CONTRIBUTION TO THE MINERALOGY AND GEOCHEMISTRY OF THE UPPER CRETACEOUS-EOCENE SEDIMENTARY SEQUENCE IN BAHARIYA OASIS, A.R.E.

BY

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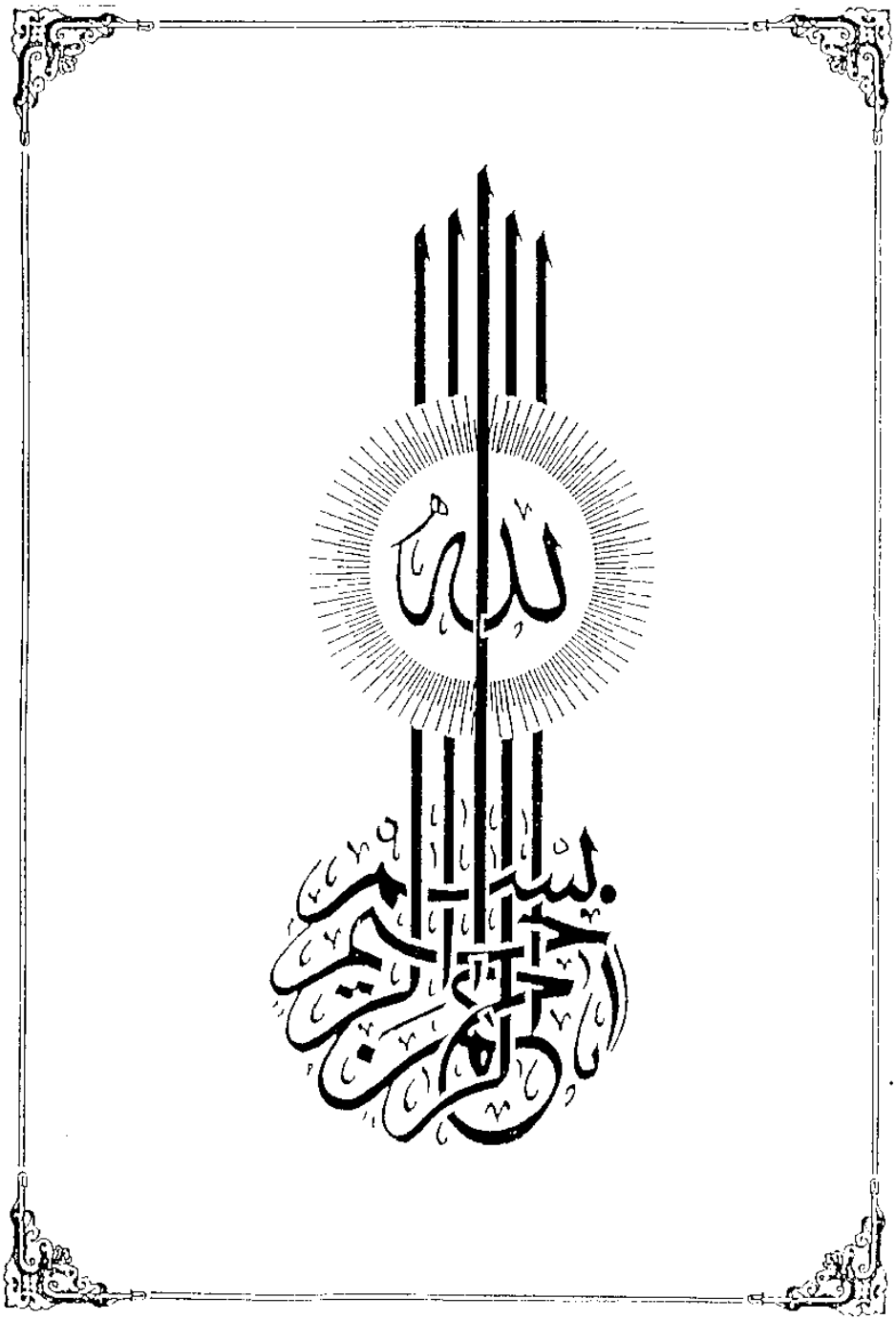

CONTENTS

Page

I. INTRODUCTION ---------- 1

I.1. Location ----------

I.2. Review of previous work ----------

I.3. Objectives ----------

II. LITHOSTRATIGRAPHY OF THE UPPER CRETACEOUS AND ECOCENE ROCKS ---------- 21

II.1. El-Dist and Naqb Ghorabi Sections of the Bahariya Foramtion (Upper Cretaceous) -------- 21

