Holocene Archaeology and Ngarrindjeri Ruwe/Ruwar (Land, Body, Spirit): A Critical Indigenous Approach to Understanding the Lower Murray River, South Australia

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Thesis submitted for the degree of Doctor of Philosophy in the Department of Archaeology, School of Humanities, Faculty of Education, Humanities and Law at Flinders University, Adelaide

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“For all Ngarrindjeri people…

… past, present and future”

This thesis is dedicated to my daughters Mikayla and Rylee

In memory of a dear friend and colleague Naomi (Jane) Anderson-Sibsado

& for Ngarrindjeri Elders who have passed during candidature

Inset Page (From left to right): Mikayla Durkin-Wilson and Rylee Durkin-Wilson on the mosaic tail of *Kondoli (whale) at Victor Harbor*, 2012 (Picture taken by Chris Wilson)

LIST OF TABLES

ABSTRACT

This thesis contributes to two areas within the discipline of archaeology. Firstly, it contributes to the emerging discourse of Indigenous archaeologies in Australia through the development of a new methodological framework for Indigenous archaeologists. Secondly, it presents a synthesis of evidence from archaeological shell deposits (also shell middens) along the Lower Murray River, South Australia, that address specific questions about chronology, antiquity of occupation, subsistence and the contemporary challenges of applying Ngarrindjeri philosophies to research, archaeological practice and ongoing management of *Ruwe/Ruwar* (Land, Body, and Spirit). Although the initial focus was to examine shell deposits located in Ngarrindjeri *Ruwe/Ruwar* it is argued that the development of methodological approaches are integral to undertaking archaeological research with Indigenous communities. For the discipline, this locally specific approach provides a framework for archaeologists and Indigenous peoples working collaboratively and interdisciplinary that consider standpoint, Indigenous epistemologies and lived histories as key criteria for identifying Indigenous specific methodologies in archaeological research.

The first contribution this thesis makes is to the field of Indigenous archaeologies through the explicit development of a methodology that considers the political context of Indigenous archaeologists conducting academic research for their own communities. Within this thesis, I have coined the phrase *'Ngarrindjeri Archaeological Standpoint'*, meaning an explicit exploration of the researcher's lived experiences and prior knowledge, relationship to the Ngarrindjeri community, critique of colonial practices (archives, representations and scientific investigations) and how multiple narratives can assist in a more holistic interpretation of the archaeological record. It is acknowledged that this approach is not necessarily exclusive to Indigenous peoples. However, in this case, identity and lived experiences provide an entry point for exploring cross-cultural engagements in the research process. Ngarrindjeri epistemologies, critical theory, standpoint theory and Indigenous archaeologies have informed the theoretical framework whilst culturally appropriate decisions were negotiated with members of the Ngarrindjeri leadership in relation to archaeological methods employed.

The second contribution this thesis makes is synthesis of archaeological research from south-eastern South Australia through an analysis of shell middens in Ngarrindjeri *Ruwe/Ruwar*. These sites (as the most dominant physically) and their associated cultural, spiritual, political values provide new evidence of occupation and lifeways in the Lower Murray River. The findings contribute to broader theories and debates about Indigenous people's use of local resources, trade networks, adaption to the environment and technological developments, as well as socio-economic behaviour in the mid-Holocene. Radiocarbon ages have provided a chronology for occupation which spans the early Holocene, from ca 8600 years BP at *Murrawong* (Glen Lossie) to the present at *Pomberuk* (Hume

Reserve). The majority of ages reported for both surface and excavated samples fall within the mid-Holocene, ca 4500 years BP. The material record associated with these investigations reflects varying historical accounts of Ngarrindjeri lifeways at contact, evidence for adaptation and seasonal patterns for resource use with a more refined chronology for occupation locally.

CANDIDATE DECLARATION

Declaration

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and to that to the best of my knowledge and belief it does not contain material previously published or written by another person except where due reference is made in the text.

20 April 2017

Signature *Date*

First, I thank the Ngarrindjeri Tendi (NT), Ngarrindjeri Regional Authority Inc., (NRA) the Ngarrindjeri Heritage Committee Inc. (NHC) and the Ngarrindjeri Native Title Management Committee Inc. (NNTMC) for enabling me to undertake archaeological research in Ngarrindjeri *Ruwe/Ruwar* and to engage in a personal journey of 'reconnection'. In particular, I admire the knowledge and education from Ngarrindjeri Elders including Uncle Marshall Carter, the late Uncle Tom Trevorrow, the late Uncle George Trevorrow (previous Rupelli of the NT), the late Uncle Matt Rigney (previous Chair of the NNTMC) and the late Uncle Neville Gollan – all of whom shared much information and knowledge about Ngarrindjeri life, culture and tradition with me. In addition, I acknowledge the ongoing support by other Ngarrindjeri community members who were involved in research planning, development and fieldwork including Grant Rigney, Luke Trevorrow, Clyde Rigney Jnr and the late Steven Walker.

The passing of five very important Ngarrindjeri leaders and cultural educators associated with this research has meant a lapse in some of the activities associated with the project and production of this thesis to allow time for people suffering with grief and loss including myself. Unfortunately, this loss and absence of leadership had a great impact on me personally coupled with my own experiences of health and wellbeing resulted in a 2 year break from professional life and progress towards the completion of the thesis until in an active process of recovery. This is to pay respect to the elders and broader academic community who have invested time and funds towards the project to ensure that I completed it in a healthy respectful and rigours manner required for a doctoral thesis. The passing of the leadership also emphasises the importance of documenting cultural knowledge during a period that requires a much younger generation of Ngarrindjeri people to begin making nation related decisions for the benefit of the broader Ngarrindjeri community. Collectively we need to keep focused, healthy and strong for our children!

Throughout the thesis process, I have had an enormous amount of support from colleagues from Flinders University, as well as developed new collaborations with academics and researchers from other institutions. Colleagues in the Office of Indigenous Strategy and Engagement have been critical to my personal and professional development and were available for numerous discussions, informal debates and advice: your insights and knowledge have been invaluable. Several archaeologists and specialists were involved throughout various stages of this project and thus provided additional expertise, advice and support. In particular, I thank Dr Roger Luebbers (supervision of Season One excavations at *Murrawong*), Dr Mick Morrison, Dr Duncan McKay, Kelly Wiltshire (assisting with excavations and advice about laboratory analysis), Glen Wade (DGPS surveying of archaeological sites through TAFE SA), Kieron Amphlett (assistance with maps and figures), Claire St George (laboratory sorting), Morgan Disspain (laboratory sorting and otolith analysis) and Shannon Smith (lithic recording and analysis).

Many shell, charcoal and otolith samples were analysed for this project under the supervision of Dr Stewart Fallon (Research School of Earth Sciences at the Australian National University), Dr Geraldine Jacobson (Australian Institute of Nuclear Science and Engineering), Dr Quan Hua and Professor Sean Ulm (both from James Cook University), and Dr Richard Gillespie (University of Wollongong).

To sustain the research, I was successful in submitting competitive grant applications to six sources of funding:

- The Indigenous Heritage Programme (IHP) Funding (SA Department for Environment and Heritage) allocated $94,000 from 2007–2011 to the Ngarrindjeri Lands and Progress Association (NLPA) for archaeological research and cultural heritage management surveys within the Lower Murray;
- The Professor Lowitja O'Donoghue Indigenous Student Postgraduate Research Scholarship (Flinders University) funded $75,000 over three years to engage in full-time research;
- The Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS) provided $21,000 (G2008/7398) for fieldwork related expenses and analysis;
- AINSE provided funding in 2010 ca $8,000 (ALNGRA10062) and 2012/13 $16,000 (ALNGRA11022) for radiocarbon analyses;
- Flinders University Research Budget (URB) Grant for postgraduate students $5000 to engage in research activities; and,
- The Aborigines Advancement League Grant for additional analysis and thesis writing $3500.

In total, ca $222,500 of competitive research grants were utilised for this research and I would like to thank the people, organisations and review committees.

During the writing phase of this thesis, two particular opportunities proved invaluable for developing my theoretical framework and without the support from Indigenous academics and colleagues I would not have understood my work in its entirety: the Summer School for Indigenous Postgraduate Students coordinated by Professor Marcia Langton and Professor Ian Anderson at the University of Melbourne in February 2010, and the Indigenous Research Methodologies Masterclass Module coordinated by Professor Aileen Moreton-Robinson (Queensland University of Technology) and Associate Professor Maggie Walter (University of Tasmania) at the University of South Australia in June 2010. Both experiences provided the foundations for being able to articulate the complex theoretical approach adopted for this thesis. During the final phase of writing, I was fortunate to be invite by Professor Moreton-Robinson to be involved in a collaborative bid to the Australian Research Council (ARC) for a Special Research Initiative (SR120100005) for the 'National Indigenous Research and Knowledges Network' (NIRAKN). The total

funding for this initiative was $3,198,392. This opportunity has enabled me to connect nationally and internationally as an early career scholar working across disciplines and boundaries.

Internationally, colleagues from other First Nations have been inspirational for their leadership in archaeology and I thank Professor George Nicholas, the Intellectual Property in Cultural Heritage (IPinCH) project for facilitating a global network of specialists in archaeology, cultural heritage and law and Professor Larry Zimmerman. Perhaps, what was the most rewarding component of the research process was the ongoing support from my supervision panel: Professor Claire Smith, Associate Professor Steve Hemming, Dr Lynley Wallis, Professor Martin Wobst, Associate Professor Joe Watkins and Mr Mark Dugay-Grist, who collectively provided an enormous amount of knowledge, experience, expertise and cultural support throughout the thesis and for providing further opportunities to pursue scholarly academic work. All these experiences have been invaluable for my professional development throughout the process of this thesis. It was a privilege to have a panel of experts such as this. For the local and logistical support I would like to extend my acknowledgment to the technical staff from the Department of Archaeology who assisted in fieldwork, sorting and analysis from 2007–2013 and volunteers who invested thousands of hours of time (which was also credited towards their degree) especially in the archaeology research laboratory. .For professional editing services, I would like to thank Dr Michael Savvas.

Finally, I would like to acknowledge here that unforeseen circumstances in my personal life significantly disrupted progress on three occasions since my initial commencement date in March 2007 and the submission line was out of reach and too far to achieve. However, I continued to push forward with the collective support from colleagues (particularly Simone Ululka Tur), my family particularly mum (Wendy Wilson), dad (Brenton Wilson), Uncle Bevin Wilson, Aunty Sue and Uncle Paul Sieben, brothers Steven and Ryan Wilson, sister Pamela Buckskin and family. Also various friends and colleagues along the way too many to name but have contributed in many ways. It was this support that reassured me in very stressful situations that I had come too far in my journey to give up and that I did have the passion, determination and commitment to complete this lifelong goal. Thank you for listening, providing advice and believing in me, even when at times, I did not believe in myself. I hope this achievement has made you all proud and I wish to share it with all of you!

Lastly, I would like to thank my two daughters, Mikayla Elizabeth and Rylee Paige Durkin-Wilson, who have kept me firmly grounded. The birth of both of you keeps me continually focused and I would not have been motivated to complete this thesis without having a reason to create a brighter future. I hope I have inspired you to follow your goals and dreams and will be there every step of the way.

Below is a list of relevant publications that have specific relevance to the methodological and theoretical development of this thesis. They include book chapters and refereed journal articles in scholarly disciplinary based journals and published during candidature. They are listed below in order of relevance by chapter.

Chapter 1 informed by the following publication:

Wilson, C.J.
2010 Becoming a Ngarrindjeri archaeologist: The journey to and from suburbia, in *Being and Becoming Indigenous Archaeologists*, Nicholas, G. (ed.), Left Coast Press, Walnut Ck, CA.

Chapter 5 informed by the following publications:

Wilson, C.J.
2008 Indigenous Research and Archaeology: Transformative practices in/with/for the Ngarrindjeri Community, *Archaeologies*, Vol 3, No. 3, pp. 320 - 334.

Wilson, C.J.
2014 Indigenous Archaeologies: Australian Perspective. In *Encyclopedia of Global Archaeology* Claire Smith, (ed.), New York, United States of America: Springer Publishing Company, pp. 3786-3793.

Tur, S. and Blanch, F. and Wilson, C.J.
2010 Developing a collaborative approach to standpoint in Indigenous Australian Research, *Journal of Australian Indigenous Issues*, University of Queensland, Vol. 39, pp. 58-67.

Chapter 7 informed by the following publications:

Wilson, C.J., Fallon, S. and Trevorrow, T.
2012 New radiocarbon ages for the Lower Murray River, South Australia. *Archaeology in Oceania*, 47(3) pp. 157-160.

Disspain, M., Wilson, C.J. and Gillanders, B.
2012 Morphological and geochemical analysis of archaeological fish otoliths from the Lower Murray River, South Australia. *Archaeology in Oceania*, 47(3) pp. 141-150.

Disspain, M. Wilson, C. Gillanders, B. Wallis, L. Ulm, S. Sumner, M.
2016, Direct radiocarbon dating of fish otoliths from mulloway (*Argyrosomus japonicas*) and black bream (*Acanthopargus butcheri*) from Long Point, Coorong, South Australia. *Journal of the Anthropological Society of South Australia.*

Uncle Marshall Carter	Board Member, Ngarrindjeri Regional Authority. Member of Kalparrin Community Inc. at Murray Bridge and Senior Educator for Ngarrindjeri people and culture along the Lower Murray. Uncle Marshall was the key Ngarrindjeri Elder involved in assisting during surveys and excavation.
Uncle Neville Gollan	The late Uncle Neville Gollan is was Senior Ngarrindjeri Elder of the Coorong and cultural educator of Ngarrindjeri language and history. Uncle Neville was heavily involved in the operations at Camp Coorong and one of the main cultural teachers for the Ngarrindjeri Lands and Progress Association.
Uncle Billy Rankine	Senior Ngarrindjeri man and cultural educator who has been at Camp Coorong since it was created in 1982. He has had many roles including caterer, landscaper and builder and continues to be involved in many Ngarrindjeri cultural events. Uncle Billy's main role however has been assisting with catering for school and community camps.
Uncle Matt Rigney	The late Uncle Matt was Chair of the Ngarrindjeri Native Title and Management Committee; Chair of the Murray Lower Darling River Indigenous Nations and member of the Ngarrindjeri Heritage Committee. Uncle Matt designed the Ngarrindjeri flag and was a former Aboriginal and Torres Strait Islander Commission Regional Chair. He was instrumental in native title negotiations and natural resource management issues over the last 40 years.
Professor Daryle Rigney	Dean, Office of Indigenous Strategy and Engagement, Flinders University. Director of Ngarrindjeri Ruwe Contracting, Board Member, Ngarrindjeri Regional Authority. Director of the Ngarrindjeri Research Institute. Daryle has been extensively involved in Ngarrindjeri governance, water management, and heritage and research policy for the Ngarrindjeri Regional Authority and has been involved with several research projects associated with Ngarrindjeri *Ruwe/Ruwar*.
Uncle Grant Rigney	Board Member, Ngarrindjeri Regional Authority. Vice-Chair of Murray Lower Darling River Indigenous Nations. Grant has extensive experience in teaching Ngarrindjeri culture and history and was based at Camp Coorong during the earlier periods of this project. He has been a key community member involved in this research since its inception and assisted with several cultural heritage surveys in the region and the Lower Murray Cultural and Archaeological Project towards the end of the project.

Uncle Darrell Sumner	Chair, Ngarrindjeri Native Title Management Committee, Chair, Ngarrindjeri Ruwe Contracting. Board Member, Ngarrindjeri Regional Authority. Uncle Darrell is a Senior Ngarrindjeri Elder from Goolwa, Milang and Hindmarsh Island. He has been involved in numerous Ngarrindjeri cultural and political activities in Ngarrindjeri *Ruwe/Ruwar* as well as managed the Ngarrindjeri Elders Group for nearly 12 years. More recently, Uncle Darrell has been heavily involved in Camp Coorong Race Relations Centre and the Ngarrindjeri Regional Authority.
Uncle Major Summer	Board Member, Ngarrindjeri Regional Authority. Uncle Major (Moogy) Sumner is the key Ngarrindjeri cultural dancer and spiritual leader for the Ngarrindjeri community. He is a cultural and spiritual advisor for the Aboriginal Sobriety Group as well as manages his own Ngarrindjeri dance group, Tal-kin-yeri. Uncle Moggy is heavily involved with the repatriation of Ngarrindjeri Old People from UK and Australian museums and the Murrundi *Ruwe/Ruwar* Pangari Ringbalin (Murray River Spirit Country) Ceremonies.
Uncle Steve Sumner	Chief Executive Officer of the Ngarrindjeri Regional Authority and Ngarrindjeri senior cultural advisor/elder.
Uncle George Trevorrow	The late Uncle George Trevorrow, was the Rupelli (Head) of the Ngarrindjeri Tendi and Chair of the Ngarrindjeri Regional Authority. Uncle George began working as an Aboriginal Education Worker at Meningie Area School and later became involved in various cultural and political issues including Ngarrindjeri heritage, repatriation of Ngarrindjeri Old People, archaeology and tourism and was also the Manager of the Coorong Wilderness Lodge which provides a Ngarrindjeri 'experience' to the broader community, including international visitors.
Uncle Tom Trevorrow	The late Uncle Tom was the key Elder with whom I worked on this research. He was involved in cultural heritage, archaeology and natural resource management for several years. Uncle Tom has more than 20 years' experience working with Indigenous and non-Indigenous Australians in relation to cultural heritage, archaeology, anthropology, native title, natural resource management and education more broadly.

Aunty Alice Abdulla	Aunty Alice is a Senior Ngarrindjeri woman and cultural advisor for the Ngarrindjeri nation. She works closely with Aunty Rita to educate people about Ngarrindjeri culture and art using both traditional and contemporary methods of feather flower making and weaving at Camp Coorong Race Relations Centre.
Aunty Eunice Aston	Current Chair of the Ngarrindjeri Regional Authority and Ngarrindjeri senior cultural advisor/elder.
Aunty Noreen Kartinyeri	Aunty Noreen is a Senior Ngarrindjeri woman from Raukkan and cultural educator at Camp Coorong who has been teaching since 1999. Aunty Noreen's main role for the Ngarrindjeri Lands and Progress Association is catering, weaving and management of accommodation services for school and community camps. She is strongly interested in preserving and maintaining Ngarrindjeri cultural heritage.
Aunty Eileen McHughes	Former Chair of the Ngarrindjeri Elders group. Senior Ngarrindjeri Elder and member of the Ngarrindjeri Regional Authority. The late Aunty Eileen was an elder from the Lower Murray River who grew up in the region. She had extensive knowledge about Ngarrindjeri lifeways and was involved in the Ngarrindjeri Cultural and Archaeological Workshop at Murray Bridge.
Aunty Ellen Trevorrow	Board Member, Ngarrindjeri Regional Authority. Aunty Ellen is a Senior Ngarrindjeri weaver and international artist whose work has been exhibited in local, national and international art galleries. Aunty Ellen is a member of the Ngarrindjeri Lands and Progress Association and the Ngarrindjeri Heritage Team and has been involved in assisting in the organisation or projects under the Indigenous Heritage Project grants that have provided financial support towards Ngarrindjeri projects in cultural heritage, archaeology, anthropology and repatriation of Ngarrindjeri Old People.
Aunty Rita Trevorrow	Aunty Rita is a Senior Ngarrindjeri woman and cultural advisor for the Ngarrindjeri nation who has been instrumental in the establishment of Camp Coorong and its educational programs for the Ngarrindjeri Lands and Progress Association. She is also an artist and assists Aunty Alice in making feather flowers, baskets and other Ngarrindjeri art materials for the Ngarrindjeri community.

Eddie Carter	Ngarrindjeri woman from Raukkan and Senior Youth Worker at Camp Coorong. Eddie is a member of the Ngarrindjeri Heritage Committee, Ngarrindjeri Lands and Progress Association and Secretary for the Ngarrindjeri Regional Authority. Eddie was involved in the early stages of this project.
Candice Hartman	Young Ngarrindjeri leader and undergraduate student in archaeology at Flinders University. Candice has been involved in several archaeological projects based at Flinders and was currently employed by the NRA as a cultural heritage officer.
Tim Hartman	Former Chair of the Ngarrindjeri Regional Authority. Ranger for the National Parks and Wildlife Service (SA) and member of the Ngarrindjeri Regional Authority. Tim has been instrumental in negotiations and management of Ngarrindjeri lands and waters including the Coorong National Park.
Clyde Rigney Jnr	Chief Executive Officer, Murrundi Aboriginal Community Controlled health Organisation, Former Project Officer for Ngarrindjeri Ruwe Contracting (NRC). Clyde is a member of the Ngarrindjeri Regional Authority and active community member within the Murray Bridge region. He has been involved in several natural resource and cultural heritage management projects.
Luke Trevorrow	Business Manager and Heritage Coordinator for the Ngarrindjeri Regional Authority. Former Managing Director of Ngarrindjeri *Ruwe/Ruwar* Contracting, Member of the Ngarrindjeri Regional Authority and Member of the Ngarrindjeri Heritage Committee. Luke plays a key role in the Ngarrindjeri community and has assisted in various projects relating to research, cultural heritage management and protection well as natural resource management. Luke has also been fundamental in assisting in coordination of Ngarrindjeri community members for this research.
Steven Walker	The late Steve Walker was the Managing Director of Ngarrindjeri *Ruwe/Ruwar* Contracting and Coordinator for the Ngarrindjeri Caring for Country Program. He was involved in various discussions relating to natural and cultural heritage management, research as well as thee management and protection of various archaeological, cultural and spiritual sites within Ngarrindjeri *Ruwe/Ruwar*.

Mr Shaun Berg	Principal of Berg Lawyers. Sean Berg is the legal representative for the Ngarrindjeri community, lawyer and expert in Intellectual Property rights. He has assisted with major government negotiations related to Murray Futures, Riverine Recovery and Native Title for the Ngarrindjeri community. More recently, he has challenged the state government in relation to the Letters Patent, issues of sovereignty and settlement in South Australia. Further, he as well as provided indirect mentoring and support towards this thesis.
Mr Michael Diplock	Michael is the current Senior Heritage Specialist for the Ngarrindjeri Regional Authority, based at the Murray Bridge Office to support the Ngarrindjeri cultural heritage program. Michael also provides mentoring and training to other Ngarrindjeri staff and community members and was involved in the Ngarrindjeri Lower Murray Cultural and Archaeological Workshop
Miss Amy Della-Sale	Amy is a current Heritage Specialist for the Ngarrindjeri Regional Authority, based at the Murray Bridge Office to support the Ngarrindjeri cultural heritage program. Amy also provides mentoring and training to other Ngarrindjeri staff and community members.
A/Prof Steve Hemming	Associate Professor in the Office of Indigenous Strategy and Engagement, Flinders University and key heritage adviser for the Ngarrindjeri community who has extensive experience in museums, anthropology, cultural studies, cultural heritage and critical Indigenous studies who worked with many Ngarrindjeri elders and community members including my great Uncle Lindsay Wilson who was one of Steve's primary cultural educators. Steve was a key specialist in assisting the Ngarrindjeri Heritage Committee and Ngarrindjeri Regional Authority develop its broader management strategies for caring for country – *Yarluwar-Ruwe* (Sea Country).
Miss Kelly Wiltshire	Senior Archivist for Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS). Kelly Wiltshire is also a PhD Candidate in the Department of Archaeology at Flinders University and contract heritage specialist for the Ngarrindjeri Regional Authority. Kelly has worked with the Ngarrindjeri Regional Authority for approximately 6 years on various heritage related projects, repatriation and reburial and community training. Prior to this, Kelly has worked for various Ngarrindjeri organisations in a heritage and research capacity since completing her Honours research with Ngarrindjeri Heritage Committee in 2006. Kelly was involved in all major field seasons, assisted with research development and dissemination of findings and general postgraduate support.

AAA	Australian Archaeological Association Inc. A national representative organisation for Australian archaeologists and those interested in archaeology.
AACAI	Australian Association of Consulting Archaeologists Incorporated.
AARD	Aboriginal Affairs and Reconciliation Division (South Australia). This State government department administers the *Aboriginal Heritage Act 1988*.
ACHM	Australian Cultural Heritage Management. A (now closed) private consulting firm formerly based in Adelaide that specialised in cultural heritage management, archaeology, anthropology and GIS. This company had a service agreement with the Ngarrindjeri Heritage Committee for undertaking cultural heritage management in Ngarrindjeri *Ruwe/Ruwar* prior to this thesis.
AEW	Aboriginal Education Worker employed by the Department for Education and Children's Services to work with Indigenous students in South Australian schools. They are now referred to as Aboriginal Community and Education Officers.
AIAA	Australian Indigenous Archaeologists Association Inc. A national representative organisation for Indigenous Australians who have degrees in archaeology, established in 2010.
AIATSIS	Australian Institute of Aboriginal and Torres Strait Islander Studies. A federally funded research organisation, which has the largest repository of information on Aboriginal and Torres Strait Islanders, based in Canberra.
AINSE	Australian Institute for Nuclear Science and Engineering. A federally funded research organisation situated within the Australian Nuclear Science and Technology Organisation (ANSTO), Sydney.
AMS	Accelerator Mass Spectrometer. An instrument used for radiocarbon dating very small amounts of organic materials.
ANSTO	Australian Nuclear Science and Technology Organisation. Federally funded organisation based in Sydney.
ANU	The Australian National University.
ANZACS	Australian and New Zealand Army Corps.
ARC	Australian Research Council. Competitive research funding organisation funded by the Australian Government.
ATSIC	Aboriginal and Torres Strait Islander Commission. Former representative body for Indigenous people. The Howard Government dismantled this organisation.
BP	Before Present.
CDEP	Community Development and Employment Program. A former Federally funded program for Indigenous Australians working within their community, which provided a source of income for individuals.
CHM	Cultural Heritage Management.
DECS	Department for Education and Children's Services (South Australia).
DEH	Department for Environment and Heritage (South Australia).
DENR	Department for Environment and Natural Resources (South Australia).

DEWHA	Department for Environment, Water, Heritage and the Arts (Federal).
dGPS	Differential Global Position System.
DIRD	Discovery Indigenous Researchers Development. A scheme funded under the Australian Research Council.
DoSAA	Former Department of State Aboriginal Affairs (South Australia).
EPA	Environmental Protection Authority (South Australia).
FTL	Fish Total Length. Refers to the calculation of the total length of a fish based on the weight and size of its otolith (ear bone).
GIS	Geographical Information System.
GLM	Glen Lossie Midden.
GLMBS	Glen Lossie Midden and Burial Site.
ICIP	Indigenous Cultural and Intellectual Property.
IHEAC	Indigenous Higher Education Advisory Committee. An Indigenous advisory committee that deals directly with government in relation to Indigenous higher education policy.
IHP	Indigenous Heritage Project. A Federally funded competitive grant scheme for Indigenous organisation to conduct heritage related projects on country.
SSIPS	Summer School for Indigenous Postgraduate Students. A program for Indigenous postgraduate students that focused on research skills and development. Organised by the University of Melbourne.
IRMMM	Indigenous Research Methodologies Masterclass Module. A program for Indigenous postgraduate students that focused on research methodologies. Organised by the Queensland University of Technology and University of Tasmania.
JCU	James Cook University.
KNY	Kungun Ngarrindjeri Yunnan Agreements. Community based agreements, which recognise Ngarrindjeri people's culture, traditions and interest in Ngarrindjeri *Ruwe/Ruwar*.
LMAHS	Lower Murray Archaeological Heritage Study. An archaeological survey conducted by Vivienne Wood between Mannum and Lake Alexandrina, South Australia. A report was submitted to DoSAA and the MDBC.
LMAP	Lower Murray Archaeological Project. The name given to the project for which the research for this thesis was conducted. LMAP was funded through the IHP grants from 2007-2011.
LMRIA	Lower Murray Reclaimed Irrigation Area. A project that aimed at reclaiming wetlands throughout the Lower Murray, South Australia.
MDBC	Murray Darling Basin Commission.
MLDRIN	Murray Lower Darling River Indigenous Nations. An organisation of Indigenous groups along the Murray Lower Darling River, which deals directly with government in relation to cultural water issues.
MNI	Minimum Number of Individuals. Refers to the smallest number of individuals that is necessary to account for all specimens in an assemblage, used when studying freshwater shellfish and non-molluscan faunal remains in this study.
NATSEP	National Aboriginal and Torres Strait Education Policy.

NBC	Ngarrindjeri Business Centre.
NLMCAW	Ngarrindjeri Lower Murray Cultural and Archaeological Workshop
NHC	Ngarrindjeri Heritage Committee. An organisation forming part of the Ngarrindjeri Regional Authority based at Camp Coorong, Meningie.
NHMRC	National Health and Medical Research Council.
NIRAKN	National Indigenous Research and Knowledges Network
NISP	Number of Identifiable Specimens Present. Refers to a count of all specimens within an assemblage, applied to non-molluscan faunal remains in this study.
NLPA	Ngarrindjeri Land and Progress Association. An organisation, part of the Ngarrindjeri Regional Authority based at Camp Coorong, Meningie.
NMLC	Ngarrindjeri Meningie Land Council.
NNTMC	Ngarrindjeri Native Title and Management Committee. An organisation, part of the Ngarrindjeri Regional Authority.
NRA	Ngarrindjeri Regional Authority. The peak governmental body of the Ngarrindjeri nation.
NRC	Ngarrindjeri *Ruwe*/*Ruwar* Contracting. A business organisation, part of the Ngarrindjeri Regional Authority.
NRMB	Natural Resource Management Board. A state government organisation dealing with natural resources.
NRPPU	Ngarrindjeri Research Planning and Policy Unit. A community research organisation established by the NRA, which is based in Yunggorendi First Nations Centre, Flinders University.
NT	Ngarrindjeri Tendi.
NYR	Ngarrindjeri Yarluwar Ruwe.
NYRP	Ngarrindjeri Yarluwar Ruwe Program. A sub-committee of the NRA.
OISE	Office of Indigenous Strategy and Engagement, Flinders University. Formerly Yunggorendi First Nations Centre.
RSES	Research School of Earth Sciences, The Australian National University, Canberra.
SA	South Australia.
SAM	South Australian Museum.
SAMDB	South Australian Murray Darling Basin.
SBREC	Social and Behavioural Research Ethics Committee, Flinders University.
SSAMS	Single Stage Accelerator Mass Spectrometer. An instrument used for radiocarbon dating very small organic samples. For this project, the SSAMS within the RSES was used to analyse shell and charcoal samples collected.
TL	Total Length. Refers to the total length of a fish from the tip of its nose to the tip of its caudal fin ray.
UoA	University of Adelaide.
UCL	University College of London.
ULIN	United League of Indigenous Nations. An organisation of Indigenous Nations that provides a global network for address issues of international importance.
URB	University Research Budget, Flinders University.

UWA	University of Western Australia.
WAC	World Archaeological Congress. An international archaeological organisation that represents archaeologists globally.
YFNC	Yunggorendi First Nations Centre. An Indigenous support, teaching and research centre in higher education and research based at Flinders University.

Kaikalamb	Granite Island
Kaldowinyeri	The creation
Kangerung	Swanport
Kilawe	Brother, brother in law
Kondoli	Whale
Korni	Man, boyfriend
Kranakung	Near Wellington
Kumarangk	Hindmarsh Island
Kungun	Listen
Kurangk	Coorong
Lakalinyerar	Clan group
Lalanganggel	Mt Misery
Len-ko	Small fishing nets
Longkewar	Rosetta Head, The Bluff
Mantera	Bush apples
Maralangk	Two sisters, the elder as the large rock
Matamai	Story of Ngurunderi's son
Merakung	Mason's Lookout
Meruki	Two sisters, the youngest as the smaller rock
Mi:mini, memini	Woman
Miwi	Soul, centre of the stomach
Mumpeluwong	Mypolonga
Murrawong	Glen Lossie
Murrundi	River Murray
Naningi	Pig face
Nganguruku	Clan group within Murray Bridge and Mannum
Ngarrindjeri	Collective first nation of peoples of the Murray River, Lakes and Coorong in South Australia
Ngaralta	Mannum
Ngartji	Friend, protector, totem

Ngurunderi	Ngarrindjeri creation ancestor of the Lower Murray, Lakes and Coorong
Ngurunderwark-ngali	Inland Younghusband Peninsula
Nukkan, nukkin	Look, see
Paingal	Seal
Pemandang	Near Merakung (Mason's Lookout)
Piwingang	The hawk place
Polmandang	Point Pomanda
Pomberuk	Hume Reserve
Raukkan, Rawukung	Point McLeay, traditional meeting place
Rupelle, Rupelli	Chair of the Tendi
Ruwe/Ruwar	Lands and waters, country, body, spirit
Ringbalin	River ceremony
Tangklang	Tankalilla Beach
Tendi	Ngarrindjeri governmental body
Waiyuruwar	Sky
Walderineind	Kings Point, on the western side of The Bluff
Wurley	A traditional shelter made from various materials including tree branches and reeds. After contact, hessian bags were commonly used in their construction.
Yarldi, Yarlde	Group of people from the Lower Murray
Yarluwar-Ruwe	Sea country
Yunnan, yannun	Speak, talk

> Yeah, I class myself as Ngarrindjeri, I might be a bit pale looking but I'm still Ngarrindjeri. (Allan Wilson 2005, pers. comm.; also see Wilson 2006)

1.1 From the Beginning: Experiences of Being Ngarrindjeri

I come from a strong group of people — the Ngarrindjeri — who are a nation from the Lower Murray, Lakes and Coorong in southeast South Australia (SA). I am Ngarrindjeri through my father and grandfather, who were both born on Ngarrindjeri *Ruwe/Ruwar* (lands, waters, body and spirit). In recent years, I have learnt that I also have connections to the Kaurna people of the Adelaide Plains through my great-grandfather, and to the *Latji Latji* people of northwest Victoria through my grandmother. I am also a proud Australian with European heritage, including Irish and British ancestry on my mother's side as a result of her grandparents' migration to Australia in the early 1920s. The Wilson name and family genealogy extends back to a 'white' whaler whose origin is unknown, however it is likely that the European connections also include Scottish and Russian ancestry (see Kartinyeri 1990). My connection and relationship to the Ngarrindjeri people is most familiar to me at present, as I grew up with an understanding passed down by my father that I am Ngarrindjeri; it is this ancestry that is the focus of this thesis. Ultimately, my lived experiences and the remembered experiences of my family ground me as a Ngarrindjeri person, the way that I have approached this research, engaged with the literature, interpreted the results and presented my findings.

I have become particularly interested in learning more about my family history, in addition to what was taught to me by relatives. Reflexivity in archaeological research provides a framework for how Indigenous peoples can engage in other aspects of knowledge production related to family history and genealogies. Learning about family is an endeavour for me as a Ngarrindjeri person learning more about my culture, identity and history on *Ruwe/Ruwar* and one which is fundamental for Indigenous peoples conducting academic research with their own communities. Through the process of this research I have become familiar with certain aspects of this history through a colonial gaze, particularly the knowledge recorded by anthropologist Norman B. Tindale in his journals from expeditions along the River Murray, the collection of photographs of so-called 'half-caste' children at *Raukkan* (previously Point McLeay Mission) and the genealogies of Ngarrindjeri families, many of whom continue to live on Ngarrindjeri *Ruwe/Ruwar* or have strong associations to places in the Lower Murray, Lakes and Coorong. According to these records, the first generation of the Wilson family extends to a white whaler and French seaman only known as "Wilson" who married a 'full blood' Ngarrindjeri women called 'Fanny'. Tindale (1930–1952 AA338/1/31/1) recorded that Fanny came from the head of the Coorong and was part of the Ngarrindjeri *Tanganekald* clan who lived with

Wilson on Kangaroo Island. Together they had four sons, only two — Robert and John (aka Sewsty or Sustie) — of whom had children. When Wilson died, Fanny went to live with another 'old man' until she died in 1863; there were no children from this relationship. I am a descendant of Sustie who was born at Cape Jervis in 1849 and died at *Raukkan* on 21 January 1935 at the age of 105. As the oldest living Ngarrindjeri person at the time, he was often approached to recount his life experiences. In a local newspaper article from 19 August 1932 (see Tindale 1930–1952 AA338/1/31/1 p.48), three particular accounts of 'hunting' on Ngarrindjeri *Ruwe*/*Ruwar* after European contact are told to the reporter (Figure 1.1). The first is a recollection of hunting kangaroos at *Raukkan*:

> According to him [Sustie] the young men of today are too lazy. When he was young men were men, he says. He can remember having secured 30 kangaroos in one kill himself. "Point McLeay was a paradise in the old days" he said. "Mobs of kangaroos came right into the mission well to get a drink. The men would spear and club them by the dozen.

The second account is a description of Sustie whaling at Encounter Bay with non-Indigenous whalers:

> He [Sustie] says that the Encounter Bay tribe of natives, many of whom were employed on the boats, were much better whalers than the whites. This, he said, was because they had been throwing spears all their lives, and took to harpooning naturally. When "Sustie" was quite young he was in a whaling crew which was dragged about 12 miles out to sea by a huge whale. "We took two days and two nights to row back", he said, "and it was hard going too, especially when the wind was against us. Not many of the young men of today could have done it.

The third is a story that Sustie tells about a whale enchanter referred to by the whalers as Charlie Warne, whose totem was the whale:

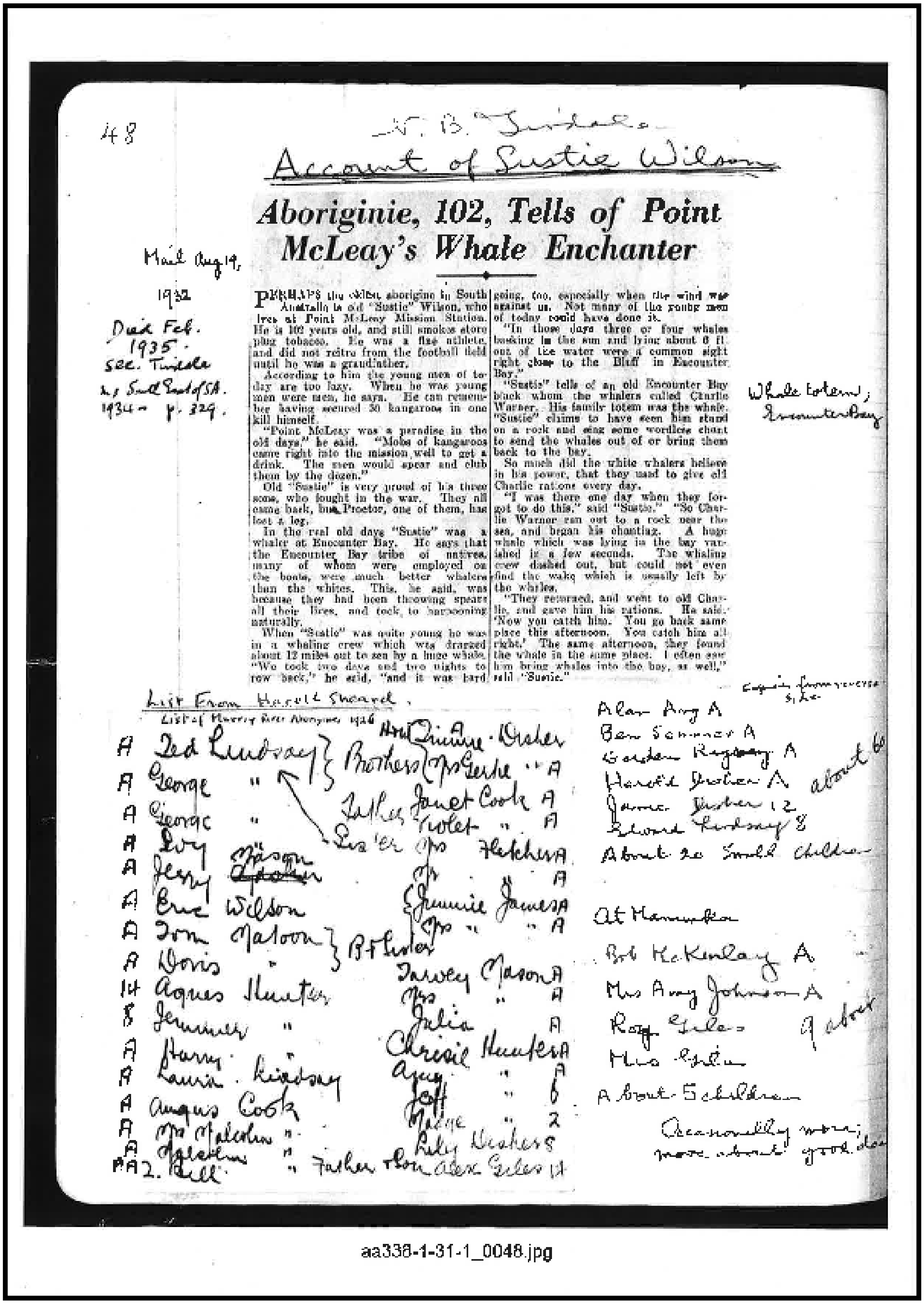
> So much did the white whalers believe in this power, that they used to give old Charlie rations every day. "I was there one day when they forgot to do this", said "Sustie." "So Charlie Warner ran out to a rock near the sea, and began his chanting. A huge whale which was lying in the bay vanished in a few seconds. The whaling crew dashed out, but could not even find the wake which is usually left by the whales." "They returned and went to old Charlie and gave him his rations. He said, 'Now you catch him. You go back same place this afternoon. You catch him all right.' The same afternoon, they found the whale in the same place. I often saw him bring whales into the bay, as well.

The significance of retelling the accounts of my great-great grandfather Sustie is to position myself in the community, and thus show the trajectory that connects past, present and future generations of Ngarrindjeri people. Later in this thesis, the importance of *Ruwe*/*Ruwar* is explained in a holistic manner from an Ngarrindjeri perspective and I build upon this understanding later in the thesis through my own lived experiences.

Sustie married a Ngarrindjeri woman, Eliza Wilkins (born on Kangaroo Island in 1851) at *Raukkan* on 22 October 1869. Eliza's father was a Russian-Finn whaler named John Wilkins and her mother was a 'full blood' Kaurna woman called Nellie *Raminyemmerin* (Figure 1.2). From this marriage, Charles (aka 'Umpsie') Wilson — my great grandfather — was born at *Raukkan* in 1882 and died there in 1942. He married Mary Jane Watson and spent his life at *Raukkan* with his wife. Charles' other three brothers — Proctor ('Poblee'), Eustace and Clifford — fought in the Great War in France between 1914–18, adding another layer to the Wilson family history as the first Ngarrindjeri ANZACS (Kartinyeri 1996) during a period when Aboriginal people were not even recognised as citizens of the country they fought for. During the war, Uncle Poblee was injured and had to have a leg amputated. It is said that he wrote a song about this experience but unfortunately I have not been able to locate its existence. Charles and Mary had a total of eight children including my grandfather, Allan Protector, who was born at *Raukkan* on 15 May 1929. Although he spent the majority of his school-aged years at *Raukkan*, there were many times the family travelled around the lakes and along the Coorong:

> We use to go down the Coorong every Christmas. Our uncle use to take us down there every year and when I was about six or seven I use to go to the Coorong, my uncle, my father and one of the other uncles brought a big boat. We use to go there every year, every Christmas time we would go down the Coorong. We use to get cockles and go to the jetty at night time and get fish's and eat all that, we lived a good life when we went down the Coorong … yeah we lived a good life down there, down the Coorong. (Wilson and Wilson, pers. comm.)

The lives of Indigenous people during this period were controlled by government authorities and most Ngarrindjeri people who were displaced onto *Raukkan* were also the objects of scientific inquiry and explanation. Interestingly enough, this colonial history has produced an historical record which younger generations are able to access. For example, there were two images that I recovered from the archives that have family significance, including a "mug-shot" black and white photograph of my pop and his brother Emmanuel Wilson taken by Tindale (Figure 1.3). This image immediately caught my attention as it is the same photo that my nana displayed in her home for many years! The second was a pencil drawing completed by pop when he was ca 6 years of age (Figure 1.4). This image I had never seen before and it provides an interesting historical account and representation of "mission life" in the 1930s.



48

N. B. Tindale

Account of Sustie Wilson

Mail Aug 19, 1932

Died Feb. 1935. see. Tindale in South Rec of SA. 1934 – p. 329.

Aboriginie, 102, Tells of Point McLeay's Whale Enchanter

PERHAPS the oldest aborigine in South Australia is old "Sustie" Wilson, who lives at Point McLeay Mission Station. He is 102 years old, and still smokes store plug tobacco. He was a fine athlete, and did not retire from the football field until he was a grandfather.

According to him the young men of today are too lazy. When he was young men were men, he says. He can remember having secured 30 kangaroos in one kill himself.

"Point McLeay was a paradise in the old days," he said. "Mobs of kangaroos came right into the mission well to get a drink. The men would spear and club them by the dozen."

Old "Sustie" is very proud of his three sons, who fought in the war. They all came back, but Proctor, one of them, has lost a leg.

In the real old days "Sustie" was a whaler at Encounter Bay. He says that the Encounter Bay tribe of natives, many of whom were employed on the boats, were much better whalers than the whites. This, he said, was because they had been throwing spears all their lives, and took to harpooning naturally.

When "Sustie" was quite young he was in a whaling crew which was dragged about 12 miles out to sea by a huge whale. "We took two days and two nights to row back," he said, "and it was hard going, too, especially when the wind was against us. Not many of the young men of today could have done it.

"In those days three or four whales basking in the sun and lying about 6 ft. out of the water were a common sight right close to the Bluff in Encounter Bay."

"Sustie" tells of an old Encounter Bay black whom the whalers called Charlie Warner. His family totem was the whale. "Sustie" claims to have seen him stand on a rock and sing some wordless chant to send the whales out of or bring them back to the bay.

So much did the white whalers believe in his power, that they used to give old Charlie rations every day.

"I was there one day when they forgot to do this," said "Sustie." "So Charlie Warner ran out to a rock near the sea, and began his chanting. A huge whale which was lying in the bay vanished in a few seconds. The whaling crew dashed out, but could not even find the wake which is usually left by the whales.

"They returned, and went to old Charlie, and gave him his rations. He said: 'Now you catch him. You go back same place this afternoon. You catch him all right.' The same afternoon, they found the whale in the same place. I often see him bring whales into the bay, as well," said "Sustie."

Whale totem; Encounter Bay

List From Harold Sheard.

List of Murray River Aborigines 1926

aa338-1-31-1_0048.jpg

Figure 1.1 An account by Sustie Wilson of a Whale Enchanter recorded in local newspaper August 19, 1932 (Norman B. Tindale River Murray Journal, Courtesy of the South Australian Museum).

Figure 1.2 Photograph of Nellie Raminyemmerin (“full-blood” Kaurna women) who had children to a Russian Finn John Wilkens who were both parents to Eliza Wilkens who married Sustie Wilson (Photo obtained from family member, 2012).

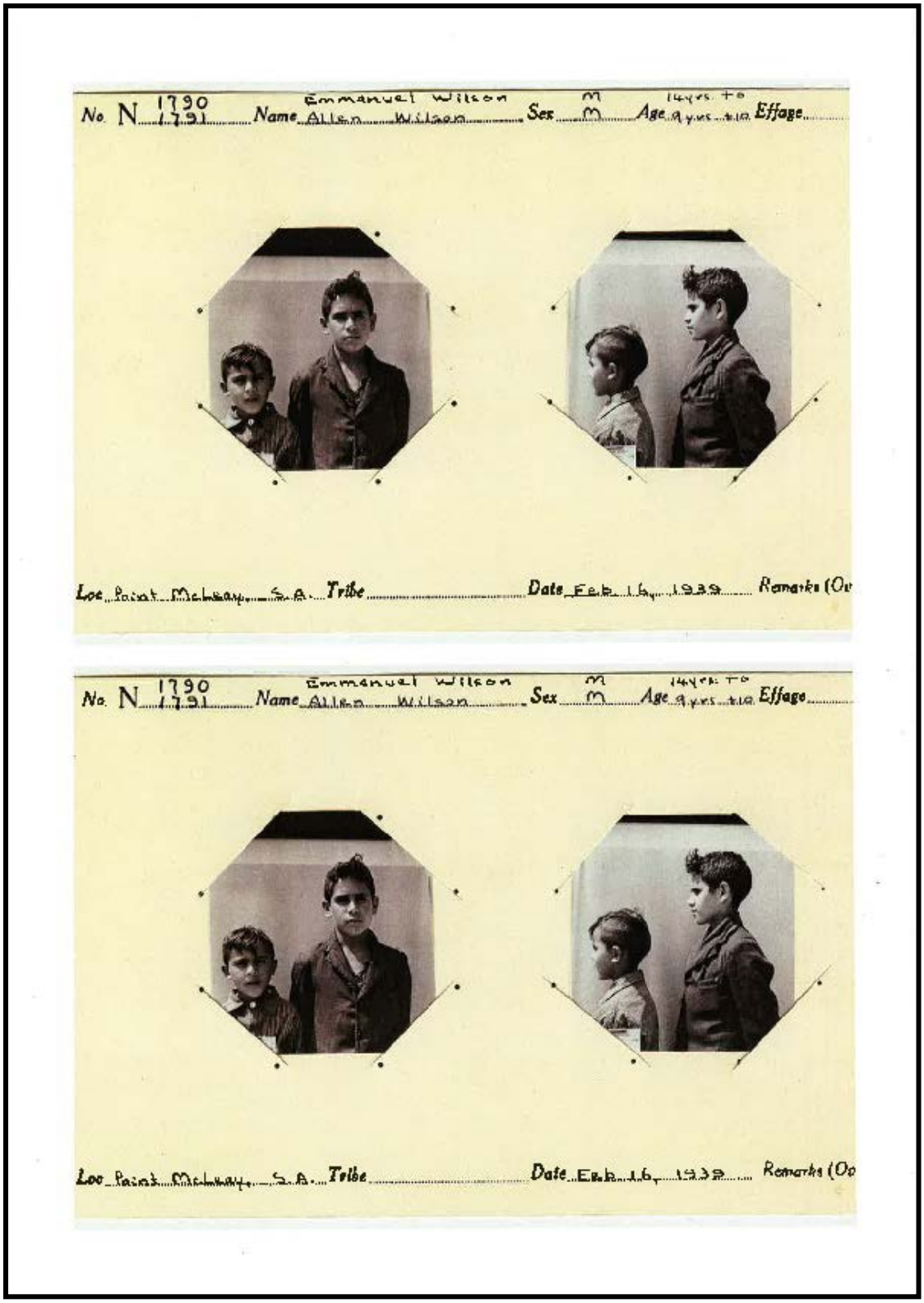


Figure 1.3 Photographs of Emmanuel and Allan Wilson taken at *Raukkan* on 16 February 1939 by Norman B. Tindale during his extensive cataloguing of Aboriginal "half-castes" in SA (courtesy South Australian Museum [SAM]).

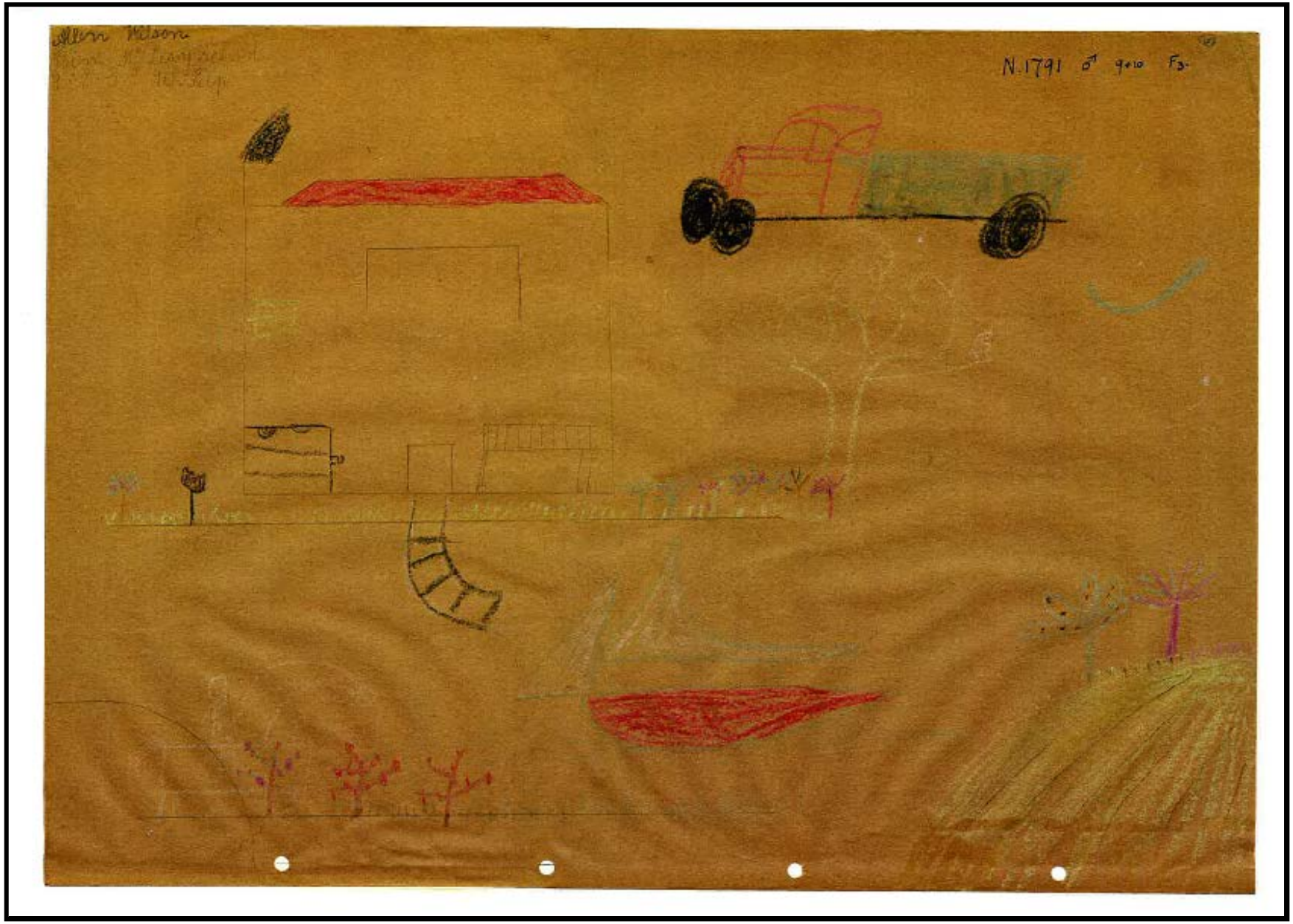


Figure 1.4 Pencil drawing by Allan Wilson (aged ca 6 years) collected by Tindale at *Raukkan* (courtesy South Australian Museum).

Allan moved to Berri in the Riverland, SA, at the age of 16 with other family members seeking work, which predominately involved picking fruit (particularly apricots). It was during this time that he met my grandmother Thelma Grace Harradine — a Latji woman from Bordertown in Victoria near the SA border. One of the stories told by my grandmother that I recorded during my Honours research was about their first encounter along the banks of the River Murray:

> He [Allan] came across in a bloody canoe, it was in the night and we was burning cows dun for the mosquitoes, keeping the mosquitoes away from the camps. We looked and my mother said "hey look at this fulla here, he come across in a bloody canoe." (Thelma Wilson in Wilson 2005:84)

Allan and Thelma spent a number of years living along the River Murray in wurleys made of hessian bags during the 1940s when assimilation and segregation policies were in full force. After several years in Berri my grandparents moved to Reynella in southern Adelaide (where the majority of my family resides today), at which time my grandfather began working along the railways. In total they had 13 children (seven boys and six girls); my father, Brenton John Wilson, was the tenth child from this marriage and he was born at Karoonda (southeast SA) on 29 December 1959. He spent the majority of his life in Reynella, though would often travel to *Raukkan* and Point Pearce (another Aboriginal Mission on Yorke Peninsula, SA) to visit extended family members.

It was common in our family to support family members passing through and this was reciprocated when we would travel to see family members along the southeast or Yorke Peninsula. I remember several occasions as a child travelling to *Raukkan* and Point Pearce to visit relatives and sometimes our stay would be extended; it was during these experiences that I became more familiar with my Ngarrindjeri/Nunga/Aboriginal identity as I began to learn more about historical impacts of colonisation and the contemporary lives of my people today. Brenton married my mother, Wendy Joanne Hart, who is of Irish and British descent (though born in Australia) and had three sons including myself.

I am amongst the sixth generation of the Wilson family and have two daughters, Mikalya and Rylee, who carry on our family legacy through lived experiences, growing up with family, learning Ngarrindjeri language and culture, visiting *Ruwe/Ruwar* and being proud of our cultural identity. Although this is only a brief genealogical overview of the Wilson family[1], it provides a starting point for this research, talking to Ngarrindjeri Elders and community members, and more importantly, to teach more about my own culture and identity, including the impact that colonisation has had on my community and one which is connected to the significance of this thesis. This form of

[1] A comprehensive genealogy of the Wilson family is available in Kartinyeri (1990).

narrative is the entry point for engaging research about my own people — the Ngarrindjeri —and is a common practice globally in Indigenous archaeologies (see Spector 1993 for an earlier account of Indigenous and feminist scholarship). Spector (1993), for example, replaced the standard archaeological report with the 'Awl' Story as part of the empathetic narrative of archaeological interpretation, which is a similar approach, adopted for this thesis.

1.1.1 Experiences in 'Suburbia'

My experiences as a Ngarrindjeri person are strongly connected to my experiences growing up in the southern suburbs of Adelaide and the knowledge I have learnt through my engagement with other family members, the schooling system and recorded experiences of my family through the colonial archive itself. It is also understood through the experiences of my grandfather who decided to make his own journey from *Raukkan* to the Riverland along the River Murray to Adelaide for employment. My uncles and aunts, as well as my father, began to make their own choices in life during the 1950s and 1960s, which is an era that can be characterised as one of extreme oppression and discrimination when government still had control over Indigenous peoples' lives. Despite such injustices experienced by other family members, this was not my experience, as I was more fortunate to have access to education, health and other services during the 1980s and 1990s.

I was born in Adelaide on the land of the Kaurna people of the Adelaide Plains. This is my birthplace, the country where I grew up and the place that continues to be associated with many memories. Ultimately, these memories of experiences as a Ngarrindjeri person living in the southern suburbs of Adelaide is the starting point for my journey of becoming an Ngarrindjeri archaeologist, a journey articulated through this thesis. In positioning my experience and connecting my memories with significant places, I also acknowledge that this journey is part of a much larger story that continues to be woven by generations of Ngarrindjeri people. At a young age I was aware of my Aboriginality but only understood this in relationship to the places I visited, my family connections and the culture learnt. As a young child, I remember learning about aspects of my culture — language, kinship, creation stories, importance of *Ruwe/Ruwar* and family, to name a few — whilst growing up with relatives. During holidays my parents would take me to visit relatives. The process of learning about family, culture and *Ruwe/Ruwar* became stronger, and I began to rediscover that my heritage extended beyond Ngarrindjeri and included connections to Narungga (people of the Yorke Peninsula) through my grandmother and Kaurna through my grandfather. It was this understanding that I carried into primary and secondary education.

I began my primary school education in Reynella, the same suburb where my father grew up. Most of the knowledge gained in this context was similar to that which many young people who attended public schools also learned. There

were days when the school would celebrate cultural diversity and engage in Aboriginal activities, such as dot painting and listening to Indigenous music, but, in hindsight, these activities did not truly capture the significance of Indigenous cultural practices within Australia. I also remember many times when I experienced verbal and physical racism. My slightly tan-colour skin and deep historical connection to the past seemed to incite racist attitudes. 'Abo', 'boong' and 'coon' were common terms used by white students to point out to me my difference and 'otherness' within society, an experience shared by many young Indigenous peoples in Adelaide. Although daunting at the time, these experiences made me more aware of my Aboriginality and made me form closer ties with other Indigenous youth, particularly during the beginning of my secondary education. In one context, racism did marginalise many young people I knew. In another, it shifted young people into a common and familiar space, creating a sense of communal identity and collective understanding. This drew young Indigenous peoples together, and many of us were either relatives or very close friends.

When I began my secondary education, I attended a school of predominantly white students and teachers, with only three Indigenous students. At this time, I had moved away from home in search of an independent life, and had also begun to set goals and to identify obstacles. During my first year at secondary school, I felt isolated, being one of only three Aboriginal students. I began to realise the importance of family and the sense of identity for young Indigenous peoples. Over the summer, I returned home and spent most of my time with friends and family. I returned to the same beaches to swim, the same streets to walk, and the same homes to sleep as I had in my earlier childhood years. It was the sense of familiarity, community and family that made me feel at home again. As a result, I was encouraged to transfer to a school with the highest numbers of Indigenous students in the southern suburbs. To my surprise, this school, which had a reputation for violence and high attrition rates, was well positioned to support Indigenous students owing to their experience and to teachers who encouraged further education. In particular, Gumillya Stattin, my Year 12 art teacher, provided me with many opportunities to grow academically and intellectually by exploring my identity through art. Through the remainder of my secondary school years, I became more aware of the importance of having a good education, and so I worked hard. While most of my friends and relatives decided to leave school for a job, sporting career or for pure "freedom," I decided to take the opportunity to further my education. I had always enjoyed learning and had a keen interest in the arts, culture, society and science. The thought of gaining employment and creating a good quality of life gave me the motivation to escape the socioeconomic factors that had affected much of my life before then. I set one goal — to complete Year 12, gain entry into university, and complete a PhD — something no-one in my family had ever achieved.

1.1.2 'Becoming' a Ngarrindjeri Archaeologist?

When I decided to apply for entry into university, I had many interests, including ambulance studies, forensic chemistry and education. After much consideration, I chose archaeology, for four reasons: to study ancient cultures, to travel around the world, to work outdoors in exotic locations and simply because it sounded like an exciting career. Initially, my imagination was fixed in the classical past, particularly Egypt, Rome and ancient Greece. I was interested in world cultures and exploring the past but also hoped that I would gain more information about Indigenous cultures and their existence within Australia. My mind had been shaped by previous educators; my understanding of the historical roots of the discipline and its impact upon my own history and culture was limited. Thus in university, I enrolled in every topic related to Indigenous archaeology and Indigenous studies to learn more about my own identity. During this period, I became heavily influenced by the ideas of a close friend, the late Naomi (Jane) Anderson-Sibsado, an Indigenous woman from Broome, Western Australia. We had similar views, ideas and interests, as well as similar goals. We wanted to create change in the discipline and produce new ways of thinking and practicing archaeology in Australian from an Indigenous perspective.

Throughout most of my undergraduate studies, I was focused on completing every task, passing every topic and trying to develop my knowledge base year by year; I made many sacrifices to achieve these goals. In particular, it was challenging to make new friendships whilst also engaging in interesting conversations and debates with old friends — during the course of my degree I separated myself from my childhood friends. While I worked to complete the degree, I was also in the process of becoming a father; this kept me even more focused and determined for my work to meet the highest standards. In 2003, I completed my undergraduate degree and secured an academic position at Yunggorendi First Nations Centre for Higher Education and Research at Flinders University in Adelaide, where I remain employed today.

My main role at Yunggorendi was to recruit Indigenous students into university and support those who were already studying. I was also expected to give lectures, tutorials and workshops, and be involved in various university processes, whilst supporting Indigenous tertiary students. At the same time, I enrolled in an honours degree program in archaeology to develop my research skills and continue my path towards a PhD. By this time, I had become increasingly interested in Indigenous Australian cultures, and my own people, the Ngarrindjeri, and was advised to approach Steve Hemming, a former curator of the South Australian Museum (SAM). It was during our initial meeting that I began to realise how much knowledge and experience Steve had regarding my people and culture; his passion for working with Ngarrindjeri people inspired me to learn more about my own. I have had many mentors in my life who have been instrumental in helping me to achieve my goals and vision.

However, I particularly admire the mentors who came into my life during the course of my Honours degree. It was during these two years that I began to shift intellectually and personally. I did not feel like an archaeologist, nor did I feel comfortable about the lack of knowledge I had about my own people. It is not surprising that my initial supervisor, Steve Hemming, took this as an opportunity to assist in my development as an archaeologist within the Ngarrindjeri community. I was interested in learning research skills and in "knowing" more about "something." I continued to plan ahead for my PhD and to work closely with my Elders, and I was particularly encouraged to learn more about the issues of repatriation and reburial of Old People (human remains) — a process that the Ngarrindjeri had been instrumental in developing within Australia.

The first component of my transformation into an Indigenous archaeologist was meeting the Elders and community members with whom I would be working at Camp Coorong Race Relations Centre (Wilson 2008). This process itself felt very awkward for me as a young Ngarrindjeri person from the southern Adelaide suburbs. I did not know how people would react to my presence or if I would be accepted. After several months of working with various Ngarrindjeri Elders, and researching the implications of repatriation for the Ngarrindjeri, I began to notice that I was not only engaging in an emotional community task to repatriate Old People (human remains), but was also engaging in my own process of repatriation to my community, and making a significant shift from the "new graduate student" and "young Ngarrindjeri man" to an "Ngarrindjeri archaeologist" (Wilson 2005).

I never felt comfortable about calling myself an archaeologist until I completed my honours degree. Even then, I had never been employed as an archaeologist or worked in the consulting industry. I had a few options to pursue: to continue working in a First Nations Centre supporting Indigenous students whilst undertaking my PhD part-time; to apply for a scholarship and undertake the PhD full-time; or to apply for a position as an archaeologist outside the university sector. I was at a crossroad. There were many other options available, and I had extensive support from my colleagues. I decided to take a year off from any studies to consider these options and gain more experience prior to making a final decision. During this time, I worked on several projects that assisted in developing my research and project management skills. I also participated in archaeological fieldwork, conferences and community meetings wherever possible.

Through this process, I was building my confidence, increasing my understanding of the issues and complexities of working collaboratively with communities, university researchers and government agencies, and, more importantly, learning from the challenges. I began to understand the importance of the strong partnership developing between Flinders University and the Ngarrindjeri community, and the dual training programs that were delivered for students (through archaeological field schools), which enabled greater awareness of cultural heritage issues (impacts of

farming, development and environment) and the reality of archaeological research in south-eastern SA. Ultimately, this created a “shared space” for all interested parties that broke cultural barriers and created positive relationships but because of Kumarangk has also created a dangerous space for heritage in Ngarrindjeri Ruwe (Hemming 2005:337). As a component of the community-initiated programs, I was also given responsibility to coordinate projects, provide teaching expertise to students and complete tasks delegated by community members. This responsibility was an obligation and a critical point of knowing my place within the community.

After five years, I now know what it means to be a Ngarrindjeri archaeologist. It indicates a Ngarrindjeri person who is grounded in the community, who is learning from the Elders, and engaging in the process of *Kungun* and *Yunnan,* which means listening to Ngarrindjeri people talking (Trevorrow and Hemming 2005:309–318). It is a reciprocal relationship between the community and the Ngarrindjeri archaeologist whereby the community provides training, direction and leadership, whilst the archaeologist develops a career and acquires more knowledge. It is about working with the community, in the community and for the community (Wilson 2007:320–334), and never from outside. I had to operate within the community as an archaeologist and a community member, a major challenge personally but the main reason for deciding to undertake a PhD with my own community. Whilst I am training under the supervision of experienced academics and gaining the necessary skills as an archaeologist, I am also training under the guidance and supervision of Ngarrindjeri Elders and community members and thus continuing my journey.

What makes me proud about being Ngarrindjeri and becoming a Ngarrindjeri archaeologist is that I know my family history. Ngarrindjeri people continue to move through the smog of colonisation that, historically, had stripped us of our *Ruwe/Ruwar*, our culture (language, ceremony, belief systems), and our people (through frontier violence, removal from *Ruwe/Ruwar* and family). Following two centuries of colonisation, many young Ngarrindjeri people today remain trapped in the familiar cycle of poverty, drug and alcohol addiction, domestic violence, poor education and poor health. Furthermore, this cycle operates in a society that views culture as either “black “or “white, “and where “traditional” people exist only in the “prehistoric” past or in the remote regions of the Australian outback (Colley and Bickford 1997; McNiven and Russell 2005; Trevorrow and Hemming 2005:309–318). Despite the lack of knowledge about Indigenous peoples and the social and economic issues that impact cultural traditions, there are some Ngarrindjeri who are learning more about their cultural heritage and actively seeking it through processes of cultural reclamation and reaffirmation. Although there is growth and optimism within our community, many still do not think about university as an option, much less about becoming an archaeologist.

My journey to and from suburbia is a continuous story of my family and their achievements throughout history, one that has extended many thousands of years. Now, finding my feet as an Ngarrindjeri archaeologist and training

within my own community are critical for developing the necessary skills that will benefit the Ngarrindjeri people and provide valuable input into the future of cultural heritage management, education and training for the nation. This journey is not an isolated example of the challenges Indigenous peoples experience globally. Indigenous peoples, whether trained archaeologists or experienced community caretakers, are continuously moving back and forth. It is a process of shifting ideologies, developing skills and knowledge, transformation and, more importantly, making positive changes that will empower the communities with and for whom we undertake our research.

1.2 Ngarrindjeri Regional Governance and Nation Philosophy

The Ngarrindjeri have been instrumental in developing regional governance structure that deploys a cohesive nation philosophy explaining the significance of *Ruwe/Ruwar* for the negotiation of future prospects particularly in the area of cultural heritage and environmental management (see Hemming and Rigney 2016; Hemming et al. 2011, 2016, 2017). This philosophy — *Ngarrindjeri Yannarumi* or 'Speaking as Country' — is built upon decades of strategic alliance with government agencies, development of Kungun Ngarrindjeri Yunnan (KNY) agreements and research by academic staff both Ngarrindjeri and non-Indigenous which aims to theorise the contemporary social, cultural and political landscape (see Bignall et al. 2015, 2016). As a result, there are clear philosophical frameworks for researchers to engage in transformative practices as part of research methodologies (see Hemming et al. 2016; Rigney et al. 2015). The research presented herein builds upon the Ngarrindjeri philosophy by tackling the complex and historic tradition of 'archaeology', which has dominated the Ngarrindjeri landscape since colonisation. Here I term my research methodology as the 'Ngarrindjeri Archaeological Standpoint' for Ngarrindjeri people engaging in modes of scientific practice that also seek to understand *Ngarrindjeri Yannarumi*. This approach has already been internationally recognised in various networks including the Australian River prize (see the Standard 2015).

1.3 Contextualising the Research Environment

Within this thesis, I draw from both Ngarrindjeri and Western epistemologies, including the shared histories and experiences outlined above, to adopt a culturally appropriate way of pursuing archaeological research within and for my community (see Chapter 4). It is a process of collaboration and negotiation that I have engaged in previously (see Wilson 2007b, 2010) for which my personal and professional development as a Ngarrindjeri archaeologist is continuously transforming. Although this research addresses research questions of an intellectual nature, it is framed to support and assist in the broader management and planning processes for the wider Ngarrindjeri nation. This has meant the production of knowledge that is relevant for both archaeology and the Ngarrindjeri community (see Arden 2002; Colwell and Ferguson 2014; Ferguson et al. 2015; Hillerdal et al. 2017), which does not exhaust community

resources that are already close to exhaustion, but rather assists in relieving the workload and thus contributes to the community's interests to 'care for *Ruwe/Ruwar*':

> The land and waters is a living body. We the Ngarrindjeri people are a part of its existence. The land and waters must be healthy for the Ngarrindjeri people to be healthy. We are hurting for our Country. The land is dying, the River is dying, the Kurangk (Coorong) is dying and the Murray Mouth is closing. What does the future hold for us? (Ngarrindjeri Nation 2006:5)

An explicit approach is central to the broader goals and visions of the community whilst making a significant contribution to the discipline. This project emerged from the desire to promote and protect Ngarrindjeri interests. The Ngarrindjeri Regional Authority (NRA), Ngarrindjeri Heritage Committee (NHC), and Ngarrindjeri Lands and Progress Association (NLPA) have supported this research from its inception and are formal partners in the training, research process and generation of new knowledge about Ngarrindjeri people and culture. These organisations (particularly the NHC) have supported and promoted Ngarrindjeri culture and research since the establishment of Camp Coorong Race Relations Centre in the 1980s. During this period, my late Uncle Lindsay Wilson mentored one of my supervisors — Steve Hemming — who was, at the time, working for SAM. Uncle Lindsay also led a team of Elders to record Ngarrindjeri histories and culture, which began discussions around the significance of Ngarrindjeri *Ruwe/Ruwar* for younger generations. Therefore, there is a complex genealogy of relationships (including supervision of archaeologists) for which Western (or archaeological) and Ngarrindjeri epistemologies are disseminated to me as the Ngarrindjeri archaeologist (Figures 1.5 and 1.6).

