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Microbial enzymatic activity and secondary production in sediments affected by the sedimentation pulse following the Deepwater Horizon oil spill

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Abstract

A large fraction of the spilled oil from the Deepwater Horizon (DwH) blowout in April 2010 reached the seafloor via sinking oil aggregates (oil snow) in a massive sedimentation that continued until late summer 2010 (“Dirty blizzard”). We measured heterotrophic microbial metabolic rates as well as porewater and sedimentary geochemical parameters at sites proximate to and distant from the wellhead to investigate microbial responses to the “Dirty Blizzard”. Lipase activity and rates of bacterial protein production were highest and leucine-aminopeptidase activity was lowest in 0-2 cm sediment layers at the sites proximate to the wellhead. These results suggest that the presence of the oil snow stimulated benthic microbial enzymatic hydrolysis of oil-derived organic matter that was depleted in peptide substrates at the time of our sampling. The strong gradients in porewater DOC, NH_4^+ , and HPO_4^{3-} concentrations in the upper 6 cm of the sediments near the wellhead likewise indicate elevated heterotrophic responses to

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