MINERAL RESOURCES TASMANIA

2023

An Early Triassic microflora from Schouten Island

Author: C. R. Calver, J. L. Everard and D. J. Mantle

Date: 27/02/2023

Email: info@mrt.tas.gov.au

Website: www.mrt.tas.gov.au

REPORT No.: TR34

Geological Survey Technical Report 34

Tasmanian Government

Mineral Resources Tasmania
Department of State Growth

Geological Survey Technical Report 34:

An Early Triassic microflora from Schouten Island

by C. R. Calver, J. L. Everard and D. J. Mantle

Cover: View of Sandstone Bluff from the northeast.

While every care has been taken in the preparation of this report, no warranty is given as to the correctness of the information and no liability is accepted for any statement or opinion or for any error or omission. No reader should act or fail to act on the basis of any material contained herein. Readers should consult professional advisers. As a result the Crown in Right of the State of Tasmania and its employees, contractors and agents expressly disclaim all and any liability (including all liability from or attributable to any negligent or wrongful act or omission) to any persons whatsoever in respect of anything done or omitted to be done by any such person in reliance whether in whole or in part upon any of the material in this report. Crown Copyright reserved.

Abstract

*A Triassic section exposed in coastal cliffs near Sandstone Bluff, western Schouten Island, shows at least 12 m of greyish shale and siltstone, sharply overlain by at least 25 m of fluvial, cross-bedded quartzose sandstone. A sample from near the base of the exposed shale yielded an Early Triassic microflora (*Lunatisporites pellucidus *Zone or possibly ranging younger to the* Protohaploxypinus samoilovichii *Zone)*.

Mineral Resources Tasmania

Department of State Growth
www.mrt.tas.gov.au

An Early Triassic microflora from Schouten Island

by C. R. Calver[1], J. L. Everard[1] and D. J. Mantle[2]
[1]*Geological Survey Branch - Mineral Resources Tasmania*
[2]*MGPaleo, Unit 1, 5 Arvida St, Malaga WA 6090*

CONTENTS

FIGURES

1.0 INTRODUCTION

The western half of Schouten Island consists largely of Triassic non-marine sedimentary rocks (Upper Parmeener Supergroup) capped by Jurassic dolerite. On the north coast, poorly exposed lithic sandstone and coal measures of presumed Late Triassic age are found, coal having been mined there in the 19th century. The lithic sandstone-coal measures sequence is faulted against quartz sandstone to the south and west (Hughes, 1959). Cliffs of quartz sandstone extend along the west coast, from about 1 km north of Sandstone Bluff to Cape Faure about 3 km south (Figure 1). By lithologic correlation, these cliff outcrops belong to the Lower Triassic Ross Sandstone and correlatives of mainland Tasmania (Hughes, 1959; Bacon & Corbett, 1984), i.e. 'Unit 2' of Forsyth (1989).

