

# **PS** Sequence Stratigraphy and Hydrocarbon Potential of the Upper Shuaiba Formation, Giant Carbonate Field, Abu Dhabi, UAE\*

**Bashayer Al Muhairi<sup>1</sup>, Gary Ottinger<sup>2</sup>, Hesham Shebl<sup>2</sup>, Thomas De Keyser<sup>2</sup>, Christopher Kendall<sup>2</sup>, and Amna Al Dhaheri<sup>2</sup>**

Search and Discovery Article #51484 (2018)\*\*

Posted June 18, 2018

\*Adapted from poster presentation given at AAPG 2017 Middle East Region Geosciences Technology Workshop, Stratigraphic Traps of the Middle East, Muscat, Oman, December 11-13, 2017

\*\*Datapages © 2018 Serial rights given by author. For all other rights contact author directly.

<sup>1</sup>ADNOC ([balmuhairi@adnoc.ae](mailto:balmuhairi@adnoc.ae))

<sup>2</sup>ADNOC

## **Abstract**

The stratigraphic framework in Giant Field has been correlated regionally and placed in the context of the sequence stratigraphy framework for the Bab intra-shelf basin that has been established during the Aptian time. This implementation demonstrates that the strata of the Upper Shuaiba Formation (Th.IB and Th.IC Reservoirs) are the basinal equivalents of a set of clinoform packages that prograded to the west-southwest into the Giant Field area. The Th.IC Reservoir is the youngest of these clinoforms; and the remnants of the Bab intra-shelf basin were filled by the overlying Nahr Umr Shale. The underlying Th.IB was deposited at a distance from the basin margin and is a tabular unit with more uniform reservoir properties ( $\phi$  and K) than the potential reservoirs in the Th.IC. Both Th.IB and Th.IC are subdivided into three sub-reservoirs named from base to top Lower, Middle and Upper; while Th.IC Upper and Th.IB Middle sub-reservoirs have been further divided into three units.

A comprehensive core and thin section descriptions have been carried out from 16 wells to enable discrimination of depositional environments and construction of a depositional model. This data was developed into a depositional model based on sequence stratigraphic principles; and the layer tops were tied to well logs and correlated throughout the field in approximately 170 wells, thereby constructing a three-dimensional stratigraphic framework. The depositional model and the three-dimensional stratigraphic framework show that most of the Th.IC Lower Unit lies outside the field limits and below the OWC. Reservoir properties from conventional core analysis and values calculated from logs have been estimated and distributed within property maps for the potential reservoirs Th.IC Upper, Th.IC Middle, and Th. IB Middle.

The prospective areas for each sub-reservoir were identified based on the Hydrocarbon Pore Volume (HCPV) maps. Ranking of these prospects was based on the following factors: credible well test results, HCPV maps, and reservoir characteristics. Prospect P1 (Th.IC Middle) is ranked highest due to two credible well tests and better depositional textures. P1 (Th.IC Upper) is ranked second due to depositional textures and high

OIIP values. These are followed by prospects P2 (Th.IC Upper) and P3 (Th.IC Upper). The prospects for Th.IB Middle are ranked lowest due to lack of credible well test results and the poor depositional textures.

### **References Cited**

Maurer, F., F.S.P. van Buchem, G.P. Eberli, B.J. Pierson, M.J. Raven, P.-H. Larsen, M.I. Al-Husseini, and B. Vincent, 2012, Late Aptian Long-Lived Glacio-Eustatic Lowstand Recorded on the Arabian Plate: *Terra Nova*, 8 p.

Maurer, F., K. Al-Mehsin, B.J. Pierson, G.P. Eberli, G. Warrlich, D. Drysdale, and H.J. Droste, 2010, Facies Characteristics and Architecture of Upper Aptian Shu'aiba Clinoforms in Abu Dhabi, *in* F.S.P. van Buchem, M.I. Al-Husseini, F. Maurer, and H.J. Droste (eds.), *Barremian - Aptian Stratigraphy and Hydrocarbon Habitat of the Eastern Arabian Plate: GeoArabia Special Publication 4*, Gulf PetroLink, Bahrain, v. 2, p. 445-468.

