



## **2021 Delaware Inland Bays Shellfish Aquaculture Report**

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

Dover, Delaware

## Delaware's Inland Bays

Delaware's Inland Bays are comprised of three shallow coastal bays—Rehoboth Bay, Indian River Bay, and Little Assawoman Bay (Figure 1). The bays and their tributaries cover about 32 square miles. The surrounding areas are densely populated. Rehoboth Bay and Indian River Bay share a tidal connection with the Atlantic Ocean via the Indian River Inlet. Little Assawoman Bay, farther south, receives tidal exchange from its connection to Ocean City Inlet.

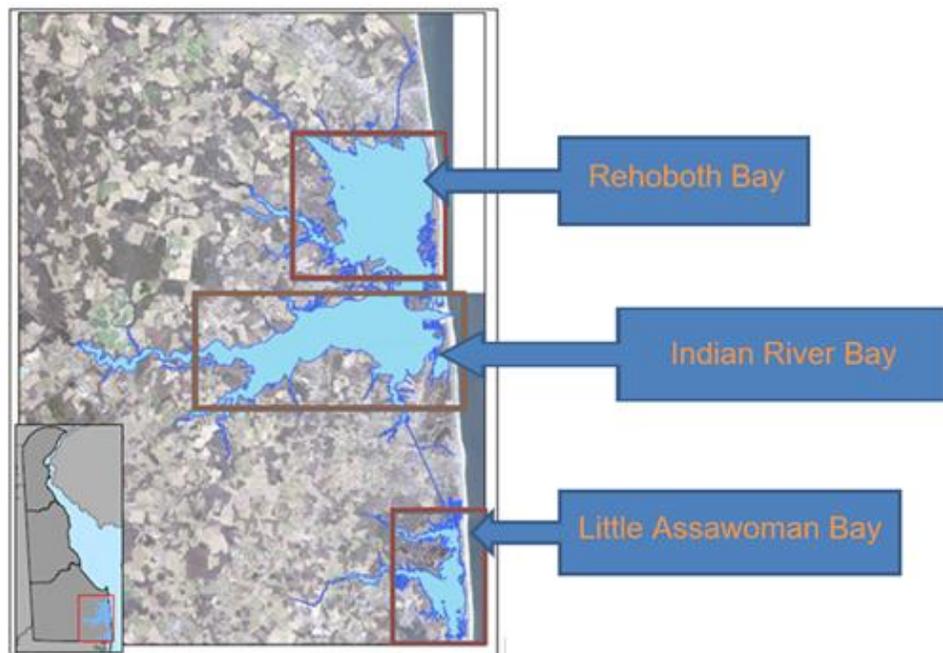
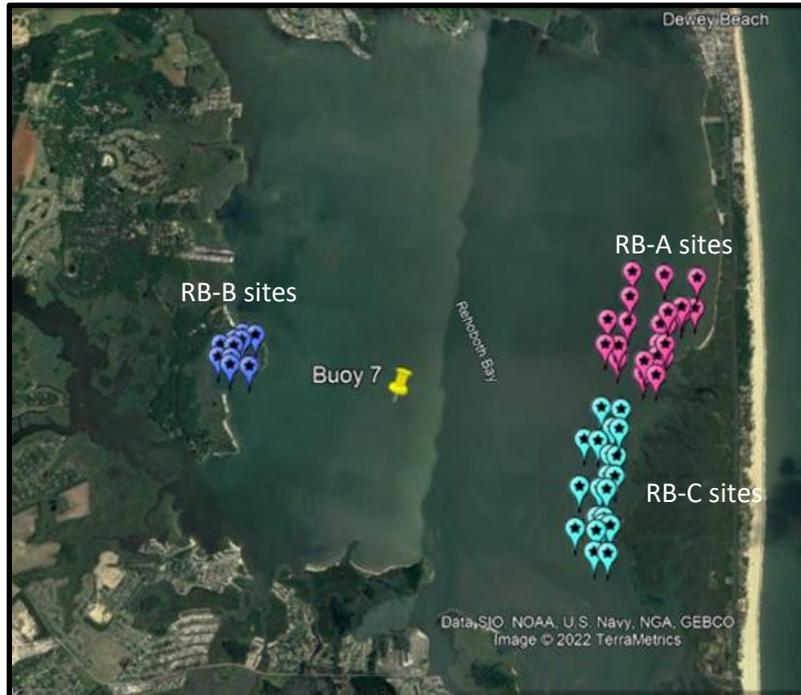


