71/142

GASON
SG 54-13

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

Palaeontology Section

UPPER CRETACEOUS PALYNOLOGY OF THE WINTON FORMATION GASON 1:250,000 SHEET

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ABSTRACT

Palynological examination of cores from the Winton Formation on GASON yielded well preserved and diverse microfloras of the Tricolpites pannosus zone of Albian - ?Cenomanian age. In one core the microfloras reflect paludal conditions whereas the others represent sedimentation in a lacustrine environment.

Recycled Triassic sporomorphs are present in most samples and indicate a probable middle - late Triassic age. The source of these is considered to be in the northern Flinders Ranges.

INTRODUCTION

As a result of a joint Geological Survey of South Australia and Bureau of Mineral Resources mapping programme of the Great Artesian Basin on GASON and PANDIE PANDIE in the north east of the state, a programme of scout hole drilling was undertaken on these sheets with a limited amount of coring of the Winton Formation.

This report details the palynology of the available cores. The relevant sample data is presented in Table I.

Detailed palynology of Winton Formation sediments in South Australia is very limited. Dettmann (1963) and Dettmann and Playford (1968, 1969) have described species (e.g. Tricolpites pannosus Dettmann and Playford 1968) and zones (e.g. Appendicisporites distocarinatus Zone) from this unit but they give no detailed information on the assemblages. Similarly Burger (1970) has described and recorded a few angiosperm pollen species (Tricolpites variabilis Burger, T. micromunus (Groot and Penny) and T. augathellaensis Burger) in the same formation in both South Australia and Queensland. Evans (1963) reported the presence of the

Cenomanian microplankton _Ascodinium parvum_ (Cookson and Eisenack) in a marine development of the Winton Formation in the Carpentaria Sub-basin.

A study of this unit therefore is important from a biostratigraphic point of view in that it bridges the gap, in part, between the well documented microfloras of the Lower Cretaceous monographed by Dettmann (1963) and the better known Upper Cretaceous assemblages of the Otway Basin (see Dettmann and Playford, 1968, 1969 and Evans, 1966).

TABLE I

DATA ON SAMPLES

Bore No. and Locality	Depth in feet (metres in parenthesis)	Sample No.	Palynological Zone
Gason No.2	265.2(80.8)	S2219	?<u>T. pannosus</u>
At Damparanie	496.5(151.3)	S2225	<u>T. pannosus</u>
Waterhole.			
Lat.27°02'00"S			
Long.139°14'30"E	500.0(152.4)	S2221	Barren
Gason No. 5			
At Mt. Gason Bore.	142.3(43.4)	S2223	?<u>T. pannosus</u>
Lat.27°19'30"S			
Long.138°44'30"E	150.0(45.7)	S2224	" "
Gason No. 6	200.7 (61.2)	S2217	<u>T. pannosus</u>
1 mile north	207.0 (63.1)	S2218	" "
Mirra Mitta Bore			
alongside Birdsville	350.0 (106.7)	S2240	" "
track.	498.0 (151.8)	S2222	" "
Lat.27°43'00"S			
Long.138°43'30"E			
Gason No. 7	295.6(90.1)	S2227	?<u>T. pannosus</u>
90m. E. New			
Kalamarina Station.	493.3(150.4)	S2226	<u>T. pannosus</u>
Lat.27°44'00"S			
Long.138°15'00"E	497.2(151.5)	S2220	" "

RESULTS

The following table lists the assemblages from each core. Where two samples from the same core have been examined the respective assemblages have been combined where they show no significant differences. The preservation and yield of sporomorphs was generally very good.

TABLE II

SPECIES	GASON NO. 2		GASON NO. 5	GASON NO. 6			GASON NO. 7	
	C1	C2	C1	C1	C2	C3	C1	C2
Aequitriradites verrucosus				X			X	
Alisporites grandis	X	X	X	X	X	X	X	X
Amosopollis cruciformis		X	X					
Appendicisporites distocarinatus		X	X	X			X	X
Araucariacites australis			X	X	X	X		X
Baculatisporites comaumensis		X	X		X	X	X	X
Balmeisporites holodictyus			X	X		X		X
Camarozonosporites sp.		X						
Ceratosporites equalis		X			X		X	
Cicatricosisporites australiensis		X	X	X	X	X	X	X

