

Vibrio parahaemolyticus and Shellfish in Southeastern Massachusetts

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What is *Vibrio parahaemolyticus*?

Vibrio parahaemolyticus (Vp) is a naturally occurring, halophilic bacterium that commonly inhabits coastal marine waters.

Vp Overview

- Growth regulated by temperature, growth ↑ at higher temperatures
- Ubiquitous – found everywhere, is not water-body specific
- Not associated with pollution or sewage
- More common in higher salinity and when water temperatures exceed 80°F
- Not all strains cause illness
- Infectious dose = several thousand cells

Why is it in the news lately?

In recent years Vp has been an emerging concern for the local commercial shellfish industry. In 2007, vibriosis (i.e. Vp illness) was identified as a nationally reportable disease to the Centers for Disease Control and Prevention (CDC).

While the bacterium is not new and illnesses are uncommon, the reported increase in incidence rates has prompted the Food and Drug Administration (FDA) to update shellfish handling requirements.

In response, in 2012 the Massachusetts Division of Marine Fisheries (DMF) developed a “Vibrio (Vp) Control Plan” for growers and harvesters of oysters in the State which was later modified in 2013. Additional changes are anticipated in the future as the Plan is reviewed and updated annually.

Current Local MA Vp Research

CCCE/WHSG Vibrio Seasonality Study

(PI: Murphy, Smolowitz, Reitsma, Markey)

- Study to examine the effects of ‘season’ on Vp levels in oysters from 2 SE MA locations

CCCE/WHSG Vibrio Time Interval Study

(PI: Murphy, Reitsma, Archer)

- Analysis of Vp levels in oysters at varying time intervals + controls
 - 5 hours out of water
 - 1 hour back in water
 - 5 hours in water
 - 19 hours in water

NRAC Grant – Develop more efficient methods of *Vibrio* sp. detection

(PI: Smolowitz, Leavitt, Murphy, Gomez-Chiari)

- Develop 3 multiplex qPCR methods for detection of Vv & Vp and pathogenic genes in oysters
- Compare new PCR methods to MPN at 2 sites (MA + RI) over 1 year, include water & sediment

In response to increased shellfish management regulations and uncertainties between the correlation of Vp levels and oysters, studies were initiated in 2011 in southeastern MA to examine Vp levels in oysters during time-temperature treatments.

Study sites were chosen to be representative ‘zones’ of aquaculture activity – results reported anonymously to avoid publicizing any individual participants. These sites were established as long-term locations for ongoing and future studies to learn more about the dynamics of Vibrio in this region.

