

G.S.C. O.F. 1860 PALYNOLOGICAL ANALYSIS OF THE INTERVAL 320-
454M, GLOOSCAP C-63 WELL, SCOTIAN SHELF

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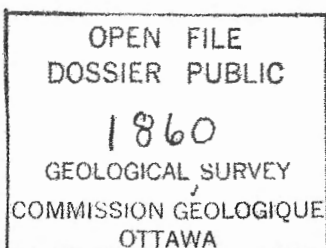
BUTAK DAVIES GROUP

PALYNOLOGICAL ANALYSIS OF THE
INTERVAL 320-4540M, GLOOSCAP C-63 WELL,
SCOTIAN SHELF

REPORT NO. 88-0008

MARCH 1988

CALGARY, ALBERTA



BIOSTRATIGRAPHIC SUMMARY

320- 380m	<u>Deflandrea heterophlycta</u> Zone (early Oligocene)
400- 460m	<u>Diphyes colligerum</u> Zone (late Eocene)
480- 490m	<u>Adnatosphaeridium reticulense</u> Zone (middle Eocene)
510- 520m	<u>Areoligera senonensis</u> Zone (early Eocene)
540- 550m	<u>D. euclaensis</u> , <u>P. pyrophorum</u> and <u>C. speciosa</u> Zones (Maastrichtian, early Paleocene and late Paleocene)
570- 820m	<u>Dinogymnium euclaensis</u> Zone (Maastrichtian)
840- 890m	probable <u>Odontochitina operculata</u> Zone (probable Campanian)
900- 910m	possible <u>Pervosphaeridium truncigerum</u> Zone (possible Santonian)
930-1060m	<u>Pervosphaeridium truncigerum</u> Zone (Santonian)
1080-1120m	<u>Oligosphaeridium pulcherrimum</u> Zone (Coniacian)
1140-1150m	<u>Surculosphaeridium longifurcatum</u> Zone (Turonian)
1170-1330m	<u>Kiokansium polypes</u> Zone (Cenomanian)
1360-1870m	<u>Chichaouadinium vestitum</u> Zone (Albian)
1890-1900m	<u>Subtilisphaera perlucida</u> Zone (late Aptian)
1920-2080m	<u>Subtilisphaera perlucida</u> Zone: <u>Cyclonephelium</u> <u>attadalicum</u> Subzone (early Aptian)

2100-2290m	<u>Aptea anaphrissa</u> Zone (Barremian)
2310-2320m	Probable <u>Ctenidodinium elegantulum</u> Zone (Hauterivian)
2340-2560m	<u>Phoberocysta neocomica</u> Zone (Berriasian - Valanginian)
2580-2650m	<u>Ctenidodinium panneum</u> Zone (Portlandian)
2670-2680m	<u>Hystrichogonyaulax cladophora</u> Zone (Kimmeridgian)
2700-2770m	<u>Hystrichogonyaulax</u> #EA Zone (Oxfordian)
2790-2800m	<u>Gonyaulacysta jurassica jurassica</u> Zone (early Oxfordian)
2820-3280m	<u>Hystrichosphaerina orbifera</u> Zone (Calloviaian)
3300-3310m	<u>Ctenidodinium combazii</u> Zone (Bathonian to early Calloviaian)
3330-3490m	<u>Gonglyodinium erymnoteichos</u> Zone (late Bajocian)
3510-3610m	<u>Eyachia prisca</u> Zone (early Bajocian)
3630-3880m	<u>Dapcodinium semitabulatum</u> Zone (Aalenian)
3890-3900m	<u>Scrinocassis weberi</u> Zone (Toarcian)
4040-4240m	No zonal assignment (No age assignment)
4255-4365m	No zonal assignment (Possible Carnian to Norian)
4380-4540m	<u>Patinasporites densus</u> Zone (Carnian to Norian)

SELECTED PALYNOMORPHS

Listings show highest occurrences unless otherwise specified.

(+) indicates marker species.

320-380m: Deflandrea heterophlycta Zone (early Oligocene)

320-330m Chiropteridium lobospinosum
Chiropteridium mespilanum
Claphyrocysta #LA (+)
Quercoidites #LA
Spiniferites monilis (Questionably present)

340-350m Hystriochokolpoma rigaudiae
Lentinia serrata (+)
Operculodinium centrocarpum

400-460m: Diphyes colligerum Zone (late Eocene)

400-410m Homotryblium floripes
Homotryblium pallidum (+)
Momipites coryloides (+)
Spiniferites pseudofurcatus
Systematophora ancyrea

425-435m Areoligera undulata (+)
Cordosphaeridium cantharellum
Dapsilidinium pastielsii
Gochtodinium simplex
Hystriochokolpoma salacium (+)

Lingulodinium machaerophorum
Palaeocystodinium golzowense
Polypodiidites favus
Spiniferites monilis (+)
Systematophora placacantha (+)
Tectatodinium pellitum

450-460m

Cribroperidinium giuseppeii
Deflandrea phosphoritica
Distatodinium ellipticum
Glaphyrocysta semitecta (+)
Pentadinium laticinctum granulatum
Pentadinium laticinctum reticulatum
Wetzeliella articulata

480-490m: Adnatosphaeridium reticulense Zone (middle Eocene)

480-490m

Cordosphaeridium inodes inodes
Dinopterygium cladoides
Glaphyrocysta laciniiforme (+)
Hystrichokolpoma unispinum (+)
Polysphaeridium subtile (+)
Rugubivesiculites reductus (Probably reworked)

510-520m: Areoligera senonensis Zone (early Eocene)

510-520m

Adnatosphaeridium vittatum
Apectodinium homomorphum
Ceratiopsis pannucea
Dapsilidinium simplex
Dracodinium solidum (+)
Oligosphaeridium complex (+)

540-550m: D. euclaensis, P. pyrophorum and C. speciosa Zones (Maastrichtian, early Paleocene and late Paleocene)

Comment: Highly condensed sequence indicated by coincident species tops.

