Benthic Communities of Biscayne Bay, Florida

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1973

[Restored and transferred to electronic form by A. Y. Cantillo (NOAA) in 1999. Original stored at the Library, Rosenstiel School of Marine and Atmospheric Science, University of Miami. Minor editorial changes were made.]

INTRODUCTION

The City of Miami and Dade County have grown rapidly in the past decade. Many people desire shoreline property for housing, and many more are interested in water oriented sports specially boating. At the same time scientists and conservationists have learned that it is the coastal zone and shallow estuarine areas that are biologically the most productive in the world. This has led to a dilemma. How can we have coastal areas utilized by people and at the same time preserve these areas? The obvious first step in developing a rational plan for our coastal zone is a resource assessment which shows the areas of high productivity and biological value which should not be altered and those areas which are less productive and could be altered to the benefit of man. In Biscayne Bay, the benthic communities were described by McNulty (1961). The area north of Rickenbacker Causeway was described by McNulty *et al.* (1962a). Kohout and Kolipinksi (1967) reported on the central area. The South Bay, Card Sound regions were investigated by Bader and Roessler (1971). Kolipinksi and Higer (1970) using multiband aerial photography studied an area near Turkey Point in south Biscayne Bay.

The objectives of this paper are: (1) to develop and make available a chart identifying the major bottom communities from Card Bank (south Card Sound) to Venetian Causeway (north Biscayne Bay); (2) to briefly discuss their relative biological value; and (3) to recommend which communities could be altered by dredging and filling with least impact on the ecosystem desired by men.

METHODS

The location, identification and mapping of the marine benthic vegetation in Biscayne bay and Card Sound was done by diver-biologists working along transects between the mainland shore and the upper Florida Keys (Figure 1).

In Card Sound and Biscayne Bay south of Featherbed Bank, the diver-biologist was towed behind the boat along each transect. He observed until the bottom community changed, then signaled the boat operator to stop. The boat was anchored and a navigational fix taken by triangulation of known landmarks. Instruments used were bearing binoculars, hand-held siting compass, pelor**us** or sextant. Two and usually three instruments were used to obtain lines of position and if the readings varied by more than ±2°, a third reading was taken. After locating the position on charts US SC141, the tow was resumed and the diver-biologist continued his visual survey until another change in bottom type was observed. The same three divers were used throughout the survey. The first day of the study was spent examining different types of communities and defining them so the diver-biologists observation would be consistent.

In the areas north of Featherbed Bank and where ever else the turbidity made it impossible to clearly view the bottom while towing behind the boat, an alternative procedure was used. At the beginning of each transect the diver-biologist described the benthic shoreline community

