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MORPHOMETRY OF DISCOASTER MULTIRADIATUS BRAMLETTE & RIEDEL (1954) AND ITS BIOCHRONOLOGICAL SIGNIFICANCE IN THE EARLY PALEOGENE OF EGYPT

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ABSTRACT

The mean ray number for Discoaster multiradiatus Bramlette & Riedel, a marker species for the Late Paleocene, is counted from samples representing the Late Paleocene-Early Eocene of Egypt.

The data from the present study indicate that there is a general decrease in the mean ray number for Discoaster multiradiatus Bramlette & Riedel through time. It is also concluded from this study that the mean diameter of this species was highly variable during the Late Paleocene-Early Eocene interval.

INTRODUCTION

The Late Cretaceous- Early Tertiary rocks are well-developed in the stratigraphic succession of Egypt. These rocks have attracted the attention of many stratigraphers and paleontologists because they are highly fossiliferous. Examples include: Nakkady, 1951; Said, 1960 ; El Naggar, 1966 a,b; Hassan et al.1978; Perch-Nielsen et al. 1978 ... and many others.

The studied succession comprises a number of rock units which are known from base to top as: the Nubia Sandstone, Quseir Shale, Duwi Formation, Dakhla Shale, Tarawan Chalk, Esna Shale and Thebes Formation.

The Nubia Sandstone, Quseir Shale, Duwi Formation and the lower part of the Dakhla Shale are of Late Cretaceous age. The Paleocene sediments are represented by the upper part of the Dakhla Shale, the Tarawan chalk and the lower part of the Esna Shale; while the upper part of the Esna Shale and the overlying Thebes Formation belong to the Early Eocene.

Moshkovitz (1967), Romein (1979) and more recently Faris (1988 b) suggested that the number of rays for the Discoaster multiradiatus Bramlette & Riedel, a marker species for the NP9 Zone, (Late Paleocene) decreases progressively in younger assemblages. In order to test this hypothesis, in some Late Paleocene-Early Eocene stratigraphic sections in Egypt (Duwi, El Ain, El Falig, Wasif, Taramsa, Abu Had, El Serai and Gurnah sections; Fig. 1) the number of rays for D. multiradiatus Bramlette & Riedel was counted in samples representing the time span Late Paleocene-Early Eocene. 20 counts of D. multiradiatus Bramlette & Riedel individuals were made for each sample. In addition, the diameter of Discoaster multiradiatus Bramlette & Riedel individuals is also counted. The numerical results are traced in Figures 2-9.

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RESULTS AND DISCUSSION

The litho- and biostratigraphy of the Late Cretaceous-Early Tertiary sequences of the studied sections have been published (Faris, 1982, 1984, 1985, 1988 a,b; Faris et al. 1986; Faris, in prep.). The Late Paleocene-Early Eocene nannofossil zones for the studied sections are shown in Table. 1.

The *Discoaster multiradiatus* Zone (NP9) is considered as the last nannofossil zone in the Paleocene (Martini, 1971; Romein 1979; Perch-Nielsen, 1981, 1985 ... and others). In general, the Paleocene-Eocene boundary is drawn between the NP9 and NP10 nannofossil zones. The Early Eocene includes the NP10, NP11 and NP12 Zones.

In the present study, there is a general decrease in the mean number of rays for *Discoaster multiradiatus* Bramlette & Riedel through the Late Paleocene-Early Eocene (NP 9- NP 11) for all the examined sections (Figs. 2-9). For example, in the Taramsa section (Fig. 8),the mean ray number of *D. multiradiatus* Bramlette & Riedel decreases from about 26 near its first occurrence level (base of NP9) to about 10 near its last occurrence level. (top of NP 11).

It can be concluded from the present study, together with other data from Um El Huetat section (Faris, 1988 b) [illegible] *Discoaster multiradiatus* Bramlette & Riedel with mean ray number greater than 17 fall into NP 9 Zone (Late Paleocene); those with mean ray numbers between 13 and 17 are within the NP 10 Zone (Early Eocene); and those with mean ray numbers less than 13 are located within NP 11 Zone (Early Eocene). The mean ray number of _Discoaster multiradiatus_ Bramlette & Riedel can then be used as age indicator. For example, in the absence of the marker species of NP 10 Zone, the mean ray number of _Discoaster multiradiatus_ Bramlette & Riedel [13-17] may indicate Early Eocene age (NP 10).

This study indicated also that the mean diameter of _Discoaster multiradiatus_ Bramlette & Riedel is highly variable in the studied samples, and no apparent relationship was found between the ray number and the diameter of this species (Figs. 2-9 & Plate 1).

