Triassic and Creataceouse Palynomorphose from Well A2-045 /01 Offshore Libya

Rajab El-Zaroug*

Abstract: Triassic and Cretaceous palynomorphs have been recovered from twenty three ditch cutting samples of borehole A2-054/01 located in the most northern part of Sirt Basin (Offshore), Libya.

Microscope investigations revealed moderately rich assemblages consisting only miospores in the Triassic section and mixed palynomorphs (dinocysts, miospores & algae) in the Cretaceous section. The recovered palynomorphose from the studied samples enabled to erect two distinctive palynological assemblages. These assemblages range from Early Triassic to Early Cretaceous in age. The ages assigned to these assemblages have been determined by comparing the palynomorphs assemblages with similar assemblages recorded from Mesozoic sequences in other nearby regions in Africa, North America and Europe.

Paleoenvironmental interpretation of the investigated sediments revelled that Cretaceous sediments were mostly deposited in shallow marine environment; other investigated rocks (Triassic) were deposited either in non-marine environment or in marginal marine environment.

Keywords: Triassic, Cretaceous, Palynomorphs, Offshore Sirt Embayment.

INTRODUCTION

Hot shot Playonological study have been utilized in order to define age and depositional environments of selected twenty three cutting samples from well A2-054/01 located in the Offshore Sirt Embayment, Libya (Fig. 1), which belongs to Hess Libya, located in the Offshore Libya.

The study based on selected of twenty three cutting samples (Table 1), and despite of difficulties caused by caved palynomorphs from younger strata and highly carbonised of palynomorphs in the last two samples (10660-10675), which may be caused by either continental environment or/and affected by heat of volcanic rocks. Palynological recovery in general was fair in most samples.

Microscope investigations revealed fair assemblages consisting of pollen grains, dinoflagelates cysts and few spores. Palynodebris (amorphose organic matter & woody derbies) are heavely counted in the investigated samples. The extracted palynomorphs assemblages range from Early Triassic – Late Cretaceous in age. The ages assigned to these assemblages have been determined by comparing the palynomorphs assemblages with similar assemblages recorded from Mesozoic sequences in other nearby regions such as Sirt Basin, north east Libya region, south east Libya (Al Kufrah Basin) and from other parts of Africa and also from North America and Europe. Paleoenvironmental interpretation is based on interpreted lithological and palynological criteria.

MATERIAL AND METHODS

Samples: Twenty three cutting samples from well A2-054/04 were selected by HESS geologists (Table 1).

Laboratory Techniques: The Samples were prepared according to standard palynological procedures. The preparation stages can be summarized as following:

Cleaning sample: Samples were washed using tap water and 150 µm mesh sieve to remove drilling mud.

Picking: All selected samples were sieved in 2 mm mesh sieve to eliminate any possible caved material (material larger than 2mm assumed to be caved)

*Geological Department, Faculty of Engineering, Tripoli University
rzaroug@yahoo.com

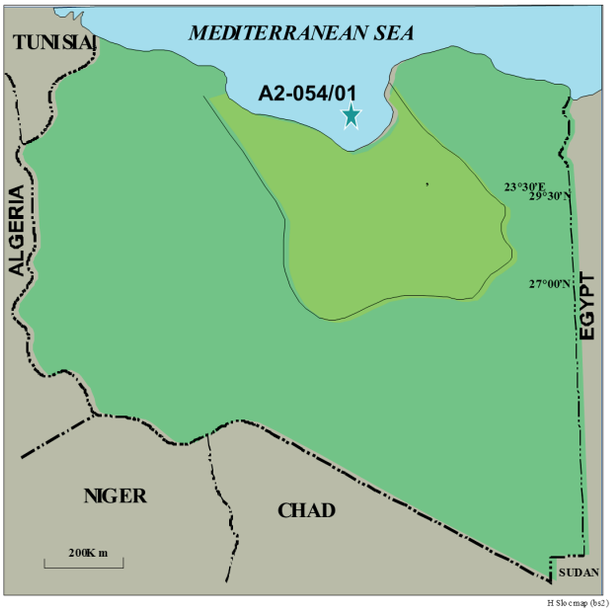

Fig.1. Location of the studied well A2-054/04

Table 1: Samples Selected for Palynological Analyses

S/N	Depth/feet
1	10000-10020
2	10020 - 10040
3	10040 - 10060
4	10060 - 10080
5	10080 - 10100
6	10100 - 10120
7	10120 - 10140
8	10140 - 10160
9	10160 - 10180
10	10180- 10200
11	10200 - 10220
12	10220- 10240
13	10240 - 10260
14	10260 - 10280
15	10280 - 10300
16	10300 - 10320
17	10320 - 10340
18	10340 - 10360
19	10360 - 10380
20	10380 - 10400
21	10400 - 10420
22	10660 - 10670
23	10675