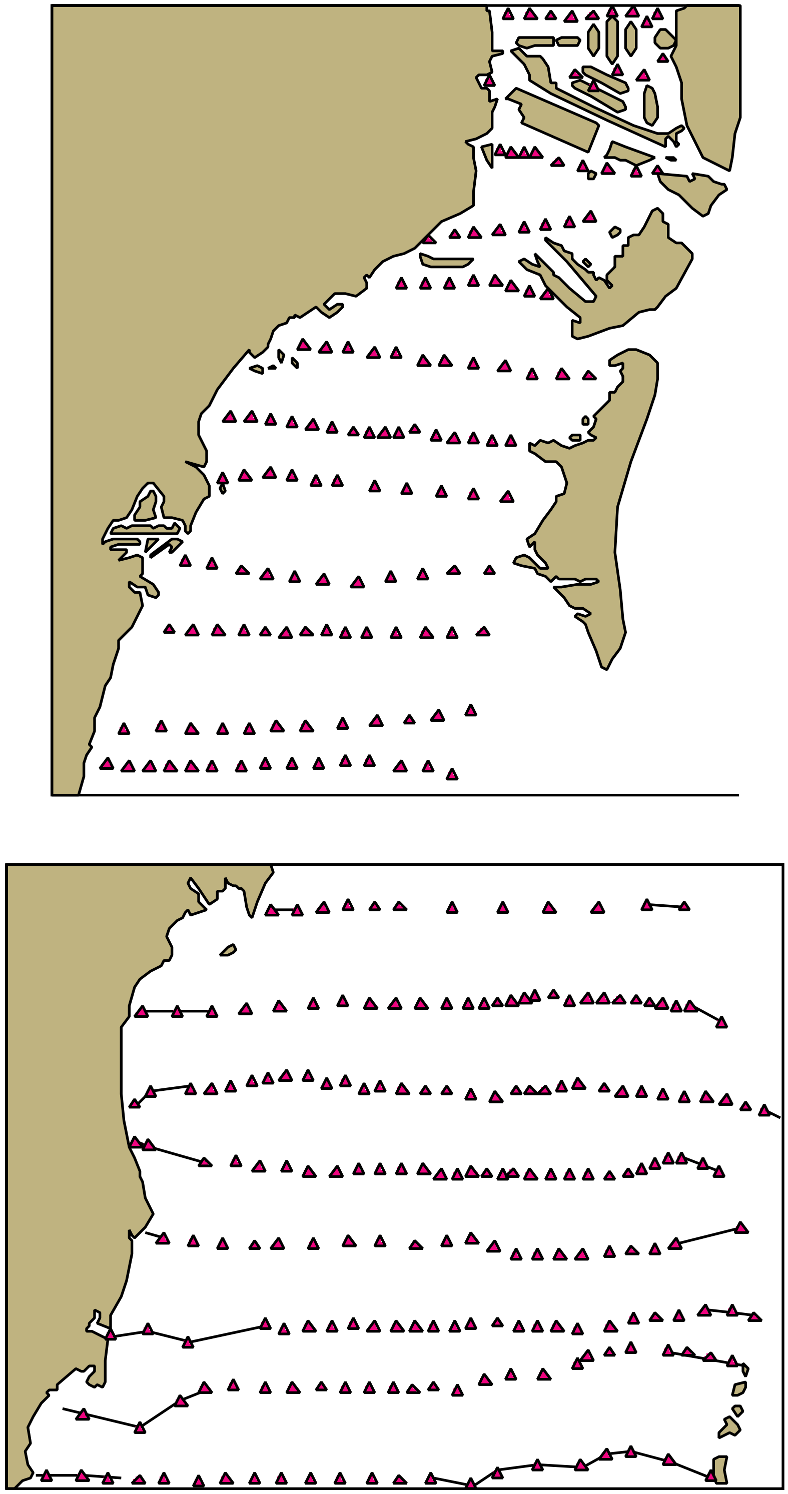

Figure 1. Transects between the mainland shore and the upper Florida Keys. (Lines depict transects in which the diver was towed and triangles denote a navigational fix.)

