

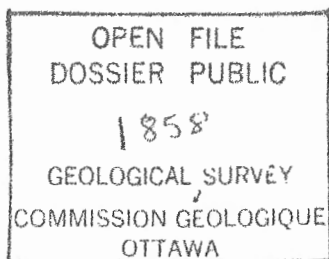
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PALYNOLOGICAL ANALYSIS OF THE  
INTERVAL 440-3950M,  
BONNET P-23, SCOTIAN SHELF

REPORT NO. 86-0066  
February, 1988

CALGARY, ALBERTA



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- |             |  |
|-------------|--|
| 440- 450m:  | probable <u>Cannosphaeropsis</u> sp. A Zone (probable late Miocene)      |
| 470- 630m:  | <u>Cannosphaeropsis</u> sp. A Zone (late Miocene)                        |
| 650- 875m:  | <u>Pentadinium laticinctum</u> Zone (middle Miocene)                     |
| 890-1560m:  | <u>Apteodinium</u> sp. B Zone (early Miocene)                            |
| 1580-1620m: | possible <u>Deflandrea heterophlycta</u> Zone (possible early Oligocene) |
| 1640-1680m: | <u>Deflandrea heterophlycta</u> Zone (early Oligocene)                   |
| 1700-1740m: | <u>Diphyes colligerum</u> Zone (late Eocene)                             |
| 1760-1770m: | <u>Adnatosphaeridium reticulense</u> Zone (middle Eocene)                |
| 1820-1830m: | Zone not assigned (Aptian to Cenomanian)                                 |
| 1850-1980m: | <u>Tenua anaphrissa</u> Zone (Barremian)                                 |
| 2000-2040m: | <u>Ctenidodinium elegantulum</u> Zone (Hauterivian)                      |
| 2060-2190m: | <u>Phoberocysta neocomica</u> Zone (Berriasian to Valanginian)           |

- 2210-2310m: Ctenidodinium panneum Zone (Portlandian)
- 2330-2910m: Gonyaulacysta cladophora Zone (Kimmeridgian)
- 3190-3200m: Ctenidodinium chondrum Zone (early Kimmeridgian)
- 3220-3230m: Systematophora orbifera Zone (early Oxfordian)
- 3250-3730m: Ctenidodinium combazii Zone (late Bathonian to  
early Oxfordian)
- 3750-3950m: Dapcodinium semitabulatum Zone to Nannoceratopsis  
gracilis Zone (Aalenian to Bajocian)

SELECTED PALYNOMORPHS

Listings show highest occurrences unless otherwise specified.

(+) indicates marker species.

440-450m: probable Cannosphaeropsis sp. A Zone (probable late Miocene)

440-450m      Caryapollenites simplex  
Ericipites antecursorioides  
Operculodinium centrocarpum  
Pterocaryapollenites stellatus  
Quercoidites #LA  
Tsugaepollenites igniculus

470-630m: Cannosphaeropsis sp. A Zone (Late Miocene)

470-480m      Ilexpollenites margaritus  
Spiniferites ramosus  
Systematophora ancyrea (+)  
Tiliaepollenites vescipites  
(possible reworked)

500-510m      Ericipites compactipolleniatus  
Impagidinium cornutum (+)  
Lingulodinium machaerophorum  
Reticulatosphaera actinocoronata  
Tectatodinium pellitum  
Tuberculodinium rossignoliae

530-540m      Dapsilidinium pastielsii (+)

Nematosphaeropsis lemniscata  
Spiniferites hexatypicus

590-600m      Melitasphaeridium choanophorum (+)  
Paralecaniella indentata

650-875m: Pentadinium laticinctum Zone (middle Miocene)

650-660m      Hystriosphæridium parvum (+)  
Hystriosphæropsis obscura (+)

680-690m      Cicatricosisporites davlesii

710-720m      Lycopodiumsporites annotinioides

890-1560m: Apteodinium sp. B Zone (early Miocene)