540-550m Arcoligera senonensis (Abundant)
Ceratiopsis speciosa glabra (+)
Cordosphaeridium fibrospinosum
Cyclonephelium distinctum (+)
Hafniasphaera septata
Isabelidinium belfastense (+)
Palaeocystodinium australinum (+)
Palaeoperidinium pyrophorum (+)
Pervosphaeridium pseudhystriodinium (+)
Phelodinium magnificum (+)
Phelodinium tricuspe (+)
Spongodinium delitiense (+)

570-820m: Dinogymnium euclaensis Zone (Maastrichtian)

690-700m Ceratiopsis diebelii

720-730m Isabelidinium cooksoniae (+)
Membranilarnacia sp., Wilson 1971 (+)
Palaeostomocysta fragilis (+)

840-890m: probable Odontochitina operculata Zone (probable Campanian)

840-850m Chatangiella tripartita (+)
(Questionably present)

1080-1120m: Oligosphaeridium pulcherrimum Zone (Coniacian)

1080-1090m Cicatricosisporites #EAM (?Reworked)
Cyclonephelium vannophorum (+) (sensu lato)
Florentinia cooksoniae
Florentinia radiculata (+)
Palaeohystrichophora infusorioides
Plicatella cristata (?Reworked)
Plicatella tricuspida (?Reworked)

1110-1120m Callaiosphaeridium asymmetricum (+)
Cicatricosisporites hughesii cf. (?Reworked)
Cleistosphaeridium aciculare
Cyclonephelium brevispinum
Isabelidium magnum -
Oligosphaeridium pulcherrimum (+)
Plicatella cristata (?Reworked)
Schizosporis reticulatus

1140-1150m: Surculosphaeridium longifurcatum Zone (Turonian)

1140-1150m Aequitriradites verrucosus (?Reworked)
Camerozonosporites dakotaensis
Isabelidium magnum (+) (Abundant)
Rouseisporites radiatus
Striamonoletes auritus
Surculosphaeridium longifurcatum (+) (Common)

1170-1330m: Kiekansium polypes Zone (Cenomanian)

1170-1180m Cicatricosisporites #EAI (?Reworked)

Cicatricosisporites crassiterminatus (+)
Coronifera oceanica
Cyclonephelium vannophorum (+)
Podocarpidites potomacensis (Common)
Silicisphaera ferox

1200-1210m Balmeisporites holodictyus
 Exochosphaeridium striolatum
 Lecaniella dictyota
 Plicatella bilateralis
 Senoniasphaera protrusa

Comment: Possible Albian at 12330m as indicated by C. vestitum
and A. cretacea.

1230-1240m Aequitriradites spinulosus (+)
 Astrocysta cretacea (+)
 Canningia colliveri
 Chichaouadinium vestitum (?Reworked)
 Hystrichosphaeridium difficile
 Rouseisporites reticulatus

1260-1270m Silicisphaera huspina
 Stiphrosphaeridium anthophorum

1290-1300m Astrocysta cretacea (+) (Common)
 Oodnadattia tuberculata

1320-1330m Aiora fenestrata
 Choanopollis sp. indet.
 Taurocusporites reduncus

1360-1870m: Chichaouadinium vestitum Zone (Albian)

- 1360-1370m Aratrisporites ocellatus (+)
 Cicatricosisporites venustus (+)
 Cleistosphaeridium huguoniotii
 Kickansium polypes (Common)
 Monosulcites scabratus (+)
 Oligosphaeridium totum totum (+)
 Senoniasphaera microreticulata (+) (Common)
 Vitreisporites pallidus (+)
- 1380-1390m Camerozonosporites insignis
 Crybelosporites pannuceus (+)
 Foraminisporis wonthaggiensis (+)
 Ischyosporites disjunctus (+)
 Parvisaccites radiatus
 Plicatella bifurcata
 Retitricolpites georgensis (+)
- 1410-1420m Aptea polymorpha (+)
 Cribroperidinium edwardsii
 Cyclonephelium eisenackii (+)
 Eucommiidites minor (+)
 Kickansium polypes (Abundant)
 Luxadinium propatulum
 Nodosisporites genuina
 Nyktericysta sp. indet.
- 1440-1450m Cribroperidinium orthoceras
 Liliacidites dividiuus (+)
 Plicatella problematica
- 1470-1480m Apteodinium grande
 Cedripites canadensis

Corollina torosa
Kleithriasphaeridium loffrense
Nodosisporites undosus (+)
Podocarpidites epistriatus
Retitricolpites vulgaris (+)
Rugubivesiculites minimus

1500-1510m Cicatricosisporites #ECE
Cupuliferopollenites minutus
Epelidosphaeridia spinosa (+) (Common)
Foveosporites canalis

1530-1540m Biretisporites potoniae
Cicatricosisporites delicatus
Endoscrinium campanulum -
Parvisaccites hortonensis (+)
Phyllocladites inchoatus
Plicatella matesovae
Rouseisporites simplex
Spongodinium #EA
Xenascus #EA

Comment: Probable middle Albian as indicated by Penetetrapites mollis.

