STRATIGRAPHIC SUCCESSION IN THE VICINITY OF MULOOWURTINA, SOUTH AUSTRALIA.

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ABSTRACT.

Alterations in interpretations of the stratigraphic succession of sediments in the vicinity of Muloowurtina Station, South Australia are suggested following geologic and palaeontologic investigations in this area. "Early Tertiary (Eyrian)" sediments of Mt. Babbage and adjacent areas are ascribed on floral evidence to the lower Cretaceous (late Neocomian-early Aptian) Blythesdale Sandstones. Cretaceous boulder bearing sediments, formerly regarded as Winton Beds (Cenomanian) are Aptian in age (Roma Formation), the boulders representing resorted scree accumulations from the adjacent Flinders Range and not as previously described Cretaceous glacial erratics.

INTRODUCTION.

The area under consideration is in the vicinity of Muloowurtina homestead, situated in Latitude 29°58' South, Longitude 139°44' East, 150 miles North-east of Copley, South Australia. The most marked physiographic feature in the area is the Flinders Range which consists of metamorphosed pre-Cambrian sediments, faulted, and subsequently dissected to form a steep mountain range between 2000' and 3000' in height.

Cretaceous sediments marginal to the Flinders range, generally have a shallow easterly dip of 2°-5°, but south of Muloowurtina homestead beds of the Roma Formation, overlying coarse, arenaceous, boulder bearing, lacustrine rocks of Upper Neocomian age (Blythesdale Sandstone) have, along the eastern scarp of the range, been sharply folded to produce dips of up to 35°, and subordinate dip faulting has resulted in an en echelon disposition of the Cretaceous outcrops.

Blythesdale Sandstone beds are exposed almost continuously

along Hamilton Creek for four miles west of Muloowurtina, where they consist of interbedded gritty sandstones, gravels, and thin carbonaceous members, yielding Mesozoic fossil plants.

Unconformably resting on pre-Cambrian basement west of Mt. Babbage are 100' of gritty sands, gravels and quartzite which have a marked easterly dip of 5°. Faulting along an N.N.E. direction has vertically displaced the Mt. Babbage rocks 150'-200'. Here only 25 feet of plant bearing sandstone and quartzite, representing the upper beds of the downfaulted sequence are found. It seems most probable that initial sedimentation took place in a lacustrine environment bounded to the east by a faultline scarp of probable Palaeozoic age. A late Mesozoic transgression succeeding the accumulation of the lower 75 to 80 feet of clastic sediments resulted in deposition of the coarse micaceous pebbly sandstones which are represented in the Mount Babbage section. Possibly however this upper 25 feet of micaceous sandstone and quartzite may represent a fossil dune deposit marginal to the area of lacustrine sedimentation, which has since undergone secondary silicification. Dr. M. F. Glaessner has identified Lycopod stigmaria from this deposit similar to forms previously described from Europe as dune inhabitants.

Late Cenozoic sedimentation is represented by coarse alluvial boulder beds, redistributed Duricrust boulders, and aeolian sand deposits overlying the Mesozoic sediments east of the Flinders Range.

Stratigraphic Succession:-

1. Pre-Cambrian:- Sheared tillite (Sturtian) granite, quartz-felspar pegmatite, gneiss, quartzite and schist form a basement complex. These rocks have been discussed in detail by Sprigg (1951) and Bowes (1952).

2. Lower Cretaceous (Late Neocomian to early Aptian).

Blythesdale Sandstone.

The lower sequence of coarse arenaceous gravels, sandstones and interbedded carbonaceous shales and boulder beds of Muloowurtina are assigned on palaeontological and structural evidence to the Lower Cretaceous, and considered equivalent to the Blythesdale Sandstone. The arenaceous beds are overlain conformably by Aptian marine shales (Roma Formation) and no time break is indicated from geologic evidence. The presence of an Upper Gondwana flora, including Lycopod stigmaria related to those from European lower Cretaceous deposits supports the contention t hat these beds are of similar age.

A generalised stratigraphic column from Mt. Babbage area reveals in descending order:-

Lithology	Thickness
Massive grey quartzite containing abundant fossil plant impressions and some silicified lamellibranchs (? Unio sp.) and passing into a coarse silicified quartz conglomerate at the base.	10-15'
Laminated medium grained micaceous silty sands with ferrgginous bands yellowish-brown in colour; the grains subangular to angular are dominantly quartzite in composition; some blue-grey quartz pebbles are concluded. In places they are mottled purplish-grey to reddish-brown in colour. Plant impressions and lycopod stigmaria are included in these sediments.	15'
Coarse heterogeneous subangular gritty sands with interbedded ferruginous gravelly lenses, grey quartzites and brown micaceous sands. Equivalents of this member in Hamilton Creek and south of Muloowurtina contain boulders and silicified tree trunks.	25'
Massive quartzite passing laterally and below into porcellanised and ferruginous coarse grits, micaceous sandstone and lensing pebble conglomerates. In Hamilton Creek exposures, intercalated carbonaceous shale lenses and micaceous sands with fossil plants (Taeniopteris spatulata McClelland, Cladophlebis australis (Morris) etc.) occur in the equivalent of this member.	33'

The micaceous sandstones and ferruginous grits at Mount Babbage are correlated, on floral evidence, with the Hamilton Creek exposures and those 2½ miles south of Muloowurtina. In

the upper portion of this sequence boulders, formerly used as evidence of Cretaceous glaciation occur both in situ and scattered over the surface, in association with silicified fossil tree trunks up to 33 feet long. The lack of glacial striae on these boulders, the effects of fluviatile transport, and the proximity of similar rock types in the Flinders Ranges suggests the most probable origin of these sediments as scree accumulations deposited by fluviatile agencies. Many of the boulders are identical with erratics now in situ in the Sturt Tillite nearby. Derivation of faceted boulders from this formation seems the most obvious explanation for their occurrence.

