

Palynology Results for the Wanship 7.5' Quadrangle, Summit and Morgan Counties, Utah

by

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Suggested citation:

Hotton, C. L., and Anderson, Z.W., 2020, Palynology results for the Wanship 7.5' quadrangle, Summit and Morgan Counties, Utah: Utah Geological Survey Open-File Report 726, 7 p., <https://doi.org/10.34191/OFR-726>.



OPEN-FILE REPORT 726
UTAH GEOLOGICAL SURVEY
a division of
UTAH DEPARTMENT OF NATURAL RESOURCES
2020

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INTRODUCTION

This Open-File Report makes available raw analytical data from laboratory procedures completed to determine the age of rock samples collected during geologic mapping funded by the U.S. Geological Survey (USGS) National cooperative Geologic Mapping Program (STATEMAP) and the Utah Geological Survey (UGS). The reference listed in table 1 provides additional information such as the geologic setting of the samples in the context of the area in which they were collected. This report was pre-pared by Carol L. Hotton of the Smithsonian Institution in cooperation with the UGS. These data are highly technical in nature and proper interpretation requires expertise in recognition and interpretation of palynomorphs and their application to biostratigraphy.

Table 1. Sample numbers, locations, and ages (see Anderson, in preparation).

Sample	Map Unit	Easting (UTM NAD 83)	Northing (UTM NAD 83)	Interpreted Age	Age Confidence	Notes
Wan_Pal_04	Kkc - Conglomeratic unit of Kelvin Formation	466903	4513376	Albian	Low	
Wan_Pal_08	Ka - Aspen Shale	466239	4515266	Latest Albian	High	
Wan_Pal_10	Kbr - Bear River Formation	466400	4515103	Latest Albian	Moderate	
Wan_Pal_05	Kkc - Conglomeratic unit of Kelvin Formation	467020	4513241			Barren
Wan_Pal_06	Kkc - Conglomeratic unit of Kelvin Formation	467059	4513225			Barren
Wan_Pal_07	Kfl - Undivided lower members of Frontier Formation	466218	4515297			Barren
Wan_Pal_09	Kbr - Bear River Formation	466327	4515131			Barren
Wan_Pal_11	Kku - Upper Kelvin Formation	465625	4514142			Barren
Wan_Pal_12	Kku - Upper Kelvin Formation	465534	4514394			Barren
Wan_Pal_13	Kku - Upper Kelvin Formation	465515	4514593			Barren

DISCLAIMER

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Anderson, Z.W., in preparation, Interim geologic map of the Wanship quadrangle, Summit and Morgan Counties, Utah: Utah Geological Survey Open-File Report, 1 plate.

Analysis of Palynological Samples from Wanship Quadrangle, Northeastern Utah

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Materials and Methods

Samples were processed by Global Geolab Ltd (<http://www.globalgeolab.com>) with no oxidation and a 5 μ filter, and mounted in Elvacite mounting medium. Palynomorphs were observed and photographed with a Nikon 80i DIC microscope. A 200-grain count was performed for each productive sample, to determine dominant taxa, and then one to three additional slides were scanned up to an estimated 800 additional grains to find rare taxa. Dinoflagellate cysts and acritarchs were noted but not included in the count. Each observed species was photographed, and its position noted with an England finder graticule. Identifications were performed by comparison with published literature, enumerated in [p]. Age dating is based primarily on comparisons with [p].

Wan_Pal_04

This assemblage is reasonably well preserved, but sparse (slightly more than 200 grains in total). The palynoflora is dominated by undiagnostic fern spores (*Biretisporites*, *Cyathidites*) as well as *Classopollis* (pollen of the extinct conifer family Cheirolepidiaceae). The presence of *Foraminisporis dailyi* suggests an Albian (or older) age for this sample—although there are a few reliably dated occurrences of this species in Late Cretaceous units, it is largely Early Cretaceous [a]. The presence of one specimen of *Cicatricosisporites mesozoicus*, described largely from Cenomanian and younger strata, might suggest a younger age, but this species has also been described from the late Albian Muddy Sandstone of Wyoming [t]. Little else in this palynoflora is particularly age diagnostic, although more material might reveal useful rare taxa. No dinoflagellates or marine acritarchs were observed, suggesting little or no marine influence.

