

**STUDY TITLE:** Tuscaloosa Trend Regional Data Search and Synthesis

**REPORT TITLE:** Tuscaloosa Trend Regional Data Search and Synthesis Study, Volume I: Synthesis Report and Volume II: Supplemental Report

**CONTRACT NUMBER:** 14-12-0001-30048

**SPONSORING OCS REGION:** Gulf of Mexico

**APPLICABLE PLANNING AREAS:** Eastern and Central Gulf of Mexico

**FISCAL YEARS OF PROJECT FUNDING:** 1983; 1984

**COMPLETION DATE OF REPORT:** June 1985

**COSTS:** FY 1983: \$148,977; FY 1984: \$136,498

**CUMULATIVE PROJECT COST:** \$285,475

**PROJECT MANAGER:** B. Vittor

**AFFILIATION:** Barry A. Vittor & Associates, Inc.

**ADDRESS:** 8100 Cottage Hill Road, Mobile, Alabama 36609

**PRINCIPAL INVESTIGATOR\*:** J. Shaw

**KEY WORDS:** Eastern Gulf; Central Gulf; Louisiana; Mississippi; Alabama; Tuscaloosa Trend; biology; physiography; geology; physical oceanography; socioeconomic; ecosystem model; Mississippi-Alabama Shelf; DeSoto Canyon; shelf; estuarine; hydrography; barrier islands

**BACKGROUND:** The Tuscaloosa Trend Region, extending from southern Louisiana into offshore waters of the Chandeleur Islands and eastward to DeSoto Canyon, may prove to be highly productive in terms of recoverable oil and natural gas reserves. The area supports significant recreational and commercial fisheries and a portion lies within Breton National Wildlife Refuge and Gulf Island National Seashore. Information describing the environment is needed by the Minerals Management Service to make management decisions regarding leasing a particular area and to define lease stipulation terms.

**OBJECTIVES:** 1) To identify and summarize important information pertaining to the environmental and socioeconomic characteristics of the Tuscaloosa Trend Region of the Gulf of Mexico.

**DESCRIPTION:** The Tuscaloosa Trend Region is located in the north-central Gulf of Mexico adjacent to Louisiana, Mississippi, and Alabama. The boundaries are defined as South Pass on the west (i.e., southeast corner of the Mississippi River Delta), a line from the DeSoto Canyon head to the Alabama-Florida boundary on the west, and the 200 m contour offshore. This report characterizes the area with respect to physiography, geology, physical oceanography, chemical oceanography, biology, socioeconomics, and an area-wide conceptual ecosystem model. Conceptual representation of physical, chemical, geological, and ecological processes were developed for the Tuscaloosa Trend ecosystem as part of the data search and synthesis effort. These representations were developed to provide a framework for this effort and to direct future research.

**SIGNIFICANT CONCLUSIONS:** The conceptual representation of the Tuscaloosa Trend Region was hierarchical, consisting of three levels: Level 1, the whole ecosystem; Level 2, individual subsystems (e.g., sedimentological, biogeochemical, and ecological); and Level 3, specific ecological applications (e.g., nekton life history, marsh-estuarine interactions, pelagic and benthic food webs). The conceptual model provides a management device which clearly identifies interrelationships and potential multiple use conflicts among resources. Significant data gaps exist particularly regarding open shelf geology, physical and chemical oceanography, ecosystem structure and function, and interrelationships between open shelf and nearshore ecosystems.

**STUDY RESULTS:** The coastal portion of the Tuscaloosa Trend Region is separated from the oceanic portion by islands and passes. Chandeleur and Breton Sounds are shallow (2 m average depth) areas behind several clusters of islands associated with subsidence of the now-abandoned St. Bernard Delta complex. Lake Borgne lies north of these features and forms the west end of Mississippi Sound, a shallow (3 m average depth) area behind six barrier islands (Cat, West and East Ship, Horn, Petit Bois, and Dauphin). The sound receives freshwater discharges from the Pearl and Pascagoula Rivers. Shallow (3 m average depth) Mobile Bay, a submerged river valley, and Bon Secour Bay, behind Ft. Morgan Peninsula, form the eastern coastal portion.

