

Shellfish Harvest, Handling & *Vibrio* Control



Basic Harvest and Handling Checklist



- ✓ Shellfish Growing Area classified as Approved or Conditionally Approved in the Open status
- ✓ Boats used in harvesting must be kept clean and free of debris during the harvest and transport of shellstock.
- ✓ Shellfish shall be stored on raised areas to prevent contact with bilge water and away from fuel, oil and other chemicals.
- ✓ Shellfish shall be covered to prevent exposure to hot sun and birds..
- ✓ Each harvest boat must have a sanitation device or container with a tight-fitting cover and be secured to prevent contamination of shellstock by spillage or leakage. Each container must be indelibly labeled "Human Waste" in contrasting letters at least three (3) inches in height.
- ✓ Containers should be emptied only into a sewage disposal system and cleaned. The overboard discharge of human waste is prohibited in Massachusetts.
- ✓ Dogs, cats and other animals are not allowed on harvest vessels or aquaculture license sites



Bulk Tagging for Culling and Overwintering (Aquaculturists Only)

If a permit is endorsed for **off-site culling** or **off-site overwintering**, the permit holder may bulk tag individual lots of shellfish during transport to and from the aquaculture license site and the off-site location.

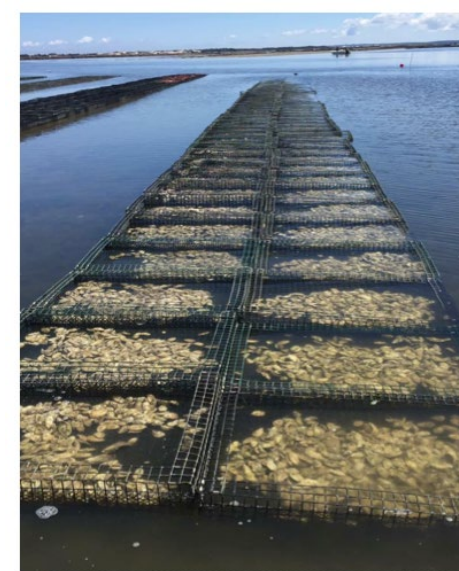
A single **green waterproof tag** may be used indicating the permit holder's name, Shellfish Aquaculture Permit number, date of removal, and location of the licensed site (town, water body and site ID), number of containers in the lot with the following statement: *All shellfish containers in this lot have the same removal date and are from the same licensed site.*

Additionally, one of the following statements must be on the tag:

1. **Aquaculturally Reared** :To be culled or overwintered.
2. **Aquaculturally Reared** :Culled or overwintered, for return License Site



No direct marketing of shellfish is allowed from any type of land-based overwintering location. All market-sized oysters overwintered out of water must **be re-submerged** (re-conditioned) on the aquaculture site for a **minimum of 14 days** prior to harvest for human consumption.



BULK TAG BACK

☐ **AQUACULTURALLY REARED
TO BE CULLED/OVERWINTERED**

☐ **AQUACULTURALLY REARED
CULLED/OVERWINTERED
FOR RETURN TO LICENSE SITE**

BULK TAG FACE

NAME: _____

Aquaculture PERMIT #: _____

REMOVAL DATE: _____ RETURN DATE: _____

HARVEST AREA: _____

AQUACULTURE SITE#: _____

TYPE OF SHELLFISH: ☐ OYSTER ☐ HARD CLAM

"Number of containers in this lot" _____ Lot# _____

ALL SHELLFISH CONTAINERS IN THIS LOT HAVE THE SAME
REMOVAL DATE AND RETURN DATE ARE FROM THE
SAME LICENSED SITE.

5 1/4"

2 5/8"

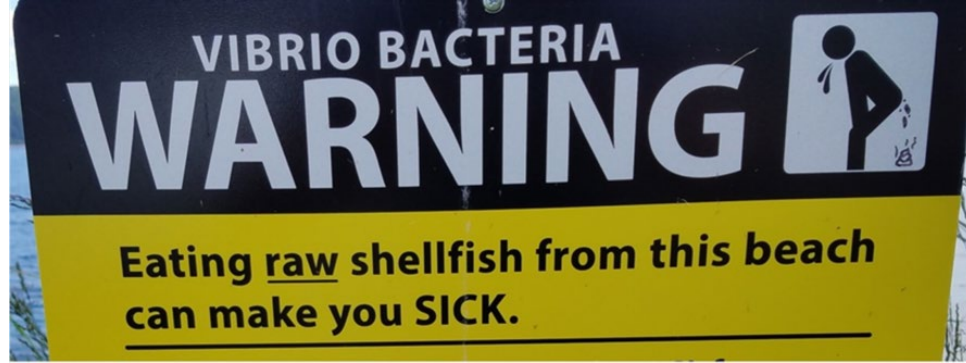


Image Source: Shutterstock

What are *Vibrio* bacteria?

