

Appendix B

Characterization of Individual NOAA Codes

Oyster Management Review:
2021-2025

A Report Prepared by
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Introduction

A review of oyster population and harvest characteristics in non-sanctuary areas, including Public Shellfish Fishery Areas (PSFAs), provides a context to discuss their performance over time. Available data on oyster populations can be used to examine general oyster characteristics, background environmental and fishery information, and oyster population trends over time for each unique area. Recognizing that trends for any given area may shift as future environmental conditions change, nevertheless, an examination of oyster populations before and after the 2010 management regulation changes can facilitate informed discussion of the general characterization of the oyster population in areas available for commercial harvest.

In the late 1980s, small-scale geographical boundaries called NOAA Codes were developed for the reporting of commercial fishery harvest data (Figure B.00-1). Commercial oyster harvest has been reported using these NOAA Code areas since 1988. This appendix uses the NOAA Code boundaries to assess oyster populations and characterize the harvest, which provides a more detailed examination of the oyster population than would a single baywide examination.

This appendix includes data from the Department for each NOAA Code. Not all types of data are available for all NOAA Codes, and the scientific value of the different types of data may vary. Data used in this assessment include the following: replenishment activities, oyster population characteristics (oyster density, recruitment, size structure, and mortality), and harvest. Data used to characterize the productivity of NOAA Codes were collected in non-sanctuary areas only. In other words, if a NOAA Code encompasses both sanctuary and PSFAs, data for this analysis were collected only from the PSFAs that have remained open to harvest.

The various data sources used in the assessment of each NOAA Code are described below. The objective and term of the sampling program are presented for each data source. The specific data sets derived from the program are described, and the value and limitations of each of the data sets for assessment purposes are identified.

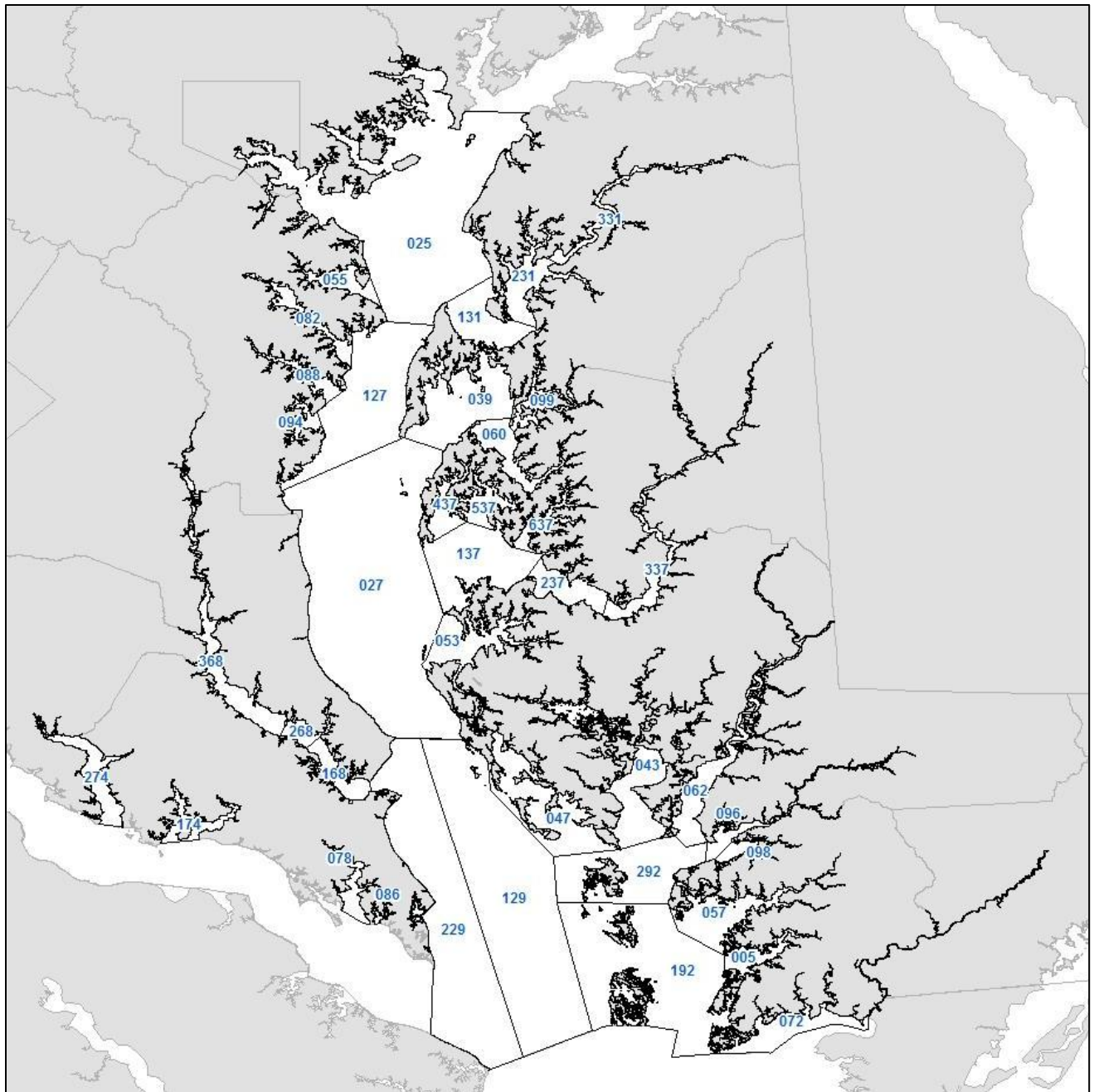


Figure B.00-1. Map of the NOAA Code areas within Maryland's portion of the Chesapeake Bay.

Data Sources for General Characterization of the Non-Sanctuary Oyster Populations and Harvest

Many of the data presented in this appendix are complex. If you have any accessibility issues or questions on what is depicted in the graphs, tables and figures, please reach out to the Department for assistance at customerservice.dnr@maryland.gov, 877-620-8367 (in-state) or 410-260-8367 (out-of-state).

Bay Bottom Surveys

Bay bottom mapping is important to determine the different substrate types and, if possible, delineate oyster bar boundaries. Two surveys have been completed in the past: the Yates Oyster Survey which conducted oyster bar mapping from 1906 to 1912 and the Maryland Bay Bottom Survey which categorized areas of bay bottom types from 1974 to 1983. There has not been a baywide bottom survey of the area open to the public fishery to determine change in bottom types since 1983. Due to inaccuracies of bottom data that are this old, bottom type information is not included in the sections below. Beginning in 2024, an updated bay bottom survey is ongoing.

Replenishment Efforts

The majority of oyster bars in Maryland have been manipulated over time. Planting activities occurring in areas open to public shellfish harvest are defined as replenishment activities. Replenishment efforts were conducted to improve oyster bar productivity and increase harvest. Enhancements include planting fresh and dredged shell, transplanting natural wild seed (young oysters), and planting hatchery-reared spat. Records of these activities date back to 1960, but only shell and seed plantings since 2006 are presented in this appendix. Not all plantings are monitored for oyster survival, natural recruitment, and/or economic benefit.

The amount of replenishment activities varies per NOAA Code. Some NOAA Codes have received numerous plantings, while others received very few or none. The annual planting information provides a general sense of how each NOAA Code was manipulated over time. An analysis to determine if replenishment activities contributed to an increase in the oyster population is beyond the scope of this report. This type of project is ongoing for smaller-sized areas and may be referenced when applicable for a particular NOAA Code.

Longevity of plantings should also be considered when examining replenishment activities. On average, in the absence of disease, it is thought that oysters can live up to 20 years¹. Even without disease-related mortality, seed plantings in the Chesapeake

¹ Buroker NE. 1983. Population genetics of the American oyster *Crassostrea virginica* along the Atlantic coast and Gulf of Mexico. Marine Biology 75:99-112.

Bay for harvest purposes are not likely to last more than three to five years due to harvest pressure. Longevity of shell can vary due to type of shell, pH and alkalinity, sediment burial, and attack from shell-boring organisms. The shell dissolution rate for fresh shell has been found to be much faster than for dredged shell. The half-lives of shell were computed by Waldbusser et al. (2011)² and the results ranged from roughly one year for fresh shell under mid and low pH to nearly 40 years. This rate however does not account for loss of shell due to burial, transport, and attack from sponges and other shell-boring organisms, all important sources of shell loss in Chesapeake Bay. A further understanding of the fate of historic plantings is important but beyond the scope of this report.

Annual Fall Oyster Dredge Survey

The purpose of the Department's Annual Fall Oyster Dredge Survey (Fall Oyster Survey), conducted since 1939, is to assess Maryland's oyster population. The Fall Oyster Survey represents the longest continuous and most geographically comprehensive oyster survey in Maryland.

The Fall Oyster Survey design includes the sampling of spatfall and relative oyster abundance at a subset of Maryland's oyster bars. This report utilizes Fall Oyster Survey data since 2006; a 20-year time period with standardized survey methodologies. In the fall each year, approximately 300 to 400 samples are collected. Some NOAA Codes may have samples taken on multiple bars annually, some have only one oyster bar sampled annually, and some have not been sampled at all by the Fall Oyster Survey. For each sample, one half-bushel subsample of material is collected by an oyster dredge, except in the case of the 43 fixed disease and biomass bars, when two half-bushel subsamples are collected. Detailed methods for the Fall Oyster Survey may be found in Tarnowski (2020)³.

For each sample collected by the Fall Oyster Survey, the number of live oysters per half-bushel of material collected is counted and then expressed as the number per bushel. Oysters are classified as spat, small-sized oysters, or market-sized oysters. Spat are less than one year old. Small-sized (sublegal) oysters are usually between one and three years old, and generally greater than 40 mm and always less than 76 mm. Market-sized (legal) oysters are equal to or greater than 76 mm and generally three years and older, though ages can vary based on growth rates. Changes in the number of oysters over time can provide a general sense of change in oyster abundance and age/size structure. Relative density of live oysters can be estimated by standardizing the count of live oysters by the total volume of the sample, tow distance, width of the dredge, and a gear efficiency coefficient.

² Waldbusser, G.G., R. A. Steenson, and M. A. Green. 2011. Oyster Shell Dissolution Rates in Estuarine Waters: Effects of pH and Shell Legacy. *Journal of Shellfish Research*, Vol. 30, No. 3, 659–669

³ Tarnowski, 2020. Maryland Oyster Population Status Report, 2019 Fall Survey.
<https://dnr.maryland.gov/fisheries/Documents/19TextFinRevColFigs.pdf>

Samples taken on a fixed 43-bar subset of all the oyster bars sampled provide detailed information on oyster sizes annually. Oyster shell height in millimeters (mm) is recorded for all oysters collected. Oyster size structure is assessed by calculating the frequency distribution of oysters in each five mm size class. A healthy oyster population would have a size distribution with oysters in all, or at least most, size classes from five mm to greater than 120 mm. This would indicate multiple age classes in the population.

Biomass 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, biomass integrates both the abundance of oysters and their collective body weight. Biomass is estimated from field-collected oyster shell height using laboratory-derived height-weight relationships. Weight is calculated in grams of dry tissue weight. Increases in biomass may reflect increases in the number of oysters and/or oyster growth.

Total observed mortality is an indicator of annual mortality rates of small and market-sized oysters. Mortality can occur from disease, other natural factors such as freshets, or old age. Mortality is estimated based on the total count of small and market-sized live oysters and the total count of small and market-sized boxes (dead oysters with the valves still articulated).

Cultch (oyster habitat) 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 Oyster Survey, cultch is defined as primarily both oysters (live and dead) and shell. The collection of quantitative cultch data was initiated during the 2005 Fall Oyster Survey. During a sampling tow, the distance covered by the dredge while sampling on the bottom is measured using a handheld geographic positioning system (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 100 by the actual tow distance and multiplying the result by the total cultch volume. If the dredge is full that sample is dropped from the analysis. A value of 1.4 bushels of cultch per 100-foot tow distance is consistent with the top 25% of all sites sampled bay-wide. It is roughly equivalent to 25 L of cultch per sq m, or approximately 1" of cultch over the bottom. This value is what the Department considers an adequate level for cultch.

Information on oyster diseases is collected from the same fixed subset of 43 bars on which shell heights are collected. Dermo (*Perkinsus marinus*) and MSX (*Haplosporidium nelsoni*) infection prevalence (the percentage of oysters infected) and dermo disease intensity (the severity of infection) are measured from 30 oysters collected at each site. Disease prevalence and intensity both relate to mortality. For example, all of the oysters in a sample may be infected, but at such low intensity that few oysters are in danger of dying in the near future. Intensity is based on a 0 to 7 scale. Individual oysters with intensities greater than 5 may indicate lethal infection levels.

The Fall Oyster Survey data are used to explore general characteristics of the oyster populations within those NOAA Codes that were sampled. Data presented examine changes over time, based on the average number of oysters per bushel of material, oyster shell height, live oyster biomass, recruitment, mortality, and disease on oyster bottom within each NOAA Code. Data for the most recent 20 years (2006-2025) are summarized into four different time periods which can be characterized baywide as:

- 2006-2010: Before the 2010 baywide management area regulation changes and through a rebuilding period after the four-year disease epizootic (1999-2002)
- 2011-2015: The first full year after the 2010 baywide management area regulation changes and a period of increasing abundance due to two relatively good spatsets in 2010 and 2012
- 2016-2020: A combination of poor recruitment and elevated disease-related mortalities led to a three-year period of declining abundance and harvests before rebounding, including a relatively good spat set in 2020.
- 2021-2025: Building on the upward population trajectory of the previous decade, this five-year period averaged the highest recruitment, biomass, and cultch indexes while disease and mortality indexes were the lowest or second lowest of any five-year period in the entire 36- and 41-year time series.

Although this report covers the last 20 years, oyster populations have varied over time.

- 1990-1994: This five-year period had three years of high streamflow (1990, 1993, 1994) and two years of below average streamflow (1991, 1992). The year 1991 was a high spatfall intensity year, being over four times the long-term average spatfall. The years 1991-1993 had a high mean prevalence of dermo and MSX disease. Elevated mortalities were correlated to the MSX frequency, with observed mortalities on individual bars as high as 88% in 1992.
- 1995-1999: Streamflows swung widely between successive years, impacting disease and resulting mortalities. The year 1995 was a period of low annual streamflow, followed by above-normal annual streamflow in 1996-1998, and 1999 was the first year of a four-year drought. These streamflow shifts were reflected in disease outcomes: 1995 was a year of increased dermo disease; 1996-1998 had low disease levels and observed mortalities; 1999 began a four-year disease epizootic and increase in observed mortality. A high spatset occurred in 1997, with over five times the long-term average spatfall, but this was not extensive, being largely confined to the Eastern Bay region.
- 2000-2005: This period began with a drought that lasted until 2002. With the exception of 2002, the years 2000-2005 saw low recruitment with a spatfall intensity index below the long-term median. Because of the continued drought, 2000-2002 experienced a disease epizootic and the highest observed mortality index on record with nearly 60% of the oysters having died by 2002. This was followed by two years of record high streamflow in 2003 and 2004, leading to a period of lower disease prevalence and reduced observed mortality (2003-2005).

There are some limitations to using oyster gears to conduct surveys. Some gears may not sample well on some alternate material sites. Due to the variability of the oyster bottom and different efficiencies between gears, particularly between dredges and other gears, direct comparisons between surveys may not be possible.

Harvest Data

The Department collects harvest data using two methods: seafood dealer reports and oyster harvester reports. The volume of oysters caught each day by each license holder is reported to the Department in bushels. One Maryland oyster bushel is approximately 46 liters, notably larger than a standard U.S. bushel (35 liters).

Seafood dealers must report their oyster purchases to the Department. These reports are called buy tickets and have been collected since the 1970's. Buy tickets are submitted weekly by licensed dealers who buy oysters directly from harvesters on the day of catch. Information reported on the buy tickets includes the broad location where harvest occurred (the NOAA Code area), quantity of oysters harvested, the gear type, and date of harvest. Both the dealer and the harvester must sign the buy ticket and include their names and license numbers. Harvest data from 2005-06 to 2025-26 seasons are presented in this appendix to be consistent with the period of Fall Oyster Survey data presented.

Starting in 2009, the Department required oyster harvesters themselves to report their catch. These reports are submitted to the Department monthly. Information reported on the harvester reports include bar-specific harvest location, quantity of oysters harvested, gear used, and the date of harvest. However, due to the longer time series available from the buy ticket record, the monthly harvester reports are not presented in this appendix.

Water Quality

Water quality influences patterns in oyster life history and disease. Oyster survival, growth, reproduction, and disease incidence are related to water quality parameters including salinity, temperature, and dissolved oxygen. Oyster reproduction (spat fall) and disease-caused mortality both decline with decreasing salinity. Therefore, in areas where reproduction is lowest, survival of mature oysters may be highest. Monitoring water quality may also detect the effects of replenishment efforts on the environment, as oysters also impact the quality of water in which they live. For example, some water quality characteristics such as clarity may be related to oyster biomass, as greater biomass results in a greater filtration rate. However, the association between water quality improvements and oyster population size is complex, since a number of other

factors, such as land use practices and water treatment facilities, greatly impact water quality.

Oyster bars in Maryland are located in the mesohaline salinity classification (5-18 ppt). Within this mesohaline zone, Maryland oyster bars are further classified into three zones: Zone 1 has an average salinity less than 11 ppt; Zone 2 has an average salinity between 11 and 15 ppt; and Zone 3 has salinities greater than 15 ppt⁴. Data from the Maryland Department of Natural Resources, Maryland Department of Environment, and Chesapeake Bay Program were used to create a Maryland-wide salinity dataset. Oyster sanctuaries are classified by salinity zone using average surface salinity from 2006 to 2020. Although bottom salinity would be more appropriate to use to classify salinity zones for oysters, surface salinity datasets had greater spatial and temporal coverage. Salinity zones were developed to be broad, general categories and some NOAA Codes may fluctuate between salinity zones given weather patterns.

NOAA Codes within Zone 1 are characterized by having lower levels of disease and better survival but low reproductive capability⁵. Oysters are also subject to intermittent freshets that can result in substantial mortality.

NOAA Codes within Zone 3 can be subjected to heavy disease pressures which historically resulted in higher mortality⁶. In Zone 3, there are also high recruitment rates that provide a fairly constant influx of new oysters.

NOAA Codes within Zone 2 may have fluctuating characteristics based on the rainfall variation between wet and dry years⁷. Annual spat settlement can range from low to moderate to high based on salinity. Mortality related to disease can also fluctuate from year to year. In years with low disease-caused mortality, the oyster populations in this area can recover as long as there is also successful recruitment. However, the reverse can also occur.

Baywide Streamflow

Freshwater inflow into the bay through streams and rainfall can impact water quality, and in particular salinity. The U.S. Geological Survey monitors freshwater streamflow into the bay annually⁸ (Figure B.00-2).

Between 1990 and 1998, freshwater inflows were variable, with high flow years alternating with low flow years. A prolonged drought began in 1999 and persisted for four years, adversely affecting oyster populations and compounding mortalities

⁴ Maryland Department of Natural Resources. 2019. Oyster Management Plan. 93 pp.
https://dnr.maryland.gov/fisheries/Documents/MD_Oyster_FMP-2019.pdf

⁵ IBID

⁶ IBID

⁷ IBID

⁸ USGS. 2015. Estimated streamflow entering Chesapeake Bay above selected cross sections. United States Geological Survey Inflow Database. <http://md.water.usgs.gov/waterdata/chesinflow/>

associated with oyster disease. The years 2003 and 2004 were high flow years with little adverse effect on oyster mortality. Normal flow conditions persisted from 2005 to 2010 and from 2012 to 2017. High flows in 2011 and 2018 contributed to oyster mortalities. In 2011, higher mortalities were confined largely to the upper bay and in 2018 the highest mortalities occurred in the upper bay as well as the Potomac River. Higher flows persisted throughout the first half of 2019 but 2020 resulted in an average flow year. Between 2021 and 2025, four of the five years had normal streamflows, averaged annually, although strong intra-annual variability was evident. The only exception, 2023, experienced well-below normal flows.

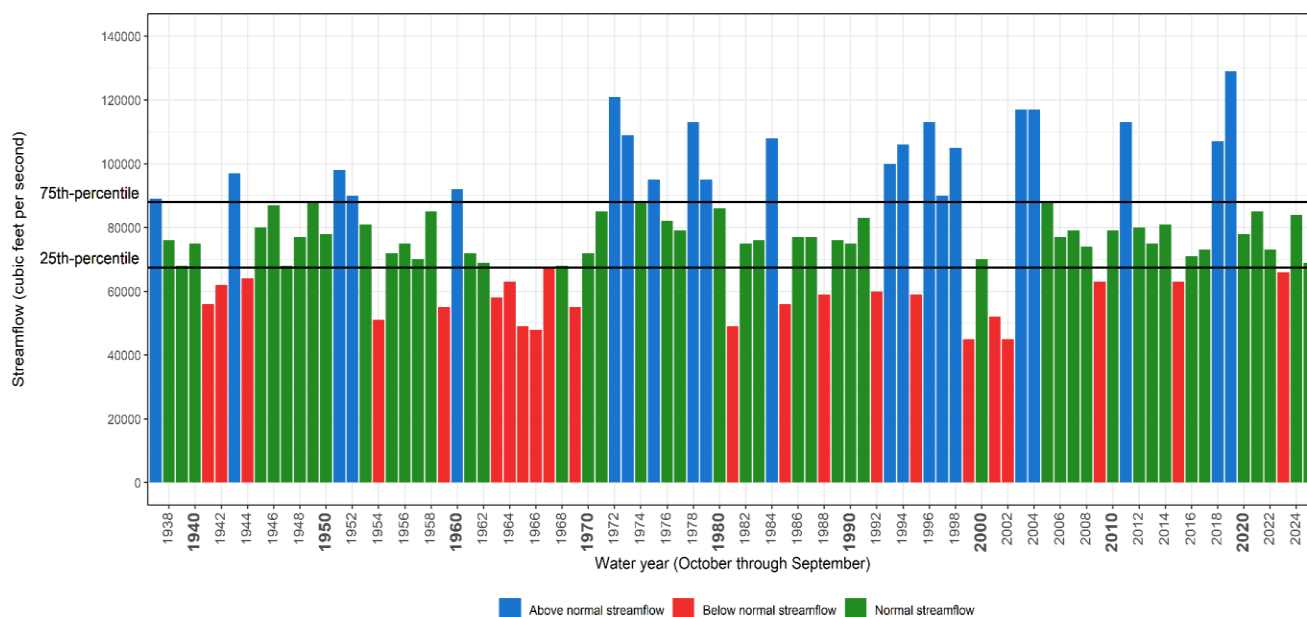


Figure B.00-2. Annual mean monthly freshwater flow into Chesapeake Bay.⁹

⁹ USGS. 2026. Estimated streamflow entering Chesapeake Bay above selected cross sections. United States Geological Survey Inflow Database. https://www.usgs.gov/centers/cba/science/freshwater-flow-chesapeake-bay?qt-science_center_objects=0#qt-science_center_objects

Overall Harvest and Effort in the Public Fishery

Maryland's oyster harvest has declined significantly since the 1880s (Figure B.00-3). The initial decline, lasting into the early part of the 20th century, was driven presumably by overharvesting and loss of habitat, both associated with an absence of conservation laws¹⁰. In the later part of the 20th century, oysters were affected by mortality from diseases, harvesting and habitat loss, including that from sedimentation and in some cases low dissolved oxygen¹¹.

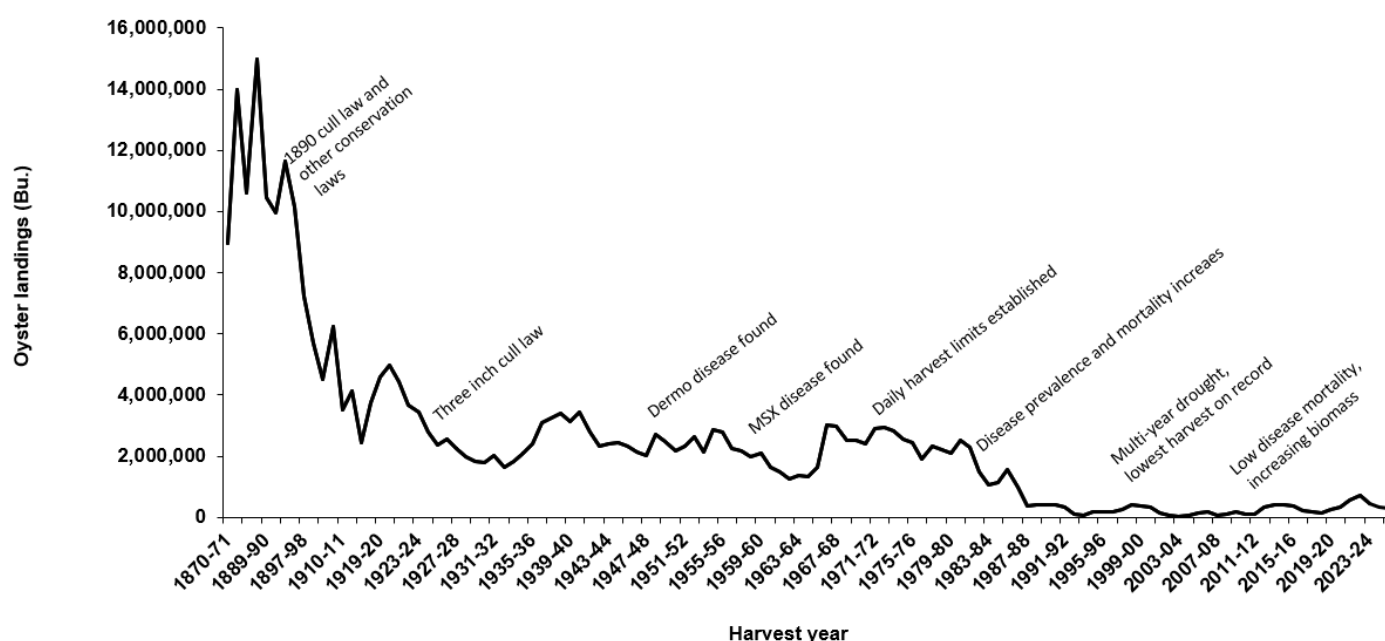


Figure B.00-3. Commercial oyster harvest (Maryland bushels) in Maryland.

Oyster harvest since 2005 has varied considerably (Figure B.00-4). The lowest harvest on record (26,000 bushels) was recorded just prior, during the 2003-2004 season. Harvest increased from the 2012-13 season to 2016-17 season due to good spatfall years (2010 and 2012) and relatively low (less than 15%) annual disease mortality. In the 2022-2023 season, 722,850 bushels of oysters were harvested, the highest since the 1986-87 season. Harvest decreased in 2023-24 and 2024-25, likely due to a

¹⁰ Brooks, W.K., 1891. The oyster, re-issued, 1996 Edition with a foreword by K.T. Paynter, Jr. Johns Hopkins University Press, Baltimore, MD, 230 pp.

¹¹ IBID

combination of factors including recent spat sets not yet recruiting to the fishery and market forces reducing demand.

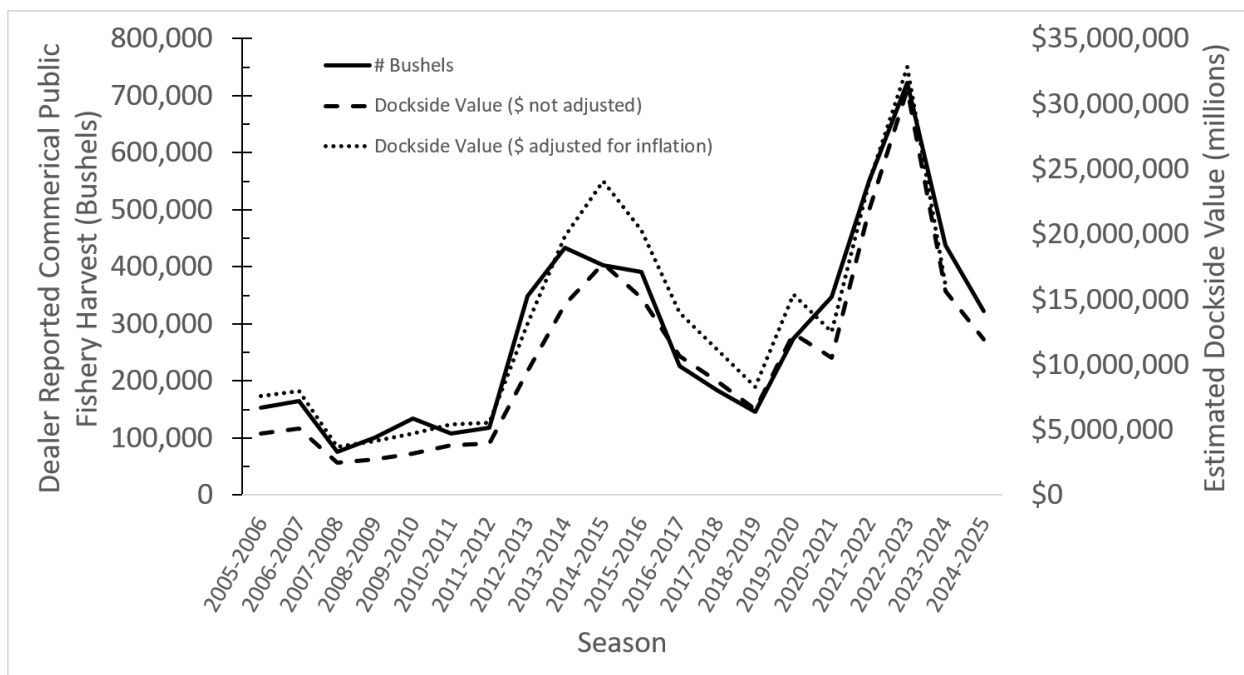


Figure B.00-4. Oyster harvest (Maryland bushels) and dockside value (dollars, adjusted for inflation and unadjusted) in Maryland as reported using seafood dealer buy tickets.

Throughout this appendix, harvest information from the 2005-06 to 2024-25 season is presented. This 20-year period is consistent with data presented from the Fall Oyster Survey.

Oyster harvest is permitted from October 1st (November 1st for sail and power dredging) to March 31st. The current oyster season has been in effect since 1992 with the exception of the 2014-2015 season that was extended to April 15th due to ice impacts.

From the 2005-06 to 2018-19 seasons, harvest per license was limited to 15 bushels per day for all gear types except power dredging (12 bushels per day) and sail dredging (150 bushels per day). These daily catch limits had been in place since 1971 for sail dredge, 1983 for power dredging, and 1987 for hand tongs, patent tongs, and diving. For the 2019-20 season through the 2024-2025 season, daily harvest per license changed to 12 bushels per day for all gear types except power dredging (10 bushels per day) and sail dredging (100 bushels per day). A maximum of two licenses is permitted on a boat harvesting oysters for all gear types except sail dredge which only allows one license.

Harvest Effort

Individuals with an oyster license who have also purchased an oyster surcharge for the current season are permitted to harvest oysters. This equates to a maximum of 2,828 licenses that have the potential to harvest oysters in any year. However, not every license holder purchases an oyster surcharge, so the number of actual harvesters is usually below the potential maximum. To harvest oysters in any year, a license holder must purchase an oyster surcharge for \$300. The surcharge funds are used to plant shell and seed for the public fishery. The surcharge requirement was enacted in 1991, and the Department began recording the number of surcharges purchased in 1994. It should be noted that not all license holders that pay the surcharge report harvesting oysters (Figure B.00-5). Current reporting compliance rates for harvesters submitting the required monthly oyster harvest report is estimated at between 60-65%.

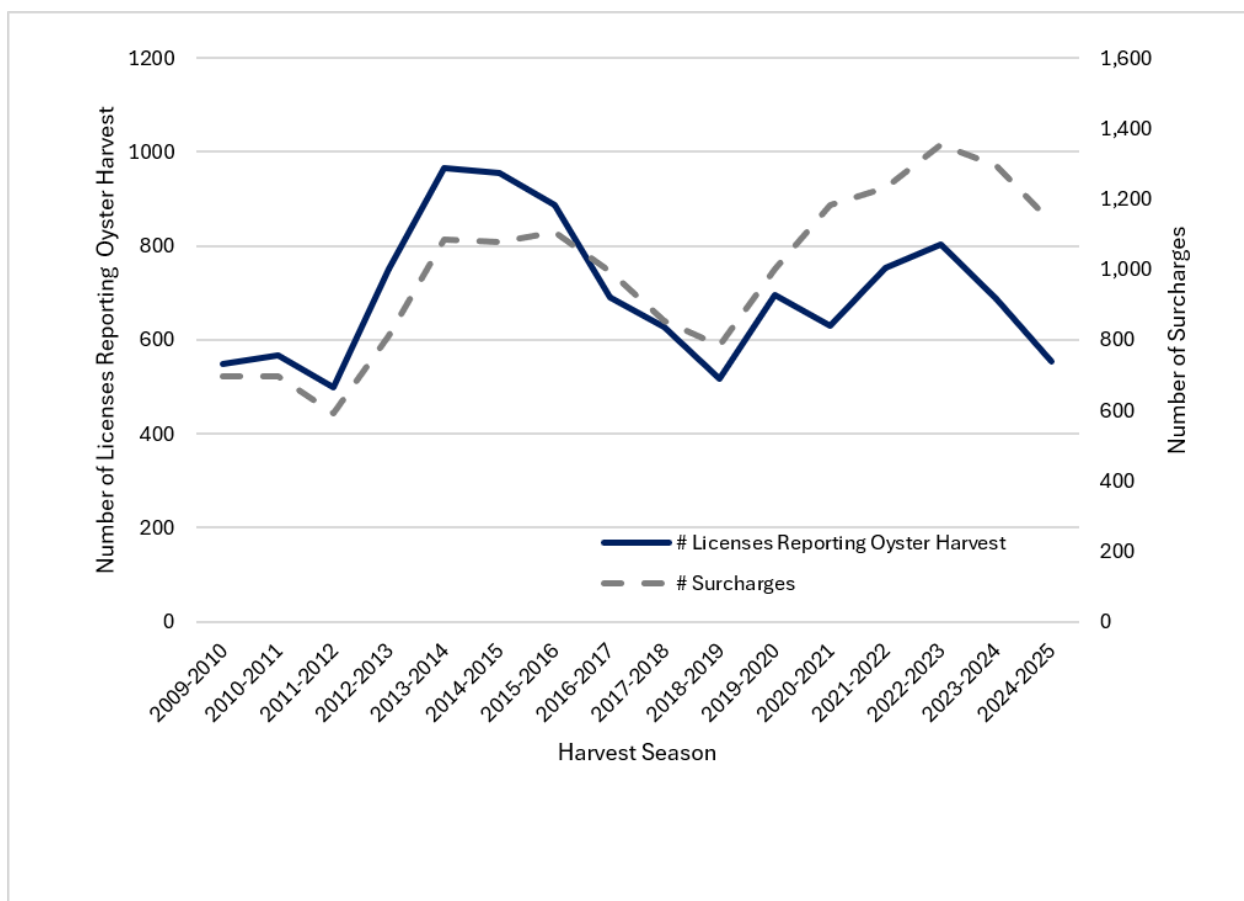


Figure B.00-5. The number of oyster surcharges sold per harvest season and the number of licenses reporting oyster harvest on Monthly Oyster Harvester Reports between 2009-10 and 2024-25. Current reporting compliance rates for harvesters submitting the required monthly oyster harvest report is estimated at between 60-65%. The total number of oyster surcharges purchased in Maryland annually has fluctuated

but slowly increased over time since the 2005-06 season with an apparent coincident increase in harvest over time (Figure B.00-6).

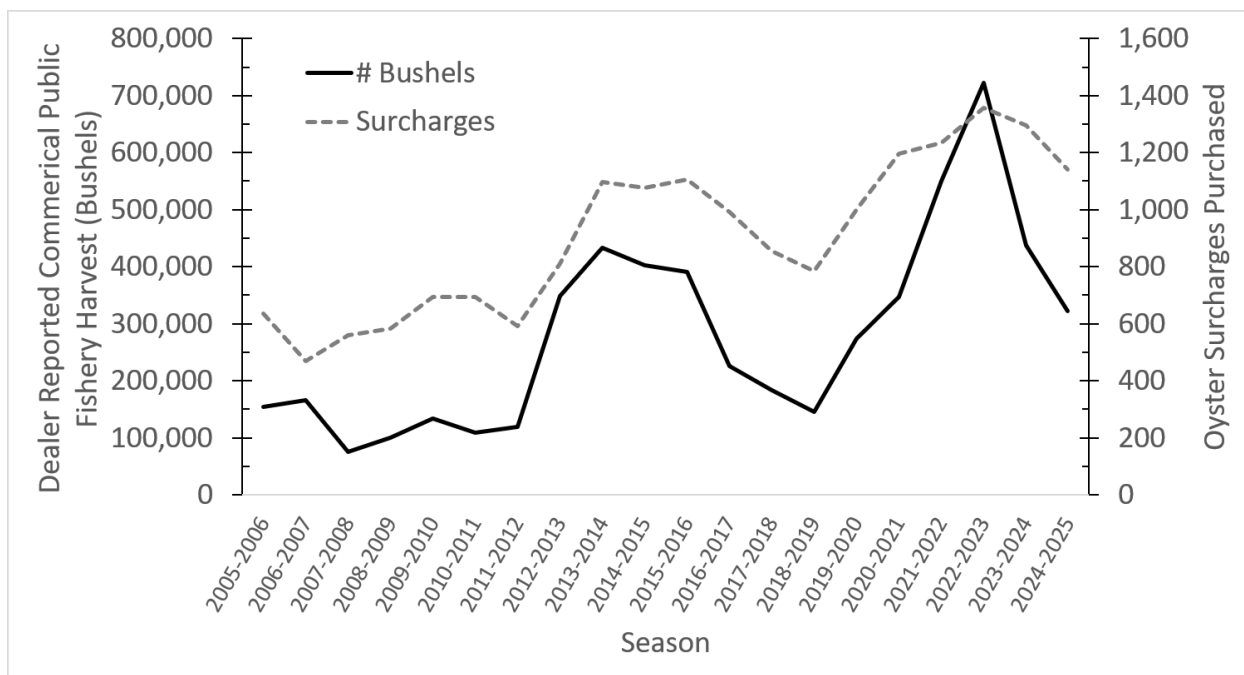


Figure B.00-6. The total number of oyster surcharges purchased in Maryland annually and the reported annual harvest from seafood dealer buy tickets.

Harvest effort has varied substantially over the 20-year period since the 2005-06 season (Figure B.00-7). Effort, as defined as the summed number of days during which oyster harvest occurred across all license holders each season, has been as low as approximately 9 thousand days in the 2007-08 season and over 60 thousand days in the 2022-23 season.

Catch per unit effort, as defined as the total harvest divided by the total number of days harvested, is a measure of two indices: efficiency of the fishery and oyster abundance. Annual catch per unit effort has been variable but relatively stable over the 20-year period (Figure B.00-7).

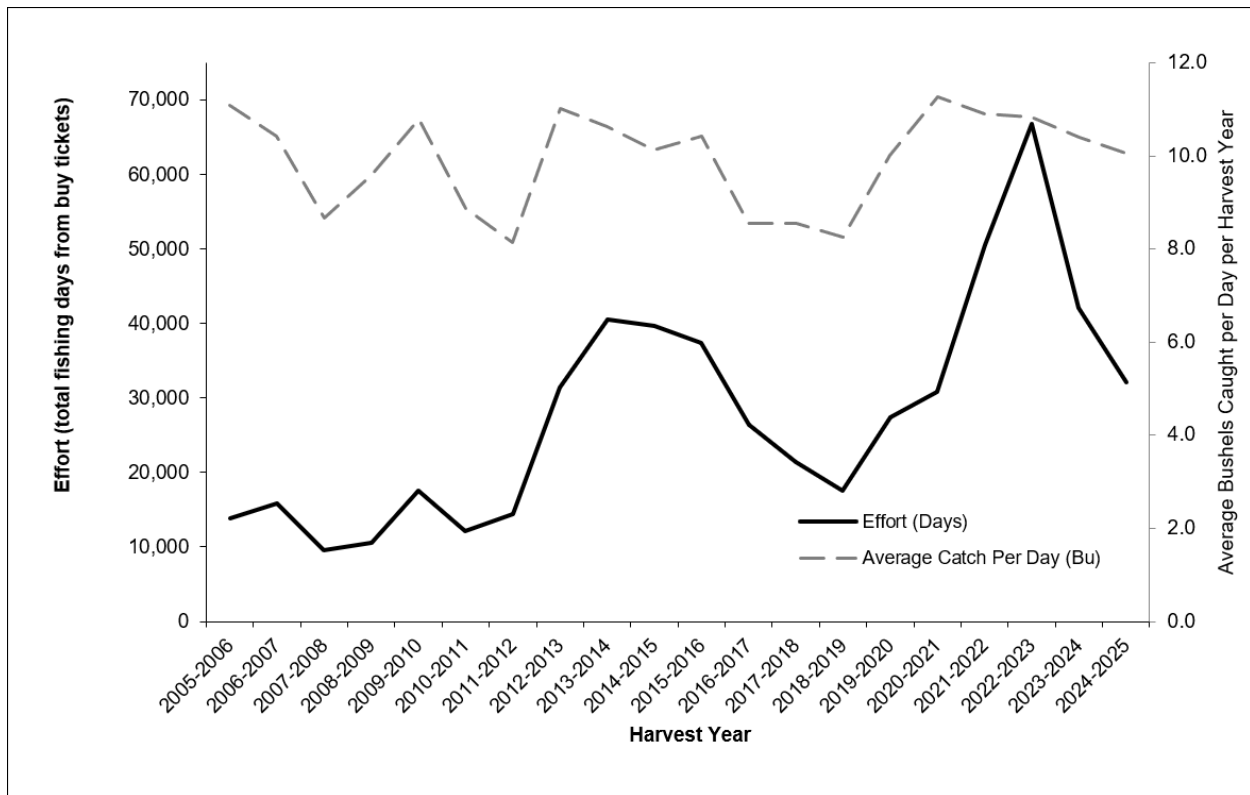


Figure B.00-7. Effort (total number of fishing days) and catch per unit effort (bushels per day) for oyster harvest in Maryland since the 2005-06 season as reported on seafood dealer buy tickets.

Harvest by Gear Types

Oysters can be harvested by multiple gear types: hand tongs, diving, patent tongs, power dredge, and sail dredge. Hand tongs are made of two wooden shafts ranging in length from 16' to 30' with rakes attached to each shaft; the shafts are joined together by a pin, mimicking scissors. The harvester stands on the side of the boat, lowering the tongs into the water, and then opens and closes the tongs catching the oysters in the rakes. Some oyster bars are restricted to hand tonging only. However, harvest by hand tonging is permitted on all oyster bars. Areas open to oystering are zoned for specific and sometimes multiple gear types.

Patent tongs employ the same basic technique as hand tongs. However, they are controlled using hydraulics and have a much bigger head (rake) than the traditional hand tong. To harvest oysters, the tongs are lowered into the water, and the head is opened and closed using hydraulics. Patent tongs vary by style and weight with lighter or heavier gear being used on different bottoms. Many boats will choose to deploy two patent tongs, one on each side of the vessel, operated by each license-holder. At the request of the industry, patent tongs, thought to be too efficient, are prohibited from

certain county waters and most tributaries. They are primarily employed in the Chesapeake Bay mainstem, the lower Patuxent River, and parts of Somerset County.

Oyster diving was legally established as a gear type in 1973. Divers remove oysters from the bottom by hand. Diving is a two-person job; once the person on the bottom fills up a basket, the person on the surface will hoist it up. Diving is allowed on all open bottoms except those reserved for Hand Tong Only and three of the four small Power Dredge Study Areas, but divers typically only work on bars where patent-tonging and dredging are prohibited.

Power dredging for oysters uses a boat with a mast and boom type rig that controls an oyster dredge. A dredge is a toothed scraping bar fitted with a chain or mesh bag that is lowered onto the bar and is then towed by the boat across the bar, collecting oysters in the bag. The dredge is then lifted back onto the boat, and the catch is deposited onto the culling station. In 1993, the power dredging gear type was legislatively discontinued but it was reestablished in 1997 in certain areas and further expanded in 1999, 2003, and 2010, to include much of the lower Bay and significant parts of the middle Bay below the Chesapeake Bay Bridge. Power dredging is allowed in much of the lower Choptank River and the majority of bottoms in southern Maryland including the Bay mainstem and much of Dorchester, Somerset, and St. Mary's Counties.

Sail dredging is a historical harvest method employing the iconic Chesapeake Bay skipjack sailing vessel. The dredge is larger than that used in power dredging and it is lowered and raised by a deck mounted winch, not by a mast and boom rig. For at least three of the work days each week the boat must be powered completely under sail. For two days a week, the skipjack can be powered using an auxiliary yawl boat to push the skipjack, effectively making it extremely similar to power dredging. Historically skipjacks operated throughout the mainstem of the Chesapeake Bay as well as some tributaries such as the Choptank River, but in recent years, fewer than ten boats are in operation. They are generally found in the Tangier Sound region, possibly due to densities of oysters elsewhere on the regulated skipjack bottom (primarily mainstem Chesapeake Bay) not being sufficient to harvest economically.

The proportion of harvest by each of the gear types has varied over time since the 2020-21 season (Figure B.00-8). Of harvest obtained by dredging, power dredging was the most frequent gear used. Patent tongs were typically the second-most used gear but in recent years hand tonging and diving has produced relatively more of the harvest compared with patent tongs.

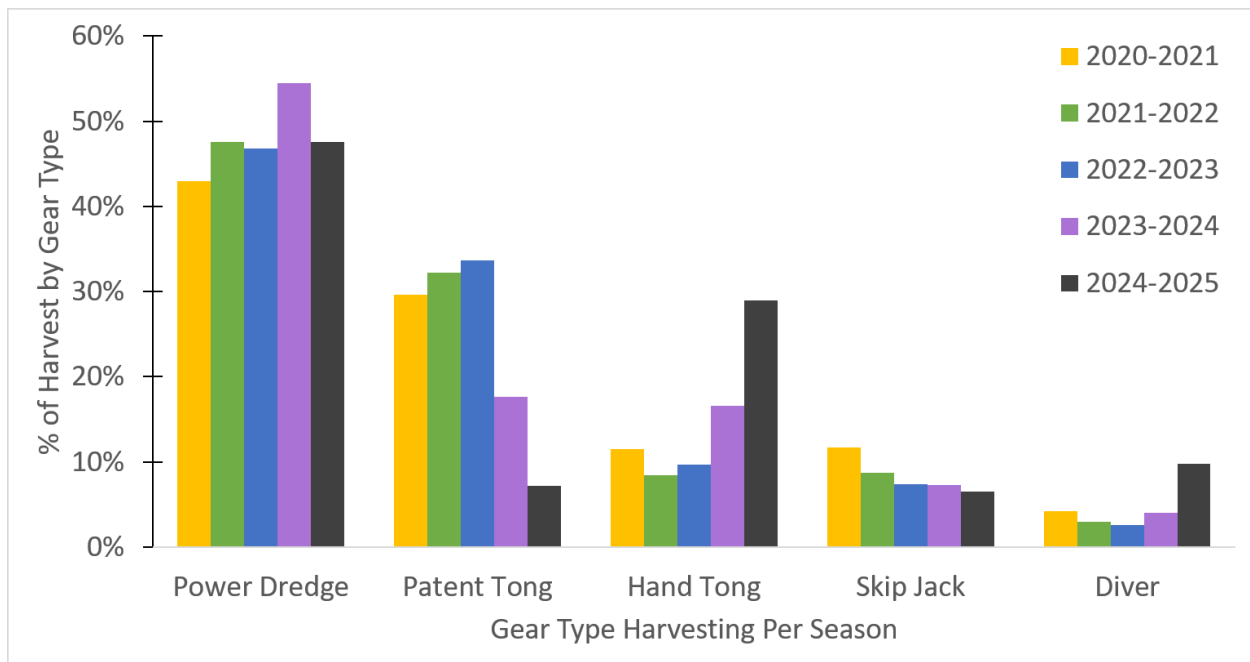


Figure B.00-8. Percent of the total oyster harvest reported in Maryland by each gear type as reported by seafood dealer buy tickets.

Spatial Extent of Harvest

Harvest reported by seafood dealer buy tickets are recorded by NOAA Codes (Figure B.00-1). The dominant harvest areas have varied over the years (Figure B.00-9). Broad Creek (537), Tangier Sound North (292) and Tangier Sound South (192) most consistently ranked in the top five NOAA Codes for harvest.

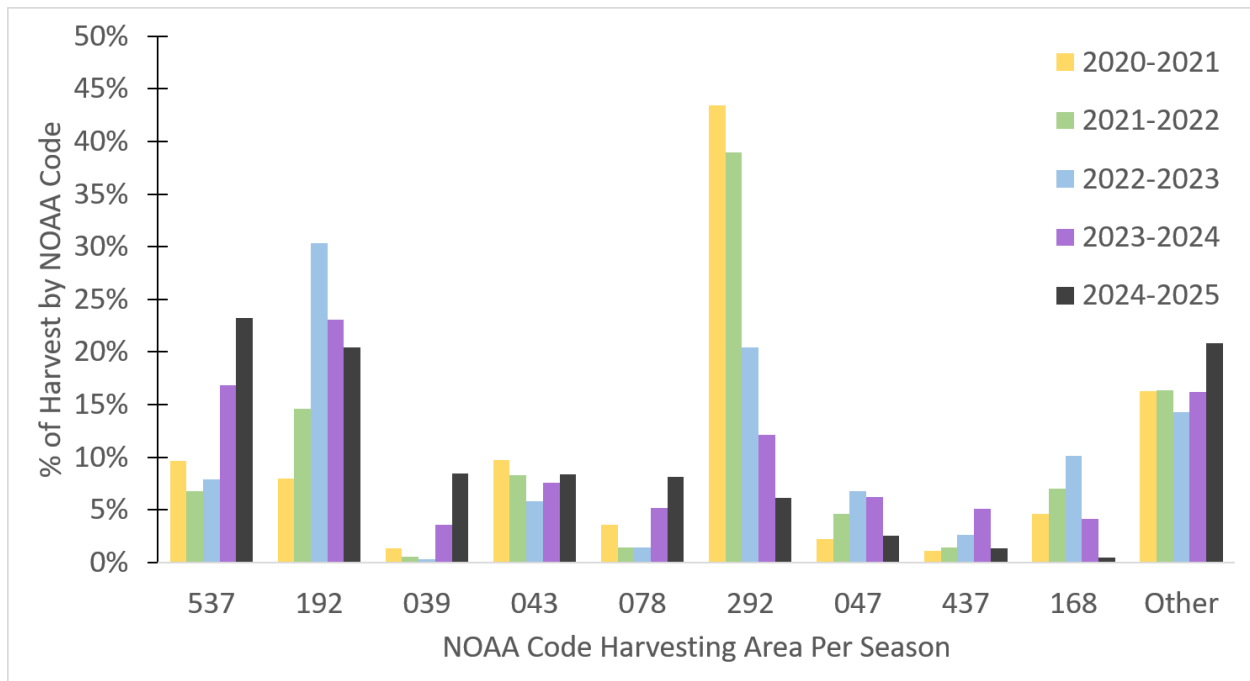


Figure B.00-9. Percent of the total oyster harvest reported in Maryland for select high harvest NOAA codes as reported by seafood dealer buy tickets. Categories on x-axis correspond to NOAA Code areas (537- Broad Creek; 192 - lower Tangier Sound; 039 - Eastern Bay; 043 - Fishing Bay; 078 - St. Mary's River; 292 - upper Tangier Sound; 047 - Honga River; 437 - Harris Creek; 168 - lower Patuxent River)

Section B.01: NOAA Code 005 – Big Annemessex River

NOAA Code 005 encompasses the Big Annemessex River and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 7,132 acres and has 15 historic oyster bars¹². The Big Annemessex River Sanctuary encompasses 10% (749 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 6,383 surface acres. There are 3,935 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 671 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's high salinity region (Zone 3).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.01-1)
- Summary statistics (Table B.01-1)
- Density per year (Figure B.01-2)
- Shell height frequencies (Figure B.01-3)
- Biomass per year (Figure B.01-4)
- Observed mortality (Figure B.01-5)
- Cultch per year (Figure B.01-6)
- Harvest (Figure B.01-7)

Total live oyster density increased during 2021-2025, the result of increases in spat and small density. Spat density was twice as high during 2021-2025, driven largely by high spat density in 2023. Density of small oysters also increased, while density of market oysters remained similar to previous five-year increments. Mortality has generally been above the baywide average (12%) but has declined in recent years. The average amount of cultch was similar across the time series.

No replenishment planting efforts were undertaken to enhance the public fishery in the non-sanctuary portions of this NOAA Code.

Harvest for this NOAA code has been reported on seafood dealer buy tickets for most years in the time series, including past harvest from areas that are now in the sanctuary. Following the sanctuary's establishment in 2010, 10% of the area was closed to harvest. Harvest has ranged from less than ten bushels in 2007-2008 to approximately 4,000 bushels in the 2015-2016 season. Power dredge and patent tong were the primary gears used in 2021-2025.

This area is categorized by low but increasing abundance and low harvest.

¹² See chart 45 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

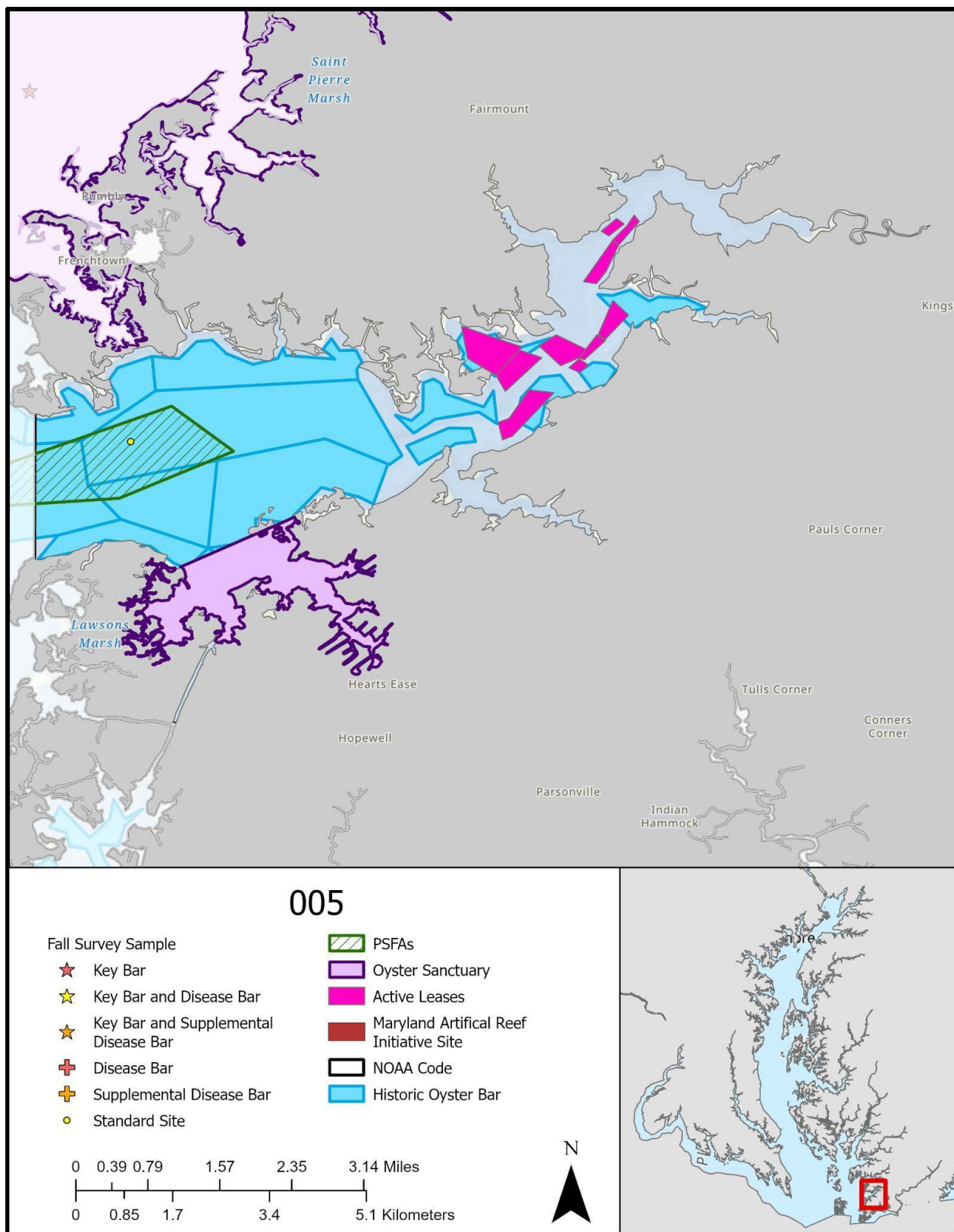


Figure B.01-1. Map of NOAA Code 005 (Big Annemessex River). Fall Oyster Survey sites may not be sampled every year.

Table B.01-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 005 (Big Annemessex River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/5	5/4	5/5	5/5
Number of Live Spat Oysters per square meter	87.7 $\pm$ 45	77.2 $\pm$ 36	51.6 $\pm$ 25	163 $\pm$ 108
Number of Live Small Oysters per square meter	7.8 $\pm$ 6	2.2 $\pm$ 1.3	2.9 $\pm$ 0.8	13.5 $\pm$ 3.8
Number of Live Market Oysters per square meter	0.6 $\pm$ 0.6	1.3 $\pm$ 0.5	0.4 $\pm$ 0.4	0.6 $\pm$ 0.6
Number of Live Oysters per square meter $\pm$	96 $\pm$ 45	81 $\pm$ 36	55 $\pm$ 25	177 $\pm$ 109
Live Biomass (g Dry Weight per Bushel)	ND	5.2 $\pm$ 1.7	4.5 $\pm$ 1.1	10.5 $\pm$ 3.5
Observed Mortality (%)	26.5 $\pm$ 14	41.7 $\pm$ 21	4 $\pm$ 4	17.4 $\pm$ 5.6
Cultch (Bushels per 100 feet towed)	0.9 $\pm$ 0.13	0.8 $\pm$ 0.2	0.7 $\pm$ 0.1	0.9 $\pm$ 0.2
Average Annual Harvest (Bushels)	46	477	955	91

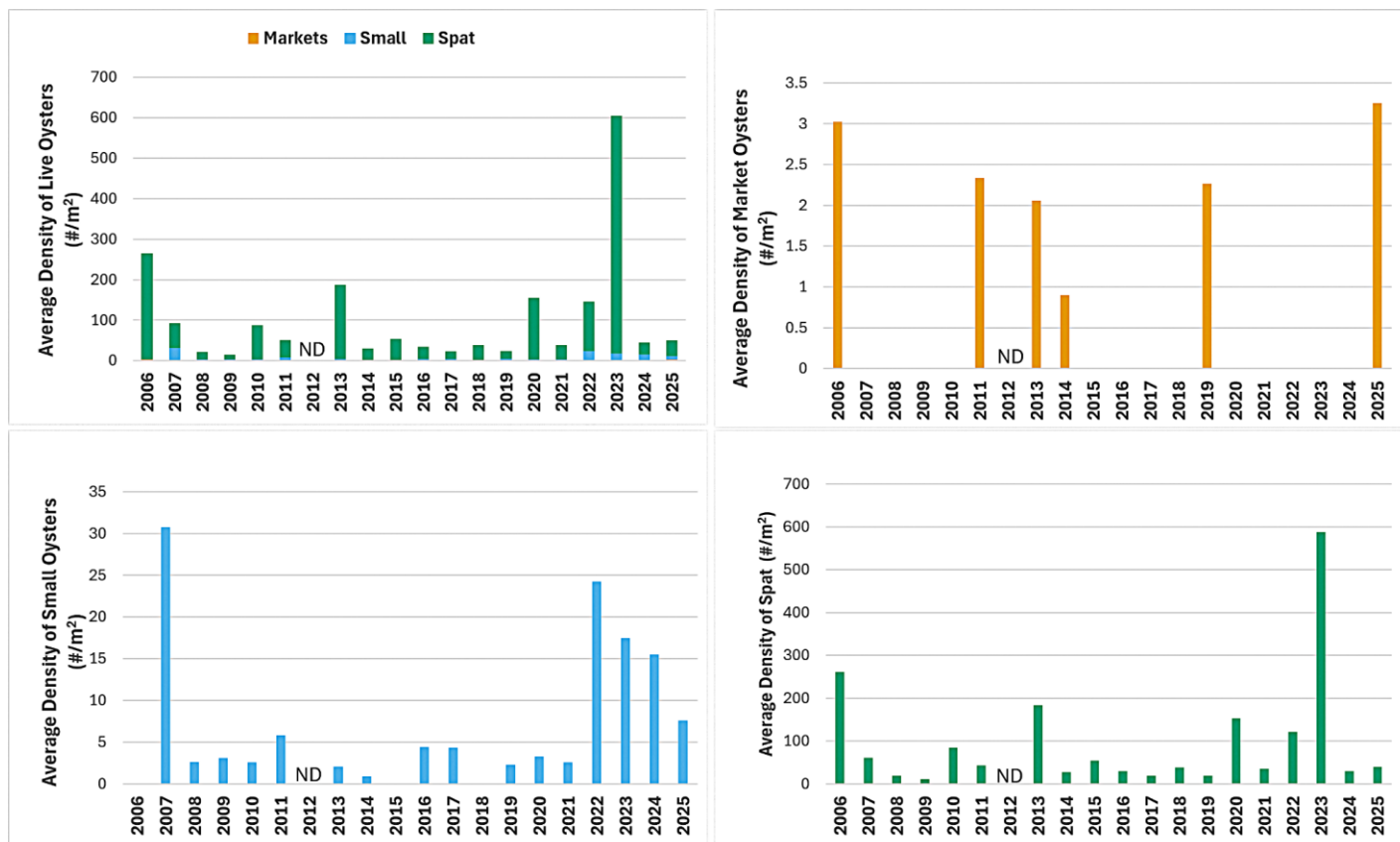


Figure B.01-2. Average number of live oysters per square meter by size class in NOAA Code 005 (Big Annemessex River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales. ND=No Data.

Big Annemessex (005)

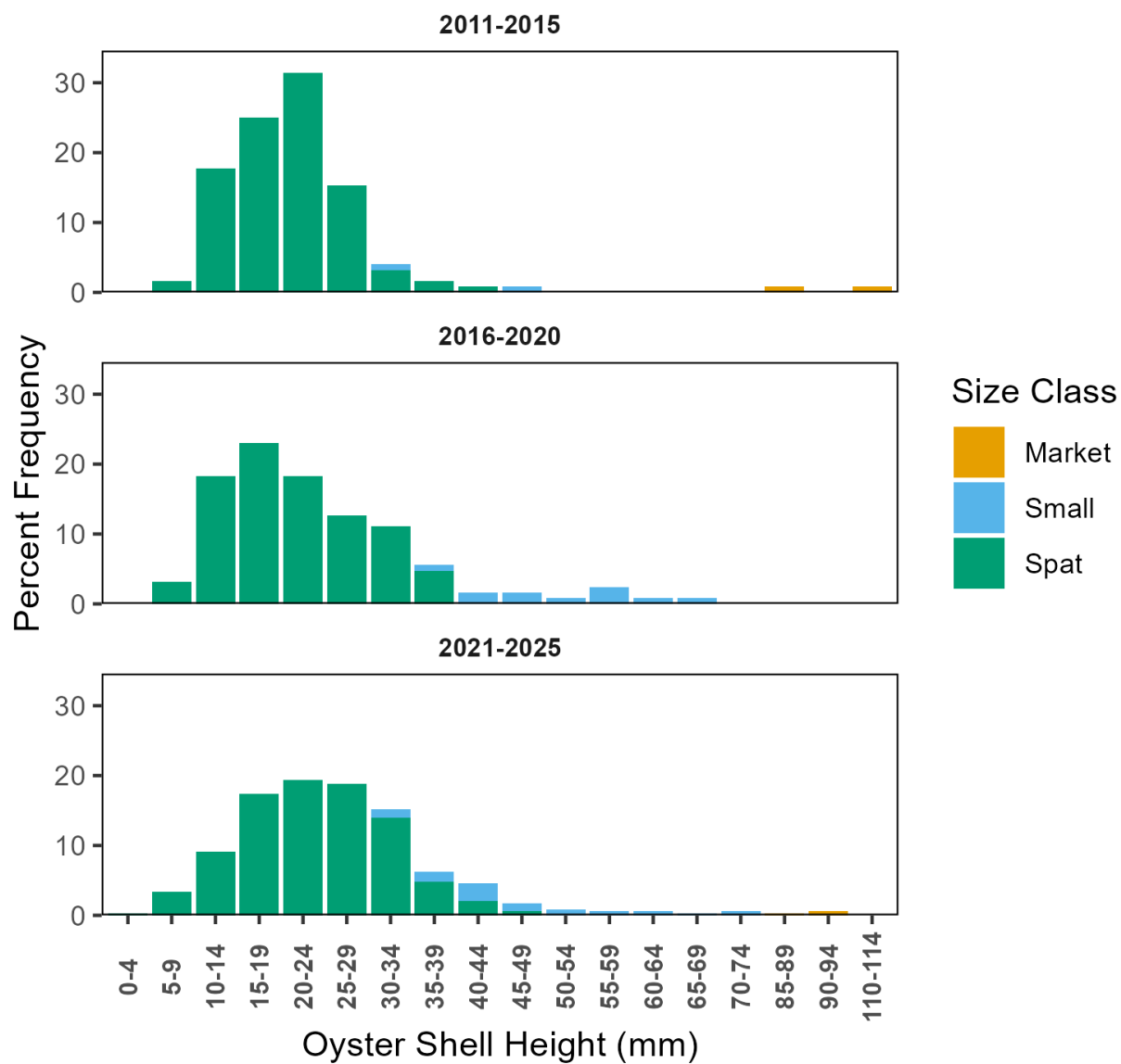


Figure B.01-3. Shell height frequencies of live oysters in NOAA Code 005 (Big Annemessex River) occurring outside of the current sanctuary area. No shell height data were collected from 2006 to 2012, 2015, 2019, and 2024.

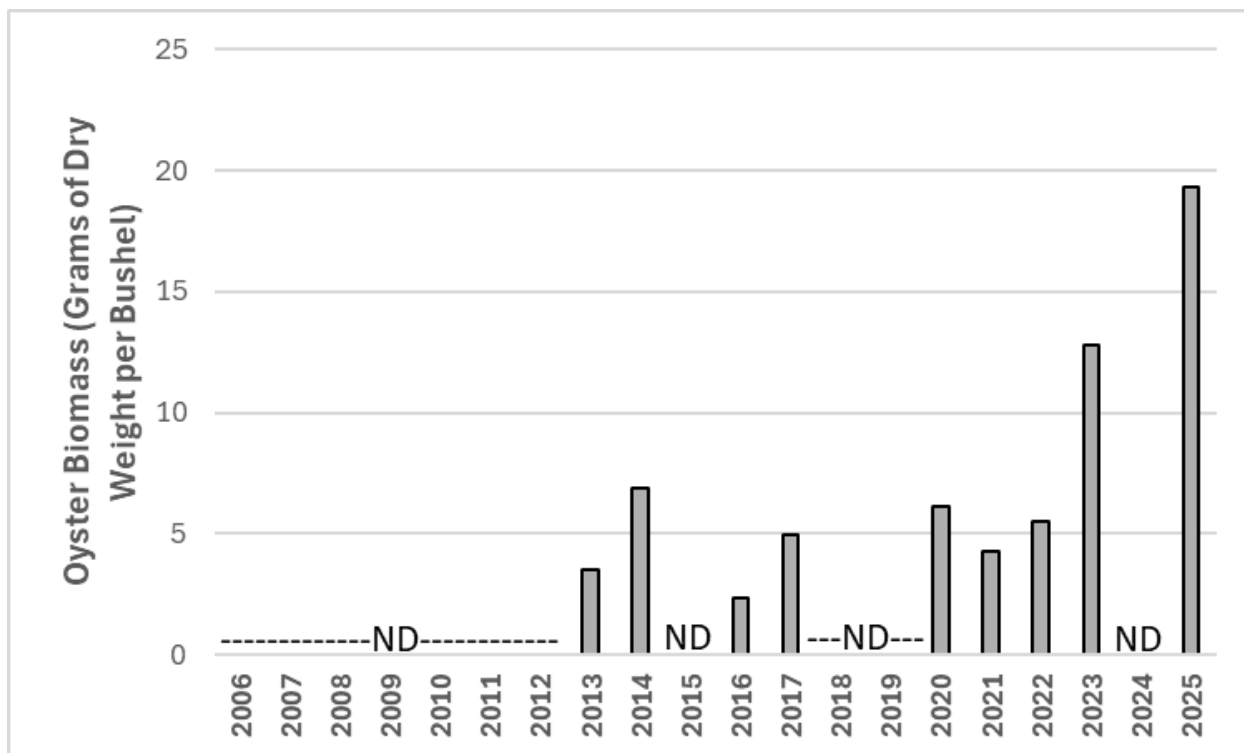


Figure B.01-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 005 (Big Annemessex River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey on Big Annemessex bar. No biomass data were collected from 2006 to 2012, 2015, 2019, and 2024.

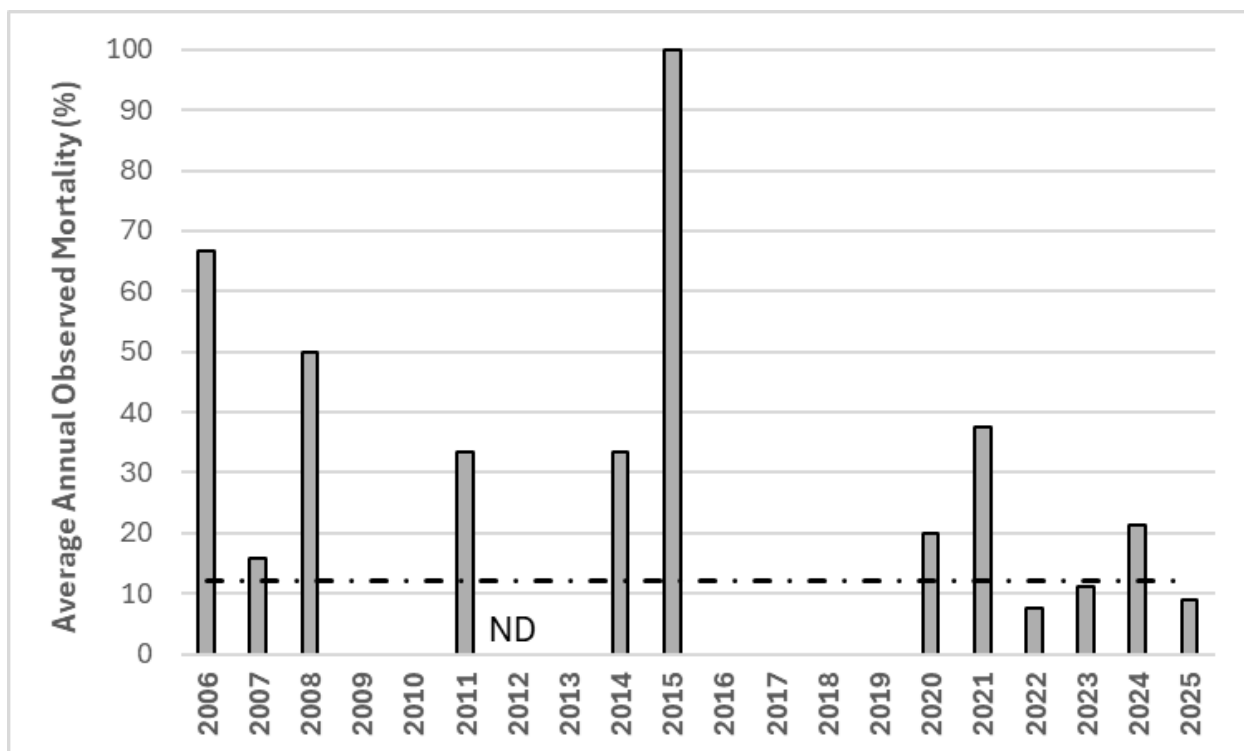


Figure B.01-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 005 (Big Annemessex River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. ND = No Data.

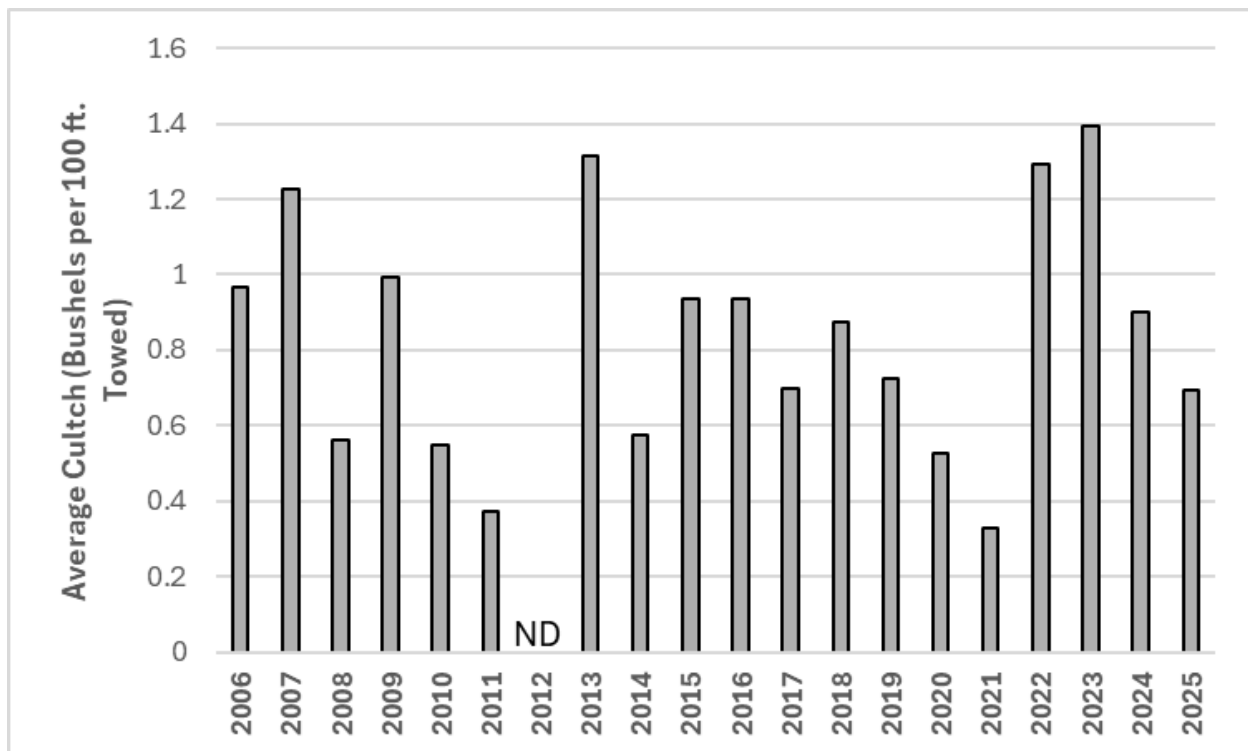


Figure B.01-6. Average cultch (live and dead oysters and loose shell) in NOAA Code 005 (Big Annemessex River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. ND = No Data.

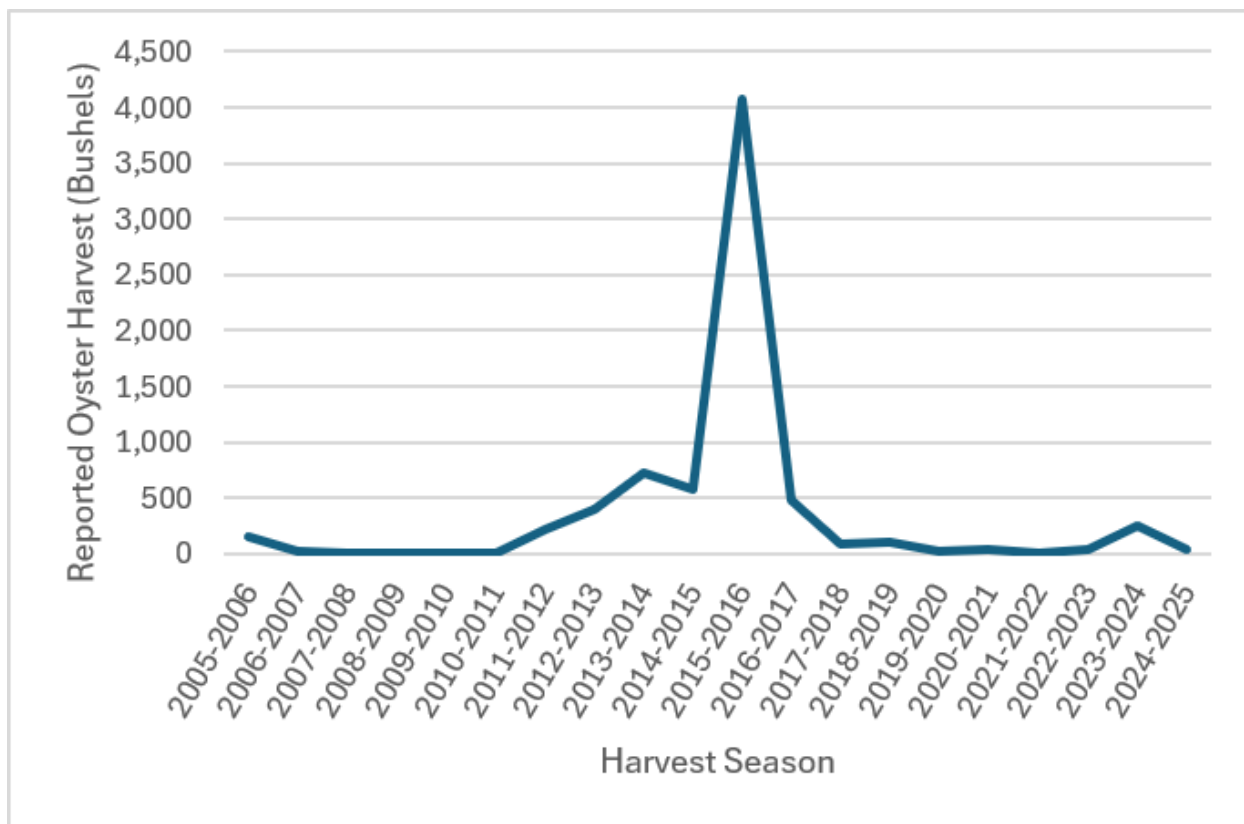


Figure B.01-7. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-06 to 2024-2025) in NOAA Code 005 (Big Annemessex River). Since 2010, 10% of the NOAA Code area has been designated as a sanctuary.

Section B.02: NOAA Code 025 – Chesapeake Bay Upper

NOAA Code 025 is located in Maryland's upper portion of Chesapeake Bay, north of the Chesapeake Bay Bridge. The entire NOAA Code is 163,540 acres and has 40 historic oyster bars¹³. The Lower Chester River, Man-O-War/Gales Lump, and Fort Carroll sanctuaries encompass 10% (16,730 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 146,810 surface acres. There are 19,300 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There were 15,465 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.02-1)
- Summary statistics (Table B.02-1)
- Density per year (Figure B.02-2)
- Shell height frequencies (Figure B.02-3)
- Biomass per year (Figure B.02-4)
- Observed mortality (Figure B.02-5)
- Dermo and MSX per year (Figure B.02-6)
- Cultch per year (Figure B.02-7)
- Harvest (Figure B.02-8)

Live density and market density increased slightly during 2021-2025, while small density declined slightly. The increase in spat density was likely due to samples taken on plantings. Average shell height of oysters has decreased, while the proportion of smaller oysters has increased, likely due to wild and hatchery seed plantings. Biomass peaked in 2008 but slightly increased during 2021-2025. The average amount of cultch was similar across the time series.

Mortality was over 50% in 2011 due to a spring freshet, a hurricane, and a tropical storm. Mortality was also high in 2018 and 2019 due to a prolonged freshet but has generally remained below the long-term average. No MSX has been detected, and dermo prevalence and intensity remained low throughout the time series. Cultch was below 1 bushel per 100 feet towed throughout most of the time series.

To boost the commercial public fishery in this NOAA Code area outside the current sanctuary, roughly 700 million hatchery spat-on-shell and 187,000 bushels of wild seed were deposited between 2006 and 2025. This included 188 million hatchery spat-on-shell added between 2021 and 2025, during which time no wild seed was planted.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years in the 20-year time series, including past harvest data from areas that are now in the sanctuary. Following the sanctuary's establishment in 2010, 10% of the area was closed to harvest. Harvest was highest in the beginning of the time series but has been

¹³ See charts 4, 5, 6, and 7 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

less than 8,000 bushels/year since the 2008-2009 season. Other than the Swan Point Power Dredge Study Area, patent tong was the primary gear type during 2021-2025.

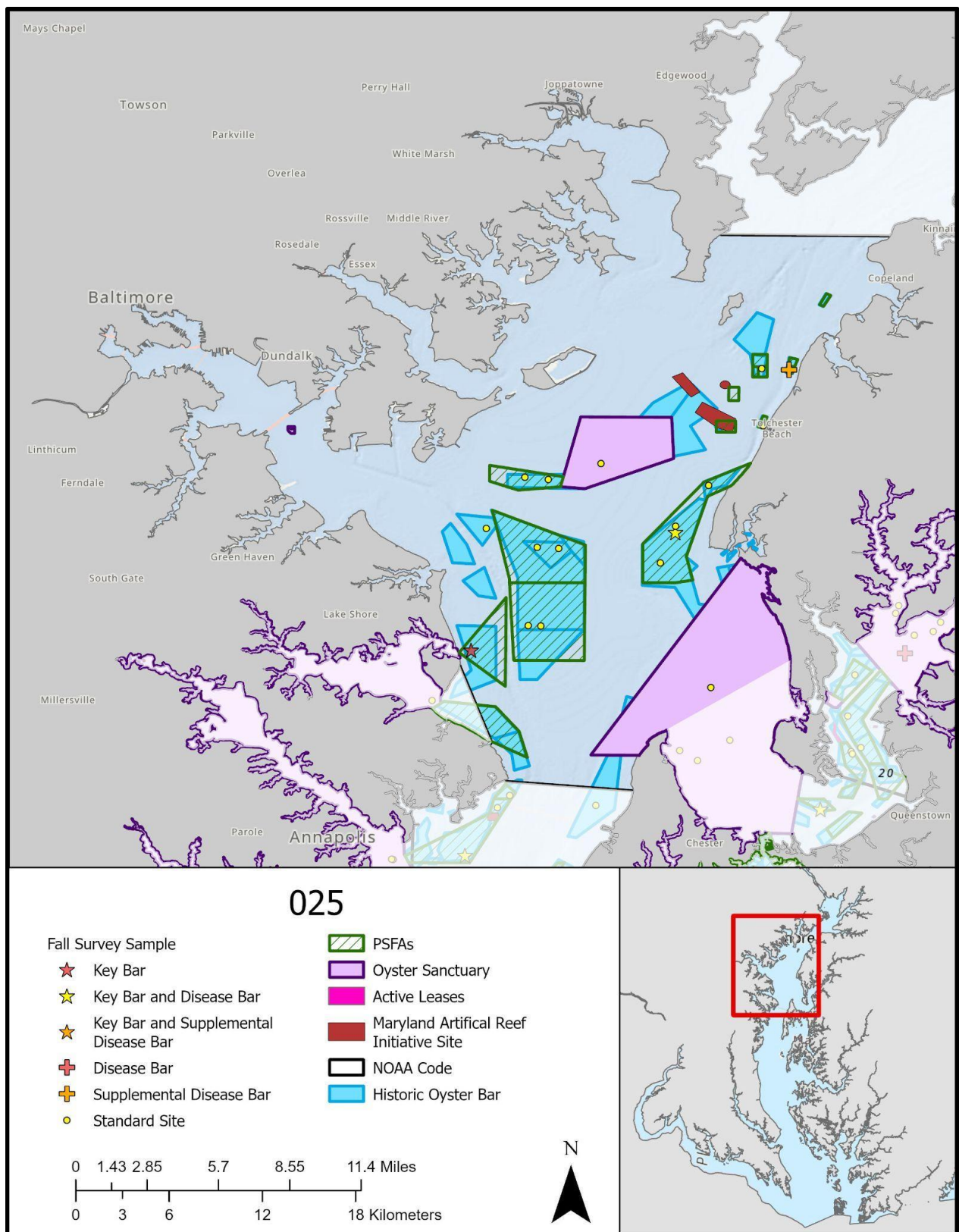


Figure B.02-1. Map of NOAA Code 025 (Chesapeake Bay Upper). Fall Oyster Survey sites may not be sampled every year.

Table B.02-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 025 (Chesapeake Bay Upper) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/102	5/77	5/83	5/71
Number of Live Spat Oysters per square meter	2.3 $\pm$ 1.9	33 $\pm$ 33*	5.1 $\pm$ 2.7*	13.6 $\pm$ 5.2*
Number of Live Small Oysters per square meter	9.5 $\pm$ 1.7	10.3 $\pm$ 5	20.3 $\pm$ 11.3	17.2 $\pm$ 5.9
Number of Live Market Oysters per square meter	15.1 $\pm$ 1.4	14.4 $\pm$ 0.9	7.5 $\pm$ 1.6	9.4 $\pm$ 1.7
Number of Live Oysters per square meter	27 $\pm$ 3	48 $\pm$ 30.3	33 $\pm$ 11.6	40.2 $\pm$ 9.6
Live Biomass (g Dry Weight per Bushel)	88.3 $\pm$ 16.5	47 $\pm$ 12	56 $\pm$ 8.3	61.8 $\pm$ 9.7
Observed Mortality (%)	6 $\pm$ 1.2	24 $\pm$ 3.7	18.3 $\pm$ 3.3	3.6 $\pm$ 0.9
Cultch (Bushels per 100 feet towed)	0.6 $\pm$ 0.04	0.6 $\pm$ 0.1	0.5 $\pm$ 0.04	0.8 $\pm$ 0.1
Harvest (Bushels)	10,044	1,700	2,388	2,950

*Includes hatchery spat-on-shell plantings.

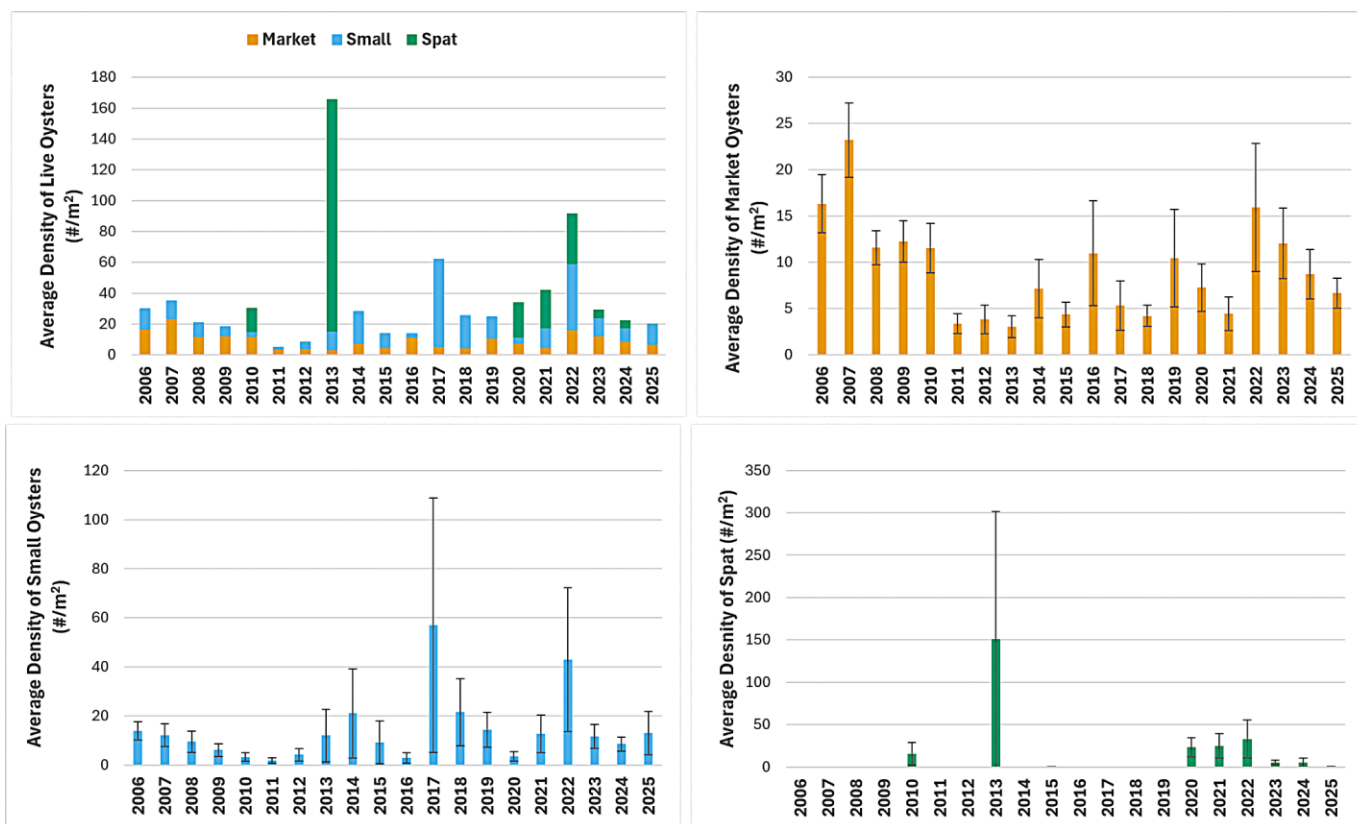


Figure B.02-2A. Average number of live oysters per square meter by size class in NOAA Code 025 (Chesapeake Bay Upper) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

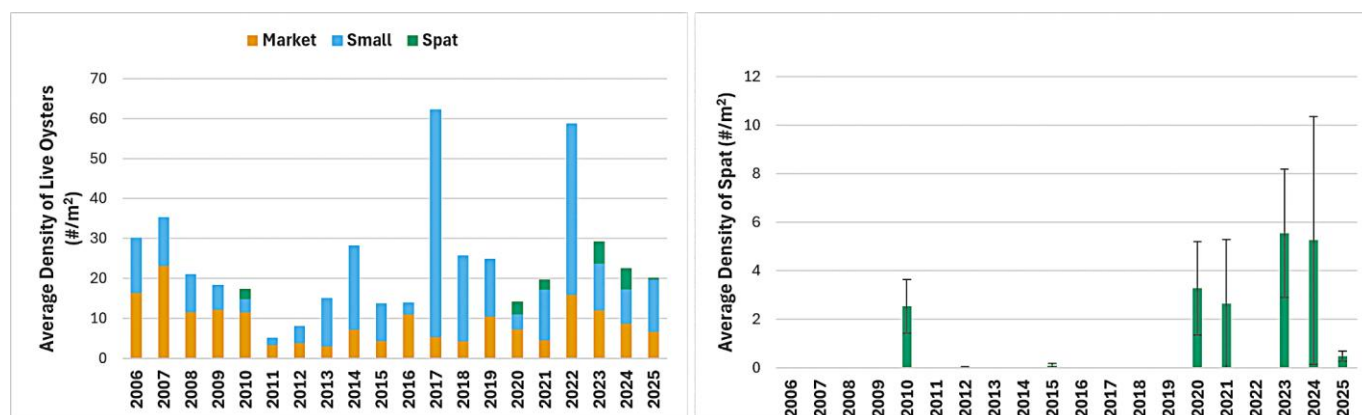


Figure B.02-2B. Average number of live oysters per square meter by size class in NOAA Code 025 (Chesapeake Bay Upper) occurring outside of the current sanctuary area excluding hatchery seed plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Chesapeake Bay Upper (025)

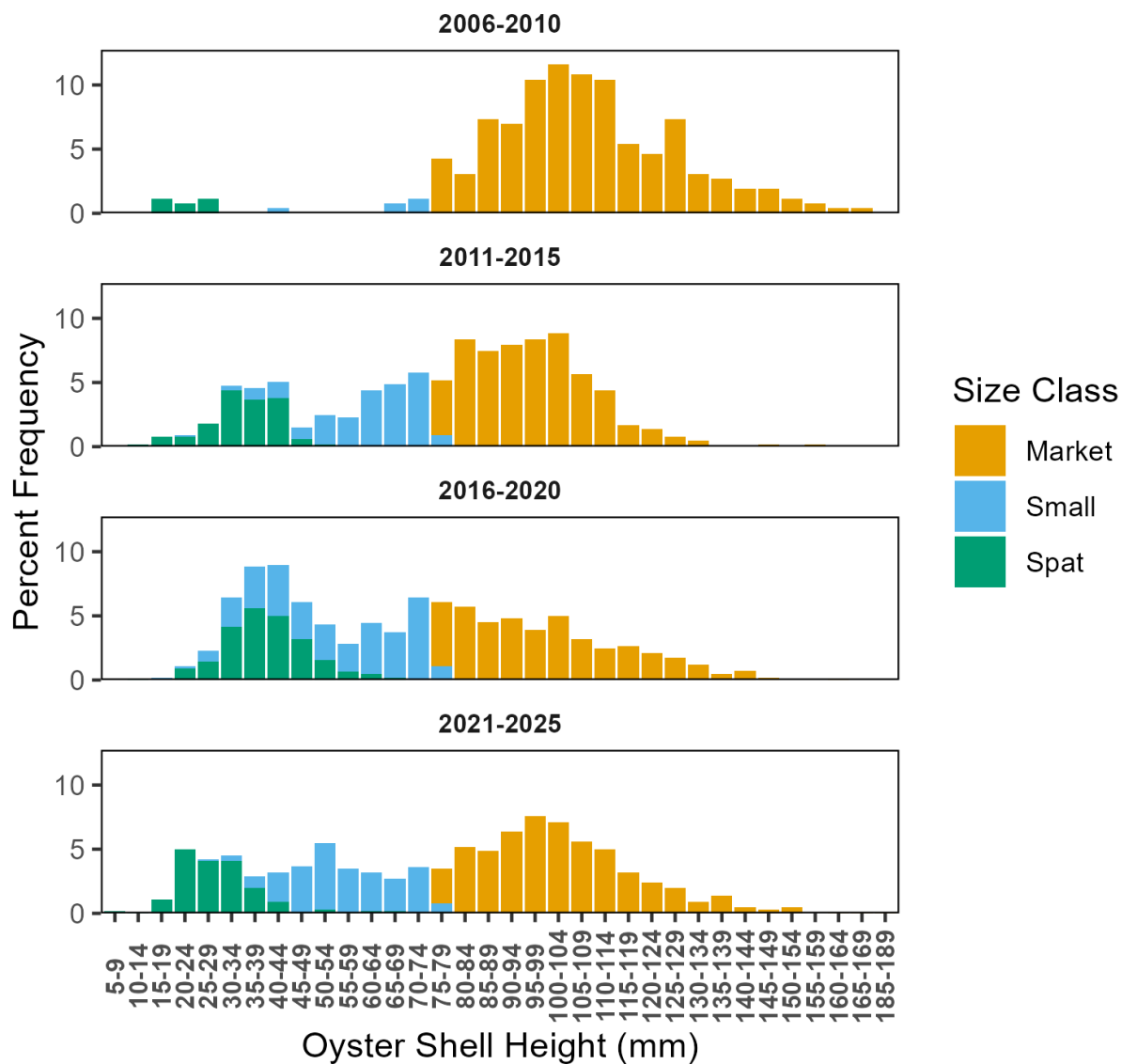


Figure B.02-3. Shell height frequencies of live oysters in NOAA Code 025 (Chesapeake Bay Upper) outside of the current sanctuary area.

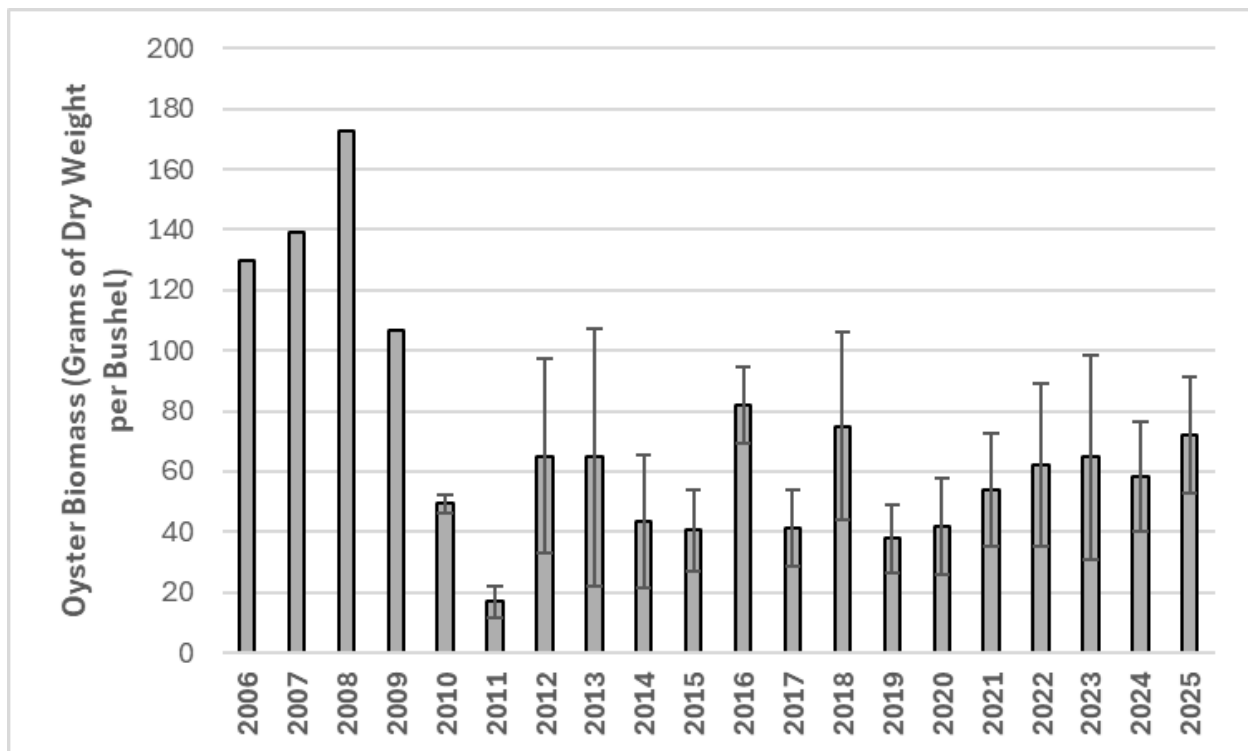


Figure B.02-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 025 (Chesapeake Bay Upper) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

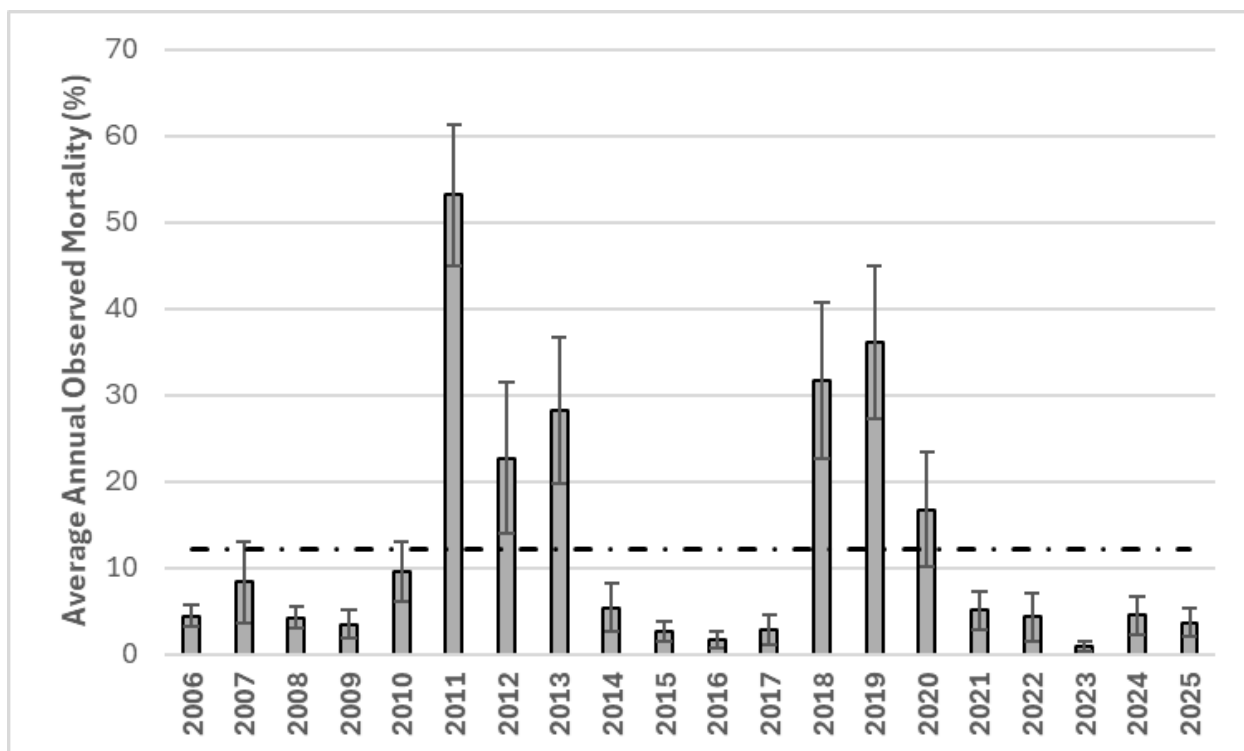


Figure B.02-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 025 (Chesapeake Bay Upper) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

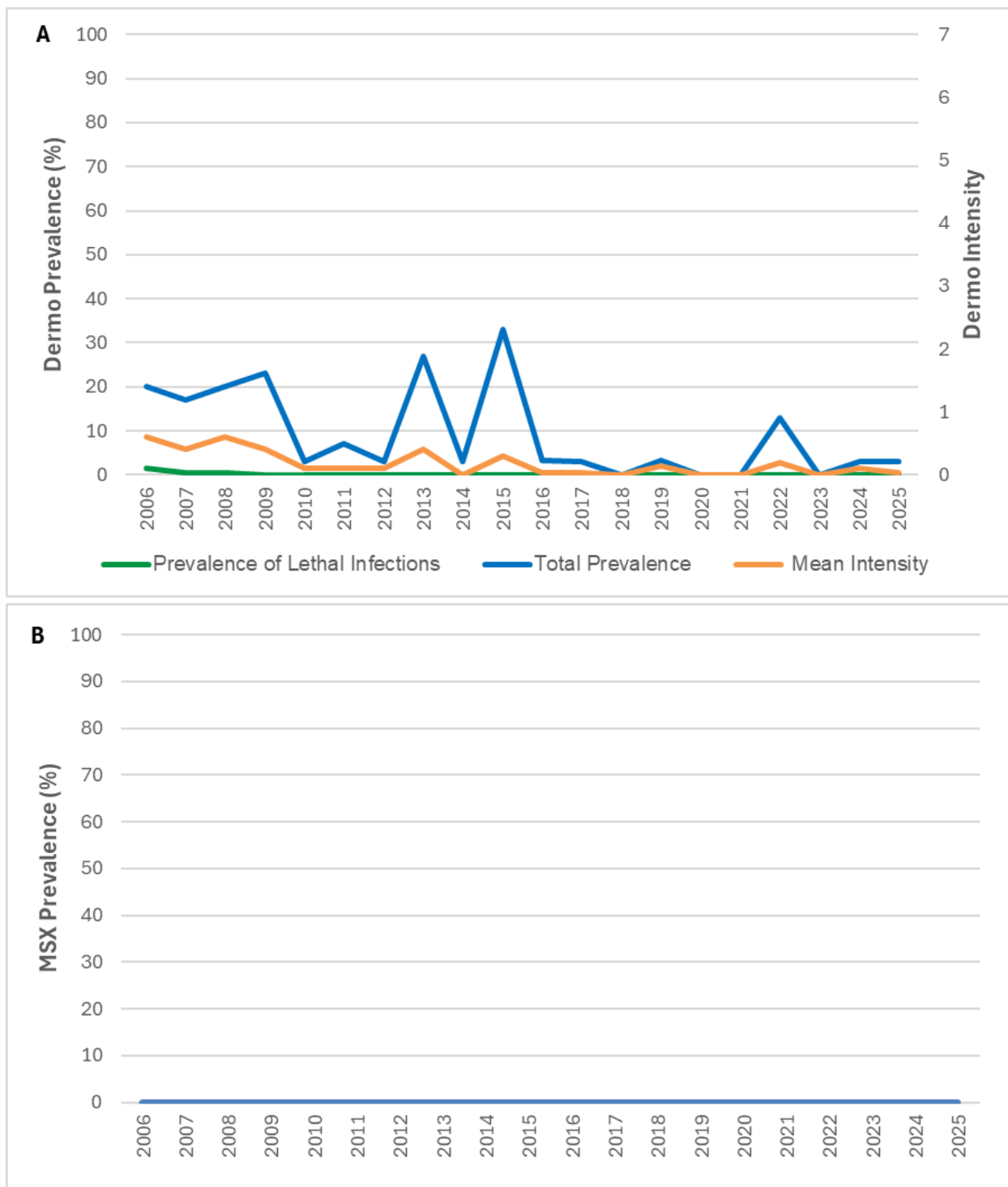


Figure B.02-6. Oyster disease prevalence and intensity in NOAA Code 025 (Chesapeake Bay Upper) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Swan Point bar.

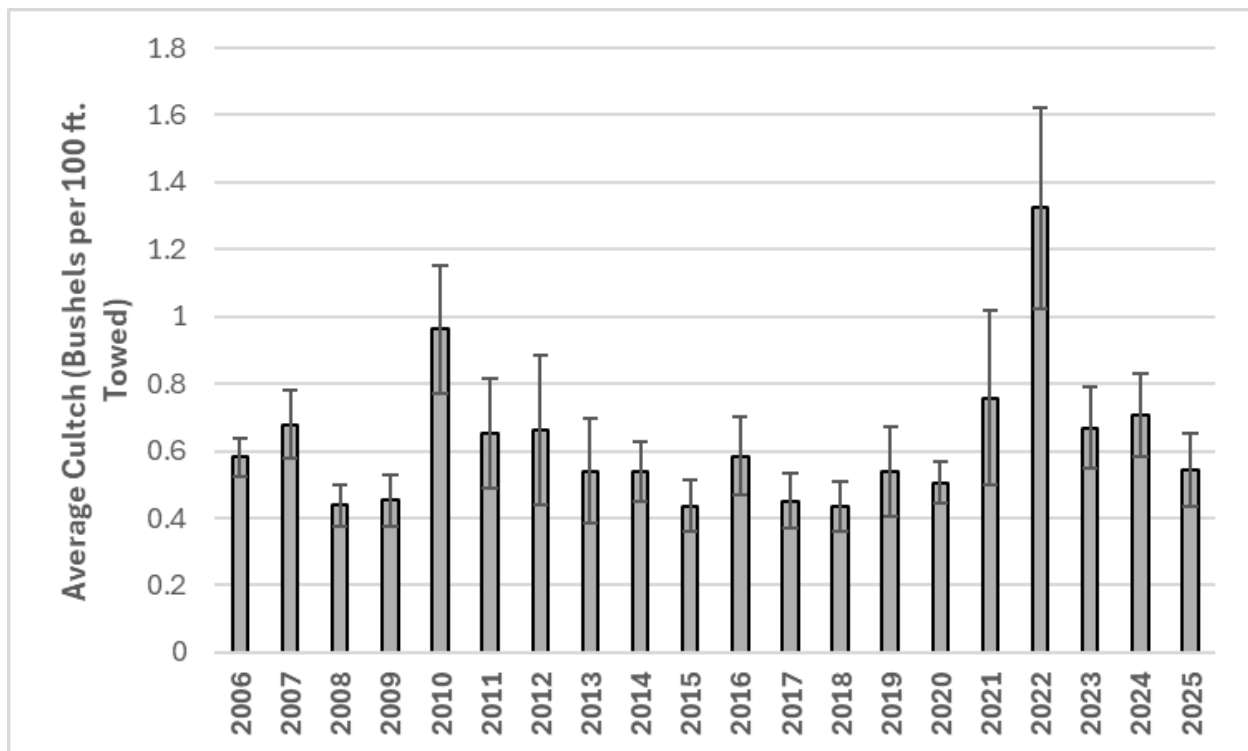


Figure B.02-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 025 (Chesapeake Bay Upper) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

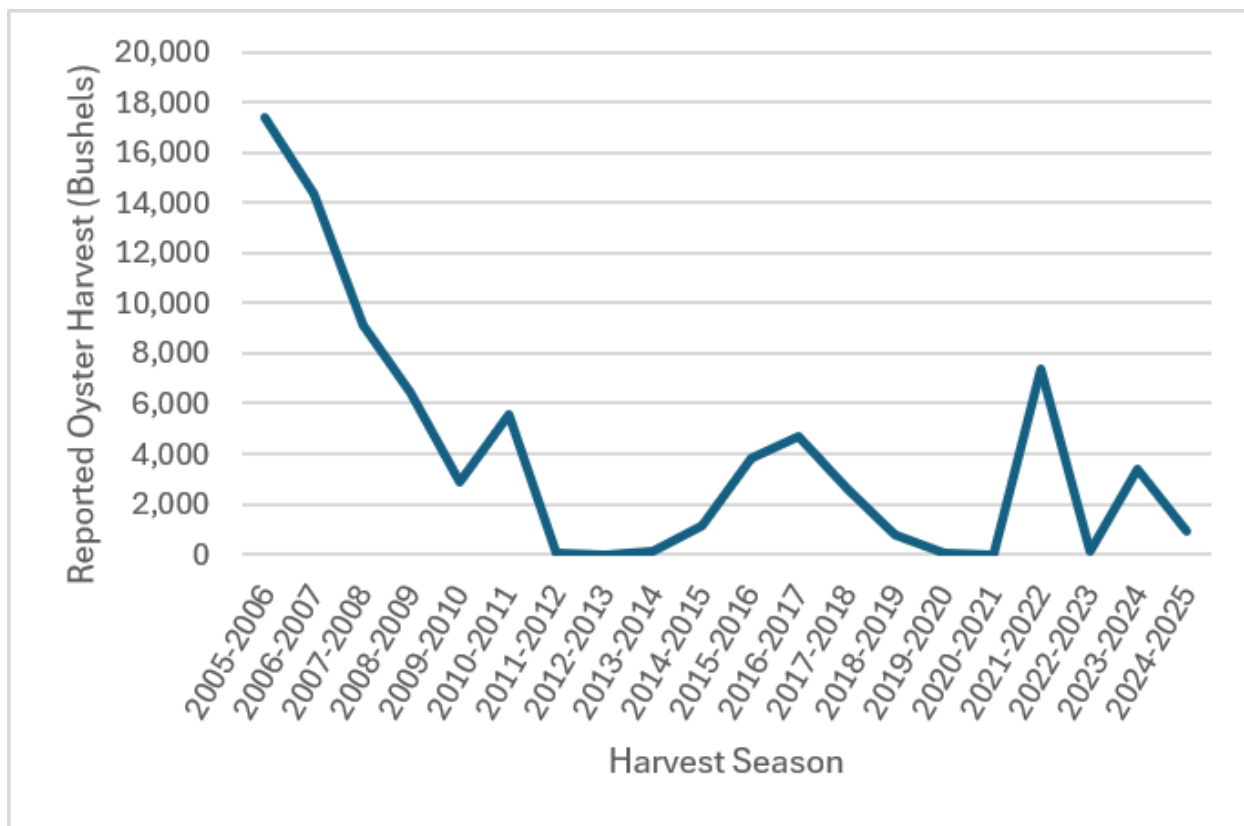


Figure B.02-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 025 (Chesapeake Bay Upper). Since 2010, 10% of the NOAA Code area has been designated as a sanctuary.

Section B.03: NOAA Code 027 – Chesapeake Bay Lower Middle

NOAA Code 027 is located in Maryland's middle portion of Chesapeake Bay, north of Cove Point. The entire NOAA Code is 185,403 acres and has 50 historic oyster bars¹⁴. Multiple sanctuaries (Plum Point, Poplar Island, Tilghman Island, Calvert Shore, and Herring Bay) encompass 12% (22,836 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the sanctuary areas. This equates to 162,567 surface acres. There are 21,939 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuaries. There are 8,421 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.03-1)
- Summary statistics (Table B.03-1)
- Density per year (Figure B.03-2)
- Shell height frequencies (Figure B.03-3)
- Biomass per year (Figure B.03-4)
- Observed mortality (Figure B.03-5)
- Dermo and MSX per year (Figure B.03-6)
- Cultch per year (Figure B.03-7)
- Harvest (Figure B.03-8)

Total live density saw a significant increase during 2021-2025, driven largely by a sharp increase in spat density. The increase in spat was the result of hatchery spat-on-shell plantings in 2024 and a very good natural spat set in 2025 on Stone, Poplar Island and Punch Island Creek bars.

Live biomass trended upward and observed mortality remained generally below the long-term average, with higher-than-average mortality in 2023 and 2024. Dermo intensity and prevalence fell until 2021, when it increased again, before declining in 2025. MSX prevalence also increased in 2023. Average cultch remained low.

To support the commercial public fishery within this NOAA Code's non-sanctuary area, roughly 22,000 bushels of shell, 19,000 bushels of wild seed, and 100 million hatchery spat-on-shell were planted between 2006 and 2025. Of the hatchery spat-on-shell, 71 million were planted between 2021 and 2025, during which time no shell or wild seed plantings occurred.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the 20-year time series, including past harvest data from areas now in the sanctuary. Following the sanctuary's establishment in 2010, 12% of the area was closed to harvest. Skipjack and diving were the primary gear types during 2021-2025. This area is characterized by low but stable abundance along with an apparent increase in

¹⁴ See chart 13, 14, 17, 23, and 24 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

density driven primarily by recent spat sets. Harvest was generally low with peaks during the 2006-2007 and 2015-2016 season and has declined, on average, over time.

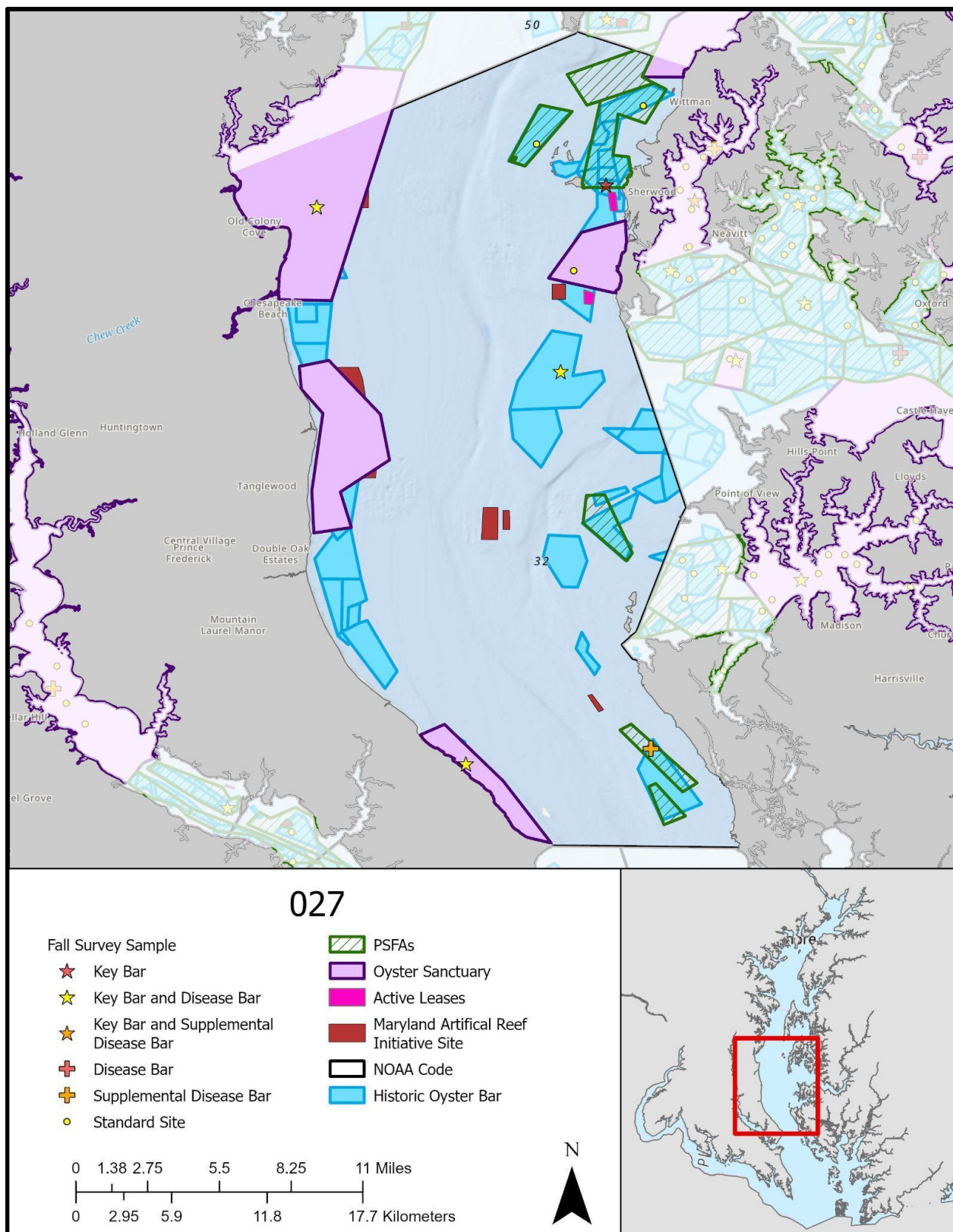


Figure B.03-1. Map of NOAA Code 027 (Chesapeake Bay Lower Middle). Fall Oyster Survey sites may not be sampled every year.

