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SEDIMENTARY BASINS AND PALAEONTOLOGY SECTIONS
SUMMARY OF ACTIVITIES, 1964.

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CONTENTS

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AUSTRALIA

GEOLOGICAL MAPPING AND DRILLING
1964 – 1965

SF 56
Revision mapping
Bowen Basin

REFERENCE

- Mapping completed 1964
- Stratigraphic holes 1964
- Core holes 1964
- Photogeology completed 1964
- Mapping programmed 1965
- Photogeology planned 1965

Bureau of Mineral Resources, Geology and Geophysics *October 1964*

To accompany Record No. 1964/151

SUMMARY

The current mapping programme in the Amadeus Basin was completed and compilation of the results for publication is in progress.

Geological mapping was continued in the Bowen and Great Artesian Basins and a preliminary reconnaissance of the Wiso Basin was made in preparation for field work in 1965.

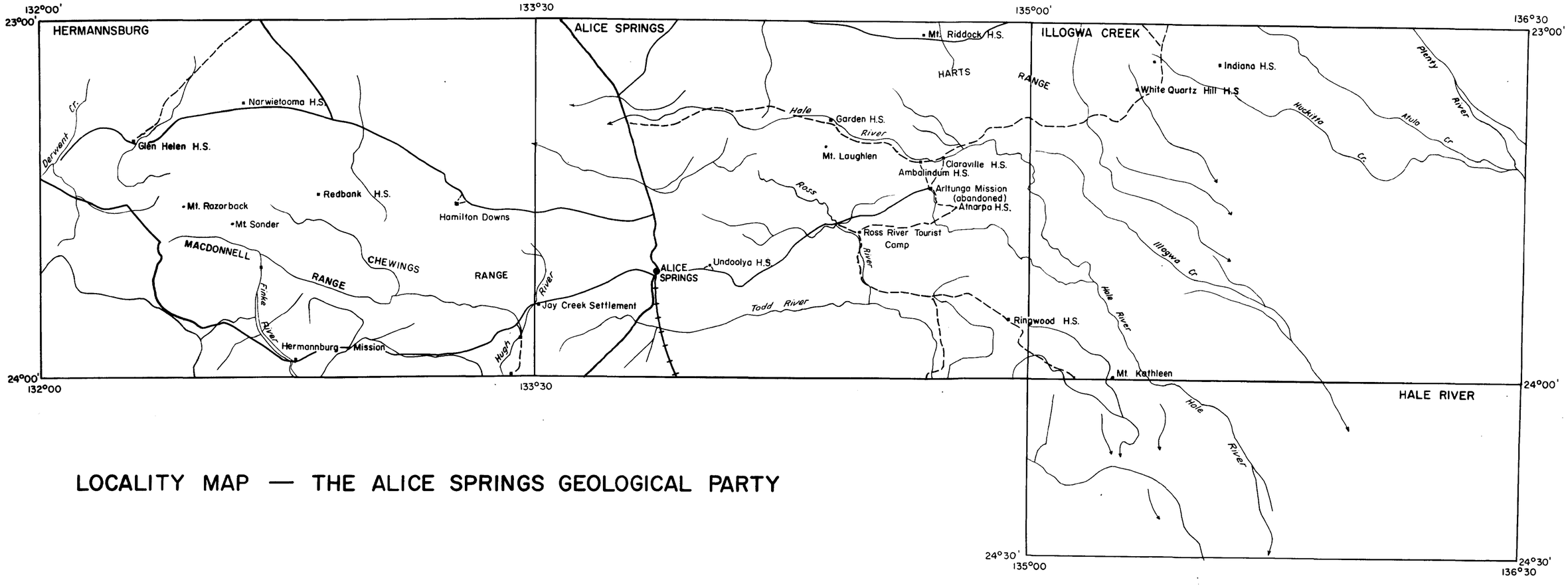
Compilation of the results of previous mapping programmes in the Bonaparte and Georgina Basins was continued throughout the period.

Core drilling in the Bowen and Great Artesian Basins and 6650 feet of stratigraphic drilling in the Georgina Basin has again added valuable subsurface information to our knowledge of these areas.

The photogeological and petrological groups continued to provide maps and the results of studies for other groups in the organization.

The palaeontological section continued with a vigorous program with studies encompassing the Amadeus, Undilla, Bonaparte Gulf, Daly River, Bowen, Perth, Carnarvon, Sydney, Great Artesian, Georgina, Papuan, Drummond, Fitzroy, Surat, Otway, Murray and Gippsland Basins.

AMADEUS BASIN



LOCALITY MAP — THE ALICE SPRINGS GEOLOGICAL PARTY

Bureau of Mineral Resources, Geology and Geophysics. *October, 1964* *To accompany Record No 1964/151*

NT/A87

LK

ALICE SPRINGS PARTY

by

D.J. Forman

Personnel:

D.J. Forman, E.N. Milligan - Geologists
N.L. Kruger - Draftsman part time
W.R. McCarthy - A.M.D.L. petrologist for two weeks

Duration of fieldwork: 23rd May, 1964 to 25th September, 1964.

Area Mapped: Most of the Illogwa Creek Sheet area, the northern two thirds of the Alice Springs Sheet area, a strip extending westerly across the centre of the Hermannsburg Sheet area and portion of the Hale River Sheet area (see locality map). This area covers the north-eastern margin of the Amadeus Basin.

Geology: The work was a continuation of the study of the structure of the Amadeus Basin margins commenced in 1962 by the Bloods Range party and continued in 1963 by the Ayers Rock party. Sedimentary units younger than the Bitter Springs Limestone were mapped by the Hale River party except on part of the Illogwa Creek Sheet area where the Alice Springs party mapped superficial Tertiary sediments and a few isolated outcrops of probable Mesozoic age. The stratigraphy of the area mapped is set out in the accompanying table.

AGE	LITHOLOGY	UNIT	REMARKS
Quaternary	Sand, alluvium	-	-
Tertiary	Conglomerate, sandstone, laterite, chert.	-	Conglomerate adjacent to mountain ranges.
Mesozoic	Sandstone, shale	-	South-east corner of Illogwa Creek Sheet area.
Upper Proterozoic	Dolomite, limestone siltstone, shale slate, schist.	Bitter Springs Limestone	Metamorphosed in nappe structures.
Upper Proterozoic	Quartzite, sandstone, pebbly conglomerate, siltstone.	Heavitree Quartzite	Metamorphosed in nappe structures.
Precambrian	Gneiss, granite, schist, amphibolite quartzite, marble, schistose gneiss.	Arunta Complex	Intruded by pegmatite and dolerite dykes.

The most important results of the season's mapping have been:

1. The Heavitree Quartzite was deposited unconformably over the Arunta Complex and some of the pegmatites within it. It is probable that the Heavitree Quartzite was deposited after intrusion of the dolerite dykes.

2. The Arunta Complex, Heavitree Quartzite and Bitter Springs Limestone are folded into a nappe structure along the margin of the basin at Arltunga and on the Illogwa Creek Sheet area. Overfolding and overthrusting is also apparent south of Alice Springs and on the western two thirds of the Hermannsburg Sheet area. The largest structure near Arltunga, has an overturned middle limb of about 15 miles across the strike. The Bitter Springs Limestone and Heavitree Quartzite, in the core of the structure, have been metamorphosed and the enveloping Arunta Complex seems to have suffered retrograde metamorphism to schist.

3. A considerable amount of structural information has been gathered but this will require detailed analysis before it is summarized.

4. The folding probably occurred during the Devonian for the following reasons:

(a) Age determinations from pegmatite and refolded gneiss in the Harts Ranges give an age of about 400 m.y.

(b) The thick sequences of clastics in the Pertnjara Formation were probably deposited during the orogeny.

(c) The type of deformation suggests a thick overburden of sediments.

(d) The folding should have produced a violent unconformity in the sedimentary sequence if it had taken place before deposition of the Pertnjara Formation. No such unconformity has been mapped.

70 rock specimens have been submitted to W.R. McCarthy of A.M.D.L. for petrological description. The descriptions should illustrate the metamorphic effects of the nappe folding.

Geochemical sampling in the Hale River drainage basin on the Alice Springs Sheet area and between the Heavitree Range and Chewings Range on the Hermannsburg Sheet area resulted in the collection of 460 stream sediment samples.

LOCALITY MAP

33°

137°

Plenty R.

Huckitta C.

Hale R.

ARLTUNGA MISSION (Abandoned)

Macdonnell Ranges

Illogwa C.

ALICE SPRINGS

Ross R. Syncline

Fergusson Syncline

Gites Ck. Syncline

Todd R.

Todd R. Anticline

RINGWOOD HS

Mosquito Bore

Phillipson Pound

Ooraminna Anticline

No. 6 Phillipson Bore

Hale R.

Todd R.

Hugh R.

Finke R.

25°

SIMPSON DESERT

ANDADO H.S.

FINKE

Finke R.

MOUNT ETINGAMBRA

NORTHERN TERRITORY

SOUTH AUSTRALIA

26°

133°

137°

SHEET INDEX

133° 137°

HERMANNS BURG	ALICE SPRINGS	ILLOGWA CREEK	HAY RIVER
HENBURY	RODINGA	HALE RIVER	SIMPSON DESERT NTH.
KULGERA	FINKE	McDILLS	SIMPSON DESERT STH.

24° 25° 26° N.T. S.A.

Indicating mapped area

SCALE : 15·78 MILES TO 1 INCH

10 0 10 20 30 40 50 MILES

HALE RIVER PARTY

Personnel: A.T. Wells (Party Leader), A.J. Stewart and R.D. Shaw. Palaeontologists J.G. Tomlinson and C. Gatehouse visited the party for about three weeks.

Area mapped: Hale River and McDill Sheet areas, together with the southern ~~half~~ third of the Alice Springs Sheet area and the south-western quarter of the Illogwa Creek Sheet area. These sheets cover the north-eastern part of the exposed Amadeus Basin.

Duration of field work: 29.5.64 - 6.10.64

Geology:

The sediments of the north-eastern part of the Amadeus Basin include about 8000 feet of Upper Proterozoic dolomite, calcarenite, siltstone and sandstone, about 5000 feet of Cambro-Ordovician dolomite, limestone, siltstone and sandstone and 3000 feet of Upper Palaeozoic sandstone and conglomerate. The units are shown in Table 1.

The more important features of the formations are as follows:

1. The Heavitree Quartzite includes 30 feet of shale at its base and rests unconformably on Precambrian basement rocks.

2. The Bitter Springs Limestone has been tentatively divided into two members. The basal Gillen Member* contains interbedded green siltstone sandstone and dolomite. Gypsum is known from within the Gillen Member. The upper Ellery Member* consists of red siltstone, dolomite and chert as well as probable volcanics. The formation has behaved incompetently, and domes and diapiric structures are common.

3. The Areyonga Formation rests with an angular unconformity on the Bitter Springs Limestone and includes conglomerate, arkose and sandstone. Phosphate occurs in the base of the formation north of Ringwood Homestead.

4. East and South of Ringwood Homestead, thick units of calcarenite, limestone, sandstone and minor conglomerate are interbedded with siltstone in the lower part of the Pertatataka Formation. This unit is thought to lie stratigraphically below the Pertatataka Formation as defined in the type section. A conglomerate, which is very similar to the Areyonga Formation and thought to be of possible glacial origin, occurs towards the top of this lower unit.

5. In the Ross River and Fergusson Synclines a thick carbonate sequence within the Pertaoorrta Formation has been divided into three Members. They are tentatively named the Ross River,* Fergusson* and Shannon Members,* and they lie between the Goyder Member above and the Arumbera Greywacke Member below.

6. The only representative of the Larapinta Group is the richly fossiliferous Pacoota Sandstone which is restricted to the ~~western half~~ southern half of the Alice Springs Sheet area.

TABLE I - STRATIGRAPHY OF THE NORTH-EAST AMADEUS BASIN

AGE	MAP SYMBOL	FORMATION	APPROXIMATE THICKNESS IN FEET	LITHOLOGY
QUATERNARY	Qa			Alluvial gravel, sand, clay and red earth plains.
	Qs			Aeolian sand.
TERTIARY	Te	Etingambra Formation*	20	Conglomerate and Sandstone.
	Tb			Grey 'billy'
	Tc			Conglomerate and breccia
	Tl		200	Lacustrine limestone, calcareous siltstone, siltstone and sandstone.
MESOZOIC Lower Cretaceous	Klr	Rumbalara Shale	200+	Shale, porcellanite and minor sandstone. Marine fossils
MESOZOIC Undifferentiated	Md	De Souza Sandstone	50+	Sandstone, siltstone and conglomerate.
?PERMIAN	Pzr	Crown Point Formation	50+	Sandstone, siltstone, and boulder beds. Probably fluvioglacial.
Undifferentiated Palaeozoic	Pzp	Portnjara Fm.	>1000	White and red-brown, fine and medium sandstone. Some 'pipe rock'
	Pzm	Mereenie Sandstone	800-1500	
Cambrian to Ordovician	€-Op	Pacoota Sandstone	100-3000	Medium, cross-bedded sandstone, in part micaceous. Richly fossiliferous.
Cambrian	€g	Pertaoorrta Formation €p — Goyder Member	1200	Dolomite, shale and siltstone overlain by thin bedded silty sandstone.
	€j	Jay Creek Limestone Member.	300-500	Algal dolomite, limestone and shale.
	€h	Hugh River Shale Member	800	Red shale and siltstone with dolomite at base.
	€s	Shannon Member *	1250	Dolomite, shale and limestone. Fossils near top.
	€f	Fergusson Member *	700	Grey massive dolomite with Girvanella, overlying foetid limestone with trilobites.
	€r	Ross River * Member	500	Silty pink dolomite with Archaeocyathids, and sandstone and siltstone with halite pseudomorphs at base.
	€l	Chandler Member	50-200	Dark grey fine, foetid dolomite and limestone with chert
	€a	Arumbera Greywacke Member	1200	Red brown silty sandstone, siltstone, and some white sandstone and chert conglomerate.
Upper Proterozoic	Pup	Pertatataka Formation	2000-4000	Shale with dolomite and limestone at top west of Ringwood. East of Ringwood the formation has four members separated by green shale. They are, from top to bottom - dolomite and limestone, conglomerate and sandstone, sandy limestone and sandstone with small cross-beds, dolomite and limestone with stromatolites.
	Pua	Areyonga Formation	150-500	Coarse arkose, conglomerate, conglomeratic siltstone some dolomite, conglomeratic sandstone, and [illegible]stone.
	Pue	Bitter Springs Limestone Pub — Ellery * Member	1000-1500	Algal dolomite, red siltstone and minor volcanics.
	Pug	Gillen * Member	1000-1500	Green siltstone, sandstone and dolomite, overlain by grey and blue grey dolomite.
	Puh	Heavitree Quartzite	500	Medium and coarse silicified sandstone, conglomeratic in places.

* These names are tentative and are yet to be approved by the Stratigraphic Nomenclature Committee.

7. The Mereenie Sandstone overlies the older formations with a low angle, regional unconformity, resting on the Pacoota Sandstone in the western part of the Alice Springs Sheet area and on the Shannon Member in the Hale River Sheet area.

8. The Pertnjara Formation appears to rest conformably on the Mereenie Sandstone in the Ooraminna Anticline, the Ross River Syncline and the Waterhouse Range. East of No.6 Phillipson Bore the Pertnjara Formation unconformably overlies the Pertaoorrta Formation.

9. The Crown Point Formation, which includes 60 feet of tillite and conglomerate, crops out in the western part of the Hale River Sheet area. It is probably Permian. In places it is unconformably overlain by a few feet of the Mesozoic De Souza Sandstone.

10. The Rumbalara Shale crops out on the McDills Sheet area where it is overlain in the central part by up to 20 feet of granule conglomerate and sandstone. The name "Etingambe Formation" is proposed for this unit which rests with a low angle unconformity on the Rumbalara Shale at Mount Etingambe.

