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

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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, and lab experiments have shown oil to be a stressor that leads to physiological responses in vital rates; together this indicates a strong potential for population declines. However, there has been little evidence of population declines in nearshore species, and in some cases, increases have even been observed. Several hypotheses have been proposed to explain this apparent paradox. These include a fishing moratorium that occurred the summer after the spill, changes in predation pressure or food availability, and other density-dependent factors. To study these possible mechanisms for population resilience, we built a small food web model around blue crabs (*Callinectes sapidus*), a key marsh species due to both its commercial value and high level of connectedness to the marsh community– blue crab is either a consumer or prey resource of most marsh species. We used this model to test how strong each hypothesized mechanism must be in isolation in order to lead to the observed population responses to the oil spill. We conducted these analyses under high and low sensitivities of vital rates to oil. Results of this work tests possible mechanisms for food web resilience to oil spills, but is applicable to other anthropogenic stressors, as well, such as hypoxia, acidification, habitat degradation, and even fishing.

Keywords: Salt marsh, blue crabs, food web, resilience, density-dependence, oil spill

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