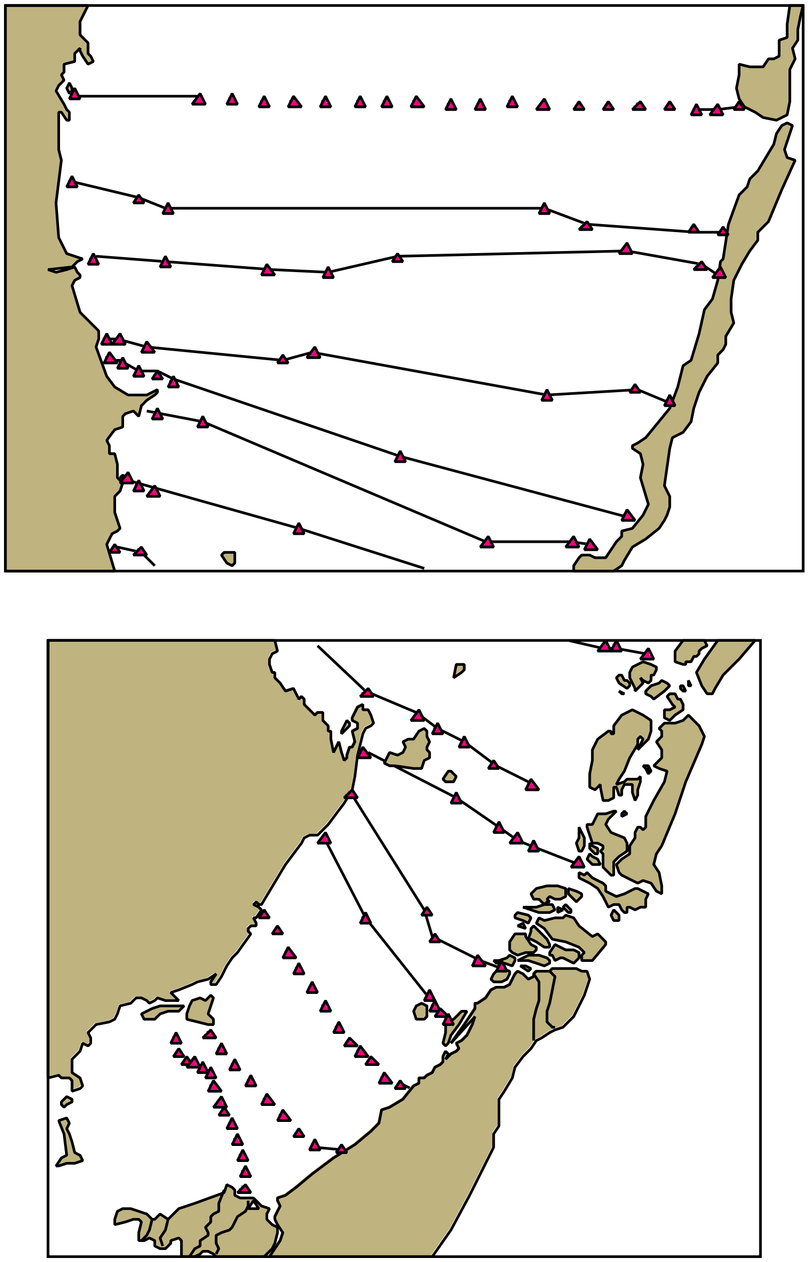

Figure 1. Transects between the mainland shore and the upper Florida Keys. (Lines depict transects in which the diver was towed and triangles denote a navigational fix.) (cont.)

and a fix was taken. Then a series of timed stations were examined along the transect. The boat was run along the transect on a compass heading for one minute at two thirds throttle. After stopping the biologist would dive and describe the bottom. The heading was resumed and another one minute run made. At each fifth station the boat was anchored and a navigation fix taken.

RESULTS

Six different communities were found. These were: (1) the turtle grass, *Thalassia testudinum* community; (2) the Cuban shoal weed *Diplanthera wrightii*; (3) the sparse *Thalassia* - green algae community; (4) the hard sand - green algae community; (5) the barren sand areas; and (6) the mud-silt bottom community. The distribution of these communities is shown in Figures 2 - 5.

The *Thalassia* community found near the shoreline on shallow banks and near the Florida Keys was composed to 15 - 100% Thalassia, often overlain with red algae (*Laurencia* spp, *Digenia simplex*, and *Acanthophora* sp.). This community was most common in the clear waters south of Feathered Bank and close to the Keys. Zieman (1970) showed the correlation between *Thalassia* and sediment depth but as shown by Wanless (1969) and McNulty (1961), sufficient sediments occur in northern bay areas to support *Thalassia*. It is probably excluded by high turbidity. The *Diplanthera* community us usually found close to shore or in muddy areas and appears to require softer more organic sediments than *Thalassia*. It generally covers 30 - 100% of the substrate. In Card Sound, it is restricted to the southeast corner. Then *Diplanthera* occurs along the mainland shore of Biscayne bay from Turkey point northward and becomes the dominant grass community in the more polluted and disturbed areas north of Key Biscayne. It is not found in the deeper parts of the northern Bay despite adequate sediments, probably because of turbidity.

