

Maryland Oyster Population Status Report 2025 Fall Survey



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Maryland Department of Natural Resources
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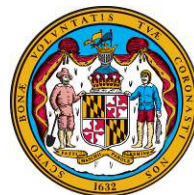
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Cover Photo: The late Capt. Larry Laird at the helm of the R/V Miss Kay. (Photo: R. Bussell)

In Memoriam
Capt. Larry Laird
(1968 – 2026)



Captain Larry Laird, master of the MDNR Research Vessel *Miss Kay*, passed away unexpectedly on 4 May 2026 at his home in Crisfield. He was 58 years old.

Capt. Larry joined the Shellfish staff in August 2022, barely a month before the start of the Fall Oyster Survey. A skilled helmsman, he quickly caught on to the Survey routine. He was dedicated to the 40 year old *Miss Kay*, maintaining her in top condition and always looking to introduce improvements. He was a first-rate boat captain.

As the manager of the MDNR Shellfish Division facility at Deal Island, he was initially challenged with working within the unfamiliar structure of a government bureaucracy, especially since Larry's familiarity with computers (an essential tool for conducting Departmental business), didn't extend beyond his phone. But to Larry's credit, he was always willing to learn and eventually caught on to the basics (after much virtual hair pulling by his supervisor, who doesn't have any to begin with).

Larry had many roles on the water prior to joining MDNR. He worked with his father, who ran the Smith Island ferry, worked on a tug boat, and captained a tour boat and charter fishing vessel. He especially enjoyed working with children on educational nature cruises for the Chesapeake Bay Foundation (CBF).

By any account, Larry was a larger than life figure in many ways. He always had a smile on his face and a joke to share, bringing good cheer to the surveys. His love for his family showed through when he was telling stories about them, especially the grandkids, such as going frogging with his grandson, or showing pictures of them. He was on the survey when his youngest grandchild was born, with his joy and excitement shared by all on the boat. He was proud of his Smith Island roots, sharing his mom's delicious fig cake with the staff during surveys, or telling stories about working

with kids while working for CBF on Smith Island. Larry loved animals and had a number of pets, including a pet pig. He never hesitated to rescue injured wildlife and getting them rehabilitated.

The overflowing crowd at the church for his celebration of life was a testament to the number of folks he knew and touched with his friendship, good humor, and kindness. It seemed like all of Smith Island and half of Crisfield were in attendance. The photos and stories they told about him were often hilarious and captured his essence, but of course underlying it all was a profound sadness. He will truly be missed.

-M. Tarnowski and J.D. Baxter



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EXECUTIVE SUMMARY

Since 1939, the Maryland Department of Natural Resources and its predecessor agencies have monitored the state's oyster population by means of annual field surveys – one of the longest continuously running programs of this kind in the world. Currently over 250 bars are sampled annually. Integral to the Fall Survey are five types of indices intended to assess the status and trends of Maryland's oyster populations: the *Spatfall Intensity Index*, a measure of recruitment success and potential increase of the population obtained from a subset of 53 oyster bars; *Oyster Disease Indices*, which document disease infection levels as derived from a subset of 43 sentinel oyster bars; the *Total Observed Mortality Index*, an indicator of annual mortality rates of post-spat stage oysters calculated from the 43 Disease Bar subset; the *Biomass Index*, which measures the number and weight of oysters from the 43 Disease Bar subset relative to the 1993 baseline; and the *Cultch Index*, a measure of habitat at the 53 Spat Intensity Index bars.

The 2025 Fall Survey was conducted from 6 October to 16 December throughout the Maryland portion of Chesapeake Bay and its tributaries, including the Potomac River. A total of 360 samples were collected from 299 oyster bars. Locations monitored included natural oyster bars, oyster seed production areas, seed and shell planting sites, and sanctuaries.

Among the environmental factors affecting oyster populations, freshwater streamflow is critical as it controls the salinity regime of the bay, which in turn influences spatset, diseases, mortality, condition, and growth of oysters. For 2025, the annual average freshwater flow was 82% of the long-term average. However, average monthly flows were above average May-July. Consequently, salinities fell during the mid-year period from June through August, a critical period for disease development. The remainder of the months had flows well below their 89-year averages and salinities rebounded. By September the salinities had risen to the extent that 15 ppt, a critical threshold above which MSX disease can cause extensive mortalities in oyster populations, was exceeded in most of the mainstem up to the Bay Bridge. The Swan Point station in the upper bay had record high salinities for the months of November and December.

The salinities were such that they enabled an exceptional spatset in 2025. The Spat Index of 250 spat/bu. was the second highest in the 41-year time series. This was a ten-fold increase over the long-term median of the Indexes and the sixth consecutive year this reference has been surpassed. The spat were widely distributed as indicated by the second-highest annual median score of the Spat Index bars over that time period. Elevated recruitment was observed throughout the Eastern Shore and its tributaries as far north as the Bay Bridge, as well as the lower portion of the Potomac River. A small number of spat were even observed at several stations north of the Bay Bridge – a rare occurrence. The highest counts of over one thousand spat per bushel were in the Choptank region, topping out at 3,600 spat/bu on two bars in Broad Creek. An experimental crushed concrete planting in Harris Creek produced 2,100 spat/bu, and an adjacent *C. gigas* (Pacific oyster) shell planting resulted in a 2,000 spat/bu count. On the Western Shore, Pagan bar in the St. Marys restoration sanctuary had a spat count of almost 2,200 spat/bu.

An abundance of the prolific 2023 year class oysters was found in many areas, boding well for both the fishery in the near term and ecologically for the sanctuaries. There was concern for the numerous two-year old oysters in the upriver portion of the Potomac River, which are vulnerable to freshwater flows, due to the plummet in salinity that occurred in June. Fortunately, salinities soon began to climb to more tolerable levels for the oysters. There were no observable mortalities, although their growth was stunted by the lower salinity.

A total of 1,590 oysters were analyzed for diseases in 2025 – 1,290 from the 43 Disease Bars (sentinel bars) and 300 from ten supplemental sites. Disease levels have continued to recede over the past two years. Both indexes of dermo disease – prevalence and intensity – again declined in degree and distribution and were among the lowest in 36 years. But the even more encouraging news was the further retreat of MSX disease. Of the 53 Disease Bar and supplemental samples, 47 had no sign of MSX disease (0% prevalence), while the highest detected prevalence was 13%. Although drought conditions once again returned during the latter half of 2025, MSX disease did not strengthen and spread.

As a consequence of the lower disease levels, observed mortalities were the third lowest since 1985. The 2025 Mortality Index was only 7.6%, in contrast to the peak year for disease in 2002, when nearly 60% of the oysters had died. Over the past several years, mortalities have dramatically declined. Since 2011, the average of the Mortality Indexes has been about half of the 41-year average.

The combination of favorable recruitment, individual growth, and low natural mortality over the past few years has resulted in the highest Biomass Index in the 33-year time series, representing an 88% gain over the long-term average. The Biomass Index has been trending upward since 2011, following an eight-year recovery period after the devastating millennial epizootics, with a five-fold increase since its lowest point in 2002.

The Cultch Index is a relative measure of oyster habitat which larval oysters need for attachment as spat. The three-year rolling average for the 2025 Cultch Index was tied for the highest in the 21-year time series. Strong regional differences in cultch mean volumes were evident. All regions except the mainstem exceeded their long-term averages. The areas with the lowest standardized cultch average included the mainstem of the bay, followed by the Potomac River region. The highest cultch indexes were in areas with more favorable recruitment and consequent additions to cultch, especially the Choptank River tributaries.

A total of 95 oyster bars within 38 sanctuaries were sampled during the 2025 Fall Survey. The priority large-scale restoration sanctuaries were compared with adjacent open areas. This was an exceptional year for recruitment within the priority sanctuaries. Sanctuary average spat counts were well above their respective Key Bar 21-year averages. The exception was the Manokin sanctuary, which had somewhat lower average spatset compared to the long-term averages of its two Key Bars. Similarly, spatsets in most of the adjacent open harvest areas were well above the long-term averages. Spat counts in the thousands were observed both in the St. Marys sanctuary and open harvest area and in Broad Creek, which experienced the highest spatset of any region in Maryland. It should be noted that the Broad Creek recruitment average is about eleven times as high as the Harris Creek Sanctuary over the 21-year time series, including prior to the creation of the sanctuary in 2010.

Aside from the Tred Avon River, the number of adult (small and market) oysters per 100 ft tow in the priority sanctuaries was consistently higher than in adjacent harvest areas (not including Broad Creek). Broad Creek, historically one of the highest oyster producing regions in Maryland had the greatest average number of adult oysters of any area in this comparison, thanks to the extraordinary spatset in 2020 and a strong set in 2023. The St. Marys sanctuary averaged the second highest number of adults.

Disease levels in the sanctuaries were about the same as the previous year. Oyster disease samples were obtained from the five priority oyster sanctuaries (Table S-2) and 14 non-priority sanctuaries. Although dermo disease was present in all thirteen sentinel Disease Bars and seven supplemental stations within these sanctuaries, prevalence remained in the moderate range, from 55% in 2024 to 56% in 2025 and intensities were little changed from 1.6 to 1.7. Dermo disease levels in the comparison harvest areas also dropped, averaging 32.0% prevalence, down from 42.0% in 2024. The open baywide mean intensity was 1.0, a decline from 1.3 in 2024. The somewhat higher dermo disease levels in the sanctuaries can be attributed to the fact that they had a greater proportion of larger, older oysters than the harvest bars; parasite burdens tend to build up as oysters age.

MSX disease was detected at none of the five priority sanctuaries and only on one of their associated harvest bars at a low level. Outside of the restoration sanctuaries and their adjacent harvest areas, MSX disease was found at only two of fourteen other sanctuaries and four of twenty-four bars in open harvest areas. The 2025 average MSX disease prevalence for baywide sanctuary disease samples was 0.7%, unchanged from 2024. Baywide harvest area disease samples averaged 0.8%, identical to 2024. The highest MSX prevalence observed in 2025 was 13%. In contrast, 2023 saw the highest MSX disease record of the 36-year time series with 93% on Lighthouse open harvest bar in the Choptank River.

Observed mortalities remained at low levels. The baywide average mortality for the sanctuary bars barely changed from 10.2% in 2024 to 10.6% in 2025. This remained lower than the long-term sanctuary index bar average of 20.3%. All eleven qualifying Mortality Index bars within sanctuaries had observed mortalities below their respective 41-year individual bar averages. Regional observed mortalities in sanctuary bars were similar to their proximal open harvest bars. In the restoration sanctuaries, the average

regional mortality in 2025 dropped to 8.4% from 13.2% in 2024, while in the corresponding harvest areas the average mortality was 7.8%, down from 11.2% in 2024.

Oyster biomass in the sanctuaries continues to outpace that of the open harvest areas. The average biomass per index bar in the sanctuaries was 262.8 g/bu, a 12% increase from 235.3 g/bu in 2024, and higher than in the harvest areas by 16%. In the open harvest areas, the average biomass per index bar substantially increased from 180.4 g/bu in 2024 to 225.8 g/bu in 2025. Over the longer term, trends in biomass, as measured in grams/bushel (g/bu), have been strongly positive both in sanctuaries and harvest areas, with the results from 2025 exceeding their 33-year averages by 86% and 93% respectively. The distributions of oyster biomass between the two management areas were distinctly different. The Biomass Index bars in the sanctuaries had higher biomass in the larger size classes, while the open areas had greater biomass in the sublegal and smaller market size classes. There was a strong difference between the two management types in the proportion of sublegal oysters in each. Sublegal oysters comprised 34.0% of the adult oysters in the sanctuaries, while in the open area it was 50.8%.

Cultch, primarily the shell and oyster substrate required for spatset, was at higher densities in all but one of the restoration sanctuaries compared to their adjacent open harvest areas. The exception was in the Tred Avon River, where cultch volumes were higher in the harvest area. For the paired comparison regions (i.e. not including Broad Creek), the St. Marys sanctuary had the highest average cultch volume per sample, standardized to 100 ft. tows, over the last three-year period. For reference, Broad Creek was highest overall in three-year average cultch density, boosted by the tremendous 2020 spatset and a strong follow-up set in 2023. The lowest cultch volume was found in the Little Choptank harvest area, which was less than half of that in the sanctuary.

Commercial oyster landings fell for the second consecutive year. With reported harvests of 323,000 bushels, oyster landings during the 2024-25 season were 26% lower than the previous season total of 438,000 bushels, and less than half of the exceptional 2022-23 season of 720,000 bushels (the highest harvest in 36 years). The 2025 total landings were somewhat higher than the 40-year average of 314,000 bu/yr. The average reported price increased slightly to \$37.00/bu from \$35.72/bu in 2024. The smaller harvest resulted in a 24% decrease in the total dockside value from \$15.6 million in 2024 to \$11.9 million in 2025, almost a third of the 2023 value. The Tangier Sound region slipped somewhat as the dominant harvest area, accounting for 41% of the 2024-25 landings in Maryland. The Choptank region was second, providing 32% of the total harvest, with the majority coming out of Broad Creek (25% of the Maryland harvest). Power dredging was the predominant method of harvesting, accounting for 48% of the total landings. This activity was mainly in the lower bay and Choptank regions. Meanwhile, hand tonging rose to second place with 29% of the landings, primarily from Broad Creek, while patent tonging fell from second into a tie for last place, accounting for only 7% of the total – behind diving (10%) and the same as skipjacks.



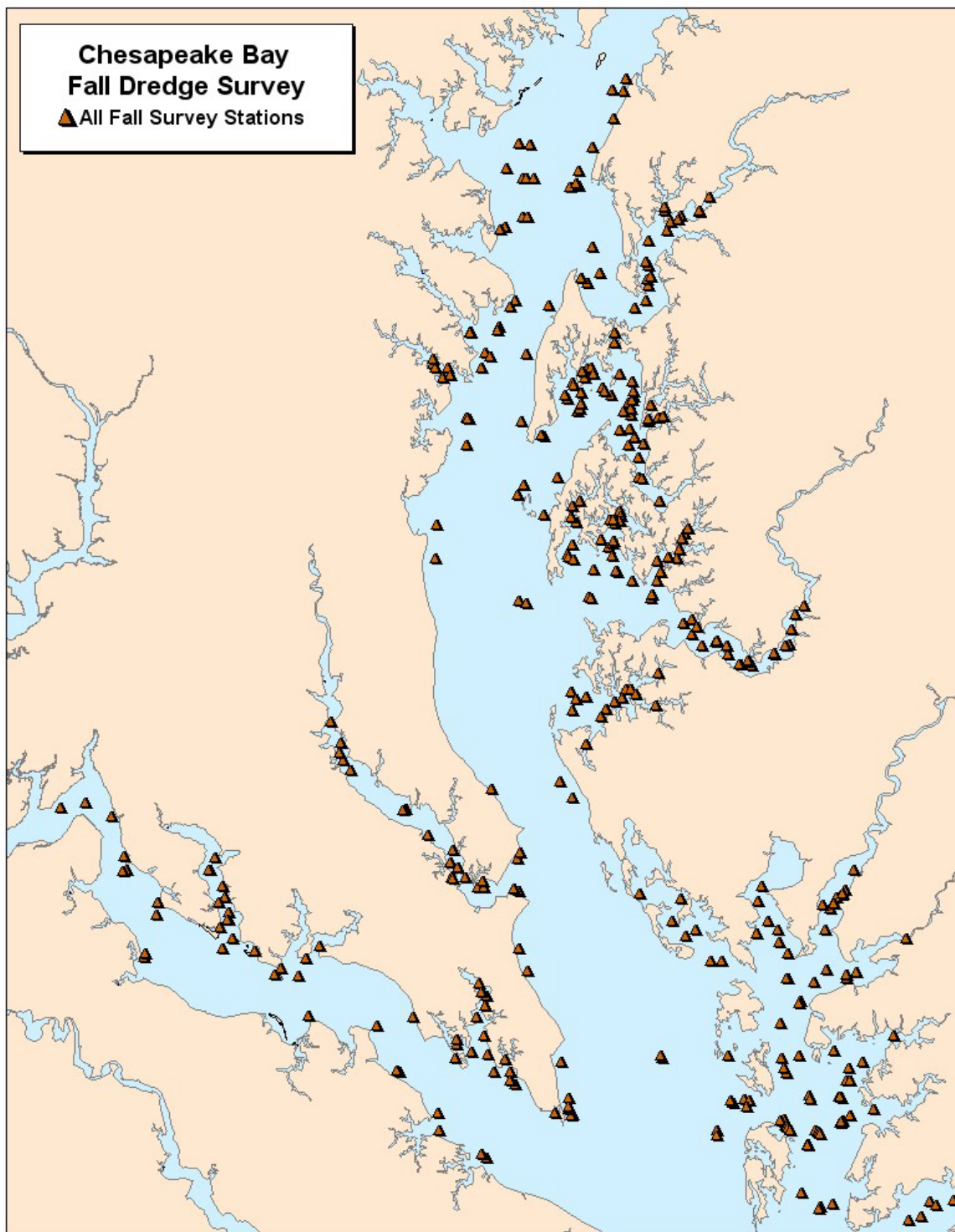


Figure 1a. 2025 Maryland Fall Survey station locations, all bar types included (Standard, Key, Disease, Seed).

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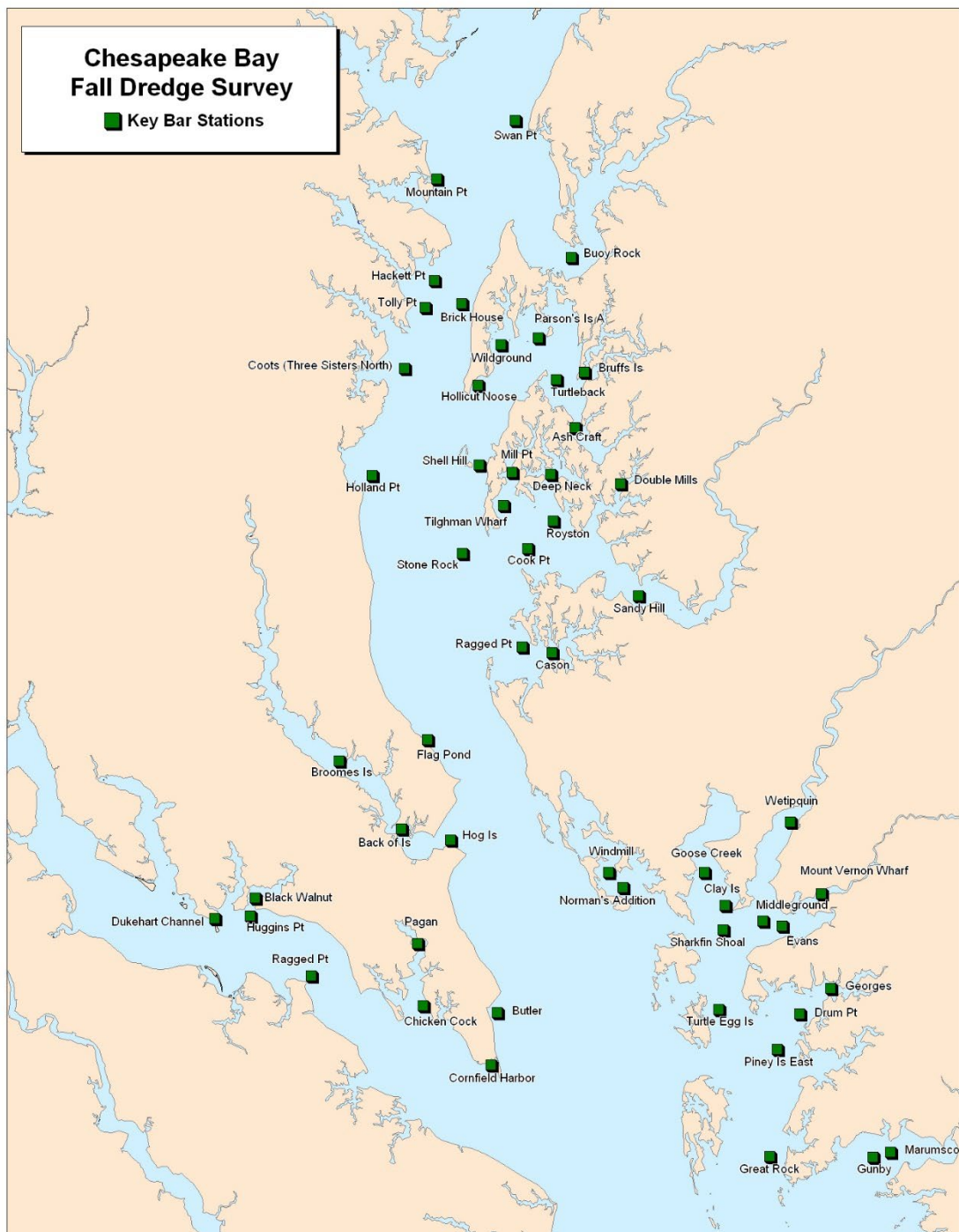


Figure 1b. Maryland Fall Survey Key Bar locations included in determining the annual Spatfall Intensity Index.

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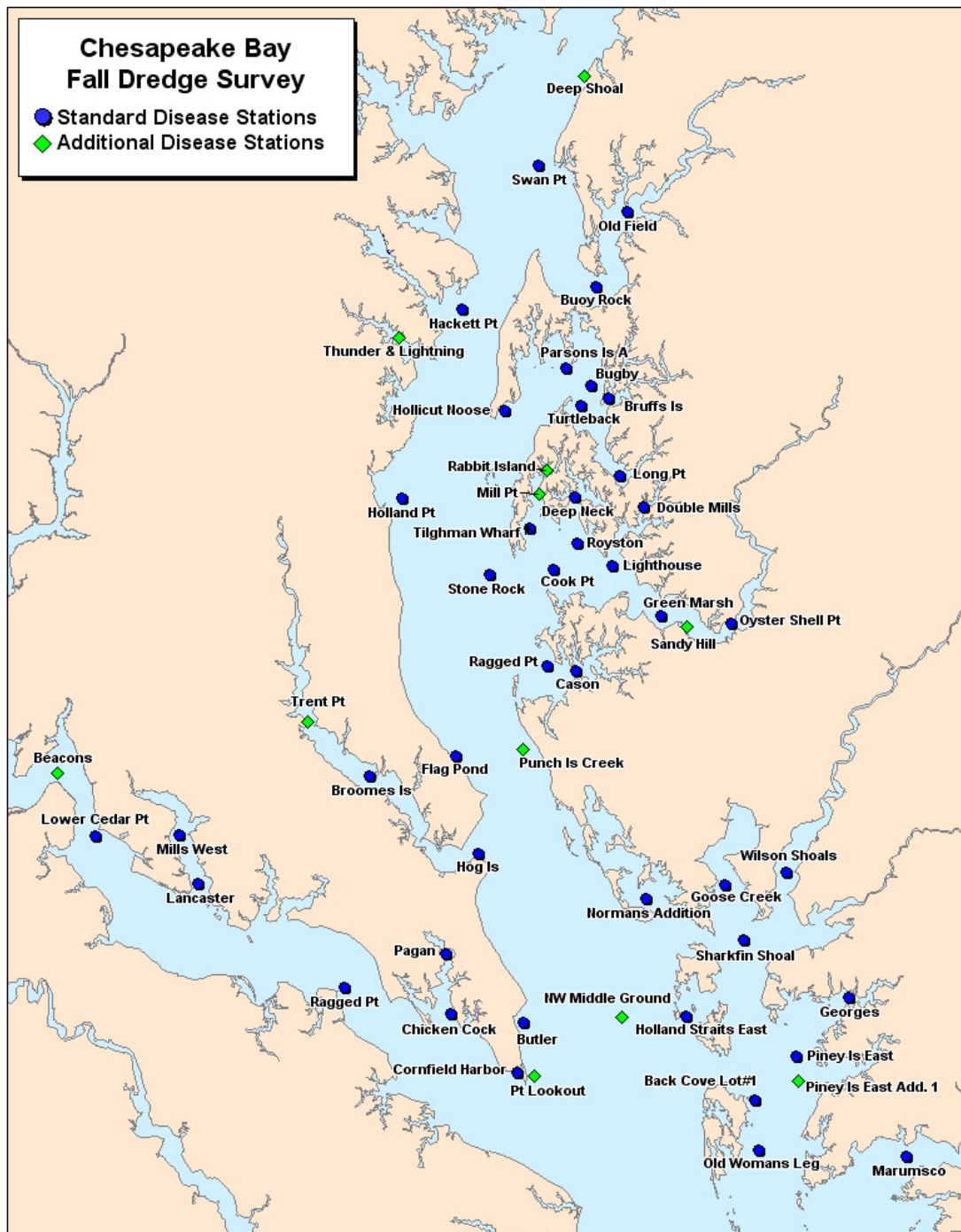


Figure 1c. Maryland Fall Survey standard Disease Bar monitoring locations and additional disease sample stations. Disease samples could not be obtained from the supplemental site at Deep Shoal in 2025.

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INTRODUCTION

Since 1939, a succession of Maryland state agencies have conducted annual dredge-based surveys of oyster bars. These oyster population assessments have provided biologists and managers with information on spatfall intensity, observed mortality, and more recently on parasitic infections, biomass, and habitat in the Maryland waters of Chesapeake Bay. The long-term nature of the data set is a unique and valuable aspect of the survey that gives a historical perspective and reveals trends in the oyster population. Monitored sites have included natural oyster bars, seed production and planting areas ([Appendix 1](#)), dredged and fresh shell plantings, and sanctuaries.

Since this survey began, several changes and additions have been made to develop structured indexes and statistical frameworks while preserving the uninterrupted integrity of the long-term data set. In 1975, 53 sites and their alternates, referred to as the historical “Key Bar” set, were fixed to form the basis of an annual spatfall intensity index (Krantz & Webster 1980). These sites were selected to provide both adequate geographic coverage and continuity with data going back to 1939. An oyster parasite diagnosis component was added in 1958, and in 1990 disease indexes were developed using standardized parasite prevalence and intensity data from a fixed 43-bar subset (Disease Bar set) ([Appendix 2](#)). Thirty-one of the Disease Bars are among the 53 spatfall index oyster bars (Key Bars). Mortality and Biomass Indexes are derived from the Disease Bar set, while a Cultch Index is based on the Key Bars.

Collaborative Studies and Outreach

Throughout the years, the Fall Survey has been a source of collaborative research opportunities for scientists and students within and outside of the Department of Natural Resources (MDNR). The Fall Survey is a key data source for the legislatively mandated Oyster Stock Assessment, a collaborative effort between the Department and the University of Maryland Chesapeake Biological Laboratory, which was first completed in 2018, and updated in 2021 and 2023; the 2024 benchmark assessment was released for review in 2025.

https://dnr.maryland.gov/fisheries/pages/oysters/oyster_stock_assess.aspx

In addition, data from the Fall Survey was used extensively by the multi-partner Oyster Restoration Program under the 2014 Chesapeake Bay Watershed Agreement. The Fall Survey continued to assist the Potomac River Fisheries Commission with their fishery management program, examining the exceptional 2023 cohort on the uppermost oyster grounds of the river and evaluating several rotational seed planting areas. Disease data collected during the survey are now shared annually in a regional database of molluscan shellfish health hosted by Rutgers University that is intended to facilitate oyster aquaculture along the east coast of the United States. Two experimental crushed concrete plantings in Pocomoke Sound and Choptank River made by the Somerset and Talbot County Watermen Associations to enhance spatset were also examined. Fall Survey data were also provided to investigators at the Oxford Lab, the NOAA Mussel Watch Program, and the U.S. Environmental Protection Agency, as well as to a professor at Goucher College to support undergraduate research projects.



METHODS

Field Collection

The 2025 Annual Fall Survey was conducted by Shellfish Division staff of the Maryland Department of Natural Resources Fishing and Boating Services from 6 October to 16 December. A total of 360 samples were collected during surveys on 299 natural oyster bars ([Figure 1a](#)), including Key Bar ([Figure 1b](#)) and Disease Bar ([Figure 1c](#)) fixed sentinel sites as well as management areas such as sanctuaries, contemporary seed oyster planting sites, shell planting locations, and former seed production areas.

A 32-inch-wide oyster dredge was used to obtain the samples. Sample volumes were measured in Maryland bushels (bu) (1 Md. bu = 1.3 U.S. standard bu; [Appendix 3](#)). The number of samples collected varied with the type of site. At each of the 53 Key Bar sites and the 43 Disease Bars, two 0.5-bu subsamples were collected from replicate dredge tows. At all other sites, one 0.5-bu subsample was collected. A list of data categories recorded from each sample appears in [Table 1](#). Oyster counts were reported as numbers per Maryland bushel. Since 2005, tow distances have been recorded for all samples using the odometer function of a global positioning system (GPS) unit, and the total volume of dredged material per tow was noted before the subsamples were removed. Photos illustrating the collection process can be viewed at:

dnr.maryland.gov/fisheries/Pages/shellfish-monitoring/sample.aspx

Fall Survey Indices

Integral to the Fall Survey are five categories of indices used to assess Maryland oyster populations: spatfall, disease, mortality, biomass, and cultch. The Spatfall Intensity Index is a measure of recruitment success and potential increase of the population obtained from an established subset of 53 oyster bars (Key Bars); it is the arithmetic mean of spat/bushel counts from this subset. Disease levels are documented by oyster disease prevalence indices (dermo and MSX disease) and an infection intensity index (dermo disease only) as derived from a subset of 43 oyster bars. The Observed Mortality Index is an indicator of annual natural mortality occurring among post-spat stage oysters from the 43 oyster bar Disease Index subset, calculated as the total number of dead oysters (boxes and gapers) divided by the sum of live and dead oysters ([Appendix 3](#)). Although keyed to the Disease Index subset established in 1990, the Observed Mortality Index also includes data from 1985-1989. The Biomass Index measures the number and estimates the weight of post-spat oysters from the 43 Disease Bar subset relative to the 1993 survey year baseline. The Cultch Index is a relative measure of oyster habitat at the 53 Key spat index bars.

The time series for the Spat Intensity, Diseases, and Mortality indices are presented in Tables 2 - 5. The majority of Fall Survey data, including supplemental pathology data and disease indices, are entered into digital files. Fouling data and oyster condition are in paper files; the data on fouling (mussels, barnacles, tunicates, etc.) and other associated organisms are being converted to a digital format.

Spatfall Intensity Index

The annual Spatfall Intensity Index is the arithmetic mean of spat counts per bushel of cultch from the 53 fixed Key Bars. As such, it does not take into account geographic distribution (i.e.,

how widespread or concentrated the spatfall is around the bay), whereas the discontinued statistical tiers method did (see Tarnowski 2019, p.14 for explanation of discontinuing this analysis). For example, the near-record high spatfall intensity in 1997 was actually limited in extent, being concentrated in the eastern portion of Eastern Bay, the northeast portion of the lower Choptank River, and to a lesser extent, in parts of the Little Choptank and St. Marys rivers (MDNR 2001). Over 75% of the 1997 index was accounted for by only five of the 53 Key Bars, and only ten contributed nearly 95%. As a result, the 1997 spat index fell into the third statistical ranking tier (of six) despite being the second highest index since 1939 and an order of magnitude higher than other Tier 3 index years (Tarnowski 2018, Figure 3a). In contrast, the 1991 spatfall (the third highest on record) was far more widespread. Fifteen Key Bars totaled 75% of the index that year, while 28 sites were needed to attain 95% of the spatfall intensity index, placing it in the top statistical ranking notwithstanding having a lower spatfall index than 1997.

Another approach to understanding these skewed spatfall distributions examines the annual medians of the index. Medians are generally higher when there is a more uniform geographic distribution and are lower when the geographic distribution is limited in extent or skewed. In cases such as in 2019, where 60% of the Key Bars accounted for only 5% of the spat index, the median was low even though the index was moderate, reflecting the disparity between the majority of bars which experienced low to zero spatset and the few relatively productive bars. In years when spatset is more widely distributed, the annual median is much higher, such as in 1985, 1991, 2025, and to a lesser extent 2010, 2021, and 2023. In contrast, most of the years had more geographically restricted spatset distributions, dominated by a few strong recruitment bars. Again, this is most vividly illustrated in 1997, when despite having the highest spat index of the time series, the median for that year was comparatively low (e.g., half of the 2012 median, even though the 1997 spat index was over four times higher than the 2012 index), resulting in a poor median:spat index ratio. Understanding the geographic distribution of recruitment in these terms provides a clearer picture of this component of oyster population dynamics.

Oyster Disease Analyses

Representative samples of 30 oysters that were at least one year old were taken at each of 43 Disease Bar sites. An additional ten samples for disease diagnostics were collected from supplemental sites, sanctuaries, and other areas of special interest. Oyster parasite diagnostic tests were performed by Shellfish Health Project staff of the Cooperative Oxford Laboratory. Data reported for *Perkinsus marinus* (dermo disease) are from Ray's fluid thioglycolate medium (RFTM) assays of rectum tissues. Prior to 1999, less-sensitive hemolymph (blood) assays were performed. Data reported for *Haplosporidium nelsoni* (MSX disease) have been generated by histology since 1999. Before 1999, hemolymph cytology was the diagnostic method used for every sample, while solid tissue histology preparations were examined for *H. nelsoni* only from selected locations.

In this report, prevalence refers to the percentage of oysters in a sample that were infected by a specific pathogen, regardless of infection intensity. Infection intensity is calculated only for dermo disease, and categorically ranks the relative abundance of pathogen cells in analyzed oyster tissues from 0-7 (Calvo et al. 1996). Mean infection intensities are calculated for all oysters in a sample or larger group (e.g., Disease Bars set), including zeroes for uninfected oysters. A measure of infection intensity that weights the mean intensity by removing uninfected oysters from the computation (zeroes) is also calculated. For details of parasite diagnostic techniques and calculations, see Gieseke (2001) and MDNR (2018).

Biomass Index

Department of Natural Resources staff at the Cooperative Oxford Laboratory developed the size-weight relationships of oysters used in calculating the Biomass Index (Jordan et al. 2002). Oyster shells were measured in the longest dimension and the meats were removed, oven-dried, then weighed. Average dry-meat weights (dmw) were calculated for oysters in each 5-mm grouping used in the field measurements, and those standards have been used to calculate the annual Biomass Index from size-frequency data collected from Fall Survey field samples, as follows.

For each of the 43 disease monitoring stations, the number of small and market oysters (post-spat or 1+ year classes) in each 5-mm size class was multiplied by the average dry-meat weight for that size class to obtain the total weight for each size grouping (Eq. 1). These were summed to get the total dry-meat weight of a 1.0 bu sample (two 0.5 bu subsamples) from a disease monitoring bar (Eq. 2). The sum of dry-meat weights from the 43 disease monitoring stations, divided by 43, yielded an annual average biomass value from the previous year's survey (Eq. 3). These annual average biomass values were keyed to the biomass value for 1993. The Biomass Index was derived by dividing the year's average biomass value by the 1993 average biomass value (1993 Biomass Index = 1.0) (Eq. 4).

Note that the baseline data are from the 1993 Fall Survey. Prior to 2012, the Biomass Index year followed the year the data were actually collected, e.g., the 1994 baseline index was from the 1993 Fall Survey. To avoid the confusion this caused, in this report the biomass index refers to the year the data were collected (survey year). Therefore, the baseline index year is now 1993, since the data were collected during the 1993 Fall Survey, and the 2023 Biomass Index is derived from the 2023 Fall Survey data.

Biomass Equations

For **each** monitoring station:

$$\begin{aligned} (\# \text{ post-spat oysters per size class}) \times (\text{avg. dmw per size class}) &= \text{total dmw per size class [Eq. 1]} \\ \sum \text{ dmw per size class} &= \text{total dmw per 1.0 bu station sample [Eq. 2]} \end{aligned}$$

For **all** monitoring stations:

$$\begin{aligned} (\sum \text{ dmw per 1.0 bu station sample})/43 &= \text{annual average biomass value [Eq. 3]} \\ (\text{annual average biomass value})/(\text{1993 average biomass value}) &= \text{Biomass Index [Eq. 4]} \end{aligned}$$

Cultch Index

The collection of quantitative cultch data was initiated during the 2005 Fall Survey. During a sampling tow, the distance covered by the dredge while sampling on the bottom is measured using a handheld GPS unit with an odometer function. After the dredge is retrieved, the total volume of oysters and shell is measured in bushel units. Since tow distances vary, the volume is standardized to a 100 ft. tow by dividing the total cultch volume by the actual tow distance, which yields the volume per foot of tow distance, and multiplying the result by 100. In the past, if the dredge was full, that sample was dropped from the analysis. In more recent surveys, a full dredge sample is discarded and the tow is redone. The Cultch Index is calculated as the annual average of the standardized cultch volumes from the 53 Key Bars used in the Spat Index. Because the dredge is less than 100% efficient in catching oysters and shells, this is not an absolute measure of cultch but provides a relative index for temporal and spatial comparisons.