II.2. Naqb, Qazzun and Hamra Formations (Eocene)---- 33

III. PETROLOGIC STUDY OF THE CRETACEOUS CLASTIC ROCKS --- 43

III.1. Grain size analysis ---------- 44

III.2. Heavy-mineral analysis ---------- 64

III.3. X-ray differaction analysis ---------- 73

III.4. Petrogenesis and environmental conditions of deposition of clay minerals ---------- 127

IV. CHEMISTRY OF THE CRETACEOUS ROCKS ---------- 142

IV.1. The shales (major and trace elements) -------- 142

IV.2. The carbonate rocks ----------

V. STRATIGRAPHICAL MICROFACIES AND PETROGRAPHY OF THE EOCENE ROCKS ---------- 253

VI. CHEMISTRY OF THE EOCENE CARBONATE ROCKS ---------- 290

VII. SEDIMENTATION MODEL---------- 325

VIII. SUMMARY AND CONCLUSION ---------- 336

REFERENCES ---------- 354

ARABIC SUMMARY

INTRODUCTION

I. INTRODUCTION

Bahariya Oasis is a large oval-shaped depression located in the northern part of the Western Desert between Latitudes 27° 48' and 28° 30' N, and Longitudes 28° 50' and 29° 10 ' E (Fig. 1). The depression is entirely surrounded by escarpments and contains a large number of isolated conical hills. The most strongly marked group of hills is that extending in a nearly straight northeast-southwest direction dividing the oasis in two parts. The largest hill of the range is G. El-Hefhuf, a narrow ridge-like hill of limestone.

The Bahariya Oasis represents one of the most important Cretaceous and Eocene occurrences in the Western Desert (Fig. 2). The geology of the oasis was first described by Ball and Beadnell (1903). Their work has been continued by several workers who contributed much to the geology of the area (Hume, 1911; Stromer, 1914; Lebling, 1919; Blankenhorn, 1921; Afia and Nessim, 1952; LeRoy, 1953; Faris et al., 1956; Hermina et al., 1957; Squares and Hermina, 1957; Zaatout, 1958; Gheith, 1959; Nakhla, 1961; El-Bassyony, 1961, 1972, and 1978; Said, 1962; El-Shazly, 1962; El-Akkad and Issawi, 1963; Said and Issawi, 1964; Soliman et al., 1970; Kamel, 1971; Amer, 1973; Saad, 1979; Franks, 1982 and El-Mansy, 1983.

