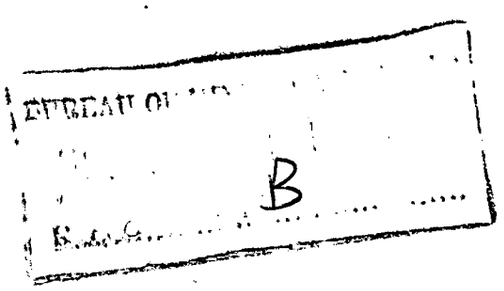
COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

RECORDS.

1962/175



SEDIMENTARY BASINS AND PALAEONTOLOGY SECTIONS SUMMARY OF ACTIVITIES, 1962.

SEDIMENTARY BASINS AND PALAEONTOLOGY SECTIONS
SUMMARY OF ACTIVITIES, 1962.

RECORDS 1962/175

CONTENTS

SUMMARY

Six field parties with fourteen geologists from the Bureau of Mineral Resources and three from the Queensland Geological Survey, worked in areas shown on the map accompanying this summary. Field work continued from June to October 1962. In addition, a stratigraphic core-hole drilling programme was carried out in the Georgina Basin under the supervision of K.G.Smith and E.N.Milligan. A.T.Wells carried out a two-months reconnaissance survey on the Gibson Desert with the Bureau of Mineral Resources Helicopter Gravity Party.

Mapping of 1:250,000 Sheet areas continued in the Amadeus, Bowen, Georgina and Great Artesian Basins.

A.T.Well's Party mapped the Lake Amadeus Sheet area and D.J.Forman's Party mapped the Bloods Range Sheet and part of adjacent Sheets in the Amadeus Basin.

In the Bowen Basin, E.J.Malone's Party mapped the Duaringa Sheet and the southern half of the St.Lawrence Sheet. The East Bowen Party led by A.R.Jensen mapped two 1:50,000 Sheet areas in the south west of the Proserpine Sheet, the central strip of the Mackay Sheet and the northern half of the St.Lawrence Sheet.

In the Georgina Basin, the Alroy Party, led by M.A. Randal, mapped the Brunette Downs and Alroy Sheet areas and re-examined parts of the Walhallow Sheet.

R.R.Vine's Great Artesian Basin Party mapped the Manuka and Richmond Sheets, and parts of the Hughenden Sheet.

ACTIVITIES SEDIMENTARY BASINS SECTION

1962 *Mapping completed.*

•7 *Core hole drilling Georgina Basin.*

1963 *Proposed mapping areas.*

○ B.M.R.11 *Proposed stratigraphic drilling.*

CAPE SCOTT
PORT KEATS
CAMBRIDGE GULF
AUVERGNE
SURVEY WILL EXTEND FROM 1963-1965

WALLHALLOW
BRUNETTE DOWNS
ALROY
RANKEN 16 ○ B.M.R. 11
FREW RIVER
AVON DOWNS 15
ELKEDRA 2 3 4 5
SANDOVER RIVER 16
URAMDANGI 9 & 9A
B.M.R. 13
HUCKITTA 1 7 8 3 6
11 12 ○ B.M.R. 12
TOBERMORY

RICHMOND
HUGHENDEN
MANUKA
TANGORIN
WINTON
MUTTABURRA

PROSERPINE
MACKAY
ST. LAWRENCE
DURINGA
SPRINGSURE
BARALABA
MONTO
EDDYSTONE
TAROOM
MURDILBERA

HELICOPTER RECONNAISSANCE →

MADLEY | WARRI | COBB
HERBERT | BROWNE | BENTLEY

BLOODS RANGE | LAKE AMADELIS | HENBURY | RODINGA
PETERMANN RANGES | AYERS ROCK | KULGERA | CHARLOTTE WATERS

Bureau of Mineral Resources, Geology & Geophysics Nov 62.

AUST 1/15

AMADEUS BASIN

AMADEUS BASIN PARTY

by

A.T. Wells

The early part of the year was spent in writing a report (Record 1962/63) on the north east part of the Amadeus Basin. A considerable amount of time was spent in correcting the report on the Rawlinson-Macdonald area as a result of the 1962 work in the north-east Amadeus Basin and Bloods Range areas. Further amendments will be necessary. Discussions were held with the Geophysical Branch regarding liason with the Helicopter Gravity Party working in the Gibson Desert area and Amadeus Basin .and a programme was arranged for one geologist to be with the Gravity Party during the 1962 survey in the Gibson Desert.

Geological Survey of the Lake Amadeus Sheet Area.

Field work in the Lake Amadeus area commenced in the early part of June and finished in early October.

Personnel - A.T. Wells - Party Leader, joined the Amadeus party on the 28th July after completing the Gibson Desert Survey.

L.C. Ranford and P.G. Cook - Geologists.

M. Featherstone - Draftsman.

The Lake Amadeus Sheet covers part of the central zone of the Amadeus Basin. A generalised geological sequence, with maximum thicknesses of formations present on this Sheet, is shown below:

	Quaternary	River gravel, alluvium and aeolian sand.
	Tertiary	Boulder conglomerate and scree capping, Mesozoic sediments. Deep weathering profiles.
	Mesozoic	Silty leached sandstone, poorly sorted sandstone, and some reworked conglomerate.
	Permian	Conglomerate and poorly sorted sandstone with erratics. Small outcrops on western part of Sheet.
	----------UNCONFORMITY----------	
AGE UNCERTAIN ORDOVICIAN	Pertnjara Formation	Siltstone overlain by sandstone in north-eastern area; conglomerate and sandstone in southern area. Siltstone has pseudomorphs after halite.
	Mereenie Sandstone - 1500'	Basal red-brown sandstone with some interbeds of siltstone overlain by clean cross-bedded quartz sandstone. Contains Cruziana and pipe rock.
	Stokes Formation - 1200'	Richly fossiliferous basal limestone overlain by siltstone.
	Stairway Sandstone - 880'	Richly fossiliferous fine sandstone, thin beds of limestone and beds rich in phosphatic nodules.
	Horn Valley Siltstone - 280'	Siltstone, in places gypsiferous, and richly fossiliferous limestone. Thin beds of oolitic limonite.

C A M B R I A N	Pacoota Sandstone - 1060'	-	Well rounded, poorly sorted sandstone with some conglomerate lenses particularly in the Innindie Bore area. Unconformably overlies Upper Proterozoic sediments on the south-eastern part of the Lake Amadeus Sheet.
	Goyder Formation - 850'	-	Fine sandstone and limestone with stromatolites.
	Cleland Sandstone - 1600' - Poorly sorted micaceous silty sandstone and red-brown siltstone. Crops out chiefly on the north-western and central part of the Sheet.		2200' Unnamed formations in the Dead Horse Anticline. Red sandstone and siltstone and glauconitic limestone with Cambrian fossils.
	----------UNCONFORMITY ?----------		
U P P E R P R O T E R O Z O I C	Unnamed Formation. Clay pellet sandstone and siltstone with worm trails. Crops out on southern part of Sheet.		Pertatataka Formation 160' Siltstone and minor sandstone and dolomite. Occurs in Dead Horse Anticline.
	----------UNCONFORMITY----------		
	Areyonga Formation - 470'		Sandstone, boulder beds and siltstone with erratics. Some beds of chert and thin beds of limestone with the siltstone, in western exposures.
	----------UNCONFORMITY----------		
	Bitter Springs Limestone - 1800'	-	Limestone, dolomite, siltstone and sandstone. Stromatolites in the limestone and dolomite.

The total thickness of sediments exposed in the north-eastern part of the Sheet is about 12,500 feet.

The oldest rocks in the area are (by convention) Upper Proterozoic in age and the oldest exposed formation is the Bitter Springs Limestone. A well exposed section in this limestone occurs in the core of the Dead Horse Anticline and a 60 feet thick lens of clear sandstone occurs within 100 feet of the top of the formation at this locality. Sandstone has not been found or reported previously from the formation. Exposures of the Bitter Springs Limestone also occur in diapiric structures where it is associated with masses of gypsum.

The Areyonga Formation unconformably overlies the Bitter Springs Limestone. The probable equivalent of the Areyonga Formation on the western and central parts of the Sheet consists of bedded chert, red siltstone, poorly sorted sandstone; erratics occur in the debris overlying these exposures. The Areyonga Formation is succeeded by a thin section of siltstone, sandstone and dolomite of the Pertatataka Formation in the Dead Horse Anticline but outside this area the probable equivalent of this formation is chiefly sandstone with subordinate siltstone and shale. In the Innindie Bore area this unnamed formation

is conformably overlain by probable Cambrian sandstone and overlain by the Ordovician Pacoota Sandstone with an angular unconformity. In other areas this unnamed formation unconformably overlies the Areyonga Formation.

The Cambrian succession in the Dead Horse Anticline is conformably overlain by the Goyder Formation, but in areas south and west of the George Gill Range the Goyder Formation overlies the Cleland Sandstone. The Cleland Sandstone is probably equivalent to the upper part of the Cambrian succession in the Dead Horse Anticline.

The Ordovician Larapinta Group conformably overlies the Goyder Formation. The Group is about 3000 feet thick in the George Gill Range but decreases in thickness to the south and west and near Mount Murray the Group is only 300 feet thick. This rapid thinning of the Formation suggests the presence of several hiatuses within the succession. Two notable discoveries in the Larapinta Group in the Lake Amadeus area were firstly the presence of well preserved graptolites in the siltstone of the Horn Valley Formation and secondly, beds rich in phosphatic nodules in the Stairway Sandstone. Some of the phosphatic material contains up to 17% P_2O_5.

The Mereenie Sandstone conformably overlies the Larapinta Group and is apparently conformably overlain by siltstone and sandstone of the Pertnjara Formation. A specimen of Cruziana was collected from the Mereenie Sandstone near Innindie Bore and "pipe rock" occurs in the Formation on the north-west part of the Henbury Sheet. These two fossil localities indicate affinities of the Mereenie Sandstone with the Larapinta Group rocks. Two outcrops of probable Permian glacial sediments unconformably overlying the Areyonga Formation, occur near the western end of Lake Amadeus.

Folds in the Amadeus Basin sediments trend in a north-westerly direction and in several places the limbs of the folds are overturned. A few large faults occur in the sediments and in most places they parallel the fold axes. Six diapiric structures occur in the sediments and have cores of sheared gypsum associated with folded masses of dolomite which are identified with the Bitter Springs Limestone. In most cases the diapirs are associated with Upper Proterozoic rocks although 20 miles south-east of Mount Murray the gypsum and dolomite mass has intruded the Mereenie Sandstone. The Larapinta Group unconformably overlies probable Bitter Springs Limestone 5 miles south-west of Innindie Bore but there are no indications that dolomite is part of a diapiric structure.

Conclusions

The main conclusions and results of the mapping on the Lake Amadeus Sheet are as follows :-

1. The identification of six diapiric structures with Bitter Springs Limestone and gypsum in the intrusions.
2. The lateral change of the Areyonga Formation to include chert beds and a thick sequence of siltstone to the west of the George Gill Range.
3. The change of the Pertatataka Formation to a sandy facies to the south and west.
4. The inclusion of fossiliferous glauconitic limestone and red siltstone in the Cambrian succession in the Dead Horse

Anticline and the change to the predominantly sandy facies of the Cleland Sandstone to the west.

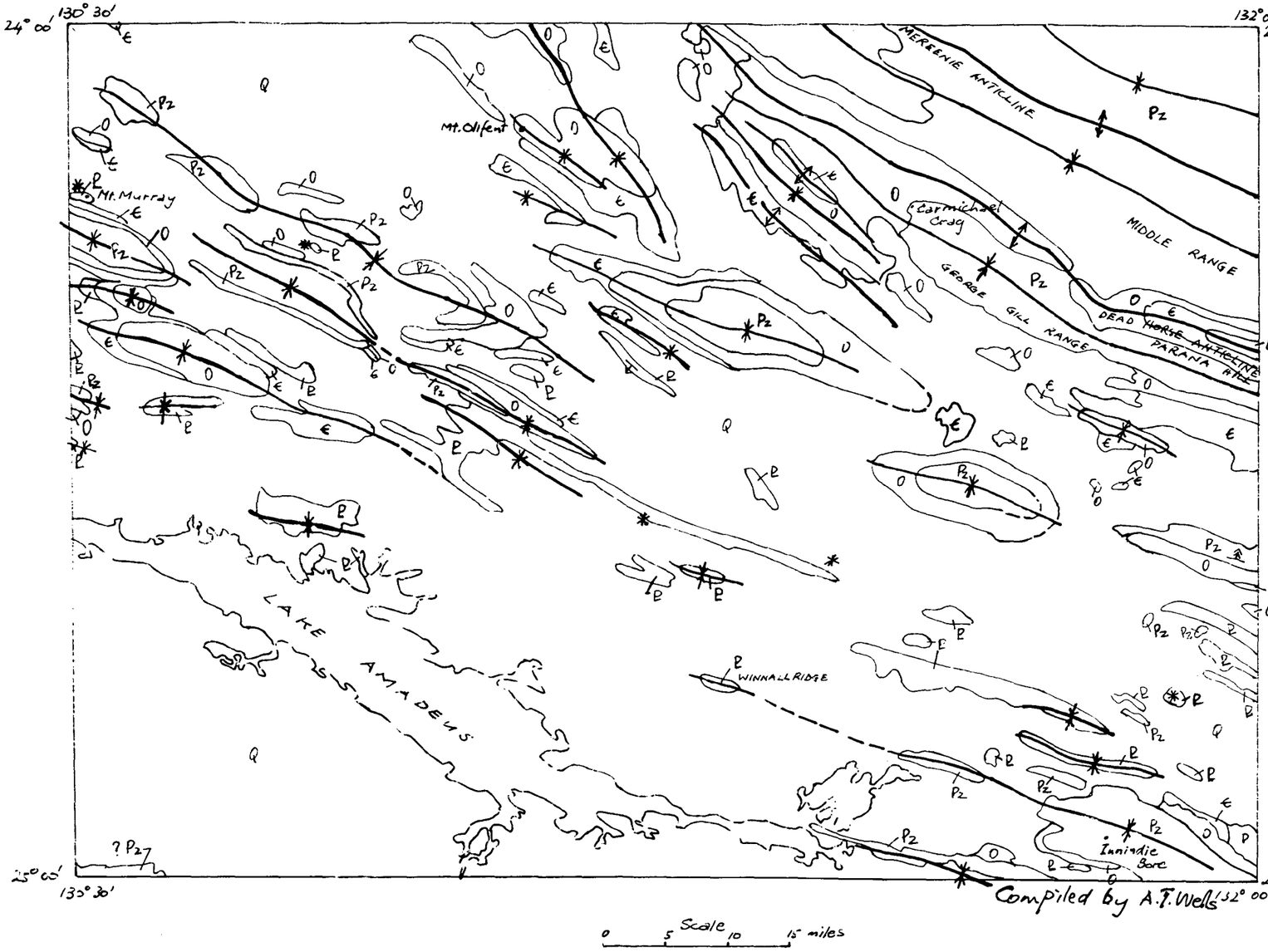
5. The rapid decrease in thickness of the Larapinta Group to the south and west of the George Gill Range.