Pierson, B.J. G.P. Eberli, K. Al-Mehsin, S. Al-Menhali, G. Warrlich, H.J. Droste, F. Maurer, J. Whitworth, and D. Drysdale, 2010, Seismic Stratigraphy and Depositional History of the Upper Shu'aiba (Late Aptian) in the UAE and Oman: *GeoArabia Special Publication 4*, Gulf PetroLink, Bahrain, v. 2, p. 411-444.

# STRATIGRAPHIC TRAPS OF THE MIDDLE EAST

MUSCAT, OMAN  
11-13 DECEMBER 2017



## ADNOC Vision

➤ To harness energy resources in the service of our nation

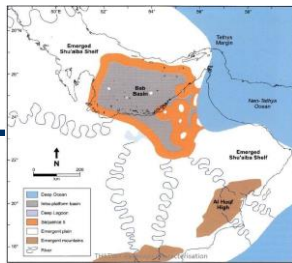
## ADNOC Mission

➤ Through partnership, innovation and a relentless focus on high performance and efficiency, we maximize the value of energy resources



## Objective

➤ To unlock potential hydrocarbon resources within the Bab intrashelf basin for optimizing well placement & uplifting the reservoir development.



## 2 Depositional Model

➤ Defined three EOD regions:

- Basin
- Margin
- Platform interior

➤ Interpreted from well-based thickness and porosity integrated with all core descriptions

➤ Most applicable to TH.IC reservoirs

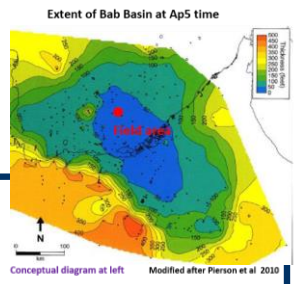
➤ Consistent with published UAE analog and subregional-scale knowledge

➤ At Field area, TH.IB depositional system aggrades, followed by TH.IC progradation from NE to SW

➤ Most grain-rich facies would be concentrated within the "margin"

EOD; decreasing away from margin

➤ Shape/extent of the "margin" EOD consistent with modern, mud-rich, prograding system (Adriatic Sea)



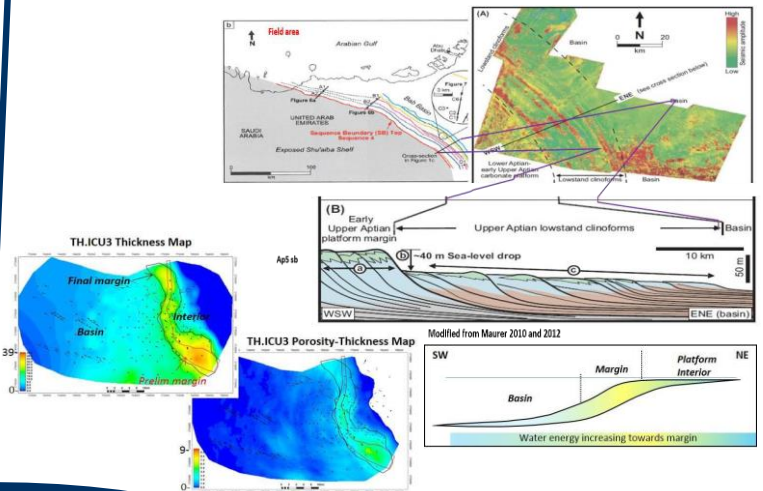
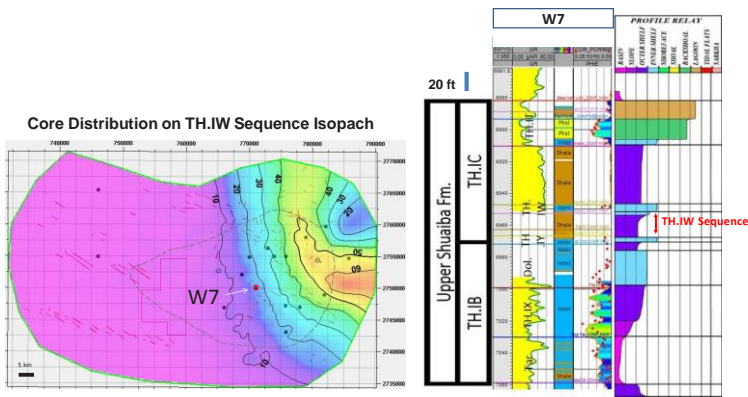
## Reservoir Characterization 1

