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I. Potential environmental causes of cultured diploid oyster mortalities in Gulf of Mexico (GoM): **What have we learned, so far?**

- ✓ Dermo disease
- ✓ Extreme salinity
- ✓ Hypoxia?
- ✓ High temperature?
- ✓ Combination of those

➤ ***Broodstock selection has significant impact on diploid seed tolerance to extreme salinity, hypoxia or high temperature, and resistance to dermo***

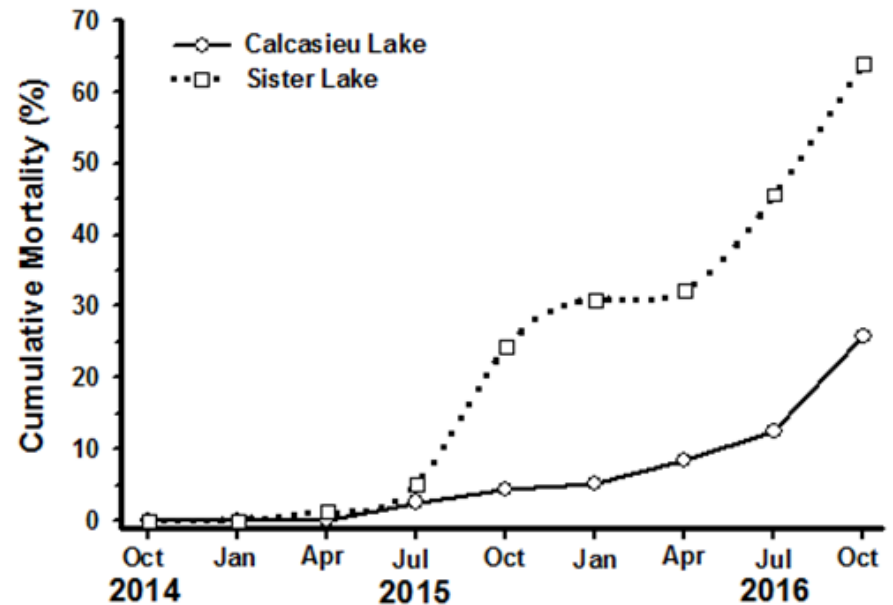
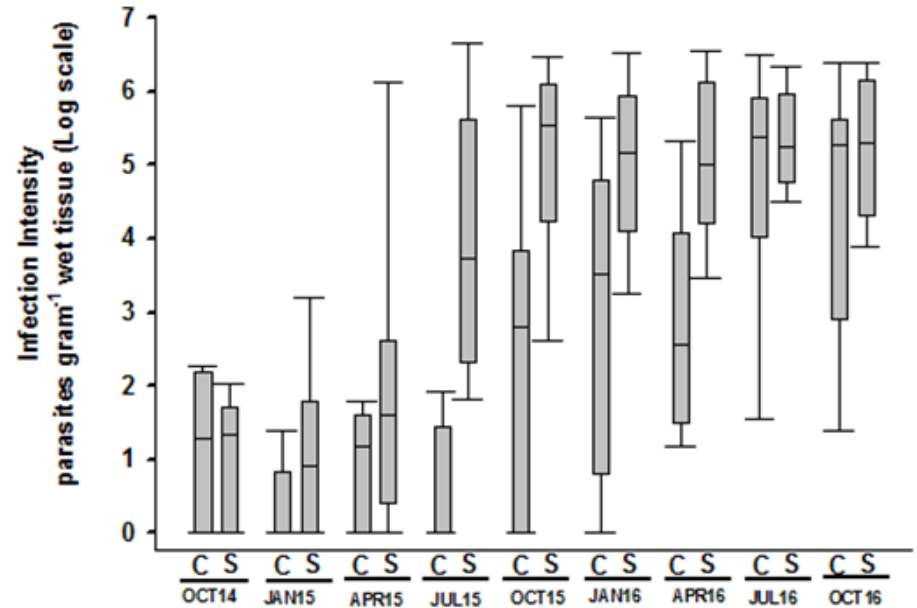
**FUNDING: Louisiana Sea Grant** - Xue, La Peyre, 2014-2016. *Marker-Assisted Selective Breeding to Produce Dermo-Resistant Eastern Oysters*

