The Astronomy of the Kamilaroi and Euahlayi Peoples and Their Neighbours

By

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A thesis submitted to the Faculty of Arts at Macquarie University for the degree of Master of Philosophy

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I certify that the work in this thesis entitled “The Astronomy of the Kamilaroi and Euahlayi Peoples and Their Neighbours” has not been previously submitted for a degree nor has it been submitted as part of requirements for a degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself has been appropriately acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

The research presented in this thesis was approved by Macquarie University Ethics Review Committee reference number 5201200462 on 27 June 2012.

Robert S. Fuller (42916135)

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Contents

Dedication

This thesis is dedicated to the Aboriginal people of north and western New South Wales, the Kamilaroi, Euahlayi, Murrawarri and Ngemba peoples, who have maintained their culture, their ties to country, and their respect for each other throughout the long years since European invasion. I would like to acknowledge and pay respect to those traditional custodians of the land on which the stories conveyed in this thesis originated.

I would also like to acknowledge and pay respect to the Wallumedegal clan of the Darug Nation, who are the traditional custodians of the land that Macquarie University sits upon.

Note to Aboriginal and Torres Strait Islander Readers

This thesis contains the names and images of people that have passed away.

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Acknowledgements

I would like to thank my wife, Robyn Fuller, for her support in encouraging me to embark on a new career late in life, and putting up with my absences while researching this project.

My Supervisors at Macquarie University, Associate Professor Michelle Trudgett and Adjunct Professor Ray Norris, have patiently helped me in the transition from being a business writer to that of an academic writer, and assisted me in the many complex tasks associated with developing and running a higher degree research project. In particular, Michelle has helped me to work through the university systems to get support for Ethics approvals, funding for an associated Giving Back project, advice on Intellectual Property, and various audited classes and workshops that have provided necessary skills. Ray, besides being my supervisor, has also been my mentor in the entire process.

In particular, I would like to express my gratitude to the Indigenous participants in this project, including Greg Griffiths, who provided the initial contact through Ray Norris, and helped find the rest of the participants; Michael Anderson, who helped support the discussions with the Kamilaroi Nation Applicant Board of elders, and subsequently became a co-author of several journal articles; and Rhonda Ashby, Lachie Dennis, Paul Gordon, Brenda McBride, Jason Wilson, and one anonymous person, for their stories and those of their families.

I'd like to thank associates in the wider Astrophysics and Indigenous Cultural Astronomy community, including Dr Duane Hamacher of University of NSW. I also thank Eleanor Galvin and Rita Metzenrath of AIATSIS for their help with library research.

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Publications

Journal Papers

- Duane W. Hamacher, Robert S. Fuller and Ray P. Norris (2012). Orientations of Linear Stone Arrangements in New South Wales. *Australian Archaeology*, No. 75, pp. 46-54.
- Robert S. Fuller, Duane W. Hamacher and Ray P. Norris (2013). Astronomical Orientations of Bora Ceremonial Grounds in Southeast Australia. *Australian Archaeology*, No. 77, pp. 30-37. **Chapter 2.**
- Robert S. Fuller, Ray P. Norris and Michelle Trudgett (2014). The Astronomy of the Kamilaroi People and Their Neighbours. *Australian Aboriginal Studies*, accepted for publication 2 April 2014. **Chapter 3.**
- Robert S. Fuller, Michael G. Anderson, Ray P. Norris and Michelle Trudgett (2014). The Emu Sky Knowledge of the Kamilaroi and Euahlayi Peoples. *Journal of Astronomical History and Heritage*, Vol. 17, Issue 2. **Chapter 4.**
- Robert S. Fuller, Michelle Trudgett, Ray. P. Norris and Michael G. Anderson (2014). Star Maps and Travelling to Ceremonies – the Euahlayi People and Their Use of the Night Sky. *Journal of Astronomical History and Heritage*, Vol. 17, Issue 2. **Chapter 5.**

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Abstract

The Kamilaroi and Euahlayi peoples and their neighbours, the Ngemba and Murrawarri, are a large Australian Aboriginal cultural grouping located in the north central and northwest of New South Wales. They have a rich history in the literature on culture and language, but have been neglected when the cultural astronomy of Australian Indigenous groups has been reported. This study examined the literature for detailed knowledge of the sky, and collected stories from Aboriginal people of these language groups who practice their culture. Combined, this knowledge was used to create a database to add to the larger body of knowledge on cultural astronomy in Australia. Specific detailed knowledge on the Emu in the Sky, and the use of star maps to teach travel to ceremony, was analysed and reported, along with the larger collection of knowledge, in journal articles that form the basis of this thesis by publication. The hypotheses that this cultural grouping has a rich cultural astronomy, and some of this knowledge was ethnoscientific in nature, were answered in the affirmative through an analysis of the collected data and stories. The results of this study point to a number of new areas of potential research in Aboriginal cultural astronomy.

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Preface

This thesis is the result of two and a half years part time work at Macquarie University, as an HDR (Higher Degree Research) candidate for a Master of Philosophy degree in Indigenous Studies. My candidature commenced in February 2012, for a maximum of four years half-time. I was "recruited" as a candidate by Adjunct Professor Ray Norris, who had encouraged my interest in Cultural Astronomy through several lectures at Northern Sydney Astronomical Society, where I was President at the time. Prof Norris, an astrophysicist at the CSIRO, has been actively studying Australian Indigenous Astronomy for some years, and along with Dr Duane Hamacher, who was completing his PhD at Macquarie in Indigenous Studies at the time, convinced me to work with them when I retired from my business career at the end of 2010. I assisted them in some research projects, and commenced a study of Aboriginal *bora* ceremonial sites, which was eventually published during my MPhil candidature. My HDR candidature has taken place at Warawara – Department of Indigenous Studies at Macquarie, and my Supervisors have been Associate Professor Michelle Trudgett, Head of Department, and Prof Norris. I have also been associated with the Research Centre for Astronomy, Astrophysics and Astrophotonics (AAAstro) at Macquarie, due to their interest in Cultural Astronomy.

A number of people have helped me transition from a long absence from academia (46 years, to be precise), and they are noted in the Acknowledgements, but I would like to particularly thank Ray Norris and Duane Hamacher for nurturing not only my interest, but acting as patient reviewers and co-authors while I slowly built my skills as an academic writer, and in particular, learned the rules of scientific writing. Further, Norris was also instrumental in identifying a particular project in Aboriginal Cultural Astronomy where interest had been identified with a particular Aboriginal language group.

