

# Delaware Shellfish Aquaculture 2023 Report

DNREC Division of Fish and Wildlife

Report release: July 2024

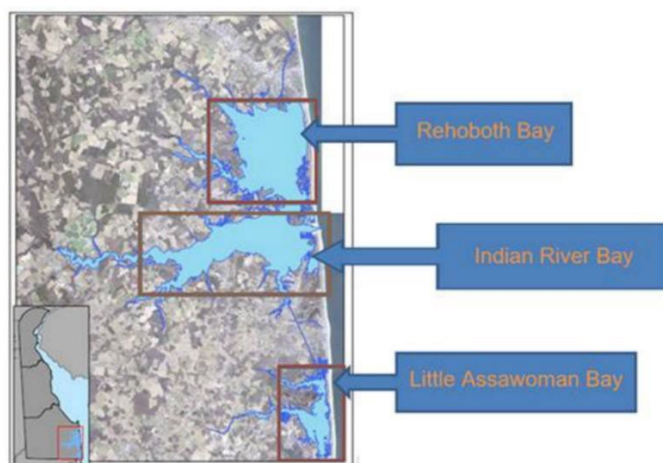
Delaware Department of Natural Resources and Environmental Control, Division of Fish and Wildlife  
Dover, DE

## Delaware Shellfish Aquaculture 2023 Report

### DNREC Division of Fish and Wildlife

#### Delaware's Inland Bays

Rehoboth Bay, Indian River Bay, and Little Assawoman Bay collectively are referred to as Delaware's Inland Bays (Figure 1). These three bays and their tributaries cover about 32 square miles of southeastern Delaware. The Inland Bays host a variety of activities including recreational and commercial fishing, recreational boating and water sports, bird watching, hunting, and kayaking. Located in Sussex County, the land surrounding the Inland Bays is densely populated. 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

Rehoboth Bay is a shallow water body with high estuarine salinity, warm summer temperatures, and typically moderate winter temperatures. Given that temperature and salinity affect the growth rate of shellfish, as well as affect other shellfish concerns like shellfish disease prevalence, local environmental variables are important considerations. 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) for several years at the Buoy 7 (STORET 306091) sampling station in Rehoboth Bay. In 2023, there is data available for every other month. 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), which are within a mile and a half of each other.

Salinity ranged from 25.0 ppt in January to 30.3 ppt in September. The water temperature was more

variable than salinity. Water temperature measured at buoy 7 ranged from a low of 3.4°C (38.12°F) at the end of November to a high of 26.9°C (80.42°F) at the end of July. Salinity and water temperature data were obtained from the Delaware Water Quality Portal.



**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 samples collected from Buoy 7 and other stations is available at the [Delaware 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 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."

### 2023 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 2023, there were 21

acres leased in Delaware's Inland Bays for shellfish aquaculture, and one acre under application. All of the leased acreage was within the Rehoboth Bay SADA. 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 11 leases in the Inland Bays at the end of calendar year 2023. Ten of those leases were commercial leases and one lease was a scientific lease.

**Oyster aquaculture**

There were ten leases with nine lessees for commercial eastern oyster (*Crassostrea virginica*) aquaculture in Delaware's Inland Bays at the end of 2023.

**Hard clam aquaculture**

Hard clam (*Mercenaria mercenaria*) culture is permitted on leases in Little Assawoman Bay. At the end of 2023, there were no leased acres within Little Assawoman Bay. Although acreage was leased in Little Assawoman Bay in previous years, no planting or harvest of hard clams was conducted from those initial leases.

**Planting**

In calendar year 2023, there were 1,686,600 oysters commercially planted on shellfish aquaculture leases in Rehoboth Bay. This was an increase of 86,600 oysters from the 2022 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.

