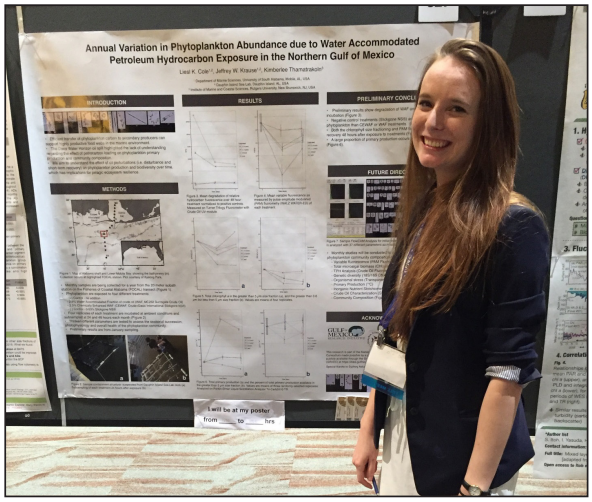
MICROPLANKTON

ALABAMA CENTER FOR ECOLOGICAL RESILIENCE

SUBGROUP SPOTLIGHT

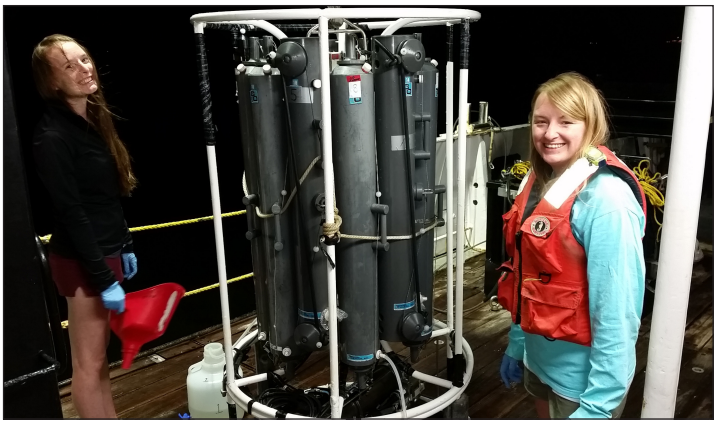
Does oil in the water affect the planktonic community? Does it change what plankton are present or affect their daily activity? Does it affect what they eat or who eats them? ACER's Microplankton group is investigating these questions. ***Plankton*** are a diverse group of pelagic, drifting organisms that include phytoplankton (plant plankton), zooplankton (animal plankton) and bacterio- and virio-plankton (single-celled bacteria and viruses respectively). These organisms are important in the marine food web as primary producers (phytoplankton) and primary consumers (zooplankton). Initial studies have shown that the amount of phytoplankton (biomass) decreases when communities are exposed to crude oil. ACER's Microplankton group has hypothesized that an increase in biodiversity within the plankton community would allow for increased resiliency against the effect of oil on the seasonal percentage of energy transferred between trophic levels.



Liesl Cole, graduate student in ACER's plankton group, presenting her poster on the annual variation in phytoplankton abundance in the northern Gulf of Mexico.. (*Photo/ ACER*)

Field Investigations: The microplankton group partnered with the CONsortium for oil spill exposure pathways in COastal River-Dominated Ecosystems (CONCORDE) to conduct field sampling aboard the R/V Pt. Sur. This partnership allowed the mapping of the variability of primary productivity rates across the northern Gulf of Mexico continental shelf during fall 2015 and spring and summer 2016. This collaboration permitted the focused field work at a single site on the AL shelf to be placed in context of the larger Gulf ecosystem. Field collections were also conducted in 2016 at the 20m Fisheries Oceanography in Coastal Alabama (FOCAL) station to determine temporal variability in microplankton biomass and productivity. Water samples for laboratory manipulations experiments were also collected from this station.

Laboratory manipulations: Water and its associated microplankton community collected from the FOCAL station were used to investigate the effects of oil contamination on primary production, plankton diversity, ***transparent exopolymer particles*** and nutrients. Five experiments ranging in duration from 2 to 5 days were conducted to measure the effects of 1) ***water-accommodated fraction (WAF)*** of crude oil, 2) WAF + dispersant, 3) dispersant only and 4) a control. During the five day experiments, additional measurements conducted included zooplankton grazing rates and ***photophysiology*** measurements on changes in fluorescence.



Liesl Cole (left) & Sydney Acton (right) retrieving water samples from Niskin bottles aboard the R/V Pt. Sur during the spring 2016 CONCORDE cruise. (*Photo/ACER*)

Sydney Acton (left) and William Dobbins (right) checking on the experimental manipulations in the Sea Lab's mesocosms. (*Photo/ ACER*)

Results to date

CONCORDE sampling: Preliminary results demonstrated that the variation in primary productivity rates at the single Alabama shelf site among all the experiments was similar to the variability observed across the northern Gulf continental shelf during a single season. These data demonstrate that rates of primary production in our coastal waters are highly dynamic (Figure 1). This information provides one of the first datasets for the entire MS-AL shelf and will improve our understanding of how changes such as ocean acidification, subsidence and sea-level rise will alter primary production and food webs in our region.

