

Impacts of overwintering strategies on oysters: Upcoming research from UMass faculty



Sarah Donelan
UMass Dartmouth

Goals of talk

1. Introduce ourselves
 - Your friendly neighborhood oyster biologists
2. New research on overwintering

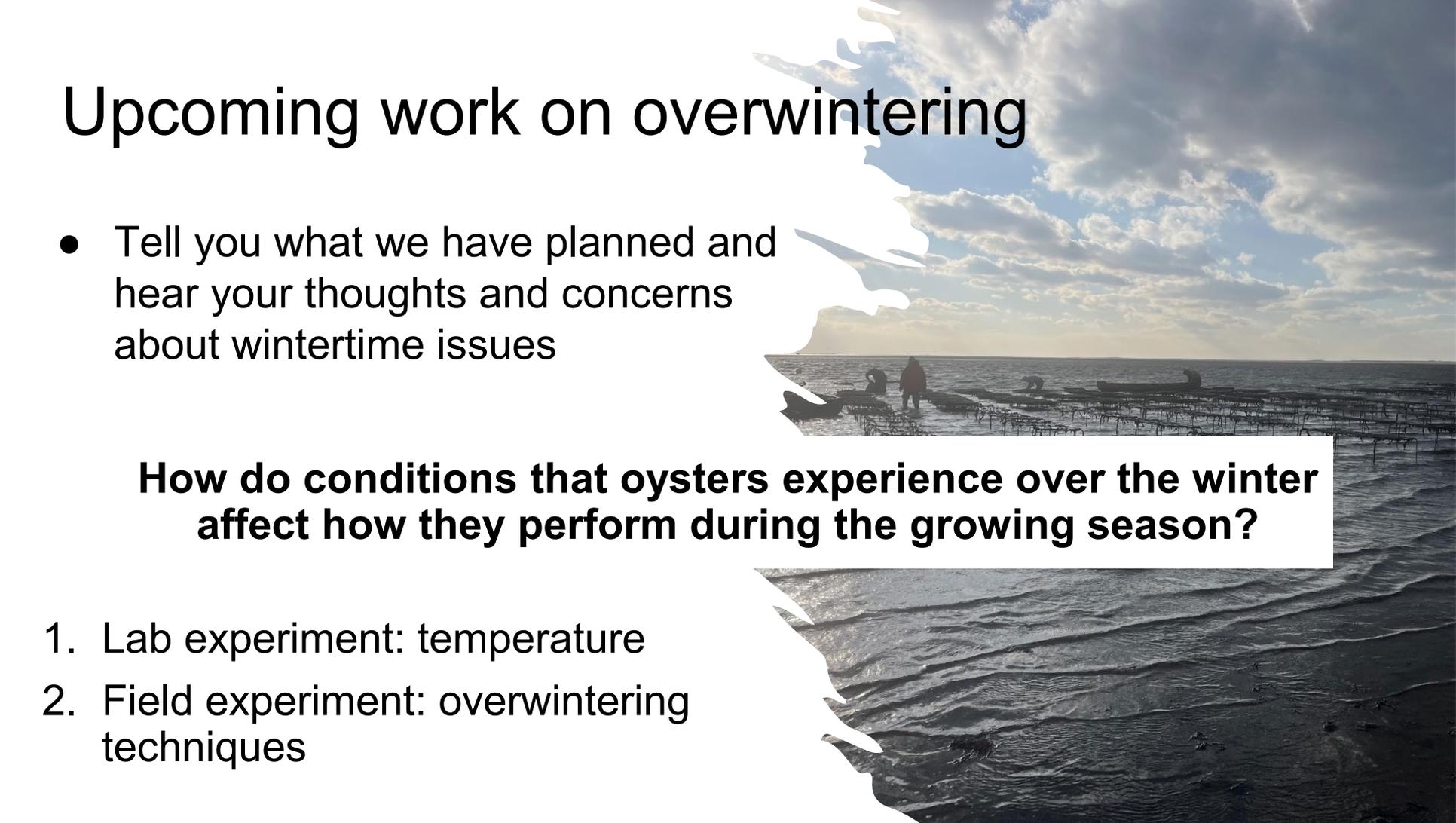
Goals of talk: Introduction

- Experimental ecologists
- Look at oyster traits that matter in aquaculture
 - Growth
 - Survival
 - Disease and ectoparasites
- Experiments in lab and field



