OYSTER GROUP

ALABAMA CENTER FOR ECOLOGICAL RESILIENCE

SUBGROUP SPOTLIGHT

The Oyster group is examining how genetic, taxonomic and functional diversity affect an oyster reef's resilience to the Deepwater Horizon (DwH) oil spill. As oysters are ***sessile*** as juveniles and adults and ***pelagic*** as larvae, oil or dispersant exposure could result from direct contact or by ingestion. The Oyster group has hypothesized that increased genetic diversity among oysters will result in higher survival and growth of oysters exposed to oil. They also hypothesized that an oyster reef with a greater diversity of additional suspension feeders will be more resilient to oil and dispersant exposure. Lastly, they predict that the relationship between resilience and diversity can be modified by other stressors such as low salinity or dispersant exposure.

An eastern oyster (*Crassostrea virginica*) collected for genetic diversity analysis. (*Photo/ACER*)

Field Investigations: Oyster reefs were sampled in Terrebonne Bay and Barataria Bay, Louisiana; in Mississippi Sound; and from Pensacola Bay to Apalachicola Bay, Florida (Figure 1). In each bay, oysters were sampled subtidally and in multiple locations along the marsh edge (nearshore). Within the subtidal and nearshore locations, oysters were collected at three sites that received high oil exposure and three sites with no documented oil exposure. Both ***mesohaline*** and high ***salinity*** locations were sampled. The oyster reef community was assessed by collecting, counting, identifying and measuring (size) all animals in a 1/4 m^2 quadrat. Genetic analyses were also conducted on a subset of oysters from each sampled reef through a single nucleotide polymorphism (SNP) analysis, which looks for DNA sequence variation at the nucleotide level. In 2017, all sites will be revisited and the community will be assessed again to see if, and how, the communities are changing over time after the oil spill.

Laboratory manipulations: 2016 microcosm experiments were focused on how genetically different juvenile oysters responded to varying levels of salinity, oil and dispersant. Researchers tested 5 oyster monocultures (low genetic diversity) and 6 oyster polycultures (higher diversity), which were divided into 3 polycultures with 2 parental pairs' offspring (i.e. 2-poly) and 3 polycultures with 3 parental pairs' offspring (i.e. 3-poly). Responses were measured as ***survivorship*** and ***growth rates***. Six different combinations of salinity, oil and dispersant were tested: mesohaline seawater, low salinity seawater, mesohaline + weathered oil, low salinity + weathered oil, mesohaline + weathered oil + dispersant, and low salinity + weathered oil + dispersant. Another microscosm experiment will be conducted in 2017 to see how oil, dispersant and low salinity affect the taxonomic diversity of oyster reefs.

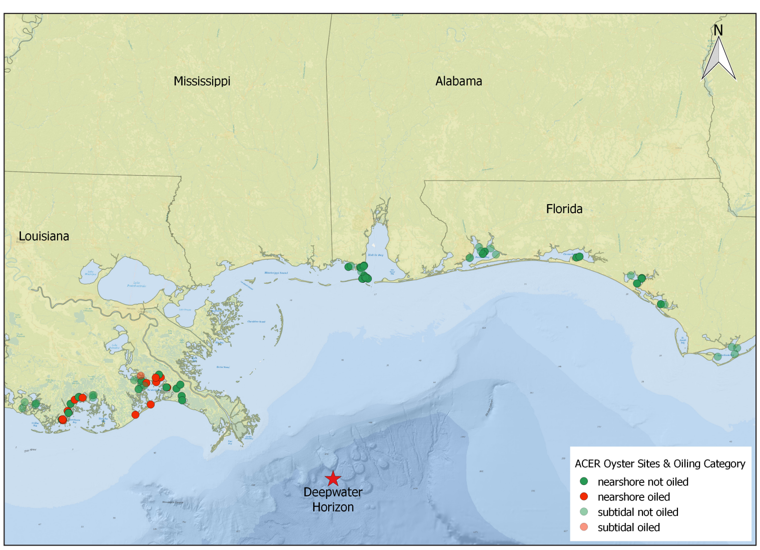

Figure 1. Oyster reef sampling locations and oiling designations.