Table B.03-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 027 (Chesapeake Bay Lower Middle) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/37	5/30	5/29	5/28
Number of Live Spat Oysters per square meter	3.2 $\pm$ 1.5	1 $\pm$ 0.6	9.1 $\pm$ 6.4	41 $\pm$ 23
Number of Live Small Oysters per square meter	6.9 $\pm$ 2	6.7 $\pm$ 2.1	2.9 $\pm$ 1.2	11 $\pm$ 4.2
Number of Live Market Oysters per square meter	3.9 $\pm$ 0.7	7.5 $\pm$ 1.7	3.6 $\pm$ 0.5	8.7 $\pm$ 1.7
Number of Live Oysters per square meter	14 $\pm$ 3	15.1 $\pm$ 3.8	15.7 $\pm$ 6.5	61.3 $\pm$ 25
Live Biomass (g Dry Weight per Bushel)	75 $\pm$ 11.3	162 $\pm$ 32	149 $\pm$ 21.3	219.4 $\pm$ 26.4
Observed Mortality (%)	11.7 $\pm$ 1.7	6 $\pm$ 1.5	11.8 $\pm$ 1.8	11.9 $\pm$ 2.1
Cultch (Bushels per 100 feet towed)	0.2 $\pm$ 0.03	0.2 $\pm$ 0.02	0.12 $\pm$ 0.02	0.3 $\pm$ 0.05
Harvest (Bushels)	5,800	3,478	5,370	2,230

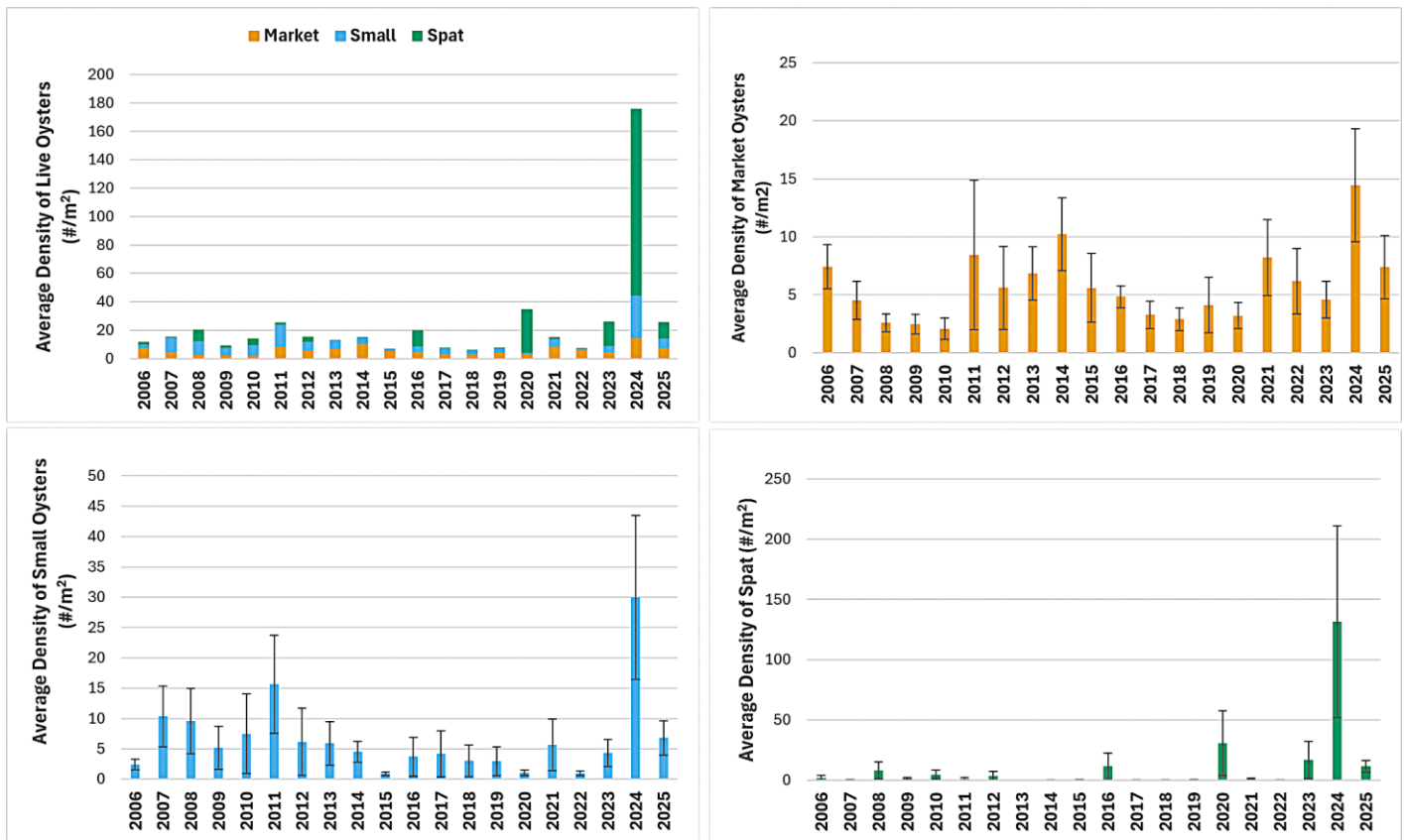


Figure B.03-2A. Average number of live oysters per square meter by size class in NOAA Code 027 (Chesapeake Bay Lower Middle) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

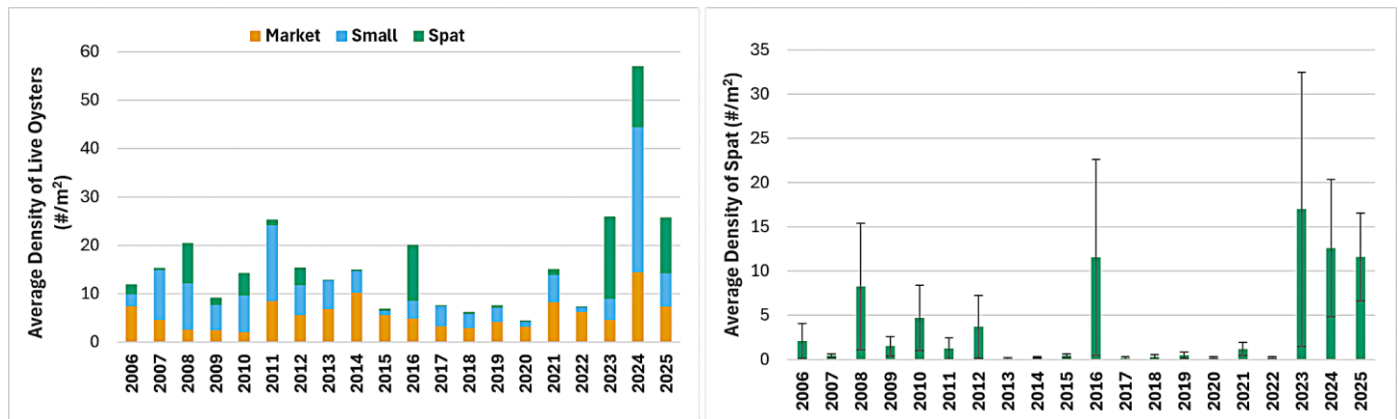


Figure B.03-3B. Average number of live oysters per square meter by size class in NOAA Code 027 (Chesapeake Bay Lower Middle) occurring outside of the current sanctuary area excluding samples taken in areas where spat planting occurred. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Chesapeake Bay Lower Middle (027)

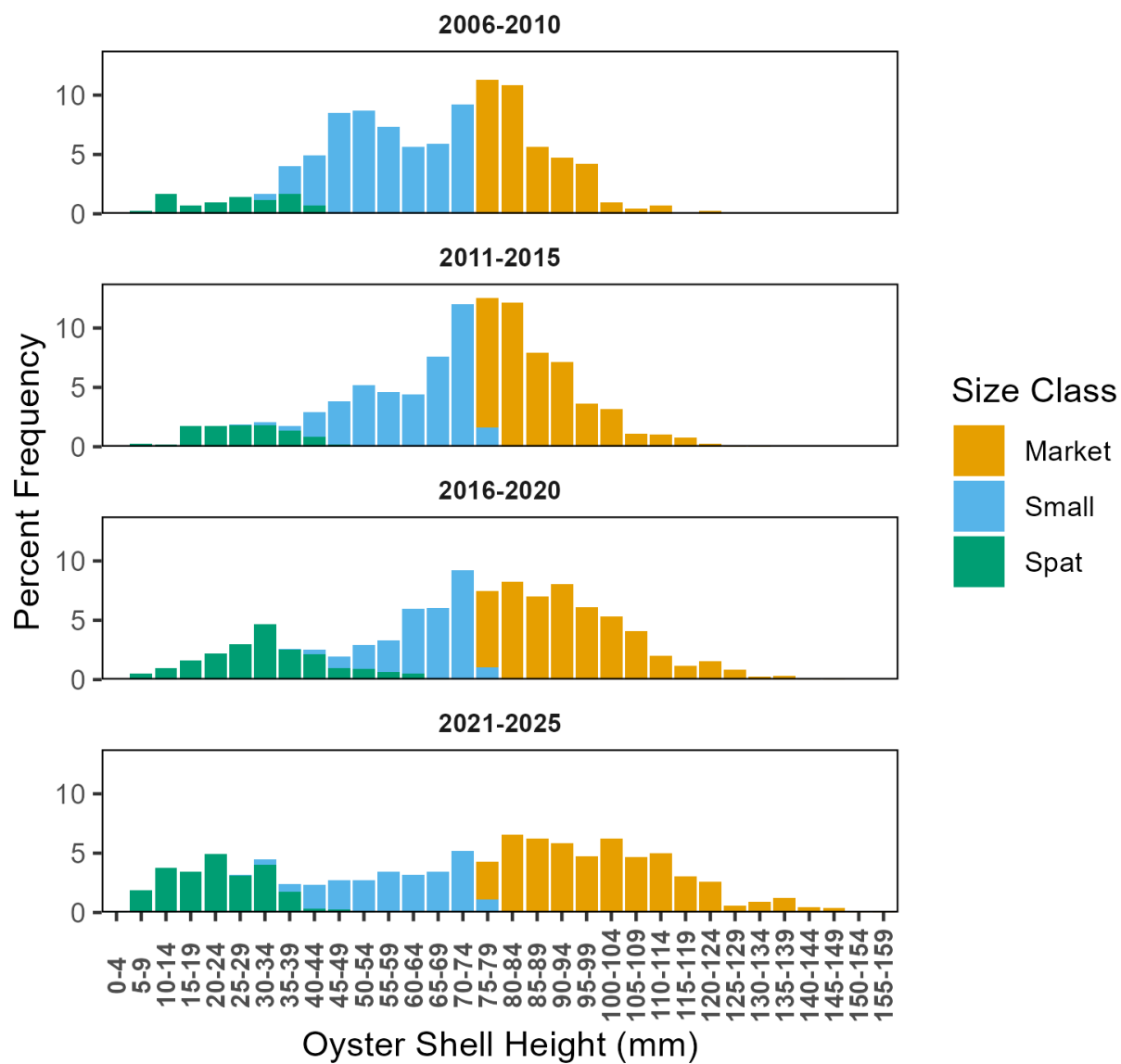


Figure B.03-4. Shell height frequencies of live oysters in NOAA Code 027 (Chesapeake Bay Lower Middle) outside of the current sanctuary area.

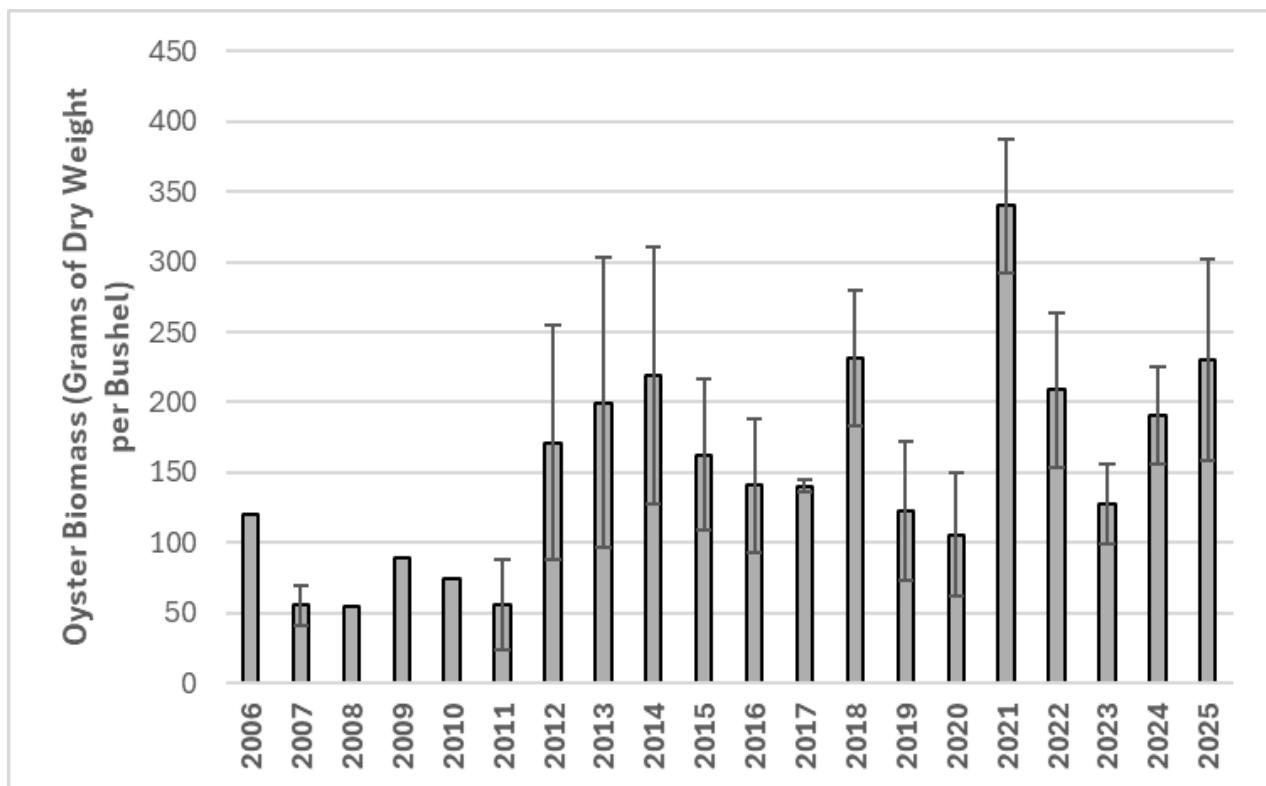


Figure B.03-5. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 027 (Chesapeake Bay Lower Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

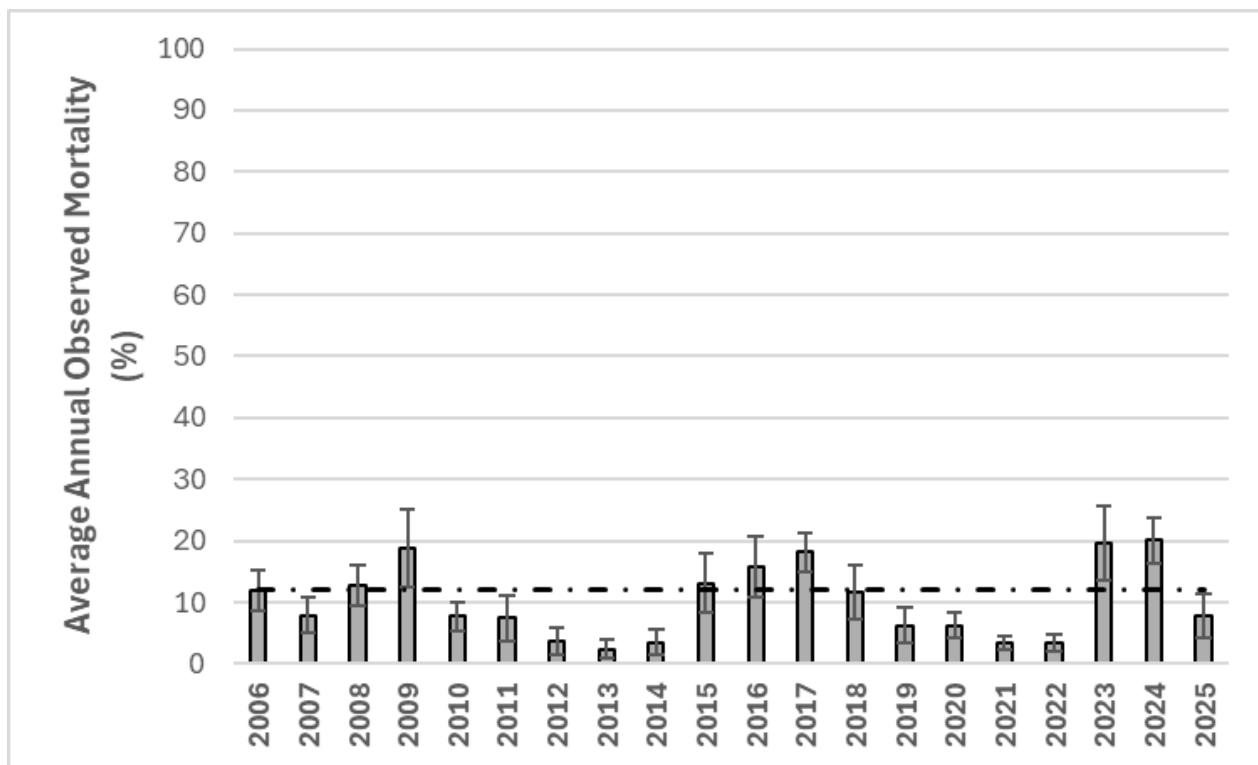


Figure B.03-6. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 027 (Chesapeake Bay Lower Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

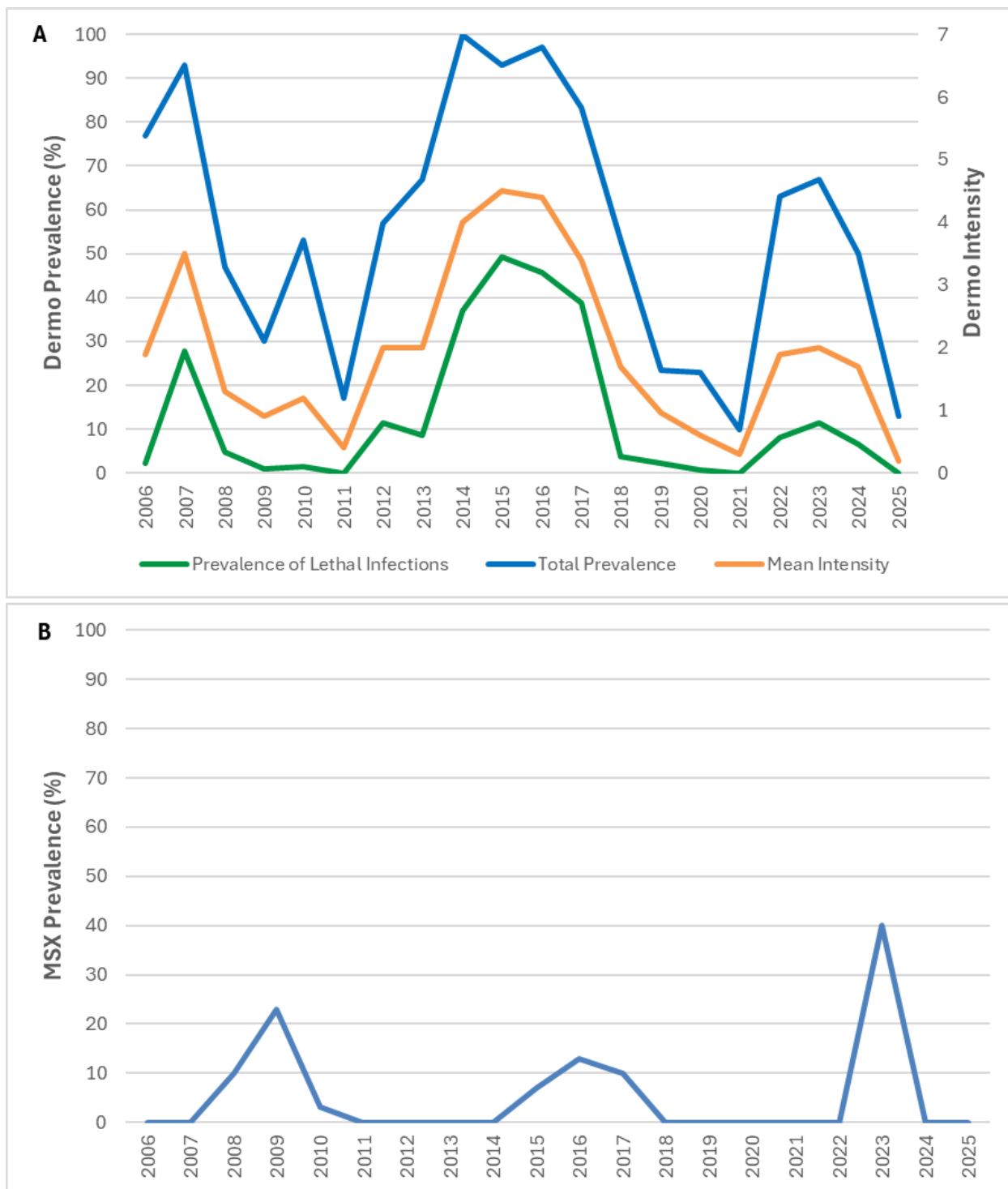


Figure B.03-7. Oyster disease prevalence and intensity in NOAA Code 027 (Chesapeake Bay Lower Middle) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Stone bar.

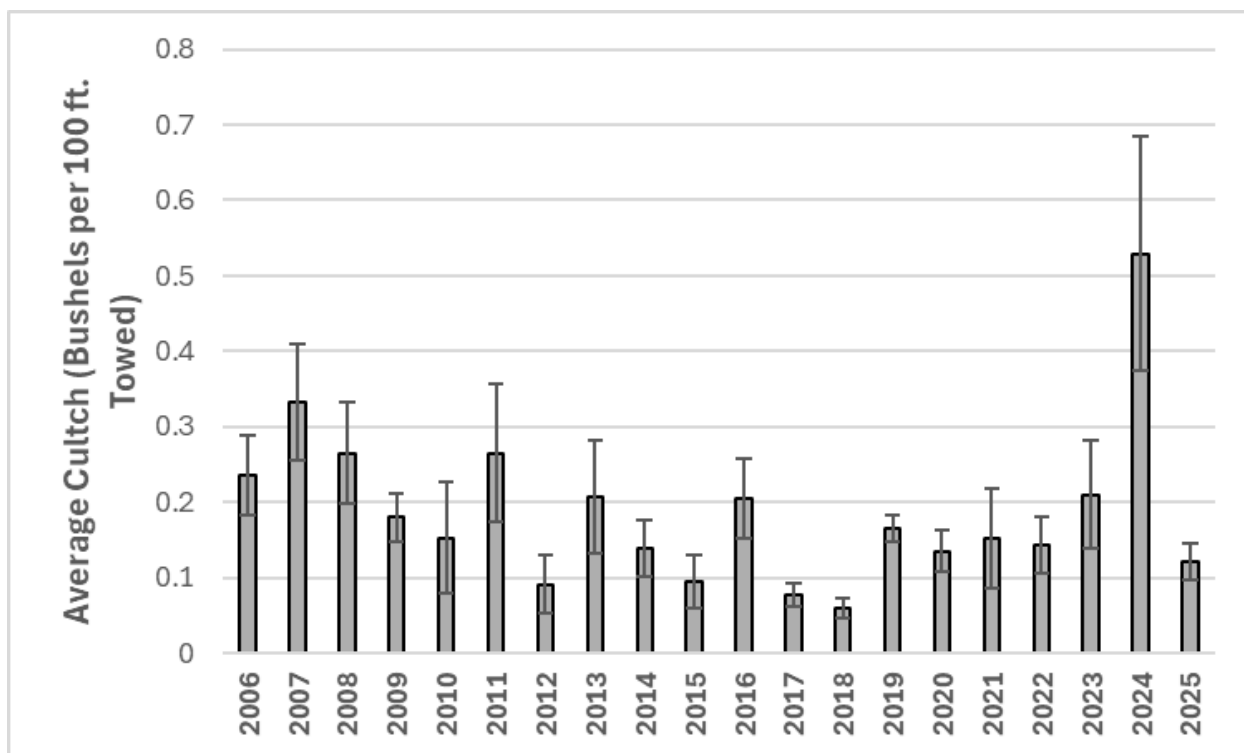


Figure B.03-8. Average cultch (live and dead oysters and loose shell) in NOAA Code 027 (Chesapeake Bay Lower Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

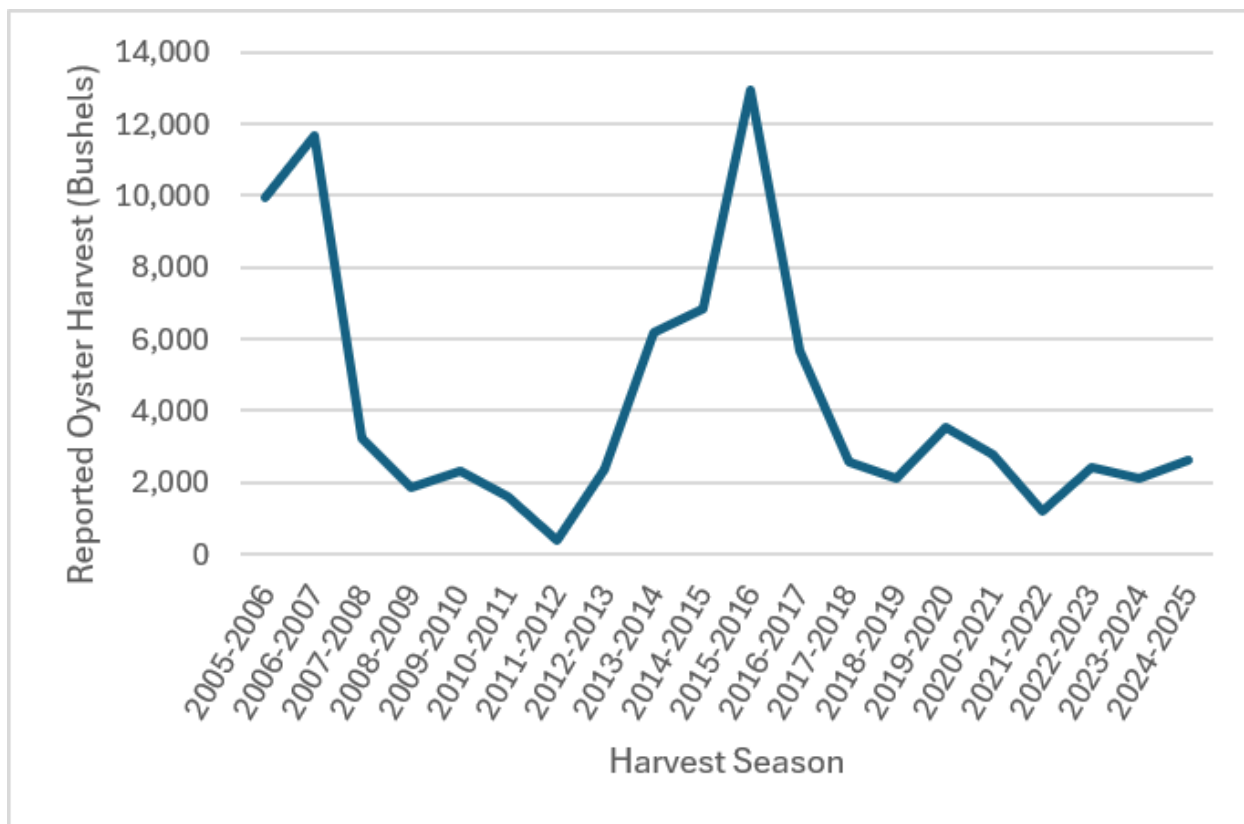


Figure B.03-9. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 027 (Chesapeake Bay Lower Middle). Since 2010, 12% of the NOAA Code area has been designated as a sanctuary.

Section B.04: NOAA Code 039 – Eastern Bay

NOAA Code 039 encompasses Eastern Bay and is located in Maryland's middle eastern portion of Chesapeake Bay. The entire NOAA Code is 33,019 acres and has 66 historic oyster bars¹⁵. Five sanctuaries (Cox Creek, Eastern Bay, Prospect Bay, Mill Hill, and Cabin Creek) encompass 25% (8,253 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 24,766 surface acres. There are 12,269 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and not within a sanctuary. In 2010, there were 17,179 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. Since 2010, 12.8 PSFA acres have been declassified with 8 acres being declassified since 2020. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Beginning in 2024, in accordance with Senate Bill 830, the Maryland General Assembly allocated \$2,000,000 annually for oyster enhancement for fiscal years 2024 through 2026, split equally between sanctuaries and fishery bars (\$1,000,000 each). Funding provided after fiscal year 2026 is contingent upon a mandatory effectiveness evaluation.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.04-1)
- Summary statistics (Table B.04-1)
- Density per year (Figure B.04-2)
- Shell height frequencies (Figure B.04-3)
- Biomass per year (Figure B.04-4)
- Observed mortality (Figure B.04-5)
- Dermo and MSX per year (Figure B.04-6)
- Cultch per year (Figure B.04-7)
- Harvest (Figure B.04-8)

Total live oyster density increased notably in the 2021-2025 time period. Density increased for every size class. Some of this increase can be attributed to the addition of hatchery spat and shell over the last five years. Average shell height declined for 2021-2025, likely because of the addition of hatchery spat, while biomass showed a consistent upward trend when compared to previous time periods. Observed mortality was below the long-term average for 2021-2025, a considerable drop from 2006-2010. MSX prevalence remained low throughout the time series, with peaks in 2009, 2016, and 2023. Dermo intensity and prevalence has generally declined from 2007, with a small peak in 2023. The prevalence of lethal infections remained low. Cultch increased substantially during 2021-2025, particularly after 2022.

Between 2006 and 2025, approximately 60,000 bushels of shell, 50,000 bushels of wild seed and 430 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code outside of the current sanctuary area. Of these

¹⁵ See chart 11 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

plantings, 367 million hatchery spat-on-shell, 31,000 bushels of shell and 7,400 bushels of wild seed were added between 2021 and 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the 20-year time series. Following the sanctuary's establishment in 2010, 25% of the area was closed to harvest. Diving was the primary gear type during 2021-2025. This area is characterized by increasing abundance and oyster density as well as harvest since 2022, in part driven by multiple years of intense enhancement activity, good recruitment and low natural mortality.

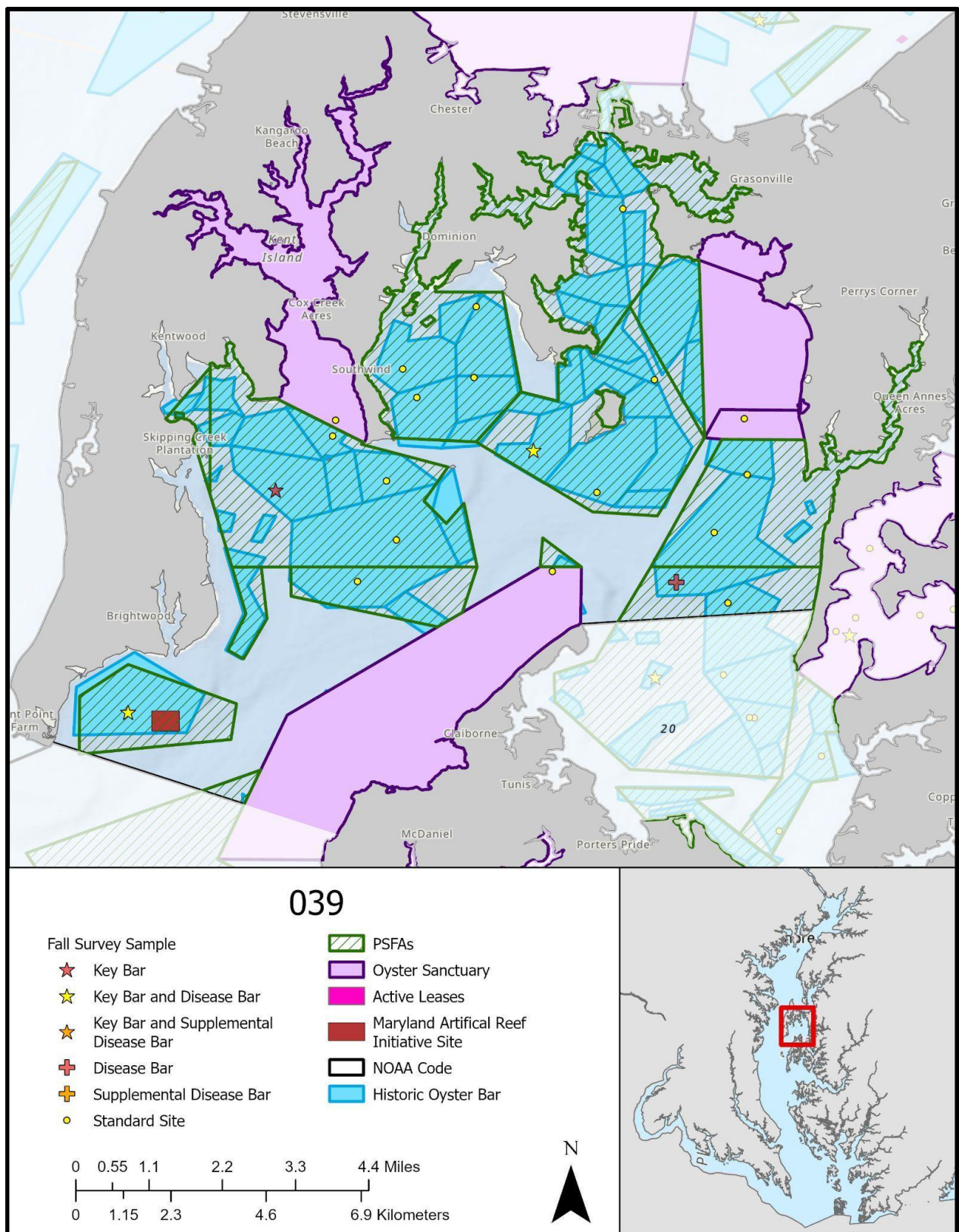


Figure B.04-1. Map of NOAA Code 039 (Eastern Bay). Fall Oyster Survey sites may not be sampled every year.

Table B.04-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 039 (Eastern Bay) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/133	5/113	5/115	5/109
Number of Live Spat Oysters per square meter	1.7 $\pm$ 0.4	1.8 $\pm$ 0.4	2.5 $\pm$ 1.3	28 $\pm$ 5.7
Number of Live Small Oysters per square meter	4.5 $\pm$ 0.8	8.6 $\pm$ 1.2	6.6 $\pm$ 1.4	41.3 $\pm$ 6.1
Number of Live Market Oysters per square meter	8.2 $\pm$ 1	10.8 $\pm$ 1.4	9 $\pm$ 0.9	44.5 $\pm$ 5.2
Number of Live Oysters per square meter	14.3 $\pm$ 1.4	21.2 $\pm$ 2	18.2 $\pm$ 2.3	113.8 $\pm$ 12.5
Live Biomass (g Dry Weight per Bushel)	55.6 $\pm$ 9.4	115.6 $\pm$ 13.7	114 $\pm$ 11	149 $\pm$ 15
Observed Mortality (%)	29 $\pm$ 2	7 $\pm$ 1	11.6 $\pm$ 0.9	7.1 $\pm$ 0.9
Cultch (Bushels per 100 feet towed)	0.6 $\pm$ 0.03	0.6 $\pm$ 0.04	0.3 $\pm$ 0.02	1.1 $\pm$ 0.1
Harvest (Bushels)	20,628	6,803	11,285	10,983

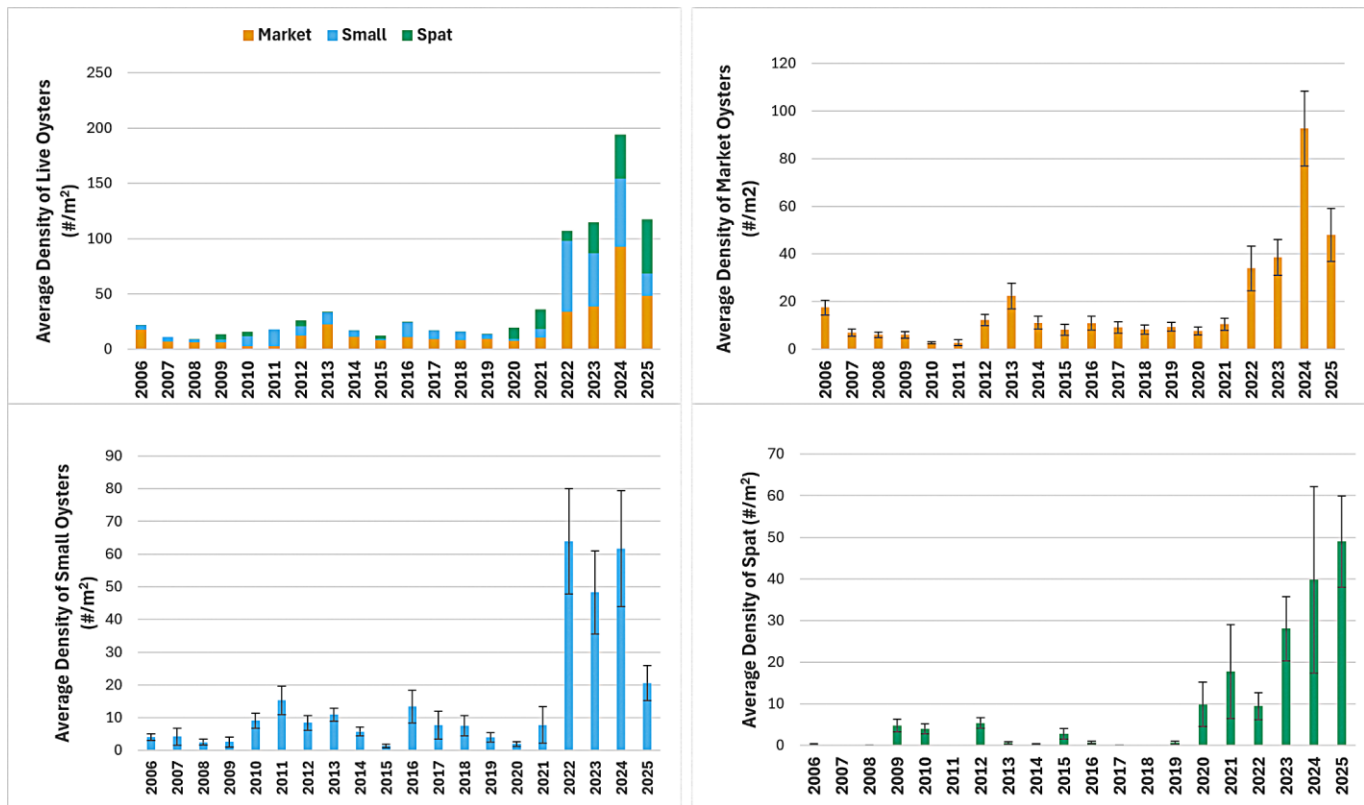


Figure B.04-2. Average number of live oysters per square meter by size class in NOAA Code 039 (Eastern Bay) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Eastern Bay (039)

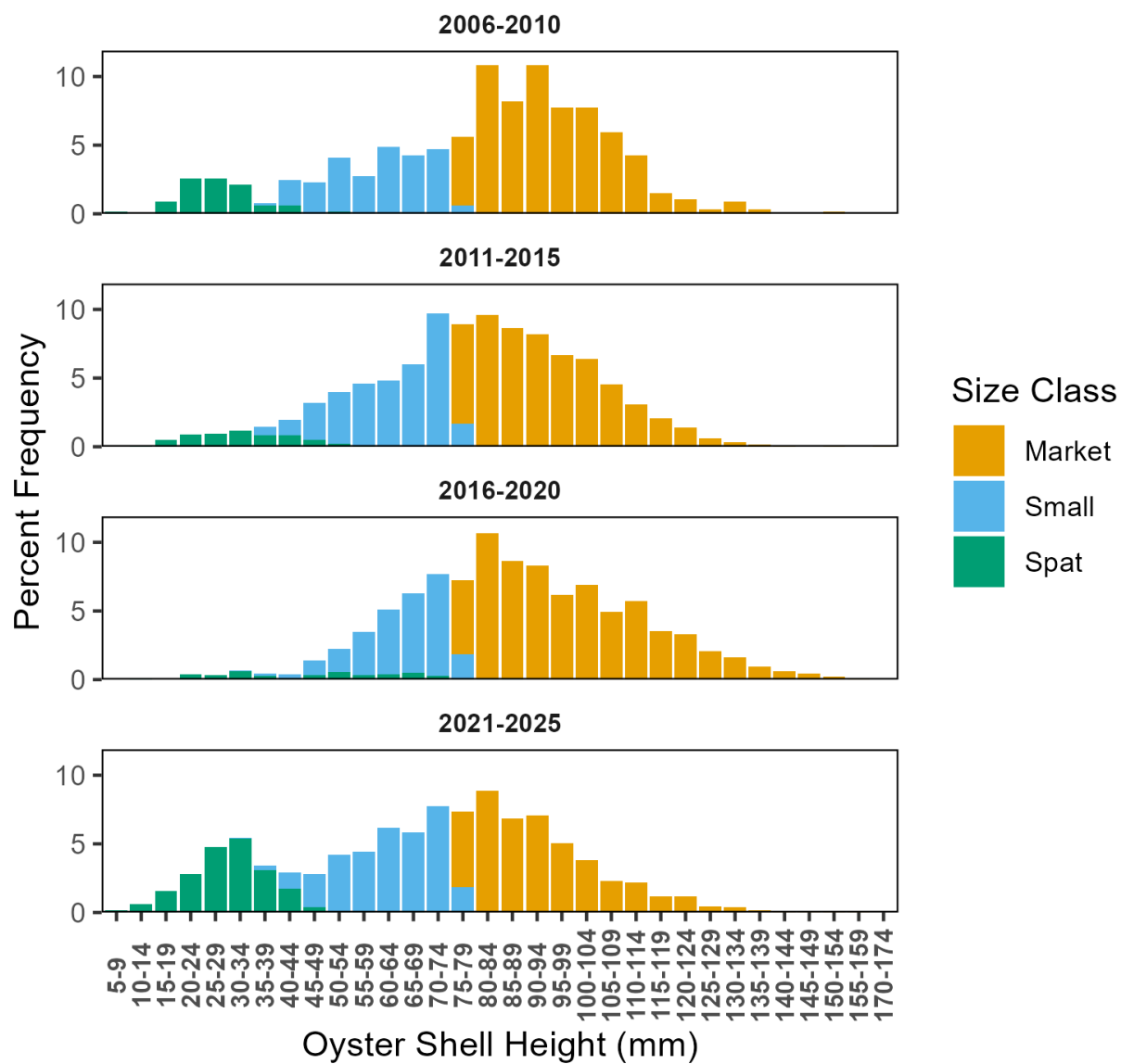


Figure B.04-3. Shell height frequencies of live oysters in NOAA Code 039 (Eastern Bay) outside of the current sanctuary area.

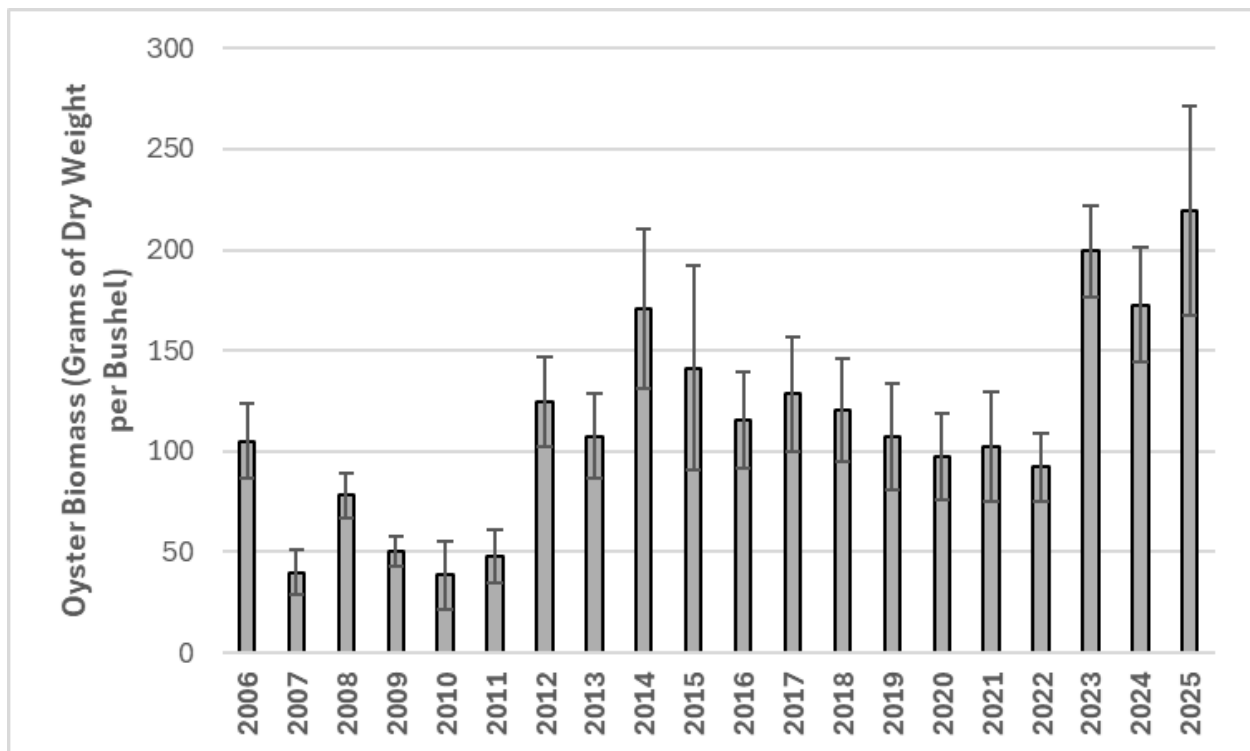


Figure B.04-4. Average oyster biomass (grams of dry weight per bushel of material) in NOAA Code 039 (Eastern Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

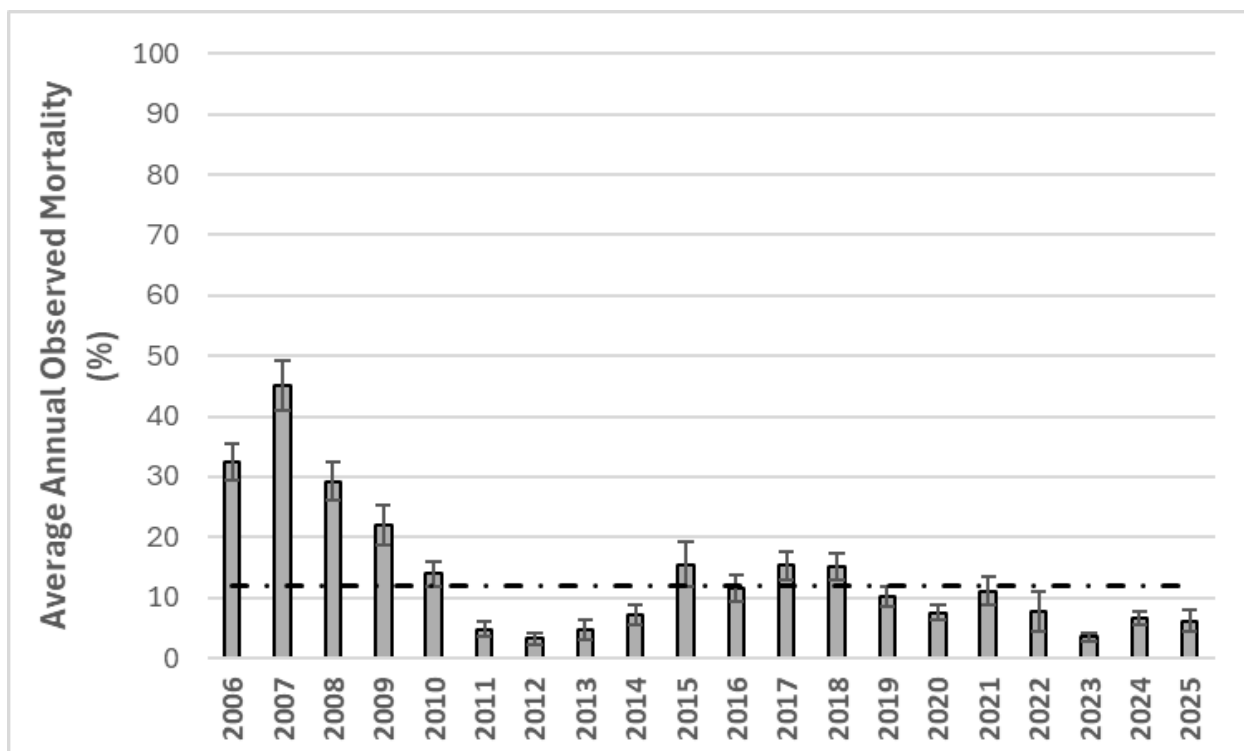


Figure B.04-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 039 (Eastern Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

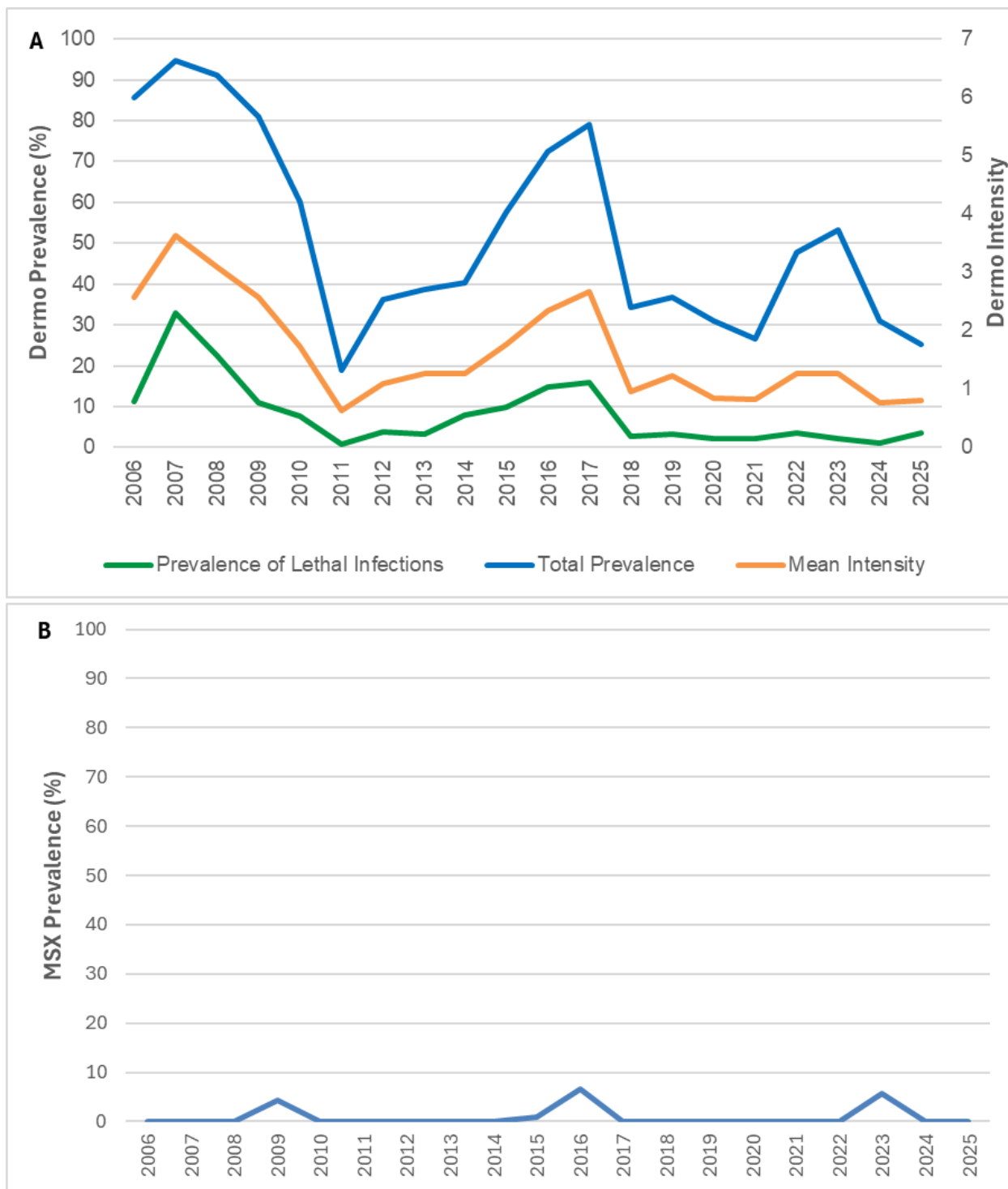


Figure B.04-6. Average oyster disease prevalence and intensity in NOAA Code 039 (Eastern Bay) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Bugby, Parson Island, and Hollicut Noose bars.

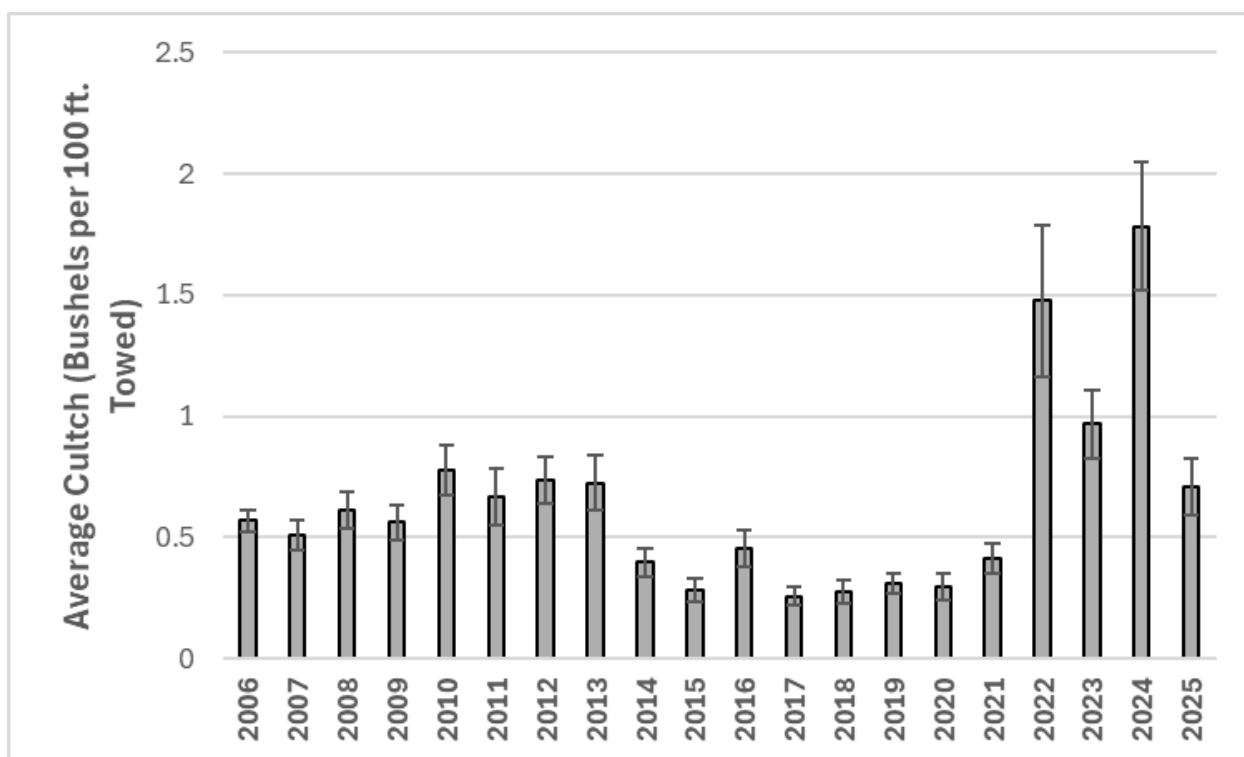


Figure B.04-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 039 (Eastern Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

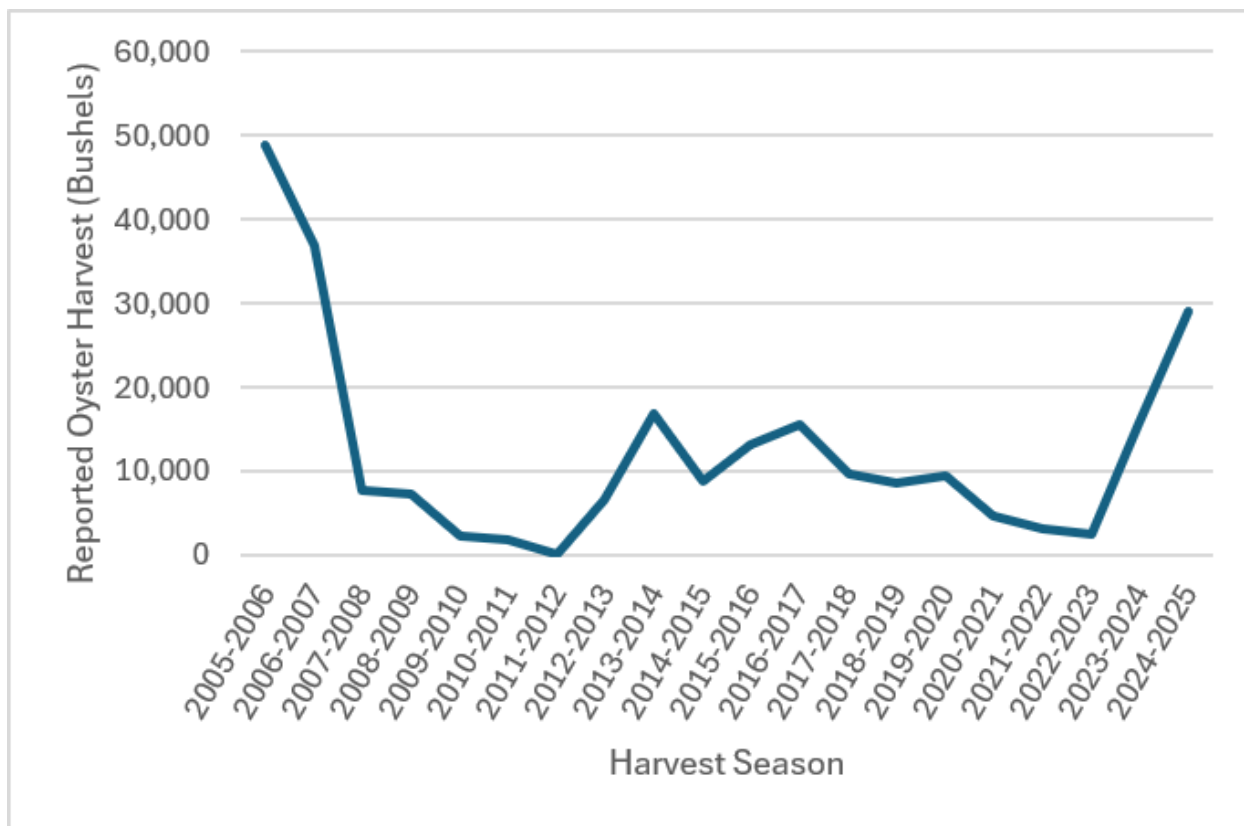


Figure B.04-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 039 (Eastern Bay). Since 2010, 25% of the NOAA Code area has been designated as a sanctuary.

Section B.05: NOAA Code 043 – Fishing Bay

NOAA Code 043 encompasses Fishing Bay and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 20,119 acres and contains 28 historic oyster bars¹⁶. None of the area in the NOAA Code is within an oyster sanctuary. There are 11,820 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code. There are 4,587 acres within the NOAA Code that were designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.05-1)
- Summary statistics (Table B.05-1)
- Density per year (Figure B.05-2)
- Shell height frequencies (Figure B.05-3)
- Biomass per year (Figure B.05-4)
- Observed mortality (Figure B.05-5)
- Dermo and MSX per year (Figure B.05-6)
- Cultch per year (Figure B.05-7)
- Harvest (Figure B.05-8)

Total live oyster density showed significant improvement in the 2021-2025 period, driven by increases in small and market oyster densities, the result of a good natural spat set in 2020. The average shell height was similar across the time series. Live biomass also followed a positive trend, nearly doubling between the 2016-2020 and 2021-2025 intervals. Biomass in 2025 was the highest of the time series. Mortality rates have remained relatively low, generally below the long-term average. There was a spike in mortality in 2023, consistent with an increase in disease prevalence (both Dermo and MSX) and Dermo disease intensity. Average cultch remained stable.

Between 2006 and 2025, approximately 235,000 bushels of shell (including 35,000 bushels of Pacific oyster (*Magallana gigas*) oyster shell), 3,000 bushels of wild seed and 45 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. The majority of the hatchery spat-on-shell (25 million), 102,000 bushels of shell (including all of the Gigas shell) and 1,500 bushels of wild seed were planted between 2021 and 2025.

Power dredging was the primary commercial harvest gear used 2021-2025 in this NOAA code. The five-year average harvest was highest in the 2021-2025 period, driven by a peak in harvest in the 2021-2022 season which has declined slowly to the end of the time period. This area is characterized by increasing oyster density as well as harvest, in part driven by multiple years of enhancement activity, good recruitment and low natural mortality.

¹⁶ See chart 30 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

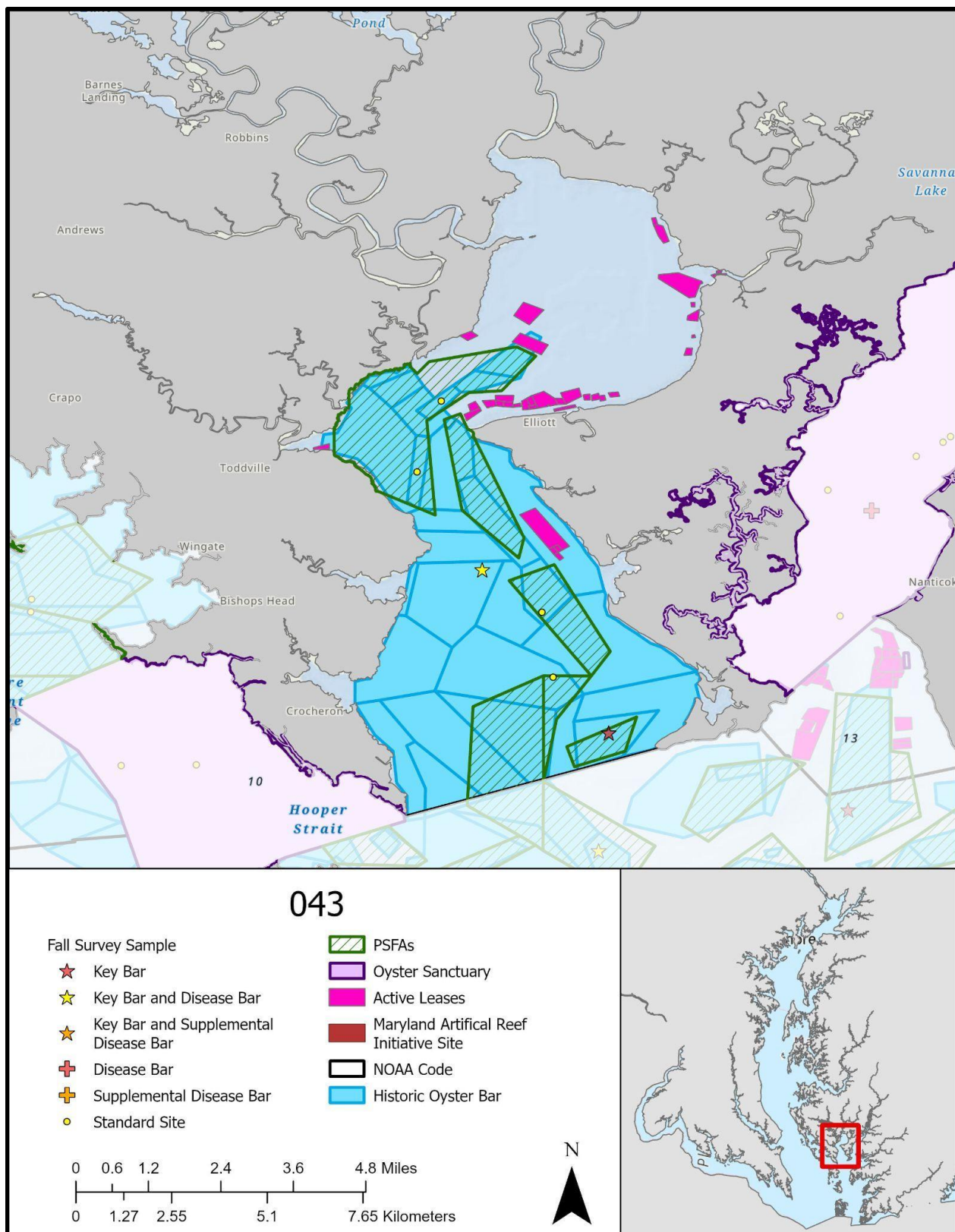


Figure B.05-1. Map of NOAA Code 043 (Fishing Bay). Fall Oyster Survey sites may not be sampled every year.

Table B.05-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 043 (Fishing Bay). ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/35	5/37	5/40	5/36
Number of Live Spat Oysters per square meter	50.8 $\pm$ 12.8	72 $\pm$ 15.4	100 $\pm$ 30	85 $\pm$ 11
Number of Live Small Oysters per square meter	23 $\pm$ 3.9	92 $\pm$ 11.6	81 $\pm$ 14	145 $\pm$ 27
Number of Live Market Oysters per square meter	13 $\pm$ 3.2	40 $\pm$ 5.8	24 $\pm$ 5.4	55 $\pm$ 9.5
Number of Live Oysters per square meter	87 $\pm$ 13	204 $\pm$ 27.5	205 $\pm$ 44	284.5 $\pm$ 39
Live Biomass (g Dry Weight per Bushel)	68.2 $\pm$ 14.5	173 $\pm$ 22.3	133 $\pm$ 22.1	230.3 $\pm$ 41
Observed Mortality (%)	6.2 $\pm$ 2	13.4 $\pm$ 2.1	9.5 $\pm$ 1.7	11 $\pm$ 1.5
Cultch (Bushels per 100 feet towed)	1.3 $\pm$ 0.1	1.5 $\pm$ 0.1	1.2 $\pm$ 0.1	1.3 $\pm$ 0.1
Harvest (Bushels)	3,707	35,789	13,917	36,618

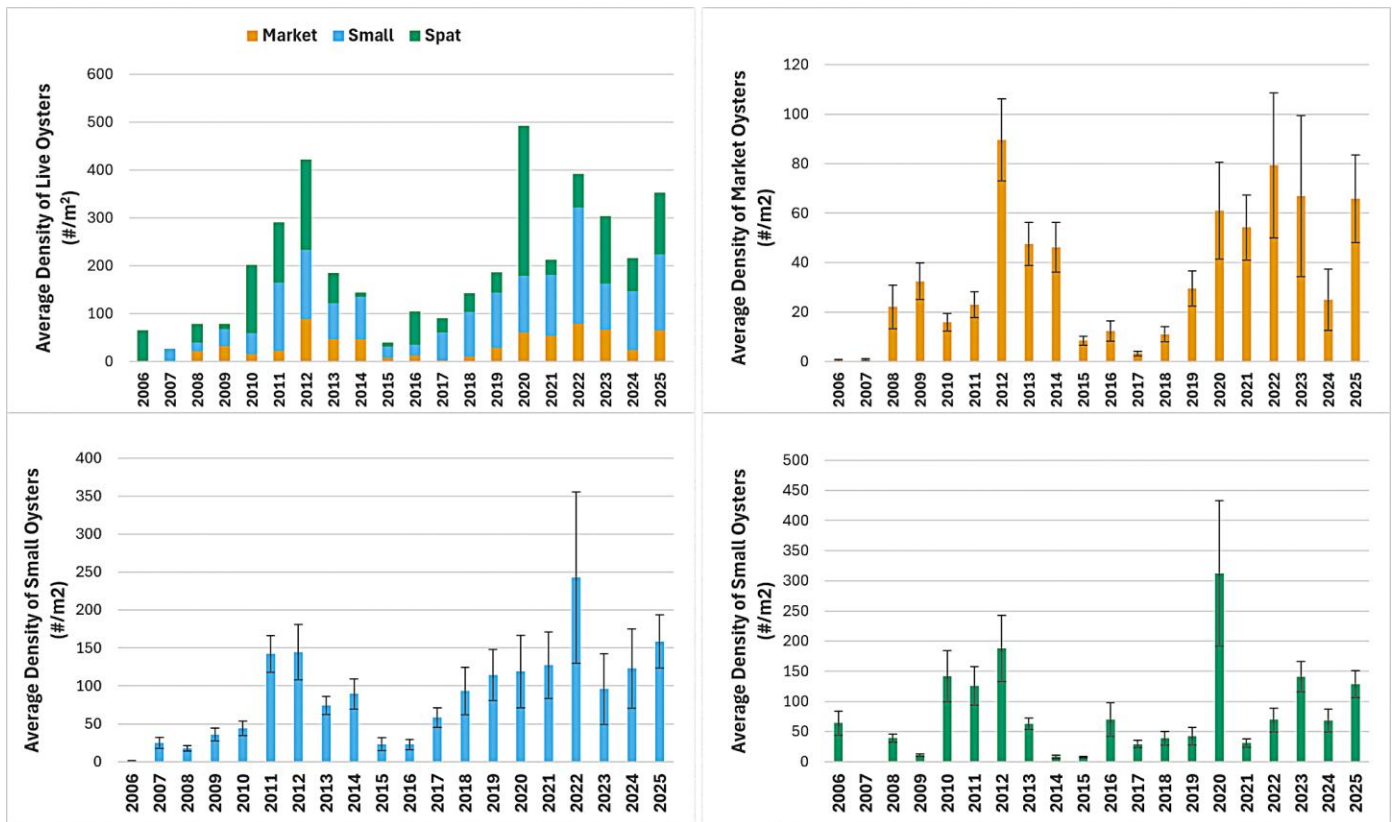


Figure B.05-2. Average number of live oysters per square meter by size class in NOAA Code 043 (Fishing Bay). Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Fishing Bay (043)

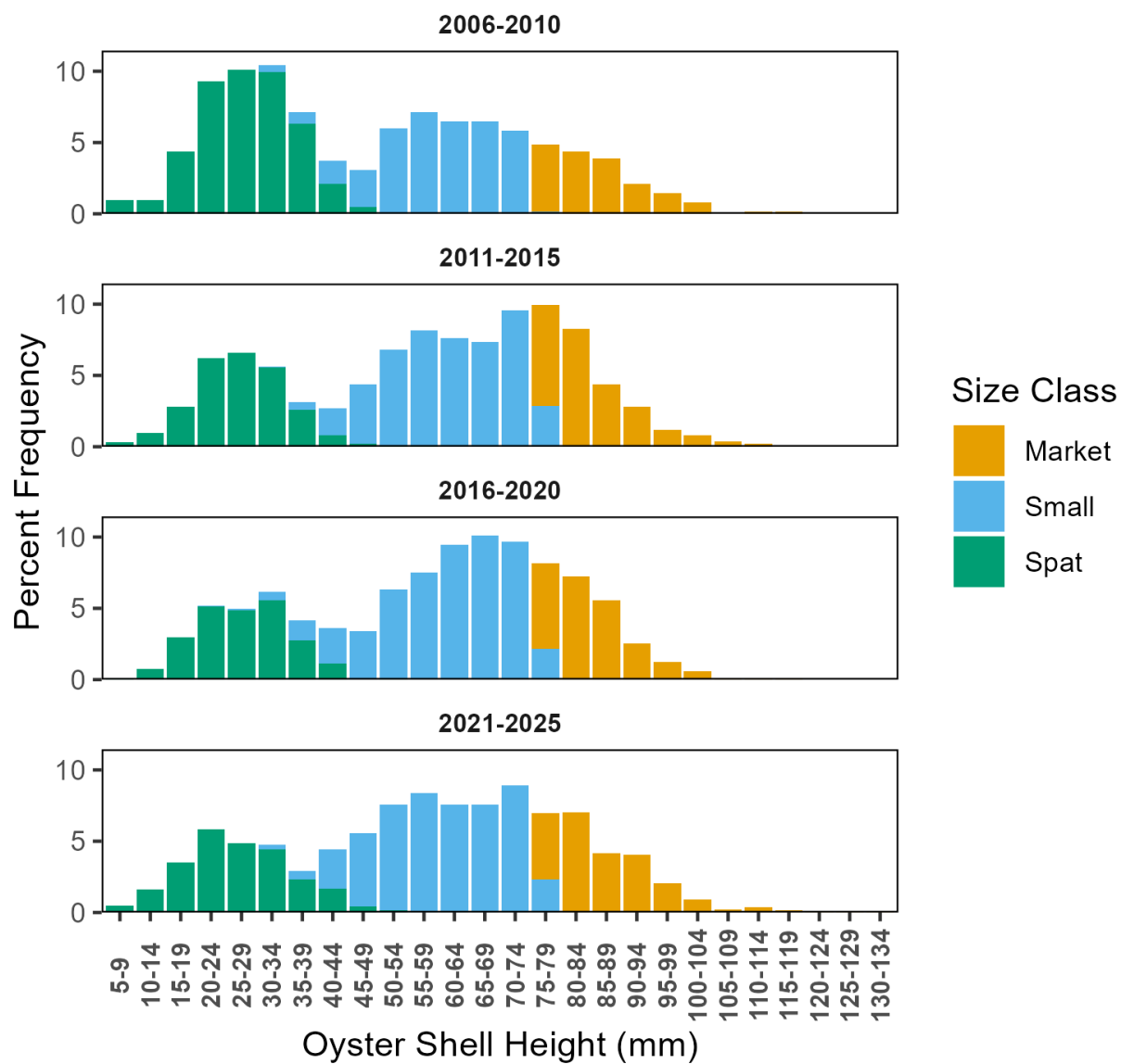


Figure B.05-3. Shell height frequencies of live oysters in NOAA Code 043 (Fishing Bay).

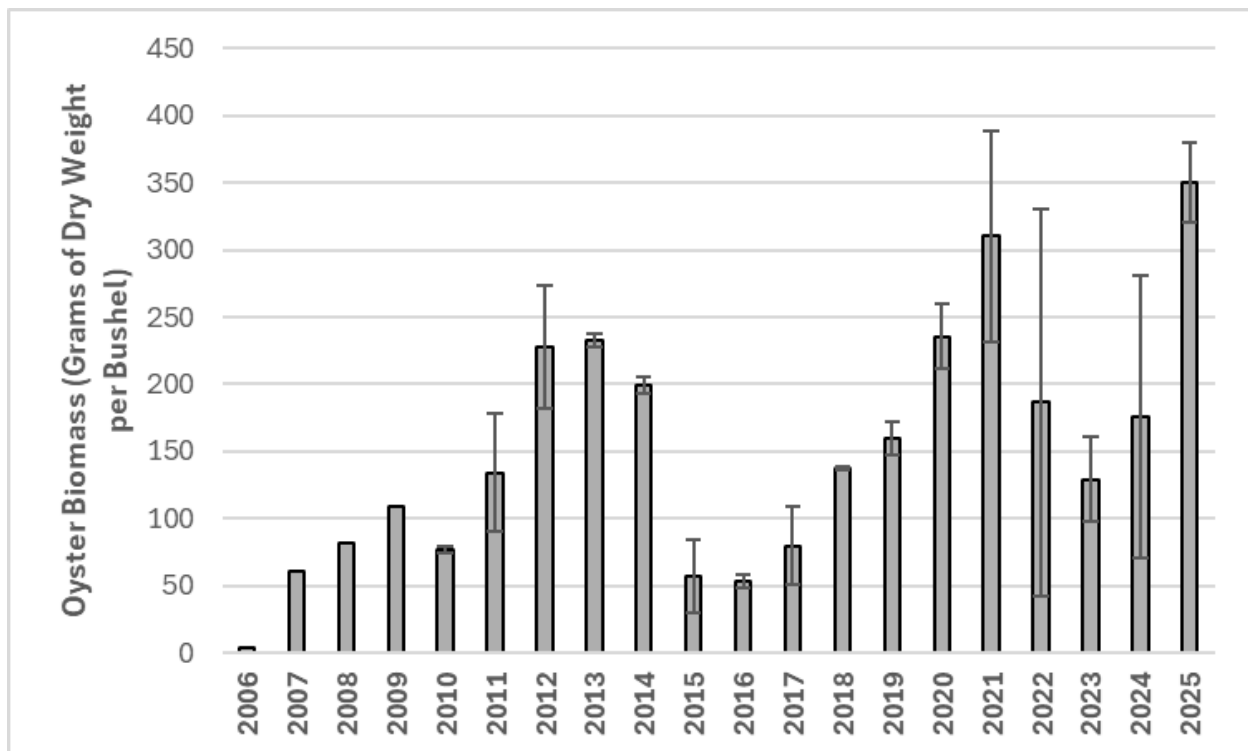


Figure B.05-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 043 (Fishing Bay). Data from Maryland's Annual Fall Oyster Dredge Survey.

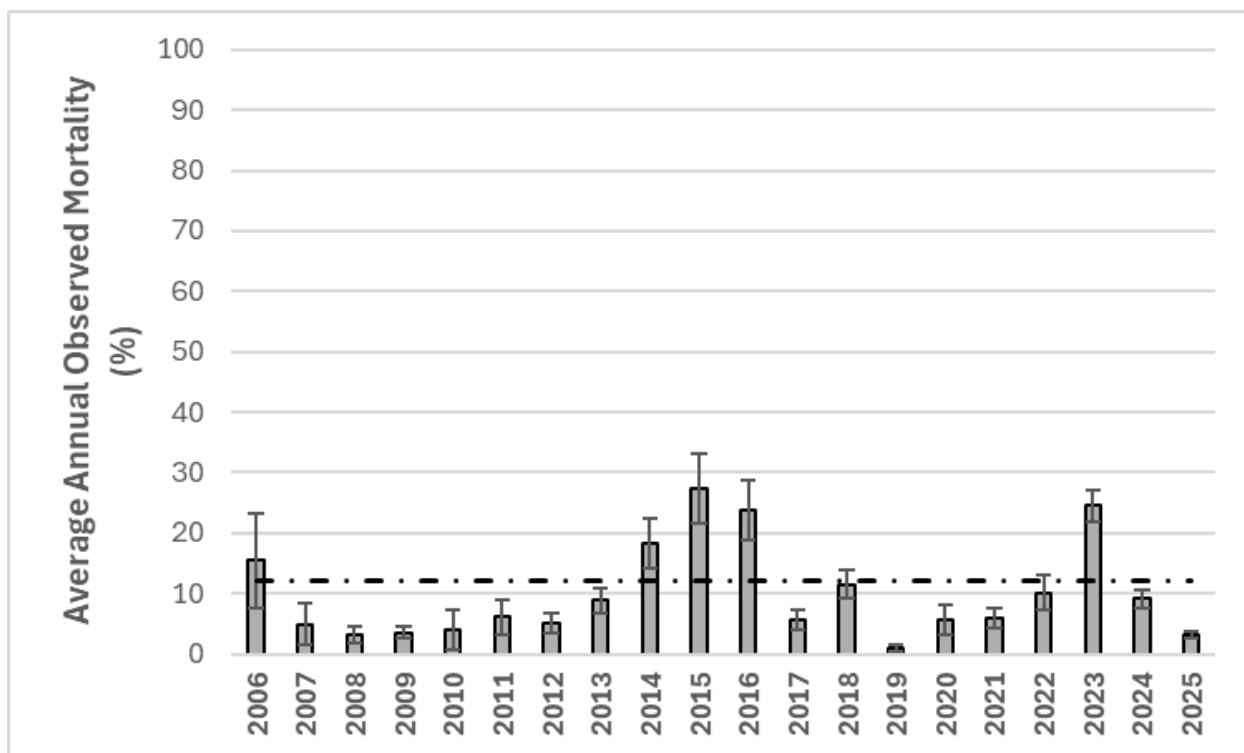


Figure B.05-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 043 (Fishing Bay). Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

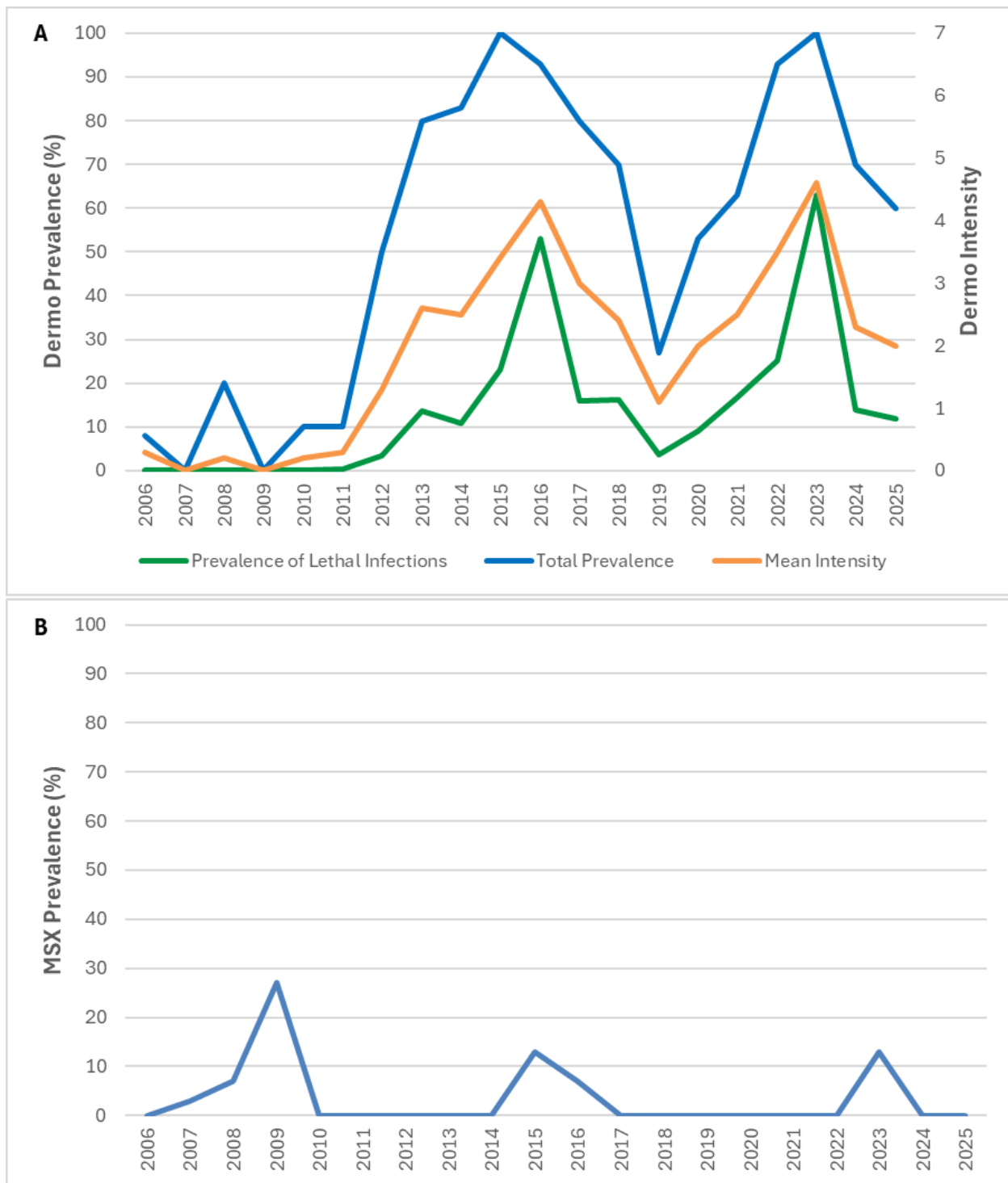


Figure B.05-6. Oyster disease prevalence and intensity in NOAA Code 043 (Fishing Bay). (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Goose Creek bar.

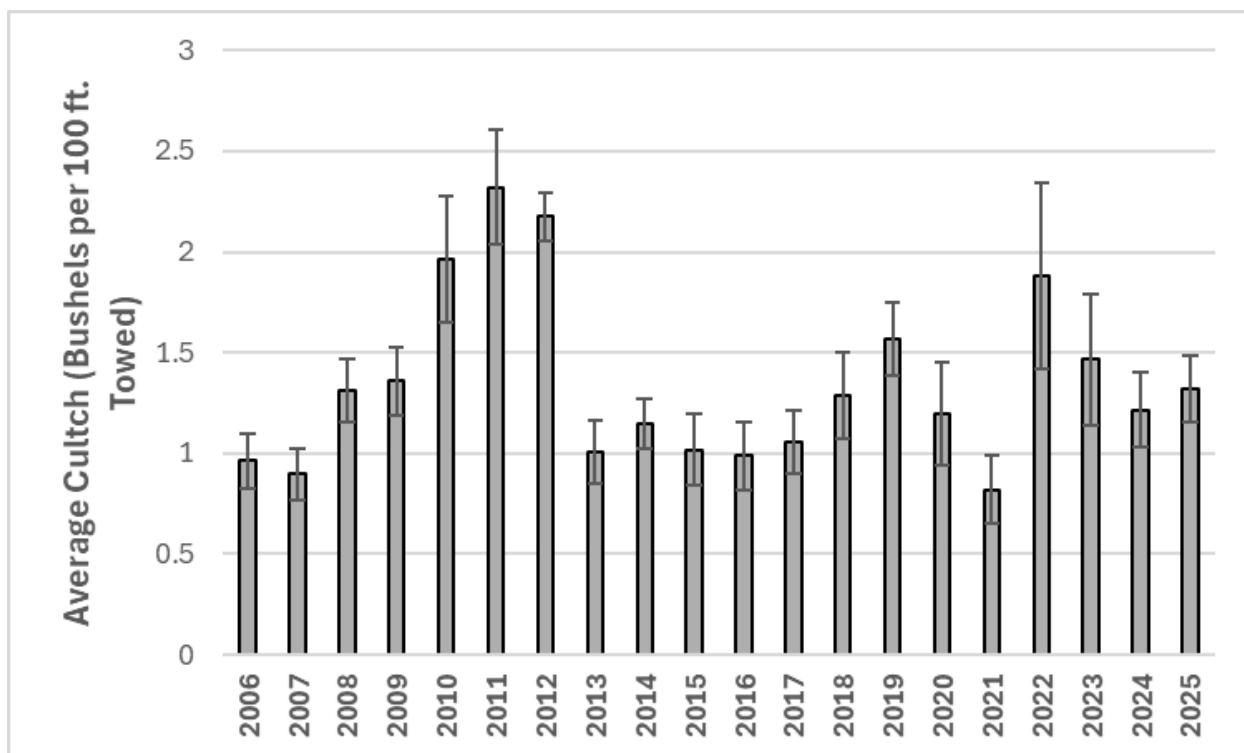


Figure B.05-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 043 (Fishing Bay). Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

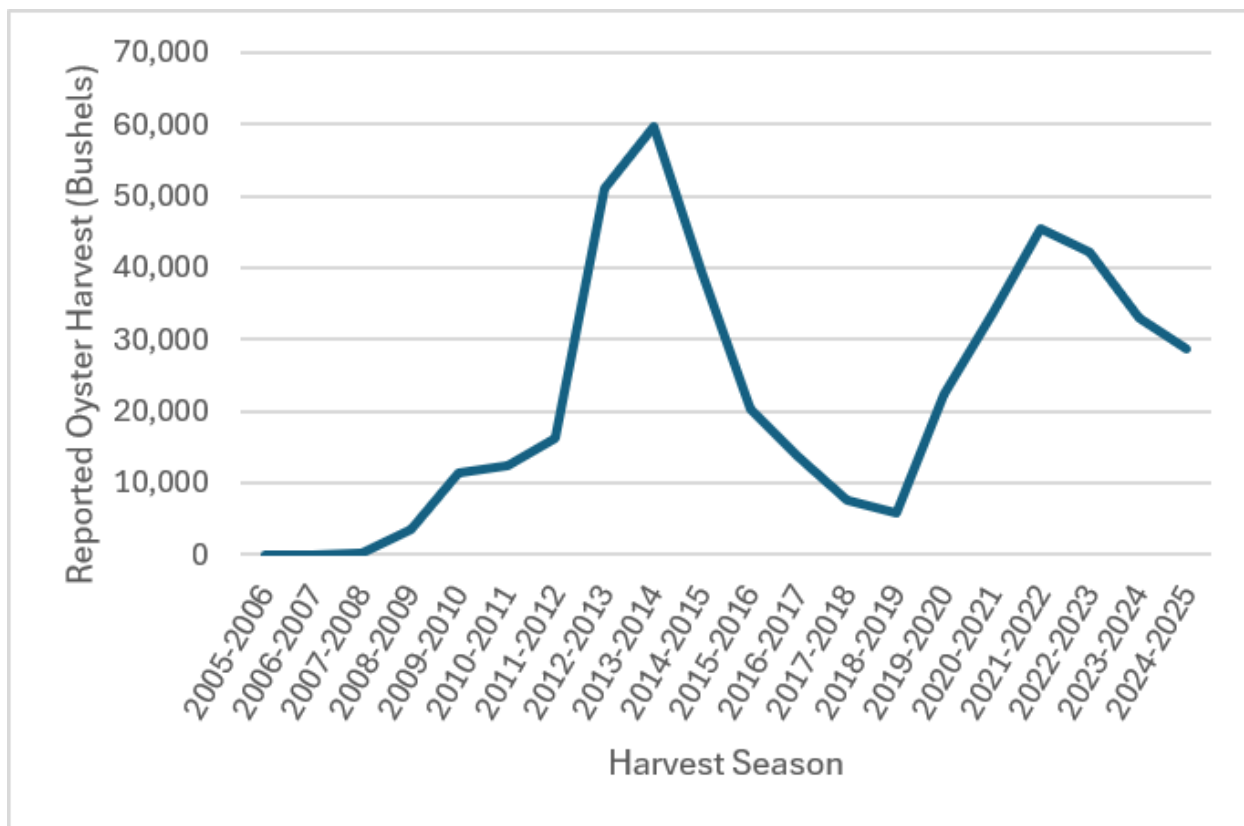


Figure B.05-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 043 (Fishing Bay).

Section B.06: NOAA Code 047 – Honga River

NOAA Code 047 encompasses the Honga River and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 31,778 acres and has 55 historic oyster bars¹⁷. The Hooper Straits Sanctuary encompasses 16% (5,087 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 26,691 surface acres. There are 16,317 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 13,346 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.06-1)
- Summary statistics (Table B.06-1)
- Density per year (Figure B.06-2)
- Shell height frequencies (Figure B.06-3)
- Biomass per year (Figure B.06-4)
- Observed mortality (Figure B.06-5)
- Dermo and MSX per year (Figure B.06-6)
- Cultch per year (Figure B.06-7)
- Harvest (Figure B.06-8)

The total live oyster density increased significantly in the most recent period (2021-2025) for all size classes. Shell height frequencies were similar across the time series, while biomass increased substantially during 2021-2025. Mortality rates were generally below the long-term average, with a slight peak in 2023, accompanied by higher disease prevalence. Average cultch was also consistent across the time series.

To support the commercial public fishery in this NOAA Code area outside of the current sanctuary, approximately 210,000 bushels of shell (including 11,500 bushels of Gigas shell), 3,000 bushels of wild seed, and 21 million hatchery spat-on-shell were planted between 2006 and 2025. From 2021 to 2025, enhancements included 59,000 bushels of shell (all Gigas shell) and all 3,000 bushels of wild seed plantings, while no hatchery spat-on-shell introductions occurred during this period.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in the sanctuary. Following the sanctuary's establishment in 2009, 16% of the area was closed to harvest. Power dredging was the primary gear during 2021-2025. The five-year average harvest was highest in the most recent time period (2021-2025) though this was largely driven by a spike in harvest from the 2022-2023 season.

¹⁷ See chart 29 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

This area is characterized by increasing abundance and oyster density as well as variable but relatively stable harvest, in part driven by multiple years of enhancement activity, good recruitment and low natural mortality.

Table B.06-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 047 (Honga River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/25	5/30	5/35	5/35
Number of Live Spat Oysters per square meter	94 $\pm$ 33	62 $\pm$ 17	33 $\pm$ 7	81.5 $\pm$ 12
Number of Live Small Oysters per square meter	79 $\pm$ 19	134 $\pm$ 24	32 $\pm$ 3.5	118 $\pm$ 15
Number of Live Market Oysters per square meter	16 $\pm$ 4.6	31 $\pm$ 5	6.4 $\pm$ 1.5	34 $\pm$ 5.3
Number of Live Oysters per square meter	189 $\pm$ 42	227 $\pm$ 24	71.5 $\pm$ 9	233 $\pm$ 24
Live Biomass (g Dry Weight per Bushel)	84 $\pm$ 23	119 $\pm$ 18.3	45.8 $\pm$ 8.8	170 $\pm$ 28.4
Observed Mortality (%)	8.8 $\pm$ 1.5	10.5 $\pm$ 1.1	16 $\pm$ 3.1	8.6 $\pm$ 1.2
Cultch (Bushels per 100 feet towed)	1.2 $\pm$ 0.1	1.2 $\pm$ 0.1	0.9 $\pm$ 0.1	1 $\pm$ 0.1
Harvest (Bushels)	7,900	17,035	6,078	23,690

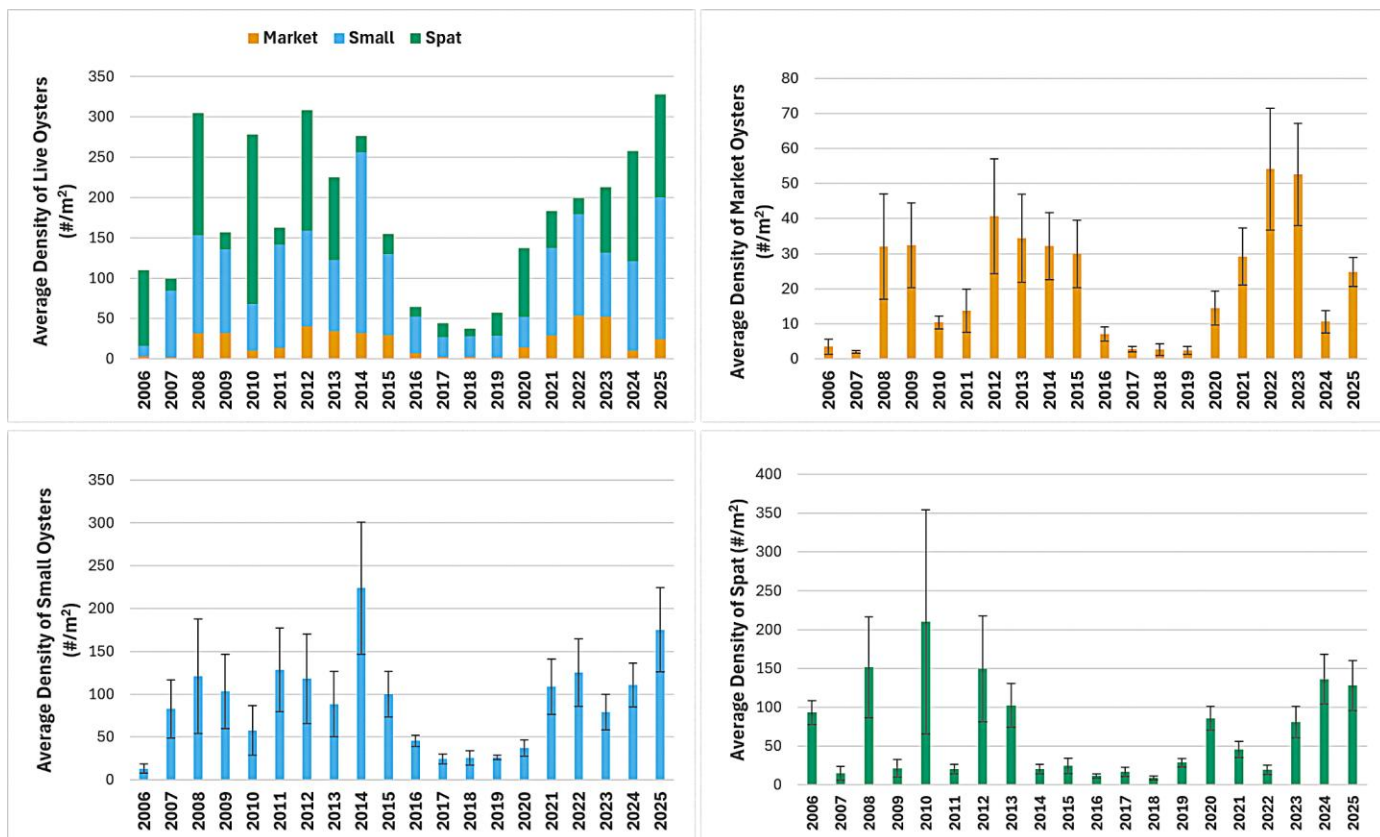


Figure B.06-2. Average number of live oysters per square meter by size class in NOAA Code 047 (Honga River) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Honga River (047)

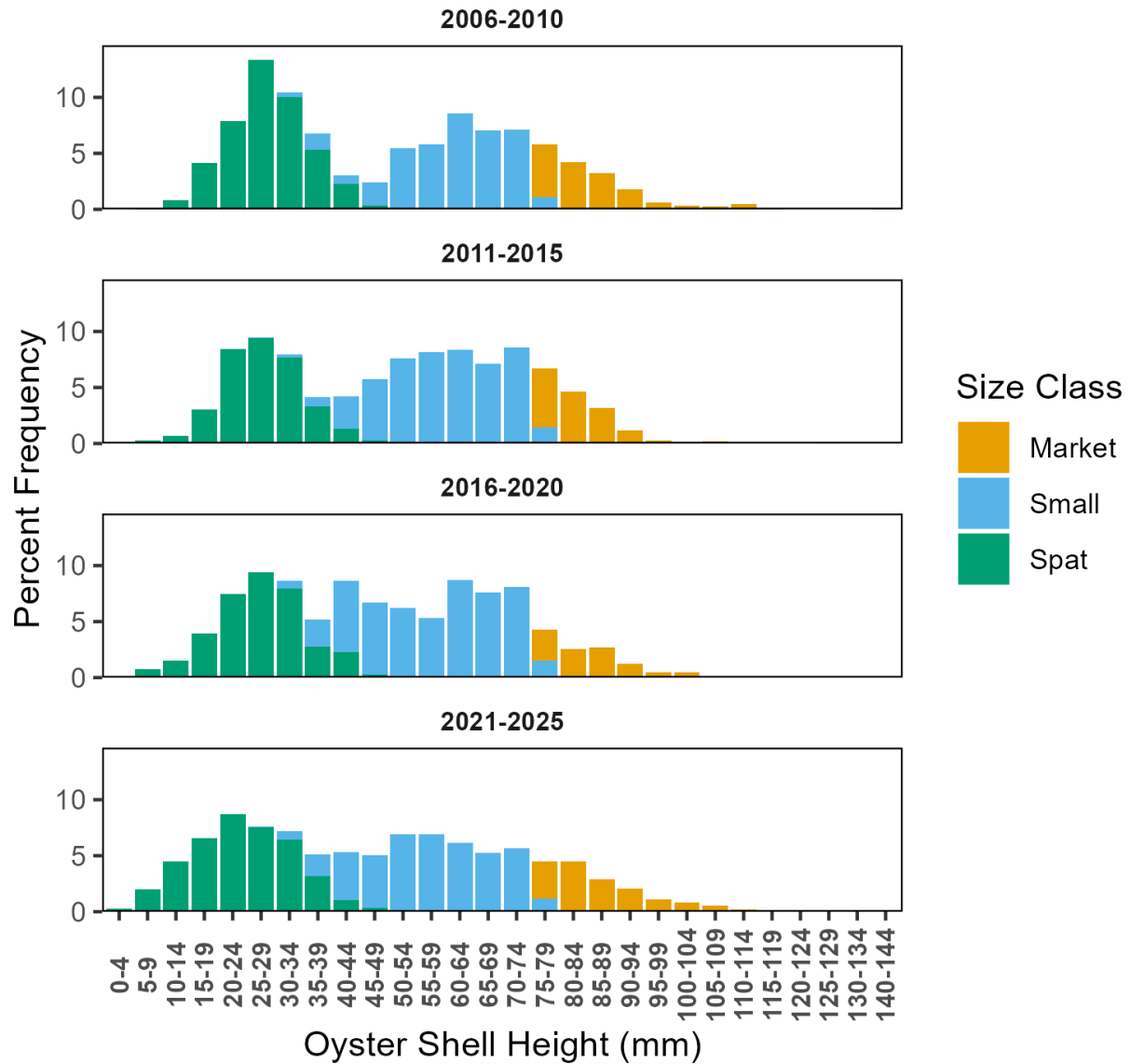


Figure B.06-3. Shell height frequencies of live oysters in NOAA Code 047 (Honga River) outside of the current sanctuary area.

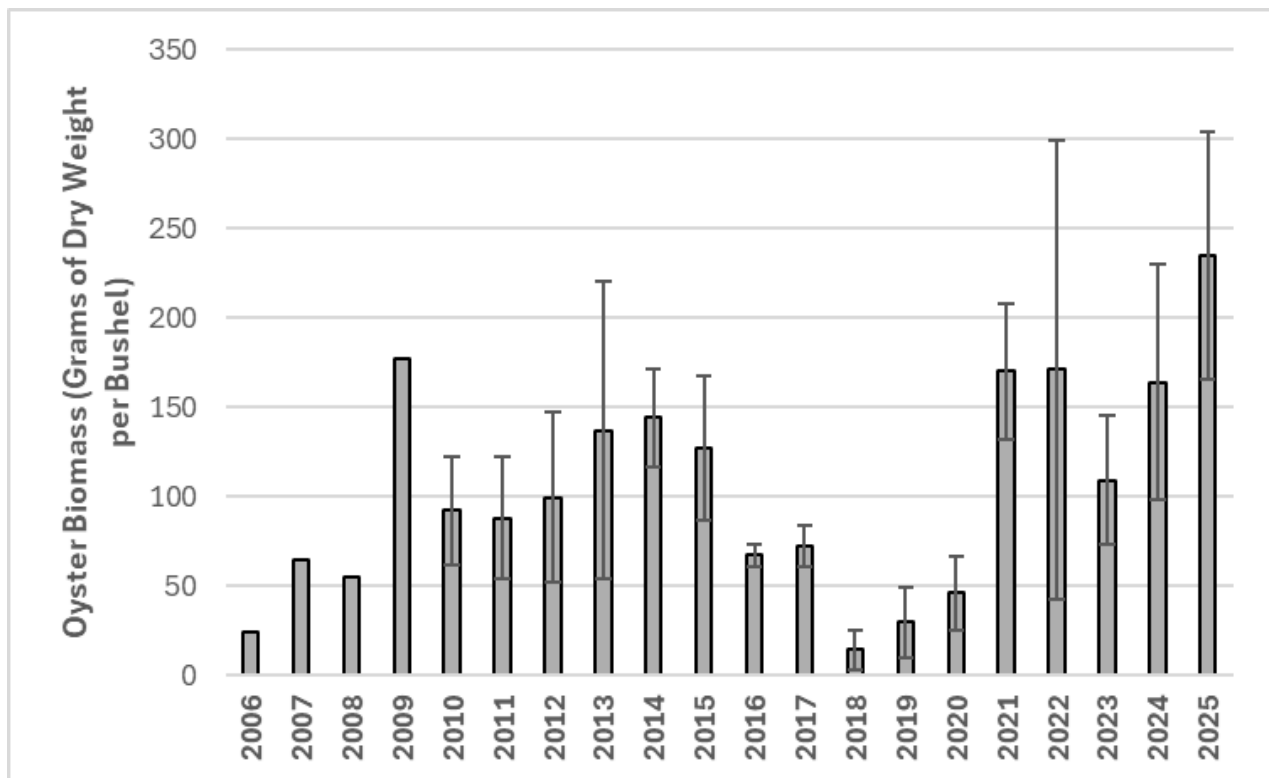


Figure B.06-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 047 (Honga River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

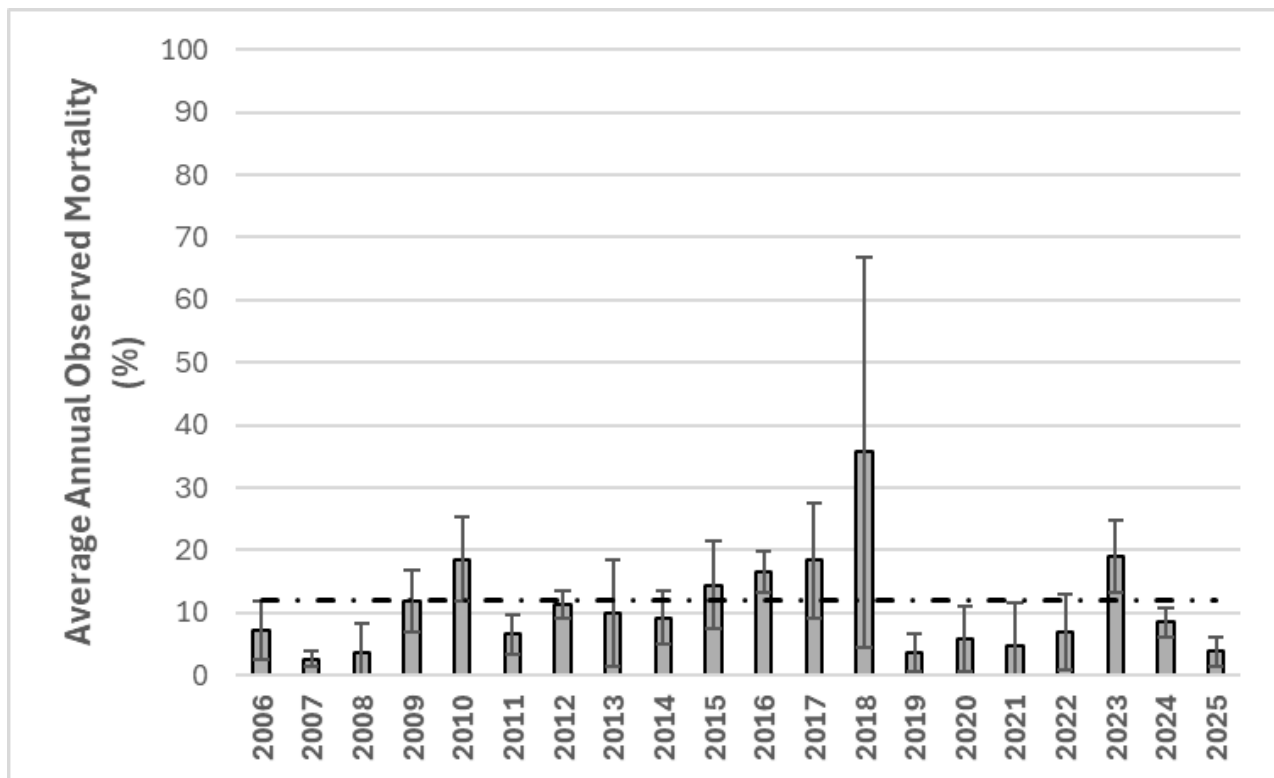


Figure B.06-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 047 (Honga River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

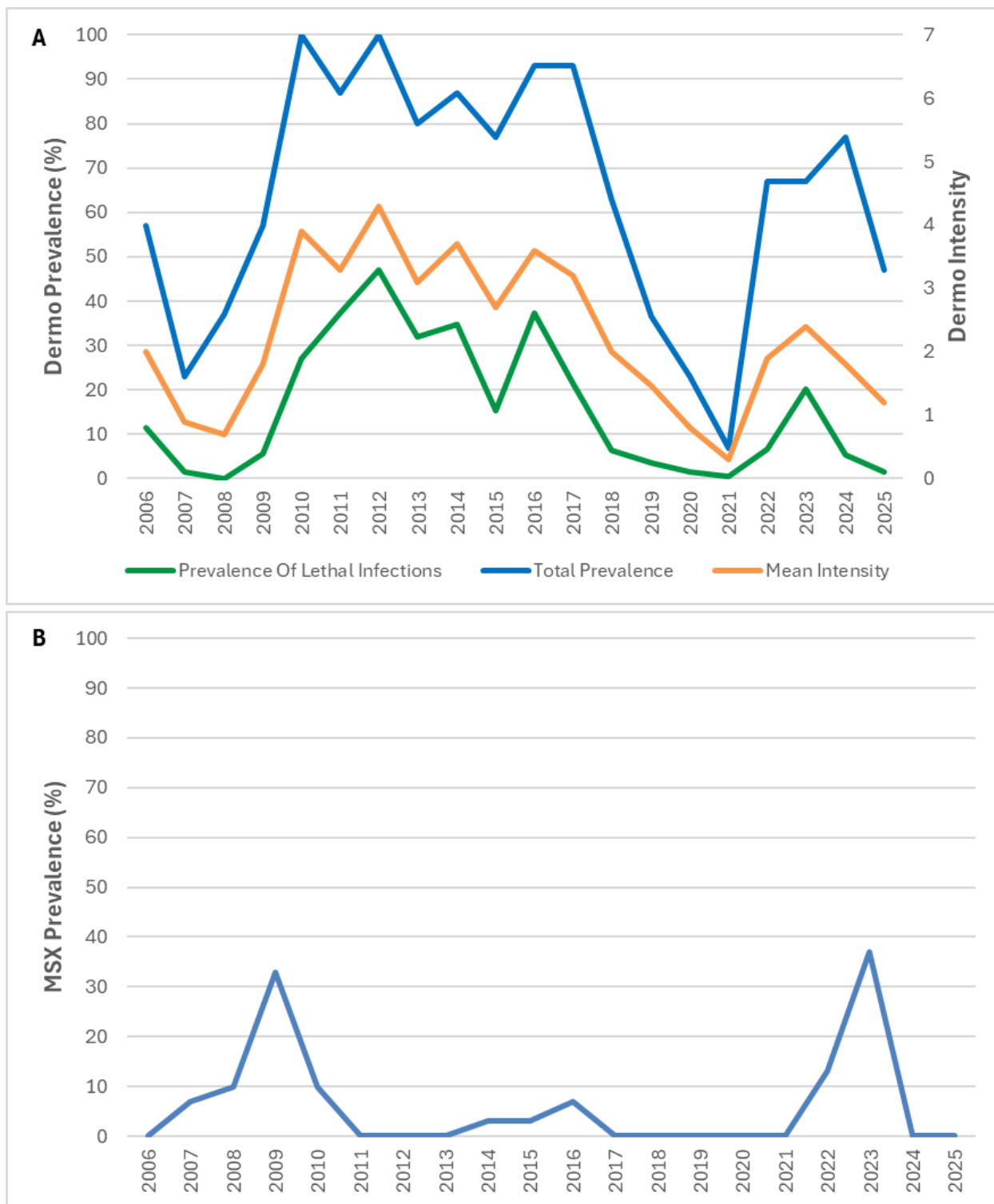


Figure B.06-6. Oyster disease prevalence and intensity in NOAA Code 047 (Honga River) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Norman Addition 1 bar.

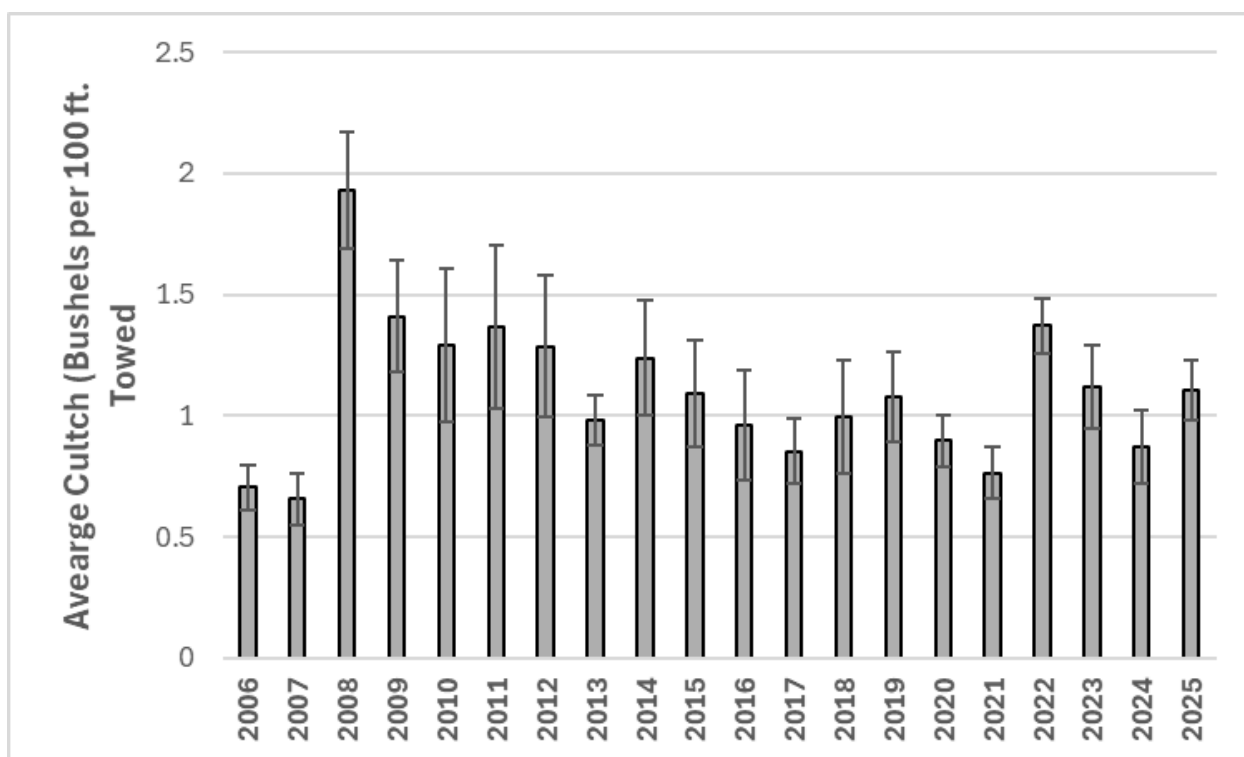


Figure B.06-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 047 (Honga River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

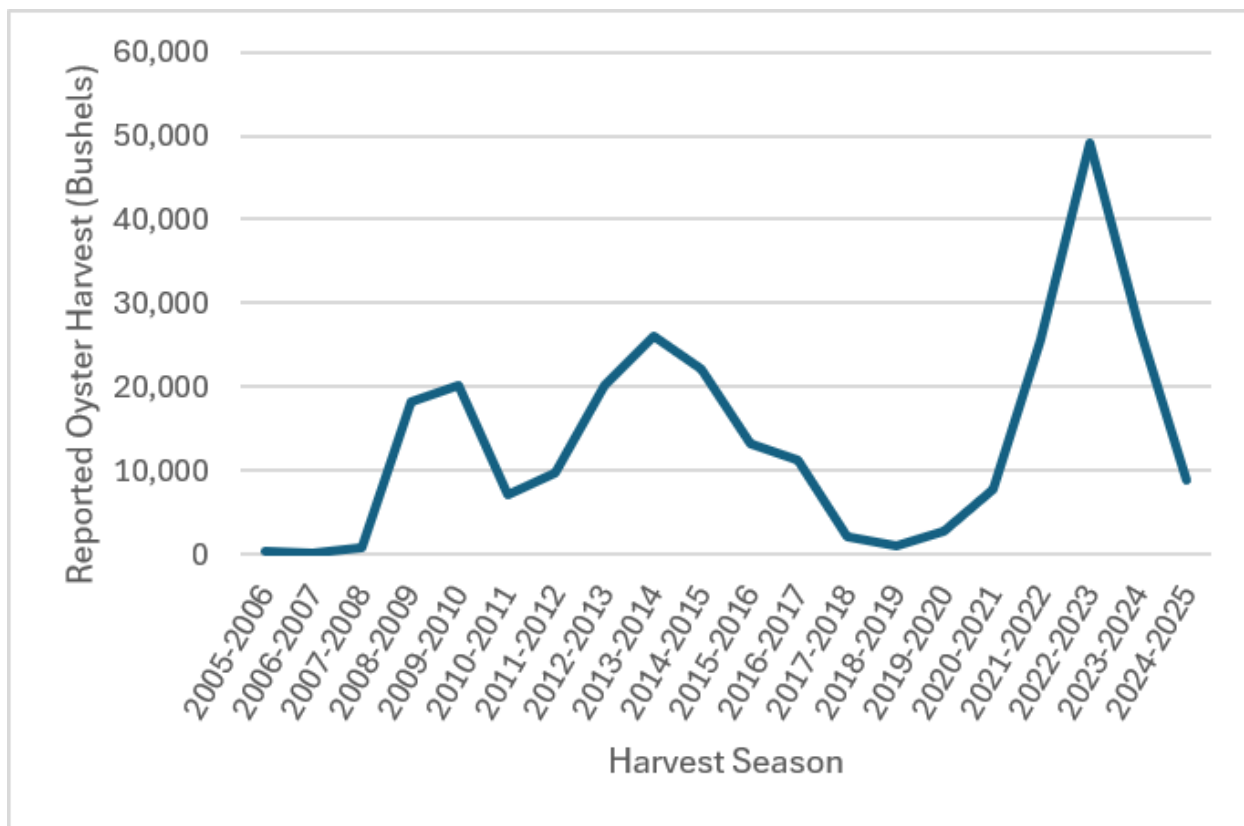


Figure B.06-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 047 (Honga River). Since 2009, 16% of the NOAA Code area has been designated as a sanctuary.

Section B.07: NOAA Code 053 – Little Choptank River

NOAA Code 053 encompasses the Little Choptank River and is located in Maryland's mid-eastern portion of Chesapeake Bay. The entire NOAA Code is 19,447 acres and has 33 historic oyster bars¹⁸. The Little Choptank River Sanctuary encompasses 48% (9,415 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 10,032 surface acres. There are 2,472 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 6,308 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.07-1)
- Summary statistics (Table B.07-1)
- Density per year (Figure B.07-2)
- Shell height frequencies (Figure B.07-3)
- Biomass per year (Figure B.07-4)
- Observed mortality (Figure B.07-5)
- Dermo and MSX per year (Figure B.07-6)
- Cultch per year (Figure B.07-7)
- Harvest (Figure B.07-8)

Total live oyster density increased significantly during 2016-2020, followed by a slight stabilization in the 2021-2025 period. Small and market-sized oyster densities increased markedly after the 2006-2010 period and have remained stable since 2018. Mean oyster shell height increased during 2021-2025. Live biomass more than tripled between the 2006-2010 and 2016-2020 time periods, with a slight decrease during 2021-2025. Observed mortality remained relatively consistent through 2020, before increasing in 2023, likely as a result of an increase in the prevalence of disease. Average cultch remained consistent throughout the time series.

Between 2006 and 2025, approximately 48,000 bushels of shell and 21 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code outside of the current sanctuary area. All of the hatchery seed was planted in 2025, and 12,000 bushels of shell were planted between 2021 and 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in the sanctuary. Following the sanctuary's establishment in 2010, 48% of the area was closed to harvest. Hand tonging and diving were the primary gears during 2021-2025. Harvest was highest early in this time period and has decreased in recent years.

¹⁸ See chart 25 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

This area is characterized by increasing abundance and oyster density; however, harvest is relatively low but apparently stable in the area outside the sanctuary.