11. Tertiary limestone, sandstone, and siltstone, which in some outcrops contain gastropods, are exposed west of Mosquito Bore, north of the Ooraminna Anticline, and south of the Macdonnell Ranges.

Two periods of diastrophism are recognised. The first period of folding resulted in the uplift of the Bitter Springs Limestone and older rocks. An angular unconformity is present between the Bitter Springs Limestone and the overlying Areyonga Formation.

The second major period of uplift and folding was in part synchronous with the deposition of the Pertnjara Formation; large thicknesses of synorogenic conglomerate make up a large part of the formation. The Bitter Springs Limestone behaved incompetently during folding and has formed a décollement. Evaporites are present in the lower member of the Bitter Springs Limestone and diapir folds have been formed. In places piercement structures are present.

RODINGA PARTY

by

L.C. Ranford and P.J. Cook

Personnel:

Geologists - L.C. Ranford and P.J. Cook
Palaeontologists - J.G. Tomlinson (10th August to 22nd August)
C.G. Gatehouse (3rd August to 22nd August)
Draftsman - J.M. Fetherston (6th June to 12th September)

Duration of Field Season: 27th May to 2nd October, 1964.

Area Mapped: Rodinga Sheet area (G53/2)

(see Locality map - Fig. 1)

General:

The stratigraphy of the Rodinga Sheet area is outlined in the accompanying table.

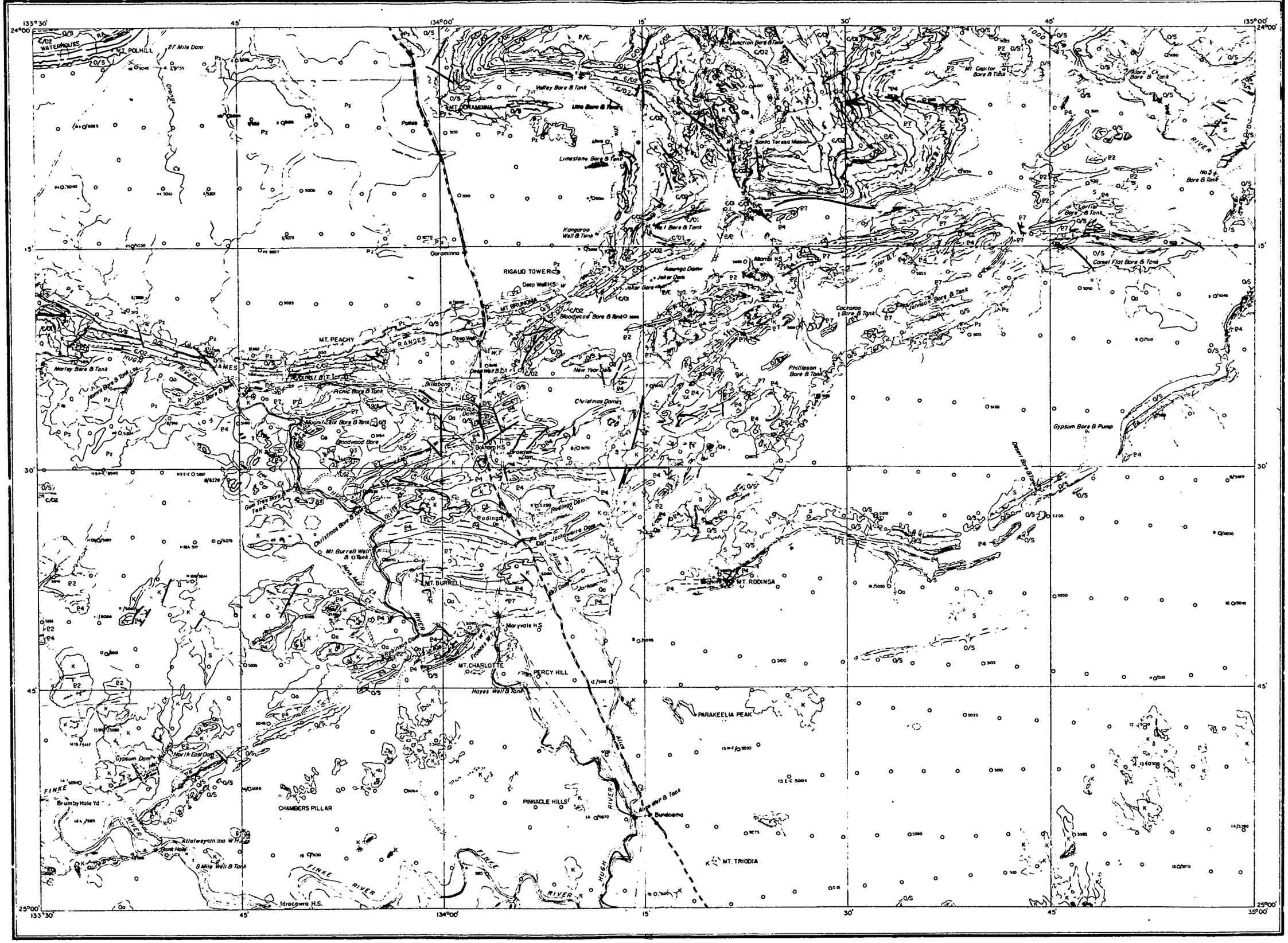
Fig 1

RODINGA

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS

NORTHERN TERRITORY

AUSTRALIA 1:250,000
PHOTOGEOLOGICAL SHEET SG53-2



INSTITUT FRANÇAIS DU PÉTROLE
Mission en Australie
BUREAU DES ETUDES GÉOLOGIQUES

Compiled under the authority of the Bureau of Mineral Resources, Geology and Geophysics Detail adjusted to photo scale compilation prepared by the Division of National Mapping, Department of National Development Aerial photography by the Royal Australian Air Force, complete vertical coverage at 1:46,300 scale
Transverse Mercator Projection.

SCALE 1:250,000

5 0 5 10 15 MILES
5 0 5 10 15 20 KILOMETRES

INDEX TO ADJOINING SHEETS

HERMANNSBURG	ALICE SPRINGS	ILLOGWA CREEK
HENBURY	RODINGA	HALE RIVER
KULGERA	CHARLOTTE WATERS	MC DILLS

Photo interpretation by the Photogeological Group of the Institut Francais du Pétrole in Australia
Drawn by the Bureau of Mineral Resources, Geology and Geophysics, 1960-1961

IFP - AUS 1-2

Reduce AB (23.8") to AC (19")

STRATIGRAPHY OF THE RODINGA SHEET AREA

AGE			FORMATION	MAP SYMBOL	MAXIMUM THICKNESS AND LOCALITY	LITHOLOGY	TOPOGRAPHIC EXPRESSION	REMARKS
QUATERNARY				Qa		Alluvium and river gravels	Stream deposits, alluvial flats	
				Qs		Aeolian sand	Dunes and sand plains	
				Ql		Travertine	Low flat areas	
				Qg		Gypsum	Low areas with mounds	
				Qc		Conglomerate (unconsolidated)	Gibber plains and scree slopes.	Commonly found over Tc
TERTIARY				Tl	50' in the Santa Teresa area	Limestone, chalcedony, siltstone and calcareous sandstone.	Cappings on very high mesas	
				Tc	50' near the Hugh and Finke Rivers	Consolidated conglomerate	Low rubbly outcrop	Old river deposits
				Tb	10'	Siliceous "billy"	Mesa cappings	
				Ta	5'	Laterite and ferricrete	Mesa cappings	
			Santa Teresa Beds*	Ts	300' (approx.) in water bores in the Yam Creek area.	Siltstone, sandstone and carbonaceous shale	Low outcrops, poorly exposed	Mainly known from water bores
MESOZOIC			Rumbalara shale	Kr	100') in the south-east corner of the Sheet area	Siltstone and shale with very minor sandstone	Mesa cappings	
			De Sousa Sandstone	Md	200')	Conglomeratic sandstone	Mesas	
UNDIFFERENTIATED PALAEOZOIC			Chambers Pillar Sandstone*	Pzb	200') south of	Kaolinitic sandstone with conglomeratic bands	Mesas	Commonly has a billy capping
			Horseshoe Bend Shale	Pzh	450') Mount Charlotte	Micaceous siltstone and shale	Plains	Very poorly exposed.
			Langra Sandstone	Pzn	20' +)	Coarsely conglomeratic sandstone		Known only subsurface south of Mount Charlotte
			Pertnjara Formation	Pzp(c)	326' at Larrier Bore	Coarse, massively bedded, conglomerate	High rounded hills	Restricted areally
			" "	Pzp(s)	800' at Larrier Bore	Red-brown, silty sandstone with pebbles.	Prominent ridges and ranges	
			" "	Pzp(a)	150' near Mount Charlotte	Green and red-brown, micaceous siltstone & shale	Strike valleys	Very poorly exposed
			Mereenie Sandstone	Pzm(2)	1700' near Desert Bore	Sandstone with large-scale cross-beds	Prominent ridges and ranges	On-laps to the east
PALAEOZOIC	ORDOVICIAN	LARAPINTA GROUP	Stokes Formation	Ot	500' near Nomra Bore	Siltstone, shale, limestone	Strike valleys	Very poorly exposed
			Stairway Sandstone	Os	600' near Nomra Bore	Sandstone, siltstone, some 'red-beds'	Strike ridges	Thin phosphatic bands
			Horn Valley Siltstone	Oh	150' near Nomra Bore	Siltstone, shale and limestone.	Strike valleys	Very poorly exposed
			Pacoota Sandstone	€O.p	1000' near Mount Peachy	Sandstone and silty sandstone	Prominent strike ridges	Wedges out to the south
	CAMBRIAN	PERTAOORRTA FORMATION	Goyder Member	€g	1175' near Mount Peachy	Silty sandstone, siltstone and limestone.	Strike valleys	Very poorly exposed
			Shannon Member*	€s	1900' at Deep Well	Interbedded dolomite and shale	Strike valleys with low limestone ridges	Present in the eastern half of the area
			Fergusson Member*	€f	1100' at Ooraminna	Massive dolomite and limestone	Strike ridges	
			Jay Creek Limestone Member	€j	900' on the western margin of the area.	Interbedded siltstone and algal limestone	Strike valleys with low limestone ridges	Present in the western half of the area.
			Chandler Limestone Member	€l	300' at Deep Well	Limestone and dolomite with chert laminae.	Moderately high ridges and mounds	Highly incompetent due to ?interbedded evaporites
			Ross River Member*	€r	150' at Ooraminna	Archeocyathid dolomites	Strike ridges	Present only in the N.E. part of the Sheet area
			Greywacke Arumbera Member	€a	2500' at Ooraminna	Red-brown conglomeratic sandstone	Very prominent strike ridge	Rapidly wedges out to the south
UPPER PROTEROZOIC			Pertatataka Formation	Bup	5000' at S.E. Phillipson Pound	Siltstone and shale with some sandy limestone and dolomite sandstone and conglomerate.	Wide strike valleys. Prominent strike ridges	Incompetent in places. Possibly tillitic
			Areyonga Formation	Bua	492' at S.E. Phillipson Pound	Siltstones, dolomites, conglomerates	Prominent ridges in places	Fluvio-glacial in part
			Bitter Springs Limestone	Bub	732'+ at S.E. Phillipson Pound	Algal dolomites, Siltstones and volcanics	Low ridges and hills	Restricted exposure

* These names are tentative and are yet to be approved by the Stratigraphic Nomenclature Committee.

Stratigraphic columns at selected localities throughout the Rodinga Sheet are shown in Figure 2.

The main points arising from this year's work are outlined below:

1. The Larapinta Group units thin markedly from north to south on the Rodinga Sheet area. The southernmost outcrops of Pacoota Sandstone and Horn Valley Siltstone occur at about latitude 24°30' and they were probably not deposited far south of this line. The Stairway Sandstone and Stokes Formation crop out as far south as latitude 24°55' and probably continue in the subsurface beyond the southern boundary of the Rodinga Sheet area.

2. The Larapinta Group units are conformably overlain by the Mereenie Sandstone along the western margin of the area but are successively removed to the east beneath the Mereenie Sandstone unconformity. The most easterly exposures of Larapinta sediments occur at about longitude 134°25'. East of this line the Mereenie Sandstone rests on the Shannon Member of the Pertaoorrta Formation.

3. More detailed study of the Stairway Sandstone has shown that the formation can be divided into three distinct lithological units. Pelletal phosphorite is generally absent or very rare in the lower and middle units but common near the top of the upper unit. Preliminary results of palaeo-current studies on the Stairway Sandstone suggest that on the Rodinga Sheet area the currents were mainly from the south-east.

4. The Arumbera Greywacke Member thins very rapidly to the south and was probably only deposited as far south as latitude 23°25'. South of this the Chandler Member overlies the Pertatataka Formation.

5. The Lower Cambrian 'Ross River Member' (informal name) lies conformably between the Arumbera Greywacke Member and the Chandler Limestone Member in the Ooraminna and Phillipson Pound structures. The most southerly exposure of the 'Ross River Member' occurs on latitude 23°15' about four miles east-south-east of Kangaroo Well, and the most westerly exposure occurs in the Ooraminna Anticline about six miles north-east of Mount Ooraminna.

6. The Chandler Limestone Member has been recognised throughout the Rodinga Sheet area. Fossils have not been found but in the Ooraminna and Phillipson structures it is underlain by the Lower Cambrian 'Ross River Member' and overlain by the Fergusson Member which contains a lower Middle Cambrian fauna. The Chandler Limestone Member is far more widespread than the fossiliferous Lower Cambrian and is considered to be more closely related to the overlying Middle Cambrian. The characteristic contorted and folded nature of the Chandler Limestone Member is as consistent as the lithology and is considered to be due to the presence of interbedded evaporites which do not crop out.

