Rept. Bk. No. 60/107
G.S. No. 3153
D.M. 1802/63
Pal. Rept. No. 9/65

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

PALAEONTOLOGY SECTION

STUART RANGE NO. 3 BORE, COOBER PEDY: STRATIGRAPHY AND MICROPALAEONTOLOGY

by

N. H. Ludbrook
Senior Palaeontologist

26th May, 1965

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ABSTRACT

Stuart Range No. 3 Bore, drilled in search for underground water at Coober Pedy Opalfield and completed as a stratigraphic bore, intersected 584 feet of Lower Cretaceous shales and Cretaceous-Jurassic sandstones overlying a sequence of Lower Permian shales, silty sands, and boulder clays at least 1459 feet thick. The marine interval between 1020 and 1660 feet depth contains the most fossiliferous Permian sediments yet intersected in South Australia, with foraminifera as well as rare gastropoda, ostracoda, and vertebrate fragments. The well was completed in boulder clay at 2043 feet.

INTRODUCTION

Stuart Range No. 3 Bore, latitude 29°01'25"S, longitude 134°44'00"E, was drilled at Coober Pedy in search for additional underground water supplies for the opalfield. From surface to 820 feet was drilled between 14th June, 1961 and 1st September, 1961 by percussion rig; the well was deepened by Failing 1500 rotary rig between 18th January, 1965 and 11th March, 1965 and then continued as a stratigraphic hole in the hope of entering crystalline basement. Drilling was principally in large granite boulders below 2000 feet, the well being completed at 2043 feet in glacigene boulder clay.

Micropalaeontological study was made of percussion sludges at approximate 5-foot intervals to 820 feet and then of rotary cuttings at approximate 20-foot intervals from 830 to 2043 feet.

Most of the sequence intersected in the well is not

formally named on a rock unit basis and some formation names await completion of the Oodnadatta 1:250,000 sheet.

A notable feature of the well is the apparent absence of the Algebuckina Sandstone from which water supplies might have been expected. The Mesozoic sandstones present are those exposed at Mt. Anna which are not one of the main aquifers of the Artesian Basin (verbal information supplied by Dr. H. Wopfner). The nomenclature of the Lower Cretaceous foraminifera is that of G.S.S.A. Bulletin 40 (Ludbrook in press, 1965). The Permian fauna is not yet described systematically.

STRATIGRAPHIC SUMMARY

The following stratigraphic units were intersected:

Formation	Age (Stage)	Depth (feet)	Thickness (feet)
Marree	Lower Cretaceous (Aptian)	0-238	238
unnamed transitional beds	(Aptian-Neocomian)	238-263	25
unnamed sandstones at Mt. Anna	Neocomian-Upper Jurassic	263-490	227
Mount Toondina Beds	Lower Permian (Sakmarian)	490-910	420
unnamed sandstones and siltstones	Lower Permian (Sakmarian)	910-1660	750
unnamed glacigene boulder clay and conglomerate	Lower Permian ?Upper Carboniferous.	1660-2043	383+ 1553

MARREE FORMATION

0-238 feet, thickness 238 feet

From surface to 238 feet the well intersected Lower Cretaceous shales of the Marree Formation. Only the lower or Aptian part of the formation is represented, with the zone of Textularia anacooraensis between 210 and 263 feet and of Trochammina raggatti between 210 and 230 feet. The shales are silicified and kaolinized at the surface.

UNNAMED TRANSITIONAL BEDS

238-263 feet, thickness 25 feet

A thin sequence of brown siltstone with cone-in-cone calcite and pyritic sandstone interbeds similar to that exposed at Teepena Bluff occurs between 238-263 feet. These are beds transitional between the Cretaceous-Jurassic sandstones and the Marree Formation. They will be named on the Oodnadatta 1:250,000 sheet.