1560-1570m Alisporites grandis
Cerebropollenites #EB
Cyclonephelium attadalicum cf. (+) (present)
Densoisporites microrugulatus
Endoscrinium luridum
Penetetrapites mollis (+)

1590-1600m Afropollis iardinus (+)
Corniculatisporites auritus cf. (+)
Cribroperidinium episomum (+)

1620-1630m Caddosphaera halosa
Ctenidodinium #ES
Impardecispora apiverrucata
Liliacidites peroreticulatus (+)
Trilobosporites humilis (+)

Comment: Possible late Aptian or early Albian as indicated by
Parvisaccites amplus.

1650-1660m Acritosporites excavatus
Cyclonephelium paucispinum
Oligosphaeridium dividuum (+)
Parvisaccites amplus (+)
Plicatella jansonius (+)
Retitricolpites fragosus (+)

1680-1690m Cerebropollenites mesozoicus
Ischyosporites estherae (+)
Stellatopollis #EA (+)
Surculosphaeridium sp. A of B&W
Taurocusporites spackmanii (+)

1710-1720m Gleicheneidites distalgranulatus
Nodosisporites spinosus (+)
Phyllocladites microreticulatus
Podocarpidites granulosus
Striatricolpites #EA
Trilobosporites aornatus (Reworked)
Triretilobata marylandensis (+)

1740-1750m Concavissimisporites punctatus
Cribroperidinium #EX
Oligosphaeridium asterigerum (+)
Platysaccus megasaccus
Plicatella potomacensis
Podocarpidites canadensis

1770-1780m Astrocysta #EA (+) (Common)
 Cicatricosisporites #EAL cf.
 Foraminisporis asymmetrica (+)

1800-1810m Stephodinium coronatum

1860-1870m Triretilobata tribotrys

1890-1900m: Subtilisphaera perlucida Zone (late Aptian)

1890-1900m Luxadinium primulum
 Muderongia asymmetrica (+)
 Subtilisphaera pirnaensis (+)
 Tanyosphaeridium isocalamus

1920-2080m: Subtilisphaera perlucida Zone: Cyclonephelium
attadalicum Subzone (early Aptian)

1920-1930m Cyclonephelium attadalicum cf. (+)
 Imbatodinium jaegeri
 Stiphrosphaeridium #EA

1950-1960m Pareodinia ceratophora

Comment: Possible Barremian as indicated by Subtilisphaera ter-
cula.

1980-1990m Cyclonephelium attadalicum (Common)
 Impardecispora sp. A, Dorhofer 1977

(?Reworked)

Subtilisphaera terrula (+)
Taeniophora #EA
Tanyosphaeridium variecalamus

2010-2020m Callialasporites dampieri
 Contignisporites glebulentus
 Parvisaccites amplus (Common)

2070-2080m Parvisaccites amplus (Abundant)
 Subtilisphaera #EA (?Reworked)

2100-2290m: Aptea anaphrissa Zone (Barremian)

2100-2110m Aptea anaphrissa
 Cicatricosisporites sternum

2130-2140m Subtilisphaera perlucida

2190-2200m Callialasporites monoalaspokus (+)
 Muderongia imparilis (+)
 Pseudoceratium pelliferum (+)

2220-2230m Oligosphaeridium macrotubulum (+)

2250-2260m Cicatricosisporites #EAL (+)
 Cicatricosisporites annulatus
 Densoisporites triradiatus (+)
 Impardecispora apigranulosa
 Oligosphaeridium sp. I, Davey 1983

2280-2290m Foveotrilletes subtriangularis
Luxadinium #EA

2310-2320m: Probable Ctenidodinium elegantulum Zone (Hauterivian)

Comment: Possible Hauterivian as indicated by Muderongia staur-ota and Occisucysta #EX.

2310-2320m Muderongia staurota (+)
Occisucysta #EX (+)
Oligosphaeridium diluculum (+)
Oligosphaeridium perforatum

2340-2560m: Phoherocysta neocomica Zone (Berrias.-Valang.)

2340-2350m Callialasporites trilobatus
Cicatricosisporites potomacensis
Ctenidodinium elegantulum
Gardodinium eisenackii
Kleithriasphaeridium eoinodes
Muderongia simplex
Muderongia tetracantha
Occisucysta distincta
Phoherocysta neocomica cruciformis (+)
Phoherocysta neocomica neocomica (+)
Polytephanophorus schindewolfii
Subtilisphaera #EA

Comment: Possible Portlandian as indicated by ?Ctenidodinium c
ulmulum.

2370-2380m Achomosphaera neptunii (+)
Callialasporites turbatus

Ctenidodinium culmulum (Questionably present)
Hystriodinium furcatum
Kleithriasphaeridium fasciatum
Systematophora fasciculigera
(Questionably present)

2400-2410m Cassiculosphaeridia magna
 Ctenidodinium rugulatum
 Endoscrinium pharo (+)
 Muderongia simplex microperforata (+) (Common)
 Polystephanophorus sarjeantii
 Pseudoceratium pelliiferum (Common)
 Spiniferites dentatus
 Systematophora complicata
 Tenua hystrix

2430-2440m Cicatricosisporites undatus (+)
 Cribroperidinium globatum
 Dingodinium cerviculum
 Oligosphaeridium helilongjainense (+)
 Perissosphaeridium #EA
 Pityosporites #EA
 Systematophora fasciculigera

Comment: Probable Berriasian as indicated by A. metaelliptica
and M. californica.

