Shellfish Sanitation- Pollution-Related vs. Naturally Occurring Pathogens

Presented to: Marine Fisheries Commission

DEPARTMENT OF ENVIRONMENTAL QUALITY

Marine Fisheries

Shannon Jenkins | November 14, 2019

Role and Responsibilities

- Public health agency
- Shellfish Sanitation: Ensure that all shellfish harvested or processed in North Carolina are safe for human consumption
- Recreational Water Quality: Monitor coastal recreational waters including ocean and estuarine beaches and post advisories when samples exceed safe standards for human activity

Molluscan Shellfish

- Bivalve mollusks such as oysters, clams and mussels are filter feeders

- Can process up to 50 gallons of water per day, and can concentrate pathogens and toxins up to 100 times the ambient levels that are in the water

- Shellfish are commonly eaten alive and raw or undercooked

- ~70% of seafood related illnesses in the United States are tied to consumption of raw shellfish

National Shellfish Sanitation Program

- Programs began in 1925 after widespread typhoid fever outbreaks (*Salmonella typhi*) which was traced to sewage polluted oysters

- Part of National Shellfish Sanitation Program
  - State Agencies
  - FDA
  - Industry Representatives

- Uniform guidelines set for all state programs by the Interstate Shellfish Sanitation Conference including the way shellfish are harvested, stored, transported, processed, sold and served

