

STUDY TITLE: MAFLA OCS Baseline Study, FY 1974

REPORT TITLE: Baseline Environmental Survey of the MAFLA Lease Areas CY 1974, Final Report #2 June 1976/April 1978

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KEY WORDS: Eastern Gulf; Central Gulf; Mississippi; Alabama; Florida; West Florida Shelf; Mississippi-Alabama Shelf; Florida Middle Ground; baseline; hydrocarbons; trace metals; sediment; water column; tissue; zooplankton; hydrography; phytoplankton; shelf; photographs; epifauna

BACKGROUND: Impending oil and gas exploration of the Mississippi-Alabama-Florida (MAFLA) Outer Continental Shelf (OCS) prompted the U.S. Department of the Interior to initiate pre-impact marine environmental assessments of the region. This study concerns baseline investigations conducted during 1974 on the MAFLA/OCS.

OBJECTIVES: (1) To obtain pre-drilling information on hydrocarbon and trace metal levels in the water column, sediments, and benthic organisms within the MAFLA region; and (2) to characterize biological, chemical, and physical parameters of the water column and seafloor in the MAFLA region.

DESCRIPTION: The study area included the MAFLA OCS from 89°W long (south of Pascagoula, Mississippi) south along the inside of the 200-m isobath to approximately

27°30'N lat (west of Clearwater, Florida). Sampling efforts during May and June 1974 were concentrated near five separate lease block areas on the MAFLA shelf. Sediment samples were taken at 65 stations with a box corer (21.5 x 30.5 cm). Forth-three stations were established for diver surveys. Divers collected photographic (still photographs and video) data samples of epibiota. Capetown dredge samples were taken at each dive station. Zooplankton were collected using 0.5-m Nitex nets (0.212-mm mesh) towed in surface, mid-depth, and bottom waters for 15 min each. Water samples were obtained at each station using 30-1 Niskin bottles. Expendable bathythermograph and salinity-temperature-depth casts were made at each station. In the laboratory, sediment samples were sieved, separated into grain size fractions, and examined for carbonate content, clay mineralogy, and skeletal fragments. Trace metal (cadmium, chromium, copper, iron, lead, and nickel) concentrations were determined by atomic absorption spectrophotometry. Barium and vanadium were determined by neutron activation analysis. Gas chromatography was used to analyze water, sediments, benthic organisms, and zooplankton for high molecular weight hydrocarbons. Prepared extracts from water and sediment samples were also analyzed for dissolved oxygen, particulate and dissolved organic carbon, dissolved low and high molecular weight hydrocarbons, particulate hydrocarbons, suspended matter, trace metals, phytoplankton, chlorophyll, and zooplankton using standard techniques.

SIGNIFICANT RESULTS: Petrogenic hydrocarbons were not detected in sediments, benthic organisms, or water column phases on the West Florida Shelf. Petroleum-derived hydrocarbon contamination was evident on the Mississippi-Alabama Shelf. This area was characterized by fine fluvial sediments and low diversity epibiotic assemblages. Input from the Mississippi River was the most significant hydrographic feature in this area. Carbonate sediments and high-relief features (Florida Middle Ground) of the West Florida Shelf supported diverse epibiotic communities. Trace metal concentrations were below contamination levels for all areas and organisms.

STUDY RESULTS: On the West Florida Shelf, sediments were high in carbonate content (ca. 80%) and the predominant clay mineral was kaolinite. Calcareous skeletal remains of annelinds, bryozoans, echinoids, foraminiferans, and molluscs were major contributors to the carbonate fraction. To the west of Cape San Blas, fine quartz sands, silts, and clays (montmorillonite) were prevalent. Mississippi River influence was responsible for these characteristics. The aliphatic n-alkanes and isoprenoid ratios from sediments of the Mississippi-Alabama Shelf were indicative of petrogenic contamination. Hydrocarbons from the West Florida Shelf were of biogenic origin. There was no appreciable trace metal contamination in any of the MAFLA sediment samples. Copper and vanadium were concentrated in crustaceans and tunicates, respectively. Sponges were enriched with nickel. Sediment trace metal concentrations were correlated with ambient iron content. Photographic and dredge samples yielded the following epibiotic groups and number of taxa: sponges (260), algae (154), crustaceans (107), molluscs (107), echinoderms (50), hard corals (24), and soft corals (19). Substrate variety dictated epibiotic diversity and relative abundance. The richest sedimentary biotopes within the MAFLA region occurred on the West Florida Shelf. Florida Middle Ground rock outcrops supported diverse epibiotic communities containing many Caribbean elements. Impoverished epibiotic communities

inhabited the Mississippi-Alabama Shelf where riverine inputs (i.e., freshwater discharges) exerted continuous natural stress. Infaunal samples were numerically dominated by polychaetes represented by 191 species and 10,020 individuals. A total of 4,281 molluscs, 3,084 gastropods, 190 benthic foraminiferans, and 90 scaphopods were reported. Hydrocarbon contents of benthic organisms were biogenic (i.e., pristane and squalene) and no n-alkanes resembling Gulf crudes were present. Zooplankton biomass ranged for 5 to 60 mg m⁻³. Bivalve larvae, calanoid copepods, fish larvae, and tunicates were representative zooplankton. A lack of consistent relationships between concentrations of aliphatics and aromatics in the water column and plankton was observed. Diatoms contributed the highest cell numbers in the shelf phytoplankton fraction and reached maximum values in coastal waters.

STUDY PRODUCTS: State University System of Florida, Institute of Oceanography. 1978. Baseline Environmental Survey of the MAFLA Lease Areas CY 1974, Final Report #2 June 1976/April 1978. A final report for the U.S. Department of the Interior, Bureau of Land Management Gulf of Mexico OCS Office, New Orleans, LA. NTIS No. PB293-913/AS. Contract No. 08550-CT4-11. 190 pp.

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