

Extension Updates for MAA

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Cape Cod Cooperative Extension

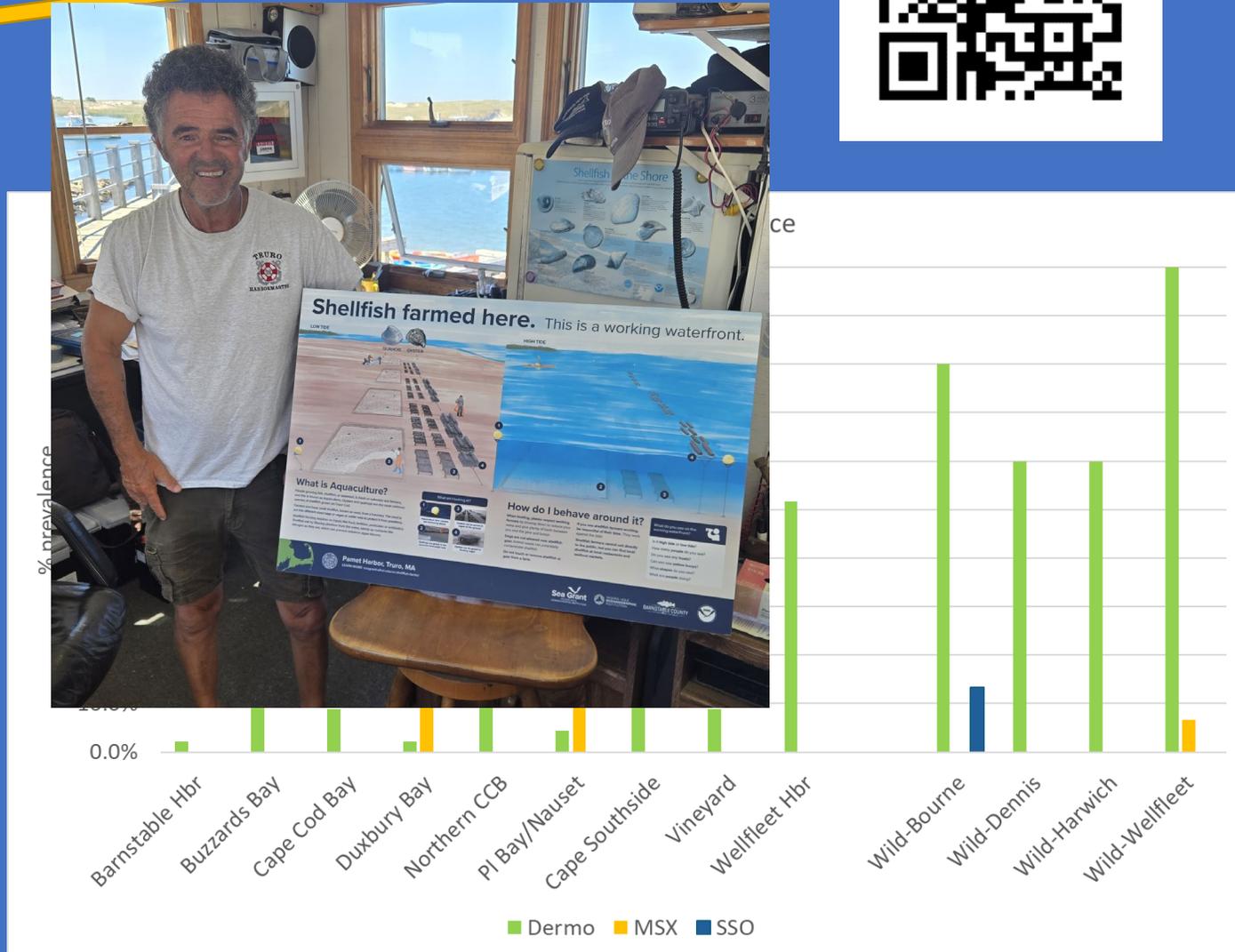
Woods Hole Oceanographic Institution Sea Grant

SouthEastern Massachusetts Aquaculture Center (SEMAC)



Quick Updates

- Water monitoring
 - Wellfleet temp, active for winter
- Shellfish Disease Monitoring
- 2 projects continuing with hard clam diseases
- AIM – Aquaculture Internship program
- Shellfish Aquaculture signs
- Shell pests and some pilots on how to handle them



What are these oyster shell pests?