Harvest Records

Two data sources are used to estimate seasonal oyster harvests: dealer reports (also called buy tickets) and harvester reports. The volume of oysters in Maryland bushels caught each day by each license holder is reported to MDNR on both forms. Dealer reports are submitted weekly by licensed dealers who buy oysters directly from harvesters on the day of catch. Reported on each buy ticket is the catch per day along with effort information, gear type, and location of catch. Both the dealer and the harvester must sign the buy ticket and include their license numbers. Each dealer is also responsible for paying a two-dollar tax on each bushel purchased and an additional one-dollar tax on each bushel exported out of state. These funds are used to plant substrate and oysters back on public fishery bars. Harvester reports are submitted monthly by each license holder authorized to catch oysters and include the catch each day along with effort information, gear type, and location of catch.

Buy ticket records are available from 1989 to present and harvester reports are available from 2009 to present. Although the area or river system was often recorded on buy tickets for much of the time series, the completeness of oyster bar and gear information is much more variable. Generally, harvester reports are more complete with regard to gear type and oyster bar name. Due to the longer time series available from the buy ticket record, this is the standard data source for long-term trends in harvest. However, for applications where gear or oyster bar name is considered critical, the harvester report data source is frequently used instead.



Catch of red-beard sponge in Tangier Sound. (Photo: R. Bussell)



RESULTS

FRESHWATER DISCHARGE CONDITIONS

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

Annual Streamflow

Note that the USGS reports refer to *water* years, which run from 1 October of the previous year to 30 September of the reporting year (USGS 2025). In contrast, this report refers to the *calendar* year.

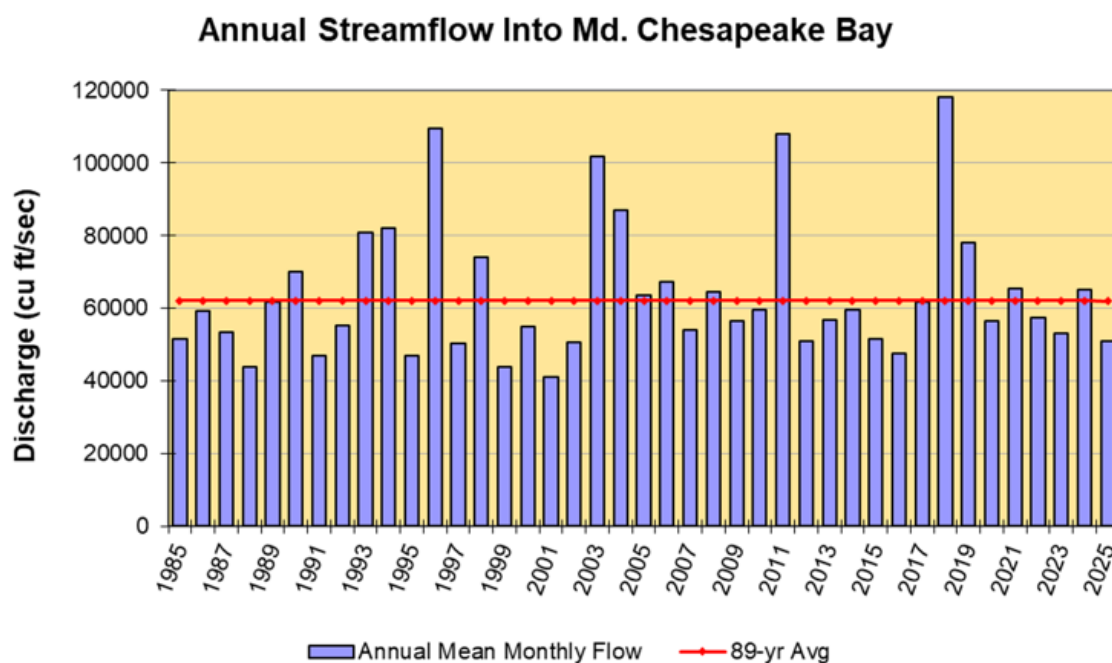


Figure 2a. Annual mean monthly freshwater flow into Chesapeake Bay, 1985-2025. USGS Section C: all Maryland tributaries and the Potomac River. Data courtesy of USGS.

According to the U.S. Geological Survey (USGS 2025), the annual average freshwater flow into the Maryland portion of the Bay (Sec. “C” in Bue 1968) in 2025 was on the low end of the normal range at 82% of the long-term average (Figure 2a).

Monthly Streamflow

Even though the average annual streamflow was lower than normal, the average monthly flows were above the long-term average during May through July. Consequently, salinities fell during the mid-year period from June through August, a critical period for disease development. The remainder of the months had flows well below their 89-year averages and salinities rebounded. By September the salinities had risen to the extent that 15 ppt, a critical threshold above which MSX disease can cause extensive mortalities in oyster populations, was exceeded in most of the

mainstem up to the Bay Bridge. The Swan Point station in the upper Bay had record high salinities for the months of November and December.

The monthly freshwater discharges in 2025 had three periods of extremes (Figure 2b). Nine months experienced streamflows well below the long-term average: four months during the winter/spring and five months in late summer/autumn. Streamflows were below their respective 89-year averages during the winter through the spring, especially in January, averaging 60% of the long-term mean for those four months (Figure 2b). Between May and July, freshwater discharges increased, averaging 172% of the mean. May was an especially high flow month, almost double its long-term mean. Afterwards began a drought period lasting the remainder of the year, with flows between August and December averaging only 53% of the long-term mean. Thus, low flow during the nine months, when averaged with the three high-flow months, resulted in what was categorized as a normal year. The timing and extent of these varying freshwater discharge periods, had profound implications for the oyster populations in Maryland.

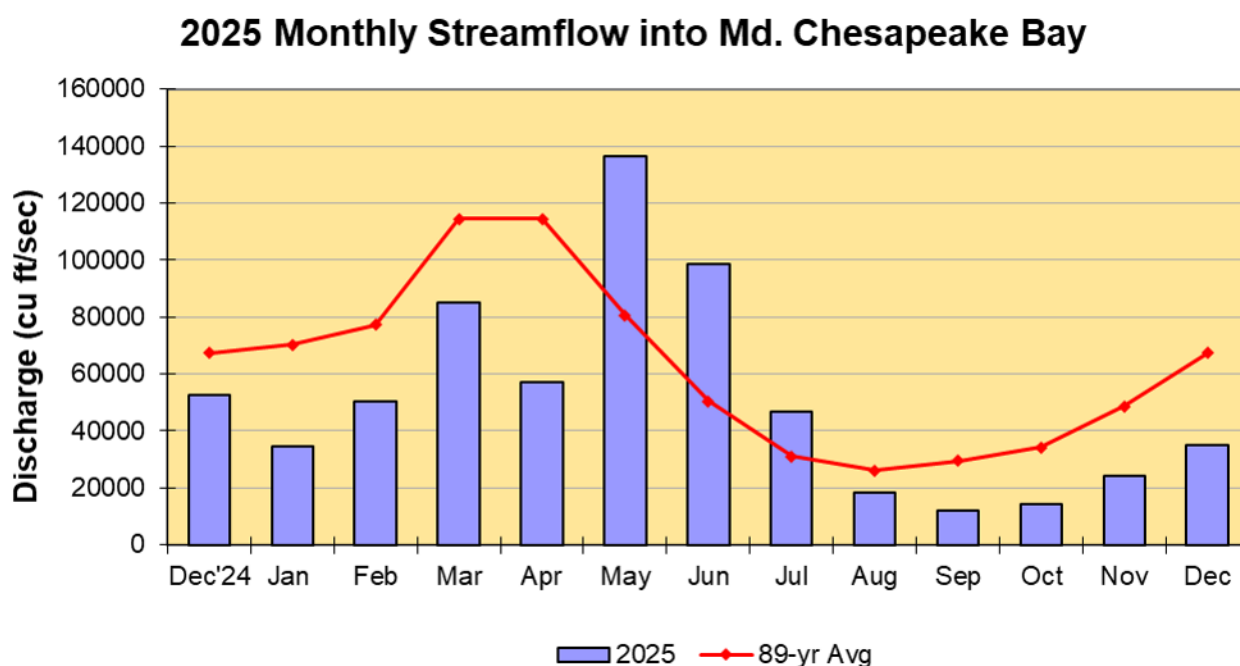


Figure 2b. Monthly average freshwater flow into Chesapeake Bay (Section C) during 2025, including the 89-yr monthly average. Data courtesy of USGS.

Salinities

Monthly surface salinities for four regions of the Chesapeake Bay in Maryland and one location in the Potomac River are compared in Figure 2c (Chesapeake Bay Program). Note that surface salinity tends to be lower than bottom salinity, depending on water depth, freshwater input, and water column stratification. The upper bay oyster grounds tend to have larger differences between surface and bottom salinities due to proximal freshwater input at the surface and the tidal intrusion of saltier water at the bottom.

The dominant environmental condition of 2025 was drought, which raised salinities above normal throughout the bay, in some cases to record high levels. Long-term maximum salinity records at the four representative Chesapeake Bay sites were broken on four occasions, as

indicated by an asterisk above the bar (Figure 2c). All but one of the months at the Tangier Sound station had surface salinities higher than 15 ppt, a critical threshold above which MSX disease can cause extensive mortalities in oyster populations. By November the salinities had risen sharply to the extent that the 15 ppt MSX threshold was exceeded in the mainstem as far upbay as the Bay Bridge (Chesapeake Bay Program). The Swan Point station in the upper bay had record high salinities for the months of November and December approaching 15 ppt - extraordinary for this region. Three years are presented for the Potomac River to show the effects of a low flow year (2023), a higher flow year (2024), and a year with fluctuating flows (2025).

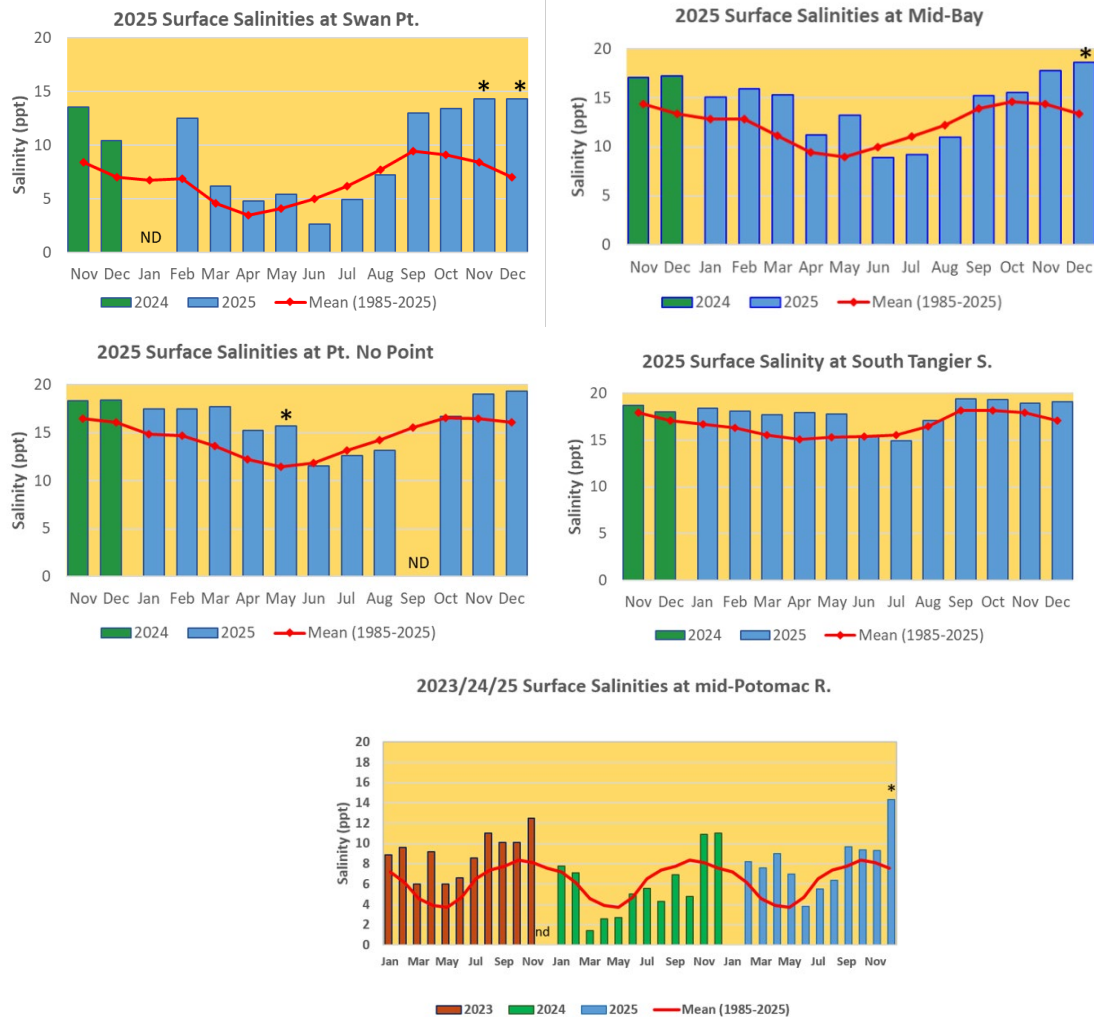


Figure 2c. Monthly surface salinities during Nov/Dec 2024 and 2025 at four monitoring stations along a salinity gradient in Chesapeake Bay and from 2023 to 2025 at one station in the Potomac River. *Swan Pt. (CB3.2) is in the upper bay, the mid-bay station (CB4.2C) is off the mouth of the Choptank R., Pt. No Point (CB5.2) is in the lower mainstem, and the southern Tangier Sound station (EE3.2) is near the Virginia state line. The Potomac River station (RET2.4) is located at the Route 301 bridge crossing at Morgantown. Sampling was not conducted in months indicated by ND. * Record maximum monthly salinity.*



SPATFALL INTENSITY

Salinities were at levels that enabled an exceptional spatset in 2025. The spat index of 250 spat/bu. was the second highest in the 41-year time series. This was a ten-fold increase over the long-term median of the Indexes and the sixth consecutive year this reference has been surpassed. Ten of the last 16 years have had above-median spat indexes, five of which can be considered exceptional (about two to nine times higher than the long-term median) (Figure 3b). Equally important as the index is how geographically extensive the spatset was. The median of the spatset is an indicator of the distribution of spat – the larger the median, the more widely distributed is the spatset. The spat were widely distributed, as indicated by the second-highest annual median score of the spat index bars over that time period - 102 spat/bu, compared with the long-term average of the medians of 14.3 spat/bu. In contrast, while the spat index in 1997 was the highest in the time series at 277 spat/bu, the median was only 8 spat/bu, reflecting the narrow distribution of high spat counts.

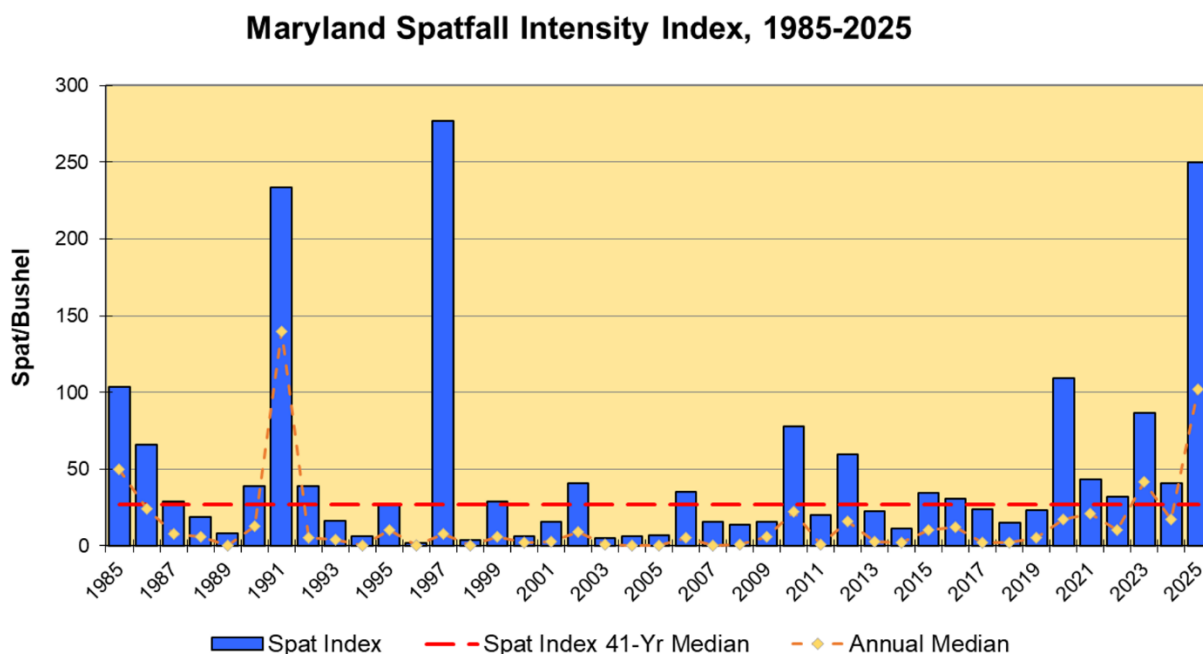


Figure 3a. Spatfall intensity (spat per bushel of cultch) on Maryland “Key Bars” for spat monitoring, including annual median values.

Spat were observed on 50 of the 53 Key Bars, the second highest number of bars with spat since 1985 ([Table 2](#)). As indicated by the spatfall median:spat index ratio, spatfall was the sixth most equitably distributed in the 41-year time series (Figure 3c). An experimental crushed concrete planting in Harris Creek produced 2,100 spat/bu, and an adjacent *C. gigas* (Pacific oyster) shell planting resulted in a 2,000 spat/bu count.

The spat total from only three bars accounted for 50% of the index, compared with seven bars in 2024 and ten bars in 2023; furthermore, in 2025, 30 index bars contributed to 95% of the spat index, down from 31 bars in 2024 and 34 bars in 2023. The remaining 23 bars comprised just 5% of the spat index, but averaged an impressive 26.7 spat/bu, equaling the long-term median of spat indexes. In contrast, the bottom 5% of index bars in 2024 averaged 4.8 spat/bu, even that a respectable number in areas that ordinarily don’t receive much if any spat. As in previous years, Deep Neck bar in Broad Creek had the highest count of the index bars with 3,658 spat/bu, or 27.6% of the entire 2025 spat index.

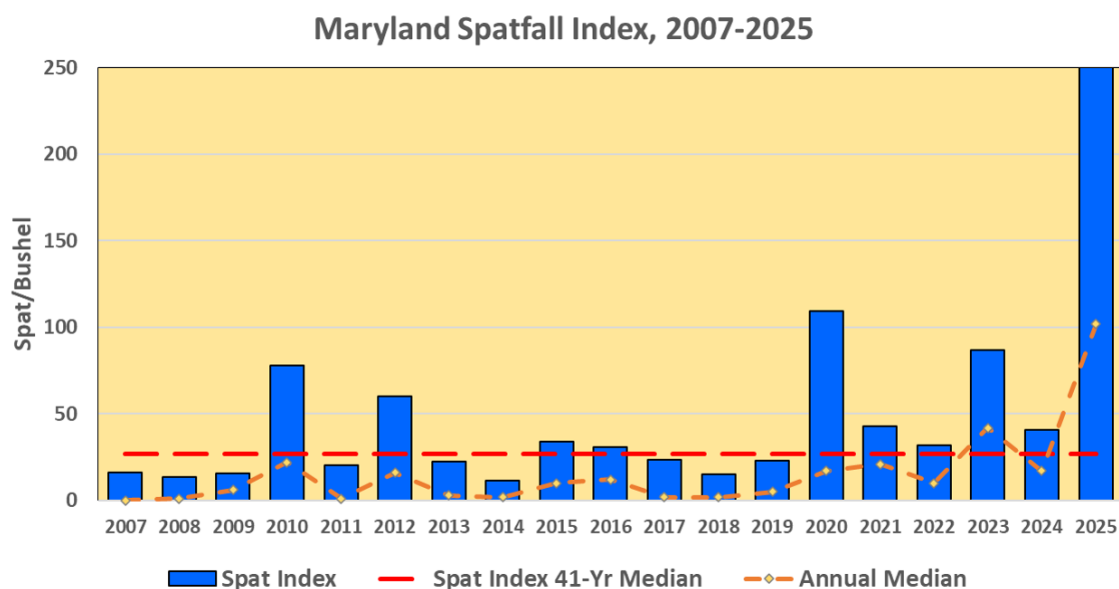


Figure 3b. Recent Maryland spatfall indices, 2007-2025, including annual and long-term median values.

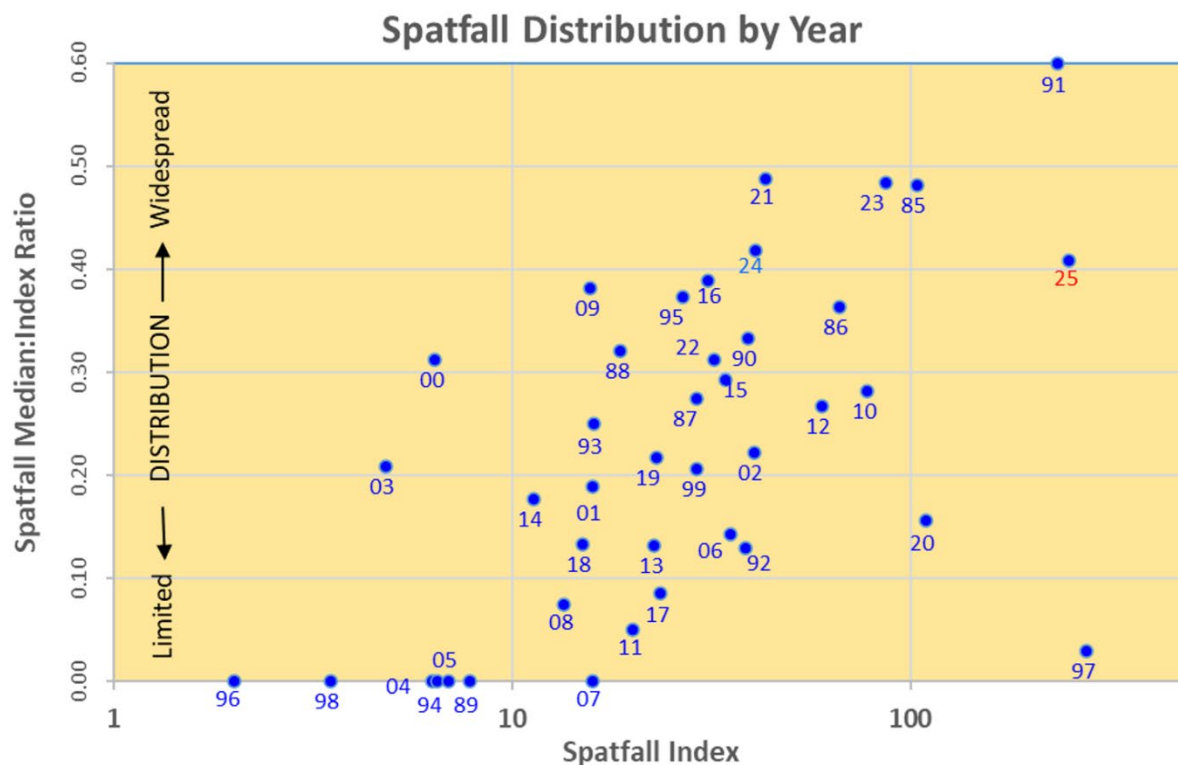


Figure 3c. Spatfall median:index ratios for the years 1985 to 2025 as denoted by “85” to “25” on the chart. The ratio integrates the geographic and numerical distributions of spat for a given year. A lower ratio indicates that the spat counts are concentrated on fewer index bars, while a higher ratio indicates the numerical distribution of spat is more evenly spread among the index bars.

When considering all bars surveyed in addition to the Key Bars, elevated recruitment was observed throughout the Eastern Shore and its tributaries as far north as the Bay Bridge, as well as the lower portion of the Potomac River (Figure 4). A small number of spat were even observed at several stations above the Bay Bridge as far north as Man-O-War Shoals – a rare occurrence.

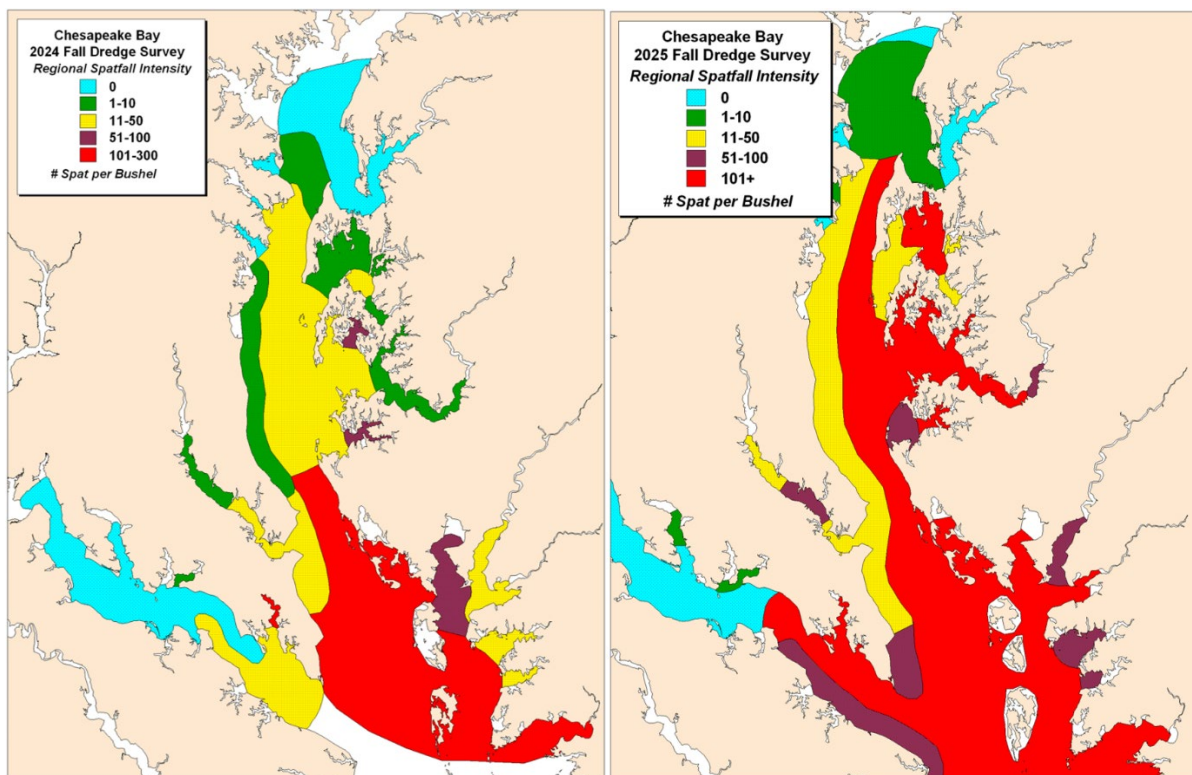


Figure 4a. Oyster spatfall intensity and distribution in Maryland, 2024 vs. 2025. Intensity ranges represent regional averages.

High counts of over 1,000 spat/bu were on fifteen bars in the Choptank region (nine on Broad Creek alone) (Figure 4b) and two bars in the St. Marys River. Broad Creek led all regions in counts, averaging 1,565 spat/bu, followed by Harris Creek with 852 spat/bu, and St. Marys River with 566 spat/bu. Twelve other regions had recruitment averages greater than 100 spat/bu. Although spat were not observed in the upper two-thirds of the Potomac River, the numerous small oysters from the 2023 spatset on the upper bars appear to have survived the low salinity episode in June (Figure 2c); no mortality was observed although growth was stunted on Waterloo, the uppermost bar. The only other regions where no spat were found were a portion of the bay north of the Bay Bridge and the upper Chester River. The highest spat count in an individual sample was 3,658 spat/bu on Deep Neck, followed by 3,611 spat/bu on a *C. gigas* shell planting on Mulberry Point, both in Broad Creek.

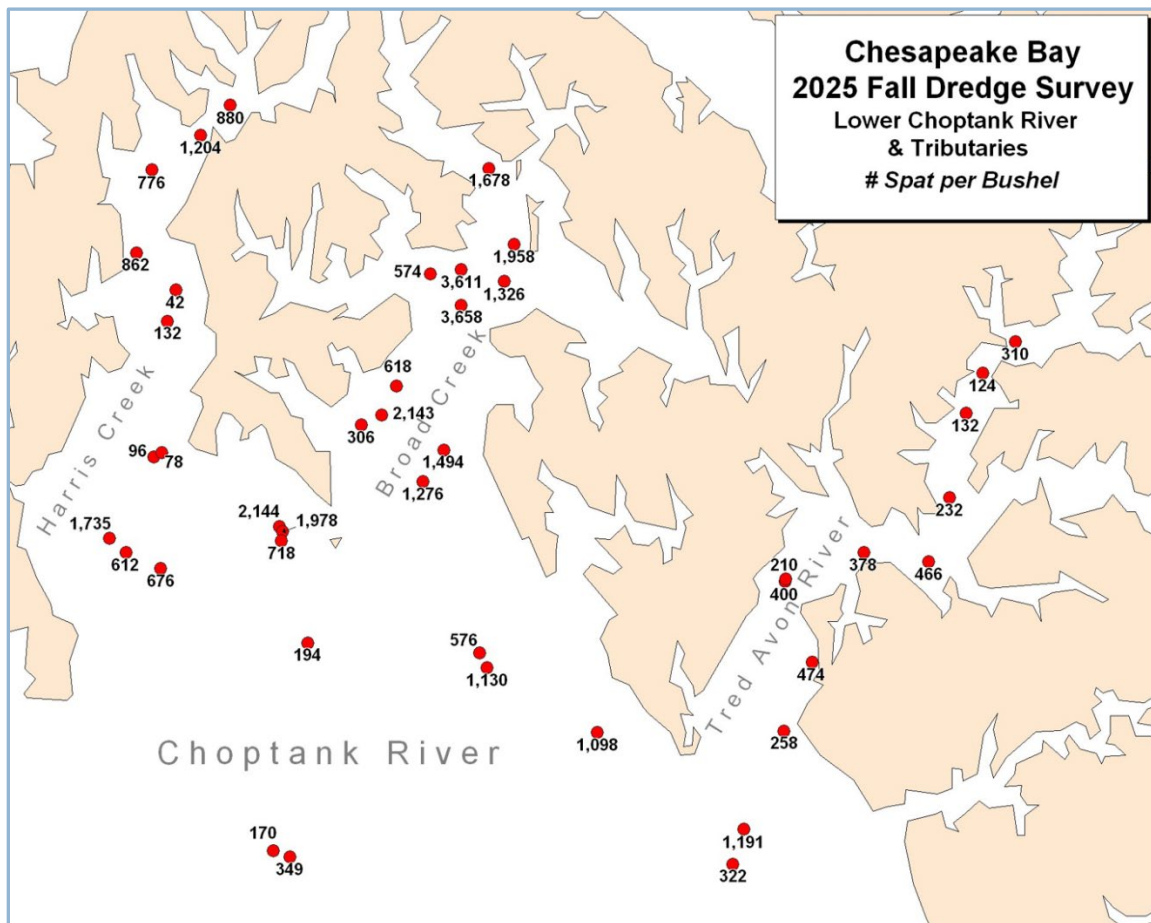


Figure 4b. Spat counts/bu in the lower Choptank River and tributaries were the highest of any region, followed by the St. Marys River.

Alternative materials plantings on several bars received enhanced spatset compared to adjacent natural areas (Figure 4c). Crushed concrete is generally an effective cultch for spatset, although timing of planting and within bar site selection is important for success. The 2025 Flat Rock planting in Pocomoke Sound may have occurred too late to catch the primary spatset.

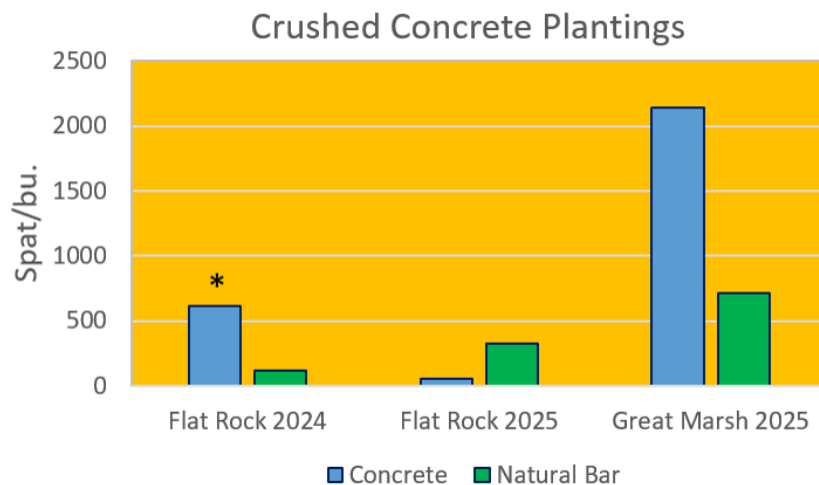


Figure 4c. Spat counts on crushed concrete plantings compared to adjacent natural areas. Asterisk indicates highest spat count of all bars in 2024.



Spat on crushed concrete-Great Marsh bar (L) and *C. gigas* shell-Mulberry Pt. bar (R)
(Photos: S. Greenberg)

C. gigas (Pacific oyster) shell is effective as cultch for spat settlement (Figure 4d). The Mulberry Point *C. gigas* shell planting had the second highest spatset pf the survey. Regardless of whether it is native or *C. gigas* shell, there is much higher spatset on clean shell than existing cultch.

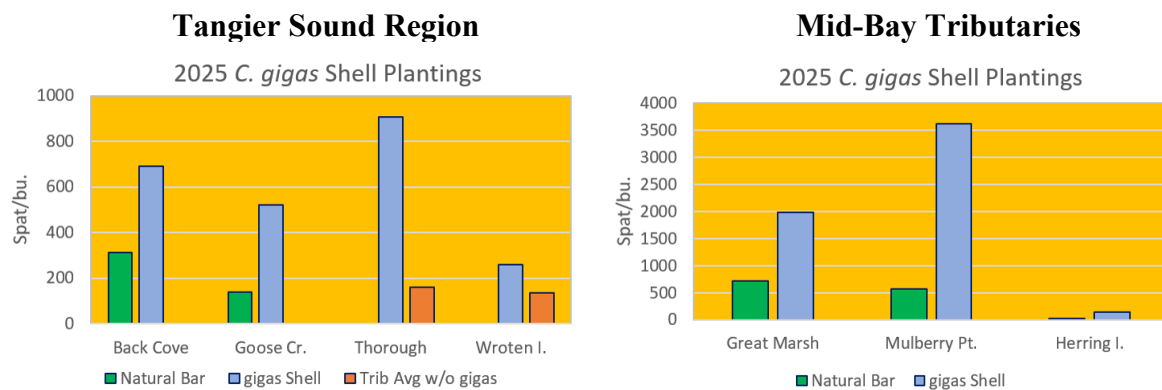


Figure 4d. Spat counts on *C. gigas* shell plantings compared to adjacent natural areas or tributary averages. Note the difference in scale on the x-axis between regions.



OYSTER DISEASES

A total of 1,590 oysters were analyzed for diseases in 2024 – 1,290 from the 43 Disease Bars (sentinel bars) and 300 from ten supplemental sites.

Dermo disease is caused by the parasite *Perkinsus marinus*. Prevalences and intensities wax and wane seasonally, and infections may persist from year to year before oysters die from the disease. Over several years of drought during the 1980s, *P. marinus* expanded its Chesapeake Bay distribution into upstream areas where previously it had been rare or absent and has remained widespread throughout Maryland ever since.

