

G.S.C. O.F. 1864 PALYNOLOGICAL ANALYSIS OF THE INTERVAL 1200--  
14,030FT, PENOBSCOT L-30, SCOTIAN SHELF

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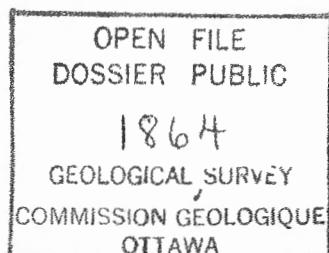
BUTAK DAVIES GROUP

PALYNOLOGICAL ANALYSIS OF THE  
INTERVAL 1200-14,030FT,  
PENOBSCOT L-30, SCOTIAN SHELF

REPORT NO. 88-0008

APRIL 1988

CALGARY, ALBERTA



BIOSTRATIGRAPHIC SUMMARY

1200-1590ft	<u>Diphyes colligerum</u> Zone (late Eocene)
1650-2220ft	<u>Adnatosphaeridium reticulense</u> Zone (middle Eocene)
2280-2310ft	<u>Palaeoperidinium pyrophorum</u> Zone (early Paleocene)
2370-2940ft	<u>Dinogymnium euclaense</u> Zone (Maastrichtian)
3000-3300ft	<u>Odontochitina operculata</u> Zone (Campanian)
3360-3390ft	<u>Oligosphaeridium pulcherrimum</u> Zone to <u>Pervosphaeridium truncigerum</u> Zone (Coniacian to Santonian)
3450-3660ft	<u>Surculosphaeridium longifurcatum</u> Zone (Turonian)
3720-3840ft	<u>Kiokansium polypes</u> Zone (Cenomanian)
3900-5790ft	<u>Chichaouadinium vestitum</u> Zone (Albian)
5860-5990ft	<u>Subtilisphaera perlucida</u> Zone (Aptian)
6060-6190ft	<u>Subtilisphaera perlucida</u> Zone: <u>Pilosporites</u> <u>trichopapillosa</u> Subzone (early Aptian)
6260-6890ft	<u>Subtilisphaera perlucida</u> Zone: <u>Cyclonephelium</u> <u>attadalicum</u> Subzone (early Aptian)

- 6960-7390ft      Aptea anaphrissa Zone (Barremian)
- 7460-8390ft      Ctenidodinium elegantulum Zone (Hauterivian)
- 8460-10,690ft      Phoberocysta neocomica Zone (Berriasian to  
Valanginian)
- 10,760-13,230ft      Hystrihogonyaulax cladophora Zone (Kimmeridgian)
- 13,280-13,311ft      Probable Hystrihosphaerina orbifera Zone  
(Callovian)
- 13,312-14,030ft      Ctenidodinium combazii Zone (late Bathonian to early  
Callovian)

SELECTED PALYNOMORPHS

Listings show highest occurrences unless otherwise specified.

(+) indicates marker species.

1200-1590f: Diphyes colligerum Zone (late Eocene)

Comment: Possible middle Eocene at 1200f based on A. homomorphum.

1200-1230f

Apectodinium homomorphum

(Possibly reworked)

Areosphaeridium arcuatum (small form) (+)

Cribroperidinium giuseppeii

Dapsilidinium pastielsii

Deflandrea phosphoritica

Glaphyrocysta semitecta (+)

Lentinia serrata

Membranophoridium aspinatum (Abundant)

Pentadinium laticinctum laticinctum

Systematophora ancyrea

Tectatodinium pellitum

Thalassiphora pelagica

1380-1410f

Cyclonephelium sp. A, Will. & Brid. 1975

Eocladopyxis peniculatum

Heteraulacacysta campanula

Kisselovia coleothrypta

Paralecaniella indentata

Systematophora placacantha (+)

1470-1500f                    Cordosphaeridium cantharellum  
Cordosphaeridium inodes inodes (+)

1650-2220f: Adnatosphaeridium reticulense Zone (middle Eocene)

1650-1680f                    Areoligera senonensis (+)  
Cordosphaeridium gracile  
Dapsilidinium simplex  
Glaphyrocysta intricata (small form)

1740-1770f                    Heteraulacacysta porosa  
Osmundacidites claytonites

1920-1950f                    Heteraulacacysta leptalea  
Phthanoperidinium levimurum

2010-2040f                    Dinopterygium cladoides  
Lingulodinium machaerophorum

2100-2130f                    Phthanoperidinium geminatum

2280-2310f: Palaeoperidinium pyrophorum Zone (early Paleocene)

Comment: Tentative top early Paleocene at 2280f based on single C. diebelii.