- *Vibrio* is a diverse genus of bacteria that exist free-living or associated with human/animal hosts and can grow/thrive in high salt concentrations
- **One of the fastest growth rates of all known bacteria (high temps)**
- **Pathogenic strains represent a small percentage of the total *V.p.* in marine waters.** Thermolabile hemolysin (*tlh*) is a genetic marker for *V.p.* Thermostable direct hemolysin (*tdh*) and thermostable direct hemolysin-related hemolysin (*trh*) are genes that are strongly correlated with virulence (human illness)
- Vibriosis causes ~80,000 illnesses (~45,000 from consumption of *Vp* contaminated food), 500 hospitalizations and 100 deaths/yr in the US
- *V.p.* leading cause of seafood borne illness (87% require no medical care)
 - Diarrhea, often accompanied by abdominal cramping, nausea, vomiting, fever, and chills. Symptoms occur within 24 hours of ingestion and last about 3 days.
 - Severe illness is rare and typically occurs in people with a weakened immune system.
- Associated with consumption of raw/undercooked seafood, particularly raw oysters
- Confirmed illnesses have increased in last 2 decades and is an ongoing public health challenge

"MAVEN" is the **Massachusetts Virtual Epidemiologic Network** - a PHIN (Public Health Information Network) compliant, secure web-based surveillance and case management system for infectious diseases that enables rapid, efficient communication among local and state health departments and laboratories.



An illness outbreak (two or more illnesses epidemiologically linked to oysters harvested on the same day from same area) triggers a *Vibrio* Control Plan for the area under NSSP standards.



2011 was the first time two illnesses had been traced back to the same Massachusetts source on same harvest day.

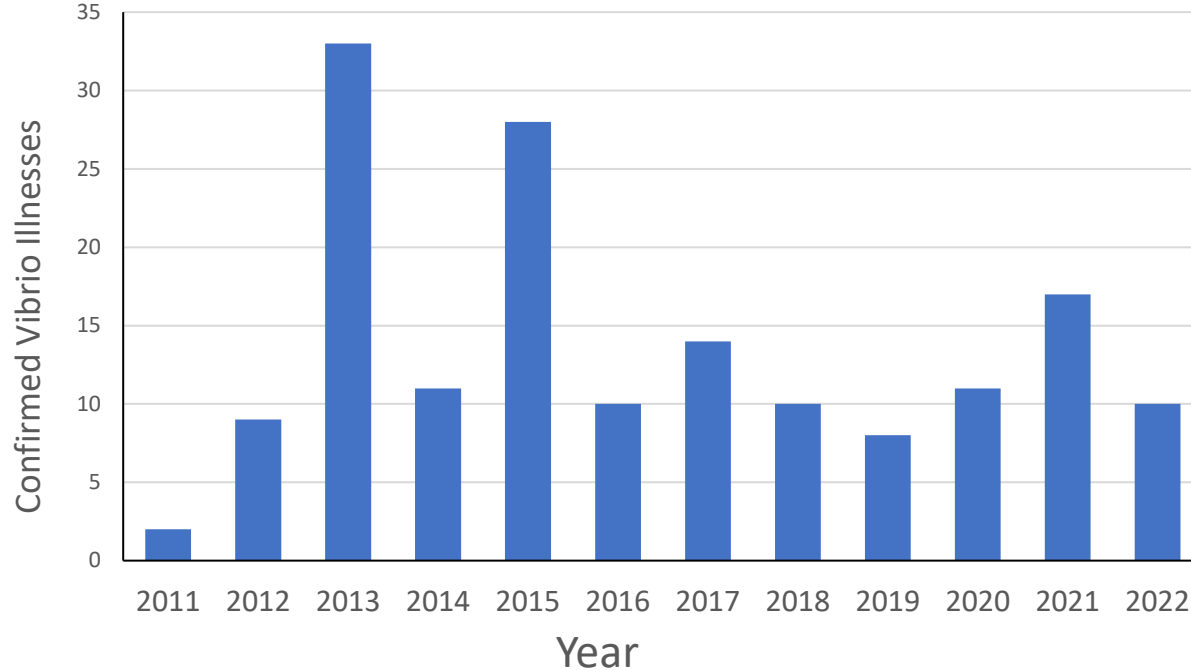


First MA *Vibrio* Control Plan implemented in 2012 for eastern Cape Cod Bay only and state-wide Plan implemented in 2013.

