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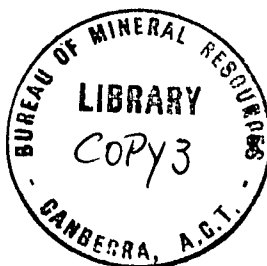
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OBSERVATIONS ON OCCURRENCES OF CRETACEOUS
STRATA IN QUEENSLAND AND NORTHERN TERRITORY
PROGRESS REPORT, 1962

by

S.K. Skwarko

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

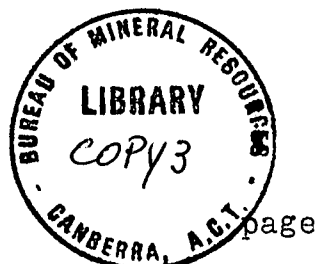
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SUMMARY

Three areas in Queensland and in the northern portion of the Northern Territory were visited during the season.

In the Maryborough Basin, Queensland, Mesozoic sedimentation continued from Middle Triassic to Lower Cretaceous and about 22,000 feet of marine and non-marine sediments accumulated. The Mesozoic rocks of the Northern Territory are much thinner and are confined to Lower Cretaceous.

Collections of fossils have been made at Stanwell, the classical locality for Lower Neocomian fossils in Australia.

The non-marine inland sedimentary belt of the Northern Territory (Skwarko, 1962) was found to extend into north-western Queensland to the south-east as far as the southern portion of the Duchess Sheet area. The Pollard Waterhole Shale was correlated with the Upper Wilgunya Formation to the south, and with the marine claystone of Albian age to the north-west.

In the Northern Territory, in Arnhem Land, the epicontinental marine Neocomian transgression was found to extend to the central portion of the Blue Mud Bay Sheet area, and may have covered most of the Mt. Marumba Sheet area. East of the Mitchell Ranges, also in this region, conditions of sedimentation may have been different as shown by the absence of fossils and different lithologies.

In the Hodgson Downs and the Brunette Downs areas the Lower Cretaceous sediments fall within the boundaries of the non-marine inland sedimentary belt.

INTRODUCTION AND ACKNOWLEDGEMENTS

During the 1962 field season, ten days were spent near Maryborough and Rockhampton, in eastern Queensland, gathering Lower Cretaceous fossils to compare them with other fossils from different Lower Cretaceous sedimentary environments in the Northern Territory. I wish to thank J.T. Woods of the Queensland Geological Survey for his help and cooperation in this project.

Three weeks were spent in north western Queensland on correlation of local units with those in the Northern Territory. In addition, the examination of the Northern Territory Mesozoic strata was continued with a ten day visit to the Brunette Downs area, a two day visit to Hodgson Downs area, and a five week visit to the Arnhem Land.

EASTERN QUEENSLAND

Two areas in eastern Queensland, near Maryborough and Rockhampton were briefly examined. The purpose of the visit was to collect Cretaceous fossils and to compare the sedimentary environment in which they occur with those in the Northern portion of the Northern Territory.

Maryborough Area: Mesozoic sediments in the area are gently folded; the open folds plunge shallowly to the north-west. Sedimentation during the Mesozoic commenced probably in Middle Triassic times with the deposition of the non-marine Brooweena Formation of unknown thickness, which was followed by 1700-2000 feet of Myrtle Creek Sandstone, and then, in the Middle Jurassic, by the accumulation of 4000 feet of coal measures. These last, named the Tiaro Coal Measures are overlain by about 4500 feet of tuffaceous sediments, the Graham Creek Formation, which are transitional with the underlying non-marine beds and the overlying marine Maryborough Formation. The Maryborough Formation is about 6000 feet thick and comprises shale, siltstone and sandstone, some of which are tuffaceous and fossiliferous. Fossils collected from the topmost 1000 feet of the Maryborough Formation have been examined, and suggest an Aptian age. Finally, the youngest Mesozoic strata are the non-marine 5500 feet of Burrum Coal Measures which are also of Lower Cretaceous age. Volcanic activity in the Maryborough area during the Mesozoic commenced in the Upper Jurassic and continued intermittently during the Lower Cretaceous until Aptian time. (Hawthorne, 1960).