Sarah Gignoux-Wolfsohn
UMass Lowell

Upcoming work on overwintering

The background of the slide is a photograph of a coastal scene. In the foreground, there are dark, rippling waves. In the middle ground, several people are visible working in the water, surrounded by rows of oyster racks. The sky is filled with white, fluffy clouds, and the overall lighting suggests a bright, sunny day.

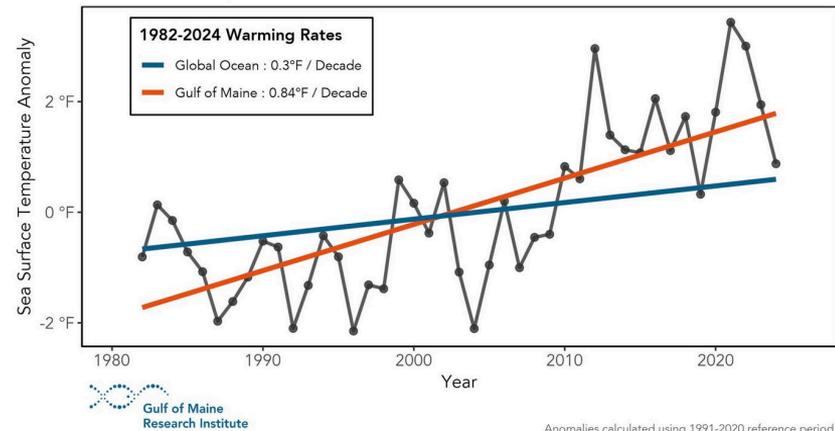
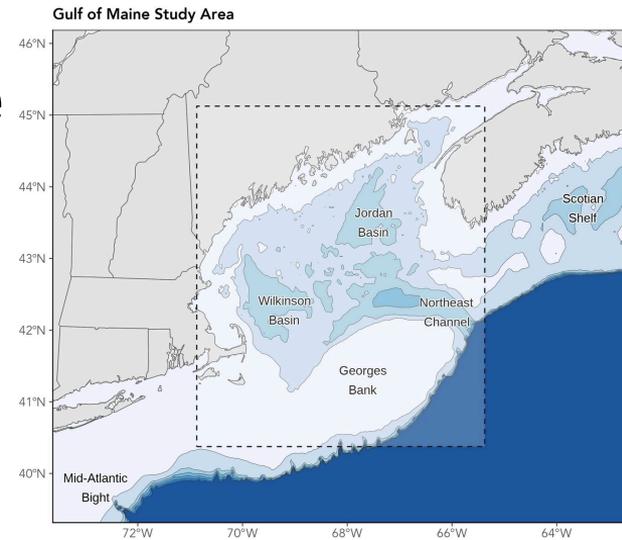
- Tell you what we have planned and hear your thoughts and concerns about wintertime issues

How do conditions that oysters experience over the winter affect how they perform during the growing season?

1. Lab experiment: temperature
2. Field experiment: overwintering techniques

Lab experiment: Temperature

- **How does winter warming affect how oysters respond to warming in summertime?**
- Winter temperatures in New England changing faster than elsewhere
- Winters are warming more than other seasons
 - +2.0°C (3.6°F) above average in winter vs. +0.8°C (1.4°F) in other seasons



Anomalies calculated using 1991-2020 reference period.

