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KEY WORDS: Eastern Gulf; Southwest Florida Shelf; biology; baseline; hydrography; hard-bottom; infauna; sediment; epifauna; videotapes; benthic photographs; currents; eddy; Loop Current; faunal zones; habitat; colonization.

BACKGROUND: The Southwest Florida Shelf Benthic Communities Study Program commenced in 1980 to investigate the location, nature, and extent of benthic communities across the southwest Florida shelf. The first three years sought to provide baseline information, geophysical and biological habitat mapping and classification of substrates and projection of relative coverage across the shelf in water depths of 20 to 200 m. The next two study years sought to more accurately predict the impacts of oil and gas activities on the southwest Florida shelf. More information on ecosystem dynamics and physical factors was needed. The present report includes the results of the fourth and fifth year field efforts.

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; (3) To determine and compare sedimentary characteristics and estimate sediment transport; and (4) To relate

differences in biological communities to hydrographic, sedimentary, and geographic variables.

DESCRIPTION: Study Years 4 and 5 of the Southwest Florida Shelf Ecosystem Study were designed to provide seasonal data for selected live-bottom and hard-bottom stations and supplemental data for soft-bottom stations. During Year 4, two station groups were sampled. Group I Stations (located in less than 20 m water depths) consisted of five soft-bottom and five hard-bottom stations. Ten replicate infaunal samples were collected at each of the soft-bottom stations. Sediment samples and hydrographic measurements were also collected at each station. Sampling at the hard-bottom stations involved dredging, trawling, underwater television, benthic still photography, sediments, and hydrography. Seven other hard-bottom stations, as well as one Group I hard-bottom station, were selected for detailed biological and physical dynamics studies. During Year 4, five of these stations, designated as Group II were sampled similarly. In situ instrument arrays were installed at these stations. The arrays were equipped with 10 sets of artificial setting plates, three sets of sediment traps (0.5, 1.0, and 1.5 m) above the bottom, and a current meter capable of measuring current velocity and temperature. Two arrays also had wave and tide gauges and all but one, the deepest station, had time-lapse camera/strobe systems. Arrays were retrieved and serviced at three month intervals.

Field efforts during Year 5 included intensive quarterly sampling of the five Group II hard bottom stations and three other stations. These stations were located in water depths ranging from 13 to 125 m. Triangle dredge tows were conducted at only two new stations of the eight. Also, seven of the eight arrays were equipped with time-lapse cameras. At each station, conductivity, salinity, temperature, pH, dissolved oxygen, and transmissivity were recorded at three depths (near-surface, mid-depth, and near-bottom) using a CSTD sonde. Niskin bottle casts were also made at each station to provide a check on the CSTD measurements. Two new transects were surveyed with underwater television and side-scan sonar to supplement habitat mapping efforts completed in previous years. Transect X-1 ran from the Tortugas Shoals southwest to a depth of 100 m; Transect X-2 ran north-south through Station 55 at an average water depth of 27 m. Underwater television surveys were conducted with a black and white stereo video system at seven stations. Density and percentage cover estimates of attached and/or motile biota were made. From trawl collections, selected fish species were analyzed for reproductive condition and stomach contents analysis.

SIGNIFICANT CONCLUSIONS: The physical environment of the southwest Florida shelf changed with depth across the shelf. Tidal currents and surface wave orbital motion were most responsible for sediment resuspension and transport in shallow (50 m) waters. Loop Current intrusions and tropical storms exerted significant influence on shelf circulation. Biological communities were distributed as mosaics reflecting the patchy nature of the substrate. On sandy bottoms, starfish, conch, and sand dollars were prevalent. Sponges, corals, and other organisms protruded through the sand in some areas providing habitat for other invertebrates and fishes. Attached biota, such as corals (soft and stony) and massive sponges, were numerically dominant on

hard-bottoms. Settling plates did not provide information on the structure of the actual recovery of benthic communities (i.e., corals, sponges, octocorals). There was no obvious temporal variability in the abundance of most benthic organisms (except for algae) at most stations.

STUDY RESULTS: Near-bottom currents at the shallow stations on the southwest Florida shelf were dominated by semidiurnal components of the tides. The diurnal component began to predominate in deeper waters. Power spectra for summer and winter currents were similar. Currents at the deeper stations were less consistent with respect to direction, while currents at shallower stations exhibited considerable constancy, usually setting to the south or southeast at less than 2 cm sec^{-1}. The current regime was affected by two phenomena; Loop Current eddies intruding onto the shelf, and passage of major storms. Sediment resuspension and transport was promoted by combined effects of wind-driven currents, tidal currents, and surface wave-induced orbital velocities. Periodically recurring storms did not cause significant amounts of sediment movement or resuspension at depths exceeding 50 m. Stations with the greatest amount of sediment resuspension were also where wave-induced orbital motion exceeded 20 cm sec^{-1}. In general, energy penetration, light intensity, sediment deposition, turbidity obscurations, and wave orbital velocities at the bottom were highest at the stations located in 13 m water depths.

Biological communities reflected the nature of the substrate. Stations located on hard substrate revealed the most attached biota (gorgonians and sponges) and fishes. On hard bottoms, corals, sponges and algae grow, providing shelter for invertebrates and fishes.

Settling plates were fouled most heavily at shallow stations where the most common organisms were hydroids, barnacles, bivalves, bryozoans, ascidians, and serpulids. In deeper water, serpulids were the most abundant settling organisms. The instrument arrays attracted a variety of fishes including jewfish, snappers, and grunts.

STUDY PRODUCTS: Danek, L. J. and G. S. Lewbel. 1986. Southwest Florida Shelf Benthic Communities Study, Year 5 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. MMS Report 86-0074. Contract No. 14-12-0001-30211. 54 pp.

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