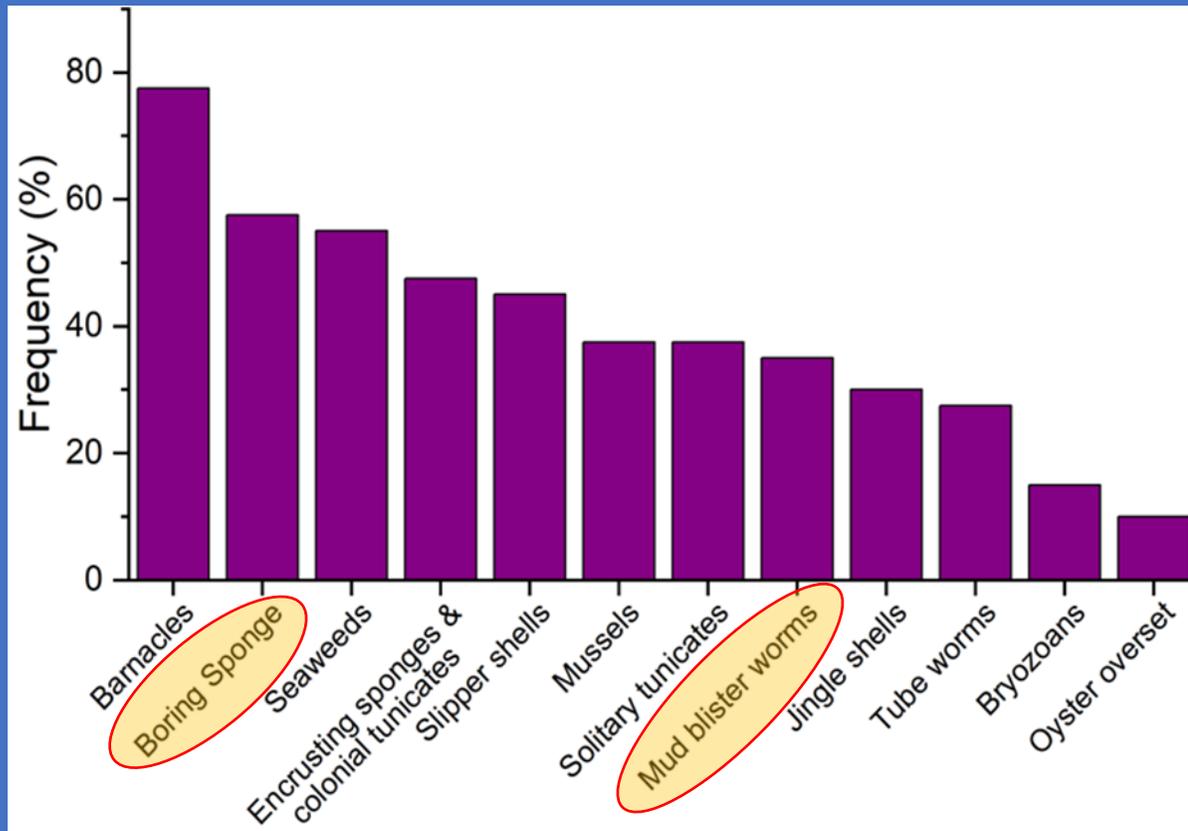
Boring sponge – *Cliona celata*



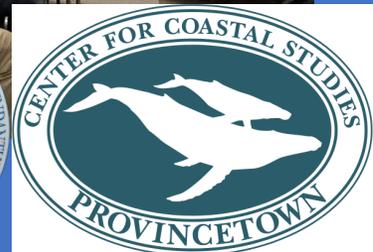
Mud blister worms – *Polydora websteri*



Shell Invading Pests as a Fouling Concern



- Top ten concerns (2&8)
- Similar shell pest nature
- Grower workshop in March 2025
 - Collaboration