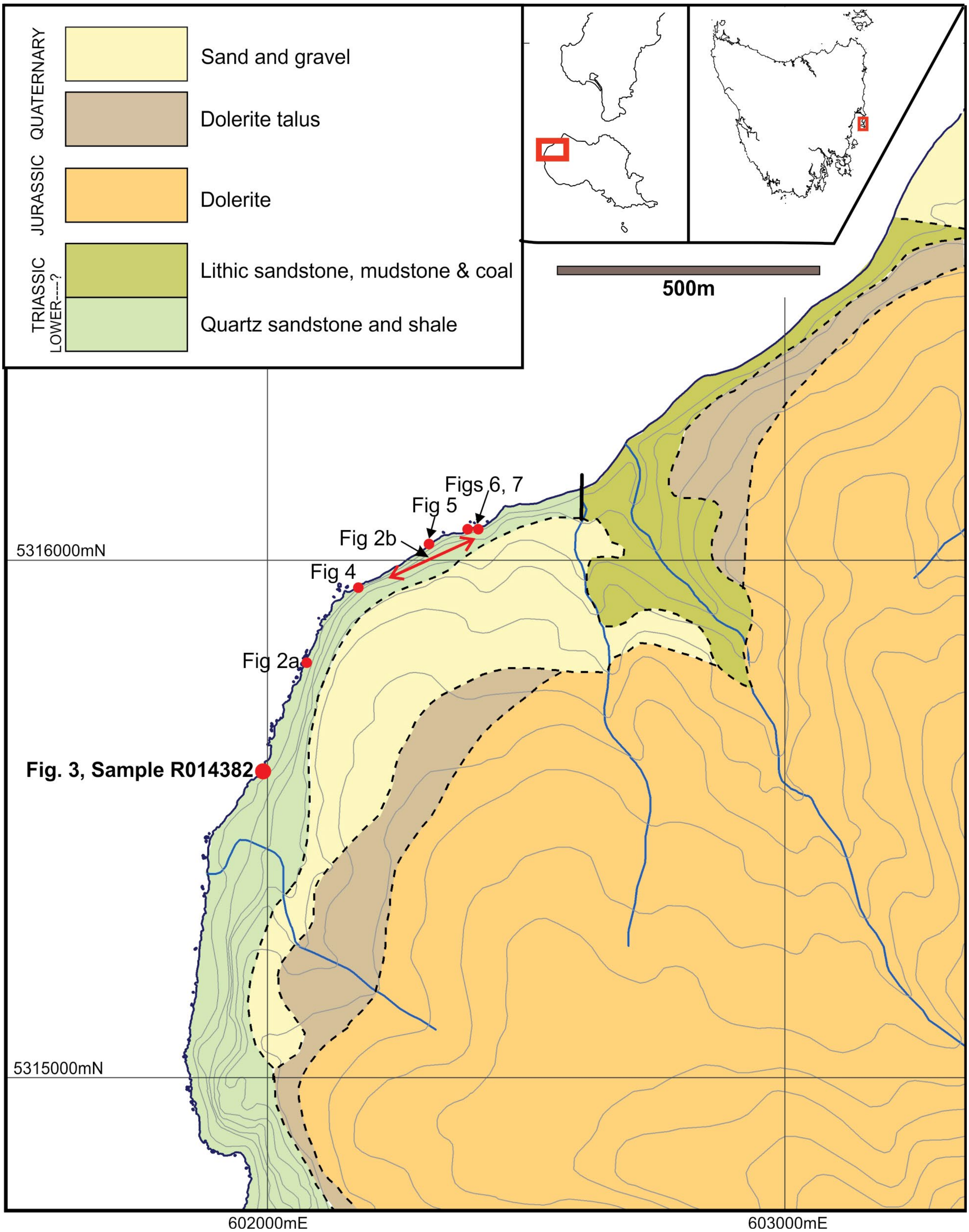

Figure. 1. Location map, showing generalised geology after Bacon & Corbett (1984).

In early 2020, two of us (JLE and CRC) noted a grey shale of non-marine aspect at the base of the cliffs underlying the sandstone. In order to clarify the correlation of this shale unit, a sample was collected and sent to DJM for palynological analysis. Correlation with the Late Permian Cygnet Coal Measures was initially considered a possibility. However, the sample yielded an unequivocal Early Triassic spore assemblage. Rough stratigraphic sections (Figure 2) were measured during a second visit to the island in 2022. Metric grid co-ordinates given below are GDA94 datum.

2.0 STRATIGRAPHY

The sequence exposed in the cliffs dips very gently (~3° - 5°) southeast. A rough stratigraphic section is given (Figure 2). The maximum observed thickness of the shale unit (ca. 12 m) is seen around 602078/5315812. It is a grey-green to dark grey, micaceous shale, in places laminated, with minor, thin to medium planar beds of siltstone and fine-grained sandstone, some with ripple cross-lamination (Figure 3). The base of the shale was not seen, here lying below sea level. A sample, R014382, for palynology was collected from near the base of cliffs, just above high water mark (601990/5315581).

