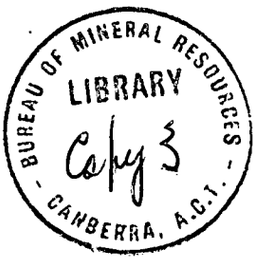
COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1965/55



NOMENCLATURE OF THE ROLLING DOWNS GROUP, NORTHERN EROMANGA BASIN, QUEENSLAND

by

R.R. Vine and R.W. Day

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Preamble

During the course of regional geological mapping of the northern Eromanga Basin a stratigraphic nomenclature has been developed which is more detailed than either Whitehouse's (1954) or Casey's (1959). Definitions of the new units are given in two of the unpublished Records on the mapping (Vine, 1962; Vine, Bastian & Casey, 1963). Some of the names have also been used in the first editions of the Brighton Downs, Mackunda, McKinlay and Julia Creek 1:250,000 Sheets, ~~at present in press~~. It is now proposed that the definitions be presented for publication in an appropriate geological journal in order to formalize the nomenclature and validate those names already in press. The paper for presentation forms the rest of this Record.

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(See also main list of references at rear)

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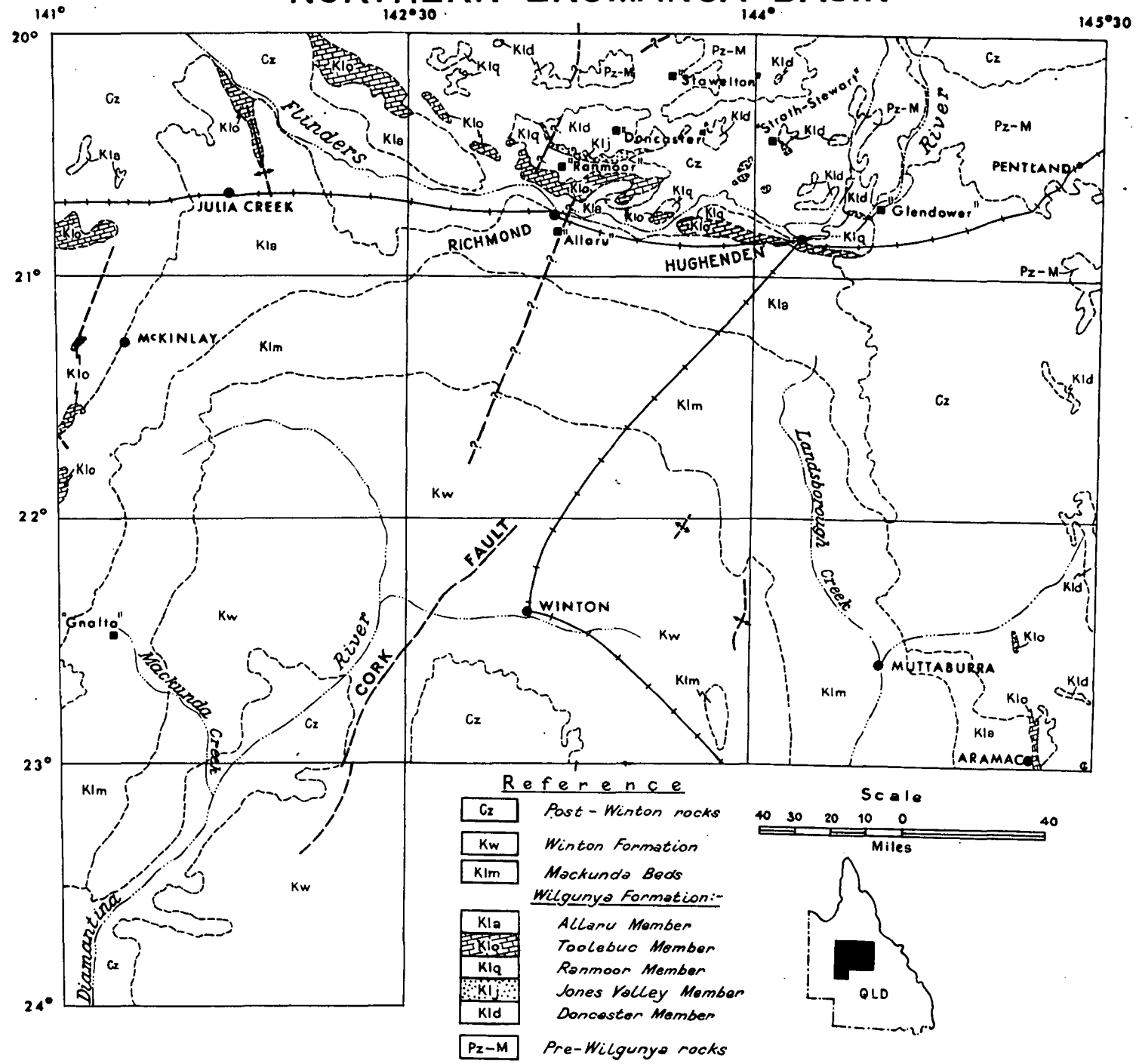
The purposes of this note are to record briefly the nomenclature used in mapping the Cretaceous Rolling Downs Group in the northern part of the Eromanga Basin, and to provide formal definitions of new stratigraphic units. Vine has written the sections on lithologies and general discussion; faunal determinations, correlation, and ages have been contributed by Day. Mapping was carried out by combined field parties of the Bureau of Mineral Resources and the Geological Survey of Queensland. A comprehensive report, which will include detailed descriptions of the type sections, will be prepared for publication by the Bureau of Mineral Resources after mapping in the Longreach area, at present in progress, has been completed.

