BIOSTRATIGRAPHY AND MATURATION OF 17 LABRADOR AND BAFFIN SHELF WELLS

Volume 7:
Pothurst P-19 & Ralegh C-02

Report No. 86-0058
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EXPLANATION OF CONTENTS

This volume contains the following results of analyses on Pothurst P-19 and Ralegh C-02.

1. **General drilling information**

2. **Consensus Age**

   The consensus age based on micropaleontology (M) and palynology (P).

3. **Palynological Results**

   The palynological zones and assigned ages in order of increasing depth within each well. The more important taxa are listed alphabetically, with miospores and fungal spores being denoted by an asterisk (*). Marker species are highlighted in bold type. The degree of confidence is given for each zonal assignment as follows:

   "4" The highest degree of confidence regarding both the zonal assignment and the sample level to which the top of the zone is assigned.

   "3" A high degree of confidence regarding the zonal assignment, but including the possibility that the zonal assignment may be slightly too low.

   "2" Indicates that the zonal asignment is probably correct but that the sample level indicated for the top of the zone is probably too low due to a scarcity of marker species.

   "1" A highly tentative zonal assignment due to extreme scarcity of marker species.

4. Micropaleontological Results

The micropaleontological zones and assigned ages in order of increasing depth. Within each zone the more important taxa are listed alphabetically with planktonic foraminiferal species being denoted by an asterisk (*) and diatom species by a cross (+). Marker species are highlighted in bold type. The degree of confidence is given for each zonal assignment as follows:

"4" The highest degree of confidence regarding both the zonal assignment and the sample level to which the top of the zone is assigned. This degree of confidence indicates the presence of planktonic foraminifera together with the main benthonic foraminiferal markers.

"3" A high degree of confidence regarding the zonal assignment. Indicates the presence of the main benthonic foraminiferal markers.

"2" Indicates that the zonal assignment is most probably correct. The assignment is based only on taxa occurring commonly within the zone, due to the scarcity of marker species.

"1" A tentative zonal assignment. Based solely on stratigraphic position due to extreme scarcity of marker species.

5. Paleobathymetric Interpretations

The interpreted paleobathymetries are in order of increasing depth, together with the criteria upon which they are based. The interpreted environments and corresponding paleobathymetries reported are: Non-marine (above sea level), Transitional (approx. 0m), Inner Neritic (approx. 0-20m), Middle Neritic (approx. 20-100m), Outer Neritic (approx. 100-200m), Upper Bathyal (approx. 200-1000m), and Lower Bathyal (>1000m).

6. Kerogen, TAI and Vitrinite Reflectance

Data on kerogen types and TAI are listed in a table, and are then discussed relative to petroleum source rock potential and the consensus ages assigned in this report. Data on vitrinite reflectance are listed and are discussed relative to their degree of reliability and indicated maturation level.

All references are given in Volume 1 of the report.

The following charts are included for each well:

1. A Palynological Summary Chart showing the assigned palynological zones, inferred ages, lithology, formational assignments provided by P.N. Moir, studies in progress, important palynological events (mostly species tops).

2. Sawtooth diagrams showing the relative abundances of the following palynological categories: Apectodinium homomorphum, Areoligera senonensis, marine dinoflagellates, Azolla, Pediastrum, gymnosperm pollen, angiosperm pollen, miospores, Late Cretaceous reworking, Early Cretaceous reworking.

3. A Micropaleontological Summary Chart showing the assigned micropaleontological zones, inferred ages, lithology, important micropaleontological events (mostly species tops), paleobathymetry.

4. A Kerogen Summary Chart showing the consensus ages, levels of Thermal Alteration (TAI), relative abundances of kerogen types.

5. A Vitrinite Summary Chart showing the consensus ages, histograms of the vitrinite reflectance measurements which are divided into three categories: caved (blue), in situ (green) and reworked (red). The in situ category is further subdivided into poor readings (horizontal lines) and good to excellent reading (solid colour). The means of the three main categories are indicated by correspondingly coloured triangles.

Pothurst P-19:

BIOSTRATIGRAPHY AND MATURATION OF

POTHURST P-19

PETRO-CANADA et al. POTHURST P-19

GSC locality: 58° 48' 53.4"N, 60° 31' 32.4"W
KB elevation: 12m Water depth: 193m
Casing set at: 242m, 530m, 1504m, 3591m
Total depth: 3992m
Interval studied for palynology: 550-3985m
Interval studied for micropaleontology: 550-3985m

CONSENSUS AGE

550- 590m	late Miocene to Pleistocene (M,P)
610-1460m	late Miocene or older (P)
1480-1640m	early to middle Miocene (P)
1660-1700m	late Oligocene (P)
1720-1940m	early Oligocene (P)
1960-2330m	late Eocene (P)
2350-3160m	middle to late Eocene (P)
3180-3430m	middle Eocene (P)
3450-3972m	early Eocene (P)

POTHURST P-19

PALYNOLOGICAL ZONATION

550- 560m	No zonal assignment (no age assignment)
580- 590m	Tsugaepollenites igniculus Zone or older (Plio-Pleistocene or older)
610-1460m	Operculodinium centrocarpum Zone or older (late Miocene or older)
1480-1640m	Systematophora ancyrea Zone to Cordosphaeridium cantharellum Zone (early to middle Miocene)
1660-1700m	Chiropteridium mespilanum Zone (late Oligocene)
1720-1940m	Areosphaeridium arcuatum Zone (early Oligocene)
1960-2330m	Deflandrea #LR Zone (late Eocene)
2350-3160m	Areosphaeridium fenestratum Zone (middle to late Eocene)
3180-3430m	Eocladopyxis #LA Zone (middle Eocene)
3450-3670m	Trinovantedinium #LA Zone (early Eocene)
3690-3985m	Dracodinium condylos Zone (early Eocene)

SELECTED PALYNOMORPHS

550-560m: No zonal assignment (no age assignment)

580-590m: Tsugaepollenites igniculus Zone or older (Plio-Pleistocene or older)

580m Veryhachium trispinosum

Degree of Confidence: 1

Remarks: This section of the well contains few palynomorphs and no marker species older than Plio-Pleistocene were observed, but their absence may be due to the scarcity of palynomorphs.

610-1460m: Operculodinium centrocarpum Zone or older (late Miocene or older)

610m **Lingulodinium machaerophorum**
Micrhystridium fragile
Tsugaepollenites igniculus *

640m Spiniferites ramosus

670m Pediastrum boryanum

760m Stereisporites antiquasporites *

970m **Ceratiacean #LA**

1420m Betulaceoipollenites betuloides *
Pterocaryapollenites stellatus *

1420m **Corylus #LA ***

Degree of Confidence: 2

Remarks: An age older than late Miocene cannot be precluded due to the scarcity of palynomorphs in this section of the well.

1480-1640m: Systematophora ancyrea Zone to Cordosphaeridium cantharellum Zone (early to middle Miocene)

1480m Laevigatosporites ovatus *
Microthyrites

1510m Alnipollenites verus *
Osmundacidites claytonites *

1540m Lycopodiumsporites annotinioides *

1570m **Camarozonosporites #LA ***

Degree of Confidence: 1

Remarks: An early to middle Miocene age is tentatively indicated by the occurrence of the fungal genus Microthyrites at 1480-1500m and the fern spore Camarozonosporites #LA at 1570-1590m.

1660-1700m: Chiropteridium mespilanum Zone (late Oligocene)

1660m **Cribroperidinium giuseppei**

Degree of Confidence: 2

Remarks: Evidence for the C. mespilanum Zone is highly tentative, being based on a single specimen of the dinoflagellate C. giuseppei whose stratigraphic range in the Labrador Shelf area is uncertain.

1720-1940m: Areosphaeridium arcuatum Zone (early Oligocene)

1720m **Jusseaia sp., Piel 1971 ***

Degree of Confidence: 2

Remarks: Penetration of lower Oligocene strata is tentative, being based on the occurrence of a single speciment of the pollen Jusseaia sp. of Piel 1971, which is a lower Oligocene marker in British Columbia and the Mackenzie Delta regions.

1960-2330m: Deflandrea #LR Zone (late Eocene)

1960m **Systematophora placacantha**

2050m Liquidambar sp. indet. *

Degree of Confidence: 2

Remarks: Evidence for the penetration of the Deflandrea #LR Zone is tentative, being based on a single specimen of S. placacantha at 1960-1980m.

2350-3160m: Areosphaeridium fenestratum Zone (middle to late Eocene)

2350m	**Areosphaeridium fenestratum**
	Pachysandra sp. indet. *
2620m	Areoligera senonensis (?reworked)
	Cordosphaeridium cantharellum
	Momipites coryloides *
	Quercoidites #LA *
2710m	**Hystrichokolpoma salacium**
2980m	Achilleodinium biformoides
3130m	Dapsilidinium simplex
	Spiniferites ramosus gracilis
3150m	Achomosphaera ramulifera
	Glaphyrocysta intricata

Degree of Confidence: 2

Remarks: A single specimen of the dinoflagellate A. fenestratum at 2350-2370m indicates penetration of the A. fenestratum Zone. It is possible that the top of this zone occurs higher in the well due to the scarcity of palynomorph markers.

3180-3430m: Eocladopyxis #LA Zone (middle Eocene)

3180m	**Ceratiopsis depressa** Homotyblium pallidum (questionable identification) Hystrichosphaeridium patulum Lejeunecysta hyalina
3210m	Deflandrea phosphoritica Lejeunecysta hyalina
3240m	Caryapollenites simplex *
3330m	Tiliaepollenites vescipites
3360m	Cordosphaeridium tiara
3390m	Deflandrea phosphoritica Pterocaryapollenites stellatus *

Degree of Confidence: 2

Remarks: Penetration of the Eocladopyxis #LA Zone is tentative, being based on the occurrence of a single specimen of the dinoflagellate C. depressa at 3180-3200m.

3450-3670m: Trinovantedinium #LA Zone (early Eocene)

3450m	**Trinovantedinium #LA**
3510m	Juglanspollenites nigripites *

3600m Systematophora #LE

3630m Areoligera senonensis

Degree of Confidence: 2 to 3

Remarks: Penetration of the Trinovantedinium #LA Zone is indicated by the presence of rare specimens of Trinovantedinium #LA at 3450-3470m.

3690-3985m: Dracodinium condylos Zone (early Eocene)

3690m **Isabelidinium #LP**
Lingulodinium machaerophorum

3750m Lentinia serrata

3810m Cicatricosisporites paradorogensis *
Glaphyrocysta vicina
Homotryblium pallidum
Rouseisporites #LA *

Degree of Confidence: 2 to 3

Remarks: Penetration of the D. condylos Zone is indicated by the presence of a single specimen of the dinoflagellate Isabelidinium #LP at 2690-2710m.

