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KEY WORDS: Eastern Gulf; Southwest Florida Shelf; biology; faunal zones; benthos; hard-bottom; macrofauna; epifauna; infauna; floral zones; hydrography; water column; sediment; transport; benthic photographs; time-lapse; community; seasonality; videotapes; fish; resuspension; currents; artificial substrates

**BACKGROUND**: In 1980, the U.S. Department of the Interior initiated a multi-year environmental assessment of the southwest Florida shelf. The first three years of study involved geophysical and biological characterization of hard-bottom and soft-bottom areas on the shelf in water depths ranging from 20 to 200 m. The present study, including Years Four and Five, sought to combine the first three years of work with physical environmental measurements to determine how natural ecosystem processes operate before evaluating impacts related to oil and gas activities. This report is essentially a progress report submitted midway during an ongoing two-year study.

**OBJECTIVES**: (1) To compare and contrast the community structure of both live-bottom and soft-bottom fauna and flora to determine the differences and similarities between them and their dependence on substrate type; (2) to determine and compare the hydrographic structure of the water column and bottom conditions at selected sites

within the study area; (3) to determine and compare sedimentary character at selected sites within the study area, and estimate sediment transport; and (4) to relate differences in biological communities to hydrographic, sedimentary, and geographic variables.

**DESCRIPTION**: Field sampling included two sets of stations visited during four seasonal cruises. Group I stations were located in 20 m water depths, sampled during Fall 1983 and Spring 1984, and consisted of 5 hard-bottom and 5 soft-bottom stations. At each soft-bottom station, 10 replicate infaunal samples were collected along with hydrographic and sediment samples. Sampling at hard-bottom stations included dredging, trawling, underwater television, still photography, sediment sampling, and hydrographic measurements (conductivity, salinity, temperature, pH, dissolved oxygen, and transmissivity). Niskin casts were collected at each station during each cruise. Five additional live-bottom stations, each representing a different community type, were sampled during four seasonal cruises. These stations, designated as Group II stations, occurred in water depths greater than 20 m except one station situated in 13 m depths. These stations were sampled quarterly by underwater television, dredge, and benthic still camera. Sediments, and hydrographic parameters were also collected at each sampling time. Instrument arrays consisting of current meters, three sets of sediment traps (0.5 m, 1.0 m, and 1.5 m above the bottom), and 10 sets of substrate plates were deployed at each Group II station. The current meters continuously recorded conductivity and temperature. The arrays at two stations contained wave gauges, tide gauges, and time lapse cameras. All arrays were retrieved at three-month intervals during the study period.

**SIGNIFICANT CONCLUSIONS**: The southwest Florida shelf is a hard-bottom platform overlain with primarily coarse carbonate sediment. Despite the predominance of coarse-grained sediments, 90% of the suspended sediment was silt and clay fractions resuspended by wave action then transported via currents. Apparently wind driven currents, tidal currents, and surface wave-induced bottom orbital velocities operate in concert to resuspend and transport significant quantities of sediment in water depths of 13 m or less. Deeper water stations with similar current velocities did not exhibit sediment resuspension indicating the influence of wave action on the resuspension. These findings have important implications regarding drilling fluid discharges on the southwest Florida shelf. While prevailing easterly winds may retard transport of surface contaminants, the net flow of suspended material would be to the southeast into Florida Bay. Biological communities in shallow waters were subjected to longer periods of turbidity than deeper water communities. Shallow water epifaunal communities consisted of dense associations of soft corals, algae, and sponges which are often subjected to high turbidity and temperature fluctuations. Time lapse photography proved useful in assessing fish behavior around the instrument arrays.

