2
	Sandy Hill	100	5.0	100	5.7	100	4.2	100	3.8	83	2.3
	Oyster Shell Point	3	0.1	60	1.7	100	3.9	93	2.8	10	0.3
Harris Creek	Tilghman Wharf	100	3.2	97	3.0	100	3.4	100	3.2	63	1.9
Broad Creek	Deep Neck	100	4.9	100	5.6	100	3.7	100	3.8	67	2.3
Tred Avon River	Double Mills	97	3.6	100	4.9	100	4.1	100	3.8	90	2.0
Little Choptank R.	Cason	100	3.4	100	4.4	90	2.6	93	2.8	83	2.2
	Ragged Point	100	4.8	100	4.6	100	5.0	100	3.9	87	2.3
Honga River	Norman Addition	100	4.2	100	3.4	83	2.0	96	3.6	93	3.3
Fishing Bay	Goose Creek	60	1.8	100	3.1	100	3.6	87	2.1	53	1.1
Nanticoke River	Wilson Shoals	93	2.9	100	2.8	90	2.5	83	1.6	40	0.9
Manokin River	Georges	83	1.9	93	2.9	58	1.4	30	0.7	50	1.2
Holland Straits	Holland Straits	100	4.2	100	4.0	100	3.4	76	2.3	57	1.6
Tangier Sound	Sharkfin Shoal	23	0.3	60	1.2	97	2.8	93	2.2	63	1.4
	Back Cove	100	2.7	100	4.2	97	3.3	36	1.0	80	2.2
	Piney Island East	93	2.7	97	3.1	87	2.7	83	2.2	87	3.1
	Old Woman's Leg	57	1.1	100	4.5	100	4.0	82	2.0	73	2.1
Pocomoke Sound	Marumsco	97	3.5	93	3.3	60	1.3	87	2.5	72	1.6
Patuxent River	Broome Island	97	3.4	100	2.8	63	1.5	87	3.0	40	0.6
St. Mary's River	Chicken Cock	100	4.2	97	3.1	93	3.2	96	2.6	40	1.0
	Pagan	93	3.3	97	2.3	100	3.0	93	2.1	10	0.3
Wicomico R. (west)	Lancaster	97	3.6	97	2.8	67	1.4	67	1.6	20	0.2
	Mills West	13	0.2	80	2.0	90	2.9	63	1.8	20	0.2
Potomac River	Cornfield Harbor	97	3.4	83	2.3	100	3.8	93	2.9	77	1.9
	Ragged Point	97	3.8	90	2.8	40	0.9	50	1.4	10	0.2
	Lower Cedar Point	40	0.7	10	0.3	23	0.6	7	0.1	7	0.1
Annual Means		70	2.3	83	3.0	83	2.8	84	2.6	54	1.4

Table 3 (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Intensity (I)											
	1995		1996		1997		1998		1999		2000	
	%	I	%	I	%	I	%	I	%	I	%	I
Swan Point	20	0.2	0	0.0	3	0.1	43	1.2	97	3.4	80	1.2
Hackett Point	90	2.5	30	0.7	43	1.3	43	1.1	97	3.3	97	3.7
Holland Point	87	2.9	47	1.4	37	1.1	37	0.9	93	2.8	87	3.4
Stone Rock	87	2.2	93	2.7	90	2.3	100	3.5	100	4.0	93	3.6
Flag Pond	87	3.3	63	2.0	53	1.2	73	2.3	NA	NA	NA	NA
Hog Island	93	2.7	43	1.2	47	1.3	97	3.2	93	5.5	83	3.9
Butler	87	2.5	60	1.6	57	1.0	97	3.3	93	3.2	83	2.7
Buoy Rock	67	1.7	13	0.4	7	0.7	33	0.9	93	3.0	97	3.5
Old Field	83	2.3	0	0.0	10	0.2	33	0.8	97	3.0	93	3.0
Bugby	83	2.6	80	2.0	70	1.8	60	1.4	100	3.9	100	4.0
Parsons Island	70	2.1	73	2.8	63	1.4	80	2.5	100	4.7	100	3.5
Hollicutt Noose	90	2.8	60	1.4	50	1.0	83	2.5	90	3.0	100	4.1
Bruffs Island	73	2.1	67	1.4	17	0.2	57	1.6	100	3.7	97	3.2
Turtle Back	100	2.8	83	2.1	83	1.8	50	1.6	100	4.3	97	3.1
Long Point	67	2.2	20	0.4	23	0.6	100	2.7	100	3.6	97	3.3
Cook Point	NA	NA	60	1.5	70	2.4	87	2.8	93	3.4	40	1.2
Royston	63	2.0	50	1.1	67	1.5	90	2.5	97	3.5	97	4.7
Lighthouse	90	3.3	77	1.8	57	1.5	43	1.5	87	2.3	100	3.4
Sandy Hill	89	3.4	30	0.7	60	1.3	40	1.0	97	3.4	87	3.6
Oyster Shell Point	68	1.8	13	0.2	50	0.9	20	0.3	83	2.3	73	2.2
Tilghman Wharf	93	2.5	67	1.3	60	1.0	67	2.0	87	2.5	93	3.4
Deep Neck	97	3.0	83	2.1	100	2.6	97	2.9	97	4.5	100	4.0
Double Mills	75	2.5	70	1.2	83	2.0	100	3.0	100	4.8	100	4.7
Cason	93	2.3	87	1.9	93	2.4	50	1.4	97	3.8	100	3.6
Ragged Point	93	2.5	97	2.6	97	2.1	87	1.4	100	4.0	97	3.7
Norman Addition	87	2.8	93	2.4	73	1.6	73	2.3	93	3.5	80	3.4
Goose Creek	87	2.5	97	4.0	83	2.0	100	3.0	100	5.4	97	3.1
Wilson Shoals	63	1.1	83	1.8	80	1.9	70	1.6	100	4.3	70	2.1
Georges	87	2.8	93	2.0	93	2.2	83	2.4	93	3.5	80	2.3
Holland Straits	93	3.1	83	2.0	67	1.8	57	1.2	80	2.5	30	0.9
Sharkfin Shoal	90	3.0	97	2.1	93	2.6	80	2.7	100	4.3	80	2.3
Back Cove	83	3.0	97	3.2	93	2.9	90	2.3	100	5.5	40	1.2
Piney Island East	93	2.5	63	1.7	73	2.2	83	1.9	63	2.4	86	2.3
Old Woman's Leg	100	4.2	80	2.3	57	1.3	90	3.2	87	3.9	70	1.7
Marumsco	100	4.2	90	2.4	61	2.1	80	2.8	90	3.4	93	2.7
Broome Island	43	1.0	17	0.4	83	2.1	83	3.0	100	4.6	93	4.0
Chicken Cock	83	1.9	77	1.4	73	1.7	80	1.7	100	5.0	63	1.8
Pagan	93	2.2	82	1.4	86	1.7	73	1.7	97	3.4	68	1.6
Lancaster	27	0.6	56	1.2	80	1.6	37	0.7	83	2.5	90	2.7
Mills West	57	1.4	60	1.2	60	1.2	20	0.4	90	3.2	97	3.6
Cornfield Harbor	93	2.5	87	2.0	83	1.8	83	2.0	97	3.9	80	2.1
Ragged Point	33	0.8	7	0.2	0	0.0	0	0.0	17	0.5	13	0.7
Lower Cedar Point	13	0.2	3	0.3	0	0.0	0	0.0	0	0.0	17	0.5
Annual Means	78	2.3	61	1.5	62	1.5	67	1.9	90	3.5	81	2.9

