Palynological analysis of the interval 1979 to 2735 metres in La Bella–1, Otway Basin.

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Summary

In this report relinquished palynological slides from 51 samples (41 sidewall core, 3 core and 7 cuttings) are analysed or reviewed from La Bella–1, over a ~750 metre interval from 1979 to 2735 metres. The bulk of the section analysed is interpreted to belong to the Waarre Formation, which is unconformably overlain by an extremely condensed Belfast Mudstone and a thick section of the Skull Creek Mudstone. A summary of the identified palynological zones, their ages, and the suggested correlation of the section analysed to the revised stratigraphy of the Sherbrook Group (Figure 1) is provide below:

Table–1: Palynological summary for La Bella–1

AGE	EQUIVALENT LITHOLOGICAL UNIT	SPORE–POLLEN ZONES & Subzones	MICROPLANKTON ZONES & Subzones
CAMPANIAN to SANTONIAN	SKULL CREEK MUDSTONE 1551–1982m	Upper *T. apoxyexinus* Zone 1979m	*N. aceras* Zone 1979m
Late SANTONIAN	BELFAST MUDSTONE 1982–2007m	Upper *T. apoxyexinus* Zone 2004m	*I. cretaceum* Zone 2004m
TURONIAN	WAARRE FORMATION 2007m–2735m Subdivided into Unit Cb 2007–2182m Unit Ca 2182–2243m Unit B 2243–2322m Unit Ab 2322–2597m	*P. mawsonii* Zone 2020–2593m *L. musa* Subzone 2020–2096m *H. trinalis* Subzone 2199–2567m	*P. infusorioides* Zone 2020–2402m *I. evexus* Subzone 2020–2096m *Heterosphaeridium* Acme 2232m *C. edwardsii* Subzone 2270–2402m
TURONIAN ?	WAARRE FORMATION Unit Aa 2597–2735m T.D.	*P. mawsonii* Zone 2624–2646.5m	Not zoned.

The study found no evidence of section age equivalent of either the older part of the Belfast Mudstone (units A and B) and underlying Flaxman Formation, or of the Early Cretaceous Eumeralla Formation in the well. The basal 300 metres, which contains only poor assemblages is interpreted as a part of the Waarre Formation that has not been previously penetrated. Based on the palynology and

the electric log character Unit A of the Waarre Formation originally recognised by Buffin (1989) is informally subdivided into Units Aa and Ab to aid the description and discussion of the sequence penetrated in La Bella–1.

Detailed interpretative data on all samples, including zone identifications, zone confidence ratings and environmental interpretation are recorded in Table 2, whilst basic data on sidewall core lithologies, number of palynological slides relinquished, visual residue yields, palynomorph preservation and species diversity are presented in Table 3. Counts of selected samples are recorded in Table 4, and distribution of selected palynomorphs are presented in Table 5.

Materials and Methods

The study is based on relinquished palynological slides borrowed from the Department of Natural Resources and Environment. Additional relinquished palynological slides were also available for another 30 sidewall cores and one cuttings sample between 635 and 1949m covering a section from Early Campanian to Early Miocene in age, but these were not reviewed as part of this study. The Basic Data range chart prepared by Dr Roger Morgan in August 1993, and included in the Well Completion Report was available during the study, but not the final interpretative written report.

Based on the number of palynological slides in the relinquishment collection, yields were mainly moderate to high between 1979m and 2567m, but were mostly low or very low below 2567m. Concentration of palynomorphs on the slides is variable with the majority of samples containing low to very low concentrations and the rest moderate to high concentrations (Table 3). Overall palynomorph preservation is mainly poor and only rarely fair. The poor preservation is due mainly to poor preparation and over-oxidation of the assemblages, but is also caused by microscopic pyrite pitting of the palynomorphs. Spore-pollen diversity is mainly moderate to high, while microplankton diversity is mostly moderate down to ~2400m and low to very low below that depth. The seven cuttings samples in the collection are mostly of poor quality and were only given a cursory examination.

The assemblage abundances given on Table 4 were counted under a x40 objective, and although providing a good approximation of the abundance of the major species groups they cannot be considered accurate to better than about ±2%. On

tables and in the text the abundance of spore-pollen species is always expressed as a percentage of the spore-pollen count. In contrast, the microplankton abundances are generally expressed as a percentage of the combined spore-pollen and microplankton count (eg. Table 2). However in the discussion of the microplankton zones abundance of individual genera and species are given as percentages of just the microplankton count (see Table 4).

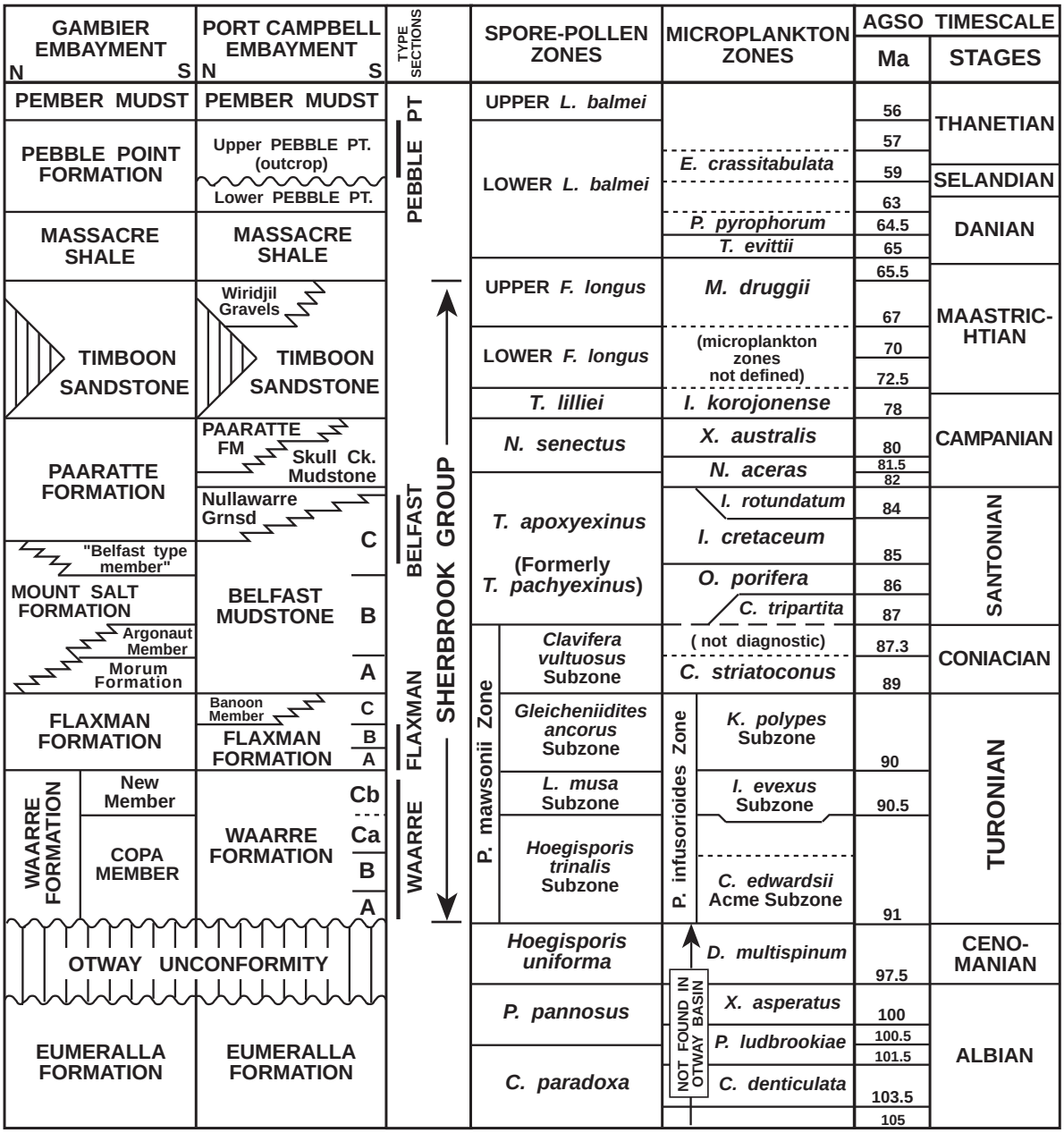

Figure 1. Revised Sherbrook Group stratigraphy, palynological biostratigraphy and proposed correlation to international stages and AGSO chronometric timescale (Young & Laurie, 1996).

Palaeoenvironments

The palaeoenvironments assigned to the samples are based on consideration of **1)** abundance, diversity and type of microplankton, **2)** the way the spore-pollen composition is skewed by changes in abundance of different species, and **3)** the lithology of the samples. The various environmental categories distinguished and their lithological and palynological characteristics are summarised in Figure 2.