Demimeralization:

- Carbonate removal using hydrochloric acid (HCI 18%).
- Silicate removal using hydrofluoric acid (HF 40%).
- Sieving using 10, 18 and 64 micron sieve as appropriate
- Oxidation to remove unwanted organic matter using nitric acid (HNO3 65%) for about 3-5 minutes (applied for some samples)
- Removal of minerals (separation the inorganic mineral from the organic matter by using zinc chloride (ZnBr) with specific gravity 2.00.
- The cleaned and neutralized residue is mixed with few drops of the dispersing solution (PVA) to prevent coagulation of the organic residue on the slide. This mixture spread on two 24X50mm cover slips using pipettes and allowed to dry on hot plate (25˚C). Mounting was achieved by placing one or two drops of the resin on to a clean microscope slide (76 X 26mm).

PALYNOLOGICAL RESULTS

Interval (ft.): 10000–10280
Samples analyzed: 14 Cutting samples.
Age: Early–Mid Cretaceouse (Albian-Cenomanian).

Remarks: Mixed land derived and marine palynomorphs, were recovered from this interval. Herbaceous debris also was highly counted in many samples of this interval.

Age of this interval based on the presence of the following palynomorphs:

Dinocyst: *Florentinia mantellii, Oligospheridium pulcherrimum, Oligospheridium complex, Odontochitina operculata, Subtilisphaera zawia, S. Cheit, Cyclonephelium* spp., and *Coronifera sp.* Cf. *C. tubulosa*.

Miospores: *Afropollis operculatus, Concavisporites spp., Ephedripites* spp., *Classopollis brasiliensis, Balmeisporites holodictyus, Elaterosporites castelainii* and *Cicatricosisporites* spp.

Similar assemblages were reported by Thusu & Van Der Eem (1985), Batten & Uwins (1985) and Uwins & Batten (1988) from Early – Mid Cretaceous sediments of North East Libya region.

Paleoenvironment: The mixed presence of land derived organic matter (miospores & woody derbies) and marine Dinocysts suggest deposition in shallow marine environments. However high abundance of herbaceous debris in number of samples suggest

close proximate toward the shore line. The presence of fresh water algae (*Pediastrum palaeogenites*) indicates fresh water influences.

Interval (ft.): 10280 – 10420
Samples analyzed: 7 Cutting samples.
Age: Early Cretaceous (late Neocomian-Aptian).

Remarks: Sparsely land derived organic matter, dominated by miospores and herbaceous debris were recovered from this interval. Age of this interval based on the presence of Miospores; *Chomotriletes minor, Dicheiropollis etruscus, Perotrilites* sp. & *Trilobosporites* cf. *Bernissartensis, along with Dinocysts; Pseudoceratium retusum, Muderongia simplex* and *Aptea securigera*.

The above assemblages indicate an age no younger than Early Cretaceous (Aptian). Almost similar assemblages were reported from early Cretaceous sediments, NE Libya by Batten (1996); Batten & Uwins (1985), Uwins & Batten (1988) and Thusu *et al* (1988).

Paleoenvironment: The predominance of land derived material in which herbaceous debris were the most common, few marine palynomorphs (few specimens of dinoflagelate cysts, most of them can be of younger cretaceouse strata), suggest deposition in marginal to shallow marine environment.

Interval (ft.): 10480 – 10675
Samples analyzed: 10 Cutting samples.
Age: ?Early–Mid Triassic (Scythian-Karnian).

