

Delaware Shellfish Aquaculture 2022 Report

DNREC Division of Fish and Wildlife

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Delaware's Inland Bays

In Delaware, Rehoboth Bay, Indian River Bay, and Little Assawoman Bay constitute the Inland Bays (Figure 1). These three bays and their tributaries cover about 32 miles of southeastern Delaware. The areas surrounding the Inland Bays are densely populated and the Inland Bays host a variety of activities including recreational and commercial fishing, recreational boating and water sports, bird watching, and kayaking. Rehoboth Bay and Indian River Bay share a tidal connection with the Atlantic Ocean via the Indian River Inlet. Little Assawoman Bay, the southernmost of the Inland Bays, receives tidal exchange from its connection to Ocean City Inlet.

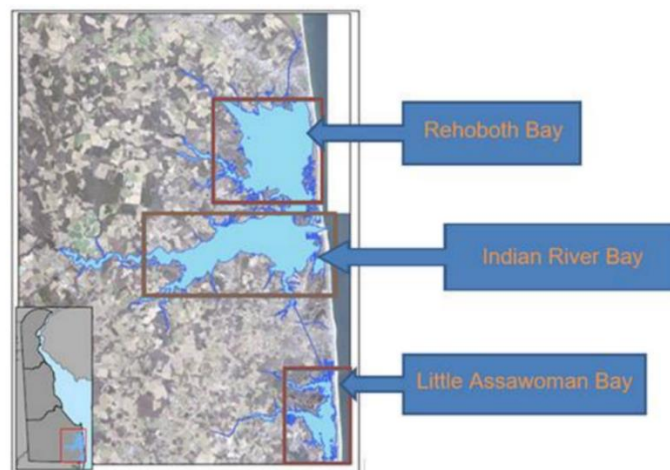


Figure 1. The location of Delaware's Inland Bays. The three bays are in Sussex County, Delaware. Little Assawoman Bay is connected to Assawoman Bay in Maryland.

Rehoboth Bay

In 2022, all of the acres leased for Inland Bays shellfish aquaculture were located in Rehoboth Bay. Rehoboth Bay is a shallow water body with high estuarine salinity, warm summer temperatures, and typically moderate winter temperatures. Temperature and salinity affect the growth rate of shellfish, as well as affect other shellfish concerns, including shellfish disease patterns, so local environmental variables are important to shellfish growers as well as to researchers and managers. The Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Water has sampled water parameters (dissolved oxygen, water temperature, pH, salinity, nitrogen, total suspended solids, phosphorus, enterococcus, Chlorophyll a) monthly for several years at the Buoy 7 (STORET 306091) sampling station in Rehoboth Bay. This water quality data, along with the data from other sampling locations, have been reported to the Environmental Protection Agency (EPA) via the Water Quality Exchange and are available publicly. The Buoy 7 sampling station is located between the three Shellfish Aquaculture Development Areas (SADA) in Rehoboth Bay (Figure 2). The three SADA in Rehoboth Bay are within a mile and a half of each other. The January through September 2022 water quality measurements at Buoy 7 were within the historic range for temperature and salinity at the station. Salinity ranged from a low of 24.61 ppt in January to a high of 31.56 ppt in September. The water

temperature was more variable than salinity. Water temperature at buoy 7 ranged from a low of 5.25°C (41.45°F) at the end of March to a high of 23.05°C (73.49°F) at the end of July. Salinity and water temperature data were obtained from the Delaware Water Quality Portal and communication with David McQuaide, DNREC.



Figure 2. The location of the Buoy 7 sampling station in Rehoboth Bay relative to the boundaries of the Shellfish Aquaculture Development Areas. Information on monthly samples collected from Buoy 7 and other stations is available at the [Delaware Water Quality Portal](#) or the [EPA’s Water Quality Portal](#).

