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Health defects found in Gulf killifish exposed to Deepwater Horizon oil spill

Sediments collected from coastal Louisiana over a year after the Deepwater Horizon oil spill in the Gulf of Mexico have been found to cause health defects in the Gulf killifish. Nearly all adult fish studied had signs of significantly altered gene function and embryos exposed to polluted sediment were less likely to hatch.

The 2010 Deepwater Horizon oil spill disaster saw as much as 700 million litres of crude oil contamination along the Gulf of Mexico's sensitive estuaries and coastal marshes. Despite clean-up efforts, the oil was widely distributed along shorelines of Louisiana and to a lesser extent, Mississippi, Alabama and Florida.

Crude oil contains chemicals that are toxic to fish, such as polycyclic aromatic hydrocarbons (PAHs), which can affect populations that live or breed in oiled habitats. Sub-lethal effects of PAH exposure can cause severe health effects in adult fish and developmental abnormalities in larval fish that affect their fitness and ultimate survival into adulthood. To date, a considerable amount of oil from the spill is likely to remain deposited in sediment, serving as a persistent source of exposure for local species. This study suggests that sediments continue to pose a significant health risk to fish embryos; effects that can potentially lead to long-term health effects to these animals.

Gulf killifish are abundant in the coastal marsh habitats along the Gulf Coast and are a key part of the ecosystem. They are non-migratory, and so measurements of their health provide a good picture of their local environment, making them an ideal subject for study.

Researchers collected killifish from an oiled site at Grande-Terre Island and from two non-oiled sites in Mississippi and Alabama. The fishes' gill and liver tissue was examined for exposure to crude oil. They also exposed killifish embryos in the laboratory to sediment collected from oiled sites at Grande-Terre Island and Barataria Bay in 2010, and to sediment collected approximately one year after the oil spill in 2011, when much of the visible oil had dispersed.

The results indicated multiple negative effects. Many embryos exposed to sediments from oiled locations in 2010 failed to hatch, and those that did, were significantly smaller, showed developmental abnormalities and had heart defects. In addition, fewer eggs hatched among those embryos exposed to sediments collected in 2011. A total of 94% of adult killifish captured from contaminated sites in the wild had abnormal gene expression in their gills and livers, providing evidence of exposure to PAHs. These findings cover two breeding seasons and indicate that the long-term fitness and developmental success of killifish in this region may be compromised.

The researchers suggest that other species that live or spawn in similar habitats, such as redfish, speckled trout, shrimp and oysters, may also be at risk from similar reproductive and developmental health problems. Oil from the Deepwater Horizon spill was found in patches without coating the entire coastline, so it also possible that some killifish may have been less affected. Nevertheless, this study highlights the population effects that accidents like the Deepwater Horizon oil spill can cause, which may potentially damage the entire ecosystem.

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Contact:
bduban1@lsu.edu;
galvezf@lsu.edu

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