MICROPALEONTOLOGICAL ZONATION

550-1250m Cassidulina teretis Zone (late Miocene or younger)

1270-2600m No zonal assignment (No age assignment)

Not observed Asterigerina guerichi: Zone (early Miocene or older)

Not observed Asterigerina bartoniana Zone (late Oligocene)

2620-2750m Ceratobulimina contraria Zone (early Oligocene)

2770-3250m Spiroplectammina adamsi Zone (late Eocene)

Not observed Cyclammina amplectens Zone (late Eocene)

3270-3955m Haplophragmoides acutidorsatum Zone (middle Eocene)

3975-3985m Bulimina ovata Zone (early Eocene)

Not observed Karreriella apicularis Zone (early Eocene)

Not observed Spiroplectammina grzybowski Zone (early Eocene)

Not observed Glomospira charoides Zone (late Paleocene)

Not observed Glomospira corona Zone (early Paleocene)

Not observed Praecystammina globigerinaeformis Zone (early Paleocene)

Not observed Rzehakina epigona Zone (Maastrichtian)

Not observed Arenobulimina dorbigny Zone (?Campanian)

SELECTED FORAMINIFERA

550-1250m: Cassidulina teretis Zone (late Miocene or younger)

550m	**Cassidulina teretis**
	Cassidulina subglobosa
	Elphidium roemeri
	Gyroidinoides soldanii
	Elphidium granosum
	Melonis affinis
	Eponides plummerae
	Trifarina gracilis
	Gyroidinoides girardana
640m	**Cibicidoides boueanus**
820m	Pyrulina fusiformis
	Triloculina trigonula
	Elphidium minutum

Degree of Confidence: 2

1270-2600m: No zonal assignment (no age assignment)

1504m	CASING
1540m	Eponides plummerae
	Elphidium roemeri
	Elphidium minutum
2560m	Elphidium roemeri

2590m Trochammina sp. C

2620-2750m: Ceratobulimina contraria Zone (early Oligocene)

2620m **Cibicidoides proprius**

2650m Elphidium minutum

Degree of Confidence: 2

2770-3250m: Spiroplectammina adamsi Zone (late Eocene)

2770m **Cribrostomoides subglobosus**
Trochammina cf. deformis
Alveolophragmium #H 1

2800m **Haplophragmoides walteri**
Cyclammina placenta
Trochamina collyra
Bathysiphon discreta

3070m **Trochammina globigeriniformis**

3130m Trochammina inflata

3180m Ceratobulimina contraria

Degree of Confidence: 3

3270-3955m: Haplophragmoides acutidorsatum Zone (middle Eocene)

3270m	**Haplophragmoides acutidorsatum** Recurvoides walteri Saccammina sphaerica Pullenia bulloides Lenticulina #H 1
3300m	**Budashevaella multicamerata** Ammodiscus cretaceus
3330m	Haplophragmoides eggeri
3390m	Ammodiscus peruvianus
3420m	Cyclammina cancellata Stilostomella midwayensis
3600m	Cyclammina amplectens Trochammina rota
3835m	Bulimina alazanensis Cribrostomoides scitulus

Degree of Confidence: 3

3975-3985:Bulimina ovata Zone (early Eocene)

3975m Bulimina ovata (single specimen)

Degree of Confidence: 3

PALEOBATHYMETRY

550-1100m Inner Neritic to Middle Neritic
Criteria: Elphidium spp., Cassidulina teretis, Gyroidinoides girardana

1180-1190m Inner Neritic
Criteria: Deepest Cassidulina teretis

1270-1520m Non-marine to Transitional
Criteria: Angiosperm pollen, no foraminifera to 1540m.

1540-1635m Transitional to Inner Neritic
Criteria: Elphidium spp.

1720-1730m Transitional to Inner Neritic
Criteria: Common Gyroidinoides soldanii

1810-1820m Inner Neritic to Middle Neritic
Criteria: Angiosperm pollen, rare Gyroidinoides soldanii, Elphidium minutum

1900-1910m Non-marine to Transitional
Criteria: Barren

1960-2090m Transitional to Inner Neritic
Criteria: Marine dinoflagellates, Elphidium granosum

2165-2270m Non-marine to Transitional
Criteria: Angiosperm pollen

PALEOBATHYMETRY (continued)

2350-2360m Transitional to Inner Neritic
Criteria: Marine dinoflagellates

2440-2540m Transitional
Criteria: Marine dinoflagellates

2560-2750m Transitional to Inner Neritic
Criteria: Elphidium spp., Trochammina sp., marine dinoflagellates

2770-2810m Inner Neritic to Middle Neritic
Criteria: Bathysiphon discreta, Cribrostomoides subglobosus, Alveolophragmium #1, Cyclammina placenta

2830-2840m Inner Neritic
Criteria: Melonis affinis, Trochammina sp.

2860-2930m Transitional to Inner Neritic
Criteria: Angiosperm pollen, Melonis affinis

2950-3250m Inner Neritic to Middle Neritic
Criteria: Cribrostomoides cf. subglobosus, Trochammina globigeriniformis, Trochammina inflata

3270-3460m Outer Neritic to Upper Bathyal
Criteria: Haplophragmoides acutidorsatum, Recurvoides walteri, Budashevaella multicamerata, Cyclammina cancellata

PALEOBATHYMETRY (continued)

3480-3520m Outer Neritic
Criteria: Decrease in diversity and abundance

3540-3880m Outer Neritic to Upper Bathyal
Criteria: Cyclammina amplectens, Cribrostomoides scitulus, Bulimina alazanensis

3900-3985m Middle Neritic to Outer Neritic
Criteria: Bulimina ovata (one specimen)

KEROGEN & TAI

Depth	AM	AT	AG	SA	M	BT	ST	I	R	TAI
3420.0	0	0	0	0	5	35	50	10	0	2
3540.0	0	0	0	0	10	30	40	20	0	2+
3630.0	0	5	0	0	5	35	40	15	0	2+
3720.0	0	5	0	0	5	30	40	20	0	2+
3810.0	0	10	0	0	5	30	35	20	0	2+
3900.0	0	5	0	0	5	30	40	20	0	2+
3975.0	0	5	0	0	5	30	40	20	0	2+
3985.0	0	5	0	0	5	30	40	20	0	

KEROGEN, TAI AND VITRINITE REFLECTANCE

The only interval available for kerogen analysis from the well is between 3420-3985m in strata of early to middle Eocene age. Amorphous kerogen is absent throughout this interval, except for rare (5% to 10%) quantities of degraded terrestrial material. Herbaceous kerogen mostly comprises 35%, woody kerogen mostly comprises 40%, and coaly inertinitic kerogen mostly comprises 20% of the total kerogen.

The level of Thermal Alteration increases from a value of 2 in the highest sample at 3420-3440m of middle Eocene age, to a value of 2+ in the underlying interval below 3540m of early Eocene age. This indicates that the herbaceous and woody kerogen below 3540m has some source rock potential for predominantly gaseous thermogenic hydrocarbons.

The following levels of thermal maturity are indicated by vitrinite reflectance analysis.

570m: Immature (Ro% = 0.369%)
760-3150m: Onset of maturation (Ro% = 0.514% to 0.565%)
1740-1230m: Mature (Ro% = 0.795% to 0.964%)
2320-2710m: Immature or caved (Ro% = 0.408% to 0.440%)
2710-3440m: Sample not available
3440-3600m: Onset of maturity (Ro% = 0.472% to 0.515%)
3720-3975m: Indeterminate

The populations of vitrinite found within this well have generally low abundances and wide variability in the reflectance values. Therefore, most readings are tentative. The lower part of the well between 3440m and 4975m contains populations with erratic readings which are therefore unreliable.

VITRINITE REFLECTANCE

Key to Measurement Qualifying Labels

E = Excellent
= Good
P = Poor
C = Caved
R = Reworked

Sample Depth : 570.0

0.170	C	0.298	P	0.315	P	0.365		0.382	P	0.385	P	0.409			
0.430	P	0.514	R	0.530	R	0.553	R	0.557	R	0.563	R	0.572	R		
0.589	R	0.590	R	0.620	R	0.645	R	0.659	R	0.661	R	0.714	R		
0.746	R	0.750	R	0.810	R	0.830	R	0.856	R	0.900	R	0.942	R		
0.978	R	1.047	R	1.088	R	1.122	R	1.163	R	1.164	R	1.175	R		
1.275	R	1.275	R	1.278	P	1.328	R	1.343	R	1.348	R	1.364	R		
1.433	R	1.450	R	1.563	R	1.587	R	1.835	R						

Actual Mean = 0.976 Actual Standard Deviation = 0.409

Edited Mean = 0.369 Edited Standard Deviation = 0.048

Sample Depth : 760.0

0.272	C	0.330		0.363	P	0.367	P	0.370	P	0.392	P	0.401	P		
0.467	P	0.484	P	0.487	P	0.503		0.507		0.527	P	0.530			
0.532	P	0.546	P	0.551		0.568		0.569	P	0.586	P	0.598			
0.614		0.628	P	0.638	P	0.643	P	0.645		0.668	R	0.698	R		
0.727	R	0.734	R	0.740	R	0.790	R	0.880	R	0.949	R	0.970	R		
1.066	R	1.115	R	1.118	R	1.222	R	1.270	R	1.375	R	1.635	R		

Actual Mean = 0.692 Actual Standard Deviation = 0.307

Edited Mean = 0.514 Edited Standard Deviation = 0.097

Sample Depth : 960.0

0.093	C	0.278	C	0.330	C	0.371	C	0.463		0.473		0.480	P
0.485		0.518	P	0.525	P	0.556		0.583	P	0.636	P	0.639	
0.650	P	0.681	R	0.702	R	0.705	R	0.706	R	0.738	R	0.782	R
0.785	R	0.841	R	0.850	R	0.875	R	0.886	R	0.920	R	0.920	R
0.928	R	0.930	R	0.960	R	1.012	R	1.049	R	1.080	R	1.158	R
1.182	R	1.202	R	1.230	R	1.268	R	1.274	R	1.307	R	1.509	R
1.510	R	1.720	R	1.833	R								

Actual Mean = 0.858 Actual Standard Deviation = 0.380

Edited Mean = 0.546 Edited Standard Deviation = 0.071

Sample Depth : 1150.0

0.427	C	0.455	C	0.470	P	0.493	P	0.513	P	0.520		0.533	P
0.551	P	0.554		0.565		0.569		0.569		0.571		0.576	P
0.583	P	0.591		0.618	P	0.623		0.630		0.636	P	0.657	R
0.682	R	0.714	R	0.751	R	0.782	R	0.786	R	0.798	R	0.802	R
0.810	R	0.826	R	0.836	R	0.856	R	0.873	R	0.897	R	0.906	R
0.910	R	0.975	R	1.093	R	1.110	R	1.200	R				

Actual Mean = 0.708 Actual Standard Deviation = 0.190

Edited Mean = 0.565 Edited Standard Deviation = 0.047

Sample Depth : 1350.0

0.203	C	0.292	C	0.341	C	0.432	C	0.443	C	0.469		0.469	
0.470	P	0.538	P	0.589		0.602	E	0.636	P	0.680	R	0.712	R
0.790	R	0.792	R	0.896	R	1.022	R	1.102	R	1.177	R		

Actual Mean = 0.633 Actual Standard Deviation = 0.267

Edited Mean = 0.539 Edited Standard Deviation = 0.071

Sample Depth : 1740.0

0.302		0.490		0.663	P	0.700		0.824	P	0.853		0.932	P
0.963	E	0.996		0.997		1.050	P	1.096	P	1.150		1.209	
1.234		1.452		1.485	P								

Actual Mean = 0.964 Actual Standard Deviation = 0.312

Edited Mean = 0.964 Edited Standard Deviation = 0.312

Sample Depth : 1930.0

0.336	P	0.367	P	0.383	P	0.456	P	0.473		0.475		0.478	P
0.501		0.570	P	0.643	P	0.653	E	0.656		0.659	P	0.720	P
0.838		0.857	P	0.870		0.905		0.926	P	0.994	P	1.025	P
1.063		1.113		1.352		1.615	E	1.747	P				

