https://doi.org/10.26749/rstpp.102.7

A REVISED STRATIGRAPHY FOR THE PRECAMBRIAN IN NORTH-WEST TASMANIA

By

R. D. GEE
Geological Survey of Tasmania

(With one text figure)

ABSTRACT

Within the Proterozoic rocks of the Rocky Cape Geanticline in north-west Tasmania, three contrasting sedimentary assemblages are recognised. The Rocky Cape Group, which has been previously used very broadly, is redefined to include only one of these assemblages. The revised definition includes the orthoquartzite, siltstone and shale which form a continuous sequence in the Rocky Cape area. Some new formations are defined. The Smithton Dolomite, and related rocks, unconformably overlie the Rocky Cape Group to the west at Black River. The Burnie Formation is a thick sequence flanking the Rocky Cape Group to the east. The Rocky Cape Group and the Burnie Formation are separated by the Keith Metamorphics, which is a belt of low grade regional metamorphic greenschist, amphibolite and pelitic schist.

INTRODUCTION

The Rocky Cape Geanticline (Carey, 1953, p. 1115) consists of deformed, unfossiliferous, and dominantly unmetamorphosed sedimentary rock of presumed Proterozoic age.

Stratigraphical terminology in the Proterozoic succession in north-west Tasmania is mainly after Spry (1957a) who introduced several formation names. The sequence proposed was later modified (Spry, 1962, p. 111), as follows:—

Top—Cave Quartzite
Port Slate and Quartzite
Bluff Quartzite
Cowrie Siltstone
Base—Burnie Quartzite and Slate.

These formations were taken to constitute the Rocky Cape Group which was defined (Spry, 1957a, p. 81) as " those sediments chiefly quartzite slate dolomite and siltstone, outcropping intermittently from Penguin to Smithton and lying unconformably below the Dundas Group at Penguin. Its thickness is in excess of 10,000 feet ".

In addition, other formations have been named in north-west Tasmania, for example, Bryant Hill Quartzite (Carey and Scott, 1952), Smithton Dolomite (Spry, 1957b), Black River Dolomite (Spry, 1957a), and Forest Conglomerate and Quartzite (Spry, 1964, p. 47). Although these formations fall within the definition of the Rocky Cape Group, it is not clear, either from the original definitions or from current usage, whether they should be included in the Rocky Cape Group.

Recent work (Gee, 1967) has shown that the succession between Penguin and Smithton consists of three assemblages of contrasting lithological characteristics, each assemblage corresponding to a different basin of deposition. In accordance with the Australian Code of Stratigraphic Nomenclature (1964), it is unjustified to call this succession a group. Furthermore, there is a proved angular unconformity separating two of these assemblages.

Figure 1 summarises the stratigraphical relations of the rocks comprising the Rocky Cape Geanticline.

ROCKY CAPE GROUP

It is proposed that the Rocky Cape Group be restricted in definition to include only the formations of orthoquartzite siltstone and shale, some of which have been defined by Spry (1957a), which form a continuous sequence in the Rocky Cape and Dip Range area. This would include all those formations listed previously, with the exception of the Burnie Quartzite and Slate. It would also exclude the Smithton Dolomite, the Black River Dolomite and the Forest Conglomerate which unconformably overlie the sequence in question. This procedure retains much of the meaning of the original definition. The Rocky Cape Group is redefined below.

The Rocky Cape Group is that group of rocks, mostly quartzite, siltstone and mudstone, at least 16,000 *feet thick, consisting of the Cowrie Siltstone (at the bottom), Detention Sub-group, Irby Siltstone, Jacob Quartzite (at the top), and including any other formation which can be shown to be conformably above the Jacob Quartzite or conformably below the Cowrie Siltstone. It occurs in the general area around Rocky Cape, Sisters Hills, Dip Range, and Mawbanna.*

The Rocky Cape Group consists of one sub-group and three additional formations.

