QBC Summer 2024 Final Presentation

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Oyster Farming

Tasks:

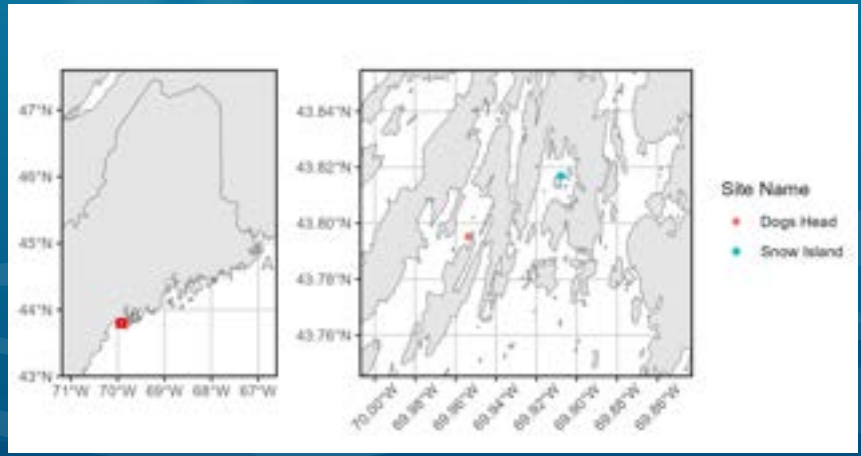
- Tumbling→ promote growth
- Cage flipping→ reduce biofoul
- Harvesting
- Maintain the farm
- Outreach

Why do we farm Oysters?

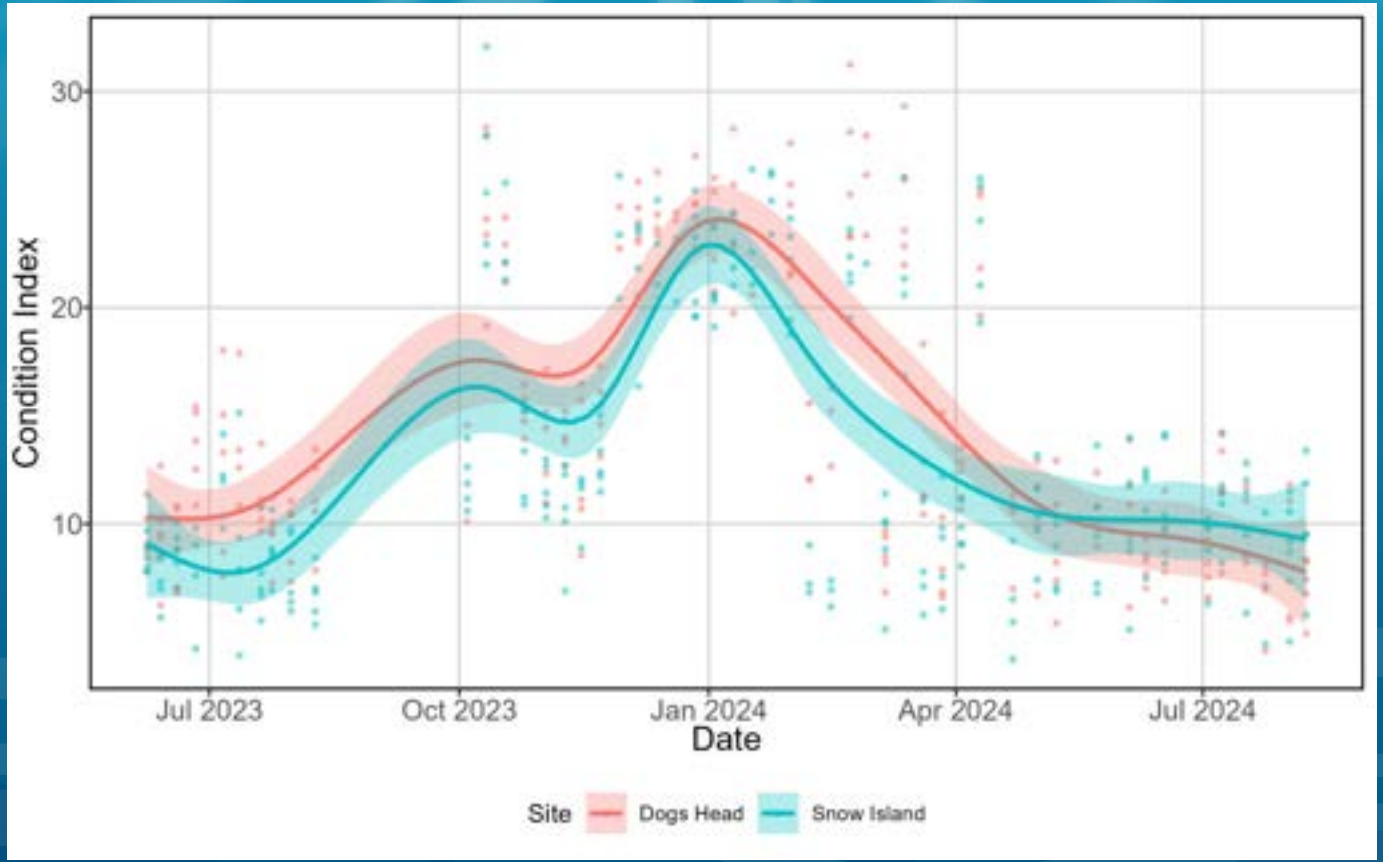
- They help water quality
- Proceeds fund QBC

Oyster Condition Index

- Weigh wet and dry shell and meat
- Measure length and width
- Compare health at Snow Island and Dogs Head sites