Recent History of Inland Bays’ Shellfish Aquaculture

Shellfish aquaculture in Delaware’s Inland Bays is administered by Delaware’s Department of Natural Resources and Environmental Control (DNREC), Division of Fish & Wildlife (DFW). In this, the most recent incarnation of Inland Bays’ shellfish aquaculture, the first subaqueous land lease was issued in December 2017. Additional leases were issued in the years that followed. The first oysters were harvested from the Inland Bays shellfish aquaculture leases in fall of 2018. Lessees submit monthly planting and harvest reports, or null reports, to DNREC DFW. When reporting commercial shellfish aquaculture statistics, DNREC DFW abides by the “rule of three,” meaning that if there are fewer than three lessees reporting harvest or planting, the collective information will not be publicly distributed in order to protect the confidentiality and private business information of individual shellfish aquaculture participants. There were a sufficient number of lessees reporting harvest for the latter half of 2019 and afterward to meet the “rule of three.”

2022 Inland Bays Shellfish Aquaculture Statistics

Acres:

Inland Bays’ shellfish aquaculture lease applications are accepted year-round, and as per Delaware Code, lessees may surrender acreage at any time during the calendar year, so there may be variability in the number of leased acres throughout the year. For the purpose of the annual report, the number of lessees and leased acres are ‘captured’ in December of each year. At the end of 2022, there were 18

acres leased in Delaware's Inland Bays for shellfish aquaculture, and one acre under application. All of the leased acreage was within the SADA in Rehoboth Bay. DNREC DFW does not limit leasing to the SADAs, but the permitting process is expedited for applicants in those areas.

Number of leases:

There were 10 leases in the Inland Bays at the end of calendar year 2022. Nine of those leases were commercial leases and one lease was a scientific lease.

Oyster aquaculture

There were nine leases for commercial eastern oyster (*Crassostrea virginica*) aquaculture in Delaware's Inland Bays at the end of 2022.

Hard clam aquaculture

Hard clam (*Mercenaria mercenaria*) culture is permitted on leases in Little Assawoman Bay. At the end of 2022, there were no leased acres within Little Assawoman Bay. Although acreage was leased in Little Assawoman Bay in previous years, no planting (and it follows, no harvest) of hard clams was conducted from those initial leases.

Planting

In calendar year 2022, there were 1,600,000 oysters commercially planted on shellfish aquaculture leases in Rehoboth Bay. This was an increase of 380,000 oysters over the 2021 commercial planting. All oysters were placed in gear. Lessees reported using a variety of gear types for oyster culture, including floating bags/baskets, floating cages, and bottom cages.

Harvest

The total number of oysters reported harvested in calendar year 2022 was 344,001, a 20% decrease from 2021 (Table 1). The 2022 dockside price per oyster varied marginally throughout the year. The weighted average price per oyster in 2022 was \$0.73, a slight increase from the previous year's \$0.71 average (Table 1). In 2022, the lowest average weighted price for the year was in April (\$0.65) and the highest monthly weighted average price was \$0.78, achieved in June and November. The gross oyster sales for 2022 totaled \$240,055.90. Some oysters were reported as harvested, but were traded, gifted, or donated rather than sold; those oysters were included in the total harvest number, but not used to compute the average weighted price or gross sales for the year. Comparing 2022 harvest and price data with Delaware Inland Bays annual records from pre-2020 is limited. There were too few participants in 2018 to publicly release data, and only data from the latter half of 2019 included enough participants to meet the "rule of three." While total harvest in 2022 declined from 2021, a new record for the Inland Bays' shellfish aquaculture program was achieved as oyster sales during August of 2022 eclipsed all previous monthly sales and set a new one-month sales record of 65,587 oysters harvested and sold (Table 1).

Table 1. Inland Bays shellfish aquaculture oysters harvested average dockside price paid by month in 2020, 2021, and 2022. 2020 harvest totals do not include 75,000 oysters that were purchased by or donated to Delaware Sea Grant from Inland Bays lessees. The number of lessees reporting harvest each month in 2022 is also included.

