

No. 07

WINDLEY KEY FOSSIL REEF STATE GEOLOGICAL SITE, FLORIDA KEYS

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Location and access

Enter the Keys on US 1 and travel through Key Largo toward Islamorada. Continue through Tavernier Key and Plantation Key. Windley Key is the next key and the one on which Holiday Isle is situated. If you pass Holiday Isle, you have gone about 400m too far SE. Fees can be waived for educational groups. Call 305-664-2540 for details.

What there is to see

Unusual outcrops of the Key Largo Formation that show the internal structure of the Pleistocene coral reef (which is a good model for the internal structure of modern reefs (the past is the key to the present ?).

Background

The Pleistocene Key Largo Formation underlies the Upper Keys from Soldier Key (about 10 miles south of Key Biscayne), through Key Largo, to Marathon. The formation was originally defined by Sanford (1906) The lower Keys, by contrast, are composed of poorly investigated Pleistocene oolite (similar to that in Miami). The Key Largo Formation has variable thickness that ranges from about 20 to 55 m.

Windley Key has the highest elevations in the Florida Keys reaching some 18 feet (~6m) above sea level. Quarrying at Windley Key began in 1908 to provide rock for the southern extension of construction of Henry Flagler's Florida East Coast Railway. After completion of the railway, quarrying continued to provide ornamental "Keystone" for architectural projects (the Coconut Grove Library and Viscaya are examples of buildings constructed from Keystone). Keystone was produced sporadically at the quarry until the early 1960's when quarrying ceased.

In the late 1970's and early 1980's the property was acquired by developers, who wished to build a development on the area. The Miami Geological Society, among others, fought to maintain the area as a geological site of interest. Eventually the site was purchased in 1985 through Florida's Conservation and Recreation Land (CARL) program.

There are three main quarry sites - from west to east they are: Windley Quarry, Flagler Quarry and Russell Quarry.

Rock type(s)

Observations

The rock is a cream to white colored rock that is obviously made up of large organic structures. These are framework-building corals. Limestones such as this are called *framestones* by sedimentologists because the fossil organisms built up an interlocking framework.

The fossils present include the same large reef framework-building organisms that populate reef tracts at the present time: star coral (*Montastrea annularis*), the larger star coral (*Montastrea cavernosa*), brain coral (*Diploria labyrinthiformis*). There other smaller sized species present including stag-horn coral (*Acropora cervicornis*), finger corals (*Porites porites*, *Porites asteroideus*), and smaller brain coral (*Diploria strigosa*).

In some of the star coral and brain coral you can see annual growth bands about 4 to 5 cm thick. These occur because the changes in growth rate during the seasons. The density of the skeleton deposited is greater during the slow growing cooler months than in the faster growing warmer months. X-rayed slabs of the fossil coral heads show that there are finer, daily growth bands within the larger scale annual bands.



Fig. Growth bands on a head of star coral (*Montastrea annularis*)

Notably absent are fossils of staghorn coral (*Acropora palmata*) which is a dominant species on the seaward crests of modern reef tracts (including that of the present day Keys) where. Many coral colonies are penetrated by tubes, indicating predation by other organisms.

Other organisms include various species of bivalves (clams) and calcareous algae.

Although corals are abundant, examination of the quarry indicates that

they compose only part of the reef volume. Moreover, the proportion of corals to other components varies vertically. At the base of the quarry, corals compose over 60% of the rock, while in the upper 30 cm. or so the proportion of corals falls to 10-15%. Sediment surrounding the corals heads is composed of

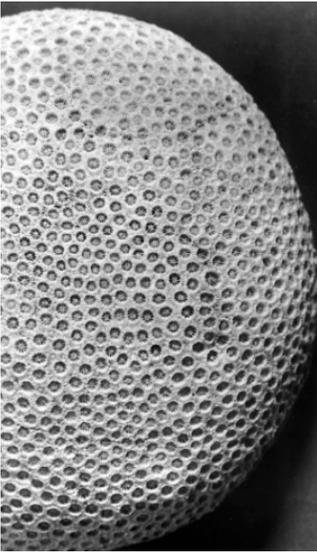
Interpretation

The Key Largo Formation obviously represents a fossil reef tract. The absence of *Acropora palmata* has led some geologists to interpret that the Key Largo Formation is not, however, a seaward reef tract, but is instead a lagoonal patch reef tract behind the main reef tract. Another possibility is that in the late Pleistocene, *Acropora palmata* had not yet migrated to southern Florida (*A. palmata* is found in reefs of the same age in the Caribbean).