ENVIRONMENT	TYPICAL LITHOLOGIES	CHARACTERISTICS OF PALYNOLOGICAL ASSEMBLAGES
NON-MARINE — including marsh, overbank, fluviatile and alluvial environments	**Coals** and **carbonaceous mudstones**	**Microplankton** absent to extremely rare, all non-marine species. **Spore-pollen** assemblages skewed with high abundances of certain species. Diagnostic species include gymnosperm pollen: *Phyllocladidites mawsonii, P. eunuchus, Trichotomosulcites subgranulatus* and spores: *Gleicheniidites* spp., *Cyathidites* spp. *Cicatricosisporites* spp., and *Ruffordiaspora* spp.
LACUSTRINE — mostly moderately long-standing fresh-water lakes on coastal plain. Ephemeral lakes mostly lack microplankton.	**Mudstones** to **siltstones** — massive or laminated	**Microplankton** diversity low (1 to 3 species), abundance usually low, but if high normally dominated by single species. Characteristic species: *Amosopollis cruciformis, Sigmopollis carbonis* and *Micrhystridium* sp. A. **Spore-pollen** assemblages less skewed but in large palaeolakes can show Neves effect characterised by abundance of *Dilwynites* spp.
PARALIC — marine incursions extending landward of palaeoshoreline. Includes coastal lagoons, estuaries and interdistributary bays. But only lagoons have unique microplankton and algae.	**Mudstones** to **sandstones** — laminated, mottled (burrowed), carbonaceous, pyritic.	**Microplankton** diversity low to moderate (3 to ~8 species), abundance low to moderate (1% to ~10%). Characterised by marine, brackish and cosmopolitan forms. Typical species include: *Amosopollis cruciformis, Heterosphaeridium* spp., *Cribroperidinium edwardsii* and algae *Botryococcus braunii*. **Spore-pollen** assemblages typically homogenous.
NEARSHORE MARINE — or proximal marine immediately offshore from palaeoshoreline.	**Mudstones** to **sandstones** — laminated, pyritic, burrowed, slightly calcareous, rare glauconite, but still carbonaceous.	**Microplankton** diversity low to moderate (>3 to <12 species), abundance moderate (>5% to <30%). Contains most marine species often associated with an abundance of forms washed out of the paralic environments. **Spore-pollen** assemblages typically homogenous.
OFFSHORE MARINE — or distal marine equivalent to middle and outer neritic environments.	**Mudstones** to **sandstones** — glauconitic, pyritic, calcareous, sparsely carbonaceous.	**Microplankton** diversity increases to >10 species and abundance >10%, with abundances of species often variable between samples. **Spore-pollen** assemblages generally show distinct Neves effect with abundance of *Dilwynites* pollen.
OCEANIC MARINE — outer shelf to slope environments.	**Mudstones** — often glauconitic, calcareous, pyritic.	**Microplankton** diversity >15 or 20 species and abundance >30%, with abundances of species often variable between samples. **Spore-pollen** often poorly preserved, with consequent increased prominence of more robust spores. Neves effect still present in better preserved assemblages.

Figure 2. Empirical model for palaeoenvironments in Sherbrook Group.

Biostratigraphy

The zone and age determinations are based on the Australia wide Mesozoic spore-pollen and microplankton zonation schemes described by Helby *et al.* (1987), with finer resolution provided by the subzones outlined in Figure 1. The latter are based on extensive unpublished work in the onshore Port Campbell Embayment (eg. Partridge, 1994, 1997, 1999). Identification of zones is determined from the presence/absence of key species recorded in Table 5, supported by the changes in assemblage composition recorded by the abundance data in Table 4. Preparation of a comprehensive range chart showing distribution of all species recorded was not commissioned as part of this review study.

Author citations for most spore-pollen species can be sourced from Helby *et al.* (1987), Dettmann (1963), Stover & Partridge (1973) or other references cited herein, whilst author citations for dinoflagellates can be found in the index of Williams *et al.* (1998). Species names followed by "ms" are unpublished manuscript names.

Upper *Tricolporites apoxyexinus* spore–pollen Zone
and
***Nelsoniella aceras* and *Isabelidinium cretaceum* microplankton Zones**
Interval: 1979 to 2004 metres.
Age: Early Campanian to Late Santonian.

The two samples in this interval are dominated by marine microplankton with the associated spore-pollen assemblages unfortunately mostly restricted to long ranging species. Although key index species were not identified the spore-pollen assemblages they can be assigned to the Upper *T. apoxyexinus* Zone on the frequent to common occurrence of triporate Proteaceous pollen in the counts (average 4%). The shallower samples is also assigned to the *N. aceras* Zone and the deeper sample to the *I. cretaceum* Zone on the presence of their respective eponymous species (Table 5).

The abundance and diversity of marine dinoflagellates extracted from the base of the thick mudstone unit is indicative of a oceanic marine environment. In such distal environments the spore-pollen assemblages could normally be expected to show a Neves effect marked by an abundance of *Dilwynites* pollen (Traverse, 1988). However, the pollen has an abundance of only 12% at 1979m, and was not recorded at 2004m, and this lack of any significant abundance is believed to be a

consequence of the low pollen count and skewing of assemblages to coarser palynomorphs by excessive sieving.

***Phyllocladidites mawsonii* spore–pollen Zone**
Interval: 2020 to 2646.5 metres.
Age: Turonian.

The *P. mawsonii* Zone and its subzones are identified with confidence ratings of B4 or better in 28 of the 42 samples over this 626 metre zoned interval. The eponymous species *Phyllocladidites mawsonii* has a FAD[1] at 2398m and is thereafter recorded from 14 of the next 26 samples. *Clavifera triplex*, the original index species, is recorded first at 2270m and thereafter from 8 of the next 20 samples. The occurrence of these two species is coincident with or shortly after the first appearance of marine microplankton in La Bella–1 at 2402m, and this is consistent with wells in the onshore Port Campbell Embayment where the FADs of marine microplankton, *P. mawsonii* and *C. triplex* are all coincide with the base of the Waarre Formation.

Samples from 2402m down to the T.D. in La Bella–1 are also considered to belong to the *P. mawsonii* Zone but the confidence in assigning them to the zone declines with increasing depth. Those from 2402 to 2567m are assigned to the zone on the presence of *Hoegisporis trinalis* ms (4 of 6 samples), *Phyllocladidites eunuchus* ms and *Verrucosisporites admirabilis* ms (both 3 of 4 samples). In contrast, the underlying interval from 2593 to 2646.5m is assigned to the zone on the rare occurrence of *Appendicisporites distocarinatus*, the similarity of the assemblage counts to shallower samples in the zone, and total lack of index species that are considered to be diagnostic of the immediately older *H. uniforma* Zone (Figure 1). The remaining cuttings and sidewall cores between 2671 to 2735m are either barren or extremely lean and do not provide any clear evidence of the age of the deepest 88 metres in well (Table 2). The only observation that can be made is that if indeed the section belongs to the Eumeralla Formation I would have expected much better assemblages.

Independent support for the Turonian age is provided by the associated marine microplankton in the samples from 2020 to 2402m which are assigned to the *P. infusorioides* microplankton Zone and its component subzones. Further details

[1] FAD = First Appearance Datum

of the assemblages from the *P. mawsonii* Zone is provided under the discussion of the *L. musa* and *H. trinalis* Subzones.

***Laevigatosporites musa* spore–pollen Subzone**

Interval: 2020–2096 metres.

Age: Mid? Turonian.

The *L. musa* Subzone was originally established for the interval between the LAD[2] for *Hoegisporis trinalis* ms, and the last consistent appearance of *Laevigatosporites musa* ms, which is usually before the FAD for *Gleicheniidites ancorus* ms. These criteria clearly do not work in La Bella–1 where there is an overlap in the range of all three species (Table 5). Therefore, following the results in Eric the Red–1 and Loch Ard–1 (Partridge, 2000a–b) the *L. musa* Subzone is identified on the total range of *Tricolporites variverrucatus* ms, (in 7 of the 9 samples in the interval) with both *H. trinalis* ms and *G. ancorus* ms recorded as rare species within the subzone (both in 2 of the 9 samples). Supporting the subzone assignment is consistent common occurrence of the colonial algae *Amosopollis cruciformis* through the interval (average 17% of total SP and MP count). The possibility that the interval from 2020 to 2076.1m may belong to the younger *G. ancorus* Subzone is rejected on the basis that the associated microplankton assemblages lack the distinctive dinoflagellate *Valensiella griphus* which is a consistent associate of the spore *Gleicheniidites ancorus* ms in the Flaxman Formation.