Intertwined in this historical context is the Kumarangk (Hindmarsh Island) Bridge Affair of the 1990s — a key event that changed the way that anthropological and archaeological research was conducted in SA. This legal and political controversy began with proposed development plans to construct a bridge from the mainland at Goolwa to Kumarangk. Various residents, environmental groups and the Ngarrindjeri people protested against its construction and, in 1994, a group of Ngarrindjeri women (referred to as 'the proponents') claimed 'secret women's business' which could not be revealed to the general public was associated with the area. Soon after, another group of Ngarrindjeri women (referred to as 'the dissidents') expressed another view, stating that they had no knowledge of such business. This common community cultural dilemma about 'who has knowledge and who does not' quickly became a point for contention, controversy and investigation which divided the Ngarrindjeri community. In 1995, the SA Government called a Royal Commission, after the Aboriginal Affairs Minister Robert Tickner placed a 25-year ban on the bridge development; his decision was based on Ngarrindjeri women's cultural information contained with an envelope that was only to be read by women. The Royal Commission subsequently found that Ngarrindjeri women had 'fabricated' secrets women's business and the Howard Government passed the *Hindmarsh Island*

Bridge Act 1997 allowing construction to proceed; the bridge was completed in 2001. The Ngarrindjeri challenged this Act on the basis that it was discriminatory under the *Racial Discrimination Act 1975 (Cth)* to declare that the *Heritage Protection Act* applied to Aboriginal heritage everywhere except Hindmarsh Island. In a controversial decision, the High Court decided that s.51 (xxvi) of the Constitution, which was amended as a result of the successful 1967 referendum, 'did not restrict the Commonwealth parliament to making laws for the *benefit* of the "Aboriginal race", and could in fact enact laws to the *detriment* of any particular race.'

After completion of the bridge, Federal Court Judge von Doussa heard from all parties and, based on the evidence presented to him, dismissed the fabrication claims. Ideologically this led to a shift in how people interpreted and re-interpreted 'Aboriginal culture' within Australia, which in turn had a more global impact on the representations of Aboriginality and ideas about 'secret women's business'. Following the tiresome court cases and acknowledgement that Ngarrindjeri people may in fact have legitimate claims of 'secret women's business', Dr Peter Sutton (former Head of Anthropology at SAM) suggested publicly that the fabrication theory was insupportable and in 2002 the Alexandrina Council apologised to the Ngarrindjeri nation. As a result, a new relationship was built between the Ngarrindjeri and the Alexandrina Council to create a positive future for Ngarrindjeri people marked by a formal *Kungun Ngarrindjeri Yunnan* Agreement, acknowledging the Ngarrindjeri as traditional owners of the *Ruwe/Ruwar*, including Kumarangk. After nearly 20 years since the saga began, the SA State Government endorsed a finding that 'secret women's business' was genuine during a ceremony beneath the bridge, marking an end to a long and emotional battle (see Bell 1998).

The Kumarangk Affair became a major case in Indigenous rights in Australia as it followed the historic Mabo vs Queensland court case where the High Court of Australia overturned the doctrine of *Terra Nullius*[2] in favour of common law doctrine of 'Aboriginal title'. This decade-long battle, led by Eddie Mabo, David Passi and James Rice from the Meriam people (Murray Islands in the Torres Strait), led to the introduction of the *Native Title Act 1993* and the establishment of the National Native Title Tribunal. Shortly before the introduction of native title legislation, the Wik peoples of western Cape York Peninsula in north Queensland (Qld), lodged their claim as the holders of native title over two areas of land that were subject to pastoral lease. Following an appeal against the original decision handed down by Justice Drummond, the High Court delivered the Wik decision in 1996, finding that 'native title rights could co-exist depending on the terms and nature of the particular pastoral lease'. This sparked fear amongst pastoralists and farmers in Qld about native title and later the Howard Government introduced a 10-point plan in response to the decision (see Bell 1998).

[2] Terra Nullius is a Latin term meaning 'no one's land' and was used in the colonisation of Australia and therefore justification of the extinguishment of basic human rights for Indigenous peoples.

Following this controversy and the division of Ngarrindjeri community members in relation to heritage and culture, there was a period of recovery and healing for the Ngarrindjeri community. During this period, there was also an emergence of a new direction for the Ngarrindjeri community led by, amongst others, Uncle Tom Trevorrow, the late Uncle Matt Rigney and the late Uncle George Trevorrow, who have continued to work with Flinders University researchers (including Steve Hemming and Daryle Rigney) to manage and protect Ngarrindjeri culture and heritage today. Two of the main initiatives that emerged more recently that are relevant for this thesis are the KNY agreements and the Lower Murray Reclaimed Irrigation Area (LMRIA) project, which have facilitated research opportunities[3]. This thesis was developed in conjunction with the NRA following the LMRIA Project (EPA 2008). Initially, cultural heritage surveys conducted by Australian Cultural Heritage Management (2005a, 2005b) under the direction of the NHC demonstrated that there were several places of cultural significance along the Lower Murray with high research value, including the *Murrawong* (Glen Lossie) Irrigation Area. *Murrawong* became the first area of investigation for this doctoral research, and following negotiations and careful planning with Elders, *Pomberuk* (Hume Reserve Midden and Historic Campsite) and Swanport were added as two additional places on which to focus research questions. All places were chosen for their cultural association with *Ngurunderi*, who is the main Creation Ancestor for the Ngarrindjeri people. Overall, this demonstrates new ways by which the Ngarrindjeri community, in collaboration with the academy and Ngarrindjeri researchers, is determining what type of research is required for our own *Ruwe/Ruwar*. It is a community-initiated project which is participatory, collaborative and beneficial for the Ngarrindjeri nation.

My position as a Ngarrindjeri archaeologist has raised a series of highly complex issues that added an additional dimension to the research; this is discussed in more detail in Chapter 4. Although this has had many benefits, I am aware that this may also be a limitation due to unforeseen conflict within the Ngarrindjeri community. This point of 'conflict' exists where a community member (in this instance myself as a Ngarrindjeri archaeologist) is in a privileged position to gain specific cultural knowledge through research and engagement with Elders. An increase in 'knowledge' in this context is coupled with an increase in 'responsibilities'. The social and cultural context provides some level of limitation for me including: age; status within the community; and, affiliation with particular family groups. It is also a complex issue for the discipline as there has been little representation of Indigenous archaeologists undertaking research within Australia at this level and therefore I have sought the views, opinions

[3] This research in particular emerged out of a Ngarrindjeri heritage research program jointly developed by Ngarrindjeri leaders and Steve Hemming.

and expertise of Native/Indigenous archaeologists working in other Pacific Rim nations (i.e. Atalay 2007; Lippert 2005; Watkins 2000; Yellowhorn 2006).

Regardless of the legislative frameworks that exist in SA, I am also transforming the archaeology of the Lower Murray. For example, the landscape that I am interacting with in Ngarrindjeri *Ruwe/Ruwar* as a Ngarrindjeri archaeologist has direct connection to my family; as a result I am re-shaping the landscape as I am conducting surveys, excavations and talking to Elders. As I read the historical sources, I also read about my grandfather and great-grandparents, and this affects the way that I interact with the historical knowledge represented in colonial archives. Working directly with Elders and community members in my academic role, I have also gained knowledge that other Ngarrindjeri people may never access. I therefore have a major responsibility to use that knowledge for the benefit of my community and not to just empower myself or privilege the discipline. I have also embarked on a process of reciprocity and giving back to my community in the form of community workshops, training and developing scholarships for Ngarrindjeri and Indigenous Australians more broadly in the areas of cultural heritage and environmental management.

1.4 Community Based Archaeology

This research considers issues of power, structure, agency and epistemology as it relates to Ngarrindjeri Ruwe/Ruwar (land body and spirit) and conducting archaeological research with my own community. In this respect, it is critical to understand the context in which archaeological research is being undertaken as the goals/objectives are to investigate 'new' places or 'sites' and produce 'new' knowledge regarding the people that we are working with. As argued by Marshall (2002: 218):

> Community archaeology represents an opportunity. We need it, not because it is politically correct, but because it enriches our discipline. Community archaeology encourages us to ask questions of the past we would not otherwise consider, to see archaeological remains in new light and to think in new ways about how the past informs the present.

Community archaeology provides alternative ways of doing archaeology that assist communities address issues that are both tangible and intangible including interpretive trails (Atalay 2015), protecting and managing traditional knowledges (Christen 2015), human rights, museums and repatriation (Lilley 2009), ethnicity and research for Inuit (Kato 2017), ethno archaeology (Brady and Kearny 2016) and even debates involving counter heritage (Bryne 2014). For Indigenous archaeologies however there are some major themes (Watkins and Nicholas 2014) that

emerge making it specific to Indigenous and local including: the treatment of ancestral remains, objects and places; Participation in cultural heritage management; and cultural heritage legislation.

Essentially, community archaeology is at the basis of developing a Ngarrindjeri specific framework for conducting archaeological research with my community. Further, it is heavily influenced by Indigenist approaches (see Rigney 2003) which aim to assist in the engagement with western academic discourse, through disrupting whiteness, power and structure (see Moreton-Robinson 2015). When applied to archaeology, this enables the Indigenous person/archaeologist to develop a standpoint (see Nakata 2007), reinforce agency, privilege Indigenous knowledges and engage in political acts such as sovereignty.

1.5 Summary

This research (like much within Indigenous archaeology globally) has been conducted within a highly complex and political landscape which is a 'double edged sword'. Although archaeology has the potential to support Indigenous communities and educate the broader community, it can also be onerous, resulting in a drain of community resources. In this thesis, archaeology is used in conjunction with Ngarrindjeri knowledge as a tool for supporting community programs by providing another understanding and interpretation of the past. Although this research cannot address in detail the broader environmental, political, social and cultural issues that are noted above, by focusing on a specific project it has allowed me to critically review the historical and ethnographic record, contribute to an alternative understanding of Ngarrindjeri history, and to further interpret the past, thus complement existing Ngarrindjeri knowledge.

The significance of my position within the research, and the interpretations that have emerged, are further woven throughout this thesis to articulate the journey and counter-narrative that has also evolved during my experiences of learning as a Ngarrindjeri archaeologist. Although I will begin to shift my language into one of an 'archaeological' nature, it demonstrates the rigour and depth undertaken to understand both the 'Ngarrindjeri cultural narrative', as well as the 'archaeological history' associated with the Lower Murray. It draws upon Ngarrindjeri knowledge foremost (through cultural beliefs and creation knowledge, as well as lived experience), and combines it with Western knowledge (i.e. historical narratives, and archaeological methods and techniques) to collectively highlight the extensive history present within this unique landscape as a learning tool for teaching others about how Ngarrindjeri people have continued to live in co-existence with our *Ruwe*/*Ruwar*.

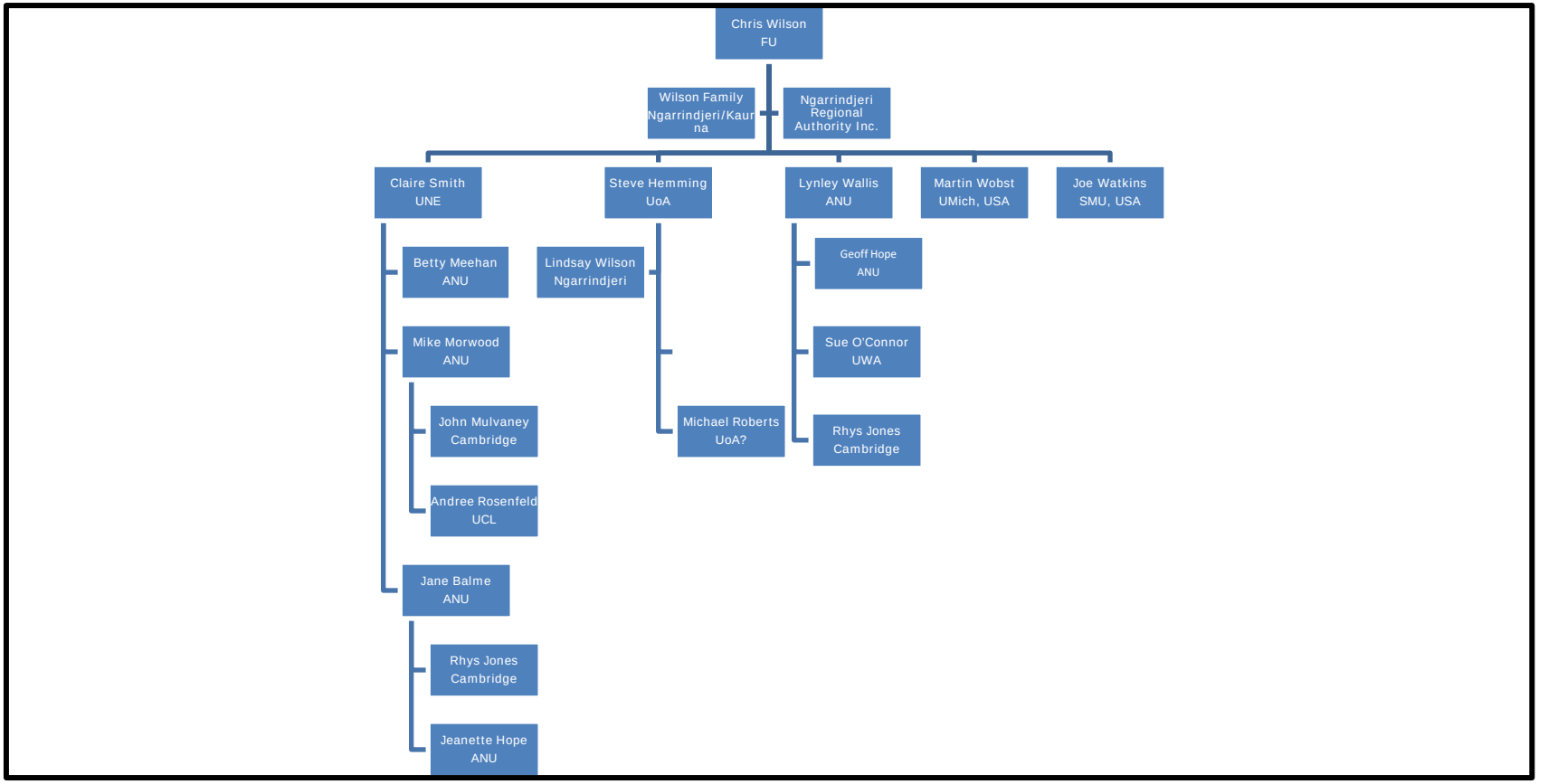


Figure 1.5 Academic knowledge tree showing supervisory relationships and dissemination of 'Western knowledge' related to supervision of this thesis. This figure demonstrates that previous knowledge obtained in this research area has been researched by 'non-Indigenous" people with no apparent cultural connections to Ruwe/Ruwar.

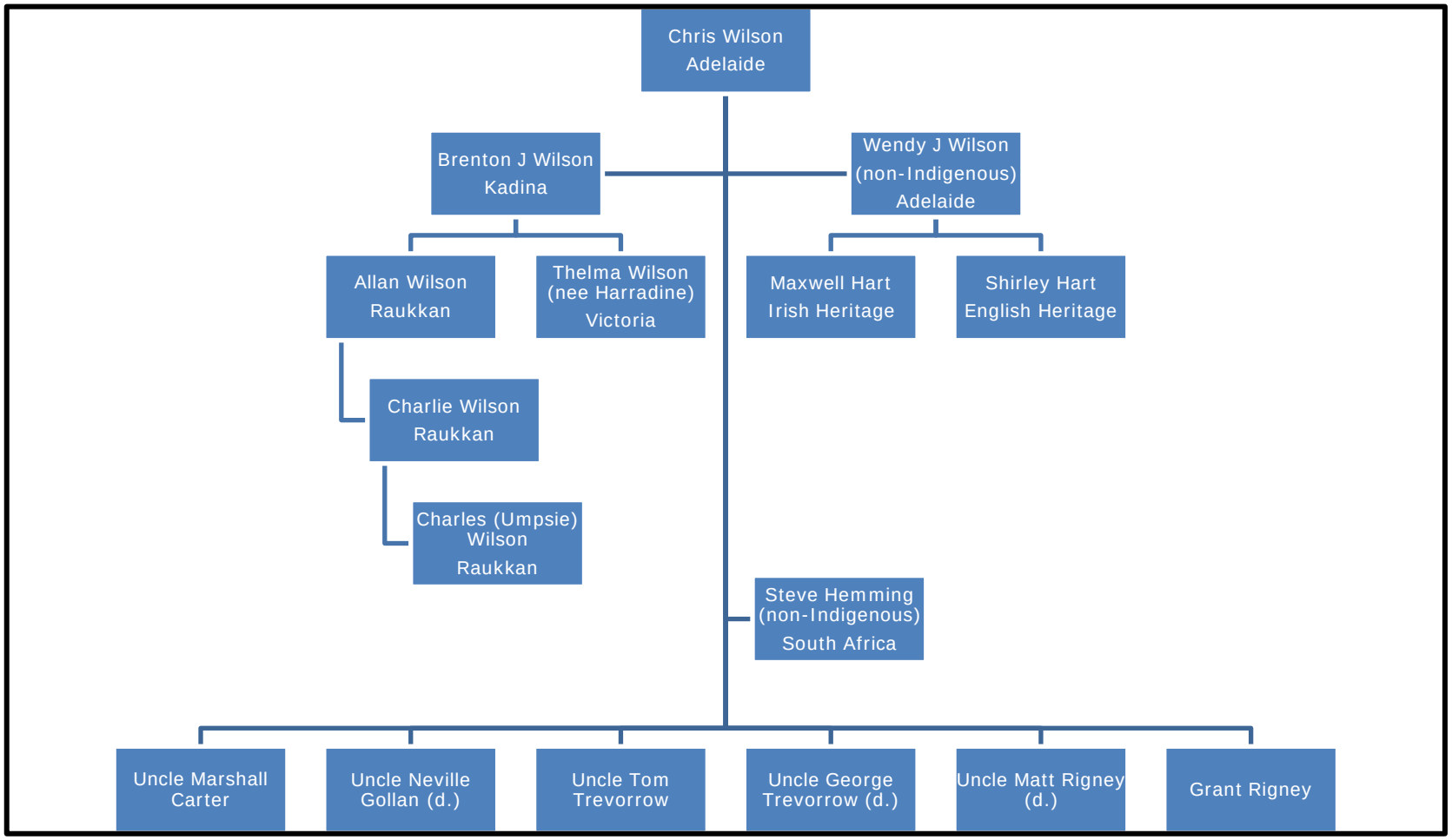


Figure 1.6 Family knowledge tree showing supervisory relationships and dissemination of 'Ngarrindjeri knowledge' related to this thesis. This figure demonstrates that there are several sources of Ngarrindjeri people who have provided cultural education and training for the researcher. Further, it also acknowledges 'non-Indigenous' family members as integral to the standpoint that the researcher has taken for this thesis.

> The land and waters is a living body. We the Ngarrindjeri people are a part of its existence. The land and waters must be healthy for the Ngarrindjeri people to be healthy. We are hurting for our Country. The land is dying, the River is dying, the Kurangk (Coorong) is dying and the Murray Mouth is closing. What does the future hold for us? (Ngarrindjeri Nation 2006:5)

It has been widely accepted that Indigenous peoples have co-existed with the environment for at least 60,000 years[4] in Australia (Sahul). Understanding this complex relationship between the human-environment relationships has been a focal point for the discipline since the emergence of processual archaeology in the 1960s. Owing to a lack of 'archaeological knowledge' about Australia, initial research questions considered meta themes including the antiquity of human migration to Sahul, human occupation and settlement of coastally-based populations, socio-economic behaviour and technological change, as well as evidence of gendered practices, symbolism and trade throughout the continent (e.g. Bowdler 1977, 1983, 1984; Hall and McNiven 1999; Jones 1965, 1966, 1968; Meehan 1982; O'Connor 1999; Przywolnik 2002; Sullivan 1981, 1984; Sullivan and Bowdler 1984; Ulm 2006).

Excluding a small number of studies from eastern Australia (Bowler et al. 2003) and the Northern Territory (NT) (Schrire 1982; Woodroffe et al. 1988), there has been limited academic research that examines the archaeology from riverine environments and the lifeways of people during the Holocene. This is particularly surprising given that the Murray Darling system is Australia's largest river system and the main artery for inland populations. Theoretically, this thesis contributes to mid- to late Holocene chronologies and debates of socio-economic complexity in south-eastern Australia through the development of a chronology for human occupation and evidence for targeted resource use along the Lower Murray River, SA. Methodologically, this thesis draws on critical theory, standpoint theory and post-processual archaeology to develop a 'critical Indigenist approach' to interpreting the archaeology of the study region. This has enabled scholarly critique of archaeological practice and thus a creative framework for sharing the historical, political, cultural and archaeological narratives that are embodied within the Lower Murray landscape.

2.1 An Archaeological History of Shell Midden Research

To contextualise the significance of the archaeological record in the Lower Murray, an understanding of investigations into coastal and riverine economies must be undertaken. The use of marine and riverine resources throughout human antiquity is widely debated globally, as it is linked to theories of the 'Out of Africa' migration model, whereby Indigenous Australians are argued to have ultimately migrated from Africa, travelled across southern Asia,

[4] BP refers to before present (uncalibrated) and calBP refers to before present (calibrated). These conventions will be used throughout this thesis.

through Indonesia, to arrive in northern Australia. The antiquity of shell fishing as a human subsistence strategy for coastal regions extends some 300,000 years BP at the site of Terra Amata on the Mediterranean coast (de Lumley 1969). Other relevant sites include Haua Fteah cave in North Africa, which contains evidence suggesting that people were consuming marine shellfish (*Patella* and *Trochus* spp.) from 70,000 BP (McBurney 1967). Midden deposits in five caves at Klasies River Mouth, on the Tzitzkama coast of South Africa, have been dated to between 70,000–120,000 years BP, where 13 different species of shellfish were being consumed, thus providing an insight into shellfish economies of early upper Pleistocene peoples (Singer and Wymer 1982; Voigt 1973, 1975). Through investigations of the material past, archaeologists have addressed questions related to the contribution of shellfish to the human diet and the antiquity of such practices, as well as determining aspects of environmental change at both regional and local scales. Shell middens provide information about how people interacted with their surrounding landscape, economic organisation, land use patterns and resource management strategies. Excavated material recovered from shell middens have yielded evidence of symbolism and other socio-cultural practices, such as modification of shells to create tools and items for trade. In many cases shells have also been used to build structures, as fill and ideal places for burying people (Claassen 1998:1).

A critical issue associated with the accumulation of shell middens is that of site formation processes, their impact on the archaeological record and subsequent interpretations assigned to shell middens. It is widely accepted that both natural and cultural processes contribute to the accumulation of shell middens, the majority of which are located along coastal regions across the world (Stein 1992:1). Storms, for example, create shell deposits along coastlines by lifting shell and living molluscs from the intertidal and shallow sub-tidal zones and sweeping them into beach ridges or cheniers (Claassen 1998:70). In Australia, a major issue for coastal shell midden research has been the task of distinguishing between naturally occurring middens and cheniers which are closely associated with human occupation sites (see Sullivan and O'Connor 1993 for discussion; also Bowdler 1977, 1983, 1984; Sullivan 1981, 1984; Sullivan and Bowdler 1984). Although chenier formation is common in tropical regions, beach ridge deposits can occur in any climatic regime. This is important for shell deposits in riverine environments and whether they are associated with human occupation, particularly in relation to flood events and shifting river courses. Storms may also erode and re-deposit shell from cultural deposits and particularly cyclones as highlighted by a case on the Qld coast (Bird 1992). Although cyclones are not expected to have affected the study region, tidal movements along the southern coastline increased salinity along the Lower Murray, Lakes and Coorong during some periods and during periods of heavy rainfall, flooding in the upper catchment would travel downstream and empty through the Murray Mouth. Investigations in the Lower Murray contribute to our understanding of riverine economies influenced by inland

and coastal resources, and therefore also to debates about broader social-cultural networks of exchange and intergroup relationships.

Apart from humans, various animals can concentrate shells including rodents, worms and birds. As discussed by Claassen (1998:71), worms are the most significant concentrators of land snails, whilst birds are significant concentrators of marine bivalves and gastropods. There is also considerable debate regarding unique shell accumulations (or mounds) which have been reported to exceed 10 m in height and 12 m in diameter from the Cape York region of north Qld (see Bailey 1993; Bailey et al. 1994; Stone 1991, 1992). It was hypothesised that mallee fowls were responsible for such an accumulation as a result of nesting behaviours. Although this scenario is unlikely to occur in the study region, it raises significant issues about the formation of shell middens along the Lower Murray as such issues have not been investigated in any detail. Overall, the issues outlined above are critical points to consider in broader debates regarding mid- to late Holocene chronologies in south-eastern SA.

2.2 Mid- to Late Holocene Chronologies and Debates in Australia

Previous archaeological research in Australia has provided evidence for Indigenous people's extensive occupation of the continent and there have been several chronologies developed to assist in understanding meta themes that have shaped current migration and colonisation theories. Perhaps a more significant contribution made over the past two decades are those that address the issue of socio-economic change during the mid- to late Holocene, as it relates to 'change' in Indigenous economies (David and Lourandos 1997, 1998, 1999; Lourandos 1997; McNiven 2006; Morrison 2010), with extensive research undertaken to date in north Western Australia (O'Connor 1999; Veitch 1996, 1999), NT mainland coast (Bourke 2000; Faulkner 2006; Hiscock 1997, 1999), the islands in the Gulf of Carpentaria (Robins et al. 1998; Sim and Wallis 2008) and Cape York Peninsula (Beaton 1985; Morrison 2010). Shell middens can form quite differently across the Australian continent and will have different explanations for the formation processes in different regions; however, collectively they provide invaluable information about human behaviour, adaptation and environmental changes such as social or demographic changes (Veitch 1999), human responses to environmental change (Haberle and David 2004) and environmental shifts (O'Connor 1999). There are five arguments commonly presented to explain changes in the mid- to late Holocene coastal archaeological record:

1. that the patterns observed are an artefact of site preservation factors, including differential destruction and visibility (see Bird 1992; Fanning and Holdaway 2001; Godfrey 1989; Head 1983; O'Connor and Sullivan 1994; Rowland 1983, 1989);

2. that the patterns observed are the product of environmental factors, particularly resource productivity and availability (Bailey 1983; Beaton 1985; Morwood 1987; Rowland 1983, 1989, 1999; Walters 1989);
3. that the patterns observed are a consequence of population growth and changes in demographic structure (Beaton 1985, 1990; Hall and Hiscock 1988; Hughes and Lampert 1982; Lampert and Hughes 1974);
4. that the patterns observed are related to the introduction and/or development of new technologies (Beaton 1985; Sullivan 1987; Vanderwal 1978); or,
5. that the patterns observed are associated with changes in social structure, especially trends towards intensification based on socio-economic indicators (Barker 1996, 2004; David 2002; Lourandos 1997).

The positing of these varied explanations are labelled the 'Intensification Debate' (Lourandos and Ross 1994) and, although issues of change had been considered by others (Hale and Tindale 1930; Hughes and Lampert 1982; Jones 1977; Mulvaney 1969), it was this debate in the 1970s and 1980s which had a major impact on the discipline for stimulating new research questions in Australian archaeology. In particular, Lourandos explored changes in the Holocene archaeological record and thus shifted disciplinary attention from initial colonisation models to the mid-Holocene period when contemporary patterns of complex socio-economic behaviour in Aboriginal societies are thought to have emerged. Some studies have focused on variability of behavioural responses at the regional level (i.e. Allan 1996; Barker 2004; David and Chant 1995; O'Connor 1999; Smith 1993; Veth 1993), thus revealing a more complex view of the human past than what has been previously known through the conventional 'continental narrative' (Frankel 1993). However, as Ulm (2006:3) has argued, the 'supraregional trajectories' emphasised by Lourandos devalue the importance of local and subregional trajectories as a primary locus of change. Although a shift towards local and regional trajectories has become more apparent, Ulm (2006:4) suggested that more fine-grained methodologies are needed to provide resolution to regional findings that are at odds with the continental narrative.

This debate is of particular relevance within the Lower Murray as there have been several interpretations of occupation, lifeways, cultural practices (specifically burials) at the regional level (Hale and Tindale 1930; Mulvaney et al. 1964; Pretty 1977; Stirling 1911), but no holistic investigation or synthesis of change and continuity has been conducted locally. Although this thesis does not address greater resolution to the local and subregional trajectories as argued by Ulm (2006), it is argued that the valuing of local, nation-based knowledge systems in archaeological research and a scholarly critique of the written texts that documented Indigenous cultural practices can provide opportunity for exploring multiple narratives at the local level and therefore a more rigorous and holistic interpretation of the past.

One of the challenges for this sort of research is the 'interpretation' of the local archaeological record, which also captures the wealth of contemporary Ngarrindjeri knowledge about these places and the past. In this thesis, I am examining Ngarrindjeri places for Ngarrindjeri people — therefore local understandings are crucial for interpreting the physical evidence and the overarching landscape. Further, the historical record had to be read critically with the advice and support of Ngarrindjeri Elders to ensure it was understood in relation to Ngarrindjeri knowledge, laws and traditions. Indigenous knowledges are local, long-term and based on empirical observations theorised from an Indigenous perspective. In this thesis, the knowledge that is encapsulated through *Ngurunderi*, a Ngarrindjeri Creation Ancestor, are rules for living, traditions and observations from past environmental changes that have been disseminated to generations of Ngarrindjeri people over an extensive period of time before European colonisation as there is detailed knowledge within these stories. Ethnographic, anthropological and archaeological accounts are critiqued where possible through a criticalist framework to reconceptualise historical accounts of Ngarrindjeri lifeways.

2.3 'Ethnography' and Challanges with Archaeological Interpretations

The use of 'ethnography' to interpret the archaeological record is a problematic issue in archaeology. In Australia, this approach is adopted with caution and in conjunction with other methods as the antiquity of human occupation in some regions extends 50,000 years from contemporary living cultures. However, its use should not be disregarded, but rather complement existing knowledge about material culture for which hypotheses can be tested and new questions developed. For example, the phenomenon involving shell mound construction in northern Australia has been a focal point for archaeologists to examine questions of a social, cultural and ceremonial nature. Previous research focused on the socio-cultural activities of Aboriginal people living in the region to learn more about the local knowledge associated with mound construction prior to European contact (i.e. Bourke 2005; Morrison 2003). Hiscock and Faulkner (2006:210) argued that these arguments rely upon historical and anthropological information and thus imply that continuity spans across several thousands of years. Ultimately, the application of 'historic ideologies' to earlier periods of human occupation, according to Hiscock and Faulkner (2006), does not acknowledge the rate of economic and ideological change experienced within these societies after colonisation. Instead, the ideologies and cosmologies associated with mound construction apparent in the ethno historic record are the recently formed understandings of new landscapes and systems of land use. Although Hiscock and Faulkner reinforced the complexities associated with such a method for interpretation, this position provides no alternative narrative that values Indigenous epistemologies and ecological knowledge, particularly for those living communities who have demonstrated an ongoing continuous connection with their traditional country.

An interesting question posed by Hiscock and Faulkner (2006: 216) in their discussion is "How do we account for the multiple transformations of knowledge about mound use, into mythologies about a variety of Ancestral Beings, into stories of biblical events, into stories about natural creations by birds or other animals, into stories of foraging debris without ceremonies and so on?" Although they challenge the use of ethnography and other forms of knowledge related to 'cultural and archaeological' places it is a relevant question for this thesis as it challenges the multiple understandings of a place or space within a landscape that is continuously transforming. Ultimately, this nexus between Western and Indigenous knowledge systems is not entirely understood but should be explored at the local level. A central point of discussion is the idea of 'changed' landscapes and how Indigenous knowledge systems (dreaming and creation stories) indicate environmental features and/or changes, and can be used or adapted to present multiple narratives at the local level.

Although Hiscock and Faulkner (2006:218) discuss 'changed' landscapes for the northern Australian coastline, it is also acknowledged that archaeological studies have identified alterations to the mythology of 'place' through 'abandoned' landscapes (see David and Lourandos 1997, 1999; Fullagar and David 1997). Further, it demonstrates re-mapping and re-conceptualisation of the landscape through the formation and transformation of cosmologies associated with these localities. This is an important debate to consider within this thesis as it draws together both archaeological knowledge of human occupation and an understanding of contemporary Ngarrindjeri knowledges about *Ruwe/Ruwar* and landscape formation (through Creation stories and/or experiences).

Contact and post-contact sites have also become a focal point for debate for the use of analogies. Harrison (Harrison and Williamson 2002:42) argued that the pastoral industry is one of the most important frontiers or 'contact zones'. Pastoral imagery and the settler nation's creation of the 'Australian outback' have emerged from the development of Australia as a nation. Country was suggested as central to the 'shared historical narrative' for pastoral Australia where both Indigenous and non-Indigenous peoples could engage in the 'pastoral' space. Harrison (2002:45) combined archaeological fieldwork investigations with oral histories. He examined mid-Holocene sites to those in the 1990s and discussed contemporary Aboriginal understandings of them. This research was later critiqued by Hiscock (2008) on the basis that they were interpreted across a time span from pre-European to post-contact, for which much difficulty and assumption of the past is employed, It is important to take community interests into consideration when examining archaeological material that has been dated prior to colonisation as many Indigenous peoples view 'pre-contact', 'contact' and 'post-contact' as part of the same timeframe. Understanding the development of riverine economies in the Holocene, and examining indicators of 'change' and 'continuity' throughout

this period, is critical for relating the findings to broader knowledge about models of occupation, use of local resources, technological change, socio-economic change and how best to interpret such places whilst respecting the objectives of the living community. The specific focus of this research is to develop a chronology of human occupation and to present multiple narratives of Ngarrindjeri life ways within the Lower Murray that also have relevance to contemporary people today.

2.4 Research Significance and Aims

This research contributes to ongoing debates related to occupation of coastal and riverine populations within Australian archaeology through developing a chronology for occupation of the Lower Murray region of southeast SA as it relates to Ngarrindjeri *Ruwe/Ruwar* more broadly. It will build on previous studies (i.e. Hope 1995; Littleton 1999; Luebbers 1978, 1982; Pardoe 1995; Paton 1983) within Ngarrindjeri *Ruwe/Ruwar* through the detailed investigation of occupational sites along the Lower Murray. Previous research in the region has focused on burials and rock shelters (Hale and Tindale 1930; Mulvaney 1964; Pretty 1977; Stirling 1911; Tindale 1936; Tindale and Mountford 1936), while shell middens have been largely ignored, despite the latter being highly visible.

Through a critical analysis of 'ethnographic' texts carried out in conjunction with Ngarrindjeri Elders, it explores how contemporary Ngarrindjeri people continue to interact with the landscape through re-visiting 'archaeological sites', and the transmission of inter-generational knowledge known about these places. The archaeological and Ngarrindjeri narratives presented contribute to an understanding of human occupation in the Lower Murray prior to European colonisation, as well as information about the archaeological record. The information and cultural knowledge exchanged during the research process between Elders and the researcher is critical for addressing the research objectives, as Elders are one of the primary 'human' sources of information about the research area. This collaborative approach will enhance our knowledge about specific Ngarrindjeri cultural practices including shell fishing strategies, utilisation of riverine resources and occupation more generally within the region.

2.5 Research Questions

The overarching research question for investigation in this thesis is: ***How can Ngarrindjeri epistemologies and lived experiences develop a more holistic archaeological interpretation of lifeways in the Lower Murray River?***

The knowledge and findings presented in this thesis address the primary research question by adopting a critical Indigenist approach to archaeological practice and to care for *Ruwe/Ruwar* and places that have both 'cultural' and 'archaeological' significance in the study region. Further, it privileges Ngarrindjeri epistemologies and understandings or culture and *Ruwe/Ruwar* as the critical methodological element underpinning the thesis and uses Ngarrindjeri knowledge, concepts and language where relevant. The geographical focus of this study was restricted at the direction of Ngarrindjeri Elders to a specific area within the Lower Murray that could contribute to a broader understanding of human occupation, life ways and continuous connections to place following European colonisation. The central location, and starting point for this research, is *Murrawong* (Glen Lossie), north of the small township of Murray Bridge. During the research process, two additional areas became places of attention: *Pomberuk* (Hume Reserve) and *Kangerung* (Swanport). The thesis addresses four sub-questions which assist in answering specific research questions of interest that contribute to a holistic interpretation of the Lower Murray.

How can Ngarrindjeri knowledges be used to provide an alternative interpretation of the archaeological record at the local level?

There is an extensive written record about Ngarrindjeri people, culture and language commencing the time of initial European incursion into the Lower Murray region in the early to mid-1800s. These texts include explorer's notes and accounts, ethnographic and anthropological journals, early water colours and paintings, photographs and drawings — the majority of which are held by the SAM — as well as various published records. In addition, there are Ngarrindjeri-authored texts including notes and drawings, autobiographies and oral traditions that continue to be disseminated to younger Ngarrindjeri people; some of these were also recorded by anthropologists and historians. An important issue to address is the use of these texts to interpret the archaeological record in the Lower Murray.

When do riverine economies become apparent in the Lower Murray?

Previous archaeological research along the Murray River has provided knowledge about Ngarrindjeri life ways and use of the landscape within Ngarrindjeri *Ruwe/Ruwar* (i.e. Hale and Tindale 1930; Mulvaney 1964; Pretty 1977; Stirling 1911). In particular, Pretty (1977) described the cultural chronology of Roonka including social organisation and burial practices which were regarded as changing over a lengthy period of time. Pretty (1977) established a cultural chronology for Roonka which provided detailed information about cultural change as evidenced by material culture, from a burial site to an occupational site.

The mid- to late Holocene period in Australian generally is typically characterised by an increase in numbers of new sites, and increased use of existing sites evidenced by an increase in discard cultural materials including stone

artefacts; changes in stone tool technologies, fishing technologies and rock art styles; an increase in the use of marginal landscapes; the utilisation of new foods and marine resources; the emergence of long distance exchange networks; and the appearance of bounded cemeteries, all of which have significance to this research and understanding the Lower Murray (i.e. Pardoe 1988).

What is the role of shellfish in comparison to non-molluscan faunal resources in the Lower Murray diet?

This includes the role of shellfish (which is the dominant food source in archaeological sites in this region) in comparison to non-molluscan food remains. Although the remains of shellfish are evident along most of the river system, they are only one indicator of the diet of people of the Lower Murray. One aspect of this research is concerned with understanding all of the resources that Ngarrindjeri people targeted. This will further develop our understanding about the role of shellfish in comparison to other food resources within the region and thus contribute to considerations about variability between sites through the mid- to late Holocene.

Most archaeological evidence to date about Ngarrindjeri riverine life ways has been derived from stable isotope studies of human remains (Owen 2003; Pate 1997a, 1997b; Pate et al. 2002, 2003). Pate (1997a, 1997b) argued that stable carbon and nitrogen isotope values from bone collagen at Roonka and Swanport suggested there was limited movement between inland lower Murray populations and those of the coastal and arid interior. He further suggested that shellfish were a regular but minor source of protein, and that individuals from Roonka obtained a large proportion of their supplementary protein from fish, along with from terrestrial animals of the adjacent floodplains and mallee plain. In order to examine the proposition that shellfish were only a minor source of protein for Ngarrindjeri people, estimates will be made about the accumulation of midden sites (based on their size and age), how much protein they could have provided and how many people this source of protein could have supported.

Is there evidence for temporal or seasonal change in different food stuffs?

Prior to European colonisation, the Lower Murray River, lakes and southern ocean were part of an active estuarine system. During tidal movements/periods, certain saltwater fish species would have travelled through the river mouth and lakes, and upstream. Several Ngarrindjeri Elders (including Uncle Neville Gollan) have recounted stories including accounts of sharks and whales travelling up the Lower Murray. If this was common throughout the mid- to late Holocene then there should exist archaeological evidence of coastal fish species in the River Murray.

2.6 Overview of Thesis

This thesis is structured to provide a holistic interpretation of engaging in archaeological research with the Ngarrindjeri community. In line with disciplinary conventions it reports the results of archaeological investigations of middens in the study area. However, it challenges these conventions and ways of knowing by critiquing practice, privileging Indigenous knowledges and formulating new approaches to conducting research within Indigenous communities. The preliminary section of the thesis provided guiding information about Ngarrindjeri language and place names, as well as outlining the key Ngarrindjeri Elders instrumental in this research.

The Prologue provides the entry point for the researcher to contextualise the research context and outlines the approach undertaken for the research including the value of lived experiences for Indigenous peoples engaging in academic research. This chapter represents the 'portal' connecting the past (i.e. colonisation, lived experiences, family genealogies and previous issues in Ngarrindjeri *Ruwe/Ruwar*), present (i.e. social, cultural and political context) and future (i.e. the thesis itself, as well as a new direction and framework for archaeologists working with the Ngarrindjeri community in the future). Within each chapter, where appropriate I privilege Ngarrindjeri language and concepts to assert my own cultural identity which is a significant aspect to engaging the Ngarrindjeri readership in the thesis as part of disseminating my findings to a broader Indigenous readership. Chapter Two presents the Ngarrindjeri knowledge and historical context associated with the region, drawing on written texts, anthropological studies, Ngarrindjeri-authored texts and other key Ngarrindjeri sources of information. As a result, a culturally appropriate version of *Ngurunderi* is presented. Further, this chapter examines the 'ethnographic record' and Ngarrindjeri knowledge systems to address particular issues of interpretation in archaeology. This is necessary for presenting the local histories for each site investigated and presented in following chapters. Chapter Four focuses on academic literature about the Lower Murray River including the geographical setting, environmental background and archaeological investigations previously undertaken in the region.

Chapter Five presents relevant theories and debates considered in this thesis, as well as providing a new theoretical framework for Indigenous people undertaking archaeological research with their own communities. This includes a detailed discussion about the complexities involved in undertaking this research for me as a Ngarrindjeri archaeologist, which I refer to as the *Ngarrindjeri Archaeological Standpoint*. Chapter Six details the archaeological methods, including surveys, sampling methodologies and excavation strategies, adopted in this thesis. Radiocarbon dating and reservoir correction issues are elaborated upon in this chapter and new problems regarding riverine reservoir effects are identified. Chapter Seven outlines the results from archaeological surveys and excavations, presented in three sections, one for each distinct place that became a focus of this research, these being *Murrawong*,

Kangerung and *Pomberuk*. These places are presented in a chronological order (oldest to youngest) to demonstrate the extent of change in the region, as well as the significance of understanding the more recent archaeological, cultural and political histories associated with each place.

Chapter Eight provides a synthesis of the results and analyses and presents the chronology for occupation associated with shell midden sites in the Lower Murray River. Models of land use and description of life ways are identified through the archaeological evidence recovered. In particular, faunal remains (including fish otoliths), molluscan and non-molluscan material, stone artefacts, charcoal and organic matter are examined to determine settlement histories for the region. In Chapter Nine, two narratives are shared to conclude the thesis. Firstly, the Ngarrindjeri narrative and lived experience is discussed and the overall significance of conducting academic research for Indigenous communities are presented using a more recent experience of learning about Kondoli — the whale. Secondly, the archaeological narrative is outlined with specific reference to understanding the local and regional context, methodological issues and limitations as well as future research directions. In the concluding statement, the key research findings and model for interpreting archaeology in Ngarrindjeri *Ruwe/Ruwar* are presented as the final synopsis for understanding change and continuity of Ngarrindjeri life ways in the Lower Murray River.

In summary, archaeological surveys and excavations were conducted as part of this research and all materials recovered were analysed with a focus on understanding Ngarrindjeri life ways including a chronology for occupation in the region. This 'archaeological narrative' is critical for addressing the research questions, however the archaeological record had little value and meaning to the Ngarrindjeri community without a broader cultural, political and social context. As a result, a 'Ngarrindjeri Archaeological Standpoint' (defined in the thesis as adopting a critical Indigenist approach specific to this region as an entry point for the investigation) was developed as an explicit approach for people engaging in archaeological research with the Ngarrindjeri community. To achieve this, critical theory and Indigenous standpoint were adopted as a framework. This enabled a particular interpretation of the ethnographic and historical texts, lived experiences and accounts of the Ngurunderi Creation Story within a culturally appropriate research framework that contributes to Ngarrindjeri interests today. Collectively, this approach proposes a new methodological framework for Indigenous archaeologists working within their own community which can be adapted by archaeologists globally as a model for best practice. The results from this research provide a 'new' interpretation of Ngarrindjeri history and occupation (through the Holocene to the present) in the Lower Murray and contribute to the disciplines overall understanding of the complexities of Indigenous social and cultural practices.

> Ngarrindjeri have occupied, enjoyed, managed and used our inhabited lands and waters, since creation. We were here when the sea level began rising about 18,000 years ago, and our ancestors watched the sea flooding over our coastal plains. We were here when the sea stabilised at its current level about 5,000 years ago. Our creation stories record these dramatic changes. We were here when the European invaders began stealing our land and our resources; killing our people and out *Ngartjis*, such as *Kondoli* (whale) and *Paingal* (seal); polluting our rivers, lakes and Coorong; and draining our wetlands/nurseries. And we are still here! (Ngarrindjeri Tendi 2006:11)

This chapter examines Ngarrindjeri lived experiences and historical texts associated with the study region. The first section draws upon public versions of the *Ngurunderi* story to form a particular version that not only has specific references to the places to be investigated for this thesis, but that has also been approved by Ngarrindjeri Elders for use. The second part of this chapter examines and critiques the written record associated with the study region and its relationship to Ngarrindjeri knowledge and interpretations of *Ruwe*/*Ruwar*. The final section relates Ngarrindjeri knowledge and the ethnohistorical literature.

3.1 Ngurunderi: Creation Ancestor of the Lower Murray

One of the earliest interpretations about the formation of the Lower Murray River and broader cultural landscape is told through *Ngurunderi* — the main creator of the Lower Murray Lakes and Coorong (Figure 3.1). Encapsulated within this creation knowledge are cultural values and practices that focus on relationships between people, changes to the natural physical landscape, various animal species, significant landmarks and a broad philosophy about creation of the Lower Murray River, Lakes and Coorong that concludes through *Ngurunderi's* journey to *Karta* (Kangaroo Island) and into the spirit world. Although the 'origins' of *Ngurunderi* continue to be debated, the key point relevant for this thesis for which I build upon, is that the process of living on *Ruwe/Ruwar* and sharing culture through the oral dissemination of knowledge and lived experiences is something familiar to Ngarrindjeri people even after colonisation. Ultimately, there is evidence to demonstrate that Ngarrindjeri epistemologies and world views were multi-layered (in comparison to a written) tradition which continues to be a great source of knowledge for providing insights into Ngarrindjeri people, culture and life ways in the Lower Murray (see Berndt et al. 1993:231).

For the purposes of this thesis, it is acknowledged that Ngarrindjeri knowledges are manifested in varied sites and locations depending on the historical context for which neither should be excluded, but rather understood in conjunction with the complexities associated with each source of knowledge. In relation to *Ngurunderi*, there have been several versions recorded at various times, at different localities with local people living in the region that

requires critique. The process of "recording" such knowledge in the form of ethnography is the first historical phase from the initial colonisation of SA in 1836 to the 1930s. The recording act, undertaken by researchers at institutions such as museums and government agencies, created a structural dominance over Elders who possess such knowledge. This objective position reinforces colonial practices of power and control, thus marginalizing Ngarrindjeri people and knowledges for which texts about Ngarrindjeri languages, traditions and creation knowledge (see Woods 1879:200–201, 205–206; Taplin in Woods 1879:65; and Cawthorne 1925–26:25–26). The second historical phase was the early development of anthropology and archaeology in SA from 1930s–1970s, which can be characterised as a shift from colonial administration and ethnography to anthropological methods of working with local people to understand the daily lives and practices during a post-colonial context. During the third phase (1970s–2000s) research was focused on community engagement and education that began to shift the power dynamics, enabling Ngarrindjeri people to have more agency and opportunity to interpret culture, history and knowledge in negotiation with the broader community. This era fore shaded by Tindale (1935:273, 1937:115–16) and Berndt et al. (1993:223–227) who conducted extensive periods of fieldwork over decades, providing an enormous amount of knowledge.

The version of the *Ngurunderi* story published by Berndt et al. (1993), similar to that of Taplin (1879a; 1979b), adds an interesting layer to the thesis as both Ronald and Catherine Berndt camped at *Pomberuk* during the 1940s as part of their fieldwork. They developed close relationships with Ngarrindjeri people, witnessed dispossession and marginalization, and were in a privileged position to learn about Ngarrindjeri culture and history during a period where Indigenous people were perceived as a 'dying race'. The pressure of colonisation on Ngarrindjeri cultural life meant a process of change whereby Ngarrindjeri people became heavily influenced by European material culture, beliefs and values. This process of social and cultural change ultimately affected the transmission of such knowledge to younger generations as they were convinced that the *Yaraldi* way was not significant for the future.

Perhaps their most valued relationships were with Albert Karloan and Pinkie Mack, both highly respected Elders who were key knowledge holders of the *Ngurunderi* story. Albert Karloan was a strong advocate for the Ngarrindjeri people and although it is not known with certainty, Albert Karloan is thought to have been the last Ngarrindjeri to have been through the men's related ceremony. Howitt (1904:488–508) recorded in his early text that '*Ngurunderi* was believed to have come from the Upper Murray, probably from the Lachlan or Darling Rivers'. According to Berndt and Berndt (1951:202–204), the majority of people camped on a small strip of land beside the Murray River near the railway station owned by the Hume Pipe Company. Located on this land were six shacks constructed of flattened kerosene tins, scraps of iron and pieces of sacking. In 1943, Ngarrindjeri people were ordered to leave the

block owing to complaints by other residents about gatherings that involved drunkenness and, despite the fact he disagreed with some of their behaviour, he demonstrated a strong sense of responsibility for the community:

> His feeling of social obligation towards people who were even so distantly related to him as many of them were was still strong despite his years of contact with Europeans. It was accentuated by a sense of "responsibility" towards them, stemming from his awareness of being the last member of the so-called "Ngarrinyeri" tribes to be initiated, in the final ceremony of that kind to be held on the Lower Murray. (Berndt and Berndt 1951:203)

He was also linked with the mythic being *Baiami*, of considerable importance ritually in traditional northern Victoria and southwestern New South Wales (Berndt 1947:334–338, 1974:27–30; Berndt et al. 1993:223). In this version of the story, *Ngurunderi* traveled downstream in search of his two runaway wives during a period when the river was only a small stream below its junction with the Darling River. As *Ngurunderi* paddled in his canoe along the stream, he scared *pondi* (the giant Murray cod) who surged downstream. The rapid movement of his tail created the bends in the river and the wetlands:

> According to Karloan, in the early days of the Dreaming, Ngurunderi followed the great Murray cod down the river, poling his canoe. The sound of the canoe pole frightened the cod and as a result it swished its tail, making the bends of the river; the wash of the water went over its banks, forming the swamps. (Before that the River Murray was a narrow stream.) Turning the river bend at Mumpeluwong (Mypolonga), Ngurunderi followed the cod to *Pomberuk* (the cliff face at Murray Bridge). The cod continued swishing its tail, forming bends and swamps, and reached Piwingang (the hawk place). Then it went on to Polmandang (Point Pomanda) on the shore of Lake Alexandrina and swam on into the lake. (Berndt et al. 1993:223)

As *Ngurunderi* was resting, he saw *pondi* once again but this time he shouted out to his brother-in-law Nepeli, who was at Rawukung (Point McLeay), to spear it. After Nepeli speared *pondi, Ngurunderi* began to cut it into pieces:

> One piece he held up and, as he threw it into the lake, he called, 'You, boney bream!' As he threw the next piece, he called, 'You, perch!' Then he cut another, 'You, callop!' Another, 'You, catfish!' Yet another, 'You, mudfish!' So he cut all the pieces, throwing them into the water, making the fish. The small pieces he threw in to form sprats. Then he threw the last piece, 'You, Murray cod!' When this was completed Ngurunderi left Nepeli, and poling away from the sand shoal landed at Pemandang (on the mainland, not far from Merakung, Mason's Lookout). Nepeli turned back to Rawukung. (Berndt et al. 1993:224)

After filling his canoe with freshwater mussels at Lalanganggel (Mt Misery), *Ngurunderi* travelled to Kranakung, near Wellington, where he saw people crawling through the lignum. '*Ngurunderi* spoke and all of sudden they turned into birds. All those birds are now among the lignum bushes' (Berndt et al. 1993:224). On the shores of Lake Alexandrina, *Ngurunderi's* two wives were cooking fish, which was forbidden; at this point *Ngurunderi* lifted his canoe into the sky to become the Milky Way (known in Indigenous astronomy as *Ngurunderi's* canoe). Following a battle with

Parampari, he walked along the Coorong eating mullet and netting fish and went to his home place, Ngurunderwerk-ngali (inland Younghusband Peninsula), wondering what happened to his wives:

> *Ngurunderi* walked back to Kandjeinwald. From there he heard his two wives swimming near Longkewar (Rosetta Head, the Bluff): they were at Kings Point (Walderineind, on the western side of the Bluff) playing a water popping game (see Berndt 1940b: 179 note 36). He said to himself. 'What are they doing there with the water making it pop?' He threw his fishing net on to some racks at Kandjeinwald, leaving it there where it may be seen today … Down by the shore, Ngurunderi stood and threw a spear into the sea, at the same time saying, 'rise up land!' It rose up and became Kaikalamb (Granite Island), near the shore. (Berndt et al. 1993:225–226)

After eating *mantera* (bush apples) and *naningi* (pig-face), *Ngurunderi* placed three granite boulders at the base of the bluff to make shelter as it was very hot at this stage. In the meantime, his two wives swam at Kings Point (creating a semi-circular sandbar) and then crossed to Coolawang Creek where they saw *Ngurunderi* at Longkewar:

> They [two wives] began walking rapidly along Dangkalyewok or Tangklang (Tankalilla Beach). They could see land in the distance (this was Kangaroo Island) and prepared to walk across. At that time, Kangaroo Island was virtually connected to the mainland: it could be reached by walking over and at times wading through the shallows. Ngurunderi followed them, walking down the beach to Tjirbuki (Tjirbruk), a place associated with the Dreaming man Blue Crane, on the coast at Blow Hole Creek. By then the two sisters were walking quickly across the strait. (Berndt et al. 1993:226)

When *Ngurunderi* finally saw his two wives crossing to *Karta*, he called out to them to come back; however, they would not listen. When the sisters were between the mainland and Backstairs Passage, *Ngurunderi* called out again in a much more 'thunderous voice' and as the sea began to rush in the two sisters struggled to survive:

> They began to swim. The younger sister became weak; she removed her net bag and threw it away. After swimming for a short distance she drowned. The elder sister swam on for a little way but she too drowned. They were metamorphosed as three rocks: the Two Sisters (Maralangk the elder as the large rock and the younger sister as the smaller one) and Meruki (the net bag) as the smallest. They are there today: the Pages, between Tankalilla Beach and Cape Willoughby on Kangaroo Island. After that time it was impossible for people to walk across to the island. (Berndt et al. 1993:226)

Following this event, *Ngurunderi* went to *Karta* where he rested for some time. Then he walked to the western side of the island and threw his last spear into the water where it formed several rocks. He then climbed onto the rocks and dived into the sea:

> He emerged from the water, cleansed. Then he climbed into the sky (Waiyuruwar), the land of the dead and of the immortals. However, before he did so, *Ngurunderi* told all the people, 'Here you must dive when death occurs, when the spirit leaves your body. When you die, all of you will dive into the sea, following my example; then you will go up walking as I did, cleansed; you will follow me into the sky!' (Berndt et al. 1993:226)

The story of *Ngurunderi* conveys significant Ngarrindjeri knowledge about the relationships between men and women (gender), *Ngartjis* and resources (fauna), and *Ruwe/Ruwar* and technology (canoes, tool kits), as well as the relationship between Ngarrindjeri people, water, wind and the sky. It also provides information about paleo-environmental change and the beginning of sea level rises (possibly alluding to the Last Glacial Maximum or some similar event) including the stabilisation of the present river system, known from Western evidence to have occurred around 6000 BP. It is core to Ngarrindjeri culture and tradition today:

> As *Ngurunderi* traveled throughout our country, he created landforms, waterways and life. He gave to his people the stories, meanings and laws associated with our lands and waters of his creation. He gave each Lakalinyeri (clan) our identity to our *Ruwe* and our *Ngarjtis* (animals, birds, fish and plants) — who are our friends. Ngurunderi taught us how to hunt and gather our foods from the lands and waters. (Ngarrindjeri Nation 2006:8)

As described by Berndt et al. (1993:226–227) the story covers a wide area of country and Ngurunderi was considered 'an explorer as well as creator'. Despite *Ngurunderi* often being named as 'the Creator' for the region, it is important to realise that he was only partially responsible for the creation of some of the landscape features, topography, cosmology and fauna within Ngarrindjeri *Ruwe/Ruwar* as outlined in the story version relayed above. There are also two related stories including *Matamai* (*Ngurunderi's* son), which conveys information about the 'smoke-drying technique' of the body, and *Waiyungari* and the two wives of *Nepeli*, a story about the brother and two wives of Nepeli (see Berndt et al. 1993:227–229).

During the 1980s, the SAM engaged in a project collating different versions of the *Ngurunderi* stories for the *Ngurunderi Exhibition* (see Hemming et al. 1989). The project involved extensive archival research, consultation with Ngarrindjeri Elders and community members, and careful planning by Hemming and Ngarrindjeri academic Dr Doreen Kartinyeri to exhibit the story for educational purposes. As part of this exhibition, the *Ngurunderi* film (SAM 1987) was produced, which formed the basis for the *Ngurunderi* creation story that continues to be told throughout schools, universities and communities today. More recently, the Ngarrindjeri community has also been publishing different aspects of *Ngurunderi* for the purposes of management planning and protection of cultural and archaeological sites throughout Ngarrindjeri *Ruwe/Ruwar*, such as in the Ngarrindjeri Yarluwar-Ruwe (Sea Country) Plan (Ngarrindjeri Nation 2006).

> A long, long time ago *Ngurunderi* our Spiritual Ancestor chased *Pondi*, the giant Murray Cod, from the junction where the Darling and Murrundi (River Murray) meet. Back then, the River Murray was just a small stream and *Pondi* had nowhere to go. As *Ngurunderi* chased him in his bark canoe he went ploughing and crashing through the land and his huge body and tail created the mighty River Murray. When *Ngurunderi* and his brother-in-law

> Nepele caught *Pondi* at the place where the fresh and salt water meet they cut him up into many pieces, which became the fresh and salt water fish for the Ngarrindjeri people. To the last piece *Ngurunderi* said, "you keep being a *Pondi* (Murray Cod)". As *Ngurunderi* travelled throughout our Country, he created landforms, waterways and life. He gave to his people the stories, meanings and laws associated with our lands and waters of his creation. He gave each Lakalinyeri (clan) our identity to our *Ruwe* (country) and our *Ngarjtis* (animals, birds, fish and plants) — who are our friends. *Ngurunderi* taught us how to hunt and gather our foods from the lands and waters. He taught us, don't be greedy, don't take any more than what you need, and share with one another. *Ngurunderi* also warned us that if we don't share we will be punished (see the *Thukeri* story). (Ngarrindjeri Nation 2006:8–9)

The Yarluwar-Ruwe version of *Ngurunderi* was developed by the Ngarrindjeri Regional Authority (NRA) for the purposes of sharing knowledge and information in the contemporary social and political landscape as a key philosophical approach. Although a shortened version, it is the most recent interpretation approved by the Ngarrindjeri leadership. The complexities associated with interpreting ethnographies and the historical impact of colonialism has already proved damaging for Ngarrindjeri people in the past, particularly in the case of *Kumarangk*, which presents particular challenges for Indigenous peoples in south-eastern SA who have been mis-represented as a group without culture, traditions and knowledge specific to *Ruwe/Ruwar.* Clarke (1994; 2002), for example, has challenged the use of *Ngurunderi* by Ngarrindjeri people for asserting cultural identity. He provided an examination of the extent to which different versions of the Ngarrindjeri 'myth' exists in a post-colonial context.

Despite the wide spread debate and experiences of those directly involved in the legal proceedings, the process also highlighted the extensive amount of information recorded about Ngarrindjeri people by ethnographers, missionaries and anthropologists from initial colonisation. Similarly, Ngarrindjeri people (particularly the key 'informants') made choices about the cultural knowledge shared (through oral histories, written texts and lived experiences) and therefore had agency and a degree of authority through this process. Furthermore, it has been widely accepted that this region was one of the most heavily resourced and therefore most highly populated at the point of contact in comparison to other regions in Australia. The colonial history and administration that followed was also unique in the sense that although Ngarrindjeri people became dispersed, other settlements were established including *Raukkan* and various fringe camps on the outskirts of towns, enabling Ngarrindjeri people to maintain a continuous relationship to *Ruwe/Ruwar*.

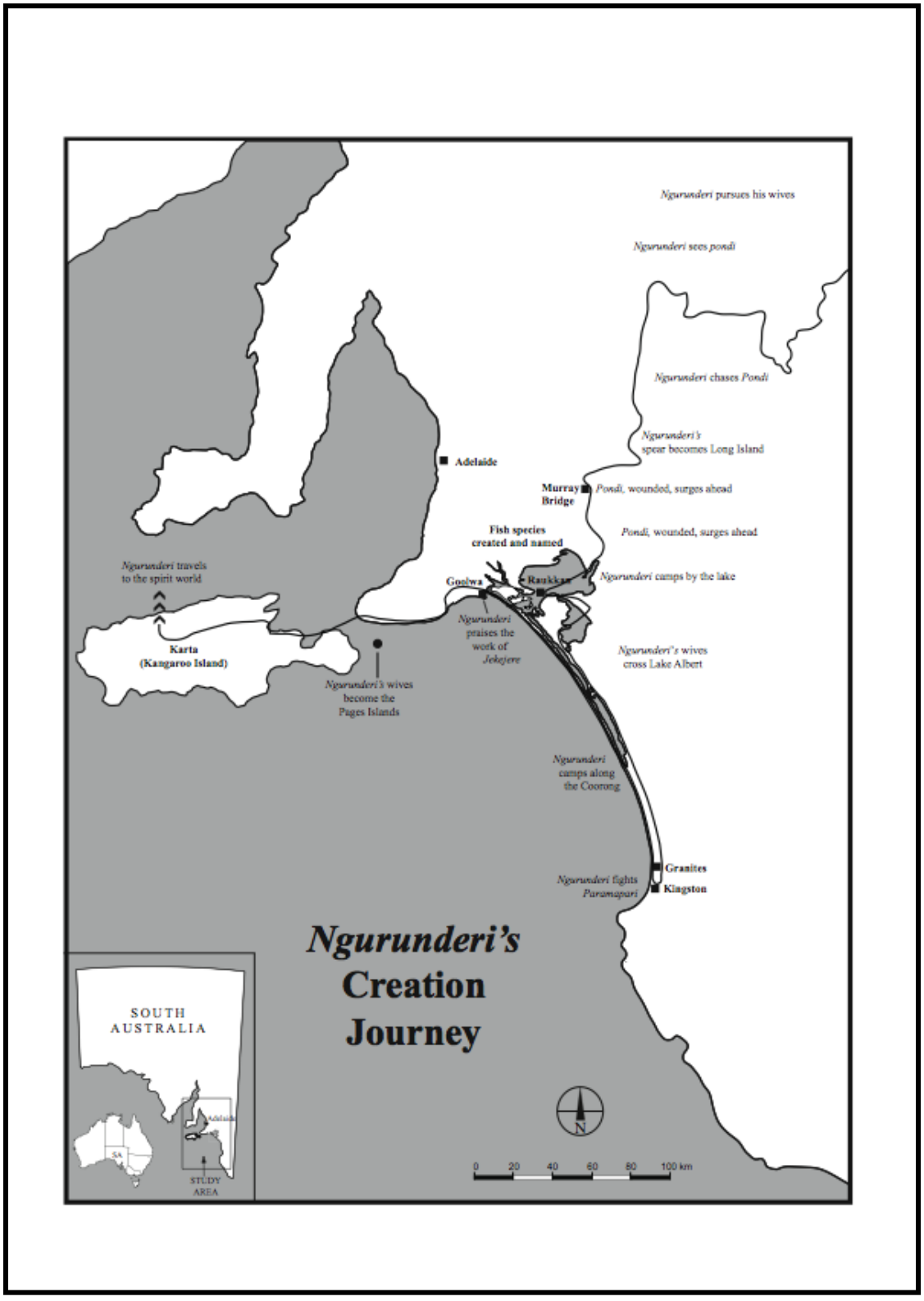


Figure 3.1 *Ngurunderi* Creation journey from Mannum down the Lower Murray River to *Karta* along the southern coastline (adapted from Ngarrindjeri Nation Yarluwar-Ruwe Plan 2006).

3.2 Overview of European Colonisation

The earliest documented evidence for contact between Indigenous peoples and Europeans was the Dutch exploration led by Thijssen in 1627 along the southern Australian coastline. In 1802, nearly 175 years later, Matthew Flinders (in the *HMS Investigator*) was sailing eastward mapping the southern coast when he met Nicholas Baudin (in the *Le Geographe*) sailing west after his Tasmanian expedition. Britain and France were at war during this period; however, the presence of both vessels on the southern coast marked a significant colonial event in Ngarrindjeri *Ruwe/Ruwar* — one that would have generational impact (see Chapter 1 and 9). As a result, Flinders named the location Encounter Bay and although a sculpture has recently been erected to mark this occasion, this maritime history and its relevance (if any) for Ngarrindjeri people has not been adequately explored.

The official colonisation of SA occurred in 1836; however, even prior to this time there was a series of events that irrevocably affected Ngarrindjeri people and *Ruwe/Ruwar*, such as the smallpox epidemic which spread through the region from 1814–1831 (Berndt et al. 1993; Jenkins 1979). Although Edward John Eyre, an English explorer sent to the continent as part of the colonial administration is recognised as the first European to cross through the Lower Murray, Joseph Hawdon had also travelled along the river stretch with stock to Adelaide during initial settlement. However, various aspects of Ngarrindjeri culture were not recorded in detail until the arrival of George Taplin in 1859 (1864, 1873, 1878, 1879a, 1979b). Taplin was a missionary and teacher appointed by the Aborigines Friends Association to Point McLeay Mission (*Raukkan*), which was one of the first European settlements established for the purposes of segregation in Australia. Although there was much control and power imposed on Ngarrindjeri people, at the time of European contact, the Lower Murray region was occupied by a number of closely related groups, many of which continued communication. Tindale (1974) recorded a total of six including two relevant to the study region for this research: *Nganguruku* (who occupied *Ruwe/Ruwar* north of Murray Bridge and Mannum) and *Ngaralta* (from the Mannum area) (Figure 3.2). Berndt et al. (1993) referred to the Ngarrindjeri as the '*Yaraldi'* and they too recorded separate (but related) language groups occupying the Lower Murray, with reference to specific Ngarrindjeri place names that are critical for understanding this landscape more broadly (Figure 3.3).

Since 1836, people of the Ngarrindjeri nation have dealt with the ongoing impacts of colonisation, including disease, warfare, dispossession and oppressive government policies which included Assimilation, Segregation and Integration. In addition, Ngarrindjeri people have been the focus of much research and are one of the most widely researched Indigenous nations globally. This research has been dominated by scientific interests within disciplines such as medical research, anatomical studies and physical anthropology. These disciplines were influenced by ideas that emerged from Social Darwinism that were based on racial differences of 'the Other' (Said 1978), which facilitate

a ‘scientific endeavour’ to reveal the ‘missing link’ of humanity to the Western world (see Hollinsworth 1998). Indigenous peoples were placed on an evolutionary scale based on physical characteristics, whereby “they roamed in what was perceived as an unbuilt environment”, and thus were viewed as inferior to Western civilisations. Alfred William Howitt, for example, was an explorer, natural scientist and heavily influenced by Social Darwinism is regarded as “a pioneer on Aboriginal culture and social organisation”. Howitt’s work was diverse and towards the later stage of his life, his work is characterised as an anthropological late phase (1891–1907) for which a large component of this work was his 1904 work, “Native Tribes of South Eastern Australia”.

The practice of collecting Indigenous human remains from burial sites and from hospital morgues was common for much of the late 19th and early 20th centuries (Fforde 2004). Simultaneously, researchers would also ‘collect’ knowledge from and about Ngarrindjeri people who were perceived at the time to be ‘living traditional lifestyles’, recording language, social systems, ceremonial activities, burial customs, and hunting and gathering techniques, as well as genealogies and interpersonal relationships (i.e. Berndt et al.1993; Tindale 1930). This was generally carried out with the view that the Ngarrindjeri people, like other Indigenous people across Australia, would become ‘extinct race’ through processes of natural selection (Hollinsworth 1998). The removal of Old People (human remains) was practice condemned by Ngarrindjeri people and even today there are rules regarding respect for those passed and appropriate burial ceremonies.

As previously mentioned, the written record is extensive and has become increasingly utilised by Indigenous peoples for family genealogical information and academic research. On one hand it provides a unique insight into the life ways of Ngarrindjeri people from the point of contact to the post-colonial era; on the other there are challenges with interpretation. Ultimately, Ngarrindjeri people’s ongoing relationships and connections and complex relationships to the Lower Murray, Lakes and Coorong region is evident through this record through creation knowledge as well as the literature (auto-biographies, oral histories, film and multimedia, government reports, expert opinion on Ngarrindjeri culture) produced by Ngarrindjeri people themselves. One of the key sites within Ngarrindjeri *Ruwe/Ruwar* that provides evidence for continuity is *Raukkan*, a traditional camping place that became the location for an Aboriginal mission when Taplin began recording language and cultural practices with the Ngarrindjeri (see Jenkin 1979:83–84). Despite Taplin’s goal to ‘civilise’ Ngarrindjeri people by replacing traditional culture with Western epistemologies, education and religion (among others) the establishment of the *Raukkan* mission on a traditional camping site enabled Ngarrindjeri people to continue many cultural practices including knowledge transmission, language and learning about *Ruwe/Ruwar*. Unlike the situation in many other parts of Australia, these

unique historical experiences form part of a long legacy of Ngarrindjeri cultural survival among extreme policies that sought to ‘’conquer’’ the Ngarrindjeri nation.

Racial ideologies that sought to “conquer the Ngarrindjeri” are evident through the works of George Angas, Edward John Eyre, Graham Jenkin, Alfred Radcliffe-Brown, George Taplin, Ramsay Smith, Alfred William Howitt and Edward Charles Stirling, all of whom engaged in the process of colonial expansion via their formal professional roles and the attitudes that were perpetuated during this period. This landscape began to shift in the 1930s when Tindale commenced extensive recording of genealogies, photographic images and material culture of Ngarrindjeri people. Ronald and Catherine Berndt, John Stanton, Diane Bell, Phillip Clarke and Steve Hemming have also contributed to the theoretical, historical and socio-cultural aspects of Ngarrindjeri people, governance and society, making the Ngarrindjeri one of the most researched groups of Indigenous peoples in Australia. Following the abolishment of racial policies and a formal constitutional change during the 1967 referendum, an influx of Ngarrindjeri authors, writers, performers, educators and academics began to critique the written record and engage with the ethnography in a more subjective manner that produced meaningful outcomes and knowledge for Ngarrindjeri people who had been previously denied of culture, history and tradition. The hard work and lifelong commitment by Ngarrindjeri Elders who have since passed are a tribute to cultural survival and maintenance. They include: Uncle David Unaipon, Dr Doreen Kartinyeri, Uncle George Trevorrow, Uncle Tom Trevorrow and Uncle Matt Rigney (to name a few). In relation to this thesis, sources were selected based on information that contained the following themes: 1) Knowledge about *Ngurunderi*; 2) Information about lifeways along the Lower Murray River; and 3) Literature on anthropology, archaeology and other primary sources for the study region. As a result, the main sources reviewed were Norman Tindale’s River Murray Journals from the 1930s (Tindale 1930–1952, 1935, 1937, 1938, 1957, 1974, 1981; Tindale and Mountford 1936), along with various written accounts from Angas (1847), Eyre (1845), Meyer (1843, 1846) and Taplin (1846, 1873,1878, 1879).

Early accounts document the Murray Darling as one of the most densely Indigenous populated areas within Australia. In 1843 it was estimated by Moorhouse (as cited in Eyre 1845:228) that there were 3000 Aboriginal people in the SA province in regular and irregular contact with Europeans, including a total of 500 at Moorunde (Murray River). This is likely to be an underestimate as Eyre who was the ‘Protector of Aborigines’ between 1841–44 had written that there was nearly three to four Aboriginal people to every mile of river, and in some places there were up to 600 people living together at once (Eyre 1845:228). Based on lists of Aboriginal people who visited European stations to obtain flour, Eyre (1845:231) estimated that the number of people at Moorunde was 4129, comprising

1266 men, 1330 women, 930 boys, 551 girls and 52 infants. There were about 5.5% more women than men visiting ration stations, and about 1.3 infants to every woman.

