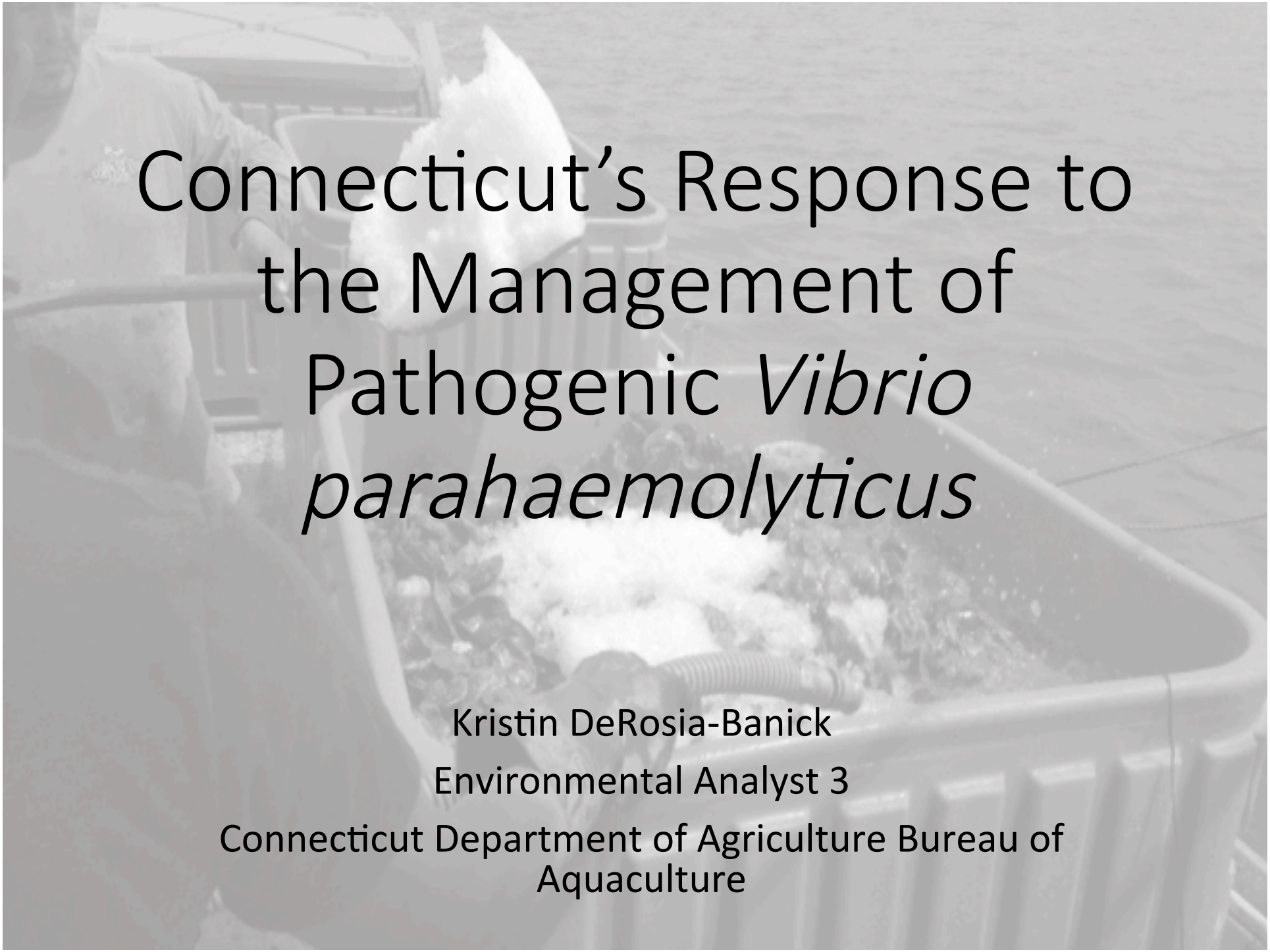
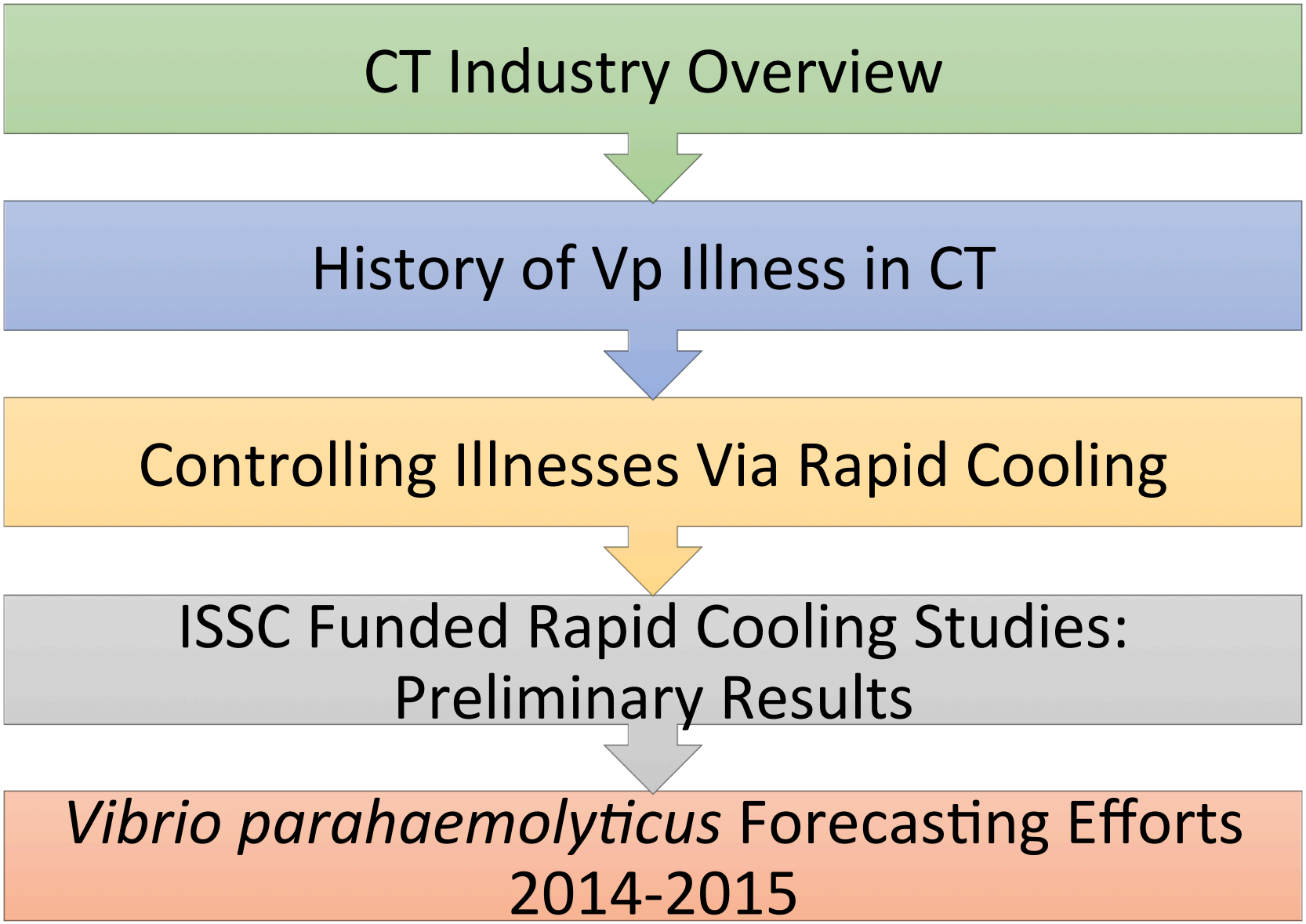


Connecticut's Response to the Management of Pathogenic *Vibrio parahaemolyticus*

Kristin DeRosia-Banick

Environmental Analyst 3

Connecticut Department of Agriculture Bureau of Aquaculture


CT Industry Overview
History of Vp Illness in CT
Controlling Illnesses Via Rapid Cooling
ISSC Funded Rapid Cooling Studies: Preliminary Results
Vibrio parahaemolyticus Forecasting Efforts 2014-2015

CT Industry Overview

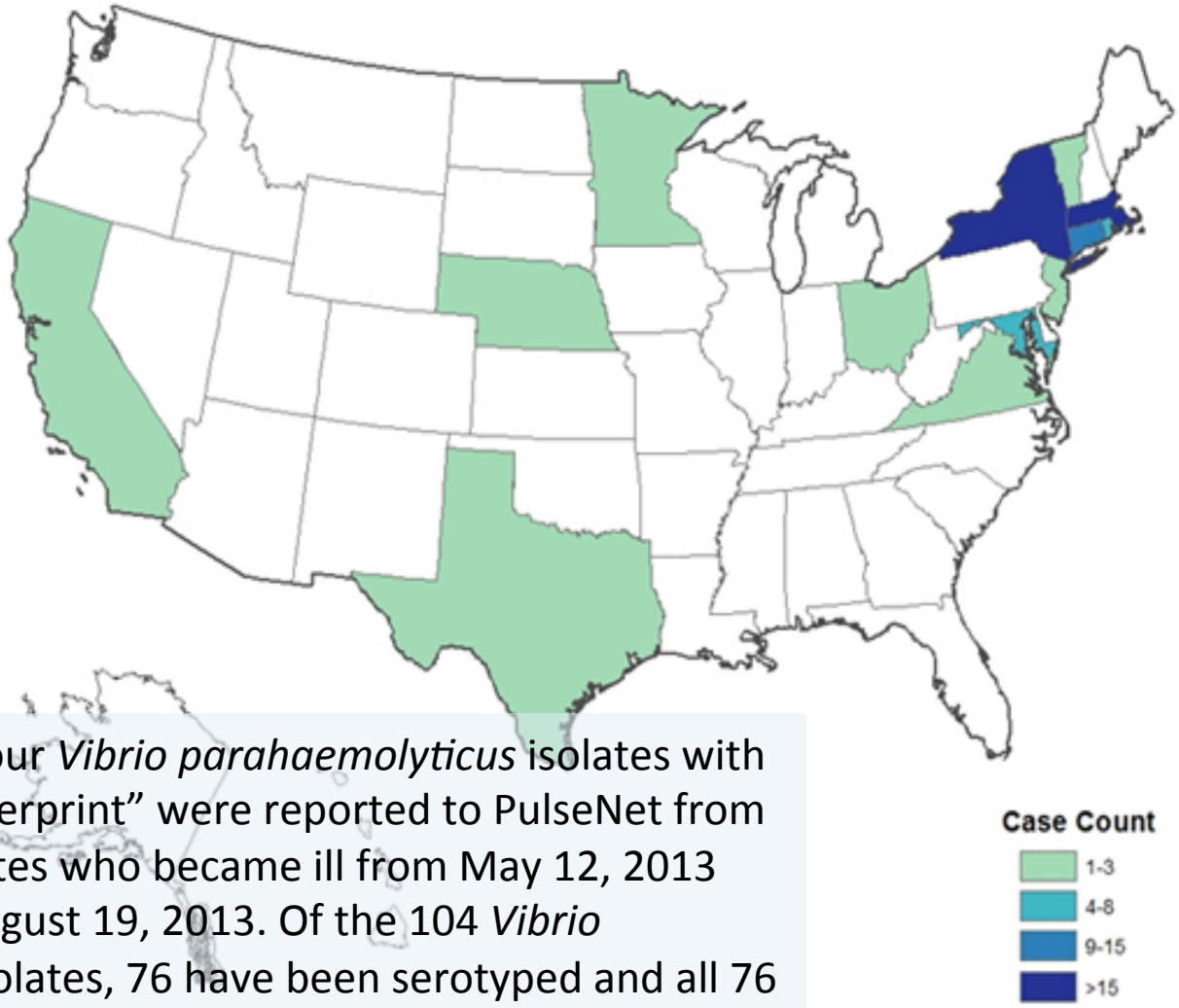
- 41 harvesters licensed as Shellstock Shippers
- Hydraulic hard clam and eastern oyster harvest
- Aquaculture cage production and bottom cultivation
- All subtidal harvest: generally >6 feet depth at MLW
- 21 Oyster producers operating under VPCP
  - 7 producers operating in the outbreak growing area of Westport Norwalk Darien utilizing rapid cooling on board vessel
  - 8 producers operating outside the outbreak area utilizing on-board mechanical refrigeration or rapid cooling
  - 6 producers operating under 5/5 traditional VPCP