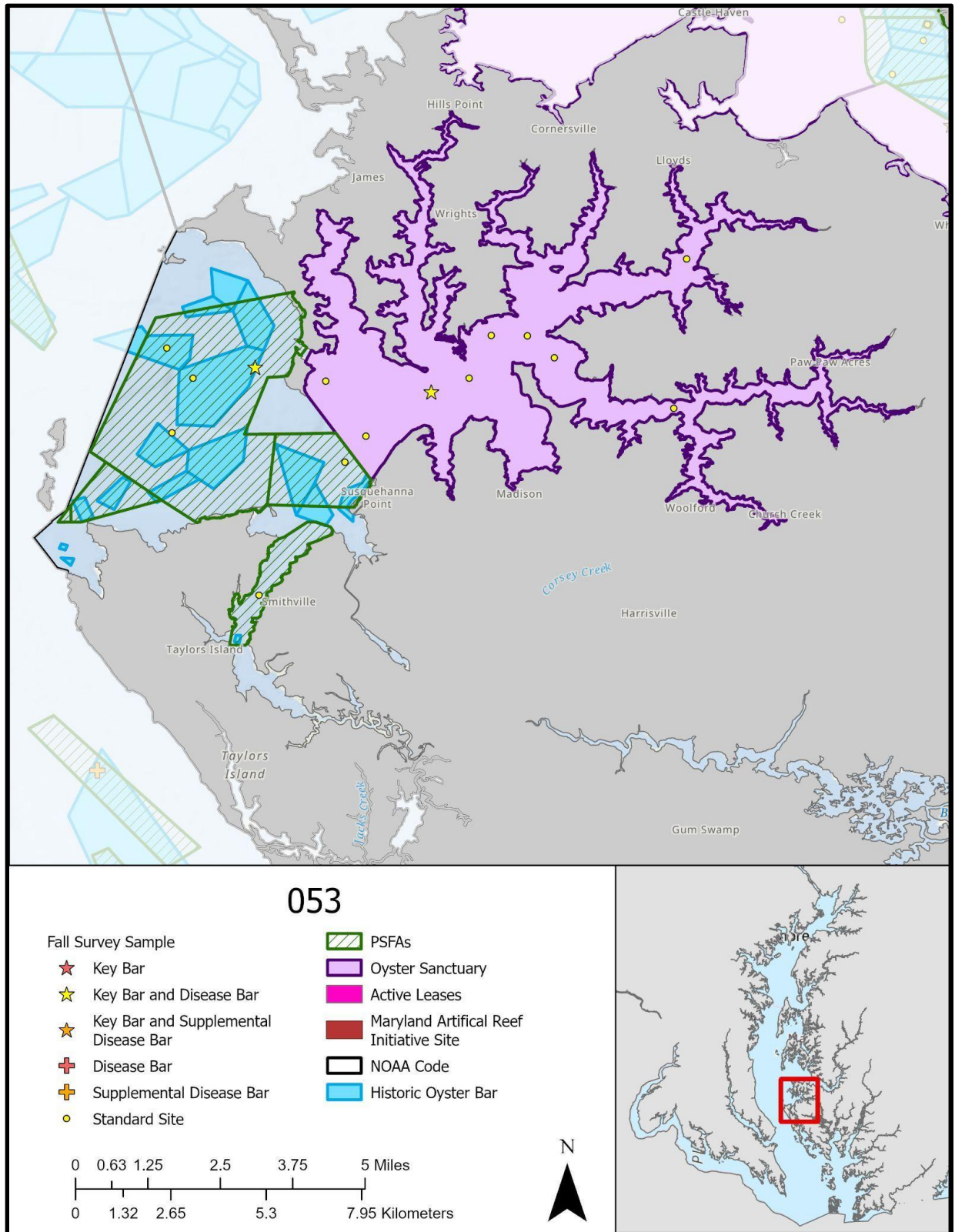


Figure B.07-1. Map of NOAA Code 053 (Little Choptank River). Fall Oyster Survey sites may not be sampled every year.

Table B.07-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 053 (Little Choptank River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/30	5/30	5/30	5/33
Number of Live Spat Oysters per square meter	6.8 $\pm$ 2	4.2 $\pm$ 1.6	31 $\pm$ 16	28 $\pm$ 6.5
Number of Live Small Oysters per square meter	17.6 $\pm$ 3.5	43 $\pm$ 10	60 $\pm$ 12.4	53 $\pm$ 10
Number of Live Market Oysters per square meter	15 $\pm$ 2.6	43 $\pm$ 6.5	47 $\pm$ 8.3	47 $\pm$ 6.8
Number of Live Oysters per square meter	39.5 $\pm$ 6	90 $\pm$ 13	135.5 $\pm$ 17	127 $\pm$ 15
Live Biomass (g Dry Weight per Bushel)	83.8 $\pm$ 4.7	228 $\pm$ 25.2	301 $\pm$ 36	270.3 $\pm$ 42.4
Observed Mortality (%)	14 $\pm$ 2.3	12.9 $\pm$ 1.5	14 $\pm$ 2.3	19.5 $\pm$ 2.8
Cultch (Bushels per 100 feet towed)	0.6 $\pm$ 0.1	0.8 $\pm$ 0.1	0.8 $\pm$ 0.1	0.8 $\pm$ 0.1
Harvest (Bushels)	2,170	1,894	3,256	6,938

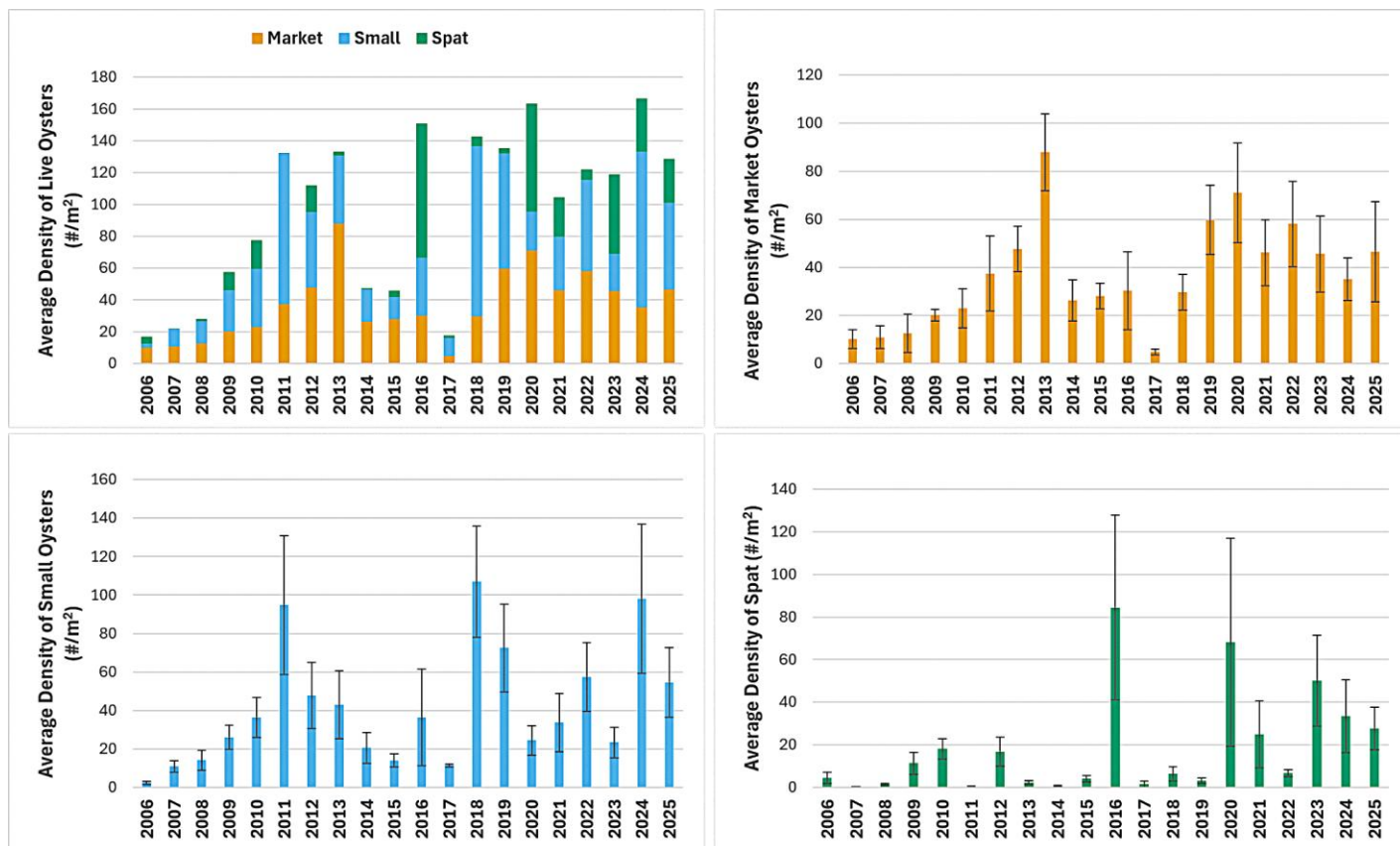


Figure B.07-2. Average number of live oysters per square meter by size class in NOAA Code 053 (Little Choptank River) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Little Choptank (053)

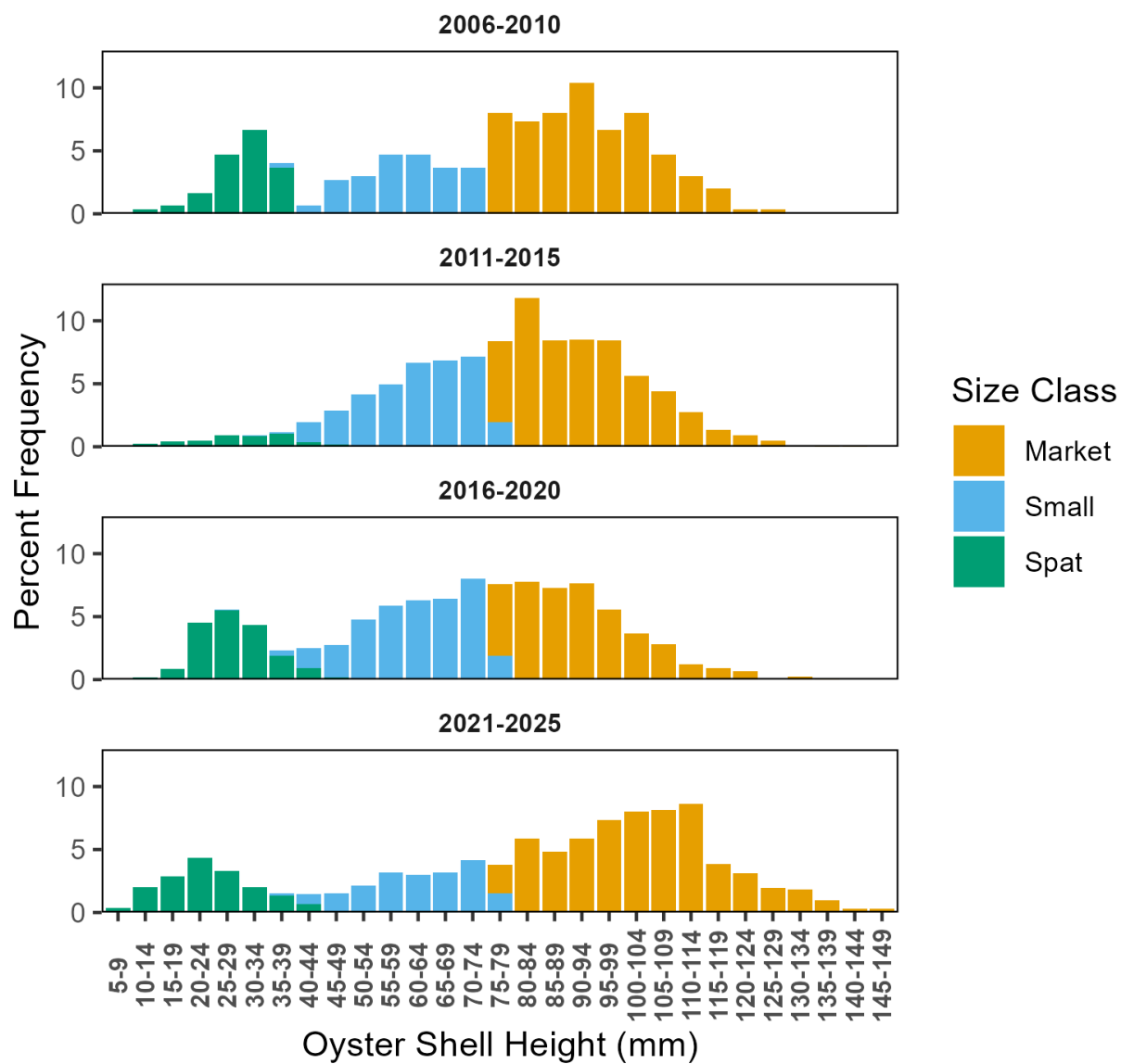


Figure B.07-3. Shell height frequencies of live oysters in NOAA Code 053 (Little Choptank River) outside of the current sanctuary area.

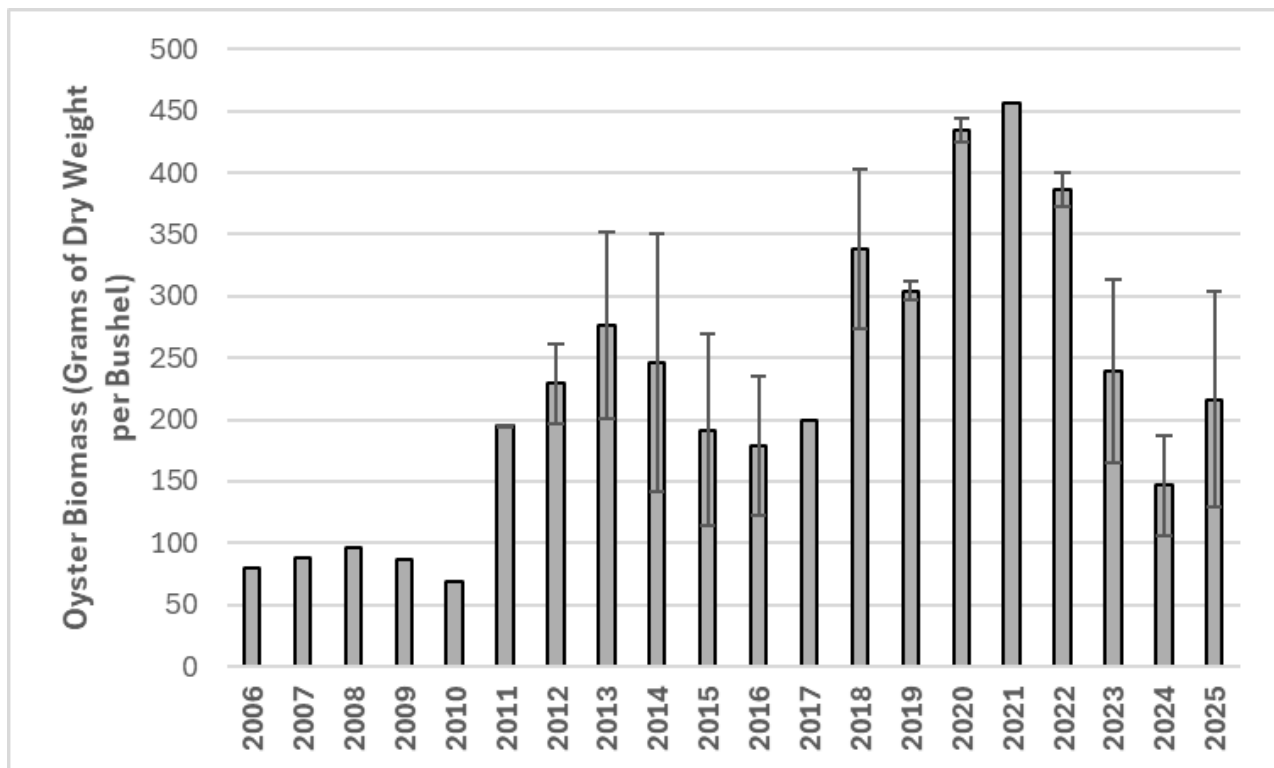


Figure B.07-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 053 (Little Choptank River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

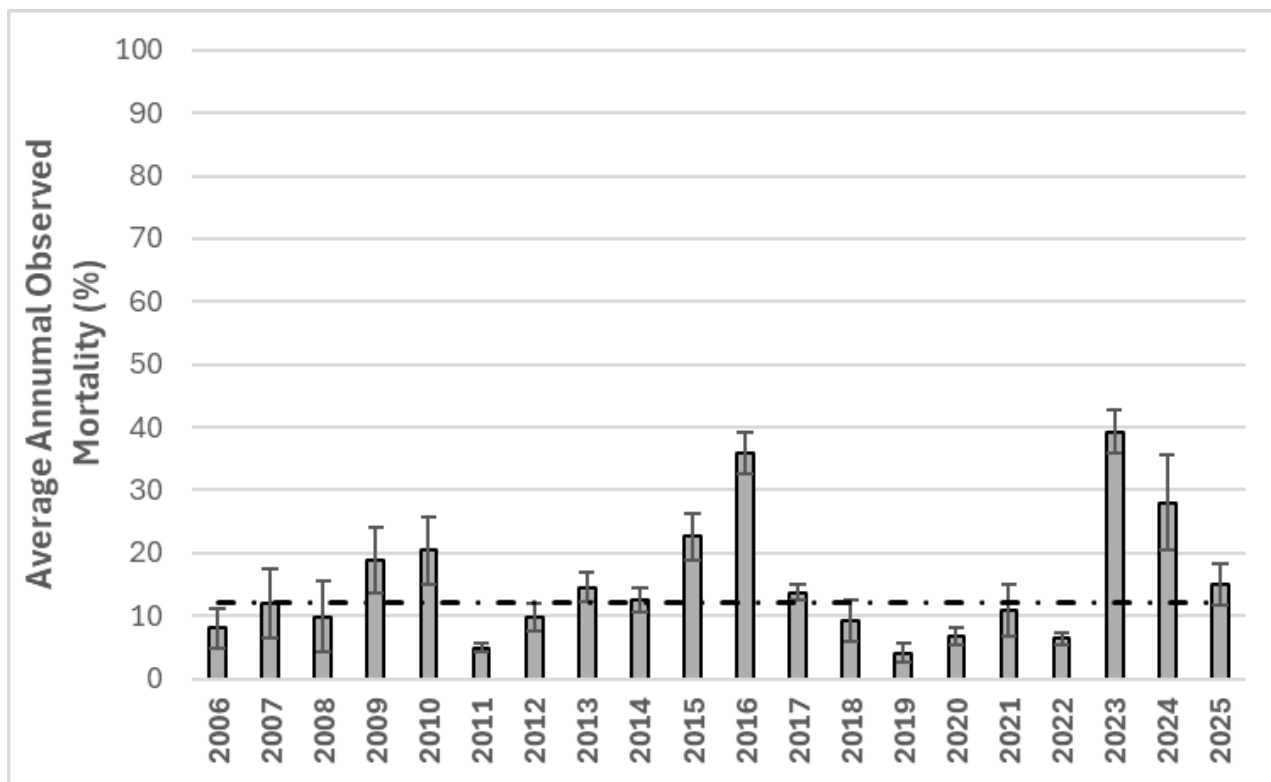


Figure B.07-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 053 (Little Choptank River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

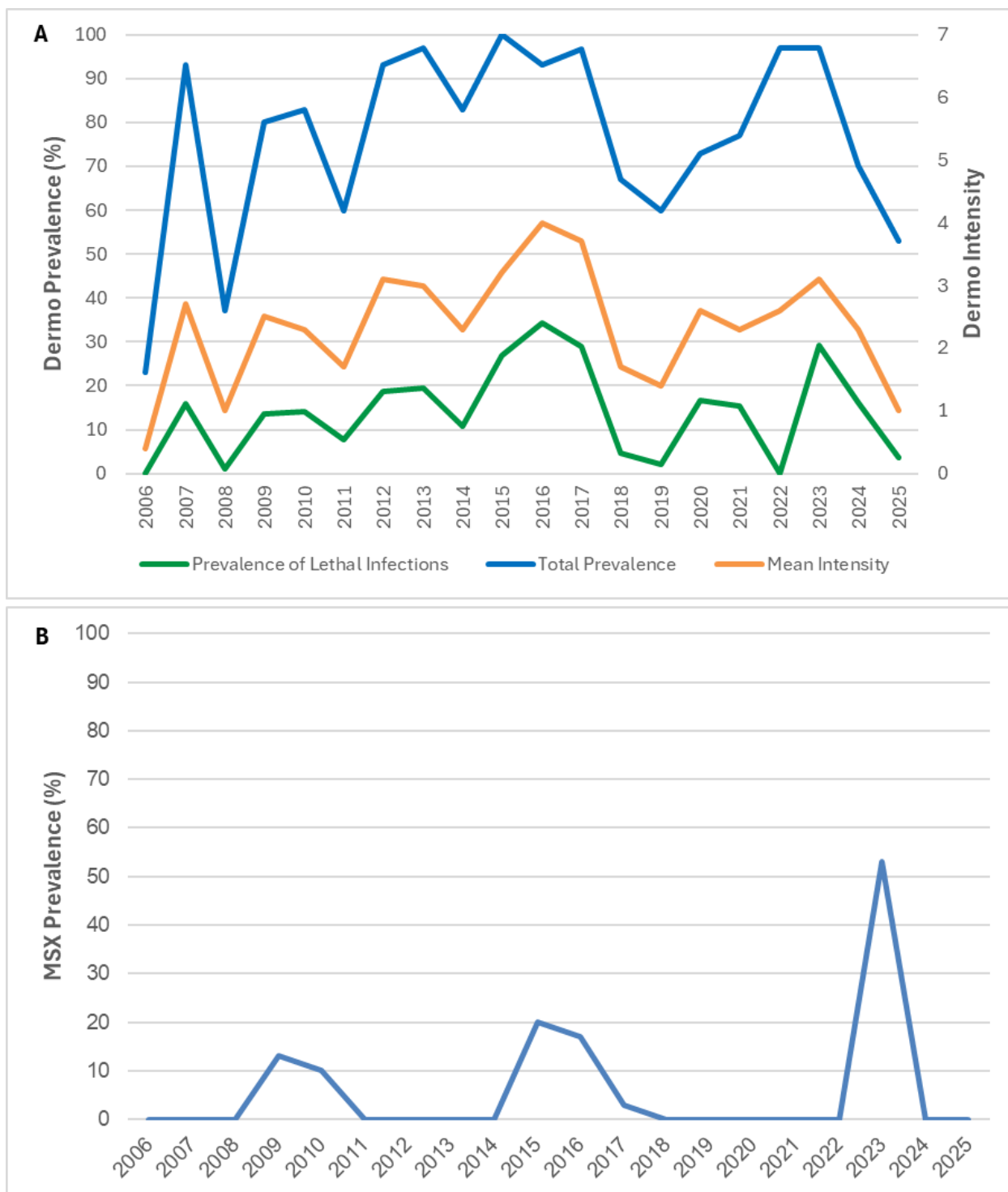


Figure B.07-6. Oyster disease prevalence and intensity in NOAA Code 053 (Little Choptank River) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Ragged Point bar.

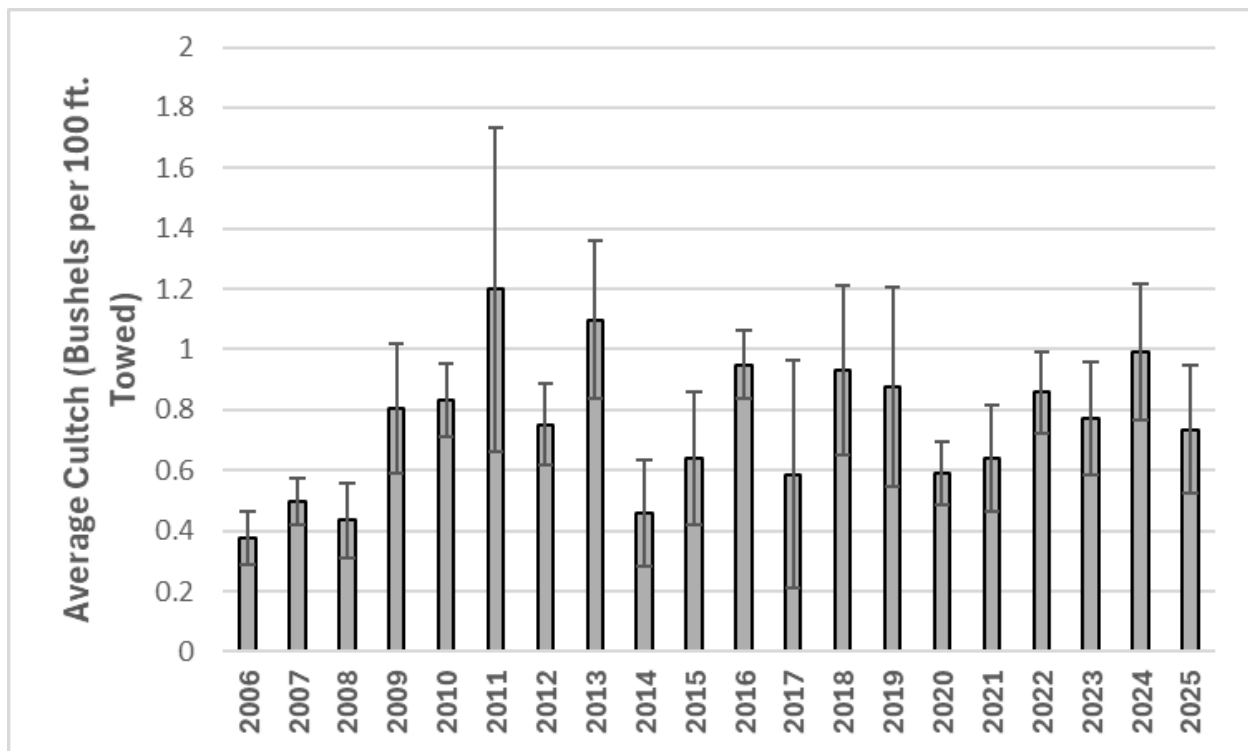


Figure B.07-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 053 (Little Choptank River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

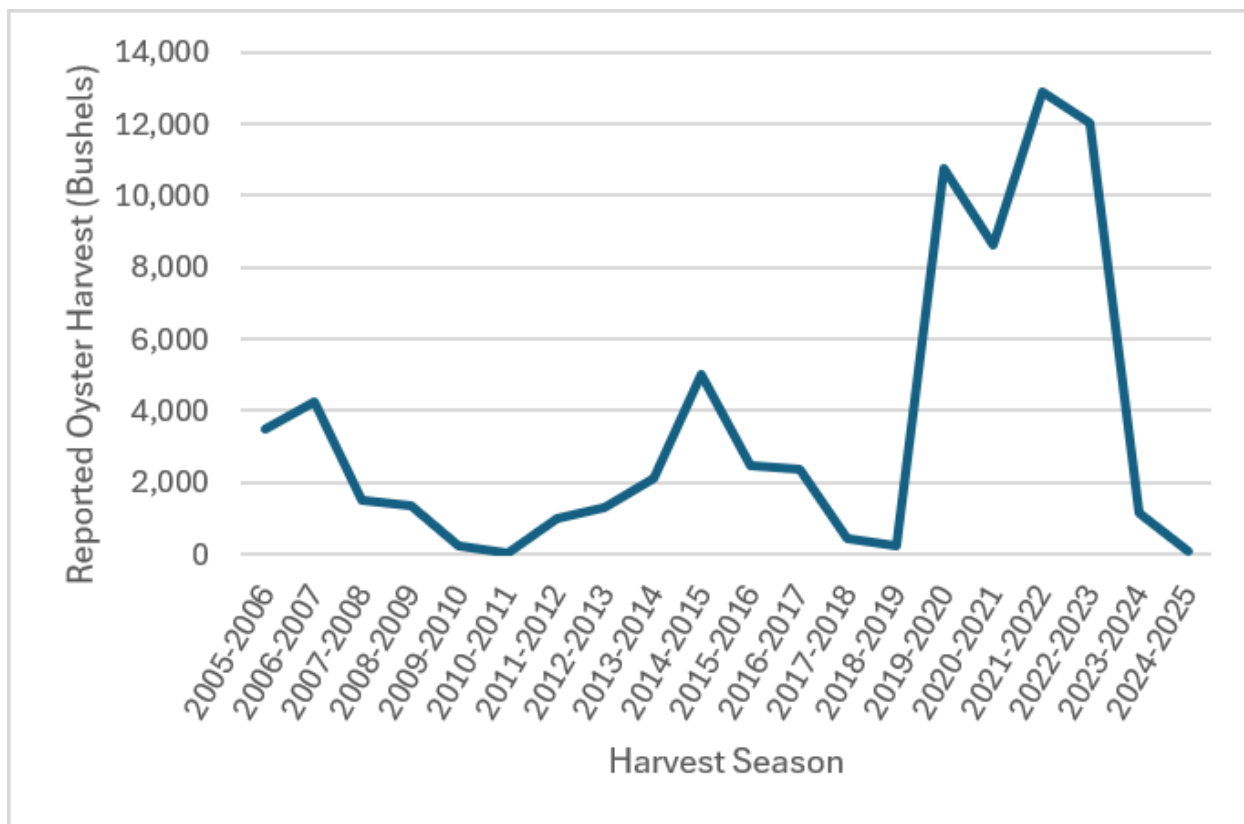


Figure B.07-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 053 (Little Choptank River). Since 2010, 48% of the NOAA Code area has been designated as a sanctuary.

Section B.08: NOAA Code 055 – Magothy River

NOAA Code 055 encompasses the Magothy River and is located in Maryland's upper western portion of Chesapeake Bay. The entire NOAA Code is 6,969 acres and has nine historic oyster bars¹⁹. The Magothy River Sanctuary encompasses 80% (5,607 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 1,362 acres. There are 717 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuary. In 2010, there were 814 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.07-1)

The Fall Oyster Survey has not collected samples in this NOAA Code outside the sanctuary during the time series. From 2006 through 2025, no replenishment planting efforts were undertaken to enhance the public fishery in the non-sanctuary portions of this NOAA Code. Following the sanctuary's establishment in 2010, 80% of the area was closed to harvest. No commercial harvest has been reported during the 2021-2025 time period.

¹⁹ See chart 6 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

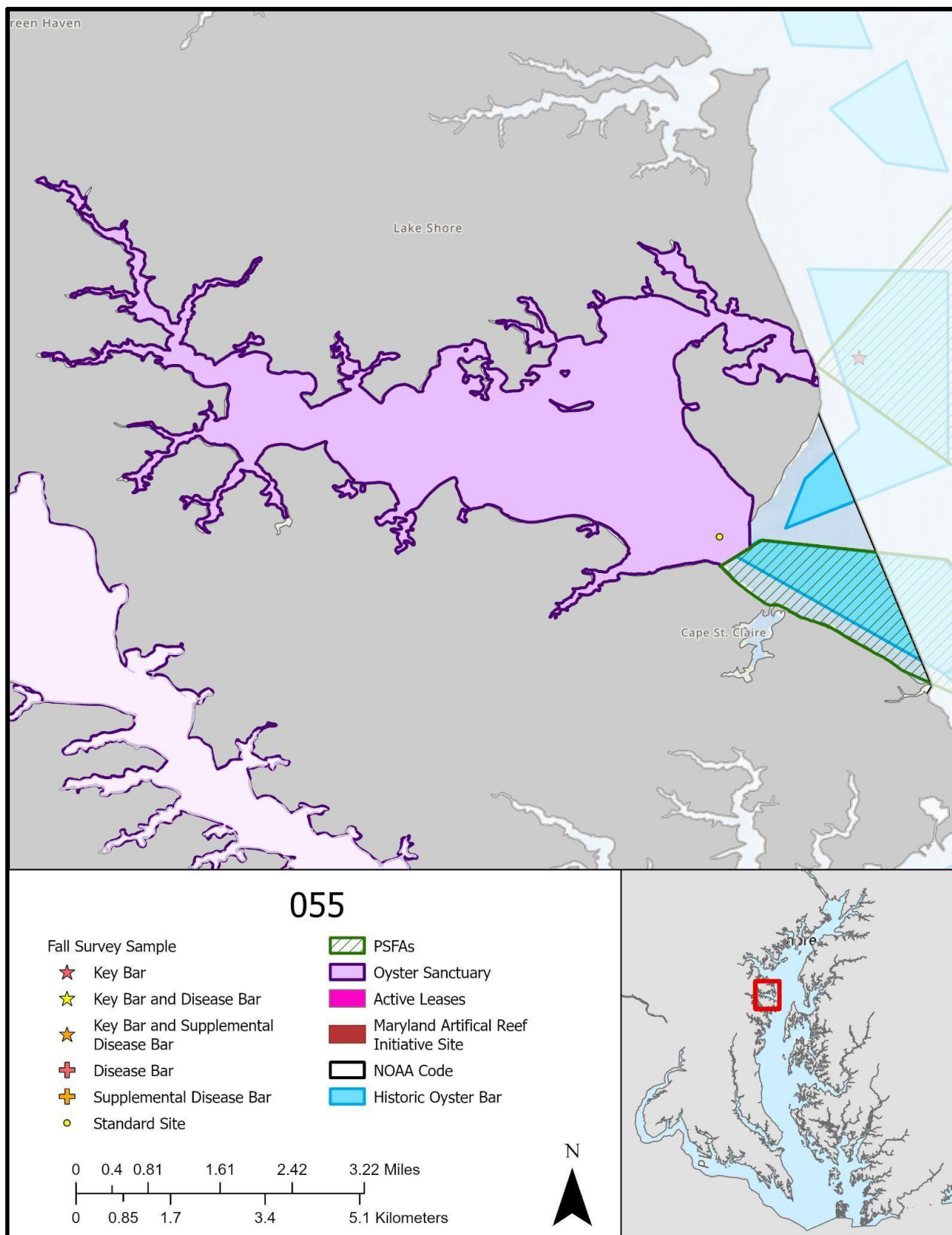


Figure B.08-1. Map of NOAA Code 055 (Magothy River).

Section B.09: NOAA Code 057 – Manokin River

NOAA Code 057 (Manokin River) is 20,172 surface acres; however, 16,320 acres (80%) of the area is within a current sanctuary boundary (Manokin River Sanctuary, established in 2010). There are 1,825 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary²⁰. There are 519 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's high salinity region (Zone 3).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.09-1)
- Harvest (Figure B.09-2)
- Summary Statistics (Table B.09-1)

In 2022 the Department added a standard Fall Oyster Survey site in the non-sanctuary portion of this NOAA Code. Because of the lack of data from the other time periods, there are no trends to report.

From 2006 to 2025, 4,400 bushels of shell and 10 million hatchery-spat-on-shell have been planted in the non-sanctuary portion of the NOAA Code. All of the shell was planted in 2023 and 2024. None of the hatchery spat-on-shell was planted between 2021 and 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in the sanctuary (Figure B.09-2). The sanctuary was established in 2010, putting 80% of the area off-limits to harvest. Power dredge and hand tong were the primary commercial harvest gears in the 2021-2025 period. The small area outside the sanctuary continues to provide a low amount of harvest.

²⁰ See chart 44 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

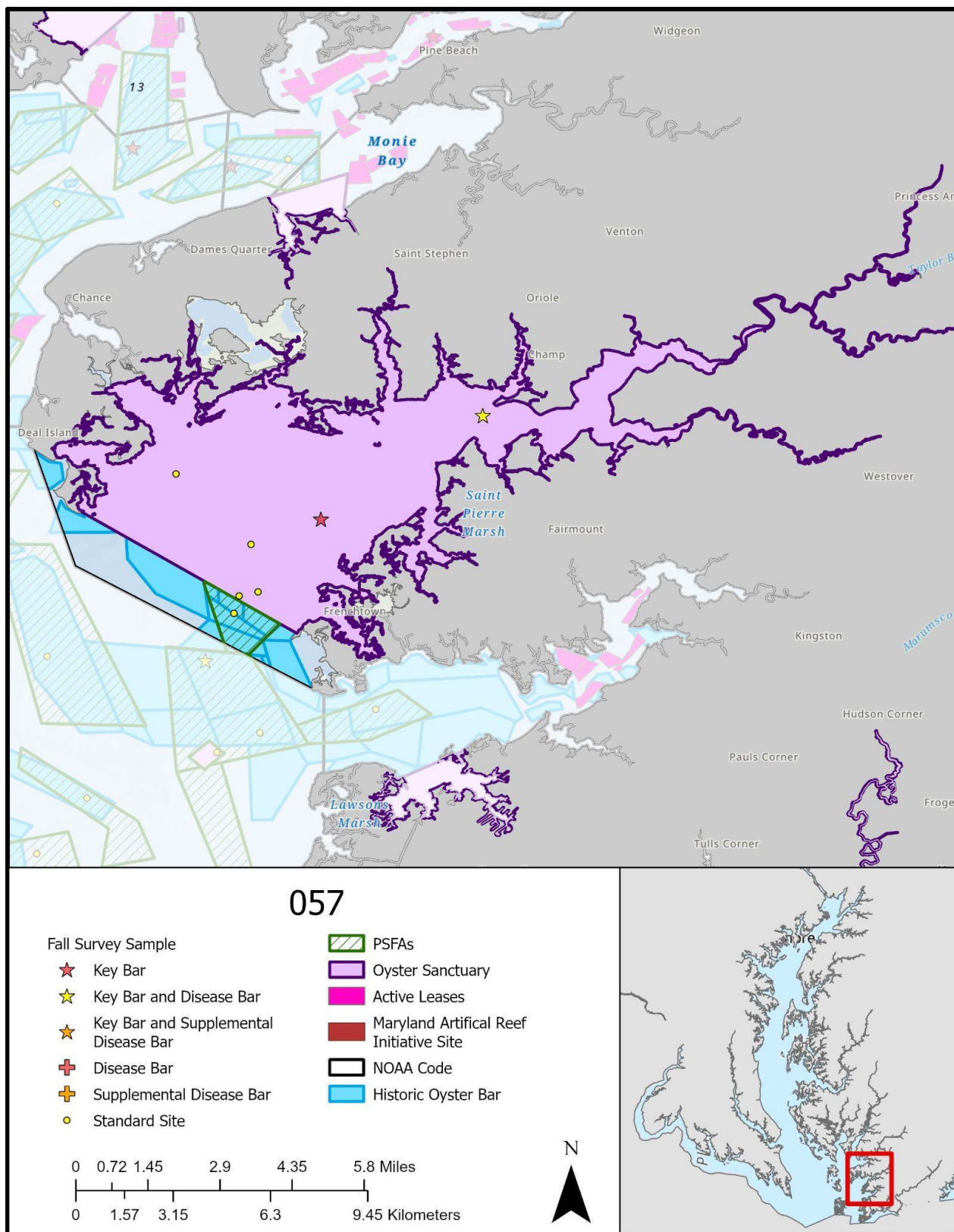


Figure B.09-1. Map of NOAA Code 057 (Manokin River).

Table B.09-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 057 (Manokin River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	ND	ND	ND	4/4
Number of Live Spat Oysters per square meter	ND	ND	ND	115 $\pm$ 56
Number of Live Small Oysters per square meter	ND	ND	ND	30 $\pm$ 8
Number of Live Market Oysters per square meter	ND	ND	ND	7.3 $\pm$ 1.7
Number of Live Oysters per square meter	ND	ND	ND	151 $\pm$ 64
Live Biomass (g Dry Weight per Bushel)	ND	ND	ND	ND
Observed Mortality (%)	ND	ND	ND	18 $\pm$ 3
Cultch (Bushels per 100 feet towed)	ND	ND	ND	0.8 $\pm$ 0.2
Harvest (Bushels)	416	1,041	1,148	401

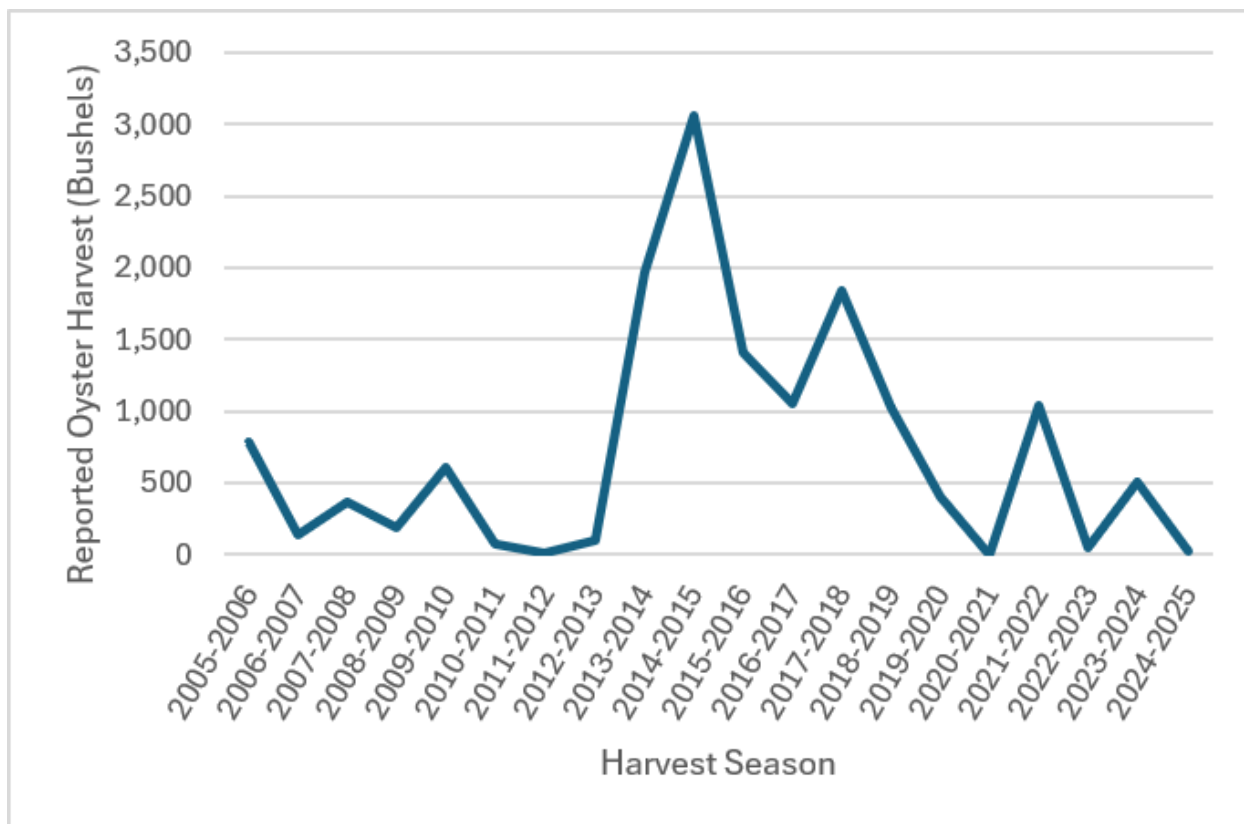


Figure B.09-2. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 057 (Manokin River). Since 2010, 80% of the NOAA Code area has been designated as a sanctuary.

Section B.10: NOAA Code 060 – Miles River

NOAA Code 060 encompasses the Miles River and is located in Maryland's upper eastern portion of Chesapeake Bay. The entire NOAA Code is 12,662 acres and has 26 historic oyster bars²¹. The Miles River Sanctuary encompasses 27% (3,449 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 9,213 surface acres. There are 3,089 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 5,458 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.10-1)
- Summary statistics (Table B.10-1)
- Density per year (Figure B.10-2)
- Shell height frequencies (Figure B.10-3)
- Biomass per year (Figure B.10-4)
- Observed mortality (Figure B.10-5)
- Dermo and MSX per year (Figure B.10-6)
- Cultch per year (Figure B.10-7)
- Harvest (Figure B.10-8)

The density of live oysters increased substantially in the 2021-2025 period. This growth was driven by sharp increases in spat, small, and market-sized oyster densities. Average oyster shell height declined during 2021-2025, likely due to larger numbers of spat from plantings. Biomass has shown a consistent upward trend through the time series, while observed mortality has declined substantially to a historic low in the 2021-2025 time period. MSX was detected in only one year (2016), while dermo prevalence and intensity declined through 2021, then climbed again through 2025. The amount of cultch increased throughout the time series.

From 2006 to 2025, approximately 265 million hatchery spat-on-shell and 20,000 bushels of shell (including 10,000 bushels of Gigas shells) were planted in the non-sanctuary portions of the NOAA Code. All of the shell and the majority of hatchery spat-on-shell was planted between 2021 and 2025. This area has benefited from additional plantings due to the funding provided by the General Assembly for Eastern Bay and its tributaries during 2024-2026.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in the sanctuary. Following the sanctuary's establishment in 2010, 27% of the area was closed to harvest. Hand tongs and diving were the primary gears during 2021-2025. While

²¹ See chart 12 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

harvests are low, the 5-year averages have been relatively consistent through time with peaks in harvest during the 2015-2016 and 2024-2025 seasons.

This area is characterized by increasing abundance and oyster density as well as harvest in recent years, in part driven by multiple years of intense enhancement activity, good recruitment and low natural mortality.

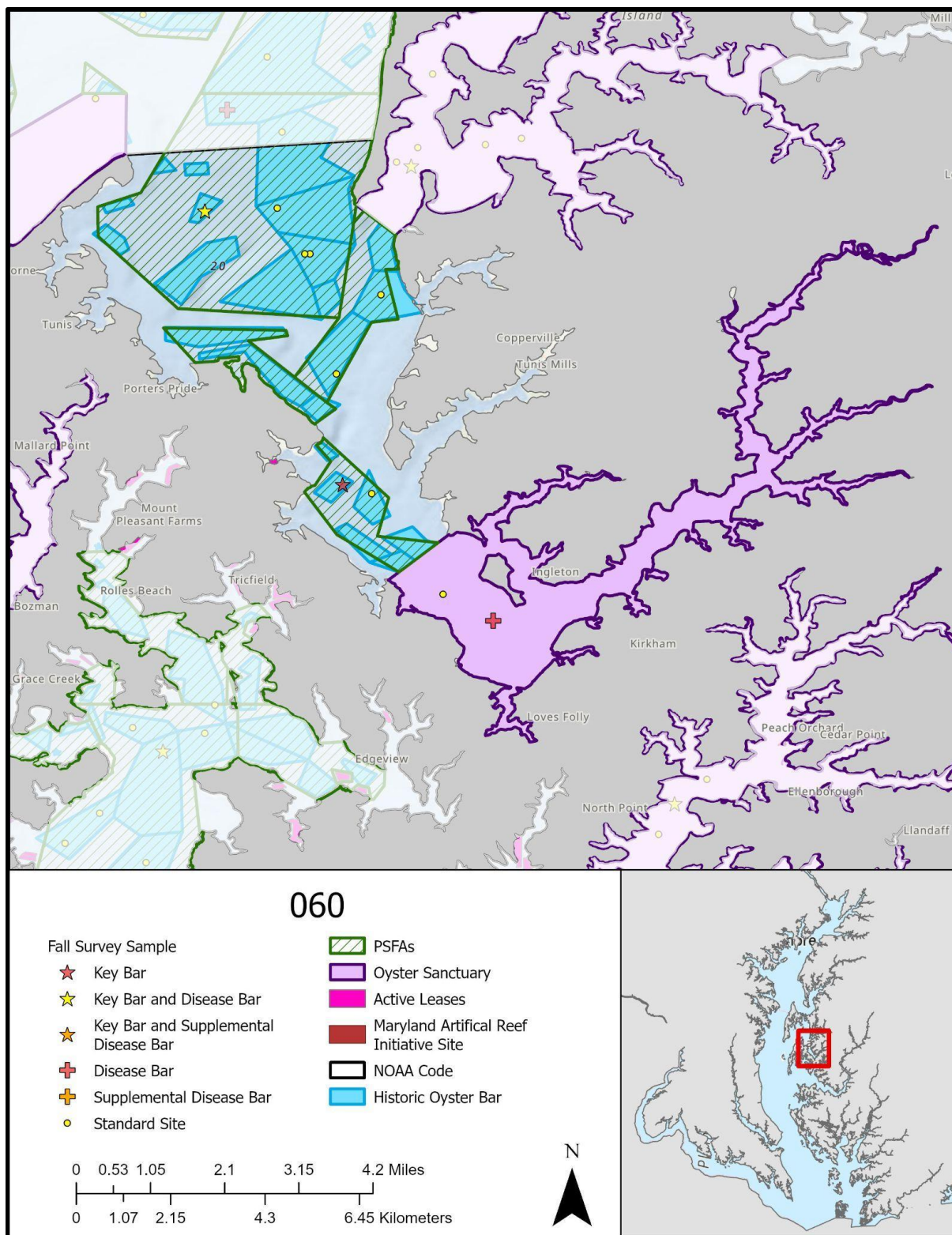


Figure B.10-1. Map of NOAA Code 060 (Miles River). Fall Oyster Survey sites may not be sampled every year.

Table B.10-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 060 (Miles River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/40	5/35	5/35	5/38
Number of Live Spat Oysters per square meter	0.7 $\pm$ 0.2	0.7 $\pm$ 0.4	0.1 $\pm$ 0.1	35 $\pm$ 9
Number of Live Small Oysters per square meter	3 $\pm$ 0.5	3.6 $\pm$ 0.8	0.8 $\pm$ 0.2	62 $\pm$ 15
Number of Live Market Oysters per square meter	16.4 $\pm$ 2.7	7.8 $\pm$ 1.4	8.5 $\pm$ 1.3	70 $\pm$ 18
Number of Live Oysters per square meter	20 $\pm$ 2.7	12 $\pm$ 1.8	9.4 $\pm$ 1.4	168.3 $\pm$ 32
Live Biomass (g Dry Weight per Bushel)	72 $\pm$ 6.3	92 $\pm$ 21.2	108.5 $\pm$ 10	180.2 $\pm$ 29.5
Observed Mortality (%)	30 $\pm$ 2.5	7.3 $\pm$ 1.5	14 $\pm$ 1.3	3.5 $\pm$ 0.7
Cultch (Bushels per 100 feet towed)	0.6 $\pm$ 0.05	0.3 $\pm$ 0.05	0.2 $\pm$ 0.01	1.4 $\pm$ 0.2
Harvest (Bushels)	1,148	575	1,422	1,177

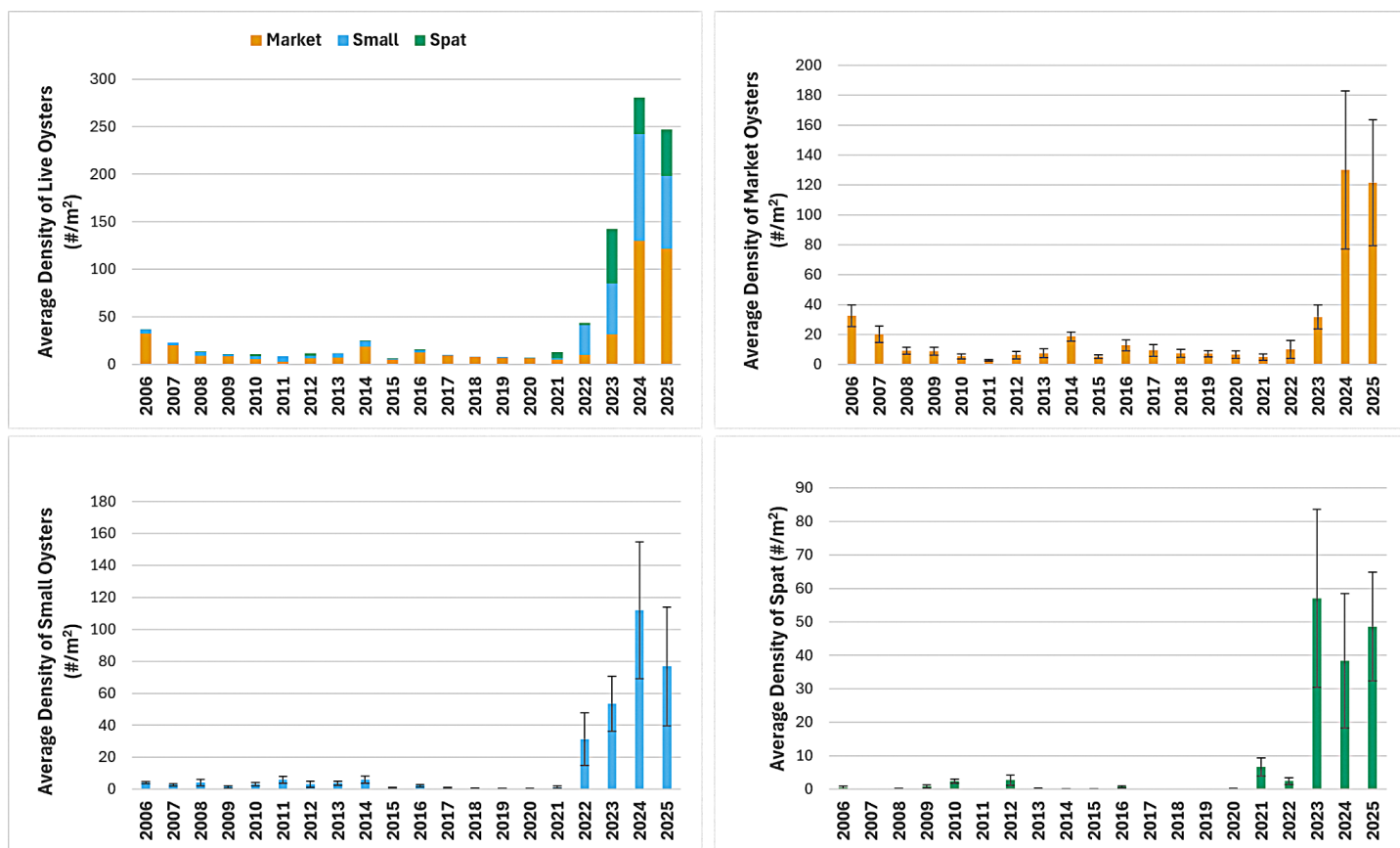


Figure B.10-2. Average number of live oysters per square meter by size class in NOAA Code 060 (Miles River) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Miles River (060)

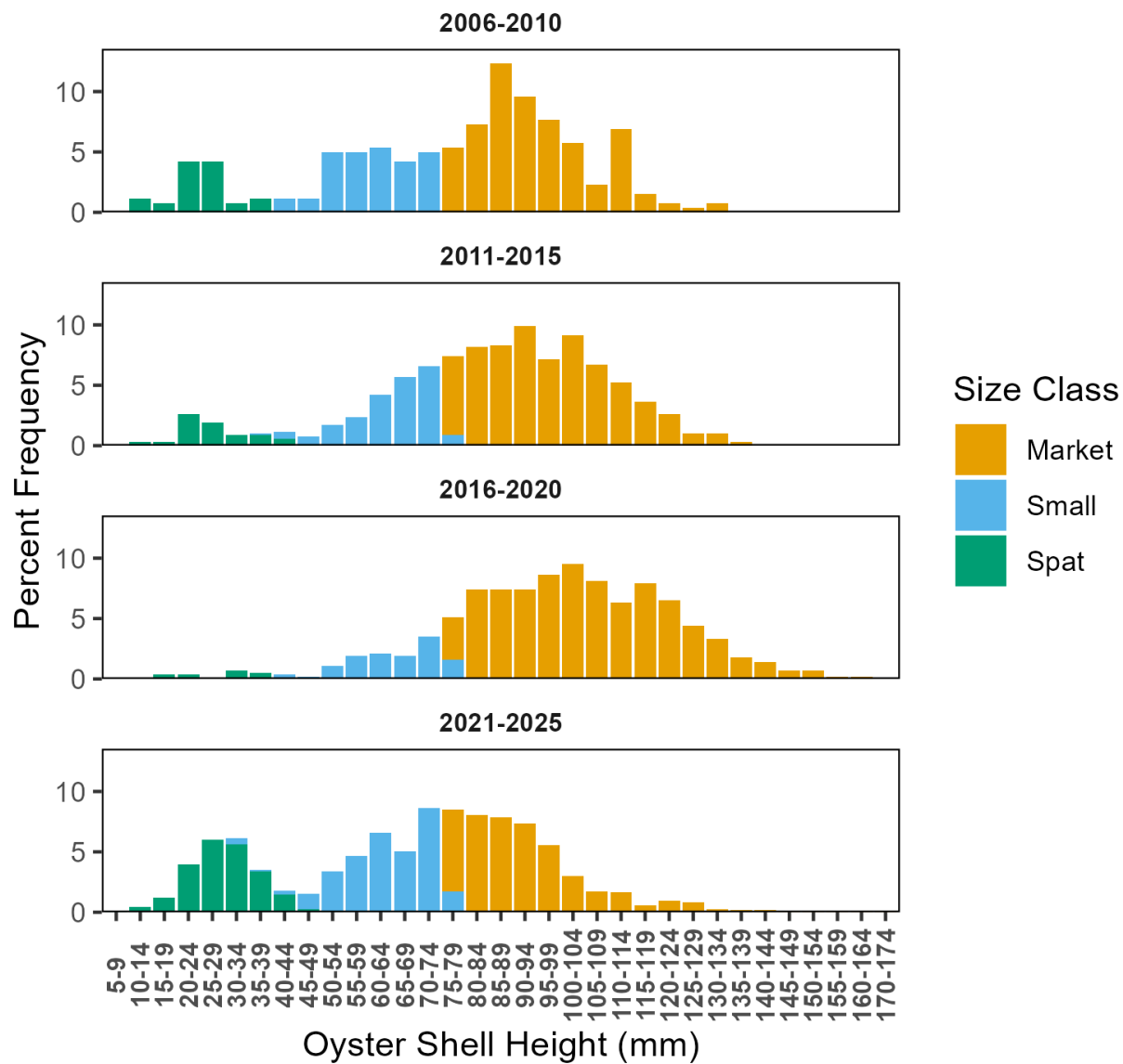


Figure B.10-3. Shell height frequencies of live oysters in NOAA Code 060 (Miles River) occurring outside of the current sanctuary area.

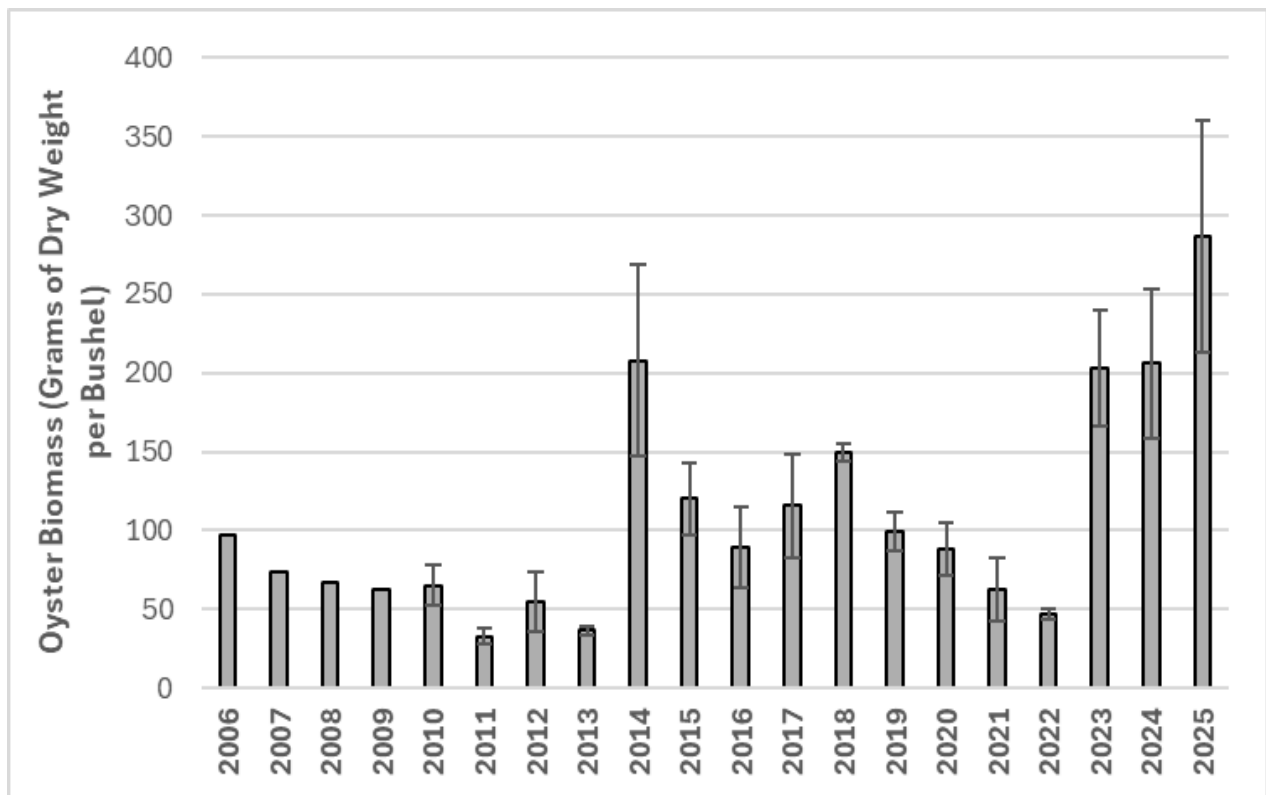


Figure B.10-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 060 (Miles River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

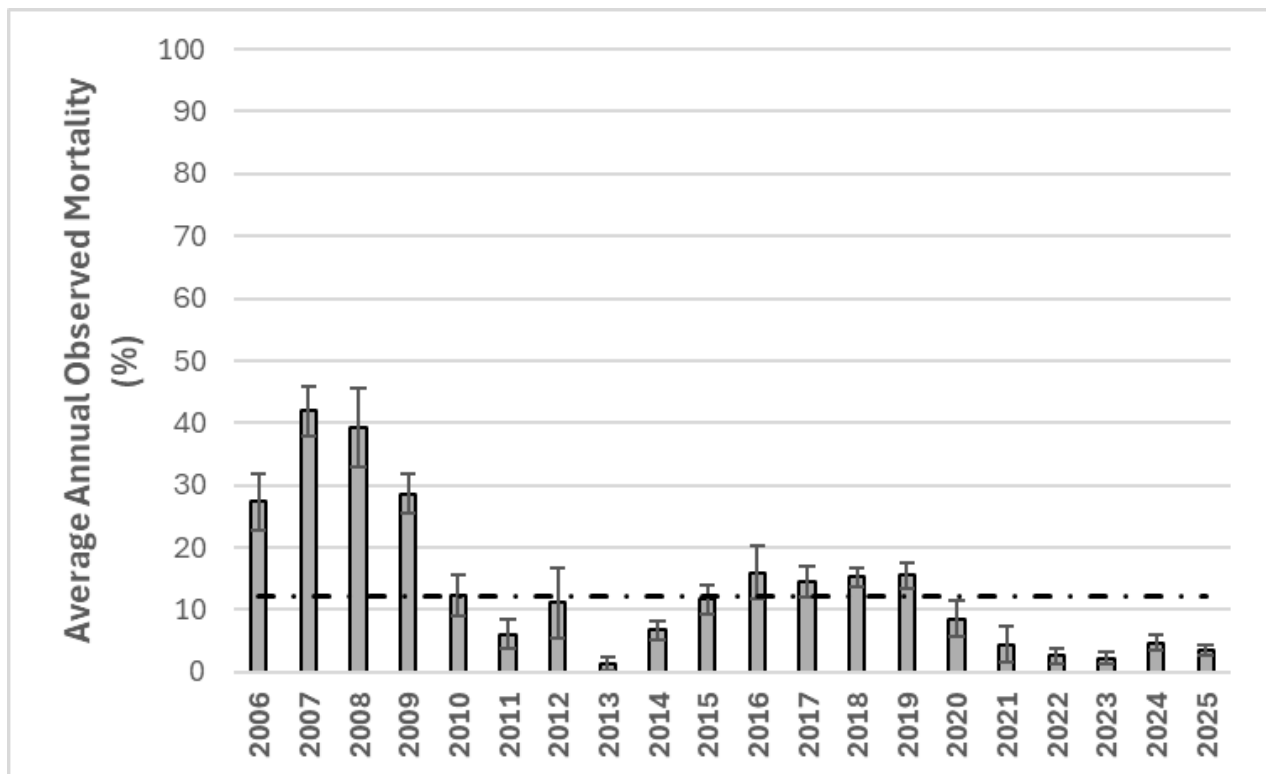


Figure B.10-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 060 (Miles River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2026 baywide average observed mortality. Error bars represent ± 1 standard error.

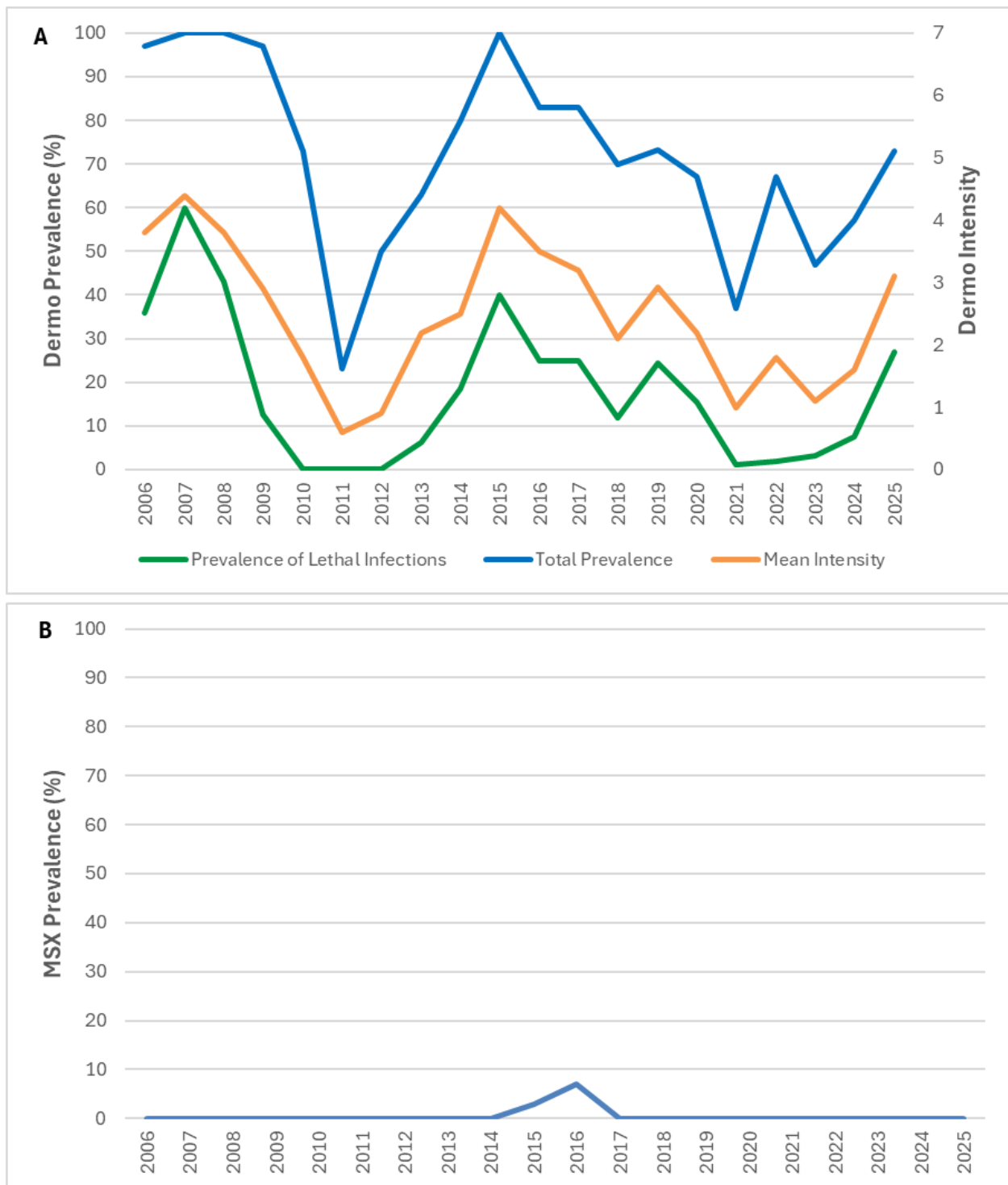


Figure B.10-6. Oyster disease prevalence and intensity in NOAA Code 060 (Miles River) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Turtleback bar.

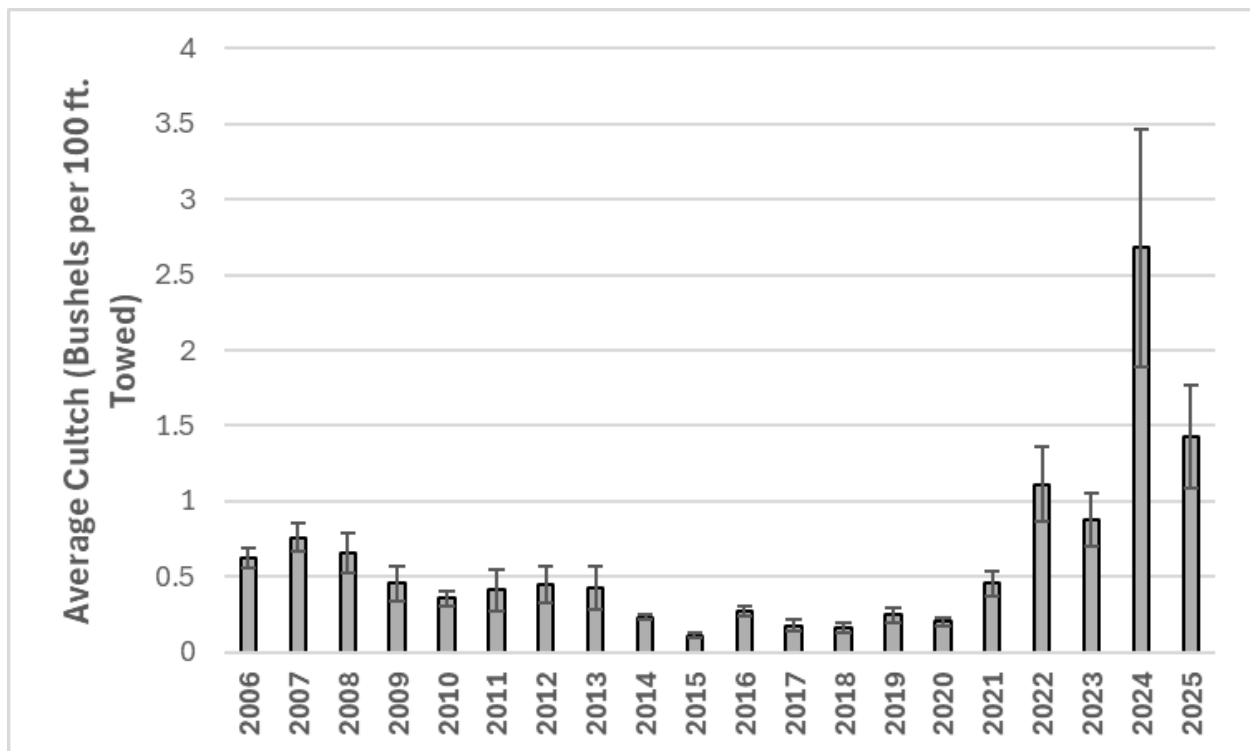


Figure B.10-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 060 (Miles River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

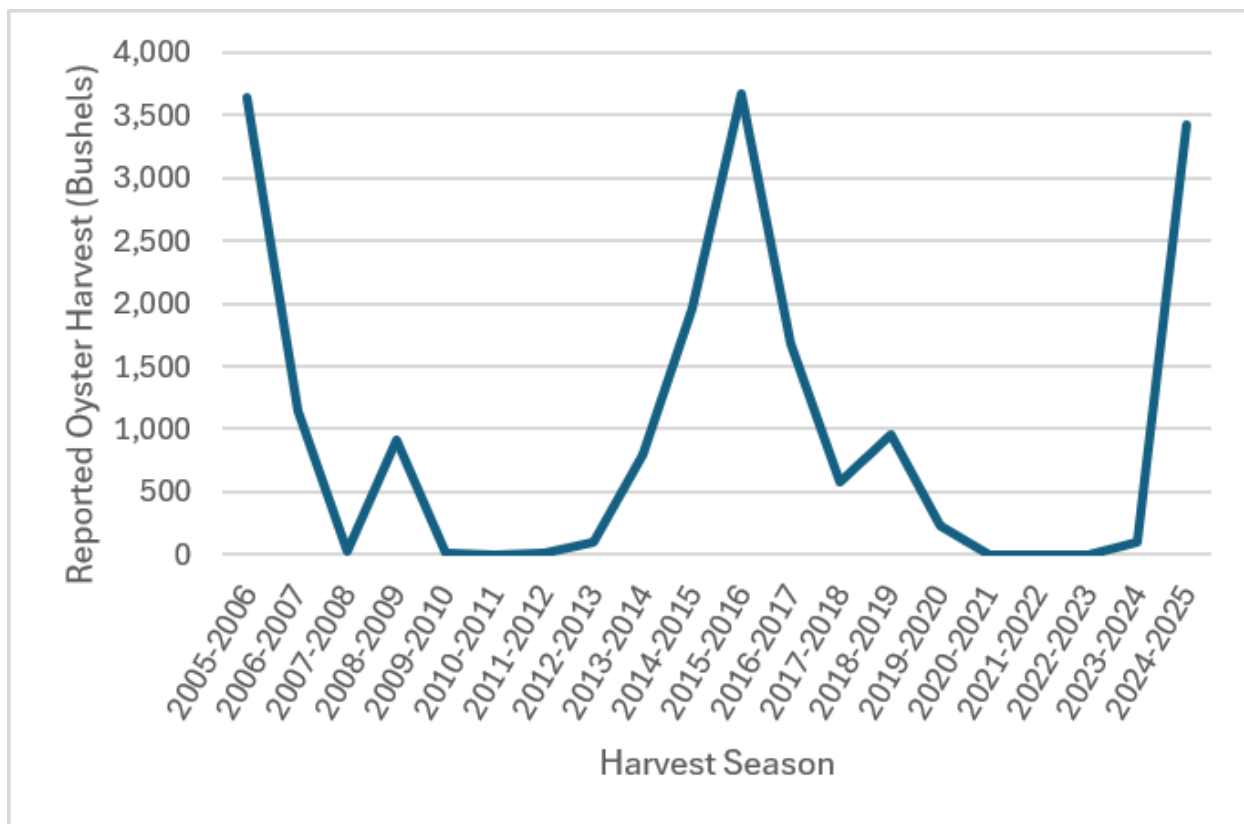


Figure B.10-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 060 (Miles River). Since 2010, 27% of the NOAA Code area has been designated as a sanctuary.

Section B.11: NOAA Code 062 – Nanticoke River

NOAA Code 062 encompasses the Nanticoke River and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 18,971 acres and has 20 historic oyster bars²². The Nanticoke River Sanctuary encompasses 88% (16,699 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 2,272 surface acres. There are 680 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 811 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. The non-sanctuary portion of this NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.11-1)
- Summary Statistics (Table B.11-1)
- Harvest (Figure B.11-2)

In 2021 the Department added a standard Fall Oyster Survey site in the non-sanctuary portion of this NOAA Code. Because of the lack of data from other time periods, there are no trends to report.

From 2006 to 2025, approximately 204 million hatchery spat-on-shell, 180,000 bushels of shell and 67,000 bushels of wild seed were planted in the non-sanctuary portions of the NOAA Code. From 2021 to 2025, enhancements included 20,000 bushels of shell, 7,200 bushels of wild seed and 117 million hatchery-spat-on-shell.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in the sanctuary. Following the establishment of the sanctuary in 2010, 88% of the area was closed to harvest. Power dredging was the primary gear during 2021-2025. This area is consistently a medium to high harvest area and appears to be relatively stable.

²² See chart 31 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

Table B.11-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 062 (Nanticoke River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	ND	ND	ND	4/7
Number of Live Spat Oysters per square meter	ND	ND	ND	348 $\pm$ 231*
Number of Live Small Oysters per square meter	ND	ND	ND	27 $\pm$ 11
Number of Live Market Oysters per square meter	ND	ND	ND	19 $\pm$ 6.5
Number of Live Oysters per square meter	ND	ND	ND	394 $\pm$ 224*
Live Biomass (g Dry Weight per Bushel)	ND	ND	ND	ND
Observed Mortality (%)	ND	ND	ND	6.7 $\pm$ 3.1
Cultch (Bushels per 100 feet towed)	ND	ND	ND	0.7 $\pm$ 0.1
Harvest (Bushels)	579	6,908	7,011	9,627

*Includes samples taken on hatchery-spat-on-shell plantings (average spat density without plantings is 41.9 $\pm$ 38, average total live is 96.5 $\pm$ 32 without plantings).

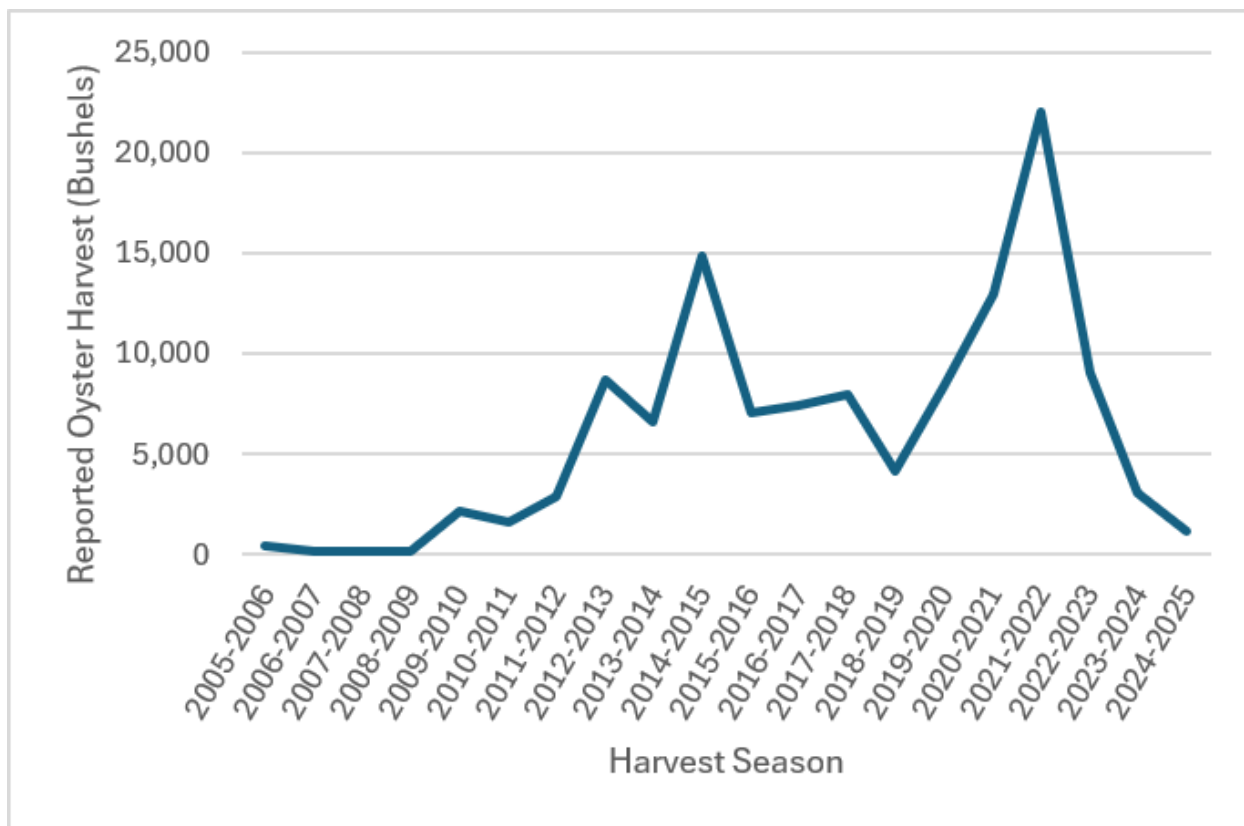


Figure B.11-2. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 062 (Nanticoke River). Since 2010, 88% of the NOAA Code area has been designated as a sanctuary.

Section B.12: NOAA Code 072 – Pocomoke Sound

NOAA Code 072 encompasses Pocomoke Sound and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 16,273 acres and has 16 historic oyster bars²³. The Kitts Creek Sanctuary encompasses 7% (1,181 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 15,092 surface acres. There are 4,018 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. None of the area within the NOAA Code was designated as a Public Shellfish Fishery Area. This NOAA Code is located within Maryland's high salinity region (Zone 3).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.12-1)
- Summary statistics (Table B.12-1)
- Density per year (Figure B.12-2)
- Shell height frequencies (Figure B.12-3)
- Biomass per year (Figure B.12-4)
- Observed mortality (Figure B.12-5)
- Dermo and MSX per year (Figure B.12-6)
- Cultch per year (Figure B.12-7)
- Harvest (Figure B.12-8)

The total live oyster density followed a non-linear trend, peaking during 2011-2015, declining during 2016-2020, and recovering during 2021-2025. Mean oyster shell height increased slightly during 2021-2025. Biomass followed a similar trend as density, while observed mortality was low and stable through 2020, then reached a peak in 2023. MSX prevalence was low throughout the time series, while dermo prevalence was 100% in 2023 before falling again. Cultch remained consistent throughout the time series.

From 2006 to 2025, approximately 46,000 bushels of shell and 10,000 bushels of crushed concrete were planted in the non-sanctuary portions of the NOAA Code. From 2021 to 2025, enhancements included all of the crushed concrete and 11,000 bushels of shell.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all of the time series. Following the establishment of the sanctuary in 2001, 7% of the NOAA Code was closed to harvest. Power dredge was the primary harvest gear during 2021-2025. This area is characterized by a relatively stable population with variable but generally low harvest.

²³ See chart 48 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

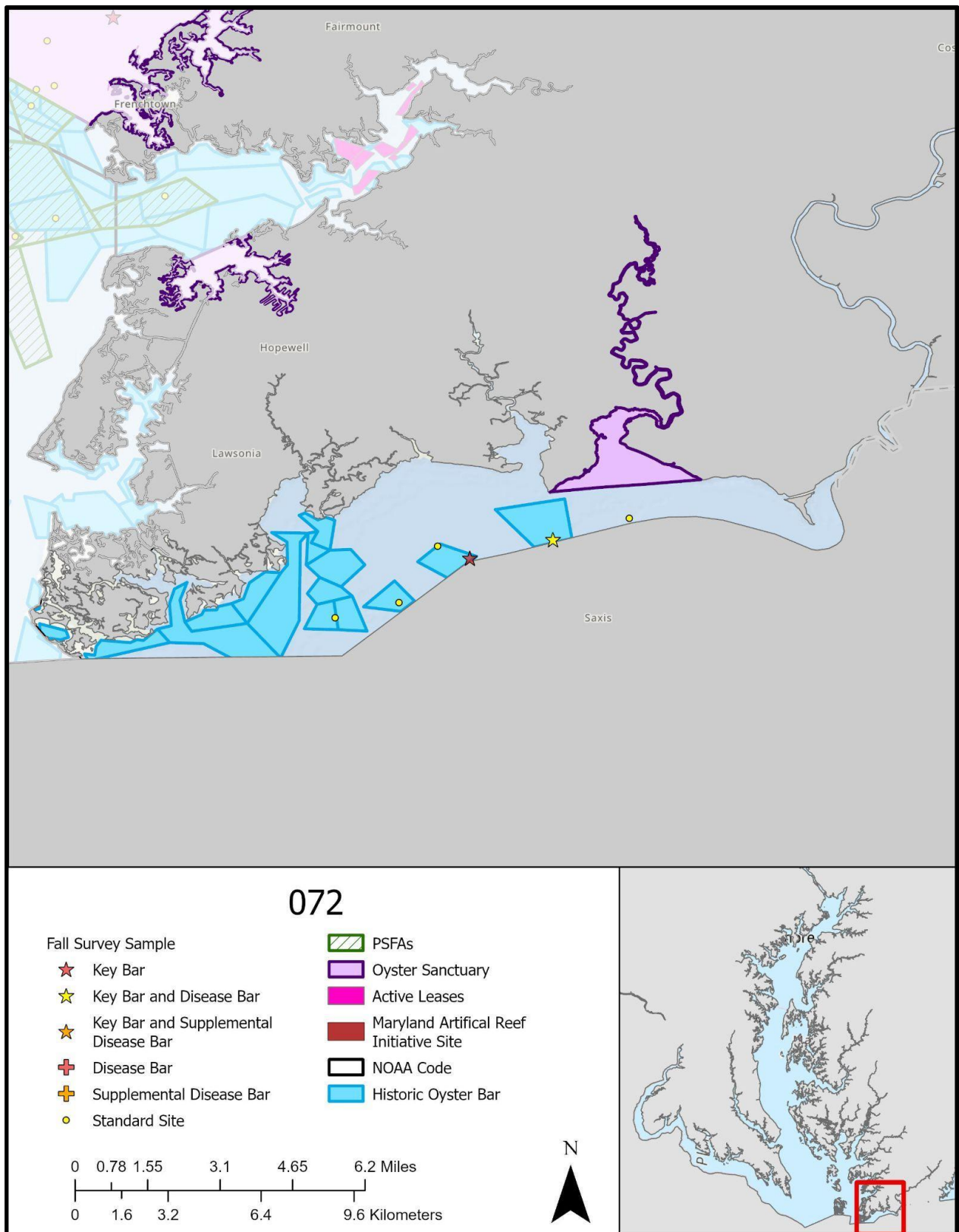


Figure B.12-1. Map of NOAA Code 072 (Pocomoke Sound). Fall Oyster Survey sites may not be sampled every year.

Table B.12-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 072 (Pocomoke Sound) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/30	5/30	5/30	5/31
Number of Live Spat Oysters per square meter	40 $\pm$ 16	77 $\pm$ 22	34 $\pm$ 5.6	79 $\pm$ 17
Number of Live Small Oysters per square meter	24 $\pm$ 6.3	102 $\pm$ 21	58 $\pm$ 9.1	54 $\pm$ 14
Number of Live Market Oysters per square meter	11 $\pm$ 2.7	40 $\pm$ 8	13 $\pm$ 3	27.5 $\pm$ 6.2
Number of Live Oysters per square meter	75 $\pm$ 17	219 $\pm$ 39	105 $\pm$ 14	160.4 $\pm$ 31
Live Biomass (g Dry Weight per Bushel)	41.2 $\pm$ 9	161.6 $\pm$ 22.2	83.6 $\pm$ 14.1	108.3 $\pm$ 15.2
Observed Mortality (%)	13 $\pm$ 1.5	10 $\pm$ 1.3	9.3 $\pm$ 1.7	15 $\pm$ 1.7
Cultch (Bushels per 100 feet towed)	1 $\pm$ 0.1	1.2 $\pm$ 0.1	0.9 $\pm$ 0.1	1 $\pm$ 0.1
Harvest (Bushels)	747	18,268	5,204	5,216

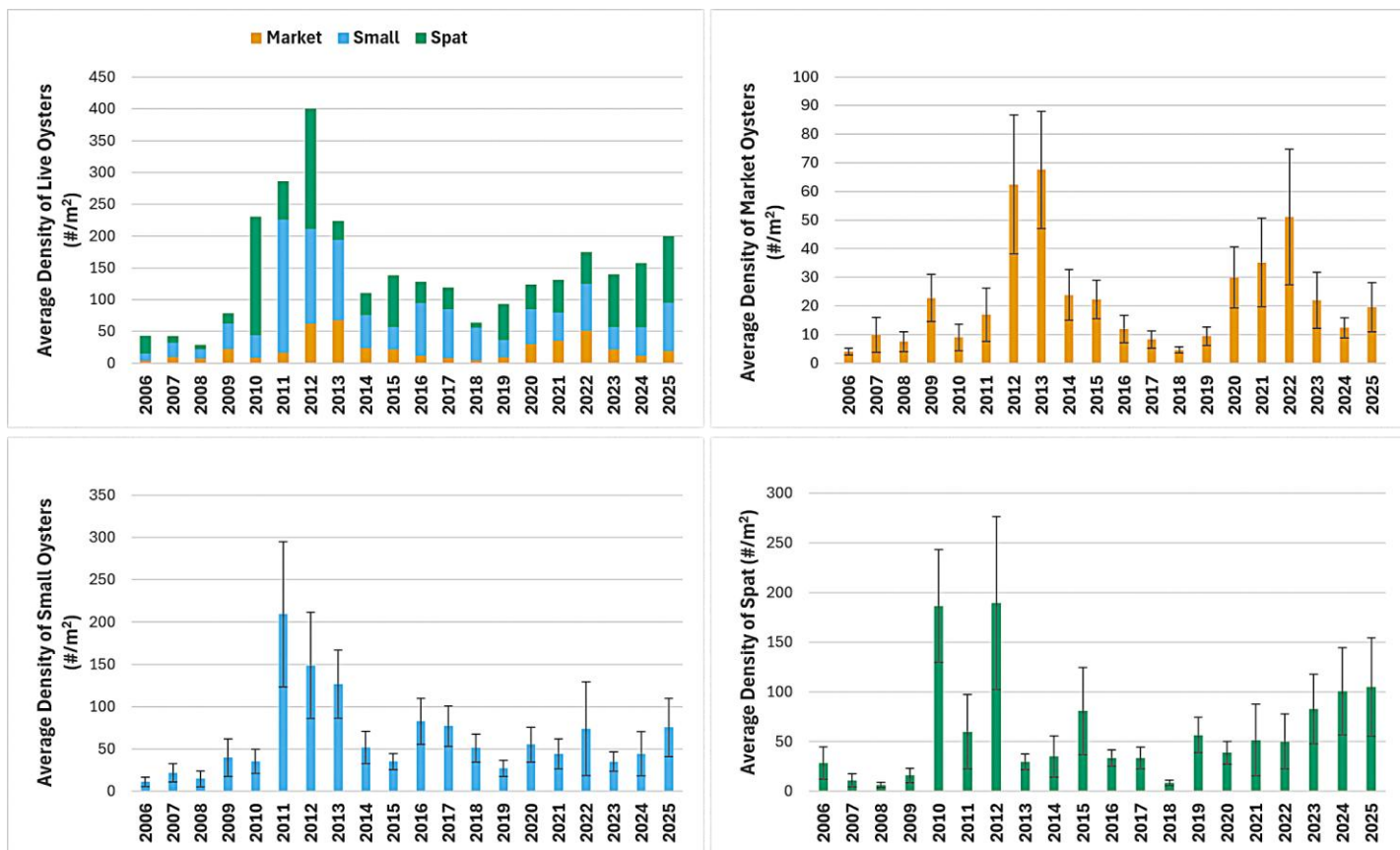


Figure B.12-2. Average number of live oysters per square meter by size class in NOAA Code 072 (Pocomoke Sound) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Pocomoke Sound (072)

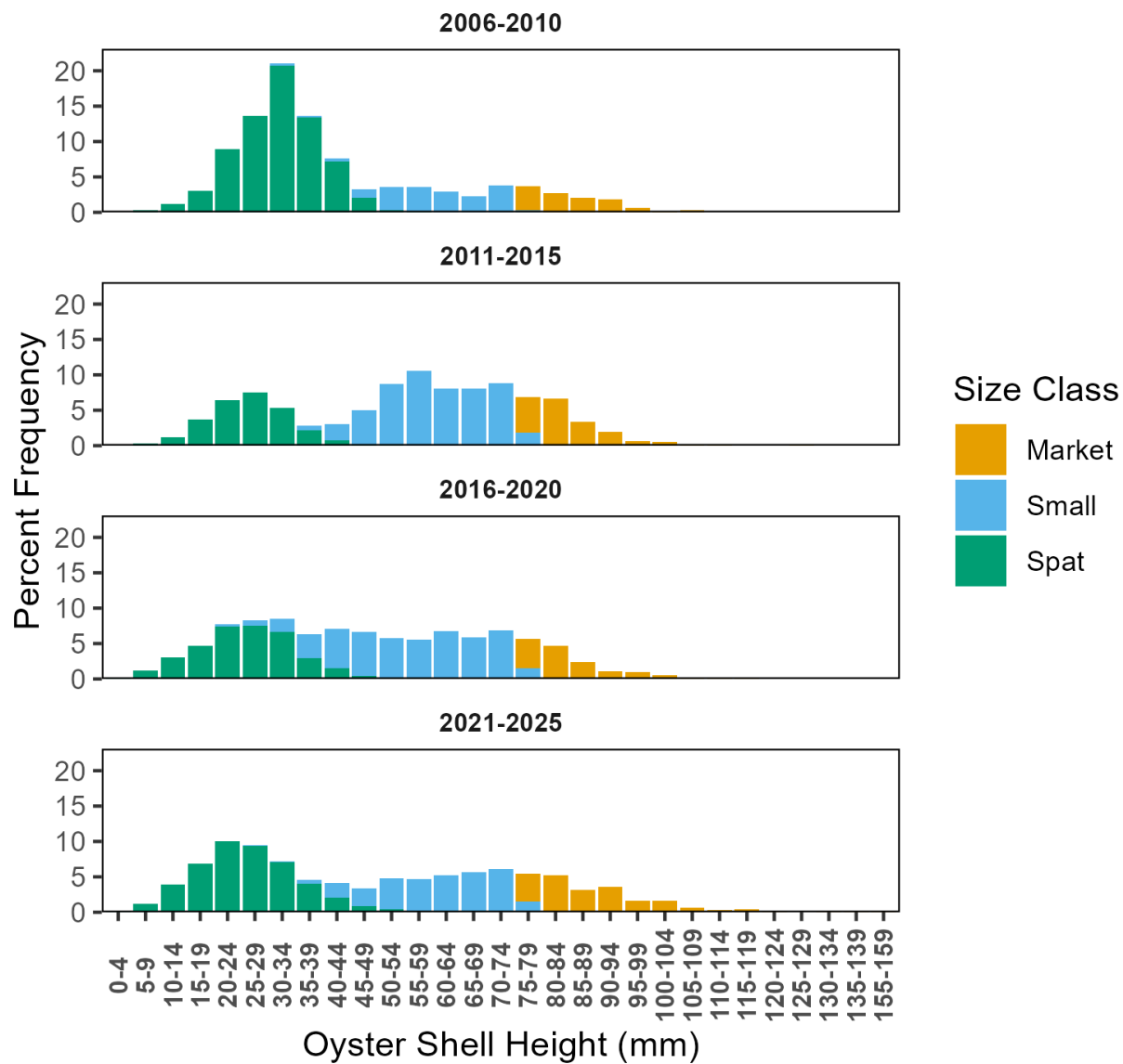


Figure B.12-3. Shell height frequencies of live oysters in NOAA Code 072 (Pocomoke Sound) outside of the current sanctuary area.

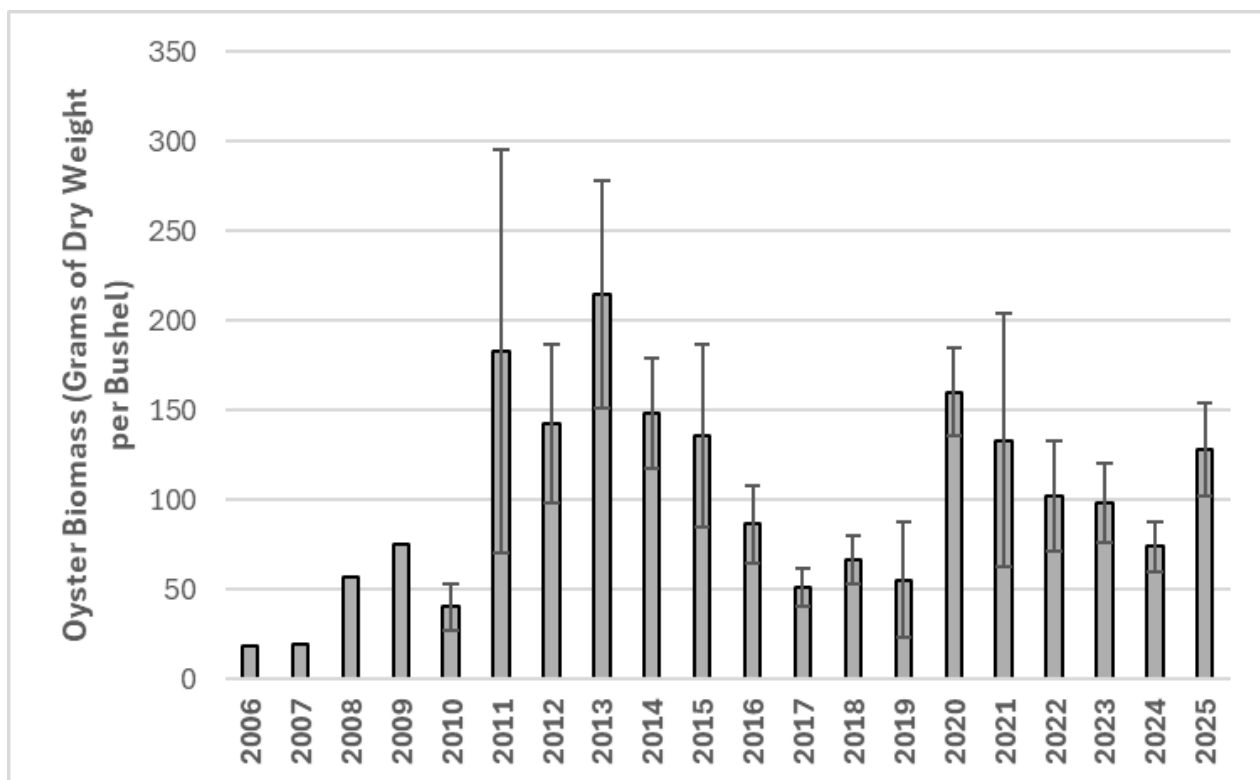


Figure B.12-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 072 (Pocomoke Sound) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

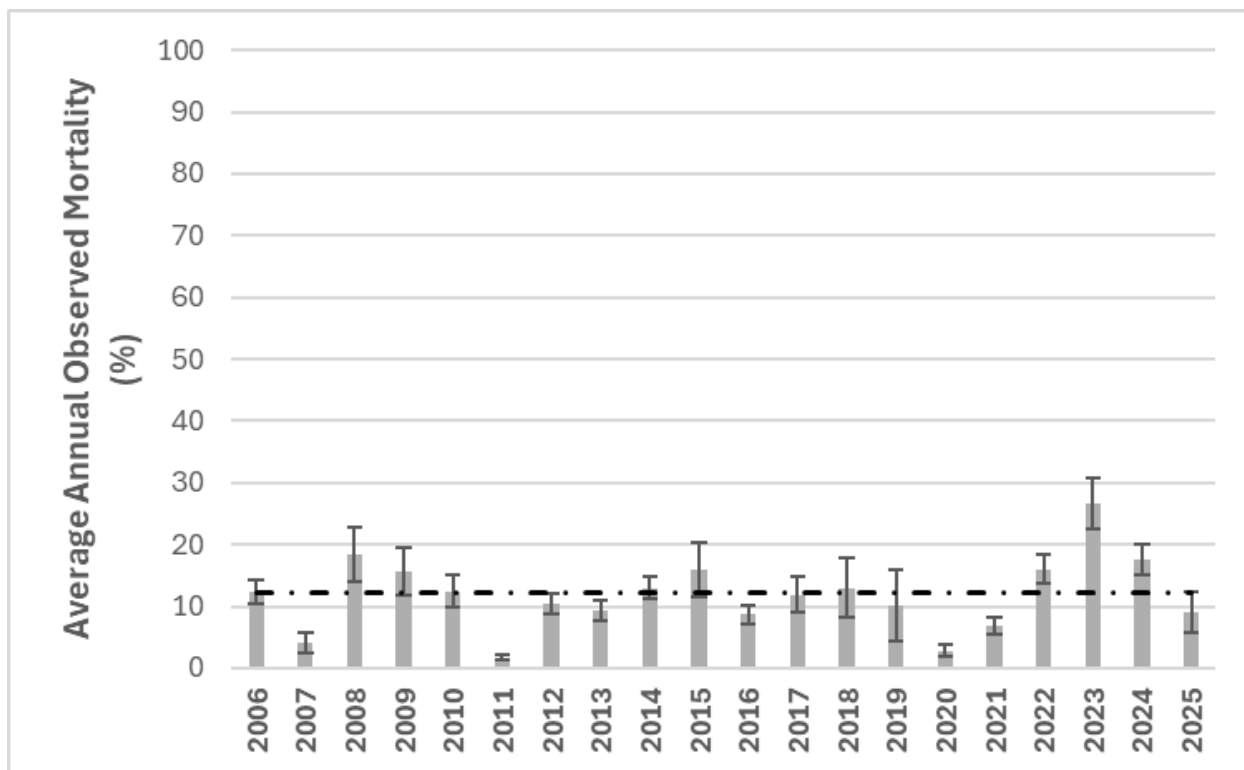


Figure B.12-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 072 (Pocomoke Sound) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

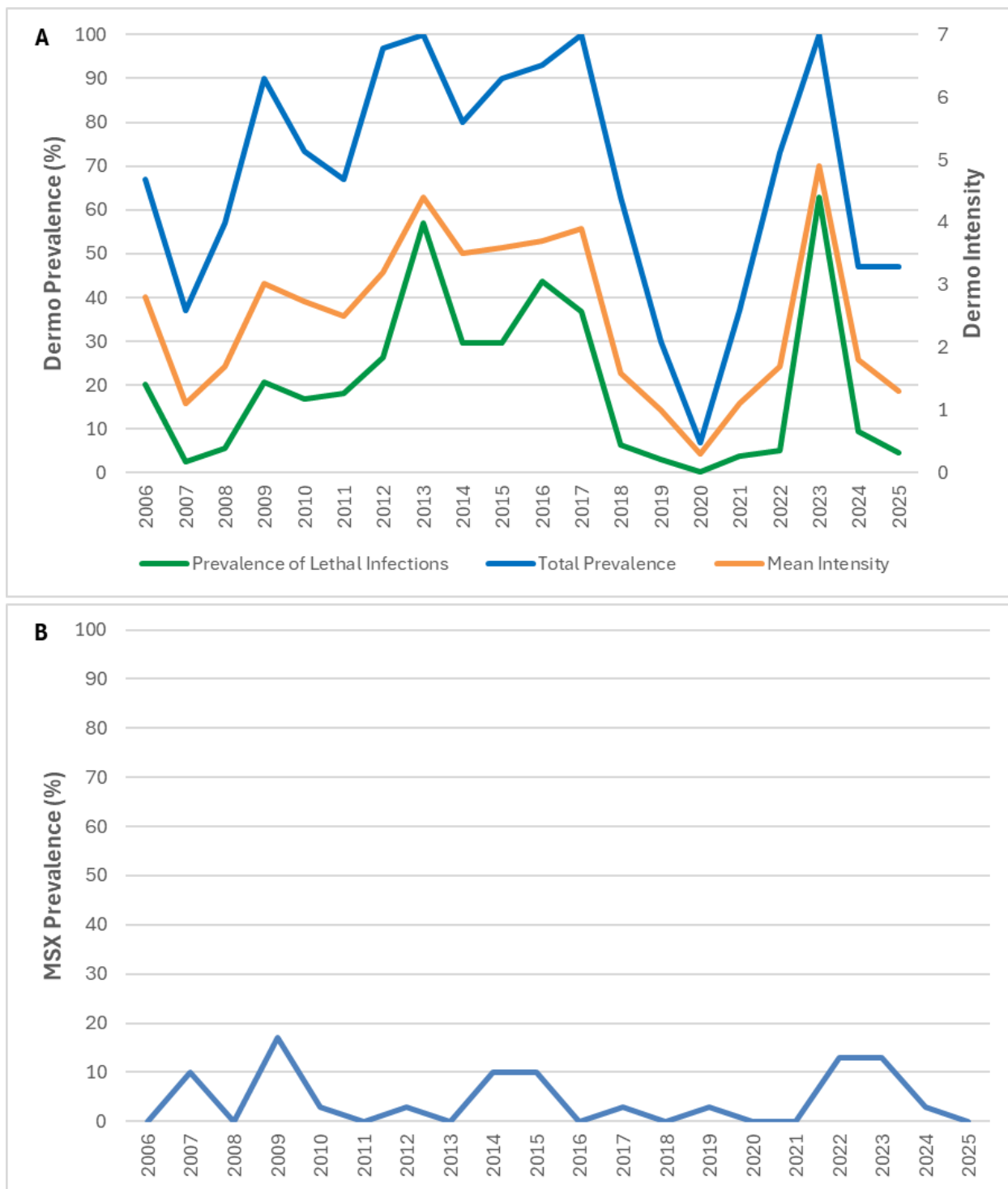


Figure B.12-6. Oyster disease prevalence and intensity in NOAA Code 072 (Pocomoke Sound) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Marumsco bar.

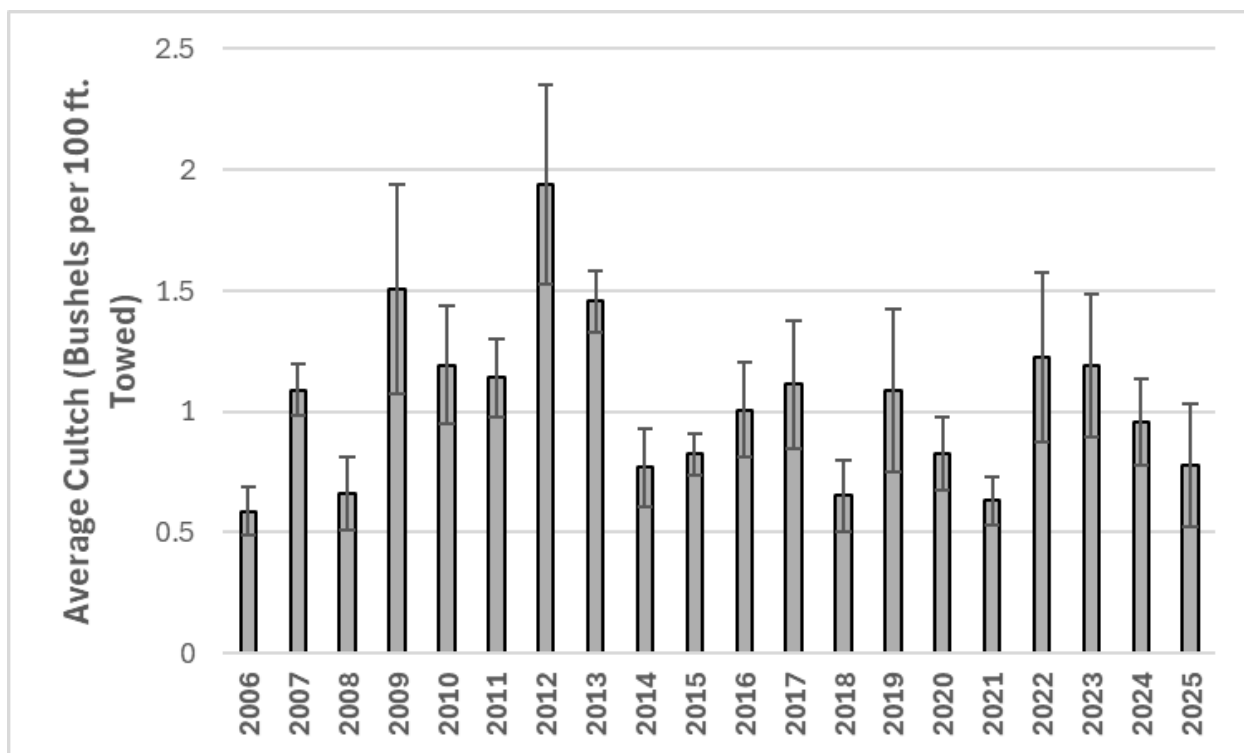


Figure B.12-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 072 (Pocomoke Sound) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

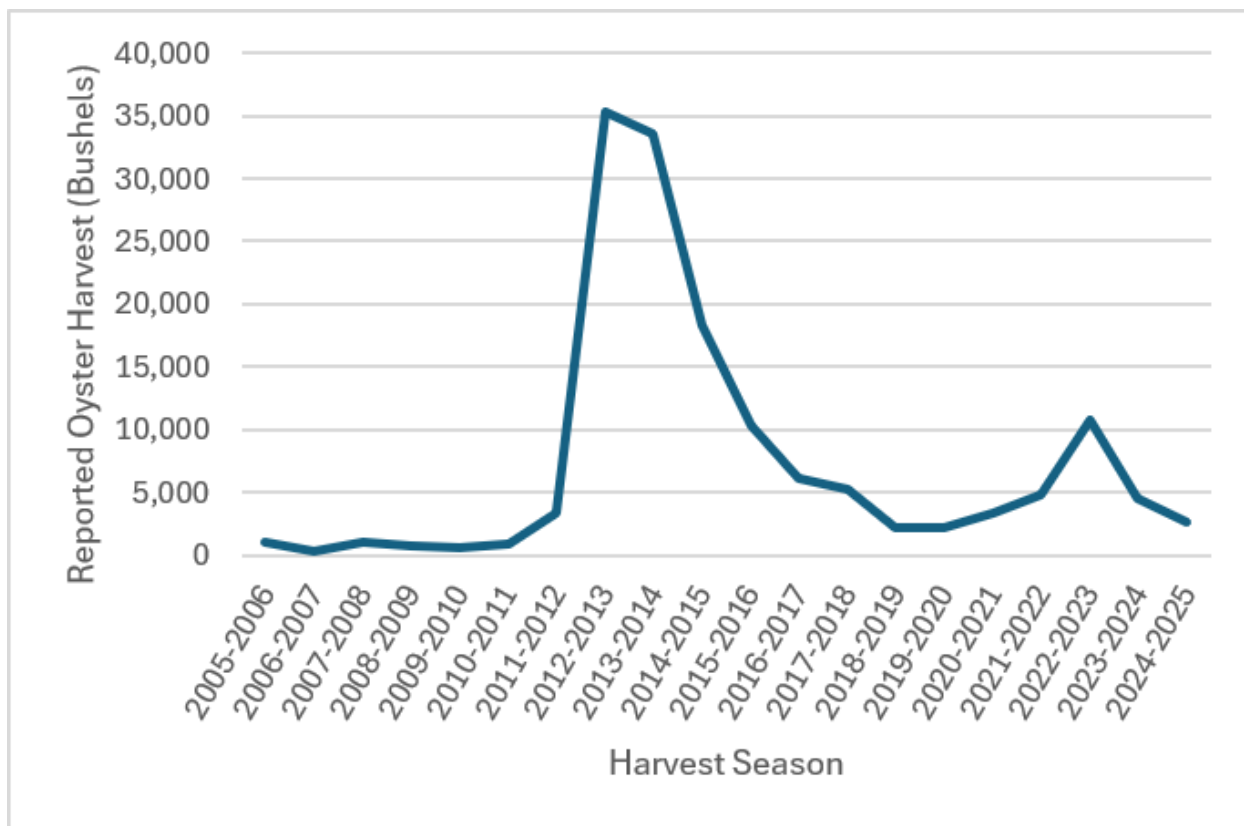


Figure B.12-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 072 (Pocomoke Sound). Since 2001, 7% of the NOAA Code area has been designated as a sanctuary.

Section B.13: NOAA Code 078 – St. Marys River

NOAA Code 078 encompasses the St. Marys River, a tributary of the Potomac River, and is located in Maryland's lower western portion of Chesapeake Bay. The entire NOAA Code is 6,020 acres and has 32 historic oyster bars²⁴. The St Marys Sanctuary encompasses 21% (1,304 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 4,716 surface acres. There are 1,096 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 1,981 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2). This report includes two bars, Hurdle and Milbourne Shores, that are in NOAA Code 177 (lower Potomac River) but are considered to be within Maryland waters and outside of PRFC jurisdiction.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.13-1)
- Summary statistics (Table B.13-1)
- Density per year (Figure B.13-2)
- Shell height frequencies (Figure B.13-3)
- Biomass per year (Figure B.13-4)
- Observed mortality (Figure B.13-5)
- Dermo and MSX per year (Figure B.13-6)
- Cultch per year (Figure B.13-7)
- Harvest (Figure B.13-8)

The density of live oysters showed a substantial increase over the study period, driven by dramatic increases in all size classes, most notably a significant jump in spat and small oyster density in the most recent period. Shell height frequencies were similar throughout the time series. Oyster biomass has consistently trended upward, nearly quadrupling from the 2006-2010 to 2021-2025 time periods. The availability of cultch nearly doubled over the same time frame. Observed mortality has been below the long-term average (12%) since 2018. MSX prevalence has generally been low, with peaks in 2009 and 2016 and a slight uptick in 2025. Dermo prevalence and intensity have fallen since a peak in 2023.

From 2006 to 2025, approximately 23 million hatchery spat-on-shell, 3,900 bushels of wild seed and 111,000 bushels of shell (including 3,000 bushels of Pacific oyster (*Magallana gigas*) (west coast) shell) were planted in the non-sanctuary portions of the NOAA Code. From 2021 to 2025, enhancements included 63,000 bushels of shell, while no hatchery spat-on-shell introductions occurred during this period.

²⁴ See chart 38 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all of the time series. Following the establishment of the sanctuary in 2010, 21% of the NOAA Code was closed to harvest. Reported harvest has increased consistently across every interval, with a peak of 27,000 bushels harvested in the 2024-2025 season. Power dredge was the primary gear during 2021-2025. This area is characterized by increasing abundance and oyster density as well as increasing harvest. This is one of the few areas where fishing mortality was above the limit reference point in the latest Oyster Benchmark Stock Assessment indicating overfishing is occurring.

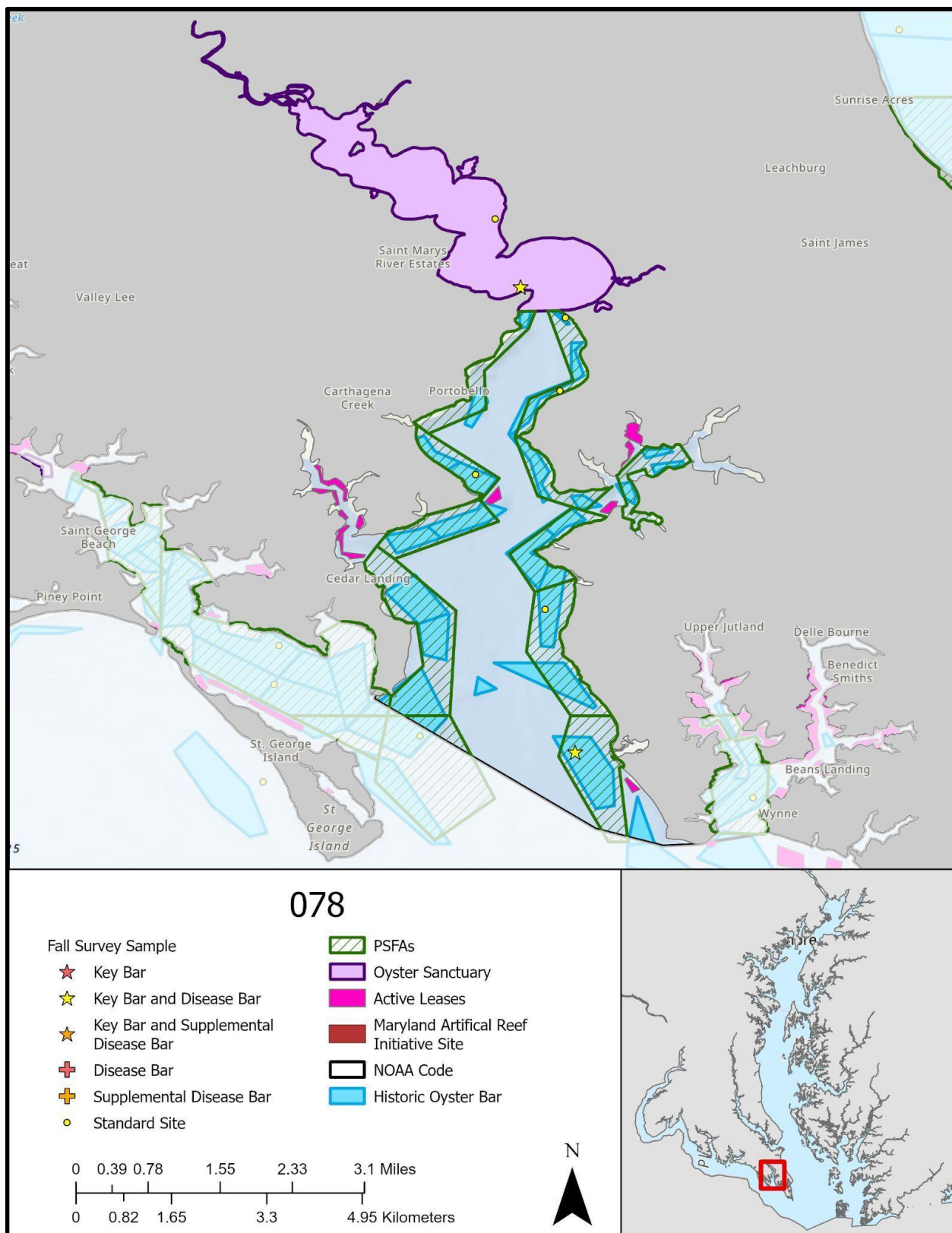


Figure B.13-1. Map of NOAA Code 078 (St. Marys River). Fall Oyster Survey sites may not be sampled every year.