C. hughesi							X	
C. pseudotripartitus					X		X	
Cingutriletes clavus			X					X
Classopollis sp.	X	X	X	X	X	X	X	X
Clavifera triplex	X	X	X	X	X	X	X	X
Contignisporites fornicatus				X	X			
Coptospora paradoxa		X		X	X	X		X
Coronatispora perforata				X				
Couperisporites tabulatus				X				
Crybelosporites striatus		X	X	X	X	X	X	X
C. punctatus								X
Cyathidites asper				X			X	
C. australis			X	X	X	X	X	X
C. minor	X	X	X	X	X	X	X	X
Cycadopites sp.		X				X		X
Densoisporites velatus				X				X
Diporate pollen		X	X	X	X	X	X	X
Dictyophyllidites sp.			X	X	X			X
Dictyotosporites complex		X						
Ephedripites spp.			X	X	X			X
Foraminisporis wonthaggiensis		X	X	X		X		X
Gleicheniidites spp.	X	X	X	X	X	X	X	X
Heogisporis lenticulifera								X

H. sp. nov.							X	X
Kuylisporites lunatus			X	X			X	X
Laevigatosporites ovatus	X	X	X	X	X	X	X	X
L. major							X	X
Leptolepidites verrucatus						X		X
Liliacidites sp.		X	X	X			X	X
Lycopodiumsporites austroclavatidites		X	X	X	X	X	X	X
L. spp.			X				X	X
Microcachyridites antarcticus	X	X	X	X	X	X	X	X
Microfoveolatosporis canaliculatus		X	X	X	X	X	X	X
Neoraistrickia truncatus						X		X
Perotrilites jubatus		X	X				X	X
Podocarpidites ellipticus	X	X	X	X	X	X	X	X
Podosporites microsaccatus	X	X	X	X	X	X	X	X
Reticulatisporites pudens		X	X				X	
Retusotriletes sp.				X				X
Rouseisporites reticulatus	X	X	X	X		X		X
R. simplex		X		X				X
Rugulatisporites sp.		X		X				
Schizosporis reticulatus		X		X				
S. sp.					X			X

Stereisporites antiquasporites	X		X	X	X		X		
cf. *S. viriosus*		X							
Tricolpites pannosus		X	X	X	X	X	X	X	
T. augathellaensis						X		X	
T. spp.		X		X	X		X	X	
Trilobosporites trioreticulosus		X		X					
T. perverulentus				X					
Tsugaepollenites dampieri			X						
Vitreisporites pallidus		X	X		X				
REWORKED SPECIES									
Michystridium sp.			X						
Veryhachium sp.			X						
Annulispora folliculosa		X			X				
Aratrisporites banksi		X	X	X	X				
Duplexisporites gyratus			X		X				
Lundbladispora denmeadi			X						
Neoraistrickia taylori			X						
cf. *Nevesisporites* sp.					X			X	
Polycingulatisporites crenulatus		X	X						
Taenisporites sp.			X	X					
Tigrisporites sp.		X							

DISCUSSION

Upper Cretaceous Assamblages

The first appearance of tricolpate angiosperm pollen, in particular Tricolpites pannosus, in south eastern Australian Cretaceous sediments is indicative of Dettmann and Playford's (1968, 1969) T pannosus Zone and as all assemblage but one (core 1 Gason No. 2) contain these forms the age is no older, biostratigraphically, than this zone. That the assemblages in Gason No. 2, core 2, Gason No. 6 and Gason No. 7 core 2 are no younger than this zone is indicated by the presence of C. paradoxa. The presence of B. holodictyus T. trioreticulosus, A. distocarinatus and P. jubatus in some of the assemblages is not inconsistent with this assignment. The apparent lack of C. paradoxa in the other cores could indicate that they are a little younger than the T. pannous zone, i.e. basal Appendicisporites distocarinatus zone. Because of the absence of Australopollis obscurus and Balmeisporites glenelgensis the assemblages are certainly no higher than the base of this zone. However Dettmann and Playford (1969 p.194) record only one occurrence of the zone in the Winton Formation (Haddon Downs No.5 bore, 42.6-141.7m) and do no list the species present. Presumably both A. obscurus and B. glenelgensis are present. Thus assemblages from Gason No. 2 core 1, Gason No. 5 and Gason No. 7 core 1 are high in the T. pannosus Zone or basal A. distocarinatus Zone. The former assignment is perhaps more reasonable.