Oyster Condition Index

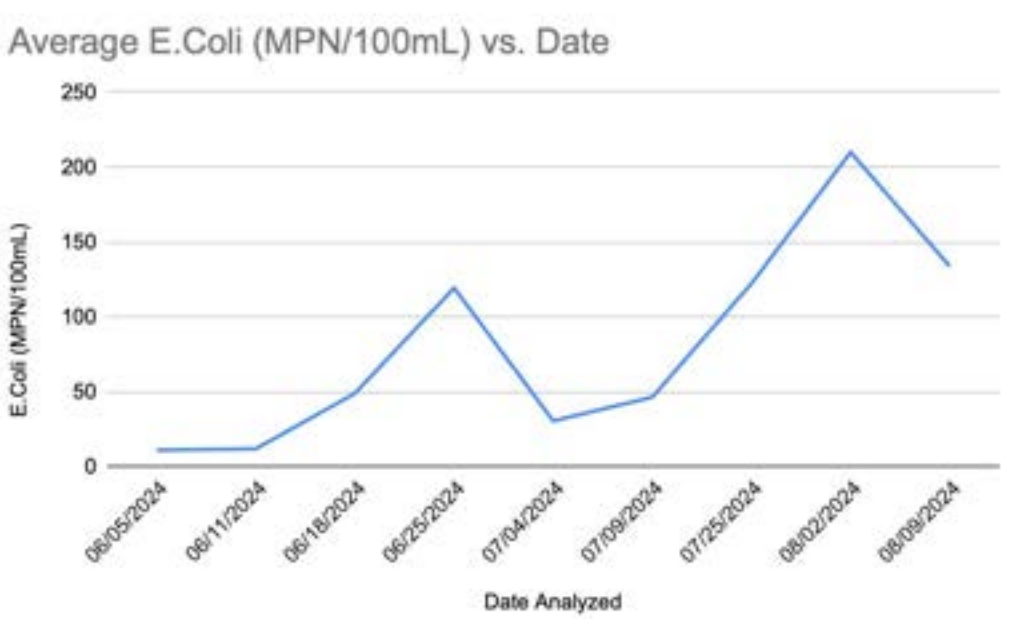


Aquaponics

- A closed looped system combining aquaculture and hydroponics
- Sustainable
- Food Security

Pump Out Service

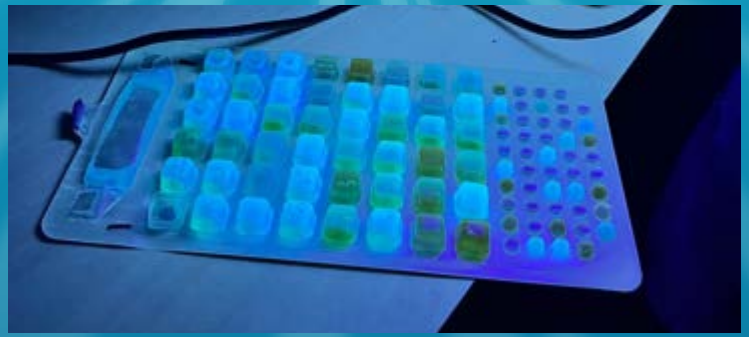
- This summer we pumped a total of **23** boats
  - **630** gallons of waste
- Funded by the State



Water Quality Monitoring

What we measure:

- Turbidity
- Depth

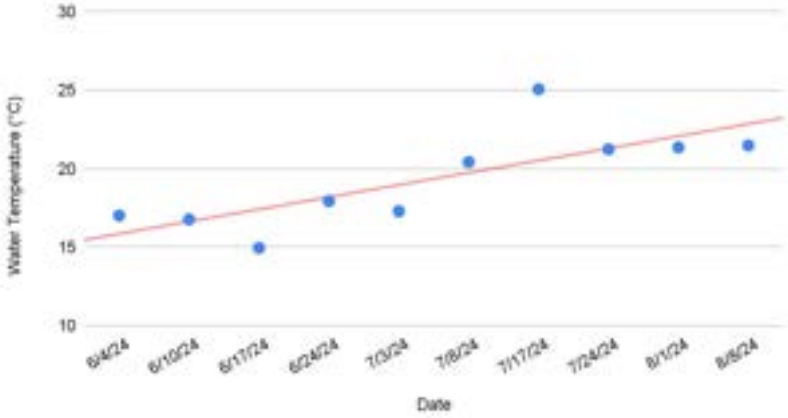


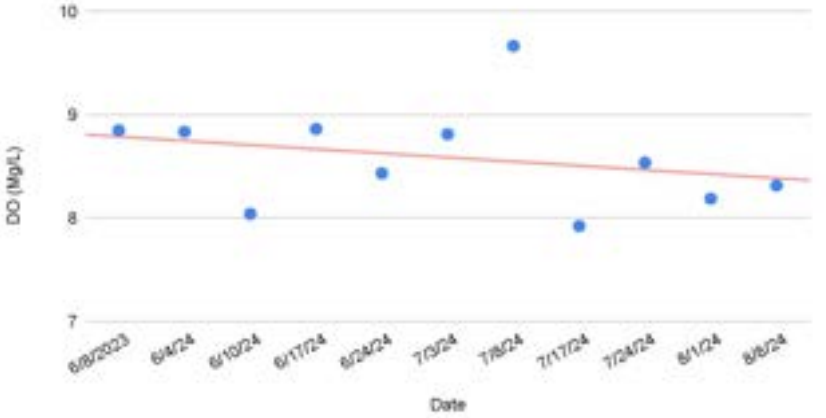
- Temperature
- Conductivity
- Salinity
- pH
- Dissolved oxygen

- Water samples (E.Coli)

Why we care:

- Observe trends over time in Casco Bay
- Understand how E.Coli is changing

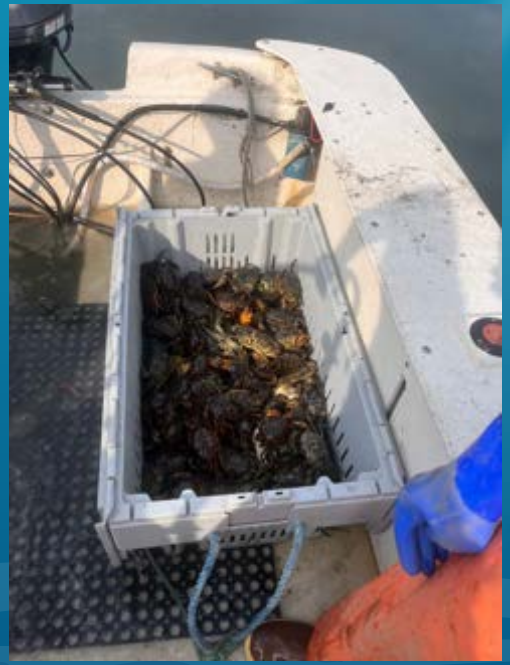

Average Water Temperature (°C) Across All Sites
Water Temperature (°C)
30
25
20
15
10
6/4/24
6/10/24
6/17/24
6/24/24
7/3/24
7/8/24
7/17/24
7/24/24
8/1/24
8/8/24
Date


Average DO (Mg/L) Across All Sites
DO (Mg/L)
10
9
8
7
6/8/2023
6/4/24
6/10/24
6/17/24
6/24/24
7/3/24
7/8/24
7/17/24
7/24/24
8/1/24
8/8/24
Date

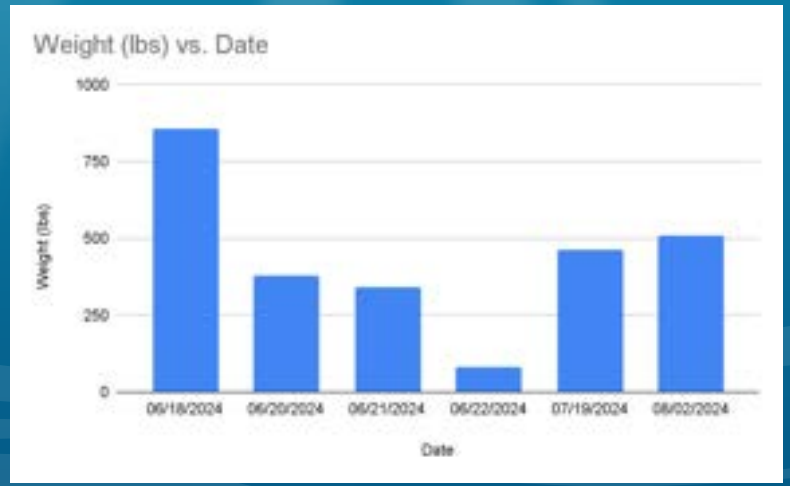

Average Turbidity (ft) Across All Sites
Turbidity (ft)
14
12
10
8
6/8/2023
6/4/24
6/10/24
6/17/24
6/24/24
7/3/24
7/8/24
7/17/24
7/24/24
8/1/24
8/8/24
Date


Average pH Across All Sites
pH
8.8
8.6
8.4
8.2
8.0
6/4/24
6/10/24
6/17/24
6/24/24
7/3/24
7/8/24
7/17/24
7/24/24
8/1/24
8/8/24
Date

Green Crab Removal



We removed over **2,121** pounds of invasive Green Crabs from Quahog Bay to be used as compost in our community!



Trash Removal

Common trash in the bay:

- Old traps and buoys
- Dock debris
- Fishing gear
- Plastics
- Rope
- Styrofoam
- Bottles & cans
- Party balloons

Why is trash bad:

- Becomes Microplastics
- Affects aquatic and terrestrial animals
- Blocks water systems

Thanks to Casco Bay Estuary Partnership for funding our trash clean up efforts!

Science Communication

- Visual and Written Storytelling
- Know your audience: a panel
- Career building skills
- Identifying and dealing with misinformation

Gulf of Maine Research Institute

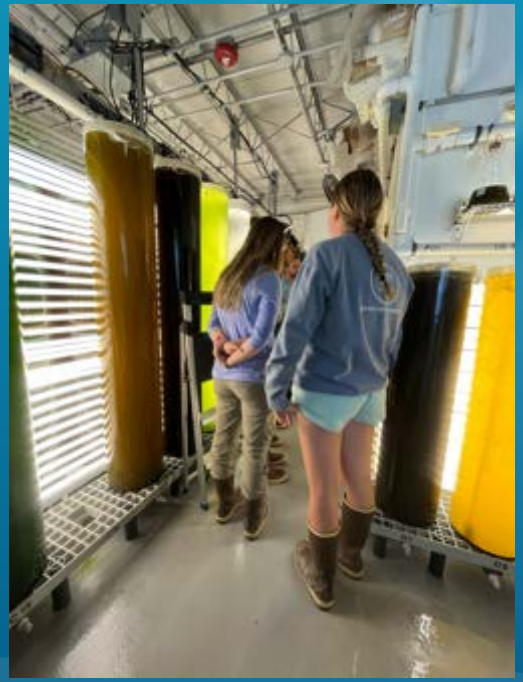
Science. Education. Community.