2460-2470m Amphorula metaelliptica (+)
 Cribroperidinium granuligerum
 Cymososphaeridium validum
 Muderongia californica (+)

2490-2500m Aequitriradites baculatus
 Lanterna bulgaria (+)
 Oligosphaeridium albertense

2520-2530m Stiphrosphaeridium dictyophorum (+)

2580-2650m: Ctenidodinium panneum Zone (Portlandian)

2580-2590m Cleistosphaeridium ehrenbergii
 Ctenidodinium culmulum
 Milliododinium jubaris (Questionably present)

2610-2620m Ctenidodinium panneum
 Hystriochodinium lanceatum
 Lanterna sportula
 Muderongia sp. A
 Varirugosisporites granituberosus

Comment: Possible Kimmeridgian at 2640m as indicated by Amphorula #EA and S. paeminosa.

2640-2650m Amphorula #EA (+)
 Chorate dino. #EA (+)
 Pityosporites dividuus
 Subtlisphaera paeminosa

2670-2680m: Hystriochogonyaulax cladophora Zone (Kimmeridgian)

2670-2680m Alisporites thomasii (+)
 Breodoxiella #EB
 Hystriochogonyaulax cladophora (+)

2700-2770m: Hystrichogonyaulax #EA Zone (Oxfordian)

2700-2710m Ctenidodinium chondrum (Questionably present)
Hystrichogonyaulax #EA (+)

2730-2740m Epiplosphaera reticulospinosa
Leptodinium sp. G of G&S 1972
Systematophora areolata

2760-2770m Glossodinium dimorphum
Ischyosporites amplireticus
Pilosporites sp. A
Senoniasphaera jurassica (Common)
Tuberositriletes montuosus

2790-2800m: Gonyaulacysta jurassica jurassica Zone (early Oxfordian)

2790-2800m Gonyaulacysta adecta (+)
Gonyaulacysta jurassica jurassica (+)
Leptodinium aceras
Systematophora #EA
Varirugosporites planirugulatus

2820-3280m: Hystrichosphaerina orbifera Zone (Callovian)

2820-2830m Atopodinium prostratum (Questionably present)
Hystrichosphaerina orbifera (+)
Leptodinium aceras (Common)
Scrinioidinium crystallinum
Tuberositriletes grossetuberculatus

2850-2860m	<u>Valensiella ovula</u>
3000-3010m	<u>Ctenidodinium pachydermum</u>
3060-3070m	<u>Fromea irregulare</u> <u>Leptodinium amabile</u>
3120-3130m	<u>Ctenidodinium continuum</u>
3150-3160m	<u>Hystrichogonyaulax</u> #EB
3180-3190m	<u>Hystrichogonyaulax</u> #EC (+) <u>Paragonyaulaxysta borealis</u> <u>Saxosporis</u> #EB
3240-3250m	<u>Acanthaulax scarburghensis</u> <u>Adnatosphaeridium caulleryi</u> <u>Epiplosphaera areolata</u> <u>Meiourogonyaulax dicrypta</u> (Common) <u>Muderongia</u> #EZ <u>Rigaudella aemula</u> (+) <u>Systematophora</u> #EB
3270-3280m	<u>Prolixosphaeridium deirense</u> <u>Sentusidinium sparsibarbatum</u>

3300-3310m: Ctenidodinium combazii Zone (Bathonian to early Callovian)

3300-3310m Compositosphaeridium polonicum
Ctenidodinium mosaicum
Ctenidodinium ornatum
Ctenidodinium sellwoodii (+)
Scriniocassis dictyota

3330-3490m: Gonglyodinium erymnoteichos Zone (late Bajocian)

3330-3340m Acanthaulax crispa
Adnatosphaeridium #EZ
Aldorfia aldorfensis (+)-
Ctenidodinium rotundatum (+)
Ellipsoidictyum gochtili (+)
Energlynia acollaris
Sentusidinium pilosum
Systematophora #EE (+)
Systematophora #EF (+)

3360-3370m Ctenidodinium #EE (+)
Diacanthum filapicatum

3390-3400m Gonglyodinium erymnoteichos (+)

3420-3430m Ctenidodinium #EA
Ctenidodinium tenellum
Ellipsoidictyum cinctum
Nummus #EZ

3450-3460m Sentusidinium pelionense

Comment: Possible early Bajocian as indicated by ?*Eyachia prisca*.

3480-3490m *Eyachia prisca* (Questionably present)
 Porcellaespora sp. indet. (?Reworked)

3510-3610m: *Eyachia prisca* Zone (early Bajocian)

3510-3520m *Cribroperidinium* #ER
 Eyachia prisca (+)

3540-3550m *Systematophora* #EC

3600-3610m *Ctenidodinium* #EF
 Gonglyodinium hocneratum

3630-3880m: *Dapcodinium semitabulatum* Zone (Aalenian)

3630-3640m *Dapcodinium holotabulatum*

3660-3670m *Dapcodinium semitabulatum* (+) (Common)

3690-3700m *Dapcodinium* #Espinete

3750-3760m *Sentusidinium asymmetricum*

3780-3790m Systematophora #EH

3840-3850m Noricysta #Ealtocrefts (+)

3890-3900m: Scrinocassis weberi Zone (Toarcian)

3890-3900m Scrinocassis weberi
 Valvaeodinium armatum

4040-4240m: No zonal assignment (No age assignment)

Comment: Abundant cavings in basaltic interval.

4040-4050m Corollina meyeriana

Comment: High thermal maturation - Dark spores may possibly be identified with S.E.M.

4170-4180m Converrucosia sporites sp. indet.

4255-4365m: no zonal assignment (Possible Carnian to Norian)

Comment: Dark spores resembling P. densus

4255-4265m Alisporites thomasi (Common)
 Patinasporites densus (Questionably present)

Comment: Common very dark bisaccates.