6. The presence of faunal links between the Mereenie Sandstone and the Ordovician sequence.

7. The identification of thin beds rich in phosphate in the Ordovician Stairway Sandstone. In the George Gill Range the upper part of the formation contains up to twelve thin beds rich in pellet phosphate ranging in thickness from 2 to 6 inches. Phosphate was found in the formation at several other widespread localities. The siltstones of the formation contain up to 5% P_2O_5.

The rapid lateral changes in the Cambrian succession indicate the necessity for numerous measured sections in the anticlines in the Henbury and Rodinga areas to correlate sequences satisfactorily.

LAKE AMADEUS
NORTHERN TERRITORY



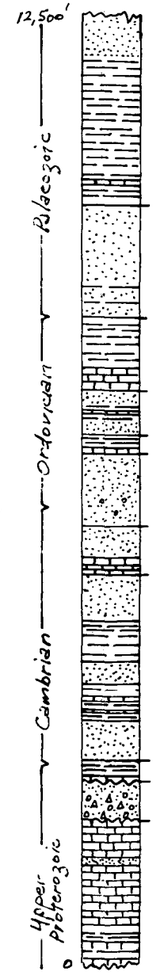
Reference

Quaternary	Q	Alluvium, evaporites etc.
Palaeozoic	Pz	Pertnjara Formation Merdenie Sandstone
Ordovician	O	Larapinta Group { Stokes Formation, Stairway Sandstone, Horn Valley Siltstone, Pacoota Sandstone
Cambrian	€	Cleland Sandstone, Goyder Formation and unnamed formations in the Dead Horse Anticline
Proterozoic	P	Pertatataka Formation and its equivalent, Areyonga Formation and Bitter Springs Limestone

Fold axis

Outcrop boundary, dashed where continuation uncertain.

Diapiric intrusion with sheared gypsum and Bitter Springs Limestone



Pertnjara Formation

Merdenie Sandstone

Stokes Formation

Stairway Sandstone
Horn Valley Siltstone

Pacoota Sandstone

Goyder Formation

Unnamed formations

Pertatataka Formation
Areyonga Formation

Bitter Springs Limestone

Generalised Geological Section at the Dead Horse Anticline.

Geological Sketch Map of the Lake Amadeus Sheet Area SG/52-4

Index to Adjoining Sheets

Mt. Rennie	Mt. Liebig	Hermannsburg
Bloods Range	Lake Amadeus	Henbury
Petermann Ranges	Ayers Rock	Kulgerd

BLOODS RANGE PARTY

by

D.J.Forman

Personnel: D.J.Forman, A.J.Stewart.

Duration of field work: 29/5/62 to 19/9/62

Area mapped:

The Bloods Range 1:250,000 Sheet area and parts of the Lake Amadeus, Petermann Ranges, Rawlinson and Scott 1:250,000 Sheet areas. The Bloods Range 1:250,000 Sheet was the party's main consideration. The western one-sixth of the Lake Amadeus Sheet was mapped to assist the Amadeus Basin Party and selected areas on Petermann Ranges, Rawlinson and Scott Sheet areas were examined to obtain a regional picture.

Geology:

Figure 1 is a sketch of the general geology of the area mapped and the interpreted geology of adjacent areas with a cross section. The stratigraphy of the area is set out in the accompanying table.

Stratigraphic names in this summary are used in an informal sense and may be revised in the final report.

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

1. The development of the recumbent fold hypothesis between the Petermann Ranges (see Fig.1.).

2. The correlation of part of the Dean Metamorphics sequence with the Heavitree Quartzite and Bitter Springs Limestone.

3. A major unconformity beneath the Cleland Sandstone and pebbles of metamorphosed "Heavitree Quartzite" in the Cleland Sandstone demonstrate that the deltaic Cleland Sandstone was deposited after the metamorphism of the "Heavitree Quartzite" and "Bitter Springs Limestone".

4. Thin flat-lying deposits of probable Ordovician age accompanied by possible wave-cut platforms between Bloods Range and the Petermann Ranges show a transgression of the Ordovician sea over the Bloods Range and at least part of the Petermann Range and Rawlinson 1:250,000 Sheet areas,

5. The sandstone overlying possible Pertatataka Formation and other rocks near Lake Neale and south of LakeNeale is lithologically similar tothe Mereenie Sandstone but is probably Upper Proterozoic in age (Wells, Ranford and Cook, pers.comm.)

6. Conglomerate exposed in Mount Currie occurs north of Pinyinna Range and Imbumbunna Hills where it unconformably overlies "Bitter Springs Limestone" and probable Upper Proterozoic Sandstone.

Geology (cont.)

7. The southern margin of the Amadeus Basin lies along Bloods Range, Pinyinna Range and Kulapurina Hills. There is no evidence for a faulted margin.

8. Several west-north-west trending faults are suspected to be parallel to fold axes in the sediments of the north-eastern area.

9. Gypsum occurs at 3 localities in the north-eastern area. At Mount Murray it is overlain by dolomite.

10. The stratigraphy of units older than the Cleland Sandstone and younger than the "Heavitree Quartzite" is in doubt due to a combination of poor exposure, complicated structure and lack of diagnostic fossils.

BLOODS RANGE PARTY

AGE	LITHOLOGY	CORRELATED WITH	REMARKS
Quaternary	Sand, sand dunes, alluvium, evaporites, travertine.		
Tertiary	Conglomerate		Derived from high ranges and hills.
Palaeozoic	Conglomerate. ?Red-brown cross-bedded sandstone. Siltstone.	?Pertnjara Formation	Conglomerate along southern edge of basin unconformably overlies older rocks. In north-east of area sandstone and siltstone appear conformable. No good exposures.
	U N C O N F O R M I T Y		
	White and brown, fine to medium-grained, cross laminated sandstone.	Mereenie Sandstone.	Appears conformable on Ordovician sediments.
Ordovician	Sandstone, siltstone and limestone. Marine fossils.	Part of Larapinta Group.	Outliers of this unit are present south of Bloods Range and in the Petermann Ranges.
Cambrian or Ordovician	White, medium and coarse-grained sandstone. Pipe rock.	Pacoota Sandstone	Up to 50 feet thick.
?Cambrian	Red-brown, brown and pale pink-brown, medium to coarse-grained sandstone and conglomeratic sandstone. Entire sequence is cross-bedded and thins to the west. Thin conglomerate lenses with phenoclasts of metamorphosed Heavitree Quartzite.	Cleland Sandstone	Deltaic deposit. Petermann Range and Bloods Range areas source of some detritus.
	U N C O N F O R M I T Y		
?Upper Proterozoic	White and brown, medium to coarse-grained, cross-bedded, pebbly sandstone with clay pellets. Yellow laminated siltstone.	Winnalls Formation.	Tightly folded. At Southern Range the sandstone unconformably overlies interbedded sandstone and yellow siltstone which may also occur north of Mount Currie.
	? ? ? ? ? ?		
?Upper Proterozoic	Red-brown, micaceous siltstone and interbedded thin dolomite with some stromatolites.	?Pertatataka Formation	Tightly folded.
	? ? ? ? ? ?		
?Upper Proterozoic	Grey, white, pale yellow-brown, pale pink, laminated, part foetid dolomite. Three outcrops of gypsum with dolomite.	?Bitter Springs Limestone.	In northern half of Sheet area. Tightly folded.
Upper Proterozoic	Grey, white, pale yellow-brown, pale pink, laminated, part foetid dolomite with rare stromatolites and siltstone. Recrystallized in most outcrops. May be intruded by dolerite dykes.	Bitter Springs Limestone.	In probable recumbent fold, southern half of Sheet area.
Upper Proterozoic	White, medium-grained and coarse-grained, laminated and thin-bedded, cross-bedded, hard silicified quartzite and sericitic quartzite.	Heavitree Quartzite.	In probable recumbent fold, southern half of Sheet area. 1000 feet - 1500 feet thick.
	U N C O N F O R M I T Y		
?Lower Proterozoic	Dirty brown, pale green and pink sandstone, tuffaceous sandstone, agglomerate, tuff, arkose, sericite-quartz schist and quartz-sericite schist. Interbedded acid and basic lavas. Associated with brown feldspar porphyry.	?Dixon Range Beds.	Southern half of Sheet area. Traces of copper.
	U N C O N F O R M I T Y		

AGE	LITHOLOGY	CORRELATED WITH	REMARKS
?Lower Proterozoic	Green epidotised, amygdaloidal and vesicular basalt with a basal sandstone and interbeds of sandstone. Intruded by coarse, hornblende granite and ?by brown feldspar porphyry.	pGb of Mount Rennie Sheet area.	Traces of copper.
	——U N C O N F O R M I T Y——		
?Lower Proterozoic	Very Coarse, foliated, porphyritic granite. Rapakivi type. Also medium, even-grained, granite and aplite.		
	——I G N E O U S C O N T A C T——		
?Lower Proterozoic	Quartz-feldspar porphyry	Rawlinson Porphyry	Evidence of intrusion rests on aplite dykes in porphyry near margin of granite and apparent chilled granite margin.

1962

BLOODS RANGE PARTY, SUMMARY OF ACTIVITIES

FIGURE 1

129°00' 130°30' 130°45'

24° 25° 26°

WESTERN AUSTRALIA

BLOODS RANGE SHEET

PETERMANN RANGES SHEET

LAKE AMADEUS SHEET

AYERS ROCK SHEET

SOUTH AUSTRALIA

OUTCROPS NOT SHOWN

OUTCROPS NOT SHOWN

Cz Sand, alluvium, travertine, evaporites.

Pzc Conglomerate.

Pz Mereenie Sandstone and ? Pertnjara Formation

O Larapinta Group

€-O Cleland Sandstone

?Pμ Sandstone (? Winalls Formation)

Pμ Dolomite, gypsum, siltstone and interbedded dolomite.

Pμh "Heavitree Quartzite"

Pli "Dixon Range Beds."

pεb Basalt

pεg Granite

pεp Porphyry

+++ Cross section only – Basement rock, undifferentiated.

24/10/62.

PETERMANN RANGES

BLOODS RA.

Pμh + Pμ

?Pμ

Pμ

Lake Neale

?Pμ

€-O O Pz ? O €-O C

Pμ + ?Pμ

(1) (Cross section A-B-C illustrating recumbent fold hypothesis)

Scale: 10 miles = 1 inch.

Lake Neale

(2) (Cross section A-B-C without regional recumbent fold)

123°00' 124°30' 126°00' 127°30'

24°00' 25°00' 26°00'

CONSTANCE HEADLAND

Outcrops of Mesozoic Permian and Precambrian rocks in core of diapirs

WOOLNOUGH HILLS DIAPIR

MADLEY DIAPIRS

pEs

P

J

K

MT. MADLEY

HUTTON RANGE

ALFRED AND MARIE RA

McPHERSONS PILLAR

RYAN BUTTES

IRAGANA HILLS

pEs

P2

T 45

T 14

Fossil wood

THREE HILLS

COBB

MT. COLLIN

MT COX

MADLEY

WARRI

CHARLIES KNOB

YOUNG RA

MT. GORDON

MT EVERARD

BROWNE RA

BEDFORD RANGE

MT BOUCAUT

KEARTLAND HILLS

FAME RANGE

Lake Buchanan

MT ARCHIE

BOOMERANG RA

MT BRADELL

BAKER RA

SUNDAY HILL

pEm

Schists with pegmatite

Precambrian Metamorphics with some outliers of Permian glacials

MT. CHARLES

TODD RA

MT. SAMUEL

BENTLEY HILL

NT GRACE

Basic and intermediate igneous rocks

BENTLEY

BARROW RA

Granitic Rocks

MT HARVEY

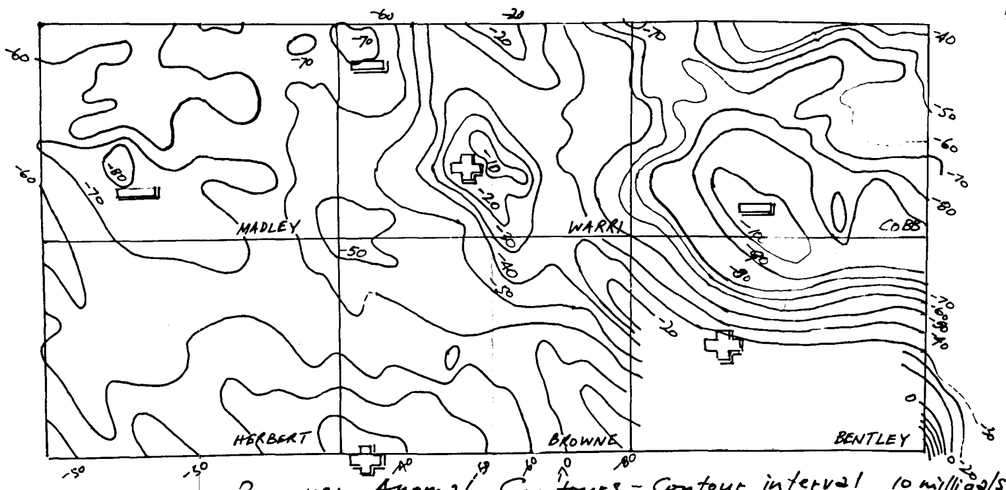
SCAMP HILL

HERBERT

BROWNE

BENTLEY

Compiled by A. T. Wells



Bouguer Anomaly Contours - Contour interval 10 milligals.

(Preliminary Contour Map from the Geophysical Section Bureau of Mineral Resources).

Geological Sketch Map
Gibson Desert Area - W.A.

Reference

K - Cretaceous < Bejah Beds / Kidson Beds

J - Jurassic

P - Permian, including Paterson Formation.

Pz - Undifferentiated Palaeozoic

pEs - Precambrian sediments

pEm - Precambrian metamorphics.

⊙ Macrofossil locality

Geological boundary

Fault

Road

GIBSON DESERT HELICOPTER SURVEY

by

A.T. Wells

Geological traverses in liason with the Gibson Desert Helicopter Gravity Party were made in the period 27th May to 24th July. During this time geological points on the Herbert, Browne, Bentley, Madley, Warris and Cobb 1:250,000 Sheets, Western Australia, were visited. Some traverses were also made on the Rawlinson Sheet area, W.A..