The largest settlement of Ngarrindjeri people after initial contact with Europeans was at *Raukkan*, where many people were shifted under assimilationist government policies. Ngarrindjeri people continue to live at *Raukkan* today, engaged in Ngarrindjeri-owned and operated businesses and enterprises. The next largest settlement of Ngarrindjeri people was at Murray Bridge, particularly *Pomberuk*, as it was located along the Adelaide to Melbourne Railway and provided the opportunity for people to easily access European resources. Fringe camps were also significant for Ngarrindjeri culture, identity and survival. Although people may have been shifted from their lakalinyerar (language groups), they were still living on Ngarrindjeri *Ruwe/Ruwar* and thus able to continue many cultural practices. These fringe camps are vital aspects of culture and history, having been later transformed into sites of resistance (Hemming 1989).

Overall, every source was approached from a criticalist perspective and several issues were considered prior to engaging with the archives, surveys and fieldwork. Some of the issues experienced for this thesis were: knowledge acquisition; the process of recording 'ethnographies'; and, problems with interpreting 'Aboriginal culture' through the written record (Denzin et al. 2008; Langton 1994). The fundamental queries for this thesis were; the accuracy and reliability of cultural knowledge recorded by non-Indigenous peoples; the relationship between colonial explorers, anthropologists and Ngarrindjeri Elders identified as 'informants' of cultural knowledge, the relationship between the SAM (as the 'gatekeeper' for some of this knowledge) and the Ngarrindjeri community today; and the relationship between myself (as a Ngarrindjeri person and archaeologist) and the archival record which is a "living archive" accessible to other Ngarrindjeri people if they wish to pursue more information and knowledge about their people, culture and history.

In relation to archaeological sites, colonisation continues to impact on the integrity of archaeological sites in the region. There are many European activities, such as irrigation, which continue to pose a threat and although some measures have been taken by local councils and landowners to protect highly significant sites such as 'burial sites' from further destruction, this task has been very difficult to manage and oversee for the NHC. The most successful option from the Ngarrindjeri perspective is co-management and negotiation with landowners and government to ensure sites that have been identified in the region are protected, particularly burial sites.

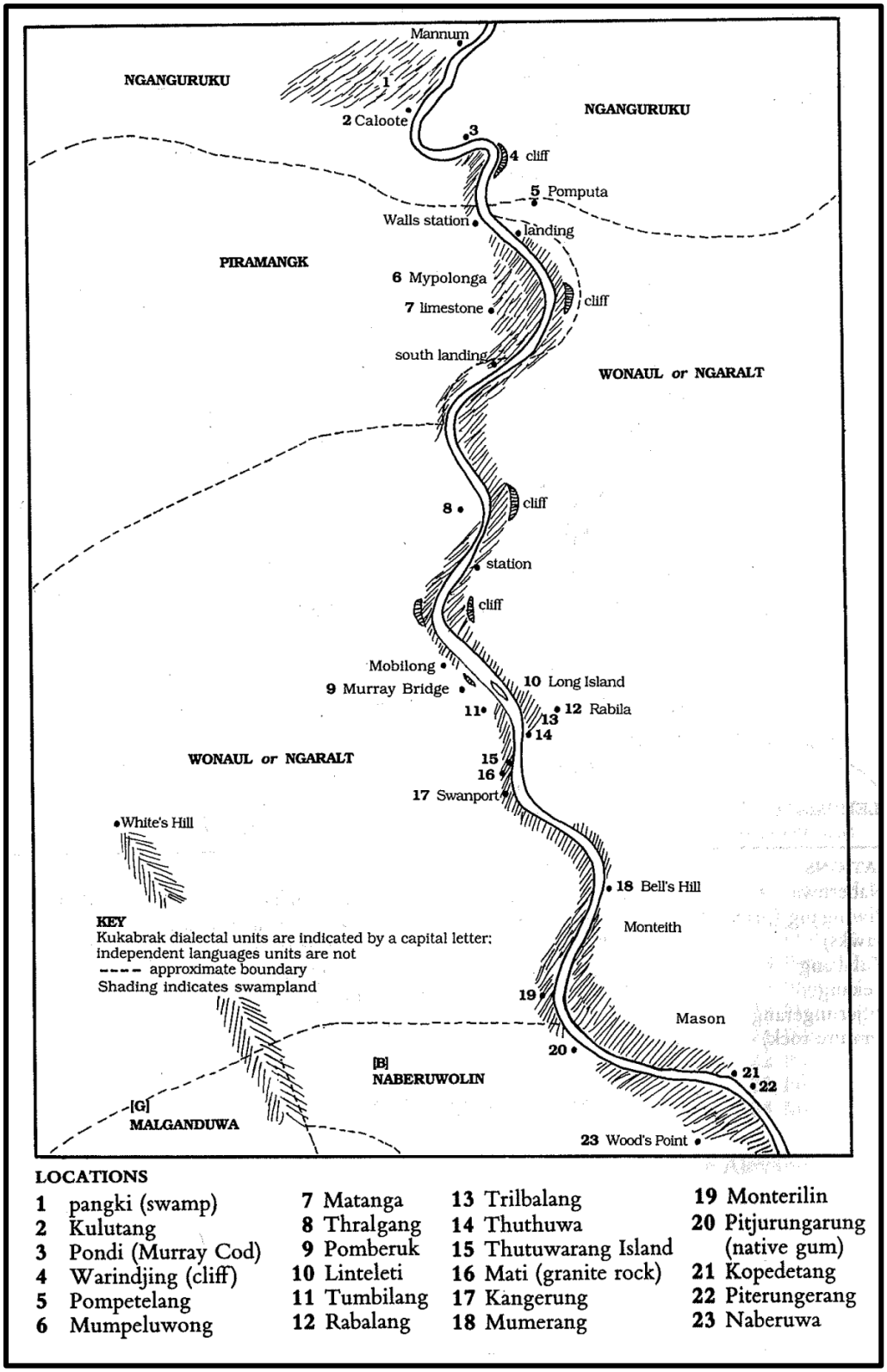


Figure 3.2 Kukabrak clan lands from Mannum to Wood's Point showing cultural knowledge associated with the study region (from Berndt et al.1993:321).

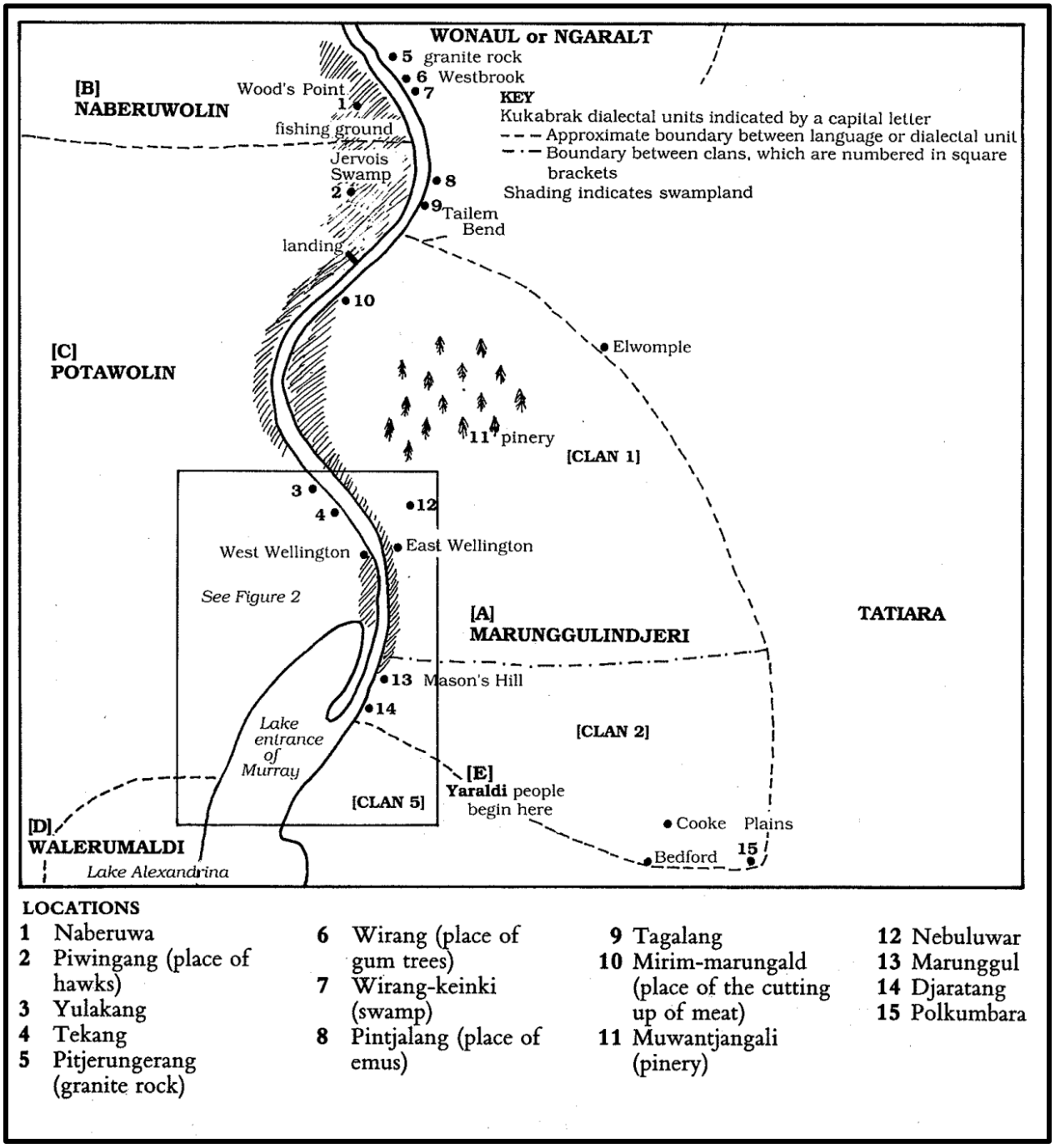


Figure 3.3 Kukabrak lands from Wood's Point to Lake Alexandrina showing the cultural knowledge associated with the study region (from Berndt et al. 1993:322).

3.3 Colonial (Mis)Representations of Ngarrindjeri Life Ways

Much knowledge regarding Ngarrindjeri life ways and occupation in the Lower Murray was recorded by non-Indigenous peoples through a colonial representation of Indigenous peoples during the 18th and 19th centuries. It is also important to acknowledge that, even though it is biased, without these records large amounts of cultural knowledge would have been irretrievably lost. Ethnohistorical records demonstrate that the Ngarrindjeri were a semi-sedentary society who lived in a diverse environment consisting of both freshwater and saltwater resources from rivers, lakes and coastal regions. Within the region, rafts and canoes were constructed as the main form of watercraft and a range of wooden and stone tools that were adapted for the environment:

> From bark canoes the Aborigine speared fish or caught them in nets woven from grasses and reeds. Parties of as many as 40 men spread out across the river and swam downstream in a line, spearing fish as they went. Shellfish and crustaceans were also plentiful. Waterfowl were caught in nets strung out across the birds' flight paths or were knocked down with throwing sticks. Kangaroos and other game were hunted and co-operative hunting techniques, such as driving animals into nets or towards a group of concealed hunters, were commonly practices. There was also a wide variety of native fruits and vegetable foods available, including cresses, native peaches and currants, pig-face and the roots of bulrushes. (Eyre 1845:115–121)

Fishing and shell fishing were dominant practices in the Lower Murray, with fish being caught using varying techniques and strategies. Angas (1847) wrote about networks of low mud weirs for catching small fish and natural outcroppings of stone used in the tidal backwaters of the Coorong lagoon, south of the River Murray, which were utilised in summer and winter (Tindale 1974). Sharpened bone prongs attached to wooden spears were employed for use from canoes, with the most common type of spear in use being the reed spear (Angas 1847). Eyre (1845) described the construction of weirs and dams, netting (both small and large), spearing and diving without implements or nets, all of which practices were carried out by parties of people at the one time during particular seasons, sometimes from canoes.

A principal method for catching fish is by using nets and diving, utilised based on the season, water depth and type of fish being targeted. Eyre (1845:117) described a method which relates to the period when female fish are seeking a place to spawn during early spring:

> Another method of diving with the net is conducted on a larger scale. The net itself is made of strong twine, from six to eight feet long, oval at the top, about two feet across, and two deep. It is looped to a wooden hoop or bow, with a strong string drawn tightly across the two ends of the bow, and passed through the loops of the straight side of the net. With this two natives dive together under the cliffs which confine the waters of the Murray, each holding one end of the bow. They then place it before any hole or cavity there may be in the rocks beneath the surface, with the size, shape and position of which they have previous experience

> become well acquainted; the terrified fish is then driven into the net and secured. Fishes varying from twenty to seventy pounds are caught this way. (Eyre 1845:117)

When the river was low and clear, groups of people from five to 40 would use spears made from hard wood, with smooth sharp points up to six feet long:

> Forming themselves into a large semicircle in the water, they all dive down, simultaneously, with their weapons, accompanied sometimes by a young man, a few yards in advance of the middle of the party, and without a spear. For a considerable time they remain under water, and then, if successful, gradually emerge, and deliver the fish that have been speared, to their friends on the shore. If unsuccessful they swim a few yards further down, and dive again with their weapons. And thus they frequently go on for a mile or two, until they are either tired or satisfied with their success. I have known a party of thirty natives kill seven or eight fish in the course of an hour, none of which were under fifteen pounds, whilst some of them were much larger. (Eyre 1845:118)

Luebbers (1978: 6) suggested that a particular type of canoe was used for crossing streams (similar to those used by Indigenous people in eastern Victoria and Tasmania), while rafts were used for traversing lakes and rivers. Although simply constructed, rafts enabled Indigenous people to travel effectively across protected waters to hunt fish as well as cross open water to visit islands to access other resources such as eggs and seals. During periods of floods and high waters, canoes were used and people would wade along the banks of the rivers or near lagoons near the reeds and rushes. The reeds provided a good place for fish to resort and feed upon insects who often make vibrations against the reeds:

> Suddenly raising his arm with great energy he strikes forcibly among the reeds with his spear, without letting it go out of his hand. If the first blow does not succeed, it is rapidly repeated, and seldom fails in securing a prize. When a large fish is speared, it is pressed downwards to the ground, and the native leaps out of his canoe and dives to the bottom to secure it. The spear (moo-ar-roo) used in this method of fishing varies from ten to sixteen feet in length, and is made of pine, pliant, and nearly uniform in thickness; it is about an inch and a half in diameter, and has two short pointed pieces of hard wood lashed to one end, projecting about five or six inches, and set a little apart, so as to form a kind of prongs or grains. This instrument is used for propelling the canoe. (Eyre 1845:119–120)

The spear used for this purpose was also used for spearing fish at night in a method described by Eyre (1845:120) as ‘by far the most interesting’. At night, two men would fish from a canoe, one would attend to a fire made in the canoe with a stock of firewood, and the other would be the guide and fisherman. According to Eyre (1845:120), the preferred firewood was a species brought in from a considerable distance on the tablelands behind the Murray Valley. When lit, it was said to have a pleasant fragrance, powerful light and to be nearly free from smoke.

Eyre (1845:122) also described fish (sometimes up to 80 pounds) becoming ill or diseased around September, and floating on the surface of larger rivers. Even though the fish may have been deceased for some time, he believed people still ate them. Other freshwater resources were caught similar to fish, using nets, spears and diving. Freshwater lobsters were caught among rocks under the cliffs or logs and roots of trees and, if procured by diving, were sometimes caught by females (Eyre 1845:121, 123). Freshwater turtles were also caught in a similar manner but usually by men. Small crayfish weighing from four to six ounces were caught by both women and men, while mussels were generally caught by women:

> Mussels of a very large kind are also got by diving. The women whose duty it is to collect these, go into the water with small nets (len-ko) hung round their necks, and diving to the bottom pick up as many as they can, put them into their bags, and rise to the surface for fresh air, repeating the operation until their bags have been filled. They have the power of remaining for a long time under the water, and when they rise to the surface for air, the head and sometimes the mouth only exposed. A stranger suddenly coming to the river when they were all below, would be puzzled to make out what the black objects were, so frequently appearing and disappearing in the water. (Eyre 1845:123)

3.4 Ngarrindjeri Agency and Social Justice

Despite colonial injustices, Ngarrindjeri people have been active agents in creating an 'Australian national identity' in numerous ways, including military service in the Great War and World War II (Kartinyeri 1996), representing Australia in cricket, contributions through paid and unpaid work in the labour force (i.e. railway construction, fruit picking, fencing, housing and domestic service), creative writing through story books and literature (e.g. Kartinyeri 2000; Unaipon 2001; Watson 2002); as well as Ngarrindjeri man David Unaipon inventing the blueprint for the electric shears and helicopter design, an engineering feat honoured by his representation on the Australian fifty dollar note.

Following the 1967 Referendum[5], many Ngarrindjeri people were recognised for their involvement in various social and political movements with the support of both Indigenous and non-Indigenous Australians. These movements aimed to challenge racial government policies that denied Indigenous people their basic human rights, thereby creating a brighter future for younger generations of Ngarrindjeri people. Some of the major issues at the forefront of contemporary Ngarrindjeri consciousness today include: economic development; water resources and policy; the repatriation and reburial of Old People (human remains); natural and cultural heritage; improving educational standards; improving the lower life expectancies than non-Indigenous Australians owing to an array of health issues

[5] The 1967 Referendum led to Indigenous peoples being included in the census and the power to change various government policies that were relevant for Indigenous Australians.

including diabetes and heart disease; high levels of drug and alcohol abuse; racial discrimination; and the need to re-organise Ngarrindjeri governance structures as a result of the Howard Government's[6] approach to 'mainstreaming' Indigenous services.

In addition to removing elected representation, the Howard Government also withdrew the Community Development and Employment Programs (CDEP) which provided services for unemployed Indigenous Australians (see Altman and Hinkson 2007; Hemming and Rigney 2008). However, perhaps the most controversial policy change was the passing of the package of Bills in response to the so-called 'National Emergency' in the NT, also referred to as 'The Intervention'[7]. This package altered welfare provision, law enforcement, land tenure and other measures to address so-called claims of child sex abuse and neglect in NT Aboriginal communities and was the Howard Government's response to the publication of the *Little Children are Sacred* report[8]. Although the report itself recommended that consultation with Indigenous communities was critical for addressing child abuse issues, it became apparent that the government did not appropriately consult with Elders in the NT. These issues will continue to affect Indigenous communities directly (through legislation) and indirectly (through media misrepresentations of Indigenous culture) and are part of the political context within which archaeological research is being conducted in Australia.

At the international level, various members of the Ngarrindjeri nation who are involved in the Academy have used academic forums and meetings — primarily conferences (particularly those organised by the World Archaeological Congress) and meetings with other First Nations — to voice Ngarrindjeri views and opinions at the international level and thus gain critical support. These engagements led to the Ngarrindjeri becoming the first Indigenous Australian nation to sign a treaty with the United League of Indigenous Nations (ULIN) in August 2007, through which a strong collaboration now exists. At present, global issues are being discussed at this level between the Ngarrindjeri and First Nations of the Pacific Rim relating to intellectual property rights, trade, climate change, natural resource management, cultural heritage and economic development. The establishment of regional governance and stronger collaborations between the multitude of Ngarrindjeri organisations and committees has created the foundations for a new and exciting chapter in Ngarrindjeri history. The Ngarrindjeri Research Planning and Policy Unit (NRPPU)[9],

[6] The Howard Government refers to the federal Executive Government of Australian led by Prime Minister John Howard from 11 March 1996–93 December 2007.
[7] Also refer to the *Northern Territory National Emergency Response Bill 2007*.
[8] *Ampe Akelyernemane Meke Mekarle* 'Little Children are Sacred', Report of the Northern Territory Board of Inquiry into the Protection of Aboriginal Children from Sexual Abuse, Darwin, Northern Territory Government, 2007.
[9] This 'Think Tank' consists of Flinders University academics and associated personnel who support the Ngarrindjeri community's research interests including Associate Professor Daryle Rigney, Steve Hemming, Dr Stephen Jenkins and Barry Lincoln.

for example, is a leading organisation in Ngarrindjeri affairs, research, policy and future planning which is assisting the community in progressing priorities and interests.

In relation to Indigenous governance, the Ngarrindjeri nation is governed by a Rupelli (Head) of the NT — a council/committee of Ngarrindjeri Elders from various family/clan groups that operated (and continues to operate) before European colonisation. Many key Ngarrindjeri Elders are also members of the NRA, which consists of various representatives from Ngarrindjeri community organisations including: Raukkan Community; Kalparrin; Camp Coorong Race Relations Centre; Ngarrindjeri Ruwe Contracting (NRC); and the Ngarrindjeri Lands and Progress Association (NLPA). Within this structure are several committees which deal with specific matters related to that committee's role, such as the NHC who deal with cultural heritage and archaeological related matters and the NNTMC who have a primary role of dealing with issues specific to land rights and native title. As a result, the Ngarrindjeri nation is shifting into a dynamic space as one of the most influential and politically motivated Indigenous communities within Australia.

The main committees within the NRA for which most of the research presented in this thesis is concerned is the NHC and NRRPU and thus are the predominant mechanism for accessing Ngarrindjeri Elders and community members for advice, direction and specific knowledge. Recent developments (see Hemming and Rigney 2008; Hemming et al. 2007a; Rigney et al. 2008) in Ngarrindjeri *Ruwe/Ruwar* have enabled the community to further develop and implement strategies for research and cultural heritage management that have emerged from KNY Agreements which have included the Ngarrindjeri Sea Country Plan (Ngarrindjeri Nation 2006) and the Ngarrindjeri Murrundi Management Plan No. 1 (Ngarrindjeri Nation 2009). The development of NRPPU has further transformed the way in which Ngarrindjeri engage in business with universities and government agencies, and will ensure that future research projects engage in ethical processes that are driven by research undertaken by Ngarrindjeri people. It is within this broader social, cultural and political context that this research and my position as a Ngarrindjeri archaeologist operates, and it is within this space that I continue to manoeuvre and learn through a journey that builds on my previous research and experiences (see Wilson 2006, 2007a, 2007b, 2008, 2009, 2010 and Wilson et al. 2012 for various publications that highlight this).

3.5 Regional Governance and Self-Determination

The NRA has been involved in major processes of consultation and negotiations with local, state and federal governments in the last decade Steve Hemming, Daryle Rigney and Shaun Berg (see Hemming et al. 2010:94–95) have been heavily involved with assisting the Ngarrindjeri leadership respond to such matters and are core to the

Ngarrindjeri Research Unit's 'think tank'. This has included negotiations involving a whole-of-government KNY agreement that provides a legal framework between the SA Government and the Ngarrindjeri for issues that involve Ngarrindjeri *Ruwe/Ruwar* (see DEH 2009; Ngarrindjeri Nation 2009); the Murray Futures Program; the Lower Lakes, Coorong Recovery Program; and, the Riverine Program, as well as coordinating working parties to respond to documents such as the *Securing the Future: Long Term Plan for the Coorong, Lower Lakes and Murray Mouth* (DEH 2009). Concerns about the health of the Lower Murray Lakes and Coorong and the injection of major resources for community and research projects within the region have meant an increase in research projects that are being carried out in primarily natural resource management but also cultural heritage and archaeology:

> Recent NRA negotiations with government in relation to cultural heritage and NRM have sought a critical shift in institutional/disciplinary understanding and practice in relation to research and management practice on Indigenous lands and waters. The usual and limited, mechanism for addressing Indigenous interests has been through cultural heritage, and to some extent Native Title legislation. Accepting that ecological and environmental research and management has a broad and direct impact on Indigenous well-being is an important shift in government policy. (Hemming et al. 2010:97)

Hemming et al. (2010:98) emphasised the importance of protecting and managing what they term 'Indigenous cultural and intellectual property' (ICIP) rights to ensure that governments and researchers are engaging in appropriate methodologies that engage Ngarrindjeri people as equal partners at the negotiating table. There are several archaeological projects that have emerged in Ngarrindjeri *Ruwe/Ruwar* in recent years as a result of collaborations between the Ngarrindjeri community, the SAM and Flinders University researchers. For example, many projects were first developed in the 1980s and 1990s through initiatives develop by the SAM in which Hemming (1994, 2000; Hemming et al. 1989) was heavily involved. This included the aforementioned *Ngurunderi* Exhibition, which involved several years of collaboration with the Ngarrindjeri to produce a public story on this important creation story. More recently, researchers from Flinders University including staff, honours and research higher degree students have become increasingly involved in various research projects that have a dual purpose to assist in the management and protection of archaeological sites (i.e. Anderson 1997; Baric 2006; Disspain 2009; Harris 1996; Hemming and Trevorrow 2005; Meara 2007; Niland 2007; Roberts et al. 2005; Ross 2009; St George 2009; von Maltzen 2009; Wallis and Gorman 2010; Wallis et al. 2006, 2008; Wilson 2005; Wiltshire 2006). Through previous research conducted on Ngarrindjeri *Ruwe/Ruwar* (Wallis et al. 2006; Wilson 2005), I had already formed a sound relationship with various Ngarrindjeri community members and organisations. The development of a positive relationship between various researchers and the community has enabled opportunities, including this research, to be conducted within culturally appropriate frameworks that will benefit the Ngarrindjeri nation; this research will contribute to this ongoing relationship that has previously been established under the NRA.

As a university researcher, my research is located under the Ngarrindjeri Caring for Country Program (NCCP), which deals with issues related to heritage and archaeology under the NRA. Throughout my project I had to work with specific community organisations and committees through the NRA to ensure that I was following their culturally sanctioned procedures. In this specific case, the NRA is ultimately a formal partner in my training, the research process and the generation of 'new' knowledge reported herein. The research process has been an explicitly negotiated one, whereby the university is one training environment where I learn with the assistance of 'supervisors', while my community is another environment in which, through the assistance of Elders and community members, I also gain knowledge and information; as such, the community Elders are also 'supervisors'. The NRA is not merely a 'stakeholder' in this research; it's members are also my 'supervisors' and official research partners. In many respects, this was a unique relationship as, being Ngarrindjeri myself, I had a different set of research issues to consider beyond those that a non-Indigenous researcher working with the Ngarrindjeri would be exposed to; these issues are further considered in Chapter Three.

3.6 The Lower Murray Cultural and Archaeological Landscape

There are several places in Ngarrindjeri *Ruwe/Ruwar* that archaeologists have not adequately captured in previous 'investigations'. This is certainly true for the three places excavated during this research: *Murrawong*, *Pomberuk* and *Kangerunk*. These places were all chosen in negotiation with the NHC as they have historical, cultural and political significance for the Ngarrindjeri, in addition to their archaeological significance. This significance is best articulated by Ngarrindjeri Elders themselves in the *Pomberuk* Heritage Management Plan:

> *Pomberuk* has a deep spiritual, cultural and historical significance to the Ngarrindjeri people — past, present and future. It is an important place of cultural teaching on the banks of the Murrundi (the Murray River) and on the nurseries (wetlands) created by *Ngurunderi* (the Creator and Lawgiver) and *Pondi* (the Murray Cod Ancestor). *Pomberuk* and Ngarrindjeri people are part of the same living body. (NRA 2009:4)

Culturally, *Pomberuk* is associated with *Ngurunderi* and there is a physical manifestation of *Ngurunderi's* 'footprint' in the form of a granite boulder near the area. Ngarrindjeri people camped here during the protection and assimilation eras through until the late 1940s when they were ordered to move by the government of the time. Further, these places were previously identified by government heritage administration as significant for Ngarrindjeri people as early back as the 1970s (see Ross and Ellis 1974). In 1939, Albert Karloan and Mark Wilson (Thralrum or Thalrum) met Ronald Berndt at Murray Bridge. This was the beginning of a long association whereby Berndt, and later his wife Catherine, began to learn about local knowledge and traditions. This was Berndt's first field experience living

with people and according to the Berndts, Karloan was concerned about the potential loss of cultural knowledge and was willing to share his knowledge as he wanted it recorded for future generations. By 1942, the Berndt's camp was established at *Pomberuk* (Figure 3.4) and there were six shacks (including Karloan's cottage) made from flattened kerosene tins, scraps of iron, wood and pieces of sacking (Figure 3.5). Karloan's intention to record cultural knowledge for future generations is realised at *Pomberuk* and is perhaps one of the earliest examples of contemporary Ngarrindjeri people re-connecting to this historical period. The process of conducting archaeological research further enables Ngarrindjeri people to directly associate with this place physically and thus learn from the material past. Furthermore, there are many 'intangible' aspects associated with *Pomberuk* including creation stories, reconnecting with the landscape, its historical past, and the various cultural and political meanings the Ngarrindjeri people attach to it today.

Unlike *Pomberuk*, *Murrawong* and Kangerunk do not have complex political histories associated with them, though they do have interesting cultural and archaeological histories. *Murrawong* is associated with *Ngurunderi* chasing *Pondi* downstream, and throughout this place and immediate surrounds culturally modified trees, freshwater shell middens and burials situated are present. Further south of *Murrawong,* as the river veers closer to the limestone cliffs, shell middens can be observed at the base of the cliffs and beneath small overhangs. Kangerunk is located directly adjacent the granite boulder associated with Ngurunderi and is where Stirling (1911) excavated several burials in the 1900s. In a similar way, Kangerunk is associated with major burial sites and large shell middens and therefore a target for looting, collecting and early research on Old People. This area is also known by Ngarrindjeri Elders as a significant place for men.

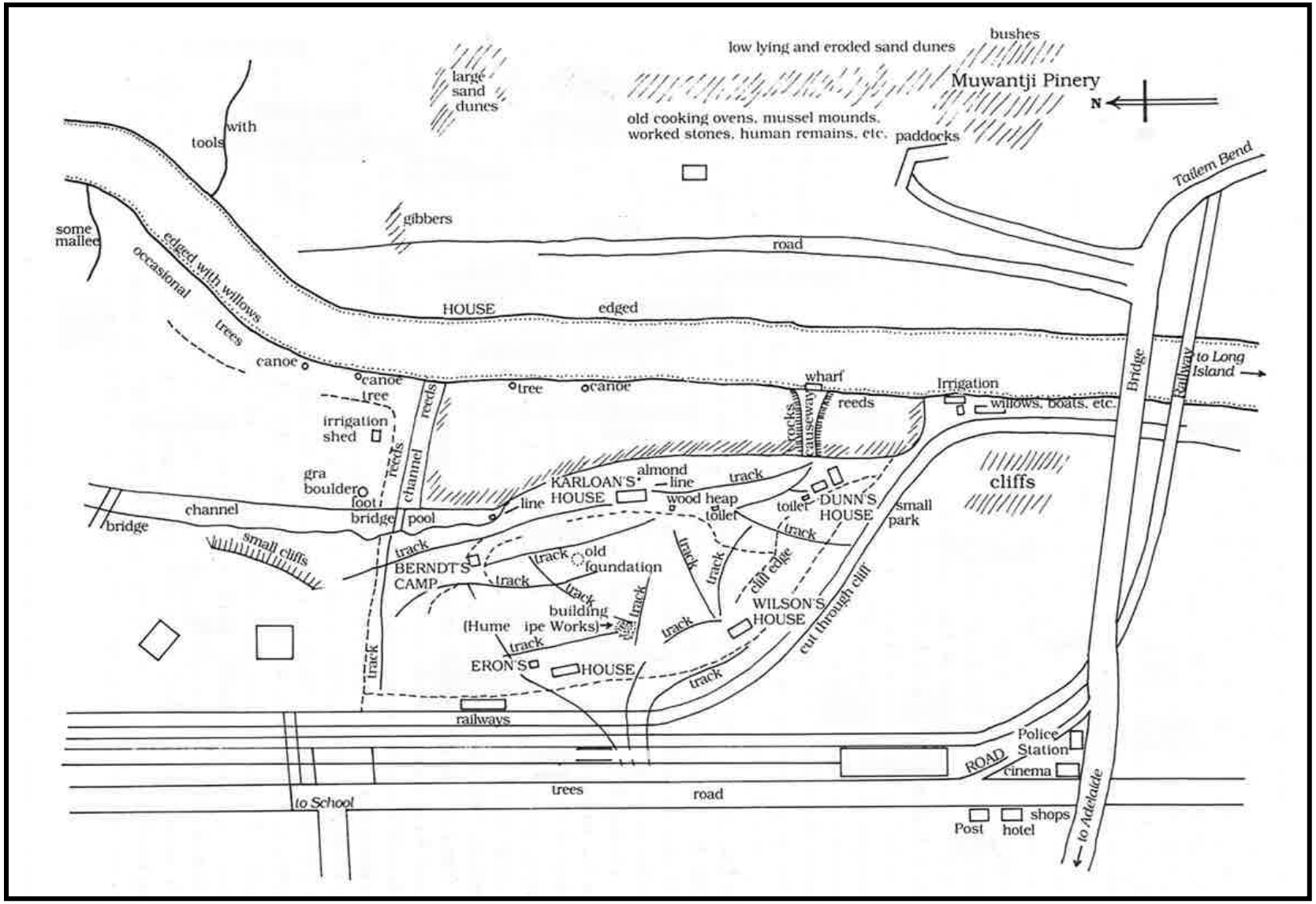
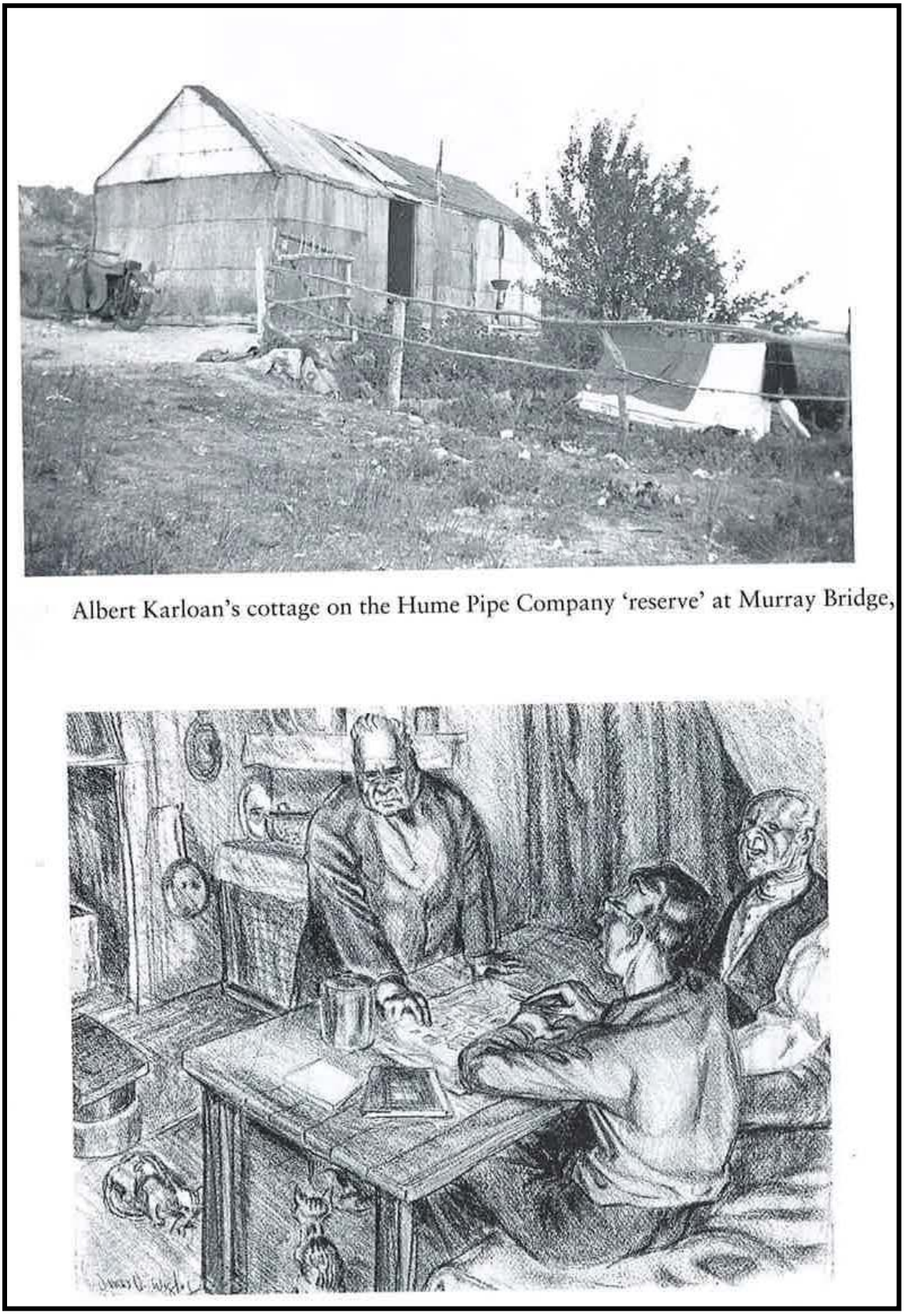


Figure 3.4 Plan of the Ngarrindjeri camp at Murray Bridge, 1942 including lactation of Karloan's House and other European dwellings situated on the site on what is now referred to as *Pomberuk* (from Berndt et al. 1993:5).



Albert Karloan's cottage on the Hume Pipe Company 'reserve' at Murray Bridge,

Figure 3.5 Albert Karloan's cottage on the Hume Pipe Company 'reserve' at Murray Bridge, 1942. This place is now referred to as *Pomberuk* (from Berndt et al.1993:16).

3.7 Summary

This chapter has provided a summary of Ngarrindjeri knowledge and sources of information related to this thesis. In particular, the knowledge revealed through Ngurunderi is a focus of this research and the places excavated in the landscape and as a result, have required a complex reading, critique and application of ethno historical texts to interpretations about Indigenous people's knowledge, practices and traditions. Ngarrindjeri people are engaging in social, political and cultural activities that aim to deconstruct past colonial practices to transform the way in which Ngarrindjeri people engage with archival records, anthropological and archaeological information and physical surveys and excavations concerning the past. From a cultural perspective, knowledge is embodied and grounded in local community context that is expressed through the avenue of creation knowledge such as *Ngurunderi*. In summary, the principles taught by Ngurunderi is the philosophy that guides caring for *Ruwe/Ruwar*, understood through Ngarrindjeri epistemologies, oral traditions and dissemination of cultural knowledge in a contemporary context. Given the complexities and usefulness for both Indigenous and western knowledge for research reported herein, multiple narratives that are localised and specific to context are presented with the archaeological record for the Lower Murray River.

> Our Lands, Our Waters, Our People, All Living Things are connected. We implore people to respect our Ruwe (Country) as it was created in the *Kaldowinyeri* (the Creation). We long for sparkling, clean waters, healthy land and people and all living things. We long for the *Yarluwar-Ruwe* (Sea Country) of our ancestors. Our vision is all people Caring, Sharing, Knowing and Respecting the lands, the waters and all living things. (NRA 2009:6)

This chapter contextualises the study region, providing an outline of the environment, and reviewing previous archaeological investigations. The first section focuses on the physical setting including the study boundary, geology, climate, hydrology, flora, fauna and palaeoenvironmental background, which provides information about resource availability as well as landscape development and formation. The second section summarises all previous archaeological research in the region and discusses the NCCP, which has enabled a range of community-driven projects to be undertaken in the study region, including this research.

4.1 Geographic Setting

This research is situated physically within Ngarrindjeri *Ruwe/Ruwar*, the traditional lands and waters of the people from the Lower Murray, Lakes and Coorong in southeast SA. The people of the Lower Murray River are part of the Ngarrindjeri nation but have also been referred to as the *Yaraldi* (Berndt et al. 1993). This river is part of the Murray Darling Basin (or Riverine Plain), which is Australia's largest river basin flowing from Mt Kosciusko northwest through NSW, VIC and SA before entering the terminal lakes system which includes Lakes Alexandrina and Albert and the Coorong at the river mouth. The Lower Murray, Lakes and Coorong region is a 'Wetland of International Importance' under the Ramsar Convention and has been the focus of much research, as well as conservation and management initiatives (The Ramsar Convention 2014).

In a contemporary context, part of Ngarrindjeri traditional *Ruwe/Ruwar* is under the Ngarrindjeri and Others Native Title Claim (Application No. SC98/4 SAD6027/98), which includes Mypolonga in the north and extends south to the River Murray, Lower Lakes and Coorong. There are two related claims including the First Peoples of the River Murray and Mallee Region Native Title Claim (Application No. SC98/3 SAD6026/98) which extends further north along the River Murray from Mypolonga to the South Australian/Victoria border. The Ramindjeri Claim (Application No. SC10/3 SAD162/10) was recently submitted to the Native Title Tribunal and overlaps the Ngarrindjeri and Others Native Title Claim (Figure 4.1).

For the purposes of this study the Lower Murray River is defined as that part of the Murray River between Mannum and the river mouth at Goolwa, including Lakes Alexandrina and Albert and the Coorong. Clarke (1994:19) defined the Lower Murray 'cultural region' slightly differently, indicating it begins just south of Murray Bridge (where the river bends south towards the lakes) and extending to the west to include Cape Jervois and Kangaroo Island, and along the coastline to the southern end of the Coorong at Kingston. Clarke's boundary was based on Ngarrindjeri creation stories and historical relationships with these places during colonisation (i.e. women kidnapped and taken to *Karta*). The archaeological investigations were focused in the area between Mypolonga in the north and Montieth in the south, located between latitude -35.2052 (Woods Point) and -34.9062 (Mannum), and longitude 139.3863 (Woods Point) -39.3066 (Mannum), covering a total of 112,396 ha. The study did not proceed further north than Mypolonga and Toora, as this is the boundary for the Ngarrindjeri and Others Native Title Claim.

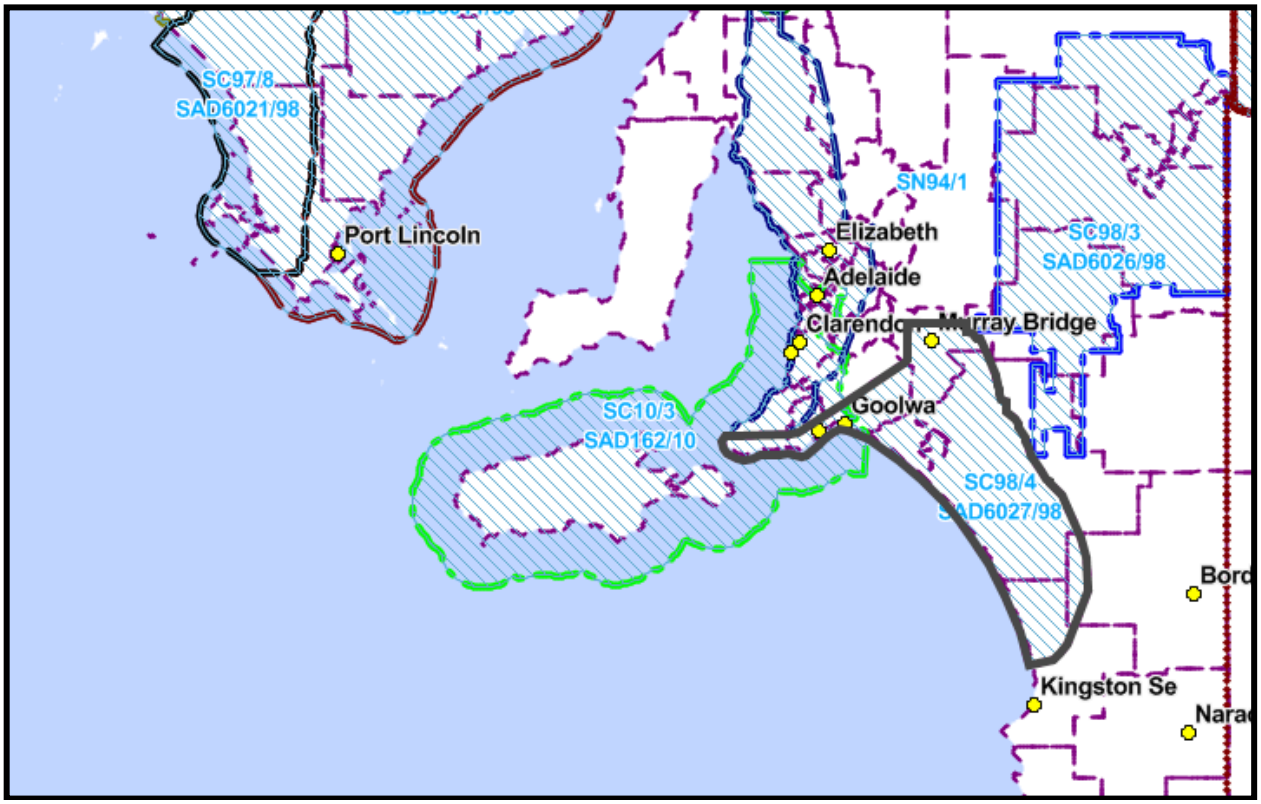


Figure 4.1 Map showing Ngarrindjeri Native Title Claim SC98/4 SAD6027/98 (outlined in grey) in reference to related claims (1) Ramindjeri SC10/3 SAD162/10 (outlined in green) and (2) First Peoples of the River Murray and Mallee Region Native Title Claim SC98/3 SAD6026/98 (outlined in bright blue) (courtesy of the National Native Title Tribunal).

4.2 Geology and Geomorphology

The Lower Murray region has been relatively stable geologically for millions of years (Fluin 2002; Rutherford 1990) with a gradient that is extremely low, ranging from 5 cm/km at Mildura to less than 2 cm/km near the Murray Mouth. The Murray Valley is of middle Pliocene age (approximately 10 million years), though the Murray River itself achieved its current form approximately 10,000 years ago. There have been four major periods during the Quaternary when the sea level was lowered by ca 100 m during glaciation events when the ancestral river incised its bed (see discussion below on palaeoenvironmental context). Currently, the flood plain is underlain by alluvium deposited as the river level rose in response to sea level rise (SA Planning Authority 1978:14).

There are three distinct geomorphic regions in the lower Murray River including the mallee trench from Wentworth to Overland Corner, the Murray Gorge from Overland Corner to Mannum, and the floodplains from Mannum through to the river mouth at Wellington (Fluin 2002:3). From the junction of the Darling River through SA, the Murray channel meanders through a 5–10 km wide floodplain trench with an average wavelength of 4 km (Rutherfurd 1990). The floodplain itself is a continuing a complex system of anabranches, wetlands and billabongs that cuts at least 30 m into the late Pliocene Parilla Sands Formation which are of fluvial-lacustrine origin deposited under Lake Bungunnia (Fluin et al. 2007; 2009; McCord 1995). Downstream from Overland Corner, the river flows through Miocene limestone (Mannum Formation) and the valley becomes narrow and deeply incised (less than 1.5–2.0 km wide and 30–40 m deep) (Gill 1973). According to McCord (1995) this was formed in the late Eocene to early Pliocene as a result of transgression of the basin by the sea when a range of fossiliferous limestones and other marine sediments were deposited. It is characterised by long straight reaches with almost vertical cliffs and is often referred to as the Murray Gorge.

After Mannum these cliffs became less steep as the valley begins to widen, creating a system of wetlands and 'nurseries[10]', which occur as a result of the river currents being relatively slow (SA Planning Authority 1978:19). Many of the nurseries have been drained in the last 100 years or more (see Twidale et al. 1978). Within the specific study region are two regions, each containing its own distinct flora and fauna: the Murray High Plains and the Murray Trench. The Miocene aged bedrock is highly calcareous and is overlain by low-lying, east-west trending dunes laid down during the Pleistocene and Holocene (Firman 1973). On the eastern side of the river are vertical cliffs caused

[10] The Ngarrindjeri describe wetlands and floodplains are 'nurseries' which provides a more accurate interpretation of the significance of nurseries in relation to the broader environmental resources within the Lower Murray region.

by strong undercutting by the river while on the western side the slopes are minimal and mantled with colluviums on the inside of the river curves. There are numerous wetlands along the Murray Trench.

4.3 Palaeoenvironmental Context

The Murray Darling Basin was once a series of complex channels, and three generations are now apparent. The first is the generation of contemporary channels and the second two are palaeochannels (Bowler 1978). The prior streams are twice the size of present channels and are preserved as oxbow lakes or billabongs, while the older generation — ancestral streams — are less sinuous, shallower and approximately three times the width in comparison to the present channel. The palaeochannels (which are indicated today by gum trees along their former creeks and banks) indicate change from a drier environment and it has been suggested that the metamorphosis from the ancestral system to prior rivers occurred between 80,000 and 50,000 BP (Page et al. 1991). Pardoe (1995) had also identified three periods of river evolution including Prior Streams (25,000–14,000 BP), Ancestral Rivers (14,000–7000 BP) and Modern Rivers (7000 BP), which he argued have specific importance for the biological and cultural evolution of the region. Over the last 20,000 years, various environmental factors including water availability have vastly impacted upon social changes (i.e. population growth and sedentism which are discussed in more detail below) across Australia, which has impacted upon settlement patterns particularly along the Murray River (Ross 1981) and an increase of sites and intensity of use as a result of intensification (Lourandos and Ross 1994).

Fossil diatom assemblage studies have demonstrated 'records river connectivity and water quality changes consistent with the regional Holocene climate record' in the Lower Murray (Gell et al. 2005:257). Sediment sequences have been investigated as a means of further understanding the local impacts of climate change, but AMS dating has proven particularly problematic in the Lower Murray, possibly due to the 'hard water' effect — inclusion of older carbon from carbonate rich ground waters (Gell et al. 2005:258). Despite sediment rates for many south-eastern Australian wetlands are slow and estimated at 1 mm/year. Muroondi Wetland (located near Tailem Bend ca 20 km south from the study region) is a shallow eutrophic (poor water conditions) wetland dominated by *Phragmites australis* and *Typha domingensis*. Diatom analysis from this wetland also provided samples for radiocarbon dating for which a chronology between 3993±42 yr BP (405–410 cm), 4627±63 BP (790–800 cm) and 4284±64 BP (1390–1400 cm) is evident, indicating possible 'shifts from open water conditions to rich silts at 8 m' which is reflective of swamp conditions.

Overall, salinity levels throughout the majority of the Lower Murray River floodplain have increased as a result of post-European activities (Gell et al. 2005:265, 2007). A further study (Fluin et al. 2007:127) has shown that the

contemporary wetland complex of Lake Alexandrina and the Coorong had originated by ca 8000 BP. The Holocene diatom assemblages of Lake Alexandrina suggest relatively freshwater conditions with major inputs from the Murray River after ca 2000 BP and for the entire late Holocene the two coastal lakes systems evolved in relative isolation (Fluin et al. 2007:132). At the site of Tareena Billabong in southwest NSW (Gell et al. 2005), there has been a palaeoliminological history of an ever-changing wetland reflecting two phases of increased connectively with the Murray River in the mid- to late Holocene. It is suggested that there were river flow changes possibly associated with regional climate change after 3000 BP, with an increase in turbidity and wetland salinity during this period (Gell et al. 2005:441).

4.4 Climate

The Lower Murray is in a semi-arid region characterised by warm summers and cool winters. Although there are no extreme monsoonal influences, intermittent gale storms and strong winds are common along the southern coast, and wind causes sediments and dune systems to shift throughout the region. The average minimum and maximum temperatures range from 14.6–29.3°C in summer to 5.4–16.2°C in winter (BoM 2011). Rainfall is most dominant during the winter months (from June–August) and the remainder of the year is relatively dry. The mean annual rainfall for the township of Murray Bridge is 348.0 mm, though more recently record high rainfall values have occurred during the summer of 2011 (BoM 2011). The Murray River has been subject to both extreme floods with the highest values recorded in 1957, as well as periods of extreme droughts. According to Craik (2005:15–16) historical records since 1890 demonstrate a cyclic variability in climate, as reflected in southern flows in the Murray.

4.5 Hydrology

The broader ecosystem of which the Lower Murray is a part covers an area of 1,061,469 km², incorporating the Murray, Darling, Murrumbidgee, Lachlan and Goulburn Rivers in the southern part of the Murry Darling Basin. In 1917, plans were established to regulate the Murray-Darling Basin through a series of weirs, with the first (Lock 1) established at Blanchetown in 1922. The mean contemporary annual flow of all combined catchments is over 14,000 GL though this became regulated following construction of weirs in 1922. Prior to weir construction, the Lower Murray River operated as a winter/spring maximum flow that was predominantly driven by winter rainfall and a few other events including the spring snow melt and a summer/autumn low flow that was dominated by evaporation in the summer months (Gell et al. 2007:136). There have been records of the river being so shallow that people could wade across it (Powell 1989). The River Murray flooded in 1956 and following this event, levy banks were constructed using local soils, many of which were taken from archaeological sites and shell middens (Figure 4.2).

The interaction between surface water and groundwater resources in the Lower Murray, Lakes and Coorong is significant, sustaining wetlands and other habitats in otherwise dry environments (SAMDB-NRMB 2011). Water exported from the region supports irrigation and stock watering in areas as far removed as the Clare Valley, Barossa Valley, Port Pirie, Whyalla, Port Augusta and Keith. Further, water from the Murray River is a key supply for metropolitan Adelaide. On average 40% of Adelaide's annual mains water needs are supplied from the Murray and this can rise to 90% during periods of drought (SAMDB-NRMB 2011). Groundwater is extracted from selected aquifers and is particularly important to agriculture in the Angas-Bremer plains and the Mallee regions for irrigation and domestic uses. Both groundwater and surface water resources are used for stock and domestic purposes throughout the eastern Mount Lofty Ranges and this remains a significant management issue, as water use from some streams and aquifers has exceeded sustainable levels. This over-use has led to the degradation of natural resources that rely on the water, with impacts including the loss of environmental water, salinisation of land and water resources, and subsequent ecosystem decline (SAMDB-NRMB 2011).

The Murray River has been regularly monitored for salinity (as EC) since 1938 at the township of Morgan, and a more comprehensive program involving 35 sites commenced in 1978. Water quality measures along the River vary considerably; however, EC, turbidity and nutrients generally decline downstream, which reflects changing catchment use and channel morphology (Gell et al. 2007:136). Since then, river flows have been regulated and for the first time in recorded history, the river mouth closed for the first time in at least 8000 years during the 1982–83 drought and it came close to closing again during the most severe period of drought in 2002–03. Subsequently this raised much concern about the health of the Murray River. The importance of the Murray River system has since become a focus for social, cultural and political discussions which have driven management decisions to limit abstractions, implement environmental flows and restore floodplain wetlands (Jones et al. 2002). In 1981, the Murray Mouth closed.

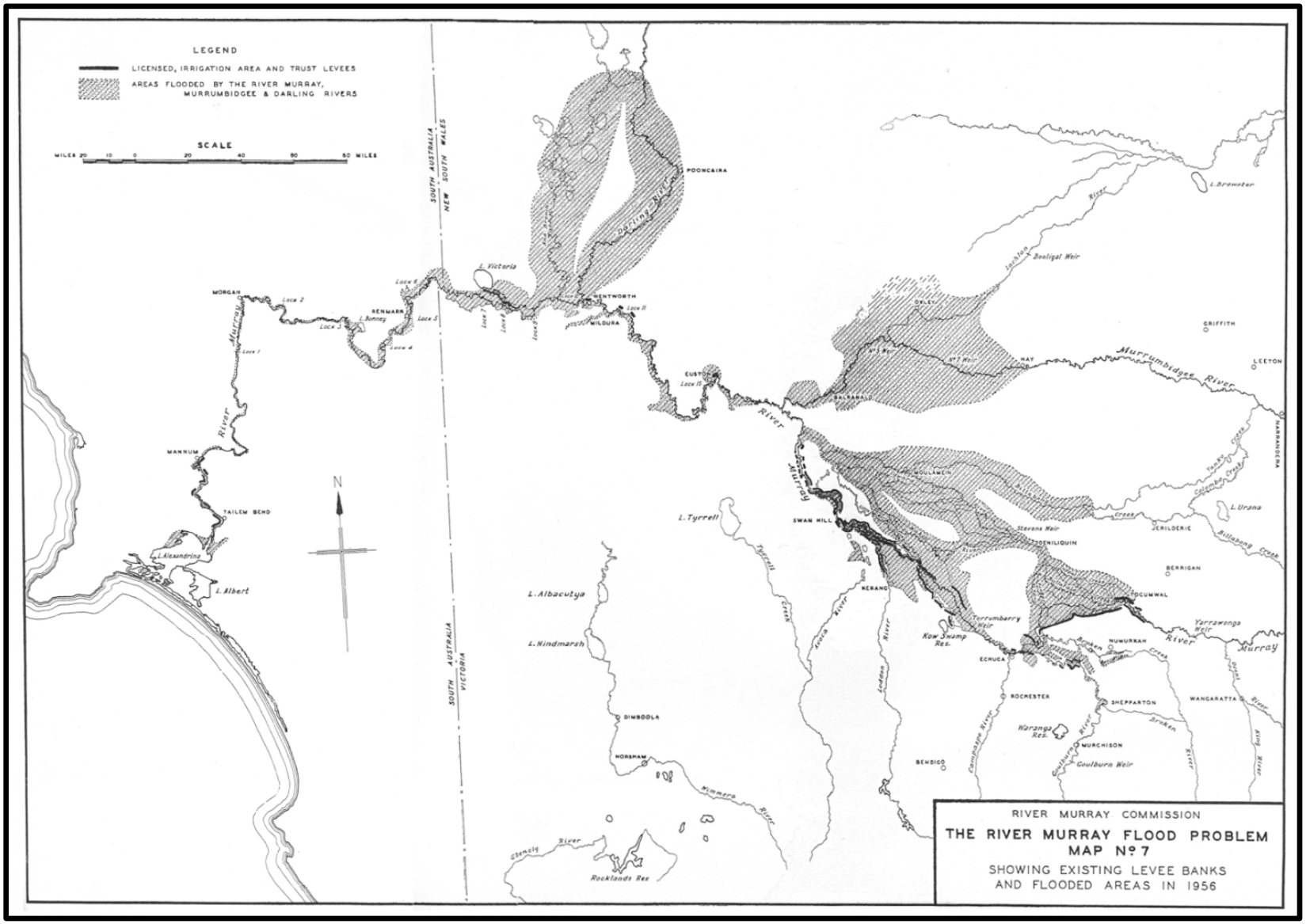


Figure 4.2 Map showing extent of River Murray flood in 1956.

4.6 Flora

Terrestrial plants within the Lower Murray consist of woodland and mallee vegetation that are adapted to semi-arid conditions. The landscape itself can withstand nurseries, wetlands, floodplains and occasional flooding from the river and during periods of high salinity. The dominant vegetation communities are open woodlands dominated by river red gum *(Eucalyptus camaldulensis*) and Murray black box (*E. largiflorens*) (Fluin 2002). The most common mallee trees and scrub include river cooba (*Acacia stenophylla*) and shrub sheoak (*Casuarina distyla*), as well as various species of tea-tree (*Amyema* spp.), emu bush (*Eremophila* spp.), and saltbush (*Atriplex* spp.). Native cypress pines (*Callitris preissii*) are common within the sand dunes between Murray Bridge and Wellington and, within the Murray Trench, river white box (*Eucalyptus albens*) and black oak (*Casuarina luehmannii*) are present. Common mallee understorey vegetation and water plants native to the region include *Cyperus gymnocaulos* (spiny sedge) and *Rynchylaena tomentosa* (ruby saltbush), as well as various species of water plants, native rhubarb (*Rheum* spp.), thistle (Asteraceae) and stinging nettle (*Urtica dioica*).

Edible terrestrial vegetables include various species of the wild potato (*Solanum berthaultii*), native radish (*Raphanus raphanistrum*), and spring and winter yams (*Dioscorea* spp.). Fruits, berries and seeds are more varied and included pig face (*Carpobrotus rossii*), native quondong (*Santalum acuminatum*), native currant (*Acrotriche depressa*), native cherry (*Exocarpus cupressiformis*), muntries (*Kunzea pomifera*) and various apple-berries (*Billardiera* spp.). Various seeds including the coast wattle seed (*Acacia sophorae*), as well as various flowers that contain honey-like substances, are also native in the region.

Introduced species including the African boxthorn (*Lycium ferocissium*) and African lovegrass (*Eragrostis curvuia*) are major threats in the region. Although these species have been identified as pests, in some cases they protect archaeological sites that are eroding.

4.7 Fauna

There is an extensive range of native fauna within the Lower Murray including mammals and marsupials (e.g. echidnas, possums, kangaroos, wallabies, and native mice), reptiles (lizards and snakes), freshwater fauna (river and lake fish, turtles, crayfish and yabbies, mussel), various land and water birds (e.g. swans, ducks and emus) and a wide range of insects. However, the decline in the health of the Murray River since colonisation and increase in salinity has resulted in a decrease in the number of native fauna that continue to inhabit the region (DENR 2011).

There are several mammals and marsupials including the red kangaroo (*Macropus rufus*) and the common wallaroo euro kangaroo (*M. robustus erubescens*), swamp wallabies (*Wallabia bicolour*), the southern brown bandicoot (*Isoodon obesulus obesulus*), ring-tailed possums (*Pseudocheirus pereegrinus*), echidnas (*Tachyglossus aculeatus*), water rats (*Hydromys chrysogaster*) and mice (*Notomys amplus*).

There are many native terrestrial and water reptiles in the region. The bob-tailed goanna (*Tiliqua rugosa*) and blue tongued lizard (*T. scincoides*) are native to the region. The two main types of snakes present in the region are the eastern brown snake (*Pseudonaja textiles*) and the eastern tiger snake (*Notechis scutatus*). Interestingly to note here that, although native to the region, Berndt et al. (1993:569) noted that snakes were not traditionally eaten by Ngarrindjeri people. There are two types of freshwater turtles in the Murray River, the Murray short-necked turtle (*Emydura macquarii*) and the eastern long-necked turtle (*Chelodina longicollis*).

There is an extensive range of land and water birds, some of which have an association to Gondwana. These include emus (*Dromaius novaehollandiae*), mallee fowl (*Leipoa ocellata*), the Australian bush turkey (*Alectura lathami*) and kookaburras (*Dacelo novaeguieae*). Other terrestrial birds include magpies (*Cracticus tibicen*), the willy-wag tail (*Rhipidura leucophrys*), white and blue cranes (*Gruidae*), pigeons (*Columbidae*) and quails (*Coturnix*). Dominant water birds include the pelican (*Pelecanus conspicillatus*), black swan (*Cygnus atratus*), cape barren goose (*Cereopsis novaehollandiae*), white ibis (*Threskiornis molucca*), black duck (*Anas superciliosa*), musk duck (*Biziura lobata*), seagull (*Laridae* spp.), large black goose (*Branta* spp.) and white goose (*Chen* spp.), as well as penguins (*Eudyptula minor*), though the latter are only found near Victor Harbour.

There are 35 species of freshwater fish in the Murray Darling Basin (MDBC 2009). In total, 26 are native species from 12 families and only 10 are endemic (Cadwallader and Lawrence 1990). Despite the limited number of species, there is a diverse range of sizes, forms and life cycle modes that require differing environmental conditions for spawning and breeding. The most dominant fish species is the Murray cod (*Maccullochella peelii*) which can reach a length up to 1800 mm and 113.6 kg and can live up to 30 years (McDowall and Fulton 1996). This species prefers habitats with cover (rocks, trees etc) and is usually associated with deep holes in rivers. Its diet consists of fish, crayfish and frogs, and individuals mature between 4–5 years of age at 500–600 mm in length. They spawn in spring and early summer when water temperatures exceed 15°C and undertake an upstream migration upstream in late winter/early spring. This movement can reach up to 120 km and after spawning, they return to the same habitat (MDBC 2009).

Other native fish species common in the Murray-Darling including trout cod (*Maccullochella macquariensis*), golden perch (*Macquaria ambigua*), Macquarie perch (*M. australasica*) and the silver perch (*Bidyanus*) which, like the Murray cod, is now exploited for commercial and recreational fisheries. Freshwater catfish (*Tandanus tandanus*), the short-finned eel (*Anguilla australis*) and the long-finned eel (*A. reinhardtii*) are also native to the region. Since European colonisation carp (*Cyprinus carpio*) has been introduced and now makes up a large proportion of the fish population in the Murray River.

It is important to understand how fish species respond to climate conditions, especially flooding, as Ngarrindjeri knowledge suggests flooding was a common occurrence in the region. The 'flood recruitment model' for example (see Harris and Gehrke 1994) demonstrates how particular fish species respond to flooding (i.e. the golden perch). As the Murray-Darling Basin is not homogenous, there is variation in breeding periods for fish and recruitment of young, with some zones having the highest flows during summer months and others during winter months. As a result, Humphries et al. (1999) identified four categories to explain life cycles of the Murray-Darling Basin (related to spawning style association/or lack of association with flooding and significance for recruitment).

The most common freshwater crustaceans include the Murray cray (also Murray spiny crayfish or Murray lobster) (*Euastacus armatus*) and the common yabby (*Cherax destructor*). The Murray cray is the second largest freshwater crayfish in the world, with a carapace length growing to greater than 150 mm. This species lives in streams abundant in debris and vegetation and will burrow underground during the warmer months. They have low tolerances to salinity, high water temperatures, drought and habitat degradation, and cannot survive prolonged drying out of their habitats. Other crustaceans include the large clawed shrimp (*Macrobrachium* spp.) and the small clawless shrimp (*Parataya* spp.).

The most common shellfish species of the Lower Murray include the river mussel (*Alathyria jacksoni*) and billabong mussel (*Velesunio ambiguus*), both of which are bivalves. Both species burrow in sediments along the edge of the river up to 3 m in depth. The river mussel has a life span between 30–50 years and is only found within larger streams and rivers such as the Murray and its major tributaries. The shell length varies up to 156 mm, is very thick and moderately to well-inflated. This particular mussel lives in cool water temperatures with higher oxygen levels and can only survive without water for a few days. In comparison, the billabong mussel can tolerate higher water temperatures and lower oxygen levels and can survive for about a year without water and are often found across dry flood plains. The shell length reaches up to 105 mm, is thin to very thick, and is moderately to well-inflated (Lamprell and Healy 1998). Introduced species of fauna that are declared pest animals include rabbits, foxes and

deer (DEH 2010). Sheep, cattle, camels and various domestic animals are farmed and domesticated throughout the Lower Murray, and these represent some of the major threats to archaeological sites.

4.8 The Regional Archaeological Record

The majority of archaeological research within the Lower Murray to date has involved burial places, in the endeavour to address questions about population densities, sedentism and prehistoric disease. This research contributes to our broader understanding of the Lower Murray region, as well as the debates that have emerged in recent years. Large burial grounds became evident along the Lower Murray River Basin after 7000 BP with a majority dating to the last few thousand years and all are associated with Holocene dune systems adjacent to the floodplains (Littleton 1999; Pardoe 1988, 1995). The majority of research conducted within the study region to date has focused on burial places and other sites along the Lower Murray including Kangerunk (Pate et al. 2003; Stirling 1911) and Roonka (Pate 1997a, 1997b; Pretty 1977) or sites further north of the study region including Fromm's Landing (Mulvaney 1960), Tartanga and Devon Downs (Hale and Tindale 1930; Smith 1977, 1978, 1982), and Swan Reach (Hemming et al. 2000). These studies have provided insights into occupation of the Murray Valley from the late Pleistocene to contact.

Pardoe (1988) presented one of the most comprehensive views on demographic change in the study region by proposing the concept of 'cemeteries' to burials throughout the Murray River. Based on Saxe's (1970) hypothesis that cemetery behaviour is linked with specific factors (i.e. resource distribution, large and dense populations and social organisation), Pardoe suggested that the distribution of burial grounds can be viewed as 'symbolic markers of group affiliation' and, through such a concept, '*land ownership*'. Pardoe (1988:9) reconstructed a chorology for cemeteries, revealing that the emergence of cemeteries began in the upper Murray during the late Pleistocene, becoming common throughout the mid-Holocene (ca 6 kya), particularly throughout the Murray Corridor; Pardoe suggested this was a reflection of an increase in resource exploitation and population increase at this time.

The relationship between people, social organisation and the environment is a widely debated topic for investigations of the archaeological record in the Holocene period. Lourandos (1976) hypothesised an alliance formation model, which focused on the relationships between status of individuals, organisation of labour, ceremonial and political groups. Core to this idea was the construction and maintenance of alliances through multiple marriages and ceremonial gatherings enabling interconnections between groups. This resulted in particular trends, such as increased production of food items (eels, yams, cyad, seeds, mammals, plants etc.), as well as non-food items (e.g. stone artefacts and ochre), all which have been related to demands related to inter-group trade (Hiscock 2008:246).

It was also suggested that the emergence of social identities resulted in greater control (or ownership) over specific territorial boundaries.

Lourandos (1997) emphasised social interactions as occurring in either 'open' and 'closed' social systems. Open systems featured few distinctions between groups, interactions across large areas, homogenous cultural life and low population densities. Closed systems featured more differences in ideology and practice, constraints of movement between groups, inter-group relationships bound by ritual and kinship, territorial marking my modifying landscapes and higher population densities. It was argued by Lourandos (1997) that the transition from open to closed systems occurred during the late Holocene and was a structural reorganisation of social systems as a result of competition and population growth. This has also been closely associated with the El Nino phenomenon, which triggered drier climatic conditions beginning around 4000 BP where people adjusted to increase/decrease and thus maintain population sizes (risk reduction response similar to technological changes).

According to Lourandos (1983), evolving social relations (including the widening of marriage systems) were identified as the prime reason for cultural change over economic and environmental pressures. In comparison, Pardoe (1988:14) argued the opposite for populations in the Murray Corridor, as marriage systems — and therefore gene flows — were restricted. Pardoe (1988) concluded that in the Murray Corridor social organisation was related to several factors including: boundary maintenance; formalised marriage exchange patterns; methods of regulating intergroup tensions; and competition, as well as maintaining localised lineages or clans all of which are expressed through cemeteries. Overall, this evidence supports the argument towards a late growth demographic model for southeast Australia.

Further analysis has been presented by Littleton (2007) who examined the relationship between Aboriginal people and their use and/or attractiveness to the landscape. Littleton's research into burials within south-eastern Australia had revealed that burial grounds were 'never formally founded and continually abandoned' and that burials operated as 'persistent places in the landscape' (Littleton 2007), maintained by people with knowledge of the region. Burials occur in differing landforms across the Murray River, however they share three commonalities: they occur close to water sources; they occur on higher ground; and they have clearly defined boundaries (Littleton 2007:1016).

Littleton (2007:1023) suggested that, in the late Holocene, burial places were selected as a result of people occupying and reacting to a landscape dependent upon specific landforms. According to Littleton (2007), it is possible to identify a sub-group of mortuary practices for young women and children based on ideas of body position

and orientation, as there are some specific and widespread practices among this group of people. While cremation is not a common practice regionally, in some sites piles of smashed burnt bone fragments are present with large amounts of ochre. Overall, Littleton provided an interpretation of how burial places and mortuary practice within south-eastern Australia is the result of temporal spans of knowledge and practice overlapping and not directly linked to ideology, culture and territory as suggested by Pardoe (1993).

4.8.1 Roonka

Perhaps the most relevant burial site related to this research is the site of Roonka, originally excavated by Graeme Pretty in 1977. It is located at Roonka Flat on a sandy bank of the Murray River and was used between 6000 and 10,000 years BP. Pretty (1977) identified four phases of occupation:

- Roonka I which consisted of a small shell midden;
- Roonka II characterised by burials dating between 7000–4000 BP;
- Roonka III characterised by burials dating between 4000 BP–present; and,
- Roonka IV, representing the historical period, based on the presence of historical objects on the surface.

As described by Pretty (1977), burial practices were varied at this site and included: shallow oval graves, in which individuals were laid on their side with arms and legs contracted towards the chest; long shallow graves, in which individuals were laid fully extended; deep shaft graves, in which individuals were placed vertically; more than one person being buried; a common practice of infants and children being buried with an adult; and alteration of burials post-interment (i.e. one male had an infant placed in chest cavity). To explain the variation of burial practices, Littleton and Allan (2007) suggested that Roonka was not a cemetery reflecting 'territorial' boundaries but rather a site used by several groups.

People at Roonka were also buried with a range of associated goods including stone artefacts, ornaments, fragments of ochre or scrap foods, headbands and clothing (wallaby teeth headbands, bone pins) and other artefacts (animal remains, ochre). Pate (2006) suggested that, as men were buried with hunting equipment more than women and more elaborate goods were found in the graves of older people, particularly males, burial goods indicated sex and age differences. Pretty (1977) suggested social inequality was evident, with those of higher status having been given elaborate funerals, which also included the sacrifice of children buried with them.

