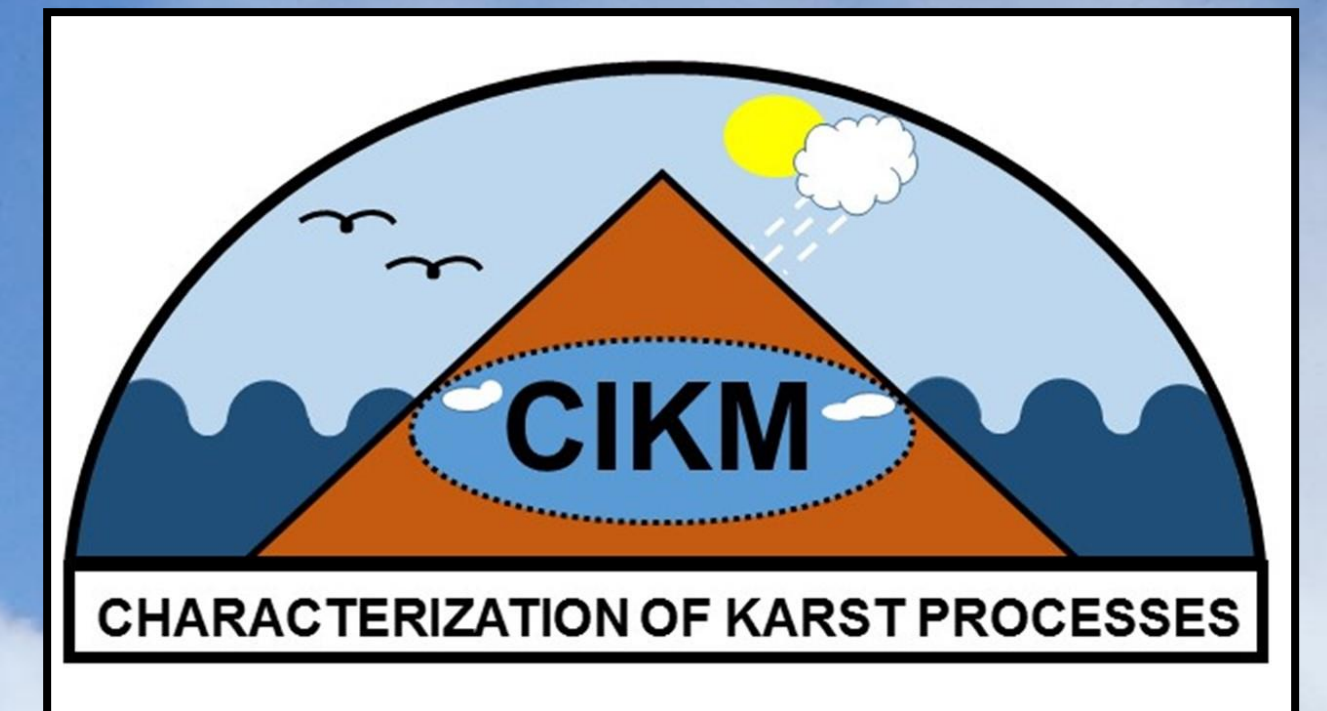


The Flank Margin Caves of Cayman Brac

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Background Image: The northeast end of Cayman Brac, showing a MIS 5e subtidal carbonate bench in the foreground, and the uplifted Oligocene Brac Formation (limestone and dolomite) escarpment, with cave entrances, in the background. Person in red circle for scale.

ABSTRACT: Cayman Brac is one of three carbonate islands in the Cayman Archipelago, located approximately 200 km south of Cuba and 120 km east of Grand Cayman, at 19° 43' N and 79° 47' W. As a result of pre-Pleistocene tectonics along the Caribbean-North American plate boundary, the island is 19 km long and 1.5 km wide, uplifted to 43 m at the east end, sloping to sea level at the west end. The Oligocene Brac Formation (limestone and dolostone) is present in the uplifted east end; a subaerial exposure surface (~8 million years) separates the unit from the overlying Cayman Formation. The bulk of the island is Miocene Cayman Formation dolostone; some unconformable overlying Pedro Castle Formation is present at the west end of the island. Surrounding this core and its vertical escarpment, with an unconformity of several million years, is the Pleistocene Ironshore Formation limestone, at ~4 m elevation, indicating little tectonic movement since MIS 5e. An extensive notch is found at ~ 6 m elevation, also indicating recent tectonic stability. This notch is rich in calcite speleothems and forms continuous dissolutional surfaces with adjacent flank margin caves, indicating that it is a breached karst feature and not a bioerosion relict. In December of 2014, the Coastal Cave Survey conducted a thorough reconnaissance and cave inventory, which resulted in 34 caves being surveyed across the island. Flank margin caves are developed in all three lithologic units at many elevations (for the Cenozoic units), with several exceeding 200 meters in surveyed length. Pit caves are also found on the plateau with depths up to 10 m. Cave entrances open on the extensive cliff faces in large numbers; the sharp, jagged nature of the surficial karren on the island plateau make access difficult in many cases. The majority of caves surveyed on this expedition meet the criteria for flank margin caves as a series of globular chambers exhibiting phreatic, slow-flow morphologies, and are restricted to what would have been the island perimeter at the time of their speleogenesis. The multiple subaerial exposure events create the possibility that some caves are Oligocene in age. The caves exhibit use by pre-Columbian Amerindians, early European settlers, and modern inhabitants.