The main features of Mesozoic sedimentary cycle in the Maryborough area are thus: long duration; alternation of marine and non-marine conditions; accumulation of a considerable thickness of sediments in a limited area; sedimentation accompanied and followed by folding and volcanic activity.

In the northern portion of the Northern Territory, on the other hand, sedimentation in Mesozoic times extended over three areas (see accompanying map), was of relatively short duration, did not favour accumulation of any great thickness of sediment in two areas out of three, and was not followed or accompanied by folding and volcanic activity.

In the area west and south-west of the Gulf of Carpentaria (2, on accompanying map) estuarine conditions of sedimentation were initiated at the beginning of Cretaceous times with the deposition of non-marine sandstone and some shale. Throughout the rest of Neocomian, however, and possibly through the greater part of the Aptian shallow-water marine conditions prevailed, and sandstone and siltstone were deposited. A temporary emergence occurred in the Aptian or early Albian times, and this was followed in the Albian by relatively deeper-sea conditions in which fine-grained sediments accumulated. Altogether several hundred feet of detritus was deposited, and most of this has by now been removed by erosion.

In the inland sedimentary belt (3 on the appended map), non-marine conditions prevailed in the Aptian times, but the sea which flooded the coastal area in the Albian also flooded the inland non-marine belt, and in a relatively short time (the sea withdrew again still in the Albian) a few hundred feet of detritus accumulated.

Compared with the rest of the northern portion of the Northern Territory, the Darwin area had an environment closely similar to that at Maryborough. The crustal sagging here was much quicker and more pronounced, allowing a greater thickness

of detritus to accumulate. Recent borings have penetrated over 1000 feet of Cretaceous beds without reaching the base. Unfortunately, however, little is known about these marine sediments except that they were already accumulating in Aptian times and continued to accumulate into Cenomanian and possible Turonian.

The Maryborough Formation, the most interesting unit in the area for comparison with the Northern Territory Cretaceous sediments and fossils, was sampled at four places. The collection from Woody Island (locality Q3, see Appendix) is derived from the top of the section, that from the vicinity of Childers (locality, Q4) from the base of the section, while the remaining two collections, Q1 and Q2 from the Sundrie and Yengarie Quarry respectively represent some of the intermediate strata. The collections are lodged at the Bureau of Mineral Resources, Canberra, and await examination.

Stanwell Area: The purpose of a visit to the Parish of Stanwell, 16 miles inland from Rockhampton, was to collect from Whitehouse's original locality of marine Neocomian (Valanginian) fossils. The description of the collecting site as published by Whitehouse (1946) is as follows: "... Portions 128 and 129, Parish of Stanwell, a locality about 20 miles W.S.W. of Rockhampton." (p. 2).

No fossils were found on Lot 128, but this could be expected as the outcrops are reputedly limited in number and surface area, and much of the area is covered by thick scrub. In addition, since the time of original collection, at least one other collection has been made.

On the Lot 129, however, a single small patch of loose surface boulders yielded a small collection of Lower Cretaceous Mollusca (locality Q5). This is still to be examined, but field determination of the commonly occurring shells referred by Whitehouse to "Pisotrigonia sp." and "Indotrigonia(?) sp." suggest that the assemblage is probably identical with that collected on previous occasions.

NORTH-WESTERN QUEENSLAND

Mesozoic strata in north-western Queensland were briefly examined. The area was mapped previously by the geologists of the Bureau of Mineral Resources, and the writer has made use of the following 1:250,000 geological maps: Boulia, Duchess, Cloncurry, Dobbyn, Mt. Isa, Camooweal, Lawn Hill, and Westmoreland. During mapping it was observed that Mesozoic sediments found in the western portion of this area differed both in lithology and fossil content from those farther to the east which definitely belonged to the Great Artesian Basin suite.