The geological succession established in this area with approximate thicknesses is tabulated below:-

Quaternary		sandplain and seif dunes, travertine, and small areas of alluvium.
Tertiary	-	laterite profiles.
Cretaceous-	200'+	Bejah Beds - white porcellanite and siltstone, marine fossils
		Kidson Beds-thin bedded sandstone, siltstone and some fine conglomerate.
Jurassic	- 100'+	white, friable, cross-bedded micaceous sandstone and interbedded siltstone.
Permian	- 100'+	fluvioglacial sandstone, very large erratics in exposures at the margin of the basin. Fossil wood in poorly sorted sandstone south of Iragana Hills.
Undifferentiated Palaeozoic	- 3000'	- poorly sorted sandstone with thin beds of conglomerate at Iragana Hills is probably equivalent to undifferentiated Upper Palaeozoic sediments on the Rawlinson Area.
Precambrian - Sediments	- 12,000'	- sandstone and siltstone at Constance Headland, and fine silty sandstone and siltstone at Iragana Hills. Dolomite with stromatolites and siltstone in the core of the Woolnough Hills Diapir and Madley diapirs. Dolomite has pseudomorphs after halite. Metamorphics, acid and basic porphyry, amphibolite, granitic gneiss and pegmatite and basalt dykes. Outcrops of these rocks are confined to the eastern half of the Bentley Sheet area.

About two-thirds of the area is covered by a thin blanket of Mesozoic sediments, and only at Woolnough Hills and Iragana Hills are the sub-Mesozoic basin rocks visible. The youngest Mesozoic formation of porcellanite and siltstone is identified with the Bejah Beds (Veevers and Wells, 1961) which conformably overlies thin bedded siltstone and sandstone of the Kidson Beds (Veevers and Wells, 1961). Both formations contain richly fossiliferous beds of Lower Cretaceous (Aptian) age. Both formations are southward continuations of a large sheet of Cretaceous rocks from the Canning Basin and extend into the Officer Basin.

Rocks of Jurassic age are confined to the area of the Ryan Buttes and some outcrops in the Woolnough Hills Dome; outcrops of Jurassic rocks were not found south of latitude 25°00'. They unconformably underlie the Cretaceous sediments.

The Permian glacials crop out at the margin of the basin and form prominent topographic features near Lake Buchanan and mesas on the eastern part of the Bentley Sheet area. Permian glacials crop out in the cores of the diapir intrusions. Permian sandstone south of Tragana Hills contains fossil wood and possible stromatolites.

Probable Palaeozoic sediments crop out in the Iragana Hills inlier. They are correlated with Palaeoaoic rocks on the Rawlinson Sheet area. At Iragana Hills they unconformably overlie probable upper Proterozoic sediments.

Upper Proterozoic sandstone and siltstone south of Constance Headland is intruded by porphyry. Dolomite in the cores of the Woolnough Hills diapir and Madley diapirs contains Stromatolites and is regarded as Upper Proterozoic. The oldest Precambrian rocks are metamorphics and igneous rocks in the eastern part of the Bentley Sheet area.

Structure:

The regional gravity contours of the area (preliminary Bouguer Anomaly contour map from the Geophysical Section, B.M.R.) suggest a basement ridge trending to the north-west of the exposed Precambrian rocks on the south-east part of the Bentley Sheet area. To the west and east of this ridge the superficial covering of Mesozoic rocks is probably underlain by thick Proterozoic and some Palaeozoic sediments. On the western side of the ridge a sedimentary pile, several thousand feet thick, is indicated by the presence of several domes of diapiric origin. The oldest rocks exposed in these domes are Upper Proterozoic. A large inlier of Proterozoic and, possibly, Palaeozoic sediments exposes several thousand feet of section on the east side of the ridge. The extension of this basin to the south as indicated by the gravity contours is problematic as the large Bouguer minimum in the north-east part of the Bentley Sheet area occurs over outcrops of Precambrian metamorphic rocks. One explanation of this gradient is that this particular area is underlain by predominantly granitic rocks of comparatively low density compared with the metamorphics.

The western basin on the Madley and Herbert Sheet areas appears to be a small but deep depression which is connected to the Officer Basin to the south by a narrow channel.

Reference

VEEVERS, J.J., and WELLS, A.T., 1961 - The Geology of the Canning Basin. Bur.Min.Resour.Aust. Bull.60.

BOWEN BASIN

Preliminary editions of the Emerald, southern half of Bowen and western third of Mackay 1:250,000 Sheet areas were published during the early part of 1962. Records, describing the geology of these areas and an additional record, "Subdivision and Correlation of the Middle Bowen Beds", were written.

The Duaringa and East Bowen parties continued regional mapping of the Bowen Basin from June to October, 1962. This year's work completes the regional mapping of the northern part of the Bowen Basin between latitudes 20°30'S and 24°S and longitudes 147°E and 150°E.

DUARINGA PARTY

by

E.J. Malone

The Duaringa Party consists of E.J. Malone, R.G. Mollan, F. Olgers and J.M. Dickins (for 4 weeks) of the Bureau of Mineral Resources and A.G. Kirkegaard of the Queensland Geological Survey. The party mapped the Duaringa 1:250,000 Sheet area and the southern half of the St. Lawrence 1:250,000 Sheet area.

The important geological features are shown in the accompanying sketch map and are briefly described below:

Metamorphic rocks near Marlborough (Pzl) are probably the oldest rocks in the area. They include quartz-mica-schist and are probably the results of high grade regional metamorphism. They are intruded by much altered and partly serpentinised ultrabasic plutonic complex (Pzs). The metamorphics and ultrabasics are intruded by gabbro, generally unaltered, except where contact metamorphosed by biotite granodiorite, containing many roof pendants of metamorphics.

The metamorphics and ultrabasics are possibly faulted against Devonian to Permian rocks of the Yarrol and Bowen Basins. Diorite intrudes one such contact north of Marlborough.

Interbedded volcanics and sediments, including a recrystallized fossiliferous limestone of Silurian to Devonian age crop out near Thuriba in the south-east of the Duaringa area. They are possibly basement to the Yarrol and Bowen Basins.

Fossiliferous Silurian to Lower Devonian limestone crops out near the eastern margin of the Duaringa area, overlain, apparently unconformably, by volcanics (Duv) at the base of the Yarrol Basin sequence.

The Yarrol Basin sequence crops out in a complex, steep flanked, sinuous anticline in the north-east of the Duaringa area. The sequence consists of intermediate volcanics (Duv) overlain by fossiliferous lower and middle Carboniferous sediments (Cl-m), including thick oolitic limestone lenses, overlain, in turn, by plant bearing sediments, largely conglomerate, of the Dinner Creek Beds (Pld). The Dinner Creek

Beds are overlain by, and appear to pass laterally into, the Rookwood Volcanics (Plr), consisting characteristically of pillow lavas. The apparent lateral equivalence of these two units is possibly due to thrust faulting, progressively cutting out the Dinner Creek Beds.

The Gogango Beds (Pg) are structurally deformed, mildly metamorphosed sediments, cropping out in the Gogango Range. Lithologically they are generally similar to the Permian sequence and to the Silurian-Devonian rocks of the Thuriba area. No fossils were found in them. The Gogango Beds dip regionally east, making it difficult to fit them into the Permian sequence. The region is one of intense structural complexity; overturning is common and dips are predominantly to the east. Lower Bowen Volcanics crop out in anticlines along the line of the Connors Range and as a south-west dipping block east of Ogmore. The volcanics are probably mainly subaerial but marine fossils occur near the top of the sequence. The Rookwood Volcanics are marine and are approximately time equivalents of the Lower Bowen Volcanics.

Tightly folded and in places overfolded Middle Bowen Beds crop out in a synclinorium to the east of the Connors Range. Farther south, they crop out in a large area west of the Fitzroy River and in a large part of the Gogango Range. Fossils are rare in this area and the unit is identified on lithologies. No contacts were seen between the Middle Bowen Beds and the Gogango Beds; in places the two units appear to grade, into one another.

The Middle Bowen Beds dip southwest off the Lower Bowen Volcanics of the Connors Range, disappearing under extensive Cainozoic deposits. They reappear to the west in several north-north-west trending anticlines in a tightly folded zone, overlain by Upper Bowen Coal Measures. Folding in this zone is extremely tight, becoming gentler to the north. In the western part of the Duaringa area the Middle Bowen Beds crop out in a number of very broad anticlines surrounded by gently folded Upper Bowen Coal Measures.

The northern end of the southerly plunging Mimosa Syncline lies within the area mapped. The Syncline is outlined by resistant beds of the Clamatis Sandstone which is underlain by the Triassic Rewan Formation, characterised by chocolate - coloured shale and sandstone, interbedded with lithologies which are typical of the Upper Bowen Coal Measures.

The Styx Coal Measures (Kls), unconformably overlying Middle Bowen Beds, crop out in a small basin centred round Ogmore.

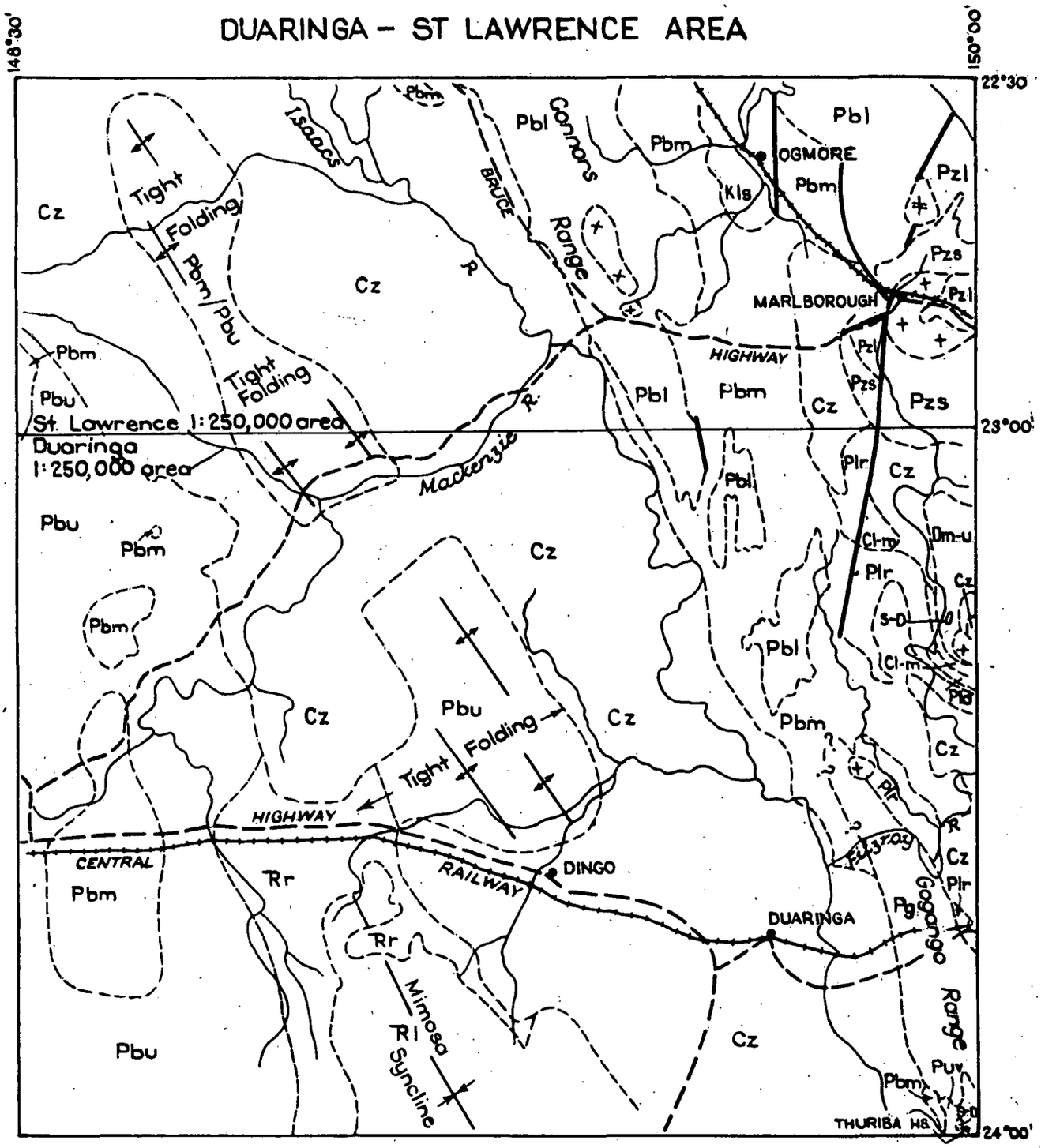
Undifferentiated Cainozoic rocks include extensive and relatively thick Tertiary sediments, commonly lateritised, volcanics and intrusives, as well as alluvium, and other superficial deposits.

The mapping has indicated the presence of possible oil reservoir sandstones in the south-west of the St. Lawrence area. This area, west of the tightly folded zone should contain some structures possessing adequate closure and dimensions to make them interesting drilling targets.

Large coal deposits in the Upper Bowen Coal Measures are being intensively prospected by Utah Development Co. in the western part of the Duaringa and St. Lawrence areas. The present regional mapping has extended the area within which the coal may be suitable for open cut mining.

Copper, chromite, nickel, and iron ores occur in the eastern part of the area and require further investigation.

GEOLOGICAL SKETCH MAP
DUARINGA – ST LAWRENCE AREA



REFERENCE

Cz	Undifferentiated
Kls	Styx Coal Measures
Rl	Clematis Sandstone
Rr	Rewan Formation
Puv	Upper Permian Volcanics
Pbu	Upper Bowen Coal Measures
Pbm	Middle Bowen Beds
Pbl	Lower Bowen Volcanics
Plr	Rookwood Volcanics
Pld	Dinner Creek Beds
Pg	Permian or older Gogango Beds
Cl-m	Lower to middle Carboniferous
Dm-u	Middle to upper Devonian
S-D	Silurian to Devonian
Pzs	Ultrabasic intrusive complex
Pzl	Metamorphics

INTRUSIVES

+ +	Granite, granodiorite
≠	Diorite
----	Approximate geological boundary
——	Fault
—+—	Anticinal axis

EAST BOWEN PARTY

by

A.R.Jensen

The East Bowen Party, consisting of A.R.Jensen and C.M.Gregory (B.M.R.) and V.R.Forbes (Q.G.S.), mapped two 1:50,000 Sheet areas (St.Helens and Midge Point) of the Proserpine 1:250,000 Sheet area, four central 1:50,000 Sheet areas of the Mackay 1:250,000 Sheet area, and the northern half of the St.Lawrence 1:250,000 Sheet area. The areal distribution of the units and their stratigraphic position, is shown on the accompanying figures.

Basement, in the Mackay and Proserpine areas, is formed by an Upper Devonian to Lower Carboniferous sequence of interbedded volcanics and minor fossiliferous marine sediments, known as the Campwyn beds. These are overlain unconformably by Permian Lower Bowen Volcanics which form basement in the St.Lawrence area. The Lower Bowen Volcanics dominantly consist of andesitic volcanics with some interbedded conglomerate, siltstone and lithic sandstone. The sediments are well developed near Mackay where a member, the Dumbleton beds, is distinguished from the formation. The thickness of both the Campwyn beds and the Lower Bowen Volcanics is unknown.