Vp Illness History in Connecticut: 2009 to 2015 Illness Summary

Year	Confirmed Cases Linked to CT Shellfish	Multi-State Shellfish Cases Including CT Source
2009	1	2
2010	1	2
2011	1	2
2012	1*	3
2013	23**	11
2014	1	2
2015	2	8

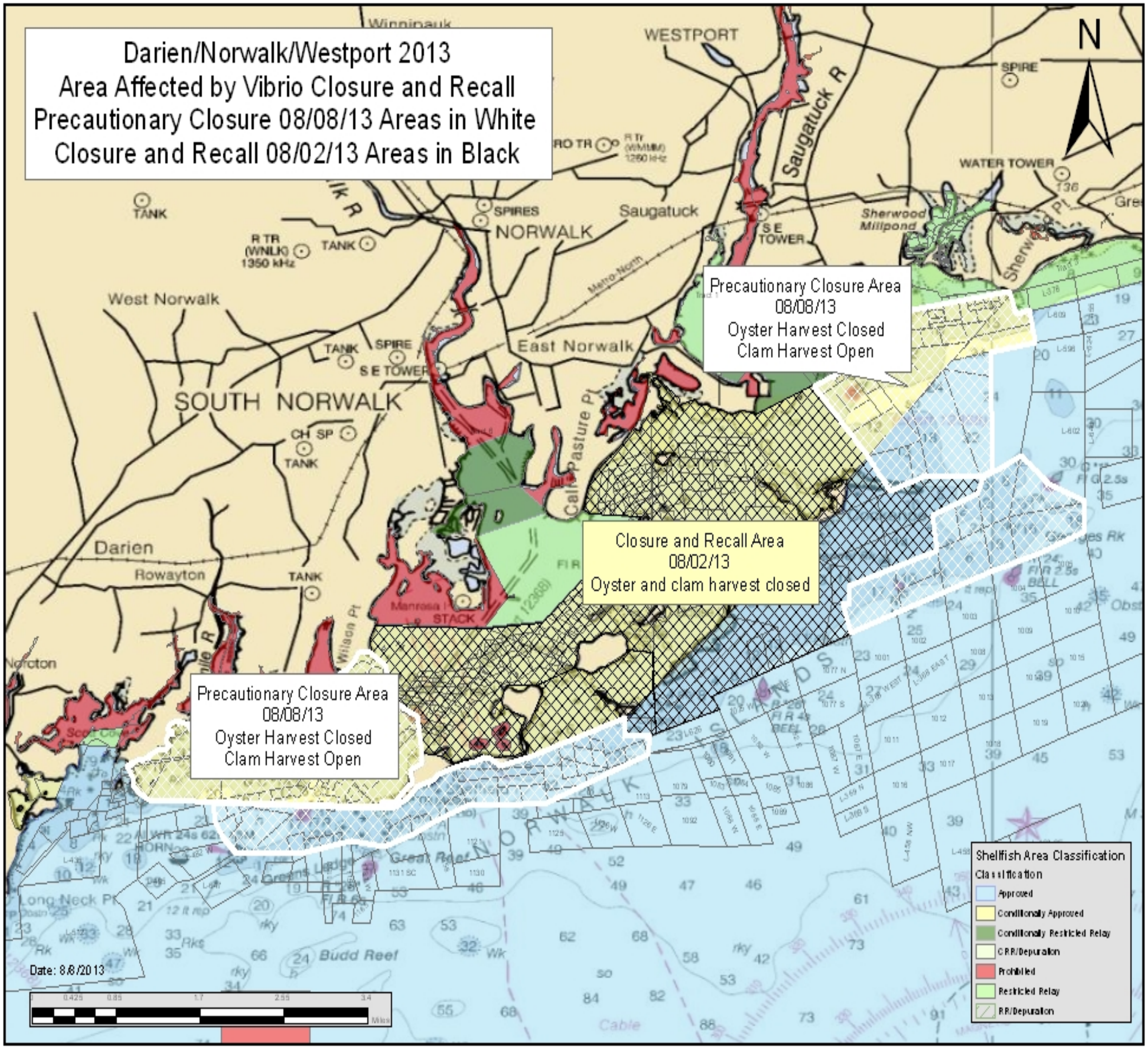
*2012 Closure of Westport/Norwalk growing area from 7/15/12 through 9/19/12
** 2013 Closure of Westport/Norwalk growing area from 8/2/13 through 9/16/13

Vp Outbreak Strain 2013 (O4:K12)



One hundred and four *Vibrio parahaemolyticus* isolates with the same DNA "fingerprint" were reported to PulseNet from persons in 13 states who became ill from May 12, 2013 through August 19, 2013. Of the 104 *Vibrio parahaemolyticus* isolates, 76 have been serotyped and all 76 were found to be serotype O4:K12

http://www.cdc.gov/vibrio/investigations/vibriop-09-13/map.html



Darien/Norwalk/Westport 2013
Area Affected by Vibrio Closure and Recall
Precautionary Closure 08/08/13 Areas in White
Closure and Recall 08/02/13 Areas in Black
Precautionary Closure Area
08/08/13
Oyster Harvest Closed
Clam Harvest Open
Closure and Recall Area
08/02/13
Oyster and clam harvest closed
Precautionary Closure Area
08/08/13
Oyster Harvest Closed
Clam Harvest Open
N
WESTPORT
NORWALK
SOUTH NORWALK
East Norwalk
West Norwalk
Saugatuck
Saugatuck R
Darien
Rowayton
Sherwood Millpond
Shellfish Area Classification
Classification
Approved
Conditionally Approved
Conditionally Restricted Relay
CRR/Depuration
Prohibited
Restricted Relay
RR/Depuration
Date: 8/8/2013
0.425
0.85
1.7
2.55
3.4
Miles

2014 and 2015 *Vibrio parahaemolyticus* Control Plan (VPCP)

- Two control plans in place: one for 2013 outbreak area and one for the rest of CT growing areas
- Vp Control Plans in CT apply to Oysters Only (only sporadic cases linked to Hard Clams in CT)
- Outbreak Area VPCP: required the rapid cooling of oysters harvested from the waters of Norwalk, Westport and Darien to an internal temperature of 50°F within one hour of harvest from June 1 though September 30
- General VPCP: 5 hours from harvest to refrigeration and 5 hours to cool to internal temperature of 50°F from June 1 through September 30

Rapid Cooling Verification Studies

Oyster with Smart Button data logger sent through process

Rapid Cooling Definition for CT

- Rapid Cooling was defined in the 2014 and 2015 Vp Control Plan as "*the reduction of the internal temperature of shellstock to 50°F within 1 hour of harvest or time of first exposure*"
- Small number of oyster producers have beds in the outbreak area
- SSCA allowed growers to propose process to meeting Rapid Cooling requirement
- Evaluated each company's process prior to allowing harvest from outbreak area
- Verification studies have included on-vessel mechanical refrigeration, ice slurry, and direct ice

Small Scale Ice Slurry

- Harvest between 25 and 150 100-count bags per day

- Cost of ice approximately $300 to $500/ week for 5 day workweek

Medium Scale Ice Slurry

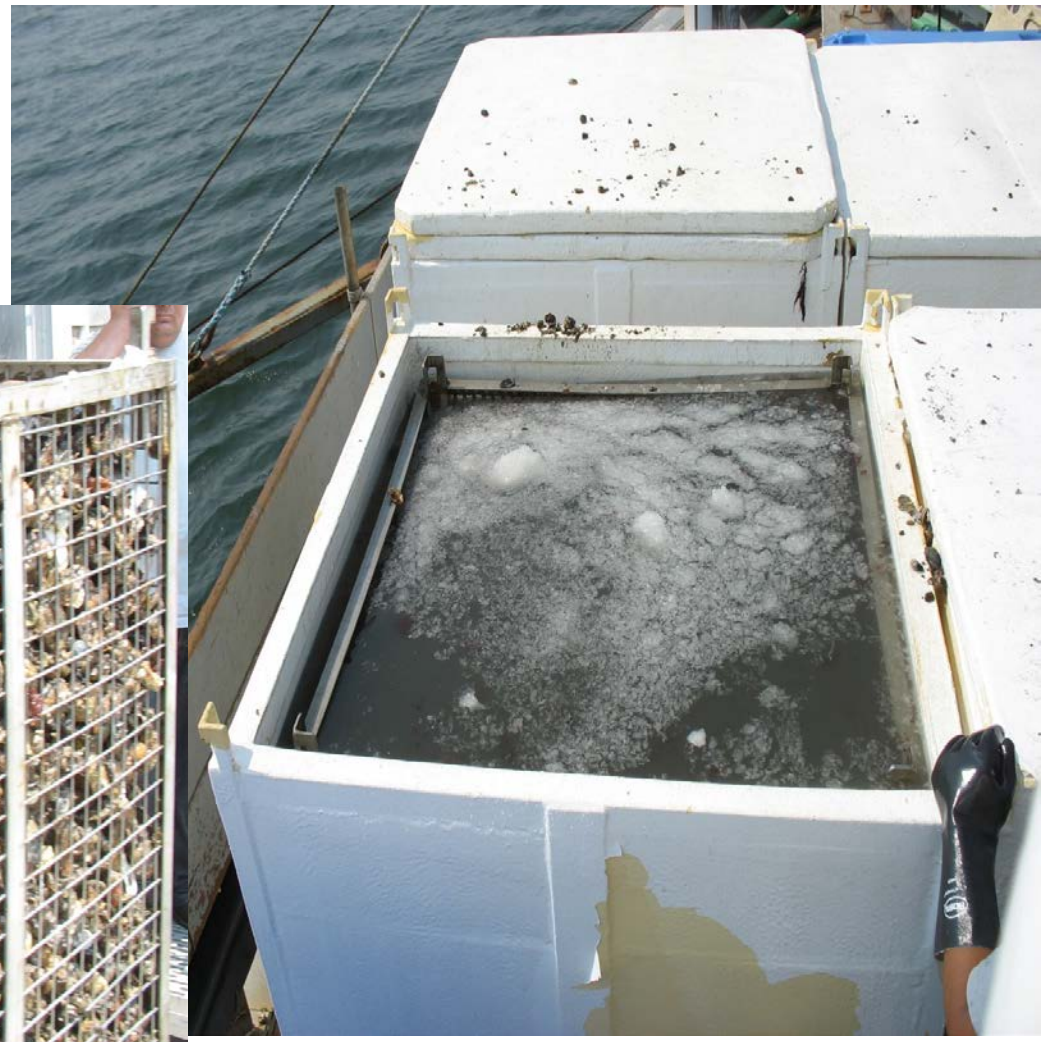
- Production level between 150 bags and 300 100-count bags per day

