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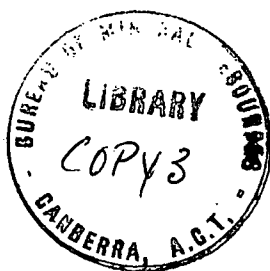
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COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.
BUREAU OF MINERAL RESOURCES
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1962/11



NOTES ON AUSTRALIAN LOWER CRETACEOUS PALAEOGEOGRAPHY

by

S.K. Skwarko

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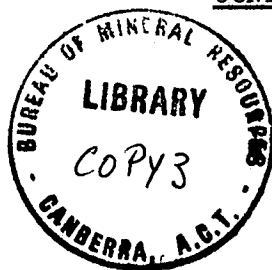
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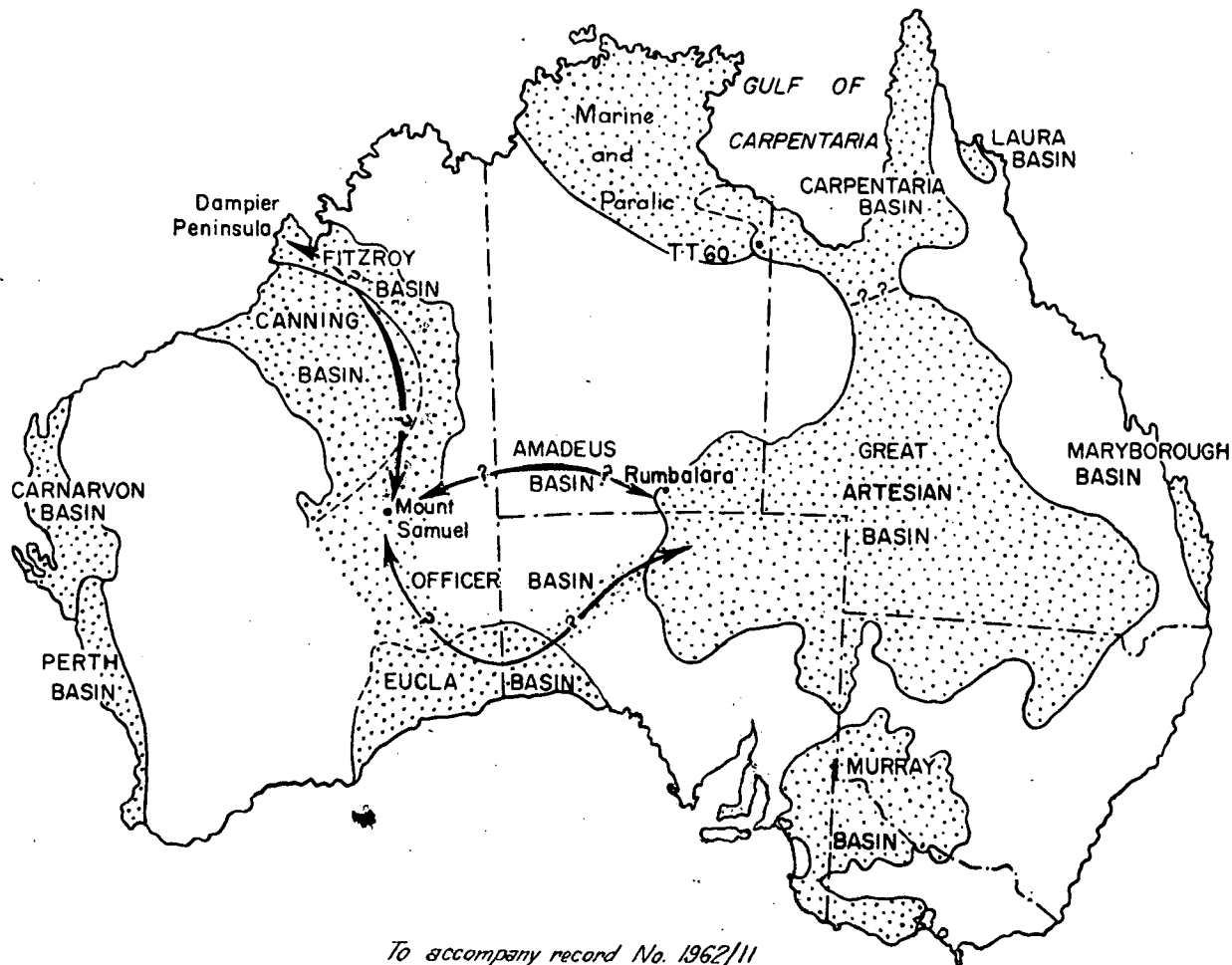
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AREAS OF CRETACEOUS SEDIMENTATION