890-900m      Thalassiphora delicata (+)  
Thalassiphora reticulata

950-960m      Nematosphaeropsis labyrinthea

980-990m      Hemicystodinium #LA

1010-1020m      Batiacasphærea scrobiculata

1100-1110m      Palaeocystodinium golzowense (+)



Palaeocystodinium sp., Costa & Downie 79

1610-1620m      Hystriehokolpoma cinctum (+)

1640-1680m: Deflandrea heterophlycta Zone (early Oligocene)

1640-1650m      Chiropteridium mespilanum  
Hystriehokolpoma salacium (+)

1670-1680m      Cordosphaeridium cantharellum  
Cyclonephelium sp. A, Will. & Brid. 1975 (+)  
Deflandrea phosphoritica  
Glaphyrocysta texta (+)  
Gochtodinium simplex (+)  
Kisselovia coleothrypta (+)  
Lentinia serrata (+)  
Membranophoridium aspinatum

1700-1740m: Diphys colligerum Zone (late Eocene)

1700-1710m      Apectodinium homomorphum (possibly reworked)  
Deflandrea heterophlycta  
Glaphyrocysta semitecta (+)  
Gochtodinium spinulum  
Phthanoperidinium comatum  
Phthanoperidinium levimurum

1730-1740m      Areosphaeridium arcuatum (small form)  
Areosphaeridium multicornutum (small)  
Glaphyrocysta intricata (small form)  
Heteraulacacysta leptalea



- 1880-1890m      Astrocysta cretacea  
                 Cribroperidinium #EX  
                 Kleithriasphaeridium corrugatum
- 1910-1920m      Alisporites bilateralis  
                 Chichaouadinium vestitum (caved)  
                 Muderongia asymmetrica (Questionably present)  
                 Muderongia imparilis (+)  
                 (Questionably present)  
                 Oligosphaeridium dividuum (+) (Rare)  
                 Podocarpidites granulosus  
                 Rugubivesiculites minimus  
                 Spongodinium solidum
- 1940-1950m      Corrudinium #EA  
                 Platysaccus megasaccus

Comment: C. macroverrucosus is Valanginian or older in the Jeanne d'Arc Basin.

- 1970-1980m      Cassiculosphaeridia magna  
                 Cerebropollenites macroverrucosus (+)  
                 Cleistosphaeridium huquontonii (caved)  
                 Kleithriasphaeridium fastigiatum

2000-2040m: Ctenidodinium elegantulum Zone (Hauterivian)

Comment: This zone may extend as high as 1850m based on questionable C. elegantulum.

- 2000-2010m      Occisucysta distincta (+)  
                 Occisucysta sp.A, Bujak & Williams (+)

Perissaeisphaeridium spp.

Podocarpidites tricocca

2060-2190m: Phoberocysta neocomica Zone (Berriasian to Valanginian)

2060-2070m Achomosphaera neptunii (+)

Comment: A Tithonian age is indicated if the *C. culmulum* is accurately identified.

2120-2130m      Aptea anaphrissa  
                  Chorate dino sp. A  
                  Ctenidodinium culmulum (+)  
  (Questionably present)  
                  Heslertonia heslertonense  
  (Questionably present)  
                  Muderongia simplex (Common)  
                  Muderongia sp. A (+)  
                  Oligosphaeridium diluculum (+)  
                  Pityosporites #EA (+)  
                  Trilobosporites acornatus (+)

2150-2160m      Corollina vignollensis (+)  
                  Kleithriasphaeridium #EA (+)

2180-2190m      *Cribroperidinium granuligerum*

2210-2310m: *Ctenidodinium panneum* Zone (Portlandian)

2210-2220m      Alisporites thomasi (+)  
                  Breodoxiella #EB (+)



Lithodinia jurassica  
Subtilisphaera inaffecta (Present)

2510-2520m Subtilisphaera inaffecta (Common)

2540-2550m Escharisphaeridium rudis  
Occisucysta evittii

2810-2820m Systematophora fasciculigera

3190-3200m: Ctenidodinium chondrum Zone (early Kimmeridgian)