UNNAMED SANDSTONES

263-490 feet, thickness 227 feet

Sandstones intersected in this interval belong to the upper part of the sequence measured and described from Mt. Anna (Wopfner and Heath, 1963). The uppermost 102 feet from 263 to 365 feet consists of sandstone and grit with porphyry pebbles, characteristic of the top member (c) described by Wopfner and Heath. Quartz grains are dominantly of clear and grey quartz. The gritty sandstone between 365 and 495 feet is less clearly correlated although it appears to be lithologically similar to that between 263 and 365 feet. Porphyry grains are rare and accessory minerals are principally rutile, garnet, red feldspar and pyrite. Although this assemblage is more characteristic of Permian than of Cretaceous-Jurassic sandstones, there is no positive evidence to support a Permian age. The absence of milky quartz and of abundant kaolin precludes correlation with the Algebuckina Sandstone from which underground water supplies might have been expected. Although the interval has gritty bands, it appears either to represent the clayey sandstone at Mt. Anna immediately below the porphyry conglomerate, (part at least of member /b/), or alternatively an uppermost part of the Mount Toondina Beds not represented in the type section (Freytag, 1965, fig. 4).

MOUNT TOONDINA BEDS

490-910 feet, thickness 420 feet

The sequence of interbedded sandstone, clayey sand and clay between 490 and 820 feet is that of the Mount Toondina Beds (Freytag, 1965, in press). In Stuart Range No. 3 Bore they are predominantly brown sandy clay rich in fine muscovite, pyrite, carbonaceous matter and plant fragments with interbeds of pyritic sandstone with angular quartz, feldspar, garnet, chlorite, graphite and some ?dolomite grains. Large lycopod megaspores were recovered from the washed residues throughout the interval. On the evidence presented by Balme (1957) for Lake Phillipson Bore and by Ludbrook (1961, p. 72) these beds are of Sakmarian age. The coal sequence in the upper part of the Lower Permian in Lake Phillipson bore was not present in any of the three Stuart Range Bores.

Owing to contamination of the samples with the change to rotary drilling, the base of the Mount Toondina Beds may not be accurately determined but occurs between 820 and 910 feet.

UNNAMED SILTSTONES AND SANDSTONES

910-1660 feet, thickness 750 feet.

Dark grey sandy siltstone and silty sandstones with coarse subangular quartz grains in a carbonaceous silty matrix below the Mount Toondina Beds belong to an unnamed formation of marine origin. The beds become less carbonaceous downwards. Arenaceous foraminifera are common or abundant throughout the interval with a marked increase in the number of species at 1182 feet. Below 1182 feet the beds are calcareous, with granite grains and pebbles and with rare mollusca and ostracoda. Above this level vertebrate teeth and bone fragments are not uncommon.

Accessory minerals in the matrix are pyrite, garnet, feldspar, tourmaline.

The microfaunas are as yet undescribed, but are the

subject of present study. It is known from palynological data that the sediments in which they occur are not younger than Lower Sakmarian. They are of presumed lowermost Sakmarian age but may be a little older.

UNNAMED BOULDER CLAY AND CONGLOMERATE

1660-2043 feet, thickness 383 + feet

Glacigene boulder clay, sandstone and conglomerate occurs below 1660 feet. The sandstone is pinkish, with medium angular quartz grains, scattered coarse quartz grains, abundant red feldspar, pyrite, pink garnet. Cuttings below 1760 feet consist mostly of granite and subrounded quartz grains, the granite boulders increasing in size downwards. Core 2 at 2017 - 2020 feet and Core 3 at 2034 - 2043 feet consist of boulder conglomerate with a thin clay matrix. Drilling which was hard in this formation was suspended at 2043 feet.

The glacigene boulder clay on present available evidence is of lowermost Permian or Upper Carboniferous age, as previously suggested (Ludbrook, 1961, p. 72).

DESCRIPTION OF THE SAMPLES

Depth (feet)	
0 - 5	Red and white silicified and kaolinized shale with quartz grains, glauconite, rare foraminifera, including Bigenerina loeblichae.
5 - 19	Bleached shale with glauconite pellets and Bigenerina loeblichae.
19 - 70	Yellow-grey and red brown ferruginized shale (siltstone), highly glauconitic, gypseous, with angular quartz grains. Bigenerina loeblichae throughout.
70 - 80	Grey calcareous siltstone with carbonaceous matter, fine muscovite, glauconite, pyrite.
80 - 100	As above, with gypsum, fish bones.
100 - 110	Siltstone as above, pyritic, with glauconite ovoids and medium quartz grains in patches, lithic grains.
110 - 126	Grey-green glauconitic siltstone with abundant dark green glauconite.

