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STUDY TITLE: Southwest Florida Shelf Regional Biological Communities Survey

REPORT TITLE: Southwest Florida Shelf Regional Biological Communities Survey, Year 3, Final Report, Volume I: Executive Summary, Volume II: Technical Report, and Volume III: Appendices

CONTRACT NUMBER: 14-12-0001-29036

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREAS: Straits of Florida and Eastern Gulf of Mexico

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CUMULATIVE PROJECT COST: $845,500

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KEY WORDS: Straits of Florida; Eastern Gulf; Southwest Florida Shelf; biology; hard-bottom; maps; distribution; faunal zones; benthos; bathymetry; hydrography; geophysical; videotapes; sediment; epifauna; infauna; grain size; hydrocarbons; benthic photographs.

BACKGROUND: In 1980, the U.S. Department of the Interior sponsored a multi-year environmental characterization of the southwest Florida continental shelf. The first two study years involved benthic station sampling, hydrographic station sampling, and benthic habitat mapping. The third study year was designed to fill gaps in habitat maps produced during the first two years, and to sample stations in shallower water depths (10 to 20 m) than those previously sampled.

OBJECTIVES: (1) To map the distribution of substrate types and benthic community types on the shelf; (2) to characterize the substrate and the benthic community at representative soft-bottom and live-bottom stations; (3) to examine relationships between the composition of benthic communities and factors such as water depth,

latitude, and substrate type; (4) to compare and evaluate certain methodologies; (5) to determine the hydrographic structure of the water column at selected locations; and (6) to discuss findings in relation to pertinent previous and ongoing studies of the west Florida shelf.

DESCRIPTION: The main components of this study were benthic habitat mapping, benthic station sampling, and hydrographic station sampling. Field sampling was conducted during three cruises. Cruise I (October 1982) was conducted to map benthic habitats along selected survey transects. Cruises II (December 1982) and III (May-June 1983) were conducted to sample water, sediments, and benthic biota at representative stations. Geophysical (side-scan sonar, subbottom profiler, and precision depth recorder) and photographic (television camera and 35-mm color still camera, both mounted on a towed sled) survey equipment were used during Cruise I mapping efforts. Five live-bottom stations in water depths ranging from 13 to 19 m were sampled during Cruises II and III. At each station, photographic surveys and dredge, trawl, and quadrat sampling were conducted during each cruise. In addition, divers conducted a fish count to supplement trawl fish data. Sediment trap/thermograph arrays were deployed during Cruise II and recovered during Cruise III. To supplement dredge and trawl collections, divers sampled 35 quadrats at each station. Sampling involved photographing the quadrat, measuring sediment thickness, and harvesting epibiota. The photographic survey was accomplished by towing the television/still camera system over a distance of several kilometers within a square kilometer block. Eleven soft-bottom stations in water depths ranging from 10 to 18 m were also sampled during Cruises II and III. At each of these stations, infaunal samples and sediment samples for grain size, carbonate, and hydrocarbon analyses were collected. Ten infaunal core samples were collected at each station during each cruise. Also, infaunal samples were collected at one of the live-bottom stations and at distances of 5, 8, 30, and 75 m from live bottom.

In the laboratory, quantitative photographs were analyzed using random dot overlays. Hydrocarbons were analyzed with gas chromatography/mass spectroscopy. Dredge and trawl specimens were sorted and identified. Quadrat epibiota were weighed to determine biomass of algae, gorgonians, hard corals, and sponges.

SIGNIFICANT CONCLUSIONS: Based on habitat mapping, the average incidence of live bottom on the southwest Florida shelf was 33%. Live-bottom areas were characterized by algae, gorgonians, and sponges. Zonation patterns of epibiotal assemblages were mostly related to water depth. Most live bottom was associated with thin sand over hard substrate or with surface rubble layers rather than with rock outcrops. Sediments on the shelf were pristine with respect to hydrocarbons.