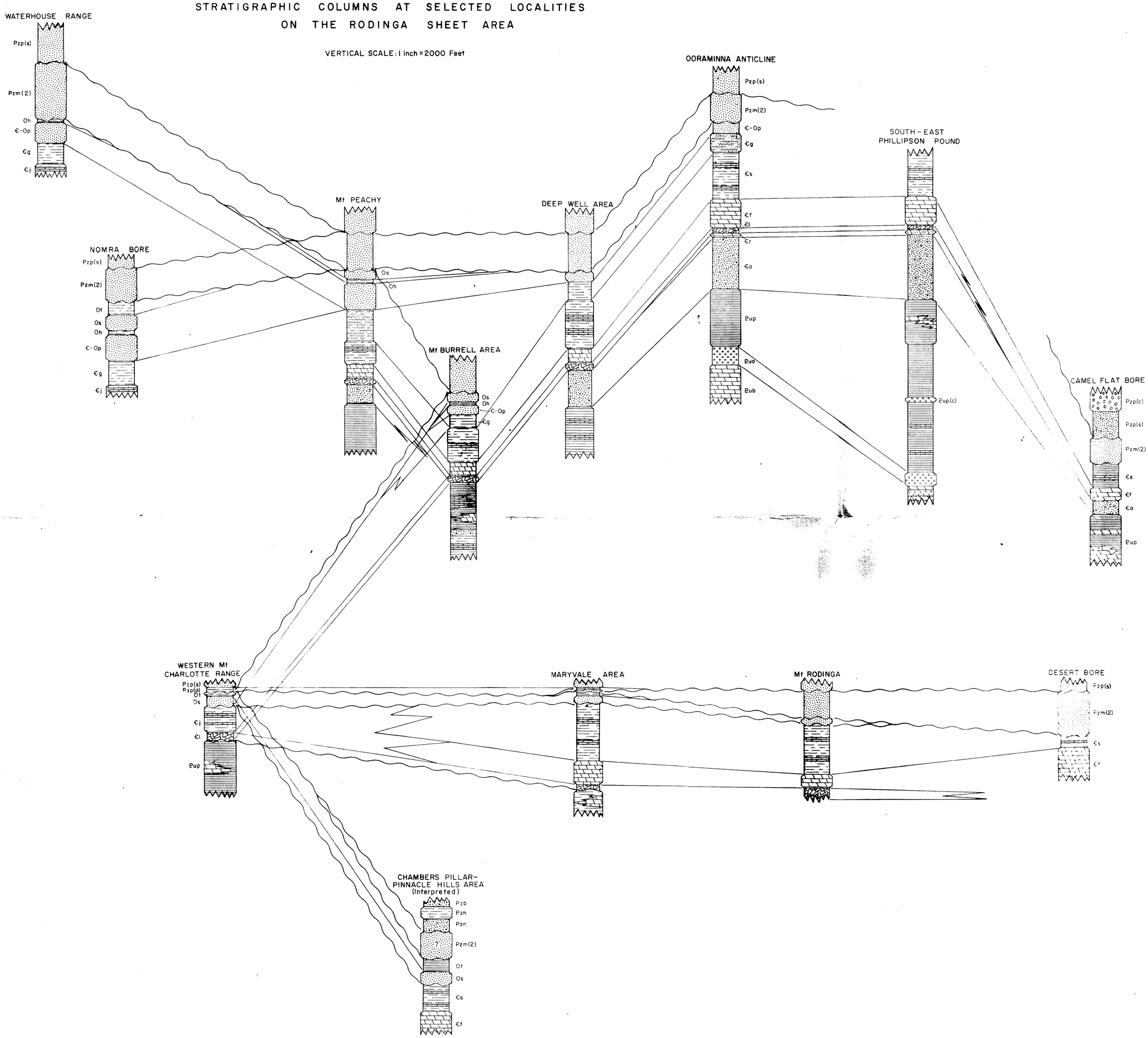
7. Two conglomeratic (possibly glacigene) horizons occur within the thick Upper Proterozoic sequence which lies above the Bitter Springs Limestone and below the Arumbera Greywacke Member in the north-east quadrant of the Rodinga Sheet area. The lower conglomeratic unit has been mapped as Areyonga Formation but the upper conglomerate occurs within a sequence typical of the Pertatataka Formation. Many of the lithologies known previously within the thick Upper Proterozoic section do not occur in the more condensed sections in the western MacDonnell and Gardiner Ranges and the use of the established rock units is regarded as a temporary simplification until the section can be studied in more detail.

8. Two major Tertiary units have been recognised on the Rodinga Sheet area. The older sequence is pre-Billy and is best known from bore information in the Phillipson Pound. The younger unit is post-Billy and is well exposed in high mesas in the northern half of the Rodinga Sheet area. This sequence is probably late Tertiary or early Quarternary in age.

9. The Mesozoic units, Rumbalara Shale and De Souza Sandstone, crop out in the south-east corner of the Rodinga Sheet area but are only preserved

STRATIGRAPHIC COLUMNS AT SELECTED LOCALITIES ON THE RODINGA SHEET AREA

VERTICAL SCALE: 1 Inch = 2000 Feet



Bureau of Mineral Resources, Geology and Geophysics *October 1964*

JMF

as remnants on scattered mesas.

10. Evaporites may occur at three levels on the Rodinga Sheet area. The oldest evaporites occur within the Bitter Springs Limestone and were intersected at the bottom of the Ooraminna No.1 Well. Evaporites may also occur within the Upper Proterozoic Pertatataka Formation and the Cambrian Chandler Limestone Member. Exaporites have not been seen at the surface on the Rodinga Sheet area and their presence is interpreted from the extremely incompetent behaviour of the sediments.

11. Isoclinally folded thrust faults have been mapped within the core of the Mount Burrell Anticlinorium. The thrusts appear to be localised in certain favourable beds and the direction of movement suggests that the major stresses were from the north. There is no evidence of any time break between the thrusting and the folding and it is assumed the process was continuous and the result of only one major orogeny.

ALICE SPRINGS TOWN AND INNER-FARM BASINS

by

T. Quinlan

Since 1956 the Resident Geologists at Alice Springs have been providing geological assistance to the Northern Territory Administration and the Commonwealth Department of Works in the investigation of the occurrence of groundwater and the construction of bores in the basins. This programme has been completed and compilation of the final report has been commenced by T. Quinlan.

The Alice Springs Town Basin is a small alluvial basin, immediately north of Heavitree Gap, with a surface area of approximately three square miles. It contains a maximum thickness of seventy-five feet of sediment, which has been deposited by the Todd and Charles Rivers. The Inner-Farm Basin is a small basin with a surface area of approximately two square miles, which lies between Heavitree Gap and Mount Blatherskite. It contains a maximum thickness of 150 feet of sediment of ?Tertiary and Quaternary age. The two basins act as one hydrologic unit.

Important aquifers occur within the fluvial sediments of Quaternary age in both basins, and in the regolith at the base of the Tertiary sediment in the Inner-Farm Basin.

Contour maps (scale one inch to 400 feet) have been compiled to illustrate the unconformities at the base of the Quaternary and Tertiary sediments. Basement to the Town Basin consists of schist, gneiss, and granite of Precambrian age, and to the Inner-Farm Basin granite of Precambrian age, Bitter Springs Limestone and the Heavitree Quartzite of Upper Proterozoic age.

A lithological correlation of the logs of the bores drilled in the Town Basin resulted in the recognition and mapping of five aquifer systems. These consist of long, narrow beds of silty sand, which have a lenticular or rectangular cross section. Their areal distribution is consistant with the assumption that they were deposited in the channel of a river. Size frequency distribution curves of samples of silty sand, collected during the drilling of test holes, have two or three modes. One mode falls within the silt to fine sand size interval, the second within the medium to coarse sand size interval and the third, if present, within the fine pebble size interval.

An analysis of the Cumulative curves indicates that the samples could be considered to consist of mixtures of varying proportions of three components, the means of which approximately correspond to the above modes. The silt component is thought to represent the suspended load of the old river. This led to the hypothesis that the permeability of the channel sand is determined by the quantity of material deposited from the suspended load of the river. A similar analysis of the size frequency distribution curves of the clayey sand, which is thought to have formed the levee banks of the river channels, showed that they were different from the channel sands, only because they contained higher proportions (greater than 40%) of material deposited from the suspended load.

Use has been made of water analyses done by the Animal Industry Branch, Northern Territory Administration, to determine the chemical character of the groundwater within each aquifer system. Areal variations in the chemical character have been mapped, and they can be related to permeability and the availability of access for recharge water from the Todd River. Water samples taken from flood water in the Todd River and from aquifers with direct access to the bed of the river contain a predominance of sodium and bicarbonate ions. As would be expected the proportion of chloride and sulphate ions increases with distance from recharge areas.

Pumping tests conducted during the investigation are being interpreted in an attempt to determine the permeability of the five aquifer systems and of the aquicludes.

BONAPARTE GULF BASIN

BONAPARTE GULF PARTY

by

J.J. Veevers

Following a five-months' field season in 1963, J.J. Veevers, J. Roberts and J.A. Kaulback (and for part of his time, P.J. Jones) have been engaged in the following activities:

1. A note briefly describing some of the discoveries made in the field was published in the Australian Journal of Science (vol.26, No.11, May 1964).

2. We compiled a 1:250,000 geological map of the southern part of the Bonaparte Basin and outliers, and part of this is being used in a compilation (now being drawn) of the Cambridge Gulf 1:250,000 geological sheet. Another compilation at a scale of 1:125,000 was circulated to interested parties.

3. Kaulback and Veevers have almost completed the first draft of a report on the Cambrian and Ordovician geology of the southern part of the Bonaparte Gulf Basin and the Cambrian and Devonian geology of the outliers, Western Australia. Our extensive collection of Cambrian and Ordovician fossils was studied by Dr. A.A. Opik, who among other things, made the discovery of probable late Lower Cambrian trilobites from the Ragged Range. Firm correlation between almost all the stratigraphical sections examined in the field has now been established on the basis of the fossils. Kaulback took up duties with the phosphate group at the beginning of August.

4. Veevers has also been engaged in analyses of directional structures (mainly in the Cockatoo Sandstone), keeping in close touch with Company activities in the Basin, and in the petrological study of the main stratigraphical sections of the Upper Devonian and Lower Carboniferous. The abundant and widespread microscopic algae found in virtually all the limestones of this age indicate long-continued deposition in very shallow water. All the sections so far studied show that marked lateral changes in lithology revealed in the sub-surface in A.O.D. Bonaparte No.1 also take place in the outcrop, so that the continuing petrological study of these rocks, hand in hand with concurrent palaeontological studies, should yield new information on stratigraphical trends in the basin.

Arrangements were made for Dr. F.C. Loughnan, University of N.S.W., to study the clay mineralogy of deep wells in the Bonaparte Basin, and for Dr. G. Playford, University of Queensland, to study the palynology of the Basin; this work is proceeding now.

Veevers collaborated with Dr. Tj. H. van Andel (Scripps Institution of Oceanography) in preparing a report on the marine geology of the Timor Sea (to be published by the Bureau). The manuscript is expected to be completed by early next year.

5. Roberts has been engaged in a detailed systematic study of brachiopod faunas from the major stratigraphic sections in the south-eastern and north-western parts of the basin. A large proportion of the newly described species and genera appear to be endemic to northwestern Australia. The comparatively short stratigraphic ranges of many brachiopod species has enabled the establishment of a very detailed Lower Carboniferous faunal sequence. This provides excellent stratigraphic control, and has resulted in a number of correlations being made between rocks of different facies along the eastern margin of the basin.

6. Jones examined Upper Devonian and Lower Carboniferous ostracods and conodonts and D.J. Belford studied foraminifera from outcrop and well samples.

Belford, Jones and Roberts prepared a palaeontological report on A.O.D. Bonaparte No.1 Well, which was included in the well completion report.

7. The immediate outcome of this current work is that the complexity of facies relationships in the Basin has been glimpsed for the first time; in consequence, field-work in 1965 will be devoted to shedding light on the key problems revealed by the present studies.

8. Close co-operation was maintained with the Bonaparte Party of the Australian Aquitaine Petroleum Pty. Ltd., who paid several visits to Canberra, and with Mr. M. le Blanc, well-site geologist of Alliance Oil Development.

BOWEN BASIN

FIG. 1

BOWEN BASIN PARTY— AREA OF OPERATIONS

SCALE 1: 1,000,000

10 0 10 20 30 40 50 M

REFERENCE

- Area mapped
- Area re-examined, with some amendments and/or additions to mapping
- Area covered by helicopter traverses
- × Age determination sample sites
- ● Cross bedding measurements
- — Measured sections

Bureau of Mineral Resources, Geology and Geophysics, October 1964

To accompany Record No 1964/151

F5

BOWEN BASIN REGIONAL SURVEY

During the early part of 1964 the results of the 1963 field season were ~~published~~ issued in three records accompanied by preliminary editions of the Springsure, Baralaba and Taroom 1:250,000 Sheet areas and the western part of the Mundubbera 1:250,000 Sheet area. In addition 5 records were written dealing with various aspects of the regional survey, and two of these were submitted for publication in outside Journals. A preliminary edition of the 1:500,000 scale geological map of the Northern Bowen Basin was also ~~published~~ issued.

The Bowen Basin and the Eddystone field parties continued the regional mapping of the Bowen Basin during 1964. In addition, a programme of shallow drilling and coring was undertaken by the Eddystone Party and both parties made use of a helicopter in mapping areas of difficult access.

BOWEN BASIN PARTY

by

F. Olgers

The 1964 Bowen Basin Party, consisted of F. Olgers and E.J. Malone (B.M.R.), A.G. Kirkegaard (G.S.Q.), and A.R. Jensen (B.M.R.) part time. The party remapped some areas in the east of the Duaringa and St. Lawrence Sheet areas as a follow-up to the work done during the 1962 field season, and examined some problems in the Northern Bowen Basin. Some of the results of the work can be summarized as follows:

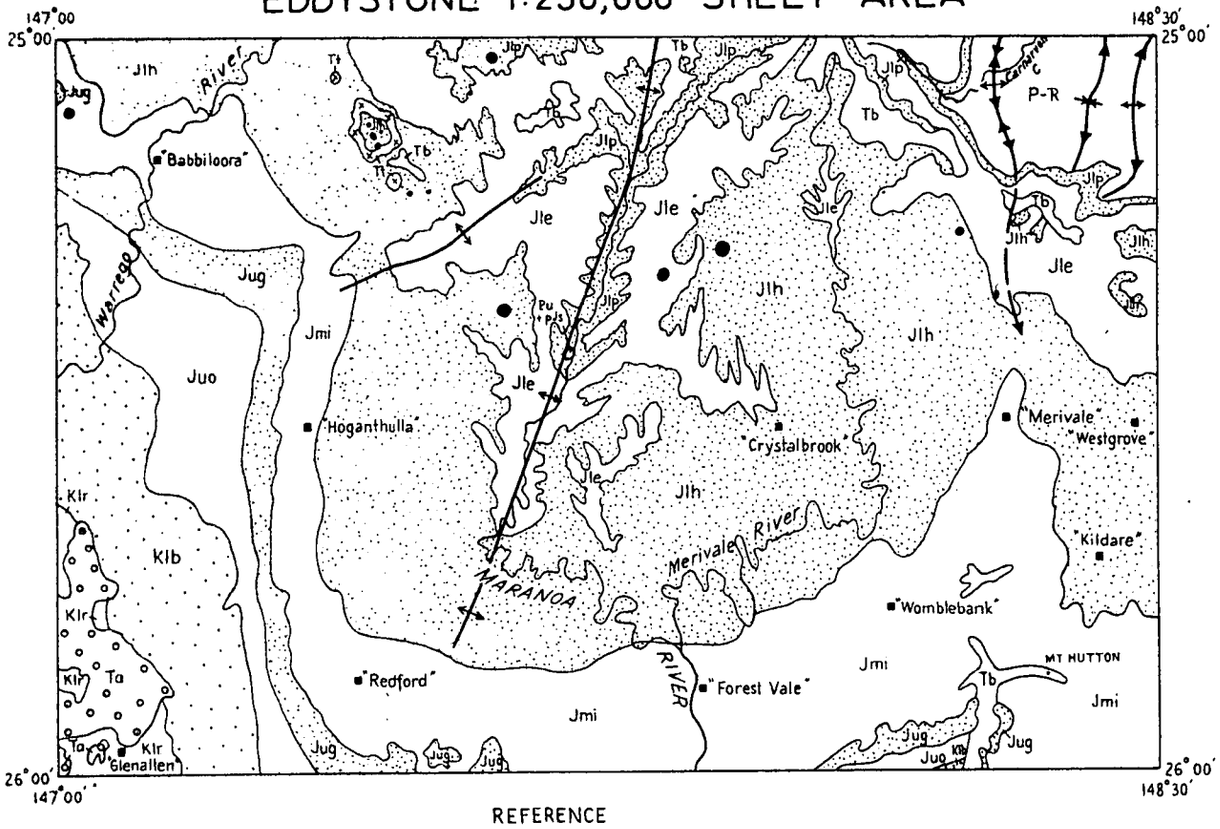
1. The Middle Bowen Beds as previously mapped in the eastern Duaringa area, can be subdivided into two units. The lower unit, informally referred to as the Rannes Beds, consists of shale, siltstone, tuffaceous and lithic sandstone and conglomerate. Deformation is generally intense and regional metamorphism mild. The unit makes up a large part of the Bowen and Gogango Ranges on the Duaringa Sheet and extends north into the St. Lawrence Sheet area. The upper unit is informally referred to as the Leura Creek Beds and consists of regularly interbedded sandstone and shale. The Leura Creek Beds have been recognised from the Don River in the south of the Duaringa Sheet area to the Strathmuir Homestead area, 15 miles north-west of Marlborough in the St. Lawrence Sheet area. The whole sequence is complexly folded and faulted and the mapping of the two units within the Middle Bowen Beds is difficult.