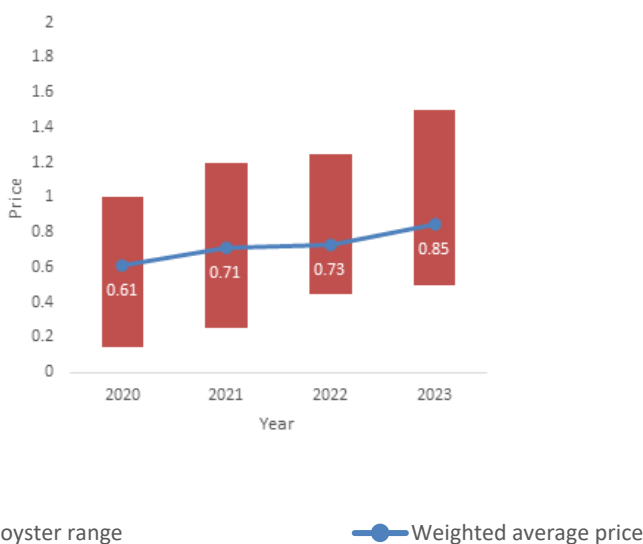
**Harvest**

The 2023 reported oyster harvest was 278,158—a decrease from 2022 (Table 1). The 2023 dockside price per oyster varied throughout the year. And the range from minimum to maximum price reported was a dollar. Lessees reported dockside sales ranging from a low of \$0.50 per oyster to a high of \$1.50 per oyster in 2023. The minimum, maximum, and weighted average price per oyster all increased from 2022, following the positive trend established in previous years (Figure 3). The weighted average price per oyster in 2023 was \$0.85, an increase from 2022's \$0.73 weighted average (Table 1). In 2023, the month with the lowest average weighted price was February (\$0.75); however, this price already exceeded the average price for the preceding year. The highest monthly weighted average price was \$0.97, achieved in November. In 2023, the gross oyster sales totaled \$236,793.17.

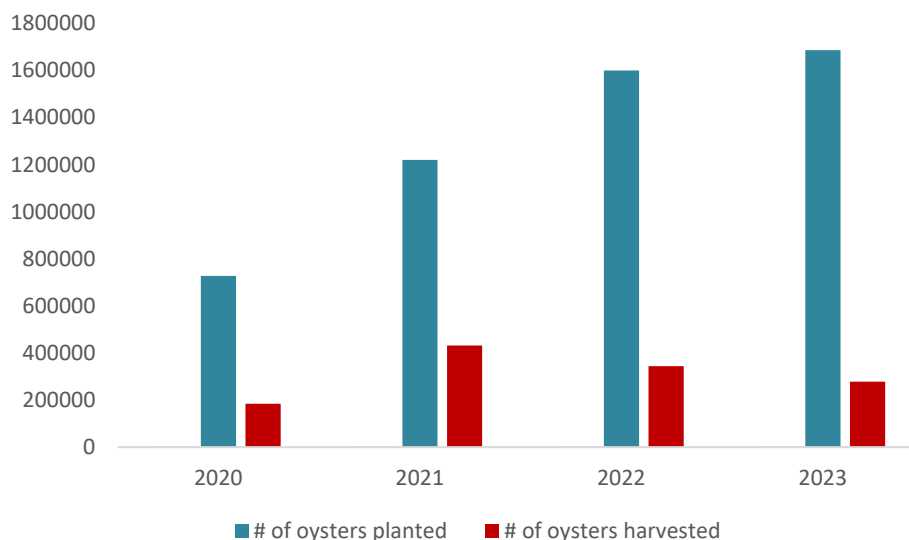
Comparing harvest and price data with Delaware Inland Bays annual records from pre-2020 is of limited use. There were too few participants in 2018 to publicly release data, and only data from the latter half of 2019 included enough participants to meet the "rule of three." While there were more acres leased for shellfish aquaculture in 2023 than the previous year, the decrease in harvest (Figure 4) shows that the total number of acres leased is one of many factors determining the level of shellfish harvest.

**Table 1.** Inland Bays shellfish aquaculture oysters harvested average dockside price paid per oyster by month in 2021, 2022, and 2023. The number of lessees reporting harvest each month in 2023 is also included.

Month	2021 Oyster Harvest	2022 Oyster Harvest	2023 Oyster Harvest	2021 \$/oyster	2022 \$/oyster	2023 \$/oyster	# of Lessees harvest 2023
Jan.	23,461	8,410	17,084	\$0.61	\$0.71	\$0.79	6
Feb.	23,727	22,758	15,865	\$0.63	\$0.70	\$0.75	4
March	28,517	25,229	12,742	\$0.71	\$0.68	\$0.77	4
April	37,200	22,817	9,616	\$0.67	\$0.69	\$0.81	5
May	37,890	14,408	16,367	\$0.69	\$0.73	\$0.89	6
June	55,320	23,598	28,614	\$0.73	\$0.78	\$0.79	6
July	47,001	27,896	27,676	\$0.69	\$0.76	\$0.83	6
Aug.	38,328	65,587	38,250	\$0.73	\$0.72	\$0.82	6
Sept.	31,475	37,412	28,766	\$0.76	\$0.72	\$0.81	6
Oct.	28,835	34,944	22,025	\$0.75	\$0.74	\$0.94	8
Nov.	37,525	30,742	31,397	\$0.75	\$0.78	\$0.97	7
Dec.	42,310	30,200	29,756	\$0.74	\$0.77	\$0.94	6
	<b>Total 2021 431,589</b>	<b>Total 2022 344,001</b>	<b>Total 2023 278,158</b>	<b>Weighted Average \$0.71</b>	<b>Weighted Average \$0.73</b>	<b>Weighted Average \$0.85</b>	



**Figure 3.** Inland Bays shellfish aquaculture oysters range of reported dockside price (in US \$), from minimum to maximum, with weighted average noted for 2020, 2021, 2022, and 2023.