The decrease of number of rays / arms for _Discoaster multiradiatus_ Bramlette & Riedel during the Late Paleocene and Early Eocene in the studied localities seems to be related to evolutionary lineages of the _Discoaster_ Group, rather than the ecological conditions of the sedimentary basins in these localities.

The comparison between the mean ray numbers for _Discoaster multiradiatus_ Bramlette & Riedel in the different studied sections shows a rather good similarities; however, minor differences may also occur (Table 2). These differences may be depend upon the geographic situation of the studied sections environmental conditions.

Age	Nannofossil Zone	Studied Sections								
		EL Ain	EL Falig	Um EL Huetat	Wasif	Duwi	Abu Had	EL Serai	Taramsa	Gurnah
Early Eocene	T. orthostylus NP12									
	D. binodosus NP11		X			X	X	X	X	X
	T. contortus NP10	X	X	X	X	X	X	X	X	X
Late Pal.	D. multiradiatus NP9	X	X	X	X	X	X	X	X	X

Table 1. Late Paleocene - Early Eocene nannofossil zones of the studied sections

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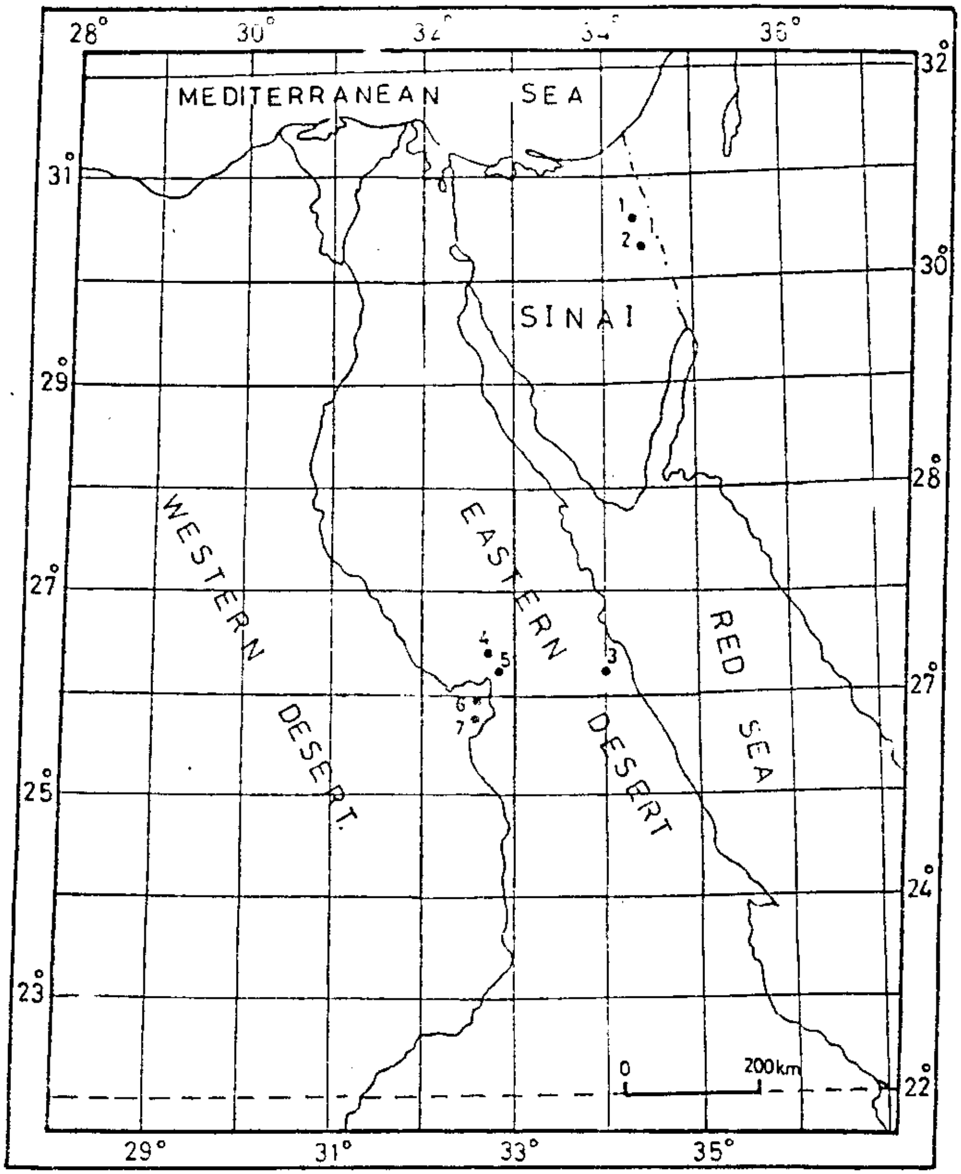
Age	Zone (NP)	Studied Sections	Mear ray numbers	
Early Eocene	*Discoaster binodosus* (NP 11)	EL Falig	12	< 13
		Duwi	12	
		Taramsa	10 - 12	
		Gurnah	8 - 10	
	Tribrachiatus contortus (NP 10)	EL Ain	17	13 - 17
		EL Falig	14 - 17	
		Um El Huetat (Faris, 1988 b)	13 - 17	
		Duwi	16 - 17	
		Abu Had	14 - 17	
		EL Serai	15 -17	
		Taramsa	14 - 17	
		Gurnah	13 - 17	
Late Paleocene	*Discoaster multiradiatus* (NP 9)	EL Ain	17 - 23	> 17
		EL Falig	20 - 23	
		Wasif	20 - 21	
		Um El Huetat (Faris, 1988 b)	20 - 23	
		Duwi	20 - 23	
		Abu Had	20 - 27	
		EL Serai	20 - 26	
		Taramsa	20 - 26	
		Gurnah	20 - 26	