- Cost of ice approximately $400 to $500/week for 5 day workweek

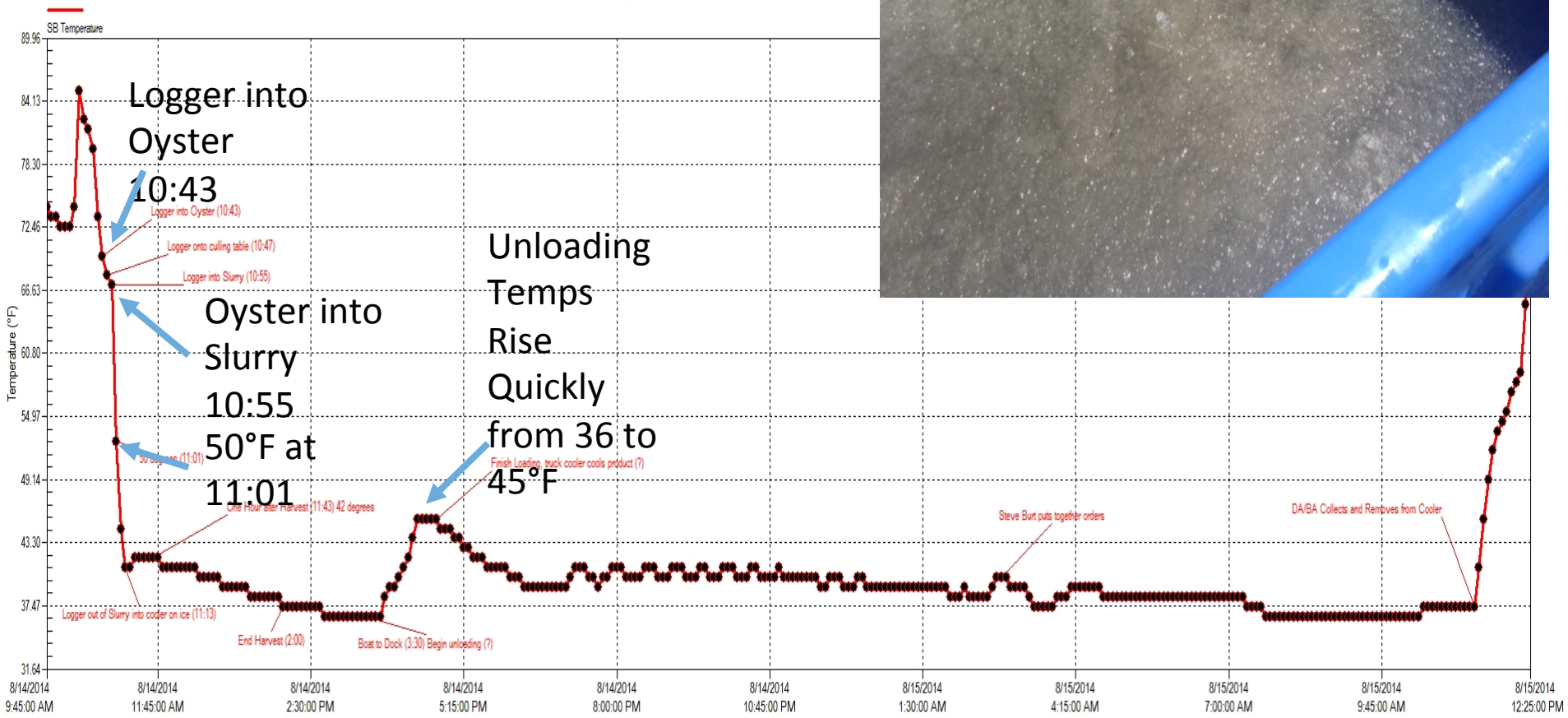
Large Scale Ice Slurry

- Harvest 500 to 1000

  100 count bags per day



Cooling Profiles: Ice Slurry

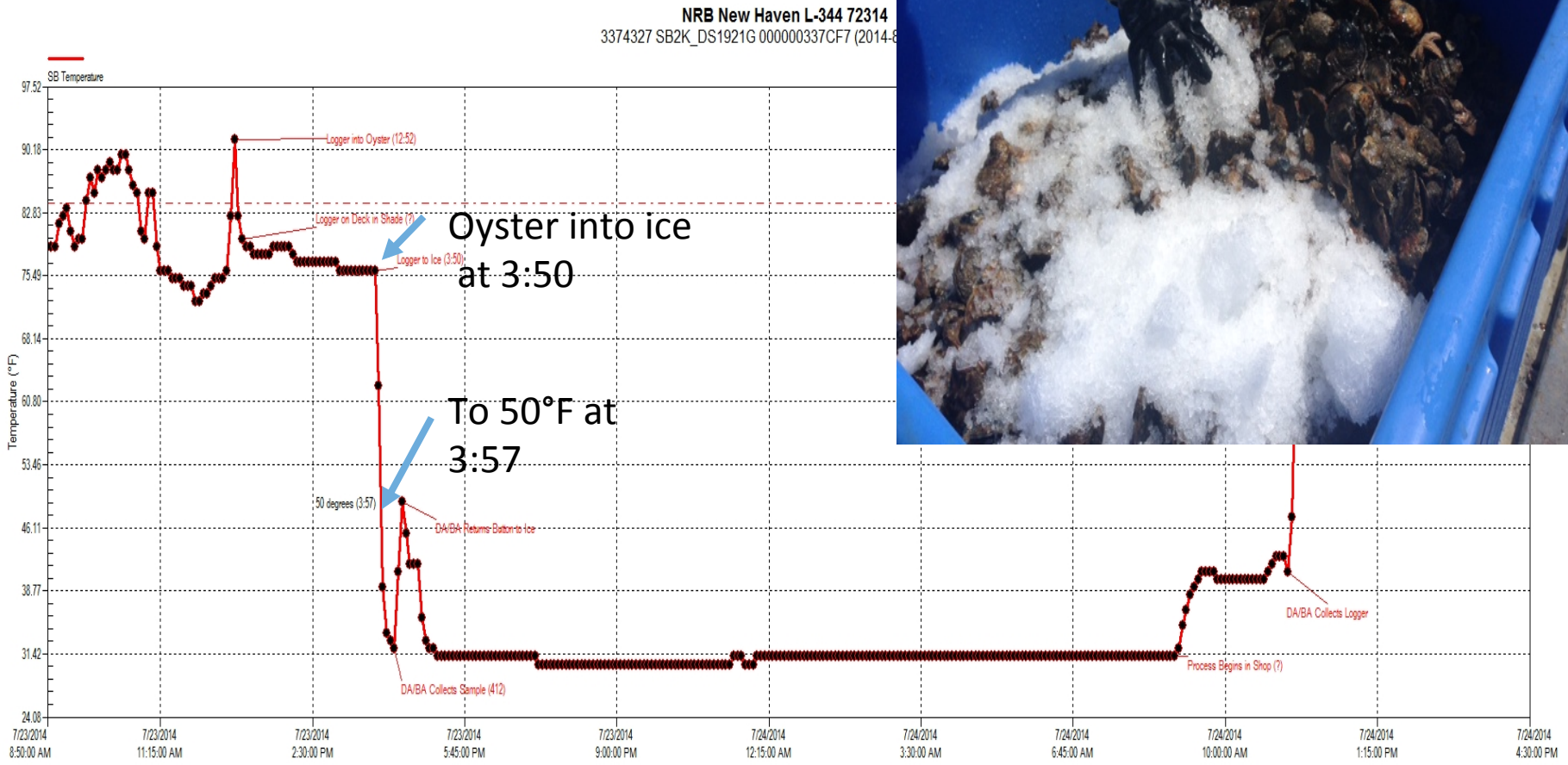


Logger into Oyster 10:43

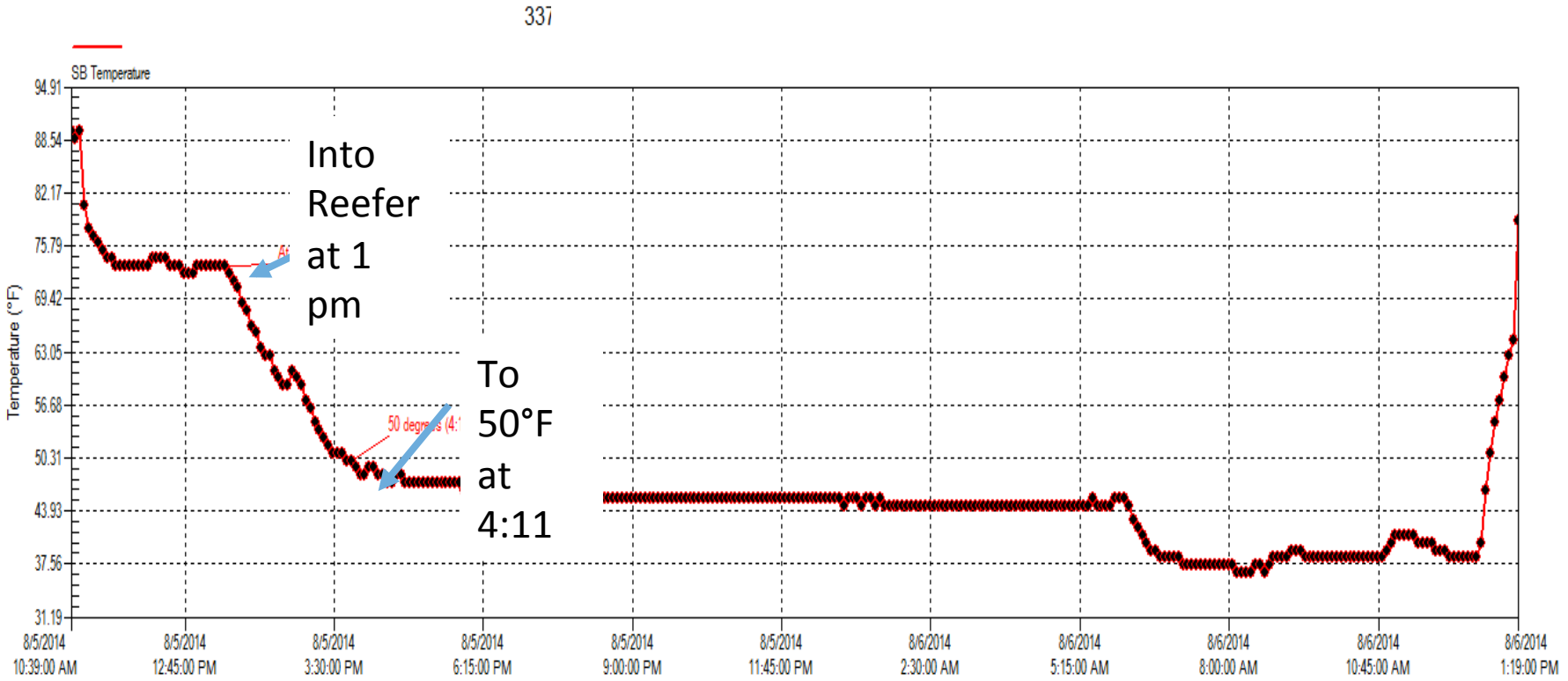
Oyster into Slurry 10:55 50°F at 11:01

Unloading Temps Rise Quickly from 36 to 45°F

