

G.S.C. O.F. 1874 PALYNOLOGICAL BIOSTRATIGRAPHY OF THE INTERVAL
2320-4570M, NORTHCOR ET AL., NARWHAL F-99, GRAND BANKS

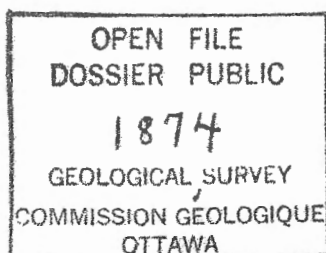
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**PALYNOLOGICAL BIOSTRATIGRAPHY
OF THE INTERVAL 2320-4570M,
NORTHCOR ET AL., NARWHAL F-99**

**REPORT # 87-0066
NOVEMBER, 1987**

CALGARY, ALBERTA



PALYNOLOGICAL SUMMARY: NARWHAL F-99

- 2320-2390m: Cannosphaeropsis sp. A Zone (late Miocene or older)
- 2390-2450m: Pentadinium laticinctum Zone (middle Miocene or older)
- 2420-2860m: Areosphaeridium arcuatum Zone (early Oligocene)
- 2860-2890m: Diphyes colligerum Zone (late Eocene)
- 2890-3270m: Adnatosphaeridium reticulense Zone and Apectodinium homomorphum Zone undifferentiated (early to (middle Eocene)
- 3280-3290m: Odontochitina operculata Zone (Campanian)
- 3305-3310m: Possible Surculosphaeridium longifurcatum Zone (early to late Turonian)
- 3310-3315m: Kiokansum polypes Zone (early to late Cenomanian)
- 3315-3370m: Chichaouadinium sp. A Zone (middle to late Albian)
- 3370-3420m: Stellatopollis sp. A Zone (early Albian)
- 3420-3450m: Parvisaccites amplius Zone (late Aptian)
- 3450-3490m: Subtilisphaera terrula Zone (early to late Barremian)

3490-3840m: Pseudoceratium pelliferum Zone (early to
middle Valanginian)

3850-4300m: Cerebropollenites macroverrucosus Zone (late
Berriasian)

4300-4475m: Ctenidodinium panneum (early Berriasian)

4475-4570m: No zonal Assignment (possible Late Jurassic)

SELECTED PALYNOMORPHS2320-2390m: Cannosphaeropsis sp. A Zone (late Miocene or older)

- 2320-2330m: Compositae #LA
 Lycopodiumsporites annotinioides
 Operculodinium centrocarpum
 Osmundacidites claytonites
 Systematophora ancylus*
 Tsugaepollenites igniculus
 Tsugaepollenites viridifluminipites
- 2330m: (swc) Spiniferites adnatus
 Tuberculodinium sp., Williams & Brideaux, 1975*
- 2350-2360m: Corylus #LA
 Ilexpollenites margaritus
 Pterocaryapollenites stellatus
- 2360m: (swc) Caryapollenites simplex
 Lingulodinium machaerophorum
 Polypodioidites favus
- 2380-2390m: Ericipites antecursorioides
 Ericipites compactipolleniatus

2390-2450m: Pentadinium laticinctum Zone (middle Miocene or older)

- 2390m: (swc) Melitasphaeridium choanophorum
 Pentadinium laticinctum laticinctum*
- 2410-2420m: Liquidambar #LA

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- 2420m: (swc) Artemisia-Taraxacum spp.
Glaphyrocysta sp. indet.*
Wetzeliiella symmetrica*
- 2440-2450m: Jusseia sp., Piel 1971
- 2470-2480m: Apteodinium spiridoides
Rouseisporites #LA
Spiniferites pseudofurcatus
- 2480m: (swc) Reticulatosphaera actinocoronata
- 2540-2560m: Juglanspollenites nigripites
Selaginella perinatus
- 2560-2570m: Camazonosporites #LA
- 2590-2620m: Cicatricosisporites daviesii
Selaginella selaginoides
Spiniferites varmae
- 2620-2660m: Deflandrea phosphoritica
Hystriocholpoma rigaudiae
Micrhystridium fragile
- 2660m: (swc) Brigantedinium simplex
Selenopemphix nephroides
Tiliaepollenites vescipes

- 2720-2730m: Cribroperidinium giuseppi
Lejeunecysta granosa
Lejeunecysta spinulosa
Tuberculodinium vancampoe (caved)
- 2740-2820m: Pachysandra #LA
- 2750m: (swc) Tuberculodinium vancampoe (probable contaminant)
- 2840m: (swc) Homotryblum floripes