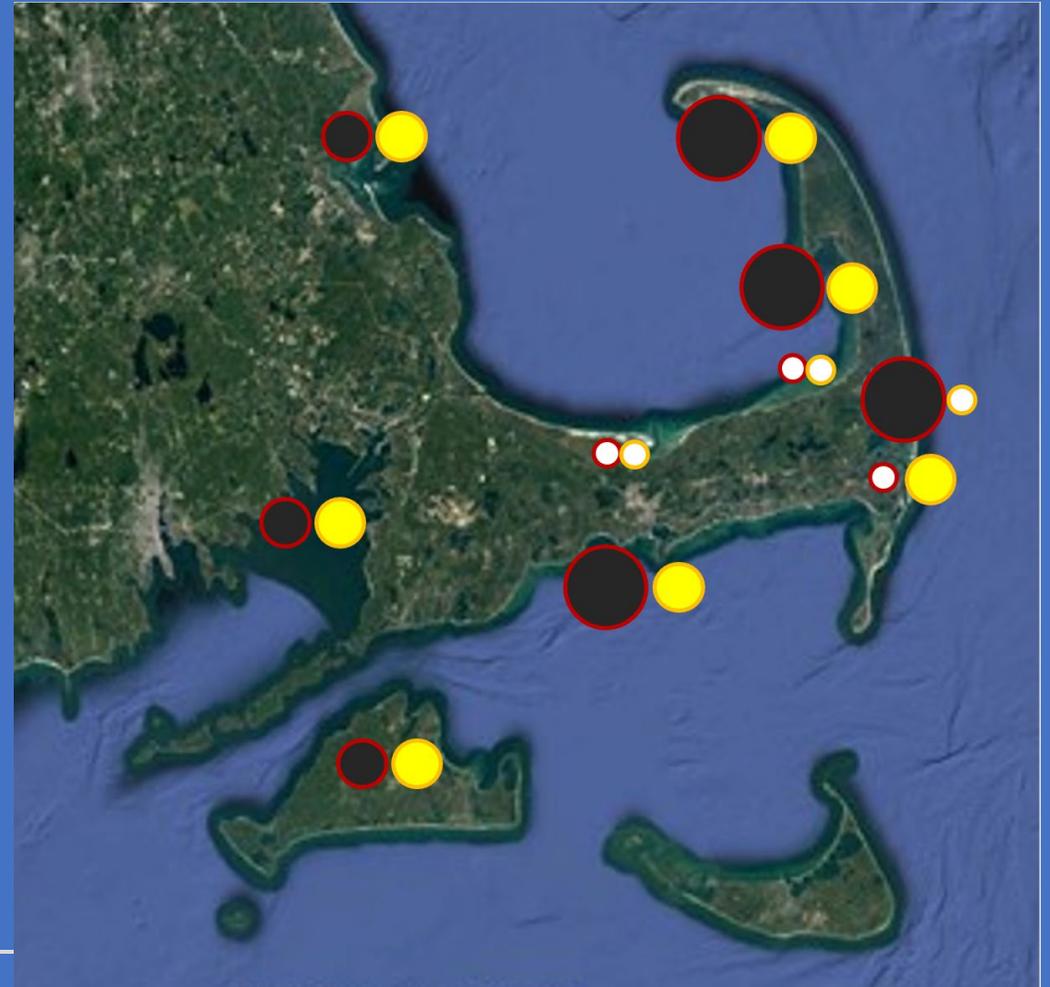


What do we know

Fairly common throughout SE MA

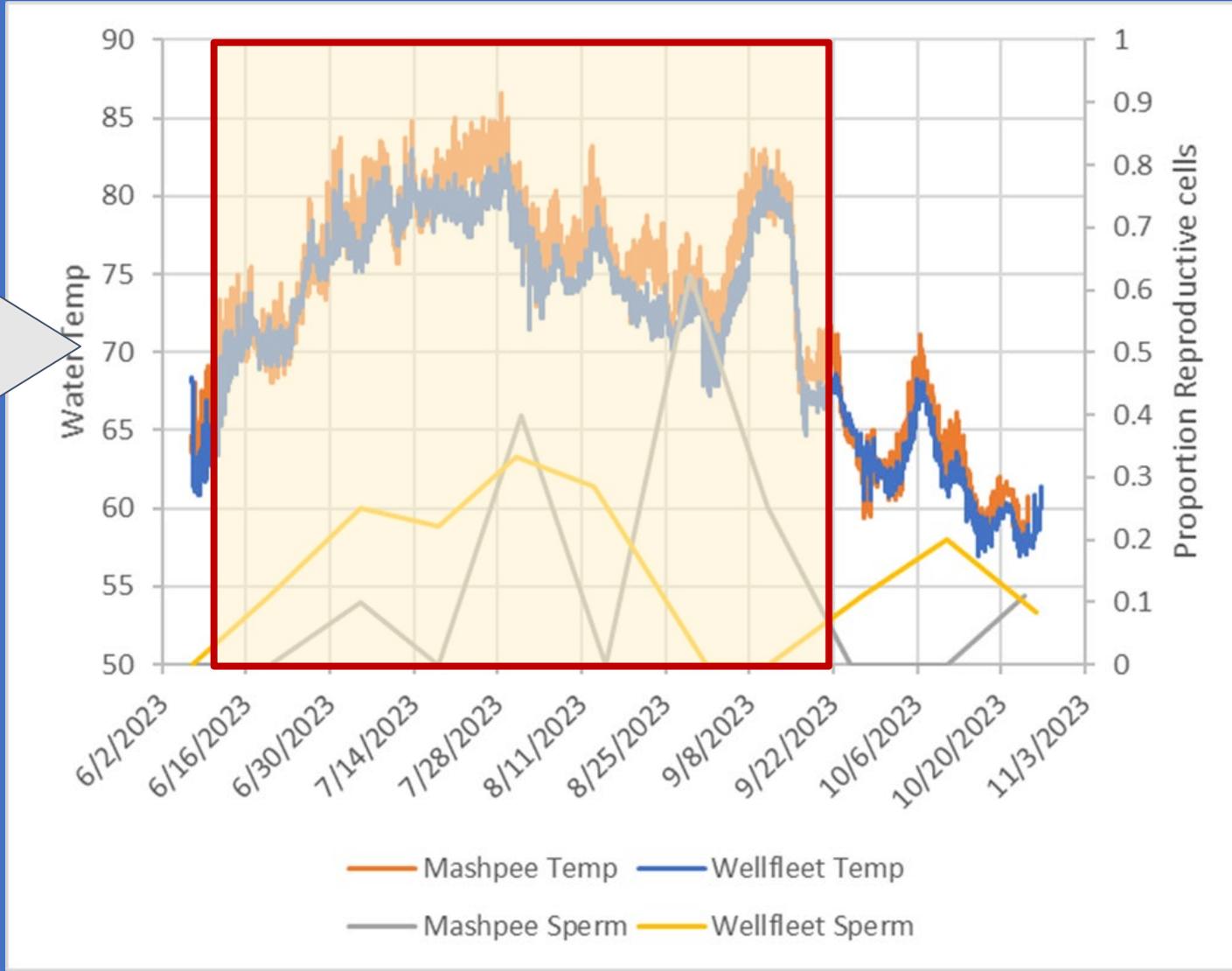
Less common in high intertidal

	Mud Blister Worms	Boring Sponge
None seen	○	○
< 50%	●	●
>= 50%	●	●



Spawning cycle of shell pests

Temps above 70 peaked sponge repro



Boring sponge - late June thru mid Sept

Mud blister – spring/summer
Wellfleet (Davinack)

What's known about mitigating shell pests

Boring sponge – *Cliona celata*

- Routine air-drying (Carroll et al 2021 and 2024)
- Brine dips (Carver et al. 2010)
- Freshwater dips (Hartman 1958)
- Coating or smothering (summarized in Carroll & Reitsma 2024)
- Chemical treatments

Mud blister worms – *Polydora websteri*

- Routine air-drying (Rawson 2024)
- Brine dips (summarized in Morse et al. 2015)
- Freshwater dips (Nel et al. 1996)
- Cool air storage (Morse et al 2015)
- Chemical treatments

Two Pilot Experiments

How much intertidal air exposure is needed to reduce these pest?