As this is a thesis by publication, Chapters 2, 3, 4, and 5 were published in peer-reviewed journals. In the case of Chapter 2, "*Astronomical Orientations of Bora Ceremonial Grounds in Southeast Australia*", the research for this was conducted prior to commencement of my candidature, but was published well after commencement. Macquarie Faculty of Arts has kindly agreed to its incorporation in this thesis, as it forms a significant background of Aboriginal culture relevant to the overall research project. In that article, I was assisted by Ray Norris and Duane Hamacher as co-authors in formatting the structure, and extensively in reviewing the text. Hamacher provided Figure 2.2, and Norris carried out the Monte Carlo simulation which was used to test the data. In Chapter 3, "*The Astronomy of the Kamilaroi People and Their Neighbours*", the main research subject of the project was reported upon. The project structure was developed with the assistance of Norris and Trudgett, and the critical task of coordinating the ethnological participants was done with the assistance of Greg Griffiths, a Kamilaroi person located in Gunnedah, NSW, and the person who originally contacted Ray with the suggestion that Kamilaroi sky knowledge might be an interesting project. Further into the project, a Reference Group made up of Griffiths and Michael Anderson from Goodooga (who is also a co-author of two of the publications) assisted in making sense of some of the stories collected from the participants, and helped to identify the main cultural threads used in the article. Chapter 4, "*The Emu Sky Knowledge of the*

Kamilaroi and Euahlayi Peoples", was developed originally as a presentation to the Indigenous Astronomy session of the Australian Space Science Conference (ASSC) at the University of NSW in October 2013. Anderson, who is a co-author, was the main source of the specialised knowledge about the various guises of the Emu in the Sky, and the link to resources and ceremony. This was an interesting addition to the main stories identified in Chapter 3, and was even significant in answering some speculation about the role of the Emu in the Sky in the *bora* ceremony identified in Chapter 2. Chapter 5, "*Star Maps and Travelling to Ceremonies – the Euahlayi People and Their Use of the Night Sky*", was an article developed towards the end of the project, based on knowledge from Anderson which, it appears, has not been previously reported upon in Australia.

Found at the end of each of Chapters 2-5 is a Postface, where the findings of that chapter are evaluated with the knowledge gained by the completion of this project. Through these, it can be seen where early assumptions were modified through the input of later knowledge, leading to new conclusions. As the references used in the Chapters based on publications came in some cases from common sources, it was decided to use a common Bibliography at the end of the thesis which contains all references.

The Chapters based on publications do not in themselves provide a complete story of the Cultural Astronomy of the Kamilaroi and Euahlayi peoples and their neighbours, so there is included an Introduction as Chapter 1, where some background to the research is provided, as well as describing the journey over the course of the project. In collecting stories, tantalising hints were found of other stories that were not complete, and not corroborated by the literature. Instead of consigning these to the research papers, I have talked to the participants and tried to establish a few stories which might add to the knowledge presented here. Rather than publish these as a series of unrelated stories, they have been compiled into Chapter 6, Additional Findings, so that they may inspire further investigation. Finally, there is a look at the overall knowledge gained from the project, and the Discussion and Conclusions has been used to wrap up the subject and speculate about future research.

List of Figures

List of Tables

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1

Introduction

1.1. Background

This thesis reports on the results of a project studying the cultural astronomy of the Kamilaroi and Euahlayi peoples and their neighbours. Cultural astronomy has been defined by Campion (2004, xv) as the study of the effect of astronomical knowledge or theories on ideologies or human behaviour. Hamacher (2011, pp. 4-5) says:

> *it is sometimes called the "Anthropology of Astronomy" (Platt 1991) and incorporates the sub-disciplines of archaeoastronomy, ethnoastronomy, and historical astronomy. It is highly interdisciplinary, drawing from the social sciences, humanities, and natural, physical, and mathematical sciences.*

Archaeoastronomy is further defined as "the interdisciplinary study of ancient, prehistoric, and traditional astronomy and its cultural context" (Krupp 1994, p. ix). Ethnoastronomy is described by Ruggles (2005, p. 152) as:

> *the study of beliefs and practices concerning the sky among modern peoples, and particularly among indigenous communities, and the uses to which people's knowledge of the skies is put.*

The Kamilaroi and Euahlayi peoples, and their neighbours the Murrawarri and the Ngemba, form an Australian Aboriginal cultural grouping in the north central and northwest of New South Wales (NSW). While there are differences in their languages and their culture, they have enough similarities that, for the purpose of this study, they can be considered as one collective group and the differences noted when necessary. In writing this thesis, describing this collective as "the Kamilaroi, the Euahlayi, the Murrawarri, and the Ngemba" each time a non-specific piece of knowledge is reviewed would be tedious to the reader. Unless it is necessary to define specific information regarding the Murrawarri, or the Ngemba language groups, the collective grouping will be described as "Kamilaroi and Euahlayi" for the purpose of this thesis only. It should be understood, however, that this grouping of Indigenous peoples is anything but homogenous, and there is great diversity amongst the different language groups. Another note on usage in this thesis: "Indigenous" applies to all Australian original peoples, including Torres Strait Islanders; "Aboriginal" applies to the original peoples of mainland Australia and Tasmania. As this thesis does not address the cultural astronomy of Torres Strait Islanders, "Aboriginal" will be used exclusively, except where "Indigenous" is used for definition within the published articles incorporated, or is used to describe the wider field of cultural astronomy in Australia.

In studying the astronomical knowledge of the Kamilaroi and the Euahlayi peoples it is necessary to use both of the cultural astronomy disciplines, archaeoastronomy and ethnoastronomy. The Kamilaroi and Euahlayi, like the majority of Australian Aboriginal language groups, are believed to be descendants of people who left the Middle East approximately 70,000 years BP (Before Present) (Rassmussen et al. 2011, p. 98), and the estimated dates of arrival of these people on the Australian continent vary from 50 to 60,000 years BP, with optical thermoluminiscence evidence from the Malakunanja II rock art site in Arnhem Land showing a range of 53 to 60,000 years BP (Roberts et al. 1994, p. 582). Archaeological evidence of people in western NSW more than 40,000 years BP (Bowler et al. 2003, p. 840) shows the likely "fast track" settlement from the northwest to the southeast of Australia. As Kamilaroi and Euahlayi culture, like other Aboriginal cultures, used oral transmission of knowledge, one aim of this study was to find some evidence of astronomical knowledge from before the European invasion of Australia (archaeoastronomy), and link that to the knowledge collected since the invasion, including the ethnological phases of this study (ethnoastronomy).

The central question of this study is then: is there a body of astronomical knowledge important to the Kamilaroi and Euahlayi peoples? If so, is that body of knowledge available through a study of the literature, and through a collection of knowledge from the contemporary Kamilaroi and Euahlayi communities? There is a growing collection of knowledge of Aboriginal cultural astronomy in Australia (Cairns & Harney 2003, Frederick 2008, Hamacher 2011, Hamacher & Norris 2011), but an initial search of the literature showed that there has been no detailed corresponding study of the Kamilaroi and Euahlayi peoples in this regard.

The academic background being defined above, my journey as researcher and author needs to be described in this Introduction. Unlike most of my peers in the field of cultural astronomy, I did not come into this field of study from either an academic or scientific environment. My previous tertiary education, a B.A. in Sociology and Anthropology (1966), while anticipating a career as an archaeologist, did not see me furthering my education in that discipline, and I subsequently had a 43-year career in first, the military, then private industry, changing nationality from the United States to Australia in the process. I never lost my interest in anthropology, however, and moving to Australia led to an interest in Australian Indigenous culture, and eventually transformed an interest in reading astronomy and cosmology books into an active hobby in astronomy, joining an amateur astronomical society. It was towards the approach of retirement from a working career that, while supporting my astronomy society with guest speakers, I met one of my eventual academic Supervisors, Prof Ray Norris, and one of his students, Duane Hamacher, who made a presentation to the society on the subject of Australian Indigenous cultural astronomy. I could quickly see the possibility of combining two of my life-long interests into one discipline, and on hearing of my background, Norris suggested that perhaps I would like to do some research with him and his colleagues after I retired. This eventually resulted in my doing some support work on a field archaeology project on the alignment of stone arrangements (Hamacher, Fuller & Norris 2012), which, incidentally, led to my first co-authorship of an academic article. Norris next set me a research task, to look at the alignment of the *bora* initiation ceremony sites common to the Aboriginal language groups of southeast Australia. That project, which was done through a study of the literature, expanded my academic writing skills, and through the support of my co-authors, Norris and Hamacher, I eventually completed and published my first journal article in *Australian Archaeology* (Fuller, Hamacher & Norris 2013). While that article was being researched and written, with the encouragement of my colleagues, I applied

for, and was accepted to commence an HDR (Higher Degree Research) program leading to an MPhil degree at Macquarie University, Warawara – Department of Indigenous Studies, at which Norris was an Adjunct Professor.