Based on studies of bone collagen, Pate (1997) argued that the diet of men and women at Roonka was similar, and that it primarily consisted of C3 (terrestrial diet) foodstuffs, and thus minimal uses of coastal resources. Later, Pate (1997) compared the bone collagen stable carbon and nitrogen isotope results from the Roonka individuals with those from individuals excavated from Kangerunk and Broadbeach. Pate (1997:108) reported high N15 values, which he related to the consumption of enriched terrestrial plants and animal foods from the surrounding semi-arid plain or N15-enriched aquatic foods from the river. One explanation put forward was that small quantities of marine food from the southern coast would flow through the river system upstream via interregional migration of anadromous[11] species. Another possibility could include minor inclusions of C4-based plant and animal foods from the arid regions to the north of the Lower Murray moving downstream. Pate (1997:108–109) provided the following dietary overview for the Roonka population:

1. People obtained the majority of their dietary protein (>50%) from larger local terrestrial herbivores that had 15N-enriched tissues (e.g. wombats), while carnivores obtained the majority of their protein from smaller herbivores with less 15N-enriched tissues (e.g. wallabies and small kangaroos);
2. People obtained at least 30% of their dietary protein from 13C-depleted freshwater fish, mussels and crustaceans, with the majority coming from the more 15N-enriched higher tropic level fish;
3. People obtained a small percentage of dietary protein (>15%) from southern coastal marine foods or anadromous fish, and/or northern arid-land terrestrial mammals with more 15N-enriched tissues; and,
4. Only a small percentage (>10%) of human dietary protein was obtained from 15N- and 13C-depleted aquatic and terrestrial vegetable foods.

4.8.2 Kangerunk

Kangerunk is another large wetland region along the River Murray which is significant to local Ngarrindjeri people. The Kangerunk Burial Site was located as a result of sand quarrying in the early 20th century, and subsequently excavated by Stirling (1911) with an estimation of 136 individuals buried at Kangerunk. Although initially thought to be an 'epidemic graveyard' as a result of smallpox, Pardoe (1988) demonstrated that this was not likely the case as there were several modes of interment over different periods of time between 3000 BP to possibly 9000 BP. Palaeodietary research by Pate (1997) has shown that, in comparison to the Roonka burials (which consisted of a predominantly C3 diet), the nitrogen levels of the Kangerunk individuals were lower, suggesting these people were

[11] This term refers to fish species (including salmon) which return from the sea to the river to breed.

not accessing marine resources. Further, based on different isotope values in their younger lives, Pate concluded that a small minority of individuals buried at Kangerunk spent the majority of their life elsewhere. He interpreted this as those individuals most likely being women from elsewhere who had married into the region.

4.8.3 Ngaut Ngaut (Devon Downs) and Tartanga

Investigations at Ngaut Ngaut (Devon Downs) provided the initial empirical evidence for Holocene occupation (dated at 5180 BP) within the region, as well as demonstrating there had been changes in flaked-stone technology through time (Hale and Tindale 1930; Smith 1977, 1978, 1982; Roberts et al 2016). Hale and Tindale (1930) identified four cultural phases over 5 m of archaeological deposits at Devon Downs (Shelter Excavation C), including the Murundian, Mudukian, Pirrian and Pre-Pirrian. The artefactual assemblage recovered indicated that bone implements were extensively used in the Mudukian phase (Hale and Tindale 1930:205). The relationship between the site of Tartanga and Devon Downs is difficult to define, with a time lapse of unknown duration between the two sites (Hale and Tindale 1930); however, it has been suggested that the Tartangan culture is more 'primitive'. The only mammals identified at Tartanga were opossum (*Trichosurus* cf. *uulpecula*) and kangaroos (*Thylogale* sp. and *Macropus* cf. *giganteus*), with other resources such as fish, shellfish and tortoises also supplementing the Tartangan diet.

Comparatively, during the Pirrian phase, people were well adjusted to riverine environments and it is suggested that *Paludina* may have been used as food as it is only during this phase that both large and juvenile shells are present (Hale and Tindale 1930). The Mudukian phase shows a significant change in diet and technology. During the earlier phase of Mudukian, people had consumed small mammals from the plains and riverine resources as they used the *muduk.* Later, they became more adjusted to river conditions and freshwater foods made up a larger component of the diet. There is an abrupt disappearance or absence of the stone 'pirri' which was followed by the arrival or presence of the bone *muduk* (Hale and Tindale 1930:213). Some other faunal changes of interest were the presence of a turtle that differs other species known from the Murray River in Layer X and the presence of *Sacrophilus* (Tasmanian devil) bones in and below Layer VI. It was concluded that the faunal modifications may have related to climate variations.

A more recent re-analysis of the Devon Downs faunal remains revealed 38 vertebrates represented by 261 individuals were presented, as well as 10 freshwater invertebrates (Smith 1978, 1982). In regards to energy levels (expressed in person/days), Smith (1978:20) estimated that mammals made up ca 60% of the diet while fish provided 15% and shellfish only 8%. As such, the overall energy that could have been obtained from the faunal

remains recovered at Devon Downs is relatively low, particularly with regard to riverine species. This is surprising considering that ethnographic accounts for the region describe abundant use of riverine resources including fish, shellfish and crustaceans (i.e. Angas 1845). Smith (1978:20–21) suggested that, if the relative importance of the various species is representative of the site as a whole, then the low energy levels might be best explained by the use of the site in winter, with the ethnography and archaeological evidence perhaps representing depicting different seasonal aspects of the same life way (subsistence cycle).

4.8.4 Fromms Landing

At Fromm's Landing, Mulvaney (1960; Mulvaney et al. 1964) excavated two limestone rockshelter sites that dated to the mid-Holocene: Fromm's Landing Shelter No. 2 (4850 BP) and Shelter No. 6 (3450 BP). The cultural assemblage recovered from these sites parallels that from the Devon Downs site, with the addition of stone artefacts (pirri points and microliths). In addition, a burial of a child and adult female were present in the Fromm's Landing site. Mulvaney (1960) noted the presence of at least 31 species of mammals, 11 species of mussels, gastropods and crustaceans, and six species of reptiles, as well as fish and bird bones which could not be identified to species level. Small mammals were the most common faunal remains recovered and included rat, hare wallaby and rat kangaroo in addition to possums, bandicoots, grey kangaroo and wombat. Specimens of lizards, snakes and tortoise were also found. The only fish identified was the Murray cod, though mussels, gastropods and crayfish were also evident.

4.8.5 Coorong and Wyrie Swamp

Further southeast are coastal areas including the Coorong and the site of Wyrie Swamp, which were excavated by Roger Luebbers in the 1970s. Luebbers (1978:209) argued variability and palaeoenvironmental significance based on two principal subsistence economies existed in the region, one involving 'swamp side exploitation' and the other associated with 'coastal subsistence'. This included an occupation phase at Wyrie Swamp dated to between 10,200–8000 BP. Two distinct phases of occupation were presented in the coastal economies including the *Early Settlement Phase* (dating from 5800–1300 BP) and the Late Phase (post-1300 BP). These phases include: The Swamp side Occupation Subsistence Model was characteristic of resources such as: duck, aquatic plants and possibly insects. Technologically, people used large flake implements and wooden tools (except spear thrower and shield).

Luebbers argued that the most dramatic changes to occupation of the marine environment occurred during the early Holocene and that sedimentation played an important role in shaping the coastal environment and suggested that

an increase in occupation in the late Holocene was a result of change in availability of resources, as well as behaviour in response to environment changes and evolution. Overall, the evidence identified by Luebbers suggests the coastal economy has shifted since its initial emergence. Archaeological sites seemed to have increased in size, the diet changed to a variety of seafood resources which appeared to be transported more frequently from the south (evidence). There is a noticeable decline in the presence of microliths, however the stone technology continues to show similar attributes which was phrased as the Small Tool Tradition. This pattern is evident in open middens (i.e. Abyssinia Bay and Cape Northumberland), in rock shelters and a number of surface scatters in sand hills. Luebbers suggested that there was a distinct 'Late Phase Economic Development' which correlated with increasing productivity should indicate transition towards greater consumption. The differences between the two phases of occupation are related to an apparent increase in the amount of resources being consumed. Camps reflecting a variety of activities (i.e. single and multi-focused) do not appear until after 1300 BP.

4.8.6 Swan Reach

Three separate sites were selected for excavation at Swan Reach including a missionaries' house that later become an Aboriginal residence (SR1); a wurley (SR5); and a shell midden adjacent to the Murray River (SR2) (Hemming et al. 2000:335). The excavations revealed an archaeological record dated from 1700–100 BP, providing evidence of occupation both before and after the arrival of European settlers. Hemming et al. (2000) emphasized the importance of interpreting contact and post-contact histories through archaeology to reveal a 'shared' historical narrative.

Results from Swan Reach help to refine Ngarrindjeri life ways and the impact of colonization on Ngarrindjeri cultural practices. One particular 'adaptation' technique observed at Swan Reach was a change in fishing tackle in the post-contact period from the use of chewed plant fibres and sinews of animals (Tindale and Mountford 1936), to European string and nylon fishing tackle. As described by Hemming et al. (2000:347), fishing (in addition to duck hunting, egg collecting and use of various bush foods) continued to be an important cultural activity, needed to supplement government-provided rations. Fishing at Swan Reach was an activity practiced by men, women and children in the contemporary ethnographic setting. People adapted their tool kits with the introduction of 'new' materials including metal and glass which was used by women to gut fish and by woodcarvers to finish their tools instead of bone and shell (Anderson 1997:56; Hemming et al. 2000:349). Oral histories recounted by Ngarrindjeri woman demonstrate the use of glass as well as for basket making (Rigney OH358/3).

4.9 Previous Cultural Heritage and Archaeological Surveys

Prior to the early 1990s, a total of 10 sites were registered as occurring in the vicinity of Glen Lossie (reported as the result of several small-scale surveys), and within the Lower Murray there were 98 (Wood 1993:10). It was not until the Lower Murray Aboriginal Heritage Survey (LMAHS) conducted by Wood (1993) that the first major, systematic archaeological survey was undertaken of the study region. The fieldwork for the second stage of this program was conducted between September 1992 and November 1993 as part of a broader three year project for DoSAA (now AARD) and the Murray Darling Basin Commission (MDBC). During this survey, Wood (1993) visited and assessed the conditions of 84 sites; 14 were not visited due to access restrictions. As a result, a total of 213 new sites were recorded, the majority (62%) being shell middens. According to Wood (1993:15): "Shell remains are usually most dense in those middens at the base of the cliff line and are often association with large quantities of charcoal and oven rocks in a dark, greasy, sandy matrix.

The middens located on the top of the cliff line are usually smaller and less dense." Approximately 66% of the middens recorded during the project did not contain stone artefacts. The conditions of all sites within the region were generally poor (73%), a situation Wood (1993:15, 19) attributed to European land use practices along the river. At the time of the current study, a total of 328 archaeological sites were listed within the study region on AARD's Register (Figure 4.3). This included 166 'archaeological' sites, six 'archaeological/burial' sites and two 'archaeological/scarred trees' (Table 4.1). The archaeological sites are dominated by freshwater shell middens (n=166), many of which are associated with burials and scarred trees.

More recently, there have been two subsequent surveys conducted within the *Murrawong* vicinity by ACHM (2005a, 2005b) which were undertaken for the NHC during the Lower Murray Irrigation Reclamation Area Project (LMRIA). During the first survey, archaeological sites within the Glen Lossie Irrigation Area were revisited and assessed for their 'significance' in relation to potential threats of irrigation works. As a result of the surveys two separately recorded sites (*Murrawong* Road Midden 1 and Willow Bend Midden 1) were renamed the 'Glen Lossie Midden and Burial Site' (GLMBS) (ACHM 2005a:15). The boundary of the site was mapped and a new site card submitted and GLMBS became a focus of the thesis.

Table 4.1 Previously recorded sites within 20 km² of Murrawong (information obtained from AARD database in 2007).

Site Type	Description of Site Type	No.
Shell Midden Site (also shell deposits)	Archaeological deposits consisting of shellfish (greater than 50%) and other cultural materials. These sites are also referred to as shell deposits	166
Cultural Modified Tree (CMT)	Culturally modified tree with distinctive scaring relating to removal or bark for shields, canoes and other cultural purposes	132
Burial Site	The primary place of interment for individuals and/or groups of people	14
Burial and Shell Midden Site	The primary place of Interment for individual/s and/or groups for which is also associated with shell middens/deposits	6
CMT and Shell Midden Site	Culturally modified trees which are associated with shell middens/deposits	2
Stone Arrangement Site	A distinctive feature or arrangement made by humans that would not occur naturally and often associated with ceremonial purposes	2
Historic Sites	Places associated with the post-European colonial period which have Indigenous and non-Indigenous significance such as dwellings and historical material culture	2
Quarry Site	A place for which cultural materials (stones and ochre) were sourced for social, economic and/or ceremonial purposes	2
CMT/Stone Arrangement Site	A combination of both CMT and stone arrangements (also see above)	1
Historic and Shell Midden Site	A combination of both CMT and stone arrangements (also see above)	1
Total		328

The research discussed herein is part of a broader Ngarrindjeri cultural heritage management and planning processes which began as a management project in response to the LMRIA. The LMRIA consists of 27 reclaimed irrigation areas between Mannum and Lake Alexandrina and was established as a mechanism for diverting up to ca 180 GL of water per year to pastures for flood irrigation (EPA 2011). During the first stages of the project, surveys were conducted within the LMRIA project area which provided an opportunity for Ngarrindjeri to examine archaeological sites and consider their significance for the community (see ACHM 2005a, 2005b). Following these surveys, Flinders University researcher Steve Hemming, in negotiation with Ngarrindjeri Elders, developed projects under the Indigenous Heritage Program (IHP)[12] that would enable future archaeological research projects to be undertaken for 'places' identified by the NHC as high priority.

[12] The IHP is an Australian Government initiative that supports the identification, conservation, and promotion (where appropriate) of Indigenous heritage through grants of up to $100,000 awarded by the Department of the Environment, Water, Heritage and the Arts (DEWHA). These grants are awarded to communities based on a competitive application process which involves various specialist input from community workers and university researchers.

In October 2000, as part of heritage management investigations, Wood (2000a; Wood 200b) conducted test excavations at Glen Lossie Midden 2 to obtain an understanding of the depth of the midden, but no radiocarbon dating or further analysis was undertaken. Five years later, ACHM conducted two surveys at *Murrawong* in 2005 for the NHC and NNTMC as part of the redevelopment of irrigation infrastructure for the Murray River reclaimed wetlands between Mannum and Wellington (ACHM 2005a). During this survey, ACHM redefined the boundary of *Murrawong* Midden/Burial 1 and Willow Bend Midden 1 as GLMBS, which was more representative of the shell midden site and supported by the Ngarrindjeri community. During the second visit, ACHM revisited GLMBS to remap a larger area of shell midden than previously recorded (ACHM 2005b). In addition, ACHM identified an additional two midden sites and a burial site which had not been previously recorded.

Within the study area, the *Murrawong* Complex (aka the Glen Lossie Complex) comprises a series of freshwater shell middens, burials, stone artefact scatters and culturally modified trees visible across ca 1 km^2. The NHC nominated this place for further archaeological research with the goal of addressing specific questions about the temporal and spatial relationships between each of the archaeological features. *Pomberuk* is another archaeological site nominated to be investigated for this project. As described in the previous chapter, it was used as a Ngarrindjeri camp from at least the 1880s until 1943. The Berndts also camped here with Ngarrindjeri people in the 1940s and described the camp in their books, *From Black to White in SA* (Berndt and Berndt 1951) and *A World that Was* (Berndt et al. 1993). The Protector of Aborigines closed the camp in 1943 and forced the families who lived here to leave. Despite this policy, some Ngarrindjeri people defied government instructions and continued to camp at *Pomberuk*, including Uncle Marshall Carter who camped here with Auntie Tike Campbell in the 1950s. Although Wood (1995a; 1995b) recorded no evidence of historic occupation at the site, there are ruins including a brick water tank stand and other materials including porcelain, tin and metal that is known by local Ngarrindjeri people to have been made by Albert Karloan (Marshall Carter, pers. comm.). The wetland shown on Berndt's map has been reclaimed as a grassy picnic area and the low-lying ground where Ngarrindjeri camps were located during the historic period was used as a dumping area for the local council, probably accounting for the lack of evidence of Ngarrindjeri occupation of the site.

Figure 4.3 Lower Murray Archaeological Sites based on data provided by AARD (courtesy of the NRA).

4.9.1 Community Negotiations and Protocols

Although the development of the thesis and discussion about possible places for archaeological investigation were discussed prior to the approval of my thesis proposal, the first phase of negotiation officially for the project commenced in March-October 2007. The Flinders University Social and Behavioural Research Ethics Committee (SBREC) granted ethics approval on 26 September 2007. The first component of the negotiation process with the Ngarrindjeri community began on 12 October 2007, when the researcher met with the NRA to provide a detailed overview of the research aims and potential questions for investigation. Additional I briefed the NRA on my progress within the first six months with regards to the research design. Plans for the fieldwork phase were discussed, with the NRA subsequently providing full support towards the project and its subsequent development through the duration of my candidature. Further negotiations to undertake surveys and excavations occurred from 15–17 October 2007. The majority of these discussions were held with Uncle Tom Trevorrow and Mr Grant Rigney, who at that stage had been coordinating the LMRIA Project for the NHC. Consultation with landowners occurred through June to November 2007 and involved locating all land parcels within the region, locating contact details for all landowners, and contacting each landowner individually via phone and/or e-mail correspondence, with follow up personal visits to discuss the project and site access. This process was difficult as many landowners were not willing to be involved in the project, and those who did become involved, were often unfamiliar with the relevant state legislation and were concerned about issues of Native Title and so forth.

4.9.2 Liaising with Government and Heritage Agencies

Although engagement with government agencies is standard in archaeological research and cultural heritage management, one of the most problematic situations encountered during this research was liaison with Aboriginal Affairs and Reconciliation Division (AARD) in relation to obtaining permits to undertake surveys and excavations. This is a critique related to broader government policies and management of Aboriginal sites rather than the administration of the Act itself. The main issue arose during the first field season when applying for a permit to excavate under s.21 of the State *Aboriginal Heritage Act 1988*. Section 21 states that 'all persons must apply for permission to the Minister to excavate and thus disturb an Aboriginal Site'. Further, if the materials are to be removed and transported elsewhere' than the person must also apply for permission under s.23. Therefore, it was advised to apply for permits under both s.21 and s.23 by this agency, even though the Ngarrindjeri community was supporting this research. This issue was discussed with Uncle Tom Trevorrow who, although he did not agree with this process, gave approval to apply for both sections for the purposes of this research only. The interesting aspect about this

process for me as a Ngarrindjeri person and archaeologist is that this process has actually created a true 'cultural dilemma' whereby approval with the respective heritage committee (in this case the NHC) must be sought from the Minister to 're-engage' with a site and its material past for the purposes of research even if the researcher is Ngarrindjeri.

Another interesting point not realised until the second field season when there were concerns about the excavation permit not being approved by AARD in time for the scheduled field work is that, under s.37 of the *Aboriginal Heritage Act 1988*, Aboriginal people should not be prevented from carrying out traditional activities with Aboriginal sites'. An AARD representative at the time informed me that even though I did not have a formal permit, there was no restriction on me as a Ngarrindjeri person to excavate. Despite this dilemma, the NHC decided it would be best to submit excavation permits for the project and thus satisfy government requirements. It may be the case that this issue is an opportunity for Aboriginal people across SA to gain greater control over cultural heritage and have a more informed decision regarding archaeological research within their country without having to continuously deal with government agencies.

4.10 Summary

This chapter has provided a brief outline of the environmental context, the cultural setting (both Indigenous and European), and previous archaeological investigations conducted in the region. Ngarrindjeri people describe the palaeoenvironmental record for the Lower Murray through creation knowledge such as Ngurunderi. Both the written and oral records are important sources of information for understanding this complex landscape and the way that both Indigenous people and Europeans have changed it, physically and culturally — a point, which is crucial when undertaking the archaeological investigations for this study. The importance of presenting this information will be examined later in the thesis to demonstrate that other forms of knowledge are valid for archaeological investigations.

5 THEORETICAL FRAMEWORK

> The supporters of a post-modern position maintain that there is no single true version of human affairs, but multiple truths that are constructed from the varied standpoints of rich and poor, winners and losers, males and females, and different ethnic groups. Radicals seek, by encouraging the development of multiple views of the past, to decenter and disempower what they characterise as hegemonic archaeology, and which they maintain serves the interests of the most privileged and conservative groups in society. (Trigger 1998:15)

This chapter details theoretical approaches adopted for this research. In particular, I consider the complexities of engaging in research as an Ngarrindjeri archaeologist and identify some of the issues that arise in this process. This reflexive approach draws upon critical and standpoint theory to develop a theoretical position in relation to understanding the broader social, cultural and political landscape within Ngarrindjeri *Ruwe/Ruwar* — within this context I call this the 'Ngarrindjeri Archaeological Standpoint'. It builds upon previous approaches developed by Indigenous and non-Indigenous archaeologists and researchers alike that are ultimately shifting towards an agenda that considers issues of power relevant for Indigenous peoples (Layton 1994; Nicholas 2008, 2010; Smith 1999; Smith and Wobst 2005; Watkins 2000), and also upon the methodological paradigm from my research on the repatriation of Ngarrindjeri Old People (Wilson 2005).

The application of research methodologies is debated within all disciplines in social sciences and humanities and, although there is no specific research methodology or framework to apply in Indigenous archaeology, there are many examples to draw upon, including from anthropology, sociology, archaeology and cultural studies. For decades there has been a focus on Indigenous peoples heritage and culture within Australian archaeology. This relationship has included much debate about 'who owns the past', the value of community-based archaeology and what constitutes 'Indigenous archaeology' (Greer et al. 2002; Harrison and Williamson 2002; Langford 1983; McBryde 1992; Mulvaney 1969; Smith and Wobst 2005). More recently, Indigenous peoples globally have engaged in the discipline as professionals (i.e. cultural heritage rangers, consultants and researchers) and thus directly inform the way that archaeological research is conducted (Isaacson 2003; Lippert 1997; Million 2005; Nicholas 2010; Richardson 1989; Trevorrow 2003; Watkins 2000; Wilson 2005, 2007b, 2010). Given the increasing interest amongst Indigenous communities in regards to their cultural heritage, it is crucial to consider the relationship between Indigenous peoples trained in archaeology who are working within Indigenous communities, particularly their own, and the issues that may impact upon this relationship. As a result, part of this research highlights issues that arose from my being an Indigenous person and archaeologist working with my community and how this is explicitly connected to the research process. Here I provide a framework for working with the Ngarrindjeri community,

including the theoretical and methodological processes that I have engaged in, the archaeological methods that I have applied and the interpretations that I make as a Ngarrindjeri archaeologist. All of these have been critical aspects for learning more about past Ngarrindjeri lifeways in a comprehensive and holistic manner that privileges Indigenous voices and epistemologies.

5.1 Profiling Indigenous People and Archaeological Training in Australia

This thesis considers Indigenous peoples engagement in archaeology and, despite the enormous amount of research conducted since Norman Tindale's excavations along the River Murray in the 1930s, the possible reasons for their underrepresentation. Within the Australian context the exact number of Indigenous peoples trained in archaeology is not known; however; it is estimated that this number would be no greater than 15 nationally. In the latest *Profiling the Profession Survey* undertaking by the AAA, (Ulm et al. 2013) reported that "there were under ten members of AAA who identified as Indigenous at the time of the survey". During the late 1980s and 1990s, Isabel McBryde (then Head of the Department of Archaeology at ANU), hosted the first major cohort (approximately 10) of Indigenous students undertaking archaeology in the early 1990s. Many of these students completed their undergraduate degrees and today they constitute the largest group of Indigenous Australians qualified as academically trained archaeologists; they include Dave Johnston (BA Hons and MA), Steve Free (BA Hons), Rick Mullet (BA Hons), Mark Dugay-Grist (BA Hons), John Mulgrave (BA Hons), Emma Lee (BA Hons), Pam Hegarty (BA) and Robyn Bancroft (BA). Despite this achievement there are several concerns that are apparent. Firstly, in the 20 years since this there has been only a small number of Indigenous peoples who have completed degrees. Secondly, very few of those who are qualified have engaged in postgraduate studies and, finally, none have completed doctorates. Although the reasons for such have not been clearly identified, it is most likely due to the fact that government agencies and other organisations immediately employ these graduates (who were very unique) while others began private consulting firms.

One might expect a gradual rise of the number of Indigenous peoples engaging in archaeology following efforts to protect cultural heritage, the growing rate of tourism, more recognition of Aboriginal people in contemporary society and a growth in development and mining exploration throughout Australia, however this is not the case. What is obvious from my own experiences, however, is that Indigenous people engaging in the research, management and protection of cultural heritage within their communities do not have the time or resources to leave the community in order to study at university, particularly to undertake the sustained study required for a doctoral thesis. Furthermore, many Indigenous students who do choose to proceed with tertiary education undertake education, law, social work and medicine degrees, most likely because they are seeking to help in these areas that are of primary concern for

their communities. Unfortunately, although cultural heritage is regarded as core to Indigenous cultural identity, it is not an immediate priority for study. What is required is a stronger commitment to training cultural heritage 'caretakers' through the implementation of archaeology and cultural heritage scholarships, cadetships and research awards that plan for success across all degree programs, from undergraduate to doctorate level.

The Australian government's policy towards 'closing the gap' in education (Macklin 2008) must be examined in this context. The National Aboriginal and Torres Strait Islander Education Policy (NATSEP), lists 21 long-term national goals under four categories which are the foundation of all Indigenous education programmes. Under the *Equity of educational participation* category, Goal 12 aims 'To achieve the participation of Aboriginal and Torres Strait Islander people in post-secondary education, in technical and further education, and in higher education, at rates commensurate with those of other Australians in those sectors'. Further, the Indigenous Higher Education Advisory Committee (IHEAC) has specific priorities that relate to research matters that aim to 'strengthen Indigenous research culture and capacity within and across universities, as well as better promotion of the funding support available must be a high priority'. Priority 3 aims to 'Improve the level of Indigenous postgraduate enrolment, enhance Indigenous research and increase the number of Indigenous researchers'.

One of the key strategies to obtain such a goal is through the Australian Research Council's (ARC) Discovery Indigenous Researchers Development Scheme (DIRD), which is designed "to encourage participation in and to improve the standard of research conducted by Aboriginal and Torres Strait Islander people through developing the research expertise of Indigenous Australian researchers to a level which is competitive with mainstream funding". The scheme supports research across all fields of study and has been in operation since 1996. In the first year, 45 applications were received but since then there has been a decline in the number of applications received, though the quality of application was high. As well as concerns about this decline in applications, there are some concerns about the knowledge base of those assessing applications. The growth in postgraduate enrolment during the past decade is interesting whereby Indigenous Australians' participation in postgraduate degrees increased by 156% between 1992 and 1999. Between 2001 and 2003, Indigenous higher degree enrolments increased by 25.6% with Indigenous males more likely to be enrolled at this level than Indigenous females (ARC 2012).

More recently Universities Australia (2017) have developed a 3 year strategy from 2017-2020 including targets for postgraduate students that commit to the following:

- Maintain institutional growth rates for Aboriginal and Torres Strait Islander peoples enrolments that are at least 50 per cent above the growth rate of non-Indigenous student enrolment, and ideally 100 per cent above;
- Aim for retention and success rates for Aboriginal and Torres Strait Islander students equal to those of domestic non-Indigenous students in the same fields of study by 2025, and
- Aim to achieve equal completion rates by field of study by 2028.

As the number of ATSI students in postgraduate awards is still relatively low, there were no numbers stated in the most recent reports.

5.2 Indigenous Archaeologies and the Australian Context

Indigenous Australian archaeology is the dominant sub-field of archaeological research in Australia, emerging from the field of 'prehistory'[13] or the study of 'Aboriginal and Torres Strait Islanders'. It also acknowledges the diversity of Indigenous peoples, communities, cultures and traditions within Australia before the 'historical era'. Today it forms a large sub-field of Australian archaeology in addition to maritime and historical archaeology which inform cultural heritage management (CHM) practice in Australia. More specifically, Indigenous archaeology in Australia should properly involve the study of Aboriginal and Torres Strait Islander people through their cultural and material remains and consider Indigenous peoples knowledge as crucial to the broader archaeological inquiry. Globally, Indigenous archaeologies as an interdisciplinary field has been widely discussed in theory and practice (see Atalay 2003, 2006; 2007; Atalay et al. 2014; Nicholas 1992, 1997, 1998, 1999, 2010; Nicholas and Andrews 1997; Nicholas and Markey 2015; Silliman 2005; 2010; Smith 2005; Smith and Jackson 2008; Watkins 2000; Watkins and Nicholas 2014; Zimmerman and Branam 2014).

In practice, Indigenous archaeologies consist of a broad spectrum of approaches. This may include non-Indigenous archaeologists undertaking 'consulting archaeology' involving Indigenous sites, teaching Indigenous archaeology to students and archaeological research in Indigenous communities. More recently, this practice has also involved Indigenous peoples/archaeologists actively directing investigations of their own past. It can be practiced by both non-Indigenous and Indigenous peoples; however, it is usually undertaken in conjunction with the descendant community whose past is being considered. Ideally, Indigenous archaeologies should be conducted within a methodological framework that engages in complex theoretical issues, adopts standard ethical guidelines in Indigenous research (see, for example, the Australian Institute for Aboriginal and Torres Strait Islander Studies

[13] Prehistory, a term often used by archaeologists [especially in Europe] is used to denote time prior to European history and writing

[AIATSIS] Guidelines), has negotiated its aims and objectives with the community, and has beneficial outcomes for Indigenous people (see Roberts 2003; Wilson 2007). There have been various models within South Australia and globally for working with communities in archaeology which have also informed this thesis (see De Leiuen and Arthure 2016; Roberts et al. 2012; 2013; 2014). However, the work in community based archaeology and heritage globally by Nicholas (2001, 2008, 2010), Atalay (2012) and others (Christen 2015; Walker 2014) enable community, participatory, decolonisation in archaeology to be systematically and cohesively practiced in the Ngarrindjeri community through the development of a locally specific model transformative to Ngarrindjeri.

Indigenous archaeologies are central to the broader 'decolonisation project' in Indigenous research which considers a range of socio-cultural issues that are often addressed by applying interdisciplinary approaches to highly politicised questions. These approaches have global significance for Indigenous rights more broadly and are often developed using models from Indigenous researchers and more recently by Indigenous archaeologists themselves. This includes the examination of creation knowledge, oral histories, lived experiences and non-Indigenous written texts (i.e., ethnographic, historical and anthropological texts) to complement the archaeological record and interpretations of the past. Indigenous archaeologies in Australia draw from various disciplines including anthropology, history, linguistics, politics, sociology and cultural studies to form a more comprehensive version about the past that does not continue to oppress Indigenous Australians and/or dispossess them from their cultural and material remains. Indigenous archaeologies hold a fundamental view that:

- Archaeology is only part of the cultural resources spectrum;
- Oral narratives, lived experiences and stories of creation and knowledge transmission influence research and management practice;
- Intellectual and material aspects of the past are not separate from each other; and,
- Alternative viewpoints provide non-Indigenous archaeologists with a tool for engaging in decolonisation.

This position engages in a broader objective to reclaim Indigenous people's human rights through cultural heritage and identity and significant for Indigenous peoples engaging in academic research, theory and politics of the past (see Smith 2004 for Australian discussion on cultural heritage and archaeological theory). It is achieved by developing in-depth theoretical frameworks and research agendas that consider rigour, validity and professionalism that translates into a 'Western' framework and mode of inquiry.

Although the meaning of 'Indigenous archaeologies' is debated internationally (see Nicholas and Andrews 1997) in the Australian context it acknowledges that there are varying ways to undertake 'Indigenous archaeology' with

descendant communities. Further, the exact constituents forming Indigenous Australian archaeologies are still in a process of discussion, debate and transformation as more Indigenous peoples became actively involved in education, training and research in archaeology and cultural heritage. Similar to gender, feminist and queer archaeologies (see Driskill et all 2011) Indigenous archaeologies are both ideological and methodological in approach and draw from a diverse range of theoretical frameworks. Within Australia some of the critical issues that have been debated include: repatriation of human remains and cultural objects; culturally appropriate archaeological methods and practices; ethical standards and codes of ethics; intellectual and cultural property rights; cultural heritage management; and legislative frameworks, as well, as the impact of development and mining on cultural and archaeological sites of significance.

Indigenous archaeology as defined by Nicholas and Andrews (1997:1) refers to 'archaeology with, for and by Indigenous peoples. It is a complex discipline which continues to broaden both theoretically and practically as Indigenous peoples progressively engage and thus transform archaeological theory and methods. Nicholas (2008:1660) presented the broad scope of Indigenous archaeology in the following way:

> Indigenous archaeology is an expression of archaeological theory and practice in which the discipline intersects with Indigenous values, knowledge, practices, ethics, sensibilities, and through collaborative and community-originated or-directed projects related critical perspectives. Indigenous archaeology seeks to (1) make archaeology more representative of, responsible to and relevant for Indigenous communities; (2) redress real and perceived inequalities in the practice of archaeology; and, (3) inform and broaden the understanding and interpretation of the archaeological record through the incorporation of Aboriginal worldviews, histories, and science.
>
> In its broadest sense, Indigenous archaeology may be defined as any one or more) of the following: (1) the active participation or consultation of Indigenous peoples in archaeology; (2) a political statement concerned with issues of Aboriginal self-government, sovereignty, land rights, identity, and heritage; (3) a post-colonial enterprise designed to decolonise the discipline; (4) a manifestation of Indigenous epistemologies; (5) the basis for alterative models of cultural heritage management or stewardship; (6) the product of choices and actions made by individual archaeologists; (7) a means of empowerment and cultural revitalisation or political resistance; and (8) an extension, evaluation, critique, or application of current archaeological theory.

Archaeology as a discipline has become extremely useful for Indigenous communities in asserting the depth of history and their association with culturally significant places (i.e. McNiven 2003; Roberts 2003). It has also become a critical space within which Indigenous peoples can engage in decolonisation and self-determination. Archaeologists have already begun to explore this significance with an attempt to articulate the complexities of interpreting the archaeological record in conjunction with Indigenous communities. Indigenous archaeologies within Australia have emerged as a response to the historical inequalities of traditional archaeological research – establishing Western chronological timeframes and models of occupation.

Within Australian archaeology, the politics of representation and the relationships between archaeologists and Indigenous peoples is not new (see Riches 2004 for a historical reflection). This relationship commenced in the 1930s with Indigenous peoples as 'informants' (Hale and Tindale 1930) and slowly progressed to involving Indigenous peoples in all aspects of the research process, including the research design, consultation, ethics, fieldwork and dissemination of information. Burke et al. (1994:13) suggested that the traditional strength of Australian archaeology has been the analysis of socio-political issues including the relationships between archaeologists and Indigenous peoples and the change in power and control Indigenous communities have reclaimed over their cultural heritage. This type of Indigenous archaeology, which has also been termed 'community based archaeology' (Greer et al. 2002; Harrison and Williamson 2002), began to shape much of the standard of archaeological research in Australia in the 1980s and 1990s. During the 1980s and 1990s, debates related to ethics and the repatriation of Old People's remains placed pressure on disciplines such as anthropology and archaeology to become more culturally inclusive with research practices which included the deconstruction of processual practices and decolonising archaeology itself (see Creamer 1975; Kelly 1975; Hemming and Trevorrow 2005; Million 2005; Smith and Wobst 2005).

In Australia archaeology has been traditionally practised through a positivist lens, whereby archaeologists were initially concerned with 'prehistory', 'discovering' the earliest evidence for human occupation in Australia and establishing a 'date for arrival' for the 'first Australians'. It is accepted that Tindale, an ethnologist/anthropologist working from the SAM, undertook the first 'scientific' archaeological investigations in the 1920s at Devon Downs (Ngaut Ngaut) and Tartanga (see Roberts et al. 2010; Roberts and Campbell 2012). The development of Australian archaeology as a discipline, however, did not occur until much later (ca 1950s) with the first university program in 'prehistory' being established at ANU in the 1960s. By the 1960s processual archaeology adopted radiocarbon dating to provide more absolute dates for human occupation extending this evidence to ca 40,000 years ago (this included sites such as Nauwalabila, Malakanunja [now Madjedbebe], Devil's Lair and Lake Mungo). During this time, Indigenous peoples were strongly advocating for basic human rights and were officially recognised in the Australian constitution during the 1967 Referendum (the 1967 Referendum meant that laws could be made [for the better or detriment] on behalf of Aboriginal and Torres Strait Islander people and that they could be counted in the Census). Although this was a symbolic gesture, ideologies about the 'extinction' of 'traditional' Indigenous people were still prevalent. By the 1980s and 1990s archaeological research conducted by some researchers moved beyond 'scientific' explorations of the past to post-processual approaches, which drew on critical theory and interdisciplinary approaches to investigating questions of ethnicity, gender and class in the archaeological record whereby critical theory and analysis was widely adopted. Trigger (1998:15–16) wrote:

> Critical analysis provides an intellectual structure and rationalization for an interest-driven examination of archaeological interpretation. At the same time the realization that archaeological interpretations are subjective and influenced by the social milieus in which archaeology is practised has become much more widely accepted as a result of the study of history of archaeology.

Although archaeological practice in Australia seemed to be shifting away from processual archaeology to one that supported a post-modern position, the hegemonic characteristics of the discipline produced ongoing conflict and debate between archaeologists and Indigenous peoples. This, of course, is not the case within all Indigenous communities, but rather an observation supported by some archaeologists and the absence of Indigenous peoples formally trained in archaeology. Within Indigenous archaeology, this included a focus on the changing environment and its impact on Indigenous peoples. This socio-economic focus provided the basis for discussions about social complexity and sophisticated systems of communication, trade, and procuring resources later termed by Harry Lourandos as 'intensification' (Lourandos and Ross 1994). By the late 1970s CHM became more prominent as legislative requirements under various state and federal heritage acts forced legal processes upon mining companies and developmental plans. Although the legislation varied between states and territories, the focus was engagement in 'good practice' and as a result consulting archaeology began to emerge within Australia, significantly changing the relationships between archaeologists, cultural heritage managers and Indigenous communities. More recently, Indigenous peoples have become more engaged in archaeology through CHM and formal training which has started to challenge traditional archaeological practise, particularly in relation to archaeological interpretations of the past and its impact on Indigenous communities today.

The issues of 'ownership over the past' within Australia also began to emerge in the 1970s which were brought to the forefront of archaeological discourse by Langford (1983) who posed the question "Who owns the past". This question, and the discussions to follow laid the groundwork for forging the relationships between archaeologists and Indigenous peoples. As pointed out by Smith and Jackson (2006), there have been some significant developments in Indigenous archaeologies through the process of decolonisation, including deconstructing archaeological discourse to transform language, obtaining permission for fieldwork from Indigenous communities, involvement of Indigenous colleagues, access to sites and knowledge, control over publications and dissemination of knowledge. Several key organisations and documents were produced including the Australian Archaeological Association's (AAA) Code of Ethics and the Guidelines for Ethical Research in Indigenous Studies by AIATSIS that began to shape archaeological research and 'best practice'. The AAA created roles on the Executive for Aboriginal representatives, though over the last two decades there has been little active involvement of Indigenous peoples taking on the roles. In 2011, the Australian Indigenous Archaeologists' Association (AAIA) was established, marking

the first Indigenous representative body whose core business is archaeology and cultural heritage; however, this organisation does not have the adequate resources to function adequately so little has developed here either. Nicholas (2001) over 15 years ago provided insights into global challenges for Indigenous archaeology which contextualised how Australian archaeology as a discipline could further develop this methodological and theoretical strand in archaeology. I would argue that it is this model of putting archaeology into context provides a more comprehensive analysis of the complexities of working with Indigenous communities in Australia and strengthens archaeological practice.

Archaeology as a discipline has become extremely useful in some instances for Indigenous Australian communities in asserting the depth of history and their association with culturally significant places. However, it has been argued that it is problematic to undertake archaeological research with Indigenous peoples who have experienced the effects of colonialism and Aboriginalist constructions of heritage and culture, particularly in south-eastern SA (see Hemming and Rigney 2010). Within Indigenous archaeologies, the politics of representation and the relationships between archaeologists and Indigenous peoples has been explored (see Riches 2004 and Roberts 2003). It is this relationship and its development that continues to be a topical issue. Some of the key issues that continue to be debated include:

- The repatriation of human remains and cultural objects from collecting institutions;
- The process of archaeological research, practices and ethical standards;
- Intellectual and cultural property rights;
- Cultural heritage management and legislative frameworks; and,
- The impact of mining, industrial waste management, natural resource management, and urban and industrial development on cultural and archaeological sites of significance.

Internationally, these practices are also evident within non-Indigenous communities. For example, Atalay (2003, 2007) has highlighted the importance of 'community based participatory research' in Turkey which involved archaeologists working closely with local people in understanding their cultural heritage. Atalay (2007:253) argued that 'Indigenous archaeology' is on the periphery of mainstream archaeological practices and is essentially a 'practice that foregrounds knowledge and experiences of Indigenous peoples to inform and influence Western archaeologies as part of the decolonisation of the discipline'. It is an approach that has global implications and can extend beyond Indigenous communities (i.e. local communities) — such as how it was applied at Catalhoyuk. It is evident through her research that some key components of this approach include identifying her privileged position,

foregrounding local knowledge and experiences, the practicing of socially-just research that has positive effects on contemporary communities, collaborative archaeology and the incorporation of worldviews, positive processes of decolonisation, long-term goals and programs, working with communities to develop research questions based on community needs, using local knowledge about the best way to conduct research, and a flexible research plan and strategy. All these components are key to any research project regardless of ethnicity and therefore challenge the concept of 'Indigenous archaeology' (Colwell-Chanthaphonh and Ferguson 2008).

5.3 Indigenous Research and Academic Discourse

There has been little engagement of Indigenous peoples undertaking archaeological research either with their own community or another (both Indigenous and non-Indigenous). Throughout the duration of this research, I have become increasingly aware of the importance of exploring this complex but critical component of research to assist the discipline in developing a holistic approach to interpreting the archaeological record and supporting Indigenous communities to manage cultural heritage. Further, I have become more aware of the problematic nature of undertaking archaeological research, particularly with the Ngarrindjeri community, who have experienced the effects of colonialism and Aboriginalist constructions of heritage and culture (see Worby and Rigney 2005; Hemming and Rigney 2010). The role that archaeologists play in complex colonial spaces such as Ngarrindjeri *Ruwe/Ruwar* has been described by Hemming and Rigney (2010:92) as the 'new protectors' whereby Western constructions of culture, tradition and the past reinforce the position of non-Indigenous 'experts' as managers and protectors of Indigenous people:

> Archaeologists, anthropologists and other researchers working in Aboriginal heritage and associated areas can be positioned in this discursive field as the new Protectors of Aborigines, reinvigorating a colonising network of power relations between researchers, the state and Indigenous people. (Hemming and Rigney 2010:92)

Nonetheless, archaeology has importance within the Ngarrindjeri community for assisting in broader management objectives. Within our current political landscape, for example, archaeology can be used as a tool to assist in translating Indigenous people's connections to country through western epistemologies, particularly in the context of Anglo-Australian legal frameworks such as land rights claims (Lilley 2000). In Indigenous societies, including the Ngarrindjeri, knowledge is transmitted to younger generations through a cyclical model of time involving complex social structures and processes of sharing stories, memory and identity (Edwards 2004). Therefore, archaeology becomes a fundamental tool for addressing complex ideological issues particularly in relation to incorporating both Indigenous and Western knowledges into academic research. However, what must first be acknowledged and

understood, and core to the research methodology, is the impact of research upon Indigenous communities, the research process and the researcher's position–often referred to within the Australian context as the 'standpoint position':

> As a method of inquiry, standpoint theory was utilised by a diversity of marginalised groups whose accounts of experience were excluded or subjugated within intellectual knowledge production. (Nakata 2007:213)

The Indigenous research agenda described by Maori academic Linda Tuwai Smith (1999:116–117) has informed my approach to undertaking research within my own community, a framework I initially explored in my Honours research (Wilson 2005). Although the latter specifically involved 'ethnographic observations', and documenting the views and opinions of my Elders in relation to the removal, repatriation and reburial of our Old People it was a transformative practice that enabled me to earn my position as a researcher, as well as a Ngarrindjeri community member (Wilson 2007). Smith's (1999) 'Indigenous Research Agenda' is about privileging Indigenous epistemologies and acknowledging that Indigenous researchers have a responsibility to ensure that research is conducted within a culturally appropriate paradigm. It ensures Elders or senior leaders are not just 'consulted' or able to enter into a process of 'negotiation', but rather have complete control over the research process including proposals, development, methodology, interpretations and the dissemination of information back to the community in a culturally appropriate and comprehensive manner. This approach considers complex issues of power imbalance and thus draws upon critical theory, post-colonial theory, standpoint theory and decolonisation of research practice (Ardill 2013; Atalay 2007; Foley 2006; Langton 1994; Lippert 1997; Million 2005; Morton-Robinson 2013; Nakata 2007; Smith 1999; Smith and Wobst 2005; Watkins 2000; Watson 2002). Therefore, it is an Indigenist framework developed for and by Indigenous peoples that is theoretically situated within post-processual and interpretative archaeologies which ultimately rejects a positivist view of science in search of new meanings and interpretations of the past (Johnson 1999).

The development of 'Indigenous research methodologies' is a paradigm that is relatively young within academia. Further, it has not been fully conceptualised and applied within the Australian context. In his anti-colonial cultural critique of research methodologies Rigney (1997:12) proposed a rationale of 'Indigenist research' which draws upon liberation epistemologies such as the feminist movement. According to Rigney (1997), the fundamental principles related to Indigenist research are resistance as the emancipatory imperative in Indigenist research, political integrity and privileging Indigenous voices. Further, he suggested that Indigenous methodologies reflect the interests, knowledge and experiences of Indigenous peoples and thus support the processes of decolonising Western research epistemologies which have historically disempowered Indigenous peoples. Although this critique is an

example of qualitative research conducted within the Australian context it has not identified an 'Indigenist research methodology' as such, or how this can be adequately applied for both qualitative and quantitative research.

This raises a critical issue for Indigenous researchers who are adopting quantitative methodologies and therefore significant to discuss these issues here. For example, most research that has attempted to articulate this issue draws upon qualitative methodologies from various paradigms. The practice of qualitative research has an extensive history for which Denzin et al. (2008:3) argued span across eight moments in North America These are the traditional (1900–1950), the modernist (1950–1970), blurred genres (1970–1986), the crisis of representation (1986–1990), the post-modern which includes experimental and new ethnographies (1990-1995), post-experimental inquiry (1995–2000), the methodologically contested present (2000-2004) and the fractured future (post-2005). In defining these key moments, Denzin et al. (2008) highlighted the complex nature of 'qualitative' research. The current research draws on critical theory, emerged from the 'blurred phase' genre (Denzin et al. 2008:120) when local knowledge and lived realities become important. It is also a period when diverse paradigms and methodologies crossed boundaries in qualitative research. Further, it is transformative, considers ethics, respect, reciprocity and critiques the 'status quo'. It challenges the dominant worldview, attempts to shift power imbalances and rewrite versions of history through the lens of the colonised. However, what is even more important is that such an approach also must be open for critique from the dominant worldview and thus engage in an active and transformative dialogue.

5.4 Standpoint Theory and Indigenous Research

The process of research continues to carry with it centuries of negative historical experiences for Indigenous peoples who were, and continue to be, the 'subject' of largely non-Indigenous research agendas (Langton 1994; Morton-Robinson 2000; Smith 1999). As an Indigenous person trained in archaeology and adopting 'scientific' approaches, it is critical for me to take into consideration a range of factors, beliefs and traditions of Ngarrindjeri people who are living today (including myself). This demonstrates the ability to apply a critical framework to a research process that considers both Ngarrindjeri and Western epistemologies, drawing upon a unique set of Ngarrindjeri cultural knowledge and lived experiences of *Ruwe/Ruwar*, in conjunction with talking with Ngarrindjeri Elders throughout the research process. I have come to understand my standpoint position through the various 'subjectivities' I bring to the research process. In theorising this position, I argue that, as a Ngarrindjeri archaeologist, the social constructions that are developed through my interactions with Ngarrindjeri people and *Ruwe/Ruwar* during my research are somewhat unique in comparison to non-Indigenous archaeologists. It has become a significant component of this research process and one that has enabled me to develop a framework that has guided the research process.

Culturally, I must begin by referring to our spiritual ancestor and creator, *Ngurunderi*, as this underpins the research and is the primary Ngarrindjeri creation knowledge from which I draw from in understanding *Ruwe/Ruwar*. This creation journey has relevance to palaeoenvironmental and ecological knowledge known from Western science and is therefore doubly significant for my research. It shapes the way that I have undertaken archaeological surveys and excavations in community-identified areas identified by community members as "culturally significant". The three places that I examine through my research tell a very important local story of change and continuity. Although the specific details of each site are covered in Chapter Six, the most challenging part of this research has been interpreting the Lower Murray region as a Ngarrindjeri archaeologist, doubly responsible for "knowledge", aware of the promise and limits of agency, and sensitive to tensions and contradictions, as well as potential strategies of practice. Ultimately, the cultural landscape and the material remains within it also have 'agency' which may affect people's behaviour and/or act as a constraint of people's decision making (see Mosley 2010:61).

An important component of this research was the process of collaboration and negotiation between the Western institution at which I am based, and the Ngarrindjeri nation. As was outlined in Chapter Four, the project was developed in conjunction with the NRA following previous work around the LMRIA Project. It is supported and part funded by the NRA who are formal "partners" in the training, research process and generation of "new" knowledge and thus follows the Ngarrindjeri policy on research practices. Collaborative research projects have been undertaken in the past, predominately related to postgraduate and staff research projects from Flinders University (Anderson 1996; Baric 2006; Disppain 2009; Harris 1996; Hemming 2000; Hemming and Trevorrow 2005; Roberts 1998, 2003; Ross 2009; St George 2009; von Maltzen 2009; Wallis et al. 2006; Wilson 2005; Wiltshire 2006). As a result there are researchers associated with the NRA who are assisting in the broader management planning of the region. This approach to research management is crucial to the health of the project and its validity, and is a framework within the Ngarrindjeri community for which my project is situated. As a result I am also drawing on the work of others, particularly Hemming and Rigney (2008), in developing a 'Ngarrindjeri Archaeological Standpoint' that has relevance to my position as an Indigenous person and archaeologist situated in a colonial discipline.

Perhaps, what is especially unique about this study is the position of the researcher, as a Ngarrindjeri person, archaeologist and academic. A point of "conflict" exists between my relationship with the community (as I am in a privileged position to access knowledge as a researcher and archaeologist) and the academy for which I am undertaking my research (as there is an underrepresentation of Indigenous peoples). Incorporating a "standpoint position" is therefore critical, but difficult within an essentially positivist discipline such as archaeology. Consequently,

I have drawn upon the work of Native American archaeologists (Atalay 2007; Lippert and Spignesi 2007; Watkins 2000) and other Indigenous academics globally (Foley 2003; Moreton-Robinson 2000; Smith 1999) to develop a theoretical and methodological approach that does not exclude the importance of Ngarrindjeri knowledges in archaeology.

Strong standpoint and transformation go together in the process of "becoming" a Ngarrindjeri archaeologist (see Wilson 2010). Smith's "Indigenous Research Agenda" is about privileging Indigenous epistemologies, and acknowledging that Indigenous researchers have a responsibility to ensure that research is conducted within a culturally appropriate paradigm. It ensures Elders or senior leaders are consulted and negotiated with at every stage of the research where necessary and results are disseminated back to the community in a comprehensive manner. This approach considers complex issues of power imbalance and thus draws upon critical theory, post-colonial theory, standpoint theory and decolonisation of research practice by Indigenous researchers (Atalay 2007; Biolsi and Zimmerman 1997; Langton 1993; Lippert 2005; Million 2005; Nakata 2007; Smith 1999; Smith and Wobst 2005; Watkins 2000; Watson 2002; Zimmerman 1995, 1997, 2003). Therefore, the research framework that I have adopted is situated within what is referred to as post-processual and interpretative archaeologies, which reject a positivist view of science in an attempt to bring new meanings and understandings to the past (Johnson 1999).

However, understanding and articulating the "Standpoint Position" can be problematic, as my research largely uses quantitative methods to obtain information. According to Nakata (2007:214), it is not enough for Indigenous researchers "to authorise themselves solely on the basis of their experience". An Indigenous standpoint theory requires "bringing in accounts of relations that "knowers" located in more privileged social positions are not attentive to". Further, Nakata (2007:215) suggested that peoples lived experiences at the cultural interface is the point of entry for investigation, not the case under question. Incorporating the Indigenous standpoint position in research can be difficult for those engaging in a discipline that is bound by scientific approaches like archaeology.

Foley (2003:44) highlighted the frustration experienced by many Indigenous postgraduate students who are "forced to accept Western ethnocentric research methodology that is culturally remote and often unacceptable to the Indigenous epistemological approach to knowledge". As a result, many Indigenous scholars draw upon critical theory, standpoint theory and insider-outsider theory in the deconstruction process with an overarching vision that there is more than one worldview or interpretation (see Moreton-Robinson 2000; Smith 1999). Insider-outsider theory is not traditionally used in archaeological research but has relevance here. This theory is "an approach used to justify mishaps in social science research and moves beyond the social base of insider doctrine (the elitist theory of white

male Anglo-Europeans) to social solipsism" (Foley 2003:46). An underlying position which is similar to standpoint theory (see Huggins 1998; Moreton-Robinson 2000; Smith 1999), is that research outcomes are enhanced if the "Indigenous" are researched by the "Indigenous".

As Foley (2003:46) argued, "Outsider Theory supports the view that non-Indigenous Australia cannot and possibly will not understand the complexities of Indigenous Australians at the same level of empathy as an Indigenous Australian researcher can achieve." It is here that my position as a Ngarrindjeri archaeologist is unique; compared with that of other doctoral students in archaeology within Australia as I am engaging in a broader social and political movement, as well as a process of cultural education through and for my own community. This approach is not a unique experience when examined internationally. Jacobs-Huey (2002), for example, provided a critical review of "native anthropology" and its implications for the construction of ethnographic knowledge. Drawing on the work of Geertz, Foucault, Minh-ha and Said, Jacobs-Huey (2002:1) examined the problematic nature of positionality and "reflexive anthropology", arguing that "this approach is rooted in the premise that ethnographic fieldwork is an *intersubjective* process of various subjectivities".

This multifaceted theoretical and ideological approach is fundamental to understanding archaeology within Ngarrindjeri community and cannot be ignored regardless of the type of archaeological research being conducted — in fact, it has to be recognised as a powerful response to that type. From a Ngarrindjeri perspective, my role as the "insider" at the "cultural interface" is to understand the broader cultural, social, political and spiritual aspects of the community and how these things are related to the research process. It is equally important to develop a holistic approach to interpreting the past which does not only rely on supposedly "objective" quantitative archaeological evidence but also depends on contemporary understandings of the past by Ngarrindjeri people. Within this framework Ngarrindjeri knowledge informs archaeological, palaeoenvironmental and geological data and vice versa, whether or not Ngarrindjeri knowledge has been directly taught to the researcher or gained through other records such as "ethnographic", historical and genealogical records.

The work of Indigenous archaeologists beyond the Australian context is invaluable as it provides alternative ways of doing and theorising within the discipline. Although the methods and techniques may not necessarily change for an Indigenous archaeologist, the ways in which they approach the research, engage in the research process and interpret the material will be different and/or influenced by Indigenous epistemologies. For example, the methods and techniques applied in the field (i.e. survey and excavation) and during lab processing (i.e. sorting and identification of archaeological materials) are standard practice, the processes in which I have engaged as an

Ngarrindjeri person/archaeologist working within my own community have been shaped by community negotiation and consultation, discussions with Ngarrindjeri Elders during meetings and fieldwork and my experiences reading the ethnographic sources. In particular, I am reading about my own family, culture and history before and after European colonisation. The fundamental difference is that I have an additional level of responsibility to my community to behave and engage within the community according to Ngarrindjeri cultural beliefs and thus am exposed to the same consequences as any other Ngarrindjeri person regardless of my privileged position as an archaeologist.

My adoption of a Ngarrindjeri Archaeological Standpoint, challenges the archaeological discipline to rethink its responsibility and duty of professional care to me as one of its members. This means rethinking ideas about research, ethics and its conduct, as well. Most Australian archaeologists today would agree to some extent that they have a duty of care for the 'people of the past' and their 'contemporary descendants'. Although such an issue cannot be addressed immediately, Australian archaeology as a discipline needs to rethink its objectives in parallel to a changing economic and political landscape that impacts upon Indigenous peoples, their histories and thus the lived experiences that they bring to archaeology and CHM more broadly.

5.5 Post-Processual and Interpretative Archaeologies

Post-processual ideas emerged from structuralism and Marxism in the 1970s and 1980s from the desire to address 'cognitive' factors in the archaeological record which 'positivist' epistemologies could not address (Trigger 2006:##). Archaeologists have also been influenced by several theoretical positions in understanding cultural meaning including feminism, critical theory and interpretative archaeologies. The methods and theories established in the 'new archaeology', the development of middle range theory (MRT) and the validity of its positivist epistemology were all challenged (i.e. Binford 1983), with Hodder's work on spatial analysis and patterning being especially influential (Hodder and Orton 1976). Hodder examined the relationship between patterns, process and the present, rather than linking arguments between the past and present. Hodder realised that in order to understand 'patterning' on the ground you must also understand people's ideas and beliefs and thus rejected Binford's confidence in MRT (Johnson 1999:99). A critical argument proposed was that "any given pattern in the archaeological record could be satisfactorily interpreted or explained in different ways with reference to a number of different possible processes" (Trigger 2006:##).

Collectively, these ideas form post-processual archaeology which supports agency — the active strategies of individuals. It is argued that Indigenous peoples understanding of 'landscapes' was not simply a set of thoughts

possessed; but rather everyday 'experiences' and movement through the landscape as a 'medium' for which an understanding of the landscape was perpetuated and transformed (Johnson 1999:102–103). Complex issues associated with interpreting meaning in the past are considered as it relates to multivocal, experimental, critical and reflexivity in archaeological practice (see Hodder et al. 1995; Schiffer 2000)

The rejection by post-processual archaeologists of grand narratives, their advocacy of multivocality and the empowerment of minority interpretations, and their decreasing support for the idea that objectivity is an ideal worth striving for encouraged the production of multiple, small scale narratives about the past. Trigger (1998:14–15) argued that:

> The repudiation of processual archaeology thus has become part of a more extensive, post-modern revolt against positivism and what is seen as the production of supposedly objective knowledge to serve the interests of the rich and powerful. The supporters of a post-modern position maintain that there is no single truth version of human affairs, but multiple truths that are constructed from the varied standpoints of rich and poor, winners and losers, males and females and different ethics groups. Radicals seek, by encouraging the development of multiple views of the past, to decenter and disempower what they characterise as hegemonic archaeology, and which they maintain serves the interests of the most privileged and conservative groups in society.

Ultimately, this position acknowledges multiple standpoints and interpretations of the past, encourages critical thinking and provides opportunity for Indigenous peoples to be positioned at the centre of inquiry. It also provides an opportunity to deconstruct hegemony and present Indigenous ways of understanding the past that can build a more culturally informed and holistic interpretation of the past through the cultural knowledge and lived experiences of Indigenous peoples themselves. An important point maintained by Hodder (1984:452) was that:

> Archaeologists have no moral right to interpret the prehistory of other peoples and that their main duty should be to provide individuals with the means to construct their own views of the past, although it was not explained how this information could be supplied without introducing inherent biases into it.

Within this thesis, standpoint and critical theory have been adopted in the development of a critical Indigenist approach to archaeological research — termed here as the 'Ngarrindjeri Archaeological Standpoint'. This methodological framework supports the ideological position that through the process of identifying and deconstructing hegemony and its impact on archaeological interpretations, a new space emerges for developing a more comprehensive understanding of the past. In turn this becomes the 'entry point' for the researcher to relate lived experiences to the research context and identify the 'multiple meanings' associated with people, places and relationships to landscapes.

5.6 Collaboration and Negotiation

The standpoint position that I have adopted as part of my research framework is manifested in all phases of collaboration and negotiation with the Ngarrindjeri community. Within this thesis, collaboration and negotiation is a reciprocal relationship that builds on standard practice in the discipline. Undertaking archaeological research also involves the process of engaging in broader issues such as cultural heritage matters, community meetings and discussions, writing non-traditional research grants to support community involvement in research projects, community reports and documents and strategic planning to ensure long-term issues can also be addressed. What is unique, however, is that I am a Ngarrindjeri person first and foremost and I am viewed as this by Elders in my community. When I undertake research, I embody the same historical experiences as other Ngarrindjeri people such as colonialism and oppression and my lived experiences whilst growing up in Adelaide that have contributed to my understanding of what it means to be Ngarrindjeri including: racism, poor health and low educational standards–all related to the impacts of colonisation. I have family and kin relationships that are extensive and responsibilities I am expected to fulfil as part of my responsibility as a Ngarrindjeri archaeologist. I have knowledge about Ngarrindjeri people and culture taught to me by my parents and grandparents and what I learn in the research process by Elders and community members is a process of learning about Ngarrindjeri people, country and history. All of my experiences and knowledge as a Ngarrindjeri person exist within me when engaging in the research process. This thesis moves beyond pure archaeological research for 'research sake' to research that has a broader social, cultural and political agenda.

5.7 The 'Ngarrindjeri Archaeological Standpoint'

As discussed above, this research adopts a critical Indigenist framework that is interdisciplinary in nature and presented as a holistic narrative that interprets Ngarrindjeri life ways through the lens of a Ngarrindjeri archaeologist. It draws upon approaches in post-processual and interpretive archaeologies, as well as critical Indigenous studies including Indigenous archaeologies, standpoint theory, critical race theory, whiteness, post-colonial theory, insider/outsider theory, native ethnographies and feminism (Moreton-Robinson 2006; Nakata 2007; Walter 2009) and various approaches undertaken by Indigenous archaeologists globally (Atalay 2003; Lippert 1997, 2005; Million 2005; Nicholas 2010; Watkins 2000). Hodder et al. (1995:3–33) discussed multivocal as essential to interpretation and building upon other forms of knowledge. In this context, the Ngarrindjeri person working within their *Ruwe/Ruwar* is demonstrating an understanding of the complexities of the research environmental in which I am working. This may also be referred to as a twofold hermeneutics for 'prehistoric archaeologies' as the social, cultural and political layers impacting interpretation need to be bridged. Further, reflexivity in critique, judgements for sampling, identifying the modes of language used in the thesis are core to the Ngarrindjeri Archaeological Standpoint. The discourse that

emerges are a form of archaeological poetics — narrative, rhetoric, histography, quotation and illustration (Tilley and Baudou 1995).

Collectively, these methodological, theoretical and ethical approaches have enabled me to arrive at a specific trajectory that provides a culturally appropriate framework for archaeological research in the Lower Murray. I have termed this specific approach as the 'Ngarrindjeri Archaeological Standpoint' which is specific to my position, the process of undertaking research in Ngarrindjeri *Ruwe/Ruwar*, the development of this specific research, the methods employed, the interpretations of findings and the broader outcomes for the Ngarrindjeri community. It draws upon the extensive work already undertaken in Ngarrindjeri *Ruwe/Ruwar* in relation to research and ethics:

> The fundamental issues of control and power are critical to the establishment of ethics and associated principles governing research and Indigenous people. Ngarrindjeri must control their knowledge and, most importantly, possess the resources required for full engagement at the local and regional level for the issue of control to be addressed. (Hemming et al. 2010:93)

The Ngarrindjeri Archaeological Standpoint privileges Ngarrindjeri knowledge and understandings of *Ruwe/Ruwar* and how the Ngarrindjeri archaeologist is connected to the landscape and thus builds upon previous research (Hemming and Rigney 2009; Rigney 1999; Wilson 2005, 2007, 2010). It acknowledges that knowledge transmission and acquisition is highly complex and that the process of 'being and becoming a Ngarrindjeri archaeologist' (see Wilson 2010 for broader discussion) is intertwined with community obligations and responsibilities. In particular, the work of Nakata (2007) with his Indigenous Standpoint Theory and Morton-Robinson (2014) Indigenous women's standpoint theory provide the methodology and framework for me as a Ngarrindjeri person/archaeologist undertaking academic research with my own community which is discussed in more detail below.

This raises an important issue that is topical within the Ngarrindjeri community about the researcher's level of collaboration and negotiation. The Indigenous or 'Indigenist' research agenda, as discussed above, differs from the standard disciplinary processes for engaging with Indigenous communities and questions issues of power privilege and control. Within Australian archaeology, there are ethical guidelines of the AAA and Australian Association of Consulting Archaeologists Inc. (AACAI) that members of these organisations follow; in many cases archaeologists develop ongoing working relationships with Indigenous communities. Many Australian archaeologists (including Indigenous peoples themselves) hold a position of power and privilege within Indigenous communities which creates a divide between the 'researcher', who brings with them knowledge taught through Western epistemologies, and the Indigenous community members with whom they work. Although this is not the case for all archaeologists within Australia, I suggest a deeper reflexive process in archaeological research which considers research ethics, methods

and practice as adopted in other disciplines such as Indigenous health. Anderson et al. (2003), for example, argued that two layers of ethical relationships need to be developed including one involving institutions and communities, and one involving the researcher and the community.

5.7.1 Epistemological Approach: Miwi (Centre of the Stomach)

The epistemological approach (way of knowing) adopted for this research is *Miwi*. Drawing on Ngarrindjeri knowledge of *Ruwe/Ruwar* through *Miwi* is fundamental to the Ngarrindjeri way of knowing. This is the Ngarrindjeri concept of 'knowing' through 'the centre of the stomach' and the feelings that are transmitted within it. It is a strong concept that is related to the connection of the mother and child through the umbilical cord. In addition, knowledge is acquired by the Ngarrindjeri archaeologist through lived experiences and the dissemination of information from the following sources:

- Direct descendants who have a genealogical responsibility to teach particular aspects of Ngarrindjeri culture and traditions;
- Elected members of the Ngarrindjeri leadership (including NRA) and recognised community Elders who have a central role in training and development of Ngarrindjeri people;
- Ethnographic texts and accounts written by white male ethnographers who recorded Ngarrindjeri customs, traditions and beliefs during the early European colonisation of Ngarrindjeri *Ruwe/Ruwar*;
- Non-Indigenous anthropologists/historians/academics employed by museums and other institutions who, in a privileged position of power, acquired knowledge from key Ngarrindjeri Elders; and,
- Western-based training through education and academia including archaeological practice, methods and theory.

5.7.2 Ontological Approach: Ngatji (Totem)

The ontological approach (way of being) can be expressed through the concept of *Ngatji* or totem. Embodied knowledge as a Ngarrindjeri person is related in this sense to the Ngarrindjeri way of being through our *Ngatji*. As a younger person who grew up in Adelaide I have only recently began to ask about my *Ngatji* and its full meaning with the Ngarrindjeri community; however, I have begun a process of enquiry. During conversations with Uncle George Trevorrow, I had asked about my *Ngartjis* and, although not positive, he suggested that one of my *Ngartjis* is likely the whale. I understand this component as the process of 'being and becoming' an Ngarrindjeri archaeologist and

acknowledging transformative practices and reciprocity that occur (see Rigney and Hemming 2013; Nicholas 2010; Wilson 2007).

5.7.3 Axiological Approach: Kungun and Yunnan (Listen and Talk)

The axiological approach (way of doing) for this thesis is through adopting the concept of *Kungun* and *Yunnan*. This is a reciprocal process of listening and talking, two very important Ngarrindjeri values that are intertwined with the notions of respect, learning and responsibilities. This concept has been applied to this project from the initial stages. This research was developed in conjunction with Ngarrindjeri Elders, emerged from the broader Ngarrindjeri approach to cultural heritage and management, privileges Ngarrindjeri knowledge and interpretations of lands and waters, and has been conducted for the benefit of all Ngarrindjeri people, past, present and future. Adopting a Ngarrindjeri Archaeological Standpoint is key to the Indigenous criticalist approach as it also provides a space for a critique of power and opportunity to challenge the discipline. Consequently, I seek to decolonise archaeological practice from a Ngarrindjeri perspective, further enhance the quality of research within Australian archaeology, and undertake archaeology that minimises the risk of further colonisation within Ngarrindjeri *Ruwe/Ruwar*.

5.8 Summary

This chapter has introduced the 'Ngarrindjeri Archaeological Standpoint' as the theoretical framework which has been specifically adopted for this thesis. This framework guides the thesis, privileging Ngarrindjeri knowledge and understandings of *Ruwe/Ruwar*, whilst also acknowledging the importance of Western aspects of archaeological research. This framework outlines explicitly the development of Indigenous archaeology, explores standpoint and critical theory, as well as post-processual and interpretative archaeologies, and their relevance to archaeological survey and excavation in the Lower Murray.

This standpoint is fundamental to the analysis of archaeological materials in the Lower Murray and interpretation of Ngarrindjeri life ways during the mid- to late Holocene, providing a culturally appropriate methodology that aims to transform the practice of archaeology within Ngarrindjeri *Ruwe/Ruwar* to ensure that the continuing effects of colonialism are not manifested in archaeology conducted by Indigenous peoples themselves. This is critical to a type of 'Indigenous archaeology' undertaken by Indigenous peoples working in their own communities who have multiple subjectivities and thus are expected to provide leadership and initiative as active agents of change.

> The fundamental issues of control and power are critical to the establishment of ethics and associated principles governing research and Indigenous people. Ngarrindjeri must control their knowledge and, most importantly, possess the resources required for full engagement at the local and regional level for the issue of control to be addressed. (Hemming et al. 2010:93)

This chapter describes the cultural and archaeological methods used in the investigation of shell midden sites along the Lower Murray including survey and excavation strategies, sampling methods, laboratory processing methods and dating techniques. These methods were employed strategically, to examine change and variability in human occupation and Ngarrindjeri life ways as well as to provide a chronology for occupation across the Lower Murray. Although standard archaeological methods and techniques were used for this research, these methodologies were also influenced by the Ngarrindjeri Archaeological Standpoint outlined in the previous chapter, in addition to a transformative process involving the researcher, various supervisors, Ngarrindjeri Elders and other community members involved in the research process. The importance of developing such an approach prior to undertaking standard archaeological investigations is to ensure that Ngarrindjeri people have control over the research process and subsequently negotiate the dissemination of the knowledge that is gained through such investigations. These issues are further elaborated in this chapter and closely examined as part of a set of unique characteristics of the type of 'Indigenous archaeology' that is undertaken by Indigenous peoples who are trained archaeologists working within their own communities.

6.1 Overview of Fieldwork

A total of ten weeks of field work was undertaken between June 2007–May 2009 (Table 2). This included one reconnaissance survey at *Murrawong* on 13–14 June 2007 (see Wilson 2007) and two archaeological surveys between November and December 2007 of the western and eastern margins of the study region within identified irrigation areas. After these initial surveys, which allowed me to familiarise myself with the study area, two field seasons were organised. Field Season One was held from 26 November–5 December during which one 1 x 1 m excavation was carried out at the Glen Lossie Midden and Burial Site (GLMBS), four column samples were collected at *Murrawong* and surface samples were collected from middens for dating (Wilson 2008). Two Flinders University students, Daniel Petracarro and Shannon Smith, carried out Directed Studies Projects in Archaeology on other aspects of the research (see Appendix B). Field Season Two was held between 22 September–17 October 2008 and involved the undertaking of three 1 x 1 m excavations: two at *Pomberuk* and one at *Kangerank* (Wilson 2009a). At the request of the NHC, a burial recovery was also undertaken at GLMBS on 27–28 March 2009 (see Domett

2009; Wilson 2009; see Appendix C) as an mitigation response to immediate erosion, rabbit burrowing, irrigation and farming threat.

Table 6.1 Overview of archaeological fieldwork undertaken in the Lower Murray River.