2280-2310f                    Ceratiopsis diebelii (+)  
Ceratiopsis pannucea  
Deflandrea heterophlycta (Caved top)  
Distatodinium ellipticum (Caved top)

Homotryblium pallidum (Caved top)

Spiniferites pseudofurcatus

(Caved top)

2370-2940f: Dinogymnium euclaense Zone (Maastrichtian)

2370-2400f

Isabelidinium belfastense (+)

Isabelidinium cooksoniae (+)

Oligosphaeridium complex

Pentadinium laticinctum granulatum

(Caved top)

Phthanoperidinium comatum (Caved top)

Tiliaepollenites vespites

(Caved top)

Wetzeliiella ovalis (Caved top)

2460-2490f

Membranophoridium sp. Wilson 1971 (+)

Palaeoperidinium pyrophorum

2550-2580f

Isabelidinium #LB (+)

Palaeocystodinium australinum

Phelodinium magnificum

2640-2670f

Spongodinium delitiense (+)

2730-2760f

Cyclonephelium distinctum (+)

Isabelidinium cretaceum (+)

2820-2850f

Rugubivesiculites rugosus







Plicatella problematica  
Protoellipsodinium spinosum  
Rouseisporites singularis

3990-4020f

Balmeisporites holodictyus  
Cicatricosisporites cocononiensis  
Cicatricosisporites hughesii  
Cribroperidinium edwardsii  
Parvisaccites radiatus  
Phyllocladites inchoatus  
Podocarpidites potomacensis (+)  
Tricolpopollenites micromunus (+)  
Vitreisporites pallidus (+)

4080-4110f

Aratrisporites monosaccus  
Biretisporites potoniae (+)  
Cerebropollenites #EC  
Perotriletes striatus  
Plicatella baconensis

4170-4200f

Cedripites canadensis  
Cerebropollenites mesozoicus  
Chichaouadinium vestitum (+)  
Cicatricosisporites crassiterminatus (+)  
Cicatricosisporites delicatus (+)  
Cicatricosisporites venustus (+)  
Coptospora williamsii (+)  
Foraminisporis wonthaggiensis  
Senoniasphaera microreticulata (+)

4260-4290f

Monosulcites scabratus  
Phyllocladites rugulatus (+)  
Podocarpidites canadensis (+)

Comment: Probable middle Albian at 4350f as indicated by Penetetrapites mollis.

4350-4380f

Cicatricosisporites #EAC  
Cicatricosisporites minor  
Cicatricosisporites potomacensis  
Penetetrapites mollis (+)  
Plicatella bilateralis  
Podocarpidites epistriatus

4440-4470f

Acanthotriletes variespinosus  
Nodosisporites #EC  
Rugubivesiculites minimus

4530-4560f

Astrocysta #EA (+)  
Cicatricosisporites subrotundus  
Ischyosporites amoholkus  
Stiphrosphaeridium anthophorum  
Xiphophoridium alatum

4620-4650f

Cicatricosisporites augustus  
(Questionably present)

4710-4740f

Afropollis jardinus (+)  
Cyclonephelium eisenackii (+)  
Eucommiidites minor (+)  
Impardecispora apiverrucata  
Rouseisporites euskirchensoides (+)  
Spongodinium solidum (+)  
Stephanodinium coronatum

4800-4830f

Apteodinium granulatum  
Distaltriangulisporites irregularis (+)  
Impardecispora pseudogibberula

Leiotriletes mecklenburgensis  
Liliacidites peroreticulatus (+)  
Ornamentifera baculata (+)  
Trilobosporites humilis (+)

4890-4920f

Aptea polymorpha (+)  
Caddasphaera halosa  
Cicatricosporites #ECD  
Cribroperidinium orthoceras  
Lecaniella dictyotum  
Liliadicites dividius (+)  
Lycopodiacidites asperatus  
Nodosisporites dentimarginatus (+)  
Phyllocladites #EA  
Tigrisporites scurrundus (+)

Comment: Probable early Albian at 4980f as indicated by P.amplus.

4980-5010f

Cicatricosporites #EAI  
Cicatricosporites annulatus (+)  
Cicatricosporites apicanalis (+)  
Concavissimisporites punctatus  
Ischyosporites disjunctus (+)  
Nodosisporites undosus  
Parvisaccites amplus  
Parvisaccites amplus cf  
Schizosporis reticulatus

5080-5110f

Klukisporites foveolatus  
Surculosphaeridium longifurcatum

(Common)

5160-5190f

Astrocysta #EA (Abundant)  
Impardecispora crispaeformis

5250-5280f

Chichaouadinium davidsii (+)  
Oligosphaeridium asterigerum (+)  
Plicatella tricornitata  
Trilobosporites perverulentus

5350-5380f

Concavissimisporites minor  
Costatoperforosporites #ET  
Impardecispora texensis (+)  
Nodosisporites babsae (+)

5450-5480f

Ischyosporites estherae (+)  
Oligosphaeridium perforatum perforatum (+)  
Plicatella pseudomacrorhyza  
Scortea tecta

5550-5580f

Foraminisporis asymmetrica  
Pilosisporites trichopapillosus  
(?Reworked)  
Schizosporis parvus

5660-5690f

Chichaouadinium davidsii (Common)  
Cribroperidinium #EX  
Gleicheniidites minor  
Nodosisporites genuina  
Subtilisphaera pirnaensis (kalyptra) (+)

5760-5790f

Luxadinium primulum (Common)  
Oligosphaeridium perforatum colum

5860-5990f: *Subtilisphaera perlucida* Zone (Aptian)

- 5860-5890f            Muderongia staurota (?Reworked)  
                        Subtilisphaera pirnaensis (+)                                 (Abundant)  
                        Subtilisphaera pirnaensis (kalyptra)                                 (Abundant)  
                        Triretilobata marylandensis

- 5960-5990f      Aequitriradites conosimilis  
                   Cicatricosisporites #EAL cf.  
                   Plicatella crimensis  
                   Plicatella macrorhyza  
                   Triretilobata #EB