Recent examination of the area has revealed that at least initially, sedimentation in this westernmost portion (see 3 on appended map) took place in an environment which represented a continuation of conditions in a large portion of the northern Northern Territory during early Cretaceous times and was quite distinct from that which predominated in the inland sea of the Great Artesian Basin.

The non-marine plant-bearing sandstone and shale, the first sediment to be deposited in the Northern Territory Lower Cretaceous inland sedimentary belt, extends into Queensland as far as the southern portion of the Duchess 1:250,000 Sheet. On the Queensland side of the border it was mapped in the past under

various names and symbols, usually as "Undifferentiated Mesozoic", and the age usually assigned to it, or implied, was Upper Jurassic.

The topmost marine claystone which was laid down over most of the northern portion of the Northern Territory in the relatively deeper Albian sea is also present in north-western Queensland, where it was mapped in the past as the Polland Waterhole Shale. Sedimentary features in the southern-most outcrops of this shale, particularly the characteristic type of "brecciation", are shared by sediments which occur within the Upper Wilgunya Formation farther to the south and the south-east. On lithology, the Polland Waterhole Shale is also very similar to the Albian claystone of the northern portion of the Northern Territory. The micro-fossils of this horizon in the three areas is also similar and its stratigraphic ~~position relative~~ to the sandstone unit the same. It is, therefore, suggested that the claystone which overlies the non-marine and marine beds of the Northern Territory, the Polland Waterhole Shale, and the Upper Wilgunya Formation were laid down in a north-western Queensland-Northern Territory extension of the Great Artesian Basin in Albian time.

BOULIA 1:250,000 SHEET AREA

Several outcrops of Lower Cretaceous strata on the northern portion of the Boulia Sheet area were examined in order to determine whether the plant-bearing non-marine quartz sandstone of the inland sedimentary belt of the Northern Territory and north-western Queensland continued to the south of the Duchess Sheet area. Examination of sections of the Longsight Sandstone exposed at Herrods Tank, at Longsight Peak, and at Momedah Hills showed that the non-marine Longsight Sandstone which apparently conformably underlies the marine Roma Formation was deposited in an environment which was distinct from that of the inland non-marine belt. This is brought out by the distinct fossil content and lithology of the Longsight Sandstone.

DUCHESS 1:250,000 SHEET AREA

Mapped outcrops of Mesozoic strata on the Duchess 1:250,000 Sheet area occur as scattered remnants of the once extensive sheet which occupied the middle and eastern portions of the area, and as more continuous outcrops in the south-eastern portion of the sheet.

For mapping purposes, Mesozoic strata were previously grouped into four units. The oldest of these, the "Undifferentiated Mesozoic", covers the largest area in the central and eastern portion of the sheet. The remaining three crop out in the south-eastern portion of the sheet. They are all of Lower Cretaceous age and have been deposited in the Great Artesian Basin, and consist of in order of decreasing age: the Longsight Sandstone, the Wilgunya Formation and the Toolebuc Member within the Wilgunya Formation.

During the recent survey, sections of the Undifferentiated Mesozoic sediments were examined in detail. The main rocks encountered were quartz conglomerate, quartz sandstone of various grain-sizes, claystone and porcellanite. The greatest single thickness was measured north-west of the Konguna Railway siding, and consists of 30 feet of massive brown coarse and fine-grained, cross-bedded and poorly sorted quartz sandstone with three bands of plant-bearing white claystone each up to one foot in thickness. Other sections examined contain the following lithologies:

Northern Sandy Creek: 15-20' Hard, silicified sandstone and claystone with slabs of agate.

2 miles north-east of Devonport Homestead: 6-8' Hard, brown, iron-impregnated sandstone with small lenses of claystone - varying proportion of quartz pebbles up to 1½" across.