Dave Berndtson

Casco Bay Aquatic Systems Survey (CBASS)

Field Trips

Merrymeeting Shellfish



Wolfe's Neck

Woods Hole Oceanographic Institution

merrymeeting shellfish co.
HATCHERY | EST. 2024

WOLFE'S NECK CENTER FOR AGRICULTURE & THE ENVIRONMENT

WOODS HOLE OCEANOGRAPHIC INSTITUTION®

Field Trips with Dr. Walt Golet

Shark Tagging

Tuna Dissection

Individual Projects

Ecotoxicological Impacts of Dicamba and Sulfur on Marine Microalgae *Tetraselmis* spp.

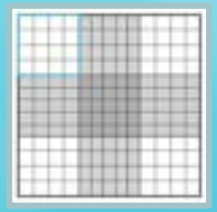
How does presence of dicamba and sulfur pesticides and herbicides affect algae growth and mortality?

Emma Archambault

Methods

- Prepare 4 treatments: 1 ppb dicamba, 10 ppb dicamba, 100 ppb dicamba, 10 ppb sulfur

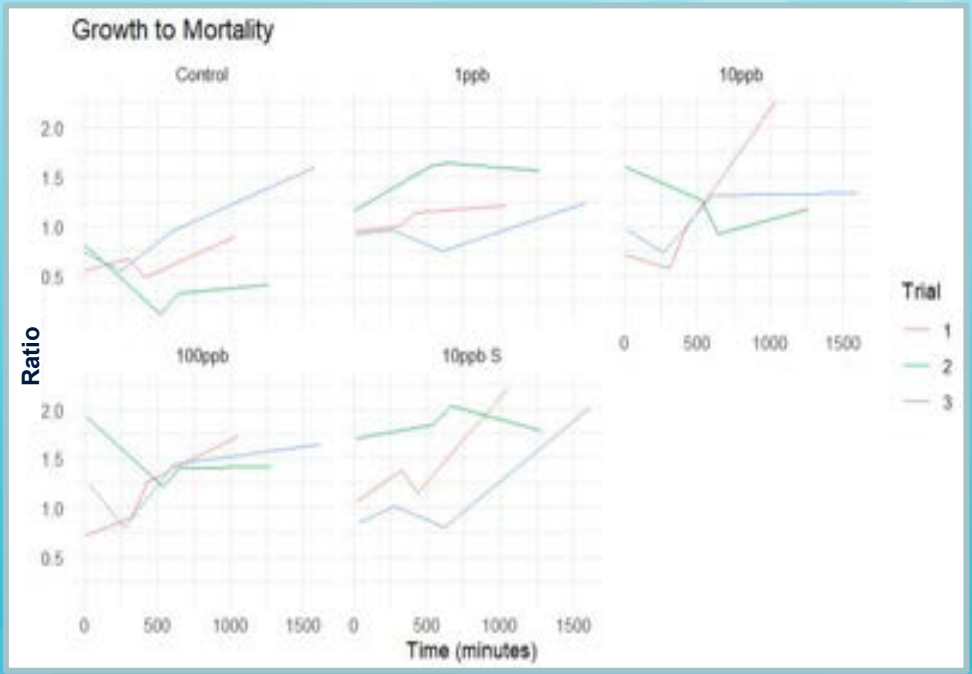
- Count total and immobile cells using a hemocytometer get cells per mL →count/4 × 10,000 cells/mL

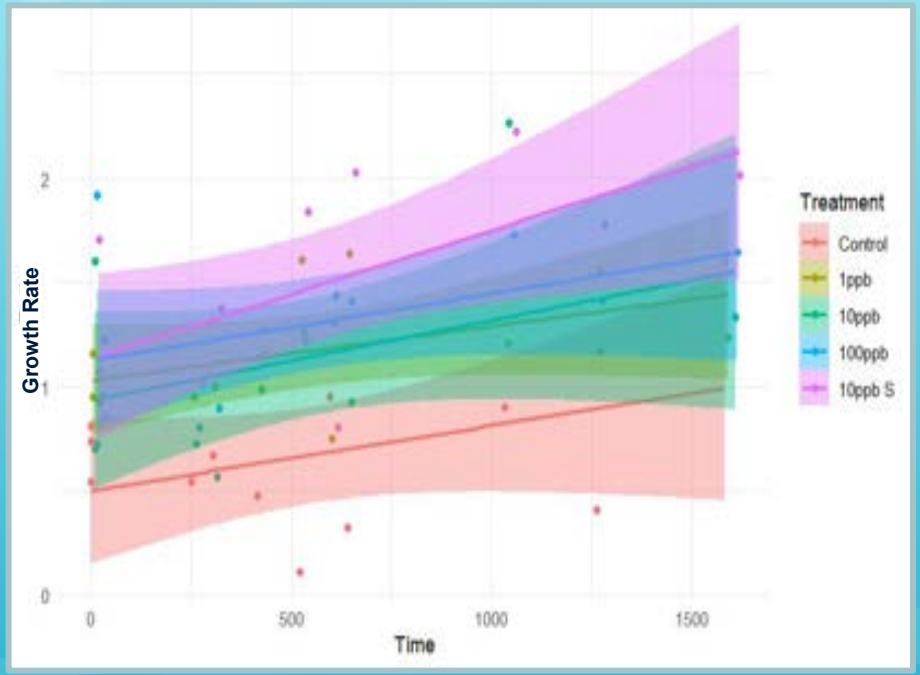


- Find ratio of growth to mortality over time to measure population growth or decline

- Conduct initial observation, then three more at 18-26 hour intervals for 3 trials

Results


Growth to Mortality
Control
1ppb
10ppb
100ppb
10ppb S
Ratio
Time (minutes)
Trial
1
2
3


Growth Rate
Time
Treatment
Control
1ppb
10ppb
100ppb
10ppb S

Why did we see these results?