The assemblages from the *L. musa* Subzone are dominated by the gymnosperm pollen (average 53%), mostly undifferentiated bisaccate pollen referred to *Podocarpidites* (average 23%), the alete pollen of *Dilwynites* spp. (average 15%), and the trisaccate pollen *Microcachryidites antarcticus* (average 7%). Spores were the next most abundant (average 44%), while angiosperms were relatively minor (average <3%). Samples at 2028m, 2043m and 2059m have the most skewed assemblages containing high abundances (>20%) of *Dilwynites* pollen diagnostic of a strong Neves effect, whereas none of the assemblages were skewed towards marsh-floras dominated by *Trichotomosulcites subgranulatus,* which averaged only 2% through the subzone. The environment of deposition of the interval is paralic or nearshore marine for the basal 10 to 20 metres and offshore marine for the upper 50 to 60 metres. Peak marine influence is at 2059m where there is maximum marine microplankton abundance (50%) and highest *Dilwynites* pollen abundance (31%).

[2] LAD = Last Appearance Datum

Indeterminate Interval: 2111.5 to 2179 metres.

Between the *L. musa* and *H. trinalis* Subzones is a 100 metre interval containing seven sidewall samples that cannot be confidently placed in either subzone, although overall the section can be clearly assigned to the broader *P. mawsonii* Zone. The assemblages recovered from this interval are lean and poorly preserved with low concentration of palynomorphs, and most contain obvious contaminants. The only exception is the sample at 2118m which contains an assemblage typical of the *L. musa* Zone. However, because this sidewall core is described as a sandstone, and the recorded assemblages is so out of character with the assemblages extracted from other sidewall cores of similar lithology, it has to be interpreted as suspicious and probably contaminated.

***Hoegisporis trinalis* spore–pollen Subzone**

Interval: 2199 to 2567 metres.

Age: Early? Turonian.

The *H. trinalis* Subzone is here identified as the interval from the LAD of Cenomanian species *Hoegisporis uniforma* to the FAD of *Tricolporites variverrucatus* ms. The eponymous species *Hoegisporis trinalis* ms is recorded in 12 of the 16 sidewall core samples in the interval. The other main characteristic of this subzone are the prominent occurrences of the spores *Appendicisporites distocarinatus* (14 out of 16 samples) and *Verrucosisporites admirabilis* ms (10 out of 16 samples). On average the assemblages are equally dominated by spores and gymnosperm pollen (both 50%) with angiosperms pollen negligible (0.4%). The most abundant gymnosperms are *Podocarpidites* (average 25%), *Microcachryidites antarcticus* (average 11%) and *Dilwynites* (average 7%), while the most abundant spores are *Cyathidites* (average 19%) and *Gleicheniidites* (average 7%).

Environment of deposition of the *H. trinalis* Subzone is mostly nearshore-marine to paralic from 2199 to 2402m, and non-marine below 2402m based on lack of marine microplankton. There are no assemblages in which the spore-pollen assemblages are skewed towards marsh environments. Peaks in the marine transgression occur from 2232 to 2270m, reflected in elevated abundances of *Dilwynites* pollen suggestive of a Neves effect, and from 2284 to 2309m, covering the interval with the highest abundance of *Cribroperidinium edwardsii*.

***Palaeohystrichophora infusorioides* microplankton Zone.**

Interval: 2020 to 2402 metres.

Age: Turonian.

The microplankton recorded through most of the *P. mawsonii* SP Zone are consistent with the *P. infusorioides* Zone. Individually, none of the samples contain a sufficiently diverse microplankton assemblage to provide confident assignment to the zone, but the composite assemblage from all samples through the interval is entirely consistent with this zone identified in other wells throughout the Otway Basin. The identification of the *I. evexus* Subzone, *C. edwardsii* Acme Subzones and new *Heterosphaeridium* Acme is based solely on a few key species.

***Isabelidinium evexus* microplankton Subzone.**

Interval: 2020m to 2096 metres.

Age: Mid? Turonian.

Eight of the 9 sidewall cores in the interval contain the eponymous species *Isabelidinium evexus* ms with its maximum abundance of 10% (of combined SP + MP count) occurring at 2059m in the middle of the subzone. The common to abundant occurrence of the colonial algae *Amosopollis cruciformis* (2 to 31%, average 17% of combined SP + MP count) is consistent with this assignment. The remainder of the recorded microplankton are long ranging and not restricted to the subzone.

***Heterosphaeridinium* microplankton Acme**

Sample at: 2232 metres.

Age: Early? Turonian.

Heterosphaeridium is present in significant abundance (43% of combined SP+ MP count) in the sidewall core at 20232m, and this abundance is believed to represent a potential marker horizon between the *I. evexus* and *C. edwardsii* Subzones. A lesser abundance peak has been identified in Minerva–1 at 2035m.

***Cribroperidinium edwardsii* microplankton Acme Subzone.**

Interval: 2270 to 2402 metres.

Age: Early? Turonian.

The *C. edwardsii* Acme Subzone was established for marine dinoflagellate assemblages found in the lower part of the Waarre Formation, which although of relatively low diversity and low abundance, often contain a dominance of the

eponymous species (Partridge, 1994). In La Bella–1 *Cribroperidinium edwardsii* is found consistently from 2270 to 2402m with peaks in abundance of 9% at 2309m and 12% at 2284m (of combined SP+ MP count). Isolated records of the species at 2179m and 2118m are interpreted to represent either contamination or reworking.

Conclusions and Recommendations

This new palynological study of La Bella–1 suggests the well did not fully penetrate a thick (>700 metres) Waarre Formation, which in turn is unconformably overlain, after a significant time break, by latest Santonian or earliest Campanian sediments of Belfast and Skull Creek Mudstones. Relative to the more inshore wells Minerva–1, Eric the Red–1 and Loch Ard–1, and most wells the Port Campbell Embayment, stratigraphic section equivalent to the Flaxman Formation and most of the Belfast Mudstone is missing in La Bella–1.

Notwithstanding, the generally good age breakdown and suggested lithological correlations established in La Bella–1, further improvement could still be achieved by processing the following additional sidewall cores that have not yet been analysed for palynology:

Sample Type	Depth	Lithology
SWC 140	2009m	Argillaceous glauconitic sandstone
SWC 132	2061m	Argillaceous glauconitic sandstone
SWC 111	2171m	Sandstone interlaminated with claystone
SWC 104	2217m	Silty claystone interlaminated with sandstone

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Confidence Ratings

The Confidence Ratings assigned to the zone identifications on Table 2 are quality codes used in the STRATDAT relational database 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.

Table 2: Interpretative Palynological Data for La Bella–1

Sample Type	Depth (metres)	Spore-Pollen Zone or Subzone	CR	Microplankton Zone or Subzone	CR	**Marine MP%**	**Ac%**	**Total MP%**	Environment from palynology	Comments & Key Species Present
SWC 143	1979	Upper *T.apoxyexinus*	B4	*N. aceras*	B2	45%	<1%	45%	Oceanic marine	FAD of *Nelsoniella aceras*
SWC 141	2004	Upper *T.apoxyexinus*	B4	*I. cretaceum*	B2	73%	NR	73%	Oceanic marine	FADs of *Isabelidinium cretaceum* and *Odontochitina porifera.*
SWC 138	2020	*L. musa*	B1	*I. evexus*	B2	47%	<1%	49%	Marine/offshore	LADs of manuscript species *Isabelidinium evexus, Laevigatosporites musa* and *Tricolporites*
SWC 137	2028	*L. musa*	B1	*I. evexus*	B2	27%	26%	53%	Marine/offshore	*Tricolporites variverrucatus* ms present
SWC 136	2043	*P. mawsonii*	B1	*I. evexus*	B2	24%	33%	57%	Marine/offshore	Anomalous low occurrence of *Gleicheniidites ancorus* ms
SWC 135	2054	*L. musa*	B1	*I. evexus*	B2	23%	31%	54%	Marine/offshore	LAD of *Hoegisporis trinalis* ms in association with *T. variverrucatus* ms
SWC 133	2059	*L. musa*	B1	*I. evexus*	B5	47%	16%	63%	Marine/offshore	*Tricolporites variverrucatus* ms *and Isabelidinium evexus* ms present.
SWC 131	2066	*L. musa*	B4	*I. evexus*	B3	16%	7%	23%	Marine/offshore	*Tricolporites variverrucatus* ms present in lean assemblage.
Core	2076.1	*P. mawsonii*	A2	*P. infusorioides*	A4	8%	26%	34%	Marine/offshore	Anomalous low occurrence of *Gleicheniidites ancorus* ms
Core	2086.1	*L. musa*	A1	*I. evexus*	A3	5%	10%	15%	Marine/nearshore to Paralic	*Tricolporites variverrucatus* ms present
Core	2096	*L. musa*	A1	*I. evexus*	A3	<3%	4%	7%	Marine/nearshore to Paralic	Lowest occurrence of significant abundance of *Amosopollis cruciformis*.
SWC 128	2111.5	Indeterminate					NR		Indeterminate	Sparse assemblage with less than 50 specimens per slide.
SWC 126	2118	*L. musa*	B5	*I. evexus*	B5	58%	NR	58%	Marine/offshore	Assemblage inconsistent with recorded SANDSTONE lithology of SWC. Treated as unreliable, probably
SWC 120	2145	*P. mawsonii*	B1	*P. infusorioides*	B4	7%	X	7%	Marine/nearshore to Paralic	Assemblage skewed to larger palynomorphs by coarse filtering.
SWC 117	2159	Indeterminate					NR	<1%	Non-marine?	Sparse assemblage with less than 50 specimens per slide.
SWC 114	2164	Indeterminate					NR	<2%	Non-marine?	Sparse assemblage from SANDSTONE. Recorded microplankton probably contaminants.
SWC 113	2166	Indeterminate					X		Non-marine?	Poorly preserved assemblage with low concentration of palynomorphs.