Depth (feet)	
126 - 130	Siltstone with Maccoyella and other molluscan fragments, Lingula.
130 - 160	Grey siltstone and mudstone in patches and swirls, calcareous foraminifera.
160 - 170	Grey mudstone.
170 - 190	Grey siltstone with fine angular quartz, pyrite, calcite, glauconite.
190 - 200	Grey mudstone and calcite with calcareous foraminifera.
200 - 210	Grey pyritic carbonaceous mudstone.
210 - 230	Grey pyritic and glauconitic mudstone.
230 - 238	Brown siltstone.
238 - 240	Brown siltstone with cone-in-cone calcite, and some coarse quartz.
240 - 255	Cone-in-cone calcite and pyritic sandstone.
255 - 260	Brown siltstone, pyrite nodules and aggregates.
260 - 263	Brown fine sandstone with fine to medium angular quartz, pyrite.
263 - 270	Gritty sandstone with porphyry grains, coarse clear and grey quartz, pyrite.
270 - 295	Gritty sandstone with coarse porphyry pebbles; milky, clear and opaline quartz.
295 - 310	Sandstone with chlorite, muscovite, feldspar.
310 - 360	Gritty sandstone with occasional red feldspar grains, grey quartz pebbles.
360 - 390	Gritty sandstone with porphyry pebble.
390 - 395	Sandstone with pyrite, rutile, graphite.
395 - 410	Sandstone with angular quartz grains, subrounded grains with pitted surfaces.
410 - 440	As above, with angular and pitted grains, red feldspar.
440 - 480	Gritty sandstone with rutile.
480 - 490	Gritty feldspathic sandstone.
490 - 495	Gritty quartz sand, illsorted, with coarse angular quartz, feldspar, pyrite and garnet.
495 - 500	As above, with coarse angular to subangular quartz, abundant garnet, pyrite, feldspar.
500 - 507	As above with abundant garnet crystals, rutile, graphite.
507 - 515	As above with abundant pyrite, garnet, grey quartz, milky quartz, opaline quartz, rutile, light

Depth (feet)	
507 - 515	brown globular dolomite aggregates, carbonized plant fragments. Lycopod megaspore.
515 - 549	Grey micaceous sandy clay with angular quartz, pyrite, muscovite, fluorite, garnet, graphite, rutile.
549 - 560	Grey sandstone with subrounded quartz grains with pitted surfaces, pyrite pellets, feldspar, garnet, lithic grains, abundant brown dolomite grains.
560 - 565	Medium to coarse sandstone with angular tightly packed quartz grains, heavy minerals, abundant mica, scattered coarse quartz grains, pyrite, coaly material.
565 - 580	Sandstone as above, micaceous, pyritic.
580 - 584	Brown sandstone with mica and coaly matter in a clayey matrix.
584 - 605	Brown sandy clay with abundant mica, pyrite, carbonaceous matter, plant fragments.
605 - 635	Pyritic sandstone with angular quartz, subrounded quartz with pitted surfaces, feldspar, garnet, chlorite, graphite, ?dolomite.
635 - 645	Grey clay.
645 - 650	Grey sandy clay.
650 - 660	Grey clay and medium-grained sandstone with abundant mica, pyrite, and carbonaceous matter.
660 - 700	Interbedded clay and sandstone as above.
700 - 820	Grey micaceous clay and silt with fine angular quartz grains, occasional coarse subrounded grains with pitted surfaces, abundant fine muscovite, biotite, chlorite, carbonaceous matter, pyrite, garnet. Lycopod megaspores throughout.

End of percussion drilling, rotary cuttings from 830 feet

830 - 910	Samples contaminated.
910 - 940	Dark grey sandy siltstone or silty sandstone with mostly illsorted coarse subangular quartz grains in a carbonaceous silty matrix.
940 - 960	Dark grey sandstone with coarse angular interlocking grains of quartz with some pyrite, garnet, siliceous matter.
960 - 980	Grey feldspathic sandstone.
980 - 1020	Grey feldspathic sandstone and pyritic coarse gritty sandstone.
1020 - 1120	Sandstone as above, with subrounded quartz in a feldspathic matrix, opaque minerals, tourmaline, vertebrate fragments, first Ammodiscus.