Table B.13-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 078 (St. Marys River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/41	5/40	5/45	5/41
Number of Live Spat Oysters per square meter	28 $\pm$ 12	32 $\pm$ 13	38 $\pm$ 14	343 $\pm$ 120
Number of Live Small Oysters per square meter	54 $\pm$ 23	80 $\pm$ 23	93 $\pm$ 26	259 $\pm$ 64
Number of Live Market Oysters per square meter	11 $\pm$ 2.4	21.5 $\pm$ 2.8	21 $\pm$ 3.8	52 $\pm$ 8.2
Number of Live Oysters per square meter	93 $\pm$ 28	133 $\pm$ 29	152 $\pm$ 39	654 $\pm$ 172
Live Biomass (g Dry Weight per Bushel)	69 $\pm$ 16	115 $\pm$ 24	128.5 $\pm$ 24	220 $\pm$ 21.5
Observed Mortality (%)	23 $\pm$ 2.2	16 $\pm$ 2.4	19 $\pm$ 2.2	9 $\pm$ 1.4
Cultch (Bushels per 100 feet towed)	0.7 $\pm$ 0.1	0.7 $\pm$ 0.1	0.85 $\pm$ 0.1	1.5 $\pm$ 0.2
Harvest (Bushels)	1,890	6,249	11,540	16,199

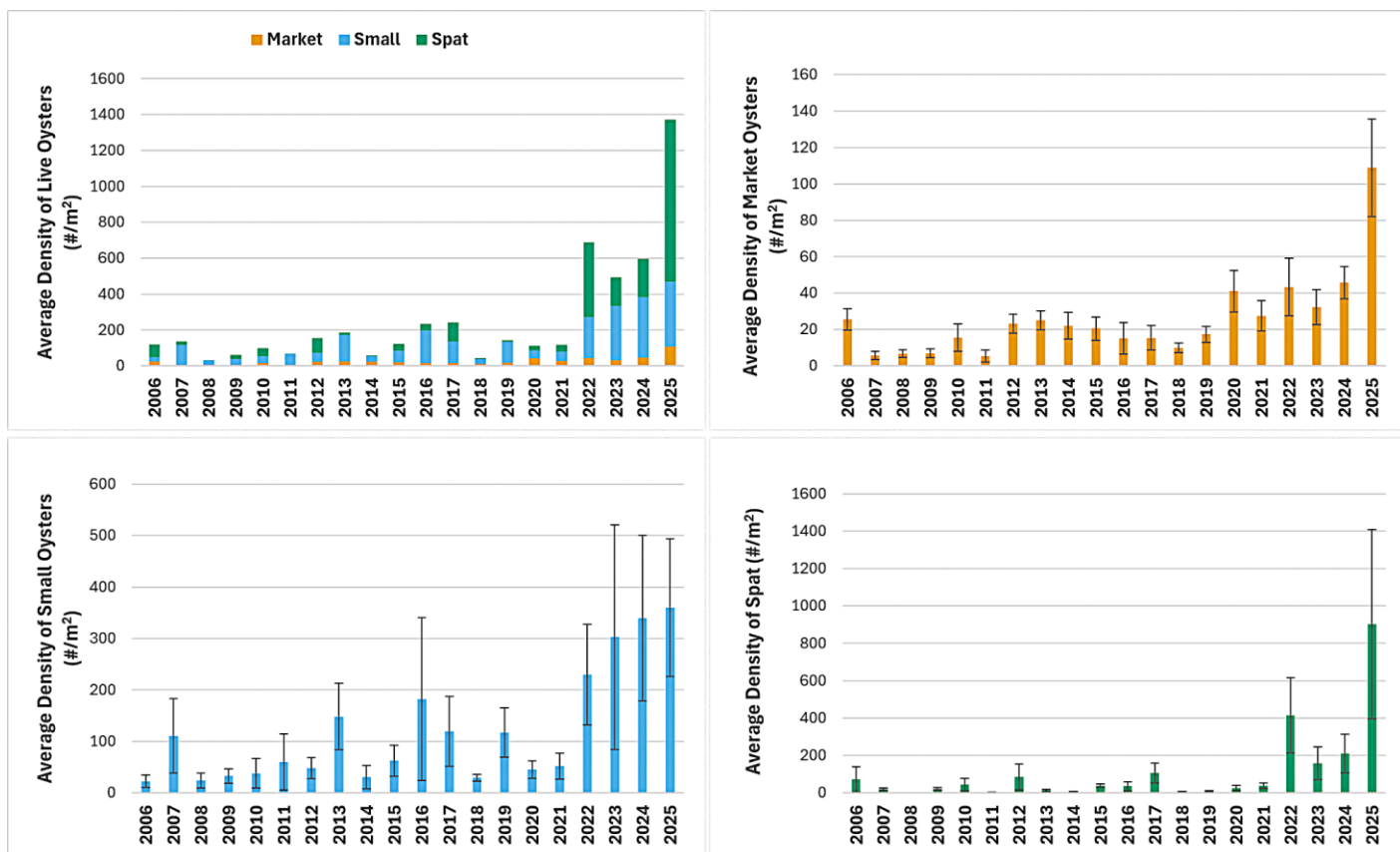


Figure B.13-2. Average number of live oysters per square meter by size class in NOAA Code 078 (St. Marys River) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

St Marys River (078)

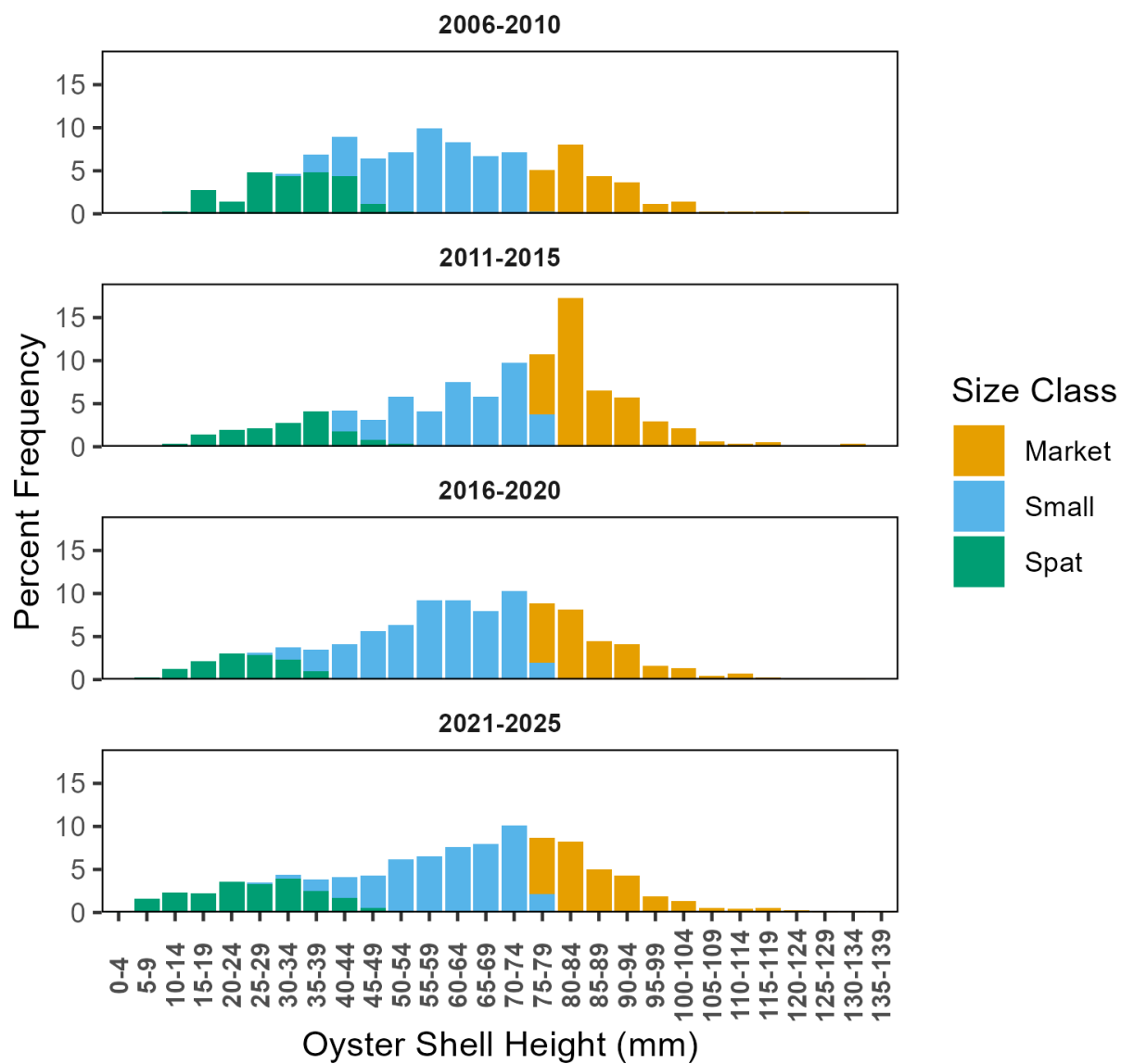


Figure B.13-3. Shell height frequencies of live oysters in NOAA Code 078 (St. Marys River) outside of the current sanctuary area.

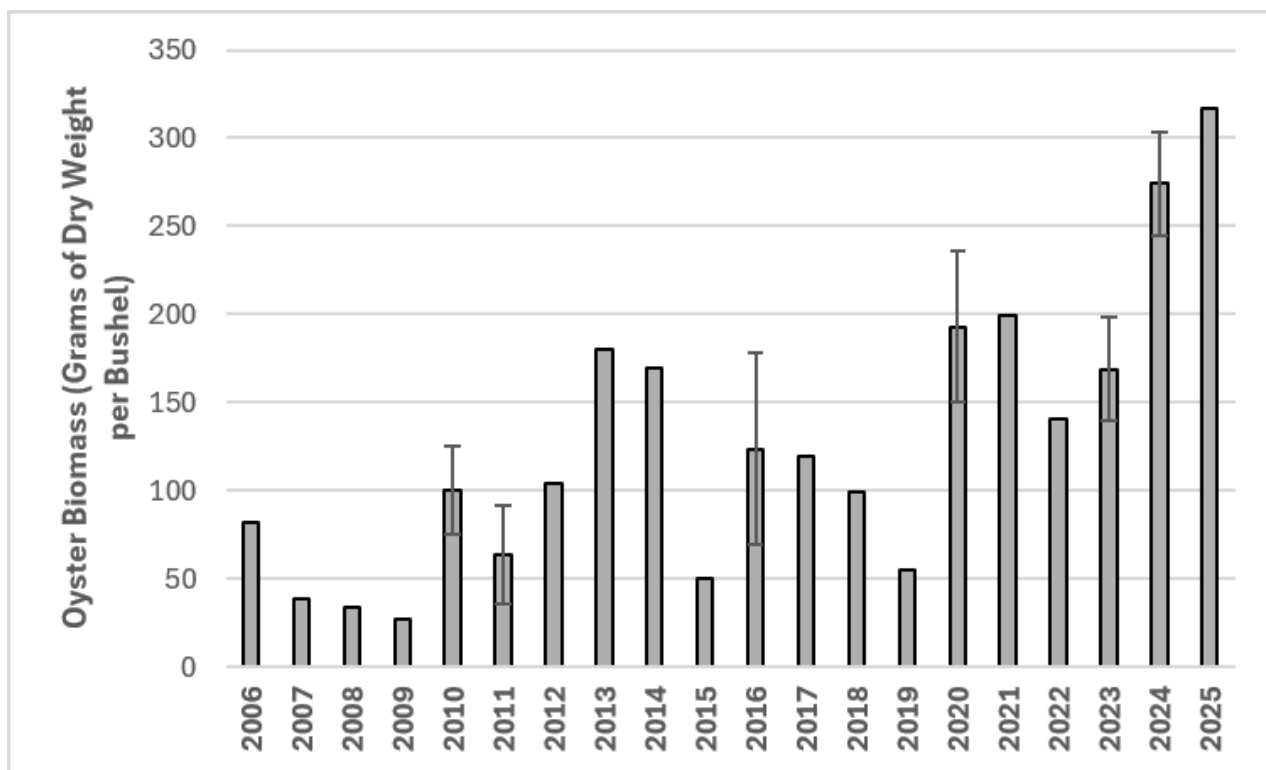


Figure B.13-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 078 (St. Marys River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

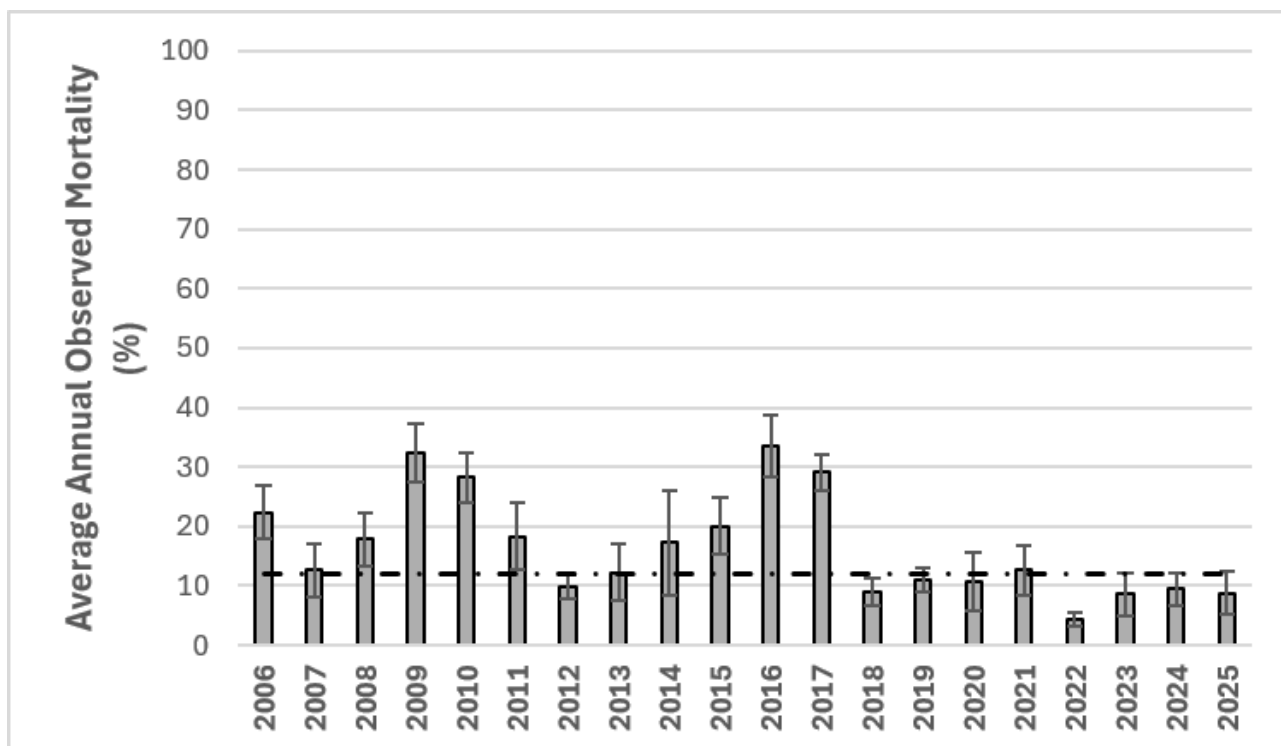


Figure B.13-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 078 (St. Marys River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

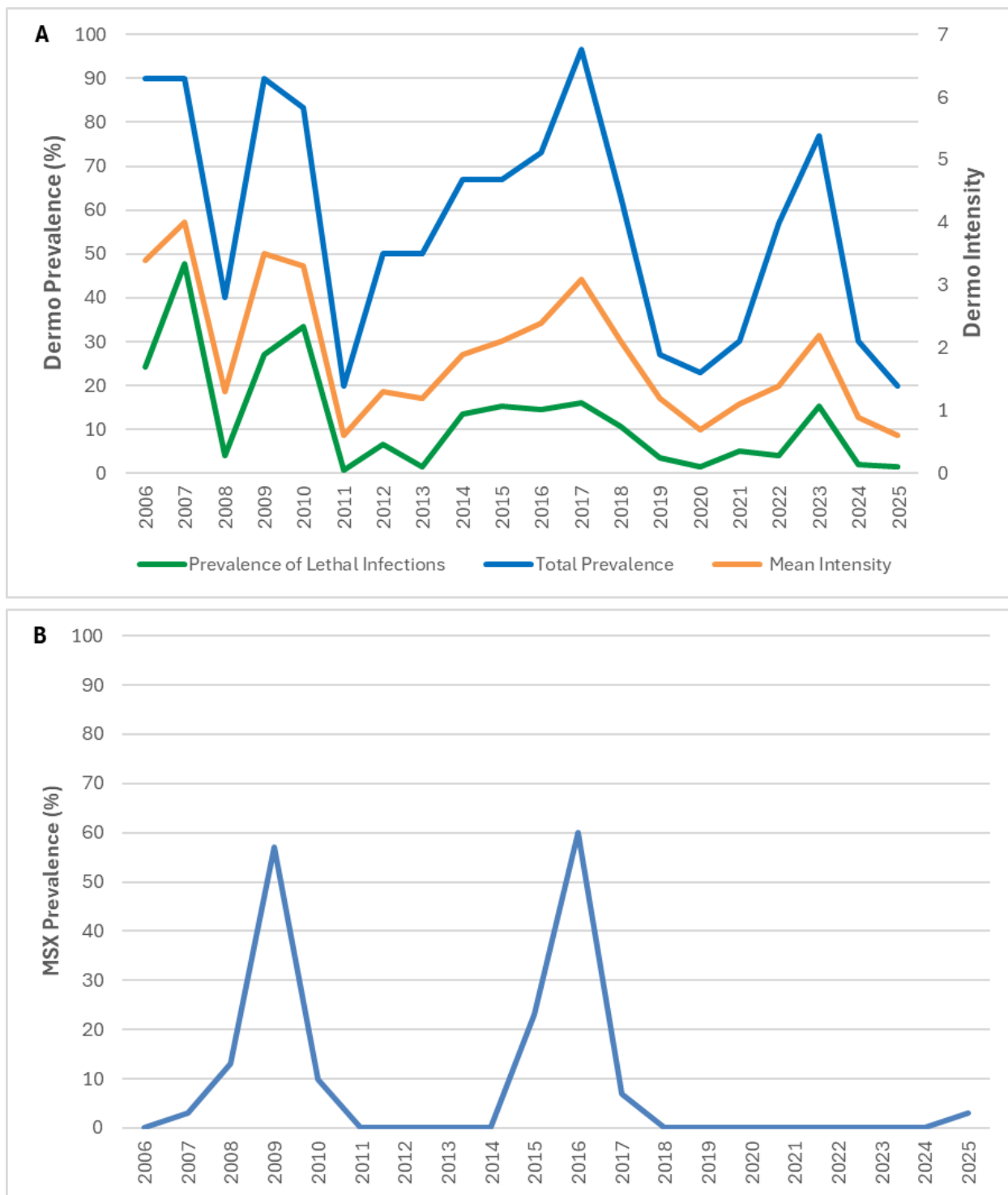


Figure B.13-6. Oyster disease prevalence and intensity in NOAA Code 078 (St. Marys River) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Chicken Cock bar.

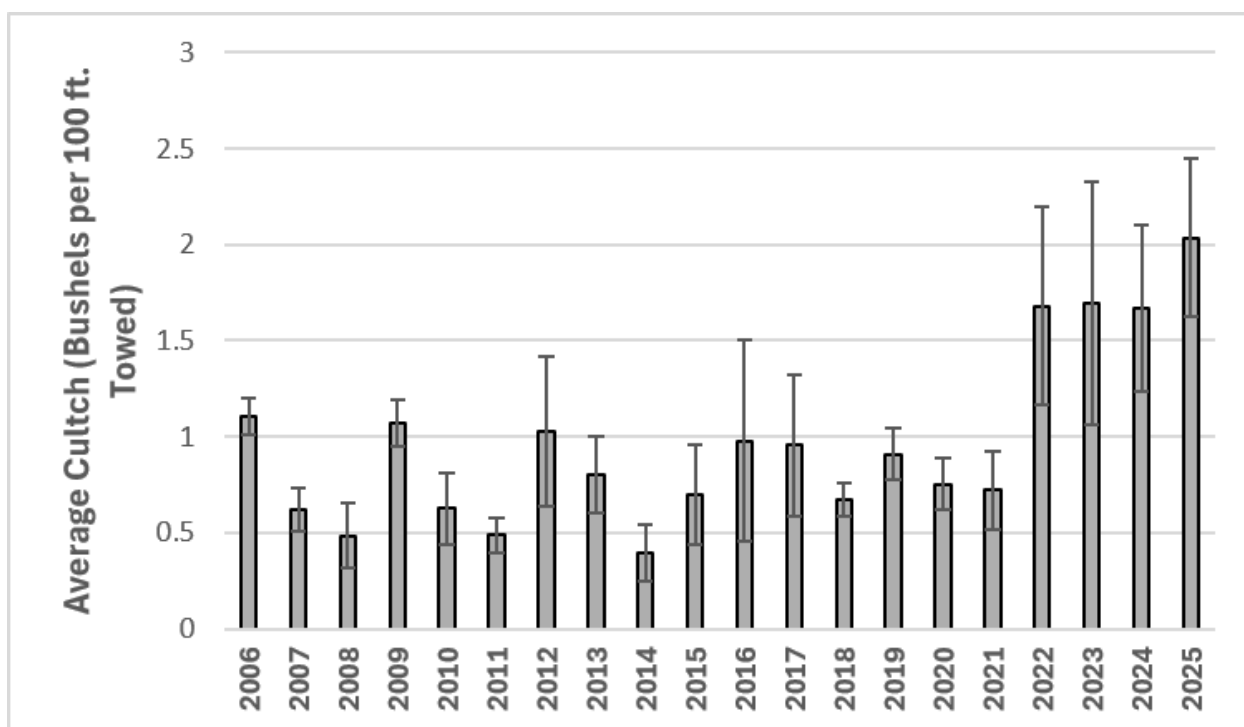


Figure B.13-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 078 (St. Marys River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

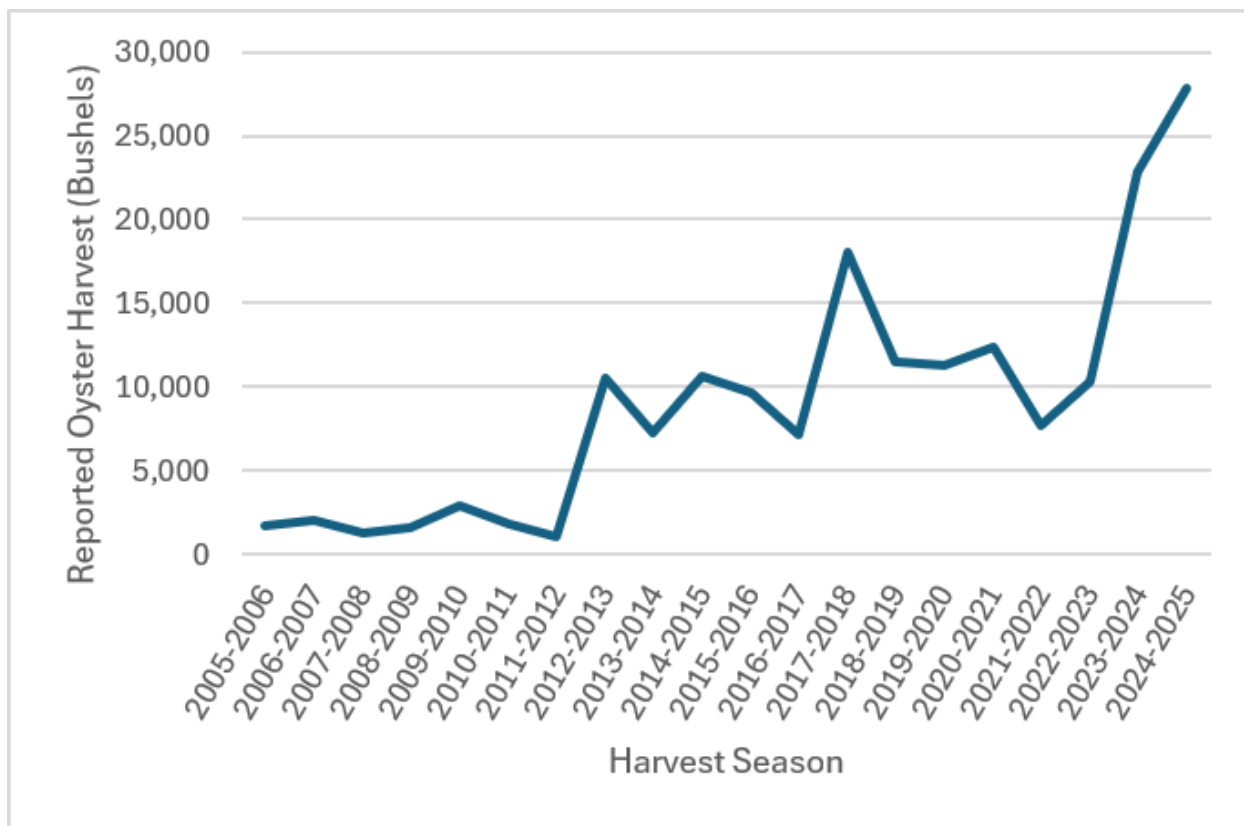


Figure B.13-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 078 (St. Marys River). Since 2010, 21% of the NOAA Code area has been designated as a sanctuary.

Section B.14: NOAA Code 082 – Severn River

NOAA Code 082 (Severn River) is 7,549 acres; however, only 151 acres is outside the current sanctuary boundary. Severn River Sanctuary was established in 1998 and expanded in 2010. There are 40 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.13-1)

No samples have been collected by the Fall Oyster Survey in the non-sanctuary portions of this area since 2006. No replenishment plantings have occurred from 2006 to 2025 to enhance the commercial public fishery. Only a few bushels of harvest were reported during 2021-2025 which may have been in error.

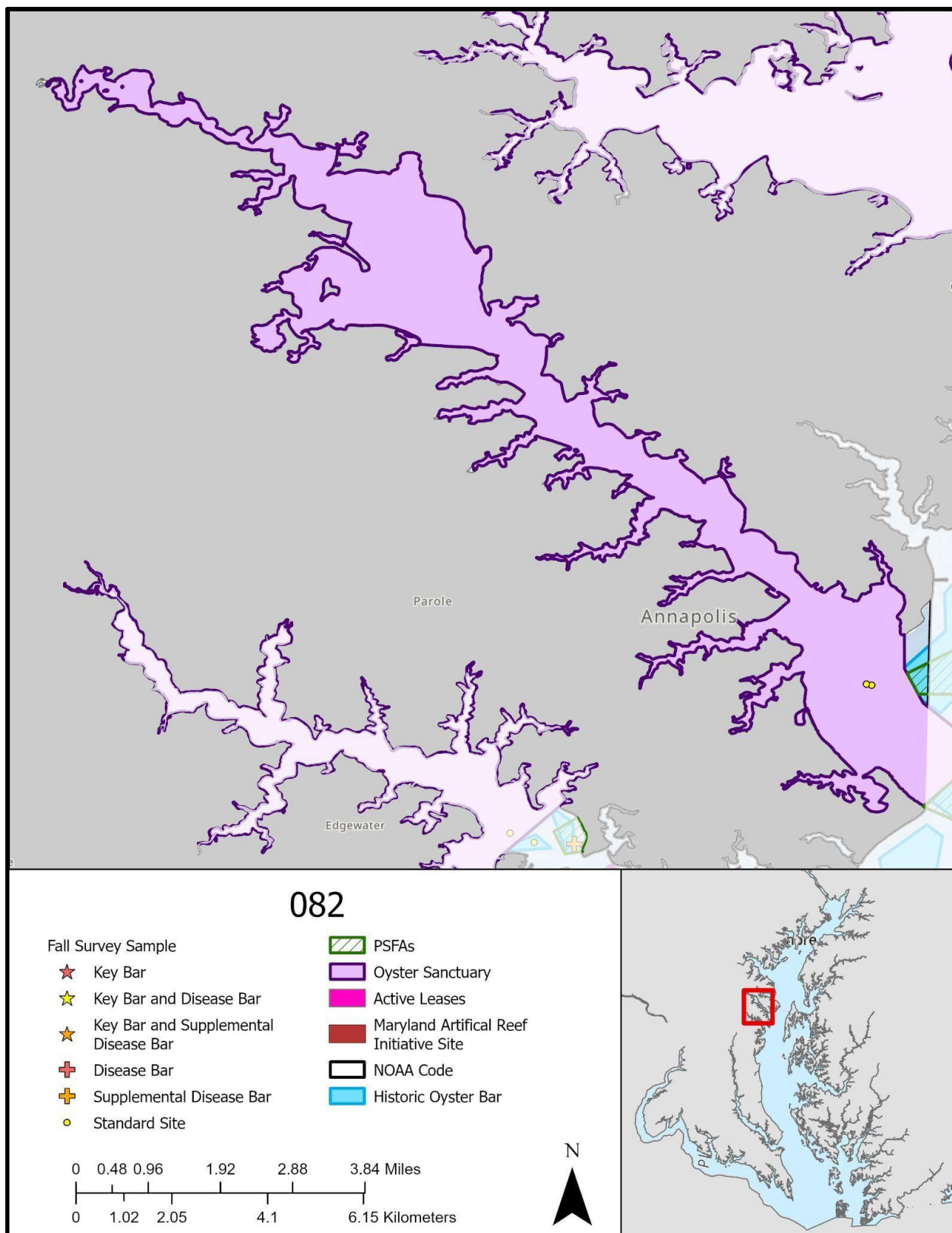


Figure B.14-1. Map of NOAA Code 082 (Severn River). Fall Oyster Survey sites may not be sampled every year.

Section B.15: NOAA Code 086 – Smith Creek

NOAA Code 086 encompasses Smith Creek and is a tributary of the Potomac River located below the St. Marys River. The entire NOAA Code is 845 acres and has six historic oyster bars²⁵. None of the area in the NOAA Code is within a sanctuary. There are 246 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code. In 2010, there were 377 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. Since 2010, 64.3 PSFA acres have been declassified with 7.3 acres declassified since 2020. This NOAA Code is located within Maryland's medium salinity region (Zone 2). This report includes one bar, Calvert Bay, that is in NOAA Code 177 (Potomac River?) but is considered to be within Maryland waters and outside of PRFC jurisdiction.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.15-1)
- Summary statistics (Table B.15-1)
- Density per year (Figure B.15-2)
- Shell Height Frequencies (Figure B.15-3)
- Biomass per year (Figure B.15-4)
- Observed mortality (Figure B.15-5)
- Cultch per year (Figure B.15-6)
- Harvest (Figure B.15-7)

Live oyster density increased in the 2021-2025 period, more than doubling from previous intervals. This growth is driven by increases across all size classes as a result of good natural spat sets in recent years. Observed mortality has improved, declining for two consecutive years. Cultch levels were variable but were typically below 1 bushel per 100 feet towed.

Smith Creek has had minimal restoration efforts. Approximately 2,600 bushels of shell were planted in 2019 to enhance the commercial public fishery in this NOAA Code.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets all years of the time series. Hand tong and diving were the primary harvest gears in the 2021-2025 time period. Harvest was highest in this area between roughly 2011 and 2019.

²⁵ See chart 38 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

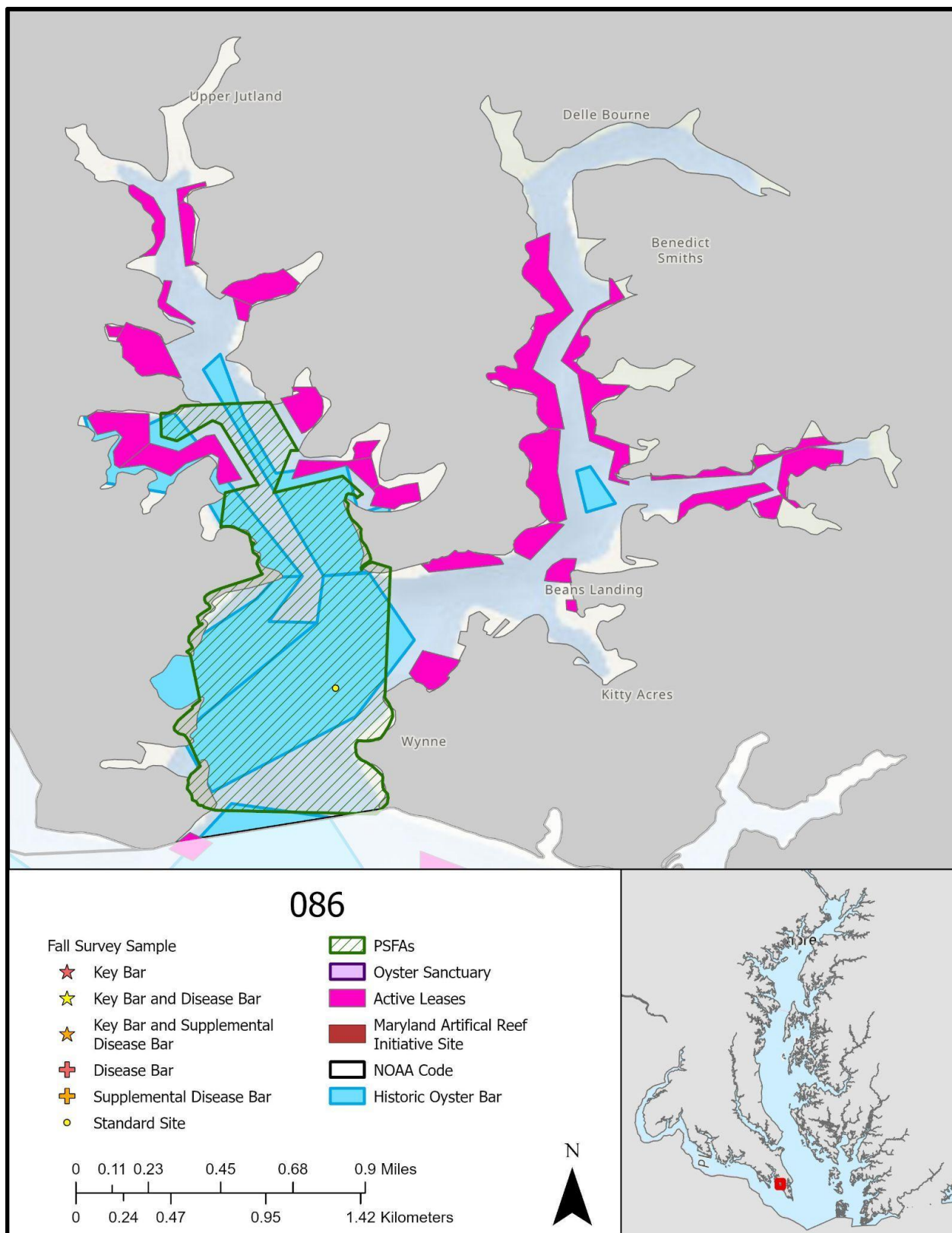


Figure B.15-1. Map of NOAA Code 086 (Smith Creek). Fall Oyster Survey sites may not be sampled every year.

Table B.15-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 086 (Smith Creek). ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/10	5/10	5/10	5/10
Number of Live Spat Oysters per square meter	10.3 $\pm$ 4	12 $\pm$ 5.5	7.5 $\pm$ 2.8	74 $\pm$ 26.6
Number of Live Small Oysters per square meter	36.3 $\pm$ 10.3	51.4 $\pm$ 18	55 $\pm$ 17.3	148 $\pm$ 45
Number of Live Market Oysters per square meter	23.2 $\pm$ 6	42.3 $\pm$ 17	35.6 $\pm$ 10	80.5 $\pm$ 25
Number of Live Oysters per square meter	69 $\pm$ 15	105 $\pm$ 32	97 $\pm$ 25	302 $\pm$ 76
Live Biomass (g Dry Weight per Bushel)	ND	224 $\pm$ 69	168 $\pm$ 55	316 $\pm$ 56
Observed Mortality (%)	20.3 $\pm$ 4.3	9.5 $\pm$ 2.3	15 $\pm$ 3.7	10 $\pm$ 2.4
Cultch (Bushels per 100 feet towed)	1.3 $\pm$ 0.2	1 $\pm$ 0.3	0.8 $\pm$ 0.1	1.1 $\pm$ 0.2
Harvest (Bushels)	72	404	908	439

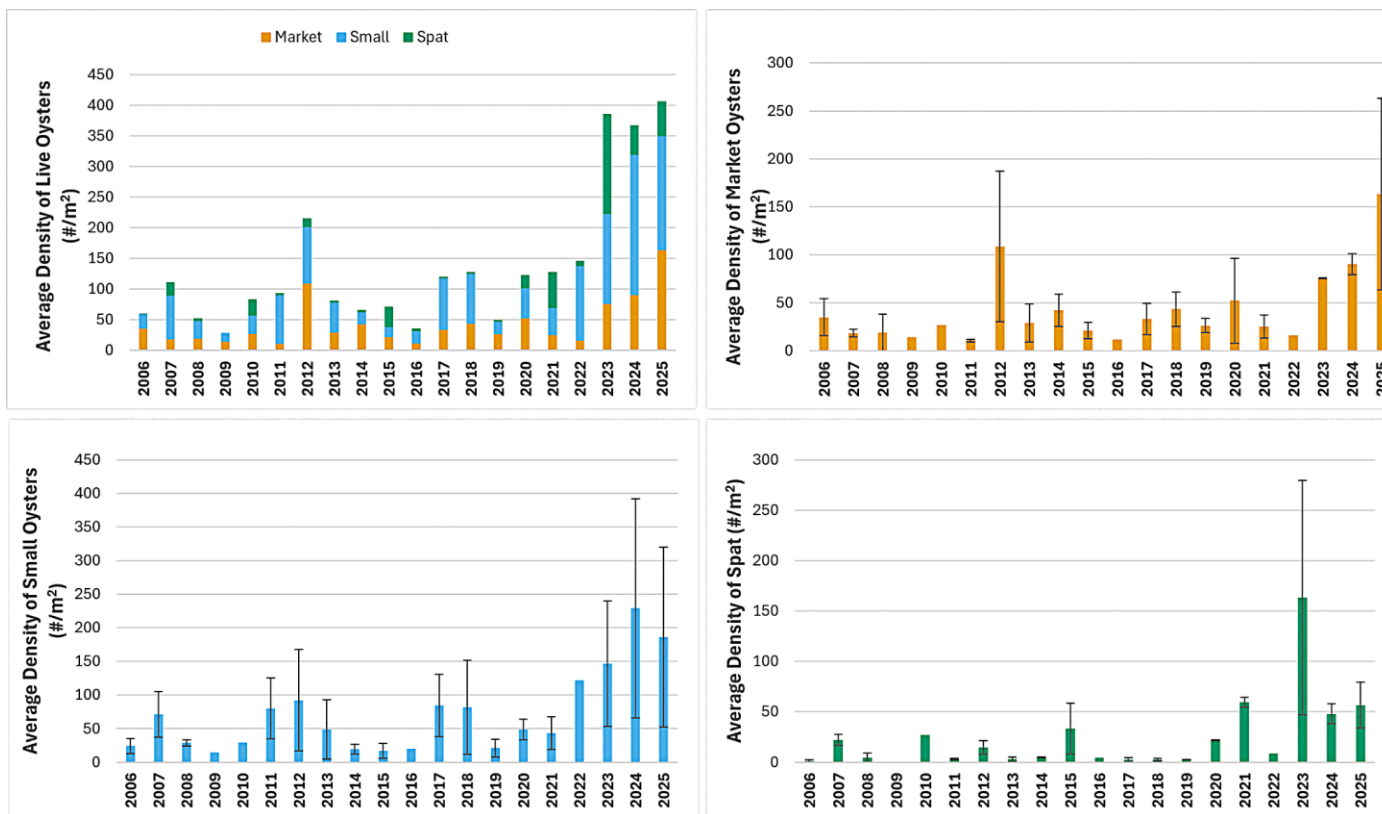


Figure B.15-2. Average number of live oysters per square meter by size class in NOAA Code 086 (Smith Creek). Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales. ND=No data. Error bars represent ± 1 standard error.

Smith Creek (086)

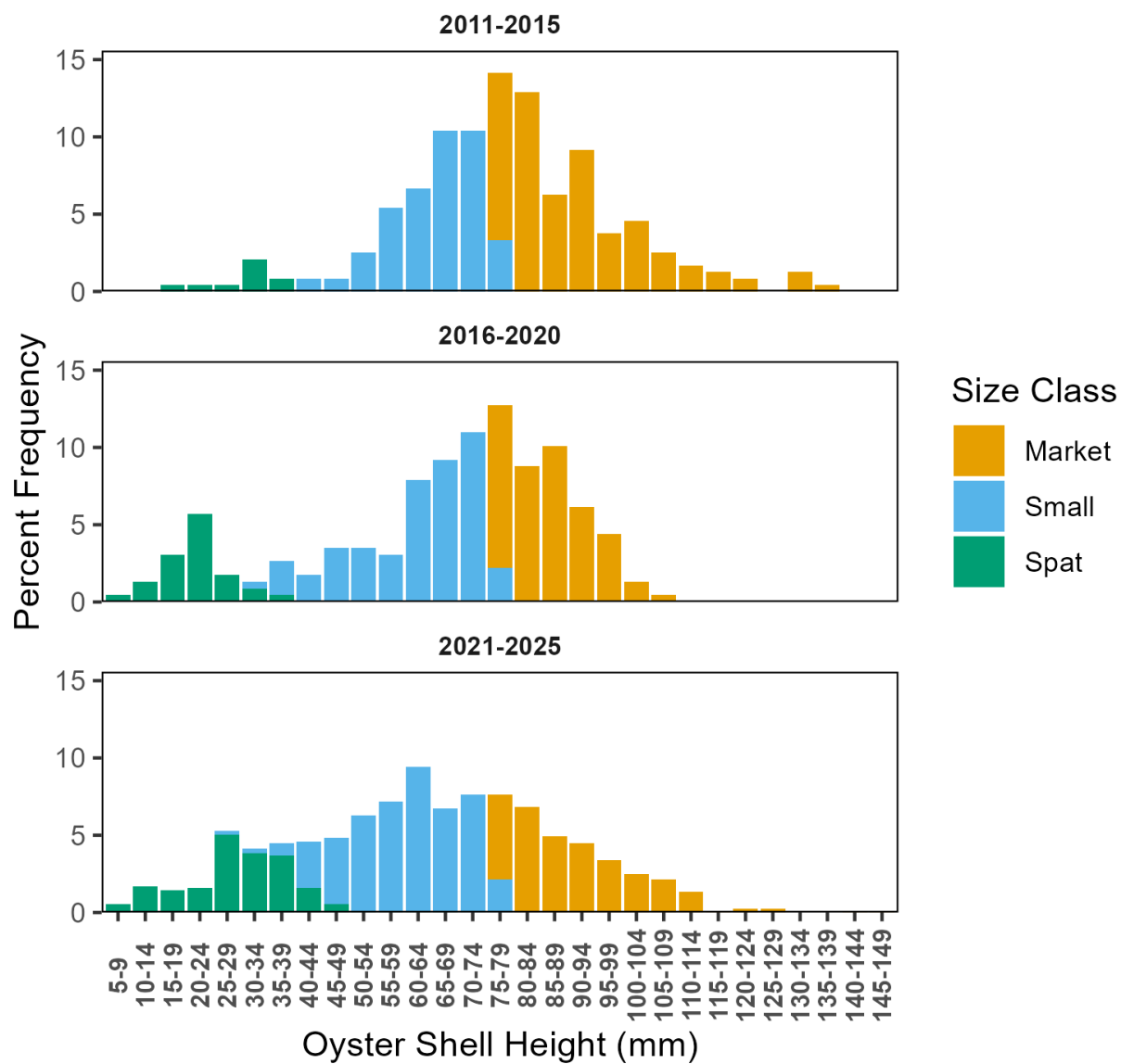


Figure B.15-3. Shell height frequencies of live oysters in NOAA Code 086 (Smith Creek).

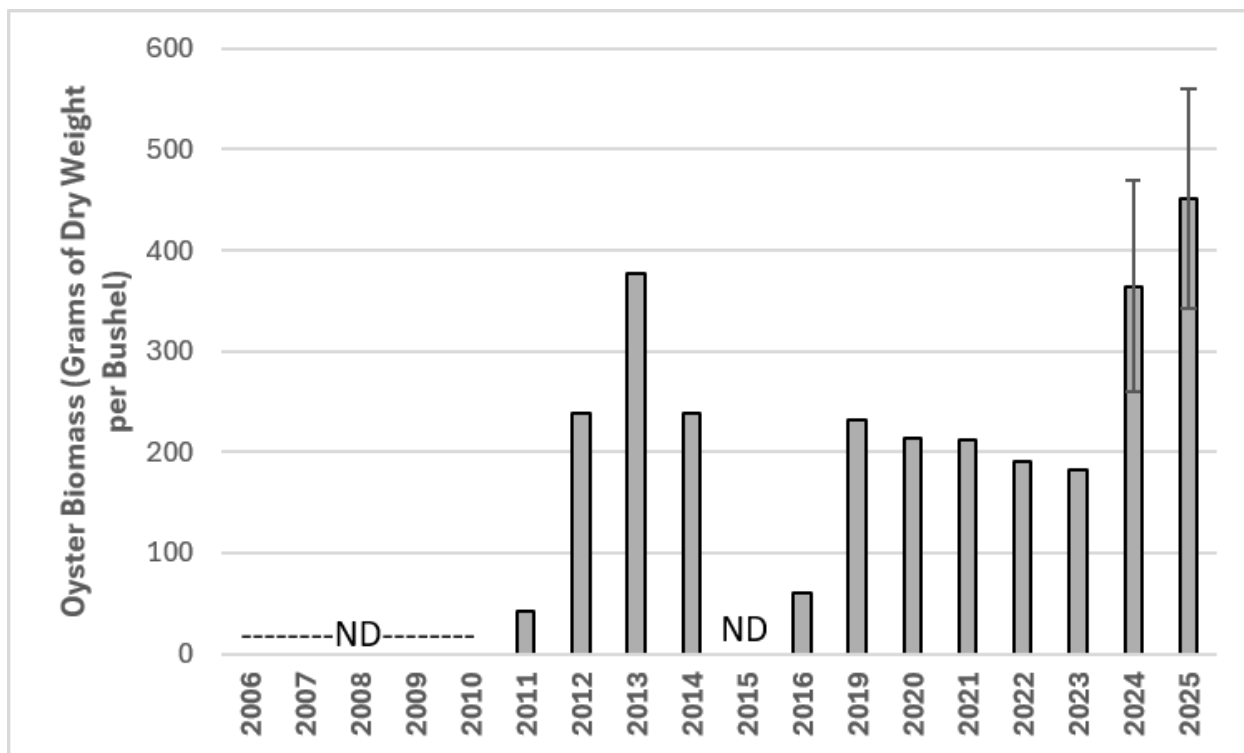


Figure B.15-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 086 (Smith Creek). Data from Maryland's Annual Fall Oyster Dredge Survey.

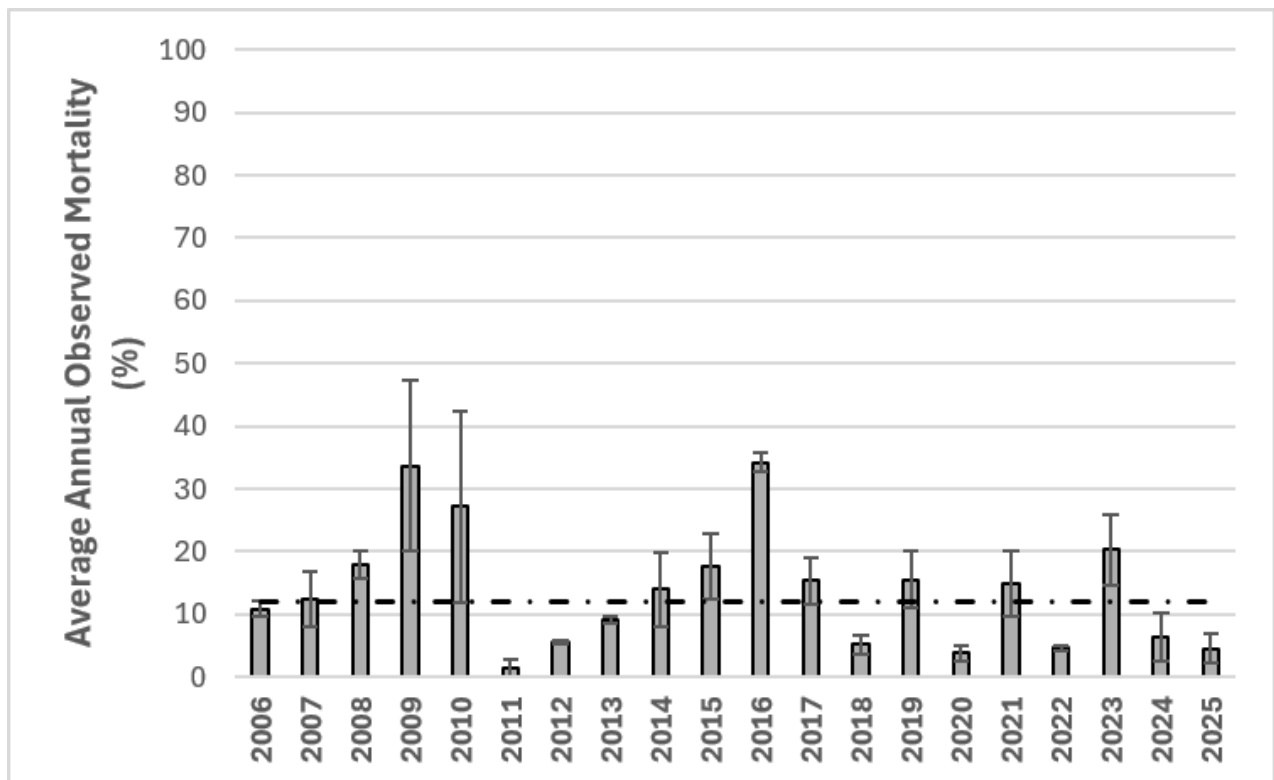


Figure B.15-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 086 (Smith Creek). Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

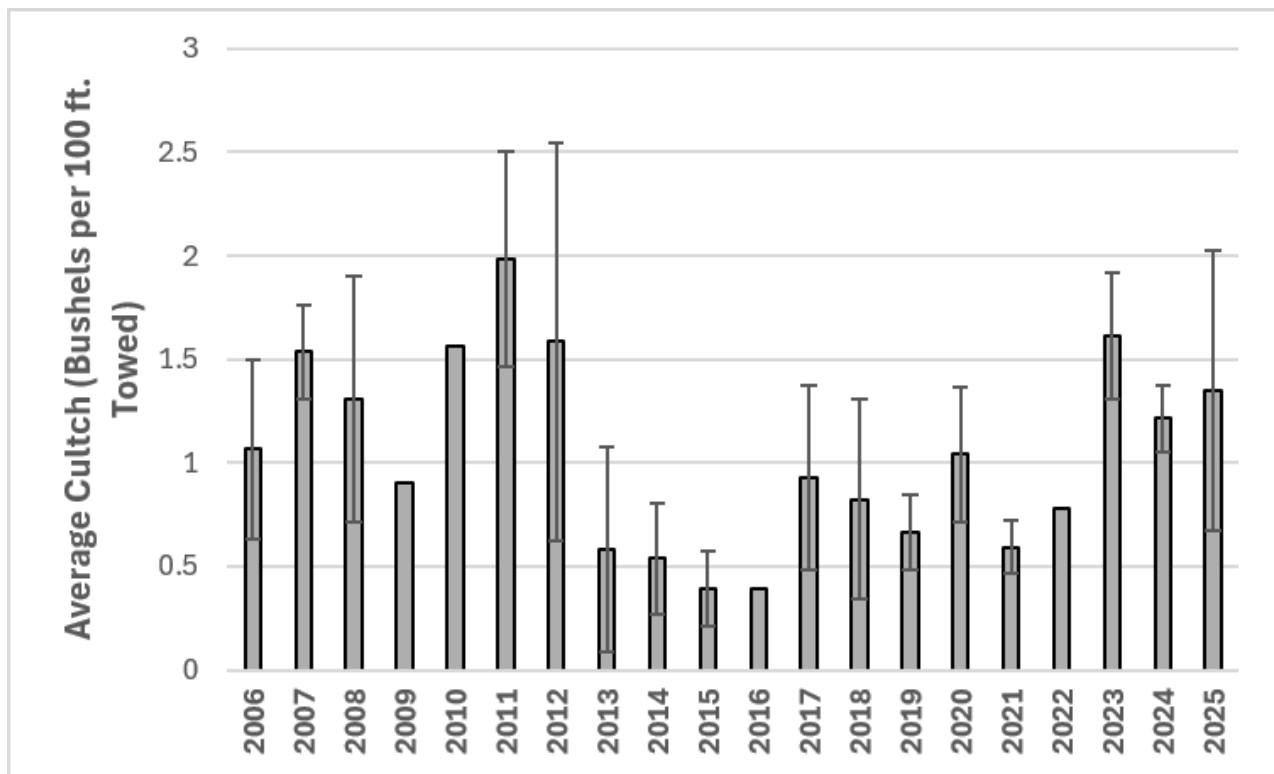


Figure B.15-6. Average cultch (live and dead oysters and loose shell) in NOAA Code 086 (Smith Creek). Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

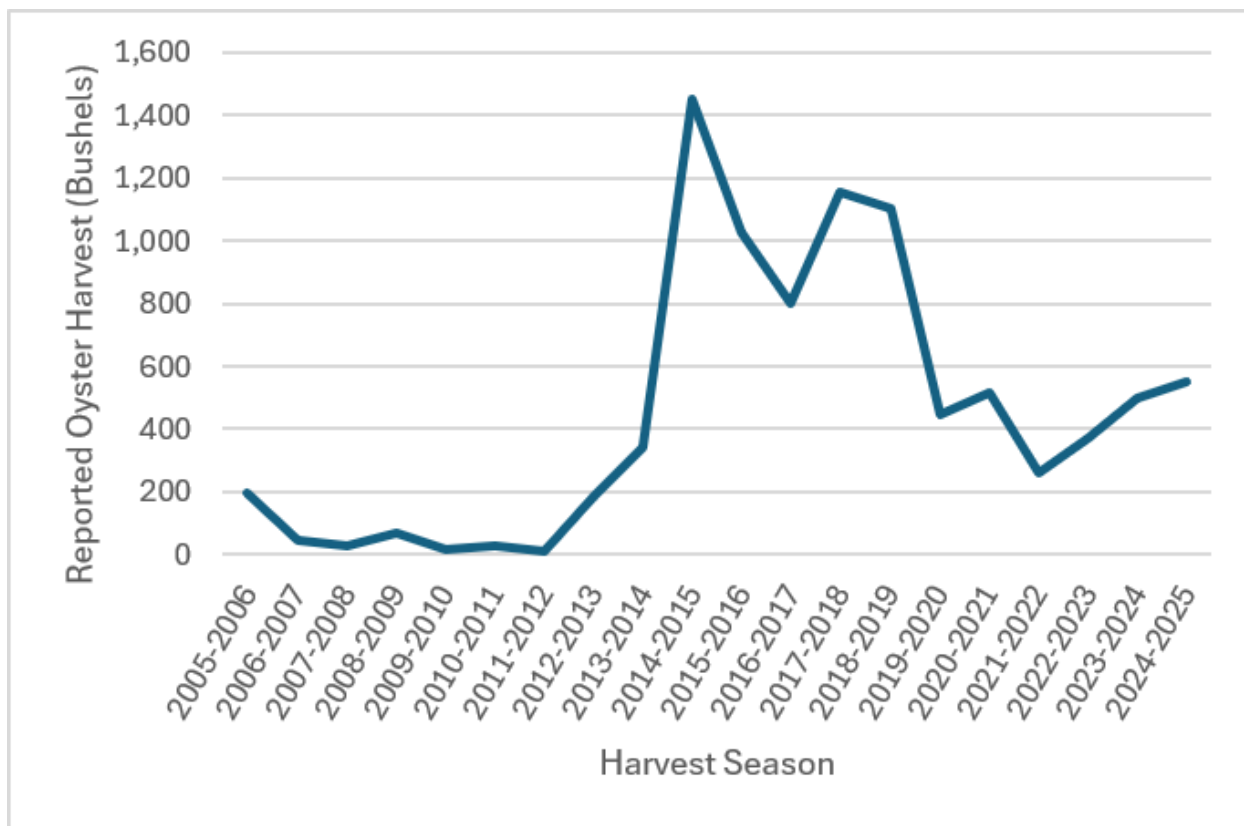


Figure B.15-7. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 086 (Smith Creek).

Section B.16: NOAA Code 088 – South River

NOAA Code 088 encompasses the South River and is located in Maryland's upper western portion of Chesapeake Bay. The entire NOAA Code is 5,995 acres and has 20 historic oyster bars²⁶. The South River Sanctuary encompasses 38% (2,327 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 3,668 surface acres. There are 1,310 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuary. There are 617 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.16-1)
- Summary statistics (Table B.16-1)
- Density per year (Figure B.16-2)
- Shell height frequencies (Figure B.16-3)
- Biomass per year (Figure B.16-4)
- Observed mortality (Figure B.16-5)
- Dermo and MSX per year (Figure B.16-6)
- Cultch per year (Figure B.16-7)
- Harvest (Figure B.16-8)

The total density of live oysters fluctuated throughout the time series but rebounded during 2021-2025. The increase in spat and small oyster density was likely the result of annual hatchery spat-on-shell plantings that began in 2020. Market density also increased and mortality decreased, leading to a higher proportion of larger oysters and higher biomass. No MSX was found during the time series, while dermo intensity and prevalence have been variable but declining in recent years. Average cultch was consistent throughout the time series, averaging 1 bushel per 100 feet towed.

Between 2006 and 2025, approximately 16,000 bushels of wild seed and 178 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code outside of the current sanctuary area. From 2021 to 2025, enhancements included 2,000 bushels of wild seed and 86 million hatchery spat-on-shell.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years time series. Following the establishment of the sanctuary in 2000, 38% of the area was closed to harvest. Hand tong was the primary harvest gear during the 2021-2025 period. This area is characterized by stable and perhaps increasing abundance and oyster density, due primarily to good recent recruitment. Harvest is low but relatively stable, in part driven by multiple years of enhancement activity and low natural mortality.

²⁶ See chart 9 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

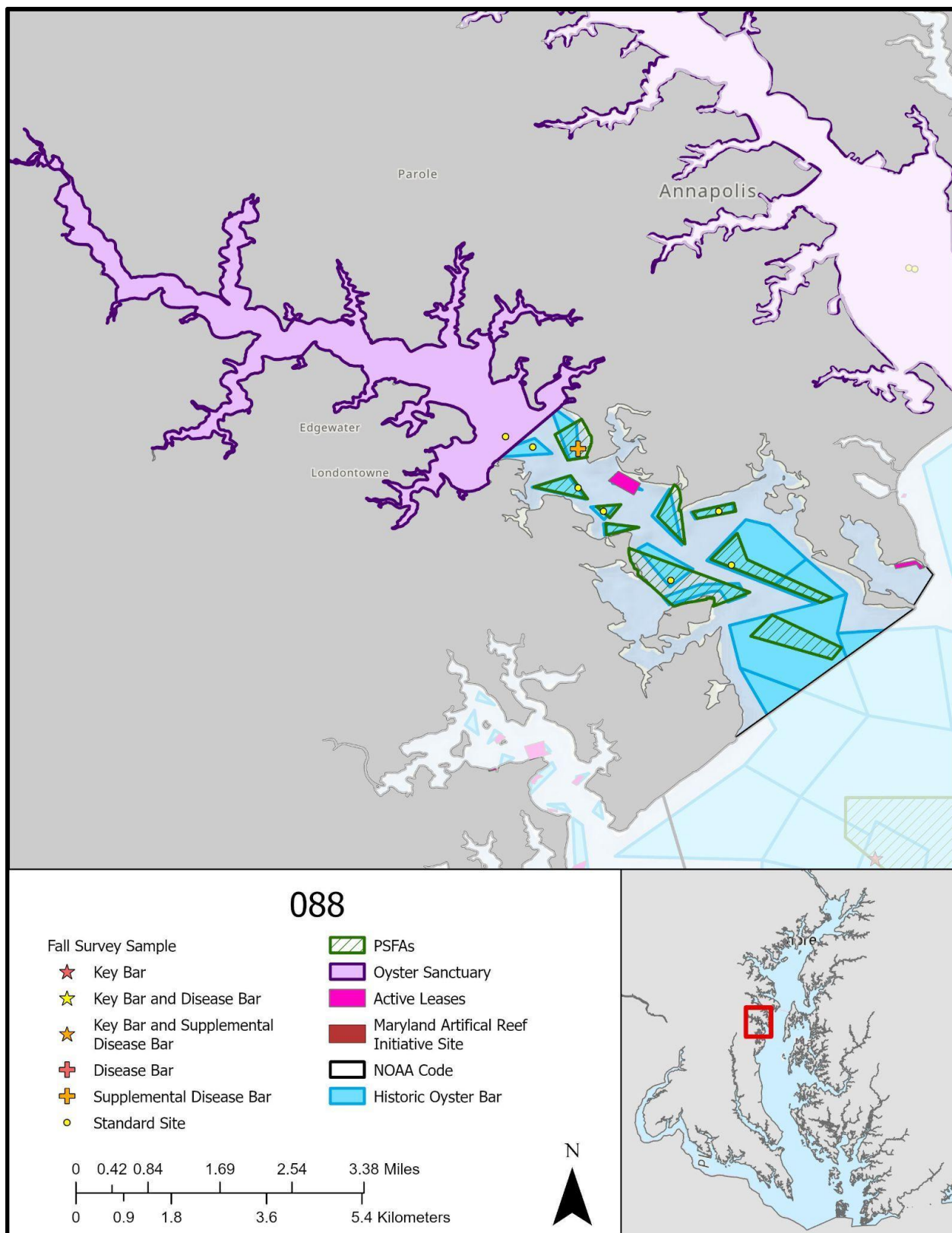


Figure B.16-1. Map of NOAA Code 088 (South River). Fall Oyster Survey sites may not be sampled every year.

Table B.16-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 088 (South River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/32	5/31	5/36	5/38
Number of Live Spat Oysters per square meter	22 $\pm$ 20	8.7 $\pm$ 8.4	8.2 $\pm$ 7.1	44 $\pm$ 27*
Number of Live Small Oysters per square meter	34 $\pm$ 13	51 $\pm$ 15	6.2 $\pm$ 2	32 $\pm$ 14
Number of Live Market Oysters per square meter	22.6 $\pm$ 4.1	57 $\pm$ 12	26 $\pm$ 2.1	41.5 $\pm$ 6
Number of Live Oysters per square meter	78.5 $\pm$ 25	117 $\pm$ 18.7	40.6 $\pm$ 7	117 $\pm$ 30.2
Live Biomass (g Dry Weight per Bushel)	114.7 $\pm$ 73.2	153 $\pm$ 30	140.4 $\pm$ 18.2	274 $\pm$ 57
Observed Mortality (%)	15.9 $\pm$ 2.4	7.7 $\pm$ 2.3	7.5 $\pm$ 1.1	10 $\pm$ 1.5
Cultch (Bushels per 100 feet towed)	0.7 $\pm$ 0.1	1.2 $\pm$ 0.1	0.7 $\pm$ 0.1	0.9 $\pm$ 0.1
Harvest (Bushels)	690	983	1,269	1,133

*Includes hatchery spat-on-shell plantings in 2020, 2021, 2023, 2024, 2025

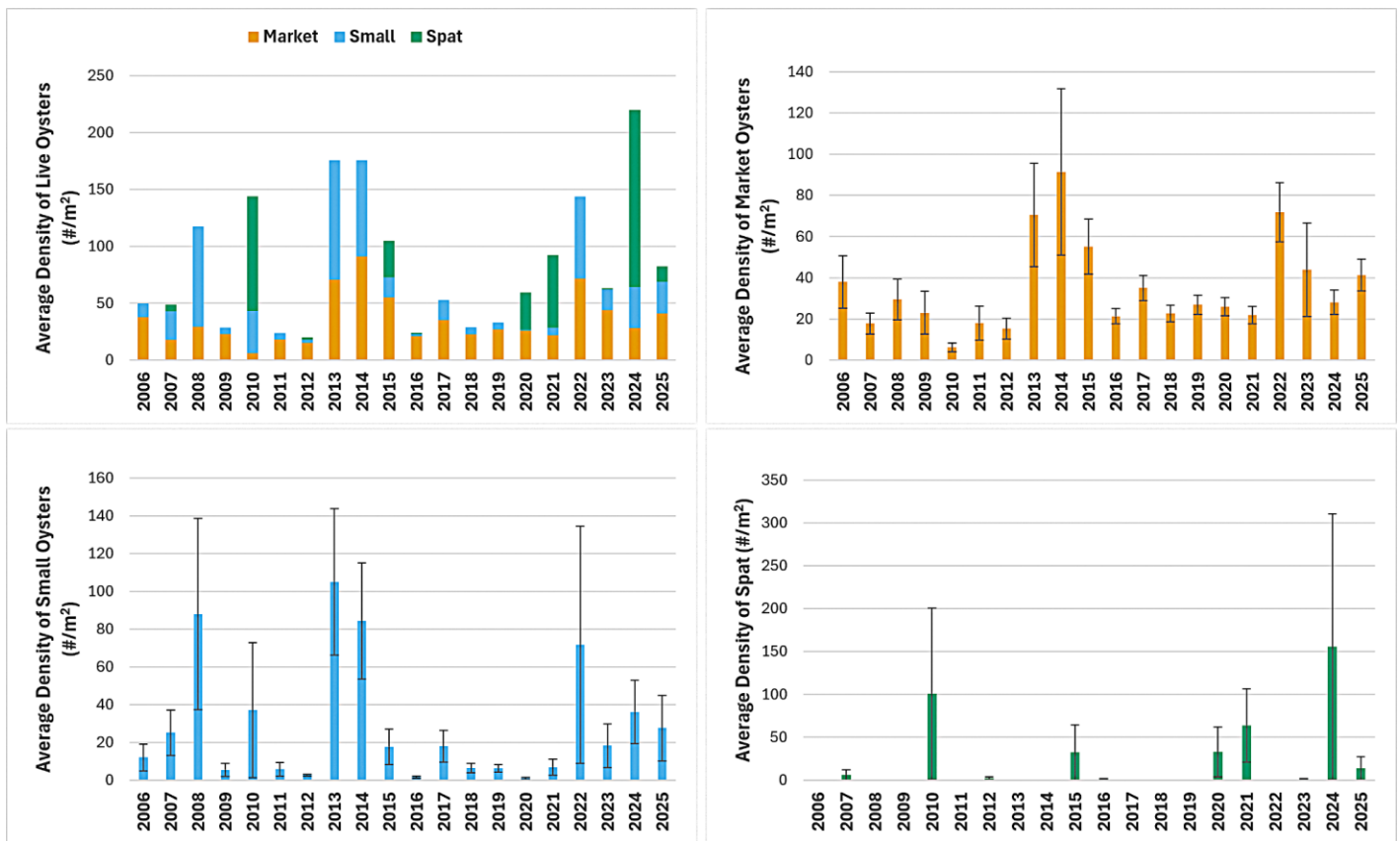


Figure B.16-2A. Average number of live oysters per square meter by size class in NOAA Code 088 (South River) occurring outside of the current sanctuary area including hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

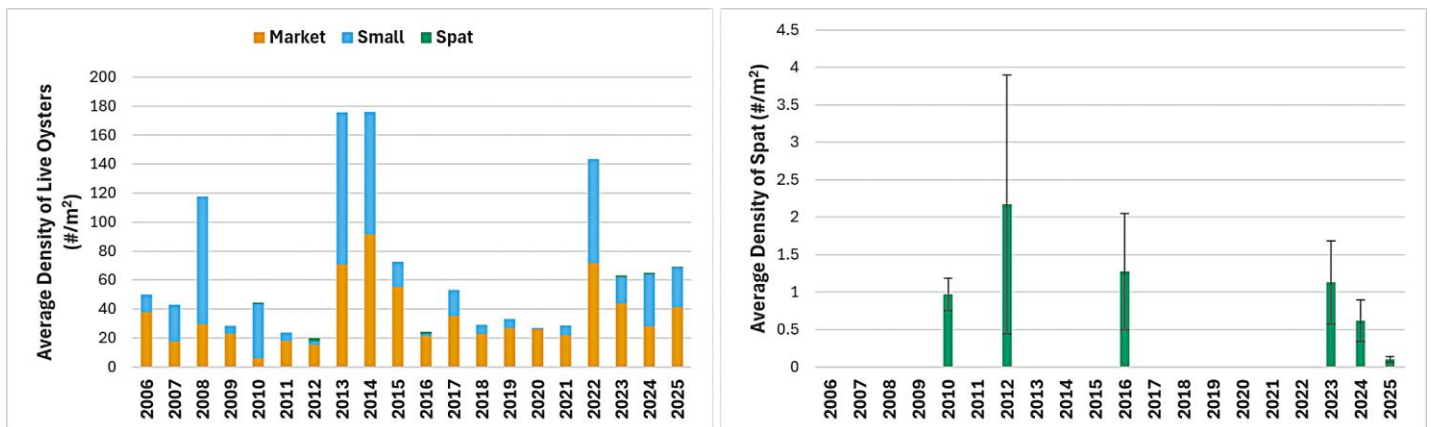


Figure B.16-2B. Average number of live oysters per square meter by size class in NOAA Code 088 (South River) occurring outside of the current sanctuary area excluding samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

South River (088)

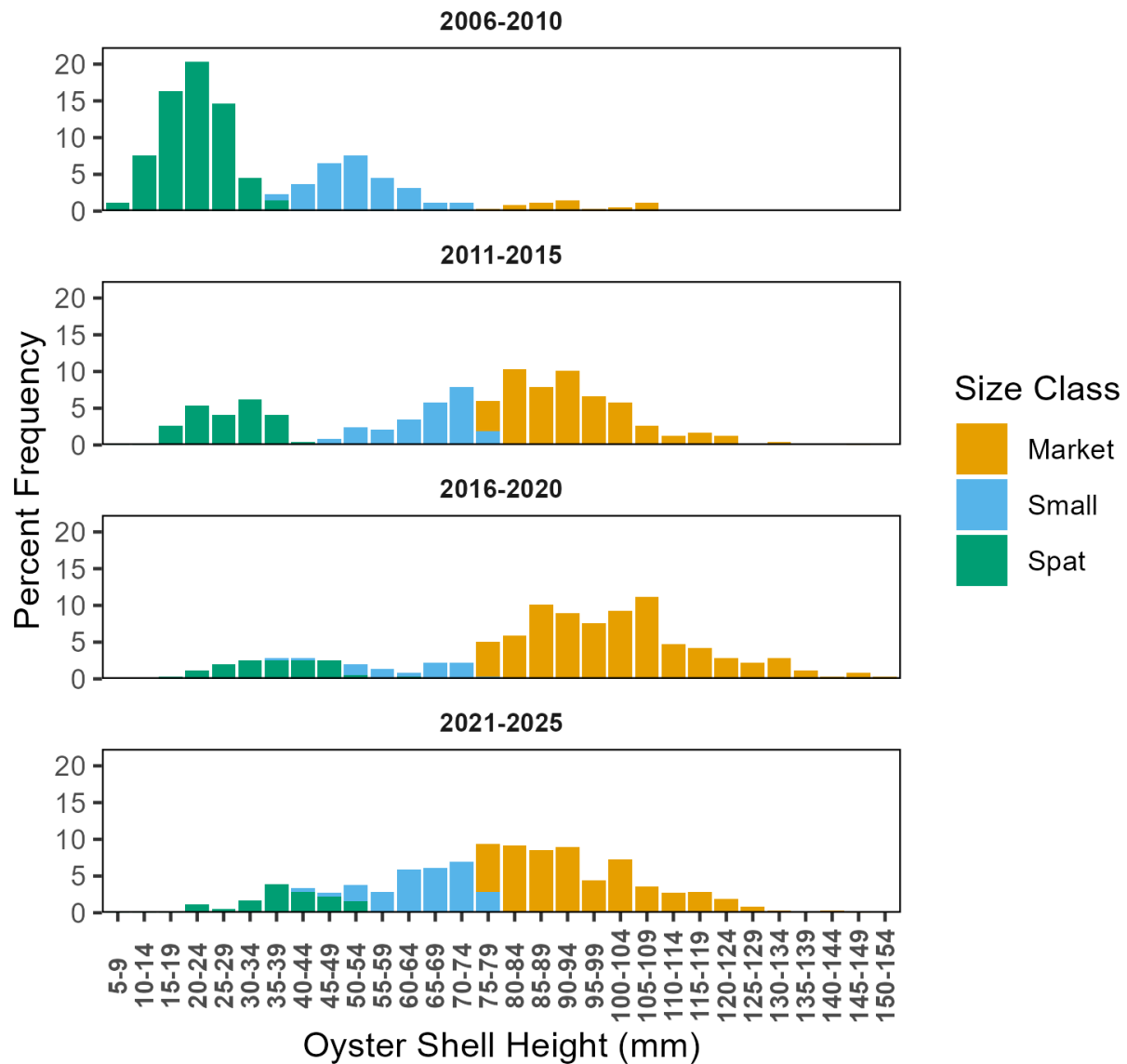


Figure B.16-3. Shell height frequencies of live oysters in NOAA Code 088 (South River) outside of the current sanctuary area. No samples were collected in 2006, 2008, 2009, 2001, and 2012.

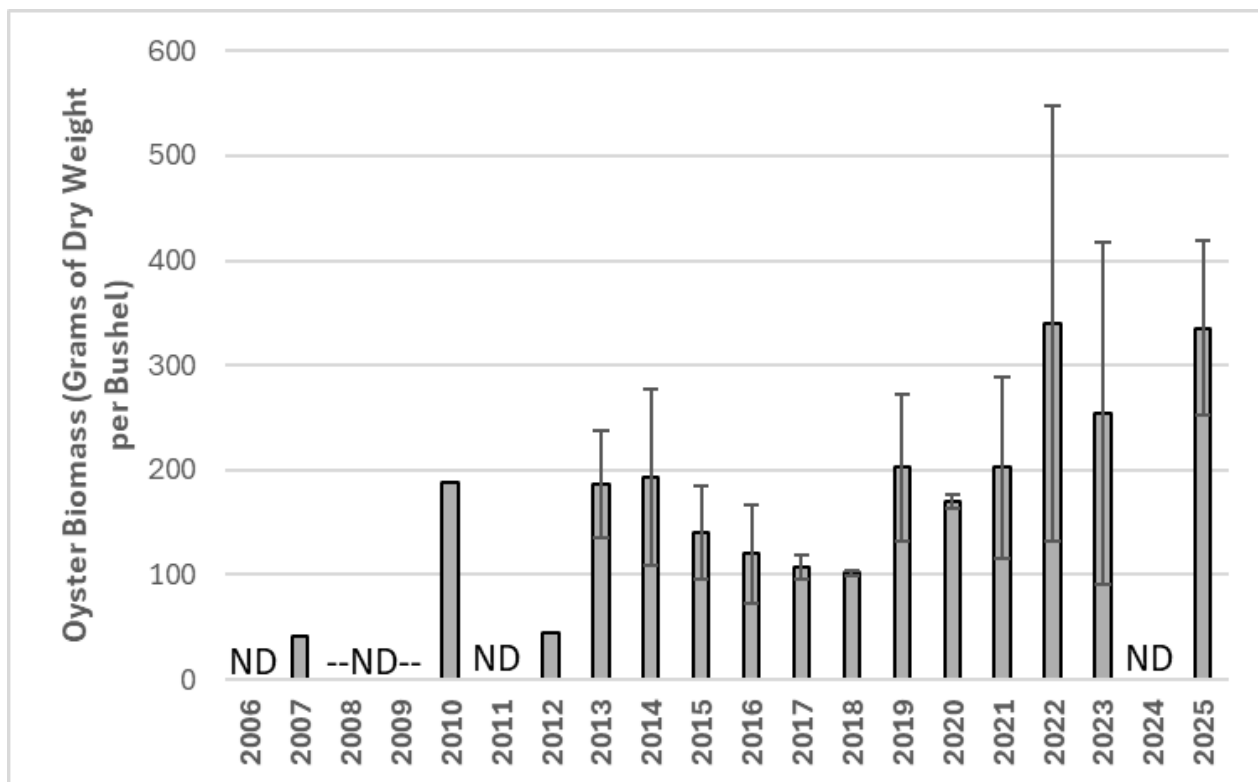


Figure B.16-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 088 (South River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. ND = No data.

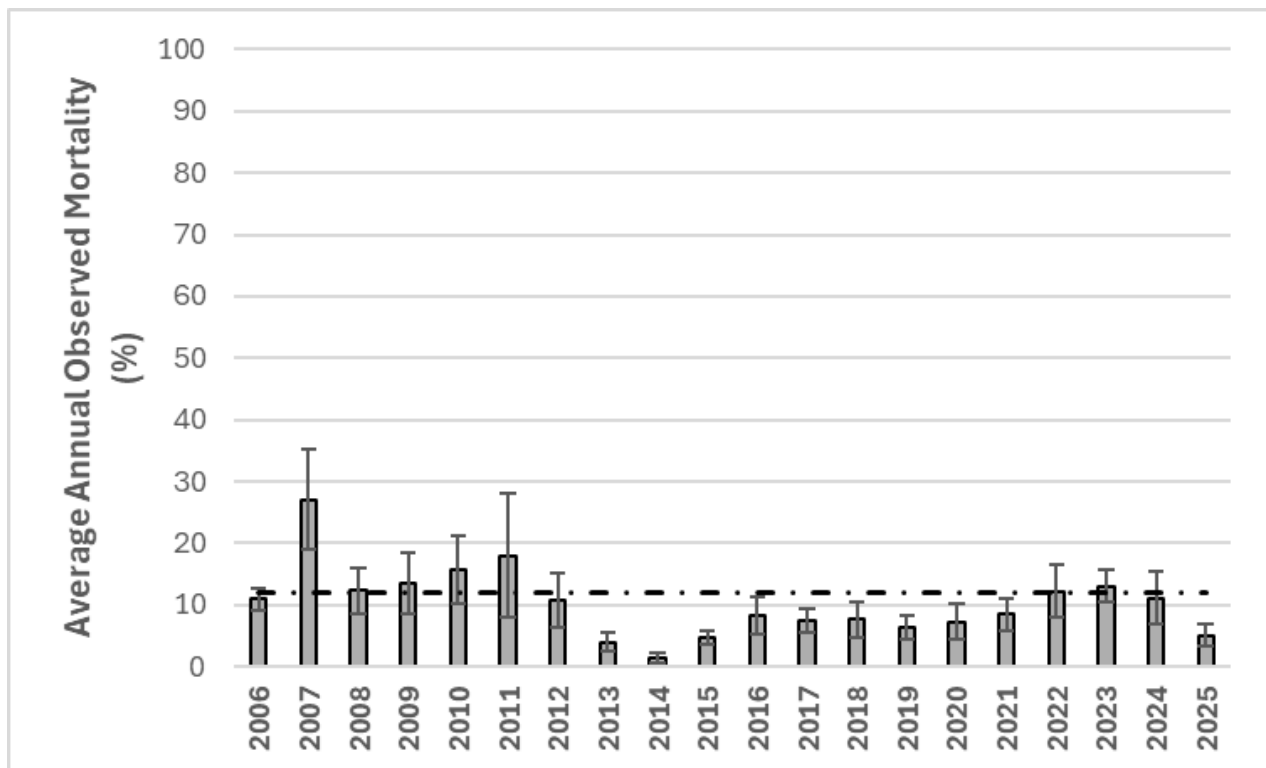


Figure B.16-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 088 (South River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

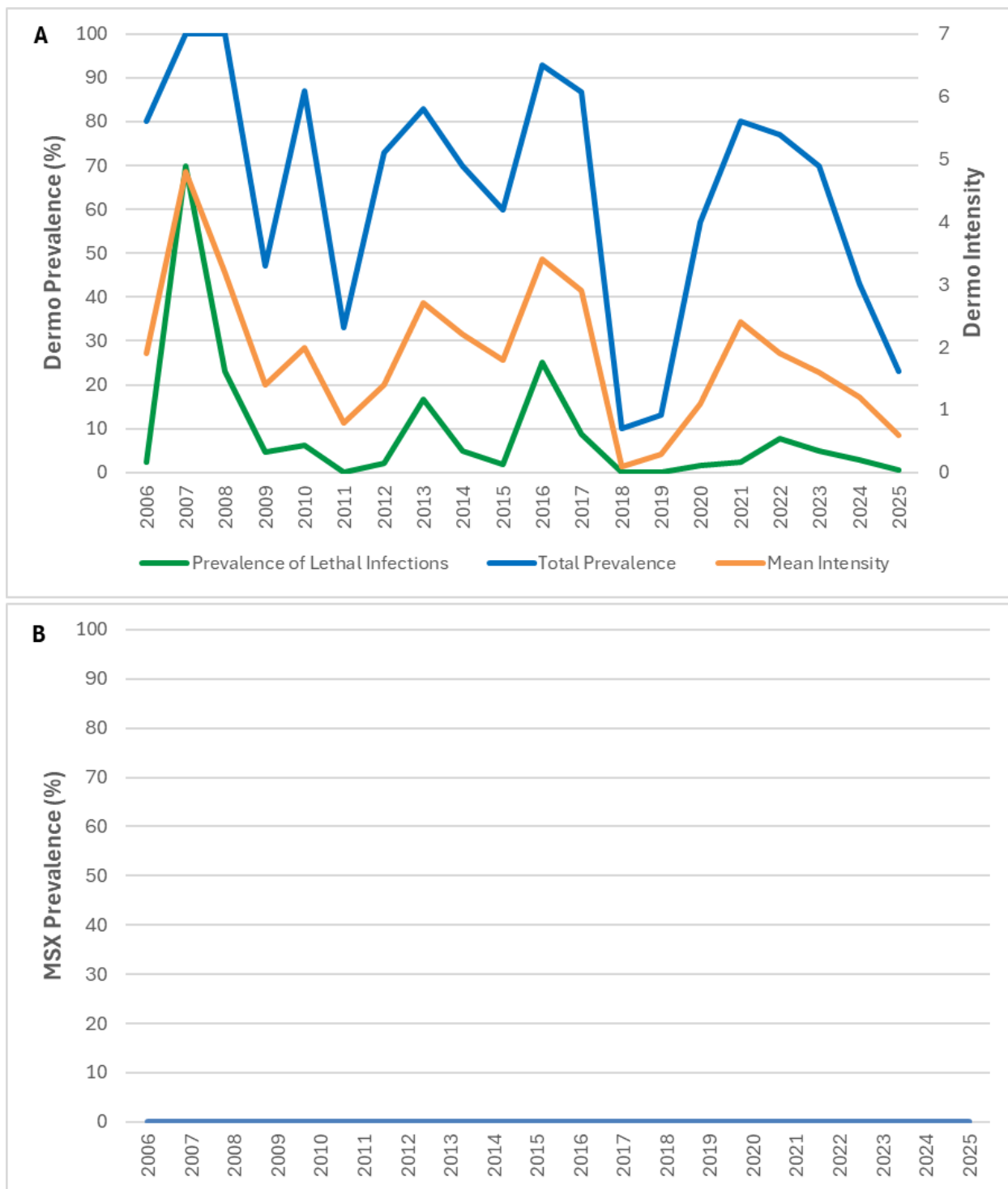


Figure B.16-6. Oyster disease prevalence and intensity in NOAA Code 088 (South River) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Thunder and Lightning bar.

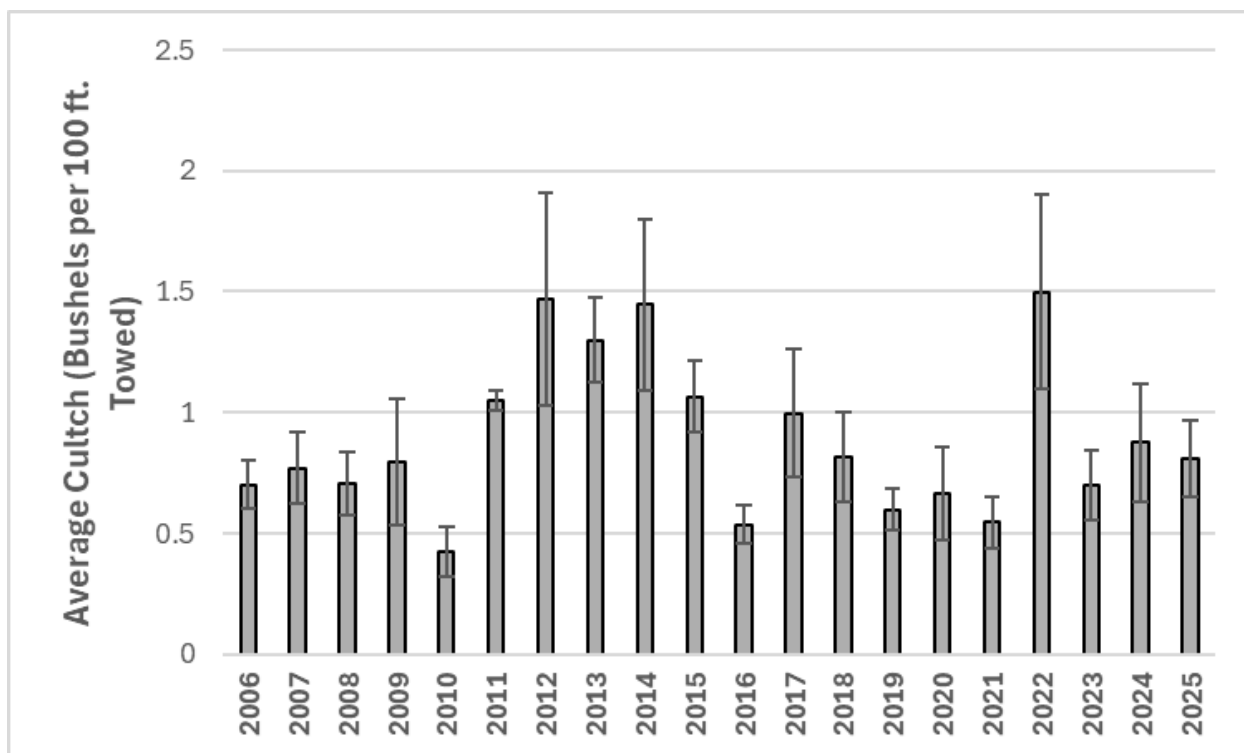


Figure B.16-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 088 (South River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

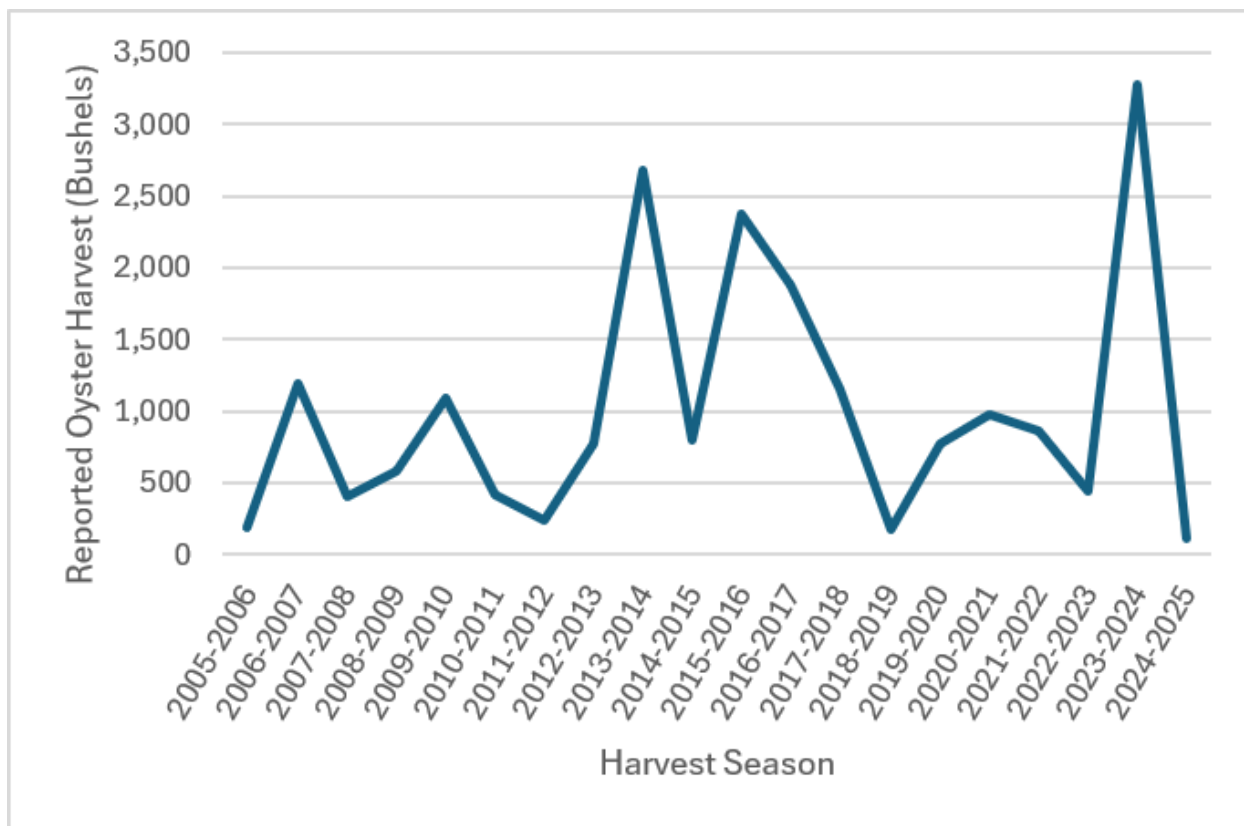


Figure B.16-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025 in NOAA Code 088 (South River). Since 2000, 38% of the NOAA Code area has been designated as a sanctuary.

Section B.17: NOAA Code 094 – West River and Rhode River

NOAA Code 094 encompasses the West and Rhode Rivers and is located in Maryland's mid-western portion of Chesapeake Bay. The NOAA Code is 3,751 acres and has 17 historic oyster bars²⁷. None of the NOAA Code is an oyster sanctuary. There are 367 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code. There are no acres within the NOAA Code designated as a Public Shellfish Fishery Area. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.17-1)

The Fall Oyster Survey has not collected samples in this NOAA Code since 2006. Between 2006 and 2025, minimal replenishment planting activities occurred to enhance the commercial public fishery in this NOAA Code outside of the current sanctuary area. Harvest for the NOAA Code has been reported on seafood dealer buy tickets for two years out of the 20-year time series for a total of 33 bushels harvested. This area has been closed to oyster harvest since 2020 at the request of the Anne Arundel County Oyster Committee.

²⁷ See chart 13 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

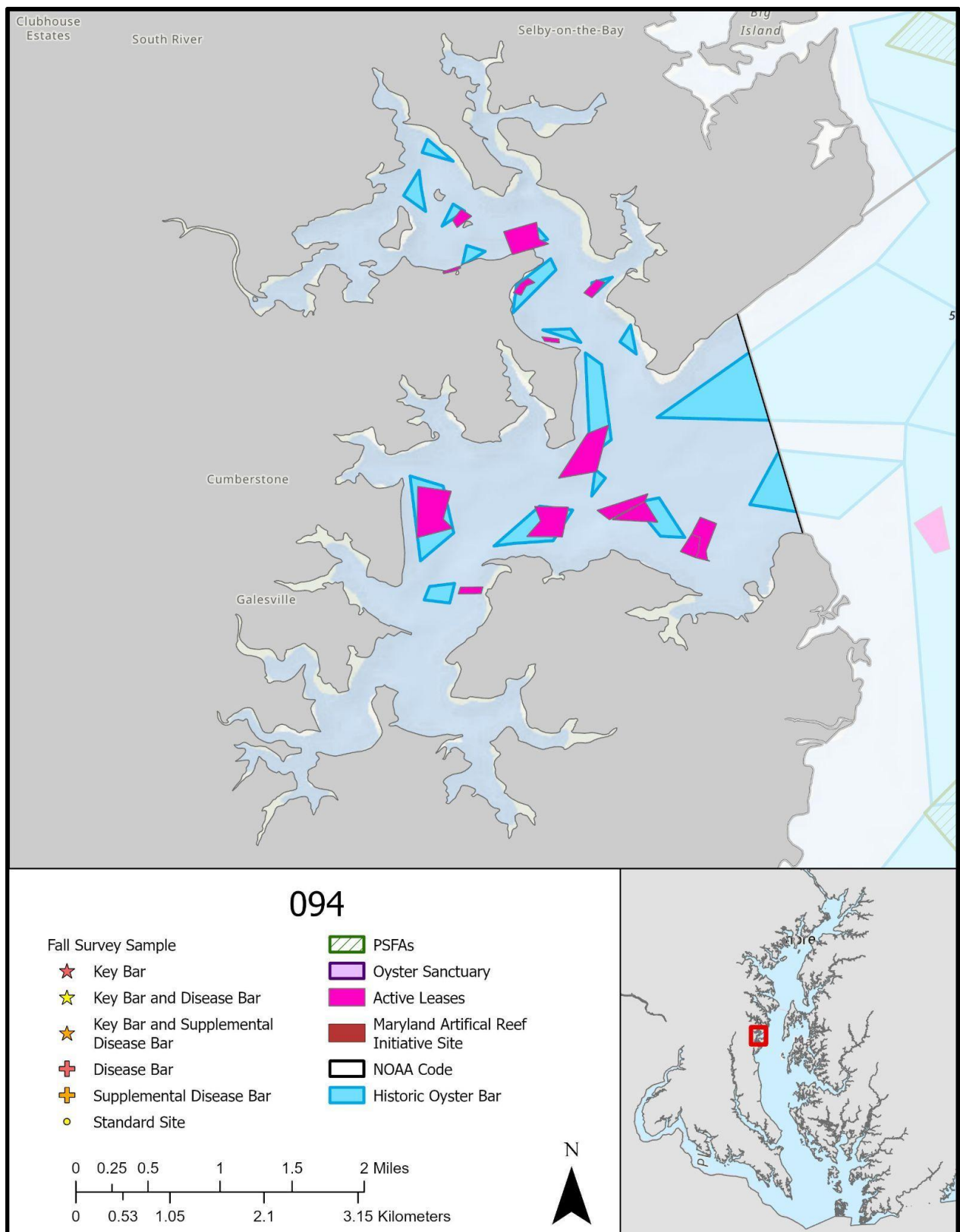


Figure B.17-1. Map of NOAA Code 094 (West River and Rhode River).

Section B.18: NOAA Code 096 – Wicomico River (East)

NOAA Code 096 encompasses the Wicomico River (East) and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 6,608 acres and has nine historic oyster bars²⁸. There are no sanctuaries in the NOAA Code. There are 715 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code. There are 766 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.18-1)
- Density per year (Figure B.18-2)
- Shell height frequencies (Figure B.18-3)
- Biomass per year (Figure B.18-4)
- Observed mortality (Figure B.18-5)
- Cultch per year (Figure B.18-6)
- Harvest (Figure B.18-7)

From the Fall Oyster Survey data, density of all size classes throughout the time series has doubled or nearly tripled during 2021-2025, compared to other time periods, which has led to a corresponding increase in biomass and cultch. Observed mortality was variable but decreased after 2023.

Between 2006 and 2025, approximately 21,000 bushels of shell, 133 million hatchery spat-on-shell and 1,300 bushels of wild seed were planted in the NOAA Code to enhance the public fishery. From 2021 to 2025, enhancements included 41 million hatchery spat-on-shell and all 1,300 bushels of wild seed.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for most years of the time series. Power dredge was the primary harvest gear during the 2021-2025 period. This area is characterized by stable and perhaps increasing abundance and oyster density, due primarily to good recent recruitment. Harvest is low and variable but relatively stable.

²⁸ See chart 31 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

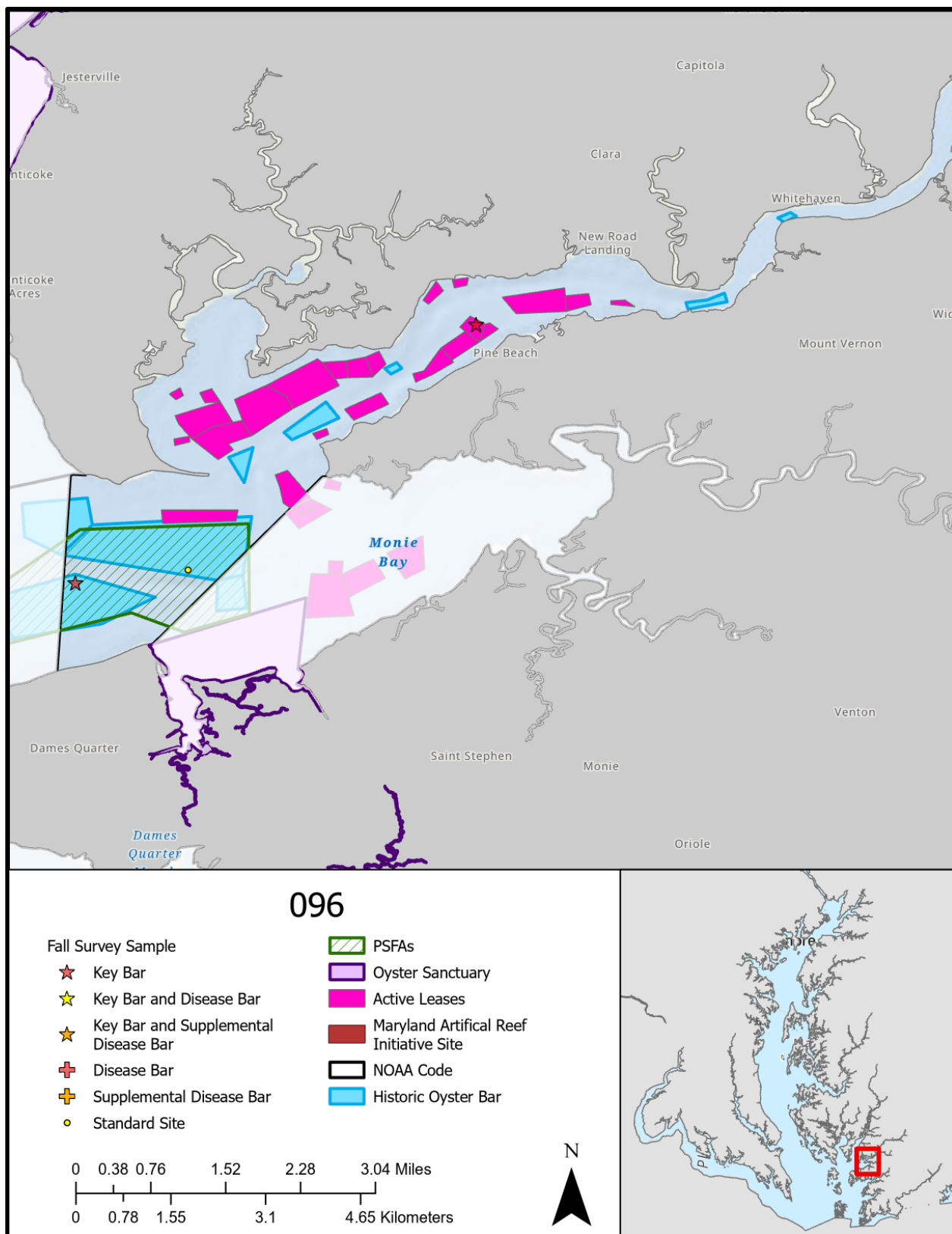


Figure B.18-1. Map of NOAA Code 096 (Wicomico River (East)). Fall Oyster Survey sites may not be sampled every year.

Table B.18-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 096 (Wicomico River (East)). ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/19	5/19	5/20	5/19
Number of Live Spat Oysters per square meter	6 $\pm$ 2.1	19.5 $\pm$ 10	19.2 $\pm$ 5.2	46.5 $\pm$ 12.5
Number of Live Small Oysters per square meter	2.9 $\pm$ 1.8	32.7 $\pm$ 8.5	21.9 $\pm$ 5.2	59.3 $\pm$ 8.5
Number of Live Market Oysters per square meter	3.8 $\pm$ 1.2	29.5 $\pm$ 5	16.1 $\pm$ 3.7	65 $\pm$ 6
Number of Live Oysters per square meter	12.6 $\pm$ 4	82 $\pm$ 13	57.3 $\pm$ 12.4	171 $\pm$ 21
Live Biomass (g Dry Weight per Bushel)	40 $\pm$ 23.6	140.3 $\pm$ 21	75.6 $\pm$ 10	193.4 $\pm$ 19.3
Observed Mortality (%)	11 $\pm$ 3.7	8.8 $\pm$ 3	13.2 $\pm$ 3.8	10.4 $\pm$ 2.5
Cultch (Bushels per 100 feet towed)	1 $\pm$ 0.1	1.3 $\pm$ 0.2	1.2 $\pm$ 0.3	1.8 $\pm$ 0.3
Harvest (Bushels)	72	1,671	3,538	1,485

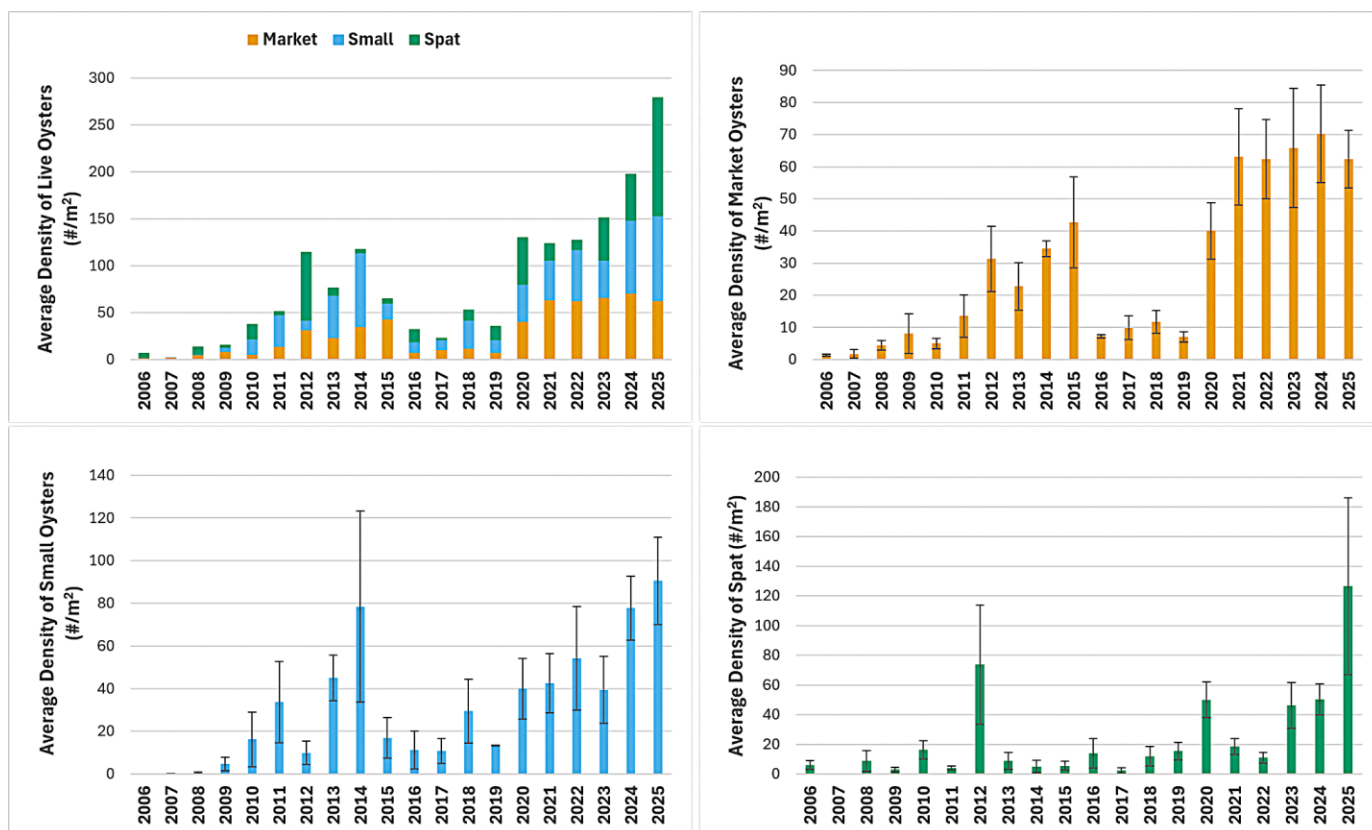


Figure B.18-2. Average number of live oysters per square meter by size class in NOAA Code 096 (Wicomico River (East)). Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Wicomico River (East) (096)

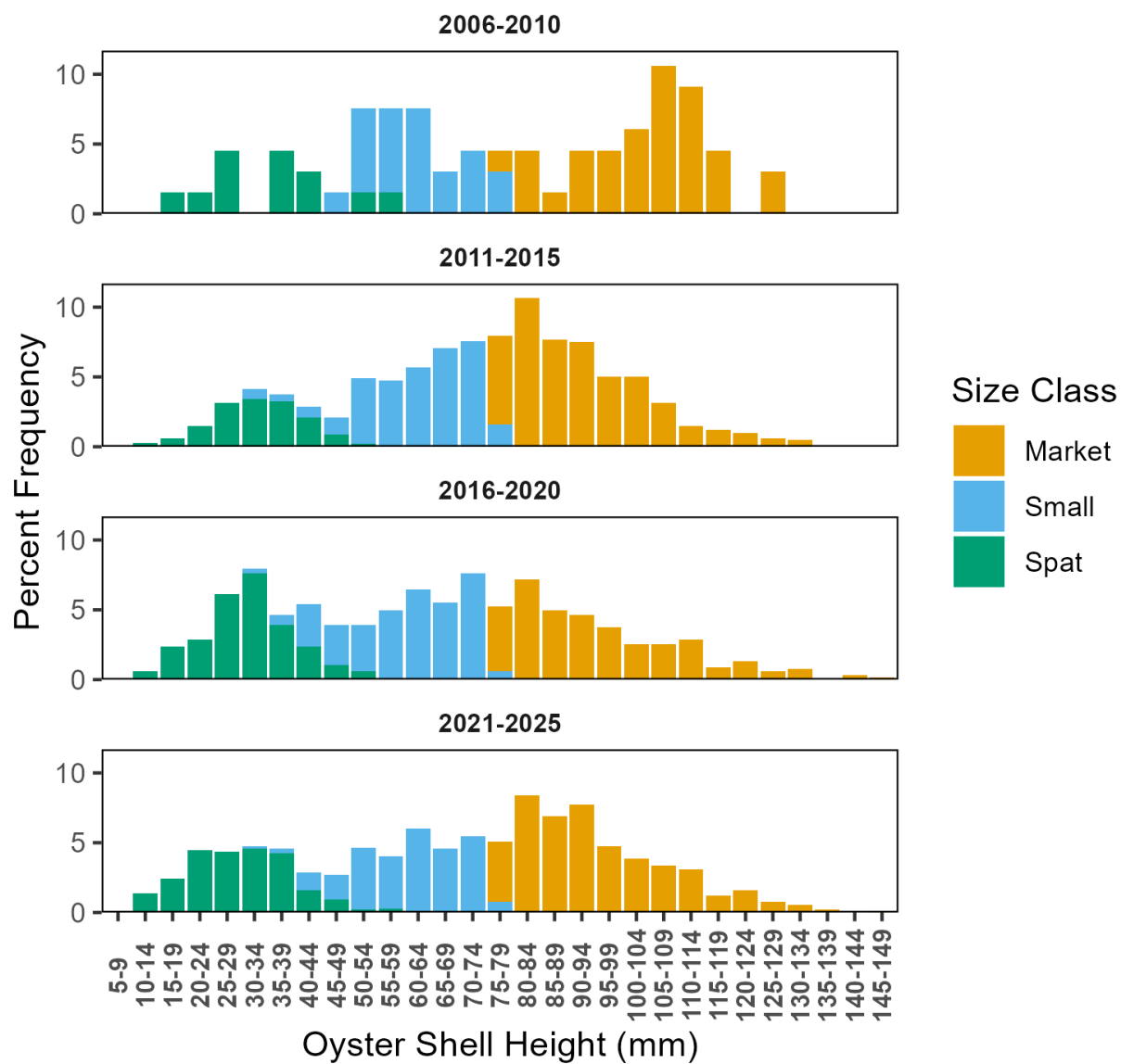


Figure B.18-3. Shell height frequencies of live oysters in NOAA Code 096 (Wicomico River (East)).

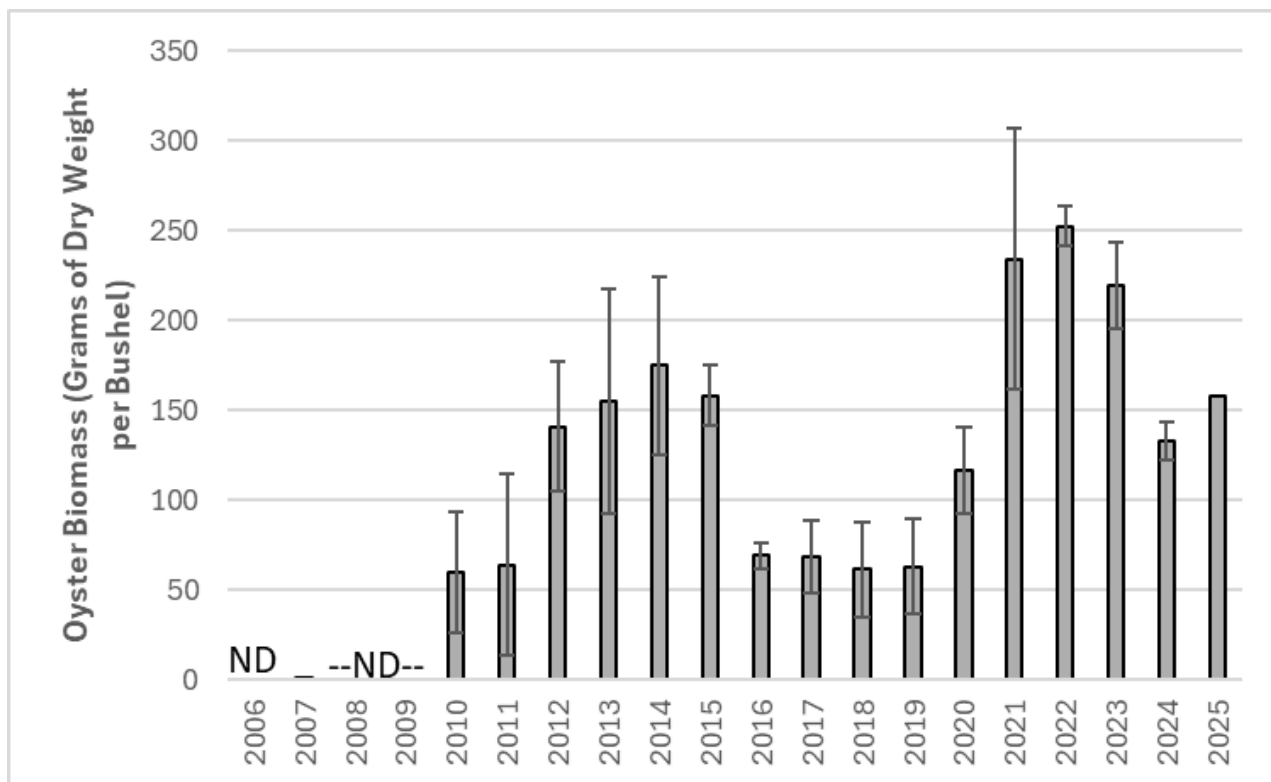


Figure B.18-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 096 (Wicomico River (East)). Data from Maryland's Annual Fall Oyster Dredge Survey. ND = No Data.

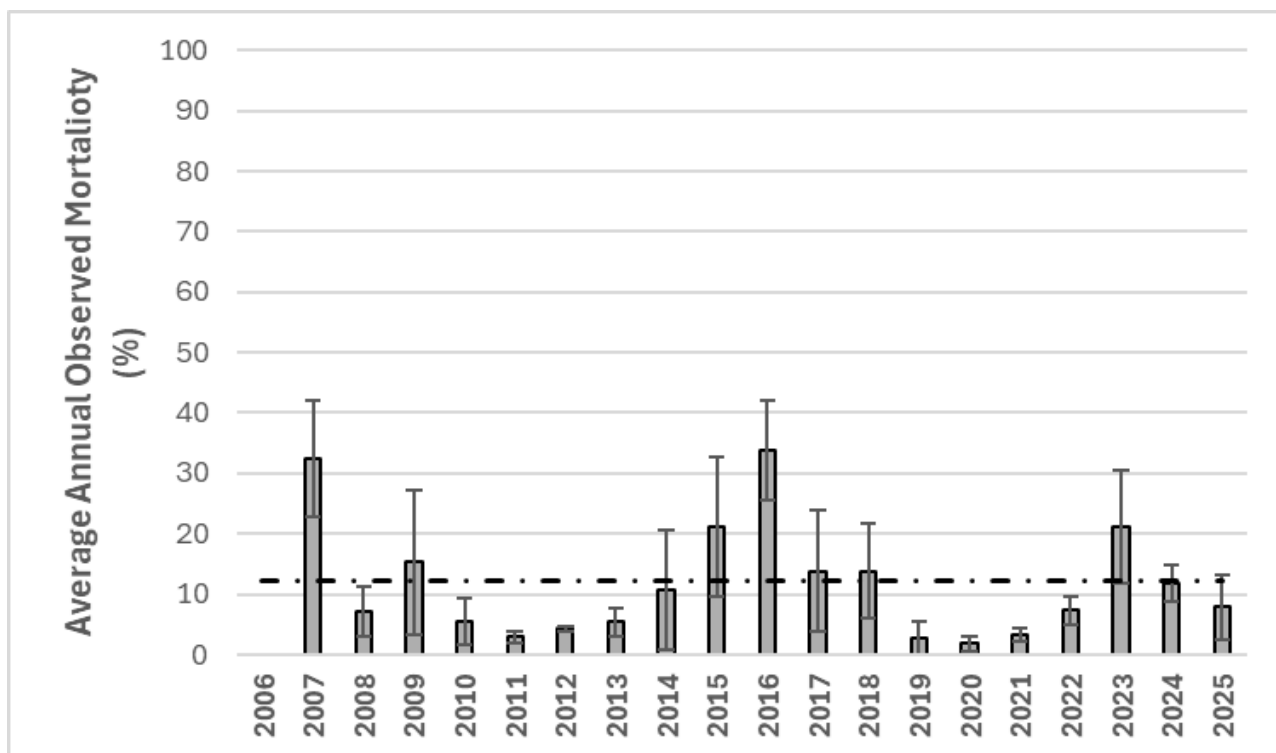


Figure B.18-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 096 (Wicomico River (East)). Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

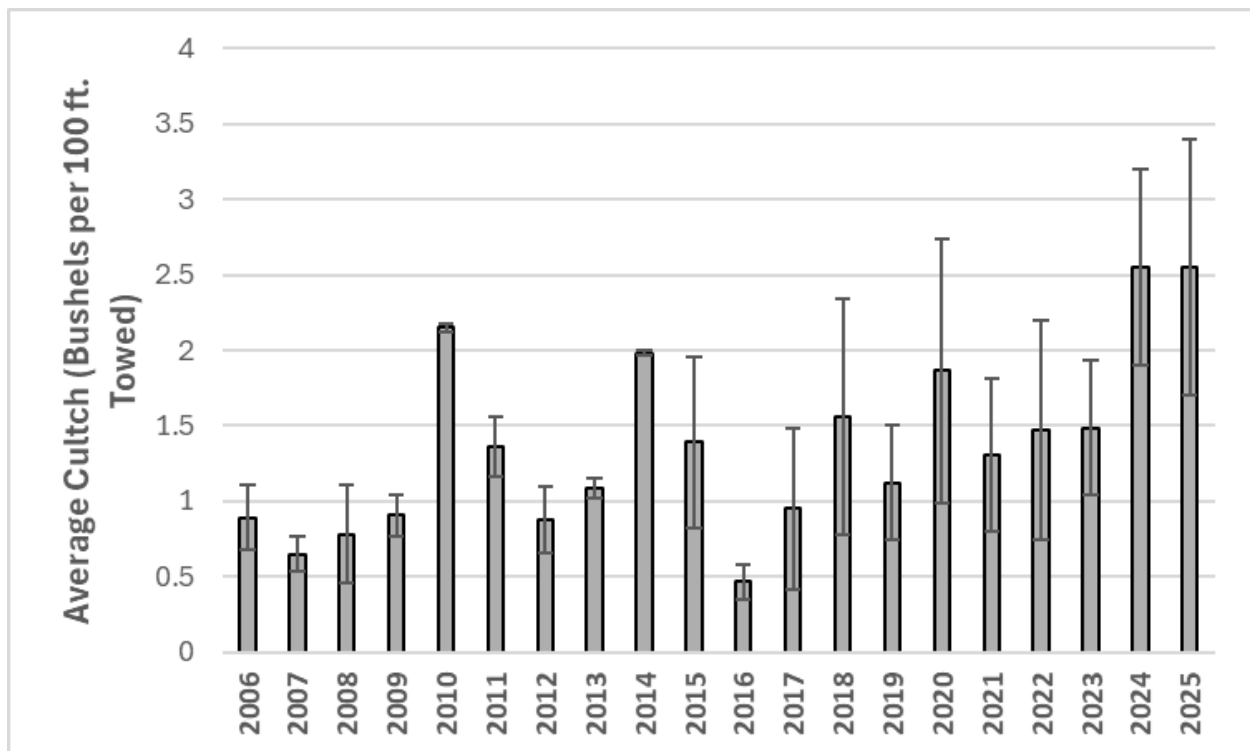


Figure B.18-6. Average cultch (live and dead oysters and loose shell) in NOAA Code 096 (Wicomico River (East)). Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

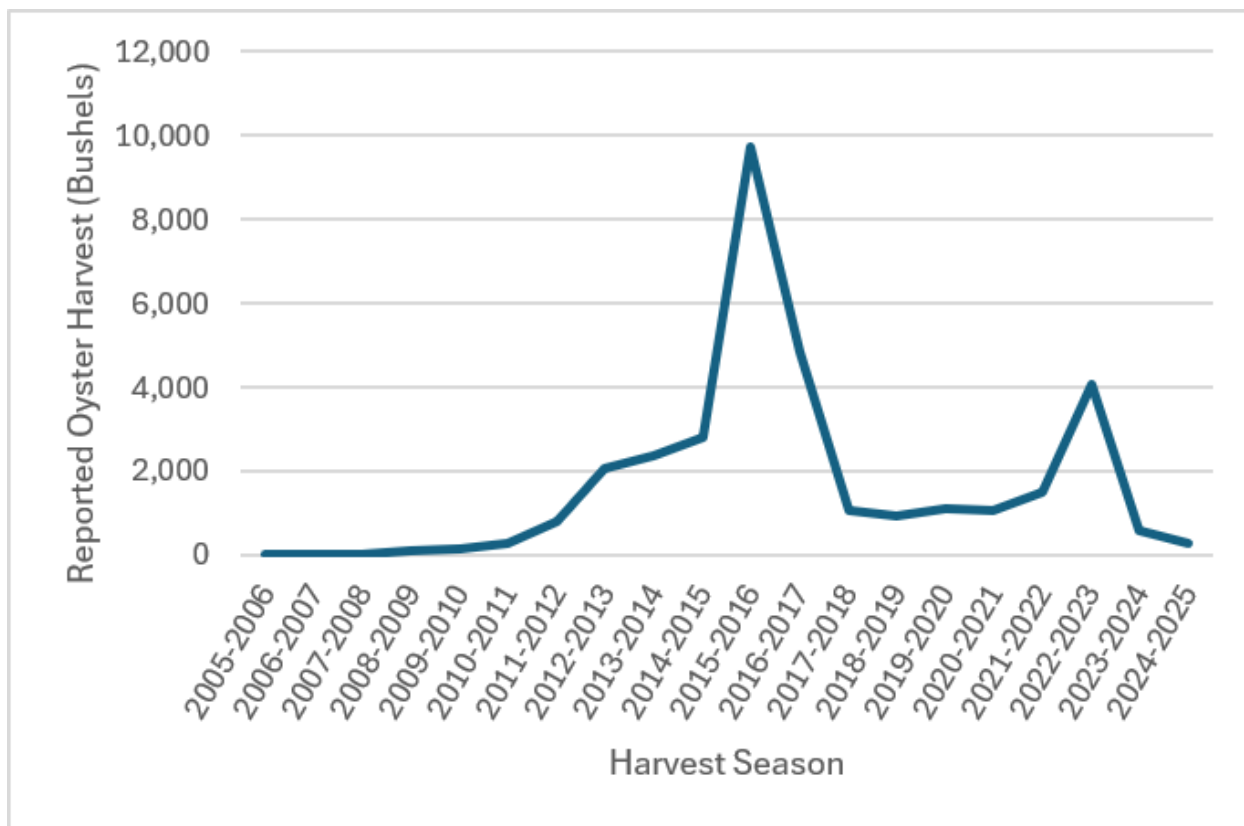


Figure B.18-7. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 096 (Wicomico River (East)).

Section B.19: NOAA Code 098 – Monie Bay

NOAA Code 098 encompasses Monie Bay and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 3,242 acres and has two historic oyster bars²⁹. The Webster Sanctuary encompasses 17% (554 total acres) of the NOAA Code. This equates to 2,688 surface acres in the NOAA code that are not in the sanctuary. There are 59 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuary area. There are 148 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2). A large part of this NOAA code was restricted for harvest due to water quality since 2005 but much of it was reclassified as approved in 2012.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.19-1)
- Summary statistics (Table B.19-1)
- Harvest (Figure B.19-2)

The Fall Oyster Survey did not collect samples in this NOAA Code between 2006 and 2025, and no replenishment planting activities have occurred in the non-sanctuary portion.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets. Following the establishment of the sanctuary in 1997, 17% of the area was closed to harvest. Power dredge and patent tong were the primary harvest gears during the 2021-2025 period. This area is characterized by generally low but variable harvest.