Table 2: Interpretative Palynological Data for La Bella–1

Sample Type	Depth (metres)	Spore-Pollen Zone or Subzone	CR	Microplankton Zone or Subzone	CR	**Marine MP%**	**Ac%**	**Total MP%**	Environment from palynology	Comments & Key Species Present
SWC 109	2179	*P. mawsonii*	B1	*P. infusorioides*	B4	<4%	<1%	<5%	Marine/nearshore to Paralic	LAD of inconsistent *Cribroperidinium edwardsii* — contamination?
SWC 107	2199	*H. trinalis*	B1	*P. infusorioides*	B4	11%	NR	11%	Marine/nearshore to Paralic	LAD of consistent *Hoegisporis trinalis* ms
SWC 103	2232	*H. trinalis*	B4	*Heterosphaeridium* Acme	B2	78%	<1%	79%	Marine/nearshore to offshore	Assemblage dominated by dinofagellate cysts of *Heterosphaeridium* ~42% of SP & MP count.
SWC 100	2252	*H. trinalis*	B1	*P. infusorioides*	B4	24%	NR	24%	Marine/nearshore to offshore	Noteable Neves effect with *Dilwynites* 21%
SWC 99	2270	*H. trinalis*	B1	*C. edwardsii*	B2	31%	1%	32%	Marine/nearshore to offshore	LAD of consistent *Cribroperidinium edwardsii* Neves effect mild with *Dilwynites* 17%
SWC 98	2277.5	*P. mawsonii*	B2	*C. edwardsii*	B3		NR		Uncertain	Assemblage with low concentration of palynomorphs — not counted.
SWC 96	2284	*H. trinalis*	B1	*C. edwardsii*	B2	22%	NR	22%	Marine/nearshore to Paralic	Peak ACME of *Cribroperidinium edwardsii* representing 12% of combined SP & MP count.
SWC 95	2286	*H. trinalis*	B1	*C. edwardsii*	B3	2%	<1%	3%	Marine/nearshore to Paralic	FAD of consistent *Laevigatosporites musa* ms
SWC 93	2309	*H. trinalis*	B1	*C. edwardsii*	B2	64%	NR	64%	Marine/nearshore to Paralic	*Paleoperidinium cretaceum* 34% and *Cribroperidinium edwardsii* 9% of total count.
SWC 92	2330	*P. mawsonii*	B1				NR		Non-marine	Permo-Triassic reworking conspicuous.
SWC 88	2398	*H. trinalis*	B1	*C. edwardsii*	B2	23%	X	23%	Marine/nearshore to Paralic	FADs of *Amosopollis cruciformis* and *Phyllocladidites mawsonii*
SWC 87	2402	*H. trinalis*	B1	*C. edwardsii*	B3	30%		30%	Marine/nearshore to Paralic	FAD of *Cribroperidinium edwardsii* but species not significant in count
SWC 81	2454	*P. mawsonii*	B4						Non-marine	*Appendisicisporites distocarinatus* and *Coptospora pileolus* ms present.
Cuttings	2489	Indeterminate							Indeterminate	Poor preparation — slides dominated by undissolved mineral matter on quick scan.
SWC 79	2497	Indeterminate							Indeterminate	Relinquished slides are effectively BARREN
SWC 77	2500	*H. trinalis*	B1						Non-marine	*Hoegisporis trinalis* ms ~2%
SWC 75	2528	*H. trinalis*	B2						Non-marine	*Hoegisporis trinalis* ms and algae *Sigmopollis carbonis* present
SWC 74	2540.5	Indeterminate							Indeterminate	BARREN — slides filled with transluscent amber coloured kerogen

Table 2: Interpretative Palynological Data for La Bella–1

Sample Type	Depth (metres)	Spore-Pollen Zone or Subzone	CR	Microplankton Zone or Subzone	CR	**Marine MP%**	**Ac%**	**Total MP%**	Environment from palynology	Comments & Key Species Present
SWC 73	2544.5	*H. trinalis*	B1					<2%	Non-marine	FAD of *Appendicisporites distocarinatus* represented by multiple specimens
Cuttings	2550	Indeterminate							Indeterminate	Poor preparations — palynomorphs clumped and obscured by mineral matter
SWC 72	2567	*H. trinalis*	B4			NR	NR	<1%	Non-marine	FAD of *Hoegisporis trinalis* ms
Cuttings	2573	Indeterminate							Indeterminate	Poor preparation — slides dominated by undissolved mineral matter on quick scan.
SWC 70	2593	*P. mawsonii*	B5						Non-marine Alluvial	Reworking represent >11% of assemblage. *A. distocarinatus* reported by R. Morgan
SWC 68	2605	Indeterminate							Non-marine Alluvial	Lean assemblage with less than 50 palynomorphs on relinquished slides.
SWC 66	2624	*P. mawsonii*	B5						Non-marine Alluvial	FAD of isolated specimen of *Appendicisporites distocarinatus* in lean assemblage.
Cuttings	2640	Indeterminate							Indeterminate	Poor preparation — slides dominated by undissolved mineral matter on quick scan.
SWC 65	2646.5	*P. mawsonii*	B5						Non-marine Alluvial?	Reworking represent >9% of assemblage. Algae *Botryococcus braunii* frequent.
SWC 64	2671	Indeterminate							Indeterminate	Lean assemblage with less than 25 palynomorphs on relinquished slides.
SWC 63	2683	Indeterminate							Indeterminate	Relinquished slides are effectively BARREN
Cuttings	2690	Indeterminate							Indeterminate	Poor preparation — slides dominated by undissolved mineral matter on quick scan.
SWC 62	2705	Indeterminate							Indeterminate	Effectively BARREN — less than 15 palynomorphs on relinquished slides
Cuttings	2715	Indeterminate							Indeterminate	Poor preparation — slides dominated by undissolved mineral matter on quick scan.
SWC 61	2730	Indeterminate							Indeterminate	Effectively BARREN — negligible palynomorphs on relinquished slides
Cuttings	2735	Indeterminate							Indeterminate	Poor preparation — slides dominated by undissolved mineral matter on quick scan.

CR = Confidence Rating
NR = Not recorded
MP% = Microplankton
Ac% = *Amosopollis cruciformis* %
X = Present in assemblage but not recorded in count.
LAD = Last Appearance Datum
FAD = First Appearance Datum

Table 3: Basic Sample and Palynomorph Data for La Bella–1

Sample Type	Depth (metres)	Lithology	Kerogen slides	Oxidised slides	Visual Yield	Palynomorph Concentration	Preservation	No. SP Species	No. MP Species
SWC 143	1979	CLAYSTONE, massive, dark grey, non-calcareous		4	Moderate	Moderate	Poor	24	12
SWC 141	2004	CLAYSTONE, silty, medium to dark grey trace glauconite.	1	3	Moderate	Moderate	Fair	17	17
SWC 138	2020	CLAYSTONE, massive, medium brownish grey trace carbonaceous flecks and laminae	1	3	High	High	Poor (over oxid.)	39	22
SWC 137	2028	SILTSTONE, laminated grading to very fine sandstone.	1	7	High	High	Very Poor	30	17
SWC 136	2043	CLAYSTONE, massive, dark grey, moderately calcareous		4	Low to Moderate	Low	Very Poor	26	12
SWC 135	2054	CLAYSTONE, medium brownish grey, interlaminated with sandstone containing trace glauconite.		4	Moderate	Low	Very Poor	27	17
SWC 133	2059	CLAYSTONE, medium brownish grey, interlaminated with sandstone containing trace glauconite.		4	Moderate	Moderate	Very Poor	22	12
SWC 131	2066	SANDSTONE with common glauconite interlaminated with minor claystone.		4	Moderate	Low	Poor	28	11
Core	2076.1		1	4	Moderate	Moderate	Poor	29	9
Core	2086.1		1	4	High	Moderate	Fair	34	8
Core	2096		1	4	High	Moderate	Fair	29	8
SWC 128	2111.5	CLAYSTONE, yellowish brown, arenaceous, strongly calcareous.		3	Moderate	Very low	Poor	14*	6*
SWC 126	2118	SANDSTONE, laminated, brownish grey with abundant argillaceous matrix.		3	Moderate	Moderate	Poor	20	18
SWC 120	2145	SILTSTONE, laminated, argeillaceous, light to medium grey grading to silty claystone.		4	Moderate	Low	Poor	33	11
SWC 117	2159	SANDSTONE, laminated, medium grey, fine-medium grained, argillaceous matrix, rare carbonaceous detritus.		3	Moderate	Very low	Poor	19	1*
SWC 114	2164	SANDSTONE, laminate light and medium grey, fine grained, trace carbonaceous flecks.		4	Moderate	Low	Poor	22	6*
SWC 113	2166	SANDSTONE, same as for SWC 114		4	Moderate	Low	Very poor	9	2
SWC 109	2179	SANDSTONE, light grey, fine grained, argillaceous matrix, interlaminate with black carbonaceous laminae.	1	4	Moderate	Low	Poor	28	9