Actual Mean = 0.795 Actual Standard Deviation = 0.369

Edited Mean = 0.795 Edited Standard Deviation = 0.369

Sample Depth : 2130.0

0.338		0.424	P	0.431		0.666	P	0.689		0.782	P	0.847	
0.880	P	0.911		0.919	P	0.930	P	1.090		1.194		1.400	

Actual Mean = 0.822 Actual Standard Deviation = 0.300

Edited Mean = 0.822 Edited Standard Deviation = 0.300

Sample Depth : 2320.0

0.206	C	0.239	C	0.272	C	0.297	C	0.353		0.357	E	0.361	E
0.365		0.365	E	0.379	E	0.393	E	0.400		0.418	E	0.420	E
0.420	E	0.446		0.502	P	0.540	P	0.610	R	0.866	R	0.957	R

Actual Mean = 0.436 Actual Standard Deviation = 0.184

Edited Mean = 0.408 Edited Standard Deviation = 0.056

Sample Depth : 2520.0

0.252	C	0.285	C	0.301	C	0.302	C	0.326	C	0.362	E	0.378	E
0.380	E	0.387	E	0.395	E	0.398	E	0.400		0.406	E	0.439	E
0.441	E	0.498		0.536	P	0.571	R	1.090	R				

Actual Mean = 0.429 Actual Standard Deviation = 0.180

Edited Mean = 0.418 Edited Standard Deviation = 0.052

Sample Depth : 2710.0

0.190	C	0.230	C	0.242	C	0.280	C	0.308	C	0.311	C	0.349	C
0.380	P	0.410	P	0.413		0.416		0.462	P	0.561	P	0.731	R
0.930	R	1.150	R										

Actual Mean = 0.460 Actual Standard Deviation = 0.265

Edited Mean = 0.440 Edited Standard Deviation = 0.065

Sample Depth : 3440.0

0.328	C	0.395	P	0.397	P	0.402	P	0.406	P	0.433		0.436	
0.438		0.443	P	0.483	P	0.498	P	0.509	P	0.512	P	0.516	P
0.517	P	0.532		0.550		0.552		0.588	R	0.662	R	0.671	R
0.688	R	0.712	R	0.713	R	0.767	R	0.792	R	0.799	R	0.828	R
0.843	R	0.892	R	0.902	R	0.907	R	1.088	R				

Actual Mean = 0.612 Actual Standard Deviation = 0.191

Edited Mean = 0.472 Edited Standard Deviation = 0.056

Sample Depth : 3600.0

0.380	C	0.406	C	0.416	C	0.460		0.475	P	0.481	P	0.502	P
0.519	P	0.550	P	0.556	P	0.574	P	0.727	R	0.756	R	0.792	R
0.810	R	0.816	R	0.864	R	0.959	R						

Actual Mean = 0.613 Actual Standard Deviation = 0.181

Edited Mean = 0.515 Edited Standard Deviation = 0.042

Sample Depth : 3720.0

0.162	C	0.165	C	0.197	C	0.211	C	0.275	C	0.335	C	0.349	C
0.349	C	0.485	C	0.560	P	0.587	P	0.726	P	0.762	P	0.806	P
0.849	P	0.960	R	1.153	R	1.300	R						

Actual Mean = 0.568 Actual Standard Deviation = 0.349

Edited Mean = 0.715 Edited Standard Deviation = 0.117

Sample Depth : 3750.0

0.314	C	0.382	C	0.390	C	0.420	C	0.430	C	0.446	C	0.461	C
0.483	C	0.560	P	0.622	P	0.671	P	1.050	R	1.190	R		

Actual Mean = 0.571 Actual Standard Deviation = 0.264

Edited Mean = 0.618 Edited Standard Deviation = 0.056

Sample Depth : 3895.0

0.483 P

Actual Mean = 0.483 Actual Standard Deviation = 0.000

Edited Mean = 0.483 Edited Standard Deviation = 0.000

Sample Depth : 3975.0

0.360		0.364		0.388		0.400		0.402		0.405		0.425	P
0.438	P	0.464		0.490		0.532		0.533	P	0.562	P	0.588	P
0.698	R	0.704	R	0.705	R	0.791	R	0.980	R	1.025	R	1.348	R

Actual Mean = 0.600 Actual Standard Deviation = 0.257

Edited Mean = 0.454 Edited Standard Deviation = 0.075

Raleigh C-02:

BIOSTRATIGRAPHY AND MATURATION OF

RALEGH C-02

CANTERRA et al RALEGH N-18

GSC locality: 62° 17' 57.16"N, 62° 32' 57.30"W
KB elevation: 12.5m Water depth: 339m
Casing set at: 389m, 692m, 1749.5m
Total depth: 3858m
Interval studied for palynology: 795-3855m
Interval studied for micropaleontology: 795-3855m

CONSENSUS AGE

795- 805m	Plio-Pleistocene or older (P)
825- 895m	late Miocene (P)
915- 985m	middle Miocene (P)
1005-1345m	early Miocene (M)
1365-1495m	early Oligocene (P)
1515-1555m	late Eocene (P)
1575-2575m	middle to late Eocene (P)
2595-2605m	middle Eocene (P)
2625-3505m	early Eocene (P)
3525-3855m	late Paleocene (P)

RALEGH C-02

PALYNOLOGICAL ZONATION

795- 805m	Tsugaepollenites igniculus Zone or older (Plio-Pleistocene or older)
825- 895m	Operculodinium centrocarpum Zone (late Miocene)
915-1345m	Systematophora ancyrea Zone (middle Miocene)
Not observed	Cordosphaeridium cantrocarpum Zone (late Miocene)
Not observed	Chiropteridium mespilanum Zone (late Oligocene)
1365-1495m	Areosphaeridium arcuatum Zone (early Oligocene)
1515-1555m	Deflandrea #LR Zone (late Eocene to early Oligocene)
1575-2575m	Areosphaeridium fenestratum Zone (middle to late Eocene)
2595-2605m	Eocladopyxis #LA Zone (middle Eocene)
2625-2935m	Trinovantedinium #LA Zone (early Eocene)
2955-3505m	Dracodinium condylos Zone (early Eocene)
3525-3655m	Ceratiopsis speciosa Zone (late Paleocene)
3675-3855m	Alisocysta circumtabulata Zone (late Paleocene)

SELECTED PALYNOMORPHS

795-805m: Tsugaepollenites igniculus Zone or older (Plio-Pleistocene or older)

795m Laevigatosporites ovatus *

Degree of Confidence: 1

Remarks: A Plio-Pleistocene or older age is assigned to the highest sample available for analysis from the well due to the scarcity of palynomorphs. It is possible that the sample is Miocene and that age-diagnostic species were not observed due to the general scarcity of palynomorphs.

825-895m: Operculodinium centrocarpum Zone (late Miocene)

825m **Ceratiacean #LA**
Corylus #LA *
Quercoidites #LA * (?reworked)
Quercoidites #LV * (?reworked)
Stereisporites antiquasporites *

Degree of Confidence: 2

Remarks: A tentative late Miocene age is indicated by the occurrence of the dinoflagellate Ceratiacean #LA and the pollen Corylus #LA, although the stratigraphic ranges of these taxa are uncertain on the Labrador Shelf. Rare specimens of the angiosperm pollen species Quercoidites #LA and Quercoidites #LV may be reworked. In most of the wells examined from the Labrador Shelf during the present study, these species appear to be restricted to lower Oligocene and older strat, but their stratigraphic ranges are uncertain.

915-1345m: Systematophora ancyrea Zone (middle Miocene)

915m	**Camarozonosporites #LA** *
	Operculodinium centrocarpum
1035m	Osmundacidites claytonites *
1335m	Lycopodiumsporites annotinioides *
	Spiniferites pseudofurcatus
	Spiniferites ramosus

Degree of Confidence: 2

Remarks: Tentative assignment to the middle Miocene S. ancyrea Zone is indicated at 915-935m by the presence of the spore Camarozonosporites #LA. A more definite middle Miocene age is indicated by the occurrence of the dinoflagellate S. pseudofurcatus at 1335-1355m.

1365-1495m: Areosphaeridium arcuatum Zone (early Oligocene)

1365m	Alnipollenites verus *
	Carpinipites #LT *
	Ericipites antecursorioides *
	Ilexpollenites margaritus *
	Pterocaryapollenites stellatus *
	Selaginella selaginoides *
1425m	Chiropteridium mespilanum
	Cyclonephelium sp. A, Williams & Brideaux 1975

Dinopterygium cladoides
Deflandrea #LB (?reworked)

1455m Deflandrea phosphoritica
Membranophoridium aspinatum

Degree of Confidence: 1

Remarks: A highly tentative assignment to the A. arcuatum Zone is indicated at 1365-1385m by the presence of the pollen E. antecursorioides. A more definite assignment to the A. arcuatum Zone is indicated at 1425-1445m by the occurrence of the dinoflagellate species Cyclonephelium sp. A of Williams & Brideaux 1975 and D. cladoides.

1515-1555m: Deflandrea #LR Zone (late Eocene to early Oligocene)

1515m Cordosphaeridium cantharellum
Hystrichokolpoma rigaudiae
Rouseisporites #LA *

1545m **Azolla * (common)**
Dapsilidinium pastielsii

Degree of Confidence: 1

Remarks: A highly tentative assignment to the Deflandrea #LR Zone is indicated at 1515-1535m by the occurrence of the spore Rouseisporites #LA, although the stratigraphic range of this species on the Labrador Shelf is uncertain.

1575-2575m: Areosphaeridium fenestratum Zone (middle to late Eocene)

1575m	**Cicatricososporites auritus** *
1605m	**Areosphaeridium multicornutum** (small) Phthanoperidinium sp. indet. Tiliaepollenites crassipites *
1845m	Quercoidites #LG *
1875m	Ericipites compactipolleniatus *
1905m	Deflandrea #LR
1935m	Retitricolpites #LF *
1995m	**Bombacacidites bombacoides** * Caryapollenites simplex *
2205m	Castanea #LA * Retitricolpites #LA *
2295m	Cicatricosisporites paradorogensis *
2385m	Hystrichosphaeridium patulum Lingulodinium machaerophorum Retitricolpites #LL *
2415m	Paralecaniella indentata Phthanoperidinium alectrolophum
2445m	**Systematophora placacantha**

Degree of Confidence: 2

Remarks: Assignment of this interval to the A. fenestratum Zone is tentatively indicated by the presence of the spore C. auritus at 1575-1595m. This is supported by the occurrence of the dinoflagellate A. multicornutum (small form) at 1605-1625m, although the full stratigraphic range of this species is uncertain on the Labrador Shelf. Deeper in the interval at 1995-2015m, the pollen B. bombacoides also supports the age assignment.

2595-2605m: Eocladopyxis #LA Zone (middle Eocene)

2595m	Fagus #LA *
	Glaphyrocysta ordinata
	Homotryblium oceanicum
	Homotryblium pallidum
	Momipites triradiatus *
	Wetzeliella articulata
	Wetzeliella ovalis

Degree of Confidence: 2

Remarks: No marker species for the Eocladopyxis #LA Zone were observed in the well other than the dinoflagellate H. oceanicum at 2595-2615m indicating tentative assignment of the sample to this zone.