The sandstone overlying the shale is more accessible and better exposed about 100 - 300 m to the NE (between 602219/5315966 and 602406/5316068). Here, the shale is abruptly overlain by 0.7 m of trough cross-bedded, medium grained quartz sandstone (quartzarenite), followed by 3 m of dominantly coarse-grained sandstone and conglomerate beds with erosive, channelled bases (Figures 4 and 5). Clast lithologies in the conglomerate are dominated by grey shale similar to the underlying unit. These coarse beds wedge out rapidly to the north (within 100 m) into white, fine to medium-grained sandstone with large, low-angle cross-beds (sets 2 m or more thick; Figure 6). This is sharply overlain by medium-grained orange-brown (iron-stained) quartz sandstone with thinner (100 mm) cross-bed sets, many with slumped (overturned) cross-bedding typical of the Lower Triassic Ross Sandstone and correlates (Figure 7).

3.0 MICROFLORA

Sample R014382, from the lowermost exposed shale, returned a high microfossil yield of mainly spore and pollen with very high diversity, but preservation is poor (Table 1).

The rare–frequent *Lunatisporites* (including rare *L. pellucidus*) and absence of *Aratrisporites* spp. favours assignment to the Early Triassic *L. pellucidus* Zone. However, as the latter group may be rare at the base of their range, a more cautious approach is a ranged *L. pellucidus* to *P. samoilovichii* zonal assignment. The common occurrences of *Densoisporites playfordii* and

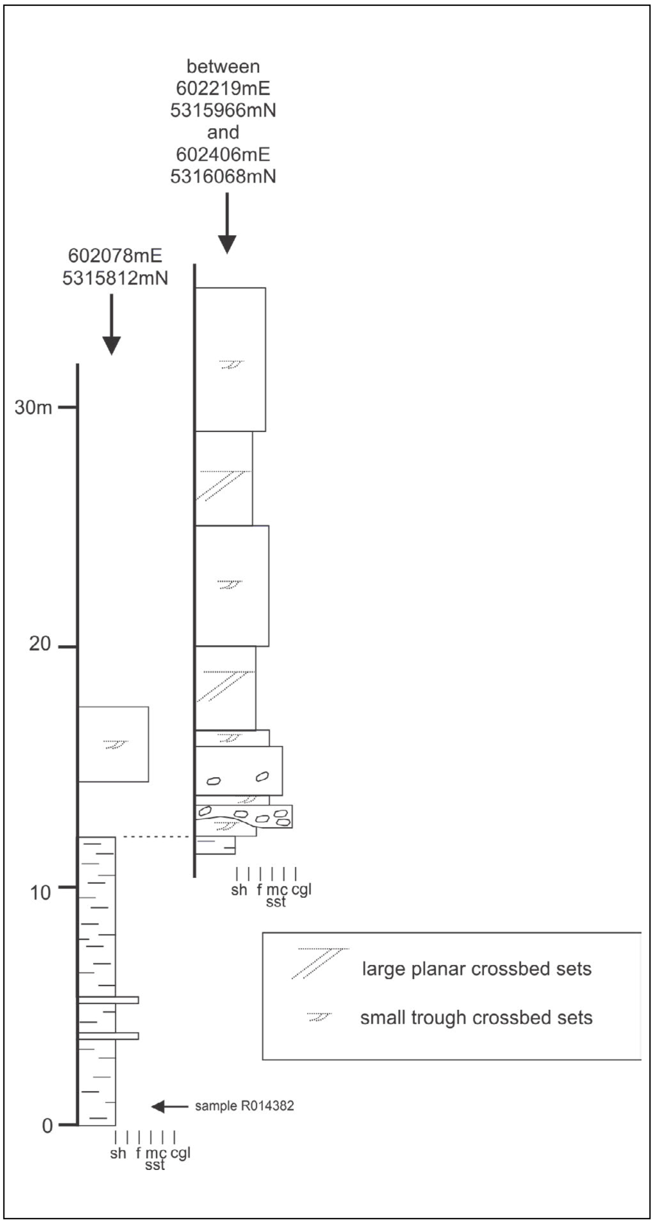

Figure. 2. Stratigraphic sections.