- Two sites in Wellfleet
- Cages with 5 different levels
- Pressure loggers - air exposure



Which dip treatment (FW or brine) works best and what is best timing?

- 3 sites: Duxbury, Wellfleet, Yarmouth
- Used brine dips and FW ice bath dips
- Tried dips in June, August, or both



Results

(Quick results)



Did treatments affect growth/survival?

Overall no major impacts to oyster performance

Tidal level treatments for air exposure

- Growth – slight reduction at top levels only
- Survival – no effect of increased air exposure
- Condition index – no effect

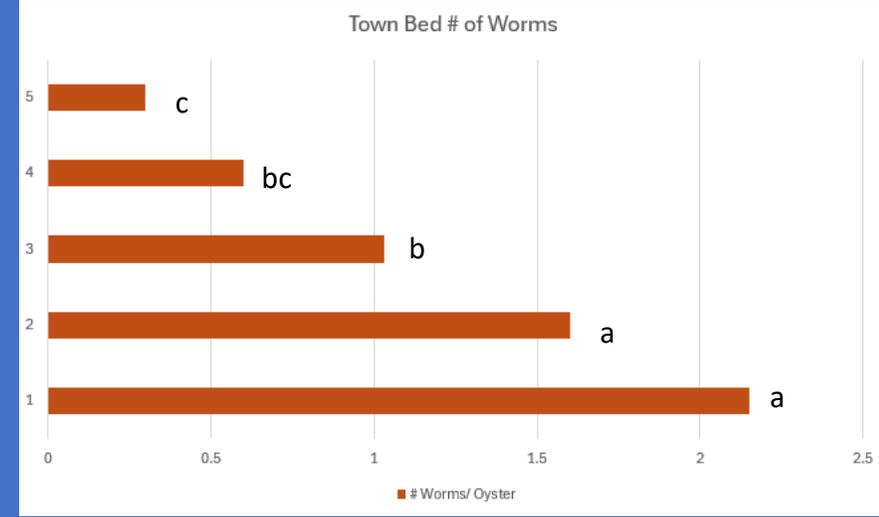
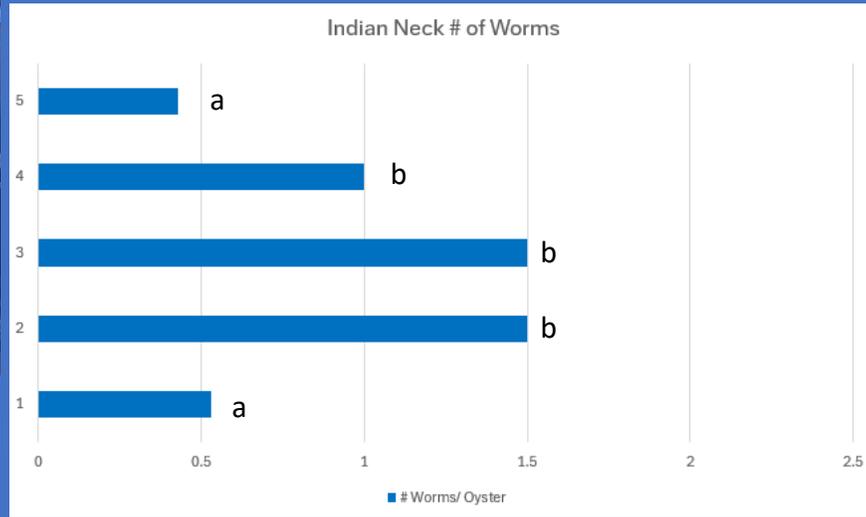