Remarks: Land derived organic matter, dominated by pollen grains and herbaceous debris was recovered from this interval. Age of this interval based on the presence of (if insitu) *Lunatisporites pellucidus, Alisporites australis, A. Robusta, Aratrisporites centatus, A. Scabrates, A. Composites, Platysaccus leschikii, P. Papilionis, Protohaploxypinus* spp., and *Voltziaceaesporites heteromorphus.*

Similar assemblages were reported from Early Triassic sediments, Northwest Libya by (Adloff *et al* 1986). Almost similar assemblages were recorded by Brugman & Visscher (1988), from Early Triassic sediments in Northeast Libya

Paleoenvironment: The predominance of land derived organic matter in which pollen grains and herbaceous debris was the most common and almost absent of marine palynomorphs (few Acritarchs were observed, but regarded to be either caved or recycled and also few caved dinocysts from younger strata), suggest deposition in a non marine environment.

Table 2: Summary of the Stratigraphy

Top Depth/feet	Series	Stage
10000-10280	Mid-Cretaceous	Albian-Cenomian
10300-10460	Early Cretaceouse Unconformity	Neocomian Aptian
10480 – 10675 (TD)	Early-Mid Triassic	Scythian-Karnian

The following summary tables are based on data obtained from the analyses of ditch cuttings samples. The boundaries quoted are either the bottom depths of sampled intervals or have been adjusted to suitable wire line log break.

CONCLUSION

Two distinctive palynological zones have been established. These from the Triassic and Cretaceous sediments of the studied well A2-054/04, on the basis of miospores and acritarchs, ranging in age from Early Triassic to Early Cretaceous (Fig. 2). These zones are assemblage zones and are correlatable with similar assemblages recorded from Mesozoic sequences in other nearby regions in Africa, North America and Europe.

Paleoenvironmental interpretation of the investigated sediments revelled that Cretaceous sediments were mostly deposited in shallow marine environments; other investigated rocks (Triassic) were deposited either in non-marine environments or in marginal marine environments.

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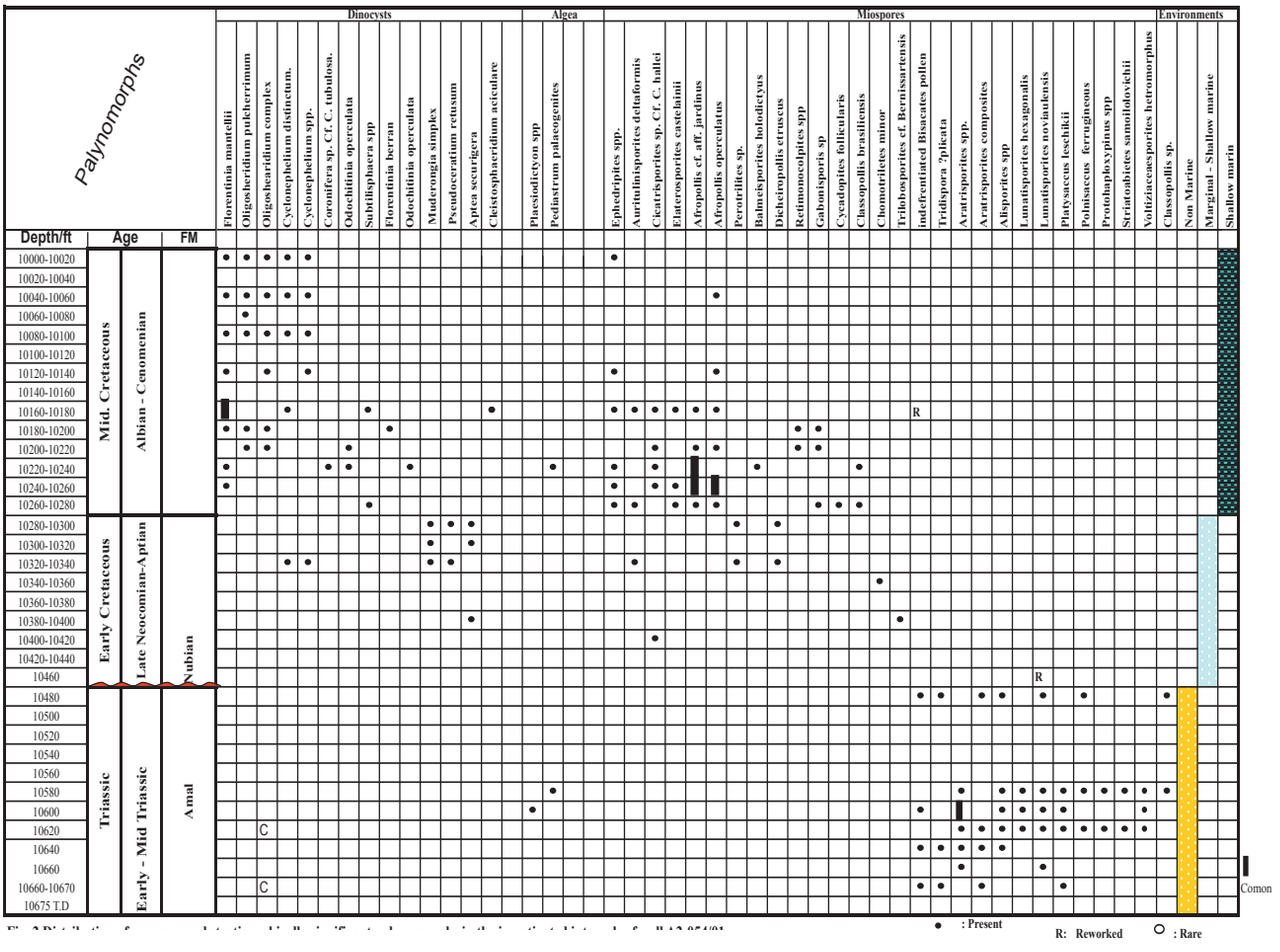