2625-2935m: Trinovantedinium #LA Zone (early Eocene)

2625m	**Trinovantedinium #LA**
	Trinovantedinium #LL
	Ulmipollenites undulosus *

2715m	Betulaceoipollenites betuloides *
	Momipites coryloides *
2745m	Dapsilidinium simplex
	Diphyes colligerum
	Luxadinium #LA
	Momipites tenuipolus *
2775m	Areoligera senonensis
	Apectodinium homomorphum
2835m	Pistillipollenites mcgregorii *
2895m	Apectodinium hyperacanthum
	Dracodinium simile
	Polysphaeridium subtile
	Systematophora #LC

Degree of Confidence: 4

Remarks: The Trinovantedinium #LA Zone is indicated with greater confidence than are the overlying zones from the well.

2955-3505m: Dracodinium condylos Zone (early Eocene)

2955m	**Isabelidinium #LP**
3105m	Heteraulacacysta leptalea

3165m	**Apectodinium homomorphum (common)**
	Cleistosphaeridium insolitum
3225m	**Areoligera senonensis (common)**
	Cordosphaeridium tiara
3255m	**Apectodinium homomorphum (frequent)**
	Apectodinium hyperacanthum (common)
3315m	Homotryblium tenuispinosum
	Hystrichokolpoma salacium
	Kisselovia coleothrypta
	Spiniferites monilis
3375m	**Areoligera senonensis (abundant)**
	Ceratiopsis pannucea
	Lentinia wetzelii
3435m	Cordosphaeridium gracile
	Isabelidinium cooksoniae (?reworked)
3465m	**Apectodinium augustum**
	Achomosphaera alcicornu
	Chatangiella verrucosa (reworked)
	Cribroperidinium giuseppei
	Manumiella cretacea (reworked)
	Turbiosphaera filosa

Degree of Confidence: 4

Remarks: Penetration of the D. condylos Zone is strongly indicated by the occurrence of the dinoflagellate Isabelidinium #LP at 2955-2975m. Other indications for the penetration of this zone are abundances of Apectodinium and Areoligera species as indicated above in bold text. The species Dracocodinium condylos and D. solodinium, which are also markers for the zone, were not observed in the well.

3525-3655m: Ceratiopsis speciosa Zone (late Paleocene)

3525m	**Ceratiopsis speciosa speciosa** Hafniasphaera septata
3585m	**Ceratiopsis speciosa glabra**
3615m	**Alisocysta #LA** **Pervosphaeridium pseudhystrichodinium** **Paraalnipollenites confusus** *

Degree of Confidence: 4

3675-3855m: Alisocysta circumtabulata Zone (late Paleocene)

3675m	**Eisenackia crassitabulata**
3705m	Laciniadinium biconiculatum (reworked)
3795m	**Alisocysta circumtabulata** Deflandrea denticulata

Degree of Confidence: 4

Remarks Penetration of the A. circumtabulata Zone is strongly indicated by the occurrence of E. crassitabulata and A. circumtabulata at 3675-3695m and 3795-3815m respectively. A specimen of the Late Cretaceous dinoflagellate L. biconiculatum is interpretated to be reworked at 3705-3725m.

MICROPALEONTOLOGICAL ZONATION

795- 985m No zonal assignment (No age assignment)

Not observed Cassidulina teretis Zone (late Miocene or younger)

1005-1555m Asterigerina guerichi Zone (early Miocene or older)

1575-3385m No zonal assignment (No age assignment)

Not observed Asterigerina bartoniana Zone (late Oligocene)

Not observed Ceratobulimina contraria Zone (early Oligocene)

Not observed Spiroplectammina adamsi Zone (late Eocene)

Not observed Cyclammina amplectens Zone (late Eocene)

Not observed Haplophragmoides acutidorsatum Zone (middle Eocene)

Not observed Bulimina ovata Zone (early Eocene)

Not observed Karreriella apicularis Zone (early Eocene)

3405-3855m Spiroplectammina grzybowski Zone (early Eocene)

Not observed Glomospira charoides Zone (late Paleocene)

Not observed Glomospira corona Zone (early Paleocene)

Not observed Praecystammina globigerinaeformis Zone (early Paleocene)

Not observed Rzehakina epigona Zone (Maastrichtian)

Not observed Arenobulimina dorbigny Zone (Campanian?)

SELECTED FORAMINIFERA

795-985m: No zonal assignment (No age assignment)

1005-1555m: Asterigerina guerichi Zone (early Miocene or older)

1005m	**Asterigerina guerichi**
	Heterolepa sp.
	Discorbis quadrata
1125m	Anomalinoides cf. midwayensis
	Acarinina sp.
1155m	Rhizammina indivisa
1425m	Guttulina problema
	Nodosaria sp.
1455m	Globulina gibba
	Pseudopolymorphina obscura
	Quinqueloculina carinata
	Lenticulina costata

Degree of Confidence: 3

1575-3385m: No zonal assignment (No age assignment)

2835m	Asterigerina guerichi (caved)
3315m	Trochammina sp.

3375m *Gyroidina* sp.

3405-3855m: Spiroplectammina grzybowski Zone (early Eocene)

3405m **Trochamminoides cf. subtrullisatus**
Haplophragmoides eggeri
Trochammina deformis
Saccammina sphaerica

3435m **Trochamminoides subtrullisatus**
Bathysiphon discreta
Bulimina ovata

3465m **Spiroplectammina grzybowski**
Bulimina quadrata
Lenticulina decorata
Spiroplectammina mexiaensis
Karreriella apicularis
Recurvoides walteri

3555m *Haplophragmoides walteri*
Bathysiphon discreta
Trochammina deformis

3615m *Spiroplectammina adamsi*
Haplophragmoides eggeri

3645m *Saccammina* sp.

3675m *Bulimina ovata*

3705m	Saccammina sphaerica
3735m	Bulimina sp.
3765m	**Allomorphina sp.** Cyclammina placenta

Degree of Confidence: 3

PALEOBATHYMETRY

795- 985m Non-marine to Transitional
Criteria: No foraminifera, angiosperm pollen

1005-1105m Inner Neritic
Criteria: Asterigerina guerichi, Discorbis quadrata

1125-1195m Inner Neritic to Middle Neritic
Criteria: Acarinina sp., Rhizammina indivisa?

1215-1375m Non-marine to Transitional
Criteria: No foraminifera, angiosperm pollen, rare marine dinoflagellates

1395-1555m Inner Neritic
Criteria: Guttulina problema, Quinqueloculina carinata, fragments of molluscs

1575-1765m Transitional to Inner Neritic
Criteria: No foraminifera, fragments of pelecypod, scaphopods

1785-3295m Non-marine
Criteria: Wood, coal

3315-3355m Transitional to Inner Neritic
Criteria: Trochammina sp.

3375-3385m Inner Neritic
Criteria: Gyroidina sp.

3405-3415m	Middle Neritic
Criteria:	Haplophragmoides eggeri, Saccammina sphaerica
3435-3445m	Middle Neritic to Outer Neritic
Criteria:	Bathysiphon discreta, Trochamminoides subtrullisatus
3465-3475m	Outer Neritic to Upper Bathyal
Criteria:	Recurvoides walteri, Karreriella apicularis
3495-3595m	Middle Neritic to Outer Neritic
Criteria:	Decrease in abundance and diversity, Bathysiphon discreta
3615-3805m	Inner Neritic to Middle Neritic
Criteria:	Ostracods, Haplophragmoides walteri, Cyclammina placenta
3825-3855m	Transitional to Inner Neritic
Criteria:	Marine dinoflagellates

KEROGEN & TAI

Depth	AM	AT	AG	SA	M	BT	ST	I	R	TAI
2955.0	0	0	0	0	10	25	50	15	0	2-2
3045.0	0	0	0	5	10	25	45	15	0	2-2
3135.0	0	0	0	0	10	25	50	15	0	2
3225.0	0	0	0	0	10	35	50	5	0	2
3315.0	0	0	0	0	10	35	45	10	0	2
3405.0	0	0	0	0	10	30	50	10	0	2
3495.0	0	0	0	0	10	20	50	20	0	2
3585.0	0	0	0	0	15	25	50	10	0	2
3675.0	0	0	0	0	15	20	50	10	0	2+
3765.0	0	0	0	0	15	20	50	15	0	2+
3845.0	0	0	0	0	5	20	45	15	0	2+
3855.0	0	0	0	0	5	20	45	15	0	

KEROGEN, TAI AND VITRINITE REFLECTANCE

The only samples available for kerogen analysis in this well are between 2955-3855m in strata of late Paleocene and early Eocene age. The relative abundances of kerogen types remain constant within this section. No amorphous kerogen was observed, with herbaceous kerogen generally comprising from 30% to 40%, woody kerogen comprising from 45% to 50%, and coaly inertinitic kerogen generally comprising from 10% to 15% of the total kerogen content.

The level of Thermal Alteration increases from a value of 2⁻ to 2 at 2955m, to a value of 2 below 3135m, to a value of 2+ below 3675m in strata of late Paleocene age. The kerogen types and level of Thermal Alteration indicate some source rock potential for predominantly gaseous hydrocarbons from the herbaceous and woody kerogen below 3675m.

The following levels of thermal maturity are indicated by vitrinite reflectance analysis.

1200-1780m: Indeterminate
1780-2470m: No samples available
2470-3315m: Immature (Ro% = 0.383% to 0.478%)
3435-3525m: Onset of maturity (Ro% = 0.528%)
3585-3825m: Mature (Ro% = 0.603% to 0.815%)

In the upper portions of the well, low abundancies of in situ vitrinite are present associated with predominantly reworked vitrinite populations. In the lower portions of the well between 3435m and 3825m, cavings are persistent and are associated with widely diverse populations of in situ and reworked vitrinite populations.

VITRINITE REFLECTANCE

Key to Measurement Qualifying Labels

E = Excellent
= Good
P = Poor
C = Caved
R = Reworked

Sample Depth : 1200.0

0.148	C	0.220	C	0.350	P	0.452	P	0.630	R	0.649	R	0.730	R
0.781	R	0.804	R	0.848	R	0.923	R	1.096	R	1.274	R		

Actual Mean = 0.685 Actual Standard Deviation = 0.329

Edited Mean = 0.401 Edited Standard Deviation = 0.072

Sample Depth : 1390.0

0.560	R	0.835	R	0.991	R	1.099	R	1.151	R	1.288	R		

Actual Mean = 0.987 Actual Standard Deviation = 0.259

Sample Depth : 1590.0

0.271	C	0.398	P	0.446	P	0.461		0.535	P	0.570	P	0.668	R
0.682	R	0.687	R	0.718	R	0.762	R	0.861	R	0.915	R	0.935	R
0.966	R	1.052	R	1.152	R	1.281	R	1.513	R				

Actual Mean = 0.783 Actual Standard Deviation = 0.320

Edited Mean = 0.482 Edited Standard Deviation = 0.070

Sample Depth : 1780.0

0.307	P	0.606	R	0.662	R

Actual Mean = 0.525 Actual Standard Deviation = 0.191

Edited Mean = 0.307 Edited Standard Deviation = 0.000

Sample Depth : 2470.0

0.278	C	0.280	C	0.301	C	0.327	E	0.329	P	0.350	E	0.360
0.371	E	0.403	E	0.405	E	0.430	E	0.430		0.440	E	0.442
0.454	E	0.479	E	0.485	P	0.793	R	0.836	R			

Actual Mean = 0.431 Actual Standard Deviation = 0.149

Edited Mean = 0.408 Edited Standard Deviation = 0.053

Sample Depth : 2640.0

0.254	C	0.254	C	0.335	C	0.358	C	0.378	C	0.378	C	0.388	C
0.394		0.400	E	0.406		0.414	P	0.418		0.422		0.436	
0.438	E	0.443	E	0.455		0.462		0.475	E	0.493	E	0.494	E
0.498	E	0.505	E	0.516	E	0.523	E	0.531	E	0.532	E	0.536	E
0.536	E	0.545	E	0.550	E	0.552		0.745	R	0.776	R	0.901	R