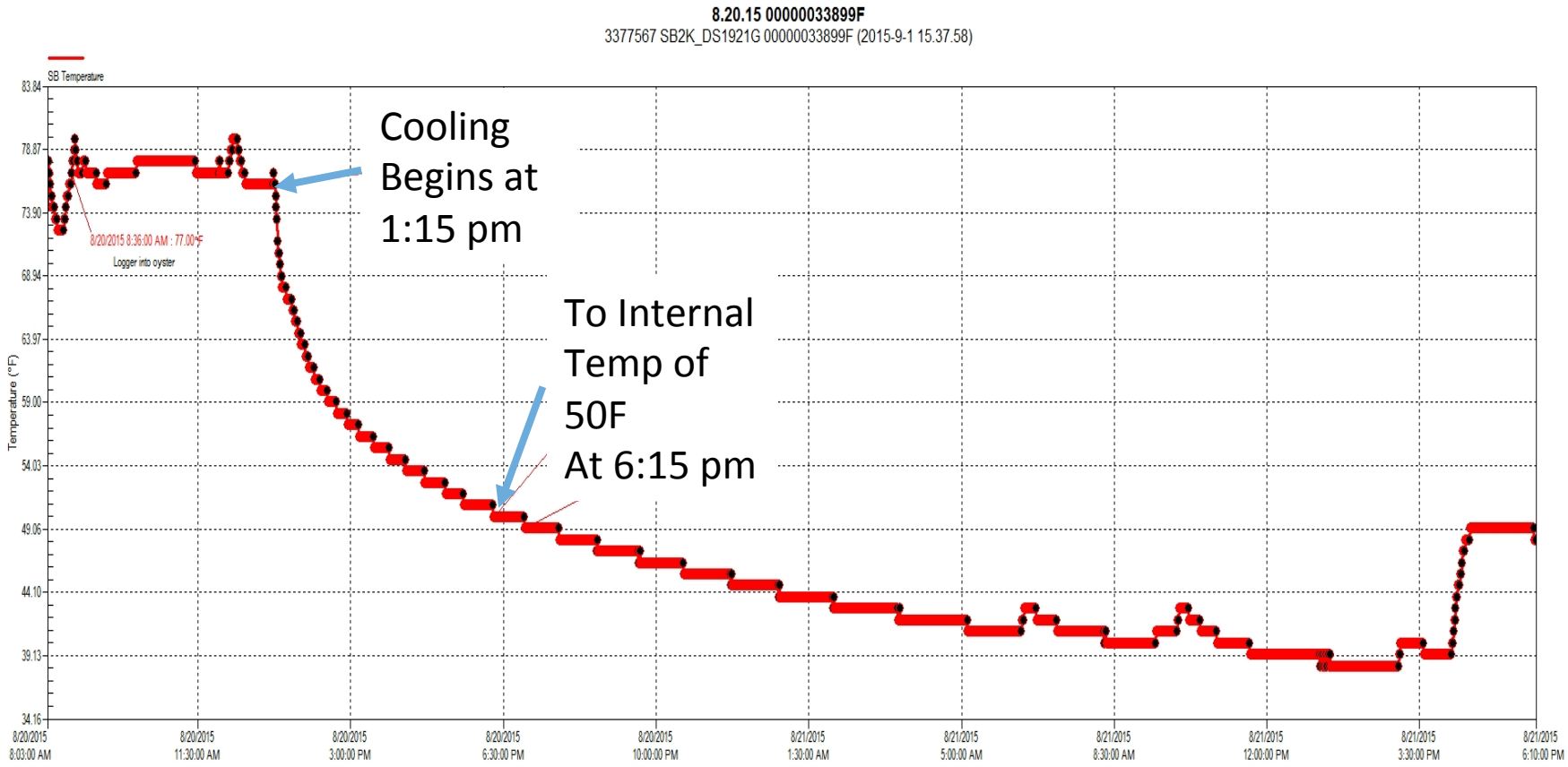
Cooling Profile: Packed in Direct Ice



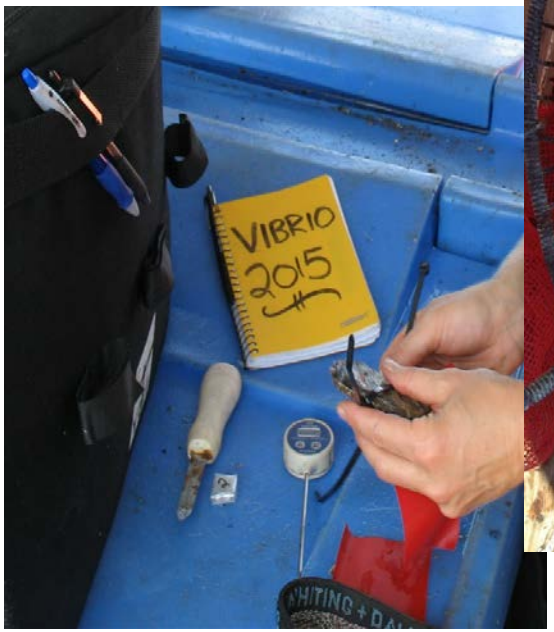
Cooling Profile: Refrigerated Truck



Cooling Profile: Mechanical Refrigeration 5 Hours



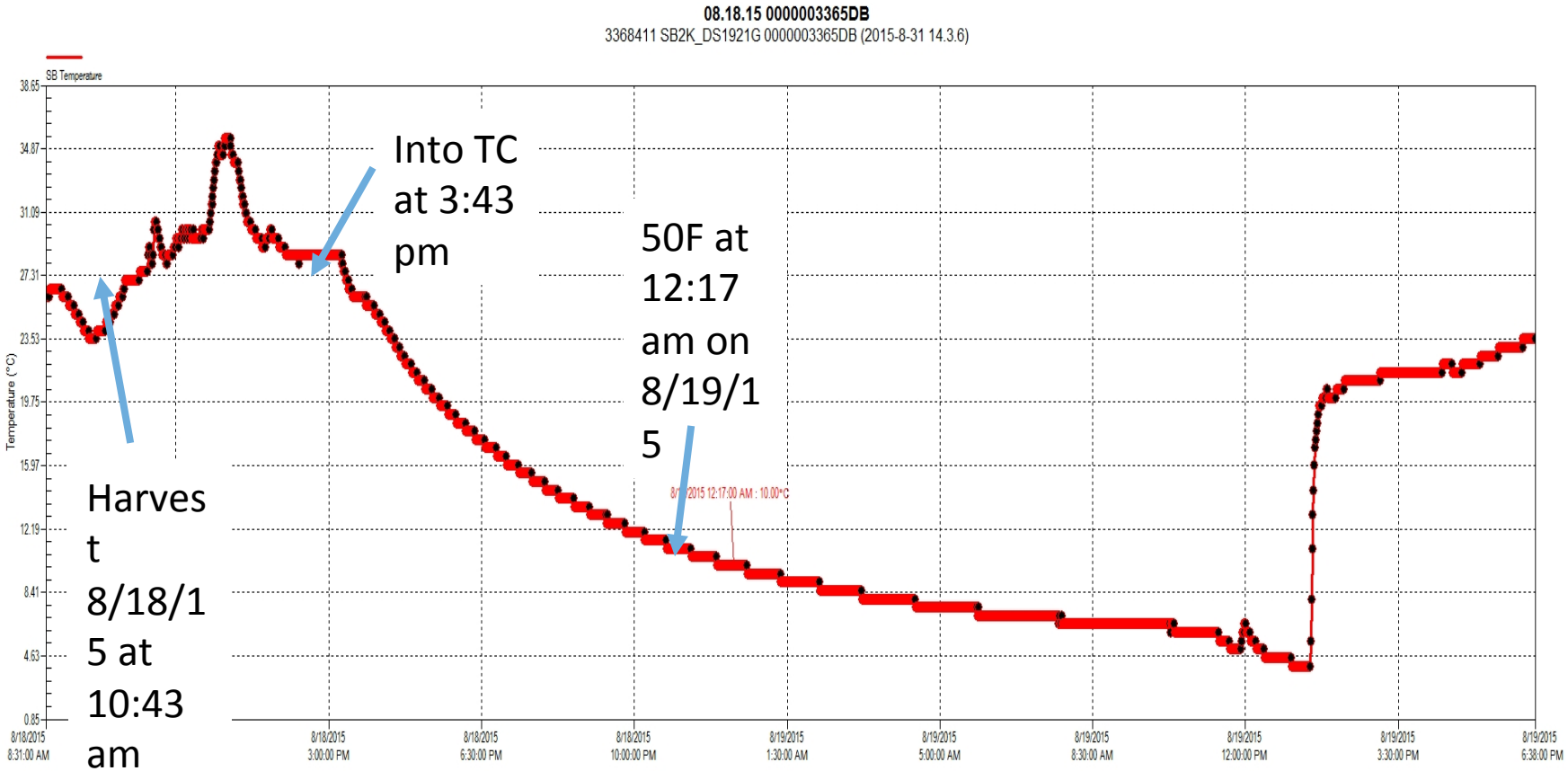
CT 2015 ISSC Study



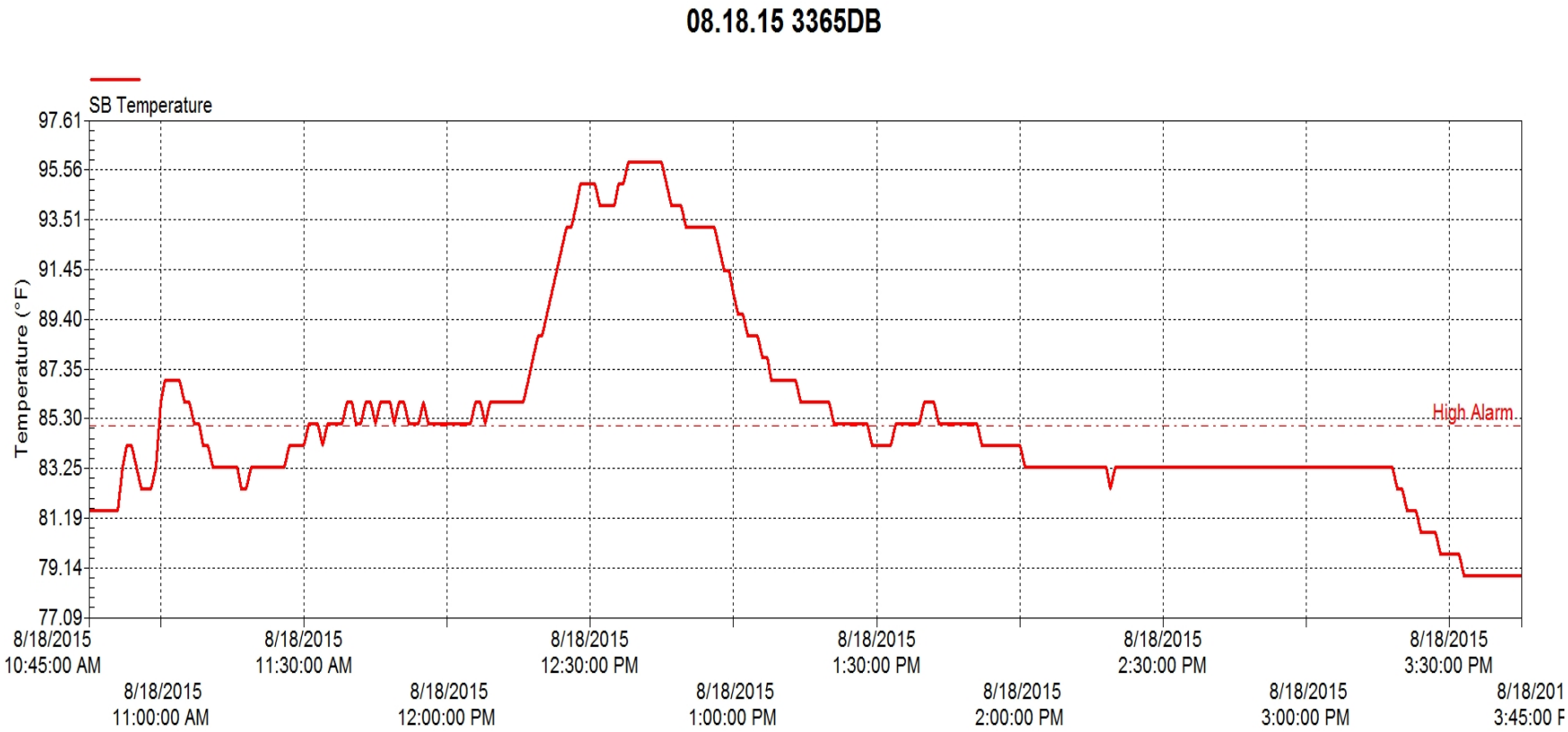
CT 2015 ISSC Study: Techniques and Practices for Vp Reduction