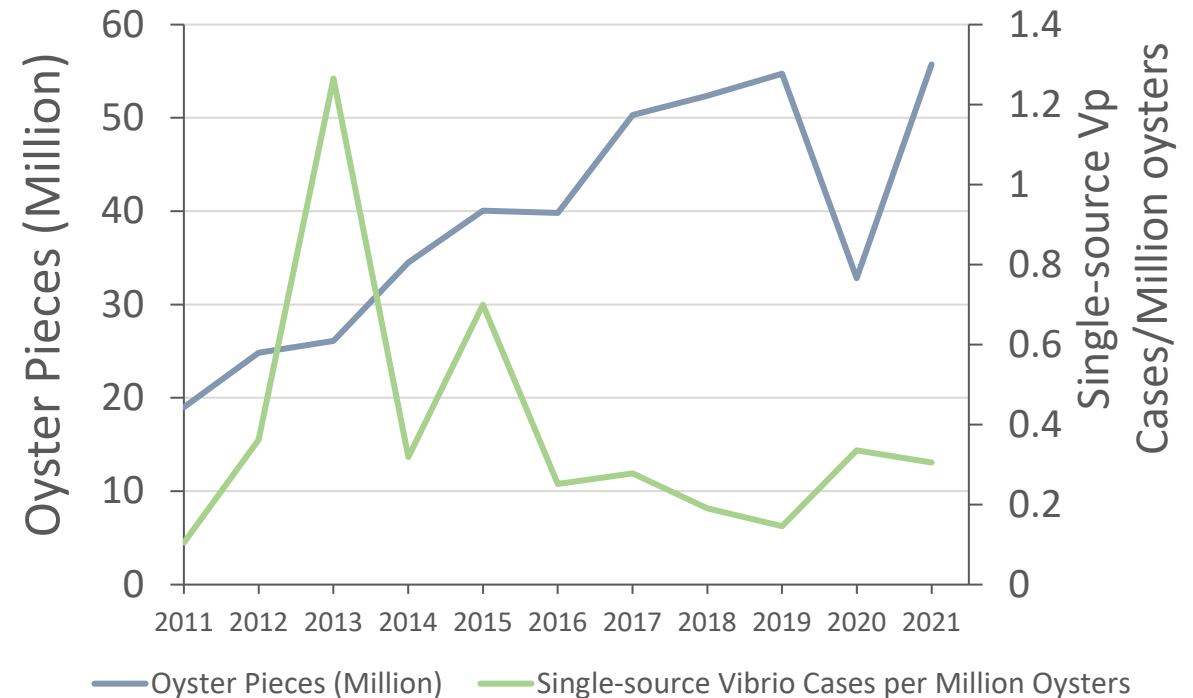


No outbreaks linked to the consumption of commercially harvested hard clams from Massachusetts harvest areas.

Massachusetts Sole Source V.p. Illness Cases



Massachusetts Oyster Landings and Vp Cases/Million Oysters Landed



***Vibrio* Control Plan And Implementing Regulations at 322 CMR 16.07**

**Division of Marine Fisheries
Department of Public Health
Office of Law Enforcement
Local Boards of Health**

***V.p.* Season May 19 - October 19**

Applies to all oysters ≥ 2.5 "



<https://www.mass.gov/service-details/review-the-vibrio-control-plan>

Rapid Cooling (Icing)

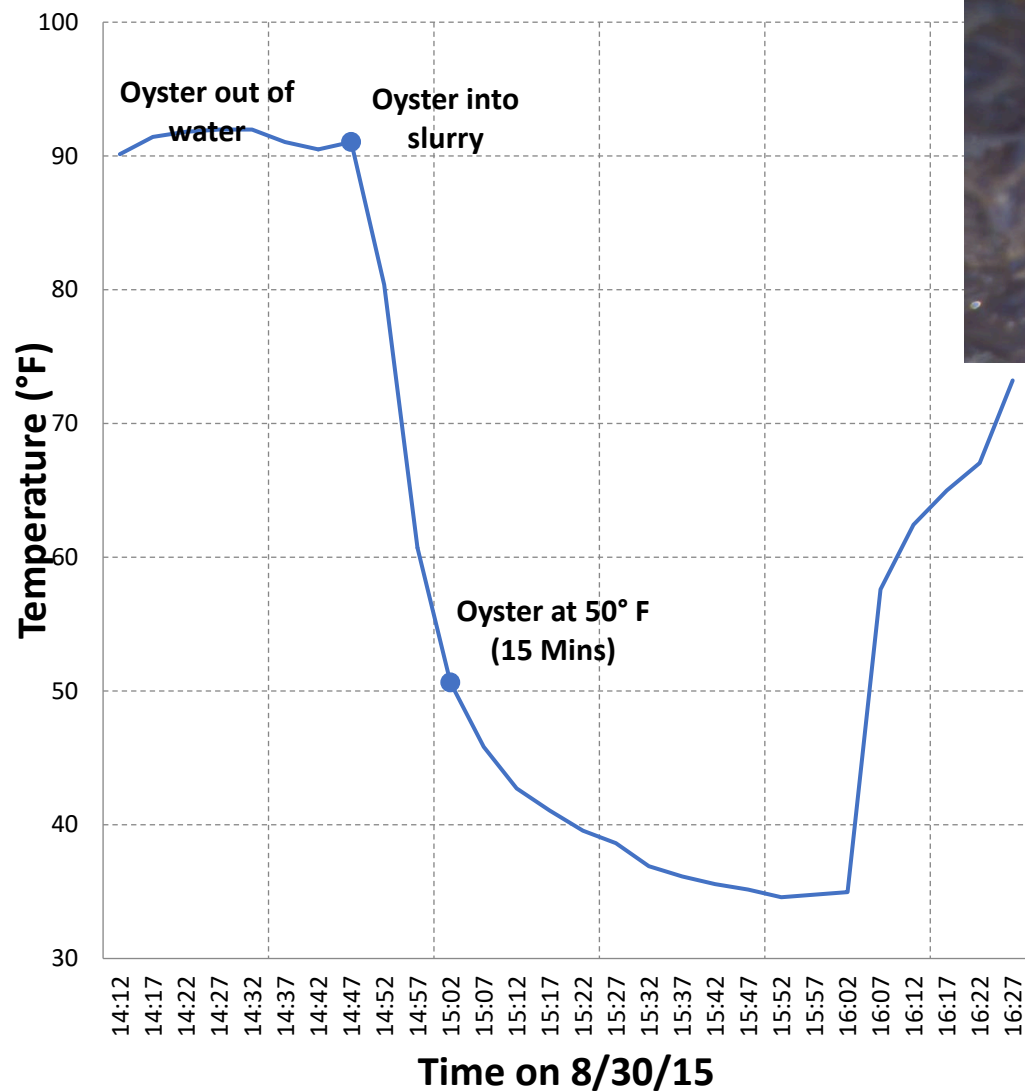


PROPER ICING TECHNIQUE FOR HARVESTERS
Ice oysters within 2 hours of time of harvest or prior to leaving the point of landing, whichever occurs first