- Dicamba inhibits growth in **terrestrial** plants
- Too low of concentrations to see a result

Why does this matter?

- Higher concentrations and chronic exposure in nature
- Increased popularity and usage of agricultural chemicals
- increased rainfall and runoff into water

Ecotoxicological Effects of Roundup Herbicide on the Hatching Success and Naupliar Survival of *Acartia* spp.

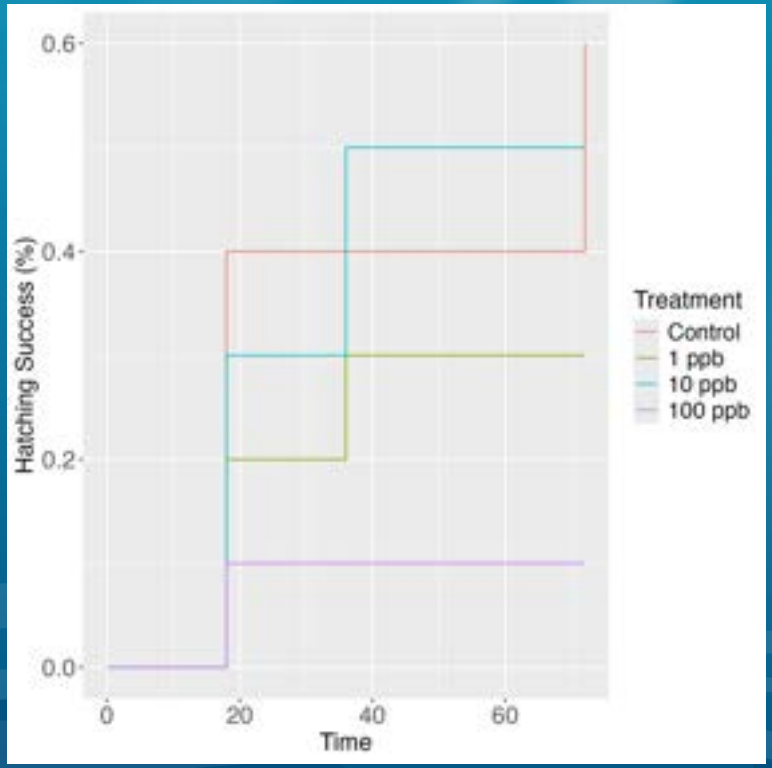
How does Dicamba at different concentrations affect **hatching success** and **naupliar survival** of *Acartia* spp.?

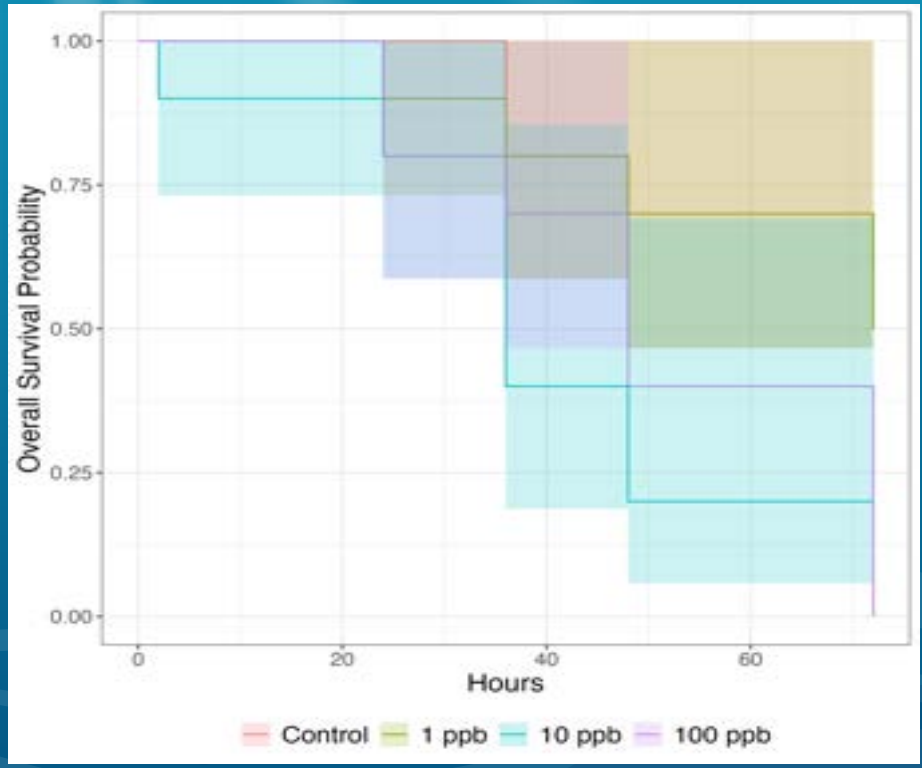
Sydney Ulland

Methods

- 4 concentrations (0, 1, 10, 100 ppb) of Dicamba (from Roundup for Lawns)
  - Friends of Casco Bay 2003 Study
- Dock and boat tows
- Egg hatching success monitored
  - Hatched nauplii
- Nauplii survival monitored
  - Motor function
- Statistical analysis of data
  - R Statistical Software

Results


0.6
0.4
0.2
0.0
Hatching Success (%)
0
20
40
60
Time
Treatment
Control
1 ppb
10 ppb
100 ppb


1.00
0.75
0.50
0.25
0.00
Overall Survival Probability
0
20
40
60
Hours
Control
1 ppb
10 ppb
100 ppb

Why is this important?