STUDY RESULTS: Near-bottom temperatures recorded at the ends of transects ranged from 18.5°C at 104 m depth to 28.5°C at 18 m depth. At live-bottom stations during Cruise II, temperatures ranged from 23.9 to 24.7°C; surface and bottom values were similar. Cruise III sampling revealed temperatures ranging from 24 to 28.5°C. Salinity values ranged from 35.15 to 36.00 ppt. The lowest dissolved oxygen values were recorded from the near-bottom waters (104 m); values ranged from 4.4 to 6.5 ml l^{-}

[1]. Transmittance values ranged from 39 to 100%. Nearshore waters were generally turbid while shelf edge waters were clear.

Habitat mapping revealed several major substrate types: soft bottom, thin sand over hard bottom, algal nodule layer over thin sand, and algal nodule pavement. Seafloor coverage along nearshore transects included 56% soft bottom and 44% thin sand over hard bottom. The average incidence of thin sand over hard bottom was lower (18%) and average incidence of soft bottom higher (82%). In 60 to 90 m water depths along the southernmost transect, algal nodule layer over sand averaged 66% and algal nodule pavement averaged 34%. Live-bottom incidence was lower (18%) on the middle shelf transects than on nearshore transects. The algal nodule area with associated sponges and algae was considered 100% live-bottom cover.

Live-bottom stations were characterized by 15 to 20% biotic cover as determined from quantitative photographs. Biotic cover consisted mostly of algae, gorgonians, and sponges. The highest values recorded at a single station (40 to 50%) were due to a single species of brown algae. The total numbers of species identified were 539 from dredges, 280 from trawls, and 449 from quadrats. Algae, crustaceans, molluscs, and sponges comprised two-thirds of the total in the dredge and quadrat collections and over one-half in the trawl collections. Biomass in each quadrat ranged from 312 to 2,162 g wet wt, with sponges accounting for 58% of the total biomass. Comparison between fishes counted by diver and those collected by trawl indicated that differences in fish species composition may be inferred by each method. Mean daily deposition rates in sediment traps at live-bottom stations ranged from 461 to 912 g dry wt when corrected to a square meter of surface area. Most deposited material consists of sediments resuspended during storms. Thermograph data showed minimum bottom temperatures of 17.8°C during winter. Temperatures below 18°C persisted no more than four days.

At soft-bottom stations, sediments were mostly carbonate rather than quartz. Percentage carbonate ranged from 25 to 99% at all stations. A total of 579 infaunal species was collected including 243 polychaetes, 187 crustaceans, and 122 molluscs. The number of species per station ranged from 88 to 200, and mean infaunal densities ranged from 3,000 to 13,272 individuals m^{-2}. There were no consistent relationships between proximity to live-bottom and infaunal abundance, species richness, or diversity. There were differences in species composition near the live-bottom area when compared to other stations. These differences seemed to be related to locomotion/feeding mode of the constituent species. Sediment hydrocarbon levels were low, and predominantly marine biogenic in origin.

STUDY PRODUCTS: Continental Shelf Associates, Inc. 1987. Southwest Florida Shelf Regional Biological Communities Survey, Year 3 Final Report. Vol. I, Executive Summary. A final report for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS Region, New Orleans, LA. Contract No. 14-12-0001-29036. 49 pp.

Continental Shelf Associates, Inc. 1987. Southwest Florida Shelf Regional Biological Communities Survey, Year 3 Final Report. Vol. II, Final Report. A final report for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS Region, New Orleans, LA. Contract No. 14-12-0001-29036. 419 pp.

Continental Shelf Associates, Inc. 1987. Southwest Florida Shelf Regional Biological Communities Survey, Year 3 Final Report. Vol. III, Appendices. A final report for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS Region, New Orleans, LA. Contract No. 14-12-0001-29036. 579 pp.

Other study products include:

Continental Shelf Associates, Inc. 1986. Southwest Florida Shelf Regional Biological Communities Survey, Year 3 Final Report, Marine Habitat Atlas. A final report and map series for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico OCS Region, Metairie, LA. Vol. 1 (Map Series, 28 oversize maps) - MS Report 86-0072; Vol. 2 (Narrative Report, 47 pp.) - NTIS No. PB86-246147; MMS Report 85-0059. Contract No. 14-12-0001-29036. 2 Vols.

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