Dip treatments

- Growth – dip treatments had slightly higher growth
- Survival – no major effect
 - Slightly reduced if brined twice



Tidal exposure and Mud Blisters



Indian Neck					
level	1	2	3	4	5
% Exposure time	0.5%	1.2%	3.2%	6.7%	9.7%
# of worms/oyster	0.53	1.50	1.50	1.00	0.43
% cover of blisters	1.1%	4.2%	4.7%	3.3%	1.7%
% Prevalence	37.5%	62.5%	77.5%	60.0%	27.5%

Town Bed					
level	1	2	3	4	5
% Exposure time	4.8%	7.2%	11.3%	14.5%	17.8%
# of worms/oyster	2.15	1.60	1.03	0.60	0.30
% cover of blisters	3.2%	5.4%	2.1%	2.5%	1.4%
% Prevalence	87.5%	82.5%	62.5%	47.5%	27.5%

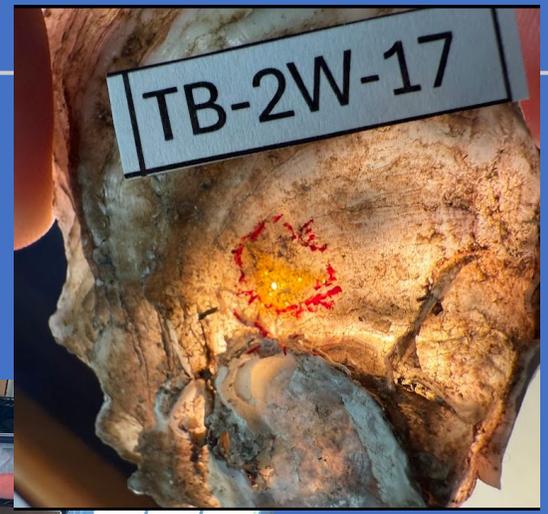
Air exposure ~7% of time or greater reduced mud blisters
 Tidal exposure up to 18% of time did not eradicate blisters

Tidal Exposure - Boring Sponge



Indian Neck					
level	1	2	3	4	5
% Exposure time	0.5%	1.2%	3.2%	6.7%	9.7%
# of holes/oyster	27.7	45.9	2.2	3.9	0.0
% Prevalence	57.5%	55.0%	7.5%	5.0%	0.0%