Table 3 (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Intensity (I)											
	2001		2002		2003		2004		2005		2006	
	%	I	%	I	%	I	%	I	%	I	%	I
Swan Point	93	3.3	97	2.7	33	1.0	33	0.7	47	1.2	20	0.6
Hackett Point	97	3.4	100	3.3	33	1.1	30	0.8	13	0.4	70	1.3
Holland Point	93	3.2	100	3.6	33	1.1	30	0.6	53	1.6	10	0.4
Stone Rock	83	2.8	100	2.3	77	2.4	10	0.2	50	1.3	77	1.9
Flag Pond	NA	NA	37	0.5	0	0.0	3	0.03	13	0.3	43	0.9
Hog Island	93	3.4	87	2.9	53	2.3	53	1.4	93	3.4	93	4.4
Butler	80	2.4	80	1.4	10	0.3	7	0.1	30	1.1	40	1.2
Buoy Rock	93	3.5	100	2.6	97	3.7	50	1.5	77	2.4	63	1.8
Old Field	100	3.3	97	2.5	80	2.5	33	0.7	57	1.1	63	1.4
Bugby	100	4.6	97	3.1	97	3.4	63	1.7	53	1.8	87	2.7
Parsons Island	100	4.5	100	4.4	90	3.3	93	2.8	87	2.6	87	2.1
Hollicutt Noose	100	4.8	100	3.6	80	2.7	40	1.5	40	1.0	83	2.9
Bruffs Island	100	3.8	100	3.6	73	1.8	80	2.5	73	1.8	53	1.6
Turtle Back	100	4.2	100	4.7	100	3.6	80	2.8	100	3.3	97	3.8
Long Point	100	4.2	100	3.1	97	2.8	97	3.2	90	2.7	80	2.1
Cook Point	77	2.2	NA	NA	66	2.1	0	0.0	13	0.3	40	0.5
Royston	100	5.2	100	4.2	48	1.8	13	0.3	3	0.2	47	0.9
Lighthouse	100	3.3	100	4.6	20	0.6	43	1.2	27	0.6	30	0.4
Sandy Hill	100	4.5	100	5.0	93	3.5	87	3.3	80	2.5	70	2.3
Oyster Shell Point	100	3.6	100	3.0	43	1.0	43	0.8	17	0.3	30	1.1
Tilghman Wharf	100	3.5	90	3.2	87	2.4	43	0.8	0	0.0	50	0.7
Deep Neck	97	4.8	100	3.2	97	3.7	27	0.5	20	0.4	50	1.1
Double Mills	100	5.5	97	2.9	53	1.7	53	2.1	53	1.6	40	1.1
Cason	100	4.3	94	4.4	17	0.4	3	0.03	33	0.5	23	0.4
Ragged Point	100	4.3	100	3.5	43	1.0	13	0.2	10	0.3	23	0.4
Norman Addition	90	3.0	67	1.9	37	1.3	93	3.3	90	3.8	57	2.0
Goose Creek	100	4.1	93	4.0	57	2.0	77	2.0	63	2.2	8	0.3
Wilson Shoals	100	4.0	100	3.6	83	2.3	97	2.3	90	3.0	93	3.7
Georges	100	5.2	100	4.0	83	2.6	100	4.2	90	3.3	97	3.8
Holland Straits	43	1.4	50	1.1	40	0.7	70	1.7	83	3.0	83	2.1
Sharkfin Shoal	90	3.7	97	3.6	47	3.4	100	4.4	87	3.2	83	3.4
Back Cove	100	5.0	97	3.8	100	4.6	97	3.7	100	3.1	77	2.5
Piney Island East	60	1.5	100	3.1	100	3.9	100	3.9	100	3.7	80	3.4
Old Woman's Leg	100	5.0	100	3.7	100	4.4	93	3.7	80	2.4	57	1.8
Marumsco	100	5.0	97	4.1	90	2.3	87	2.8	93	3.3	67	2.8
Broome Island	100	4.8	97	3.8	47	1.3	47	1.4	37	0.9	77	2.5
Chicken Cock	93	3.6	100	2.9	23	0.7	40	0.9	87	3.5	90	3.4
Pagan	100	4.6	93	4.0	60	1.3	83	2.3	83	2.9	80	3.1
Lancaster	100	4.5	97	2.7	50	1.5	37	0.9	57	1.5	73	2.2
Mills West	100	4.8	93	3.1	60	1.6	57	1.5	50	1.3	87	2.6
Cornfield Harbor	80	2.9	97	1.7	27	0.7	30	0.5	80	2.6	100	3.3
Ragged Point	33	0.5	93	2.6	24	0.7	9	0.1	37	0.9	0	0.0
Lower Cedar Point	90	2.3	97	2.5	13	0.5	17	0.4	13	0.2	10	0.1
Annual Means	93	3.8	94	3.2	60	2.0	53	1.6	57	1.8	60	1.9

