



PE990252

# **Biostratigraphy and interpreted stratigraphy of Champion-1 and Conan-1 from open file basic data.**

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**Petroleum Development Unpublished Report 1998/01**

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### Introduction

Basic data palynological range charts placed on open file by Minerals & Energy Victoria from the BHP Petroleum Pty Ltd wells Champion-1 and Conan-1 in the offshore Otway Basin have been reviewed to interpret the palynological zonation and age of the sequence drilled. This data has then been integrate with basic electric logs to derive formation tops (Tables 1 & 2).

The original palynological analysis and preparation of range charts was by Morgan (1995a, b). The stratigraphy is interpreted in terms of recent revisions to the Sherbrook Group by Partridge (1997) as illustrated in Figure 1.

### Interpretation of Champion-1

In Champion-1 twenty-eight samples (19 SWCs and 9 cuttings) were analysed between 1255 to 1882m. A 457 metre thick section of Late Cretaceous Sherbrook Group is identified overlying the Eumeralla Formation of which only 182 metres was penetrated before the well reached T.D. The Tertiary was not sampled, as most of it lies behind casing extending down to ~1218m. The gamma ray spike between 1235 to 1245m is interpreted to represent the K/T boundary shale (Partridge, 1997). Below this is a 37 metre thick sand referred to the Timboon Sandstone (1245-1280m), overlying 157 metres of interbedded sands and shales of the Paaratte Formation. The last unit becomes gradually shallier (note SP log) and grades into the Skull Creek Mudstone identified between 1433 to 1528m. The underlying mixed blocky sands and shales between 1528 to 1613m are equated to the Nullawarre Greensand, an identification consistent with the probable presence of the *Isabelldinium rotundatum* Subzone at 1592m. The Belfast Mudstone is then identified by the homogeneous shale between 1613 to 1674m. Only the upper Unit C of Partridge (1997) is considered to be present. The lower Units B and A, the underlying Flaxman Formation and part of the Waarre Formation are interpreted to be missing in Champion-1 at an unconformity (or fault contact?) at 1674m. The eroded or faulted top of Waarre lies within Unit B of the formation. The top of the Eumeralla Formation extends as high as 1712m based on palynological assemblages in sidewall cores and possibly as high as 1700m based on the cuttings analysed. The log pick for top of formation could however be at 1696m or 1708m depending on whether the sandy section between these picks is interpreted as part of the Eumeralla or as Unit A of the Waarre

Formation. The deeper pick is preferred. The presence of *Eumeralla* microfloras in this sand section is interpreted as reworking at base of the Waarre Formation.

### Interpretation of Conan-1

In Conan-1 thirty-one samples (17 SWCs and 14 cuttings) were analysed between 1250 to 1965m. The section analysed consists of 770 metres of Sherbrook Group overlying 115 metres of *Eumeralla* Formation. The well reached T.D. in the upper part of the latter formation. The top 100 metres of Sherbrook Group was not sampled as it is behind casing. The Sherbrook Group below casing comprises a mainly shaly Paaratte Formation (to 1284m) overlying a homogeneous shaly interval referred to the Skull Creek and Belfast Mudstones. Only the upper Unit C of Partridge (1997) appears to be represented in the Belfast Mudstone. The underlying Units B and A are either very condensed (<1 metre thick) or missing at an unconformity at top of thin Flaxman Formation which is ~13 metres thick. All three Units A to C of the Waarre Formation appear to be present in Conan-1. The identification of the *Cribroperidinium edwardsii* microplankton Acme between 1775 to 1824m is consistent with onshore determinations of Waarre Unit B.

The top of the *Eumeralla* Formation is not clearly evident on the palynology data because of nearly barren sidewall cores (at 1861m and 1867m). Possible log breaks corresponding to the top Otway unconformity occur at 1835m and 1870m on the sonic log. The deeper pick is preferred as it is a more distinct break on the other logs. The palynological assemblages from the *Eumeralla* Formation are poor and could be from either the *P. pannosus* or older *C. paradoxa* Zone. The younger zone is considered more likely as it has been recovered from below the Otway unconformity in most other wells in the area.

### References

- MORGAN, R., 1995a. Champion #1 Palynology Report, (Basic Data – Palynological Range Charts – September).
- MORGAN, R., 1995b. Conan #1 Palynology Report, (Basic Data – Palynological Range Charts – September).
- PARTRIDGE, A.D., 1997a. New Upper Cretaceous palynology of the Sherbrook Group, Otway Basin. In *Victorian Supplement, PESA News* April/May, p.9.



