ACCESS NUMBER: **29168**

STUDY TITLE: South Atlantic Living Marine Resources Study, Year I.

REPORT TITLE: South Atlantic OCS Area Living Marine Resources Study. Vols. I through III.

CONTRACT NUMBER(S): BLM: CT9-27; MMS: 14-12-0001-29168.

SPONSORING OCS REGION: Atlantic.

APPLICABLE PLANNING AREA(S): South Atlantic.

FISCAL YEAR(S) OF PROJECT FUNDING: 1979; 1980; 1981.

COMPLETION DATE OF REPORT: October 1981.

COST(S): FY 1979: $531,704; FY 1980: $206,643; FY 1981: $857; CUMULATIVE PROJECT COST: $739,204.

PROJECT MANAGER(S): V. Burrell, Jr.

AFFILIATION: Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Department.

ADDRESS: Box 12559, Charleston, South Carolina 29142.

PRINCIPAL INVESTIGATOR(S)*: D. Blizzard, B. Boothe, D. Calder, C. Harris, D. Knott, T. Mathews, G. Sedberry, F. Stapor, R. Van Dolah, E. Wenner.

KEY WORDS: South Atlantic; biology; North Carolina; South Carolina; Georgia; Florida; biology; hard-bottom; hydrography; videotapes; photographs; epifauna; fish; seasonality; shelf.

BACKGROUND: Widespread areas of hard bottom on the continental shelf offshore the southeastern United States are important to commercial and recreational fisheries of the region, but the ecology of these areas is poorly known. The region has been opened to oil and gas exploration, and areas of prime industry interest often coincide with outcroppings of sedimentary rock that support abundant sessile epibiota and bottom fishes. This study was funded to provide a better understanding of such "live-bottom" habitats so that potential impacts of oil- and gas-related activities could be assessed and minimized.

OBJECTIVES: (1) To characterize invertebrate and fish communities associated with representative live-bottom habitats on the continental shelf offshore the southeastern United States; (2) To characterize food habits of selected fish species of commercial or recreational importance; (3) To conduct a limited assessment of bottom topography and substrate type; and (4) To evaluate potential impacts of oil- and gas-related activities on live-bottom organisms.

DESCRIPTION: Four representative live-bottom stations were chosen in each of three depth ranges (inner shelf, 19 to 27 m; middle shelf, 28 to 55 m; and outer shelf, 56-100 m) on the continental shelf offshore North and South Carolina, Georgia, and northeastern Florida. Nine stations offshore South Carolina, Georgia, and Florida were sampled during winter (January-March) and summer (August-September) 1980; the three stations offshore North Carolina were sampled only during summer. Sampling at each station generally included: (1) profiles (10-m depth intervals) of water column temperature, salinity, transmissivity, and dissolved oxygen, and a light penetration (Secchi depth) measurement; (2) three 20-min transect surveys using a towed television system; (3) collection of 25 color still photographs each at 1- and 3-m heights above the bottom (0.5 and 3.0 m^2 areal coverage, respectively); (4) diver surveys (inner and middle shelf stations only) to measure bottom relief, collect rock samples, and photograph fishes and epibenthos; (5) trawl sampling of fishes and other nekton using a 40/54 fly net (3 day and 3 night tows of 1 km each); (6) deployment of baited fish gears (Antillean S-traps, vertical longlines, and manual snapper reels); (7) collection of juvenile fishes using an epibenthic sled (two 5-min night tows); (8) dredge sampling of epibiota and rocks using a heavy-duty Kahlsico rock dredge (two 0.1-km tows); and (9) collection of five samples of small epibiota and infauna

in sediments overlying hard bottom using 0.1-m^2 suction (inner and middle shelf stations) or Smith-McIntyre grab (outer shelf stations) samplers.

All samples and data were processed and analyzed to produce physical and biological descriptions of the stations and to elucidate spatial and seasonal trends. Physical descriptions were based on data from diver and television surveys and petrographic analyses of rock samples. Benthic epibiota were characterized by analysis of television and still photographs and data from dredge, trawl, and suction/grab sampling. Numerical classification and reciprocal averaging ordination techniques were applied to dredge, trawl, and suction/grab data; diversity (Shannon index) and evenness (Pielou's J') values were calculated and dominance-diversity curves plotted only for the suction/grab data. Fish populations were described (biomass and abundance) on the basis of data from trawls, baited fish gears, television and diver surveys, and epibenthic sled sampling. Stomach contents of selected fish species were analyzed to determine the composition and inter-species overlap of fish diets.

