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KEY WORDS: Western Gulf; Stetson Bank; East Flower Garden Banks; 28 Fathom Bank; South Baker Bank; Southern Bank; Hospital Rock; baseline; biology; geology; hydrography; nutrients; hydrocarbons; epifauna; maps; submersible; infauna; meiofauna; videotapes; photographs; faunal zones; tissue; nepheloid layer; trace metals

BACKGROUND: The initial investigation of topographic features on the Texas continental shelf began in 1974. That study provided baseline biological and geological information to facilitate judgements concerning protective regulations. Fifteen banks were geophysically mapped; six of the banks were examined and sampled using a submersible. This study extended the mapping program to three more banks, included additional submersible work on four banks, assessed past drilling effects at four banks, and pursued quantitative ecological relationships of epibenthic communities and nepheloid layers at two banks. A total of nine banks were investigated.

OBJECTIVES: (1) To produce detailed bathymetric charts for Stetson and East Flower Garden Banks, and 28 Fathom Bank, southwest peak; (2) to complete descriptive reconnaissance studies (i.e., geology, biology, and hydrography of the banks; chemical analyses of sediments and selected fauna for trace metals and high molecular weight hydrocarbons; chemical analyses of the water column for nutrients, dissolved oxygen, and low molecular weight hydrocarbons; and temperature, salinity, and transmissivity

water column profiles) for Blackfish Ridge, and Aransas, Mysterious, and 28 Fathom Banks; (3) to assess the post-drilling environment at Stetson, South Baker, Southern, and East Flower Garden Banks; and (4) to pursue quantitative ecological relationships of epibenthic community distribution and abundance and nepheloid layers at Southern Bank and Hospital Rock.

DESCRIPTION: Field work was divided into three phases: mapping, sampling, and submersible. Phase I provided survey data for construction of detailed bathymetric charts of Stetson and East Flower Garden Banks. Phase II sampling occurred during three legs. Leg I involved water column sampling for chemical analysis at all primary stations of first priority banks. Ten grab samples were taken at each primary station on both first and second priority banks and each was subsampled for geological texture/composition analysis; six samples were sieved for macroinfauna and four grabs were sampled for hydrocarbons, trace metals, Casey foraminifera, and meiofauna. During Legs II and III, transmissometry and salinity/temperature/depth profiles were taken at all stations. On Leg II, water column samples were taken only at primary stations on second priority banks. On Leg III, water column samples were taken at all Hospital Rock and Southern Bank stations. During Leg II, grab samples and gravity cores were collected at East Flower Garden and 28 Fathom Banks. Snappers (*Lutjanus campechanus* and *Rhomboplites aurorubens*) were collected by hook-and-line at the banks for trace metal and high molecular weight hydrocarbon analyses. During the Phase III submersible cruises, biological and geological descriptions, post-drilling biological assessments, and quantitative ecological observations were made on nine banks. Surficial geology, epifauna, and groundfishes were assessed visually using the submersible, scuba divers, or underwater television; observations were documented on videotape or 35-mm color film. Rock dredges, grab samplers, and the submersible's manipulator arm were used to collect epifauna. The arm was used for attachment of a temperature probe, sediment sampler, and hose for collection of water samples. Bottom currents and water movements were studied from the submersible by deploying several series of weighted dye markers.

SIGNIFICANT CONCLUSIONS: A clear-water benthic community occupied the crest of 28 Fathom Bank, southwest peak. Chronic nepheloid layers enveloped the lower portions of Southern Bank and Hospital Rock; Blackfish Ridge and Mysterious Bank were almost always covered by nepheloid layers. Mechanical damage and pathological conditions were noted for corals at East Flower Garden Bank; a brine seep was also discovered at this bank. Stable infaunal communities were found on the flanks of hard banks. Texas-Louisiana fishing banks were prioritized into four categories. No obvious effects of drilling operations were noted at Stetson, South Baker, Southern, or East Flower Garden Banks.

