Acute bird mortality from the *Deepwater Horizon* MC 252 oil spill. II. Carcass sampling and exposure probability estimates for coastal Gulf of Mexico

J. Christopher Haney*, Harold J. Geiger, Jeffrey W. Short
*Email: chaney@defenders.org

ABSTRACT: Two separate approaches, a *carcass sampling model* and an *exposure probability model*, provided estimates of bird mortalities of 600000 and 800000, respectively, from the 2010 *Deepwater Horizon* MC 252 oil spill in coastal waters of the Gulf of Mexico. Monte Carlo simulation of parameter uncertainty led to respective 95% uncertainty intervals of 320000 to 1200000 and 160000 to 1900000. Carcass sampling relied on expansion factors multiplied by counts of bird carcasses retrieved in shoreline surveys, whereas exposure probability estimated bird deaths as a product of estimated coastal bird density, average daily oil slick size, slick duration, and proportionate mortality due to oiling. The low proportion of small-sized carcasses recovered, compared with considerably higher proportions of small live birds in coastal Gulf habitats, indicate an especially low probability of recovery for small birds after oil spills at sea. Most mortality affected four species: laughing gull (*Leucophaeus atricilla*, 36% of the northern Gulf of Mexico population killed), royal tern (*Thalasseus maximus*, 15%), northern gannet (*Morus bassanus*, 8%) and brown pelican (*Pelecanus occidentalis*, 12%). Declines in laughing gulls were confirmed by ~60% reductions evident in National Audubon Society Christmas Bird Count data for 2010–2013 along the Gulf coast. Population-level effects in apex predators of this magnitude likely had effects on prey populations that warrant careful assessment.