The sparse *Thalassia* (5 - 20% cover) and the green algae-sand communities occur generally in the central portions of the Bay. The Thalassia is found growing in crevices and pot holes in a bottom which is predominantly composed of calcite rock with 2 - 5 cm of shell fragment and coarse sand. If numerous crevices and pot holes occur, the sparse Thalassia community exists but if the sediment is thin and few holes exist the dominant vegetation is composed of green algae, predominantly *Udotea*, *Penicillum*, *Rhipocephalus* and *Halimeda*. These algae generally attached by holdfasts to stones or shells of sufficient size to serve as anchors. In southern Biscayne Bay and Card Sound, sponges and alcyonaria are commonly found in this community. They are generally attached to rocks but often grow large enough to drift freely with currents carrying the small attached rocks.

Sand which is almost barren occurs near Featherbed Bank and in the tidal channels of the Safety Valve area. Where rock outcroppings occur, sponges occur in the Featherbank area.

The soft mud-silt covered with microalgae occurs in a small stretch between Pumpkin Key and Steamboat Creek in Card Sound and in central and northern Biscayne Bay. The Card Sound mud appears associated with the Ocean Reef marine and poor circulation. the northern mid-silt areas appear to be associated with high turbidity and urban runoff from Miami, Coconut Grove, Coral Gables, and Gables by the Sea.

Trawl studies in southern Biscayne Bay and Card Sound by Roessler *et al.* (1971) and Bader and Roessler (1972) have shown greatest diversity and abundance of animals occurs in the read algae (*Laurencia-Digenia*) complex but these algae are seasonal and appropriately named "rolly moss" because of their ability to drift with the currents. generally the algae are most abundant near shower over *Thalassia* and *Diplanthera* communities but may also be in great quantities where sponges are common.