Actual Mean = 0.478 Actual Standard Deviation = 0.129

Edited Mean = 0.479 Edited Standard Deviation = 0.053

Sample Depth : 2820.0

0.263	C	0.358		0.366	E	0.378		0.381		0.388	E	0.389	E
0.394		0.400	E	0.402	E	0.405		0.422		0.430	E	0.444	E
0.446		0.458	E	0.520		0.523	E	0.528	E	1.065	R		

Actual Mean = 0.448 Actual Standard Deviation = 0.158

Edited Mean = 0.424 Edited Standard Deviation = 0.053

Sample Depth : 2985.0

0.000

Actual Mean = 0.000 Actual Standard Deviation = 0.000

Edited Mean = 0.000 Edited Standard Deviation = 0.000

Sample Depth : 3105.0

0.225	C	0.234	C	0.248	C	0.263	C	0.264	C	0.267	C	0.270	C
0.292	C	0.296	C	0.308	C	0.318	C	0.318	C	0.330		0.333	
0.342		0.362		0.366		0.370	P	0.387		0.392		0.444	
0.499		0.589	R										

Actual Mean = 0.336 Actual Standard Deviation = 0.087

Edited Mean = 0.383 Edited Standard Deviation = 0.053

Sample Depth : 3255.0

1.367 R

Actual Mean = 1.367 Actual Standard Deviation = 0.000

Sample Depth : 3315.0

0.259	C	0.291	C	0.298	C	0.335	C	0.410		0.		0.435	P
0.437		0.520	P										

Actual Mean = 0.379 Actual Standard Deviation = 0.087

Edited Mean = 0.446 Edited Standard Deviation = 0.043

Sample Depth : 3435.0

0.258	C	0.282	C	0.374	C	0.592	P	0.678	P	0.792	P	1.065	R

Actual Mean = 0.577 Actual Standard Deviation = 0.296

Edited Mean = 0.687 Edited Standard Deviation = 0.100

Sample Depth : 3525.0

0.108	C	0.174	C	0.178	C	0.181	C	0.340	C	0.346	C	0.390	C
0.435	P	0.436	P	0.458		0.467		0.477	P	0.509		0.514	
0.540	P	0.581		0.599		0.654	P	0.662	P	0.746	R	0.835	R
0.852	R	0.859	R	0.928	R	0.976	R	0.986	R	1.072	R	1.120	R
1.129	R	1.165	R										

Actual Mean = 0.624 Actual Standard Deviation = 0.309

Edited Mean = 0.528 Edited Standard Deviation = 0.080

Sample Depth : 3585.0

0.220	C	0.239	C	0.240	C	0.252	C	0.340	C	0.340	C	0.352	C
0.356	C	0.386	C	0.393	C	0.438		0.448	P	0.450		0.453	P
0.484	E	0.531	P	0.553	P	0.589	P	0.684	P	0.689	P	0.710	P
0.786	P	0.791	P	0.836	E	0.898	R	0.918	R	0.971	R	1.028	R
1.202	R	1.276	R										

Actual Mean = 0.595 Actual Standard Deviation = 0.292

Edited Mean = 0.603 Edited Standard Deviation = 0.144

Sample Depth : 3615.0

0.210	C	0.366	C	0.545		0.549		0.561		0.592		0.615	P
0.630	P	0.658	P	0.660	P	0.683		0.713	P	0.732		0.740	
0.760		0.788		0.814		0.898	R	0.917	R	0.997	R	1.062	R
1.101	R	1.170	R	1.385	R								

Actual Mean = 0.756 Actual Standard Deviation = 0.260

Edited Mean = 0.669 Edited Standard Deviation = 0.087

Sample Depth : 3645.0

0.282	C	0.296	C	0.307	C	0.313	C	0.320	C	0.356	C	0.370	C
0.395	C	0.417	C	0.463	C	0.47[illegible]	C	0.498	C	0.637	P	0.646	P
0.658		0.660	P	0.700	P	0.7[illegible]0	P	0.818	P	0.828	P	0.863	
0.891		0.977	R	1.707	R								

Actual Mean = 0.609 Actual Standard Deviation = 0.319

Edited Mean = 0.745 Edited Standard Deviation = 0.098

Sample Depth : 3675.0

0.210	C	0.221	C	0.272	C	0.281	C	0.292	C	0.310	C	0.333	C
0.334	C	0.352	C	0.358	C	0.373	C	0.375	C	0.412	C	0.414	C
0.417	C	0.417	C	0.448	C	0.475	C	0.486	C	0.500	C	0.502	C
0.533	C	0.540	C	0.550	C	0.555	C	0.657	P	0.663	P	0.663	P
0.668	P	0.726	P	0.768	P	0.786	P	0.790	P	0.807	P	0.810	
0.811	P	0.832	P	0.840	P	0.843	P	0.856		0.860		0.867	
0.875	P	0.922	P	0.950	P	0.953	P	0.976	P	1.070	R	1.213	R

Actual Mean = 0.616 Actual Standard Deviation = 0.252

Edited Mean = 0.815 Edited Standard Deviation = 0.095

Sample Depth : 3705.0

0.287	C	0.328	C	0.423	C	0.430	C	0.449	C	0.452	C	0.488	C
0.536	C	0.619	P	0.636	P	0.656	P	0.803	P	0.810	P	0.830	P
1.279	R												

Actual Mean = 0.602 Actual Standard Deviation = 0.253

Edited Mean = 0.720 Edited Standard Deviation = 0.098

Sample Depth : 3735.0

0.229	C	0.318	C	0.330	C	0.420	C	0.439	C	0.480	C	0.520	C
0.596	P	0.650	P	0.670	P	0.690	P	0.710	P	0.717	P	0.773	P
0.790	P	0.792	P	0.813	P	0.849		0.865	P	0.891		0.976	R
1.022	R	1.049	R	1.053	R	1.230	R						

Actual Mean = 0.715 Actual Standard Deviation = 0.256

Edited Mean = 0.754 Edited Standard Deviation = 0.090

Sample Depth : 3765.0

0.259	C	0.392	C	0.405	C	0.450	C	0.482	C	0.563	C	0.646	P
0.667	P	0.711	P	0.758	P	0.764	P	0.765		0.796	P	0.825	P
0.856	P	0.867	P	0.886	P	1.155	R						

Actual Mean = 0.680 Actual Standard Deviation = 0.221

Edited Mean = 0.776 Edited Standard Deviation = 0.079

Sample Depth : 3795.0

0.233	C	0.481	C	0.580	P	0.629	P	0.737	P	0.863	

Actual Mean = 0.587 Actual Standard Deviation = 0.218

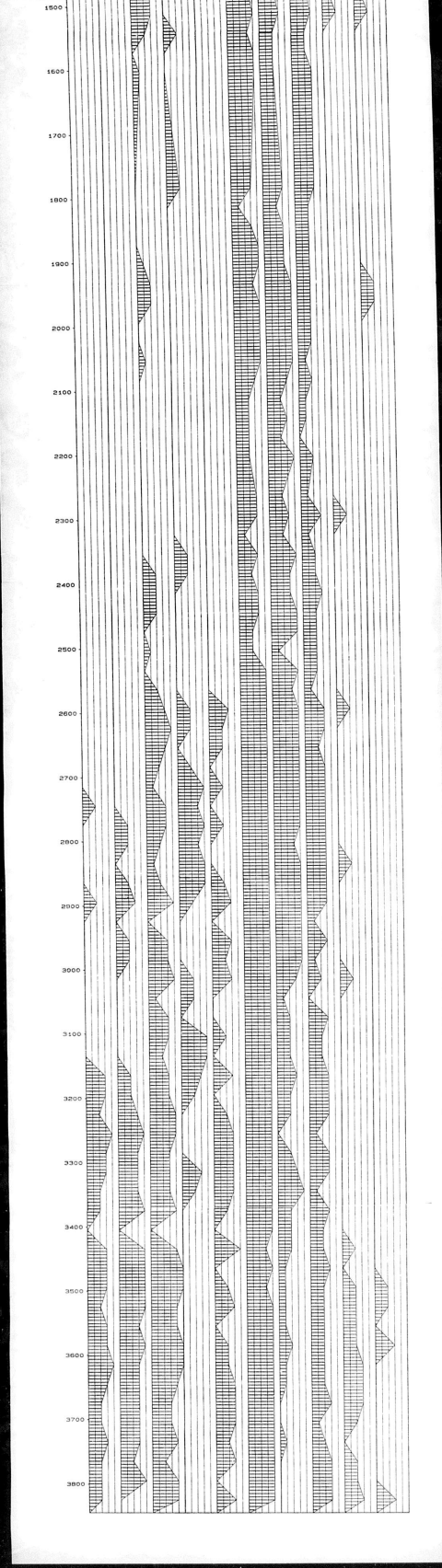
Edited Mean = 0.702 Edited Standard Deviation = 0.126

Sample Depth : 3825.0

0.207	C	0.314	C	0.398	C	0.423	C	0.453	C	0.641	P	0.690	P
0.693	P	0.780	P	0.832	P	0.939	P	1.032	R	1.133	R	1.243	R

Actual Mean = 0.698 Actual Standard Deviation = 0.316

Edited Mean = 0.763 Edited Standard Deviation = 0.111


1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800

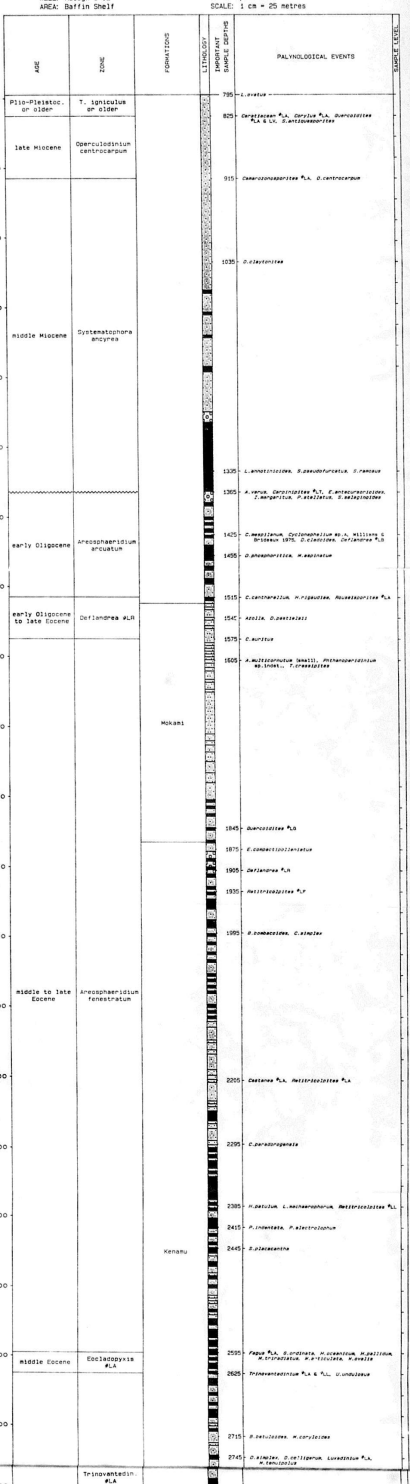
1500
1400
1300
1200
1100
900
800
P R C A D
Apectodinium homomorphum
Areoligera senonesis
Marine Dinoflagellate
Azolla
Pediastrum
Gymnosperm Pollen
Angiosperm Pollen
Spores
Upper Cretaceous Reworking
Lower Cretaceous Reworking