Disease levels continue to recede. Dermo **disease prevalence** on the 43 Disease Bars was the fifth lowest on record, decreasing to 39.1% in 2025 from 45.3% in the preceding year ([Table 3](#)). Consequently, the 2025 prevalence was under the 36-year average prevalence of 61.5% (Figure 5), marking the nineteenth of the last 23 years that dermo disease mean prevalences have been below the long-term average since the record high epizootics at the turn of the millennium. From 2019 to 2021, the percentage of individual infected oysters were the lowest on record, but in 2022 and 2023 the overall mean infection prevalence in oysters sampled on the Disease Bars had increased substantially, so the 2025 results were a welcome reversal. The disease was found throughout most of the bay and tributaries, being detected in oysters on 93% of the Disease Bars and supplemental sites (Figure 6). This is in contrast to 2020 when it was found at 84% of the bars, the lowest frequency since the 43-bar sentinel subset was standardized in 1990.

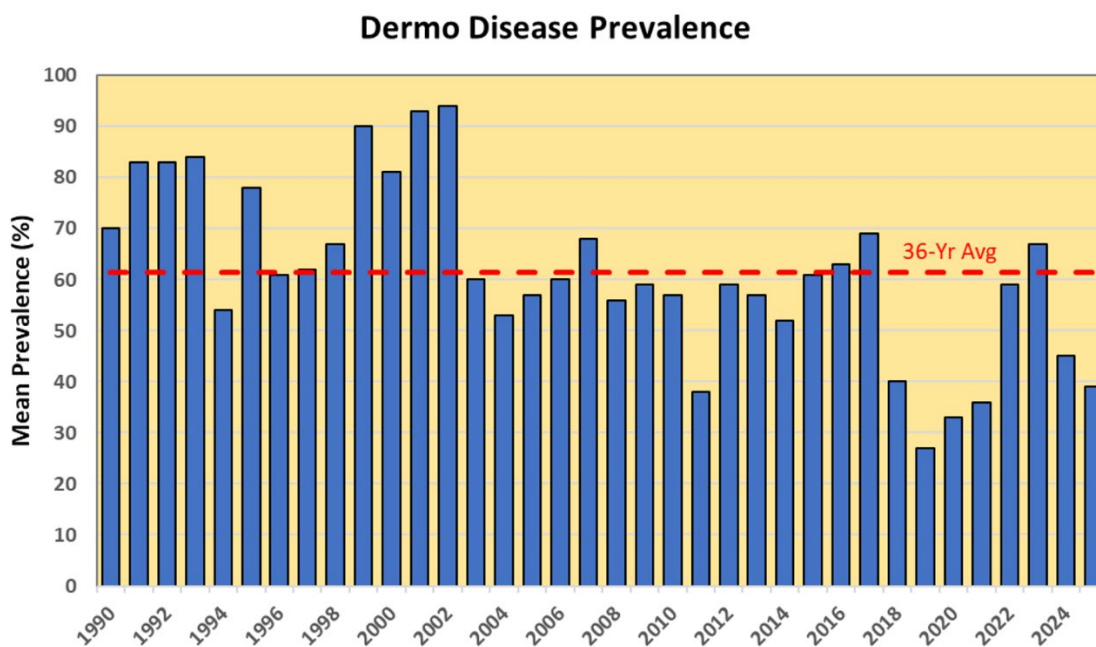


Figure 5. Annual mean *P. marinus* prevalences from Maryland disease monitoring bars.

The number of samples exhibiting high prevalences (>60%) had increased substantially over a four year period from 19% of the Disease Bars in 2020 to 67% 2023, but dropped back to 37% in 2024 and 23% in 2025. (Table 3, Figure 6). The distribution of elevated dermo prevalences was largely confined to the Eastern Shore in the southern portion of the bay. In comparison, the Western Shore had a wider distribution of high prevalences in 2024 (Figure 6).

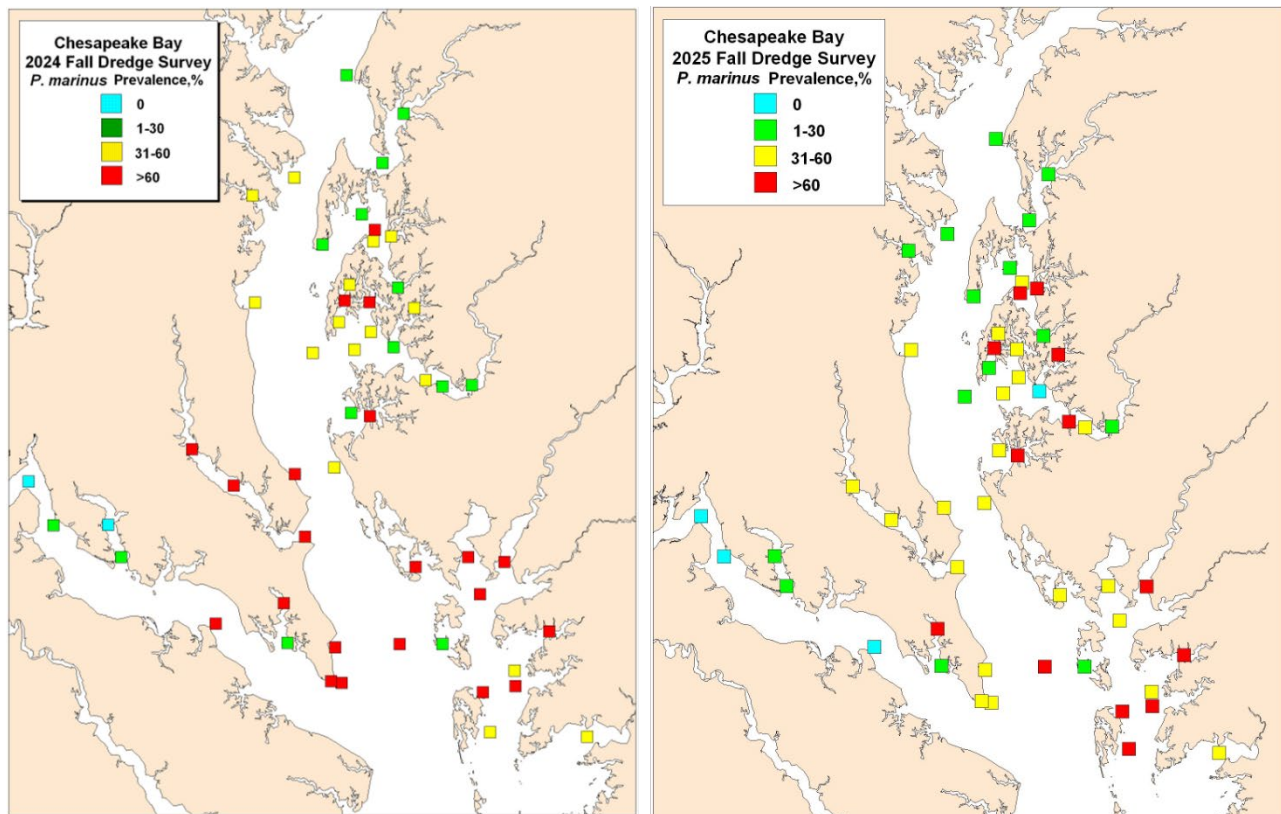


Figure 6. Geographic extent and prevalence of dermo disease in all disease samples, 2024 vs. 2025.

Outside of the sentinel disease monitoring sites, dermo disease was found at nine of the ten supplemental sites, with prevalences greater than 60% at three of the bars, compared to five bars in 2024 and eight bars in 2023. Dermo disease was not detected at Beacon bar in the upper Potomac River. The supplemental bar furthest upstream in the mainstem, Deep Shoal (Figure 1c), once again was not sampled for disease in 2024 because of low densities of oysters due to freshet-related mortalities in 2018/19.

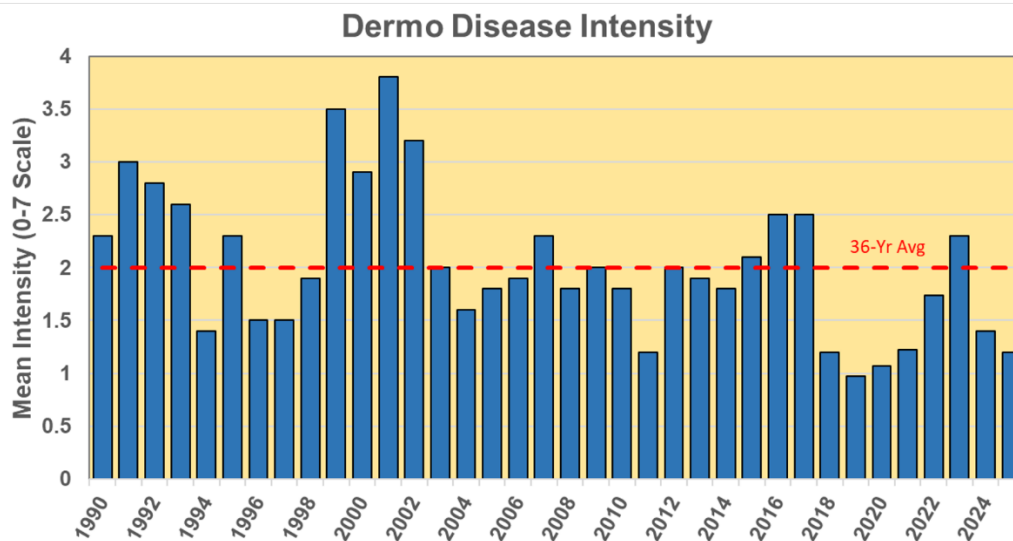


Figure 7. Annual *P. marinus* infection intensities on a scale of 0-7 in oysters from Maryland disease monitoring bars.

The mean **infection intensity** for dermo disease in 2025 was tied for the third-lowest of the time series, falling below the long-term average for the eighteenth time in the 23 years following the millennial epizootic (Figure 7). The 2025 mean infection intensity (1.19 on a 0-7 scale) was almost half of the most recent peak in 2023 (2.28) (Table 3). The average infection intensity over the 23 years since the end of the 1999-2002 drought is 1.7. In comparison, the annual infection intensities during this drought period averaged 3.4, which contributed to historically high mortalities.

The 2025 frequency distributions of sample mean infection intensities on the Disease Bars remained low in the uppermost range (Figure 8). Only one of the sentinel bars (2%) had a mean intensity in the high range (3.0 or greater), compared to 17 bars (40%) in 2023. The proportion of bars that were in the lowest intensity categories of zero and less than 1.0 rose slightly to 17% in 2025. Meanwhile, the highest proportion of bars were in the moderate intensity (1.0 to <3.0) range at 58%. This large reservoir of moderate intensity oysters can potentially shift to the problematic high intensity category given the right environmental conditions. None of the ten supplemental bars had mean infection intensities of 3.0 or greater in 2025 (Figure 9). For perspective, over the last two decades dermo disease intensities for the entire population have remained much lower than during the millennial epizootic. During the peak infection intensity year of 2001, 81% of the sentinel bars had dermo disease mean intensities equal to or greater than 3.0 and 51% had intensities equal to or greater than 4.0.

Infection intensities in individual oysters that are ≥ 5.0 on a 0–7 scale are considered lethal; such infection intensities were found in at least one oyster at 74% of the sentinel sites in 2025, slightly lower than in 2024. Lethal infections as a percentage of all oysters sampled from sentinel and supplemental bars were detected in 10% of individual oysters in 2025, less than half of the 25% lethal prevalence during the elevated dermo disease year of 2023.

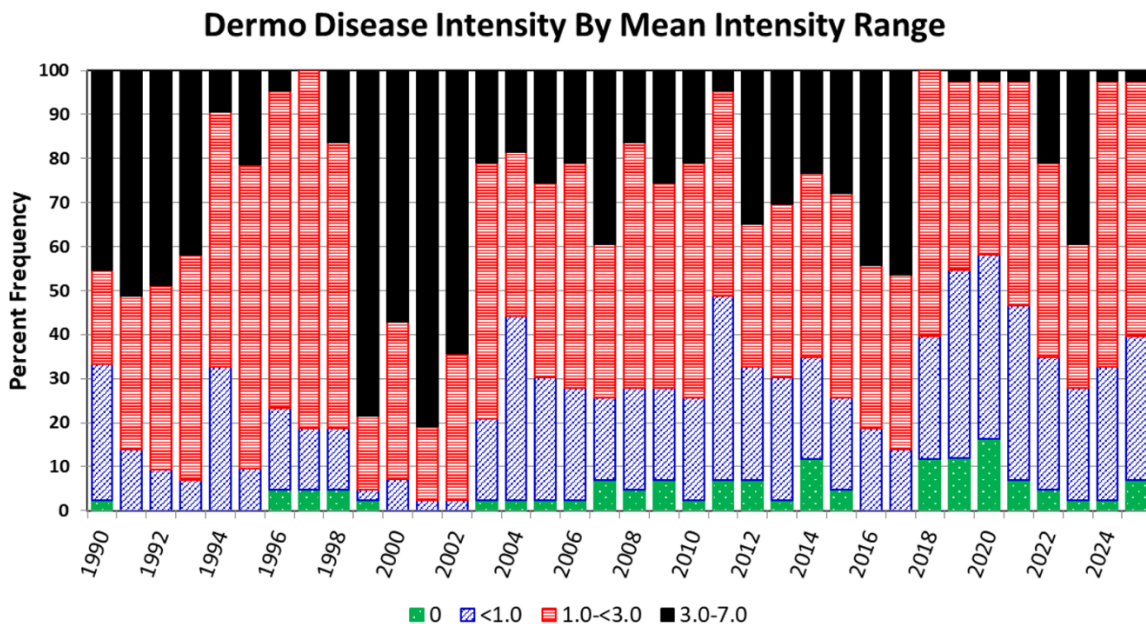


Figure 8. *Perkinsus marinus* infection intensity ranges (percent frequency by range and year) in oysters from Maryland disease monitoring bars.

The two-year shift between 2023 and 2025 in the geographic distribution of intensity ranges for both Disease Bars and supplemental sites is shown in Figure 8a. In 2025, the highest intensity category was seen at only one site in the Miles River. In contrast, the highest intensity sites were much more numerous and widely distributed in 2023. The majority of the highest intensities that year were detected in southern Maryland as far north as the Choptank River and noticeably in several of the tributaries. On the Western Shore in particular, high intensities reached all the way up to the mid-Patuxent River and the Potomac River to the western Wicomico River. These had largely shifted to the moderate category by 2025.

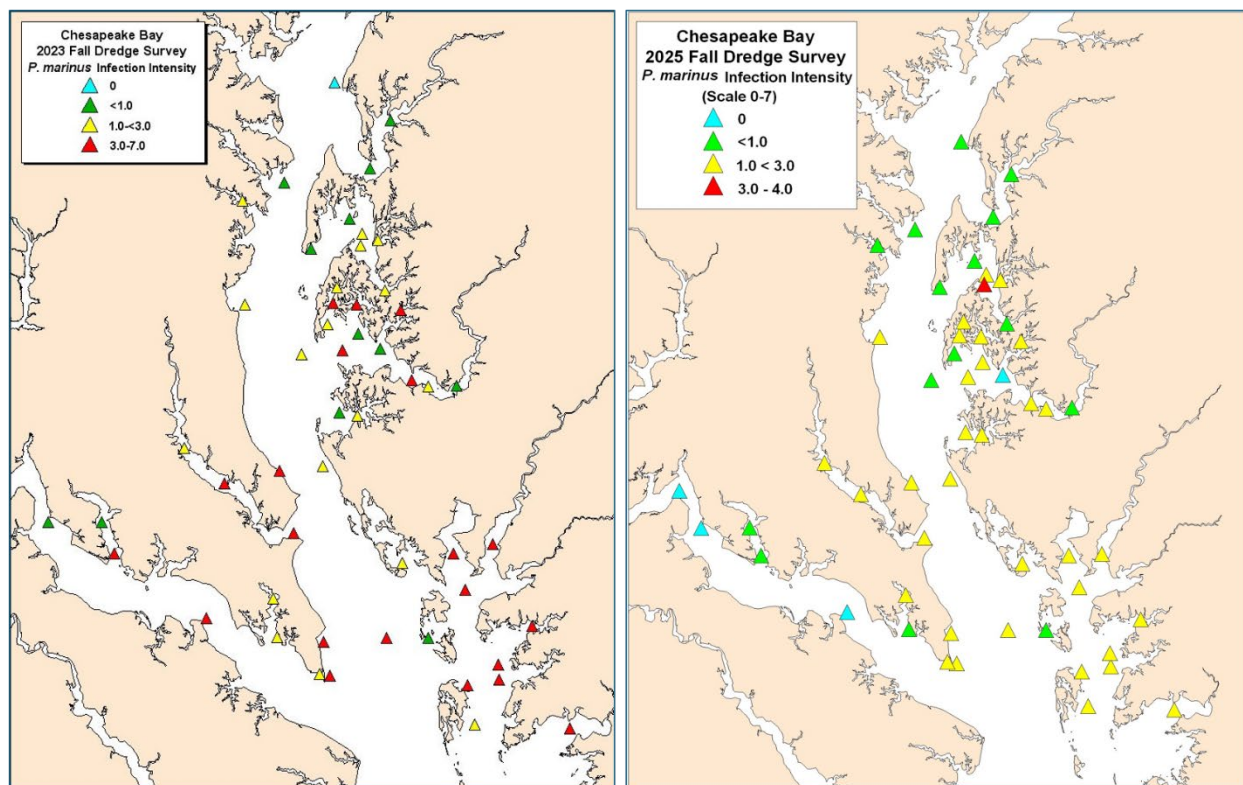


Figure 8a. Two-year shift in geographic distribution of *P. marinus* infection intensity ranges in all disease samples, 2023 vs. 2025. Intensity distributions were similar between 2024 and 2025.

MSX disease, resulting from the parasite *Haplosporidium nelsoni*, is another potentially devastating oyster disease. This parasite can cause rapid mortality in oysters and generally kills a wide range of year classes, including younger oysters, over a long seasonal period. When MSX disease coincides with elevated dermo disease intensities, mortality levels can be extremely high, as seen in 2001 and 2002. In Chesapeake Bay, MSX disease is most active in higher salinity waters (>15 ppt) (Appendix 2).

The prevalence of MSX disease on the Disease Bars remained at low levels in 2025. The mean prevalence index of infected oysters was 0.6%, the same as the previous year. (Table 4, Figure 9). Prevalences on individual Disease Bars where MSX was detected ranged from 3% to 13%, compared to a peak prevalence of 93% in 2023, which was the highest recorded prevalence for an individual bar in the 36-year time series. Eight of the last nine years have had prevalence indexes well below the long-term average of 5.4%, three of which were record lows.

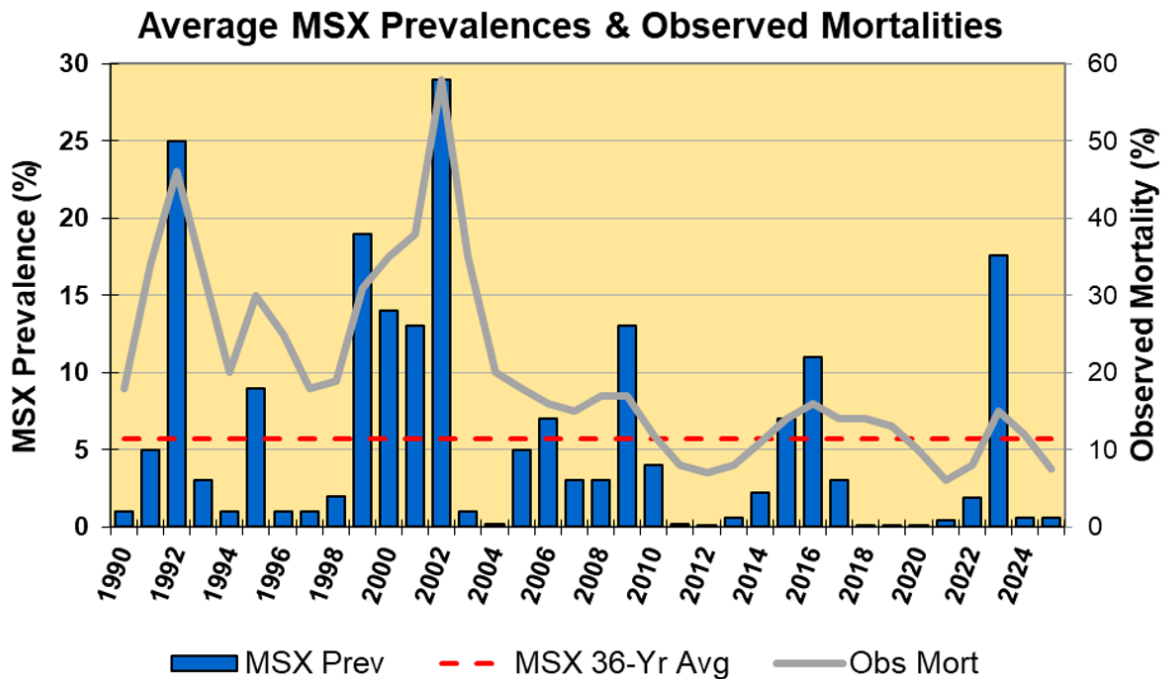


Figure 9. Annual percentage of Maryland oysters with MSX disease compared to 36-year mean and the correlation with observed mortalities on the disease monitoring bars from 1990 to 2025.

Despite salinities that were above 15 ppt in many bay segments, the geographic extent of MSX remained confined the lower bay (Figure 10). However, the restricted distribution of the disease may have resulted from salinities below 15 ppt during the summer months from the mid-bay northward. The frequency of positive Disease Bars was four bars (9%) (Table 4). MSX was also detected on three of the ten supplemental disease sites, with the highest prevalence of only 7% on Point Lookout in the western lower mainstem. For reference, at its greatest extent the parasite occurred on 90% of the examined bars in 2002.

Historically, the abatement of MSX disease in 2003-2004, due to two consecutive years of greatly elevated freshwater flows into the bay, signified the end of the most severe *H. nelsoni* epizootic on record in Maryland waters. The 2002 epizootic set record high levels for both the frequency of affected disease monitoring bars (90%) and the mean annual prevalence within the oyster populations (28%), leaving in its wake observed oyster mortalities approaching 60% statewide in conjunction with dermo disease. Since 1990, there have been six *H. nelsoni* epizootics: 1992, 1995, 1999-2002, 2009, 2015-16, and 2023. The first three were associated with prominent spikes in observed mortalities (Figure 9), while the 2009 and 2016 outbreaks were accompanied by modest mortality increases that were ameliorated by timely freshwater flows (Tarnowski 2011, 2018). Although elevated salinities persisted throughout 2023 and the MSX average prevalence was above normal, the Mortality Index was below the long-term average (Figure 11). All of these epizootics coincided with dry years (Figure 2a) and consequent elevated salinities. These were followed closely by periods of unusually high freshwater inputs into parts of Chesapeake Bay, which purged *H. nelsoni* infections from most Maryland oyster populations (MDNR 2001; Tarnowski 2005, 2011). The recent six-year period (2017-2022) of greatly diminished *H. nelsoni* infections is associated with the extraordinarily high streamflows of 2018 and 2019, followed by a return to normal flows (Figure 2a). This pattern repeated in

2024, with winter/spring freshets and high mid-year flows in 2025 resulting in the reduction of MSX disease.

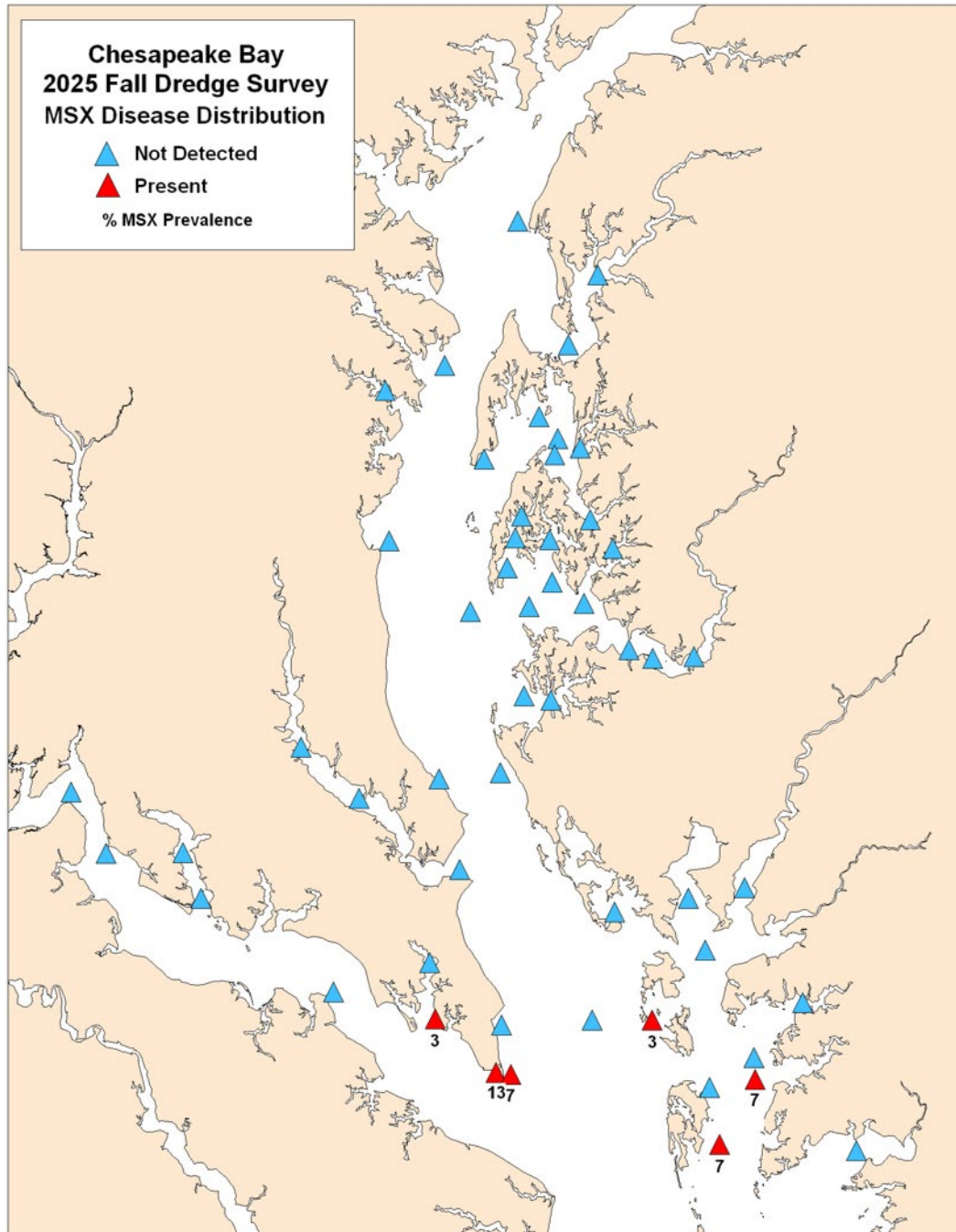


Figure 10. Geographic distribution and prevalence of MSX disease in Maryland waters in 2025, illustrating the limited extent and low levels of the disease despite generally favorable salinities in the lower half of the bay. This may have resulted from the mid-year freshet which temporarily lowered salinities under 15 ppt in the upper half of the bay.



OBSERVED MORTALITY

At 7.6%, the 2025 Observed Mortality Index was the third lowest in the 41-year time series, dropping by 34% from 2024 ([Table 5](#)). The 2025 mortality index marks the 22nd consecutive year that mortalities were below the long-term mean of 20.5% (Figure 11), largely as a consequence of low to moderate disease pressure during that time period. From 2010 to 2025, the average observed mortality of 11.1% approaches the background mortality levels of 10% or less found prior to the mid-1980s disease epizootics (MDNR, unpubl. data). This is in remarkable contrast to 2002 when record-high disease levels devastated Maryland populations, resulting in a 58% observed mortality rate.

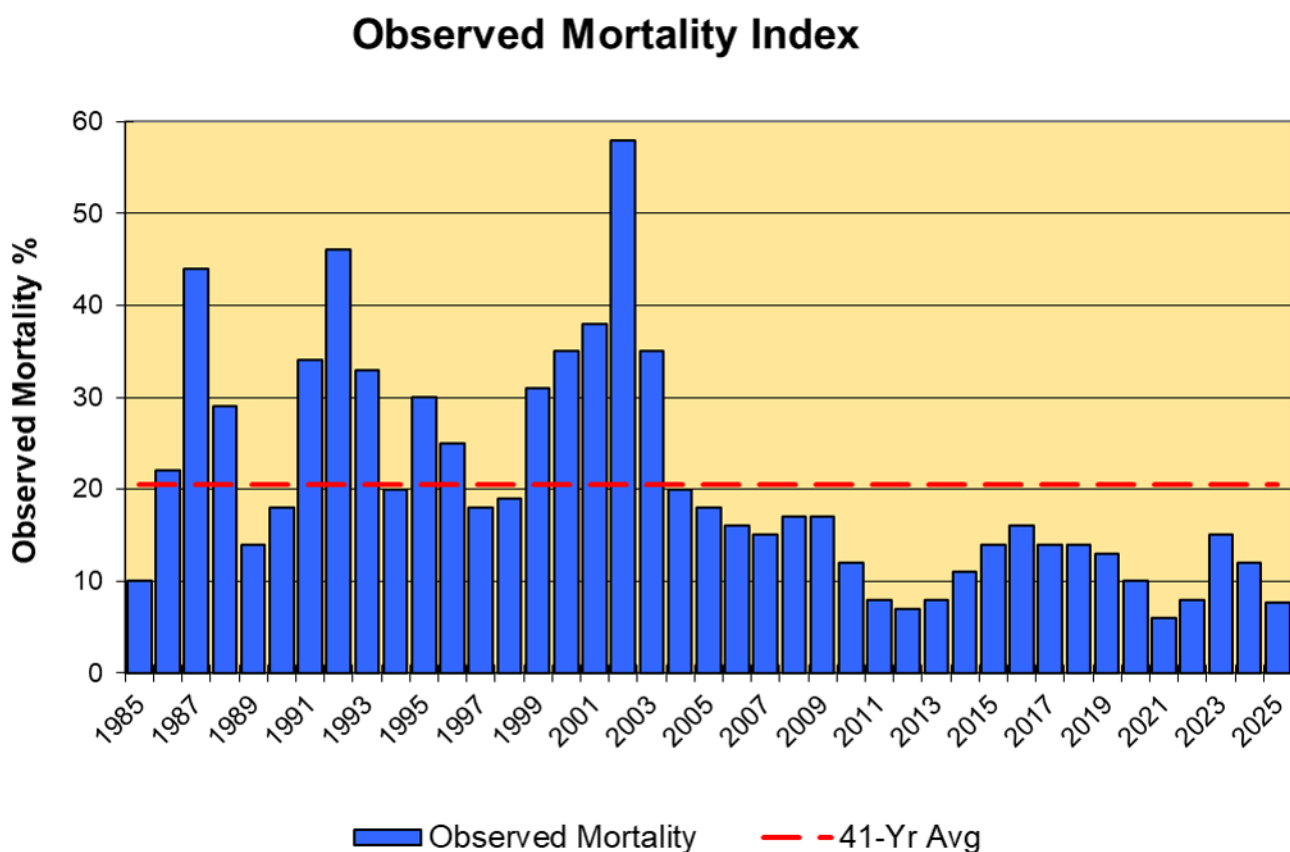


Figure 11. Mean annual observed mortality, small and market oysters combined.

Looking at all Fall Survey sites, regional observed mortalities were generally low throughout the bay and tributaries, with the moderate to high mortality categories receding from the previous peak in 2023 (Figure 12). Tangier Sound, typically a higher mortality area, averaged 11.0%, less than half of the 2023 average of 24.8%. For reference, the Tangier Sound observed mortalities at the start of the millennial epizootic in 1999 had an average mortality of 48.0%. The highest index bar mortality on bars with 40 or more small and market oysters was observed on Ragged Point (29.0%) in the Little Choptank River, the third year in a row it ranked in the top two, followed by Georges (24.1%) in the Manokin River ([Table 5](#)). For non-index bars with 40 or more oysters older than one year, the highest observed mortalities were seen on Tilghman Pt. (84.5%) in Eastern Bay and Applegarth (47.6%) at the mouth of the Honga River. Both of these sites are in deeper water (23-24 ft.) that could have been impacted by low dissolved oxygen levels. Long

Point in the Miles River had 52% mortality, but the depth was only 13 ft. Interestingly, no mortality was observed on another site on Long Point bar.

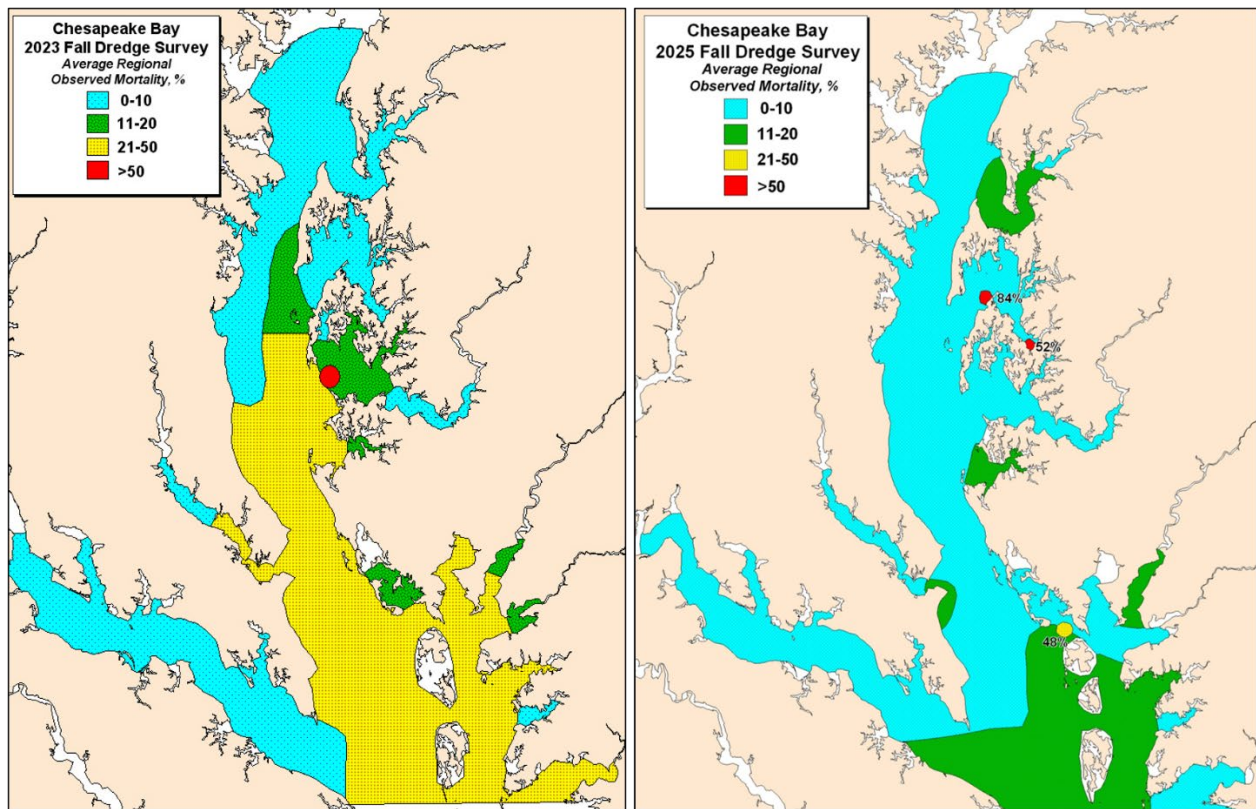


Figure 12. Geographic distribution of total observed oyster mortalities (small and market oysters) in Maryland, from the last mortality peak in 2023 vs. 2025. Mortality ranges represent regional averages of all Fall Survey sites; individual bars may vary substantially. Percent figures are at sites with the highest observed mortalities in 2025: Tilghman Point (84%), Long Point (52%), and Applegarth (48%).



BIOMASS INDEX

The Biomass Index is a relative measure of how the oyster population is doing over time. It accounts for recruitment, individual growth, natural mortality, and harvesting in a single metric. In assessing the size of the population, the Biomass Index integrates both the abundance of oysters and their collective body weight (another way of looking at how large they are). For example, when examining two groups of oysters with the same abundance, the group with the greater number of larger oysters would have the higher biomass.

The combination of favorable recruitment, individual growth, and low natural mortality over the past few years has resulted in the highest Biomass Index of the 33-year record (Figure 13). The 2025 biomass index of 2.78 was an increase of 19.8% from the 2024 index of 2.32 and represents a gain of 89% over the long-term average. While prior to 2025 the index had trended downward slightly from the previous peak index in 2021, the indexes over the most recent five years have been the highest in the time-series. Twelve of the last fourteen years have had biomass indexes above the 33-year mean.

