A PALYNOLOGICAL REPORT ON PLANET HEATHFIELD NO.1 WELL

by

E.A. Hodgson

Records 1954/74

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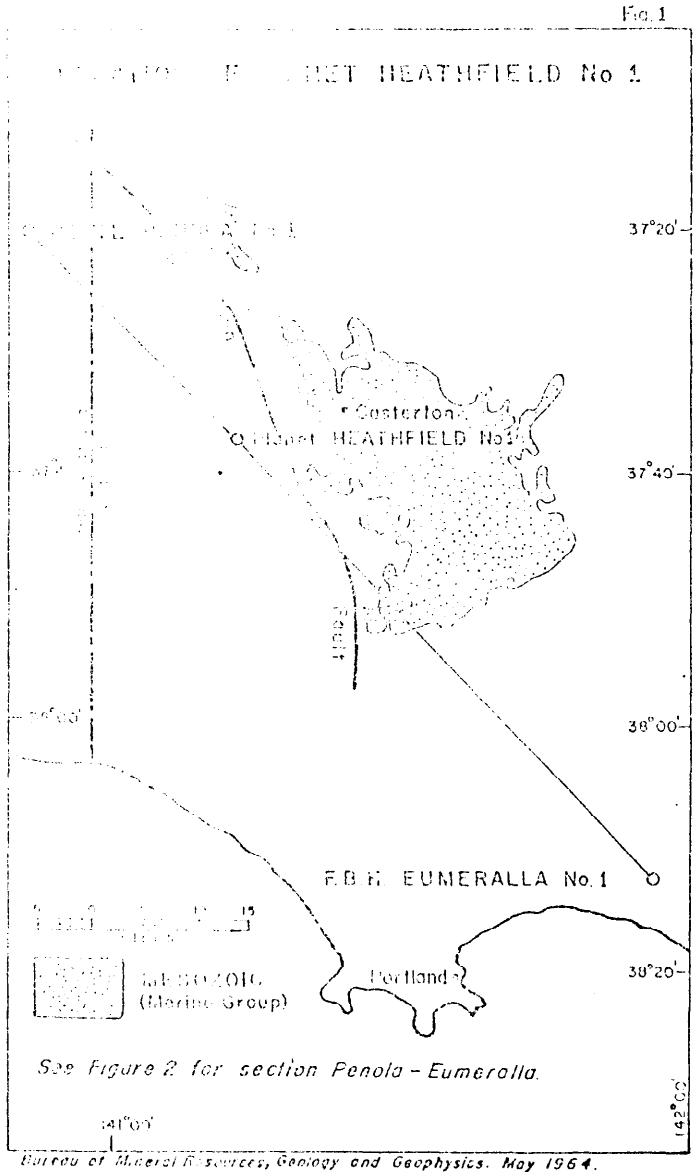
Fig. 1



See Figure 2 for section Penola - Eumeralla.

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To Accompany Record 1964/74

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SUMMARY

Samples of thirteen cores from the Merino Group in Planet Heathfield No.1 Well have been examined for their content of spores and pollens. The microfloral assemblages between Core 6, 2374 feet, to Core 18, 6893 feet, are of Lower Cretaceous age. Core 19 (7499 feet) could be of lowermost Cretaceous age but its microfloral content, although lacking diagnostic Jurassic forms, suggests that it is possibly of uppermost Jurassic age. Microplankton were observed only in Core 6 (2374 feet) and indicate a marine or brackish water origin for this sample.

INTRODUCTION

Planet Heathfield No.1 Well was drilled during March and April 1964 at Latitude 37°37'38" south, Longitude 141°11'08" east in the Otway Basin, Victoria, to a total depth of 7,500 feet.

The well was sited on the culmination of a seismically delineated, closed anticline and was drilled to determine the section to the base of the Mesozoic. The limitations of the rig prevented the well from being deepened beyond 7,500 feet even though it was still in Upper Mesozoic rocks at this depth.