²⁹ See chart31 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

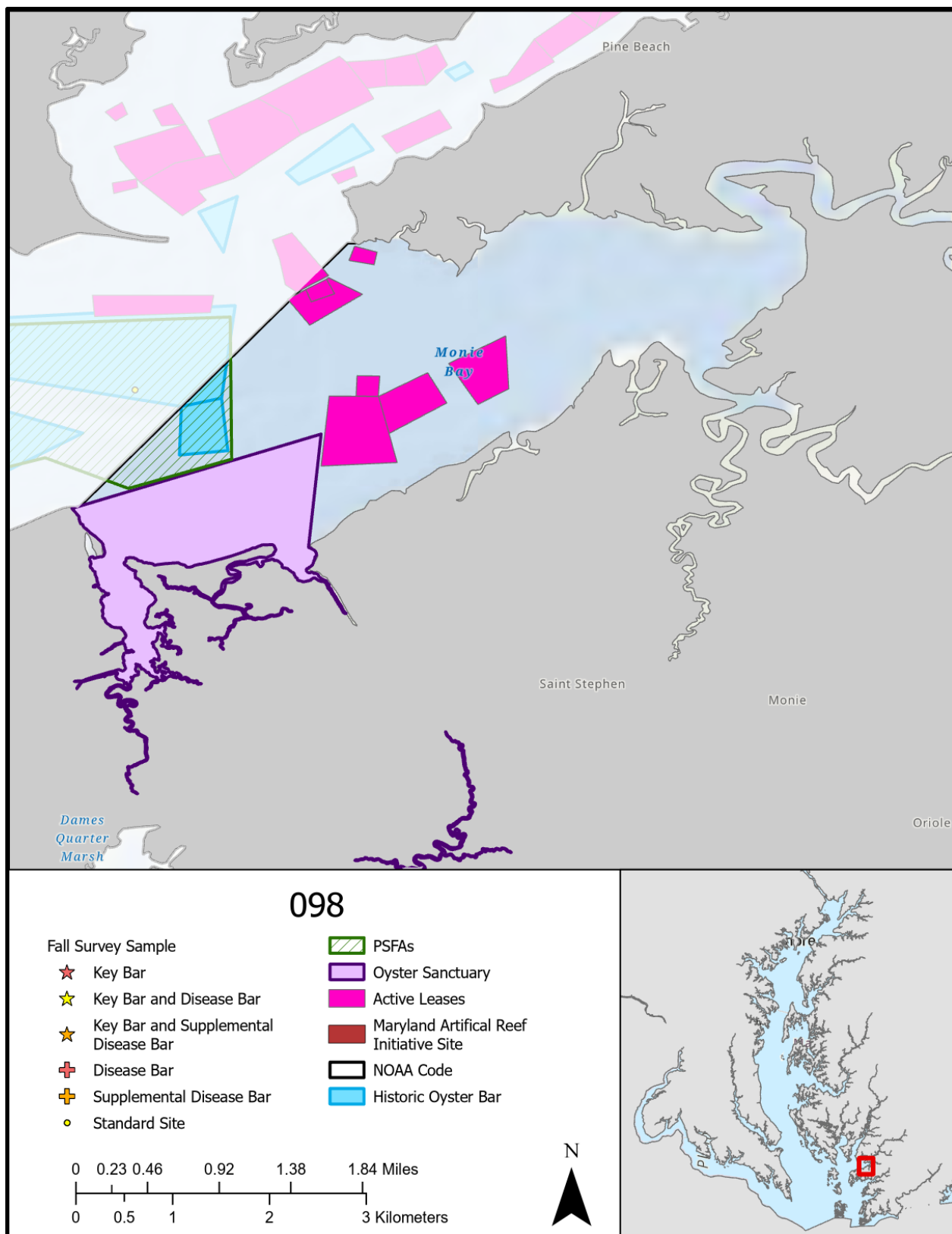


Table B.19-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 098 (Monie Bay) occurring outside of the current sanctuary area. ND=No Data. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	ND	ND	ND	ND
Number of Live Spat Oysters per square meter	ND	ND	ND	ND
Number of Live Small Oysters per square meter	ND	ND	ND	ND
Number of Live Market Oysters per square meter	ND	ND	ND	ND
Number of Live Oysters per square meter	ND	ND	ND	ND
Live Biomass (g Dry Weight per Bushel)	ND	ND	ND	ND
Observed Mortality (%)	ND	ND	ND	ND
Cultch (Bushels per 100 feet towed)	ND	ND	ND	ND
Harvest (Bushels)	67	559	151	192

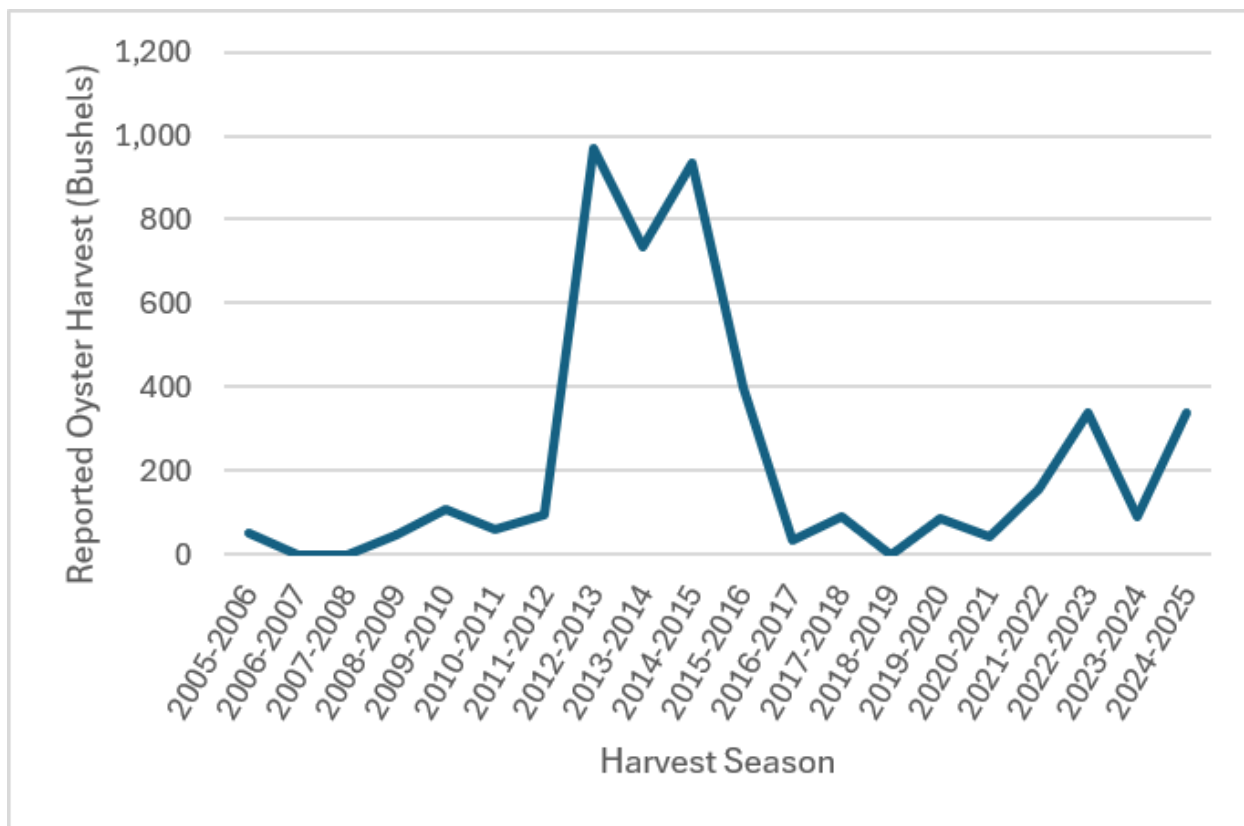


Figure B.19-2. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 098 (Monie Bay). Since 1997, 17% of the NOAA Code area has been designated as a sanctuary.

Section B.20: NOAA Code 099 – Wye River

NOAA Code 099 (Wye River) is 6,411 acres (Figure B.20-1); all of the area is within the Wye River Sanctuary boundary (established in 2010). See Appendix A, Section A.51 for more information on the oyster population characteristics.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.20-1)

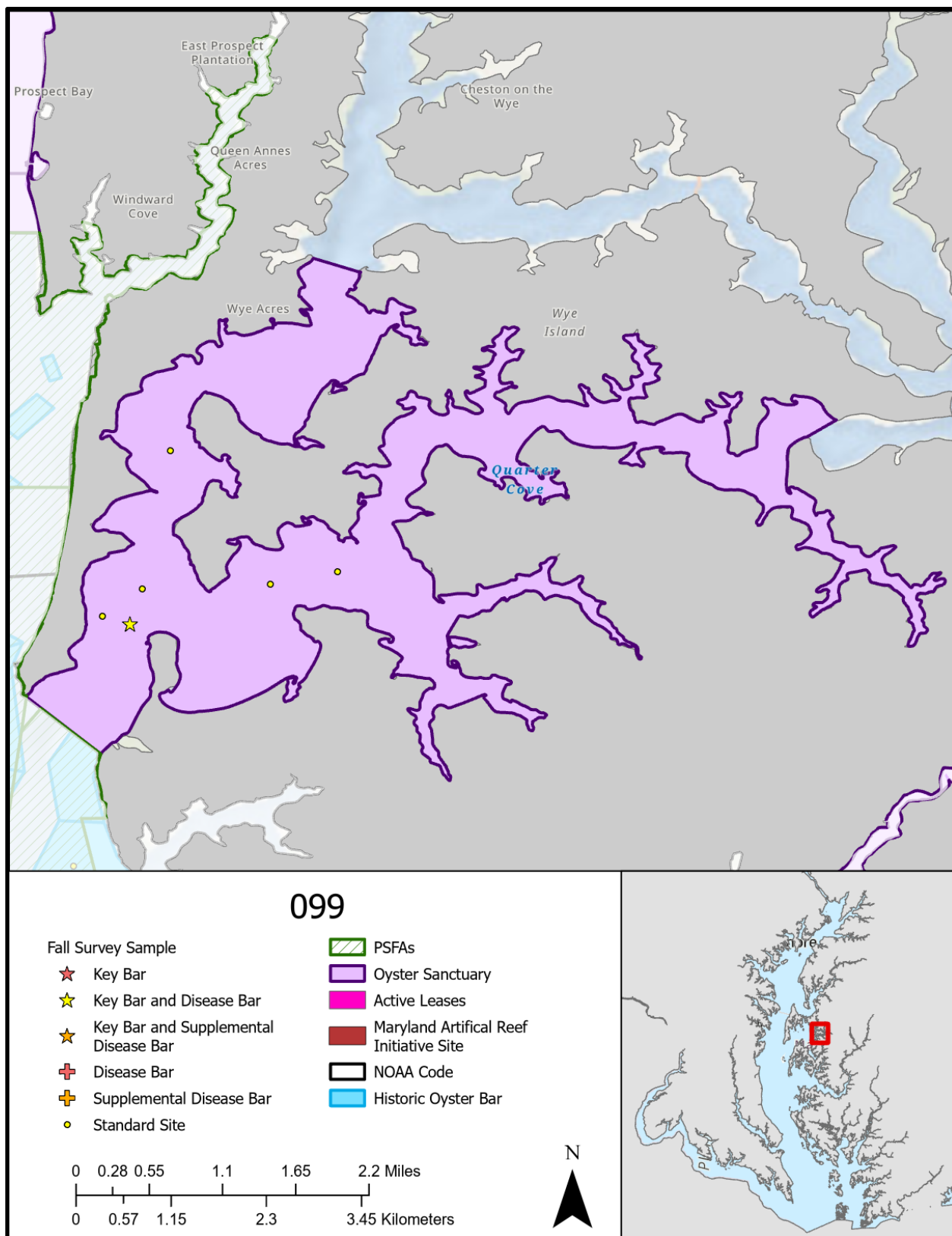


Figure B.20-1. Map of NOAA Code 099 (Wye River). Fall Oyster Survey sites may not be sampled every year.

Section B.21: NOAA Code 127 – Upper Middle Chesapeake Bay

NOAA Code 127 encompasses Chesapeake Bay mainstem south of the Bay Bridge and north of a line from Kent Point to Fairhaven. The entire NOAA Code is 57,029 acres and has 30 historic oyster bars³⁰. The Herring Bay and Severn River sanctuaries encompass 10% (5,623 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 51,406 surface acres. There are 14,777 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuary areas. There are 5,709 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.21-1)
- Summary statistics (Table B.21-1)
- Density per year (Figure B.21-2)
- Shell height frequencies (Figure B.21-3)
- Biomass per year (Figure B.21-4)
- Observed mortality (Figure B.21-5)
- Dermo and MSX per year (Figure B.21-6)
- Cultch per year (Figure B.21-7)
- Harvest (Figure B.21-8)

Total live oyster density peaked in the 2016-2020 time period. Much of the increase in spat density was driven by plantings of hatchery spat-on-shell. Density of all size classes moderated during 2021-2025, but it remained higher than levels recorded between 2006 and 2015. Biomass has fluctuated but remained relatively consistent throughout the time series. Observed mortality, while slightly higher during 2021-2025, was below the long-term baywide average. MSX was rarely detected and dermo intensity and prevalence have declined in recent years. Cultch available was consistently low, with a slight increase after 2021.

Between 2006 and 2025, approximately 102,000 bushels of wild seed and 282 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. From 2021 to 2025, enhancements included 155 million hatchery spat-on-shell and 1,900 bushels of wild seed.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. This includes past harvest data from areas in the NOAA Code that are currently in a sanctuary. Following the establishment of the sanctuary in 2010, 10% of the NOAA Code was closed to harvest. Patent tong was the primary harvest gear in this area during the 2021-2025 period. This area is characterized by a relatively stable population with low harvest and potentially an increase in oyster density over

³⁰ See charts 9, 10, and 13 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

time, apparently driven primarily by a recent good spat set in 2025 and hatchery spat-on-shell plantings.

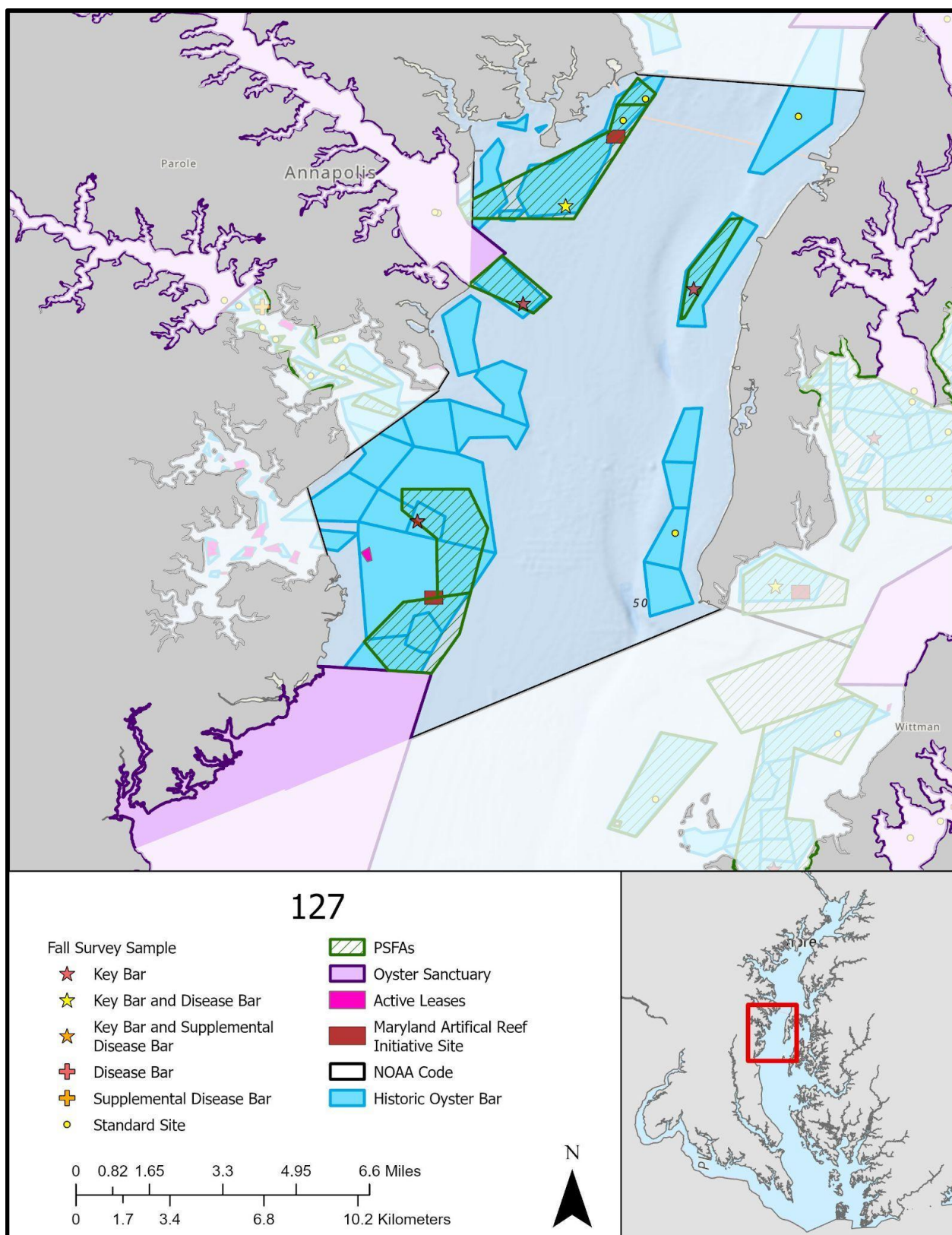


Figure B.21-1. Map of NOAA Code 127 (Upper Middle Chesapeake Bay). Fall Oyster Survey sites may not be sampled every year.

Table B.21-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 127 (Upper Middle Chesapeake Bay) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/65	5/52	5/52	5/49
Number of Live Spat Oysters per square meter	0.3 $\pm$ 0.1	0.05 $\pm$ 0.04	24 $\pm$ 15.6*	13.5 $\pm$ 7.1*
Number of Live Small Oysters per square meter	6.8 $\pm$ 1.7	1.9 $\pm$ 0.5	10.4 $\pm$ 7.4	10.3 $\pm$ 4.5
Number of Live Market Oysters per square meter	8.3 $\pm$ 1	3.5 $\pm$ 0.6	5 $\pm$ 0.8	6.4 $\pm$ 0.8
Number of Live Oysters per square meter	15.4 $\pm$ 2	5.5 $\pm$ 1	39.5 $\pm$ 17	30.2 $\pm$ 7.7
Live Biomass (g Dry Weight per Bushel)	88.5 $\pm$ 13.6	62.6 $\pm$ 10.6	82 $\pm$ 11.8	75.7 $\pm$ 10.3
Observed Mortality (%)	10 $\pm$ 0.9	4.1 $\pm$ 0.9	4.4 $\pm$ 0.8	6.9 $\pm$ 1
Cultch (Bushels per 100 feet towed)	0.3 $\pm$ 0.03	0.3 $\pm$ 0.04	0.3 $\pm$ 0.04	0.5 $\pm$ 0.05
Harvest (Bushels)	3,128	278	1,721	1,012

*Includes plantings in 2018 and 2024

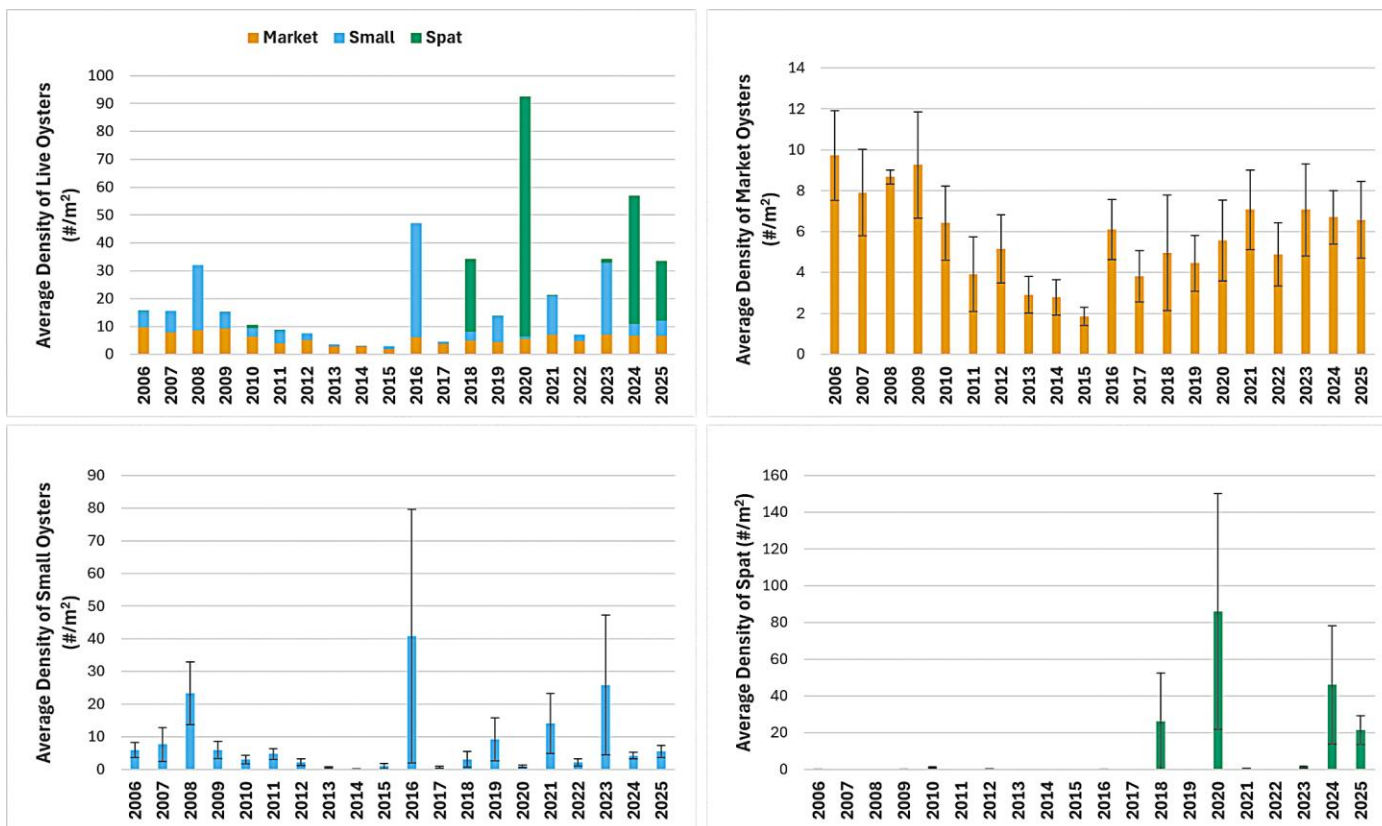


Figure B.21-2A. Average number of live oysters per square meter by size class in NOAA Code 127 (Upper Middle Chesapeake Bay) occurring outside of the current sanctuary area including samples taken on spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

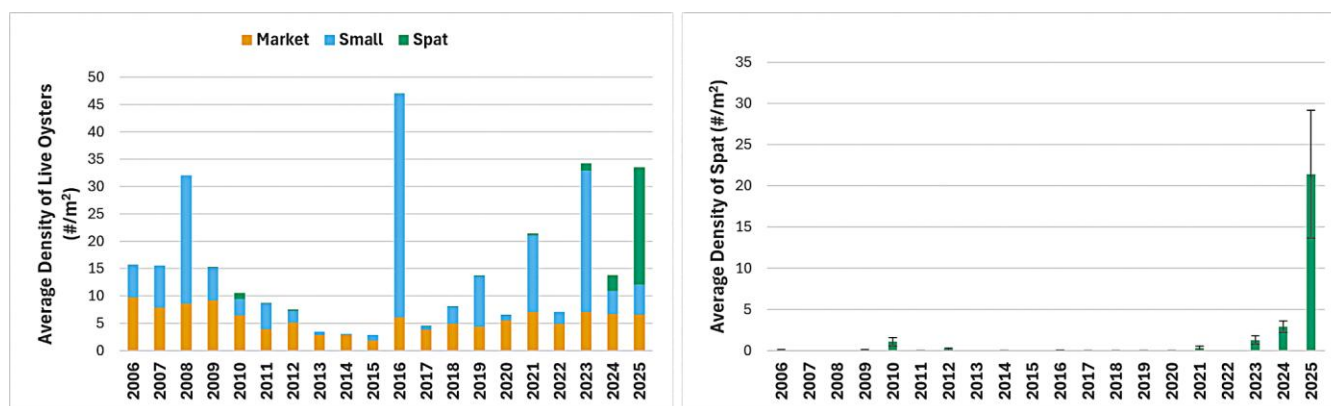


Figure B.21-2B. Average number of live oysters per square meter by size class in NOAA Code 127 (Upper Middle Chesapeake Bay) occurring outside of the current sanctuary area excluding samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Chesapeake Bay Upper Middle (127)

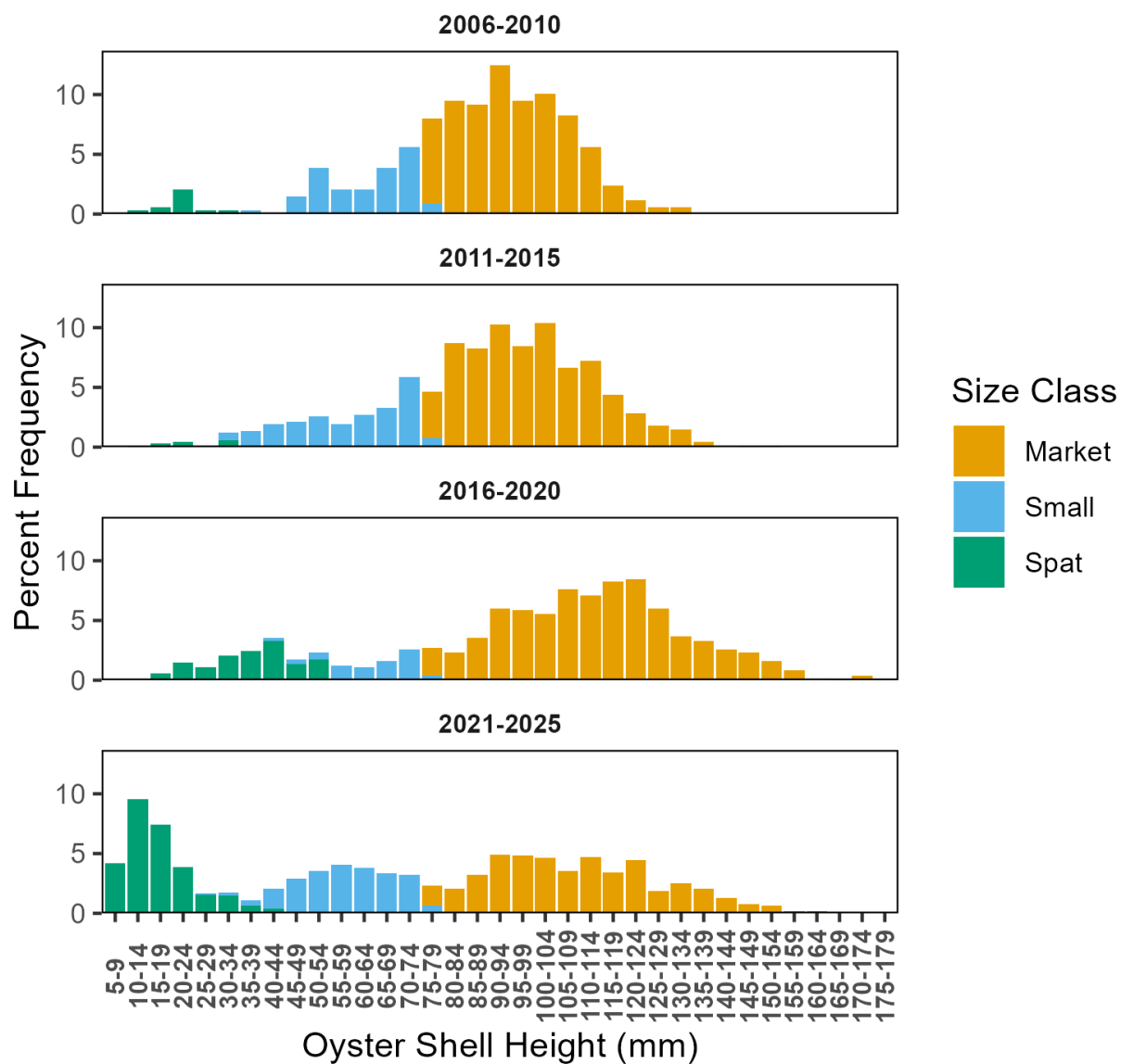


Figure B.21-3. Shell height frequencies of live oysters in NOAA Code 127 (Upper Middle Chesapeake Bay) outside of the current sanctuary area.

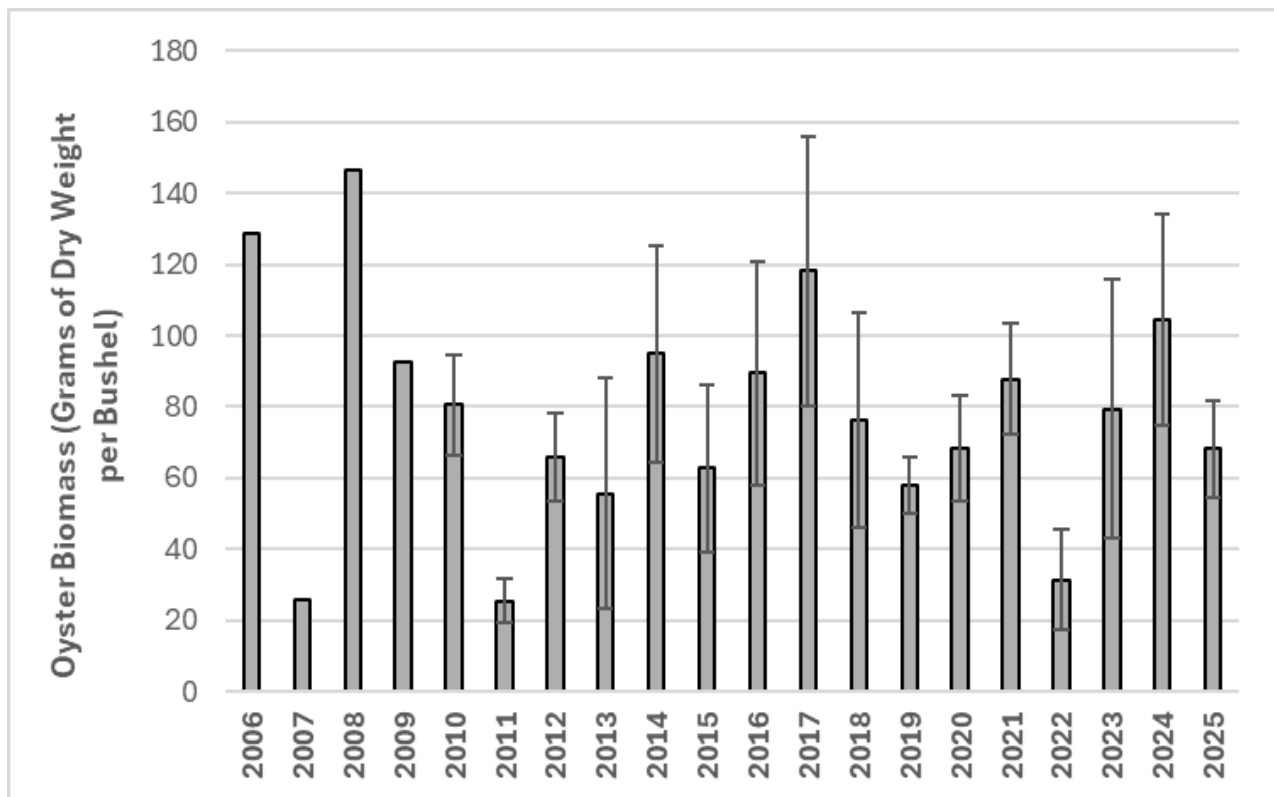


Figure B.21-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 127 (Upper Middle Chesapeake Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

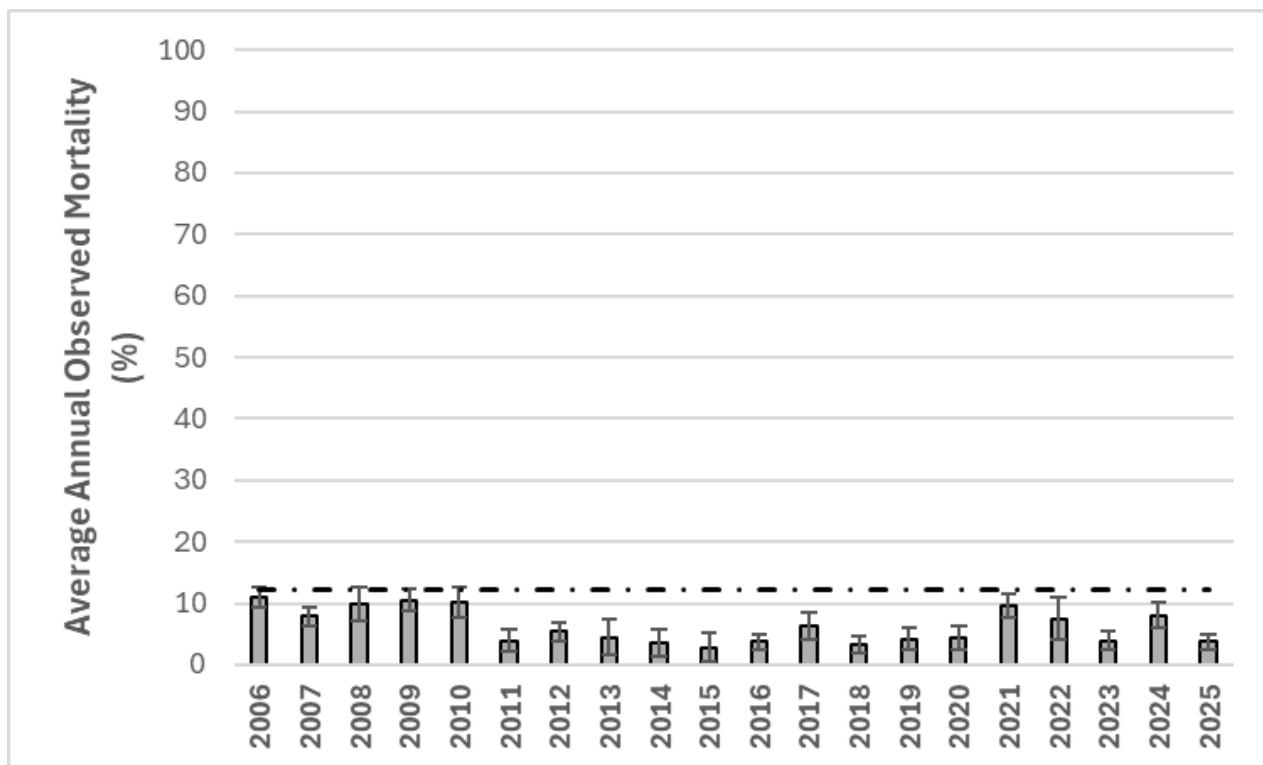


Figure B.21-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 127 (Upper Middle Chesapeake Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

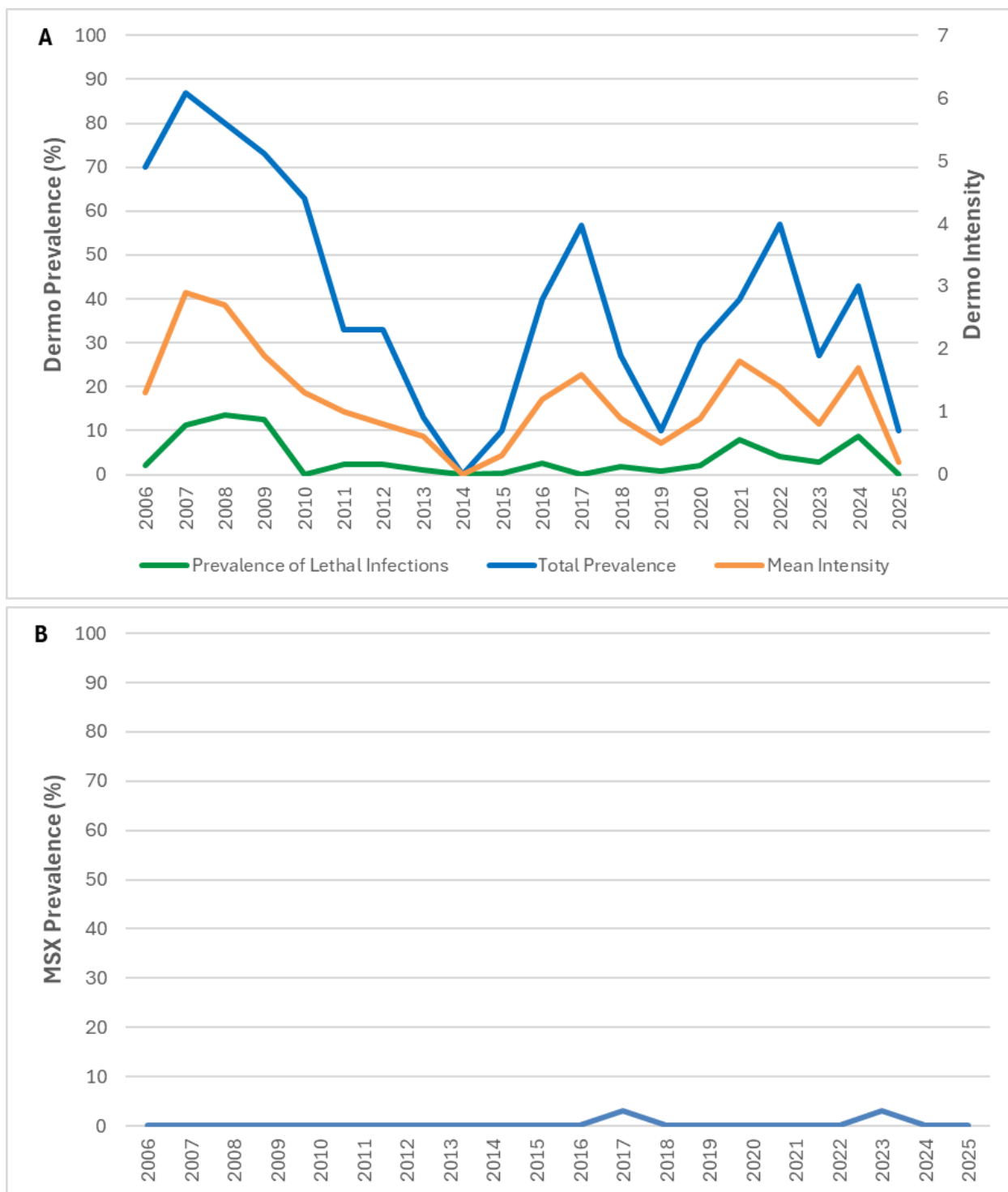


Figure B.21-6. Oyster disease prevalence and intensity in NOAA Code 127 (Upper Middle Chesapeake Bay) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Hackett Point bar.

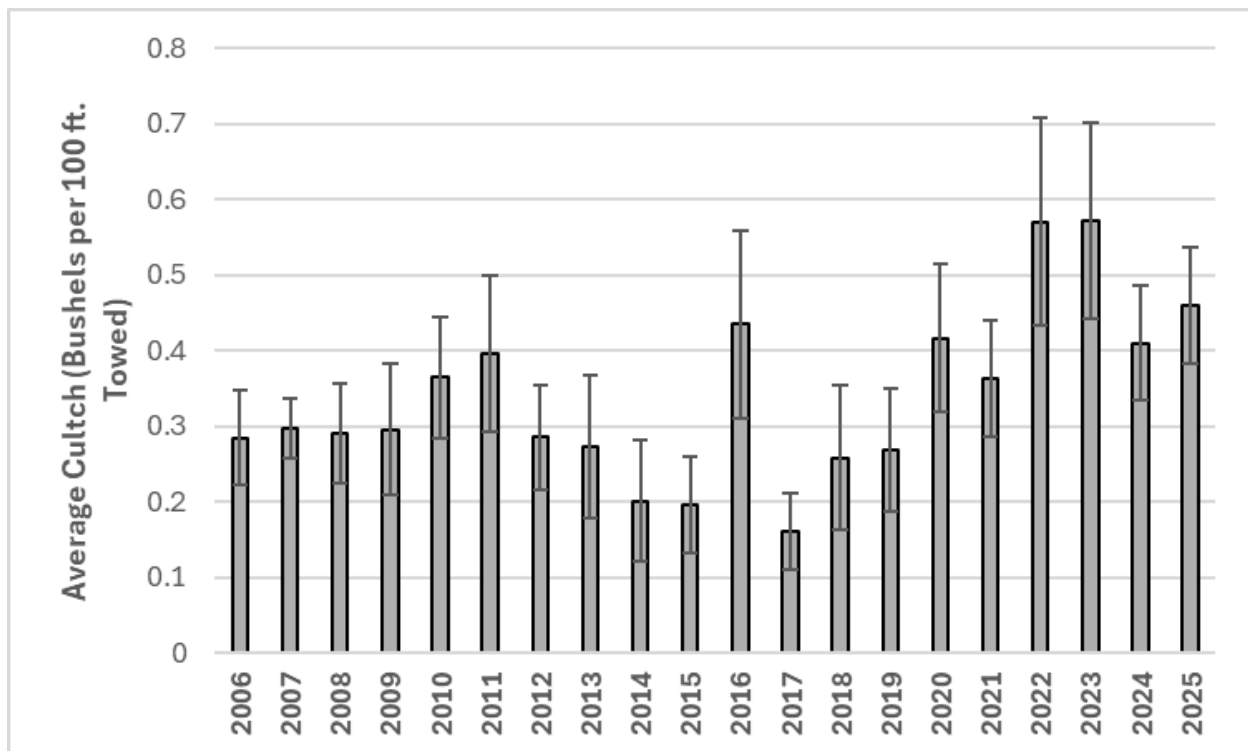


Figure B.21-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 127 (Upper Middle Chesapeake Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

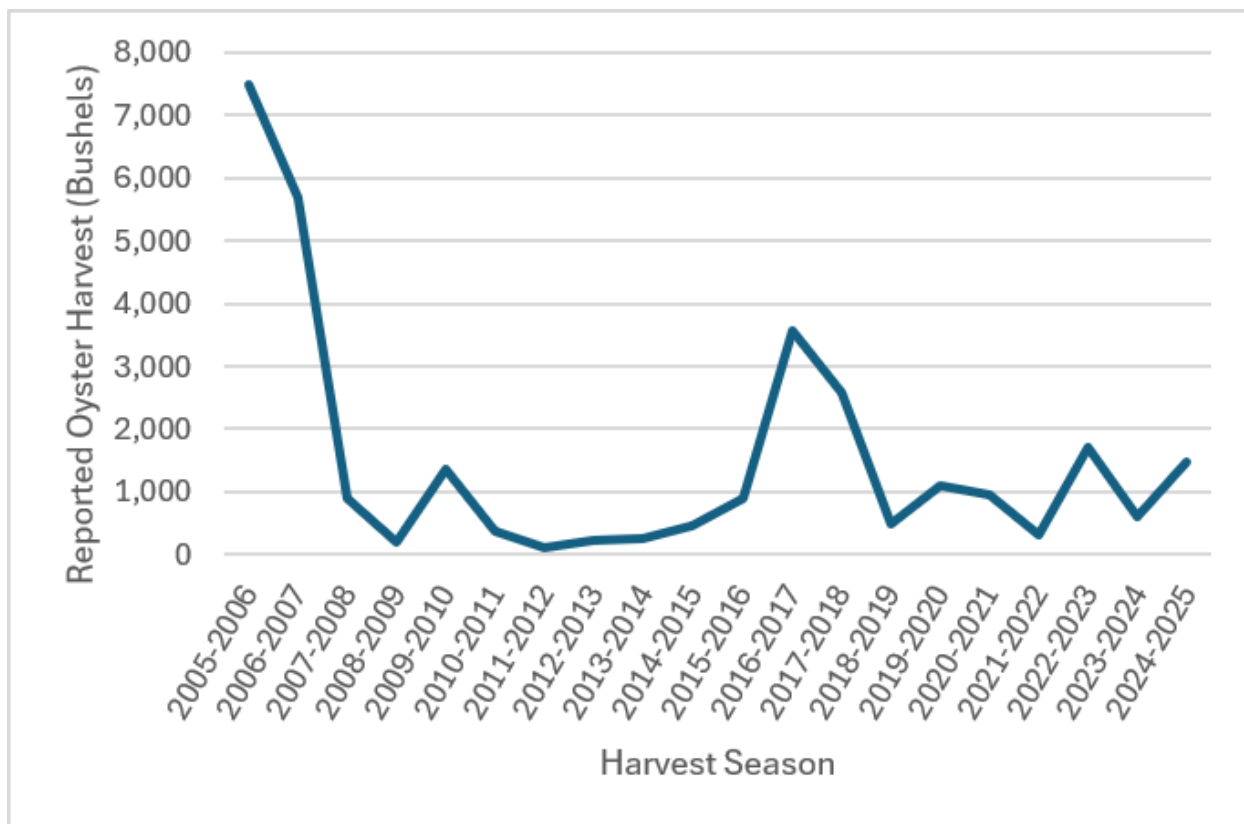


Figure B.21-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025 in NOAA Code 127 (Upper Middle Chesapeake Bay). Since 2010, 10% of the NOAA Code area has been designated as a sanctuary.

Section B.22: NOAA Code 129 – Lower East Chesapeake Bay

NOAA Code 129 encompasses the Chesapeake Bay mainstem south of Cove Point and east of the shipping channel and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 130,570 acres and has 16 historic oyster bars³¹. The Lower Mainstem Sanctuary encompasses 24% (31,934 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 98,636 surface acres. There are 1,359 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. No acres within the NOAA Code are designated as a Public Shellfish Fishery Area. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.22-1)
- Summary Statistics (Table B.22-1)
- Harvest (Figure B.22-8)

No samples have been collected by the Fall Oyster Survey in the non-sanctuary portions of this area since 2006. No plantings have occurred since 2006 to enhance the commercial public fishery.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets, including past harvest from areas now in a sanctuary. Following the establishment of the sanctuary in 2010, 24% of the area was closed to harvest. Power dredge was the primary harvest gear over the 2021-2025 time period. Over time, this region has experienced a decline in harvest.

³¹ See chart 28 and 41 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

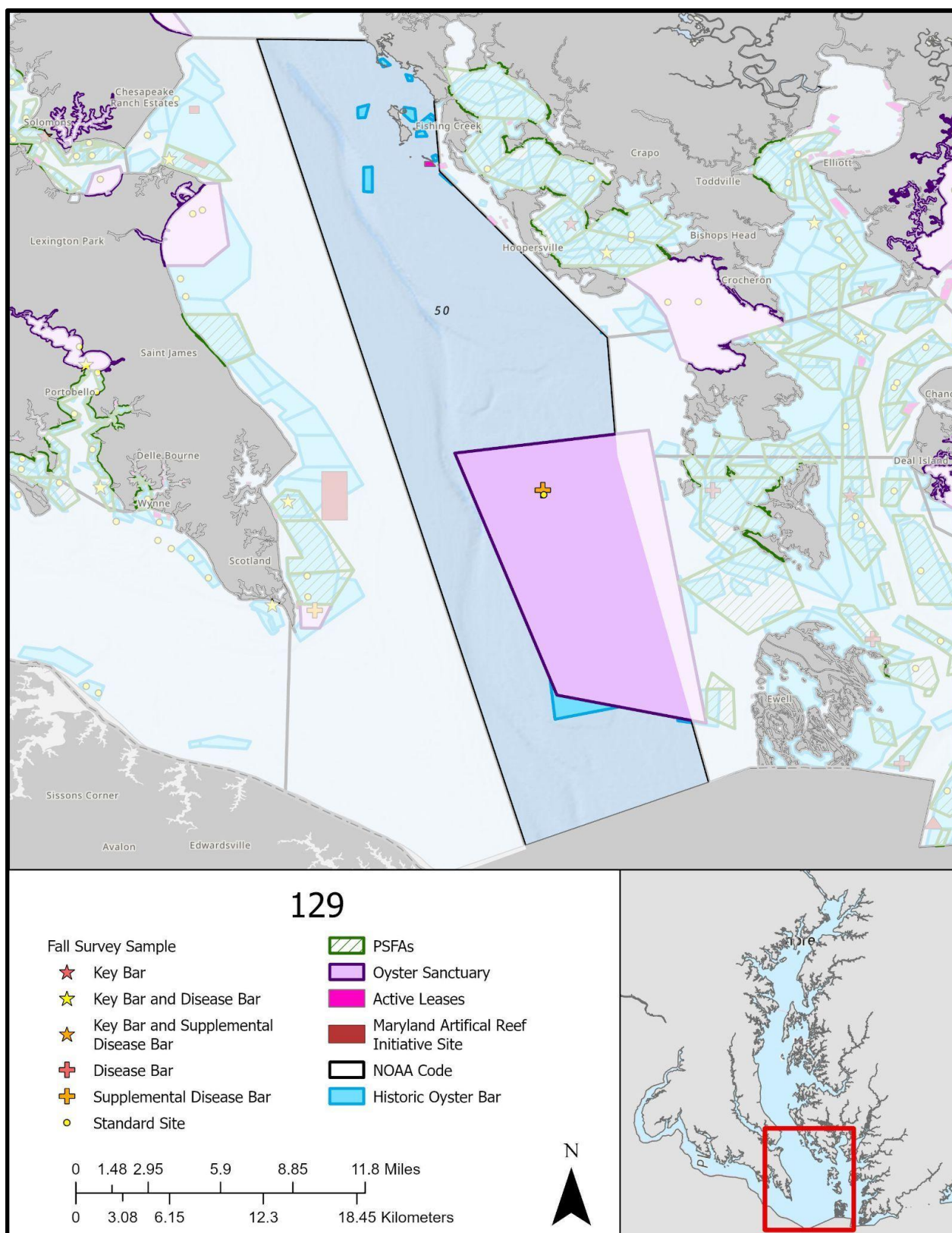


Figure B.22-1. Map of NOAA Code 129 (Lower East Chesapeake Bay). Fall Oyster Survey sites may not be sampled every year.

Table B.22-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 129 (Lower East Chesapeake Bay) occurring outside of the current sanctuary area. ND=No Data. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	ND	ND	ND	ND
Number of Live Spat Oysters per square meter	ND	ND	ND	ND
Number of Live Small Oysters per square meter	ND	ND	ND	ND
Number of Live Market Oysters per square meter	ND	ND	ND	ND
Number of Live Oysters per square meter	ND	ND	ND	ND
Live Biomass (g Dry Weight per Bushel)	ND	ND	ND	ND
Observed Mortality (%)	ND	ND	ND	ND
Cultch (Bushels per 100 feet towed)	ND	ND	ND	ND
Harvest (Bushels)	3,420	4,978	2,078	1,829

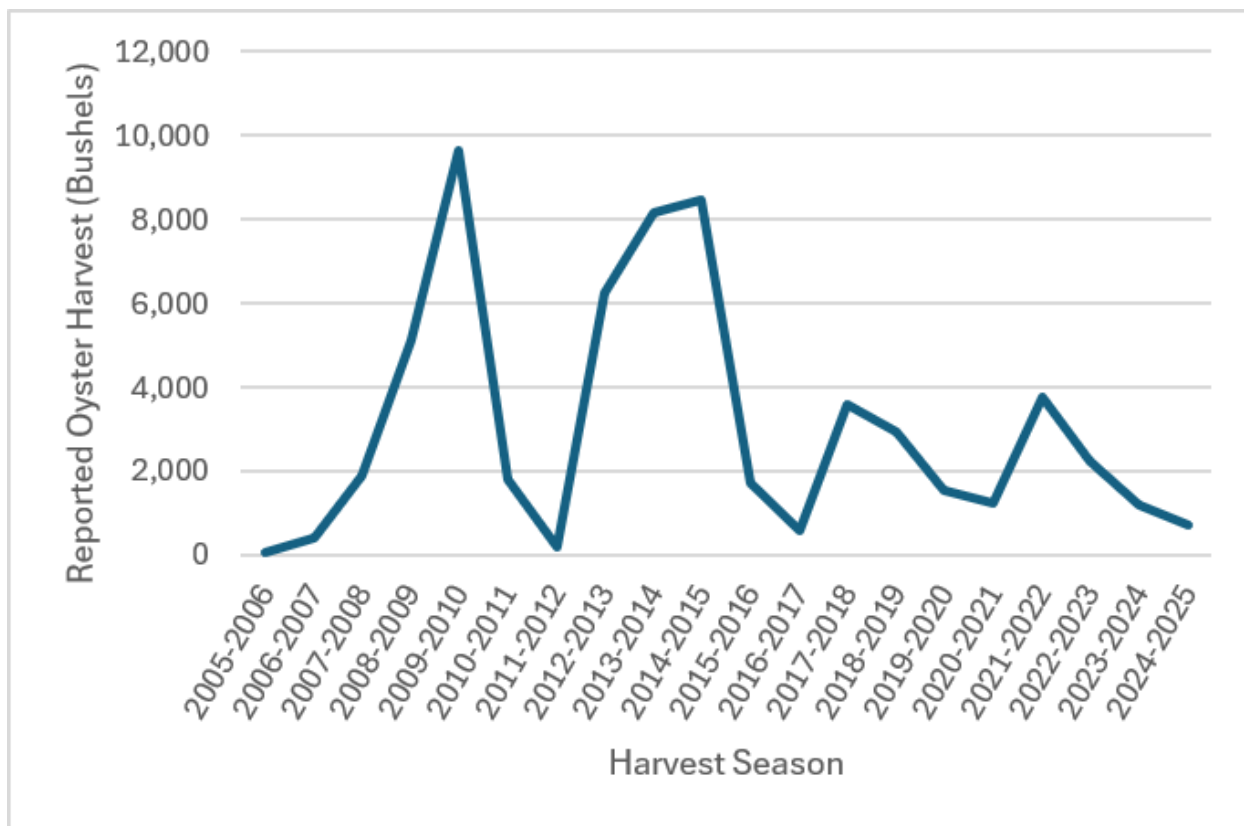


Figure B.22-2. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 129 (Lower East Chesapeake Bay). Since 2010, 24% of the NOAA Code area has been designated as a sanctuary.

Section B.23: NOAA Code 131 – Chester River Lower

NOAA Code 131 encompasses the lower portion of the Chester River below Queenstown Creek and is located in Maryland's upper eastern portion of Chesapeake Bay. The entire NOAA Code is 18,080 acres and has 18 historic oyster bars³². The Lower Chester River Sanctuary encompasses 69% (12,591 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 5,489 surface acres. There are 986 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuary. There are 763 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1). The Chester River has been closed to harvesting except for planted areas for the 2021-2025 time period due to continuing low abundance.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.23-1)
- Summary statistics (Table B.23-1)
- Density per year (Figure B.23-2)
- Shell height frequencies (Figure B.23-3)
- Biomass per year (Figure B.23-4)
- Observed mortality (Figure B.23-5)
- Dermo and MSX per year (Figure B.23-6)
- Cultch per year (Figure B.23-7)
- Harvest (Figure B.23-8)

The overall density of live oysters peaked during 2011-2015, likely the result of hatchery spat-on-shell plantings in 2009 and 2011. The density of all small and market density has declined since then, while spat density remained near zero. Despite low densities of oysters, biomass increased slightly during 2021-2025. Mortality was well below the long-term average for the time period, allowing oysters to survive and grow larger. Cultch availability showed a gradual, consistent decline across all time periods. Dermo intensity and prevalence declined throughout the time series and no MSX has been found in this area.

Between 2006 and 2025, approximately 238 million hatchery spat-on-shell and 2,700 bushels of wild seed were planted in this NOAA Code to enhance the commercial public fishery. Between 2021 and 2025, approximately 7 million hatchery spat-on-shell were planted.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in the sanctuary. Following the establishment of the sanctuary in 2010, 69% of the NOAA Code was closed to harvest. The Chester River has been closed to harvesting except for planted

³² See chart 7 and 8 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

areas for the 2021-2025 time period; hand tong and diving were the primary harvest gears. This area is characterized by a low or slightly decreasing population. Harvest, even within the planted areas, has decreased over time.

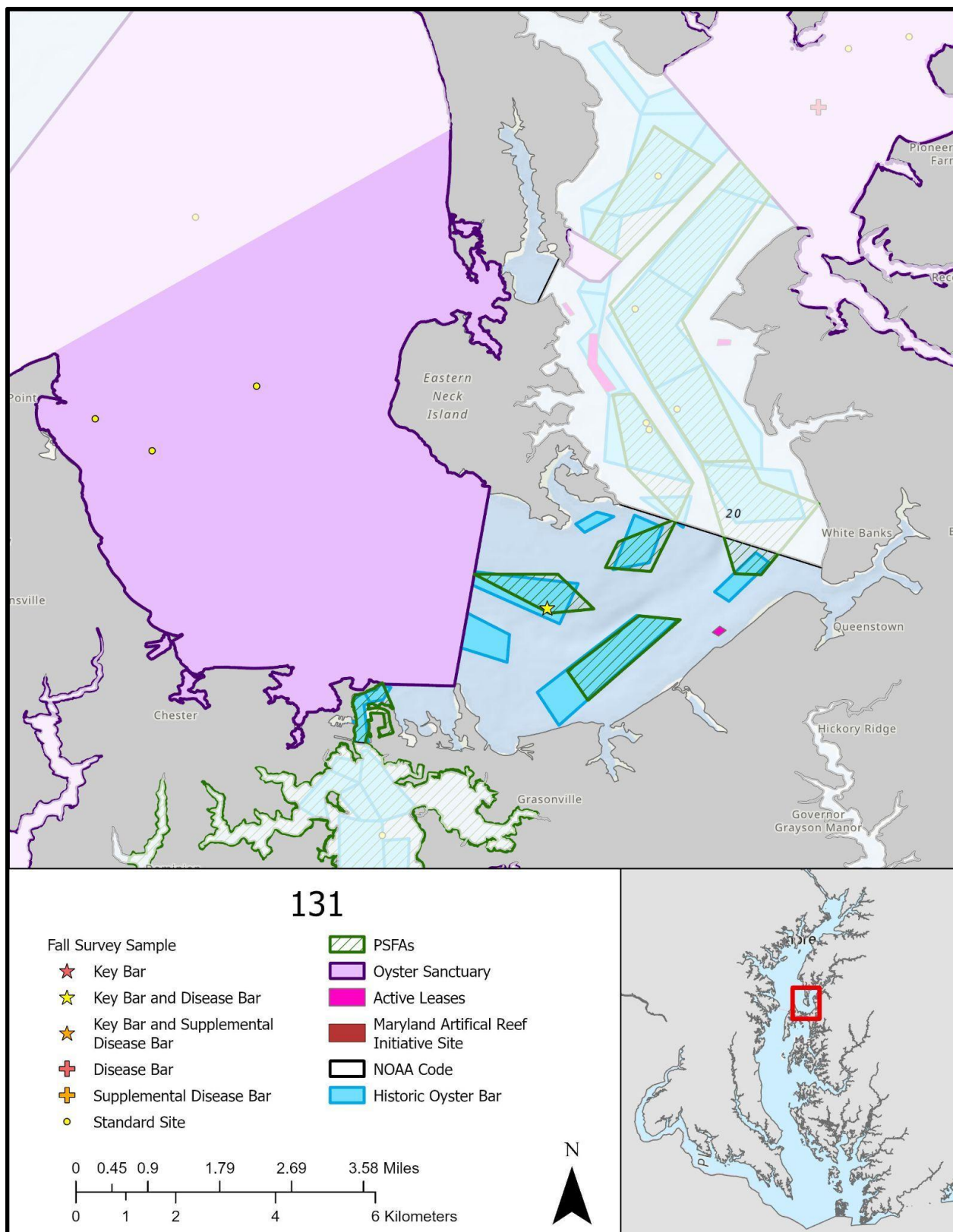


Figure B.23-1. Map of NOAA Code 131 (Chester River Lower). Fall Oyster Survey sites may not be sampled every year.

Table B.23-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 131 (Chester River Lower) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/9	5/11	5/12	5/5
Number of Live Spat Oysters per square meter	2.5 $\pm$ 2.2*	0.1 $\pm$ 0.1	0	0.02 $\pm$ 0.02
Number of Live Small Oysters per square meter	7.6 $\pm$ 4.6	6.8 $\pm$ 3.2	3.5 $\pm$ 3.5	0.2 $\pm$ 0.6
Number of Live Market Oysters per square meter	9.3 $\pm$ 4.4	16.7 $\pm$ 5.9	5.5 $\pm$ 2.7	2.5 $\pm$ 0.5
Number of Live Oysters per square meter	19.4 $\pm$ 6.6	23.5 $\pm$ 7.1	9 $\pm$ 6.2	2.7 $\pm$ 0.5
Live Biomass (g Dry Weight per Bushel)	63 $\pm$ 16.7	119.2 $\pm$ 23.6	66.6 $\pm$ 14	88.4 $\pm$ 20
Observed Mortality (%)	18 $\pm$ 4.8	3.8 $\pm$ 0.7	17 $\pm$ 5.2	4.5 $\pm$ 1.5
Cultch (Bushels per 100 feet towed)	0.4 $\pm$ 0.03	0.4 $\pm$ 0.1	0.3 $\pm$ 0.04	0.2 $\pm$ 0.05
Harvest (Bushels)	1,797	676	806	304

*Includes hatchery spat-on-shell planting in 2009

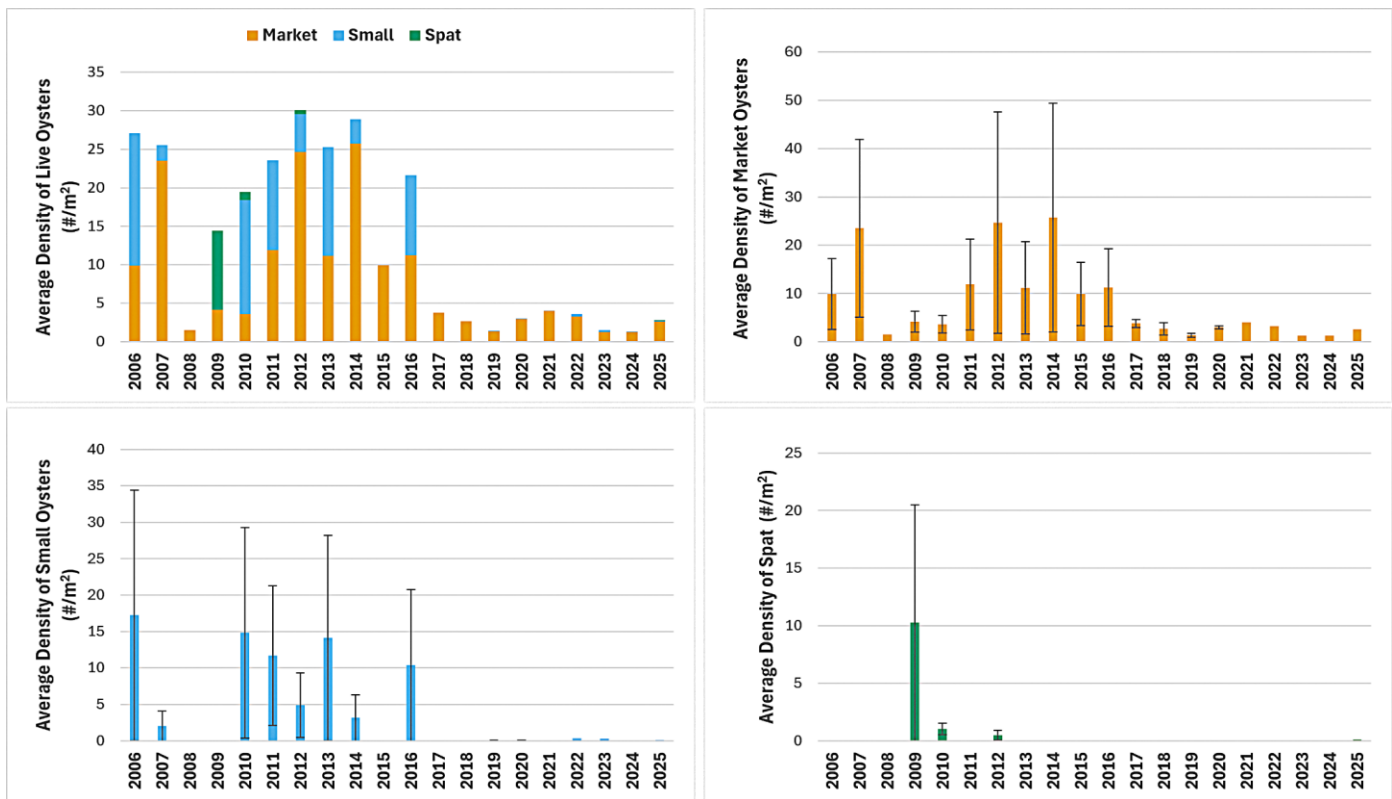


Figure B.23-2A. Average number of live oysters per square meter by size class in NOAA Code 131 (Chester River Lower) occurring outside of the current sanctuary area including samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

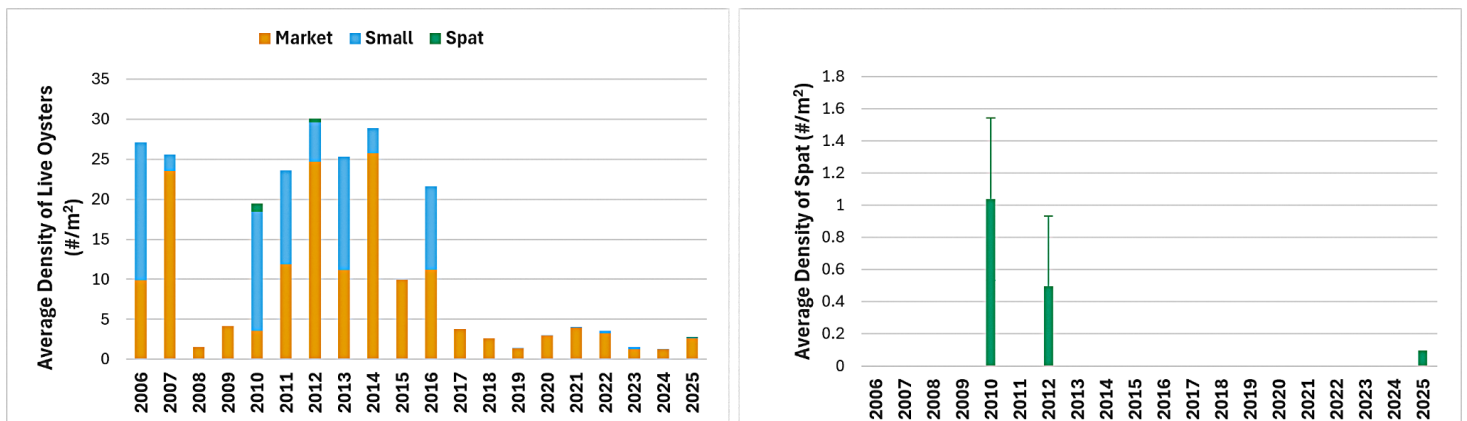


Figure B.23-2B. Average number of live oysters per square meter by size class in NOAA Code 131 (Chester River Lower) occurring outside of the current sanctuary area excluding samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Chester River Lower (131)

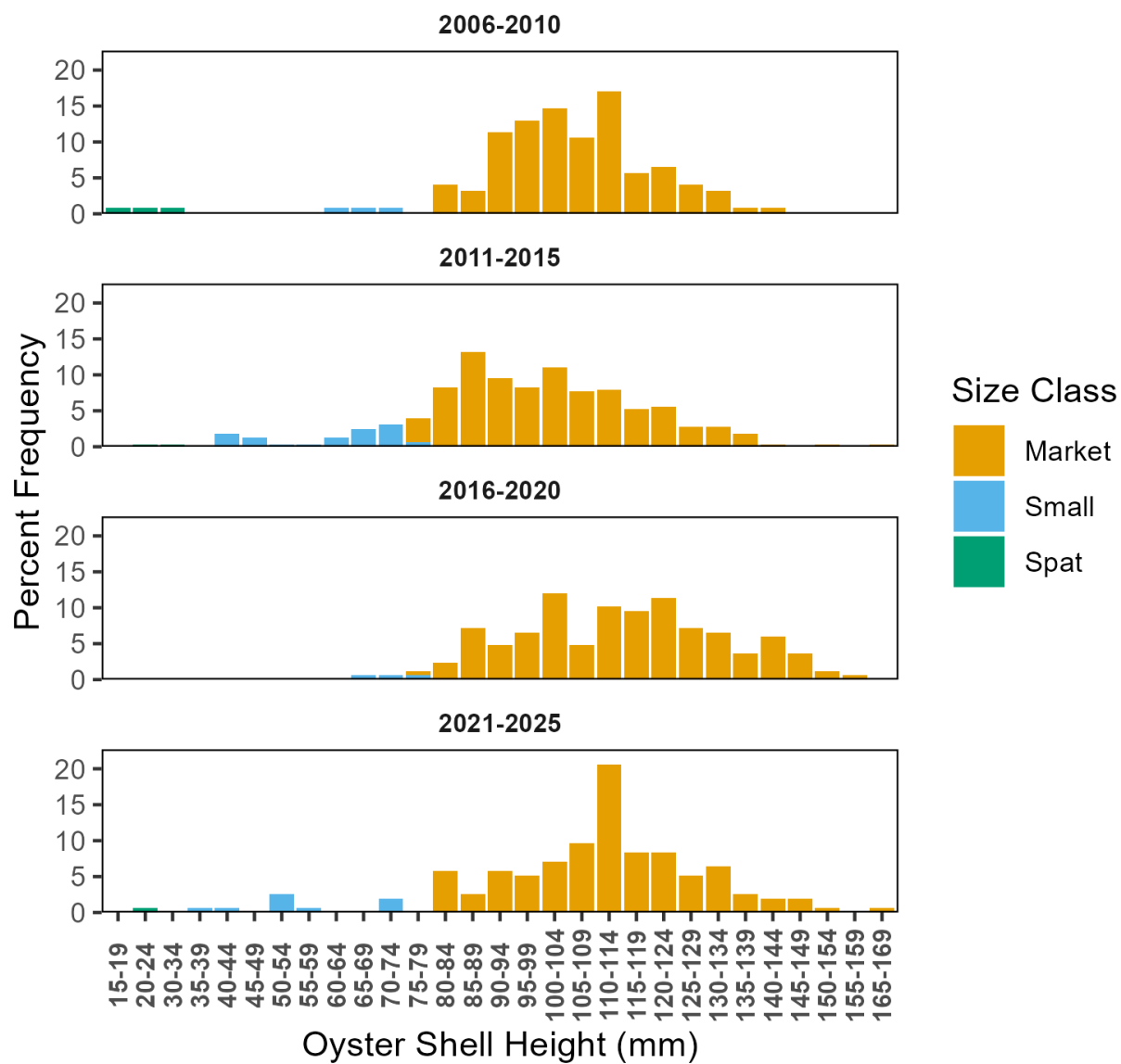


Figure B.23-3. Shell height frequencies of live oysters in NOAA Code131 (Chester River Lower) outside of the current sanctuary area.

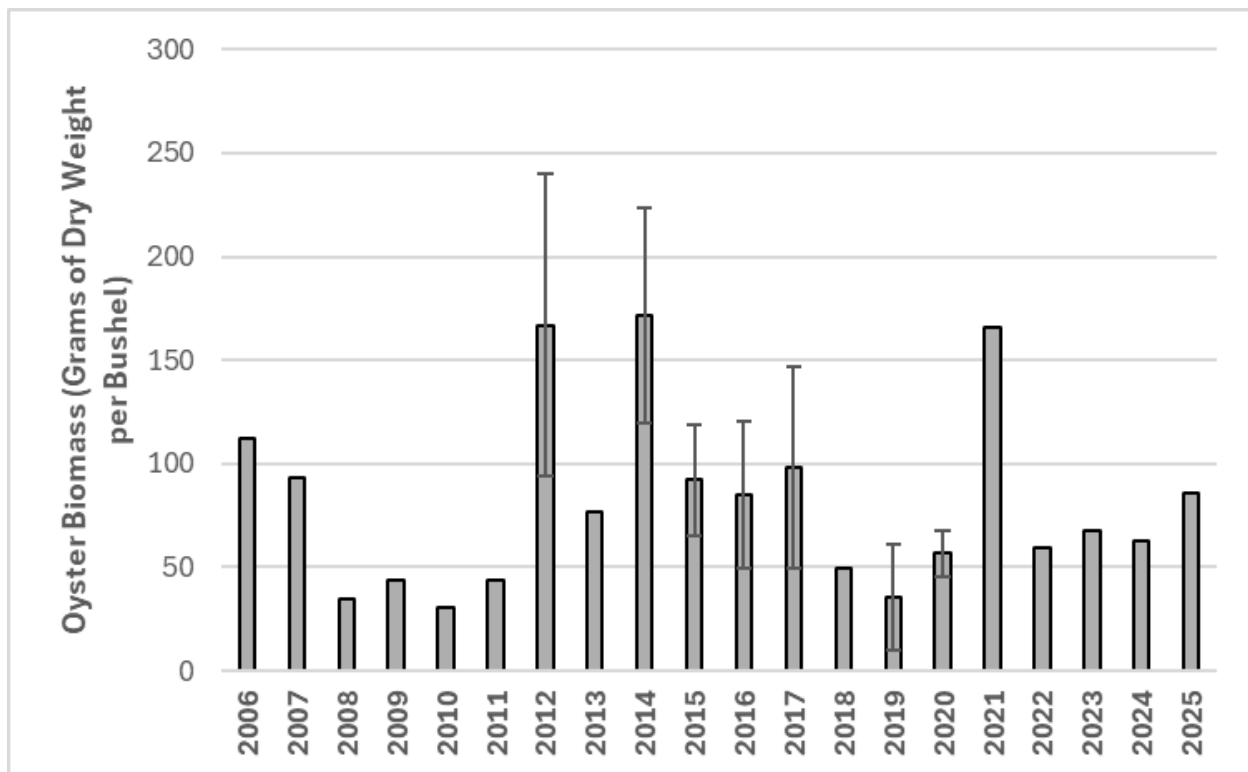


Figure B.23-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 131 (Chester River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

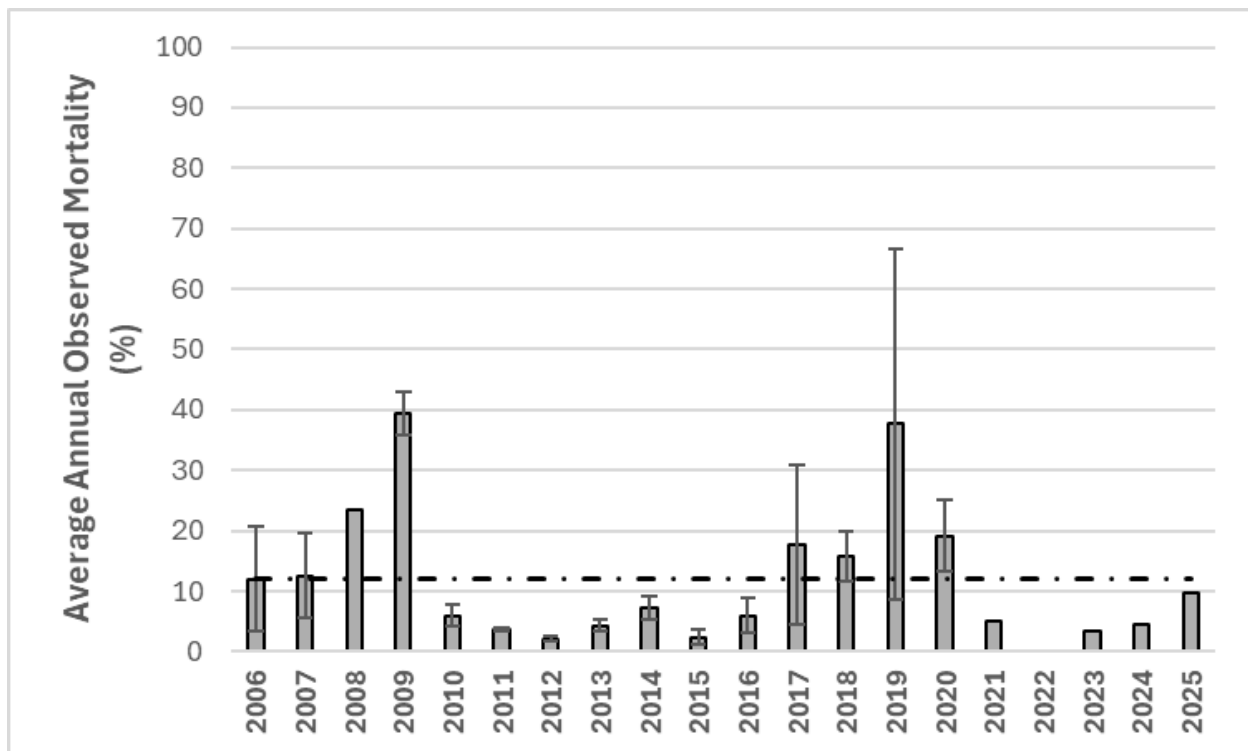


Figure B.23-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 131 (Chester River Lower) outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

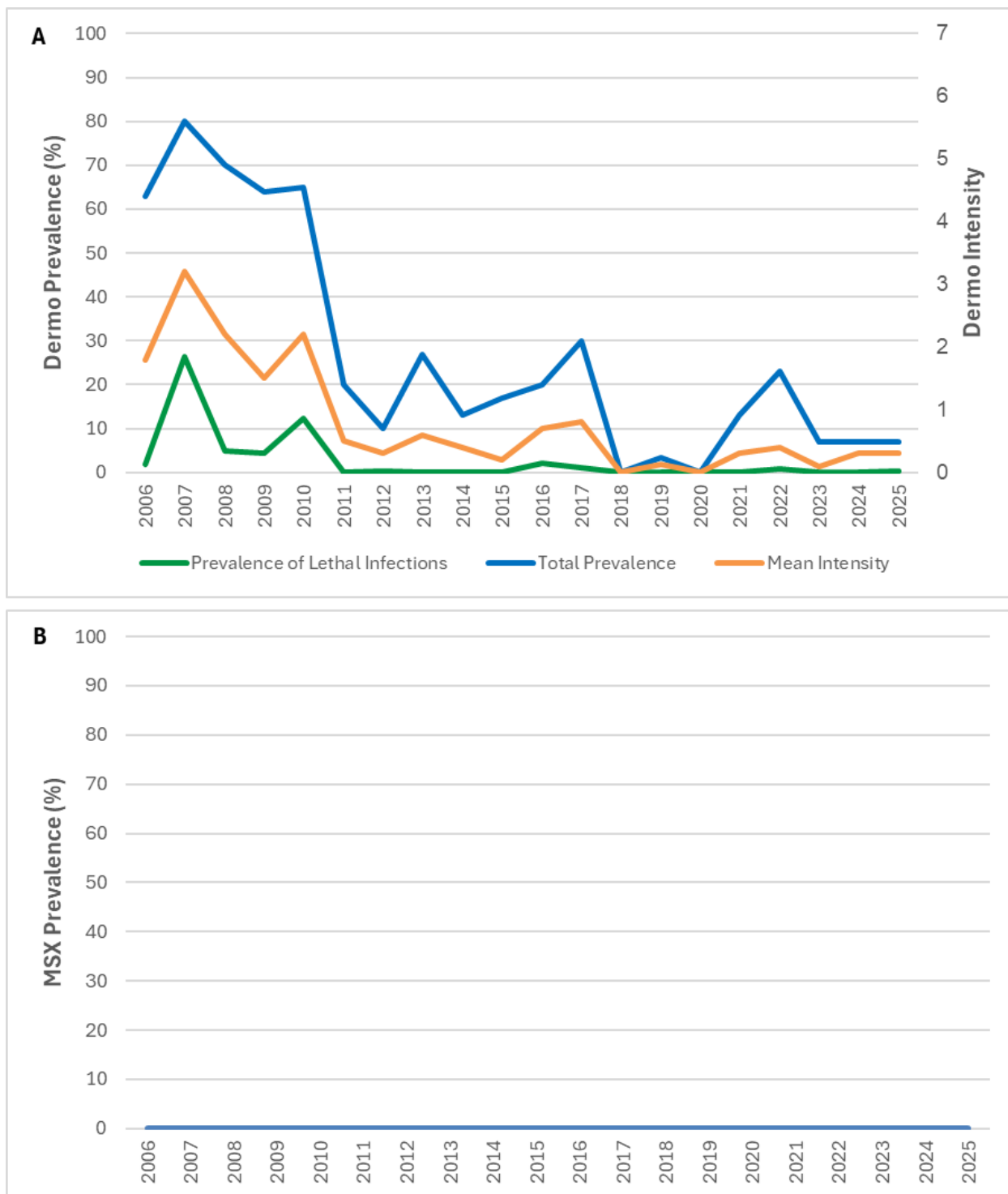


Figure B.23-6. Oyster disease prevalence and intensity in NOAA Code 131 (Chester River Lower) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Buoy Rock bar.

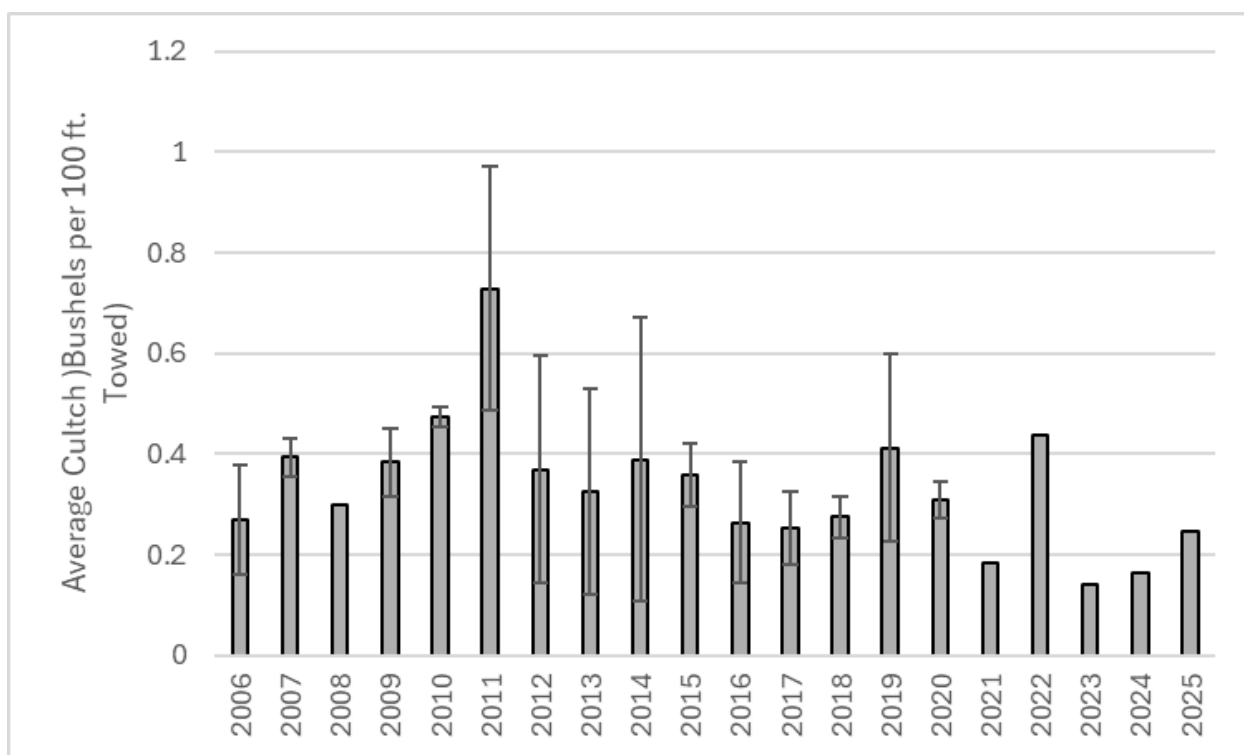


Figure B.23-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 131 (Chester River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

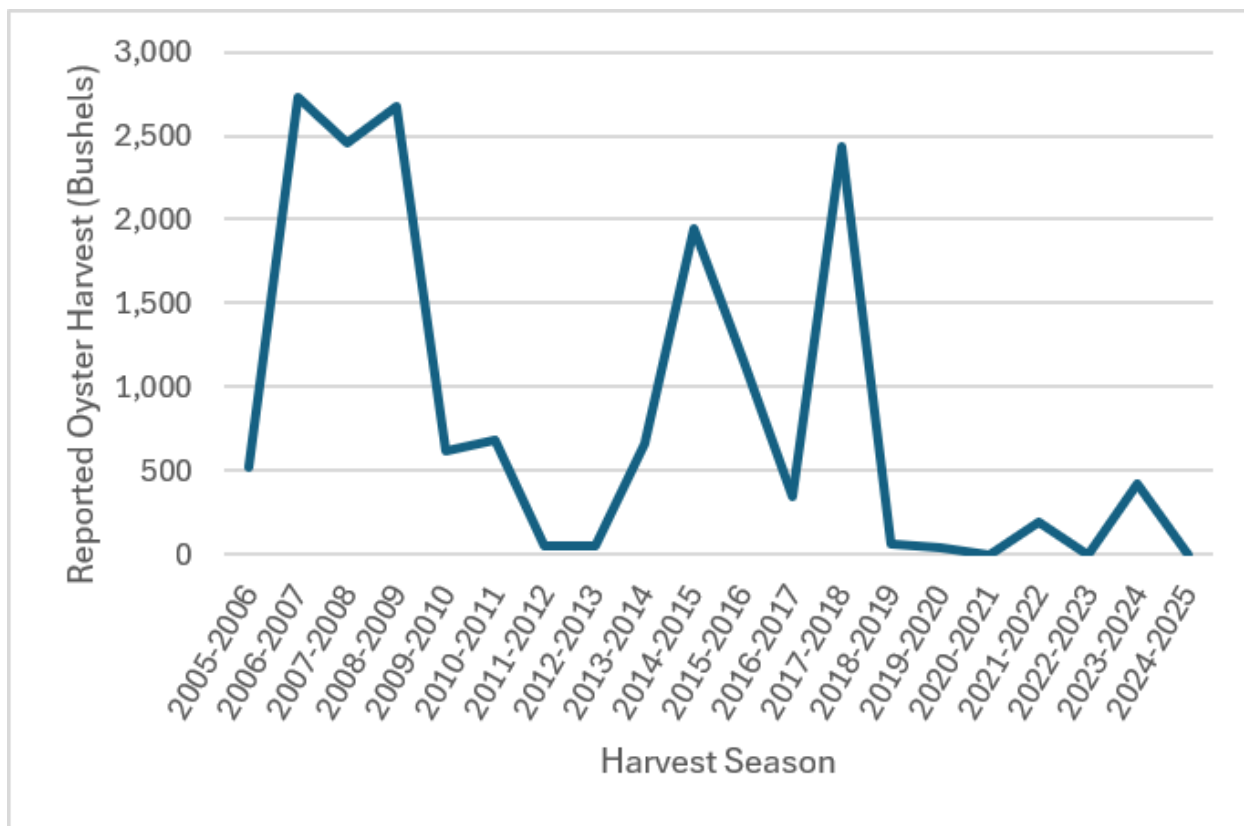


Figure B.23-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 131 (Chester River Lower). Since 2010, 69% of the NOAA Code area has been designated as a sanctuary.

Section B.24: NOAA Code 137 – Choptank River Lower

NOAA Code 137 encompasses the lower portion of the Choptank River west of Castle Haven and is located in Maryland's mid-eastern portion of Chesapeake Bay. The entire NOAA Code is 34,721 acres and has 48 historic oyster bars³³. Two sanctuaries (Lower Choptank and Cook Point) encompass 14% (4,996 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 29,725 surface acres. There are 17,314 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 17,603 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.24-1)
- Summary statistics (Table B.24-1)
- Density per year (Figure B.24-2)
- Shell height frequencies (Figure B.24-3)
- Biomass per year (Figure B.24-4)
- Observed mortality (Figure B.24-5)
- Dermo and MSX per year (Figure B.24-6)
- Cultch per year (Figure B.24-7)
- Harvest (Figure B.24-8)

Total live oyster densities have increased significantly throughout the time series. All size classes showed a marked increase in density, particularly for the 2021-2025 time period. Most of this increase is due to good recruitment after 2020. This has led to a corresponding increase in biomass, while cultch has remained relatively low throughout the time series. Observed mortality rose slightly in 2023 and 2024 but has generally been below the long-term baywide average. Dermo prevalence and intensity were generally low throughout the time series, while there was a spike in MSX prevalence in 2023, which may account for the rise in mortality that year.

To enhance the commercial public fishery within this NOAA Code, approximately 33 million hatchery spat-on-shell, 3,300 bushels of wild seed, and 127,000 bushels of shell, including 18,500 bushels of Pacific oyster (*Magallana gigas*) (west coast) shell, were planted between 2006 and 2025. The majority of these efforts took place from 2021 to 2025, a period that included all of the hatchery spat-on-shell, all wild seed, and 57,500 bushels of shell (including all *Gigas* shell).

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest from areas now in the sanctuary.

³³ See chart 19 and 20 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

Following the establishment of the sanctuary in 2010, 14% of the NOAA Code was closed to harvest. Power dredge was the primary harvest gear during the 2021-2025 period. This area is characterized by increasing oyster biomass and density and apparently stable medium to high harvest levels since 2011.

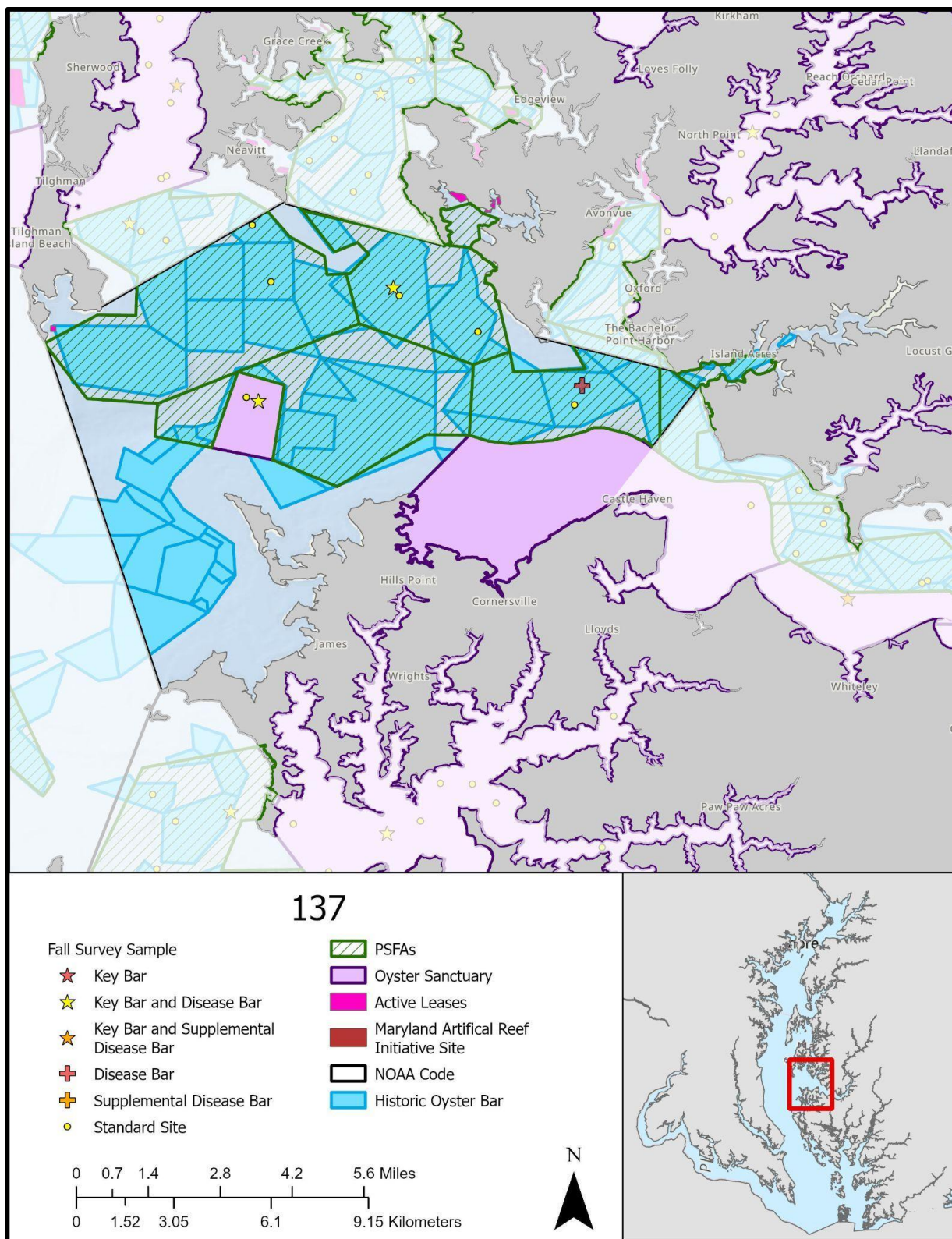


Figure B.24-1. Map of NOAA Code 137 (Choptank River Lower). Fall Oyster Survey sites may not be sampled every year.

Table B.24-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 137 (Choptank River Lower) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/40	5/35	5/39	5/38
Number of Live Spat Oysters per square meter	6 $\pm$ 1.7	6 $\pm$ 2.7	21.7 $\pm$ 17	71 $\pm$ 22
Number of Live Small Oysters per square meter	13.1 $\pm$ 3.3	20 $\pm$ 5	17.1 $\pm$ 6.7	76.3 $\pm$ 26
Number of Live Market Oysters per square meter	8.2 $\pm$ 1.8	18.3 $\pm$ 3.3	11.9 $\pm$ 3.8	39.2 $\pm$ 13
Number of Live Oysters per square meter	27.4 $\pm$ 4.1	44.1 $\pm$ 8	50.7 $\pm$ 23.8	186.4 $\pm$ 43
Live Biomass (g Dry Weight per Bushel)	46 $\pm$ 7.7	161 $\pm$ 20	171 $\pm$ 22.3	269.5 $\pm$ 31
Observed Mortality (%)	3.5 $\pm$ 0.9	3.8 $\pm$ 0.7	7.5 $\pm$ 1.6	8.3 $\pm$ 1.5
Cultch (Bushels per 100 feet towed)	0.6 $\pm$ 0.06	0.4 $\pm$ 0.04	0.3 $\pm$ 0.04	0.6 $\pm$ 0.1
Harvest (Bushels)	2,096	12,495	13,564	10,465

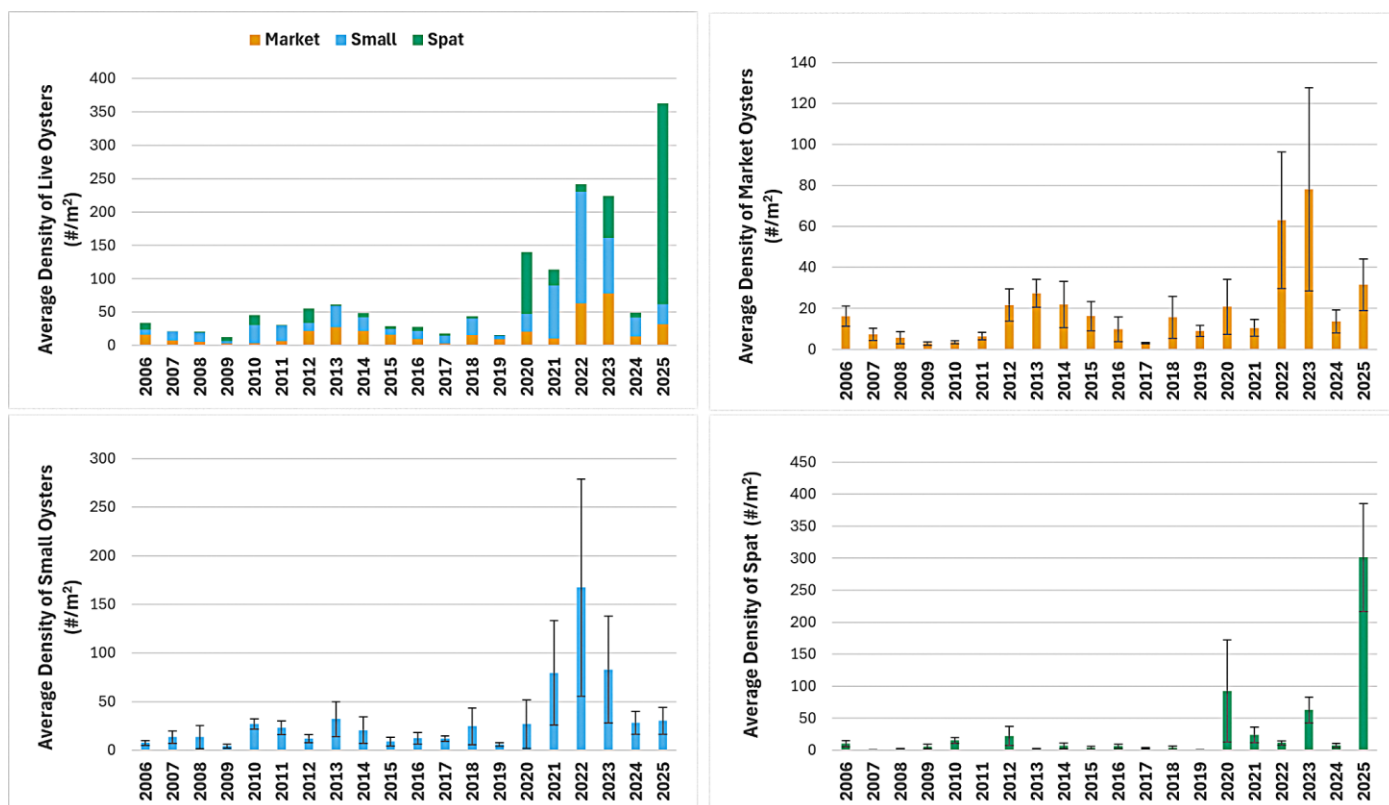


Figure B.24-2. Average number of live oysters per square meter by size class in NOAA Code 137 (Choptank River Lower) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Choptank River Lower (137)

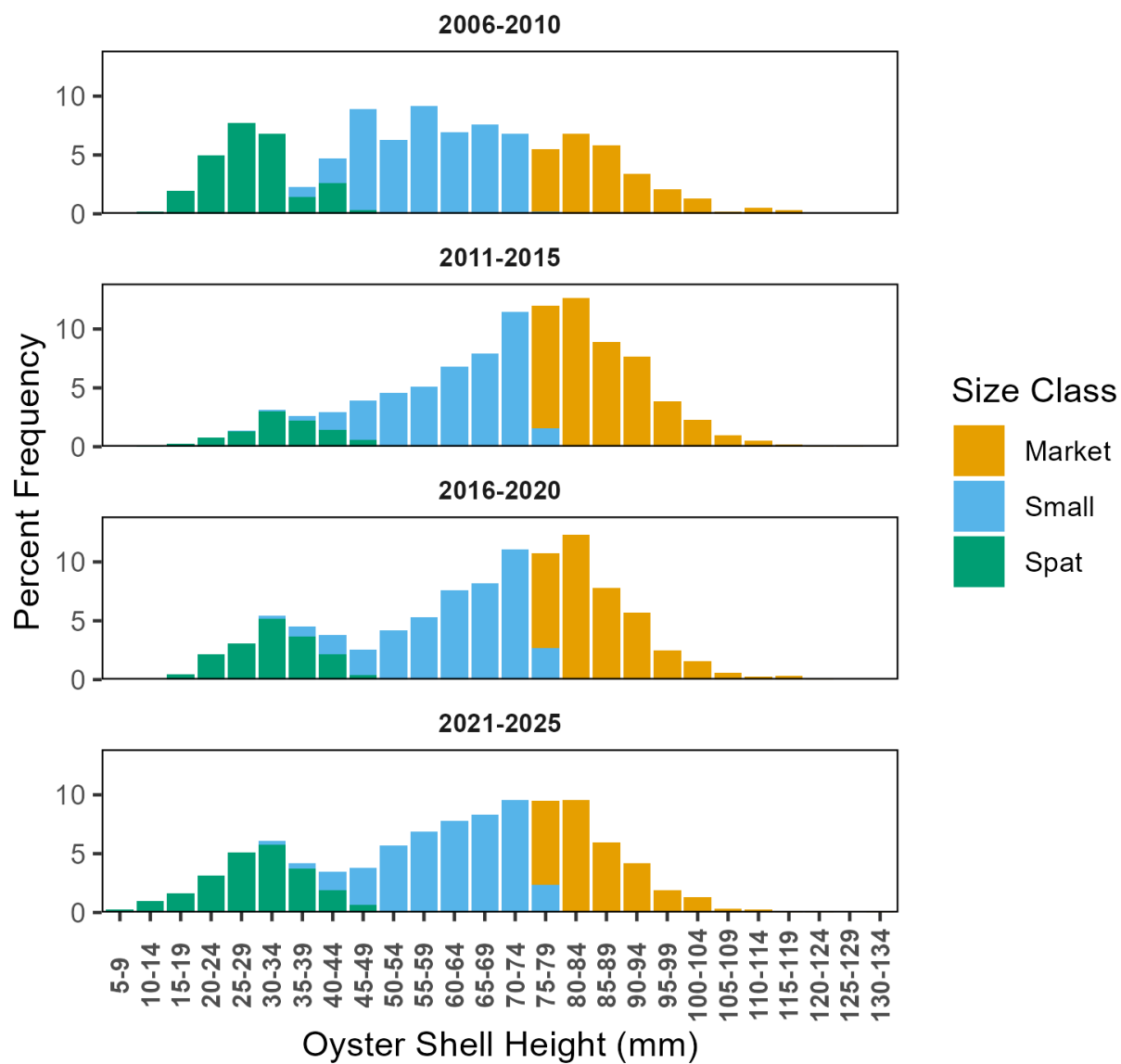


Figure B.24-3. Shell height frequencies of live oysters in NOAA Code 137 (Choptank River Lower) outside of the current sanctuary area.

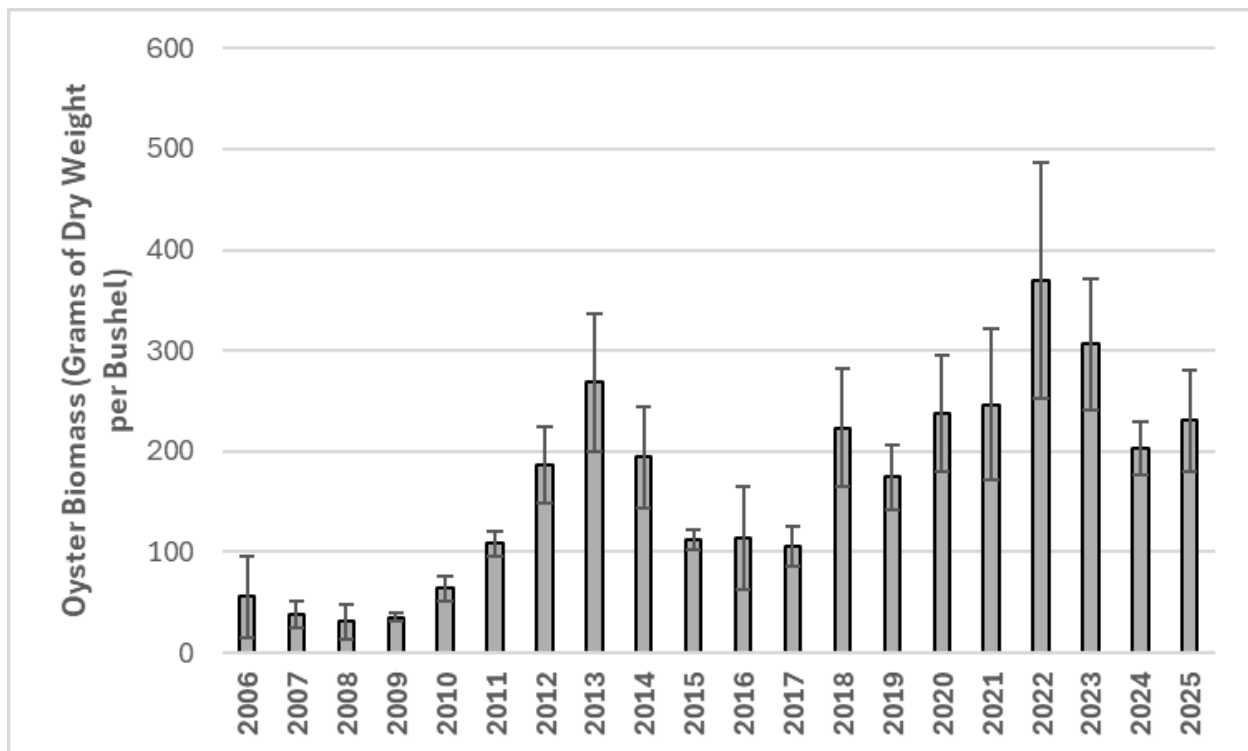


Figure B.24-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 137 (Choptank River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

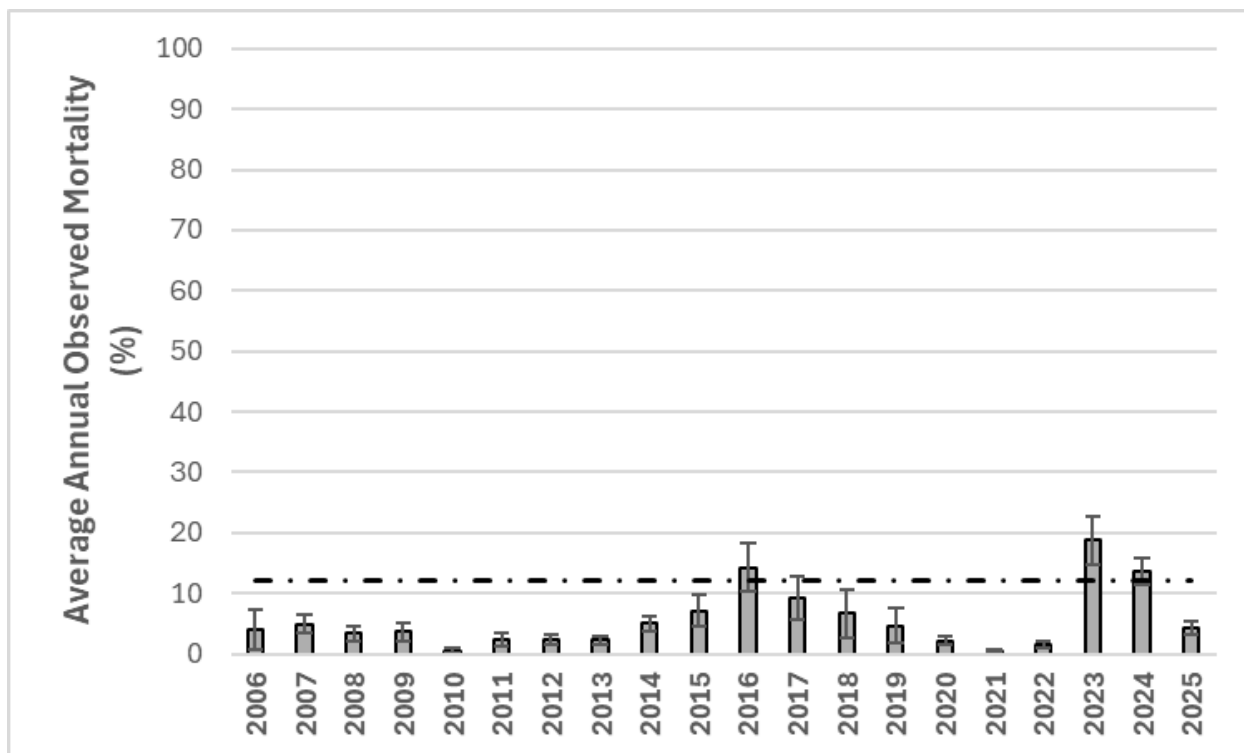


Figure B.24-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 137 (Choptank River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

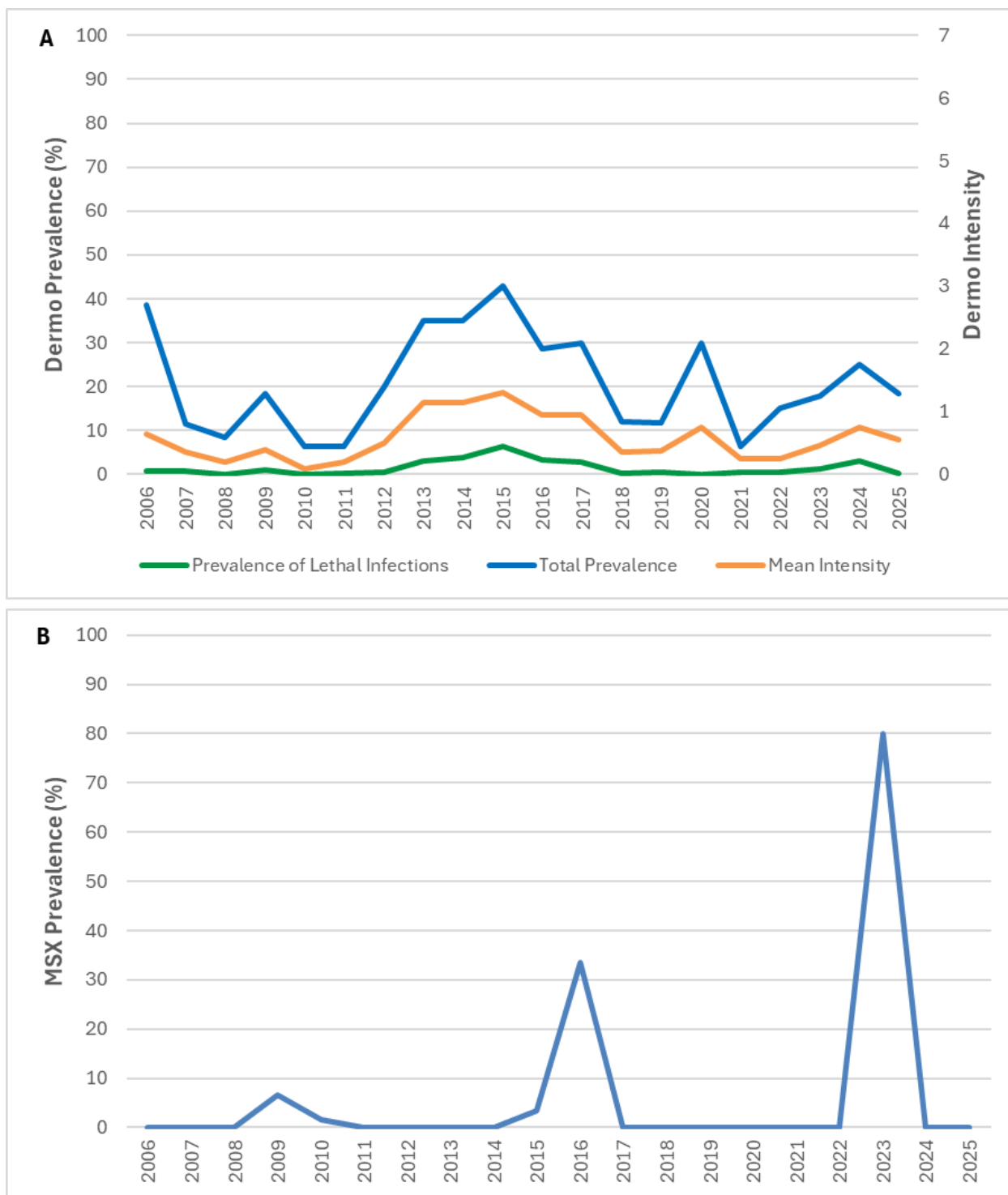


Figure B.24-6. Oyster disease prevalence and intensity in NOAA Code 137 (Choptank River Lower) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey based on an average of Royston and Lighthouse bars.

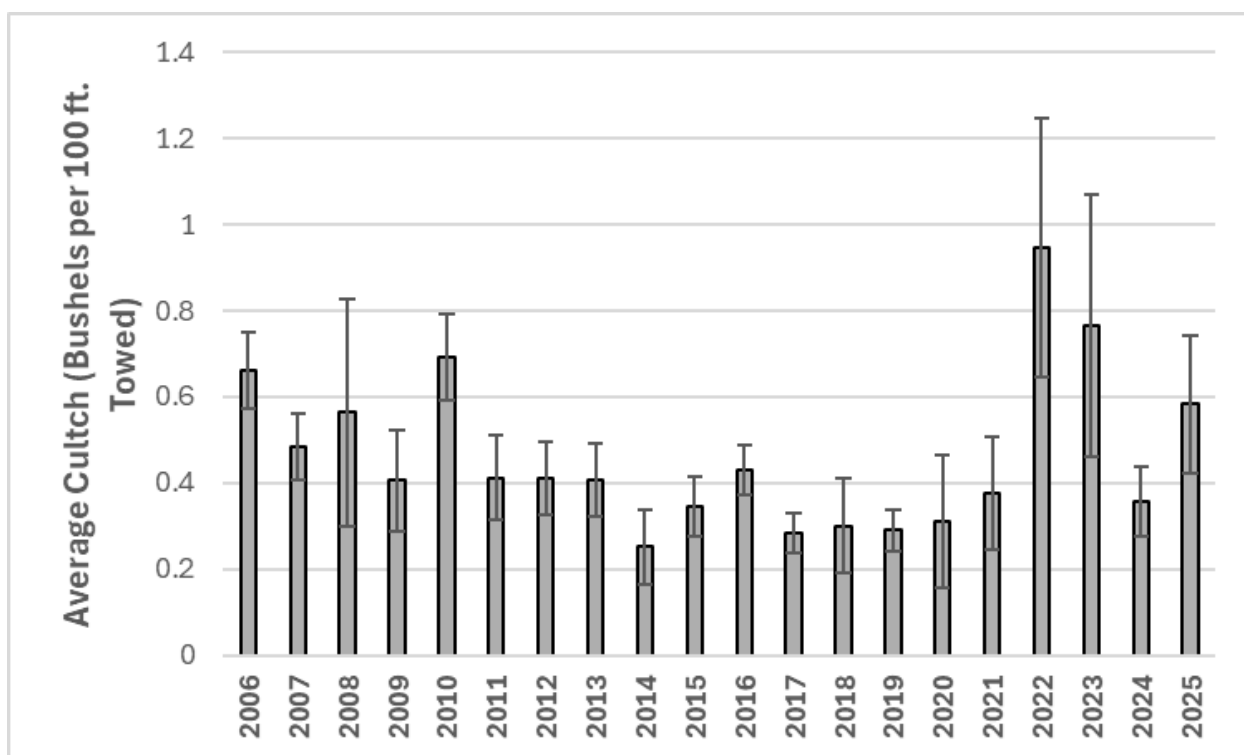


Figure B.24-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 137 (Choptank River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

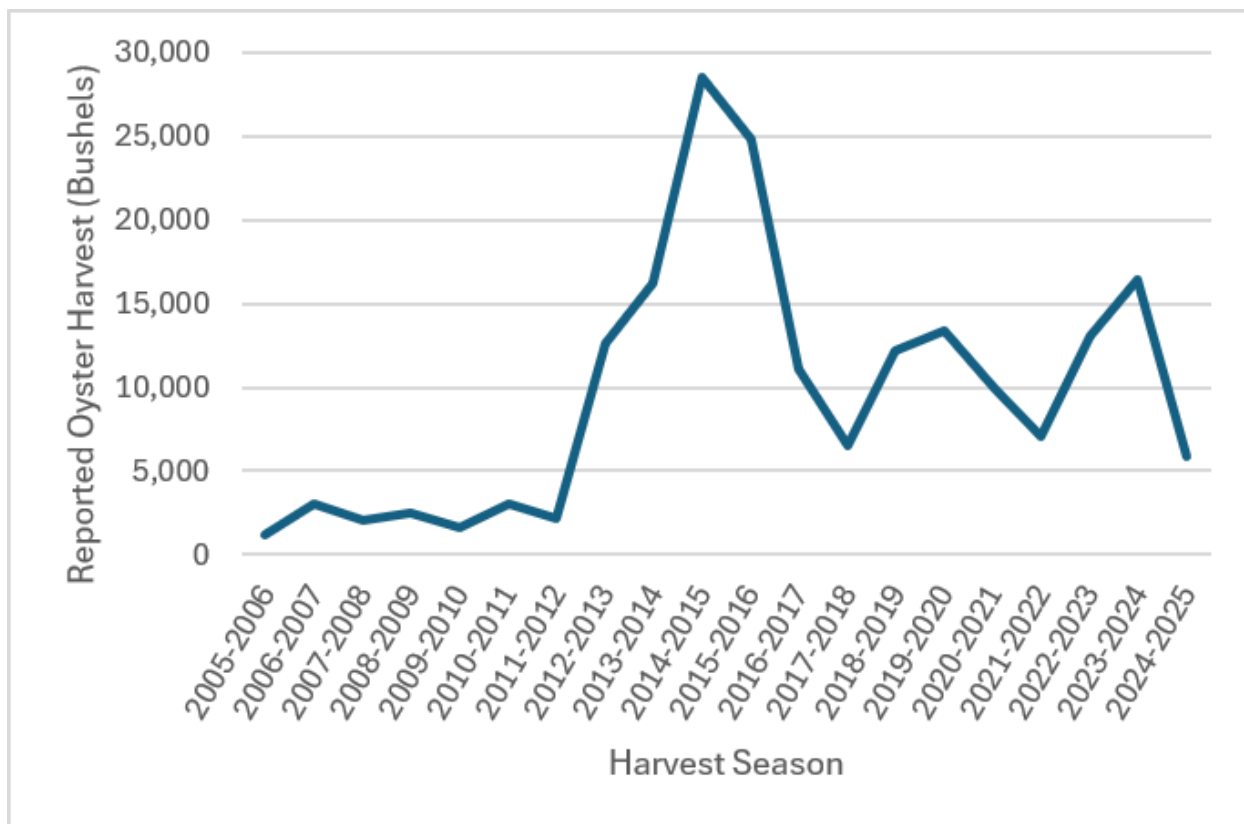


Figure B.24-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 137 (Choptank River Lower). Since 2010, 14% of the NOAA Code area has been designated as a sanctuary.

Section B.25: NOAA Code 168 – Patuxent River Lower

NOAA Code 168 encompasses the lower portion of the Patuxent River south of St. Leonard Creek and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 8,799 acres and has 22 historic oyster bars³⁴. Two sanctuaries (Solomons Creek and Lower Patuxent), both established in 2010, are within the NOAA Code and encompass 11% (951 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 7,848 surface acres. There are 2,231 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and not within a sanctuary. In 2010, there were 2,994 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. Since 2010, 28.4 PSFA acres have been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.25-1)
- Summary statistics (Table B.25-1)
- Density per year (Figure B.25-2)
- Shell height frequencies (Figure B.25-3)
- Biomass per year (Figure B.25-4)
- Observed mortality (Figure B.25-5)
- Cultch per year (Figure B.25-6)
- Harvest (Figure B.25-7)

Total live oyster density exhibited a significant upward trend throughout the time series, driven mainly by increases in spat and market densities. 2023 was a good year for recruitment, with a subsequent increase in small and market oysters. Higher densities led to a corresponding increase in biomass for the 2021-2025 interval, while cultch availability has remained stable. Observed mortality has fluctuated over the time series but has generally fallen in recent years.