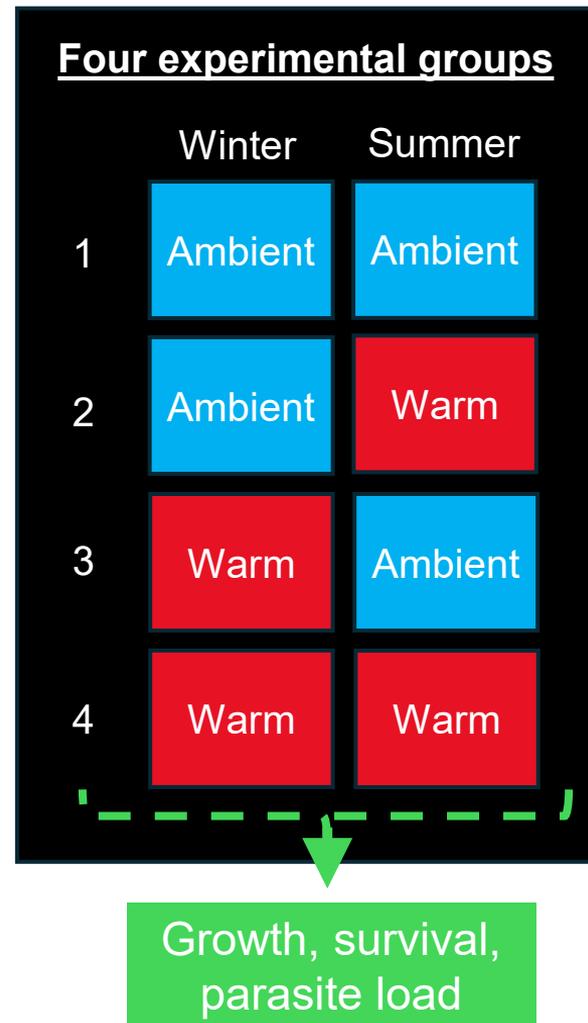
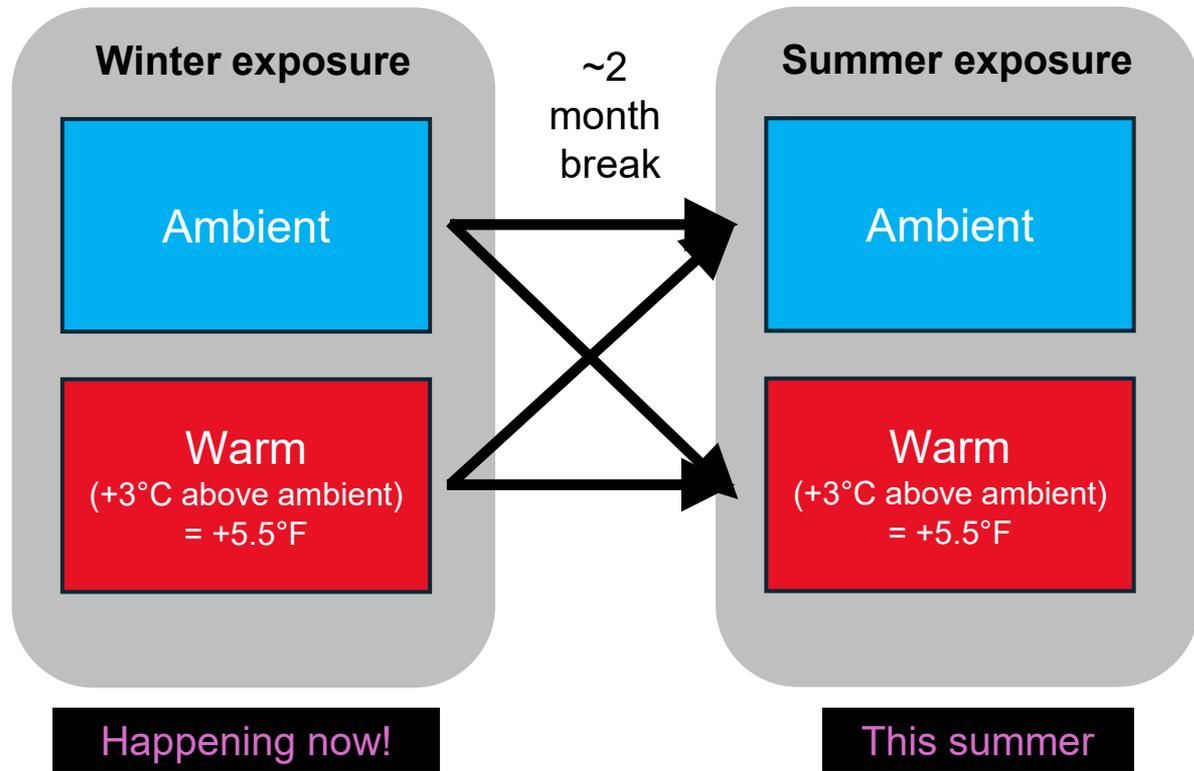
Lab experiment: Temperature

