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Abundance and Size of Gulf Shrimp in Louisiana's Coastal Estuaries following the Deepwater Horizon Oil Spill

Joris L. van der Ham*, Kim de Mutsert

Department of Environmental Science and Policy, George Mason University, Fairfax, Virginia, United States of America

Abstract

The Deepwater Horizon oil spill impacted Louisiana's coastal estuaries physically, chemically and biologically. To better understand the ecological consequences of this oil spill on Louisiana estuaries, we compared the abundance and size of two Gulf shrimp species (*Litopenaeus setiferus* and *Litopenaeus setiferus*) in heavily affected and relatively unaffected estuaries before and after the oil spill. Two datasets were used to conduct this study: data on shrimp abundance and size before the spill were available from Louisiana Department of Wildlife and Fisheries (LDWF). Data on shrimp abundance and size four years after the spill were independently collected by the authors and by LDWF. Using a Before-After-Control-Impact with Parallel sampling (BACIP) design with monthly samples of two selected basins, we found brown shrimp to become more abundant and the mean size of white shrimp to become smaller (longer) a BACIP with data on successive shrimp year-classes of

As a result of the Deepwater Horizon oil spill in April 2010 (referred to as the spill hereafter), a large amount of spilled oil was introduced to the coastal estuaries of eastern Louisiana. Oil washed up on hundreds of kilometers of marsh shoreline and triggered its known influences of shallow coastal estuaries [1,2]. As the oil traveled coastal estuaries it was in various stages of chemical and physical deterioration [3]. The oil inevitably affected microbial communities [4], marsh vegetation [2,5], benthic invertebrate communities [6], and oysters [7]. Louisiana's coastal estuaries function as primary habitat for

shrimp when they reach a threshold size [8]. The synchronous life-cycles of both species causes a single calendar year to represent one brown shrimp year-class and two white shrimp year-classes, one that entered the estuary late in the previous year and another that entered starting in May. During and after the spill all stages of the shrimp life cycle could potentially have been exposed to contaminants. These contaminants include PAHs, which are natural components of crude oil. Laboratory results have shown that PAHs reduce growth rates of shrimps, increase the mortality period and decrease the growth rate of white shrimp [9,10].

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