The research project that has led to this thesis also deserves explanation, as a possible guide to anyone commencing such research in cultural astronomy in Australia, and as a background to some of the articles that make up this thesis by publication. While the description of the process could be applied to any scientific research project, there are a number of twists and turns that benefit from illustration.

1.1.1 Finding a project

Coming up with an HDR research project in the field of Australian Indigenous cultural astronomy is more a matter of choice, as there are more potential projects than researchers. The entire field of Australian cultural astronomy is currently being researched at post-graduate level by no more than a dozen persons, whereas there were more than 250 distinct language groups with individual cultures in Australia pre-invasion (Walsh 1991, p. 27). Indigenous language groups often have distinctive cultural features which are incorporated into spiritual beliefs, which, being oral cultures, are transmitted in a number of ways, including art, dance, and stories. Their Dreaming stories incorporate many aspects of their culture, including their astronomical knowledge. The Dreaming (or Dreamings to be correct, as each language group had its own Dreaming) is a subject of some confusion to non-Indigenous people. One of the clearer explanations was given by Tex Skuthorpe in Sveiby and Skuthorpe (2006, p. 6). He used the Nhunggabarra name for the Dreaming, *Burruguu*, and describes it as follows:

> *The Burruguu happened in what those in the West consider to be 'the past'. But for the Nhunggabarra there was no difference between past, present and future. The Burruguu still exists; it is the environment that the Aboriginal people lived in and still live in. Human life and being were as permanent, enduring and unchanging as the world itself. All things had always been the same. Thus people on earth did not create anything new. For the Nhunggabarra, the dynamics and changes that they experienced during their existence on earth were only illusions. An innovation was interpreted as merely the discovery of feature that had always been there. New rituals and new songs – which, for Westerners, are the products of*

> *human creation – were for the Nhunggabarra clearer views of what had always been there.*

Michael Anderson, the Euahlayi culture person[1], described the Dreaming in the documentary film, *Star Stories of the Dreaming* (2014), by telling the story of Vincent Lingiari, the leader of the Gurindji people of the Northern Territory, who won the right to reclaim their land at Wave Hill Station. When Prime Minister Gough Whitlam was talking to Lingiari at the time the handing-back ceremony took place, he asked Lingiari to explain the Dreaming. Lingiari responded by pointing to a nearly propeller airplane, and explaining that when the propeller was not turning, it was not possible to see through it, but when it was turning quickly, it was then possible to see right through. In this way, the Dreaming was there, but not visible except in certain circumstances.

Since invasion, the number of distinct language groups may have dropped to as low as 60 in 2007 (Koori Mail Wednesday June 6, 2007, p. 12), and in NSW, that may be as low as 20 (Koori Mail Wednesday October 22, 2008, p. 37). My Supervisors and I decided early to limit the choices of potential language groups to NSW in order to remain within the budgetary restrictions. Prior to commencing my research, Norris, who was at this time an astrophysicist (radio astronomer) with the CSIRO, as well as Adjunct Professor at Macquarie University, was becoming well-known in the field of Indigenous cultural astronomy, and through public outreach his website; "Emu Dreaming – the Australian Aboriginal Astronomy Project", was familiar in some Indigenous circles. He had been contacted by a Kamilaroi culture person, Greg Griffiths, who indicated that he would like to share his knowledge of Kamilaroi astronomy. I discussed this with Griffiths in Gunnedah, NSW, where he lived, and after some discussion, I reported that he appeared to have knowledge that would inform an interesting project. A literature search was conducted to see whether there was any significant knowledge of Kamilaroi astronomy. While some literature was found, it was quite limited and highlighted a gap in terms of documented astronomical knowledge pertaining to the Kamilaroi people. Hence, it was decided that my research project would be the "Astronomy of the Kamilaroi People". Later in the project more language groups were associated with the Kamilaroi, and the project name changed to first, "Astronomy of the Kamilaroi People and Their Neighbours", as the Euahlayi, the Murrawarri, and the Ngemba language groups were added to the project, and then, "Astronomy of the Kamilaroi and Euahlayi Peoples and Their

[1] person known for his/her knowledge and practice of Aboriginal ceremony.

Neighbours', when it became clear that the majority of the knowledge gained was from Euahlayi sources. The reason for this last change was the importance of the work done with Michael Anderson, as described later in the history of the project.

Some of the issues canvassed in the Project Proposal were Ethics (the need for Ethics Approval to carry out ethnography), Intellectual Property and Participant Rights, Cultural Sensitivity, and a Fall Back Option, should sufficient information not be collected. As the HDR degree would be a thesis by publication, a list of possible papers to be published was included. One major issue was the incorporation of a "Giving Back" to the Community component, which was included both as an extension of the Ethics process, and as a logical approach to supporting the cultural aims of the community that was providing a large component of the knowledge.

1.1.2. Literature Study and Working with the Community

An in-depth literature review on the Kamilaroi and Euahlayi and astronomy was undertaken. It led to a very large number of online references, some of which could be further researched online, but many of which had to be viewed in a number of libraries, including the Macquarie University Library, the State Library of NSW, the National Library, and in particular, the AIATSIS (Australian Indigenous and Torres Strait Islander Studies) library in Canberra. In the end, over 5000 online references were evaluated, with an initial literature study bibliography of approximately 150 sources. It became apparent that the literature on Kamilaroi and Euahlayi culture was mostly limited to ceremonies (the early anthropologist, Robert Mathews, being the major source), language (the Rev. William Ridley being prominent), and folklore (K. Langloh Parker being the main source). These early researchers (Ridley during the mid-1800's, Mathews and Parker from the late 1800's), while reporting on other aspects of Kamilaroi and Euahlayi culture, had valuable references to sky knowledge that formed major components of the cultural objects and stories that eventually made up the articles published from this study. Researching these references, cross-referencing them with other sources, and using valuable general sources on Australian Indigenous astronomy, such as Fredrick's *The Sky of Knowledge* (2008), led to a database of stories and objects which would be useful in the study of stories collected in the ethnography phase of the project.

The project has an ethnographic phase, as the literature references in themselves were not enough to develop a complete understanding of the Kamilaroi and Euahlayi knowledge of the sky and how it related to their culture. Many literature references were very limited in the

development of the story related to the object or culture figure in the sky, and others appeared to be very fragmented, rather than a complete description. Discussions with Griffiths led to a project proposal, which was developed for presentation to, initially, the Red Chief Local Aboriginal Land Council (LALC) in Gunnedah, as it was thought Gunnedah would be the centre of research. Griffiths also initiated contact with the Kamilaroi Nation Applicant Board, a body set up to process a Native Title claim, and the only body in the Kamilaroi community that could be considered a council of elders representing the wider community.

