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Palynological analysis of eight core samples from the Sherbrook Group in Belfast-11, Otway Basin.

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INTERPRETATIVE DATA

Introduction

A single sample from each of eight cores cut in the Sherbrook Group are analysed in Belfast-11. The palynological zones and ages identified and their correlations to formations or units identified in the well are summarised in Table-1 below. This is followed by discussion of methods, geological comments and basis of zone picks. Additional interpretative data on each of the samples with zone identification and Confidence Ratings are recorded in Table-2, whilst basic data on cuttings lithologies, sample quantities, residue yields, preservation and diversity are recorded on Tables-3 and 4. All species which have been identified with binomial names are tabulated on Table-5.

Table-1: Palynological Summary for Sherbrook Group in Belfast-11.

AGE	UNIT	SPORE-POLLEN ZONES	MICROPLANKTON ZONES (SUBZONES)
PALEOCENE	PEBBLE POINT FORMATION 933-936m	Not sampled	Not sampled
DANIAN to MAASTRICHTIAN	K/T Boundary Shale 936-948m	Upper *T. longus* 937.6-941.5m	*M. druggii* 937.6-941.5m
MAASTRICHTIAN to LATE CAMPANIAN	TIMBOON SAND 948-1087m	Lower *T. longus* 1029.6-1034.5m *T. lilliei* 1086.3-1090.9m	No zones identified
EARLY CAMPANIAN to SANTONIAN	PAARATTE FORMATION 1087-1310m	*N. senectus* 1146.7-1182m *T. apoxyexinus* 1223.5-1281.1m	*X. australis* 1146.7-1182m *N. aceras* 1223.5-1281.1m
SANTONIAN	BELFAST MUDSTONE 1310-1344m	*T. apoxyexinus* 1325.3-1326.2m	*I. cretaceum* 1325.3-1326.2m
ALBIAN	EUMERALLA FORMATION 1344-1483m	Not analysed	No zones defined.

T.D. 1483m

Materials and Methods

A single sample was collected by the author from each core then forwarded to Laola Pty Ltd in Perth for processing. Because the samples could not be accurately located within the cores when collected they are assigned the depth interval for the whole core. This however has created problems or ambiguity were the cores are located close to the formation boundaries picked from the gamma ray log. An additional uncertainty concerns the accuracy of the tie between the measured or drillers depth for the cores and their calibration to the electric logs. Where either of these possible inaccuracies may effect the interpretation of the results they are discussed in the text. Finally for the purposes of the summary, geological and zone discussions all depths are quoted in metres. The original depths in feet are given on Tables-2 to 4.

Between 17 to 22 grams (average 19.3g) of the core samples were processes for palynology and all gave high residue yields and high palynomorph concentrations. Palynomorph preservation was fair to good, with some specimens excellently preserved. Where poorly preserved it was due to the palynomorphs being fragmented and difficult to identify. In the same samples many specimens were well preserved.

Overall spore-pollen diversity was high averaging 39+ species per sample (Table-4). Microplankton abundance and diversity was low averaging 9+ species per sample. The microplankton abundance data presented in Table-2 was obtained from counts made on slides prepared using 8microns filter cloth.

Geological Comments

1. The deepest core sample examined is from the upper part of the *I. cretaceum* Zone based on the presence of *Isabelidinium rotundatum* which is found in the uppermost part of the Belfast Mudstone and Nullawarre Greensand in the Port Campbell Embayment (Partridge, 1994a, b). The first appearance of *I. rotundatum* has the potential to define a Subzone within the upper part of the *I. cretaceum* Zone. Assuming the unconformity at the top of the Eumeralla Formation is correctly picked at 1344m the occurrence of *I. rotundatum* less than 20 metres above the unconformity suggests that only the upper part of the Belfast Mudstone is present in Belfast-11. It is also suggested that the sands evident on gamma log between 1291-1310m in Belfast-11 correlate to the Nullawarre Greensand.