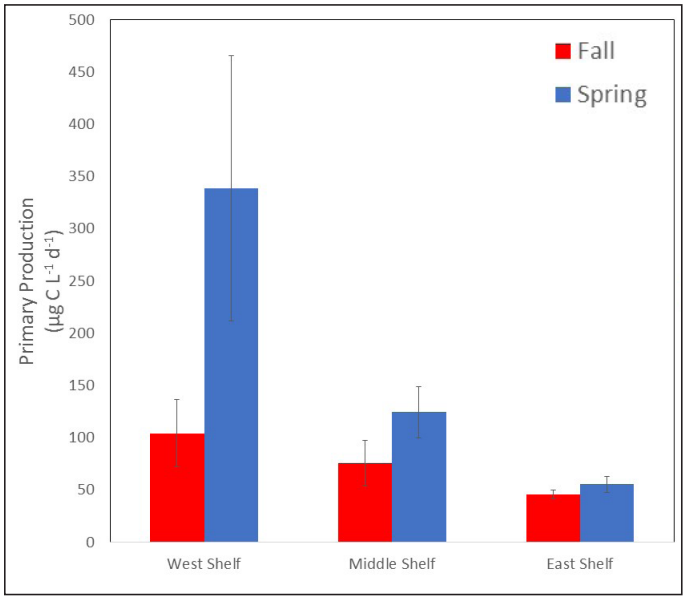


Figure 1. A comparison of the spatial and temporal variability of total primary production samples collected across the northern Gulf continental shelf in fall 2015 and spring 2016.

Mesocosm experiments: For all five experiments, the addition of the WAF, CEWAF and dispersant lowered primary productivity. However, in many of the experiments the rate of primary production in the WAF, and sometimes CEWAF, treatments rebounded (Figure 2). This rapid recovery indicates the field microplankton community is fairly resilient to the addition of crude oil contamination (i.e. WAF and CEWAF) in our experiments.

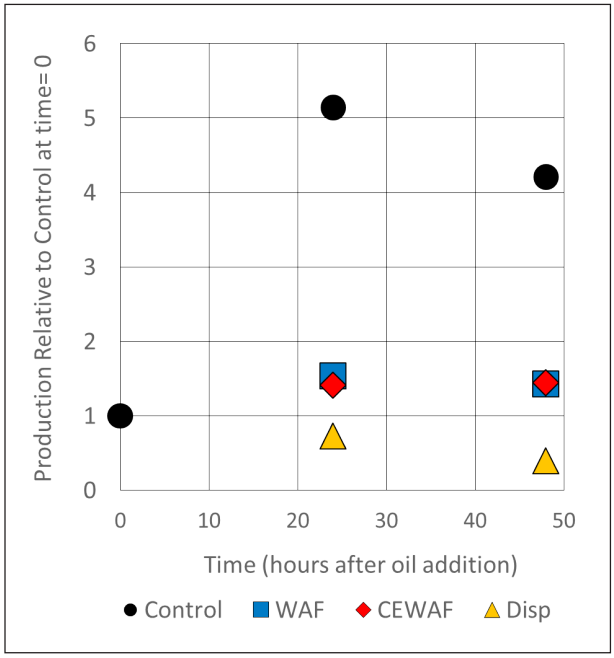


Figure 2. Normalized primary production from the mesocosm experiments for the control, WAF, CEWAF and dispersant additions over time after the addition of weathered crude oil.

KEY WORDS

photophysiology - all the functions of an organism relating to light (e.g. photosynthesis); previous studies have shown a deleterious effect from oil

plankton - pelagic organisms (animal, plant, single-celled or viruses) that drift with the current; microplankton are plankton between 0.02-0.2 mm in size

transparent exopolymer particles - large, clear molecules which are made by interaction of smaller "sticky" units which are expelled by plankton in marine and freshwater environments

water-accommodated fraction (WAF) - a preparation method where oil is added to a volume of water and mixed, followed by a period of rest and a final removal of the mixed water and dissolved oil; the chemically-enhanced WAF or CEWAF method has dispersant added along with crude oil, which results in the oil being dispersed in the WAF making process

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.

This publication was made possible by grant number GoMRI231504-00 from the Gulf of Mexico Research Initiative.

Project Contact Information
http://acer.disl.org/
acer@disl.org
Dauphin Island Sea Lab
101 Bienville Blvd,
Dauphin Island, AL 36528