- Administered by the U.S. Food and Drug Administration

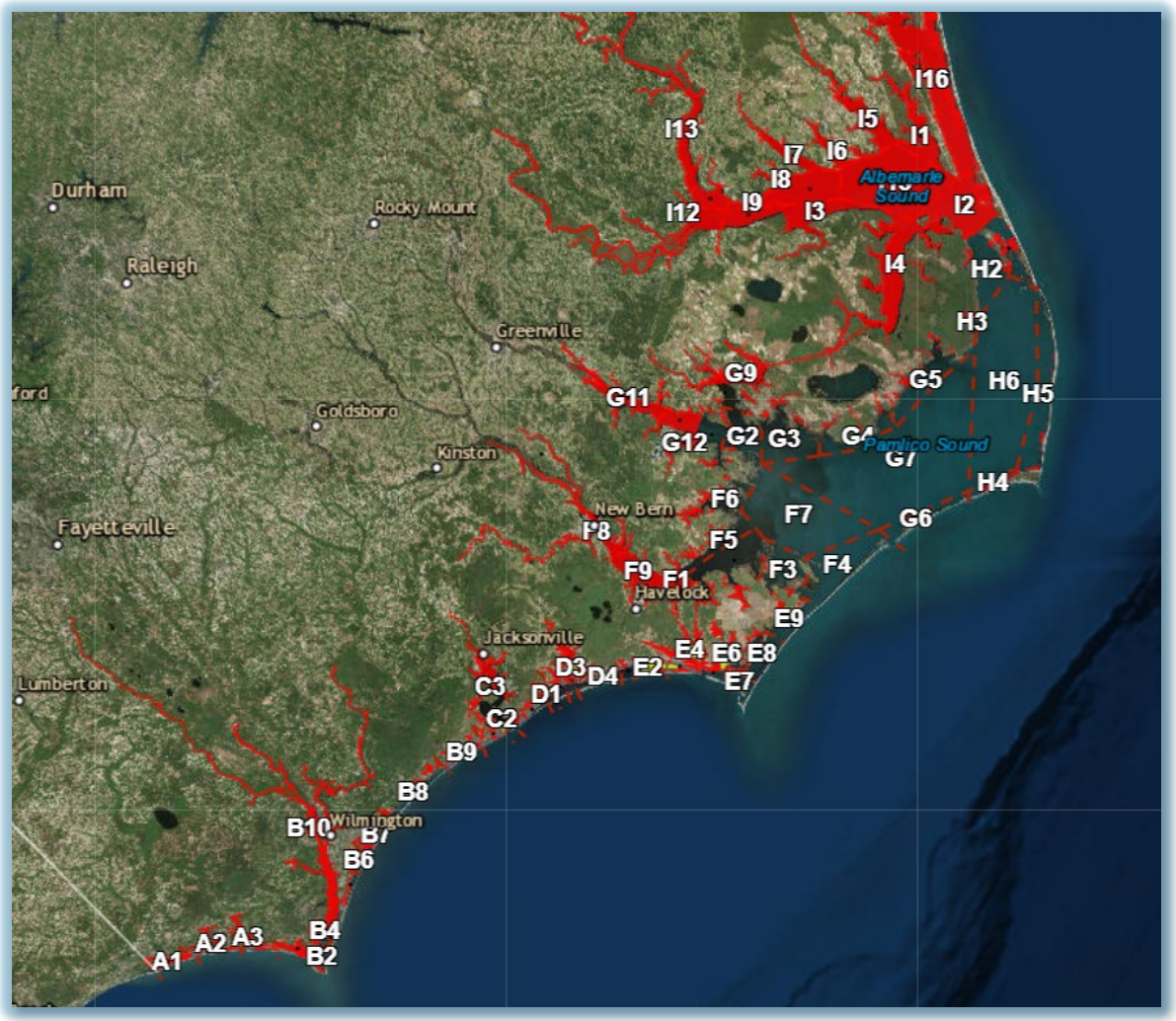
Shellfish Growing Area Program

- Classify coastal waters for safe shellfish harvesting for human consumption

- Waters classified using Sanitary Surveys

- An evaluation of the environmental factors that affect water quality in shellfish growing areas:
  - Bacteriological water quality survey
  - Shoreline survey of pollution sources
  - Hydrographic survey (dye studies)
  - Meteorological survey
  - Sanitary Survey Report

Growing Areas



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Bacteriological Sampling

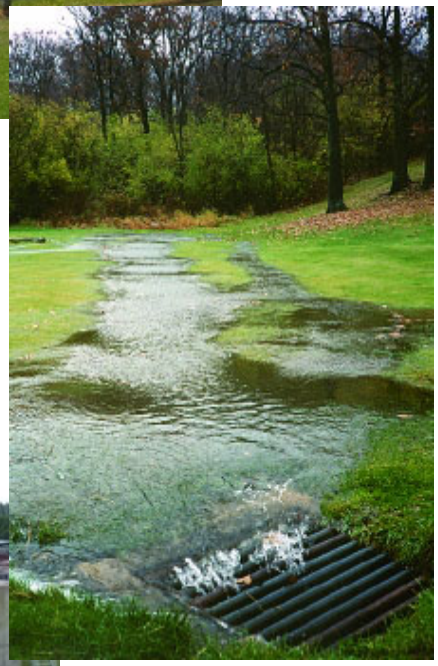
- 1,000 stations coast wide sampled randomly a minimum of six times per year
- All samples are planted, cultured, and analyzed using division laboratories
- Sample results used to classify shellfish growing areas and to reopen temporarily closed areas