- Herbicides are common
- Runoff is entering marine ecosystems
  - More common with storm events, flooding, sea level rise, and erosion
- Contamination is affecting organisms
- Potentially impacts food production and economic activities in coastal communities

Temperature Effects on Hatching Success and Respiratory Rate of *Acartia spp.* (Copepoda: Calanoida) in Quahog Bay, Maine

- Sea surface temperature is increasing
- *Acartia spp.* are sensitive to environmental conditions
- Essential prey species within the Gulf of Maine

Reuven Frye

Methods

Temperature

- 16°C and 20°C

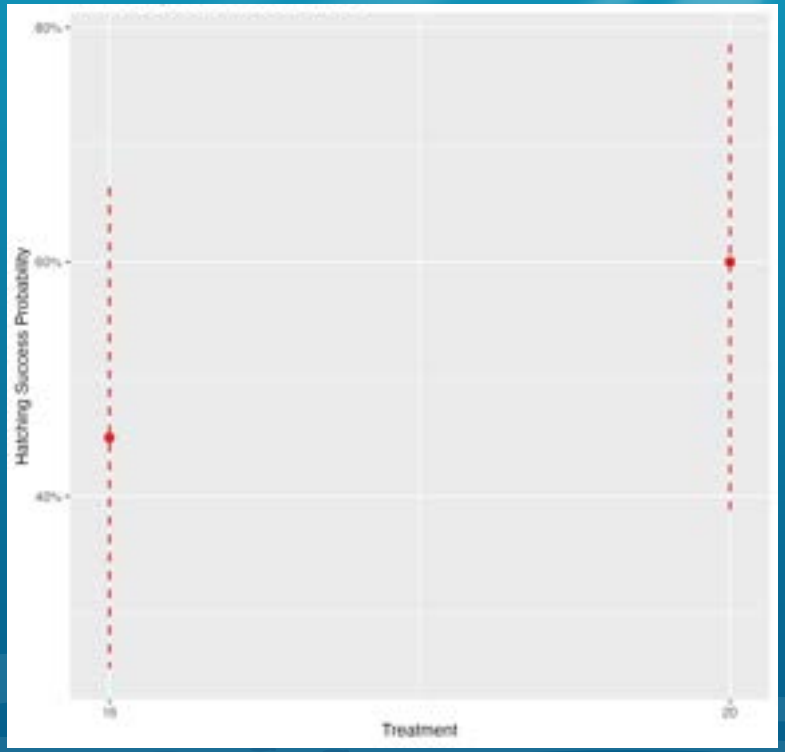
Hatching Success

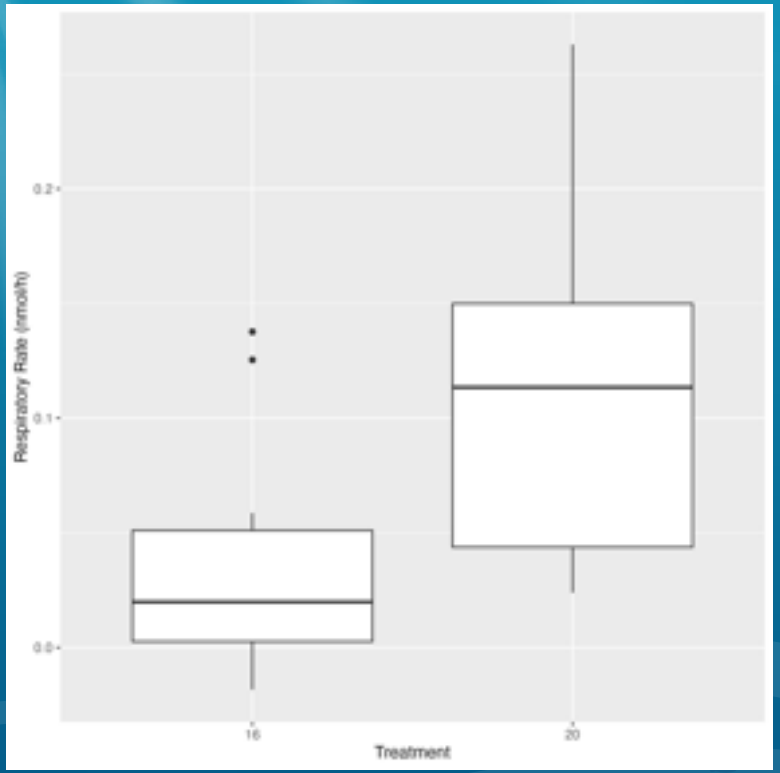
- Counted number of non-hatched eggs, hatched eggs, and nauplii
- Observed over 96 hours

Respiratory Rate

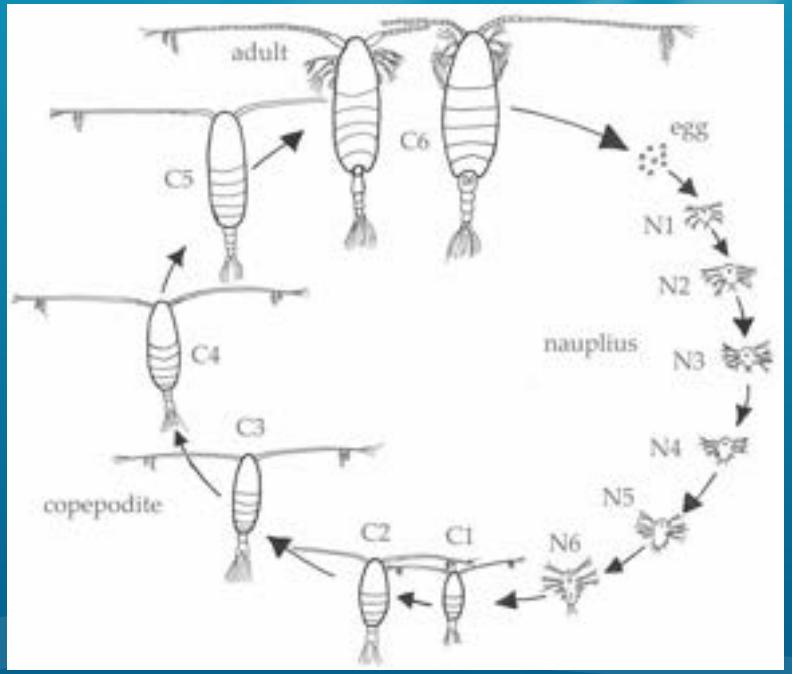
- Used a respirometer
- Calculated as change in oxygen saturation between (10pm - 4am)