Between 2006 and 2025, approximately 130 million hatchery spat-on-shell, 41,000 bushels of wild seed, and 157,000 bushels of shell were planted in this NOAA Code to enhance the commercial public fishery. From 2021 to 2025, enhancements included 54 million hatchery spat-on-shell, 75,000 bushels of shell and 6,400 bushels of wild seed.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas in the NOAA Code that are currently in a sanctuary. Following the establishment of the sanctuaries in 2010, 11% of the NOAA Code was closed to harvest. Patent Tong was the primary harvest gear from 2021-2025. This area is characterized by stable or increasing abundance and oyster density, due primarily to good recent recruitment. Natural mortality has declined over time. Harvest is variable but relatively high in most years, peaking in the 2022-

³⁴ See chart 26 and 27 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

2023 season. This is one of the few areas with a fishing mortality rate above the limit reference point according to the latest Oyster Benchmark Stock Assessment indicating overfishing is occurring.

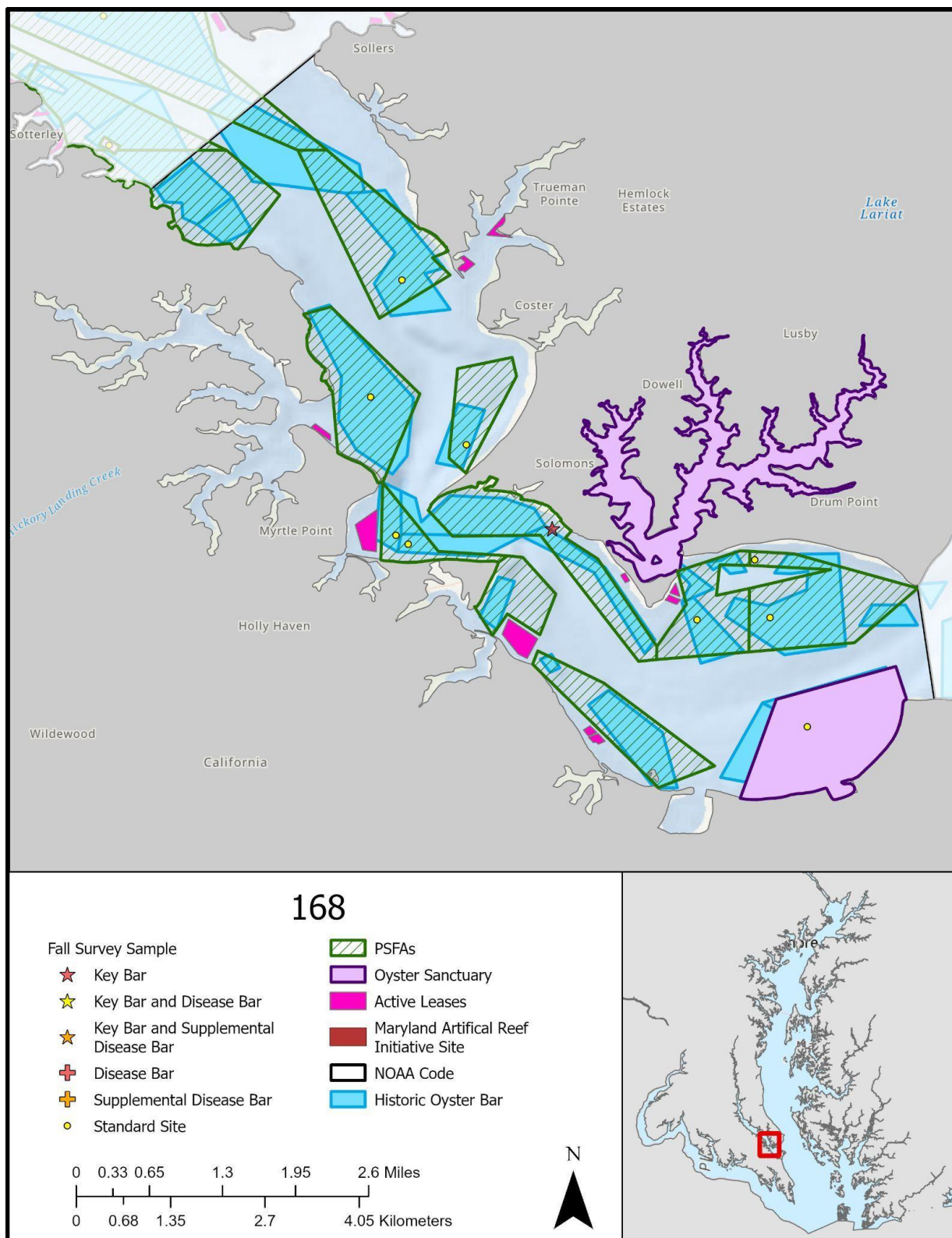


Figure B.25-1. Map of NOAA Code 168 (Patuxent River Lower). Fall Oyster Survey sites may not be sampled every year.

Table B.25-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 168 (Patuxent River Lower) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/47	5/46	5/53	5/47
Number of Live Spat Oysters per square meter	8.1 $\pm$ 2.7	15.2 $\pm$ 4.7	10 $\pm$ 2	59 $\pm$ 17
Number of Live Small Oysters per square meter	30 $\pm$ 5.2	54.9 $\pm$ 10.8	68 $\pm$ 10.4	66 $\pm$ 9.3
Number of Live Market Oysters per square meter	21.4 $\pm$ 3	24.5 $\pm$ 1.9	21.4 $\pm$ 2	48 $\pm$ 4.7
Number of Live Oysters per square meter	59.4 $\pm$ 7.6	94.6 $\pm$ 11.7	99 $\pm$ 10	173.6 $\pm$ 19.4
Live Biomass (g Dry Weight per Bushel)	122.3 $\pm$ 27	160.7 $\pm$ 21.1	133.3 $\pm$ 14.5	192.3 $\pm$ 17.2
Observed Mortality (%)	24.3 $\pm$ 1.9	13 $\pm$ 1.2	12 $\pm$ 1.2	11.4 $\pm$ 1.3
Cultch (Bushels per 100 feet towed)	1 $\pm$ 0.1	0.8 $\pm$ 0.1	0.9 $\pm$ 0.1	1 $\pm$ 0.1
Harvest (Bushels)	3,033	16,135	19,603	29,583

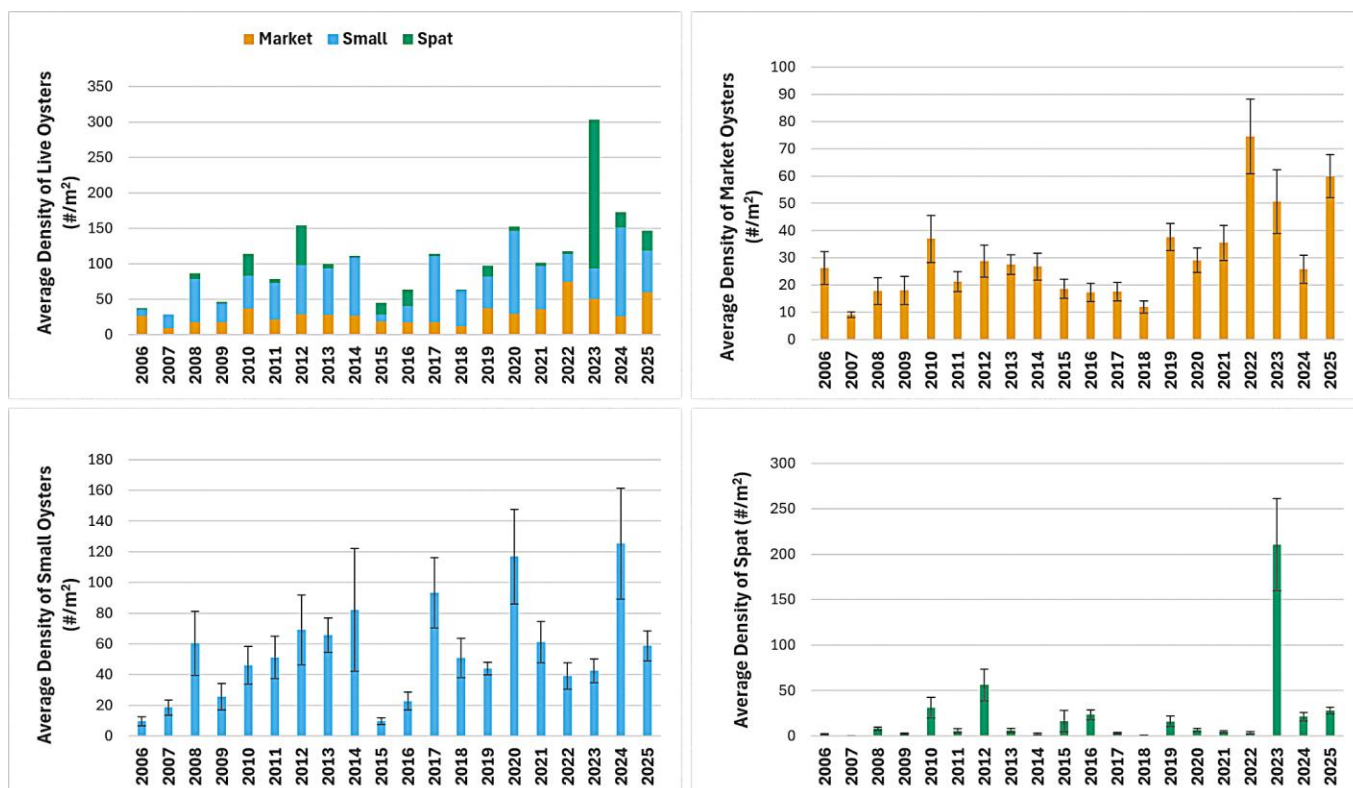


Figure B.25-2. Average number of live oysters per square meter by size class in NOAA Code 168 (Patuxent River Lower) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Patuxent River Lower(168)

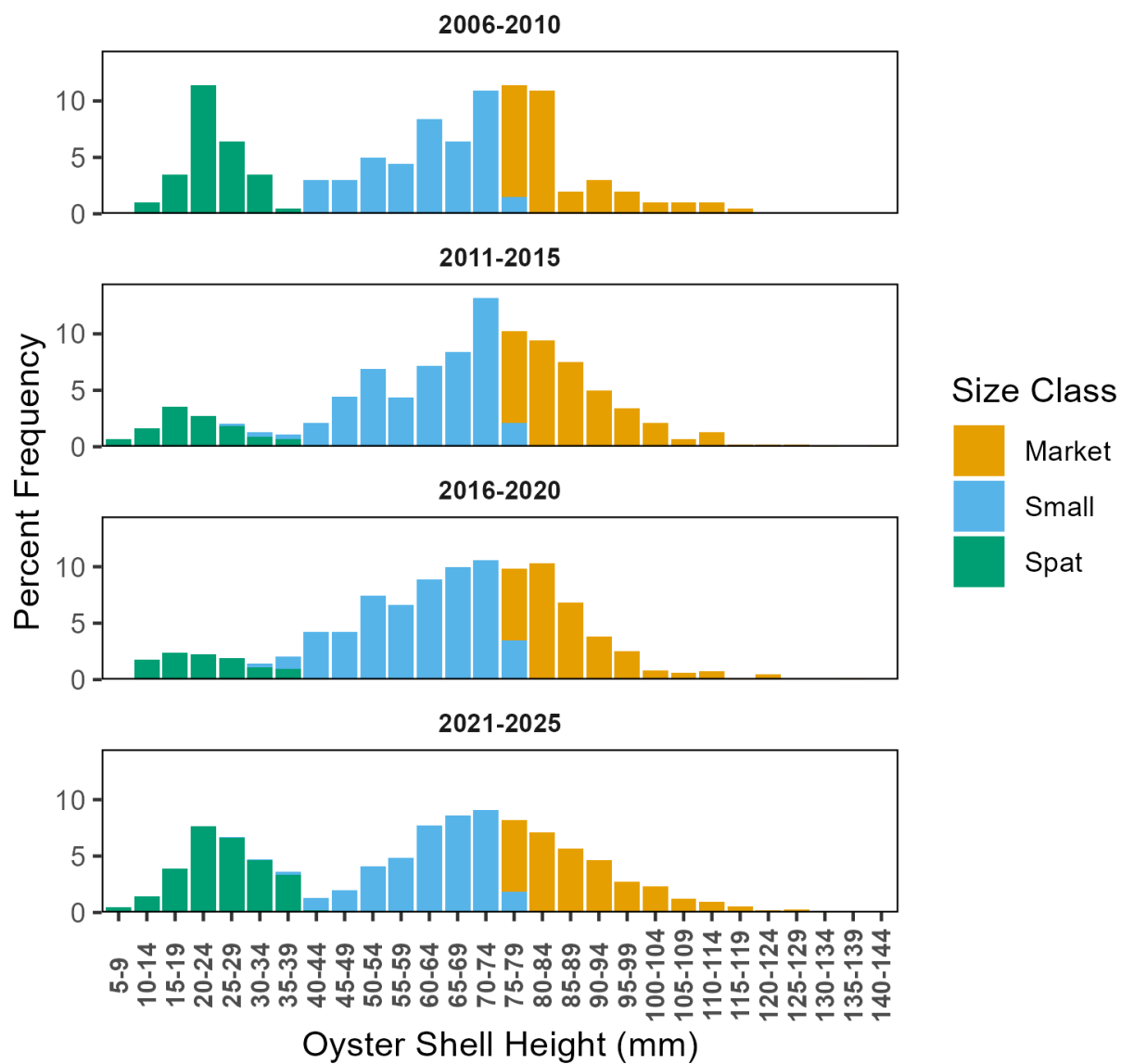


Figure B.25-3. Shell height frequencies of live oysters in NOAA Code 168 (Patuxent River Lower) outside of the current sanctuary area.

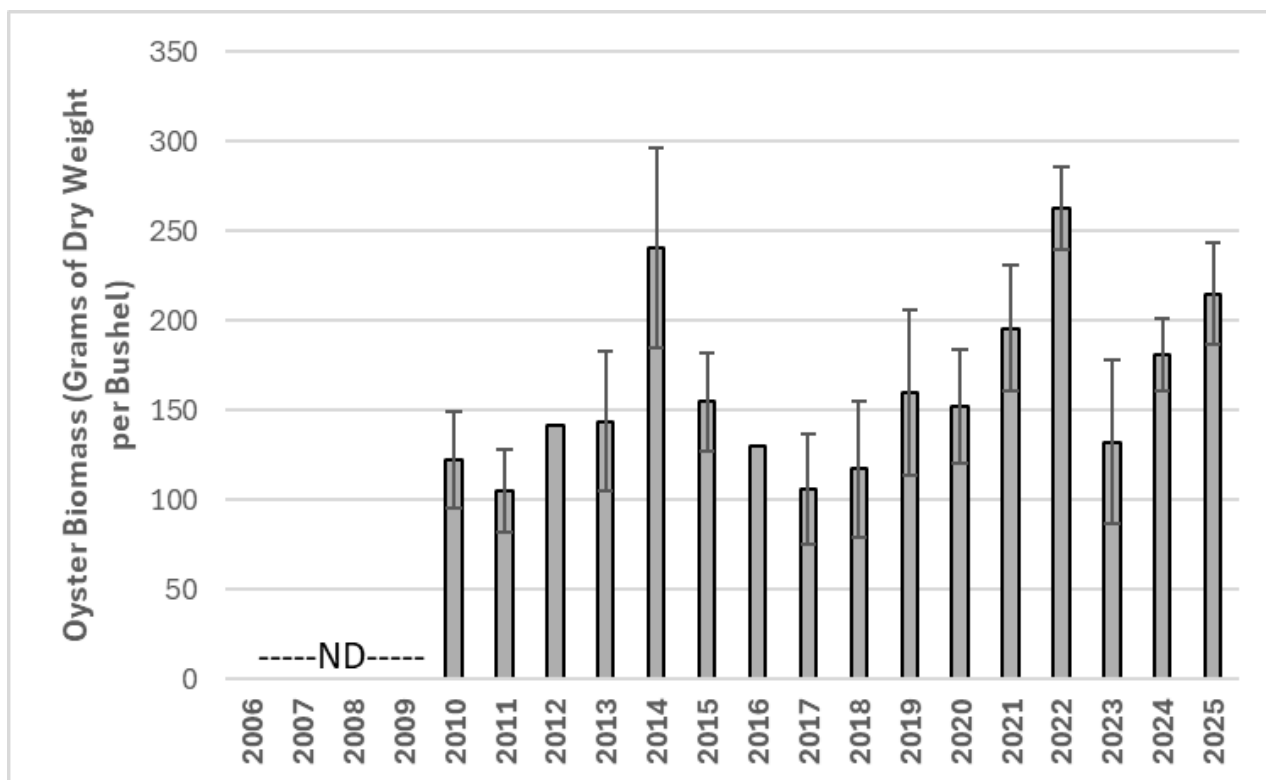


Figure B.25-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 168 (Patuxent River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

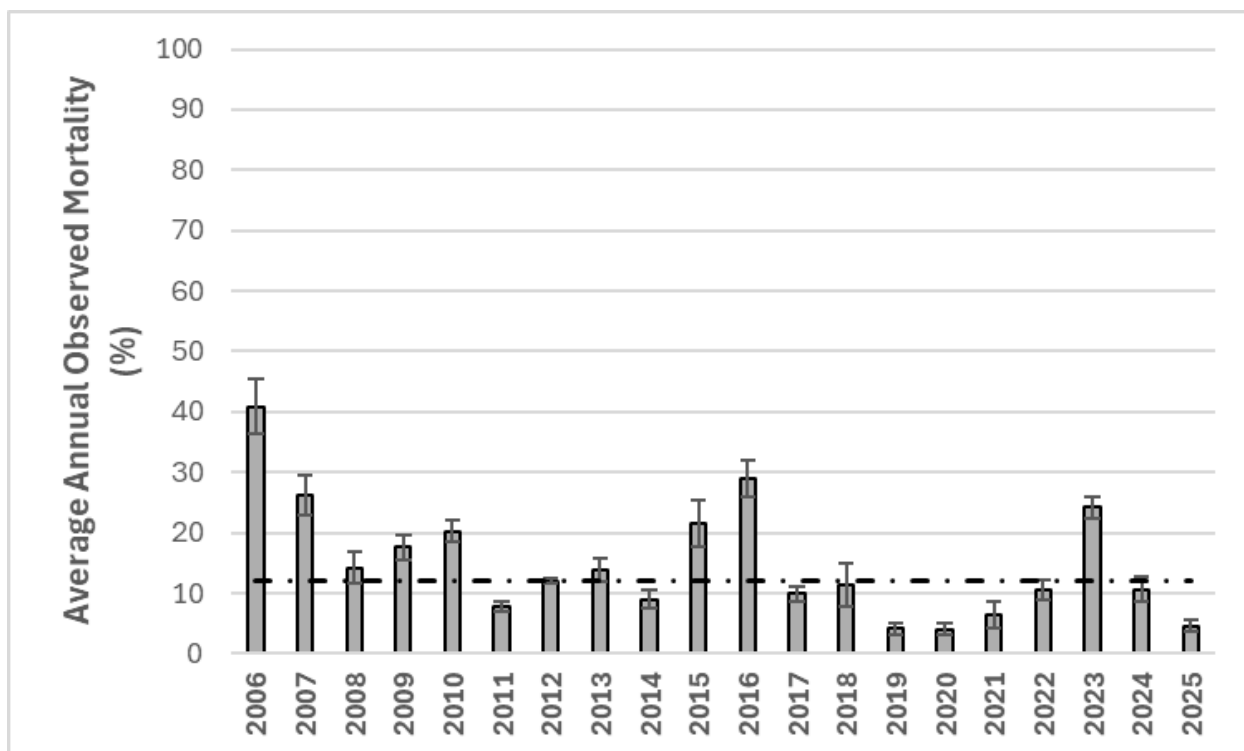


Figure B.25-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 168 (Patuxent River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

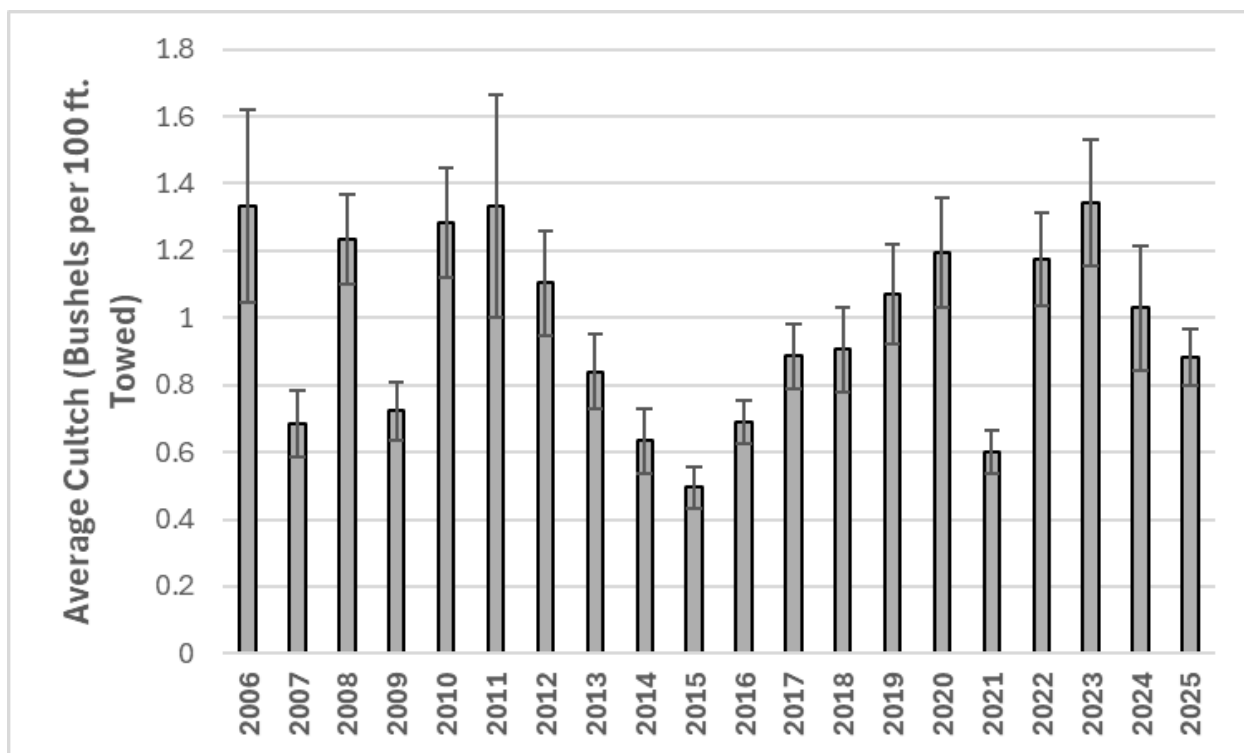


Figure B.25-6. Average cultch (live and dead oysters and loose shell) in NOAA Code 168 (Patuxent River Lower) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

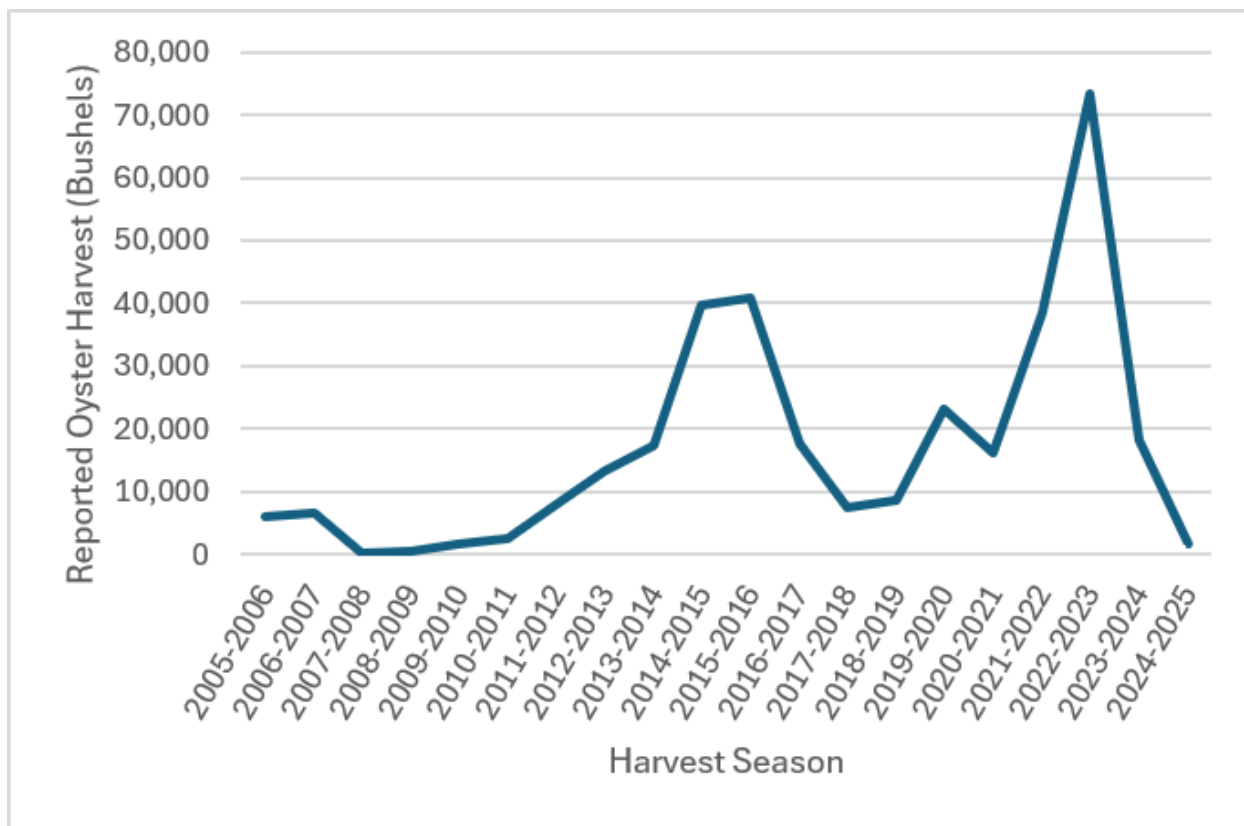


Figure B.25-7. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025 in NOAA Code 168 (Patuxent River Lower). Since 2010, 11% of the NOAA Code area has been designated as a sanctuary.

Section B.26: NOAA Code 174 – St. Clements and Breton Bay

NOAA Code 174 encompasses St. Clements and Breton Bays, tributaries of the Potomac River, located in Maryland's lower western portion of Chesapeake Bay. The entire NOAA Code is 7,061 acres and has 23 historic oyster bars³⁵. The Breton Bay Sanctuary encompasses 46% (3,212 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 3,849 surface acres. There are 1,496 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuary. There are 8 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1). There is no reported commercial harvest from this area in most years.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.26-1)
- Summary statistics (Table B.26-1)
- Density per year (Figure B.26-2)
- Observed mortality (Figure B.26-3)
- Cultch per year (Figure B.26-4)
- Harvest (Figure B.26-5)

Total live oyster density peaked during 2011-2015 and has declined steadily since, driven by declines in market and small oyster densities. Spat density showed a marked increase for the most recent time period, largely due to good recruitment in 2023. Biomass decreased sharply after the 2011-2015 time period, while observed mortality has been below the long-term average for most of the time series. The amount of cultch has remained low throughout the time series.

Between 2006 and 2020, no replenishment planting activities occurred to enhance the commercial public fishery in this NOAA Code.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets, including past harvest data from areas now in the sanctuary. Following the establishment of the sanctuary in 2010, 46% of the NOAA Code was closed to harvest. This area is characterized by low but apparently stable biomass and density in the 2021-2025 time period with minimal harvest (and none since 2018).

³⁵ See chart 34 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

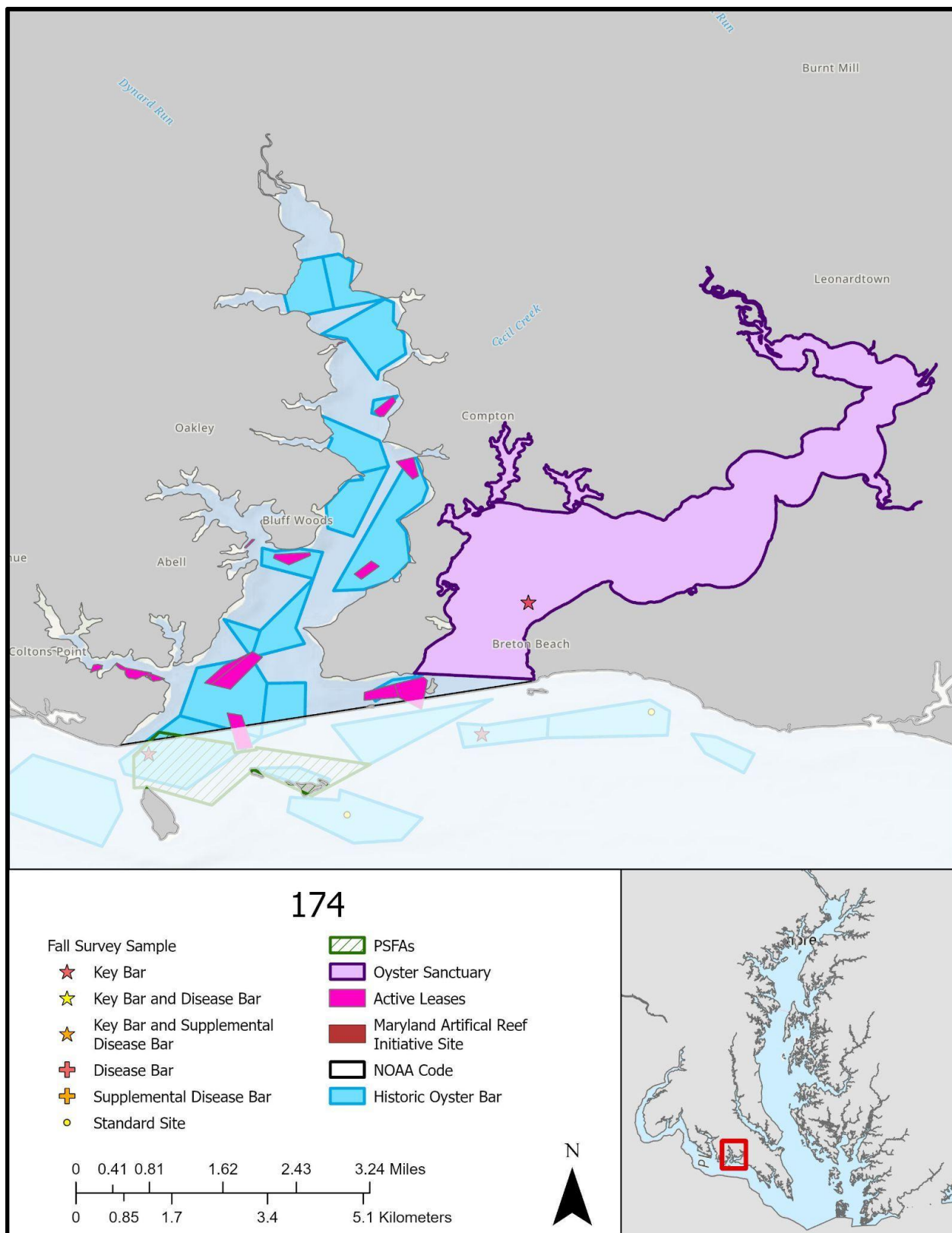


Figure B.26-1. Map of NOAA Code 174 (St. Clements and Breton Bays). Fall Oyster Survey sites may not be sampled every year.

Table B.26-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 174 (St. Clements and Breton Bays) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/12	5/9	5/9	5/6
Number of Live Spat Oysters per square meter	0.1 $\pm$ 0.04	0.01 $\pm$ 0.01	0.3 $\pm$ 0.2	2 $\pm$ 1.8
Number of Live Small Oysters per square meter	5.2 $\pm$ 3.7	18.4 $\pm$ 13	5.1 $\pm$ 3.3	3.2 $\pm$ 2.3
Number of Live Market Oysters per square meter	7.2 $\pm$ 3.6	7 $\pm$ 2.3	3.5 $\pm$ 2.2	1.4 $\pm$ 0.9
Number of Live Oysters per square meter	12.5 $\pm$ 5.5	25.4 $\pm$ 15.5	7.9 $\pm$ 4.5	6.7 $\pm$ 2.1
Live Biomass (g Dry Weight per Bushel)	ND	167 $\pm$ 51	57.7 $\pm$ 31.5	62 $\pm$ 31
Observed Mortality (%)	4.9 $\pm$ 1.7	13 $\pm$ 5	3.4 $\pm$ 1.4	0.6 $\pm$ 0.6
Cultch (Bushels per 100 feet towed)	0.5 $\pm$ 0.1	0.4 $\pm$ 0.1	0.2 $\pm$ 0.1	0.2 $\pm$ 0.04
Harvest (Bushels)	57	20	42	0

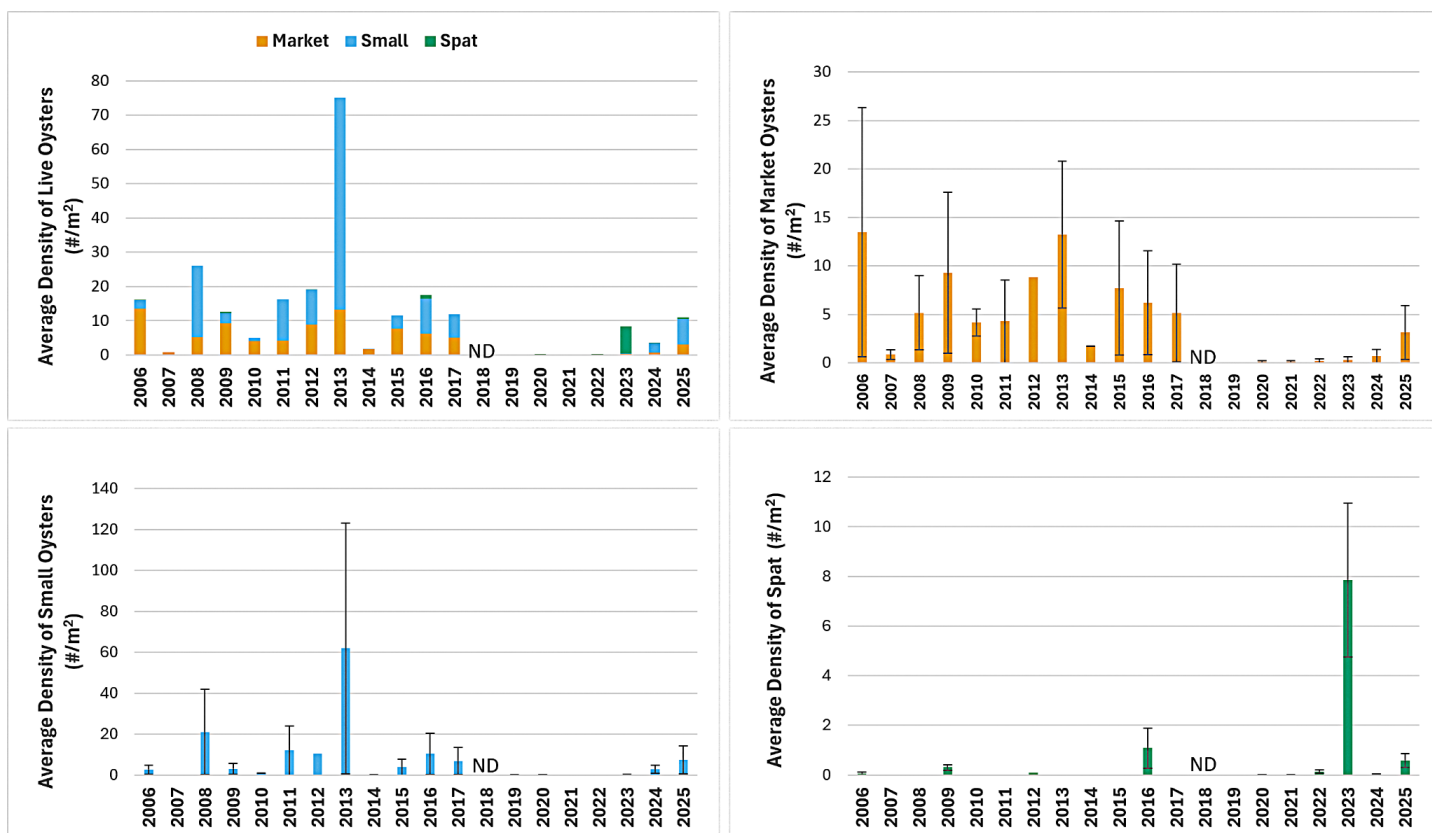


Figure B.26-2. Average number of live oysters per square meter by size class in NOAA Code 174 (St. Clements and Breton Bays) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

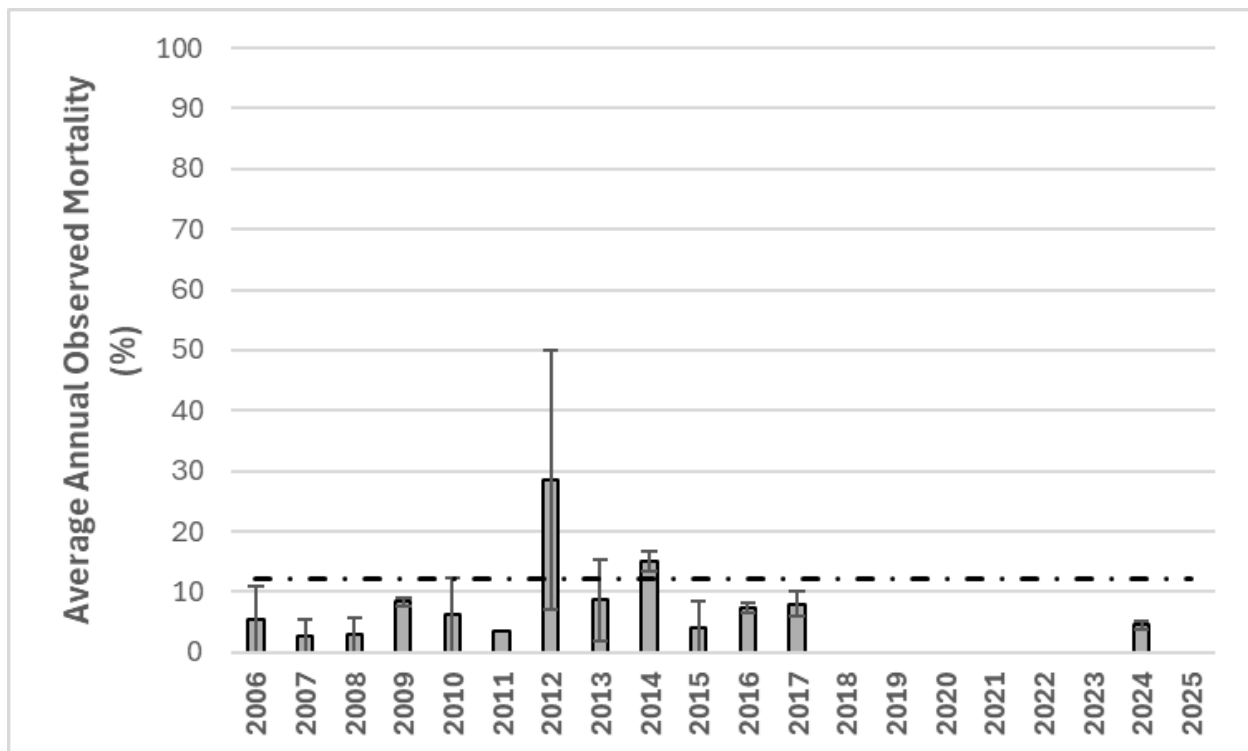


Figure B.26-3. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 174 (St. Clements and Breton Bays) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality.

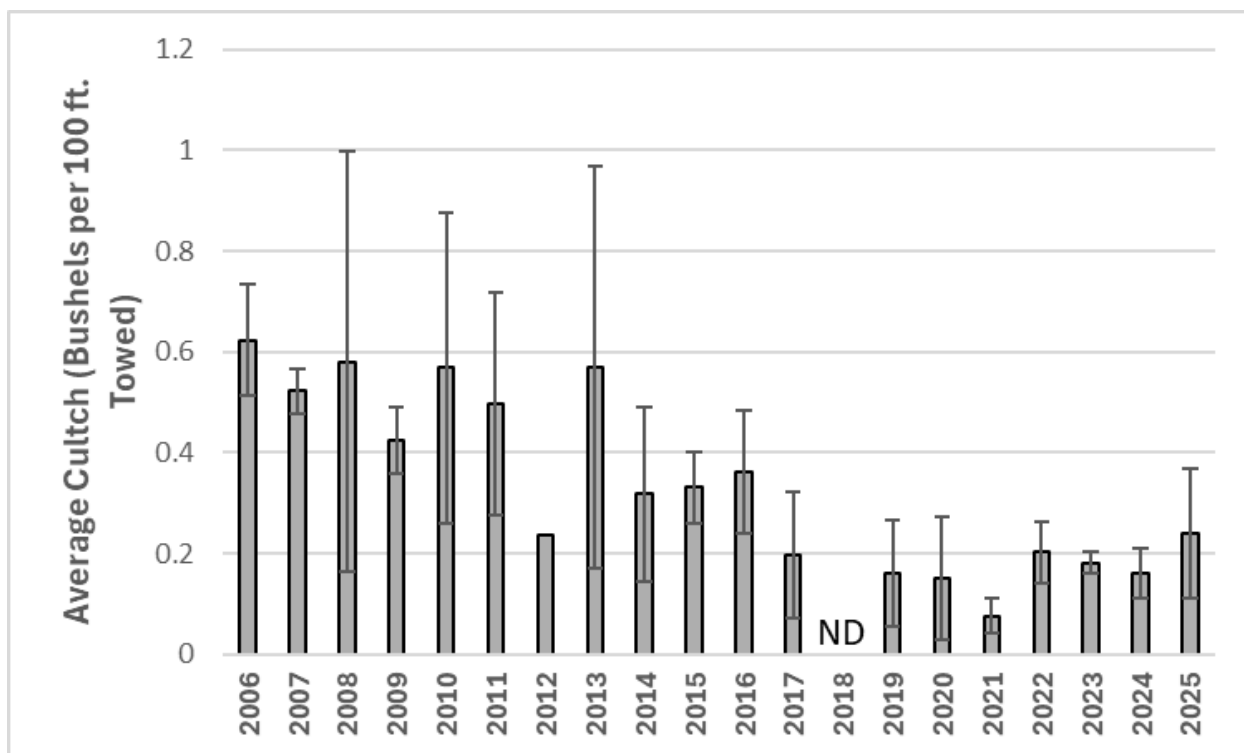


Figure B.26-4. Average cultch (live and dead oysters and loose shell) in NOAA Code 174 (St. Clements and Breton Bays) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. ND = No Data.

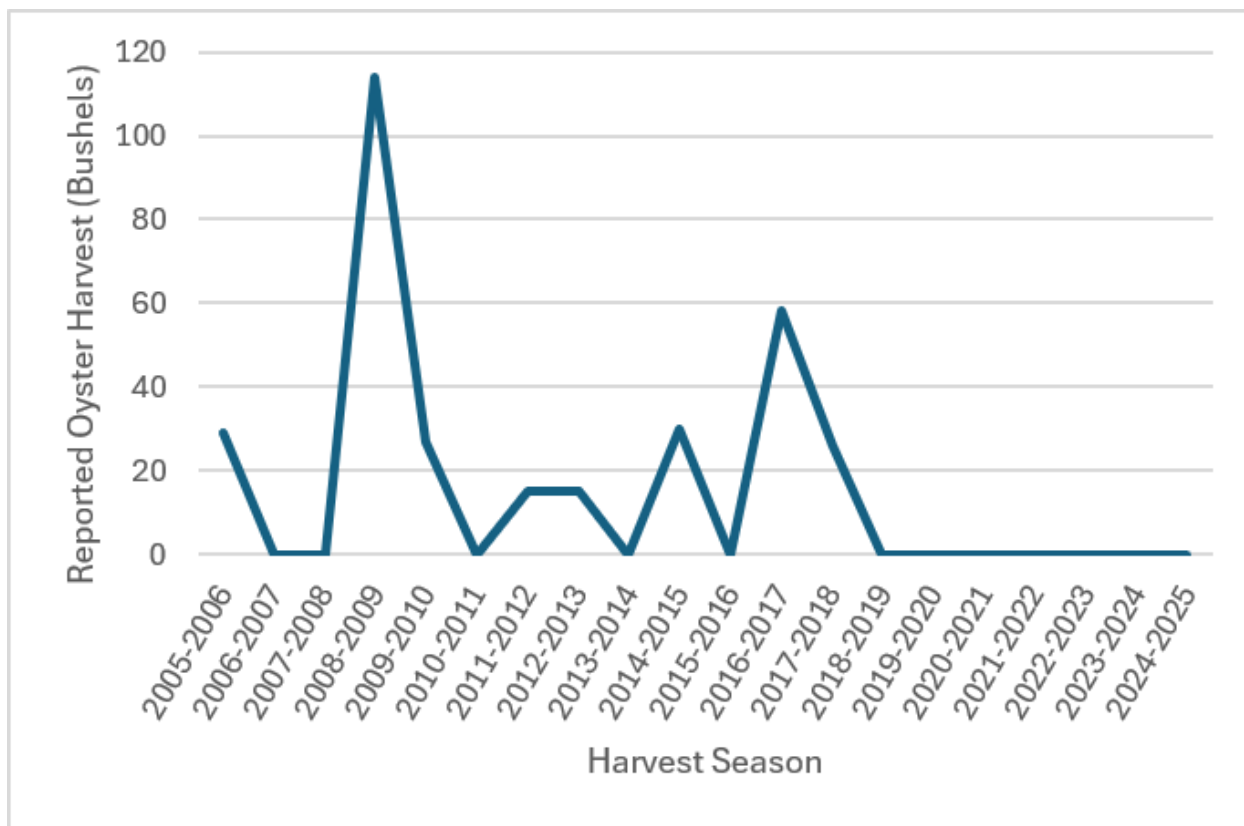


Figure B.26-5. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 174 (St. Clements and Breton Bays). Since 2010, 46% of the NOAA Code area has been designated as a sanctuary.

Section B.27: NOAA Code 192 – Tangier Sound South

NOAA Code 192 encompasses the southern portion of Tangier Sound and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 89,457 acres and has 75 historic oyster bars³⁶. There are two sanctuaries (Lower Mainstem and Somerset Sanctuaries) within the NOAA Code, and they encompass 6% (5,755 acres) of the NOAA Code. With the exception of harvest information from before the sanctuaries were established, this section will focus on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 83,702 surface acres. There are 37,269 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and not within a sanctuary. There are 26,478 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's high salinity region (Zone 3).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.27-1)
- Summary statistics (Table B.27-1)
- Density per year (Figure B.27-2)
- Shell height frequencies (Figure B.27-3)
- Biomass per year (Figure B.27-4)
- Observed mortality (Figure B.27-5)
- Dermo and MSX per year (Figure B.27-6)
- Cultch per year (Figure B.27-7)
- Harvest (Figure B.27-8)

Total live oyster density increased significantly during 2021-2025, driven by increases in all size classes. There was a corresponding increase in biomass during the most recent time period. Observed mortality was consistently higher than the long-term average but has trended downward throughout the time series. A peak in mortality occurred in 2023, which corresponded with peaks in MSX prevalence and dermo prevalence and intensity. Cultch availability has remained low, but stable throughout the time series.

Between 2006 and 2025, approximately 45 million hatchery spat-on-shell, 59,500 bushels of wild seed, and 314,000 bushels of shell (including 49,000 bushels of Gigas shell) were planted in this NOAA Code to enhance the commercial public fishery. Of these plantings, 99,000 bushels of shell, including all the Gigas shell, were added from 2021 to 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in sanctuaries. With the establishment of the Lower Mainstem and Somerset sanctuaries in 2010, 6% of the NOAA Code is now off-limits to harvest. Power dredge was the primary harvest gear

³⁶ See charts 36, 42, 43, 46, and 47 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

from 2021-2025. The highest harvest of the time series occurred during the 2022-2023 season which increased the average harvest for the 2021-2025 time period.

This area is characterized by stable and perhaps increasing biomass and oyster density and is consistently one of the highest harvest areas. Fortunately, there seems to have been some rebound in the last five years compared with the concerning low harvest of the 2016-2020 period, which coincided with an estimated density below the density limit reference point established in the 2024 Oyster Benchmark Stock Assessment. This is also one of the areas where the fishing mortality is above the limit reference point according to the latest Oyster Benchmark Stock Assessment indicating overfishing is occurring.

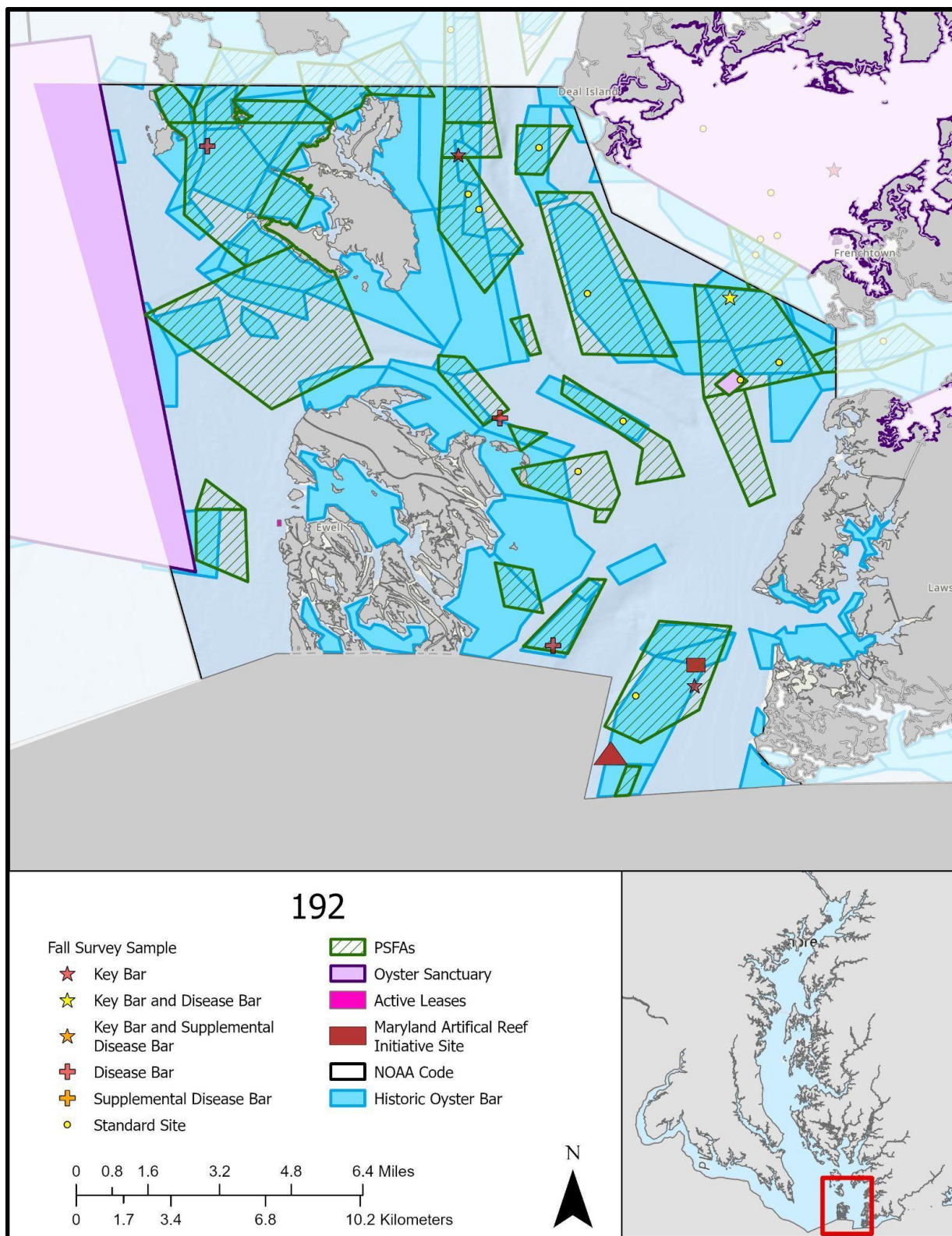


Table B.27-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 192 (Tangier Sound South) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/161	5/95	5/77	5/79
Number of Live Spat Oysters per square meter	62 $\pm$ 7.6	30.5 $\pm$ 5	48 $\pm$ 9.3	84 $\pm$ 9.1
Number of Live Small Oysters per square meter	59 $\pm$ 6.5	32 $\pm$ 4.4	19.7 $\pm$ 3.2	64 $\pm$ 7.3
Number of Live Market Oysters per square meter	14.6 $\pm$ 1.8	13 $\pm$ 1.3	4.1 $\pm$ 0.6	30 $\pm$ 3.5
Number of Live Oysters per square meter	135.3 $\pm$ 8.4	75.2 $\pm$ 7.2	72.2 $\pm$ 11.2	177 $\pm$ 17
Live Biomass (g Dry Weight per Bushel)	96.5 $\pm$ 11	104 $\pm$ 14.3	63 $\pm$ 12.3	204.2 $\pm$ 17.6
Observed Mortality (%)	18 $\pm$ 1.1	17.2 $\pm$ 1.6	15.1 $\pm$ 2	13 $\pm$ 1
Cultch (Bushels per 100 feet towed)	0.8 $\pm$ 0.05	0.7 $\pm$ 0.05	0.6 $\pm$ 0.05	0.7 $\pm$ 0.05
Harvest (Bushels)	16,787	29,534	10,968	99,681

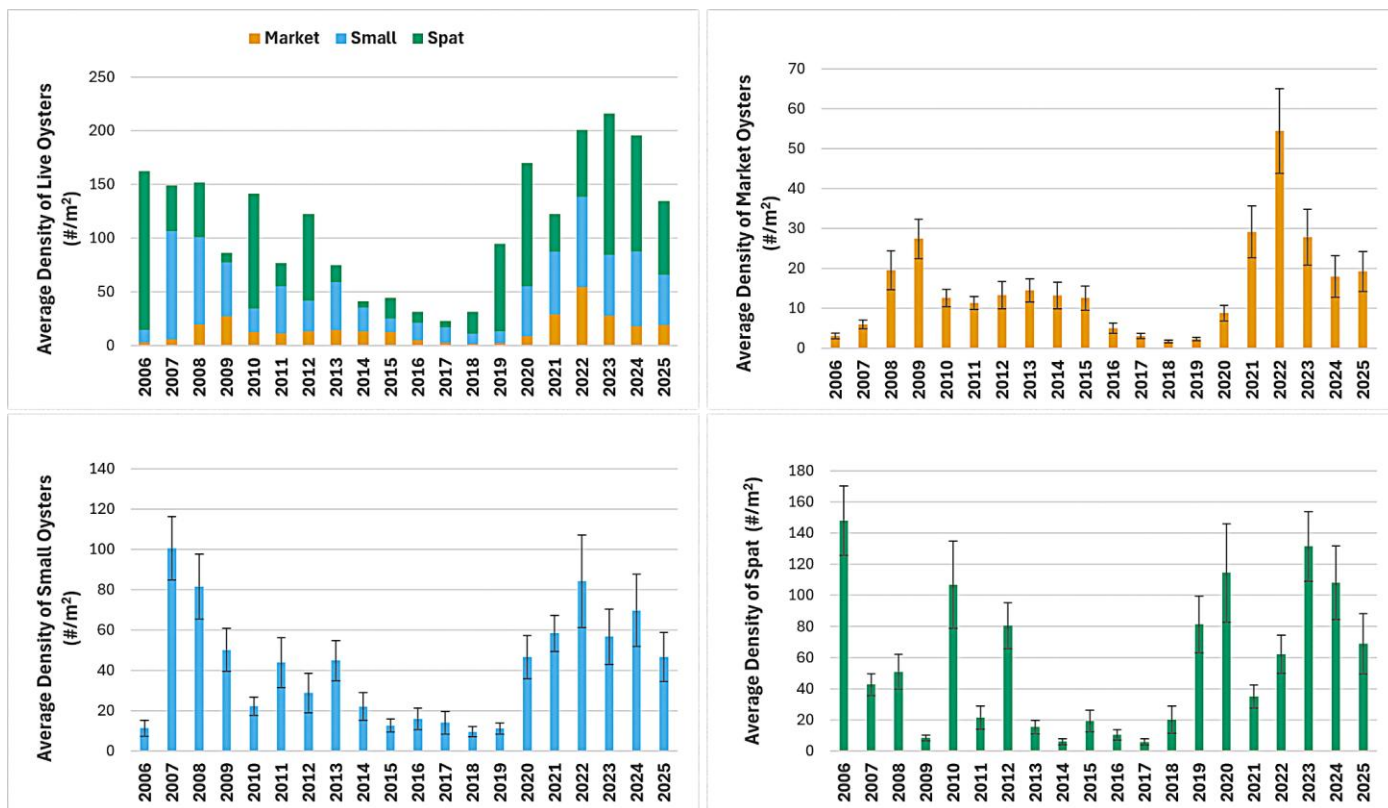


Figure B.27-2. Average number of live oysters per square meter by size class in NOAA Code 192 (Tangier Sound South) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Tangier Sound South (192)

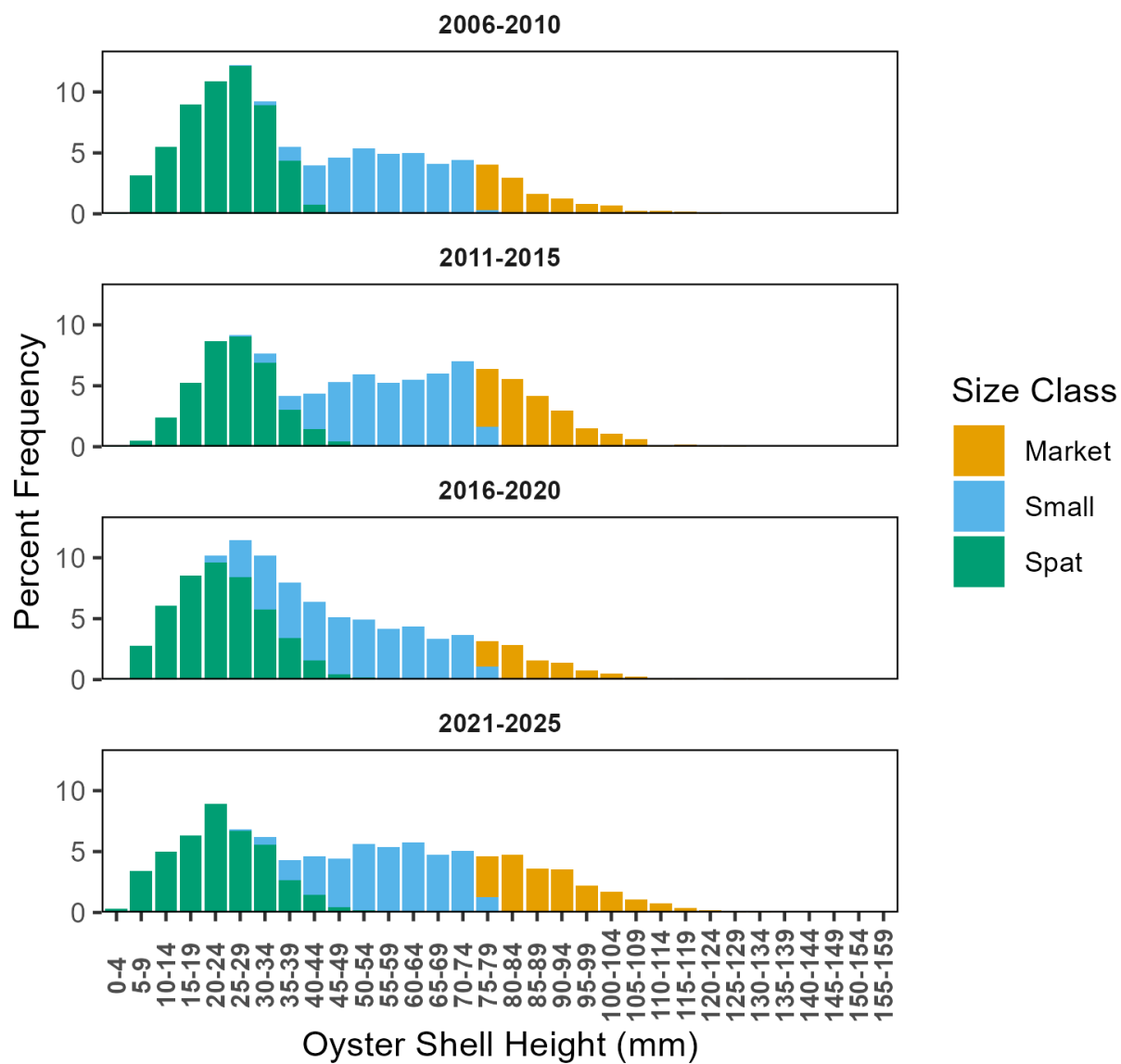


Figure B.27-3. Shell height frequencies of live oysters in NOAA Code 192 (Tangier Sound South) outside of the current sanctuary area.

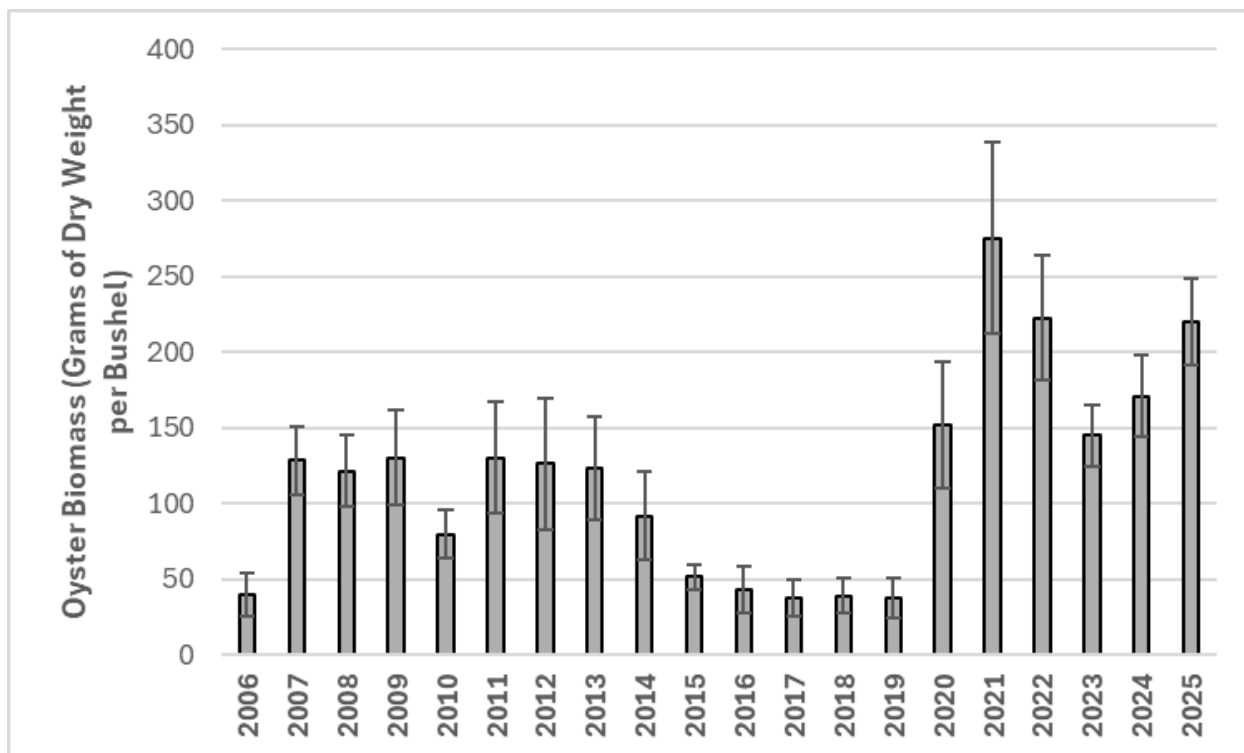


Figure B.27-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 192 (Tangier Sound South) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

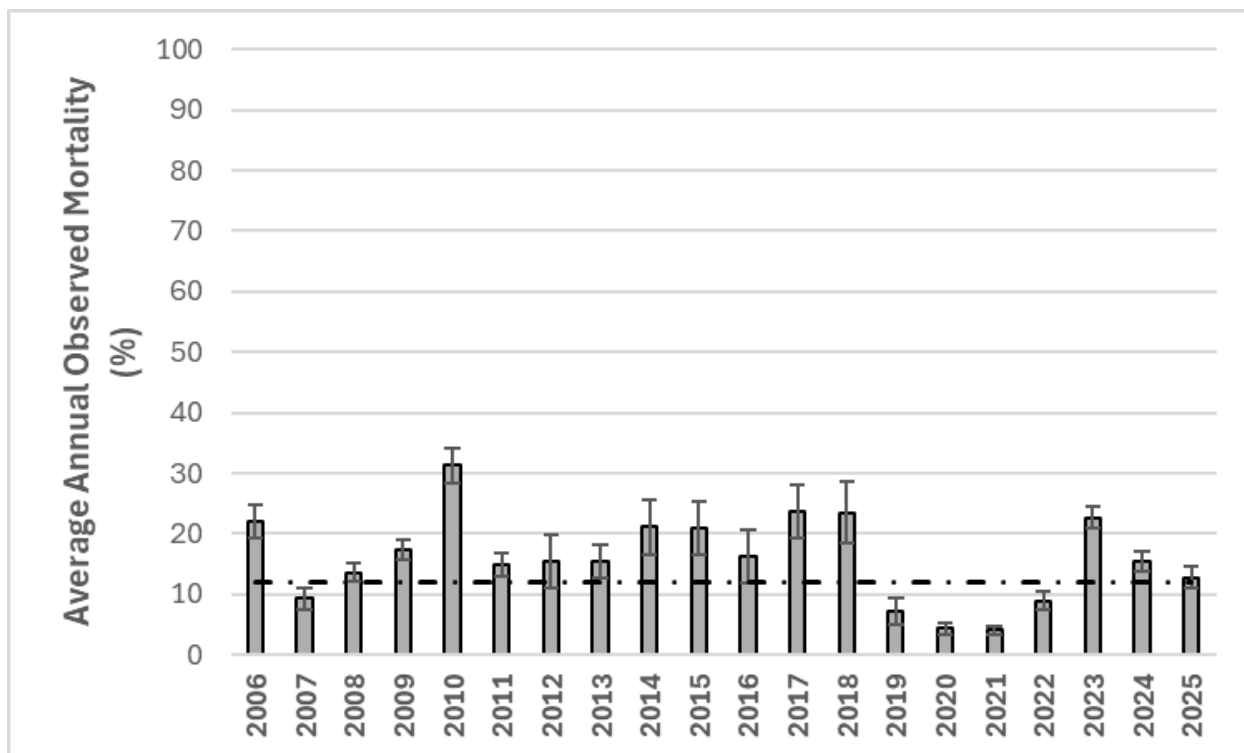


Figure B.27-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 192 (Tangier Sound South) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

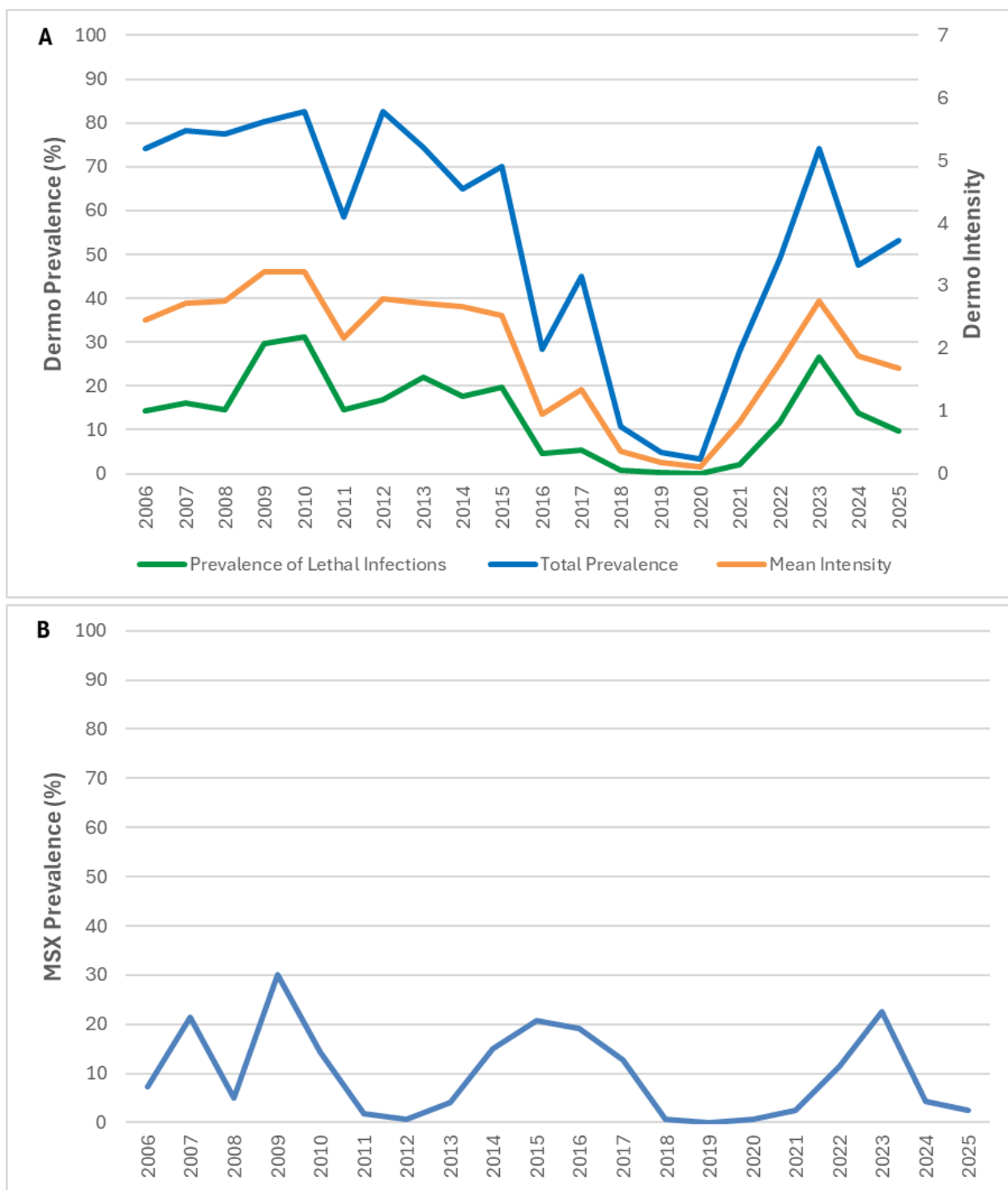


Figure B.27-6. Oyster disease prevalence and intensity in NOAA Code 192 (Tangier Sound South) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey based on an average of Holland Straits, Old Womans Leg, Back Cove, and Piney Island East bars.

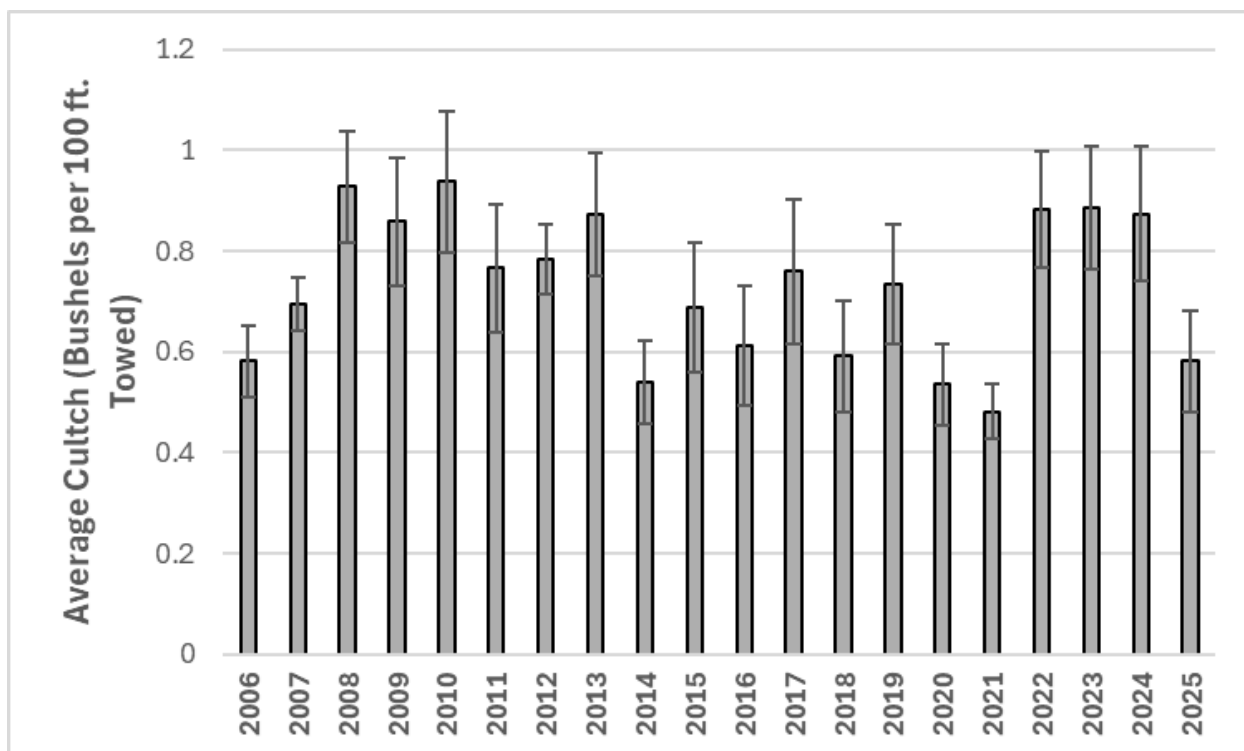


Figure B.27-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 192 (Tangier Sound South) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

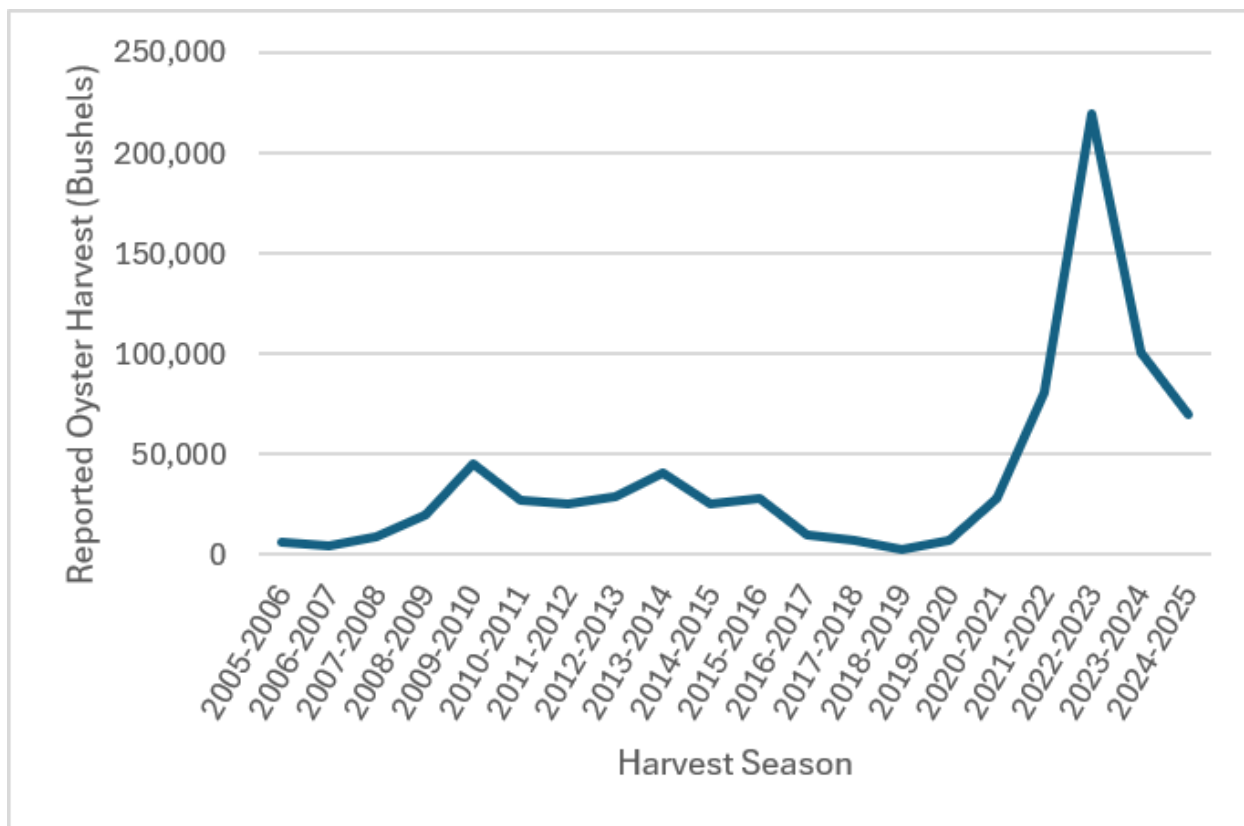


Figure B.27-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 192 (Tangier Sound South). Since 2010, 6% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.28: NOAA Code 229 – Lower West Chesapeake Bay

NOAA Code 229 is located in Maryland's lower western portion of the Chesapeake Bay mainstem, south of Cove Point and west of the shipping channel. The entire NOAA Code is 107,484 acres and has 28 historic oyster bars³⁷. Two sanctuaries (Point Lookout Sanctuary and Cedar Point Sanctuary), both established in 2010, encompass 4% (3,976 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 103,508 surface acres. There are 20,262 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 6,790 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.28-1)
- Summary statistics (Table B.28-1)
- Density per year (Figure B.28-2)
- Shell height frequencies (Figure B.28-3)
- Biomass per year (Figure B.28-4)
- Observed mortality (Figure B.28-5)
- Dermo and MSX per year (Figure B.28-6)
- Cultch per year (Figure B.28-7)
- Harvest (Figure B.28-8)

Total live oyster density has shown a significant upward trend, nearly tripling between the 2006-2010 and 2021-2025 time periods, primarily due to increases in small and market oyster density. These increases have led to a corresponding increase in biomass through the time series. Observed mortality has been variable, but generally below the long-term average. A spike in mortality in 2023 corresponded to an increase in MSX and dermo. Cultch availability has remained stable and low.

Between 2006 and 2020, approximately 220,000 bushels of shell, 23,500 bushels of wild seed and 20 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 16 million hatchery spat-on-shell, 81,000 bushels of shell and 5,700 bushels of wild seed were added from 2021 to 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in a sanctuary. Following the establishment of the sanctuary in 2010, 4% of the NOAA Code was closed to harvest. Power dredge was the primary harvest gear during the 2021-2025 time period. This area is characterized by relatively low but apparently increasing biomass and oyster density. Harvest has generally been low but increasing with a peak in the 2022-2023 season.

³⁷ See chart 35 and 40 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

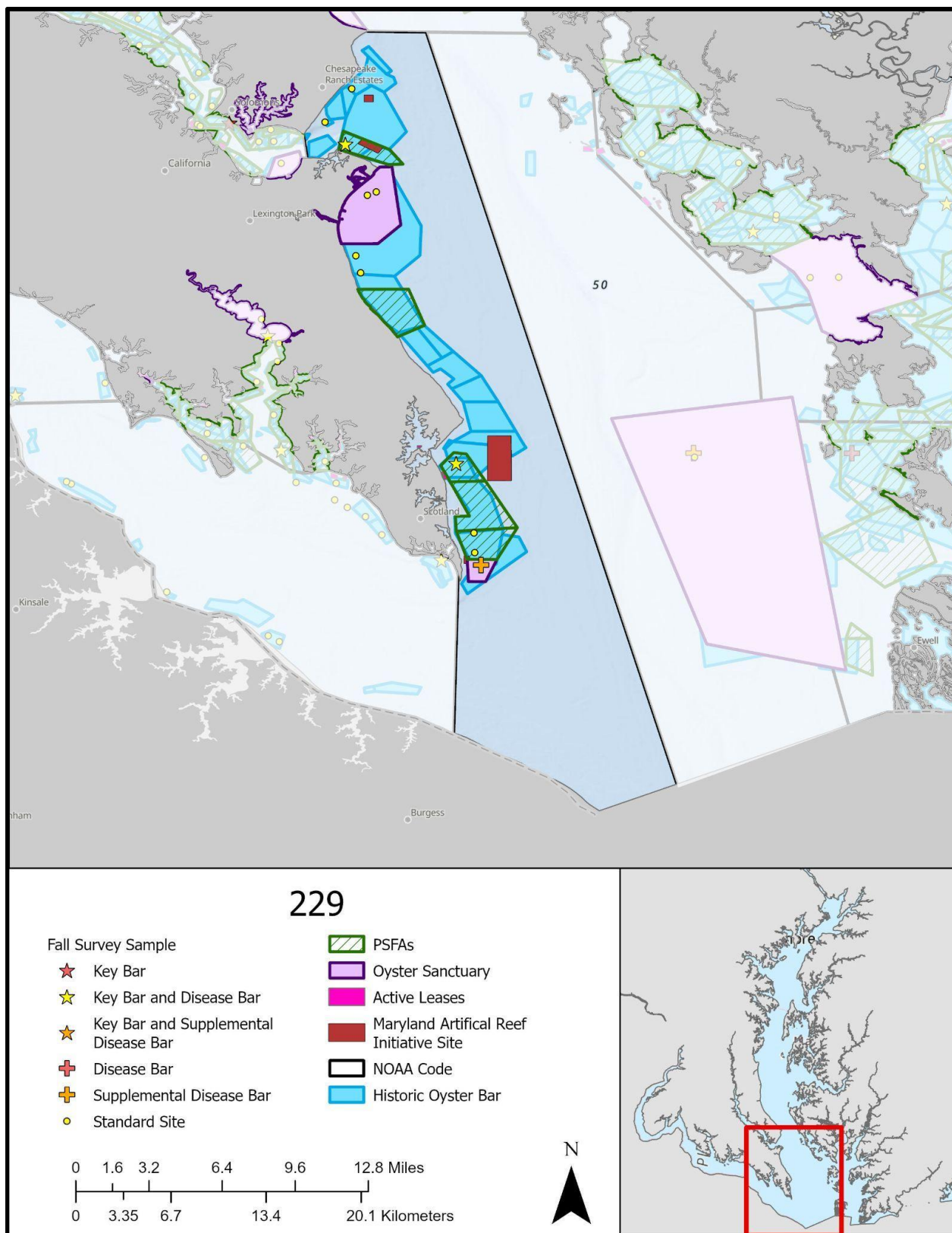


Figure B.28-1. Map of NOAA Code 229 (Lower West Chesapeake Bay). Fall Oyster Survey sites may not be sampled every year.

Table B.28-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 229 (Lower West Chesapeake Bay) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/46	5/34	5/37	5/39
Number of Live Spat Oysters per square meter	1.7 $\pm$ 0.4	1.6 $\pm$ 0.4	21* $\pm$ 17	15.6* $\pm$ 5.4*
Number of Live Small Oysters per square meter	7.4 $\pm$ 1.8	5.4 $\pm$ 1.9	17.6 $\pm$ 5.4	20.6 $\pm$ 3.9
Number of Live Market Oysters per square meter	8.8 $\pm$ 1.7	6 $\pm$ 0.6	7.6 $\pm$ 1	15 $\pm$ 2.2
Number of Live Oysters per square meter	18 $\pm$ 2.9	13 $\pm$ 2.1	46 $\pm$ 17	51 $\pm$ 8.3
Live Biomass (g Dry Weight per Bushel)	72 $\pm$ 16	110.4 $\pm$ 16.2	152 $\pm$ 34.4	228 $\pm$ 17.7
Observed Mortality (%)	15.4 $\pm$ 1.5	7.8 $\pm$ 1.2	10.4 $\pm$ 1.7	11.4 $\pm$ 1.5
Cultch (Bushels per 100 feet towed)	0.3 $\pm$ 0.03	0.2 $\pm$ 0.03	0.2 $\pm$ 0.03	0.3 $\pm$ 0.04
Harvest (Bushels)	597	2,980	6,554	11,765

*Includes samples taken on hatchery apt-on-shell plantings.

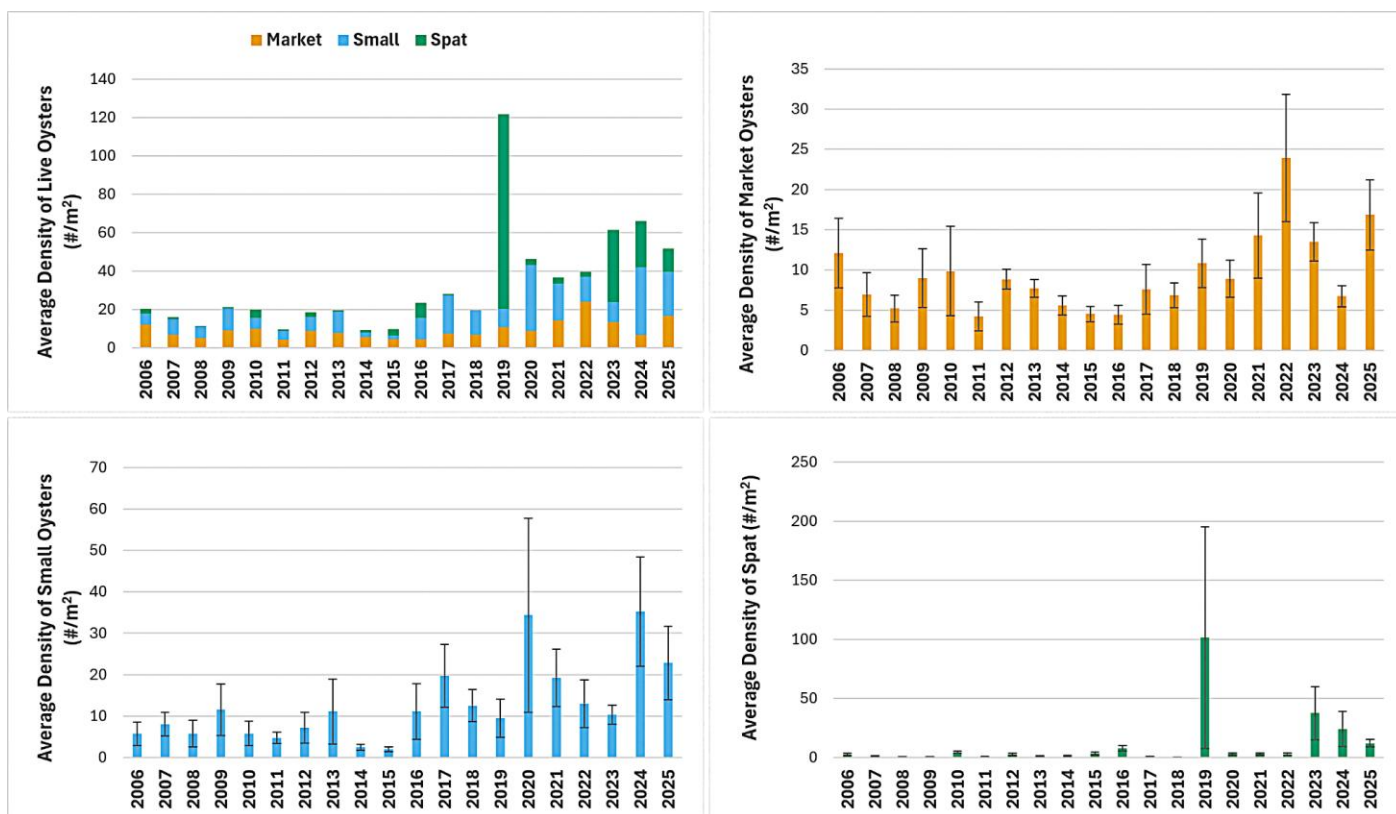


Figure B.28-2A. Average number of live oysters per square meter by size class in NOAA Code 229 (Lower West Chesapeake Bay) occurring outside of the current sanctuary area including samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

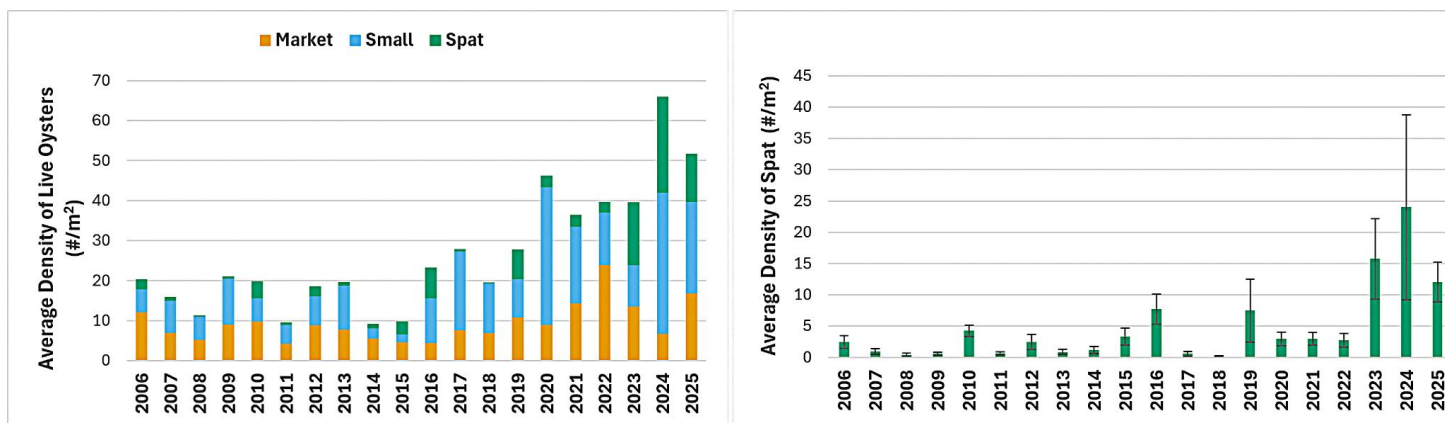


Figure B.28-2B. Average number of live oysters per square meter by size class in NOAA Code 229 (Lower West Chesapeake Bay) occurring outside of the current sanctuary area excluding samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Lower West Chesapeake Bay (229)

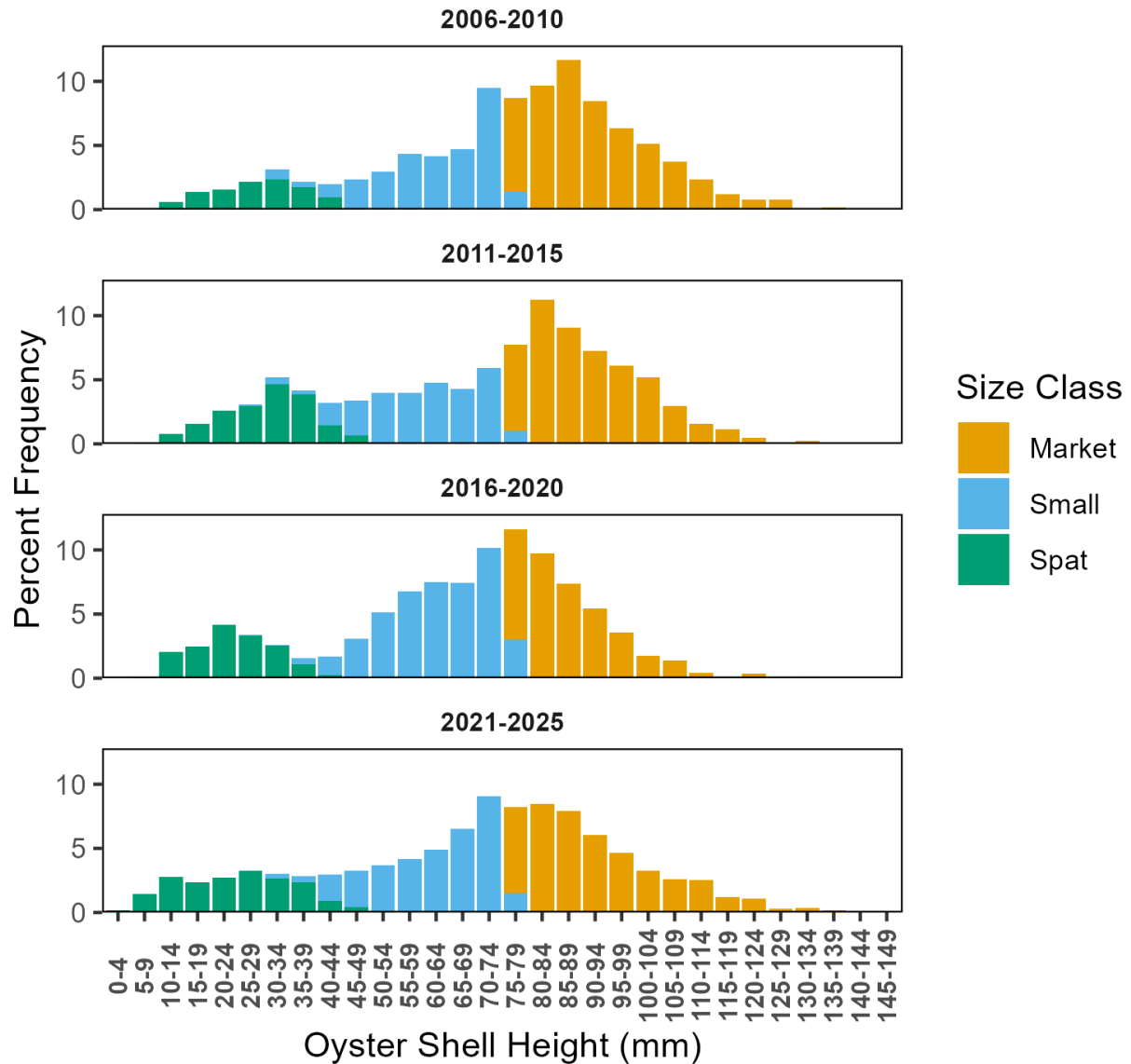


Figure B.28-3. Shell height frequencies of live oysters in NOAA Code 229 (Lower West Chesapeake Bay) outside of the current sanctuary area.

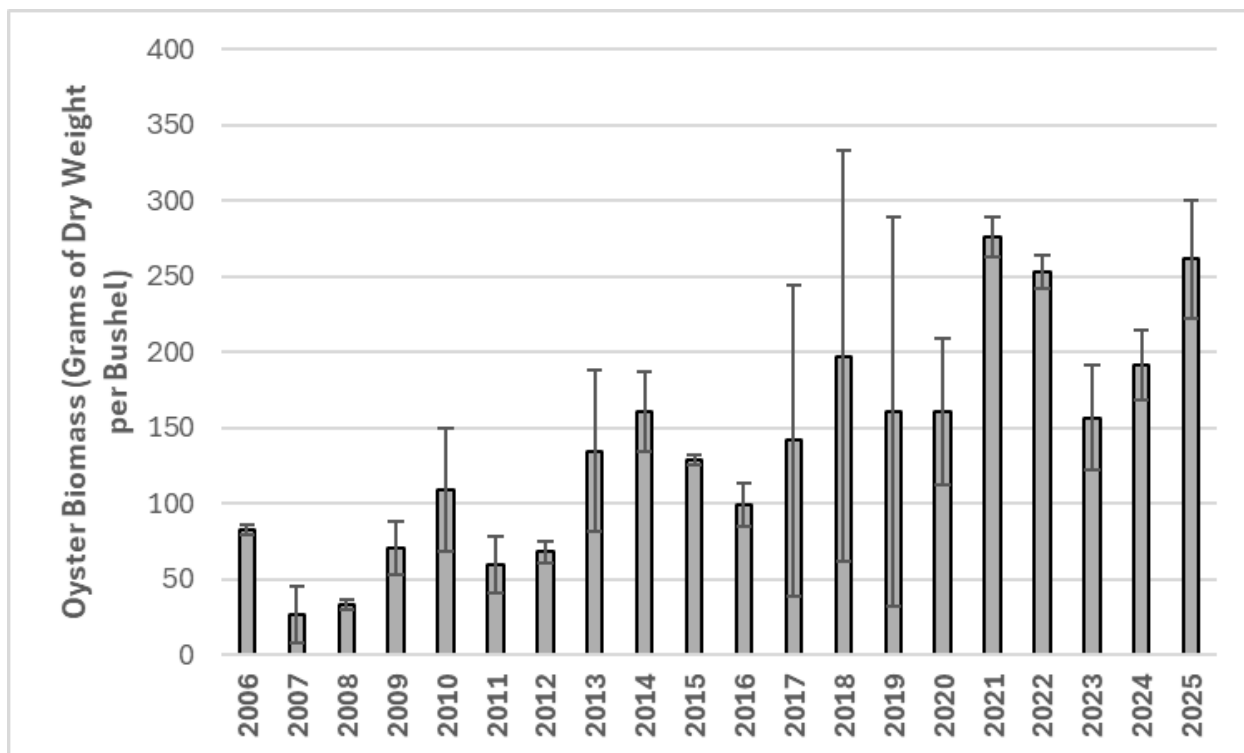


Figure B.28-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 229 (Lower West Chesapeake Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

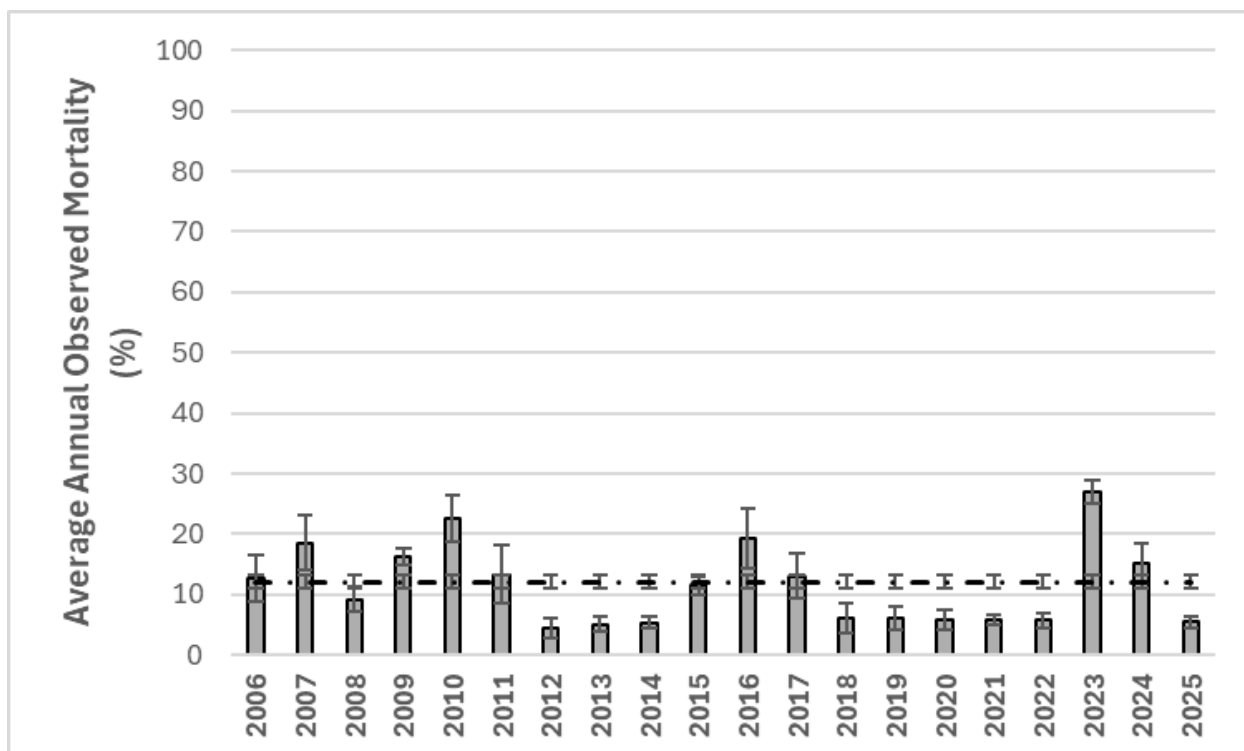


Figure B.28-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 229 (Lower West Chesapeake Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

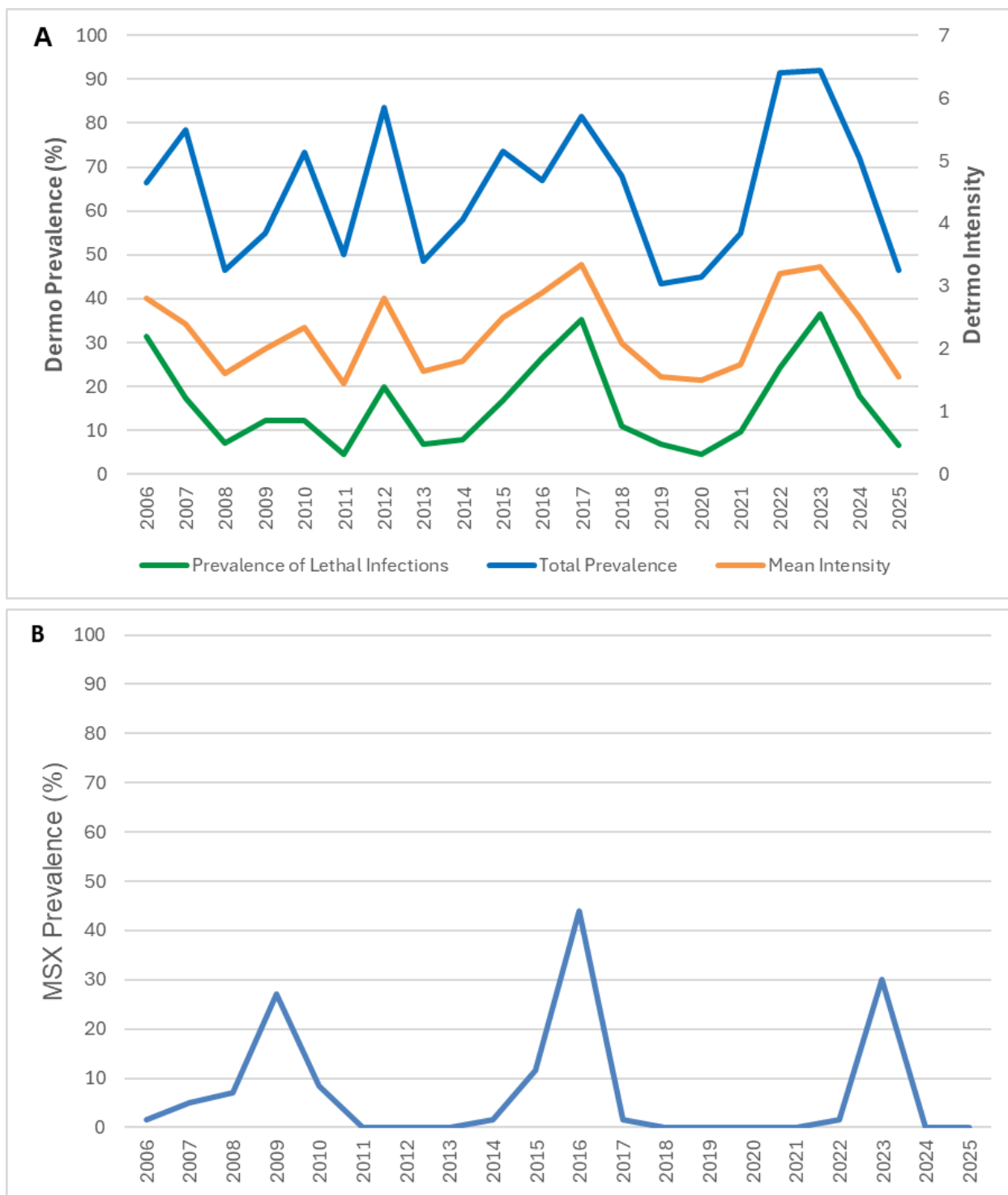


Figure B.28-6. Oyster disease prevalence and intensity in NOAA Code 229 (Lower West Chesapeake Bay) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey based on an average of Butler and Hog Island bars.

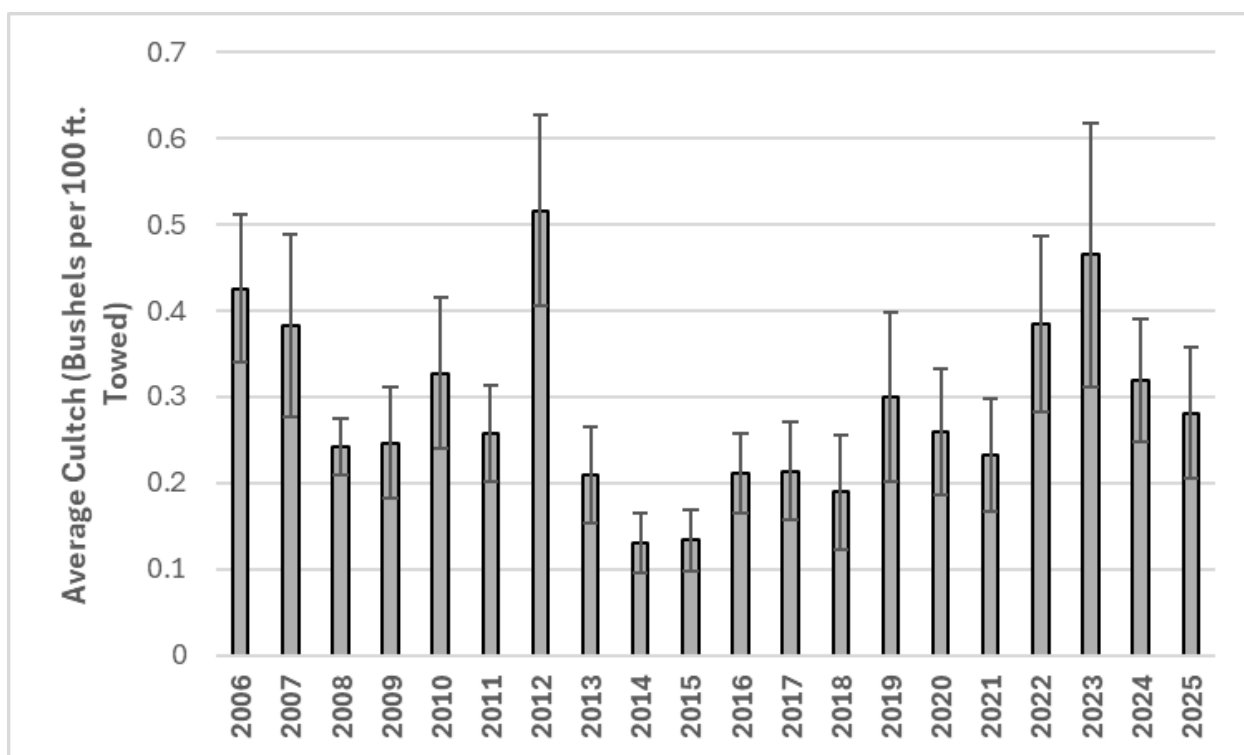


Figure B.28-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 229 (Lower West Chesapeake Bay) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

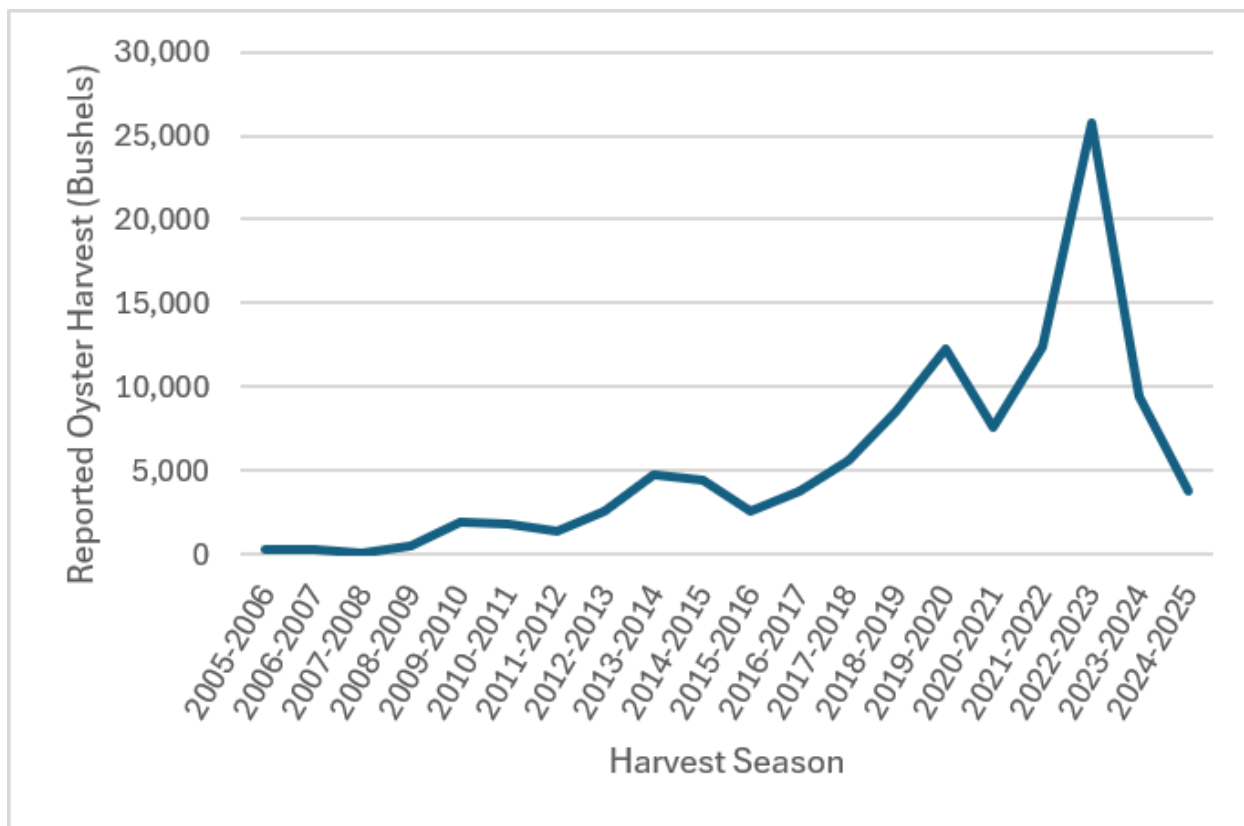


Figure B.28-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 229 (Lower West Chesapeake Bay). Since 2010, 4% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.29: NOAA Code 231 – Chester River Middle

NOAA Code 231 encompasses the middle section of the Chester River, from Spaniard Point to Queenstown Creek, and is located in Maryland's upper eastern portion of Chesapeake Bay. The entire NOAA Code is 15,280 acres and has 38 historic oyster bars³⁸. There are two sanctuaries in this NOAA Code (Ringgold and Upper Chester River Sanctuaries), encompassing 53% (8,211 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 7,069 surface acres. There are 3,220 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuaries. There are 2,780 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.29-1)
- Summary statistics (Table B.29-1)
- Density per year (Figure B.29-2)
- Observed mortality (Figure B.29-3)
- Cultch per year (Figure B.29-4)
- Harvest (Figure B.29-5)

Total live oyster density dropped significantly after 2006-2010, but has been trending upward since, driven by increases in the density of all size classes from the spat-on-shell and wild seed plantings solely. Biomass has also been trending upward, while observed mortality has consistently declined and was usually below the long-term average. Cultch availability has been variable but increasing slightly in recent years.

Between 2006 and 2020, approximately 324 million hatchery spat-on-shell and 1,500 bushels of wild seed were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 47 million hatchery spat-on-shell were added from 2021 to 2025, during which time no shell or wild seed plantings occurred.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years out of the time series, including past harvest data from areas now in a sanctuary. The Ringgold and Upper Chester River sanctuaries were added in 2010, closing 53% of the NOAA Code to harvest. The Chester River has been closed to harvesting except for planted areas during the 2021-2025 seasons based on The Oyster Benchmark Stock Assessment results. Hand tong and dive were the primary harvest gear types. This area is characterized by low but seemingly stable biomass and oyster density. Harvest is low and decreasing even among the few planted areas.

³⁸ See chart 7 and 8 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

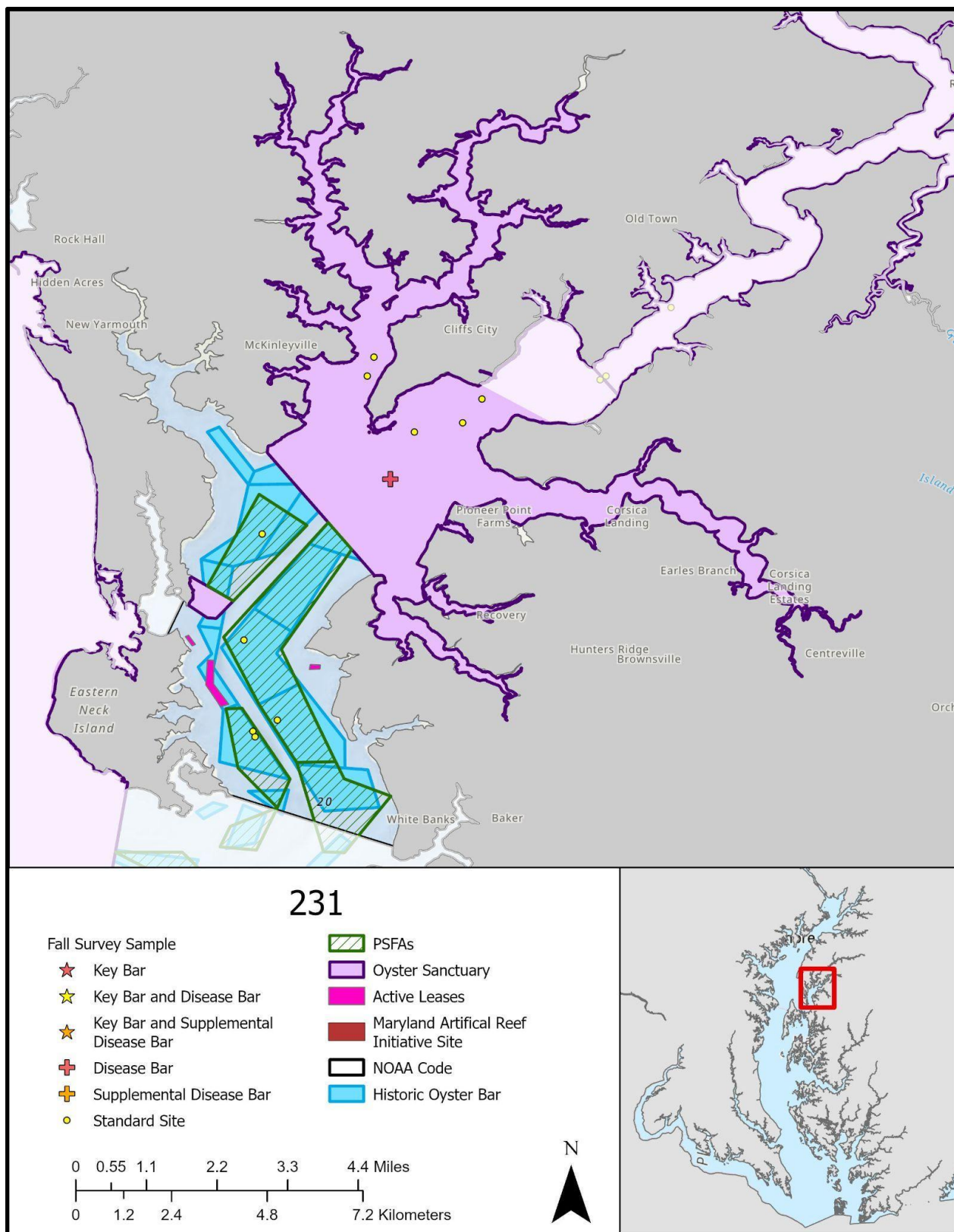


Figure B.29-1. Map of NOAA Code 231 (Chester River Middle). Fall Oyster Survey sites may not be sampled every year.