6060-6190f: *Subtilisphaera perlucida* Zone: *Pilosisporites trichopapillosa* Subzone (early Aptian)

- [illegible]

- |            |   |
|------------|---|
| 6160-6190f | <u>Cicatricosisporites exilioides Singh '71</u> |
| ,          | <u>Impardecispora apigranulosa</u>              |
|            | <u>Oligosphaeridium dividuum</u>                |

6260-6890f: Subtilisphaera perlucida Zone: Cyclonephelium  
attadalicum Subzone (early Aptian)

- 6260-6290f      Aptea anaphrissa (?Reworked)  
                  Cyclonephelium attadalicum cf. (+)  
                  Oligosphaeridium albertense

6360-6390f Cicatricosisporites #EAL

Comment: Possible Barremian at 6460 as indicated by S.terrula and Taeniophora #EA.

6460-6490f Subtilisphaera terrula  
Taeniophora #EA

6560-6590f Parvisaccites amplus (Abundant)

6660-6690f \*Kleithriasphaeridium eoinodes  
Pareodinia ceratophora

Comment: Possible Hauterivian at 6760f as indicated by Occisucysta sp. A.

6760-6790f Callialasporites trilobatus (+)  
Occisucysta sp. A, Williams 1975  
(?Reworked)  
Podocarpidites granulosus

6960-7390f: Apteia anaphrissa Zone (Barremian)

6960-6990f Callialasporites turbatus (+)  
Coronatispora valdensis  
Cyclonephelium attadalicum (Common)  
Muderongia imparilis  
(Questionably present)  
Pseudoceratium pelliiferum (+)

7060-7090f

Aegitriradites #ER  
Cicatricosisporites nankingensis  
Corollina itunensis  
Costatoperforosporites #EB  
Cribroperidinium borealis (Common)  
Muderongia simplex (+)  
Subtilisphaera pirnaensis (Abundant)  
Subtilisphaera terrula (+)  
Trichodinium speetonense

7160-7190f

Aegitriradites verrucosus  
Cometodinium #EA  
Hystriodinium furcatum  
Subtilisphaera #EA

7260-7290f

Couperisporites major  
Kleithriasphaeridium fasciatum  
Muderongia simplex (Abundant)  
Muderongia simplex microperforata (Common)  
Parvisaccites #EA  
Pilosporites verus  
Subtilisphaera perlucida

7360-7390f

Ephedripites proceras  
Oligosphaeridium macrotubulum (+)  
Pilosporites ericus  
Pseudoceratium #EB

7460-8390f: Ctenidodinium elegantulum Zone (Hauterivian)

7460-7490f

Cicatricosisporites angicanalis  
(Questionably present)  
Systematophora turonica (+)



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7560-7590f

Aequitriradites baculatus  
Callialasporites monoalaeus  
Chasmatosporites major  
Gardodinium eisenackii  
Stiphrosphaeridium dictyophorum  
Triretilobata trioreticulosa

7660-7690f

Kleithriasphaeridium eoinodes (+)  
Striatella #EF (+)  
Surculosphaeridium sp. III (+)

7760-7790f

Cicatricosporites undatus  
Pilosporites semicapillosus  
Taeniophora #EA !!!double!!

7860-7890f

Cicatricosporites #EAG  
Cicatricosporites striatus  
Pseudoceratium pelliiferum (Common)

7960-7990f

Cicatricosporites sternum

8060-8090f

Cicatricosporites #EL  
Psilatriletes #EB

8160-8190f

Imbatodinium micropodium  
Muderongia sp. A  
Pseudoceratium nudum

8260-8290f

Occisucysta distincta



Polystephanephorus sarjeantii  
Systematophora complicata

8960-8990f

Ctenidodinium elegantulum  
Cymososphaeridium validum  
Lanterna sportula

9160-9190f

Cicatricosisporites reticicatricosus  
Hystriodinium lanceatum (+)  
Muderongia californica (+)

9360-9390f

Cicatricosisporites #EO  
Contignisporites cooksoniae  
Ctenidodinium schizoblatum (?Reworked)  
Stiphrosphaeridium arbustum (+)  
Tuberositriletes montuosus (+)

9460-9490f

Oligosphaeridium djenn

9560-9590f

Cribroperidinium #EZ (?Reworked)  
Leptodinium aceras (?Reworked)

9760-9790f

Concavissimisporites multituberculatus (+)  
Endoscrinium pharo (+)

9860-9890f

Callialasporites infrapunctatus

9960-9990f

Lanterna bulgarica  
Pityosporites dividiuus (+) (Common)

10060-10090f      Alisporites thomasii (+)  
                    Cleistosphaeridium ehrenbergii (+)  
                    Cribroperidinium granuligerum (+)

10160-10190f      Callialasporites trilobatus cf.  
                    Cedripites #EA

10260-10290f      Cicatricosisporites magnus

Comment: Possible Portlandian at 10360f as indicated by common  
Alisporites thomasii

10360-10390f      Contignisporites dorsostriatus  
                    Phoberocysta neocomica cruciformis

10660-10690f      Amphorula metaelliptica (+)  
                    Gonyaulacysta diutina (+)

10760-13230f: Hystrichogonyaulax cladophora Zone (Kimmerid-  
gian)

10760-10790f      Aequitriradites subverrucosus  
                    Pityosporites dividius (+) (Common)  
                    Senoniasphaera jurassica (+)

10860-10890f      Alisporites #EG (+)  
                    Breodoxiella #EB  
                    Imbatodinium kondratjevii (+)  
                    Subtilisphaera paeminosa (+)

Comment: Probable early Kimmeridgian at 10960f.

