2023 Oyster Recruitment Study

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ABSTRACT

This observational study on oyster recruitment in the St. Mary's River has been implemented over multiple years, beginning with a pilot study in 2018. The goal is to use cost-effective methods to determine where substantial spat recruitment (hereafter spatfall) occurs. Understanding where spatfall occurs will aid decision makers in deciding where to establish reserve areas or to deploy substrate. In this way, industry can maximize investment and future harvest. An additional goal is to inform an expanding body of science regarding restoration efforts.

Spatfall in the St. Mary's River was measured throughout the lower seven miles of the tidal river at twelve sites inside and outside the sanctuary. We also measured spatfall at an additional site in Breton Bay (see Appendix A). Four "traps" (wire cages with 120 oyster shells each) were placed at each of these study sites in June and retrieved in October. As we have done in past years (2019 - 2022), we collected monthly water quality readings at each of the twelve sites in the St. Mary's River and counted the number of spat in and on the traps in November. Then, we compared 2023 spatfall and water quality to prior years.

The total number of spat collected in 2023 in the St. Mary's River traps was 14,696 - a decrease from the 2022 count of 17,111 spat. Total spatfall data for each study site revealed that five study sites had over 1,000 spat, and four had over 2,000 spat. Total spatfall decreased at nine sites and increased at three sites (Seminary, Portobello, and Cooper Creek) from 2022 to 2023. All five of the study sites with total spatfall above 1,000 were within or very close to the St. Mary's River sanctuary. However, Bryan, a site within the sanctuary, had a total spatfall of 573. Horseshoe had the highest total spatfall of all the sites while Goad had the lowest. The spatfall and water quality results from 2023 and prior years are examined in detail for five sites (Bryan, Horseshoe, Portobello, Coppage, and Mouth of Creek).

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INTRODUCTION

The Eastern Oyster (*Crassostrea virginica*), a once prevalent organism in the Chesapeake Bay, is now at less than 1% of its historic population (Newell, 1988). The population decline can be linked to destructive fishing practices (dredging) and over harvesting (Rothschild et al, 1994). Diseases such as Dermo (*Perkinsus marinus*) and MSX (*Minchina nelsoni)* have furthered the decline (Ford and Tripp, 1996). The Eastern Oyster's depletion has had far reaching impacts and has led many to work to re-establish the organism's prominence.

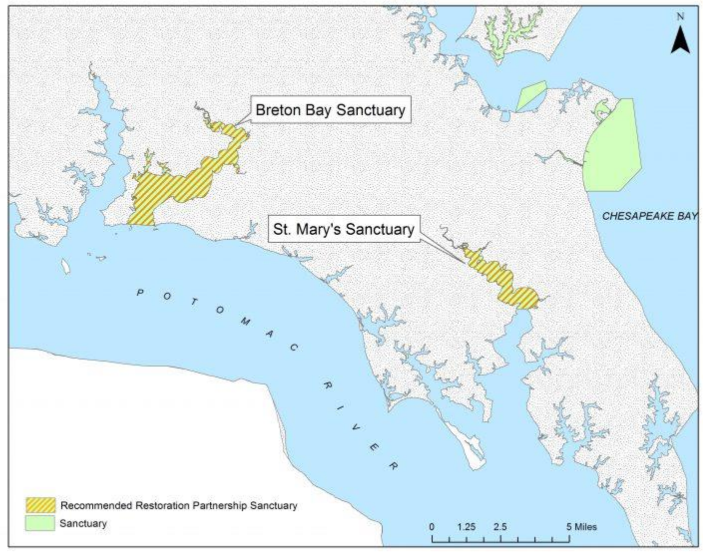

Figure 1. Map of Breton Bay and St. Mary's River shellfish sanctuaries as of 2017 (Source: MD DNR, 2017).

The St. Mary's River is a Tier 1 tributary with the necessary requirements to support oyster restoration, including adequate overall salinity, temperature, and dissolved oxygen levels (United States Army Corps of Engineers [USACE], 2012). The Upper St. Mary's River is one of fifty-one designated oyster sanctuaries in Maryland's portion of the Chesapeake Bay. The sanctuaries are of varying size and condition but represent the State's commitment to restore the Eastern Oyster population. The St. Mary's River shellfish sanctuary was first established on October 1, 2010 (Figure 1; Code of Maryland Regulations 08.02.04.15). The prohibition on harvest within the sanctuary has led to 1) the re-establishment of thriving oyster bars with multiple age classes, and 2) substantial oyster population growth—both in the overall area of reefs and animal density (Maryland Department of Natural Resources [MD DNR], 2021).

In 2022, Maryland celebrated the completion of the first phase of large-scale oyster restoration in the St. Mary's River shellfish sanctuary. The State of Maryland and its partners installed 9.7 acres of stone reefs and seeded 25.5 acres with spat-on-shell. SMRWA's 5-acre three-dimensional Oyster Reef Project, currently undergoing restoration, is immensely successful with water clarity and quality noticeably enhanced compared to ten years earlier. Ongoing scientific monitoring by St. Mary's College of Maryland (SMCM) and SMRWA confirms this success.

The fertilized larvae of breeding oysters swim and drift in the water column for about two weeks prior to seeking permanent residence. Several factors play a role in where larvae may settle. Localized currents (or lack thereof), tidal flows, and wind effects are believed to be significant factors in larval settlement (Rothschild et al., 1994). Scientific studies in areas with recurring moderate to high velocity current suggest larval drift distance is significant and recruitment can happen miles away. These currents are typically downriver for the Chesapeake Bay's tidal tributaries. The St. Mary's River has a weak current throughout most of the tidal estuary; some areas have recurring tidal flows and other areas have little current as a result of tidal rise and fall. In these areas, wind likely plays a greater role.

Another known factor is that reproduction is highly successful in areas with high density of adult oysters, which are areas with more than 150 animals per square meter (MD DNR Fishing and Boating Services, 2018). Conversely, areas with few oysters have very poor reproductive success. The lower St. Mary's paltry spatfall is likely due to the depleted stock and resulting low oyster density (less than 5 per square meter). The upper tidal stretch, containing the shellfish sanctuary, does recruit successfully, and the oyster biomass in this area has increased over the past ten years (MD DNR, 2021).

Data collected annually can inform the development and placement of shell-planted reserve areas or sanctuary areas that will have the best outcomes for the fishery. Some questions we seek to answer with this study are:

1. To what extent do larvae drift out of the sanctuary and recruit into the public fishery areas?
2. What areas of the public fishery receive the highest recruitment?
3. To what extent is successful recruitment a factor of larval drift and local adult oyster densities?
4. What other factors are important to know that might impact successful recruitment (i.e., weather factors, climate change, nutrient loading, algae blooms, chemical pollutants)?

SMRWA implements outreach programs such as the Marylanders Grow Oyster (MGO) program and the Living Reef Action Campaign, as well as other direct restoration related efforts within the St. Mary's River shellfish sanctuary. Additionally, they engage in or support research through a variety of different entities including local high school and college students, graduate students from regional institutions, and marine scientists. The five-acre Oyster Reef Project located adjacent to St. Mary's College of Maryland serves as a living classroom and enhances their curricular programming.

MATERIALS AND METHODS

The 2023 Recruitment Study measured spatfall at the same twelve sites as the 2022 Recruitment Study: Bryan, Horseshoe, Seminary, Portobello, Green Pond (also known as Gravelly Run), Cooper Creek, Priest Point, Thompson, Coppage, Goad (also known as Graveyard), Sage Point (also known as Gum Edge or Sedge Point), and Mouth of Creek (Figure 2; Table 1). A thirteenth study site in Breton Bay was added in 2022 and examined again this year (Appendix A).

