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The Geology of the Country between Arthur's Lakes and the Lake River, Tasmania

By

ALAN H. VOISEY

Department of Geology and Geography, the New England University College, Armidale

(Communicated by Professor S. W. Carey)

PLATE IV and FIG. 1

INTRODUCTION

The country between Arthur's Lakes and the Lake River shown on Plate IV is drained in the western part by Tumbledown Creek and Jones Rivulet which flow into the Eastern Lake, and in the eastern by the tributaries of the Lake River. The escarpment of the Western Tiers marks the eastern margin of the Central Plateau of Tasmania.

Mapping was carried out with the assistance of aerial photographs and the structure-lines of the dolerites were obtained from them.

This paper is submitted as a small contribution to the aerial mapping of Tasmania.

GENERAL GEOLOGY

Three main groups of rocks were found outcropping in the area mapped.

(i) A series of metamorphosed rocks of probable Cambrian age consisting of slates, quartzites and 'porphyroids' which is laced by quartz veins.

(ii) A series of fossiliferous sandstones, shales and glacial beds of Permian age.

(iii) The Jurassic dolerites which are in the form of sills injected into the other formations.

There are also deposits of glacial material resulting from the presence of the Pleistocene Ice sheets and masses of dolerite talus of more recent origin.

Alluvium occupies areas marginal to the main streams.

(1) CAMBRIAN

No fossils have been found in the metamorphosed rocks assigned to this system but S. W. Carey (verbal communication) regards them as being the equivalents of similar beds of Cambrian age elsewhere in Tasmania.

Road cuttings expose the beds in the neighbourhood of 'Parknook'. They continue south along the eastern slopes of O'Connor's Peak. Another area of them lies around E. Casey's house beside the Lake River.

The rocks are principally slates with well developed cleavages, grading into phyllites. Interbedded with them are the sheared tuffs which are called 'porphyroids'. Good outcrops may be examined along the south-eastern flanks of O'Connor's Peak.

The Cambrian beds are characterised by veins of milky quartz and fragments of these in the soil were used to determine the presence of the slates when outcrops were few. Bands of quartzite are present in the vicinity of E. Casey's house and were especially well developed close to 'Billop' station just beyond the northern limit of the map.

(2) PERMIAN

Permian beds outcrop on the slopes of the Western Tiers running north-west from the vicinity of W. Casey's house. Another belt runs along the side of the ridge west of E. Casey's house.

The hills north of 'Parknook' are composed of glacial beds probably corresponding to the Basal Glacial Stage (Voisey 1938). Outcrops are very poor indeed and pebbles of West Coast Conglomerate and other rock types in the soil have been used to determine the limits of this unit.

Several other small outcrops are shown on the map. It is probable that they also underlie deposits of dolerite talus and accumulations of boulders in the foothills of the Western Tiers.

Other beds may be assigned to the Ferntree, Woodbridge, Grange and Granton Stages of the Permian System. (See Voisey (1938); Lewis (1946) and Prider (1948).)

The only section which gives any continuous sequence is that just west of W. Casey's house along the Hydro-Electric Commission's Pipeline Survey line between pegs 1 and 13. Even here outcrops leave much to be desired though it is possible to recognise some of the established horizons. Laterally, from this section the vegetation cover and presence of much dolerite talus made mapping of the beds virtually impossible.

The section measured from the Lake River thence up the traverse line reveals a maximum of 1500 feet of sediment but exposures on the low ground are rare and intermittent. Higher in the sequence on the steeper slopes sandstones and mudstones containing marine fossils outcrop. These probably correspond to the Granton facies. Conglomerates which indicate the presence of the Woodbridge Stage follow. About 600 feet below the dolerite base, which here is at approximately 2100 feet, lies the Risdon Sandstone horizon (Carey and Henderson, 1945). The remainder of the section consists of light coloured mudstones of the usual Ferntree type. Occasional fossils were found in this unit.

No comprehensive collection of fossils was made but the usual Permian suite including *Spirifer, Martiniopsis*, Fenestellidae &c. is present.