In 2025, the size distribution of index bars slightly favored market oysters at a ratio of 0.89 sublegals to one market oyster. In contrast, the ratio was heavily weighted toward sublegal oysters at a proportion of 1.70 sublegals to one market oyster in 2024. This can also be expressed as the percentage of sublegal oysters: 46.0% in 2025, reduced from 63.0% in 2024. This shift is reflected in the increase in average size of index bar oysters, from 70.5 mm in 2024 to 77.6 mm in 2025. Consequently, the increase in the average oyster size contributed to an increase in biomass. In addition, the second component of the Biomass Index, oyster abundance, showed an increase. For all index bars, the average number of oysters per one bushel sample rose modestly from 156.7 in 2024 to 161.3 in 2025. The large influx in the number of small oysters and their growth into the market category was due to recent improved recruitment, especially the strong 2023 year class, mitigating biomass removals (as related in the Commercial Harvest section). This interplay between recruitment and declining harvests has resulted in the peaking of the Biomass Index in 2025.

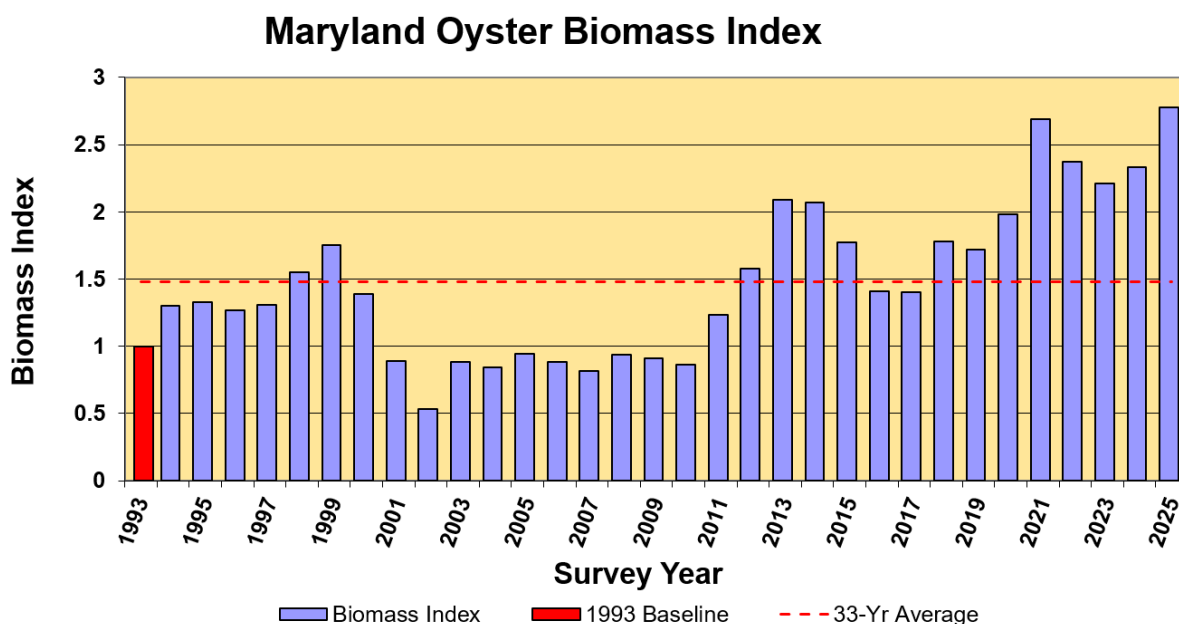


Figure 13. Maryland oyster Biomass Index. The year 1993 represents the baseline index of 1.0.

The oyster population had been slow to recover in the decade after its nadir in 2002, the last year of the devastating four-year disease epizootic. The Biomass Index remained below 1.0 for eight consecutive years despite low disease pressure and high oyster survivorship over this period.¹ Spatfall during this timeframe was sufficient to maintain the population at this level but did not increase it. It was not until the strong recruitment event in 2010 - bolstered by another good spatset in 2012 - that the population began to grow, as mirrored in the increase in the Biomass Index. Since then, the upward trajectory of the Biomass Index has been above the long-term average in twelve of the last fourteen years, with the 2025 index more than five-fold higher than the low point in 2002. With the strong spatsets of the last six years and ongoing restoration efforts in the sanctuaries, the index should continue to improve in the near future, depending on disease-related mortality remaining low, populations in the sanctuaries continuing to grow both in numbers and shell height, and the number of oysters removed by harvesting as these cohorts attain legal size.



The Biomass Index is calculated from the numbers and size distributions of oysters at the 43 Disease Bar sites.



¹ The baseline (Biomass Index = 1) year of 1993 was chosen because it had the lowest harvest on record when the index was established.

CULTCH INDEX

The Cultch Index is a relative measure of oyster habitat; because the dredge is less than 100% efficient, the index is not an absolute measure of cultch. Cultch is crucial for providing hard substrate for oyster setting as well as habitat for the myriad other organisms associated with the oyster community. For the purpose of the Fall Survey, cultch is defined as both live and dead oysters plus loose shell combined. The collection of quantitative cultch data was initiated during the 2005 Fall Survey. A three-year rolling average was used to smooth the interannual variability inherent in the index (the rolling average is assigned to the terminal or third year of each grouping) and assist in following trends. For reference, a value of 1.4 bushels of cultch per 100 foot tow distance is approximately equivalent to 25L of cultch per square meter, or about 1" of cultch over the bottom. This value is what the Department considers as an adequate level for cultch.

The three-year rolling average for the 2025 Cultch Index of 1.20 bu/100 ft. was the tied for the highest in the time series. It represents a 28% increase over the 21-year average of 0.94 bu/100 ft. (Figure 14).

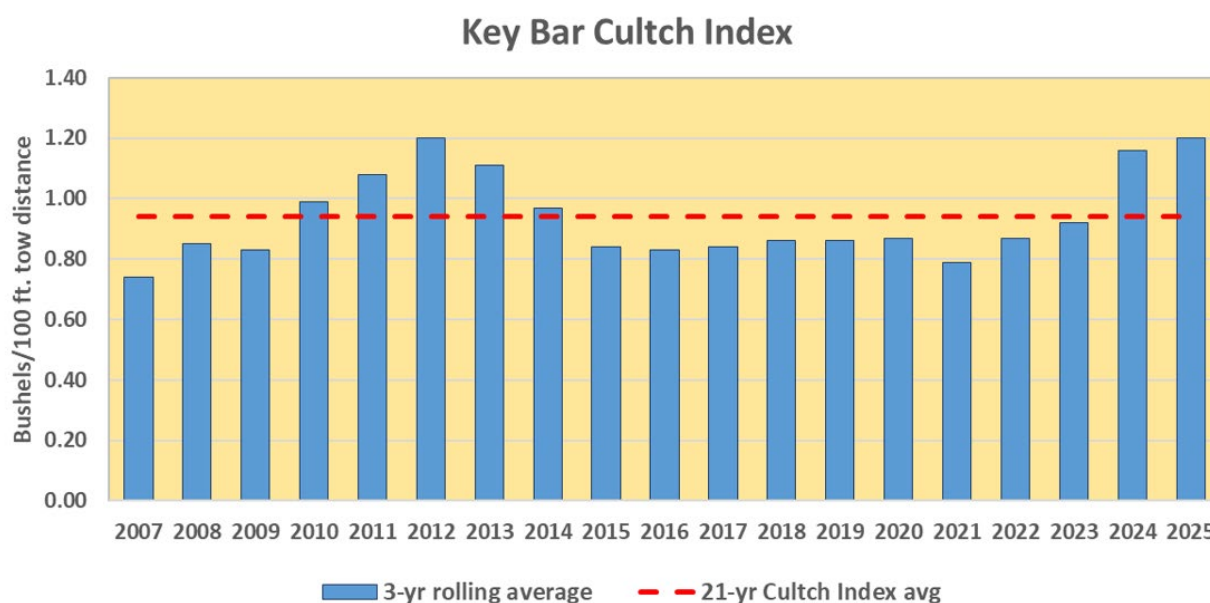


Figure 14. Three-year rolling average of annual means for the Key Bar Cultch Index, 2005-2025. The average is represented by the third year of the grouping (e.g., the 2005-07 average is graphed as 2007).

Although 21 years is a comparatively short time frame for discerning long-term trends in the Cultch Index, a distinctive pattern emerged over this period (Figure 14). The increase in the Cultch Index during the early 2010s reflects improvements in recruitment and survivorship during that period, especially the strong spatsets in 2010 and 2012 (Figure 3b). The growth and high survivorship of these year classes contributed substantially to the index. The subsequent decline may be due to harvesting and inconsistent recruitment, as well as ongoing taphonomic processes such as shell burial and degradation. The more recent rise in recruitment adding to the population has been responsible for the increasing trend in the index over the last four years.

Despite the overall positive trends, some individual bars showed steep declines and continue to struggle. Of the 53 bars used in this analysis, nine had three-year average standardized volumes that were less than 75% of their respective 21-year averages (Figure 15). In contrast, 17 bars had

average cultch volumes greater than 125% of their long-term means. These percentages represent the most substantial changes from the long-term mean. The remaining 27 bars were relatively unchanged, falling within 25 percentage points of their respective long-term averages.

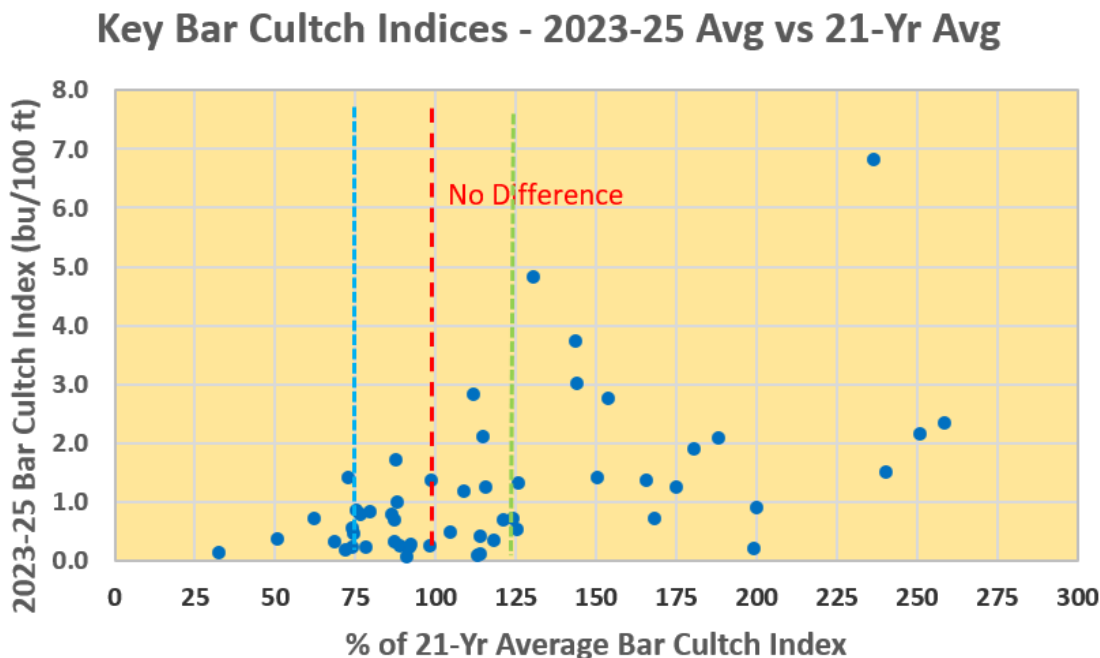


Figure 15. Range of cultch index values for individual Key bars for the average of three years ending in 2025 and the percent difference from their respective 21-year averages. The red dashed line represents the respective 21-year average; the blue dashed line is 75% of that average and the green dashed line is 125% of that average.

Strong regional differences in cultch mean volumes were evident (Figure 16a). The areas with the lowest standardized cultch averages included the mainstem of the bay, followed by the Chester River region. The recent five years of strong recruitment has benefited the cultch index. The highest cultch indexes were in areas with more favorable recruitment and consequent additions to cultch, specifically the Tangier Sound and Choptank River tributaries, as well as the Patuxent River. Most regions showed improved indexes above their 21-year averages, in particular Eastern Bay (Figure 16a).

Cultch volumes among subregions of the broader regions can be highly variable. The greater part of the Tangier Sound regional cultch index (Figure 16a) is contributed by the tributaries and not Tangier Sound proper (Figure 16b). In 2025, the three-year average of the index stations of the five subregional tributaries was 1.45 bu/100 ft. tow distance while the Tangier Sound proper stations averaged 0.93 bu/100 ft. The three-year average cultch indices for the individual tributaries were substantially higher in the Nanticoke River (2.76 bu/100 ft) and the Manokin River sanctuary (1.77 bu/100 ft) (Figure 16b).

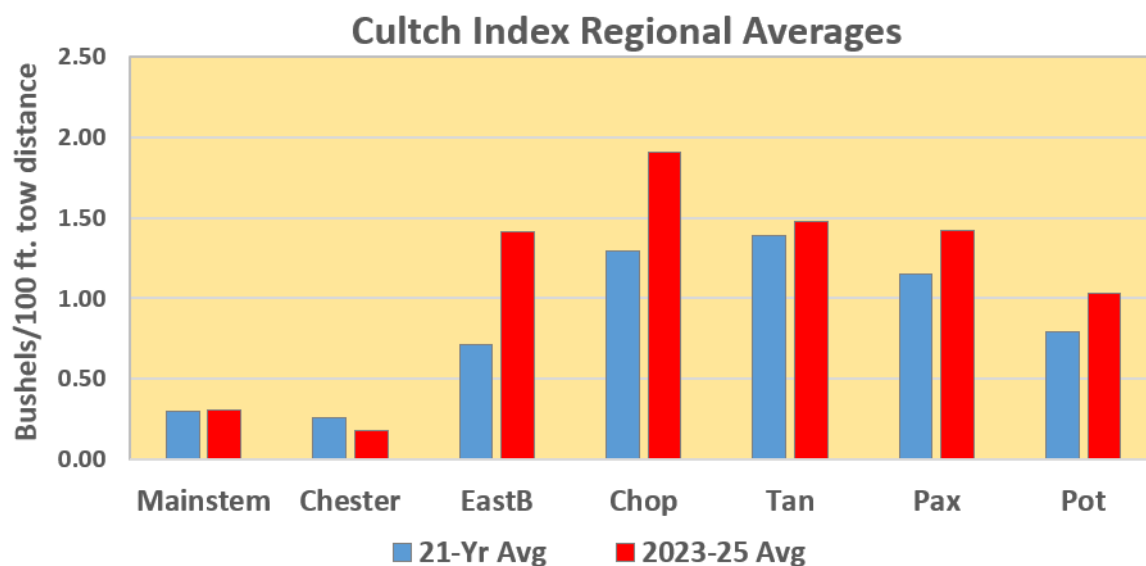


Figure 16a. Regional cultch index averages for the 20-year time series and most recent three years.
Mainstem=Bay mainstem; Chester=Chester River; EastB=Eastern Bay region; Chop=Choptank River region; Tan=Tangier Sound region; Pax=Patuxent River; Pot=Potomac River tributaries

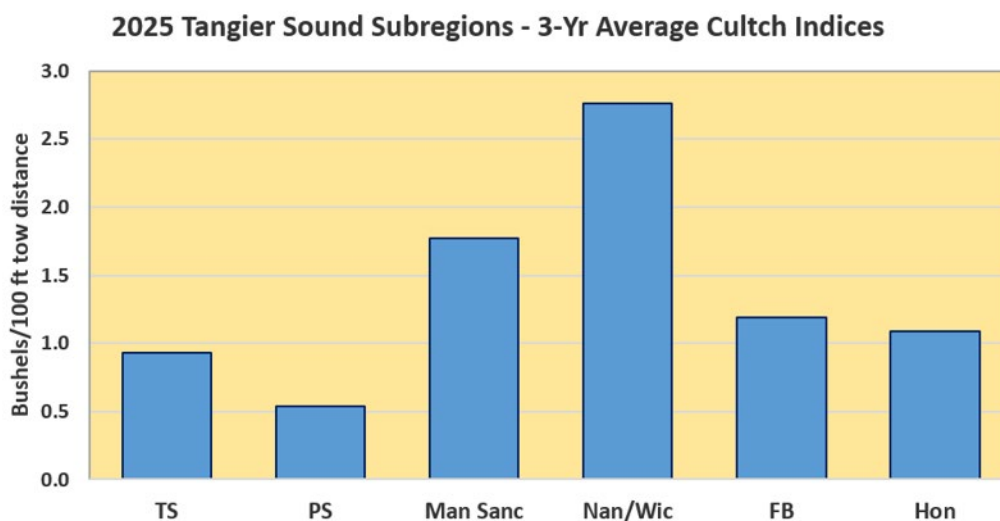


Figure 16b. Three-year averages (2023-2025) of bushels of cultch per 100 ft. tow distance for index stations by subregion within the Tangier Sound region.
TS=Tangier Sound; PS=Pocomoke Sound; Man=Manokin River; Nan=Nanticoke River; FB=Fishing Bay; Hon=Honga River



COMMERCIAL HARVEST

Commercial oyster landings fell for the second consecutive year. With reported harvests of 323,000 bushels, oyster landings during the 2024-25 season were 26% lower than the previous season and less than half of the exceptional 2022-23 season of 720,000 bushels, (the highest harvest in 36 years) (Table 6, Figure 17a). The 2024-25 landings were slightly above the 40-year average of 314,000 bu/yr. The average reported price increased modestly to \$37.00/bu from \$35.72/bu in 2024. The smaller harvest and low price per bushel resulted in a 24% decrease in the total dockside value from \$15.6 million in 2024 to \$11.9 million in 2025, almost a third of the 2023 value (Table 7a.).

Md. Oyster Biomass Index and Harvests

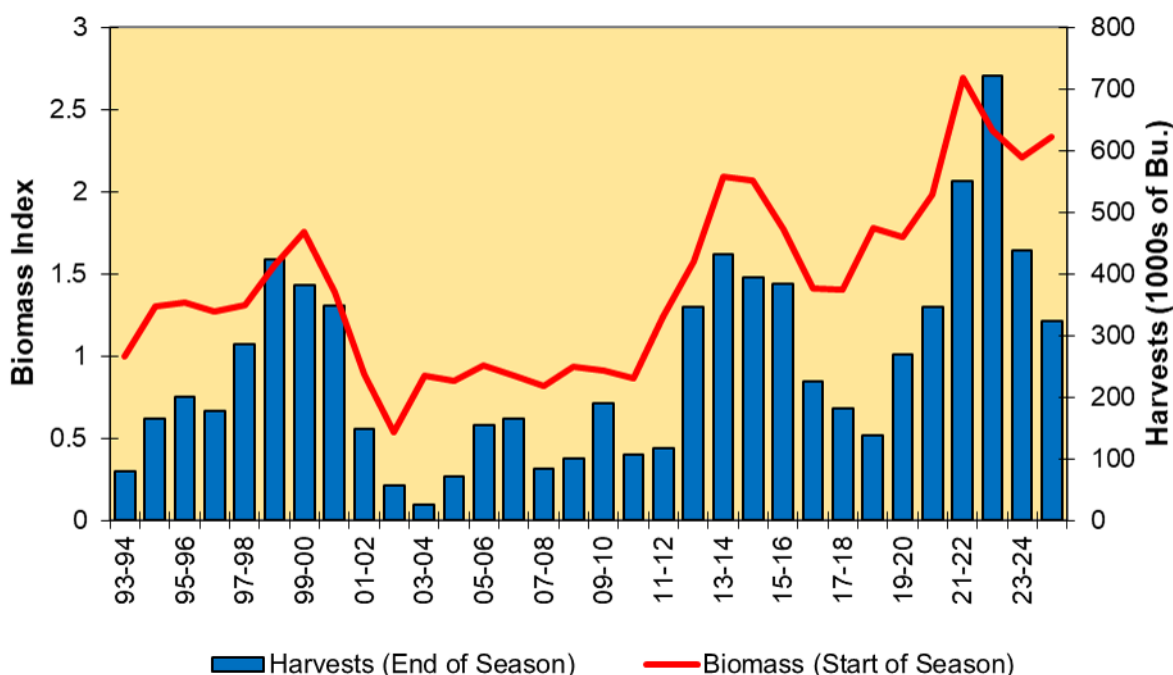


Figure 17a. Maryland reported oyster landings over the past 32 seasons and the relationship between the Biomass Index calculated at the start of the harvest season and total landings reported at the end of that same season. Note lag between the two metrics when abundant sublegal oysters add to the Biomass Index but have not yet entered the fishery.

Commercial oyster landings generally follow a similar pattern as the Biomass Index (Figure 17a). However, in some years there is a lag between the two metrics when abundant sublegal oysters add to the Biomass Index but have not yet entered the fishery (e.g., 2003-04, 2011-12, 2018-19). The dip in the autumn 2023 index was likely due to increased harvest activity during the previous season, which was reflected in the subsequent lower harvests during the 2023-24 season. External factors affecting landings, such as weather and market demand, can result in a break in this relationship

Harvests have been on a positive trajectory following the record-low harvests of the 2003-04 season (Figure 17b). Initially, the fishery struggled to rebound from the devastating oyster blight that concluded in 2002, when the Biomass Index reached its lowest point in the time series (Figure 17a). This was followed by the record low landings of 26,000 bu taken in 2003-04. Harvests remained relatively low during the remainder of the years prior to the 2012-13 season.

The sizeable harvest increases of 2012-2016 (Figure 17b), after these below-average yields of the decade beforehand, were due to the strong 2010 and 2012 year-classes and subsequent good survivorship, allowing a larger proportion of those cohorts to attain market size. This abundance of oysters, as reflected in the Biomass Index, led to an increase in the number of harvesters and fishing effort, resulting in higher landings. However, unexceptional spatsets in 2011, 2013, and 2014 were insufficient to sustain harvests, leading to the considerable drop in landings in the 2016-17 to 2018-19 seasons. The Biomass Index did not parallel this harvest decline, but actually increased in 2019 because of above-median spatfalls in 2015 and 2016. As these two year classes of sublegal-size oysters accumulated, their subsequent growth as well as continued growth of oysters protected in sanctuaries contributed to maintaining the Biomass Index despite the drop in landings. Furthermore, the high streamflows in 2018/19 inhibited the growth of these sublegal oysters, delaying their reaching market size (Tarnowski 2020). As these year classes have entered the fishery, the general correlation between harvests and Biomass Index resumed in the 2019-20 season, with higher landings over the last five years reflected in the rise of the index. This correlation broke down in the 2024-25 season due to a poor market conditions (Figure 17a).

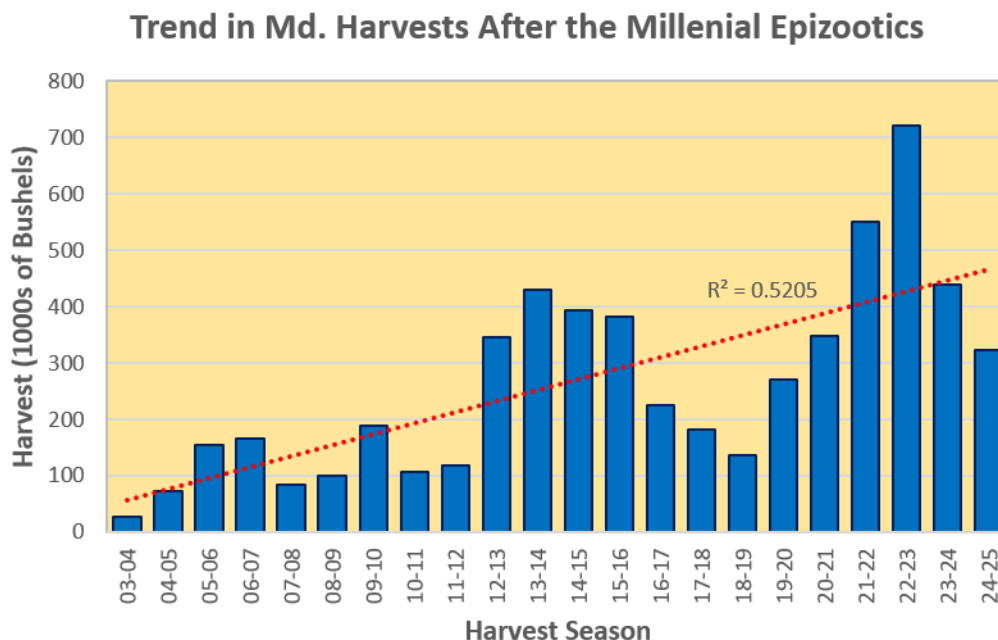


Figure 17b. Upward trend in Maryland reported harvest following the millennial epizootics, 2003-04 to 2024-25.

Taken in the longer historical context, the average landings over the last several years remain a fraction of the harvests prior to the disease epizootics of the mid-1980s, when harvests ranged between one to two million bushels (Figure 17c). Since the heyday of the Maryland oyster fishery in the 19th century, annual landings below 100,000 bushels have been reported in only five seasons, all within the past 32 years (and four of these in the most recent 23 years) following the onset of a series of disease epizootics beginning in the mid-1980s (Figure 17a).

Maryland Oyster Harvest

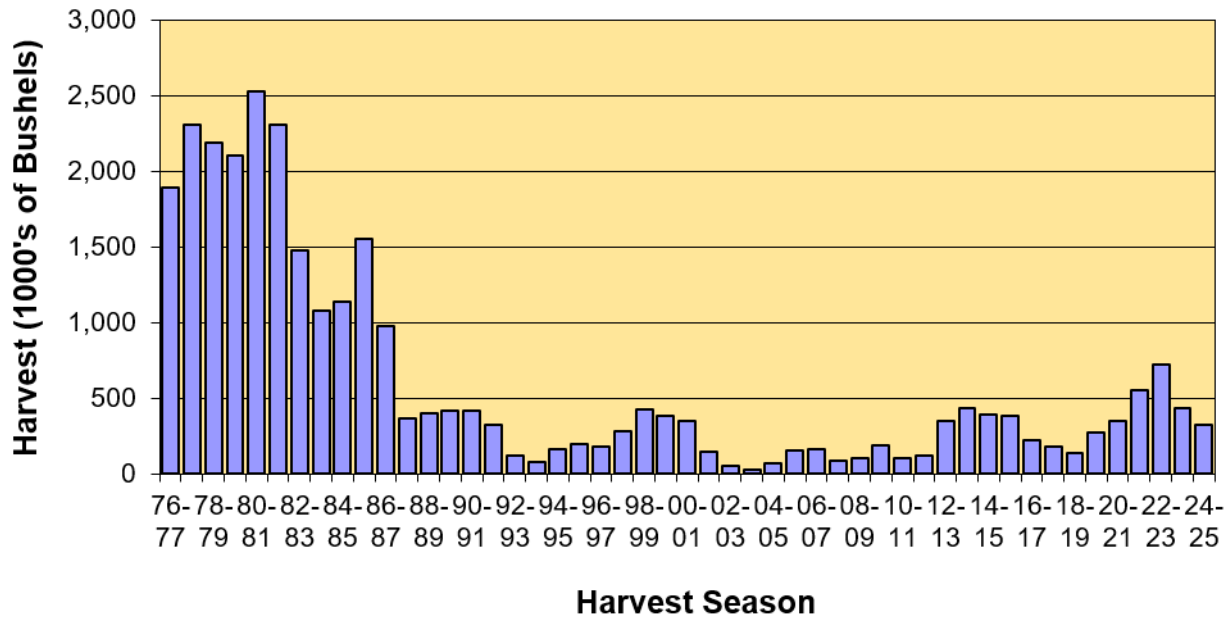


Figure 17c. Maryland seasonal oyster landings, 1976-77 to 2024-25.

For the 2024-25 season, the Tangier Sound region, with landings of 133,000 bu, slipped somewhat as the dominant harvest area, accounting for 41% of the landings in Maryland (Figure 17d). The greatest proportion of these landings came from lower Tangier Sound (70,000 bu or 22% of the Maryland harvest). The Choptank region was second (102,000 bu, providing 32% of the total harvest), with the majority coming out of Broad Creek (80,000 bushels or 25% of the Maryland harvest) – the highest harvest of any subregion in Maryland ([Table 6](#)).

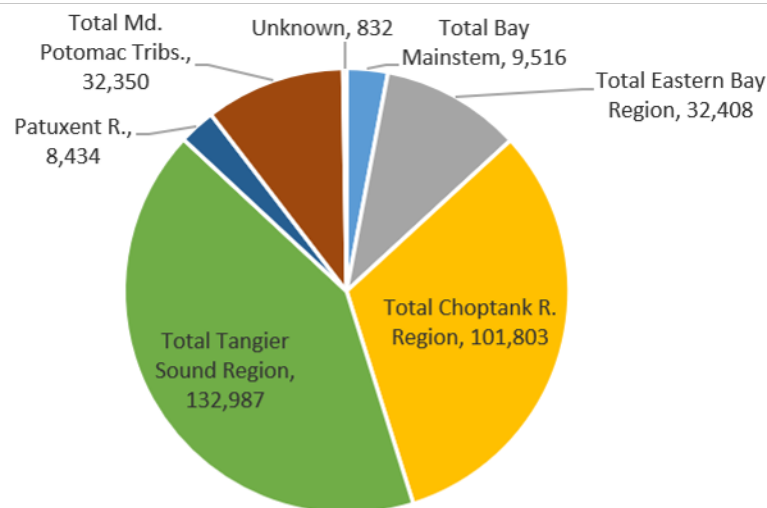


Figure 17d. Distribution of regional landings (in bushels) relative to Maryland total landings (438,000 bu) for the 2024-25 season.

In keeping with the overall losses in landings, most of the major harvest regions exhibited declines, including the Tangier region, the lower Bay, and Patuxent and Little Choptank rivers. Regions that bucked this trend by showing gains were the Choptank and St. Marys rivers and

Eastern Bay. The most substantial changes (>5,000 bu) in Maryland regional landings between the 2023-24 and 2024-25 seasons are listed in Table A.

Table A. Regional changes of more than 5,000 bu in landings between seasons ending in 2024 and 2025.

Region	2025 Landings (bu)	Change from 2024 (bu)	% Change
Total Eastern Bay	32,408	+16,672	+105.9%
Total Tangier Sound	132,987	-90,251	-40.4%
Total Choptank River	101,803	-24,125	-19.2%
Patuxent River	8,434	-12,009	-58.7%
Total Mainstem Bay	9,516	-10,392	-52.2%

The heaviest losses were in the combined harvests for the entire Tangier Sound region, which dropped by 90,000 bushels or -40% from the 2023-24 season. In addition, the combined Choptank River region, the second most-productive area, showed a decrease of 24,000 bu (-19%). However, the Broad Creek subregion of the Choptank had a harvest increase of 6,000 bu. Despite the recent declines, many regions remained above their long-term harvest averages, especially in the most productive areas, including Upper Tangier Sound, Fishing Bay, Broad Creek, the St. Marys River, and Eastern Bay (Table 6).

Generally, the northern portion of the bay and tributaries continued to perform poorly due to a lack of both recruitment and large-scale repletion activity. The combined percentage of landings from the upper bay and Chester River, which in some seasons in the 1990s and early 2000s accounted for over half of Maryland's total landings, has been negligible in recent years – 4,000 bu in 2024-25 (Table 6). For reference, the 40-year harvest average for these two regions is 29,000 bu/year, primarily sustained by numerous seed plantings from the historic MDNR Repletion Program. More encouragingly, the Eastern Bay region exceeded its 40-year average landings during the 2024-25 season for the first time in 23 years.

Not surprisingly, the primary gear types, namely power dredges and patent tongs, as well as sail dredges, showed losses in harvests from the previous season ([Table 7a](#)). The exceptions were hand tongs, which gained 20,000 bu over 2024 landings, as well as diver harvests. For the 18th consecutive season, power dredging was the predominant method of harvesting, accounting for 48% of the total landings ([Table 7b](#)). This activity was mainly in the lower Eastern Shore and Choptank regions. Hand tonging supplanted patent tonging for second place, producing 29% of the total harvests, primarily from Broad Creek. Divers accounted for 10% in third place, while patent tonging fell into a tie for last with skipjacks, each with only 7% of the current landings. Just two seasons earlier patent tonging had accounted for 34% of the landings.

Images of hand tonging for oysters.
(Photos: R. Bussell)



OYSTER SANCTUARIES

An in-depth analysis of the performance of Maryland's oyster sanctuary system is beyond the scope of this report but is provided in a stand-alone document examining longer-term trends (MDNR 2021, dnr.maryland.gov/fisheries/Pages/oysters/5-Year-Oyster-Review-Report.aspx). However, this report provides some important points and a concise view of the sanctuary oyster populations, focusing primarily on the priority (i.e., large-scale restoration) sanctuaries: the Tred Avon, Little Choptank, Manokin, and St. Marys rivers and Harris Creek. Broad Creek is included here for reference and not for direct comparisons as it is a unique system that historically has been the most productive tributary for its size in Maryland (Table 6).

A total of 95 oyster bars within 38 sanctuaries were sampled during the 2025 Fall Survey (Table 8). For comparison among areas, oyster counts were standardized to 100 ft dredge tows, as the number per bushel count does not take into account varying tow distances. This was an exceptional year for recruitment within the priority sanctuaries. Sanctuary average spat counts were well above their respective Key Bar 21-year averages (Table S-1). The exception was the Manokin sanctuary, which had somewhat lower average spatset compared to the long-term averages of its two Key Bars. Similarly, spatsets in most of the adjacent open-harvest areas were well above the long-term averages. Spat counts in the thousands were observed both in the St. Marys sanctuary and open-harvest area and in Broad Creek, which experienced the highest spatset of any region in Maryland (Table S-1). It should be noted that the Broad Creek Key Bar recruitment average is about eleven times as high as the Harris Creek Sanctuary over the 21-year time series, including prior to the creation of the sanctuary in 2010. For this comparison, Royston bar at the mouth of Broad Creek was omitted. This bar has substantially different characteristics from the remainder of the Broad Creek bars further upstream, with longer tow distances, fewer small and market oysters, and lower recruitment. Broad Creek averages with and without Royston are presented in Table S-1.

Table S-1. 2025 average number of oysters/100 ft tow by region and size/age class (Sm=smalls, Ma=markets) and average Key Bar (KB) spat/100 ft tow since 2005 (when tow distances were first measured) for priority restoration sanctuaries and nearby harvest areas. Broad Creek averages are presented both with and without Royston bar. n/a = There is no Key Bar in the Tred Avon River open area.

Region	Status	Regional 2025 Sm+Ma (#/100 ft tow)	Regional 2025 Spat (#/100 ft tow)	KB Spat 21-yr Avg (#/100 ft tow)	Regional 2025 Avg. Cultch (bu/100 ft tow)
Harris Cr.	Sanc.	364	839	40.6	2.09
Harris Cr.	Open	140	574	22.9	0.45
Broad Cr.	Open	1,065	4,867	89.0	3.46
Broad Cr. ^a	Open	1,288	5,493	453.8	4.17
Tred Avon R.	Sanc.	240	332	32.0	1.47
Tred Avon R.	Open	507	916	n/a	3.03
L.Choptank R.	Sanc.	554	657	55.1	2.59
L.Choptank R.	Open	176	50	7.4	1.27
Manokin R.	Sanc.	175	103	139.8 ^b	1.27
Mid-Tangier S.	Open	138	169	61.8 ^b	0.76
St. Marys R.	Sanc.	759	2,549	325.1	2.01
St. Marys R.	Open	553	1,030	24.8	2.33

^a Not including Royston bar.

^b Average of two Key Bars.

Aside from the Tred Avon River, the number of adult (small and market) oysters per 100 ft tow in the priority sanctuaries was consistently higher than in adjacent harvest areas (Table S-1) (not including Broad Creek). Broad Creek, had the greatest average number of adult oysters of any area in this comparison, thanks to the extraordinary spatset in 2020 and a strong set in 2023 (Table 2). The St. Marys sanctuary averaged the second highest number of adults.