2. The first appearance of *Nelsoniella aceras* associated with a high microplankton abundance (14%) at 1279–81m suggests this sample correlates to the Skull Creek Mudstone. Although picking the top of this formation is equivocal on the electric logs, a top is suggested at approximately 1246m based on the marked decline in microplankton abundances in the overlying samples.

3. The pick for the base of the Timboon Sand at 996m, which was annotated on the electric logs provided for this review, equates on the basis of the palynological dating to one or other of the major sequence boundaries in the Mid to Late Maastrichtian (Haq *et al*, 1986, 1987). This formation pick in Belfast–11 conflicts however with current knowledge of the type section for Timboon Sand in the Port Campbell Embayment where the base of the unit lies around about the basal Maastrichtian to latest Campanian. In Belfast–11 the equivalent level would equate to the log break at 1087m, a depth straddled by the core containing *T. lilliei* Zone assemblage. Further to the west in Lindon-1 the interval equivalent to the Lower *T. longus* to *X. australis* Zones in Belfast-11 (approximately 996-1195m) is considered to be missing (Partridge, 1996). Comparing the two wells this can be interpreted to mean that the "intra-Timboon" unconformity located at 996m in Belfast-11 has in Lindon-1 eroded the lower part of the Timboon Sand and upper part of the Parratte Formation.

4. The sample from the core at 1029-1035m although containing a relatively high abundance of microplankton (25%) it is not considered to be as "open marine" as the two deepest cores analysed which have the next highest microplankton abundances of 1?% and 21% (Table-5). The difference is that the microplankton count at 1029–1035m is dominated by a single species of the algae *Nummus* which represents 21% of the total count. This algal type is typical found in what are interpreted as shallow marine environments on the North West Shelf and its occurrence in abundance in Belfast–11 is similarly interpreted to represent a shallow marine interdistributary bay or coastal lagoon environment. Excluding *Nummus* from the count gives a microplankton abundance of only 4% which is more compatible with microplankton abundances in adjacent samples.

5. The shallowest core sample analysed contained a diverse spore-pollen and microplankton assemblages which is latest Maastrichtian in age and characteristic of assemblages from within or just below the

Cretaceous/Tertiary boundary shale. From the gamma log it is difficult to be confident about the precise location of the boundary shale but the interval 936–948m is suggested as most likely.

Biostratigraphy

The zone and age determinations are based on the Australia wide Mesozoic spore-pollen and microplankton zonation schemes described by Helby, Morgan & Partridge (1987). Author citations for most spore-pollen species can be sourced from Helby, Morgan & Partridge (1987), Dettmann (1963), Stover & Partridge (1973) or other references cited herein, whilst author citations for dinoflagellates can be found in the index of Lentin & Williams (1993). Species names followed by "ms" are unpublished manuscript names.

Upper *Tricolpites longus* spore-pollen Zone
and
Manumiella druggii microplankton Zone
Interval: 937.6–941.5 metres.
Age: Latest Maastrichtian.

The sample contained a highly diverse spore-pollen assemblage associated with a limited diversity but diagnostic microplankton assemblage. Abundant *Gambierina rudata* at 25% of spore-pollen count and presence of *Stereisporites (Tripunctisporis)* sp. indicate an age no older than the Upper *T. longus* Zone, whilst the presence of *Forcipites* (al. *Tricolpites*) *longus*, *Tricolporites lilliei* and several other index species preclude a younger zone assignment. The microplankton assemblage is dominated by *Canninginopsis bretonica* which appears to range throughout the Maastrichtian in the Otway Basin. Other index species recorded were *Alterbidinium acutulum* and *Manumiella conorata*. The latter species confirms assignment of the sample to the *M. druggii* Zone.

Lower *Tricolpites longus* spore-pollen Zone.
Interval: 1029.6–1034.5 metres.
Age: Maastrichtian.