Cowrie Siltstone

Spry (1957a) proposed the name Cowrie Siltstone for the well-bedded siltstone which outcrops along the foreshore between Rocky Cape and Black River. At that time its stratigraphic position was not understood, but later Spry (1962, 1964) recognised that it lay beneath the orthoquartzite at Rocky Cape. In accordance with the usage of Spry, it is formally defined as follows.

The Cowrie Siltstone is that formation of finely laminated shale, well-bedded flaggy or laminated siltstone, and black mudstone, with some cross-bedded sandstone layers, lying conformably beneath the Detention Sub-group; it is approximately 8,000 *feet thick, and its type locality is on the western foreshore of Rocky Cape,* 1½ *miles from the point of Rocky Cape* (966,300y N, 332,500y E).

It occurs extensively on the flat plains between Sisters Hills and Black River, and also in the headwaters region of the Black and Dip Rivers but its outcrop is limited because of the cover of Tertiary basalt and Recent sediments. It outcrops along the foreshore in the vicinity of Cowrie Point.

The thickness of the Cowrie Siltstone is difficult to estimate because of a large transcurrent fault, and the effect of folding. The figure of 8,000 feet is an estimate based on an assumed regional dip with a correction for the transcurrent movement. The fold profiles at Cowrie Point indicate that the folding had little effect on the thickness.

Detention Sub-group

The Detention Sub-group is proposed to embrace the Bluff Quartzite, the Port Slate, and the Cave Quartzite of Spry (1957a). Mapping has shown that these three units taken together constitute the only mappable unit. The Port Slate of Spry is only 200 feet thick and cannot be traced for more than a few hundred yards. Thin, non-persistent lenses of siltstone comprise about 15% of the Detention Sub-group.

The Detention Sub-group is defined as that assemblage of dominantly cross-bedded orthoquartzite with minor interbedded non-persistent siltstone beds, lying conformably above the Cowrie Siltstone at Rocky Cape and below the Irby Siltstone at Sisters Beach. It is 4,600 *feet thick and has its type locality at Rocky Cape* (354,000y E, 967,000y N), *where it consists of the Bluff Quartzite, the Port Slate and the Cave Quartzite.*

The Detention Sub-group forms the dominant line of hills between Rocky Cape and Sisters Beach, and occurs on the Shakespeare Hills, the Sister Hills and the Dip Range.

Irby Siltstone

This is defined as that formation of black siltstone and minor dolomite and sandstone, lying conformably above the Jacob Quartzite. Its type locality is at Sisters Beach (358,500y E, 960,500y N). *It is named after Irby Flats behind Sisters Beach.*

The original thickness is not precisely known because it is an incompetent formation between two massive quartzite formations. At Sisters Beach it is about 2,500 feet thick.

Jacob Quartzite

This is defined as that formation of dominantly cross-bedded orthoquartzite with minor interbedded non-persistent siltstone horizons, being about 3,700 *feet thick, and having its type locality on the headland at Jacobs Boat Harbour* (364,500y E, 959,000y N), *after which it is named.*

It outcrops continuously along the coast between Sisters Beach and Jacobs Boat Harbour, and also forms the syncline on the hills just inland from Jacobs Boat Harbour. In the core of this syncline, forming the contorted southern block of the major east-west transcurrent fault, is about 200 feet of siltstone and mudstone overlying the Jacob Quartzite. This un-named siltstone is taken as the top of the Jacob Quartzite.

SMITHTON DOLOMITE

The Rocky Cape Group is overlain in the west by a blanket of dolomite which in places has a basal conglomerate layer. The widespread occurrence of dolomite in the Smithton district was first noted by Nye, Finucane and Blake (1934), and has been referred to frequently by many writers, including Carey and Scott (1952), and Hosking and Hueber (1954). Spry (1957b) formally defined the Smithton Dolomite as "the formation, chiefly dolomite, lying below the Dundas Group and above the Bryant Hill Quartzite of Carey and Scott (1952), being approximately 3,000 feet thick, with its type locality being immediately west of the Duck River, just north of the Smithton-Marrawah Road".

