Assessing Seasonal and Potential Hydrocarbon and Dispersant Influences on Coastal Alabama Microbial Populations

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Abstract

The catastrophic oil spill on April 20, 2010, in which an estimated five million barrels of crude oil were released into the Gulf of Mexico from a depth of 1544 m, has been postulated to promote a bloom of disease causing *Vibrios*. To determine if *Vibrio* populations increased as a result of the *Deepwater Horizon* oil spill, water column and salt marsh sediment samples were collected from a coastal study site, Point Aux Pins, Alabama beginning in June 2010. During July 2010, tar balls, mousse, and oil sheens were observed at the salt marsh study site. A coupled microbiological and molecular approach was used to determine the frequency of known hydrocarbon degrading strains. PhyloChip 16S microarray analysis indicated significant increases in OTU richness from June 2010 to July 2010. Specifically, we detected high numbers of Gammaproteobacteria. Within the Gammaproteobacteria, *Vibrio* populations exhibited significant increases in OTU richness from June 2010 to July 2010 in the Inlet 0-2 cm (surficial) sediments. A gene-based functional microarray based analysis, i.e., GeoChip, indicated significant increases in functional gene richness amongst the following categories: antibiotic resistance, metals resistance, organic remediation, stress, and virulence for the salt marsh microbial community. Increases in the abundances of *Vibrio*-associated genes were also seen amongst the same categories. In addition to the molecular analyses described, lab-based hydrocarbon and dispersant amendments yielded results that suggested that non-weathered MC252 oil stimulates microbial growth, while the dispersant (Corexit 9500) significantly inhibited microbial growth. The weathered MC252 tar balls and mousse that impacted the salt marsh study site were incubated under lab conditions to enrich and culture bacterial strains from samples collected at Point Aux Pins, Dauphin Island and Gulf Shores, Alabama. Preliminary results indicate that presumptive *Vibrios* comprised 86%, 100%, and 14% respectively from the tree sampling sites. The observed shifts in the microbial community at Point Aux Pins, Alabama following the *Deepwater Horizon* oil spill indicated a rapid response by the salt marsh microbes such that potential hydrocarbon degrading genera were enriched, including *Vibrio* populations, although the propensity of *Vibrios* to degrade MC252 requires further investigation.