2. Detailed mapping of the anticline north-east of Balcomba Homestead on the Duaringa Sheet area showed the presence of an unconformity in the west limb of the structure. The core of the anticline consists of east dipping (70° - 80°) volcanics with some interbedded sediments. In the west limb, the volcanics are overlain by west dipping (10° - 50°) regularly interbedded sandstone and siltstone of the Permian Leura Creek Beds. The age of the volcanics is not known but they are tentatively correlated with the Devonian volcanics of the eastern Duaringa area.

3. Volcanics north and north-east of Leura Homestead and extending north-north-west across the St. Lawrence Sheet area are unconformably overlain by Permian rocks. They were previously included in the Lower Bowen Volcanics and are now referred to as the Connors Volcanics, of possibly Devonian to Carboniferous age.

GEOLOGICAL SKETCH MAP
EDDYSTONE 1:250,000 SHEET AREA

FIG. 1



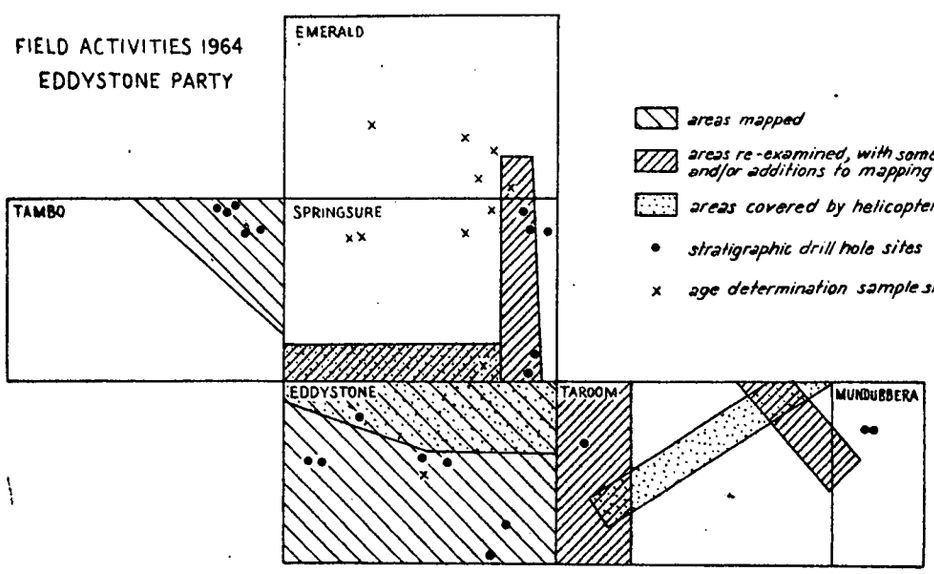
REFERENCE

CAINOZOIC		Czo	Alluvium
		Cz (omitted from map)	thick residual soil, 'billy' boulder gravels
	TERTIARY		laterite
		Ta	pebbly quartzose sandstone
		Tb	basaltic flows
		Tt (Attica*) Gabbro	olivine gabbro sill and stocks
MESOZOIC	L. CRETACEOUS	Klr Roma Formation	siltstone, calcareous sandstone
		Klb Blythesdale Formation	pebbly sub-labile to quartzose sandstone, minor siltstone
	JURASSIC UPPER	Juo Orallo Formation	quartzose sandstone, siltstone, minor limestone
		Jug Gubberamunda Sandstone	pebbly quartzose to sub-labile sandstone
	JURASSIC MIDDLE	Jmi Injune Creek Beds	calcareous lithic and quartzose sandstone, siltstone, shale, coal seams
	JURASSIC LOWER	Jlh Hutton Sandstone	quartzose sandstone
		Jle (Jlo (members not shown on map) Jlb) Evergreen Formation	(Westgrove*) Ironstone Member - concretionary ironstone, oolitic in places, some shale Boxvale Sandstone Member - quartzose sandst., labile sandst., siltstone, shale
		Jlp Precipice Sandstone	cross-bedded pebbly quartzose sandstone
	pre-JURASSIC	pJs	ferruginous sediments, ? tuff
	TRIASSIC	Rm Moolayember Formation	labile sandstone, calcareous in places, siltstone, shale
		Re Clematis Sandstone	conglomeratic quartzose sandstone, red mudstone, grey shale & siltst., labile sandst.
		Rr Rewan Formation	red and green silty mudstone, green conglomeratic sandstone at base
PALAEOZOIC	PERMIAN UPPER	Pua Bandanna Formation	dark shale, clay, siltstone, green feldspatho-lithic sandstone, coal seams
		Pup Peawaddy Formation	dark silty shale, feldspatho-lithic sandstone in top part, siltstone
	PERMIAN LOWER	Pli Ingelara Formation	sandy siltstone with floating pebbles and sand grains, shelly calc. concretions
	? PRECAMBRIAN	Pu	ultrabasic plutonic rocks, mainly gabbro

(Formations not shown)

• basalt plug * names to be submitted, if available, to Strat. Nomen. Committee for approval

FIELD ACTIVITIES 1964
EDDYSTONE PARTY



Bureau of Mineral Resources, Geology and Geophysics, October 1964 To accompany Record No. 1964/151 G 55/A7/1

4. The base of the Lower Permian Carmila Beds was examined in the Carmila and Koumala areas on the Mackay Sheet. The unit was found to be unconformable on sediments, volcanics and intrusives. These sediments and volcanics are possibly equivalents of the Devonian-Carboniferous Campwyn Beds to the east and the Connors Volcanics to the west.

5. The Thuriba Homestead area in the south-east of the Duaringa Sheet area was remapped. Additional fossil evidence indicates that the rocks previously mapped as ?Silurian-Devonian could be of Permian age. Outcrop in the area is poor and the structure is not fully understood.

6. The ultrabasic complex and associated rocks near Marlborough in the south-east of the St. Lawrence Sheet area were re-examined. The oldest rocks in the area are metamorphics, mainly quartz-mica schists. They are intruded at Marlborough by granite. Some possibly younger intrusions occur north-east and east of Marlborough. The ultrabasic rocks are possibly the youngest rocks in the area and occur in a steeply inclined north-east trending zone north-west of Marlborough and form a large mass to the south-east. The structure in this area is not known. The ultrabasic rocks may occur in a flat lying sheet over the granite and metamorphics.

7. Current bedding measurements were collected at six localities from the Carborough Sandstone in the Redcliffe Tableland and Carborough Ranges and from the Clematis Sandstone in the Blackdown Tableland. Preliminary figures indicate that most of the sand was derived from a northerly source area.

EDDYSTONE PARTY

by

R.G. Mollan

Personnel: R.G. Mollan, N.F. Exon and V.R. Forbes (G.S.Q.).

The Eddystone Party completed the following work (see Fig.1) during the 1964 field season:

1. The Eddystone 1:250,000 Sheet area was mapped (whole party).

2. The pre-Jurassic rocks of the Tambo Sheet were mapped (N.F. Exon in conjunction with A.G. Kirkegaard of the Bowen Basin Party).

3. Permian formations were mapped in the northern part of the Springsure Anticline in the Emerald 1:250,000 Sheet area (R.G. Mollan).

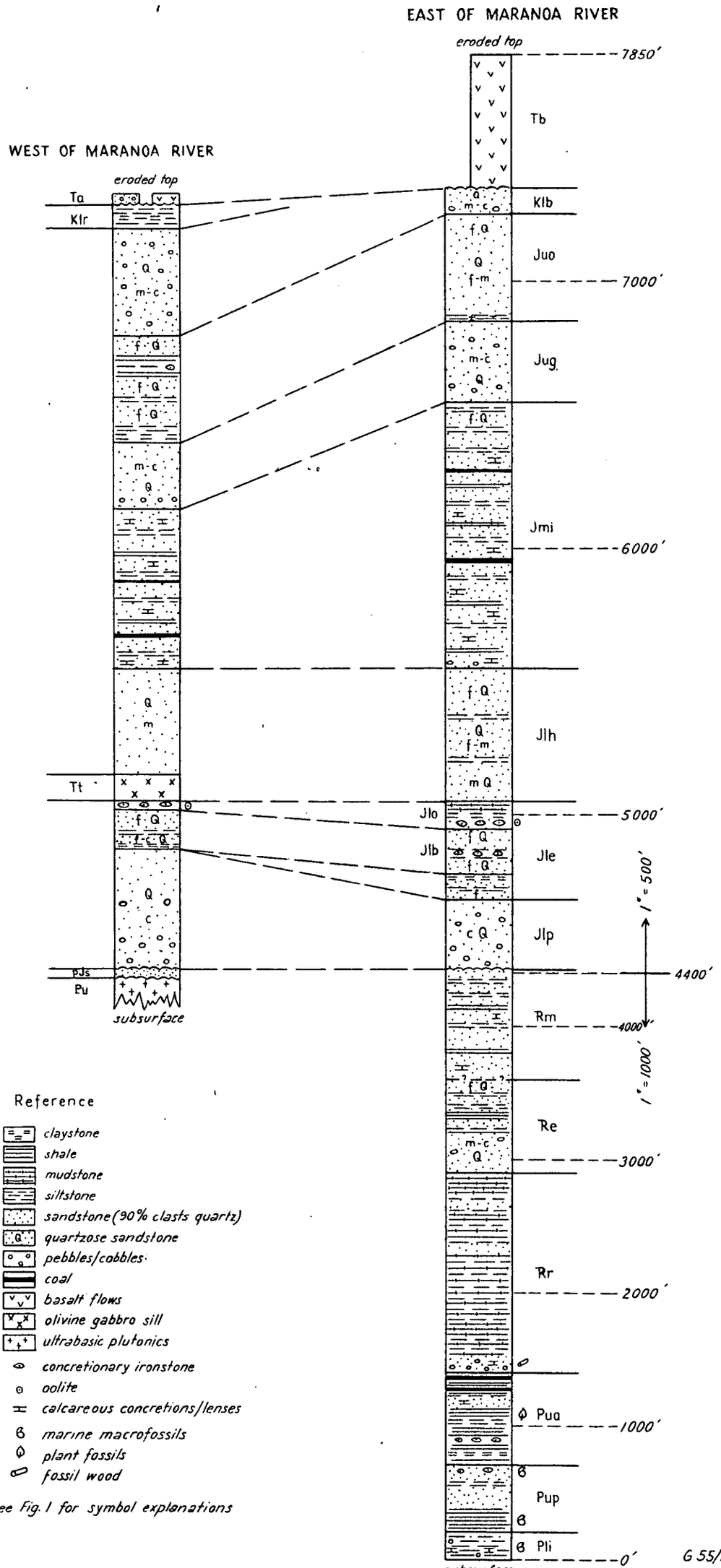
4. Critical parts of the Permo-Triassic sequence in the Springsure Anticline and Reid's Dome in the Springsure 1:250,000 Sheet area were investigated and some amendments made to the stratigraphy and mapping (R.G. Mollan, in conjunction with J.M. Dickins).

5. Critical areas in the Lower Jurassic sequence in the Taroom and Mundubbera Sheet areas were examined (V.R. Forbes); type sections of the Lower Jurassic formations were measured in the western part of the Taroom Sheet (whole party).

6. The Lower Jurassic sequence and Tertiary volcanics in the southern part of the Springsure Sheet were mapped and investigated and amendments made to the 1963 mapping (R.G. Mollan and V.R. Forbes).

FIG. 2

GENERALISED COLUMNAR SECTIONS OF OUTCROP EDDYSTONE 1:250,000 SHEET AREA



G 55/A7/2

Bureau of Mineral Resources, Geology and Geophysics, October 1964

To accompany Record No. 1964/151

Summary of Geological Results (see Figs. 1, 2, & 3)

1. The Eddystone Sheet area (Figs. 1, 2). An inlier of gabbro and other ultrabasic rocks in the middle of the sheet probably represents part of a postulated north trending ridge (the Nebine Ridge) of pre-Permian crystalline basement (?Precambrian). The inlier is overlain by about 40 feet of probable pre-Jurassic sediments which are, in turn, overlain (?unconformably) by the Lower Jurassic Precipice Sandstone.

Lower Permian to Triassic sediments are exposed in the north-east corner of the Sheet. Formations, lithologies and average thicknesses are summarised in Figs. 1 & 2. Important stratigraphic results from work in this area are summarized in para (4). The rocks are folded into asymmetric domes, with steeper west flanks, along the southerly extension of the Reid's Dome - Springsure Anticline axis.

The Triassic rocks are unconformably overlain by the Lower Jurassic Precipice Sandstone which is a coarse-grained, cross-bedded quartzose sandstone whose thickness varies from 250 feet in the north-east to almost 500 feet in the north of the Sheet. The Evergreen Formation changes in character and thickness from east to west. In the north-east the formation is about 400 feet thick and includes the Boxvale Sandstone Member (170 feet) and the (Westgrove) Ironstone Member (? 30 feet). The poorly exposed mudstone of the Evergreen Formation above the (Westgrove) Ironstone Member are not mapped separately from the member. In the west of the Sheet area the Evergreen Formation decreases to about 200 feet thick whereas the Boxvale Sandstone Member remains about 170 feet thick, and thus becomes the dominant unit in the formation. The (Westgrove) Ironstone Member persists across the Sheet, becoming thinner to the north-west. The Hutton Sandstone (400 feet) has been traced across the sheet. Lithologically the unit does not vary significantly being typically a medium grained clayey quartzose sandstone, in places appreciably feldspathic.

The Hutton Sandstone is overlain, probably conformably, by the Middle Jurassic Injune Creek beds ranging from 1200 feet thick in the south-east to 600 feet in the "Babbiloora" area. The unit consists typically of calcareous labile sandstone and siltstone with minor limestone and coal; the labile, and calcareous nature of the sandstones distinguishes them from the Hutton Sandstone.

Four Jurassic-Cretaceous units, the Gubberamunda Sandstone, Orallo Formation, Blythesdale Formation and Roma Formation, were traced across the southern and western parts of the Sheet after a brief inspection of their types in the Roma Sheet area.

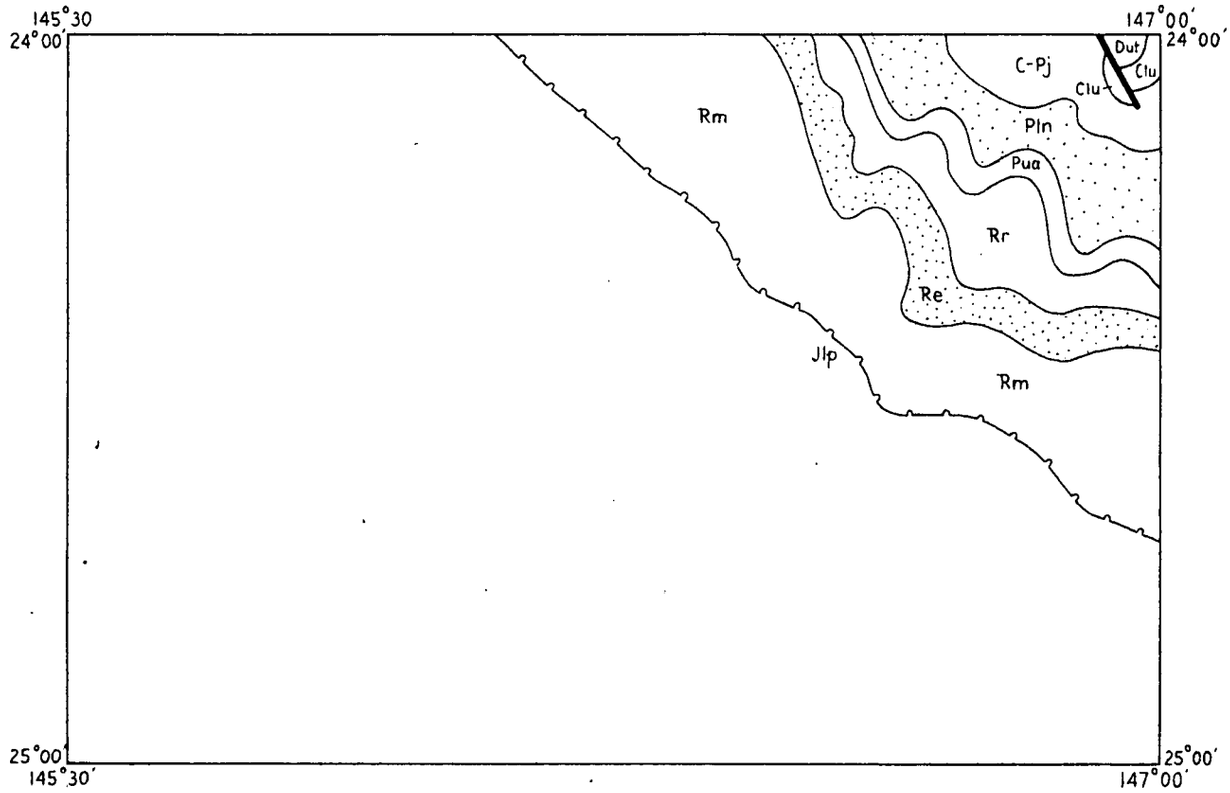
A thin veneer of Tertiary lateritised pebbly quartzose sandstone covers much of the western part of the Sheet area.

