**ACCESS NUMBER: 73719**

**STUDY TITLE:** Document & Characterize the Branching Deep Water Corals & Geology at Two Upper-Slope Site in the Northeastern Gulf of Mexico

**REPORT TITLE:** Seafloor Characteristics and Distribution Patterns of Lophelia pertusa and Other Sessile Megafauna at Two Upper-Slope Sites in the Northeastern Gulf of Mexico

CONTRACT NUMBER: 01-03-PO-73719

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREA: Central Gulf of Mexico

FISCAL YEARS OF PROJECT FUNDING: FY 2003; FY 2004; FY 2005; FY 2006; FY 2007

COMPLETION DATE OF REPORT: June 2007

COSTS: $51,914

PROJECT MANAGER: William W. Schroeder

AFFILIATION: University of Alabama

ADDRESS: Dauphin Island Sea Lab, 101 Bienville Boulevard, Dauphin Island, AL 36528

PRINCIPAL INVESTIGATOR: William W. Schroeder

KEY WORDS: Branching Deep Water Corals, Lophelia pertusa, sessile megafauna, seafloor characteristics, northeastern Gulf of Mexico

**BACKGROUND:** Habitat-forming deep-water (a.k.a. cold-water) coral ecosystems are known to serve as important components of the world's oceans and seas. One of the principal species of branching scleractinian corals that form deep-water assemblages is the tuft coral *Lophelia pertusa*. Generally, these corals are very slow to develop and fragile. As a result they are vulnerable to sustaining damage that if extensive can require years for recovery, if at all. Unfortunately this situation is already occurring globally principally due to destructive fishing practices and secondarily as a consequence of activities associated with exploration and extraction of fossil fuels. In light of the continuing expansion of oil and gas activities into the deep Gulf of Mexico (GoM), there is a crucial need to understand the basic biology and functional ecology of these unique systems, and ultimately to determine appropriate management strategies for their protection. One of the first steps in achieving these goals is to survey and describe deep-water coral communities and their geologic settings. This research report directly addresses this need by documenting the seafloor characteristics and the distribution patterns of *L. pertusa* and other sessile megafauna at two sites in the northeastern Gulf of Mexico. Both sites, Viosca Knoll 826 (VK 826) and Viosca Knoll

862-906 (VK 862-906) are located on the upper DeSoto Slope subprovince, which extends westward from the northern end of the West Florida Terrace and the DeSoto Canyon to the eastern side of the upper Mississippi Fan.

**OBJECTIVES:** Document seafloor characteristics and distribution patterns of *Lophelia pertusa* and other sessile megafauna at deep-water two sites in the northeastern Gulf of Mexico.

**DESCRIPTION:** In July 2002, the U.S. Navy Nuclear Research Submarine NR1 conducted deep seafloor survey operations at VK 826 and VK 862-906. High-resolution side-looking sonar (SLS), bathymetry and video data were collected at both sites. Over 50 km/27 nm of track-lines were surveyed at VK 826 while over 60 km were surveyed at VK 862-906. SLS data were collected operating at a frequency of either 150 kHz or 600 kHz, with range settings varying from 50 to 200 m per side, respectively. From these data mosaics of the seafloor for each of the study areas were constructed. Video data was also collected with two camera systems along each track line. In addition, video and visual observation records were obtained for 26 Johnson-Sea-Link (JSL) manned submersibles dives over the period 1991-2005. These data along with video and visual observations obtained on NR1 serve as the principal sources of documentation of the seafloor and macroepifauna at the two study site. Other data sets utilized in the preparation of this report were ROV video surveys conducted by the NOAA Ship *Ronald H. Brow*n in 2003 during cruise RB-03-07-leg-2 and by Oryx Energy Company, Inc., Dallas, Texas, in 1990 in conjunction with pre-exploratory drilling activity.

