

STRATIGRAPHIC NOTE

Oligocene / Miocene boundary in northern Iraq

Nabil Y. Al-Banna

The position of the Oligocene/Miocene boundary in Iraq has been debated for more than 50 years. This stratigraphic note reviews various proposed positions and presents paleontological evidence for its suggested position.

Van Bellen et al. (1959, Figure 1) interpreted the Tertiary succession of northern Iraq in terms of several transgressive-regressive sequences. They positioned the Oligocene/Miocene boundary between the Ibrahim-Azkand-Anah sequence (*Ibrahim Sequence*) and the Serakangi-Euphrates-Dhiban sequence (*Euphrates Sequence*). These authors interpreted the ages of the Ibrahim as probably “upper” Oligocene, and the Euphrates Sequence as probably “lower” Miocene, but stated that *this dating does not imply strict correlation with the European Oligocene and Miocene stages*. Their age attributions were highlighted with quotation marks and were based on stratigraphic position rather than on paleontological evidence.

Indeed, in an earlier 1953 unpublished report (IPC Ltd, Table 1 by van Bellen, 1953) the Azkand and Anah formations were interpreted as Early Miocene, whereas the Bajawan and Baba formations (*Tarjil sequence*) were interpreted as Late Oligocene, thus placing the Oligocene/Miocene boundary between the Tarjil and Ibrahim sequences. This note summarizes the results of further studies that support this lower position for the boundary. The implication is that in several regional stratigraphic frameworks, which adopted the higher position (e.g. Buday, 1980; Goff et al., 1995; Sharland et al., 2004; Jassim and Goff, 2006), the boundary is mispositioned, and its bounding sequences are incorrectly dated and regionally miscorrelated.

Youhanna (1983) was among the first biostratigraphers to study the Ibrahim Formation in its type locality (Ibrahim-1). He concluded that its faunal assemblages mainly consist of planktonic foraminifera genus *Globigerinodes*, considered to be diagnostic for the Miocene. In the Kirkuk area, Al-Eisa (1992) also interpreted the age of the Ibrahim Formation as Early Miocene. These studies revised the previously assigned “upper” Oligocene age suggested by van Bellen et al. (1959).

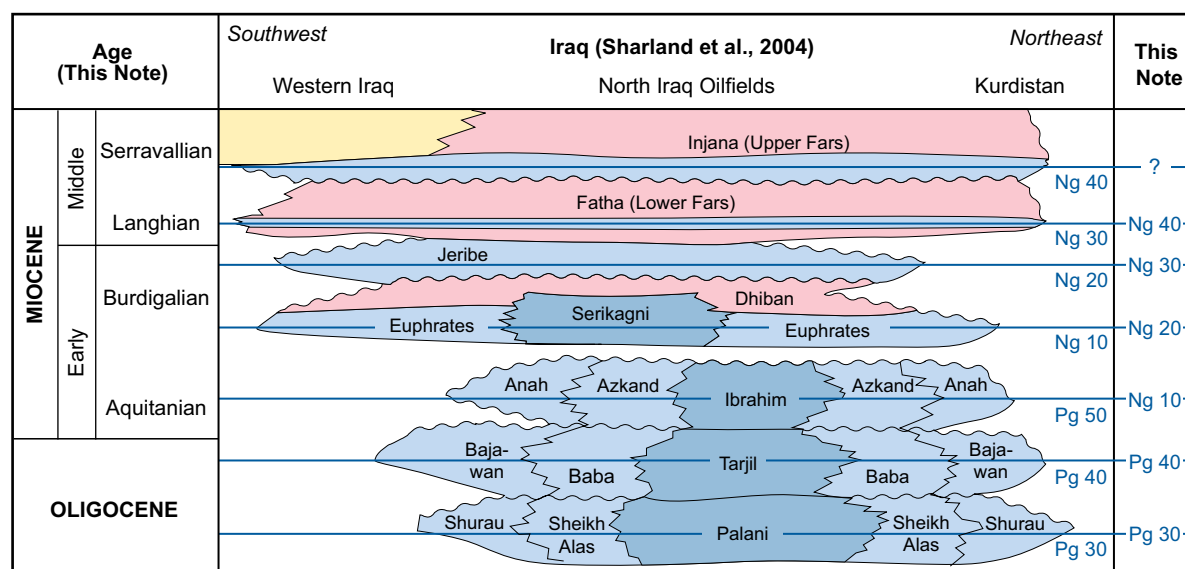


Figure 1: Tertiary sequence stratigraphy of Iraq in which the Oligocene-Miocene boundary is interpreted between the Ibrahim and Tarjil sequences (modified after van Bellen et al., 1959). The correct position of the boundary and the MFS of Sharland et al. (2004) are revised here.