OBSERVATIONS AND COMMENTS

Table 1 shows the observed distribution of spores, pollens and microplankton in Planet Heathfield No.1 Well.

O.D.N.L. Penola No.1 which is approximately twenty-seven miles north-west of Heathfield No.1 has been palynologically examined by Dettmann (1963) and Evans (in O.D.N.L., 1963a). Penola No.1 therefore provides a suitable section to which the Heathfield stratigraphy can be referred (see Fig.1).

Dettmann investigated microfloral successions in the Great Artesian Basin (Oodnadatta Bore No.1 and Cootabarlow Bore No.2) and the Otway Basin (Penola Bore No.1 and Robe Bore No.1) and delineated three microfloral assemblages based on the restricted vertical distribution of distinctive species. The microfloral assemblages are named from their most consistently occurring diagnostic species which in stratigraphic order of appearance are Crybelosporites stylosus * , Dictyotosporites speciosus and Coptospora paradoxa.

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* For authorship of this and subsequent species mentioned see Dettmann 1963.

Heathfield Cores 16 (5990 feet) to 19 (7499 feet), i.e. below the lowest recorded occurrence of D. speciosus, contain members of Dettmann's stylosus assemblage (recorded by Dettmann in Penola between 4766 and 4776 feet) including Cyclosporites hughesi and Coronatispora perforata. Because the stylosus assemblage of Dettmann and the Neocomian - Aptian Microflora 11B of Balme (1957), which are closely comparable, contain supposedly diagnostic Lower Cretaceous forms including Cicatricosisporites australiensis, they were assigned a Lower Cretaceous rather than Jurassic age. Heathfield Cores 16 - 18 contain C. australiensis, Cicatricosisporites ludbrooki and Microcachyridites antarcticus and are accordingly assigned the same age. Core 19, although lacking key Jurassic forms, does not contain C. australiensis or C. ludbrooki and is therefore possibly of uppermost Jurassic age.

Dictyotosporites speciosus occurs in Heathfield Cores 12 (4621 feet) to 15(5693 feet) where it is associated with Schizosporis reticulatus and Pilosisporites notensis, both members of Dettmann's speciosus assemblage. (At Penola, Dettmann reported the speciosus assemblage between 2990 and 4618 feet). The validity of species assemblages and the usefulness of comparing such units from different wells must be questioned since the coincidence of life ranges of perhaps unrelated spores and pollens which constitute the "assemblage", may be fortuitous. This is indicated by variation in the "assemblage" associated with a particular species in various well sections. At Heathfield, Cicatricosisporites ludbrooki first appears in Core 18, Cicatricosisporites australiensis in Core 17 and Dictyotosporites speciosus in Core 15. Dettmann (1963) however, found that D. speciosus occurred below the first appearance of C. australiensis which in turn preceded C. ludbrooki, except at Penola where both C. australiensis and C. ludbrooki begin their life ranges together in Core 14 (3715-21 feet). However, the life range of D. speciosus has been observed in Penola No.1, Heathfield No.1 and Eumeralla No.1 (Evans, 1963). It is a distinctive feature of the well sections and as such provides a means of correlating them (see Fig. 2).

Ludbrook (1963) suggested that a slight angular unconformity at 4200 feet in Penola No.1 corresponded "to the disconformity between the Runnymede Formation and the Mocamboro Member exposed at Killara Bluff (Kenley, 1954)". This level is within the range of Dictyotosporites speciosus (2990-4618 feet) and neither Dettmann nor Evans, report microfloral changes which might support the existence of such an unconformity. The presence at Heathfield of the subsurface correlate of the post-Mocamboro disconformity cannot be identified by this means until there is palynological evidence of its age at outcrop.