A major threefold division of the Rolling Downs Group is recognized: the Wilgunya Formation (Casey, 1959) of dominantly argillaceous marine sediments; transition beds, for which the name Mackunda Formation is proposed, of argillaceous and arenaceous sediments deposited in marine and paralic environments; and the Winton Formation (Whitehouse, 1954; Dunstan, 1916) of argillaceous and arenaceous sediments deposited in freshwater environments. The Wilgunya Formation is further divided into five members, including the Toolebuc Member (Casey, 1959). The correlation of the whole marine sequence with European stages is discussed separately in the final section. All names have been approved by the Queensland Stratigraphic Nomenclature Sub-committee. The term "Mackunda Beds" has previously been used in anticipation of this paper in Explanatory Notes to accompany geological maps of western Queensland (Vine, 1964 a, b, c; Jauncey, 1964); ~~This paper contains the formal definition of the unit, and a re-naming to~~ the unit is here formally defined and re-named Mackunda Formation. The proposed new nomenclature, together with a probable correlation with that of Whitehouse (1954), is given in Table 1.

Table 1

Whitehouse (1954)			This paper		
ROLLING DOWNS GROUP	Winton Formation		Winton Formation		ROLLING DOWNS GROUP
			Mackunda Formation		
	Tambo Formation (coquina at base)		Wilgunya Formation	Allaru Member	
				Toolebuc Member	
	Non sequence			Ranmoor Member	
	Roma Formation			Jones Valley Member	
				Doncaster Member	

GEOLOGICAL SKETCH MAP
NORTHERN EROMANGA BASIN



The Rolling Downs Group is a conformable sequence of sediments ranging in age from Aptian to Albian (Lower Cretaceous) and probably to Cenomanian (Upper Cretaceous). Sedimentation took place in a very large basin, of which the area so far mapped (the northern Eromanga Basin) is only a small part. During Wilgunya times the basin was occupied by a very shallow sea, possibly with only limited access to the open ocean and with poor water circulation. The Mackunda Formation represents the advent of arenaceous sedimentation and the periodic exclusion of the sea. The Winton Formation represents the continuation of sedimentation in exclusively freshwater environments.

Since Cretaceous times the sediments have been undisturbed, except for the development of gentle drape folds over basement ridges and some monoclinal folding or faulting over re-activated basement faults.

On the northern margin of the Eromanga Basin the Rolling Downs Group conformably overlies the Gilbert River Formation (Laing & Power, 1959), which is correlated with the upper part of the Blythesdale Group of Whitehouse (1954). The upper limit of the Rolling Downs Group is an erosion surface, locally overlain by thin Cainozoic sediments. Some of the Cretaceous sediments are now preserved in lateritic residuals.

Microfossils are present throughout the marine sequence and work is at present in progress on these. Samples from the north-western margin of the Eromanga Basin were described by Crespin (1963).

