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Preliminary report 1949 Ord-Victoria  
region, Northern Australia Regional  
Survey

by

D.M. Traves

PRELIMINARY REPORT 1949 ORD - VICTORIA REGION.

NORTHERN AUSTRALIA REGIONAL SURVEY.

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INTRODUCTION

The Northern Australia Development Committee nominated the region of the Ord and Victoria rivers to be surveyed by the Northern Australia Regional Survey, when the Barkly Region had been completed.

The immediate objectives of the Survey are "to accurately record the nature of the country, to establish a sound basis upon which the production possibilities of the Region may be appraised and to make general recommendations concerning development and further investigations." It was decided that the Region should include the Army Four Mile Map Sheets of Delamere, Victoria River Downs, Wave Hill, Birrundudu, Limbunya, Waterloo, Auvergne, Port Keats, Medusa Banks, Cambridge Gulf, Lissadell, Dixon Range, and Gordon Downs, and that the field work would be commenced during the 1949 dry season. The region covers an area of 70,000 square miles; approximately two-thirds of which lie in the Northern Territory and one-third in Western Australia.

The scientific personnel consisted of:- G.A. Stewart, Acting Officer in Charge, Pedologist, C.S.I.R.O.; R.A. Perry, Botanist, C.S.I.R.O.; M. Lazarides, Botanical Assistant, C.S.I.R.O.; and the writer. W.C. Smith, Bureau of Mineral Resources, joined the party for six weeks to carry out more detailed geological work in the Paleozoic basin and Dr. Opik, Bureau of Mineral Resources, spent a month in the Region visiting fossil localities. The non-scientific personnel consisted of:- H.J. Mason, Supply and Transport Officer, C.S.I.R.O.; E.L. Corby, Mechanic, C.S.I.R.O.; R.W. Munyard, Technical Assistant, C.S.I.R.O.; J.W. Snowie, Cook, C.S.I.R.O.; and H. Perry, Assistant, C.S.I.R.O.

TECHNIQUE AND METHODS.

In 1948 the R.A.A.F. photographed the Region, and, before the 1949 field season, the photos were laid out in rough mosaics and photographic patterns recognised and delineated. These patterns are

produced by the recurrence of surface features of the landscape including topography, rock outcrops, stream patterns, distribution of vegetation, and some soil features. Then traverses were planned to give cross-sections of these patterns. Twelve base camps were arranged, each of approximately one week's duration, at convenient points along the route. The traverse party worked between base camps while the assistants moved forward to establish the next camp. On arrival at base, two or three short traverses of one to three days duration were planned, radiating out from the camp. The traverse vehicles generally consisted of a weapon-carrier and jeep; the base camp vehicles were a weapon-carrier and trailer, jeep and trailer, and a 3 ton garage waggon and trailer. Field work was commenced at Katherine on 1st June, and the party returned to Katherine on 22nd August. Dr. Opik arrived on the 23rd and flew with the writer to Fitzroy Crossing, and thence by jeep we revisited the fossil localities of the Paleozoic basin of the East Kimberleys.

#### STRATIGRAPHY.

The N.T. - W.A. border approximately divides the Region into two separate geological units. To the east is the stable land surface of Upper Proterozoic sediments and Lower Cambrian volcanics with a thin discontinuous capping of Cretaceous sediments. To the west is a more complex unit of metamorphic and granitized Pre-Cambrian rocks, covered to the north by Cambrian, Devonian, Carboniferous, and Permian sediments. The stratigraphic units represented are listed below:-

#### Pre-Cambrian -

- (a) Between Halls Creek and Wyndham metamorphosed rocks (slates, schists, phyllites, and greenstones) occur. These have been correlated previously with the "Mosquito Creek series" of Western Australia. In places these older rocks have been intruded by igneous rocks of uncertain age.
- (b) In the centre of the metamorphics, granites and granitized sediments are found.

- (c) Upper Proterozoic sediments, mainly sandstones, limestones, and shales, cover a large portion of the Region. Tentatively these have been named the Victoria River Group, and are of Nullagine Age.

Cambrian -

Antrim Plateau  
Volcanics

- (a) In the southern, central, and eastern portions of the Region there are large areas (approximately 10,000 square miles) of Lower Cambrian volcanics - "the Antrim Plateau basalts." (David, 1931). These consist of flows, sills, and dykes, and also include tuffaceous material. In the north-western portion of the Region there are numerous small outcrops of these volcanics.

Nagri Limestone

Mt. Elder sandstone

- (b) In the Upper Ord River area, Middle Cambrian sediments overlie the volcanics in the Argyle, Rosewood, and Hardman basins. The "Negri Series" (Matheson and Teichert, 1945) consists of interbedded limestones and shales containing trilobites, hyolithes, and graptolites, overlain by the "Mt. Elder Series" (Matheson and Teichert, 1945) of sandstones and quartzites.