2860-2890m: Diphyes colligerum Zone (late Eocene)

- 2860-2870m: Cordosphaeridium gracile*
Cordosphaeridium inodes inodes*
Hystrichokolpoma salacium*
Phthanoperidinium comatum
Samlandia chlamydophora*
- 2870m: (swc) Achilleodinium biformoides*
Areosphaeridium arcuatum (large form)
Cicatricosisporites dorogensis
Deflandrea heterophlycta
Deflandrea spinulosa
Hystrichokolpoma cinctum*
Kisselovia coleothrypta
Phthanoperidinium levimurum*

2890-3280m: Adnatosphaeridium reticulense Zone and Apectodinium homomorphum Zone undifferentiated (early to middle Eocene)

- 2890-2910m: Achomosphaera sagena
Camaroazonosporites #LB*

Glaphyrocysta vicina*

Lentinia serrata

Systematophora placacantha*

Wetzeliiella articulata

2920-2940m: Cordosphaeridium divergens
Cordosphaeridium funiculatum
Glaphyrocysta laciniiforme*

2950-2960m: Rhombodinium draco

2960m: (swc) Dinopterygium cladoides

2980-3000m: Areosphaeridium diktyoplokus*
Glaphyrocysta spineta*
Phthanoperidinium alectrolophum*

3010-3040m: Cerebrocysta bartonensis*

3050m: (swc) Cordosphaeridium minus
Dapsilidinium simplex

3100-3120m: Areosphaeridium fenestratum
Areosphaeridium multicornutum (small form)
Deflandrea oebisfeldensis*

3130-3136m: Araneosphaera araneosa
Areoligera sentosa*
Deflandrea eocenica*
Glaphyrocysta semitecta
Spiniferites monilis

3136m: (swc) Areosphaeridium arcuatum (small form)
Phthanoperidinium #LG

Phthanoperidinium echinatum
Phthanoperidinium multispinosum

3160-3171m: Phthanoperidinium geminatum

3171m: (swc) Impagidinium californiense*

3186m: (swc) Thalassiphora patula

3200m: (swc) Rottnestia borussica

3220-3270m: Impagidinium #LG*

3280-3305m: Odontochitina operculata Zone (Campanian)

3280-3290m: Chatangiella tripartita*

3305-3310m: possible Surculosphaeridium longifurcatum Zone: Subzones 14A-B (early to late Turonian)

3305m: (swc) Silicisphaera buspinum (questionably present)*
Spinidinium spp.

3310-3315m: Kiokansum polypes Zone: Subzones 13A-B (early to late Cenomanian)

3310-3315m: Cicatricosisporites cocononiensis
Cleistosphaeridium huguontoni (common)*
Litosphaeridium siphoniphorum
Odontochitina costata
Xenascus ceratioides

3315-3370m: Chichaouadinium sp. A Zone: Subzones 12B-C (middle to late Albian)

- 3315-3330m: Cerebropollenites #EC
 Chichaouadinium vestitum*
 Cicatricosisporites venustus*
 Gonyaulacysta cassidata (present)*
 Odontochitina operculata (common)
 Plicatella problematica (present)
- 3340-3350m: Cicatricosisporites #EF
 Nodosisorites babsae*
 Plicatella baconensis
 Plicatella bifurcata*
- 3360m: (swc) Apteodinium grande
 Cicatricosisporites #EAI*
 Cyclonephelium eisenackii*
 Cyclonephelium vannophorum
 Lecaniella dictyotum
 Ornamentifera echinata*
 Ovoidinium verrucosum (questionably present)

3370-3390m: Stellettopollis sp. A Zone: Subzone 11B (early Albian)

- 3370-3390m: Corollina torosa
 Plicatella macrorhyza
 Plicatella matesovae*
 Rouseisorites reticulatus

3390-3420m: Stellatopollis sp. A Zone: Subzone 11A (early Albian)

- 3390m: (swc) Foraminisporis asymmetrica
 Tigrisporites scurrundus*
- 3400-3420m: Cicatricosisporites #EAP (derived)
 Cicatricosisporites delicatus
 Cicatricosisporites microrugulatus

3420-3450m: Parvisaccites amplius Zone: Subzone 10C (late Aptian)

