

Supplementary Information

Table S1. Dinoflagellate and acritarch taxa from the Bloomfield study section. Numerical entries indicate number of individuals counted per sample. Symbol x indicates the presence of a taxon that is not included in the counts. Dashes indicate taxa that are not present. Asterisked taxa are illustrated in Figures 4–6 in the text. Two dinoflagellate species, *Glaphyrocysta retiintexta* and *G. reticulosa*, were counted together as it was difficult to differentiate them into separate species. Dinoflagellates were grouped together in their common genus if a species could not be distinguished, e.g., *Florentinia* spp. and *Spiniferites* spp. In certain cases, poor preservation or awkward orientation of a dinocyst would not permit specific identifications to be attained. Species and genus names are based on the terminology of Fensome and Williams [1] as extended in Fensome, MacRae and Williams [2], with the exception of two newly assigned species [3] which follow principles used in Lentin and Williams [4] and Stover and Evitt [5].

Formation Name	Owl Creek						Clayton						Porters Creek	
Sample #	1	2a	2b	3	4	5	6a	6b	7	8	9	10	11	12
<i>Alterbidinium</i> sp.	x	1	x	-	-	-	-	2	1	2	4	x	-	-
<i>Andalusiella polymorpha</i>	-	x	-	-	-	-	-	-	-	-	-	-	-	-
<i>Apteodinium</i> sp.	1	1	4	-	-	-	x	-	8	-	8	2	1	7
<i>Arvalidinium cristatum</i> * [53]	-	1	-	-	-	-	-	2	-	1	2	-	-	-
<i>Carpatella cornuta</i> *	-	-	x	-	-	-	-	1	-	-	-	-	-	1
<i>Cerodinium diebelii</i>	3	2	3	-	-	-	-	-	-	-	x	-	3	2
<i>Cerodinium striatum</i>	-	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Cerodinium</i> sp.	1	3	2	-	-	-	2	6	1	3	1	3	4	5
<i>Cordosphaeridium fibrospinosum</i>	x	x	-	-	-	-	x	1	x	2	1	1	x	-
<i>Cordosphaeridium inodes</i>	1	2	3	1	-	-	x	1	1	2	3	2	x	2
<i>Cordosphaeridium</i> sp.	3	5	3	2	-	-	2	-	2	6	3	3	2	7
<i>Coronifera oceanica</i> ?	x	-	x	1	-	1	x	x	x	2	2	x	-	-
<i>Cribroperidinium</i> sp.	3	3	1	-	-	-	2	1	4	-	2	1	1	9
<i>Cyclonephelium</i> sp.	-	x	-	-	-	-	-	-	-	-	-	-	x	-
<i>Cycloposiella</i> sp.	x	2	3	1	-	-	5	-	x	x	1	x	-	-
<i>Damassadinium californicum</i> *	-	-	x	-	-	-	2	1	2	x	2	1	x	10
<i>D. californicum</i> / <i>Cordosphaeridium</i> /	-	-	1	-	-	-	2	x	1	9	5	1	x	9
<i>Exochosphaeridium integrades</i> *	-	-	1	-	-	-	2	x	1	9	5	1	x	9
<i>Deflandrea galeata</i>	x	2	x	-	-	-	5	1	2	2	1	-	2	-

Table S1. Cont.