Assigned to the Lower *T. longus* Zone on the presence of *Tetracolporites verrucosus* and *Proteacidites reticuloconcavus* ms and absence of younger index species. Other species consistent with this zone assignment are *Camarozonosporites horrendus* ms, *Pseudowinterapollis wahooensis*, and *Tetrapollis securus* ms. The associated microplankton cannot be assigned to any of the formally described zones of Helby, Morgan & Partridge (1987) but are consistent with the spore-pollen assignment. The microplankton are dominated by the algal cyst *Nummus* sp. which represents 21% of total count and 83% of all the microplankton recorded. The other significant species present are either new, like *Cleistosphaeridium* sp. or are variants of local species as is the case with *Isabelidinium* sp. cf. *I. greenense*.

Tricolporites lilliei spore-pollen Zone.
Interval: 1086.3–1090.9 metres.
Age: Campanian.
This core is assigned to the *T. lilliei* Zone on the oldest occurrence of *Battenipollis sectilis*, *Gambierina rudata* and *G. edwardsii* in the absence of the eponymous species. The presence of *Forcipites sabulosus* suggests an age no younger than this zone. The associated microplankton are not diagnostic of any established zones.

Nothofagidites senectus spore-pollen Zone
and
Xenikoon australis microplankton Zone.
Interval: 1146.7–1182.0 metres.
Age: Early Campanian.
The two cores in this interval are assigned to the *N. senectus* Zone based on the presence of the eponymous species in the shallower sample and *Forcipites sabulosus* in the deeper sample. The spore-pollen counts of both samples are dominated by *Proteacidites* spp. and bisaccate gymnosperm pollen. The associated microplankton although relatively low in abundance and diversity do contain the index species *Xenikoon australis*, *Nelsoniella aceras* and *N. tuberculata* which provide a confident zone assignment.

Tricolporites apoxyexinus spore-pollen Zone
and
Nelsoniella aceras microplankton Zone.
Interval: 1223.5–1281.1 metres.
Age: Santonian.
Assigned to the *T. apoxyexinus* Zone based on the presence of the eponymous species and *Latrobosporites amplus* in both samples and *Tricolpites confessus* and *Ornamentifea sentosa* in the shallower sample, and absence of index species of younger zones. The associated microplankton are of moderate diversity with numerous specimens of the eponymous species *N. aceras* recorded from the deeper sample providing a high confidence pick to the base of the zone.

Tricolporites apoxyexinus spore-pollen Zone
and
Isabelidinium cretaceum microplankton Zone.

Interval: 1325.3–1326.2 metres.

Age: Santonian.

The deepest sample analysed in this report is clearly no older than the *T. apoxyexinus* Zone based on the presence of both the eponymous species and the secondary index species *Ornamentifea sentosa*. These first appearances are supported by the common occurrence of *Proteacidites* spp. representing 14% of the spore-pollen counted. Such abundances of the latter species group are typically only recorded towards the top of the of the *T. apoxyexinus* Zone. The sample also contains abundant microplankton (21%) which are assigned to the *I. cretaceum* Zone on the presence of *Amphidiadema denticulata*, *Isabelidinium cretaceum*, *I. thomasii* and *I. rotundatum* ms in an assemblage dominated by *Heterosphaeridium* spp. *Isabelidinium rotundatum* ms Marshall, 1985, is a new name for the dinoflagellate specimens identified as *I. cretaceum* by Cookson & Eisenack (1961, p.11, figs 1,2) from the Belfast No.4 bore between 1369.2–1371.3m.

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Table-2: Interpretative Palynological Data for Belfast-11, Otway Basin.