Table-1: Champion-1 Zone and Formation Picks

Depth (metres)	Zone and Formation Datums	Pick Type	Hi/Lo	Pref/Alt	Confidence Ratings	
1163.0	Pember Mudstone	FORMATION	H			
1195.0	Pebble Point Formation	FORMATION	H			
1235.0	K/T Shale	FORMATION	H			
1243.0	Timboon Sand	FORMATION	H			
1255.0	<i>M.druggii</i> Øa	SINGLE			B	2
1255.0	Upper <i>T.longus</i>	PALAEO	H	P	B	4
1277.0	Upper <i>T.longus</i>	PALAEO	L	P	B	4
1280.0	Paaratte Formation	FORMATION	H			
1313.0	<i>T. lilliei</i>	PALAEO	H	P	B	4
1404.0	Skull Creek Mudstone	FORMATION	H			
1428.0	<i>T. lilliei</i>	PALAEO	L	P	B	4
1460.0	<i>N. senectus</i>	PALAEO	H	P	B	2
1460.0	<i>X. australis</i> Øci	PALAEO	H	P	B	2
1527.0	<i>X. australis</i> Øci	PALAEO	L	A	B	2
1528.0	Nullawarre Greensand	FORMATION	H			
1545.0	<i>X. australis</i> Øci	PALAEO	L	P	D	3
1545.0	<i>N. senectus</i>	PALAEO	L	A	B	2
1547.0	<i>N. aceras</i> Øcii	PALAEO	H	P	B	3
1572.0	<i>N. senectus</i>	PALAEO	L	P	B	5
1592.0	<i>T. apoxyextrus</i>	PALAEO	H	P	B	5
1612.0	<i>N. aceras</i> Øcii	PALAEO	L	A	B	3
1613.0	Belfast Mudstone	FORMATION	H			
1620.0	<i>N. aceras</i> Øcii	PALAEO	L	P	D	3
1654.0	<i>I. cretaceum</i> Ødi	PALAEO	H	P	B	2
1673.0	<i>I. cretaceum</i> Ødi	PALAEO	L	P	B	2
1674.0	Waarre Formation	FORMATION	H			
1686.0	<i>P. mawsonii</i>	SINGLE			B	1
1686.0	<i>P. infusorioides</i> lai	SINGLE			B	3
1700.0	<i>P. pannosus</i>	PALAEO	H	P	D	4
1708.0	Eumeralla Formation	FORMATION	H			
1751.0	<i>P. pannosus</i>	PALAEO	H	A	B	2
1812.0	<i>P. pannosus</i>	PALAEO	L	P	B	2
1882.0	<i>C. paradoxa</i>	MAX			D	3
1882.0	T.D.					

Hi/Lo = High or Low picks

Pref/Alt = Preferred or Alternate picks

**Table-2: Conan-1 Zone and Formation Picks**

Depth (metres)	Zone and Formation Datums	Pick Type	Hi/Lo	Pref/Alt	Confidence Ratings	
1100.0	Paaratte Formation	FORMATION	H			
1250.0	<i>N. senectus</i>	PALAEO	H	P	D	1
1250.0	<i>X. australis</i> Øci	PALAEO	H	P	D	2
1300.0	<i>X. australis</i> Øci	PALAEO	H	A	D	2
1539.0	<i>X. australis</i> Øci	PALAEO	L	P	B	1
1575.0	<i>N. aceras</i> Øcii	PALAEO	H	P	B	2
1601.5	<i>N. senectus</i>	PALAEO	L	P	B	3
1649.0	<i>N. aceras</i> Øcii	PALAEO	L	P	B	2
1649.0	<i>T. apoxyextrus</i>	PALAEO	H	P	B	4
1660.0	Belfast Mudstone C	FORMATION	H			
1678.0	<i>I. cretaceum</i> Ødi	PALAEO	H	P	B	2
1704.0	<i>I. cretaceum</i> Ødi	PALAEO	L	P	B	2
1704.0	<i>T. apoxyextrus</i>	PALAEO	L	P	B	4
1705.0	Flaxman Formation	FORMATION	H			
1715.0	<i>P. mawsonii</i>	PALAEO	H	P	B	3
1715.0	<i>P. infusorioides</i> lai	PALAEO	H	P	B	4
1715.0	<i>K. polypes</i> Subzone 1aiA	SINGLE			B	3
1718.0	Waarre Sandstone C	FORMATION	H			
1761.0	Waarre Sandstone B	FORMATION	H			
1775.0	<i>C. edwardsii</i> Acme 1aiC	PALAEO	H	P	B	3
1824.0	<i>P. infusorioides</i> lai	PALAEO	L	P	B	1
1824.0	<i>C. edwardsii</i> Acme 1aiC	PALAEO	L	P	B	3
1829.0	<i>P. mawsonii</i>	PALAEO	L	P	B	1
1833.0	Waarre Sandstone A	FORMATION	H			
1870.0	Eumeralla Formation	FORMATION	H			
1872.0	<i>P. pannosus</i>	MIN			B	5
1875.0	<i>C. paradoxa</i>	MAX			B	3
1985.0	T.D.					

**Confidence Ratings**

Alpha codes: Linked to sample type		Numeric codes: Linked to fossil assemblage		
A	Core	1	<b>Excellent confidence:</b>	High diversity assemblage recorded with key zone species.
B	Sidewall core	2	<b>Good confidence:</b>	Moderately diverse assemblage recorded with key zone species.
C	Coal cuttings	3	<b>Fair confidence:</b>	Low diversity assemblage recorded with key zone species.
D	Ditch cuttings	4	<b>Poor confidence:</b>	Moderate to high diversity assemblage recorded without key zone species.
E	Junk basket	5	<b>Very low confidence:</b>	Low diversity assemblage recorded without key zone species.
F	Miscellaneous/unknown			
G	Outcrop			