The Jurassic sandstones are overlain by Tertiary basalt flows which form a large part of the Great Dividing Range in the east of the Sheet area. Large remnants of the volcanic pile are over 500 feet thick in the north-east. Numerous basalt plugs and dykes in the northern part of the Sheet represent old vents and fissures through which the basalt flows were extruded.

The (Attica) Gabbro is an olivine gabbro forming a large sill (100 feet thick with a plan diameter of 5 miles) and at least two stocks (each about a mile in diameter).

The most marked structure in the area is a very broad anticline in Jurassic rocks which trends slightly east of north in the centre of the Sheet area (see Fig. 1). The fold coincides with the postulated basement ridge and the southerly extension of the Nogoa Axis (Springsure Sheet area). Eastward, broad folds parallel the major fold, whereas westwards folds trend slightly north of east.

GEOLOGICAL SKETCH MAP
1:250,000 TAMBO SHEET AREA



Precipice Sandstone	Jlp	*Pebbly quartzose sandstone*
Moolayember Formation	Rm	*Calcareous sandstone and siltstone*
Clematis Sandstone	Re	*Pebbly quartzose sandstone*
Rewan Formation	Rr	*Sublabile sandstone, siltstone, mudstone*
Bandanna Formation	Pua	*Calcareous sandstone, siltstone*
Colinlea Sandstone	Pln	*Pebbly quartzose sandstone*
	Plj	*Sandstone, siltstone*
Joe Joe Formation	C-Pj	*Siltstone, sandstone, conglomerate*
Ducabrook Formation	Clu	*Green and red siltstone and sandstone*
Telemon Formation	Dut	*Acid volcanics, sandstones, siltstone*

unconformity

Bureau of Mineral Resources, Geology and Geophysics, October 1964 To accompany Record No. 1964/151 G 55/A2/1

2. The pre-Jurassic rocks of the Tambo Sheet area (Fig. 3). The Devonian to Triassic sequence is essentially similar to that of the western part of the Springsure Sheet. Thicknesses mentioned are approximate maximums.

(a) The oldest rocks are exposed in the Mount Beaufort Anticline. They consist of acid and intermediate tuffs and flows which are tentatively mapped with an overlying 800 feet of sediments of the Tolemon Formation (Upper Devonian). The volcanics may prove to be better placed in the Dunstable Formation (Middle Devonian). The sediments consist of sandstone, siltstone, and calcareous beds.

A lens of Mount Hall Conglomerate (Lower Carboniferous), 200 feet thick, underlies the Ducabrook Formation in the southern plunge of the Anticline. No Raymond Sandstone was mapped. The Ducabrook Formation consists of about 3500 feet of red and green, tuffaceous and calcareous sandstone and siltstone.

(b) The Carboniferous-Permian Joe Joe Formation consists of a lower conglomeratic part and an upper part of siltstone, sandstone, tuff and limestone; the sequence is similar to that in the Springsure Sheet; it is 1500 feet thick.

(c) The pebbly quartzose Lower Permian Colinlea Sandstone is 400 feet thick. A softer quartzose unit (100 feet) above, with some feldspathic sandstone probably represents the Upper Permian Peawaddy Formation. The overlying Upper Permian Bandanna Formation contains labile, commonly calcareous, sandstone and siltstone; thickness is about 400 feet in the south and thinner in the north.

(d) Shell's Cheshire Series has been separated into three Triassic units, as was done in the Springsure Sheet in 1963: (i) Rewan Formation (300') largely mudstone, some siltstone and sublabile sandstone. (ii) Clematis Sandstone (300'): cross-bedded fine to coarse clayey quartzose sandstone. (iii) Moolayember Formation: siltstone, labile to sublabile sandstone, commonly calcareous, some fine quartzose sandstone.

(e) Tertiary: up to 100 feet of pebbly quartzose sandstone and conglomerate, commonly lateritised.

3. Springsure and Emerald Sheet areas. Lower Permian formations were mapped in the northerly extension of the Springsure Anticline into the Emerald Sheet. The main results are: (a) The Aldebaran Sandstone (1000 feet) retained its characteristics from the Springsure Sheet area. (b) The units below the Aldebaran (the Stanleigh Formation, Staircase Sandstone, and Sirius Formation) are difficult to separate mainly because the Staircase Sandstone has largely "shaled-out". (c) The Springsure Anticline about the boundary of the Emerald and Springsure Sheets is complicated by a tight syncline in the broad nose of the Anticline, probably resulting from a low angle thrust to the west.

Examination in detail of some critical parts of the Permo-Triassic sequence exposed in Reid's Dome and the Springsure Anticline revealed that: (a) there is apparently no overlap of the Cattle Creek Formation by the Aldebaran Sandstone. (b) The Aldebaran Sandstone in Reid's Dome consists of three units, a lower sandstone, a middle conglomeratic, and an upper transition unit. The position of the lower sandstone is equivocal because it either represents the Staircase Sandstone of the Springsure Anticline or it is an extra sand unit in the Reid's Dome area. The upper transition member is laterally persistent and consistent in thickness; there is no suggestion of overlap at the base of the Ingelara Formation. (c) The Catherine Sandstone, throughout the Springsure Anticline and Reid's Dome, lies at the same stratigraphic level in relation to the underlying Ingelara and overlying Peawaddy Formations which are lithologically distinct. The contact between the Ingelara and Peawaddy Formations was observed (and shown to be distinct) at the southern end of

Reid's Dome where the Catherine Sandstone is absent. (d) The most suitable boundary between the Rewan and Bandanna Formations is that taken by Shell, that is, at the base of a green, slightly lithic, pebbly, "gritty" sandstone above the highest coal seam of the Bandanna Formation - the boundary at the base of the sand is sharp

4. Taroom and Mundubbera Sheet areas

Parts of the Evergreen Formation were examined around the nose of the Mimosa Syncline to try to identify the chamositic marker. No pelletal or oolitic ironstone was found but this does not necessarily mean that the chamositic marker is absent as weathering makes identification difficult. Thus, although it is still thought that the two ironstone members in the Hutton Creek and Cockatoo Creek areas can be equated, it may be preferable, until definite correlation has been established, to apply two different names to these members. The name Westgrove Ironstone Member is being considered for the unit in the Hutton Creek-Eddystone Sheet area.

Type sections were measured in the Precipice Sandstone (140'), Evergreen Formation (400'), and Hutton Sandstone (400') in the western part of the Taroom Sheet. The (Westgrove) Ironstone Member is so poorly exposed that an attempt will be made to drill and core it so that the resultant litholog will serve as a type section.

5. Lower Jurassic and Tertiary, southern part of Springsure Sheet.

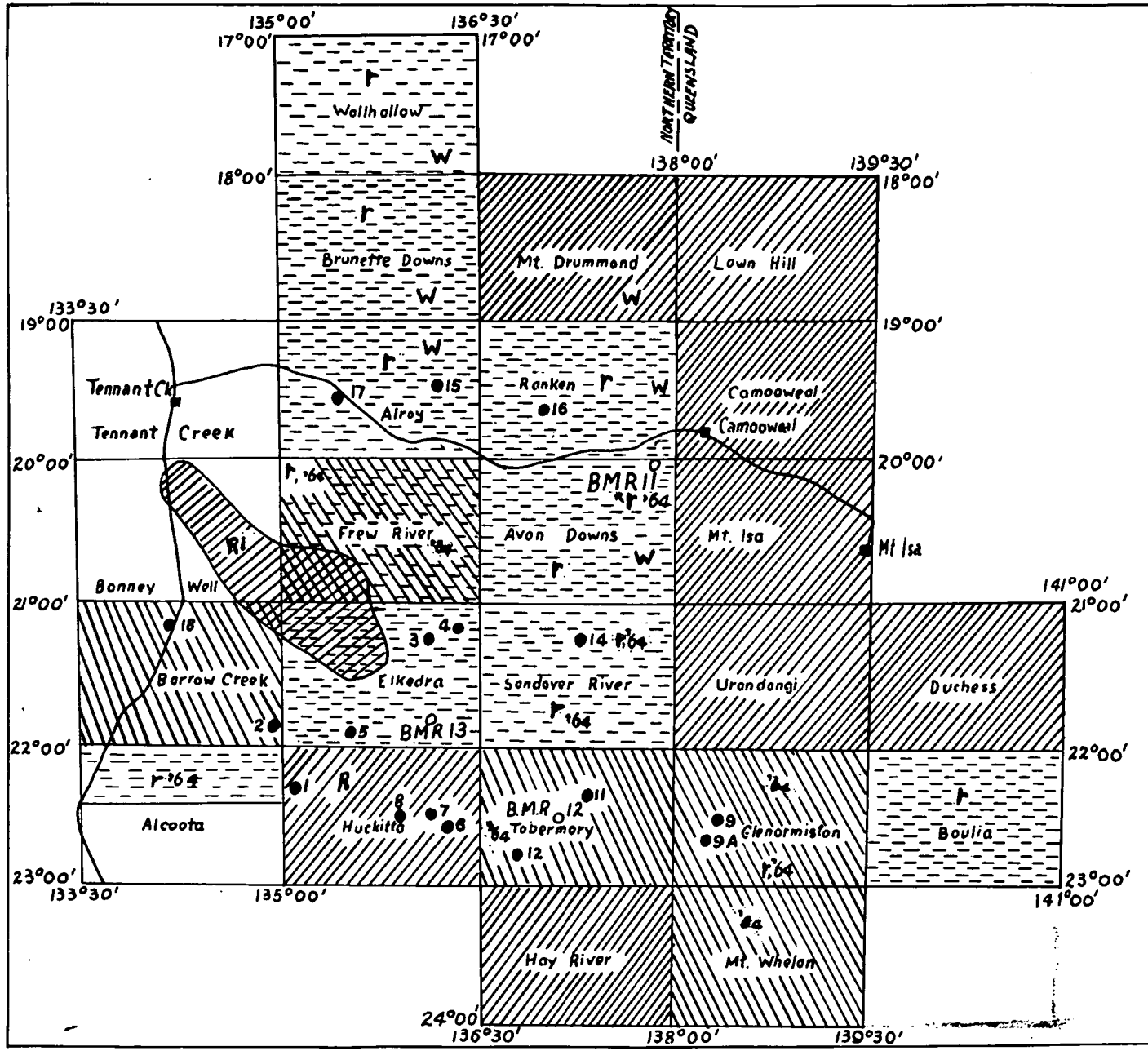
The Evergreen Formation and Hutton Sandstone were traced into the area with the aid of a helicopter. In 1963 the units were mapped with the Precipice Sandstone because of unfamiliarity with the sequence and lack of access.

Tertiary comendite and fayalite trachyte plugs, near the head of Skeleton Creek, were visited by helicopter. Similar plugs, some of which may have not reached the surface, have probably formed several broad domes, a few miles in diameter, in the Precipice Sandstone. Siltstone and sandstone in one of the breached domes probably belongs to the Triassic Moolayember Formation.

GEORGINA BASIN

Fig. 1.

PROGRESS, GEORGINA BASIN, 1964.



Scale

100 0 100 200 Miles.

Reference

- '64 — Work prepared, 1964
- Map Published, 4-mile and/or 1:250,000 Scale.
- Map and Explanatory Notes in press
- R — Report in press.
- Ri — Report Issued
- Preliminary Edition Issued.
- r — BMR Record issued.
- W — Water Supply Research.
- ●1 — BMR Core Holes, Grg 1, 2, 3 etc. NOTE: Nos 10 and 13 non-existent.
- BMR II ○ — BMR Stratigraphic Well.

GEORGINA BASIN PARTIES

by

K.G. Smith

Personnel: K.G. Smith; R.A.H. Nichols; M.A. Randal; E.N. Milligan; N.E.A. Johnson; R.D. Shaw and A. Fehr (all part time).

Activities:

Figure 1 shows the total progress to date in the Georgina Basin, and the areas and specific localities of 1964 activities, which were:

Field Mapping: Nil.

Reporting: The following Records were prepared and issued:

1964/28 - The Geology of the Glenormiston 1:250,000 Sheet area. By M.A. Reynolds and P.W. Pritchard.

1964/43 - The Regional Geology of the northern half of the Alcoota 1:250,000 Sheet Area, N.T. By E.N. Milligan.

1964/45 - Completion Report, B.M.R. No.11 (Cattle Creek), N.T. By N.E.A. Johnson, R.A.H. Nichols, and M.D. Bell.

1964/49 - Explanatory Notes to accompany the Frew River 1:250,000 Sheet, N.T. By K.G. Smith.

1964/63 - The Geology of the Sandover River 1:250,000 Sheet N.T. By R.A.H. Nichols.

1964/69 - Report on Core Hole Grg.14, Georgina Basin, and correlation with Grg.4. By R.A.H. Nichols and A. Fehr.

The following EXPLANATORY NOTES were prepared and are in press:

FREW RIVER, by K.G. Smith; GLENORMISTON, by M.A. Reynolds; TOBERMORY, by K.G. Smith; MOUNT WHELAN, by M.A. Reynolds.

The following reports are in progress:

B.M.R. 13 Completion Report, by A.R. Lloyd; EXPLANATORY NOTES, SANDOVER RIVER, by R.A.H. Nichols; Georgina Basin Report, by K.G. Smith. All of the Map Sheets shown on Fig.1., except Tennant Creek and Bonney Well, have been reduced to 1:500,000 Scale and await drafting; four separate sheets are required to cover the area at the scale of the reductions. A draft of the Precambrian and Lower Cambrian geology on the margins of the Georgina Basin has been completed, and drafts of Middle and Upper Cambrian geology are in progress.

Research:

An investigation of underground water supplies in the Barkly Tableland area has been continued by M.A. Randal. No new basic data were collected during 1964; maps and figures concerning the investigation are now being fair-drawn.

R.A.H. Nichols and A. Fehr continued research on cores of carbonate rocks obtained in the Bureau's 1962 Georgina Basin coring programme. A detailed study of cores from B.M.R. Grg.14 was completed (Records 1964/69, listed previously) and revealed some parameters which could be used for

correlation with B.M.R. Grg 4; the distribution of pellets and intraclasts and detrital quartz provided parameters for correlation, with supporting evidence from the distribution of ooliths, detrital tourmaline and zircon. By the use of these parameters, Nichols and Fehr suggested that correlatable intervals between the two wells are 170-200 feet deeper in Grg 14 than in Grg 4.