- Lab experiments allow us to isolate specific factors like temperature while keeping everything else constant
- SMAST at UMass Dartmouth in New Bedford
- 24 tanks:
 - 12 ambient temperature
 - 12 warm



Sophie Montague





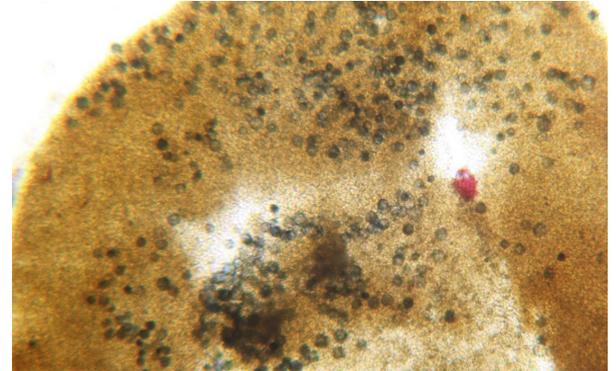
How we measure growth and parasites

- Actually assess tissue and shell **growth** and not just size
 - Non-destructive buoyant weighing technique
- Data from Chesapeake Bay shows that exposing 3 month old spat to warming reduces tissue growth later in life
 - Not sure if this will happen in New England



Perkinsus marinus (Dermo)

- Measured using RFTM (incubate tissues and stain)
- In Chesapeake Bay, February and March temperatures have largest effect on *P. marinus* load in wild oysters
- We expect that oysters in our heated winter treatment may have higher loads



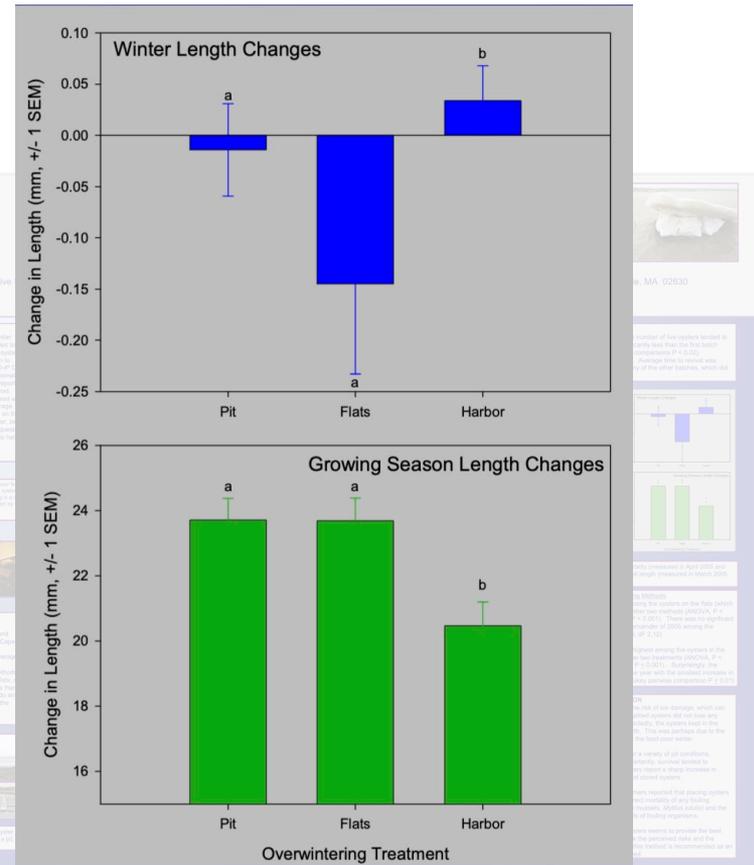
We should have data from this experiment in 2027