Fig.2. Distribution of common and stratigraphically significant palynomorphs in the investigated intervals of well A2-054/01.

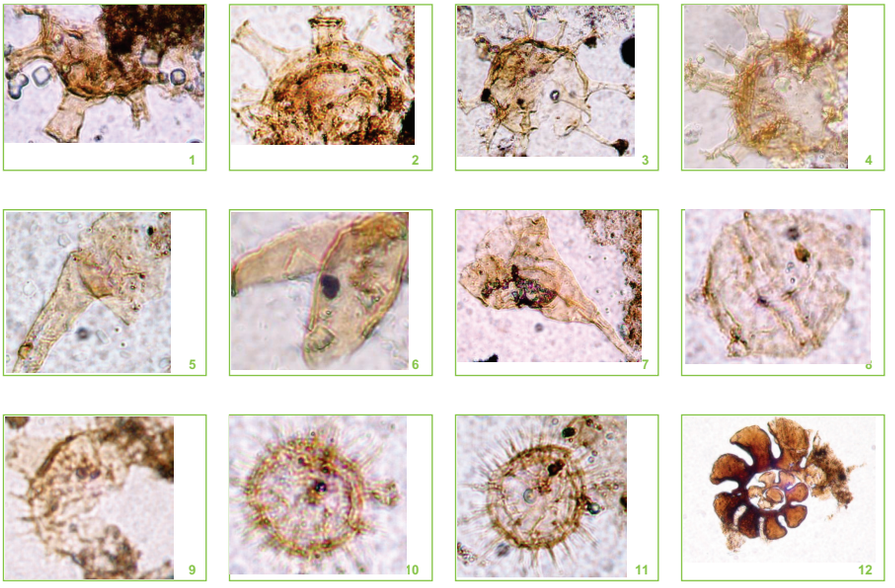

PLATE I

Early and Mid Cretaceous Dinocysts
The species name is followed by the sample depth in feet. All figures are X800 unless otherwise indicated

Plate I - 1, 2 Florentinia mantellii @ 10160-10180
Plate I - 3, 4. Oligospheridium complex @ 10080-10100
Plate I - 5 - 7 Odontochitina operculata @ 10200-10220
Plate I - 8. Subtilisphaera zawia @ 10260-10280
Plate I - 9. Florentinia berran.
Plate I - 10, 11 Coronifera sp. Cf. C. tubulosa @ 10220-10240
Plate I - 12. Foram lining @ 10040-10060