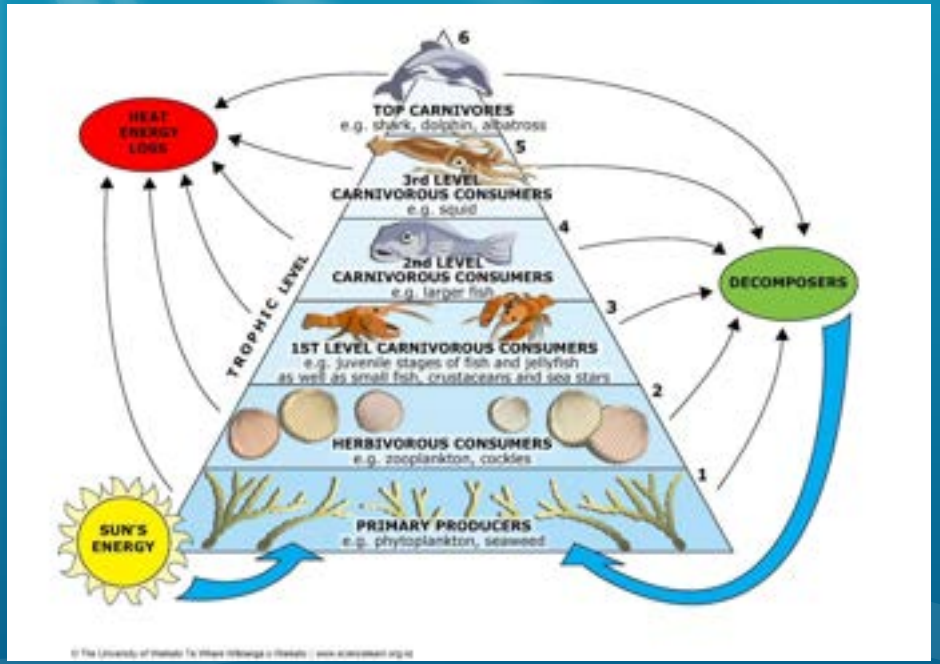
Results


Hatching Success Probability
60%
40%
16
20
Treatment


Respiratory Rate (nmol/h)
0.2
0.1
0.0
16
20
Treatment

Why is it important?





Growth Rates of Atlantic Herring and Atlantic Silverside in Response to Temperature Changes on the Gulf of Maine

Atlantic Silverside

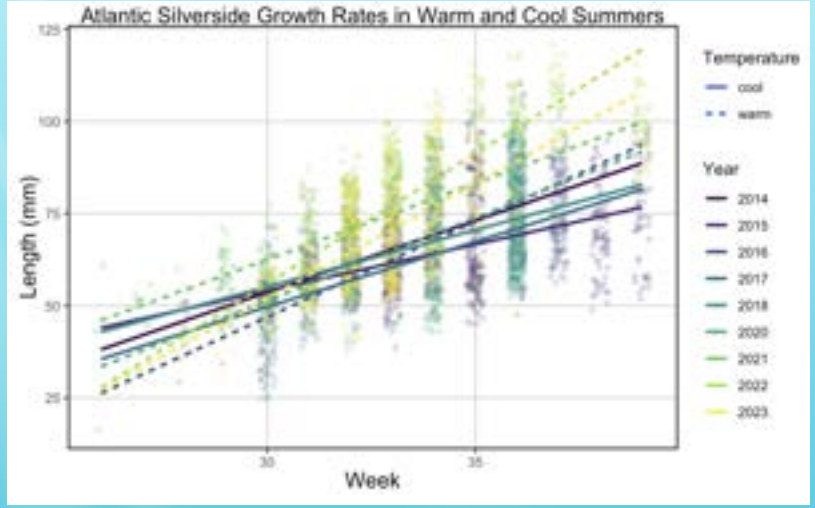
Atlantic Herring

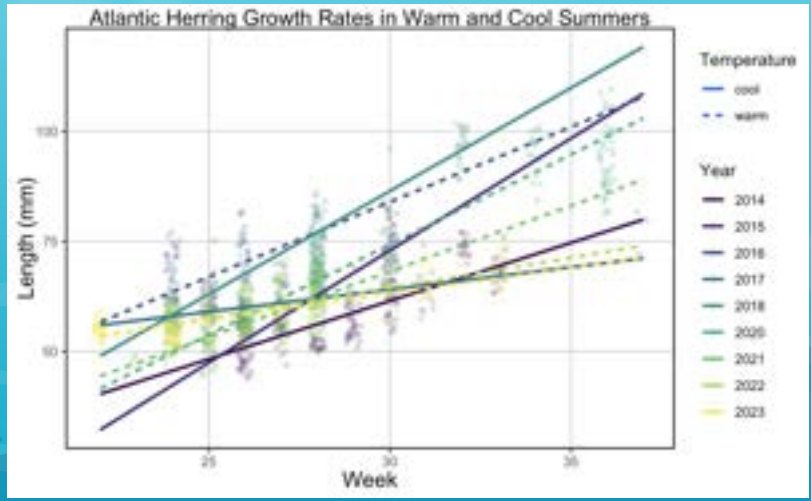
How do **warm-adapted** species react to warming waters, and is this similar to **cold-adapted** species?