Vibrio Monitoring Sites in MA



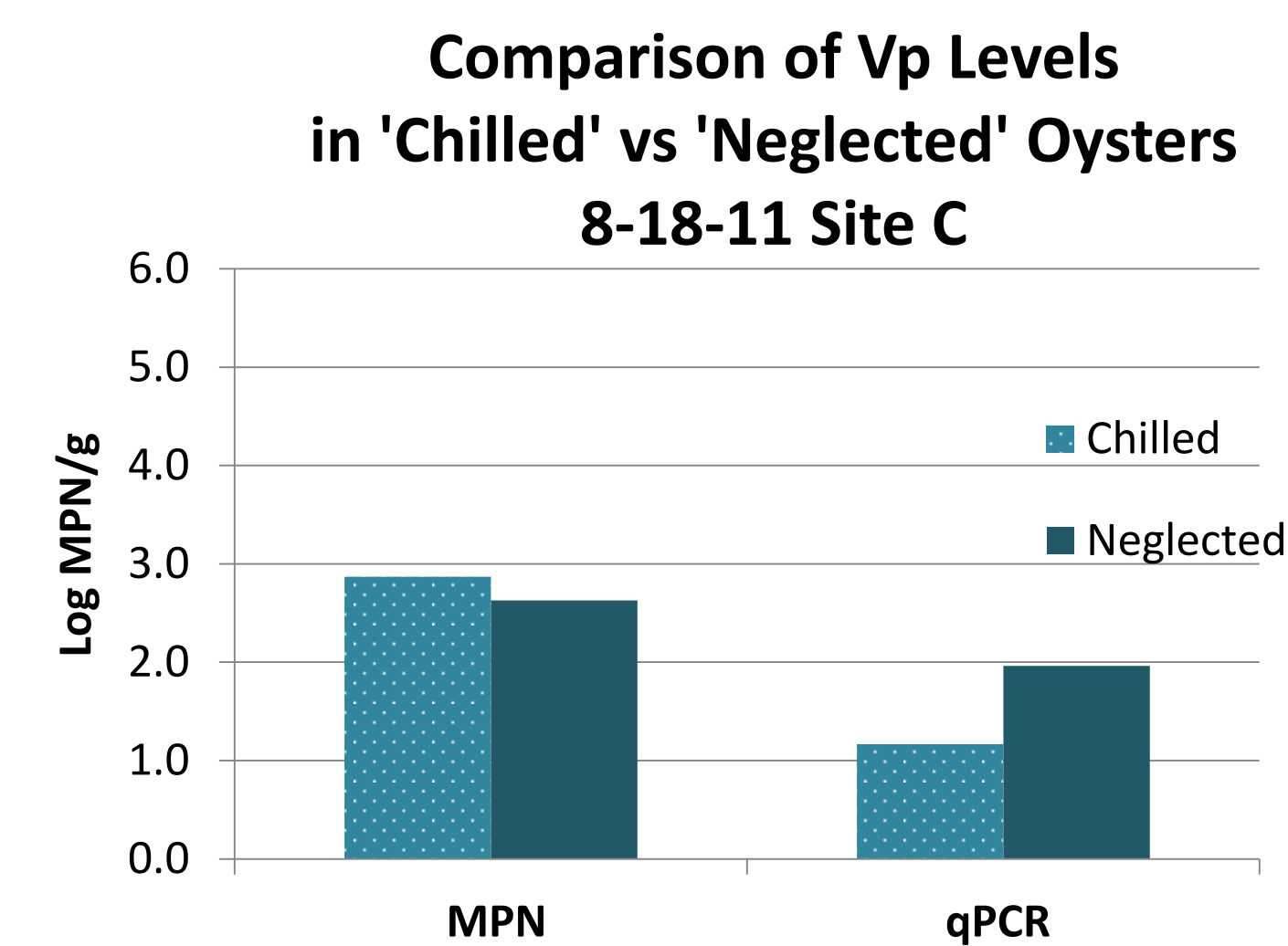
Current Local MA Vp Research

In this preliminary study two groups of oysters were compared for Vp levels using traditional MPN methods and qPCR-MPN methodology. From one site (C), 10 oysters were “chilled” on ice and processed immediately while a second group of 10 were processed after 2 hours of temperature “neglect” in the hot bed of a pickup truck parked in direct summer sun.

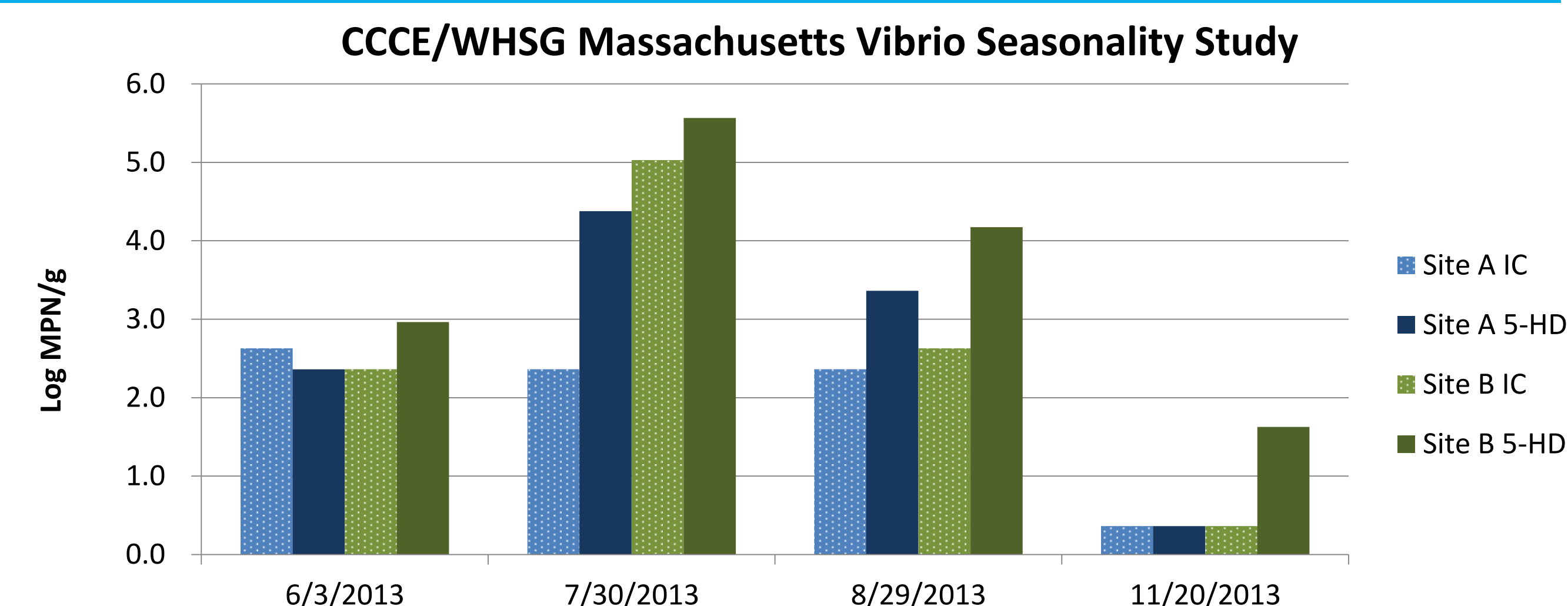
Interestingly, results showed the MPN method (based on growth alone) revealed higher MPN/g in “chilled” versus the “neglected” oyster samples, whereas the qPCR MPN was the reverse – higher in “neglected” oysters.

