50 YEARS OF RESEARCH ON THE JOULTERS OOID SHOAL: IMPACT ON CARBONATE SEDIMENTOLOGY AND DIAGENESIS AND LESSONS LEARNED FROM AN INVALUABLE ANALOG

Paul (Mitch) Harris

PROJECT OBJECTIVES

- The Joulters sand body is a vast expanse of muddy ooid sands (packstones) rimmed by clean ooid sands (grainstones), which would produce a thin (average thickness 4 m) reservoir layer of significant extent (~400 km^2).
- It's importance as a subsurface analog is considered in this comprehensive review as it illustrates the strike elongated nature of carbonate sand reservoirs relative to the platform margin, lateral heterogeneity that is inherent in such depositional systems and reservoirs due to sand flats and tidal channels, and complexity that is added due to beach/island complexes and their associated diagenesis.
- An understanding of the development of depositional and diagenetic patterns in the Joulters example provides valuable insight to our interpretation of ancient accumulations.

PROJECT RATIONALE

The development of the Joulters sand body (Fig. 1) provides one possible scenario for the evolution of the bar and channel physiography seen in other modern examples. The shoal-generating physiography has been erased, as bar and channel topography were extinguished and filled in, and ooid sands were mixed with other sediments by burrowing. The resulting accumulation – a belt of ooid grainstone bordering a belt of ooid packstone that becomes increasingly muddy with depth – is one that is common in the geologic record. Given its perceived importance, a timely review and discussion of surface sediment distribution, subsurface facies relations, and overprint of early diagenesis, all from the standpoint of Joulters serving as a key subsurface analog, is warranted.

APPROACH

The discussion will: 1) begin with a review of surface depositional environments encountered across the sand body covering surface sediments, details of environments, the importance of islands, change over time, the role of storms, and importance of Hydrodynamics; 2) then emphasize the geologic record of the sand body by detailing facies anatomy and growth, details of the subsurface facies, facies relations in 2D and 3D, the tie to SL and timing, island growth and role of storms, and small-scale facies variation; and 3) finish with a look at diagenesis including marine hardgrounds and beachrock, meteoric island diagenesis, and various cement types and their distribution. Knowledge of the development of the depositional and diagenetic patterns in the Joulters sand body provides insight toward an

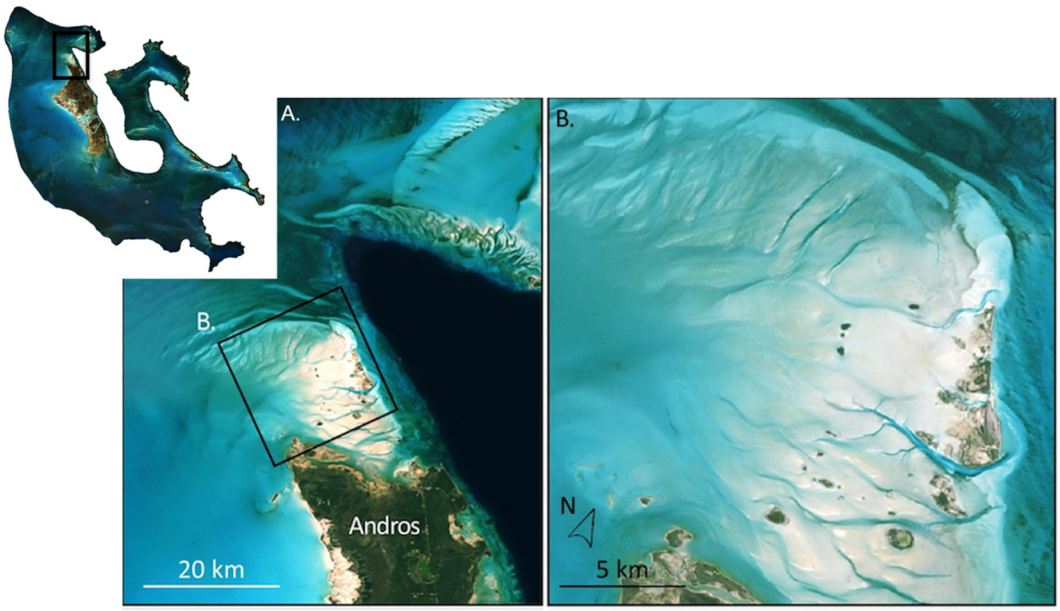

Figure 1: The Joulters sand body sits north of Andros Island on Great Bahama Bank (index and A). Closer view (B) shows details of vast sand flat partially cut by tidal channels and rimmed on the windward margins by active shoals and islands.

interpretation of ancient accumulations. As examples, the following key points will be emphasized:

- Facies calibration
- Facies geometry
- Genesis of upward-shoaling cycle
- Depositional model relative to sea-level change
- Facies preservation
- Subsurface record in 3-D
- Diagenetic overprint and porosity modification

SIGNIFICANCE

An understanding of surficial depositional environments and their associated sediments that comes from visiting a modern environment can only sharpen one's eye when faced with trying to interpret rocks on outcrop, in cuttings, or cores. In a similar manner, coring of the modern settings reveals how the facies evolved over time to result in the current depositional and diagenetic patterns and hints at facies and diagenetic relationships that improve one's ability to unravel challenges in subsurface correlation and modelling. It is not an exaggeration that an ooid grainstone/packstone system will be looked at from an entirely different point of view after examining a modern ooid sand shoal like the Joulters example and experiencing first-hand this dynamic landscape and its hydrodynamic setting. The hope is that short of an actual visit to this superb field locality, the review and discussion will serve as a meaningful "virtual field trip" giving an opportunity to appreciate how the many lessons learned from 50 years of research can impact our way of approaching subsurface studies.