9 miles north of Selwyn Railway Siding: 12' Strongly lateritised (mottled zone) clayey sandstone with few indeterminate plant remains (locality, Q7).

Mistake Bore: 10' Strongly jointed yellow-brown claystone.

Upper Mort River: 8' Richly silicified mottled claystone with rounded quartz pebbles of varying size.

Merlin Tank-Cuckadoo Road: 10-12' Massive, hard, purplish claystone with rounded quartz pebbles at the base; underlain by 8' of yellowish clayey quartz sandstone.

The three remaining units, viz. the Longsight Sandstone, the Toolebuc Member, and the Wilgunya Formation, all of Lower Cretaceous age, appear to be identical in lithology and fossil content with similar units to the east and south of the sheet with which they are correlated. Their mutual relationship has been firmly established in the south-western Queensland (Casey, Reynolds, Dow, Pritchard, Vine, Paten, 1960) and is further brought out in the Duchess area.

No field relationship has been observed between any of these and the Undifferentiated Mesozoic sediments which, however, were regarded in the past as older than the Longsight Sandstone. The fossil content of the Undifferentiated Mesozoic sediments is limited to poorly preserved plant impressions and does not allow close dating, but on lithology they are quite distinct from all of the three named Lower Cretaceous units, and closely resemble the non-marine plant-bearing sandstone and conglomerate outcropping over a large area in the northern portion of the Northern Territory.

On the basis of work done previously in the Northern Territory it is suggested that the Longsight Sandstone, Toolebuc Member and Wilgunya Formation were deposited in a sedimentary environment distinct from that in which the Undifferentiated Mesozoic sediments were laid down. The Lower Cretaceous inland belt of non-marine sedimentation of the northern portion of the Northern Territory extended into the north-western Queensland. The suggested boundary between the two sedimentary environments is broadly outlined on the accompanying map.

CLONCURRY 1:250,000 SHEET AREA

Only a few outcrops of Mesozoic strata are found on the Cloncurry 1:250,000 Sheet area. These are small and are scattered over most portions of the sheet, but seem to be absent from its western extremity. On the legend accompanying the map all are grouped under the heading of "Mesozoic" and are said to consist of "Conglomerate, siltstone, shale and porcellanite (?)."

Several outcrops have been examined in detail and appear to fall into two distinct groups. Those in the eastern portion of the Sheet, especially those near Clonagh and Granada Homesteads, resemble closely both in lithology and fossil content, the Toolebuc Member of the Wilgunya Formation as previously defined

from the much more numerous and extensive outcrops farther to the south. Limestone and sandy limestone are the predominant rock types while the fossil assemblage is limited to such forms as Aucellina, Inoceramus and belemnites, as well as fish remains. Outcrops are poor and almost invariably limited to loose boulders and cobbles scattered on the Cainozoic surface.

The Mesozoic outcrops on the middle-western portion of the sheet differ radically from these. They are mesaforming and provide good sections. One such section located about 4 miles north-west of Cloncurry township consists of:

- 20' Loosely packed but well indurated white coarse quartz sandstone, which weathers to red friable sandstone; with large and small quartz fragments.
- 15' Medium-grained quartz sandstone with poorly preserved wood fragments and with quartz pebbles and cobbles derived from the underlying Lower Proterozoic volcanics. Some poorly developed cross-bedding.

These coarser-grained sediments resemble very closely the non-marine Mesozoic sediments previously examined in the northern portion of the Northern Territory, and are thought to have been deposited in an environment distinct from that in which the Toolebuc Member sediments were laid down. No strata showing unmistakable marginal environment have been encountered.

The dividing line between the two types of Mesozoic sediments runs south-south-east on the east of and roughly parallel to the Kajabbi-Cloncurry railway line.

DOBBYN 1:250,000 SHEET AREA

Sediments of Mesozoic age on the Dobbyn 1:250,000 Sheet area have been in the past grouped into two units. The "Mesozoic conglomerate, coarse sandstone, siltstone (terrestrial)" which in a few places overlie the Lower Proterozoic strata on the western portion of the sheet are placed, on the Dobbyn Sheet legend, below the "Lower Cretaceous Tambo Formation: limestone, siltstone, sandstone".