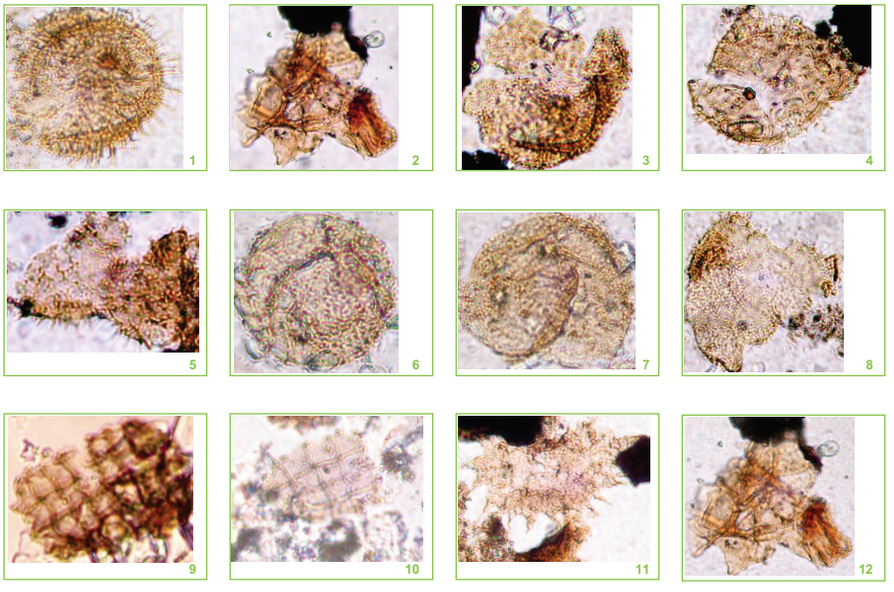

PLATE II

Early and Mid Cretaceous Dinocysts & Algea

Plate II - 1. Cleistosphaeridium aciculare @ 10340-10360
Plate II - 2, 12 Muderongia simplex @ 10320-10340
Plate II - 3, 4. Cyclonephelium distinctum @ 10340-10360
Plate II - 5, 8 Pseudoceratium retusum @ 10340-10360
Plate II - 6, 7 Cyclonephelium sp@ 10300-10320
Plate II - 9, 10 Plaesiodictyon spp (Algae) @ 10675
Plate II - 11 Pediastrum palaeogenites (fresh water algae) @ 10220-10240

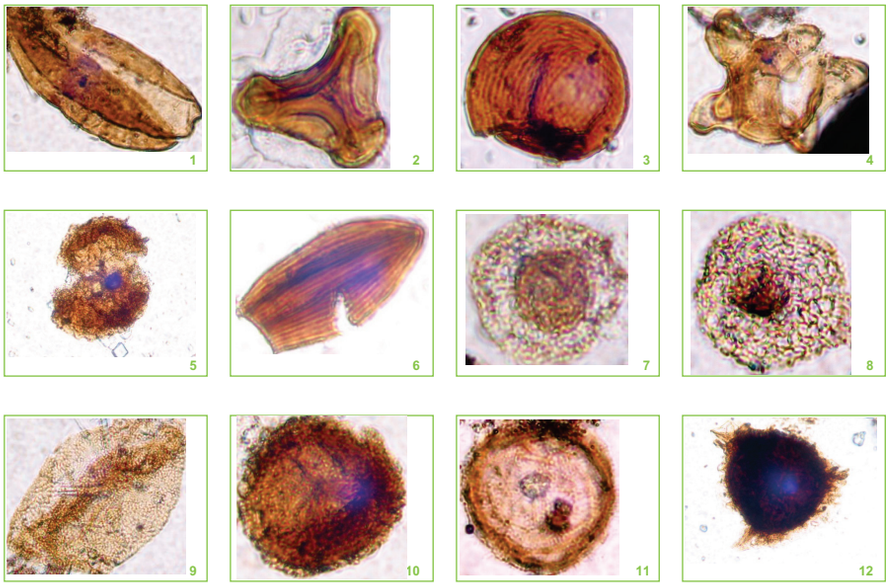

PLATE III

Early and Mid Cretaceous Miospores

Plate III - 1, 6 Ephedripites spp @ 10160-10180
Plate III - 2 Auritulinisporites deltaformis. @ 10160-10180
Plate III - 3 Cicatrisporites sp. Cf. C. hallei @ 10160-10180
Plate III - 4 Elaterosporites castelainii@ 10200-10220
Plate III - 5 Dicheiropollis etruscus @ 10320-10340
Plate III - 7 Afropollis operculatus @ 10160-10180
Plate III - 8 Afropollis cf. aff. jardinus @ 10320-10340
Plate III - 9 Retimonocolpites spp @ 10180-10200
Plate III - 10 Gabonisporis sp. @ 10220-10240
Plate III - 11 Chomotriletes minor @ 10340-10360
Plate III - 12 Perotrilites sp.. @ 10320-10340