Table 2 . The mean ray numbers of ***Discoaster multiradiatus*** Bramlette & Riedel (1954) in the studied sections



1. EL Falig 2. EL Ain 3. Duwi 4. Abu Had 5. EL Serai

6. Taramsa 7. Gurnah

Fig. 1: Location map of the studied sections

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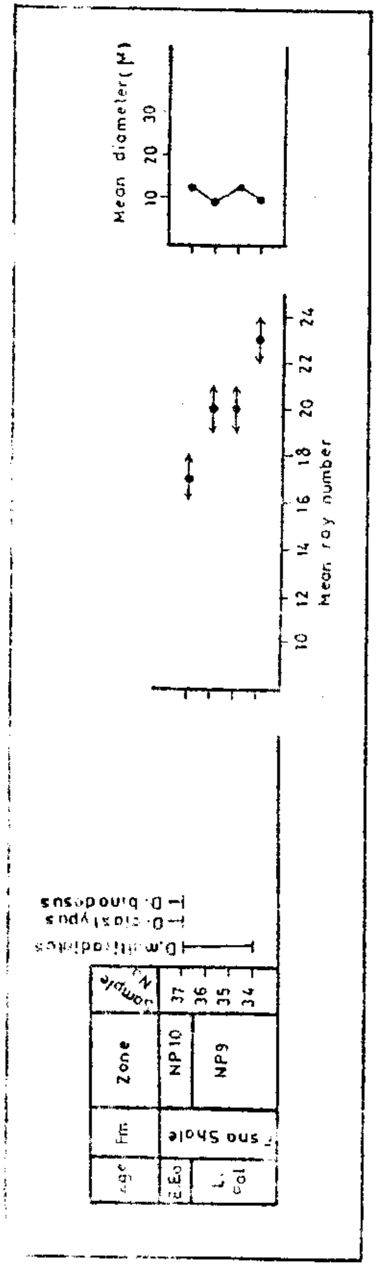

Fig. 2: Mean ray number changes of *Discoaster multiradiatus* through time, El Ain section, NE Sinai.