- 3420m: (swc) Cicatricosisporites annulatus
 Coronatispora valdensis
 Cyclonephelium attadalicum cf.*
 Lycopodiacidites irregularis
 Neoraistrickia truncata
 Parvisaccites amplius (rare)*
 Plicatella #EY
- 3430-3450m: Cicatricosisporites sternum (derived)

3450-3490m: Subtilisphaera terrula Zone: Subzones 9C-D (early to late Barremian)

- 3450m: swc Cicatricosisporites #EAL*
 Cicatricosisporites #EU (questionable)
 Cicatricosisporites apicanalis
 Cicatricosisporites potomacensis
 Corollina torosa (common)
 Costatoperforosporites #EG*
 Crybelosporites pannuceus
 Interlobites triangularis

Januasporites spiniferus
Triretilobata marylandensis
Uvaesporites glomeratus
Velosporites triquetrus

3460-3480m: Cicatricosisporites microstriatus (derived)
Cicatricosisporites striatus
Costatoperforosporites #EF (derived)
Couperisporites complex (common)
Plicatella #EE
Podocarpidites herbtsii

3480m: (swc) Callialasporites monoalaspurus*
Cicatricosisporites australiensis
Cicatricosisporites exilioides
Contignisporites glebulentus
Pilosisorites verus
Reticulatisporites #EA*

3490-3560m: Pseudoceratium pelliferum Zone: Subzone 7C (middle Valanginian)

3490-3520m: Cicatricosisporites #ECG*
Cicatricosisporites (28 CICATR DG) (common)
Cicatricosisporites tersus
Concavissimisporites giganteus
Costatoperforosporites #EB*
Costatoperforosporites #EF*
Striatella #EF

3520-3530m: Cicatricosisporites (28 CICATR DG)
Contignisporites hilsei*
Pilosisorites crassangularis

3530m: (swc) Hystrichogonyaulax cladophora cf.

3550-3560m: Cicatricosporites microstriatus
Contignisporites dorsostriatus
Trilobosporites tenuiparietalis (derived)

3560-3840m: Pseudoceratium pelliferum Zone: Subzone 7A (early Valanginian)

3560m: (swc) Callialasporites infrapunctatus*
Ctenidodinium #ES
Subtilisphaera terrula
Trilobosporites valanginensis*

3580-3590m: Campenia #EA*
Pilososporites ericus
Striatella imperfecta*
Taurocusporites spackmanii

3590m: (swc) Cicatricosporites #EAJ

3620m: (swc) Cicatricosporites #EAE
Cicatricosporites #EAL (common)
Corollina itunensis*
Ctenidodinium panneum (derived)
Densoisporites triradiatus cf.
Occisucysta spp.

3640-3650m: Cicatricosporites exilioides Dorh '71

3650m: (swc) Cicatricosporites striatus
Pilososporites semicapillosus

3730-3750m: Triretilobata trioreticulosa

- 3760-3766m: Plicatella #EAB
- 3776m: (swc) Cicatricosisporites globosus
Cicatricosisporites hannoverana
Corollina #EA (derived)
Reticulatisporites #EA (common)
Rotverrusporites obsurilaesuratus
- 3790-3793m: Cicatricosisporites #EAL (common)
Cicatricosisporites #ES
Ischyosporites tuberosus (questionable)
Rotverrusporites tenuis
- 3793m: (swc) Wanaea fimbriata (derived)
- 3820m: (swc) Hystrichogonyaulax #EB (derived)

3850-4300m: Cerebropollenites macroverrucosus Zone: Subzone 6A (late Berriasian)

- 3850-3860m: Cicatricosisporites undatus*
Dingodinium cerviculum
Striatella #EJ (questionable)
- 3850m: (swc) Rotverrusporites #EA
Surculosphaeridium sp.III
- 3880-3900m: Costatoperforosporites #EI
- 3910-3930m: Concavissimisporites robustus*

- 3970-4000m: Concavissimisporites robustus
Impardecispora apigranulosa
- 4010m: (swc) Muderongia simplex
- 4030-4050m: Concavissimisporites longiverrucatus
Plicatella fucosa
- 4060-4070m: Contignisporites hilsei
- 4070m: (swc) Contignisporites major
- 4090-4110m: Costatoperforosporites cf. #EG
Ischyosporites #EA
Rotverrusporites obsurilaesuratus
- 4120-4130m: Cicatricosisporites magnus*
- 4130m: (swc) Cicatricosisporites aff. hannoverana
- 4160m: (swc) Januasporites tumulosus
Muderongia simplex perforata
Pseudoceratium pelliferum
Subtilisphaera terrula
- 4180-4190m: Cicatricosisporites abacus
- 4190m: (swc) Cicatricosisporites grabowensis
- 4220m: (swc) Oligosphaeridium diluculum*
Trilobosporites aornatus (questionable)
- 4240-4241m: Ischyosporites amplireticosus (questionable)