Field experiment: Overwintering strategies

- **Motivation: Lack of experimental data from northern oyster reefs and farms vs. those further south like Chesapeake**
- Harsh winter conditions are unique to northern growers!
- From conversations, 3 commonly used strategies in MA:
 1. Maintained in surface floats
 2. Sunk to bottom
 3. Pitting
 - Especially intertidal farms that ice over
- Lack of experimental data on how these strategies affect yield...

What is known already

- Scientific data:
 - Oysters kept at depth grew over the winter while those at surface and in pit did not
 - BUT oysters kept at depth grew the **LEAST** during the growing season vs. surface or pitted oysters
- Grower knowledge and experience:
 - Suggests that pitting reduces fouling by ectoparasites



Bill Walton and Diane Murphy 2005 WHOI SG report
Available at ECSGA website

Ectoparasites and dermo disease

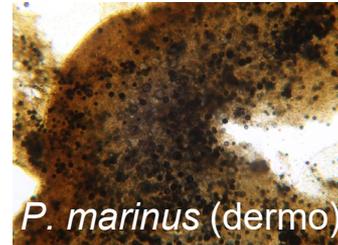
- Ectoparasites: mud blister worms and boring sponge
- We expect ectoparasite load to be reduced in pitted oysters, but what about dermo?
 - Does pitting make oysters better or worse at combating parasites?
- Does ectoparasite/disease load vary between oysters grown at surface or at depth?
- Does *P. marinus* affect tissue and shell growth?



Polydora websteri
(mud blister worm)



Cliona celata
(boring sponge)



P. marinus (dermo)

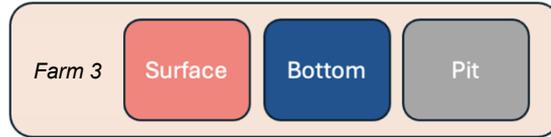
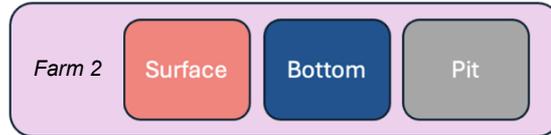
What we're doing

- Replicating Walton and Murphy with a field experiment at three farms:
 - Two South Coast, one North Shore
- At each farm, overwinter oysters using the 3 common strategies:
 1. Surface floats
 2. Bottom cages
 3. Pit
- Two size classes:
 1. Spat purchased in June
 2. Spat purchased in September
- Measure growth, survival, and parasite load at multiple timepoints
 - After overwintering
 - After summer





Overwintering treatment (Nov-March, Year 1-2)



Weight, parasite load

What we're doing

- Replicating the same thing at each farm to reduce possibility of a site effect
 - We know conditions vary between farms
 - Doing it at more than one site (farm) helps assess generality of findings
 - Also get preliminary data on how farm environment might change outcomes
 - But we would need to do a replicated follow up study to really test that



What we're doing

- Track 3,000+ oysters individually
- Buying seed from local hatchery
 - Same source as growers
 - Keep at SMAST from time of purchase (June or September) until start of overwintering (November) = “common garden”
 - Standardizes their conditions before experiment starts



Closing thoughts

- What do you think we'll see? Anything else to look at?
- Specifically for overwintering:
 - How do you overwinter? Is this determined by your site or permits?
 - What do you see on your farm?
 - Do you quantify overwinter mortality?
 - What are your constraints on measuring survival, etc.?
- What do you wish we knew more about as far as factors that affect growth, survival, and disease of oysters on your farm?

We're interested in collaborating on questions you're interested in!

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Thank you!

