Depositional Facies of Crooked-Acklins Platform, Bahamas: Contrasts with the Caicos Platform Model

Gene Rankey, Andrew Berkeley, Don McNeill, Fikril Hakiki

Project Purpose

The project will explore an understudied Bahamian platform that is dominated by grainy deposits in its interior (like Caicos platform), although it is surrounded on three sides by islands that protect it from oceanic swells (unlike the Caicos platform which is open on its windward side). Study of both surface sediments and cores, and comparative analysis, will allow us to better constrain controls on Holocene and Pleistocene sediment accumulations in Bahamian-type platforms.

Scope of Work

The project includes field observations of water depths and depositional facies, wave and current patterns, petrographic study of sedimentologic components, and collection and analysis of shallow cores.

Figure 1. Regional setting, Crooked-Acklins Platform (CAP). The platform is located in the trade wind belt, in the southeastern Bahamas.
Key Deliverables

The basic data that will come from this study include more complete sedimentologic characterization and understanding of Holocene and Pleistocene of Crooked-Acklins platform. This information should provide fundamental insights that could be applied to better predict facies trends in reservoir analogs.

Project Description

Isolated carbonate platforms have occurred throughout geologic history, and many represent important reservoir systems. To better understand these systems, many geologists have explored the natural laboratories of the present-day Bahamian platforms and the Caicos platform. An oft-discussed contrast on these platforms is the grain-dominated nature of the interior of Caicos platform, which differs from the muddy interior of the west side of Great Bahama Bank or Little Bahama Bank (e.g., Purdy, 1963; Enos, 1974; see results from 2007 CSL sponsors meeting). This contrast has been interpreted (e.g., Wanless et al., 1989; Wanless and Tedesco, 1993) to be the result of wave-dominance on the Caicos platform, as a result of its being in the easterly trade wind belt.

As an explicit test of this idea, this study documents facies patterns on Crooked-Acklins Platform (CAP), located in the southeastern Bahamas. The CAP lies within the easterly trade-wind belt with a semi-arid climate (annual rainfall ~880 mm; Pierson, 1982). In these aspects, it is more like the nearby (and extensively studied; Wanless et al., 1989) Caicos platform than the more distant Little Bahama Bank or northern Great Bahama Bank (e.g., Purdy, 1963). Nonetheless, unlike the Caicos platform, the CAP is not open to the ocean on the eastern, windward side, and as such it should have smaller waves. The our results from last year suggest that the CAP is grain-dominated, even though it is protected by islands on three sides, including the windward flank.

This year, the project will expand to further document the facies and facies patterns, focusing on the northern reef rim and apron, the tidal flats south of Crooked Island, and the oolitic shoals on the southwestern platform margin. These areas will be examined in the field, and samples for thin section petrography will be collected. Data on the character of waves and currents should allow us to explore possible controls on facies patterns in the interior of the platform. These data will allow us to explore the role of Pleistocene bedrock on facies patterns, the co-existence of muddy and more grainy tidal flats, and the unique oolitic-skeletal shoals of the southwestern margin.

If logistically possible, we will collect shallow cores from these areas and age date the sediments in the core. In comparing these with the better-studied examples from the northern Bahamas, we hope to better understand the nature, timing, and controls on Holocene accumulation. We plan to describe and date Pleistocene outcrops from the islands also, to better constrain the geologic history of the platform.
Figure 2. Generalized facies patterns, CAP, based on direct observations and analysis of over 150 sediment samples. Note that islands surround the platform on three sides, yet much of the platform interior is grainy (mean mud = 1.6 %, based on 166 sediment samples).

**Expected Results**

This study will provide information on the regional patterns and geologic history of Crooked-Acklins platform, which will provide an important contrast with both the Caicos platform and more northern Bahamian platforms. These insights should provide new insights into the controls on facies patterns on Bahamian-type carbonate platforms.

**References Cited**