Results also indicate the MPN culture method may over estimate Vibrio levels. It is also possible that ‘other’ bacteria proliferated in the ‘neglected’ oysters, outcompeting Vibrio. These bacteria may not grow in the enrichment media, causing higher apparent levels of Vibrio in chilled vs. neglected samples.

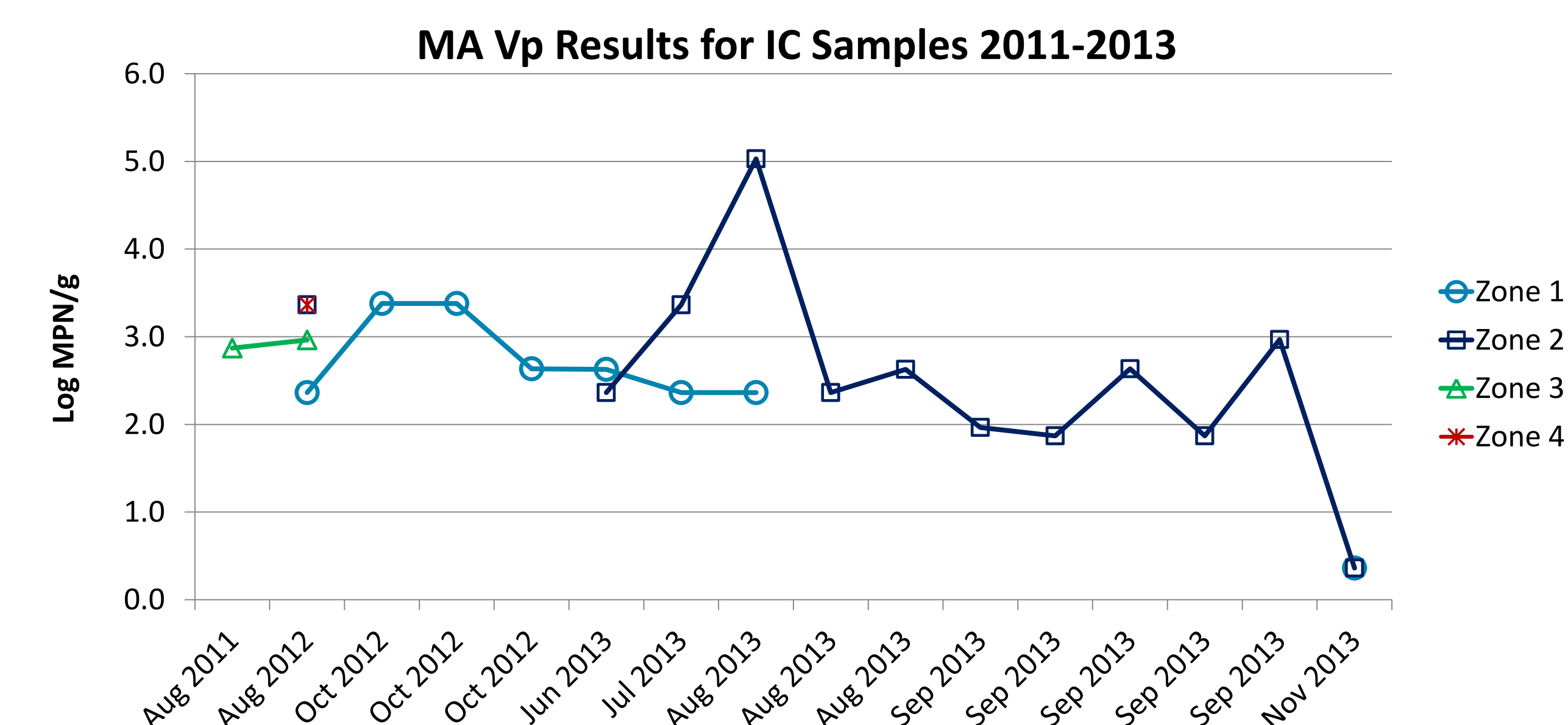
Note: Lab processing and analyses of Vibrio samples provided by Roxanna Smolowitz & Kate Markey, Roger Williams University Aquatic Diagnostics Lab