4402m: (BH) Cicatricosisporites #EN
 Cicatricosisporites caucasica
 Phoberocysta neocomica neocomica*

4420-4475m: Ctenidodinium panneum Zone: Subzone 5B (early Berriasian)

4420-4430m: Stenozonotriletes #EA*

4450m: (swc) Corollina echinata*

4480m: (swc) Plicatella #EQ

4475-4570m: No zonal assignment (possible late Jurassic)

4475-4485m: Saxosporis variabilis

Alisporites thomasi

4510-4530m: Breodoxiella #EA

Varirugosisporites #EA

4540-4560m: Gonyaulacysta jurassica (questionable)*

4570m: Vastisporites vastiformis*

APPENDIX AAlphabetical Listing of Species Shown on Occurrence Chart:Marine Dinoflagellates

Index number	Taxon names		
38	Achilleodinium biformoides	20	Filisphaera filifera
12	Achomosphaera ramulifera	103	Florentina radiata
45	Achomosphaera sagena	133	Florentina spp.
104	Apteodinium grande	26	Geiselodinium sp. cf. tyonekense
119	Apteodinium granulatum	54	Glaphyrocysta laciniiforme
27	Apteodinium sp. Williams & Brideaux '75	70	Glaphyrocysta semitecta
10	Apteodinium spiridoides	8	Glaphyrocysta sp. indet.
67	Araneosphaera araneosa	58	Glaphyrocysta spineta
68	Areoligera sentosa	46	Glaphyrocysta vicina
39	Areosphaeridium arcuatum (large form)	100	Gonyaulacysta cassidata
72	Areosphaeridium arcuatum (small form)	143	Gonyaulacysta jurassica
57	Areosphaeridium diktyoplokus	113	Gonyaulacysta spp.
64	Areosphaeridium fenestratum	32	Homotryblum floripes
65	Areosphaeridium multicornutum (small)	136	Hystrichodinium furcatum
142	Breodoxiella #EA	93	Hystrichodinium pulchrum
18	Brigantedinium simplex	141	Hystrichodinium voightii
129	Caddosphaera halosa	124	Hystrichogonyaulax #EB
120	Canningia reticulata	112	Hystrichogonyaulax cladophora cf.
123	Canningia ringnesiorum	42	Hystrichokolpoma cinctum
51	Canningia? sp. indet.	17	Hystrichokolpoma rigaudiae
77	Cannosphaeropsis utinensis	35	Hystrichokolpoma salacium
60	Cerebrocysta bartonensis	82	Impagidinium #LG
83	Chatangiella tripartita	85	Impagidinium #LLG
98	Chichauadinium vestitum	78	Impagidinium californiense
91	Cleistosphaeridium huguontonii	30	Impagidinium cornutum
86	Cleistosphaeridium spp.	79	Impletosphaeridium insolitum
52	Cordosphaeridium divergens	43	Kisselovia coleothrypta
53	Cordosphaeridium funiculatum	24	Lejeunecysta granosa
33	Cordosphaeridium gracile	29	Lejeunecysta hyalina
34	Cordosphaeridium inodes inodes	25	Lejeunecysta spinulosa
61	Cordosphaeridium minusum	47	Lentinia serrata
92	Coronifera oceanica	6	Lingulodinium machaerophorum
23	Cribroperidinium giuseppi	94	Litosphaeridium siphoniphorum
99	Cribroperidinium orthoceras	7	Melitaspheridium choanophorum
110	Cribroperidinium sepimentum	131	Muderongia simplex
144	Cribroperidinium spp.	134	Muderongia simplex perforata
117	Ctenidodinium panneum	118	Occisucysta spp.
115	Ctenidodinium spp.	95	Odontochitina costata
121	Cyclonephelium attadalicum	101	Odontochitina operculata
108	Cyclonephelium attadalicum cf.	96	Oligosphaeridium complex
89	Cyclonephelium distinctum	137	Oligosphaeridium diluculum
116	Cyclonephelium distinctum brevispinum	132	Oligosphaeridium djenn
105	Cyclonephelium eisenackii	125	Oligosphaeridium pulcherrimum
106	Cyclonephelium vannophorum	1	Operculodinium centrocarpum
28	Dapsilidinium pastielsii	107	Ovoidinium verrucosum
62	Dapsilidinium simplex	22	Palaeocystodinium golzowense
69	Deflandrea eocenica	140	Pentadinium laticinctum granulatum
40	Deflandrea heterophlycta	31	Pentadinium laticinctum laticinctum
66	Deflandrea oebisfeldensis	73	Phtherocysta neocomica neocomica
16	Deflandrea phosphorica	59	Phthanoperidinium #LG
41	Deflandrea spinulosa	36	Phthanoperidinium alectrolophum
126	Dingodinium cerviculum	74	Phthanoperidinium comatum
56	Dinopterygium cladoides	76	Phthanoperidinium echinatum
84	Dracodinium condylos	44	Phthanoperidinium levimurum
138	Epiplosphaera spp.	75	Phthanoperidinium multispinosum
130	Escharisphaeridia spp.	111	Plicatella spp.
		102	Prolixosphaeridium parvispinum
		135	Pseudoceratium pelliferum