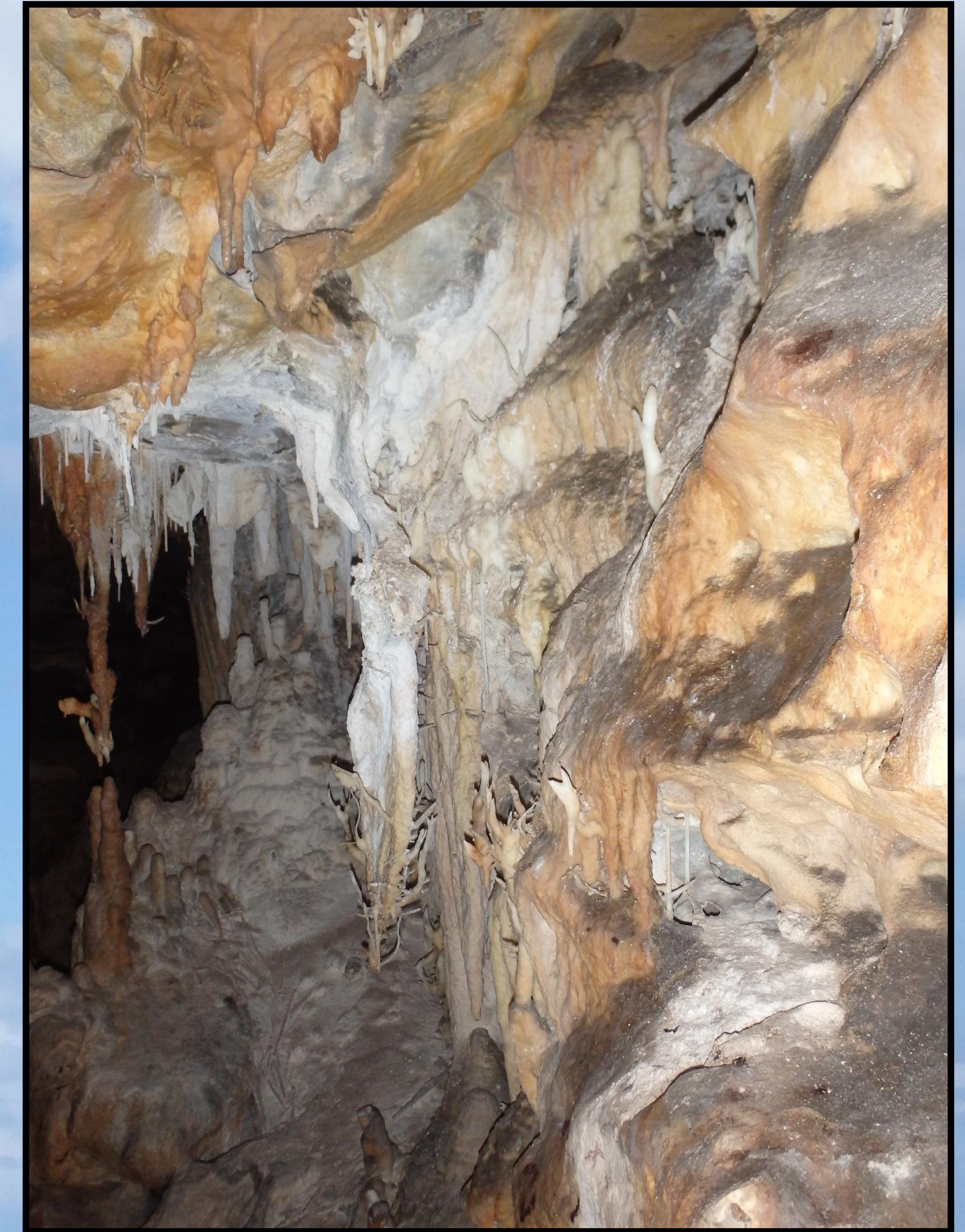


Figure 4: Some Cayman Brac flank margin caves are large enough that conditions for speleothem growth continue despite cave entrance development and ventilation.



Figure 2: Flank margin caves exposed by scarp retreat of the Brac Formation (people in red ovals for scale). The entrances occur at a variety of elevations, indicating episodic pre-Quaternary tectonic uplift, local sea-level change, and vertical change of the fresh-water lens position.