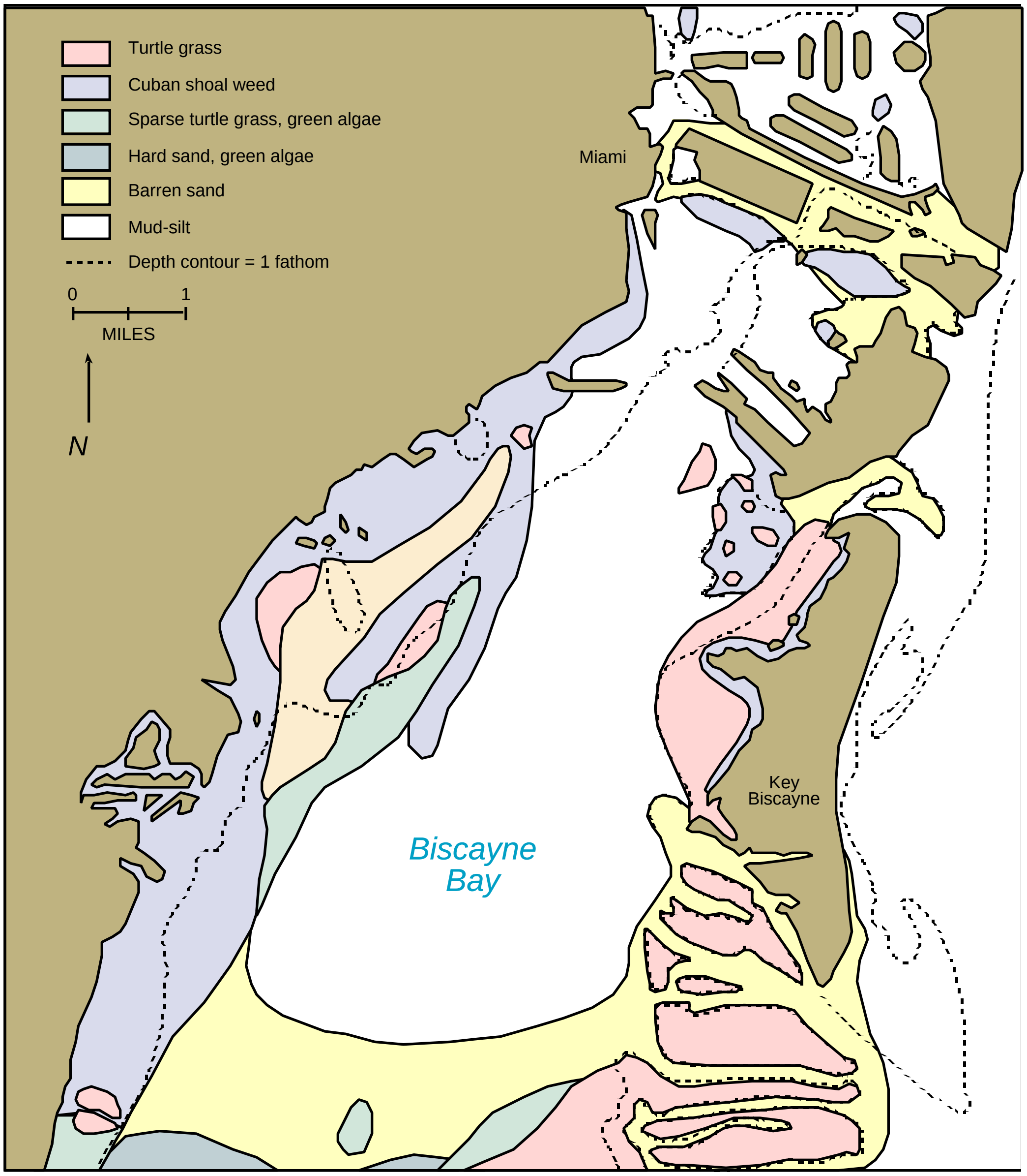

Figure 2. Results of survey of northern section of Biscayne Bay.