4355-4365m Alisporites thomasi (Common)

4380-4540m: Patinasporites densus Zone (Carnian to Norian)

4380-4390m Alisporites thomasi (Abundant)
 Corollina meyeriana (+) (Abundant)
 Corollina murphyi (+)
 Corollinoid sp. of Cornet and Traverse
 Patinasporites densus (+) (Common)

4510-4520m Alisporites giganteus

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
250	Acanthaulax crispata	65	Cribroperidinium wetzelii
243	Acanthaulax scarburghensis	274	Ctenidodinium #EA
165	Achomosphaera neptunii	269	Ctenidodinium #EE
13	Achomosphaera ramulifera	204	Ctenidodinium #EF
261	Adnatosphaeridium #EZ	120	Ctenidodinium #ES
244	Adnatosphaeridium caulleryi	206	Ctenidodinium chondrum
35	Adnatosphaeridium vittatum	238	Ctenidodinium continuum
97	Aiora fensholtii	166	Ctenidodinium culmulum
262	Aldorfia aldrfensis	156	Ctenidodinium elegantulum
102	Alterbidinium minor	255	Ctenidodinium mosaicum
201	Amphorula #EA	256	Ctenidodinium ornatum
237	Amphorula #ED	234	Ctenidodinium pachydermum
103	Amphorula metaelliptica	125	Ctenidodinium pannum
36	Apectodinium homomorphum	263	Ctenidodinium rotundatum
143	Aptea anaphrissa	171	Ctenidodinium ruquilatum
103	Aptea polymorpha	257	Ctenidodinium sellwoodii
110	Apteodinium grande	231	Ctenidodinium sp. indet.
130	Apteodinium granulatum	275	Ctenidodinium tenellum
228	Apteodinium nuciforme	138	Cyclonephelium attadalicum
42	Areoligera senonensis	116	Cyclonephelium attadalicum cf.
14	Areoligera undulata	80	Cyclonephelium brevispinum
127	Astrocysta #EA	46	Cyclonephelium distinctum
89	Astrocysta cretacea	105	Cyclonephelium eisenackii
222	Atopodinium prostratum	121	Cyclonephelium paucispinum
223	Breodoxiella #EA	74	Cyclonephelium vannophorum
203	Breodoxiella #ED	185	Cymosphaeridium validum
119	Caddosphaera halosa	209	Dapcodinium #Espinata
78	Callaioisphaeridium asymmetricum	206	Dapcodinium holotabulatum
90	Canningia colliveri	207	Dapcodinium semitabulatum
170	Cassiculosphaeridia magna	16	Dapsilidinium pastielsii
56	Ceratiopsis diebelii	38	Dapsilidinium simplex
37	Ceratiopsis pannucea	24	Deflandrea phosphoritica
43	Ceratiopsis speciosa glabr	270	Diacanthum filapicatum
60	Chatangiella tripartita	179	Dingodinium cerviculum
61	Chatangiella verrucosa	213	Dingodinium jurassicum
91	Chichaquadinium vestitum	31	Dinopterygium cladoideis
1	Chiropteridium lobospinosum	25	Distatodinium ellipticum
2	Chiropteridium mespilanum	35	Dracodinium condylos
79	Cleistosphaeridium aciculare	39	Dracodinium solidum
192	Cleistosphaeridium ehrenbergii	276	Ellipsoidictyum cinctum
99	Cleistosphaeridium huguonitii	128	Endoceratium sp. indet.
254	Compositosphaeridium polonicum	113	Endoscrinium campanulum
15	Cordosphaeridium cantharelum	117	Endoscrinium luridum
44	Cordosphaeridium fibrospinum	172	Endoscrinium pharo
45	Cordosphaeridium gracile	202	Endoscrinium subvallare
30	Cordosphaeridium inodes inodes	264	Energlynia acollaris
84	Coronifera oceanica	235	Energlynia sp. indet.
281	Cribroperidinium #ER	112	Epelidosphaeridia spinosa
125	Cribroperidinium #EX	245	Epiplosphaera areolata
104	Cribroperidinium edwardsii	209	Epiplosphaera reticulospinosa
118	Cribroperidinium episomum	246	Escharisphaeridia pocockii
23	Cribroperidinium giuseppi	210	Escharisphaeridia rudis
178	Cribroperidinium globatum	62	Exochosphaeridium bifidum
181	Cribroperidinium granulatum	86	Exochosphaeridium striolatum
103	Cribroperidinium orthocera	273	Eyachia prisca
233	Cribroperidinium sp. indet.	63	Florentina sp. indet.

APPENDIX A cont'd

Alphabetical Listing of Species Shown on Occurrence Chart:

Marine Dinoflagellates

Index number	Taxon names	Index number	Taxon names
75	Florentinia radicata	248	Meiourugonyaulax dicrypta
157	Gardodinium eisenckii	193	Meiourugonyaulax sp. indet.
205	Genus & sp. indet. 4 of Gocht	58	Membranilarnacia sp., Wilson 1971
3	Glaphyrocysta #LA	251	Mendicodinium groenlandicum
32	Glaphyrocysta laciniiforme	194	Milliododinium jubaris
26	Glaphyrocysta semitecta	249	Muderongia #EZ
214	Glossodinium dimorphum	133	Muderongia asymmetrica
17	Gochtodinium simplex	186	Muderongia californica
273	Gonglyodinium erynoteichos	146	Muderongia imparilis
205	Gonglyodinium hockeratum	159	Muderongia simplex
242	Gonglyodinium sp. indet.	173	Muderongia simplex microperforata
217	Gonyaulacysta adactyla	198	Muderongia sp. A
145	Gonyaulacysta helioides	152	Muderongia staurota
218	Gonyaulacysta jurassica jurassica	160	Muderongia tetracantha
47	Hafniasphaera septata	203	Noricysta #Ealtocrests
10	Homotryolium floripes	199	Nummus #EA
11	Homotrybium pallidum	277	Nummus #EZ
167	Hystrichodinium furcatum	107	Nyktericysta sp. indet.
196	Hystrichodinium lanceatum	153	Occisucysta #EX
66	Hystrichodinium pulchrum	187	Occisucysta balios
207	Hystrichogonyaulax #EA	161	Occisucysta distincta
239	Hystrichogonyaulax #EB	149	Occisucysta sp. indet.
240	Hystrichogonyaulax #EC	200	Occisucysta tentori
288	Hystrichogonyaulax #EZ	73	Odontochitina costata
204	Hystrichogonyaulax cladophora	67	Odontochitina operculata
247	Hystrichogonyaulax cladophora cf.	71	Odontochitina poritera
205	Hystrichogonyaulax sp. indet.	109	Oligosphaeridium albertense
5	Hystrichokolpoma rigaudiae	126	Oligosphaeridium asterigerum
18	Hystrichokolpoma salacium	10	Oligosphaeridium complex
33	Hystrichokolpoma crispum	154	Oligosphaeridium diluculum
76	Hystrichosphaeridium cooksoniae	122	Oligosphaeridium dividiu
92	Hystrichosphaeridium difficile	130	Oligosphaeridium heliologjainense
93	Hystrichosphaeridium stellatum	148	Oligosphaeridium macrobulum
215	Hystrichosphaerina orbifera	155	Oligosphaeridium perforatum
70	Hystrichosphaeropsis ovum	82	Oligosphaeridium pulcherrimum
135	Imbatodinium jaegeri	150	Oligosphaeridium sp. I, Davey 1983
48	Isabelidinium belfastense	100	Oligosphaeridium totum totum
57	Isabelidinium cooksoniae	96	Oodnadattia tuberculata
81	Isabelidinium magnum	7	Operculodinium centrocarpum
271	Kalyptea glabra	49	Palaeocystodinium australinum
98	Kiokansium polypes	20	Palaeocystodinium golzowense
150	Kleithriasphaeridium eoinodes	77	Palaeohystrichophora infusorioides
168	Kleithriasphaeridium fasciatum	50	Palaeoperidinium pyrophorum
111	Kleithriasphaeridium loffrense	59	Palaeostomocysta fragilis
188	Lantern bulgarica	241	Paragonyaulax borealis
197	Lantern sportula	137	Pareodinia ceratophora
6	Lentinia serrata	27	Pentadinium laticinctum granulum
219	Leptodinium aceras	28	Pentadinium laticinctum reticulatum
236	Leptodinium amabilis	100	Perisseiasphaeridium #EA
229	Leptodinium hyalodermopsis	181	Perisseiasphaeridium pannosum
211	Leptodinium sp. G of G&S 1972	232	Perisseiasphaeridium sp. indet.
220	Leptodinium sp. indet.	51	Pervosphaeridium pseudohystrichodinium
19	Lingulodinium macherophorum	52	Phelodinium magnificum
123	Litosphaeridium siphoniphorum	53	Phelodinium tricuspe
151	Luxadinium #EA	162	Phoberocysta neocomica cruciformis
192	Luxadinium primulum	163	Phoberocysta neocomica neocomica
106	Luxadinium propatum	34	Polysphaeridium subtile
224	Meiourugonyaulax difflandrei	174	Polystephanophorus sarjeantii

APPENDIX A cont'dAlphabetical Listing of Species Shown on Occurrence Chart:Marine Dinoflagellates

Index number	Taxon names	Index number	Taxon names
164	Polylephanthophorus schindewolfii	102	Tenua anaphrissa
252	Prolixosphaeridium deirense	177	Tenua hystrix
147	Pseudoceratium peliferum	41	Thalassiphora pelagica
108	Pterodinium aliferum	60	Trichodinium castaneum
258	Rigaudella aemula	290	Tubotuberella rhombiformis
259	Scriniocassis dictyota	227	Valensiella ovula
294	Scriniocassis websteri	295	Valvaedinium armatum
225	Scriniodinium crystallinum	23	Wetzeliella articulata
216	Senoniasphaera jurassica	115	Xenascus #EA
101	Senoniasphaera microreticulata	69	Xenascus ceratioides
87	Senoniasphaera procrusa		
64	Senoniasphaera reticulata		
291	Sentusidinium asymmetricum		
208	Sentusidinium cuculliformis		
280	Sentusidinium erythrocomum		
278	Sentusidinium pelionense		
266	Sentusidinium pilosum		
226	Sentusidinium riontii		
272	Sentusidinium sp. indet.		
253	Sentusidinium sparsibarbatum		
94	Silicisphaera buspina		
85	Silicisphaera ferax		
72	Spinidinium styliferum		
129	Spinidinium vestitum		
175	Spiniferites dentatus		
4	Spiniferites monilis		
12	Spiniferites pseudofurcatus		
8	Spiniferites ramosus ramosus		
114	Spongodinium #EA		
54	Spongodinium deliliense		
131	Stephodinium coronatum		
136	Stiphrosphaeridium #EA		
95	Stiphrosphaeridium anthophorum		
191	Stiphrosphaeridium dictyophorum		
142	Subtilisphaera #EA		
144	Subtilisphaera perlucida		
89	Subtilisphaera pirnaensis		
202	Subtilisphaera paerimosa		
139	Subtilisphaera terrila		
83	Surculosphaeridium longifurcatum		
124	Surculosphaeridium sp. A of B&W		
221	Systematophora #EA		
250	Systematophora #EI		
203	Systematophora #EC		
267	Systematophora #EL		
268	Systematophora #EF		
292	Systematophora #EH		
9	Systematophora anzyrea		
212	Systematophora areolata		
176	Systematophora complicata		
169	Systematophora fasciculigera		
21	Systematophora pleocantha		
230	Systematophora sp. indet.		
141	Taeniophora #EA		
134	Tanyosphaeridium localamus		
140	Tanyosphaeridium varicolum		
22	Tectatodinium pellitum		