One assemblage, Gason No. 2 core 1, stands apart from the others in that it has a much lower species diversity and therefore difficulties in assigning it to a biostratigraphic unit must be expected. It is dominated by laevigate monolete and trilete spores and probably represents a very restricted environment such as a swamp with minimal water transport of species representative of other environments. All other assemblages could be derived from freshwater lacustrine environments. There is no indication of any marine influence.

Previous occurrences of the T. pannosus Zone in the South Australian portion of the Eromanga Basin have been reported by Dettmann and Playford (1969) from the Santos Oodnadatta No. 1 well (87-167 feet, upper part of the Oodnadatta Formation, Wopfner et. al. 1970) and by Harris (1968) from Winton Formation sediments in Delhi-Santos Kalladiena No. 1 Well (GASON; Lat. 27°39'28"S, Long. 139°24'00", cuttings samples between 147.5 and 359.7m). The presence of A. distocarinatus, tricolpate pollen and C. paradoxa in the upper samples indicate a correlation with the T. pannosus Zone. Because of cuttings contamination the age of the lower samples is dubious but there is nothing in the assemblages to indicate an age older than T. pannosus Zone.

The assemblages from the GASON drilling are particularly diverse and may lead to further biostratigraphic subdivisions in this region. The stratigraphic and taxonomic importance of some species is discussed more fully in the Appendix.

Age: Dettmann & Playford (1969) date the T. Pannosus Zone as Upper Albian - ?Cenomanian on the basis of its occurrence in the Santos Oodnadatta Bore 1 in sediments which contain the ammonite genus Falciferella regarded by Ludbrook (1966) on evidence from several specialists as of Upper Albian age. Day (1969) has similarly reached the same conclusion. More recently Scheibnerova (1971) has suggested that the presence of the calcareous benthonic foraminifer, Lingulogavelinella frankei (Bykova), (which Ludbrook described as Anomalina santoodnae Ludbrook and Anomalinoides innaminckae Ludbrook from sediments about 35m. below the base of the T. pannosus Zone in Oodnadatta No. 1, see synonomy account in Scheibnerova) indicates a Cenomanian age in comparison with other world occurrences of the species. There would then appear to be conflict between the datings provided by the ammonites on the one hand and foraminifera on the other. However in her synonomy Scheibnerova lists "Lingulogavelinella albiensis Malapris, forme annonçant l'espèce frankei (Bykova) 1953" which Malapris-Bizouard (1967, table 1) records from the Middle and Upper Albian through to the Vraconian of France. If this synonomy is accepted then the range of L. frankei must be Albian - Cenomanian and there need not be any conflict with the more persuasive ammonite evidence.

Recycled Triassic Assemblages

The majority of samples yielded small assemblages of reworked species of Triassic age. One sample (Core 1, Gason No.6) yielded two species of microplankton which could have been derived from Cretaceous sediments. They have also been reported from Triassic & Jurassic sediments in the Eromanga Basin by Evans (1966).

Regarding the spores and pollen, they have distinct Triassic affinities especially Aratrisporites sp. and Duplexisporites gyratus. In terms of Evans' biostratigraphic zone system the presence of D. gyratus indicates a lower limit of Unit Tr 3-d. In the Eromanga Basin Unit Tr 3-d is confined to the Moolyamber Formation (Evans 1966, Table 1). It is also present in the Triassic of the Leigh Creek coalfield (Playford and Dettmann 1965).

Harris (1963) recorded a late Triassic assemblage from D.S.Pandieburra No. 1 in the Cooper Basin. Re-examination of the residues confirms the abundance of Alisporites sp. together with Aratrisporites sp. and Guthoerlisporitee cancellosus (cf. Correlation table of Triassic rocks of Australia by Banks, 1969). Whilst this may be a "mixed" Triassic assemblage, its age is no older than Unit Tr2b and is probably as young as Unit Tr3d.