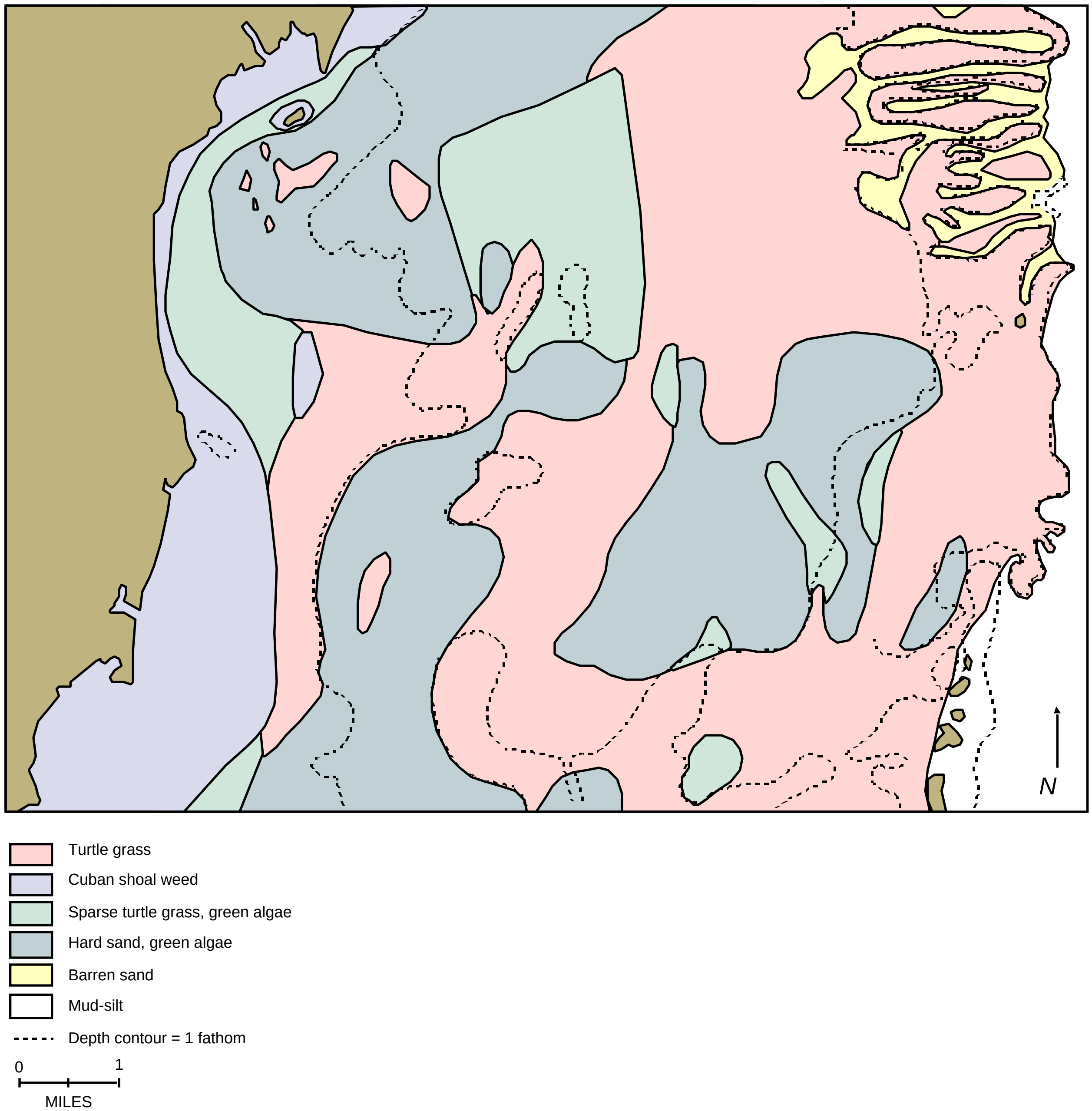

Figure 3. Results of survey of northern mid section of Biscayne Bay.