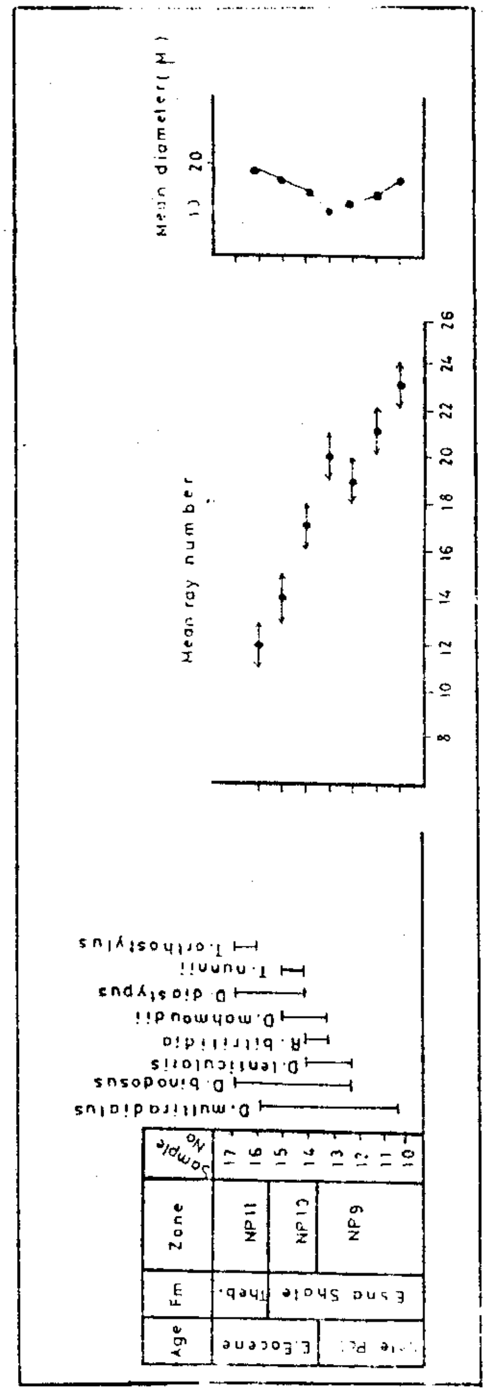

Fig. 3: Mean ray number changes of *Discoaster multiradiatus* through time, El Falig section, NE Sinai.

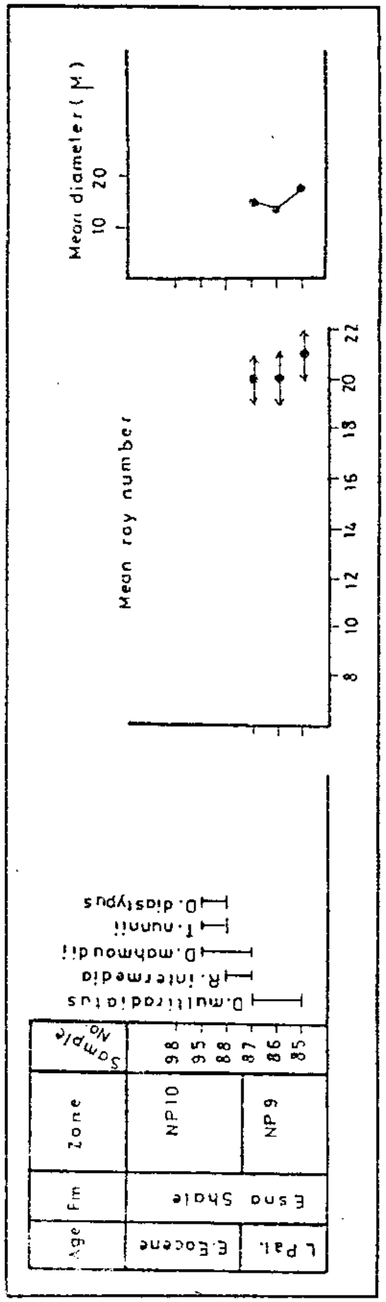

Fig. 4: Mean ray number changes of *Discoaster multiradiatus* through time, Wasif section, Safaga area.

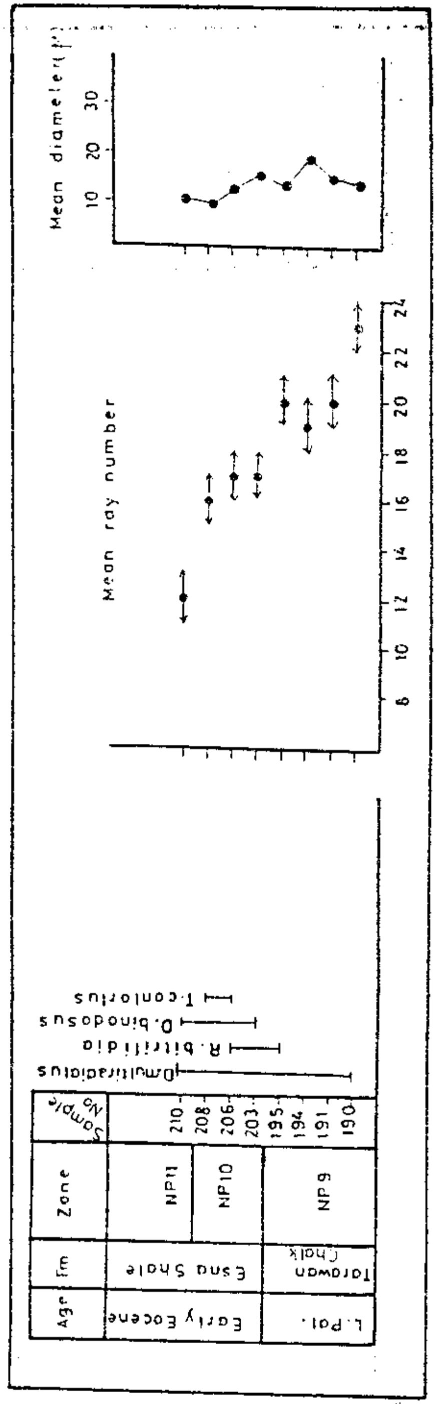

Fig. 5: Mean ray number changes of *Discoaster multiradiatus* through time, Duwi section, Quseir area.