APPENDIX A (cont'd)Alphabetical Listing of Species Shown on Occurrence Chart:Marine Dinoflagellates

13	<i>Reticulosphaera actinocoronata</i>
55	<i>Rhombodinium draco</i>
81	<i>Rottneustia borussica</i>
37	<i>Samlandia chlamydophora</i>
139	<i>Scortea tecta</i>
19	<i>Selenopemphix nephroides</i>
87	<i>Silicisphaera buspinum</i>
88	<i>Spinidinium</i> spp.
3	<i>Spiniferites adnatus</i>
21	<i>Spiniferites membranaceus</i>
71	<i>Spiniferites monilis</i>
11	<i>Spiniferites pseudofurcatus</i>
5	<i>Spiniferites ramosus ramosus</i>
15	<i>Spiniferites varmae</i>
90	<i>Spongodinium delitiense</i>
109	<i>Stiphrosphaeridium anthophorum</i>
127	<i>Subtilisphaera perlucida</i>
114	<i>Subtilisphaera terrula</i>
128	<i>Surculosphaeridium</i> sp. III
2	<i>Systematophora ancyrea</i>
48	<i>Systematophora placacantha</i>
49	<i>Tectatodinium pellitum</i>
80	<i>Thalassiphora patula</i>
63	<i>Thalassiphora pelagica</i>
4	<i>Tuberculodinium</i> sp., Will. & Brid. 1975
122	<i>Wanaea fimbriata</i>
50	<i>Wetzeliella articulata</i>
9	<i>Wetzeliella symmetrica</i>
97	<i>Xenascus ceratioides</i>

APPENDIX A (cont'd.)Alphabetical Listing of Species Shown on Occurrence Chart:Pollen and Spores