Al-Banna (1997) and Al-Banna et al. (2002) studied the paleontology of the Oligocene-Miocene interval between the Tarjil and Ibrahim formations from three core holes that were drilled in the Sheikh Ibrahim and Sasan areas in western Mosul, near to the Ibrahim-1 well (Figure 2). The cores represent a complete succession, 150-180 m thick, which includes the Tarjil, Ibrahim, Hamrin (new formation described by Al-Banna and Amin, 2000; and first formally named by Ahmad and Al-Eisa, 2003), Serikagni, Euphrates and Dhiban formations. They identified 24 planktic foraminiferal species and subspecies, and recognized four biostratigraphic zones (Table 2). On the basis of lithological and paleontological evidence they positioned the Oligocene/Miocene boundary between the Tarjil and Ibrahim formations.

**Table 1: Kirkuk Group, Qarah Chauq Dagh Area, Iraq
(after R.C. van Bellen, 1953)**

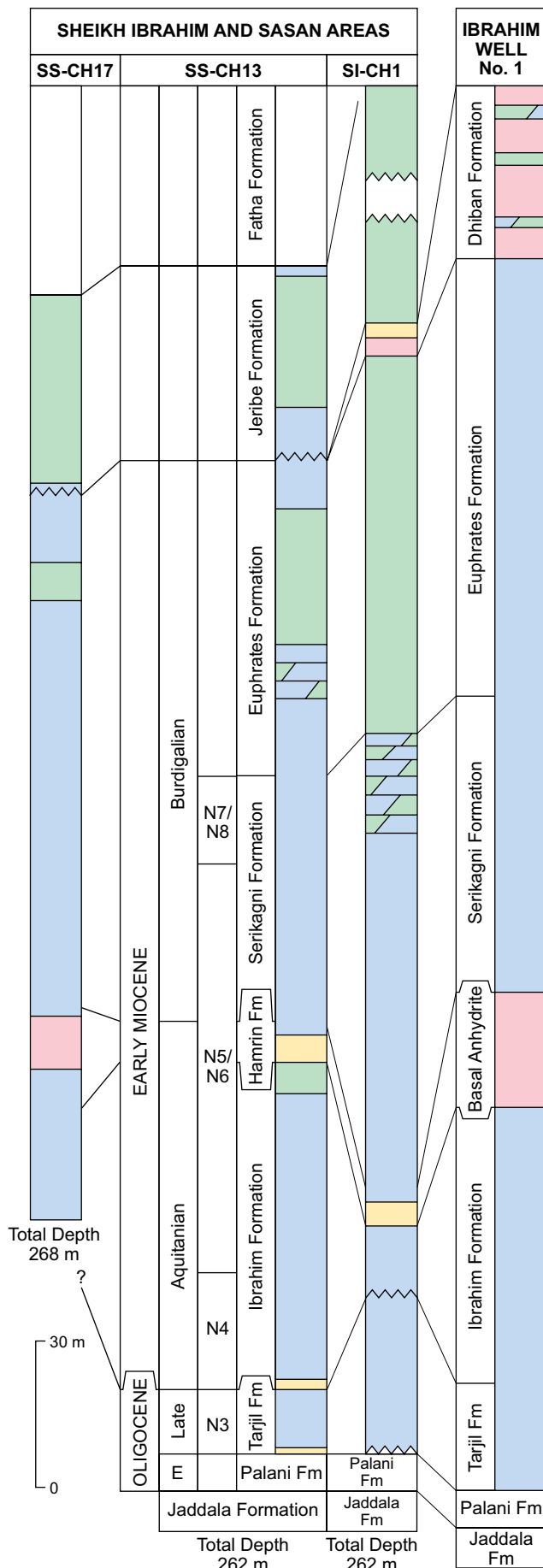
Back reef/ Lagoonal	Faunizones	Fore reef/Shoal	Faunizones	Age
Anah Formation	Miogypsinoidea Miogypsinoidea/ Lapidocyclina	Azkand Formation	Miogypsinoidea Miogypsinoidea/ Lapidocyclina	Early Miocene, Aquitania
Bajawan Formation	Kirkukensis delicata	Baba Formation	Lapidocyclina Lapidocyclina/ Nummulites ?Nummulites	Late Oligocene
Shurau Formation	Dendrophyllum paucialveolata	Sheikh Alas Formation	Nummulites	Early Oligocene