STUDY RESULTS: Biological reconnaissance assessments confirmed that the crest of 28 Fathom Bank, southwest peak, is occupied by a clear-water Algal-Sponge Zone community above 76 m depth. Below this, there is a transformation downward to a unique deepwater (below 120 m) epibenthic community typified by lithistid sponges and large solitary corals. Zonation and the communities at 28 Fathom Bank are essentially the same as those found at East and West Flower Garden Banks below the shallow

coral reefs. Aransas Bank is a typical, high-relief south Texas fishing bank bearing an Antipatharian Zone community which is best developed above 70 m where water turbidity is not as severe and persistent as it is lower on the bank. Blackfish Ridge and Mysterious Bank are classified as low-relief fishing banks that are almost always covered by highly turbid nepheloid layers. Consequently, epifaunal populations on these banks are sparse, although large attached organisms are the same as those found in the Antipatharian Zone of the high-relief banks to the north. Post-drilling assessments at Stetson, South Baker, Southern, and East Flower Garden Banks revealed no obvious effects on epifaunal and groundfish populations. In all cases, benthic communities appeared healthy as in past years and no signs of catastrophic mortality were evident. Quadrat counts at Southern Bank and Hospital Rock support the opinion that species diversity and abundance decrease is a response to high turbidity and sedimentation associated with chronic nepheloid layers enveloping the lower portions of the banks. Chemical analyses of macronekton and *Spondylus* samples imply substantial trace metal pollution. A brine seep was discovered and documented at East Flower Garden Bank. A detailed laboratory-field study of white inclusions in the mucous of the hermatypic coral *Montastrea cavernosa* revealed that they do not appear to be infectious, of pathological significance, or affect normal daily coral behavior. Numerous instances of mechanical coral damage and an array of coral pathological conditions were found at East Flower Garden Bank. Macroinfauna and meiofauna on the flanks of hard banks form stable communities that vary with depth, orientation downcurrent of the main mass of the bank, and sediment grain size. Both groups had substantially higher numbers on banks than on adjacent level bottoms. Nematode/harpacticoid copepod ratios were significantly greater at banks than at transect stations. Texas-Louisiana fishing banks were categorized and prioritized according to hydrographic, geomorphic, and biological characteristics.

1) West Flower Garden, East Flower Garden, and 28 Fathom Banks: Shelf-edge constructional banks of high relief harboring clear-water epibenthic communities, including coral reef and Algal-Sponge Zone communities in which predominant active frame builders are hermatypic corals and coralline algae, respectively.

2) Stetson, Claypile, and Sonnier Banks: Mid-shelf claystone-siltstone banks of shallow crest depth (25 to 30 m) bearing several species of hermatypic corals and numerous tropical reef fishes, and depauperate, clear-water epibenthic communities on their upper portions.

3) Baker, South Baker, Aransas, Southern, and Dream Banks, and Hospital and North Hospital Rocks: Mid-shelf carbonate banks of deep crest depth (56 to 67 m) and high relief that are subject to frequent turbid water influxes and bear moderately developed Antipatharian Zone epifaunal communities.

4) Big Adam Rock, Small Adam Rock, Blackfish Ridge, and Mysterious Bank: Mid-shelf carbonate banks of deep crest depth (60 to 70 m) and low relief which bear poorly developed Antipatharian Zone benthic communities which are subject to almost constant high turbidity and sedimentation.

Geologic observations confirm this classification and delineate carbonate banks (Categories 1, 3, and 4) as construction features and claystone-siltstone banks (Category 2) as lithified Tertiary sediments brought to the surface by salt tectonics. Sediments surrounding

Category 2, 3, and 4 banks are primarily clays with admixtures of sand and silt. Sedimentary aprons around Category 1 banks consist of carbonate sediments produced in situ; these sediments include coral debris facies, algal nodule facies, and *Amphistegina* sands.

STUDY PRODUCTS: Bright, T. J. and R. Rezak. 1978. South Texas Topographic Features Study. A final report by Texas A&M Research Foundation and Texas A&M University Department of Oceanography for the U.S. Department of the Interior, Bureau of Land Management Gulf of Mexico OCS Office, New Orleans, LA. Vol. I (Final Report) - NTIS No. PB294-768/AS (772 pp.); Vol. II (Executive Summary) - NTIS No. PB81-106197 (PC/A04) (52 pp.). Contract No. AA550-CT6-18.

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