Stratigraphic Drilling: B.M.R. 11 (Cattle Creek) and B.M.R. 13 (Sandover) have been completed, and B.M.R. 12 was drilling at 2802 feet on 20th October, 1964 in the Middle Cambrian. A summary of the results of the two holes follows:-

B.M.R.11.

Location: Lat. 20°00' 33"S, Long. 137°50'06"E.

Elevation: G.L. 736 feet.

R.T. 742 "

Date Spudded: 6/7/63

Date Completed: 16/11/63

T.D.: 1501½ feet

Log: Surface - 1412 feet - Cambrian dolomite, with some limestone and chert; fragmentary fossils between 575 and 1250 feet

1412 feet - T.D., ?Upper Proterozoic, ?Lower Cambrian Red and grey sandstone.

Hydorcarbons: Traces of asphalt.

Geological Significance of results: The well spudded in the Camooweal Dolomite and penetrated fossiliferous Cambrian sediments in the interval 575-1250 feet. A considerable volume of water (tested at 6000 gph, by air-lifting) was obtained at depths greater than those normally drilled in pastoral bores in the Barkly Tableland area.

B.M.R. 13.

Location: Lat 21°51'25"S, 136°09'06"E.

Elevation: G.L., 1055 feet.

R.T., 1063 "

Date Spudded: 15/1/64.

Date Completed: 7/7/64.

T.D.: 3331 feet

Log: Surface-40 feet, Quaternary sand, soil.

40-2235 " , Upper Cambrian limestone, dolomite, siltstone and quartz sandstone of the Arrinthrunga Formation.

2235-3096 " Middle Cambrian dolomite, siltstone and limestone of the Arthur Creek Beds; fossiliferous.

3097-3305	feet	? Lower Cambrian dolomite and quartz sandstone: fragmentary fossils, unidentifiable.
3305-3328	"	?Archaean gneiss.
3328-3331	"	Granite
Hydrocarbons:		Globules of oil, and gas, 2950-2975 feet in the Arthur Creek Beds. A drill-stem test, 2950-2990 feet, recovered 22 cu ft. of gas-cut mud.

Geological Significance of results: (i) To 1460 feet the well penetrated the middle part of the Arrinthrunga Formation which generally crops out poorly and which the Bureau attemped to core in Grg 7 and 8. There is good correlation between the lithological logs of part of Grg 7 and part of B.M.R. 13.

(ii) There is good lithological correlation between outcrop in the Anitowa area (north of B.M.R. 13) and part of the log of B.M.R. 13. Therefore Grg 4, which was cored to 740 feet below the base of the Anitowa outcrops, also penetrated the Arrinthrunga Formation.

(iii) The well proved the presence of oil and gas in Middle Cambrian sediments: petroliferous odours have been reported in outcrops of Middle Cambrian sediments at many localities around the margins of the Georgina Basin, and gas has been reported previously in the Ammaroo area.

(iv) The depth to basement agrees with the computed depth suggested by the Geophysical Branch from magnetometer data.

B.M.R. 12

Location: Lat 22°33'20"S, long. 137°10'05"E (approx).

Elevation: G.L. 720 feet (approx)

R.T. 728 " "

Date Spudded: 14/8/64

Present Depth: 2802 feet on 20/10/64

Log :	Surface-500 feet,	Upper Cambrian - Lower Ordovician Ninmaroo Formation; dolomite, limestone, siltstone, quartz sandstone.
	500 - 2720 feet	Upper Cambrian Arrinthrunga Formation; limestone, dolomite, siltstone.
Hydrocarbons:		None recorded.

GREAT ARTESIAN BASIN

GREAT ARTESIAN BASIN
1964 Mapping

REFERENCE

- Geological boundary
- Strike and dip of strata
- Fault or monocline, with throw; U-up, D-down
- Trend lines, photo interpretation
- Dry oil exploration well
- B.M.R. Core Hole
- Oil exploration well, now drilling
- Limit of mapping
- Dip, photo interpretation, less than 10°

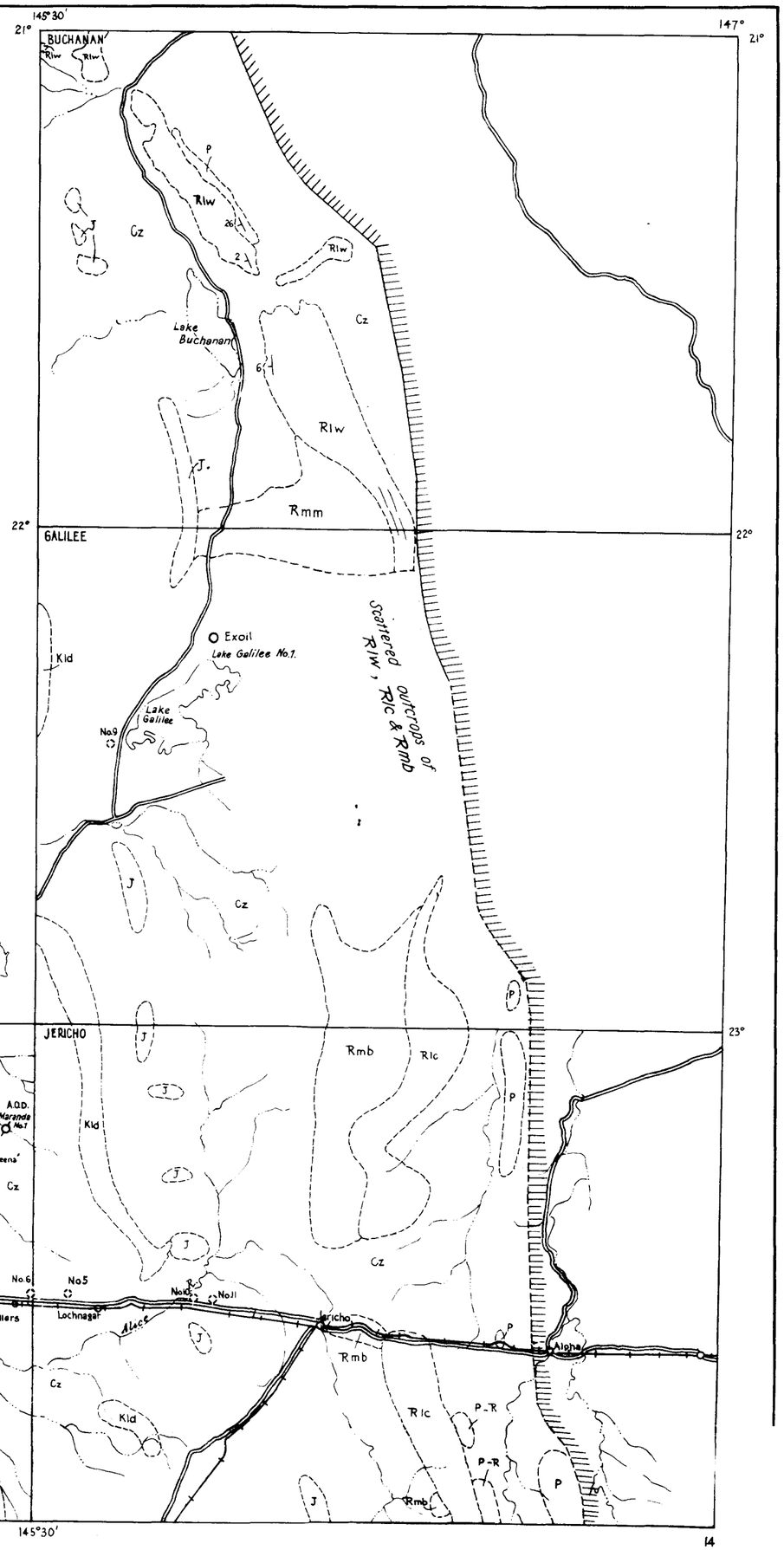
Cz	Cainozoic sediments
Kw	Winton Formation
Klm	Mackunda Beds
Klw	Wilgunya Formation
Kla	Allaru Member
Klo	Toolebuc Member
Klc	Unnamed Member
Kld	Doncaster Member
J	Undifferentiated Jurassic arenites
Rmm	Moolayember Formation
Rmb	Unnamed sandstone/siltstone unit
Ric	Clematis Sandstone
Riw	Warang Sandstone
P-R	Rewan (?) Formation
P	Undifferentiated Permian sediments

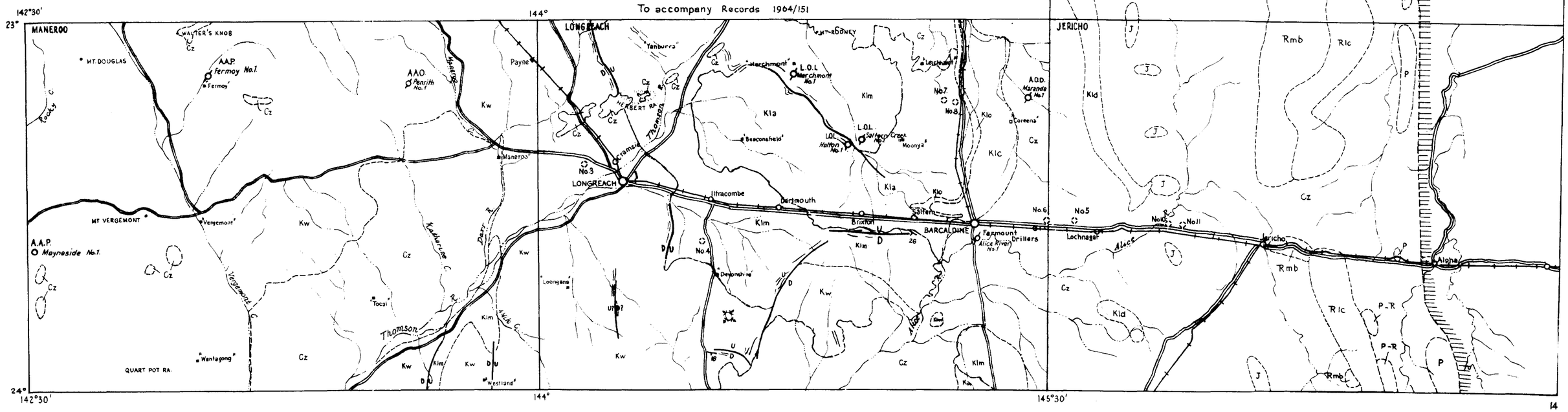
Scale : 1:1,000,000.

SCALE

10 0 10 20 30 40 MILES

To accompany Records 1964/151





GREAT ARTESIAN BASIN PARTY

by

R.R. Vine

The early part of the year was spent on the preparation of the report covering the 1963 mapping. Preliminary editions of the Hughenden, Tangorin, Muttaburra and Winton 1:250,000 Sheets were prepared.

For the 1964 field season the programme was to map the whole of the Longreach and Maneroo Sheet areas and the Eromanga Basin part of the Buchanan, Galilee and Jericho Sheet areas. A programme of core drilling was also carried out, mainly in the Longreach and Galilee Sheet areas. The object of the drilling was to provide information on the lithologies of poorly exposed sequences and to provide fresh material for micropalaeontological examination.

The party consisted of R.R. Vine (Party Leader), W. Jauncey, M.C. Galloway and I. Chertok (draftsman) of the Bureau of Mineral Resources, and D.J. Casey of the Geological Survey of Queensland. Field mapping was carried out during the months of June to October, and the programme was completed. The most important results of the mapping are as follows (see also attached sketch map):

(A) The Lower Triassic Warang Sandstone could be traced south-southeast across the Buchanan Sheet area and into the Galilee Sheet area. There it appears to be interfingering with the Clematis Sandstone, which was traced northwards from the Tambo Sheet area.

(B) A sequence of arenites, overlying the Triassic Moolayember Formation and underlying the Cretaceous Rolling Downs Group, extends roughly north-south across the Buchanan, Galilee and Jericho Sheet areas. No determinable fossils were found and no more specific age than Jurassic can be assigned to these sediments. However, they lack any of the diagnostic features of the Lower and Middle Jurasic sequence of the Eddystone Sheet area and are possibly part of the Blythesdale Group. Attempts were made to obtain fresh cores from the sequence, but these failed mainly because of the thickness of overlying Cainozoic sediments and a deep weathering profile. The stratigraphic position of this sequence may be better understood when the mapping of the Tambo Sheet area to the south has been completed.

(C) The sequence between the Doncaster and Toolebuc Members in the area mapped during 1964 contains numerous beds of coarse-grained siltstone grading to fine-grained sandstone, many of them calcareous and commonly richly fossiliferous. This is in marked contrast to the Hughenden - Richmond area where, in the same stratigraphic position, the Ranmoor Member is almost entirely mudstone and carbonaceous shale, and only locally fossiliferous. It will be necessary to map this southern development as a separate member of the Wilgunya Formation, but regarded as a correlate of the Ranmoor Member. Preliminary examination by R.W. Day (Australian National University) indicates that the un-named member has a Tambo fauna.

(D) Cainozoic deposits are widespread and much thicker than was originally expected. Detailed examination of water bore logs will be necessary before the full extent can be determined, but it is already evident that these deposits occur as piedmonts with thicknesses in excess of 300 feet. Aquifers are commonly present but contain waters of very variable salinities.

(E) Several major structures (faults or monoclines) occur in the Longreach and Maneroo Sheet areas. Surface traces are linear bedding trends, some of which are associated with lateral displacements of geological boundaries. Drilling by Longreach Oil Limited indicates that one of the structures represents displacement over a buried basement scarp, against which late Palaeozoic and Mesozoic sediments wedge out.

WISO BASIN

WISO BASIN, and MARGINS.

Scale.

32 16 0 32 64 96 128 Miles.

Darwin 360 miles.

Top Springs.

Beef Road

Murranji Track

Dunmara

17°S

WAVE HILL.

Newcastle Waters.

Newcastle Waters

Elliot

Wave Hill

Cl-

Em

M

18°S

WINNECKE CREEK.

SOUTH LAKE WOODS

Hooker Creek

Winnecka CK

W.H.

BASIN

Buchanan Hills.

19°S

TANAMI EAST

GREEN SWAMP WELL

Wilson Creek

Approx. 6000' to magnetic basement.
VH-MIW traverse, 1962

WISO

140

Barkly HWy.

Tennant Creek.

Tanami

20°S

MT. SOLITAIRE

LANDER RIVER

TENNANT CK.

HWY

BONNEY WELL

STUART

Lander River

Hanson River

The Granites

W.H.

Wauchope

Nummagalong

21°S

130°30'E

132°E

139°30

BARROW CREEK

BMR. Gr918.
T.D 320'.
Upper Cambrian fossil at T.D.

Alice Springs. 850 miles

Willowra.

Alice Springs.

Alice Springs. 200 miles

GEORGINA BASIN

Reference

- M — Mesozoic sedimentary rocks.
- Em — Middle Cambrian limestone, chert.
- Elv — Lower Cambrian volcanic rocks.
- Pc2 — Precambrian sedimentary rocks, and igneous intrusions. (Hatches Ck Group, Ashburton Sandstone).
- Pc1 — Precambrian sedimentary rocks (Warramunga Group) and igneous intrusions.
- Precambrian metamorphic and igneous rocks.
- HWY — Sealed highway.
- Road and/or Track.
- Settlement; homestead; town.
- Landing ground.
- Water bore
- Grg 18 — B.M.R. Core hole
- W.H. — Waterhole

To accompany Records 1964/151.

WISO BASIN RECONNAISSANCE

by

K.G. Smith

A brief ground reconnaissance was made to parts of the margins of the Wiso Basin, in June and July, 1964. The Basin was named by Hossfeld (1954), who stated that it occupied an area bounded roughly by Barrow Creek, Newcastle Waters, Wave Hill, Tanami and The Granites. Hossfeld predicted that this area was underlain at shallow depth by Cambrian sediments.