- Baseline/Zero Hour: Immediate rapid cooling to internal temperature of 50°F or less using ice slurry
- 1 hour from harvest to internal temperature of 50°F or less using ice slurry
- 3 hours from harvest to internal temperature of 50°F or less using ice slurry
- 5 hours from harvest to internal temperature of 50°F or less using ice slurry
- NSSP standard VPCP: 5 hours from harvest into traditional mechanical temperature control and 10 hours to an internal temperature of 50°F

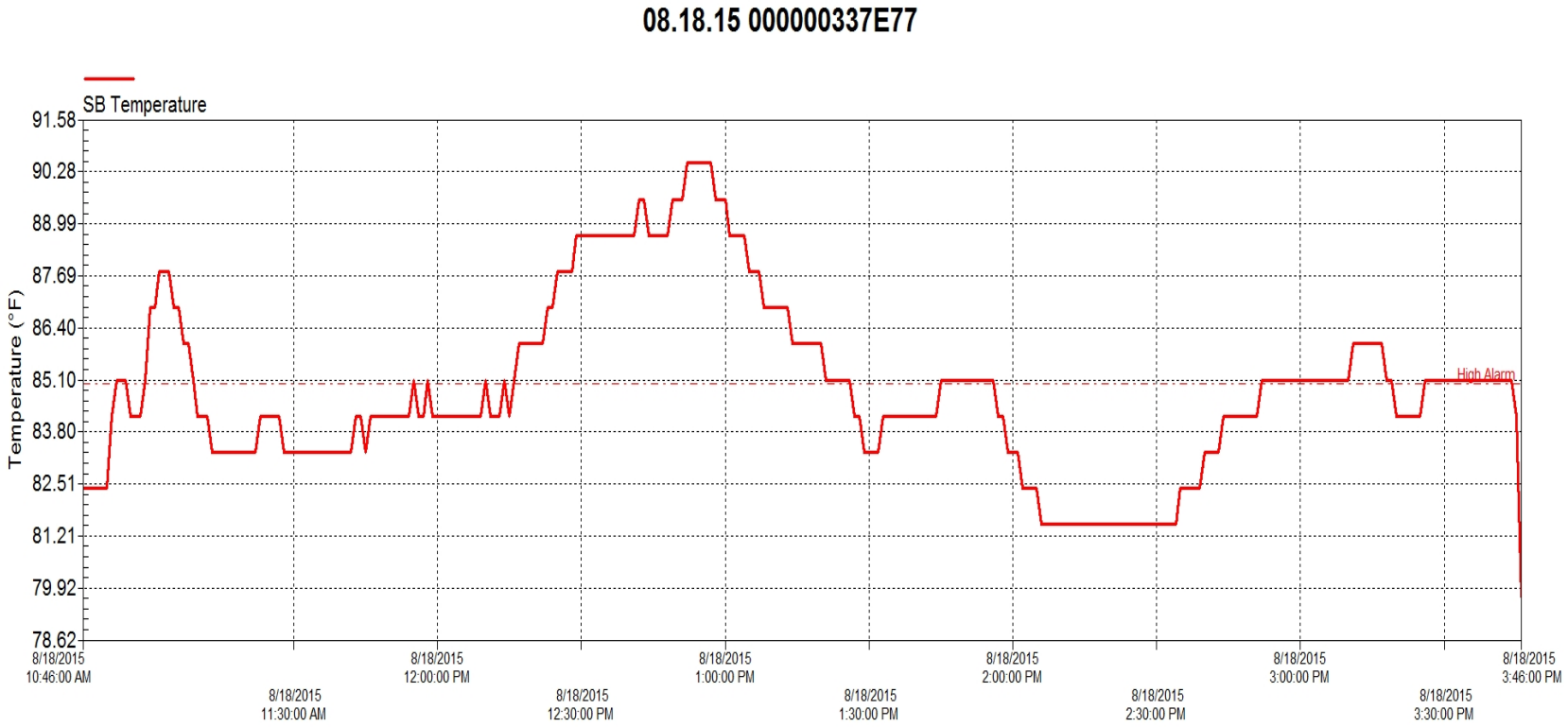
Temperature Profile:
5 Hours from Harvest to Temperature Control/ 10 Hours to 50F



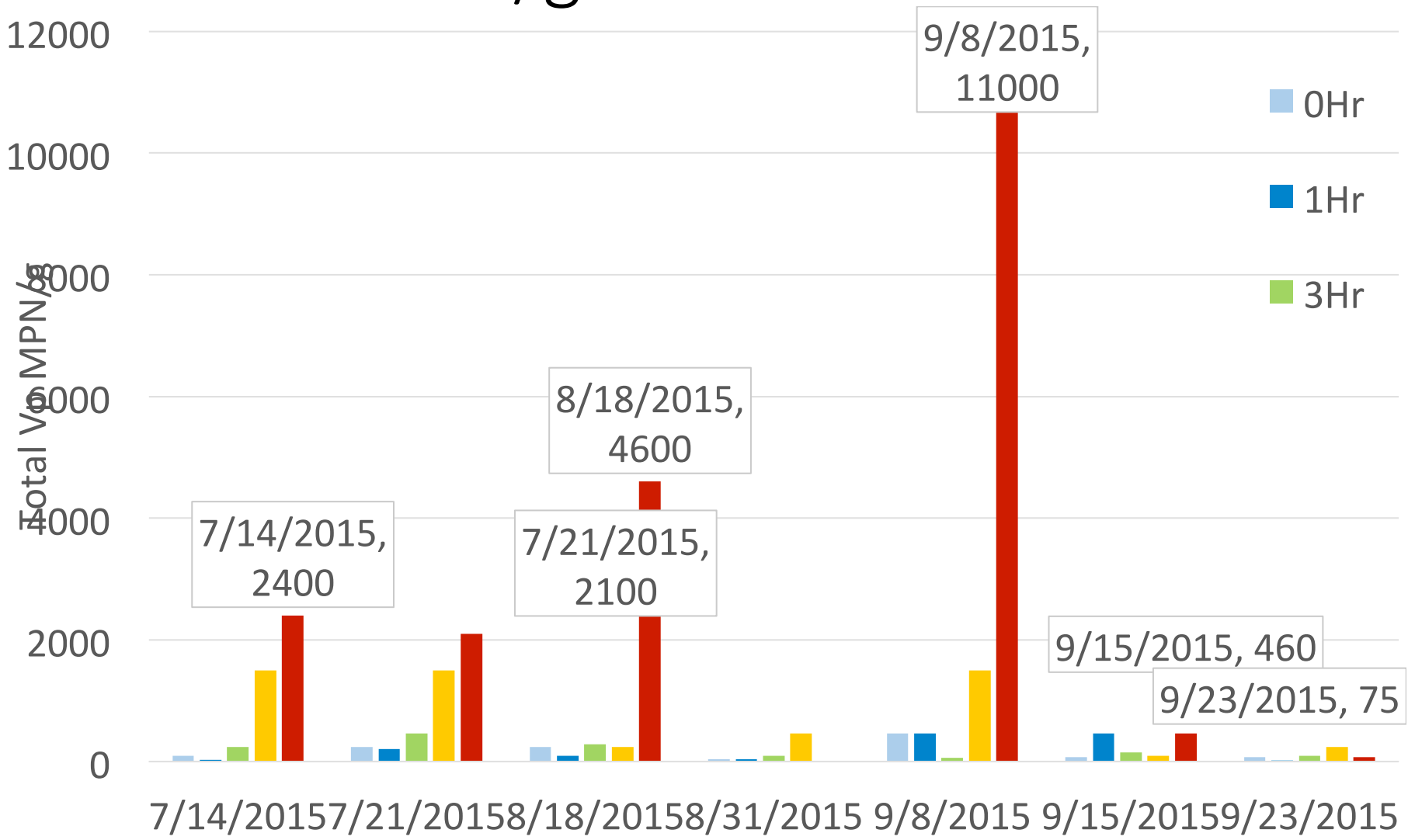
Ambient Temp: 5 Hours on Deck (8/18/15)

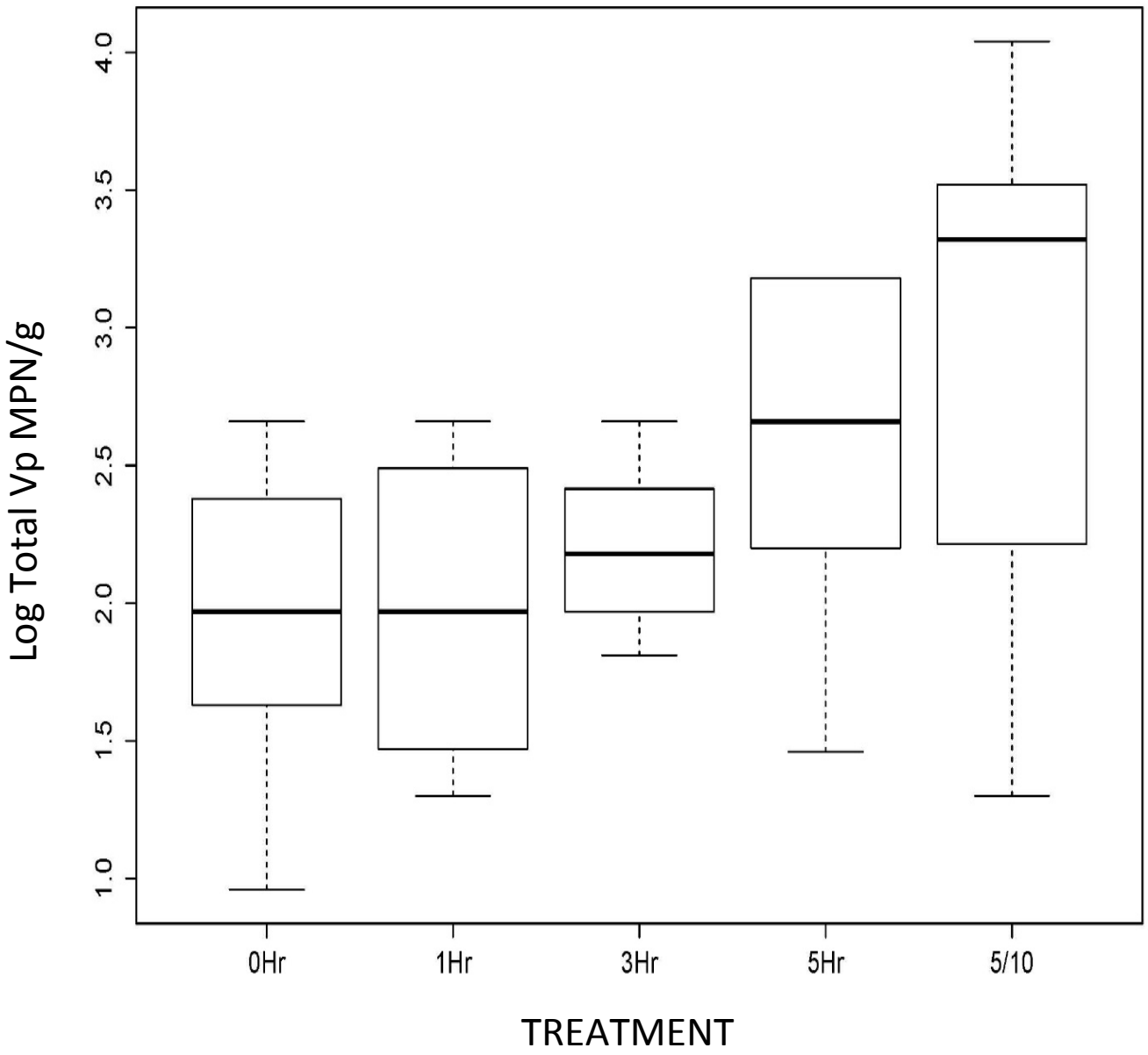


Internal Oyster Temp 5 Hours on Deck (8/18/15)