To accompany record No. 1962/11
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NOTES ON AUSTRALIAN LOWER CRETACEOUS PALAEOGEOGRAPHY

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SUMMARY

A small collection of marine Lower Cretaceous Mollusca from Mount Samuel area, central Western Australia, consists of six genera and seven species which are known from the Roma Formation beds of the Great Artesian Basin. It is suggested that a communicating seaway existed between the Great Artesian Basin and Mount Samuel area during Aptian times. Migration of marine organisms probably took place along a southern route through Officer and Eucla Basins, but may have possibly proceeded directly to the west from Rumbalara. It is also suggested that at the same time another seaway existed between Mount Samuel area and the Dampier Peninsula.

The sediments of the Great Artesian Basin occur in two areas in the Northern Territory, viz. in the vicinity and to the east of Rumbalara, at the southern extreme of the Northern Territory where they are of Aptian age and are correlated with beds of Roma Formation in Queensland; and up to about one hundred miles south of the Gulf of Carpentaria, close to the Queensland border, where they are of Aptian and of Upper Albian age and can be correlated with the Roma and Tambo Formation beds of Queensland.

Basin1. Great Artesian Fossils from central Western Australia

In 1960 a small collection of Mesozoic fossils was collected by a Bureau of Mineral Resources geologist, A.T. Wells, from an outcrop of limited areal extent in the vicinity of Mount Samuel, central Western Australia. The collection, though prolific in the number of specimens, contained but a limited fauna; the following genera and species were identified:

Pelecypods: Maccoyella cf. barklyi (Moore), 1870

"Macrocallista" plana (Moore), 1870

Modiolus tatei (Etheridge Jnr.), 1902

Maccoyella reflecta (Moore), 1870

Malletia cf. elongata (Etheridge Snr.), 1872

?Fissilunula clarkei (Moore), 1870

Gastropoda: ?Natica (Lunatia) variabilis (Moore), 1870

All these forms are well known from the Lower Cretaceous strata of the Great Artesian Basin, and the qualifications accompanying some specific and generic determinations reflect poor preservation rather than morphological departures from eastern type specimens.

Maccoyella barklyi, "Macrocallista" plana and Modiolus tatei are confined to the sediments of Roma Formation of Queensland, New South Wales and South Australia; the same is true of Maccoyella reflecta, which in addition has been reported from Rumbalara, at the southern extremity of the Northern Territory. Malletia elongata occurs in both Roma and Tambo Formations of Queensland, but it is also known from Roma (?) beds of New South Wales and South Australia. Fissilunula clarkei is the most widely distributed of all pelecypods characterising Roma sediments; it is known from the Dampier Peninsula, Western Australia and from Rumbalara, as well as from the other three States already mentioned. Natica (L.) variabilis is a familiar gastropod from Roma and Tambo deposits of Queensland, New South Wales and South Australia.

The age of the Roma Formation is regarded as Aptian and that of Tambo Formation as Upper Albion on the basis of ammonite correlations with European Cretaceous sequences (Whitehouse, 1926). The evidence from the above fossils suggests Aptian as the age of the assemblage and implies contemporaneity of deposition and communicating seaways between beds at Mount Samuel and the Roma beds of the Great Artesian Basin.