Sample Type	Depths	Spore Pollen Zone (Microplankton Zone)	CR*	Comments and Key Species Present
Core	3076-89 ft 937.6-941.5 m	Upper *T. longus* *(M. druggii)*	A1 A3	Microplankton 9%. *Proteacidites* spp. 32% *Gambierina rudata* 25% FAD for *Stereisporites* (*Tripunctisporis*) sp. with LADs of dinoflagellates *Manumiella conorata, Canninginopsis bretonica* and *Alterbidinium acutulum*
Core	3378-94 ft 1029.6-1034.5 m	Lower *T. longus*	A1	Microplankton 25%. *Amosopollis cruciformis* <<1%. *Proteacidites* spp. 35% FAD for *Tetracolporites verrucosus* Microplankton dominated by *Nummus* sp. 21%
Core	3564-79 ft 1086.3-1090.9 m	*T. lilliei*	A4	Microplankton <3% *Amosopollis cruciformis* <<1%. *Proteacidites* spp. 34% Presence of *Gambierina rudata* and *Battenipollis sectilis* considered diagnostic of *T. lilliei* Zone.
Core	3762-67 ft 1146.7-1148.2 m	*N. senectus* *(X. australis)*	A1 A3	Microplankton <1%. *Amosopollis cruciformis* <3%. *Proteacidites* spp. 18% *Nothofagidites senectus* 2% and *Forcipites sabulosus* 8%.
Core	3871-78 ft 1179.9-1182.0 m	*N. senectus* *(X. australis)*	A4 A2	Microplankton 6%. *Amosopollis cruciformis* 2%. *Proteacidites* spp. 19% FADs for *Forcipites sabulosus* with *Xenikoon australis* and both *Nelsoniella aceras* and *N. tuberculata* present.
Core	4014-34 ft 1223.5-1229.6 m	*T. apoxyexinus* *(N. aceras)*	A1 A2	Microplankton 2%. *Amosopollis cruciformis* <1%. *Proteacidites* spp. 16% *Tricolporites apoxyexinus, Ornamentifera sentosa* and *Nelsoniella aceras* present.
Core	4197-4203 ft 1279.2-1281.1m	*T. apoxyexinus* *(N. aceras)*	A1 A2	Microplankton 14%. *Amosopollis cruciformis* 3.5%. *Proteacidites* spp. 18% FAD for *N. aceras* which is common.
Core	4348-51 ft 1325.3-1326.2 m	*T. apoxyexinus* *(I. cretaceum)*	A1 A2	Microplankton 20.5%. *Amosopollis cruciformis* 1.5%. *Proteacidites* spp. 14% FADs for *T. apoxyexinus* and *O. sentosa*. *Amphidiadema denticulata, Isabelidinium cretaceum* and *I. rotundatum* ms and *I. thomasii* are key dinoflagellates present.

*CR = Confidence Ratings
LAD = Last Appearance Datum
FAD = First Appearance Datum

Confidence Ratings

The Confidence Ratings assigned to the zone identifications on Table-2 are quality codes used in the STRATDAT relational database being developed by the Australian Geological Survey Organisation (AGSO) as a National Database for interpretive biostratigraphic data. Their purpose is to provide a simple relative comparison of the quality of the zone assignments. The alpha and numeric components of the codes have been assigned the following meanings:

Alpha codes: Linked to sample type

- A Core
- B Sidewall core
- C Coal cuttings
- D Ditch cuttings
- E Junk basket
- F Miscellaneous/unknown
- G Outcrop

Numeric codes: Linked to fossil assemblage

1	Excellent confidence:	High diversity assemblage recorded with key zone species.
2	Good confidence:	Moderately diverse assemblage recorded with key zone species.
3	Fair confidence:	Low diversity assemblage recorded with key zone species.
4	Poor confidence:	Moderate to high diversity assemblage recorded without key zone species.
5	Very low confidence:	Low diversity assemblage recorded without key zone species.

BASIC DATA

Table–3: Basic Sample Data – Belfast–11, Otway Basin.

Sample Type	Depth	Lithology	Sample Wt (G)	Residue Yield
Core	3076–89 ft 937.6–941.5m	Medium grey fine grained sandstone.	19.5	High
Core	3378–94 ft 1029.6–1034.5m	Medium grey fine grained sandstone.	18.6	High
Core	3564–79 ft 1086.3–1090.9m	Medium grey siltstone.	22.2	High
Core	3762–67 ft 1146.7–1148.2m	Light grey sandstone with laminations of medium grey mudstone.	18.9	High
Core	3871–78 ft 1179.9–1182.0m	Medium grey siltstone.	21.2	High
Core	4014–34 ft 1223.5–1229.6m	Light-medium grey fine grained sandstone.	16.7	High
Core	4197–4203 ft 1279.2–1281.1m	Medium-dark grey micaceous siltstone.	17.8	High
Core	4348–51 ft 1325.3–1326.2m	Medium grey micaceous siltstone.	19.6	High

Table–4: Basic Palynomorph Data for Belfast–11, Otway Basin.