In the eastern parts of the Mackay and St.Lawrence areas the Lower Bowen Volcanics is, in part, overlain by the Carmila Beds, which crop out in the western limb of a south plunging syncline. The Carmila Beds consist of 4,000 feet of conglomerate, quartz sandstone, lithic sandstone, siltstone, and acid flows and tuffs.

The Lower Permian Middle Bowen Beds overlie the Lower Bowen Volcanics in the south-east of the St.Lawrence area and in the west of the St.Lawrance and Mackay Sheets. They consist of marine siltstone, quartz and lithic sandstone, calcareous sandstone, and, near the base, water-lain tuffs. The relationship of the Carmila beds to the Middle Bowen Beds is not clear; the Carmila beds are possibly the oldest.

A unit consisting of quartz sandstone, carbonaceous siltstone, coal, and rhyolite unconformably overlies the Lower Bowen Volcanics in the Proserpine area. It is possibly equivalent to the Upper Bowen Coal Measures, an Upper Permian unit which lies conformably above the Middle Bowen Beds in the Bowen Basin.

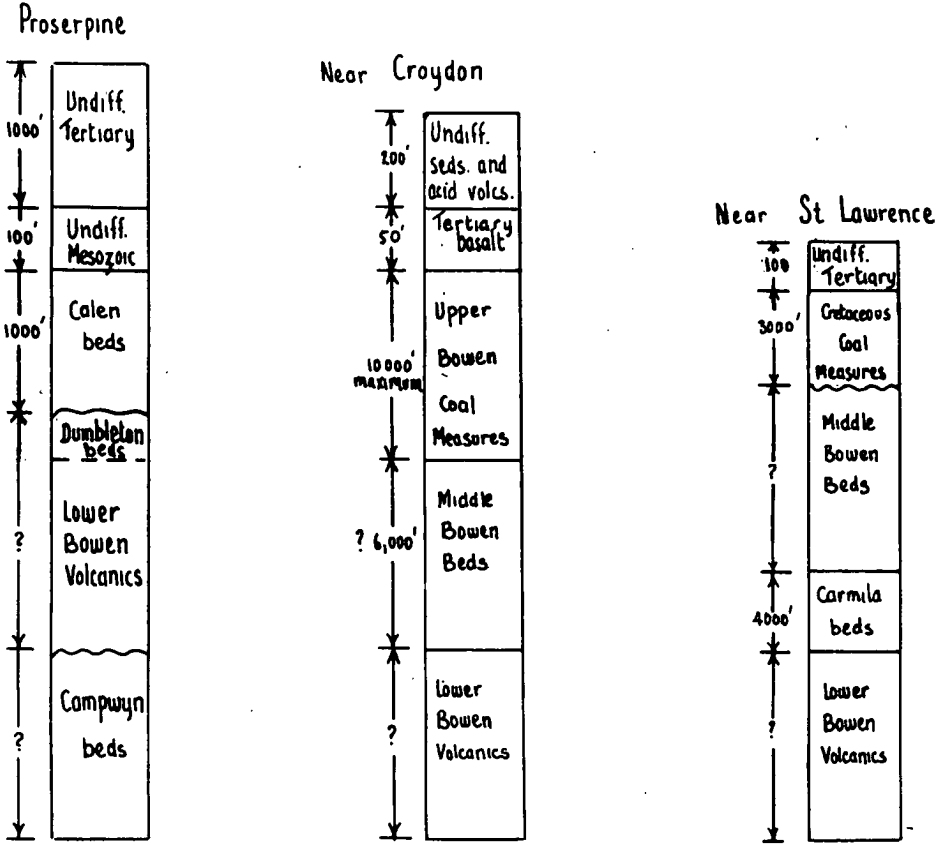
The Cretaceous Styx Coal Measures unconformably overlie the Middle Bowen Beds near St.Lawrence. The other Mesozoic sedimentary units are known in the area mapped except for the quartz sandstone on Newry Island, on the Proserpine Sheet.

Tertiary rocks, consisting of acidic to basic volcanics and freshwater sediments are widespread and a maximum thickness of 1,000 feet occurs in the Proserpine area.

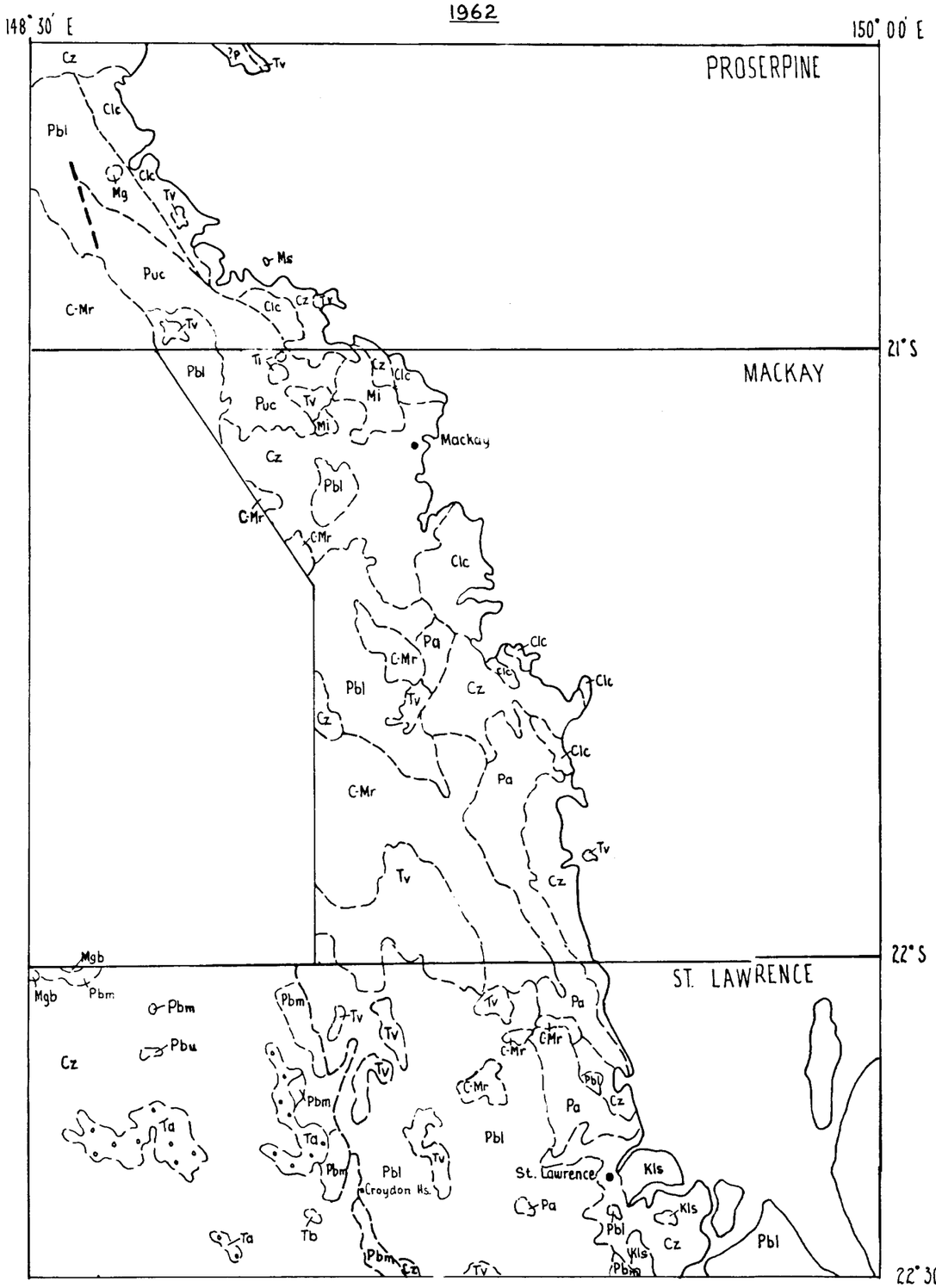
Igneous intrusions, ranging from Carboniferous to Tertiary are widespread; they range from acidic to basic.

The accumulation of petroleum in pools of economic size in the area mapped is unlikely. Although possible source and reservoir beds are present elsewhere, it is only in the south-west of the St. Lawrence area that igneous intrusion is rare, and tectonic movements have not been too strong for oil accumulation.

Generalized Stratigraphic Sequences of Areas Mapped by East Bowen Party



Geological Sketch Map of Area Mapped by East Bowen Party 1962



Scale 1:1,000,000

REFERENCE

CAINOZOIC	TERTIARY	Cz	Coastal mud, river alluvium, soil, coastal sand dunes
		Ta	Quartz sandstone, partially lateritized, siltstone
		Tv	Acid volcanics, intermediate volcanics
		Tb	Basalt
		Ti	Granophyre, diorite
MESOZOIC		Ms	Quartz sandstone
		Mi	Undiff. intrusive rocks - basic and intermediate
		Mg	Undiff. intrusive rocks - acid
	Bundarra Granodiorite	Ngb	Granodiorite
		Kls	Coal Measures
CARB to MESOZOIC	Urannah Complex	C-Mr	Acid, intermediate and basic igneous rocks
PALAEOZOIC		?P	Undiff ? Permian
	PERMIAN — Calen Beds	Puc	Quartz sandstone, siltstone, rhyolite, coal, carbonaceous shale
	PERMIAN — Upper Bowen Coal Meas.	Pbu	Conglomerate, lithic sandstone, siltstone coal
	PERMIAN — Middle Bowen Beds	Pbm	Quartz sandstone, calcareous lithic sandstone, siltstone, tuff
	PERMIAN — Carmila Beds	Pa	Conglomerate, siltstone, sandstone, tuff, rhyolite
	PERMIAN — Lower Bowen Volc.	Pbl	Adesitic volcanics, conglomerate, siltstone, lithic sandstone
	CARBONIFEROUS — Campwyn Beds	Clc	Acid and intermediate volcanics, quartz sandstone, siltstone, limestone

GEORGINA BASIN

ALROY PARTY

by

M.A. Randal

GENERAL

During 1962 M.A. Randal and R.A.H. Nichols mapped the Brunette Downs and Alroy Sheet areas and re-examined part of the Walhallow 1:250,000 Sheet area in the northern part of the Georgina Basin. The area forms the central part of the Barkly Tableland and for the most part consists of black soil plains covered by Mitchell grass and containing few rock outcrops. The southern part of the Alroy Sheet consists of a large "desert area" which extends onto the adjacent Tennant Creek, Borrow Creek, Frew River, and Sandover River Sheet areas.

During the survey the Commonwealth Department of Works was constructing an all weather road from the Barkly Highway to Anthony Lagoon: it was given some assistance in the search for suitable gravel deposits and in the re-routing of the alignment necessitated by the presence of sinkholes.

The logs for over 250 water bores were collected from the Brunette , Alroy, Walhallow and Mt. Drummond Sheet areas; most logs contain complete hydrological information including the drillers' descriptions of rock types. A visit was made to the Water Resources Branch in Darwin where registered numbers for 400 bores in the central and eastern part of the Barkly Tableland were obtained.

Bore logs collected in the field during 1961 and 1962 were checked against the Branch's records and some new information was obtained. Most of the data previously collected by the party was new information to the Branch and copies were made available to it.

A programme of bore water sampling was carried out during the field season in an attempt to relate the water to specific aquifers. The analyses are still being processed and results are not yet available. 238 samples were collected of which 123 were forwarded to A.M.D.L. Adelaide and the remainder to B.M.R. Canberra for analysis.

Barometric levelling was carried out concurrently with the water sampling and geological traverses. All bores in the area have been levelled and sufficient levels have been obtained to draw surface contour maps of the region.

GEOLOGY.

Rocks of Precambrian, Cambrian, Mesozoic and Tertiary ages occur in the areas mapped. Superficial deposits are widespread. Stratigraphic information is obtained with difficulty due to the paucity of outcrop and the total lack of exposed contacts. Large areas are covered with black soil and sand with "floaters" of dolomite, limestone and sandstone. Chert and ironstone gravels are common. Structures which appear on air-photos cannot be verified on the ground. The region adjoins the southern part of the Carpentaria Upper Proterozoic Province.

A resumé of the geology of the Sheet areas is given below.

Brunette Downs

Medium grained quartz sandstone crops out in the north-east corner of the Sheet area as a low but well defined west striking ridge. The sandstone is ferruginous in part, prominently cross-bedded, and contains poorly preserved ripple marks. No reliable dips can be measured on the ground, although on air-photos the ridge appears to dip at less than 5° to the south. The rocks are similar to the Upper Proterozoic Mittebah Sandstone which crops out on the adjoining Mt. Drummond and Ranken Sheet areas (Randal and Brown, 1962).

Cambrian rocks occur in the central and north-western parts of the Brunette Downs 1:250,000 Sheet area. They are continuous with the Anthony Lagoon Beds (Plumb, 1962) which crop out on the Walhallow Sheet area in the vicinity of Anthony Lagoon Homestead. West of Brunette Downs Homestead, flaggy and blocky carbonate rocks crop out as scattered blocks and boulders in the grassy black soil downs. The rocks consist of limestone, dolomitic limestone, dolomite, and algal limestone. Quartz sandstone and siltstone interbeds are present. Much of the outcrops of Cambrian rocks are covered by an extensive chert scree, some of which represents silicified carbonate rocks, particularly coquinite. Both the chert and the carbonate rocks are in part fragmental and oolitic. The colours of the carbonate rocks are dark grey, grey, buff, cream, and brown; two-tone dolomite is common. Chert nodules are rare. No identifiable fossils have been found in the Anthony Lagoon Beds; algal remains are present in the dolomites south of Anthony Lagoon Homestead and west of Brunette Homestead, where cross-sections of trilobites were also found.

The limestone and dolomite in this area show the marked leaching effects seen in carbonate rocks elsewhere on the Barkly (Condon 1961). This, with the extensive lateritisation of the siltstone and sandstone portions of the sequence hinders an appraisal of the sub-surface sequence, and the differentiation in outcrop between parts of the Cambrian sequence and possible marine Mesozoic rocks.

Because of the poor nature of outcrops and the cover of superficial deposits it has not been possible to estimate the thickness of the Anthony Lagoon Beds.

An isolated outcrop of Mesozoic rocks occurs seven miles south-east of Creswell Homestead. The outcrop is a yellowish-white silicified sandstone and contains abundant plant fossils. Laterised siltstone and claystone north-west of Brunette Homestead may represent marine sedimentation in the Mesozoic, but it is impossible in hand specimens to differentiate between these lateritised rocks and the lateritised and leached fine-grained carbonate rocks in the Cambrian sequence.