Laboratory

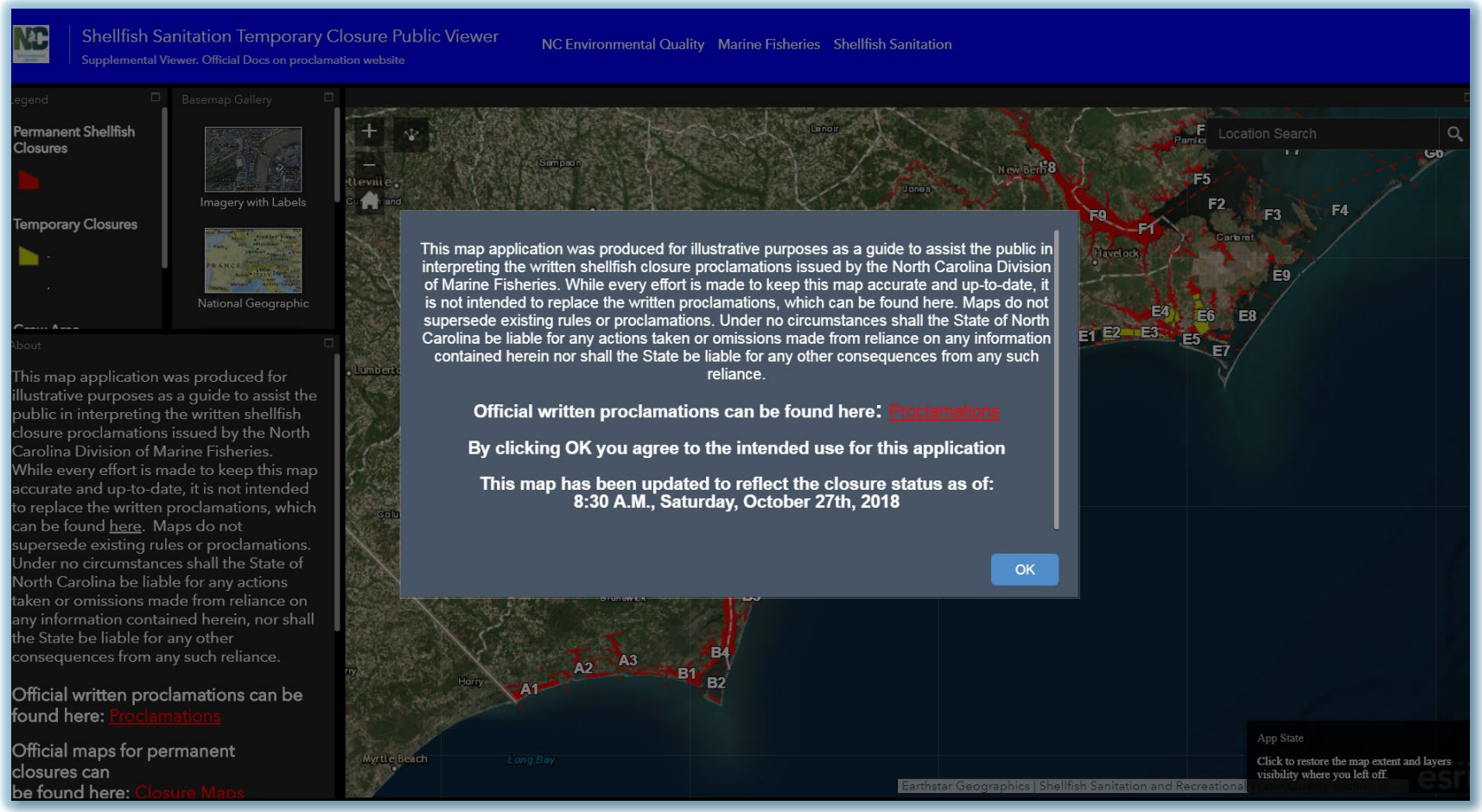
- Morehead City and Wilmington
- U.S. Food and Drug Administration / State certified and inspected
- Fecal coliform indicator organism- Indicates potential presence of pathogens such as viruses, bacteria, protozoa that are harmful to humans
- Multiple tube fermentation method

Shoreline Surveys

- Evaluation of all existing or potential sources of pollution that can affect shellfish growing waters
- Staff evaluate wastewater treatment plants, onsite septic systems, marinas, stormwater conveyances, animals and other areas of concern
- Work with appropriate agencies such as the local Health Departments to resolve issues where possible