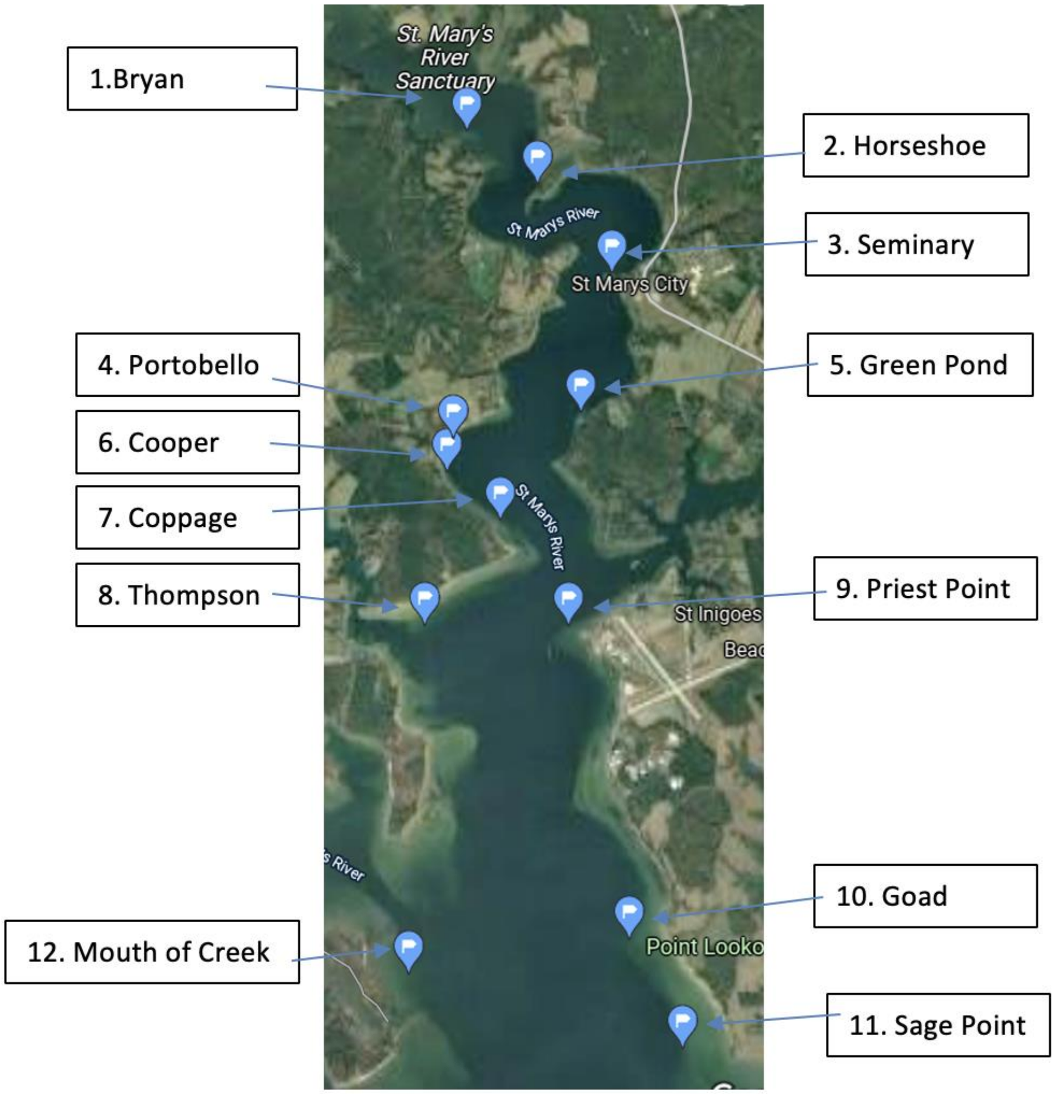

Figure 2. Map of study sites in the St. Mary's River and their corresponding numbers.

Table 1. Coordinates (Latitude and Longitude) and mean low water depth (m) of study sites. Note: coordinates for Priest Point changed from 38.15151°, -76.44261° in 2022.

Site	Latitude	Longitude	Depth (meters)
01. Bryan	38.20361°	-76.45626°	2.2
02. Horseshoe	38.19792°	-76.44672°	1.5
03. Seminary	38.18859°	-76.43687°	2.4
04. Portobello	38.17131°	-76.45811	3.1
05. Green Pond	38.17402°	-76.44096-7°	3.0
06. Cooper Creek	38.16773°	-76.45881°	3.0
07. Coppage	38.16256°	-76.45119°	3.0
08. Thompson	38.15158°	-76.46190°	2.3
09. Priest Point	38.15192°	-76.44185°	2.9
10. Goad	38.11855°	-76.43439°	2.8
11. Sage Point	38.10708°	-76.42731°	2.8
12. Mouth of Creek	38.11483°	-76.46398°	2.9

Forty-eight "traps" (wire cages measuring 12" x 18" x 8") were each filled with 120 wild grown, aged oyster shells selected for equivalent size, surface area, and no indication of spat scars. Shells were purchased from Shore Thing Shellfish, LLC, who had purchased them several years ago from Maryland Seafood. The shells are believed to be mostly from wild caught oysters from the St. Mary's River system and the nearby Potomac River. Prior to deployment, the shells were power washed inside the traps while the traps were rolled over several times. At each of the twelve sites, four survey traps were placed on the river bottom in a square pattern and spaced three meters apart (Photo 1). Chain of custody forms tracked the traps throughout the project.

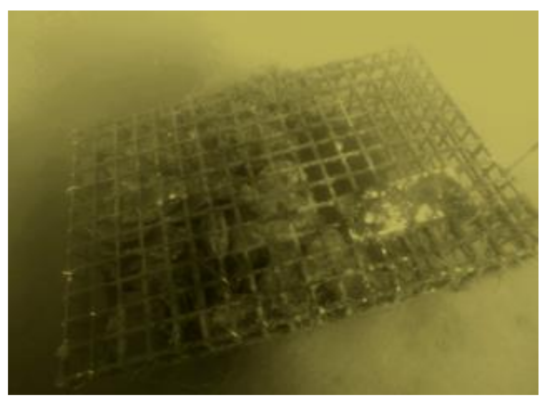

Photo 1. Underwater photo of trap deployed on river bottom.

Attached to one of the traps at each site was a buoy suspended in the water column to approximately one meter below MLW. In addition to the underwater buoy, a second surface-floating buoy was attached to an anchor and was placed next to one of the nearshore traps at each of the twelve sites. This way, if a passerby disturbed the floating buoy, it would not disturb the experiment. Each of the twelve floating buoys were labeled as follows:

DO NOT DISTURB
SCP202350
301-904-2387

The labeling indicated that the area should not be disturbed, our scientific collections permit number, and a cell phone number where we could be reached to address any concerns or questions.

Traps were deployed on May 31st, and GPS coordinates were recorded for the central location of each deployment at the twelve sites. Traps were checked monthly and water quality readings were taken on June 1st, July 1st, August 1st, September 1st, October 1st, and November 2nd. A Secchi disk and YSI PRO2030 were used to collect water quality readings. The YSI receives annual maintenance and was calibrated for dissolved oxygen prior to each monthly sampling of the twelve sites. Standardized field log sheets were used to record the data, and, in every case, a second set of eyes verified the datum entered for each parameter.

Traps were retrieved on October 23rd and 24th (Photo 2). Upon collection, each trap was labeled both internally and externally with a tag that indicated the study site and trap identifier (A, B, C, or D). The traps were taken to a holding area at the SMCM waterfront where they were temporarily placed in shallow water on hardwood pallets. Each shell within the traps was inspected for spat, and a standardized field log sheet was used to record the presence of live and dead spat (referred to as "box"). Spat were measured in three size groupings: equal to and under 10 mm, 11 mm to 25 mm, and over 25 mm using rulers. Our analysis and graphs depict the size groupings, not the actual measurements. Counters included Meredith Nishiura, Bob Lewis, Emma Green, Norm O'Foran, Shelly O'Foran, William Faller, Anna Culver, Elaine Symkowiak, Will Gates, and Emerson Schaefer. All volunteer counters were trained and, in all cases, an inexperienced worker was paired with an experienced person. Spat counting occurred on October 28th and 30th and November 1st, 3rd, 6th, 8th, 10th, 11th, 13th, and 15th. Counting on October 28th occurred at the St. Mary's County STEAM Fair (Photo 3), where students from local schools observed and aided in the counting process. Any counts proposed by students were verified by experienced counters.

Photo 2. Oyster cages immediately after retrieval.

Please note that total spatfall includes both live and box, along with loose spat not attached to any shell, but still in or attached to the trap. In the description of the results, each site's total spatfall is reported by size grouping and by live and box/dead count. Mortality was also calculated for each site by dividing the number of boxed spat by the total spatfall (live and box).

Photo 3. Meredith Nishiura and William Faller demonstrate counting spat at the STEAM festival on October 28th.

Our permit required us to remove the traps prior to November 1st, which is opening day for public harvest with dredges. The study area is not usually harvested during the hand tong season in October. In some years, the breeding season does linger well into October.

The dataset will be shared with decision makers—DNR Shellfish Division, St. Mary's County oyster committee, scientists at St. Mary's College of Maryland—and made publicly available through our website http://www.SMRWA.org.

RESULTS

Total Spatfall

In 2023, there was a 14.1 % decrease in oyster recruitment compared to 2022 (2022: 17,111 spat; 2023: 14,696 spat). However, total spatfall for 2023 was still higher than the four years prior to 2022 (2018, 2019, 2020, and 2021). Spatfall in 2023 was 38.8 % higher than in 2021, which had the highest spatfall of the first four study years. Therefore, spatfall in 2023 remains most comparable to that in 2022, the highest recorded spatfall, and the decrease does not represent a return to recruitment levels prior to 2022 (Figure 3; Figure 4). The general trend of more spatfall closer to or within the sanctuary (Figure 3) is consistent over the six years of observations. Compared to 2022, nine of the twelve study sites had a decrease in total spatfall. Three sites, Seminary, Portobello, and Cooper Creek, had higher spatfall in 2023 (Figure 3; Figure 4).

