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STUDY TITLE: Mississippi-Alabama Shelf Pinnacle Trend Habitat Mapping Study

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CONTRACT NUMBER: 14-35-0001-30494

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREAS: Eastern and Central Gulf of Mexico

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BACKGROUND: Significant topographic features were identified during the Mississippi-Alabama Marine Ecosystem Study performed by Texas A&M University (1987-1990) in adjacent areas west of those where geophysical mapping occurred. As a result of these findings, the MMS determined a need for further geophysical mapping and biological characterizations in this western area.

OBJECTIVES: (1) To geophysically survey and map significant topographic features and substrate trends located within the study area; and (2) To characterize the biological communities associated with these topographic features.

DESCRIPTION: Data collection was divided into two separate field sampling efforts. The first field effort (Survey 1) was planned and conducted with the intent of collecting geophysical data (i.e., side-scan sonar and subbottom profiler data) throughout the entire study area. This collection procedure required 100% coverage of the seafloor within the study area using side-scan sonar to locate and plot significant topographic features. Following analysis of the geophysical data and the development of draft

features and substrate maps, a second field effort took place (Survey 2). The purpose of Survey 2 was to verify the side-scan sonar target interpretations and to characterize the biological communities associated with these previously mapped features. A remotely operated vehicle (ROV) equipped with video and still cameras were utilized to conduct the biological characterizations.

The geophysical characterization survey (Survey 1) was conducted between 11 September and 10 October 1990. A total of 92 survey lines, including 86 east-west lines and 6 north-south tie lines, were investigated using side-scan sonar and subbottom profiler. Bathymetric data was collected simultaneously with the geophysical data.

The biological characterization survey (Survey 2) was conducted between 11 October and 7 November 1991. Using the data collected during Survey 1, significant and representative topographical features and substrates were selected and prioritized for investigation.

SIGNIFICANT CONCLUSIONS: Detailed maps of hard bottom, pinnacles, prominences, and sediment reflectivity were produced based on an OCS lease block grid. The presence of extensive pinnacle complexes south and southwest of the previously mapped areas of the Mississippi-Alabama shelf were confirmed and biological data on the community structure of organisms inhabitating that environment were collected. Two distinct areas of hard bottom and pinnacle features were noted which probably show differing geologic origins.

STUDY RESULTS: Two physiographically different areas of the Mississippi-Alabama shelf and slope were surveyed under this research effort. A large portion of the study area was above the shelf break which is generally considered to be the 75 m (245 ft) isobath in this part of the Gulf. The Mississippi-Alabama shelf is divided into two sedimentary provinces. In the eastern province there is a thin, well-sorted layer of fine- to medium-grained quarzose sand transported to the shelf by rivers during the Pleistocene and early Holocene (1.6 million to 100,00 YBP). To the west, the shelf in this area is covered by a layer of fine silts, sands and clays associated with Mississippi River disposition. The present study straddles these provinces. In the east, sediment reflectivity is high and penetration poor. Toward the west where the silts and clays of the old St. Bernard Delta overlap the quartzose sediments, subbottom profiler penetration increases and bottom reflectivity drops. Burred channels are also evident in this area. A series of low-relief hard bottom features are seen at or near the shelf break in the eastern portion of the study area which appear similar to inner shelf hard bottom features described from the Alabama shelf.

Beyond the shelf break on the upper slope (75 to 400 m; 246 to 1,300 ft), two major areas of hard bottom, shelf-edge prominences were mapped. These included (1) an area of large pinnacle development between the 80 and 90 m (260 to 295 ft) bathymetric contours termed Area 1; and (2) an area of low relief hard bottom and small pinnacles or mound type features between the 110 and 130 m (360 to 426 ft)

bathymetric contours termed Area 2. Pinnacles observed in the first area were large features which were seen singly or in clumps often reaching a height of 20 m (60 ft) or more above the seafloor. These features were oriented in a northwest to southwest direction and were surrounded by a sand bottom. The features seen in Area 2 were different in appearance on the geophysical record. Area 2 features were smaller in overall height than Area 1 features, although some individual features reached heights similar to the smaller features seen in Area 1. Small mound-like features were also evident which were much wider and did not show the same subbottom characteristics as pinnacle features, although they reached the same height above bottom. In addition, the general substrate in this deeper area appeared to be continuous low-relief hard bottom.

A total of 19 ROV dives were conducted at separate locations during the biological survey. Nine of these dives were in the major pinnacle area described above (Area 1), and three dives were in shallow water areas on the Mississippi-Alabama shelf above the 75 m (246 ft) depth contour. Biological communities occurring on the major pinnacles were dominated by tropical and subtropical suspension-feeding invertebrates. Communities were similar on all features investigated, but very subtle differences were noted based on individual pinnacle size. Generally, the horizontal surfaces in the upper areas of the pinnacle supported the most diverse and abundant communities. Near the base of a feature, the associated biological community was reduced both in numbers of individuals and in terms of community diversity.

No true hard bottom was seen at any of the three sites investigated above the 75 m (246 ft) contour, suggesting that these features were artifacts of side-scan sonar interpretation. Hard bottom and similar signatures were removed from the final map products produced. If these low-relief features were present and were subsequently covered by shifting sand, it is very likely that the epibiota and fishes associated with them would be minimal. Further investigations are needed to verify the possible hard bottom signatures seen in other upper shelf areas covered by this survey.

STUDY PRODUCTS: Continental Shelf Associates, Inc. 1992. Mississippi-Alabama Shelf Pinnacle Trend Habitat Mapping Study. Final Report. A final report for the U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study 92-0026. Contract No. 14-35-0001-30494. 75 pp + app.

A two-part map set (scale: 1:120,000) was also prepared under this study effort.

*P.I.'s affiliation may be different than that listed for Project Manager.