Process Study: Total Vp MPN/g




Log Total Vp MPN/g
1.0
1.5
2.0
2.5
3.0
3.5
4.0
0Hr
1Hr
3Hr
5Hr
5/10
TREATMENT

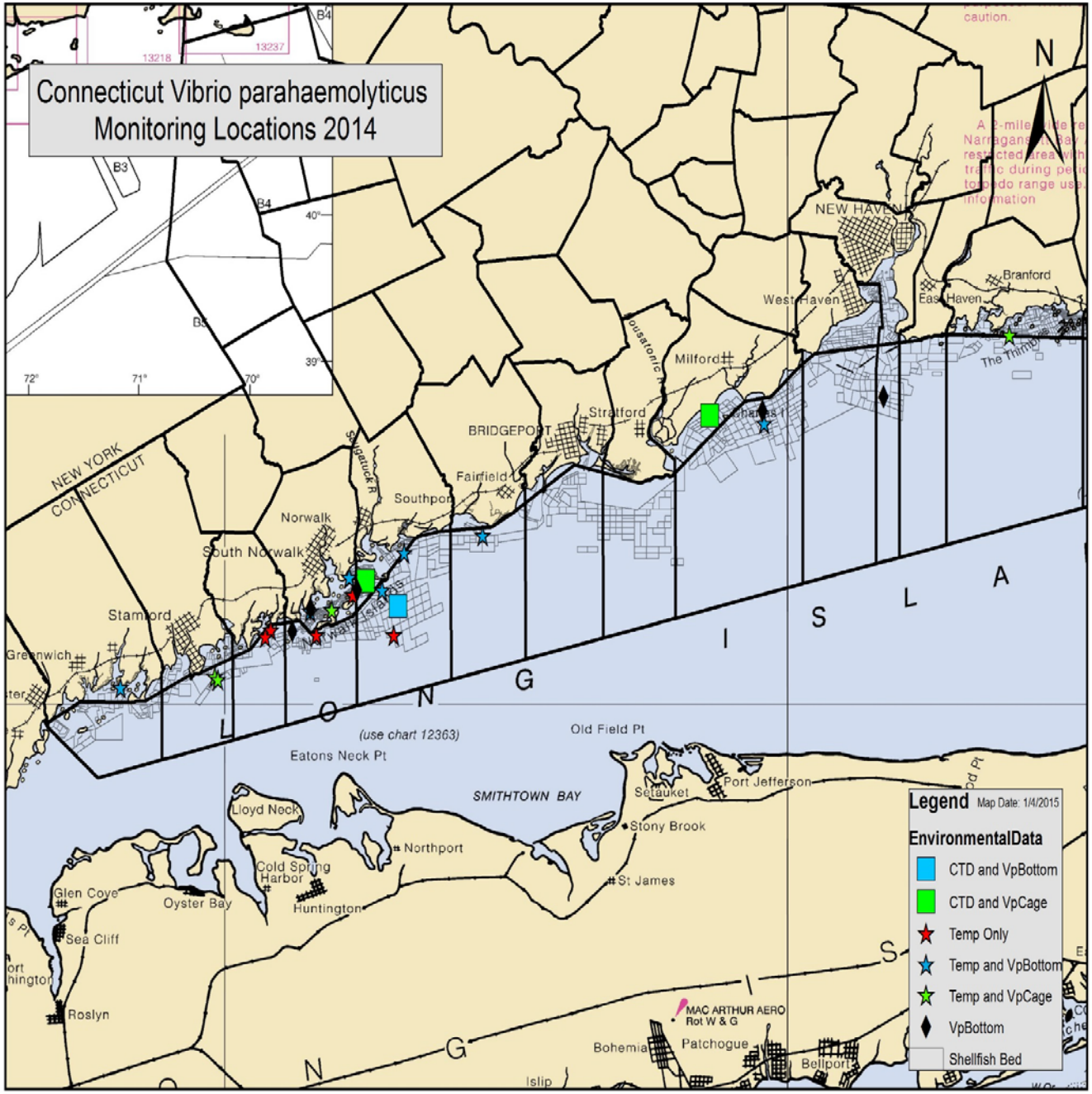
Modeling *Vibrio parahaemolyticus* Outbreaks in Commercial Shellfish Areas

Principal investigators are Mike Whitney (UCONN Marine Sciences), Evan Ward (UCONN Marine Sciences), and Kristin DeRosia-Banick (CT Department of Agriculture Bureau of Aquaculture)

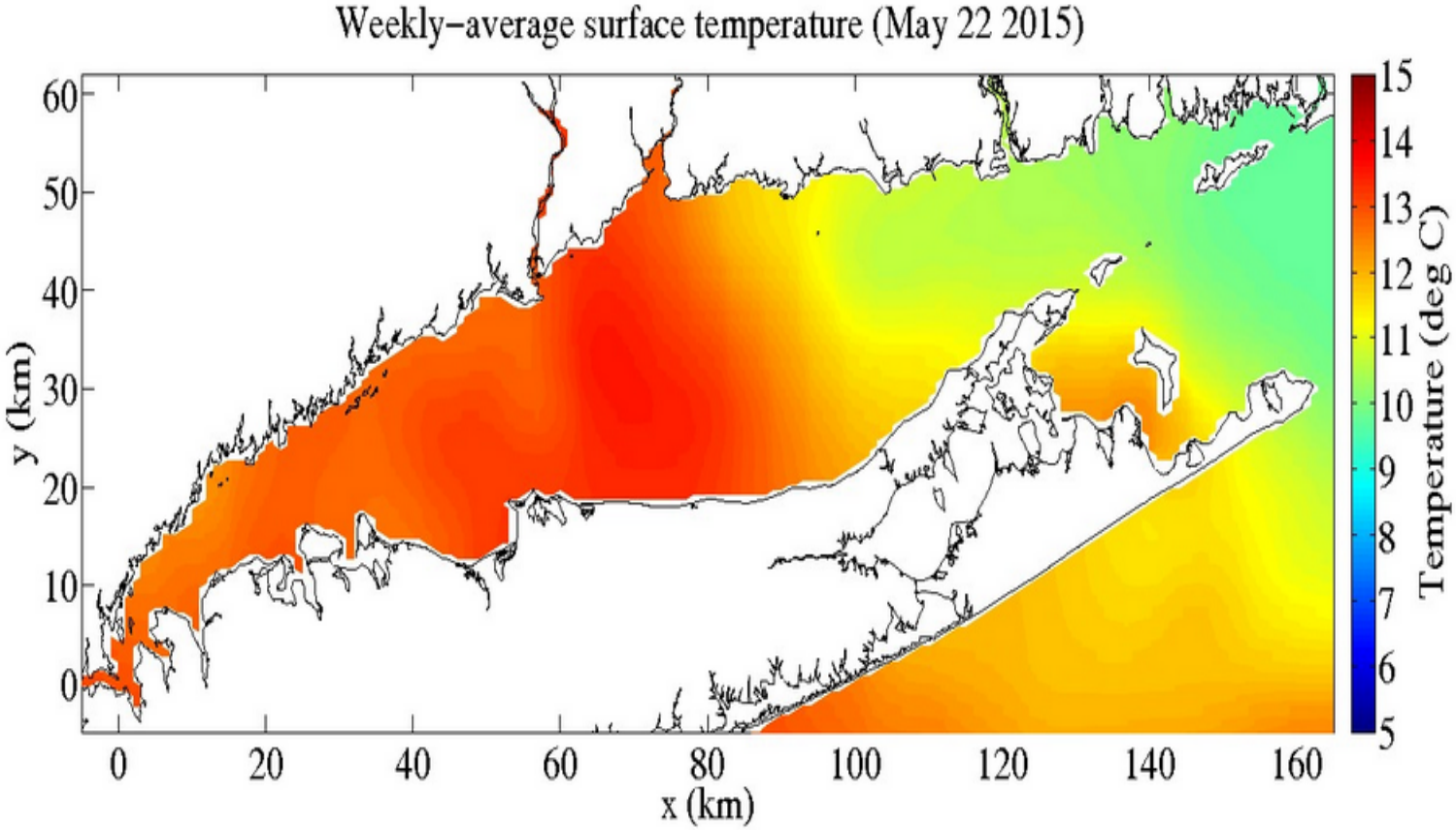
How do the spatial and temporal patterns in water temperature and salinity over Norwalk/Westport commercial shellfish areas influence *Vibrio parahaemolyticus* concentrations in oysters?

Project Page: http://cprime.uconn.edu/vibrio/

Funding Provided by Connecticut Sea Grant, University of Connecticut through Award No. NA14OAR4170086, Project Number R/EM-2