Table 2: Biozones in Western Mosul, Iraq

Sasan area core hole (SS-CH13)			
Formation	Depth /Thickness	Biozone	Age
Serikagni Formation	116 - 143 27 m	<i>Praeorbulina transitoria</i> - <i>Globigerinoides minutus</i> (N7/N8)	Early Miocene, Burdigalian
Hamrin Formation	143 - 146.5 3.5 m	<i>Globigerinoides trilobus trilobus</i> (N5/N6)	Early Miocene, Aquitania-Burdigalian
Ibrahim Formation	146.3 - 200 53.7 m	<i>Globigerinoides quaderilobatus</i> <i>primordius</i> (N4)	Early Miocene, Aquitania
Tarjil Formation	200 - 210.5 10.5 m	<i>Globorotalia kugleri</i> (Part N3)	Late Oligocene
Palani Formation	210.5 - 215 4.5 m	???	Early Oligocene

Table 3: Biozones in Sinjar area, Northwestern Iraq

Section near Bara Village			
Formation	Thick	Biozone	Age
Serikagni Formation	56 m	<i>Catapsydrax stainforthi</i> - <i>Catapsydrax unicavus</i> (N6)	Early Miocene, Burdigalian
Ibrahim Formation	37 m	<i>Globigerinoides trilobus trilobus</i> - <i>Catapsydrax</i> <i>dissimilis</i> (N5)	Early Miocene, Aquitania-Burdigalian
		<i>Globigerinoides primordius</i> (N4)	Early Miocene, Aquitania
Tarjil Formation	40 m	<i>Globigerina ciperensis ciperensis</i> (P22) <i>Globorotalia opima opima</i> (P21) <i>Globigerina ampliapertura</i> (P20)	Late Oligocene
Palani Formation	6 m	<i>Pseudohastigerina micra</i> (P19)	Early Oligocene



In the outcrop type section of the Serikagni Formation, van Bellen et al. (1959) considered the formation as “lower” Miocene, and placed it unconformably above the Eocene Jaddala Formation. They considered the Oligocene to be absent. A paleontological and sedimentological re-examination of a succession near to the type section (Al-Banna, 2004; Ismail, 2006) provided a complete stratigraphic succession in which the Ibrahim, Tarjil and Palani formations were recognized (Table 3). Again the Oligocene/Miocene boundary was found between the Tarjil and Ibrahim formations.

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Figure 2: Correlation section between core holes (in Sasan and Sheikh Ibrahim areas) and Ibrahim well no. 1. In Ibrahim-1 well, the Tarjil Formation was previously considered the Azkand Formation by van Bellen et al. (1959), the present interpretation is after Al-Banna (1997).

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ABOUT THE AUTHOR

Nabil Y. Al-Banna obtained a BSc in Geology from Mosul University, Iraq, in 1978 and received an MSc in Sedimentology (Clastic rocks) and a PhD in Sedimentology (Carbonate rocks) from Mosul University in 1983 and 1997, respectively. Between 1983 and 1998 Nabil worked as a Geologist in the Underground Storage Team of the Iraq Oil Company. In 1999 he moved to Mosul University as a Lecturer at the Dams and Water Resource Research Center. Since 2000 Nabil's main research interests are in sedimentology and sequence stratigraphy of the Mesozoic and Cenozoic.

n_albanna2005@yahoo.com