Table B.29-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 231 (Chester River Middle) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/34	5/28	5/35	5/36
Number of Live Spat Oysters per square meter	50.5* $\pm$ 35.4	0	2.8 $\pm$ 1.6	23.6* $\pm$ 23
Number of Live Small Oysters per square meter	19.7 $\pm$ 15.7	1.4 $\pm$ 0.4	4.4 $\pm$ 1.7	10.6 $\pm$ 3.1
Number of Live Market Oysters per square meter	11.1 $\pm$ 1.8	8 $\pm$ 1.6	14.1 $\pm$ 4.8	21.5 $\pm$ 4.2
Number of Live Oysters per square meter	81.4 $\pm$ 31.2	9.2 $\pm$ 1.7	21.3 $\pm$ 6	55.3 $\pm$ 24.8
Live Biomass (g Dry Weight per Bushel)	32.7 $\pm$ 21.5	75.7 $\pm$ 20	ND	83 $\pm$ 32.5
Observed Mortality (%)	15.3 $\pm$ 2.7	10 $\pm$ 3.4	9.6 $\pm$ 2.3	7.2 $\pm$ 2.9
Cultch (Bushels per 100 feet towed)	0.6 $\pm$ 0.1	0.7 $\pm$ 0.1	0.7 $\pm$ 0.1	0.8 $\pm$ 0.1
Harvest (Bushels)	2,912	1,120	815	236

* Includes two spat-on-shell plantings

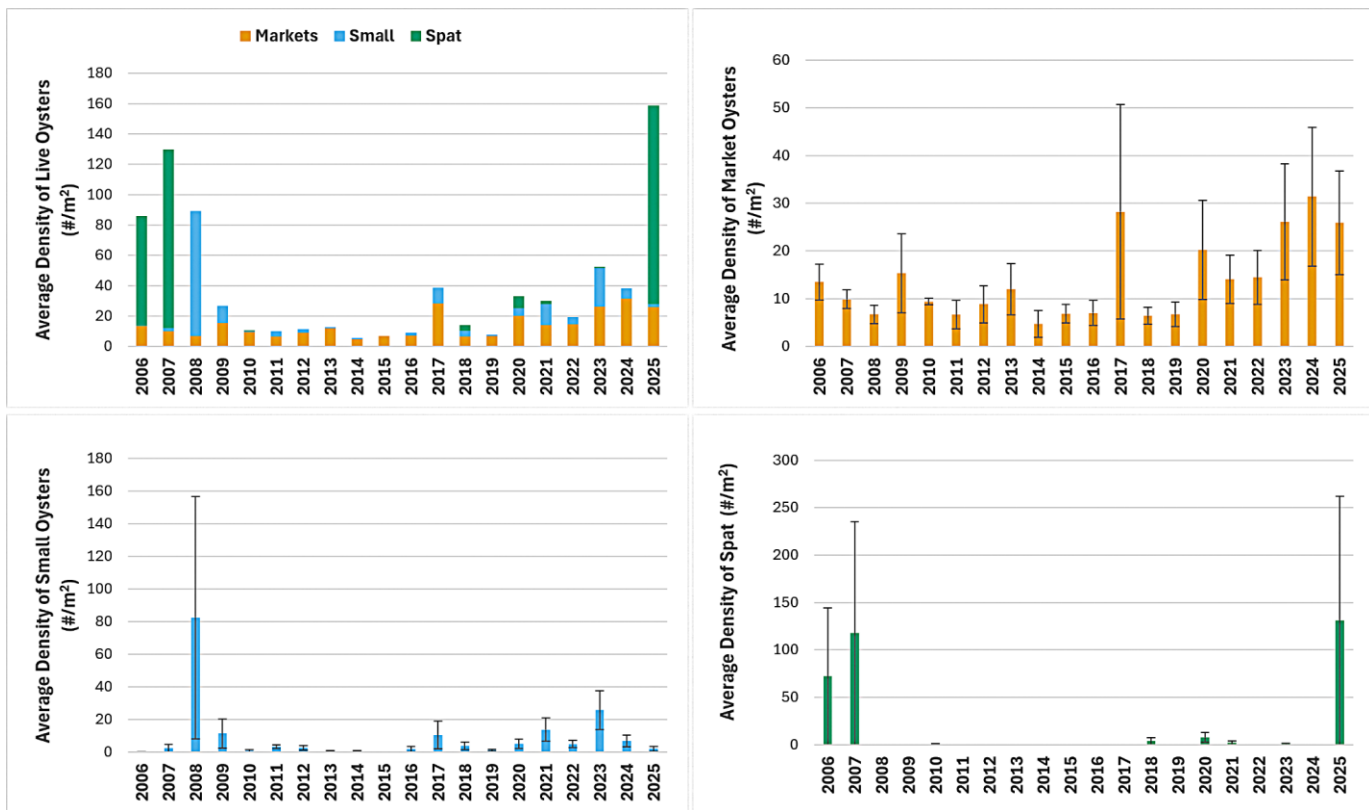


Figure B.29-2A. Average number of live oysters per square meter by size class in NOAA Code 231 (Chester River Middle) occurring outside of the current sanctuary area including samples collected on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

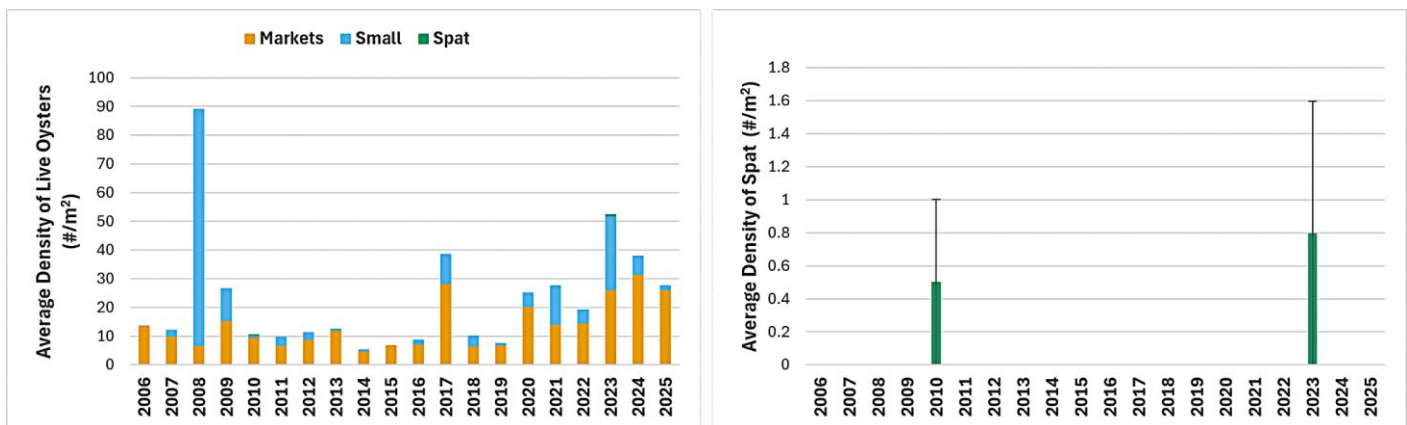


Figure B.29-2B. Average number of live oysters per square meter by size class in NOAA Code 231 (Chester River Middle) occurring outside of the current sanctuary area excluding samples collected on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

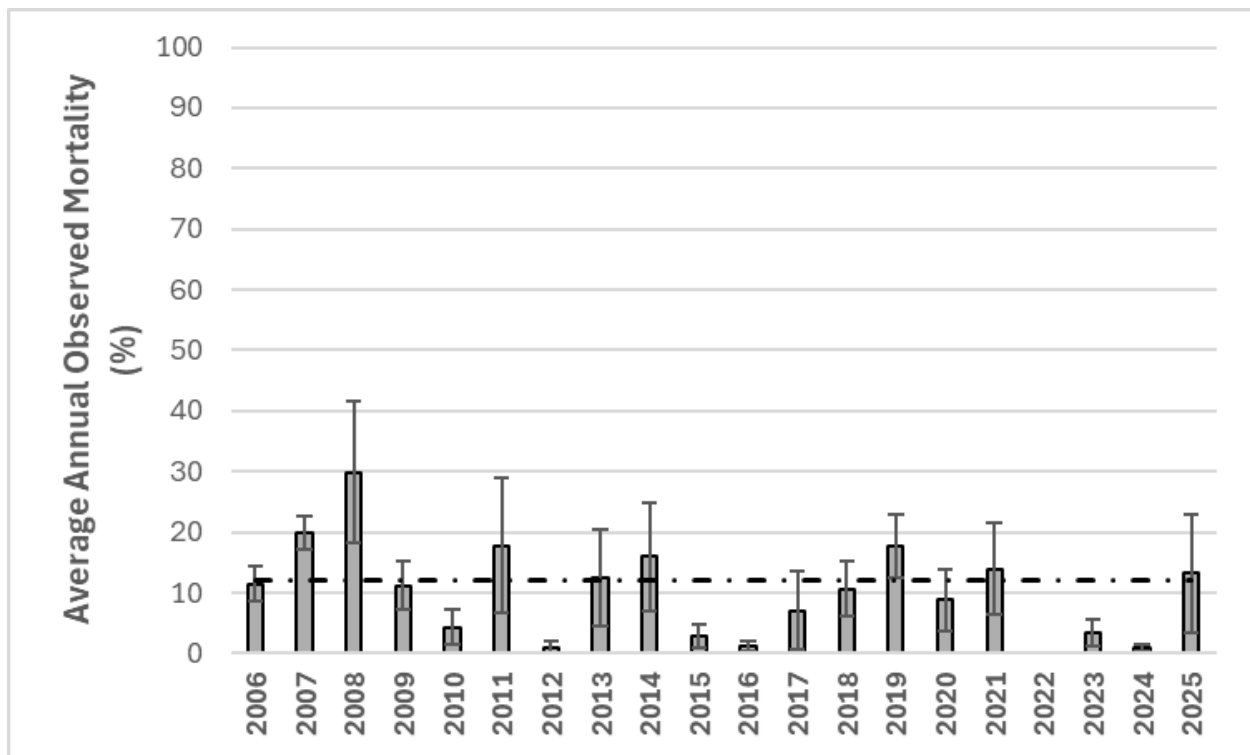


Figure B.29-3. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 231 (Chester River Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

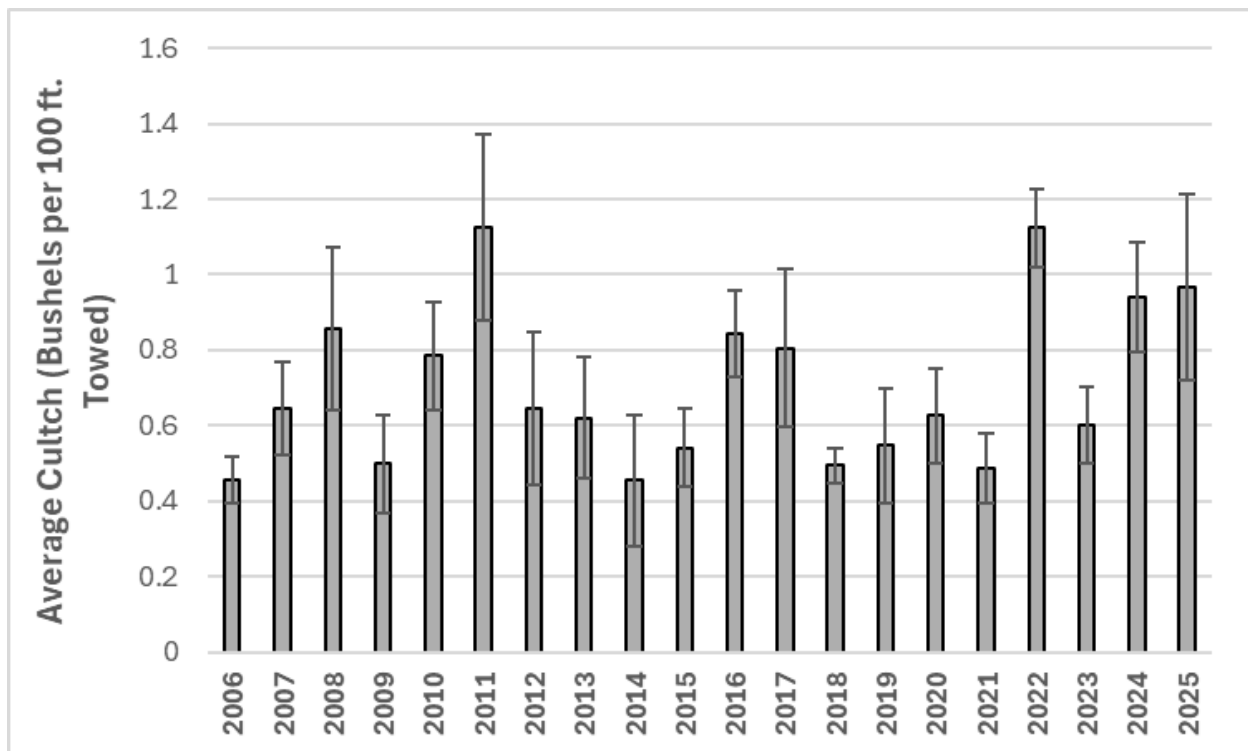


Figure B.29-4. Average cultch (live and dead oysters and loose shell) in NOAA Code 231 (Chester River Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

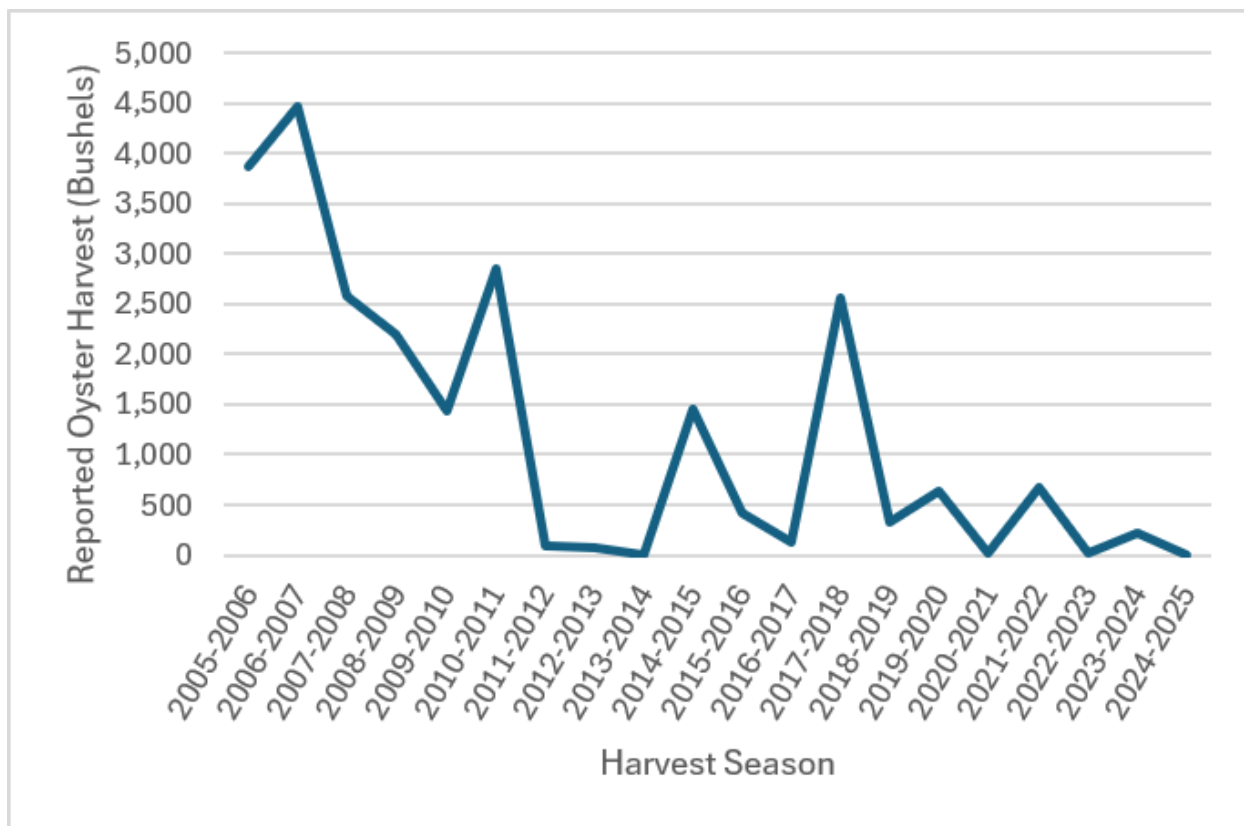


Figure B.29-5. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 231 (Chester River Middle). Since 2010, 53% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.30: NOAA Code 237 – Choptank River Middle

NOAA Code 237 encompasses the middle portion of the Choptank River and is located in Maryland's mid-eastern portion of Chesapeake Bay. The entire NOAA Code is 11,946 acres and has 37 historic oyster bars³⁹. There are five sanctuaries partially or completely within the NOAA Code: Sandy Hill, La Trappe Creek, Howell Point – Beacon, Upper Choptank River, and Lower Choptank River (total of 6,221 sanctuary acres, 52% of the NOAA Code). This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 5,725 surface acres. There are 3,605 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside of a sanctuary. There are 3,457 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.30-1)
- Summary statistics (Table B.30-1)
- Density per year (Figure B.30-2)
- Shell height frequencies (Figure B.30-3)
- Biomass per year (Figure B.30-4)
- Observed mortality (Figure B.30-5)
- Cultch per year (Figure B.30-6)
- Harvest (Figure B.30-7)

Total live oyster density rose significantly throughout the time series. This increase is reflected across all size classes, with a corresponding increase in biomass. Good recruitment in recent years, particularly in 2025, as well as planting of hatchery spat-on-shell accounted for this increase. Observed mortality rates were generally below the long-term average. Cultch availability also improved during the most recent time period.

Between 2006 and 2025, approximately 4,400 bushels of wild seed and 185 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 50 million hatchery spat-on-shell and 2,100 bushels of wild seed were added from 2021 to 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series, including past harvest data from areas now in a sanctuary. Since 2010, 52% of the NOAA Code has been off-limits to harvest. Hand tong was the primary harvest gear over the 2021-2025 time period. This area is characterized by relatively stable biomass and oyster density and relatively low but somewhat variable harvest that has increased some in recent years, primarily driven by multiple years of enhancement activity and low mortality.

³⁹ See chart 20 and 21 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

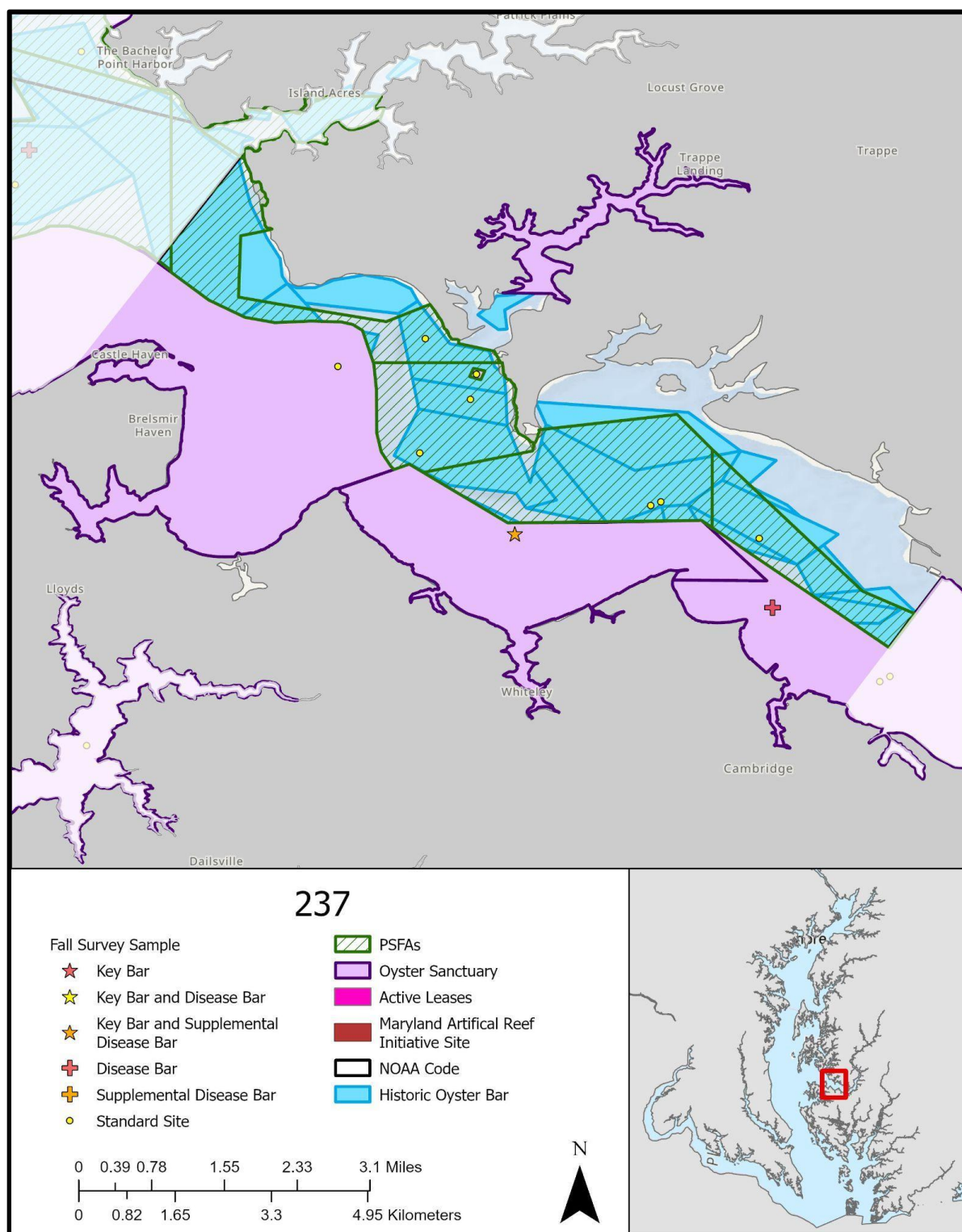


Figure B.30-1. Map of NOAA Code 237 (Choptank River Middle). Fall Oyster Survey sites may not be sampled every year.

Table B.30-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 237 (Choptank River Middle) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/34	5/30	5/33	5/32
Number of Live Spat Oysters per square meter	6 $\pm$ 2.6	5.1 $\pm$ 2.8	28.3 $\pm$ 19	54 $\pm$ 16
Number of Live Small Oysters per square meter	11.1 $\pm$ 3.5	28 $\pm$ 16	31.5 $\pm$ 14	73 $\pm$ 13
Number of Live Market Oysters per square meter	20 $\pm$ 3.3	42 $\pm$ 6.1	27.7 $\pm$ 6.1	86 $\pm$ 13
Number of Live Oysters per square meter	37 $\pm$ 6	75.3 $\pm$ 18.7	87.4 $\pm$ 20	213 $\pm$ 35.5
Live Biomass (g Dry Weight per Bushel)	124 $\pm$ 34.5	177 $\pm$ 23	124.6 $\pm$ 22	276 $\pm$ 22.4
Observed Mortality (%)	7.2 $\pm$ 1.4	6.7 $\pm$ 1	6.5 $\pm$ 1.4	4.8 $\pm$ 0.7
Cultch (Bushels per 100 feet towed)	0.7 $\pm$ 0.1	0.8 $\pm$ 0.1	0.7 $\pm$ 0.1	1.3 $\pm$ 0.2
Harvest (Bushels)	1,048	2,984	6,057	4,490

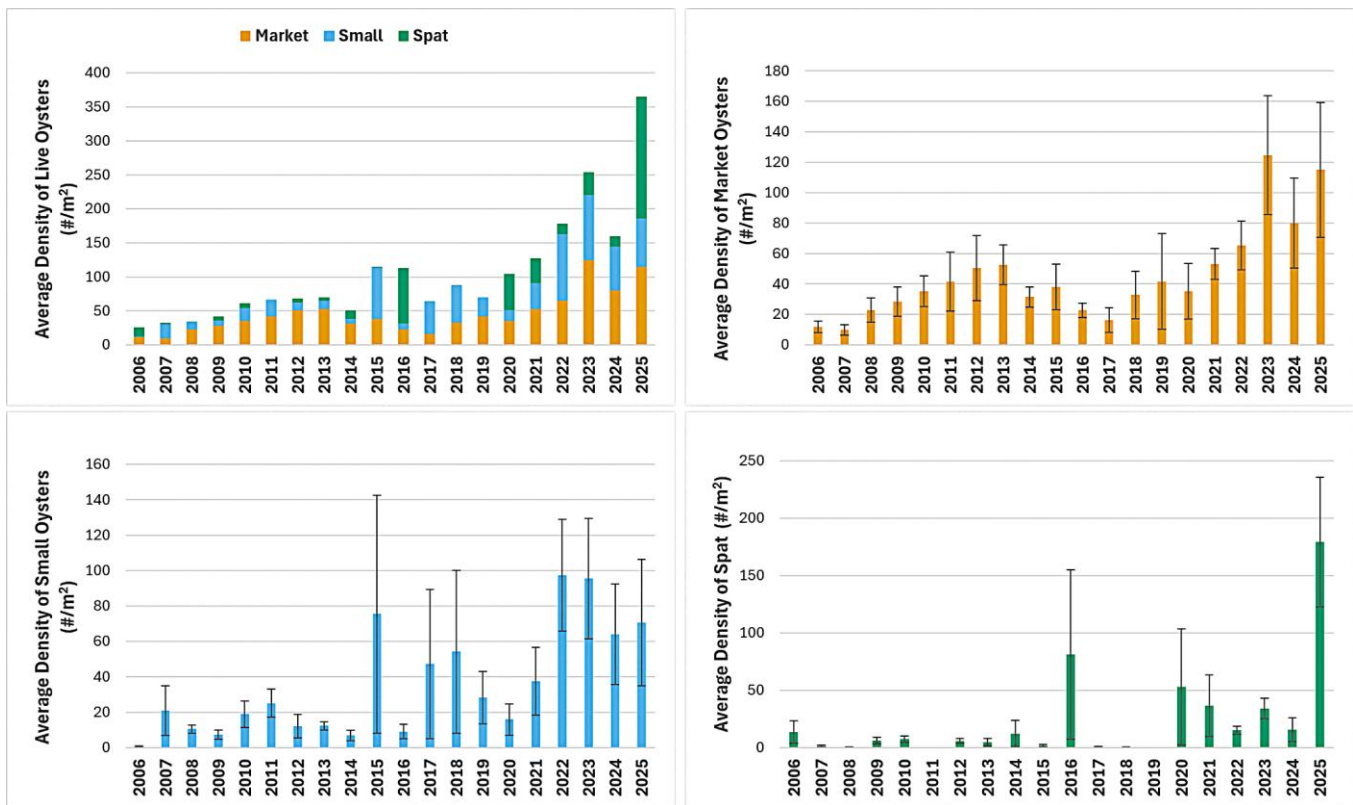


Figure B.30-2A. Average number of live oysters per square meter by size class in NOAA Code 237 (Choptank River Middle) occurring outside of the current sanctuary area including samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

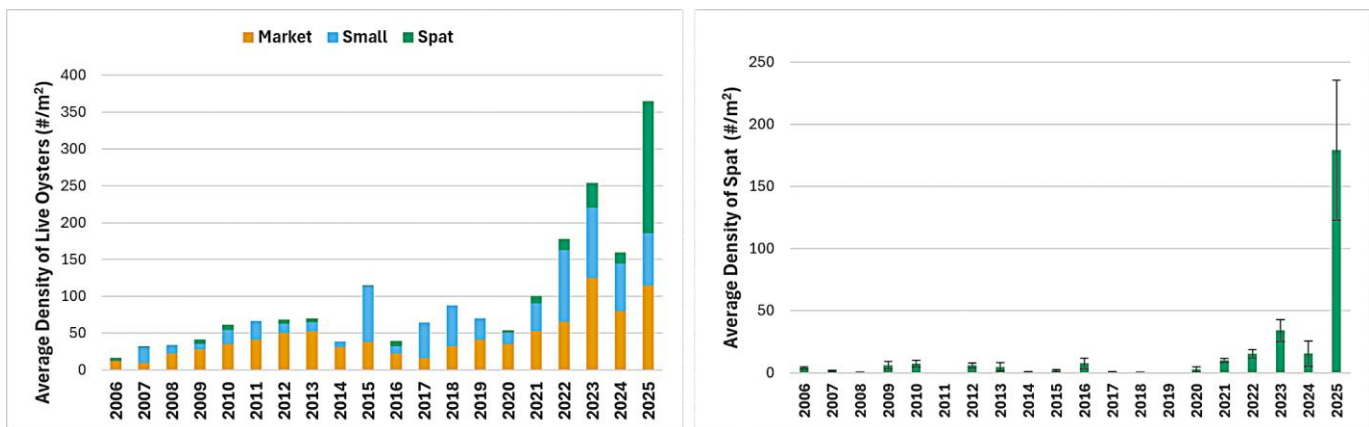


Figure B.30-2B. Average number of live oysters per square meter by size class in NOAA Code 237 (Choptank River Middle) occurring outside of the current sanctuary area excluding samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Choptank River Middle (237)

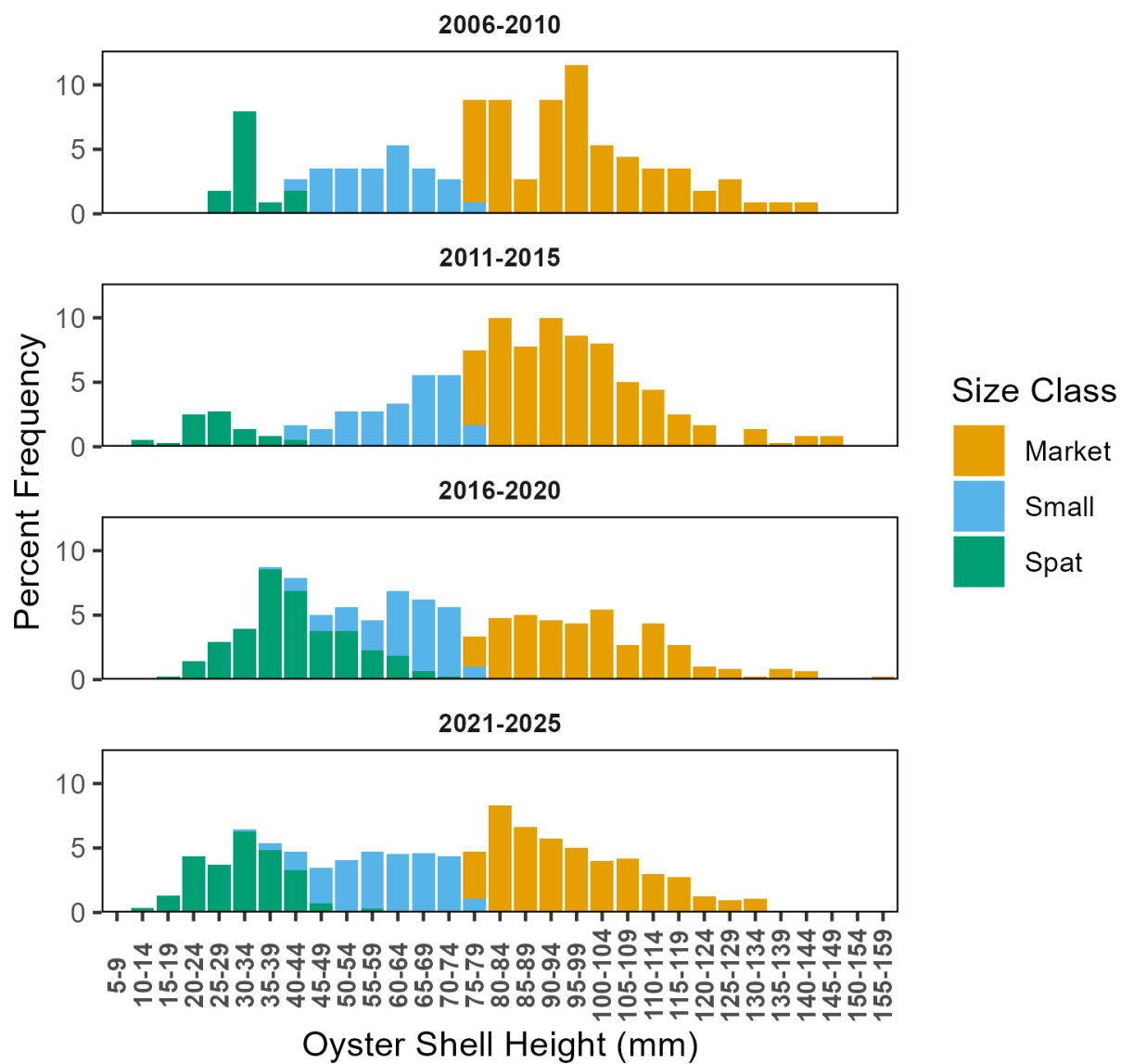


Figure B.30-3. Shell height frequencies of live oysters in NOAA Code 237 (Choptank River Middle) outside of the current sanctuary area. No data was collected from 2006 to 2010 and 2014 to 2015.

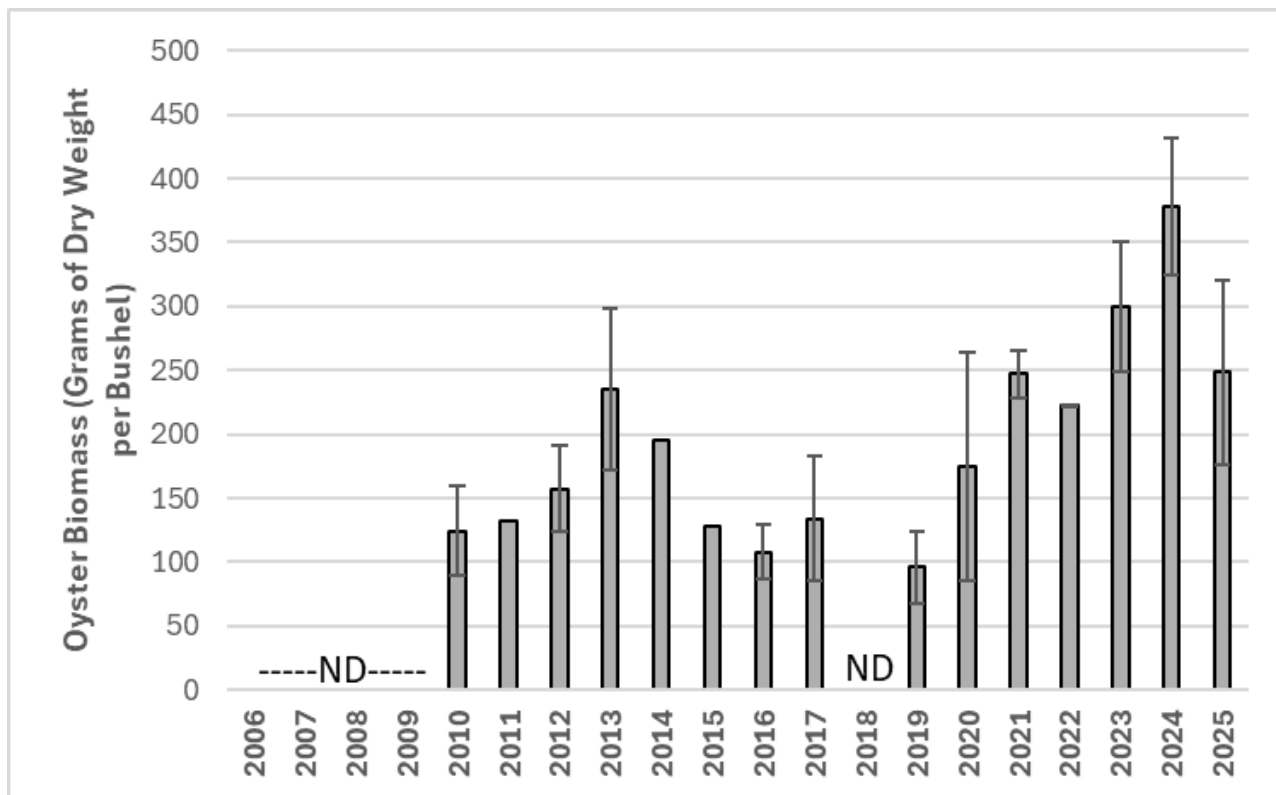


Figure B.30-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 237 (Choptank River Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. ND = No Data.

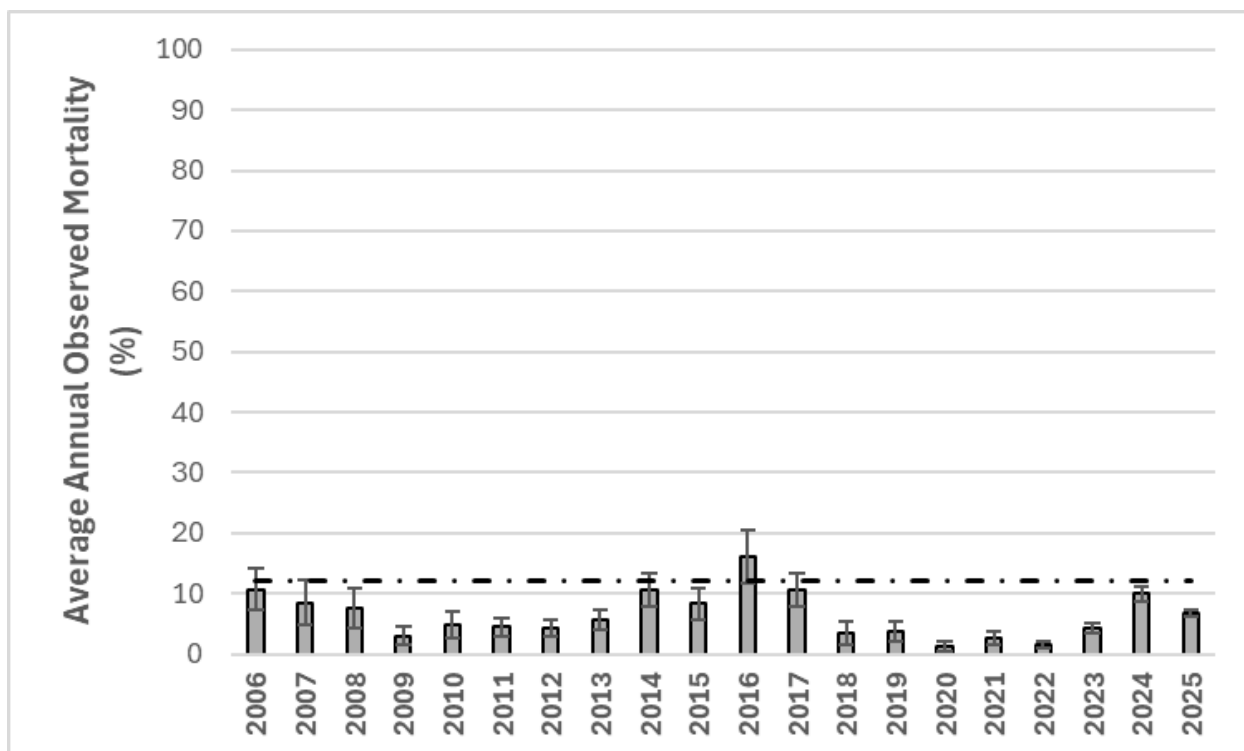


Figure B.30-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 237 (Choptank River Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

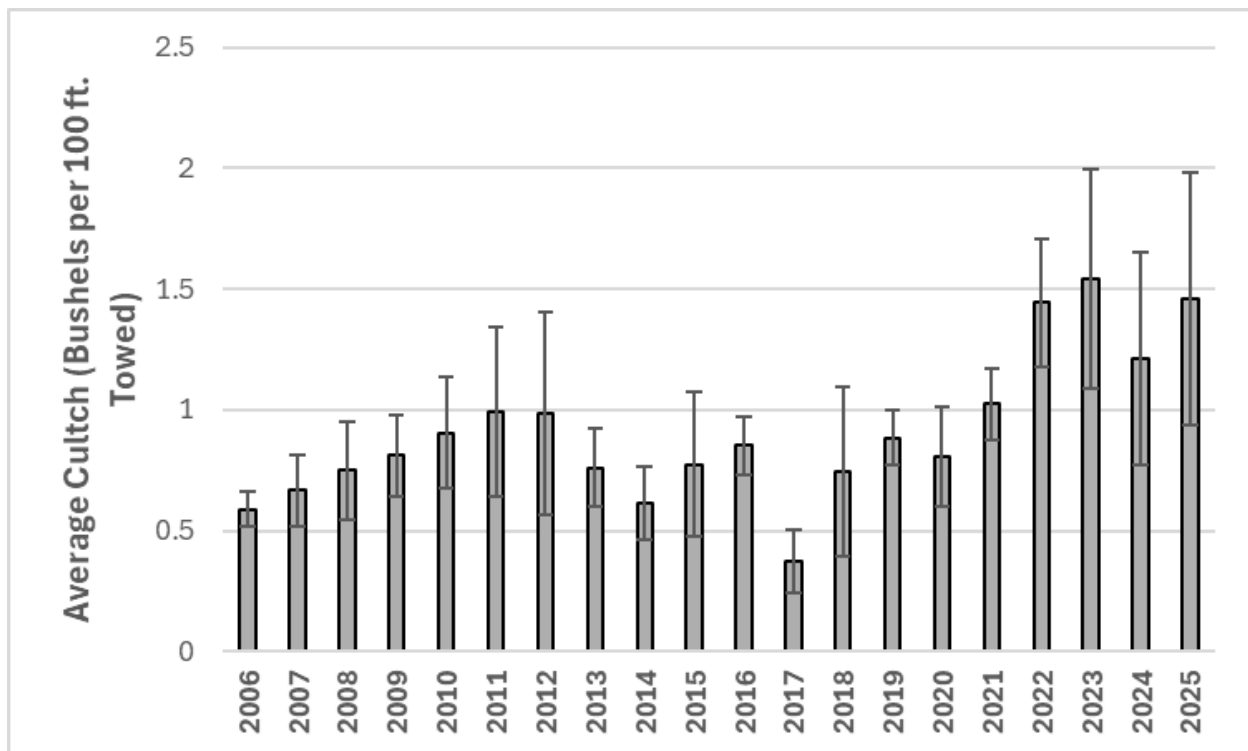


Figure B.30-6. Average cultch (live and dead oysters and loose shell) in NOAA Code 237 (Choptank River Middle) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

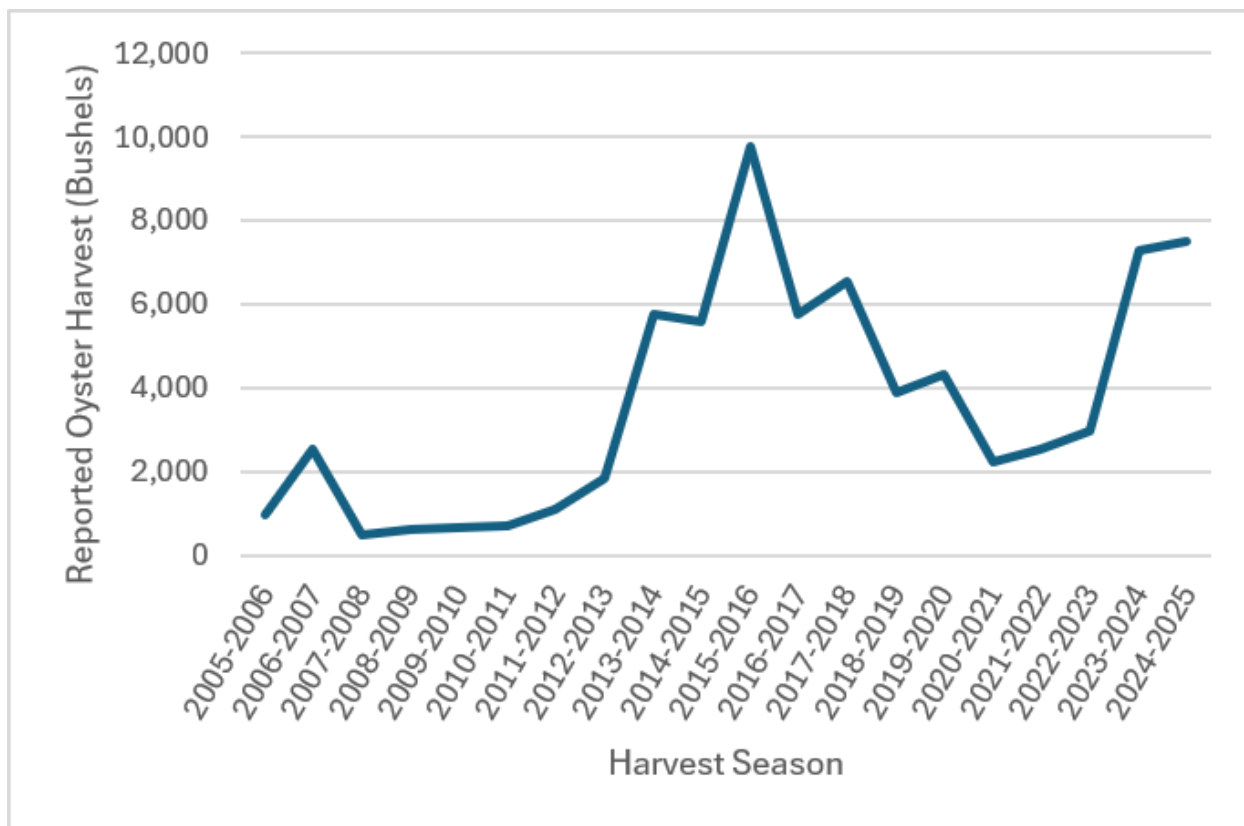


Figure B.30-7. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 237 (Choptank River Middle). Since 2010, 52% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.31: NOAA Code 268 – Patuxent River Middle

NOAA Code 268 encompasses the middle portion of the Patuxent River between Broomes Island and St. Leonard Creek and is located in Maryland's lower western portion of Chesapeake Bay. The entire NOAA Code is 4,432 acres and has seven historic oyster bars⁴⁰. The Neal Addition Sanctuary was established in 2001 and encompasses less than 1% (6.7 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 4,425 surface acres. There are 1,223 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 1,878 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.31-1)
- Summary Statistics (Table B.31-1)
- Harvest (Figure B.31-2)

In 2019 the Department added a standard Fall Oyster Survey site in the non-sanctuary portion of this NOAA Code. Because of the lack of data from other time periods, there are no trends to report.

Between 2006 and 2020, approximately 12,000 bushels of shell, 2,600 bushels of wild seed and 10 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 2,500 bushels of shell and 1,200 bushels of wild seed were added from 2021 to 2025, during which time no hatchery spat-on-shell were planted.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. Diving was the primary harvest gear type during the 2021-2025 time period. This area is characterized by low but relatively stable harvest.

⁴⁰ See chart 26 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

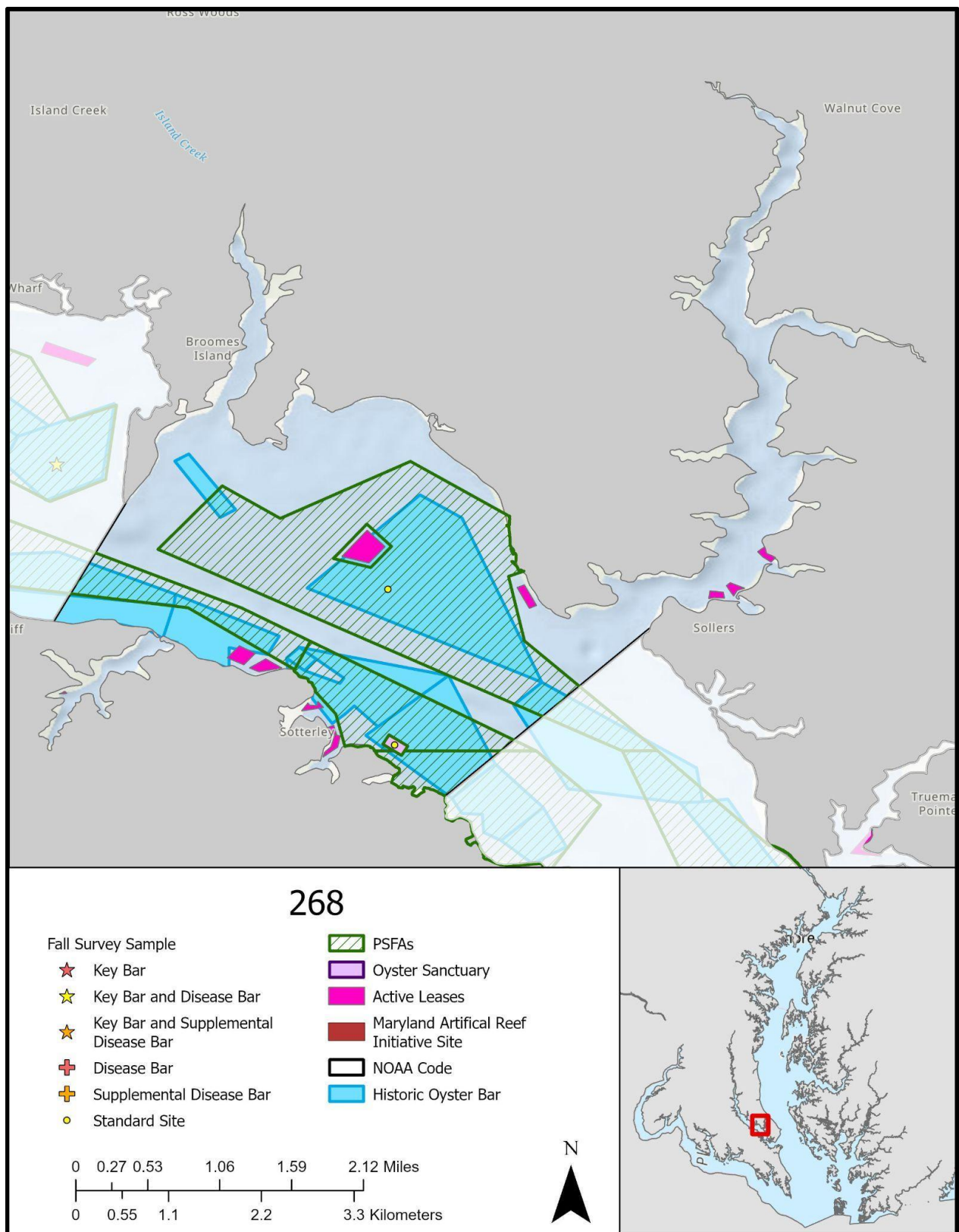


Figure B.31-1. Map of NOAA Code 268 (Patuxent River Middle). Fall Oyster Survey sites may not be sampled every year.

Table B.31-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 268 (Patuxent River Middle) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	ND	ND	ND	5/5
Number of Live Spat Oysters per square meter	ND	ND	ND	101 $\pm$ 80
Number of Live Small Oysters per square meter	ND	ND	ND	63 $\pm$ 32
Number of Live Market Oysters per square meter	ND	ND	ND	14 $\pm$ 9
Number of Live Oysters per square meter	ND	ND	ND	178 $\pm$ 84
Live Biomass (g Dry Weight per Bushel)	ND	ND	ND	ND
Observed Mortality (%)	ND	ND	ND	38 $\pm$ 19
Cultch (Bushels per 100 feet towed)	ND	ND	ND	0.9 $\pm$ 0.2
Harvest (Bushels)	2,599	1,774	1,833	1,154

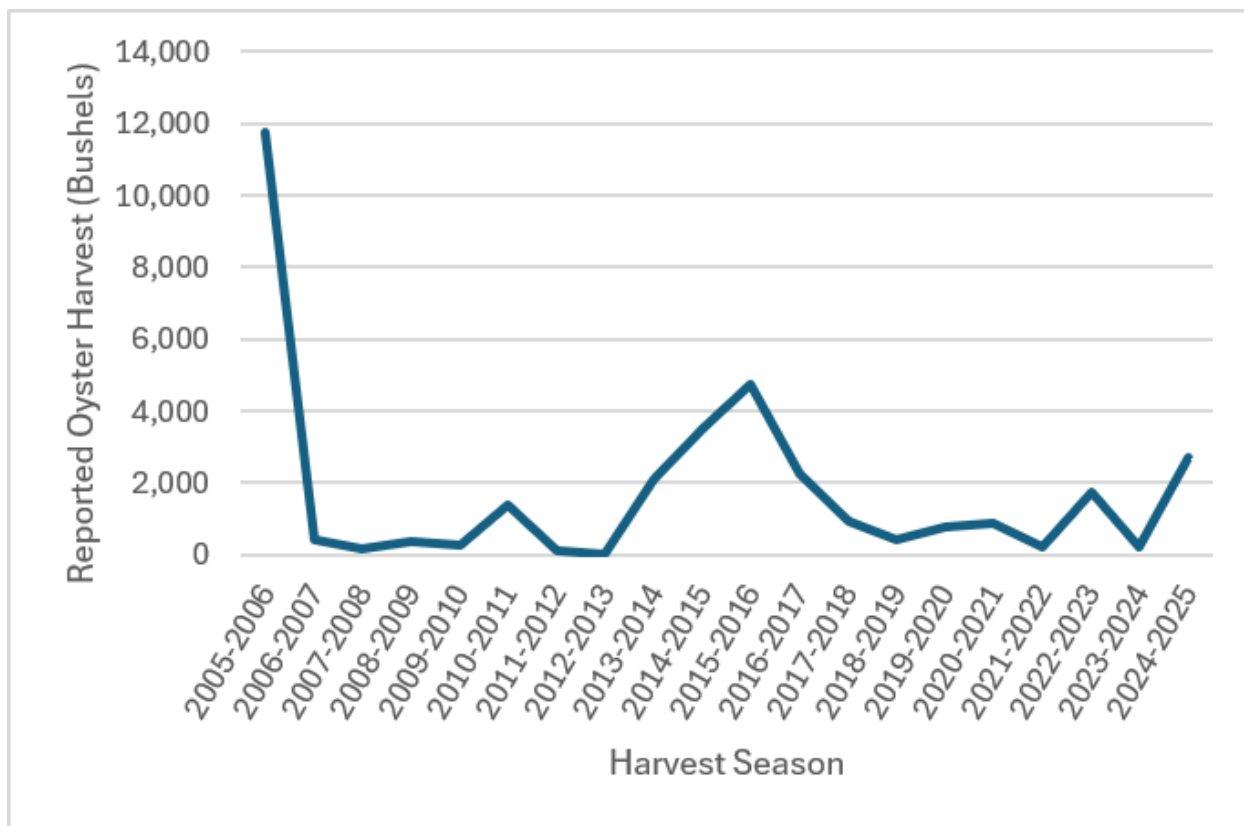


Figure B.31-2. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 268 (Patuxent River Middle). Since 2001, less than 1% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.32: NOAA Code 274 – Wicomico River West

NOAA Code 274 encompasses the Wicomico River (West), a tributary of the Potomac River and is located in Maryland's lower western portion of Chesapeake Bay. The entire NOAA Code is 11,774 acres and has 24 historic oyster bars⁴¹. The Wicomico River Sanctuary was established in 2010 and encompasses 4% (450 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 11,324 surface acres. There are 4,128 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and not in a sanctuary. In 2010, there were 5,950 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. Since 2010, 77.7 PSFA acres have been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.32-1)
- Summary statistics (Table B.32-1)
- Density per year (Figure B.32-2)
- Shell height frequencies (Figure B.32-3)
- Biomass per year (Figure B.32-4)
- Observed mortality (Figure B.32-5)
- Dermo and MSX per year (Figure B.32-6)
- Cultch per year (Figure B.32-7)
- Harvest (Figure B.32-8)

Total live density more than tripled between the 2016-2020 and 2021-2025 time periods. All size classes showed increases in density, driven by good recruitment and planting of hatchery spat-on-shell. Mean shell height declined as the density of spat increased. Biomass and cultch availability increased as a result of higher oyster densities. Observed mortality was below the long-term average for most of the time series. No MSX was detected and although dermo intensity and prevalence spiked in 2022 and 2023, there was no corresponding rise in mortality.

Between 2006 and 2025, approximately 2,400 bushels of shell, 27,000 bushels of wild seed and 451 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 207 million hatchery spat-on-shell and 4,000 bushels of wild seed were added from 2021 to 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. Since the establishment of the sanctuary in 2010, 4% of the area was closed to harvest. Hand Tong was the primary harvest gear type from 2021-2025. This area is characterized by apparently increasing biomass and oyster density due primarily to good recent recruitment and multiple years of enhancement activity. Harvest is generally low but stable with increases primarily driven by selective openings of multiple years of enhancement plantings coupled with low mortality.

⁴¹ See chart 33 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

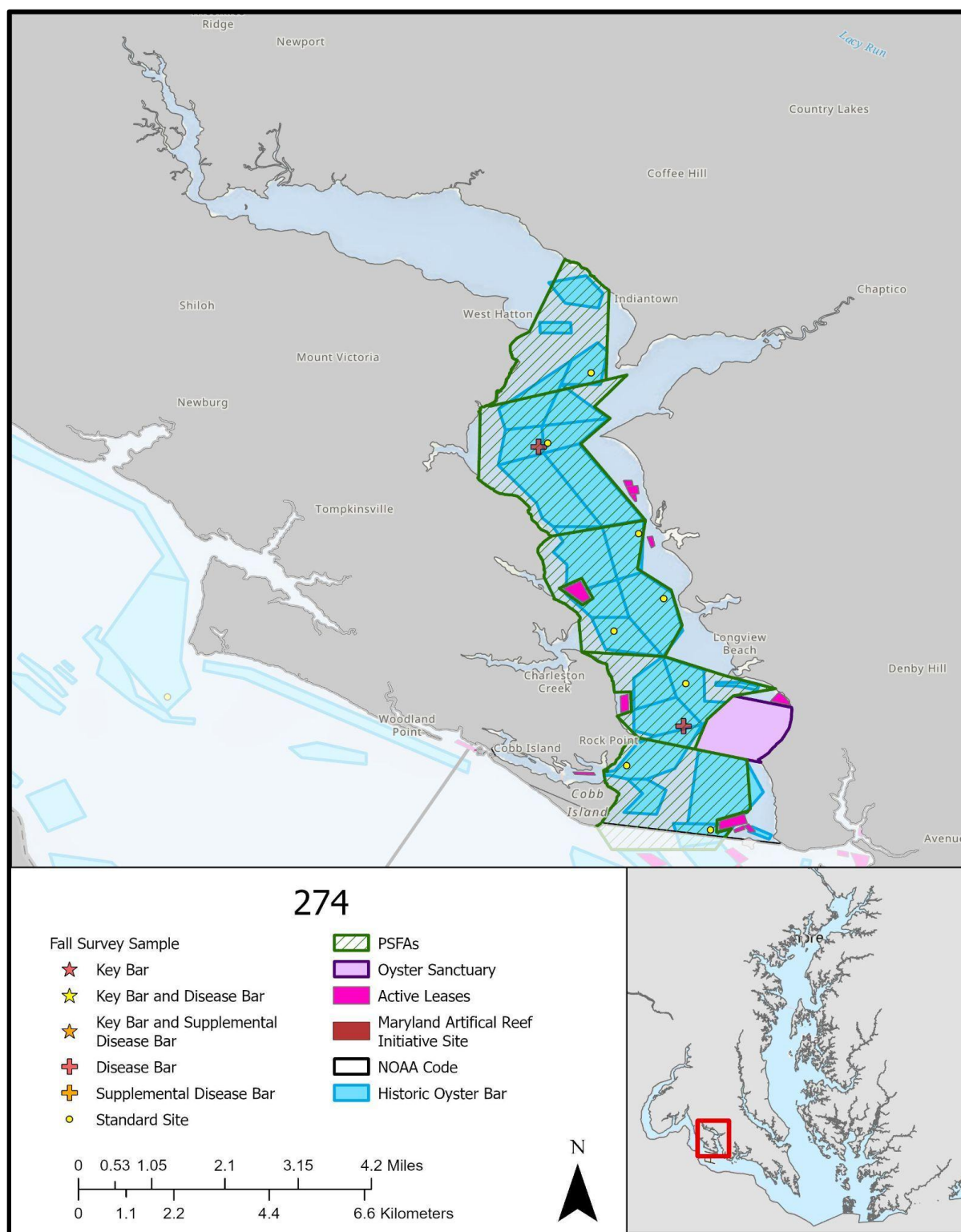


Figure B.32-1. Map of NOAA Code 274 (Wicomico River (West)). Fall Oyster Survey sites may not be sampled every year.

Table B.32-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 274 (Wicomico River West) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/52	5/49	5/52	5/53
Number of Live Spat Oysters per square meter	0.2 $\pm$.1	41.5 * $\pm$ 41.5	23* $\pm$ 13	89* $\pm$ 36
Number of Live Small Oysters per square meter	8.6 $\pm$ 2.7	26 $\pm$ 17	40 $\pm$ 13	144 $\pm$ 26.4
Number of Live Market Oysters per square meter	16 $\pm$ 3	13.5 $\pm$ 3	26 $\pm$ 5.8	70 $\pm$ 12.3
Number of Live Oysters per square meter	25 $\pm$ 4.2	81 $\pm$ 36	89 $\pm$ 17.3	303 $\pm$ 42
Live Biomass (g Dry Weight per Bushel)	37.6 $\pm$ 7.4	50 $\pm$ 10	118 $\pm$ 17.4	196 $\pm$ 31.5
Observed Mortality (%)	15 $\pm$ 1.8	5.9 $\pm$ 1.1	9.8 $\pm$ 1.8	3.7 $\pm$ 0.6
Cultch (Bushels per 100 feet towed)	0.8 $\pm$ 0.1	0.8 $\pm$ 0.1	0.8 $\pm$ 0.1	1.8 $\pm$ 0.2
Harvest (Bushels)	707	2,461	2,165	2,914

*Includes a spat-on-shell planting

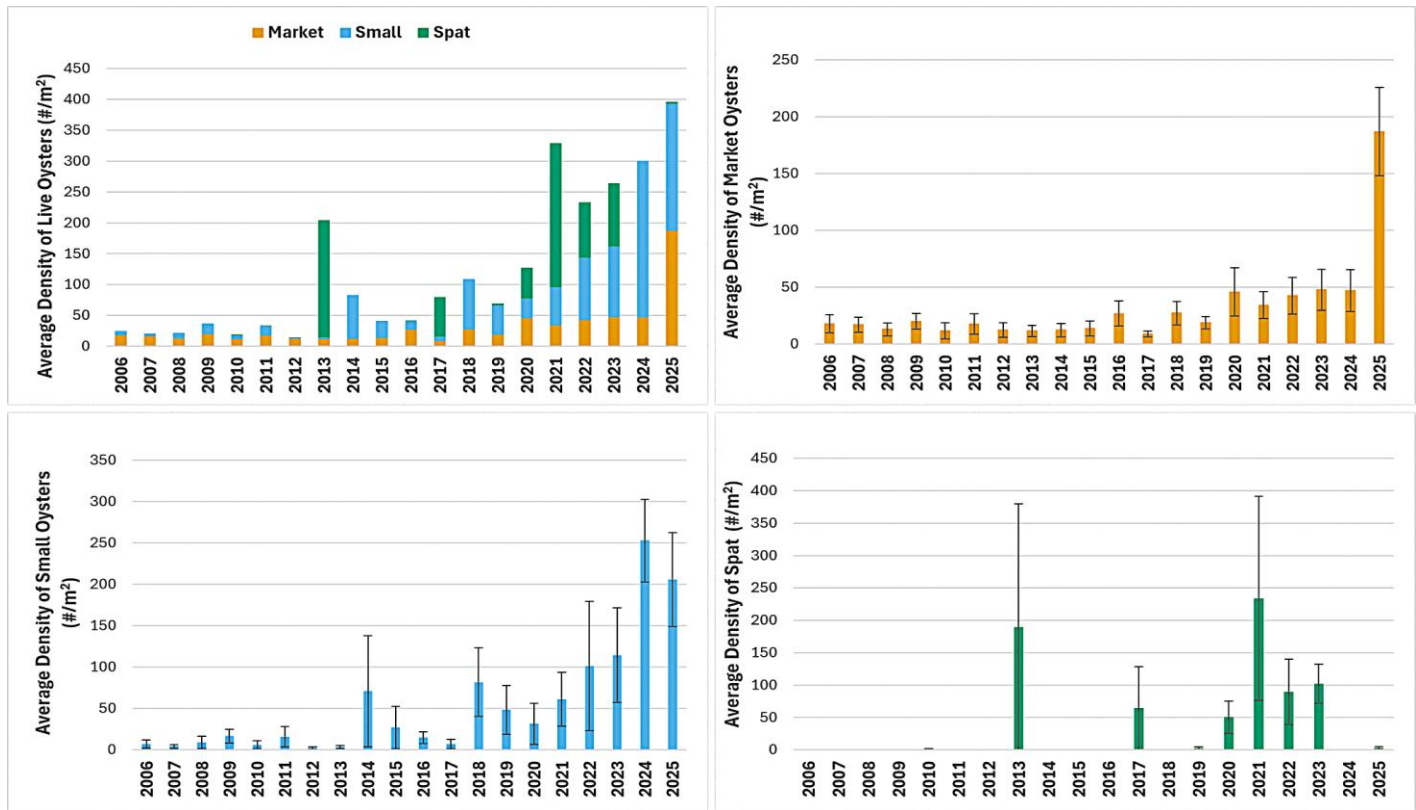


Figure B.32-2A. Average number of live oysters per square meter by size class in NOAA Code 274 (Wicomico River (West)) occurring outside of the current sanctuary area including samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

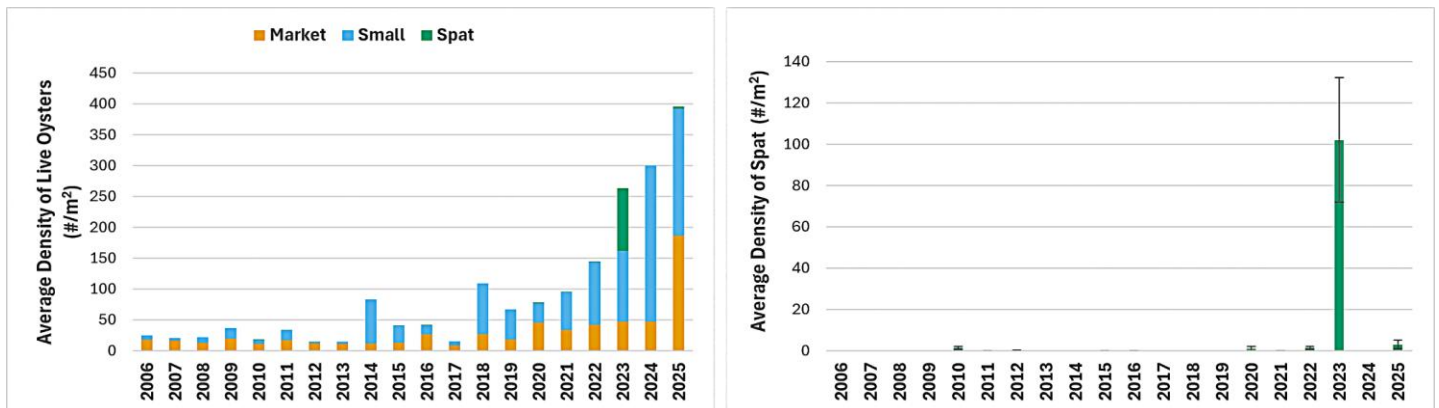


Figure B.32-2B. Average number of live oysters per square meter by size class in NOAA Code 274 (Wicomico River (West)) occurring outside of the current sanctuary area excluding samples taken on hatchery spat-on-shell plantings. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Wicomico River (West) (274)

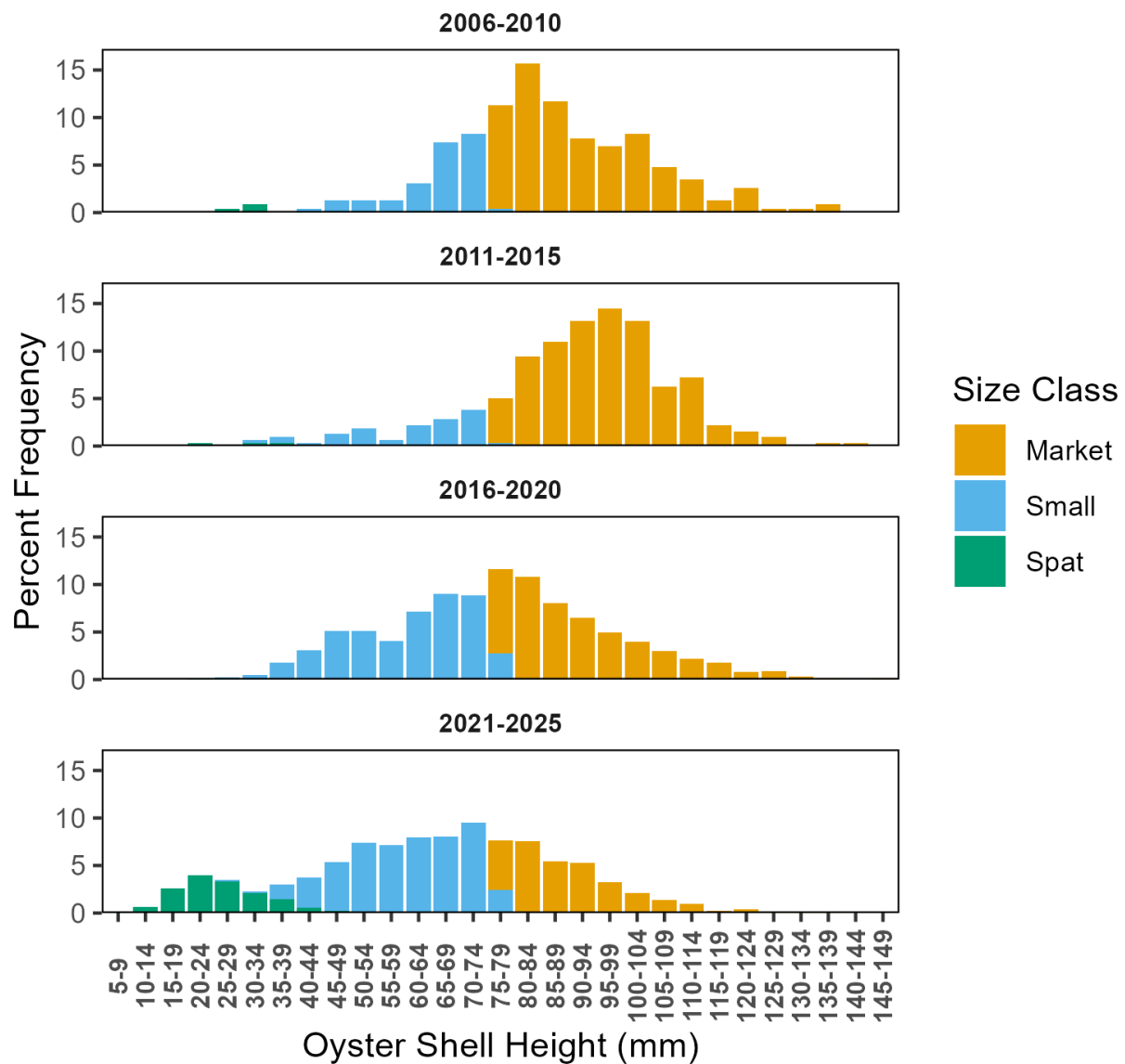


Figure B.32-3. Shell height frequencies of live oysters in NOAA Code 274 (Wicomico River (West)) outside of the current sanctuary area.

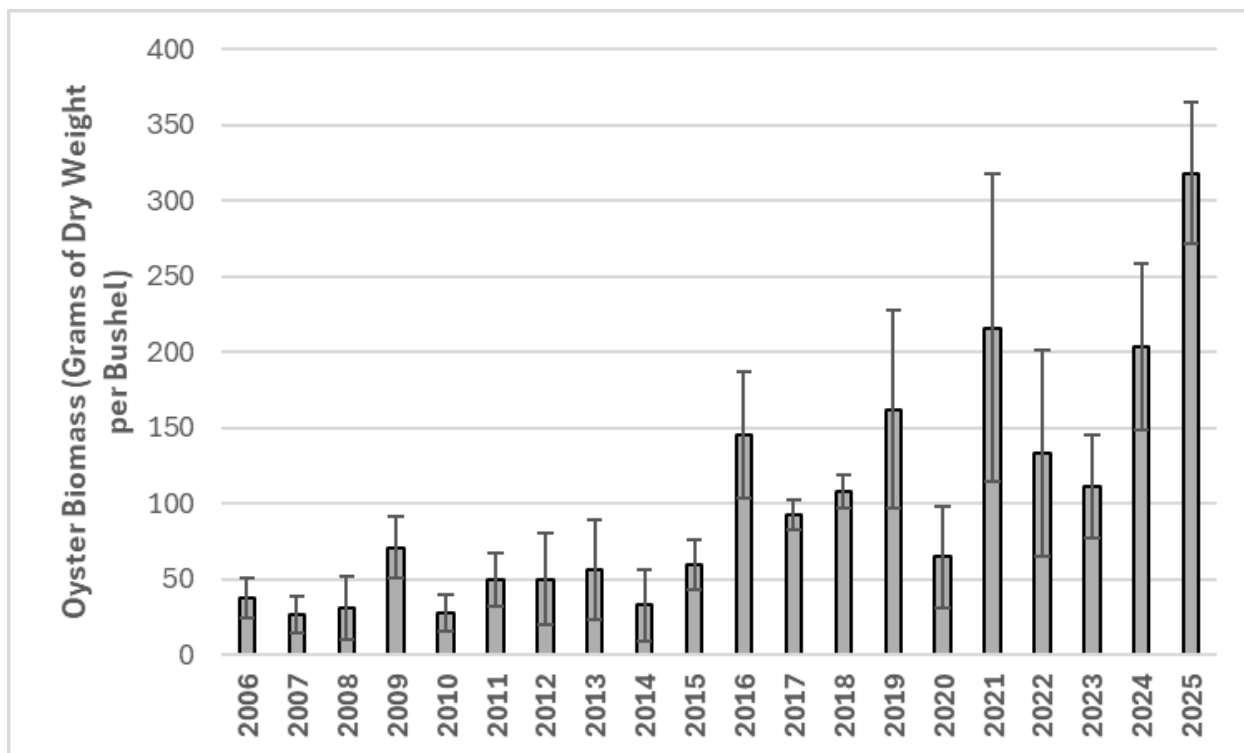


Figure B.32-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 274 (Wicomico River (West)) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

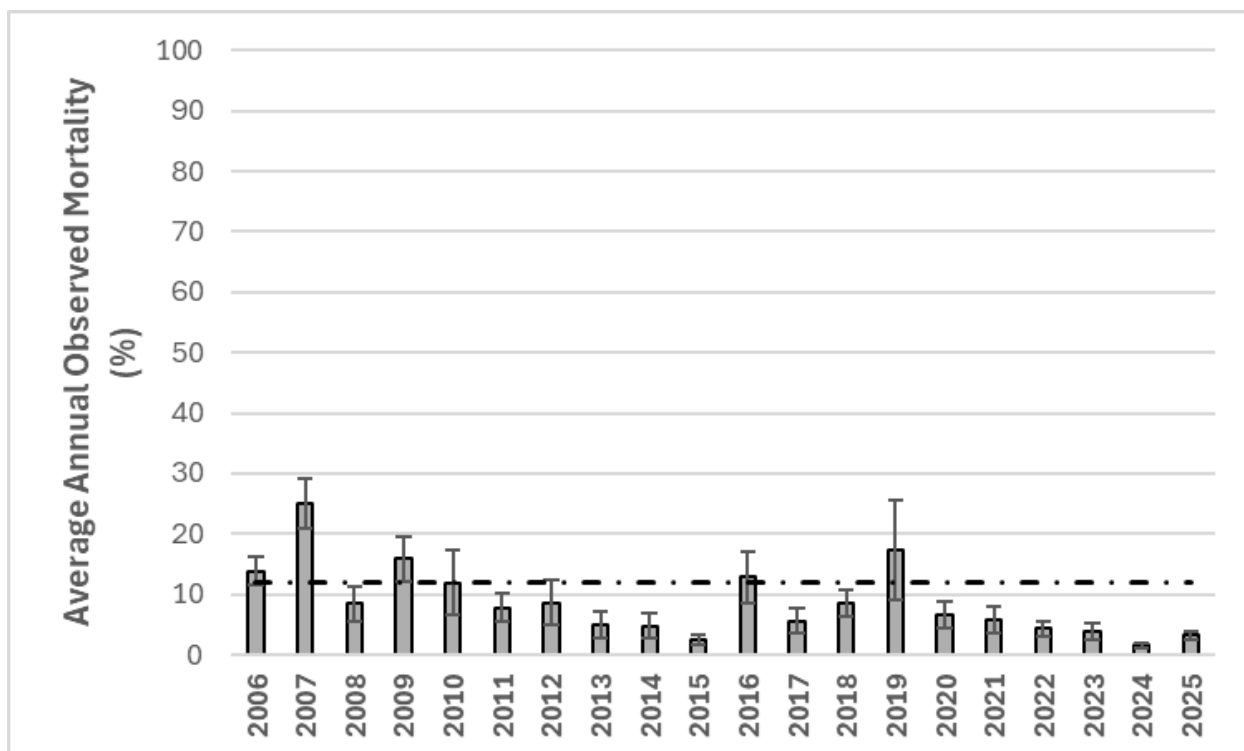


Figure B.32-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 274 (Wicomico River (West)) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2020 baywide average observed mortality. Error bars represent ± 1 standard error.

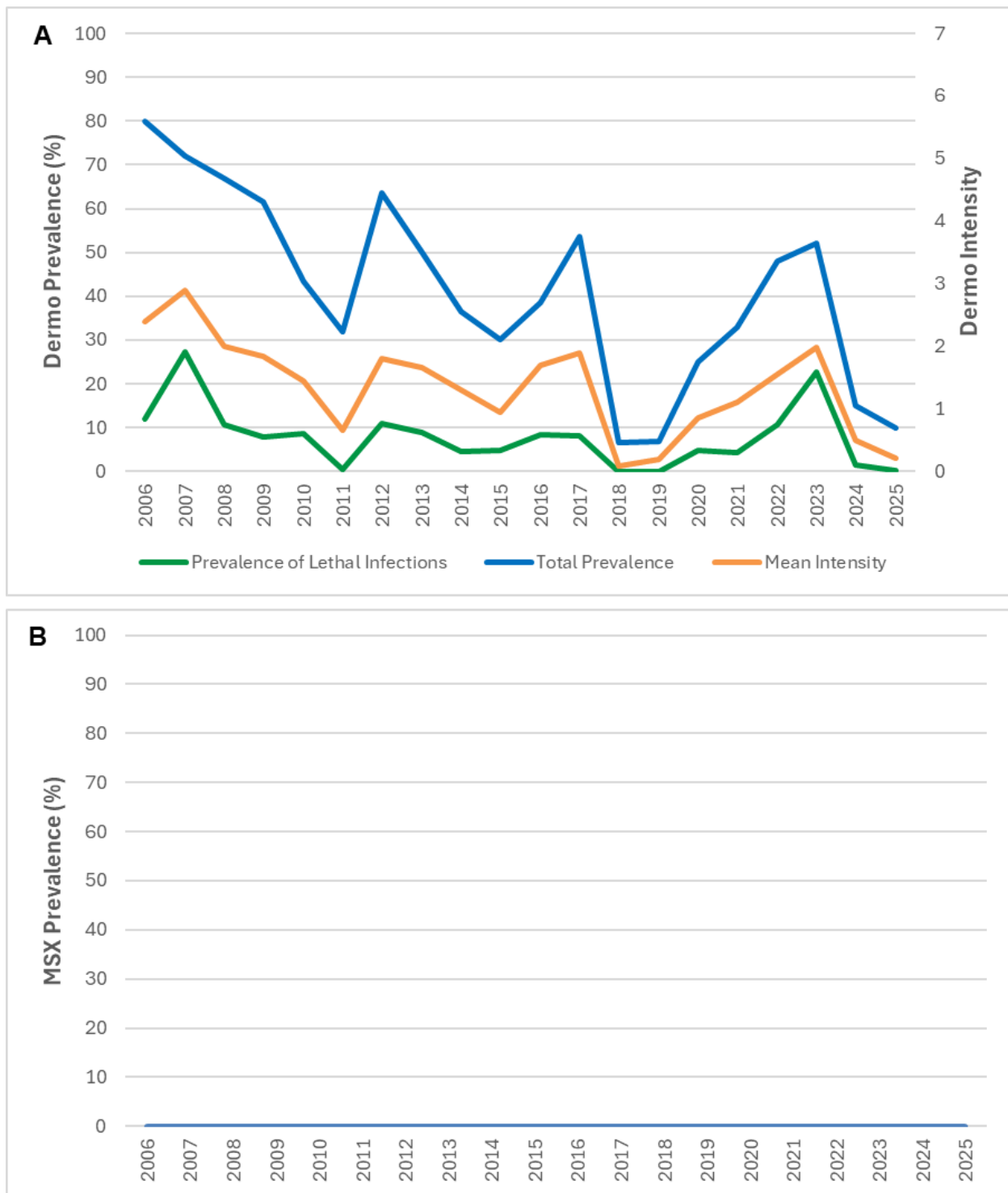


Figure B.32-6. Oyster disease prevalence and intensity in NOAA Code 274 (Wicomico River (West)) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey based on an average from Lancaster and Mills West bars.

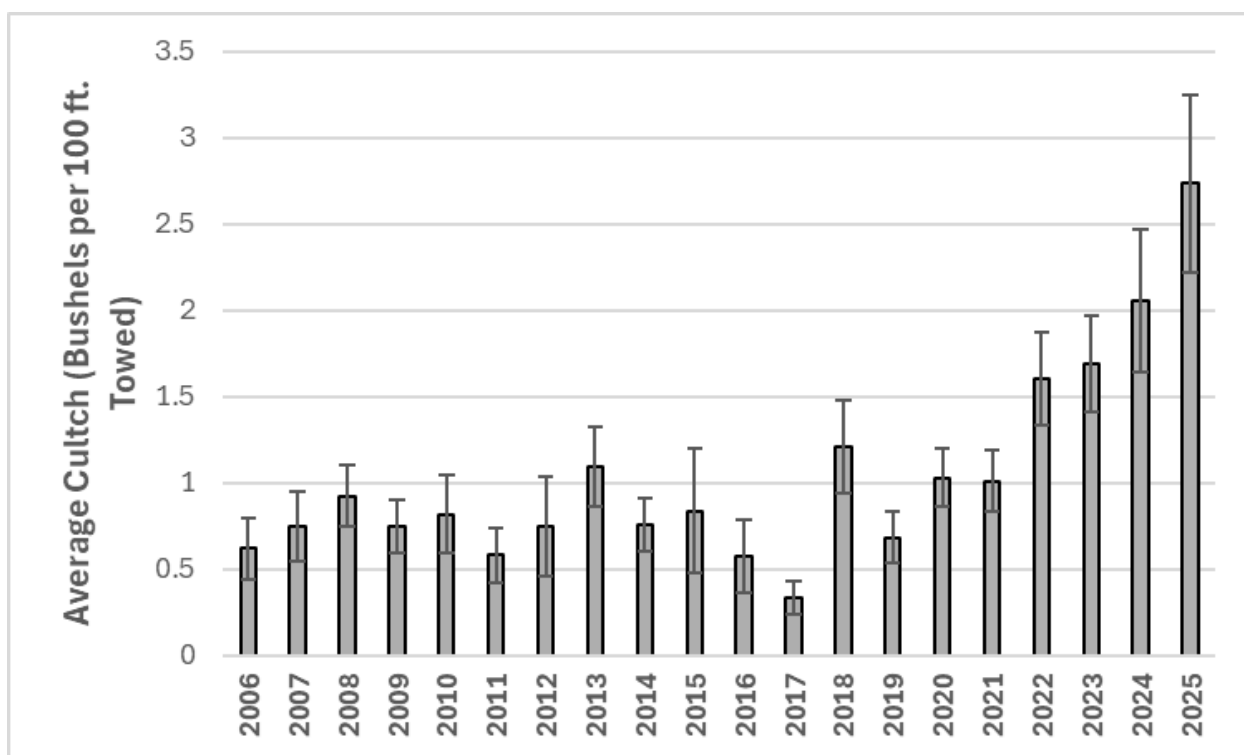


Figure B.32-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 274 (Wicomico River (West)) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

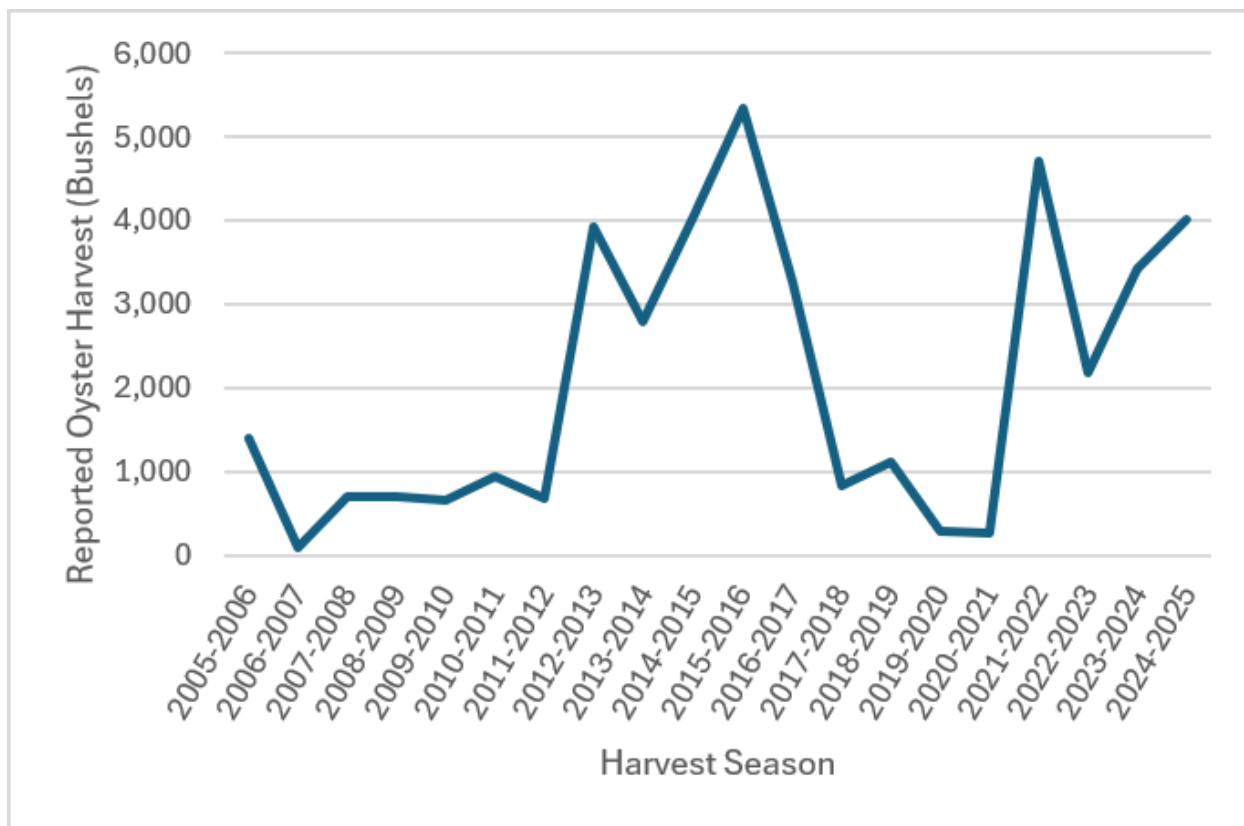


Figure B.32-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 274 (Wicomico River (West)). Since 2010, 4% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.33: NOAA Code 292 – Tangier Sound North

NOAA Code 292 encompasses the northern portion of Tangier Sound and is located in Maryland's lower eastern portion of Chesapeake Bay. The entire NOAA Code is 35,607 acres and has 53 historic oyster bars⁴². Two sanctuaries (Lower Mainstem and Hooper Straits) are partially located within the NOAA Code and contain 8% (2,924 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary areas. This equates to 32,683 surface acres. There are 17,401 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside a sanctuary. There are 9,663 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.33-1)
- Summary statistics (Table B.33-1)
- Density per year (Figure B.33-2)
- Shell height frequencies (Figure B.33-3)
- Biomass per year (Figure B.33-4)
- Observed mortality (Figure B.33-5)
- Dermo and MSX per year (Figure B.33-6)
- Cultch per year (Figure B.33-7)
- Harvest (Figure B.33-8)

Total density of live oysters has remained steady over the last three time periods. Density of spat and market-sized oysters has increased, while density of small oysters declined between the 2016-2020 to 2021-2025 time periods. Biomass rose from 2011-2015 to 2016-2020 but remained stable during 2021-2025. Observed mortality varied, with a peak in 2023 and a decline in recent years. MSX and dermo both peaked in 2023, likely contributing to higher mortality rates. Cultch availability remained relatively stable throughout the time series.

Between 2006 and 2025, approximately 326,000 bushels of shell, 26,000 bushels of wild seed and 110 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 10 million hatchery spat-on-shell and 83,000 bushels of shell were added from 2021 to 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. Since the establishment of the sanctuaries, 8% of the area was closed to harvest. Patent tong and power dredge were the primary harvest gear types during 2021-2025. This area is characterized by relatively stable biomass and oyster density, on average, and an apparent increase in market density after the first time period of this report (2006-2010). This is one of the consistently highest harvest areas

⁴² See chart 30, 31, and 37 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

and harvest has increased over time, peaking in the 2021-2022 season. This is one of the areas where fishing mortality is above the limit reference point according to the latest Oyster Benchmark Stock Assessment indicating overfishing is occurring.

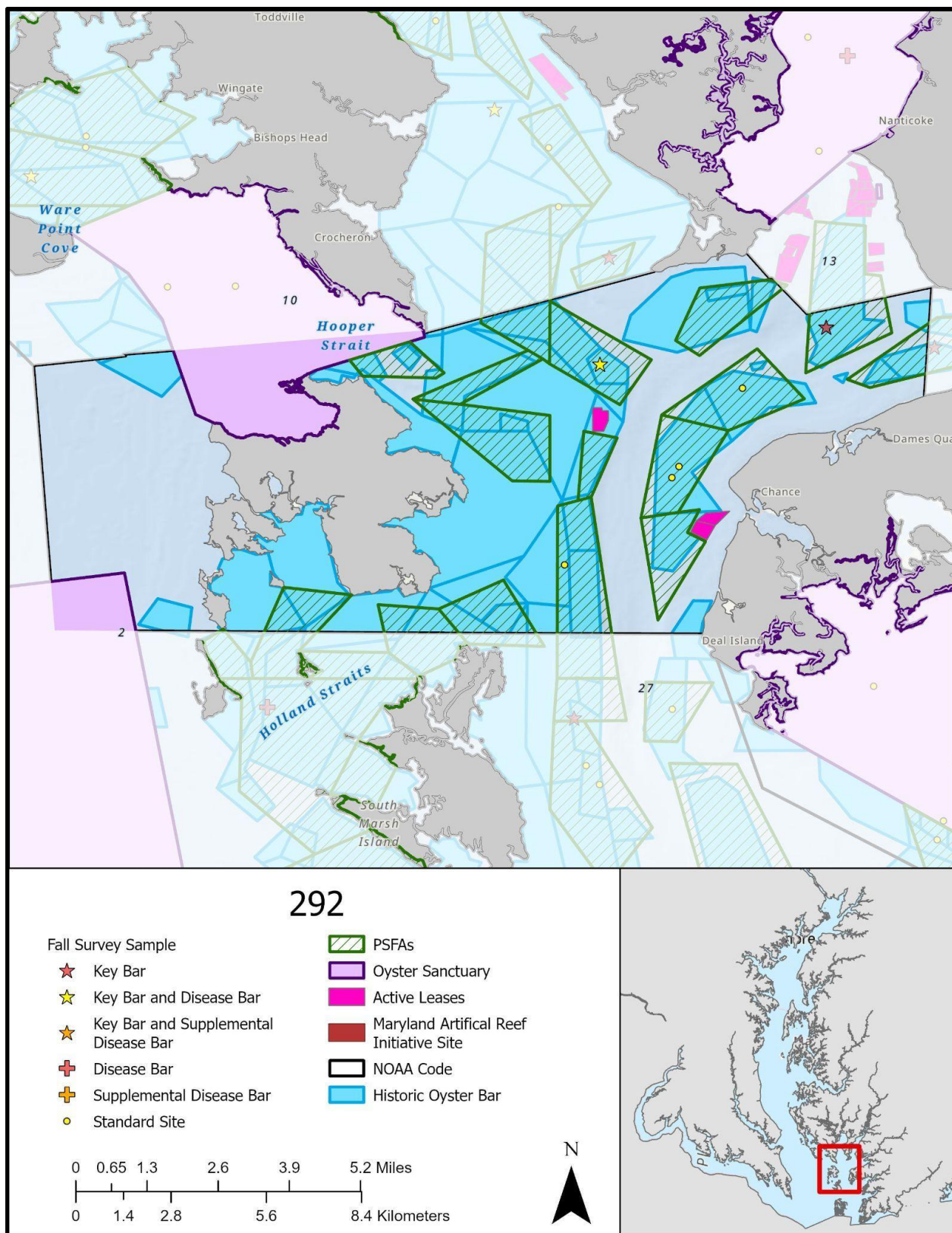


Figure B.33-1. Map of NOAA Code 292 (Tangier Sound North). Fall Oyster Survey sites may not be sampled every year.

Table B.33-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 292 (Tangier Sound North) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/41	5/36	5/30	5/37
Number of Live Spat Oysters per square meter	33.4 $\pm$ 9.2	35 $\pm$ 8.2	30.6 $\pm$ 4.8	48.4 $\pm$ 8
Number of Live Small Oysters per square meter	17.4 $\pm$ 4.8	52.3 $\pm$ 10.3	75.5 $\pm$ 12	52 $\pm$ 8
Number of Live Market Oysters per square meter	10.4 $\pm$ 2.7	31.4 $\pm$ 5.7	33.1 $\pm$ 7.1	44 $\pm$ 6.7
Number of Live Oysters per square meter	61.3 $\pm$ 13	123 $\pm$ 18.5	139 $\pm$ 15	144 $\pm$ 19
Live Biomass (g Dry Weight per Bushel)	59 $\pm$ 11.8	96.2 $\pm$ 24.8	158 $\pm$ 26.7	156 $\pm$ 28.2
Observed Mortality (%)	17.5 $\pm$ 2.3	14.6 $\pm$ 1.2	8.8 $\pm$ 1.5	14.5 $\pm$ 1.6
Cultch (Bushels per 100 feet towed)	1 $\pm$ 0.1	1.1 $\pm$ 0.1	1 $\pm$ 0.1	0.9 $\pm$ 0.1
Harvest (Bushels)	8,098	45,072	48,025	117,265

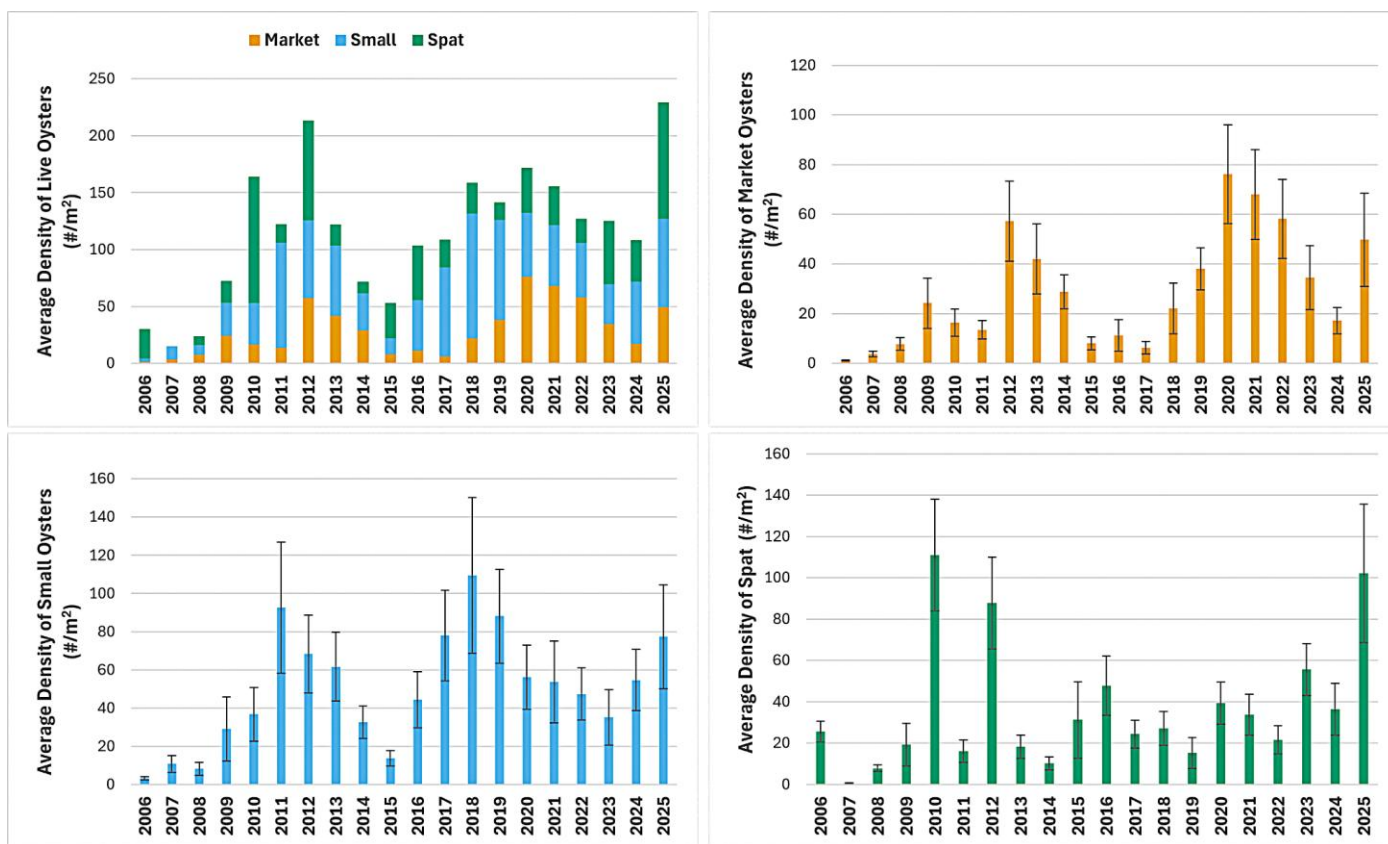


Figure B.33-2. Average number of live oysters per square meter by size class in NOAA Code 292 (Tangier Sound North) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Tangier Sound North (292)

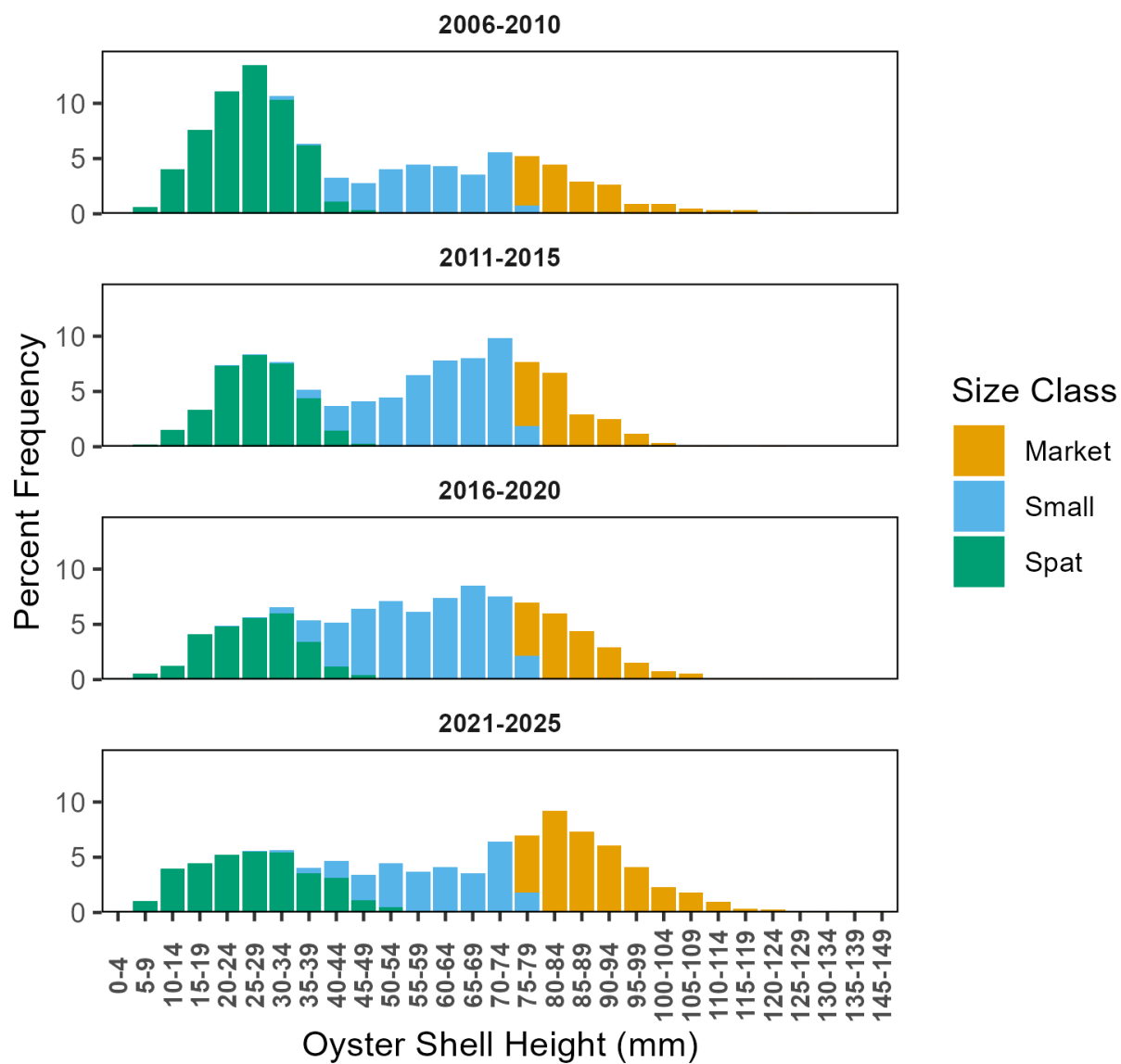


Figure B.33-3. Shell height frequencies of live oysters in NOAA Code292 (Tangier Sound North) outside of the current sanctuary area.

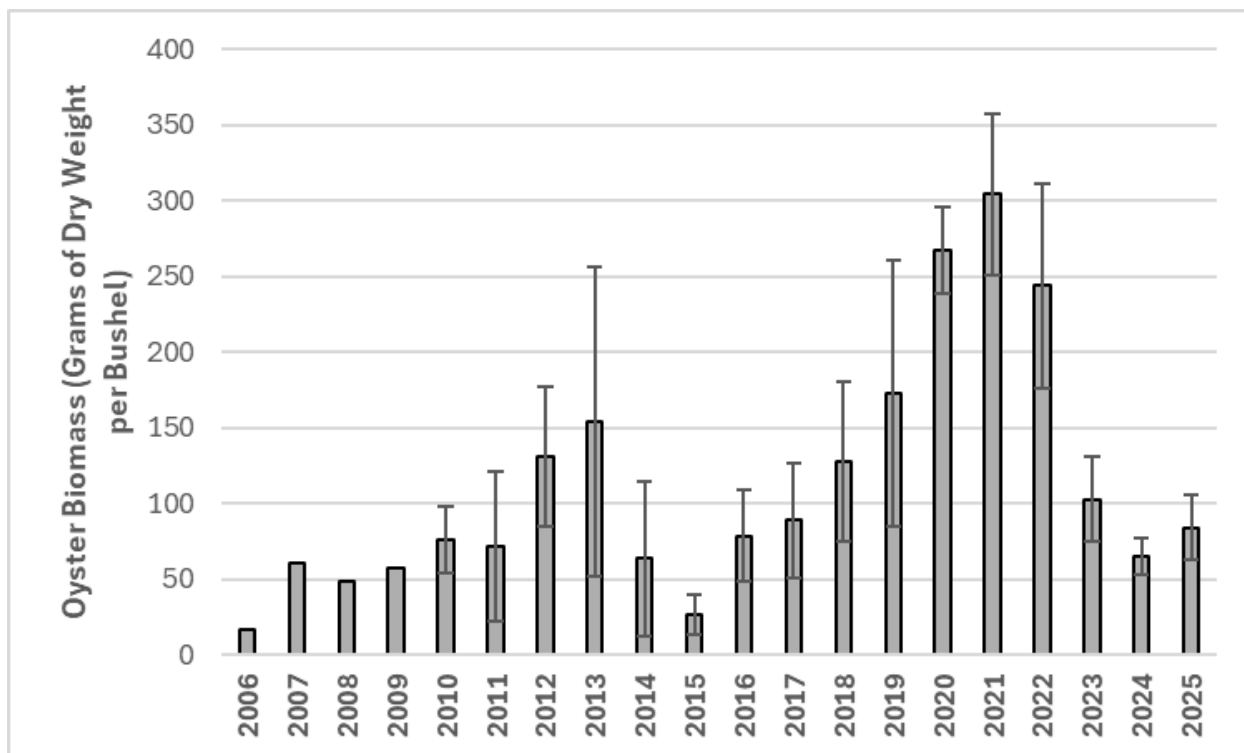


Figure B.33-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 292 (Tangier Sound North) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

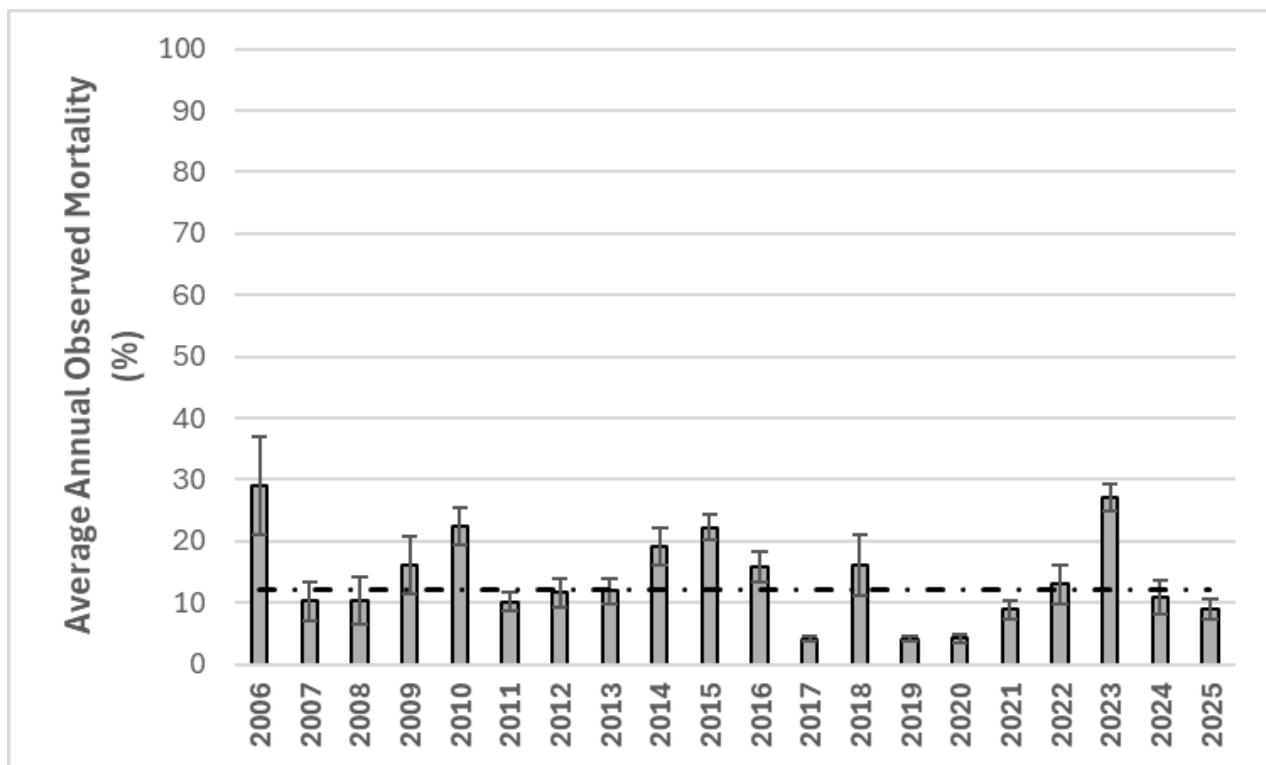


Figure B.33-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 292 (Tangier Sound North) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

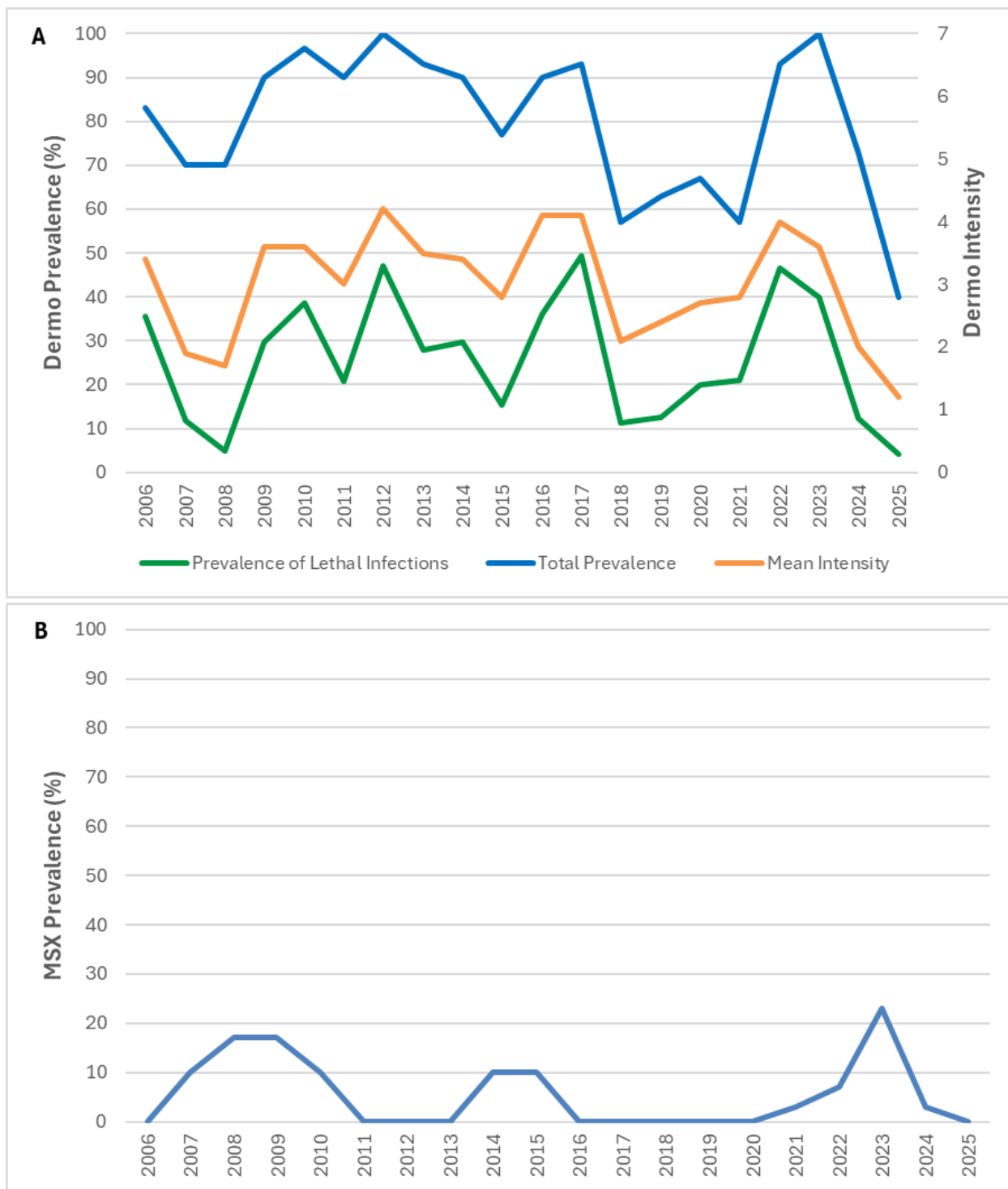


Figure B.33-6. Oyster disease prevalence and intensity in NOAA Code 292 (Tangier Sound North) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Sharkfin Shoal bar.

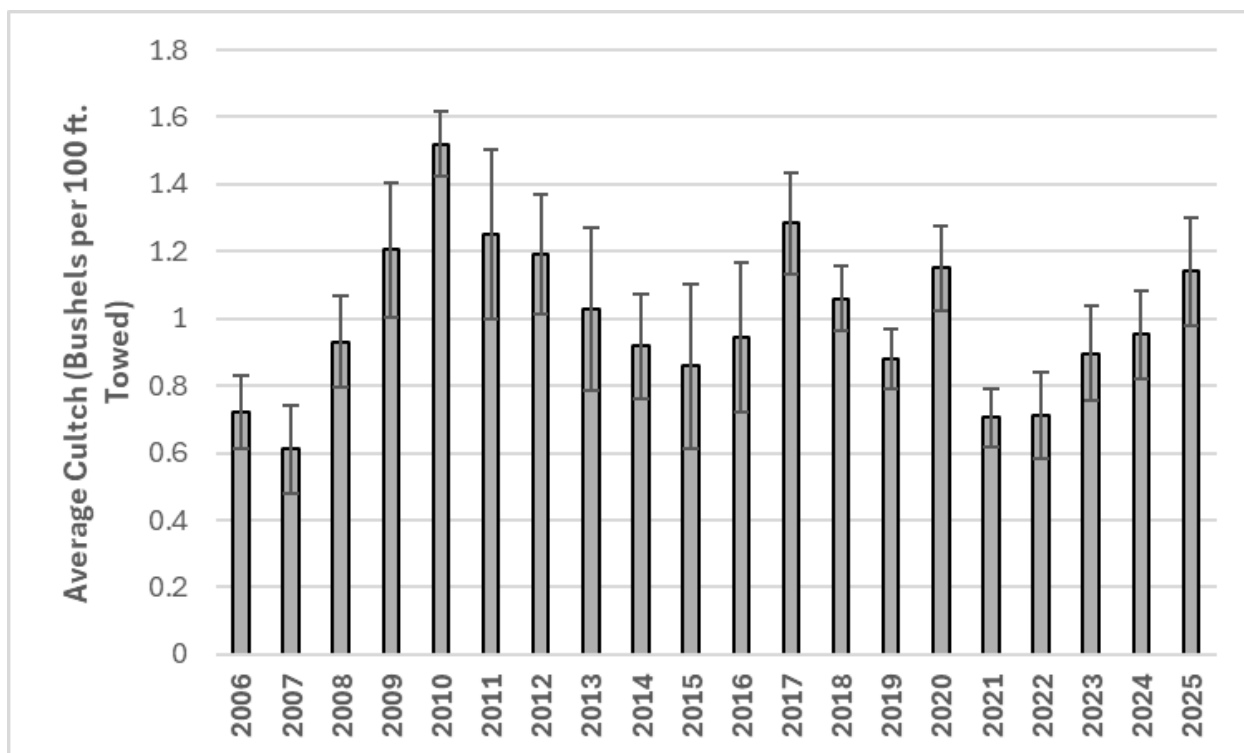


Figure B.33-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 292 (Tangier Sound North) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

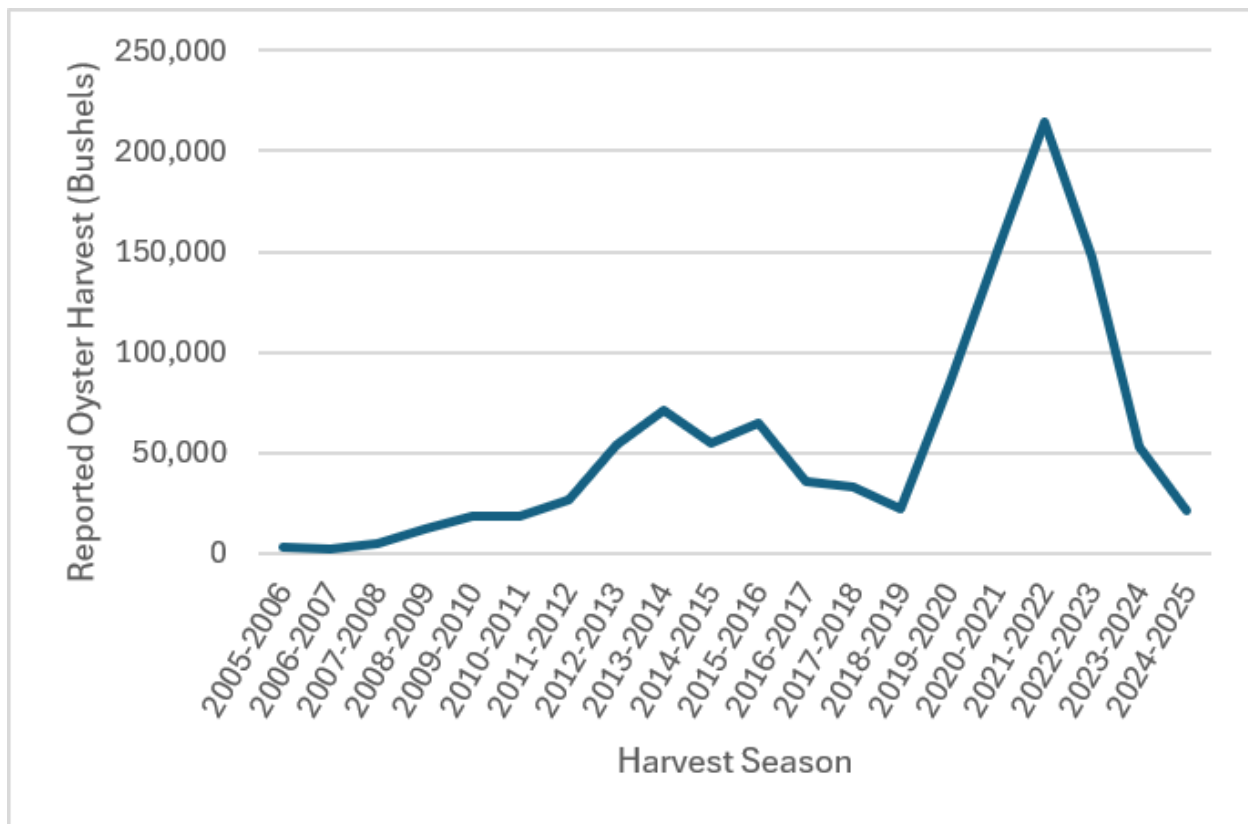


Figure B.33-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 292 (Tangier Sound North). Since 2010, 8% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.34: NOAA Code 331 - Chester River Upper

NOAA Code 331 (Chester River Upper) is 7,204 acres (Figure B.34-1); all of the area is within a current sanctuary boundary. The two sanctuaries are Chester River ORA Zone A (established in 1996) and Upper Chester River (established in 2010). See Appendix A Sections A.05 and A.46 for more information on the oyster population characteristics.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.34-1)

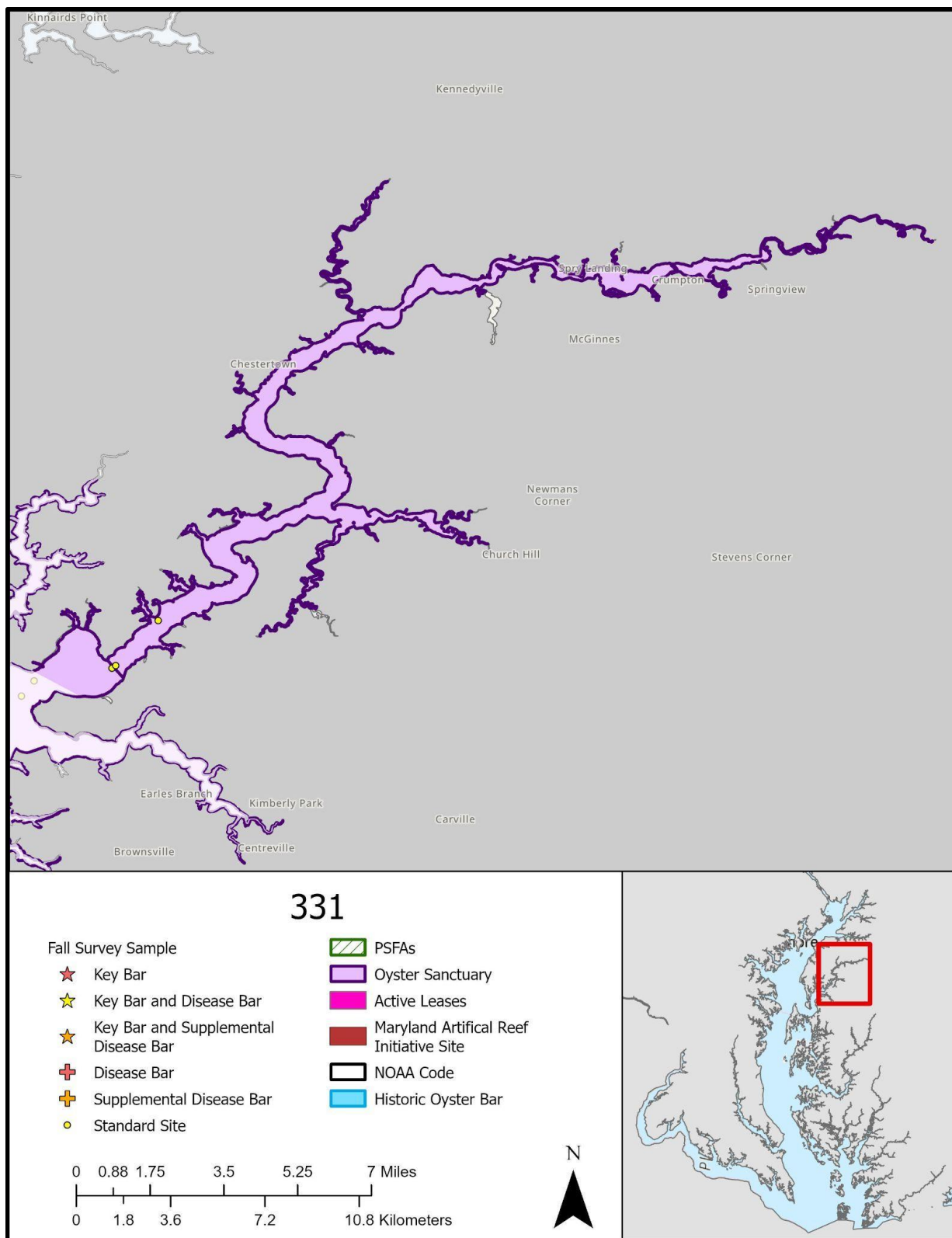


Figure B.34-1. Map of NOAA Code 331 (Chester River Upper). Fall Oyster Survey sites may not be sampled every year.