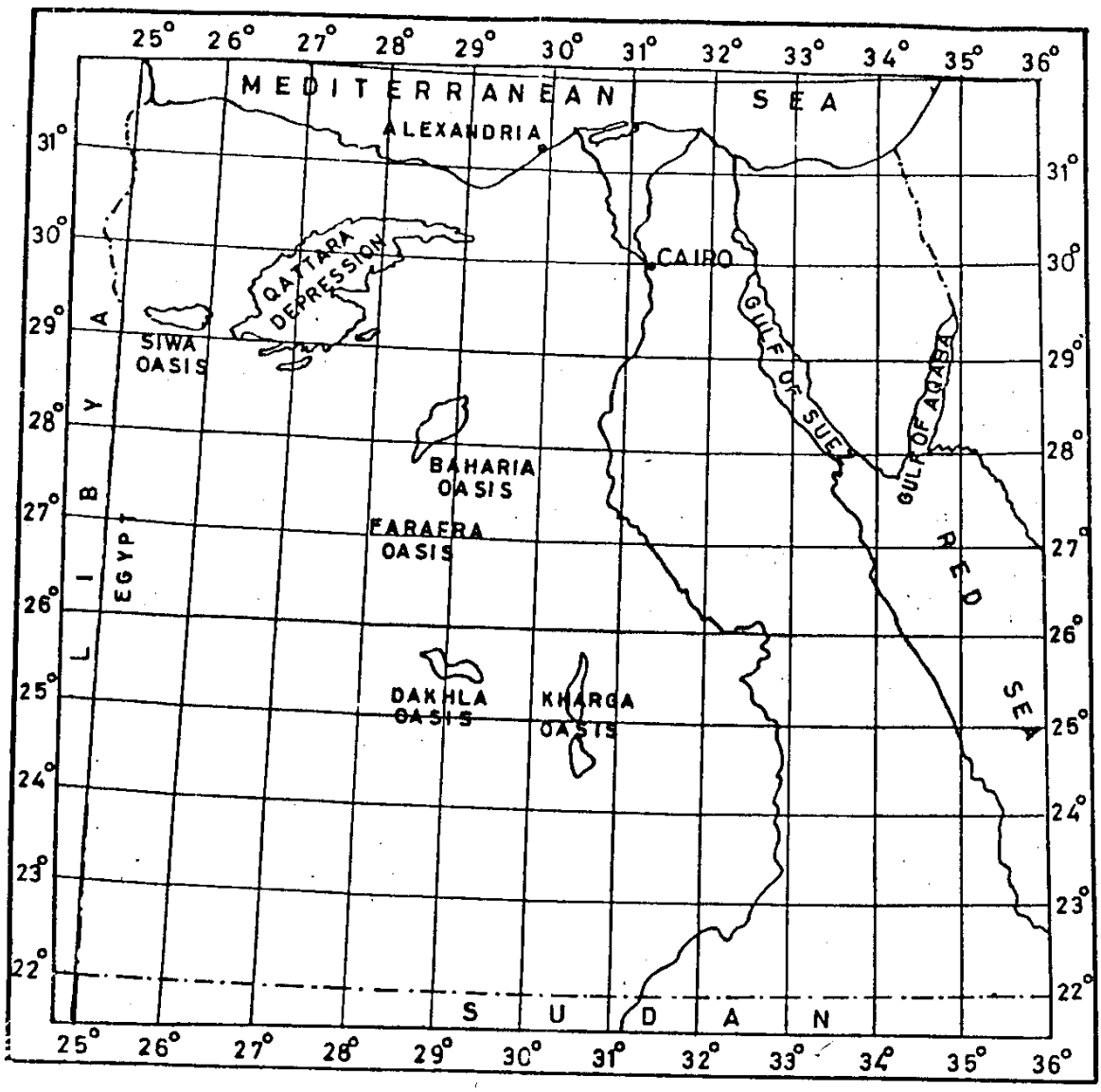

Fig.(1)- Location Map Of The Bahariya Oasis

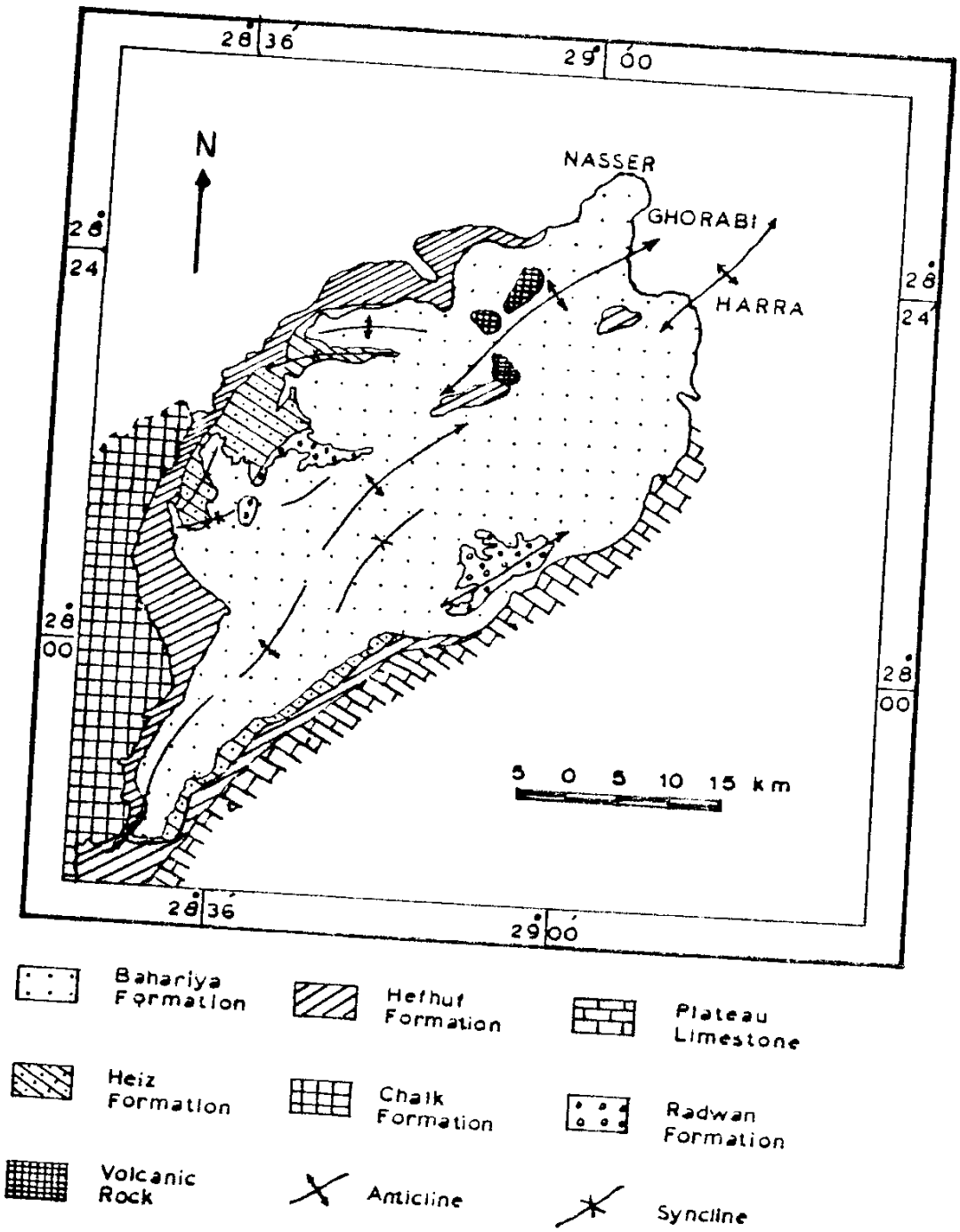

Fig.(2)- Geological Map of the Bahariya Oasis
(After El-Akkad and Issawi,1964)

Several successions in the oasis have been measured by various workers. Different names have been given for the different lithologic units (Table 1). Throughout the present work, the names adopted by El-Akkad and Issawi (1963) for the Cretaceous formations and Said and Issawi (1964) for the Eocene formations will be used. The exposed rocks in the floor and escarpments of the oasis fall into the following stratigraphic rock units (from top to base) :

8- The surface deposits (top)		Pleisto-Rec.
7- The volcanic rocks		Oligocene
6- Radwan Formation		
5- Plateau Limestone	Eocene	Eocene
c- El-Hamra Formation		
b- Qazzun Formation		
a- Naqb Formation		
4- Chalk Formation	Early Maestrichtian	Cretaceous
3- El-Hefhuf Formation	Campanian	
2- El-Heiz Formation	Late Cenomanian	
1- Bahariya Formation (base)	Early Cenomanian	

The following is a brief description of these units as refered to Stromer (1914), Said (1962), El-Akkad and Issawi (1963), Said and Issawi (1964) and Soliman et al. (1970).