Both Longman and Matthews (1962), and Spry (1962, p. 112, 1964, p. 47) noted the regionally transgressive nature of the Smithton Dolomite and have suggested an unconformity at the base.

The dolomite at Black River was named by Spry (1957a) the *Black River Dolomite*, who thought it was low down in the Rocky Cape Group. Later, Spry (1964) ascertained that the Cowrie Siltstone at Black River was overlain by conglomerate, quartz sandstone, chert, and then the Black River Dolomite. The Black River Dolomite is correlated with the Smithton Dolomite by lithological identity and close proximity to the Smithton Dolomite near South Forest and Irishtown (Gulline, 1959). Spry (1964) named the conglomerate and quartz sandstone that underlie the dolomite at Black River the *Forest Conglomerate and Quartzite* after the nearby village of Forest.

The sequence at Black River is as follows:—

Black River (Smithton) Dolomite	30 feet
blended chert	30 feet
quartz sandstone with cross-bedding	20 feet
conglomerate with minor sandstone	25 feet
unconformity	
Cowrie Siltstone	8,000 feet

In the Black River area there is an angular discordance between the Cowrie Siltstone and the Forest Conglomerate. The unconformity is best exposed in the bank of the Black River, exactly three-quarters of a mile west-south-west of the railway bridge across the river. Here the conglomerate dips 065°/60° NW and the siltstone dips 090°/61° N, giving an angular discordance of 22°. The base of the conglomerate transgresses across four feet of siltstone in a width of exposure of 15 feet.

The best indication of an unconformity is the presence of rectilinear grooves and ridges on the sole of the basal conglomerate bed. Superficially these ridges resemble incipient rotational or shear joint boudinage, however there are no joints in the conglomerate or siltstone having the required orientation. The ridges are the casts of sand and