Shellfish Closures



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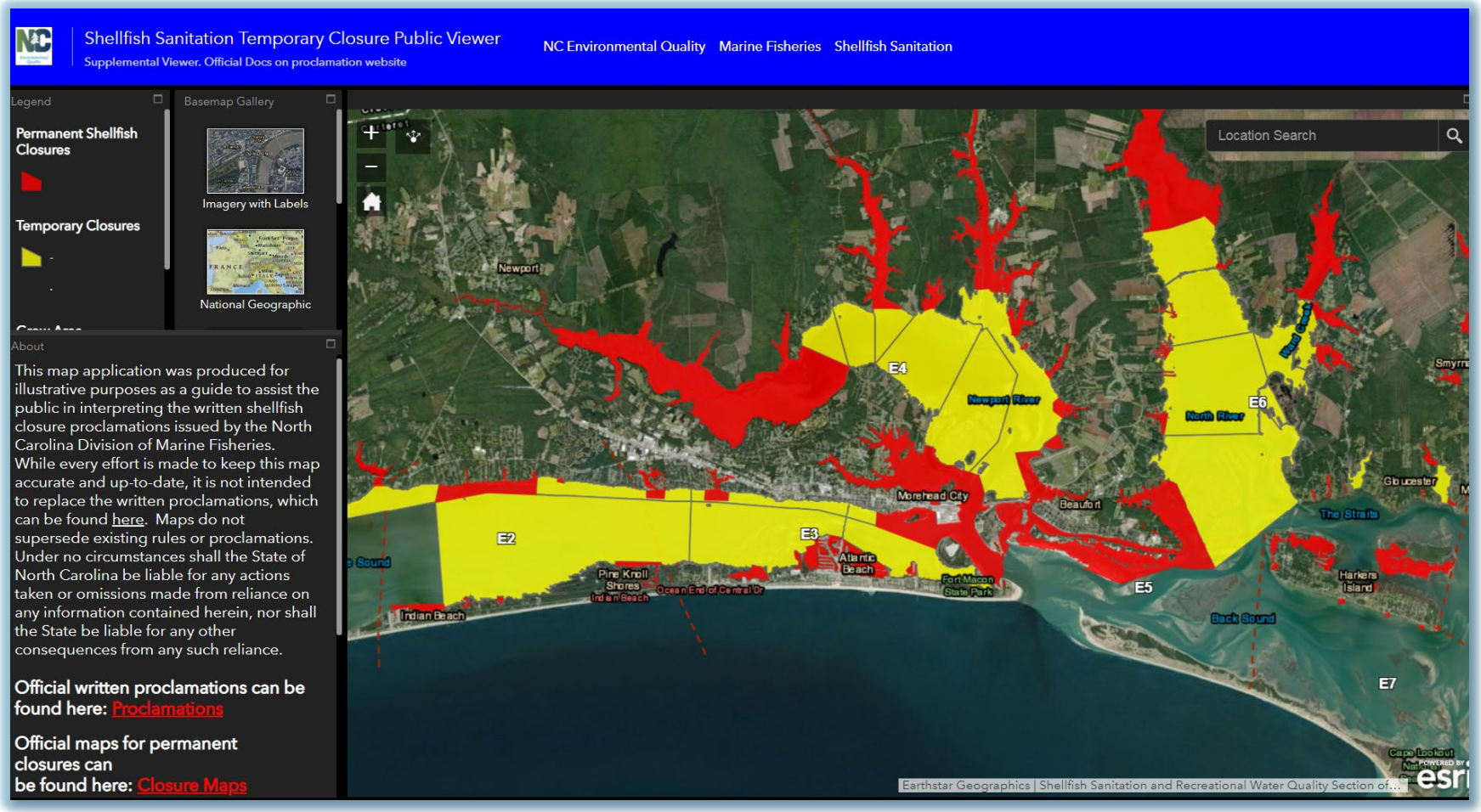
Shellfish Closures



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Emerging Concern- Vibrio bacteria

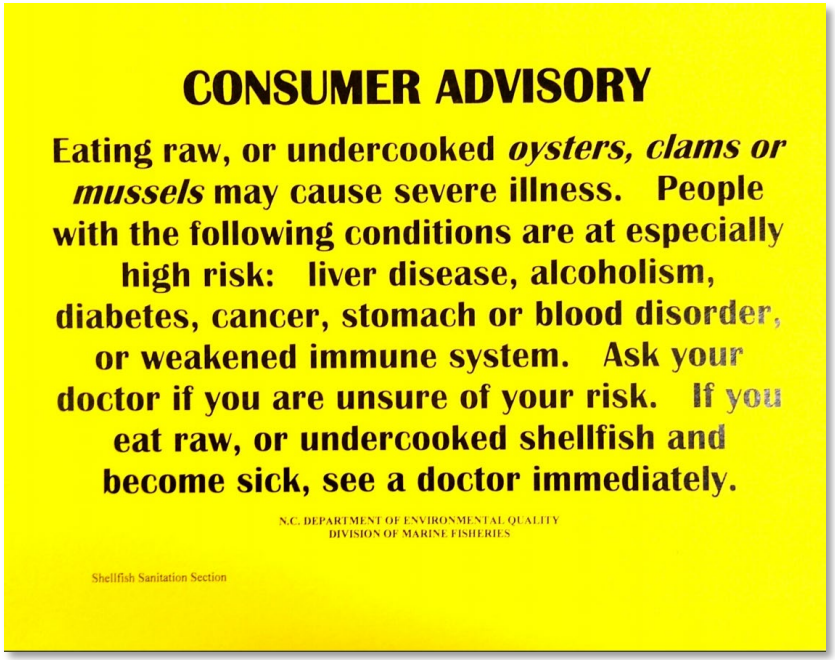
- Naturally occurring in the environment and not related to pollution
- More abundant when water temperatures are warm
- Rare, but can cause serious gastrointestinal illness or wound infections
- Immunocompromised individuals are more at risk:
  - Liver disease
  - Diabetes
  - Stomach or iron disorders
  - Alcoholism
  - Cancer
  - Acid reducing medicines
- Centers for Disease Control and Prevention (CDC) has reported increase nationally