The 1964 reconnaissance was made in three areas:

(i) Willowra-Lander River, for a distance of about 60 miles north-west from Willowra homestead. On this traverse, several outcrops of ? Archaean gneiss were observed in the river bed and on the eastern bank. The log of a water bore near the north-western end of the traverse indicates that the bore bottomed in ? Archaean rocks.

(ii) From Tennant Creek north-west for about 65 miles. Fossiliferous Middle Cambrian chert crops out along the margins of west-dipping ridges of Precambrian Ashburton Sandstone. About 15 miles west of these ridges, a large sink-hole was observed; it may be developed in Cambrian carbonate rocks, but no fresh rock could be obtained.

(iii) From Dunmara to Top Springs, via a new beef-road, thence to Wave Hill, Hooker Creek settlement and Winnecke Creek.

The geology between Dunmara and Hooker Creek settlement is as outlined on the Tectonic Map of Australia. Outcrop of ?Mesozoic in gravel pits along the new beef-road is strongly leached, and specimens collected for palaeontological examination contained no fossils. Examination of logs of Government water bores along the Murranji Track indicates about 300 feet of ?Mesozoic sediments underlain by limestone of ? Cambrian age; none of the bores penetrated basement rocks.

South-east from Hooker Creek settlement, all outcrops near the track consisted of laterite.

PETROLOGICAL STUDIES

PETROLOGICAL STUDIES

by

L.V. Bastian

Personnel: L.V. Bastian and M. Arman.

In November 1963, L.V. Bastian was working on the logs and reports of petrological studies made in conjunction with A. Fehr of the I.F.P. during 1962 and 1963, and involving the wells Cabawin No.1, Cabawin East No.1, Pickanjinnie No.1, Combarngo No.1, Sunnybank No.1, and Winnathoola No.1. The first draft of this report was checked by the supervisor in January; this led to further work later. During December and January, thin sections of rocks collected by E. Malone in the Duaringa 1:250,000 Sheet area, were described. A total of two weeks leave was taken during this period.

During February, March and April, thin sections of rocks collected by the Taroom and Springsure field parties were described in order to include the information in the respective reports. A study was also made during this period of the Evergreen and Boxvale Sandstones in the wells Glentullock No.1, Rosewood No.1, Kooringa No.1, Meeleebee No.1, Wandoan No.1 and Burunga No.1; this had been necessitated by problems encountered by the Taroom party. Examination of the material collected by E. Malone was then resumed in May and a report completed in June for inclusion in a record.

From 8th June, and through July, a re-examination of thin sections from the Bowen-Surat Basin wells was made. During August, further substantial corrections to the logs of these wells were made, and a second draft of the report was prepared. In September, while a draughtsman was engaged in altering the logs, a report was prepared on the Springsure units Staircase Sandstone, Aldebaran Sandstone, Catherine Sandstone and Colinlea Sandstone, and diagrams were drawn up for these. This work continued into October.

Periodically during the year, checks were made of the thin sections described by M. Arman and the drafts of his reports.

M. Arman in November and December was working with Dr. Fehr on Georgina Basin material, and was then on leave from 18th December to 23rd January. During February he studied thin sections of rocks collected by the Great Artesian Basin field party, and also in April when he prepared notes for inclusion in that party's report. He studied the Permian rocks of Warrinilla North No. 1 well during March, April and May, working on cores and cuttings supplemented by thin sections.

From 4th June he began work on the shallow holes drilled in the Bowen Basin during 1963, selecting material for thin sectioning, and later examining the thin sections. This work continued through July and August, and in September he prepared a report on these holes. Late in September he commenced on examination of Wandoan No.1 cuttings, supplemented by thin sections, and this work continued into October.

REPORT OF PHOTOGEOLOGICAL GROUP

REPORT OF PHOTOGEOLOGICAL SECTION

by

W.J. Perry

Personnel:

R. Richard : I.F.P. Attached

W.J. Perry : B.M.R.

N. Exon, W. Jauncey, (B.M.R.) and D. Casey (B.M.R.) worked in the section temporarily during the first quarter of the year.

Movements:

Perry and Richard visited the Lansdowne Field Party in August. This provided an opportunity for checking the interpretation of some of the Kimberley area sheets.

Remarks:

After discussion with J.N. Casey it was decided as a general policy that 1:250,000 scale photogeological sheets of areas to be mapped in the season immediately following the interpretation, should not be fair drawn. Preparation of these sheets is achieved by photographic reproduction of overlay print assemblies, with letter symbols added by hand and the reference typed. The advantages of this method are economy of drafting time, and speed of preparation, the latter, however, being subject to the type of service available from the National Mapping photographic section.

PHOTOGEOLOGICAL WORK COMPLETED, 1964

(1:250,000 Scale Sheets except where otherwise indicated)

Bonaparte Gulf Basin, W.A. and N.T.

Cambridge Gulf-Point Spring area (6 sheets at 1:15,840 scale)

Port Keats

Cape Scott

Kimberley Area, W.A.

Charnley
Yampi
Prince Regent
Camden Sound
Montague Sound
Ashton
Drysdale

In progress, October, 1964.

East Artesian Basin, Queensland.

Tambo

Canberra Area, A.C.T. Dam Site E.

Detailed interpretation of approx. 10 sq. miles at 1:21,000 scale.

Dobbyn-Kajabbi Queensland.

Detailed interpretation at 1:48,000 scale of approx. 1000 sq. miles; subsequently it was found that only approx. 160 sq. miles round Dobbyn was required, and the final map was modified accordingly.

MACROPALAEONTOLOGY

MACROPALAEONTOLOGY

ANNUAL REPORTS BY INDIVIDUAL AUTHORS

A.A. Öpik

Summary:

Completed (in typescript) Bulletin 74 of which the 67 plates are already printed; concluded the manual development (dematrication) and the photography of hitherto undescribed polymerid trilobites from the Undilla Basin of Queensland; concluded the dematrication and photography, as well as generic indentification of, the Middle Cambrian agnostids of the stratigraphically significant subfamilies Ptychagnostinae and Diplagnostinae from Queensland, Northern Territory and New South Wales; prepared (in collaboration with Mr. J. Kaulback) a report on the stratigraphy and fossils of the Cambrian and Ordovician sequence of the Joseph Bonaparte Basin; prepared a record on the newly discovered Ordovician (Tremadocian) sequence and fossils from the Fergusson River Area (Daly River Area, Northern Territory); identified various fossils collected by the parties of the Bureau as well as those submitted by private companies; read several manuscripts of palaeontological papers for the Editor.

Ostracods were discovered in the Middle Cambrian of Queensland; this discovery is significant because true ostracods were hitherto unknown in the Cambrian.

J. Gilbert-Tomlinson

Summary:

Study of lower Palaeozoic faunas of northern Australia was concentrated almost exclusively on the Amadeus Basin, and the first draft of a record "Palaeozoic fossils from the Amadeus Basin, N.T." was completed. In field studies, the emphasis has been largely on systematic collecting within the larger rock sequences previously established. Repetition of observations in a number of sections has permitted considerable refinement in stratigraphy and palaeogeography. In particular, the Ordovician can now be split into three distinct faunal stages. Special attention has also been paid to the problem of the age of the fossils in the sandstone at Mount Watt. Determinations of some fossils collected in the Georgina Basin have also been made. In Upper Palaeozoic stratigraphy, significant advances include new discoveries of Devonian vertebrates in three regions. Three weeks were spent in Tasmania examining field occurrences of Ordovician fossils and studying collections held in the University of Tasmania.

1. Amadeus Basin

The year has been one of consolidation of the results of previous surveys and increasing exactitude in delimiting the horizontal and vertical distribution of faunal assemblages.

Cambrian. The faunas of the Lower Cambrian archaeocyathid-bearing dolomite can now be divided into two on the basis of the associated brachiopods. The younger fauna contains the rare and very fragmentary trilobite tagmata - the first Lower Cambrian trilobites found in central Australia. In the early Middle Cambrian limestone, the hyolithid Biconulites proves to be the characteristic fossil of the area east of the Telegraph Line. New records of Middle Cambrian trilobites for the Basin include Redlichia and a possible Kootenia. Specimens of several new genera

of trilobites and one new ribeirioid have been recovered from Upper Cambrian limestone and sandstone. A unique example of a late Upper Cambrian gastropod sandstone has been recovered at one locality. It contains the bellerophontoid genus Chalarostrepsis, previously known only from North America.

Ordovician. The recognition of three faunal stages within the Ordovician of the Basin constitutes a major advance in stratigraphy. The stages are temporarily designated "Pre-Larapintine", "Early Larapintine", and "Late Larapintine". The Pre-Larapintine faunas contain a mixture of local and extra-Australian forms, and the latter securely date the faunas as Tremadocian (lowermost Ordovician). The proportion of endemic forms inceases in the Early Larapintine faunas; they can, however, be assigned with confidence to the late lower Ordovician (Arenigian) and perhaps, in some cases, to the early Middle Ordovician (Llanvirnian). The Late Larapintine faunas are wholly Australian and, except for two species, restricted to the Amadeus Basin. Objective correlation on the basis of shelly fossils is therefore not feasible. A late Middle to early Upper Ordovician age is postulated. In no case does the passage from one faunal stage to the next correspond to a mapped lithological boundary.

Most of the material examined was collected by Bureau geologists, including the author. Collections from Resident Geologists at Alice Springs and oil-company geologists have also been examined. Core from Exoil et al. Mereenie No.1 Well was examined and reported on.

2. Special project : Sandstone at Mount Watt

The sandstone outlier at Mount Watt (Finke Sheet), near the southern edge of the Amadeus Basin contains an anomalous fauna of Ordovician molluscs, equivocal graptolite fragments, and large heavily-ornamental plates that may be part of the armour of heterostracans (jawless vertebrates). The anomaly arises from the fact that the latter are not of the well-known Ordovician model, but of a kind unknown elsewhere before latest Silurian or early Devonian time.

The importance of this discovery from the viewpoint of vertebrate history need not be laboured. A snap decision on the age of the deposit is neither practicable nor desirable, and the possibility of derived fossils must be seriously considered. The field geologists' assignment of the rock to Middle Ordovician Stairway Sandstone may be allowed to stand pro tem.

Several weeks have been spent on laboratory examination of the fossils, a new collection has been made from Mount Watt itself, the Stairway Sandstone from the area of Rodinga Sheet has been systematically collected, and a check of earlier collections from Kulgera and southern Henbury Sheet areas is now in progress.

3. Devonian vertebrates

Knowledge of the distribution of Devonian sediments has greatly increased by the discovery of remains of the dermal armour of placoderms (armoured vertebrates) at widely separated localities. The following have been examined by the author:

(i) The cosmopolitan Middle to Upper Devonian antiarch Bothriolepsis in the Mereenie Anticline area, Amadeus Basin (coll. R.M. Hopkins, Magellan Petroleum Corporation).

(ii) An unidentified plate, perhaps an arthrodire, in the Toko Range area (co. C.J. Mulders).

(iii) Plates of the arthrodire Phyllolepsis and acanthodian spines in sandstone from the Bourke area, N.S.W.

4. Ordovician of Tasmania

The main Ordovician fossil localities in the State of Tasmania were visited in company with Mr. M.R. Banks of the University of Tasmania, and a large suite of fossils was collected. In addition to gaining an enlarged experience of the Australian Ordovician, the author was able to interpret a number of little-known trilobites for the Tasmanian palaeontologists.

J.M. Dickins

Summary:

J.M. Dickins was concerned with coordination and planning of the Bowen Basin Regional Survey and continued work on the palaeontology and stratigraphy of the Basin. He prepared papers on this work and examined and prepared reports on fossils of Devonian, Permian and Triassic age from well cores and surface samples. He arranged and supplied information for description of fossils from the Bureau collections by outside workers, drew upplans for equipping the new building and prepared reports by other workers for publication.

BOWEN BASIN REGIONAL SURVEY

Coordination and planning of this survey was continued combined with palaeontological work on the Permian marine macrofossils and examination of specific stratigraphical problems. Fossils from the Baralaba, Monto, Mundubberra and Springsure areas were studied and reports prepared for inclusion in the Records on these areas. Basin-wide correlation is now possible and this has been used in establishing stratigraphical units of regional extent. These units are basic on an understanding of the sedimentary and tectonic development of the Basin. Papers on the regional stratigraphy of the Basin and the results of the regional survey were prepared and delivered at meetings of ANZAAS, Section C, and the Queensland Division of the Geological Society respectively.

In conjunction with colleagues a note on the Springsure area has been prepared and is to be published in the Queensland Government Mining Journal

Field work comprised collection of fossils from the central eastern (Marlborough area) and south-western parts of the Basin and examination and measurement of critical sections and areas.

A description of a species of the crinoid Calceolispongia, discovered for the first time in Queensland in the Bowen Basin, has been prepared for publication.

EXAMINATION AND DESCRIPTION OF FOSSILS

In addition to the material examined and described from the Bowen Basin, fossiliferous cores have been examined, and reports prepared on Wapet's Jurien No.1, Quail No.1, Yardarino No.1, and Learmonth No.1; Planet's Warrinilla No.1, and Warrong No.1, and A.A.O. Rolleston No.1. Pelecypods from the Devonian Cockatoo Sandstone of the Bonaparte Basin, gastropods from the Devonian of the Fitzroy Basin and Permian marine fossils from Lake Blanche, Canning Basin were examined. Reports on the latter two were forwarded for use by the Western Australian Geological Survey and West Australian Petroleum Pty. Ltd. (Wapet) respectively.

A report on the fossils and correlation of the marine Permian rocks of the Hunter Valley, New South Wales, was prepared initially as a Record and has been distributed.

Permian pelecypods and gastropods from New South Wales and Queensland have been photographed in preparation for their description.

OTHER

Stratigraphical and geographical information was supplied on fossils from the Bureau collections being described by outside workers. Arrangements were made for the description of Permian pelecypods from the Bowen Basin by B.N. Runnegar of the University of Queensland and of the Bryozoa by R.E. Wass of the University of Sydney.

Plans were prepared for the macropalaeontological rooms in the new building and the reports on B.M.R. 8 and B.M.R. 9 by C.R. Mercer and B.M.R. 10 and B.M.R. 10A by R.A. McTavish were prepared for editing and publication.

N.D. Newell, Curator of Invertebrate Palaeontology at the American Museum of Natural History and Professor of Geology at Columbia University, New York, visited the Bureau. He was primarily concerned with examining Permian pelecypods and discussing problems of their evolution and classification, especially in connection with the Treatise of Invertebrate Palaeontology.

Administrative duties concerned mainly with the Palaeontological Section were carried out.

C.G. Gatehouse

Summary:

During the year a paper was prepared for publication on the "Early Upper Cambrian Fossils from the Comet Slate at Dundas, Tasmania". A paper titled "First Record of lithistid sponges in the Cambrian of Australia" has been compiled. Palaeontological examinations have been made on Purni No.1, South Australia; B.M.R. No. 13 stratigraphic hole, Northern Territory, and Gidgealpa No.1 and No.2 wells in South Australia. Fossils of upper Middle or early Upper Cambrian age from the Que River in Western Tasmania were reported on. Field work was undertaken in the Canberra-Yass district and in the Amadeus Basin, for the purpose of collecting fossils of Silurian-Devonian and Cambrian-Ordovician age respectively.

1. Paper in press:

A short paper titled "Early Upper Cambrian Fossils from the Comet Slate at Dundas, Tasmania" is being published by the Mines Department of Tasmania. It will be published in their "Technical Reports for 1963". The paper deals with field work carried out in Tasmania by invitation from Mr. M.R. Banks of the University of Tasmania to recollect upper Middle Cambrian fossils from the Comet Slate at Dundas.

