Prelim Interpretation of Precambrian - Palaeozoic Geology of S.W. Tas

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PRELIMINARY OF INTERPRETATION
OF PRECAMBRIAN-PALAEOZOIC
GEOLOGY OF SW TASMANIA

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Regional No 15

A PRELIMINARY INTERPRETATION
OF THE
PRECAMBRIAN - PALAEOZOIC GEOLOGY
OF S.W. TASMANIA

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000 To: Mr. G.F. Hudspeth.

A PRELIMINARY INTERPRETATION OF THE PRECAMBRIAN - PALAEOZOIC GEOLOGY OF S.W. TASMANIA

Introduction

A generalised geological map of S.W. Tasmania is given in Figure 1; Table 1 summarises the more important aspects of the geological history of the area.

The work is a preliminary interpretation of the geology and it forms part of the regional mapping programme being carried out by Lyell - E.Z. Explorations, a group jointly financed by the Mount Lyell Mining and Railway Company Ltd. and the Electrolytic Zinc Company of Australasia Ltd. This group is responsible for the exploration of an area of 4,500 square miles in S.W. Tasmania, the area covered by the scope of this paper. Obviously the geology of such an area could not be the work of one person and the author makes grateful acknowledgement for the many discussions he has had with the geological staffs of the University of Tasmania, the Hydro-Electric Commission of Tasmania and the two major mining concerns on the West Coast of Tasmania.

General Discussion

The Precambrian strata form the core of S.W. Tasmania and undoubtedly underlie the considerable area which is at present covered by post Precambrian rocks. They have been divided into two groups, the Davey and the Carbine (Carey, 1953, p.1108), which differ radically in their lithology and metamorphic grade. The Davey Group consists of a series of phyllites, garnet-quartz-mica schists and metaquartzites, calcareous sediments

appear to be generally absent except at the top of the Group, in the Scotchfire schists. The rocks, which are strongly deformed, have a distinctive fabric and have been thrown into a series of isoclinal folds about north to south axis, overturning to the west is common with these folds. The succession in Table 1 is based on the mapping which has been carried out by the Hydro Electric Commission of Tasmania in the Frenchmans Cap area, notably by Spry (1957b). Whilst at the present time it would be unwise to extend these names beyond the areas in which they were mapped, similar rocks of the same metamorphic grade are known on the coastal plain east and south of Elliott Bay, and inland between Lake Pedder and Frenchmans Cap. South of this latter zone, in the Arthur Ranges - S.W. Cape area, the Davey Group consists of a more siliceous series which is expressed in the great thicknesses of conglomerate and metaquartzites which exist in this area. Calcareous sediments appear to be absent from this zone.

The Carbine Group consists of a series of dolomites, limestones, shales, quartzites and conglomerate whose metamorphic grade is considerably lower than that of the Davey. Wherever the top of this Group is exposed it shows a considerable thickness of dolomite. This can be seen in the Needles anticline, where the Stephens Dolomite is up to 4,000 feet thick; dolomite has also been recognised in the Huon River valley by Blake (1956) and whilst there is little doubt regarding the stratigraphical position of these dolomites, the position of the Jane Dolomite is not so well defined. This unit, which is up to 2,000 feet thick, rests directly on the Davey Group of the Lake Pedder - Frenchmans Cap area, it has not been recognised in the Precambrian area to the south of the Arthur Ranges. In this paper,

on the basis of lithological and broad structural grounds, the Stephens Dolomite is correlated with the Jane Dolomite. Where the latter is not faulted against other rock types it is associated with schists of the Scotchfire type and their difference in metamorphic grade and degree of deformation is striking. This feature, the distinctive fabric of the Davey Group, the presence of two series of basic intrusions in the Davey Group, an older group which had been regionally metamorphosed and a younger group which had not, led Spry (1957a, p.37 and 1957b, p.106) to establish the Frenchman Orogeny. The deposition of the Carbine Group, which may extend into the Lower Cambrian, is considered to have been terminated by the Stichtan Movement of the Tyennan Orogeny. This movement heralded the beginning of the Dundas eugeosynclinal sedimentation on the West Coast. Within the scope of this paper sedimentation continued in S.W. Tasmania until the Lower Devonian when it was terminated by the Tabberabberan Orogeny.