In the lithological descriptions which follow the term "mudstone" is used for non-fissile, fine-grained argillaceous sediments for which size analyses are not available. The term includes claystone, fine-grained siltstone, and lithified sediments of mixed silt and clay grades.

DONCASTER MEMBER of the WILGUNYA FORMATION

The Doncaster Member is mainly blue-grey mudstone, with subsidiary glauconitic mudstone and glauconitic siltstone; the occurrence of beds rich in glauconite is diagnostic of the unit. Some siltstone beds are calcareous and some are gradational in grain size to very fine-grained sandstone. Lenticular thick bedded coarse-grained quartz sandstone is locally developed within the basal 150 feet of the member. Dark grey concretionary limestone is locally common; some of the concretions are extensively brecciated, and a few of the fragments have algal encrustations. Cone-in-cone limestone occurs in small amounts. Gypsum is locally abundant.

The name is taken from Doncaster Station, approximately 30 miles NNE of Richmond, where there are plentiful rubbly outcrops of the characteristic glauconitic sediments and concretionary limestone. The type section is in the face of cliffs on the south bank of the Flinders River on Glendower Station at The Rockies Waterhole, 32 miles NE of Hughenden, at Lat. 20°40'S, Long. 144°39'E.

The maximum exposed thickness is 193 feet, in the type section; the thickness of the whole member, estimated from water-bore logs, ranges between 350 and 550 feet. Good exposures occur in the river cliffs along the Flinders River on Glendower Station and in gorges cut into basalt-capped plateaus north and north-west of Hughenden. Westward it forms a belt of undulating grassland with rubbly exposures of the tougher beds, and isolated small exposures in creeks. Leached exposures occur in the scarp-faces of duricrust-capped hills extending north from near Aramac.

A rich, marine, largely molluscan fauna of Lower Cretaceous (Aptian) age, has been collected from the Doncaster Member. Fossils are sporadically distributed within the strata, usually occurring in beds in which concretions are well developed.

Pelecypods dominate the assemblage. Prominent species include Maccoyella barklyi, M. corbiensis, M. reflecta, Pseudavicula anomala, Fissilunula clarkei, Panopea rugosa and "Myacites" planus. Ammonites are less well represented; noteworthy genera being Australiceras, Tropaeum, and Lithancyclus. Other mollusca include the belemnite Peratobelus oxys and the gastropods Actaeon hochstetteri and Euspira reflecta.

In addition, the crinoid Isocrinus australis, rhynchonelloid brachiopods, decapod crustacea and calcareous algae have been found.

JONES VALLEY MEMBER of the WILGUNYA FORMATION

In outcrop the Jones Valley Member is composed mainly of pale brown siltstone, with subsidiary calcareous siltstone and brown limestone. The siltstone is gradational in grain size to very fine-grained sandstone. Cores show that the fresh rocks are pale green. Bedding is very thin to thin and some beds are cross-laminated. Lenticular intraformational conglomerate also occurs.

The type section is at Lat. 20°26'S, Long. 144°06'E, in a river cliff of a small tributary of Jones Valley Creek (from which the name is taken), beside the track to Strath Stewart Homestead and 200 yards north of the southern boundary of the station. In the type section the member is 25 feet thick, and this seems to be the thickest development. The member thins eastwards and in the valley of the Flinders River on Glendower Station it is represented by about 7 feet of glauconitic siltstone interfingering with the uppermost mudstone beds of the Doncaster Member.

North of Hughenden, the Jones Valley Member forms a small bench on the flanks of valleys cut into basalt-capped plateaus. Westwards it forms small rubbly outcrops on the crests of low hills aligned roughly E-W to the north of Richmond. The member has not been identified further south and so far has been recognized as a mappable unit at the top of the Doncaster Member only in the area north of Hughenden and Richmond.

Fossils have been found at only a few localities in the Jones Valley Member. The most fossiliferous of these occur in the valley of the Flinders River near Glendower. The fauna is marine, and is similar to the Lower Cretaceous (Aptian) fauna of the underlying Doncaster Member.

No ammonites have been collected to date, the fauna being largely a pelecypod one. Important species are Maccoyella corbiensis, M. reflecta and Pseudavicula anomala. Other fossils include the belemnite Peratobelus oxys, the burrow Rhizocorallium, the crinoid Isocrinus, scaphopods and linguloid brachiopods.