**& National Science Foundation** - Kelly, La Peyre, Beseres-Pollack. 2018-2020. *Testing for local adaptation and responses to multiple stressors among populations of eastern oysters inhabiting a natural salinity gradient*

# Causes of mortalities of GoM cultured oysters

## 1) Dermo disease

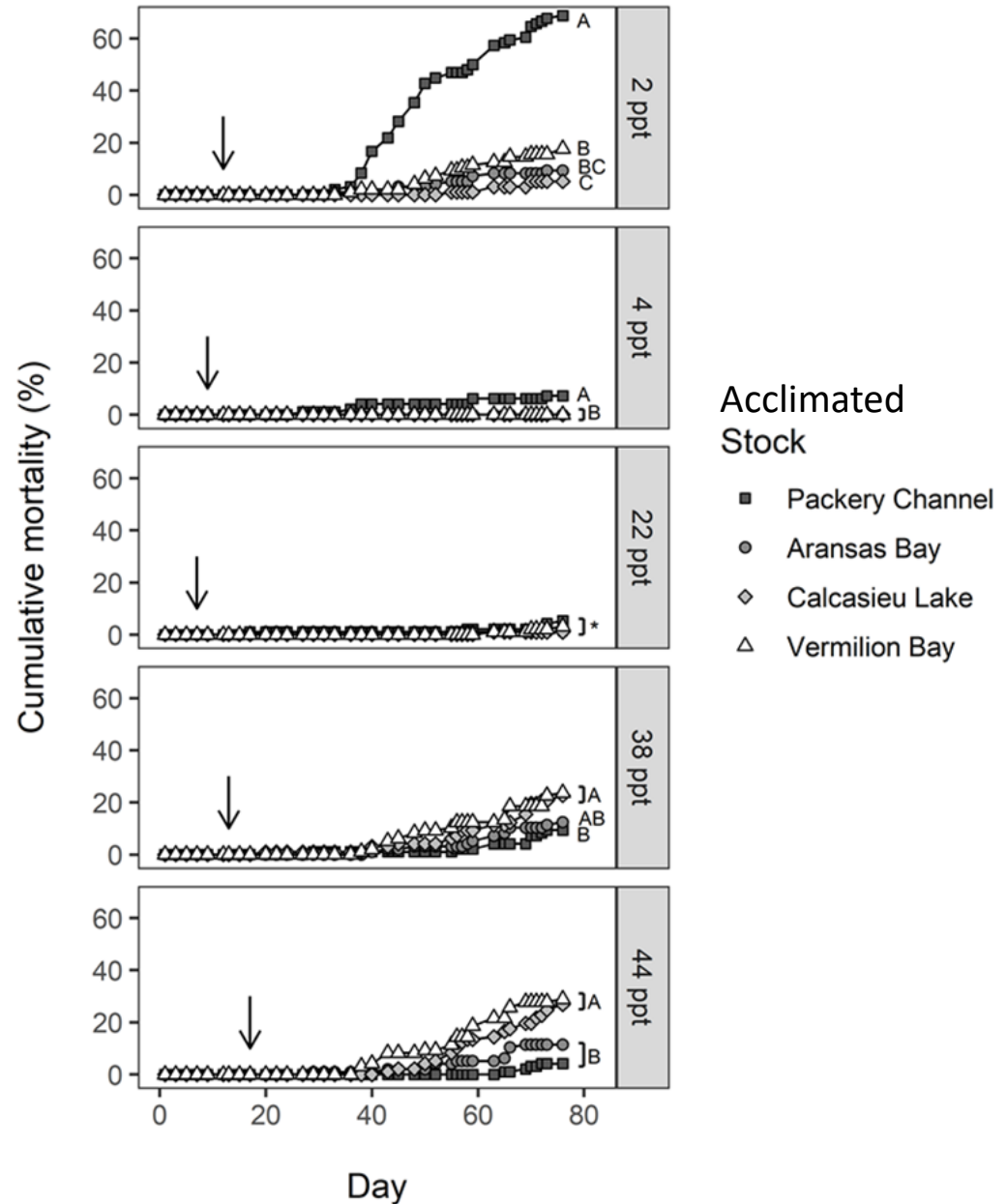
- ✓ Caused by parasite *Perkinsus marinus*
- ✓ Much knowledge
  - easy diagnostic test
- ✓ Summer & Fall mortalities
  - High temperature and salinity favor parasite proliferation
  - > 500,000 parasites / g oyster meat
- ✓ Older oysters > 1 year
- **Broodstock selection impact disease progression in progeny**



