VIRGINIA AGRICULTURAL EXPERIMENT STATION
VIRGINIA SEAFOOD AGRICULTURAL RESEARCH AND EXTENSION CENTER
VIRGINIA TECH

NOAA Saltonstall-Kennedy Grant #16GAR008

Keeping Farmed Oysters Cool From Pool to Plate:

Cold Supply Chain Temperature Monitoring of Half-shell Oysters Farmed in Washington Sate and the Chesapeake Bay Region

Robert M. Lane Virginia Tech, Virginia Seafood AREC

Background

Vibrio spp.

- Cause disease in oysters consumers
- Challenge for oyster industry

State Vibrio Control Plans (VCPs)

- Restrict harvest times
- Regulates time and temperature during harvest
- Cold chain requirements:
  - internal oyster temp < 50 ° F
  - Mechanical refrigeration temp < 45 ° F

Research Questions

•Are oysters maintained < 50 °F in the supply chain?
•Does temperature vary by the type or stage of the supply chain?
•Do modeled *Vibrio parahaemolyticus* levels change in the supply chain?

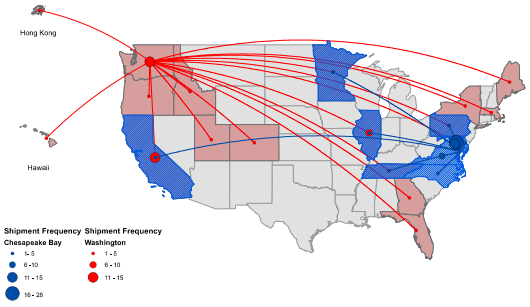
Methods

Study Scope
•*C. virginica* oysters from the Chesapeake Bay in 2017
•*C. gigas* oysters from Washington State in 2018
•n = 143 businesses participated
•n = 5 supply chain types

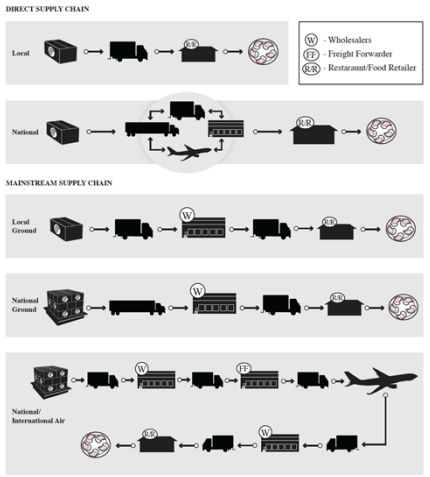
Temperature Tracking from harvest to retail
•ARC Smart Button temp sensors
•n = 126 boxes tracked over 2 years (81% sensors returned)

Inserting Temp Sensors Into Oysters

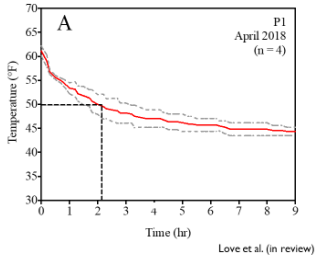
Shipments Tracked in 2017 and 2018 for Washington State and Chesapeake Bay



Oyster Supply Chains

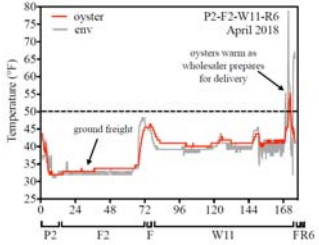


Example of On-Farm Temp Control (*C. gigas*, WA)

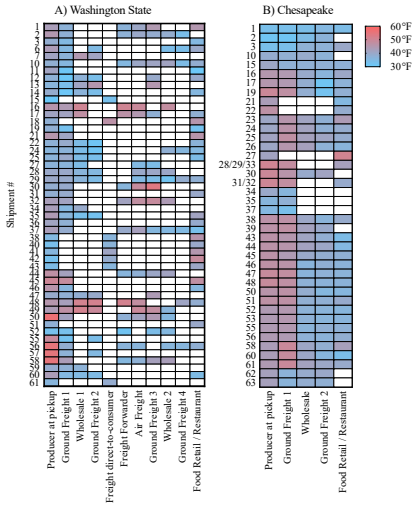


Love et al. (in review)

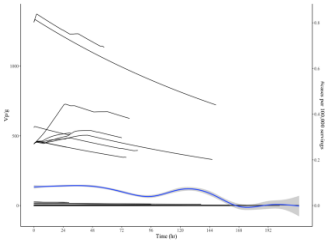
Example of Supply Chain Temp (*C. gigas, WA)*



Oyster Internal Temp By Supply Chain Stage



Modeled *Vp*/g and illness risks (*C. gigas,* WA)



Summary of Key Findings

Supply Chain (delivery mode)	N *	Delivery (± st dev) Avg time (days)	Median distanc e (km)	Temperat ure (°C)	Percent of shipments (%) Time-temperat ure abuse	*Vibrio parahaem olyticus* growth
Direct Sales						
Local (ground)	14	1.1 ± 1.0	34	5.1 ± 2.9	14	29
National (air, ground)	11	1.6 ± 1.0	1,914	3.6 ± 1.9	0	36
Mainstream						
Local (ground)	34	3.5 ± 1.8	429	4.5 ± 4.2	18	29
National (air)	15	3.5 ± 1.4	5,097	5.4 ± 2.1	33	33
National (ground)	15	5.0 ± 1.8	1,389	3.0 ± 1.4	13	0
International (air)	2	3.5 ± 0.1	10,606	5.8 ± 0.2	100	0
Total	91	3.1 ± 2.0	504	4.4 ± 3.1	19	25

*Vp growth = Vp levels at customer > harvest

Love et al. (in review)

Conclusions

- 18% (16/91) of shipments w/ oyster temps > 50 °F (10 °C) for +1 hr with similar rates in WA and CB supply chains
- 2 °F (1.2 °C) warmer oysters in CB (vs WA) supply chains
- Air freight higher temps than other freight types
- 75% (68/91) of shipments had a net decrease in Vibrio parahaemolyticus conc.

Dave Love (PI), Jillian Fry (Co-I), Jamie Harding, Kate Clancy, Ben Davis
Johns Hopkins University
Bobbi Hudson (Co-I) Pacific Shellfish Inst.
Bob Lane (Co-I) Va Tech
Lillian Kuehl WWU

Sea Grant Virginia