Sample Type	Depths	Palynomorph Concentration	Palynomorph Preservation	Number S-P Species*	Microplankton Abundance	Number MP Species*
Core	3076–89 ft 937.6–941.5m	High	Good	39+	Common 9%	7+
Core	3378–94 ft 1029.6–1034.5m	High	Fair-good	43+	Abundant 25%	4+
Core	3564–79 ft 1086.3–1090.9m	High	Good	51+	Rare <3%	6+
Core	3762–67 ft 1146.7–1148.2m	High	Fair-good	34+	Rare <1%	6+
Core	3871–78 ft 1179.9–1182.0m	High	Fair-good	39+	Common 8%	11+
Core	4014–34 ft 1223.5–1229.6m	High	Good	47+	Rare 2%	11+
Core	4197–4203 ft 1279.2–1281.1m	High	Fair-good	30+	Common 14%	12+

Core	4348–51 ft 1325.3– 1326.2m	High	Good	36+	Abundant 21%	18+

*Diversity:

Very low	=	1–5 species
Low	=	6–10 species
Moderate	=	11–25species
High	=	26–74species
Very high	=	75+ species
NR	=	Not recorded in sample

Note: Spore-pollen and Microplankton diversity excludes reworked and obviously caved species in samples.

Table-5: Belfast-11 Range Chart for Spore-Pollen

P OF CORED INTERVAL	937.6m	1029.6m	1086.3m	1146.7m	1179.9m	1223.5m	1279.2m	1325.3m
SPORE-POLLEN SPECIES								
Aequitriradites spinulosus			X			cf		
Aglaorcidia qualumis	X							
Appendicisporites sp.			X					
Araucariacites australis*	3%	3%	7%	4%	2%	####	####	####
Australopollis obscurus			X	3%	2%	2%	5%	2%
BACULATISPORITES spp.	####	2%	3%	####	####	####	####	3%
Battenipollis sectilis	3%		X		cf			
Beaupreaidites orbiculatus	X							
Camarozonosporites apiculat	X	X	X					
Camarozonosporites australi	X	cf	X			X		
Camarozonosporites bullatus	X							
Camarozonosporites heskermensis		X				X		
Camarozonosporites horrendus ms		X	X					
Ceratosporites equalis			X	X		X		
CICATRICOSISPORITES spp.		X			X	X	X	####
Cicatricosisporites australiensis		X						
Clavifera triplex	####		X	####	####	####	####	####
Clavifera vultuosus ms					X	X	X	
Coptospora pileolus ms						X	cf	cf
Corallina jardinae						X		
Corallina simplex					X			
Corollina torosa			####	####	####	####		####
Cupressacites sp.					####	5%	2%	4%
Cyatheacidites tectifera								X
Cyathidites asper		cf			X			
Cyathidites spp. (>40µm) larg	####	####	####	####	2%	####	3%	####
Cyathidites spp. (<40µm) sm		3%	3%	####	5%	4%	4%	8%
Cyathidites splendens	X	X						
Cyclosporites hughesii		RW						
Dacrycarpites australiensis			X					
Densoisporites apollo ms					X			
Densoisporites velatus			X	X		X		
Dicotetradites clavatus		####	####		X	X		
DICTYOPHYLLIDITES spp.			####	X	####	####	####	2%
Dictyotosporites complex					RW			
Dictyotosporites speciosus					RW			RW
Didecitriletes ericianus RW			RW					
Dilwynites echinatus ms						X	X	X
Dilwynites granulatus	####	2%	####	####	5%	3%	2%	3%
Dilwynites pusillus ms (sm.var.)					6%	####	6%	4%
Dilwynites tuberculatus		X						
Dulhuntyispora dulhuntyi			RW					
Ericipites crassiexinus	X							
Ericipites scabratus	X	cf						
FORCIPITES spp.			####		2%	2%	####	####
Forcipites longus	X			X				
Forcipites sabulosus		cf	X	8%	X	X		
Forcipites stipulatus			X	####		X		
Foveogleicheniidites confossus								
Foveotriletes balteus						X		
Gambierina edwardsii			X					
Gambierina rudata	25%		2%	####				