Lundbladispora brevicula, along with the absence of any Permian-restricted marker species also strongly favours an Early Triassic age for this sample. Some of these typical Early Triassic species are figured (Figure 8). The paleoenvironment is interpreted as brackish to marginal marine.

4.0 DISCUSSION

Forsyth (1989) subdivided the Upper Parmeener Supergroup into 4 units:

- Unit 4 (Volcanic lithic sandstone and coal measure sequence; Carnian);
- Unit 3 (Sequence with quartz and lithic sandstone (pre-Anisian to Ladinian);
- Unit 2 (Quartz sandstone sequence and associated rocks; Griesbachian to pre-Anisian);
- Unit 1 (Cygnet Coal measures and correlates, upper Permian).

Figure 3. Grey micaceous shale near sample locality (602073/5315796).

Figure. 4. Channel (~ 5m wide x 1 m deep) of very coarse-grained quartz sandstone with basal granule conglomerate, cut into planar laminated sandstone and overlain by 0.2m of medium-grained cross-bedded quartz sandstone, followed by 1.5 m of ±massive coarse-grained sandstone with shale clasts (602168/5315940).

Figure 5. Channel of pebble conglomerate, eroded into ± planar-bedded sandstone (602329/5316037).

Figure 6. White fine- to medium-grained sandstone with very long (~5m) low angle cross-bedded foresets and some thin slightly carbonaceous laminae (602397/5316053).

Figure. 7. White fine- to medium-grained laminated quartz sandstone, overlain by medium-grained iron-stained quartz sandstone with thin, slumped (overturned) cross-bedding (602383/5316049).

Table 1: Palynological data summary.

Top Depth [mbRT]	Base Depth [mbRT]	Sample Type	Microfossil Yield	Preservation	Percentage				Diversity (*1)		Spore-Pollen Colour (*2)	Zone	Subzone	Environment (*3)	Key Datums
					Microplankton			Spore-pollen	Micro-plankton	Spore-pollen					
					Dinoflag	Spiny AC.	Other								
0	0	Outcrop	High	Poor	0	1	6	93	3	32	Mid Brown	*L. pellucidus - P. samoilovichii*		Brackish to Marginal Marine	*L. pellucidus* (VR), *Lunatisporites spp* (R-F), *D. playfordii* (C), *L. brevicula* (C), *L. willmotti* (R), *T. playfordii* (VR), *P. samoilovichii* (VR), *L. limatulus* (R), *L. fossulatus* (R)

*1: Diversity	
V. High	30+ species
High	20-29 species
Moderate	10-19 species
Low	5-9 species
Very Low	1-4 species

<table>
<tr><th colspan="3">*2: Spore-pollen colour</th></tr>
<tr><th>Colour</th><th colspan="2">HC Potential</th></tr>
<tr><td>Translucent to pale yellow</td><td colspan="2">Pre-generation</td></tr>
<tr><td>Yellow</td><td colspan="2">Immature to Early Oil</td></tr>
<tr><td>Orange</td><td rowspan="2">Main Oil</td><td rowspan="2">Early Wet Gas & Condensate</td></tr>
<tr><td>Orange-brown</td></tr>
<tr><td>Light brown</td><td rowspan="2">Late Oil</td><td rowspan="2">Wet Gas and Condensate</td></tr>
<tr><td>Mid brown</td></tr>
<tr><td>Dark brown</td><td rowspan="2">Dry Gas</td><td>Late Wet Gas</td></tr>
<tr><td>Black</td><td>Overmature</td></tr>
<tr><td colspan="3">The spore-pollen colour is related to hydrocarbon potential assuming that regional thermal maturity has increased with depth over a similar time frame. However other factors such as volcanic intrusions of localised movements of hot fluids may also greatly affect spore-pollen colour.</td></tr>
</table>