Vibrio vulnificus

- Generally found in lower salinity waters
- Multiplies rapidly above 55°F
- Serious infections almost exclusively affects those with compromised immune systems
- Sepsis infections are rare and sporadic but can be fatal

  * Ingestion (primarily raw or undercooked shellfish)

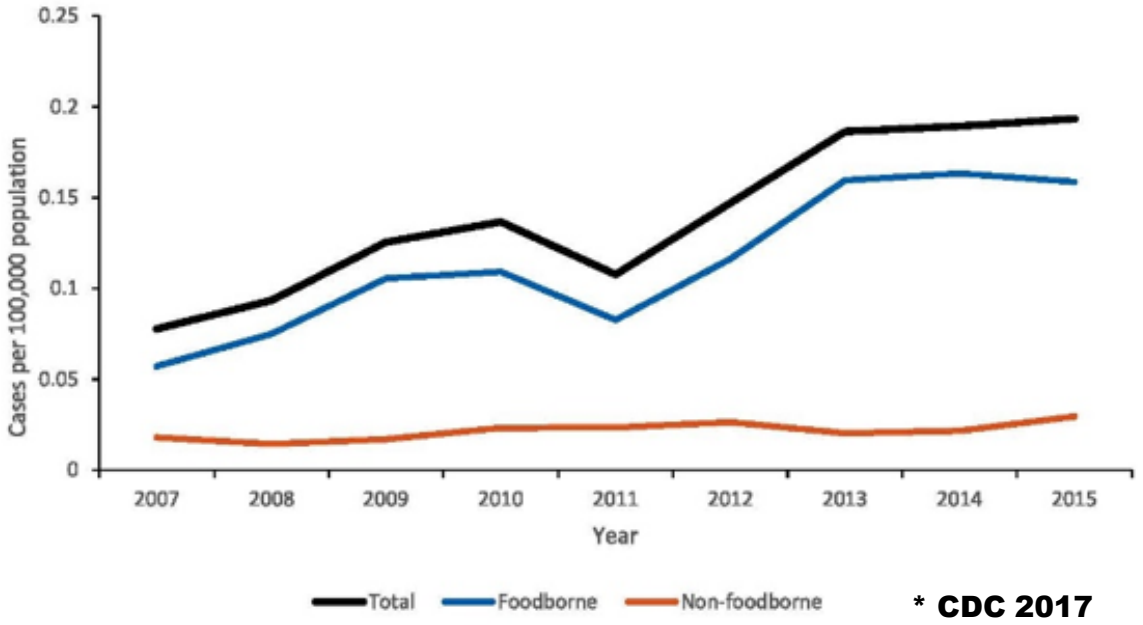
  * Wound Infections (NC cases*)



Vibrio parahaemolyticus

- CDC estimates 45,000 cases each year in United States
- Wider salinity range than vulnificus
- Multiplies rapidly above 50°F
- Causes mild to severe gastroenteritis
- More severe in immune-compromised individuals

V. parahaemolyticus incidence, 2007–2015



* CDC 2017

NC Vibrio Research

Differences in Abundances of Total Vibrio spp., V. vulnificus, and V. parahaemolyticus in Clams and Oysters in North Carolina.

Froelich BA[1], Phippen B[2], Fowler P[3], Noble RT[4], Oliver JD[2].

Author information

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4 The University of North Carolina at Chapel Hill, Institute of Marine Sciences, Morehead City, North Carolina, USA.

Development of a matrix tool for the prediction of Vibrio species in oysters harvested from North Carolina.

Froelich BA[1], Ayrapetyan M[2], Fowler P[3], Oliver JD[4], Noble RT[5].