Wan_Pal_08

This palynoflora is dominated by spores of ferns, lycophytes and bryophytes. The two most common taxa are *Cyathidites minor* and *Gleicheniidites senonicus*, both stratigraphically undiagnostic. Bisaccate conifers and Cupressaceae are the dominant pollen types. Other than these taxa, the palynoflora displays high evenness, i.e., diverse rare taxa, some stratigraphically diagnostic. It closely resembles that of the Muddy Sandstone of Wyoming [t] of latest Albian age, as well as the latest Albian palynostratigraphic unit 2 of the Dakota Formation from Iowa, Nebraska and Kansas [p]. Stratigraphically diagnostic taxa include *Plicatella jansonii*, *Eucommiidites troedssonii*, *Cicatricosisporites australiensis* and *C. potomacensis*, none appearing above Palynostratigraphic Unit 2 [p]. Late Albian angiosperm pollen forms include *Clavatipollenites minutus*, *Retimonocolpites larius* and *Pennipollis reticulatus* [y] [l]. The angiosperm pollen *Brenneripollis textus* may also indicate a latest Albian age, by comparison with the Muddy Sandstone [t]. In addition, taxa characterizing the early Cenomanian of the upper Dakota Formation of Iowa, Nebraska and Kansas, such as *Lycopodiacidites arcuatus*, *Foveogleicheniidites confossus*, *Cicatricosisporites crassiterminatus*, *Foveosporites cenomanianus*, *Microreticulatisporites sacalii* and *Artiopollis indivisus* [p], among others, are absent. In general, the angiosperm pollen taxa display low morphological diversity, and are comparable to those described for the late Albian Cheyenne and Kiowa Formations of Kansas [y].

Dinoflagellate cysts and acritarchs were present but subordinate to the terrestrial palynomorphs. Their biostratigraphic signal is mixed. Two taxa, cf. *Aptea polymorpha* and cf. *Apteodinium granulatum*, suggest a latest Albian age [r]. However, a third species, *Dapsilidinium marinum*, was described from Cenomanian strata of the Peace River Formation [v]. *Dapsilidinium marinum* has rarely been described elsewhere, and its full stratigraphic range is uncertain.

Wan_Pal_10

This palynoflora is heavily dominated by a small number of spore forms, notably *Pilosisporites trichopapillosus* and probably related echinate forms, *Cyathidites minor*, *Granulatisporites* sp., *Laevigatosporites ovatus* and *Gleicheniidites senonicus*. With the exception of *Pilosisporites*, most of these also occur in Wan_Pal_08. In fact, this palynoflora looks like a depauperate version of Wan_Pal_08, possessing few distinctive taxa of its own. There are few stratigraphically significant taxa, but the presence of *Plicatella jansonii* supports a latest Albian age [p]. Dinoflagellate cysts are extremely rare, but one *Aptea polymorpha* was observed, which also supports an age estimate of late Albian [r].

Unproductive Samples

Wan_Pal_05: Organic residue is extremely sparse, comprising mainly degraded tissue. A few well-preserved specimens of Betulaceae, which are presumed to be contaminants, are present.

Wan_Pal_06: Organic residue virtually absent.

Wan_Pal_07: Palynofacies comprising dark brown/black structured woody material and fusain, with lesser amounts of light brown degraded tissue and cuticle and some amorphous organics (?= algal remains). No identifiable palynomorphs.

Wan_Pal_09: Palynofacies comprising primarily light brown degraded tissue, some amorphous organic material (?= algal remains), and minor amounts of vitrain/fusain. No identifiable palynomorphs.

Wan_Pal_11: Palynofacies comprising primarily light brown, degraded tissue and cuticle, some fungal debris. Abundant *Glomus*-like fungal spores are present, which are likely modern contamination. No identifiable palynomorphs.

Wan_Pal_12: Little organic residue, consisting primarily of degraded tissue and dark woody fragments. One bisaccate pollen grain observed; otherwise no identifiable palynomorphs.

Wan_Pal_13: Palynofacies comprising dark brown/black structured woody material and fusain, with minor amounts of light brown, degraded tissue. Abundant *Glomus*-like fungal spores are present, which are likely modern contamination. No identifiable palynomorphs.

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*(In addition to citations in the text, the letters in brackets correspond to references cited in Table 1 for botanical identity and estimated age range for each taxon.)

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Table 1. Stratigraphically important taxa indicated in bold.