# Causes of mortalities of GoM cultured oysters

## 2) Extreme Salinities

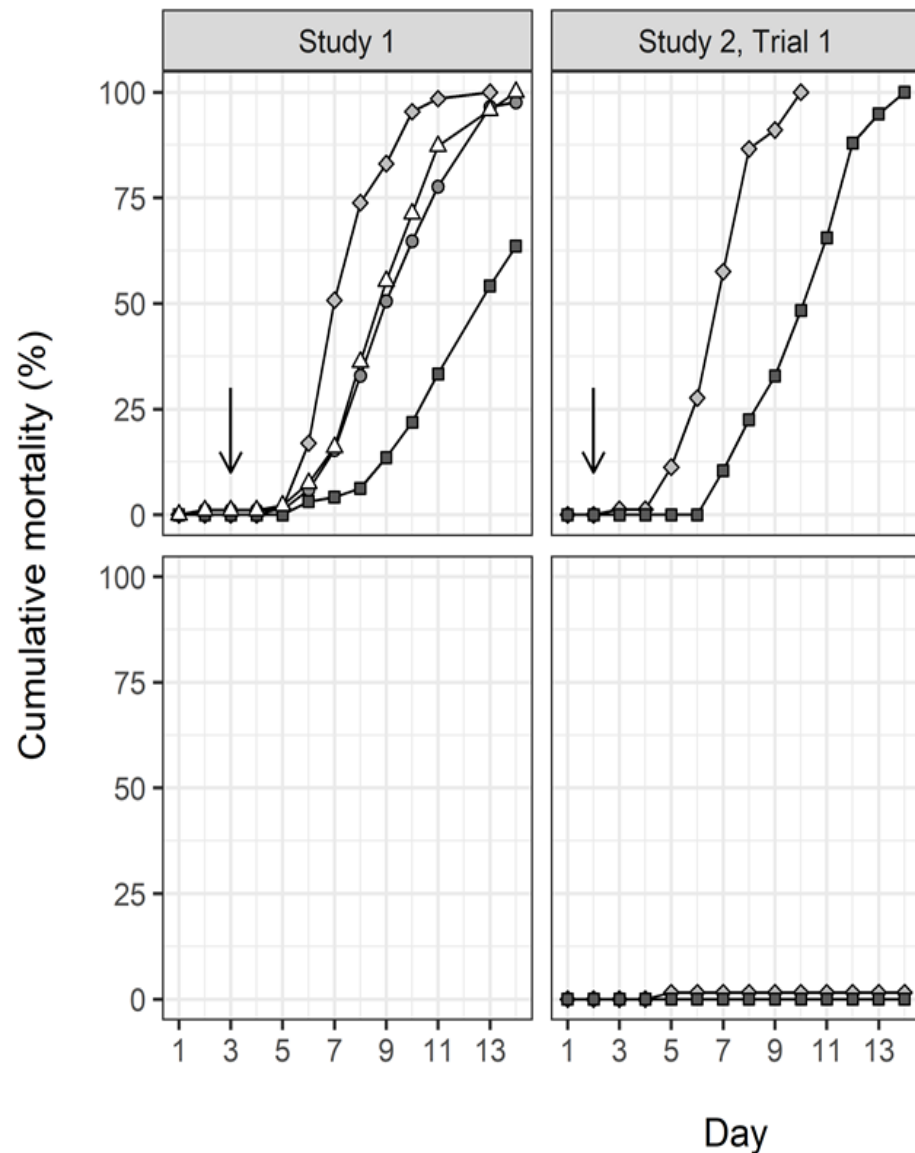
- ✓ <4; much knowledge  
>36; little studied / less frequent condition
- ✓ Laboratory salinity tolerance studies confirm field observations
- ✓ Mortality increases at salinities <4 and  $\geq 38$  (or lower?)
- ✓ **Tolerance differs between progeny depending on wild broodstock origin**
  - stocks derived from broodstocks collected in low salinity estuaries (LA) did worse at highest salinity
  - stocks derived from broodstocks collected in high salinity estuaries (TX) did worse at lowest salinity