Disease levels in the sanctuaries were about the same as the previous year. Oyster disease samples were obtained from the five priority oyster sanctuaries (Table S-2) and 14 non-priority sanctuaries. Although dermo disease was present in all thirteen sentinel Disease Bars (Table 3) and seven supplemental stations within these sanctuaries, prevalence remained in the moderate range, from 55% in 2024 to 56% in 2025 and intensities were basically unchanged from 1.6 to 1.7. Of these, four had dermo disease prevalences above their 36-year site averages, but only two of those had an intensity above the long-term average. Dermo disease levels in the comparison harvest areas also dropped, averaging 32.0% prevalence, down from 42.0% in 2024. The open baywide mean intensity was 1.0 (Table S-2), a decline from 1.3 in 2024. The somewhat higher dermo disease levels in the sanctuaries can be attributed to the fact that they had a greater proportion of larger, older oysters than the harvest bars (Figure 18); parasite burdens tend to build up as oysters age (Ford & Tripp 1996).

MSX disease was detected at none of the five priority sanctuaries and only on one of their associated harvest bars at a low level (Table S-2). Outside of the restoration sanctuaries and their adjacent harvest areas, MSX disease was found at only two of fourteen other sanctuaries and four of twenty-four bars in open harvest areas. The 2025 average MSX disease prevalence for baywide sanctuary disease samples was 0.7%, unchanged from 2024. Baywide harvest area disease samples averaged 0.8%, identical to 2024. The highest MSX prevalence observed in 2025 was 13% (Tables 4). In contrast, 2023 saw the highest MSX disease record of the 36-year time series with 93% on Lighthouse open harvest bar in the Choptank River.

Table S-2. 2025 oyster disease levels and observed mortality estimates for Disease Bars and regional averages on priority restoration sanctuaries and nearby harvest areas. Baywide disease and mortality averages for all Disease Bars and Supplemental sites combined both within and outside sanctuaries are also presented.

Region	Disease Bar	Status	Dermo		MSX	Observed Mortality %	
			Prev.%	Int.	Prev.%	Disease Bar	Regional
Harris Cr.	Mill Pt. ^a /Rabbit Is. ^a	Sanc.	83/53	2.1/1.4	0/0	11.2/6.1	10.0
Harris Cr.	Tilghman Wharf	Open	3	0.2	0	3.5	4.3
Tred Avon R.	Double Mills	Sanc.	70	1.9	0	6.3	7.4
Mid-Choptank R	Lighthouse	Open	0	0	0	0.0	5.7
Broad Cr.	Deep Neck	Open	60	1.5	0	2.8	5.3
L. Choptank R.	Cason	Sanc.	77	2.6	0	9.6	11.4
L. Choptank R.	Ragged Pt.	Open	53	1.0	0	29.0	13.5
Manokin R.	Georges	Sanc.	70	2.2	0	24.1	17.2
Mid-Tangier S.	Piney Is. E./Back Cove	Open	50/73	1.8/2.4	0/0	7.4/10.7	11.5
St. Marys R.	Pagan	Sanc.	77	2.0	0	5.2	4.6
St. Marys R.	Chicken Cock	Open	20	0.6	3	1.6	7.2
Average of Restoration Sanctuary Samples			71.7	2.0	0	9	8.4
Average of Adjacent Harvest Samples			42.7	1.2	0.4	6.2	7.8
Avg. of Baywide Sanctuary Disease Samples ^b			56.4	1.7	0.7	10.6	
Avg. of Baywide Harvest Disease Samples ^b			32.0	1.0	0.8	6.3	

^a Supplemental bars; not part of the Disease Index set.

^b Including both Disease Bars and Supplemental sites.

Observed mortalities remained at low levels. The baywide average mortality for the sanctuary bars barely changed from 10.2% in 2024 to 10.6% in 2025. This remained lower than the long-term sanctuary index bar average of 20.3%; all eleven qualifying (>40 oysters) Mortality Index bars within sanctuaries had observed mortalities below their respective 41-year individual bar averages (Table 5). Holland Point and Old Field were not included in this evaluation as they had fewer than 40 oysters, which could skew the averages. Regional observed mortalities in sanctuary bars were similar to their proximal open-harvest bars (Table S-2). In the restoration sanctuaries, the average regional mortality dropped to 8.4% from 13.2% in 2024, while in the corresponding harvest areas the average mortality was down from 11.2% in 2024 to 7.8%.

Oyster biomass in the sanctuaries continues to outpace that of the open-harvest areas. Of the 43 Biomass Index bars, 13 bars are within sanctuaries (Table 8). The average biomass per index bar in the sanctuaries was 262.8 g/bu, a 12% increase from 235.3 g/bu in 2024, and higher than in the harvest areas by 16% (Table S-3). In the open-harvest areas, the average biomass per index bar had slipped in the previous three years, from the high point in 2021 of 232.1 g/bu to 168.4 g/bu in 2023, but increased to 225.8 g/bu in 2025. Over the longer term, trends in biomass, as measured in grams/bushel (g/bu), have been strongly positive both in sanctuaries and harvest areas, with the results from 2025 exceeding their 33-year averages by 86% and 93% respectively.

Table S-3. Average biomass/bar comparisons between Biomass Index bars in the sanctuaries and open-harvest areas for 2025, as well as average shell heights and the proportion of sublegal oysters (<76 mm).

Status	n	Avg. Total Biomass	Avg. Market Biomass	Avg. Sublegal Biomass	Avg. Height	% Sublegals
Sanctuaries	13	262.8 g/bu	219.0 g/bu	43.8 g/bu	83.9 mm	34.0%
Harvest Areas	30	225.8 g/bu	151.9 g/bu	73.9 g/bu	75.2 mm	50.8%

The distributions of oyster biomass between the two management areas were distinctly different (Table S-3). Considering all of the Biomass Index bars, the sanctuaries had a higher proportion of biomass in the larger size classes than the open areas, as reflected in the percentage of sublegal counts (Figure 18). Biomass in the harvest areas drops off sooner above the minimum legal harvest size. The average biomass of sublegal oysters decreased from the previous year, from 54.7 g/bu to 43.8 g/bu (-19.9%) in the sanctuaries and from 81.4 g/bu to 73.9 (-9.2%) in the harvest areas, due to the growing out of the strong 2023 cohort from the small category into the market category. Consequently, the average market oyster biomass in the sanctuaries of 219 g/bu increased from 180.6 g/bu in the previous year (+21.3%), while the open-harvest areas jumped substantially to 151.9 g/bu from 99.1 g/bu in 2024 (+53.3%).

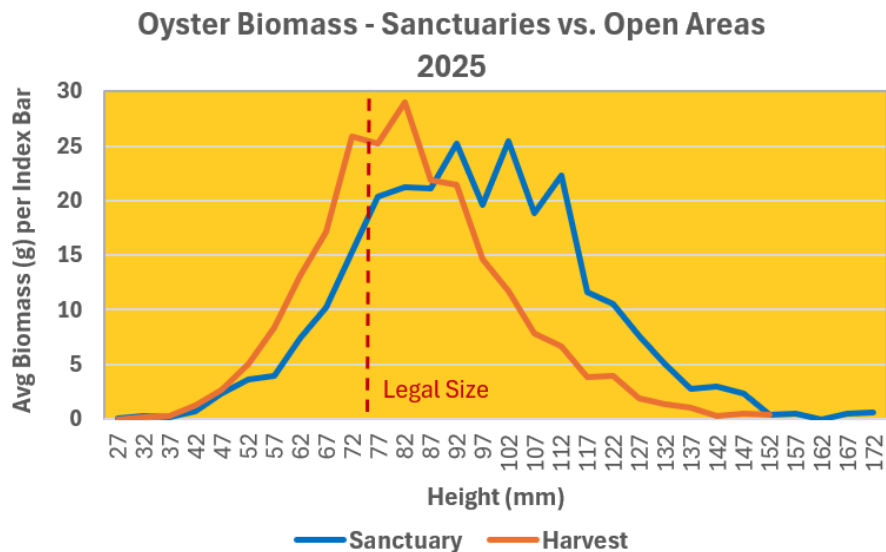


Figure 18. Average oyster biomass by 5 mm size classes on all Biomass Index bars in harvest areas and sanctuaries. Dashed line indicates minimum legal harvest size.

The biomass on the large-scale restoration sanctuary Index bars was substantially higher than their respective open area Index bars (Figure 19). The average biomass/bar standardized to a 100 ft tow distance for these five sanctuary bars was 937.5 g/bu, compared to 477.4 g/bu on the seven Biomass Index bars in adjacent open-harvest areas. If Deep Neck bar in Broad Creek is excluded, the average biomass/bar from the remaining six open-harvest bars plummets to 102.7 g/bu. This was a function of higher oyster densities in the sanctuaries, as reflected by the shorter average tow distance required to obtain a sample (43.8 ft for the five sanctuary bars versus 182.1 ft for the seven open area bars), as well as larger average size (Table S-3). The dominating biomass value for Deep Neck bar is the product of the exceptional 2020 recruitment event (Tarnowski 2022), followed by strong spatsets in 2021 and 2023 and low natural mortalities.

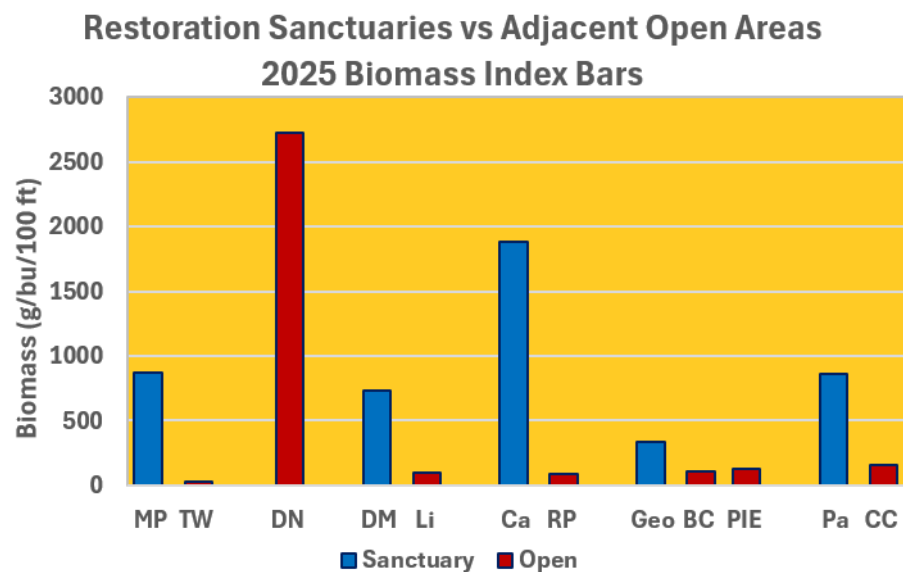


Figure 19. Comparison of biomass standardized to 100 ft tows between Biomass Index bars in the large-scale restoration sanctuaries and adjacent open areas. See Table S-2 for the regional locations of these bars. MP=Mill Point (not a Biomass Index bar), TW=Tilghman Wharf, DN=Deep Neck, DM=Double Mills, Li=Lighthouse, Ca=Cason, RP=Ragged Point, Geo=Georges, BC =Back Cove, PIE=Piney Island East, Pa=Pagan, CC=Chicken Cock



A sanctuary oyster. (Photo: R. Bussell)

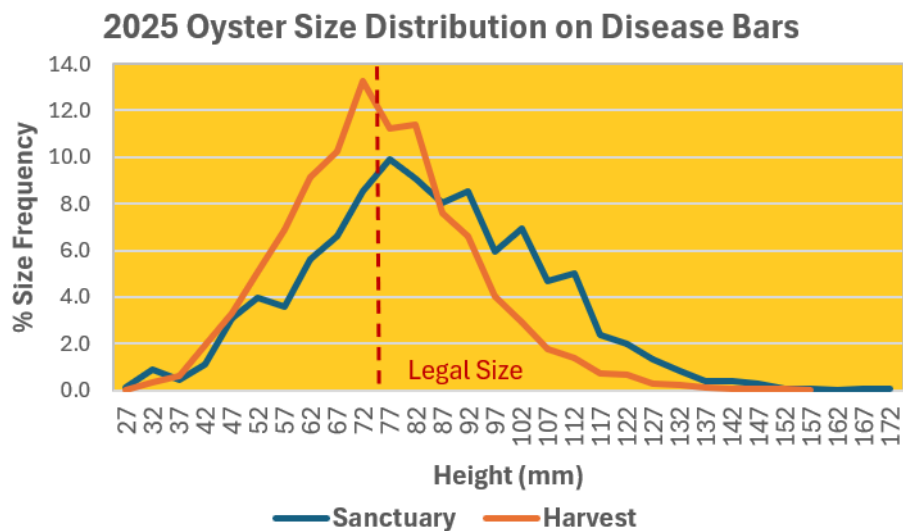


Figure 20. Size-frequency distributions of oysters in the sanctuaries and open-harvest Biomass Bars in 2025. The open-harvest area size distribution around the mode of 72 mm is due to the strong 2023 year class.

The size distribution of oysters is a reflection of the strong recruitment events in recent years. The dominant size classes of the sanctuary oysters were spread across a broad range of sizes, with peaks at 32 mm, 52 mm, 77 mm, 92 mm, 102 mm and 112 mm, whereas the modal height in the adjacent open areas was a more defined peak at 72 mm (Figure 20). The average size of adult oysters (equal to or greater than one-year old) on the Biomass Index bars in the sanctuaries increased from the previous year (79.6 mm in 2024 to 83.9 mm in 2025), and the harvest bar populations also grew in average size (67.1 mm in 2024 to 75.2 mm in 2025). These changes in

the harvest areas were driven by the growth of oysters from the strong recruitment events over the past five years and lower landings which left more market-size oysters in place (Figure 20). There was a sizable difference between the two management types in the proportion of sublegal oysters. Sublegal oysters comprised 34.0% of the adult oysters in the sanctuaries, while in the open area it was 50.8% (Table S-3).

Cultch, the shell and oyster substrate required for spatset, was at higher densities in all but one of the restoration sanctuaries compared to their adjacent open-harvest areas (Figure 21). The exception was in the Tred Avon River, where cultch volumes were higher in the harvest area. Within the paired comparison regions, the St. Marys sanctuary had the highest average cultch volume per sample, standardized to 100 ft. tows, over the last three-year period (2.67 bu/100 ft). For reference, Broad Creek was highest overall in three-year average cultch density (3.31 bu/100 ft), boosted by the tremendous 2020 spatset and a strong follow-up set in 2023. The lowest cultch volume was found in the Little Choptank harvest area, which was less than half of that in the sanctuary.

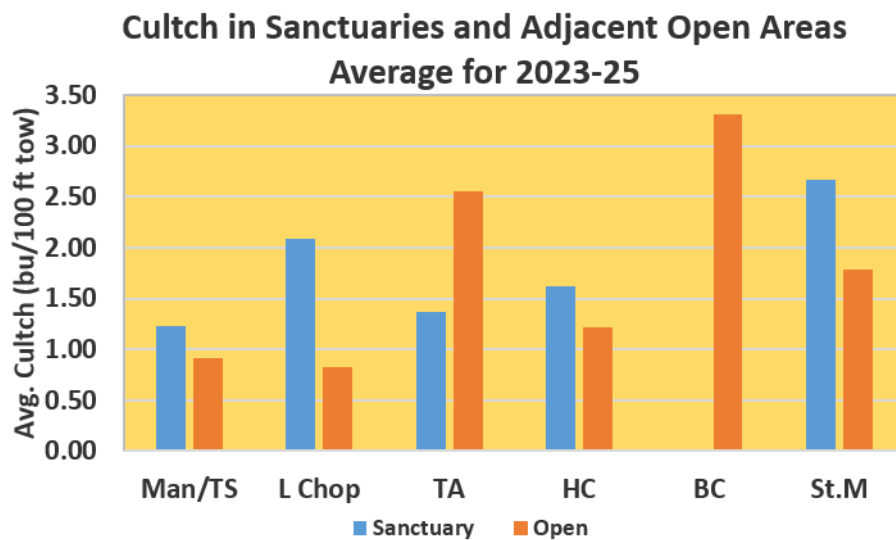


Figure 21. Comparison of cultch volumes between sanctuaries and adjacent open areas averaged for 2023-25. All stations with sufficient data within an area were included in the averages, standardized to 100 ft. tow distances. Man=Manokin River; TS=mid-Tangier Sound; L Chop=Little Choptank River; TA=Tred Avon River; HC=Harris Creek; BC=Broad Creek; St.M=St. Marys River



DISCUSSION

A Year of Superlatives

Results from 2025 Fall Oyster Survey, which was conducted throughout the oyster growing waters of the Maryland portion of Chesapeake Bay and its tributaries, found the oysters faring exceptionally well - likely the best in decades. Gains were witnessed in every metric used to evaluate the status of the population, resulting in top or near-top rankings in their respective time-series. These outcomes build upon a decade or more of positive trends in the population. Among the outstanding findings were the following:

- The 2025 Spat Index was the **second highest** in the 41-yr time series. This was the sixth consecutive year the long-term median of the Indexes has been surpassed.
- The spat were widely distributed as indicated by the **second highest** annual median score of the Spat Index bars over that same time period. Triple digit counts were found as far upbay to the Kent Island shore. A small number of spat were even observed in the bay north of the Bay Bridge – a rare occurrence.
- Recruitment was extraordinarily robust in some areas. Counts of over one thousand spat per bushel were observed in the Choptank region, topping out at 3,600 spat/bu on two bars in Broad Creek. An experimental crushed concrete planting in Harris Creek produced 2,100 spat/bu, and an adjacent *C. gigas* (Pacific oyster) shell planting resulted in a 2,000 spat/bu count. On the Western Shore, Pagan bar in the St. Marys restoration sanctuary had a spat count of almost 2,200 spat/bu
- There was an abundance of the prolific 2023 year class oysters in many areas, boding well for both the fishery in the near term and ecologically for the sanctuaries.
- Dermo disease average prevalence was the **fourth lowest** and average intensity tied for **third lowest** in the 36-yr time series.
- MSX disease was exceptionally low, continuing a trend that began in 2018 (with the exception the drought year of 2023).
- As a consequence of the lower disease levels, the Mortality Index was the **third lowest** since 1985. Observed mortalities have remained below the long-term average for 20 years in a row.
- The 2025 Biomass Index was the **highest** in the 33-year record, due to a combination of favorable recruitment, individual growth, and low natural mortality over the past few years. The Biomass Index has increased **five-fold** since its lowest point in 2002, when the oyster populations had been devastated by disease.

-The three-year rolling average for the 2025 Cultch Index was tied for the **highest** in the 21-year time series. Cultch has been trending upwards for the past five years as the oyster population increases.

During the mid-20th century, Maryland had a productive and sustainable oyster fishery averaging one to three million bushels per year over a span of 60 years. But in the mid-1980s, disease outbreaks began a stranglehold on the oyster population. Disease and mortality conditions worsened during the 1990s, culminating in the devastating four-year millennial epizootics, which by 2002 had claimed almost 60% of the oysters. As a result, harvests collapsed to their lowest point in 150 years. The situation appeared so bleak that serious consideration was given to introducing a non-native species as a replacement for the native *Crassostrea virginica* (ACOE 2008).

It is remarkable to witness the extent that the population has rebounded from this dark period. Certainly, there have been setbacks along the way, but the overall trajectory has been upward. Although the epizootics ended after 2002, in reality this rebound took place over a relatively short time span, beginning with the strong recruitment event in 2010. The Biomass Index, a measure of the number and size of oysters, has increased five-fold in recent years from its nadir in 2002. Landings reached their highest level in 35 years during 2022-23 season. Recruitment has been above the 41-year median of indexes over the last six years, including a widespread, once-in-a-generation spatset in the Potomac River and other normally low-recruitment areas. And there is evidence that some populations may be developing disease resistance or tolerance. Granted, there is a distance yet to go for a full recovery (however that is defined), but the resiliency demonstrated by this species over the past quarter-century is truly extraordinary. The hope for the future is that Maryland's oyster population continues to grow and thrive.

The Unheralded Sanctuaries of the Choptank River

Over the past 15 years, the five large-scale restoration sanctuaries have received major investments of seed oysters and substrate, significantly expanding their oyster populations. The magnitude and success of these projects have overshadowed a group of sanctuaries that have also been showing improvements to their populations despite little if any management actions, save from closing them to harvesting. Population metrics in all six Choptank River sanctuaries (Choptank ORA, Upper Choptank River, Howell Point, Sandy Hill, Lower Choptank River, Cook Point) (Figure D-1) trended upwards during 2021-2025,² largely due to natural processes – better than average recruitment exceeding observed mortality – that have increased oyster densities, though at a much slower rate than in the restoration sanctuaries.

² A recent analysis of sanctuary performance taking into account a number of population metrics in five-year intervals from 2006 to 2025 will be extensively referred to in this discussion. The associated report is “Oyster Management Review 2021-2025; Appendix A: Characterization of Individual Sanctuaries” by the Maryland Department of Natural Resources (2026).

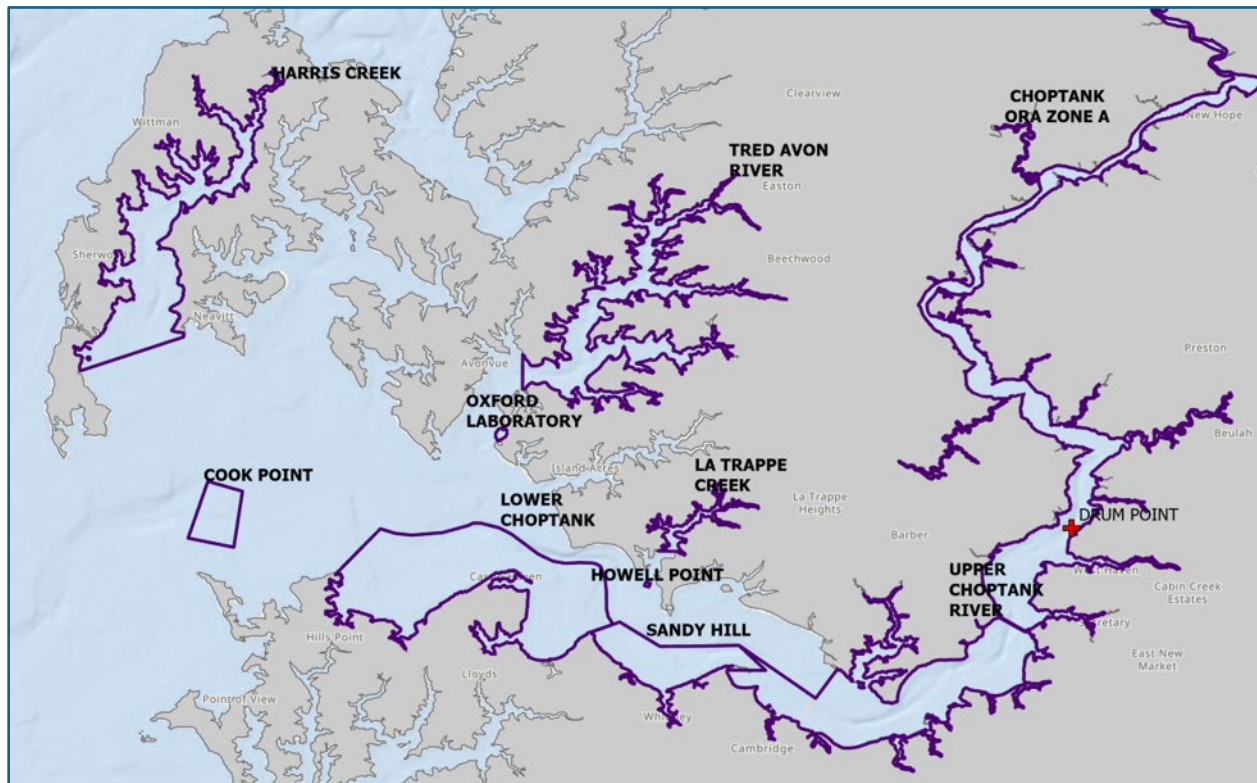


Figure D-1. Oyster sanctuaries of the Choptank region.

Higher Recruitment

The main driver of the recent upward trends in these unrestored sanctuaries is higher recruitment over the most recent five years, coupled with declining or stable observed mortalities. Although the 2021-2025 average spat densities were in relatively modest double digits in all six Choptank sanctuaries, nonetheless these were substantially higher than their respective 10 to 15 year prior averages. These gains ranged from five times to two orders of magnitude higher than the averages for the previous 15 years.

Above average salinities have been favorable for recruitment in the two upriver sanctuaries – Upper Choptank River and Choptank ORA – which typically have lower salinity regimes. At Drum Point, the uppermost sampled bar of the Choptank River sanctuaries (Figure D-1), four of the five past years had salinities greater than 10 ppt, which is suitable for spatset. In contrast, during the wet year of 2018, salinity there was 2.1 ppt, which is marginal for oyster survival. These elevated salinities enabled increased spatsets on Drum Point bar - which normally has single digit spat counts, if any - with 50 spat/bu in 2023 and 68 spat/bu in 2025. But adequate salinities do not ensure good spatsets. In 2022, spat counts on Drum Point were only 6 spat/bu (typical for this area), despite a salinity of 10.9 ppt.

Cultch Important for Recruitment

Even the lowest average spatfall counts of the six sanctuaries, at 16.4 spat/bu on Lower Choptank River Sanctuary, experienced a five-fold increase in spat density over the average for the previous 15 years. The overriding constraint in this sanctuary is the paucity of cultch, which

averaged only 0.7 bu/100 ft towed, or half of the MDNR cultch threshold of 1.4 bu/100 ft towed that the Department strives for to ensure complete coverage of the bottom to a cultch depth of one inch. Likewise, the much smaller Cook Point Sanctuary also suffers from a scarcity of cultch, averaging a mere 0.5 bu/100 ft towed. Despite that, the average spatset during 2021-2025 was eight times higher than the average for the previous ten years. Both of these sanctuaries would greatly benefit from substrate plantings to enhance recruitment and accelerate population growth by expanding the habitat footprint.

Although the middle Choptank sanctuaries were faring better in cultch density at 1.1 bu/100 ft towed, both the Howell Point and Sandy Hill sanctuaries were below the MDNR threshold density. Nevertheless, both experienced greatly improved recruitment during the 2021-2025 period – Howell Pt. was 48 times higher than the average for the previous 10 years, and Sandy Hill experienced a two orders of magnitude leap compared to its prior 15 year average.

Tolerable Mortalities

Observed mortalities during 2021-2025 ranged between extremely low to moderate, following a distinct salinity gradient. The two sanctuaries in the lower Choptank had mortalities of about 18.5%, which was lower or about the same as the previous five-year averages. For comparison, this was nine percentage points higher than the Baywide Mortality Index average for this same period. In contrast, within the most upriver of the sanctuaries - Choptank ORA - mortalities averaged only 3.3%. Observed mortalities at the two middle Choptank sanctuaries averaged about 9%. These observed mortality rates were sufficiently low to allow the six sanctuary populations to grow.

Gains in Overall Oyster Densities

Even with these modest spat counts, the populations increased because recruitment rates were higher than observed mortalities. The net result of this surplus in recruitment was a substantial upsurge in total oyster densities relative to previous time periods. Average densities ranging from 75.5 to 344 oyster/m² during 2021-2025 represented increases in every one of the six sanctuaries by two to four times the densities of the 2016-2020 period. Three of these sanctuaries have exceeded the long-term target of 94 oysters/m² established by the 2024 Benchmark Oyster Stock Assessment (MDNR, 2025). The remaining three are just shy of this target.

Upper Choptank River Sanctuary

Of the Choptank River sanctuaries, the most impressive performance over the most recent five years was in the Upper Choptank River Sanctuary, which extends from Cambridge to Jamaica Point, with the Choptank ORA situated above and adjacent to it. Despite being located in a low salinity zone, the population density of 344 oysters/m² of all size classes exceeds the long-term density target of the 2024 Stock Assessment by nearly four-fold. Observed mortalities have been low at about 6%, except for the 2016-2020 period, which experienced an average mortality of 16.4%. The most recent period had relatively substantial recruitment for this region, averaging 68.9 spat/bu. Aside from the above-average salinities that occurred during this period, another factor that enabled the higher recruitment was the abundance of cultch, which provides substrate for oyster larvae to attach to. The cultch volume of 2.6 bu/100 ft tow distance is well over the

MDNR cultch threshold. All of these factors contributed to the Upper Choptank River Sanctuary being ranked fifth highest among the 51 sanctuaries, behind three of the large-scale restoration sanctuaries. Aside from several hatchery plantings in the 1990s to early 2000s, no management improvements have been made to this area since the establishment of the sanctuary. This supports the concept that when given the right conditions, including adequate salinity, broodstock numbers, and cultch volumes, a sanctuary can thrive essentially on its own.

Choptank ORA

Likewise, the Choptank ORA, located in an even lower salinity regime, has shown substantial improvement over the past five years. The average total oyster density for all size classes was four times higher than the 2016-2020 period and over twice the Stock Assessment long-term target. Cultch was also abundant, averaging 2.0 bu/100 ft towed, exceeding the MDNR threshold planting density. Although the double-digit spatsets in both the Upper Choptank River Sanctuary and Choptank ORA pale in comparison to the thousands observed this year in the Talbot tributaries and adjacent mainstem bars, those spat survived and contributed to the expansion of these upriver populations.

Potential Sources of Larvae

The greatly improved recruitment during the 2021-2025 period compared to the previous 10 to 15 years and good survivorship was responsible for the increase in oyster densities in the Choptank River sanctuaries. This raises the question as to where these larvae originated. Potential sources are the high densities of broodstock oysters in the large-scale restoration sanctuaries – Harris Creek and Tred Avon – as well as in Broad Creek, an open-harvest tributary. Strong recruitment has been occurring in that region since 2020, and spillover to the Choptank sanctuaries, especially those in the lower and middle reaches of the river closest to those sources, is possible. It is also feasible that the source of larvae reaching the ORA came from the Upper Choptank River Sanctuary, given the high density and proximity of broodstock oysters there and the salinity conditions conducive to spat settlement in that portion of the river over the last few years. It may be that the upriver sanctuaries are self-sustaining, acting as both a source and sink of larvae between the two sanctuaries. Alternatively, the Upper Choptank River Sanctuary may be acting as a “stepping stone” – both a source and sink - receiving larvae from downriver and sending larvae up to the Choptank ORA. Conversely, the larvae from the Upper Choptank River Sanctuary could be subsidizing the downstream sanctuaries. Or it may be a combination of these, depending on environmental conditions such as streamflow, salinity, and wind, as well as biological factors. However, although these scenarios are plausible, as of now no definitive conclusions can be drawn; they await further research on the question of larval connectivity among these populations.

Conclusion

Compared to the natural Choptank sanctuaries, the large-scale restoration sanctuaries had the advantage of receiving consistently high spat and cultch plantings, greatly accelerating the process of rebuilding their populations. Nevertheless, despite the vagaries of natural processes resulting in slower and more variable rates of rebuilding, the upward oyster population

trajectories in the Choptank River sanctuaries are highly encouraging. They demonstrate that given the right conditions, unrestored sanctuaries can improve with minimal management actions, albeit in a longer timeframe. Even with the modest double-digit spat counts observed over the last five years, the Choptank sanctuary populations should continue to grow, provided there is not a sustained recruitment failure or an unusual mortality event - which have been rare during the past two decades. That is not to say that no management actions should be taken. Where enhancement is clearly needed, such as increasing cultch densities on the lower and middle Choptank sanctuaries to expand the habitat footprint, small-scale substrate plantings are justified to help give these populations a substantial boost.

The Biomass Conundrum

The upward trajectory of the oyster population and its biomass over the past decade and a half raises a potential issue with the Biomass Index. The Biomass Index is based on the number and sizes of oysters in a bushel of dredged material averaged over 43 sentinel stations. This material is made up of both oysters and cultch. However, as the oyster population increases, the potential for only oysters to fill a bushel becomes a real prospect. Therein lies the problem. There are only a limited number of oysters that can fit in a bushel. The maximum biomass a sample can attain is constrained by the bushel measure.

This theoretical biomass limit is dictated by the size of the oysters. For this discussion, it is assumed that the oysters are all of one size class consisting of a 5 mm grouping. These single size classes are used to calculate the bushel biomass limits (Table D-1). The numbers per bushel for each size class are from the Fourth Report of the Shell Fish Commission (Grave, 1912). In reality, there would be a mixture of size classes, but the ratios are so variable that it would be an unachievable task to calculate the biomass for all possible combinations. The size-weight relationships of oysters used in calculating the Biomass Index were developed by Jordan et al. (2002).

Table D-1. Oyster size classes, dry weight (g/bu) for an oyster of that size, number of oysters/bu, maximum biomass/bu, and maximum biomass index for a sample. See the Biomass subsection in Methods for an explanation of how the biomass numbers were derived.

Oyster Size					
in	mm	Dry Wt (g/bu)	Oysters/bu	Max.Biom. (g/bu)	Biomass Index
2.5	63.5	0.816	690	562.8	6.67
2.75	69.8	1.084	582	630.9	7.48
3	76.2	1.357	475	644.4	7.64
3.25	82.6	1.629	412	671.3	7.95
3.5	88.9	1.898	350	664.2	7.87
3.75	95.2	2.166	305	660.7	7.83
4	101.6	2.438	260	634.1	7.51
4.25	108	2.711	220	596.5	7.07
4.5	114.3	2.979	180	536.4	6.35

When plotted, the maximum biomass for each of the size classes form a parabola (Figure D-2).

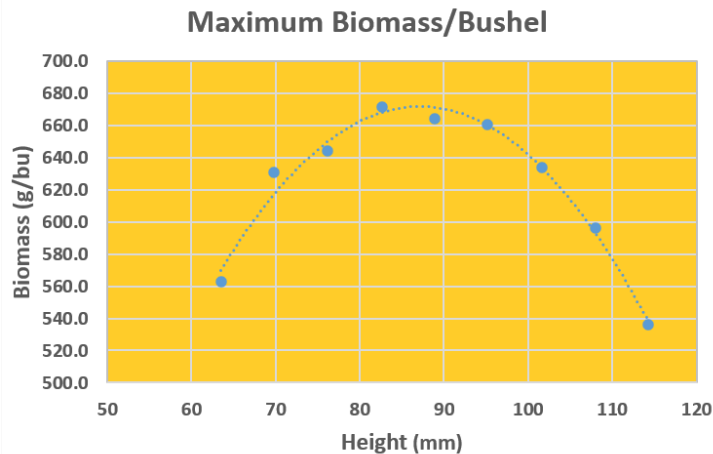


Figure D-2. Distribution of theoretical maximum biomass indexes for each 5 mm size class.

More smaller oysters can fill a bushel, but their biomass is much less (Table D-1). As oysters get larger, their total biomass/bushel increases, peaking at a size class between 80 and 90 mm. Larger oysters don't pack as well, leaving gaps in the bushel, so the number of oysters and total biomass/bushel decline. If there is a mixture of sizes, the smaller oysters could fill in the gaps, which would maximize the biomass, nevertheless at a higher finite amount. When biomass is converted to an index, the theoretical maximum is 7.92 for a uniform size.

The theoretical maximum per size class in this example of 5 mm groupings from 60-64 mm to 115-119 mm, ranges from 536.4 g/bu to 671.3 g/bu. In recent years only one sample approached this maximum biomass – Deep Neck bar in Broad Creek had a biomass of 613.4 g/bu in 2021. Half of this total was in the 40-64 mm size range, suggesting that this sample may have indeed been at the theoretical maximum. The highest biomass/bu of the 43 sentinel bars in 2025 was 492.8 g/bu on Double Mills bar in the Tred Avon sanctuary.

The issue of a constrained maximum can be circumvented by using an areal measure incorporating tow distances and total volumes of catch, rather than a volumetric measure of biomass. This method is self-adjusting, since tow distances will shorten to prevent filling the dredge as oysters become more abundant. The distances are then standardized for comparison among the sentinel bars (e.g. (biomass/bu x total bu)/100 ft tow). The shorter the distance, the larger the multiplier applied to the total tow volume (e.g. 25 ft tow = 4x total tow volume for a 100 ft standard distance).

Another issue with the volumetric approach is relatability among individual bars. The standard unit of measurement is the bushel. It doesn't discern whether the bushel of material is caught in a 10 ft tow or a 1,000 ft tow. The areal method accounts and adjusts for these tow differences.

From a baywide perspective, the volumetric approach is not an issue until the number of sentinel bars reaching such substantial densities is sufficient to statistically underestimate the Biomass Index. One or a few stations may result in only a slight, probably nondetectable underestimate of the Index, which taken as a whole over 43 bars, would tend to average out the extremes.

The Biomass Index was originally developed on a volumetric basis because that was the only measure used in the Fall Survey. The baseline year was 1993 because it had the lowest biomass at that time. Tow distances and total catch volumes were first recorded in 2005. A new index

could potentially be developed based on tow distances and total catch volume, but thirteen years of data would be lost from a critical period when the oyster population was beset by severe disease epizootics. More properly, the areal method is the accepted approach when evaluating individual bars, while the volumetric approach remains a viable method for baywide assessments.