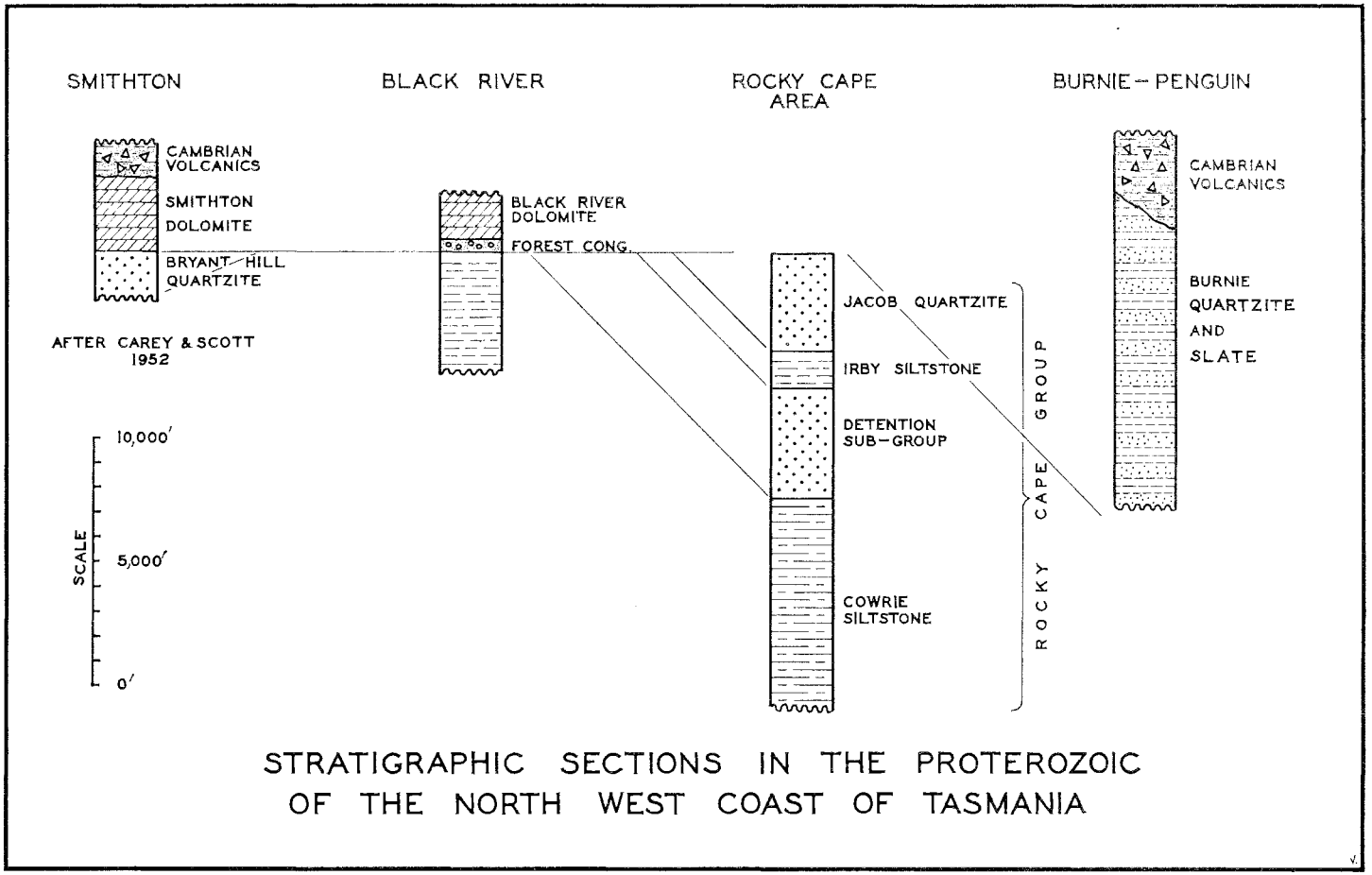
SMITHTON
BLACK RIVER
ROCKY CAPE AREA
BURNIE – PENGUIN
CAMBRIAN VOLCANICS
SMITHTON DOLOMITE
BRYANT HILL QUARTZITE
AFTER CAREY & SCOTT 1952
BLACK RIVER DOLOMITE
FOREST CONG.
JACOB QUARTZITE
IRBY SILTSTONE
DETENTION SUB-GROUP
COWRIE SILTSTONE
ROCKY CAPE GROUP
CAMBRIAN VOLCANICS
BURNIE QUARTZITE AND SLATE
SCALE
10,000'
5,000'
0'
STRATIGRAPHIC SECTIONS IN THE PROTEROZOIC OF THE NORTH WEST COAST OF TASMANIA
3019

FIG. 1.

fine-pebble infillings of depressions between small strike ridges on an erosional surface which truncates the bedding at an acute angle. The sharpness of these ridges indicates that the siltstone must have been compacted prior to the erosion. It is noteworthy that the cast ridges are present only when the size of the pebbles is less than the spacing of the strike ridges.

KEITH METAMORPHICS

The Rocky Cape Group is bounded on the east by a belt of low-grade greenshists. This belt can be followed from Wynyard south-west through Meunna to the Arthur River, and is a direct continuation of the Keith Beds of McNeil (1961). This ribbon-like belt is about four miles wide, and separates the Rocky Cape Group and the Burnie Formation. The schists are considered to be derived mainly from the surrounding sediments and partly from intrusive dolerite. The western contact, although gradational, is parallel to bedding in the adjacent Rocky Cape Group. These formations strike north-east with steep dips *facing the south-east* and in places are overturned. Thus the metamorphic rocks stratigraphically *overlie* the Rocky Cape Group. It is defined below as a rock-unit, considered to have been derived from sedimentary rocks which lie stratigraphically above the Jacob Quartzite.

The Keith Metamorphics is that assemblage of phyllite, muscovite schist, calcite schist, amphibolite and quartzite, originally named the Keith Beds; which forms a linear belt between Wynyard and the Arthur River near the Keith River, and probably extends much further to the south-west. It lies stratigraphically above the Rocky Cape Group, and its type locality may be taken as the area of best exposure which is where Hilder's timber road from Meunna meets the Arthur River (346, 000y E, 934,000y N).

