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Persistence of Dermo (*Perkinsus marinus*) in Sun-Cured Eastern Oysters (*Crassostrea virginica*)



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Introduction

- Eastern oysters (*Crassostrea virginica*) are affected by Dermo (*Perkinsus marinus*), a spore forming protozoan, which negatively affects the health and fitness of the oysters.
- Dermo can be transferred between living and dead oysters and tends to be highest in warmer and more saline water in Galveston Bay, TX (Silvy et al. 2020).
- Oyster reef restoration often uses recycled oyster shells. Because even dead tissue can transfer Dermo, sun-curing protocols are used to minimize the risk of adding Dermo to the environment during restoration projects.
- Objectives of this study were to:
 - Track Dermo presence, prevalence, and intensity in sun-cured oysters.
 - Evaluate influence of location of oysters within curing pile on Dermo presence, prevalence, and intensity.
 - Evaluate impact from wildlife on the curing process.

Methods

- Oysters were collected from Confederate Reef in West Bay, Galveston Bay, TX on October 6, 2022.
- Oysters (n = 80) were deployed at four experimental plots at the Galveston Bay Foundation's (GBF) Red Bluff Sun-Curing Site (Fig. 1).
- Plots A and C were fenced to prevent access from large wildlife. Plots B and D were left unfenced.

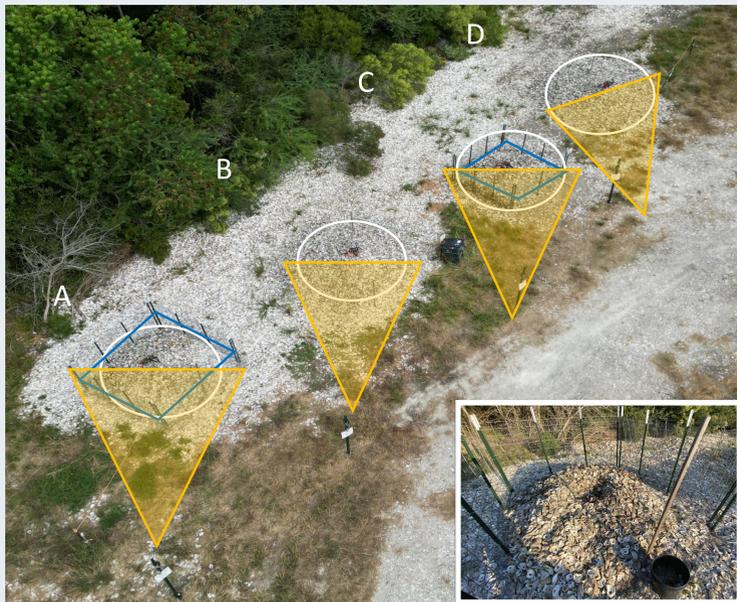


Figure 1: Study area located at the GBF Red Bluff Sun-Curing Site. Design of deployment piles for oysters. Photo shows fenced and unfenced piles.

- Ten oysters were deployed at the top and interior of each pile.
- Half were sampled for Dermo and half were tracked for tissue.
- Interior Dermo oyster samples and pile C top samples had co-located temperature and relative humidity sensors.
- Deployed oyster tissue are sampled weekly for 6 weeks and every two weeks for 27 weeks, and monthly after that.
- Categorical oyster tissue condition is recorded during each sampling (Fig. 2).
- Weight and percent coverage of tissue are also recorded during each sampling for tissue oysters.
- Dermo oysters are sampled using the Ray's Fluid Thioglycollate Method and assigned an intensity rating (Fig. 3).



Figure 2: Categorical tissue condition ranging from plump, like the oyster you want to see on your plate in a restaurant, to the point at which no discernable tissue remains.

Methods

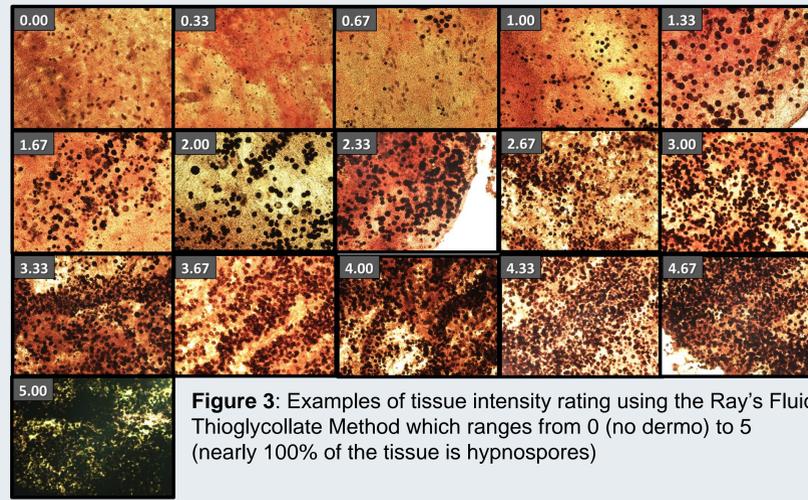


Figure 3: Examples of tissue intensity rating using the Ray's Fluid Thioglycollate Method which ranges from 0 (no dermo) to 5 (nearly 100% of the tissue is hypospores)

Results

Dermo Intensity

- Dermo intensity and prevalence drastically decreased after the first week of deployment and continued to reduce in intensity and prevalence (Fig. 4).
- No Dermo has been detected in the interior of the piles since week 6.
- As of week 27, a total of 6 of the 40 dermo oysters still had tissue remaining, and 4 of those had low levels (0.33) of Dermo present.

