

**STUDY TITLE:** Southwest Florida Shelf Coastal Ecological Characterization

**REPORT TITLE:** The Ecology of the South Florida Coral Reefs: A Community Profile

**CONTRACT NUMBERS:** BLM: MU0-48; MMS: 14-12-0001-30036

**SPONSORING OCS REGION:** Gulf of Mexico

**APPLICABLE PLANNING AREAS:** Straits of Florida; Eastern Gulf of Mexico

**FISCAL YEARS OF PROJECT FUNDING:** 1980; 1981; 1982; 1983

**COMPLETION DATE OF REPORT:** August 1984

**COSTS:** FY 1980: \$390,973; FY 1981: \$350,000; FY 1982: \$200,000; FY 1983: \$150,000

**CUMULATIVE PROJECT COST:** \$1,090,973

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**KEY WORDS:** Straits of Florida; Eastern Gulf; Southwest Florida Shelf; Florida; baseline; biology; characterization; coral reef; community; ecosystem; benthos; Florida Current; plankton; fish; productivity; impacts; coastal zone; historical review; literature review; synthesis

**BACKGROUND** Coral reefs are a unique community limited to tropical and subtropical climates. Coral reefs are biologically and economically important habitats. Increased reef usage in south Florida due to population growth emphasizes the importance of proper management of this environment. South Florida reef communities are in close proximity to areas of potential oil and gas activities. Because of habitat location and sensitivity, it is vital to present information concerning management and potential man-induced impacts.

**OBJECTIVES:** (1) To describe coral reef community structure and function; and (2) to present potential impacts to these communities and outline appropriate management of coral reef resources.

**DESCRIPTION:** The report presents information concerning coral reefs in general, however, emphasis is on reefs of south Florida. This report is a synthesis of knowledge concerning the environment, community types, benthic fauna and flora, plankton, fish populations, ecology, and management of south Florida coral reefs. Also present is a historical synopsis of Florida coral reef research. This document should serve as a reference for responsible personnel concerned with environmental management and those seeking a better understanding of Florida's coral reefs.

**SIGNIFICANT CONCLUSIONS:** Florida coral reef development is maximized to the south and west of Cape Florida, offshore of the Florida Keys archipelago. This reef system is the only

shallow water (<10 m) tropical coral reef ecosystem on the United States continental shelf. Coral reefs are considered one of the most productive ecosystems on earth, and organism diversity may exceed that of all other marine ecosystems.

Reef systems are very complex and consist of a near balance of constructive (accumulation of calcareous framework) and destructive (biological and physical degradation) forces. Most significant impacts to coral reefs, presently, are due to natural causes (e.g., hurricanes). Human impacts have the potential to increase, since Florida coral reefs accounted for an estimated 30-50 million dollars annually from fishing, diving, education, and research. The need to preserve reef resources stems as much from its economic as its biological value. Before coral reef resources can be managed effectively, more data and multidisciplinary studies are necessary. Increased development in close proximity to south Florida coral reefs increases the potential of human impact (e.g., dredging and oil). Hydrocarbon pollution is poorly understood as it relates to coral reefs. Detrimental effects of dredging have been established. It is the opinion of this report that field surveys (e.g., monitoring) and concurrent research need to be done as a critical part of dredging activities.

**STUDY RESULTS:** Coral reefs are tropical or subtropical phenomena, having distribution limited by climate, substratum, temperature, light, salinity, and sediments. Recent coral reef growth in south Florida began 5,000 to 7,000 years ago.

One factor considered critical to coral reef development and maintenance in south Florida is the Florida Current which provides plankton. Plankton provides food for various trophic levels and recruitment which maintains reef populations.

Four coral community types occur off southeast Florida. Listed in a seaward progression, the communities are: live bottom, patch reef, transitional reef, and major bank reef. All these communities are characterized as shallow water, wave-resistant, and constructed by calcium carbonate secreting organisms on a pre-existing hard substrate.

Coral reefs exhibit a highly diverse benthic community. Faunal groups critical to community structure are algae, sponges, and cnidarians (e.g., corals). All three groups are important for niche creation. Biological control of algae occurs by competition for space and grazing. Sponges are major space competitors, having the best overgrowth capability. They also serve as shelter and food for other reef organisms, and are considered a major bioerosional factor on coral reefs. Corals most responsible for reef development are *Acropora palmata* and *Montastraea annularis*. Soft corals are functionally important to the reef community principally as shelter and refuge.

The coral reef plankton community is highly abundant and diverse. Most zooplankters are residents of the coral reef. The zooplankton population consists of true planktonic forms that use reef formations and water currents to maintain position within the reef. The majority of zooplankton are epibenthic forms that migrate from the substrate to the water column at night. The coral reef phytoplankton assemblage is similar to open water communities.

Fish assemblages are more diverse on coral reefs than any other habitat, numbering approximately 450 species. Fish constitute a major portion of the faunal biomass of a coral reef. Most fish are classified as either herbivorous or carnivorous while very few utilize an omnivorous or detrital feeding mode. Many fish use the reef for refuge and utilize adjacent habitats (e.g., grass beds) for feeding. Multihabitat utilization by fish is a prominent nutrient pathway. Evolved behavior and resource availability largely determine social organization of

reef fish. Coral reefs generally have numerous microhabitats, which allow occupation by a high diversity of fish species.

Coral reef fish resources are extensively utilized. Four species groups (grunts, snappers, dolphin, and grouper) comprise almost the entire recreational and commercial harvest.

Coral reefs have a high level of symbiosis, which contributes to high diversity and productivity. Organism interactions are very complex; most interactions are due to food and shelter associations. Space competition is the major competitive interaction, playing an important role in determining community structure.

Natural impacts consist predominantly of hurricanes and thermal stress. Hurricanes cause considerable habitat alteration and increased turbidity. Both heat and cold can cause negative impacts on the reef. Heat stress usually occurs in late summer and is localized, whereas cold stress is usually due to cold water mass movement. Natural impacts maintain species diversity by opening new spatial habitat.

Human impacts to coral reefs consist of dredging, anchor damage, ship groundings, fishing, diving, and pollution. In terms of severity, dredging is the most damaging human impact. The State of Florida and Federal agencies have established parks, sanctuaries, and regulations to properly manage and limit potential human impacts.

**STUDY PRODUCT:** Jaap, W. C. 1984. The Ecology of the South Florida Coral Reefs: A Community Profile. A final report by U.S. Fish and Wildlife Service for the U.S. Department of Interior, Minerals Management Service Gulf of Mexico OCS Region, Metairie, LA. NTIS No. PB85-243509. FWS/OBS-82/08. Contract No. 14-12-0001-30036. 152 pp.