

The role of nutrients versus dispersants as modulators of oil biodegradation capacity in Gulf of Mexico surface waters

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Abstract

Perturbations like oil spills alter the structure and function of oceanic microbial communities. Understanding how microbial fitness and stress affect the microbiome's ability to respond to perturbations is important. In general, the open ocean is profoundly nutrient limited, exerting a stress on microbial populations that may impact their ability to respond to other stressors. With the integration of biogeochemical profiles and metagenomic data, we examined the interacting stressors of nutrient limitation and organic carbon loading in oligotrophic pelagic microbial communities from the Gulf of Mexico. The response to organic carbon loading from oil or synthetic chemical dispersants was a function of nutrient availability. Nutrient additions altered microbial community composition and the potential hydrocarbon oxidation rates. These results suggest that conducting dispersant investigations solely under nutrient replete conditions is not representative the natural environment, and in fact can provide a false impression that

dispersants enhance oil biodegradation rates. Nutrient limited microbial communities are, in fact, very ineffective at degrading oil and dispersants.