Oyster Tissue Condition

- Nearly all of the tissue oysters deployed at the top of the unfenced piles were consumed/removed by wild hogs (represented as "N/A" in Fig. 4) (Fig. 5).
- Oysters placed in the interior of the pile had less remaining tissue and faster decomposition.
- Tissue condition seemed to stabilize around week 5 when most of the tissue had reached the desiccated condition category.
- Temperature and Relative Humidity were more consistent in the interior of the piles compared to the top of the piles. (Fig. 6 & Fig. 7)

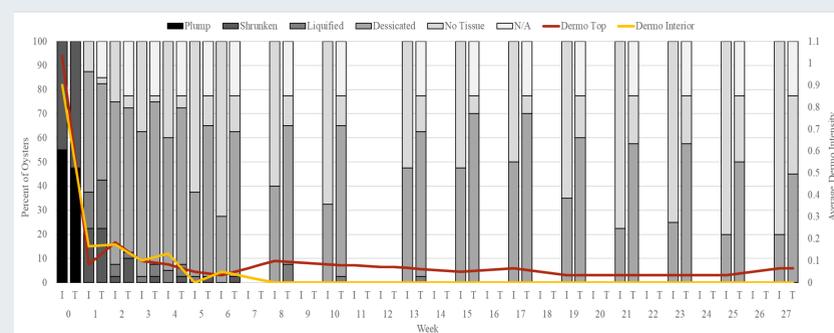


Figure 4: Percent of oysters by tissue condition category by sampling week, and average dermo intensity rating by sampling week, by oyster deployment location.



Figure 5: Unfenced (a) and fenced (b) piles being impacted by wildlife eating decomposing oysters.

Results

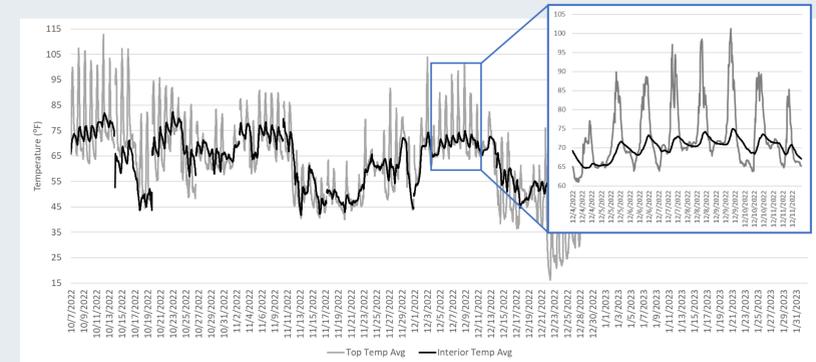


Figure 6: Subset of the averaged temperature readings from all of the interior loggers and plotted them with our ambient logger.

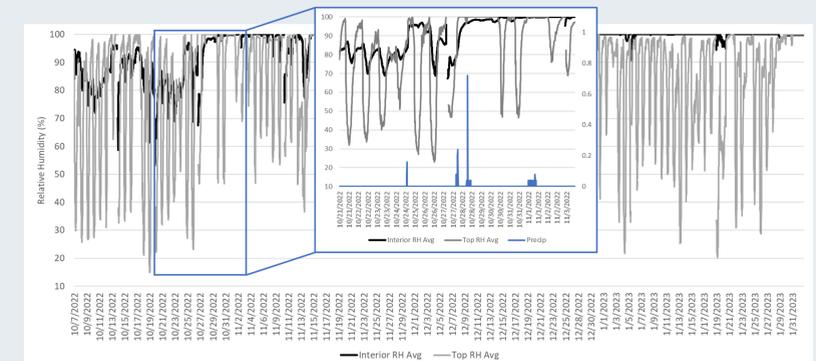


Figure 7: Subset of the averaged relative humidity readings from all of the interior loggers and plotted them with our ambient logger.

Discussion & Conclusions

- Significant decrease in dermo intensity by more than 80% after one week.
- Dermo persisted through 27+ weeks of curing, much longer than a previous study found (Bushek et al. 2004).
- Dermo may continue to be detected as long as tissue is present.
- Tissue condition and degradation stabilized after 5th week, at this time most of the remaining tissue became desiccated.
- Oysters in the interior of the pile had faster tissue and Dermo degradation.
- More insects were found in interior oysters potentially aiding in tissue breaking down, insects were observed less when the tissue became desiccated.
- Wildlife removed/consumed tissue, impacting only the top of the pile.

Future Work & Recommendations

- Continue monitoring Dermo and tissue through July 2023.
- Conduct follow-up study using various commercially sourced oysters, deployed "open", and evaluate seasonality in curing.
- Laboratory-based experiments evaluating viability of Dermo in cured tissue.

Literature Cited

Bushek, D., D. Richardson, M.Y. Bobo, and L.D. Coen. 2004. Quarantine of Oyster Shell Cultch Reduces the Abundance of *Perkinsus marinus*. *Journal of Shellfish Research*. Vol 23, No.2 369-373.
 Silvy, H., E. 2020. Determining Factors Affecting Dermo Disease (*Perkinsus marinus*) in Populations of Eastern Oysters (*Crassostrea virginica*) in Galveston Bay, Texas. *Journal of Environmental Science and Engineering*. A9, 227-245.

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