Foraminisporis asymmetricus and Foraminisporis wonthaggiensis are included in Dettmann's speciosus assemblage and range up into the paradoxa assemblage. These species have not been observed at Heathfield in samples containing D. speciosus but they are confined to Core 10 and above. Over this interval F. asymmetricus and F. wonthaggiensis (both very abundant in Core 9 (3763 feet)) and other species which begin their life ranges in Core 10 (including Cingutriletes clavus) define a distinctive microfloral unit which is very different from the microflora of Cores 12-15. The life range of F. wonthaggiensis in Heathfield (Cores 6 (2374 feet) to 10 (4145 feet)), defines a microfloral unit younger than that characterized by the presence of D. speciosus and older than Dettmann's paradoxa assemblage (reported from 1200-2790 feet in Penola) since neither Coptospora paradoxa nor any of its associates were observed at Heathfield.

PALYNOLOGICAL CORRELATION WITH NEIGHBOURING WELLS

Figure 2 shows a palynological correlation of Penola, Heathfield and Eumeralla wells based on the life ranges of Coronatispora perforata, Dictyotosporites speciosus and Balmeisporites holodictyus. The life range of C. perforata at Penola, as shown in Figure 2/not in agreement with Dettmann's observations of it in other wells where it is usually found below and within the lower part of the life range of D. speciosus At Heathfield C. perforata ends its life range before the first appearance of D. speciosus. The correlation lines in Figure 2 join the centres of intervals between observation points and within which the floral changes apparently take place.

D. speciosus was present at total depth (10,308 feet) in Eumeralla whereas Penola and Heathfield were completed below the first appearance of D. speciosus in apparently older rocks containing members of Dettmann's stylosus assemblage.

The life ranges of D. speciosus and B. holodictyus at Penola overlap slightly but B. holodictyus was not observed at Heathfield although it could be present above Core 6 (2374 feet), the highest fossiliferous sample. The Heathfield section between Cores 6 (2374 feet) and 10 (4145 feet) is a distinctive unit characterized by the presence of Foraminisporis asymmetricus and Foraminisporis wonthaggiensis and lacking both D. speciosus and B. holodictyus. A correlate of this unit is present at Eumeralla but not at Penola. S.E.O.S. Beachport No.1 drilled approximately 25 miles west of Penola, but not included on the correlation chart, also apparently lacks this unit since Core 9 (3665-3675 feet) from that well contains Coptospora paradoxa and Core 10 (3938-48 feet) D. speciosus (on the basis of data recorded shortly after the well was drilled in 1962).

The presence of this unit in the eastern wells and its apparent absence in Penola and Beachport suggests either that an hiatus exists in the west or that deposition of the unit did not extend as far west as Penola.

Core 34 (10,037 feet) of O.D.N.L. Mount Salt No.1 (T.D. 10,044 feet) contained microplankton and the spores Aequitriradites tilchaensis and Laevigatosporites ovatus (al."Polypodiaceaesporites" sp. of Evans in O.D.N.L. 1963b) which were recorded in Penola Core 12 (3363-73 feet). It is therefore possible that Mount Salt No.1 bottomed in sediments as old as the Lower Cretaceous Heathfield No. 1, Core 10. This would be in contrast to the suggestion by O.D.N.L. (1963b) that Mount Salt No.1 bottomed in either "Equivalents of the Paaratte Formation", "Equivalents of the Belfast Mudstone" or "Equivalents of the upper part of the Waarre Formation", as the Belfast Mudstone of the Port Campbell embayment is Upper Cretaceous in age (e.g. Cookson and Eisenack, 1961., Bain, 1962). It is not clear what is meant by "Equivalents of the upper part of the Waarre Formation", especially as no mention is made of the unit above, the Flaxmans Beds, although the bottom of Mount Salt, as a correlate of Heathfield Core 10, could still be older than this third alternative. However, it is in general agreement with the observations in Mount Salt No.1 , about 3000 feet above the base of the hole, of D. belfastensis which is associated with the Belfast Mudstone in the Port Campbell area.