3190-3200m Ctenidodinium chondrum (+) (Common)  
Foraminisporis jurassica (+)  
Glomodinium tripartitum (+)  
Mendicodinium groenlandicum  
Sentusidinium cuculliforme (Present)

3220-3230m: Systematophora orbifera Zone (early Oxfordian)

3220-3230m Corollina #ED  
Ctenidodinium pachydermum (+) (Common)  
Ctenidodinium tenellum (+)  
Ellipsoidictyum cinctum (+)  
Exesipollenites scabratus (Common)  
Hystriosphera orbifera (+)

3250-3730m: Ctenidodinium combazii Zone (late Bathonian to early Oxfordian)

- 3250-3260m      Ctenidodinium sellwoodii (+)  
                 Diacanthum filapicatum (+)  
                 Tuberositriletes grossetuberculatus
- 3280-3290m      Ctenidodinium pachydermum (Common)
- 3310-3320m      extruded hydrocarbons (Common)
- 3370-3380m      Hystrihogonyaulax #EB  
                 Systematophora #EE
- 3400-3410m      Triangulopsis discoidalis
- 3430-3440m      Hystrihogonyaulax cladophora
- 3490-3500m      Diacanthum spp. (Common)
- 3520-3530m      Ctenidodinium continuum (Questionably present)
- 3550-3560m      Aldorfia aldorphensis (Present)  
                 Ctenidodinium #ESY (Present)
- 3720-3730m      Ctenidodinium ornatum (+) (Common)

3750-3950m: Dapcodinium semitabulatum Zone to Nannoceratopsis  
gracilis Zone (Aalenian to Bajocian)

3750-3760m      Dapcodinium semitabulatum  
                 Nannoceratopsis senex var.A

3840-3850m      Dingodinium #EA

Comment: Abundant cavings occurred throughout this well.

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

Index number	Taxon names		
28	Achomosphaera allicornu	10	Dapsilidinium pastielsii
111	Achomosphaera neptunii	64	Dapsilidinium simplex
4	Achomosphaera ramulifera	57	Deflandrea heterophlycta
29	Achomosphaera sagena	50	Deflandrea phosphoritica
71	Adnatosphaeridium multispinosum	157	Diacanthum filapicatum
165	Aldorfia aldorphensis	162	Diacanthum spp.
80	Alterbia spp.	171	Dingodinium #EA
151	Amphorula spp.	39	Dinopterygium cladoides
56	Apectodinium homomorphum	20	Diphyes latiusculum
114	Aptea anaphrissa	74	Distatodinium ellipticum
20	Apteodinium granulatum	41	Distatodinium paradoxum
72	Areoligera tauloma	154	Ellipsoidictyum cinctum
62	Areosphaeridium arcuatum (small form)	158	Escharisphaeridia spp.
73	Areosphaeridium fenestratum	141	Escharisphaeridium rudis
63	Areosphaeridium multicornutum (small)	65	Glaphyrocysta intricata (small form)
91	Astrocysta cretacea	58	Glaphyrocysta semitecta
20	Datiacaspharea scrobiculata	51	Glaphyrocysta texta
122	Breodoxiella #CB	147	Glomodinium tripartitum
145	Callaiosphaeridium asymmetrica	52	Gochtodinium simplex
130	Canningia minor	59	Gochtodinium spinulum
31	Cannosphaeropsis #LA	142	Gonyaulacysta spp.
103	Cassiculosphaeridia magna	21	Hafniasphaera septata
133	Chichaoquadinium davidii	19	Hemicystodinium #LA
96	Chichaoquadinium vestitum	117	Heslertonia heslertonense
46	Chiropteridium mespilanum	36	Heteraulacacysta campanula
104	Chlamydophorella nyei	66	Heteraulacacysta leptalea
115	Chorate dino sp. A	67	Heteraulacacysta porosa
105	Cleistosphaeridium huquntionii	32	Homotryblium floripes
48	Cordosphaeridium cantharellum	160	Hystrichogonyaulax #EB
43	Cordosphaeridium gracile	161	Hystrichogonyaulax cladophora
82	Coronifera oceanica	45	Hystrichokolpoma cinctum
102	Corrudinium #EA	35	Hystrichokolpoma rigaudiae
92	Cribroperidinium #EX	47	Hystrichokolpoma salacium
93	Cribroperidinium edwardsii	14	Hystrichosphaeridium parvum
40	Cribroperidinium giuseppei	155	Hystrichosphaerina orbifera
125	Cribroperidinium globatum	15	Hystrichosphaeropsis obscura
121	Cribroperidinium granuligerum	123	Imbatodinium sp.
166	Ctenidodinium #ESY	5	Impagidinium cornutum
149	Ctenidodinium chondrum	53	Kisselovia coleothrypta
116	Ctenidodinium culmulum	120	Kleithriasphaeridium #EA
83	Ctenidodinium elegantulum	106	Kleithriasphaeridium fastigiatum
152	Ctenidodinium pachydermum	132	Lanterna bulgarica
128	Ctenidodinium panneum	26	Lejeunecysta hyalina
156	Ctenidodinium sellwoodii	54	Lentinia serrata
113	Ctenidodinium spp.	75	Lentinia wetzelii
153	Ctenidodinium tenellum	6	Lingulodinium machaerophorum
143	Cyclonephelium attadalicum	138	Lithodinia jurassica
126	Cyclonephelium distinctum	168	Lithodinia sp.
49	Cyclonephelium sp. A, Will. & Brid. 1975	13	Melitasphaeridium choanophorum
97	Cyclonephelium spp.	55	Membranophoridium aspinatum
78	Cycloporella sp. A, Bujak & Williams	150	Mendicodinium groenlandicum
167	Dapcodinium semitabulatum	136	Muderongia #EA
		98	Muderongia asymmetrica
		99	Muderongia imparilis