At this point in the narrative it is necessary to give a bit of background on the politics of the Kamilaroi and Euahlayi cultural grouping. When commencing this research, I was not really aware of how important community consensus is to Aboriginal communities. Rather than having to meet with many different persons in the Kamilaroi and Euahlayi communities to propose and hopefully receive agreement with the objectives of the project, I was privileged to see how consensus could be used to establish approval of a project that was considered positive within the community. The experience during this project was that within the communities where I collected stories, consensus decision-making was the only accepted form of decision-making, and although I rarely saw 100% agreement on any issue, when there was a general acceptance of an issue, most of the community got behind it.

The Macquarie University Human Research Ethics Committee granted ethics approval at the end of June 2012. As a part of this process, an Inform and Consent form was developed for working with collection of stories from individuals, and an Intellectual Property Statement was developed with the help of the University lawyers to assist in discussion with the community. The Red Chief LALC provided a letter of support to the project in September, and a meeting was held with the Kamilaroi Nation Applicant Board around the same time, where a presentation of the project was made. The outcome of the presentation was that, while there was not universal agreement on the Board, a majority of members supported the project, and in the words of one person who would become critical to the project later, “just go ahead and do it”. The first step was to find participants for the collection of stories, and in this, Griffiths was instrumental. With his help, I was eventually able to work with eight people (including Griffiths), who had family heritage connections with Kamilaroi, Euahlayi, Murrawarri, Ngemba, and Wiradjuri language groups. Most were from either Kamilaroi or Euahlayi language groups. The ethnography phase commenced in November 2012, and continued until mid-2013, when I commenced writing publications. In any case, the

ethnography has continued to the end of the project, as new information is still arriving from participants.

1.1.3. Writing, Publishing, and Outreach

The literature study and the collection of stories enabled me to put together a useful database of information that formed the content of the first publication based purely on this research (which is Chapter 3 in this thesis). In the meantime, one of the participants, Michael Anderson, who had both Euahlayi and Kamilaroi heritage, became very interested in the project, and in what turned out to be a number of sessions over eight months, provided a large number of stories that had not been told by other participants. Because the stories were so complete, and because Anderson could trace some of them back four generations in his family, it was decided that several would form the basis of journal articles, with Anderson as co-author. Those stories, which form Chapters 4 and 5 of this thesis, have been published in *The Journal of Astronomical History and Heritage* in July 2014. The Euahlayi Emu story, which forms Chapter 4, was originally presented during an Indigenous Astronomy Session of the Australian Space Science Conference in Sydney in October 2013. The story on Euahlayi star maps, which forms Chapter 5, was developed later, but still made it into the same issue of *JAHH*, and after a report by the ABC Science Unit on their website, has had an online presence in various science and Indigenous blogs.

From the earliest proposal for this project, and in the Ethics Approval application we thought that a Giving Back phase provided a good conclusion to the project. This was clearly stated in project and IP statements during negotiation with the community, and in the Inform and Consent form used with participants. The original concept was one of a BBQ somewhere in the community area of north central and northwest NSW, where the findings would be presented, possibly with a modified version of the Stellarium computer planetarium software, in which cultural objects can be shown as artwork in the simulated sky. As the project progressed, the information to be handed back grew, and there was discussion with my Supervisors and the participants about what was possible in regards to material to be handed back. The original intention for a simple handover grew to include an educational component for use in primary schools. In November 2013, the possible forms of Giving Back had grown to the extent that it was clear that there was insufficient funding within the project itself to accomplish this, and an application was made to Macquarie University for a HEPPP (Higher Education Participation and Partnerships Program) grant. HEPPP is a Federal Government

initiative to help universities interest school students of lower socioeconomic status to go on to tertiary education. The application for HEPPP funding was based on engaging Indigenous students in (1) science, (2) tertiary studies, and (3) Macquarie University, with the target audience being primary school students in the study area of the project. After talks with the HEPPP administrator, we increased our aims in the Giving Back to include a video and accompanying study guide for students. To everyone's delight, in May 2014 a HEPPP grant was approved with sufficient funds to carry out the expanded aims. As a result, a videographer with experience in Aboriginal culture was engaged to produce a full-length (hour) documentary on the basis of a "fireside story-telling" by Anderson, with cutaways to cultural objects in Stellarium. To ensure that the documentary, which was aimed at both students and the adult community, could be used in a school curriculum, a specialist in study guides with experience with Indigenous education was brought into the project, and a place in the Years 5-6 Science curriculum in NSW was found for the material. The HEPPP funding was for a pilot project, so schools with a large Aboriginal student population in Goodooga and Lightning Ridge, NSW, were identified, and educators at those schools were "recruited" to learn the material and run a trial with students. Finally, the original idea of a BBQ was expanded to a larger cultural event to hand the documentary and other materials back to the community, along with a night star party. This will take place in November 2014 at Lightning Ridge, with participants, teachers, elders, and other persons supporting the project to attend.

Due to the publicity around some of the publications, particularly the Euahlayi star maps, there has been an increasing demand from schools, scout organisations, and amateur astronomy societies for presentations on Aboriginal Astronomy, and depending on the audience, I have been using the findings of the project in some presentations, and a more general background on the subject in others. It seems my original spark of interest in this subject has come full circle (Ray Norris' presentation to my astronomy society), so perhaps I can create a similar interest in someone else.

1.1.4. Hypotheses

In the development of this project, there are some explicit hypotheses underlying the research, and these are stated in Chapter 3 as:

- Hypothesis 1: that knowledge from these language groups (Kamilaroi, Euahlayi, and neighbours) could add to the current body of knowledge of Aboriginal sky culture, and;
- Hypothesis 2: that the Kamilaroi, Euahlayi, and their neighbours had an ethnoscientific knowledge of the night sky through observation and experience.

Both hypotheses will be discussed in Chapter 7, Discussion and Conclusions, but some discussion here would be useful in reading this thesis. Regarding Hypothesis 1, I never had any doubt after initial discussions with the participants in the ethnography that a body of sky culture knowledge would exist. In the case of Hypothesis 2, the use of the word "ethnoscientific" may need some explanation to readers. Ethnoscience, as a word, was first introduced in the 1960's in the context of a new theory of culture by anthropologists. Sturtevant (1964) called ethnoscience the "New Ethnography", but due to the negative implications for other kinds of ethnography, he further described it as a system of classifying things within a culture, and in particular, a way of classifying their universe as they see it. By the last decade, ethnoscience as a term for one approach to anthropology has begun to be used less, as more specific "ethno" specialities, such as ethnobotany and ethnoecology came into use (Alves & de Albuquerque 2010, pp. 68-70). In the use of the word for this study, the Oxford Dictionary definition, "The study of the different ways the world is perceived and categorized in different cultures" (OED Online, n.d.), is probably most correct. The knowledge contained in the Kamilaroi and Euahlayi cultural astronomy was, and is, a way for the Kamilaroi and Euahlayi peoples to understand the universe as they can see it in the sky every night, and with that understanding, they are able to reconcile their culture with the observable universe. Their culture, in this case, includes their system of laws, their very close connection to country, their stories, songs, and ceremonies, and their understanding of natural resources.

1.2. Thesis Structure

The four journal articles making up Chapters 2-5 of this thesis, with the exception of Chapter 2, were researched, presented, and accepted for publication during the period of my HDR candidature. The Chapter 2 article on *bora* site orientation was still being revised when my candidature commenced, and published during the candidature. As the subject was extremely relevant to the topic of the research and eventual publications, it was included in this thesis.

All published articles were co-authored by my Supervisors, and in the case of Chapters 4 and 5, with the addition of Anderson as co-author. Contributions by co-authors and other persons to the articles have been specified in the Preface to this thesis. All articles presented in this thesis have been principally authored by myself.