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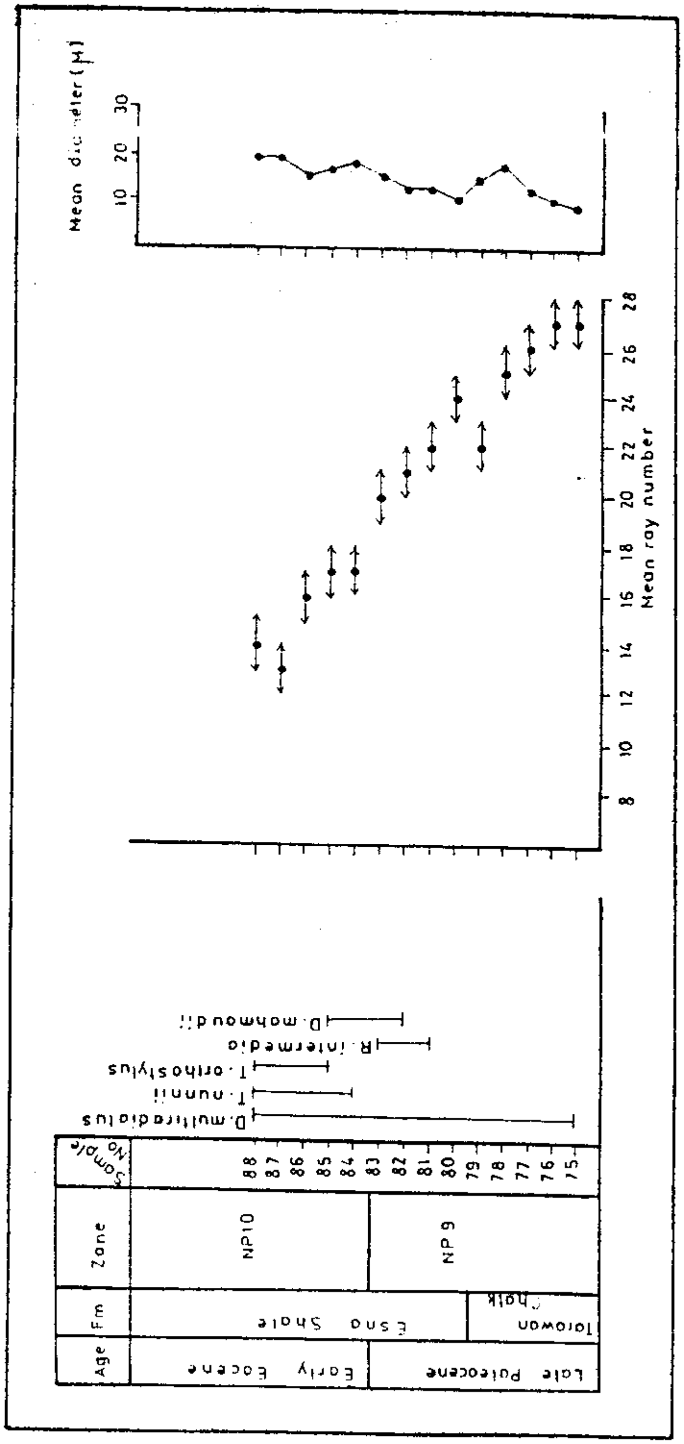

Fig. 6: Mean ray number changes of *Discoaster multiradiatus* through time, Abu Had section, Qena region