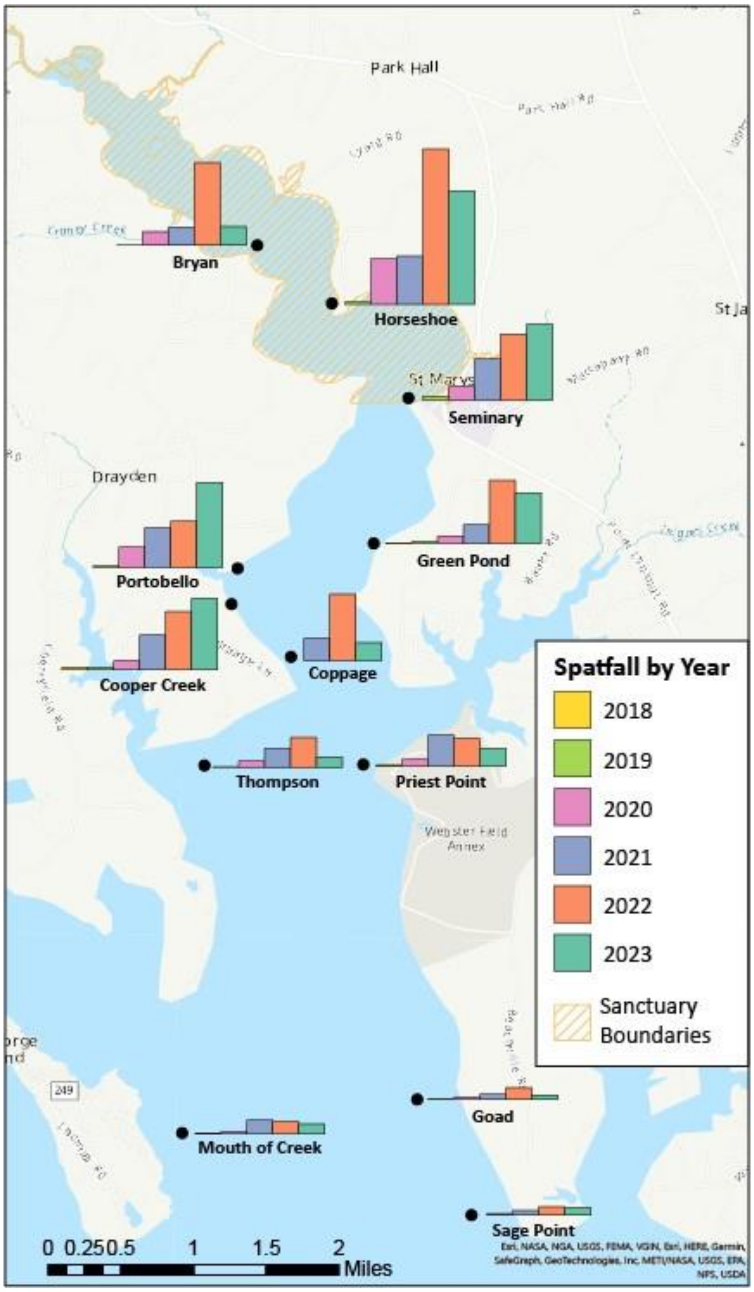

Figure 3. Locations of the twelve study sites with total spatfall for each year that the study was conducted at a given site. The map also includes the boundaries of the St. Mary's River Oyster Sanctuary.

The total spatfall decrease from 2022 to 2023 could be attributed to a variety of factors. According to the Maryland Department of Natural Resources (MD DNR) 2023 Oyster Stock Assessment, the St. Mary's River is one of only two NOAA codes in the Chesapeake Bay where harvesting has exceeded the upper sustainability limit for four or more consecutive seasons. These unsustainable practices could have depleted the reproductive population and decreased spatfall. Additionally, summer 2023 was characterized by an extended period of drought and subsequent increase in salinity. The higher salinity could have resulted in an increase in mobile predators traditionally not found in the St. Mary's River. As an example of the St. Mary's River's change in community composition, we observed a seahorse, an uncommon occurrence, while collecting recruitment study cages in the fall (Photo 4). This atypical community could have increased predation on oyster larvae or small spat not visible to the naked eye and caused the decrease in spatfall from 2022 to 2023. Finally, summer 2022 had unusually high air temperatures in June that were reflected in high water temperatures (Cox, 2023). These warm conditions could have instigated an earlier start to spawning in 2022 and thus extended the spawning period. Lower June temperatures were recorded in 2023, so it is possible that reproduction occurred over a shorter period than in 2022, resulting in lower spatfall.

Photo 4. Seahorse observed at cage retrieval in fall 2023.

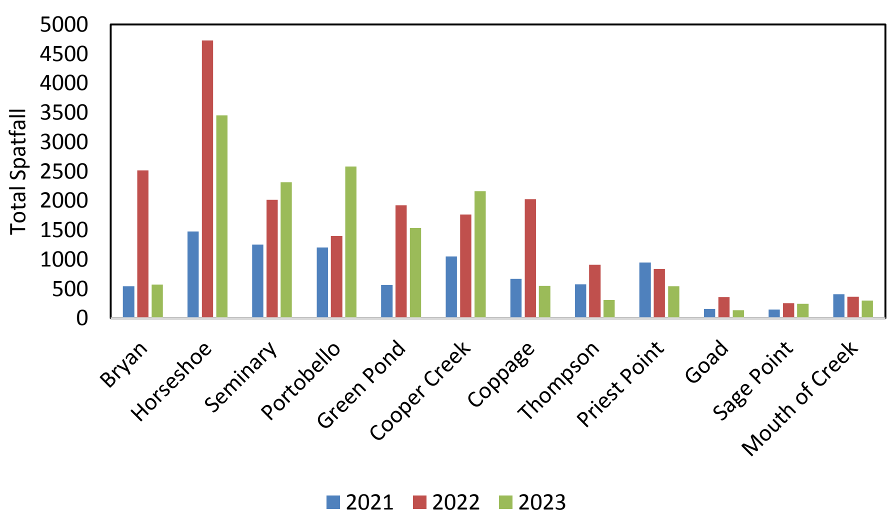

Figure 4. Comparison of 2021, 2022, and 2023 total spatfall counts. All but three sites (Seminary, Portobello, and Cooper Creek) had lower counts in 2023 than the previous year 2022.

Mortality

When data were aggregated for all sites in 2023, 83.5 % of spat were live and 16.5 % were dead (subsequently referred to as "box"). All study sites except for Portobello varied from 5.4 % to 20.7 % mortality (Figure 5). *Stylochus* were noted several times during the counting process although their observed abundance was not different from previous years. The highest mortality (40.4 %) was observed at Portobello. High mortality at Portobello may have been affected by the abundance of anoxic (black) mud present in the cage at retrieval (Photo 5). A change in the orientation of the cage on the river bottom could have submerged spat in mud and led to suffocation. Anoxic mud in high quantities was not observed at any of the other sites upon retrieval.

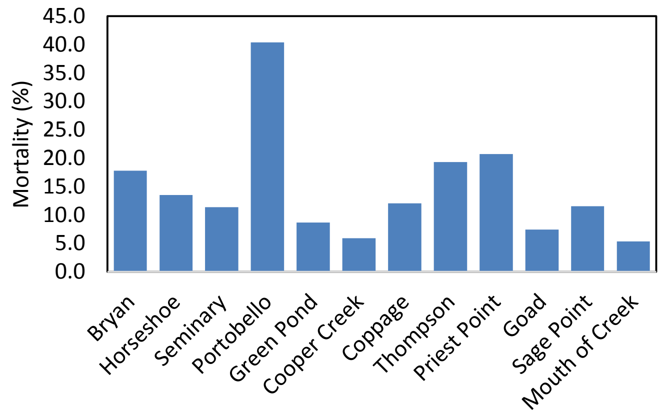

Figure 5. Percent mortality for each site in 2023. Mortality (%) was calculated by dividing the number of boxed spat by the total spatfall at the site.

Sites that experienced the lowest dissolved oxygen—Seminary, Sage Point, and Goad—did not similarly experience high levels of mortality. None of these low-oxygen events occurred over multiple monthly sampling events, suggesting that prolonged hypoxia (dissolved oxygen readings of less than 2 mg/L) was not a major cause of mortality.

Photo 5. Anoxic mud on Portobello cage at retrieval.

Spatfall by Size

Of the total spatfall by size, 11.9 % were 10 mm or less, 35.6 % were 11-25 mm, and 52.5 % were above 25 mm. Of the total live spatfall, the majority (58.8 %) were greater than 25 mm. The intermediate size class (11- 25 mm) accounted for 33.7 % of the total live spat while 6.3 % were less than 10 mm (Figure 6). The size distribution for total box spatfall differed from total live spatfall (Figure 7). Of the box spatfall, 40.9 % were less than 10 mm, 45.1 % were 11 – 25 mm, and only 14.3 % were over 25 mm. The majority of the box spat (86.0 %) died before they reached 25 mm (Figure 7).

The size distribution of live spatfall suggests that spawning occurred more than once over the summer and fall. Similar to other areas of the Chesapeake Bay, it is likely that the spawn began in June and that spawning continued through July or August in localized areas. Several very small spat (under 5mm) were observed, suggesting a minimal late September-October spawn did occur.

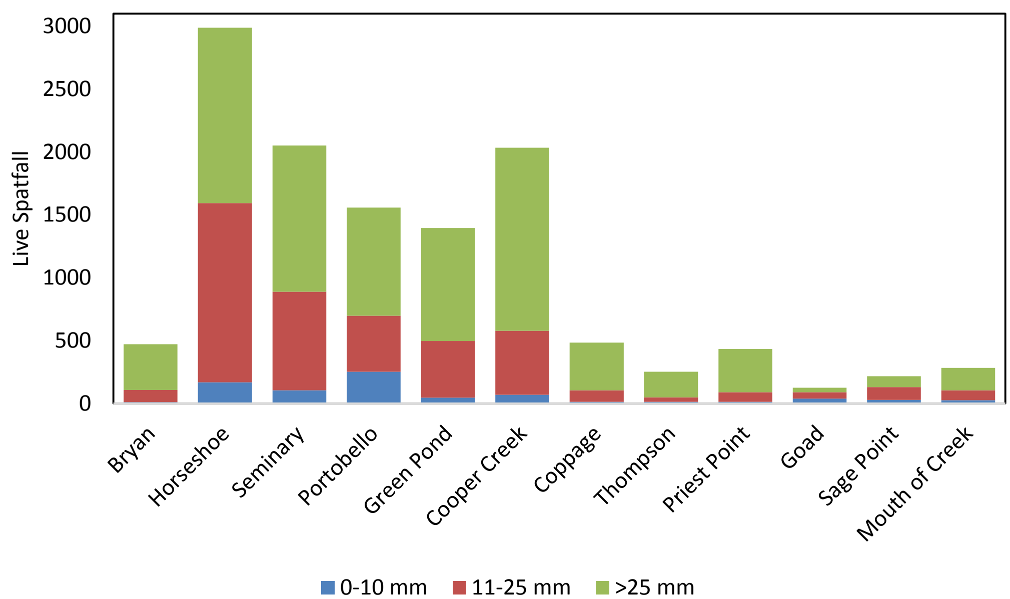

Figure 6. Comparison of live spatfall by size groupings in 2023.