Table 3 (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Intensity (I)	
	2007	
	%	I
Swan Point	17	0.4
Hackett Point	87	2.9
Holland Point	33	0.6
Stone Rock	93	3.5
Flag Pond	87	2.0
Hog Island	80	3.1
Butler	77	1.7
Buoy Rock	80	3.2
Old Field	100	4.0
Bugby	100	3.9
Parsons Island	97	4.0
Hollicutt Noose	87	3.0
Bruffs Island	100	3.8
Turtle Back	100	4.4
Long Point	93	3.8
Cook Point	17	0.3
Royston	23	0.7
Lighthouse	0	0.0
Sandy Hill	87	2.5
Oyster Shell Point	27	0.7
Tilghman Wharf	23	0.5
Deep Neck	90	2.7
Double Mills	87	2.9
Cason	60	1.9
Ragged Point	93	2.7
Norman Addition	23	0.9
Goose Creek	0	0.0
Wilson Shoals	93	2.7
Georges	83	3.8
Holland Straits	80	3.0
Sharkfin Shoal	70	1.9
Back Cove	93	3.2
Piney Island East	67	2.5
Old Woman's Leg	73	2.2
Marumsco	37	1.1
Broome Island	97	3.6
Chicken Cock	90	4.0
Pagan	90	2.5
Lancaster	97	4.2
Mills West	47	1.6
Cornfield Harbor	97	3.5
Ragged Point	0	0.0
Lower Cedar Point	30	0.6
Annual Means	68	2.3

[\(Return to Text\)](#)

Table 4. Prevalence of *Haplosporidium nelsoni* in oysters from the 43 disease monitoring bars, 1990-2007. NA=insufficient quantity of oysters for analytical sample. ND= no diagnostic sample collected; prevalence assumed to be 0.

Region	Oyster Bar	<i>Haplosporidium nelsoni</i> Prevalence (%)							
		1990	1991	1992	1993	1994	1995	1996	1997
Upper Bay	Swan Point	0	0	0	0	ND	0	0	0
Middle Bay	Hackett Point	0	0	3	0	0	0	0	0
	Holland Point	0	3	13	0	0	0	0	0
	Stone Rock	0	0	43	0	0	3	0	0
	Flag Pond	0	0	53	0	0	27	0	0
Lower Bay	Hog Island	0	0	43	0	0	14	0	0
	Butler	0	0	50	0	0	23	0	7
Chester River	Buoy Rock	ND	0	0	0	ND	0	0	0
	Old Field	ND	0	0	0	ND	0	0	0
Eastern Bay	Bugby	0	7	3	0	0	0	0	0
	Parsons Island	ND	0	7	0	0	0	0	0
	Hollicutt Noose	0	0	17	0	0	0	0	0
Wye River	Bruffs Island	0	0	0	0	0	0	0	0
Miles River	Turtle Back	0	0	0	0	0	23	0	0
	Long Point	0	0	0	0	0	0	0	0
Choptank River	Cook Point	0	7	73	0	0	ND	0	3
	Royston	ND	0	33	0	0	0	0	0
	Lighthouse	0	0	53	0	0	0	0	0
	Sandy Hill	0	0	13	0	ND	0	0	0
	Oyster Shell Point	0	0	30	0	ND	0	0	0
Harris Creek	Tilghman Wharf	0	0	40	0	0	0	0	0
Broad Creek	Deep Neck	0	0	30	0	0	0	0	0
Tred Avon River	Double Mills	0	0	17	0	0	0	0	0
Little Choptank R.	Cason	0	0	43	0	0	0	0	0
	Ragged Point	0	20	57	0	0	0	0	0
Honga River	Norman Addition	3	0	53	0	0	33	0	0
Fishing Bay	Goose Creek	0	10	27	7	0	20	0	0
Nanticoke River	Wilson Shoals	0	0	57	0	ND	7	0	0
Manokin River	Georges	10	7	23	0	0	33	0	0
Holland Straits	Holland Straits	0	20	13	13	0	52	0	10
Tangier Sound	Sharkfin Shoal	20	43	40	17	0	33	0	0
	Back Cove	0	17	27	33	7	20	3	3
	Piney Island East	7	23	17	20	13	10	7	13
	Old Woman's Leg	0	33	23	30	10	43	20	4
Pocomoke Sound	Marumsco	0	20	20	0	0	20	0	11
Patuxent River	Broome Island	0	ND	20	0	0	0	0	0
St. Mary's River	Chicken Cock	0	0	57	0	ND	0	0	0
	Pagan	0	0	0	0	ND	0	0	0
Wicomico R. (west)	Lancaster	0	0	0	0	ND	0	0	0
	Mills West	0	0	0	0	ND	0	0	0
Potomac River	Cornfield Harbor	0	0	57	0	0	37	0	0
	Ragged Point	0	0	0	0	0	0	0	0
	Lower Cedar Point	ND	ND	0	0	ND	0	0	0
Percent Frequency		9	28	74	14	7	40	7	16