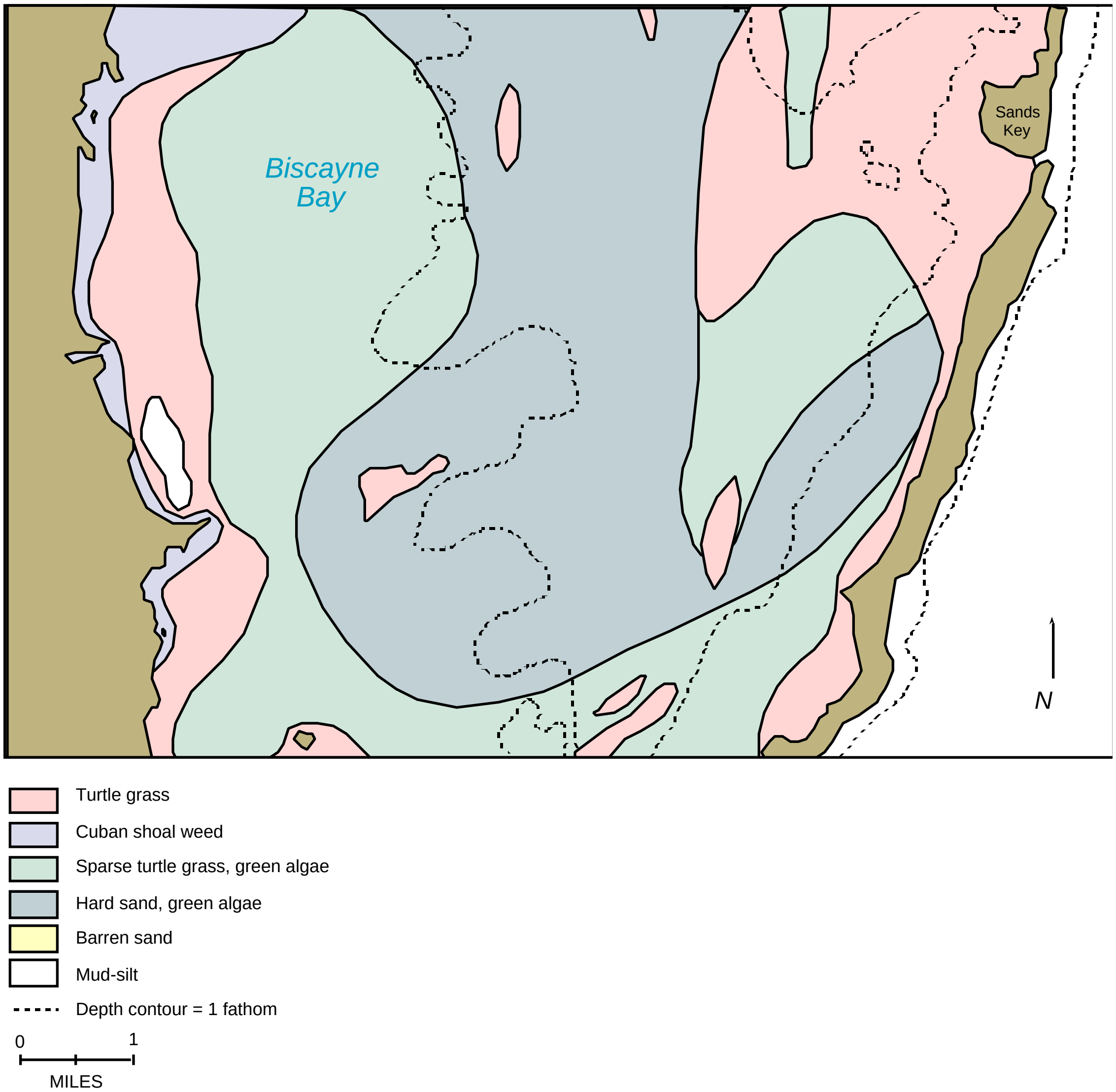

Figure 4. Results of survey of southern mid section of Biscayne Bay.