Formation Name	Owl Creek					Clayton					Porters Creek				
Sample #	1	2a	2b	3	4	5	6a	6b	7	8	9	10	11	12	
<i>Deflandrea phosphoritica</i> *	-	-	-	-	-	-	-	-	-	-	-	-	-	x	
<i>Deflandrea</i> sp.	1	8	4	1	-	1	1	4	2	4	11	2	2	1	
<i>Diconodinium</i> sp.	-	2	x	-	-	-	-	1	-	x	-	-	-	-	
<i>Dinocyst A</i>	-	-	5	-	-	-	-	-	-	-	-	-	-	-	
<i>Dinocyst B</i>	-	-	2	-	-	-	-	-	-	-	-	-	-	-	
<i>Dinocyst C</i>	-	-	4	-	-	-	-	1	-	-	-	-	-	-	
<i>Dinocyst D</i>	1	-	4	-	-	-	-	-	-	-	-	-	-	-	
<i>Dinogymnium</i> sp. *	x	1	x	-	-	-	-	-	-	-	-	-	-	-	
<i>Disphaerogena carposphaeropsis</i>	4	1	3	-	-	-	-	-	-	-	-	-	-	-	
<i>Eisenackia</i> sp.	x	x	-	-	-	-	-	x	-	-	-	-	-	x	
<i>Exochosphaeridium</i> spp.	2	2	5	2	-	-	15	2	3	18	5	2	2	3	
<i>Fibradinium annetorpense</i>	-	x	3	1	-	1	11	16	3	10	15	48	15	49	
<i>Fibrocysta axialis</i>	x	1	3	-	-	-	x	-	x	1	-	-	-	-	
<i>Fibrocysta ovalis</i>	-	2	5	-	-	-	1	1	-	-	-	x	-	-	
<i>Fibrocysta</i> sp.	x	4	3	-	-	-	13	5	1	6	2	4	-	8	
<i>Florentinia ferox</i>	-	x	-	-	-	-	-	-	2	1	x	1	x	1	
<i>Florentinia</i> spp.	2	x	4	-	-	-	8	5	11	1	1	8	7	1	
<i>Fromea fragilis</i>	3	5	3	-	-	-	2	7	7	1	3	7	-	1	
<i>Glaphyrocysta retiintexta/reticulosa</i>	23	7	12	1	-	-	-	-	-	-	-	-	-	-	
<i>Glaphyrocysta</i> sp.	2	1	x	-	-	-	-	-	x	-	x	-	-	-	
<i>Hafniasphaera fluens</i> *	22	13	8	-	-	-	8	6	5	5	5	x	12	6	
<i>Hafniasphaera hyalospinosa</i> *	-	-	-	-	-	-	2	-	4	4	1	11	1	2	
<i>Hafniasphaera</i> sp.	x	-	1	-	-	-	6	1	-	5	2	4	2	9	
<i>Hystrichokolpoma bulbosum</i>	x	1	1	-	-	-	-	-	1	1	x	x	-	-	
<i>Hystrichokolpoma</i> sp.	x	4	3	-	-	-	1	2	1	x	3	x	1	-	
<i>Hystrichosphaeridium recurvatum</i>	2	x	x	-	-	-	-	x	1	-	x	-	x	x	
<i>Hystrichosphaeridium tubiferum</i>	15	15	23	-	-	-	3	7	10	7	5	5	26	10	
<i>Hystrichostrogylon</i> sp.	1	1	x	-	-	-	-	-	-	-	1	-	x	x	
<i>Impagidinium</i> sp.	2	1	1	1	-	1	1	8	2	x	10	8	2	3	

Table S1. Cont.