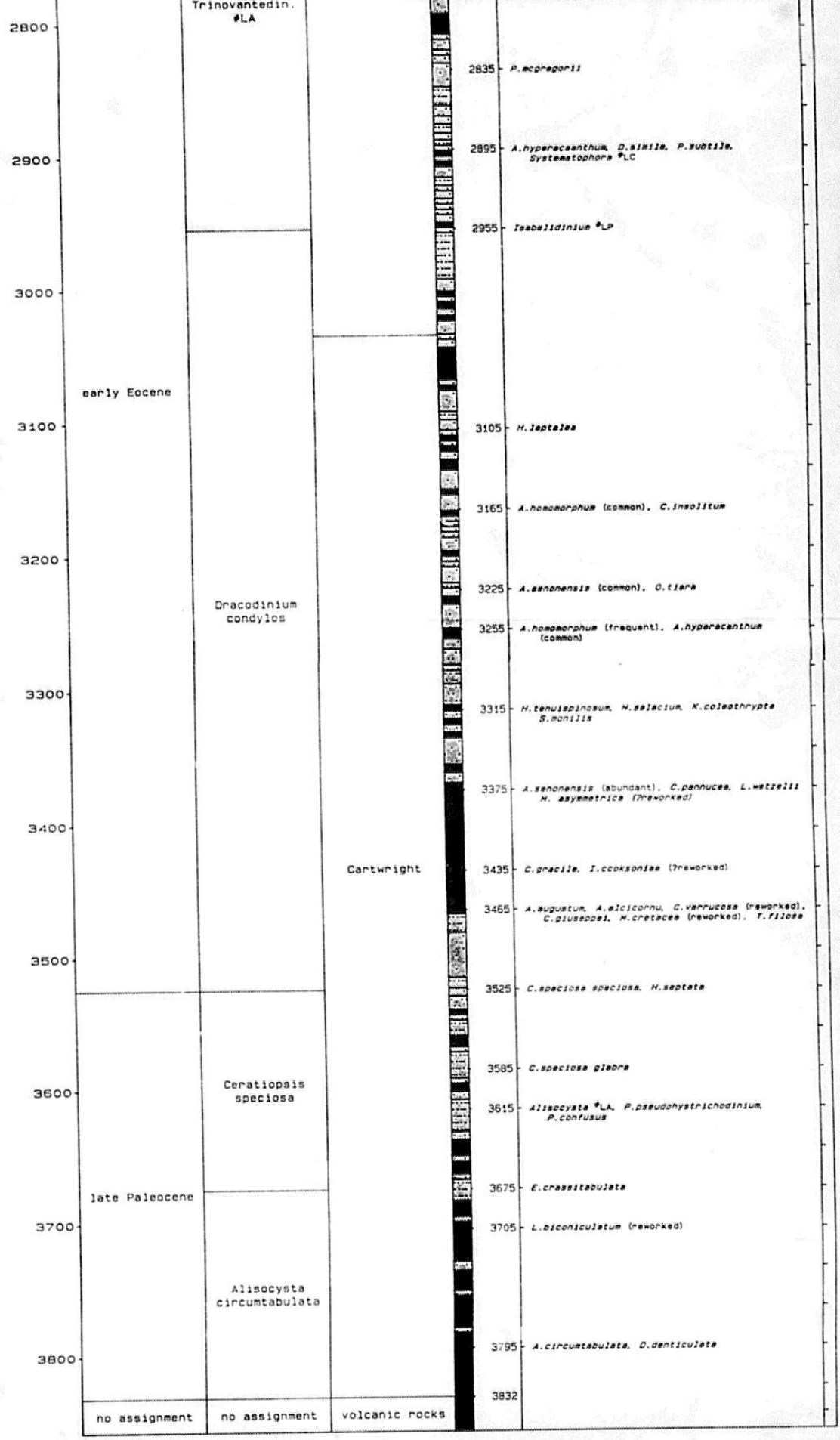
PALYNOLOGICAL ANALYSIS CHART

BUJAK DAVIES GROUP

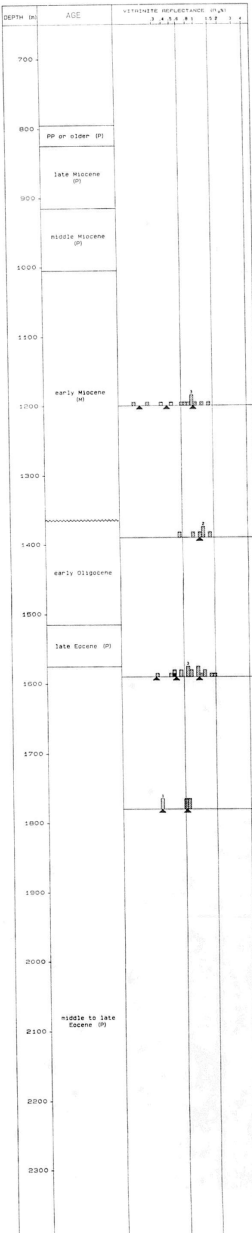
CLIENT: G.S.C.
WELL: Raleigh C-02
AREA: Baffin Shelf

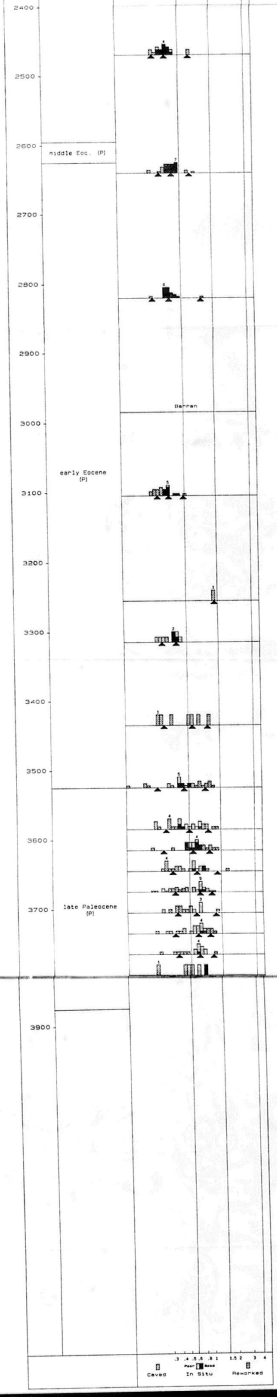
SCIENTIST: Bujak Davies Group
DATE: April 1987
SCALE: 1 cm = 25 metres

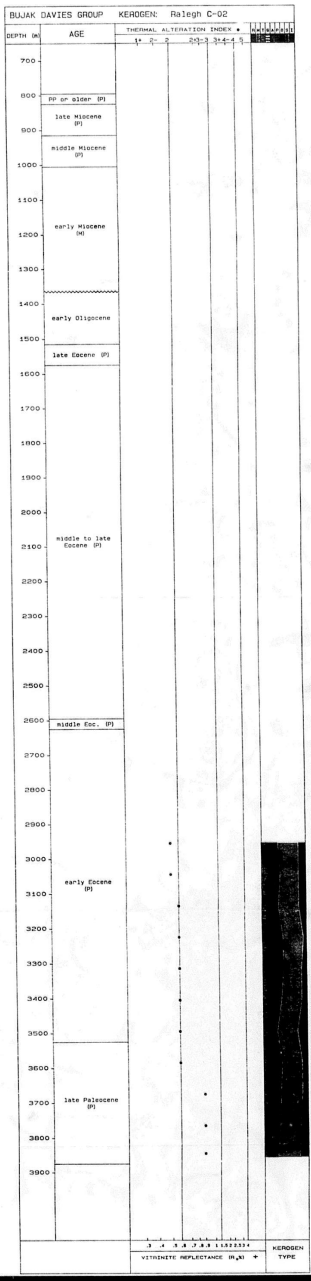



2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
Trinovantedin. #LA
Dracodinium condylos
Ceratiopsis speciosa
Alisocysta circumtabulata
early Eocene
late Paleocene
Cartwright
no assignment
no assignment
volcanic rocks
2835 P.mcgregorii
2895 A.hyperacanthum, D.simile, P.subtile, Systematophora #LC
2955 Isabelidinium #LP
3105 H.leptalea
3165 A.homomorphum (common), C.insolitum
3225 A.senonensis (common), O.tiara
3255 A.homomorphum (frequent), A.hyperacanthum (common)
3315 H.tenuispinosum, H.salacium, K.coleothrypta S.monilis
3375 A.senonensis (abundant), C.pannucea, L.wetzelii H. asymmetrica (?reworked)
3435 C.gracile, I.cooksoniae (?reworked)
3465 A.augustum, A.alicornu, C.verrucosa (reworked), C.giuseppei, H.cretacea (reworked), T.filosa
3525 C.speciosa speciosa, H.septata
3585 C.speciosa glabra
3615 Alisocysta #LA, P.pseudohystrichodinium, P.confusus
3675 E.crassitabulata
3705 L.biconiculatum (reworked)
3795 A.circumtabulata, D.denticulata
3832

BUJAK DAVIES GROUP VITRINITE: Raleigh C-02




2400
2500
2600
middle Eoc. (P)
2700
2800
2900
Barren
3000
early Eocene
(P)
3100
3200
3300
3400
3500
3600
3700
late Paleocene
(P)
3900
.3 .4 .6 .8 1 1.2 3 4
Caved
In Situ
Reworked

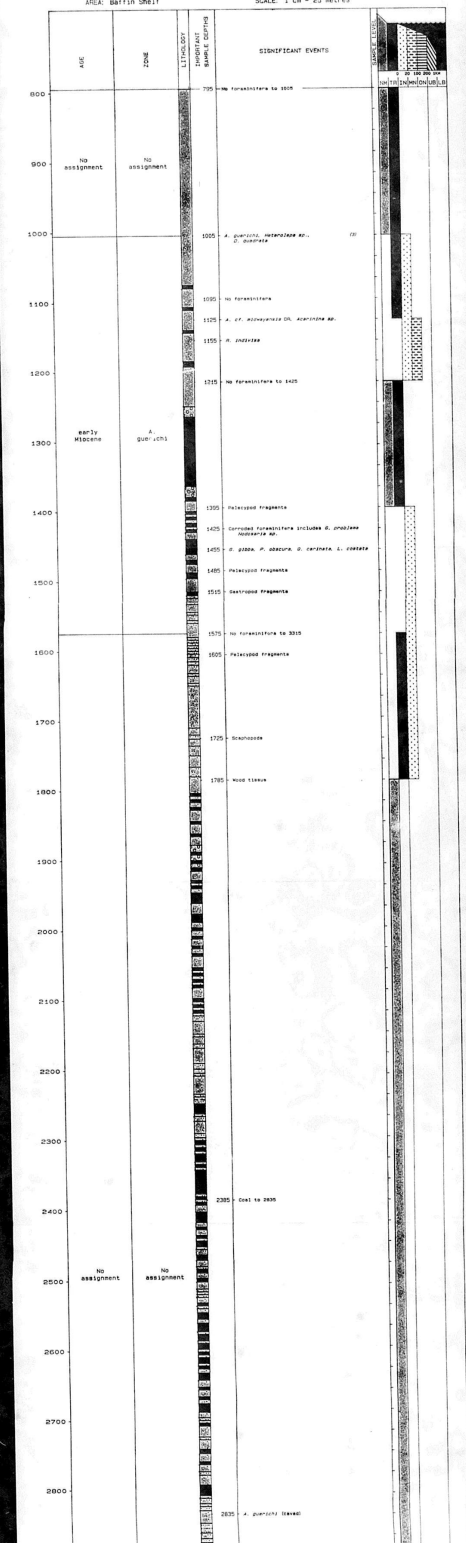

BUJAK DAVIES GROUP
KEROGEN: Ralegh C-02
DEPTH (m)
AGE
THERMAL ALTERATION INDEX
1+ 2- 2 2+ 3 3+ 4- 4 5
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
PP or older (P)
late Miocene (P)
middle Miocene (P)
early Miocene (M)
early Oligocene
late Eocene (P)
middle to late Eocene (P)
middle Eoc. (P)
early Eocene (P)
late Paleocene (P)
.3 .4 .5 .6 .7 .8 .9 1 1.5 2 2.5 3 4
VITRINITE REFLECTANCE (Rm%)
KEROGEN TYPE