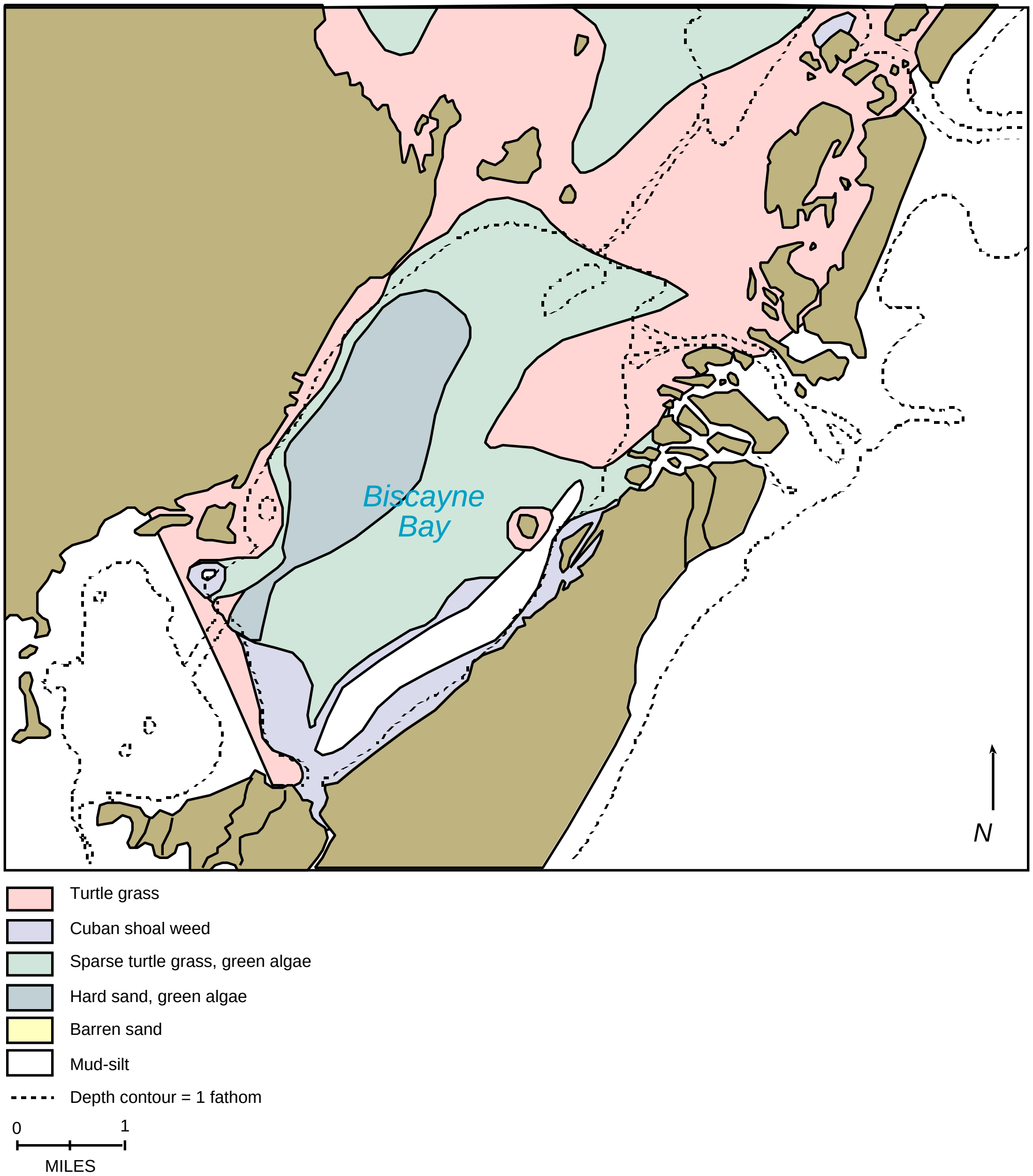

Figure 5. Results of survey of southern section of Biscayne Bay.

Trawl samples indicate *Thalassia* and *Diplanthera* are productive of animals; the sparse *Thalassia* and sand-green algae are less productive of animals; the sparse *Thalassia* and sand-green algae are less productive; and barren sand is virtually a desert. The mud community was not sampled by trawling but the work of McNulty *et al.* (1962a and b) and McNulty (1970) shows except for a few polychaete worms and brittle stars the muds are not productive. Sandy muds found in inshore areas have large populations of bivalve mollusks.

CONCLUSIONS

In planning for channels for access to marinas, for navigation or for dredging to obtain fill areas containing grass beds should be avoided and operations restricted to mud or sand areas. The mud is generally deeper but the higher organic content and finer particle size will cause higher turbidity and BOD than the coarse sand areas. These sand areas are generally shallow beds overlying calcium carbonate rock which should provide good fill material.

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ACKNOWLEDGEMENTS

This work was supported by NOAA Sea Grant NOAA 04-3-158-27. The US AEC, EPA and Florida Power and Light purchased the vessel used and supported and trawl studies used in evaluating the fauna found in the various communities.

Drs. Durbin C. Tabb and E. J. Heald, Tropical BioIndustries Deveopment Company, Mr. R. Nixon and Ms. J. Sprogie, Rosenstiel School of Marine and Atmospheric Science, University of Miami read the manuscript and mad valuable criticism.