- 10960-10990f Breodoxiella #ER (+)  
Corollina chateaunovii (+)  
Perisseiasphaeridium pannosum  
Saxosporis #EB  
Trilobosporites tuberculiformis  
Tuberositriletes grossetuberculatus  
Tuberositriletes major
- 11060-11090f Meiourogonyaaulax deflandrei  
Occisucysta halios  
Oligosphaeridium pulcherrimum cf.  
Podocarpidites #ED
- 11160-11190f Pilosisorites sp. A (+)  
Varirugosisorites #EK
- 11260-11290f Cribroperidinium globatum  
Ctenidodinium chondrum  
(Questionably present)  
Systematophora fasciculigera
- 11360-11390f Amphorula #EA (Questionably present)  
Cicatricosisporites angicanalis  
Corollina vignollensis
- 11560-11590f Amphorula #EA
- 11660-11690f Clavitriletes spp.  
Ctenidodinium chondrum  
(Questionably present)  
Ctenidodinium schizoblatum  
Saxosporis variabilis (+)

- 11760-11790f Ctenidodinium culmulum
- 11860-11890f Escharisphaeridia porockii  
Meiourogonyaulax callomonii (+)
- 12060-12090f Cicatricosporites notabilis  
Exesipollenites scabratus
- 12260-12290f Varirugosisporites granituberosus
- 12360-12390f Kraeuselisporites #EA  
Systematophora #EA (+)  
Tuberositriletes minutus
- Comment: Possible late Oxfordian at 12460f as indicated by Vastisporites vastiformis
- 12460-12490f Pilosporites sp. A (Common)  
Subtilisphaera inaffecta  
Vastisporites vastiformis
- 12570-12600f Callialasporites obrutus
- 12660-12690f Ctenidodinium #ER  
Meiourogonyaulax dicrypta (+)  
Meiourogonyaulax valensii (+)  
Occisucysta aculeata  
Pareodinia sp. C
- 12750-12780f Ctenidodinium pachydermum (+)  
Senoniasphaera jurassica (Common)

- 12930-12960f Leptodinium hyalodermopsis
- 13110-13140f Adnatosphaeridium caulleryi (+)  
Hystrichogonyaulax cladophora (+)
- 13200-13230f Breodoxiella #EA  
Ctenidodinium rotundatum  
Occisucysta aculeata (Common)
- 13280-13311f: Probable Hystrichosphaerina orbifera Zone (Callovian)
- 13280-13310f Hystrichosphaerina orbifera (+)  
Meiourogonyaulax deflandrei (Common)
- 13303-13303.3f (Core) Amphorula metaelliptica  
Epiplosphaera reticulospinosa  
Lanterna bulgarica (Common)  
Systematophora #EA
- 13305-13305.3f (Core) Amphorula metaelliptica  
Lanterna bulgarica  
Perisseiasphaeridium pannosum  
Systematophora #EA (Common)  
Systematophora fasciculigera (Common)
- 13308.1-13308.3f (Core) Perisseiasphaeridium pannosum
- 13311-13311.4f (Core) Adnatosphaeridium caulleryi  
Amphorula metaelliptica (Common)  
Escharisphaeridia rudis  
Hystrichosphaerina orbifera