Outcrops of the Brunette Limestone are widespread in the eastern and western part of the Sheet area. The unit occurs as scattered blocks and boulders and nodular pebbles in the black soil. The maximum thickness observed is 46 feet in a large sinkhole east of Brunette Homestead. The limestone is a skeletal and siliceous nodular white limestone with some small sandy interbeds. It is similar to the Austral Downs Limestone on the Avon Downs Sheet (Randal and Brown, 1962b). The unit was originally named by Noakes and Traves (1954) in the Brunette and Alroy area and is regarded as Tertiary.

Alroy

Outcrops of fossiliferous Middle Cambrian rocks occur in the south-eastern part of the Alroy 1:250,000 Sheet area. They consist of silicified limestone, siltstone, chert, silicified shale and quartz sandstone. Residual rocks from the leaching of carbonates are present. These rocks generally occur as rubble-strewn low rises and are continuous with the Wonarah Beds which crop out on the adjoining Rankin and Avon Downs Sheet areas (Randal and Brown, 1962a & b). A number of bores have been drilled in the downs country immediately north of these outcrops and chips of fossiliferous limestone have been recovered from the bore drains. Some of these limestones are lithologically similar to those found near Alexandria Homestead (Burton Beds).

Similar fossiliferous rocks to the Wonarah Beds occur at scattered intervals westwards near outcrops of the Gum Ridge Formation east of Tennant Creek. It seems possible that the Burton Beds, Wonarah Beds and the Gum Ridge Formation may have been deposited in a continuous Middle Cambrian sea.

Outcrops of the Brunette Limestone occur in the central and northern part of the Alroy 1:250,000 Sheet area. They are continuous with the scattered outcrops of this unit on the Brunette Sheet to the north.

Travertinous limestone covers large areas in the southern part of the Alroy Sheet area. It is similar to the Brunette Limestone, but because of the marked difference in the topographical expression of the two units and some slight lithological variations, the travertine is not included in the formal unit. The travertine appears to overlie leached carbonate rocks in the Wonarah Beds.

Detrital laterite occurs extensively along the Barkly Highway and to the south. The pebbles are cemented in part and are highly ferruginous; channel samples have been obtained for analyses. The material has been used for road-making and quarries expose up to nine feet. The material becomes coarser to the west, and beyond the Rockhampton Downs turn-off cobbles of chert occur in the deposit.

Walhallow

Outcrops of the Top Springs Limestone were examined on the Walhallow 1:250,000 Sheet area. The lithology is varied: fine grey and black smelly limestone, coarse crystalline limestone and dolomitic limestone. Algal remains and chert smears and nodules are present. The limestone is capped by a sandy and silicified leached zone which is characteristic of the limestones of the Daly River Group near Katherine. A collection of trilobites from this unit will possibly provide a means of correlation with other Cambrian rocks in the Barkly area.

Recent deposits cover most of the Walhallow and Alroy areas. They consist of black soil, gravel and residual sand. The black soil appears to be developed on carbonate rocks of Tertiary and Cambrian ages. The residual sand is produced from the weathering of sandy beds in the Mesozoic and Cambrian sequences; it is also developed on the Wonarah Beds and the travertinous limestone in the Alroy area. Black soil downs are developed on silty beds in the Mesozoic on the northern part of the Walhallow Sheet area.

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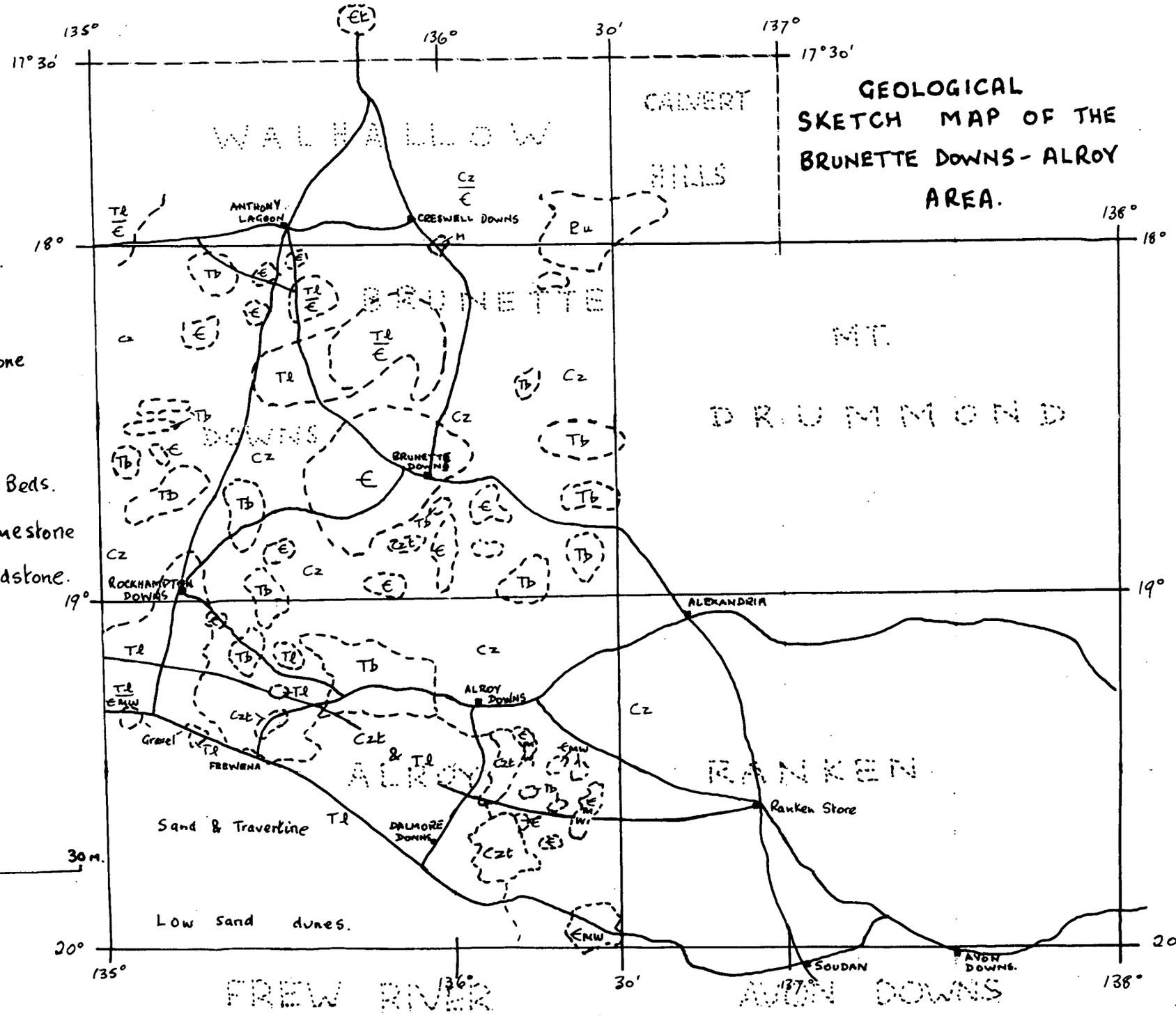
GEOLOGICAL SKETCH MAP OF THE BRUNETTE DOWNS - ALROY AREA.

Cz – Black Soil & Residual Sand.
Czt – Travertine.
Tl – Laterite.
Tb – Brunette Limestone
M – Mesozoic.
€mw – Wonarah Beds.
€a – Anthony Lagoon Beds.
€t – Top Springs Limestone
Pu – Mittiebah Sandstone.



GM 6

GEORGINA BASIN CORE - HOLE DRILLING

Summary of bore logs completed to 14th November, 1962.

GRG 1 (Huckitta Sheet - 10 miles NW of New MacDonald Downs Homestead).

0 - 30 feet Quaternary sand
30 - 116 feet Tertiary Arltunga Formation
116 - 210 feet Upper Cambrian (?) Arrinthrunga Formation. T.D.

GRG 2 (Elkedra Sheet - 4 miles NW of Corella Bore, Ammaroo Station)

0 - 280 feet Quaternary sand
280 - 354 feet Dulcie Sandstone (Upper Devonian) T.D.

GRG 3 (Elkedra Sheet - 24 miles WNW of Annitowa Homestead)

0 - 126 feet Quaternary sand
126 - 206 ? Tertiary Arltunga Formation T.D.
Below 206 feet ? Cambrian chert not penetrated.

GRG 3A (200 yds. W. of GRG 3)

0 - 125 feet Quaternary sand, clay, gravel.
125 - 220 feet Tertiary limestone, sand and chert.
220 - 243 feet Upper Cambrian (?)Arrinthrunga FormationT.D.

GRG 4 (Elkedra Sheet - 4 miles NNW of Annitowa Homestead)

0 - 91 feet Quaternary sand
91 - 739 feet Upper Cambrian (?)Arrinthrunga Formation T.D.

GRG 5 (Elkedra Sheet - Derry Downs Pastoral Block, 25 miles SE of Ammaroo Homestead).

0 - 173 feet Quaternary sand
173 - 450 feet Upper Cambrian (?)Arrinthrunga Formation T.D.

GRG 6 (Huckitta Sheet - ½ mile S of No.1 bore Lucy Creek)

0 - 23 feet sand, clay and travertine.
23 - 28 feet buff and yellow fine ss
28 - 682 feet fine grained calcarenite and calci-lutite, ss. and siltstone grey to dark grey. Dark grey limestone. T.D.

GRG 7 (Huckitta Sheet - 7 miles W of Lucy Creek Homestead)

0 - 6 feet gravel
6 - 755 feet Upper Cambrian (?)Arrinthrunga Formation T.D.

GRG 8 (Huckita Sheet - 15 miles W of Lucy Creek Homestead)

0 - 16 feet alluvium
16 - 295 feet Arrinthrunga Formation T.D.

GRG 9 (Urandangie Sheet - 8 miles ENE of Urandangi)

0 - 2 feet Quaternary red clay
2 - 373 feet ?Lower Ordovician dolomite, dolarenite, dolomitic limestone. T.D.

GRG 9A (Urandangie Sheet - Lake Marion, 10 miles SW of GRG 9)

0 - 94 feet	Austral Downs Limestone - Tertiary	
94 -420 feet	? Lower Ordovician, dolomite, dolomitic limestone. T.D.	

GRG 11 (Tobermory Sheet - 4½ miles SW of Clough's Bore)

0 - 26 feet	sand and travertine	
26 -456 feet	dolomite, minor dolarenite, sandstone and siltstone. T.D.	

GRG 12 (Tobermory Sheet - 4 miles SSW Tarlton Downs)

0 - 6 feet	gravel and clay.	
6 - 42 feet	clay, silt, blue gypsiferous claystone and siltstone	Nora Formation
42 -120 feet	blue claystone, and siltstone; fine-grained grey ss.; coquinite.	Middle Ordovician
120 -755 feet	fine-grained glauconitic ss; blue grey claystone and siltstone; glauconitic crystalline and sandy dolomite T.D.	Kelly Creek Formation Lower Ordovician

GRG 14 (Sandover River - 5 miles north of Scarr Hill)

0 -115 feet	alluvium
115 -720 feet	Cambrian dolomite and some ss. and limestone. T.D.

GREAT ARTESIAN BASIN

GREAT ARTESIAN BASIN PARTY

by

R. R. Vine

During the early part of the year reports, in the form of expanded Explanatory Notes, were compiled by R.R. Vine and W. Jauncey for the four 1:250,000 Sheets mapped during 1961. The Sheets, Julia Creek, McKinlay, Mackunda and Brighton Downs, were produced as preliminary editions.

The 1962 field party consisted of R.R. Vine, L.V. Bastian and I. Chertok (draftsman) of the B.M.R., and D. Casey of the Queensland Geological Survey. R. Day, palaeontologist of the Queensland Geological Survey was with the party for the last month of the season. Four months were spent in the field, from 6th June to 14th October. During this time reconnaissance mapping of the Manuka and Richmond 1:250,000 Sheets and about one third of the Hughenden Sheet was completed.

The geology of the area mapped is shown on the accompanying sketch map and graphic log. The main results of the year's mapping are given below.

Precambrian?

Igneous and metamorphic rocks, of presumed Precambrian or Lower Palaeozoic age, crop out in the north of the Richmond and Hughenden areas. They are a continuation of the exposed part of the Georgetown Inlier.

Pre-Cretaceous sedimentary rocks

Permian and presumed Triassic-Jurassic rocks were not examined in detail. Where seen they consist dominantly of kaolinitic, pebbly sandstone, with *Glossopteris*-bearing carbonaceous shale and coal.

Gilbert River Formation

This unit is the probable equivalent of the Longsight Sandstone of the western margin of the basin and the Blythesdale Group of the Eastern margin.

In the Cambridge Creek (=upper Stawell River) area the sequence comprises 560 feet of sandstone with some conglomerate and siltstone. It rests unconformably on a lateritised surface of metamorphic and igneous rocks.

Farther east the relationship with the presumed Triassic-Jurassic arenites has not yet been established and further work is necessary on this problem. In Galah Gorge Permian rocks are overlain unconformably by sandstone which is probably of the Gilbert River Formation. This will be investigated further during 1963.

Wilgunya Formation

The lower member was found to be divisible into three lithological units. Unit A, the lowest, consists of about 60% blue-grey clay, with glauconitic siltstone and nodular limestone; some of the limestone is strongly brecciated and some algal? structures are present. It is about 200 feet thick.

Unit B, 30 feet thick, consists of very fine-grained arkose? with tough calcareous culminations. Both these units are fossiliferous, with a Roma-type fauna. Unit C, approximately 200 feet thick, consists almost entirely of blue-grey clay and outcrops are scarce. Fossils are difficult to find.

The Toolebuc Member, 30 feet thick, was traced from the north-west of the Richmond area/to east of Hughenden Town. There it disappears below a thick Cainozoic cover. The thickness of the Wilgunya Formation is between 1500 and 2000 feet.

Mackunda Beds

Where this unit was established in the Mackunda Creek area it is characterised by thin interbeds of arkose and siltstone It was recognised as a transitional unit between marine lutites of the Wilgunya Formation and the non-marine, arenitic Winton Formation.

In the Manuka area thin interbedding of arkose and siltstone is no longer characteristic; the dominant lithologies are thin to medium-bedded friable arkose and medium-bedded, calcareous arkose grading to arkosic limestone. The unit is thus very similar to the Winton Formation, but is clearly distinguishable by the presence of marine fossils (Tambo-type fauna) often in sufficient abundance to form coquinites. The basic concept of transition beds is thus still valid.

The thickness is approximately 400 feet.

Winton Formation

The Winton Formation is confined to the south of the Manuka Sheet. Only plant and wood fragments were found in it. The complete sequence is not present in the area, but over 800 feet is exposed.