Figure 1. The location of Delaware's Inland Bays. The three bays are in Sussex County, Delaware. Little Assawoman Bay is connected to Assawoman Bay in Maryland.

### Rehoboth Bay

All shellfish aquaculture leased acres in 2021 were in the Rehoboth Bay. Rehoboth Bay has high estuarine salinity and warm summer temperatures. Water parameters have been measured monthly for several years at the Buoy 7 (STORET 306091) sampling station in Rehoboth Bay (Figure 2) by the Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Water. These data, along with many other sampling locations, have been reported to the Environmental Protection Agency (EPA) via the Water Quality Exchange and multiple years of data have been made available through the EPA's Water Quality Portal. In 2021, Buoy 7's salinity measurements ranged from a low of 25.8 parts per thousand (ppt) in March to a high of 32.0 ppt in July. The temperatures, also measured monthly at the Buoy 7 sampling station ranged from a low of 3.9°C (39.02°F) in February to a high of 27.2°C (80.96°F) in August 2021. Salinity and temperature data were obtained from the Delaware Water Quality Portal and David McQuaide, DNREC.



**Figure 2.** The location of the Buoy 7 sampling station in Rehoboth Bay relative to the outlines of the Shellfish Development Areas. Information on monthly samples collected from Buoy 7 is available at [Delaware Water Quality Portal \(udel.edu\)](https://delawarewaterqualityportal.udel.edu) or the EPA’s [Water Quality Portal](https://www.epa.gov/water-quality).

## 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 (FW). The first subaqueous land aquaculture lease was issued in December 2017. Additional leases were issued in 2018, 2019, 2020, and 2021. The first harvest of shellfish in the Inland Bays through these leases consisted of oysters in the fall of 2018. Lessees submit monthly planting and harvest reports, or null reports, to DNREC FW. When reporting commercial shellfish aquaculture statistics, DNREC FW 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 distributed in order to protect the confidentiality and private business information of individual shellfish aquaculture participants. From August through December 2019, sufficient numbers of lessees reported harvest and planting to allow commercial shellfish aquaculture statistics to be shared. The “rule of three” threshold was met for each month’s harvest report in 2020 and 2021, and cumulatively for those years’ plantings.

## 2021 Inland Bays Shellfish Statistics

At the end of 2021, 23 acres were leased in Delaware’s Inland Bays for shellfish aquaculture. All leased acreage was within the Shellfish Aquaculture Development Areas (SADA) in

Rehoboth Bay. DNREC FW does not limit leasing to the SADAs, but the permitting process is expedited for applications in those areas.

#### **Number of leases**

There were 11 leases in the Inland Bays at the end of calendar year 2021. Ten of those leases were commercial leases and one lease was a scientific lease.

#### **Oyster aquaculture:**

There were 10 leases for commercial eastern oyster (*Crassostrea virginica*) aquaculture in Delaware's Inland Bays in 2021.

#### **Hard clam aquaculture:**

Hard clam (*Mercenaria mercenaria*) culture is permitted on leases in Little Assawoman Bay. At the end of 2021, there were no leased acres within Little Assawoman Bay. Although acreage had been leased in Little Assawoman Bay in previous years, no planting (and it follows, no harvest) of hard clams has been conducted from those initial leases.