Table 4 (continued).

Oyster Bar	<i>Haplosporidium nelsoni</i> Prevalence (%)									
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Swan Point	0	0	0	0	0	0	0	0	0	0
Hackett Point	0	0	0	0	13	0	0	0	0	0
Holland Point	0	0	3	7	40	0	0	0	0	0
Stone Rock	0	30	47	40	30	3	0	0	0	0
Flag Pond	0	NA	NA	NA	20	0	0	0	0	0
Hog Island	0	60	27	27	20	0	0	0	0	0
Butler	3	47	17	27	20	3	3	0	3	10
Buoy Rock	0	0	0	0	0	0	0	0	0	0
Old Field	0	0	0	0	0	0	0	0	0	0
Bugby	0	0	0	0	27	0	0	0	0	0
Parsons Island	0	0	0	3	17	0	0	0	0	0
Hollicutt Noose	0	7	10	17	37	0	0	0	0	0
Bruffs Island	0	0	0	3	17	0	0	0	0	0
Turtle Back	0	0	0	7	33	0	0	0	0	0
Long Point	0	0	0	0	3	0	0	0	0	0
Cook Point	0	13	33	37	NA	0	0	3	0	0
Royston	0	3	7	0	60	0	0	0	0	0
Lighthouse	0	13	7	3	67	0	0	0	0	0
Sandy Hill	0	0	0	10	53	0	0	0	0	0
Oyster Shell Point	0	0	0	0	7	0	0	0	0	0
Tilghman Wharf	0	3	27	7	60	0	0	0	0	0
Deep Neck	0	3	7	0	63	0	0	0	0	0
Double Mills	0	3	0	0	33	0	0	0	0	0
Cason	0	7	27	33	59	0	0	0	0	0
Ragged Point	0	20	47	40	30	0	0	0	0	0
Norman Addition	3	63	37	37	20	7	0	0	0	7
Goose Creek	0	47	17	13	33	0	0	0	0	3
Wilson Shoals	0	4	10	10	27	0	0	0	0	7
Georges	0	40	20	13	30	0	0	0	0	7
Holland Straits	3	73	40	47	57	7	0	0	0	23
Sharkfin Shoal	20	53	37	20	27	7	0	0	0	10
Back Cove	10	33	37	10	7	7	0	7	13	33
Piney Island East	17	43	53	40	17	10	3	0	3	0
Old Woman's Leg	23	53	30	13	13	3	3	13	13	13
Marumsco	7	37	30	17	30	0	0	0	0	10
Broome Island	0	3	10	0	13	0	0	0	0	0
Chicken Cock	0	77	7	17	30	3	0	0	0	3
Pagan	0	3	13	10	40	0	0	0	0	0
Lancaster	0	0	0	0	10	0	0	0	0	0
Mills West	0	3	0	0	43	0	0	0	0	0
Cornfield Harbor	3	53	17	33	50	10	0	0	0	7
Ragged Point	0	13	10	7	60	0	0	0	0	0
Lower Cedar Point	0	0	0	0	0	0	0	0	0	0
% Frequency	19	67	64	67	90	23	7	7	9	30

[\(Return to Text\)](#)

Table 5. Oyster population mortality estimates from the 43 disease monitoring bars, 1985-2007.
 NA=unable to obtain a sufficient sample size.