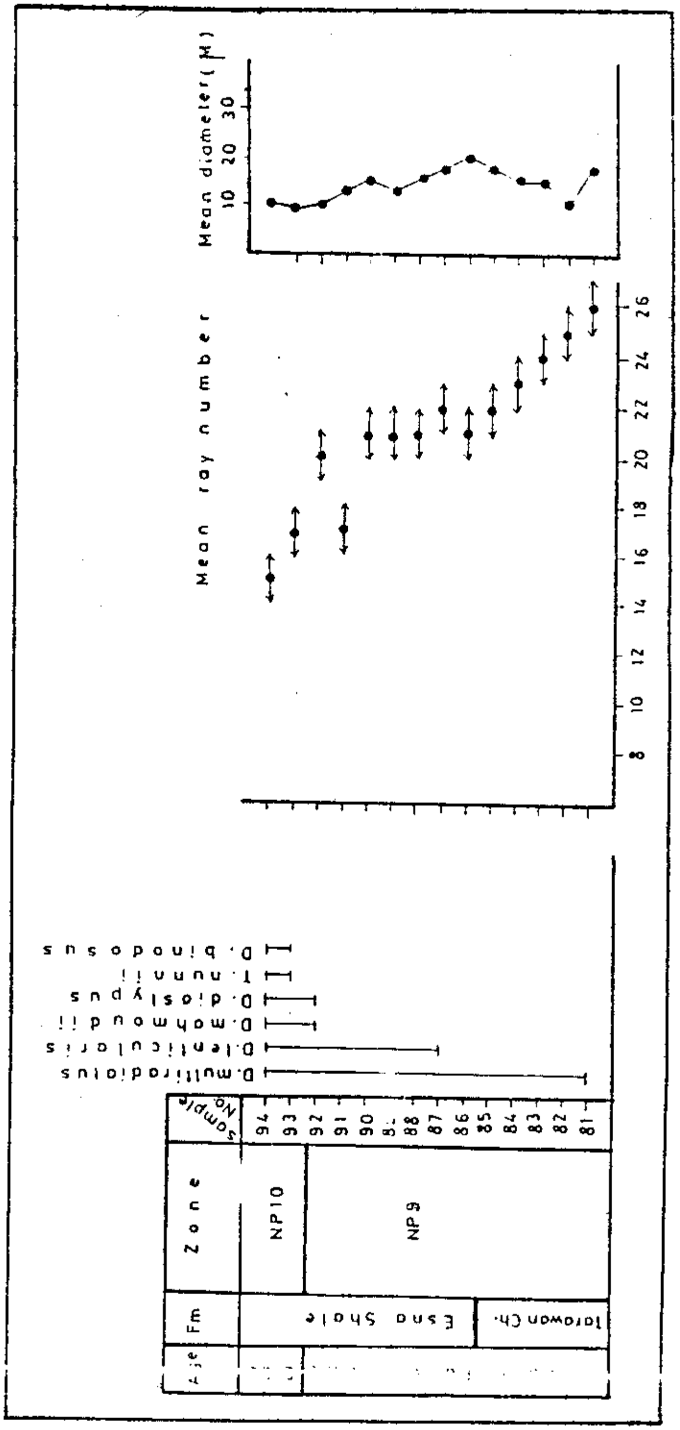

Fig. 7: Mean ray number changes of *Discoaster multiradiatus* through time, El Serai section, Qena region

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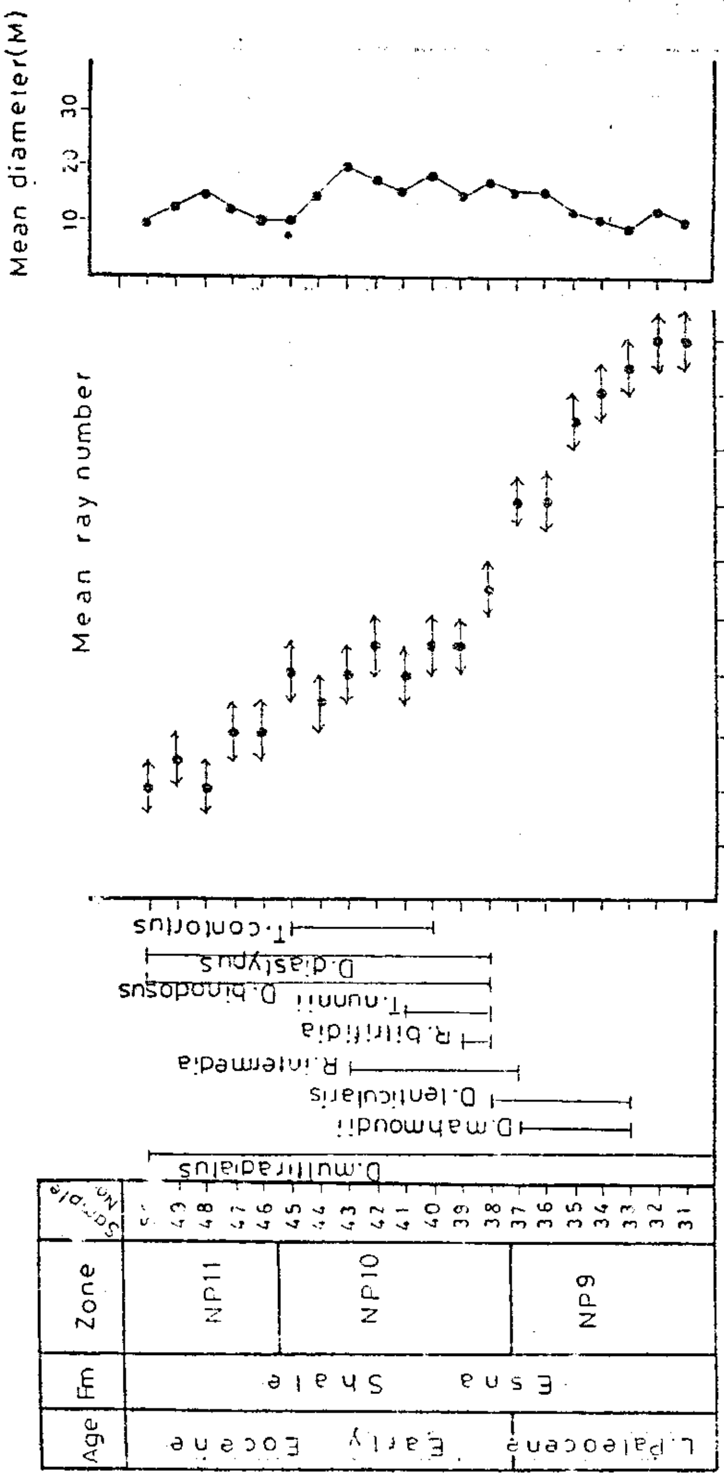