#### **Planting:**

In calendar year 2021, there were 1,220,000 oysters commercially planted on shellfish aquaculture leases in Rehoboth Bay. All oysters were placed in gear, as is required for the Inland Bays. Lessees reported using a variety of gear types for oyster culture, including floating bags/baskets, floating cages, and bottom cages.

Using planting records from 2019, 2020, and 2021 (in 2018 there were too few participants to publicly share planting reports), 3,400,951+ oysters were commercially planted in the first few years of shellfish aquaculture in the Inland Bays.

#### **Harvest:**

The number of oysters reported harvested in calendar year 2021 was 431,589 (Table 1). The dockside price varied throughout the year. The weighted average price per oyster in 2021 was \$0.71, a \$0.10 (16%) increase in price per oyster from the previous year. More than twice as many Inland Bays oysters were harvested in 2021 than were reported harvested in 2020. While the harvest more than doubled from the previous year, the amount of leased acreage dropped by nearly half, indicating that oyster leases were operating more efficiently on the acreage. The gross oyster sales for 2021 totaled \$306,172.70. The comparison of 2021 harvest records with 2018 and 2019 harvest records is of limited use because 2018 had too few participants to share data and only half of the year in 2019 had enough participants to publicly release data.

**Table 1.** Inland Bays shellfish aquaculture oysters harvested, and average dockside price paid by month in 2020 and 2021. 2020 harvest totals do not include 75,000 oysters that were purchased by or donated to Delaware Sea Grant from Inland Bays growers.

Month	Total # Oysters Harvested 2020	Total # Oysters Harvested 2021	Average Dockside Price/Oyster 2020	Average Dockside Price/Oyster 2021	# Lessees Harvesting 2020	# Lessees Harvesting 2021
January	14,900	23,461	\$0.45	\$0.61	4	6
February	9,755	23,727	\$0.46	\$0.63	4	6
March	3,470	28,517	\$0.55	\$0.71	4	6
April	4,165	37,200	\$0.50	\$0.67	6	5
May	5,251	37,890	\$0.63	\$0.69	4	6
June	8,329	55,320	\$0.64	\$0.73	5	7
July	11,145	47,001	\$0.64	\$0.69	6	5
August	17,985	38,328	\$0.61	\$0.73	6	6
September	21,193	31,475	\$0.64	\$0.76	6	6
October	20,806	28,835	\$0.64	\$0.75	6	6
November	25,578	37,525	\$0.67	\$0.75	7	6
December	41,456	42,310	\$0.65	\$0.74	7	6
	<b>Yearly Total 2020</b>	<b>Yearly Total 2021</b>	<b>Weighted Average</b>	<b>Weighted Average</b>		
	<b>184,033</b>	<b>431,589</b>	<b>\$0.61</b>	<b>\$0.71</b>		

## COVID-19:

While there was an increase in sales and increased price per oyster from 2020 to 2021, the lessees were still affected by the COVID-19 pandemic during 2021. New variants of SARS-COV-2 continued to alter restaurant and bar occupancies, the venues where most seafood is sold. The State of Delaware was still under a State of Emergency for a portion of the year. In recognition of the continuing challenges that COVID-19 posed to Inland Bays' shellfish growers in selling and marketing oysters, DNREC Secretary Garvin signed an extension of the 2020 Emergency order suspending the required planting minimum for Inland Bays shellfish leases in the 2021 calendar year.

## 2021 Challenge:

The Inland Bays shellfish growers experienced another setback in sales at the end of 2021 that would stretch into 2022. On December 28, 2021, a plumbing contractor cut a sewer line in a neighborhood on Rehoboth Bay, resulting in the discharge of untreated wastewater into the bay. DNREC's Shellfish and Recreational Water Programs, following the National Shellfish Sanitation Program guidelines, closed the bay to bivalve shellfish harvest for 21 days. This closure took place immediately, and unfortunately coincided with the New Year's holiday sales for oyster growers in Rehoboth Bay.

