

# Detecting Ecological Disturbances from Economic Data: The Case of Hypoxia in the Gulf of Mexico

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## Abstract:

Ecological shocks can threaten renewable resource extraction and flows of non-extractive ecosystem services. We show that resource prices can provide a signal of a major ecological disturbance that is otherwise difficult to detect in quantity data. Because ecological shocks can affect different sizes of organisms differently, they could induce relative price changes in resource products that are priced by size. Here, we analyze the Gulf of Mexico shrimp fishery and a potential market regime shift triggered by the Gulf Dead Zone, a large seasonal area of hypoxia (low dissolved oxygen) that coincides with the height of the shrimp season. Because hypoxia may alter the size structure of stocks and corresponding catches, periods with worse hypoxia will see relatively large catches of small shrimp and smaller catches of large shrimp. In contrast, recruitment shocks would tend to increase or decrease all size classes. Thus, we expect hypoxia to alter relative prices, but relative prices to remain unchanged in the presence of recruitment variability attributable to other sources. Using monthly brown shrimp prices from January 1990 to March 2010, we find strong evidence that hypoxia induces relative price changes. The findings are robust to changes in fuel prices that may have altered the level and spatial distribution of fishing effort. Our analysis suggests that the industry is likely compensated partially through higher prices in bad hypoxic years. However, as imports rise, this price compensation may be dissipated.