Fieldwork Name	Location	Date/s	Team Members	Outcome
Reconnaissance Survey	*Murrawong*	13–14 June 2007	Chris Wilson, Alice Gorman, Michael Bonner	Wilson (2007)
LMAP Survey 1	Eastern Murray River	November 2007	Chris Wilson, Kelly Wiltshire, undergraduate students	Survey
LMAP Survey 2	Western Murray River		Chris Wilson, Kelly Wiltshire, undergraduate students	Survey
Field Season 1	*Murrawong*	26 November – 5 December 2008	Chris Wilson, Roger Luebbers, Duncan Wright, Kelly Wiltshire, Daniel Puletama, Michael Bonner	GLMBS 1 x 1 m excavation; GLM6, GLM5 and GLM3 column samples.
Field Season 2	*Pomberuk* and *Kangerung*	22 September – 17 October 2008	Chris Wilson, Kelly Wiltshire, Morgan Disspain, Daniel Petracarro, undergraduate students	POM/SQA 1 x 1 m and POM/SQB 1 x 1 m; SWM1 1 x 1 m excavations.
Burial Recovery	GLMBS	27–28 March 2009	Chris Wilson, Kate Domett, Kelly Wiltshire	Wilson (2007) and Domett (2007) Reports

In June 2007, a preliminary reconnaissance survey was conducted within the Glen Lossie Complex as a component of the Ngarrindjeri Heritage Project (Wilson 2007). The overall purpose of the survey was to assess future research and excavation potential for previously recorded sites and to formally document the current conservation status of sites within the region. Members of the NHC requested that the focus of the survey be the assessment of GLMBS and the condition of burials eroding from the midden. At this time five sites were identified as being suitable for excavation and/or research: GLMBS, Glen Lossie Burial Site (GLBS), and Glen Lossie Midden 6 (GLM6), Glen Lossie Midden 5 (GLM5) and Glen Lossie Midden 3 (GLM3). GLMBS and GLBS in particular reflect a variety of cultural practices including stone tool technology, burial practices and subsistence strategies.

Excavations of burials are not supported by Ngarrindjeri leadership unless such features are under immediate threat of destruction, in which case a 'rescue excavation' may be recommended. Accordingly, GLMBS was targeted for research and rescue excavation, which included recording and mapping Old People's remains and surface artefacts,

and reburial. GLMBS and GLBS were recorded in detail to ascertain levels of erosion (as compared to previous recordings of these sites) and future research potential. Throughout each field season, the NHC were informed of the field program, with NHC members involved on an 'as needs' basis. This ensured that the broader Ngarrindjeri community was aware of work being undertaken and that Ngarrindjeri Elders and community members could also contribute when necessary and/or available yet not have the added burden of committing to participation on a daily basis. At the completion of this fieldtrip a written and oral report were presented to the NHC. The aims of the surveys were to re-locate previously recorded midden sites and access their condition; identify and record any new sites; obtain surface shell samples for radiocarbon dating; and, assess all sites for their research potential. While an attempt was made to re-locate all sites selected within the region, this was not always possible owing to a lack of access permission from landowners, low visibility due to vegetation cover, and terrain that presented a high risk for injury.

The condition of all shell midden sites within the region (i.e. those previously recorded as well as any new sites identified) were assessed as being either poor, fair or good. Assessment was on the basis of the level of disturbance including that from (1) natural erosion; (2) post-European activities; (3) rabbit burrowing; and, (4) vegetation coverage. This objective assessment enabled consistency in relation to perceived site condition and its potential for excavation. The identification of 'at risk' middens and those with high levels of integrity will assist the Ngarrindjeri with future management in the region.

6.2 Sampling Methods

Determining what comprises a representative sample in archaeology requires a degree of knowledge about site boundaries, deposit volume and variability within the occupational debris but typically this information is not usually available prior to commencing excavation. Although there is no universal sampling 'rule', Claassen (1998:100) argued that the minimum proportion of the 'universe' (i.e. the total site area) that should be investigated is 38–50% and that, within this sample, sub-sampling should also occur. Such an approach was not applicable to the Lower Murray sites central to this thesis for three reasons. Firstly, the destruction of archaeological sites (even through excavation) is not in accordance with Ngarrindjeri beliefs. Secondly, numerous 'sites' are recorded across the study region and determining their 'boundaries' was almost impossible: according to Uncle Marshall Carter, the whole region is viewed as 'one big midden' (2007 pers. comm.) so interactive mapping was adopted to represent knowledge shared by community members and Elders. This also represents the multiple layers of knowledge and history associated with the research.

The overall methodology employed was 'judgement sampling' also referred to as non-random or non-probability sampling (Orton 2000:21). This allowed me to draw upon existing knowledge about site locations (including Ngarrindjeri, as well as archaeological knowledge) and avoid selecting random samples from the substantially modified landscape. Ngarrindjeri Elders advised on midden sites suitable for excavation and other sites that may have posed particular cultural risks (i.e. burial sites, gender specific sites). Ngarrindjeri knowledge also influenced the selection of midden sites for excavation, as I began to consider the relationship of such sites to other geographical features in the landscape, especially those that were particularly associated with the Ngarrindjeri creation ancestor Ngurunderi. The, NHC members had selected two areas of priority: (1) the *Murrawong* (Glen Lossie) owing to its cultural significance to the Ngarrindjeri community and (2) *Pomberuk* (Hume Reserve and Midden Campsite), this being one of the last known Ngarrindjeri camping grounds that was occupied during the 1940s. In consultation with the NHC, *Kangerank* (Swanport) was identified as the third location for the research. Taking Ngarrindjeri customs and cultural knowledge of 'places' within the study region, it was determined that four 1 x 1 m test pit excavations at three site 'complexes' would be undertaken — one at *Murrawong* (Glen Lossie); two at *Pomberuk* (Hume Reserve); and one at Kangerunk — thereby ensuring a minimum area of the site was destroyed. A further four column samples were also excavated in the wetlands adjacent to *Murrawong*.

Ngarrindjeri knowledge, ethnohistorical records and existing site cards and reports registered with AARD were drawn upon to develop the survey strategy. As there were many previously recorded sites within the region, the survey strategy targeted known middens to assess their excavation potential, which was determined based on a combination of: (1) Ngarrindjeri knowledge about that specific site; (2) site condition; (3) size and height of the midden; (4) materials present in the midden; and, (5) relationship to other sites within the study region. An initial reconnaissance visit, coupled with results from previous cultural heritage surveys that were heavily influenced by Ngarrindjeri Elders provided the basis for understanding sites in the study region (ACHM 2005a, 2005b; Wood 1993).

Taking these factors into account, an area of ca 20 km² centred around Glen Lossie was selected for the focus of the study. This area is within the Ngarrindjeri Native Title Claim boundaries, and comprises both private and Crown land; access to private land was negotiated between the researcher and landowners prior to and during the surveys. Negotiations were complex, as a result of factors such as some landowners failing to reply to access requests for reasons unknown, refusing to provide permission and the sheer numbers of individual landowners within the study area given the available time. Therefore, the majority of the study area was surveyed using main access roads/tracks in order to relocate previously recorded sites and record any new sites not previously identified in previous surveys.

6.2.1 Surface Collection and Sampling

Samples of *Velesunio ambiguus* (freshwater mussel shell) were collected from the surfaces of the middens to establish minimum ages of occupation for each site. In most cases, the sample was collected from the approximate centre of each midden at a depth of 1–5 cm, avoiding the uppermost shell in case it had been deposited on the site in more recent times, such as by birds. Where the margins of the midden were deemed to be more intact than the central area, samples were collected from the former. If the site was particularly large in spatial extent, additional samples were taken. Samples were also collected from any stratified sections exposed through erosion.

6.2.2 Excavation Methods

The main purpose for conducting excavations was to obtain information about changes in occupation and subsistence through time, as well as to develop a chronology for occupation in the region. Two techniques were employed for excavation: test pits and column sampling.

Test pitting was undertaken at the open midden sites GLMBS, *Pomberuk*, and Kangerunk Midden 1 which were located on relatively flat plains adjacent to wetland (nursery) environments along the river. For each site, a 1 x 1 m test pit was established and arbitrary spits of 5 cm were excavated until either culturally sterile sediment was reached or limestone bedrock was present. Taking into consideration issues of sieve fraction size (Bowdler 1983:137), nested 5 and 3 mm sieves were used, though only a 3 mm sieve was used for GLMBS/SQA. Double bagged, labelled plastic zip lock bags were used to store and transport sieve residues to the lab. Limestone boulders of non-cultural origin or modification were weighed in the field and then discarded. All materials recovered from sieves were retained for lab analysis, with obvious bone fragments and stone artefacts bagged separately in the field to ensure their protection during transportation.

Column sampling was employed at GLM6/C1, GLM6/C2, GLM5/C1 and GLM3/C1 as these sites were located on relatively sloped cliff faces with very compact sediments. The column samples measured 40 x 20 cm and varied in depth. Each excavation unit (comprising 5 cm arbitrary spits) were removed with a trowel and spade. Each XU was placed in a bucket and weighed before being bagged for sieving and analysis back in the laboratory. In total, two column samples at GLM6, one column sample at GLM5 and one column sample at GLM3 were excavated.

6.2.3 Laboratory Methods

All excavated materials were transported back to the Department of Archaeology laboratory at Flinders University and examined over the subsequent 12 month period. All sieve residues were passed through a 1 mm sieve to remove excess sediment that had been dislodged during transportation; the extraneous sediment was retained in compliance with the wishes of NHC. This method aimed to ensure that the entire matrix would be carefully examined in the laboratory to recover small fish and terrestrial faunal remains and was easier to carry out on the sites situated on cliff faces. All materials were weighed on an A&E QT 600 electronic scale to the nearest 0.1 g and in some cases an A&D GX 200 electronic balance to the nearest 0.001 g if samples were very small. All materials over 10 kg were weighed on an A&D SK-20K electronic scale to the nearest 0.1 g.

Molluscan remains were separated into diagnostic (i.e. when >50% of an umbo/hinge was present) and non-diagnostic (all other fragments) categories. The high level of fragmentation caused by taphonomic processes meant that diagnostic pieces were heavily under-represented. Vertebrate faunal remains were sorted into fish (otoliths and vertebrae), mammals (teeth and vertebrae) and other (all other unknown bones and fragmented pieces). All vertebrate and invertebrate remains were identified to the lowest taxonomic level with the assistance of staff in the School of Biology at Flinders University and by comparison to shell reference collections from the SAM.

Minimum number of individual (MNI) and weight per taxon were used to calculate shellfish abundance (Claassen 1998:106). The use of number of identified specimens (NISP) measure proved unhelpful as species identification for shellfish throughout all sites restricted the ability to apply this method. The use of both MNI and weight measurements in preference to the number of identified specimens present (NISP) is common in Australian midden studies, though it is recognised that the weight method can provide less accurate information and is more time consuming (Bowdler 1983:140). Size measurements (including width, height and thickness) were made of all shell valves greater than 50% complete. MNI values were estimated on diagnostic pieces only. The highest number of umbos of one *V. ambiguus* valve was taken as the MNI for that sampling unit. For gastropods, spires were used to calculate the MNI.

For fish and terrestrial bones body part representation, vertebral sizing, identification rates, number of fragments, NISP and MNI were calculated MNI and NISP counts were conducted on diagnostic features such as the otolith, pre-maxilla, mandible or pelvis and, in cases where none of these were present, other body parts such as femur, tibia and humerus (after Davis 1987). Terrestrial and fish taxa were identified using reference collections from the School of Biology at Flinders University and the SAM. For all fish otoliths, detailed morphological and geochemical

analyses were undertaken by Disspain (2009), including image acquisition, species identification, fish size determination, sectioning, age determination and trace element analysis. Details of the methods used are presented in more detail in Appendix D.

A simple technological analysis was carried out of all lithic pieces recovered from excavations. Stone artefacts were individually counted, weighed and their main attributes systematically recorded. Electronic callipers were used to measure artefacts, an electronic scale was used to weigh individual artefacts and a protractor was used to measure platform angles on flakes. Stone including limestone and sandstone nodules with no apparent signs of cultural modification were regarded as non-artefactual stone and therefore weighed with no further analysis occurring. Granite pieces were identified as 'manuports', counted and weighed.

Smith (2010) undertook lithic analysis of stone artefacts recovered from GLMBS (Square A) and *Pomberuk* (Square B) as part of a Directed Studies project at Flinders University under the supervision of Dr Alice Gorman. Attributes recorded included weight, artefact type, raw material type, length, width, breadth (max. measurement), fracture type, presence/absence of platform and termination type (see Appendix E). The presence of a bulb of percussion, platform or point of force application was used to define stone artefacts; objects that were ambiguous were classified as artefactual if their raw material was non-local (and they were therefore categorised as manuports).

Any shell or bone artefacts were identified during laboratory sorting and bagged separately for further analysis. A binocular microscope (maximum 40x magnification) was then used to observe rounding, striation or retouch. All charcoal (carbonised organic material) recovered during laboratory processing was weighed. Other than charcoal, organic material included plant remains such as roots, leaves, seeds, wood and insect casings were present.

6.2.4 Radiocarbon Dating and Calibration

Radiocarbon dating was a major component of this research with successful funding secured from Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS) and the Australian Institute for Nuclear Science and Engineering (AINSE). Collaborations were developed with experienced researchers resulting in conference papers and journal publications (see Wilson et al. 2012). The first group of samples submitted for dating were shell and charcoal samples collected from surface surveys and excavations. These samples were dated at the Research School of Earth Sciences (RSES) at ANU in collaboration with Dr Stewart Fallon using Single Stage Accelerator Mass Spectrometry (SSAMS). I travelled to Canberra in April 2008 to pre-treat the samples and an induction was provided prior to commencing work. For the pre-treatment, a standard acid-base-acid procedure was applied to

remove any contaminants and all samples weighed, labelled on test tubes and entered into the RSES database before AMS dating. The chemistry components and loading samples into apparatus was undertaken by Dr Stewart Fallon (or his assistant) (see Appendix B).

Otolith samples were dated at AINSE. In preparation for dating, some otolith samples needed to be removed from the indium resin used during elemental analysis (see Disspain 2009 Disspain et al. 2012; Appendix E). All samples were washed with ultrapure water with a total of 10 samples from *Kangerank* (SP01-SP07) and *Pomberuk* (HR08, HR09, HR10) had to be carefully released from the resin using a dremmil drill. After this process, all samples underwent a standard acid etch pre-treatment to remove contaminants. Pre-treatment was carried out in collaboration with Dr Geraldine Jacobson (AINSE) prior to AMS dating.

Conventional radiocarbon ages were calibrated using CALIB (v6.0) (Stuvier and Reimer 1993) with the southern hemisphere offset of 41±14 years. An important component of interpreting radiocarbon ages for developing chronologies about human occupation is calculating the reservoir effect that exists from atmospheric carbon being observed (Ulm 2006). Within Australia, correction of the marine reservoir effect is relatively new and there is uncertainty regarding the reservoir effect for estuarine and riverine environments (see Ulm 2002). In such environments determining the correction factor for freshwater mussel carbonate is difficult as the levels of carbon absorbed by different species varies, particularly for those living amongst limestone catchments (Fiona Petchey 2009 pers. comm.); this includes the Lower Murray. Although studies on riverine reservoir effects in Australia are limited, Gillespie et al. (2009:1) recently examined the issue using carbon isotope measurements on pre-bomb museum samples of *V. ambiguus*. They reported calculated reservoir ages ranging from -60 to +112 for this species. In an attempt to address a similar issue for the study area, four modern shell samples from the Lower Murray River were obtained for a comparison. All four samples were pre-bomb single shell valves of *V. ambiguus* collected by various researchers between 1886–1930. The samples were provided by Bob Hamilton-Bruce from the Marine Invertebrates (Molluscs) Collection at the SAM and posted to RSES at ANU for radiocarbon dating:

VA-1 *V. ambiguus*, from Lake Bonney, southeast SA. Collected by Cotton in 1930.
VA-2 *V. ambiguus*, from Berri, River Murray, SA. Collected in 1923 by unknown collector.
VA-3 *V. ambiguus*, from Lake Alexandrina, southeast SA. Collected in 1886 by unknown collector.
VA-4 *V. ambiguus*, from Mannum, River Murray, SA. Collected by Cotton in 1930.

In addition to these four samples [whereby reservoir age at time R(t) = uncalibrated 14C age - SHCal04 age(t)], seven paired (charcoal and shell) archaeological samples [where R(t) = uncalibrated 14C age of shell (t) - uncalibrated 14C age of charcoal (t)] were used to determine reservoir (R) ages. Dr Quan Hua (ANSTO) calculated the mean reservoir ages for these samples as ranging from -85 to +487 C14 years. Pair #7 was reported as having a mean value between +86 to +1910 and may be unreliable, with the high R value possibly being caused by reworking of the shell sample (Hua pers. comm. 2010). In principle, R has to be 0 or positive. However, as the pMC level of sample ANU-3121 is higher than that for sample ANU-3120, the R value is more negative if it is calculated from paired ANU-3121 and ANU-3119 samples, and thus for pair #3, R was calculated based on ANU-3120 and ANU-3119. The negative value of this R means there are some problems associated with the dating and samples. Ultimately, the weighted mean value of R derived from four known-age shells and four charcoal-shell pairs for the study region is 229 +/- 172 yr; this value was used for calibrating all shellfish dates in this research (Tables 6.2 and 6.3).

Table 6.2 Uncalibrated radiocarbon ages for modern pre-bomb *Velesunio ambiguus* samples provided by the SAM.

LAB. NO.	SAMPLE NAME	SAMPLE	$d^{13}C$	±	UNCALIB. ^{14}C AGE	±
ANU-9409	VA1_LakeBonney	*V. ambiguus*	-17	97.06	240	35
ANU-9410	VA2_Berri	*V. ambiguus*	-19	97.15	235	40
ANU-9411	VA3_LakeAlexandrina	*V. ambiguus*	-11	92.44	630	30
ANU-9412	VA4_Mannum	*V. ambiguus*	-22	94.71	435	30

Table 6.3 R-corrected radiocarbon ages for modern pre-bomb *Velesunio ambiguus* samples provided by the SAM.

LAB. NO.	% MODERN **CARBON ± 1σ**		UNCALIB. ^{14}C **AGE ± 1σ (BP)**		COLLECTION DATE (calBP)	SHCal04 AGE ± **1σ (BP)**		RESERVIOR AGE (^{14}C yr)	
ANU-9409	97.06	0.39	240	35	20	154	10	86	36
ANU-9410	97.15	0.46	235	40	27	152	9	83	41
ANU-9411	92.44	0.29	630	30	64	143	9	487	31
ANU-9412	94.71	0.31	435	30	20	154	10	281	32

6.3 Ngarrindjeri Cultural and Research Obligations

A significant component of this research was to establish specific cultural and research objectives that were important for the Ngarrindjeri nation foremost and archaeological research as a secondary objective. This meant working in conjunction with existing Ngarrindjeri committees and projects to further advance Ngarrindjeri community development in the area of cultural heritage and research. This is my obligation as a Ngarrindjeri archaeologist and ensures that I uphold my ongoing relationship with the community for the benefit of the community and not solely my own interests or those of the discipline. This has meant that in addition to the specific research objectives of the thesis, I have also had to attend community meetings, continue my involvement with repatriation and reburial of Ngarrindjeri Old People and to engage in immediate surveys or recoveries on Ngarrindjeri *Ruwe/Ruwar* where possible. Three specific projects emerged within the timeframe of this thesis which can be related to the Ngarrindjeri Archaeological Standpoint and my obligations to the Ngarrindjeri community including:

- Burial recovery at Glen Lossie Burial Site: a site directly related to the study region for the thesis but for which involved on site recovery, research and recommendation of management strategies for the Ngarrindjeri Heritage Committee;
- Burial recovery at *Polltollach* Station on Lake Alexandrina: an extensive burial recovery led by Dr Roger Luebbers to recover all human remains disturbed by local infrastructure development; and,
- Repatriation and reburial of Ngarrindjeri Old People: including participation on the International Repatriation Advisory Committee (appointed by the then Federal Minister for Indigenous Affairs, the Hon. Jenny Macklin MP).

6.3.1 Glen Lossie Burial Site recovery

A burial recovery was conducted at GLBS on 27–28 May 2009. Following recommendations made in 2007 (Wilson 2007), the specific aims of the project were to record the location of eroded remains in relation to individuals *in situ* at GLBS; to collect eroded remains from the surface of the site; and to rebury all Old People's remains collected during the recovery under the supervision of Ngarrindjeri Elders (see Appendix C).

The recovery provided an opportunity to undertake non-destructive analysis of Old People's remains eroding from the midden through observation only. While this was not a primary focus of my research, it does serve to demonstrate how my responsibilities as an archaeologically-trained Ngarrindjeri person are of immediate value to my community.

All recording and analysis was conducted on site and no artefacts or Old People's remains were removed from the site.

A key outcome was detailed information that can be used to make informed recommendations about conservation and management of the site. The field team included Dr Kate Domett (Biological Anthropologist, School of Medicine, James Cook University), who was employed for her expertise in human osteology, and Ms Kelly Wiltshire (PhD Candidate, Department of Archaeology, FU). Uncle Marshall Carter (Kalparrin Community Inc.) and Mr Steve Hemming (Department of English and Cultural Studies, FU) were also present on site during the second day. Initially a survey across GLBS to locate any eroded Old People's remains; artefacts (including faunal remains) were also flagged. All located finds were subsequently mapped in relation to the eroding midden face using an offset survey technique. GPS coordinates were taken for the baseline, an isolated fish (mulloway) otolith and the reburial location.

On-site analysis of the skeletal remains comprised element identification, measurements (where possible, i.e. when elements were sufficiently complete) and element condition. Following discussions with Steve Hemming, a reburial site was chosen by Uncle Marshall approximately 4 m north-west from an *in situ* burial. Upon instruction from Uncle Marshall Carter a ca 50 x 50 cm pit was dug to an approximate depth of 1 m. The reburial location itself contained no cultural material and comprised of reddish-yellow loose sandy sediment consistent with the underlying dune systems within the *Murrawong* Complex. All Old People's remains were passed through smoke from a camp fire built by Uncle Marshall Carter and positioned together in the reburial place in no particular articulation by Dr Kate Domett. Uncle Marshall Carter proceeded with a short speech thanking everyone for his or her assistance in the reburial process before the reburial place was backfilled. The field team was confident that no destruction to the burial or midden site occurred as a result of the reburial.

6.3.2 Ngarrindjeri Cultural and Archaeological Workshop

A workshop was held with NRA and NYR members on 30 July 2012 to discuss the findings from this research. The purpose of the workshop was to bring together Ngarrindjeri leaders and community members who are willing to share their knowledge and experiences of life along the Lower Murray as part of a broader research project about the occupation and life ways of Ngarrindjeri people prior to European contact. The workshops was developed with the NRA as a reciprocal training opportunity for me to share my findings and for Ngarrindjeri community members to share their knowledge, experiences, opinions, and thoughts, interpretations of materials excavated from Glen Lossie, *Pomberuk* and *Kangerank*.

Preparation and planning was carefully undertaken to determine the most appropriate strategy to adopt for recording and sampling. Ngarrindjeri-trained film makers and camera operators accepted the task of recording and workshops whilst the researcher could actively engage in cultural knowledge transmission and cross-generational discussions. Equipment used was a HD single camera on a tripod with wireless microphones for speakers. Zooming and panning was undertaken and although the workshop was undertaken on a small vicinity there were some sound issues that were detected early during the recording and later resolved by the camera team. During the workshop field notes were taken by Candice Hartman (Ngarrindjeri undergraduate archaeology student and cultural heritage advisor for the NRA) to enable the researcher to focus on the delivery and dissemination of information and engagement with community members and elders that was viewed as culturally appropriate for Ngarrindjeri people.

Following the workshop, a strategy for community training that can be accredited in the future as part of the NRA broader cultural events/calendar and heritage activities on an annual basis was intended as part of being developed for this thesis; however, over the last few years several elders and community members involved in this research have since passed and it has been culturally respectful to give the families and myself time to grieve the process. Unfortunately, this grieving process has not been completed. It is hoped that following the completion of this thesis the researcher will spend time with families to follow this section of the thesis through. Many people provided their time and effort towards the training and community development initiative speakers/trainers including: Uncle Marshall Carter, Aunty Eileen McHughes, Grant Rigney, Steve Hemming and Kelly Wiltshire. Some of the issues identified by Dr Steve Jenkins (Research Officer for the NRA) who was assisting during planning and organisation for the workshop included:

1. How should the sharing or knowledge and experiences be recorded, for example by minutes, notes or video, or by all these means?
2. Should a lawyer be invited to attend the Workshop, in particular regarding confidentiality, Intellectual Property, Cultural Knowledge and Native Title implications?
3. How does the Workshop fit into the over-arching Ngarrindjeri Cultural Heritage Strategy?
4. Is there a Ngarrindjeri Cultural Heritage Strategy, if not, does one need to be articulated or developed prior to the Workshop?
5. What are the aims for the workshop, in terms of research, PhD, the Ngarrindjeri people, cultural heritage etc.?
6. Does a strategy need to be developed to ensure that the workshop is conducted in a culturally safe environment, for example, where no cultural offence can occur, cultural boundaries are not crossed, sensitive knowledge is not divulged?
7. A senior Ngarrindjeri person should be involved to co-facilitate the workshop.
8. The use of artefacts during the presentation needs to be considered in terms of archaeological interpretation and cultural appropriateness.
9. Site visits to where the archaeological excavations were conducted are planned as an integral part of the workshop.

10. Definition needs to be given to the status of the Workshop, whether it is a joint Flinders University and NRA event or other partners are involved, the budgetary implications of its status and determining what the benefits will be for the organisational partners.
11. A budget needs to be developed to cover catering, transport costs for the site visits, materials for distribution to participants and other costs to be identified.
12. The workshop can also be developed into an accredited training program, possibly Certificate 3 or 4 levels, and be used as a pathway to further education and capacity development opportunities for Ngarrindjeri. External accredited training programs could possible adapted for use by the NRA, for example, Victoria TAFE's Aboriginal Heritage Mapping certificate or the AARD/Flinders University Heritage Training Package.
13.

6.4 Summary

This chapter has detailed the field and laboratory methods related to this thesis, including sampling methods and community obligations towards the research. These additional obligations that have arisen have been significant aspects of the framework developed for undertaking this thesis and are viewed as part of the 'holistic' approach for undertaking research within Ngarrindjeri *Ruwe/Ruwar* and were important for engaging in community negotiations for undertaking the archaeological investigations for the project.

> Our culture and economy have always depended on the resources of our Yarluwar-Ruwe. We used and continue to use the resources of the land, but it was the saltwater and freshwater environments that provided us with most of our needs. Such was the wealth of sea and marine life such as fish, shellfish, eels, waterbirds and water plants that we have always lived a settled lifestyle. (Ngarrindjeri Nation 2006:11)

This chapter details the results from all surveys, test pit excavations and laboratory analysis from the Lower Murray River. These results from the 'archaeological narrative' associated with Ngarrindjeri life ways are presented over four sections, each reporting on specific localities: the first section reports on all surveys and sampling undertaken in the study region prior to excavation. The second reports on *Murrawong* (Glen Lossie) for which the earliest evidence for occupation was obtained; the third reports on *Kangerung* (Swanport) which contributes to previous research on burial places; and, the fourth reports on *Pomberuk* (Hume Reserve Midden and Historic Campsite) — one of the favoured camping places for Ngarrindjeri people throughout the colonial era. The results are presented in a chronological manner from the earliest evidence for occupation to the more recent past. Contemporary understandings of Ngarrindjeri culture and tradition specific to the Lower Murray River are also reported in this chapter.

7.1 Surveys and Sampling Results

Existing information about the archaeology and cultural heritage of the region was obtained from several key sources including: recommendations by the NHC; existing cultural heritage reports from LMRIA projects; and AARD. As a result, a total of 99 archaeological sites were identified within the selected region between Mypolonga (south of the Ngarrindjeri Native Title Claim) and Montieth (north of Tailem Bend). Transects were established along each geographical area and all attempts were made to ensure that every site was relocated; assessed and new sites recorded using AARd site recording forms.

As a result, a total of 84 sites were surveyed including 76 previously recorded or registered sites which were re-assessed and 8 new sites identified during surveys. Archaeological sites were located in all geographical settings situated directly above river terraces and wetlands, adjacent to floodplains and along fluvial terraces (Figures 7.1 and 7.2).

Several site types were identified during surveys including:

- Shell middens – referred to as “Archaeological” sites by AARD;
- Stone artefact scatters – surface scatters that consist of stone artefactual material as the predominant artefact type;
- Burials – including isolated burials located in sandy sediment and burials associated with archaeological material (i.e. shell middens); and,
- Culturally modified trees – for which a distinctive modification is evident consistent with previous descriptions recorded.

An assessment of site condition was also conducted to determine immediate threats. Of the 84 recorded sites, 61% were assessed as being in poor condition, 35% in fair condition and 4% in good condition. Observable threats to site condition and integrity included: post-European activities (land clearing and construction of the levy banks); erosion and exposure to natural elements; animal disturbance (particular rabbit burrowing); human traffic (pedestrian and vehicle); as well as vandalism. Only three whole shell samples were recovered from the excavations from GLMBS/SQA/XU9, HRM/SQA/XU2 and HRM/SQA/XU4 (Figure 7.3) leaving a small sample for identification purposes and therefore species could not be accurately determined.

Professor Keith Walker (University of Adelaide) was approached to identify the three samples which were identified as a lentic form of *V. ambiguous* from a billabong, lake or sheltered river margin. Therefore, it was assumed that a majority of the shellfish recovered from the sites were from these species, although it is possible that another species *Alathyria jacksonii* may also be present. This is somewhat interesting given that the radiocarbon ages associated with all XUs for which the valves were recovered are dated to the mid-Holocene.

7.2 Radiocarbon Dating Summary

A total of 69 shell (*Velesunio ambiguus*), charcoal and fish otolith samples were selected for AMS radiocarbon dating, which included 38 surface and subsurface samples collected from 30 shell midden sites. Surface *V. ambiguous* samples were collected from shell middens located on floodplains 0–4 cm in depth from the surface (n=26); as well as 10 *V. ambiguus* and two charcoal samples collected from stratified deposits located on fluvial terraces 5–50 cm in depth. Fish otolith samples were either retrieved from the sieve during excavation or recovered during laboratory processing (Figure 7.4).

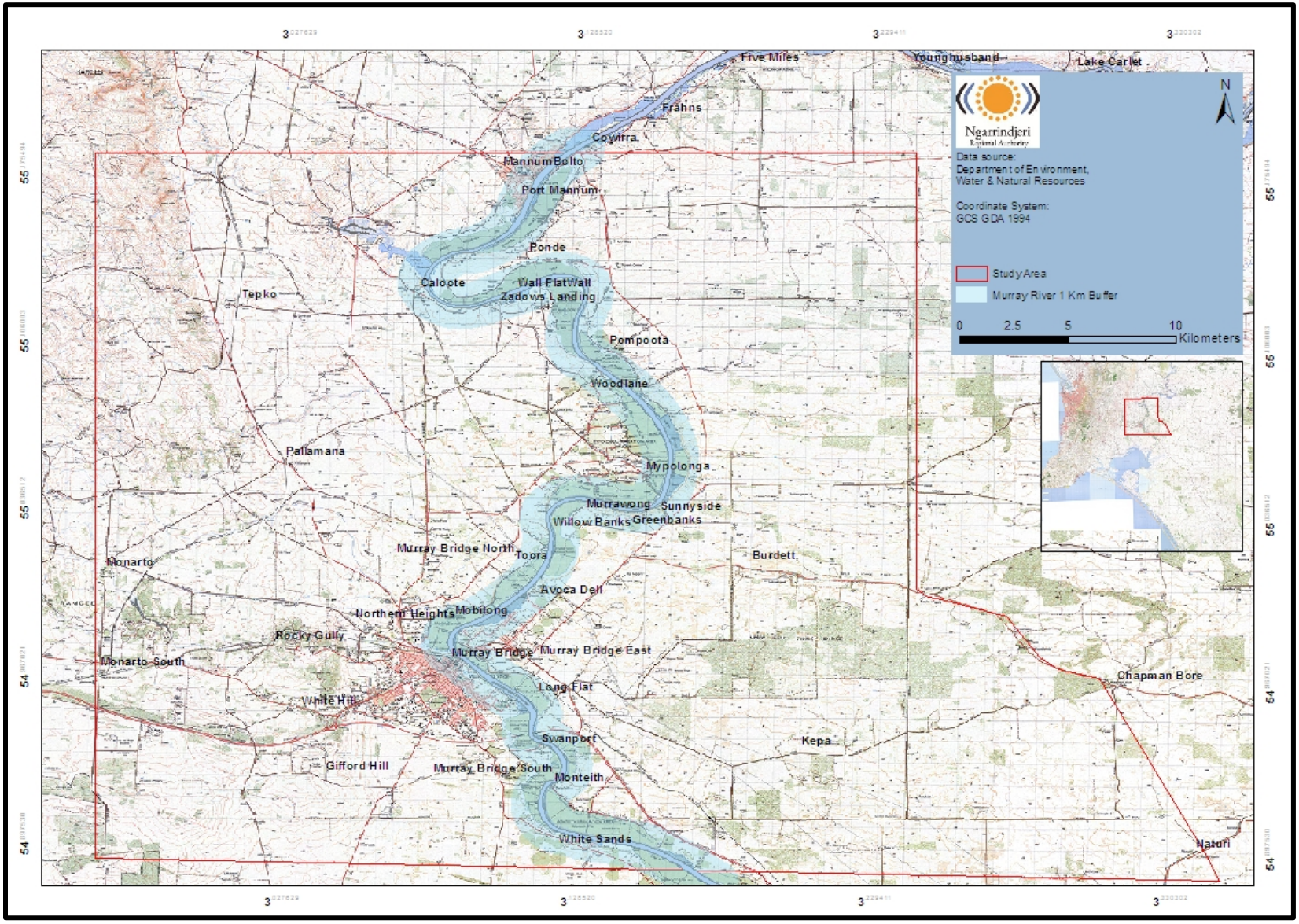


Figure 7.1 Total survey area for the study region in the Lower Murray River (courtesy of the NRA).

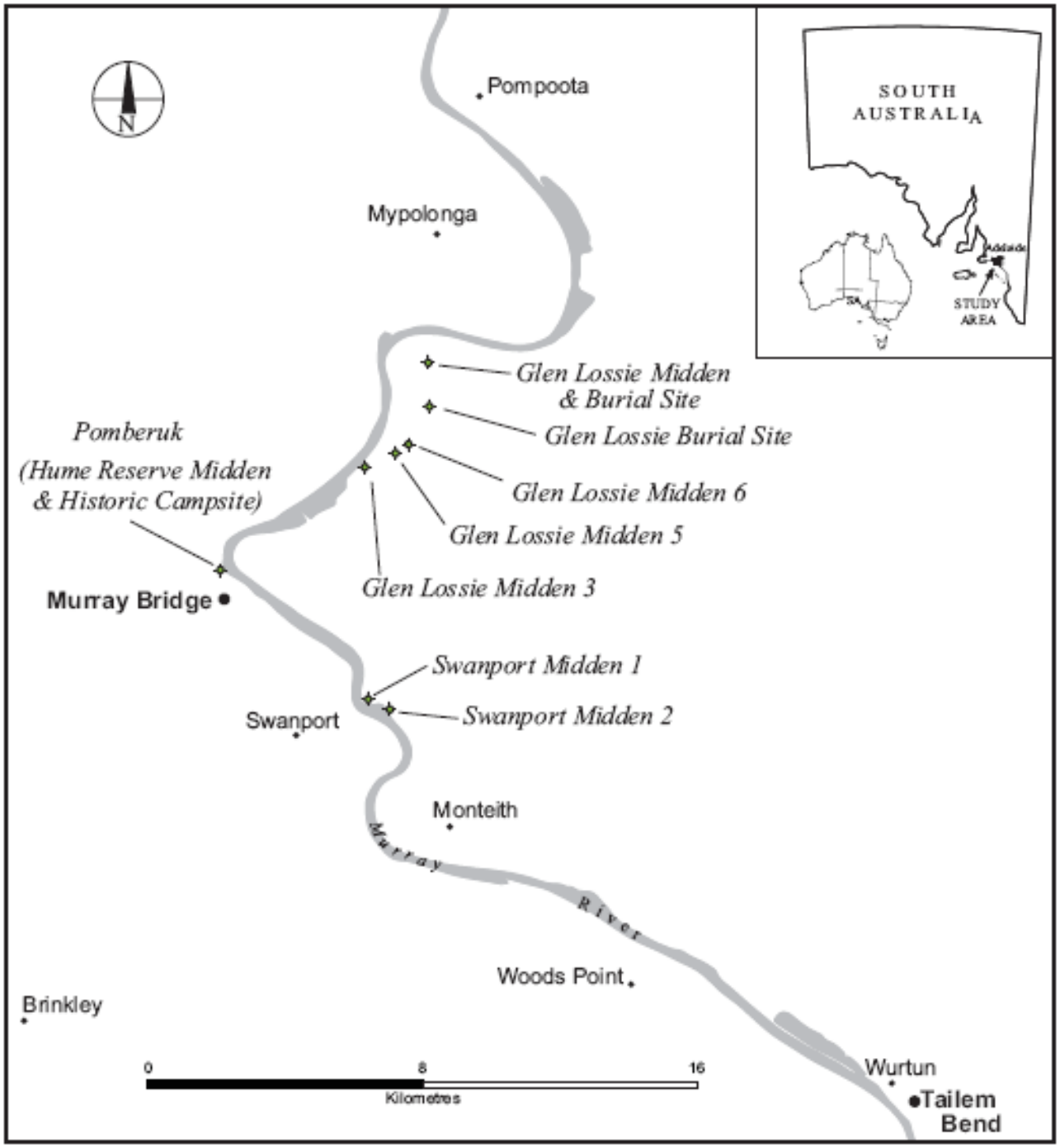


Figure 7.2 Map of survey areas and sites excavated along the Lower Murray River (image by Kieron Amphlett).

Shell 1: GLMBS/SQA/XU9b (cal BP 4890–5300)*

Shell 1: GLMBS/SQA/XU9a (cal BP 4890–5300)*

Shell 2: HRM/SQA/XU2b (cal BP 4430–4820)*

Shell 2: HRM/SQA/XU2a (cal BP 4430–4820)*

Shell 3: HRM/SQA/XU4b (cal BP 4580–4960)*

Shell 3: HRM/SQA/XU4a (cal BP 4580–4960)*

Figure 7.3 Whole shell valves excavated from GLMBS and HRM. These were the only three complete valves recovered from excavations and the most reliable for identifying species of shellfish (photographs courtesy Daniel Petracarro).

** These ages are calibrated years cal BP at 95.4% probability (2 sigma) using the southern hemisphere (shcal104.14c) data set. Note: CALIB REV 5.0.2 M Stuvier and PJ Reimer 1986–2005.*

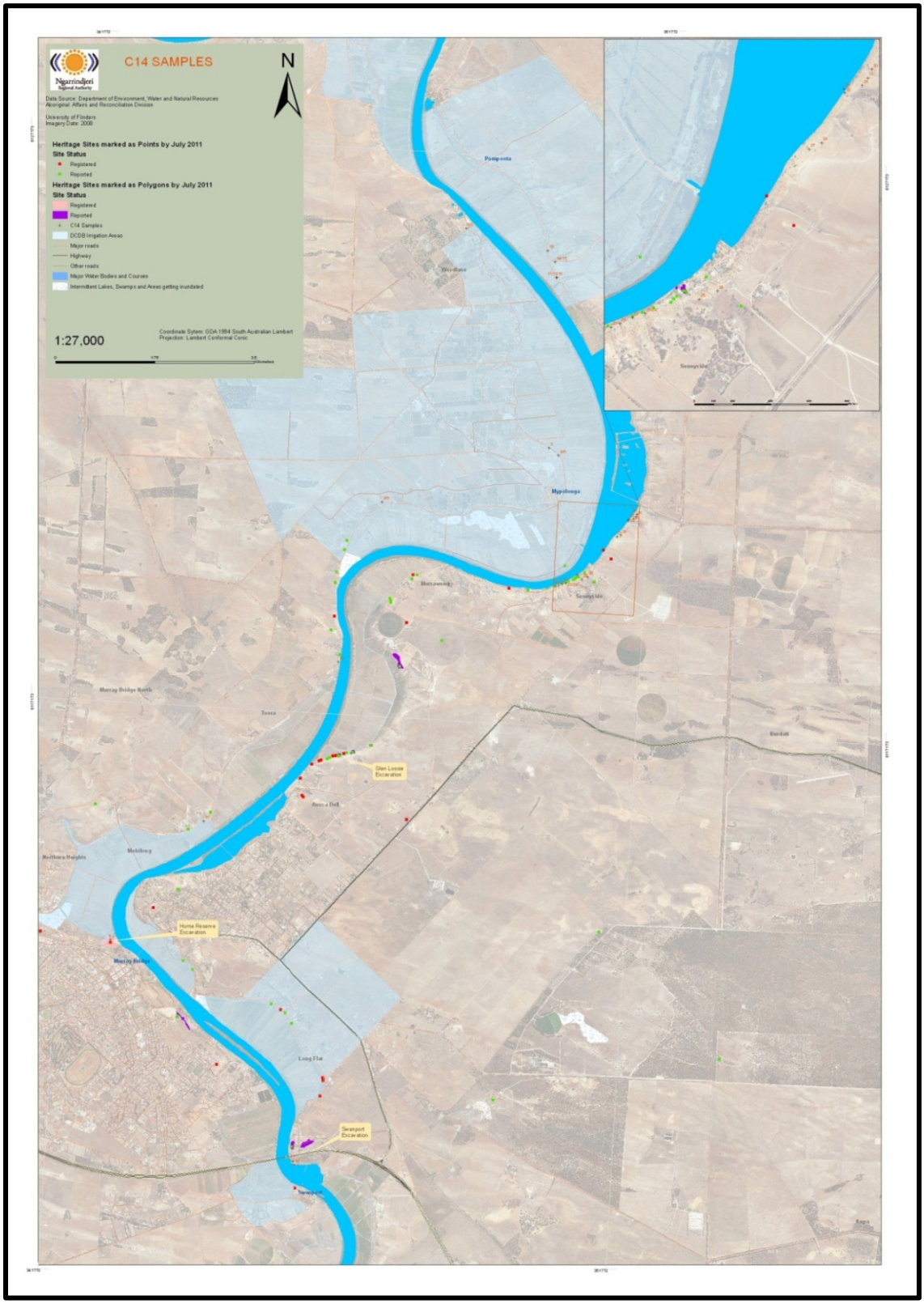


Figure 7.4 Location of C14 samples collected from the Lower Murray River (courtesy of the NRA).

7.3 Murrawong (Glen Lossie) Complex

The *Murrawong* (Glen Lossie) Complex is located approximately 15 km north of Murray Bridge on the low-lying plains of the Lower Murray wetlands, which are now primarily used for Irrigation purposes and farming. As previously mentioned (see Chapter 1), there are 20 archaeological 'sites' that comprise the Glen Lossie site complex: eight shell middens, three burials, one discretely bounded midden with burials present, eight scarred trees and an artefact scatter. Five excavations were undertaken including: one 1 x 1 m test pit excavation at GLMBS; two column samples at GLM6; one column sample at GLM5 and one column sample at GLM3. Only the 1 x 1 m test pit at GLMBS was included in the analysis for this thesis.

In total, there were 20 sites within the Glen Lossie Complex, 17 of which have been previously identified by other archaeologists and three new sites which were identified during the survey. These include eight middens, three burials, one distinct midden and burial and eight scarred trees. Since GLBS was initially recorded by ACHM in 2005, extensive erosion was evident, with previously identified Old People's remains no longer *in situ* and others newly exposed. As a result of the preliminary survey the following management recommendations were made to the NHC: to develop a management plan for GLBS in conjunction with the local landowner and thus restrict the impact of erosion occurring at the site; to obtain samples for dating from GLMBS and GLBS; to conduct further archaeological investigations within the Glen Lossie region; and, to complete AARD Site Cards for unreported sites to assist in the future management and conservation of the area (see Wilson 2007).

7.4 Glen Lossie Burial Site (GLBS)

7.4.1 Site Description and Setting

GLBS is located approximately 10 km north east of Murray Bridge and 1 km south of GLMBS. The site is ca 100 x 60 m in spatial extent and situated on a high rise in the landscape approximately 500 m from the Glen Lossie homestead. The site was first surveyed by in 2005 (ACHM 2005b) at which time it was noted that, although AARD field officers had visited the site in April 2003, and although no site card was submitted, the site was fenced off to restrict further disturbance by cattle following negotiations between the NHC and landowner in 2005 (ACHM 2005a). The site is currently surrounded by livestock enclosures on three sides, with the floodplain to the west. The site slopes considerably from the highest point in the east of the midden to the western side (i.e. towards the Murray River). Stratified deposits at the site consist of a layer of shell deposit in a grey silt matrix (of varying depth between 5–30 cm) and yellow sand, which extends beneath the grey silt to the visible base of the mound. The Ngarrindjeri community was concerned about human remains eroding from the western side of the midden as they were exposed

to sunlight, wind blasting and rabbit burrowing which had caused the site to become unstable. A request to assist in the recording and recovery was proposed for the site.

Dr Kate Domett was engaged to assist in the identification of Old People's remains, recovery and subsequent reburial as well as to make recommendations on future management and planning of the burial site. All Old People's remains and artefacts were mapped in relation to the eroding midden face using a baseline-offset survey.

7.4.2 Radiocarbon Dating and Chronology

Three *V. ambiguus* samples from GLBS were submitted for radiocarbon dating, either from the surface of the site or from the already exposed sections as no excavations were conducted at this site (Table 5). GLBS-ss9 was a surface sample collected from the centre of the midden site. GLBS-ss8 and GLBS-ss10 were *in situ* samples located within the stratified layer above an eroding burial (Individual 1). Results show that the surface sample was reported younger than that of the samples collected from above the burial layer.

Table 7.1 Calibrated radiocarbon dates for surface samples at GLBS.

SITE	DEPTH BELOW SURFACE (CM)	LAB. NO.	SAMPLE MATERIAL	$\delta^{13}C$	^{14}C age	CAL. AGE
GLMBS	0–2	ANU-2730	*V. ambiguus*	-7.7	4330±40	4650–4970
GLMBS	20	ANU-2729	*V. ambiguus*	-10.5	6320±40	7010–7280
GLMBS	20	ANU-2731	*V. ambiguus*	-12.8	6210±40	6910–7170

7.4.3 Cultural Materials

Cultural materials present at GLBS included stone artefacts (predominantly quartz), faunal remains (fish otoliths, vertebrae, shellfish and terrestrial remains) and charcoal. The site also included human remains that had eroded from the western side of the site. A total of 44 surface artefacts were mapped to show their general relationship to the human remains and erosion at the site. General descriptions were recorded including raw material and artefact type and faunal remains including a Murray cod (*Maccullochella peelii*) jawbone, as well as numerous stone artefacts. The predominant raw material type was clear quartz; however, milky quartz and chert were also present. In addition, two granite nodules and one mulloway *(Argyrosomus japonicus)* otolith were observed approximately 20 m north of the eroding bones.

7.4.4 Old People's (Human) Remains

In 2007 eroded remains were mapped at GLBS which, when compared with earlier site records made by ACHM (2005a) and Wood (1993), demonstrate rapid erosion had occurred over the past decade (see Appendix A). During the 2007 reconnaissance survey one human tooth and vertebra were identified as well as several unidentified bone fragments. In 2009, a more comprehensive and detailed survey was undertaken (Appendix C. The majority of the bone fragments had eroding down slope on the north-western slope of the site up to 30 m and were highly fragmented. Most measured from 2–3 cm in length and were exposed to sunlight, weathering and foraging activities.

In total, 98 bones (or bone fragments) of Old People were recorded (see Table 6 for a summary and Appendix C for extensive list). Domett (2009) suggested they represent at least two adults, a proposition based on the presence of two right navicular (a mid-foot) bones of different sizes. There was also evidence to suggest both male and females were present as the general morphology of the remains ranged from robust to gracile. Further, there was a small piece of cranium that could have belonged to an infant and a finger phalanx that could belong to an older child though there were not sufficient other remains present to confirm this (Domett 2009:3).

Some of the individual bone fragments indicated the presence of pathology or other features (Domett 2009; see Table 7), thereby providing information about disease (including osteoarthritis and gum disease), as well as age and sexing of individuals. It is clear from these results that the first priority is the long-term preservation and management of GLBS to prevent further erosion and destruction of the site, particular for Individual 1 as Individual 2 had already eroded during the second survey of the site.

Table 7.2 Number of 'bone types' identified from surface remains recorded by Domett (2009).

Bone	Description	No. Present
Skull	Cranium (unspecified vault fragments, Individual 1 in situ	20
	cranium)	1
	Maxilla	2
	Temporal	
Upper Limb	Humerus	2
	Radius	2
	Ulna	2
	Finger phalanx	2
Trunk	Clavicle	1
	Scapula	4
	Rib	4
	Vertebrae	3
	Sacrum	1
	Pelvis	2
Lower Limb	Femur	4
	Tibia	1
	Fibula	1
	Talus	1*
	Calcaneus	1*
	Cuboid	1*
	Navicular	2*
	Metatarsal	2*
Unidentified	Long bone	29
	Unknown	10
Total		98

Table 7.3 Overview of pathology results and observations made by Domett (2009).

ID No.	Bone Fragment	Description	Diagnosis/Observation
B.75	Right Navicular (midfoot bones)	Large osteophyte (lipping around joint margin)	Indicative of joint disease (osteoarthritis)
B.15	Right Maxilla (upper jaw)	Some degree of periodontal resorption (recession of the alveolar crest)	Indicative of gum disease
	Right central incisor	Lost antemortem (before death)	Possibly removed some time before death intentionally
	Teeth	Tooth wear light to moderate average grading	Most likely young adult or just reached middle age
B.11	Right femur	Femur head measurement of 37.9mm	Most likely female adult
B.29G	Right Calcaneus (heel bone)	Calcaneus measurement of 72.3mm (Length) 39.8mm (Breadth)	Possibly belongs to same individual as B.64 ankle bone
B.20	Cranium (Individual 1)	Superior aspect of cranium	Most likely adult
B.29	Cluster of remains	Piece of ulna, parts of two vertebrae, parts of pelvic bone and sacrum, foot and hand bone fragment	Most likely 'Individual 2'
B.28	Cluster of remains	Left humerus, parts of the shaft of a femur, small piece of tibia, part of the right scapula (shoulder blade)	Most likely 'Individual 2'

7.5 Glen Lossie Column Samples

In addition to the 1x1 m test pits, four column samples were excavated from three shell middens at the Glen Lossie Complex: Glen Lossie Midden 6, Column 1 (GLM6/C1); Glen Lossie Midden 6, Column 2 (GLM6/C2); Glen Lossie Midden 5, Column 1 (GLM5/C1); and, Glen Lossie Midden 3, Column 1 (GLM3/C1). All three middens were situated along limestone cliff faces that had been heavily eroded as well as disturbed by rabbit burrowing. The aim of obtaining these samples was to test the changes in faunal recovery by analysing the cultural materials in the laboratory using a fine mesh sieve.

7.6 Glen Lossie Midden 6

GLM6 consists of orange clay sediments with stratified shell lenses with located at the base of limestone cliffs approximately 150 m from the banks of the river. The site was first recorded by Gara (1985a, 1985b, 1988) as GLM3 (Site Card: 6727-2301) in 1985 and then again by Wood (1993) when it was renamed GLM6 (Site Card: 6727-1133). During LMRIA surveys in 2005 the name GLM6 was used to describe this site by ACHM (2005a, 2005b) and has been retained for the current research to minimise further confusion. The spatial dimensions of GLM6 suffering erosion are approximately 20 x 30 m; three gullies created through water and wind erosion have exposed stratified deposits measuring up to 1 m in depth. While shell was abundant, only minimal amounts of faunal remains and flaked stone artefacts were observed. Human remains were located on the eastern side of the cliff face which had been dug out from rabbit burrowing. There was no previous record of the sites existence and seems to be an extension of GLM6.

Two column samples were established at GLM6; one in the second gully and the other in the third gully — both of which had the most intact shell deposits undisturbed by the erosion. The total sample size for GLM6/C1 was 40 (w) x 20 (d) x 140 (h) cm with a total volume of 0.064 m^3. Twelve excavation units were removed until sterile sediment was reached with three distinct shell lenses evident. The total sample size for GLM6/C2 was 35 (w) x 40 (d) x 220 (h) cm with a total volume of 0.0112 m^3. As a result, six excavation units were removed until sterile with two distinct shell lenses evident. Two *V. ambiguus* samples were collected from GLM6/C2 and submitted for radiocarbon dating from the stratified deposits at a depth of 15–20 cm which revealed ages from 4530–4820 calBP to 6290–6460 cal BP (see Table 8).

Shellfish remains totalling 51.70 g/kg (NISP = 61, MNI = 30) were recovered from GLM6. This site comprises dense concentrations of bands in some sections (UXs 3, 7, 8, 10 and 13) with low concentration of absence of shell for the other sections (XUs, 1, 2, 4, 5, 6, 9, 11 and 12).

Fish remains totalling 0.3 g/kg and faunal remains totalling 0 g/kg were recovered from GLM6. A total of five fish remains and one faunal remain was recovered from GLM6. Owing to high levels of fragmentation, neither NISP nor MNI for the fish nor faunal bones could be quantified. One mullet otolith was recovered from XU3.

7.7 Glen Lossie Midden 5

GLM5 is located approximately 200 m east of the river and consists of dense shell lenses with dark grey sediments eroding from two gullies at the base of limestone cliffs. The site was first recorded by Wood (1993) (Site Card: 6727-1132) and also has the name Glen Lossie Midden 2 (GLM2). The site was surveyed again by ACHM (2005a, 2005b) who continued to use the name GLM5. Overall, this site has been subject to extensive quarrying for use along the river as levy banks exposing a large component of the site and its contents which is rich in charcoal, small fish remains and stone artefacts. The total size of the site is approximately 150 x 20 m and was probably about 150 x 40 m before quarrying was undertaken.

The column sample was established to the left of the first gully at the site along a stratified deposit that consisted of intact shell midden, rich dark grey sediments with a clear limestone bedrock indicating the base of the deposit. During preparation of the site for excavation, a small quartzite hammer stone was removed from the column sample. The total sample size for GLM5/C1 was 40 cm (w) x 20 cm (d) x 124 cm (h) with a total volume of 0.0120 m³. A total of ten excavation units were removed until limestone was reached with six stratigraphic units evident. Two *Velesunio ambiguous* samples were submitted for radiocarbon dating, producing age estimates between 660–730 calBP (at a depth of 2–4 cm below surface) and 5730–5920 calBP (at a depth of 10 cm below surface).

7.7.1 Glen Lossie Midden 3

The final column sample was excavated at GLM3, which is located approximately 15 m east of the river at the base of the limestone cliff beneath a rocky overhang. The site consists of very dark grey fine sediments rich in charcoal and highly fragmented shell. The site is approximately 80 x 20 m in total size and there was a stratified wall beneath a small overhang that was exposed through rabbit burrowing. During excavation of the column sample it was noted that there were dense shell remains and charcoal present, perhaps indicating that the site was more recently

occupied then GLM6 and GLM5. The most interesting artefact for further investigation was recovered from GLM3 (Figures 7.5): a possible shell artefact with boring evident. This artefact was confirmed by Professor Sue O'Connor (ANU) as a possible shell ornament. This is one interpretation of the artefact which would place its antiquity at over 5000 years BP.

The column sample was established along the stratified deposit beneath the overhang at the site. There was a small rabbit burrow to the left of the column however, investigation of the burrow revealed that it did not extend to the area for which the column was established. The total sample size for GLM3/C1 was 40 cm (w) x 20 cm (d) x 54 cm (h) with a total volume of 0.048 m^3. As a result, six excavation units were removed with four distinct stratigraphic units evident. Unlike the other three column samples, a probe was used to determine the depth of the site after the column sample was removed and it revealed a further 2 m of cultural material present. If we were to proceed with removing the column vertically we would have to excavation the midden more extensively and following discussions with the NHC it was decided that no further excavation should be undertaken during this field season until the column was analysed. One *V. ambiguus* sample was submitted for radiocarbon dating produced an age estimate of 560–660 calBP for the site.

Shellfish remains totalling 77.48 g/kg (NISP = 369, MNI = 184) were recovered from GLM3. XU2 yielded the highest density of shellfish with a maximum recovery of 104.01 g/kg (NISP=225 MNI=112.5). XU1 yielded the next most dense unit of shellfish with a maximum recover of 75.78 g/kg (NISP = 94 MNI = 47). Excavation unit three yielded the lowest density of shellfish 45.23 g/kg (NISP = 50 MNI = 25). GLM3 indicates a gradual increase in the quantity of shellfish from the uppermost layer to the centre of the deposit. The quantity of shellfish then gradually decreases from the centre of the deposit to the basal layer.

Faunal remains totalling 13.8 g (n=164 fragments, equivalent to 0.43 g/kg) were recovered from GLM3. Owing to fragmentation, neither NISP nor MNI for faunal species could not be quantified. A total of 117 faunal bones fragments (74%) were burnt. Quantification of the 17.1 g (n=278 fragments, equivalent to 0.53 g/kg) of fish bone from GLM3 is shown in Tables 9 and 10. Owing to fragmentation, neither NISP or MNI for the fish bones could be quantified beyond otolith analysis. Two Murray Cod otoliths (different individuals) and one golden perch otoliths were identified. A total of 74 (27%) of the bones fragments recovered were burnt.

Table 7.4 Radiocarbon dates for GLM3, GLM5 and GLM6 surface samples.

SITE	DEPTH BELOW SURFACE (CM)	LAB. NO.	SAMPLE MATERIAL	δ13C	^{14}C age	CAL. AGE
GLM3	2–4	ANU-3116	*V. ambiguus*	-13.4	690±35	560–660
GLM5	10	ANU-2735	*V. ambiguus*	-8.5	5130±35	5730–5920
GLM5	2-4	ANU-2736	*V. ambiguus*	-7.9	805±30	660–730
GLM6	15–20	ANU-2732	*V. ambiguus*	-9.0	5645±40	6290–6460
GLM6	15–20	ANU-2733	*V. ambiguus*	-3.8	4185±30	4530–4820

Figure 7.5 GLM6 Shell Artefact (photographed at ANU).

7.8 Glen Lossie Midden and Burial Site (GLMBS)

GLMBS is located on the eastern side of the River Murray ca 300 m from the contemporary river's edge. It is situated in a dune system across that spans an area of 130 x 50 m. The site has an extensive artefact scatter to the north and a stratified shell deposit to the south with stratified shell lenses. Dune deflation has revealed an extensive amount of artefactual material including flaked quartz (milky, rose and crystal), chert, granite and an abundance of burnt and heat-fractured limestone cobbles. Fish remains (particularly vertebrae) and fragmentary terrestrial remains are also present. Historically, the complex was used for dairy farming which has caused disturbance to the site and

its integrity as there has been removal of vegetation by grazing. Today, rabbit burrowing and natural erosion are the main causes of disturbance to this site and it is easily accessible from the public road that cuts through part of the site.

There have been reports that human remains eroded from the site across a number of years and, according to the landowner Mr Arnold Vogan (pers. comm.), amateur collectors and university researchers removed the human remains from the site during the 1960s and 1970s. This similar account was also recorded on the original site card for GLMBS. Further, some support for this assertion was recorded by Wood (1993) who observed the presence of human remains at the site during regional surveys and recommended that the remains be retrieved. However, there was no evidence of human remains recorded during the survey for this study in 2007 suggesting most had been removed and/or shifted in the intervening period. As there was no evidence for burials at the site, the NHC granted approval for a component of the site to be surveyed and excavated.

7.8.1 Excavation Results

A total of 21 excavation units were removed from Square A in 5 cm intervals to a total depth of 1.24 m until a seemingly sterile sandy unit was reached (Figure 7.6). Between a depth of 103–124 cm a 50 x 50 cm southwest quadrant was further excavated to ascertain the presence of any cultural materials. Although the deposit was sterile, an additional 100 cm of deposit was removed using a hand auger to ensure there was no further shell, charcoal or other cultural materials present in the underlying deposit.

7.8.2 Radiocarbon Dating and Chronology

In total, nine radiocarbon dates were obtained for GLMBS including a paired *V. ambiguus* and charcoal sample at XU15 from a hearth feature. The sample obtained from this feature reveals the earliest radiocarbon age for the study region (Table 7.5). Overall, there is a relative age-depth chronology for occupation which begins at 8190–8390 calBP and ends at 4450–4830 calBP. Given the historical context for the site and the high level of disturbance it is highly likely that an unknown depth of deposit was destroyed at the site (although this has not been tested).

Further, two samples from each of XU1, XU2 and XU15b so as to address concerns about potential laboratory contamination; however, as seen in Table 12 the results were statistically identical to the previous ages reported and therefore regarded as reliable. There is one inverted radiocarbon date from XU19 which is suggested was not collected *in situ* and is therefore regarded as unreliable. Further there is a relative age-depth relationship for the

radiocarbon sequence for the deposit and the only disturbance noticable was fibourous roots during the first SU. There is strong evidence to suggest that there is a high degree of stratigraphic integrity at GLMBS/SQA as there were no burrows were encountered during the excavation and the shell matrix was horizontally in tact.

Table 7.5 Calibrated radiocarbon dates from GLMBS/SQA.

SQUARE	XU	DEPTH BELOW SURFACE (CM)	LAB. NO.	SAMPLE MATERIAL	d13C	^{14}C age	CAL. AGE
A	1	6	ANU-3117	*V. ambiguus*	-2.9	4185±50	4450–4830
			ANU-2737	*V. ambiguus*	-1.1	4155±35	4450–4820
	2	20	ANU-3118	*V. ambiguus*	-13.6	4060±50	4290–4800
			ANU-2738	*V. ambiguus*	-5.9	4000±30	4250–4520
	7	51	ANU-2739	*V. ambiguus*	-10.7	4515±40	4890–5300
	15a	78	ANU-3119	*Charcoal*	-26.2	7535±50	8190–8390
	15b	78	ANU-3120	*V. ambiguus*	-9.0	7450±50	8050–8350
			ANU-3121	*V. ambiguus*	-17.1	7380±50	8010–8310
	19	104	ANU-3123	*V. ambiguus*	-16.1	4440±60	5750–6180

7.8.3 Cultural Deposit and Stratigraphy

Three distinct stratigraphic units were identified for GLMBS/SQA with a rich cultural deposit and total of 19 excavation units.

Stratigraphic Unit 1: The uppermost unit comprising XU1–XU5. Consists of dark organic sediment (varying in pH from 6.5–9.0) with large amounts of fibourous roots in XU1. There was a pocket of mixed sediment containing roots and dense shell material emerging from the south face between XU2–XU5. The remaining excavation consisted of semi-consolidated grey silty soil.

Stratigraphic Unit 2: This is a mixed zone between the overlying SU1 and underlying SU3 and includes XU6–XU8. It consists of semi-consolidated, reddish brown soils of pH 8.5. Towards the base on XU7 is a visible lens of charcoal. There is a clear sediment change between XU8 and XU9 from reddish brown to light brown, with the sediments in the lower levels being more consolidated than those above. There was an obervable decrease of cultural materials in this SU.

Stratigraphic Unit 3: Consisting of XU9–XU21, SU3 contains minimal amounts of cultural material with a high concentration of charcoal in the southeastern corner of the test pit in XU15. Within the feature itself, burnt shell material was recorved even though there was no surrounding shell material present in this SU. This feature was

bagged seperately and not sieved for laboratory processing and analysis. The majority of this SU is culturally sterile, consolidated, yellow-brown sand (pH 8.0–9.0) consistent with the underlying dune system in the area.

Throughout the deposit sediments were moderately to well sorted sandy sediments with a pH range from 6.5 for XU1–XU3 and 8.5–9.0 for XU4–XU21. As a result of the excavation, it is most likely that the formation of the shell midden began to accumulate on the surface of the underlying sandy sediments from the dune system which created a 'mound-like' feature in the landscape. This provided information into the site formation processes occuring at GLMBS as well as protected the dune from deflation.

7.8.4 Cultural Materials

A small variety of cultural materials were identified in GLMBS/SQA, dominated by shellfish, particularly in SU1 and SU2 (Figure 7.7 and Table 13). Other cultural materials present included non-molluscan famual remains (fish and terrestrial bone), stone artefacts (dominated by quartz) and charcoal. Granite nodules were observed on the surface of the site during survey but none were recovered during excavation.

By weight, shellfish was the dominant cultural material present of which a total of 49,819.2 g was recovered (Figure 7.8). The highest abundance of shellfish was recorded in XU2, in which nearly half the total shellfish was recovered (24,840 g), below which it steadily decreased until entirely disappearing in XU20. The highly fragmented nature of the shellfish make it extremly difficult to identify shellfish taxa. Only one taxa of shellfish could be identified as occuring throughout all sites: *V. ambiguus*. As there was no other species of freshwater or marine shell recovered during excavations it is assumed that, despite their fragmentary nature, the shellfish recovered belong to one taxa. A total of 349 umbos were identified with an MNI = 175, with a clear under-representation of shellfish abundance using MNI in comparison to weight.

A total of 1121 fragments of non-molluscan faunal remains weighing 71.7 g were recovered from GLMBS/SQA (Figure 7.9). Similary to shellfish, vertabrate remains were most abundant in XU2 (23.8 g), followed by a sudden decline in XU3 (0.1 g). Fish made up the majority of the vertabrate assemblege, consisting of 96 bone fragments with a total weight of 24.2 g which is predominately representative of large vertebrae fragments from Murray cod (Figure 10). A total NISP of 39 and a MNI of 11 was calculated from the following taxa: Murray cod (*M. peeli*), golden perch (*Macquaria ambigua*), and posssible callop (poor preservation precluded confident identification). Otoliths were present in the first four excavation units. From the seven otoliths recovered, five were identified as Murray cod, one as golden perch and the remaining otolith was either golden perch or callop and could not be assigned a taxa due to poor preservation conditions. The partial Murray cod otolith in XU2 weighed at 1.1638 g and was

estimated to have a fish total length (FTL) of at least 1982.32 mm. Other vertabrate remains were present in SU2 including: two pieces of turtle carapace in XU5; a mammal falange in XU7; rodent dentary in XU8; and, possible reptile scales in XU8. Four teeth were recovered from XU1, XU2, XU5 and XU12 which could not be assigned a taxa but most likely represent terrestrial remains.

There was a total of 54 stone artefacts recovered from GLMBS/SQA, with three types of raw material types present: high quality crystal quartz, chert (of various colours) and silcrete. Although there is a relative increase in number of artefacts from XU1–XU4, the most abundant amount recovered was from XU5 (Table 14). A majority of artefacts were flakes, with one thumb nail scraper that was a dark brown chert in XU4 (ART.ID 25) and a possible pirri point (XU5) made from yellow/orange chert (ART.ID 33). Smaller amounts of artefactual stone were also present in XU15a, XU15b, XU16 and XU19. The relative platform width for quartz was reduced and relative flake length was greater than with the platform ratio of 1:2 having the longest flakes. For chert, this pattern was the opposite whereby the relative platform width was increased and relative flake length increase, with the platform ratio of 4:5 having the longest flake (see Smith 2010).

The only other type of cultural material excavated from the site was charcoal (Figure 7.11), non-artefactual stone and all organic matter was not retained. A total of 47.4 g of charcoal was recovered from the site with the highest amount 11.9 g (25.1%) retrieved from the hearth feature in XU14. There was only a minimal amount of charcoal recovered from the site making it difficult to distinguish any patterns in the data. Non-artefactual stone was dominant in XU1 (2,670 g in total) and gradually decreased in weight until it ceased at XU9.

Table 7.6 Summary of 3 mm lithics recovered from GLMBS/SQA.

Raw Material	XU1	XU2	XU3	XU4	XU5	XU6	XU7	XU8	XU9	XU10	XU11
Quartz	8	6	8	8	12	1	2	0	0	1	1
Chert	0	1	0	2	2	0	0	0	0	0	0
Silcrete	0	0	0	0	2	0	0	0	0	0	0

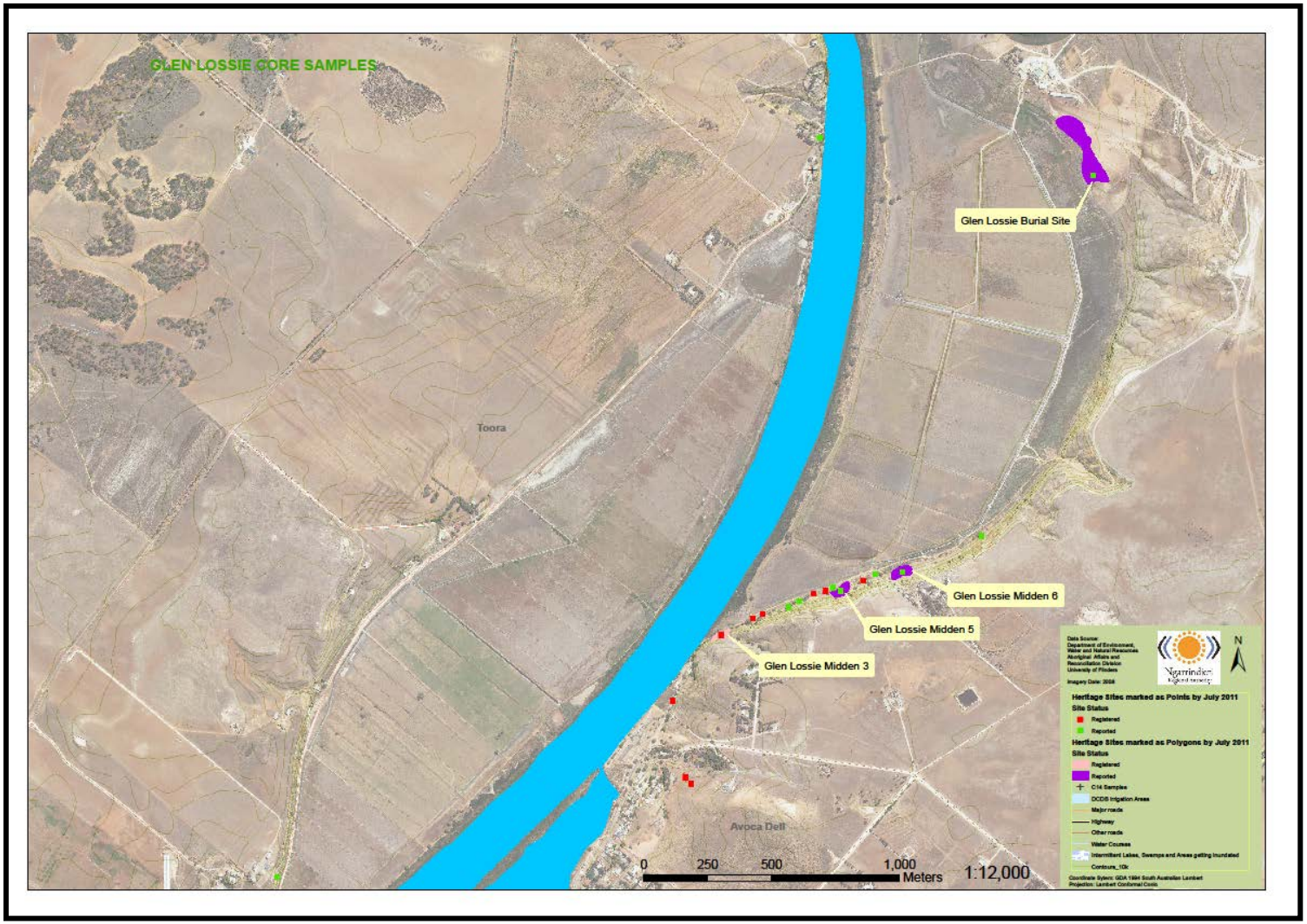


Figure 7.6 Location of *Murrawong* (Glen Lossie) Excavations, Lower Murray River (courtesy of the NRA).

