ICHNOLOGY AND PALEOENVIRONMENTAL RECONSTRUCTION OF THE LOWER CAMBRIAN ROCKS, UM BOGMA AREA, SINAI, EGYPT

A thesis
Submitted to

Geology Department
Faculty of Science-Cairo University

By

Walid Gamal Kassab

B.Sc., Very Good

In Partial Fulfillment for the Requirements of
Master Degree of Science in Geology

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Approval Sheet Submission

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To My Parent

NOTE

Besides the work carried out in this thesis, the candidate Walid Gamal Kassab, has pursued post graduate studies for the partial fulfillment of M.Sc. Degree in the following topics:-

1. Lithostratigraphy
2. Biostratigraphy
3. Macropaleontology
4. Micropaleontology
5. Paleoecology
6. Sedimentary Rocks
7. Sedimentation
8. Structure Geology
9. Photogeology & Remote Sensing
10. Statistics
11. German Language

He has passed successfully an examination in the above mentioned topics; in October 2003.

Prof. Adel Abdel Aziz Sehim

Head of Geology Department,
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KEY WORDS:

Ichnology, Paleoenvironmental Reconstruction, Cambrian Rocks, Sarabit El Khadim and Abu Hamata formations, Um Bogma Area, Sinai, Egypt.

ABSTRACT

Facies and ichnofabric of the Lower Cambrian siliciclastic rocks of Um Bogma region are correlated and compared to evaluate changes in palaeoceanographic conditions controlled by palaeogeography in the distal zone of the southern Tethys. The investigated slope forming Lower Cambrian sections are subdivided into two distinctive stratigraphic sequences. The lower is represented by basal conglomeratic successions separated by red ferruginous oxipaleosols of generally humid to tropical environment and an ichnofossils dominating upper fining- and thinning upward successions of sandstone-shale intercalations. Four stratigraphic sections are measured and traced laterally at Um Bogma, G. Sarabit El Khadim, G. Lehian and Wadi Baba. The investigated slope forming Lower Cambrian sections comprise a fining- and thinning upward succession measured at Gabal Um Bogma, Gabal Sarabit El Khadim, Gabal Lehian and Wadi Baba. A diverse trace fossil association is described from siliciclastic rocks on a finer scale to map local environmental patterns, or biotic responses to episodic events (storms, flood). It includes nein ichnogenus with seven identified ichnospecies assigned to the *Cruziana* and *Skolithos* ichnofacies, including *Arenicolites* isp., *Bergaueria sucta*, *Bergaueria prantli*, *Cruziana salomonis*, *Dimorphichnus* cf. *obliquus*, *Dimorphichnus* cf. *quadrifidus*, *Diplichnites* isp., *Gordia marina*, *Planolites vulgaris*, *Rusophycus* isp and *Skolithos* isp. This faunal association allows an age determination for these siliciclastic sediments as Early Cambrian. The trace fossils were likely produced by trilobites, suspension feeding annelids and deposit feeding “worms”, probably polychaetes. Sections bearing abundant *Skolithos* represent the *Skolithos* ichnofacies, which is typical of high energy environments with loose sandy, well sorted to slightly muddy substrates in intertidal to shallow subtidal zones. The other trace fossils represent the *Cruziana* ichnofacies, which is typical of subtidal, poorly sorted and soft substrates, from moderate energy to low energy environments between the fair weather and storm wave base. The Lower Cambrian siliciclastic sediment was deposited at an early stage in a fluvial condition. Then subsidence in a later stage affected by normal faults along which shallow marine clastic sedimentation took place in the final stage of the shelf development.

(Submitted to the 10th Annual meeting of the Geological Society of Egypt)

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1.1. PREAMPLE

Egyptian Paleozoic sediments have a special interest in natural resources prospecting including hydrocarbons, manganese oxides, kaolinite, turquase, glass sand and radioactive minerals. These sediments have widespread distrribution in the Egyptian terriotery and nighbouring counteries. In subsurface studies, these clastics are lumped together and known as Nubia sandstone from older to younger as D, C, B, and A. They are of Cambrian-Lower Cretaceous age. These sediments represent the valuble producive reservoir in many fields in the Gulf of Suez, such as Ras Badran and Zeit Bay oil fields of Suez Zeit Company. Except for the marine Carboniferous carbonates, scarcity of fossil contents and the clastics natures of the Paleozoic sediments were reasonses for contraversity in stratigraphic divisions and defintion of rock units and stratigraphic boundaries especially in subsurface studies. The Lower Cambrian clastics have distinguishble lower bounary representing by the non-conformity surface with Precambrian basement complex. On the other hand, the upper boundary is unclear and needs more investigations. Using the ichnological and microfacies characterization suppose to provide some constrains to define the Cambrian sediments boundaries and their environments of deposition. So the present work is intended to concern with ichnological investigation, microfacies and paleoenviroments characterization for the Lower Cambrian sediments of Um Bogma area which represent the closeby surface analouge for the off shore hydrocarbon reservoirs in Gulf of Suez rift.

1.2. LOCATION OF THE STUDY AREA.

The study area is located in West Central Sinai, Egypt (Fig. 1.1). It is bounded by the following coordinates: longitudes between 33^{o} $15^{\backslash}$ and 33^{o} $30^{\backslash}$ E and latitudes between 28^{o} $55^{\backslash}$ and 29^{o} $10^{\backslash}$ N. The area under consideration can be reached from the Suez city through the Suez