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DIVING INVESTIGATIONS OF BERMUDA'S DEEP WATER CAVES

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Mixed gas rebreathers allowed divers to explore the shelf edge of the Bermuda sea mount at depths from 60 to 136 m to search for potential refugia of anchialine taxa during Pleistocene periods of sea level regression. Divers discovered karst and sea level features including a remnant natural bridge cave, drowned coral reefs, wave-cut notches and high relief escarpments.

Key words: anchialine, Pleistocene, sea level eustasy, mixed gas rebreather diving, Bermuda

INTRODUCTION

The inland anchialine caves of Bermuda, like many others in the Caribbean and elsewhere in the world, contain evidence of extended periods of sub-aerial exposure such as massive, now underwater stalactites and stalagmites. During a large part of the Pleistocene, regressed glacial sea levels were as much as 120 m below present levels such that essentially all known anchialine habitats would have been dry and air-filled. This raises the question as to where current anchialine species could have resided.

In order to attempt to answer this question, a three part program was initiated. The first two phases in the search for Bermuda's deep water caves consisted of multi-beam sonar mapping of the shelf edge from 60 to 200 m depths, followed by ROV dives to investigate potential points of interest (ILIFFE et al., 2011). The third and last phase of the current project involved a series of mixed gas rebreather dives reaching depths between 60 and 136 m. These were the deepest scuba dives ever attempted in Bermuda and resulted in the discovery of remnant natural bridge caves, drowned coral reefs, deep sea level notches and near vertical, high relief escarpments.

MATERIAL AND METHODS

A four member deep diving team used closed circuit rebreathers with 10:50 (10% oxygen, 50% helium, 40% nitrogen) trimix to make a series of dives to depths between 60 and 136 m along the shelf edge of the Bermuda and Challenger seamounts. Dive sites were selected based upon previously obtained multibeam sonar maps and data from ROV dives.

RESULTS AND DISCUSSION

A total of eight deep dives were conducted during the project between depths of 60 to 136 m. The first dive resulted in the discovery of a natural bridge cave off

Fig. 1. Rebreather divers sampling rocks at base of natural bridge cave in 64 m depth near North Rock, Bermuda (photo by Jill Heinerth).

Fig. 2. Drowned reef at 60 m depth off South Shore, Bermuda (photo by Jill Heinerth).

North Rock at 64 m depth (Fig. 1). This short cave, open at both ends, was situated perpendicular to the platform edge and appeared to be a small remnant of what was once a much larger system carrying fresh water runoff to the sea at times when the entire platform top was exposed and a substantially larger catchment area existed.

A drowned coral reef occurred at 60 m depth off Bermuda's South Shore (Fig. 2). Although it's primary reef building corals were long dead due to deep submergence by rising sea level, colorful sponges and other encrusting organisms still cover the old reef.

Fig. 3. Diver at sand-floored, wave-cut or bioerosional notch in side of Bermuda Platform at 100 m depth off the East End of the Bermuda Platform (photo by Jill Heinerth).

Fig. 4. Rebreather diver exploring near vertical escarpment at 136 m depth on the edge of the Challenger Bank, Bermuda (photo by Jill Heinerth).

A sea level notch consisting of a 1.5 m deep by 2 m high indentation into the rock cliff face was found at 100 m depth near the East End of the main platform (Fig. 3). The level floor of this notch, covered in white sand, ended at a relatively smooth, concave indentation in the otherwise irregular rock surface and extended horizontally for at least 50 m or more. This shape is consistent with notches forming today along high energy coastlines of Bermuda's north and south shores (NEUMANN, 1966).

Two dives to a maximum of 136 m depths were made on the edge of Challenger Bank (Fig. 4), an adjacent sea mount whose summit is submerged by 50 m. The

near vertical escarpment rimming the bank perimeter was far more irregular than the rock faces circling the edge of the main Bermuda platform and all visible surfaces appeared to be covered with carbonate encrustation.

CONCLUSIONS

Due to restrictions placed on divers by depth and decompression obligations, only a brief period was available for exploration on these dives. Considering the great size of both the Bermuda and Challenger Banks, not to mention Argus Bank that is similar in depth and size to Challenger, there is obviously much left to be discovered by further exploration. A manned submersible would greatly aid in this exploration and assist in locating sites that could subsequently be directly investigated by divers.

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