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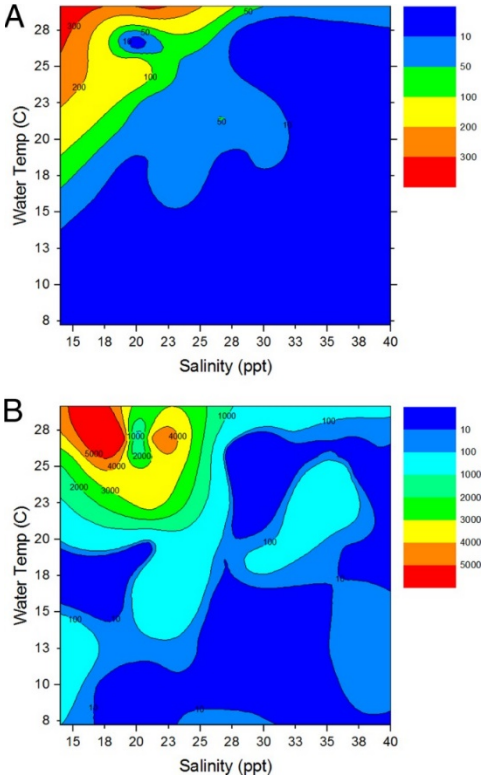
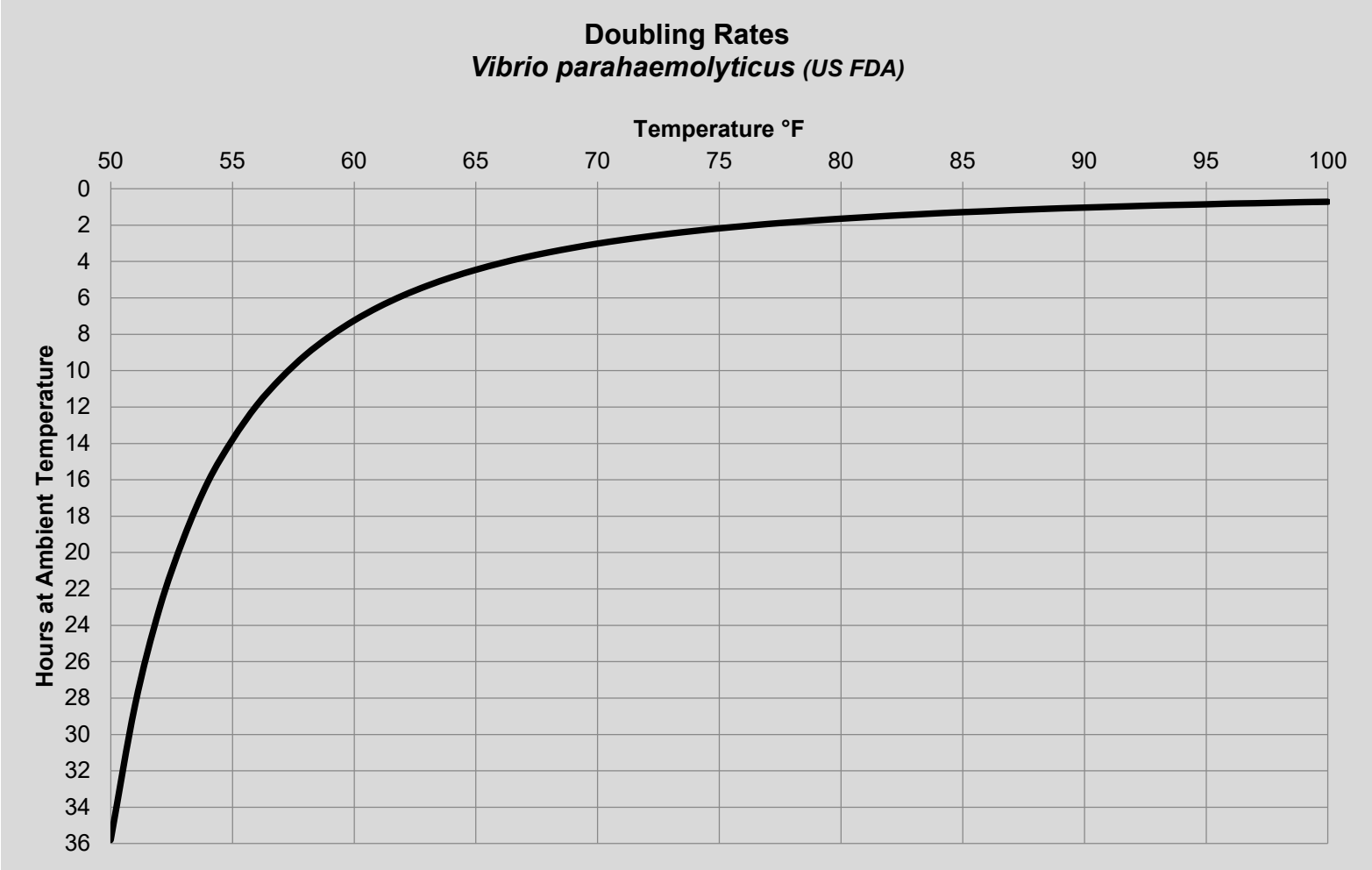
- Differences between Vibrio concentrations in oysters and surrounding waters
- Variation in Vibrio concentrations from oyster to oyster
- Difficult to predict pathogenic Vibrio concentrations within oysters from environmental parameters



