

## CLIMATE ADAPTATION IN *Ostrea lurida* VIA TRANSGENERATIONAL EPIGENETIC INHERITANCE

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A broadening body of work indicates that low pH and high temperature negatively affect fertilization and early life stages of many marine invertebrates. Oysters may, however, contain a unique capacity to keep pace with rapidly shifting climate stressors via epigenetic plasticity. To examine whether populations of *Ostrea lurida*, the only oyster native to the United States' west coast, will persist in a rapidly changing environment the impacts of climate stressors on fecundity, larval production, larval survival, and overall fitness were measured. First-generation hatchery reared broodstock from three sub-populations in the Puget Sound estuary in Washington State were over-winter in elevated temperature and dissolved CO<sub>2</sub>, then induced to spawn. We will present results on eight weeks of larval production data, as well as survival to metamorphosis and juvenile stages for a subset of the progeny, which were collected over seven weeks. Results will include gonad histology, sampled after each treatment exposure, and gene expression and methylation patterns in both generations. Initial findings suggest a universally negative effect of elevated temperature on larval survival to the juvenile stage, and differential spawning patterns by sub-population.

The oyster genome is highly polymorphic, with a diverse set of genes that respond to environmental stress. While natural selection operates on times scales not relevant to projected changes in climate, the newly emerging field of epigenetics suggests a potential for expedited adaptation. Epigenetic transgenerational plasticity is the concept that the environment can alter gene expression without modifying DNA sequence, and these modifications are hereditary. Adult oysters in poor environmental conditions may acclimate via epigenetic modifications, which are then inherited by their progeny. While, urchins, mussels and oysters exposed to low pH have been shown to produce more pH-tolerant larvae, to date there has been no direct confirmation that observed transgenerational plasticity is due to epigenetic changes. Also unknown is how if the degree of epigenetic change differs between families. This project seeks to answer these questions, and will be the first to explore mechanisms underlying potential differential gene expression and transgenerational inheritance in oysters reared in dual climate stressors. Results from this project could directly inform restoration and commercial hatchery breeders to select for climate change-tolerant oysters, or to induce a multi-generational "immune-like" response by exposing broodstock to future climate conditions. Additionally, resource managers and commercial growers could apply lessons from *O. lurida* to other economically vital species, such as *Crassostrea gigas* and *Crassostrea virginica* (oysters), *Mytilus edulis* (mussel), and *Venerupis philippinarum* (manila clam).