Index number	Taxon names		
60	Abiespollenites microreticulatus	177	Cicatricosisporites exilioides
120	Acanthotriletes varispinosus	145	Cicatricosisporites exilioides Dorh '71
221	Aequitriradites conosimilis	124	Cicatricosisporites exilioides Sin.'71
198	Aequitriradites spinulosus	178	Cicatricosisporites globosus
228	Aequitriradites spp.	214	Cicatricosisporites grabowensis
94	Aequitriradites subverrucosus	179	Cicatricosisporites hannoverana
187	Aequitriradites tilchaensis	209	Cicatricosisporites hannoverana aff.
156	Aequitriradites verrucosus	195	Cicatricosisporites hannoviana
35	Alisporites bilateralis	207	Cicatricosisporites magnus
67	Alisporites grandis	78	Cicatricosisporites microstriatus
14	Alnipollenites verus	136	Cicatricosisporites mohrioides
34	Araucariacites australis	98	Cicatricosisporites potomacensis
216	Araucariacites punctatus	36	Cicatricosisporites spp.
20	Artemisia-Taraxacum spp.	92	Cicatricosisporites sternum
75	Baculatisporites comaunensis	112	Cicatricosisporites striatus
61	Biretisporites potoniae	137	Cicatricosisporites tersus
81	Callialasporites dampieri	188	Cicatricosisporites undatus
157	Callialasporites infrapunctatus	43	Cicatricosisporites venustus
121	Callialasporites monoalasporus	31	Cicatricosisporites auritus
215	Callialasporites segmentatus	1	Compositae #LA
144	Callialasporites trilobatus	138	Concavissimisporites giganteus
222	Callialasporites trilobatus cf.	230	Concavissimisporites informis
133	Callialasporites turbatus	199	Concavissimisporites longiverrucatus
25	Camerozonosporites #LA	48	Concavissimisporites punctatus
33	Camerozonosporites #LB	194	Concavissimisporites robustus
40	Camerozonosporites insignis	125	Concavissimisporites spp.
164	Campania #EA	154	Concavissimisporites variverrucatus
15	Caryapollenites simplex	139	Contignisporites dorsostriatus
158	Cedripites canadensis	126	Contignisporites glebulentus
41	Cedripites cretaceus	146	Contignisporites hilsei
42	Cerebropollenites #EC	204	Contignisporites major
153	Cerebropollenites macroverrucosus	237	Contignisporites triletus
229	Cerebropollenites macroverrucosus cf.	180	Corollina #EA
55	Cerebropollenites mesozoicus	173	Corollina echinata
170	Cicatricosisporites #EAE	147	Corollina itunensis
56	Cicatricosisporites #EAI	62	Corollina torosa
168	Cicatricosisporites #EAJ	159	Corollina vignoniensis
95	Cicatricosisporites #EAL	83	Coronatipora valdensis
122	Cicatricosisporites #EAL cf.	11	Corylus #LA
76	Cicatricosisporites #EAP	140	Costatoperforosporites #EB
134	Cicatricosisporites #ECG	232	Costatoperforosporites #EC
47	Cicatricosisporites #EF	223	Costatoperforosporites #ECF
226	Cicatricosisporites #EM	113	Costatoperforosporites #EF
240	Cicatricosisporites #EN	99	Costatoperforosporites #EG
182	Cicatricosisporites #ES	200	Costatoperforosporites #EG cf.
96	Cicatricosisporites #EU	193	Costatoperforosporites #EI
135	Cicatricosisporites (28 CICATR DG)	127	Costatoperforosporites fistulosus
211	Cicatricosisporites abacus	100	Costatoperforosporites foveolatus
82	Cicatricosisporites annulatus	101	Costatoperforosporites spp.
97	Cicatricosisporites apicanalis	114	Couperisporites complex
123	Cicatricosisporites australiensis	102	Crybelosporites pannuceus
241	Cicatricosisporites caucasica	160	Ctenidodinium #ES
38	Cicatricosisporites cocononiensis	49	Cyathidites australis
26	Cicatricosisporites daviesii	50	Cyathidites minor
77	Cicatricosisporites delicatus	2	Cyathidites spp.
32	Cicatricosisporites dorogensis	37	Deltoidospora hallii
		79	Densosporites microrugulatus
		186	Densosporites triradiatus
		171	Densosporites triradiatus cf.

APPENDIX A (cont'd.)Alphabetical Listing of Species Shown on Occurrence Chart:Pollen and Spores