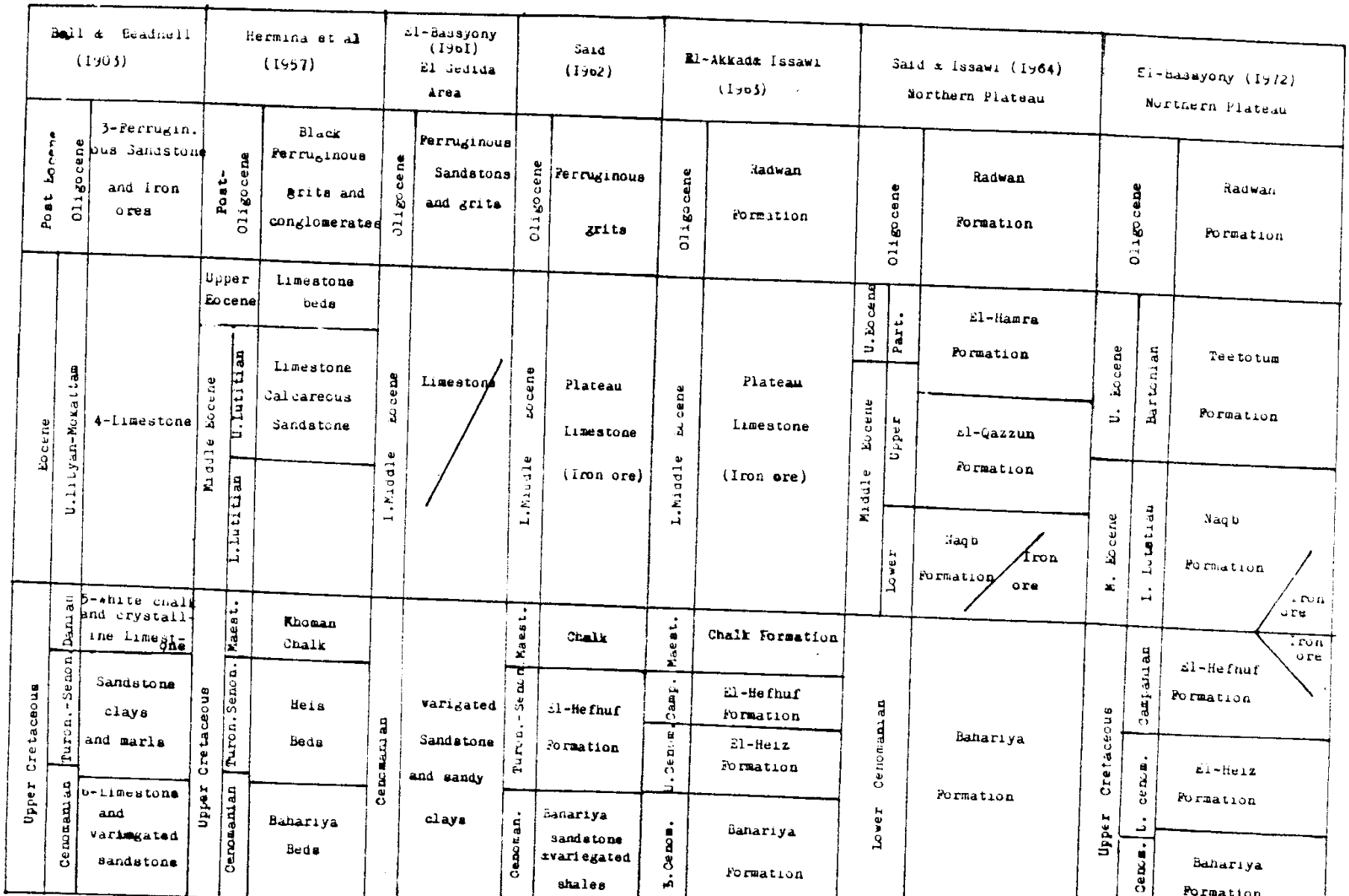

Table (I) Different formation names adopted by various authors for the Cretaceous and Eocene units in the Bahariya Oasis

1- The Bahariya Formation (Early Cenomanian)

The Behariya Fromation is represented by sandstones and variegated shales with many ironstone bands. It contains cross laminations, unconformities, glauconite, coprolites, vertebrate bones, osterca, and coal fragments particularly at the base. According to Soliman et al. (1970), this association represents a prodeltaic, partly restricted, reducing environment.

The Bahariya Formation forms the floor of the oasis and parts of the walls of the escarpments. It is better developed in the northern part of the oasis particularly in G. El-Dist where it is directly overlain by the Eocene limestone. In the southern parts of the oasis, the Bahariya Formation is overlain by El-Hefhuf Formation, while in the hills within the depression, it is capped either by the Eocene limestone or by the volcanic rocks.

The following is the section measured and compiled at Gebel El-Dist by Ball and Beadnell (1903) and Stromer (1914), (from top to base) :

		Thick.
7_a	(21- Alternation of shale and shaley sandstone with Exogyra columba.	8.0 m
	(20- Soft shale and sandstone with many hard ferruginous bands containing Gigantichthys spines and silicified wood.	21.0 m

7_b	(19-	Grey marl with plant remains and wood	1.5 m
7_c	(18-	*Compact yellow sandstone, false-bedded*	11.5 m
7_d	(17-	Hard ferruginous band with fish ossicles.	2.0 m
7_e	(16-	Grey shale with Longopteris leaves and turtle and Plesiosaurus remains.	1.5 m
	(15-	Soft sand alternating with hard ferruginous bands	6.0 m
	(14-	Shales with ferruginous bands containing Exogyra columba and Ostrea flabellata.	16.0 m
7_f	(13-	White to grey bedded sandstone	9.0 m
	(12-	Covered beds, one having Exogyra columba.	15.0 m
7_g	(11-	Shaley sandstone with hard ferruginous nodules containing Ostrea rouvillei and Exogyra costa.	3.5 m
	(10-	Sand beds	6.0 m
7h	(9-	Sandy shale	20.0 m
7i	(8-	Sandy shale	1.0 m
7k	(7-	Sandstone, brown to grey with red bands.	3.0 m
7l	(6-	Sandstone with dark ferruginous bands	10.0 m
7m	(5-	Sandstone	15.0 m
7n	(4-	Dark carbonaceous shale with plant remains	15.0 m
	(3-	Sandy beds	1.5 m
7O	(2-	White to grey sandstone	2.0 m
7p	(1-	Sandstone above becoming sandy shale, below with barite crystals.	