These undifferentiated Mesozoic sediments have difficult access in the Dobbyn area, where they were not examined during the recent survey. They are thought to be an eastern extension, and the eastern limit, of similar sediments outcropping more commonly on the Camooweal 1:250,000 Sheet area to the west. The boundary between all these sediments and the Tambo strata, which is thought to have been laid down in a distinct area of sedimentation, is plotted on the appended map.

The Tambo sediments occupy a relatively large area in the middle of the eastern portion of the sheet, as well as in a few scattered outcrops just east of the Leichhardt River. They contain fossil invertebrate remains such as Aucellina, Inoceramus and belemnites, as well as fish remains, and this assemblage, as well as the lithology in which it occurs, seems to be identical with sediments and fossils which were referred farther to the south to the Toolebuc Member of the Wilgunya Formation.

MT. ISA 1:250,000 SHEET AREA

On this sheet area, the Mesozoic sediments mapped as "Undifferentiated Mesozoic" occur in a few outcrops of small areal extent scattered over the sheet. They consist of conglomerate and plant-bearing quartz sandstone. Outcrops are poorly developed and no sections have been measured. Individual quartz pebbles and cobbles making up the conglomerate vary greatly in roundness; the ratio of pebbles to matrix also varies considerably. The matrix consists of quartz sandstone. There is also some claystone.

Plant remains belong to the "Otozamites flora" characteristic of the non-marine sandstone in the belt of Lower Cretaceous sedimentation in the Northern Territory.

Outcrops of the "Lower Cretaceous Pollard Waterhole Shale" which crops out in the northern portion of the sheet are much more extensive, both laterally and in thickness. These sediments are marine and their original thickness is not known because of erosion. The lithology is uniformly shale; in the southern-most outcrops "brecciation" similar to that observed in the sediments of the Wilgunya Formation becomes noticeable.

CAMOOWEAL 1:250,000 SHEET AREA

Sediments of Mesozoic age outcrop in many places in the southern and central-eastern portion of the Camooweal 1:250,000 Sheet area. The units recognised in the past are, the "Upper Jurassic(?) Less Sandstone (Ju1)" and the unnamed sandstone "(Ju)"; the Lower Cretaceous "Pollard Waterhole Shale (Klp)"; and the "Jurassic-Lower Cretaceous undifferentiated conglomerate, sandstone and shale (M)", in order of decreasing age.

A number of outcrops have been recently visited and at least one of each of the recognised units was examined in detail. As a result, the following observations have been made.

The Less Sandstone and the lower part of the unnamed "Jurassic(?) sandstone member (Ju)" are regarded as stratigraphically equivalent, the Less Sandstone being a very strongly iron-impregnated equivalent of the "Ju" sandstone; a cover of claystone shields the relatively iron-free "Ju" sandstone. Much of the cover-free Ju sediment, however, is also lateritized to a varying degree, and poorly preserved plant remains have been found in the less altered sediment. Even fresher boulders of quartz sandstone have been found closely associated with outcrops mapped as Less Sandstone; plant remains have been collected from these, (locality, Q8). These two units may be grouped under one name. They are regarded as once continuous with the non-marine plant-bearing quartz sandstone in the inland belt of sedimentation in the Northern Territory.

At least one of the sections examined showed Less Sandstone overlain without angular unconformity by greenish-brown claystone. Almost identical claystone was observed underlying the mapped Pollard Waterhole Shale in a road section between Mt. Isa and Camooweal. The Pollard Waterhole Shale is a marine sediment and its lithology, mode of weathering, fossil content as well as its stratigraphical position suggest that it can be correlated with the Albian marine claystone which overlies the non-marine plant-bearing quartz sandstone and claystone in the inland belt of sedimentation in the Northern Territory.