Fig. 8: Mean ray number changes of *Discoaster multiradiatus* through time, Taramsa section, west of Qena, Nile Valley

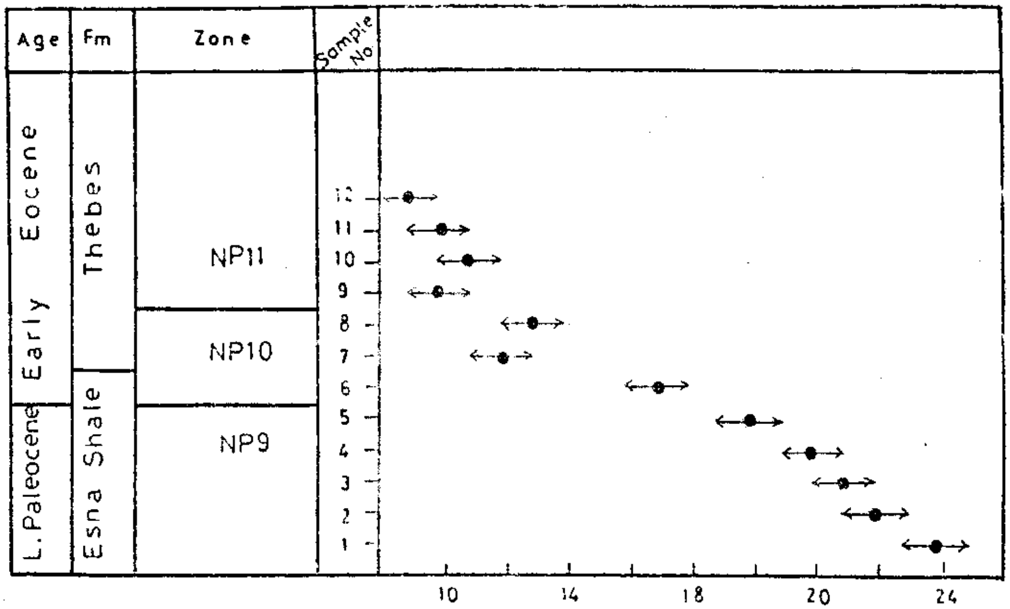

Fig. 9: Mean ray number changes of *Discoaster multiradiatus* through time, G. Gurnah section, Luxor, Nile Valley