COMPARISON WITH OUTCROP SAMPLES FROM THE MERINO GROUP

Evans (1961) examined nine samples from outcrops of the Merino Group of south-western Victoria (see Fig. 1). Two were barren, three were fossiliferous but lacked diagnostic species and four contained sufficient spores to determine their Lower Cretaceous (?Albian) age. The latter group has been considered in relation to the microfloral succession of Heathfield. One sample, W 37, can be directly compared with Heathfield Core 9 (3763 feet) since it contains a number of key forms found in this core, including relatively common Foraminisporis asymmetricus, Foramminisporis wonthaggiensis and Filosisporites notensis. Merino outcrop sample W12 contains Cingulatisporites euskirkensoides, Trilobosporites trioreticulatus and Coptospora paradoxa none of which have been observed at Heathfield, but which characterize Dettmann's paradoxa assemblage. W12 is therefore younger than any of the samples which have been studied from Heathfield. The Merino samples W55 and W 139 contain no diagnostic species which would permit comparison with the Heathfield well section.

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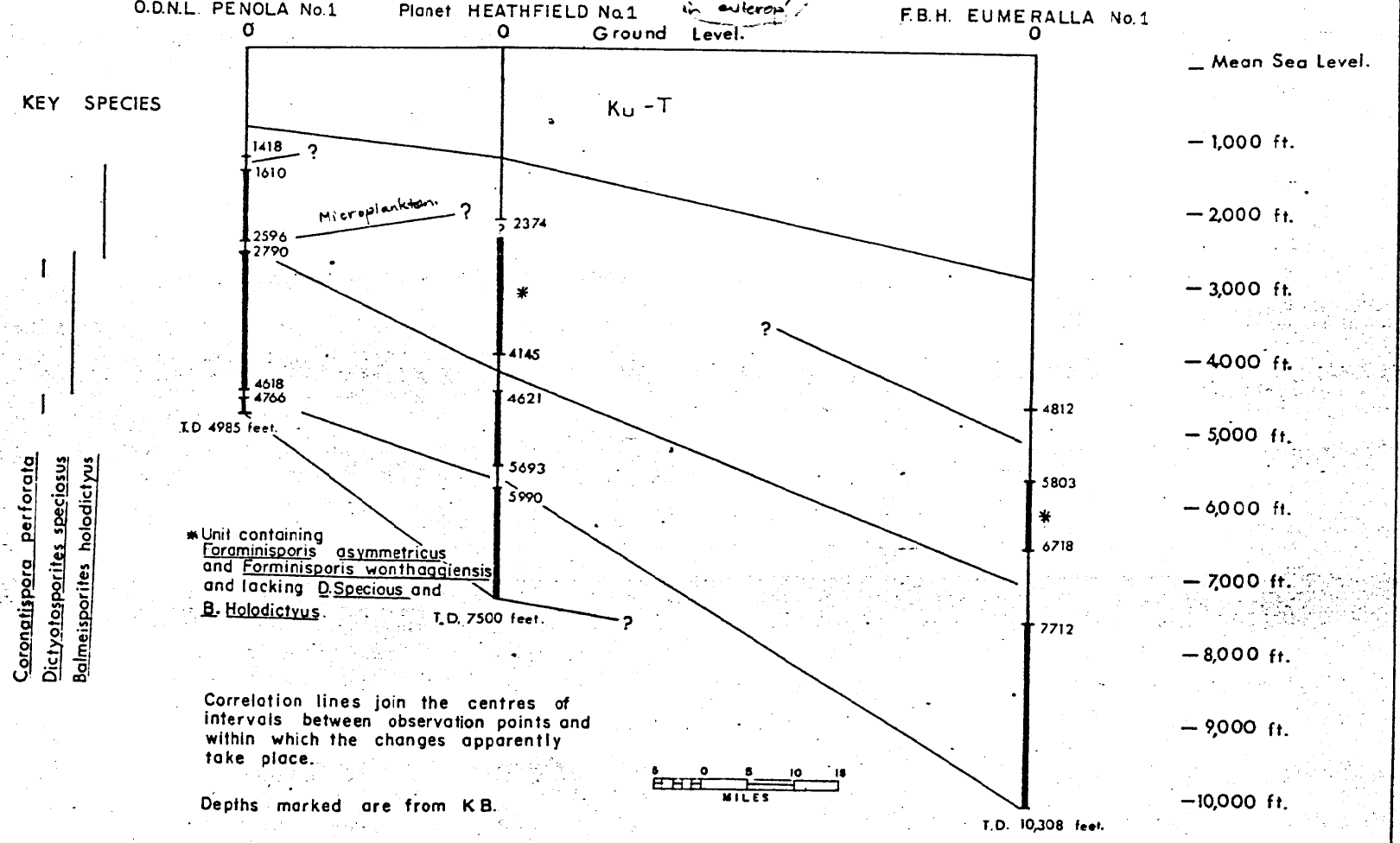
Fig. 2