Month	Total # Oysters Harvested 2020	Total # Oysters Harvested 2021	Total # Oysters Harvested 2022	Ave. Dockside price/oyster 2020	Ave. Dockside price/oyster 2021	Ave. Dockside price/oyster 2022	# of Lessees harvest 2022
Jan.	14,900	23,461	8,410	\$0.45	\$0.61	\$0.71	4
Feb.	9,755	23,727	22,758	\$0.46	\$0.63	\$0.70	4
March	3,470	28,517	25,229	\$0.55	\$0.71	\$0.68	4
April	4,165	37,200	22,817	\$0.50	\$0.67	\$0.69	5
May	5,251	37,890	14,408	\$0.63	\$0.69	\$0.73	5
June	8,329	55,320	23,598	\$0.64	\$0.73	\$0.78	6
July	11,145	47,001	27,896	\$0.64	\$0.69	\$0.76	6
Aug.	17,985	38,328	65,587	\$0.61	\$0.73	\$0.72	6
Sept.	21,193	31,475	37,412	\$0.64	\$0.76	\$0.72	6
Oct.	20,806	28,835	34,944	\$0.64	\$0.75	\$0.74	6
Nov.	25,578	37,525	30,742	\$0.67	\$0.75	\$0.78	7
Dec.	41,456	42,310	30,200	\$0.65	\$0.74	\$0.77	6
	Yearly Total 2020 184,033	Yearly Total 2021 431,589	Yearly Total 2022 344,001	Weighted Average \$0.61	Weighted Average \$0.71	Weighted Average \$0.73	

2022 Challenges

The Delaware Inland Bays lessees started calendar year 2022 with a setback. On December 28, 2021, a plumbing contractor cut a sewer line in a neighborhood on Rehoboth Bay, resulting in the discharge of untreated wastewater. DNREC's Shellfish and Recreational Water Program, following the National Shellfish Sanitation Program guidelines, closed the bay to bivalve shellfish harvest for 21 days. This closure took place immediately. Unfortunately, this incident meant that Inland Bays' oyster growers lost out on New Year's holiday sales as well as sales for the majority of January 2022. The growing area was reopened for harvest on January 18, 2022. The oyster sales in January 2022 were the lowest numbers of the entire year; January was the only month not to meet at least 14,000 oysters sold. Comparing January 2022 to January of 2020 and 2021, there was a decline in oysters harvested (Table 1).

The COVID-19 pandemic continued to impact Delaware Inland Bays shellfish growers in 2022, as the uncertain markets of 2020 and 2021 disrupted the scheduled planting and harvest plans for some of the oyster lessees.

The Inland Bays' shellfish aquaculture program had a shellfish disease mortality event reported by lessees in spring of 2022. One of the lessees experiencing elevated oyster mortality in harvest-sized oysters during May and June sent samples to both the Rutgers shellfish laboratory and a USDA laboratory for diagnosis. Ultimately, the mortality event was diagnosed via PCR and histological testing as a *Haplosporidium costale* infection. *Haplosporidium costale* is most prevalent in salinities above 25

ppt, which earned it the name seaside organism (SSO). While not posing a threat to people, SSO can cause heavy mortality or slow the growth of oysters, most often in May and June in the mid-Atlantic. The disease usually affects oysters in their second spring or later, after being infected the previous year (www.dfo-mpo.gc.ca/science/aah-saa/diseases-maladies/hcoy.eng.html). Evidence suggests that SSO has an as-yet-undetermined intermediate host rather than being transmitted oyster to oyster (personal communication with Roxanna Smolowitz, Shellfish Pathologist, Roger Williams University Shellfish Lab).