Section B.35: NOAA Code 337 - Choptank River Upper

NOAA Code 337 (Choptank River Upper) is 13,306 acres (Figure B.35-1); all of the area is within a current sanctuary boundary. The two sanctuaries are Choptank River ORA Zone A (established in 1996) and Upper Choptank River (established in 2010). See Appendix A Section A.06 and A.47 for more information on the oyster population characteristics.

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.35-1)

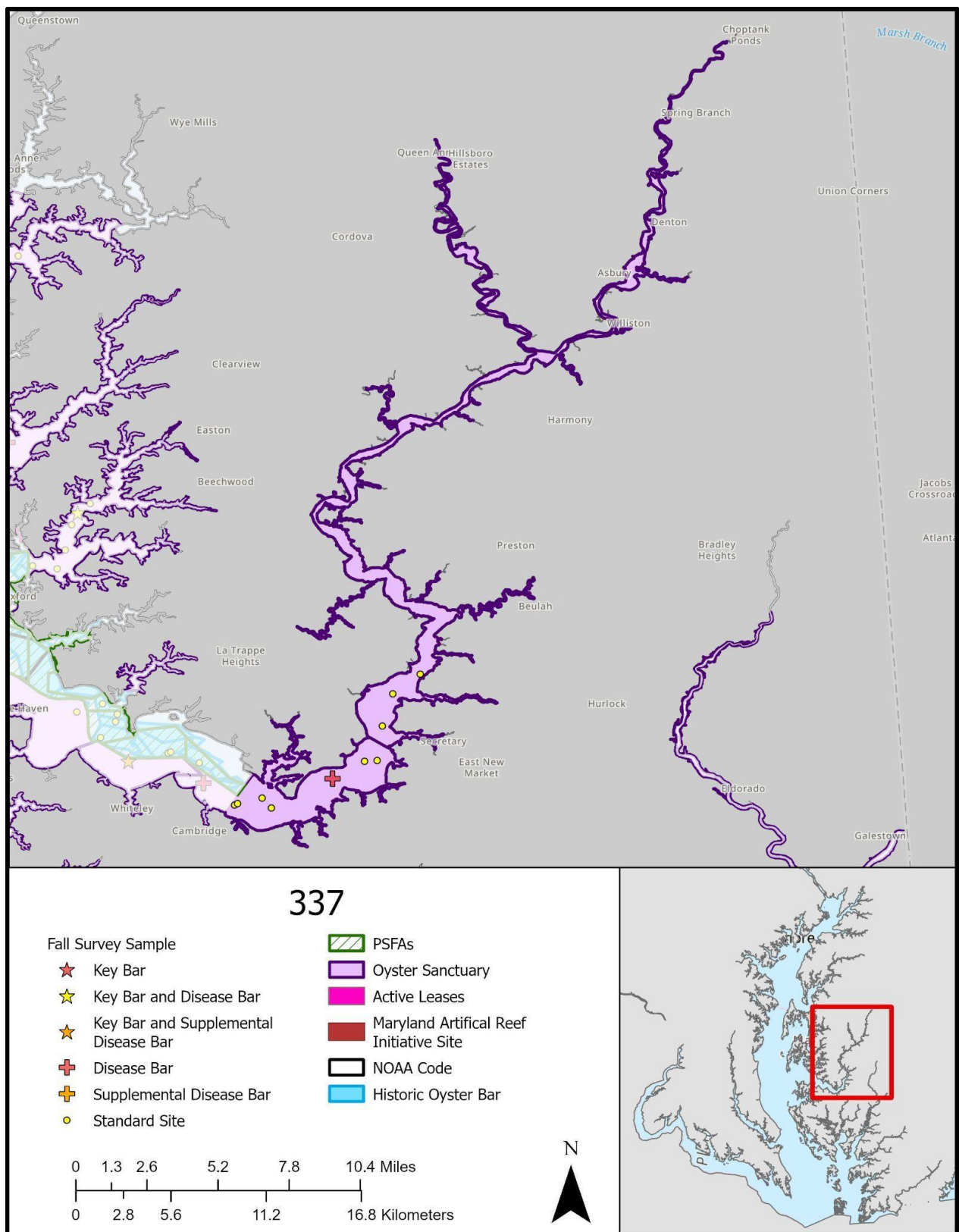


Figure B.35-1. Map of NOAA Code 337 (Choptank River Upper). Fall Oyster Survey sites may not be sampled every year.

Section B.36: NOAA Code 368 – Patuxent River Upper

NOAA Code 368 consists of the Patuxent River north of Broomes Island and is located in Maryland's mid-western portion of Chesapeake Bay. The entire NOAA Code is 18,153 acres and has 41 historic oyster bars⁴³. The Upper Patuxent River Sanctuary encompasses 79% (14,461 total acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 3,692 surface acres. There are 1,769 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and not within a sanctuary. There are 2,130 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's low salinity region (Zone 1).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.36-1)
- Summary statistics (Table B.36-1)
- Density per year (Figure B.36-2)
- Shell height frequencies (Figure B.36-3)
- Biomass per year (Figure B.36-4)
- Observed mortality (Figure B.36-5)
- Dermo and MSX per year (Figure B.36-6)
- Cultch per year (Figure B.36-7)
- Harvest (Figure B.36-8)

Total live oyster density experienced a significant increase during 2021-2025; all size classes showed marked growth in density during this interval. This increase was likely due to good natural recruitment in 2023 and 2025 and was accompanied by an increase in biomass, particularly in 2024 and 2025, as well as an increase in cultch availability. Observed mortality has been below the long-term average for the last decade, despite a spike in MSX in 2023 and a spike in dermo intensity and prevalence in 2023 and 2024.

Between 2006 and 2020, approximately 12,000 bushels of shell and 3,000 bushels of wild seed were planted to enhance the commercial public fishery in this NOAA Code. None of these plantings occurred between 2021 and 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. Since the establishment of the sanctuary in 2010, 79% of the area is closed to harvest. Diving was the primary harvest gear type during 2021-2025. This area is characterized by low but apparently increasing biomass and oyster density primarily driven by recent good recruitment and low mortality. There is also low but increasing harvest.

⁴³ See chart 22 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

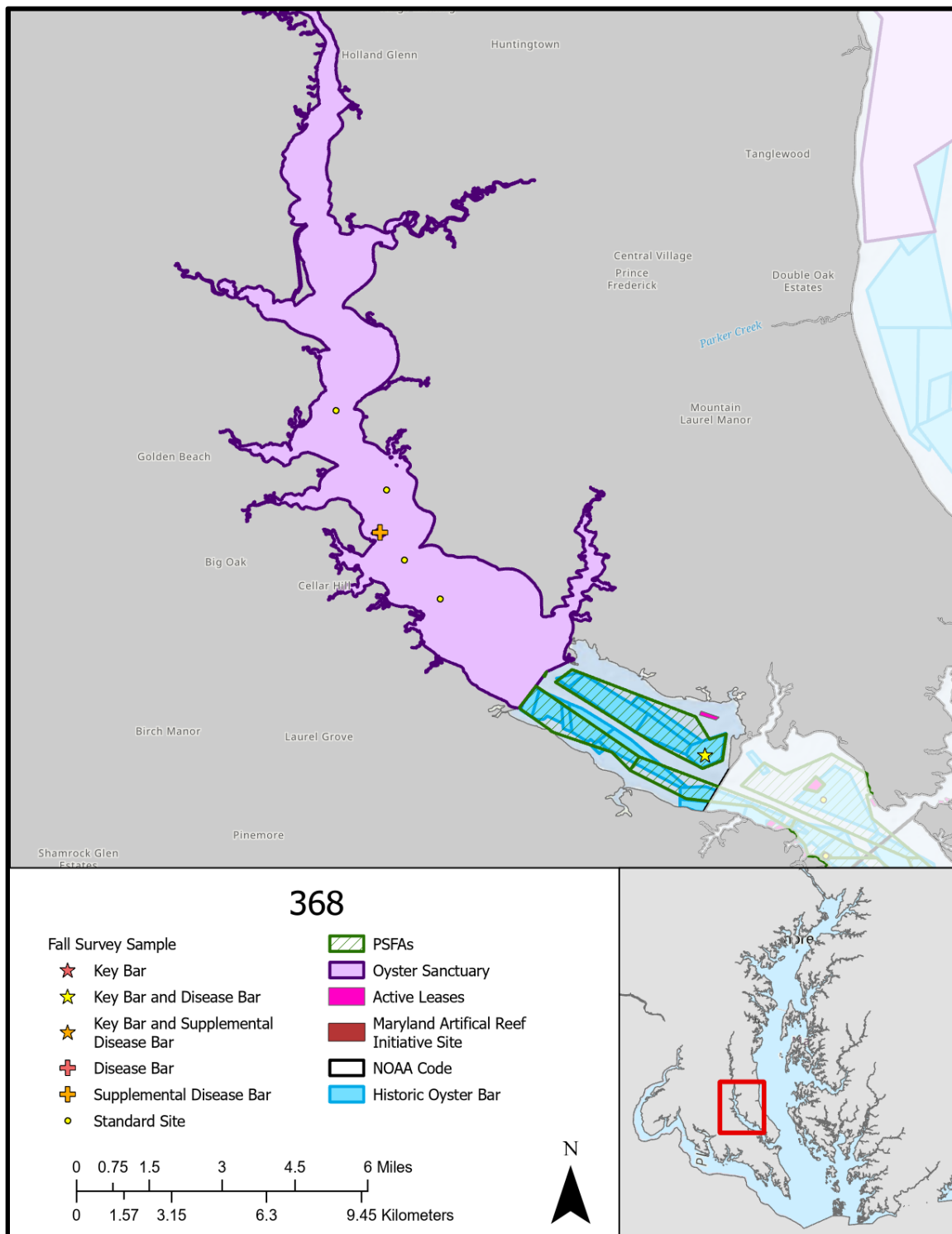


Figure B.36-1. Map of NOAA Code 368 (Patuxent River Upper). Fall Oyster Survey sites may not be sampled every year.

Table B.36-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 368 (Patuxent River Upper) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/10	5/7	5/6	5/5
Number of Live Spat Oysters per square meter	3.3 $\pm$ 2.1	1.3 $\pm$ 0.5	2.6 $\pm$ 0.8	35.4 $\pm$ 17
Number of Live Small Oysters per square meter	7.1 $\pm$ 1.6	9.9 $\pm$ 2.1	23.6 $\pm$ 6.2	52 $\pm$ 21
Number of Live Market Oysters per square meter	13 $\pm$ 5.3	11.7 $\pm$ 2.2	12.5 $\pm$ 3	61.5 $\pm$ 17
Number of Live Oysters per square meter	23.4 $\pm$ 6	23 $\pm$ 3.2	38.7 $\pm$ 7.6	149 $\pm$ 34
Live Biomass (g Dry Weight per Bushel)	70.5 $\pm$ 28.5	177 $\pm$ 46	113.8 $\pm$ 18.8	231.8 $\pm$ 44.7
Observed Mortality (%)	20 $\pm$ 5	7 $\pm$ 1.3	8.5 $\pm$ 3.8	3.2 $\pm$ 1.3
Cultch (Bushels per 100 feet towed)	0.9 $\pm$ 0.1	0.6 $\pm$ 0.1	1 $\pm$ 0.2	1.8 $\pm$ 0.4
Harvest (Bushels)	281	1,624	2,264	3,139

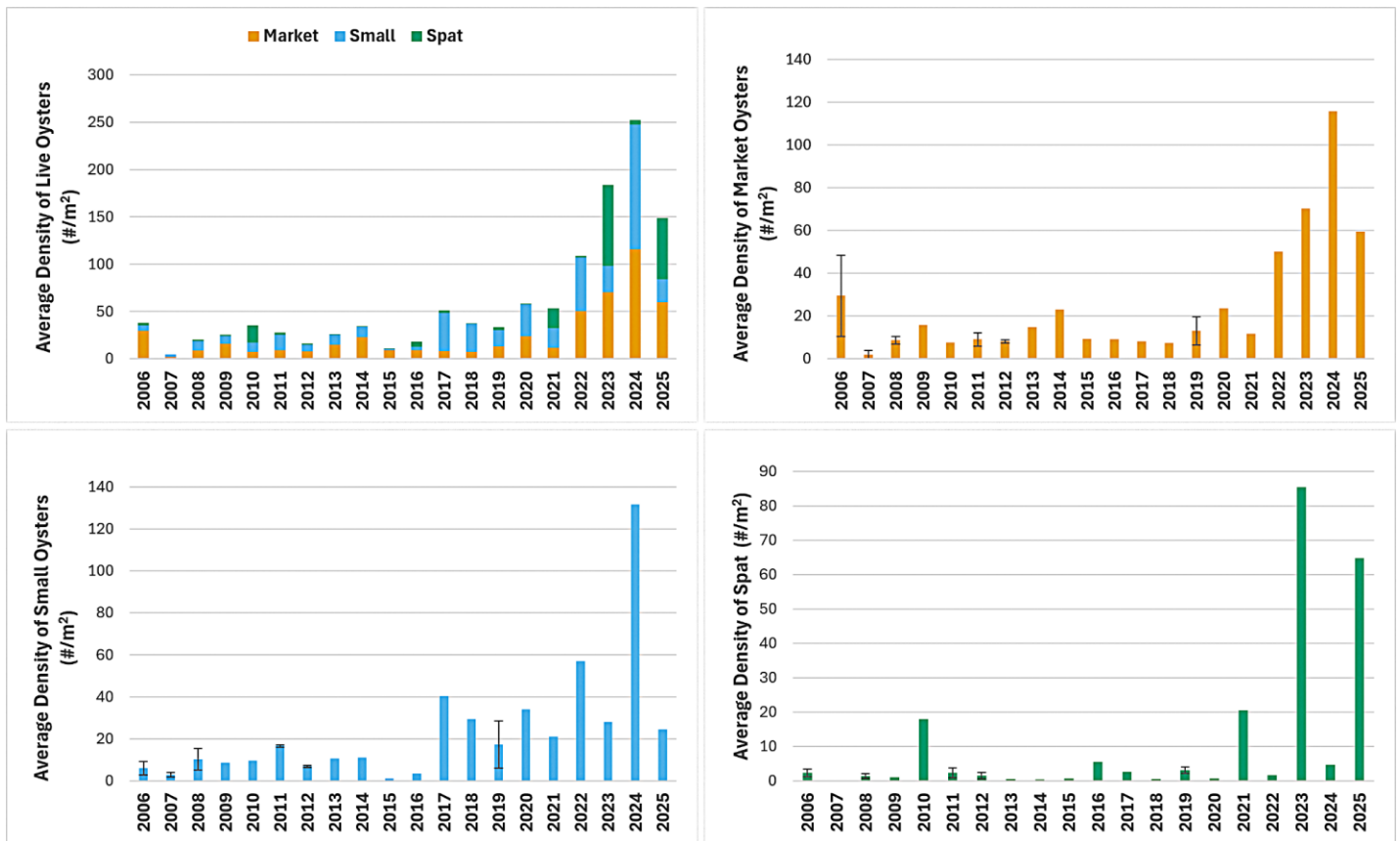


Figure B.36-2. Average number of live oysters per square meter by size class in NOAA Code 368 (Patuxent River Upper) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Patuxent River Upper (368)

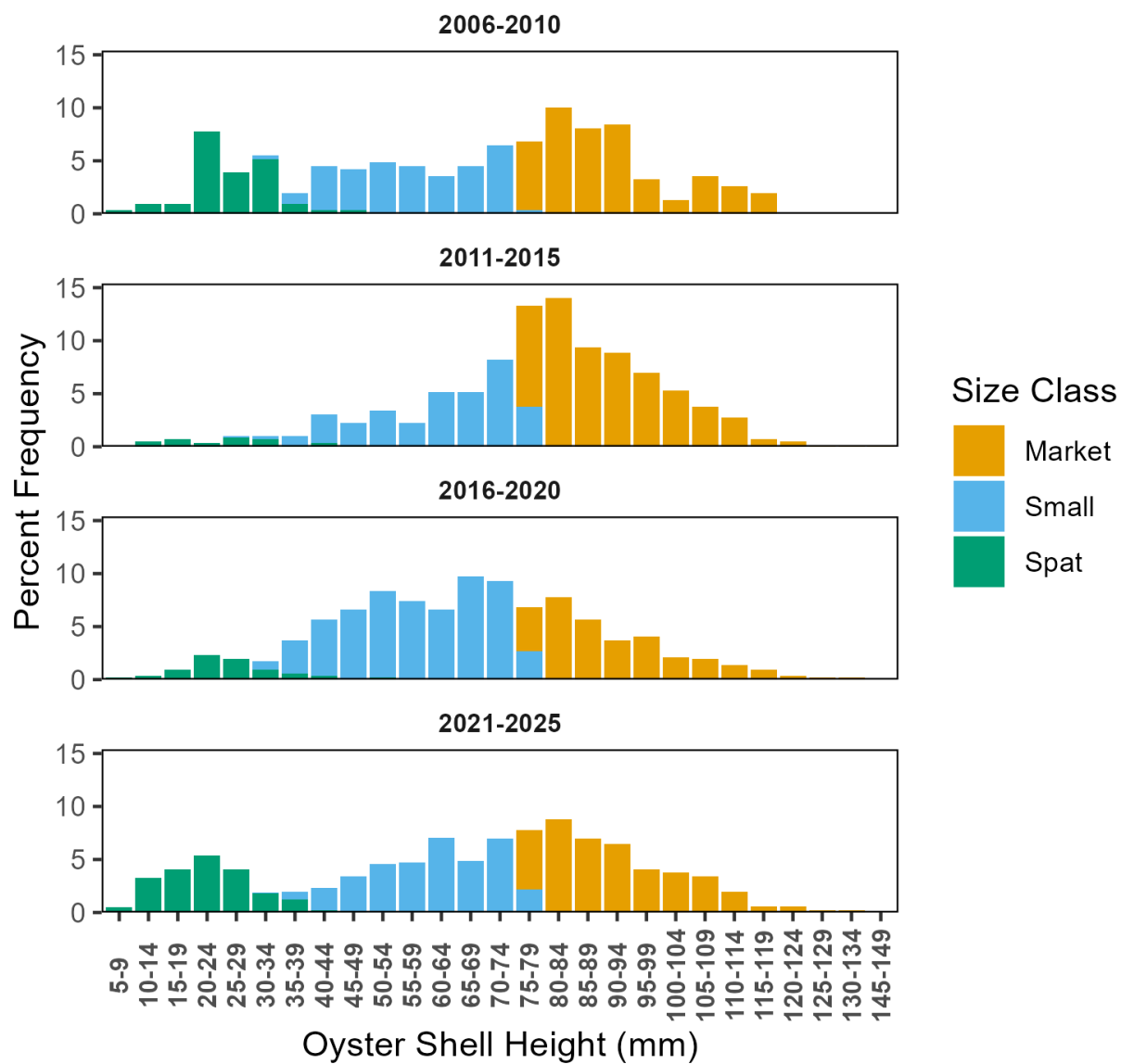


Figure B.36-3. Shell height frequencies of live oysters in NOAA Code 368 (Patuxent River Upper) outside of the current sanctuary area.

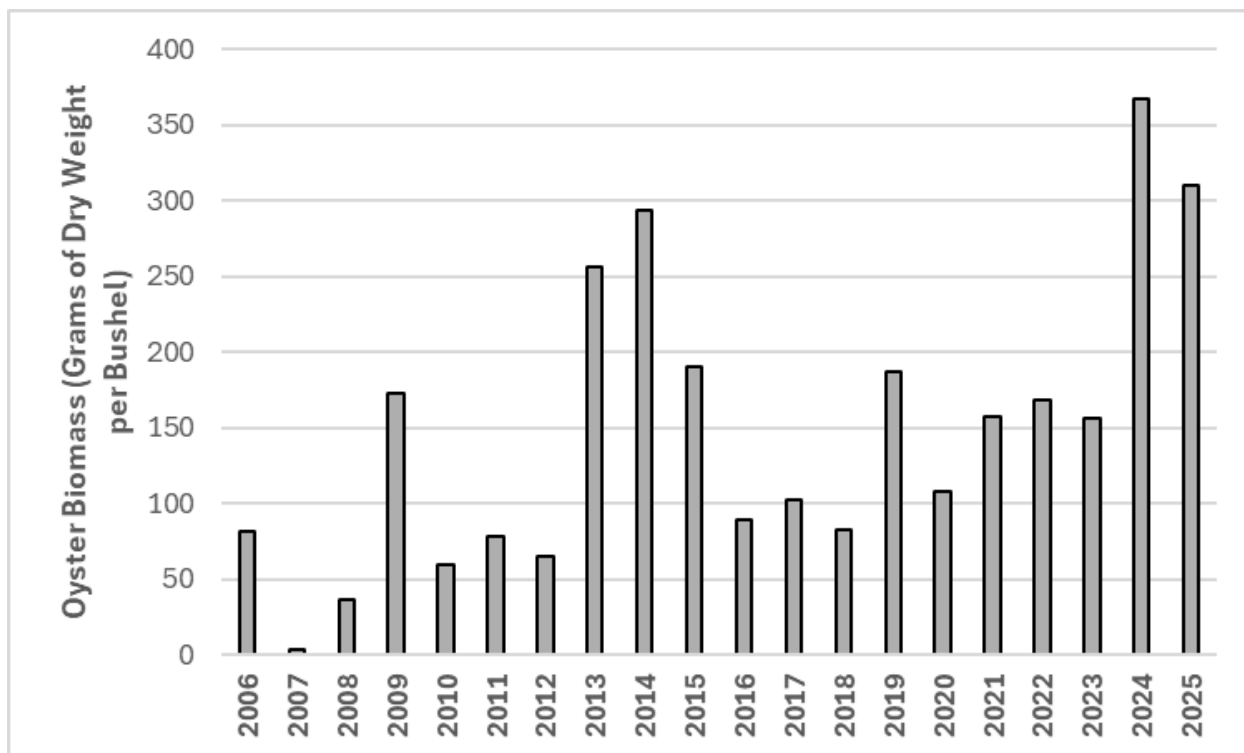


Figure B.36-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 368 (Patuxent River Upper) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey.

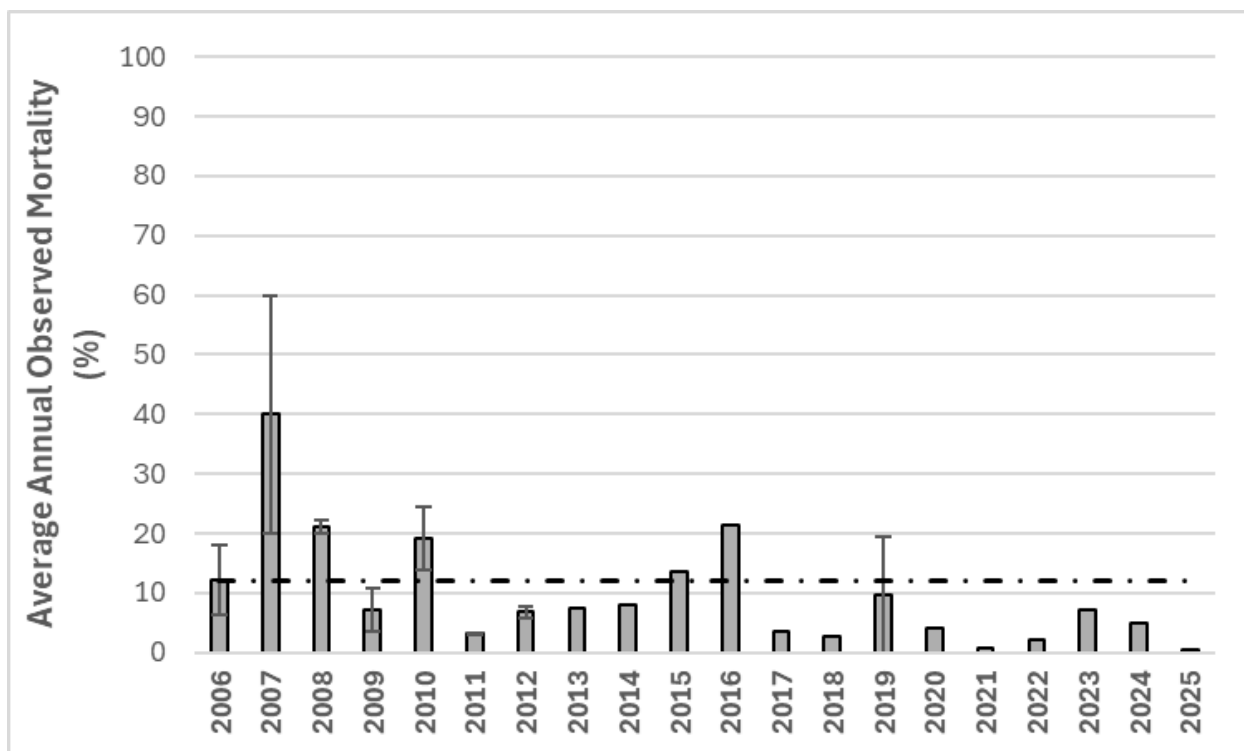


Figure B.36-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 368 (Patuxent River Upper) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

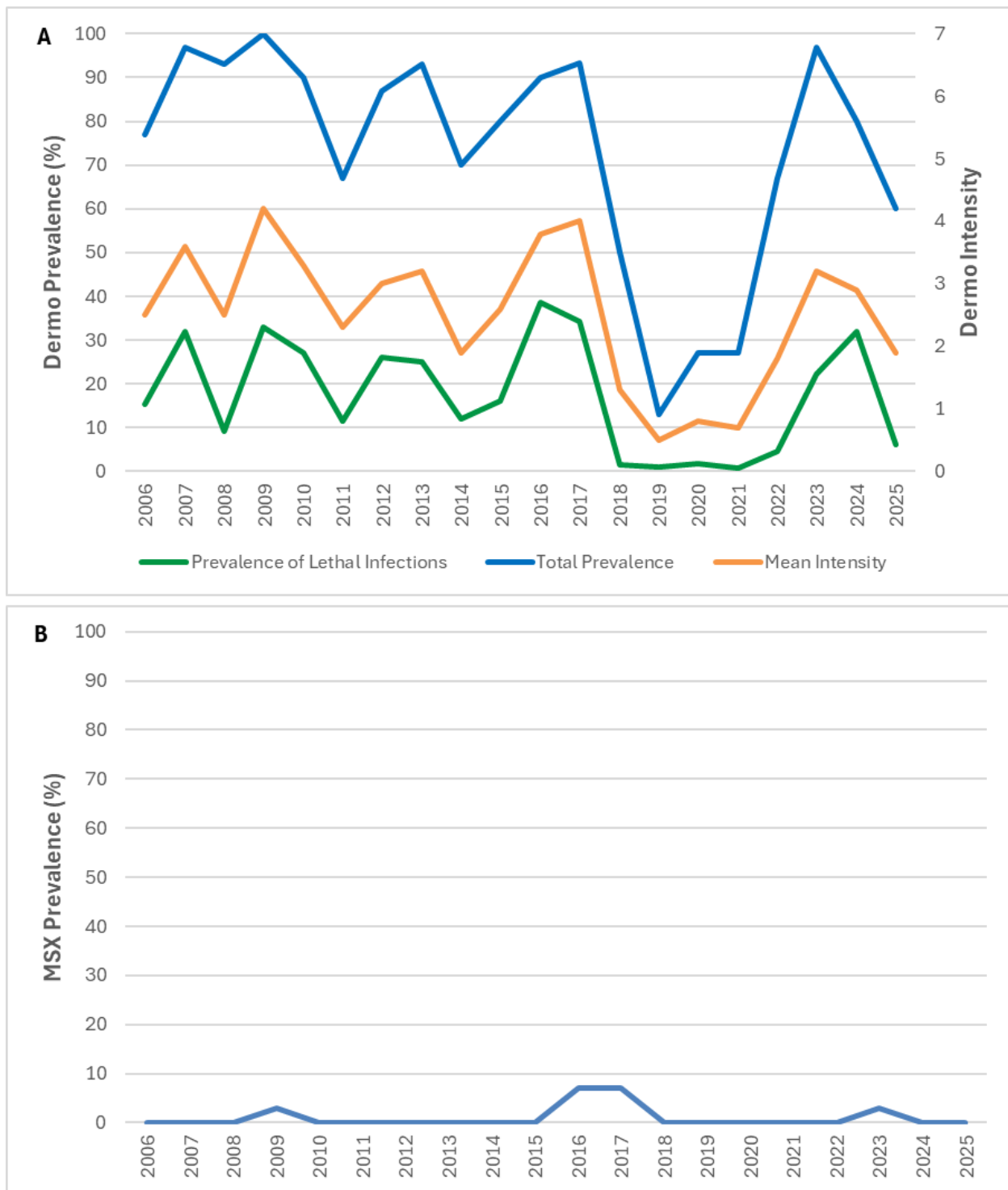


Figure B.36-6. Oyster disease prevalence and intensity in NOAA Code 368 (Patuxent River Upper) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Broome Island bar.

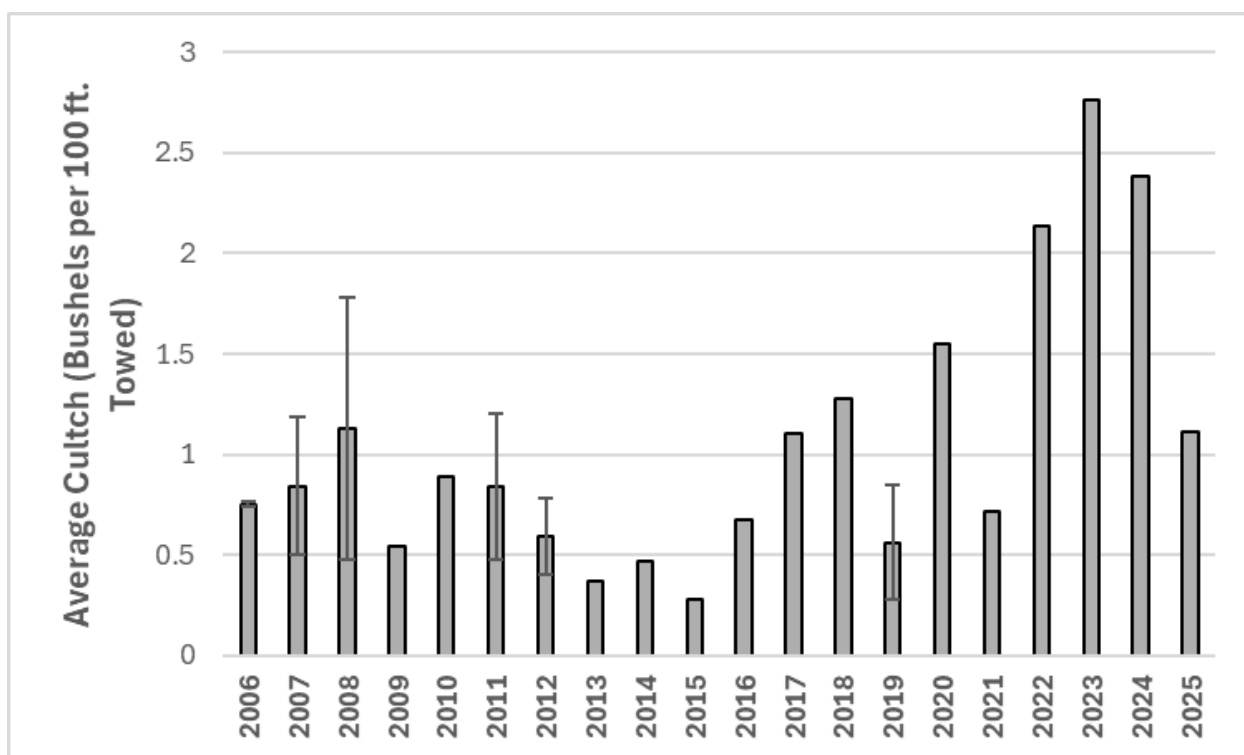


Figure B.36-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 368 (Patuxent River Upper) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

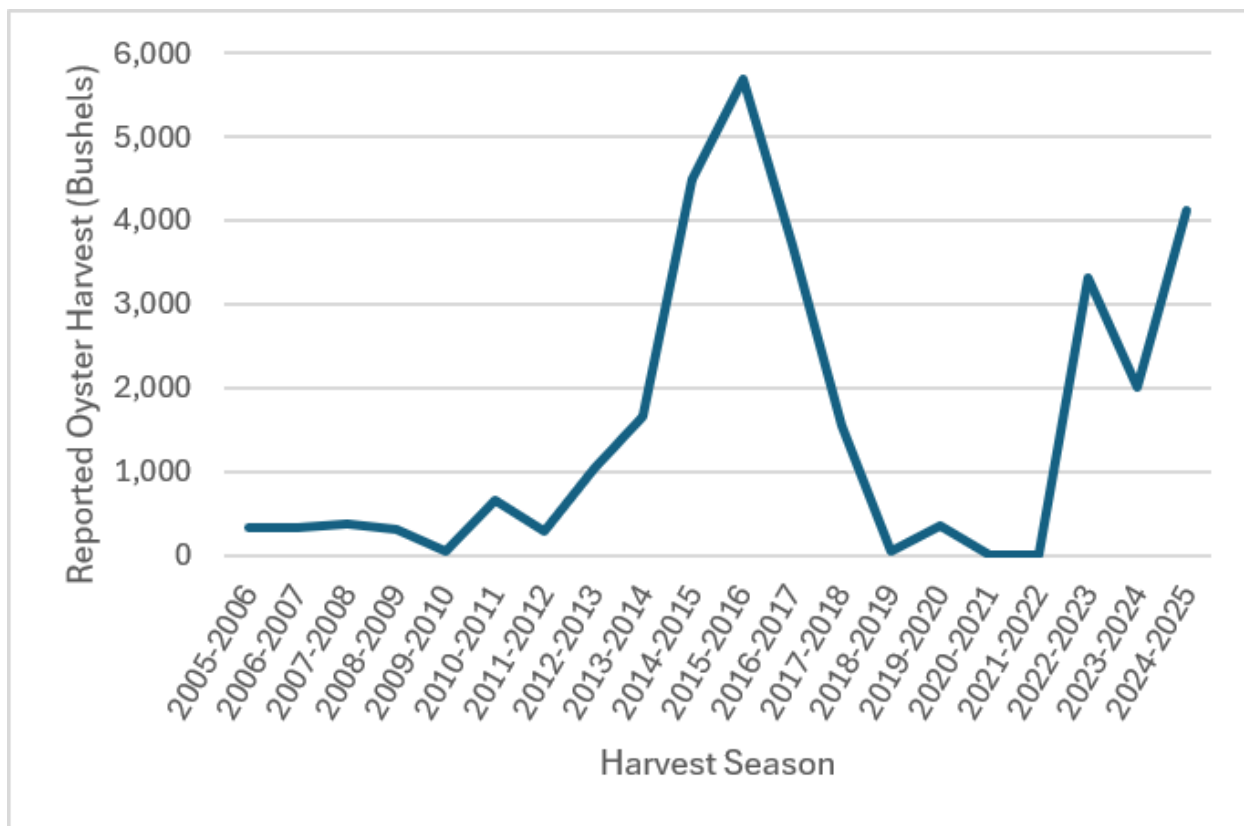


Figure B.36-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 368 (Patuxent River Upper). Since 2010, 79% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.37: NOAA Code 437 – Harris Creek

NOAA Code 437 encompasses Harris Creek, a tributary of the Choptank River, and is located in Maryland's mid-eastern portion of Chesapeake Bay. The entire NOAA Code is 7,176 acres and has 18 historic oyster bars⁴⁴. The Harris Creek Sanctuary encompasses 64% (4,647 acres) of the NOAA Code. This section focuses on information collected within the NOAA Code outside of the current sanctuary area. This equates to 2,529 surface acres. There are 1,506 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code and outside the sanctuary. There are 1,823 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. This NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.37-1)
- Summary statistics (Table B.37-1)
- Density per year (Figure B.37-2)
- Shell height frequencies (Figure B.37-3)
- Biomass per year (Figure B.37-4)
- Observed mortality (Figure B.37-5)
- Dermo and MSX per year (Figure B.37-6)
- Cultch per year (Figure B.37-7)
- Harvest (Figure B.37-8)

Total live density increased significantly from the 2016-2020 to the 2021-2025 time periods, driven by increases in the density of all size classes. Biomass showed an upward trend for all time periods except the most recent 5-year period, which was similar to 2016-2020. Biomass declined for 2024 and 2025, possibly due to increased harvest in the 2023-2024 season. Observed mortality has trended slightly upward, with a peak in 2022 and above average mortality in 2024. MSX and dermo increased in 2023 then declined in subsequent years.

Between 2006 and 2025, approximately 84,000 bushels of shell (including 21,000 bushels of Gigas shell) were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 50,000 bushels of shell, including all of the Gigas shell, were added between 2021 and 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. Since the establishment of the sanctuary in 2010, 64% of the area was closed to harvest. Power dredge was the primary harvest gear type during 2021-2025. This area is characterized by increasing biomass and oyster density primarily driven by multiple years of enhancement activity and low mortality. Harvest in the relatively small area outside the sanctuary has been variable but generally has increased over time.

⁴⁴ See chart 15 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

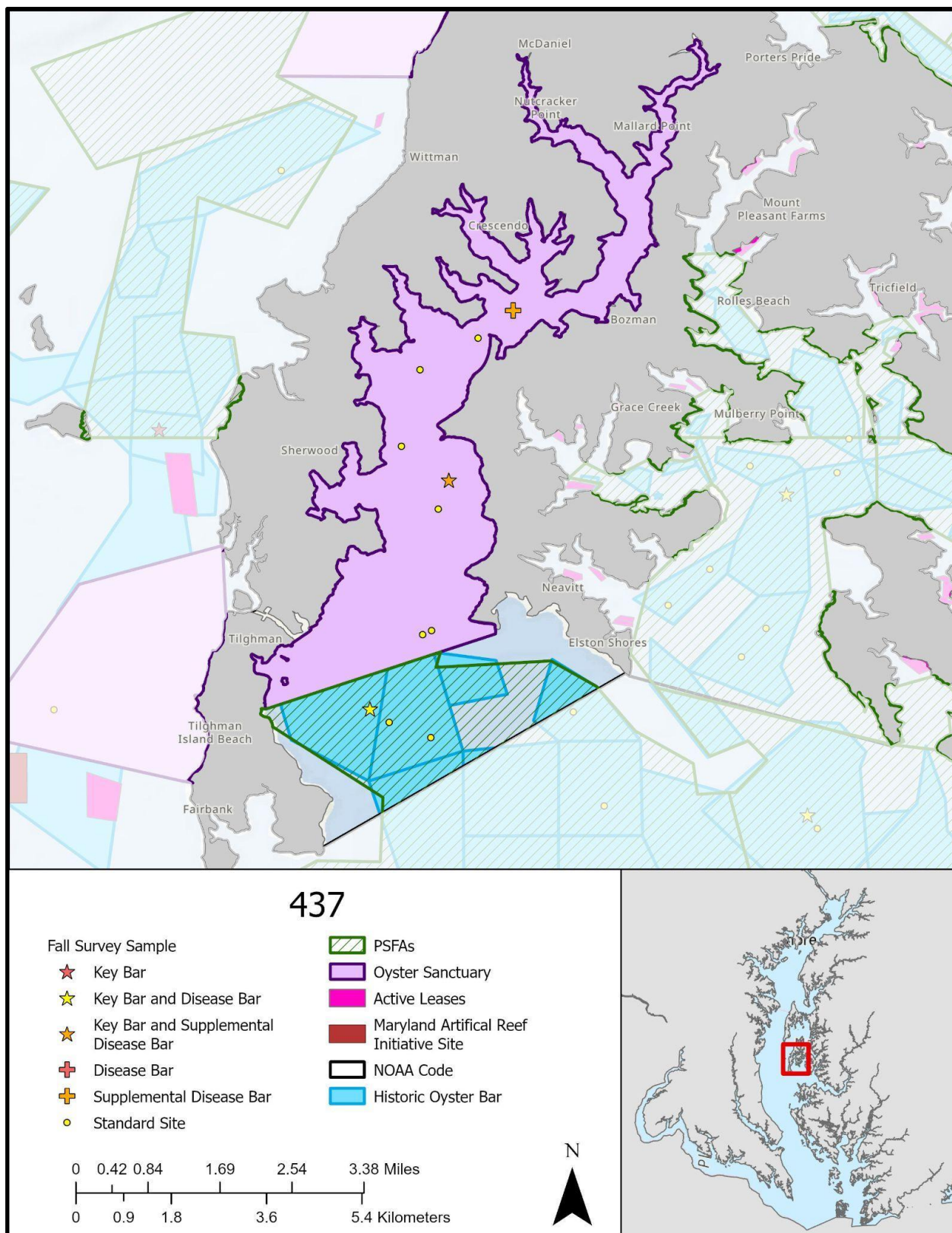


Figure B.37-1. Map of NOAA Code 437 (Harris Creek). Fall Oyster Survey sites may not be sampled every year.

Table B.37-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 437 (Harris Creek) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/17	5/15	5/18	5/19
Number of Live Spat Oysters per square meter	8.2 $\pm$ 3.6	15 $\pm$ 6	12.6 $\pm$ 5.6	93.8 $\pm$ 48.3
Number of Live Small Oysters per square meter	11.6 $\pm$ 3	42 $\pm$ 9.6	21.7 $\pm$ 7.3	76.4 $\pm$ 28.1
Number of Live Market Oysters per square meter	9.4 $\pm$ 1.9	30.6 $\pm$ 7.7	11.7 $\pm$ 3.5	31.7 $\pm$ 10
Number of Live Oysters per square meter	29.2 $\pm$ 6.6	87.2 $\pm$ 16.2	46 $\pm$ 10.2	202 $\pm$ 67.4
Live Biomass (g Dry Weight per Bushel)	70.7 $\pm$ 13.6	192.2 $\pm$ 37.4	271 $\pm$ 41	271.4 $\pm$ 51.8
Observed Mortality (%)	4.7 $\pm$ 1.1	2.8 $\pm$ 0.5	8.7 $\pm$ 2.1	10 $\pm$ 4.1
Cultch (Bushels per 100 feet towed)	0.6 $\pm$ 0.1	0.6 $\pm$ 0.1	0.3 $\pm$ 0.1	0.6 $\pm$ 0.1
Harvest (Bushels)	2,975	4,327	5,024	11,516

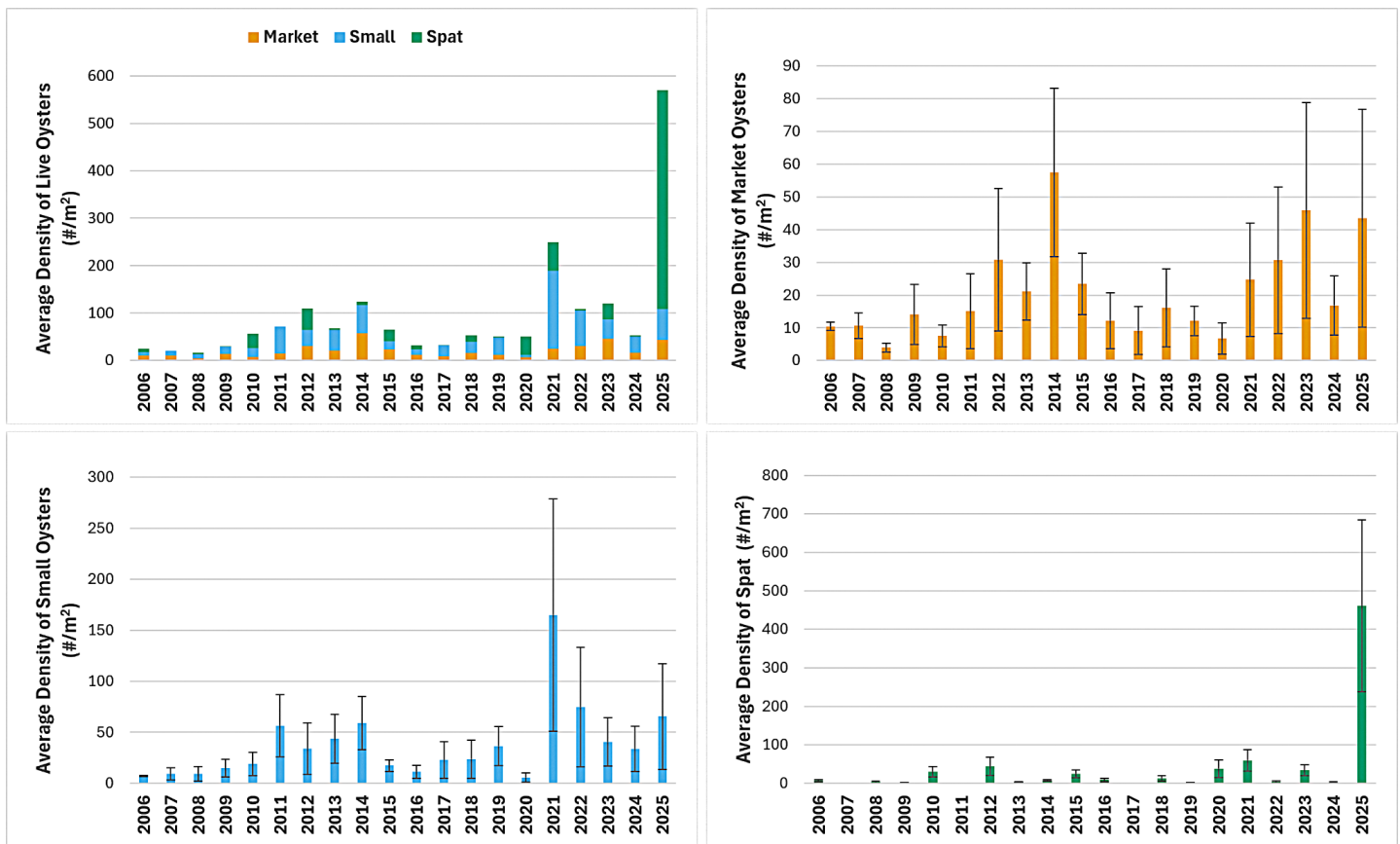


Figure B.37-2. Average number of live oysters per square meter by size class in NOAA Code 437 (Harris Creek) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Harris Creek (437)

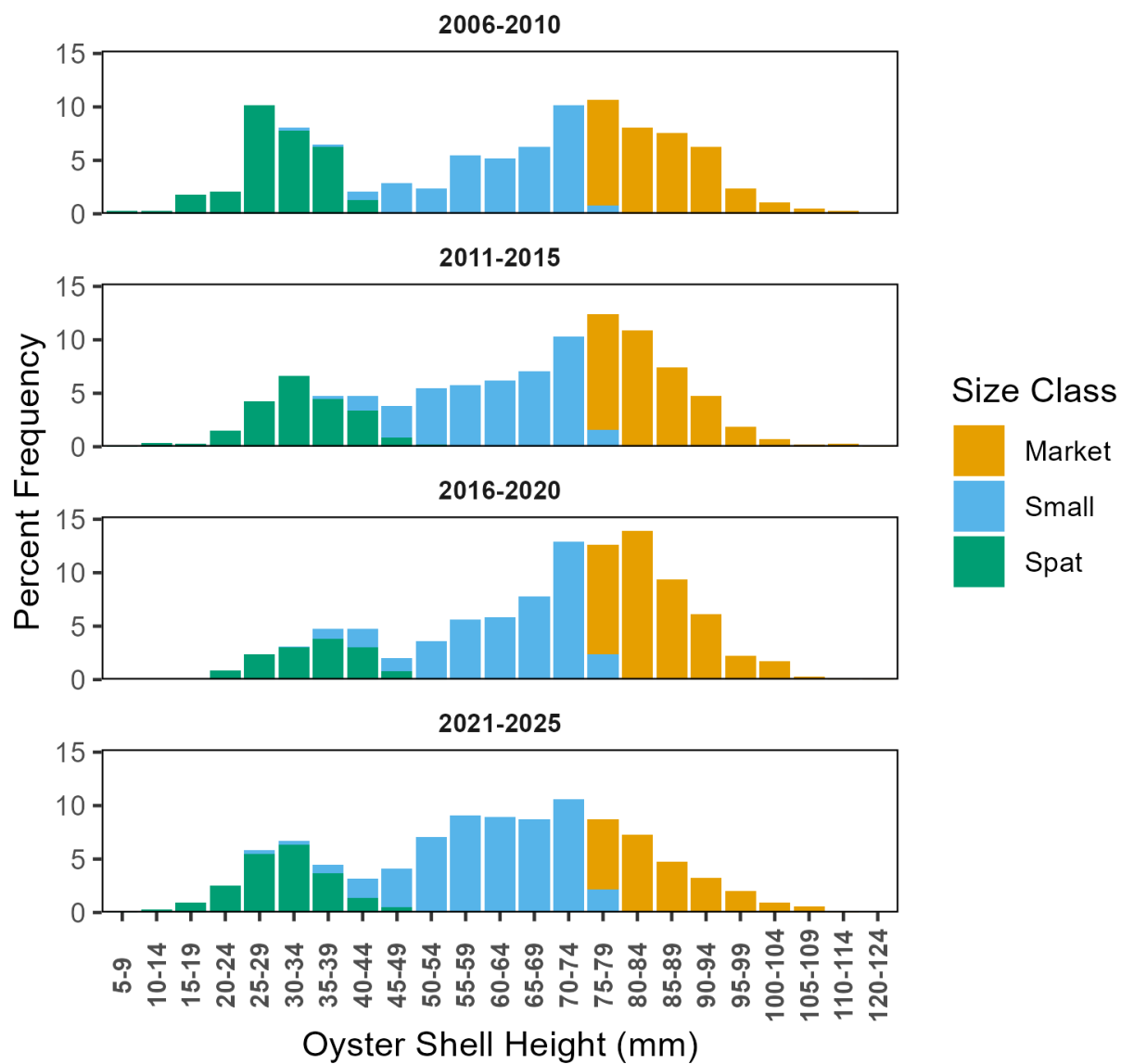


Figure B.37-3. Shell height frequencies of live oysters in NOAA Code 437 (Harris Creek) outside of the current sanctuary area.

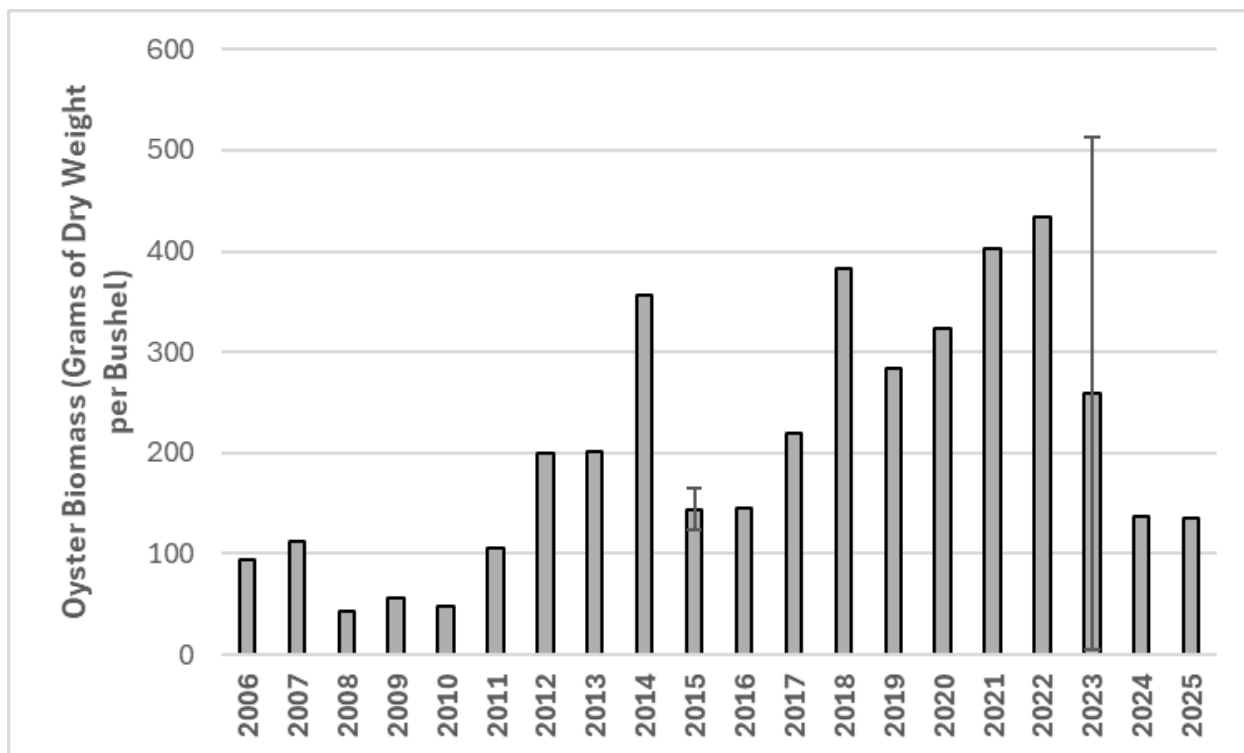


Figure B.37-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 437 (Harris Creek) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey on Tilghman Wharf bar.

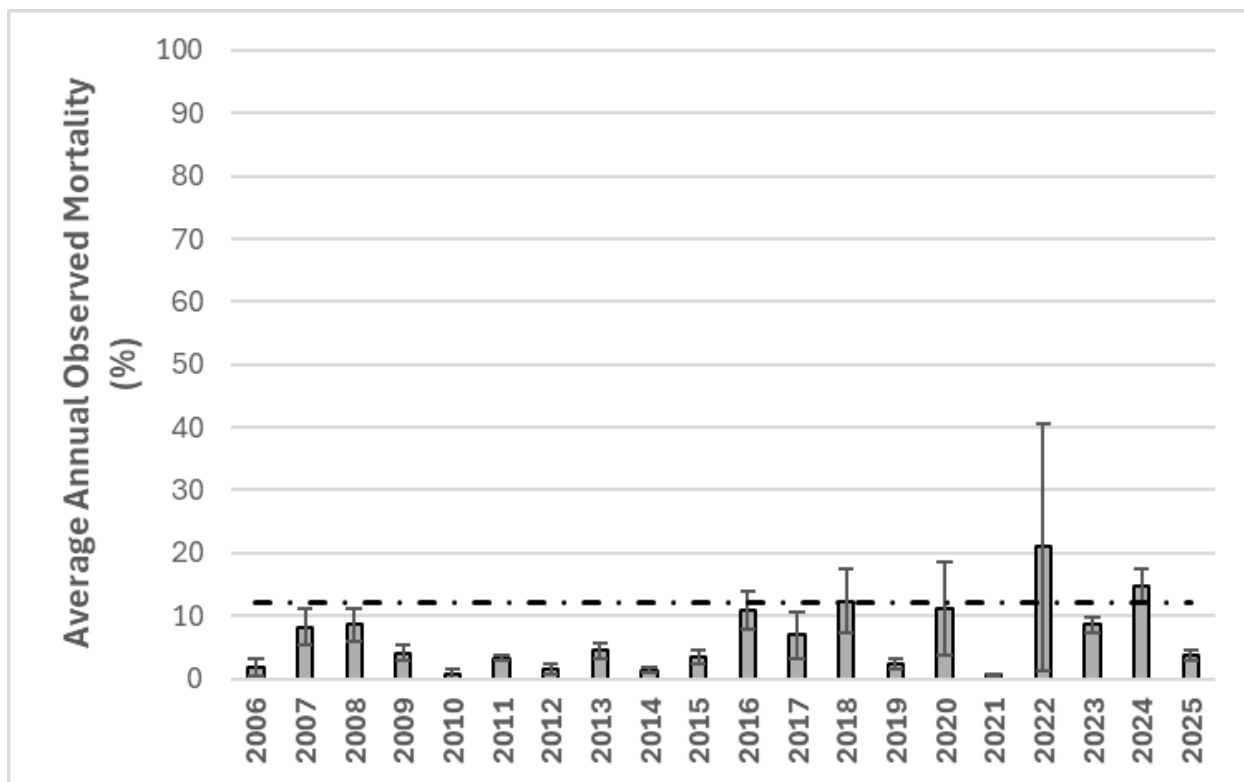


Figure B.37-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 437 (Harris Creek) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

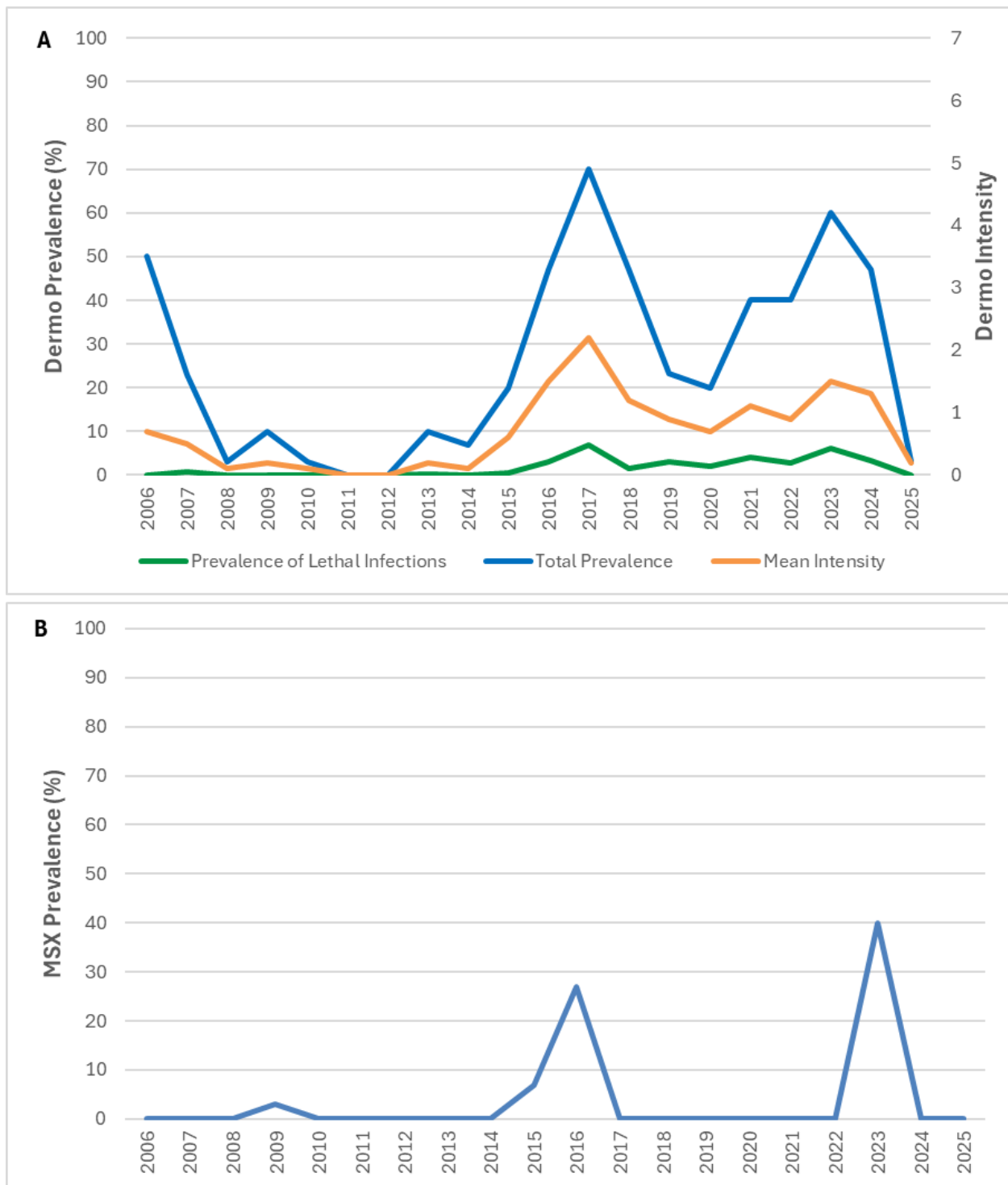


Figure B.37-6. Oyster disease prevalence and intensity in NOAA Code 437 (Harris Creek) occurring outside of the current sanctuary area. (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Tilghman Wharf bar.

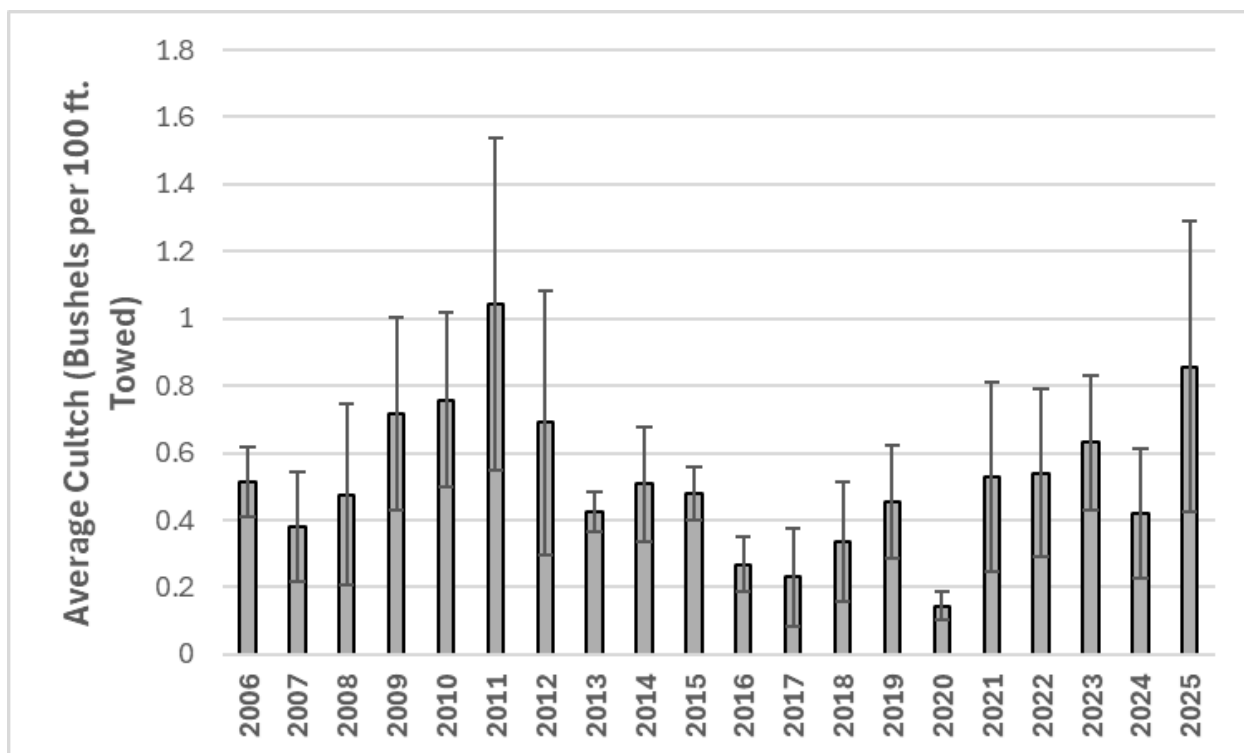


Figure B.37-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 437 (Harris Creek) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

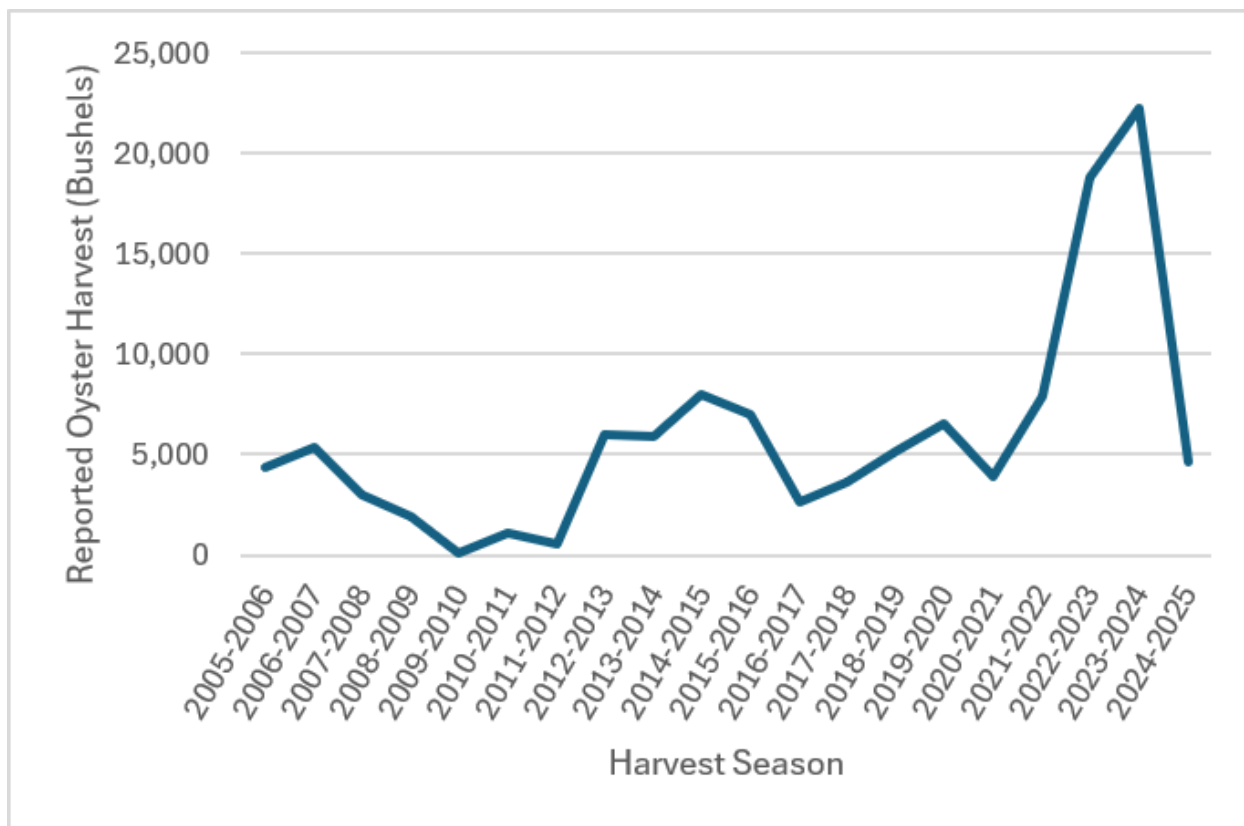


Figure B.37-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 437 (Harris Creek). Since 2010, 64% of the NOAA Code area has been a sanctuary where harvest is prohibited.

Section B.38: NOAA Code 537 – Broad Creek

NOAA Code 537 encompasses Broad Creek and is located in Maryland's mid-eastern portion of Chesapeake Bay as a tributary to the Choptank River. The entire NOAA Code is 7,747 acres and has 23 historic oyster bars⁴⁵. There are 2,760 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code. None of the area within the NOAA Code is an oyster sanctuary. In 2010, there were 5,391 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. Since 2010, 28.7 acres have been declassified. This NOAA Code is generally located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.38-1)
- Summary statistics (Table B.38-1)
- Density per year (Figure B.38-2)
- Shell height frequencies (Figure B.38-3)
- Biomass per year (Figure B.38-4)
- Observed mortality (Figure B.38-5)
- Dermo and MSX per year (Figure B.38-6)
- Cultch per year (Figure B.38-7)
- Harvest (Figure B.38-8)

Total live oyster density nearly tripled during 2021-2025 over the previous interval. Recruitment has been very good for several years, but was exceptionally high in 2025, leading to a doubling of spat density for the most recent time period. These increases led to strong gains in biomass and an increase in cultch availability. Observed mortality was consistently below the long-term average. MSX remained at low levels, with a small increase in 2023. Dermo prevalence reached 100% in 2023, accompanied by increases in intensity and lethal prevalence, all of which declined in subsequent years.

Between 2006 and 2025, approximately 394,000 bushels of shell (including 6,000 bushels of Gigas shell), 53,000 bushels of wild seed and 19 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code. Of these plantings, 72,000 bushels of shell, including all the Gigas shell, were added between 2021 and 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. Hand tong and power dredge were the primary harvest gear types during 2021-2025. This area is characterized by increasing biomass and oyster density primarily driven by multiple years of good recruitment, enhancement activity, and low mortality. Harvest has been variable but has generally increased over time. This NOAA code is consistently one of the highest harvest areas in the Bay.

⁴⁵ See chart 15 for bar names and locations in the State of Maryland Shellfish Closure Areas Book
<http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

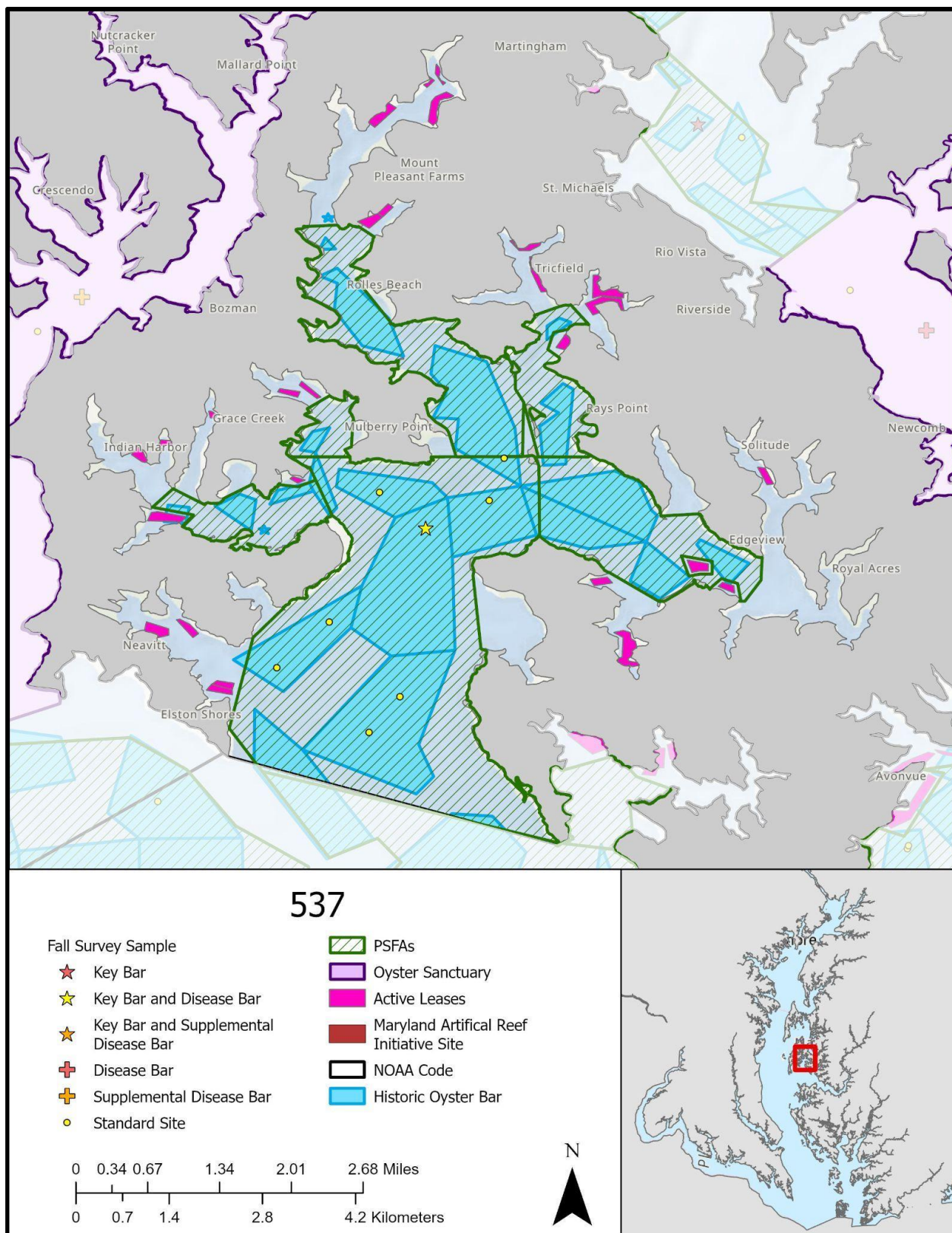


Figure B.38-1. Map of NOAA Code 537 (Broad Creek). Fall Oyster Survey sites may not be sampled every year.

Table B.38-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 537 (Broad Creek). ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/56	5/59	5/60	5/54
Number of Live Spat Oysters per square meter	38.6 $\pm$ 7.4	56 $\pm$ 18	310 $\pm$ 85	664 $\pm$ 224
Number of Live Small Oysters per square meter	94.7 $\pm$ 22.9	164 $\pm$ 22	247 $\pm$ 29	794 $\pm$ 88
Number of Live Market Oysters per square meter	42.6 $\pm$ 6	77 $\pm$ 7.0	77 $\pm$ 7.5	207 $\pm$ 21
Number of Live Oysters per square meter	176 $\pm$ 26	296 $\pm$ 25	634 $\pm$ 84	1,665 $\pm$ 245
Live Biomass (g Dry Weight per Bushel)	186.4 $\pm$ 25	331 $\pm$ 28.6	303.5 $\pm$ 36	554.4 $\pm$ 34
Observed Mortality (%)	7.2 $\pm$ 0.8	5.2 $\pm$ 0.6	5.1 $\pm$ 0.6	6 $\pm$ 0.6
Cultch (Bushels per 100 feet towed)	1.2 $\pm$ 0.1	1.2 $\pm$ 0.1	1.6 $\pm$ 0.1	3 $\pm$ 0.3
Harvest (Bushels)	19,332	45,317	40,965	56,166

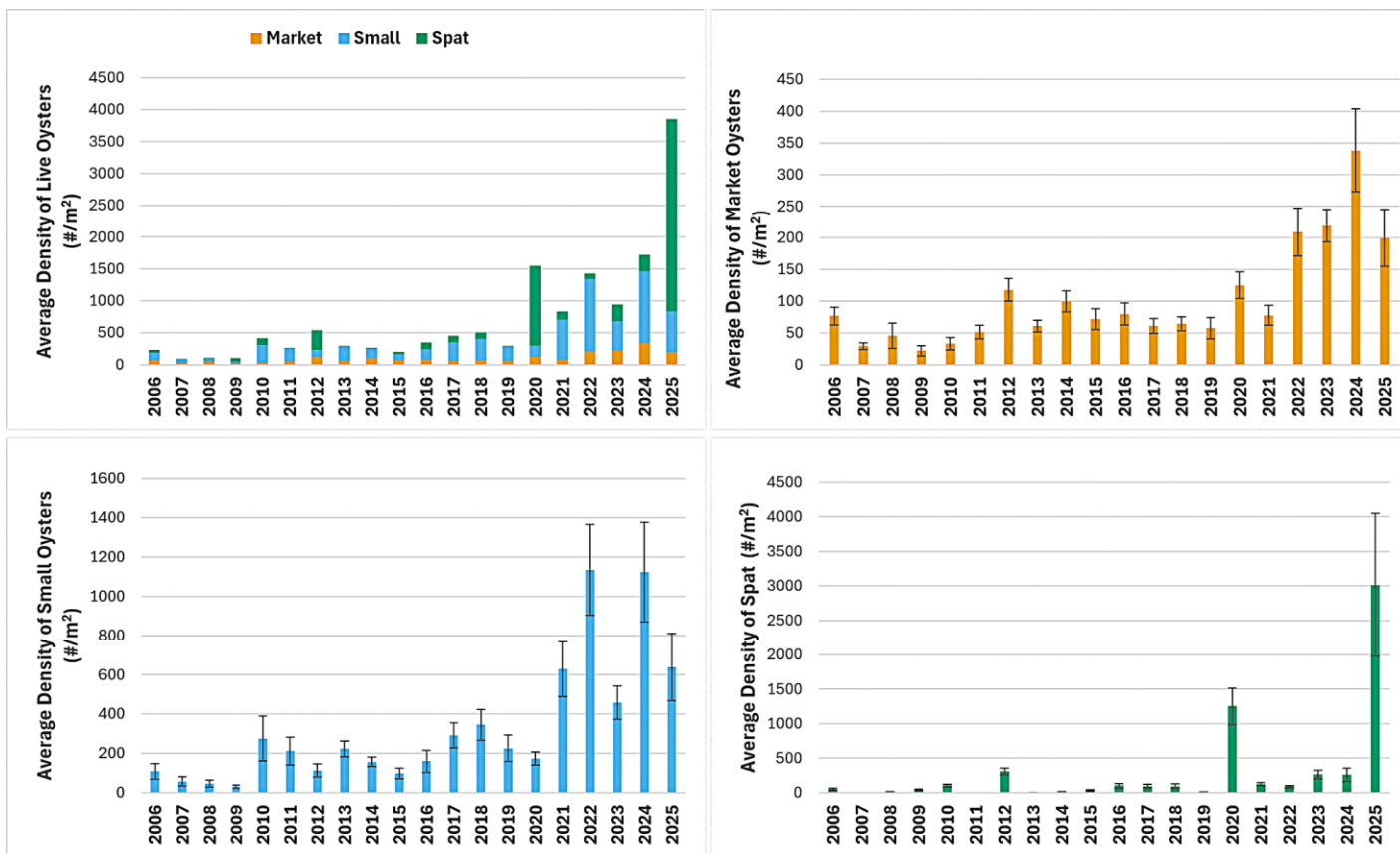


Figure B.38-2. Average number of live oysters per square meter by size class in NOAA Code 537 (Broad Creek). Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

Broad Creek (537)

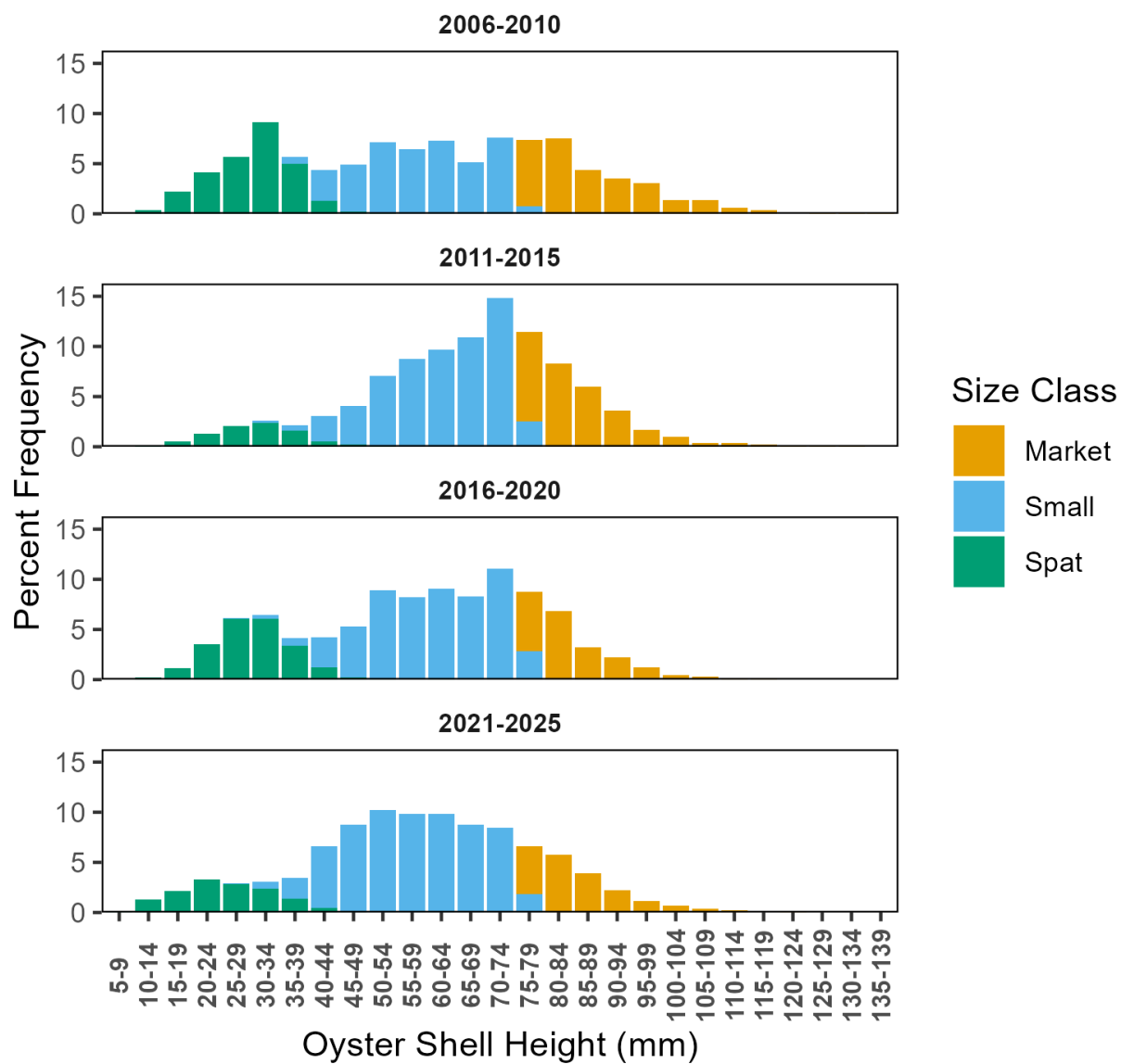


Figure B.38-3. Shell height frequencies of live oysters in NOAA Code 537 (Broad Creek).

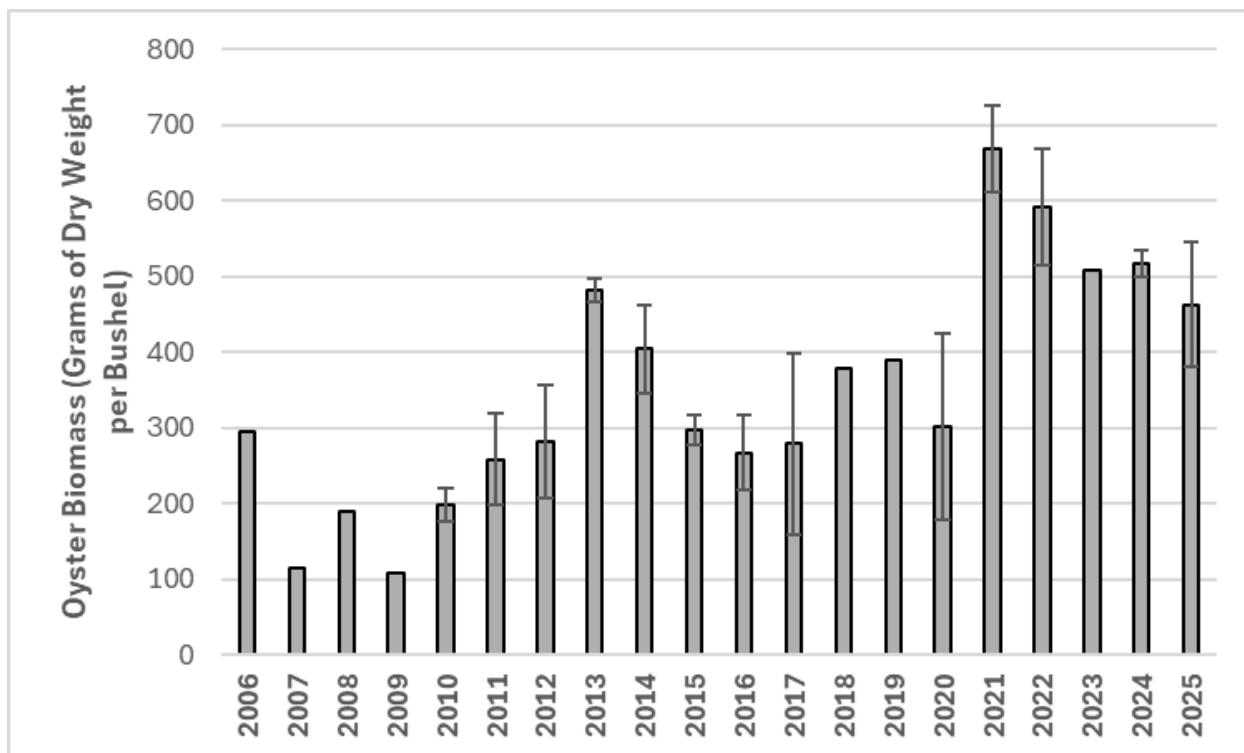


Figure B.38-4. Oyster biomass (grams of dry weight per bushel of material) in NOAA Code 537 (Broad Creek). Data from Maryland's Annual Fall Oyster Dredge Survey.

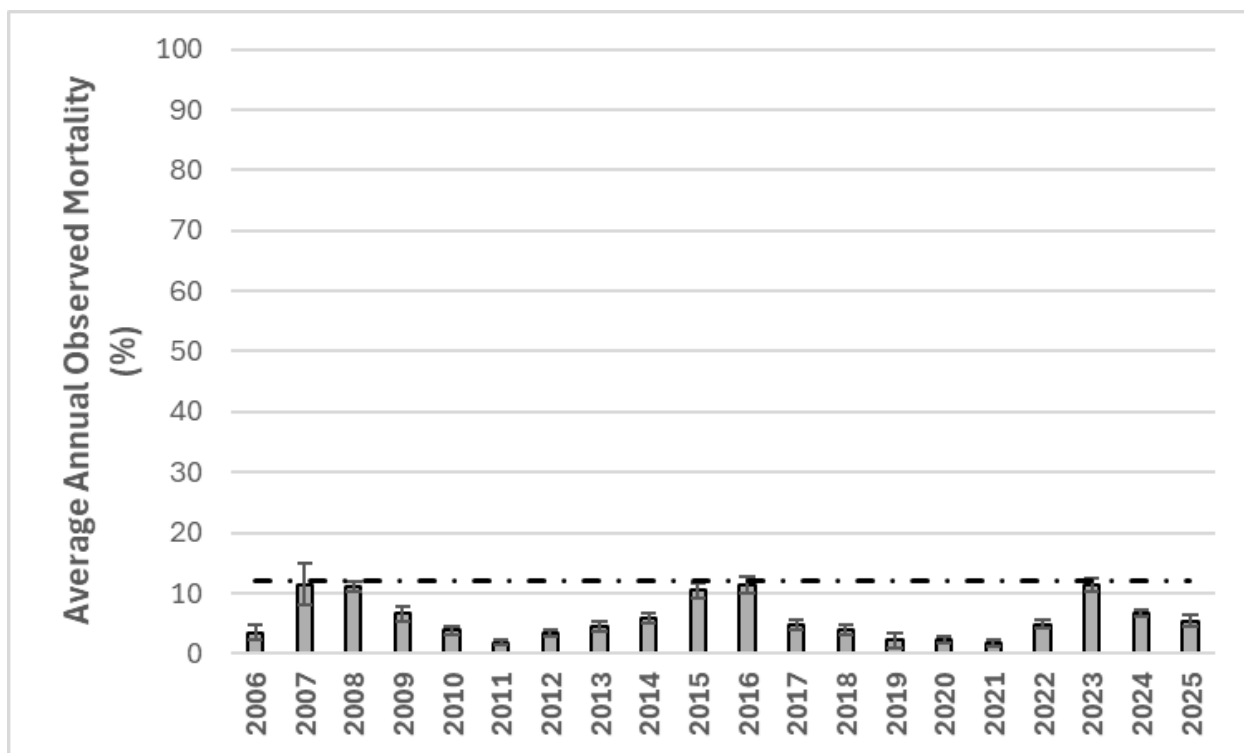


Figure B.38-5. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 537 (Broad Creek). Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

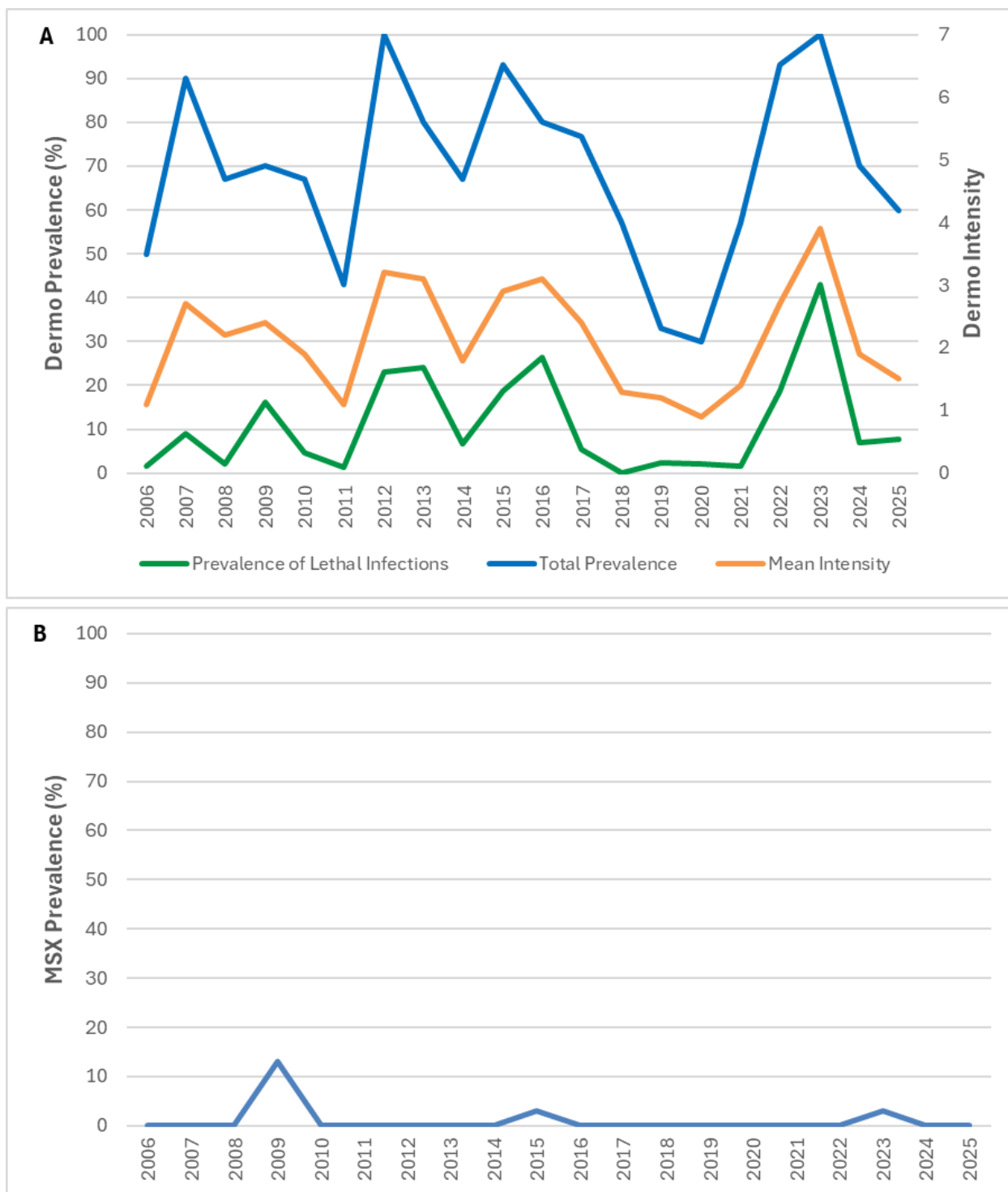


Figure B.38-6. Oyster disease prevalence and intensity in NOAA Code 537 (Broad Creek). (A) Dermo prevalence and mean intensity (B) MSX prevalence (intensity is not examined). Data from Maryland's Annual Fall Oyster Dredge Survey on Deep Neck bar.

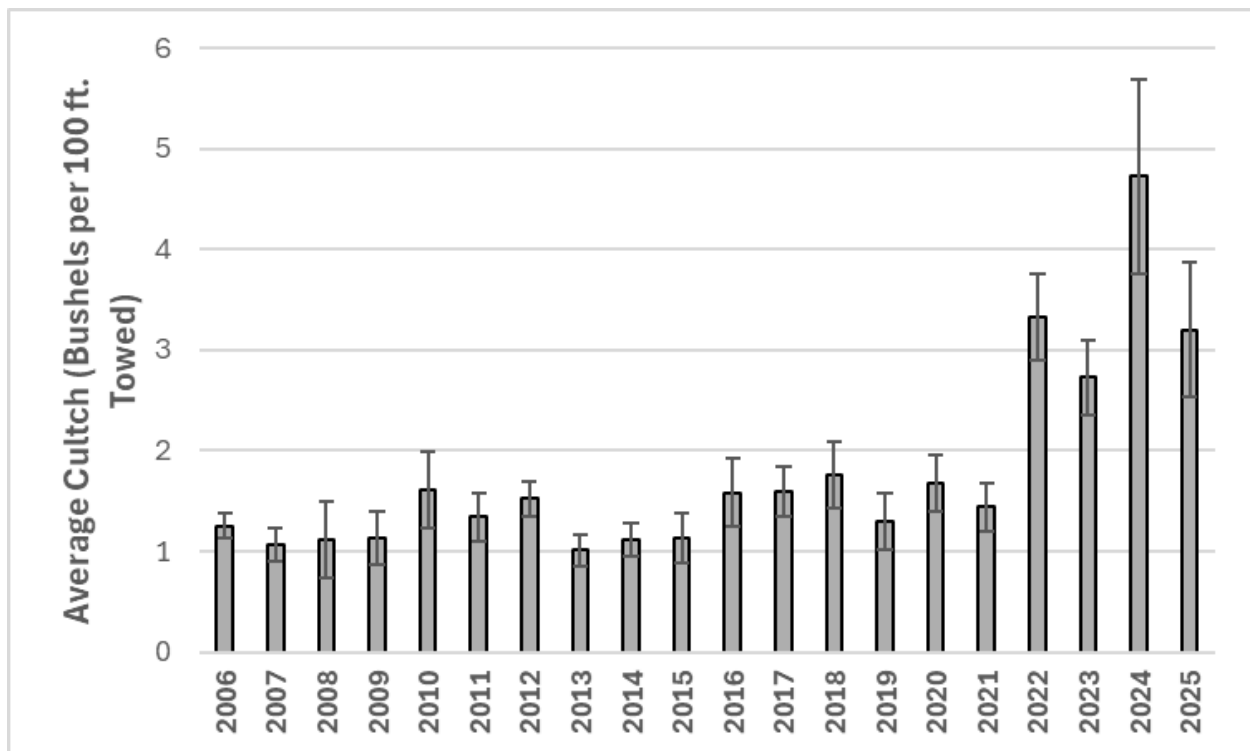


Figure B.38-7. Average cultch (live and dead oysters and loose shell) in NOAA Code 537 (Broad Creek). Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

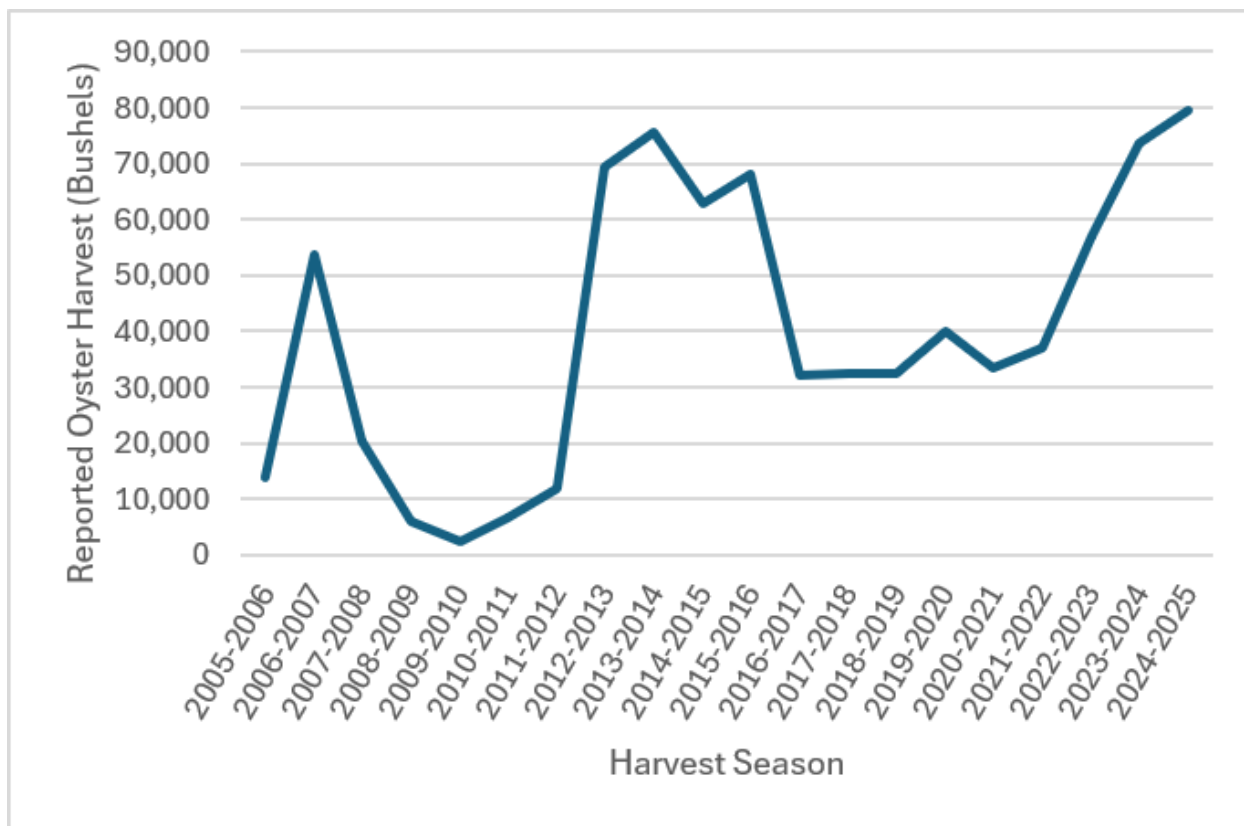


Figure B.38-8. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 537 (Broad Creek).

Section B.39: NOAA Code 637 – Tred Avon River

NOAA Code 637 encompasses the Tred Avon River and is located in Maryland's mid-eastern portion of Chesapeake Bay. The entire NOAA Code is 6,497 acres and contains 34 historic oyster bars⁴⁶, of which 64% (4,184 total acres) falls within the Tred Avon River and Oxford Sanctuaries. This section focuses on information collected within the NOAA Code occurring outside of the current sanctuary areas. This equates to 2,313 surface acres. There are 1,304 acres of historic oyster bottom (as charted in the Yates Oyster Survey from 1906 to 1912 plus its amendments) located within the NOAA Code that are not within a sanctuary. There are 1,683 acres within the NOAA Code designated as a Public Shellfish Fishery Area (PSFA) where aquaculture leasing is prohibited. No PSFA area has been declassified. The non-sanctuary portion of this NOAA Code is located within Maryland's medium salinity region (Zone 2).

Information available for this NOAA Code includes:

- NOAA Code map (Figure B.39-1)
- Summary statistics (Table B.39-1)
- Density per year (Figure B.39-2)
- Observed mortality (Figure B.39-3)
- Cultch per year (Figure B.39-4)
- Harvest (Figure B.39-5)

There was a significant increase in oyster density for all size classes in the 2021-2025 time period, following several years of good recruitment. Biomass and cultch have also shown improvement, while mortality has generally been below the long-term average in this area.

Between 2006 and 2025, approximately 5,000 bushels of wild seed and 36 million hatchery spat-on-shell were planted to enhance the commercial public fishery in this NOAA Code outside of the current sanctuary area. Of these plantings, 21 million hatchery spat-on-shell and all the shell were added between 2021 and 2025.

Harvest for the NOAA Code has been reported on seafood dealer buy tickets for all years of the time series. Since the establishment of the sanctuary in 2010, 64% of the NOAA code was closed to harvest. The highest recorded harvest occurred in the 2023-2024 season. Hand tong was the primary harvest gear type for 2021-2025. This area is characterized by increasing biomass and oyster density primarily driven by multiple years of good recruitment, enhancement activity, and low mortality. Harvest has been low but appears to be increasing.

⁴⁶ See chart 16 for bar names and locations in the State of Maryland Shellfish Closure Areas Book <http://dnr.maryland.gov/fisheries/Pages/oysters/index.aspx>

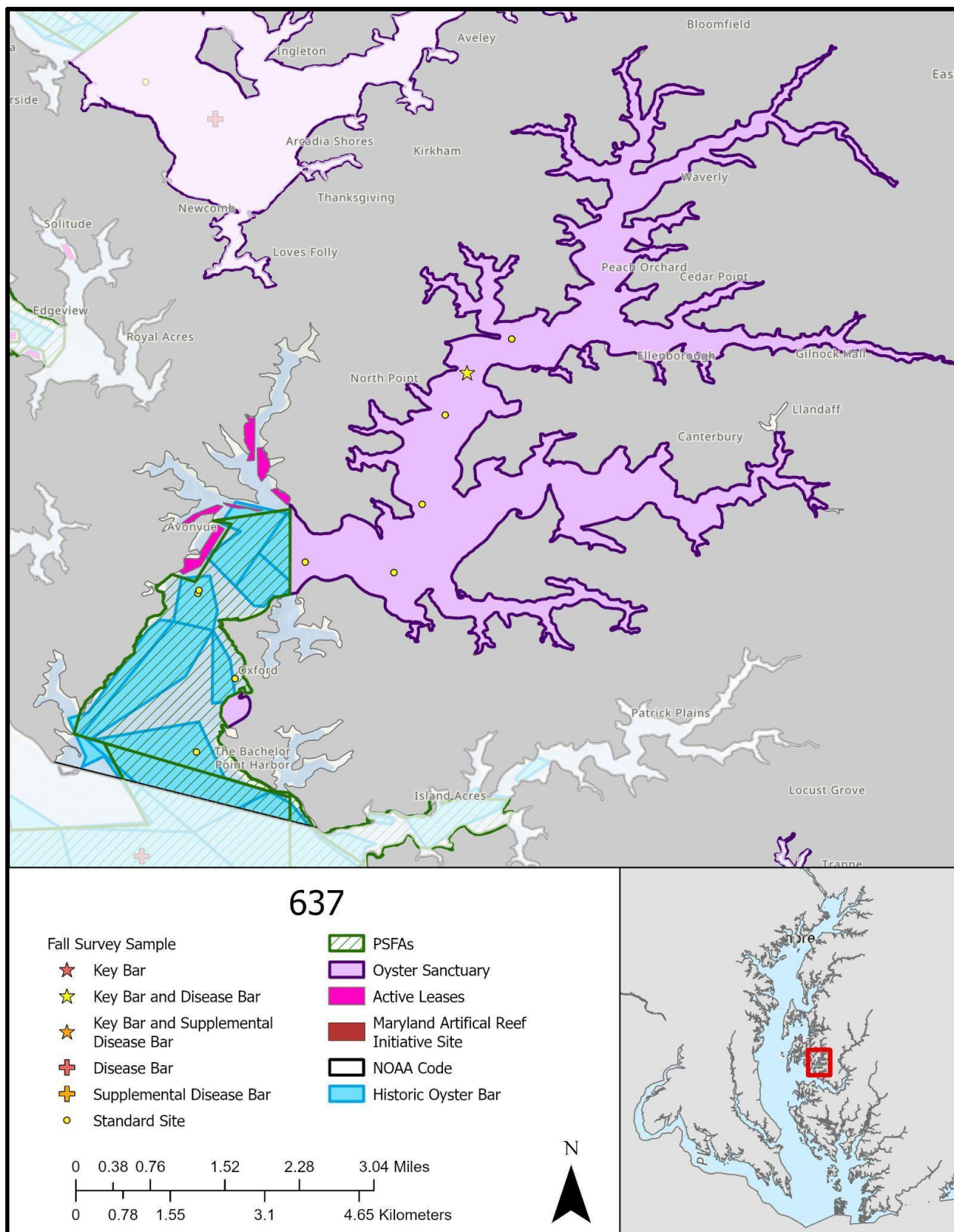


Figure B.39-1. Map of NOAA Code 637 (Tred Avon River). Fall Oyster Survey sites may not be sampled every year.

Table B.39-1. Oyster population characteristics based on the Fall Oyster Survey in NOAA Code 637 (Tred Avon River) occurring outside of the current sanctuary area. ND=No Data. Values given are annual mean $\pm$ standard error. Harvest is the five-year average from dealer-reported harvest reports.

Oyster Characteristic	2006-2010	2011-2015	2016-2020	2021-2025
Number of years sampled/number of samples	5/15	5/15	5/16	5/21
Number of Live Spat Oysters per square meter	3.2 $\pm$ 1	8 $\pm$ 3.7	36 $\pm$ 21	240 $\pm$ 77
Number of Live Small Oysters per square meter	5.2 $\pm$ 1.2	35.6 $\pm$ 10.3	34.5 $\pm$ 12	275 $\pm$ 67
Number of Live Market Oysters per square meter	25 $\pm$ 4.4	78 $\pm$ 12.3	56 $\pm$ 6.2	159 $\pm$ 32
Number of Live Oysters per square meter	33.2 $\pm$ 2.6	122 $\pm$ 17	127 $\pm$ 19	682 $\pm$ 135
Live Biomass (g Dry Weight per Bushel)	118 $\pm$ 55	ND	ND	145.5 $\pm$ 22
Observed Mortality (%)	8.8 $\pm$ 2	6.6 $\pm$ 1.5	8.3 $\pm$ 1.8	5.4 $\pm$ 0.9
Cultch (Bushels per 100 feet towed)	1.1 $\pm$ 0.2	1.6 $\pm$ 0.2	1.6 $\pm$ 0.3	2.4 $\pm$ 0.3
Harvest (Bushels)	125	1,451	2,106	3,046

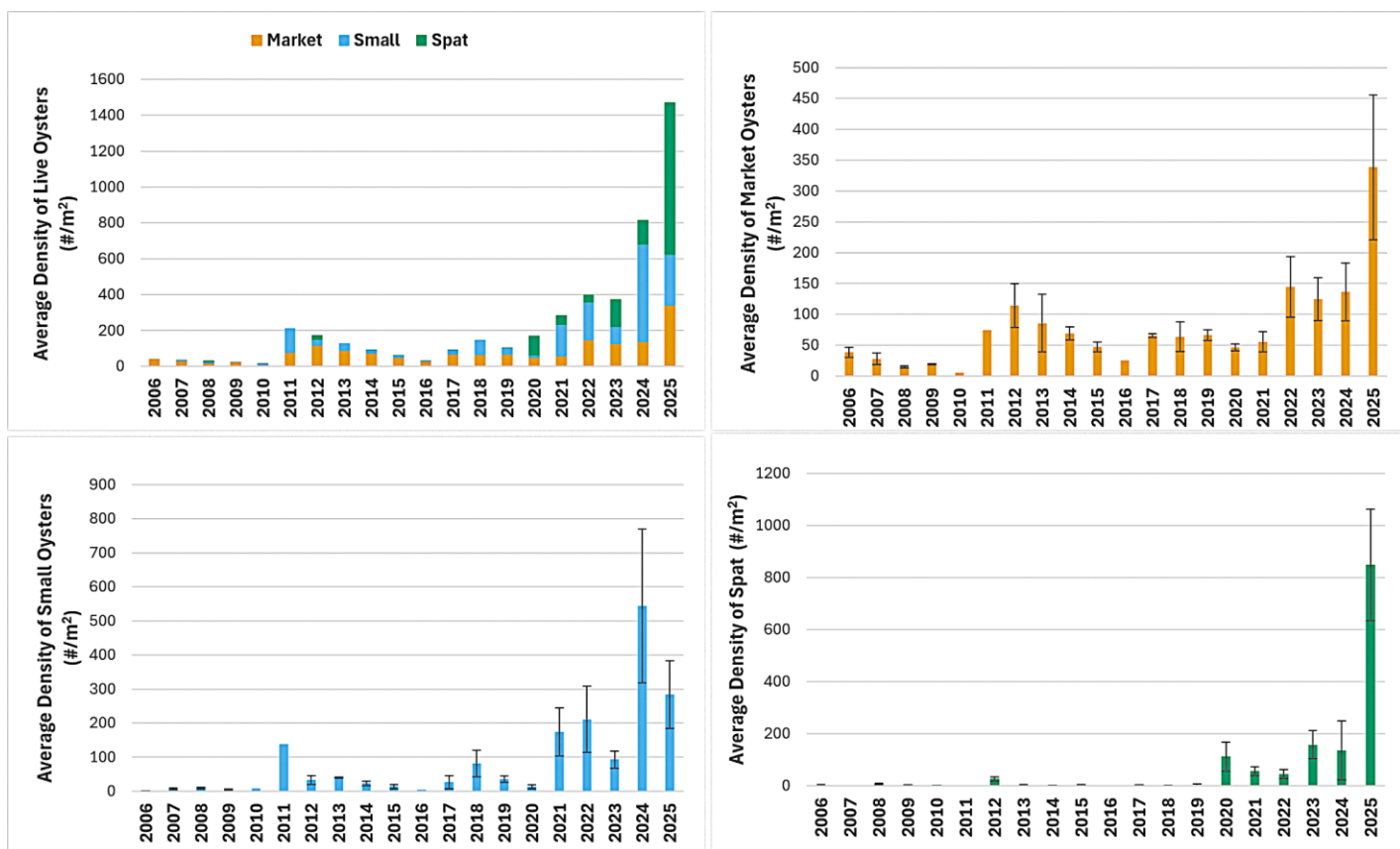


Figure B.39-2. Average number of live oysters per square meter by size class in NOAA Code 637 (Tred Avon River) occurring outside of the current sanctuary area. Error bars represent ± 1 standard error. Data from Maryland's Annual Fall Oyster Dredge Survey. Note differing Y-axis scales.

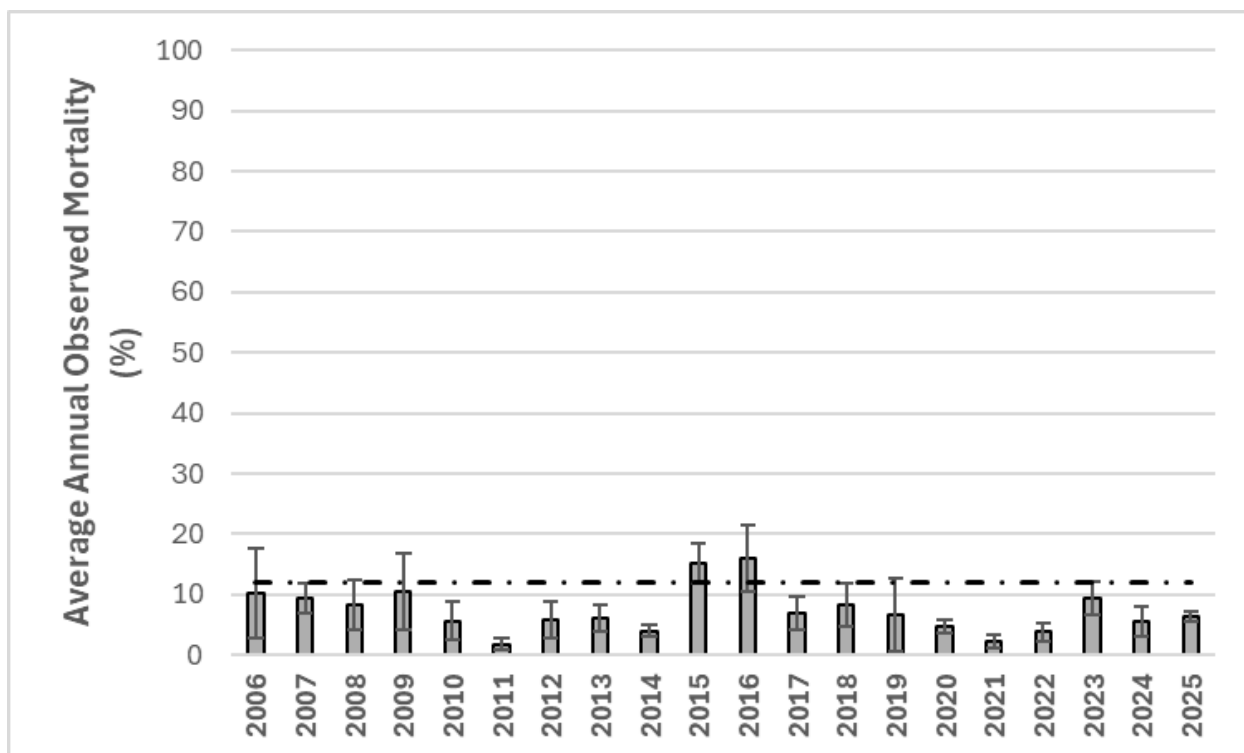


Figure B.39-3. Average annual observed mortality of market-sized and small-sized oysters in NOAA Code 637 (Tred Avon River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. The dashed line represents the 2006-2025 baywide average observed mortality. Error bars represent ± 1 standard error.

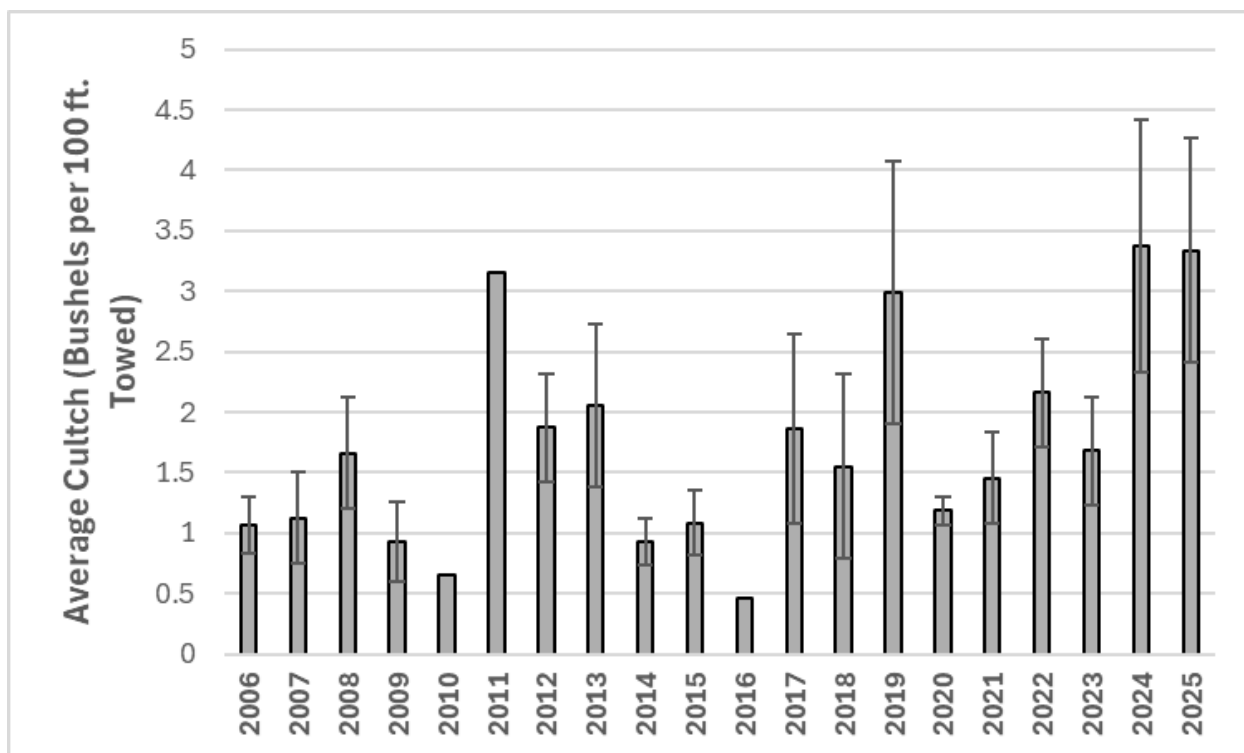


Figure B.39-4. Average cultch (live and dead oysters and loose shell) in NOAA Code 637 (Tred Avon River) occurring outside of the current sanctuary area. Data from Maryland's Annual Fall Oyster Dredge Survey. Error bars represent ± 1 standard error.

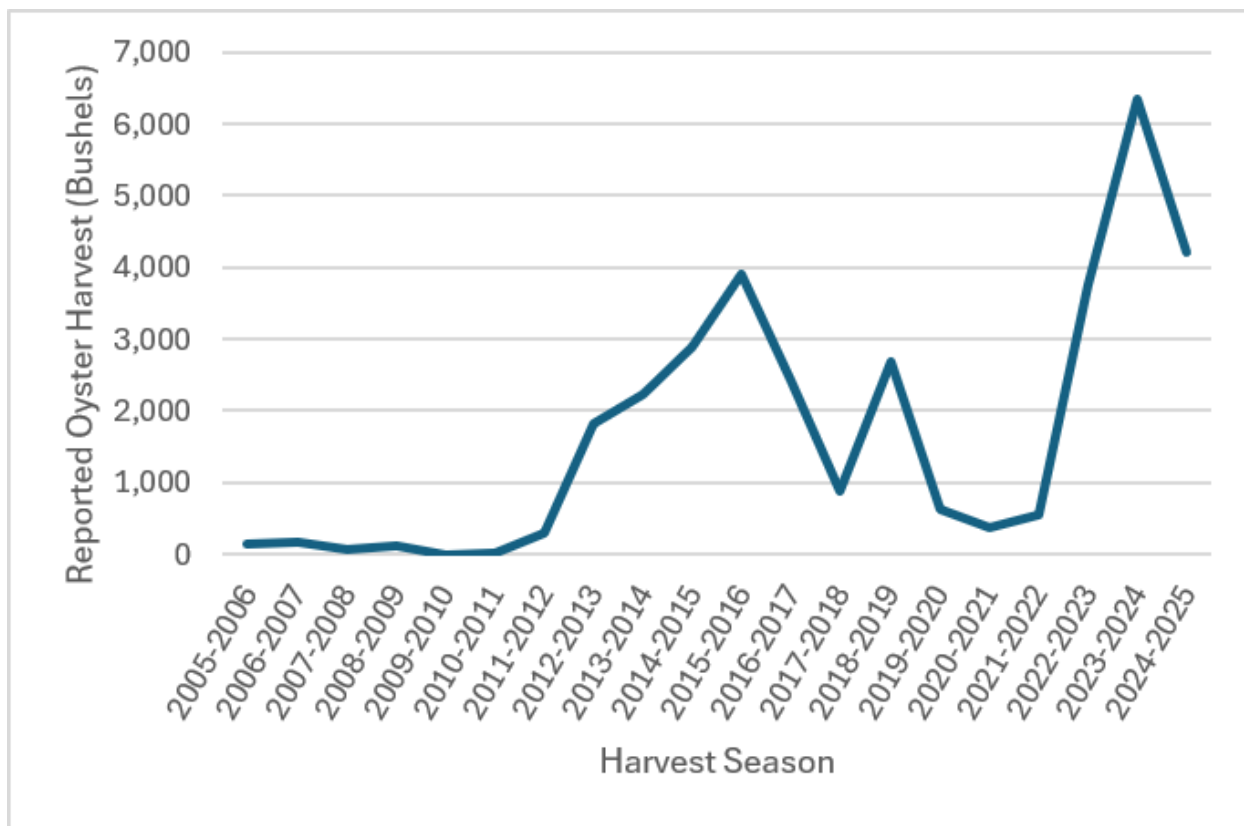


Figure B.39-5. Oyster harvest reported from seafood dealer buy tickets (harvest seasons 2005-2006 to 2024-2025) in NOAA Code 637 (Tred Avon River). Since 2010, 64% of the NOAA Code area has been a sanctuary where harvest is prohibited.