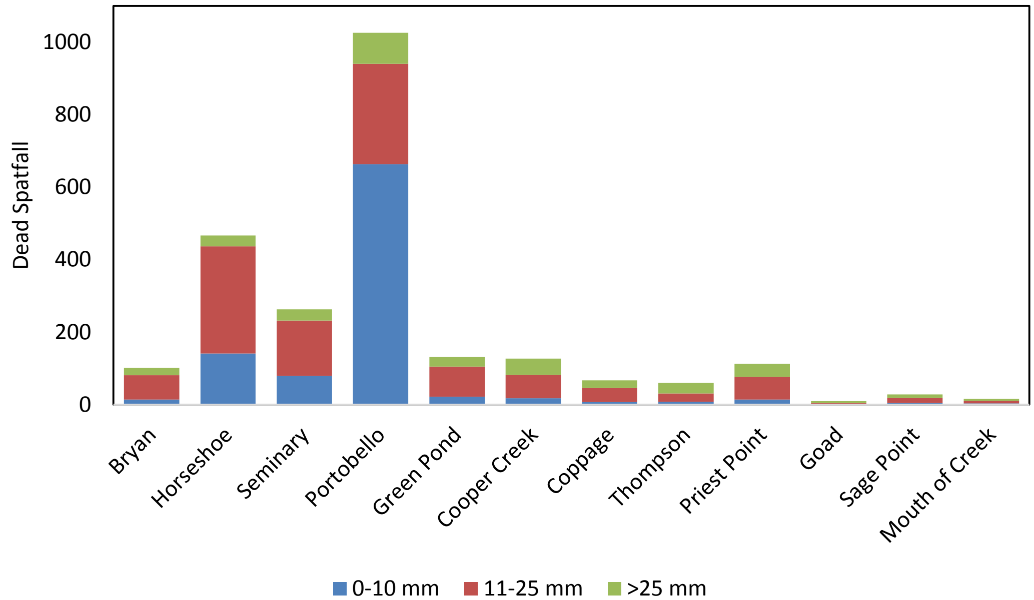

Figure 7. Comparison of box spatfall by size groupings in 2023.

<u>Water Quality</u>

Summer 2023 was characterized by an atypical period of drought. According to the U.S. Drought Monitor, areas of St. Mary's County experienced moderate drought for sixteen consecutive weeks between March 28th and July 11th, the longest sustained period of drought in the county since 2012 (U.S. Drought Monitor, 2023). Salinity (ppt) readings reflect these conditions. Bottom salinity increased at all sites from June to November compared to previous years and exceeded 16 ppt at all sites by November. At five sites, bottom salinity met or exceeded 17 ppt. When compared to previous years, salinity in 2023 was higher, especially in the early months of the summer. For example, salinity in June of 2023 was an average of 3.89 ppt higher than in June of 2022 (2022: 8.36 ppt; 2023: 12.25 ppt). In 2023, the highest bottom water salinity recorded was 17.3 ppt at Goad in November. The lowest salinity recorded was 12.0 ppt at Bryan in June.

Dissolved oxygen (mg/L) at the river bottom was similar in 2022 and 2023 and generally higher than in previous study years. High dissolved oxygen in 2023 can potentially be attributed to drought conditions and subsequent lack of nutrient pollution to incite major algal blooms. Seven sites experienced their lowest bottom dissolved oxygen in August and four sites experienced their lowest bottom dissolved oxygen in September. Horseshoe and Bryan experienced their lowest dissolved oxygen in June, 4.16 and 6.21 mg/L respectively. Near-hypoxic conditions were observed at three sites in August: Seminary with 2.32 mg/L, Sage Point with 3.49 mg/L, and Goad with 3.56 mg/L. Dissolved oxygen levels at these sites increased incrementally in September before reaching pre-event levels in October.

In the report by the USACE, "Chesapeake Bay Oyster Recovery: Native Oyster Restoration Master Plan," the authors suggest a minimum mean dissolved oxygen of 5.00 mg/L from June to August for successful oyster restoration. (USACE, 2012). Dissolved oxygen remained above 5.00 mg/L on the days on which readings were taken except for Bryan in June; Seminary, Sage Point, and Goad in August; and Horseshoe and Seminary in September. Dissolved oxygen during the time in between water quality readings is unknown.

Bottom water temperatures (°C) were similar in 2022 and 2023. The highest temperature was 29.4 °C at Bryan on August 1st and the lowest temperature was 14.7 °C at Sage Point on November 1st.

SELECTED STUDY SITE OBSERVATIONS

In 2023, spatfall decreased at nine sites and increased at three sites (Seminary, Portobello, and Cooper Creek), disrupting the pattern of increasing spatfall year-after-year (Figure 4). When oyster density was surveyed in 2019, the five sites in the lowest part of the tidal river (Thompson, Priest Point, Goad, Sage Point, and Mouth of Creek) had less than 5 oysters per square meter. The three sites in the sanctuary (upper river) had oyster densities that were much higher, exceeding 150 oysters per square meter at Bryan and Seminary. Oyster density did not necessarily correlate with spatfall.

Bryan

Bryan had a 77.4 % decrease in spatfall from 2022, with 573 spat (Photo 6; Figure 8). Mortality at Bryan was the fourth highest of the study sites, at 17.3 % (Figure 5). We observed a high amount of polychaete tube casings on shells at this site (Photo 7). Although the exact species of polychaete is unknown, other species such as *Polydora cornuta* can develop large colonies with the ability to reduce water flow within cages (Hood et al, 2020). It is possible that these polychaetes lowered spatfall at Bryan by reducing water flow or competing with spat for substrate.

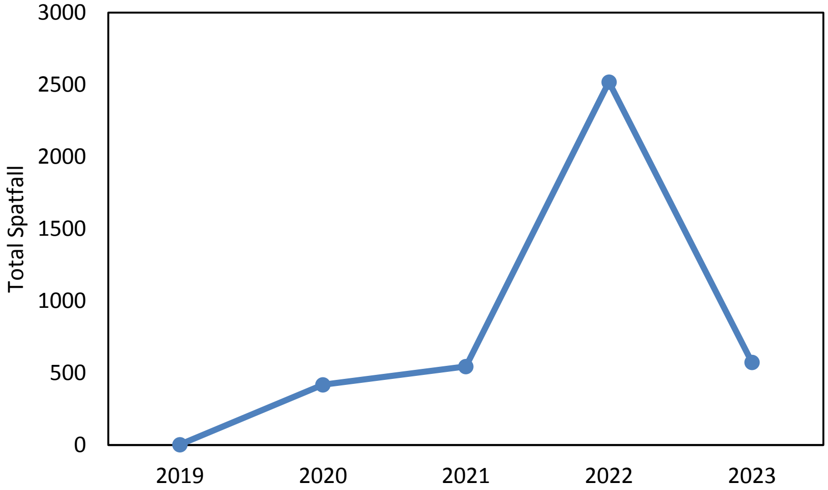

Figure 8. Total spatfall from 20192023 at Bryan.

Salinity (parts per thousand [ppt]) at Bryan was higher in 2023 than previous years, and temperature (°C) was lower in June of 2023 than in June of 2022 (Figure 9; Figure 10). Dissolved oxygen (mg/L) declined in June and September (Figure 11).

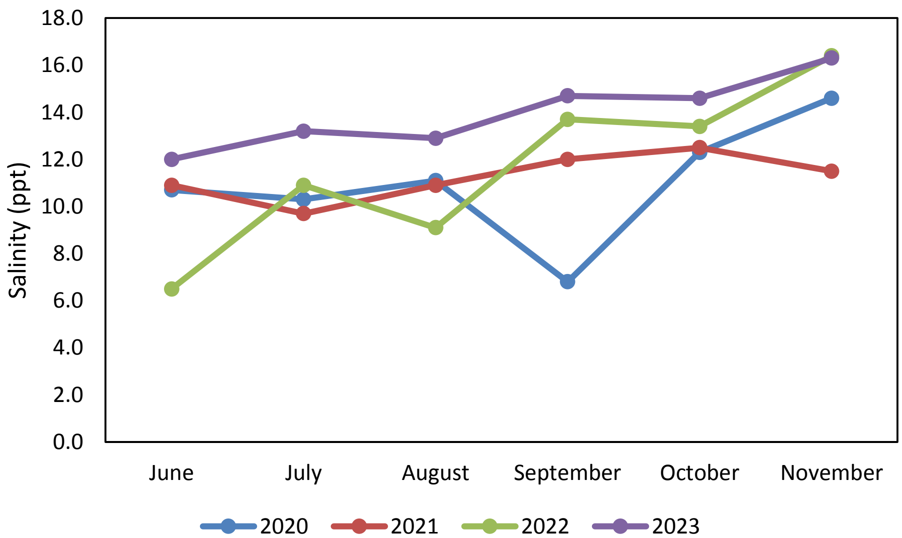

Figure 9. Bottom salinity (parts per thousand [ppt]) measurements from June-November 2020-2023 at Bryan.

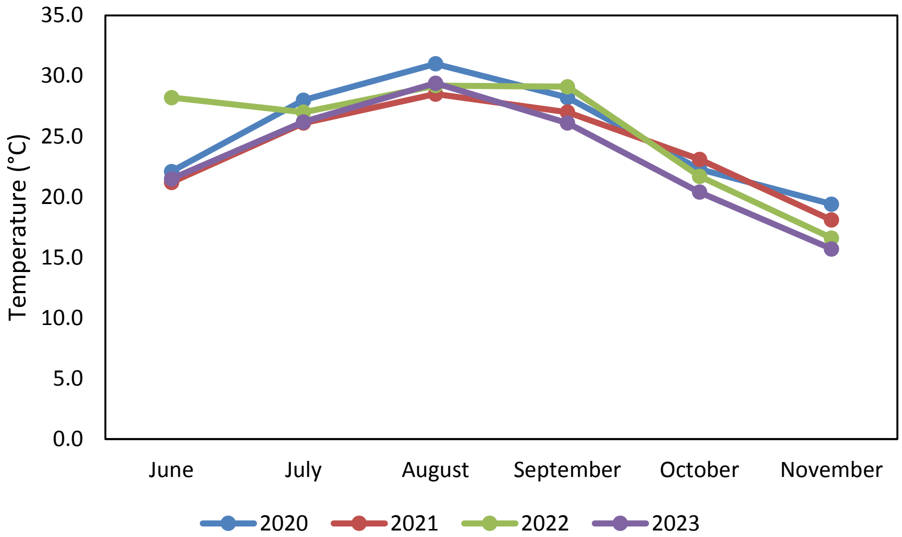

Figure 10. Bottom temperature (°C) measurements from June-November 2020-2023 at Bryan.