3. Lower Cretaceous (Aptian).

Roma Formation.

The marine sequence consists of fossiliferous yellow and blue grey clays, and variegated kaolinised silty sands, overlain by a hard siliceous Duricrust. Woolnough (1927, p.32) discussing this superficial deposit states:-

"All the Duricrust in this locality possesses a more or less well marked concretionary structure. Sometimes this results in spheroidal nodules; but, in some instances, the concretions are much elongated in a direction perpendicular to the original surface --- In one place, near Muloowurtina, the average diameter of the nodules is over three feet, and they reach a length of at least fifteen feet-----".

These features were noted by the writers, but in places the Duricrust above the Cretaceous marine beds is represented by a dense indurated quartzite, and in (still) further cases is a porcellanised gravel unit. Folding in this area post-dates the formation of the Duricrust.

A generalised stratigraphic column taken from tableland exposures north of Muloowurtina homestead revealed in descending order:-

	Lithology	Thickness
1.	Massive pebbly chert and dense quartzite, grey and stained reddish brown, with sub-rounded white and grey quartz pebbles.	15'

	Lithology.	Thickness.
2.	Grey silty gypsiferous clays 5-6' which pass transitionally into a securely kaolinised white micaceous soft sandstone with abundant free gypsum. The upper 12 feet of these thick white beds are mottled pink with small orange pink crystals of selenite gypsum, bedded and disseminated; some purple remnants and dark brown ferruginous concretions.	40'
3.	Yellow gypseous clays with limonite bands and ferruginous lenses, and containing the foraminifera Haplophragmoides dickinsoni (Crespin) and Ammobaculoides romaensis (Crespin) etc.	28'
4.	Dark blue grey to mottled greenish brown gypseous clays with large plates of selenite gypsum, the clays weathering into powdery greenish-blue detrites. The clays enclose gypsum covered concretions of fine grained blue-grey dolomitic limestone between 18-24 inches in diameter. Fossils including belembites (Peratobelus oxys, Dimetobelus) and pelecypods (Maccoyella cf. barklyi, Nuculana cf. randai) were obtained.	120'+

South of the homestead where deformation has been more pronounced the upper section has undergone more severe alteration, ferruginisation and mottling largely obscuring the original nature of the sediments. Gypsum, which is largely secondary is abundant, both as disseminated and bedded masses. Fossiliferous fine-grained dolomitic nodules irregularly disposed in the bluegrey shales are surrounded by gypsum.

The fauna, while not abundant, definitely indicates a Lower Cretaceous (Aptian) age for these sediments. They belong therefore to the Roma Formation and not, as previously stated (Woolnough and David, 1926) to the Winton Beds.

4. Late Cainozoic to Recent.

Piedmont boulder beds, alluvial clays, and aeolian sand deposits overlie the Mesozoic sediments east of the Flinders Ranges. Downcutting by Hamilton Creek has exposed more than 15 feet of coarse boulder conglomerate and reddish-brown clays unconformably overlying the Mesozoic sediments. Dissection and breaking up of the duricrust has resulted in the accumulation of coarse chert "gibbers" in areas formerly capped by this bed.

Palaeontology.

Floral and faunal identifications undertaken by V.R.Rao are listed below:-

Cladophlebis australis (Morris)

Location:- Woolshed section Hamilton Creek, and from sediments bordering the western margin of the Flinders Range.

Taenéopteris spatulata McClelland

Location:- Most commonly from Mt. Babbage quartzite and woolshed section.

?Cycadites sp.

Nilsonia compta (Phillips)

Location:- Woolshed section (collected by Miss M.Wade,1950).

Otozamites bengalensis (Oldham)

Location:- Tableland quartzite east of Mt. Babbage.

Elatocladus planus.

Location:- Tableland quartzite east of Mt. Babbage.

In addition to this flora, fossil wood remains have been collected from the Mt. Babbage sections, Hamilton Creek, and the boulder bearing beds 2½ m. south of Mulcowurtina.

Dr. M.F. Glaessner has identified stigmaria of a Lycopod ~~flora~~ from the quartzite and underlying micaceous sandstone of Mount Babbage.

From the overlying Lower Cretaceous marine blue clays:-

Peratobelus oxys (Ten.-Woods).

Dimetobelus canhami

Maccoyella cf. barklyi Moore

Nuculana cf. randsi (Etheridge) have been identified, and from the yellow clays:-

Ammobaculoides romaensis (Crespin)

Haplophragmoides dickinsoni (Crespin)

SUMMARY.

Boulder bearing grits in the vicinity of Muloowurtina Station, previously regarded as glacial deposits of Cretaceous (Winton) age, are scree accumulations resorted by fluviatile agencies and deposited in a lacustrine environment. Many of the boulders are erratics derived from the Sturt Tillite.

The presence of an Upper Gondwana flora in these sediments, and their stratigraphic relationship to the Roma Formation places them within the lower Cretaceous (Blythesdale Sandstone).

The generally coarse clastic nature of the sediments, pronounced current bedding and ripple marking of the lower grits gives evidence in support of torrential stream accumulation into a lacustrine environment. The Mount Babbage and adjacent sections, previously thought to be early Tertiary (Eyrian) have, on floral and lithologic evidence been correlated with the boulder beds.

Over the whole area a later deposit of piedmont gravels has been developed, obscuring much of the outcrop of earlier sediments.

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