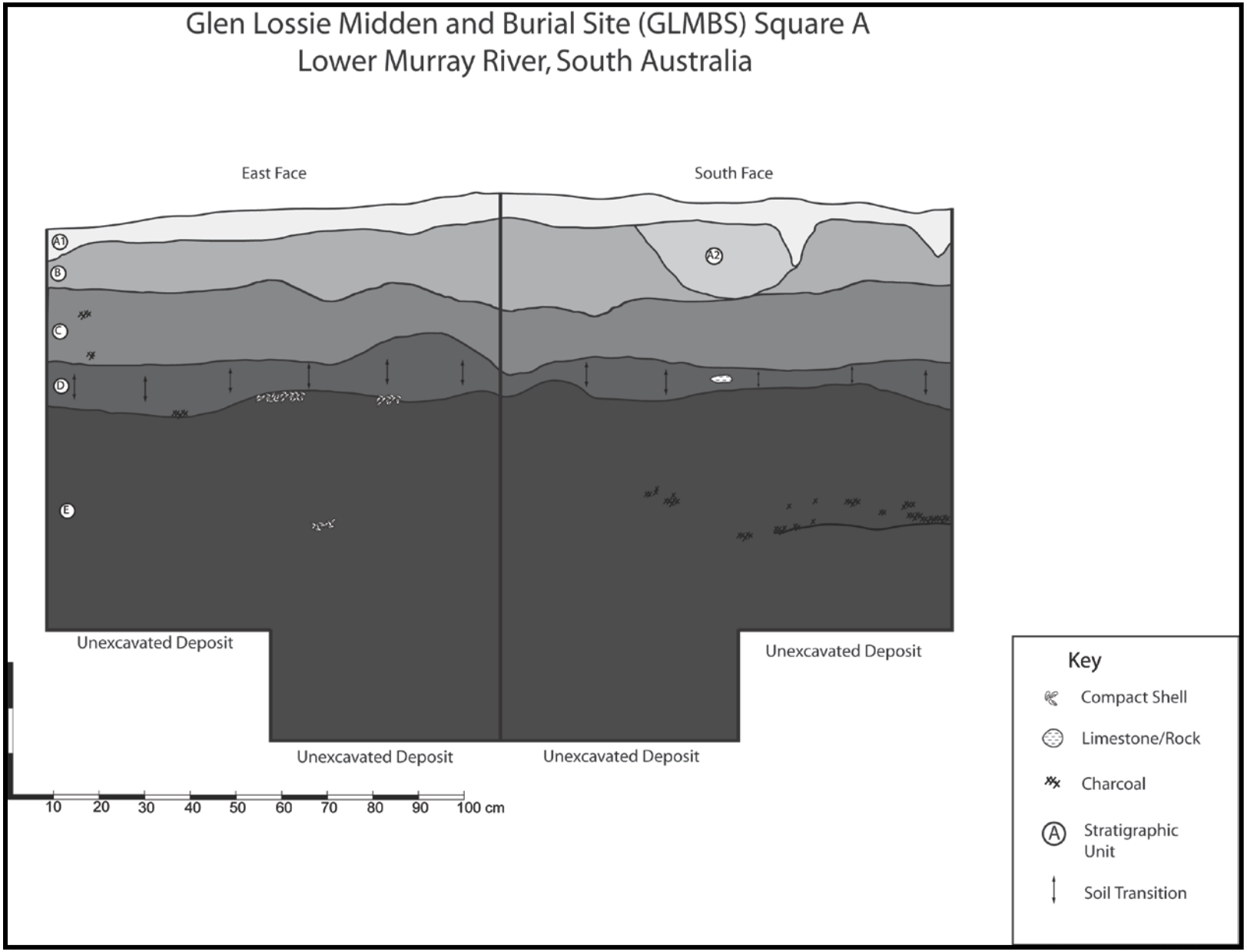


Figure 7.7 Stratigraphic section, Glen Lossie Midden and Burial Site, Square A.

XU	Stratigraphic Layer	Munsell Colour	pH	Level of Sorting	Grain Size	Spherecity	Rounding
1	A1	N/A	6.5	N/A	N/A	N/A	N/A
2	B/A2	10YR 4/3 Brown	6.5	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=low	Medium=sub-angular; Fine=angular
3	B/A3	N/A	6.5	N/A	N/A	N/A	N/A
4	C	10YR 4/3 Brown	9	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=medium	Medium=sub-angular; Fine=sub-angular
5	C	10YR 4/3 Brown	9	Moderate-Well	Fine grain to occasional medium grain sand	Fine=medium; Medium=medium	Fine=sub-angular; Medium=sub-angular
6	D	10YR 4/3 Brown	8.5	Moderate-Well	Medium grain to occasional fine sands	Medium=low; Fine=medium	Medium=subangular; Fine=sub-angular
7	D	10YR 5/3 Brown	8.5	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=medium	Medium=sub-rounded; Fine=sub-rounded
8	E	10YR 4/3 Brown	8.5	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=medium	Medium=sub-angular; Fine=sub-rounded
9	E	10YR 4/3 Brown	8.5	Moderate-Well	Fine grain to occasional medium grain sand	Fine=high; Meidum=medium	Fine=sub-rounded; Medium=sub-rounded
10	E	10YR 4/4 Dark-yellowish brown	8.5	Moderate-Well	Fine grain to occasional medium grain sand	Fine=high; Meidum=medium	Fine=sub-rounded; Medium=sub-angular
11	E	10YR 5/4 Yellowish brown	8	Moderate-Well	Fine grain to occasional medium grain sand	Fine=high; Medium=medium	Fine=sub-rounded; Medium=sub-angular
12	E	10YR 4/3 Brown	8	Moderate-Well	Fine grain to occasional medium grain sand	Fine=high; Medium=medium	Fine=sub-rounded; Medium=sub-angular
13	E	10YR 4/4 Dark-yellowish brown	8.5	Moderate-Well	Fine grain to occasional medium grain sand	Medium=medium; Fine=high	Fine=sub-rounded; Medium=sub-angular
14	E	10YR 5/4 Yellowish brown	8.5	Moderate-Well	Fine grain to occasional medium grain sand	Fine=high; Medium=medium	Fine=sub-rounded; Medium=sub-angular
15a	E	10YR 4/4 Dark-yellowish brown	8	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=high	Medium=angular; Fine=sub-angular
15b	E	10YR 5/4 Yellowish brown	8.5	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=high	Medium=angular; Fine=sub-rounded
16	E	10YR 5/6 Yellowish brown	8	Moderate-Well	Medium grain sand	Medium=medium	Medium=sub-angular
17	E	10YR 5/4 Yellowish brown	8.5	Moderate-Well	Fine grain to occasional medium grain sand	Fine=high; Medium=medium	Fine=sub-rounded; Medium=sub-angular
18	E	10YR 5/6 Yellowish brown	8.5	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=high	Medium=sub-angular; Fine=sub-rounded
19	E	10YR 5/6 Yellowish brown	8	Moderate-Well	Medium grain to occasional fine sands	Medium=medium; Fine=high	Medium=sub-rounded; Fine=sub-rounded
20	E	10YR 5/4 Yellowish brown	9	Moderate-Well	Fine grain to occasional medium grain sand	Fine=high; Medium=medium	Fine=sub-rounded; Medium=sub-angular
21	E	10YR 5/6 Yellowish brown	8.5	Moderate-Well	Medium grain to occasional fine	Medium=medium; Fine=high	Medium=sub-rounded; Fine=sub-rounded

Figure 7.8 Glen Lossie Midden and Burial Site (GLMBS), Square A Sediment Analysis.

Table 7.7 Summary of cultural materials from GLMBS, Square A.

Unit	Strat Layer	Conv Age Cal BP	Stones		Shell		Umbo		Bone		Stone Artefacts	
			g	g/kg	g	g/kg	g	g/kg	g	g/kg	g	g/kg
1	A1	3867–4821	2670	108.54	890	36.18	0.1	0.00	0.8	0.03	1	0.04
2	B/A2	3616–4570	1020	6.88	24,840	167.50	9.6	0.06	23.8	0.16	3.3	0.02
3			280	3.61	8610	110.95	3.2	0.04	0.1	0.00	4.4	0.06
4	C		140	1.44	5210	53.44	3.8	0.04	13.3	0.14	5.1	0.05
5			10	0.09	4990	43.58	5.2	0.05	13.1	0.11	21.1	0.18
6	D	4296–5307	0.8	0.04	550	29.10	1	0.05	1.5	0.08	3.5	0.19
7			5.2	0.05	2090	20.69	8.8	0.09	7.9	0.08	0.4	0.00
8	E	8187–8385	0.4	0.01	1180	20.74	3	0.05	2.9	0.05	0	0.00
9			0.8	0.01	1050	16.56	11.7	0.18	6.3	0.10	0	0.00
10					261.9	3.90	0.4	0.01	1.2	0.02	0.1	0.00
11					147.3	2.46	0.7	0.01	0.2	0.00	0.1	0.00
12					45.7	0.76			0.2	0.00		
13					113.7	1.24	0.1	0.00	0.3	0.00		
14					82.7	1.32						
15a			0.2	0.00	19	0.33						
15b			0.2	0.03	5.2	0.90						
16			0.4	0.01	18.4	0.32	0.1	0.00				
17					9.6	0.17						
18					7.9	0.11	0.1	0.00				
19			0.4	0.00	26.9	0.21	0.1	0.00	0.1	0.00		
20												
21					0.6	0.02						
Total			4127.2	120.7	49,819.2	505.10	47.5	0.59	71.1	0.77	39	0.55

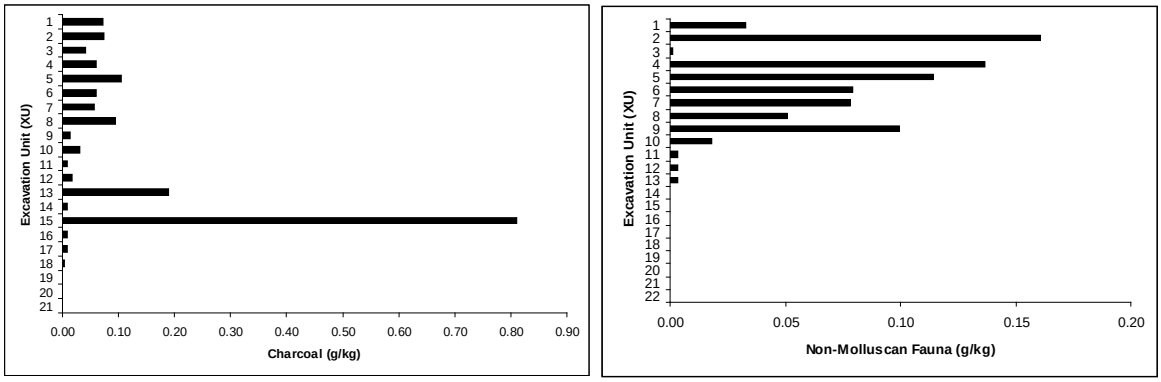


Figure 7.9 Volumetrically adjusted weights of faunal remains recovered from GLMBS/SQA.

Figure 7.10 Volumetrically adjusted weights of charcoal recovered from GLMBS/SQA.

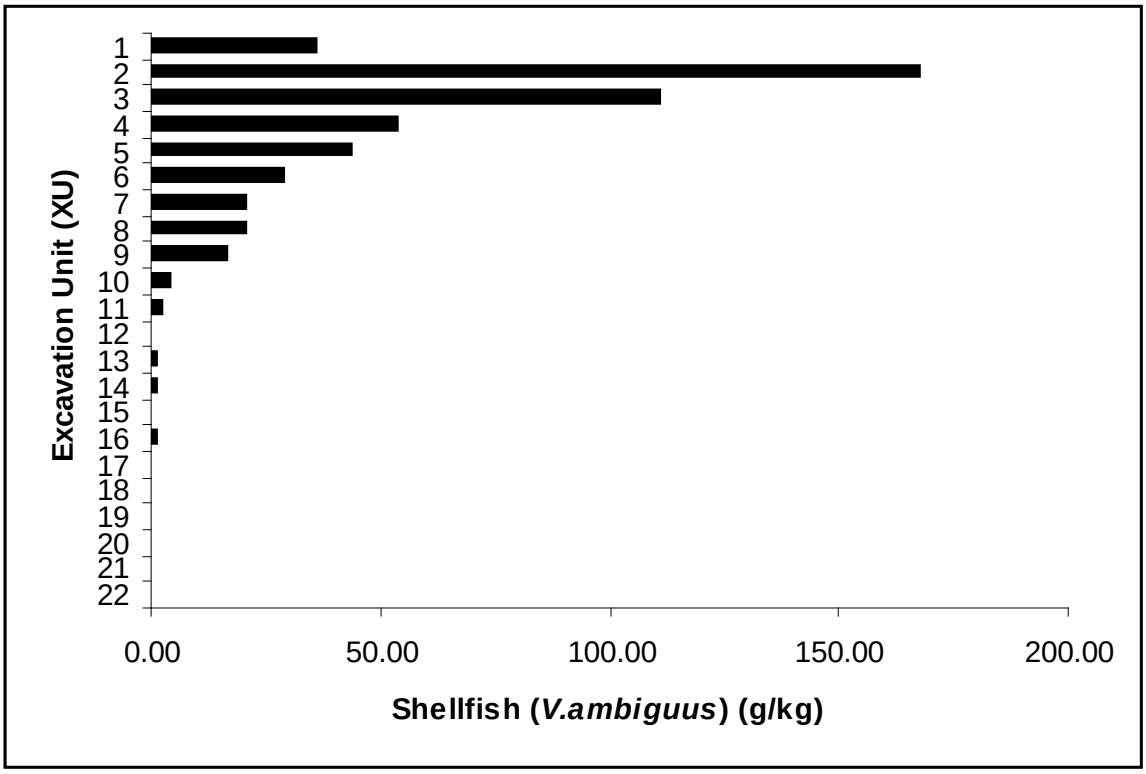
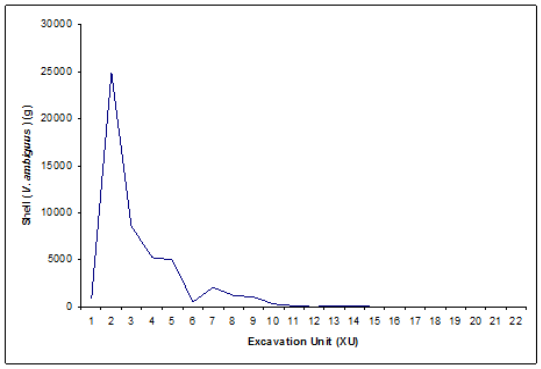
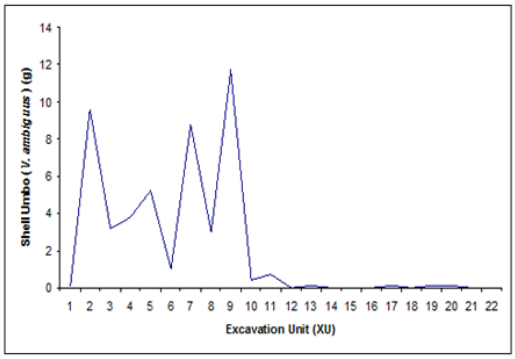


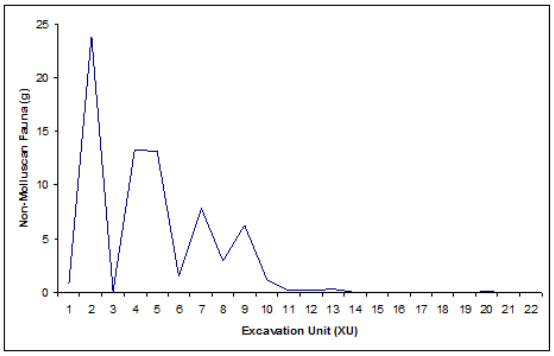
Figure 7.11 Volumetrically adjusted weights of shellfish recovered from GLMBS/SQA.



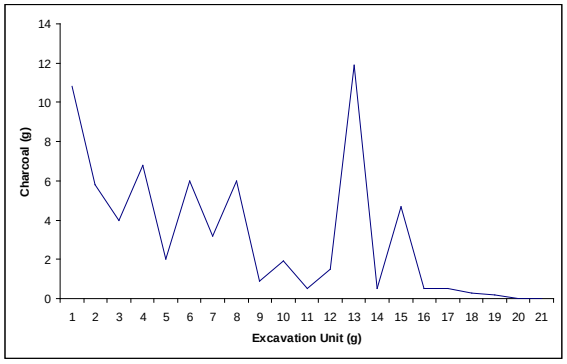
Abundance of shellfish (V. ambiguus).



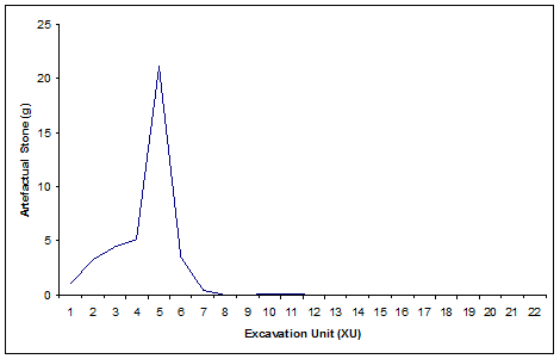
Abundance of umbo (*V. ambiguus*).



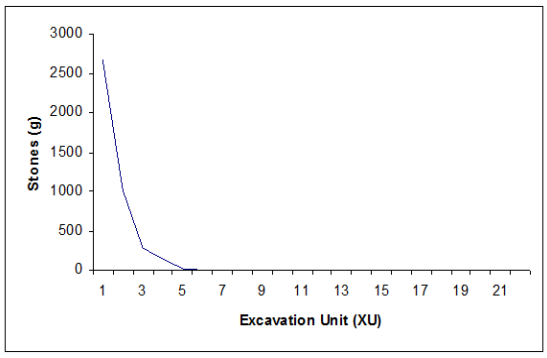
Abundance of non-molluscan fauna.



Abundance of charcoal.



Abundance of artefactual stone.



Abundance of non-artefactual stone.

Figure 7.12 Abundance for cultural materials by total weight and excavation unit at GLMBS, Square A. From top left to right (shellfish, umbo, non-molluscan fauna, charcoal, artefactual stone and non-artefactual stones).

7.9 Kangerung (Swanport) Complex

The *Kangerung* complex is located ca 2 km south of the Murray Bridge township on the eastern side of the Kangerunk Bridge. It is adjacent to the River Murray (approx. 100 m) and only 1 km southwest of the Kangerunk Burial Site (see Stirling 1911).

7.10 Swanport Midden 1

7.10.1 Site Description and Setting

SWM1 site consists of low density shell scattered over an area measuring ca 50 x 140 m. The surrounding environment consists of a narrow floodplain along the Murray River flanked by low limestone cliffs and various species of vegetation including river red gums, willows and grasses. This site is closely associated with Swanport Midden 2 (approx. 400 m south of SWM1). One 1 x 1 m test pit was established at SWM1 in the approximate centre of the site on the highest point (Square SWM1/SQA). A total of 13 excavation units were removed until sterile sediment was reached at a total depth of 85 cm below surface (Figure 7.13).

7.10.2 Radiocarbon Dating and Chronology

Three *V. ambiguus* and two charocal samples were submitted for SWM1, including paired samples from XU6 and XU11. As shown in Table 11 the results range from 4420–5930 years calBP with an inverted charcoal date in XU11 that conflicts with the results obtained from the shell samples. The inverted charcoal date is most likely the result of the type of wood dated or possible movement of the sample through the excavation.

Table 7.8 Radiocarbon dates for Swanport Midden 1, Square A

XU	DEPTH BELOW SURFACE (CM)	LAB. NO.	SAMPLE MATERIAL	d13C	^{14}C age	CAL. AGE
2	13	ANU-6609	*V. ambiguus*	-1	4225±45	4540–4840
6	35	ANU-6610	*V. ambiguus*	-6	4230±90	4430–4870
6	35	ANU-6611	*Charcoal*	-25	4130±50	4420–4820
11	50	ANU-6612	*V. ambiguus*	-1	5110±70	5620–5930
11	50	ANU-6613	*Charcoal*	-24	3200±50	3220–3470

7.10.3 Cultural Deposit and Stratigraphy

There is strong evidence to suggest that there is a high degree of stratigrahic integrity at SWM1/SQA as there is a dense layer of *V. ambiguus* across two stratigraphic units that is undisturbed and an absence of burrows or intrusions during the excavation process. pH levels ranged from 8.0–8.5 across all excavation units (Figure 7.14). The majority of cultural materials were situated within the first two excavation units located 10–30 cm below the surface.

Stratigraphic Unit 1: Consists of XU1–XU4 and is predominately dark brown silty topsoil with fibrous roots and minimal amounts of mussel shell (pH 8.0–8.5).

Stratigraphic Unit 2: This SU consists of XU5–XU9 and comprises light grey silty sediment with intact shell lenses. The pH is 8.0–8.5 and there are some limestone nodules and other cultural remains present.

Stratigraphic Unit 3: Consisting of XU10–XU11, this SU comprises dark brown silty sediment with minimal amounts of shell material (pH 8.5). There are no root intrusions or limestone nodules present in this SU.

Stratigraphic Unit 4: The base of the deposit which includes XU12 and XU13. This SU is a thin layer of light grey silty sediment with minimal amounts of shell material. Limestone bedrock was encountered in XU13.

7.10.4 Cultural Materials

There was a large variety of cultural materials identified from SWM1/SQA. The range of cultural materials present included non-molluscan famual remains (fish and terrestrial), stone artefacts (predominantly quartz), charcoal, granite, organic material, and a single piece of ochre (Figure 7.15).

Shellfish fragments were the most dominant material present by weight in Square A SWM1, with a total of 24,806.3 g recovered and only one taxa identified (*V. ambiguus*; see Figure 7.16). Shellfish were most abundant in XU7. There were no whole shell valves present in the deposit and a total of 549 umbos were identified with an MNI of 275.

A total of 1042 pieces of non-molluscan faunal remains weighing 123.6 g were recovered from SWM1/SQA, with a peak in XU11 (Figure 7.17). Fish bone made up the majority of the vertabrate assemblege consisting of 199 bone fragments with a total weight of 68.2 g (MNI=11 and NISP=48). The only identified fish taxa was Murray cod (*M. peeli*). Otoliths were present in XU1, XU4, XU6, UX7 and XU8. Two otoliths analysed by Disspain (2009) indicated

a FTL of at least 2166.67 mm for SP02 (XU6) and 2200 mm for SP03 (XU7). No other vertabrate remains could be identified to a taxonomic level in this deposit.

A total of 48 stone artefacts were recovered from SWM1/SQA. The most dominant raw material type was milky quartz which was present in XU1 (n=4) and XU4 (n=1), XU6 (n=2), XU7 (n=2) and XU8 (n=2) with a slight increase in abundance at XU9 (n=6). Grey, rose, white and opaque grey quartz are only present in XU9. The only other materials present in SWM1/SQA were non-artefactual stones with a high concentration in XU12 and XU13, and charcoal, which was most abundant in XU13.

Table 7.9 Summary of lithics recovered from SWM1/SQA/5mm.

Raw Material	XU1	XU2	XU3	XU4	XU5	XU6	XU7	XU8	XU9	XU10	XU11
Quartz	7	0	4	3	0	3	3	3	12	1	0
Quartzite	0	1	2	0	0	0	0	0	0	0	0
Chert	1	0	0	0	0	0	0	1	0	0	0
Unknown	1	0	1	0	3	0	0	1	0	0	0
Glass	1	0	0	0	0	0	0	0	0	0	0

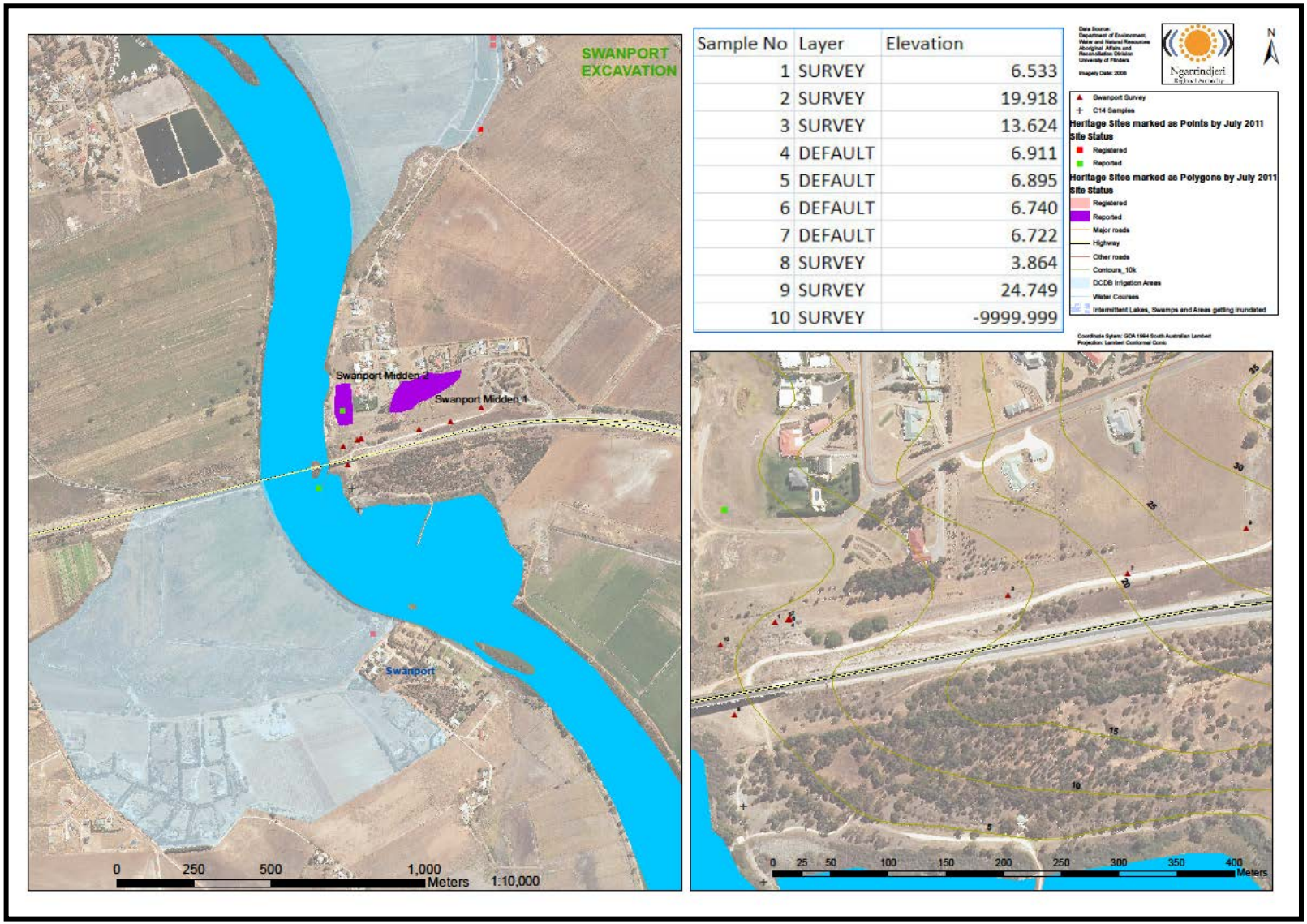


Figure 7.13 Location of Swanport Excavation, Lower Murray River (NRA 2012).

Figure 7.14 Ariel view of Swanport Midden 1 showing approximate boundaries

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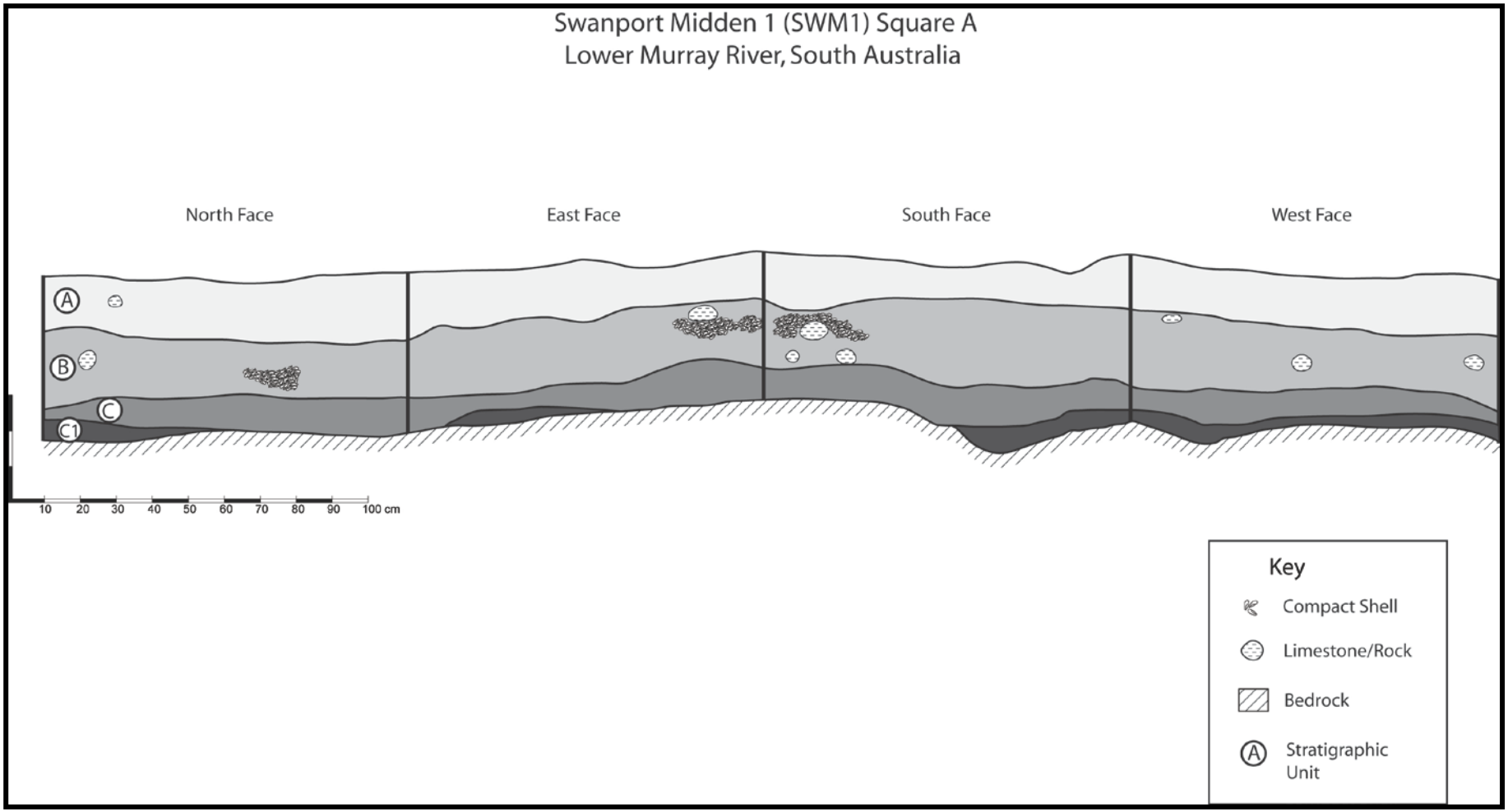
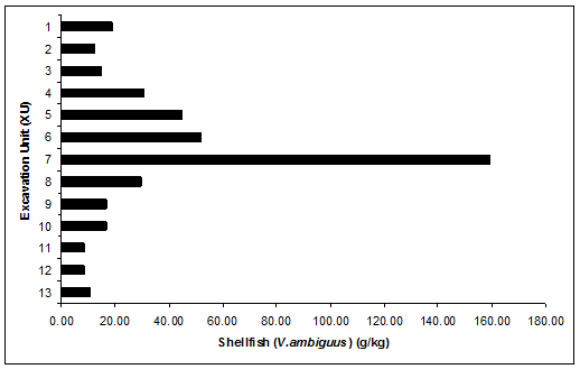


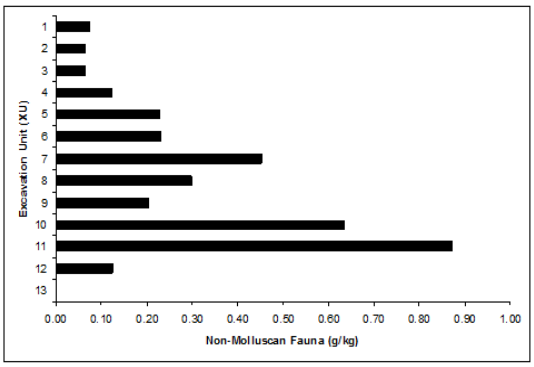
Figure 7.15 Stratigraphic section, Swanport Midden 1, Square A.

XU	Stratigraphic Layer	Munsell Colour	pH	Level of Sorting	Grain Size	Spherecity	Rounding
1	A	10 YR 3/3 Dark brown	8.5	Well	Fine	Medium	Sub-angular
2	A	10 YR 3/3 Dark brown	8	Well	Fine	High	Sub-rounded
3	A	10 YR 3/3 Dark brown	8	Well	Fine grained sand with occasional very fine grains	Fine = high; Very fine = high	Fine = sub-rounded; Very fine = sub-rounded
4	A	10 YR 3/2 Very dark greyish brown	8	Well	Fine	High	Sub-rounded
5	B	10 YR 3/2 Very dark greyish brown	8	Well	Fine	High	Sub-rounded
6	B	10 YR 3/2 Very dark greyish brown	8.5	Well	Fine	High	Sub-rounded
7	B	10 YR 4/3 Brown	8.5	Well	Fine	High	Sub-rounded
8	B	10 YR 4/2 Dark greayish brown	8.5	Well	Fine	Medium	Sub-rounded
9	C	10 YR 4/2 Dark greayish brown	8.5	Well	Fine grained sand with occasional medium grains	Fine = medium; Medium = medium	Fine = sub-rounded; Medium = sub-angular
10	C	10 YR 4/3 Brown	8.5	Well	Fine	medium	Sub-rounded
11	C	10 YR 4/2 Dark greayish brown	8.5	Well	Fine	High	Sub-rounded
12	C1	10 YR 4/3 Brown	8.5	Well	Fine	High	Sub-rounded

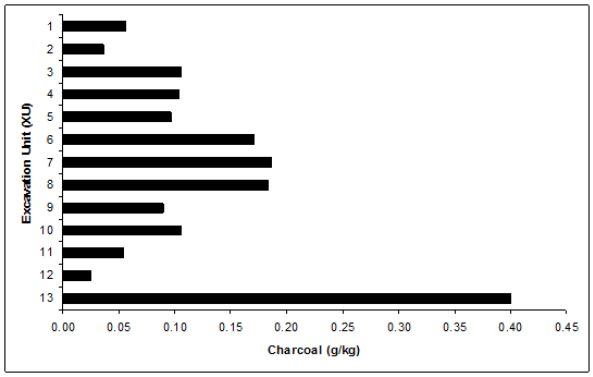
Figure 7.16 Swanport Midden 1, Square A Sediment Analysis.



Volumetrically adjusted weights of shellfish recovered from SWM1, Square A.

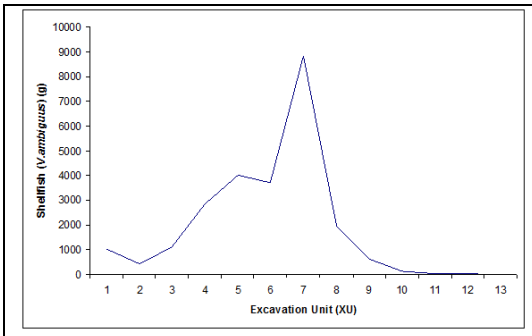


Volumetrically adjusted weights of faunal remains (inc. fish and terrestrial) recovered from SWM1, Square A.

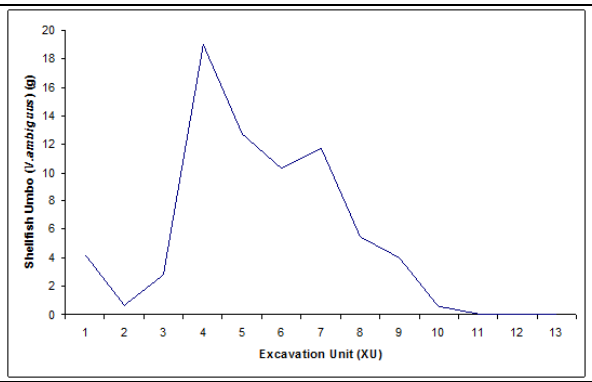


Volumetrically adjusted weights of charcoal recovered from SWM1, Square A.

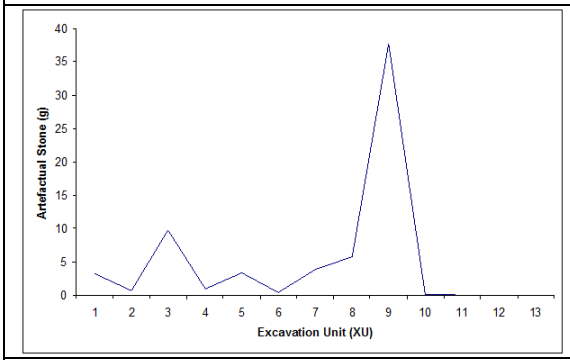
Figure 7.17 Volumetrically adjusted weights for cultural materials from SWM1, Square A.



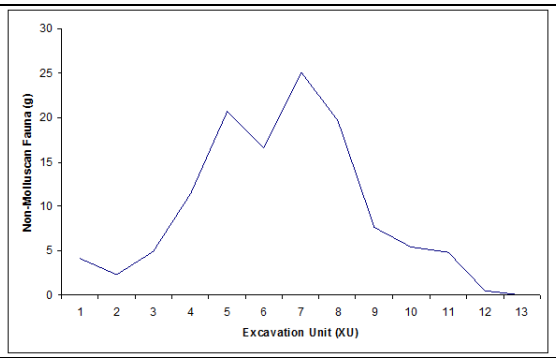
Abundance of shellfish (*Velesunio ambiguus*).



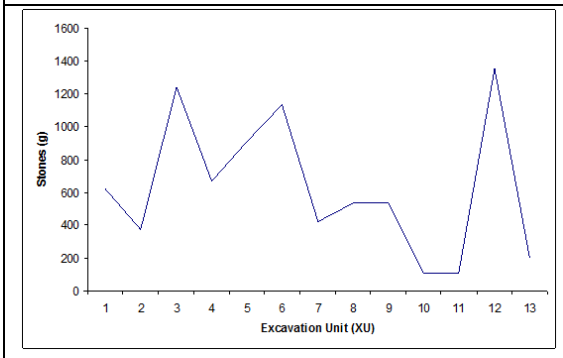
Abundance of umbo (*Velesunio ambiguus*) recovered.



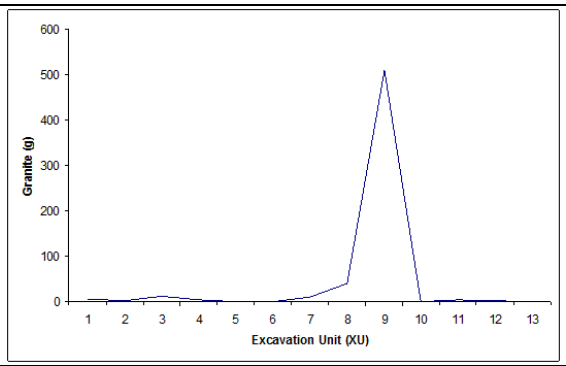
Abundance of artefactual stone.



Abundance of non-molluscan fauna.

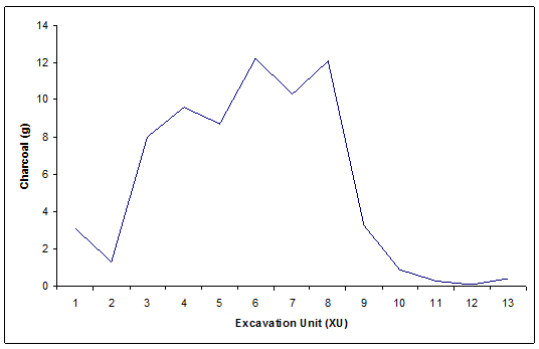


Abundance of non-artefactual stone.

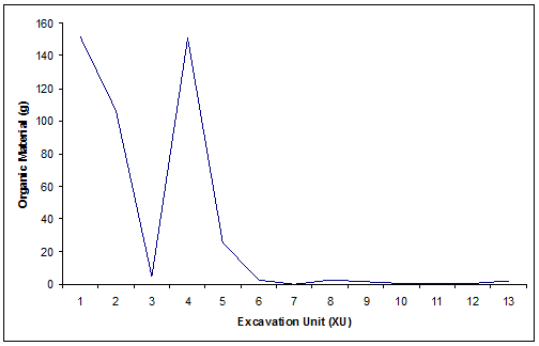


Abundance of granite.

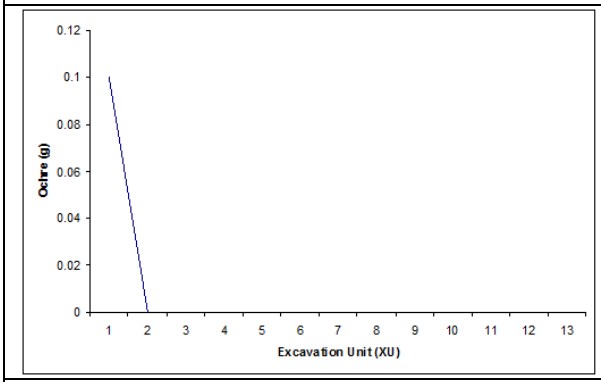
Figure 7.18 Abundance of cultural materials at SWM1, Square A.



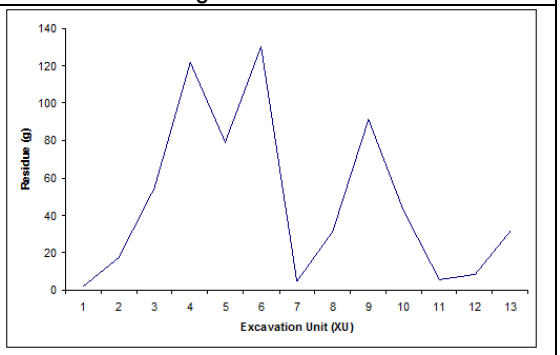
Abundance of charcoal.



Abundance of organic material.



Abundance of ochre.



Abundance of residue (<1mm).

Figure 7.19 Abundance of organic materials at SWM1, Square A.

Table 7.10 Summary of cultural materials from GLMBS/SQA.

SU	XU	Stones		Shell		Umbo		Bone		Stone Artefacts		Charcoal	
		g	g/kg	g	g/kg	g	g/kg	g	g/kg	g	g/kg	g	g/kg
A1	1	2670	108.54	890	36.18	0.1	0.00	0.8	0.03	1	0.04	<0.1	0.00
B/A2	2	1020	6.88	24,840	167.50	9.6	0.06	23.8	0.16	3.3	0.02	10.8	0.07
	3	280	3.61	8610	110.95	3.2	0.04	0.1	0.00	4.4	0.06	5.8	0.07
C	4	140	1.44	5210	53.44	3.8	0.04	13.3	0.14	5.1	0.05	4	0.04
	5	10	0.09	4990	43.58	5.2	0.05	13.1	0.11	21.1	0.18	6.8	0.06
D	6	0.8	0.04	550	29.10	1	0.05	1.5	0.08	3.5	0.19	2	0.11
	7	5.2	0.05	2090	20.69	8.8	0.09	7.9	0.08	0.4	0.00	6	0.06
E	8	0.4	0.01	1180	20.74	3	0.05	2.9	0.05			3.2	0.06
	9	0.8	0.01	1050	16.56	11.7	0.18	6.3	0.10			6	0.09
	10			261.9	3.90	0.4	0.01	1.2	0.02	0.1	0.00	0.9	0.01
	11			147.3	2.46	0.7	0.01	0.2	0.00	0.1	0.00	1.9	0.03
	12			45.7	0.76			0.2	0.00			0.5	0.01
	13			113.7	1.24	0.1	0.00	0.3	0.00			1.5	0.02
	14			82.7	1.32							11.9	0.19
	15a	0.2	0.00	19	0.33							0.5	0.01
	15b	0.2	0.03	5.2	0.90							4.7	0.81
	16	0.4	0.01	18.4	0.32	0.1	0.00					0.5	0.01
	17			9.6	0.17							0.5	0.01
	18			7.9	0.11	0.1	0.00					0.3	0.00
	19	0.4	0.00	26.9	0.21	0.1	0.00	0.1	0.00			0.2	0.00
	20												
	21			0.6	0.02								
Total		4127.2	120.7	49,819.2	505.10	47.5	0.59	71.1	0.77	39	0.55	68	1.7

Table 7.11 Summary of faunal remains from GLMBS/SQA.

SU	XU	MURRAY COD (g)	GOLDEN PERCH (g)	TURTLE (g)	REPTILE (g)	FISH (g)	RODENT (g)	TERRESTRIAL (g)	UNKNOWN (g)
A1	1		0.4					0.2	0.2
B/A2	2	1.2				2.2		0.4	20.1
	3	0.1							
C	4	1.0	0.2			5.2		0.6	6.3
	5			0.3		6.3		0.1	6.4
D	6					0.6		0.4	0.5
	7					3.0	0.2		4.7
E	8				0.1	2.3	0.1		0.4
	9					1.8			4.5
	10					0.1			1.3
	11								
	12					0.3			0.2
	13								0.1
	19								
	Total	2.3	0.6	0.3	0.1	21.8	0.3		44.7

7.11 Pomberuk (Hume Reserve) Complex

7.11.1 Site Description and Setting

The *Pomberuk* (Hume Reserve) Complex is located ca 1 km southeast of the Murray Bridge township, and comprises a shell midden and the ruins of historic buildings that were built to the east of the midden. This was a campsite for Ngarrindjeri people up until the 1940s and therefore represents a site of 'memory' and 'resistance'. Approximately 200 m southeast of *Pomberuk* is a large granite boulder of high cultural significance for Ngarrindjeri people as it relates to the journey of *Ngurunderi*. Recently, the Ngarrindjeri produced a management plan for the area which captures the broader philosophy of Ngarrindjeri culture:

> The land, waters, people and all living things are connected. *Pomberuk* has deep spiritual, cultural and historical significance to the Ngarrindjeri people — past, present and future. It is an important place of cultural teaching on the banks of Murrundi (the Murray River) and on the nurseries (wetlands) created by Ngurunderi (the Creator and Lawgiver) and Pondi (the Murray Cod Ancestor). *Pomberuk* and Ngarrindjeri people are part of the same living body. (NRA 2009:4)

7.12 Pomberuk (Hume Reserve) Midden and Historic Campsite

The site is situated atop limestone cliffs overlooking a narrow river flat and wetland area adjacent the Murray River and covers an area measuring ca 250 x 100 m. Shell material and stone artefacts are visible on the surface and vary in density. Historical remains are also present and are both the result of building in the area before the 1950s as well as construction of more modern buildings for contemporary public use. There has been some disturbance to the site including land clearance for farming and irrigation; and it later became a public space for docking boats. At present, the ruins of a clubroom, public toilet and a public road which cuts through part of the site are evident.

7.12.1 Radiocarbon Dating and Chronology

A total of six samples were dated from this site: three *V. ambiguus* and two charcoal samples from *Pomberuk*, Square A, which included two paired samples in XU2 and XU4 (Table 7.12). Upper and lower ages for this square are between 4300–4780 to 6210–6410 calBP, respectively. This demonstrates a relative chronological sequence for POM/SQA. There is a relative age-depth relationship for the radiocarbon sequence for the deposit. Only one *V. ambiguus sample* was obtained for *Pomberuk*, Square B, as the deposit contained minimal amounts of shell and charcoal. The age for this sample was reported at 150–490 calBP (Table 12). The age indicates that occupation is

more recent towards the eastern end of the site near the historic remains and there are no other dates to compare this with for this deposit.

Table 7.12 Radiocarbon dates for *Pomberuk*.

SQUARE	XU	DEPTH BELOW SURFACE (CM)	LAB. NO.	SAMPLE MATERIAL	d13C	^{14}C age	CAL. AGE
A	2	15	ANU-6535	*V. ambiguus*	-11	4140±70	4430–4820
A	2	15	ANU-6536	*Charcoal*	-22	4055±40	4300–4780
A	4	25	ANU-6537	*V. ambiguus*	-11	4295±50	4580–4960
A	4	25	ANU-6538	*Charcoal*	-27	4210±40	4620–4830
A	10	56	ANU-6606	*V. ambiguus*	-7	5575±50	6210–6410
B	3	20	ANU-6607	*Charcoal*	-23	300±55	150-490

7.12.2 Pomberuk (Square A) Cultural Deposit and Stratigraphy

A total of two 1 x 1 m test pits were established (Squares POM/SQA and POM/SQB). POM/SQA was established towards the western end of the midden adjacent the river near a limestone water tank stand that is still relatively undisturbed. A total of 11 excavation units were removed to a total depth of 60 cm below surface, at which depth limestone bedrock was reached (Figure 7.18). Four distinct stratigraphic units were apparent:

Stratigraphic Unit 1: Comprises predominantly of very silty brown top soil (pH of 4.0–8.5) in XU1 and XU2, with fibrous roots in XU1 and minimum amounts of highly fragmented mussel shell in XU2.

Stratigraphic Unit 2a: Comprises XU3–XU5 and consists of compact shell lenses interspersed with silty grey sediment with some fibrous roots (pH 8.5–9.0). Shell remains in this SU are fragmented.

Stratigraphic Unit 2b: This SU is a distinct pocket observed in the northern wall of the deposit and is part of the sediment of SU2, however there was very little to no cultural material present in this section of the deposit.

Stratigraphic Unit 3: Comprises XU6–XU11 and consists of light brown silty sediment more compact than previous layers. pH is 8.0–8.5. Limestone nodules increase throughout this SU and the density of shell materials decrease relatively and become sterile towards the base of the unit. No root or other intrusions are evident.

There is strong evidence to suggest that there is a high degree of stratigraphic integrity at POM/SQA. The dense layer of *V. ambiguus* across SU2a which was horizontal and compact; and, only a small intrusion was were

encountered during the excavation. The only disturbance noticable was fibourous roots during the uppermost 20 cm. There was a well-moderate level of sorting for th sediments within the deposit and the pH levels were consistent throughout with 8.0–9.0 from XU2–XU11 (Figure 7.19).

7.12.3 Cultural Materials

A range of cultural materials were identified in POM/SQA with a relatively high concentration of non-molluscan faunal remains present. Other cultural remains included non-molluscan faunal remains, stone artefacts, charcoal, granite, ochre and organic material (Figure 7.20).

By weight, shellfish were the most dominant material present with a total of 27,166.4 g recovered. Shellfish, all from *V. ambiguus*, were dominant in XU1–XU5 with a peak in XU3 (Figure 7.21). There were no whole shell valves present though a total of 1406 umbos were identified, with an MNI of 703. A total of 2878 pieces of non-molluscan faunal remains weighing 393.5 g were recovered from POM/SQA. The greatest quantities were rcovered from XU3, with a relative decrease in weight for subsequent XUs (Figure 7.22).

Fish bone made up the majority of the vertebrate assemblege consisting of 1727 bone fragments with a total weight of 307.4 g (Figure 7.23), a MNI of 12 and a NISP of 179. Identified taxa include Murray cod (*M. peeli*) from otoliths and freshwater catfish (*Tandanus tandanus*) from spines. Otoliths were present in XU2–XU5. Of the 14 fish otoliths recovered, 13 were identified as Murray cod and the remaining as either Murray cod or trout cod. Six of the otoliths were sectioned (see Disspain 2009) and the FTL ranged from 685.51–1770.43 mm. Other vertabrate remains recovered include turtle carapace (n=6) from XU2–XU5, kangaroo teeth (n=3) from XU5 and XU6, snake vertebrae (n=5) from XU2, XU3 and XU6, and rodent dentary (n=1) in XU6. Ten unidentified teeth were also recovered between XU1–XU6.

Stone artefacts were most abundant in XU3 (Figure 7.24). The dominant raw material recovered for stone artefacts was crystal quartz which increased in abundance from XU1 (n=45) to XU3 (n=70) with a steady decrease in abundance from XU4 (n=18) to XU8 (n=8). A similar pattern was evident for milky quartz which was high in abundance in XU1 and XU2 (n=16, 33) and steadily decreased from XU2 to XU5 (n=26, 9) but with no artefacts recovered from XU6, XU7 and XU8. The pattern is also evident for rose and opaque rose quartz; however, opaque grey and grey quartz' abundance was relatively constant between XU1 to XU4.

Smith (2010) observed a range of quartz colours which included a high quality crystal, white, citrine, translucent brown and translucent red quartz. Likewise, a range of coloured chert was present, and there was one chalcedony artefact present in XU4. A total of 14 tools were identified by Smith (2010) in POM/SQA: backed flakes (n=6), geometric microliths (n=5), blades (n=2) and a pirri point (n=1) (Table 15). The backed artefacts found in POMA/SQA are similar to those found at Fromm's Landing (Mulvaney 1960:61), particularly (A52013) (Smith 2010). Granite, charcoal, non-artefactual stone, ochre and organic matter was also retrieved from this deposit in small quantities but there were no other major materials evident.

Table 7.13 Summary of lithics recovered from POM/SQA/5mm.

Raw Material	XU1	XU2	XU3	XU4	XU5	XU6	XU7	XU8
Quartz	76	114	112	54	30	5	1	1
Quartzite	7	1	1	0	0	0	0	0
Chert	0	3	0	2	1	0	0	0
Silcrete	0	2	0	0	0	0	0	0
Unknown	0	0	1	1	1	0	0	0
Chalcedony	0	0	0	1	0	0	0	0
Sandstone	0	0	0	0	0	1	0	0

Table 7.14 Summary of lithics recovered from POM/SQA/3mm.

Raw Material	XU1	XU2	XU3	XU4	XU5	XU6	XU7
Quartz	25	22	47	20	10	3	0
Chert	0	0	0	0	0	0	1
Unknown	10	0	0	1	0	0	0

7.12.4 Pomberuk (Square B) Cultural Deposit and Stratigraphy

POM/SQB was established on the same baseline as POM/SQA towards the eastern end of the site adjacent the Hume Reserve Road (Figure 7.25). Eight excavation units were removed before limestone bedrock was reached at a depth of 35 cm below surface (Figure 7.26). This deposit was very shallow in Square B and was dominated by limestone and sandstone nodules. Minimal amounts of fragmented shell and cultural material were also present. The level of sorting for sediments at the site was poor–moderate with pH levels ranging from 8.0–8.5 (Figure 7.27).

Stratigraphic Unit 1: This SU consists of medium brown fine silty soil and includes XU1 and XU2. pH is 8.0–8.5, and there are roots, limestone and sandstone nodules, and very minimal amounts of shell.

Stratigraphic Unit 2: Consists of XU3 and XU4 and is a grey brown sediment which is lighter than that of SU1. pH is 8.0–8.5 and the sediment is dense and harder which includes stratified shell lenses with limestone and sandstone nodules.

Stratigraphic Unit 3: Consists of XU5–XU8, and comprises of solid limestone layers with protruding limestone rocks which are silty and chalky. pH is 8.0–8.5 and towards the base of the deposit the sediment becomes more orange brown in colour with more coarse soil evident.

There is a low degree of stratigrahic integrity for POM/SQB as there were only a small quantity of cultural materials recovered from the excavation. The deposit has no compact shell lenses and predominately consists of limestone and sandstone nodules. During excavation it was realised that this location is much closer to the base of the limestone bedrock for which the shell midden has formed. Further, the accessability of the site and close proximity of the dirt vehicle track to this excavation would have impacted on the site integrity.

Table 7.15 Summary of lithics recovered from POM/SQA/5mm.

Raw Material	XU1	XU2	XU3	XU4	XU5	XU6
Quartz	0	1	2	18	7	12
Chert	0	0	0	1	0	0
Silcrete	0	0	0	6	0	0
Glass	0	0	0	1	0	0

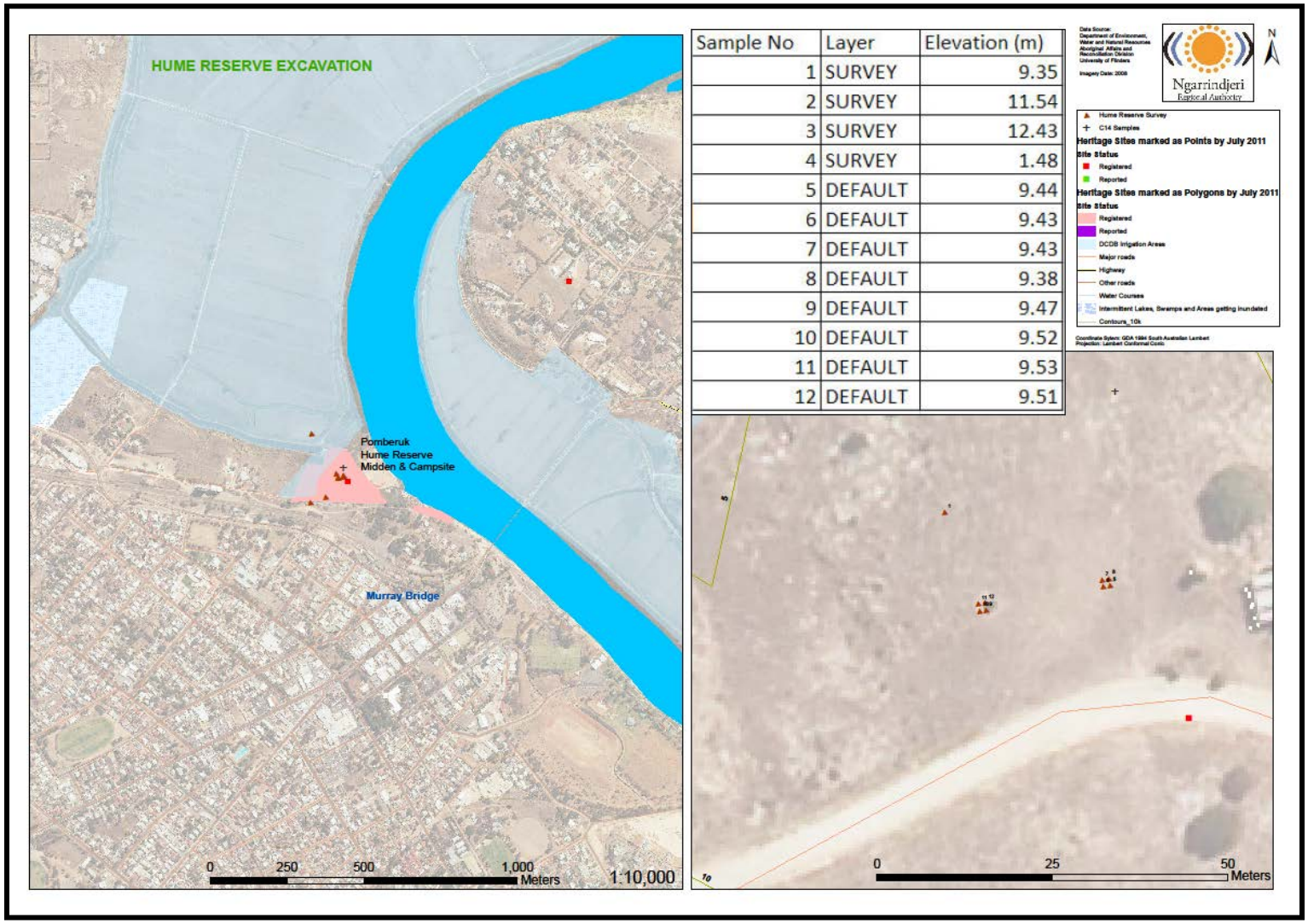


Figure 7.20 Location of *Pomberuk* (Hume Reserve) Excavation, Lower Murray River (NRA 2012).

Figure 7.21 Aerial view of *Pomberuk* showing approximate boundaries.

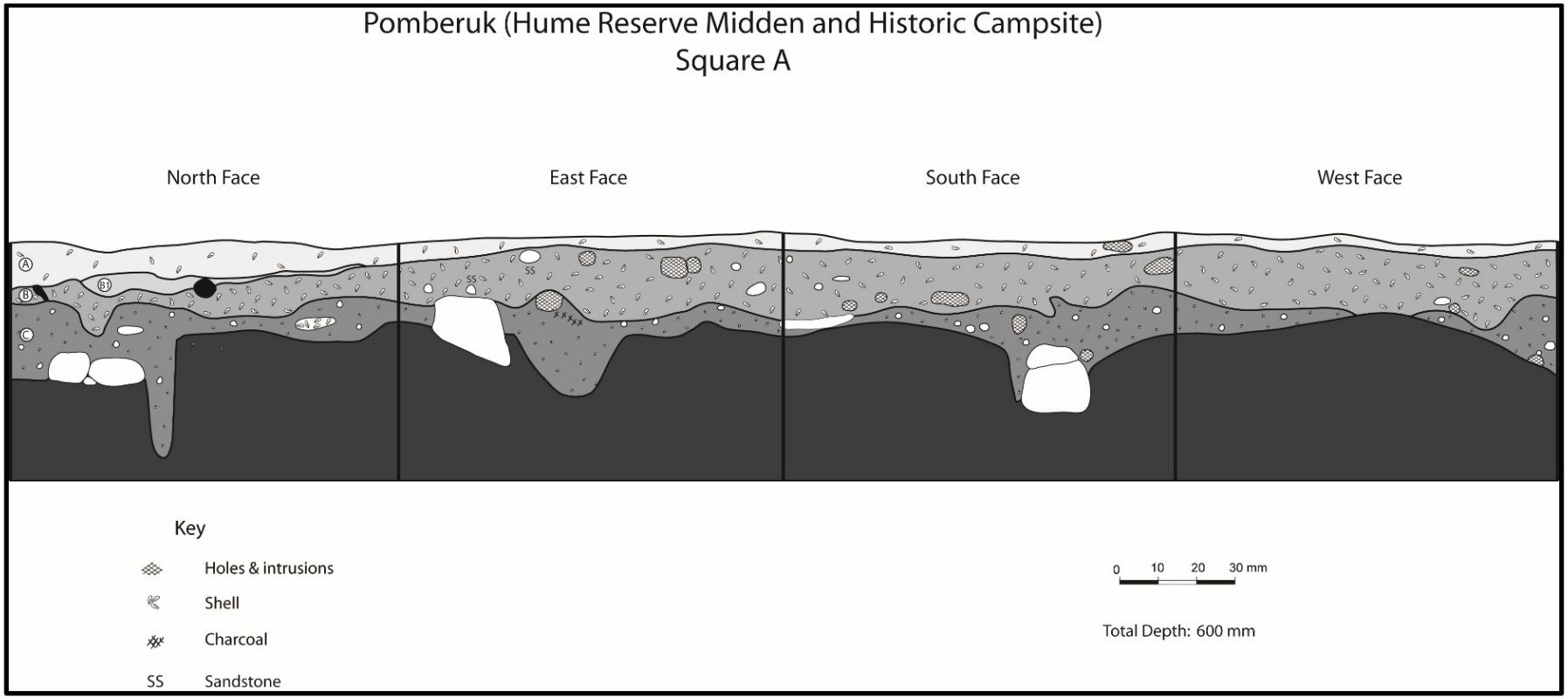


Figure 7.22 Stratigraphic section, *Pomberuk* (Hume Reserve Midden and Campsite), Square A.

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XU	Stratigraphic Layer	Munsell Colour	pH	Level of Sorting	Grain Size	Spherecity	Rounding
1	A	10YR 4/1 Dark grey	4	Well	Very fine sand	High	Very fine grains = sub-rounded
2	A	10YR 4/1 Dark grey	8.5	Well	Very fine sand	High	Very fine grains = sub-rounded
3	B/B1	10YR 4/2 Dark greyish brown	8.5	Well	Very fine sand	High	Very fine grains = sub-rounded
4	B	10YR 4/2 Dark greyish brown	9	Well-Moderate	Very fine sand	High	Very fine grains = sub-rounded
5	B	10YR 4/3 Brown	8.5	Well-Moderate	Very fine sand with occasional fine sand	Very fine grains = high Fine grains = high	Very fine grains = sub-rounded; fine grains = sub-rounded
6	C	10YR 4/3 Brown	8.5	Well-Moderate	Very fine sand with occasional fine sand	Very fine grains = high Fine grains = high	Very fine grains = sub-rounded; fine grains = sub-rounded
7	C	10YR 4/3 Brown	8.5	Well-Moderate	Very fine sand with occasional fine sand	Very fine grains = high Fine grains = high	Very fine grains = sub-rounded; fine grains = sub-rounded
8	C	10YR 4/3 Brown	8.5	Well-Moderate	Very fine sand with occasional fine sand	Very fine grains = high Fine grains = high	Very fine grains = sub-rounded; fine grains = sub-rounded
9	C	10YR 4/3 Brown	8.5	Well-Moderate	Very fine sand with occasional fine sand	Very fine grains = high Fine grains = high	Very fine grains = sub-rounded; fine grains = sub-rounded
10	C	10YR 5/3 Brown	8	Well-Moderate	Very fine sand with occasional fine sand and medium sand	Very fine grains = high Fine grains = high Medium grains = medium	Very fine grains = sub-rounded; fine grains = sub-rounded; medium grains = sub-rounded
11	C	10YR 6/3 Pale brown	8	Well-Moderate	Very fine sand with occasional fine sand	Very fine grains = high Fine grains = medium	Very fine grains = sub-rounded; fine grains = sub-rounded

Figure 7.23 *Pomberuk* (Hume Reserve Midden and Historic Campsite), Square A Sediment Analysis.

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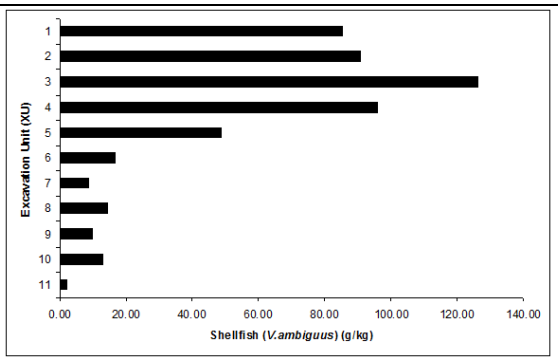
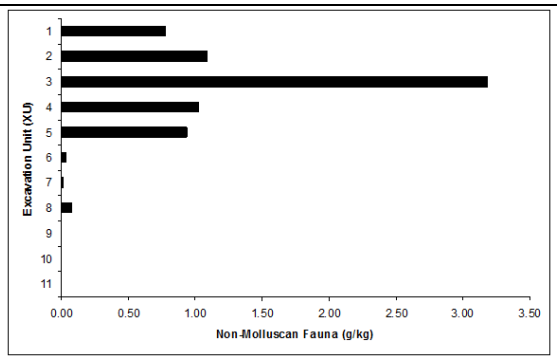
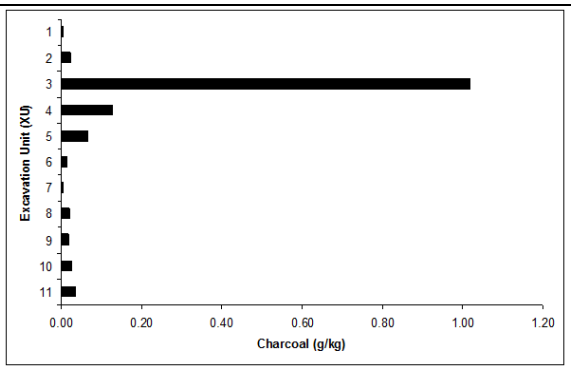
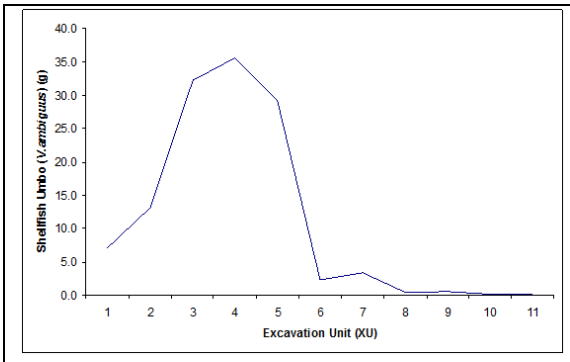
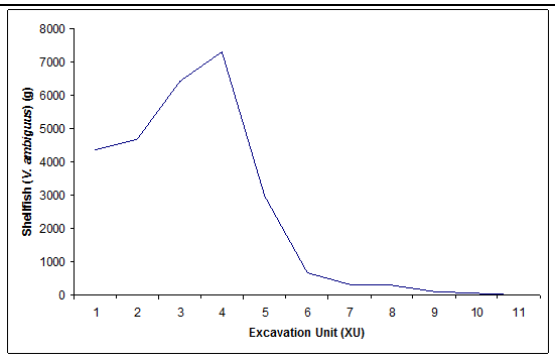
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Volumetrically adjusted weights of shellfish recovered from POM/SQA.</td><td>Volumetrically adjusted weights of faunal remains (inc. fish and terrestrial) recovered from POM/SQA.</td></tr>
<tr><td> 
</td><td></td></tr>
<tr><td>Volumetrically adjusted weights of charcoal recovered from POM/SQA.</td><td></td></tr>
</table>

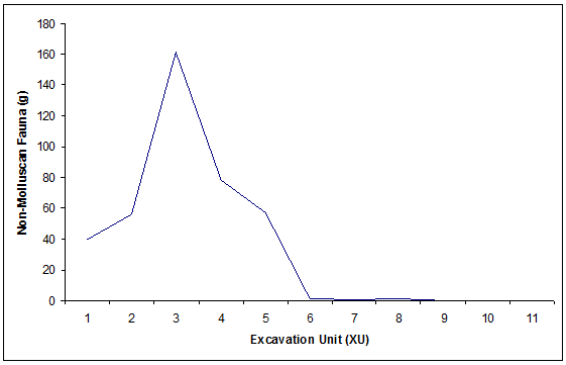
Figure 7.24 Volumetric adjusted weights for POM/SQA.



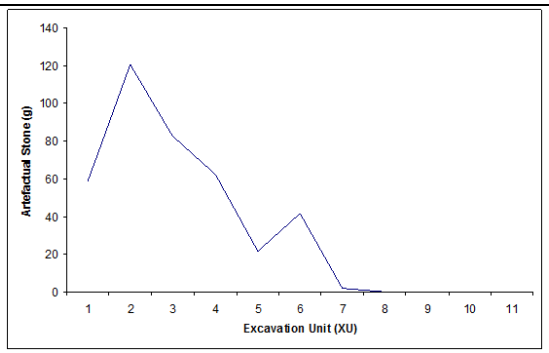
Abundance of umbo (*Velesunio ambiguus*) recovered.



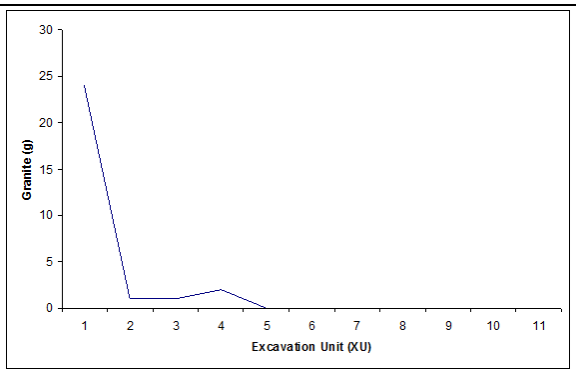
Abundance of shellfish (*Velesunio ambiguus*), POM/SQA.



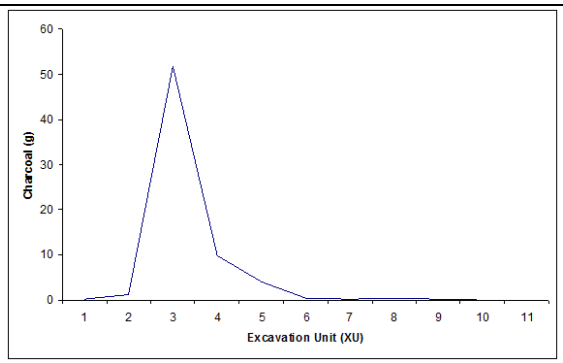
Abundance of non-molluscan fauna.



Abundance of artefactual stone.

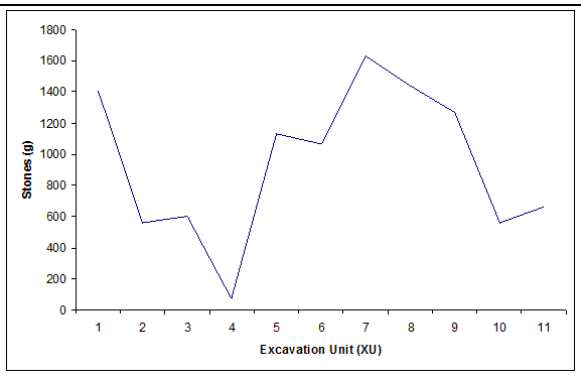


Abundance of granite.

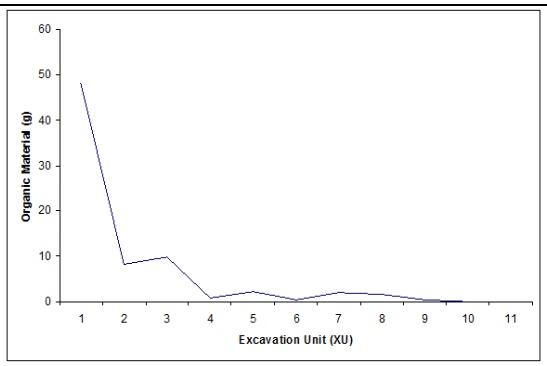


Abundance of charcoal.