Kapel (1966, fig.8) and Papalia (1969,fig.2) provide isopach maps of the Triassic sediments in the Cooper Basin. Because of the generally very thick and widespread cover of later Mesozoic and particularly lower Cretaceous sediments over the Triassic Nappamerri Formation in the Cooper Basin, a source for the Triassic microfossils must have been marginal to the Eromanga Basin. The most likely region, and the closest, is the northern Flinders Ranges where late Triassic intracratonic basins near Leigh Creek are known.

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APPENDIX

Notes on Selected Species

aff. Balmeisporites holodictyus Cookson and Dettmann

Plate 1, fig. 4.

This type closely resembles B. holodictyus but lacks a complete reticulum on the equatorial interradial regions (cf Pl.1, fig. 5).

Camarozonosporites sp.

Plate 1 figs. 6 & 7.

Equatorial diameter - 37.5 μ. The thinning of the exine in the radial regions is not strongly marked in this form. There is a very distinct coarse rugulate ornament on the distal face.

Cicatricosisporites sp.

Plate 1 fig. 13.

Equatorial diameter 47.5 μ.

This form is characterised by a weakly developed ornament and by a reticulum on the distal surface towards the radial regions. It is probably the same species that Burger (1968, p.19) described from the "Upper Wilgunya Formation". The striae are indistinct and foveolae are most prominent at the apices but are present to a lesser degree on other parts of the distal surface. Proximal surface psilate.

Clavifera triplex (Bolkovitina)

Plate 1, fig. 16.

Equatorial diameter 31 μ.

The form illustrated would be accommodated in this species although the radial crassitudes are not as prominent as those figures by Dettmann and Playford (1968) particularly their Plate 6, figure 8. There appears to be a intergradation of forms between "Gleicheniidites" spp. and those species of C. triplex with strong thickening in the radial region.

Monolete spore

Plate 1, figs. 17, 18.

Equatorial diameter 38 μ., polar diameter 25 μ.

This common species is characterised by very small isodiametric projections of the exine spaced 2-3 times their diameter from each other.

Hilate spore

Plate 2, fig. 1.

Equatorial diameter 36 μ. The proximal surface is smooth in the contact area and there is no clear indication of an aperture but rugulae outside the contact area form a more or less circular pattern around what may be the apertural region. There is a faint suggestion of a trilete mark. The distal surface is ornamented with widely spaced rugulae.

Perinate spore

Plate 2, fig. 2.

Equatorial diameter 31 μ. The perine covers both proximal and distal surfaces, is 0.5 μ. thick and closely rugulate.

Hoegisporis sp.

Plate 2, figs. 6 & 7.

Equatorial diameter 71 μ. This form has an indistinctly two layered exine except at the apices (which arealso prominently thickened) where the layers separate. All surfaces are finely granulate.

It would appear to be a species of Hoegisporis (see Pl. 2, fig. 8 for H. lenticulifera) from a comparison of the characteristic exine thickenings. It differs from H. lenticulifera by having only three thickened areas, and its large size.

Diporate genus

Plate 2, figs. 10 & 11.

Equatorial diameter 22 μ., polar diameter 19 μ.

This species is often very common and is characterised by a distinctly two layered exine, 1-2 μ., thick, and two often indistinct apertures (12 μ. in diameter). The exine surface is finely granulate and the granules "coalesce" around the apertures.

Monosaccate pollen

Plate 2, figs. 14-16.

Overall diameter 35.5 μ. This species is rare and distinctly monosaccate. There is a distinct OL pattern on the cappa and the tenuitas is psilate.

Liliacidites sp.

Plate 2, fig. 23.

Dimensions in polar view, 35 x 21 μ. The diameter of the lumen is about 1 μ. becoming smaller and less distinct towards the ends of the sulcus.

Triporate pollen

Plate 2, fig.24.

Diameter 18 μ. This species is characterised by being tripolate, pores 3 μ. in diameter, and having a finely reticulate exine, 1.5 μ. thick. Single rows of strongly capitate bacula form muri 1 μ. wide and lumina 2 μ. in diameter.

PLATE 1

All figures unless otherwise specified photographed in normal transmitted light at a magnification X 500.

Fig. 1 Appendicisporites distocarinatus Dettmann & Playford. Slide No. S2227/1, 32.8:109.4. Proximal focus.