Glendower Formation

Extensive arenites, unconformably overlying the Cretaceous units and overlain in part by basalt, are assigned to the Glendower Formation. It is of very variable thickness, locally probably exceeding 300 feet. The unit had previously been described as lightly lateritised, but several exposures were found with a complete, deep laterite profile.

Chudleigh Basalt.

Numerous basalt flows and several vents were seen. No lateritised basalt was found. The maximum thickness recorded in a bore is 163 feet; outcrops are normally much thinner.

Cainozoic Sand.

A large, thin sheet of sand with some gravel covering many of the older rocks extends around the areas of outcrop of both Cretaceous and Tertiary sandstones. Characteristically the sand is red in colour and appears to be derived mainly from an old lateritised surface developed on the older arenites.

Economic Geology

Coal: A coal-bearing sequence which crops out in the Oxley Creek area was examined in detail by Mt. Isa Mines Ltd. In Galah Gorge a similar coal-bearing sequence is present, with four seams, 3 to 6 feet thick, and varying from carbonaceous shale to coal. Galah Gorge is approximately 20 miles west of Oxley Creek, and the area between is covered mainly by Cainozoic arenites and basalt.

Difficulties of access precluded the economic working of the Oxley Creek deposit, but a railway or road could be built to the top of Galah Gorge without much difficulty. Further work is necessary in order to decide whether predictions can be made on:-

a. The continuity sub-surface of the coal bearing sequence between Oxley Creek and Galah Gorge.

b. The probable depth below the existing land surface.

c. The possibility and extent of lateral variations from carbonaceous shale to coal.

Water: The main aquifers for the area are in the Gilbert River Formation (= Longsight Sandstone), with smaller, shallow supplies from the Mackunda Beds in the south of the Manuka area.

In the east of the Richmond area and the west of the Hughenden area water is obtained from the Glendower Formation below basalt. Supplies are very variable in quantity. This aquifer is of importance for it occurs near the intake area of the Gilbert River Formation, where the deeper water seldom rises sufficiently within the bore to be economically pumped.

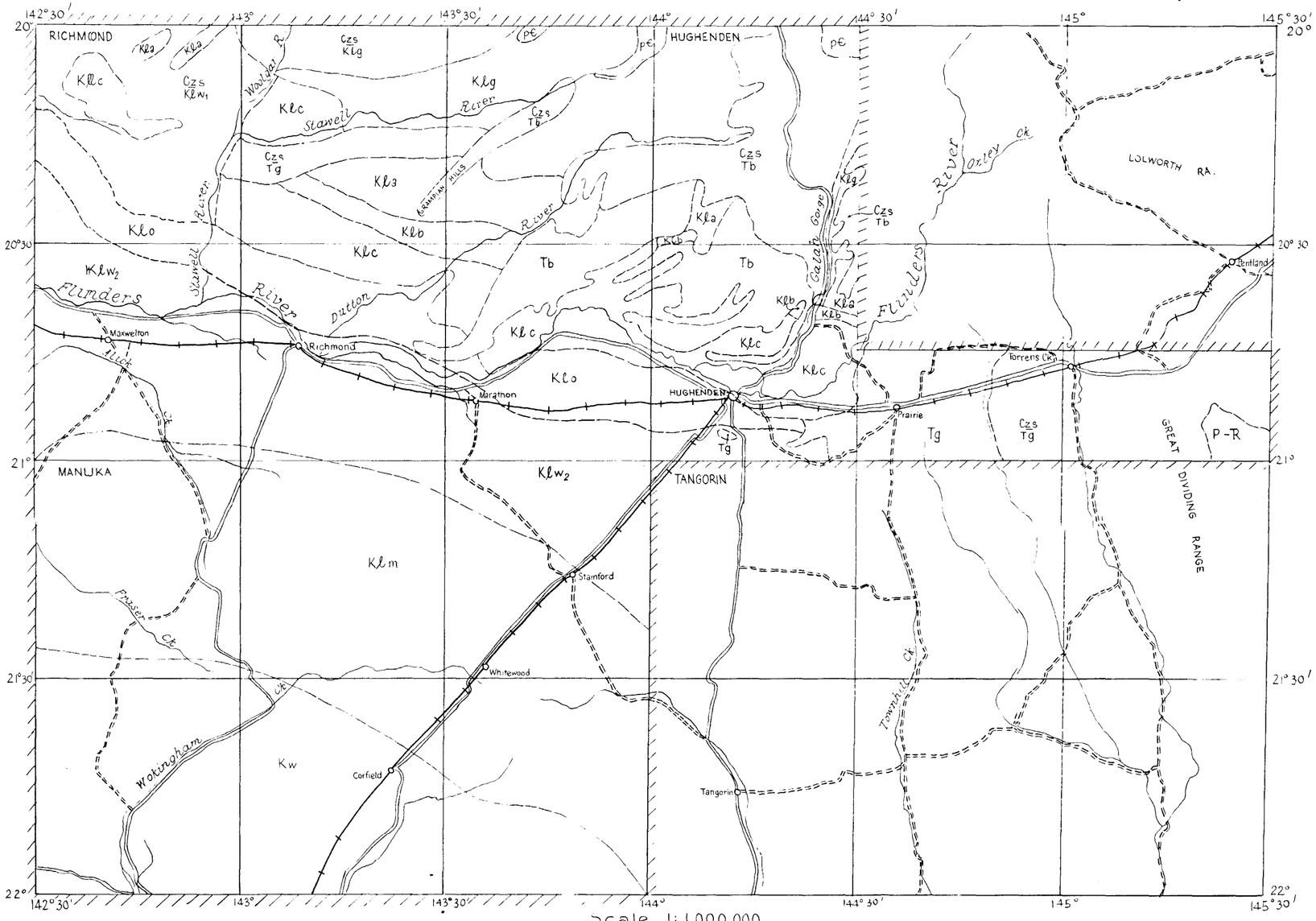
North-east of Hughenden some small supplies, sufficient for sheep, are being obtained from above the Gilbert River Formation. The water is possibly coming from Unit B of the Wilgunya Formation, but insufficient data has been collected so far to establish this. Further work to the south and east may elucidate this problem.

Oil: Several drillers have recorded traces of petroleum from water bores in the area.

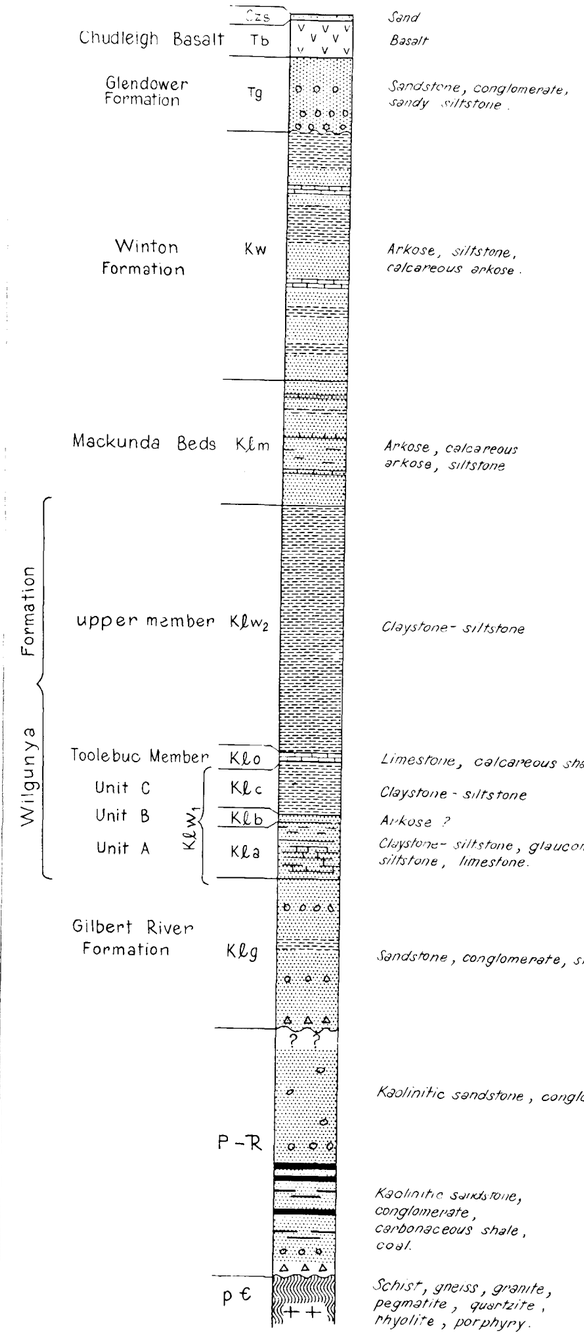
No major structures were located during the surface mapping, although the position of outcrops of the Toolebuc Member along the Dutton River are anomalous. A preliminary interpretation of the drillers' logs of the Manuka area suggests an anticline east of Stamford. Full details of the structure of the area will not be clear until all the bore logs have been obtained and interpreted.

GREAT ARTESIAN BASIN PARTY

Field Mapping 1962



Reference and Graphic Log



Approximate Vertical Scale 1" = 500'

PHOTOGEOLOGICAL SHEETS COMPLETED 1962.

Bowen Basin Q.

St. Lawrence
Duaringa

Artesian Basin North. Q.

Richmond
Hughenden
Maruka
Tangerin

Artesian Basin East. Q.

Jericho
Galilee

Arnhem Land. N.T.

Arnhem Bay
Wessel Islands
Milingimbi*
Blue Mud Bay*
Mt. Marumba

Kimberley Area W.A.

Gordon Downs 1:250,000
plus four Sheets at 1:50,000

Pilbara Area. W.A.

Yarraloola
Mt. Bruce
Wyloo

W.A.

Herbert*

* not fair drawn.

MACROPALAEONTOLOGY

Annual Reports for 1962 by individual workers.

A.A. Öpik

Summary:

A.A. Öpik continued preparation of papers to present the results of his study of Cambrian palaeontology and stratigraphy, and, as routine work, identified fossils and the geological ages of strata, discussed matters of stratigraphical nomenclature, corresponded (within Australia and overseas) on matters of lower Palaeozoic stratigraphy and palaeontology, and delivered lectures on similar and related subjects.

Presentation of Results

Papers.

Published - The Geology and Palaeontology of the Headwaters of the Burke River, Queensland. Bur.Min.Resour.Bull.53.

In Press - Early Upper Cambrian fossils from Queensland. Bur.Min.Resour.Bull. 64.

In Preparation - (a), in an advanced state, a monograph of latest Middle Cambrian and early Upper Cambrian fossils from Queensland (code name 'Mindyallan'); (b) a monograph of the trilobite family Nepeidae.

Routine Work

Below follows a selection of items assumed to be of some importance.

Stratigraphical Nomenclature.

Prepared and submitted the expositions, (a) The geolgraphical system of stratigraphical nomenclature, and (b) Nomenclature of time and time-rock units and the Australian Code of Stratigraphic Nomenclature.

Manuscript reading.

Read (as a contributor) the typescript of 'The Geology of Tasmania', to be published as a separate volume in the Journal of the Geological Society of Australia.

Stratigraphy, palaeontology.

Reported (a) on the newly discovered Cambrian and Ordovician of the Mootwingee Range New South Wales; (b) on the Ordovician graptolite sequence in the Dullingari No.1 Well, South Australia (in collaboration with P.J. Jones); (c) on Cambrian and Ordovician fossils from northern Tasmania - for the Mines Department, Hobart.

Visited the Geology Department, and the Geography Department of the University of Adelaide, and the Geological Survey of South Australia; in the course of discussions the correlation of the Lower Cambrian of the Mootwingee Range (N.S.W.) and the upper half of the Lower Cambrian of South Australia was established.

Correspondence:

Corresponded (a) with Dr. R. Neuman (U.S. Geol. Survey) and Dr. H. Whittington (Harvard University, Mass.) as regards the stratigraphy and correlation of the newly discovered Ordovician in the State of Maine, U.S.A.; (b) with Professor Dorothy Hill (Brisbane) as regards the standard concept and the Russian version of the Lower Cambrian/Middle Cambrian boundary.

Lectures, addresses.

Delivered lectures on lower Palaeozoic stratigraphy, fossils, correlation, and geomorphology in Canberra (Geological Society) and Adelaide (University, Geological Survey).

Personalia.

Elected to the fellowship of the Australian Academy of Science; awarded the Charles Doolittle Walcott Medal - National Academy, Washington.

J.M. Dickins

Summary:

J.M. Dickins continued work on the palaeontology and stratigraphy of the Bowen Basin and examined fossil collections from Timor and eight petroleum bores. Publications were prepared on the palaeontology and stratigraphy of the Triassic and Permian rocks of the Perth, Carnarvon, and Canning Basins. Collections were made from the Permian rocks of the Hunter Valley for comparison with the Bowen Basin. Administrative and supervisory duties were carried out in connection with the Bowen Basin Regional Survey, the Palaeontological Section, and the Museum.

Examination and Description of Fossil Collections:

Fossils were examined from the Devonian and Permian rocks of the Bowen, Emerald, and Mackay 1:250,000 Sheets of the Bowen Basin and reports prepared for inclusion in the Records on these areas. Material from Timor (jointly with S.K. Skwarko), Wapet Eneabba No.1, A.A.O. Glentulloch No.1, A.A.O. Meeleebee No.1, Wapet Wandagee Core Holes No.1 and No.2 (jointly with P.J. Jones), A.A.O. Westgrove No.1 and No.2, Wapet Babrongan No.1, was examined and reports were prepared. The identification of Devonian or Lower Carboniferous rocks, instead of the expected Permian, at shallow depth beneath the Cretaceous in Wandagee Core Hole No.1 was of particular interest.

Field Work:

Collections were made in the Permian of the Hunter Valley in order to determine the faunal succession for correlation with the Bowen Basin. In the Bowen Basin, collections were made and sections measured in the Springsure, Bowen, Mackay, St. Lawrence, and Duaringa 1:250,000 Sheet areas. General help was given to the field parties in their mapping programme.

Reports:

Description of the Lower Triassic marine fossils from Beagle Ridge BMR No.10 Well (jointly with R.A. McTavish) was completed and will be published in the Journal of the Geological Society of Australia. Galley proofs of Bulletin 63 "Permian Pelecypods and Gastropods from Western Australia" have been corrected and returned to the printer. A Record "Correlation and Subdivision of the Middle Bowen Beds" (jointly with E.J. Malone and A.R. Jensen) was prepared. A regional subdivision has been found possible which allows the solution of a number of outstanding problems. Work has begun on rewriting parts of Reprot 41A "Summary of Oil Search Activities in Australia". Additional reports have been completed as indicated in a previous section.

Other:

Teaching material has been sent to Universities and locality information and reference specimens supplied to outside organisations and individuals. Administrative work in connection with organization of Bowen Basin Regional Survey has been carried out as well as editing reports and manuscripts on the Wallal B.M.R. 4 and 4A Wells and the Mesozoic of the Northern Territory. Comments have been made on a number of applications and reports received under the Petroleum Search Subsidy Acts. Two Technical Assistants are being trained in their duties.