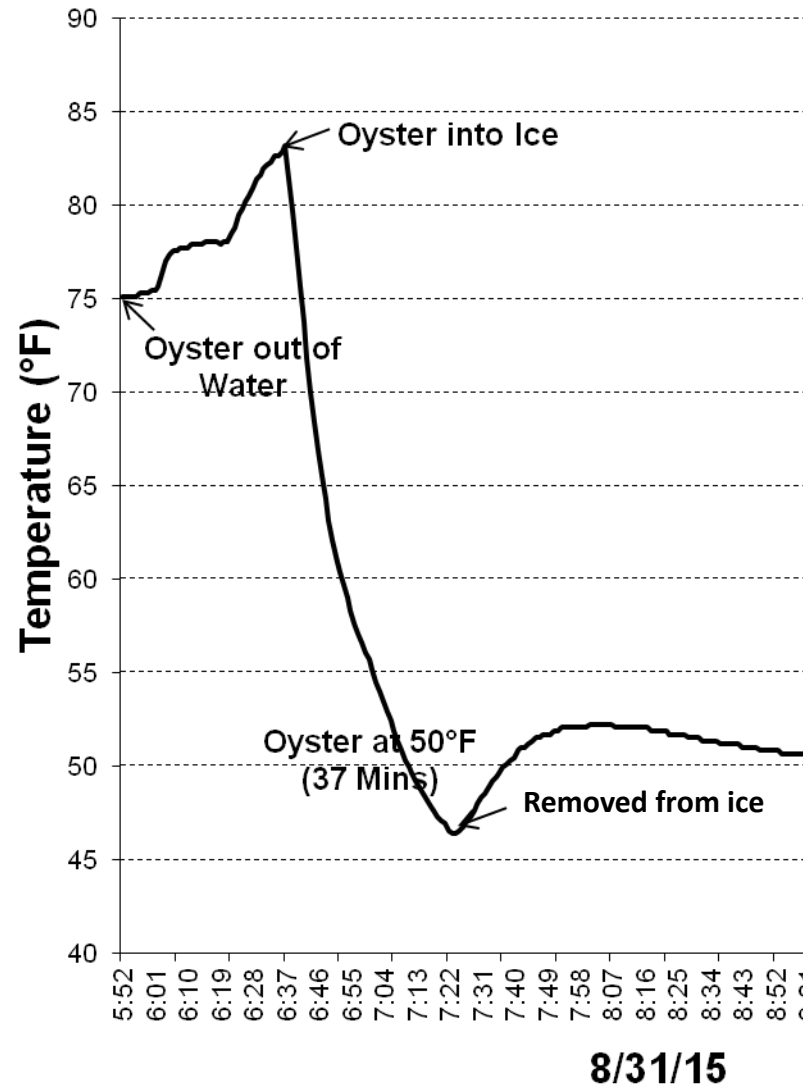


Oyster Temp (° F)	Growth Rate (logs/hr)	Doubling Time (hours)
50	0.008	35.8
70	0.100	3.01
90	0.292	1.03
100	0.426	0.71

Ice Slurry Cooling Time



Direct Ice Cooling Time



Definitions:

Layer means a single thickness or coating spread out and continuously covering an entire surface.

Market-bound Oysters means all oysters removed from a shellfish growing area by a commercial fisherman or **aquaculturist** intended for sale to a permitted dealer on that calendar day.

Adequate icing:

8. All **market-bound oysters** must remain **adequately iced** until received by the original dealer. To accomplish this, harvesters must place oysters into a **shellfish icing container** and:
 - a. Mesh bags containing oysters must be completely surrounded by ice, ~~with at least two (2) inches of ice between each bag and the bottom and sides of the container, and at least three (3) inches of ice on top of the top layer of bags;~~
 - a. including the bottom of the container and each level of bags, with a layer of ice that continuously and completely covers each shellfish bag;
 - b. Loose oysters placed into a **shellfish container** must be completely surrounded by ice, including the bottom of the container, with a layer of ice that continuously and completely covers the top of the oysters. Additionally, ice should be layered as needed in the container to ensure immediate cooling of oysters.
~~with at least two (2) inches of ice at the bottom and sides of the container, and at least three (3) inches of ice on top of the top layer of bags; or~~
 - c. Oysters held in an ice and water mixture (e.g. ice slurry, cold water dip) must be fully submerged and the ice and water mixture must be at or below 45°F to inhibit growth and proliferation of bacteria. Fresh potable water or ocean water from an area classified as **Approved** or **Conditionally Approved** by the Division of Marine Fisheries and in the “open status” may be used to constitute the mixture.
 - d. Exception: Harvesters may be exempted from adequately icing market-bound oysters only if the original dealer takes on the burden of adequate icing (Section C.3) at the landing site and within the time to icing requirements described in Sections B.6 and B.7. The harvester is still required to record the accurate time of icing on the harvester icing tag.