Marine Dinoflagellates: cont'd

- |     |                                       |     |                              |
|-----|---------------------------------------|-----|------------------------------|
| 107 | Muderonqia simplex                    | 69  | Systematophora placacantha   |
| 118 | Muderonqia sp. A                      | 112 | Tanyosphaeridium isocalamum  |
| 33  | Multispinula quanta                   | 8   | Tectatodinium pellitum       |
| 169 | Nannoceratopsis senex var. A          | 16  | Thalassiphora delicata       |
| 18  | Nematosphaeropsis labyrinthea         | 70  | Thalassiphora pelagica       |
| 11  | Nematosphaeropsis lemniscata          | 17  | Thalassiphora reticulata     |
| 79  | Nummus #EA                            | 135 | Trichodinium spp.            |
| 129 | Nummus #EB                            | 9   | Tuberculodinium rossignoliae |
| 146 | Nummus spp.                           | 124 | Wallodinium spp.             |
| 108 | Occisucysta distincta                 | 25  | Xandarodinium #LA            |
| 140 | Occisucysta evittii                   | 27  | Xiphophoridium alatum        |
| 109 | Occisucysta sp. A, Bujak & Williams   |     |                              |
| 139 | Odontochitina costata                 |     |                              |
| 81  | Odontochitina operculata              |     |                              |
| 84  | Oligosphaeridium complex              |     |                              |
| 113 | Oligosphaeridium diluculum            |     |                              |
| 100 | Oligosphaeridium dividiuum            |     |                              |
| 85  | Oodnadattia tuberculata               |     |                              |
| 1   | Operculodinium centrocarpum           |     |                              |
| 22  | Palaeocystodinium golzowense          |     |                              |
| 44  | Palaeocystodinium sp., Costa & Downie |     |                              |
| 86  | Palaeohystrichophora infusorioides    |     |                              |
| 37  | Palaeoperidinium pyrophorum           |     |                              |
| 170 | Pareodinia ceratophora                |     |                              |
| 163 | Pareodinia sp. C                      |     |                              |
| 37  | Pentadinium laticinctum granulum      |     |                              |
| 42  | Pentadinium laticinctum laticinctum   |     |                              |
| 110 | Perissaeisphaeridium spp.             |     |                              |
| 60  | Phthanoperidinium comatum             |     |                              |
| 61  | Phthanoperidinium levimurum           |     |                              |
| 68  | Phthanoperidinium multispinosum       |     |                              |
| 76  | Polysphaeridium subtile               |     |                              |
| 7   | Reticulatosphaera actinocoronata      |     |                              |
| 77  | Rhombodinium draco                    |     |                              |
| 30  | Selenopemphix coronata                |     |                              |
| 34  | Selenopemphix nephroides              |     |                              |
| 131 | Senoniasphaera jurassica              |     |                              |
| 94  | Senoniasphaera protrusa               |     |                              |
| 148 | Sentusidinium cuculliforme            |     |                              |
| 164 | Sentusidinium erythrocomum            |     |                              |
| 95  | Sentusidinium spp.                    |     |                              |
| 88  | Silicisphaera ferox                   |     |                              |
| 89  | Silicisphaera spp.                    |     |                              |
| 12  | Spiniferites hexatypicus              |     |                              |
| 23  | Spiniferites pseudofurcatus           |     |                              |
| 2   | Spiniferites ramosus                  |     |                              |
| 101 | Spongodinium solidum                  |     |                              |
| 137 | Subtilisphaera inaffecta              |     |                              |
| 144 | Subtilisphaera paeminosa              |     |                              |
| 134 | Subtilisphaera terrula                |     |                              |
| 24  | Sumatradinium hispidum                |     |                              |
| 159 | Systematophora #EE                    |     |                              |
| 3   | Systematophora ancyrea                |     |                              |
| 127 | Systematophora fasciculigera          |     |                              |