Table 3: Basic Sample and Palynomorph Data for La Bella–1

Sample Type	Depth (metres)	Lithology	Kerogen slides	Oxidised slides	Visual Yield	Palynomorph Concentration	Preservation	No. SP Species	No. MP Species
SWC 107	2199	SILTSTONE, medium to dark grey, aboundantly argillaceous, common carbonaceous laminae and flecks.	1	4	High	High	Poor-fair	38	12
SWC 103	2232	SILTY CLAYSTONE, medium to dark grey traces carbonaceous flecks and micromica.		4	High	Moderate	Very poor (pyrite pitted)	19	14
SWC 100	2252	SILTSTONE, light grey, aboundantly argillaceous, and with common thin carbonaceous laminae.	1	5	High	Low	Poor	28	12
SWC 99	2270	CLAYSTONE, massive, dark brownish grey, micromicaceous, carbonaceous flecks laminae.	1	4	High	Moderate	Poor (pyrite pitted)	29	16
SWC 98	2277.5	CLAYSTONE, massive, dark brownish grey common carbonaceous flecks, trace glauconite.		4	High	Low	Poor	23	17
SWC 96	2284	CLAYSTONE, dark brownish grey, interlaminated with fine grained sandstone.	1	4	High	Moderate	Poor-fair	29	14
SWC 95	2286	CLAYSTONE same as SWC 96.	1	4	High	Low	Poor-fair	29	3
SWC 93	2309	CLAYSTONE same as SWC 96.		4	High	High	Very poor (pyrite pitted)	24	14
SWC 92	2330	SILTSTONE, argillaceous, medium brownish grey laminae of mm scale, common carbonaceous flecks.	1	4	High	Moderate	Poor-fair	27	
SWC 88	2398	SANDSTONE, argillaceous, light greenish grey, trace to common lithics, rare glauconite (chlorite?) and coaly detritus.	1	4	High	High	Poor	31	13
SWC 87	2402	CLAYSTONE same as SWC 96.	1	4	High	Low to moderate	Poor	26	8
SWC 81	2454	CLAYSTONE, dark brownish grey, common carbonaceous flecks, interlaminated with fine grained sandstone.		6	High	Low to moderate	Very poor	31	
Cuttings	2489			4	Low	Low	Poor	14*	2
SWC 79	2497	SANDSTONE, argillaceous, off white to light grey, medium to coarse abundant kaolinitic matrix.	1	1 + B	Very low	Very low	Poor	7*	
SWC 77	2500	SILTSTONE, argillaceous, medium grey grading to silty claystone.	1	3	High	Moderate	Very poor	29	
SWC 75	2528	CLAYSTONE, massive, brownish/olive grey, trace micromica and carbonaceous flecks.		4	High	Moderate	Very poor	24	
SWC 74	2540.5	SANDSTONE, argillaceous, interbedded with coal.		4	High	Barren			

Table 3: Basic Sample and Palynomorph Data for La Bella–1

Sample Type	Depth (metres)	Lithology	Kerogen slides	Oxidised slides	Visual Yield	Palynomorph Concentration	Preservation	No. SP Species	No. MP Species
SWC 73	2544.5	CLAYSTONE, massive, dark brownish grey, common cargbonaceous flecks and laminae.	1	3	High	High	Poor	28	2
Cuttings	2550				High	Moderate	Poor	23*	10
SWC 72	2567	SILTSTONE, argillaceous, medium brownish grey, common carbonaceous flecks.	1	4	High	High	Fair	37	2
Cuttings	2573			7	Moderate	Low	Poor	20*	3
SWC 70	2593	CLAYSTONE, massiv, medium-olive grey, common carbonaceous flecks.	1	2	Low	Moderate	Poor	13	1
SWC 68	2605	SANDSTONE, light greenish grey, speckled, medium grained, multicoloured lithics (volcanogenic?) and quartzoze, off-white argillaceous matrix.	1	1 + B	Low	Very low	Very poor	10	
SWC 66	2624	SANDSTONE, off white, fine-medium grained quartzose, aboundant off white argillaceous matrix.	1	1 + B	Very low	Very low	Poor	5	
Cuttings	2640			5	Low	Low	Poor	14*	
SWC 65	2646.5	CLAYSTONE, dark grey, interbedded with sandstone same as for SWC 68.		4	High	Moderate	Poor	17	
SWC 64	2671	SANDSTONE same as for SWC 68.	1	1	Very low	Very low	Poor	17	
SWC 63	2683	SANDSTONE same as for SWC 68.	1	2	Low	Low	Poor	14*	
Cuttings	2690			5	Low	Low	Poor	17	
SWC 62	2705	SANDSTONE same as for SWC 68.	1	2	Very low	Very low	Poor	6	
Cuttings	2715			7	Low	Low	Poor	24*	2
SWC 61	2730	SANDSTONE same as for SWC 68.	1	1	Very low	Very low	Poor	3	
Cuttings	2735			4	Low	Low	Poor	18	2
		Total slides:	26	186 + 3B			Averages:	22.5	9.6

NB. Lithologies not available for cuttings or core samples.

B in "Oxidised slides" column = Blank slide in relinquishment slide set.

Asterisks in "No. Species" column = Number of species recorded by Roger Morgan in original report.

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	SWC 143	SWC 141	SWC 138	SWC 137	SWC 136	SWC 135	SWC 133	SWC 131
Depth (m)	1979.0	2004.0	2020.0	2028.0	2043.0	2054.0	2059.0	2066.0
SPORES								
Appendicisporites spp.				1.2%		1.4%		
Baculatisporites spp.	1.1%				2.9%	2.9%		6.7%
Cicatricosisporites spp.	2.3%		0.8%					1.1%
Clavifera triplex					1.4%			1.1%
Cyathidites (large) >40µm	2.3%	2.6%	3.4%	2.3%	2.9%	4.3%	5.0%	3.4%
Cyathidites (small) <40µm	17.0%	15.8%	20.3%	9.3%	12.9%	18.6%	5.0%	21.3%
Dictyophyllidites spp.	4.5%	5.3%	9.3%	1.2%		2.9%	8.3%	3.4%
Gleicheniidites spp.	4.5%	2.6%	12.7%	2.3%	4.3%	5.7%	8.3%	7.9%
Herkosporites/Ceratosporites spp.	1.1%		1.7%			2.9%		1.1%
Laevigatosporites spp.			4.2%	2.3%				3.4%
Laevigatosporites musa †								
Osmundacidites wellmanii	1.1%	2.6%		2.3%		1.4%		
Peromonolites spp.								
Perotrilites spp.								
Retitriletes spp.	1.1%	2.6%	1.7%	1.2%		1.4%		1.1%
Rugulatisporites/Verrucosisporites spp.			1.7%					
Stereisporites spp.			0.8%					1.1%
Triletes undiff.	1.1%	13.2%	2.5%	4.7%	1.4%	8.6%	5.0%	2.2%
Triporoletes reticulatus								1.1%
Total Spores:	**36%**	**45%**	**59%**	**27%**	**26%**	**50%**	**32%**	**55%**
GYMNOSPERMS								
Araucariacites australis	2.3%				5.7%		5.0%	2.2%
Corollina spp.	2.3%				1.4%			1.1%
Cupressacites sp.	1.1%	2.6%	2.5%	2.3%	1.4%		3.3%	1.1%
Dilwynites pusillus †	3.4%		0.8%	8.1%	14.3%	7.1%	11.7%	1.1%
Dilwynites spp.	9.1%		5.1%	15.1%	8.6%	5.7%	18.3%	6.7%
Hoegisporis trinalis †								
Microcachryidites antarcticus	5.7%	5.3%	9.3%	12.8%	8.6%	2.9%	8.3%	2.2%
Phyllocladidites eunuchus †								
Phyllocladidites mawsonii	5.7%			1.2%		1.4%		
Podocarpidites spp.	28%	34%	13%	29%	33%	27%	17%	28%
Trichotomosulcites subgranulatus	2.3%		2.5%	4.7%		4.3%		
Total Gymnosperms:	**60%**	**42%**	**33%**	**73%**	**73%**	**49%**	**63%**	**43%**
ANGIOSPERMS undiff.			0.8%					
Asteropollis/Australopollis spp.							3.3%	
Liliacidites spp.								1.1%
Proteacidites spp.	1.1%	7.9%						
Tricolpites/Tricolporites spp.	2.3%	5.3%	6.8%		1.4%	1.4%	1.7%	1.1%
Total Angiosperms:	**3.4%**	**13.2%**	**7.6%**		**1.4%**	**1.4%**	**5.0%**	**2.2%**
Total Spore-Pollen Count:	**88**	**38**	**118**	**86**	**70**	**70**	**60**	**89**