115	Densoisporites velatus	191	Pilosisorites trichopapillosus
116	Distaltriangulisporites perplexus	129	Pilosisorites verus
190	Ephedripites costaliferus	7	Pinuspollenites spp.
151	Ephedripites sp. 3, Kotova 1968	249	Pityosporites dividiuus
17	Ericipites antecursorioides	176	Plicatella #EAB
18	Ericipites compactipolleniatus	117	Plicatella #EE
201	Exesipollenites scabratus	227	Plicatella #EO
68	Exesipollenites tumulus	233	Plicatella #EP
69	Foraminisporis asymmetrica	239	Plicatella #EQ
197	Foraminisporis wonthaggiensis	89	Plicatella #EY
70	Gleicheneidites distalgranulatus	53	Plicatella baconensis
57	Gleicheneidites senonicus	54	Plicatella bifurcata
12	Ilexpollenites margaritus	118	Plicatella bilateralis
196	Impardecispora apigranulosa	203	Plicatella fucosa
152	Impardecispora apiverrucata	64	Plicatella macrorhyza
218	Inaperturopollenites #EVL	65	Plicatella matesovae
103	Interlobites triangularis	149	Plicatella parviangulata
205	Ischyosporites #EA	130	Plicatella potomacensis
219	Ischyosporites amplireticus	45	Plicatella problematica
104	Ischyosporites disjunctus	72	Plicatella tricornitata
141	Ischyosporites spp.	235	Podocarpidites canadensis
183	Ischyosporites tuberosus	174	Podocarpidites epistriatus
105	Januasporites spiniferus	46	Podocarpidites granulatus
212	Januasporites tumulosus	119	Podocarpidites herbtsii
23	Juglanspollenites nigripites	108	Podocarpidites potomacensis
21	Jusseia sp., Piel 1971	238	Polycingulatisporites segmentatus
128	Klukisporites areolatus	16	Polypodiidites favus
142	Klukisporites foveolatus	13	Pterocaryapollenites stellatus
247	Klukisporites fuscus	131	Reticulatisporites #EA
51	Klukisporites pseudoreticulatus	244	Reticulatisporites #EC
106	Kraeuselisporites linearis	192	Rotverrusporites #EA
107	Laevigatosporites mesozoicus	224	Rotverrusporites grandis
3	Laevigatosporites ovatus	225	Rotverrusporites granulatum
213	Leiotriletes equiexinus	181	Rotverrusporites obsurilaesuratus
63	Leiotriletes mecklenburgensis	184	Rotverrusporites tenuis
220	Leiotriletes sp	22	Rouseisporites #LA
206	Leptolepidites major	132	Rouseisporites radiatus
208	Leptolepidites verrucatus	66	Rouseisporites reticulatus
19	Liquidambar #LA	39	Rugubivesiculites reductus
84	Lycopodiacidites irregularis	24	Selaginellaites perinatus
4	Lycopodiumsporites annotinioides	27	Selaginellaites selaginoides
44	Lycopodiumsporites austroclavitudites	90	Sestrosporites pseudoalveolatus
85	Lycopodiumsporites marginatus	243	Stenozonotriletes #EA
242	Matonisporites equiexinus	8	Sternisporites antiquasporites
86	Neoraistrickia truncata	73	Stereisporites clavus
52	Nodosisorites babsae	143	Striatella #EF
202	Nodosisorites spp.	189	Striatella #EJ
58	Ornamentifera echinata	236	Striatella #ET
5	Osmundacidites claytonites	166	Striatella imperfecta
87	Osmundacidites wellmannii	210	Striatella sp. indet.
30	Pachysandra #LA	167	Taurocuposporites spackmanii
88	Parvisaccites amplius	29	Taxodiaceapollenites hiatus
80	Parvisaccites radiatus	74	Tigrisporites scurrundus
71	Perinopollenites elatoides	28	Tiliaepollenites vespipites
93	Phyllocladites inchoatus	185	Todisporites major
6	Piceapollenites spp.	91	Todisporites minor
148	Pilosisorites crassangularis	217	Trilobosporites aornatus
165	Pilosisorites ericus	234	Trilobosporites perversulentus
172	Pilosisorites semicapillosus	155	Trilobosporites tenuiparietalis

APPENDIX A (cont'd.)Alphabetical Listing of Species Shown on Occurrence Chart:Pollen and Spores

161	Trilobosporites valanginensis
162	Trilobosporites weylandii
109	Triretilobata marylandensis
150	Triretilobata spp.
175	Triretilobata trioreticulosa
9	Tsugaepollenites iquiculus
10	Tsugaepollenites viridifluminipites
248	Tuberositriletes major
110	Uvaesporites glomeratus
245	Uvaesporites subequatorialis
246	Varirugosisporites #EA
250	Varirugosisporites mutabilis
169	Varirugosisporites spp.
163	Vastisporites vastiformis
111	Velosporites triquetrus
231	Vitreisporites minor
59	Vitreisporites pallidus

APPENDIX A (cont'd.)Alphabetical Listing of Species Shown on Occurrence Chart:Algae, Fungi and Miscellaneous Palynomorphs

Index number	Taxon names
10	BARREN OF PALYNOMORPHS
4	foraminiferal liners
7	Lecaniella dictyotum
3	Micrhystridium fragile
6	Paralecaniella indentata
5	Pediastrum boryanum
2	Pluricellaesporites spp.
9	Schizocysta parvus
8	Schizosporis reticulata
1	Tasmanites globulus

APPENDIX A (cont'd.)Alphabetical Listing of Species Shown on Occurrence Chart:Reworked Palynomorphs

Index number	Taxon names
6	*Aquilapollenites spp.
1	*Cicatricosisporites spp.
4	*Densosporites spp.
5	*Dinogymnium spp.
9	*Distaltriangulisporites perplexus
2	*Isabelidinium spp.
8	*Oligosphaeridium spp.
3	*Palaeohystrichophora infusorioides
7	*Spinidinium spp.