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

## Taxa location index

Index numbers are the columns in which the taxon appears

Index number	Taxon names	Index number	Taxon names
130	Achomospaera neptunii	220	Ctenidodinium pachydermum
222	Adnatosphaeridium caulleryi	225	Ctenidodinium rotundatum
65	Alterbia minor	170	Ctenidodinium schizoblatum
204	Amphorula #EA	229	Ctenidodinium sellwoodii
106	Amphorula metaelliptica	205	Ctenidodinium sp. indet.
211	Amphorula sp. indet.	117	Cyclonephelium attadalicum
1	Apectodinium homomorphum	109	Cyclonephelium attadalicum cf.
108	Aptea anaphrissa	50	Cyclonephelium brevispinum
91	Aptea polymorpha	50	Cyclonephelium distinctum
90	Apteodinium granulatum	174	Cyclonephelium distinctum brevispinum
22	Areoligera senonensis	87	Cyclonephelium eisenackii
2	Areosphaeridium arcuatum (small form)	15	Cyclonephelium sp. A, Will. & Brid. 1975
81	Astrocysta #EA	59	Cyclonephelium vannophorum
66	Astrocysta cretacea	165	Cymosphaeridium validum
224	Breodoxiella #EA	148	Dapsilidinium chems
192	Breodoxiella #EB	4	Dapsilidinium pastelsii
195	Breodoxiella #ER	24	Dapsilidinium simplex
92	Caddasphaera halosa	155	Dapsilidinium warrenii
111	Callaerosphaeridium asymmetricum	34	Deflandrea heterophlycta
179	Canningia reticulata	5	Deflandrea phosphoritica
154	Cassiculosphaeridia magna	130	Dingodinium cerviculum
32	Ceratiopsis diebelii	230	Dinopteridium absidatum
33	Ceratiopsis pannucea	29	Dinopteridium cladoides
95	Chichacuadanium davidii	35	Distatodinium ellipticum
79	Chichacuadanium vestitum	159	Endoceratium dettmanniae
69	Chlamydothorella nyei	180	Endoscrinium pharo
85	Cleistosphaeridium aciculare	16	Eocladopyxis periculatum
180	Cleistosphaeridium ehrenbergii	67	Epelidosphaeridia spinosa
56	Cleistosphaeridium huguonotii	227	Epiplosphaera reticulospinosa
123	Cometodinium #EA	200	Escharisphaeridia pocockii
212	Cometodinium sp. indet.	228	Escharisphaeridia rudis
20	Cordosphaeridium cantharellum	60	Exochosphaeridium striolatum
23	Cordosphaeridium gracile	70	Florantinia cooksoniae
21	Cordosphaeridium inodos inodos	133	Gardodinium eisenackii
86	Coronifera oceanica	25	Glaphyrocysta intricata (small form)
100	Cribroperidinium #EX	6	Glaphyrocysta semitecta
177	Cribroperidinium #EZ	205	Gochteodinia villosa cf.
120	Cribroperidinium borealis	231	Gonglyodinium hooneratum
77	Cribroperidinium edwardsii	189	Gonyaulacysta diutina
57	Cribroperidinium episomum	160	Gonyaulacysta kostromiensis
3	Cribroperidinium giuseppii	17	Heteraulacysta campanula
201	Cribroperidinium globatum	27	Heteraulacysta leptalea
184	Cribroperidinium granulosum	26	Heteraulacysta porosa
93	Cribroperidinium orthoceras	36	Homotryblum pallidum
144	Cribroperidinium sepiamentum	124	Hystrichodinium furcatum
172	Cribroperidinium sp. indet.	167	Hystrichodinium lanceatum
215	Ctenidodinium #ER	135	Hystrichodinium pulchrum
202	Ctenidodinium chondrum	223	Hystrichogonyaulax cladophora
207	Ctenidodinium culmulum	7	Hystrichokelpoma rigaudiae
164	Ctenidodinium elegantulum	61	Hystrichosphaeridium stellatum

## APPENDIX A Cont'd

Alphabetical Listing of Species Shown on Occurrence Chart:Marine Dinoflagellates

Taxa location index

Index numbers are the columns in which the taxa appears

Index number	Taxon names	Index number	Taxon names
226	Hystriochosphaerina ochrifera	52	Odontochitina operculata
193	Imbatodinium fendratjevi	110	Oligosphaeridium albertense
140	Imbatodinium micropodum	96	Oligosphaeridium asterigerum
46	Isabelidinium #LB	40	Oligosphaeridium complex
38	Isabelidinium belfastense	156	Oligosphaeridium diluculum
39	Isabelidinium cooksoniae	106	Oligosphaeridium divinum
51	Isabelidinium cretaceum	176	Oligosphaeridium djenn
139	Kalypteia glabra	147	Oligosphaeridium helilongjainense
62	Kiopsanum polypes	100	Oligosphaeridium macrotubulum
18	Kisselevia coleothrypta	103	Oligosphaeridium perforatum colum
145	Kleithriasphaeridium corrugatum	98	Oligosphaeridium perforatum perforatum
136	Kleithriasphaeridium eoinodes	73	Oligosphaeridium pulcherrimum
127	Kleithriasphaeridium fasciatum	197	Oligosphaeridium pulcherrimum cf.
187	Lanterna bulgarica	152	Oligosphaeridium reniforme
106	Lanterna sportula	74	Oligosphaeridium totum minor
8	Lentinia serrata	75	Oligosphaeridium totum totum
178	Leptodinium aceras	63	Oodnadattia tuberculata
234	Leptodinium amabile	47	Palaeocystodinium australium
221	Leptodinium hyalodermopsis	53	Palaeohystriochophora infusorioides
200	Leptodinium sp. indet.	45	Palaeoperidinium pyrophorum
30	Lingulodinium machaerophorum	62	Palaeostomocysta fragilis
146	Luxadinium #Ehuge	115	Pareodinia ceratophora
102	Luxadinium primum	219	Pareodinia sp. C
71	Luxadinium propatulum	41	Pentadinium laticinctum granulatam
209	Meiourogoniaulax callomonii	10	Pentadinium laticinctum laticinctum
197	Meiourogoniaulax deflandrii	196	Perisselasphaeridium pannosum
216	Meiourogoniaulax dicrypta	190	Perisselasphaeridium sp. indet.
185	Meiourogoniaulax sp. indet.	48	Phelodinium magnificum
151	Meiourogoniaulax stoveri	188	Phoberocysta neocomica cruciformis
217	Meiourogoniaulax valensii	150	Phoberocysta neocomica neocomica
9	Membranophoridium aspinatum	42	Phthanoperidinium comatum
44	Membranophoridium sp. Wilson 1971	31	Phthanoperidinium geminatum
187	Mendicodinium groenlandicum	28	Phthanoperidinium levimurum
94	Muderongia asymmetrica	162	Polystephanophorus sarjeantii
168	Muderongia californica	76	Protoellipsodinium spinosum
118	Muderongia imparilis	131	Pseudoceratium #EB
121	Muderongia simplex	157	Pseudoceratium gochti
128	Muderongia simplex microperforata	142	Pseudoceratium nudum
141	Muderongia sp. A	119	Pseudoceratium pelliiferum
206	Muderongia sp. indet.	181	Pterospermella helios
104	Muderongia staurata	99	Scortea tecta
169	Muderongia tetracantha	191	Senoniasphaera jurassica
72	Nyktericysta arachnion	80	Senoniasphaera microreticulata
210	Occisucysta aculeata	158	Sentusidinium cuculliforme
198	Occisucysta balios	232	Sentusidinium erythrocum
143	Occisucysta distincta	149	Sentusidinium filiatum
161	Occisucysta evittii	79	Silicisphaera sp. indet.
116	Occisucysta sp. A, Williams 1975	125	Spiniferites dentatus
175	Occisucysta spp.	37	Spiniferites pseudofurcatus
55	Odontochitina costata	11	Spiniferites ramosus