➤ TH.IC:

- Overall, relatively shallower water setting compared to Th.IB
- Mix of facies: shallow water Grst/Pkst/Mud; locally oolitic; fine-grained clastics; coarsening upward

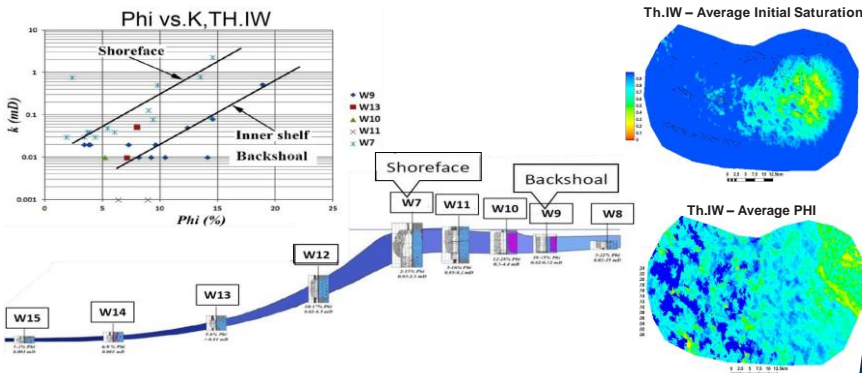
➤ TH.IB:

- Relatively deeper water setting compared to Th.IC (eg., planktonic forams; mud-dominated)

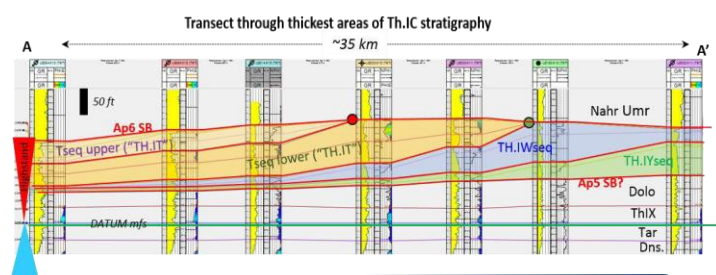


# Sequence Stratigraphy and Hydrocarbon Potential of the Upper Shuaiba Formation, Giant Carbonate Field, Abu Dhabi, UAE

## Petrophysical Properties 5



## 3 Stratigraphic Framework



➤ The studied intervals represent one major Highstand Systems Tract (HSST) that progrades into Bab Basin

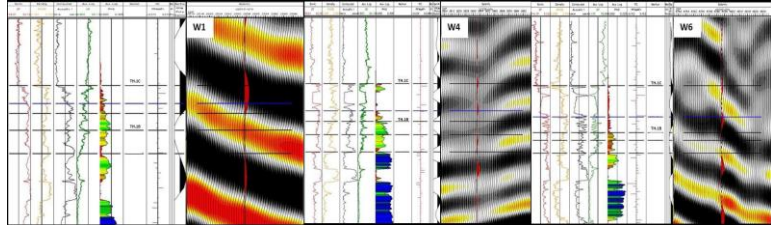
- TH.IX, Dolomite consist mainly of aggrading to weakly prograding deeper water facies of early HSST
- TH.IC characterized by prograding packages into Bab Basin from the northeast (late HSST)

➤ Adjustments made to legacy of studied interval for stratigraphic framework (litho vs chrono "tops")

- Primarily in eastern part of the field where prograding geometries are more pronounced
- Individual clinoform geometries are below seismic resolution
- Consistency between core/log-based stratigraphic framework and seismic interp/well ties
- Inherent uncertainty in inter-well chronostratigraphic correlations due to limited data

## 3D Seismic 4

Seismic to Well tie correlation in different locations:



Seismic cross section Vs Geological cross section:

