Why were saltmarsh species assemblages so resilient to the Deepwater Horizon oil spill?

Kiva L. Oken, Olaf P. Jensen, Kenneth W. Able, Kim De Mutsert, F. Joel Fodrie, Paola C. López-Duarte, Charles W. Martin, Michael J. McCann, Philipp Neubauer, Jill A. Olin, Michael J. Polito, Brian J. Roberts

The 2010 Deepwater Horizon oil spill released approximately 210 million gallons of oil into the Gulf of Mexico, impacting all ecosystems in the region. There was a clear signal of oil exposure in individuals across many taxa, lab experiments have shown oil to be a stressor that leads to physiological responses in vital rates, and there were changes observed in lower trophic level communities. Together this indicates a strong potential for population declines of commercially and recreationally valuable fishes and aquatic invertebrates. However, there has been little evidence of population declines for those species, and in some cases, brief increases were even observed. Several hypotheses have been proposed to explain this apparent paradox. Two possibilities include a fishing moratorium that occurred the summer after the spill and changes in predation pressure due to predator die offs. We used food web models to quantify how much species would be expected to increase given only a fishing moratorium or predator die off, assuming no oil induced mortality. Increases of a magnitude much greater than anything observed indicate evidence for population-level impacts of oil mortality. Food web resilience to oil spills is not unique to the Deepwater Horizon, and this work tests possible mechanisms for such resilience so that we can better anticipate how ecological communities may respond to future spills or other pulsed environmental disturbances globally. We emphasize that oil spills are one influence within a large socio-ecological system, and understanding oil spill impacts requires consideration of this complexity.

Keywords: Food webs, oils spills, resilience

Contact author: Kiva Oken, Rutgers University Department of Marine and Coastal Sciences, [okenk@marine.rutgers.edu](mailto:okenk@marine.rutgers.edu), 71 Dudley Rd., New Brunswick, NJ 08901, USA