Heatwave duration correlates with the poor recruitment of oysters in northern Gulf of Mexico coastal waters

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Oysters in the northern Gulf of Mexico

1000 metric tons in 1950's

2014 – 2018 Landings
15,263 ± 5,734 kilograms

NOAA Commercial Fisheries Landings for Alabama, 2022
Oysters in the northern Gulf of Mexico
Heatwaves are becoming more common

**Definition**

Three continuous days

Daily max temperature $\geq 90^{\text{th}}$ percentile

Time period July and August
How do extreme environmental conditions (heatwaves) alter the recruitment success of oysters in Mobile Bay?

**Spawning**

- Spawning temperature driven
- Drops > 2 °C decreases in temperature within 24 hours

**Recruitment**

- Oyster recruit as spat
- Post-spawn larval duration: 10-18 days
- 10-12 days in the summer months (Kim et al. 2010)
Poor Recruitment

Good recruitment = very difficult to predict

Many co-occurring favorable conditions

Poor recruitment = easier to predict

Only one unfavorable condition required

Gross et al. 2022
Changing Environments

### Cutoff
- **Mobile Bay**: 33.6 ºC
- **Apalachicola Bay**: 33.2 ºC

### Magnitude
- **Mobile Bay**: 37.2 ºC
- **Apalachicola Bay**: 36.7 ºC

### Yearly Temperature
- **Mobile Bay**: 36.7 ºC
- **Apalachicola Bay**: 36.7 ºC

### Duration
- **Mobile Bay**: 44.5 Days
- **Apalachicola Bay**: 42.5 Days

### Number of Days Above 11 Days
- **Mobile Bay**: 11 Days
- **Apalachicola Bay**: 11 Days

### Frequency
- **Mobile Bay**: 6 Heatwaves
- **Apalachicola Bay**: 5 Heatwaves

Plumlee et al. *in Prep*
Changing Environments

Mobile Bay
- 42.5% Poor Recruitment
- 80.0% Poor Recruitment

Apalachicola Bay
- 43.3% Poor Recruitment
- 88.9% Poor Recruitment

Plumlee et al. in Prep
**Heatwave Intensity**

- **Predation**
- **Hypoxia**
- **Low Salinity**
- **Metabolic Stress**
- **Physiological Stress**

**Mortality**
- High
- Low

**Normal**

**Extreme**