Rept.Bk.No.756
G.S.No.4351
Pal.Rept.No.3/69

# DEPARTMENT OF MINES
# SOUTH AUSTRALIA

GEOLOGICAL SURVEY

## OUTBACK OIL - PICKRELL MALLABIE NO. 1 WELL

## PALAEONTOLOGICAL REPORT

by

W.K. HARRIS
ASSISTANT SENIOR PALYNOLOGIST

J.M.LINDSAY
ASSISTANT SENIOR PALAEONTOLOGIST

B. McGOWRAN
ASSISTANT SENIOR PALAEONTOLOGIST

SR.27/4/10

8th October, 1969

DEPARTMENT OF MINES
SOUTH AUSTRALIA

# OUTBACK OIL - PICKRELL MALLABIE NO. 1 WELL

# PALAEONTOLOGICAL REPORT

by

W.K. HARRIS
ASSISTANT SENIOR PALYNOLOGIST

J.M. LINDSAY
ASSISTANT SENIOR PALAEONTOLOGIST

B. McGOWRAN
ASSISTANT SENIOR PALAEONTOLOGIST

CONTENTS PAGE



Rept.Bk.No. 756
G.S. 4351
S.R. No. 27/4/10
Pal.Rept.No. 3/69

8th October, 1969.

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 756
G.S. No. 4351
S.R. No. 27/4/10
Pal.Rept.No. 3/69

# OUTBACK OIL - PICKRELL MALLABIE NO. 1 WELL

## PALAEONTOLOGICAL REPORT


## ABSTRACT

Of the total depth of 4906 feet, apparently the top 1420 feet only are fossiliferous. The stratigraphy of this fossiliferous interval is outlined. The sequence as identified comprises Quaternary units (0 - 20 feet), Miocene Nullarbor Limestone (20-108 feet), Middle Eocene Wilson Bluff Limestone (108 - ?approx. 600 feet), Lower Cretaceous (Aptian) beds (?approx. 600 - 1140 feet), and early Permian beds (1140 - 1420 feet).


## INTRODUCTION

Outback Oil - Pickrell Mallabie No. 1 Well was drilled in the Eucla Basin, South Australia at latitude 31°32'14", longitude 130°36'06", to a depth of 4906 feet in June - July 1969.

Selected cuttings and all cores from the pre-Permian sequence (approx. 1420 ft. to total depth) were examined but no fossils were found. This report accordingly covers only the interval 0 - 1420 ft., within which selected samples were examined both palynologically and for foraminifera. The (biostratigraphically proved) downward extension of the Permian section known in the Eucla Basin is the most significant addition to geological knowledge reported herein.

## STRATIGRAPHY

### Quaternary Units

Within this 20-foot interval are included:

1. Thin soil. Recent.

2. Calcrete, compact to gravelly, pale brown and black, concretionary. Ripon Calcrete, Middle Pleistocene (Firman, 1969).

3. Fossiliferous limestone, pale pinkish brown, quartzose, calcreted; with a rather varied marine microfauna of small foraminifera dominated by Elphidium sp. Lower member of Bridgewater Formation, early Middle Pleistocene (Firman, 1969).

Boulders of Miocene Nullarbor Limestone are apparently recycled into the basal part of (3). They are first encountered at 12 feet in Outback - Pickrell Mallabie Water Well.

## Tertiary

### Nullarbor Limestone

Cuttings from Outback - Pickrell Mallabie No. 1 Well are fortunately supplemented at this stratigraphic level by reliable cable-tool sludges from the adjacent Outback - Pickrell Mallabie Water Well, which enable the base of Nullarbor Limestone to be recognised at 108 feet, a thickness of 88 feet.

The formation is a densely recrystallised fossiliferous limestone, white, fawn, pale brown, or pink in colour. It becomes glauconitic in the bottom 20 feet.