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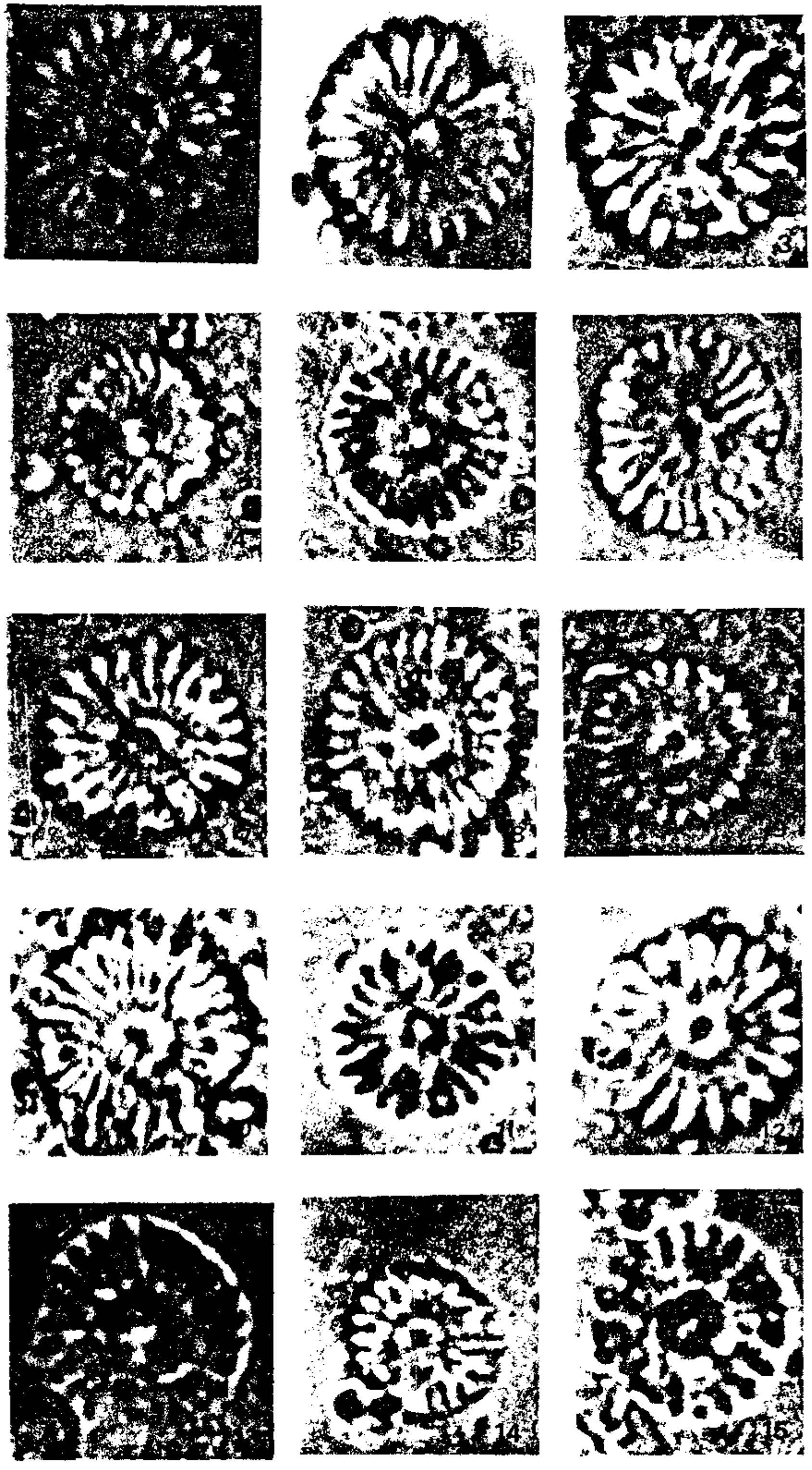
PLATE 1

(All Figures X 2000)

Fig.	
1-15	*Discoaster multiradiatus* Bramlette & Riedel (1954)
1,2	El Ain section, NE Sinai
1	Sample No. 36, *D. multiradiatus* Zone (NP9)
2	Sample No.37, *T. contortus* Zone (NP10)
3,4	EL Falig section, NE Sinai
3	Sample No.10, *D.multiradiatus* Zone (NP9)
4	Sample No.16, *T. contortus* Zone (NP10)
5,6	Wasif section, Safaga area
5	Sample No.86, *D. multiradiatus* Zone (NP9)
6	Sample No.88 , *T. contortus* Zone (NP10)
7,8	Duwi section, Quseir area
7	Sample No.194, *D. multiradiatus* Zone (NP9)
8	Sample No.210, *D. binodosus* Zone (NP11)
9,10	Abu Had section, Qena region
9	Sampel No.75, *D. multiradiatus* (NP9)
10	Sample No.85, *T. contortus* Zone (NP10)
11,12	El Serai Section, Qena region
11	Sample No,90 *D. multiradiatus* Zone (NP9)
12	Sample No.93, *T. contortus* Zone (NP10)
13,14	Taramsa section, west of Qena
13	Sample No.40, *T. contortus* Zone (NP10)
14	Sample No. 48, *D. binodosus* Zone (NP11)
15	G. Gurnah section, Luxor, Nile Valley
	Sample No. 12 , *D. binodosus* Zone (NP 11)

PLATE 1



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قياسات الابعـــاد(مورفومترية) نوع Discoaster multiradiatus واهميته الطباقية فى صخور الباليوجين المبكر فى مصـــر

محمـــود فارس محمـــد
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يتناول هذا البحث دراسة احصائية لعدد الازرع فى نوع coaster multiradiatus من عينات جمعت بالقرب من الحد الفاصل بين الباليوسين والايوسين السفلـــى مـــن بعض القطاعات الطباقية فى مصـــر.

اكدت تلك الدراسة ان عدد الازرع يتناقص بصفـــة عامـــة فوق الحـــــد الفاصـل بين الباليوسين والايوسين السفلى وان متوسط قطر صدفته كان متغيرا ولم تثبت علاقة بين عدد الازرع ومتوسط قطره خلال تلك الفترة الزمنيـــــة.