Figure 3: Skull (Halfway Ground) Cave, central north shore of Cayman Brac, developed in the Miocene Cayman Formation. The cave displays laminar flow phreatic features typical of flank margin caves.



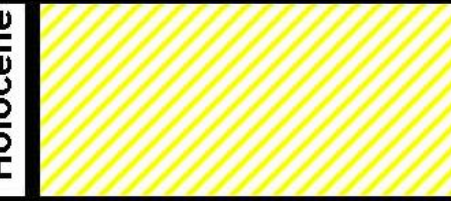

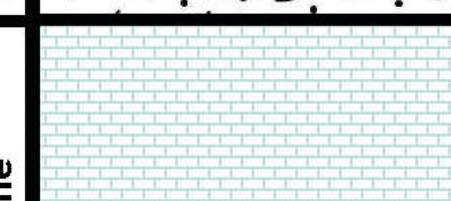
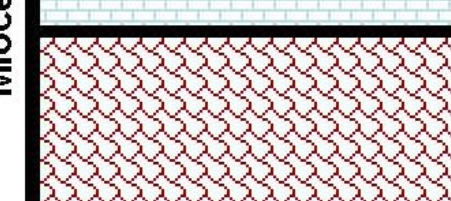
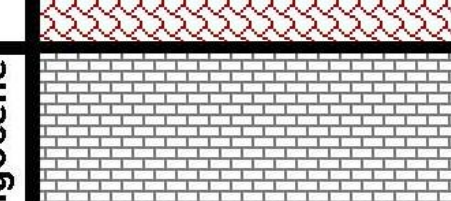

Holocene		Holocene Carbonates
Pleistocene		Ironshore Formation
Miocene		Pedro Castle Formation
Oligocene		Cayman Formation
Mesozoic		Brac Formation
		Oceanic Crust (not exposed)

Figure 1: Location map, island map and geologic column for Cayman Brac.