Table-5: Belfast-11 Range Chart for Spore-Pollen

P OF CORED INTERVAL	937.6m	1029.6m	1086.3m	1146.7m	1179.9m	1223.5m	1279.2m	1325.3m
Gephrapollenites wahooensis		X						
Gleicheniidites circinidites		11%	2%	8%	5%	6%	5%	3%
Herkosporites elliottii*	2%	5%	####	3%	2%	####	2%	####
Herkosporites proxistriatus B75							X	
Ilexpollenites primus ms							X	X
Ischyosporites crateris			RW?					
Juxtacolpus peiratus ms	X							
Laevigatosporites major		X	X					
Laevigatosporites ovatus	X	X	X	X	X	X	X	X
Laevigatosporites spp.	2%	4%	4%	4%	####	6%	3%	3%
Latrobosporites amplus	X	X	X	####	X	X	2	
Latrobosporites ohaiensis			X	X	X			
Leptolepidites verrucosus	RW				X			
LILIACIDITES spp.	X		X			X		
Lygistepollenites balmei		####	X					
Lygistepollenites florinii	X	####	####	X				
Marratisporites scabratus	X	X			X			X
Matonisporites cooksoniae								
Microbaculispora spp. RW			RW		RW	RW		
Microcachryidites antarticus	3%		X	####	3%	6%	####	4%
Neoraistrickia truncata								X
Nevesisporites dailyi					X			
NOTHOFAGIDITES spp.	4%	X	4%	2%				
Nothofagidites flemingii	X							
Nothofagidites senectus	X	X	4%	X				
Ornamentifera sentosa		X		X	X	X		X
Osmundacidites wellmanii					####	####	####	####
Peninsulapollis gillii	####	####	####			X		X
Periporopellenites demarcatu	X							
Periporopellenites polyoratus	X		X					
PEROMONOLITES spp.					X			
Peromonolites densus			X					
Perotrilites majus			X	X	cf	X	X	X
Perotrilites oepikii		X			X	X		
Phyllocladidites mawsonii	4%	2%	4%	13%	2%	5%	8%	####
Phyllocladidites reticulosaccatus				X				
Pilosisporites notensis RW			RW		RW			
Plicatipollenites spp. RW	RW	RW	RW			RW	RW	RW
PODOCARPIDITES spp.	7%	8%	23%	15%	23%	23%	19%	20%
Podosporites microsaccatus	####		3%	4%	3%	5%	6%	10%
PROTEACIDITES spp.	32%	33%	35%	18%	19%	16%	18%	14%
Proteacidites amolosexinus		X	X					
Proteacidites clinei ms	X							
Proteacidites n.sp. cf. P. conf	X	X	X					
Proteacidites gemmatus	X							
Proteacidites otwayensis ms	X	X	X	X				
Proteacidites palisadus		X						
Proteacidites preangulatus ms			X					
Proteacidites reticuloconcav	X	X						
Protohaploxypinus spp. RW					RW		RW	
Pseudoreticulatispora pseudo	RW		RW				RW	
RETITRILETES spp.	####	3%	6%	####	2%	####	####	3%
Retitriletes austroclavatidites								X