Due to recrystallisation, few foraminifera were released during drilling or washing of samples, but species present include: Austrotrillina howchini, Marginopora vertebralis, Operculina victoriensis, Crespinella umbonifera, Discorbis aff. acervulinoides, D. cycloclypeus, and near the base, Pararotalia sp.

The suggested age is Balcombian to ?Batesfordian Stage, ?Middle to Lower Miocene.

## Wilson Bluff Limestone

Apparently no Wilson Bluff Limestone material was returned by Mallabie No. 1 Well while drilling through the formation. There was nil return between 190 and 620 feet, and there is no recognisable Wilson Bluff Limestone in cuttings from 108 to 190 feet. The adjacent Mallabie Water Well provided good cable-tool sludges of the formation from 108 feet to total depth of 224 feet. Here the formation is white, compact to friable, chalky bryozoal limestone, slightly glauconitic, and with thin beds containing hard pale grey chert.

The Eocene benthonic species Maslinella chapmani, first found at 108 feet, is the most prominent foraminifer. A planktonic assemblage including Truncorotaloides primitivus, Turborotalia aff. pseudomayeri, Globigerapsis index, Pseudohastigerina micra, and Chiloguembelina cubensis, is present at 116 feet. It indicates a late Middle Eocene age, Globigerapsis index Zone (Ludbrook and Lindsay, 1969).

Cuttings from the Cretaceous interval in Mallabie No. 1 Well at 620 - 625 feet contain caved material from the glauconitic chalky and marly unit at the base of Wilson Bluff Limestone, with Truncorotaloides aff. topilensis of Middle Eocene age (McGowran and Lindsay, 1969).

## Cretaceous

The following samples were examined for acid-resistant microfossils, and foraminifera respectively (depths in feet)

| | | |
|---|---|---|
| Cuttings: | | 620-625 |
| Core 1: | at 630 | at 630 |
| | | at 635 |
| | at 645 | at 645 |
| Cuttings: | 720-730 | |
| | 790-800 | |
| | | 810-820 |
| | 820-830 | |
| | | 830-840 |
| | 840-850 | |

1. Acid-resistant microfossils

Assemblages in these samples were poor, yielding few identifiable spores and pollen and varying proportions of dinoflagellate cysts and acritarchs. The terrestrial microfloras differ little and are characterised by saccate pollen - Podocarpidites ellipticus, Microcachryidites antarcticus and Alisporites grandis. The remainder of the assemblage includes Ceratosporites equalis, Cyclosporites hughesi, Classopollis sp., Cyathidites australis, Dictyotosporites complex, Gleicheniidites circinidites, Foraminisporis wonthaggiensis, Lycopodiumsporites austroclavatidites and Steriesporites antiquasporites. The planktonic component includes Dingodinium cerviculum, Canningia sp. Chlamydophorella neyei, Gonyaulacysta diaphanus, Hystrichodinium oligacanthum and Veryhachium hyalodermum.

The presence of C. hughesi together with F. wonthaggiensis places the terrestrial microflora within the lower half of Dettmann's (1963) Speciosus Assemblage of ?Valanginian to Aptian age. Confirmatory evidence is offered by the presence of D. cerviculum, the nominate species of Evans' (1966) Dingodinium cerviculum Zone, which approximates his Klb-c spore-pollen zone, in part equivalent to the lower unit of the Speciosus Assemblage.

Thus on this evidence the age of the Cretaceous section, as far as has been examined, is ?Valanginian - Aptian and it is marine.

2. Foraminifera

Some of the samples examined contain a few agglutinating foraminifera in facies consistent with restricted marine conditions of deposition. Ammobaculites sp. was noted at 630 feet in core of greenish-grey glauconitic silty fine-grained sand(stone). Haplophragmoides audax is present at 830-840 feet in greenish-grey glauconitic shale. Ludbrook (1966) records the latter species from Aptian to basal Albian.

Thus a Lower Cretaceous, Aptian, age for the Cretaceous section is consistent with the evidence both from acid-resistant microfossils and from foraminifera.