(3) JURASSIC DOLERITES

Most of the area is comprised of dolerite. The rock is particularly conspicuous along the north-eastern margin of the Central Plateau where the main sill is approximately 2000 feet thick. The igneous rock also occupies the foothills forming, among others, the prominent O'Connor's Peak.

Although faulting has been responsible for the lower elevation of the dolerite in some parts of the area there is at least one lower sill of considerable thickness as can be seen by a study of the section (fig. 1).

Variations in the petrology of the dolerite mass have been described in some detail by A. B. Edwards (1942). Prider (1948, p. 142) noted that 'at the actual igneous contacts the dolerite is very fine-grained, dense and microporphyritic, consisting of small phenocrysts of olivine, augite, and plagioclase in an aphanitic groundmass'. Several feet from the contact the dolerite is coarser and grain size is not significant in determining whether the contact is intrusive or faulted.

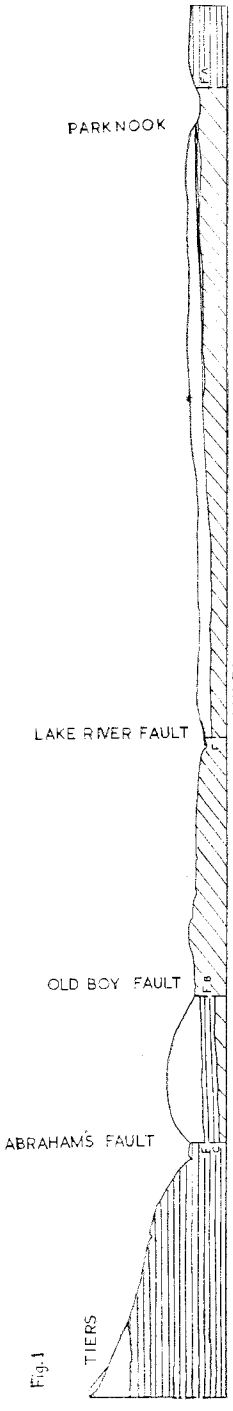
PARKNOOK
LAKE RIVER FAULT
5 MILES
OLD BOY FAULT
ABRAHAMS FAULT
TIERS

Fig. 1

The dolerites have been broken down by weathering processes into boulders which are concentrated on the steep slopes to form deep and extensive masses of talus as indicated on the map. Besides the areas which are almost entirely composed of this loose material the lower slopes are strewn with boulders which obscure most of the underlying Permian formations. These sedimentary beds may be overlooked altogether where they are weathered deeply and only occasional boulders of dolerite protrude through the soil cover.

Geological Structures

The Cambrian suite has been tightly folded and metamorphosed, dips ranging from 45° to 50° usually to the north or north-east.

The Permian strata dip gently, apparently at only a few degrees.

The dolerite is in the form of two or more large sills. The lowest has been injected along the unconformity between the Cambrian and Permian formations. Some of the basal Permian conglomerates appear to have been caught between the dolerite and the Cambrian basement as pebbles of rocks similar to those in the conglomerates have been found along the south-easterly slopes of O'Connor's Peak and on the north side of Little Billop just north of the area mapped. Pebbles were also found along the eastern face of the ridge which runs west-north-west from E. Casey's house forming an interfluve between Dabool Rivulet and Abraham's Creek. This ridge, together with O'Connor's Mount and Little Billop is composed of the dolerite of the lower sill.

The higher sill has invaded the Ferntree mudstones probably in a position very close to the junction between the Permian and Triassic systems. Between the two main sills there may be others because the Permian sequence south of W. Casey's house appears to be broken by sheets of dolerite in several places

Large faults have been responsible for breaking the north-east section of the area into a number of blocks. S. W. Carey (1946) discusses them in a general way as the 'Western Tiers Fault System'. He shows diagrammatically (p. 38) two faults giving rise to a step between the lowlands and the Central Plateau. He states that the faults all seemed to be normal with steeply dipping fault planes showing little evidence of strike-shift movement. Carey gives the age of this faulting as Lower Miocene.

The faults indicated on the map (Plate IV) have been determined principally by field work assisted by the stereoscopic examination of aerial photographs.