2 Perotrilites jubatus (Dettmann & Playford) Evans. Slide No. S2227/1, 43.8:105.6. Proximal focus.

3 Trilobosporites trioreticulosus Cookson & Dettman Slide No. S2225/1, 28.8:100.9. Proximal focus.

4 aff. Balmeisporites holodictyus Cookson & Dettman X300. Slide No. S2227/1, 27.3:104.7. Lateral view, high focus.

5 Balmeisporites holodictyus Cookson & Dettmann X300. Slide No. S2218/1, 33.5:108.2. Lateral View, sectional focus.

6,7 Camarozonosporites sp.
Slide No. S2225/1, 34.7:109.0. Fig.6, Proximal focus, Fig. 7 Distal focus.

8,9,10 Crybelosporites punctatus Dettmann
Fig. 8,9. Slide S2220/1, 36.8:108.8. Lateral view, high & sectional focus.
Fig. 10 Slide 2220/1, 21.6:100.0. Lateral view, sectional focus.

11,12 Crybelosporites striatus (Cookson & Dettman) Dettmann Slide No. S2225/1, 28.8:100.9. Lateral view, sectional & high focus.

13 *Cicatricosisporites* sp.

Slide No. S2220/1, 36.8:106.9. Proximal focus.

14 *Lundbladispora denmeadi* (de Jersey) Playford & Dettmann. Slide No. S2220/2, 26.9:102.9. Proximal focus.

15 *Duplexisporites gyratus* Playford & Dettmann. Slide No. S2220/1, 27.6:113.4. Distal focus.

16 cf. *Clavifera triplex* (Bolkovitina) Bolkovitina Slide No. S2220/1, 25.6:101.9. Proximal focus.

17,18 Monolete spore.

Slide No.S2219.1, 28.4:110.1. Lateral view high focus. Fig. 18 in differential interference contrast.

19 *Aratrisporites banksi* Playford

Slide No. S2225/1, 42.6:105.6. Lateral view.