To understand the structure of the thesis, it is necessary to go back to the original Project Proposal, which was developed for discussion with the Kamilaroi community. In that, we expressed that "in many Aboriginal cultures, knowledge of the Sun, Moon, and night sky played an important part in the culture and oral history". We referenced some studies previously done, and described Ray Norris' Aboriginal Astronomy Project. We stated that the aim of this project was "to record and present the understanding of the astronomy of the Kamilaroi people to non-Aboriginal Australians, and to future generations of Aboriginal Australians".

To achieve this aim, there would have to be sufficient information researched about the cultural astronomy of the Kamilaroi people (and the Euahlayi and their neighbours, as eventuated) that a reading of the published articles would give a non-specialist reader a general understanding of the importance of the cultural astronomy to the wider culture of the Kamilaroi and Euahlayi peoples and their neighbours. This would apply to both non-Indigenous and Indigenous Australians (as well as a reader from any background). Further, the information developed from the project would have to add to the wider field of knowledge of Indigenous astronomy in Australia (which is an aim of any Masters-level degree program).

Finally, in the course of the research, particularly the collection of stories, there were a number of subjects which never ended up fitting into any of the articles, or were collected after the last of the articles was submitted for publication. This material, where it is of interest, is contained in Chapter 6, Additional Findings.

An Appendix was added for the database from the literature study, which may be useful to future researchers. As mentioned in the preface, the references from the individual articles, plus from the introduction and concluding chapters, have been combined into one set of references at the end of the thesis.

1.3. Methodology

The methodology of this study is well-described in Section 2 of Chapter 3, but there were some developments in the methodology which took place after the initial research leading to

that article/chapter which should be detailed in this Introduction. The reflective section (1.2 of Chapter 3), describes the way the literature search was organised, and the development of the story collection by ethnography. The resulting set of stories and descriptions of culture figures were combined in the database described in Chapter 3, and used to determine the final list of night sky objects which could be eligible for inclusion in the main article. A Reference Group was successfully used to bring the experience of several persons knowledgeable about Kamilaroi and Euahlayi culture to the evaluation of the stories, and to the process of choosing the various versions and parts of the stories to combine into what we proposed as a complete version of each story. At that point, the basic data structure of the article forming Chapter 3 was complete, and the article could be written. If the research had ended at that point, then the objectives of the research would have been met, and the results could have formed an acceptable answer to Hypothesis 1. In other words, a significant body of knowledge about Kamilaroi and Euahlayi cultural astronomy could be added to the larger body of Australian Indigenous cultural astronomy. However, even as the initial article was being written, there were questions such as:

- Were many of the stories just what they appeared, stories, or did they have deeper meanings?
- How did those stories answer Hypothesis 2; that the Kamilaroi and Euahlayi peoples had an ethnoscientific approach to their cultural astronomy?
- Did the stories have significance beyond the Kamilaroi and Euahlayi area of study?

I began to ask some of the main participants these questions, and by this time I could show them the early drafts of the initial article, which I believe gave them the confidence to explore these issues further with me. Aboriginal people in Australia are strongly sceptical of researchers, whether from university or government. Smith (1999, p.1), said: "The word itself, 'research', is probably one of the dirtiest words in the Indigenous world's vocabulary." Anthropologists, in particular, have earned their ire, probably as a result of statements like Lang's (Parker & Lang 1905, pp. v-vi):

> *As far as what we commonly call material civilisation is concerned, the natives of the Australian continent are probably the most backward of mankind, having no agriculture, no domestic animals, and no knowledge of metal-working. Their*

> *weapons and implements are of wood, stone, and bone, and they have not even the rudest kind of pottery.*

Lang, no doubt, had not seen examples of Aboriginal agriculture, and Sveiby & Skuthorpe (2006) have spoken at length about innovation and Aboriginal culture, and why it was that Aboriginal people appeared not to be interested in new technology (the reason appears to be that they were only interested in new technology that fitted into their needs and their finely-tuned management of their resources and their lives). I believe that the original approach to this project, by seeking community support, asking open-ended questions about stories being collected (I never asked specific questions to the participants, just asked them more broadly if they would mind telling me about their knowledge of their astronomy), and willingness to show the drafts of proposed articles, was instrumental in creating a second phase of research and story collection. It was this second phase that I believe has resulted in the most interesting findings of this project, which are reported in Chapters 4-6.

1.4. Considering this Thesis

Whether you are a cultural astronomer, anthropologist, or a casual reader, here are a few suggestions for improving your journey through Kamilaroi and Euahlayi astronomy:

- According to my reading and my experience, everything is connected in Aboriginal culture. A story of a culture being in the sky may, on the surface, appear to be a way to explain the nature of the object in the sky, such as its colour, movement, or appearance at particular times, but there's a strong chance that the story that we, non-Aboriginal persons, hear may just be the tip of the iceberg. The participants talked of several levels of meaning (confirmed by Sveiby & Skuthorpe), such as a child's cautionary tale, or meaning in regards to law of relationships or country, and ultimately, a ceremonial meaning which is only known by people with the appropriate level of initiation. One person told me that stories could have "up to 30 levels", so what has been reported in this project are obviously only the "public" meanings of stories.

- As will be reiterated several times, "everything up there was down here once", which was pointed out to me frequently. The stories and objects in the sky not only come down to Earth occasionally, they actually were on Earth before everything was "shaken up" and ended up in the sky. There is a strong theme of a time once when

everything on Earth was messed up, and *Baiame*, the culture hero, flipped the Earth and the sky. There is also a hint that the sky may come back to Earth again in the future.

- There is a progression in the articles which make up this thesis, perhaps mirroring the progression I made in understanding Kamilaroi and Euahlayi culture. Understanding the central importance of the *bora* ceremony in Kamilaroi and Euahlayi (and other southeast Australian Aboriginal language group) cultures is important to understanding their cultural astronomy. The hypothesis in the study of the orientation of the *bora* sites that they were aligned to the southern quadrant, due to objects in that area of the sky, is slowly confirmed as you read through the articles in the order they were researched, so that, at the end, there is a strong argument, confirmed to me personally, that the hypothesis was correct.
- In discussing the levels of meaning in the stories, and understanding the importance of ceremony in culture, you should look out for a larger connection within all the stories and uses of the night sky. The connection between the Earth and the sky, and in particular, songlines and the Dreaming, is central to the cultural astronomy of the Kamilaroi and Euahlayi peoples.

I am confident that what you will read are *gay giirruu*.[2]

[2] True words! (Gamilaraay)

2

Astronomical Orientations of Bora Ceremonial Grounds in Southeast Australia

2.1. Introduction

In traditional Aboriginal cultures across Australia, young males are taught the laws, customs, and traditions of the community and undergo a transition ceremony from boyhood to manhood. This ceremony often includes a "rite of passage" event in which the initiated males undergo some form of body modification (Jacob 1991), typically involving tooth evulsion in southeast Australia (Berndt 1974, pp. 27-30). This ceremony goes by many names but in Queensland and New South Wales, it has come to be generally known as “Bora”, the name used by the Kamilaroi of north central New South Wales (Ridley 1873, p. 269). Bora grounds generally consist of two circles of differing diameter connected by a pathway. The larger circle is regarded as a public space, while the smaller circle some distance away is restricted to the initiates and elders. Bora ceremonies were one of the first Aboriginal cultural activities described by early Australian colonists in the Sydney basin (Tench 1793; Hunter 1793; Collins 1798). Because information about Bora ceremonies is culturally sensitive, here we limit discussion of the ceremony itself.