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	SWC 143	SWC 141	SWC 138	SWC 137	SWC 136	SWC 135	SWC 133	SWC 131
Depth (m)	1979.0	2004.0	2020.0	2028.0	2043.0	2054.0	2059.0	2066.0
MICROPLANKTON % of MP COUNT								
Microplankton undiff.	19.2%	17.3%	42.0%	11.3%	15.2%	17.1%	33.0%	22.2%
Amosopollis cruciformis	1.4%		3.6%	49.5%	57.6%	57.3%	25.2%	29.6%
Apteodinium/Cribroperidinium spp.			1.8%	2.1%	5.4%	6.1%	5.8%	
Cassidium sp.		33.7%						
Chatangiella/Isabelidinium spp.		10.6%						
Cleistosphaeridium ancoriferum								
Cribroperidinium edwardsii								
Cyclonephelium compactum								
Cyclonephelium distinctum								3.7%
Heterosphaeridium spp.	49.3%	19.2%	37.5%	24.7%	17.4%	12.2%	14.6%	18.5%
Isabelidinium cretacem		8.7%						
Isabelidinium evexus †			2.7%	2.1%		4.9%	15.5%	18.5%
Kiokansium polypes			1.8%	6.2%	2.2%	1.2%	2.9%	3.7%
Micrhystridium/Veryhachium spp.								
Nelsoniella aceras	16.4%							
Nummus spp.					1.1%			3.7%
Odontochitina spp.	1.4%	7.7%	2.7%			1.2%	1.0%	
Oligosphaeridium spp.			4.5%	1.0%			1.9%	
Palaeoperidinium cretaceum								
Palaeohystrichophora infusorioides	9.6%		1.8%	2.1%				
Sigmopollis spp.								
Spiniferites spp.	2.7%	1.0%	1.8%	1.0%	1.1%			
Trithyrodinium spp.		1.9%						
Total Microplankton Count:	**73**	**104**	**112**	**97**	**92**	**82**	**103**	**27**
Microplankton % of total SP & MP	45%	73%	49%	53%	57%	54%	63%	23%
A. cruciformis as % of total SP & MP	1%		2%	26%	33%	31%	16%	7%
Total SP and MP COUNT:	**161**	**142**	**230**	**183**	**162**	**152**	**163**	**116**
Other Palynomorphs Count								
Botryococcus braunii	0.6%							
Fungal fruiting bodies						0.7%		
Fungal spores/hyphae								
Reworked Fossils					0.6%			1.7%
TOTAL COUNT:	**162**	**142**	**230**	**183**	**163**	**153**	**163**	**118**

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	Core	Core	Core	SWC 126	SWC 120	SWC 114	SWC 109	SWC 107
Depth (m)	2076.1	2086.1	2096.0	2118.0	2145.0	2164.0	2179.0	2199.0
SPORES								
Appendicisporites spp.								1.5%
Baculatisporites spp.		0.8%			2.0%	6.4%	1.2%	
Cicatricosisporites spp.	2.0%	1.5%	1.3%				1.8%	3.0%
Clavifera triplex							0.6%	
Cyathidites (large) >40µm	2.0%	2.3%	2.5%		8.0%	17.0%	2.4%	3.7%
Cyathidites (small) <40µm	18.6%	18.8%	18.4%	11.4%	21.0%	19.1%	8.4%	11.2%
Dictyophyllidites spp.	4.9%	3.8%	2.5%	2.3%	4.0%		1.8%	9.0%
Gleicheniidites spp.	16.7%	2.3%	13.3%	2.3%	8.0%		6.0%	14.9%
Herkosporites/Ceratosporites spp.		0.8%	3.8%		2.0%		1.8%	3.0%
Laevigatosporites spp.	3.9%	3.8%	1.3%		1.0%	6.4%	0.6%	1.5%
Laevigatosporites musa †		0.8%	1.3%		1.0%	2.1%	0.6%	2.2%
Osmundacidites wellmanii		3.8%	1.9%		2.0%	2.1%	1.8%	1.5%
Peromonolites spp.			0.6%					
Perotrilites spp.					1.0%			0.7%
Retitriletes spp.		1.5%	0.6%	2.3%	1.0%		0.6%	0.7%
Rugulatisporites/Verrucosisporites spp.			0.6%	2.3%	3.0%		1.2%	2.2%
Stereisporites spp.		0.8%						0.7%
Triletes undiff.	6.9%	3.0%	2.5%	2.3%	5.0%	6.4%	1.8%	5.2%
Triporoletes reticulatus		0.8%			1.0%			
Total Spores:	**55%**	**44%**	**51%**	**23%**	**60%**	**60%**	**31%**	**61%**
GYMNOSPERMS								0.7%
Araucariacites australis	1.0%	0.8%	0.6%	2.3%	2.0%	6.4%	1.2%	0.7%
Corollina spp.			1.3%					1.5%
Cupressacites sp.	2.0%	1.5%		4.5%	1.0%			0.7%
Dilwynites pusillus †	11.8%	2.3%	3.2%		3.0%		10.8%	3.0%
Dilwynites spp.	1.0%	6.0%	5.7%	2.3%	6.0%		3.0%	2.2%
Hoegisporis trinalis †			0.6%	2.3%				
Microcachryidites antarcticus	10.8%	6.8%	3.8%	4.5%	3.0%	4.3%	10.2%	8.2%
Phyllocladidites eunuchus †	1.0%		2.5%				4.2%	
Phyllocladidites mawsonii	1.0%							
Podocarpidites spp.	13%	30%	23%	55%	22%	26%	31%	16%
Trichotomosulcites subgranulatus	1.0%	1.5%	5.7%	2.3%	2.0%		5.4%	3.0%
Total Gymnosperms:	**42%**	**49%**	**47%**	**73%**	**39%**	**36%**	**66%**	**36%**
ANGIOSPERMS undiff.						2.1%		
Asteropollis/Australopollis spp.	1.0%						1.8%	
Liliacidites spp.	1.0%	1.5%		4.5%		2.1%		3.0%
Proteacidites spp.								
Tricolpites/Tricolporites spp.	1.0%	5.3%	2.5%		1.0%		1.2%	
Total Angiosperms:	**2.9%**	**6.8%**	**2.5%**	**4.5%**	**1.0%**	**4.3%**	**3.0%**	**3.0%**
Total Spore-Pollen Count:	**102**	**133**	**158**	**44**	**100**	**47**	**166**	**134**

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	Core	Core	Core	SWC 126	SWC 120	SWC 114	SWC 109	SWC 107
Depth (m)	2076.1	2086.1	2096.0	2118.0	2145.0	2164.0	2179.0	2199.0
MICROPLANKTON % of MP COUNT								
Microplankton undiff.	3.8%	8.7%	18.2%	9.8%	12.5%	100%	12.5%	56.3%
Amosopollis cruciformis	75.5%	65.2%	63.6%				12.5%	
Apteodinium/Cribroperidinium spp.				1.6%	12.5%			
Cassidium sp.								
Chatangiella/Isabelidinium spp.								
Cleistosphaeridium ancoriferum	5.7%							
Cribroperidinium edwardsii							12.5%	
Cyclonephelium compactum				3.3%			12.5%	6.3%
Cyclonephelium distinctum					12.5%		12.5%	
Heterosphaeridium spp.	13.2%	26.1%		21.3%	12.5%		12.5%	6.3%
Isabelidinium cretacem								
Isabelidinium evexus †				9.8%				
Kiokansium polypes	1.9%			18.0%	12.5%			6.3%
Micrhystridium/Veryhachium spp.								6.3%
Nelsoniella aceras								
Nummus spp.			9.1%	4.9%			12.5%	
Odontochitina spp.				3.3%				18.8%
Oligosphaeridium spp.			9.1%	21.3%	25.0%			
Palaeoperidinium cretaceum								
Palaeohystrichophora infusorioides				1.6%	12.5%			
Sigmopollis spp.								
Spiniferites spp.				4.9%			12.5%	
Trithyrodinium spp.								
Total Microplankton Count:	**53**	**23**	**11**	**61**	**8**	**1**	**8**	**16**
Microplankton % of total SP & MP	34%	15%	7%	58%	7%	2%	5%	11%
A. cruciformis as % of total SP & MP	26%	10%	4%				1%	
Total SP and MP COUNT:	**155**	**156**	**169**	**105**	**108**	**48**	**174**	**150**
Other Palynomorphs Count								
Botryococcus braunii								
Fungal fruiting bodies								
Fungal spores/hyphae		0.6%						
Reworked Fossils					0.9%			2.6%
TOTAL COUNT:	**155**	**157**	**169**	**105**	**109**	**48**	**174**	**154**