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

Index number	Taxon names		
50	Alisporites #EG	42	Pityosporites #EA
22	Alisporites bilateralis	31	Platysaccus megasaccus
46	Alisporites thomasii	34	Podocarpidites epistriatus
1	Alnipollenites verus	29	Podocarpidites granulosus
23	Araucariacites australis	35	Podocarpidites potomacensis
48	Araucariacites punctatus	38	Podocarpidites tricoeca
2	Betulaceopollenites betuloides	25	Pseudoceratium pelliiferum
52	Caddosphaera halosa	10	Pterocaryapollenites stellatus
61	Callialasporites infrapunctatus	11	Quercoidites #LA
51	Callialasporites monoalasporus	30	Rugubivesiculites minimus
73	Callialasporites obrutus	40	Rugubivesiculites reductus
68	Callialasporites sp. indet.	10	Stereisporites antiquasporites
58	Callialasporites turbatus	21	Stereisporites clavus
49	Campania #EA	64	Taurocusporites reduncus
3	Caryapollenites simplex	15	Taxodiaceapollenites hiatus
56	Cedripites #EA	16	Tiliaepollenites vespites
27	Cedripites canadensis	53	Todisporites major
32	Cerebropollenites macroverrucosus	69	Triangulopsis discoidalis
36	Cerebropollenites mesozoicus	43	Trilobosporites aornatus
19	Cicatricosisporites daviesii	12	Taugaepollenites igniculus
67	Concavissimisporites spp.	66	Tuberositriletes grossetuberculatus
62	Corollina #ED	72	Uvaesporites subequatorialis
47	Corollina itunensis		
65	Corollina torosa		
44	Corollina vignollensis		
74	Coronatispora valdensis		
13	Corylus #LA		
70	Ctenidodinium continuum		
71	Ctenidodinium ornatum		
4	Cyathidites spp.		
41	Cyclonephelium distinctum brevispinum		
37	Deltoidospora hallii		
5	Ericipites antecursorioides		
17	Ericipites compactipolleniatus		
63	Exesipollenites scabratus		
54	Exesipollenites tumulus		
45	Exochosphaeridium scitulum cf.		
60	Foraminisporis jurassica		
33	Gleicheneiidites senonicus		
14	Ilexpollenites margaritus		
26	Kleithriasphaeridium corrugatum		
6	Laevigatosporites ovatus		
57	Laricoidites magnus		
59	Leiotriletes mecklenburgensis		
20	Lycopodiumsporites annotinioides		
53	Meiourogoniaulax deflandrei		
7	Osmundacidites claytonites		
24	Parvisaccites amplius		
28	Parvisaccites radiatus		
39	Perinopollenites elatoides		
8	Piceaepollenites spp.		
9	Pinuspollenites spp.		