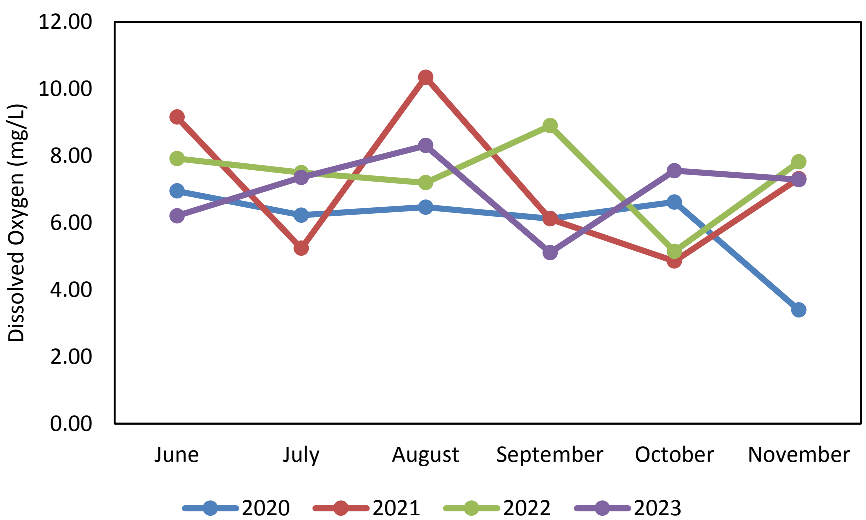

Figure 11. Bottom dissolved oxygen levels (mg/L) from June-November 2020-2023 at Bryan.

Photo 6. Spat on shell at Bryan.

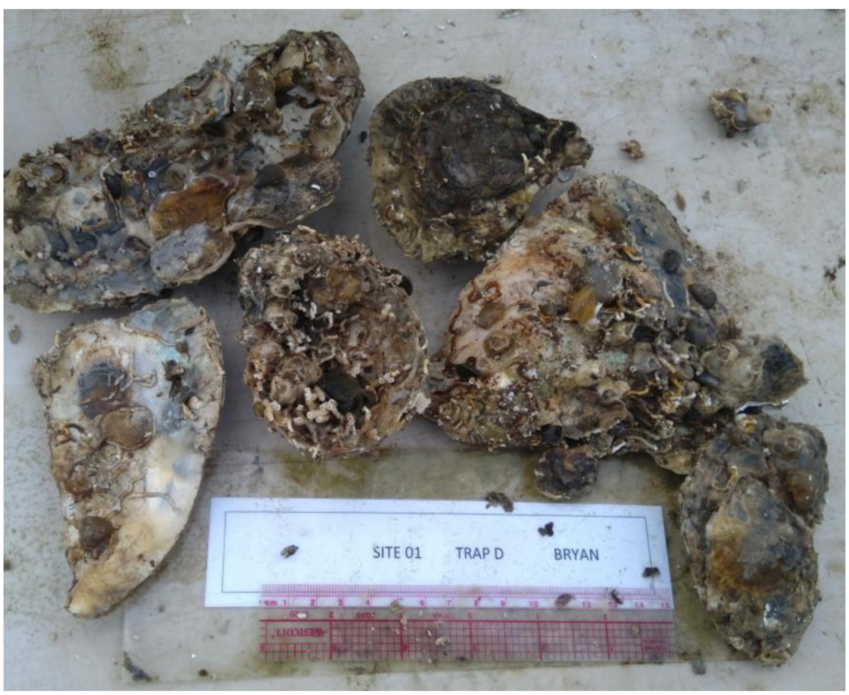

Photo 7. Spat on shell with worm casings at Bryan.

Horseshoe

Horseshoe had a 26.9 % decrease in spatfall from 2022, with 3,456 total spat (Photo 8; Figure 12), which was the highest spatfall of all sites in 2023. It had the fifth highest mortality at 13.5 % (Figure 5).

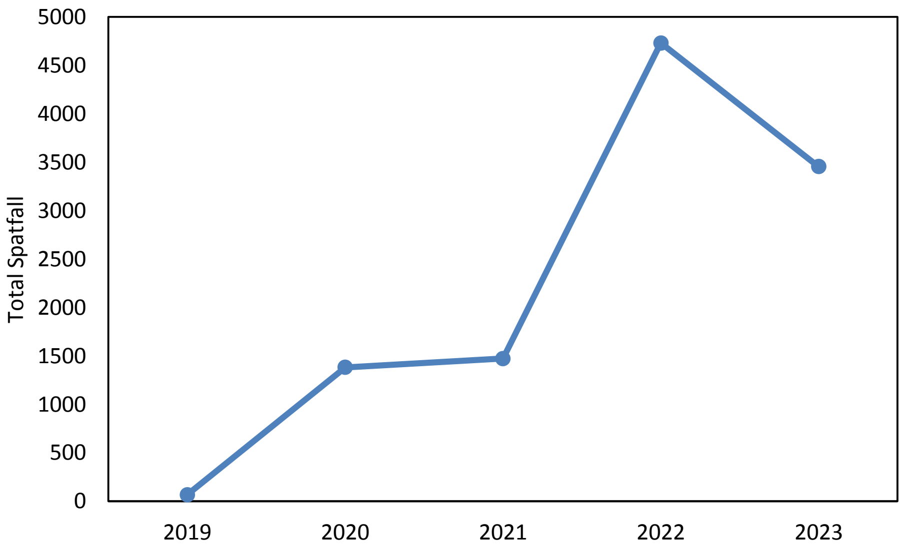

Figure 12. Total spatfall for 2019-2023 at Horseshoe.

Temperature (°C) at Horseshoe remained consistent with previous years from June through November (Figure 14). Dissolved oxygen (mg/L) was below 5.00 mg/L in June and September (Figure 13). Salinity (ppt) was higher than in previous years (Figure 15).

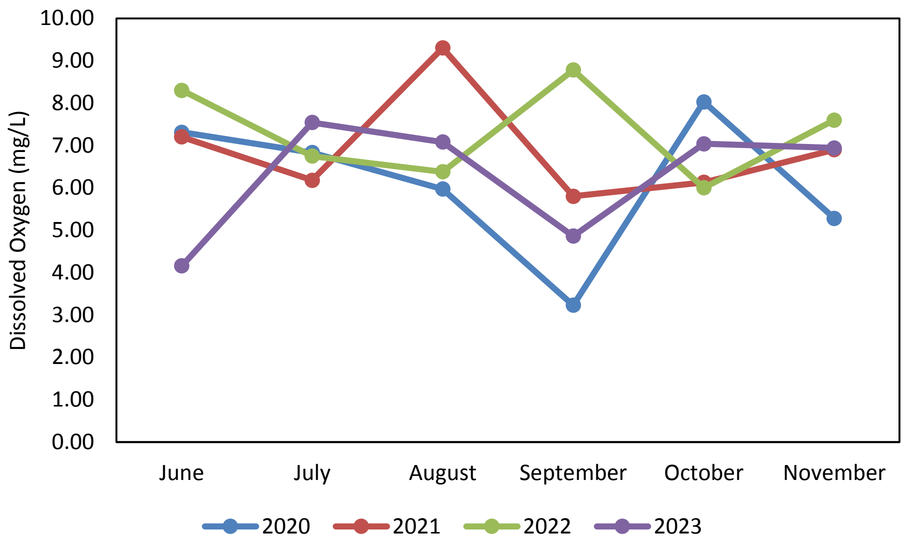

Figure 13. Bottom dissolved oxygen (mg/L) from June to November of 2020-2023 at Horseshoe.

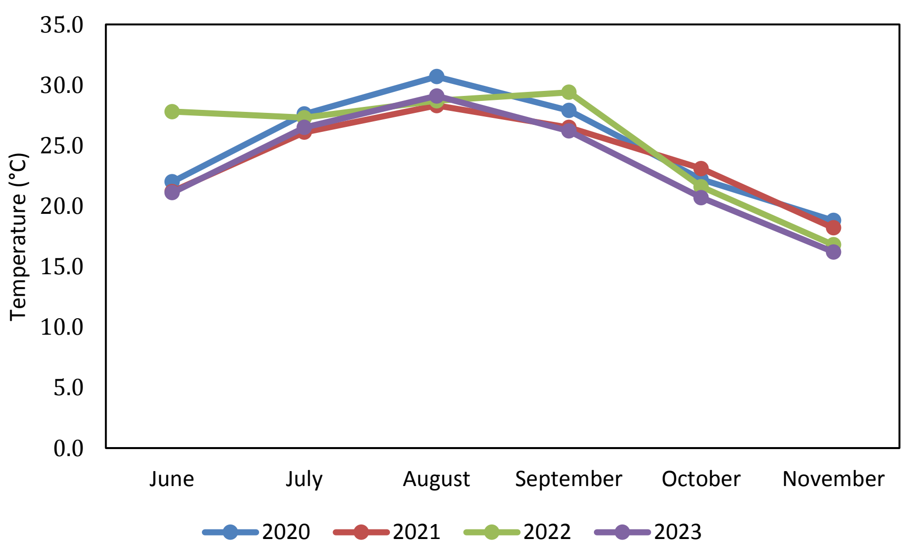

Figure 14. Bottom temperature (°C) measurements from June-November 2020-2023 at Horseshoe.