C.G. Gatehouse

Summary:

Six weeks were spent visiting the Amadeus Basin Party in the Lake Amadeus Sheet area. Graptolites and asaphid trilobites of Ordovician age and some Cambrian phosphatic brachiopods were collected. Assisted in organisation of fossil collections in the Administration Building sub-basement. A total of 540 photographic negatives were prepared of A.A. Opik's Middle and lower Upper Cambrian trilobites. Palaeontological techniques (casting with rubber plastic and plaster) were experimented with. Middle Cambrian faunas from Daly River (N.T.) and Christmas Hill (Tas.) are being cleaned and prepared for systematic study.

1a. Field Work:

Six weeks were spent visiting the Amadeus Basin Party where Cambrian and Ordovician fossils were collected from the George Gill and Levi Ranges. Of particular note were the graptolites (Didymograptus) and the large complete asaphid trilobites found in the Horn Valley Siltstone near Mt. Olifent.

b. Silurian fossils were collected from the Canberra district and at Cooleman on the Canberra Sheet area.

2. Papers in progress:

a. A correlation chart for sediments of the Canberra Sheet area (1953 ed.) was compiled in collaboration with A.A. Opik.

b. The manuscript on the Middle Cambrian trilobite Proampyx from Christmas Hill, Tasmania, is being revised to include supplementary material.

c. The Middle Cambrian trilobite fauna from the Daly River(N.T.) is being studied. Some of the material was submitted to P.J. Jones for conodont examination but so far the samples have been barren.

J.G. Tomlinson

SUMMARY

J. Gilbert-Tomlinson continued work on stratigraphy and palaeogeography of the Amadeus Basin, N.T. New discoveries of Cambrian and Ordovician fossils have been made, mostly in the western part of the Basin, but a stratigraphically significant collection was made from the Cambrian - Ordovician transition in the Alice Springs area. Routine examination was also carried out on Upper Cambrian and lower Ordovician fossils from the Georgina Basin. A reorganization of fossil collections was made, and a card index of fossiliferous localities was started. An exhibit of fossils was prepared for the Bureau exhibition.

AMADEUS BASIN

Mt. Rennie Sheet. A unique fauna of lower Ordovician trilobites, containing the Asian genera Bathyuriscops, Encrinurella, and Prosopiscus, was found in association with the world-wide trilobite Carolinites. A somewhat younger fauna contains a brachiopod comparable with Orthis nipponica (middle Ordovician of Korea).

Mt. Liebig Sheet. A fauna from the Sardiner Range was provisionally dated as Lower Cambrian, (hitherto Lower Cambrian fossils have been restricted to the area east of the Telegraph Line). The Ordovician succession from the eastern part of the Sheet is similar to that of the Western MacDonnell Range (Hermannsburg Sheet). On the western part of the Sheet the few fossils so far discovered seem to indicate a different development.

Bloods Range Sheet. The southern part of the Sheet contains a widespread development of pipe-rock (Scolithus), stratigraphically uncontrolled but correlated with some confidence with the pipe-rock of the lower Pacoota sandstone (Tremadocian) of the Western MacDonnell Range. A correlation with a similar rock in the Everard Ranges of South Australia seems to be indicated. The northern part of the Sheet contains sandstones with middle Ordovician brachiopods and gastropods comparable with forms from the Mt. Rennie Sheet area.

Lake Amadeus Sheet. Ordovician fossils include a Tremadocian pilekiid trilobite in the Dead Horse Anticline, (the oldest diagnostic Ordovician fossil west of Areyonga) and complete specimens of "Asaphus" howchini Etheridge in association with Didymograptus at Mt. Olifant. A giant pygidium of the howchini group from middle Ordovician sandstone of Johnnys Creek Anticline indicates a complete skeleton of at least nineteen inches - the largest known asaphid. Another locality for Bathyuriscops was found in collections from the Palengitaira Hills near Mt. Olifant.

Alice Springs Sheet. The first discovery of late Upper Cambrian in the Alice Springs area was made near Native Pine Gap. Subsequently a very complete collection from a measured section in the same area yielded five superimposed lower Ordovician assemblages overlying the Upper Cambrian. The succession is probably conformable. A middle Cambrian nepeid trilobite from the Ross River section is now in course of systematic description by Dr. A.A. Opik - the first Cambrian trilobite to be described from the Amadeus Basin.

Rodinga Sheet. Collections from a measured section at Mt. Peachy yielded an unusual fauna of trilobites and brachiopods in association with "Orthis" dichotomalis. The fauna, which is lower Ordovician (Arenig) in age, includes the rare Himalayan trilobite Prosopiscus.

GEORGINA BASIN

Trilobites provisionally dated as Upper Cambrian were studied in core from B.M.R. Georgina No. 5 Bore. A new genus of lower Ordovician) kaolishaniid trilobites was found in collections from near Southern Cross (Marqua) Bore (Tobermory Sheet). The late Upper Cambrian faunas of the Lily Creek Section (Boulia Sheet) were studied with Dr. Öpik.

MISCELLANEOUS

Bore Cores. The Permian Coral Verbeekiella was identified in Wapet (Subsidized) Jurien No. 1 Bore.

Exhibition. The palaeontological exhibition displayed plant and animal fossils of Proterozoic to sub-Recent age from 54 areas. A brief explanation was compiled and a locality map accompanied the exhibit. A list of the material has been retained for future reference.

Gift. A collection of described Cambrian trilobites from western Queensland was selected for presentation to the Geology School, Australian National University.

S.K. Skwarko.

SUMMARY

S.K. Skwarko continued his work on the Mesozoic fossils of the Northern Territory, and as a result of this, one paper is with the publishers, one with the editor, and another in an advanced stage of preparation. Eight Records on this topic have been distributed during the year. A paper has been published on his previous work. During four months' field season he visited Maryborough, Rockhampton and western Queensland, as well as Arnhem Land, Hodgson Downs and Brunette Downs areas in the Northern Territory, and an accompanying map illustrates progress made in dating of Mesozoic sediments in the Northern Territory.

ROUTINE WORK

Activities at Canberra during 1962 consisted chiefly of photographing, describing, and dating of the Mesozoic fossils of the Northern Territory. This is the main project, which has beenin progress intermittently since September, 1960, and which is now nearing completion.

Fossiliferous samples sent in from Timor, New Guinea and Western Australia have been dated and briefly described.

PUBLICATIONS

PUBLISHED : "Graptolites of Cobb River - Mount Arthur Area, North-West Nelson, New Zealand." TRANS.ROY.SOC.N.Z.88 Pt.4, 216-247.

WITH THE PUBLISHERS : "A new Ophiuroid from Upper Cretaceous Strata of Bathurst Island, Northern Territory." PALAEONTOLOGY.

WITH THE EDITOR : "Australian Mesozoic Trigoniids". This paper is to be published as a Bureau of Mineral Resources Bulletin.

IN PREPARATION : "Marine Mollusca from the Lower Cretaceous strata of northern portion of the Northern Territory". Work on this paper continued intermittently for the last two years, and is approaching final stages.

B.M.R. RECORDS

1. 1961/153: "Progress Report on the Field Activities in the Northern Territory during 1961 Field Season."

2. 1962/11: "Notes on Australian Lower Cretaceous Palaeogeography".

3. 1962/20: "A new Ophiuroid from Upper Cretaceous Strata of Bathurst Island, Northern Territory."

4. 1962/73: "The Mesozoic strata of Calvert Hills 1:250,000 Sheet area".

5. 1962/82: "The Mesozoic strata of Roper River and Urapunga 1:250,000 Sheet areas."

6. 1962/83: "The Mesozoic strata of Mt. Young 1:250,000 Sheet area."

7. 1962/84: "The Mesozoic strata of Katherine and Fergusson River 1:250,000 Sheet areas"

8. 1962/85: "The Mesozoic strata of Bauhinia Downs 1:250,000 Sheet area."

FIELD WORK

During 1962, four months were spent in the field examining Lower Cretaceous strata in three areas in Queensland as well as in the Northern Territory.

In the eastern Queensland area, Lower Cretaceous strata and fossils were sampled and collected in the vicinity of Maryborough and Rockhampton and await detailed examination.

In the western Queensland area, the Lower Cretaceous inland sedimentary belt of the Northern Territory was found to extend as far as the southern portion of the Duchess 1:250,000 Sheet area (see appended map). Outcrops mapped previously as "Undifferentiated Mesozoic" and "Upper Jurassic" and as "Less Sandstone (?Upper Jurassic)" on geological maps of western Queensland have been correlated with the non-marine basal sandstone of the inland sedimentary belt of the Northern Territory, while the Polland Waterhole Shale of the Mt. Isa and Camooweal 1:250,000 Sheet areas was correlated with the upper claystone of Albian age which in the Northern Territory overlies the non-marine and marine pre-Albian Cretaceous sediments.

The examination of the Mesozoic beds in the northern portion of the Northern Territory continued with a visit to Arnhem Land, Hodgson Downs 1:250,000 Sheet area, and Brunette Downs 1:250,000 Sheet area. The Neocomian marine beds which crop out along the south-western periphery of the Gulf of Carpentaria (area 2 on the appended map), have been found to extend into the Blue Mud Bay and the Mt. Marumba 1:250,000 Sheet areas in Arnhem Land. Mesozoic sediments on the Bauhinia Downs and on the Brunette Downs 1:250,000 Sheet areas, fall into the Lower Cretaceous inland sedimentary belt of the Northern Territory. Collections of fossils gathered in the Northern Territory are being at present described and dated.

AREAS OF LOWER CRETACEOUS SEDIMENTATION IN THE NORTHERN PORTION OF THE NORTHERN TERRITORY AND IN NORTH--WESTERN QUEENSLAND

133°30'

11°

129°

138°

141°

17°

23°

MELVILLE ISLAND
COBOURG PENINSULA
JUNCTION BAY
WESSEL ISLANDS
DARWIN
ALLIGATOR RIVER
MILINGIMBI
ARNHEM BAY
CAPE SCOTT
PINE CREEK
MT EVELYN
MT MARUMBA
BLUE MUD BAY
PORT KEATS
FERGUSSON RIVER
KATHERINE
URAPUNGA
ROPER RIVER
AUVERGNE
DELAMERE
LARRIMAH
HODGSON DOWNS
MT YOUNG
PELLEW
WATERLOO
VICTORIA RIVER DOWNS
DALY WATERS
TANUMBIRINI
BAUHINIA DOWNS
ROBINSON RIVER
MORNINGTON
LIMBUNYA
WAVE HILL
NEWCASTLE WATERS
BEETALOO
WALLHALLOW
CALVERT HILLS
WESTMORELAND
BURKETOWN
BIRRINDUDU
WINNECKE CREEK
SOUTH LAKE WOODS
HELEN SPRINGS
BRUNETTE DOWNS
MT DRUMMOND
LAWN HILL
DONOR'S HILL
TANAMI
TANAMI EAST
GREEN SWAMP WELL
TENNANT CREEK
ALROY
RANKEN
CAMOOWEAL
DOBBYN
THE GRANITES
MT SOLITAIRE
LANDER RIVER
BONNEY WELL
FREW RIVER
AVON DOWNS
MT ISA
CLONCURRY
HIGHLAND ROCKS
MT THEO
MT PEAKE
BARROW CREEK
ELKEDRA
SANDOVER RIVER
URANDANGI
DUCHESS
LAKE MACKAY
MT DOREEN
NAPPERBY
ALCOOTA
HUCKITTA
TOBERMORY
GLENORMISTON
BOULIA

1
2
3
4

Darwin
Pine Creek
Katherine
Mataranka
Birdum
Daly Waters
Newcastle Waters
Helen Springs
Tennant Creek
Camooweal
Mt Isa
Cloncurry
Duchess
Boulia

NORTHERN TERRITORY

QUEENSLAND

SCALE

100 50 0 50 100 Miles

Reference

- Outcrops of Lower Cretaceous Sediments
- Approximate Boundaries of Sedimentation
- State Boundary
- Highway

1 Darwin Area. Marine Sandstone and Siltstone (Aptian - Turonian)

2 Epicontinental Marine and Lacustrine Sandstone and Conglomerate (Neocomian - Aptian) overlain by Marine Siltstone (Upper Albian)

3 Inland Belt of non-marine sandstone and siltstone (Aptian - ?Albian) overlain by Marine Siltstone (Upper Albian)

4 Great Artesian Basin Sediments (Aptian and Albian)

Bureau of Mineral Resources, Geology and Geophysics August 1962

NT/16 A.M.

APPENDIX

Notable Discoveries and Identifications

1. Discovery of Tertiary land fossils - Alcoota Bone bed.

2. Discovery of sponges in the Precambrian of Northern Territory.

3. Discovery of a Palaeozoic pipe-rock sequence, Arnhem Land.

4. Identification of Ordovician strata in South Australia (Dullingari Well).

5. Graptolites and complete Ordovician trilobites in the Amadeus Basin.

6. Recovery of a reptile skull in the Artesian Basin from the Toolebuc Limestone member of the Cretaceous Wilgunya Formation.

7. Identification of the trilobite Nepea in the early Middle Cambrian of the Alice Springs Area.

8. Earliest known Cambrian(early Middle-Є) conodonts.

9. Succession of six assemblages in the Cambrian-Ordovician transition (Alice Springs area).

10. Late Tremadocian pilekiid trilobite in Dead Horse Anticline (Lake Amadeus Sheet).

11. Bathyuriscops (Ordovician trilobites) in Kazakhstan, Argentina, central Australia, North America.

12. Fragment of 19" trilobite of the "Asaphus" howchini group in Johnnys Creek anticline (Lake Amadeus Sheet).

13. Identification of Devonian or Lower Carboniferous rocks instead of the expected Permian, at shallow depth beneath the Cretaceous in Wandagee Core Hole No.1.

14. Stratigraphic subdivision of the Permian Middle Bowen Beds of Queensland.

15. Detection of a stratigraphic break in the Permian sequence of Wallal No.4 and 4A Bores.

16. Extension of Neocomian shallow marine strata of the south-western periphery of the Gulf of Carpentaria into Mt. Marumba and Blue Mud Bay 1:250,000 Sheet areas, Arnhem Land.

ACTIVITIES OF THE MICROPALAEONTOLOGICAL GROUP

by

G.R.J. Terpstra

GENERAL

During the year 1962 the micropalaeontological section was joined by:

E.A. Hodgson (as a palynologist), on 22nd January, A.R. Lloyd (as a micropalaeontologist to work on foraminifera), on 16th February, and Miss Aino Jaatinen (as a technical assistant), on 15th January.

D.J. Belford continued his studies at the Australian National University and A.R. Lloyd was away from the laboratory from July to October on a field assignment.