Shellfish Disease Testing:

Inland Bays lessees were contacted in the fall of 2022 and asked to contribute oysters for annual shellfish disease surveillance testing. Four of Rehoboth Bay's lessees donated oysters for testing. The lessees were asked to provide a sample of oysters that reflected the market size oysters that they were cultivating on their lease. The average height of the sampled oysters was 75 mm. The oysters were packed by DNREC DFW and shipped live to Roger Williams University Shellfish Lab in Bristol, Rhode Island. Sixty oysters were tested individually via qPCR for Dermo (*Perkinsus marinus*), MSX (*Haplosporidium nelsoni*), and SSO (*Haplosporidium costale*). Dermo and MSX have a long history in the Delaware Bay and Chesapeake Bay region, and the salinity in Rehoboth Bay is favorable to SSO. These diseases can impact shellfish but pose no threat to human health. In the results of these tests, prevalence is the proportion of the population affected (Table 2). None of the 60 oysters tested were positive for SSO. The Dermo test for the Inland Bays aquaculture oysters showed the prevalence was 5% and the prevalence of MSX was 1.7%. Intensity ratings are assigned for each disease on a scale for Dermo that ranges from 0.5-very light to 5.0-very heavy and for MSX and SSO from 1-light to 3-severe. The overall intensity rating is the total of the individual scores divided by the number of positive animals. The weighted intensity or weighted prevalence is a rating system that combines prevalence and intensity of infection. The weighted intensity is the total of the scores for each individual animal divided by the total number of animals in the sample. The low prevalence and weighted intensity of Dermo means that Dermo is likely not contributing to mortality at the time of testing. One animal was infected with MSX. While the infection was heavy in that animal, the lack of infection in the rest of the sample means a low weighted intensity for the Inland Bays' population and that MSX is likely not contributing to mortality in the general population at the time of testing.

Table 2. Results reported by Roger Williams University Shellfish Lab for qPCR testing performed on Rehoboth Bay shellfish aquaculture oysters. Oysters collected November 5-8, 2022.

Parasite	Prevalence	Weighted Intensity	Intensity
Dermo	5%	0.08	1.50
MSX	1.7%	0.05	3.00
SSO	0%	0.00	0.00

Survey of Participants:

At the end of each calendar year, DNREC DFW sends commercial lessees a survey. The survey asks about employees or volunteer workers, hours worked on the lease, hours worked by other employees, estimates of sales markets, acres used for growing shellfish, equipment used on the lease, shellfish mortality estimates, and any reports of poaching, boating incidents, or vandalism on the lease. The information is compiled so as not to identify any single respondent.

- **Work on the lease:** The total reported workers on Inland Bays leases (including the lessees themselves), included two full-time employees, twelve part-time employees, and three volunteers. The respondents indicated that spring and summer were the busiest seasons, with between 8 and 24 hrs/week estimated work. The seasonal estimate of required work hours was the lowest during winter, at 8-16 hrs/week. The fall estimate ranged from 8-20 hrs/week.
- **Acres used to grow shellfish:** The lessees were asked how many acres of their lease they physically used to grow shellfish in 2022. The average fell between one and two acres per lessee, the same as previous years.
- **Grower sales:** Lessees were asked to estimate the percentage of total sales sent to wholesale/retail, direct to consumer, or harvested but nonsaleable. Similar to previous years, the answers that lessees provided showed that each had a strong sales leaning in one direction or the other, and no lessee reported an even split between sales categories.
- **New markets:** Marking a difference from previous years of the program, none of the lessees indicated exploring new sales categories in 2022. In 2020, 70% of respondents reported trying new markets and in 2021, 33% reported trying new markets.
- **Poaching:** Reported poaching incidents remained low. In 2020, no poaching was suspected, and in 2021, only one of the lessees described potential theft. To continue the trend, in the 2022 response, there were no reports of poaching.
- **Boating incidents:** The survey responses of 2022 indicated a decreasing trend in boating damage to aquaculture equipment. There were no reports of boater damage on the 2022 survey.
- **Shellfish mortality:** The survey of 2022 did mark an uptick in shellfish mortality reports from previous years. Lessees reported losing an estimated 40%-80% of their crops. These losses were attributed by survey respondents to winter storms, shellfish disease, and husbandry practices.

