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Deepwater Horizon oil spill response and McMurdo Sound, Antarctica: Case studies using acoustic and camera imaging systems

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The application of optical and acoustic instruments will be described for two recent research initiatives. (1) The response of the lower trophic food web to the Deepwater Horizon (DWH) oil spill in the NE Gulf of Mexico during 2010 was assessed using a towed camera imaging system (SIPPER), instrumented with CTD, chlorophyll fluorescence, and transmissometer sensors, in combination with bongo net tows. Net data provided information on changes in species composition, while SIPPER provided fine-scale vertical distributions of marine snow and zooplankton taxa in relation to environmental data. A ZooScan imaging system also is being used to analyze bongo samples collected prior to the oil spill to provide baseline data for comparison. Results of 13 cruises (2010-2014) revealed that high marine snow concentrations occurred during and immediately after the DWH oil spill, resulting in an unexpected extended sedimentation of oil-associated marine snow to the seafloor. Overall, zooplankton communities appear to have been resilient to this large disturbance. (2) Predator-prey interactions were assessed in McMurdo Sound, Antarctica using the SCINI ROV camera system with a 120 kHz acoustic transducer to observe the abundance and distribution of prey (krill and fish) under the fast ice. Because about 60% of McMurdo Sound is covered by fast ice most of the year, broad-scale net deployments are not practical. The foraging behavior of predators (killer whales and Adelie penguins) in relation to prey was investigated using a combination of satellite and time-depth-recorder tags. Complex ecosystem dynamics and predator-prey behavior impacted the distribution of prey.

Keywords: Deepwater Horizon oil spill, McMurdo Sound, Sipper, SCINI ROV, ZooScan, marine snow, zooplankton

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