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

Index number	Taxon names
4	extruded hydrocarbons
5	foraminiferal liners
3	Michrystidium fragile
2	Paralecaniella indentata
1	Pediastrum boryanum

Reworked Palynomorphs

Index number	Taxon names
2	*Isabelidium magnum
1	*Palaeohystrichophora infusorioides
3	*Surculosphaeridium longifurcatum

APPENDIX BExamined Samples: Bonnet P-23

440.00	: Cuttings	2090.00	: cuttings
470.00	: Cuttings	2120.00	: cuttings
500.00	: Cuttings	2150.00	: cuttings
530.00	: Cuttings	2180.00	: cuttings
560.00	: Cuttings	2210.00	: cuttings
590.00	: Cuttings	2240.00	: cuttings
620.00	: Cuttings	2270.00	: cuttings
650.00	: Cuttings	2300.00	: cuttings
680.00	: Cuttings	2330.00	: cuttings
710.00	: Cuttings	2363.00	: cuttings
740.00	: Cuttings	2390.00	: cuttings
770.00	: Cuttings	2420.00	: cuttings
800.00	: Cuttings	2450.00	: cuttings
830.00	: Cuttings	2480.00	: cuttings
865.00	: Cuttings	2510.00	: cuttings
890.00	: Cuttings	2540.00	: cuttings
920.00	: Cuttings	2570.00	: cuttings
950.00	: Cuttings	2600.00	: cuttings
980.00	: Cuttings	2630.00	: cuttings
1010.00	: Cuttings	2660.00	: cuttings
1040.00	: cuttings	2690.00	: cuttings
1070.00	: cuttings	2720.00	: cuttings
1100.00	: cuttings	2750.00	: cuttings
1130.00	: cuttings	2780.00	: cuttings
1160.00	: cuttings	2810.00	: cuttings
1190.00	: cuttings	2840.00	: cuttings
1220.00	: cuttings	2870.00	: cuttings
1250.00	: cuttings	2900.00	: cuttings
1280.00	: cuttings	3190.00	: cuttings
1310.00	: cuttings	3220.00	: cuttings
1345.00	: cuttings	3250.00	: cuttings
1370.00	: cuttings	3280.00	: cuttings
1400.00	: cuttings	3310.00	: cuttings
1430.00	: cuttings	3340.00	: cuttings
1460.00	: cuttings	3370.00	: cuttings
1490.00	: cuttings	3400.00	: cuttings
1520.00	: cuttings	3430.00	: cuttings
1550.00	: cuttings	3460.00	: cuttings
1580.00	: cuttings	3490.00	: cuttings
1610.00	: cuttings	3520.00	: cuttings
1640.00	: cuttings	3550.00	: cuttings
1670.00	: cuttings	3580.00	: cuttings
1700.00	: cuttings	3610.00	: cuttings
1730.00	: cuttings	3640.00	: Cuttings
1760.00	: cuttings	3675.00	: Cuttings
1820.00	: cuttings	3700.00	: Cuttings
1850.00	: cuttings	3720.00	: Cuttings
1880.00	: cuttings	3750.00	: Cuttings
1910.00	: cuttings	3780.00	: Cuttings
1940.00	: cuttings	3810.00	: Cuttings
1970.00	: cuttings	3840.00	: Cuttings
2000.00	: cuttings	3870.00	: Cuttings
2030.00	: cuttings	3895.00	: Cuttings
2060.00	: cuttings	3940.00	: Cuttings