CONTENTS ENVELOPE 6758

PALYNOLOGY OF CRAYFISH-1A

by

ROGER MORGAN

for Ultramar Australia

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Depth (ft)	Key Sample (ft)	Spore-pollen Zone	Dinocyst Zones	Palyno-Event
1000	1192	L.balmei		L.balmei, G.edwardsii
	1239		N.aceras	N.aceras
	1245	T.pachyexinus		
	1250		I.cretacea	T.pachyexinus, I.cretacea
	1305	A.distocarinatus	?P.infusorioides	A.distocarinatus
	1473–1515			
	1500	P.pannosus		C.paradoxa
	1700			P.pannosus
2000	1710			P.grandis
		upper C.paradoxa		
3000	3165			P.grandis
	3297	lower C.paradoxa		C.paradoxa
	3685			
4000		C.striatus		
	4452			C.striatus (Dettmann)
	4608			
	4816	upper C. hughesi		
5000	5017			C.variabilis
	5171			F. asymmetricus
	5236	middle C. hughesi		common Cicatricosisporites
	5588			P.notensis
6000				M.florida
7000		lower C.hughesi (=F.wonthaggiensis)		
8000				
	8636.5			D.speciosus
	8780			D.speciosus (Dettmann)
9000	9094			
	9224			C.stylosus
10000		C.stylosus (=upper C.australiensis)		
	10481			C.hughesi
	10493	?		
11000				

Palynological Summary, Esso Crayfish 1A

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I SUMMARY

1192 ft. (swc):L. balmei Zone:Paleocene:marginal marine

T. longus to N. senectus Zone not seen

1239 ft. (swc)-1305 ft. (swc):T. pachyexinus Zone:Santonian to Coniacian:nearshore marine

1239 ft. (swc)-1245 ft. (swc)N. aceras Zone

1250 ft. (swc) ft.-1305 ft. (swc):I cretaceum Zone

C. triplex Zone not seen

1473 ft. (core)-1510 ft. (core):A. distocarinatus Zone: Cenomanian:very marginal marine

1473 ft. (core)-1500 ft. (core):?P. infusorioides Zone

1510 ft. (cuttings)-1700 ft. (cuttings):P. pannosus Zone latest Albian:non-marine

1710 ft. (cuttings)-3165 ft. (swc):upper C. paradoxa Zone: late Albian:very marginal marine

3297 ft. (core):lower C. paradoxa Zone:mid Albian:non-marine

3685 ft. (core)-4452 ft. (swc):C. striatus Zone:early Albian: non-marine

4608 ft. (swc)-5017 ft. (core):upper C. hughesi Zone:Aptian: non-marine to very marginal marine

5171 ft. (swc)-5236 ft. (swc):middle C. hughesi Zone:Aptian: non-marine

5588 ft. (core)-8780 ft. (swc):lower C. hughesi Zone (=F. wonthaggiensis Zone):late Neocomian:non-marine to very marginal marine

9094 ft. (core)-10481 ft. (core):C. stylosus Zone(= upper C. australiensis Zone):early Neocomian:non-marine to very marginal marine

II INTRODUCTION

Crayfish-1A was extensively sampled by Esso, both with side-wall cores and conventional cores. The palynology was performed by Dettmann (1968). Her report is included in the well completion report, but no data or even list of samples was provided.

The slides prepared and studied by Dettmann were never submitted to the South Australian Mines Department and were subsequently lost in the Brisbane river flood, and so are not available for restudy. Dettmann has performed work on this, and other Otway Basin wells since the original work, in a review for Shell, but this is considered confidential despite her intention to publish at least some of it in the next twelve months.

The conventional cores are available for study at the South Australian Department of Minerals and Energy (SADME) and have been resampled and restudied. The results are presented herein. The Dettmann report still contains significant data, although it cannot be fully evaluated in the absence of side-wall core material. Dettmann's conclusions are accepted herein, and only modified in minor ways by the present new information. The discussion therefore refers to both the present study and that of Dettmann (1968) in reaching the final breakdown.

The occurrence data for the restudied samples is presented in Appendix I. The zonation used is that of Dettmann as modified in Dettmann and Douglas (1976), for use in the Otway Basin. Equivalents in the more recent zonation of Helby, Morgan and Partridge (in prep.) are given, and are of Australia wide application.

III PALYNOSTRATIGRAPHY

A. 1192 ft. (swc):L. balmei Zone

Dettmann's (1968) record of Lygistepollenites balmei, Gambierina edwardsii and Phyllocladidites reticulosaccatus indicate assignment to the Palaeocene L. balmei Zone. The sidewall core is not available for restudy.

The present of dinocysts indicate marine influence, but few species are listed, and the interval is usually marginally marine to non-marine elsewhere in the basin. A marginal marine environment is inferred.