The oceanic portion lies on the Mississippi-Alabama shelf, a triangular shaped region between the Mississippi River Delta and DeSoto Canyon. The shelf width varies: 10 km off the Mississippi Delta, 56 km at DeSoto Canyon, and 128 km at the widest part east of the Delta. The shelf slope break occurs at 55 m average depth.

The primary geologic feature of the Tuscaloosa Trend Region is the Gulf coast geosyncline, a clastic wedge extending from Alabama to northeastern Mexico. The continental shelf topography and sediment distribution results from combined sea level transgressive-regressive episodes and deltaic progradation and destruction. The present Mississippi River deposition seems to be shifting to the Atchafalaya Basin. Little active sedimentation is occurring in the Trend area, which enables the persistence of the DeSoto Canyon, an S-shaped canyon formed by late Tertiary erosion, deposition, and structural control by diapiric activity.

Geological processes in the Trend area include relatively rapid bathymetric changes related to the delta front depositional patterns as well as long-term geologic structure formation and movement (e.g., salt domes and faults). Potential Trend area geohazards result from diapirism, rapid deltaic sediment accumulation, and shelf break wasting.

The Trend area is influenced primarily by the anticyclonic Bermuda High in spring and summer and by continental pressure systems in fall and winter. Seasonal tropical cyclones periodically impact the area. Wave heights are primarily wind speed and direction influenced.

Riverine discharges from the Mississippi, Pearl, Pascagoula, and Mobile Rivers strongly affect the turbidity levels, temperature, and salinity of the Trend area coastal and shelf waters. The Loop Current, a dominant Gulf of Mexico circulation feature, has periodic intrusions into the area. DeSoto Canyon may act as an intrusion conduit. Sustained winds are the dominant inner continental shelf and coastal water circulation driving force, while riverine discharges also influence circulation in shallow Mississippi Sound and Mobile Bay. Semidiurnal tides (average tidal range from 37 cm in the mouth of Mobile Bay, to 47 cm in Chandeleur Sound) influence currents through the passes.

Chemical oceanography of coastal waters is better known than for outer continental shelf waters in the Trend area. Levels of dissolved oxygen, nutrients, sediment trace metals, sediment and water hydrocarbons, suspended particulates, heavy metals, and particulate organics and carbon demonstrate seasonal and geographical trends. Low heavy metal concentrations in biota reflect minimal anthropogenic contamination.

Coastal marshes fringing the Trend area seasonally contribute large amounts of organic material to coastal waters. Net organic material export from the marshes is episodic. The coastal area has three principal food chains: primary production and consumption of marsh and seagrass vegetation; detritus production by the marshes and seagrasses for a detritus-based food chain; and phytoplankton production linked to higher trophic levels by zooplankton. Coastal area nekton and macroepifauna are relatively well-studied because of their economic importance.

The open shelf ecosystem has two principal food chains: plankton-based (water column) and detritus-based (benthic). Open shelf nekton is a mixture of coastal and marine organisms. Open shelf epifaunal communities are well-described as distinct assemblages.

Trend area socioeconomic resources include waterborne commerce, travel and tourism, sport and commercial fisheries, and oil and gas.

**STUDY PRODUCTS:** Barry A. Vittor & Associates, Inc. 1985. Tuscaloosa Trend Regional Data Search and Synthesis Study. Vol. I, Synthesis Report. A final report for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS

Region, Metairie, LA. NTIS No. PB86-245941. MMS Report 85-0056. Contract No. 14-12-0001-30048. 505 pp.

Barry A. Vittor & Associates, Inc. 1985. Tuscaloosa Trend Regional Data Search and Synthesis Study. Vol. II, Supplemental Report. A final report for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS Region, Metairie, LA. NTIS No. PB86-245958. MMS Report 85-0057. Contract No. 14-12-0001-30048. 373 pp.