Heat maps of V. vulnificus abundances in water (A) or oyster (B) samples by salinity and water temperature during the collection period. Numbers on heat maps and in keys represent bacterial counts in CFU/ml for water and CFU/g for oysters.

Temperature Control



* Background bacteria can grow quickly if improperly stored

Temperature Control

NC Vibrio Control Plan

- Time and Temperature Control - Proclamations SS-1/SS-2 (2019)
- Maximum 5 hours from harvest to refrigeration at dealer from May 1 – October 14
- Certified shellfish dealer must cool oysters to 50°F within 10 hours or less
- Oysters must be maintained at 45°F or below at dealer and through distribution/transportation network (Inspections)

HARVEST TAG

Name John Smith
Address 123 Shellfish Rd
Coastal Towne, NC
Phone# 555-555-5555
Harvester's Cert. No. 111111
Harvest Date: 3/11/13 Time: 7:00 A.M.
Harvest Area: E-5
Type & Quantity

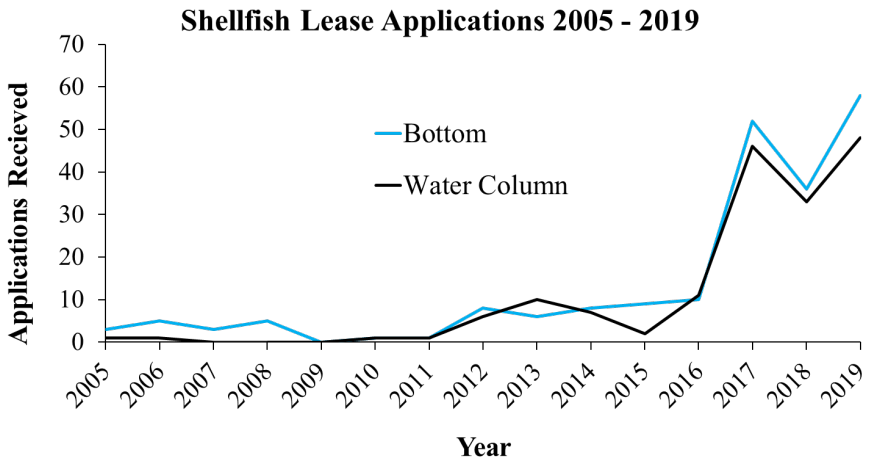
Oyster 1 Bu. Clams #

"THIS TAG IS REQUIRED TO BE ATTACHED UNTIL CONTAINER IS EMPTY AND THEREAFTER KEPT ON FILE FOR 90 DAYS"

TO:

Expansion of Shellfish Aquaculture in NC

- 106 new lease applications in 2019 (58 bottom, 48 water column)
- Oyster aquaculture is a year-round market
- Continued diligence required for public health and reputation of aquaculture industry
- Can't completely remove all risk
- Stakeholder meetings to get input on further strengthening controls
  - Pamlico County December 3, 2019
  - Carteret County December 4, 2019
  - Onslow County December 5, 2019



Implications to Industry

- Risk Evaluation completed annually for *Vibrio vulnificus* and *Vibrio parahaemolyticus*
- (2) *Vv* illnesses within 10- year period would require much more stringent controls
- > 2 *Vp illnesses* from same harvest day or > 4 *Vp illnesses within 30-day period (same harvest area) would require temporary closure of growing area*

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