APPENDIX A Cont'd

Alphabetical Listing of Species Shown on Occurrence Chart:  
Marine Dinoflagellates

Taxa location index  
 Index numbers are the columns in which the taxon appears

Index number	Taxon names
47	Spongodinium delitense
88	Spongodinium solidum
107	Spongodinium sp. indet.
89	Stephanodinium coronatum
82	Stiphrasphaeridium anthophorum
171	Stiphrasphaeridium arbustum
104	Stiphrasphaeridium dictyophorum
112	Stiphrasphaeridium sp. indet.
106	Subtilisphaera BEA
114	Subtilisphaera inaffecta
104	Subtilisphaera paucinos
129	Subtilisphaera perlucida
105	Subtilisphaera pirnaensis
101	Subtilisphaera pirnaensis (kalyptra)
113	Subtilisphaera terrula
54	Surculosphaeridium longifurcatum
127	Surculosphaeridium sp. III
213	Systematophora IIIA
12	Systematophora ameyrea
163	Systematophora complicata
203	Systematophora fasciculigera
19	Systematophora placacantha
210	Systematophora sp. indet.
132	Systematophora turenica
114	Taeniophora BEA
83	Tarsoesphaeridium socialamus
13	Tetradinium pellitum
172	Tenua hystrix
11	Thalassophora pelagica
27	Trichodinium castaneum
122	Trichodinium speetonense
233	Tubuloborella egemenii
43	Wetzeliella ovalis
64	Xenacoccus corallioides
84	Xiphophoridium alatum

## APPENDIX A (cont'd)

Alphabetical Listing of Species Shown on Occurrence Chart:Pollen and Spores

Taxa location index

Index numbers are the columns in which the taxon appears

Index number	Taxon names	Index number	Taxon names
70	Abiespollenites macroreticulatus	79	Cicatricosisporites augustus
74	Acanthotriletes varicospinosus	40	Cicatricosisporites cocononiensis
154	Aequitriradites baculatus	59	Cicatricosisporites crassiterminatus
112	Aequitriradites conosimilis	60	Cicatricosisporites dricatus
32	Aequitriradites spinulosus	130	Cicatricosisporites exilioides Singh '71
134	Aequitriradites subverrucosus	41	Cicatricosisporites hughesia
146	Aequitriradites verrucosus	190	Cicatricosisporites magnus
141	Aequitriradites #LR	62	Cicatricosisporites minor
91	Afropollis jadinus	22	Cicatricosisporites mohrioides
33	Ajatispollis sp.A	142	Cicatricosisporites nantiquensis
196	Alisporites #EG	211	Cicatricosisporites notabilis
11	Alisporites bilateralis	70	Cicatricosisporites potomacensis
25	Alisporites grandis	175	Cicatricosisporites purbeckensis
187	Alisporites thomasi	131	Cicatricosisporites purbeckensis cf.
40	Aratrisporites monosarcus	177	Cicatricosisporites reticicatricosus
26	Aratrisporites ocellatus	14	Cicatricosisporites sp. indet.
49	Araucariacites australis	136	Cicatricosisporites sp. indet.
150	Araucariacites punctatus	165	Cicatricosisporites sternum
120	Baculatisporites comamensis	164	Cicatricosisporites striatus
39	Balmeisporites holodictylus	77	Cicatricosisporites subrotundus
50	Biretisporites potoniae	161	Cicatricosisporites undatus
160	Callialasporites dampieri	61	Cicatricosisporites venustus
185	Callialasporites infrapunctatus	207	Clavitriletes sp. indet.
155	Callialasporites monoleporus	109	Concavissimisporites minor
221	Callialasporites obrutus	104	Concavissimisporites multituberculatus
135	Callialasporites trilobatus	100	Concavissimisporites punctatus
138	Callialasporites trilobatus cf.	159	Concavissimisporites variverrucatus
138	Callialasporites turbatus	127	Concavissimisporites verrucatus
51	Camareconosporites insignis	181	Contignisporites cooksoniae
27	Campania #EA	191	Contignisporites dorsostratus
8	Caryapollenites simplex	62	Coptospora williamsii
189	Cedripites #EA	190	Corollina chateauxvii
57	Cedripites canadensis	140	Corollina itunensis
52	Cerebropollenites #CC	34	Corollina torosa
172	Cerebropollenites macroverrucosus	206	Corollina vignollensis
58	Cerebropollenites mesocricus	224	Coronatispora sp. indet.
156	Chasmatosporites major	139	Coronatispora valdensis
60	Cicatricosisporites #EAC	1	Corylus #LA
225	Cicatricosisporites #EAF	144	Costatoperforosporites #EB
163	Cicatricosisporites #EAL	195	Costatoperforosporites #EF
97	Cicatricosisporites #EAL	110	Costatoperforosporites #ET
103	Cicatricosisporites #EAL	147	Couperisporites major
123	Cicatricosisporites #EAL cf.	220	Cribreripidium sp. F
91	Cicatricosisporites #ECD	35	Cupuliferopollenites minutus
166	Cicatricosisporites #EL	13	Cyathidites australis
180	Cicatricosisporites #LO	15	Cyathidites minor
209	Cicatricosisporites abacus	2	Cyathidites sp. indet.
152	Cicatricosisporites angicanalis	20	Deltoidospora hallii
98	Cicatricosisporites annulatus	134	Denseisporites microrugulatus
99	Cicatricosisporites apicanalis	53	Denseisporites perinatus