The identical likeness between individual specimens of the Mount Samuel collection and type specimens from eastern Australia suggests connecting migratory routes in the Lower Cretaceous times between central Western Australia on the one hand and the Great Artesian Basin on the other. An accompanying map shows the distribution of Lower Cretaceous areas of sedimentation in Australia. This distribution suggests several possible connecting routes; some of these, however, can be eliminated as highly improbable when their exact age and fossil content is considered.

Faunal influence from the west is ruled out. In the northern Carnarvon Basin sedimentation took place in the Neocomian times and the faunal assemblage (Cox, 1962, in press) differs entirely from that in the Mount Samuel area. There is a conspicuous lack of Lower Cretaceous outcrops east from the Carnarvon and Perth Basins and invertebrate macrofaunas in these two basins are quite different from that at Mount Samuel.

In the Carpentaria Basin, Aptian fossiliferous strata are relatively common but extend only a short distance across the border into the Northern Territory and are absent from the rest of the Northern Territory. Work in progress shows that the Mullaman Beds differ in age and faunal content from Mt. Samuel fauna. It is thought improbable that within the Australian region migration proceeded along a north-eastern route.

The only fossil evidence for Lower Cretaceous sedimentation in the Canning Basin are the numerous occurrences of Rhizocorallum - a Lower Cretaceous problematicum - it is rather unlikely that an Aptian sea-route existed through this Basin without leaving behind some molluscan fossils as evidence; however, only parts of the Canning Basin have been so far examined in detail and it is possible that more evidence will be forthcoming in the future.

From the Dampier Peninsula, Western Australia, Roma-type fossils have been described recently by Brunschweiler (1960) and the following genera and species of Pelecypoda were identified:

Fissilunula clarkei (Moore), 1870

Panopea rugosa Moore, 1870

Genus ind. cf. Homomya Agassiz, 1843

Apiotrigonia sp. nov. cf. A. minor var. nankoi Nakano, 1957.

The distribution and age of Fissilunula clarkei has already been mentioned above, but for completeness of record it should be added that there is some evidence of this fossil in the Neocomian rocks of the Northern Territory. Panopea rugosa has not been identified from the Mount Samuel collection, but according to Brunschweiler the Dampier Land specimens, which like all specimens of Panopea rugosa are subject to intraspecific variations, are morphologically closer to the South Australian forms than to the Queensland representatives. The questionable Homomya is poorly preserved and differs from the Queensland Homomya in its stronger ornamentation. Finally, the genus Apiotrigonia is not known from the Great Artesian Basin; it is an Indo-Pacific genus and its presence in the Aptian sediments of the Dampier Peninsula points to some influence by the Indo-Pacific faunal elements in north-west of Australia in the Aptian times.

On the above evidence it is suggested that during Aptian times Mount Samuel area was connected with the Dampier Peninsula, which in turn was open to faunal influences from the north. No rocks younger than Triassic are known in the Fitzroy Basin. At this stage it is not very clear which way precisely the migration took place.

A few years ago Öpik (in Sullivan and Öpik, 1951) identified a small assemblage of Aptian marine macrofossils from Rumbalara. Maccovella reflecta and Fissilunula clarkei were among the fossils recognised*, and it is not unlikely that a direct route to the west existed through that area although the sedimentation in the essentially Palaeozoic Amadeus Basin to the west of Rumbalara is considered to have ceased well before the Cretaceous times. Sporadic remnants of Lower Cretaceous beds have been traced for a considerable distance towards the Western Australian border; no typically marginal facies have been encountered here and there is no evidence that the basin-margin existed in the vicinity.

A southern route seems most convincing. There is a chain of outcrops which have yielded in the past shells common both to the eastern margin of the Great Artesian Basin and to Mount Samuel area - these are scattered along the southern margin of the Basin in New South Wales and South Australia. From there on outcrops are scarce, but it is possible that faunal movements proceeded to the west and south-west along the Officer - Eucla Basins. Unfortunately no Cretaceous fossils have been so far found in the newly defined Officer Basin where surface outcrops are very few; but a specimen of Maccovella corbiensis (Moore), a shell commonly encountered in the Queensland Aptian beds, was recovered from a bore sunk in the Eucla Basin (Glauert, 1926).