## Permian

The following samples were searched for acid-resistant microfossils and foraminifera respectively (depths in feet).

| | | |
|---|---|---|
| Cuttings: | | 1120-30 |
| | | 1140-50 |
| | 1150-60 | |
| | 1160-70 | 1160-70 |
| | | 1190-1200 |
| | | 1200-1210 |
| | 1220-30 | 1220-30 |
| | | 1240-50 |
| | 1250-60 | |
| | | 1280-90 |
| | 1340-50 | |
| Core 2 | | 1400 |
| | 1401 | |
| | 1402.5 | |

Permian microfloras first appear in cuttings from 1150-60 ft. and continue, with low diversity and little change, through to Core 2. Assemblages include Apiculatisporites cf. A. levis, Granulatisporites sp., Lophotriletes sp., Limitisporites sp., Parasaccites sp., Potoniesporites sp., Punctatisporites gretensis, Retusotriletes diversiformis, Striatoabietites multistriatus and cingulate mesosporoids. Planktonic microfossils are represented by leiospheres and rare acritarchs.

No indigenous foraminifera were found in any of the samples examined.

The microflora can be correlated with Stage 2 in the biostratigraphic sequence set up by Evans (1967). The very low frequency of striate, bisaccate pollen, and the apparent absence of Stage 3 elements including Marsupipollenites spp., Verrucosisporites pseudoreticulatus, indicates that the assemblage is older than Stage 3 and thus of lowest Permian age.

The assemblage differs, furthermore, from that found in the Permian in Yangoonabie bore (Nullarbor No. 8) (Harris and Ludbrook 1966); the latter is correlated with Stage 3. There is a typical Permian foraminiferal fauna in Yangoonabie associated with the Stage 3 microflora, and there is no lithological evidence of glacigene sediments. Core 2 in Mallabie No. 1 is distinctly glacigene in aspect and no foraminifera were found either here or in cuttings above. These contrasts with Yangoonabie together with the palyno-biostratigraphic contrast indicate that the Eucla Basin section more closely parallels Permian sections elsewhere in the State than was evident previously.

The top of the Permian appears from examination of cuttings to be at 1140-50 ft. (no recovery 1120-30 ft.).

The top of the pre-Permian appears to be 1420-30 ft. as based on first appearance of "Hughes-Denman redbeds" of unknown age.

REFERENCES

DETTMANN, M.E., 1963. Proc. Roy. Soc. Vict. 77(1): 1-148.

EVANS, P.R., 1966. Australas. Oil Gas J. March: 58-63.

_____, 1967. Rec. Bur. Miner. Resour. Geol. Geophys. Aust. 1967/99 (unpub.).

FIRMAN, J.B., 1969. In "Handbook of South Australian Geology" ed. L.W. Parkin : 204-233. (Government Printer, Adelaide).

HARRIS, W.K. and LUDBROOK, N.H., 1966. Quart. geol. Notes geol. Surv. S.Aust. No. 17 ; 11-14.

LUDBROOK, N.H., 1966. Bull. geol. Surv. S.Aust. No. 40 : 1-223, Pls. 1-28.

_____ and LINDSAY, J.M., 1969. In "Proceedings of the First International Conference on Planktonic Microfossils, Geneva, 1967". Vol. II. Ed. P. Bronnimann and H.H. Renz. (E.J. Brill, Leiden) (in press).

McGOWRAN, B. and LINDSAY, J.M., 1969. Quart. geol. Notes geol. Surv. S.Aust. No. 30 (in press).

W.K. HARRIS
ASSISTANT SENIOR PALYNOLOGIST

J.M. LINDSAY
ASSISTANT SENIOR PALAEONTOLOGIST

WKH:JML:BMcG:/JMM
8.10.69

B. McGOWRAN
ASSISTANT SENIOR PALAEONTOLOGIST