APPENDIX A (cont'd)

Alphabetical Listing of Species Shown on Occurrence Chart:

Pollen and Spores

Index number	Taxon names	Index number	Taxon names
82	Abiespollenites microreticulatus	84	Corniculatisporites auritus cf.
85	Acanthotriletes vriespinosus	149	Corollina itunensis
89	Acriosporites exavatus	161	Corollina meyeriana
130	Aequitriradites baulatus	165	Corollina murphyi
32	Aequitriradites sinulosus	63	Corollina torosa
27	Aequitriradites verrucosus	166	Corollinoid sp. of Cornet and Traverse
83	Afropollis jadinii	139	Coronatispora valdensis
17	Alisporites bilateralis	6	Corylus #LA
170	Alisporites glandulosus	32	Crybelosporites pannuceus
77	Alisporites grandis	69	Cupuliferopollenites minutus
136	Alisporites thomasi	16	Cyathidites australis
5	Alnipollenites veus	12	Cyathidites sp. indet.
44	Aratrisporites oculatus	167	Deltoidospora diaphana
31	Araucariacites australis	34	Deltoidospora hallii
37	Salmeisporites holodictyus	79	Densosporites microrugulatus
71	Biretisporites peroniae	145	Densosporites perinatus
114	Callialasporites campieri	120	Densosporites triradiatus
154	Callialasporites infrapunctatus	148	Densosporites velatus
117	Callialasporites monolasporeus	50	Eucosmiidites minor
131	Callialasporites segmentatus	134	Exesipollenites tumulus
123	Callialasporites trilobatus	46	Flagellisporites sp. indet.
125	Callialasporites turbatus	159	Foraminisporia dailyi
28	Camarozonosporites dakotaensis	110	Foraminisporis asymmetrica
51	Camarozonosporites insignis	53	Foraminisporis wonthaggiensis
137	Campania #CA	70	Foveosporites canalis
11	Caryapollenites simplex	122	Foveotriletes subtriangularis
62	Cedripites canadensis	150	Fromea irregulare
70	Cerebropollenites SED	98	Gleicheneidites distalgranulatus
153	Cerebropollenites macroverrucosus	47	Gleicheneidites senonicus
93	Cerebropollenites mesozoicus	121	Impardecispora apigranulosa
164	Chasmatosporites nelsonii	36	Impardecispora apiverrucata
42	Choanopollis sp. indet.	113	Impardecispora sp. A, Dorhofer 1977
133	Chorate dino. #EA	140	Ischyosporites amplireticosus
32	Cicatricosisporites #CAI	54	Ischyosporites disjunctus
118	Cicatricosisporites #EAL	95	Ischyosporites estherae
109	Cicatricosisporites #EAL cf.	156	Klukisporites areolatus
22	Cicatricosisporites #CAM	157	Kraeuselisporites #EA
60	Cicatricosisporites #ECE	13	Laevigatosporites ovatus
138	Cicatricosisporites abacus	127	Leiotriletes equiexinus
119	Cicatricosisporites annulatus	35	Leiotriletes meckelburgensis
33	Cicatricosisporites crassiterminatus	60	Liliacidites dividius
72	Cicatricosisporites delicatus	87	Liliacidites peroreticulatus
25	Cicatricosisporites hughesii cf.	20	Lycopodiumsporites austroclavitudites
124	Cicatricosisporites potomacensis	7	Momipites coryloides
94	Cicatricosisporites sp. indet.	168	Patinasporites densust.
116	Cicatricosisporites sternum	40	Monosulcites scabratus
126	Cicatricosisporites undatus	59	Nodosisporites genuina
45	Cicatricosisporites venustus	99	Nodosisporites spinosus
105	Concavissimisporites punctatus	64	Nodosisporites undosus
144	Concavissimisporites verrucatus	1	Osmundacidites claytonites
115	Contignisporites glebulentus	80	Osmundacidites major
129	Convrrucosisporites proxigranulatus	41	Osmundacidites wellmannii
163	Convrrucosisporites sp. indet.	90	Parvisaccites amplus
155	Convolutispora Klukiforma	73	Parvisaccites hortonensis