**Figure 4.** Inland Bays shellfish aquaculture reported planting and harvest totals for 2020, 2021, 2022, and 2023. *\*Please note that harvest total for 2020 does not include 75,000 oysters purchased by or donated to Delaware Sea Grant.*

#### Shellfish Disease Testing:

The Inland Bays' shellfish aquaculture program had a shellfish disease mortality event reported by multiple lessees in late summer 2023. Samples were sent by DNREC DFW to Roger Williams University shellfish laboratory for diagnosis. Ultimately, the mortality event's cause was not determined by histopathology testing. The oysters were tested via qPCR for Dermo, MSX, and SSO. The oysters were also examined histologically. The oyster health report prepared by the laboratory stated, "no cause for significant mortality could be identified using these testing methods." The histopathologist further reported that the digestive gland of most animals did not appear to be inflamed or to be impeding acquisition of food and that most of the other organs appeared normal, with the animals in good condition.

Additionally, Inland Bays lessees were contacted in the fall of 2023 and asked to contribute oysters for annual shellfish disease surveillance testing. Three 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 shell height of the sampled oysters was 89 mm (3.5 inches). The oysters were packed by DNREC DFW and shipped live to Kennebec River Biosciences Shellfish Lab. Sixty oysters were tested individually via multiplex PCR for Dermo (*Perkinsus marinus*), MSX (*Haplosporidium nelsoni*), SSO (*Haplosporidium costale*), and JOD/ROD (*Roseovarius crassostreae*). 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. The JOD/ROD has been a disease that has been historically confined to New England, and especially detrimental to seed and small oysters in nurseries. 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). Dermo and MSX were not detected in any of the samples. There was SSO detected in 10% (6 of the 60 samples). The low prevalence of Dermo and MSX means that these diseases are likely not contributing to mortality at the time of testing. Six of the oysters were infected with SSO, or *Haplosporidium costale* infection. *Haplosporidium costale* is most prevalent in salinities above 25 ppt, which earned it the name seaside organism (SSO). The disease can cause heavy mortality or

*Delaware Shellfish Aquaculture 2023 Annual Report*

slow the growth of oysters, and has been identified as the cause of a mortality event in Delaware’s Inland Bays in the past. The disease usually affects oysters in their second spring or later, after being infected the previous year. Evidence suggests that SSO has an as-yet-undetermined intermediate host rather than being transmitted oyster to oyster. One oyster was infected with JOD/ROD. Roseovarius Oyster Disease (ROD) was previously known as Juvenile Oyster Disease (JOD). This disease affects hatchery-raised seed, typically from Maine to New York. The disease causes acute infection resulting in slowed growth and mortality in seed oysters. Being that Delaware is outside of the typical range, previous annual shellfish disease testing of Inland Bays oysters has not included specific JOD/ROD testing, so this positive test is a new finding in Delaware Inland Bays shellfish aquaculture.

**Table 2.** Results reported by Kennebec River Biosciences for multiplex PCR testing performed on Rehoboth Bay shellfish aquaculture oysters. Oysters collected beginning of December 2023.

Parasite	Prevalence
Dermo	0%
MSX	0%
SSO	10%
JOD/ROD	1.6%

#### 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:** In the responses provided, there was one full-time employee, five part-time employees, four volunteers, and three barter employees working the leases. The respondents indicated that spring, summer, and fall were the busiest seasons, with between 2 and 32 hrs/week estimated work. The seasonal estimate of required work hours was the lowest during winter, at 0-24 hrs/week.
- **Acres used to grow shellfish:** The lessees were asked how many acres of their lease they used to grow shellfish in 2023. The average fell between one and two acres per lessee, the same as in 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:** In the survey responses, about 30% reported exploring new sales categories in 2023. There were no new markets reported in 2022; however, 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 and 2023 responses, there were no reports of poaching.

- **Boating incidents:** There were no reports of boater damage on the 2023 survey.
- **Shellfish mortality:** Lessees reported losing an estimated 2%-80% of their crops. These losses were attributed by survey respondents to water conditions and various other factors.