Taxon	Reference Image	Age Range	Botanical Affinity	%Wan_Pal 04	% Wan_Pal 08	% Wan_Pal 10
SPORES						
<i>Antulsporites clavus</i> (Balme) Filatoff 1975	Balme 1957: pl 1, figs 4-6	Oxfordian-?Paleogene [a]	Sphagnaceae [c]	0.5		
<i>Apiculatisporites</i> sp. of Tanrikulu & al 2017 (cf. <i>A. babsae</i>)	Tanrikulu & al 2017: pl. 1, fig 3	late early Albian [x]	Polypodiopsida [x]		3	
<i>Biretisporites potonie</i> Delcourt & Sprumont 1963	Delcourt & al 1963: pl 42, figs 12-14; pl 44, fig 11	Jurassic-Cretaceous [s]	Polypodiopsida [s]	12.5	2.5	
<i>Biretisporites</i> sp.			Polypodiopsida			1.5
<i>Ceratospores</i> sp.			Polypodiopsida or Lycopodiopsida [s]			6.5
<i>Cibotiumspora juriensis</i> s (Balme) Filatoff 1975	Filatoff 1975: pl 1, fig 4	Rhaetian-Cenomanian [a]	<i>Hausmannia</i> (Dipteridaceae) [w]	0.5		
<i>Cicatricosisporites australiensis</i> (Cookson) Potonié 1956	Dettmann 1963: Pl 9, figs 10-16	Late Jurassic-latest Albian (lower Dakota Formation) [p]	Anemiaceae [g]		0.5	
<i>Cicatricosisporites biauriculatus</i> (Markova) Ravn 1995	Ravn 1995: pl 8, figs 14-15	Berriasian-Cenomanian [a] [p]	Anemiaceae [g]		0.5	
<i>Cicatricosisporites hughesii</i> Dettmann 1963	Dettmann: pl 10, figs 6-16	Berriasian-Senonian [a]	Anemiaceae [g]		present	
<i>Cicatricosisporites ludbrookii</i> Dettmann 1963	Dettmann 1963: pl 9, figs 17-22	Tithonian-Campanian [a]	Anemiaceae [g]		0.5	
<i>Cicatricosisporites mesozoicus</i> Agasie 1969	Agasie 1969: pl 1, fig 12	Cenomanian-Campanian [a] [e] [u]	Anemiaceae [g]	0.5		
<i>Cicatricosisporites minor</i> (Bolsh.) Pocock 1964	Singh 1971: pl 9, figs 7-8	Late Jurassic-Paleogene [a]	Anemiaceae [g]		0.5	
<i>Cicatricosisporites mohrioides</i> Delcourt & Sprumont 1955	Delcourt & Sprumont 1955: pl 1, fig 2	Kimmeridgian-Maastrichtian [a]	Anemiaceae [g]		1.5	
<i>Cicatricosisporites potomacensis</i> Brenner 1963	Brenner 1963: pl 9, figs 4-5	latest Albian (lower Dakota	Anemiaceae [g]			
<i>Cicatricosisporites pseudotripartitus</i> (Bolsh.) Dettmann 1963	Dettmann 1963: pl. 10, figs 1-5	Berriasian-Maastrichtian [a]	Anemiaceae [g]		2	
<i>Cicatricosisporites</i> sp. cf. <i>C. robustus</i> (Kemp) Davies 1985	Ravn 1995: pl 6, figs 9-10	late Albian [t]	Anemiaceae [g]		1.5	
<i>Cicatricosisporites venustus</i> Deak 1963	Ravn 1995: pl 7, figs 15-20	Valanginian-Campanian [a]	Anemiaceae [g]		1.5	0.5
<i>Cicatricosisporites</i> sp. 1			Anemiaceae [g]		1	
<i>Cicatricosisporites</i> spp. indet.			Anemiaceae [g]		3.5	1
<i>Concavissimisporites punctatus</i> (Delcourt & Sprumont) Brenner, 1963	Brenner 1963: pl 14, fig 6	Late Jurassic-Cretaceous [s]	Schizaeales or Cyatheaes [s]			5.5
<i>Contignisporites</i> sp. cf. <i>C. cooksoniae</i> (Balme) Dettmann 1963	Dettmann 1963: pl 15, figs. 11-16	Oxfordian-Cenomanian [a]	Polypodiopsida [s]		0.5	
<i>Cyathidites minor</i> Couper 1953	Couper 1953: pl 2, fig 13	Mesozoic-Neogene [s]	Polypodiopsida, likely Cyatheaes [s]	15.5	18.5	23