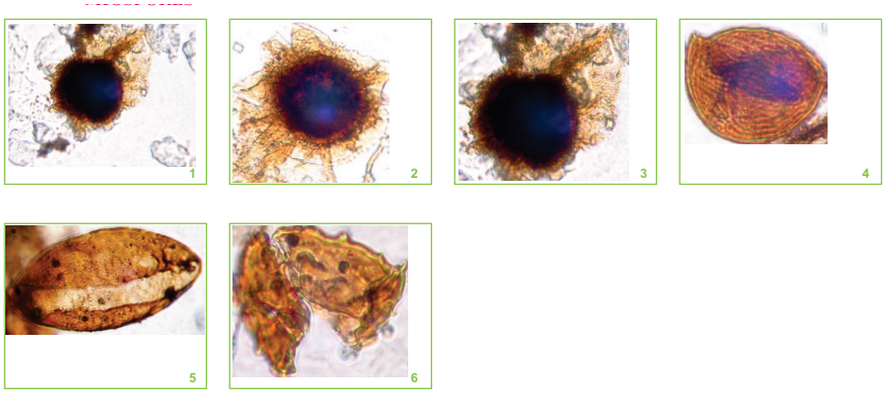

PLATE IV

Early and Mid Cretaceous Miospores

Plate IV - 1 - 3. Balmeisporites holodictyus @ 10220-10240
Plate IV - 4. Classopollis brasiliensis @ 10220-10240
Plate IV - 5. Cycadopites follicularis @ 10300-10320
Plate IV - 6. Trilobosporites cf. Bernissartensis@ 10380-10400

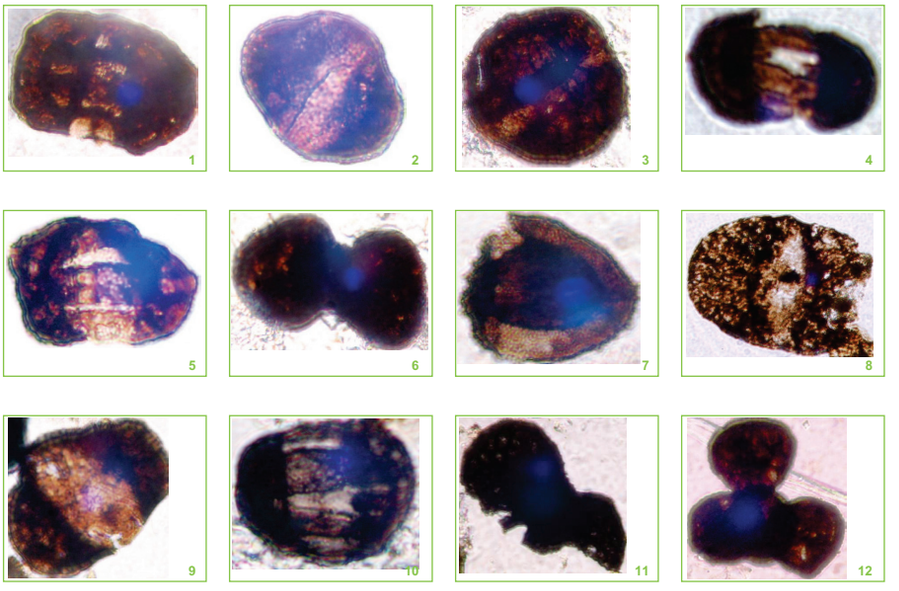

PLATE V

Triassic Miospores

Plate V - 1	Lunatisporites hexagonalis@ 10660
Plate V - 2	Triadispora plicata @ 10580
Plate V - 3	Polnisaccus ferrugineous @10660
Plate V - 4	Protohaploxypinus spp @10600
Plate V - 5	Striatoabietes samoilolovichii @10660
Plate V - 6	Platysaccus leschikii @10660
Plate V - 7	Aratrisporites composites @ 10620
Plate V - 8	Voltziaceaesporites hetromorphus @ 10600
Plate V - 9	Alisporites spp., @10600
Plate V - 10	Lunatisporites noviaulensis @10660
Plate V - 11	Indiferentiated Bisaccates pollen @ 10600
Plate V - 12	Classopollis sp. @ 10600