Vibrio Seasonality Study



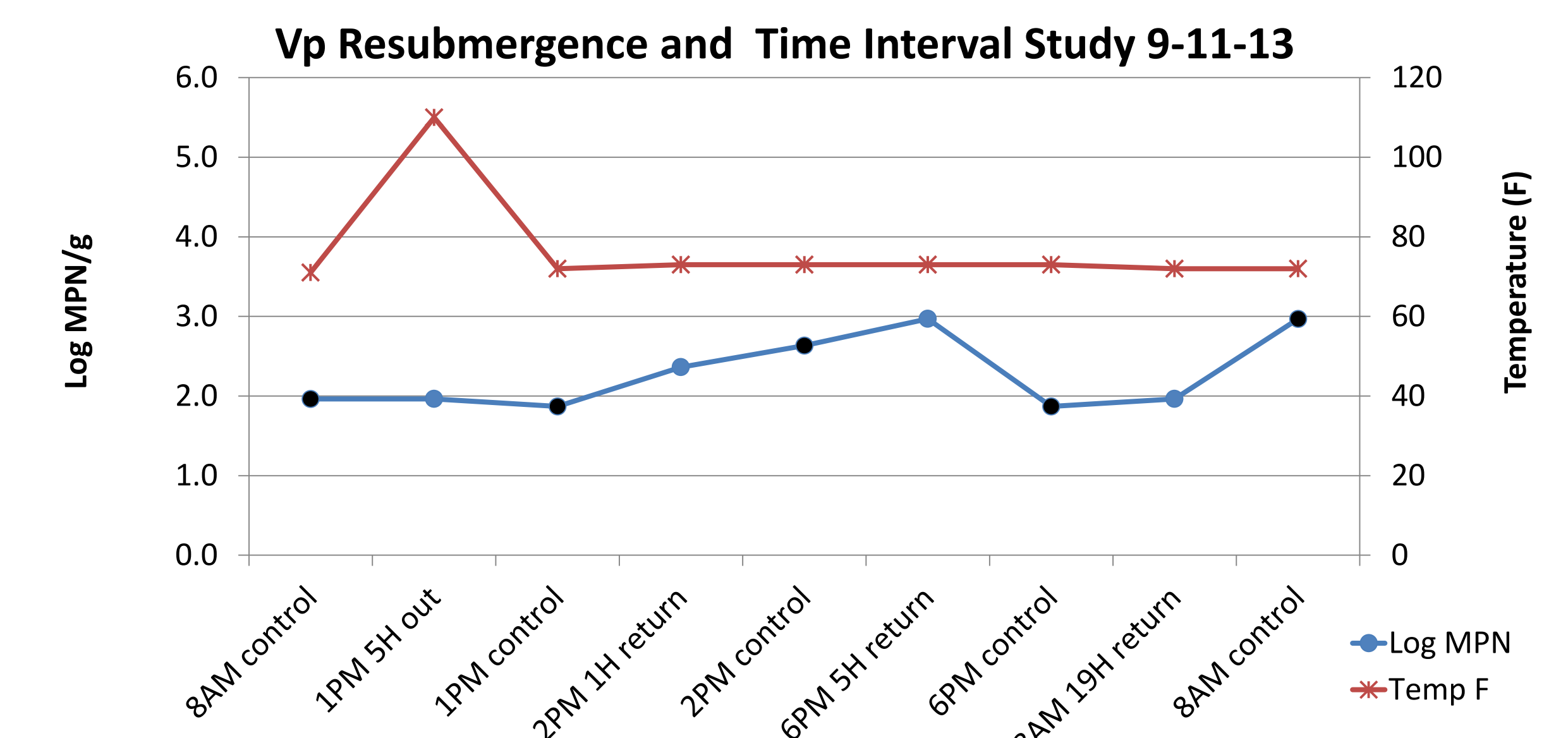
Oysters were sampled at two MA sites during 4 time periods representative of seasonal changes in air & water temperatures throughout 2013. During each sampling 10 oysters were collected and immediately iced (IC) and 10 oysters were left out at ambient temperatures for a 5 hour delay (5-HD).