B. T. longus to N. senectus Zones:not seen

The Maastrichtian to Companian T. longus, T. lillei and N. senectus Zones were not seen. These zones are always relatively thin in the basin, and are best represented in thicker sections offshore. They may be totally absent from this well, although they may be present but undetected in the 47 ft. sample gap. Cuttings study is not possible, as there was no cuttings recovery in this interval. An unconformity is considered likely.

C. 1239 ft. (swc)-1305 ft. (swc):T. pachyexinus Zone

The present of Tricolporites pachyexinus in the absence of younger indicators (such as Nothofagidites senectus), indicates the zonal assignment. The dinocysts (discussed below) confirm the assignment. These samples are swc's studied by Dettmann, and so cannot be re-examined.

The dinocysts seen by Dettmann indicate assignment to two dinocyst zones. The presence of Nelsoniella aceras without the stratigraphically younger Xenikoon australis indicates assignment of the sidewall cores at 1239 ft. and 1245 ft. to the N. aceras dinocyst Zone. The presence of Isabelidinium cretaceum without the

stratigraphically younger N. aceras indicates assignment of the swc's from 1250 ft. to 1305 ft. to the I. cretaceum Zone. 0058

No indication of dinocyst content or diversity is given in the Dettmann report. This interval usually has low content of moderately diverse dinocysts indicating a nearshore marine environment.

D. C. triplex Zone:not seen

The Coniacian to Turonian C. triplex Zone has not been seen, despite being extremely thick offshore. It may be present in the 168 ft. sample gap. Cuttings study is not possible as no cuttings were recovered in the interval.

E. 1473 ft. (core)-1510 ft. (core):A. distocarinatus Zone

The presence of Appendicisporites distocarinatus without overlying C. triplex Zone indicators, or the underlying P. pannosus Zone indicator, Coptospora paradoxa, indicate assignment to the A. distocarinatus Zone. The present study confirms the observations of Dettmann. The top-range of Cribroperidinium edwardsii in this core indicates probably assignment to the P. infusorioides dinocyst Zone of Helby et al. (in prep).

The present of scarce, very low diversity dinocysts indicates very marginal marine environments.

F. 1510 ft.-1700 ft. (both cuttings):P. pannosus Zone

The toprange of Coptospora paradoxa at 1570 ft. (cuttings) and baserange of Phimopollenites pannosus at 1700 ft. (cuttings) indicate assignment of the interval to the P. pannosus Zone. Since only cuttings samples are available, the zone base has a lower confidence rating than other boundaries in the well.

Non-marine environments are inferred, as Dettmann did not mention dinocysts or acritarchs, and the cuttings slides no long exist for re-examination.

G. 1710 ft. (cuttings)-3165 ft. (swc):upper C. paradoxa Zone

The toprange of Pilosisporites grandis at 1710 ft. in cuttings, coincident with the baserange of P. pannosus in cuttings at 1700 ft. (Dettmann data) indicates the top of the upper C. paradoxa Zone. The baserange of P. grandis at 3165 ft. (swc) seen by Dettmann (1968), indicates the zone base.

Very marginal marine environments are indicated at 1786 ft. and 2773-95 ft. (both core), by the presence of spiny acritarchs (Micrystridium and Veryhachium spp.). Freshwater algae include Botryococcus and Schizosporis. Spores are dominant and diverse, with common pollen and very rare acritarchs. Minor Permian reworking was seen.

H. 3297 ft. (core):lower C. paradoxa Zone

Coptospora paradoxa was seen at 3297 ft. herein, about 130 ft. lower than seen by Dettmann (1968). This sample is therefore assigned to the lower C. paradoxa Zone.

A non-marine environment is indicated for the one sample assigned to this subzone, as no acritarchs were seen. This may, however, not be representative of the entire interval. Spores and pollen are abundant and diverse, and minor Permian reworking was seen.

I. 3685 ft. (core)-4452 ft. (swc):C. striatus Zone

The Zone top is defined immediately beneath the base-range of C. paradoxa above. The next sample studied herein was at 3853 ft. (core), and by Dettmann was

at 3685 ft. The Zone base is defined by the base-range of Crybelosporites striatus, seen by Dettmann at 4452 ft. (swc) and herein at 3853 ft. I accept Dettmann's data but am unable to confirm it.

Non-marine environments are indicated by common cuticle, tracheid and inertinite fragments, with common and moderately diverse spores and pollen. Acritarchs were not seen. Triassic reworking was seen.

J. 4608 ft. (swc)-5017 ft. (swc):upper C. hughesi Zone

The upper C. hughesi Zone is defined at its top by the base range of C. striatus, (4452 ft., Dettmann data) and its base by the baserange of Foraminisporis asymmetricus. (5017 ft. herein and Dettmann data)

This subzone is equivalent to most of the C. hughesi Zone as used by Helby et al. (in prep.).

Non-marine to very marginal marine environments are indicated. Spores, pollen and cuticle are dominant, with very rare acritarchs in one sample only.