## Shellfish Disease Testing:

In October of 2021, five of Rehoboth Bay’s lessees each donated 13 oysters that DNREC FW collected for shellfish disease 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 growers reported that the oysters ranged in age from specimens planted in spring of 2021 to oysters a few years old. The average height of the sampled oysters was 94 mm (3.7 inches). The oysters were packed in a cooler and shipped live overnight to Roger Williams University Shellfish Lab located in Bristol, Rhode Island. Sixty oysters (65 were requested by the lab to test 60 in case some oysters died in transit) were tested individually via qPCR for Dermo (*Perkinsus marinus*), MSX (*Haplosporidium nelsoni*), and SSO (*Haplosporidium costale*). The summary report from the lab read: “Animals were examined using the triplex quantitative PCR method. Using evaluation methods described above, animals were lightly positive for Dermo (*Perkinsus marinus*) and negative for MSX (*Haplosporidium nelsoni*) and SSO (*Haplosporidium costale*).” It is important to note that while Dermo, MSX, and SSO can limit growth and reproduction or kill oysters, these diseases pose no threat to human health. Results of the PCR tests performed for these shellfish diseases by Roger Williams University were sent to DNREC FW (Table 2). In the lab report, prevalence is the proportion of the population affected. In the case of the Dermo test on the Inland Bays aquaculture oysters, 10% means that 6 of the 60 oysters tested were positive for Dermo. Prevalence is presence/absence, not a measure of intensity of the disease. Intensity ratings are assigned for each disease; in the case of the Roger Williams University Shellfish Lab, Dermo intensity ratings range from 0.5 very light to 5.0 very heavy and MSX and SSO intensity ratings range 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 the 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 this time. The absence of MSX and SSO in this test indicates that these diseases are likewise not contributing to mortality in the population at the time of testing. The levels of shellfish disease found in the Inland Bays aquaculture oyster population is lower than the level of disease found in natural shellfish in neighboring waters of comparable salinity and temperature.

**Table 2.** Results reported by Roger Williams University Shellfish Lab for qPCR testing performed on Rehoboth Bay shellfish aquaculture harvest-size oysters. Oysters collected October 24, 25 and 26, 2021.

Parasite	Prevalence	Weighted Intensity	Intensity
Dermo	10%	0.16	1.58
MSX	0.0%	0.00	0.00
SSO	0.0%	0.00	0.00

## Survey of Participants:

At the end of each calendar year, DNREC FW sends commercial lessees a survey. The survey includes queries about number of full time or part time workers, hours the lessee worked on the lease, hours by other employees, whether work was bartered or volunteered, 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 in a manner so as not to identify any single respondent.

- **Work on the lease:** There were several different working arrangements used on the Inland Bays leases. Lessees reported that for all Inland Bays leases (these counts include the lessees themselves) there were four full-time employees, thirteen part-time employees, a barter situation, and multiple volunteer hours on the leases.
- **Acres used to grow shellfish:** The lessees were asked how many acres of their lease they physically used to grow shellfish in 2021. The average fell between one and two acres per lessee, the same as the previous year.
- **Grower sales:** Lessees looked to multiple venues to sell their oysters, with most growers leaning more strongly toward one of two routes. Individual reports ranged from 0-80% of sales in the direct-to-consumer category and 0-100% in the wholesale category.
- **New markets:** One third of the respondents reported trying new sales categories in 2021. This was a marked decrease from 2020, when almost 70% of lessees reported trying new sales categories, half of them reporting that this was in response to COVID closures and restrictions.
- **Poaching:** Only one of the lessees reported suspected theft of oysters in 2021. The previous year there were no incidents of poaching suspected.
- **Boating incidents:** One third of the lessees reported that they had cages or lines damaged by boaters in the past year. This was a decrease from the previous year.
- **Shellfish mortality:** Inland Bays lessees reported 10%-50% mortality rates on their oysters in 2021. Most of the losses were attributed to environmental factors (storm damage, silting/smothering, predation) and oysters ageing, specifically attributed to sales slowed by a COVID-influenced market.