V.p. Compliance Monitoring at Harvest: General Tagging Requirements

C Shellfish Tagging:

- | | | | |
|---|--|-----|----|
| 1 | Are All Containers Properly Tagged? | Yes | No |
| 2 | Do the Tags Include the Following Information? | | |
| a | Time of Harvest: | Yes | No |
| b | Time of Icing | Yes | No |
| c | Harvest Date: | Yes | No |
| d | Harvest Area: | Yes | No |
| e | Harvester ID | Yes | No |

All containers of shellfish in transit, wild harvested or removed from an aquaculture license site, seed or market sized, intended for market or not, must bear a tag:

Tagging Requirement. A tag with the features and harvest information specified in 322 CMR 16.05(1)(a) **must be attached** to all containers of shellfish shellstock **before** reaching the landing site.

V.p. Compliance Monitoring at Harvest: Time of Harvest

All commercial fisherman or aquaculturists must accurately record the time of harvest for each harvester lot of market bound oysters

322 CMR 16.02 General Definitions:

Harvester Lot means containers of oysters identified by the harvest tag as having the **same time of harvest** and consisting of oysters from **a single defined growing area** gathered by **a single commercial fisherman or aquaculturist**.

Market Bound Oysters means oysters removed from a shellfish growing area by a commercial fisherman or aquaculturist intended for commercial purposes on that calendar day.

Time of Harvest for **sub-tidal areas** means the time when the **first oyster** in a harvester lot is **taken from the water** on a calendar day and for **intertidal areas** means the time when the **first oyster** in a harvester lot is **exposed during a single low tide cycle** or when the first oyster in a harvester lot is taken from the water, whichever occurs first.

-Harvesters must accurately record when oysters are exposed by tide at the time of exposure

***In intertidal areas time of harvest may only occur on the Ebb tide during the V.p. Control Season**



V.p. Compliance Monitoring at Harvest: Shading Requirements

E Shellfish Handling:

- | | | | |
|---|--------------------------------|-----|----|
| 1 | Are Oysters Adequately Iced? | Yes | No |
| 2 | Are Oysters Adequately Shaded? | Yes | No |

322 CMR 16.07 (2) Adequately Shaded means the measures required to be taken to protect oysters from direct exposure to sunlight.

322 CMR 16.07 (3)(b) Shading requirement. All commercial fishermen and aquaculturists shall adequately shade oysters **immediately following harvest and until oysters are adequately iced**.

Materials in direct contact with oysters or bags of oysters must be smooth, easily cleanable and impervious to water to avoid cross contamination with bacteria.

Harvesters are encouraged to avoid placing shading materials in direct contact with oysters to allow adequate air flow between oysters and shading materials.



V.p. Compliance Monitoring at Harvest: Icing Requirement

322 CMR 16.07 (2) Adequately iced means the amount and application methods of ice described in 322 CMR 16.07(3)(a)

322 CMR 16.07 (3)(a) Icing Requirement All commercial fishermen and aquaculturists shall adequately ice oysters within two (2) hours of time of harvest or exposure or prior to leaving the point of landing, whichever occurs first.

Seasonal Time to Icing Requirements for Certain Growing Areas. From July 1 – September 15, all commercial fishermen and aquaculturists who are harvesting oysters in shellfish growing areas CCB-42, CCB-43, CCB-45, CCB-46, CCB-47 and V-20, shall adequately ice oysters within 1 hour of time of harvest or exposure, or prior to leaving the point of landing, whichever occurs first.

*Oysters must remain adequately iced until received by a wholesale dealer.





Vibrio Season Summary

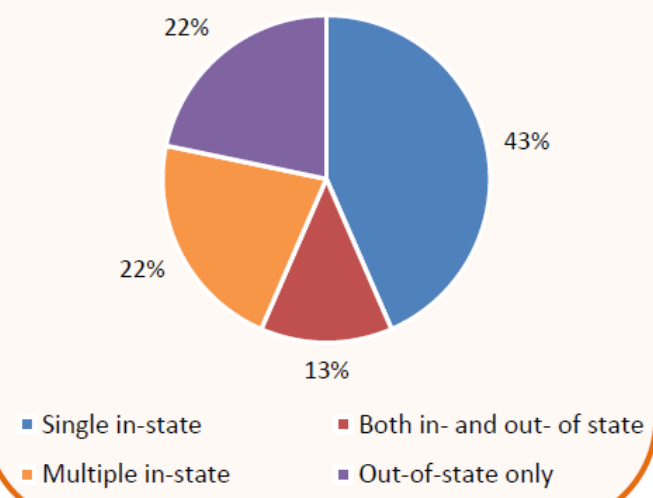
41

MA residents investigated with *Vibrio parahaemolyticus* or *Vibrio* sp. (not further speciated) from stool