APPENDIX BList of Samples for Palynological Analysis

2320.00 : cuttings	3190.00 : cuttings	3949.00 : swc
2330.00 : swc	3200.00 : swc	3955.00 : swc
2350.00 : cuttings	3220.00 : cuttings	3970.00 : cuttings
2360.00 : swc	3230.00 : swc	3980.00 : swc
2380.00 : cuttings	3250.00 : cuttings	4000.00 : cuttings
2390.00 : swc	3257.00 : swc	4010.00 : swc
2410.00 : cuttings	3262.00 : swc	4030.00 : cuttings
2420.00 : swc	3265.00 : swc	4060.00 : cuttings
2440.00 : cuttings	3280.00 : cuttings	4070.00 : swc
2450.00 : swc	3305.00 : swc	4090.00 : cuttings
2470.00 : cuttings	3310.00 : cuttings	4102.00 : swc
2480.00 : swc	3310.00 : swc	4120.00 : cuttings
2500.00 : cuttings	3315.00 : swc	4130.00 : swc
2510.00 : swc	3328.00 : swc	4150.00 : cuttings
2530.00 : cuttings	3340.00 : cuttings	4160.00 : swc
2540.00 : swc	3360.00 : swc	4180.00 : cuttings
2560.00 : cuttings	3370.00 : cuttings	4190.00 : swc
2570.00 : swc	3390.00 : swc	4210.00 : cuttings
2590.00 : cuttings	3400.00 : cuttings	4220.00 : swc
2600.00 : swc	3420.00 : swc	4240.00 : cuttings
2620.00 : cuttings	3430.00 : cuttings	4251.00 : swc
2630.00 : swc	3450.00 : swc	4270.00 : cuttings
2650.00 : cuttings	3460.00 : cuttings	4280.00 : swc
2660.00 : swc	3480.00 : swc	4300.00 : cuttings
2680.00 : cuttings	3490.00 : cuttings	4310.00 : swc
2700.00 : swc	3520.00 : cuttings	4330.00 : cuttings
2704.00 : swc	3530.00 : swc	4340.00 : swc
2710.00 : cuttings	3550.00 : cuttings	4360.00 : cuttings
2720.00 : swc	3560.00 : swc	4390.00 : cuttings
2740.00 : cuttings	3580.00 : cuttings	4397.00 : swc
2750.00 : swc	3590.00 : swc	4402.00 : cuttings
2770.00 : cuttings	3610.00 : cuttings	4420.00 : cuttings
2780.00 : swc	3620.00 : swc	4430.00 : swc
2800.00 : cuttings	3640.00 : cuttings	4450.00 : cuttings
2810.00 : swc	3650.00 : swc	4450.00 : swc
2830.00 : cuttings	3665.00 : swc	4480.00 : cuttings
2840.00 : swc	3670.00 : cuttings	4480.00 : swc
2860.00 : cuttings	3675.00 : swc	4510.00 : cuttings
2870.00 : swc	3690.00 : swc	4540.00 : cuttings
2890.00 : cuttings	3700.00 : cuttings	4570.00 : swc
2900.00 : swc	3703.00 : swc	
2920.00 : cuttings	3704.00 : swc	
2930.00 : swc	3730.00 : cuttings	
2950.00 : cuttings	3760.00 : cuttings	
2960.00 : swc	3776.00 : swc	
2980.00 : cuttings	3781.00 : swc	
2990.00 : swc	3790.00 : cuttings	
3010.00 : cuttings	3793.00 : swc	
3020.00 : swc	3820.00 : cuttings	
3040.00 : cuttings	3820.00 : swc	
3050.00 : swc	3850.00 : cuttings	
3070.00 : cuttings	3850.00 : swc	
3080.00 : swc	3867.00 : swc	
3100.00 : cuttings	3880.00 : cuttings	
3106.00 : swc	3880.00 : swc	
3130.00 : cuttings	3905.00 : swc	
3126.00 : swc	3910.00 : cuttings	
3160.00 : cuttings	3932.00 : swc	
3171.00 : swc	3936.00 : swc	
3186.00 : swc	3940.00 : cuttings	