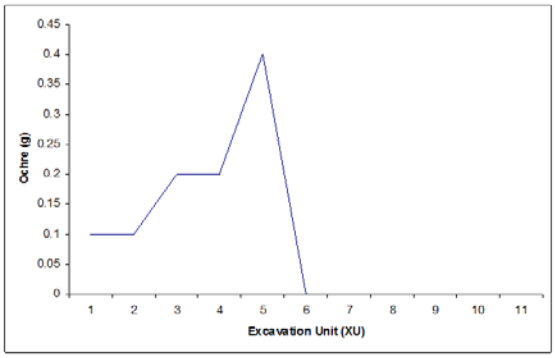
Figure 7.25 Abundance of cultural materials from POM/SQA



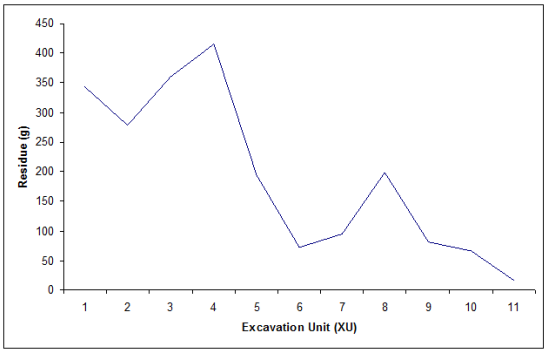
Abundance of non-artefactual stone.



Abundance of organic material.



Abundance of ochre.



Abundance of residue (<1mm).

Figure 7.26 Abundance of cultural materials from POM/SQA (continued).

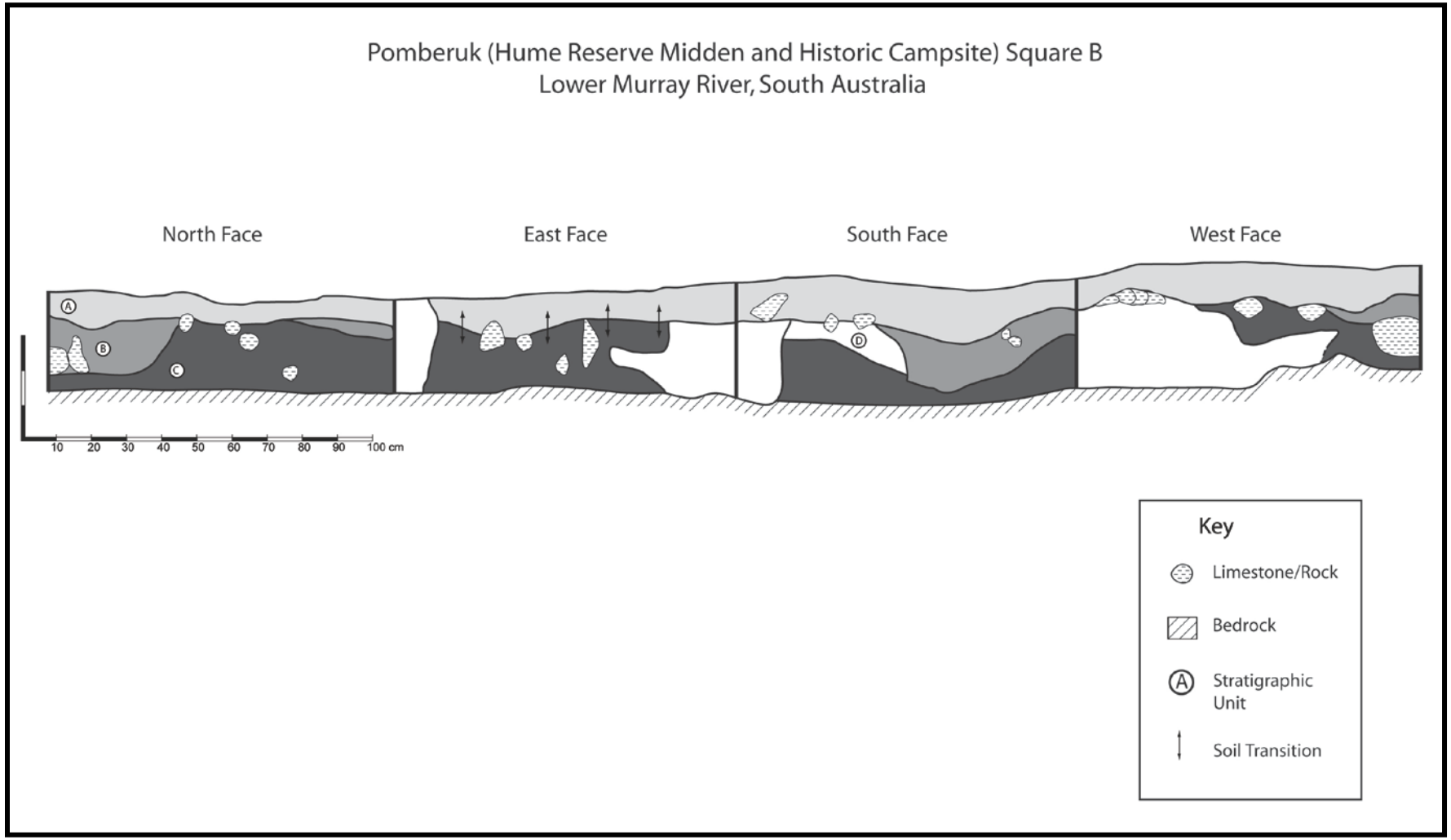
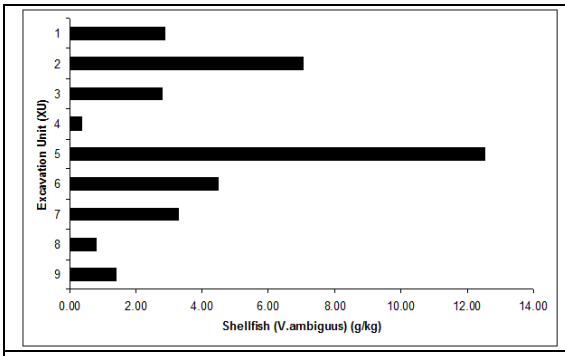


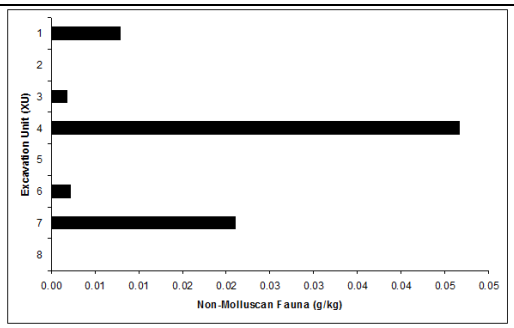
Figure 7.27 Stratigraphic section *Pomberuk* (Hume Reserve Midden and Campsite), Square B.

XU	Stratigraphic Layer	Munsell Colour	pH	Level of Sorting	Grain Size	Spherecity	Rounding
1	A	10 YR 4/3 Brown	8.5	Poor	Medium grained sand with common coarse sand	Medium grains = low; Coarse grains = medium	Mediuam grains = sub-angular; Coarse grains = sub-angular
2	A	10 YR 4/3 Brown	8	Poor	Medium grained sand with common coarse grains	Medium grains = medium; Coarse grains = medium	Medium grains = sub-rounded; Coarse grains = sub-rounded
3	B	10 YR 4/3 Brown	8	Moderate to poor	Medium grained sand with occasional fine sands	Medium grains = medium; Fine grains = high	Medium grains = sub-rounded; fine grains = rounded
4	B	10 YR 4/3 Brown	8.5	Poor	Medium grained sand with common coarse sand	Coarse grains = medium; Medium graiins = medium	Coarse grains = sub-angular; Medium grains = sub-rounded
5	C	10 YR 4/2 Dark greyish brown	8.5	Moderate to poor	Corase grained sand with common medium sand	Coarse grains = medium; Medium grains = high	Coarse grains = sub-angular; Medium grains = sub-rounded
6	C	10 YR 5/3 Brown	8	Moderate	Medium grained sand with occasional fine sands	Medium grains = low; Fine grains = medium	Medium grains = angular; fine grains = sub-angular
7	C	10 YR 6/4 Light yellowish brown	8	Moderate	Coarse grained sand with occasional very coarse sand	Coarse grains = high; Very coarse grains = high	Coarse grains = sub-angular; Very coarse grains = sub-angular
8	C	10 YR 8/4 Very pale brown	8.5	Moderate to poor	Corase grained sand with common medium sand	Coarse grains = high; Medium grains = high	Coarse grains = sub-angular; Medium grains = sub-angular

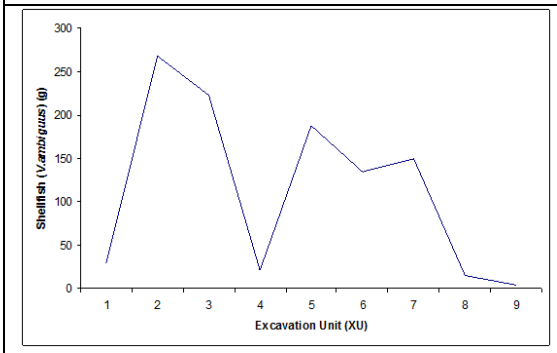
Figure 7.28 *Pomberuk* (Hume Reserve Midden and Historic Campsite), Square B Sediment Analysis.



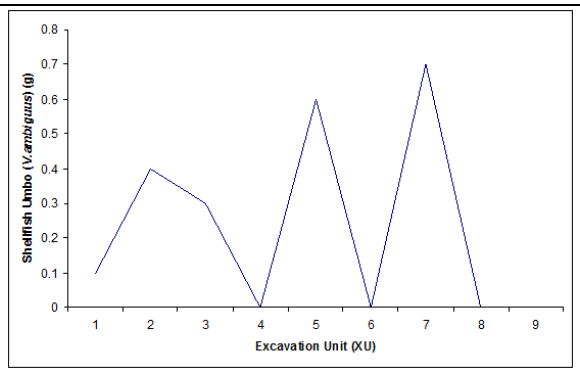
Volumetrically adjusted weights of shellfish recovered from POM/SQB.



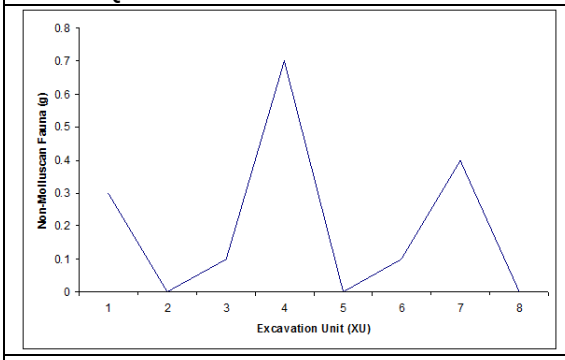
Volumetrically adjusted weights of faunal remains (inc. fish and terrestrial) recovered from POM/SQB.



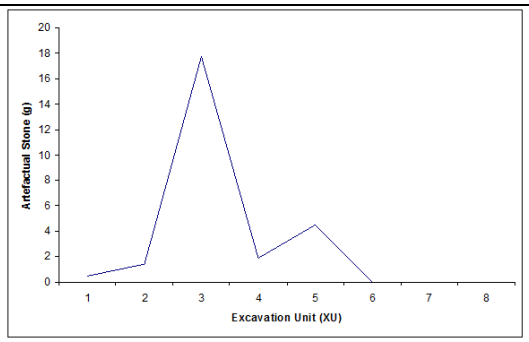
Abundance of shellfish (*Velesunio ambiguus*), POM/SQB



Abundance of umbo (*Velesunio ambiguus*) recovered.

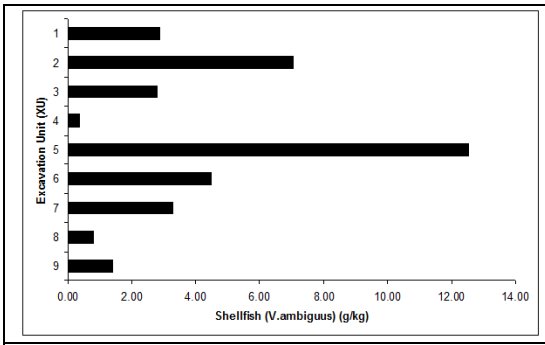


Abundance of non-molluscan fauna.

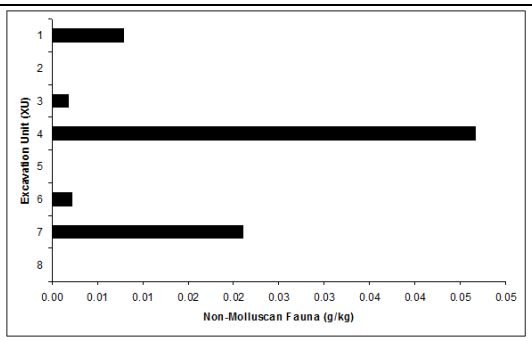


Abundance of artefactual stone.

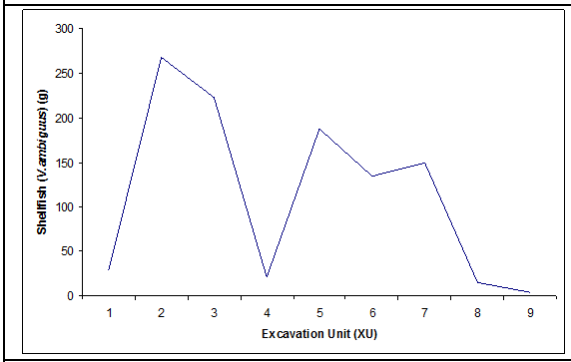
Figure 7.29 Abundance of cultural materials from POM/SQB (Continued).



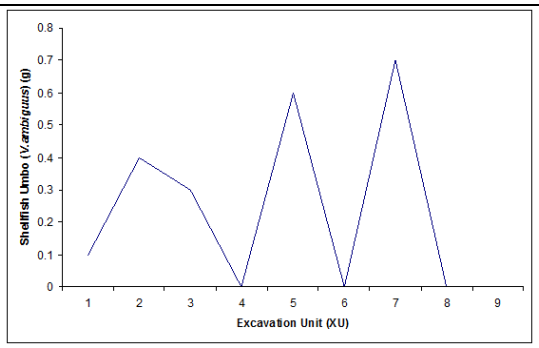
Volumetrically adjusted weights of shellfish recovered from POM/SQB.



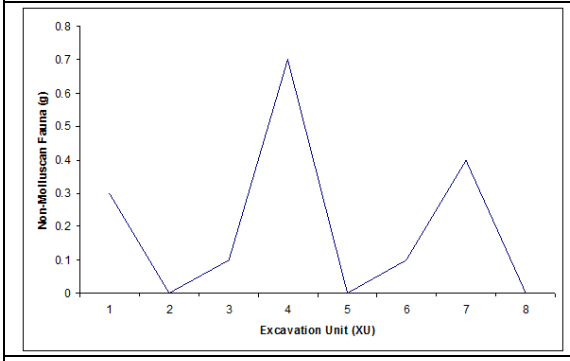
Volumetrically adjusted weights of faunal remains recovered from POM/SQB.



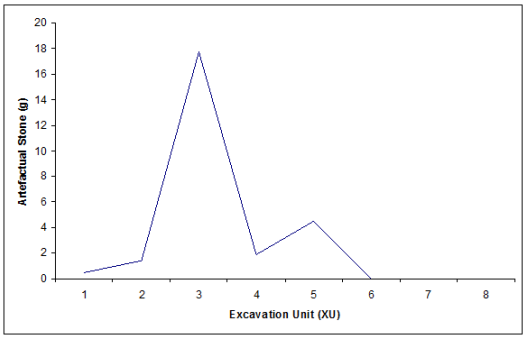
Abundance of shellfish (*Velesunio ambiguus*), POM/SQB



Abundance of umbo (*Velesunio ambiguus*) recovered.



Abundance of non-molluscan fauna.



Abundance of artefactual stone.

Figure 7.30 Abundance of cultural materials at Pomberuk (Hume Reserve), Square A.

7.13 Column Samples

The egg shells of emu (*Dromaius novaehollandiae)*, the vertebrae of a lizard (Scincidae), and fractured teeth from either a kangaroo or wallaby species (Macropodidae) were the only non-aquatic species to be represented within the GLM3 and GLM6 sites. When comparing the results to the variety of species known to be living within the Murray Valley, the faunal species within the site is highly non-representational. Hunting of faunal and bird species is evident at the Fromm's Landing and Devon Downs sites which display a rich faunal assemblage with 30 species identified and represented, presenting one of the richest faunal assemblages within the region (Mulvaney 1964:494). The general absence of non-molluscan fauna may be a product of preservation factors; however, the calcareous environment would have been favourable for organic preservation, and thus faunal bones should have been equally well preserved alongside the abundant shellfish (Luebbers 1978:145). As determined with the reduction of the aquatic bones, taphonomic processes are likely to explain the reduction of bone within the assemblage.

Land snail is all of the species *Theba pisana*, an introduced terrestrial Mediterranean snail. It is an edible species of medium-sized air-breathing land snail, a pulmonate gastropod mollusc in the family Helicidae. The smaller shells (conical, with smooth shell surface) are most likely to be *Angrobia* sp. (Hydrobiidae), and the larger ones with sculptured shells are *Thiara balonnensis* (Thiaridae).

For the purposes of this thesis, the column samples were not included in the overall analysis and interpretation of the research owing to time constraints, community decisions regarding further research and analysis expenses.

7.14 Summary

As evident in this chapter, standard archaeological methods and techniques were adopted for surveys and sampling for the Lower Murray region. However, these were carried out under the direction of Ngarrindjeri elders and community members to address specific questions related to Ngarrindjeri cultural heritage management and planning for the community as a whole. Having now presented the methods used in this thesis, the research results are presented in the following chapter.

The results and analysis provide physical archaeological evidence of occupation and life ways in the Lower Murray River spanning the early Holocene (8500 years BP) to the present. This information is invaluable for the Ngarrindjeri community who are developing broader scale chronologies and databases that are culturally appropriate and which address cultural questions and issues related to Ngarrindjeri knowledge and epistemologies. As outlined by the NRA

in the Sea County Plan, the philosophy of all things living are connected also include archaeological places as they are viewed as another layer of cultural, historical and political value for the community.

A critical component of the strategy was to separate observations from inferences to distinguish between ‘what’ was ‘observed’ and ‘how’ it ‘unfolded’ for analytical purposes. Indexing was also applied to provide quick reference and for future data analysis for the community to make available to other researchers, students and community members upon formal request to the NRA., data selection — it is understood that inductive and deductive approaches are applicable in video analysis which distinguishes between narrative evolving approaches to video selection. As a result, video segments for this thesis represent ‘events’ which allows the selection process to determine which events are brought into focus for deeper analysis.

> It is noted that the existing site cards are not comprehensive and relate primarily to the physical/archaeological aspects of the area. Wilson's research is taking these preliminary investigations further, and importantly, in the course of the development of this management plan, the cultural and spiritual significance of the *Pomberuk*/Hume reserve area has been articulated by the Ngarrindjeri Regional Authority and Ngarrindjeri Elders. (NRA 2009:18)

This chapter provides a holistic interpretation of the Lower Murray River by presenting multiple narratives that have emerged from results, analysis and the development of a Ngarrindjeri Archaeological Standpoint specific for this thesis. The discussion and subsequent interpretations of the archaeological record provide a focal point for the researcher and Ngarrindjeri community to engage in dialogue regarding Ngarrindjeri archaeological, cultural, historical and political histories relevant to each complex. Further, it provides an insight into how the philosophical and methodological approach adopted for the thesis creates a space for intellectual engagement regarding a more recent phenomenon — Indigenous people undertakes archaeological research in, with and for their community. It is argued here that archaeology, as a colonial practice, has an opportunity to re-negotiate notions of power, authority and representation at the cultural interface.

8.1 Ngarrindjeri Cultural and Archaeological Workshop

The narratives told by Ngarrindjeri Elders and community members either present during surveys and/or involved in excavation, analysis and workshops were also noted, cross referenced where possible and analysed in addition to the survey ''data' (see Table 8.1). Information regarding people's relationship/s to *Ruwe/Ruwar* (based on lived experiences and/or knowledge learnt) specifically were recorded in reference to archaeological sites which are characterised under five broad themes which provided the basis for the focus questions for the Ngarrindjeri Cultural and Archaeological Workshop and video recording:

- *Creation knowledge* – through an understanding of *Ngurunderi* and the chase for *Ponde* which formed the Lower Murray landscape;
- *Granite* – being the physical remnants of *Ngurunderi's* footprints as he chased *Ponde* downstream. The presence of granite is strongly associated with deep spiritual significance and ceremony;
- *Birthplace* – some areas were identified as the birthplace of parents and grandparents within living memory
- *Gendered* – some places were strongly viewed as having more significance for one particular gender which was associated with ceremony; and,

- *Political* – many places have a political history representing colonisation and the impact of Ngarrindjeri campsites and spaces of cultural enjoyment. This includes research and the endless struggle that Ngarrindjeri people have encountered.

There are several places within the study region that had cultural significance for Ngarrindjeri Elders and community members involved in the research. The key Elders who provided information and knowledge associated with these places included Uncle Marshall Carter and Uncle Tom Trevorrow. Themes that emerged from elders included *Ngurunderi's* footprints, Mason's Rock, *Ponde*, *Mulywonk*, Albert Karloan and *Pomberuk*, and the relevance of Swanport to the Granite Boulder, Ngarrindjeri names of places and representations of cultural practices by elders such as Uncle Marshall Carter during their lived memory (see Figure 7.33). All of which is understood through a Ngarrindjeri philosophy of Ruwe/Ruwar. The passing of elders made it difficult to progress the analysis of workshops any further and could not be included into the final production of the thesis but will be further investigated when appropriate cultural and family permissions are allowed.

Table 8.1 Archaeological material recorded showing socio-cultural relationships to *Ruwe/Ruwar* identified during surveys.

Location	Landform	Archaeological Material					Ngarrindjeri Socio-Cultural Indicators				
		Freshwater Mussels	Aquatic Fauna	Terrestrial Fauna	Stone Artefacts	Burials	Creation Knowledge	Granite	Birthplace	Gendered	Political
Mypolonga	floodplain	*					*				
Toora	floodplain	*					*				
Murray Bridge	fluvial terrace floodplain	*				*	*	*	*		*
Swanport	floodplain	*	*	*	*	*	*	*		*	*
Pomberuk	fluvial terrace limestone	*	*	*	*		*	*			*
Pompoota	fluvial terrace	*				*	*				
Sunnyside	fluvial terrace	*	*	*	*	*	*				
Murrawong	floodplain	*	*	*	*	*	*				
Long Flat	floodplain	*					*				
Montieth	floodplain	*					*	*	*		
Burdett	floodplain	*					*				

Figure 8.1 Uncle Marshall Carter interpretation of the Study Region (map courtesy of NRA 2013).

8.2 Radiocarbon Ages and Chronologies

Radiocarbon ages varied significantly between sites within the region and ranged from 150–490 calBP at *Pomberuk* to 8190–8390 calBP at GLMBS. The age ranges for the surface and sub-surface samples from sites across the Lower Murray vary significantly with a majority of calibrated dates ranging from 510–630 calBP at Mypolonga Flat Midden 2 (ANU-6513) to 7010–7280 calBP at GLBS. Only three samples reported ages under 1000 calBP: GLM3-ss14 (ANU-3116) which ranged from 560–660 calBP and GLM3-ss14(r) (ANU-2736) ranging from 660–730 calBP. Overall, the surface samples show evidence for occupation that spans the mid-late Holocene, with the earliest ages obtained from in situ samples collected from stratified deposits above an in situ burial at GLBS. The shell artefact was dated to 5750–6180 calBP and thus represents the oldest recorded shell artefact for the region. Radiocarbon ages for all excavated samples fell within a range between 150–490 calBP at POM/SQB (ANU-6607) to 8190–8390 calBP at GLMBS/SQA (ANU-3119) (see Figures 8.1 and 8.2). The discrepancy related to the lack of recent dates and artefacts related to historical period that Ngarrindjeri have specific knowledge about is related to the widespread destruction of post-colonial activities across the Lower Murray including farming, irrigation, construction of the levy banks and urban development.

The earliest age for occupation was obtained from *Murrawong* GLMBS/SQA/XU14 at 8190–8390 calBP (ANU-3119) from a small hearth feature for which a paired shell/charcoal sample was obtained. The shell sample was also similar in age dated at 8050–8350 calBP (ANU-3120). The dates for XU1 are slightly older than XU2 but given the amount of disturbance on the surface of the site the date for XU2 is considered more reliable. There is also an inverted date for UX19, which was a very small V. ambiguus sample collected from a unit that had very minimal cultural materials. At POM/SQA there is a mid-Holocene cultural sequence with initial occupation beginning at 6210–6410 calBP (ANU-6606). Although the deposit terminates at 4430–4820 (ANU-6535) there is a charcoal sample taken from POM/SQB dated at 150–490 (ANU-6607) and thus providing evidence for more recent occupation. No other samples were submitted for radiocarbon dating for SQB. SWM1 also has a mid-Holocene sequence with two inverted dates at XU2 and XU9. Similarly, to GLMBS, there has been disturbance at the surface of the site, which could explain the inverted date for XU2.

There is a clear pattern that emerges from the archaeology of the Lower Murray that provides a chronology of occupation that spans 18,000 years BP–present. The Roonka burial site provides evidence for changes in social behaviour through the preference of burial modes and as well as changes in site use over time. Further, it is evident that people continued to occupy Roonka and the surrounding region until the recent past. The rock shelters at Devon Downs and Tartanga contribute to this regional occupation and provide evidence for cultural change and social

expression which includes rock engravings, the use of bone implements, the process of trading raw materials and changes in stone tool technology — all of which occurred during the Holocene. The new radiocarbon ages between 8190–8390 calBP and 150–490 calBP collected further south support this narrative. In relation to the surface samples there was a broad range of minimum ages reported across various sites in the region demonstrating that site integrity is evident for some open sites. However, the radiocarbon ages for the excavation deposits suggest continuous use from ca 8400 years BP but termination during the mid- to late Holocene. Possible explanations for this are currently being investigated but it is most likely that farming, irrigation and natural erosion are all contributing factors for an absence of a more recent record.

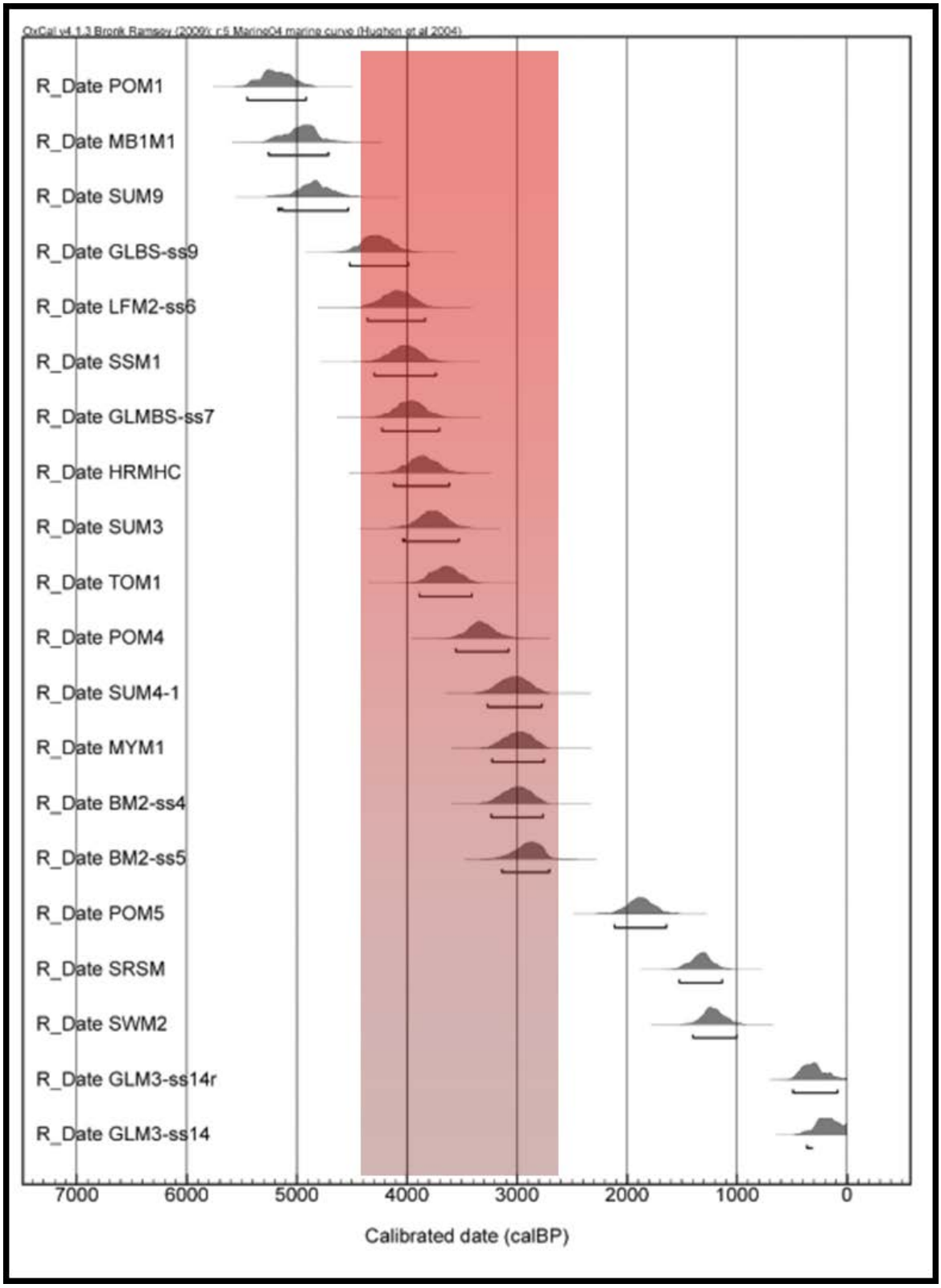


Figure 8.2 Overview of surface samples collected for radiocarbon dating show mean age range.

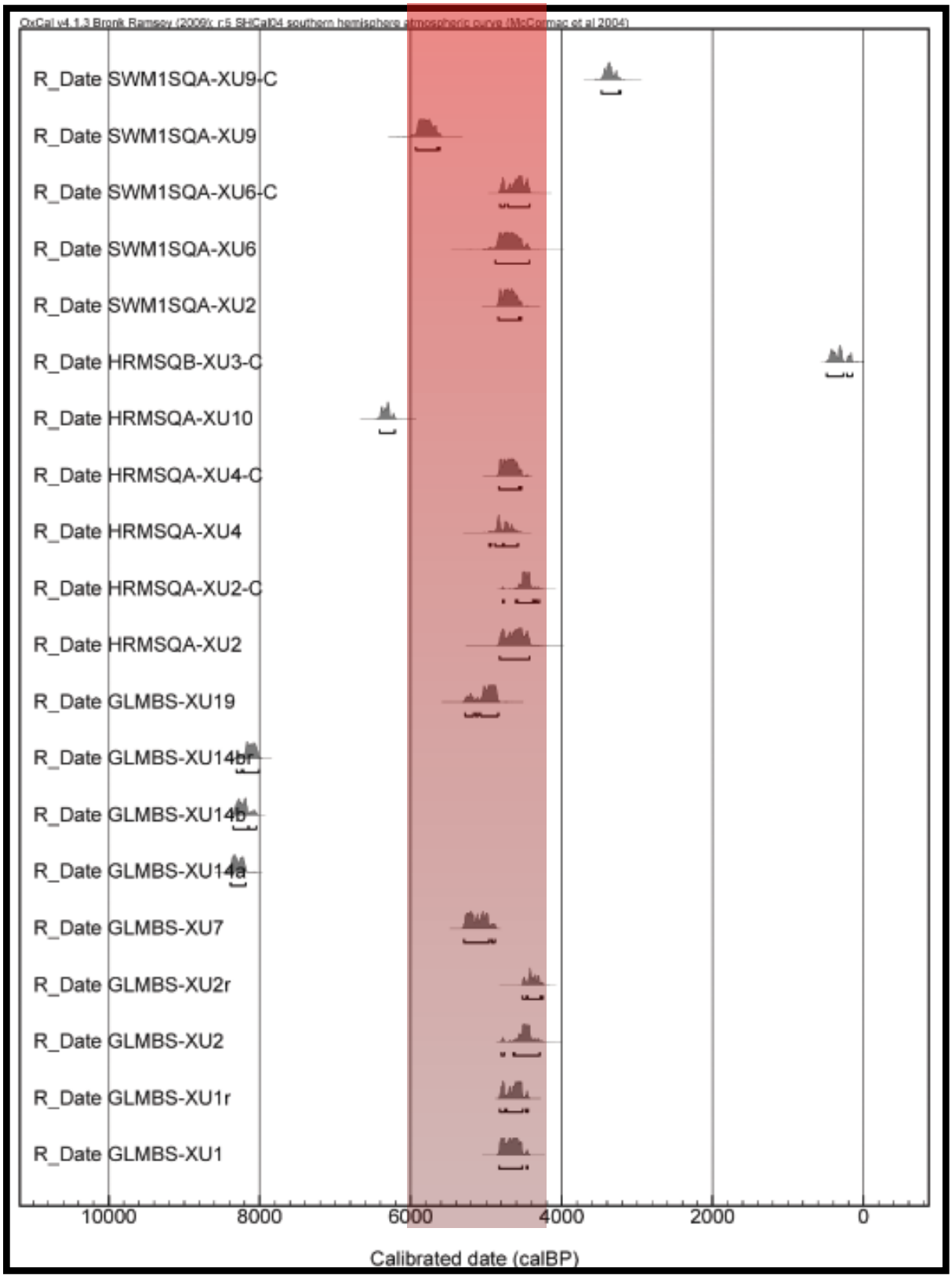


Figure 8.3 Overview of excavated samples showing mean age range.

8.3 Shellfishing Strategies and Resource Use

In total, 2304 umbos were observed across all four sites, with the greatest quantities at *Pomberuk* (n=911; Table 51). As a result, there is a high degree of fragmentation evident throughout all 1 x 1 m test pits which has resulted in an under-representation of shellfish MNI. The major factors contributing to this are post-depositional processes, the inherent nature of *V. ambiguus* shells, and people using the site over time.

Column Samples

Velesunio ambiguus (billabong mussel) was the dominant shellfish species recovered from the GLM3 and GLM6 column samples, constituting up to 95% by weight for shellfish. The dominant exploitation of this species compared to the River Murray mussel and the freshwater clam is most likely due to the accessibility of its habitat, most commonly found in flood plains and wetlands (Sheldon and Walker 1989:491). *Alathyria jacksoni* (the River Murray mussel) and C*orbicula angasi* (freshwater clam/cockle) are also abundant within the River Murray system; however, they prefer deeper water (Sheldon and Walker 1989:491). *Alathyria jacksoni* can withstand lower oxygen levels and burrows deeper into river floor making the collection more time-consuming.

Collection strategies of shellfish are also influenced by the meat turnover from the shellfish gathered. Depending on the environmental conditions, the billabong mussel is large in terms of a shellfish species and can grow up to 9 cm. The whole shell samples of billabong mussel represented at the GLM3 and GLM6 size varied from 5–8 cm long (Figures 51 and 52). The size represented is not just an indication of the quality of shellfish but reflects the available stock. The sizes of the shellfish represented are of good quality and in good quantity. From the analysis of the bones of the Roonka population, the people living in the Murray Valley were healthy compared to other hunter-gatherer populations (Pretty and Kricun 1989:205). The size of the shellfish and the human skeleton analysis both support that the Murray Valley contained an abundant resources of food validating the hypothesis that the region supported one of the largest population pre European settlement (Tindale 1957: 1-2). Due to fragmentation, it is difficult to determine if size of the shellfish changes over time. If so, it may be an indication of environmental change or increase in population.

There is some archaeological evidence to suggest that the River Murray mussel and the freshwater clam are represented in sites along the River Murray. At Fromm's Landing *Alathyria jacksoni,*[14] *Corbicula angasi* and *V. ambiguus* were present in concentrated bands within all stratigraphic layers. At Devon Downs *C. angasi* was also

[14] The binomial name *A. jacksoni* was taxonomically identified in 1934 (Iredale 1934) and therefore was not available when the Devon Downs excavation was published in 1930.

identified in all layers. All the shellfish identifiable from the GLM3 and GLM6 sites were the billabong mussel species. However, the presence of other shellfish species in smaller numbers could be present but was difficult to determine due to the high fragmentation rate. One cannot assume that the middens only contain the shellfish of the billabong mussel because other sites in the region also display the collection of *A. jacksoni* and *C. angani*. What is evident is that there was a strong emphasis on the collection of the billabong mussel. Sites were developed around the billabong areas where the species commonly occurred.

8.4 Lithic Technology

The dominant raw materials throughout the study region are milky and crystal quartz, in line with Wood's (1994a; 1994b) observations. In comparison, each site presented different usage patterns, however there is an abundance of stone artefacts associated with mid-Holocene ages which may suggest more frequent use of the site, particularly within XU1–XU5, with XU4 and XU5. At *Pomberuk* (POM/SQA) there is an increase in variety of raw materials and abundance of lithics in both excavations. Smith (2010) noted that in Square A at *Pomberuk* there is an increase in both the >5 mm stone artefacts in XU2 and XU3 and an increase in the <3 mm stone artefacts in XU3. Similarly, the >5 mm stone artefacts in Square B are minimal in the uppermost three excavation units but then increase between XU4–XU6. Similarly, there is an increase in stone artefact abundances and the variety of lithic assemblages represented in Square A for XU8 and XU9, with a much larger variety of quartz being evident in these particular spits.

The presence of chert across all sites are of particular which may suggest an increase in trade or perhaps a further extension of the trade network during this period as raw materials, such as chert, is most likely traded in from the Riverland. At POMA/SQA/5mm, 50% of the chert recorded came from XU2 and XU3. Likewise, the POMA/SQB/5mm assemblage indicated that 100% of the chert lithics came from XU4, XU5 and XU6, which have shown to increase in abundance and raw material types. However, at POMA/SQA/3mm there was no chert identified. Similarly, at GLMBS, 75% of the chert artefacts recorded were identified in XU4 and XU5. At Swanport 50% of the chert artefacts were identified in XU8 and XU9.

Table 8.2 Number of Stone Artefacts vs Total Weight.

XU	GLMBS/SQA			POM/SQA			POM/SQB			SWM1/SQA		
	Weight (g)	No. artefacts	Weight/no. artefacts	Weight (g)	No. artefacts	Weight/no. artefacts	Weight (g)	No. artefacts	Weight/no. artefacts	Weight (g)	No. artefacts	Weight/no. artefacts
1	1	8		59.2	118		0	0		3.2	10	
2	3.3	7		121	142		0.5	1		0.7	1	
3	4.4	8		83.1	161		1.4	2		9.7	7	
4	5.1	10		62.5	79		17.7	26		1	3	
5	21.1	16		21.5	42		1.9	7		3.3	3	
6	3.5	1		41.6	9		4.5	12		0.2	3	
7	0.4	2		1.8	2					3.9	3	
8				0.2	1					5.7	5	
9										37.2	13	
10	0.1	1								0.1	1	
11	0.1	1										
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
Total	39	54		390.9	554		26	48		65	49	

Table 8.3 Summary of stone artefacts recovered from the Lower Murray.

	GLMBS/SQA 3mm		POM/SQA 5mm		POM/SQA 3mm		POM/SQB 5mm		POM/SQB 3mm		SWM1/SQA 5mm		SWM1/SQA 3mm	
XU	#	(g)	#	(g)	#	(g)	#	(g)	#	(g)	#	(g)	#	(g)
1	8	1	83	57.6	35	1.6					10	3.2		
2	7	3.3	120	120	22	1	1	0.5			1	0.7		
3	8	4.4	114	81	47	2.1	2	1.4			7	9.7		
4	10	5.1	58	61.6	21	0.9	26	17.7			3	1		
5	16	21.1	32	21	10	0.5	7	1.9			3	3.3		
6	1	3.5	6	41.5	3	0.1	12	4.5					3	0.2
7	2	0.4	1	1.7	1	0.1					3	3.9		
8			1	0.2							5	5.7		
9											3	36.7	10	0.5
10	1	0.1									1	0.1		
11	1	0.1												
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
TOTAL	54	39	415	384.6	139	6.3	48	26	0	0	36	64.3	13	0.7

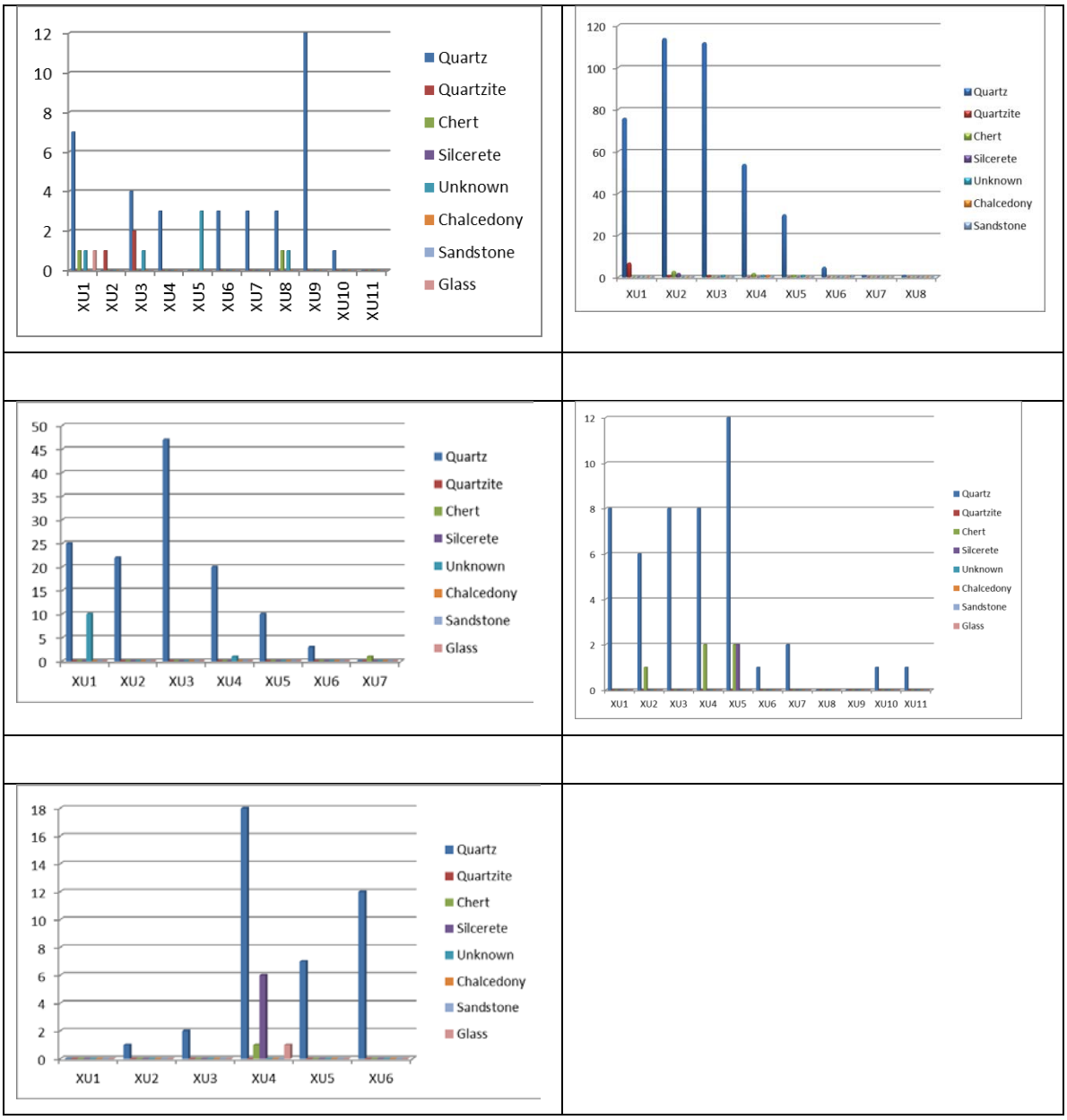


Figure 8.4 Quantity of lithics across all sites in the Lower Murray River.

8.5 Occupational Patterns and Seasonality

Radiocarbon determinations of shellfish and charcoal from middens in the Lower Murray demonstrate they range in age from 8500 years ago to recent times (Wilson et al. 2012), supporting a previous hypothesis that the middens were formed after the Murray Valley stabilised around 10,000 years ago.

8.6 Column Samples

Akin to other middens in the lower Murray, the GLM3 and GLM6 sites were formed as the result of the meals of people who exploited the riverine and terrestrial resources. The GLM3 and GLM 6 middens contained a large quantity of mussel (*Alathyria jacksoni)* complemented with fish species (*Maccullochella peelii* and *Maquaria ambigua*), yabbies (*Cherax destructor*), the egg shells of emu (*Dromaius novaehollandiae)*, the vertebrae of a lizard (Scincidae), and fractured teeth from either a kangaroo or wallaby species (Macropodidae). Unfortunately, the exact MNI the faunal remains and fish remains was unable to be calculated due to fragmentation.

As such, GLM6 and GLM3 support ethnographic accounts and past research that a semi-sedentary lifestyle with a possible seasonal preference during the spring and summer months. Shellfish were collected by men, women and children. Shellfish were only available from the end of spring to the end of summer; at other times of the year, they burrowed too deep within the mud to be gathered (Berndt et al. 1993; Knight 1995. Thin section analysis of fish otoliths in Lower Murray Middens (Disspain 2009), ethnographic accounts (Angas 1887; Berndt and Berndt 1993) and current Indigenous knowledge (Clarke 1994; Luebbers 1978, 1983; St George 2009) also suggest that the fish were also caught during the warm months.

Seasonal changes would significantly influence the availability of resources, particularly as biodiversity in the region is heavily reliant upon seasonal fluctuations. Climatic changes would therefore be reflected in the archaeological record as human populations adapted their subsistence strategies to suit changing patterns of resource availability (St George 2009:93). The site patterns of middens in the Lower Murray suggest the people camped above the flood level. Therefore, collection must have occurred during the spring months when the water was at peak level. If shellfish collection occurred during the winter months when water level was at its lowest, then the sites would have been inundated rather than dominating the landscape. If inundated sites were discovered in the Lower-Murray it would also suggest that shellfish gathering occurred during the winter months when the water level was low. Emu eggshell suggests some possibility of seasonal preference. Emus generally lay their eggs in winter, but are also known to lay anytime between April and October dependent upon conditions. The presence of a few fractured emu eggshells in

GLM3 is not evidence of human occupation during the winter months but instead is most likely evidence of good environmental conditions within the Valley.

While a number of researchers agree that the formation of midden sites in the Lower Murray occurred during the spring to summer months, little research has been discussed on the location of winter sites. Owing to inclement conditions during the winter months, shellfish gathering would a difficult task. Paton (1983:16) suggested that during the winter months when standing water was available, the faunal species would move into the mallee. Therefore, humans would also move into the mallee during the winter months following the migratory patterns of the mammals (Wood 1993:13). However, other than a small number of recorded campsites sites within the mallee is limited. Wood (1993:14) suggested that the destabilisation of sand dunes within the mallee are covering a large number of sites. The inclement conditions during winter would also force groups to disperse throughout the River Murray Valley, which in term would limit dense site activity within one particular area. The archaeological evidence does not mean that people were not in the region during the colder months, basically that there is limited evidence for this being the case.

Luebbers (1978:274) also noted that the use of the landscape by Indigenous hunter-gatherers is also influenced by a number of factors. Under the winter conditions where people lived depended on the availability of fuel, and protection. In the sand dunes huts are known to have been erected for protection against the elements but wouldn't be able to sustain large groups of individuals (Luebbers 1978:274). Therefore it is most likely that people moved to the cliff face where rock shelters are prominent and into the mallee where wood is abundant.

8.7 Regional Comparisons

Palaeodiet had also been inferred from isotopic analysis of human bones and faunal remains. At Roonka Flat the diet predominately consisted of freshwater and terrestrial foods found locally. This is evidenced by lenses of mussel shells found in the site and confirmed by isotopic analysis of bone collagen (Pretty 1997:300; Pate 2000:71). About half of the dietary protein came from terrestrial herbivores and just under half from freshwater fish and shellfish. Owing to the extreme high contribution of shellfish compared to faunal remains, the middens are a reflection of the billabong mussel as a targeted food staple within this particular area. Due to bone reduction, the faunal species in the midden deposit are unrepresented.

Carnivore activity, dispersal of bones away from sites and the discarding of bones in fires are other taphonomic factors to consider while fish and faunal bones were not present at the GLM3 and GLM6 sites. A total of 194 bone

fragments (43% of the faunal assemblage) showed signs of burning. This percentage is significantly high supporting the argument that the discarding of bones in fire played a significant role in the reduction of bone at the GLM3 and GLM6 sites. Overall, the stable carbon and nitrogen isotopes do still support that fishing and shellfish gathering played an important role in the subsistence of Indigenous occupation within the region.

8.8 Summary

The results reported here provide evidence for human occupation in the Lower Murray that spans the Holocene from ca 8600 years calBP to the present. Further, there is a distinctive pattern of the presence and absence of particularly cultural materials that suggests an increase in the manufacturing of stone artefacts in the mid-Holocene which is later followed by an increase in resource use which is evident through the abundance of shellfish and vertabrate remains in the late Holocene. Detailed morphological and geochemical analysis of fish otoliths have also provided unique information into the life cycle of Murray cod, as well as the size and age of fish that were recovered from the Lower Murray sites.

	GLMBS SQUARE A					POM SQUARE A					SWM1 SQUARE A			
XU	NUMBER SPECIMENS	TOTAL WEIGHT (g)	NISP	MNI		NUMBER SPECIMENS	TOTAL WEIGHT (g)	NISP	MNI		NUMBER SPECIMENS	TOTAL WEIGHT (g)	NISP	MNI
1	1	0.4	1	1		98	17	7	2		2	0.7	2	2
2	7	3.3	7	1		50	34.3	32	3		0	0	0	0
3	1	0.1	1	1		707	137.4	74	2		0	0	0	0
4	14	6.4	4	3		493	65.9	46	2		25	4.8	1	1
5	19	6.3	12	1		374	52.3	19	2		8	3.4	5	1
6	3	0.6	0	0		3	0.1	1	1		13	15.5	8	1
7	19	3	2	1		2	0.4	0	0		63	22	9	3
8	23	2.3	10	2		0	0	0	0		60	11.9	19	2
9	2	1.8	2	1		0	0	0	0		27	6.7	3	1
10	1	0.1	1	1		0	0	0	0		2	2	2	1
11	0	0	0	0		0	0	0	0		1	1.9	1	1
12	0	0	0	0		0	0	0	0		0	0	0	0
13	7	0.3	0	0		0	0	0	0		0	0	0	0
Total	**96**	**24.2**	**39**	**11**		**1727**	**307.4**	**179**	**12**		**199**	**68.2**	**48**	**11**

Figure 8.5 Abundance of fish remains at GLMBS/SQA, POM/SQA and SWM1/SQA.

Otolith	Species Name	Common Name	Preservation	Otolith weight (g)	Fish TL (mm)	Estimated Age	Edge Band colour
GLMBS01	*Macquaria ambigua* (Unsure - otolith deteriorated and broken)	Golden perch	Partial	0.4347	479.82	Not sectioned	Not sectioned
GLMBS02	*Maccullochella peelii peelii*	Murray Cod	Partial	1.1638	1982.32	Unable to read	Unable to read
GLMBS03	*Maccullochella peelii peelii*	Murray Cod	Partial	0.1037	Not sectioned	Not sectioned	Not sectioned
GLMBS04	*Maccullochella peelii peelii*	Murray Cod	Partial	0.6979	1307.1	23	Translucent
GLMBS05	*Maccullochella peelii peelii*	Murray Cod	Partial	0.2344	Not sectioned	Not sectioned	Not sectioned
GLMBS06	*Macquaria ambigua*	Golden perch	Complete	0.2032	354.68	5	Translucent
GLMBS07	*Maccullochella peelii peelii*	Murray Cod	Partial	0.0784	Not sectioned	Not sectioned	Not sectioned
HRM01	*Maccullochella peelii peelii*	Murray Cod	Partial	1.0176	1770.43	26	Translucent
HRM02	*Maccullochella peelii peelii*	Murray Cod	Complete	0.4511	949.42	13	Translucent
HRM03	*Maccullochella peelii peelii*	Murray Cod	Partial	0.3711	833.48	11	Translucent
HRM04	*Maccullochella peelii peelii*	Murray Cod	Partial	0.3579	Not sectioned	Not sectioned	Not sectioned
HRM05	*Maccullochella peelii peelii*	Murray Cod	Partial	0.1914	Not sectioned	Not sectioned	Not sectioned
HRM06	*Maccullochella peelii peelii*	Murray Cod	Partial	0.4787	989.42	24	Translucent
HRM07	*Maccullochella peelii peelii* (Unsure - possibly *Maccullochella macquarienesis)*	Murray Cod or Trout Cod	Partial	0.217	Not sectioned	Not sectioned	Not sectioned
HRM08	*Maccullochella peelii peelii*	Murray Cod	Partial	0.449	Not sectioned	Not sectioned	Not sectioned
HRM09	*Maccullochella peelii peelii*	Murray Cod	Complete	0.269	685.51	7	Translucent
HRM10	*Maccullochella peelii peelii*	Murray Cod	Partial	0.29	715.94	Unable to read	Unable to read
SP01	*Maccullochella peelii peelii*	Murray Cod	Partial	0.34	788.41	12	Translucent
SP02	*Maccullochella peelii peelii*	Murray Cod	Partial	1.291	2166.67	31	Translucent
SP03	*Maccullochella peelii peelii*	Murray Cod	Complete	1.314	2200.00	25	Translucent
SP04	*Maccullochella peelii peelii*	Murray Cod	Partial	0.356	811.59	22	Translucent
SP05	*Maccullochella peelii peelii*	Murray Cod	Partial	0.152	Not sectioned	Not sectioned	Not sectioned
SP06	*Maccullochella peelii peelii*	Murray Cod	Complete	0.535	1071.01	14	Translucent
SP07	*Maccullochella peelii peelii*	Murray Cod	Partial	0.1684	539.71	12	Translucent

Figure 8.6 Otolith analysis results (courtesy of Morgan Disspain 2009).

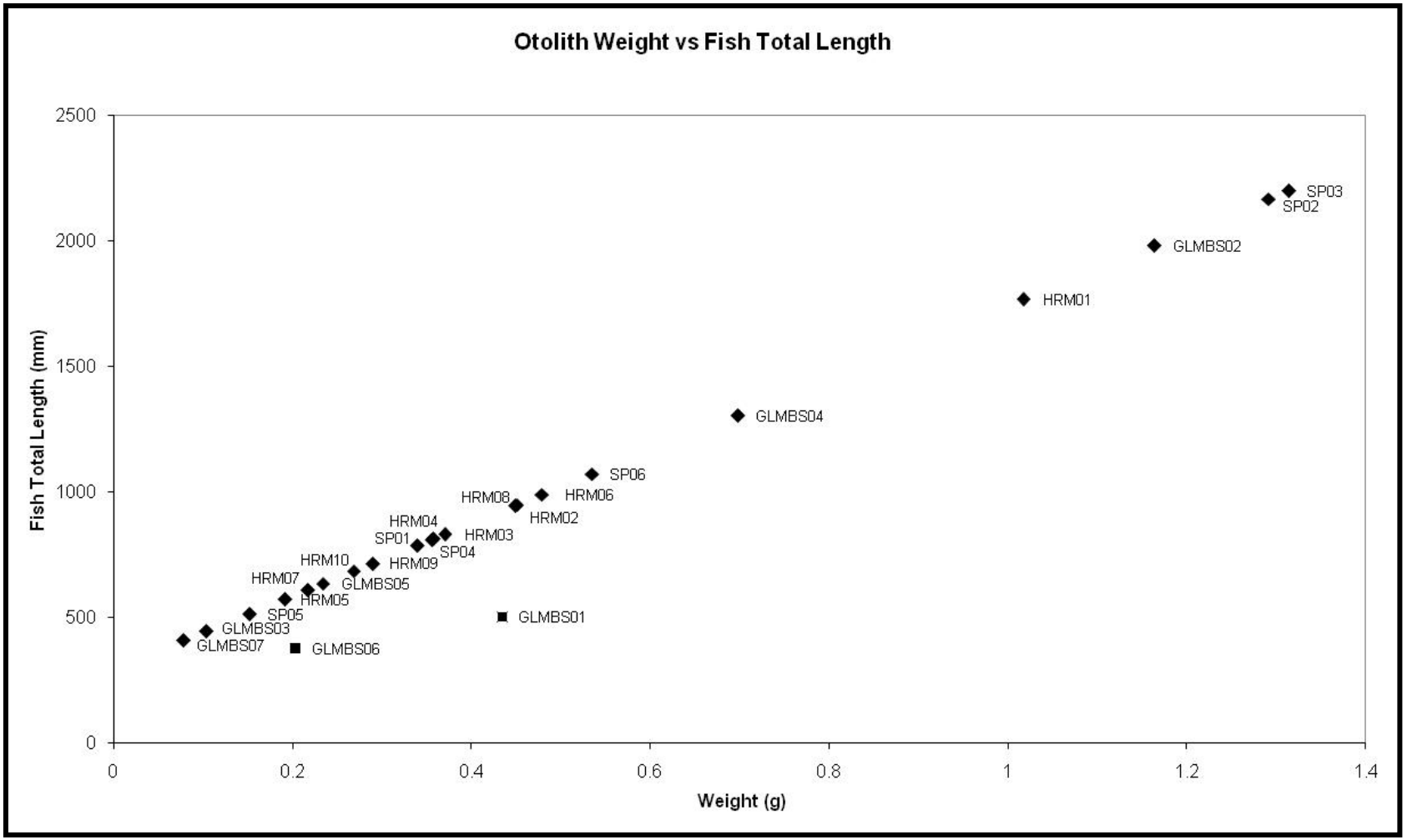


Figure 8.7 Lower Murray otolith weight vs. fish total length (courtesy of Morgan Disspain 2009).

9 CONCLUSIONS AND BEGINNINGS: LEARNING FROM RUWE/RUWAR

> According to the judicio-philosophical tradition, possession is the foundation of property; it requires physical occupation and will and desire to possess. Possession of lands is imaged to be held by the king, and in modernity it is the nation-state (the crown) that holds possession on behalf of its subjects. Therefore, possession is tied to right and power. Foucault argues that right is both an instrument of and vehicle for the exercising of the multiplicity of dominations in society and the relations that enable their implementation. He notes that their relations are not relations of sovereignty and argues that the system of right and the judicial field are enduring change for relation of domination and the many forms of techniques of subjugation. For this reason, right should not be mis-understood as the establishment of legitimacy but rather the methods by which subjugation is carried out. (Moreton-Robinson 2015:134)

This chapter provides a summary of the key findings of this research. It positions my argument within broader debates in Indigenous research, critical whiteness studies and socio-political studies that consider ideas of sovereignty, racialisation and colonialism within academic research. In the last chapter, I present three narratives. In this chapter I have developed my conclusion through a discussion of the relationship between healthy Ruwe/Ruwar and healthy people. These discussions focus on country, family, healthy living, Ngartjis rather than ideas of possession, ownerships and legitimacy. Indigenous people's narratives and philosophies hold meaning and value for archaeological research, particularly in colonised spaces.

There are three narratives informing this thesis and its findings. Firstly, in this conclusion, I provide a summary of how these narratives are applied to the research context and how they provided an entry point for re-commencing thesis writing and completing the final product. Secondly, the archaeological research in the Lower Murray is presented and the local record is discussed in relation to regional ideas and theories for the discipline. The methodological framework unique to this thesis and limitations are discussed including future directions. Finally, I discus the relationship between sovereignty and Indigenous research and the implications for archaeology as a discipline. Collectively, these three strands provide valuable insights into the importance of returning to Ngarrindjeri *Ruwe/Ruwar* and 'uncovering' family history. The final narrative emerged from time with elders and community members, some of whom have now passed and their spirits are now resting as part of Ruwe/Ruwar. Much of what I was told related to my family connection to the southeast and *Kondoli* — the whale — one of my family *Ngartjis.* As a Ngarrindjeri archaeologist this emphasises the deep ontological/epistemological understandings that Ngarrindjeri hold and practice and in this context their implications for Ngarrindjeri people conducting academic research with their community.

A key finding and outcome from this thesis is the fundamental philosophy that underpins the formation of the Ngarrindjeri specific methodological approach applied to academic research what I have framed herein as *The Ngarrindjeri Archaeological Standpoint*. Before formulation of the research question the first and most respectful phase of engaging with the archaeology of Indigenous communities in this context was to discuss a proposal with key Ngarrindjeri elders and community members, receiving ongoing guidance and thus strengthening the extended supervisory roles that I had to develop throughout the candidature. I engaged in this process as a community member prior to ethics clearance and the conscious application of disciplinary standards. For me as a Ngarrindjeri person it was the most respectful way to engage with my community, as It acknowledged the shift in power and control in relation to research practice and was the first step for engaging in collaborative archaeological research. These key people are honoured in the front of the thesis as an acknowledgement of their roles and contributions to various aspects of my personal, cultural and research development whilst engaging in academic research as a doctoral student. I have drawn from ideas in critical theory, standpoint theory, Indigenous strategies for decolonisation of archaeologies and further debates to develop a culturally specific methodological approach for working with the Ngarrindjeri community in highly politicised spaces. The research context is more than a field or lab expedition: we transform history and the landscape as we engage with the Ruwe/Ruwar and Ngarrindjeri people.

9.1 Well-being and Returning to Ruwe/Ruwar

It has been over two years since taking back control of my life and this thesis following a decline in my overall health and wellbeing. During this time I had to intermit my thesis submission and take extended leave from work. My health impacted on my relationship with my children and extended family, adversely effecting my financial commitments, personal goals and ambitions. All of these relationships and responsibilities which extend beyond these — an intimate nature of this thesis which is respected culturally but academically driven through planning, sensitivities, relationships to *Ruwe/Ruwar*. It is an experience shared by many doctoral students undertaking the rigours and overwhelming task of PhD thesis writing especially in the final stages of completion. These experiences are both at the conscious and sub-conscious levels and exhibit through physiological symptoms. As a young Ngarrindjeri person and one of the first Indigenous people undertaking a PhD in this discipline, the pressure and expectations multiply with the various community and family commitments for which I am responsible. In retrospect, a decline in my health and wellbeing was a ‘normal’, ‘expected’, ‘predicted’ process of the PhD journey and my experiences of ‘crashing’ and ‘burning’ leading to a life changing arrival point and paradox intellectually (challenging my worldviews, values and beliefs as a Ngarrindjeri person) and academic researcher in a discipline such as archaeology. This endeavour is, was and always will be more than a thesis: it is an emotional, intellectual, cultural, political and spiritual journey

and has emerged from my understandings of Ngarrindjeri philosophy and epistemologies that can be shared with all Ngarrindjeri people.

9.2 Narrative One: The Holocene Archaeology of the Lower Murray

The regional context suggests a chronology of occupation along the Lower Murray which spans the Holocene and there has been evidence to suggest earlier occupation from 18,000 years BP. Although this date is debated it forms part of the regional context for the study area. Research from Fromm's Landing and Devon Downs also provides a detailed cultural chronology of occupation. Research from Swan Reach provides a more recent history for the region which is methodologically related to this research. The Ngarrindjeri Cultural Workshop provides a contemporary method for sharing knowledge and narratives about the Lower Murray from diverse Ngarrindjeri community members who discussed the significance of the archaeological knowledge obtained from the research. This new research builds upon previous knowledge and theories about Ngarrindjeri lifeways and provides a chronology for occupation that is continuous, despite the effects of colonialism and post-European settlement in the region. For example, Creation knowledge through *Pondi*, granite a physical manifestation of *Ngurunderi* chasing *Ponde*, was identified in workshops by elders and community members as still holding meaning and value for the Lower Murray region and closely associated with archaeological sites. Themes including birthplace (associated with physical and non-physical parts of the landscape) and 'political attachment' for the Ngarrindjeri as a nation were also raised as well as 'gendered' specific narratives when on *Ruwe/Ruwar* near *Ngurunderi's* footsteps (or granite). It is not my role or the role of the archaeologist 'to interpret' the narratives of Indigenous peoples but rather provide the mechanism and tools for the narrative to be shared.

This research makes a major contribution to understanding the past lives of Ngarrindjeri people. Locally, Wood (1994a, 1994b, 1994c, 1994d, 1995a, 1995b, 2000a, 2000b) had carried out a series of surveys; however, limited archaeological research is available as a baseline for the research, and hence the significance of detailed investigations in the local study area. Ngarrindjeri knowledge and information related to the local region provides breathes life into the archaeological record and further insights into the cultural, political and contemporary significance for the research. The information obtained from excavations undertaken for this research is sufficient to answer the research questions addressed in this thesis and to contribute to broader debates and discussions related to archaeology in the regional context. While the analysis of lithics and terrestrial fauna was minimal, this material was not the primary focus of this research. It does, however, offer fruitful areas for future research.

Interpretation of the archaeological record in the Lower Murray is problematic due to colonialism and the socio-political debates that have mis-represented the validity and reliability of Ngarrindjeri peoples culture and traditions. However, the extensive historical documentation recorded since contact demonstrates that Ngarrindjeri people have continued to live as part of *Ruwe/Ruwar* since the contact era despite dispossession from land, removal of children and deterioration of language and cultural practices. All three places investigated including *Murrawong*, *Kangerank* and *Pomberuk* have multiple layers of meaning that are intertwined in a complex history before and after European settlement in the region.

Multiple layers of meaning and significance are evident in the region which is cultural, archaeological, historical, political and contemporary. All these parallels intertwine and are relational to individuals (i.e. cultural background, lived experiences, attainment of local and regional knowledge as well as age and gender). Although shell middens are the prominent archaeological sites, shell fishing is a reflection of activity that requires minimal energy output in comparison to targeted fishing strategies for the Murray Cod (reaching up to 2.2 m in length). The analysis of otoliths has provided detailed information about age, length and life history for individual fish at the time of death. The middens have for some become symbols of authentic Aboriginality and 'sites' of research providing re-sources for archaeological careers.

As evident throughout the thesis, Ngarrindjeri people's involvement in archaeological research is a socio-political activity that disrupts the western hegemonic power structures inherent in south-eastern SA. Extensive radiocarbon dating provides evidence for human occupation 8600 years BP to the present demonstrating continuous use of the Lower Murray landscape following sea level stabilisation when resources became more abundant and readily available. Otolith analysis provides a narrative for fishing resource use and strategies, individual fish histories and environmental changes/information that are relevant for understanding human occupation in the Lower Murray during the Holocene. Lithic analysis, demonstrates that there is a distinct increase in resource use in the mid-Holocene, providing possible evidence for 'intensification' in the Lower Murray. There is a distinct increase during the mid-Holocene (4500 years BP) for each place investigated raising further questions about social organisation, technological change and external factors related to such evidence.

Further research is necessary to determine whether the hiatus of 4500 years BP is a methodological issue or characteristic of people shifting practices in response to changes in the environment. While radiocarbon determinations provide a strong chronology of occupation, further research into the reliability of freshwater shellfish is required to ensure the accuracy of such conclusions. It is also evident that European colonization and associated activities (farming, irrigation, and development) have significantly impacted the archaeological record of the area.

Indigenous people's engagement in archaeology is a developing area of Indigenous archaeologies and one which has not been sufficiently addressed in SA is both academia and government policy. These issues must be addressed to ensure that archaeology and cultural heritage management in Australia centers Indigenous peoples at the core of any research agenda (Hemming and Rigney 2008; Wiltshire and Wallis 2008).

The second key finding relates to an historical and political observation noted as part of the investigation of archaeological sites, as there is evidence (and lack thereof) which demonstrates an erasure of the archaeological record of the recent past (approx. 1000 years BP to the present). The impacts of colonization, farming and irrigation and development activities have meant a 'loss' of the record and dispossession of the archaeological evidence. It is also evident that environmental factors may have also contributed to this erasure (including the 1957 flood) albeit diversion of water flow from the River Murray was a direct impact from governments during the historic period. The archaeological results have provided physical evidence for the Ngarrindjeri community for making determinations about management planning, cultural education as well as heritage protection. The information obtained through these investigations has further enhanced Ngarrindjeri knowledge and lived experiences as well as provided new understandings about Ngarrindjeri life ways before colonisation (NRA 2009).

9.3 Narrative Two: Yannarumi (Speaking as Country)

My teaching and learning philosophy is based on self-reflexive practices and reconciliation pedagogy and adapted from colleagues within my department and research groups of interest. I draw on Yannarumi (see Hemming et al. 2017) as the basis for my standpoint which encompasses a set of obligations and responsibilities as a Ngarrindjeri researcher. My goal is to activate change in archaeological teaching and learning that shifts archaeology towards a new (archaeological) research agenda that acknowledges the complex histories and identities and begins to integrate these shared narratives through the higher educational system. This should then filter through secondary and primary education and society more broadly as we come to understand 'truth' and 'validity' in various contexts with multiple narratives depending on the 'narrator' (see Biolsi and Zimmerman 1997; Zimmerman et al. 2003). My understanding of sovereignty, whiteness, race and epistemology is informed by various Indigenous academics such as Moreton-Robinson (2015). Indigenous elders such as the late Uncle Tom Trevorrow, Uncle George Trevorrow and Uncle Matt Rigney have also been equally valuable for providing community (grass roots) knowledge towards the importance of sovereignty too (Kartinyeri 2000; O'Brien 2007; also see Langton 1994). Before taking leave without pay from Flinders University over a two-year period my contributions to the National Indigenous Researchers and Knowledges Network (funded by the ARC) provided the grounding for understanding more broadly how to apply Indigenous methodologies to quantitative research particular what is undertaken in the discipline of archaeology.

Moreton-Robinson (2006) in reference to Foucault's *Society Must Be Defended*, raised the ideas of sovereignty in modernity, the "sociological imagination" and thinking beyond what is familiar as we (as Indigenous researchers) transform the disciplines in which we are trained to develop new research agendas that do not separate Indigenous peoples sovereignty, epistemologies, Ruwe/Ruwar from colonised spaces. Indigenous peoples are too familiar with the process of colonialism and its intergenerational impacts.

As Indigenous leaders such as Moreton Robinson have suggested in sociology, I also challenge archaeology to extend the scope of teaching and learning about Indigenous peoples beyond historical debates of race, decolonisation, deconstruction through further debate, discussion and research into the archaeological imagination for Indigenous communities post-apology in Australia and to raise key concepts of sovereignty, critical whiteness, education, politics and cultural heritage and how these practices of collecting and invasive methods of research informs interpretations of the culturally respected for Indigenous communities (past, present and future). This healthy way of approaching academic research contributes to the holistic model applied for this thesis which acknowledges Ngarrindjeri epistemologies, recognition of Indigenous sovereignty and empowers Indigenous communities more broadly. For the discipline, it demonstrates capacity for broadening the scope of research to benefit the communities with whom we rely upon to present our interpretations.

Representations and mis-representations have often been spoken and written by the dominant voices of 'western science' in Indigenous spaces for the benefit of the academy/knowledge/science as the key paradigm. This has been draining upon Indigenous communities with short term benefits with no strategic direction or outcomes for the community as a whole. There are no "one size fits all" approaches or simple answers to address complex socio-economic matters, however, process of consolation, negotiation, Indigenous methodologies, community driven or initiated projects are self-determining in nature. When an Indigenous person/academic begins to engage with academia, the archives, literature, debates, photographs, sound recordings, art etc. emotional and psychological affects bring to the surface/consciousness trauma whether lived, shared or inter-generational. Indigenous academics offer scholarly and rigorous solutions to assist the academy in addressing such matters in the hope that the next Indigenous person will be able to determine between the emotional journey of academic scholarship involved in a PhD and one that is very different — post-traumatic as a result of colonialism, genocide, removal of children and dispossession of land, and so forth. Further, there is a co-creation of knowledge and production of Indigenous knowledges that differs from standard archaeological theses. As Indigenous peoples engaging in the academy we are privileged and in a position to undertaken an endeavour that begins to examine such matters in an explicit way. This should not be the only view or perspective: Indigenous peoples have the right not to explore such

matters and choose or self-determine their own futures without academic engagement. Agency, having voice and the right to choice is important in colonial spaces for Indigenous people's health and well-being as well.

Decolonising methodologies are critical for Indigenous archaeologies as they contribute to improving ways of doing for Indigenous communities within a criticalist paradigm informed by scholarly and rigorous academic research within the discipline/s. These multiple narratives, layers of unearthing, uncovering and excavating are ideologies that are not new to Australian archaeology, however how they are applied in practise I would argue is a different story in itself. Various aspects of trauma, loss and grief need to be managed, resolved and/or discussed by communities as well as individuals in order to continue with research. This endeavour is time consuming, and requires reciprocity and multiple meetings/gatherings to support the researcher and their team.