PLATE I

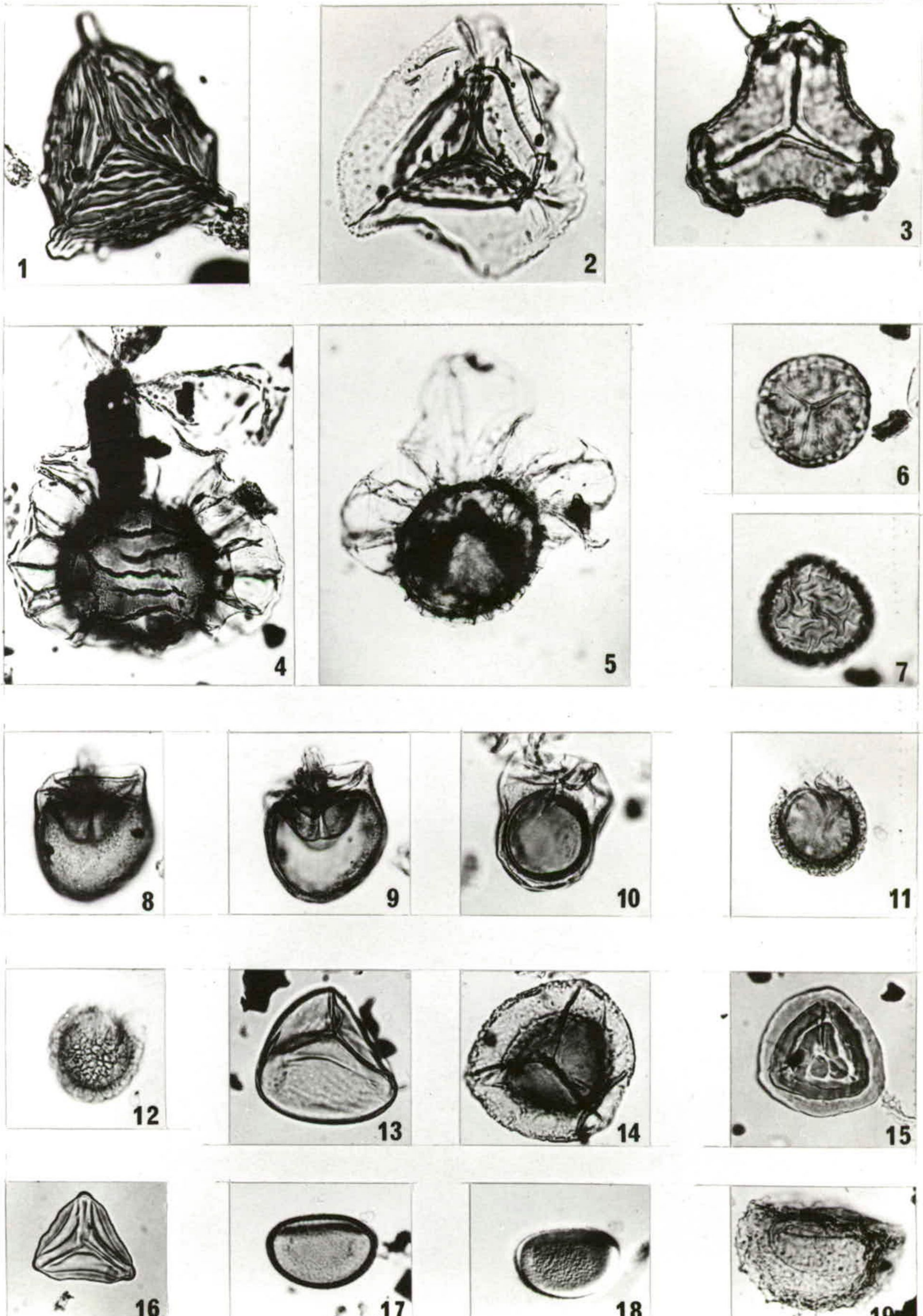

PLATE 2

All figures unless otherwise specified photographed normal transmitted light at a magnification X 500.

Fig -1 Hilate spore.

Slide No. S2220/2, 97.8:31.3. Proximal focus.

2 Trilete, perinate spore.

Slide No.S2218/1, 24.3:111.3. Distal focus.

3,4 <u>Ephedripites</u> spp.

Slide No.S2217/1, Fig.3, 33.6:105.0 Fig.4, 33.1: 103.8. Lateral views.

5 <u>Michystridium</u> sp.

Slide No.S2225/1, 29.5:110.0. Sectional focus.

6,7 <u>Hoegisporis</u> sp.

Fig.6 Slide No.S2217/1, 21.9:111.0. High focus.

Fig.7 Slide No.S2227/1, 39.1:98.6. High focus.

8 <u>Hoegisporis lenticulifera</u> Cookson

Slide No.S2220/1, 40.5;107.1. High focus.

9 <u>Schizosporis</u> sp.

Slide No.S2220/1, 24.9:104.4. High focus.

10,11 Diporate genus X1250

Slide No.S2220/1 26.3:101.7. Fig.10 in differential interference contrast. High focus, lateral view.

12 <u>Veryhachium</u> sp

Slide No.S2223/1, 26.8:105.5.

13 <u>Tricolpites</u> sp.

Slide No.S2225/1, 34.5:107.9.

14,15,16 Monosaccate pollen

Slide No.S2223/1, 39.1:105.2. Fig.14,16 distal focus, fig.15 high focus. Figs.15 & 16 in differential interference contrast.

17 *Classopollis* sp.

Slide No.S2220/1, 29.4:101.9.

18,19 *Amosopollis cruciformis* Cookson & Balme

Fig.18, Slide No.S2225/1, 25.8:11.7, Fig.19,

Slide No. S2223/1, 28.8:106.4.

20 *Tricolpites* cf. *T. augathellaensis* Burger

Slide No.S2220/1, 33.7:11.9. Sectional focus.

21 *Podosporites* sp.

Slide No.S2217/1, 34.7:106.0.

22 *Tricolpites pannosus* Dettmann & Playford

Slide No.S2223/1, 35.7:101.1. High focus.

23 *Liliacidites* sp.

Slide No.S2227/1, 44.8:101.5. High focus.

24 Triporate pollen

Slide No.S2220/1, 37.4:95.4. Mid focus.

25 *Vitreisporites pallidus* (Leschik) Nilsson

Slide No.S2220/1, 36.8:96.5. Mid focus.

26 *Araucariacites* sp.

Slide No.S2220/1, 35.4:95.5. Sectional focus.

PLATE 2