Carlton Formation

- (c) Cambrian sandstones and oolitic limestones outcrop to the east of Carlton Homestead. Reeves (1948) collected trilobites and brachiopods from this area. Fossils collected this field season are:-

Trilobitae: Solenoparia n.sp., Damesella sp. Blackwelderia sp.

Brachiopoda: Acrotreta sp., Obolus sp., Lingullela sp.

This fauna represents the top of Middle Cambrian. Sediments overlying this fossiliferous horizon probably belong to the Upper Cambrian.

## Ordovician

Overlying the Cambrian sediments to the east of Carlton Homestead, and without a visible break in sedimentation, are Lower Ordovician glauconitic sandstones containing conodont genera, Drepanodus Pander and Acontiodus Pander, and the brachiopod Lingulella.

## Devonian

Cockatoo Sandstone and  
Burt Range Limestone

Rocks of Devonian age are found in the Burt Range area, east of Carlton Homestead, around Winbing Outstation, and possibly in the Ragged Range.

In the Burt Range area, the sequence is the "Cockatoo Series" (Matheson and Teichert, 1945) overlain by the fossiliferous "Burt Range Series" (Matheson and Teichert, 1945) containing brachiopods, corals, and gastropods. Both these formations are placed in the Upper Devonian.

The sandstones of Mt. Cecil were included in the "Cockatoo Series" by Matheson and Teichert (1945) on the evidence of a Leptophloeum that they collected. Reeves (1948) mapped the outcrop as Nullagine.

This year lamellibranchs were found at the southern end of the mountain. The area is strongly faulted, and from photo-interpretation it is probable that part of the outcrop is Nullagine, flanked by the Devonian sandstones.

The conglomerate and sandstone of the Ragged Range overlie fossiliferous Middle Cambrian sediments, and on lithology have been correlated with the Cockatoo sandstone.

In the Carlton area, limestones to the north east of the Ordovician outcrop contained a spirifer, non-diagnostical Radiolaria, and a few indeterminable Ostracods. From these

fossils it is not possible to say whether the age is Middle or Upper Devonian. Farther to the north-east round Ninbing, there are outcrops of Upper Devonian fossiliferous limestone beds, belonging to the Burt Range Limestone.

## Carboniferous -

- (a) The sandstones, containing worm burrows, forming the upper portion of the "Burt Range Series" (Matheson and Teichert, 1945) have been placed, tentatively, in the Carboniferous, as the Burt Range Limestone is thought to be at the top of the Devonian.
- (b) Overlying the sandstone is the highly fossiliferous Mt. Septimus Limestone (Reeves, 1948) containing corals, bryozoa, crinoids, brachiopods, gastropods, trilobites, and ostracods, of Lower Carboniferous age.

Mt. Septimus  
Limestone

## Permian -

- (a) The sandstones overlying the Mt. Septimus Limestone are placed, tentatively, in the Permian. No fossils have been recorded from these beds.
- (b) The "Weaber Range Series" was described by Reeves (1948) as sandstones, conglomerates and sandy shales. This year, plant fossils (Gordaites - like leaves, Calamites stems, and stigmaria) were observed in the upper sandstones at Point Spring, and marine fossils (brachiopods) in the lower sandstones. Outcrops of fossiliferous limestones at Sandy Creek and fossiliferous sandstones at Flapper Hill have been included in the Weaber Range Group. Further stratigraphical work may show that all Permian sediments bordering the Joseph Bonaparte Gulf can be placed in the Port Keats Group, (Noakes, 1947).

## Weaber Range Group

Cretaceous -

Mullaman Group

In the north-eastern portion of the Region many of the mesas have a laterized capping of Lower Cretaceous sediments. These form an extension of the Mullaman Group (Noakes, 1947), and both the marine and lacustrine sediments were examined. Taxites, Sphenopteris, Thinnfeldia, and Gladophlebis were collected from the lacustrine sediments.

Tertiary -

White Mountain  
Formation

(a) Two small areas of lacustrine sediments cap hills of Cambrian sediments north of the Ord River Homestead. The sediments are mainly silicified limestones, containing Corellis harmanni, Planorbina sp.ind., and Ostracodes sp. ind., of probable Miocene age.

(b) In many places in the Region the Tertiary land surface has not been dissected or truncated and Tertiary swamps and lateritic profiles mask the underlying geology.

Pleistocene -  
Recent

Heavy and light textured Post Tertiary alluvia now form grassy flats, swamps and salt-pans, near the coast and river alluvia and levees border the major streams.

The paleontology and determination of age of the Paleozoic sediments were done by Dr. A. Opik, who is preparing a report on the subject.

Fossils from the Mesozoic and Kainozoic sediments have been examined by Miss Crespin and Dr. Brunnschweiler.

#### SOILS IN RELATION TO UNDERLYING ROCKS.

The presence of a pedologist in the party greatly facilitates the work of the regional geologist when rock outcrops are sparse.