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	SWC 103	SWC 100	SWC 99	SWC 96	SWC 95	SWC 93	SWC 92	SWC 88
Depth (m)	2232.0	2252.0	2270.0	2284.0	2286.0	2309.0	2330.0	2398.0
SPORES								
Appendicisporites spp.			1.9%	0.8%				
Baculatisporites spp.		0.9%	0.9%	1.6%			1.6%	0.9%
Cicatricosisporites spp.	3.6%	0.9%	1.9%	3.2%	0.9%	1.9%		0.9%
Clavifera triplex								
Cyathidites (large) >40µm	7.1%	1.8%	3.8%	3.2%	4.6%	1.9%	3.9%	5.3%
Cyathidites (small) <40µm	10.7%	9.9%	14.2%	8.0%	20.2%	18.5%	11.7%	12.3%
Dictyophyllidites spp.	7.1%	7.2%	10.4%	6.4%	1.8%	5.6%	2.3%	3.5%
Gleicheniidites spp.	17.9%	14.4%	5.7%	17.6%	7.3%	11.1%	1.6%	5.3%
Herkosporites/Ceratosporites spp.		0.9%		2.4%		1.9%	0.8%	2.6%
Laevigatosporites spp.		1.8%	0.9%	2.4%	3.7%	1.9%	0.8%	1.8%
Laevigatosporites musa †		4.5%			0.9%			
Osmundacidites wellmanii			4.7%	2.4%	0.9%		6.3%	2.6%
Peromonolites spp.								
Perotrilites spp.			0.9%					
Retitriletes spp.		0.9%	0.9%	1.6%	0.9%		1.6%	1.8%
Rugulatisporites/Verrucosisporites spp.	7.1%	0.9%	2.8%		1.8%			
Stereisporites spp.		2.7%						0.9%
Triletes undiff.	3.6%	2.7%	4.7%	5.6%	11.0%	5.6%	5.5%	7.0%
Triporoletes reticulatus			0.9%					
Total Spores:	**57%**	**50%**	**55%**	**55%**	**54%**	**48%**	**36%**	**45%**
GYMNOSPERMS								
Araucariacites australis		3.6%	1.9%		2.8%		3.1%	1.8%
Corollina spp.	3.6%			1.6%	0.9%	5.6%	0.8%	
Cupressacites sp.				0.8%		1.9%		
Dilwynites pusillus †	14.3%	18.9%	13.2%	4.0%	6.4%	1.9%	1.6%	5.3%
Dilwynites spp.		1.8%	3.8%	2.4%	1.8%	7.4%	3.9%	0.9%
Hoegisporis trinalis †	3.6%	0.9%	2.8%		0.9%			
Microcachryidites antarcticus		8.1%	5.7%	10.4%	11.0%	11.1%	15.6%	21.9%
Phyllocladidites eunuchus †				1.6%			1.6%	
Phyllocladidites mawsonii				0.8%				
Podocarpidites spp.	18%	16%	14%	23%	21%	20%	36%	23%
Trichotomosulcites subgranulatus	3.6%	0.9%	1.9%		0.9%	3.7%	0.8%	2.6%
Total Gymnosperms:	**43%**	**50%**	**43%**	**45%**	**46%**	**52%**	**63%**	**55%**
ANGIOSPERMS undiff.								
Asteropollis/Australopollis spp.								
Liliacidites spp.			1.9%					
Proteacidites spp.								
Tricolpites/Tricolporites spp.							0.8%	
Total Angiosperms:			**1.9%**				**0.8%**	
Total Spore-Pollen Count:	**28**	**111**	**106**	**125**	**109**	**54**	**128**	**114**

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	SWC 103	SWC 100	SWC 99	SWC 96	SWC 95	SWC 93	SWC 92	SWC 88
Depth (m)	2232.0	2252.0	2270.0	2284.0	2286.0	2309.0	2330.0	2398.0
MICROPLANKTON % of MP COUNT								
Microplankton undiff.	9.7%	48.6%	19.6%	19.4%		4.0%		47.1%
Amosopollis cruciformis	1.0%		3.9%		33.3%			
Apteodinium/Cribroperidinium spp.	1.0%							
Cassidium sp.								
Chatangiella/Isabelidinium spp.								
Cleistosphaeridium ancoriferum	1.0%		2.0%	2.8%		1.0%		
Cribroperidinium edwardsii				52.8%	33.3%	14.0%		
Cyclonephelium compactum								17.6%
Cyclonephelium distinctum		17.1%	7.8%					
Heterosphaeridium spp.	54.4%	20.0%	27.5%	2.8%				14.7%
Isabelidinium cretacem								
Isabelidinium evexus †								
Kiokansium polypes		5.7%	7.8%					2.9%
Micrhystridium/Veryhachium spp.								
Nelsoniella aceras								
Nummus spp.					33.3%			
Odontochitina spp.			7.8%	2.8%		26.0%		
Oligosphaeridium spp.	26.2%	2.9%	13.7%	16.7%		1.0%		8.8%
Palaeoperidinium cretaceum	4.9%					52.0%		
Palaeohystrichophora infusorioides			3.9%					
Sigmopollis spp.								
Spiniferites spp.	1.9%	5.7%	5.9%	2.8%		2.0%		8.8%
Trithyrodinium spp.								
Total Microplankton Count:	**103**	**35**	**51**	**36**	**3**	**100**		**34**
Microplankton % of total SP & MP	79%	24%	32%	22%	3%	65%		23%
A. cruciformis as % of total SP & MP	1%		1%		1%			
Total SP and MP COUNT:	**131**	**146**	**157**	**161**	**112**	**154**	**128**	**148**
Other Palynomorphs Count								
Botryococcus braunii					0.9%			
Fungal fruiting bodies								
Fungal spores/hyphae						0.6%		
Reworked Fossils		0.7%			3.4%		3.8%	2.6%
TOTAL COUNT:	**131**	**147**	**157**	**161**	**117**	**155**	**133**	**152**

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	SWC 87	SWC 81	SWC 77	SWC 75	SWC 73	SWC 72	SWC 70	SWC 65
Depth (m)	2402.0	2454.0	2500.0	2528.0	2544.5	2567.0	2593.0	2646.5
SPORES								
Appendicisporites spp.	1.9%		0.7%		0.6%			
Baculatisporites spp.	1.9%	4.2%	0.7%	4.1%		3.8%	2.2%	0.7%
Cicatricosisporites spp.	2.8%	0.7%	2.1%	0.7%	13.0%	2.4%		1.4%
Clavifera triplex								
Cyathidites (large) >40µm	6.5%	5.6%	9.0%	8.1%	0.6%	5.3%	10.1%	10.0%
Cyathidites (small) <40µm	18.5%	7.6%	16.6%	15.5%	16.9%	15.9%	14.4%	13.6%
Dictyophyllidites spp.	3.7%	1.4%	3.4%	0.7%	0.6%	3.8%	1.4%	
Gleicheniidites spp.	1.9%	0.7%	0.7%					
Herkosporites/Ceratosporites spp.	2.8%	1.4%	2.1%		1.1%	2.9%		1.4%
Laevigatosporites spp.			0.7%					
Laevigatosporites musa †								
Osmundacidites wellmanii	6.5%	6.3%	6.2%	2.7%	0.6%	3.4%	2.2%	5.0%
Peromonolites spp.								
Perotrilites spp.	0.9%	0.7%	0.7%	0.7%		0.5%		
Retitriletes spp.	8.3%	2.8%	3.4%	2.0%		5.8%	4.3%	3.6%
Rugulatisporites/Verrucosisporites spp.		2.1%		0.7%				
Stereisporites spp.	0.9%		2.1%	0.7%		0.5%		
Triletes undiff.	4.6%	9.7%	6.2%	4.1%	1.7%	2.9%	2.2%	3.6%
Triporoletes reticulatus			0.7%		4.5%	0.5%		
Total Spores:	**61%**	**43%**	**55%**	**40%**	**40%**	**48%**	**37%**	**39%**
GYMNOSPERMS								
Araucariacites australis	4.6%	0.7%	5.5%	0.7%	3.4%			
Corollina spp.	5.6%		2.1%	2.0%		0.5%	2.9%	0.7%
Cupressacites sp.					1.1%	0.5%		
Dilwynites pusillus †	1.9%							
Dilwynites spp.	2.8%	6.3%	2.1%	2.7%	1.7%			
Hoegisporis trinalis †	1.9%		2.1%	0.7%				
Microcachryidites antarcticus	0.9%	10.4%	10.3%	4.1%	29.4%	10.6%	2.9%	3.6%
Phyllocladidites eunuchus †								
Phyllocladidites mawsonii								
Podocarpidites spp.	21%	40%	22%	50%	22%	39%	58%	56%
Trichotomosulcites subgranulatus			0.7%		2.8%	1.4%		0.7%
Total Gymnosperms:	**39%**	**57%**	**45%**	**60%**	**60%**	**52%**	**63%**	**61%**
ANGIOSPERMS undiff.								
Asteropollis/Australopollis spp.								
Liliacidites spp.								
Proteacidites spp.								
Tricolpites/Tricolporites spp.								
Total Angiosperms:								
Total Spore-Pollen Count:	**108**	**144**	**145**	**148**	**177**	**208**	**139**	**140**