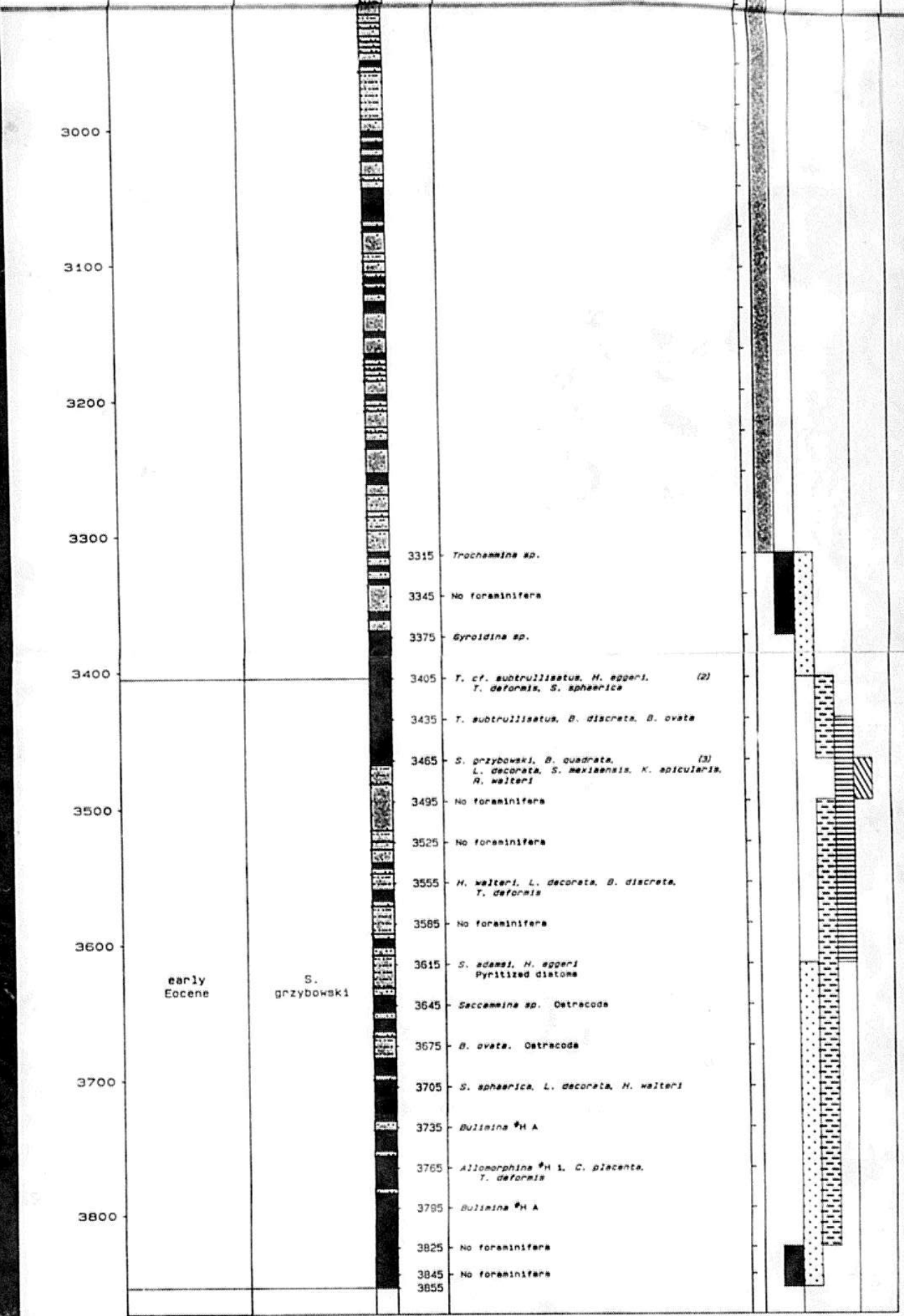
MICROPALEONTOLOGICAL ANALYSIS CHART

BUJAK DAVIES GROUP

CLIENT: G.S.C.
WELL: Raleigh C-02
AREA: Baffin Shelf

SCIENTIST: Bujak Davies Group
DATE: April 1987
SCALE: 1 cm = 25 metres



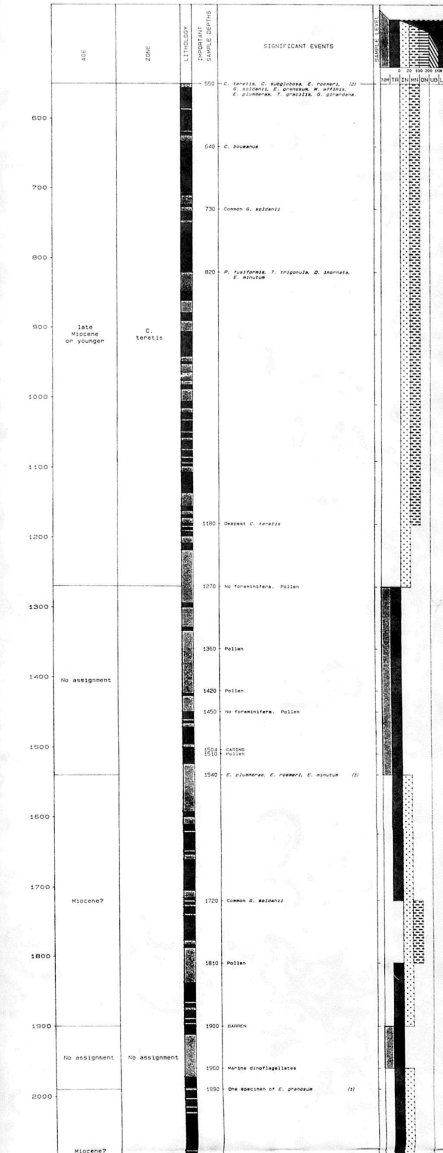

3000
3100
3200
3300
3400
3500
3600
3700
3800
early Eocene
S. grzybowski
3315 Trochammina sp.
3345 No foraminifera
3375 Gyroidina sp.
3405 T. cf. subtrullisatus, H. eggeri, T. deformis, S. sphaerica (2)
3435 T. subtrullisatus, B. discreta, B. ovata
3465 S. grzybowski, B. quadrata, L. decorata, S. mexicensis, K. spicularis, R. walteri (3)
3495 No foraminifera
3525 No foraminifera
3555 H. walteri, L. decorata, B. discreta, T. deformis
3585 No foraminifera
3615 S. adamsi, H. eggeri Pyritized diatoms
3645 Saccammina sp. Ostracods
3675 B. ovata. Ostracods
3705 S. sphaerica, L. decorata, H. walteri
3735 Bulimina ?H A
3765 Allomorphina ?H 1, C. placenta, T. deformis
3795 Bulimina ?H A
3825 No foraminifera
3845 No foraminifera
3855

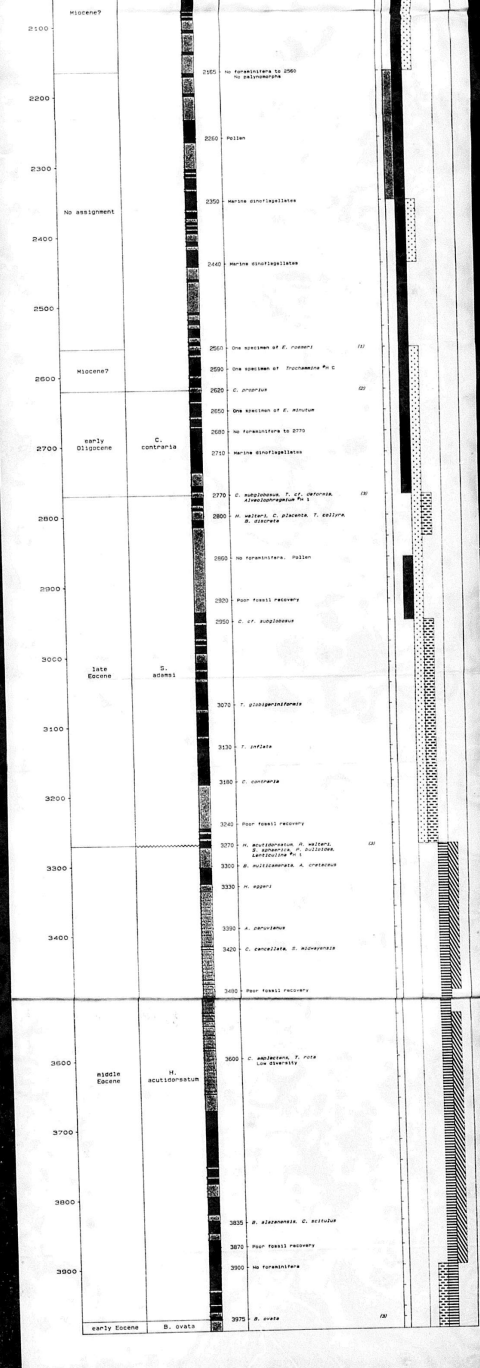
MICROPALEONTOLOGICAL ANALYSIS CHART

BUJAK DAVIES GROUP

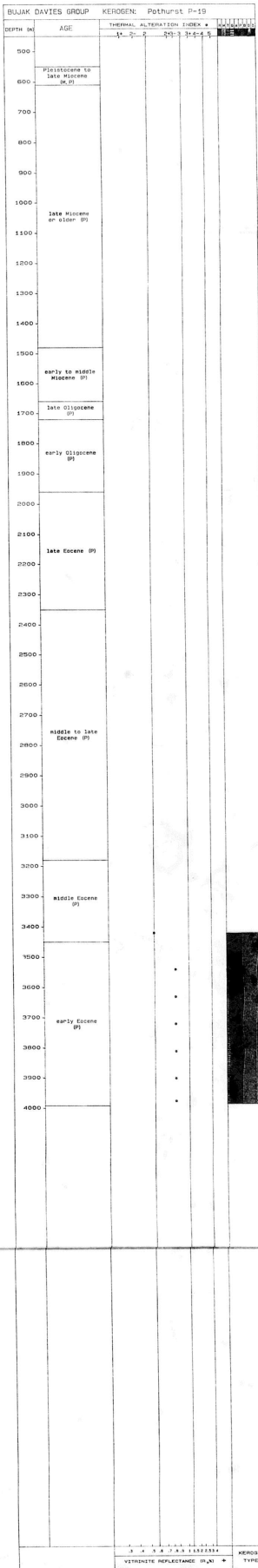
CLIENT: G.S.C.
WELL: Pothurst P-19
AREA: Labrador Shelf