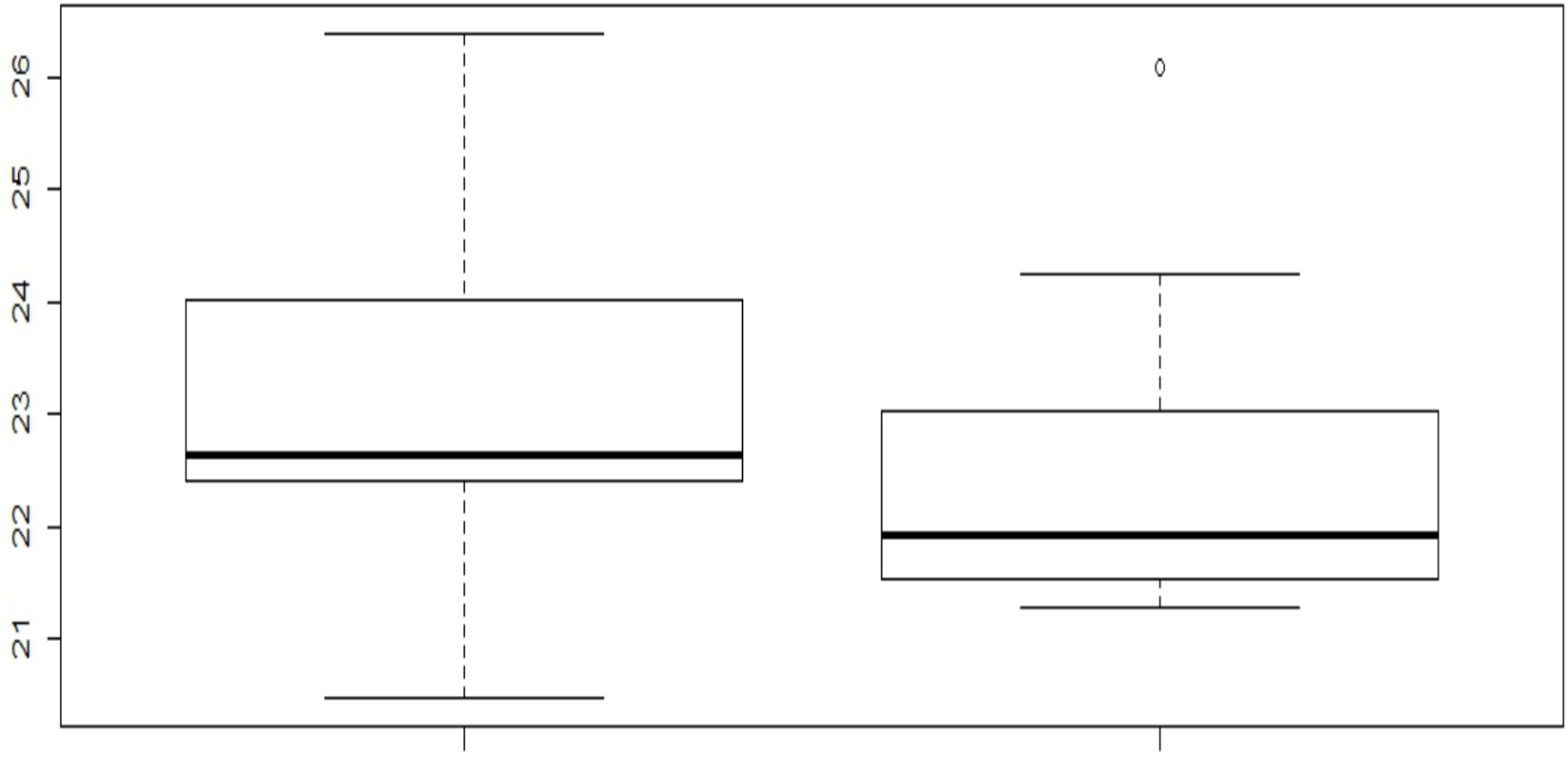

Connecticut Vibrio parahaemolyticus
Monitoring Locations 2014
NEW YORK
CONNECTICUT
NEW HAVEN
West Haven
East Haven
Branford
The Thimble
Milford
Stratford
BRIDGEPORT
Fairfield
Southport
Norwalk
South Norwalk
Stamford
Greenwich
Housatonic R.
Saugatuck R.
LONG ISLAND
(use chart 12363)
Old Field Pt
Eatons Neck Pt
SMITHTOWN BAY
Setauket
Port Jefferson
Stony Brook
Lloyd Neck
Northport
Cold Spring Harbor
St James
Glen Cove
Oyster Bay
Huntington
Sea Cliff
Roslyn
MAC ARTHUR AERO
Rot W & G
Bohemia
Patchogue
Bellport
Islip
Legend
Map Date: 1/4/2015
EnvironmentalData
CTD and VpBottom
CTD and VpCage
Temp Only
Temp and VpBottom
Temp and VpCage
VpBottom
Shellfish Bed

2015 VPCP Risk Assessment: Water Temperatures Associated with CT Vp Illnesses



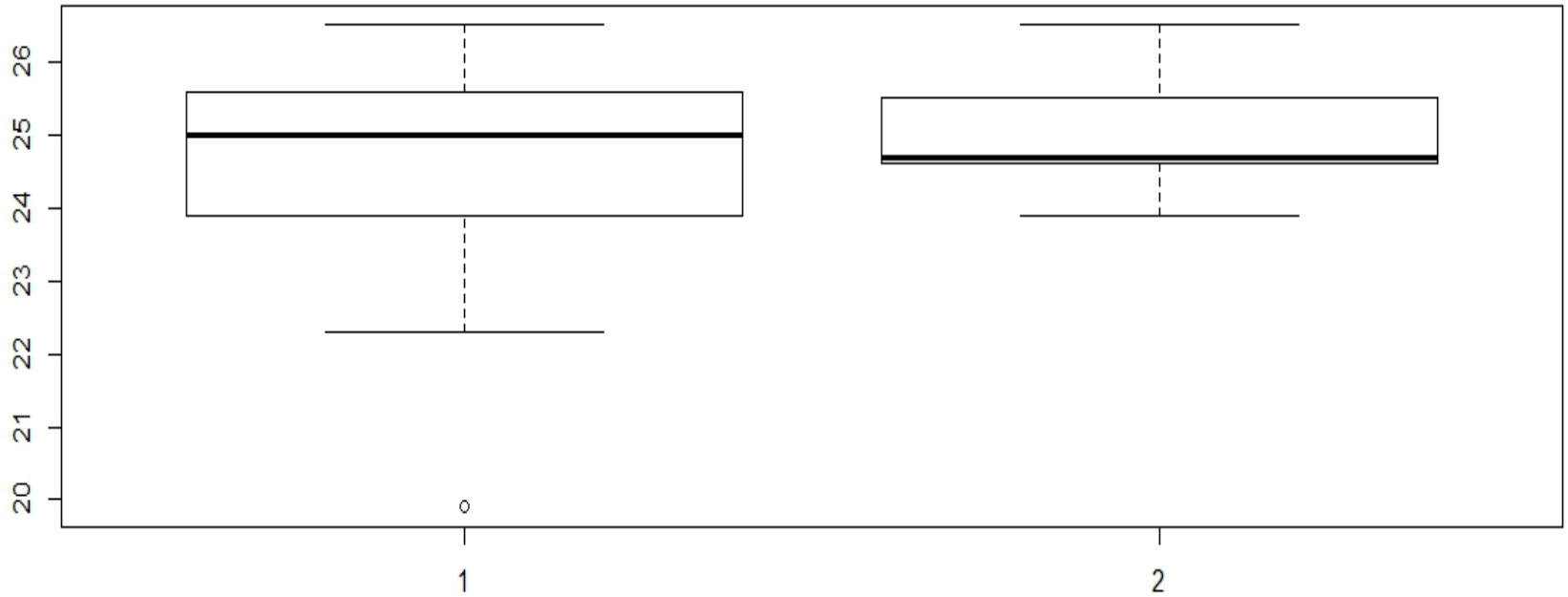
Surface temperatures from G1SST satellite-observational product. Temperatures are averaged over the previous 7 days.

2015 VPCP Risk Assessment:
Water Temperatures Associated with CT Vp Illnesses



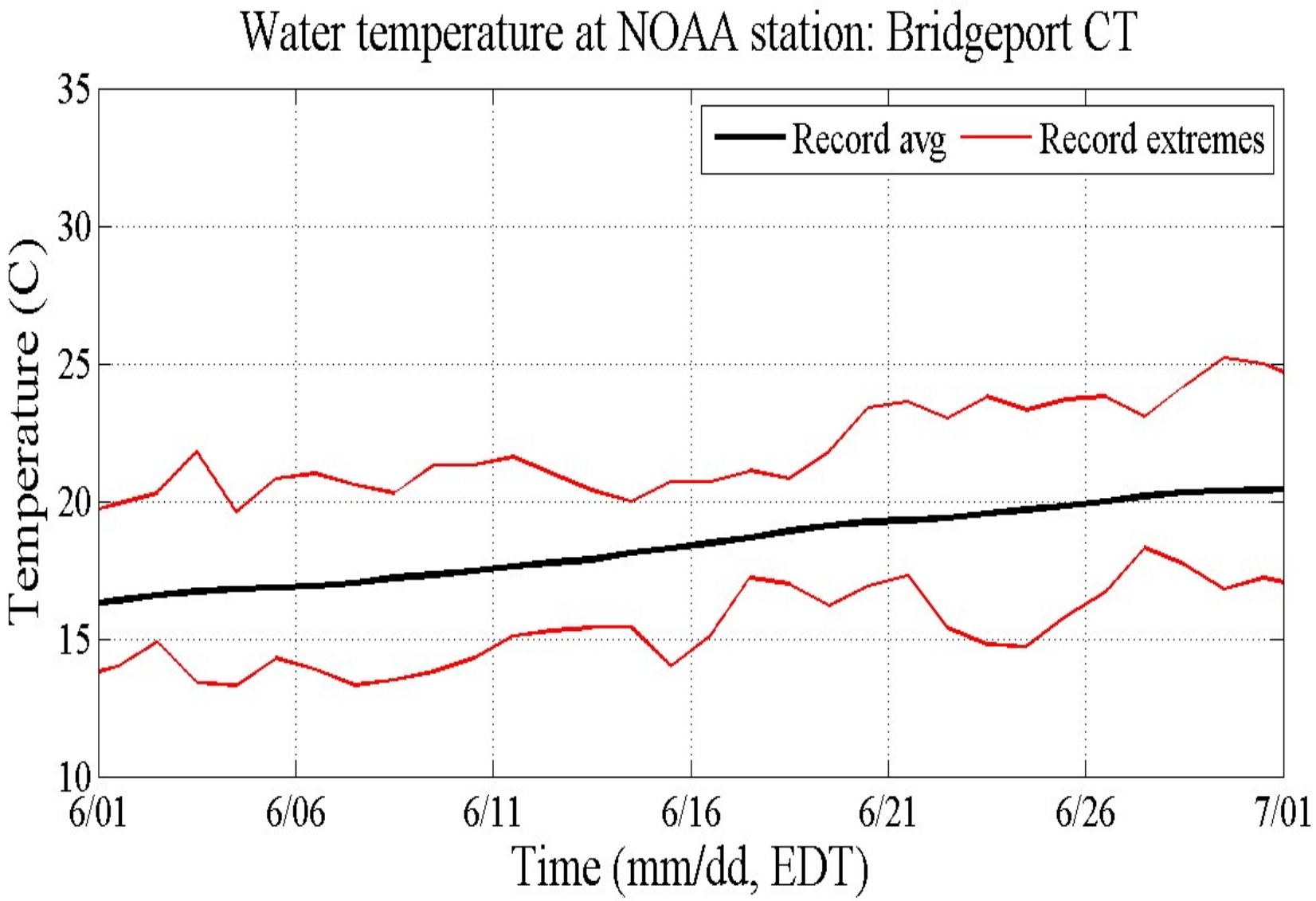
NASA G1SST Daily Seawater Surface Temperature in C associated with Vp illnesses, plotted by Traceback Code. Only confirmed CT source cases, Code 1 cases are single CT source harvest location/date, code 2 cases were confirmed CT source, multiple potential CT harvest location/date.