Table 4: La Bella–1 **Abundance Chart for selected palynomorphs.**

Sample Type	SWC 87	SWC 81	SWC 77	SWC 75	SWC 73	SWC 72	SWC 70	SWC 65
Depth (m)	2402.0	2454.0	2500.0	2528.0	2544.5	2567.0	2593.0	2646.5
MICROPLANKTON % of MP COUNT								
Microplankton undiff.	34.8%					50.0%		
Amosopollis cruciformis								
Apteodinium/Cribroperidinium spp.								
Cassidium sp.								
Chatangiella/Isabelidinium spp.								
Cleistosphaeridium ancoriferum								
Cribroperidinium edwardsii								
Cyclonephelium compactum	8.7%							
Cyclonephelium distinctum	50.0%							
Heterosphaeridium spp.								
Isabelidinium cretacem								
Isabelidinium evexus †								
Kiokansium polypes								
Micrhystridium/Veryhachium spp.					50.0%	50.0%		
Nelsoniella aceras								
Nummus spp.								
Odontochitina spp.	2.2%							
Oligosphaeridium spp.	2.2%							
Palaeoperidinium cretaceum								
Palaeohystrichophora infusorioides								
Sigmopollis spp.	2.2%			100%	50.0%			
Spiniferites spp.								
Trithyrodinium spp.								
Total Microplankton Count:	**46**			**1**	**4**	**2**		
Microplankton % of total SP & MP	30%			1%	2%	1%		
A. cruciformis as % of total SP & MP								
Total SP and MP COUNT:	**154**	**144**	**145**	**149**	**181**	**210**	**139**	**140**
Other Palynomorphs Count								
Botryococcus braunii	0.6%							2.5%
Fungal fruiting bodies				0.6%	0.5%			
Fungal spores/hyphae		2.6%	1.3%			0.5%		
Reworked Fossils	1.3%	3.3%	4.5%	2.6%		0.5%	10.9%	8.3%
TOTAL COUNT:	**157**	**153**	**154**	**154**	**182**	**212**	**156**	**157**

Table 5: Stratigraphic distribution of key index palynomorphs in La Bella–1.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Sample Type	**Depth (metres)**	Crybelosporites striatus	Appendicisporties distocarinatus	Cicatricosisporites cuneformis	Hoegisporis trinalis ms	Phyllocladitides eunuchus ms	Cupressacites sp.	Coptospora pileolus ms	Dilwynites spp.	Verrucosisporites admirabilis ms	Interulobites intraverrucatus	Phyllocladitides mawsonii	Laevigatosporites musa ms	Cyatheacidites tectifera	Clavifera triplex	Senectotetradites fistulosus	Tricolporites variverrucatus ms	Gleicheniidites ancorus ms	Proteacidites spp.	Veryhachium n.sp.	Cribroperidinium edwardsii	Cyclonephelium compactum	Odontochitina operculata/costatae	Oligosphaeridium spp.	Heterosphaeridium spp.	Kiokansium polypes	Amosopollis cruciformis	Paleoperidinium cretaceum	Palaeohystrichophora infusorioides	Isabelidinium evexus ms	Isabelidinium cretaceum	Cassidium sp.	Trithyrodinium spp.	Odontochitina porifera	Nelsoniella aceras
SWC 143	1979					X	1%		12%			6%						X	1%					X	22%		<1%		4%				X	7%	7%
SWC 141	2004					•	3%		•			•			X			•	8%				X	X	14%		•		•		6%	25%	8%	<1%	
SWC 136	2020		X	X		•	3%		6%	2%		•	X		X		X	•				X	1%	2%	18%	X	2%		X	1%					
SWC 137	2028		1%	X		X	2%	X	23%	X		1%	X		•		X	•				X	X	X	13%	3%	26%		1%	1%					
SWC 136	2043		•	•		•	X	•	20%	X		•	•		3%		•	X				•	X	•	9%	1%	31%		•	X					
SWC 135	2054		1%	•	X	•	•	•	13%	•		1%	•		•		X	•				•	X	X	7%	X	31%		•	3%					
SWC 133	2059		X	•	•	•	6%	•	31%	•		•	•		•		X	•				•	X	1%	9%	2%	16%		•	10%			V		
SWC 131	2066		•	•	•	X	1%	•	8%	•		X	•		X		X	•				•	•	X	4%	1%	7%		•	4%					
Core	2076.1		X	•	•	1%	2%	•	13%	•		1%	•		X		•	X				•	•	X	5%	1%	26%		•	•					
Core	2086.1		X	•	•	•	2%	•	9%	X	X	•	1%		•		4%					•	•	•	4%	•	10%		•	X					
Core	2096		1%	•	•	X	•	•	8%	X	•	X	1%		•		3%					•	•	X	X	•	4%		•	X					
SWC 128	2111.5		•	•	•	•	•	•	X	•	•	•	•		•							•	•	X	X	•	•		•	•					
SWC 126	2118		2%	•	X	•	4%	•	2%	•	•	•	•		X						W	•	2%	12%	11%	10%	•		X	X					
SWC 120	2145		X	•	•	•	1%	•	6%	2%	•	X	1%		X							•	•	1%	1%	1%	X		1%						
SWC 117	2159		•	•	•	X	•	•	7%	•	X	•	•		•							•	•	X	•	•	•		•						
SWC 114	2164		X	•	•	•	•	X	•	X	•	X	2%		•	X						•	•	X	X	•	•		•						
SWC 113	2166		X	•	•	X	•	•	X	•	•	X	•		•	•						•	X	•	X	•	X		•						
SWC 109	2179		X	X	•	X	•	•	14%	1%	•	X	1%		X	X					X	1%	•	•	1%	•	1%		•						
SWC 107	2199		2%	•	X	•	1%	•	5%	2%	X	X	2%		•						•	•	1%	•	X	X	•	X	X						
SWC 103	2232		X	•	4%	•	•	•	14%	7%	•	•	•		•						•	?	X	21%	43%	•	X	4%	•						
SWC 100	2252		X	X	1%	•	•	•	21%	1%	•	X	5%		•						•	•	•	1%	5%	1%	•	3%	•						
SWC 99	2270		2%	•	3%	X	•	•	17%	3%	•	X	•		X						X	•	3%	4%	9%	3%	1%	X	X						
SWC 98	2277.5		X	•	•	X	X	•	X	•	•	•	•								X	X	X	X	X	X	•	X						
SWC 96	2284		1%	X	X	2%	1%	•	6%	•	•	1%	X	X							12%	X	1%	4%	1%	•	•	X							
SWC 95	2286		X	•	1%	•	•	•	8%	2%	•	•	1%								1%	•	•	•	•	•	X	•							
SWC 93	2309		•	•	X	X	•	•	9%	X	•	•									9%	X	17%	1%	X	•	•	34%							
SWC 92	2330		X	•	•	2%	•	•	6%	•	•	•									•	•	•	•	•	•	•								
SWC 88	2398		X	•	X	X	•	X	6%	X	•	X									X	4%	X	2%	3%	X	X								
SWC 87	2402		2%	•	2%	•	•	•	5%	X	•										X	2%	X	1%	X										
SWC 81	2454		X	•	•	X	•	X	6%	2%	X																								
SWC 77	2500		1%	•	2%	?	•	•	2%	•			?																						
SWC 75	2528	X	X	•	1%	X	•	•	3%	1%																									
SWC 73	2544.5	•	1%	•	?	•	X	X	2%	?										1%															
SWC 72	2567	X	•	X	X	X	X													1%															
SWC 70	2593	•	?	•																															
SWC 68	2605	•	•	•																															
SWC 66	2624	•	X	•																															
SWC 65	2646.5	X	•	X																															
SWC 64	2671	•	•			?																													
SWC 63	2683	•	•																																
SWC 62	2705	•	X																																

Numbers 1 to 18 are spore-pollen species.

Numbers 19 to 34 are microplankton species

LEGEND

1%	= Percentage abundance
X	= Present but <1% of count
?	= Questionable identification or occurrence
W	= Reworked species occurrence
V	= Caved species occurrence
Z	= Interpreted laboratory cross-contamination
•	= Not recorded in sample within species range