STUDY TITLE: Gulf of Mexico Effects of OCS Oil and Gas Activities on Reef Fish

REPORT TITLE: Study of the Effect of Oil and Gas Activities on Reef Fish Populations in the Gulf of Mexico OCS Area, Volume I: Executive Summary and Volume II: Final Report

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BACKGROUND: Effects of offshore oil and gas development and production activities on fish populations in the Gulf of Mexico must be identified and quantified so that effective resource management policies can be designed. The first step in that direction is to estimate standing stocks of commercially and ecologically important fish species that are associated with natural hard-bottom areas and offshore oil and gas platforms. This study was funded to provide preliminary fish population estimates and to evaluate alternative methods of developing such estimates.

OBJECTIVES: (1) To develop fish population censuring methods that could be used in water depths greater than those that are readily accessible to divers; and (2) to compare reef fish populations associated with natural hard-bottom areas with those associated with offshore oil and gas platforms.

DESCRIPTION: The study was conducted during May-October 1980 in the northern Gulf of Mexico between 90 and 94°W long and in water depths between 18 and 200 m. The study consisted of three phases. Phase I was an evaluation of potential study sites; Phase II involved methodological evaluations at selected sites; and Phase III

involved the use of selected methods (chosen following Phase II) to generate and evaluate standing stock estimates of fish species associated with a natural hard-bottom site and several platforms.

During Phase I, 12 natural hard-bottom areas and 13 platforms were surveyed by divers using a combination of television and still camera photography and limited collections of invertebrates and fishes for identification. Physical and biological characteristics of each site were described.

One hard-bottom site and one platform were chosen for methodology evaluations during Phase II. Four photographic approaches were evaluated in Phase II: (1) use of a television camera mounted on a remotely controlled vehicle (Hydro Products RCV-225); (2) use of a television and a still camera mounted on a non-propelled sled; (3) use of fixed arrays of time-lapse movie cameras; and (4) use of diver-operated movie cameras. Accessory techniques included qualitative photographic surveys by divers, hook-and-line sampling, and deployment of fish traps. Fish abundances were quantified (number per cubic meter) from photographs by calculating volumes by reference to visual targets of known size and distance from the cameras. Results from the two remote television methods were compared between locations (platform vs. hard bottom) and between depths within the platform using analysis of variance. Results from the fixed movie camera array were tested for differences between locations but were not compared to results from the other techniques.

For Phase III, four platforms and one hard-bottom site were selected for application of methods chosen to estimate fish populations. The primary method was use of television and still cameras mounted on a remotely controlled vehicle (Perry Recon III-B); time-lapse camera arrays were also deployed. Differences in fish populations between locations, depths, transect within platforms, and legs within platforms were tested using analysis of variance. Standing stock estimates were derived for each platform and for the hard-bottom sites.

SIGNIFICANT CONCLUSIONS: Remote photographic methods were determined to be useful in quantifying fish populations associated with platforms and natural hard-bottom areas. Each approach had significant problems, however, and quantification was complicated by spatial variations both within and between locations and by differences in the zonation patterns of hard-bottom biota in the northern Gulf of Mexico.

STUDY RESULTS: Phase I surveys produced descriptions of fishes and invertebrates associated with platforms, low-relief hard-bottom areas in turbid, shallow water, and high-relief hard-bottom areas in clear, deeper water. Depth-related variations in the biological composition of these sites were in accord with previously described zonation patterns of hard-bottom biota in the northern Gulf of Mexico.

Phase II produced comparative evaluations of the results and feasibility of different methodologies used to estimate fish populations. Quantitatively comparable results were achieved using television cameras mounted on either a remotely-controlled vehicle or a non-propelled sled. However, the sled was not maneuverable enough to be

useful in routine fish surveys around platforms. The remotely controlled vehicle suffered mechanical breakdowns and was unable to maneuver in strong currents. The fixed movie camera arrays viewed too small a volume of water to be useful and could not be placed close to the platform, preventing any direct comparison of results to those obtained by the television surveys. Diver swimming motions frightened fishes away, invalidating the use of diver-held movie cameras. Fish trapping, hook-and-line sampling, and tag-recapture methods were not very successful.

Phase III produced fish population estimates for one hard-bottom area and four platforms. At the hard-bottom site (Sonnier Bank), total fish abundance was estimated to be 1.84 individuals per cubic meter, or 16,610 individuals in the volume immediately overlying the bank. Fish abundance at platforms ranged from 0.02 to 0.42 individuals per cubic meter and 283 to 3,955 individuals per platform. Variations in platform surface area could explain most of the between-platform differences in total fish abundance. Leg-to-leg variations in fish abundance were high; fishes tended to accumulate on the upcurrent side of a platform. Most individual fish species showed distinct depth zonation patterns.

STUDY PRODUCTS: Continental Shelf Associates, Inc. 1982. Study of the Effect of Oil and Gas Activities on Reef Fish Populations in the Gulf of Mexico OCS Area. A final report for the U.S. Department of the Interior, Bureau of Land Management Gulf of Mexico OCS Office, New Orleans, LA. Vol. I (Executive Summary) - NTIS No. PB82-263567 (PC/A10); Vol. II (Final Report) - NTIS No. PB82-263559 (PC/A02). Contract No. AA551-CT9-36.

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