PALYNOLOGICAL CORRELATION OF O.D.N.L. PENOLA No.1 PLANET HEATHFIELD No.1 AND F.B.H. EUMERALLA No.1 WELLS; OTWAY BASIN



W 12 Paradoxa Assemblage in outcrop

TABLE 1

DISTRIBUTION OF SPORES, POLLENS AND MICROPLANKTON IN PLANET HEATHFIELD NO.1 WELL

x present
c common

SPORES AND POLLENS	Core 19 7499 ft.	Core 18 6893 ft.	Core 17 6387 ft.	Core 16 5990 ft.	Core 15 5693-703 ft.	Core 14 5414 ft.	Core 13 5028-34 ft.	Core 12 4621 ft.	Core 10 4145 ft.	Core 9 3763 ft.	Core 7 2877 ft.	Core 6 2374 ft.	Core 4 1868 ft.
Coronatispora perforata	x		x	x									Barren
Ceratosporites equalis	x		x	x		x							
Cyclosporites hughesi	x			x	x			x					
Apiculati spp.	x			x	x	x	x	x	x				
Neoraistrickia truncatus	x	x		x	x	x	x	x	x				
Leptolepidites verrucatus	x	x	x	x		x	x	x	x				
Klukisporites scaberis	x						x	x	x				
Cyathidites australis	x	x	x		x	x	x	x	x	x			
Lycopodiumsporites austroclavatidites	x	x	x	x			x	x		x			
Lycopodiumsporites spp.	x	x	x	x	x	x	x	x	x	x	x	x	
Cyathidites minor	c	x	x	x	x	x	c					x	
Ginkgocycadophytus sp.	x	x	x	x	x	x	x	x	x			x	
Classopollis cf. classoides	x			x		x		x	x	x		x	
Disaccites spp.	x	x	x	x	x	x	x	x	x	x	x	x	
Osmundacidites wellmanii		x											
Aequitriradites spinulosus		x	x						x	x			
Cyathidites sp.		x	x	x		x	c	x	x	x			
Baculatisporites comaumensis		x	x	x	x		x	x	x			x	
Lycopodiumsporites circolumenus		x		x					x		x	x	
Microcachyridites antarcticus		x		x		x			x	x	x	x	
Cicatricosisporites ludbrooki		x	x			x			x				
Stereisporites antiquasporites			x	x		x		x	x				
Cicatricosisporites australiensis			x					x	x	c		x	
Murospora florida				x									
Podocarpidites sp.				x				x	x	x		x	
Alisporites sp.				x		x	x		x			x	
Dictyotosporites speciosus					x	x	x	x					
Gleicheniidites cercinidites						x	x		x			x	
Schizosporis reticulatus							x						
Pilosisporites notensis							x		x	x			
Aequitriradites cf. tilchaensis									x				
Araucariacites sp.									x				
Foraminisporis asymmetricus									x	c			
Foraminisporis wonthaggiensis									x	c		x	
Cingutriletes clavus									x			x	
Murospora sp.												x	
Acritarcha												x	