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STUDY TITLE: Impact of Offshore Exploratory Drilling: Eastern Gulf of Mexico

REPORT TITLE: Habitat Impacts of Offshore Drilling: Eastern Gulf of Mexico

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BACKGROUND: More than 30 offshore exploratory wells have been drilled in the eastern Gulf during the 1970s, 1980s, and early 1990s. Little was known about the aerial extent of impact to the marine environment. As a result of concern about possible impacts, a moratorium was placed on all OCS areas south of parallel 26^{o} N. A National Academy of Sciences panel review report in 1989 highlighted the lack of knowledge, as did a 1989 State of Florida Governor's Report. A drilling moratorium for the northeastern Gulf of Mexico is being sought by a coalition of many interested parties. This report presents the finding of studies of six abandoned exploratory well sites in various environments ranging in depths from 21 to 149 m.

OBJECTIVES: (1) To locate and systematically sample, video, and photograph six different drill sites in the eastern Gulf of Mexico (the age of these sites ranged from 15 months to 17 years since drilling took place), (2) to conduct grain-size, mineralogical and elemental analyses in order to map aerial extent of benthic impact, and (3) to determine whether drill sites recovered to predrilling conditions over time.

DESCRIPTION: Six drill site locations provided by MMS were located using GPS and examined using a 2-person research submersible. Using the submersible's collecting arm, samples were taken in radial transacts extending outward from the borehole. Samples were sieved into 16 separate grain sizes and the percent of grains larger than 2 mm was used to circumscribe a halo of impact surrounding the borehole. The mud

fraction was analyzed for barium, the weighting component of drill mud, and trace metals Cr, Fe, V, and Zn, using Induction Coupled Neutron Activation Analysis (INAA). XRD was used to detect barite. A continuous video record was made at each site along with selected still photographs.

Sites ranging in depth from 21 to 149 m consisted of Pensacola Block 996 No. 1 drilled in 1988, Destin Dome Block 56 No. 1 drilled in 1989, Gainesville Block 707 No. 1 drilled in 1985 Main Pass Block 255 No. 1 drilled in 1990, Florida Middle Ground 455 No. 1 drilled in 1986, and Florida Middle Ground Block 252 No. 1 drilled in 1974. Bottom habitats included medium quartz sand, carbonate mud, coarse biogenic carbonate sand, hard limestone with corals and gorgonians (tropical organisms), and relict reefs (pinnacle reef trend with deep-water gorgonian fauna).

CONCLUSIONS: Areas impacted by cuttings and drilling debris, especially used welding rods, ranged from as little as a few meters to over 13,000 m^2 (over 3 acres). Barium at levels above background (200 ppm is considered natural background) extended beyond the range of our sampling pattern but clearly show a bullseye distribution of decreasing values away from the borehole. High levels near boreholes were on the order of 50,000 to 150,000 ppm. At the shallow Gainesville Block 707 site, which had been affected by two post-drilling hurricanes, barium was at background level except in one sample taken at the borehole where the level was 8 times background level. Tropical fish were abundance and 11 groupers were counted in and around the borehole.

At the oldest site (Middle Ground Block 252 No. 1 drilled 17 years ago), only background barium levels were detected. Cuttings mixed with biogenic sand were rippled and little debris was detected. No fish life was seen.

Main Pass Block 225, in 104 m of water, had been drilled adjacent to a pinnacle reef and a reentry device with provisions for 4 wells was attached on the bottom. The site is within a nepheloid layer. The bottom was dusted with fine rust-colored mud and water visibility was very poor. The greatest impact at this site was a series of zigzag trenches apparently made by the legs of a jack-up rig during either mobilization or demobilization. Large fish had been attracted to the reentry structure.

The well head at Destin Dome Block 56 No. 1 was covered with a steel pyramid-shaped protection device. This was the most heavily impacted site observed. The well was a very deep test and produced more cuttings than the other wells. Fish were abundant.

Only one dive was made at Middle Grounds Block 455 No. 1, which was the deepest site examined. The bottom consisted of burrowed lime mud with no plant life. The water was 149 m deep. Very large groupers hovered around the borehole, which was in the center of a hexagon-shaped steel template half buried in the mud. In general, sites with structures, open boreholes and/or debris served as artificial reefs and harbored the most diverse fish fauna. Our observations indicate that sites in shallow water return more quickly to predrilling conditions than do sites in more than 50 m of

water. Storm waves and currents can more easily remove drilling debris and barium, and the organisms that live in shallow water grow much faster than those in deep cold waters.

STUDY PRODUCT: Shinn E.A., Lidz, B.H., and Reich C.D. 1993, Habitat Impacts of Offshore Drilling: Eastern Gulf of Mexico, OCS Study MMS 93-0021, and a 12-minute Open-File video produced by USGS.