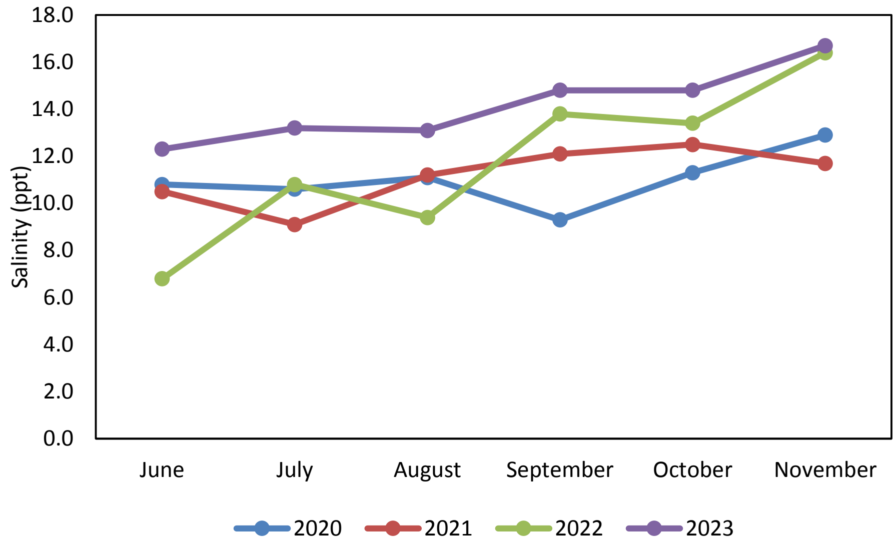

Figure 15. Bottom salinity (ppt) measurements from June-November 2020-2023 at Horseshoe.

Photo 8. Spat on shell at Horseshoe.

Portobello

Portobello had a total spatfall increase of 84.5 %, with a total of 2,585 spat (Photo 9; Figure 16). However, Portobello had the highest mortality at 40.4 % (Figure 5). High amounts of anoxic mud were noted upon retrieval of the cages, which could have contributed to the high mortality.

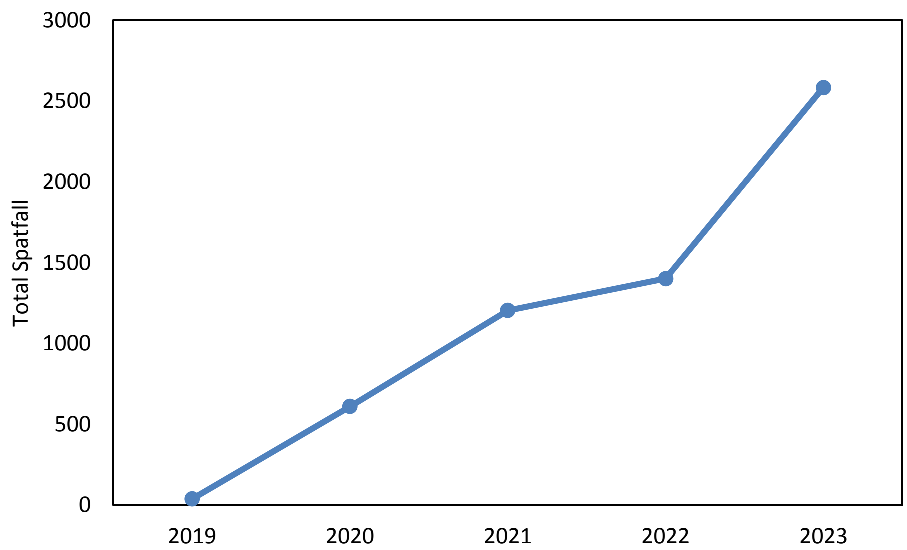

Figure 16. Total spatfall for 2019-2023 at Portobello.

Temperature (°C) at Portobello was consistent with previous years (Figure 17). Dissolved oxygen (mg/L) remained above 5.00 mg/L for all measurements in June through November (Figure 18). Salinity (ppt) was higher than in previous years (Figure 19).

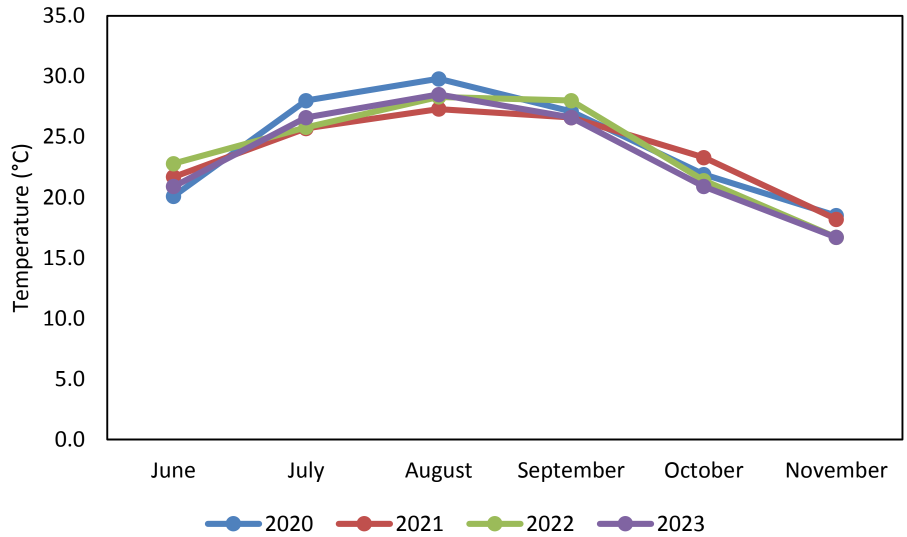

Figure 17. Bottom temperature (°C) measurements from June-November 2020-2023 at Portobello.

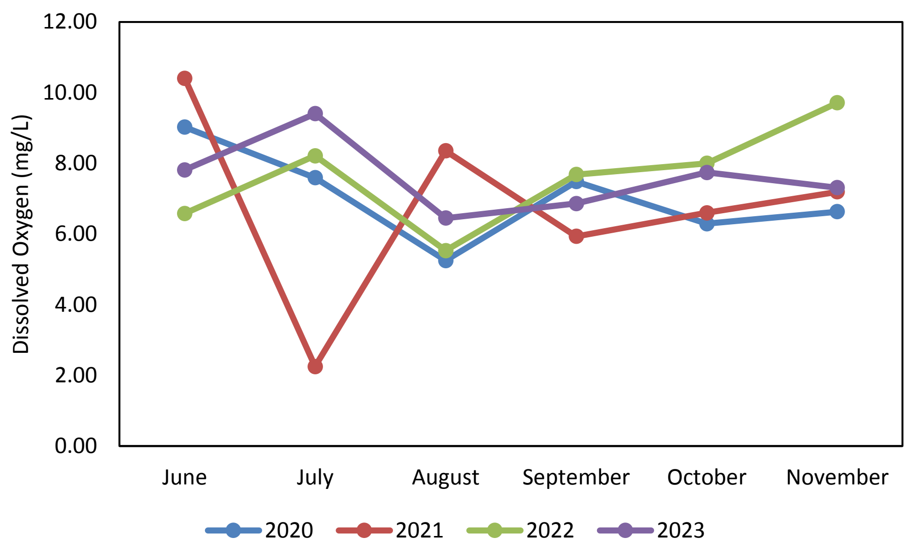

Figure 18. Bottom dissolved oxygen levels (mg/L) from June-November 2020-2023 at Portobello

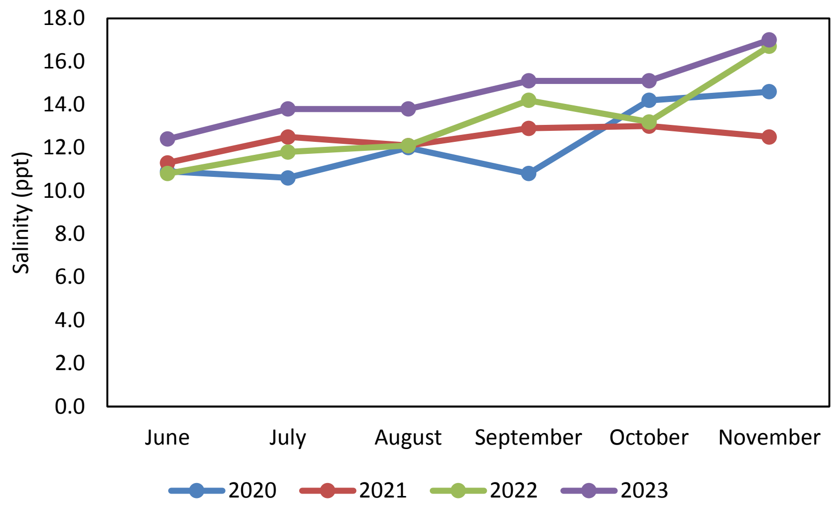

Figure 19. Bottom salinity (parts per thousand [ppt]) measurements from June-November 2020-2023 at Portobello.

Photo 9. Spat on shell at Portobello.

Coppage

Coppage had a 72.9 % decrease in spatfall from 2022, with a 549 total spat (Photo 10; Figure 20). The mortality at Coppage was 12.0 % (Figure 5). The data for total spatfall in 2020 are unavailable because traps were lost that year.