Fault A which might be referred to as the Parknook Fault is demanded by the relationships between dolerite, Permian and Cambrian outcrops and its presence is supported further by the anomalous steep dips of Permian sandstone outcropping on the hilltop just west of the point where the road crosses the fault.

Fault B or Old Boy Fault is easily picked out by the topography as it lies along the front of a high dolerite ridge. Fault C or Abraham's Fault is responsible for the steep southern slope of this ridge. It brings the dolerite up against the Permian sediments.

The western limits of these faults could not be determined satisfactorily because of the thick vegetation cover, poor outcrops and scattered dolerite boulders. The apparent termination of Old Boy Fault against the escarpment of the Tiers strongly suggests that a major fault runs along the cliffs. This could perhaps change its direction and pass into Abraham's Fault.

Yet another fault which may be referred to as the Lakes River Fault must run in a north-easterly direction under the flats of the Lake River and thence along the lower part of Dabool Rivulet. This is demanded by the presence of Cambrian

beds around E. Casey's house, west of the river. As the O'Connor's Peak sill dips gently to the west it is difficult to account for this occurrence without postulating such a fault. No outcrops of the fault were seen so it is not marked on the map.

Fault D or O'Connor's Fault has been inferred because a steep sided valley is shown on the aerial photographs in this position and structure-lines strongly suggest such a fracture.

In addition to these larger faults there are a number of small dislocations, shears and joints in the rocks, particularly in the dolerite. These structure lines are conspicuous on aerial photographs and are shown on the map. Prider's map of the Tarraleah Area (Prider 1948) shows similar 'shear zones'. Carey (1946 pp. 36-37) says of those on his map 'there are two pronounced systems of joints which show up strongly on the aerial photographs. One trends north-west and the other north-east. Movement in these directions varies considerably, the structures ranging from joints with little or no movement to important shear zones'.

PHYSIOGRAPHY

About three-quarters of the area mapped consists of a glaciated plateau and the other quarter includes portion of the marginal escarpment and foothills. Most of the Eastern and portion of the Western of the two Arthur's Lakes are included.

The surface of the plateau is very uneven though most of it lies between 3700 and 4200 feet. The highest point, Brady's Lookout, rises to 4497 feet.

Numerous marshes separate boulder-strewn dolerite ridges. These marshes are practically treeless but the rocky hills support stunted eucalypts. Ice action has resulted in the formation of lakes and marshes and the deposition of many large boulders. The last named are very wide-spread—practically every marshy area having a share.

Inequalities in the pre-glacial surface may have been tectonic in origin but fluvial erosion must have played a large part in shaping the country. There does not seem to be any real evidence to suggest that Arthur's Lakes are in a down-faulted area although there could be a fault along the boundary of the higher western block which starts close to the western margin of the map (Plate IV).

It is probable that the lakes are due to the action of an ice-sheet which over-deepened what was previously a wide river valley. Morainic material lies at the southern end of the Western Lake.

Little Lake is one typical of glacial origin. It drains into the Eastern Lake through Jones Rivulet—a small stream in a wide flat valley.

The eastern escarpment of the Central Plateau forms the well known Western Tiers which rise 4000 feet above the central valley of Tasmania. Faulting along it and the geological history of the Launceston District have been dealt with by Carey (1946).

To some extent the Lake River shows the characteristics of an antecendent stream. In the south-east corner of the map where it is following the junction between Cambrian and Permian rocks—both more easily eroded than dolerite—it has a wide flood-plain. The valley narrows rapidly where the stream cuts through dolerite and a narrow gorge is developed. It widens once more where the Cambrian beds are met near E. Casey's house. Again the valley is restricted in the dolerite country west of O'Connor's Peak, widening out once more in the Cambrian area shown in the north-east corner of the map.

ACKNOWLEDGMENTS

The investigations which led to the mapping of the country just described were carried out for the Hydro-Electric Commission of Tasmania and I desire to thank the Commission for allowing me to publish this paper.

I am deeply indebted to Professor S. W. Carey, Geological Consultant to the Commission who introduced me to the area and whose advice and assistance were most welcome. I also desire to thank Mr. Frank Brown of Hobart and Mr. William R. Blevin of New England University College, Armidale, for their assistance in the field.