2- The El-Heiz Formation (Late Conomanian)

The El-Heiz Formation conformably covers the Bahariya Formation. It is composed mainly of marly shale, sandy limestone, and calcareous sandstone and shale. The formation shows opening of the environment of sedimentation. Uplifting

took place at its end and hence, in many parts of the oasis, it is unconformably covered by the El-Hefhuf Formation with the missing of, at least, the Turonian.

3- The El-Hefhuf Formation (Campanian)

The El-Hefhuf Formation is composed mainly of variegated sandstone and hard dolostones with some chert bands and intraformational conglomerates. It is best developed at the southern end of the Bahariya Depression and in the series of hills located in the center of the depression. Ball and Beadnell (1903) reported Cidaris thenasi, Lecocidaris bondai, Ostrea flabellata ..... etc.

4- The Chalk Formation (Early Maestrichtian)

This is rather a dolostone foramtion formed of porous dolostone and dolomitic limestone with veinlets of calcite. At the western scarp, it conformably overlies the El-Hefhuf Formation and is angular unconformably covered with the Middle Eocene limestone. At the southern end of the Bahariya Depression, the Chalk Formation was reported to contain Exogyra overwegi.

The previously given succession of the Cretaceous system in the Bahariya Oasis shows that this system is devided into clastic groups in the base and nonclastic deposits at the top. According to Soliman et al. (1970), these signify the change of the environment from a prodeltaic

and platform environments with fluviatile contribution to a shallow marine environment of nonclastic deposition.

5- The Plateau Limestone (Eocene)

The Plateau limestone is assigned by Said (1962) to the early Middle Eocene. It covers an extensive tract particularly in the northern plateau of the Bahariya Oasis. The Plateau Limestone is encountered both in the walls of the escarpments and in the isolated hills within the depression directly overlying the Bahariya Formation. To the south, it overlaps the lower Maestrichtian Chalk, while in the middle part of the oasis, it covers the El-Hefhuf Formation.

Said and Issawi (1964), investigated and mapped the area to the north of the Bahariya Oasis and established a palaeontological zonation of the Eocene rocks. They subdivided the Plateau Limestone into three formational rock units; namely (from base to top): the Naqb Formation, the Qazzun Formation and the El-Hamra Formation. The three formations differ from each other in lithology and field appearance. The Naqb Formation (Early Lutetian) overlies with angular unconformity the Bahariya Formation in the area north of the oasis. It consists of a succession of limestone beds with few marl and clay interbeds. The limestones are partly siliceous and occasionally dolomitic. At Gebel Ghorabi and Nasser area, the stratigraphic position

of the Naqb Formation is partly taken up by iron ore deposits. The Qazzun Formation (Late Lutetian) conformably overlies the Naqb Formation. It is represented by numerous nummulitic limestone beds which are occasionally siliceous and/or dolomitic particularly at the south where the beds are thinner. Beside Nummulites species, the limestone beds contain Lucina sp. and Ostrea multicostata. The El-Hamra Fromation (Late Lutetian-Bartonian) overlies the Qazzun Formation with apparent conformity. It is mainly formed of limestones with a few clastic intercalations that become especially more frequent towards the upper part of the succession.

The following sections representing the Naqb Formation, the Qazzun Formation and the El-Hamra Formation were measured and described by Said and Issawi (1964).

A- The Naqb Formation (Northern Plateau, drill hole No. 1)

Top.

11- Loose sand and gravel, made up of pebbles of siliceous and ferruginous limestone embedded in clay matrix of reddish color. 1.50 m

10- Ferruginous limestone, dark reddish at top, porous, glauconitic with rare yellow ochreous patches. At the middle of the bed, the limestone becomes less porous, ferruginous with rare sandy intercalations and fossiliferous. The lower 3 meters are again ferruginous, porous with hard compact siliceous bands. 8.75 m