The Biomass Index provides valuable insights into baywide trends of Maryland's oyster population over time. It has effectively tracked how the population was impacted by epizootics and its response in the aftermath – the length of time to begin recovery and its ascending path of recent years. Perhaps it is too optimistic to anticipate that oyster population will reach such high densities that the Biomass Index will be rendered obsolete, but the example at Deep Neck bar indicated that the potential is real. It's certainly a nice problem to entertain.



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TABLES

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

Physical Parameters

- Latitude and longitude (deg., min., decmin.)
- Depth (ft.)
- Temperature (°C; surface at all stations, 1 ft. above bottom at Key & Disease Bars)
- Salinity (ppt; surface at all stations, 1 ft. above bottom at Key & Disease Bars)
- Tow distance (ft.) (2005-present)

Biological Parameters

- Total volume of material in dredge (Md. bu.) (2005-present)
- Counts of live and dead oysters by age/size classes (spat, smalls, markets) per Md. bushel of material
- Stage of oyster boxes (recent, old)
- Observed (estimated) average and range of shell heights of live and dead oysters by age/size classes (mm)
- Shell heights of oysters grouped into 5-mm intervals (Disease Bars, 1990-2009) or 1-mm intervals (Disease Bars and other locations totaling about 30% of all surveyed bars, 2010-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.)

The time series for the Spat Intensity, Diseases, and Mortality Indices are presented in Tables 2 - 5. The majority of Fall Survey data, including supplemental disease results, are contained in digital files. Fouling and oyster condition data are mostly in paper files.

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Table 2. Spatfall intensity (spat per bushel of cultch) from the 53 “Key” spat monitoring bars, 1985-2025. (S) = bar within an oyster sanctuary since 2010.

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 (S)	6	5	0	0	0	0
	Stone Rock	136	20	0	50	22	37
	Flag Pond (S)	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 (S)	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 (S)	74	16	2	0	0	28
	Royston	440	8	8	0	0	57
	Cook Point (S)	66	82	4	28	0	17
Harris Creek	Eagle Pt./Mill Pt. (S)	258	92	2	6	6	18
	Tilghman Wharf	156	28	38	4	4	109
Broad Creek	Deep Neck	566	114	6	22	4	48
Tred Avon River	Double Mills (S)	332	24	2	0	0	1
Little Choptank R.	Ragged Point	134	82	34	112	0	65
	Cason (S)	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 (S)	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 (S)	26	98	14	4	16	4
	Drum Point (S)	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 (S)	140	34	52	36	6	613
Breton Bay	Black Walnut (S)	16	12	0	0	0	1
	Blue Sow (S)	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
Median		50	24	8	6	0	13

Table 2 - Spat (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 (S)	0	0	0	0	0	0	0	0
Stone Rock	355	9	4	4	16	0	18	0
Flag Pond (S)	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 (S)	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 (S)	179	2	0	0	4	0	55	0
Royston	595	20	10	0	10	0	289	0
Cook Point (S)	171	1	0	2	14	0	20	0
Eagle Pt./Mill Pt. (S)	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 (S)	129	0	13	0	15	0	40	0
Ragged Point	1036	53	9	1	25	0	106	0
Cason (S)	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 (S)	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 (S)	52	42	19	9	5	0	8	6
Drum Point (S)	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 (S)	190	62	15	7	54	0	1390	6
Black Walnut (S)	6	0	1	0	1	0	2	0
Blue Sow (S)	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
Median	140	5	4	0	10	0	8	0

Table 2 - Spat (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 (S)	0	0	1	4	0	0	0	0
Stone Rock	3	34	2	17	1	0	0	3
Flag Pond (S)	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 (S)	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 (S)	4	0	1	1	0	2	0	5
Royston	39	0	3	10	0	14	0	44
Cook Point (S)	1	5	5	3	1	4	0	9
Eagle Pt./Mill Pt. (S)	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 (S)	1	0	0	0	0	3	0	3
Ragged Point	43	3	5	0	1	2	0	6
Cason (S)	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 (S)	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 (S)	50	6	1	280	15	4	5	75
Drum Point (S)	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
Marumsco	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 (S)	95	42	117	535	9	6	10	125
Black Walnut (S)	3	0	1	2	0	0	0	0
Blue Sow (S)	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
Median	6	2	3	9	1	0	0	5

Table 2 - Spat (continued).

Oyster Bar	Spatfall Intensity (Number per Bushel)							
	2007	2008	2009	2010	2011	2012	2013	2014
Mountain Point	0	0	0	0	0	0	0	0
Swan Point	0	0	0	0	0	1	0	0
Brick House	0	0	6	4	1	7	0	0
Hackett Point	0	0	0	5	0	0	0	1
Tolly Point	0	0	0	2	0	1	0	0
Three Sisters	0	0	0	3	0	0	0	0
Holland Point (S)	0	0	0	1	0	0	0	0
Stone Rock	0	1	4	22	1	46	2	1
Flag Pond (S)	0	0	0	15	4	8	2	6
Hog Island	1	1	4	4	8	42	11	3
Butler	1	8	1	15	3	7	0	14
Buoy Rock	0	0	0	3	0	1	0	0
Parsons Island	0	0	8	2	0	13	0	1
Wild Ground	0	1	1	3	0	7	0	2
Hollicutt Noose	0	0	0	5	0	8	0	0
Bruffs Island (S)	0	0	0	3	0	18	0	0
Ash Craft	0	0	2	39	0	1	3	0
Turtle Back	0	0	13	13	0	16	1	1
Shell Hill	0	0	0	1	0	4	0	0
Sandy Hill (S)	3	1	5	5	0	6	1	1
Royston	2	5	20	27	0	46	9	19
Cook Point (S)	1	10	18	37	2	41	6	1
Eagle Pt./Mill Pt. (S)	0	2	17	44	0	29	4	1
Tilghman Wharf	0	6	15	72	0	183	20	46
Deep Neck	1	23	100	144	1	331	14	9
Double Mills (S)	1	3	11	4	0	5	2	1
Ragged Point	0	2	12	33	0	14	5	2
Cason (S)	0	13	9	50	0	65	14	4
Windmill	4	79	7	85	12	88	114	19
Norman Addition	0	102	6	155	27	138	145	38
Goose Creek	0	35	20	75	83	98	128	8
Clay Island	1	94	29	342	26	103	56	6
Wetipquin (S)	0	2	2	8	4	8	5	22
Middleground	0	21	6	92	23	78	59	7
Evans	0	14	9	27	10	98	3	1
Mt. Vernon Wharf	0	0	8	2	4	16	0	9
Georges (S)	5	28	22	753	243	133	117	35
Drum Point (S)	56	124	34	524	248	219	92	58
Sharkfin Shoal	1	16	14	169	23	65	46	24
Turtle Egg Island	7	32	17	202	23	153	47	24
Piney Island East	44	23	0	160	109	199	6	14
Great Rock	64	38	5	12	5	111	0	2
Gunby	4	5	24	317	25	251	20	43
Marumsco	14	12	24	261	44	81	43	19
Broome Island	0	3	5	52	2	8	4	2
Back of Island	2	7	8	47	7	70	6	3
Chicken Cock	9	1	16	37	11	27	15	38
Pagan (S)	616	0	321	227	110	325	196	64
Black Walnut (S)	0	0	0	1	0	0	0	0
Blue Sow (S)	0	0	3	0	0	0	0	0
Dukehart Channel	0	0	1	0	0	1	0	0
Ragged Point	2	1	2	0	1	0	0	2
Cornfield Harbor	7	1	1	28	3	7	7	46
Spat Index	15.9	13.5	15.7	78.0	20.1	59.9	22.7	11.3
Median	0	1	6	22	1	16	3	2

Table 2 - Spat (continued).

Oyster Bar	Spatfall Intensity (Number per Bushel)									
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Mountain Point	0	0	0	0	0	0	0	0	0	3
Swan Point	0	0	0	0	0	0	0	0	0	2
Brick House	0	0	0	0	0	0	1	0	10	37
Hackett Point	0	0	0	0	0	0	0	0	7	17
Tolly Point	0	2	0	0	1	0	0	0	15	21
Three Sisters	0	0	0	0	1	0	1	0	10	7
Holland Point (S)	0	0	0	0	0	1	0	0	3	3
Stone Rock	2	17	0	4	6	7	1	0	19	13
Flag Pond (S)	10	12	28	0	2	0	0	0	25	2
Hog Island	9	22	1	0	19	8	14	7	32	8
Butler	68	90	2	1	42	34	65	28	55	37
Buoy Rock	0	0	0	0	0	0	0	0	0	0
Parsons Island	8	0	0	0	2	0	13	5	15	3
Wild Ground	15	0	0	0	1	2	9	2	7	9
Hollicutt Noose	1	0	0	0	0	2	7	4	17	11
Bruffs Island (S)	0	0	0	0	0	0	28	10	29	4
Ash Craft	0	0	0	0	0	1	14	0	9	5
Turtle Back	13	4	0	0	0	5	42	7	12	17
Shell Hill	4	2	1	5	2	0	7	9	30	4
Sandy Hill (S)	0	3	1	0	2	5	18	13	32	10
Royston	21	13	23	22	0	231	96	17	75	23
Cook Point (S)	1	21	2	4	7	68	28	10	202	18
Eagle Pt./Mill Pt. (S)	34	68	55	28	0	187	51	7	8	15
Tilghman Wharf	45	58	13	40	5	247	134	22	91	35
Deep Neck	83	91	205	119	17	1838	162	75	371	251
Double Mills (S)	9	12	3	1	1	74	21	5	299	2
Ragged Point	19	125	35	2	1	18	6	0	27	16
Cason (S)	11	60	67	9	4	613	62	24	22	49
Windmill	16	9	9	4	12	62	66	8	203	101
Norman Addition	34	60	44	13	24	227	170	38	275	174
Goose Creek	11	44	27	23	18	448	44	65	137	69
Clay Island	43	68	41	43	14	43	35	79	167	41
Wetipquin (S)	2	6	0	21	33	15	13	17	6	15
Middleground	12	32	66	49	138	100	41	14	108	65
Evans	14	18	1	7	37	52	66	19	28	28
Mt. Vernon Wharf	1	3	1	10	7	42	4	11	34	28
Georges (S)	29	61	137	40	78	185	20	14	86	6
Drum Point (S)	59	172	78	110	160	445	61	58	105	56
Sharkfin Shoal	57	53	32	23	14	17	21	16	72	56
Turtle Egg Island	64	57	15	69	88	122	66	47	196	125
Piney Island East	3	0	2	0	68	196	103	95	206	71
Great Rock	13	4	14	93	151	258	44	288	120	204
Gunby	95	73	34	25	46	18	54	47	97	87
Marumsco	141	69	31	8	61	53	29	48	39	59
Broome Island	6	21	6	1	12	1	73	2	79	5
Back of Island	18	42	5	5	13	7	18	5	282	36
Chicken Cock	712	33	19	5	10	37	111	23	182	50
Pagan (S)	24	91	247	7	15	53	426	478	183	198
Black Walnut (S)	3	4	0	0	0	0	0	1	42	2
Blue Sow (S)	0	10	0	0	0	1	1	1	60	1
Dukehart Channel	0	3	0	0	0	0	0	2	175	0
Ragged Point	1	11	2	2	0	4	9	10	190	6
Cornfield Harbor	100	92	6	6	108	55	70	68	107	54
Spat Index	34.2	30.9	23.6	15.0	23.0	109.1	43.9	32.1	86.8	40.7
Median	10	12	2	2	5	17	21	10	42	17

Table 2 - Spat (continued).

Oyster Bar	Spatfall Intensity (Number per Bushel)	
	2025	41-Yr Avg
Mountain Point	0	0.3
Swan Point	0	0.4
Brick House	257	12.8
Hackett Point	12	1.5
Tolly Point	27	2.2
Three Sisters	102	3.5
Holland Point (S)	20	1.1
Stone Rock	259	27.7
Flag Pond (S)	21	20.5
Hog Island	32	17.6
Butler	75	41.2
Buoy Rock	1	1.1
Parsons Island	95	94.1
Wild Ground	139	38.1
Hollicutt Noose	40	6.1
Bruffs Island (S)	34	24.8
Ash Craft	45	60.9
Turtle Back	181	115.3
Shell Hill	21	7.9
Sandy Hill (S)	171	15.9
Royston	576	67.6
Cook Point (S)	349	30.7
Eagle Pt./Mill Pt. (S)	42	40.7
Tilghman Wharf	1735	110.4
Deep Neck	3658	253.4
Double Mills (S)	124	27.8
Ragged Point	28	50.9
Cason (S)	108	96.3
Windmill	195	58.4
Norman Addition	102	90.0
Goose Creek	139	48.6
Clay Island	252	55.1
Wetipquin (S)	21	6.9
Middleground	51	34.1
Evans	69	16.9
Mt. Vernon Wharf	157	9.4
Georges (S)	160	70.5
Drum Point (S)	35	102.7
Sharkfin Shoal	105	31.0
Turtle Egg Island	230	95.5
Piney Island East	310	107.3
Great Rock	27	54.1
Gunby	278	64.1
Marumsco	93	42.5
Broome Island	149	13.3
Back of Island	81	22.5
Chicken Cock	148	81.6
Pagan (S)	2168	226.7
Black Walnut (S)	0	2.4
Blue Sow (S)	7	5.6
Dukehart Channel	6	5.9
Ragged Point	162	13.9
Cornfield Harbor	152	74.9
Spat Index	250.0	42.2
Median	102	27*

*41-yr median of the Spat Indexes

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Table 3. *Perkinsus marinus* prevalence and mean intensity (scale of 0-7) in oysters from the 43 disease monitoring bars, 1990-2025. NA = insufficient quantity of oysters for analytical sample. (S) = bar within an oyster sanctuary since 2010.

Region	Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Mean 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 (S)	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 (S)	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 (S)	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 (S)	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 (S)	73	2.3	94	4.3	86	3.0	77	2.6	60	2.0
Choptank River	Cook Point (S)	17	0.2	23	0.3	87	3.7	97	4.2	90	3.0
	Royston	NA	NA	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 (S)	100	5.0	100	5.7	100	4.2	100	3.8	83	2.3
	Oyster Shell Pt. (S)	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 (S)	97	3.6	100	4.9	100	4.1	100	3.8	90	2.0
Little Choptank R.	Cason (S)	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 (S)	93	2.9	100	2.8	90	2.5	83	1.6	40	0.9
Manokin River	Georges (S)	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 (S)	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		69	2.3	82	3.0	83	2.8	84	2.6	54	1.4
Frequency of Positive Bars (%)		98		100		100		100		100	

Table 3 - Dermo (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Mean 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 (S)	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 (S)	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 (S)	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 (S)	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 (S)	67	2.2	20	0.4	23	0.6	100	2.7	100	3.6	97	3.3
Cook Point (S)	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 (S)	89	3.4	30	0.7	60	1.3	40	1.0	97	3.4	87	3.6
Oyster Shell Pt. (S)	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 (S)	75	2.5	70	1.2	83	2.0	100	3.0	100	4.8	100	4.7
Cason (S)	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 (S)	63	1.1	83	1.8	80	1.9	70	1.6	100	4.3	70	2.1
Georges (S)	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 (S)	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
Bar Freq. (%)	100		95		95		95		98		100	

Table 3 - Dermo (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Mean 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 (S)	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 (S)	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 (S)	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 (S)	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 (S)	100	4.2	100	3.1	97	2.8	97	3.2	90	2.7	80	2.1
Cook Point (S)	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 (S)	100	4.5	100	5.0	93	3.5	87	3.3	80	2.5	70	2.3
Oyster Shell Pt. (S)	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 (S)	100	5.5	97	2.9	53	1.7	53	2.1	53	1.6	40	1.1
Cason (S)	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 (S)	100	4.0	100	3.6	83	2.3	97	2.3	90	3.0	93	3.7
Georges (S)	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 (S)	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
Bar Freq. (%)	100		100		98		98		98		98	

Table 3 - Dermo (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Mean Intensity (I)											
	2007		2008		2009		2010		2011		2012	
	%	I	%	I	%	I	%	I	%	I	%	I
Swan Point	17	0.4	20	0.6	23	0.4	3	0.1	7	0.1	3	0.03
Hackett Point	87	2.9	80	2.7	73	1.9	63	1.3	33	1.0	33	0.8
Holland Point (S)	33	0.6	23	0.8	33	0.8	13	0.4	17	0.4	0	0.0
Stone Rock	93	3.5	47	1.3	30	0.9	53	1.2	17	0.4	57	2.0
Flag Pond (S)	87	2.0	67	2.3	57	2.1	33	1.2	38	0.9	53	1.5
Hog Island	80	3.1	50	2.0	67	2.7	70	2.0	40	1.0	77	2.2
Butler	77	1.7	43	1.2	43	1.3	77	2.7	60	1.9	90	3.4
Buoy Rock	80	3.2	70	2.2	64	1.5	65	2.2	20	0.5	10	0.3
Old Field (S)	100	4.0	90	3.3	87	3.3	70	2.2	40	0.8	67	2.2
Bugby	100	3.9	93	2.9	100	3.8	67	2.0	27	0.6	73	2.3
Parsons Island	97	4.0	87	3.1	100	2.5	60	1.8	10	0.4	23	0.7
Hollicutt Noose	87	3.0	93	3.3	43	1.4	53	1.4	20	0.9	13	0.3
Bruffs Island (S)	100	3.8	93	3.0	83	2.6	73	1.6	47	1.1	33	0.9
Turtle Back	100	4.4	100	4.1	97	2.9	73	1.8	23	0.6	50	0.9
Long Point (S)	93	3.8	87	3.1	46	1.6	50	1.3	31	0.7	46	1.5
Cook Point (S)	17	0.3	13	0.4	7	0.1	43	1.0	40	1.0	93	3.2
Royston	23	0.7	17	0.4	27	0.7	3	0.1	13	0.4	27	0.8
Lighthouse	0	0.0	0	0.0	10	0.1	10	0.1	0	0.0	13	0.2
Sandy Hill (S)	87	2.5	17	0.5	13	0.2	30	0.7	40	1.5	80	2.5
Oyster Shell Pt. (S)	27	0.7	0	0.0	0	0.0	0	0.0	3	0.1	0	0.0
Tilghman Wharf	23	0.5	3	0.1	10	0.2	3	0.1	0	0.0	0	0.0
Deep Neck	90	2.7	67	2.2	70	2.4	67	1.9	43	1.1	100	3.2
Double Mills (S)	87	2.9	67	2.2	80	2.1	63	1.5	53	1.7	83	3.4
Cason (S)	60	1.9	100	2.9	100	3.2	97	3.8	70	2.2	93	3.3
Ragged Point	93	2.7	37	1.0	80	2.5	83	2.3	60	1.7	93	3.1
Norman Addition	23	0.9	37	0.7	57	1.8	100	3.9	87	3.3	100	4.3
Goose Creek	0	0.0	20	0.2	0	0.0	10	0.2	10	0.3	50	1.3
Wilson Shoals (S)	93	2.7	80	2.3	87	2.9	80	1.9	62	2.0	97	4.1
Georges (S)	83	3.8	57	2.2	57	1.6	73	2.4	50	1.2	100	3.9
Holland Straits	80	3.0	50	2.0	47	1.5	70	2.2	37	1.4	83	3.0
Sharkfin Shoal	70	1.9	70	1.7	90	3.6	97	3.6	90	3.3	100	4.2
Back Cove	93	3.2	80	2.6	87	3.3	93	3.6	80	2.7	90	3.0
Piney Island East	67	2.5	90	3.3	90	3.4	97	4.1	70	2.7	80	2.5
Old Woman's Leg	73	2.2	90	2.8	97	4.7	70	3.0	47	1.9	77	2.7
Marumsco	37	1.1	57	1.7	90	3.0	73	2.7	67	2.5	97	3.2
Broome Island	97	3.6	93	2.5	100	4.2	90	3.3	67	2.3	87	3.0
Chicken Cock	90	4.0	40	1.3	90	3.5	83	3.3	20	0.6	50	1.3
Pagan (S)	90	2.5	57	1.8	93	2.7	97	3.9	53	2.0	87	2.8
Lancaster	97	4.2	77	2.1	73	2.4	60	2.0	37	0.8	47	1.1
Mills West	47	1.6	57	1.9	50	1.3	27	0.9	27	0.5	80	2.5
Cornfield Harbor	97	3.5	73	2.6	87	3.7	83	2.5	40	1.3	83	3.0
Ragged Point	0	0.0	8	0.1	0	0.0	4	0.1	0	0.0	3	0.03
Lower Cedar Point	30	0.6	7	0.1	10	0.3	40	0.9	20	0.4	20	0.3
Annual Means	68	2.3	56	1.8	59	2.0	57	1.8	38	1.2	59	2.0
Bar Freq. (%)	93		95		93		98		93		93	

Table 3 - Dermo (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Mean Intensity (I)											
	2013		2014		2015		2016		2017		2018	
	%	I	%	I	%	I	%	I	%	I	%	I
Swan Point	27	0.4	3	0.0	33	0.3	3	0.0	3	0.0	0	0.0
Hackett Point	13	0.6	0	0.0	10	0.3	40	1.2	56	1.6	27	0.9
Holland Point (S)	5	0.1	0	0.0	0	0.0	27	0.6	47	1.2	7	0.1
Stone Rock	67	2.0	100	4.0	93	4.5	97	4.4	83	3.4	53	1.7
Flag Pond (S)	23	0.8	10	0.3	18	0.5	50	1.9	52	1.6	27	0.6
Hog Island	27	0.9	43	1.2	87	3.0	97	4.3	100	4.5	63	2.1
Butler	70	2.4	73	2.4	60	2.0	37	1.5	63	2.2	73	2.1
Buoy Rock	27	0.6	13	0.4	17	0.2	20	0.7	30	0.8	0	0.0
Old Field (S)	57	1.5	47	1.5	57	1.7	63	2.1	60	2.1	27	0.7
Bugby	73	2.5	83	2.8	87	3.3	90	3.3	97	3.3	43	1.1
Parsons Island	30	0.9	15	0.4	53	1.3	77	2.2	83	2.9	43	1.3
Hollicutt Noose	13	0.4	23	0.6	33	0.7	50	1.5	57	1.8	17	0.5
Bruffs Island (S)	37	1.2	23	0.7	77	2.0	100	4.2	97	4.3	63	1.9
Turtle Back	63	2.2	80	2.5	100	4.2	83	3.5	83	3.2	70	2.1
Long Point (S)	37	1.2	10	0.4	20	0.5	73	2.6	36	1.1	7	0.3
Cook Point (S)	97	3.2	80	3.1	90	3.3	100	4.6	90	3.5	63	1.6
Royston	60	2.0	60	2.0	63	2.1	47	1.5	43	1.5	17	0.5
Lighthouse	10	0.3	10	0.3	23	0.5	10	0.4	17	0.4	7	0.2
Sandy Hill (S)	93	2.8	77	2.4	93	3.3	93	4.0	96	3.9	53	1.4
Oyster Shell Pt. (S)	7	0.2	3	0.0	40	1.0	80	2.6	77	2.8	57	1.8
Tilghman Wharf	10	0.2	7	0.1	20	0.6	47	1.5	70	2.2	47	1.2
Deep Neck	80	3.1	67	1.8	93	2.9	80	3.1	77	2.4	57	1.3
Double Mills (S)	83	3.1	73	2.6	70	2.9	87	3.6	97	3.9	67	2.1
Cason (S)	80	2.8	90	2.8	93	2.8	100	4.2	97	3.3	77	2.2
Ragged Point	97	3.0	83	2.3	100	3.2	93	4.0	97	3.7	67	1.7
Norman Addition	80	3.1	87	3.7	77	2.7	93	3.6	93	3.2	63	2.0
Goose Creek	80	2.6	83	2.5	100	3.4	93	4.3	80	3.0	70	2.7
Wilson Shoals (S)	93	3.0	90	3.4	80	2.8	90	3.2	87	3.2	73	2.1
Georges (S)	83	3.4	97	3.9	93	3.9	83	3.4	97	3.9	77	2.7
Holland Straits	90	3.7	80	3.6	83	3.0	13	0.3	30	0.6	7	0.2
Sharkfin Shoal	93	3.5	90	3.4	77	2.8	90	4.1	93	4.1	57	2.1
Back Cove	93	3.9	80	3.1	77	3.2	30	0.9	30	0.9	3	0.1
Piney Island East	63	2.0	40	1.4	53	1.8	60	2.4	70	2.3	27	1.1
Old Woman's Leg	52	1.3	60	2.6	67	2.1	11	0.2	50	1.6	6	0.1
Marumsco	100	4.4	80	3.5	90	3.6	93	3.7	100	3.9	63	1.6
Broome Island	93	3.2	70	1.9	80	2.6	90	3.8	93	4.0	50	1.3
Chicken Cock	50	1.2	67	1.9	67	2.1	73	2.4	97	3.1	63	2.1
Pagan (S)	77	2.4	83	2.1	83	2.9	83	3.1	80	3.1	63	1.4
Lancaster	30	1.2	20	0.8	3	0.2	37	1.6	47	1.8	10	0.1
Mills West	70	2.1	53	1.8	57	1.7	40	1.8	60	2.0	3	0.1
Cornfield Harbor	90	3.1	80	3.1	57	1.8	63	2.6	97	3.6	63	1.9
Ragged Point	0	0.0	3	0.0	0	0.0	3	0.0	7	0.1	0	0.0
Lower Cedar Point	20	0.4	3	0.1	55	1.6	33	1.1	50	1.6	0	0.0
Annual Means	57	1.9	52	1.8	61	2.1	63	2.5	69	2.5	40	1.2
Bar Freq. (%)	98		95		95		100		100		91	

Table 3 - Dermo (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Mean									
	2019		2020		2021		2022		2023	
	%	I	%	I	%	I	%	I	%	I
Swan Point	3	0.1	0	0.0	0	0	13	0.2	0	0
Hackett Point	10	0.5	30	0.9	40	1.8	57	1.4	27	0.8
Holland Point (S)	0	0.0	0	0.0	3	0.1	3	0.1	90	2.1
Stone Rock	23	1.0	23	0.6	10	0.3	63	1.9	67	2
Flag Pond (S)	13	0.5	87	3.0	90	3.8	100	3.2	93	3.9
Hog Island	27	1.0	30	1.0	30	0.7	90	2.7	97	3.4
Butler	60	2.0	60	2.0	80	2.8	93	3.7	87	3.2
Buoy Rock	3	0.1	0	0.0	13	0.3	23	0.4	7	0.1
Old Field (S)	17	0.4	20	0.7	17	0.6	39	0.7	27	0.5
Bugby	90	2.8	57	1.6	67	2.2	90	2.5	93	2.3
Parsons Island	7	0.4	23	0.5	3	0.07	20	0.4	37	0.9
Hollicutt Noose	13	0.5	13	0.4	10	0.2	33	0.9	30	0.6
Bruffs Island (S)	70	2.3	33	0.8	57	2.3	13	0.3	63	1.2
Turtle Back	73	2.9	67	2.2	37	1	67	1.8	47	1.1
Long Point (S)	3	0.03	13	0.3	27	1	70	1.6	67	1.3
Cook Point (S)	37	1.2	80	2.6	57	2	90	2.2	100	4.3
Royston	20	0.6	60	1.5	13	0.5	27	0.5	33	0.9
Lighthouse	3	0.2	0	0.0	0	0	3	0	3	0.03
Sandy Hill (S)	53	2.4	67	2.1	27	0.7	70	1.5	97	3.6
Oyster Shell Pt. (S)	3	0.1	20	0.5	13	0.2	60	1.1	47	0.7
Tilghman Wharf	23	0.9	20	0.7	40	1.1	40	0.9	60	1.5
Deep Neck	33	1.2	30	0.9	57	1.4	93	2.7	100	3.9
Double Mills (S)	47	1.8	63	2.2	70	2.3	97	3	97	3.1
Cason (S)	60	2.0	50	1.7	57	1.7	90	2.6	87	2.6
Ragged Point	60	1.4	73	2.6	77	2.3	97	2.6	97	3.1
Norman Addition	37	1.5	23	0.8	7	0.3	67	1.9	67	2.4
Goose Creek	27	1.1	53	2.0	63	2.5	93	3.5	100	4.6
Wilson Shoals (S)	30	1.0	47	1.2	60	2	90	3	97	4.3
Georges (S)	77	3.1	77	2.9	73	2.6	90	4	100	4.3
Holland Straits	0	0.0	0	0.0	3	0.03	20	0.6	27	0.8
Sharkfin Shoal	63	2.4	67	2.7	57	2.8	93	4	100	3.6
Back Cove	3	0.2	10	0.3	83	2.6	93	4.1	97	4.7
Piney Island East	17	0.5	3	0.1	23	0.6	53	1.7	100	3.3
Old Woman's Leg	0	0.0	0	0.0	3	0.1	30	0.7	73	2.2
Marumsco	30	1.0	7	0.3	37	1.1	73	1.7	100	4.9
Broome Island	13	0.5	27	0.8	27	0.7	67	1.8	97	3.2
Chicken Cock	27	1.2	23	0.7	30	1.1	57	1.4	77	2.2
Pagan (S)	17	0.4	37	1.1	70	2.4	50	1.6	87	2.7
Lancaster	7	0.2	47	1.5	63	2	93	3.1	97	3.9
Mills West	0	0.0	3	0.2	3	0.2	3	0	7	0.1
Cornfield Harbor	40	1.3	53	2.0	43	1.6	90	2.3	83	2.3
Ragged Point	0	0.0	0	0.0	0	0	23	0.3	3	0.03
Lower Cedar Point	NA	NA	10	0.4	17	0.5	7	0.1	27	0.5
Annual Means	27	1.0	33	1.1	36.2	1.2	58.9	1.7	67.3	2.28
Bar Freq. (%)	88		84		93		100		98	

Table 3 - Dermo (continued).

Oyster Bar	<i>Perkinsus marinus</i> Prevalence (%) and Mean Intensity (I)					
	2024		2025		36-Yr Avg	
	%	I	%	I	%	I
Swan Point	3	0.1	3	0.03	23.0	0.6
Hackett Point	43	1.7	10	0.2	46.6	1.4
Holland Point (S)	50	1.3	40	1.2	38.2	1.1
Stone Rock	50	1.7	13	0.2	65.6	2.2
Flag Pond (S)	63	1.5	57	1.7	52.5	1.7
Hog Island	67	2.7	33	1.3	70.0	2.6
Butler	77	2.3	60	1.8	68.5	2.2
Buoy Rock	7	0.3	7	0.3	43.6	1.4
Old Field (S)	24	0.7	17	0.4	51.4	1.5
Bugby	70	1.6	60	1.9	79.6	2.6
Parsons Island	20	0.6	13	0.4	62.1	2.1
Hollicutt Noose	3	0.1	3	0.1	52.1	1.6
Bruffs Island (S)	33	0.8	77	2.7	68.5	2.2
Turtle Back	57	1.6	73	3.1	79.7	2.7
Long Point (S)	3	0.1	13	0.4	58.1	1.9
Cook Point (S)	57	1.4	40	1.1	60.4	2.0
Royston	47	1.4	37	1.1	51.1	1.8
Lighthouse	3	0.1	0	0	36.8	1.2
Sandy Hill (S)	50	1.3	70	2.5	72.8	2.6
Oyster Shell Pt. (S)	10	0.1	13	0.3	37.9	1.1
Tilghman Wharf	47	1.3	3	0.2	49.2	1.4
Deep Neck	70	1.9	60	1.5	76.8	2.6
Double Mills (S)	57	1.6	70	1.9	78.4	2.8
Cason (S)	80	1.9	77	2.6	78.2	2.5
Ragged Point	70	2.3	53	1	79.4	2.6
Norman Addition	77	1.8	47	1.2	73.0	2.5
Goose Creek	70	2.3	60	2	67.3	2.4
Wilson Shoals (S)	67	2.1	70	2.1	80.8	2.5
Georges (S)	83	2.9	70	2.2	81.5	2.9
Holland Straits	10	0.3	23	0.4	54.6	1.8
Sharkfin Shoal	73	2	40	1.2	80.3	2.9
Back Cove	83	4	73	2.4	76.8	2.9
Piney Island East	57	1.9	50	1.8	71.1	2.4
Old Woman's Leg	40	1.3	67	2.1	65.0	2.3
Marumsco	47	1.8	47	1.3	76.3	2.7
Broome Island	80	2.9	60	1.9	72.0	2.5
Chicken Cock	30	0.9	20	0.6	66.4	2.2
Pagan (S)	63	1.8	77	2	76.1	2.3
Lancaster	30	1	17	0.4	56.3	1.7
Mills West	0	0	3	0.03	46.9	1.4
Cornfield Harbor	73	1.8	57	1.6	76.1	2.4
Ragged Point	3	0.03	0	0	16.9	0.5
Lower Cedar Point	3	0.1	0	0	20.3	0.5
Annual Means	45.3	1.38	39.1	1.19	61.5	2.0
Bar Freq. (%)	98		93		96.5	

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Table 4. Prevalence of *Haplosporidium nelsoni* in oysters from the 43 disease monitoring bars, 1990-2025. NA = insufficient quantity of oysters for analytical sample. ND = sample collected but diagnostics not performed; prevalence assumed to be 0. (S) = bar within an oyster sanctuary since 2010.

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 (S)	0	3	13	0	0	0	0	0
	Stone Rock	0	0	43	0	0	3	0	0
	Flag Pond (S)	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 (S)	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 (S)	0	0	0	0	0	0	0	0
Miles River	Turtle Back	0	0	0	0	0	23	0	0
	Long Point (S)	0	0	0	0	0	0	0	0
Choptank River	Cook Point (S)	0	7	73	0	0	NA	0	3
	Royston	NA	0	33	0	0	0	0	0
	Lighthouse	0	0	53	0	0	0	0	0
	Sandy Hill (S)	0	0	13	0	ND	0	0	0
	Oyster Shell Pt. (S)	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 (S)	0	0	17	0	0	0	0	0
Little Choptank R.	Cason (S)	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 (S)	0	0	57	0	ND	7	0	0
Manokin River	Georges (S)	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 (S)	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
Average Prevalence (%)		1.1	5.1	24.5	2.8	0.9	9.5	0.7	1.2
Frequency of Positive Bars (%)		9	28	74	14	7	40	7	16

Table 4 – MSX (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 (S)	0	0	3	7	40	0	0	0	0	0
Stone Rock	0	30	47	40	30	3	0	0	0	0
Flag Pond (S)	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 (S)	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 (S)	0	0	0	3	17	0	0	0	0	0
Turtle Back	0	0	0	7	33	0	0	0	0	0
Long Point (S)	0	0	0	0	3	0	0	0	0	0
Cook Point (S)	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 (S)	0	0	0	10	53	0	0	0	0	0
Oyster Shell Pt. (S)	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 (S)	0	3	0	0	33	0	0	0	0	0
Cason (S)	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 (S)	0	4	10	10	27	0	0	0	0	7
Georges (S)	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	17
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 (S)	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
Avg. Prev. (%)	2.1	19.2	14.9	13.0	29.0	1.4	0.2	0.5	0.7	3.1
Pos. Bars (%)	19	67	64	67	90	23	7	7	9	30

Table 4 - MSX (continued).