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

Taxa location index

Index numbers are the columns in which the taxon appears

Index number	Taxon names	Index number	Taxon names
64	Densosporites triradiatus	104	Parvisaccites amplus cf.
153	Densosporites velatus	42	Parvisaccites radiatus
85	Distaltricolpites irregularis	71	Penetetrapites mollis
150	Ephedripites procerus	60	Perinopollenites elatoides
82	Eucornidites minor	135	Perotrilletes striatus
212	Exesipollenites scabratus	35	Phyllocladites #EA
192	Exesipollenites tumulus	43	Phyllocladites inchoatus
115	Foraminisporis asymetrica	66	Phyllocladites rugulatus
63	Foraminisporis wenthaggonensis	4	Piceapollenites sp. indet.
176	Foveosporites foveoreticulatus	129	Pilososporites crassangularis
18	Foveotrilletes subtriangularis	151	Pilososporites ericus
120	Gleicheniidites distalgranulatus	162	Pilososporites semicapillosus
117	Gleicheniidites minor	204	Pilososporites sp. A
21	Gleicheniidites senecius	110	Pilososporites trichopapillosus
132	Impardecispora apigranulosa	149	Pilososporites verus
83	Impardecispora ap. verrucata	5	Pinuspollenites sp. indet.
106	Impardecispora crispaeformis	179	Pityosporites #EA
86	Impardecispora pseudogibberula	100	Pityosporites dividiuus
119	Impardecispora sp. indet.	56	Plicatella baconensis
111	Impardecispora texensis	27	Plicatella bifurcata
169	Interlobites triangularis	72	Plicatella bilateralis
70	Ischyosporites amebellus	124	Plicatella erimensis
101	Ischyosporites disjunctus	23	Plicatella cristata
113	Ischyosporites estherae	125	Plicatella macrorhyza
105	Klukisporites foveolatus	36	Plicatella matesovae
178	Klukisporites pseudoreticulatus	37	Plicatella problematica
197	Klukisporites variegatus	114	Plicatella pseudomacrorhyza
216	Kraeuselisporites #EA	16	Plicatella sp. indet.
3	Laevigatosporites ovatus	107	Plicatella tricornitata
210	Laricoidites magnus	203	Podocarpidites #ED
145	Leiotrilletes equisetinus	67	Podocarpidites canadensis
87	Leiotrilletes mecklenburgensis	73	Podocarpidites epistriatus
183	Leptolepidites epicornatus	157	Podocarpidites granulatus
88	Liliadites peroreticulatus	173	Podocarpidites herbstii
22	Liliadites dividiuus	44	Podocarpidites potomacensis
93	Lycopodiadites asperatus	171	Podocarpidites tricolca
54	Lycopodiumsporites circolumenus	167	Psilatriletes #EB
140	Lycopodiumsporites marginatus	6	Quercoidites #LA
226	Matonisporites phlebopteroides	20	Retitricolpites georgensis
65	Monosulcites scabratus	31	Retitricolpites vulgaris
75	Nodosisporites #EC	170	Rotverrusporites obscurilaeuratus
112	Nodosisporites babsae	193	Rotverrusporites sp. indet.
94	Nodosisporites dentimarginatus	81	Rouseisporites eustirchensoides
118	Nodosisporites gemina	45	Rouseisporites radiatus
102	Nodosisporites undosus	17	Rouseisporites reticulatus
89	Ornamentifera baculata	38	Rouseisporites singularis
9	Osmundacidites claytonites	76	Rugubivesiculites minimus
19	Osmundacidites wellmannii	24	Rugubivesiculites reductus
148	Parvisaccites #EA	12	Rugubivesiculites rugosus
103	Parvisaccites amplus	199	Saxosporis #EB