SIGNIFICANT CONCLUSIONS: Live-bottom areas were typified by expanses of sand-covered hard bottom and scattered outcrops and ledges of low to moderate relief (generally <2 m). Outcrops were most common at outer shelf stations, which were located on a series of discontinuous ridges (remnants of ancient reefs) that extend from offshore North Carolina to northern Florida. Bottom coverage by epibiota averaged 60 to 100% for most stations. Both tropical and warm-temperate forms of invertebrates and fishes were common. Species composition of live-bottom communities varied in relation to depth and, to a lesser extent, latitude and season. Sponges contributed most of the attached biomass (wet weight) at stations offshore South Carolina, Georgia, and Florida, and macroalgae contributed most at stations offshore North Carolina. Abundance of bottom fishes at live-bottom stations was higher than reported for soft-bottom habitats; enhanced abundance and diversity of fishes reflects in part availability of numerous food organisms and shelter associated with live-bottom habitats. Offshore oil- and gas-related activities could have deleterious effects on live-bottom organisms, primarily through smothering or burial of epibiota; however, the presence of platforms and other structures could have favorable effects by increasing the amount of available habitat.

STUDY RESULTS: Bottom temperatures ranged from about 12 to 29°C on the inner shelf, 15 to 25°C on the middle shelf, and 15 to 19°C on the outer shelf. Salinities were generally >35 ppt except at a few inner and middle shelf stations that were affected by river runoff during winter. Dissolved oxygen levels were consistently high (generally <4 ml l^{-1}). Water clarity measurements showed no consistent patterns; transmittance ranged from 38 to 94%, and Secchi depth from 6 to 31 m.

Substratum relief ranged from <0.5 to about 2 m. Live-bottom coverage ranged from about 60 to 100% at most stations and exhibited no consistent geographic trends. The incidence of rock outcrops ranged from 5 to 40% and was highest at outer shelf stations, which are located along a series of discontinuous relict reefs that extend from offshore North Carolina to northern Florida. Rock samples from inner and middle shelf stations were similar in composition, consisting of heavily encrusted and bioeroded fragments of sandy biomicrite. Only one sample, a quartz sandstone rock, was obtained from an outer shelf station.

A total of 1,175 invertebrate taxa were collected by dredge, trawl, suction, and grab sampling. Species richness and biomass of epibenthic organisms differed between stations and seasons, but not in a consistent pattern. At stations offshore South Carolina, Georgia, and Florida, sponges contributed the most biomass (especially at inner shelf stations, where large sponges were common) and the most frequently collected organisms in dredges and trawls were species of bryozoans, hydroids, and sponges. At stations offshore North Carolina, macroalgae, hard corals, and molluscs contributed the most biomass, and species of macroalgae, molluscs, and decapod crustaceans were the most frequently collected organisms. Species composition varied in relation to depth, with inner and outer shelf biota being the most dissimilar.

Fish abundance, biomass, and community composition varied in relation to depth, season, and time of collection (day vs. night). The biomass and abundance of commercially important species were highest at middle shelf stations. Biomass was higher during summer than winter at most stations. Night trawls collected a different and more diverse group of fishes than day trawls. Abundances of most species showed large seasonal differences, but seasonality of biomass and species composition was lowest at middle shelf stations. Benthic crustaceans (decapods, amphipods, etc.) were a major food source for most of the fish species (four from stations offshore North Carolina; seven from the remaining stations) whose gut contents were examined, but diets of the fishes showed little overlap.

STUDY PRODUCT(S): Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Department, and Georgia Department of Natural Resources, Coastal Resources Division. 1981. South Atlantic OCS Area Living Marine Resources Study. A final report for the U.S. Department of the Interior, Bureau of Land Management Atlantic OCS Office, New York, NY. Set - NTIS No. PB82160086; Executive Summary - NTIS No. PB82160094; Vol. I - NTIS No. PB82160102; Vol. II - NTIS No. PB82160110; Vol. III - NTIS No. PB82160094; Appendices - NTIS No. PB82160094. Contract No. AA551-CT9-27.

*P.I.'s affiliation may be different than that listed for Project Manager(s).