<i>Cyathidites australis</i> Couper 1953	Couper 1953: pl 2, figs 11-12	Mesozoic-Neogene [s]	Polypodiopsida, likely Cyatheaes [s]	0.5		
? <i>Densoisporites</i> sp. indet.		Mesozoic	Isoetales, Selaginellales [d]		0.5	
<i>Dictyophyllidites harrisi</i> Couper 1958	Couper 1958: pl 21, figs 5-6	Mesozoic [a]	Dipteridaceae, Matoniaceae [d]		1.5	
<i>Dictyophyllidites</i> sp.			Polypodiopsida	1.5		5.5
<i>Dictyophyllidites</i> sp. 1 of Ravn & Witzke 1995	Ravn 1995: pl 10, figs 13-14	late Albian [t]	Polypodiopsida		1	
? <i>Distaltriangulisporites</i> cf. Ravn 1995	Ravn 1995: pl 6, figs 9-10	late Albian [t]	probably Anemiaceae	0.5	0.5	
<i>Foraminisporis dailyi</i> (Cookson & Dettmann 1958) Dettmann 1963	Dettmann 1963: pl 14, figs 15-18	Cretaceous [s]	Anthocerotopsida [f]	2.5		
<i>Foraminisporis wonthaggiensis</i> Dettmann 1963	Dettmann 1963: pl 14, figs 19-23	largely Early Cretaceous [a]	Anthocerotopsida [f]			2
<i>Foraminisporis</i> sp. indet		Mesozoic-Neogene	Anthocerotopsida [f]		0.5	
<i>Foveotriletes</i> sp.		Mesozoic	Lycopodiopsida or Polypodiopsida			0.5
<i>Gleicheniidites senonicus</i> Ross, 1949	Ross 1949: pl 1, fig 3	Mesozoic-Neogen [s]	Gleicheniaceae [s]	1.5	10	2.5
<i>Granulatisporites michinus</i> (Srivstava) Ravn 1995	Ravn 1995: pl 10, fig 17-23	Albian-Cenomanian [t]	Polypodiopsida [v]		1	0.5
cf. <i>Granulatisporites michinus</i>			Polypodiopsida [v]			12.5
<i>Ischyosporites pseudoreticulatus</i> (Couper) Doering 1965	Fensome 1987: pl 3, figs 10, 12	Kimmeridgian-Cenomanian [a]	Schizaeales [d]		1	2
<i>Ischyosporites</i> sp. cf. <i>I. disjunctus</i> Singh 1971	Singh 1971: pl 17, figs 6-7	Kimmeridgian-Cenomanian [a]	Schizaeales [d]	2		
<i>Ischyosporites</i> sp. 1			Schizaeales?	1	1	
<i>Kuylisporites lunaris</i> Cookson & Dettmann 1958	Cookson & Dettmann 1958: pl 14 figs 21-23	Cretaceous-Paleogene [a]	Hemitelia, Cnemidaria [s]	0.5		
<i>Laevigatosporites ovatus</i> Wilson & Webster 1946	Wilson & Webster 1946: fig 5	Cretaceous-Neogene [s]	Polypodiales, Gleicheniales, Schizaeales [d]	1.5	2	7
<i>Leptolepidites epacronatus</i> Norris 1969	Norris 1969: pl 103, figs 6-9, 11	Late Jurassic-Early Cretaceous [a]	Polypodiopsida [s]		2	
<i>Lycopodiacidites wardi</i> Ravn 1995	Ravn 1995: pl 1, figs. 20-25	Late Albian-Middle Cenomanian [p]	Polypodiopsida [d]	0.5		
<i>Nodosisporites</i> sp. indet.		Aptian-Recent	Anemiaceae [g]		0.5	0.5
<i>Osmundacidites wellmanii</i> Couper 1953	Dettmann 1963: pl 3, figs 19-21	Late Permian-Neogene [a]	Osmundaceae [d]	1.5		
<i>Pilosporites trichopapillosus</i> (Thiergart) Delcourt & Sprumont 1955	Brenner 1963: pl 20, fig 3	Late Jurassic-Cenomanian [a]	Polypodiopsida [s]			20.5
<i>Pilosporites</i> sp.			Polypodiopsida			5.5
<i>Plicatella</i> sp. cf. <i>P. cristata</i> ((Markova) Davies 1985	Ravn 1995: Pl 4, figs 13-14	Barremian-Albian; Cenomanian in upper Dakota Formation [p]	Anemiaceae [g]		0.5	
<i>Plicatella jansonii</i> (Pocock) Dörhöfer 1977	Ravn 1995: pl 5, figs 7-8	latest Albian (lower Dakota	Anemiaceae [g]		0.5	0.5