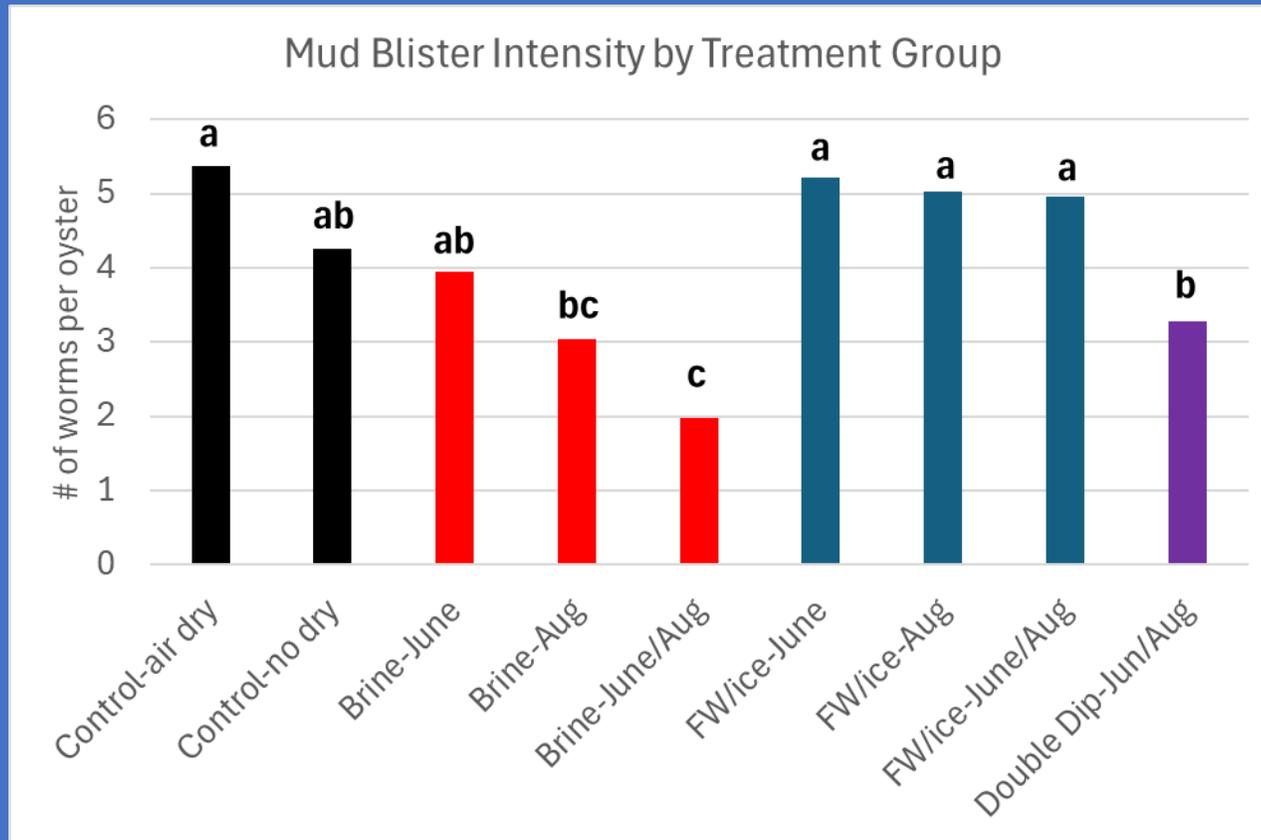
Town Bed					
level	1	2	3	4	5
% Exposure time	4.8%	7.2%	11.3%	14.5%	17.8%
# of holes/oyster	0.9	0.8	0.2	0.0	0.0
% Prevalence	10.0%	5.0%	2.5%	0.0%	0.0%



>3% time of exposure seems to really limit sponge
 *Town Bed was low in boring sponge as all levels were >3% exposure time



