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Monitoring long-term effects of offshore oil and gas development along the Southern California outer continental shelf and slope: Background environmental conditions in the Santa Maria Basin

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Abstract

Potential environmental impacts of materials discharged from oil and gas development and production platforms off the coast of southern California (Santa Maria Basin) are being monitored during an ongoing, long-term (fiveyear) field program. The study combines hypothesis testing of platform effects with basic research on the structure and dynamics of the regional ecosystem over a time series encompassing both seasonal and repeated annual scales. Oceanographic features and processes that are being measured focus on the benthos and include biological community indices and species abundances for hard-bottom and soft-bottom (macroinfauna and meiofauna) assemblages; levels and distributions of trace metals and hydrocarbons in bottom sediments, suspended particulates, animal tissues, and pore waters; water currents and other physical-oceanographic features; various sedimentological properties (sediment grain size, total organic carbon, shear strength, distribution of mineral types, radioisotope profiles, and degrees of sediment mixing as a

result of bioturbation); sediment and pollutant-transport processes; and animal-sediment-pollutant interactions. Synoptic measurement of these different environmental variables over the extended sampling period provides an opportunity to examine long-term variability in the benthic environment with respect to both natural and anthropogenic causes. Efforts to distinguish between natural variability and low-level cumulative impacts of drilling are given special attention.

Results obtained during the first two years of sampling provide a basis for beginning to understand environmental processes and relations important in detecting and interpreting any subsequent impacts caused by drilling activities in this complex and productive region of the California outer continental shelf and slope. Background chemical, physical, and biological data generated during this period demonstrate that impacts of discharges from oil and gas operations should be detectable, if they occur, and should be distinguishable from natural environmental variability. Small inputs of barium and petroleum hydrocarbons have been detected and appear to be associated with the minor drilling activities that have occurred in the area thus far, however, these initial inputs have not led to any noticeable biological impacts. These initial results are hopefully of value for two reasons: (1) in providing a summary of basic chemical, physical, and biological features of the benthic environment within the Santa Maria Basin; and (2) in presenting information on research strategies that should be considered in designing studies dealing with similar resource-management problems in other parts of the world.

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