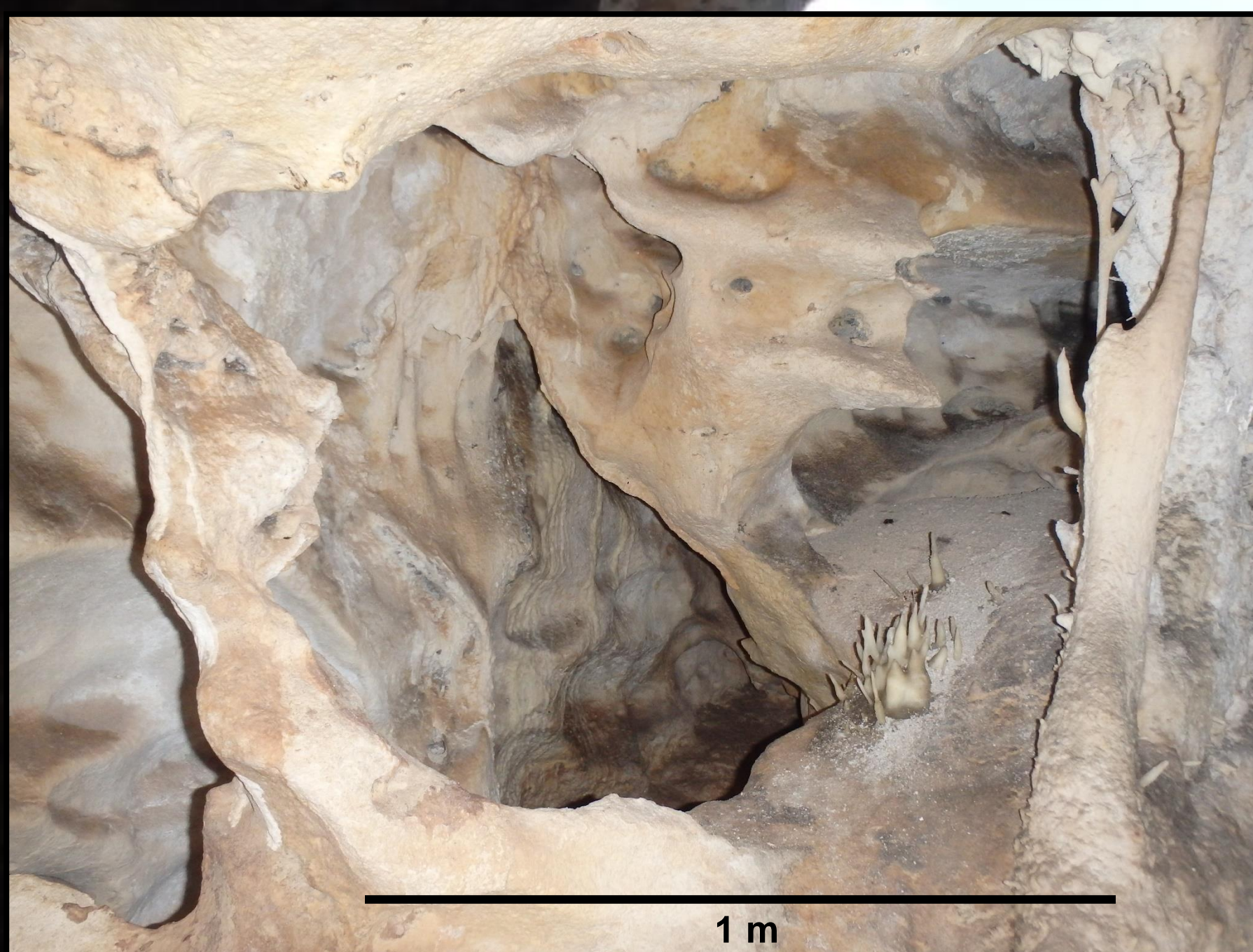
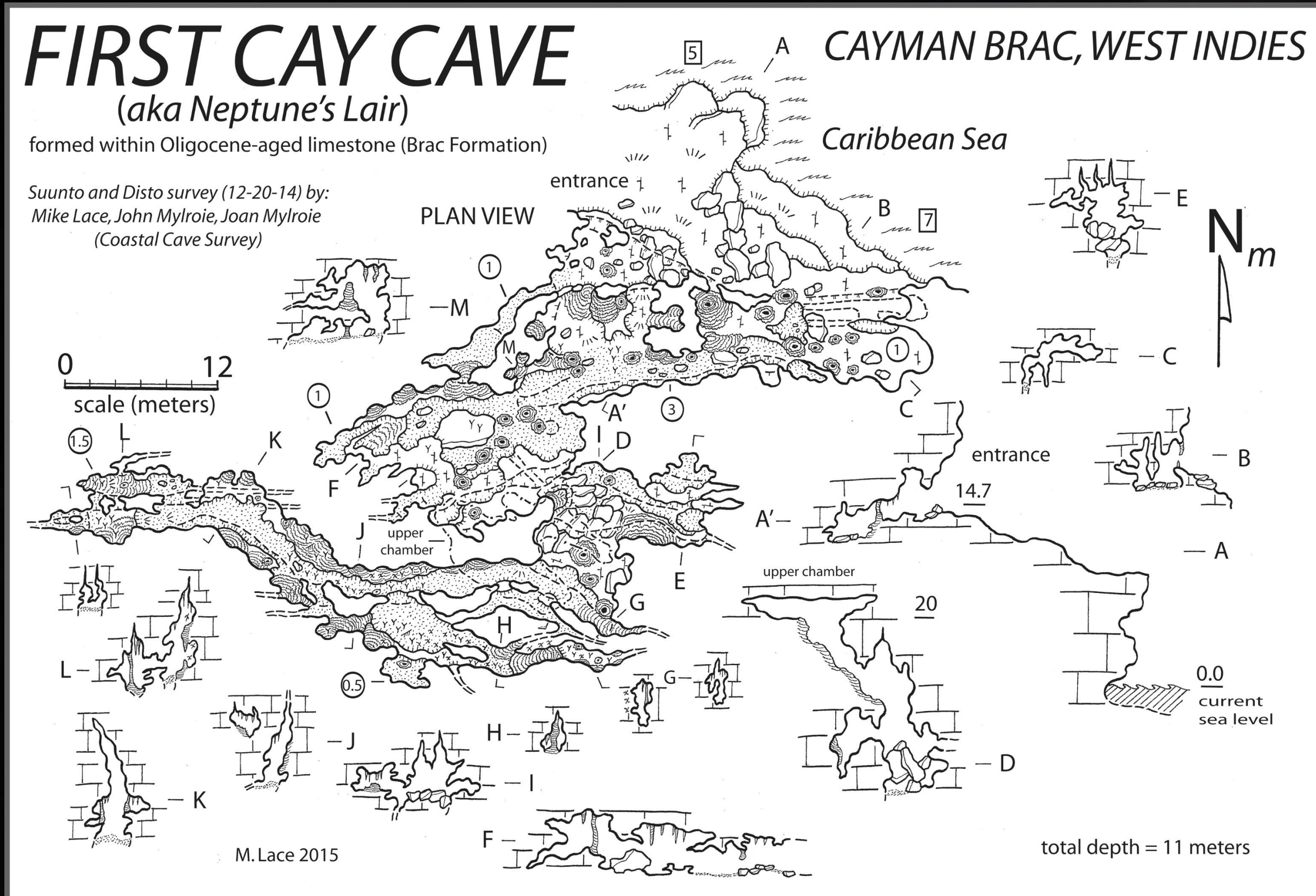


Figure 5: First Cay Cave on the eastern north coast is a large, complex flank margin cave in the Brac Formation, with three levels exhibiting varied phreatic dissolution surfaces.