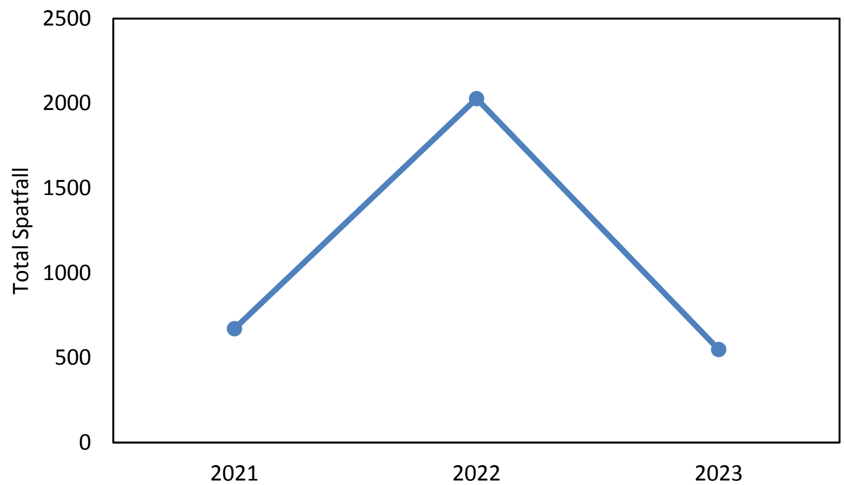

Figure 20. Total spatfall for 2021-2023 at Coppage (data from 2020 are unavailable).

Dissolved oxygen (mg/L) remained above 5.00 mg/L at each monthly reading (Figure 21), and temperature (°C) was consistent with previous years (Figure 22). As with other sites, salinity (ppt) at Coppage in 2023 was higher than in past study years (Figure 23).

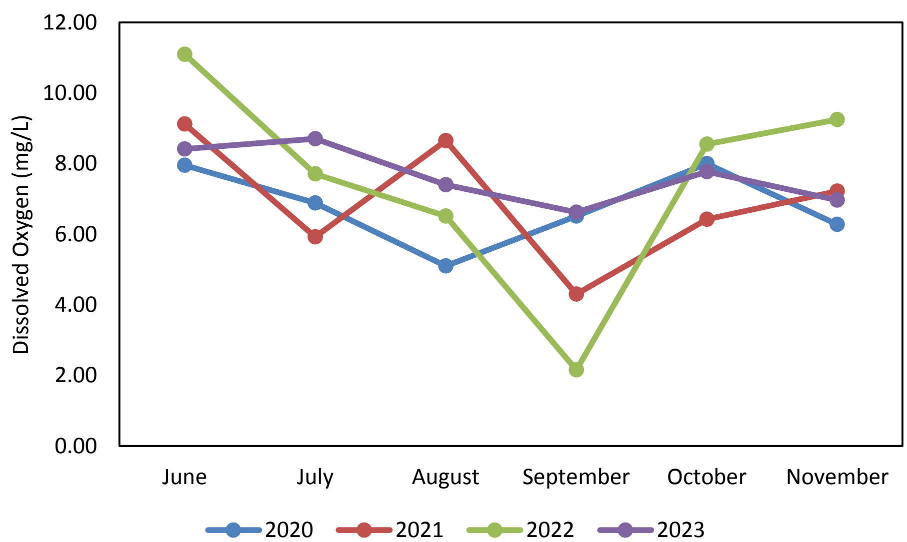

Figure 21. Bottom dissolved oxygen levels (mg/L) from June-November 2020-2023 at Coppage.

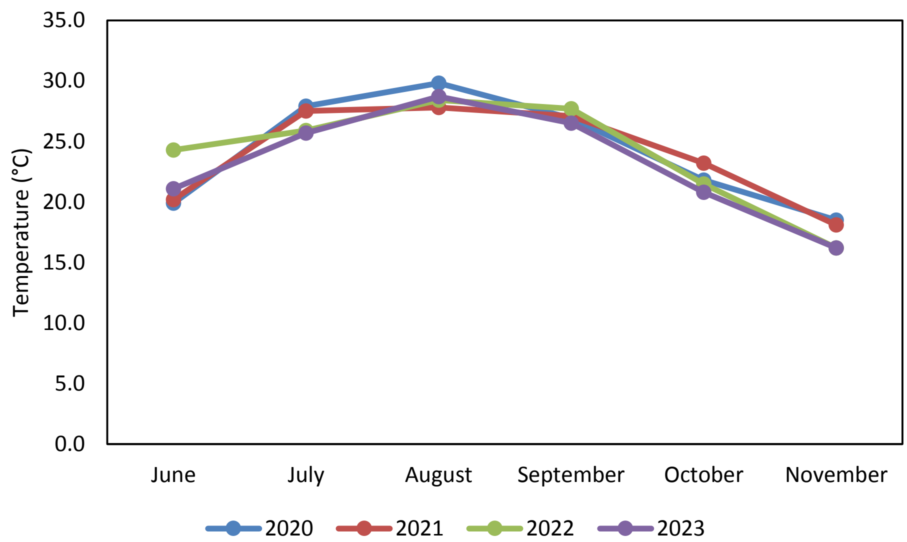

Figure 22. Bottom temperature (°C) measurements from June-November 2020-2023 at Coppage.

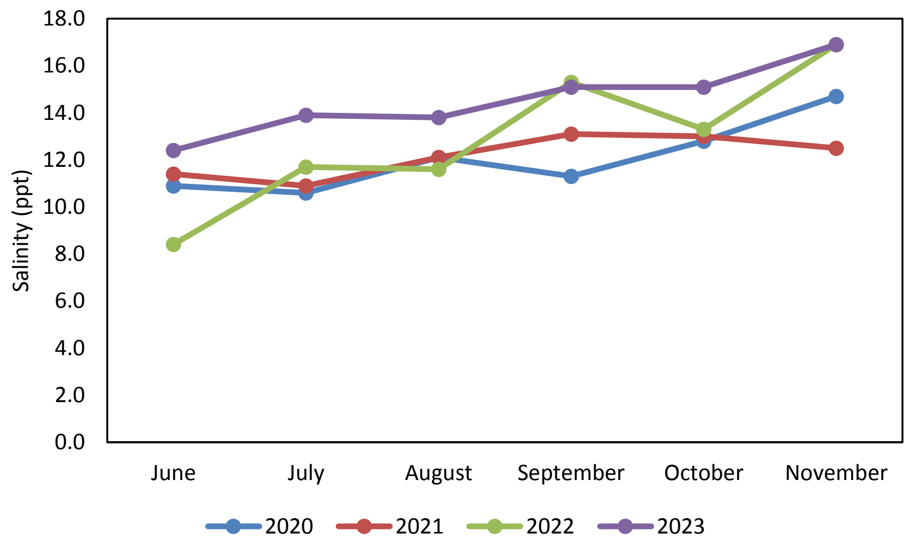

Figure 23. Bottom salinity (ppt) measurements from June-November 2020-2023 at Coppage.

Photo 10. Spat on shell at Coppage.

Mouth of Creek

Spatfall at Mouth of Creek decreased by 18.3 % The total spatfall was 299 (Photo 11; Figure 24), which is the third lowest total spatfall at any site in 2023 (Figure 4). Mortality was 5.4 % and was the lowest mortality of all twelve study sites (Figure 5).

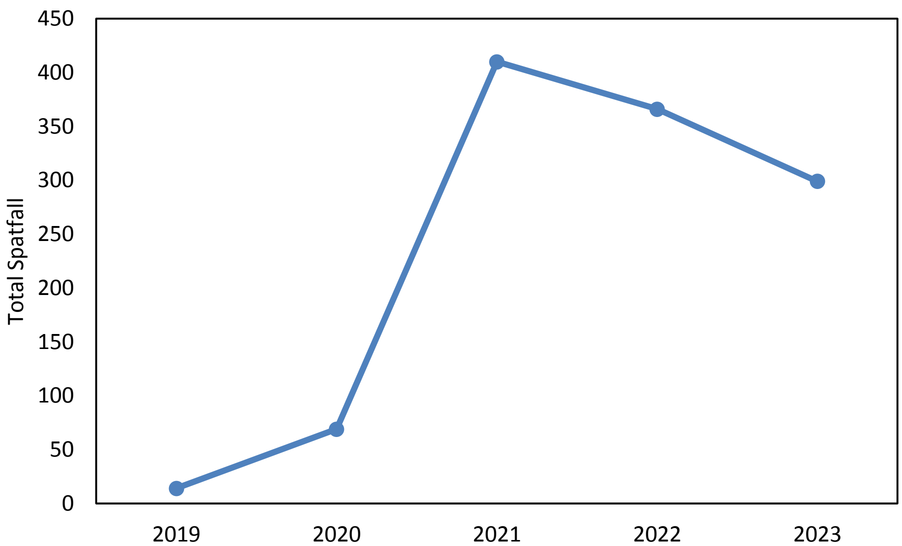

Figure 24. Total spatfall for 2019-2023 at Mouth of Creek.

Water quality at Mouth of Creek was consistent with previous years, and dissolved oxygen (mg/L) remained above 5.00 mg/L at all sampling dates (Figure 25; Figure 26). As with other sites, salinity (ppt) at Mouth of Creek was higher than previous years (Figure 27).

