



THE SEDIMENTOLOGY AND STRATIGRAPHY OF THE  
LATE PRECAMBRIAN POUND SUBGROUP,  
CENTRAL FLINDERS RANGES,  
SOUTH AUSTRALIA

by

JAMES G. GEHLING, B.Sc.(Hons)

Submitted for the Degree of M.Sc. through the Department  
of Geology and Mineralogy, University of Adelaide,  
July, 1982.

## CONTENTS

	Page
SUMMARY	iii
STATEMENT OF ORIGINALITY	v
ACKNOWLEDGEMENTS	vi
MAIN TEXT	
1. Introduction	1
2. Scope and Method of Investigation	3
3. Regional Tectonic Setting	4
4. Stratigraphy of the Pound Subgroup	6
5. Basal Contact with the Wonoka Formation	9
6. Lithofacies of the Bonney Sandstone	10
7. Facies Relationships in the Bonney Sandstone	17
8. Environmental Interpretation of the Bonney Sandstone	19
9. Lithofacies of the Rawnsley Quartzite	24
10. Facies Relationships in the Rawnsley Quartzite	31
11. Environmental Interpretation of the Rawnsley Quartzite	33
12. Distribution of the Ediacara Assemblage	42
13. Contribution of the Ediacara Assemblage to Environmental Interpretation	45
14. Depositional History of the Ediacara Member	51
APPENDICES	
Appendix 1 Method of Field Study	55
Appendix 2 Co-ordinates of Measured Sections	58
Appendix 3 Thin Section Descriptions	60
Appendix 4 Analysis of Facies Sequence - Bonney Sandstone	94
Appendix 5 Base of the Rawnsley Quartzite	100
Appendix 6 Stratigraphic Distribution of Fossils of the Ediacara Assemblage	103
Appendix 7 Dreamtime Origin of Wilpena Pound	104
Appendix 8 Field Sections Fig. I - Fig. XI	Back Pocket
BIBLIOGRAPHY	105
PLATES 1 to 19	after 112

## CONTENTS (contd.)

## FIGURES (within Main Text)

<u>No.</u>	<u>Description</u>	<u>Location (between page numbers)</u>
1.	Locality map	before 1
2.	Isopach map - Pound Subgroup	4-5
3.	Rockrelation diagram	6-7
4.	Vertical sections - Pound Subgroup (enlargement - back pocket)	17-18
5.	Facies relationships - Bonney Sandstone	19
6.	Palaeocurrent measurements - Pound Subgroup	23-
7.	Current roses - Facies F	
8.	Current roses - Facies G	
9.	Current roses - Facies H (lower)	
10.	Current roses - Facies N	
11.	Current roses - Facies H (upper)	-24
12.	Generalized vertical section - Ediacara Member	30-
13.	Measured vertical sections - Ediacara Member	-31
14.	Location diagram - cross sections	31-
15.	Cross section - Wilpena Pound (ENE)	
16.	Cross section - Wilpena Pound (SW)	
17.	Cross section - Heysen Range	
18.	Cross section - North Heysen Range	
19.	Cross section - Elder Range	
20.	Cross section - Chace Range	
21a.	Cross section - Druid Range	
21b.	Cross section - East of Blinman	-32
22.	Isopach map - Ediacara Member	34-35
23.	Block diagrams: reconstruction of depositional environments of the Ediacara Member	50-51
24.	Block diagram: palaeogeography of the Ediacara Member	51-52

## SUMMARY

Facies analysis of the Pound Subgroup has enabled the first detailed environmental interpretation of the Bonney Sandstone and the Rawnsley Quartzite, with particular reference to the Ediacara Member.

A regional disconformity separates the clayey sandstones of the Bonney Sandstone from the overlying, more mature sandstones of the Rawnsley Quartzite. Within the previously defined Rawnsley Quartzite, the Ediacara Member occurs with a marked erosionally unconformable base in the Wilpena Pound area. The fossiliferous facies of the Ediacara Member increase in frequency toward the top.

The red clayey sandstones of the Bonney Sandstone represent a prograding tidal mud flat and delta sand ridge complex passing up into alluvial plain sediments. These are disconformably overlain by clean, current bedded feldspathic sandstones of the Rawnsley Quartzite which are interpreted as shallow marine and intertidal sand flat deposits. The Ediacara Member comprises an anomalous packet of sediments deposited after a spectacular erosional event within the Rawnsley Quartzite, when valleys were incised some 250 metres into the underlying sediments. These southeast trending valleys were filled by a sequence of pelagic silt and proximal turbidite grain-flow sand, passing up into more widespread coarsening upward cycles of bedded silts and sands where storm-surge sands facilitated the preservation of animals of the Ediacara assemblage. Prograding shelf sands capped the sequence, heralding a widespread return to stable, shallow marine and tidal flat conditions.

A review of the relationships of animals of the Ediacara assemblage to their preservational environment suggests that most species were fossilized close to where they lived : either as offshore benthic, free living

and sessile forms or from the water column above.

A local palaeogeographic model for the Pound Subgroup envisages a source area to the west or northwest and a tidally swept, north-south trending shelf deepening to the east or south east. Periodic development of local tectonic highs influenced the Bonney Sandstone facies. Following a rapid transgression, early deposition of the Rawnsley Quartzite took place under stable conditions. A submarine erosional event followed tectonic overdeepening on the southeast part of the shelf. Subsequent progradation from the west led to a turbidite fill of the submarine valleys, followed by shallowing up cycles recording the return to tidal shelf deposition. Onshore aeolian dunes, reworking alluvial plains, are suspected as the source of mature sand which comprises much of the Rawnsley Quartzite.