Region	Oyster Bar	Total Observed Mortality (%)							
		1985	1986	1987	1988	1989	1990	1991	1992
Upper Bay	Swan Point	14	1	2	1	9	4	4	3
Middle Bay	Hackett Point	7	0	10	9	5	2	2	12
	Holland Point	4	21	19	3	19	3	14	45
	Stone Rock	6	NA	NA	NA	NA	2	9	45
	Flag Pond	NA	48	30	39	37	10	35	77
Lower Bay	Hog Island	NA	26	47	25	6	19	73	85
	Butler	NA	23	84	15	7	30	58	84
Chester River	Buoy Rock	10	0	0	1	10	5	11	16
	Old Field	8	3	3	4	2	7	3	9
Eastern Bay	Bugby	8	25	46	33	25	39	53	18
	Parsons Island	19	1	26	13	2	7	43	27
	Hollicutt Noose	2	32	42	25	14	1	7	9
Wye River	Bruffs Island	2	1	45	12	9	12	50	77
Miles River	Turtle Back	NA	1	19	27	15	27	51	23
	Long Point	17	8	23	8	12	11	53	73
Choptank River	Cook Point	40	20	45	63	6	11	2	88
	Royston	4	21	19	11	14	14	33	43
	Lighthouse	3	14	59	14	8	8	45	52
	Sandy Hill	12	6	29	34	7	11	75	48
	Oyster Shell Point	9	0	1	2	2	3	2	19
Harris Creek	Tilghman Wharf	2	36	57	NA	20	30	34	26
Broad Creek	Deep Neck	2	25	37	32	47	66	48	40
Tred Avon River	Double Mills	4	7	13	9	6	28	82	50
Little Choptank R.	Cason	4	22	60	37	40	63	25	48
	Ragged Point	5	31	84	38	7	23	53	49
Honga River	Norman Addition	15	53	82	NA	11	11	48	49
Fishing Bay	Goose Creek	6	26	84	59	19	7	23	63
Nanticoke River	Wilson Shoals	23	65	51	41	38	10	29	60
Manokin River	Georges	5	24	84	55	23	31	50	55
Holland Straits	Holland Straits	19	51	85	90	15	27	35	71
Tangier Sound	Sharkfin Shoal	25	61	94	80	8	0	10	63
	Back Cove	NA	NA	NA	NA	NA	11	49	88
	Piney Island East	21	16	88	11	5	23	57	55
	Old Woman's Leg	4	17	79	21	8	5	50	80
Pocomoke Sound	Marumsco	3	27	77	NA	20	8	31	44
Patuxent River	Broome Island	10	29	31	6	4	24	53	70
St. Mary's River	Chicken Cock	18	43	63	43	24	27	31	51
	Pagan	9	30	27	13	20	39	24	19
Wicomico R. (west)	Lancaster	13	6	4	4	6	28	20	8
	Mills West	18	0	2	1	1	2	11	9
Potomac River	Cornfield Harbor	17	59	92	51	11	16	29	77
	Ragged Point	10	14	29	79	54	63	34	63
	Lower Cedar Point	6	9	2	1	6	6	7	5
Annual Means		10	22	44	29	14	18	34	46

Table 5 (continued).

Oyster Bar	Total Observed Mortality (%)									
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Swan Point	5	35	18	43	20	3	7	13	12	14
Hackett Point	18	30	30	16	10	26	22	13	30	60
Holland Point	43	42	35	49	36	36	8	33	42	67
Stone Rock	30	29	40	25	15	33	46	66	30	86
Flag Pond	43	28	24	16	13	33	50	NA	NA	23
Hog Island	76	16	45	20	16	33	67	67	14	31
Butler	66	37	63	17	20	20	48	67	32	11
Buoy Rock	51	33	22	17	7	7	6	25	43	61
Old Field	8	12	8	17	8	5	8	21	36	47
Bugby	29	18	18	27	15	8	5	29	48	63
Parsons Island	29	18	36	22	25	8	16	29	60	59
Hollicutt Noose	29	32	30	13	15	14	13	38	55	85
Bruffs Island	47	47	33	6	6	11	16	33	44	50
Turtle Back	24	40	51	21	9	9	26	38	48	54
Long Point	44	8	28	8	3	9	14	33	34	66
Cook Point	63	40	22	16	11	20	35	63	28	100
Royston	37	10	17	9	9	6	32	31	51	91
Lighthouse	57	27	18	15	5	6	20	33	44	92
Sandy Hill	45	36	29	23	22	4	15	27	50	77
Oyster Shell Point	20	14	18	25	6	2	1	15	28	55
Tilghman Wharf	36	6	10	9	15	6	12	19	34	85
Deep Neck	32	1	23	14	8	13	37	23	37	85
Double Mills	24	10	20	9	8	10	38	40	50	85
Cason	53	6	7	12	11	18	28	32	62	98
Ragged Point	71	17	16	12	13	19	34	37	70	94
Norman Addition	51	28	39	55	31	54	35	38	29	29
Goose Creek	38	7	38	69	64	20	64	63	81	85
Wilson Shoals	23	10	17	11	11	9	29	25	26	52
Georges	16	0	55	33	36	12	32	60	50	44
Holland Straits	18	16	45	43	20	18	35	35	17	12
Sharkfin Shoal	16	7	66	59	47	28	62	61	39	61
Back Cove	4	6	46	33	29	50	59	20	46	38
Piney Island East	13	20	65	56	49	67	38	27	12	20
Old Woman's Leg	15	25	63	46	33	38	42	15	53	27
Marumsco	21	8	78	53	49	26	40	22	35	45
Broome Island	53	27	8	0	13	11	44	25	59	72
Chicken Cock	33	28	15	10	7	24	82	63	28	63
Pagan	17	11	9	27	15	3	14	35	51	84
Lancaster	7	4	19	25	8	8	18	48	58	52
Mills West	2	4	21	18	17	16	24	36	40	75
Cornfield Harbor	47	25	56	24	7	27	78	62	44	33
Ragged Point	28	35	8	11	4	25	10	8	33	NA
Lower Cedar Point	47	28	5	23	3	26	8	0	3	44
Annual Means	33	20	30	25	18	19	31	35	38	58

Table 5 (continued).

Oyster Bar	Total Observed Mortality (%)				
	2003	2004	2005	2006	2007
Swan Point	13	10	11	8	10
Hackett Point	17	10	2	5	11
Holland Point	50	29	5	0	0
Stone Rock	13	5	5	20	5
Flag Pond	0	0	2	4	0
Hog Island	11	6	12	25	42
Butler	9	2	3	23	0
Buoy Rock	41	28	6	21	20
Old Field	34	10	38	12	12
Bugby	50	14	2	20	52
Parsons Island	37	11	8	35	50
Hollicutt Noose	25	3	6	48	43
Bruffs Island	50	12	5	4	12
Turtle Back	43	11	12	51	57
Long Point	54	10	10	14	38
Cook Point	21	0	0	0	12
Royston	69	14	0	0	9
Lighthouse	89	47	0	0	0
Sandy Hill	88	59	44	24	4
Oyster Shell Point	48	20	0	4	0
Tilghman Wharf	62	17	0	1	10
Deep Neck	54	14	1	3	8
Double Mills	59	23	8	0	7
Cason	57	4	0	2	4
Ragged Point	52	5	4	13	13
Norman Addition	9	14	40	5	3
Goose Creek	53	59	50	50	1
Wilson Shoals	19	27	7	21	7
Georges	4	24	44	76	16
Holland Straits	11	18	43	48	17
Sharkfin Shoal	23	32	54	22	10
Back Cove	22	23	32	12	5
Piney Island East	28	48	50	23	6
Old Woman's Leg	35	56	26	0	12
Marumsco	4	11	29	20	10
Broome Island	14	19	6	6	20
Chicken Cock	2	38	50	20	20
Pagan	7	29	66	9	4
Lancaster	35	27	14	7	31
Mills West	48	11	0	7	33
Cornfield Harbor	1	7	20	2	9
Ragged Point	76	NA	NA	NA	0
Lower Cedar Point	55	22	17	3	11
Annual Means	35	20	17	16	15

[\(Return to Text\)](#)

Table 6. Regional summary of oyster harvests (bu.) in Maryland, 1985-86 through 2006-07 seasons.

Region/Tributary	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91
Upper Bay	5,600	30,800	19,100	17,700	15,700	19,800
Middle Bay	73,400	37,900	42,500	10,500	15,900	17,700
Lower Bay	32,500	5,900	70	0	3,600	37,900
<i>Total Bay Mainstem</i>	<i>111,500</i>	<i>74,600</i>	<i>61,700</i>	<i>28,200</i>	<i>35,200</i>	<i>75,400</i>
Chester R.	21,300	20,600	30,900	49,900	54,000	60,400
Eastern Bay	216,100	149,100	28,700	15,700	20,400	33,200
Miles R.	40,400	20,600	17,100	13,600	1,400	1,700
Wye R.	20,100	2,200	700	3,800	8,000	2,300
<i>Total Eastern Bay Region</i>	<i>276,600</i>	<i>171,900</i>	<i>46,500</i>	<i>33,100</i>	<i>29,800</i>	<i>37,200</i>
Upper Choptank R.	29,000	42,400	36,500	51,900	27,700	42,200
Middle Choptank R.	144,500	89,700	66,400	66,400	71,000	49,700
Lower Choptank R.	225,100	52,500	26,200	9,100	32,100	9,000
Tred Avon R.	67,700	60,900	13,700	42,400	92,100	22,000
Broad Cr.	12,900	58,700	8,500	13,500	8,100	4,300
Harris Cr.	3,500	16,700	6,900	7,800	8,800	3,300
<i>Total Choptank R. Region</i>	<i>482,700</i>	<i>320,900</i>	<i>158,200</i>	<i>191,100</i>	<i>239,800</i>	<i>130,500</i>
Little Choptank R.	27,100	10,500	21,500	15,000	19,000	8,800
Upper Tangier Sound	84,000	30,400	40	0	0	1,000
Lower Tangier Sound	64,400	22,200	90	0	0	1,600
Honga R.	29,400	49,300	7,700	300	1,100	5,600
Fishing Bay	107,600	87,300	90	20	20	900
Nanticoke R.	21,300	5,100	1,500	900	2,600	3,000
Wicomico R.	3,600	200	100	40	20	60
Manokin R.	40,800	47,400	500	70	10	60
Annemessex R.	90	10	10	0	40	0
Pocomoke Sound	32,700	22,300	0	0	0	300
<i>Total Tangier Sound Region</i>	<i>383,900</i>	<i>264,200</i>	<i>10,000</i>	<i>1,300</i>	<i>3,800</i>	<i>12,500</i>
Patuxent R.	96,300	16,800	1,400	3,700	8,900	48,400
Wicomico R., St. Clement and Breton Bays	16,000	23,400	23,000	47,600	22,200	36,000
St. Mary's R. and Smith Cr.	80,700	30,700	2,300	500	1,100	1,700
<i>Total Md. Potomac Tribs</i>	<i>96,700</i>	<i>54,100</i>	<i>25,300</i>	<i>48,100</i>	<i>23,300</i>	<i>37,700</i>
Total Maryland (bu.)¹	1,500,000	1,000,000	360,000	390,000	413,000	411,000

¹ Including regions not listed.

Table 6 (continued).

Region/Tributary	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97
Upper Bay	35,200	18,200	8,900	7,800	26,600	2,600
Middle Bay	39,200	9,000	4,400	4,900	12,600	20,000
Lower Bay	9,300	90	0	1,100	800	300
<i>Total Bay Mainstem</i>	<i>83,800</i>	<i>27,300</i>	<i>13,300</i>	<i>13,800</i>	<i>40,000</i>	<i>22,800</i>
Chester R.	55,100	53,800	51,300	29,100	42,600	5,400
Eastern Bay	20,600	3,600	2,400	3,700	1,500	1,100
Miles R.	100	300	0	200	200	500
Wye R.	300	20	30	50	0	0
<i>Total Eastern Bay Region</i>	<i>21,000</i>	<i>3,900</i>	<i>2,400</i>	<i>4,000</i>	<i>1,700</i>	<i>1,600</i>
Upper Choptank R.	29,200	9,500	2,600	2,500	11,600	3,200
Middle Choptank R.	25,000	3,100	1,600	4,900	15,000	4,700
Lower Choptank R.	14,200	1,700	900	600	900	300
Tred Avon R.	800	0	0	5,900	1,300	3,800
Broad Cr.	40	50	10	400	1,000	4,000
Harris Cr.	100	20	0	14,200	5,000	13,600
<i>Total Choptank R. Region</i>	<i>69,300</i>	<i>14,400</i>	<i>5,100</i>	<i>28,500</i>	<i>34,800</i>	<i>29,600</i>
Little Choptank R.	3,800	50	300	19,300	1,900	40,800
Upper Tangier Sound	11,300	70	0	17,600	12,100	8,100
Lower Tangier Sound	1,700	40	0	5,400	500	10,100
Honga R.	600	20	100	1,700	400	200
Fishing Bay	6,400	500	30	11,900	20,900	8,800
Nanticoke R.	12,500	7,700	2,500	10,500	15,200	23,000
Wicomico R.	600	500	500	80	100	1,400
Manokin R.	200	40	10	100	0	900
Annemessex R.	10	0	0	0	0	0
Pocomoke Sound	500	0	0	100	0	300
<i>Total Tangier Sound Region</i>	<i>33,800</i>	<i>8,900</i>	<i>3,100</i>	<i>47,400</i>	<i>49,200</i>	<i>52,800</i>
Patuxent R.	24,500	0	0	30	100	20
Wicomico R., St. Clement and Breton Bays	29,600	14,900	4,000	18,200	27,500	7,300
St. Mary's R. and Smith Cr.	100	60	30	3,900	900	16,200
<i>Total Potomac Md. Tribs</i>	<i>29,000</i>	<i>15,000</i>	<i>4,000</i>	<i>22,100</i>	<i>28,400</i>	<i>23,500</i>
Total Maryland (bu.)¹	323,000	123,000	80,000	164,000	199,000	178,000

¹Including regions not listed.

Table 6 (continued).

Region/Tributary	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03
Upper Bay	18,800	13,100	28,100	31,150	16,100	18,930
Middle Bay	15,300	55,800	31,500	16,400	4,550	2,410
Lower Bay	4,800	8,300	3,800	2,050	600	50
<i>Total Bay Mainstem</i>	<i>38,900</i>	<i>77,200</i>	<i>63,400</i>	<i>49,600</i>	<i>21,250</i>	<i>21,390</i>
Chester R.	43,000	21,000	70,100	20,800	29,450	11,830
Eastern Bay	3,800	30,900	75,800	120,500	33,400	4,650
Miles R.	30	800	35,700	20,150	6,600	50
Wye R.	400	900	9,400	11,300	1,800	60
<i>Total Eastern Bay Region</i>	<i>4,200</i>	<i>32,600</i>	<i>120,900</i>	<i>151,950</i>	<i>41,800</i>	<i>4,760</i>
Upper Choptank R.	4,800	3,100	7,100	1,100	7,450	10
Middle Choptank R.	5,600	2,800	1,900	8,150	5,600	520
Lower Choptank R.	200	2,400	8,300	350	1,500	40
Tred Avon R.	6,900	11,700	3,700	8,950	1,000	40
Broad Cr.	27,600	46,200	18,200	36,850	4,900	700
Harris Cr.	21,400	67,000	18,200	26,200	3,300	30
<i>Total Choptank R. Region</i>	<i>66,500</i>	<i>133,200</i>	<i>57,400</i>	<i>81,600</i>	<i>23,750</i>	<i>1,340</i>
Little Choptank R.	36,100	84,100	33,600	27,850	2,400	190
Upper Tangier Sound	6,000	3,500	1,500	100	5,050	3,570
Lower Tangier Sound	4,200	8,500	2,800	1,450	13,200	5,960
Honga R.	1,300	300	50	0	50	590
Fishing Bay	3,800	700	90	0	0	390
Nanticoke R.	30,300	21,700	8,800	600	2,700	540
Wicomico R.	2,200	1,400	500	50	50	10
Manokin R.	600	300	90	200	1,850	970
Annemessex R.	0	0	200	0	0	0
Pocomoke Sound	400	80	100	10	20	0
<i>Total Tangier Sound Region</i>	<i>48,800</i>	<i>36,500</i>	<i>14,100</i>	<i>2,400</i>	<i>22,920</i>	<i>12,030</i>
Patuxent R.	60	5,600	2,000	10	0	0
Wicomico R., St. Clement and Breton Bays	10,200	13,700	8,800	2,600	1,400	220
St. Mary's R. and Smith Cr.	36,700	16,400	4,500	6,150	1,650	0
<i>Total Potomac Md. Tribs</i>	<i>46,900</i>	<i>30,100</i>	<i>13,300</i>	<i>8,750</i>	<i>3,050</i>	<i>220</i>
Total Maryland (bu.)¹	285,000	423,000	380,700	348,000	148,200	55,840