Table-5: Belfast-11 Range Chart for Spore-Pollen

P OF CORED INTERVAL	937.6m	1029.6m	1086.3m	1146.7m	1179.9m	1223.5m	1279.2m	1325.3m
Retitriletes eminulus			X					
Retitriletes nodosus					X	X	X	
Rugulatisporites n. sp. (coarse clav		X						
Schizocolpus marlinensis		X						
Sestrosporites pseudoalveolatus					X			
STEREISPORITES spp.	5%	8%	####	####	####	2%	2%	2%
Stereisporites (Tripunctispor	X							
Stereisporites antiquisporite	X	X		X	X	X	X	X
Stereisporites australis			X				X	
Stereisporites regium	X	cf						
Stereisporites viriosus	X		X	X			X	
Tetracolporites verrucosus		X						
Tetradcpollis securus ms		X						
TRICOLPITES/TRICOLPORIT	3%	5%	5%	4%	4%	3%	3%	3%
Tricolpites confessus			3%			X		
Tricolpites walparaensis	X	X						
Tricolporites apoxyexinus			X	X	X	X	X	X
Tricolporites lilliei	####	####						
TRILETES undiff.	3%	5%	6%	####	5%	4%	3%	3%
Trilobosporites trioreticulosus						X		
Triporoletes reticulatus			X		X		X	####
TRIPOROPOLLENITES spp.					####	####		####
Vitreisporites pallidus		X		X		X		X
SPORES as %	13%	41%	27%	23%	30%	28%	29%	32%
GYMNOSPERM POLLEN as %	18%	16%	18%	41%	42%	47%	44%	48%
ANGIOSPERM POLLEN as %	69%	43%	55%	36%	28%	25%	27%	20%
COUNT SPORE-POLLEN	177	160	141	142	130	177	142	156
Microplankton undifferentia	9%	23%	3%	1%	6%	2%	14%	20%
Amosopollis cruciformis			1%	2%	2%	1%	3%	1%
COUNT MICROPLANKTON	9%	23%	3%	3%	8%	3%	17%	21%
Fungal hyphae					1%			1%
Fungal spores		####		1%		1%	2%	2%
Fruiting bodies								####
REWORKED Spore-Pollen		2%	2%		1%		1%	
TOTAL COUNT - ALL PALYNO	195	214	149	146	144	183	176	208

MP%

Table-6: Belfast-11 — Range Chart for Microplankton

OF CORED INTERVAL	937.6m	1029.6m	1086.3m	1146.7m	1179.9m	1223.5m	1279.2m	1325.3m
DINOFLAGELLATE SPECIES								
Alterbidinium acutulum*	X	?						
Amphidiadema denticulata*								X
Callaoisphaeridium asymmetricum*								X
Canninginopsis bretonica	56%	?						
Chatangiella victoriensis								X
Circulodinium colliveri					X	X		
CLEISTOSPHAERIDIUM sp	X	6%	X					
CRIBROPERIDINIUM spp.		X	X					
Dinogymnium spp.								X
Dinogymnium nelsonense							X	
Exochosphaeridium sp.		X						
HETEROSPHAERIDIUM spp.				X	64%	40%	40%	70%
Heterosphaeridium evansii ms							X	X
Heterosphaeridium heteracanthum				X	X	X	X	X
ISABELIDINIUM spp.			40%				3%	5%
Isabelidinium balmei					X	X		
Isabelidinium cretaceum								X
Isabelidinium sp. cf. I. greenense		X						
Isabelidinium rotundatum ms								X
Isabelidinium thomasii					X			X
Isabelidinium variabile M88						X		
Maduradinium pentagonum*					X			
Manumiella conorata	X							
Nelsoniella aceras				X	X	X	F	
Nelsoniella tuberculata					X			
Odontochitina costata							10%	X
Odontochitina porifera					X	X	X	X
Oligosphaeridium pulcherrimum							X	X
Palaeohystrichophora infusorioides*								X
Paralecaniella indentata*	6%							
SPINIDINIUM spp.			X		X	X	X	X
SPINIFERITES spp.	X	X	X					1
Tanyosphaeridium spp.			X					
TRITHYRODINIUM spp.							X	
Trithyrodinium vermiculata				X				X
Xenikoon australis				X	X			
DINOFLAGELLATES undiff.	39%	10%	?0%	25%	9%	20%	20%	9%
ALGAL SPECIES								
Amosopollis cruciformis	X		X	75%	27%	20%	20%	7%
Lecaniella dictyota								X
Nummus spp.		14%			X			
Schizosporis reticulatus			RW?					
COUNT MICROPLANKTON	18	49	5	4	11	5	30	44