It would seem that there is better evidence for the southern connection between Mount Samuel and the Great Artesian Basin than for the other routes considered. Further work in key areas may throw additional light on the Australian Lower Cretaceous palaeogeography and the currently held view may have to be revised, but whatever the location of the past connecting routes it is certain that Mount Samuel area was once covered by a body of water which was continuous with that of the Great Artesian Basin. This suggests a greater extent of Aptian seas in Australia than has been hitherto suspected.

2. Extension of the Great Artesian Basin into the Northern Territory

In 1951 Öpik listed the following Lower Cretaceous fossils from Rumbalara, at the southern extremity of the Northern Territory:

<u>Purisiphonia clarkei</u> Bowerbank, 1869	<u>Panope</u> cf. <u>rugosa</u> (Moore), 1870
<u>Purisiphonia</u> sp. nov.	<u>Pecten</u> (<u>Camptonectes</u>) sp.
<u>Rhizocorallum</u> sp. nov.	<u>Pseudavicula anomala</u> (Moore), 1870
<u>Cyrene</u> sp.	<u>Tatella maranoana</u> (Etheridge Jnr.), 1892
<u>Fissilunula</u> cf. <u>clarkei</u> (Moore), 1870	<u>Tatella</u> cf. <u>maranoana</u> (Etheridge Jnr.) 1892.
<u>Maccovella reflecta</u> (Moore), 1870	

* For complete list see the following article.

There were also some large indeterminate pelecypods, indeterminate gastropods, and pentacrinite stem-joints.

All the above determined fossils have been previously reported from the Lower Cretaceous strata of the Great Artesian Basin in Queensland. In particular, forms such as Fissilunula clarkii, Maccovella reflecta, and Pseudavicula anomala are confined to the Roma Formation of the Great Artesian Basin, which on the basis of ammonite correlation with Europe is known to be of Aptian age. The age of the collection is thus suggested as Aptian and it is thought that the sediments from which these fossils were derived were deposited in a Northern Territory extension of the Great Artesian Basin in Lower Cretaceous times.

During recent systematic examination of Mesozoic strata of the northern portion of the Territory a small collection of Lower Cretaceous fossils (serial number T.T.60) was obtained from the eastern portion of Calvert Hills 4-mile Sheet; this Sheet adjoins the Northern Territory - Queensland border.

The fossils identified from the collection included the following:

Pelecypoda: Aucellina hughendenensis (Etheridge Snr.), 1872

Brachiopoda: Argiope sp. aff. A. punctata Moore, 1870

Rhynchonella sp. aff. R. solitaria Moore, 1870

Cephalopoda: Dimitobelus canhami (Tate), 1879.

Apart from the plant remains, belemnites are the only fossils at T.T.60 which are not affected by the severe crushing by compaction. Aucellina hughendenensis is confined to the sediments of Tambo Formation and its equivalents of the Great Artesian Basin, and its abundance at locality T.T.60 strongly suggests correlation with Tambo strata farther to the east. The age of the Tambo Formation is Upper Albian on ammonite correlation with Europe (see Whitehouse, 1926). The presence of commonly occurring belemnite, Dimitobelus canhami strengthens the evidence for Upper Albian; D. canhami is confined to Tambo strata. On the other hand the two brachiopods have been so far only known from the Roma (Aptian) strata of Wallumbilla, eastern Queensland, and their occurrence at T.T.60 suggests an extension of their ranges.

The above map of Australia (see the preceding note) shows the position of locality T.T.60 as well as the probable extent of the Upper Albian beds, which is quite limited, in that part of the Territory. Immediately to the north, west and south-west Mesozoic beds are older than Upper Albian; the few scattered outcrops to the south have not been examined. In addition, the very rapid changes in lithology and sequence observed in sections examined in immediate vicinity of T.T.60 reflect near-shore facies and suggest that this indeed is the western margin of the Great Artesian Basin in that part of Australia in Upper Albian times.