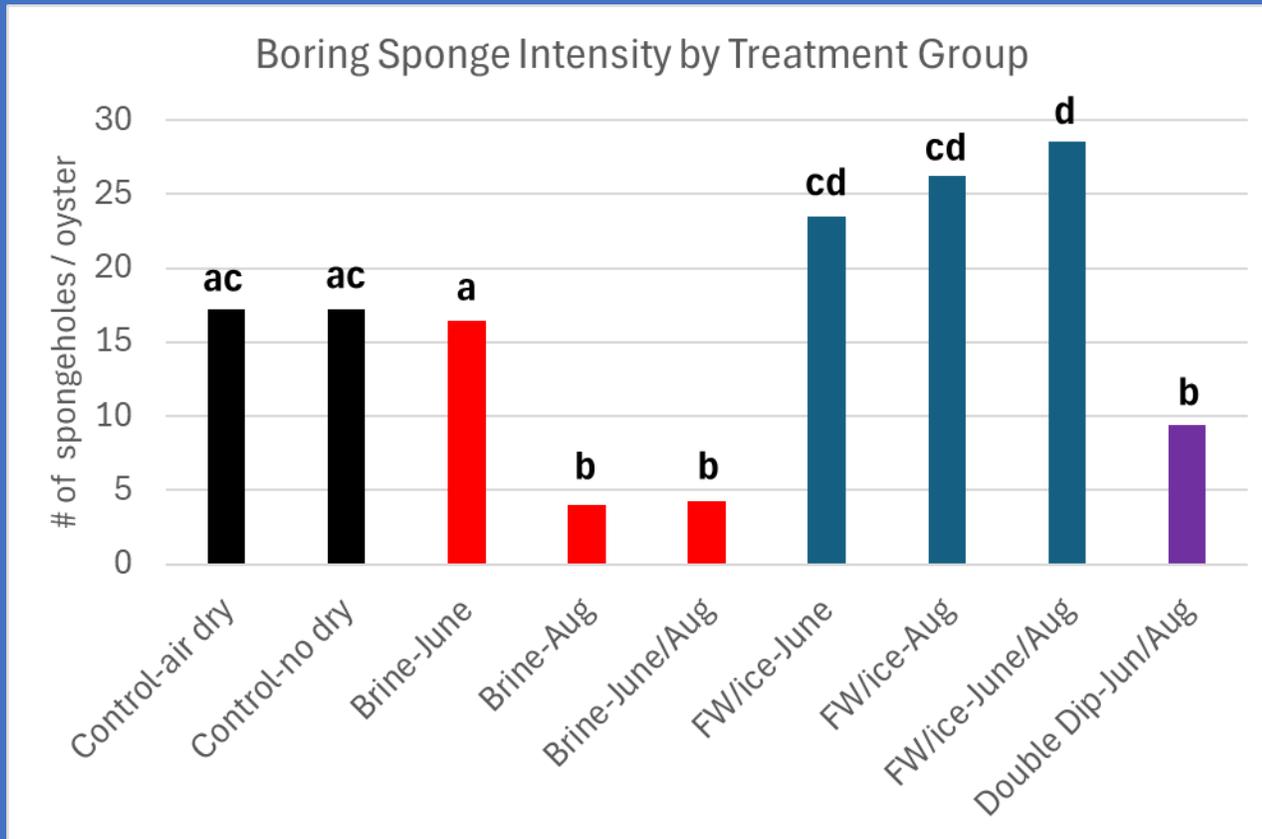
Dip Treatments and mud blister worms



- Brining twice cut worm intensity in half
- Brining just in August had smaller effect
- No effect without brine

Group	Control-air dry	Control-no dry	Brine-June	Brine-Aug	Brine-June/Aug	FW/ice-June	FW/ice-Aug	FW/ice-June/Aug	Double Dip-Jun/Aug
Mud Blister Prevalence	83.3%	78.9%	85.6%	76.7%	73.3%	82.2%	82.2%	85.6%	86.7%

Dip Treatments and Boring Sponge



- Brining in August reduced sponge intensity 4-fold
 - No added benefit of brining twice
- Prevalence also reduced
- FW had opposite effect?

Group	Control-air dry	Control-no dry	Brine-June	Brine-Aug	Brine-June/Aug	FW/ice-June	FW/ice-Aug	FW/ice-June/Aug	Double Dip-Jun/Aug
Boring sponge prevalence	57.8%	62.2%	55.6%	34.4%	41.1%	57.8%	62.2%	65.6%	42.2%
% of shells that broke	8.9%	10.0%	6.7%	3.3%	5.6%	11.1%	10.0%	7.8%	6.7%

Did treatments affect other biofouling?

Tidal level treatments for air exposure

- Fouling biomass overall was reduced by increased air exposure
- >3% air exposure reduced tunicates
- >5% air exposure reduced hydroides, jingle shells, slipper shells, and bryozoans

Dip treatments

- Brining had the largest impact on overall biofouling presence
 - Brining in August had biggest impact
- Aug brine also reduced slipper shells, jingle shells, sponges & tunicates



Hydroides-tube worms



Jingle shells



Slipper shells



Tunicates



Sponges

Conclusions/Summary

- Tidal exposure
 - >3% air exposure reduced boring sponge
 - Avg 23 minutes of exposure per low tide
 - >7% air exposure reduced mud blister worms
 - Avg 53 minutes of exposure per low tide
- Dip treatments
 - Brining in August had most impact, reduced boring sponge 4-fold
 - Brining both in June and Aug had most impact for mud blisters
- Other fouling observations?
 - Brining in Aug significantly reduced biofouling mass
 - Increased tidal exposure reduced fouling
 - Oyster spat and barnacles still a challenge



Acknowledgements

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