Formation Name	Owl Creek					Clayton					Porters Creek				
Sample #	1	2a	2b	3	4	5	6a	6b	7	8	9	10	11	12	
<i>Isabelidinium?</i> sp.	x	-	-	-	-	-	-	-	-	1	x	1	-	-	
<i>Lanternosphaeridium lanosum?</i>	x	x	1	-	-	-	-	-	-	-	-	-	-	-	
<i>Lanternosphaeridium reinhardtii</i> *	-	-	x	-	-	-	-	-	-	-	-	-	-	-	
<i>Litosphaeridium?</i> spp.	7	x	5	-	-	-	5	5	5	4	5	4	4	2	
<i>Magallanesium densispinatum</i>	-	2	x	1	1	-	3	20	2	2	2	1	-	-	
<i>Magallanesium essoi</i>	-	3	x	-	-	-	2	3	x	1	1	-	-	-	
<i>Micrhystridium</i> spp.	6	15	10	-	-	-	1	7	1	1	4	1	-	1	
<i>Misc. Areoligera</i> spp.	22	10	9	4	-	2	2	8	2	5	1	3	5	5	
<i>Misc. small peridiniceans</i>	4	5	x	1	-	4	7	10	5	12	9	12	4	6	
<i>Oligosphaeridium complex</i>	-	-	1	-	-	-	-	1	1	4	2	1	8	x	
<i>Oligosphaeridium</i> sp.	1	1	-	-	-	-	1	3	-	2	-	-	-	-	
<i>Operculodinium</i> sp.	5	6	3	1	1	1	5	7	6	9	9	x	3	4	
<i>Palaeocystodinium</i> spp.	x	6	2	-	-	1	3	6	4	4	13	8	3	7	
<i>Palaeoperidinium pyrophorum</i>	1	4	1	-	-	2	1	9	5	2	-	1	29	-	
<i>Palaeotetradinium silicorum</i>	x	3	-	-	-	-	-	x	x	1	1	x	-	-	
<i>Palynodinium grallator</i> *	36	18	26	-	-	-	-	-	-	-	-	-	-	-	
<i>Paralecaniella indentata</i>	2	7	1	-	-	1	3	-	3	3	2	2	3	-	
<i>Phelodinium magnificum</i>	-	2	-	-	-	-	-	x	-	-	-	-	1	-	
<i>Phelodinium</i> sp.	-	1	-	-	-	22	-	1	x	1	2	x	3	-	
<i>Phelodinium tricuspe</i> *	x	x	-	-	-	-	-	-	-	-	-	-	-	-	
<i>Pierceites pentagonus</i> *	4	2	1	-	-	-	-	-	-	-	-	-	-	-	
<i>Pterospermopsis</i> sp.	1	x	x	-	-	1	x	1	1	-	-	-	-	-	
<i>Renidinium gracile</i>	-	1	7	-	-	-	-	-	-	-	-	-	-	-	
<i>Riculacysta amplexa</i> *	x	-	1	-	-	-	-	-	-	-	-	-	-	-	
<i>Senegalinium iterlaaense</i> *	-	-	-	-	-	-	-	5	x	-	1	5	x	x	
<i>Senegalinium simplex</i> * [53]	x	13	6	2	-	-	11	15	3	5	15	8	-	7	
<i>Senegalinium</i> sp.	-	-	-	-	-	-	-	-	-	-	1	1	-	1	
<i>Senoniasphaera inornata</i> *	-	x	2	-	-	-	-	-	-	-	-	-	-	-	
<i>Spinidinium</i> spp.	x	15	x	-	2	-	20	23	2	14	6	6	-	1	

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Formation Name	Owl Creek						Clayton					Porters Creek		
Sample #	1	2a	2b	3	4	5	6a	6b	7	8	9	10	11	12
<i>Spiniferella cornuta</i>	-	1	x	-	-	-	2	-	4	1	2	4	1	2
<i>Spiniferites</i> spp.	111	88	101	9	-	14	130	89	153	126	106	102	133	109
<i>Tanyosphaeridium xanthiopyxides</i>	4	1	1	-	-	-	-	-	2	1	1	1	3	2
<i>Tenua</i> sp. c.f. <i>Tenua formosa</i>	-	-	-	-	-	-	4	x	1	x	1	x	6	-
<i>Thalassiphora pelagica</i>	-	x	2	1	-	-	-	-	2	-	-	2	x	-
<i>Trithyrodinium evittii</i>	1	1	1	-	-	-	-	-	1	-	-	-	-	-
<i>Trithyrodinium</i> sp.	x	-	-	-	-	1	2	1	13	1	9	9	-	-
<i>Trigonopyxidia ginella</i>	-	-	-	-	-	-	1	-	1	-	1	x	1	-
<i>Xenikoon australis</i>	x	x	-	-	-	-	x	1	3	1	-	8	3	-
<i>Xenicodinium lubricum</i> *	-	-	-	-	-	-	-	-	x	-	1	x	x	-
Un-identified dinocysts	3	4	2	4	2	2	5	3	5	6	6	6	7	7
Total Counted	300	300	300	34	6	55	300	300	300	300	300	300	300	300

References

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2. Fensome, R.A.; MacRae, R.A.; Williams, G.L. *DINOFLAJ2, Version 1*; Data Series No. 1; American Association of Stratigraphic Palynologists: Reston, VA, USA, 2008.
3. Lucas-Clark, J. Small peridinioid dinoflagellate cysts from the Paleocene of South Carolina, U.S.A. *Palynology* **2006**, *30*, 183–210.
4. Lentin, J.K.; Williams, G.L. *A Monograph of Fossil Peridinioid Dinoflagellate Cysts*; Bedford Institute of Oceanography Report Series B-R-75-16; Bedford Institute of Oceanography: Dartmouth, Canada, 1976.
5. Stover, L.E.; Evitt, W.R. *Analyses of Pre-Pleistocene Organic-Walled Dinoflagellates*; Stanford University Publications, Geological Sciences; Stanford University: Stanford, CA, USA, 1978; Volume 15.