LAWN HILL AND WESTMORELAND 1:250,000 SHEET AREAS

The few outcrops of Mesozoic strata which do occur on these two sheets are limited to the western portion of the Lawn Hill and to the south-western portion of the Westmoreland Sheet area. They consist of white saccharoidal sandstone, in places plant-bearing, overlain by claystone. These sediments are a continuation of outcrops of similar lithology and fossil content outcropping extensively in the inland belt of non marine sedimentation in the Northern Territory.

NORTHERN TERRITORYBRUNETTE DOWNS AREA

The writer spent ten days with the Bureau of Mineral Resources Alroy Field Party examining Mesozoic sediments of the Barkly Tableland and the Brunette Downs 1:250,000 Sheet area.

Brunette Downs 1:250,000 Sheet area:

Outcrops of Mesozoic strata on the Brunette Downs Sheet area are poor and usually limited to a few sporadic occurrences of loose boulders on the Cainozoic surface.

At least two main lithologies are represented. The basal sandstone is a hard, massive and compact quartz sandstone with plant remains and inclusions of Cambrian chert at or close to the base. This is overlain by claystone which is apparently barren of macrofossils but which is probably of marine origin. In one or two outcrops, there is a suggestion that this claystone may in turn be overlain by an apparently barren sandstone which again is overlain by more claystone. The evidence from this is, however, not conclusive, as outcrops are poor and sections lacking.

Plant remains have been collected at a single locality, T.T. 63, which is close to the site from which Brunnschweiler collected in 1950. He identified the following species of plants from the original collection:

Ptilophyllum sp. nov.

(?) Cycadites sp. ind.

Elatocladus sp.cf.E.planus (Feistmantel)

According to Brunnschweiler (1950) these plants point to a Lower Cretaceous age. It is suggested that the beds represented belong to those which have accumulated in the inland belt of sedimentation of the Northern Territory. It has been argued elsewhere (Skwarko, 1962a) that these sediments have accumulated in the interval of time between Aptian and Albian in the Lower Cretaceous.

HODGSON DOWNS AREAHODGSON DOWNS 1:250,000 SHEET AREA

Several outcrops of Mesozoic strata were examined in the southern portion of the Hodgson Downs 1:250,000 Sheet area near Nutwood Downs Homestead. Sections examined are typical of those which characterise sequences in the Lower Cretaceous non-marine belt of sedimentation in the northern portion of the Northern Territory. They consist of up to 30 feet of non-marine

quartz sandstone with wood fragments overlain by about 40 to 60 feet of marine claystone and sandy siltstone which is regarded as of Albian age.

The Hodgson Downs area thus falls within the boundaries of the area 3 on the appended map.

ARNHEM LAND AREA

The writer spent five weeks with the Bureau of Mineral Resources Arnhem Land Field Party to examine Mesozoic strata and collect fossils on the following sheet areas: Mt. Marumba, Blue Mud Bay, Milimgimbi, Arnhem Bay, Junction Bay, and Wessel Islands. Unfortunately, due to unforeseeable technical difficulties only three sheet areas were visited; these were the Mt. Marumba, Blue Mud Bay and Arnhem Bay 1:250,000 Sheets.

BLUE MUD BAY 1:250,000 SHEET AREA

As shown on the photo-geological compilation, the Mesozoic strata on the Blue Mud Bay 1:250,000 Sheet covers large patches of the surface area in every part of the sheet. Most of the outcrops, however, consist of loose residual sand which obscures the sequence and hinders collection of fossils.

Because of technical difficulties only a few outcrops were examined in detail, and altogether only four collections of fossils were made. Strata examined were those to the east of and close to the Mitchell Ranges, and those which extend to the east and north-east of the Walker River. Sections to the east of the Mitchell Ranges are barren of fossils and consist of up to 8 feet of coarse-grained quartz sandstones and some conglomerate, overlain by about 10 feet of claystone.