References and further reading

- Harrison, R.S., and Coniglio, M., 1985 Origin of the Pleistocene Key Largo Limestone, Florida Keys, Bulletin of Canadian Petroleum Geology, v. 33(3), p. 350-358.
- Hoffmeister, J. E., Jones, J.I., Milliman, J.D., Moore, D. R. and Multer, H. G., 1964, Living and fossil reefs of south Florida, Miami Geological Society Field Guide, 28 pp.
- Hoffmeister, J. E. and Multer, H. G., 1968, Geology and origin of the Florida Keys, Geological Society of America Bulletin, v. 79, p. 1487-1502.
- Sanford, S. 1909, Topography and geology of southern Florida: Florida Geological Survey, 2nd annual report, p. 175-231.
- Stanley, S. M., 1966, Paleoecology and diagenesis of the Key Largo Limestone, Florida, Bulletin of the Association of Petroleum Geologists, v. 50 (6) 1927-1947.

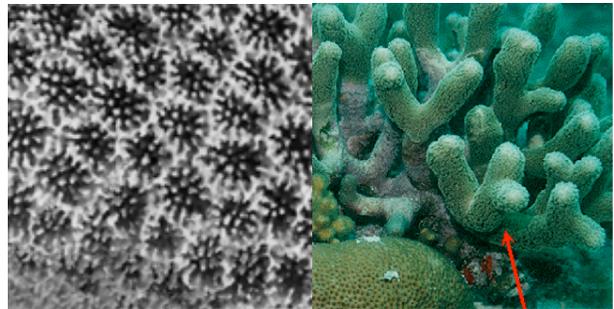
Appendix: some common coral skeletons



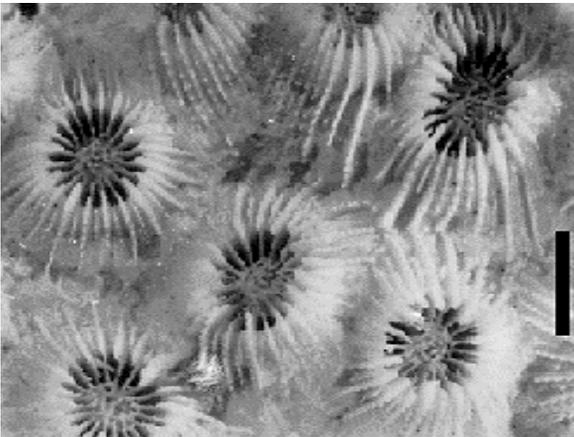
Montastrea annularis (star coral)



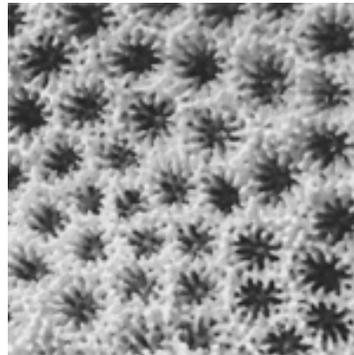
Acropora cervicornis (stag horn coral)



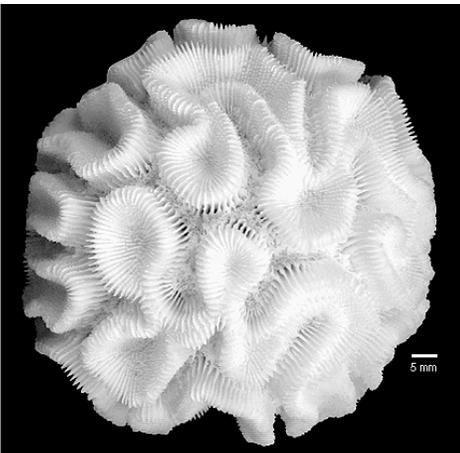
Porites porites (finger coral)



Montastrea cavernosa



Porites astreoides



Diploria labyrinthiformis (brain coral)



Acropora palmata