2015 VPCP Risk Assessment: Water Temperatures Associated with CT Vp Illnesses



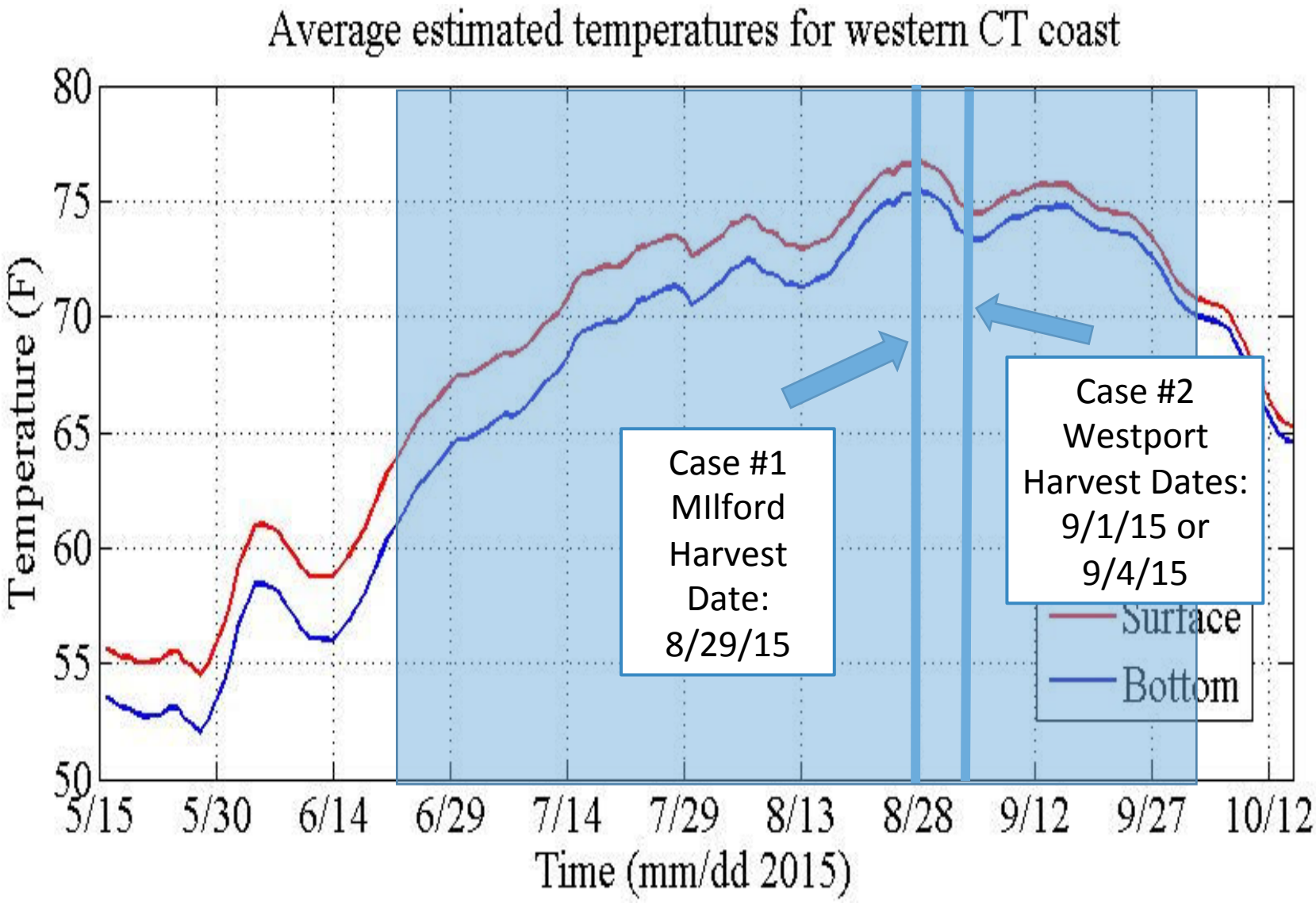
NOAA BRHC3 Daily Maximum Seawater Surface Temperature in C associated with Vp illnesses, plotted by Traceback Code. Only confirmed CT source cases, Code 1 cases are single CT source harvest location/date, code 2 cases were confirmed CT source, multiple potential CT harvest location/date.

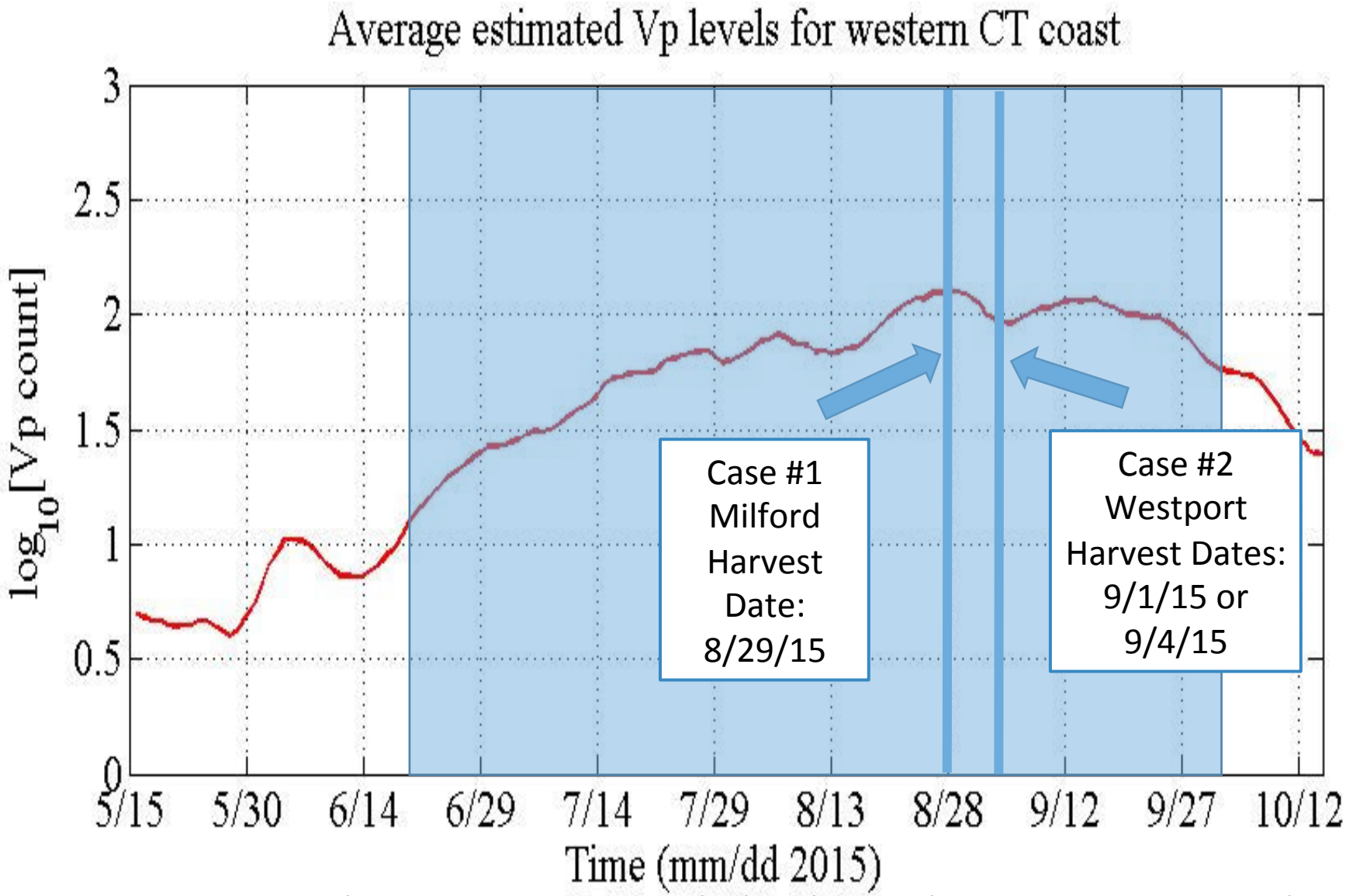
2015 VPCP:
Water Temperature Trigger Based on Risk Assessment



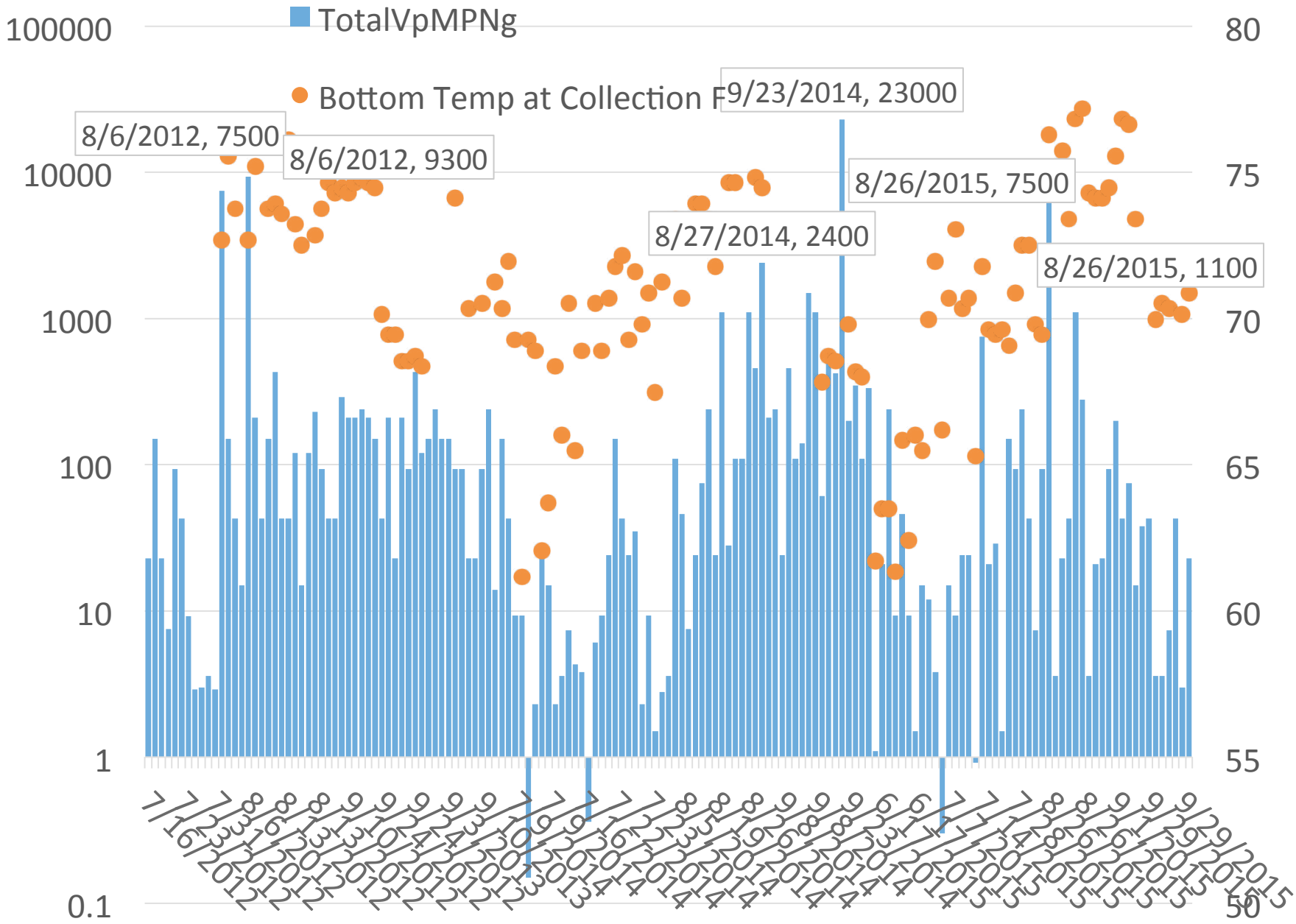
2015 VPCP:
Water Temperature Trigger Based on Risk Assessment

- In 2015 we triggered the Rapid Cooling VPCP based on surface water temperatures of 20°C/68°F rather than the 2015 trigger of June 1
- We were able to predict the approximate date when water temperatures were likely to hit the trigger based on the historical means and extremes so that growers could prepare for when the rapid cooling controls were likely to start
- Trigger for 5 Hour VPCP remained June 1th through September 30th
- During 2015 we were able to trigger the Rapid Cooling controls on June 19th, almost 3 weeks later than we would have using the previous risk assessments
- End of VPCP controls remained the same September 30th, as water temperatures did not drop below 20°C
- In 2015, no cases were confirmed prior to the June 19th Rapid Cooling trigger


Average estimated temperatures for western CT coast
Temperature (F)
80
75
70
65
60
55
50
5/15
5/30
6/14
6/29
7/14
7/29
8/13
8/28
9/12
9/27
10/12
Time (mm/dd 2015)
Case #1
MIlford
Harvest
Date:
8/29/15
Case #2
Westport
Harvest Dates:
9/1/15 or
9/4/15
Surface
Bottom



Vp counts in pre-harvest oyster tissue calculated using the FDA Quantitative Risk Assessment with bottom temperature and salinity estimates as inputs.


TotalVpMPNg
Bottom Temp at Collection F
8/6/2012, 7500
8/6/2012, 9300
9/23/2014, 23000
8/27/2014, 2400
8/26/2015, 7500
8/26/2015, 1100
100000
10000
1000
100
10
1
0.1
80
75
70
65
60
55
50

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CT Industry Partners and Captains

Norm Bloom & Sons

CT Department of Public Health Epidemiology and Emerging Infections Program

Quyen Phan, MPH

Department of Agriculture Bureau of Aquaculture

David Carey, Director

Joseph DeCrescenzo, Alissa Dragan, David Lamoureux, Jr., Jenifer Yeadon