At locality T.T.65, a maximum of 20 feet of cross-bedded saccharoidal sandstone or its ferruginised equivalent is overlain by not more than 6 feet of leached yellow-stained claystone. Thin lenses of pebble conglomerate with well-rounded and sorted pebbles occur close to the base of some sections. The sandstone layer contains an assemblage of fossils consisting of a well-preserved molluscan fauna with an indeterminate bamboo-like flora at the base. A very similar combination of assemblages has been observed in some fossil localities (e.g. T.T. 35, 55) on the Mt. Young Sheet area some 140 miles to the south (Skwarko, 1962b). The claystone layer is barren of fossils, but is very similar lithologically to the microfossil-bearing marine claystone overlying the sandstone in other portions of the Northern Territory. A Neocomian age is suggested for the sandstone and Upper Albian for the overlying claystone, the latter on stratigraphy and correlation.

Fossils were collected at three other sites on the Blue Mud Bay Sheet area. T.T. 66, 67 and 68. All are from near Walker River and represent a small percentage of all Cretaceous rocks on the sheet area. Fossil assemblages are limited to pelecypods and suggest a Neocomian age.

MT. MARUMBA 1:250,000 SHEET AREA

A large portion of this sheet area is covered by residual sands presumably derived from the disintegration of the Mesozoic rocks. Good outcrops of Cretaceous strata are rare, and fossils were collected at a single locality, T.T. 64.

At this locality up to 20 feet of fossiliferous sandstone and breccia conglomerate is overlain by a thinner layer of apparently barren claystone and siltstone. Several species of

Mollusca are represented, some already known from other parts of the Northern Territory, and the age suggested is Neocomian.

ARNHEM BAY 1:250,000 SHEET AREA

Mesozoic strata outcropping in the north-eastern extremity of Arnhem Land, particularly to the east of Mitchell Ranges, seem to be entirely barren of fossils, and their dating as probably Lower Cretaceous is based solely on stratigraphical position and lithological similarities to presumably similar outcrops farther to the south. In this coastal strip, however, some marked variations in lithology and sequences have been noted between northern and southern outcrops, and severe ferruginisation, which has affected most sediments, may mask considerable variations in the original compositions of individual outcrops.

In the southern portion of the coastal strip only two lithologies have been encountered. These are the coarse-grained quartz sandstone with very dark coloured clay matrix, and the claystone and siltstone which overlies it. In its outcrop, the claystone layer appears identical with the Lower Cretaceous claystone occupying a similar stratigraphical position farther to the south (e.g. Blue Mud Bay 1:250,000 Sheet area), and correlation seems to be justified. The quartz sandstone, however is lithologically unlike the usually fossiliferous quartz sandstone previously examined in other areas of the Northern Territory, and the correlation may not be warranted. In this southern portion of the coastal strip the base of the sequence is visible in a number of outcrops, and the top of the sequence is everywhere an erosional surface. The sections measure less than 40 feet. Lateritization in the area is very strong.

In the northern portion, i.e. in the area which falls within the boundaries of the Arnhem Bay 1:250,000 Sheet area, the lowest lithology visible is claystone, and it is overlain by coarse quartz sandstone, which in turn is covered by claystone containing a variable but usually small proportion of quartz grains; this lithology is in some outcrops overlain by quartz-free claystone. The overall thickness of sections seldom exceeds 40 feet, but the base is not visible and the top is an erosion surface. Lateritization in this northern area is extreme, and strongly affects the whole visible sequence, which is mapped as Cretaceous. The individual quartz grains in the sandstone layer have been naturally little affected by the percolating solutions beyond becoming coated by a thin red or very dark brown layer of iron oxide. Sandy claystone, however, develops a closely spaced and irregular network of solution passages and cavities. This brings about a gradual disintegration and gives rise to a residual gravel of pebbles and cobbles of irregular shape. The claystone layer has been observed to respond in at least three different ways to extreme lateritization to which it has been subjected, and the end product of this process is at least in part dependant on the original composition of the claystone, the degree of its induration, and on the composition of percolating solutions. The following are the three end-products:

1. "Brecciated" type of claystone strongly enriched in iron, especially haematite and limonite. The replacement by, and the deposition of, iron seem to have been concentrated along close network of cleavage planes.
2. Large and irregular concretions which have been observed in claystone at some localities and horizons. These are similar to those occurring in the Upper Wilgunya Formation in the south-west Queensland.