It is a noticeable feature that the post Carbine sediments transgress on to the core of Davey Group, as now exposed.

Systematic Account

It is considered that the geological history of S.W. Tasmania has been broadly controlled by the interplay of three structural units which trend north-south. These are, west to east, the West Coast unit, the Pedder and Adamsfield units. The limits of these would approximate to the present extent of the Dundas and post Dundas sediments of the West Coast, the Davey Group of the central and the Carbine and post-Dundas sediments of the eastern zone. Obviously the western boundary of these units bears no

relationship to the present coastline. The limits of individual units would have been determined by a combination of folding and faulting; on the basis of present information, whilst on the western limit of the central unit faulting appears to have played a more important role than folding, the reverse appears to be true on its eastern margin.

1. The earliest event of which there is a record is the deposition of the sediments of the Davey Group over the entire area now occupied by all three units. A considerable thickness of argillaceous and arenaceous sediments appear, with conglomerates in the south. These sediments were intruded by basic dykes which was followed by the isoclinal folding associated with the Frenchman Orogeny in which the rocks were regionally metamorphosed and given a distinctive fabric. The direction of folding was regionally north-south; despite the tight folding of the strata it appears that on a regional basis they must have still been subhorizontal.

2. The Frenchman Orogeny was ultimately responsible for the depression of the Adamsfield and West Coast units. On to these depressed units several thousand feet of sediments of the Carbine Group were deposited, primarily shales and quartzites with conglomerates. Carey (1953, p.1108) considers that the Carbine may rest unconformably on the Davey Group.

The Carbine Group is well exposed in the Adamsfield area but on the West Coast it is considerably obscured by the Dundas and later sediments. South of Macquarie Harbour, rocks of this Group are considered to exist on the west side of the peninsula between Macquarie Harbour and the ocean.

3. Towards the end of the deposition of the Carbine Group, a marine transgression covered the Pedder unit and resulted in the deposition of a considerable thickness of dolomite, conformably on the

Carbine of the Adamsfield area but unconformably on the Davey of the Pedder unit. The western extent of the dolomite is problematical, it is known to occur in the Maxwell River syncline which is immediately to the west of the Denison River. Obviously it could either have wedged out before it reached the King - Sophia Synclinorium, which is placed between Mount Darwin and the eastern edge of the Pedder unit, or the dolomite may underlie the post Carbine rocks here but not be visible owing to the established eastward overlap of the younger on to the older rocks; of the two the author prefers the latter hypothesis.

4. The Dundas regression on the Pedder and Adamsfield units commenced with the Stichtan Movement of the Tyennan Orogeny. The broad open folding which is associated with this movement, which folded the Carbine Group, must have taken place along the existing north-south lines, which had been established by the Frenchman Orogeny. Eugeosynclinal sedimentation continued only in the West Coast zone and until the beginning of the Jukesian Movement. Between these two periodsof tectonic movement minor adjustments appear to be responsible for the disconformities which appear in the sediments (Carey and Banks, 1954/ p.260). The Dundas Group overlaps on to the Precambrian strata and elsewhere in Tasmania this Group rests directly on both the Carbine and Davey sediments.

5. The end of the deposition of the Dundas Group is marked by the Jukesian Movement, again the folding appears to have been along the lines established by the Precambrian Orogeny. This Movement resulted in a regression and at the end of the Upper Cambrian it is considered that all three units were being actively eroded. The effect of this is well expressed at Mount Darwin where there is a 90 degree angular unconformity

between sediments of the Dundas Group and those of the Owen Conglomerate. There is little doubt that the Darwin Granite and the hematite/magnetite mineralisation in the Mount Darwin - Queenstown area is associated with this orogeny and that these are also some of the first metamorphic effects which are known to be associated with the Lyell Shear.

6. This period of erosion after the Jukesian regression was terminated by the Owen transgression. The base of the Owen Conglomerate typically consists of rocks which have been derived from the underlying basement (i.e. granite, serpentinite, dolomite, schists and metaquartzites), a feature recognised by Hills and Carey (1949, p.25). High in the stratigraphic sequence the conglomerates occur with a wide uniformity of lithology and consist primarily of the more resistant particles, quartz, quartzite and quartz schists. The base of the Owen Conglomerate is demonstrably marine at Adamsfield (Carey and Banks 1954, p.261), also the occurrence of fossils in what has been called the Upper Owen Conglomerate at Queenstown indicates a similar environment. By the Upper Owen the transgression is considered to have been complete and all three structural units were covered by the Owen sea. However, it is reasonable to assume that the central, Pedder unit was the last area to be submerged and that, on a regional basis, it was above sea level during the time of the deposition of the Lower and Middle Owen in the adjacent areas. The transgressive nature of the Owen Conglomerate is readily apparent with it resting on a basement of the Dundas, Carbine or Davey Groups.