Results of all Vp testing conducted from 2011 through 2013. Samples were collected and immediately chilled prior to processing. *When conducted, PCR testing for tdh & trh pathogenic genes was negative.

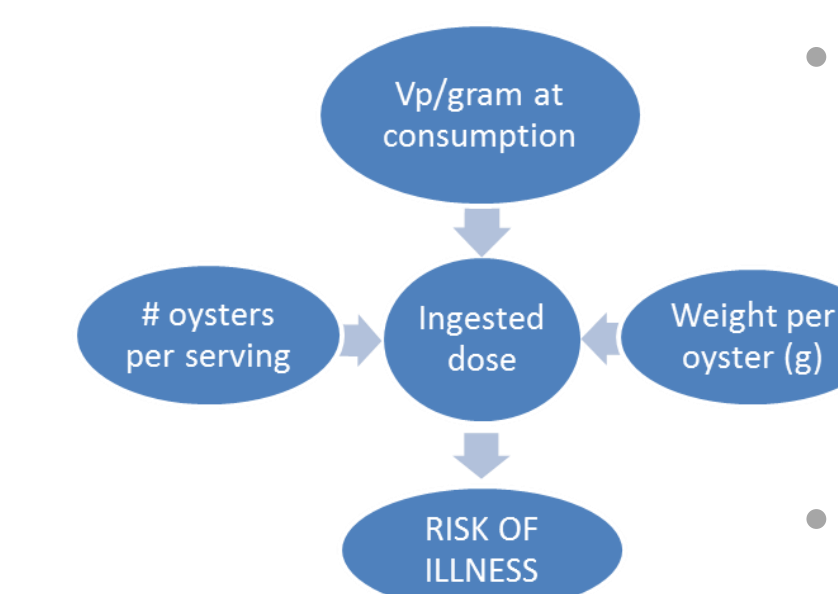
Vibrio Resubmergence and Time Interval Study

This study examined Vp levels in oysters removed from the water for 5 hours as well as Vp levels in oysters after 1, 5, and 19 hours returned to the water. Study was limited to one site over a 2-day period. An Hobo datalogger attached to the ‘treatment’ oyster bag recorded continuous temperatures from the water to 5-hour air exposure back to submergence.



- Highest MPN in graph is 930 MPN (log 2.97) so multiply 930 X 144 = 133,920 or number of Vibrio cells consumed per serving.
- = LESS than 1% risk of illness

Risk Reduction



- MPN (Most Probable Number) is multiplied by the number of oysters per serving (assumes 12) and the weight of the oysters (assumes 12g/oyster) to yield the ingested dose, or 144 X MPN = estimated risk of illness
- It should be noted the average serving size may be closer to 6 in the Northeast which would have significant effect on risk calculations.



Consumption module for exposure assessment of Vp in oysters (Vp = pathogenic *Vibrio parahaemolyticus*) (FAO figure)

Common Sense Risk Reduction

- Get shellfish down in temperature as quickly as possible (at least to 50°F)
- Keeping shellfish adequately cool will ensure safety and quality of product
- Cooking will kill Vibrio bacteria
- Immunocompromised individuals are at greatest risk of Vp illness
 - need to be aware of this heightened risk when consuming raw food products
 - should avoid eating shellfish raw as a precaution

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