3. Pirolitic deposits of bauxite formed by closer spacing of concretionary centres in the presence of other favourable factors.

The Mitchell Ranges formed an elongated land-barrier in the Cretaceous times which seems to have obstructed the westerly directed marine transgression which flooded the south-western and western periphery of the Gulf of Carpentaria at the beginning of Cretaceous times. The shallow sea penetrated farther inland in the vicinity of Walker River (Blue Mud Bay 1:250,000 Sheet area).

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KEY TO FOSSIL LOCALITY NUMBERS1. QUEENSLAND

All collections were made by S.K. Skwarko, unless otherwise specified.

Q1: Maryborough 1:250,000 Sheet area, Maryborough 1-mile Sheet. Sundrie Quarry, on the north bank of Mary River, about $2\frac{1}{2}$ miles north-west of the railway yards. Grid Reference, 830267.

Q2: Maryborough 1:250,000 Sheet area, Maryborough 1-mile Sheet. Yengarie Quarry; west bank of Mary River, about $\frac{1}{4}$ mile from the river, near Yengarie village. Grid Reference, 782251.

Q3: Maryborough 1:250,000 Sheet area, (?)Pielba 1-mile Sheet. Woody Island, north-east of Maryborough, about 1 mile off the coast from Urangan. Eastern coast of the island.

Q4: Maryborough 1:250,000 Sheet area, Darralnil 1-mile Sheet. Road cutting in Bruce Highway between Maryborough and Childers $3\frac{1}{2}$ miles west of Isis River.

Q5: Rockhampton 1:250,000 Sheet area, Westwood(?) 1-mile Sheet. Portion 129 Stanwell Parish, 17 miles inland from Rockhampton, Queensland.

Q6: Longreach 1:250,000 Sheet area. Just south of Longreach - Barcaldine road at Dartmouth; in creek bed on Barcaldine side of Dartmouth.

Q7: Duchess 1:250,000 Sheet area. 9 miles north of Selwyn Railway siding; west side of the road.

Q8: Camooweal 1:250,000 Sheet area. On the Camooweal - Undilla road; $1\frac{1}{2}$ miles east of Yellow Waterhole, about 9 miles west of Undilla.

2. NORTHERN TERRITORY

T.T. 63: Brunette Downs 1:250,000 Sheet area. Brunette Downs - Cresswell Road, about 7 miles south of Cresswell, east side of the road, 2.3 miles north of tank 100 yards from the road. M. Randal and S.K. Skwarko, 6.7.62.

T.T. 64: Mt. Marumba 1:250,000 Sheet area. 25 miles north-west of Bulman. Photo Reference, Run 7, Ph. 61 Pt. 1 & 1a. D. Dunnett and S.K. Skwarko, 22.7.62.

T.T. 65: Blue Mud Bay 1:250,000 Sheet area. 30.6 miles at 260° from the northern tip of Fowler Island. Run 5A Ph. 5108 Pt. 1.

T.T. 66: Blue Mud Bay 1:250,000 Sheet area. Headwaters of Walker River. Run 9 Ph. 5155 Pt. 11. K.A. Plumb 28.8.62.

T.T. 67: Blue Mud Bay 1:250,000 Sheet area. Upper Walker River, Run 9 Ph. 55 Pt. 5. K.A. Plumb, 28.8.62.

T.T. 67: Blue Mud Bay 1:250,000 sheet area. Walker River.

Run 10 Ph 5153 Pt 6. D. Dunnett, 27.8.62.