SCIENTIST: Bujak Davies Group
DATE: April 1987
SCALE: 1 cm = 25 metres

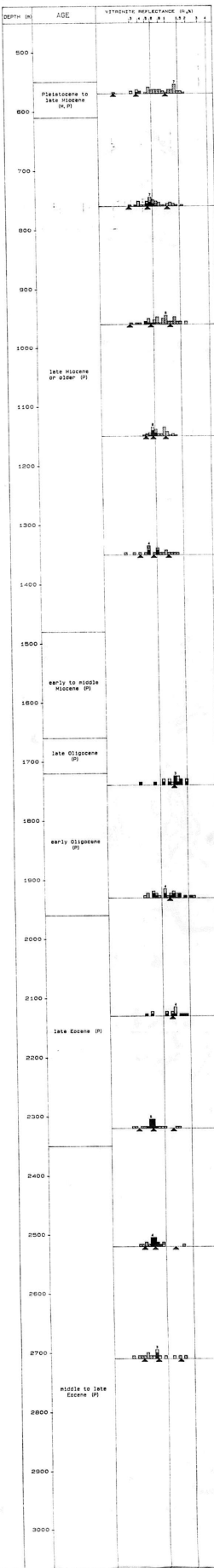


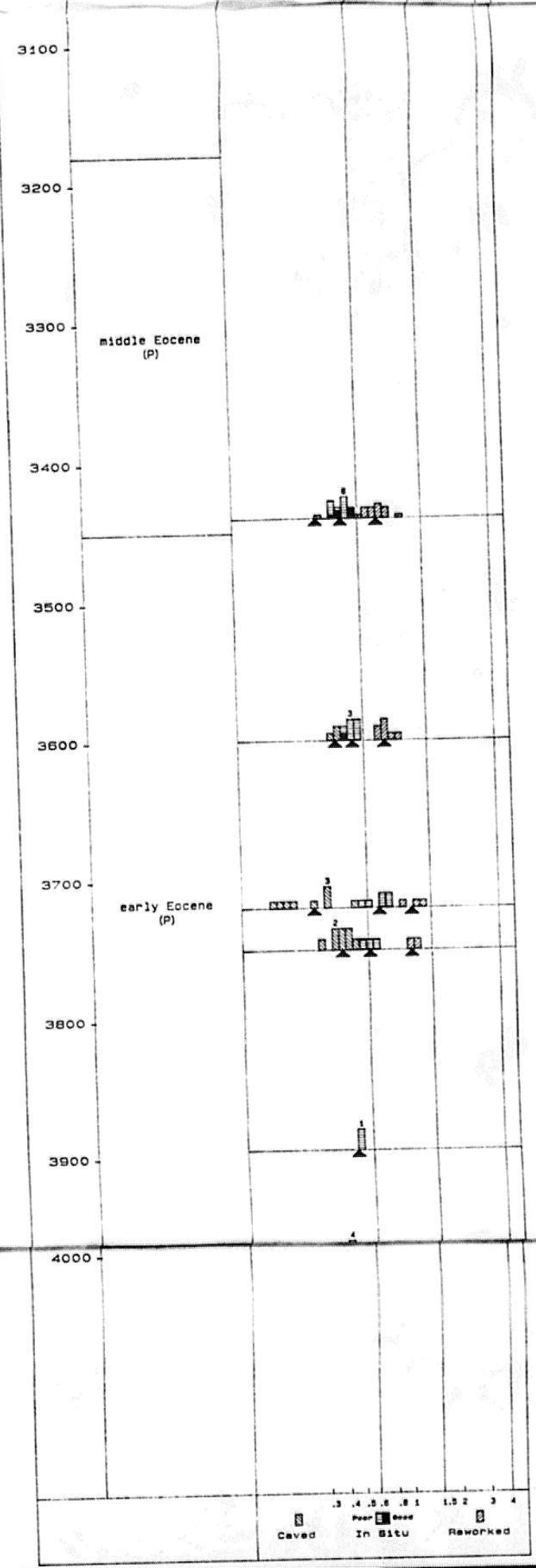

Miocene?
No assignment
Miocene?
early Oligocene
C. contraria
late Eocene
S. adamsi
middle Eocene
H. acutidorsatum
early Eocene
B. ovata
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3600
3700
3800
3900
2165 - No foraminifera to 2560 No palynomorphs
2260 - Pollen
2350 - Marine dinoflagellates
2440 - Marine dinoflagellates
2560 - One specimen of E. rosenni (1)
2590 - One specimen of Trochammina Fm C
2620 - C. proprius (2)
2650 - One specimen of E. minutum
2680 - No foraminifera to 2770
2710 - Marine dinoflagellates
2770 - C. subplacenta, T. cf. deformis, Alveolophragmium Fm 1 (3)
2800 - H. walteri, C. placenta, T. collura, B. discreta
2860 - No foraminifera. Pollen
2920 - Poor fossil recovery
2950 - C. cf. subplacenta
3070 - T. glostigerinaformis
3130 - T. inflata
3180 - C. contraria
3240 - Poor fossil recovery
3270 - H. acutidorsatum, H. walteri, S. sphaerica, H. bulloides, Lenticulina Fm 1 (4)
3300 - B. multicamerata, A. cretaceus
3330 - H. eggeri
3390 - A. carusoensis
3420 - C. cancellata, S. mississippiensis
3480 - Poor fossil recovery
3600 - C. amplectens, T. rota Low diversity
3835 - B. alazanensis, C. scitulus
3870 - Poor fossil recovery
3900 - No foraminifera
3975 - B. ovata (5)

BUJAK DAVIES GROUP KEROGEN: Pothurst P-19



BUJAK DAVIES GROUP VITRINITE: Pothurst P-19




3100
3200
3300
middle Eocene
(P)
3400
3500
3600
3700
early Eocene
(P)
3800
3900
4000
.3 .4 .5 .6 .8 1 1.5 2 3 4
Poor Good
Caved
In Situ
Reworked

3900
3800
3700
3600
3500
3400
3300
3200
3100
3000
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800

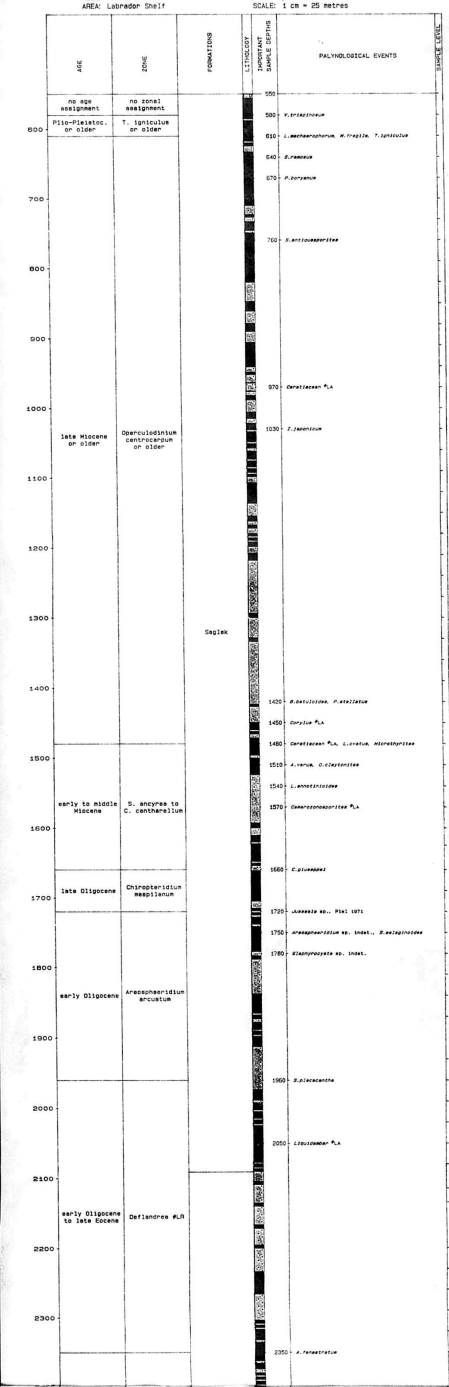
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
Apectodinium homomorphum
Areoligera senonensis
Marine Dinoflagellate
Azolla
Pediastrum
Gymnosperm Pollen
Angiosperm Pollen
Spores
Upper Cretaceous Reworking
Lower Cretaceous Reworking

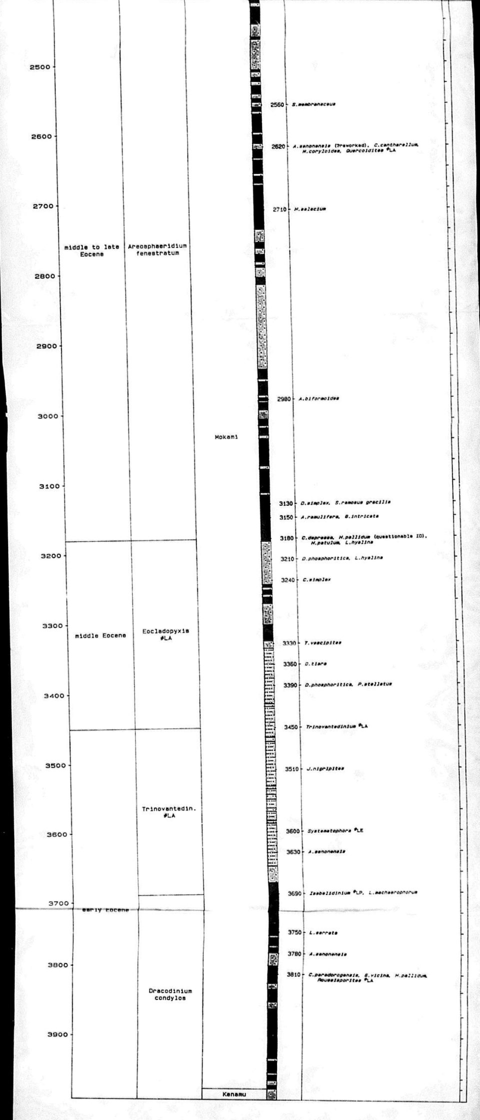
PALYNOLOGICAL ANALYSIS CHART

BUJAK DAVIES GROUP

CLIENT: G.S.C.
WELL: Pothurst P-19
AREA: Labrador Shelf

SCIENTIST: Bujak Davies Group
DATE: April 1987
SCALE: 1 cm = 25 metres




2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
middle to late Eocene
middle Eocene
early Eocene
Areosphaeridium fenestratum
Eocladopyxis #LA
Trinovantedin. #LA
Dracodinium condylos
Mokami
Kenamu
2560 S.membranaceus
2620 A.senonensis (?reworked), C.cantharellum, H.coryloides, Quercoidites *LA
2710 H.eelecium
2980 A.biformoides
3130 D.simplex, S.ramosus gracilis
3150 A.ramulifera, G.intricata
3180 C.depressa, H.pallidum (questionable ID), H.patulum, L.hyalina
3210 D.phosphoritica, L.hyalina
3240 C.simplex
3330 T.vescipites
3360 D.tiara
3390 D.phosphoritica, P.stellatus
3450 Trinovantedinium *LA
3510 J.nigripites
3600 Systematophora *LE
3630 A.senonensis
3690 Isabelidinium *LP, L.machaerophorum
3750 L.serrata
3780 A.senonensis
3810 C.paradorogensis, S.vicina, H.pallidum, Rousseisporites *LA