2. Papers in progress:

A paper with the proposed title "First Record of lithistid sponges in the Cambrian of Australia" has been compiled. Lithistid desmas were first recognized in B.M.R. No.13 stratigraphic hole; they were not previously known from the Cambrian of Australia. They have since been found at two other localities in the Georgina Basin, i.e. in B.M.R. Grg. No.8 and B.M.R. Grg No.16 stratigraphic holes.

3. Palaeontological reports on, and examination of, drill cores and other material:

Purni No.1 Well, South Australia.

Core 8 (6100-6150 feet) was examined for graptolites and other fossils; none were observed.

B.M.R. No.13 stratigraphic hole near Ooratippra, Northern Territory.

A palaeontological examination of core 11 (2579-2582½ feet), showing treatment of the core with 10% formic acid, showed that the sample contained large numbers of lithistid and lyssakid sponge spicules. A report on core 11, core 12 (2817-2827 feet) and selected cuttings from 2574 down to 3230 feet has been completed. It is concluded in the report that the material in the cores and cuttings is of early Middle Cambrian age.

Gidgealpa No.1 Well, South Australia:

A palaeontological examination of the available core has been completed. Core 11 (9140-9151 feet) through to core 23 (12,239-12,264 feet) contain trilobites and brachiopods of Cambrian age (A.A. Opik pers. comm.).

Gidgealpa No.2 Well, South Australia:

An examination of cores below the Permian section did not indicate any Cambrian strata.

Other collections:

A collection of fossils from the Que River crossing of the Murchison Highway in western Tasmania, was received from the Mines Department, Hobart. The material was thought to be upper Middle or early Upper Cambrian.

A study of Ptychopariid trilobite from the Daly River Basin, is being continued from the previous year.

4. Field Work

Canberra District

Fossils of Silurian and Devonian age have been collected from a number of localities from the Canberra and Yass districts. An extensive but as yet incomplete collection of Silurian trilobites, brachiopods and gastropods was made from Coppins Crossing. Brachiopods, corals, trilobites and a fish plate of Devonian age were collected from the Yass District for school collections (see Museum annual report).

Amadeus Basin

Six weeks were spent visiting the Rodinga and Hale River Geological Parties in the Amadeus Basin. Middle and Upper Cambrian and Lower Ordovician fossils were collected from measured sections and isolated localities.

5. A number of carbonate rocks from the Northern Territory, Queensland and Western Australia were digested in 10% formic acid. All the samples were of Middle Cambrian age.

5. Technical Assistant

R. Miniotas did the following work:

For Dr. A. A. Öpik he photographed some 500 fossils and stored the negatives in the Administration building. For Miss J. Gilbert-Tomlinson he helped reorganize the Amadeus Basin fossil collections in the Administration building. He also performed routine office duties.
For C.G. Gatehouse he assisted in collecting fossils in the Canberra-Yass area; he also prepared some photographic negatives and prints.
For Dr. J.J. Veevers he prepared about 300 thin section, took photographs and printed the negatives, made rubber casts and packed fossils for transportation.

MICROPALAEONTOLOGY

ACTIVITIES OF THE MICROPALAEONTOLOGICAL GROUP

by

G.R.J. Terpstra

General:

The staff finalized requirements for equipping and furnishing the Micropalaeontological Laboratory in the new Bureau building. Items of new equipment have also been installed in the present laboratory.

No major staff changes occurred during the year. A. Wilson joined the technical staff in October, 1963.

P.R. Evans spent the months of June and July visiting palynological laboratories in India, France, The Netherlands, Great Britain and U.S.A. He spent one week in Queensland with the Eddystone Field Party, represented the B.M.R. at the 1964 A.P.E.A. Conference in Melbourne and acted as Convenor to the Symposium on Permian-Jurassic geology at A.N.Z.A.A.S.

A.R. Lloyd was well-site geologist from 3/1/64 to 25/3/64 on B.M.R. No.13 (Sandover). He was then engaged in the preparation of the Well Completion Report, which will be issued as Record 1964/127.

The new arrangement which came into force during 1963, whereby all the samples of cores and cuttings of wells and water-bores and of seismic shotholes are being received in the B.M.R. core and cutting Laboratory at Fyshwick, has proved to be satisfactory.

1690 samples were washed for foraminifera, some of which also contained ostracods. All these samples were picked and examined. 293 thin sections were prepared and 62 polished surfaces of harder rocks.

171 samples were treated with acetic acid in order to extract conodonts. A notable feature of the conodont work was the acid treatment of large samples (between 2 to 25 lbs). This led to more positive results than the treatment of a greater number of small samples. Approximately 165 gallons of acetic and monochloracetic acid were used and approximately 200 k.g. of limestone were dissolved.

513 samples were treated for their spore, pollen and microplankton content.

The registration of slides for the micropalaeontological collections continued. One supplement to the Ellis and Messina catalogue of foraminifera was received during the past year.

FORAMINIFERA:

G.R.J. Terpstra was engaged in the examination of surface samples collected by the field parties in Queensland, Northern Territory and Papua-New Guinea and on the study of cores and cuttings from water-bores and subsidized wells. Stratigraphical sequences of Tertiary, Upper and Lower Cretaceous and Permian have been established and reported on. A large number of shot-hole samples submitted by Francarep from the Drummond Basin, Queensland, have been examined for microfossils, mostly with negative results except for some fish teeth. These are comparable with palaeoniscid fish teeth described from the Pennsylvanian (Carboniferous) U.S.A. indicating a fresh water environment. Microfossils indicating an Upper Cretaceous age have been observed in samples from Arakan, Bengal Bay, Burman, submitted by Dr. R. Brunnschweiler, Samples from outcrops and the B.H.P. prospecting

shaft (manganese deposits) at Groote Eylandt N.T. revealed microfossils of Lower Cretaceous age. Samples from six station-bores in Queensland, comprising 9000 feet of sampling, have for the greater part been examined. The bores penetrated Lower Cretaceous sediments. The completion of this study will contribute to the knowledge of the ranges of the arenaceous foraminifera occurring in the Great Artesian Basin area. A sample of diatomite (submitted by R.G. Horne) from the Asaro River area near Goroka, New Guinea, has been examined. It contains an abundance of Melosira sp. and the deposit is comparable with Tertiary deposits of diatomite known from Queensland, New South Wales, Victoria and Tasmania.

Time was spent on the supervision of the preparation of records on plant fossils examined by the consulting palaeobotanist, Mrs. M.E. White. Six records dealing with the examination of plant fossils from the East Bowen Basin, the Duaringa, Springsure, Taroom and Hughenden areas have been issued.

D.J. Belford has continued with routine examination of cores and cuttings from exploratory wells in Western Australia and Papua, and of surface samples collected by Bureau field parties. The main results for the period under review are:

(1) A manuscript on smaller foraminifera from the Miocene and Pliocene of Papua and New Guinea has been completed, and is to be published as a Bureau bulletin.

(2) A systematic study of Carboniferous foraminifera from the Bonaparte Gulf Basin, Western Australia, is in progress. Excellent faunas have been obtained from the Bonaparte No.1 Well, and from samples collected during the 1963 field season. Endathyrid foraminifera dominate the fauna, and include the general Endathyra, Endothyranopsis? and Haplophragmella; the primitive fusulinid genus Paromillerella also occurs. The tournayellid genera Tournayella and Lituotubella have been recognized for the first time in Australia; other genera recorded for the first time are Valvulinella and Fourstonella - the last, as far as is known, for the first time away from the type locality in England.

(3) A large and well preserved Upper Cretaceous fauna of smaller foraminifera from the Western Highlands of New Guinea has been added to the Bureau collection. The occurrence of beds of this age in New Guinea was known, but a good representative fauna has not been available previously.

(4) Paleocene planktonic foraminifera have been identified from the Western Highlands, New Guinea. This is the first record of beds of this age from Papua and New Guinea.

(5) Miocene planktonic foraminifera which are the fore-runners of the genus Orbulina have been recognised in samples from the Western Highlands, New Guinea; this is the first record of their occurrence in Papua and New Guinea. The beds in which they occur may be correlated with the Globigerinatella insueta zone of Trinidad.

A.R. Lloyd examined for microfossils over 60 samples submitted by Francarep from the Drummond Basin, Queensland. With the exception of three samples, they were all barren. One yelded a poorly preserved ostracod and two yielded fish teeth which are comparable with paleoniscid fish teeth.

A report on the foraminifera from a single sample submitted by Dr. E.K. Carter from the eastern Gazelle Peninsula, New Britain, was added as an Appendix to Record 1964/105.

A report on foraminifera from representative samples of the Permian formations of the Hunter Valley, N.S.W., was included as an Appendix to Record 1964/96.

He is presently engaged in the preparation of a report on the occurrence of foraminifera in the White Mountain Formation, Kimberley Region, Western Australia; Brunette Limestone, Barkly Tableland, Northern Territory; and in the Austral Downs Limestone at Roxburgh, western Queensland, which is intended for publication as a joint paper with Dr. D.F. McMichael of the Australia Museum, Sydney. Dr. McMichael is engaged in the study of the non-marine molluscs collected from these areas and other areas in Central Australia and Western Queensland. Most of the molluscan material was collected during the Tertiary Vertebrate Field Study with Dr. R.H. Tedford of the University of California in 1963. This work will tie up with the study, now being carried out at the University of California, of the Tertiary vertebrate fossils collected during 1963 at Alcoota and Deep Well in the Northern Territory and Riversleigh, north-west Queensland.

Conodonts and Ostracods

P.J. Jones examined conodonts and ostracods extracted from surface and subsurface samples. Particular emphasis was placed on the Lower Carboniferous of the Bonaparte Gulf Basin and the Ordovician of the Georgina Basin.

The main results of these activities are outlined below:

Bonaparte Gulf Basin

1. A great number of conodonts were found in some 65 samples taken from 11 measured sections of the Lower Carboniferous and Upper Devonian carbonates. Many of these are conspecific with North American and European forms, and their local ranges are being determined.

2. Lower Carboniferous and Upper Devonian ostracods are being used for local correlation; the species, many of which occur in the Fitzroy Basin, are being described for publication.

3. An interim report on the fossils from Bonaparte No.1 Well, in collaboration with D.J. Belford and J. Roberts, has shown that the Carboniferous-Devonian boundary occurs between the interval 6,620 feet and 8,310 feet.

4. Lower Ordovician (Tremadocian) conodonts found in sections of the Pander Greensand are being described, together with those of the same age found at Claravale in the Daly River Basin.

Georgina Basin

5. Conodonts found in Bedourie Scout Hole No.1 (Bedourie 1:250,000 Sheet, Queensland) belong to an assemblage that occurs in the Middle Ordovician Mithaka Formation in the Toko Range.

6. Conodonts from the Chatsworth Formation (Upper Cambrian) and the Ninmaroo Formation (Lower Ordovician) of western Queensland are being described.

Amadeus Basin

7. Ordovician conodonts were found in samples collected from rocks mapped by Wells et al (1963) as Cambrian, in the Briscoe Tent Hill area (Henbury 1:250,000 Sheet).

8. Ordovician conodonts were found in samples collected from the Stokes Formation in the core of Gosses Bluff (Hermannsburg 1:250,000 Sheet).

9. Phosphate bores AP 1 and AP4 contained Ordovician conodonts; further studies are needed to determine the stratigraphical signifi-

cance of these forms.

Adavale Basin

10. Devonian (probably Lower Devonian) conodonts were found in the limestone directly below the salt sequence penetrated by Boree No.1 Well.

11. Limestone samples collected by the B.M.R. Baralaba Party (1963) from the Gogango Range (Duaringa 1:250,000 Sheet) were examined with negative results.

12. Ostracods from Rolleston No.1 Well (7,592 feet) were examined and found to be inconclusive for age-determination; a non-marine environment was suggested by Dickins & Jones based on the pelecypods and ostracods.

Miscellaneous

Numerous well samples (e.g., Quail No.1, Gidgealpa No.1, Ivanhoe No.1) and water bore samples (e.g. Lake Nash Bathurst No.3, McMinns Lagoon, Darwin) have been examined with negative results.

Spores and Microplankton

P.R. Evans and E.A. Hodgson continued the study of oil exploration stratigraphic problems, which occupied much of their time. A proportion of the samples processed came from the Roma area where the selection of the base of the Precipice Sandstone, the major reservoir, depends mainly on palynology. However, a greater proportion of time than in previous years was devoted to matters concerning B.M.R. field parties. Field data collected during the 1963 season, in conjunction with observations on samples from the B.M.R. shallow drilling programme in the Bowen Basin and related areas, completed resolution of surface to subsurface correlation in the Upper Palaeozoic and early Mesozoic of Central Queensland.

Other investigations included:

1. Discovery and examination of Devonian spores in the Pertnjara Formation, Northern Territory.

2. Observation of early Permian spores in samples from below the Great Artesian Basin in the Northern Territory.

3. Examination (without success) of samples from the Drummond Basin, Queensland.

4. Examination of the Mesozoic of Planet Heathfield No.1, Otway Basin, and the determination of a possible hiatus within the Merino Group.

5. Examination of Ivanhoe No.1, Conoble No.1, and Killendoe No.1, Murray Basin.

6. Determination of Permian below the Gippsland Basin (Duck Bay No.1).

PUBLICATIONS AND RECORDS BY THE MICROPALAEONTOLOGICAL SECTION

PUBLICATIONS

EVANS, P.R., - 1963 - The application of palynology to stratigraphy in Australia. Proc. ECAFE Congr. Terorn 1962, 285-290.

EVANS, P.R., - 1963 - The development of palynology in Australia Ibid.

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EVANS, P.R., - 1964 - Some limitations to the application of palynology to oil exploration in Australia. A.P.E.A. Journ. (1964), 64-66.

RECORDS

BELFORD, D.J. - Foraminifera from Mutare No.1 Bore, Papua- 1963/170.

TERPSTRA, G.R.J. - Age determinations of limestone samples of Woodlark Island, Papua. 1964/6.

EVANS, P.R. & HODGSON, E.A. - A palynological report on Arco - Woodside Duck Bay No.1 Well. 1964/50.

HODGSON, E.A. - A palynological report on Planet Heathfield No.1 Well. 1964/74.

EVANS, P.R. - Some palynological observations on samples from the north-eastern Eromanga Basin, Central Queensland. 1964/76.

EVANS, P.R. - Some palynological observations on the Mesozoic of the Baralaba, Monto, Taroom and Mundubbera 1:250,000 Sheet areas, Bowen - Surat Basin, Queensland. 1964/91.

TERPSTRA, G.R.J. - Micropalaeontological examination of samples from water-bores from the Northern Territory (Bores: F53/16-19; F53/16-22; G53/7-16; G53/3-2; G53/3-25; and G53/6-120. 1964/124.

JONES, P.J. - Conodonts, in Opik, A.A. - "Early Ordovician at Claravale in the Fergusson River area, Northern Territory". B.M.R. Records 1964/136.

EVANS, P.R. - Report on oveaseas tour - 1964. 1964/152.

APPENDICES FOR WELL COMPLETION REPORTS

BELFORD, D.J., JONES, P.J., & ROBERTS, J. - "Upper Devonian and Lower Carboniferous fossils from A.O.D. Bonaparte No.1 Well".

BELFORD, D.J. - Foraminifera from side-wall cores, Paterson No.1 Well Western Australia.

EVANS, P.R. - A.A.O. Arbroath No.1.

JONES, P.J. - Boree No.1, Bedourie Scout Hole No.1, Rolleston No.1, Quail No.1, Ivanhoe No.1 and Gidgealpa No.1.

TERPSTRA, G.R.J., EVANS, P.R., & HODGSON, E.A. - Brief palaeontological examination of some material from Ivanhoe No.1, N.S.W.

TERPSTRA, G.R.J., HODGSON, E.A. - Notes on the micropalaeontological examination of samples of North Star Oil Corporation Conoble No.1 Well.