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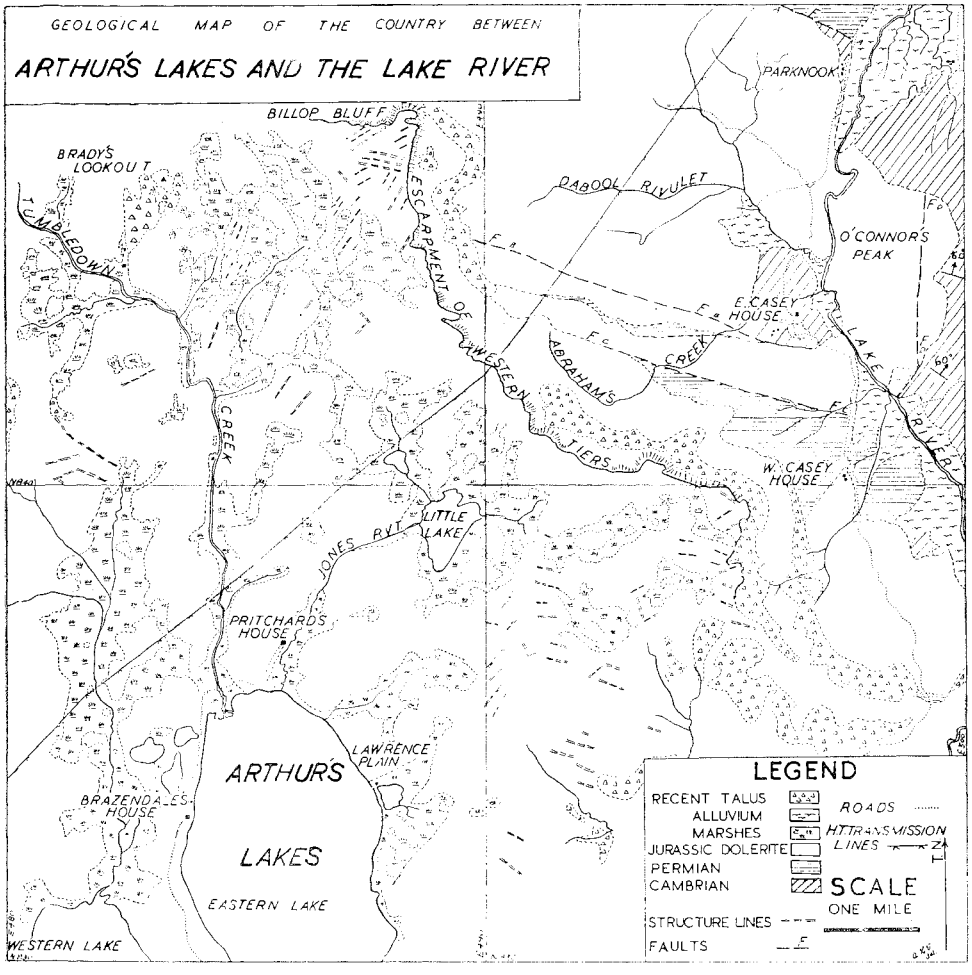
GEOLOGICAL MAP OF THE COUNTRY BETWEEN
ARTHUR'S LAKES AND THE LAKE RIVER
BILLOP BLUFF
BRADY'S LOOKOUT
TUMBLEDOWN
ESCARPMENT OF WESTERN TIERS
DABOOL RIVULET
PARKNOOK
O'CONNOR'S PEAK
E. CASEY HOUSE
ABRAHAMS CREEK
LAKE RIVER
W. CASEY HOUSE
JONES R.
LITTLE LAKE
PRITCHARD'S HOUSE
LAWRENCE PLAIN
ARTHUR'S LAKES
EASTERN LAKE
WESTERN LAKE
BRAZENDALES HOUSE
LEGEND
RECENT TALUS
ALLUVIUM
MARSHES
JURASSIC DOLERITE
PERMIAN
CAMBRIAN
STRUCTURE LINES
FAULTS
ROADS
H.T. TRANSMISSION LINES
SCALE
ONE MILE