Many stratigraphical boundaries are marked by a distinct change in soil types. For example, the boundaries between the Victoria River Group and the Lower Cambrian volcanics may be mapped by the change in the

soil where the underlying geology is hidden; also, within the Cambrian sediments, the shales and limestones can be mapped separately by their soil characteristics. The following is a list of soil types found in the Region:-

Rock types	Soil types
Pre-Cambrian Metamorphics and Granites.	Shallow Skeletal soils.
Basic granitized rocks containing abundant biotite.	Red Brown Earths.
Sandstones and Quartzites of the Victoria River Group.	Skeletal and sandy podzols.
Limestones of the Victoria River Group and also of the Cambrian, Devonian, and Carboniferous.	Desert loams or similar shallow shallow soils, with small areas of heavy grey soils.
Lower Cambrian volcanics.	Stony heavy textured grey soils.
Cambrian shales.	Heavy textured grey or brown soils.
Paleozoic sandstones.	Deep sandy soils.
Calcic alluvia.	Heavy textured grey soils.
Non-calcic alluvia.	Yellow podzolic soils.

The areas of Tertiary lateritic soils are formed on the Victoria River Group, Lower Cambrian volcanics, and Mullaman Group.

It is worth noting that the heavy textured stony downs formed on the Lower Cambrian volcanics provide the best pastoral country, the downs formed on Cambrian shales, next best, then the other heavy soils. The sandy soils on sandstones and quartzites provide poor grazing country, and the skeletal soils are nearly useless.

#### ECONOMIC GEOLOGY.

Very little mining is being carried out in the Region at the present time. The Halls Creek goldfield is almost deserted and, although silver lead deposits have been discovered in many places north of Halls Creek, none is being worked now.

The area of granites and granitized Pre-Cambrian rocks between Halls Creek and Wyndham provides a geologically favourable area for ore deposits, but, due to the rugged terrain, the area has never



been systematically prospected. Traces of copper are found throughout the Lower Cambrian volcanics, and in some places secondary copper carbonates occur in the overlying Cambrian limestones.

Non-metallic minerals such as barite, ochre, and possibly quartz crystals, and bauxite, occur but generally the high cost of transport from inaccessible areas depreciates their economic value.

(a) Bauxite

The Tertiary land surface is intact over a large area inland from the coastal fall and in many places has been formed on the Lower Cambrian volcanics, thus providing possible areas for the occurrence of aluminous laterites. Chemical analysis of channel samples collected this year from scarps in the lateritic profiles show that in these places the silica content is much too high (ranging from 26% to 70%) for the use of these aluminous laterites as bauxite deposits. However laterites with a lower silica content may occur in other localities.

(b) Ochre

Red and yellow Ochre deposits occur between Carlton and Leguna Homesteads. The red ochre is worked spasmodically and shipped south from Wyndham.

(c) Quartz Crystals

Low temperature quartz crystals, up to two inches long, occur as aggregates of rock crystal, amethyst, and smoky quartz, generally with the pyramidal faces well developed, and the prismatic faces poorly developed. The aggregates are formed in vughs in the Lower Cambrian volcanics and, after erosion, are commonly found littering the surface. Further investigation may lead to the discovery of crystals of commercial value.

(d) Oil

A large thickness of Paleozoic sediments occurs in the Ord River basin, but, so far, insufficient detailed structural mapping has been done to estimate the prospects of finding oil. Farther to the south of the Ord River basin, at

Pompy Springs, a small deposit of asphaltite occurs along a fault line in the Lower Cambrian volcanics. This residue may be from the volcanics, the underlying Nullagine sediments, or from younger sediments which have since been removed.

(e) Underground Water

Supplies of underground water to supplement surface waters during the dry season are essential to the cattle industry of this region. The geology is so variable that no generalisations may be made, and detailed mapping is necessary to determine the essential factors governing the supply of underground water. In the Lower Cambrian volcanics (underlying the best grazing country), the water collects in cracks and joints, so that favourable bore sites are very difficult to determine.

Most of the bores in the Region are sub-artesian, ranging in depth from 50 feet to 700 feet, and the average water level is approximately 100 feet. Two flowing bores were seen, one at the Wave Hill Police Station (Depth 700'), and one at Soda Spring, east of Argyle (Depth 30 feet).

FUTURE WORK.

It has been decided that the survey should remain in Canberra during 1950 to complete the maps and report on the Barkly Region. The aerial photographs of the Ord-Victoria Region will then be laid out in mosaics, traverse data plotted, and geological boundaries marked, and then transferred to photo-compilation maps prepared by National Mapping Section, Department of Interior.

University students, employed by the Bureau during the University vacation, will complete the interpretation of the detailed structural geology of the Paleozoic basin in the Ord River area. This detailed structural mapping should cover the Lissadell, Waterloo, Limbunya, Auvergne, Pt. Keats, and Medusa Banks Army 4-mile sheets.

Traverses for the 1951 field season will be planned so as to investigate key areas, especially those in which problems have

been found during the photo-interpretation, and isolated areas which were not visited during 1949.

At the end of the 1951 field season the final mapping will be completed, and reports on the Region will be prepared.

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Geologist.  
N.A.R.S.

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CANBERRA, A.C.T.