RANMOOR MEMBER of the WILGUNYA FORMATION

The Ranmoor Member consists almost entirely of grey to black mudstone with subsidiary carbonaceous shale. Near the top it is commonly calcareous and contains laminae of Inoceramus plates. Thin beds of silty sandstone crop out in the bank of the Flinders River 17 miles ENE of Hughenden, but this occurrence is not typical of the unit.

The name is taken from Ranmoor Homestead, at Lat. 20°34'S, Long. 143°10'E near where dark mudstone and carbonaceous shale have been exposed by road works in an area of the characteristic treeless plains. The type section is in the east bank of the Flinders River, 20 miles ENE of Hughenden and 2 miles south of Glendower Homestead, at Lat. 20°46'S Long. 144°29' E.

In the type section, 40 feet of mudstone is exposed, and this is the thickest continuous exposure. The complete thickness, estimated from water-bore logs and recent core drilling is between 160 and 200 feet. The only good exposures are in the banks of the Flinders River between Glendower Homestead and Hughenden. Elsewhere the Ranmoor Member forms flat, treeless plains, and the rare exposures are only found where there has been gullying by watercourses.

Much of the Ranmcor Member appears to be unfossiliferous. Marine fossils have been collected only in the Hughenden area, from near the base and near the top of the unit. Their abundance in apparently equivalent sediments of the Aramac - Barcaldine area, where they occur in coquinites, is in distinct contrast.

Only the fauna from the vicinity of Glendower, near the base of the member, has been studied in detail. It is of Lower Cretaceous (Lower Albian) age and is quite distinct from the Aptian faunas of the underlying members. The important fossils are the ammonites Beudanticeras flindersi and Aconeceras sp., the belemnite Dimitobelus diptychus, and the pelecypods Aucellina hughendenensis and Inoceramus constrictus. These species, with the exception of Aconeceras sp. also occur at Hughenden, near the top of the unit. The intervening beds are unfossiliferous.

TOOLEBUC MEMBER of the WILGUNYA FORMATION

The Toolebuc Member was defined by Casey (1959) from outcrops on the east bank of the Hamilton River east of Boulia. Outcrop of the member has now been traced round the northern margin of the Eromanga Basin as far east as Hughenden, and other outcrops occur near Aramac. Continuity of outcrop is locally interrupted by Cainozoic superficial sediments.

A large part of the member consists of platy or flaggy, grey, coarsely-crystalline limestone, with very thinly interbedded grey, calcareous shale. The outcrops near Aramac consist almost entirely of the platy crystalline limestone and calcareous shale. These sediments mainly form rubbly rises, except north of Julia Creek where thick sets of flaggy limestone form a low, rocky ridge. The subsidiary lithology is concretionary limestone, pink, white or grey and richly fossiliferous. Fossiliferous concretions are characteristic of the member in most outcrops, and commonly litter the surface of the ground when the less resistant beds are concealed.

In outcrop the thickness is mainly between 30 and 40 feet, except in the Aramac area where it is probably less than 10 feet. In the sub-surface, the member is seldom identified as a limestone in water-bore logs, but may be recorded as sandy shale, or by a colour change. Logs of oil exploration wells do not usually record a well-defined limestone interval. Some show a shale sequence, with limestone fragments recorded in the cuttings or with an increase in the calcareous content. However, this is accompanied by a strong positive deflection of the gamma-ray logs and forms a useful sub-surface marker. The gamma-ray logs indicate either that the radioactive interval extends below the Toolebuc Member or else the member thickens towards the deeper parts of the basin.

In the Julia Creek, Richmond and Hughenden areas, the marine fauna of the Toolebuc Member is a restricted one, in which the pelecypods Aucellina hughendenensis and Inoceramus occur in profusion, together with abundant fragmentary fish remains. Usually there are few other fossils, although at some localities the belemnite Dimitobelus sp., the patelliform gastropod Acmaea? sp. and marine reptilian remains occur. Further to the west, in the Boulia area, ammonites occur in the member, and Dickins (1960) recorded the genera Myloceras, Labeceras, Appurdiceros and cf. Falciferella. The fauna is Lower Cretaceous (Albian) in age.