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

In. ex number	Taxon names
15	Parvisaccites radiatus
11	Penetetrapites mollis
112	Perinopollenites elatoides
74	Phyllocladites inchoatus
100	Phyllocladites microreticulatus
2	Piceapollenites spp.
146	Pilosiporites crassangularis
141	Pilosiporites sp. A
100	Pilosiporites trichopapillosus
3	Pinuspollenites spp.
113	Pityosporites #EA
115	Pityosporites dividiuus
103	Platysaccus megasaccus
55	Plicatella bifurcata
23	Plicatella bilateralis
23	Plicatella cristata
41	Plicatella jansonius
73	Plicatella matesovae
107	Plicatella potomacensis
61	Plicatella problematica
10	Plicatella sp. indet.
21	Plicatella tricuspidata
100	Podocarpidites canadensis
65	Podocarpidites epistriatus
10	Podocarpidites granulatus
7	Podocarpidites potomacensis
160	Podocarpidites sp. indet.
14	Polypodioidites favus
150	Porcellaespora sp. indet.
3	Pterocaryapollenites stellatus
1	Quercoidites #EA
91	Retitricolpites fragosus
51	Retitricolpites georgensis
67	Retitricolpites vulgaris
29	Rouseisporites radiatus
40	Rouseisporites reticulatus : y
71	Rouseisporites simplex
61	Rugubivesiculites minimus
11	Rugubivesiculites reductus
21	Rugubivesiculites rugosus
151	Saxosporis #EB
21	Schizosporis reticulatus
91	Stellatopollis #EA
3	Stereisporites antiquasporites
41	Stereisporites clavus
31	Striamonoletes auritus
102	Striatricolpites #EA
41	Taurocusporites reduncus
91	Taurocusporites spackmanii
11	Taxodiaceapollenites hiatus
16	Triangulopsis discoidalis
15	Trilobosporites aequiverrucatus
101	Trilobosporites acornatus
81	Trilobosporites humilis
10	Triretilobata marylandensis
11	Triretilobata tribotrys
11	Tsugaepollenites igniculus
141	Tuberositriteles grossetuberculatus
141	Tuberositriteles montuosus
131	Varirugosisporites granituberosus
141	Varirugosisporites planirugulatus
51	Vitreisporites pallidus

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

Index numbers are the columns in which the taxon appears

Index number	Taxon names
1	for <i>Gracilaria</i> sp.
3	<i>Le. melleo dictyola</i>
2	<i>Paralecomella indentata</i>

APPENDIX BExamined Samples: Glooscap C-63

320.00 : cuttings	2100.00 : cuttings	3870.00 : cuttings
340.00 : cuttings	2130.00 : cuttings	3890.00 : cuttings
370.00 : cuttings	2160.00 : cuttings	4040.00 : cuttings
400.00 : cuttings	2190.00 : cuttings	4050.00 : cuttings
425.00 : cuttings	2220.00 : cuttings	4070.00 : cuttings
450.00 : cuttings	2250.00 : cuttings	4095.00 : cuttings
480.00 : cuttings	2280.00 : cuttings	4115.00 : cuttings
510.00 : cuttings	2310.00 : cuttings	4135.00 : cuttings
540.00 : cuttings	2340.00 : cuttings	4150.00 : cuttings
570.00 : cuttings	2370.00 : cuttings	4170.00 : cuttings
600.00 : cuttings	2400.00 : cuttings	4210.00 : cuttings
630.00 : cuttings	2430.00 : cuttings	4230.00 : cuttings
660.00 : cuttings	2460.00 : cuttings	4255.00 : cuttings
690.00 : cuttings	2490.00 : cuttings	4275.00 : cuttings
720.00 : cuttings	2520.00 : cuttings	4295.00 : cuttings
750.00 : cuttings	2550.00 : cuttings	4315.00 : cuttings
780.00 : cuttings	2580.00 : cuttings	4340.00 : cuttings
810.00 : cuttings	2610.00 : cuttings	4355.00 : cuttings
840.00 : cuttings	2640.00 : cuttings	4380.00 : cuttings
865.00 : cuttings	2670.00 : cuttings	4405.00 : cuttings
890.00 : cuttings	2700.00 : cuttings	4435.00 : cuttings
900.00 : cuttings	2730.00 : cuttings	4460.00 : cuttings
930.00 : cuttings	2760.00 : cuttings	4485.00 : cuttings
960.00 : cuttings	2790.00 : cuttings	4510.00 : cuttings
990.00 : cuttings	2820.00 : cuttings	4530.00 : cuttings
1020.00 : cuttings	2850.00 : cuttings	
1050.00 : cuttings	2880.00 : cuttings	
1080.00 : cuttings	2910.00 : cuttings	
1110.00 : cuttings	2940.00 : cuttings	
1140.00 : cuttings	2970.00 : cuttings	
1170.00 : cuttings	3000.00 : cuttings	
1200.00 : cuttings	3030.00 : cuttings	
1230.00 : cuttings	3060.00 : cuttings	
1260.00 : cuttings	3090.00 : cuttings	
1290.00 : cuttings	3120.00 : cuttings	
1320.00 : cuttings	3150.00 : cuttings	
1360.00 : cuttings	3180.00 : cuttings	
1380.00 : cuttings	3210.00 : cuttings	
1410.00 : cuttings	3240.00 : cuttings	
1440.00 : cuttings	3270.00 : cuttings	
1470.00 : cuttings	3300.00 : cuttings	
1500.00 : cuttings	3330.00 : cuttings	
1530.00 : cuttings	3360.00 : cuttings	
1560.00 : cuttings	3390.00 : cuttings	
1590.00 : cuttings	3420.00 : cuttings	
1620.00 : cuttings	3450.00 : cuttings	
1650.00 : cuttings	3480.00 : cuttings	
1680.00 : cuttings	3510.00 : cuttings	
1710.00 : cuttings	3540.00 : cuttings	
1740.00 : cuttings	3570.00 : cuttings	
1770.00 : cuttings	3600.00 : cuttings	
1800.00 : cuttings	3630.00 : cuttings	
1830.00 : cuttings	3660.00 : cuttings	
1860.00 : cuttings	3690.00 : cuttings	
1890.00 : cuttings	3720.00 : cuttings	
1920.00 : cuttings	3750.00 : cuttings	
1950.00 : cuttings	3780.00 : cuttings	
1980.00 : cuttings	3810.00 : cuttings	
2010.00 : cuttings	3840.00 : cuttings	
2040.00 : cuttings		
2070.00 : cuttings		