Depth (feet)	
1120 - 1140	Carbonaceous siltstone with pyrite ball, Ammodiscus.
1140 - 1349	Dark grey carbonaceous siltstone with scattered coarse subrounded quartz grains, abundant fine muscovite, pyrite; feldspathic sandstone as above with medium to coarse quartz grains, pink garnet. Vertebrate teeth and bone fragments, abundant arenaceous foraminifera.
1349 - 1420	Light grey calcareous clay with fine muscovite, scattered coarse subrounded grains, pyrite, grey calcite, pink garnet. Foraminifera common.
1420 - 1460	As above with granite grains.
1460 - 1480	Light grey calcareous clay with abundant pink garnet.
1480 - 1620	Light blue-grey boulder clay with a few foraminifera, principally Hyperammina and Thurammina.
1620 - 1640	As above, with abundant granite pebbles.
1640 - 1660	Grey clay and sandstone with mostly medium quartz grains, but with scattered coarse subrounded grains, red feldspar, pyrite.
1660 - 1760	Pinkish sandstone with medium angular quartz grains, scattered coarse quartz grains, abundant red feldspar and pyrite, biotite, pink garnet, granite pebbles.
1760 - 2043	Boulder conglomerate with granite and other boulders increasing in size downwards. Cores 1, 2 and 3 were cut in conglomerate with boulders and grit of various sizes and heterogeneous rock types from various sources. One pebble in Core 3 at 2037 feet shows evidence of faceting. There is a thin grey clay matrix.

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PALAEONTOLOGY SECTION

NHL:AGK
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E.& W.S. DEPARTMENT. STUART RANGE No.3 WELL, COOBER PEDY.

AGE	STAGE	FORMATION	COLUMNAR SECTION
UPPER JURASSIC-L.CRETACEOUS LOWER	Neocomian Aptian	UNNAMED	238
	APTIAN	MARREE	263
		UNNAMED	365
			490
PERMIAN	SAKMARIAN	TOONDINA BEDS MOUNT	820 ?
		UNNAMED	910
			1020
			1349
LOWER		UNNAMED GLACIGENES	1660
			2043

samples contaminated

end of percussion drilling

CORE 1

CORE 2

CORE 3

CRETACEOUS FORAMINIFERA ETC.

1. Haplophragmoides chapmani
2. Bigenerina loeblichae
3. Ammodiscus erectomuralis
4. Trochammina minuta
5. Textularia wilgunyaensis
6. Haplophragmoides audax
7. Marginulinopsis arimensis
8. Lenticulina dalhousiensis
9. Astacolus sp cf A. chaini
10. Dentalina santoadnae
11. Lenticulina australiensis
12. Marginulinopsis santoadnae
13. Praebulimina hergottensis
14. Valvulineria crespinae
15. Pseudobolivina engenirensis
16. Lenticulina warregoensis
17. Marginulinopsis australis
18. Dentalina hamiltonensis
19. Lenticulina kiwania
20. Globulina lacrima
21. Saccammina lagenoides
22. Textularia anacoracaensis
23. Trochammina raggatti
24. Haplophragmoides davenportensis
25. Ammobaculites fisheri
26. Ammobaculites irregularis
27. Pseudobolivina parvula
28. Gaudryinella enodis
29. Spiroplectammina edgelli
30. Miliammina inferior
31. Gaudryinella permacra*

ostracodes
Lingula fragments
Maccoyella fragments
fish bones
fossil wood

PERMIAN FORAMINIFERA ETC.

1. lycopod megaspores
2. Hyperammina hebatenensis
3. Ammodiscus sp.1
4. Hemidiscus sp.1
5. Ammovertella sp.1
6. Lugtonia thomasi
7. Tolypammina undulata
8. Pelosina ampulla
9. Textularia bookeri
10. Hyperammina acicula
11. Hippocrepinella biaperta
12. Thurammina sphaeroidalis
13. Glomospirella sp.1
14. Tolypammina sp.1
15. Genus 1
16. Genus 2
17. Ammobaculites woolnoughi
18. Hyperammina sp. cf H. expansa
19. Saccammina sp.1
20. Reophax subasper
21. Ammodiscus sp.2
22. Glomospira adhaerens

ostracodes
Mollusca
vertebrate teeth and bones

Spores

Foraminifera

Mollusca

From * Cavings

65-434
Bb.