Three students were employed in the laboratory during the 1961/62 vacation.

Some time was spent by the staff considering the requirements and design of the micropalaeontological laboratory in the proposed new Bureau building.

A total of 36,380 samples were handled in the section during 1962, (26,000 more than the previous year). These consist of cores and cuttings of subsidized and unsubsidized wells and water bores and of outcrop samples, mainly collected by Bureau geologists from the Northern Territory, Queensland and Papua - New Guinea. (See Appendix 'A'). All samples have been recorded and stored either in the Bureau Museum, the sample store at Fyshwick or in the basement of the Administrative Building.

744 thin sections were prepared, 1210 samples were washed and studied for foraminifera, radiolaria and ostracods, 380 samples were treated with acetic acid to extract conodonts, and 532 samples were treated for pollen and spores. Registration of slides in the micropalaeontological collection continued. A collection of types of Fusulinidae from the Carboniferous and Permian of North America prepared by Mr. W. Ellis Hall, Midland Texas, was donated by Dr. I. Crespin to the Bureau Museum.

FORAMINIFERA

G.R.J. Terpstra examined surface samples collected by the field parties in Queensland, Northern Territory and Papua - New Guinea and studied cores and cuttings from subsidized wells. Seventeen wells were examined and stratigraphical sequences of marine Lower Cretaceous and marine Permian have been established. Reports have been made on samples from Mornington Island Well No. 1 and Moonie Well No. 1 and on surface and outcrop samples collected by the B.M.R. field parties.

A collection of thin sections from limestone samples from Woodlark Island, Papua, was studied, which established a Lower Miocene (Tertiary 'e' stage) age for the rocks. A collection of thin sections of limestone samples from the Western Highlands District, T.P.N.G., was further examined and rocks of Upper Cretaceous, Upper-Middle Eocene and Lower

Miocene were identified. Specimens of the genus Hauthenina, previously not recorded from Papua and New Guinea were found. Considerable time was spent in studying the existing foraminiferal collections, and the sorting out of literature and reports and on general administrative matters.

A.R. Lloyd worked and reported on samples from Portuguese Timor, Gazelle Peninsula New Britain, and on cores and cuttings from Westgrove No. 1. Samples were examined from Mornington Island No. 2, and S.E.O. Beachport No. 1. In Mornington Island No. 2 a sequence of marine Lower Cretaceous was established and in Westgrove No. 1 Permian fossils were found between 2,000 and 4,130 feet. A detailed micropalaeontological study is being carried out on the the Wreck Island and Heron Island bores.

CONODONTS

P.J. Jones continued the study of conodonts from Cambrian and Ordovician limestones of the Georgina and Amadeus Basins, with two aims in view. Firstly, to establish the conodont sequence in relation to the known trilobite and brachiopod faunas, and secondly, to test their zonal value. So far, conodonts have been found in eight successive horizons from early Middle Cambrian to early Upper Ordovician. In addition to conodonts, the insoluble residues have yielded phosphatic brachiopods, silicified trilobites, and sponge spicules.

Work on the Georgina Basin Core-holes has been started; a preliminary result shows that both GRG 1 and GRG 5 have penetrated Upper Cambrian sediments.

Examination, in collaboration with A.A. Öpik, of cores from below the Permian in Dullingari No. 1 Well, S.A., revealed the presence of graptolites, that established an Ordovician age.

A short paper was prepared in collaboration with P.R. Evans on "New Applications of Micropalaeontology in Australia" for the Geneva Conference on Scientific Development of Under-developed Countries.

SPORES AND MICROPLANKTON (P.R. Evans, E.A. Hodgson).

Studies of samples from oil wells formed the major part of the year's activities. Forty two well sections were examined. Based on experience of collecting fossiliferous outcrop samples from the Triassic of the Sydney Basin in the previous year, collections of outcrop material were made from the Permian of the Hunter Valley (E.A.H.) and from the Permian, Triassic and Jurassic of the Springsure and Taroom areas of the Bowen and Surat Basins (P.R.E.). Outcrop material from other parts of the Bowen Basin was submitted by field parties but did not give good results. On the other hand, material submitted by Frome-Broken Hill Pty Ltd from the Cretaceous of the Otway Basin was suitable to make general stratigraphical conclusions. Seismic shot-hole material has also been employed as a compromise between the needs for accurately located outcrop samples and for material fresh enough to retain the fossils.

Investigations employing this material were guided mainly by the need to confirm and, where necessary, to elaborate the spore distribution framework derived from the previous year's work. Subsidized wells were very useful for this purpose and discussions on coring and sidewall coring programmes with the drilling companies prior to drilling greatly enhanced their value to palynology.

The main results of these activities are outlined below:

Great Artesian and Bowen Basins

1. Recognition of Carboniferous (Durabilla No. 1) and Devonian (Birkhead No. 1, Etonvale No. 1 - original identification by Queensland Geological Survey) below the Artesian sequence.

2. Recognition of two ages of Permian deposition in the Eromanga Basin (Etonvale No. 1). The Middle Bowen seems to be severely reduced or absent to the west of the Nebine Ridge; a condition similar to that recognized in the Murray Basin (q.v.)

3. Subdivision of the Middle and Upper Bowen in the Surat and Bowen Basins. Correlation between wells (Killoran No. 1, Glentulloch No. 1, Westgrove No. 1, 2, Arcadia No. 1) is apparently satisfactory but problems of correlation with outcrop remain.

4. Separation of Permian coal measures from Lower Triassic sandstones and "red beds" (using the Sydney Basin as a reference point) in wells has led to a similar division of the Upper Bowen in the southern part of the Bowen Basin.

5. Better understanding of the extent and nature of the Triassic section (Cabawin East No. 1, Meeleebee No. 1, Wandoan No. 1, Dullingari No. 1, Bauhinia Downs Seismic Survey, B.M.R. Duaringa - Emerald Seismic Survey).

6. Confirmation that the basal sands of the Bundamba Group are Jurassic in age and correlate with the Hospital Hill and Links Sandstones of the Roma area (via Glentulloch No. 1).

7. Confirmation that hystrichospheres occur in the Bundamba Group (associated with foraminifera in Moonie No. 1).

8. Lateral persistence of the Cretaceous microplankton sequence, particularly below the Toolebuc Member, permitting zonation of the lower Wilgunya Formation (Roma Formation) - (Mornington Island No. 1, Cothalow No. 1, St. Andrews Bore and Cabawin No. 1).

9. Recognition in the Gulf of Carpentaria of marine equivalents of the Winton Formation (Mornington Island No. 1).

Otway Basin

1. Tentative subdivision of Upper Cretaceous sections by flagellate zones (Flaxmans Hill No. 1, Mount Salt No. 1).

2. Correlation of the outcropping Lower Cretaceous Merino Group and Otway Group with subsurface sections (Beachport No. 1, Flaxmans Hill No. 1).

Murray Basin

1. Identification of two Permian ages of sedimentation at Oaklands and Coorabin; the upper of coal measures, the lower of ?glacigenes in which foraminifera had been found previously (recently confirmed in Jerilderie No. 1).

2. Recognition of large variations in the abundance of Nothofagus and other pollens that aid correlation of the Lower Tertiary (Bundy No. 1, Balranald No. 1, Wentworth No. 1).

Sydney Basin

Discovery of microfloras in outcrop and bore sections through the Maitland and Dalwood Groups in the Hunter Valley.

Laura Basin

The first bore drilled in the Laura Basin, Marina No. 1, demonstrates the presence of possible marine Lower or Middle Jurassic.

Northern Territory

1. Examination of the Cherry Creek Bore (Amadeus Basin) gave negative results.

2. Realization of a probable Tertiary age of sediments penetrated in the Alice Springs Farm Bore 26.

OSTRACODA

P.J. Jones continued the study of Lower Carboniferous and Upper Devonian ostracods of Western Australia; an outline of preliminary stratigraphic results has been published in the Canning Basin bulletin (No.60). A paper on the ostracod genus Cryptophyllus, and a preliminary report on the ostracods found in WAPET Meda No. 1 has been published. Additional collections of Upper Devonian ostracods has resulted from examination of Babrongan No. 1 and Wondagee No. 1. Babrongan well yielded well-preserved Devonian foraminifera. Fresh-water ostracods, gastropods, and charophyte oogonia were reported from Tertiary limestones on the north-western margin of the Great Artesian Basin.

PUBLICATIONS

D.J. Belford : Miocene and Pliocene Planktonic Foraminifera from Papua-New Guinea. Aust.Bur.Mir.Resour.Bull. 62, 1962

Irene Crespin : Lacazinella, a new genus of trematophore Foraminifera. Cushman Fdn.Foram.Res.

_____ : Foraminifera from Samphire Marsh No. 1, Canning Basin. Appendix D to P.S.S.A. Publication No. 5.

_____ : Foraminifera in Cores No. 1, 2, 3, from Meda No. 1. Appendix A to P.S.S.A. Publication No. 7.

P.R. Evans : Microplankton from BMR 4 and 4A (Wallal) Boreholes. Appendix 5 to Bulletin 60 (Geology of the Canning Basin) by J.J. Veevers and A.T. Wells.

P.R. Evans : The Development of Palynology in Australia (E.C.A.F.E. Conference - Teheran).

P.R. Evans : The Application of Palynology to Stratigraphy in Australia. (E.C.A.F.E. Conference - Teheran).

P.J. Jones : Ostracod assemblages near the Upper Devonian - Lower Carboniferous Boundary in the Fitzroy and Bonaparte Gulf Basins. Appendix 3 to Bulletin 60 (Geology of the Canning Basin) by J.J. Veevers and A.T. Wells, 277-281.

P.J. Jones : The Ostracod Genus Cryptophyllus in the Upper Devonian and Carboniferous of Western Australia. Aust.Bur.Min.Resour. Bull. 62 (3), 1-37.

P.J. Jones : Micropalaeontological Examination of the Lower Carboniferous - Upper Devonian Sequence of Meda No. 1. Appendix A to P.S.S.A. Publ.7, 31-2.

PUBLICATIONS IN PRESS

Irene Crespin	:	Arenaceous Foraminifera from the Lower Cretaceous of Australia. Aust.Bur.Min. Resour. Bull.63, 1962.
P.R. Evans	:	Palaeontological Appendices to P.S.S.A. reports on Frome Rocks No. 1, Thangoo Nos. 1 and 1A, Betoota No. 1.
P.R. Evans and P.J. Jones	:	New Applications of Micropalaeontology in Australia U.N. Conference (Geneva, 1962) on Scientific Development of Under-developed Countries.
P.J. Jones	:	Palaeontological Appendix to P.S.S.A. report on Frome Rocks No. 2.

RECORDS BY THE MICROPALAEONTOLOGICAL SECTION

P.R. Evans	:	A Palynological Examination of Samples from the Merino Group, Victoria. 1961/155.
P.R. Evans	:	A Palynological Report on A.O.G. Wentworth No. 1, N.S.W. with observations on the Permian of the Oaklands - Coorabin Area of the Murray Basin. Rec. 1962/4.
Irene Crespin & P.R. Evans	:	Cretaceous microfossils from the Hay River Area, Northern Territory.
P.R. Evans	:	Palynological Observations on F.B.H. Flaxman's Hill No. 1 Well. 1962/57.
P.R. Evans	:	Appendix A (Explanatory Notes, Julia Creek Sheet Queensland by R.R. Vine and W.Jauncey.) Notes on a Palynological Examination of St. Andrews Bore, Julia Creek, Queensland.
P.R. Evans	:	Microfossils Associated with the "Bundamba Group" of the Surat Basin, Queensland. 1962/115.
P.R. Evans	:	A Revised Palynological Report on S.P.L. No. 1 (Birkhead) Well, Great Artesian Basin, Queensland.

APPENDIX "A"

A. Cores and Cuttings were received from:

Queensland:

South Pacific	Birkhead No. 1
U.K.A.	Burunga No. 1
Phillips-Sunray	Durabilla No. 1
Phillips-Sunray	Etonvale No. 1
A.A.O.	Glentulloch No. 1
Phillips Sunray	Gumbardo No. 1
Nortex	Jambin No. 1
A.O.G.	Jerilderie No. 1
A.A.O.	Killoran No. 1
Phillips Sunray	Kogan No. 1
Phillips Sunray	Kogan South No. 1
A.A.O.	Kooringa No. 1
O.D.N.L.	Maranda No. 1
C.B. Cabot Blueberry	Marina No. 1
A.A.O.	Meeleebee No. 1
U.K.A.	Middle Creek No. 1
U.K.A.	Moonie No. 1
U.K.A.	Moonie No. 3
L.H. Smart O.E.	Orient No. 2
A.A.O.	Penrith No. 1
A.A.O.	Pleasant Hills No. 1
U.K.A.	Wandoan No. 1
A.A.O.	Westgrove No. 1
A.A.O.	Westgrove No. 2
U.K.A.	Yarril Creek No. 1

New South Wales

Woodside Oil	Balranald No. 1
Woodside Oil	Bundy No. 1
A.O.G.	Mount Hunter No. 1
Farmout Drillers N.L.	Stockyard Mountain No. 1

South Australia

South East Oil and Gas Syndicate:	Beachport No. 1
Beach Petroleum	Geltwood Beach Structural Hole No. 1 and 2.
Beach Petroleum	Grange No. 1
Oil Development N.L.	Mount Salt No. 1
Oil Development N.L.	Mount Salt Structure Holes 1 - 5
Delhi-Aust. Santos	Dullingari No. 1

West Australia

W.A.P.E.T.	Babrongan No. 1
W.A.P.E.T.	Eneabba No. 1
W.A.P.E.T.	Hill River No. 1
W.A.P.E.T.	Hill River No. 2
W.A.P.E.T.	Jurien No. 1
W.A.P.E.T.	Wandagee C.H. 1-3
W.A.P.E.T.	Wandagee No. 1

Northern Territory

Waterbores:

W.R.B./Zk and W.R.B./ZG.
Nemo Water Bore, Alice Springs
Penola Downs No. 11
Rockhampton Downs No. 32
South Barkley No. 7
Alice Springs Farm Bore 26

Victoria

Oil Development N.L.	Anglesea No. 1
F.B.H.	Pretty Hill No. 1
Arco and Woodside	Wellington Park No. 1

B. OUTCROP SAMPLES WERE RECEIVED FROM :

Australia

Alice Springs Farm Area, N.T.
Colac 4-mile Sheet area, Victoria.
Cooktown Field Party, Queensland
Darwin, Pine Creek, Katherine 4-mile Sheet areas, N.T.
Manuka, Richmond 4-mile Sheet areas, Queensland
Razorback Range, New South Wales
Walhallow, Mount Young 4-mile Sheet areas, Queensland.

New Guinea - Papua

South Coast of Papua
Rabaul
Wabag Area Western Highlands
Woodlark Island

Foreign

Portuguese Timor.