Table 1. Stratigraphically important taxa indicated in bold.

Taxon	Reference Image	Age Range	Botanical Affinity	%Wan Pal 04	% Wan Pal 08	% Wan Pal 10
<i>Plicatella potomacensis</i> (Brenner) Davies 1985	Brenner 1963: pl 6, figs 4-5	Barremian-Turonian [a]	Anemiaceae [g]		present	present
<i>Plicatella witzkei</i> Ravn 1995	Ravn 1995: pl. 7, figs 1-4	late Albian-middle Cenomanian [p]	Anemiaceae [g]		present	
<i>Retritriletes</i> sp. indet.		Mesozoic-Neogene [s]	Lycopodiales [s]	0.5	0.5	
? <i>Stereisporites</i> sp. indet.		Mesozoic-Neogene [a]	Sphagnaceae [f]		0.5	
<i>Todisporites minor</i> Couper 1958	Couper 1958: p. 16, figs 9-10	Mesozoic-Neogene [a]	Osmundaceae [d]		0.5	0.5
<i>Trilobosporites (Impardecispora) marylandensis</i> Brenner 1963	Brenner 1963: pl 23, fig 5	Valanginian-Campanian [a]	Schizaeales [j]	0.5		
<i>Undulatisporites undulapolus</i> Brenner 1963	Brenner 1963: pl 24, fig 1	Middle Jurassic-Paleogene [a]	Polypodiopsida [s]	0.5		
GYMNOSPERM POLLEN						
<i>Alisporites bilateralis</i> Rouse 1959	Rouse 1959: pl 1, figs 10-11	Oxfordian-Paleogene [a]	Pinaceae, ?Corystospermaceae	0.5	1	
<i>Alisporites</i> sp. 1			Pinaceae	0.5		
<i>Balmeiopsis limbatus</i> (Balme) Archangelsky 1977	Balme 1957: pl 7, figs 83-84	Sinemurian-Maastrichtian [a]	Araucariaceae [d]	1		
<i>Araucariacites australis</i> Cookson 1947	Cookson 1947: pl 13, figs 1-4	Late Triassic-Neogene [s]	Araucariaceae [d]	2.5	1	
<i>Callialasporites dampieri</i> (Balme) Dev 1961	Balme 1957: pl 8, figs 88-90	Jurassic-Cretaceous [s]	Araucariaceae [d]		0.5	
<i>Callialasporites crenulatus</i> Pocock 1970	Pocock 1970: Pl 13, figs 1-3	Bajocian-Hauterivian [a]	Araucariaceae [d]		0.5	
<i>Callialasporites turbatus</i> (Balme) Schulz 1967	Balme 1957: pl 7, figs 85-86	Aalenian-Albian [a]	Araucariaceae [d]		0.5	0.5
<i>Callialasporites</i> spp. indet.			Araucariaceae [d]		1.5	
<i>Cerebropollenites mesozoicus</i> (Couper) Nilsson 1958	Couper 1958: pl 30, figs 8-10	Rhaetian-Cenomanian [a]	Pinales [d]	0.5		
<i>Classopollis simplex</i> (Danze-Corsin & Laveine 1963) Reiser & Williams 1969	Reiser & Williams 1969: pl 6, fig 15	Hettanian-Maastrichtian [a]	Cheidolepidiaceae [d]	36.5	3.5	
<i>Eucommiidites troedssonii</i> Erdtman 1948	Couper 1956: pl 7, figs a-k	Middle Jurassic-latest Albian (lower Dakota Formation) [p]	Erdtmanitheceae [k]		0.5	
<i>Exesipollenites tumulus</i> Balme 1957	Balme 1957: figs 123-125	Jurassic-Cretaceous [a]	probably Cupressaceae [d]	3	0.5	
<i>Equisetosporites concinnus</i> Singh 1964	Singh 1964: pl 75, figs 10-15	Hauterivian-middle Cenomanian [a] [p]	Gnetales [d]			0.5
<i>Pityosporites constrictus</i> Singh 1964	:Singh 1971: pl 25, fig 10	Kimmeridgian-Maastrichtian [a]	largely Pinaceae (in these strata)	0.5		
<i>Pityosporites</i> spp. indet.		Mesozoic-Neogene	largely Pinaceae (in these strata)		2	