Oyster Bar	<i>Haplosporidium nelsoni</i> Prevalence (%)										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Swan Point	0	0	0	0	0	0	0	0	0	0	0
Hackett Point	0	0	0	0	0	0	0	0	0	3	0
Holland Point (S)	0	0	3	0	0	0	0	0	0	3	0
Stone Rock	10	23	3	0	0	0	0	7	13	10	0
Flag Pond (S)	3	13	7	0	0	0	0	12	10	0	0
Hog Island	7	17	0	0	0	0	0	10	40	3	0
Butler	7	37	17	0	0	0	3	13	48	0	0
Buoy Rock	0	0	0	0	0	0	0	0	0	0	0
Old Field (S)	0	0	0	0	0	0	0	0	0	0	0
Bugby	0	0	0	0	0	0	0	3	3	0	0
Parsons Island	0	0	0	0	0	0	0	0	7	0	0
Hollicutt Noose	0	13	0	0	0	0	0	0	10	0	0
Bruffs Island (S)	0	3	0	0	0	0	0	0	3	0	0
Turtle Back	0	0	0	0	0	0	0	3	7	0	0
Long Point (S)	0	0	3	0	0	0	0	0	0	0	0
Cook Point (S)	7	43	10	0	0	0	0	13	30	3	0
Royston	0	0	0	0	0	0	0	7	30	0	0
Lighthouse	0	13	3	0	0	0	0	0	37	0	0
Sandy Hill (S)	0	0	0	0	0	0	0	0	0	0	0
Oyster Shell Pt. (S)	0	0	0	0	0	0	0	0	0	0	0
Tilghman Wharf	0	3	0	0	0	0	0	7	27	0	0
Deep Neck	0	13	0	0	0	0	0	3	0	0	0
Double Mills (S)	0	0	0	0	0	0	0	0	0	0	0
Cason (S)	0	20	0	0	0	0	0	23	0	0	0
Ragged Point	0	13	10	0	0	0	0	20	17	3	0
Norman Addition	10	33	10	0	0	0	3	3	7	0	0
Goose Creek	7	27	0	0	0	0	0	13	7	0	0
Wilson Shoals (S)	0	7	0	0	0	0	0	3	0	0	0
Georges (S)	0	10	0	0	0	0	0	3	0	0	0
Holland Straits	7	33	23	0	0	0	3	10	13	0	0
Sharkfin Shoal	17	17	10	0	0	0	10	10	0	0	0
Back Cove	13	27	7	0	0	3	10	17	37	13	0
Piney Island East	0	33	7	0	0	10	27	33	10	13	3
Old Woman's Leg	0	27	20	7	3	3	20	23	17	25	0
Marumsco	0	17	3	0	3	0	10	10	0	3	0
Broome Island	0	3	0	0	0	0	0	0	7	7	0
Chicken Cock	13	57	10	0	0	0	0	23	60	7	0
Pagan (S)	0	30	0	0	0	0	0	0	0	0	0
Lancaster	0	0	0	0	0	0	0	0	0	0	0
Mills West	0	0	0	0	0	0	0	0	0	0	0
Cornfield Harbor	10	30	7	0	0	10	10	30	33	7	0
Ragged Point	0	0	0	0	0	0	0	0	3	10	0
Lower Cedar Point	0	0	0	0	0	0	0	0	0	0	0
Avg. Prev. (%)	2.7	13.0	3.6	0.2	0.1	0.6	2.2	7.0	11.1	2.6	0.1
Pos. Bars (%)	30	60	40	2	5	9	21	56	56	33	2

Table 4 - MSX (continued).

Oyster Bar	<i>Haplosporidium nelsoni</i> Prevalence (%)							
	2019	2020	2021	2022	2023	2024	2025	36-yr avg
Swan Point	0	0	0	0	0	0	0	0.0
Hackett Point	0	0	0	0	3	0	0	0.6
Holland Point (S)	0	0	0	0	27	0	0	2.8
Stone Rock	0	0	0	0	40	0	0	8.4
Flag Pond (S)	0	0	0	0	33	3	0	5.5
Hog Island	0	0	0	0	33	0	0	8.4
Butler	0	0	0	3	27	0	0	10.2
Buoy Rock	0	0	0	0	0	0	0	0.0
Old Field (S)	0	0	0	0	0	0	0	0.0
Bugby	0	0	0	0	0	0	0	1.2
Parsons Island	0	0	0	0	0	0	0	1.0
Hollicutt Noose	0	0	0	0	17	0	0	3.6
Bruffs Island (S)	0	0	0	0	0	0	0	0.7
Turtle Back	0	0	0	0	0	0	0	2.0
Long Point (S)	0	0	0	0	0	0	0	0.2
Cook Point (S)	0	0	0	0	47	0	0	9.5
Royston	0	0	0	0	67	0	0	5.9
Lighthouse	0	0	0	0	93	0	0	8.0
Sandy Hill (S)	0	0	0	0	17	0	0	2.7
Oyster Shell Pt. (S)	0	0	0	0	0	0	0	1.1
Tilghman Wharf	0	0	0	0	40	0	0	5.9
Deep Neck	0	0	0	0	3	0	0	3.4
Double Mills (S)	0	0	0	0	0	0	0	1.5
Cason (S)	0	0	0	0	37	0	0	6.9
Ragged Point	0	0	0	0	53	0	0	9.2
Norman Addition	0	0	0	13	37	0	0	10.5
Goose Creek	0	0	3	0	13	0	0	6.9
Wilson Shoals (S)	0	0	0	0	13	0	0	4.1
Georges (S)	0	0	0	0	17	0	0	5.9
Holland Straits	0	0	0	3	20	0	3	13.1
Sharkfin Shoal	0	0	3	7	23	3	0	11.9
Back Cove	0	0	3	13	7	7	0	11.8
Piney Island East	0	3	3	17	40	7	0	14.4
Old Woman's Leg	0	0	7	13	23	3	7	14.9
Marumsco	3	0	0	13	13	3	0	7.8
Broome Island	0	0	0	0	3	0	0	1.9
Chicken Cock	0	0	0	0	0	0	3	10.5
Pagan (S)	0	0	0	0	0	0	0	2.7
Lancaster	0	0	0	0	0	0	0	0.3
Mills West	0	0	0	0	0	0	0	1.3
Cornfield Harbor	0	0	0	0	7	0	13	11.8
Ragged Point	0	0	0	0	3	0	0	2.9
Lower Cedar Point	NA	0	0	0	0	0	0	0.0
Avg. Prev. (%)	0.1	0.1	0.4	1.9	17.9	0.6	0.6	5.4
Pos. Bars (%)	2	2	12	19	65	14	9	28.2

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Table 5. Oyster population observed mortality estimates from the 43 disease monitoring bars, 1985-2025.
NA = unable to obtain a sufficient sample size. (S) = bar within an oyster sanctuary since 2010.

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 (S)	4	21	19	3	19	3	14	45
	Stone Rock	6	NA	NA	NA	NA	2	9	45
	Flag Pond (S)	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 (S)	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 (S)	2	1	45	12	9	12	50	77
Miles River	Turtle Back	NA	1	19	27	15	27	51	23
	Long Point (S)	17	8	23	8	12	11	53	73
Choptank River	Cook Point (S)	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 (S)	12	6	29	34	7	11	75	48
	Oyster Shell Pt. (S)	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 (S)	4	7	13	9	6	28	82	50
Little Choptank R.	Cason (S)	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 (S)	23	65	51	41	38	10	29	60
Manokin River	Georges (S)	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 (S)	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 - Mortality (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 (S)	43	42	35	49	36	36	8	33	42	67
Stone Rock	30	29	40	25	15	33	46	66	30	86
Flag Pond (S)	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 (S)	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 (S)	47	47	33	6	6	11	16	33	44	50
Turtle Back	24	40	51	21	9	9	26	38	48	54
Long Point (S)	44	8	28	8	3	9	14	33	34	66
Cook Point (S)	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 (S)	45	36	29	23	22	4	15	27	50	77
Oyster Shell Pt. (S)	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 (S)	24	10	20	9	8	10	38	40	50	85
Cason (S)	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 (S)	23	10	17	11	11	9	29	25	26	52
Georges (S)	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 (S)	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 - Mortality (continued).

Oyster Bar	Total Observed Mortality (%)									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Swan Point	13	10	11	8	10	9	33	20	27	1
Hackett Point	17	10	2	5	11	26	15	14	0	13
Holland Point (S)	50	29	5	0	0	11	0	8	50	7
Stone Rock	13	5	5	20	5	25	16	8	2	2
Flag Pond (S)	0	0	2	4	0	14	26	20	11	0
Hog Island	11	6	12	25	42	14	18	12	8	14
Butler	9	2	3	23	0	9	8	8	12	4
Buoy Rock	41	28	6	21	20	24	43	8	4	2
Old Field (S)	34	10	38	12	12	17	17	11	21	12
Bugby	50	14	2	20	52	42	50	12	4	9
Parsons Island	37	11	8	35	50	34	36	16	10	4
Hollicutt Noose	25	3	6	48	43	27	12	23	0	0
Bruffs Island (S)	50	12	5	4	12	36	33	28	0	7
Turtle Back	43	11	12	51	57	55	34	5	11	4
Long Point (S)	54	10	10	14	38	46	17	33	0	33
Cook Point (S)	21	0	0	0	12	22	7	8	6	5
Royston	69	14	0	0	9	5	10	0	1	3
Lighthouse	89	47	0	0	0	0	4	1	3	4
Sandy Hill (S)	88	59	44	24	4	5	5	0	8	6
Oyster Shell Pt. (S)	48	20	0	4	0	4	4	2	1	3
Tilghman Wharf	62	17	0	1	10	14	2	2	3	0
Deep Neck	54	14	1	3	8	9	3	6	4	3
Double Mills (S)	59	23	8	0	7	4	19	6	4	14
Cason (S)	57	4	0	2	4	16	17	33	10	13
Ragged Point	52	5	4	13	13	2	22	15	4	2
Norman Addition	9	14	40	5	3	2	6	15	9	10
Goose Creek	53	59	50	50	1	2	6	0	3	1
Wilson Shoals (S)	19	27	7	21	7	30	10	3	5	8
Georges (S)	4	24	44	76	16	48	10	12	2	11
Holland Straits	11	18	43	48	17	27	12	14	5	7
Sharkfin Shoal	23	32	54	22	10	3	18	20	12	13
Back Cove	22	23	32	12	5	8	6	15	4	10
Piney Island East	28	48	50	23	6	18	20	26	17	11
Old Woman's Leg	35	56	26	0	12	14	37	38	26	0
Marumsco	4	11	29	20	10	21	7	13	4	15
Broome Island	14	19	6	6	20	20	11	14	3	6
Chicken Cock	2	38	50	20	20	7	27	22	11	1
Pagan (S)	7	29	66	9	4	11	29	13	5	11
Lancaster	35	27	14	7	31	17	24	0	0	0
Mills West	48	11	0	7	33	0	16	10	11	12
Cornfield Harbor	1	7	20	2	9	25	44	16	9	8
Ragged Point	76	NA	NA	NA	0	0	0	0	0	10
Lower Cedar Point	55	22	17	3	11	5	4	7	14	10
Annual Means	35	20	17	16	15	17	17	12	8	7

Table 5 - Mortality (continued).

Oyster Bar	Total Observed Mortality (%)										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Swan Point	4	0	3	0	0	8	12	3	3	12	1
Hackett Point	0	0	0	3	19	3	5	21	23	4	4
Holland Point (S)	12	40	29	0	0	50	NA	NA	0	50	0
Stone Rock	2	5	31	36	30	9	5	4	3	6	24
Flag Pond (S)	15	13	5	6	50	3	1	7	17	17	37
Hog Island	2	2	12	38	27	18	0	5	3	3	31
Butler	7	7	10	11	4	5	7	14	8	14	30
Buoy Rock	5	9	3	12	4	12	9	13	5	0	3
Old Field (S)	0	3	0	5	33	10	31	33	7	33	18
Bugby	8	31	21	21	13	12	17	18	23	9	11
Parsons Island	2	4	15	2	10	14	0	5	0	0	1
Hollicutt Noose	1	9	6	7	29	30	8	2	10	4	3
Bruffs Island (S)	0	4	5	16	20	41	38	25	20	4	3
Turtle Back	0	8	14	18	3	15	8	3	0	7	2
Long Point (S)	20	0	0	17	0	0	37	NA	0	0	7
Cook Point (S)	9	12	16	48	45	24	13	12	5	8	56
Royston	1	6	9	16	4	2	4	3	2	0.3	18
Lighthouse	1	1	2	9	7	0	4	2	1	0	21
Sandy Hill (S)	3	13	11	15	15	11	11	4	4	7	10
Oyster Shell Pt. (S)	2	5	2	11	11	18	24	12	4	3	6
Tilghman Wharf	5	1	5	11	1	7	4	6	1	1	8
Deep Neck	5	7	16	8	2	3	3	2	1	6	9
Double Mills (S)	11	12	10	20	13	11	2	7	6	13	17
Cason (S)	11	8	17	26	33	8	4	2	2	2	12
Ragged Point	15	13	21	45	14	6	3	11	4	8	53
Norman Addition	9	7	13	14	15	8	2	2	1	2	18
Goose Creek	5	15	22	27	6	10	3	4	5	7	32
Wilson Shoals (S)	5	4	7	17	6	4	4	6	9	2	22
Georges (S)	15	5	8	23	15	9	5	7	9	26	27
Holland Straits	9	48	71	18	4	17	4	1	0	6	16
Sharkfin Shoal	16	18	24	19	3	7	4	5	13	20	29
Back Cove	11	19	14	1	2	8	1	1	4	22	41
Piney Island East	7	10	9	21	25	38	33	4	9	6	19
Old Woman's Leg	50	75	15	0	50	25	10	5	5	5	12
Marumsco	13	13	17	13	20	34	36	4	8	23	26
Broome Island	7	8	14	21	3	4	0	4	1	2	7
Chicken Cock	1	7	16	32	20	17	20	2	6	3	3
Pagan (S)	4	13	22	28	6	4	4	49	11	7	3
Lancaster	13	0	3	1	1	10	5	2	5	10	10
Mills West	20	9	5	14	0	5	15	21	5	0	0
Cornfield Harbor	10	16	10	36	8	3	5	2	3	4	6
Ragged Point	0	0	50	10	8	4	33	0	12	0	1
Lower Cedar Point	0	0	6	8	27	96	100	100	1	1	0
Annual Means	8	11	14	16	14	14	13	10	6	8	15

Table 5 - Mortality (continued).

Oyster Bar	Total Observed Mortality (%)		
	2024	2025	41-yr Avg
Swan Point	5	13	10.1
Hackett Point	14	8	12.7
Holland Point (S)	NA	nd	23.2
Stone Rock	31	7	20.4
Flag Pond (S)	26	10	20.8
Hog Island	34	10	25.3
Butler	15	4	22.4
Buoy Rock	0	0	14.6
Old Field (S)	0	33	14.6
Bugby	3	9	23.4
Parsons Island	4	4	18.1
Hollicutt Noose	5	7	18.6
Bruffs Island (S)	3	7	21.3
Turtle Back	6	7	21.4
Long Point (S)	6	0	19.9
Cook Point (S)	17	9	25.1
Royston	18	5	15.9
Lighthouse	13	0	17.8
Sandy Hill (S)	15	10	22.5
Oyster Shell Pt. (S)	6	2	10.1
Tilghman Wharf	7	4	15.2
Deep Neck	6	3	18.2
Double Mills (S)	3	6	18.7
Cason (S)	20	10	22.9
Ragged Point	62	29	26.6
Norman Addition	8	4	21.8
Goose Creek	7	5	29.0
Wilson Shoals (S)	16	14	19.1
Georges (S)	20	24	27.0
Holland Straits	13	4	26.0
Sharkfin Shoal	19	9	28.8
Back Cove	12	11	21.2
Piney Island East	12	7	26.6
Old Woman's Leg	7	14	27.8
Marumsco	22	14	24.1
Broome Island	5	1	17.9
Chicken Cock	6	2	24.0
Pagan (S)	4	5	19.3
Lancaster	2	3	13.6
Mills West	2	1	13.2
Cornfield Harbor	2	3	24.5
Ragged Point	6	0	19.4
Lower Cedar Point	6	2	17.7
Annual Means	11.6	7.6	20.5

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

Table 6. Regional summary of oyster harvests (bu.) in Maryland from buy tickets, 1985-86 through 2024-25 seasons as reported by seafood dealer buy tickets.

Maryland Oyster Harvests (bu)						
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
Big 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. Marys 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	976,000	360,000	390,000	414,000	418,000

¹ Includes harvests from unidentified regions. Not all harvest reports provided region information, but were included in the Md. total.

Table 6 - Landings (continued).

Maryland Oyster Harvests (bu)						
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
Big 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. Marys 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	124,000	80,000	165,000	200,000	178,000

¹ Includes harvests from unidentified regions.

Table 6 - Landings (continued).

Maryland Oyster Harvests (bu)						
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
Big 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. Marys 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	381,000	348,000	148,000	56,000

¹ Includes harvests from unidentified regions.

Table 6 - Landings (continued).

Maryland Oyster Harvests (bu)						
Region/Tributary	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Upper Bay	2,210	1,632	17,420	14,052	13,601	7,020
Middle Bay	750	295	17,346	17,004	3,728	1,870
Lower Bay	187	1,801	269	642	2,077	5,554
<i>Total Bay Mainstem</i>	<i>3,147</i>	<i>3,728</i>	<i>35,035</i>	<i>31,698</i>	<i>19,406</i>	<i>14,444</i>
Chester R.	557	3,239	4,385	7,201	4,685	4,826
Eastern Bay	5,446	16,767	49,120	36,268	8,582	7,390
Miles R.	56	353	3,660	1,133	27	910
Wye R.	0	173	122	0	0	12
<i>Total Eastern Bay Region</i>	<i>5,502</i>	<i>17,293</i>	<i>52,902</i>	<i>37,401</i>	<i>8,609</i>	<i>8,312</i>
Upper Choptank R.	0	78	591	11	95	15
Middle Choptank R.	30	67	967	2,510	597	597
Lower Choptank R.	0	267	1,250	3,037	2,426	2,535
Tred Avon R.	0	139	149	157	61	112
Broad Cr.	954	1,342	14,006	53,577	20,413	6,097
Harris Cr.	12	71	4,429	5,342	3,308	1,900
<i>Total Choptank R. Region</i>	<i>996</i>	<i>1,964</i>	<i>21,392</i>	<i>64,634</i>	<i>26,900</i>	<i>11,256</i>
Little Choptank R.	1,150	144	3,534	4,218	1,516	1,163
Upper Tangier Sound	7,630	13,658	2,874	3,856	4,614	12,454
Lower Tangier Sound	5,162	15,648	5,828	1,996	8,970	19,600
Honga R.	378	2,744	270	154	860	17,305
Fishing Bay	24	106	6	0	197	3,320
Nanticoke R.	57	965	387	97	97	134
Wicomico R.	0	0	0	30	11	118
Manokin R.	1,638	2,816	737	91	364	184
Big Annemessex R.	0	5	108	17	5	13
Pocomoke Sound	0	2,676	1,071	277	1,051	765
<i>Total Tangier Sound Region</i>	<i>14,889</i>	<i>38,618</i>	<i>11,281</i>	<i>6,518</i>	<i>16,169</i>	<i>53,893</i>
Patuxent R.	0	466	17,808	7,316	831	1,258
Wicomico R., St. Clement and Breton bays	13	18	1,414	80	698	808
St. Marys R. and Smith Cr.	0	91	1,863	2,069	1,252	1,643
<i>Total Potomac Md. Tribs.</i>	<i>13</i>	<i>109</i>	<i>3,277</i>	<i>2,149</i>	<i>1,950</i>	<i>2,451</i>
Total Maryland (bu.)¹	26,000	72,000	154,000	165,000	83,000	101,000

¹ Includes harvests from unidentified regions.

Table 6 - Landings (continued).

Maryland Oyster Harvests (bu)						
Region/Tributary	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Upper Bay	8,723	6,310	297	19	45	606
Middle Bay	4,012	2,054	439	4,310	9,218	7,321
Lower Bay	14,927	2,759	2,249	8,134	13,670	12,298
<i>Total Bay Mainstem</i>	<i>27,662</i>	<i>11,123</i>	<i>2,985</i>	<i>12,463</i>	<i>22,933</i>	<i>20,224</i>
Chester R.	2,874	5,290	119	102	556	3,493
Eastern Bay	2,662	1,957	221	4,966	15,650	8,763
Miles R.	11	12	81	82	727	1,871
Wye R.	227	0	9	0	0	73
<i>Total Eastern Bay Region</i>	<i>2,900</i>	<i>1,969</i>	<i>311</i>	<i>5,048</i>	<i>16,377</i>	<i>10,707</i>
Upper Choptank R.	42	412	0	149	213	73
Middle Choptank R.	661	523	1,598	1,725	4,032	5,548
Lower Choptank R.	3,424	3,534	3,402	11,336	12,934	26,008
Tred Avon R.	0	68	402	1,095	2,038	2,850
Broad Cr.	5,328	7,646	11,382	72,643	76,125	62,436
Harris Cr.	1,227	191	100	3,043	3,353	8,112
<i>Total Choptank R. Region</i>	<i>10,682</i>	<i>12,374</i>	<i>16,884</i>	<i>89,991</i>	<i>98,695</i>	<i>105,028</i>
Little Choptank R.	923	0	568	1,216	2,137	5,044
Upper Tangier Sound	24,553	19,098	24,076	40,143	57,853	53,270
Lower Tangier Sound	61,771	27,849	29,578	38,802	45,301	25,660
Honga R.	24,696	10,213	10,391	20,182	24,594	22,122
Fishing Bay	14,949	10,174	13,852	51,038	61,909	39,054
Nanticoke R.	2,168	5,300	10,121	8,385	6,558	14,924
Wicomico R.	109	1,140	3,587	5,551	4,253	3,748
Manokin R.	888	1,477	1,731	84	1,863	3,158
Big Annemessex R.	0	1,036	546	79	730	576
Pocomoke Sound	1,165	855	3,859	35,193	33,343	18,262
<i>Total Tangier Sound Region</i>	<i>130,299</i>	<i>77,142</i>	<i>97,741</i>	<i>199,457</i>	<i>236,404</i>	<i>180,773</i>
Patuxent R.	3,456	6,535	8,419	13,764	19,984	45,781
Wicomico R., St. Clement and Breton bays	712	2,132	1,931	4,504	6,383	3,822
St. Marys R. and Smith Cr.	3,186	2,275	1,454	11,345	7,909	10,775
<i>Total Potomac Md. Tribs.</i>	<i>3,898</i>	<i>4,407</i>	<i>3,385</i>	<i>15,849</i>	<i>14,292</i>	<i>14,597</i>
Total Maryland (bu.)¹	185,245	123,613	137,317	341,232	416,578	388,658

¹ Includes harvests from unidentified regions.

Table 6 - Landings (continued).

Region/Tributary	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Upper Bay	3,634	4,657	2,603	794	48	0
Middle Bay	14,112	9,196	5,160	2,977	4,960	3,749
Middle Bay Tributaries	2,398	1,900	1,180	181	780	979
Lower Bay	4,285	4,314	9,204	11,347	13,506	8,797
<i>Total Bay Mainstem</i>	<i>24,428</i>	<i>20,067</i>	<i>18,146</i>	<i>15,298</i>	<i>19,294</i>	<i>13,525</i>
Chester R.	1,533	469	5,024	386	644	23
Eastern Bay	13,180	15,619	9,678	8,578	9,696	4,671
Miles R.	3,335	1,666	572	962	180	0
Wye R.	8	17	4	0	0	0
<i>Total Eastern Bay Region</i>	<i>16,523</i>	<i>17,302</i>	<i>10,254</i>	<i>9,540</i>	<i>9,876</i>	<i>4,671</i>
Upper Choptank R.	62	36	83	167	0	0
Middle Choptank R.	9,782	5,749	6,545	3,891	4,367	2,209
Lower Choptank R.	24,611	11,017	6,472	11,853	13,111	10,124
Tred Avon R.	3,901	2,431	889	2,730	631	375
Broad Cr.	68,039	32,075	32,581	32,359	39,984	33,970
Harris Cr.	7,028	2,663	3,631	5,220	6,508	3,248
<i>Total Choptank R. Region</i>	<i>113,423</i>	<i>53,970</i>	<i>50,200</i>	<i>56,220</i>	<i>64,600</i>	<i>49,926</i>
Little Choptank R.	2,481	2,361	445	222	9,864	8,588
Upper Tangier Sound	64,342	35,522	33,287	22,029	83,248	148,232
Lower Tangier Sound	28,491	9,481	7,277	2,790	7,522	29,462
Honga R.	13,285	11,188	2,122	916	2,788	7,678
Fishing Bay	20,258	13,637	7,508	5,828	23,329	33,621
Nanticoke R.	7,075	7,430	7,984	4,193	8,435	13,144
Wicomico R.	10,137	4,735	1,132	939	1,185	952
Manokin R.	1,409	1,054	1,843	1,029	407	0
Big Annemessex R.	4,076	473	90	74	24	37
Pocomoke Sound	10,261	6,131	5,269	2,166	2,178	3,705
<i>Total Tangier Sound Region</i>	<i>159,333</i>	<i>89,650</i>	<i>66,511</i>	<i>39,963</i>	<i>129,115</i>	<i>236,830</i>
Patuxent R.	51,451	23,623	9,973	9,395	24,525	17,001
Wicomico R., St. Clement and Breton bays	5,608	3,452	893	1,166	356	231
St. Marys R. and Smith Cr.	10,574	7,974	19,224	12,361	11,686	13,167
<i>Total Potomac Md. Tribs.</i>	<i>16,181</i>	<i>11,426</i>	<i>20,117</i>	<i>13,527</i>	<i>12,042</i>	<i>13,398</i>
Total Maryland (bu.)¹	388,381	223,616	182,639	145,208	272,143	345,479

¹ Includes harvests from unidentified regions.

Table 6 - Landings (continued).

Region/Tributary	2021-22	2022-23	2023-24	2024-25	40-yr Avg
Upper Bay	7,351	146	3,338	947	10,741
Middle Bay	1,545	4,126	2,737	3992	13,372
Middle Bay Tributaries	889	439	3,270	116	1,213
Lower Bay	17,583	29,312	10,563	4,461	7,227
<i>Total Bay Mainstem</i>	<i>27,368</i>	<i>34,022</i>	<i>19,908</i>	<i>9516</i>	<i>31,283</i>
Chester R.	856	26	646	0	17,938
Eastern Bay	3,181	2,384	15,631	28,976	25,863
Miles R.	3	0	105	3,432	4,465
Wye R.	0	0	0	0	1,550
<i>Total Eastern Bay Region</i>	<i>3,184</i>	<i>2,384</i>	<i>15,736</i>	<i>32408</i>	<i>31,878</i>
Upper Choptank R.	0	0	0	0	7,847
Middle Choptank R.	2,518	2,970	7,261	7477	15,955
Lower Choptank R.	6,722	13,012	16,381	5,904	14,369
Tred Avon R.	553	3,663	6,333	4,218	9,392
Broad Cr.	37,441	57,017	73,687	79,544	26,615
Harris Cr.	7,892	18,969	22,266	4,660	8,231
<i>Total Choptank R. Region</i>	<i>55,127</i>	<i>95,630</i>	<i>125,927</i>	<i>101803</i>	<i>82,408</i>
Little Choptank R.	12,882	12,032	1,132	64	10,599
Upper Tangier Sound	215,101	147,541	53,095	21,069	31,797
Lower Tangier Sound	80,687	218,643	100,904	69,987	24,589
Honga R.	24,997	47,403	27,205	8,775	9,474
Fishing Bay	46,032	42,056	33,059	28,781	17,454
Nanticoke R.	22,043	9,061	3,028	1,140	7,579
Wicomico R.	1,646	4,404	660	614	1,409
Manokin R.	1,037	20	504	20	2,911
Big Annemessex R.	0	44	243	42	214
Pocomoke Sound	4,821	10,847	4,543	2,559	5,195
<i>Total Tangier Sound Region</i>	<i>396,363</i>	<i>480,017</i>	<i>223,238</i>	<i>132987</i>	<i>100,621</i>
Patuxent R.	38,800	78,470	20,443	8434	15,389
Wicomico R., St. Clement and Breton bays	4,697	2,190	6,917	4,005	8,966
St. Marys R. and Smith Cr.	8,004	10,659	23,335	28,325	9,819
<i>Total Potomac Md. Tribs.</i>	<i>12,700</i>	<i>12,849</i>	<i>30,252</i>	<i>32350</i>	<i>18,768</i>
Total Maryland (bu.)¹	548,155	719,716	438,072	322,510	313,714

¹ Includes harvests from unidentified regions.[\(Return to Text\)](#)

Table 7a. Bushels of oyster harvest by gear type in Maryland, 1989-90 through 2024-25 seasons as reported by seafood dealer buy tickets. Dockside value is in millions of dollars.

Season	Hand Tongs	Diver	Patent Tongs	Power Dredge	Skipjack	<i>Total Harvest¹</i>	<i>Dockside Value</i>
1989-90	309,723	47,861	31,307	11,424	14,007	414,445	\$ 9.9 M
1990-91	219,510	74,333	105,825	4,080	14,555	418,393	\$ 9.4 M
1991-92	124,038	53,232	108,123	6,344	31,165	323,189	\$ 6.4 M
1992-93	71,929	24,968	18,074	1,997	8,821	123,618	\$ 2.6 M
1993-94	47,309	19,589	11,644	787	133	79,618	\$ 1.4 M
1994-95	99,853	29,073	31,388	1,816	2,410	164,641	\$ 3.2 M
1995-96	115,677	25,657	46,040	6,347	7,630	199,798	\$ 3.2 M
1996-97	130,861	16,780	15,716	8,448	6,088	177,600	\$ 3.8 M
1997-98	191,079	37,477	30,340	14,937	10,543	284,980	\$ 5.7 M
1998-99	294,342	58,837	36,151	25,541	8,773	423,219	\$ 7.8 M
1999-2000	237,892	60,547	44,524	18,131	12,194	380,675	\$ 7.2 M
2000-01	193,259	75,535	43,233	18,336	8,820	347,968	\$ 6.8 M
2001-02	62,358	30,284	26,848	17,574	8,322	148,155	\$ 2.9 M
2002-03	11,508	9,745	18,627	12,386	2,432	55,840	\$ 1.6 M
2003-04	1,561	5,422	3,867	13,436	1,728	26,471	\$ 0.7 M
2004-05	5,438	14,258	6,548	37,641	4,000	72,218	\$ 1.1 M
2005-06	28,098	38,460	49,227	30,824	3,576	154,436	\$ 4.7 M
2006-07	55,906	36,271	31,535	35,125	3,250	165,059	\$ 5.0 M
2007-08	24,175	11,745	15,997	25,324	4,243	82,958	\$ 2.6 M
2008-09	11,274	9,941	15,833	50,628	5,370	101,141	\$ 2.7 M
2009-10	7,697	6,609	48,969	107,952	12,479	185,245	\$4.5 M
2010-11	13,234	5,927	27,780	65,445	10,550	123,613	\$4.3 M
2011-12	4,885	12,382	22,675	84,950	11,305	137,317	\$4.6M
2012-13	53,622	8,107	48,095	212,837	18,471	341,132	\$10.9 M
2013-14	67,093	21,510	75,937	242,964	9,074	416,578	\$14.1 M
2014-15	57,289	25,126	98,187	154,716	33,518	388,658	\$17.1 M
2015-16	79,060	38,202	103,620	126,290	38,774	388,381	\$15.0 M
2016-17	45,301	24,113	53,710	81,815	17,647	223,616	\$10.6 M
2017-18	37,449	22,922	31,417	78,694	11,135	182,369	\$8.7 M
2018-19	35,899	11,556	21,257	64,222	12,243	145,208	\$6.6 M
2019-20	44,174	19,978	69,796	113,038	25,083	272,143	\$12.3 M
2020-21	39,193	14,452	102,573	148,624	40,533	345,479	\$10.5 M
2021-22	45,146	15,405	177,364	262,017	48,175	548,155	\$21.8 M
2022-23	67,331	17,660	243,177	338,287	53,138	719,716	\$31.1M
2023-24	72,546	17,520	77,370	238,560	31,950	438,072	\$15.6M
2024-25	93,347	31,525	23,045	153,315	21,079	322,510	\$11.9M

¹ Harvest reports without gear information were not included in harvest by gear type totals but were included in total harvest.

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

Table 7b. Percent of oyster harvest by gear type in Maryland, 1989-90 through 2024-25 seasons as reported by seafood dealer buy tickets. Some years may not total 100% due to incomplete data or rounding.

Season	Hand Tongs	Diver	Patent Tongs	Power Dredge	Skipjack
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
1999-2000	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
2007-08	29	14	19	30	5
2008-09	12	11	17	54	6
2009-10	4	4	26	58	7
2010-11	11	5	23	53	8
2011-12	4	9	17	62	8
2012-13	16	2	14	62	5
2013-14	16	5	18	58	2
2014-15	16	7	27	42	9
2015-16	20	10	27	33	10
2016-17	20	11	24	37	8
2017-18	21	13	17	43	6
2018-19	25	8	15	44	8
2019-20	16	7	26	42	9
2020-21	11	4	30	43	12
2021-22	8	3	32	48	9
2022-23	9	2	34	47	7
2023-24	17	4	18	54	7
2024-25	29	10	7	48	7

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

Table 8. Oyster bars within sanctuaries sampled during the 2025 Fall Survey.

Region	Oyster Sanctuary	Surveyed Bars Within Sanctuary
Upper Bay	Man O War/Gales Lump	Man O War Shoals, Tea Table
Middle Bay	Poplar Island	Poplar I.
	Herring Bay	Holland Pt. ^{1,2}
	Tilghman Island	Pone
	Calvert Shore	Flag Pond ^{1,2}
Lower Bay	Lower Mainstem East	Northwest Middleground ³
	Cedar Point Hollow	Cedar Point Hollow Addition 1
	Point Lookout	Pt. Lookout ³
Chester River	Lower Chester River	Love Pt., Strong Bay, Wickes Beach
	Upper Chester River	Boathouse, Cliff, Drum Pt., Ebb Pt., Emory Hollow, Old Field ² , Sheep, Spaniard Pt.
	Chester ORA Zone A	Shippen Creek
Eastern Bay	Mill Hill	Mill Hill
	Prospect Bay	Sawmill Creek
	Cox Creek	Ringold Middleground
	Eastern Bay	Tilghman Pt.
Wye River	Wye River	Bruffs I. ^{1,2} , Mills, Race Horse, Whetstone, Wye River Middleground
Miles River	Miles River	Long Pt. ² , Bazzles Hill
Choptank River	Cook Point	Cook Pt. ^{1,2}
	Lower Choptank River	Chlora Pt.
	Sandy Hill	Sandy Hill ^{1,2}
	Howell Point - Beacons	Beacons
	Upper Choptank River	Green Marsh ³ , Shoal Creek, Bolingbroke Sand, The Black Buoy, Oyster Shell Pt. ² , Dixon, Mill Dam
	Choptank ORA Zone A	Tanners Patch, Cabin Creek, Drum Pt.
Harris Creek	Harris Creek	Change, Mill Pt. ^{1,3} , Seths Pt., Walnut, Little Neck, Rabbit I. ³
Tred Avon River	Tred Avon River	Pecks Pt., Mares Pt., Louis Cove, Orem, Double Mills ^{1,2} , Maxmore Add. 1
Little Choptank River	Little Choptank River	Little Pollard, Susquehanna, Cason ^{1,2} , Butterpot, McKeils Pt., Grapevine, Town, Pattison
Hooper Straits	Hooper Straits	Applegarth, Lighthouse
Nanticoke River	Nanticoke River	Roaring Pt. East, Wilson Shoals ² , Bean Shoal, Cherry Tree, Cedar Shoal, Old Woman's Patch, Hickory Nut, Wetipquin ¹
Manokin River	Manokin River	Piney I. Swash, Mine Creek, Marshy I., Drum Pt. ¹ , Georges ^{1,2}
Tangier Sound	Somerset	Piney I. East Add. ^{1,3}
Magothy River	Magothy River	Persimmon
Severn River	Severn River	Chinks Pt.
South River	South River	Almshouse
Patuxent River	Upper Patuxent	Thomas, Broad Neck, Trent Hall, Buzzard I., Holland Pt.
	Neal Addition	Neale
	Lower Patuxent	Millstone
St. Marys River	St. Marys River	Pagan ^{1,2} , Horseshoe
Breton Bay	Breton Bay	Black Walnut ¹

¹ Key Spat Bar ² Disease/Biomass Index Bar ³ Supplemental Disease Bar

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

Appendix 1

Hatchery Seed Plantings

Amy Larimer

Over 600 million hatchery spat-on-shell were planted on 33 oyster bars sampled by the Fall Survey during 2025, covering 157 acres (Table A-1). Mean density was almost 4 million spat per acre. The Fall Survey sampled 16 of these plantings (Figure A-1; Table A-2). Most were new locations on bars with other Fall Survey samples. Three sites were planted with triploid oysters; two were sampled (Flood Point and Well Cove).

The amount of hatchery spat-on-shell planted was less than half of the total from 2024 and fewer acres were planted in 2025. A slight majority of the plantings occurred on non-sanctuary bars (Table A-3). Drum Point in the Manokin, which is in the sanctuary, had the largest amount of spat planted and the highest total acres planted.

