ELSEVIER

Cretaceous Research 26 (2005) 213–224

CRETACEOUS RESEARCH

www.elsevier.com/locate/CretRes

The nature and origin of Upper Cretaceous basin-margin rudist buildups of the Mesopotamian Basin, southern Iraq, with consideration of possible hydrocarbon stratigraphic entrapment

Fadhil N. Sadooni

Department of Geology, UAE University, PO Box 17551, Al-Ain, United Arab Emirates

Received 23 April 2004; accepted in revised form 16 November 2004
Available online 10 March 2005

Abstract

The Cenomanian Mishrif Formation is the main carbonate Cretaceous reservoir in southern Iraq. The reservoir units of the formation consist of bioclastic and peloidal limestones, derived mainly from rudist banks within the formation. The banks are found to be of two types, either basin margin buildups occupying a narrow belt along the present day Iraq-Iran border, or as patchy buildups on the crestal parts of the giant structures such as at West Qurna, Rumaila and Zubair. These buildups were eroded as they shallowed to reach the wave-base zone. Data from the Dujaila Field in southern Iraq suggest that these buildups may act as stratigraphic traps that produced oil from a relatively structurally lower well, while the higher well was found to be dry. This finding is of significant exploration value and may prove the existence of large hydrocarbon accumulations in the Mishrif (as well as the Shu'aiba and Mauddud formations) in areas beyond the known structures.

Keywords: Iraq; Mesopotamian Basin; Mishrif, Rudist; Dujaila Field; Cretaceous; Albian; Cenomanian; Arabian Plate

1. Introduction

The importance of rudist buildups as a major component of the reservoir facies of Cretaceous strata was recognized early in the exploration of the Arabian Basin. Henson (1950) mentioned that rudist shoal-reefs are common in the Lower–Middle Cretaceous limestones covering large areas of the Middle East. He indicated that these rocks were associated with detrital, foraminiferal limestone and suggested that the rudist reefs be referred to as "bank-shoal-reefs". Wilson (1975) reviewed organic buildups including the rudist constructions in the Cretaceous sediments of the Arabian Basin. Alsharhan and Nairn (1997) drew attention to the rudist basin-margin buildups in the Shu'aiba, Mauddud and Mishrif formations in most parts of the Arabian Plate.

Rudist-bearing rocks have been described from the Aptian Shu'aiba Formation from many locations in the Arabian Basin, such as the eastern parts of the Arabian Peninsula (Frost et al., 1983), numerous oilfields in Saudi Arabia (Hughes 1998, 2000a,b); northeastern Jebel Akhdar, Oman (Masse, 1997) and the United Arab Emirates (Hamdan and Alsharhan, 1991). In southern Iraq, the Shu'aiba Formation mainly consists of coarse dolomites; however, dolomitized rudist fragments were recovered from the well Awasil-5 in central Iraq (Fig. 1 for locations) (van Bellen et al., 1959).

Rudist buildups have been recognized in the Albian–Cenomanian Mauddud Formation in the North Field of

E-mail address: f.sadooni@uaeu.ac.ae

0195-6671/$ - see front matter © 2005 Elsevier Ltd. All rights reserved.
doi:10.1016/j.cretres.2004.11.016