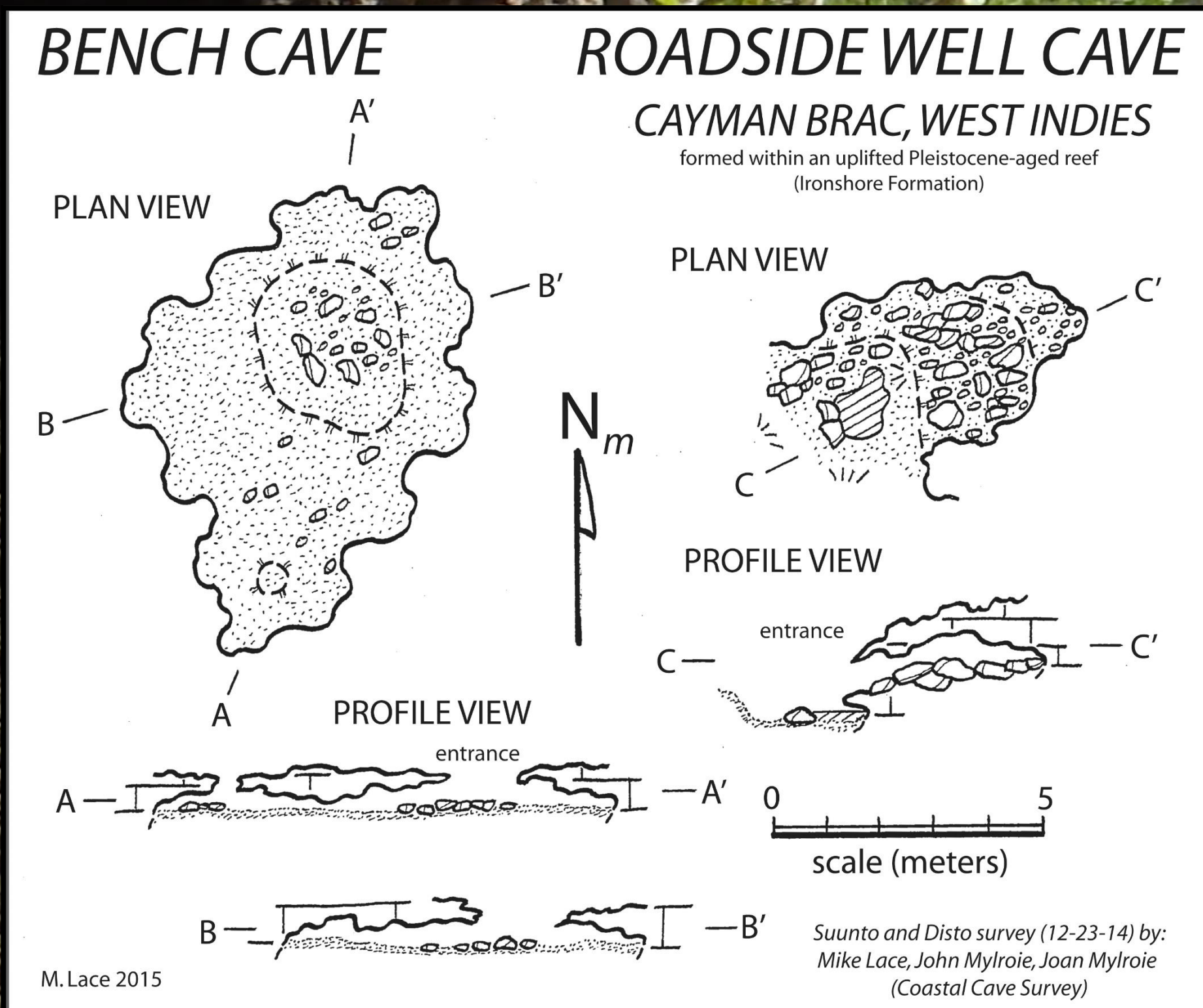
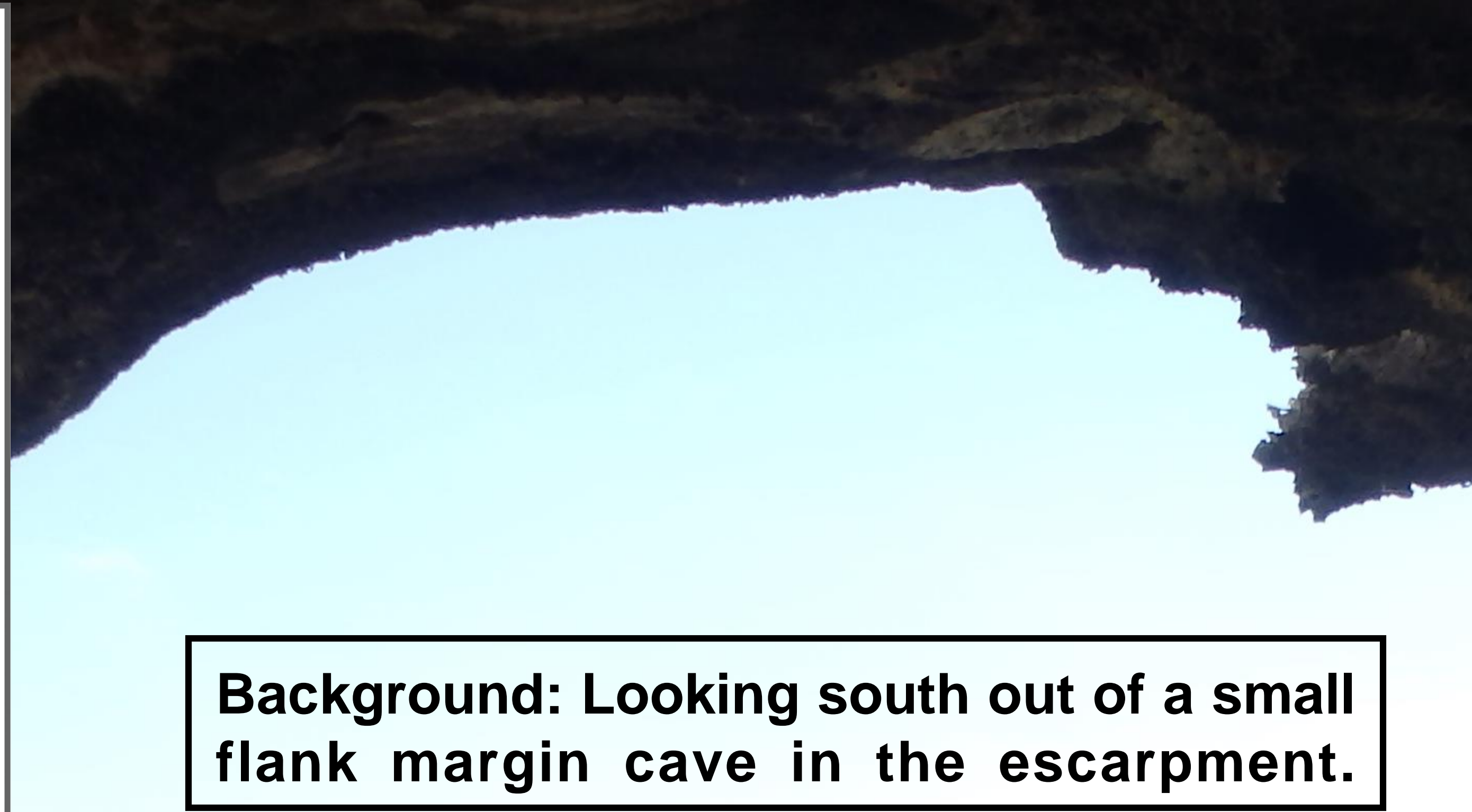


