Scientists to study impact of gulf oil spill on marine food webs

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New reports are surfacing every day about the immediate impacts of the Deepwater Horizon oil spill on Gulf Coast wildlife, especially as the oil reaches the sensitive marshlands along the coast. But how will these communities be affected over time? Scientists currently know very little about how long it takes for the hydrocarbons and heavy metals in crude oil to work their way through marine food webs.

To address this issue, Academy scientist Peter Roopnarine is working with Laurie Anderson from Louisiana State University and David Goodwin from Denison University to collect and analyze three different types of mollusks from the Gulf Coast. These animals are continually building their shells, and if contaminants are present in their environment, they can incorporate those compounds into their shells. Roopnarine and his colleagues will study growth rings in the shells - much like scientists would study tree rings - to determine how quickly harmful compounds from the oil become incorporated into the animals' homemade armor. They will also sample tissues from the animals over the next four months to test for hydrocarbons, and will measure changes in growth rate and survivorship. In addition to its value in informing conservation and policy decisions, this research will have direct implications for the region's commercial oyster fisheries.

"We know that mollusks can capture this kind of information in their shells because of our ongoing work in San Francisco Bay," says Roopnarine, Curator of Geology at the California Academy of Sciences. "We have been analyzing shellfish from across the Bay over the past three years, and we have documented that the animals from the more polluted areas, like the waters around Candlestick Park, have incorporated vanadium and nickel into their shells - two metals that are common in crude oil. It appears that the metals can be substituted for calcium as the animals build their calcium-carbonate shells."

By studying oysters, tellinid clams, and periwinkles in the Gulf, the scientists will be able to monitor three different pathways for hydrocarbons into the food web, since oysters are stationary filter feeders that eat mostly plankton, tellinid clams are stationary bottom feeders that eat mostly detritus, and periwinkles are mobile grazers that eat mostly algae. If the team's results show that all of these animals are incorporating hydrocarbons into their shells at the same rate, this would indicate that they are likely pulling these compounds directly from the water column. However, if there is a difference in how quickly hydrocarbons show up in their shells, it would suggest that the animals are acquiring the contaminants at different rates through their food sources.

The scientists collected their first set of specimens in early May from the vicinities of Grand Isle, Louisiana and Dauphin Island, Alabama, before the oil had reached those regions. These specimens will provide pre-spill baseline data for the study. Over the course of the summer, they will collect additional specimens from both sites to monitor the change in hydrocarbon levels as the oil spreads and begins to work its way through the food chain.

As primary consumers in the food chain, oysters, clams, and periwinkles will likely be among the first animals to begin accumulating hydrocarbons and heavy metals, but they will not be the last. In much the same way that mercury becomes concentrated in large, predatory fish, the harmful compounds released during an oil spill may get passed on to the marine organisms that feed on shellfish. While hydrocarbons are organic compounds that will eventually break down over time, the staying power and long-term impacts of heavy metals like vanadium and nickel in the food web are unknown. Additionally, many hydrocarbons are known to be carcinogenic, and they could cause any number of physiological problems for animals that ingest them in high quantities. While much remains unknown, Roopnarine's research provides a framework to answer some of these questions, by monitoring and predicting community response over both short and long time horizons.

Provided by California Academy of Sciences

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