K. 5171 ft. (swc)-5236 ft. (swc):middle C. hughesi Zone

The interval is assigned to the middle C. hughesi Zone as it contains Pilosisporites notensis (to 5236 ft., Dettmann data) without either F. asymmetricus (characterizing the overylying upper C. hughesi Zone) or Murospora florida (characterizing the underlying lower C. hughesi Zone). The designated zone species Triporoletes reticulatus was not seen, herein but the range of P. notensis is considered to be equivalent. Notably, Cicatricosisporites spp. are common from this point upward, and extremely scarce beneath. The

toprange of Cooksonites variabilis at 4816 ft. is potentially useful for subdividing the Aptian interval. This subzone is equivalent to the basal part of the C. hughesi Zone as used by Helby et al. (in prep.).

Non-marine environments are indicated. Spores, pollen and cuticle are dominant, with no acritarchs seen.

L. 5276 ft. (swc)-5579 ft. (core):indeterminate

These samples comprise sandy lithologies, and are almost barren of recognizable palynomorphs, despite repeated sampling and processing. Tracheid and cuticle, and sparse palynomorphs were seen. No zonal assignment is possible.

M. 5588 ft. (core)-8780 ft. (swc):lower C. hughesi Zone

The interval top is defined by the toprange of Murospora florida at 5588 ft., and confirmed by the baserange of P. notensis at 5236 ft. above. The interval base is defined by the toprange of Crybelosporites stylosus at 9094 ft. below, and confirmed by the baserange of Dictyotosporites speciosus at 8780 ft. (Dettmann swc data), seen herein at 8636.5m (core). The subzone is eqivalent to the Foraminisporis wonthaggiensis Zone of Helby et al. (in prep.). Spore colours show a marked darkening at this point, suggesting an unconformity.

Non-marine to very marginal marine environments are indicated by the abundant and diverse spores and pollen (generally dominated by Cyathidites spp. and Osmundacidites wellmanii) and the absence or occasional presence of rare spiny (Micrhystridium) and non-spiny (Microfasta evansii) acritarchs. Cicatricosisporites are almost totally absent from the interval.

N. 9094 ft. (core)-10481 ft. (core):C. stylosus Zone

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The zone top is defined by the toprange of Crybelosporites stylosus at 9094 ft., and its base by the baserange of Cyclosporites hughesi at 10481 ft. Assemblages are of low diversity, with common O. wellmanii, Cyathidites and Falcisporites similis. Contignisporites cooksoniae is a rare element, and Cicatricosisporites spp. are totally absent. The Zone is equivalent to the upper part of the C. australiensis Zone of Helby et al. (in prep.).

Non-marine to very marginal marine environments are indicated by the dominance of spores and pollen, common cuticle and tracheid and extremely scarce spiny acritarchs (Micrhystridium sp.) in one sample only (9094 ft.).

O. 10483-10484 ft. (both core):probably C. stylosus Zone

These samples yielded abundant inertinite and scarce spores and pollen. C. hughesi was not seen, but there in no reason to consider these assemblages as significantly older than those immediately above. They are, however, poorer in palynomorphs.

IV CONCLUSIONS

A. Stratigraphic

1. The base of the Otway Group, considered on seismic evidence to be the oldest in the region, is basal Cretaceous (early Neocomian age), and definitely not Late Jurassic.

2. The Otway Group is thick, but has some marine influence intermittently throughout. The influence, however, is never more than very marginal marine, but estuarine and beach environments are entirely possible.

3. The "top Pretty Hill" angular unconformity seen on siesmic is interpreted to lie at 5240 ft. in the well section. No missing zones occur at this point, but the two overlying subzones (middle C. hughesi and upper C. hughesi) are quite thin. These two are noted to have widely variable thicknesses within the Victorian part of the basin (Dettmann and Douglas 1976, p. 168) and the lower subzone is occasionally absent (op. cit.). This change in sedimentation style corresponds with a similar change from coarse to fine clastics in the Great Artesian Basin in central Australia, and there may be a tectonic or eustatic link. The unconformity occurs at the base of the Aptian.

4. The Sherbrook Group is extremely thin and may be incomplete. Study of selected cuttings may clarify the interval.

5. Overlying a probable unconformity, the basal Tertiary Dilwyn Formation is present.

B. Palynological

1. The extreme scarcity of Citcatricosisporites in the Neocomian section is remarkable, as it is common in equivalent section worldwide. Picking the baserange is thus likely to be impossible in this basin.

2. Although F. wonthaggiensis is extremely rare in the F. wonthaggiensis Zone (= lower C. hughesi Zone), D. speciosus is much more consistent, and they have approximately coincident baseranges.

3. The occurence of consistent M. evansii in the lower C. hughesi Zone is remarkable, given that its range is identical in the Great Artesian Basin to the north.

V REFERENCES

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