Within this sea, islands, or island ridges, must have existed but essentially deposition continued until the Lower Devonian with the upper Junee and Eldon Groups.

7. The Tabberabberan Orogeny terminated the deposition of the Eldon Group and broadly folded the strata about the north-south axes, with overfolding and thrusting to the east. Again, the folding took place along lines established by the Precambrian orogeny with the exception of the northern area where a north-west - south-east direction is also prominent. Also associated with this orogeny was the marked metasomatism along the Lyell Shear of the West Coast unit, with the introduction of the sulphide mineralisation along this line of strong shearing.

The absence of particles of granite in the Owen Conglomerate of the Elliott Bay area indicates that the granite here is associated with this orogeny and was not introduced in the Stichtan Movement of the Cambrian period.

8. Active erosion continued on all three units during the Devonian - Carboniferous periods resulting in the stripping of a considerable thickness of sediments, in particular from the central Pedder unit. Here erosion has reached a very deep level with the Carbine, Junee and Eldon Groups only being preserved in the synclines, with adjoining anticlines exposing the Davey Group.

Barry Scott,
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TABLE 1

SUMMARY OF THE PALAEOZOIC - PRECAMBRIAN GEOLOGY OF S.W. TASMANIA

PERIOD	GROUP	FORMATION	TECTONIC	LITHOLOGY	IGNEOUS	ECONOMIC
LOWER DEVONIAN TO SILURIAN	ELDON GROUP		Tabberabberan Orogeny	Miogeosynclinal. Alternating shales & orthoquartzites.	Granite	Copper, lead, zinc sulphide mineralisation
ORDOVICIAN	JUNEE GROUP	Gordon Lst. Owen Congl.	Owen Transgression	Limestone & fine to coarse conglomerate		
UPPER - MIDDLE CAMBRIAN	DUNDAS GROUP		Jukesian Movement Tyennan Orogeny Stichtan Movement	Eugeosynclinal. Greywackes, tuffs, basic lavas, shales & siltstones.	Serpentinite, lavas & Darwin granite	Hematite/ magnetite, sulphide mineralisation? Osmiridium
LOWER CAMBRIAN TO PRECAMBRIAN	CARBINE GROUP	Dolomite (Jane and Stephens)	Carbine Transgression	Dolomite, slates, conglomerates, quartzites & cherts	Basic dykes (later igneous group)	
PRECAMBRIAN	DAVEY GROUP	Scotchfire Franklin Mary	Frenchman Orogeny Unconformity?	Phyllites, garnet-mica schists, quartz schists.	Basic dykes (older igneous group)	
		Joyce		Garnet-mica schists		

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AMG
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GORMANSTON
QUEENSTOWN

Lyell

Lake St. Clair

DERWENT BRIDGE

Highway

Lake
Echo

STRAHAN

Cape Sorell

FRENCHMAN
CAP

MT. DARWIN

Macquarie Harbour

TARRALEAH

Tarraleah

Derwent

Highway

River

OUSE

HAMILTON

Franklin

River

Gordon

Denison

River

Florentine River

LYELL SHEAR

Pt. Hibbs

A

ADAMSFIELD

B

MT. OSMUND

Lake Pedder

MT. ANNE

ELLIOTT
BAY

HUON RIVER

AMG
476800E
5228000N

ARTHUR
RA.

approx. North

5 cm

AMG REFERENCE POINTS ADDED

Port
Davey

PICTON FAULT

Picton River

South West Cape

S.P.L.
Boundary

SOUTH WEST
TASMANIA

Scale : 8miles to 1inch

INDEX

Q16a

LEGEND

Post Dundas

Dundas Group (Cambrian)

Pre Cambrian (Carbine)

(Davey)

Granite

Fault

Anticline

Syncline

Boundary

A

B

Vertical Scale Exaggerated