**STUDY RESULTS**: The Group I soft-bottom stations yielded 414 taxa; polychaetes were numerically dominant with 223 taxa, followed by 117 crustaceans and 54 molluscs (23 gastropods, 25 bivalves, 5 scaphopods, and 1 polyplacophoran). Mean density of individuals ranged from 3425 $m^{-2}$ to 15,821 $m^{-2}$ at soft-bottom stations. Videotapes and

dredge and trawl samples revealed hard-bottom stations to be characterized by habitat-forming invertebrates such as sponges, soft corals, and hard corals. Videotapes confirmed the occurrence of corals at stations where none were collected by dredging. Most inner shelf stations were low-relief with varying amounts of sponge and coral cover. Similarity of benthic macroinvertebrates was higher among inner shelf stations than among middle/outer shelf stations. Conspicuous macroinvertebrates occurring at deepest (47 to 75 m water depths) live-bottom stations differed considerably. One station was characterized by the hard coral *Agaricia* and green alga *Anadyomene*. The bottom at another station, in 75-m water depths, was overlain by coralline algal nodules. Crinoids covered the low-relief rock outcrops at a station in 75 m depths. Group I hard-bottom and soft-bottom stations exhibited similar hydrographic characteristics; salinity ranged from 35.08 to 36.46 ppt, dissolved oxygen ranged from 6.5 mg $l^{-1}$ to 8.78 mg $l^{-1}$ and pH varied little ranging from 7.82 to 7.88. Sediments at these stations ranged from coarse sand to fine sand covering a hard substrate.

Trawl samples from Group II stations yielded 98 fish species in 36 families. The most commonly captured species were blackear bass, *Serranus atrobranchus* (6.6 individuals/trawl); the offshore lizardfish, *Synodus poeyi* (4.5 individuals/ trawl); the tattler, *Serranus phoebe* (4.3 individuals/trawl); the shortwing searobin, *Prionotus stearnsi* (1.8 individuals/trawl); and the horned whiff, *Citharichthys cornutus* (1.4 individuals/trawl). Butterflyfishes, groupers, jacks, porgies, and trunkfishes were the most widespread groups of live-bottom fishes. Underwater television revealed additional species not captured by trawl, particularly fast swimmers such as jacks. Several fish families censused with video were restricted in their distributions to either deep water (e.g., bigeyes, bonnetmouths, and squirrelfishes) or to shallow water, inner shelf environments (e.g., snappers and grunts). Time lapse camera data were most useful in assessing fish behavior around the instrument arrays.

Sediment resuspension occurred only at the 13-m, Group II station; there was no evidence of sediment resuspension at the deeper stations. Sediment resuspension at the 13-m station was correlated with the frequency of current speeds exceeding 60 cm $s^{-1}$. Extreme bottom currents were recorded in winter and spring. Time lapse photography did not reveal any bed load transport, though storm-induced bed load transport was suspected. Trapped sediments were predominantly silt-sized particles: 36% clay and 18% sand. Bottom sediments collected throughout the study area were 94% sand. Calcium carbonate content of trapped sediment increased with increasing sediment mass. Mineralogy of the samples showed no evidence of clay minerals, and the calcium carbonate fractions were aragonite and calcite.

Fouling communities developed much faster in shallow waters than deep waters. This suggested that shalllow water epifaunal communities would recover from disturbances faster than deep water areas. The fouling community on settlement plates deployed in shallow waters were well developed after one year, while the plates at 125 m water depth had minimal growth consisting mostly of hydroids. These and other biological data will be analyzed following the second year of the study.

**STUDY PRODUCTS)**: Danek, L. J., M. S. Tomlinson, G. H. Tourtellotte, W. A. Tucker, K. M. Erickson, G. K. Foster, G. S. Lewbel, G. S. Boland, and J. S. Baker. 1985. Southwest Florida Shelf Benthic Communities Study, Year 4 Annual Report. Vol. I, Executive Summary. A final report by Environmental Science and Engineering, Inc. and LGL Ecological Research Associates, Inc. for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS Region, Metairie, LA. NTIS No. PB86-246311. Contract No. 14-12-0001-30071. 55 pp.

Danek, L. J., M. S. Tomlinson, G. H. Tourtellotte, W. A. Tucker, K. M. Erickson, G. K. Foster, G. S. Lewbel, G. S. Boland, and J. S. Baker. 1985. Southwest Florida Shelf Benthic Communities Study, Year 4 Annual Report. Vol. II, Technical Discussion. A final report by Environmental Science and Engineering, Inc. and LGL Ecological Research Associates, Inc. for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS Region, Metairie, LA. NTIS No. PB86-246329. Contract No. 14-12-0001-30071. 296 pp.

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