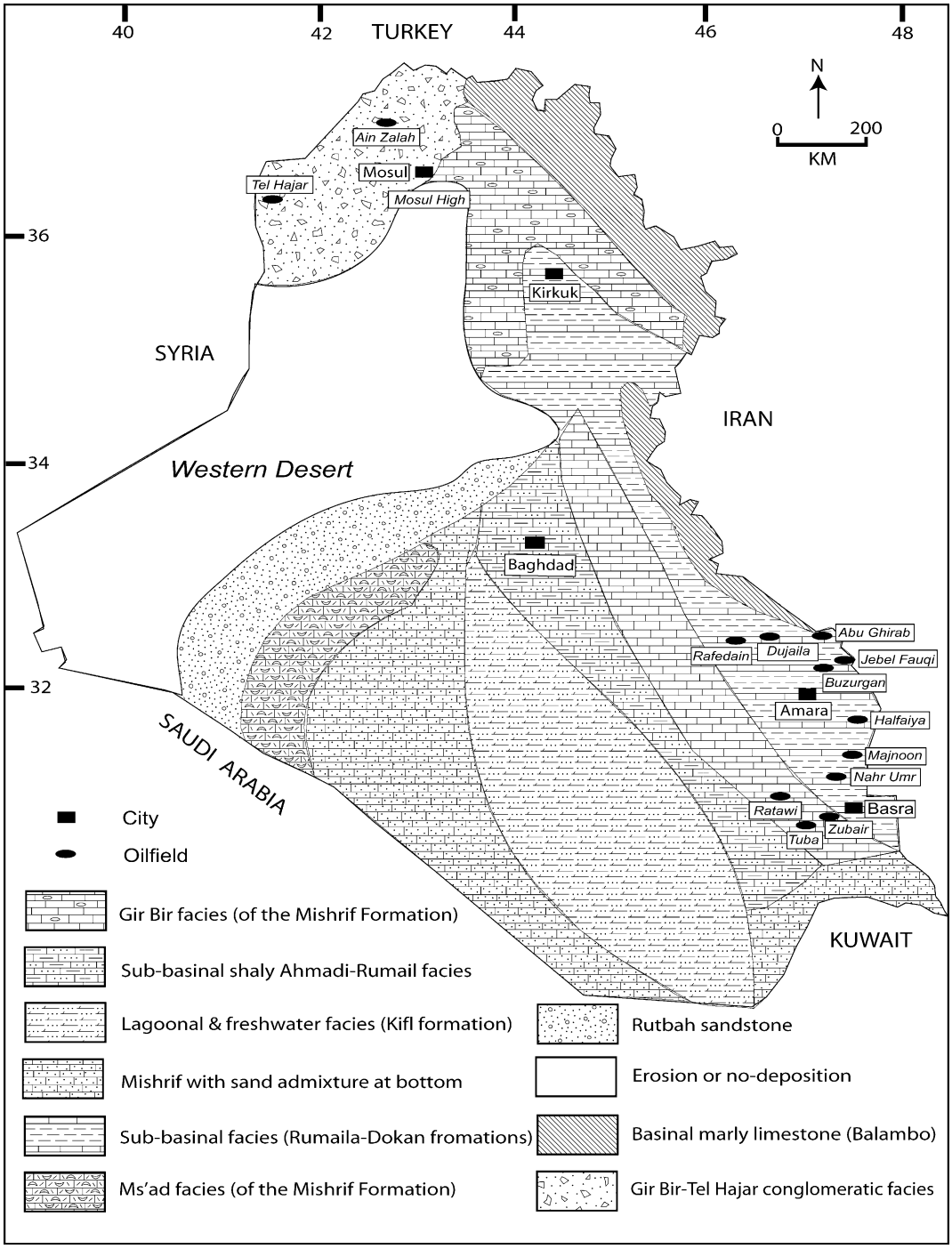

Fig. 1. A preliminary facies map of Iraq during the Cenomanian–Early Turonian cycle showing the main locations mentioned in the text (modified after Buday, 1980).

Qatar (Focke et al., 1986), while the Mauddud Formation of the Buzurgan and Abu Ghirab fields, near the Iraqi-Iranian borders (Fig. 1), has yielded similar materials (Mohammed and Al-Sayyab, 1993; Sadooni and Alsharhan, 2003).

In the southern parts of the Arabian Plate, the Mishrif Formation (Cenomanian) contains several rudist banks and buildups at different intervals (Burchette, 1993; Videtich et al., 1988). In southern Iraq, the Mishrif Formation is the most important Cretaceous carbonate reservoir, representing the main reservoir in the supergiant fields of Rumaila North, West Qurna and Majnoon, and a significant reservoir in Zubair, Rumaila South and Ratawi (Gaddo, 1971; Al-Sakini, 1992; Aqrawi et al., 1998).

The aim of this paper is to explore the potential for stratigraphic traps within rudist buildups outside the usual structures of the Mesopotamian Basin in the