¹Including regions not listed.

Table 6 (continued).

Region/Tributary	2003-04	2004-05	2005-06	2006-07
Upper Bay	2,210	1,632	17,420	14,052
Middle Bay	750	295	17,346	17,004
Lower Bay	187	1,801	269	642
<i>Total Bay Mainstem</i>	<i>3,147</i>	<i>3,728</i>	<i>35,035</i>	<i>31,698</i>
Chester R.	557	3,239	4,385	7,201
Eastern Bay	5,446	16,767	49,120	36,268
Miles R.	56	353	3,660	1,133
Wye R.	0	173	122	0
<i>Total Eastern Bay Region</i>	<i>5,502</i>	<i>17,293</i>	<i>52,902</i>	<i>37,401</i>
Upper Choptank R.	0	78	591	11
Middle Choptank R.	30	67	967	2,510
Lower Choptank R.	0	267	1,250	3,037
Tred Avon R.	0	139	149	157
Broad Cr.	954	1,342	14,006	53,577
Harris Cr.	12	71	4,429	5,342
<i>Total Choptank R. Region</i>	<i>996</i>	<i>1,964</i>	<i>21,392</i>	<i>64,634</i>
Little Choptank R.	1,150	144	3,534	4,218
Upper Tangier Sound	7,630	13,658	2,874	3,856
Lower Tangier Sound	5,162	15,648	5,828	1,996
Honga R.	378	2,744	270	154
Fishing Bay	24	106	6	0
Nanticoke R.	57	965	387	97
Wicomico R.	0	0	0	30
Manokin R.	1,638	2,816	737	91
Annemessex R.	0	5	108	17
Pocomoke Sound	0	2,676	1,071	277
<i>Total Tangier Sound Region</i>	<i>14,889</i>	<i>38,618</i>	<i>11,281</i>	<i>6,518</i>
Patuxent R.	0	466	17,808	7,316
Wicomico R., St. Clement and Breton Bays	13	18	1,414	80
St. Mary's R. and Smith Cr.	0	91	1,863	2,069
<i>Total Potomac Md. Tribs</i>	<i>13</i>	<i>109</i>	<i>3,277</i>	<i>2,149</i>
Total Maryland (bu.)¹	26,471	72,218	154,436	165,059

¹ Including regions not listed.

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Table 7. Distribution of oyster harvest by gear type. Data do not necessarily add up to 100% in some cases due to incomplete or illegible buyticket information submitted to MDNR.

% of Harvest by Gear Type

SEASON	HT	DI	PT	PD	SJ
1989-90	75	12	8	3	3
1990-91	52	18	25	1	3
1991-92	38	16	33	2	10
1992-93	57	20	14	2	7
1993-94	60	25	15	<1	<1
1994-95	61	18	19	1	1
1995-96	57	13	23	3	4
1996-97	74	9	9	5	3
1997-98	67	13	11	5	4
1998-99	69	14	9	6	2
1999-00	62	16	12	5	3
2000-01	56	22	12	5	3
2001-02	41	20	18	12	6
2002-03	21	17	33	22	4
2003-04	6	20	15	51	7
2004-05	8	20	9	52	6
2005-06	18	25	32	20	2
2006-07	34	22	19	21	2

HT = Hand Tongs
DI = Diver
PT = Patent Tongs
PD = Power Dredge
SJ = Skipjack

Bushels of Harvest by Gear Type

SEASON	HT	DI	PT	PD	SJ
1989-90	309,723	47,861	31,307	11,424	14,007
1990-91	219,510	74,333	105,825	4,080	14,555
1991-92	124,038	53,232	108,123	6,344	31,165
1992-93	71,929	24,968	18,074	1,997	8,821
1993-94	47,309	19,589	11,644	787	133
1994-95	99,853	29,073	31,388	1,816	2,410
1995-96	115,677	25,657	46,040	6,347	7,630
1996-97	130,861	16,780	15,716	8,448	6,088
1997-98	191,079	37,477	30,340	14,937	10,543
1998-99	294,342	58,837	36,151	25,541	8,773
1999-00	237,892	60,547	44,524	18,131	12,194
2000-01	193,259	75,535	43,233	18,336	8,820
2001-02	62,358	30,284	26,848	17,574	8,322
2002-03	11,508	9,745	18,627	12,386	2,432
2003-04	1,561	5,422	3,867	13,436	1,728
2004-05	5,438	14,258	6,548	37,641	4,000
2005-06	28,098	38,460	49,227	30,824	3,576
2006-07	55,906	36,271	31,535	35,125	3,250

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