STATEMENT OF ORIGINALITY

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university, and the thesis contains, to the best of my knowledge, no material previously published or written by any other person, except where due reference is made in the text of the thesis.

Signed,

ACKNOWLEDGEMENTS

I thank my supervisors, Dr V.A. Gostin and Dr R.J.F. Jenkins for their helpful advice and discussion during the study, and for their constructive criticisms during the write up.

I am most grateful to my wife Inara and sons Adam and Karl for their cheerful companionship, endurance and patience in accompanying me on extended field studies. Dennis Westlake and David Lowe provided valuable field assistance while I was reconnoitring in the most rugged parts of my field area. Particular thanks go to Eric Matson, whose voluntary services ranged from the use of his vehicle in exploratory trips, photographing cliff sections while suspended from the open door of a light aircraft and the reproduction of photographic plates for this document.

The reproduction of diagrams was performed with the help of Justin Shaw and Steven Yarrow.

I thank Mr Fred Teague of Hawker for his continued hospitality and encouragement.

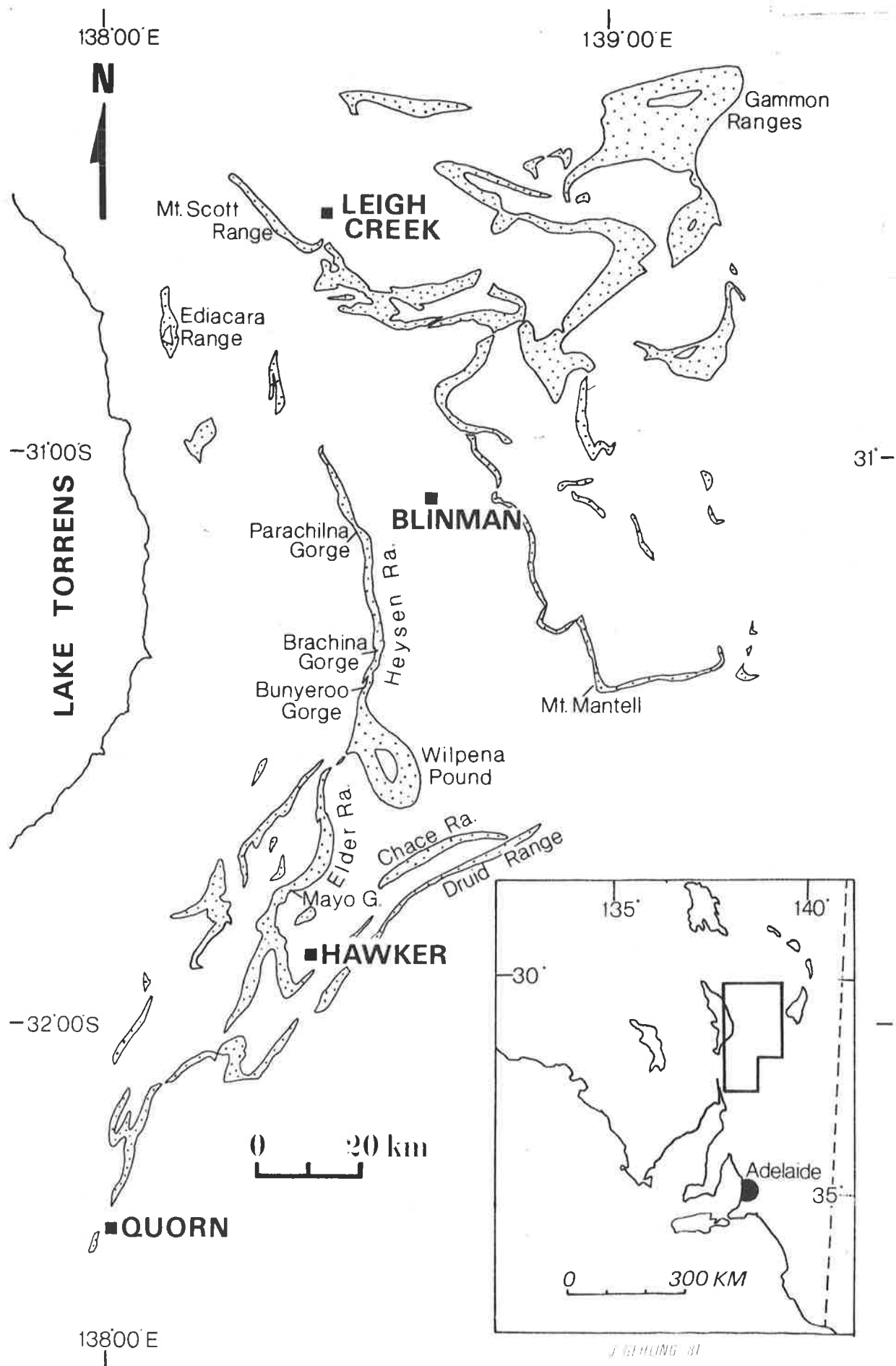
Finally, my thanks to Mrs Roslyn Leane for deciphering and typing this manuscript.

FIGURE 1

Locality map, showing principle outcrops of the Pound Subgroup (undifferentiated). Main area of study was in exposures between Hawker and Blinman.



FIG. 1



J. GILHING 81