ALLARU MEMBER of the WILGUNYA FORMATION

The Allaru Member is mainly blue-grey mudstone, but contains minor tough interbeds of very thin to thin calcareous siltstone. Thin seams of cone-in-cone limestone, occurring along bedding planes and coating concretions, are common and locally abundant.

The name is taken from Allaru Homestead, 3 miles south of Richmond, at Lat. 20°47'S, Long. 143°09'E. The type area is along the main Richmond-Winton Road, from Richmond south to Twenty-Mile Creek.

Exposures are not common and seldom more than a few feet thick. They are found along creeks, or as low rubbly rises of calcareous beds. The thickness of the member, estimated from water-bore logs, ranges between 600 and 800 feet.

The member forms a crescentic belt of very gently undulating grassland, commonly almost devoid of trees except along watercourses. Some leached exposures also occur in the faces of duricrust-capped hills south of McKinlay and south of Hughenden.

The marine Lower Cretaceous (Albian) fauna of the Allaru Member has not been studied in detail. It is largely molluscan, with ammonites and pelecypods the dominant elements. Ammonite genera noted include Beudanticeras, Myloceras and a form resembling Falciferella. Pelecypods, though numerous, are usually represented only by Aucellina hughendenensis and species of Inoceramus.

MACKUNDA FORMATION

The Mackunda Formation contains both argillaceous and arenaceous sediments. Argillaceous sediments are blue-grey mudstone, similar to that in the Wilgunya Formation, with some calcareous siltstone. Arenites are very thin to thin-bedded and cross-laminated, lithic and feldspathic sandstone. They are mainly very fine-grained but the grain size varies within the range fine-grained sandstone to coarse-grained siltstone. Some have between 40 and 60% calcite cement (grading to sandy limestone) and commonly have concretionary form. Non-calcareous sandstones are friable, but the calcareous sediments are tough and form fairly resistant horizons. Minor lithologies are cone-in-cone limestone and, in the uppermost part of the unit, intraformational conglomerate.

Lithologically the Mackunda Formation is distinguished from the underlying Wilgunya Formation by the common occurrence of sandstone beds. The boundary, although gradational, appears to be fairly sharp, and represents the sudden onset of arenitic sedimentation without any known tectonic disturbance in the area of deposition.

The name is taken from Mackunda Creek, in the Mackunda Sheet area. The type area is in the headwaters of Mackunda Creek on Gnalta Station.

The Mackunda Formation forms a crescentic belt of undulating grassland with scattered trees on the rubbly rises. Some leached exposures also occur in the faces of duricrust-capped hills south of McKinlay.

Exposures are more common than those of the Allaru Member, but are seldom more than a few feet thick. They occur along creeks, or as rubbly outcrops of the calcareous beds on low rises. The thickness of the unit, estimated from water-bore logs ranges from approximately 300 feet in the south-west to 800 feet in the north-east.

A rich marine fauna has been collected from coquinite bands in the Mackunda Formation, but only collections from the McKinlay area have been studied.

Pelecypods are abundant, and exhibit a considerable diversity of species. They include Maccoyella rockwoodensis, Pseudavicula papyracea and Cyrenopsis hudlestoni. Gastropods are also represented by a wealth of species and specimens, including Anchura cf. wilkinsoni, Euspira cf. reflecta, Cancellaria terraereginensis, and Avellana spp. Ammonites, which occur only rarely, are represented by species of Myloceras and Labeceras. The fauna is Lower Cretaceous (Albian) in age.

WINTON FORMATION

Dunstan (1916) named the Winton "Series" without formal definition. The name was changed to Winton Formation by Whitehouse (1954) and the unit was defined (p. 10) as 'the blue shales and sandstones with intercalated coal seams met with in the bores in and about Winton.'

Lithologies of the Winton Formation are similar to those of the Mackunda Formation. They consist mainly of interbedded blue-grey mudstone, and lithic and feldspathic sandstone, in part calcareous. The main differences are:

(a) the sandstones tend to be slightly coarser (fine to medium-grained) in the Winton Formation;

(b) intraformational conglomerate is abundant in the Winton Formation, but is common only in the uppermost part of the Mackunda Formation;

(c) coal seams (recorded in water-bore logs) are restricted to the Winton Formation;

(d) marine fossils are restricted to the Mackunda Formation.

The Winton Formation represents the continuation of Mackunda-type sedimentation, but in exclusively terrestrial environments.