<i>Pristinuspollenites microsaccus</i> (Couper) Tschudy, 1973	Tschudy 1973: pl 7, figs 4-6	Middle Jurassic - Paleogene [a]	Pinales, ?Podocarpaceae, ?Corystospermaceae	2.5	0.5	
<i>Taxodiaceapollenites hiatus</i> (Potonie) Kremp 1949	Ravn 1995: pl 15, fig 11	Albian-Recent [a]	Cupressaceae [s]	0.5	5	
<i>Vitreisporites pallidus</i> (Reissinger) Nilsson 1958	Nilsson 1958: pl 7, figs 12-14	Rhaetian-Late Cretaceous [a]	Caytoniales [n]	1		
bisaccate pollen indet.		late Paleozoic-Recent	Pinaceae, ?Podocarpaceae, ?Veltziales, ?Corystospermaceae (Mesozoic) [d]	6	9.5	
ANGIOSPERM POLLEN						
<i>Brenneripollis textus</i> (Norris) Juhasz & Goczan 1985	Juhasz M & Goczan F 1985: pl 3, figs 1-35	Barremian-middle Cenomanian [a]	?Chloranthaceae [i]		2	
<i>Clavatipollenites minutus</i> Brenner 1963	Brenner 1963: pl. 41, figs 8-9	Barremian-Albian (in central U.S.) [y]	Chloranthaceae [h]		1	
<i>Clavatipollenites</i> spp. indet.			Chloranthaceae [h]		1	
<i>Dichastopollenites</i> sp. cf. <i>D.</i> sp. of Tanrikulu & al 2017		early Albian-Cenomanian [x]	magnoliid angiosperm [y]		0.5	
<i>Fraxinopollenites constrictus</i> (Pierce) Chlonova 1976	Singh 1983: pl 17, figs 3-4	Albian-Cenomanian [p]	eudicot [h]		1	
<i>Pennipollis (Retimoocolpites) reticulatus</i> (Brenner) Friis & al 2000	Brenner 1963: pl 6, figs 8-11	Aptian-Albian [a] [l] [y]	Chloranthaceae [i]		0.5	
<i>Retimonocolpites larius</i> Ward 1986	Ward 1986: pl 5, figs 6-13	late Albian [y]	magnoliid angiosperm [y]		0.5	
<i>Retimonocolpites</i> sp.			magnoliid angiosperm [y]	0.5		
<i>Rausea</i> sp. 8 of Horikx et al. 2016	Horikx et al. 2016: p. 6, figs 13-14	late Albian [o]	eudicot [h]		1	
<i>Tricolpites minutus</i> (Brenner) Dettmann 1973	Brenner 1963: pl. 50, figs 5-6	middle Albian-Cenomanian [y]	eudicot [h]		1	
<i>Tricolpites parvus</i> Stanley 1965	Stanley: pl 47, figs 28-31	middle Albian-Paleocene [y]	eudicot [h]		1	
<i>Tricolpites</i> sp. indet.			eudicot [h]		0.5	
<i>Tricolporoidites minimus</i> Pacltova 1971	Ward 1986: pl 17, figs 20-23	early Albian-Cenomanian [y]	eudicot [h]			0.5
<i>Tricolporites</i> sp. 1			eudicot [h]			0.5
TOTAL				100	100	100
DINOFLAGELLATE CYSTS						
cf. <i>Aptea polymorpha</i> Eisenack 1958	Singh 1971: pl 63, fig 7	Aptian - latest Albian [r]	Dinophyceae [r]		present	present
cf. <i>Apteodinium granulatum</i> Eisenack 1958	Nøhr-Hansen et al. 2019: fig 10m	Aptian - latest Albian [q] [r]	Dinophyceae [r]		present	

Table 1. Stratigraphically important taxa indicated in bold.

Taxon	Reference Image	Age Range	Botanical Affinity	%Wan_Pal 04	% Wan_Pal 08	% Wan_Pal 10
<i>Dapsilidinium marinum</i> Singh 1983	Singh 1983: pl 41, figs 7-9	Cenomanian [v]	Dinophyceae [t]		present	
<i>Baltisphaeridium</i> sp.		Phanerozoic	Dinophyceae [m]		present	
<i>Leiosphaeridia</i> spp.		Phanerozoic	alga sensu lato		present	
<i>Micrhystridium</i> sp.		Phanerozoic	alga sensu lato			present
<i>Pterospermella</i> sp.		Phanerozoic	prasinophyte alga [m]		present	