Figure 6: Map of two small caves developed in the Ironstone Formation. Images from Bench Cave, south and seaward of First Cay Cave. On the south coast, Roadside Well Cave is located near Bat Cave.



Background: Looking south out of a small flank margin cave in the escarpment.

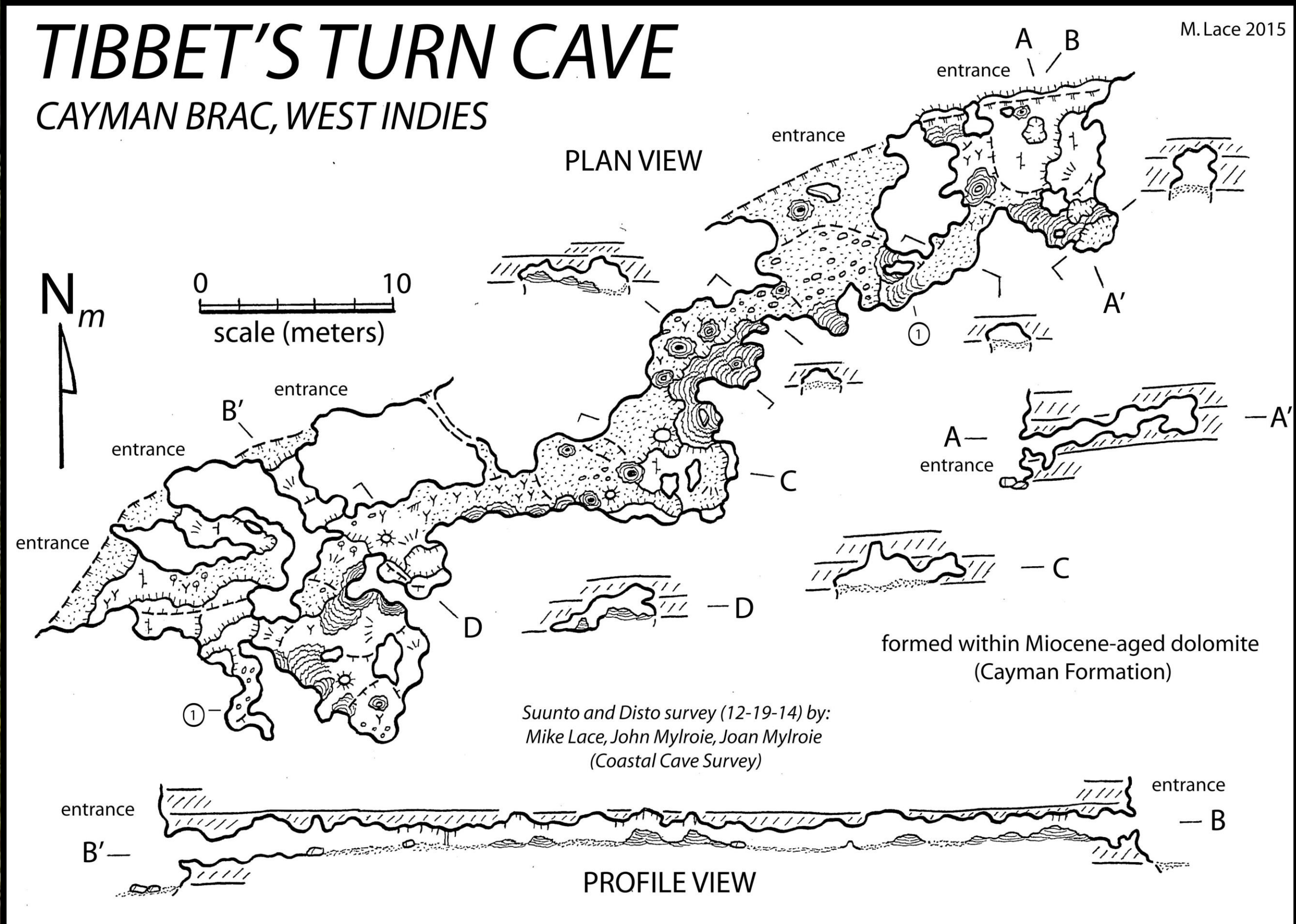


Figure 7: Tibet's Turn Cave, Cayman Formation, north coast, displaying scarp-parallel cave development typical of flank margin cave genesis.

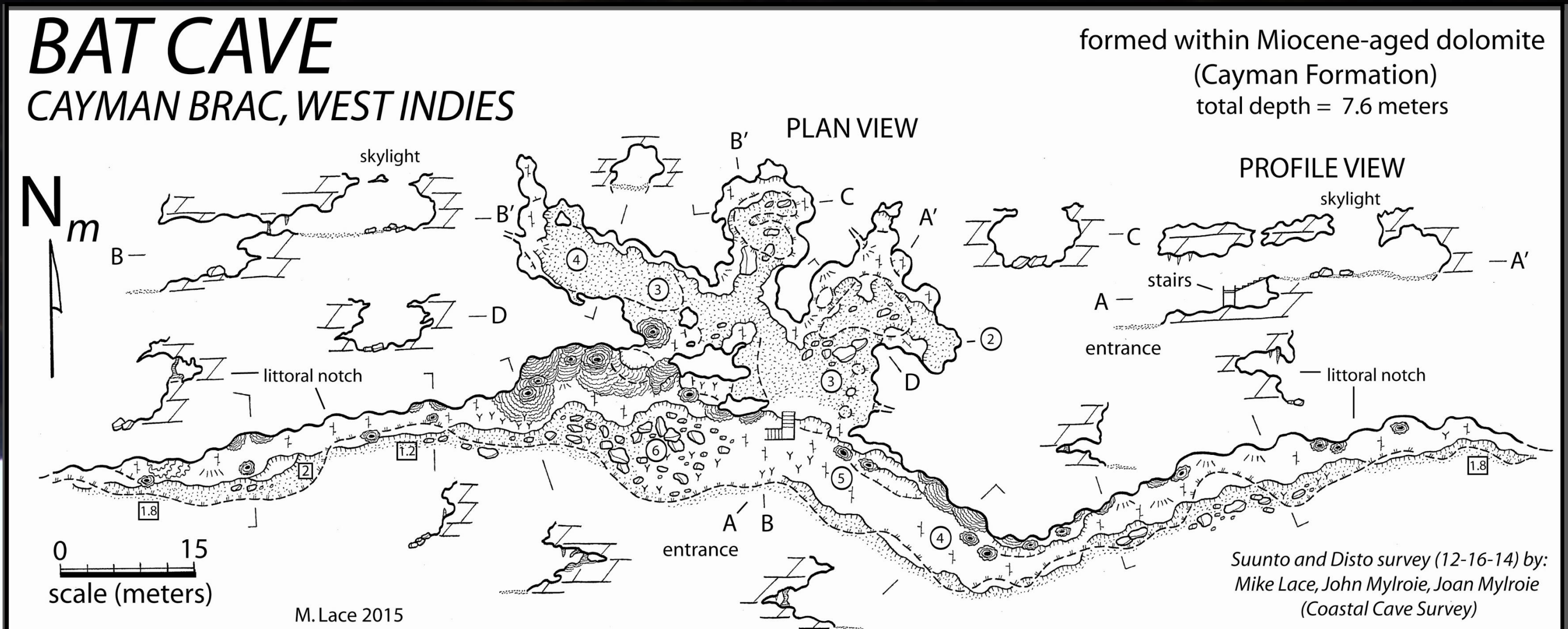


Figure 8: Map of Bat Cave, Cayman Formation, south coast, showing that notches here are not bioerosion notches (left-hand image, person in oval), but breached scarp-parallel dissolutional voids. Right-hand image displays terra rossa breccia infill formed prior to cave dissolution (object in oval 8 cm long for scale).

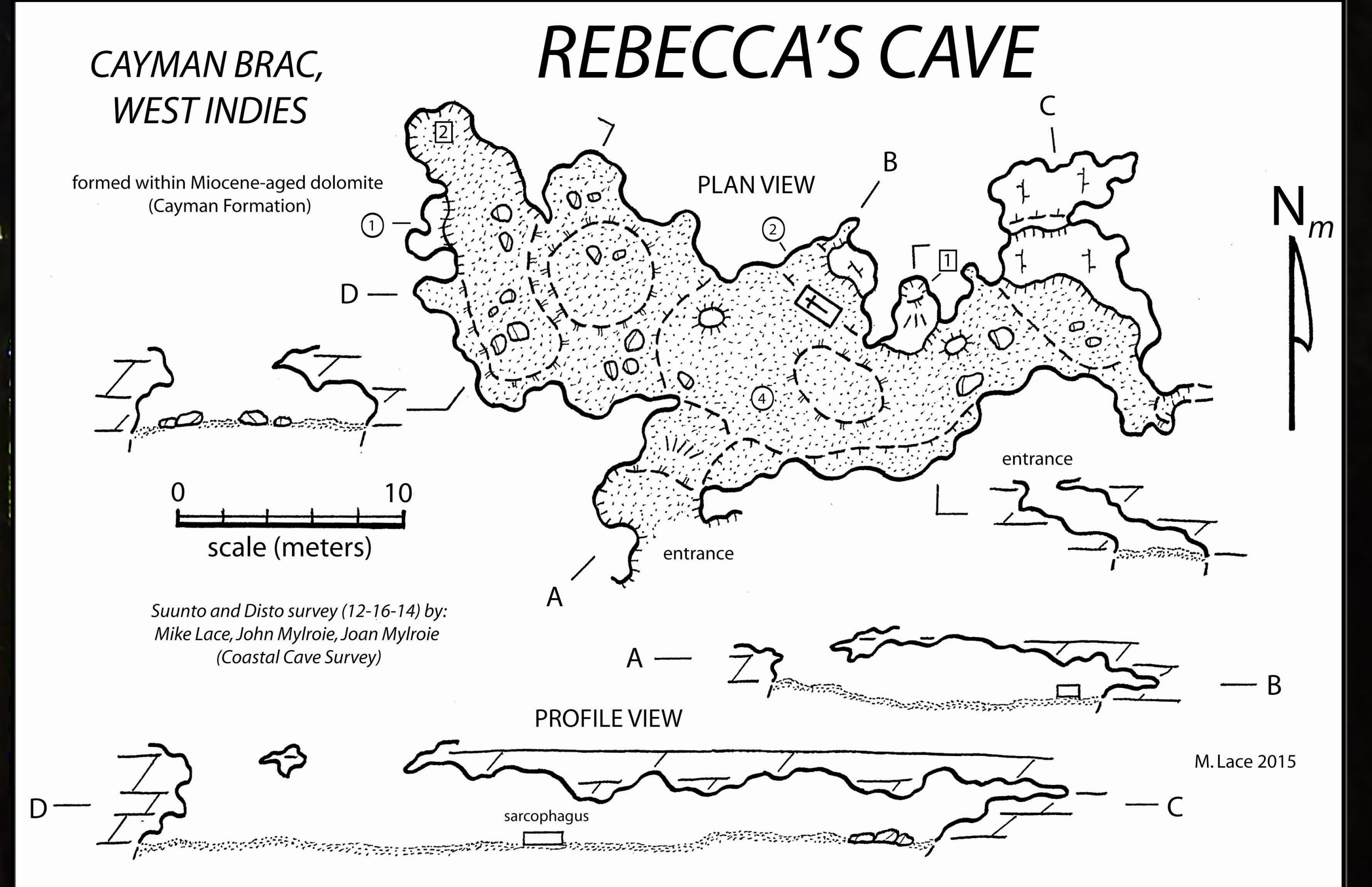


Figure 9: Rebecca's Cave, Cayman Formation, south coast. This flank margin cave was used as a burial site for a child drowned in a hurricane.