Fresh exposures are seldom more than a few feet thick, although thicker, but leached, exposures occur in the faces of duricrust-capped hills in the south-west of the area. Most outcrops occur along creeks and as rubbly rises of the calcareous beds. The maximum thickness of the Winton Formation in the northern Eromanga Basin is approximately 1000 feet in the sub-surface, but the upper limit is an erosional surface.

Well-preserved fossils are rare. During the recent mapping only a few freshwater pelecypods (Hyridella and Mesohyridella) and some leaves have been found, although wood fragments are common. Only two plant fossil collections contain material of value for age determination The forms were identified as Sphenopteris burrumensis and Zamites or Podozamites sp. by White (1962, 1964), who suggested that these forms are no younger than Lower Cretaceous: both collections are from near the base of the Winton Formation.

Because the underlying Mackunda Formation and much of the Wilgunya Formation are also Albian (upper lower Cretaceous) in age, deposition of the Winton Formation probably did not start until late in the Lower Cretaceous and continued into the Upper Cretaceous.

Correlation

Faunally the Doncaster and Jones Valley Members are part of what Whitehouse (1926) termed the "Roma Series" - a unit he correlated with the Aptian Stage of the European standard sequence. Most of the fauna is unknown in Europe. However, Whitehouse's correlation is confirmed by the occurrence in the Doncaster Member, of the well known ammonite genera Australiceras, Tropaeum, and Lithancyclus (a new record from Australia). These genera characterize Aptian strata in many parts of the world (Casey, 1960). Some doubt has arisen concerning the age of Australian species of Australiceras. Whitehouse regarded them as Lower Aptian, whereas Casey (op. cit.) concludes they are Upper Aptian. The occurrence of a Lower Albian fauna in the immediately overlying Ranmoor Member would seem to lend support to the views of Casey.

Within the Great Artesian Basin, the pelecypod fauna associated with these Aptian ammonites is remarkably uniform in content. The widely separated Blackdown and Roma Formations both have pelecypod faunas very similar to those of the Doncaster and Jones Valley Members.

During the present study no evidence was found to support the stage subdivision proposed by Whitehouse (1928).

The faunas of the Ranmoor, Toolebuc, and Allaru Members, and that of the Mackunda Formation, include many species of the "Tambo Series" of Whitehouse (1926). This unit was correlated by him with the Hysteroceras orbignyi and H. varicosum sub-zones, i.e. the lower part of the Upper Albian of Europe. Subsequently, Whitehouse (1928) suggested that in the Great Artesian Basin there was a period of non-deposition during Lower and Middle Albian time, although he later stated (1954) that Middle Albian was also present.

No non-sequence is apparent in the northern part of the Eromanga Basin. In the Hughenden area basal sediments of the Ranmoor Member have been dated as Lower Albian by the association of the ammonite genera Beudanticeras and Aconeceras. The former is known only in Albian strata (Casey, 1961), while the latter ranges from Barremian to Lower Albian (Casey, 1954). Considerable reliance is placed on these ranges, as both genera are well known and virtually worldwide in their distribution. Aconeceras has not been found higher in the sequence.

The faunas of the overlying units are characterized by a rich development of Myoceras and Labeceras, genera not known in Europe.

While the faunas are unquestionably of Albian age, there is a dearth of species suitable for correlation with the finer subdivisions of the standard European Gault sequence. This problem was initially encountered by Whitehouse (1926). His evidence for a low Upper Albian correlation was principally, the occurrence at a few localities of Prohysteroceras species like those of the varicosum and orbignyi subzones. Since then, Myloceras and Labeceras have been reported in East Africa and Madagascar by a number of workers including Spath (1925) and Collignon (1932; 1950 1963), where they are represented by different species. The more cosmopolitan fauna associated with them allows better reference to the Gault sequence. In Madagascar Myloceras and Labeceras range from the Dipoloceras cristatum subzone to the Mortoniceras inflatum zone (Collignon, 1963), i.e. from Uppermost Middle Albian to Lower Upper Albian.

If Myloceras and Labeceras have an identical range in Australia, then the faunas of the Toolebuc and Allaru Members and the Mackunda Formation are all of this age.

No Middle Albian faunas have been recognised, although there is a form like the English Middle Albian Falciferella in the Toolebuc and Allaru Members.

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