For each of the sampled plantings, spat were counted and the number of spat per bushel was enumerated (Table A-2). Spat were measured at approximately half the samples; for the rest, a size range was determined, including a “typical” middle value. The overall range was 3 to 68 mm, with a mean of 35.

The “average” number of days since planting is the average of the number of days between the sampling date and the planting date. This ranged from 44 days to 175 days, with a mean of 127 (Table A-3). Growth rates were calculated by dividing the “typical” size by the number of days (Table A-2; Figure A-2). Well Cove and Flood Point were planted with triploid spat, which normally grow faster than diploid spat, but the interval between planting and sampling for these was relatively short. The average growth rate was 0.28 (Figure A-2). Batts Neck had the highest growth rate and also the highest mean size.

The number of spat per bushel ranged from 101 to 1343, with a mean of 480 (Table A-3). Spat counts are generally a function of both the initial planting density as well as elapsed time. Shorter elapsed time in 2022 and 2024 resulted in higher numbers of spat per bushel. The average elapsed time in 2025 was 128 days, higher than the previous year.

Table A-1. Hatchery spat-on-shell plantings on Fall Survey bars. Locations in bold were sampled during the survey.

Region	Bar Name	Area (acres)	#Planted (millions)	Density (Millions per acre)
Chester River	Durdin	2.69	10.19	3.78
Chester River	Ferry Point	0.97	6.88	7.12
Choptank River	Dickinson	1.80	10.85	6.02
Eastern Bay	Bald Eagle Add 3	1.31	6.94	5.3
Eastern Bay	Batts Neck	4.36	7.63	1.75
Eastern Bay	Crab Alley Lumps	2.77	19.86	7.16
Eastern Bay	Hood	2.49	11.08	4.45
Eastern Bay	Johnson Island	1.96	10.03	5.12
Eastern Bay	Parsons Island	2.07	10.18	4.92
Eastern Bay	Tilghmans Point	3.73	0.07	0.02
Eastern Bay	Well Cove	1.13	9.34	8.26
Eastern Bay	Wild Ground	9.94	43.90	4.41
Fishing Bay	Hill Add 1	0.29	5.57	19.33
Little Choptank	McKeils Point	1.74	2.01	1.15
Little Choptank	Ragged Point	0.95	6.82	7.21
Little Choptank	Susquehanna	0.66	14.22	21.64
Manokin River	Drum Point	40.45	158.46	3.92
Manokin River	Georges	2.11	8.58	4.07
Manokin River	Marshy Island	13.48	28.54	2.12
Mid-Bay West	Coots	2.81	14.31	5.09
Mid-Bay West	Lulu/Saunders	2.59	13.38	5.16
Mid-Bay West	Bozman Neck	3.52	13.90	3.95
Miles River	Coffee	4.27	17.37	4.07
Miles River	Herring Island/West End	6.37	43.57	6.84
Miles River	Scotland	1.35	11.36	8.43
Nanticoke River	Middleground	6.83	16.92	2.48
South River	Outer Round Point	1.82	6.64	3.60
South River	Rock Point	2.29	9.60	4.20
South River	Saunders	2.98	14.40	4.83
Tred Avon River	Bamings Cove	1.24	1.21	0.97
Tred Avon River	Louis Cove	2.09	10.05	4.79
Upper Bay East	Swan Point	10.34	23.73	2.29
Wicomico River West	Wicomico Lumps	2.82	5.75	2.04
All Regions	Total	157.5	618.4	3.92

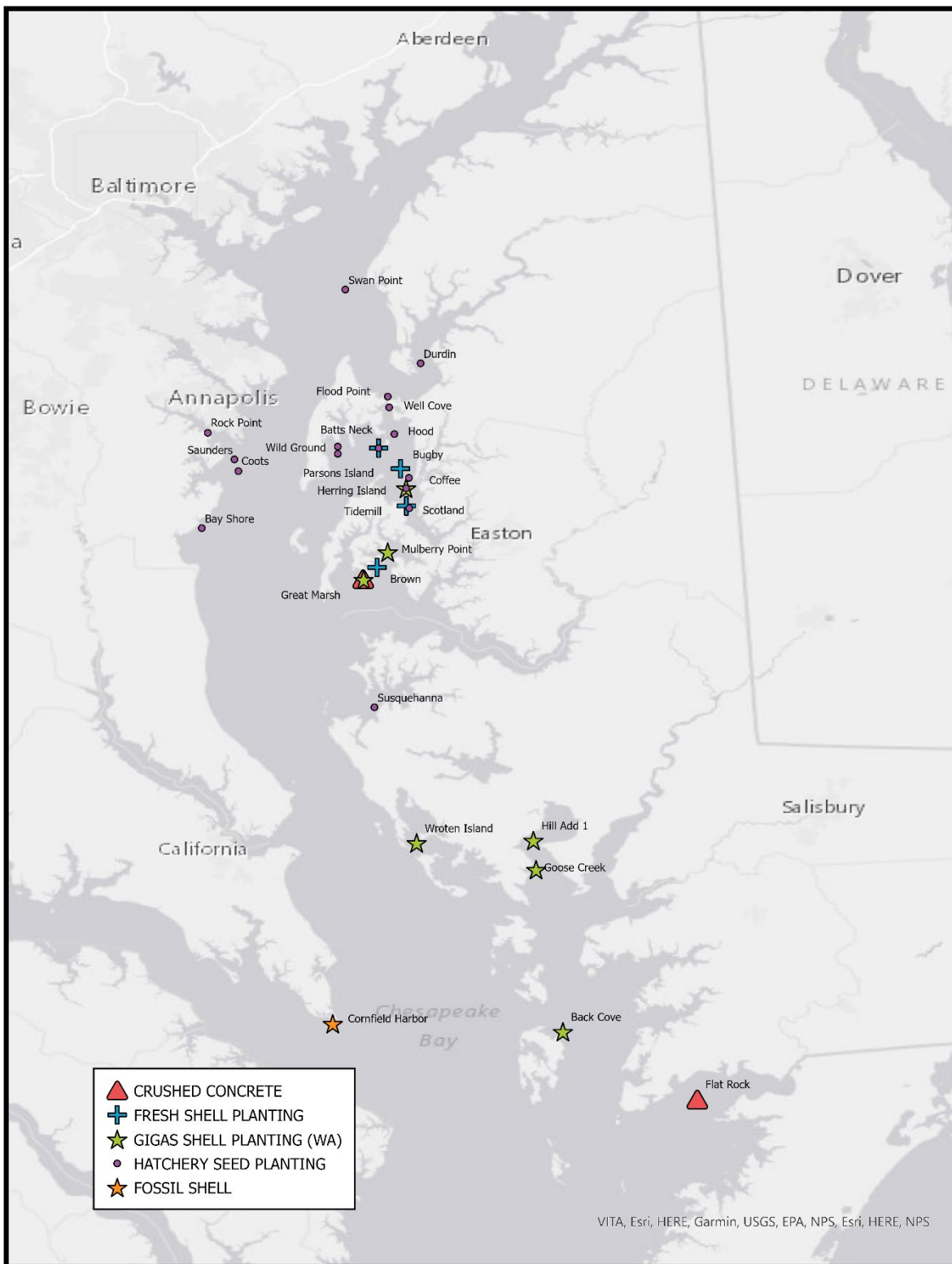


Figure A-2. Map of Fall Survey stations on 2025 plantings.

Table A-2. Hatchery planting spat counts, sizes, mean elapsed time since planting in days, and growth rate.

Region	Bar Name	# Spat (#/bu)	Min. Size (mm)	Max. Size (mm)	Avg. Size (mm)	Avg. Days from Planting	Growth Rate (mm/day)
Chester River	Durdin	806	22	50	40	100	0.40
Chester River	Flood Point (triploid)	1099	4	10	6.57	49	0.13
Eastern Bay	Batts Neck	902	42	71	58.37	136	0.43
Eastern Bay	Hood	202	22	45	31.77	136	0.23
Eastern Bay	Parsons Island	101	25	65	40	167	0.24
Eastern Bay	Well Cove (triploid)	140	3	26	10	44	0.23
Eastern Bay	Wild Ground	1343	28	53	40.13	151.5	0.26
Little Choptank	Susquehanna	136	13	31	25	84	0.30
Mid-Bay West	Bay Shore	593	30	68	50	175	0.29
Mid-Bay West	Coots	690	10	56	38.33	142	0.27
Mid-Bay West	Saunders	124	9	60	36.48	124	0.29
Miles River	Coffee	193	21	58	37.93	163	0.23
Miles River	Herring Island	147	24	47	35	151	0.23
Miles River	Scotland	662	20	60	41.23	166	0.25
South River	Rock Point	104	9	54	36.60	104.5	0.35
Upper Bay East	Swan Point South	497	28	60	42.03	148	0.28
All Regions	Averages	480	19.4	50.9	35.6	127.6	0.27

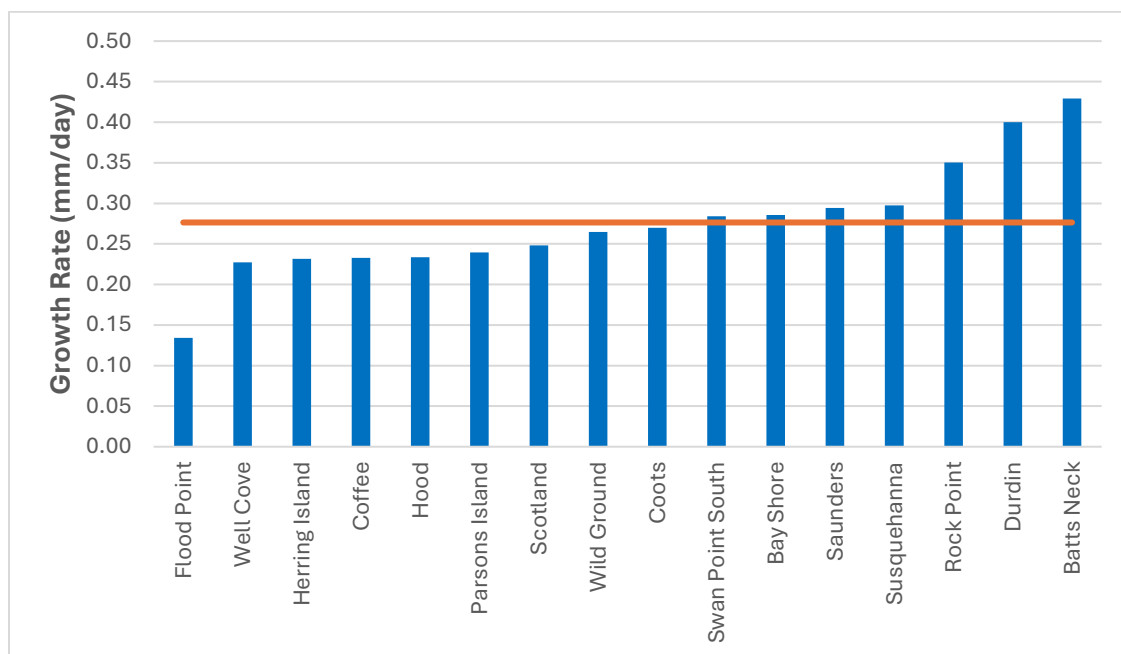


Figure A-3. Growth rates of spat on hatchery plantings on Fall Survey sites in 2025. The red line is the mean (0.28 mm/day).

Table A-3. Table comparing sizes, elapsed time, spat counts and planting volumes for 2020-2025.

Parameter	2020	2021	2022	2023	2024	2025
Min. Size	22 mm	17 mm	16 mm	25 mm	20 mm	3 mm
Mean Size	41 mm	33 mm	32 mm	45 mm	34 mm	36 mm
Max. Size	60 mm	53 mm	49 mm	65 mm	51 mm	68 mm
Min. Days Since Planting	72	42	21	110	26	44
Mean Days Since Planting	132	108	83	136	101	128
Max Days Since Planting	181	161	129	173	175	175
Min. Spat per Bushel	26	32	268	76	4	101
Mean Spat per Bushel	299	680	874	339	608	480
Max. Spat per Bushel	1288	4068	2436	932	3149	1343
Total Acres Planted	209	220	258	470	191	158
Sanctuary Acres Planted	38	96	125	250	93	79
Non-Sanctuary Acres Planted	171	124	133	220	98	79
Total Volume Planted (millions)	377	712	725	1,686	717	309
Sanctuary Volume Planted (millions)	124	464	503	1,257	354	271
Non-Sanctuary Volume Planted (millions)	253	248	222	429	417	347
Total Average Density (millions/acre)	2.5	3.4	2.8	3.6	4.0	3.9
Sanctuary Average Density (millions per acre)	3.3	4.8	4.0	5.0	3.8	3.4
Non-Sanctuary Average Density (millions per acre)	1.5	2.0	1.7	1.9	4.3	4.4

Substrate Plantings

In 2025, four types of substrate were planted on Fall Survey bars with the goal of attracting spat. One was a planting of small concrete pieces on Flat Rock in Pocomoke Sound and Great Marsh in Harris Creek (Table A-4). The rest were planted with either Eastern oyster shell (*Crassostrea virginica*), acquired from regional shucking houses and other locations (Table A-5), or Pacific oyster shells (*Magallana*=*Crassostrea gigas*), sourced from Washington state (Table A-6). A single planting of fossil shells was made on Cornfield Harbor in the Potomac River (Table A-7). Pacific oysters are native to Asia but are used extensively in oyster farms on the west coast of the United States. Shells are allowed to dry for weeks or months and then placed back in the water or used in hatcheries for spat-on-shell production. Over 109,000 bushels (Eastern oyster shell, Pacific oyster shell, concrete and fossil shell) were planted on 56 acres in 2025, with most of that on the fall survey sample locations.

For most of the Fall Survey samples on these sites (Figure A-4), the spat counts per bushel exceeded the average of other sites in the area (Table 8-11) that were not planted with either fresh shell or hatchery spat-on-shell. The highest counts were in Broad Creek. Broad Creek had some of the highest spat sets of the Fall Survey. Fresh shell plantings appear to attract spat at a greater rate than non-planted areas (Figure 4); this was true for all shell types, including the fossil shell in the Potomac River. For the eastern oyster plantings, most spat counts were greater than the regional mean, except for Bugby, in Eastern Bay. 2025 was such an exceptional year for spat (the second-highest spat index on record at almost 250 per bushel). The average spat count on shell plantings was five times higher than the next highest year (Figure 5) and almost four times higher than the spat index for 2025.

Four of the last five years have been above average for spat and this is reflected in the higher counts on shell-planted areas. The non-planted areas in many locations also saw higher spat counts. Mean, maximum and average shell height of spat in the fall survey samples taken on these sites are listed in Tables A-8 to A-11. The shell heights of spat on fresh shell plantings ranged from 3 mm to 65 mm, with a mean of 30 mm.

Substrate is a key issue in oyster management. Removing oysters also removes their habitat and most of the oyster shell is not returned to the bay. The limited supply of shell has led to searches for alternate materials such as rock or concrete. Rock (usually in the form of approximately three-inch pieces) has been used in restoration work in some sanctuaries. The Pocomoke Sound concrete planting did not fare as well in 2025 compared to 2024. But the Harris Creek concrete planting had one of the highest spat counts of all the plantings.

Table A-4. Plantings of crushed concrete on Fall Survey bars in 2025.

Region	Bar Name	Acres	#Planted (bushels)	Density (bushels per acre)
Harris Creek	Great Marsh	1.18	4,940	4,174
Pocomoke Sound	Flat Rock	2.08	5,287	2,537
Total	All Bars	3.26	10,227	3,356

Table A-5. Fresh shell plantings of Eastern oyster (*Crassostrea virginica*) on Fall Survey bars in 2024.

Region	Bar Name	Acres	#Planted (bushels)	Density (bushels per acre)
Broad Creek	Brown	6.04	10,846	1,796
Eastern Bay	Bugby	3.94	9,984	2,532
Eastern Bay	Parsons Island	4.11	10,034	2,437
Honga River	Lakes Cove	2.34	5,046	2,156
Miles River	Tidemill	3.1	10,034	3,257
Nanticoke and Wicomico Rivers	Halls Point	1.3	7,540	5,675
St. Marys River	Cherry	3.5	9,860	2,906
Total	All Bars	25.4	66,650	2,624

Table A-6. Shell plantings of Pacific oyster shells (*Magallana gigas*) on Fall Survey bars in 2025.

Region	Bar Name	Acres	#Planted (bushels)	Density (bushels per acre)
Broad Creek	Mulberry Point	3	6,000	2,000
Fishing Bay	Goose Creek	1.5	5,000	3,360
Fishing Bay	Hill Add 1	2.4	5,000	2,070
Harris Creek	Great Marsh	2.9	9,000	3,126
Honga River	Wroten Island	2.2	5,000	2,293
Miles River	Herring Island	3.3	10,000	2,987
Tangier Sound	Back Cove	6.3	15,000	2,367
Total	All Bars	21.6	55,000	2,546

Table A-7. Fossil Shell plantings on Fall Survey bars in 2025

Region	Bar Name	Acres	#Planted (bushels)	Density (bushels per acre)
Potomac River	Cornfield Harbor	5.9	32,787	5,557

Table A-8. Fall Survey samples on concrete plantings in 2025: number of spat per bushel, sizes and the average spat count in the area.

Region	Bar Name	Spat (# per bu)	Min. Size (mm)	Max. Size (mm)	Avg. Size (mm)	Avg. Spat Count in Area
Pocomoke Sound	Flat Rock	54	4	44	22	247
Harris Creek	Great Marsh	2144	6	53	32	718
All Regions	Average	1,099	5	48.5	27	482.5

Table A-9. Fall Survey samples on Fresh shell plantings of Eastern oyster (*Crassostrea virginica*): number of spat per bushel, sizes and the average spat count in the area. *Also had hatchery-spat-on-shell planting.

Region	Bar Name	Spat (# per bu)	Min. Size (mm)	Max. Size (mm)	Avg. Size (mm)	Avg. Spat Count in Area
Broad Creek	Brown	2360	6	30	20	1039
Broad Creek	Mulberry Point	3611	8	40	22	1829
Eastern Bay	Bugby	115	14	45	35	133
Eastern Bay*	Parsons Island	101	25	65	40	95
Miles River	Tidemill	262	24	52	39	38
All Regions	Average	1,290	15.4	46.4	31.2	627

Table A-10. Fall Survey samples on Fresh shell plantings of Pacific oyster shells (*Magallana gigas*): number of spat per bushel, sizes and the average spat count in the area. *Also had hatchery spat-on-shell planting.

Region	Bar Name	Spat (# per bu)	Min. Size (mm)	Max. Size (mm)	Avg. Size (mm)	Avg. Spat Count in Area
Fishing Bay	Goose Creek	522	8	44	30	139
Fishing Bay	Hill Add 1	906	16	60	34	102
Harris Creek	Great Marsh	1978	NA	NA	NA	718
Honga River	Wroten Island	258	8	40	20	124
Miles River*	Herring Island	147	24	47	35	24
Tangier Sound	Back Cove	691	18	50	30	312
All Regions	Average	750	15	48	30	236.5

Table A-11. Fall Survey samples on a fossil shell planting: number of spat per bushel, sizes and the average spat count in the area.

Region	Bar Name	Spat (# per bu)	Min. Size (mm)	Max. Size (mm)	Avg. Size (mm)	Avg. Spat Count in Area
Potomac River	Cornfield Harbor	790	3	47	28	152

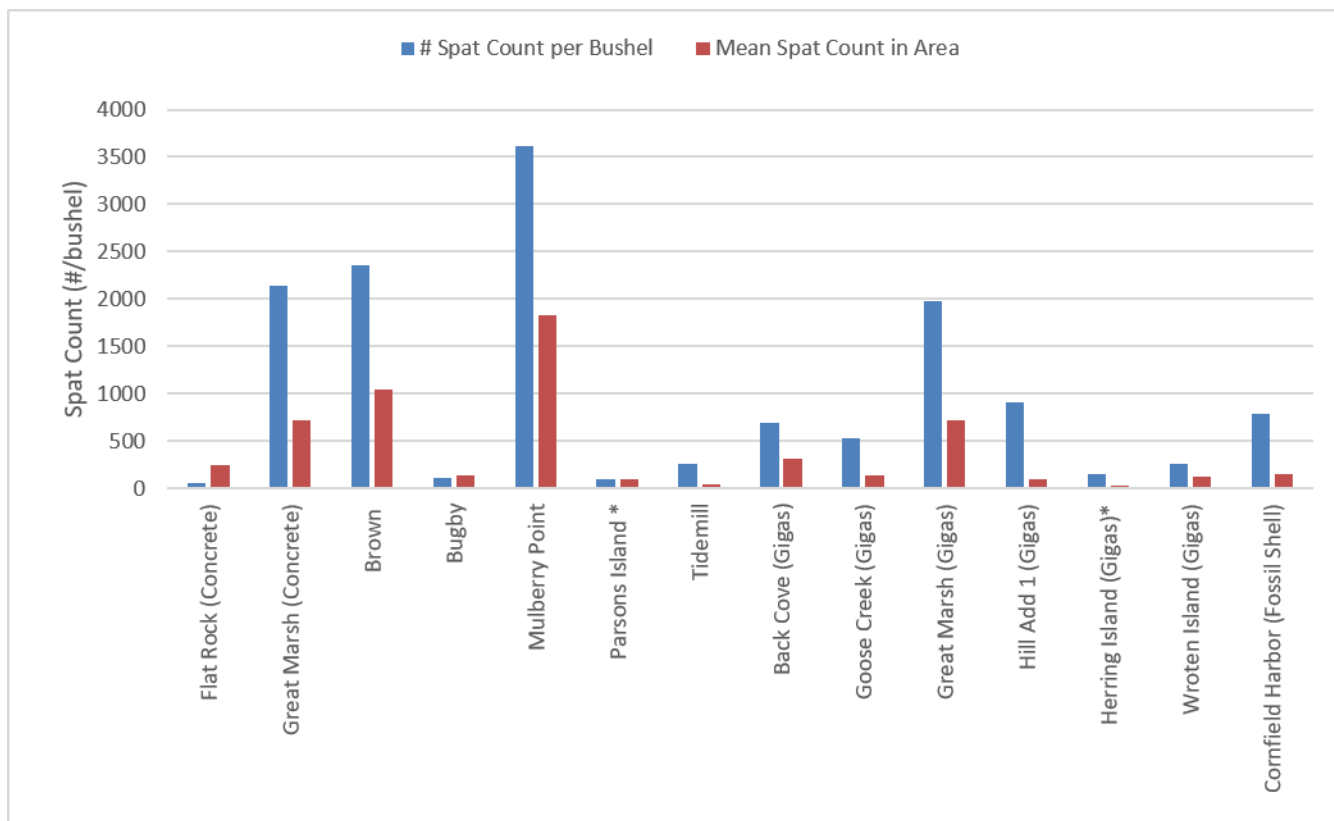


Figure A-4. Spat counts for substrate plantings on Fall Survey sites in 2025 and the mean spat count for other, unplanted sites in the vicinity. Gigas = Pacific oyster shell. *Also had a hatchery spat-on-shell planting.

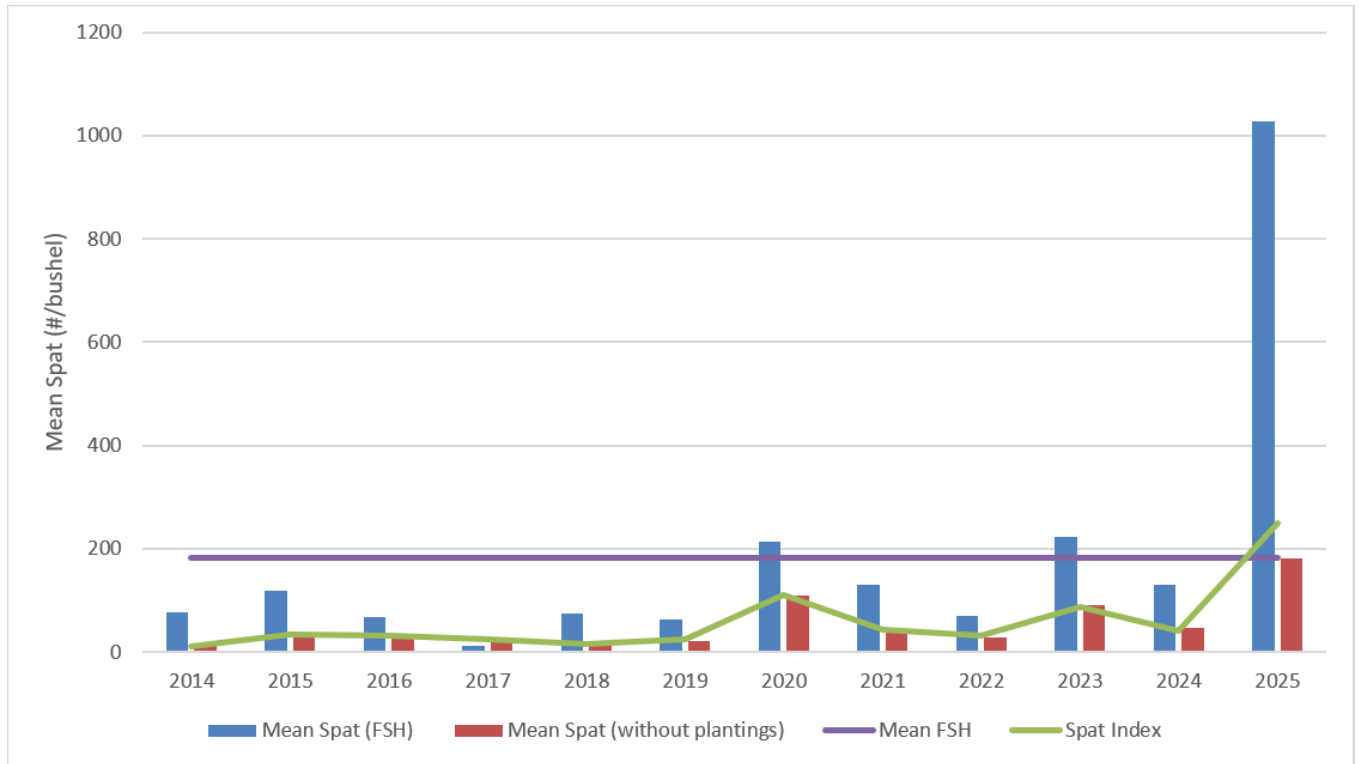


Figure A-5. Average spat counts (spat per bushel) on fresh shell plantings (blue), average spat counts on areas without either shell or seed plantings (red), mean fresh shell spat count for all years (purple) and the annual spat index (green). For 2025, this included both Eastern oyster and Pacific oyster shell plantings, but not the concrete plantings.

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APPENDIX 2

Oyster Host & Oyster Pathogens

Chris Dungan, revised by Carol McCullough 2 July 2021

Oysters

The eastern oyster *Crassostrea virginica* is found in waters with temperatures of -2°C to 36°C and sustained salinities of 4 to 40‰, where ocean water salinity is 35‰. Oysters reproduce (spawn) when both sexes simultaneously release gametes. Spawning in Chesapeake Bay occurs from May-September, and peaks during June-July. Externally fertilized eggs develop into swimming planktonic larvae. These are transported by water currents for 2-3 weeks while feeding on phytoplankton as they grow and develop. Mature larvae attach to solid benthic substrates, preferably oyster shells, and metamorphose to become sessile juvenile oysters. Unlike fishes and other vertebrates, oysters do not regulate the salt content of their tissues. Instead, oyster tissues conform to the broad and variable range of salinities that are found in oyster habitats. Thus, oyster parasites with narrow salinity requirements may be exposed to adverse salinities, inhibiting their virulence and reducing prevalences to the point of being eliminated altogether. At death, oyster shells (valves) passively open, exposing the soft tissues to predators and scavengers. However, the resilient hinge ligament holds the articulated valves together for months after death. Empty, articulated oyster shells (boxes) in survey samples are interpreted to represent oysters that died during the previous year. In dredge samples the numbers of dead and dying (gaper) oysters are compared to those of live oysters to estimate natural mortalities.

Dermo Disease

Although the protozoan parasite that causes dermo disease is now known as *Perkinsus marinus*, it was first described in Gulf of Mexico oysters and named *Dermocystidium marinum* (Mackin, Owen & Collier 1950), colloquially abbreviated then as ‘dermo’. Almost immediately, dermo disease was also reported in Chesapeake Bay (Mackin 1951). *Perkinsus marinus* is transmitted through the water to nearby uninfected oysters in as few as three days, and across distances as much as five kilometers from infected populations. Heavily infected oysters are emaciated; showing reduced growth and reproduction (Ray & Chandler 1955, McCollough et al. 2007). Although *P. marinus* survives low temperatures and low salinities, it multiplies most rapidly in the broad range of temperatures (20-35°C) and salinities (10-30‰) that are typical of Chesapeake Bay waters during oyster dermo disease mortality peaks (Dungan & Hamilton 1995). Over several years of drought during the 1980s, *P. marinus* expanded its Chesapeake Bay distribution into upstream areas where it had been previously rare or absent (Burrenson & Ragone Calvo 1996, Carnegie et al. 2021). Between 1990 and 2018, at least some oysters in 91-100% of all regularly tested Maryland populations have been infected. During 2019, the percentage of infected bars dropped to a 30-year low of 88%. Annual mean prevalences for dermo disease have ranged at 27-94% of all tested oysters, with a 30-year average of 64%.

MSX Disease

The high-salinity protozoan oyster pathogen *Haplosporidium nelsoni* was first detected and described as a *multinucleated sphere unknown* (MSX) from diseased and dying Delaware Bay oysters during 1957 (Haskin et al. 1966). It also infected oysters in lower Chesapeake Bay

during 1959 (Andrews 1968). The common location of lightest *H. nelsoni* infections is in oyster gill tissues. Although this suggests waterborne transmission of infectious pathogen cells, the complete life cycle and actual infection mechanism of the MSX parasite remain unknown. Despite numerous experimental attempts, MSX disease has rarely been transmitted to uninfected oysters in laboratories. However, captive experimental oysters reared in enzootic waters with salinity above 14‰ are frequently infected, and may die within 3-6 weeks. In Chesapeake Bay, MSX disease is most active in higher salinity waters with temperatures of 5-20°C (Ewart & Ford 1993). MSX disease prevalences typically peak during June, and deaths from such infections peak during August. In Maryland waters, annual average prevalences for MSX disease have ranged at 0.07-28%, with a 30-year average of 5.8%.

Since MSX disease is rare in oysters from waters with salinity below 10‰, the distribution of *H. nelsoni* in Chesapeake Bay varies as salinity changes with variable freshwater inflow. During an extended drought of 1999-2002, consistently low freshwater inflows raised salinities of Chesapeake Bay waters, which fostered upstream range expansions by MSX disease during each successive drought year (Tarnowski 2003). The geographic range for MSX disease also expanded widely during recent epizootics of 2009 and of 2014-2016. During 2003-2008, 2010-2012, and 2017-2018, freshwater inflows near or above historic averages reduced salinities of upstream Chesapeake Bay waters, and dramatically restricted the geographic range and effects of MSX disease (Tarnowski 2018). During 2018, low water salinities reduced the distribution and the mean prevalence of MSX disease to historic minima.

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dnr.maryland.gov/fisheries/Pages/shellfish-monitoring/reports.aspx



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APPENDIX 3

GLOSSARY

box oyster	Pairs of empty shells joined together by their hinge ligaments. These remain connected for months after the death of an oyster, providing a durable estimator of recent oyster mortality (see gaper). Recent boxes are those with no or little fouling or sedimentation inside the shells, generally considered to have died within the previous two to four weeks. Old boxes have heavier fouling or sedimentation inside the shells and the hinge ligament is generally weaker.
bushel	Unit of volume used to measure oyster catches. The official Maryland bushel is equal to 2,800.9 cu. in., or 1.0194 times the U.S. standard bushel (heaped) and 1.3025 times the U.S. standard bushel (level). (Return to Text)
cultch	Hard substrate, such as oyster shells, spread on oyster grounds or used in hatcheries for the attachment of spat.
dermo disease	The oyster disease caused by the protozoan pathogen <i>Perkinsus marinus</i> .
disease resistance/tolerance	Disease resistance is the ability of the oyster to prevent infection. Disease tolerance is the maintenance of relatively normal function (growth, reproduction, survival) despite the presence of disease in the animal.
dredged shell	Oyster shell dredged from buried ancient (3000+ years old) shell deposits. From 1960 to 2003 this shell had been the backbone of the Maryland shell planting efforts to produce seed oysters and restore/replenish oyster bars.
fresh shell	Oyster shells from shucked oysters. These shells are planted back on oyster bars.
gaper	Dead or moribund oyster with gaping valves and tissue still present (see box oyster).
<i>Haplosporidium nelsoni</i>	The protozoan oyster parasite that causes MSX disease.
infection intensity, individual	<i>Perkinsus</i> sp. parasite burdens of individual oysters, estimated by RFTM assays and categorized on a 0-7 scale. Uninfected oysters are ranked 0, heaviest infections are ranked 7, and intermediate-intensity infections are ranked 1-6. Oysters with infection intensities of 5 or greater are predicted to die within a short time.
infection intensity, mean sample	Averaged categorical infection intensity for all oysters in a sample: $\frac{\text{sum of all categorical infection intensities (0-7)}}{\text{number of sample oysters}}$ Oyster populations whose samples have mean infection intensities of 3.0 or greater are predicted to have significant near-term mortalities.

infection intensity, annual	Average of mean intensities for annual survey samples from constant mean sites: $\text{sum of all sample mean intensities} \div \text{number of annual samples}$
intensity index, sample	Infection intensities averaged only for infected oysters: $\text{sum of individual infection intensities}(1-7) \div \text{number of infected oysters}$
intensity index, annual	Infection intensities averaged for all infected survey oysters: $\text{sum of all sample intensity indices} \div \text{number of annual samples}$
market oyster	An oyster measuring 3 inches (76 mm) or more from hinge to bill (ventral margin).
Millennial years	The years 1998-2002, defined by drought, elevated salinities, severe disease epizootics, and high oyster mortalities.
MSX disease	The oyster disease caused by the protozoan pathogen <i>Haplosporidium nelsoni</i> .
MSX % frequency, annual	Percent proportion of sampled populations infected by <i>H. nelsoni</i> (MSX): $100 \times (\text{number of sample with MSX infections} \div \text{total sample number})$
observed mortality, sample	Percent proportion of annual, natural oyster population mortality estimated by dividing the number of dead oysters (boxes and gapers) by the sum of live and dead oysters in a sample: $100 \times [\text{number of boxes and gapers} \div (\text{number of boxes and gapers} + \text{number of live})]$
observed mortality, annual	Percent proportion of annual, bay-wide, natural oyster mortality estimated by averaging population mortality estimates from the 43 Disease Bar (DB) samples collected during an annual survey: $\text{sum of sample mortality estimates} \div 43 \text{ DB samples}$ (Return to Text)
<i>Perkinsus marinus</i>	The protozoan oyster parasite that causes dermo disease.
prevalence, sample	Percent proportion of infected oysters in a sample: $100 \times (\text{number infected} \div \text{number examined})$
prevalence, mean annual	Percent proportion of infected oysters in an annual survey: $\text{sum of sample percent prevalences} \div \text{number of samples}$
RFTM assay	Ray's fluid thioglycolate medium assay. Method for enlargement, detection, and counting of <i>Perkinsus marinus</i> cells in oyster tissue samples. This diagnostic assay for dermo disease has been widely used and refined for over sixty years to date.

seed oysters	Young oysters produced by providing shell as a substrate for oyster larvae to settle on, either naturally or in a hatchery. The seed oysters are subsequently transplanted to growout (seed planting and sanctuary) areas.
small oyster	An oyster equal to or greater than one year old but less than 3 inches (see market oyster, spat).
spat	Oysters younger than one year old.
spatfall, spatset, set	The process by which swimming oyster larvae attach to a hard substrate such as oyster shell. During this process the larvae undergo metamorphosis, adopting the adult form and habit.
spatfall intensity, sample site	The number of spat per bushel of cultch. This is a relative measure of oyster spat density at a specific location, which may be used to calculate the annual spatfall intensity index.
spatfall intensity index	The arithmetic mean of spatfall intensities from 53 fixed reference sites or Key Bars: <i>sum of Key Bar spatfall intensities ÷ number of Key Bars</i>
spatfall intensity index, annual median	The median of spatfall intensities from 53 fixed reference sites (Key Bars).
spatfall intensity index, long-term median	The median of the spatfall intensity indices over the time series.



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R/V *Miss Kay* returning to port. (Photo: R. Bussell)