Courtney Swenson

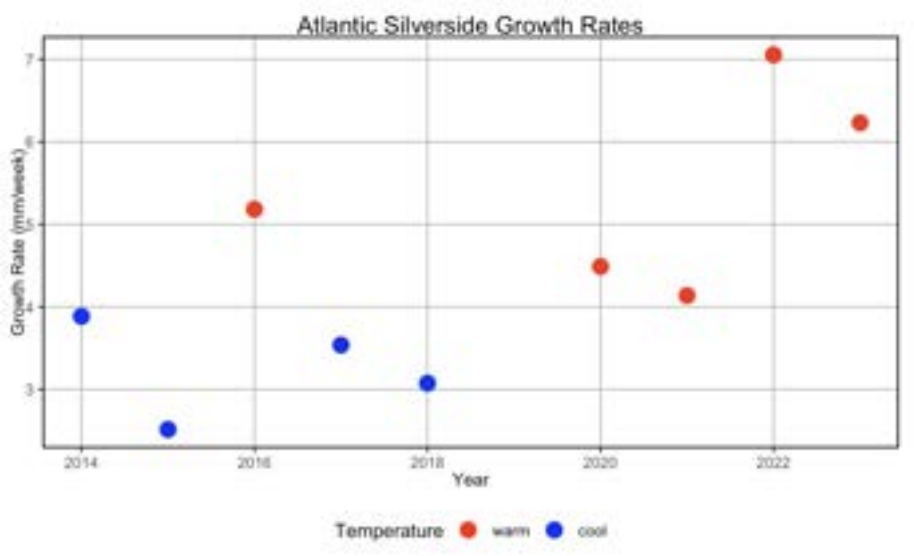
Methods

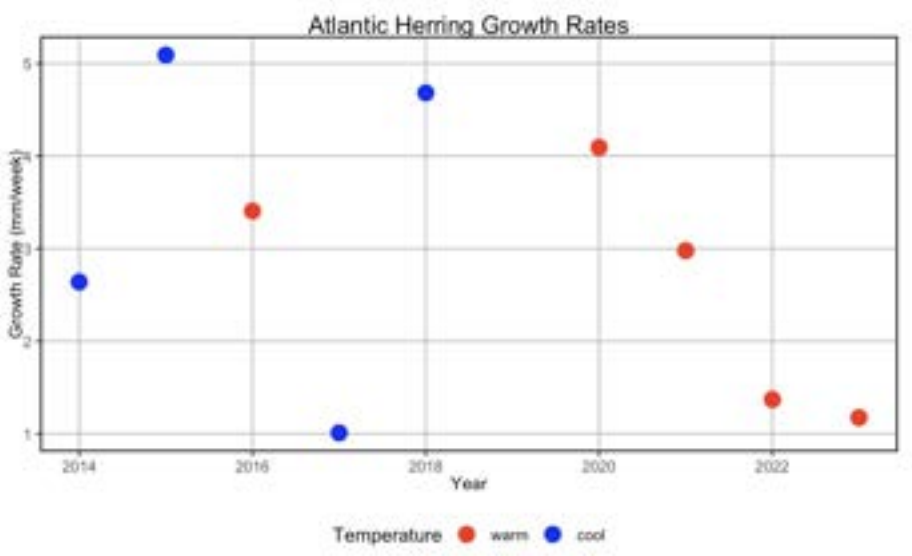
- Divide into “warm” and “cool” summers
- Averaged weekly length
- Generalized linear model
- Compare growth rates





Results


Atlantic Silverside Growth Rates
Growth Rate (mm/week)
7
6
5
4
3
2014
2016
2018
2020
2022
Year
Temperature
warm
cool


Atlantic Herring Growth Rates
Growth Rate (mm/week)
5
4
3
2
1
2014
2016
2018
2020
2022
Year
Temperature
warm
cool

Why Did We See These Results?

- Life Cycle Differences
- Migration
- Spatio-Temporal Mismatch

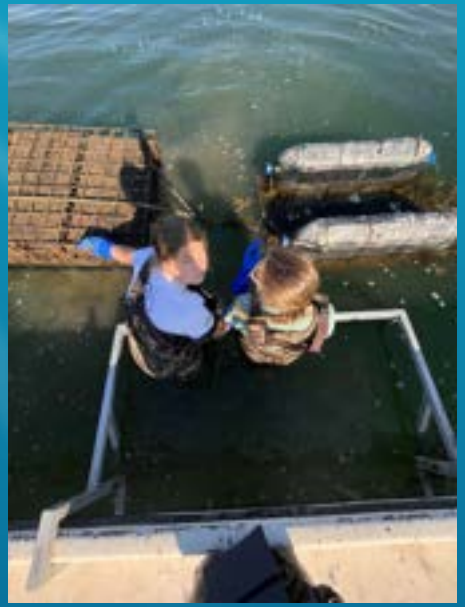
Why Does This Matter?

- Food web composition shift
- Bottom-up effect
- Economic impact

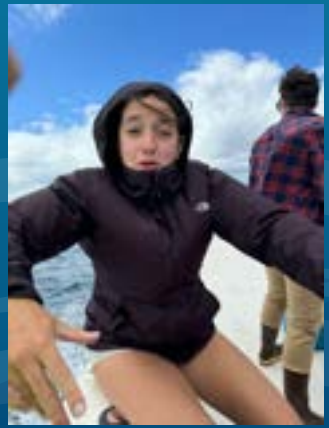



THANK YOU!!!

For a great summer :)



QUESTIONS?



Summary Video