Archaeology in Indigenous Australia has much to contribute to schools, the health system and for employment for Indigenous peoples whilst further educating non-Indigenous Australians the importance of acknowledging the past. The work conducted by Hemming, Rigney and others with the Ngarrindjeri heritage committee for example are world leading examples of how communities strategize to address disadvantage and work with governments to have workable, achievable and beneficial outcomes for the Ngarrindjeri peoples. The Ngarrindjeri Regional Authority (NRA) focuses on culture and identity protection foremost but negotiates aspects of employment, cultural heritage, developments, infrastructure, health and economy. These are all interconnected and based on Ngarrindjeri philosophies and approaches. They are meaningful, practical, pro-active in approach and holistic in ideology with goals, targets and outcomes for all Ngarrindjeri (Trevorrow and Hemming 2005).

The key point to emphasise in relation to this narrative is that Ngarrindjeri elders knowledge and supervision throughout the thesis intersects with the production of knowledge in the academy in a contested space. Although Ngarrindjeri people approach this space from a disposed position of power to engage in complex racialized structures such as heritage and archaeology in South Australia, through the process of education (including educating and growing our own) is critical for community and economic development. More importantly it is critical for the leadership of the nation. It is within this space where archaeologists can assist in contributing to positive outcomes for Indigenous communities through co-creation of knowledge, co-production of reports and publications, co-operation with grants and economic development, and holistic engagement with communities that consider the broader social, cultural, political and historical agendas that determine the lives of many Indigenous communities in Australia.

9.4 Narrative Three: Learning about Kondoli

> I remember standing in the staff tea room celebrating someone's birthday and as I went to cut a piece of cake left at the table I was told by an unknown person that I couldn't touch the cake because it was his! After exchanging words of confusion, I remember being escorted down the hall and being met with disgust and anger by all staff as I screamed in the front office. I was told by a colleague that I was a sook and a rich boy who needed to go home and as I became more confused. I could see people whispering in the distance as I was being pushed out the door. Then, as I finally built up the courage to leave the space, a close friend and colleague followed me as I screamed outside, cried openly and fell to my knees in exhaustion. At this point I realised I had enough ... with the thesis! (Chris Wilson 2012)

The quote above relates to a period that I characterise as a life-changing event, personally and academically, following several months of difficulty trying to write up the last stages of this thesis. On 7 August 2012, something very strange occurred during the early hours of this morning which has formed an understanding of the importance of this thesis and how unique the experiences of Indigenous peoples conducting academic research in archaeology can be:

> It's 1.00pm and I have just been woken up by a dream about my workplace, colleagues and thesis which felt so real emotionally that I started crying when I woke up. This is the first time I have ever remembered a dream so clear and vivid that left me feeling the same way when I woke up!(Chris Wilson 2012)

Conversations with Faye Blanch, a friend and colleague, helped me realise where I have been and I shifted intellectually. This incident symbolises an intellectual change in my life. Faye explained that my previous work with Old People is still evident through this thesis as I am returning back to country. However, this time I am 'digging' the past and uncovering layers of Ngarrindjeri history and culture which also include my cultural identity. We discussed the process of learning about the "Whale Enchanter" from Encounter Bay as told by Sustie Wilson which I found during archival research at the SAM (see Tindale 1930–55).

We discussed the uncanny process of avoiding the thesis in early 2012 (around Easter) and although I was constantly thinking about the thesis I could not write it. One day Faye brought in an Adelaide Entertainment Book with tickets. The one that I chose was for the Whale Centre at Victor Harbour as I thought I could use it for the kids to teach them more about what I had learnt as well. It wasn't until four months later when I had moved through a major barrier in the thesis that I was physically and physiologically able to organise a trip to the Whale Centre. During the drive down to Victor Harbour I told the kids about the Whale Enchanter and that a close Elder (Uncle George Trevorrow) told me that the *Kondoli* was most likely one of our family *Ngartjis* (totems). To celebrate the moment of

imparting this knowledge, we stopped at the entrance to Victor where the mosaic *Kondoli* sat overlooking the coast and great bluff (Figure 54). As we arrived at the Whale Centre, to our surprise the staff handed the kids an archaeologist's tool kit (bucket, spade and brush) and as the girls turned to look at me I told them 'Wow, you get to be like dad for the day and be an archaeologist'. They smiled with excitement and raced down to the lower level of the Whale Centre to begin uncovering *Kondoli* in the sand pit (Figures 9.1-9.4).

9.5 Conclusions and Final Yunnan

Reflecting on this thesis has been fulfilling. Simultaneously reciprocity, respect and shared narratives have assisted in this process of healing for Ngarrindjeri *Ruwe/Ruwar* — I am also part of Ngarrindjeri *Ruwe/Ruwar* and being repatriated back to *Ruwe/Ruwar*. During the process of bringing the Old People home I was re-connecting with people and country and throughout my journey engaging in this doctoral thesis, I have had a different connection to country 'you have been walking the land, working with the land, transforming the land and uncovering your Ngarrindjeri past' (2012 Faye Blanch pers. comm.). Ultimately, there is a sense of letting go of something as personal, intimate and significant such as this thesis. It is giving birth to new knowledges and unique interpretations from the discipline, being re-born and transformation of our lives to be sovereign and healthy as well as engaging in a ceremony of teaching and learning. It is now time to let go, to impart this knowledge to inform others to benefit all Ngarrindjeri people in this endeavour for establishing 'truth' and 'validity' through the creation of this thesis. There are now multiple narratives that exist (not replace or supersede) and are exhibited in some form of 'equality' throughout this thesis. I dedicate this knowledge to all Ngarrindjeri people, past present and future regardless of ownership. It is a gift I leave my family, particular my daughters Mikalya Elizabeth Durkin-Wilson and Rylee Paige Durkin-Wilson. I honour those who have passed including Allan Proctor Wilson, Thelma Wilson (nee Harradine), Uncle George Trevorrow and Uncle Tom Trevorrow. Their collective knowledge has formed and informed this thesis. In conclusion, I present the Holocene Archaeology of Ngarrindjeri Ruwe/Ruwar as an alternative method for engaging with archaeology and Indigenous peoples in Australia and elsewhere. In this thesis, I provide evidence from archaeological and Ngarrindjeri methods, approaches and epistemologies. I do so with academic rigour, validity and respect. This is my approach to sharing knowledge about my people – the Ngarrindjeri. It is a gift I leave for my family, particularly my daughters who I hope are proud to call themselves Ngarrindjeri.

Figure 9.1 (from left): Rylee Durkin-Wilson, Chris Wilson and Mikayla Durkin-Wilson sitting on *Kondoli* showing the bluff in the background, Victor Harbour (photo by Chris Wilson, 2012).

Figure 9.2 (from left): Rylee and Mikayla Durkin-Wilson posing on *Kondoli's* tail, Victor Harbour (photo by Chris Wilson, 2012).

Figure 9.3 (from left): Rylee and Mikayla Durkin-Wilson looking at the Bluff through the telescope, Victor Harbour (photo by Chris Wilson, 2012).

Figure 9.4 (from left): Mikalya and Rylee Durkin-Wilson uncovering *Kondoli* bones at the Whale Centre, Victor Harbour (photo by Chris Wilson, 2012).

FINAL PAGE ... NUKKIN!

Thank you for taking the time to read the thesis
I hope it has provided you with an insight into my own personal and professional experiences growing up in the southern suburbs of Adelaide and undertaking archaeological research with my own community.

Archaeological Sites Surveyed in the Lower Murray

MAP	SITE	STATUS	SITENAME	SITE TYPE	ACTION	DATE	CONDITION
6727	137	Registered	Murray Bridge Midden	Archaeological	Not Visible	8/11/2007	Not known
6727	139	Registered	Glen Lossie Midden 2	Archaeological	No Access	9/11/2007	Not known
6727	141	Registered	Pompoota Burial & Midden Site	Archaeological/Burial	Re-located	1/10/2008	Fair
6727	143	Registered	Avoca Dell Burial Site	Burial	No Access	9/11/2007	Not known
6727	145	Registered	Glen Lossie Midden 1	Archaeological	No Access	9/11/2007	Not known
6727	147	Registered	Walla Swamp Midden Site	Archaeological	No Access	9/11/2007	Not known
6727	149	Registered	Sunnyside 2 Midden Site	Archaeological	Re-located	13/11/2007	Fair
6727	150	Registered	Sunnyside 3 Midden Site	Archaeological	Not Visible	13/11/2007	Not known
6727	152	Registered	Pompoota Midden Site	Archaeological	Relocated	1/10/2008	Fair
6727	154	Registered	Sunnyside 1 Midden Site	Archaeological	Relocated	6/10/2008	Fair
6728	1045	Reported	Sunnyside South Midden 1	Archaeological	Relocated	1/10/2008	Poor
6727	1046	Reported	Sunnyside South Midden 2	Archaeological	Relocated	1/10/2008	Poor
6727	1047	Reported	Sunnyside South Midden 3	Archaeological	Relocated	1/10/2008	Poor
6727	1048	Reported	Sunnyside South Midden 4	Archaeological	Relocated	1/10/2008	Poor
6727	1049	Reported	Sunnyside South Midden 5	Archaeological/Burial	Relocated	1/10/2008	Poor
6727	1050	Reported	Toora Midden 1	Archaeological/Burial	Relocated	26/09/2008	Fair
6727			Toora Midden 1 (ACHM)	Archaeological	Relocated	23/09/2008	Poor
6727	1051	Reported	Toora Midden 2	Archaeological	Relocated	26/09/2008	Poor
6727			Toora Midden 2 (ACHM)	Archaeological	Relocated	26/09/2008	Poor
6727	1052	Reported	Toora Midden 3	Archaeological	Relocated	26/09/2008	Poor
6727			Toora Rockshelter 1 (ACHM)	Archaeological	Relocated	26/09/2008	Poor

6727			Toora Rockshelter 2 (ACHM)	Archaeological	Relocated	26/09/2008	Poor
6727			Toora Rockshelthers & Midden (ACHM)	Archaeological	Relocated	26/09/2008	Poor
6727			Rock with Deposited Midden (ACHM)	Archaeological	Relocated	26/09/2008	Poor
6727	1053	Reported	Toora Midden 4	Archaeological	Relocated	26/09/2008	Poor
6727			Toora Midden 5 (ACHM)	Archaeological	No Access	26/09/2008	N/A
6727	1070	Reported	*Murrawong* Road Midden 1	Archaeological/Burial	Re-located	13/11/2007	Fair
6727	1071	Reported	*Murrawong* Road Midden 2	Archaeological	Not Visible	13/11/2007	Not known
6727	1074	Reported	Mypolonga Midden 1	Archaeological	Relocated	23/09/2008	Good
6727	1075	Reported	Mypolonga Flat Midden 1	Archaeological	Relocated	25/09/2008	Poor
6727	1076	Reported	Mypolonga Flat Midden 2	Archaeological	Relocated	25/09/2008	Poor
6727	1077	Reported	Mypolonga Flat Midden 3	Archaeological	No access	25/09/2008	N/A
6727	1078	Reported	Mypolonga Flat Midden 4	Archaeological	No access	25/09/2008	N/A
6727	1079	Reported	Mypolonga Flat Midden 5	Archaeological	Relocated	25/09/2008	Poor
6727	1080	Reported	Mypolonga Scarred Tree	CMT	Re-located	26/09/2008	Poor
6727	1081	Reported	Swanport Midden 1	Archaeological/Burial	Relocated	30/09/2008	Fair
6727	1082	Reported	Swanport Midden 2	Archaeological	Relocated	30/09/2008	Fair
6727	1106	Reported	Murray Bridge Midden 1	Archaeological	Not Visible	8/11/2007	Not known
6727	1107	Reported	Murray Bridge Midden 2	Archaeological	Re-located	8/11/2007	Poor
6727	1110	Reported	Montieth Midden 1	Archaeological	Re-located	7/10/2008	Fair
6727	1128	Reported	Glen Lossie Scarred Tree 6	CMT	Re-located	9/11/2007	Fair
6727	1129	Reported	Glen Lossie Scarred Tree 7	CMT	Re-located	9/11/2007	Fair

6727	1130	Reported	Glen Lossie Scarred Tree 8	CMT	Re-located	9/11/2007	Fair
6727	1131	Reported	Glen Lossie Midden 4	Archaeological	Re-located	12/11/2007	Fair
6727	1132	Reported	Glen Lossie Midden 5	Archaeological	Re-located	12/11/2007	Fair
6727	1133	Reported	Glen Lossie Midden 6	Archaeological	Re-located	12/11/2007	Fair
6727	1134	Reported	Sunnyside Midden/Burial 4	Archaeological/Burial	Re-located	7/10/2004	Fair
6727	1135	Reported	Sunnyside Midden 5	Archaeological	Re-located	6/10/2008	Fair
6727	1136	Reported	Sunnyside Midden 6	Archaeological	Re-located	6/10/2008	Fair
6727	1137	Reported	Sunnyside Midden 1	Archaeological	Re-located	6/10/2008	Fair
6727	1654	Registered	Sunnyside Scarred Tree 14	CMT	Re-located	13/11/2007	Fair
6727	2294	Registered	Glen Lossie Scarred Tree 1	CMT	No access	12/11/2007	N/A
6727	2298	Registered	Glen Lossie Scarred Tree 2	CMT	Re-located	12/11/2007	Fair
6727	2299	Registered	Glen Lossie Scarred Tree 3	CMT	No Access	12/11/2007	N/A
6727	2300	Registered	Glen Lossie Scarred Tree 4	CMT	No Access	9/11/2007	Not known
6727	2301	Registered	Glen Lossie Midden Site 3	Archaeological	Re-located	12/11/2007	Fair
6727	2417	Registered	Long Flat Scarred Tree 1	Scarred Tree	Re-located	7/11/2007	Fair
6727	2446	Reported	Pompoota Midden 4	Archaeological	Relocated	1/10/2008	Poor
6727	2447	Reported	Pompoota Midden 5	Archaeological	Relocated	1/10/2008	Poor
6727	2448	Reported	Pompoota Midden 6	Archaeological	Relocated	1/10/2008	Poor
6727	2449	Reported	Pompoota Midden 7	Archaeological	Relocated	1/10/2008	Poor
6727	2450	Reported	Pompoota Midden 8	Archaeological	Relocated	1/10/2008	Poor
6727	2554	Registered	Glen Lossie Scarred Tree 5	CMT	No Access	9/11/2007	Not known
6727	2998	Registered	"*Pomberuk*"	Archaeological/Historic	Relocated		Good

6727	3150	Registered	Long Flat Scarred Tree 2	CMT	Not Visible	7/11/2007	Not known
6727	3151	Registered	Long Flat Scarred Tree 3	CMT	Re-located	7/11/2007	Fair
6727	3152	Registered	Long Flat Scarred Tree 4	CMT	Re-located	7/11/2007	Fair
6727	3153	Registered	Long Flat Scarred Tree 5	CMT	Re-located	7/11/2007	Fair
6727	3918	Reported	Long Flat Midden 2	Archaeological	Not Visible	7/11/2007	Not known
6727	3919	Reported	Long Flat Midden 1	Archaeological	Re-located	7/11/2007	Fair
6727	3924	Reported	Murray Bridge Midden 3	Archaeological	Re-located	8/11/2007	Poor
6727	3925	Reported	Long Flat Scarred Tree 6	Scarred Tree	Not Visible	7/11/2007	Not known
6727	4411	Reported	*Murrawong* Road Midden 3	Archaeological	No Access	13/11/2007	Not known
6727	4484	Reported	Sturt Reserve South Midden	Archaeological	Relocated	24/09/2008	Fair
6727	4571	Reported	Sunnyside South Midden 6	Archaeological	Relocated	1/10/2008	Poor
6727	4572	Reported	Sunnyside South Midden 7	Archaeological	Relocated	1/10/2008	Poor
6727	4573	Reported	Sunnyside South Midden 8	Archaeological	Relocated	1/10/2008	Poor
6727	4574	Reported	Sunnyside South Midden 9	Archaeological	Relocated	1/10/2008	Poor
6727	4575	Reported	Sunnyside South Midden 10	Archaeological	Relocated	1/10/2008	Poor
6727	5873	Reported	Mypolonga Flat Archaeological Site	Archaeological	Relocated	25/09/2008	Poor
6727	5874	Reported	Jury Swamp Archaeological Site	Archaeological	Not Visible	25/09/2008	N/A
6727	6760	Reported	Willow Bend Midden 1	Archaeological	Re-located	13/11/2007	Fair
6727	6761	Reported	Willow Bend Scarred Tree 1	CMT	Re-located	13/11/2007	Fair
6727	6762	Reported	Willow Bend Scarred Tree 2	CMT	Re-located	13/11/2007	Not known
6727	6774	Reported	North Bokara Road Midden Site	Archaeological	Fair	Relocated	25/09/2008
6727	6780	Reported	Sunnyside Burial & Midden Site	Archaeological/Burial	Re-located	6/11/2008	Fair

6727	7236	Reported	Sunnyside Midden	Archaeological	Re-located	6/11/2008	Fair
6727	7472	Reported	Glen Lossie Burial Site	Archaeological/Burial	Re-located	13/11/2007	Fair
6727			Long Flat Midden 3	Archaeological	Re-located	7/11/2007	Fair
6727			Disturbed Midden 1	Archaeological	Re-located	8/11/2007	Poor
6727			Burdett Midden 1	Archaeological	Re-located	8/11/2007	Poor
6727			Burdett Midden 2	Archaeological	Re-located	8/11/2007	Poor
6727			Disturbed Midden 3	Archaeological	Re-located	8/11/2007	Poor
6727			Glen Lossie Midden 8	Archaeological	Re-located	13/11/2007	Fair
6727			Glen Lossie Midden 9	Archaeological	Re-located	13/11/2007	Fair
6727			Murray Bridge Midden 4	Archaeological	Recorded	8/11/2007	Poor
6727			Disturbed Midden 4	Archaeological	Recorded	8/11/2007	Poor
6727			Glen Lossie Scarred Tree 9	CMT	Recorded	12/11/2007	Fair
6727			Glen Lossie Midden 10	Archaeological	Recorded	12/11/2007	Fair
6727			Glen Lossie Midden 11	Archaeological	Recorded	12/11/2007	Fair
6727			Glen Lossie Midden 12	Archaeological	Recorded	13/11/2007	Fair
6727			Glen Lossie Midden 13	Archaeological	Recorded	13/11/2007	Fair
6727			Sunnyside Midden 8	Archaeological	Recorded	7/10/2008	Fair

Radiocarbon Data and Analysis

Lower Murray Surface Samples - Radiocarbon Ages (Uncalibrated)

Sample	Lab number	Sample material	Depth (cm)	$\delta^{13}C$	±	% Modern	±	D14C	±	^{14}C age	±
BM2-ss1	ANU-2716	*V. ambiguus*	50	-10.0	1.6	69.26	0.27	-307.4	2.7	2950	35
MBM2-ss2	ANU-2718	*Charcoal*	50	-25.1	1.1	71.61	0.27	-283.9	2.7	2680	30
MBM2-ss3	ANU-2719	*V. ambiguus*	80	-11.1	1.0	63.36	0.35	-366.4	3.5	3665	45
BM2-ss4	ANU-2720	*V. ambiguus*	0-2	-8.4	1.2	66.10	0.24	-339.0	2.4	3325	30
BM2-ss5	ANU-2721	*V. ambiguus*	0-2	-9.1	0.8	66.86	0.25	-331.4	2.5	3235	30
LFM2-ss6	ANU-2724	*V. ambiguus*	0-2	-4.8	1.6	59.37	0.24	-406.3	2.4	4190	35
GLMBS-ss7	ANU-2725	*V. ambiguus*	5	-2.3	0.7	59.98	0.22	-400.2	2.2	4105	30
GLBS-ss8	ANU-2729	*V. ambiguus*	20	-10.5	1.2	45.52	0.22	-544.8	2.2	6320	40
GLBS-ss9	ANU-2730	*V. ambiguus*	0-2	-7.7	1.7	58.34	0.27	-416.6	2.7	4330	40
GLBS-ss10	ANU-2731	*V. ambiguus*	20	-12.8	1.4	46.15	0.21	-538.5	2.1	6210	40
GLM6-ss11	ANU-2732	*V. ambiguus*	15-20	-9.0	1.9	49.53	0.23	-504.7	2.3	5645	40
GLM6-ss12	ANU-2733	*V. ambiguus*	15-20	-3.8	0.4	59.40	0.22	-406.0	2.2	4185	30
GLM5-ss13(r)	ANU-2735	*V. ambiguus*	10	-8.5	0.3	52.80	0.20	-472.0	2.0	5130	35
GLM3-ss14(r)	ANU-2736	*V. ambiguus*	2-4	-7.9	1.3	90.44	0.29	-95.6	2.9	805	30
GLM3-ss14	ANU-3116	*V. ambiguus*	2-4	-13.4	1.9	91.77	0.36	-82.3	3.6	690	35
MYMBS	ANU-6507	*V. ambiguus*	40	-6	1	58.28	0.19	-417.2	1.9	4340	40
MYMBS-C	ANU-6509	*Charcoal*	40	-22	1	58.47	0.18	-415.3	1.8	4310	35
MYM1	ANU-6510	*V. ambiguus*	0-2	-11	1	66.20	0.20	-338.0	2.0	3315	35
HRMHC	ANU-6511	*V. ambiguus*	0-2	-6	1	60.58	0.15	-394.2	1.5	4025	30
SRSM	ANU-6512	*V. ambiguus*	0	-5	1	78.88	0.17	-211.2	1.7	1905	30
MYFM2	ANU-6513	*V. ambiguus*	50	-6	0	93.01	0.27	-69.9	2.7	580	35

TOM1	ANU-6514	*V. ambiguus*	0-2	-7	1	61.84	0.17	-381.6	1.7	3860	35
MB1M1	ANU-6516	*V. ambiguus*	0-2	-7	1	54.77	0.18	-452.3	1.8	4835	40
SWM2	ANU-6517	*V. ambiguus*	0-2	-6	1	79.87	0.23	-201.3	2.3	1805	35
POM1	ANU-6518	*V. ambiguus*	0-2	-7	1	53.48	0.18	-465.2	1.8	5030	40
POM4	ANU-6519	*V. ambiguus*	0-2	-6	1	63.96	0.17	-360.4	1.7	3590	35
POM5	ANU-6520	*V. ambiguus*	0-2	-6	1	74.14	0.20	-258.6	2.0	2405	35
SSM1	ANU-6521	*V. ambiguus*	0-2	-4	1	59.71	0.20	-402.9	2.0	4140	40
SSM2	ANU-6523	*V. ambiguus*	2-4	-4	1	53.38	0.20	-466.2	2.0	5040	45
SSM5	ANU-6524	*V. ambiguus*	0-2	-11	6	52.62	0.35	-473.8	3.5	5160	70
SSM4	ANU-6525	*V. ambiguus*	50	-9	1	58.65	0.18	-413.5	1.8	4285	35
SUMB5	ANU-6526	*V. ambiguus*	0-2	-1	1	46.52	0.20	-534.8	2.0	6150	45
SUM5-2	ANU-6527	*V. ambiguus*	2-4	-9	1	52.69	0.21	-473.1	2.1	5145	45
SUM9	ANU-6529	*V. ambiguus*	2-4	-2	4	55.32	0.27	-446.8	2.7	4755	50
SUM3	ANU-6530	*V. ambiguus*	2-4	-7	1	61.11	0.15	-388.9	1.5	3955	30
SUM4	ANU-6531	*V. ambiguus*	4-5	-9	2	52.16	0.24	-478.4	2.4	5230	50
SUM8	ANU-6532	*V. ambiguus*	4-5	-13	2	51.64	0.21	-483.6	2.1	5310	45
SUM4-1	ANU-6533	*V. ambiguus*	4-5	-9	1	65.94	0.24	-340.6	2.4	3345	40

Lower Murray Excavation Samples - Radiocarbon Ages (Uncalibrated)

Sample Name	Lab number	Sample material	Depth (cm)	$\delta^{13}C$	±	% Modern	±	D14C	±	^{14}C age	±
GLMBS-Xu1	ANU-3117	*V. ambiguus*	6	-2.9	4.9	59.39	0.36	-406.1	3.6	4185	50
GLMBS-Xu1r	ANU-2737	*V. ambiguus*	6	-1.1	2.0	59.61	0.26	-403.9	2.6	4155	35
GLMBS-Xu2	ANU-3118	*V. ambiguus*	20	-13.6	3.8	60.33	0.70	-396.7	7.0	4060	50

GLMBS-Xu2r	ANU-2738	*V. ambiguus*	20	-5.9	1.2	60.79	0.23	-392.1	2.3	4000	30
GLMBS-Xu7	ANU-2739	*V. ambiguus*	51	-10.7	2.0	57.02	0.25	-429.8	2.5	4515	40
GLMBS-XU14a	ANU-3119	*Charcoal*	78	-26.2	3.2	39.15	0.23	-608.5	2.3	7535	50
GLMBS-XU14br	ANU-3120	*V. ambiguus*	78	-9.0	3.6	39.55	0.23	-604.5	2.3	7450	50
GLMBS-XU14br	ANU-3121	*V. ambiguus*	78	-17.1	3.8	39.90	0.41	-601.0	4.1	7380	50
GLMBS-XU19	ANU-3123	*V. ambiguus*	104	-16.1	5.5	57.56	0.39	-424.4	3.9	4440	60
HRMSQA-XU2	ANU-6535	*V. ambiguus*	15	-11	6	59.71	0.42	-402.9	4.2	4140	70
HRMSQA-XU2c	ANU-6536	*Charcoal*	15	-22	2	60.38	0.19	-396.2	1.9	4055	40
HRMSQA-XU4	ANU-6537	*V. ambiguus*	25	-11	3	58.58	0.26	-414.2	2.6	4295	50
HRMSQA-XU4c	ANU-6538	*Charcoal*	25	-27	1	59.21	0.21	-407.9	2.1	4210	40
HRMSQA-XU10	ANU-6606	*V. ambiguus*	56	-7	3	49.97	0.24	-500.3	2.4	5575	50
HRMSQB-XU3c	ANU-6607	*Charcoal*	20	-23	4	96.35	0.51	-36.5	5.1	300	55
SWM1SQA-XU2	ANU-6609	*V. ambiguus*	13	-1	3	59.11	0.24	-408.9	2.4	4225	45
SWM1SQA-XU6	ANU-6610	*V. ambiguus*	35	-6	9	59.08	0.56	-409.2	5.6	4230	90
SWM1SQA-XU6c	ANU-6611	*Charcoal*	35	-25	3	59.79	0.29	-402.1	2.9	4130	50
SWM1SQA-XU9	ANU-6612	*V. ambiguus*	50	-1	6	52.92	0.36	-470.8	3.6	5110	70
SWM1SQA-XU9c	ANU-6613	*Charcoal*	50	-24	3	67.15	0.31	-328.5	3.1	3200	50
GLM6-s1a	ANU-3129	*V. ambiguus*	N/A	-11.0	5.4	52.06	0.35	-479.4	3.5	5240	60

** The GLM6 Shell Tool is described in more detail in Chapter 7.*

Lower Murray Surface Samples - Radiocarbon Ages (Calibrated)

Sample Name	Lab number	Sample material	Depth (cm)	$\delta^{13}C$	±	% Modern Carbon	±	D14C	±	Cal BP 95.4% probability
MBM2-ss1	ANU-2716	*V. ambiguus*	50	-10.0	1.6	69.26	0.27	-307.4	2.7	2880-3200
MBM2-ss2	ANU-2718	*Charcoal*	50	-25.1	1.1	71.61	0.27	-283.9	2.7	2620-2840
MBM2-ss3	ANU-2719	*V. ambiguus*	80	-11.1	1.0	63.36	0.35	-366.4	3.5	3730-4080
BM2-ss4	ANU-2720	*V. ambiguus*	0-2	-8.4	1.2	66.10	0.24	-339.0	2.4	3390-3570
BM2-ss5	ANU-2721	*V. ambiguus*	0-2	-9.1	0.8	66.86	0.25	-331.4	2.5	3340-3470
LFM2-ss6	ANU-2724	*V. ambiguus*	0-2	-4.8	1.6	59.37	0.24	-406.3	2.4	4530-4820
GLMBS-ss7	ANU-2725	*V. ambiguus*	5cn	-2.3	0.7	59.98	0.22	-400.2	2.2	4420-4800
GLBS-ss8	ANU-2729	*V. ambiguus*	20	-10.5	1.2	45.52	0.22	-544.8	2.2	7010-7280
GLBS-ss9	ANU-2730	*V. ambiguus*	0-2	-7.7	1.7	58.34	0.27	-416.6	2.7	4650-4970
GLBS-ss10	ANU-2731	*V. ambiguus*	20	-12.8	1.4	46.15	0.21	-538.5	2.1	6910-7170
GLM6-ss11	ANU-2732	*V. ambiguus*	15-20	-9.0	1.9	49.53	0.23	-504.7	2.3	6290-6460
GLM6-ss12	ANU-2733	*V. ambiguus*	15-20	-3.8	0.4	59.40	0.22	-406.0	2.2	4530-4820
GLM5-ss13(r)	ANU-2735	*V. ambiguus*	10	-8.5	0.3	52.80	0.20	-472.0	2.0	5730-5920
GLM3-ss14(r)	ANU-2736	*V. ambiguus*	2-4	-7.9	1.3	90.44	0.29	-95.6	2.9	660-730
GLM3-ss14	ANU-3116	*V. ambiguus*	2-4	-13.4	1.9	91.77	0.36	-82.3	3.6	560-660
MYMBS	ANU-6507	*V. ambiguus*	40	-6	1	58.28	0.19	-417.2	1.9	4650-5030
MYMBS-C	ANU-6509	*Charcoal*	40	-22	1	58.47	0.18	-415.3	1.8	4630-4960

MYM1	ANU-6510	*V. ambiguus*	0-2	-11	1	66.20	0.20	-338.0	2.0	3390-3580
HRMHC	ANU-6511	*V. ambiguus*	0-2	-6	1	60.58	0.15	-394.2	1.5	4300-4530
SRSM	ANU-6512	*V. ambiguus*	0	-5	1	78.88	0.17	-211.2	1.7	1710-1870
MYFM2	ANU-6513	*V. ambiguus*	50	-6	0	93.01	0.27	-69.9	2.7	510-630
TOM1	ANU-6514	*V. ambiguus*	0-2	-7	1	61.84	0.17	-381.6	1.7	4010-4410
MB1M1	ANU-6516	*V. ambiguus*	0-2	-7	1	54.77	0.18	-452.3	1.8	5330-5600
SWM2	ANU-6517	*V. ambiguus*	0-2	-6	1	79.87	0.23	-201.3	2.3	1600-1810
POM1	ANU-6518	*V. ambiguus*	0-2	-7	1	53.48	0.18	-465.2	1.8	5600-5890
POM4	ANU-6519	*V. ambiguus*	0-2	-6	1	63.96	0.17	-360.4	1.7	3700-3960
POM5	ANU-6520	*V. ambiguus*	0-2	-6	1	74.14	0.20	-258.6	2.0	2210-2680
SSM1	ANU-6521	*V. ambiguus*	0-2	-4	1	59.71	0.20	-402.9	2.0	4440-4820
SSM2	ANU-6523	*V. ambiguus*	2-4	-4	1	53.38	0.20	-466.2	2.0	5600-5890
SSM5	ANU-6524	*V. ambiguus*	0-2	-11	6	52.62	0.35	-473.8	3.5	5660-5990
SSM4	ANU-6525	*V. ambiguus*	50	-9	1	58.65	0.18	-413.5	1.8	4630-4860
SUMB5	ANU-6526	*V. ambiguus*	0-2	-1	1	46.52	0.20	-534.8	2.0	6800-7160
SUM5-2	ANU-6527	*V. ambiguus*	2-4	-9	1	52.69	0.21	-473.1	2.1	5670-5930
SUM9	ANU-6529	*V. ambiguus*	2-4	-2	4	55.32	0.27	-446.8	2.7	5320-5580
SUM3	ANU-6530	*V. ambiguus*	2-4	-7	1	61.11	0.15	-388.9	1.5	4160-4420
SUM4	ANU-6531	*V. ambiguus*	4-5	-9	2	52.16	0.24	-478.4	2.4	5750-6170
SUM8	ANU-6532	*V. ambiguus*	4-5	-13	2	51.64	0.21	-483.6	2.1	5920-6180
SUM4-1	ANU-6533	*V. ambiguus*	4-5	-9	1	65.94	0.24	-340.6	2.4	3410-3630

Lower Murray Excavation Samples - Radiocarbon Ages (Calibrated)

Lab number	Sample Name	Sample material	Depth (cm)	$\delta^{13}C$	±	% Modern Carbon	±	D14C	±	Cal BP 95.4% probability
ANU-3117	GLMBS-Xu1	*V. ambiguus*	6	-2.9	4.9	59.39	0.36	-406.1	3.6	4450-4830
ANU-2737	GLMBS-Xu1repeat	*V. ambiguus*	6	-1.1	2.0	59.61	0.26	-403.9	2.6	4450-4820
ANU-3118	GLMBS-Xu2	*V. ambiguus*	20	-13.6	3.8	60.33	0.70	-396.7	7.0	4290-4800
ANU-2738	GLMBS-Xu2 repeat	*V. ambiguus*	20	-5.9	1.2	60.79	0.23	-392.1	2.3	4250-4520
ANU-2739	GLMBS-Xu7	*V. ambiguus*	51	-10.7	2.0	57.02	0.25	-429.8	2.5	4890-5300
ANU-3119	GLMBS-XU14a	*Charcoal*	78	-26.2	3.2	39.15	0.23	-608.5	2.3	8190-8390
ANU-3120	GLMBS-XU14br	*V. ambiguus*	78	-9.0	3.6	39.55	0.23	-604.5	2.3	8050-8350
ANU-3121	GLMBS-XU14brep	*V. ambiguus*	78	-17.1	3.8	39.90	0.41	-601.0	4.1	8010-8310
ANU-3123	GLMBS-XU19	*V. ambiguus*	104	-16.1	5.5	57.56	0.39	-424.4	3.9	5750-6180
ANU-6535	HRMSQA-XU2	*V. ambiguus*	15	-11	6	59.71	0.42	-402.9	4.2	4430-4820

ANU-6536	HRMSQA-XU2c	*Charcoal*	15	-22	2	60.38	0.19	-396.2	1.9	4300-4780
ANU-6537	HRMSQA-XU4	*V. ambiguus*	25	-11	3	58.58	0.26	-414.2	2.6	4580-4960
ANU-6538	HRMSQA-XU4c	*Charcoal*	25	-27	1	59.21	0.21	-407.9	2.1	4620-4830
ANU-6606	HRMSQA-XU10	*V. ambiguus*	56	-7	3	49.97	0.24	-500.3	2.4	6210-6410
ANU-6607	HRMSQB-XU3c	*Charcoal*	20	-23	4	96.35	0.51	-36.5	5.1	150-490
ANU-6609	SWM1SQA-XU2	*V. ambiguus*	13	-1	3	59.11	0.24	-408.9	2.4	4540-4840
ANU-6610	SWM1SQA-XU6	*V. ambiguus*	35	-6	9	59.08	0.56	-409.2	5.6	4430-4870
ANU-6611	SWM1SQA-XU6c	*Charcoal*	35	-25	3	59.79	0.29	-402.1	2.9	4420-4820
ANU-6612	SWM1SQA-XU9	*V. ambiguus*	50	-1	6	52.92	0.36	-470.8	3.6	5620-5930
ANU-6613	SWM1SQA-XU9c	*Charcoal*	50	-24	3	67.15	0.31	-328.5	3.1	3220-3470
ANU-3129	GLM6-s1a	*V. ambiguus*	N/A	-11.0	5.4	52.06	0.35	-479.4	3.5	5750-6180

Note: CALIB REV5.0.2 M Stuvier & PJ Reimer 1986-2005

Lower Murray Radiocarbon Ages (R-corrected) - Surface Samples

Lab number	Sample Name	Sample material	Approximate depth below surface (cm)	Conventional ^{14}C age ± 1σ (BP)		R-corrected ^{14}C age ± 1σ (BP)*		Calibrated ages at 2σ (cal BP)**		
								Age range		Median
ANU-2716	MBM2-ss1	*V. ambiguus*	50	2950	35	N/A	N/A	2621	2842	2752
ANU-2718	MBM2-ss2	*Charcoal*	50	2680	30	N/A	N/A	2621	2842	2752
ANU-2719	MBM2-ss3	*V. ambiguus*	80	3665	45	3435	176	3212	4143	3643
ANU-2720	BM2-ss4	*V. ambiguus*	0-2	3325	30	3095	173	2788	3612	3215
ANU-2721	BM2-ss5	*V. ambiguus*	0-2	3235	30	3005	173	2745	3554	3116
ANU-2724	LFM2-ss6	*V. ambiguus*	0-2	4190	35	3960	174	3889	4829	4333
ANU-2725	GLMBS-ss7	*V. ambiguus*	5	4105	30	3875	173	3722	4808	4218
ANU-2729	GLBS-ss8	*V. ambiguus*	20	6320	40	6090	175	6473	7292	6897
ANU-2730	GLBS-ss9	*V. ambiguus*	0-2	4330	40	4100	175	3987	5026	4532
ANU-2731	GLBS-ss10	*V. ambiguus*	20	6210	40	5980	175	6323	7237	6765
ANU-2732	GLM6-ss11	*V. ambiguus*	15-20	5645	40	5415	175	5726	6495	6129
ANU-2733	GLM6-ss12	*V. ambiguus*	15-20	4185	30	3955	173	3888	4827	4326
ANU-2735	GLM5-ss13(r)	*V. ambiguus*	10	5130	35	4900	174	5051	5981	5570
ANU-2736	GLM3-ss14(r)	*V. ambiguus*	2-4	805	30	575	173	145	900	533
ANU-3116	GLM3-ss14	*V. ambiguus*	2-4	690	35	460	174	0	674	421
ANU-6507	MYMBS	*V. ambiguus*	40	4340	40	N/A	N/A	4628	4955	4832
ANU-6509	MYMBS-C	*Charcoal*	40	4310	35	N/A	N/A	4628	4955	4832
ANU-6510	MYM1	*V. ambiguus*	0-2	3315	35	3085	174	2780	3609	3203

ANU-6511	HRMHC	*V. ambiguus*	0-2	4025	30	3795	173	3632	4779	4110
ANU-6512	SRSM	*V. ambiguus*	0	1905	30	1675	173	1181	1925	1538
ANU-6513	MYFM2	*V. ambiguus*	50	580	35	350	174	0	620	333
ANU-6514	TOM1	*V. ambiguus*	0-2	3860	35	3630	174	3463	4406	3888
ANU-6516	MB1M1	*V. ambiguus*	0-2cm	4835	40	4605	175	4728	5644	5198
ANU-6517	SWM2	*V. ambiguus*	0-2cm	1805	35	1575	174	1071	1818	1440
ANU-6518	POM1	*V. ambiguus*	0-2cm	5030	40	4800	175	4972	5892	5447
ANU-6519	POM4	*V. ambiguus*	0-2cm	3590	35	3360	174	3078	3982	3552
ANU-6520	POM5	*V. ambiguus*	0-2cm	2405	35	2175	174	1634	2696	2107
ANU-6521	SSM1	*V. ambiguus*	0-2cm	4140	40	3910	175	3832	4821	4266
ANU-6523	SSM2	*V. ambiguus*	2-4cm	5040	45	4810	176	4976	5894	5459
ANU-6524	SSM5	*V. ambiguus*	0-2cm	5160	70	4930	184	5049	5999	5608
ANU-6525	SSM4	*V. ambiguus*	50cm	4285	35	4055	174	3928	4947	4470
ANU-6526	SUMB5	*V. ambiguus*	0-2cm	6150	45	5920	176	6310	7156	6693
ANU-6527	SUM5-2	*V. ambiguus*	2-4cm	5145	45	4915	176	5053	5989	5590
ANU-6529	SUM9	*V. ambiguus*	2-4cm	4755	50	4525	177	4627	5584	5114
ANU-6530	SUM3	*V. ambiguus*	2-4cm	3955	30	3725	173	3563	4515	4016
ANU-6531	SUM4	*V. ambiguus*	4-5cm	5230	50	5000	177	5303	6178	5692
ANU-6532	SUM8	*V. ambiguus*	4-5cm	5310	45	5080	176	5326	6192	5779
ANU-6533	SUM4-1	*V. ambiguus*	4-5cm	3345	40	3115	175	2794	3638	3238

Excavation Samples

Lab number	Sample Name	Sample material	Depth (cm)	Conventional ^{14}C age ± 1σ (BP)		R-corrected ^{14}C age ± 1σ (BP)*		Calibrated ages at 2σ (cal BP)**		
								Age range		Median
ANU-3117	GLMBS-Xu1	*V. ambiguus*	6	4185	50					
ANU-2737	GLMBS-Xu1repeat	*V. ambiguus*	6	4155	35					
	GLMBS-Xu1_combined			4165	30	3935	173	3867	4821	4299
ANU-3118	GLMBS-Xu2	*V. ambiguus*	20	4060	50					
ANU-2738	GLMBS-Xu2 repeat	*V. ambiguus*	20	4000	30					
	GLMBS-Xu2_combined			4015	30	3785	173	3616	4570	4097
ANU-2739	GLMBS-Xu7	*V. ambiguus*	51	4515	40	4285	175	4296	5307	4769
ANU-3119	GLMBS-XU14a	*Charcoal*	78	7535	50	N/A	N/A	8187	8385	8296
ANU-3120	GLMBS-XU14br	*V. ambiguus*	78	7450	50	N/A	N/A	8187	8385	8296
ANU-3121	GLMBS-XU14brep	*V. ambiguus*	78	7380	50	N/A	N/A	8187	8385	8296
ANU-3123	GLMBS-XU19	*V. ambiguus*	104	4440	60	4210	180	4155	5280	4672
ANU-6535	HRMSQA-XU2	*V. ambiguus*	15	4140	70	N/A	N/A	4297	4781	4477
ANU-6536	HRMSQA-XU2c	*Charcoal*	15	4055	40	N/A	N/A	4297	4781	4477
ANU-6537	HRMSQA-XU4	*V. ambiguus*	25	4295	50	N/A	N/A	4533	4830	4694
ANU-6538	HRMSQA-XU4c	*Charcoal*	25	4210	40	N/A	N/A	4533	4830	4694

ANU-6606	HRMSQA-XU10	*V. ambiguus*	56	5575	50	5345	177	5657	6406	6064
ANU-6607	HRMSQB-XU3c	*Charcoal*	20	300	55	N/A	N/A	147	486	327
ANU-6609	SWM1SQA-XU2	*V. ambiguus*	13	4225	45	3995	176	3909	4841	4382
ANU-6610	SWM1SQA-XU6	*V. ambiguus*	35	4230	90	N/A	N/A	4423	4815	4582
ANU-6611	SWM1SQA-XU6c	*Charcoal*	35	4130	50	N/A	N/A	4423	4815	4582
ANU-6612	SWM1SQA-XU9	*V. ambiguus*	50	5110	70	N/A	N/A	3219	3471	3370
ANU-6613	SWM1SQA-XU9c	*Charcoal*	50	3200	50	N/A	N/A	3219	3471	3370
ANU-3129	GLM6-s1a	*V. ambiguus*	N/A	5240	60	5010	180	5308	6179	5703

Lower Murray Otolith Samples

Lab number	Sample Name	Sample material	Conventional ^{14}C age ± 1σ (BP)		R-corrected ^{14}C age ± 1σ (BP)*		Calibrated ages at 2σ (cal BP)**		
							Age range		Median
OZM960	GLMBS02	*Murray cod Otolith*	4080	40	3850	175	3696	4799	4185
OZM961	GLMBS04	*Murray Cod Otolith*	4185	40	3955	175	3879	4828	4326
OZM962	HRM01	*Murray Cod Otolith*	5200	40	4970	175	5082	6176	5657
OZM963	HRM02	*Murray Cod Otolith*	5265	40	5035	175	5320	6178	5730
OZM964	HRM03	*Murray Cod Otolith*	4310	35	4080	174	3982	4959	4504
OZM965	HRM06	*Murray Cod Otolith*	4240	35	4010	174	3924	4850	4404
OZM966	SP06	*Murray Cod Otolith*	5100	35	4870	174	5046	5920	5530
OZM967	SP02	*Murray Cod Otolith*	4775	35	4545	174	4645	5589	5136
OZM968	SP03	*Murray Cod Otolith*	4580	30	4350	173	4414	5444	4878
OZM969	SP04	*Murray Cod Otolith*	5650	50	5420	177	5720	6502	6134

Known-age shells (from Wilson unpublished, and Gillespie et al 2009)

Location	Latitude, Longitude	Sample ID	Collection year	Species	Lab number	^{14}C age ± 1σ (BP)	Reservoir age (yr)
Lake Bonney		VA1_LBon	1930	V. ambiguus	ANU-9409	240 ± 35	86 ± 36
Berri		VA2_Berri	1923	V. ambiguus	ANU-9410	235 ± 40	83 ± 41
LakeAlexandrina		VA3_Alex	1886	V. ambiguus	ANU-9411	630 ± 30	487 ± 31
Mannum		VA4_Man	1930	V. ambiguus	ANU-9412	435 ± 30	281 ± 31
Castlereagh R, Gilgandra	31°43'S, 148°40'E	VA-1	1940	V. ambiguus	OZH767	65 ± 30	-60 ± 30
Darling R, Bourke	35°5'S, 145°56'E	VA-2	1909	V. ambiguus	OZH768	90 ± 30	-36 ± 30
Mooni R, Mogil Mogil	29°21'S, 148°41'E	VA-3	1911	V. ambiguus	OZH766	135 ± 30	-6 ± 30
Murrumbidgee R, Gundagai	35°4'S, 148°7'E	VA-4	1940	V. ambiguus	OZH769	230 ± 30	89 ± 30
Murrumbidgee R, Yanko	34°38'S, 146°22'E	AJ-1	1932	A. jacksoni	OZH770	270 ± 30	112 ± 30

Shell-charcoal pairs (Wilson unpublished)

Pair #	Site	Depth (cm)	Lab number	Sample Name	Sample material	^{14}C age ± 1σ (BP)	Reservoir age (yr)
1	Murray Bridge	50cm	ANU-2716	MBM2-ss1	V.Ambiguus	2950 ± 35	270 ± 46
			ANU-2718	MBM2-ss2	Charcoal	2680 ± 30	
2	Mypolonga	40cm	ANU-6507	MYMBS	V.Ambiguus	4340 ± 40	30 ± 53
			ANU-6509	MYMBS-C	Charcoal	4310 ± 35	
3	Glen Lossie	78cm	ANU-3120	GLMBS-XU14br	V.Ambiguus	7450 ± 50	-155 ± 71
			ANU-3121	GLMBS-XU14brepeat	V.Ambiguus	7380 ± 50	-85 ± 71
			ANU-3119	GLMBS-XU14a	Charcoal	7535 ± 50	
4	Hume Reserve	15cm	ANU-6535	HRMSQA-XU2	V.Ambiguus	4140 ± 70	85 ± 81
			ANU-6536	HRMSQA-XU2c	Charcoal	4055 ± 40	
5	Hume Reserve	25cm	ANU-6537	HRMSQA-XU4	V.Ambiguus	4295 ± 50	85 ± 64
			ANU-6538	HRMSQA-XU4c	Charcoal	4210 ± 40	
6	Swanport	35cm	ANU-6610	SWM1SQA-XU6	V.Ambiguus	4230 ± 90	100 ± 103
			ANU-6611	SWM1SQA-XU6c	Charcoal	4130 ± 50	
7	Swanport	50cm	ANU-6612	SWM1SQA-XU9	V.Ambiguus	5110 ± 70	1910 ± 86
			ANU-6613	SWM1SQA-XU9c	Charcoal	3200 ± 50	

Dumping only Pair 7, mean reservoir age is ca. 85 years, but this will be incorrect because values are not statistically identical.

Fish Otolith Analysis and Technical Data

Morgan Disspain, Bronwyn Gillanders & Christopher Wilson

Excerpts from Morgan Disspain, Christopher Wilson & Bronwyn Gillanders (see Disspain et al. 2012) discussion on morphological and geochemical analysis of fish otoliths excavated from the Lower Murray River, South Australia.

Overview

Twenty-four otoliths were recovered; seven from Glen Lossie Midden and Burial site (GLMBS), ten from *Pomberuk* (HRM), and seven from Swanport Midden (SP). Of these, 21 were identified as belonging to *Maccullochella peelii* (Murray cod) (Table). One sample (HRM07) was identified as possibly belonging to this same species; however, its fragmentary nature meant that a definite identification could not be achieved, as it may also be from *M. macquariensis* (trout cod), a species closely related to *M. peelii* that no longer inhabits this part of the river. While this is acknowledged, the distribution of this species ca. 4000–6000 years ago may have been more widespread. For the purpose of subsequent analyses, HRM07 was included in the *M. peelii* species group. A further two otoliths (GLMBS01, GLMBS06) were identified as *Macquaria ambigua* (golden perch). However, one of these samples (GLMBS01) was broken and poorly preserved and the identification is tentative. Excluding the two samples mentioned above, the remaining otoliths appeared to be in good condition with no evidence of taphonomic or diagenetic alteration.

Within the assemblage of 24 otoliths, only 15 were able to be sectioned (see Table). Based on these 15 samples, minimum length estimates for *Maccullochella peelii* range from 685 to 2200mm (see Figure). The *Macquaria ambigua* otolith (GLMBS06) weighed 0.2032g, resulting in a fish length of 355mm. Of the 15 sectioned otoliths, two (GLMBS02, HRM10) were unable to be aged because of a lack of visible annuli. The remaining 13 otoliths came from fish aged between 5 and 31 years (Table). Owing to deterioration, the edge increments of two otoliths were unable to be determined, (GLMBS06 and HRM10). However, from the data available, the majority of the fish were harvested during the warmer months, with 13 otoliths possessing translucent edge increments (Table). Maccullochella peelii *chemistry* Distinct patterns emerge within the trace element data of the Murray cod otoliths. All fish were spawned in freshwater environments, as Ba:Ca levels remained above 0.006 mmol.mol-1 in the core of the otoliths. The Ba:Ca levels remain above this limit throughout the entire profile for the majority of otoliths (GLMBS04, SP01, SP03, SP06, SP07, HRM09 and HRM10), which would be expected of a freshwater species (Figure). The Sr:Ca levels within these seven profiles all followed relatively similar trends to those of the Ba:Ca levels. This differs from the positive Sr:Ca relationship with salinity levels, suggesting that Sr:Ca is also influenced by water temperature and ambient water chemistry.

Data from three profiles, (GLMBS02, HRM02 and HRM03) indicate Ba:Ca decreases to brackish water levels (between 0.005 mmol.mol-1 and 0.006 mmol.mol-1) at different stages after the nucleus. These levels then fluctuate between brackish and freshwater for the reminder of the profile, with the fish residing in freshwater environments at the time of capture. Sr:Ca levels in GLMBS02 fluctuate in a similar pattern to the Ba:Ca levels, while levels in HRM02 and HRM03 show fluctuations with no apparent relationship to Ba:Ca levels (Figure). Ba:Ca data from profiles in four fish (HRM01, HRM06, SP02 and SP04) display fluctuations between freshwater, brackish and saline environment levels (Figure). The low Ba:Ca levels at the end of two of the profiles (HRM01 and HRM06) imply that the fish died in environments with relatively high levels of salinity. Ba:Ca levels at the end of the profile of SP02 indicate that the fish died in freshwater, while those of SP04 suggest that the fish died in a brackish environment. As above, the Sr:Ca levels in HRM01 and HRM06 fluctuate with no apparent relationships to Ba:Ca levels; however, those of SP02 and SP04 seemingly fluctuate in a similar pattern to the Ba:Ca levels. Macquaria ambigua *chemistry* The very high peak of Ba:Ca levels in the centre of the nucleus indicates that the fish (GLMBS06) was spawned in freshwater (Figure). The Ba:Ca levels then remain lower than this initial peak, fluctuating throughout the profile, but remaining above levels indicative of marine salinity (0.006).

Maccullochella peelii, Murray cod, is a large freshwater fish that constitutes the majority of this Lower Murray otolith assemblage. in the period 1955 to 2001, *M. peelii* was the third most commercially harvested species in the Lower Murray-Darling catchment (Gilligan 2005:63), however the commercial fishery is now closed and the species has been listed as vulnerable under Australia's Environmental Protection and Biodiversity Act 1999 (Federal threatened species legislation) (Koehn and Harrington 2006:327; Lintermans 2009:5). The species generally prefers slow flowing, turbid water in streams and rivers, favouring deeper water around boulders, undercut banks, overhanging vegetation and logs (Koehn 2009). *M. peelii* has previously been considered to be a largely sedentary, non-migratory species (Reynolds 1983), though recent studies have shown that some adult Murray cod undertake complex movements that follow a seasonal pattern, with large scale movements (>5km) more commonly observed in the period from August to January (Koehn et al. 2009). The species is a member of the family Percichthyidae, is known to live to a maximum age of c.48 years, and to grow to a maximum length of 1800mm and a weight of c.100kg (Anderson et al.1992a:983). Average lengths in large waterways are usually 900–1000mm, with weights of 15–20kg (Native Fish Australia 2009). Whitley (1955) recorded a maximum length (TL) of *Maccullochella peelii* of 1800mm, and a weight of 83kg. However, Anderson et al.'s (1992a) more recent study revealed maximum figures of 1400mm and 47.3kg. Three lengths determined from the archaeological *M. peelii* samples (GLMBS02 – 1982.32mm, SP02 – 2166.67 and SP03 – 2200mm) exceed both of the previously recorded maximums. Further, as these otoliths were broken, these are minimum estimates and the fish may have been larger. While the sample size is admittedly small,

these data support suggestions that there has been a general decrease in the size of individual fish. This decrease is likely a result of a combination of factors including European fishing.

Macquaria ambigua (golden perch/callop), represented by only two otoliths in the assemblage, is a freshwater species that is distributed throughout most of the Murray- Darling Basin and the Lower Lakes (Sloan 2005:82). They prefer warm, turbid, slow flowing inland rivers, floodplains and lakes, and favour deep pool habitats with an abundance of refuges in the form of snags, undercut ledges and dead trees (Merrick and Schmida 1984). *M. ambigua* is well adapted to the dynamic conditions of the Murray River and can withstand significant changes in temperature (4–37°C) and salinity (Harris and Rowland 1996). This flexibility means that the species is ideally suited as a subject for chemical analysis. Golden perch are known to reach a weight of 23kg, although are commonly <5kg (Anderson et al. 1992b). The maximum recorded length measurements for this species are 760mm TL (Lake 1967), and 604mm TL (Anderson et al. 1992b), while the maximum known age is about 26 years (Ye 2004). The one archaeological *M. ambigua* otolith studied was considerably smaller and younger than this, at 355mm and five years of age. Unfortunately this age difference combined with the small archaeological sample size, mean that the modern and archaeological total length data for this species cannot be usefully compared. Spawning occurs during spring and summer, in a temperature range between 20°C and 25°C. Females sexually mature at 4–5 years, and males at 2–3 years (Harris and Rowland 1996) suggesting that the archaeological specimen was mature.

Trace Element Analysis

The trace element data provides information about the life history of individual fish. Those of the *Maccullochella peelii* fish from the Lower Murray sites show distinct variation within the species, though all were spawned in freshwater. Fluctuations between low and higher salinity levels are possibly the result of fish movement further up or down stream as discussed by Koehn et al. (2009), or seasonal fluctuations within the river environment; however, the occurrence of high salinity Ba:Ca concentrations in the data is problematic in that *M. peelii* are physiologically inclined to reside in freshwater environments. Salinities above 0.34g/L may result in significant impacts on Murray Cod (Chotipuntu 2003) while elevated salinity levels may also affect food sources such as invertebrates, algae and macrophytes, consequently affecting habitat complexity and quality (Koehn and Clunie 2010:15). These data are likely to have been influenced by other variables such as ambient temperature and water chemistry. Notably, the comparative trace element values indicative of salinity are based on data from *Acanthopagrus butcheri*, an estuarine/marine fish, and species specific differences can occur. As such, these data should be interpreted with caution and further research needs to be done to explore the influences of environmental variables on trace elemental data of different species. All but three of the *M. peelii* fish were captured in freshwater environments during the warm season. This is in agreement with the idea that freshwater flowed from upstream during spring as a result

of rainfall and runoff. The three fish that were caught in more saline waters during the warm season could have travelled further downstream, or could have died during a season when freshwater inflow was exceeded by a combination of marine inflow and evaporation, contributing to higher salinity levels.

The single *Macquaria ambigua* otolith indicated a fish that was spawned in, and inhabited, freshwater environments throughout its life. This species is able to withstand significant changes in temperature and salinity, and the profile indicates varying levels of Ba:Ca and Sr:Ca, but the Ba:Ca levels do not decrease past the lower freshwater limit of 0.006 mmol.mol-1. Edge increment analysis demonstrates this fish was also caught during the warmer months, possibly in the river immediately adjacent to, or nearby, the middens. As only one specimen of this species could be analysed, any claims made using these data are merely speculative. The trace element data has revealed that prior to human interference, water of the Murray River experienced fluctuating salinity levels (as indicated by the trace element data of *Maccullochella peelii*); however, as a result of barrage construction and water management strategies, the river is now predominantly fresh (Fluin et al. 2007). These observations support Disspain et al. (2011) who suggested that people have significantly altered the waterways of the Coorong. Trace element data of the Coorong otoliths associated with shell and charcoal dates ranging from ca 6500 BP to ca 200 BP revealed fluctuating levels of salinity in the estuary, which were significantly lower than the hypersaline conditions experienced in some areas today. As mentioned above, our results are based on values for freshwater versus marine conditions obtained from experiments and field studies on *Acanthopagrus butcheri*, an estuarine species. Variation in trace elements among species has been found even for fish inhabiting the same region (i.e. Gillanders and Kingsford 2003); therefore, caution is required in definitively attributing concentrations to brackish and saline conditions.

A number of inferences can be made in relation to Ngarrindjeri subsistence strategies and occupation. All of the fish in the middens were caught during the warm season, consistent with ethnographic observations about Ngarrindjeri fishing activities (Berndt et al. 1993:79; Tindale 1981:1878-80) and traditional Ngarrindjeri knowledge. These results align with those discussed by Disspain et al. (2011) concerning the capture of *Argyrosomus japonicas* (mulloway) within the Coorong at the mouth of the Murray River. Saltwater fish were difficult to catch during the winter, except in protected areas, while freshwater fish were largely inaccessible due to floodwaters. in accordance with this, no fish from the Lower Murray sites were caught during the cold season.

Dependant on species, different fishing techniques were likely used by the Ngarrindjeri. The large predatory *Maccullochella peelii* could have been caught using spears or clubs. They could also have been caught with nets, however, based on the small numbers of otoliths recovered; this is unlikely, as the technique would have resulted in a larger number of fish of approximately the same size being captured. Disspain et al. (2011) detailed similar findings

in relation to the use of nets in the estuary. Both *M. peelii* and *Macquaria ambigua* prefer to inhabit warm deep water around trees and snags, possibly making spearing difficult.

The analysis of fish otoliths endeavoured to be of contemporary environmental relevance by providing information concerning the changing fish populations of the region and contributing to the topical issue surrounding the impacts humans have had on the Murray River system and its resulting condition. The study also demonstrates the unique nature of otoliths and their potential for investigating indigenous subsistence strategies. Within Australia, previous otolith studies have focused on morphological analyses. This project has successfully expanded the examination of archaeological otoliths to include chemical analyses. By integrating various methodological techniques, further understanding of the subsistence strategies of the Ngarrindjeri, and the fish population dynamics and environmental conditions of the Lower Murray River, from the mid-Holocene to the present, can be developed. Impacts that human predation and environmental degradation have had on the fish populations of the study region have also been explored. By utilising numerous analytical techniques, otoliths from the archaeological record can provide informative data that is unable to be acquired by any other archaeological material.

Morphological analysis

Images of each otolith were acquired to create a comprehensive archival record. The proximal and distal surfaces of each otolith were photographed using a Nikon D60 digital camera equipped with a Nikon AF Micro Nikkor 60mm lens and a flash diffuser. Photomicrographs of the sectioned otoliths were acquired using a Leica MZ16A stereomicroscope with a PLANAPO 1.0x lens. Morphological comparisons with modern reference collections held at South Australian Research Development Institute, Aquatic Sciences (Adelaide) and Southern Seas Ecology Laboratories (University of Adelaide) enabled species identifications. Published images were also used to support these identifications (i.e. Furlani et al. 2007).

Otolith weight was used to determine total fish length (TL), defined as the length from the tip of the snout to the extended longest caudal finray. Some otoliths were broken and incomplete owing to post-depositional processes such as physical weathering and breakage; therefore, weights recorded for these specimens are minimum values only, and thus calculated fish lengths should be considered under-estimates. Only those otoliths >50% complete (i.e. large enough to be sectioned) were included in the size determination analysis, though all otoliths were weighed. The relationship between otolith weight and fish length for *Maccullochella peelii* is: TL (mm)=(Otolith weight (g)+0.204)/0.00069 (from Anderson et al. 1992a:1003), and that for *Macquaria ambigua* is: TL(mm)=(log(Otolith weight(g)/0.02354))/0.0026393+23.9293329 (from Anderson et al. 1992b:1116).

Geochemical analysis

Otoliths with a nucleus were rinsed using ultrapure water and left to air dry. Approximately 15 mg was cut from each sample using a dremmel drill on the slowest setting (avoiding the nucleus). This was done to provide material for future radiocarbon dating, which was stored in a labelled microcentrifuge tube. Remaining otoliths were embedded in latex moulds in Indium spiked resin (40 ppm), and placed in an oven at 54.5°C to harden overnight. They were then sectioned transversely through the nucleus using a Buehler Isomet Low Speed Saw (speed 2.5) equipped with twin diamond edge blades with spacers (0.35 ± 0.05 mm). The sections were mounted on glass slides using crystal bond and labelled, but were not polished using lapping film because of their fragility.

Continuous profiles were made across each otolith section using an Agilent 7500s Inductively Coupled Plasma-Mass Spectrometer (ICP-MS) coupled to a Merchantek UP213 (New Wave Research) laser (see Disspain et al. 2011 for operational details). Each profile was positioned to capture the nucleus, growth axis and edge of the otolith, and was pre-ablated (spot size 80 μm, scan speed 10 μm/sec, depth 5 μm, pulse rate 5.0 Hz) to remove contaminants and allow the ablation to penetrate the otolith during operations. The ablations were conducted at a scan speed of 5 μm/sec with a spot size of 30 μm, and nine elements analysed (Li7, Na23, Mg24, Ca43, Ca44, Mn55, Sr88, In114 and Ba138). To correct for machine drift, a reference sample (National Institute of Standards and Technology, NIST 612) was analyzed at the beginning and end of each laboratory session, and after analysis of every five or six samples. Background gases were measured for 30 seconds before each ablation to determine the detection limits of ICP-MS. GLITTER software (www.glitter-gemoc.com/) was used to determine the positions of the background and otolith element mass count data. Data were further processed using Excel to determine concentrations of elements, and ratioed to calcium. We have used the term *profiles* to describe the analysis of chemicals along a continuous transect across the otolith surface, in line with Elsdon et al (2008).

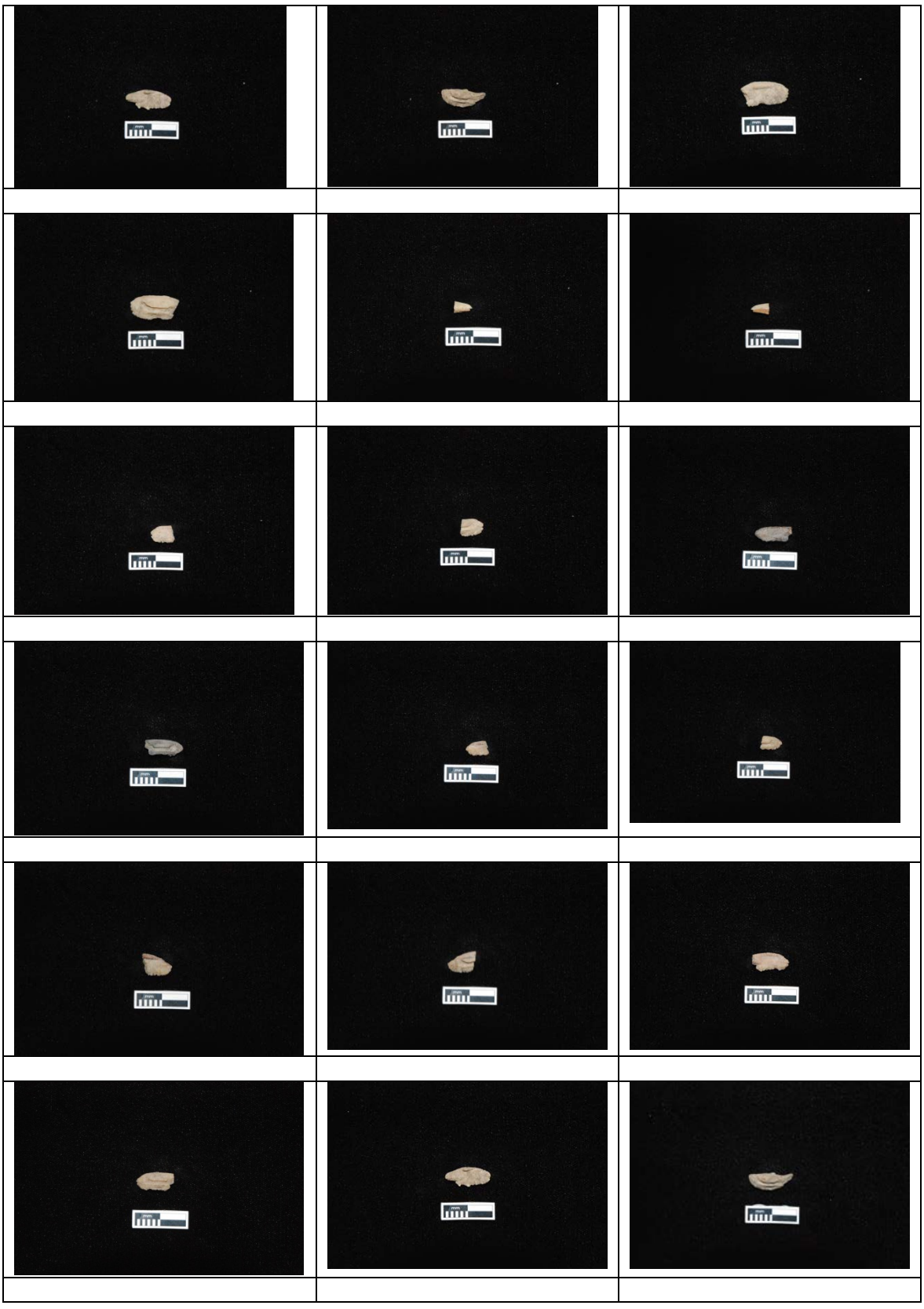
Due to the nature of this study, it was not possible to determine the elemental concentrations within the ambient water, which is necessary for accurately determining fish migrations (Elsdon and Gillanders 2006:653; Elsdon et al 2008). Therefore, modern day relationships between ambient element concentrations, salinity and otolith elemental concentrations from Elsdon and Gillanders (2005) were used. Elsdon and Gillanders (2005) determined, through laboratory and field studies, that Ba:Ca levels <0.005 $mmol.mol^{-1}$, were considered to indicate freshwater levels of salinity, >0.006 $mmol.mol^{-1}$ to indicate marine levels, and 0.005 – 0.006 $mmol.mol^{-1}$ to indicate brackish water levels. Previously, they had established that Sr:Ca leves within otoliths can be influenced by a range of environmental variables, though they are often used to determine salinity (Elsdon and Gillanders 2004). Owing to this, Sr:Ca data were used as comparative data. It is impossible to know if fish migrated or if local water conditions changed around

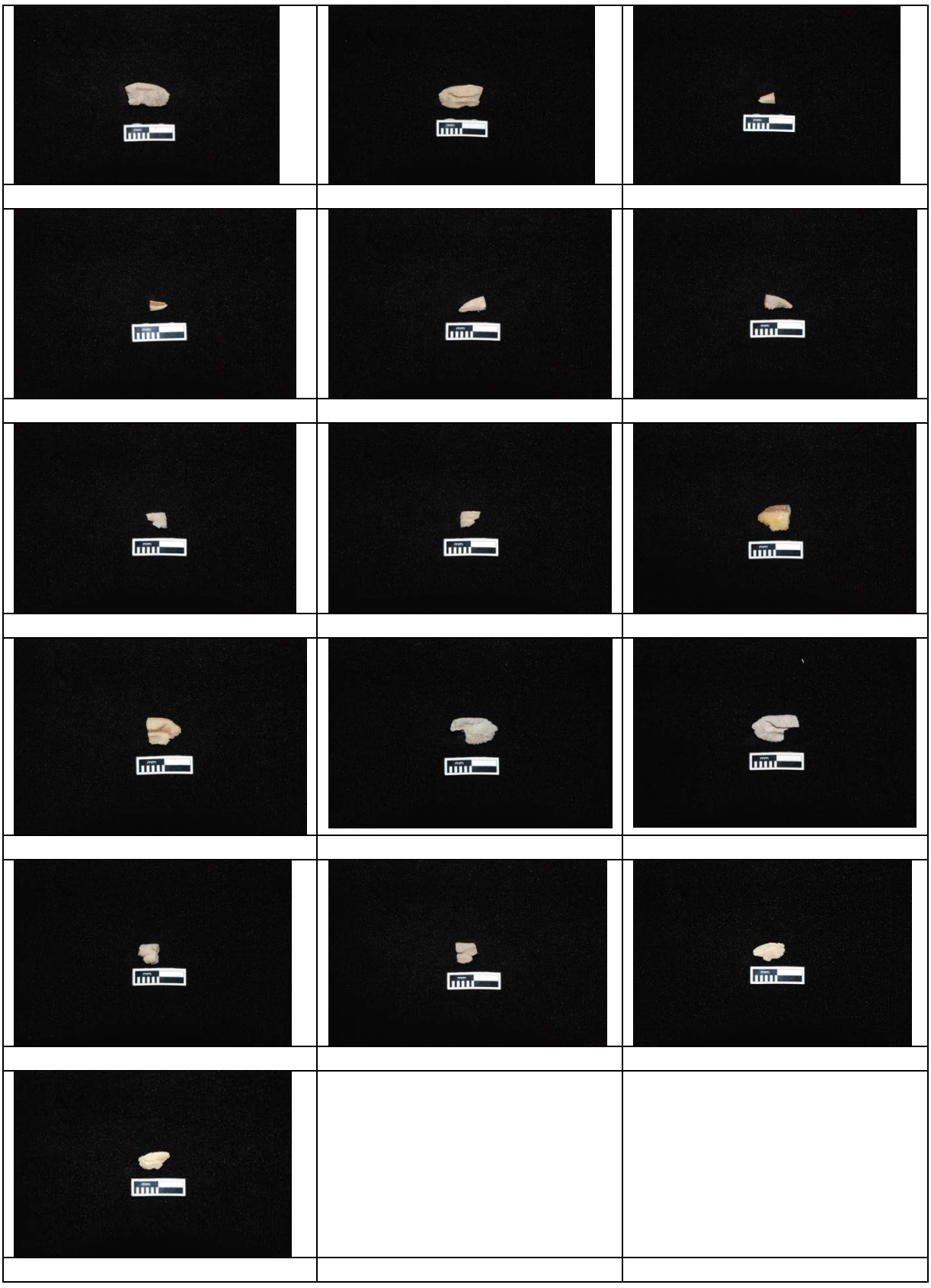
an essentially stationary fish without knowledge of the ambient elemental variability (Elsdon et al. 2008). It can be expected that freshwater flowed further downstream, and salt water further upstream at the time the fish were alive, than occurs today because of the absence of river regulation by barrages and dams. However, salinity levels are unable to be determined beyond generalising between 'freshwater', 'brackish' and 'marine' based on the above findings.

Age estimation

The visible annuli of each sectioned otolith were counted to estimate the individual age of each fish at the time of death. Sections were viewed under a Leica MZ16FA stereomicroscope illuminated by transmitted light. The annuli were counted from the nucleus to the outer edge of each otolith on two separate occasions (the second count was made with no prior knowledge of the initial count in order to avoid prejudice). The edge annulus was also recorded as being translucent or opaque, as this information indicates the season during which the fish was caught. The wide, translucent band is laid down during periods of fast growth during the warmer months, while the narrower, opaque bands are laid down during periods of slow growth during the cooler months.

The stereomicroscope images of each otolith section obtained were then viewed using AnalySIS 5 iTEM software to link the trace element data to the appropriate annuli. Each image was calibrated using a 1 mm scale bar, and the accumulated distance function was used to trace each profile, defining the annuli along the trace. In the case of HRM10, where no annuli were visible, points were defined along the profile at every identifiable colour change or feature in the section in order to compare the measurements with the trace element data.





List of Publications & Research by Candidature

Books and Journal Articles (Peer Reviewed)

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