There is a variety of evidence from the anthropological literature (Winterbotham 1957; Berndt 1974; Love 1988) that Bora ceremonies are related to the Milky Way and that ceremonial grounds are oriented to the position of the Milky Way in the night sky at particular times of the year. We begin by exploring connections between Bora ceremonies and the Milky Way using ethnographic and ethno-historic literature. We then use the archaeological record to determine if Bora grounds are oriented to the position of the Milky Way at particular times of the year. Finally, we use Monte Carlo statistics to see if these orientations were deliberate or the result of chance.

2.1.1. Bora Ceremonial Grounds

The layout of Bora ceremonial grounds is similar across southeast Australia, with only minor differences from region to region (Mathews 1894, p. 99; Bowdler 2001, p. 3). Several reports (Collins 1798, 391; Fraser 1882; Mathews 1897a; Howitt 1904; Black 1944) describe the grounds as comprising two rings, of different sizes, connected by a pathway. The area within each ring is cleared of all debris and the earth is stamped until firm, A border is made of raised earth or stone. The larger ring, which is considered public, has a typical diameter of 20-30 m. The smaller ring (generally 10-15 m diameter) is considered the sacred area, where body modification takes place, and is restricted to initiates and Elders. The two rings are separated by a pathway that ranges from a few dozen to a few hundred metres in length. In 2004, an Aboriginal man reported that parts of many ceremonial sites were destroyed after the ceremony to conceal the location of these sacred sites (Hardie 2004). For this reason, some Bora sites reported in the archaeological literature feature only a single circle, as the smaller, sacred circle was destroyed.

Bora grounds are distributed throughout southeast Australia, covering most of New South Wales (NSW) and southern Queensland (QLD) and may extend into South Australia (Howitt 1904, pp. 501-508). Ceremonial rings, which may be Bora grounds, have been found near Sunbury, Victoria (VIC), although there are no ethnographic records attesting to their ceremonial use (Frankel 1982). Howitt cites a geographic boundary of Bora from the mouth of the Murray River to the Gulf of Carpentaria (ibid, p. 512). Mathews (1897b, p. 114) notes the Bora can be found across three-quarters of NSW and some distance into QLD, with a boundary from Twofold Bay near Eden, NSW to the south, Moulamein, NSW to the west, and Barringun, QLD to the north. We recognise that the geographical area covered by this paper includes several distinct language groups, each of whom may have a separate culture

and traditions, and it may be misleading to aggregate the data together from such a wide area. However, (a) the existence of similarly constructed Bora rings implies some commonality in culture, and (b) the effect of aggregating orientations with different distributions will be to destroy any underlying correlation arising from one culture, rather than forming a correlation of spurious significance.

The time of the year in which Bora ceremonies were held is unclear. Sources in the literature cite times throughout the year, including March-May (Winterbotham 1957), April-June (Mathews 1894, p. 99), May-July (Mathews 1894), August (Needham 1981, p. 70), September-November (Winterbotham 1957), and October-December (Mathews 1894). It seems Aboriginal groups across QLD and NSW did not have a uniform preference for the date of the ceremony. Instead, a number of variables inform each community of when to hold a Bora ceremony, relying on things such as food and water supplies. While these factors vary across the region, there are some interesting links that associate the Bora ceremony with the night sky and the orientation of the Milky Way.

2.1.2. Anthropological Support of an Astronomical Connection

It is well established that the night sky plays a significant role in several Aboriginal cultures (Hamacher 2011; Norris & Hamacher 2009; Cairns & Harney 2003; Johnson 1998). In Aboriginal astronomical traditions, dark spaces within the Milky Way are as significant as bright objects. Two animals symbolically link Bora ceremonies to these dark spaces. One was a spiritual serpent, commonly referred to as the Rainbow Serpent across Australia, traced out by the curving dust lanes in the Milky Way. Needham (1981, p. 69) explains that in Aboriginal communities of the Hunter Valley north of Sydney, motifs of the spiritual serpent were represented in Bora ceremonies and oral traditions about the serpent were recounted during the ceremony itself. The other was an emu, which is also traced by dust lanes in the Milky Way (Norris & Norris 2009). The Coalsack, a dark absorption nebula bordering the Western constellations Crux (Southern Cross), Centaurus, and Musca, represents the head of the emu, with the star BZ Crucis representing the eye. The dust lanes that run through the stars Alpha and Beta Centauri represent the neck while the Galactic bulge, near the intersection of Sagittarius, Scorpius, and Ophicius represents the body. The dust lanes along the Milky Way through Sagittarius trace out the legs (Figure 2.1). Love (1988, pp. 129-138) argues that the emu was an important part of the Bora ceremony in southeast Australia and Berndt (1974, pp. 27-30) notes that the emu is frequently associated with Bora ceremonies,

since male emus brood and hatch the emu chicks and rear the young (Love 1987). This is symbolic of the initiation of adolescent boys by their male elders.

Figure 2.1: *The 'Emu in the Sky' over an emu engraving at Elvina Track in Kuringai Chase National Park which may represent her celestial counterpart (image © Barnaby Norris, 2007).*

Needham (1981, p. 70) provides an illustration of the night sky and associated stars in local Aboriginal astronomical traditions. The illustration, which cites the "All Father" as the star Altair, provides the positions of celestial objects in August, "the month when Aboriginal initiation ceremonies were held". During the early part of the night in August, the Milky Way stretches across the sky from the northeast to the southwest. Many early colonial reports referred to an Aboriginal religion based on a deity variously described as Baiame, Bunjil, or Mungan-ngaua (Howitt 1904, pp. 490-491; Henderson 1832, p. 147; Ridley 1873, p. 268). These names roughly translate to "father" or "father of all of us" (ibid, 491). According to Fraser (1882, p. 208) and Howitt (1884, p. 58), Baiame gave his son, Daramulan, to the people and it is through Daramulan that Baiame sees all. Baiame is worshipped at the Bora ceremony (Ridley 1873, p. 269) and Daramulan is believed to come back to the earth by a pathway from the sky (Fraser 1882, p. 212). Eliade (1996, p. 41) reports that Baiame "dwells in the sky, beside a great stream of water" (Milky Way) and various reports (Howitt 1884; Hartland 1898; Berndt 1974) claim that the wife of Baiame (or in some cases Daramulan) is an emu. Reports of Baiame, Daramulan, and Bunjil come from a variety of different cultures across southeast Australia, resulting in variations in these reports. However, they share some features, such as a close connection between Bora ceremonies and the Milky Way.

2.1.3. Testing the Hypothesis

To focus the discussion, we concentrate specifically on the hypothesis advanced by William R.F. Love (1987, 1988) who argues that ancestral spirits in the heavens held Bora ceremonies in the Milky Way, which we refer to as the "Sky Bora". Love bases his work, in part, on Winterbotham (1957, p. 38), who obtained information from a Jinibara man named Gaiarbau from Southeast Queensland. According to Winterbotham, Bora circles

> *were always oriented towards points of the compass, the larger one to the north, and the smaller to the south. [...] They conformed in this rule to the position of two dark (black) spaces (circles) - the Coal Sacks in the heavens.*

The "Coal Sacks", or *Mimburi*, to which Winterbotham refers, are dark absorption nebulae in the Milky Way. According to Love (1988, pp. 130-131), the Jinibara account identifies the Sky Bora with the Emu in the Sky (Winterbotham 1957, p. 46; Gaiarbau et al. 1982, p. 77). The small circle is the emu's head in the Coalsack nebula. The larger circle is the body of the emu in the region of the Milky Way near the intersection of Scorpius, Sagittarius, and Ophicius (Figure 2.1). This area is the centre of our Milky Way Galaxy, known as the

Galactic bulge. The motif of the celestial emu is found across Australia (Stanbridge 1861, p. 302; Wellard 1983, p. 1; Cairns & Harney 2003; Norris & Hamacher 2009, p. 13).