BURNIE QUARTZITE AND SLATE

The Burnie Quartzite and Slate was defined (Spry 1957a, p. 81) as the "formation of subgreywacke quartzite and slate outcropping along the foreshore at West Burnie, and which appears to outcrop from Howth to Doctors Rocks, except where covered by later superficial material".

Spry (1962, 1964) suggested that the formation was the lowest in the Rocky Cape Group and the general dip was toward the west. Detailed mapping between Penguin and Doctors Rocks has shown that large tracts are overturned, and that formation is generally younging to the east. Therefore, the Burnie Formation appears to lie *above* the Rocky Cape Group, and to be separated from it by the Keith Metamorphics.

The Burnie Formation has a minimum thickness of 14,500 feet. It is a quartz wacke and slate assemblage containing minor pillow lavas, and is unlike the Rocky Cape Group. It was laid down in a different basin of deposition. Therefore it is not included in the Rocky Cape Group.

SUMMARY

In order to clarify the stratigraphic position of the Proterozoic rocks of the Rocky Cape Geanticline in north-west Tasmania, the Rocky Cape Group is redefined to include a conformable sequence of shale, quartzite and siltstone which has a discrete lithogenetic significance.

Unconformably overlying the Rocky Cape Group in the west is the Smithton Dolomite which has a basal conglomerate. The Burnie Formation to the east is younger than the Rocky Cape Group, but onlaps it rather than overlies it.

Separating the Rocky Cape Group and the Burnie Formation is a belt of metamorphic rocks called the Keith Metamorphics. This belt is interpreted as a high-angle shear zone of Proterozoic age.

ACKNOWLEDGMENTS

The writer acknowledges Dr E. Williams, Dr A. H. Spry and Mr M. R. Banks, for helpful discussion. This paper is published with the permission of the Director of Mines.

REFERENCES

CAREY, S. W., 1953.—Geological structure of Tasmania in relation to mineralization. 5th *Empire Min.* and *Metal. Congr.*, 1, 1108-1128.

———— and SCOTT, B., 1952.—Revised interpretation of the geology of the Smithton district. *Pap. Roy. Soc. Tas.*, 88, 63-70.

GEE, R. D., 1967.—The tectonic evolution of the Rocky Cape Geanticline. Unpub. Ph.D. Thesis, University of Tasmania.

GULLINE, A. B., 1959.—The underground water resources of the Smithton district. *Underg. Wat. Supply Pap.* 5.

HOSKING, J. S. and HUEBER, H. V., 1954.—Limestones of Tasmania and their industrial development. *Tech. Pap.* C.S.I.R.O. (Build. Res.), 3.

LONGMAN, M. J. and MATTHEWS, W. L., 1962.—The geology of the Bluff Point and Trowutta Quadrangles. *Tech. Rep. Dep. Min. Tas.*, 6, 48-54.

MCNEIL, R. D., 1961.—Geological reconnaissance of the Arthur River Area. *Tech. Rep. Dep. Min. Tas.*, 5, 46-60.

NYE, P. B., FINUCANE, K. J. and BLAKE, F., 1934.—The Smithton District. *Bull. Geol. Surv. Tas.*, 41.

SPRY, A. H., 1957a.—Precambrian rocks of Tasmania, Part I. Dolerites of the North-west Coast. *Pap. Roy. Soc. Tas.*, 91, 81-93.

———— 1957b.—Precambrian dolomites of Tasmania, in Limestones of Tasmania. *Geol. Surv. Tas. Min. Res.*, 10, 32-38.

———— 1962.—The Precambrian rocks; in Geology of Tasmania. *Jour. Geol. Soc. Aust.*, 9, (2), 107-126.

———— 1964.—Precambrian rocks of Tasmania, Part VI. The Zeehan-Corinna area. *Pap. Roy. Soc. Tas.*, 98, 23-48.