**SIGNIFICANT CONCLUSIONS:** VK 826 has the most extensive development of *L. pertusa* found in the GoM to date. The site consists of a 90 m tall, isolated knoll on the seaward steepening upper De Soto Slope and an adjacent, smaller 26 m tall pinnacle shaped mound named Knobby Knoll. Water depths range between 430-520 m. Seafloor characteristics included locally hummocky terrain made up of carbonate capped knolls and ridges, some with steep vertical relief, terrace-like features composed of carbonate outcrops/buildups, boulders, slabs, rubble, sediment veneered hardgrounds, extensive shell lag deposits and open flats of unconsolidated sediment, and a sediment fan-debris field with large boulders and blocks and smaller material of various sizes and shapes. *Lophelia pertusa*, the gorgonian *Callogorgia americana delta*, antipatharians, and tubeworms are all widely distributed across large portions of VK 826 while anemones were restricted to the deeper seafloor adjacent to Knobby Knoll. The dominant megafauna taxon at this site is *L. pertusa* which has successfully developed extensive assemblage complexes, comprised of large colony aggregations/thickets, at numerous locations on the main knoll and a thicket-coppice complex covering the top of Knobby Knoll. VK 862-906 is located in a low-relief mound and ridge complex approximately 37 km west-southwest of the VK 826 site. The primary study site is a small, low-relief mound formed from large blocks and boulders in the southeast corner of VK 862. A second site, approximately 1100 m to the southwest, is located in the northeast corner of VK 906. Water depths range between 304-352 m. The only significant development of *L. pertusa*, an aggregation of at least five large colonies, was found on the crest of the mound in VK 862. No *Lophelia* were observed in VK 906. The dominant taxa at both sites, in terms of numbers and biomass, are anemones. The largest megafauna

observed were antipatharians with individual colonies estimated to be between 2.1-2.4 m.

**STUDY RESULTS:** Seafloor characteristics and distribution patterns of *Lophelia pertusa* and other sessile megafauna at two deep-water sites in the northeastern Gulf of Mexico: VK 826 and VK 862-906 both located on the upper DeSoto Slope subprovince. VK 826 has the most extensive development of L. pertusa found in the GoM to date. The primary site is located on a 90 m tall, isolated knoll on the seaward steepening upper De Soto Slope. A second site, the crest and upper portions of a small 26 m tall pinnacle shaped mound, lies approximately one kilometer northeast of the top of the main knoll. Seafloor characteristics include: 1) Broken hardgrounds, low-relief outcrops/buildups, shell pavements and unconsolidated sediment on the crest of the main knoll; 2) locally hummocky terrain made up of carbonate capped knolls and ridges, some with steep vertical relief, and relatively flat terraces constructed of hardgrounds, shell pavement and unconsolidated sediment on the crest-rim; 3) terrace-like features composed of carbonate outcrops/buildups, sediment veneered hardgrounds, extensive shell lag deposits and open flats of unconsolidated sediment on the north and south sides of the main knoll; 4) a gully cut by one or more debris flows on the southwest side; 5) a sediment fan and debris field composed of broken hardground, large boulders and blocks and smaller material of various sizes and shapes on the southwest flank; 6) hardgrounds and low relief buildups/outcrops and open areas of unconsolidated sediment on the northwest side; 7) ridges and/or hummocks and swales of unconsolidated sediment; some with crest capped with hard substrates on the steep upper slope of the west-southwest side; 8) a complex of buildups/outcrops, hardgrounds, boulders, slabs, rubble and unconsolidated sediment on the adjacent western flank; and 9) a hummocky or knob-like construction at the top and exposed slab-like or hardground-like substrate on the sides on Knobby Knoll. *L. pertusa*, *C. americana delta*, antipatharians, and tubeworms were all widely distributed across large portions of the study site while anemones were restricted to the deeper seafloor adjacent to Knobby Knoll. The dominant megafauna taxon at this site is *L. pertusa* which has successfully developed extensive assemblage complexes, comprised of large colony aggregations/thickets, at numerous locations on the main knoll and a thicket-coppice complex covering the top of Knobby Knoll.

Seafloor characteristics at VK 862-906 consist of a rugged low-relief mound formed from large blocks and boulders southeast corner of VK 862 and portions of two parallel ridges, covered with carbonate pavement, and the adjacent unconsolidated sediment flats northeast corner of VK 906. Three of the five megafauna taxa reported from VK 826 also occur at VK 862-906: *L. pertusa*, antipatharians and anemones. The only significant development of *L. pertus*a, an aggregation of at least five large colonies, was found on the crest of the mound site in VK 862. Other smaller colonies were observed scattered throughout the site; with a slight preference for the northern flank of the mound. No *Lophelia* were observed at the ridges site in VK 906. The dominant taxa at both the VK 862 and VK 906 sites, in terms of numbers and biomass, are anemones. The largest megafauna observed were the antipatharians: numerous colonies having attained small ‘tree’ dimensions at the VK 862 site. There appear to be at least four

species of antipatharians and collectively they are the second most abundant megafauna taxa at both sites.

**STUDY PRODUCTS:** Schroeder, W.W. 2007. Seafloor characteristics and distribution patterns of *Lophelia pertusa* and other sessile megafauna at two upper-slope sites in the northeastern Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2007-035. 49p.