According to Winterbotham, other Aboriginal groups knew of these dark nebulae, including the Badjala people of Fraser Island and the adjacent mainland who call them *Wurubilum*, and the Wakka people near Murgon, QLD. This concept extends beyond southeast Australia. For example, Smith (1913) explains that during an initiation ceremony in Western Australia, the initiate is left tied to the ground until the Milky Way is visible. He is then asked if "he can see the two dark spots," and when he is able, he is released. While this account is not from the area of this study, it may be a similar example of what Gaiarbau was describing.

Gaiarbau said that Bora ceremonies were not held until the celestial Bora rings returned to their "proper points of the compass" (Winterbotham 1957). In clear skies, the Milky Way is visible about an hour after sunset. The orientation of the plane of the Milky Way, as seen from southeast Australia an hour after sunset, changes from near vertical in the south-southeast in March to horizontal across the southern sky from east-southeast to west in June and back to vertical (but inverted) in the southwest in September. The Galactic bulge and the Coalsack (celestial emu) are not visible in the sky together an hour after sunset until May. At this time, the emu is not vertical in the sky (perpendicular to the horizon), but stretches from south to east.

The only time that the Sky Bora is vertically aligned to the horizon and can be seen in the sky together an hour after sunset is in August (or later in the night as the months progress). The Galactic plane, which goes straight through the celestial emu, is vertical in August an hour or two after sunset (earlier in the evening later in the month, Figure 2.2). At this time, the azimuth is approximately 213º (south-southwest).

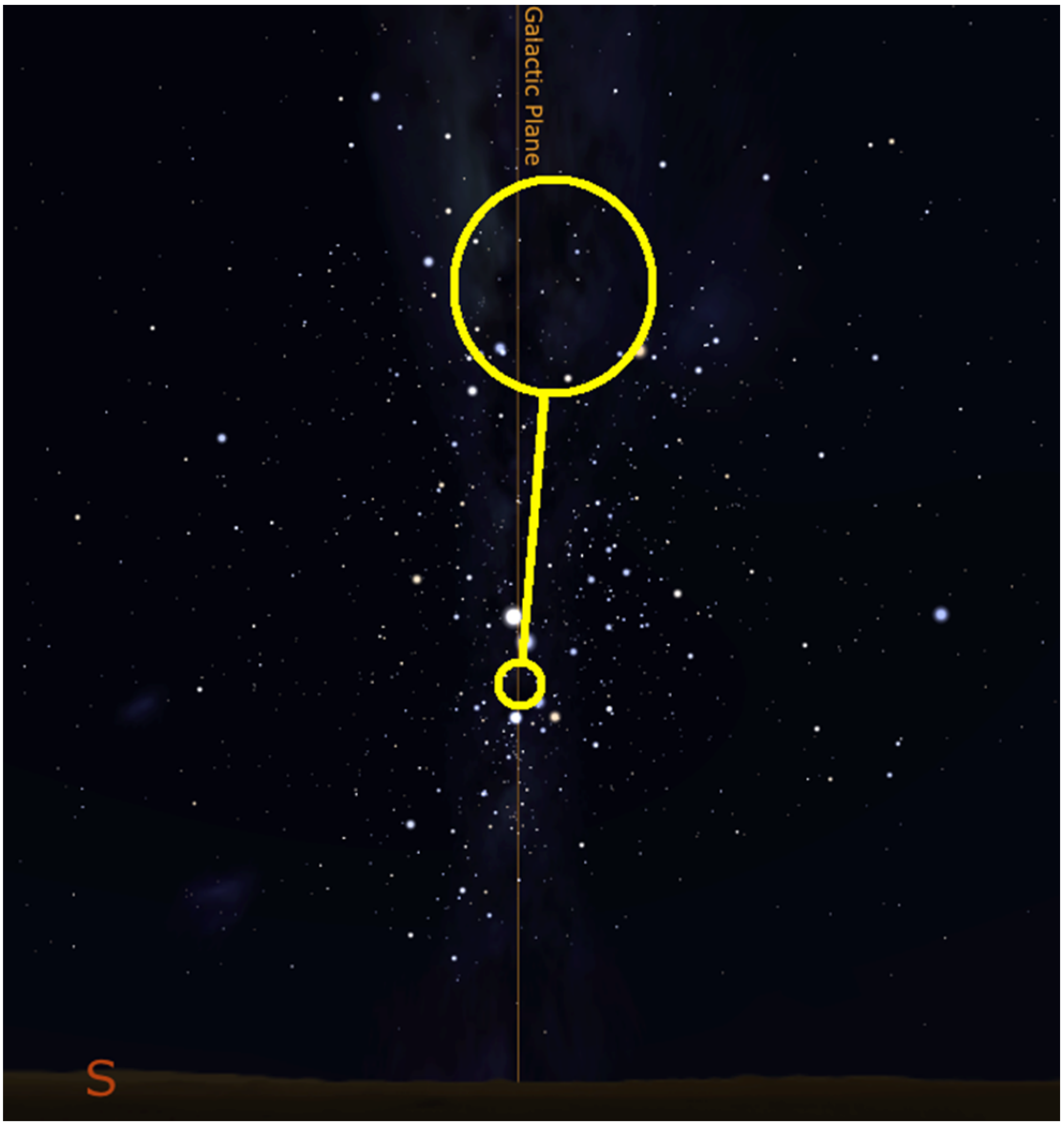

Figure 2.2: *The Sky Bora in the Milky Way oriented vertically in the south-southwest sky in mid-August an hour after sunset as seen from Brisbane. The large circle represents the larger Bora circle and the body of the emu (near zenith). The smaller circle represents the Coalsack and the head of the emu (image courtesy of Starry Night Education).*

If Love's hypothesis is correct, we can measure the orientation of each Bora site from the larger circle to the smaller circle and expect to find them oriented to roughly 213º, corresponding to the time ceremonies are held (August). This assertion agrees with Needham (1981, p. 70) who claimed that Bora ceremonies in the Hunter Valley (NSW) were held in August when the Milky Way was vertical in the south-southwest.

Other researchers report that Bora ceremonies in QLD and NSW are held at various times of the year, as noted in the previous section. Bora ceremonies may be held at times of the year

that have little or nothing to do with the position of the Milky Way in the sky, even if the ceremonies are symbolically linked to the Milky Way. For example, Mathews (1894, p. 128) claims that the direction of one Bora ring to the other "is entirely dependent on the conformation of the country within which the ceremony is being held". If Bora grounds are not oriented to any particular object or direction, we expect to find a roughly even distribution in the orientations of Bora Ceremonial grounds. However, if at least some Bora grounds are oriented to the position of the Sky Bora, then we expect to find a preference for south-southwest orientations when we look at the overall distribution of Bora ground orientations.