## Causes of mortalities in GoM cultured oysters

### 3) Hypoxia?

- ✓ Dissolved O<sub>2</sub> concentration <2 mg/L
- ✓ Not well studied
- ✓ Not much information on the presence of hypoxic waters in GoM estuaries except for Mobile Bay
- ***Broodstock origin has significant impact on the tolerance of diploid progeny to hypoxic waters***



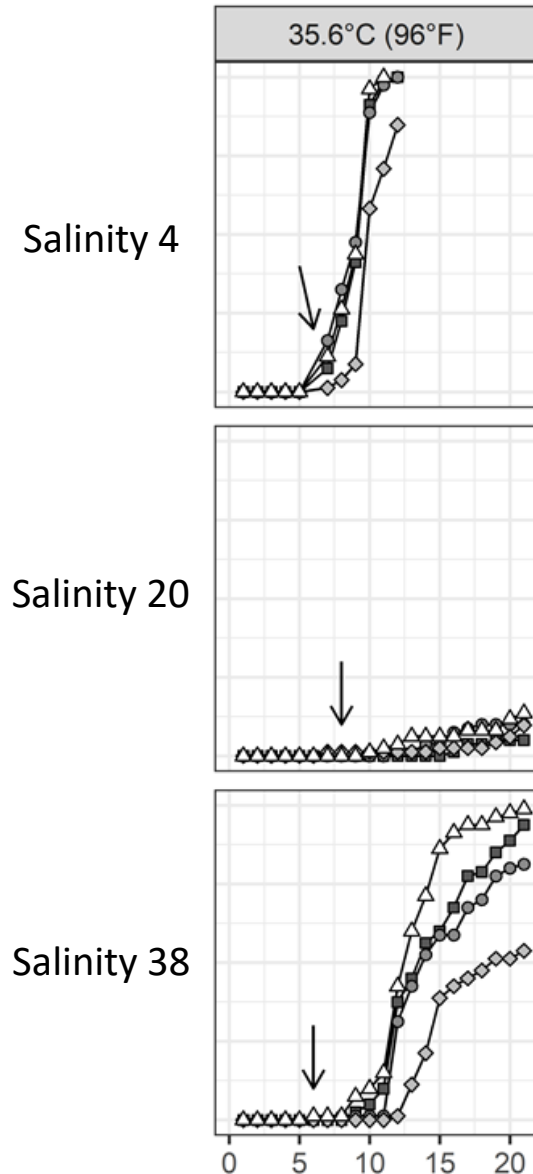
## Causes of mortalities of GoM cultured oysters

### 4) High Temperature? (>32°C)

- ✓ Less studied

### 5) Combinations?

- ✓ Extreme Salinity + high temperature →
- ✓ Hypoxia + high temperature
- ✓ Hypoxia + dermo
- **Climate change impact?**
  - ↑ Higher temperature
  - ↑ Number of days with >30°C (~86°F)
  - ↑ More intense freshet events
  - ↑ Variability



## II. Explaining Unexplained triploid mortalities

### 1) Why are triploid oysters dying?

- Investigating metabolic demand & dysfunction at the organism (Energy Budget) and sub-organism levels (cellular & molecular) during gonad development during spring and summer

### 2) Can diploid broodstock selection for triploid production decrease mortality?

### 3) Are triploid oysters less tolerant than diploid oysters to unfavorable and changing environmental conditions (e.g., salinity extremes, high temperatures, hypoxia, dermo)

- **NOAA Aquaculture Program** - La Peyre, Walton, Callam, Tiersch - **2019-2021** - “Decreasing mortalities of triploid eastern oysters in commercial grow-out in Gulf of Mexico estuaries”

- **Louisiana Sea Grant** - Kelly, La Peyre, Callam - **2020-2021** - “Identifying the molecular causes of elevated mortality in triploid oysters”

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Grand Isle (LSU cohort) - 2020