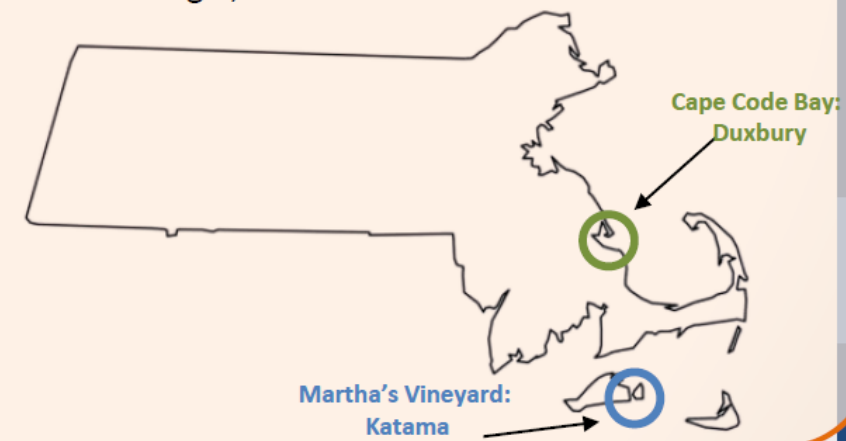
80%

Reported consuming raw oysters (28 out of 35 with information available)

Harvest Area Illness Attribution (n=23)



MA harvest areas associated with ≥ 3 cases with a single, in-state illness attribution



An additional 17 out-of-state residents reported with consumption of oysters in MA, or whose illness was traced back to oysters in MA.

Data from MAVEN as of 12/7/22 and are subject to change.

V.p. Compliance Monitoring at Harvest: Icing Requirements

322 CMR16.07 (3)(a) **Oysters must remain adequately iced until received by the wholesale dealer.** To accomplish this, commercial fishermen and aquaculturists must place oysters and ice into a shellfish icing container using one of the following methods:

1. Mesh bags containing oysters must be completely surrounded by ice, including the bottom of the container, with a **layer** of ice that continuously and completely covers the top of the oysters. Additionally, ice should be **layered** as needed in the container to ensure immediate cooling of oysters.;
2. Loose oysters placed into a shellfish icing container must be completely surrounded by ice, including the bottom of the container, with a **layer** of ice that continuously and completely covers the top of the oysters. Additionally, ice should be **layered** as needed in the container to ensure immediate cooling of oysters.
3. Oysters held in an ice and water mixture (e.g., ice slurry or cold-water dip) must be fully submerged and the ice and water mixture must be at or below 45°F to inhibit growth and proliferation of bacteria.

*Wholesale Dealers may take on the burden of icing at the landing provided the lot is adequately iced within the time to icing required for the harvest area. Harvester still responsible for verifying adequate icing and recording accurate time of icing on tag(s).

V.p. Compliance Monitoring at Harvest: Time of Icing

Time of Icing means the time when the last oyster or bag of oysters in a harvester lot is placed in a shellfish icing container and is adequately iced in accordance with the procedure at 322 CMR 16.07(3).

322 CMR 16.07 (3)(c) **Shellfish Icing Tag Requirement**: “...Commercial fishermen and aquaculturists shall record the time of icing on all harvester tags affixed to containers of oysters or record the time of icing on a single harvester tag attached to a shellfish icing container.”

A single harvester icing tag for the purpose of meeting the shellfish icing tag requirements may be used in instances when:

1. All oysters in the shellfish icing container are from a single harvester lot;
2. The shellfish icing tag is attached to the shellfish icing container at the time of icing and remains attached to the shellfish icing container until received by the primary buyer;
3. The shellfish icing tag also includes the time of harvest, harvest date, harvest area, harvester identification and quantity of oysters harvested.

The use of a single harvester tag for the purpose of meeting this shellfish icing tag requirements does not exempt commercial fishermen and aquaculturists from attaching harvester tags, as specified at 322 CMR 16.05, to all individual containers of market bound shellfish.

V.p. Compliance Monitoring at Harvest: Transport Requirements

F Shellfish Delivery:

1 Name of Wholesale Dealer: _____

2 Quantity of Oysters: _____

3 Oysters Received at (circle one):

Truck

Dealer's Facility

322 CMR 16.07 (3)(e) Restrictions on Transport of Market Bound Oysters to the Primary Buyer All market bound oysters shall be transported by the commercial fishermen, or aquaculturist or his or her licensed employee, **directly to the primary buyer's physical facility or received by the primary buyer at the landing site**. Commercial fishermen and aquaculturists are prohibited from **handling and/or holding** market bound oysters at any unlicensed facility prior to receipt by the primary buyer.

All oysters must be received by the primary buyer and checked to be $\leq 45^{\circ}\text{F}$ within 10 hours of the Time of Harvest (TOH) to be in compliance with Hazard Analysis Critical Control Point (HACCP) Plan

- No off-site culling of market-bound product prior to delivery
- No holding overnight for AM delivery when harvesting on late tides

All oyster transactions must be completed by the harvester and an employee of the original dealer.

- No unattended drop-offs at dealer facilities

V.p. Compliance Monitoring at Harvest: Logbook Requirements

D Harvest Log Book:

322 CMR 16.05 (3)(d)

- 1 Is the Log Book Present? Yes No
- 2 Is the Following Information Provided?
 - a Time of Harvest: Yes No
 - b Time of Icing: Yes No
 - c Date: Yes No
 - d Quantity of Oysters : Yes No

The image shows two pages of a V.p. Harvest Logbook. The left page is titled "2014 Massachusetts Vp Control Plan Landings of Oysters" and contains a table with columns for Date, Harvest Area, and Quantity (Pounds). The right page is titled "Vibrio parahaemolyticus (Vp) Harvest Logbook" and contains a table with columns for Time of Harvest - First Exposure, Time of Icing, and Original Dealer. Both pages have handwritten entries.