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

## Taxa location index

Index numbers are the columns in which the taxon appears

Index number	Taxon names
217	Saxosporis sp. indet.
200	Saxosporis variabilis
213	Scortea sp. indet.
174	Striatella #CA
160	Striatella #EF
222	Taurocusporites reduncus
7	Taxodiaceapollenites hiatus
96	Tigridsporites scurrundus
10	Tiliaepollenites vespites
46	Tricolpopollenites micromunus
90	Trilobosporites humilis
100	Trilobosporites perversulentus
200	Trilobosporites tuberculiiformis
126	Triretilobata #EF
121	Triretilobata marylandensis
157	Triretilobata trioreticulosa
227	tuberositriletes #EF
201	Tuberositriletes grossetuberculatus
202	Tuberositriletes major
210	Tuberositriletes minutus
102	Tuberositriletes montuosus
214	Tuberositriletes sp. indet.
205	Varirugosisporites #EF
215	Varirugosisporites granituberosus
212	Varirugosisporites spp.
220	Vastisporites vastiformis
47	Vitreisporites pallidus

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

## Taxa location index

Index numbers are the columns in which the taxon appears

Index number	Taxon names
2	Concentricystes minor
2	Foraminiferal liners
4	Leontiaella dictyotum
7	Microhystridium fragile
2	Microthallites sp. indet.
1	Paraleptanella indentata
8	Pluricellaesporites sp. indet.
6	Schizosporis parvus
5	Schizosporis reticulatus

Reworked Palynomorphs

## Taxa location index

Index numbers are the columns in which the taxon appears

Index number	Taxon names
1	*Chatangiella spp.
2	*Isabelidium belfastense
3	*Kleithriasphaeridium ecinodes
4	*Murospora spp.

APPENDIX BExamined Samples: Penobscot L-30

1100.00 : cuttings	5550.00 : cuttings	10360.00 : cuttings
1120.00 : cuttings	5660.00 : cuttings	10460.00 : cuttings
1380.00 : cuttings	5760.00 : cuttings	10560.00 : cuttings
1470.00 : cuttings	5860.00 : cuttings	10660.00 : cuttings
1560.00 : cuttings	5960.00 : cuttings	10760.00 : cuttings
1650.00 : cuttings	6060.00 : cuttings	10860.00 : cuttings
1740.00 : cuttings	6160.00 : cuttings	10960.00 : cuttings
1830.00 : cuttings	6260.00 : cuttings	11060.00 : cuttings
1920.00 : cuttings	6360.00 : cuttings	11160.00 : cuttings
2010.00 : cuttings	6460.00 : cuttings	11260.00 : cuttings
2100.00 : cuttings	6560.00 : cuttings	11360.00 : cuttings
2190.00 : cuttings	6660.00 : cuttings	11460.00 : cuttings
2280.00 : cuttings	6760.00 : cuttings	11560.00 : cuttings
2370.00 : cuttings	6860.00 : cuttings	11660.00 : cuttings
2460.00 : cuttings	6960.00 : cuttings	11760.00 : cuttings
2550.00 : cuttings	7060.00 : cuttings	11860.00 : cuttings
2640.00 : cuttings	7160.00 : cuttings	11960.00 : cuttings
2730.00 : cuttings	7260.00 : cuttings	12060.00 : cuttings
2820.00 : cuttings	7360.00 : cuttings	12160.00 : cuttings
2910.00 : cuttings	7460.00 : cuttings	12260.00 : cuttings
3000.00 : cuttings	7560.00 : cuttings	12360.00 : cuttings
3090.00 : cuttings	7660.00 : cuttings	12460.00 : cuttings
3180.00 : cuttings	7760.00 : cuttings	12570.00 : cuttings
3270.00 : cuttings	7860.00 : cuttings	12660.00 : cuttings
3360.00 : cuttings	7960.00 : cuttings	12750.00 : cuttings
3450.00 : cuttings	8060.00 : cuttings	12840.00 : cuttings
3540.00 : cuttings	8160.00 : cuttings	12930.00 : cuttings
3630.00 : cuttings	8260.00 : cuttings	13020.00 : cuttings
3720.00 : cuttings	8360.00 : cuttings	13110.00 : cuttings
3810.00 : cuttings	8460.00 : cuttings	13200.00 : cuttings
3900.00 : cuttings	8560.00 : cuttings	13280.00 : cuttings
3990.00 : cuttings	8660.00 : cuttings	13303.00 : core
4080.00 : cuttings	8760.00 : cuttings	13305.00 : core
4170.00 : cuttings	8860.00 : cuttings	13308.00 : core
4260.00 : cuttings	8960.00 : cuttings	13311.00 : core
4350.00 : cuttings	9060.00 : cuttings	13312.00 : core
4440.00 : cuttings	9160.00 : cuttings	13313.70 : core
4530.00 : cuttings	9260.00 : cuttings	13390.00 : cuttings
4620.00 : cuttings	9360.00 : cuttings	13470.00 : cuttings
4710.00 : cuttings	9460.00 : cuttings	13560.00 : cuttings
4800.00 : cuttings	9560.00 : cuttings	13650.00 : cuttings
4890.00 : cuttings	9660.00 : cuttings	13740.00 : cuttings
4980.00 : cuttings	9760.00 : cuttings	13830.00 : cuttings
5080.00 : cuttings	9860.00 : cuttings	13920.00 : cuttings
5160.00 : cuttings	9960.00 : cuttings	14000.00 : cuttings
5250.00 : cuttings	10060.00 : cuttings	
5350.00 : cuttings	10160.00 : cuttings	
5450.00 : cuttings	10260.00 : cuttings	