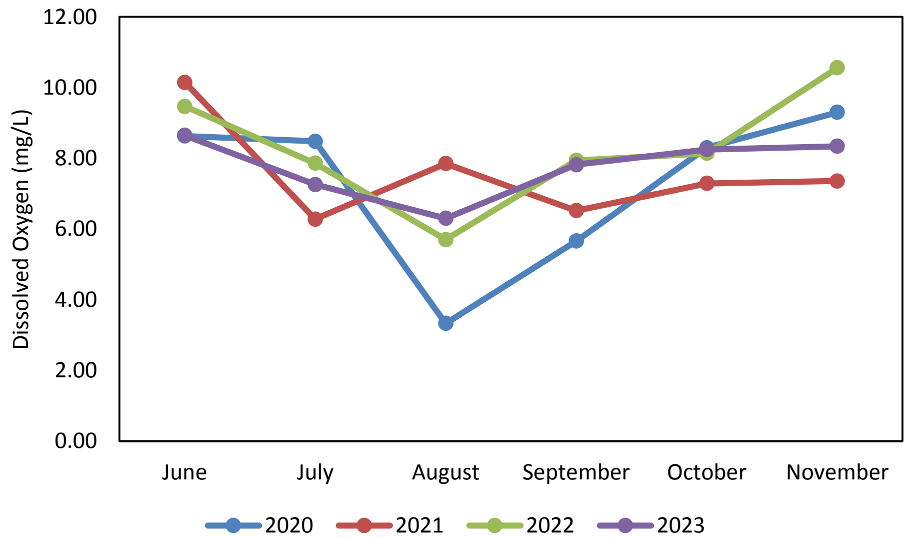

Figure 25. Bottom dissolved oxygen levels (mg/L) from June-November 2020-2023 at Mouth of Creek.

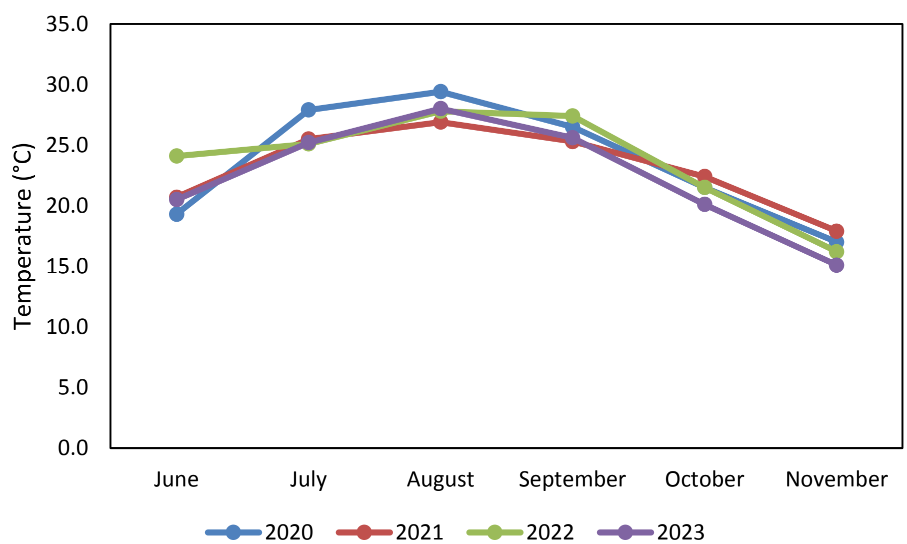

Figure 26. Bottom temperature (°C) measurements from June-November 2020-2023 at Mouth of Creek.

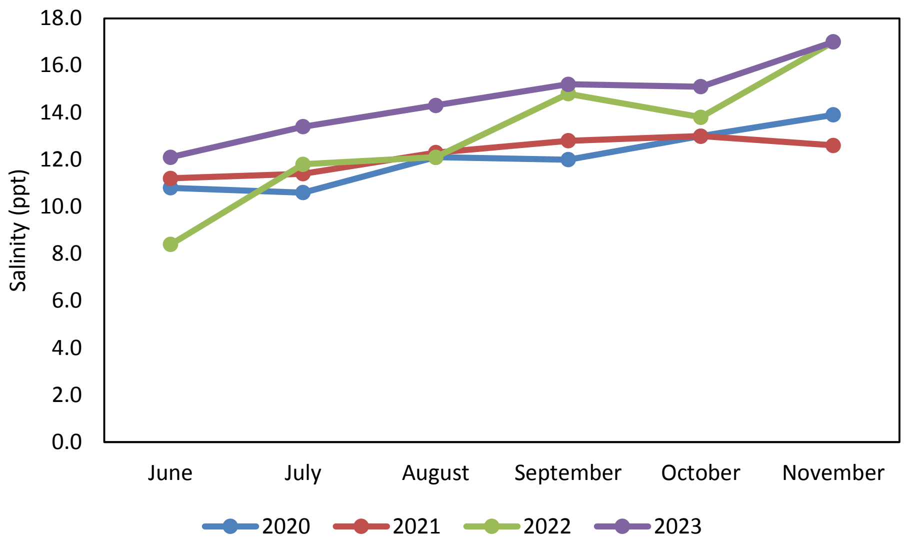

Figure 27. Bottom salinity (ppt) measurements from June-November 2020-2023 at Mouth of Creek.

Photo 11. Spat on shell at Mouth of Creek.

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APPENDIX A

Monitoring Oyster Recruitment in Breton Bay

INTRODUCTION

The State of Maryland designated Breton Bay as an oyster sanctuary in 2010 because of its potential for oyster restoration. In 2017, it was initially chosen as one of five shellfish sanctuaries to receive large scale restoration. However, the next year the decision was revoked after a comprehensive survey returned poor results. No live oysters were found in a patent tong oyster survey conducted by DNR in April of 2018 (MD DNR, 2018). Despite this, the community of Breton Bay continues to have strong support for restoration efforts there.

The Friends of St. Clements Bay and the St. Mary's River Watershed Association (SMRWA) have planted more than three million oysters at Lover's Point (Figure A1). From 2017 - 2021, the Friends of St. Clements Bay and SMRWA planted 700,000 spat-on-shell and 600,000 ten-month-old oysters from the Marylanders Grow Oysters program. In 2022, these organizations along with Shore Thing Shellfish LLC and Southern Maryland Recreational Fishing Organization added 820,000 spat-on-shell to the Lover's Point restoration site. In September and October (2023), an additional 250 bushels of spat-on-shell, approximately 981,157 spat, were scattered throughout areas planted in prior years.

Friends of St. Clements Bay have monitored the oysters since 2018 and have observed that the oysters are surviving. Spatfall surveying at Lover's Point was launched in 2022 with four traps.

Figure A1. Map of Breton Bay depicting Lovers Point study site coordinates: 38.264300°N, -76.649717°W.

METHODS

In 2022, SMRWA added an additional oyster recruitment study site in Breton Bay at the Lover's Point oyster restoration site (Figure A1). Following the same methods as in the St. Mary's River, on June 2nd (2022) we deployed four traps with 120 shells in each in a central location within the Lovers Point restoration site. The traps were retrieved on October 17th (2022). In 2023, the cages were deployed on June 8th and retrieved on September 29th. Spat were counted in accordance with the procedures in the St. Mary's River.

RESULTS

In 2023, natural spatfall was observed for the first time at the Lover's Point site. A total of 28 live spat and three box spat settled on shell in study traps. Of the total spatfall, the intermediate size class (11-25 mm) accounted for the majority (83.9 %) of the observed recruitment. The remaining 16.1 % of spat fell into the smallest size class (0-10mm). Of the total live spatfall by size, 17.9 % were below 11 mm, and 82.1 % were 11 mm or above (Figure A2). All three of the box spat fell into the intermediate size class (11-25 mm). None of the spatfall observed, live or box, were above 25 mm. Three of the 31 spat counted at Breton Bay were box, representing 9.7 % mortality.

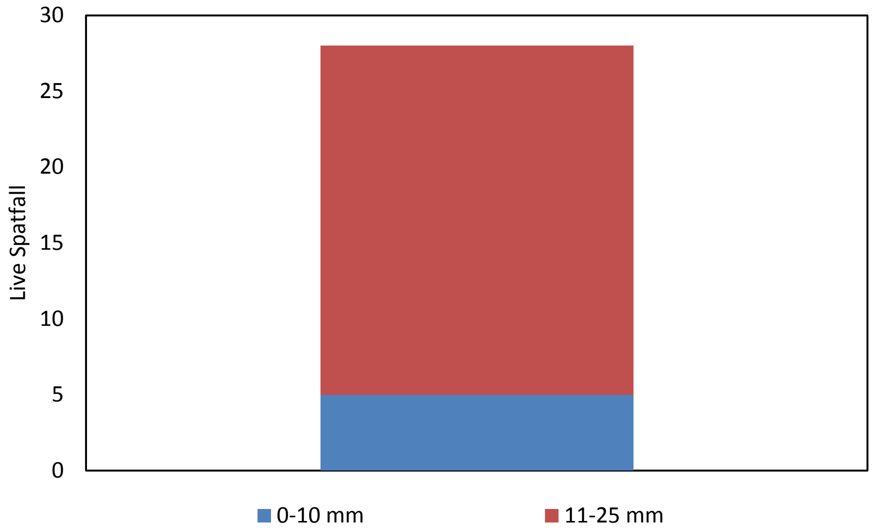

Figure A2. Comparison of Breton Bay live spatfall in 2023 by size groupings.

Photo A. Spat on shell at Breton Bay.

CONCLUSIONS

The recruitment of spat is a significant step in the restoration of the Breton Bay oyster population. The total spatfall is low when compared to study sites in the St. Mary's River—in 2023, total spatfall at St. Mary's sites ranged from 135 to 3,456. However, prior to these findings there was no documentation that the oysters in the central and upper sections of Breton Bay were reproducing. Additionally, spat that settled in 2023 did not appear to experience an unusually high mortality. In the St. Mary's River in 2023, mortality ranged from 5.4 to 40.4 % (Figure 5). The mortality of 9.7% in Breton Bay falls within the lower end of this range. The presence of spat in Breton Bay represents progress towards restoration goals and indicates that oysters there are capable of both survival and reproduction. We hope to further this progress and continue to plant and monitor the population at this site in 2024.

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