*3: Environment	Dinoflagellate Content %	Dinoflagellate Diversity	Freshwater Algae Content %
Offshore Marine	67 to 100	Very High	Low
Shelfal Marine	34 to 66	High	"
Nearshore Marine	11 to 33	Moderate	"
Very Nearshore Marine	5 to 10	Moderate-Low	"
Marginal Marine	<1 to 4	Low-Very Low	"
Brackish	0, Spiny Acritarchs only	Extremely Low	"
Non-Marine (undiff.)	0, no Spiny Acritarchs	Nil	Low <3
Non-Marine (lacustrine)	0, no Spiny Acritarchs	Nil	Moderate 3-10+

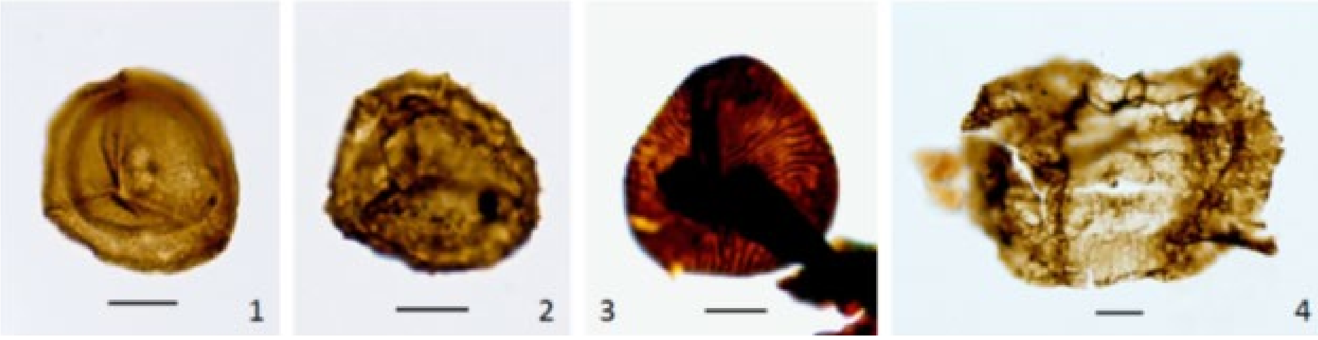

Figure. 8. Palymorphs. (1) *Densoisporites playfordii*, (2) *Lundbladispora brevicula,* (3) *Triplexisporites playfordii,* and (4). *Lunatisporites pellucidus,* a relatively finely sculptured specimen.

Forsyth (1989, p. 320) states that microfloras of Unit 2 can be grouped into an older assemblage with rare or absent *Aratrisporites*, and a younger assemblage with common to abundant *Aratrisporites*. Our assemblage is similar to Forsyth's older assemblage, which is characteristic of the lower, sandstone-dominated parts of 'Unit 2', i.e. the Ross Sandstone and correlatives. A "Griesbachian to mid-Smithian (possibly pre-mid-Dienerian) age" (Forsyth., 1989; p. 320) was assigned to the older assemblage. Forsyth also states (p. 320) that a palyno-correlate occurs on Schouten Island, without providing further detail.

The microflora thus unequivocally confirms that the shale unit at the base of the cliff succession belongs to the lower part of the Early Triassic Unit 2, and not to the Late Permian Cygnet Coal Measures and correlatives (Unit 1).

5.0 ACKNOWLEDGEMENTS

We thank DPIPWE for permitting collection of the sample within the Freycinet National Park.

A. McNeill critically reviewed the manuscript, which was prepared for publication by C. Large.

6.0 REFERENCES

Bacon, C. A., and Corbett, K. D. 1984. The Schouten Island Coalfield. UR1984/37.

Forsyth, S. M. 1989. Upper Parmeener Supergroup. In C. F. Burrett, & E. L. Martin, (Eds.) Geology and Mineral Resources of Tasmania. *Geological Society of Australia Special Publication*, 15, 309–333.

Hughes, T. D. 1959. Schouten Island. *Tasmania Department of Mines Technical Reports,* 3, 81-88.

Tasmanian
Government

Mineral Resources Tasmania
PO Box 56 Rosny Park
Tasmania Australia 7018
Ph: +61 3 6165 4800

info@mrt.tas.gov.au www.mrt.tas.gov.au