To the north-west of locality T.T.60, closer to the coast, Mesozoic fossils were collected at numerous localities, and in fifteen of these, on the Bauhinia Downs 4-mile Sheet, the following pelecypods were recognised:

Astarte(?) 2 spp. nov.

Maccovella corbiensis (Moore), 1870

Maccovella sp. (large form)

Fissilunula clarkei (Moore), 1870

Trigonia cf. cinctuta Etheridge Jnr., 1902

Trigonia sp. ind.

Tatella cf. aptiana Whitehouse, 1925

Pecten (Camptonectes) sp. nov.

Pecten (Camptonectes) sp.

Barbatia sp.

Of these, M. corbiensis, large Maccovella sp., F. clarkei, T. aptiana and T. cinctuta occur in the Roma Formation and its equivalents in the Great Artesian Basin strata and suggest Aptian age.

In the field, the difference in age between these beds and beds of Neocomian age immediately to the north (on the Mount Young 4-mile Sheet) was not recognised, and the whole region up to Roper River and beyond was mapped as of Neocomian age (Skwarko, 1961). It is hoped that detailed examination and correlation of fossils will show the relationship between these areas.

In this portion of the Northern Territory the Neocomian sea which covered south-western and western peripheries of the Gulf of Carpentaria may have transgressed farther to the south-east in the Aptian times, into the Great Artesian Basin, but more detailed research and observations are necessary before the history of this region can be understood.

In 1926, Whitehouse dated as Upper Albian, assemblages of fossils which were collected at the close of last century by Brown (1895) from Charles Point and Gunn Point in the vicinity of Darwin; they were originally examined by Etheridge Jnr. (1902, 1907) who recognised them as of Lower Cretaceous age. These collections consist of ammonites and a pelecypod of variable preservation, which belong to species unknown from the Great Artesian Basin. More recently the author recollected fossils from Gunn Point. In addition to the fossils already known a small assemblage of hitherto unknown discoidal gastropods and some crustacean remains was also gathered.

One must agree with Etheridge and Whitehouse in concluding that the Upper Albian marine incursion in the northern extreme of the Northern Territory occurred in a portion of Upper Albian unrepresented by marine macro-fossils in the Great Artesian Basin.

REFERENCES

- BROWN, H.Y.L., 1895 - Government Geologist's Report on Explorations in the Northern Territory. Sth.Aust.Parl. Paper 82.
- BRUNNSCHWEILER, R.O., 1960 - Marine fossils from the Upper Jurassic and the Lower Cretaceous age of Dampier Peninsula, Western Australia. Bur.Min. Resour.Aust.Bull. 59.
- COX, L.R., 1962 - The molluscan fauna and probable Lower Cretaceous age of the Nanutarra Formation of Western Australia. Bur.Min.Resour. Aust.Bull. 61 (In press).
- ETHERIDGE, R., JNR., 1902 - The Cretaceous Mollusca of South Australia and Northern Territory. Mem.Roy.Soc.Sth.Aust. 2(1) pp.1-54.
- _____, 1907 - Preliminary Report on other fossils forwarded to me by the Govt. Geologist of South Australia. Sth.Aust.Parl.Paper No. 55, 15. pp.317-329.
- GLAUERT, L., 1926 - A list of Western Australian Fossils (systematically arranged). Supplement No. 1, 1925. Geol.Surv.W.Aust.Bull. 88 pp. 36-71.
- SKWARKO, S.K., 1961 - Progress Report on Field Activities in the Northern Territory during the 1961 Field Season. Bur.Min.Resour.Aust.Rec. 1961/153. (Unpubl.)
- SULLIVAN, J. and OPIK, A.A., 1951 - Ochre deposits, Rumbalara, Northern Territory. Appendix 2. Bur.Min. Resour.Aust.Bull. 8.
- WHITEHOUSE, F.W., 1926 - The correlation of the marine Cretaceous deposits of Australia. Aust.Assoc.Adv. Sci. 18 pp. 275-280.