Date	Harvest Area	Quantity (Pounds)
6/20/14	CC B 31	200

Date	Harvest Area	Quantity (Pounds)	
6/20/14	7/1/14	CC B 31	100

Time of Harvest - First Exposure	Time of Icing	Original Dealer
0700	0815	A.B.C. Shellfish

Containers	Type	Number	Category*	Notes
Cages	2	2	2	Supplied to dealer

*Re-submergence Categories: (1) Air drying for antifouling; (2) Cutting activities; (3) Non-compliance at original dealer; (4) Recall

322 CMR 16.07 (3)(d) **Logbook Requirement.** When landing oysters, all commercial fishermen and aquaculturists must have in their possession the Division of Marine Fisheries issued V.p. logbook. The commercial fishermen, aquaculturist **or his or her licensed employee** shall record in **indelible ink** the date, shellfish growing area, time of harvest, time of icing, quantity harvested (in pieces or bushels) and the dealer who received the product. The V.p. logbook shall be filled out by the permit holder, or his or her licensed employee, at the time of landing before the day's harvest is placed in transit or leaves the landing site except that the primary buyer information may be completed upon receipt of the market bound oysters by the primary buyer.

Licensed employees are individuals with DMF issued employee transaction cards linking them to the primary license holder's commercial permit identified on the harvester tags and logbook.

Commonwealth of Massachusetts

Division of Marine Fisheries



Oyster Harvest Logbook

Vibrio parahaemolyticus (Vp)

Harvester Name:

Harvest Year:

MA Comm. Shellfish Permit ID:

Effective Dates: May 19 – October 19

This Logbook must be turned in to the Massachusetts Division of Marine Fisheries by the end of the calendar year.

706 South Rodney French Blvd. New Bedford, MA 02744

Vibrio Logbook

Landing of Oysters Bound for... ..Market or Direct Human Consumption							
Date	Harvest Area	Site (grant) ID No. or <u>W</u> for Wild Harvest	Quantity		Time of Harvest- First Exposure	Time of Icing	Original Dealer; (Write "PC" if Personal Consumption)
6/29/2021	CCB42	ADA-57	1500 pcs		10:00 am	11:00 am	Yummy Oyster Co.
7/8/2021	CCB42	W	2000 pcs		2:00 pm	3:30 pm	ABC Seafood
7/30/2021	CCB42	ADA-59	1000 pcs		8:15 am	9:15 am	Yummy Oyster Co.

Some Red Flags:

CCB42 is a growing area with 1 hour to icing

Highly unlikely that the exact harvesting and icing times all end in a zero or five

Re-submergence of... ..Cultured Oysters										
Date		Harvest Area	Site (grant) ID No.	Quantity		Containers		Category	Date Tags Removed	Notes
Removed from Site	Re-submerged					Type	Number			
7/30/21	8/1/21	CCB42	ADA-59	1000 pcs		bags	10	1, 2	8/11/21	Market size/ Sponge fouling

*Re-submergence Categories (1) Air drying for anti-fouling;

(2) Culling activities; (3) Non-compliance at original dealer; (4) Recall

Culling, Sorting, Air Drying and Re-submergence



Restrictions that Apply to Aquaculturists Only: Oyster Culture Activities

Oyster culture activities means activities conducted by some aquaculturists that require the removal of oysters from the waters of the license site (grant) for the purposes of sorting, culling, grading, pitting, overwintering and/or the removal of fouling organisms to enhance oyster marketability.

Market-sized oysters may be brought onboard barges, boats and other floating structures for the purpose of oyster culture activities, provided:

1. All oyster culture activity that is not conducted on the license site is conducted within the same shellfish growing area as the license site or adjacent area specifically authorized on propagation permit ;
2. **When oyster culture activities exceed two (2) hours (or 1-hr if applicable) from the time of harvest or time of first exposure**, all oysters subject to such activities must be returned to the license site, segregated and re-submerged for at least 10 days prior to being harvested for commercial sale
3. **When oyster culture activities do not exceed two (2) hours (or 1-hr if applicable) from the time of harvest or first exposure**, all oysters subject to such activities may either be properly tagged and harvested during that calendar day, in accordance with the procedures set forth at 322 CMR 16.00, **or returned to the original license site and harvested not before the next calendar day (need to document how long the activity did take)**



Restrictions that Apply to Aquaculturists Only: Off-site culling

322 CMR 16.07 (4)(a) Re-submergence Requirements for Off-site Culling Practices. Market-sized oysters may be removed from the original license site for the purpose of off-site culling, provided:

1. All removed oysters are returned to and segregated on the license site for at least 10-days prior to being harvested for commercial purposes;
 2. Off-site culling activities are subject to Aquaculture Propagation Permit conditions
 3. Prior to the removal of any shellstock from a license site, harvesters are required to notify the local municipal shellfish authority.
-
- If oysters are removed from the license site for purposes other than marketing on the same calendar day they are required to be re-submerged for 10 days prior to sale.
 - In Intertidal areas harvesters may cull oysters on their license sites during low tide without requirement for re-submergence. Oysters not iced within 2 hours of tidal exposure (or 1-hr if applicable) may not be harvested until the following tide.
 - Use a stopwatch or mark the time oysters are removed from water when conducting activities that take < 2 hrs.



