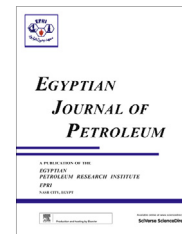




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FULL LENGTH ARTICLE

Palynostratigraphical studies on some subsurface middle Albian–early Cenomanian sediments from North Western Desert, Egypt

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Abstract The Kharita and Bahariya formations are of great importance for Egyptian economy. They are the target of the oil and gas exploration in the Egyptian Western Desert. The present study investigated the palynostratigraphy, palynofacies and spore coloration of samples from these two formations in Negelah-1 Borehole. The investigations were used to evaluate their thermal maturity and potentiality to generate the hydrocarbons. The identified palynozones are *Afropollis jardinus* Acme Zone (late Albian–early Cenomanian) and *Araucariacites australis* Acme Zone (middle Albian). The first zone is differentiated into two subzones, which are *Elaterosporites klaszii* Interval Subzone and *Cretacaeiporites densimurus* Interval Subzone. The palynofacies analysis revealed that the Kharita Formation was deposited in proximal near shore marine environment under oxic conditions. Whereas the lower part of the Bahariya Formation was initially deposited in proximal near shore dysoxic marine conditions and the environment of deposition getting more distal to inner shelf dysoxic to anoxic marine conditions in the younger upper part. The samples from both formations include gas prone type III and IV. The spore color observations indicated that the samples from both formations are immature to yield gas and are not effective hydrocarbon source.

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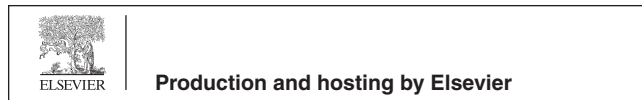
1. Introduction

The lower Cretaceous succession in the Western Desert of Egypt has great importance in oil and gas generation. The palynostratigraphy and related paleoenvironmental investigations of this succession were the central focus of numerous papers in the past decades [1–13]. More recently, the palynofacies studies were developed and spread out as a useful tool to interpret the paleoenvironmental conditions and their organic geochemical inferences e.g. [14–17]. The present paper is a continuation of that phase of palynological investigations. The present study deals with the palynostratigraphy of the

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Albian–Cenomanian sediments from Negelah-1 borehole in the Western Desert of Egypt and they comprise the Kharita and Bahariya formations. The location of the studied borehole is in a poorly studied remote part of the northern Western Desert and still under continuous exploration. The Kharita and Bahariya formations have vast economic importance because they trap some commercial gas accretions [18]. The aim of the present study is to determine their geological age, environment of deposition and to examine their potentiality to generate hydrocarbons. These implications are discussed with the assist of the palynofacies and spore coloration as well as the palynostratigraphy.

2. Stratigraphic setting

The studied succession in Negelah-1 borehole (north Western Desert, southeast Mersa Matruh, lat. $31^{\circ} 11' 45.00''$ N and long. $26^{\circ} 36' 04.00''$) is comprising the Bahariya (Medeiwar) and Kharita formations, Fig. 1, which are of Albian–Cenomanian age according to the operator company. The thickness of these formations and their lithological and gamma-ray log are after the operator. The lithological and gamma-ray log are presented in Fig. 2.

2.1. Kharita Formation

El Gezeery et al. [19] described the type section of this Formation at the Kharita-1 borehole in the Western Desert. The maximum thickness (3610 feet) of this unit is found at the Mersa

Matruh-1 borehole [20]. In the present Negelah-1 borehole, it is composed essentially of thick sandstone beds intercalated with thin shale, siltstone and frequent carbonate beds. The dominance of sandstones is indicated from the consecutive low API units in gamma-ray log, Fig. 2. The sandstone is medium- and occasionally coarse grained, moderately sorted, massive in parts and frequently contains carbonaceous matter. The shale intercalations are thick and common. The boundary between Kharita and Bahariya formations is marked with a widespread and well recognizable limestone bed [20]. In the Negelah-1 borehole, this Formation is encountered from 6550 to 8100 feet and a thickness of 1550 feet.

2.2. Bahariya Formation

The operator called this unit, the Medeiwar Formation, but this nomenclature is equivalent to the Bahariya Formation [20]. The carbonates (marls and limestones) are more common in the Bahariya Formation, especially at the top. It is mainly composed of shales intercalated with sandstones and silt. The dominance of shales is indicated from the high API units in gamma-ray log, Fig. 2. The sandstones are dark gray, massive coarse to fine and well sorted in part. The shales are thinly laminated dark gray and dark green, calcareous and silty in part. The Bahariya Formation conformably underlies the Abu Roach Formation. In the Negelah-1 borehole, the Formation covers the range from 5350 to 6550 feet and a thickness of 1200 feet.

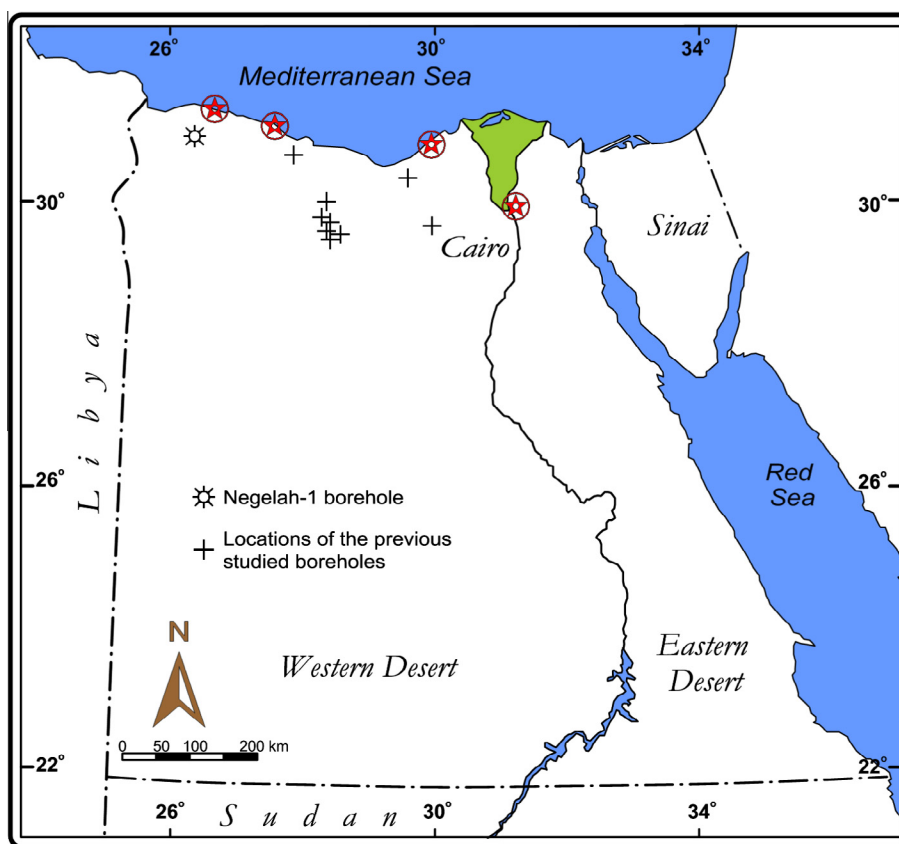


Figure 1 The location map of studied Negelah-1 borehole and some previously studied boreholes in the Northern part of the Western Desert.

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