Post-doctoral Research Associate Meagan Schrandt and captain Joe Dear preparing to sample nearshore oysters. (*Photo/ ACER*)

Results to date

To date, the oyster group has sampled 78 sites (44 nearshore, 34 subtidal) from fall 2015 through spring 2016. Over 650 kg of oyster reef samples has been sorted, counted and identified. Other organisms collected on reefs include 5 mussel species, 7 clam species, oyster drills and 5 other snail species, a variety of crabs including stone, mud, blue and hermit crabs, shrimp, fish and other invertebrates.

The first of 2 microcosm experiments was completed in fall 2016 and required 330 individual tanks (pictured below) and approximately 16,500 juvenile oysters. Results showed that all three factors (oil treatment, salinity and diversity) significantly affected oyster survivorship (Figure 2). Survival was lowest for the weathered oil + dispersant treatments, followed by weathered oil treatments; but survival was nearly 100% in control treatments. In weathered oil and weathered oil + dispersant treatments, increased salinity resulted in lower survival. Survival was highest in the 2 polyculture and least for the monoculture.

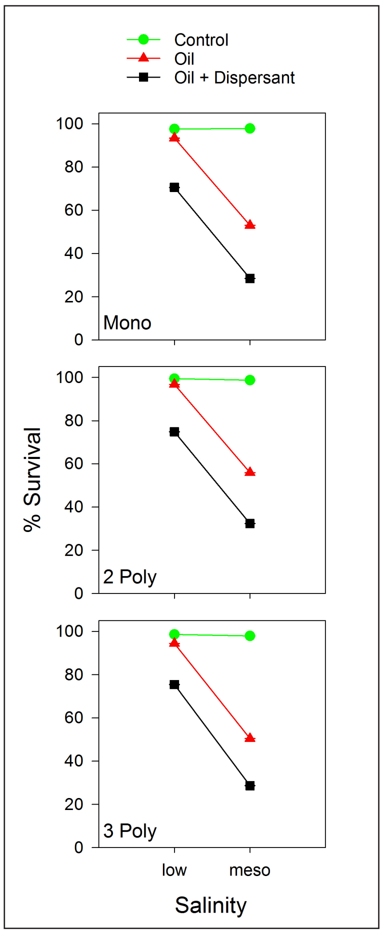

Figure 2. Percent survival for monoculture and polyculture (2-poly and 3-poly) oysters from weathered oil and weathered oil + dispersant treatments and across salinity gradients.

Powers lab interns Oliver Ho (front) and Kyle Hafstad (back) shuck oysters for condition index. (*Photo/ ACER*)

Microcosm experiment treatments with juvenile oysters. (*Photo/ ACER*)

Subtidal oysters collected by oyster dredge in Louisiana. (*Photo/ ACER*)

KEY WORDS

growth rates - the change in shell height over a period of time; growth rates can be affected by temperature, food, salinity, disease and other factors

mesohaline - a salinity range from approximately 5 to 18 ppt; saltier than freshwater, but not as salty as the ocean

oyster spat - oyster larvae that have attached to a hard surface

pelagic - an organism that lives in the water column

salinity - a measure of the dissolved salt content in water often measured in parts per thousand (ppt); the average salinity of the ocean is 35 ppt

sessile - an organism that is permanently attached to a substrate and not free to move about

survivorship - the number or percentage of individuals that live to a certain age or size or across a time period

ABOUT US

The Alabama Center for Ecological Resilience (ACER) Consortium investigates how biodiversity influences an ecosystem's ability to resist and recover from disturbance, focusing on impacts of the 2010 Deepwater Horizon oil spill on coastal ecosystems in the northern Gulf of Mexico.

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