Re-Submergence of Non-Compliant Oysters

322 CMR 160.07 (5)(b) Re-Submergence of Non-Compliant Oysters: In the event of a recall resulting from the closure of a harvest area due to illness, **only those oysters received from harvesters and stored at a primary buyer's facility may be re-submerged.**

322 CMR 16.07 (4)(d) Re-submergence of oysters **may only be conducted by the permitted aquaculturists on the license site where the oysters originated**, unless otherwise approved in advance in writing by the Division.

***No holding of wild oysters on aquaculture sites**

In the event that DMF or the Department of Public Health determines **that a primary buyer is in possession** of noncompliant oysters, such oysters may be returned to the aquaculturists, re-submerged and segregated on the license site where they originated for 10 days **under the supervision of the local Shellfish Constable and if outside of *Vibrio* Control Season a resubmergence form must be completed.**

Restrictions that Apply to Aquaculturists Only:

Re-submergence tagging and Logbook requirements

1. Logbook Requirements. Aquaculturists shall maintain a record in their *V.p.* logbook of all market-sized oysters returned to the license site after off-site culling or oyster culture activities requiring re-submergence. **The *V.p.* logbook shall be filled out** by the permit holder, or his or her licensed employee, when removing product from the license site and **at the time of re-submergence** when the last market-sized oyster is returned to the license site.



2014 Massachusetts Vp Control Plan

Landings of Oysters		
Date	Harvest Area	Quantity (Pieces)
6/20/14	CCB31	200

Re-submergence			
Date		Harvest Area	Quantity (Pieces)
In	Out		
6/20/14	7/4/14	CCB31	100

*Re-submergence Categories: (1) Air drying for antifouling;

Vibrio parahaemolyticus (Vp) Harvest Logbook

Bound For Market		
Time of Harvest - First Exposure	Time of Culling	Original Dealer (complete following transfer at dealer's facility)
0700	0815	ABC Shellfish

of Oysters			
Containers		Category*	Notes
Type	Number		
Cages	2	2	Segregated on east end of base

(2) Culling activities; (3) Non-compliance at original dealer; (4) Recall

Disposition and Handling of Non-Compliant Oysters and Recalled Oysters

322 CMR 16.07 (5)(a) **Destruction of Non-Compliant Oysters**: In the event that DMF, the local Shellfish Constable or the Office of Law Enforcement determines that a commercial fisherman or aquaculturist is in possession of oysters that are out of compliance with the tagging, icing or other requirements set forth at 322 CMR 16.00, such oysters shall be destroyed.

Oysters distributed into commerce that are recalled in the case of illness are typically destroyed.

Why destruction?

- One harvester's poor actions can result in potentially life-threatening illness, the closure of multiple growing areas, and loss of income for many individuals

Critical Violations

- Incomplete tagging or lack of tags** results in destruction because suitability of oysters for human consumption cannot be guaranteed.
- Improper icing or lack of ice** results in destruction as *V.p.* growth following harvest degrades the suitability of oysters for human consumption



Grower Harvest and Handling Training

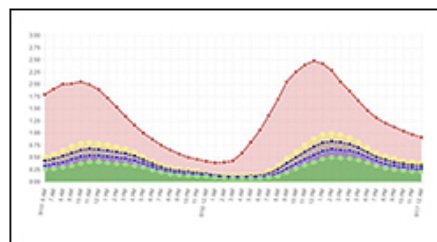
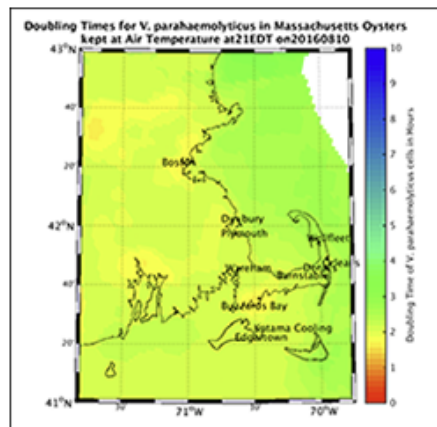


*Remember that resubmergence window has been updated to 10 days

<https://www.mass.gov/service-details/watch-vibrio-training-videos>



Proactive *V.p.* Tools



Doubling Time of *Vibrio parahaemolyticus* (*Vp*) in Massachusetts Oysters

Vibrio parahaemolyticus has one of the fastest growth rates of all estuarine bacteria, and the population can replace itself, or double every hour at 90°F. This [product](#) uses surface air temperature from the National Digital Forecast Database to force a statistical growth rate equation for *Vp*. Forecasts are hourly for the first 36 hours, then every 3 hours until 72 hours and finally every 6 hours out to 7 days.

[View Model](#)

Best Harvest Windows

The *Vp* doublings given different cooling strategies are shown for growing areas in Massachusetts. These graphs allow users to determine where and when the highest doubling times will occur in advance to plan harvest and cooling strategies.

[View Model](#)

[Return to top of page](#)

Questions



Future questions may be directed to
Chrissy Petitpas: christian.petitpas@mass.gov
or
Gabe Lundgren: gabriel.lundgren@mass.gov