2.2. Methodology

To determine the orientations of Bora ceremonial sites, we obtained data for 63 Bora sites from the following published literature: Mathews (1894, 1896a, 1896b, 1897a, 1907, 1917), Hopkins (1901), Towle (1942), Bartholomai & Breeden (1961), Richmond River Historical Society (1973), McBryde (1974), Steele (1984), Satterthwait & Heather (1987), and Bowdler (2001). We also obtained 1107 archaeological site cards from the NSW Aboriginal Heritage Information Management System (AHIMS) related to stone arrangements and ceremonial grounds. The total number of Bora grounds for which we obtained data was 1170.

We then filtered the data through a rigorous selection process, discarding data for any Bora ground that failed to meet any of the following criteria:

1. The site is clearly described as a Bora ceremonial ground;
2. The site is in NSW or southeast QLD (see Figure 2.3);
3. Measurements were made by an appropriately trained or qualified person (e.g. a surveyor or archaeologist);
4. The data are either first-hand, or second-hand from a trusted source;
5. There is unambiguous information on the direction from the large to small circle.
6. Either
    a. Both rings and the pathway between them are identifiable, or
    b. Both rings and at least one opening are identifiable**,** or

c. Only one ring is identifiable, but it has a clearly identifiable opening and there is unambiguous information as to whether it is the larger or the smaller ring

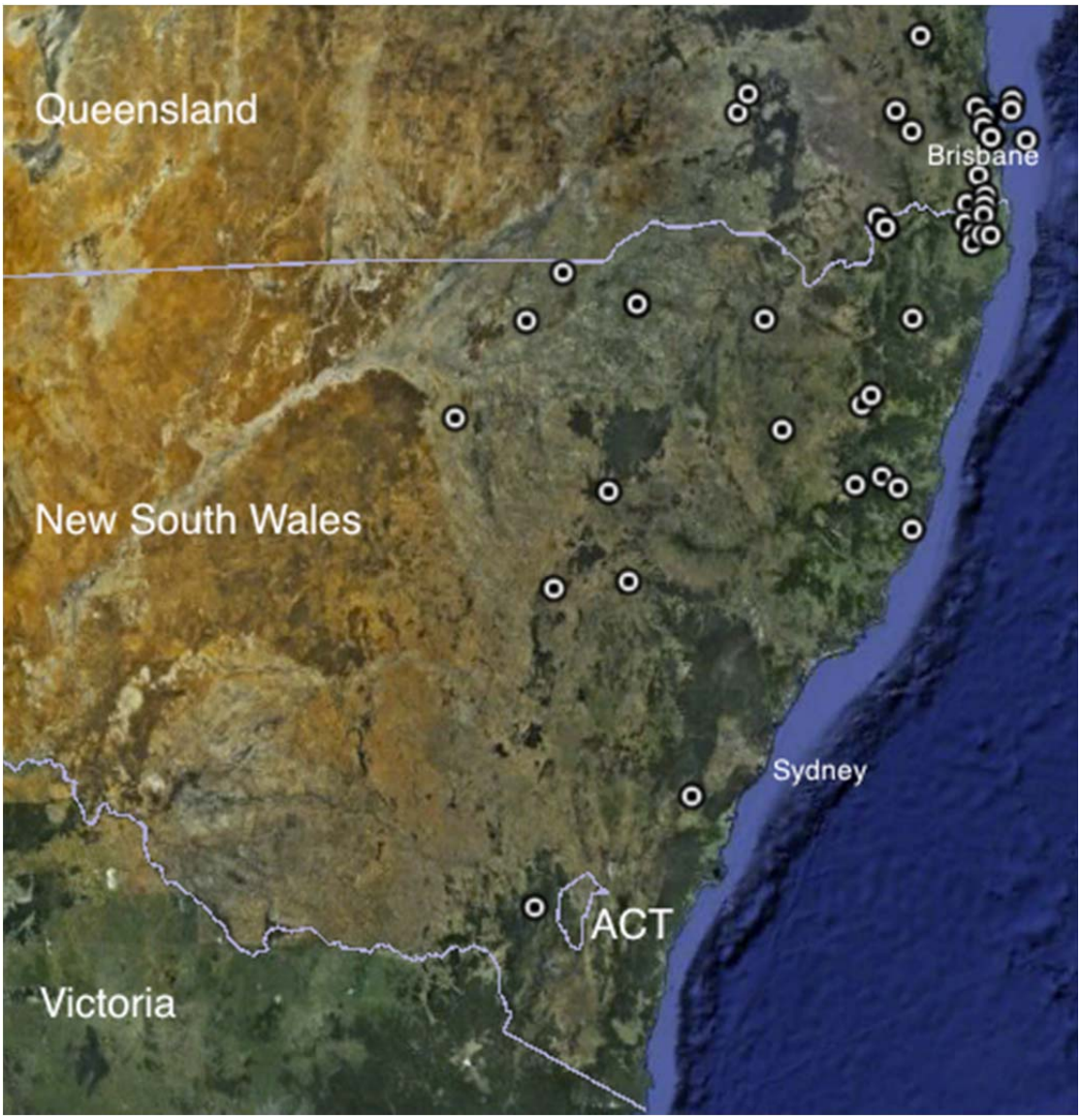

Figure 2.3: *Locations of all Bora grounds in Table 2 excluding the data from Satterthwait & Heather (1987). The coordinates given are adjusted to as to protect exact location of each site. The coordinates given are within 10 km of the site, which is why some appear over the sea (image source Google Maps).*

The orientation of each site is measured from the centre of the largest circle to the centre of the smaller circle. If the second circle is missing, the orientation is taken from the centre of the circle to the middle of the opening. Measurements are either taken directly from the records given by the surveyor or measured by hand with a protractor and ruler. We divide the azimuths into sixteen bins (N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, NNW), each with a width of 22.5º and an azimuth given in Table 2.

O	Az(cen)	Az(min)	Az(max)
N	0	348.76	11.25
NNE	22.5	11.26	33.75
NE	45.0	33.76	56.25
ENE	67.5	56.26	78.75
E	90.0	78.76	101.25
ESE	112.5	101.26	123.75
SE	135.0	123.76	146.25
SSE	157.5	146.26	168.75
S	180.0	168.76	191.25
SSW	202.5	191.26	213.75
SW	225.0	213.76	236.25
WSW	247.5	236.26	258.75
W	270.0	258.76	281.25
WNW	292.5	281.26	303.75
NW	315.0	303.76	326.25
NNW	337.5	326.26	348.75

O	Az(cen)	Az(min)	Az(max)
N	0	337.5	22.5
NE	45	22.6	67.5
E	90	67.6	112.5
SE	135	112.6	157.5
S	180	157.6	202.5
SW	225	202.6	247.5
W	270	247.6	292.5
NW	315	292.6	337.5

O	Az(cen)	Az(min)	Az(max)
N	0	316	45
E	90	46	135
S	180	136	225
W	270	226	315

***Table 2.1**: Azimuths of the inter-ordinal (left), ordinal (right top), and cardinal (right bottom) orientations used to bin the data in Fig. 4. O is the orientation, Az(cen) is the central azimuth, Az(min) is the minimum azimuth in each bin and Az(max) is the maximum azimuth.*

2.3. Results & Analysis

Of the 1170 sites obtained from the literature and AHIMS site cards, only 68 passed the selection criteria (Table 2.2, Figure 2.3). The 68 sites can be divided into two groups:

1. Those in which the orientation has been recorded individually for each site, (46 sites) and
2. Those in Satterthwait & Heather (1987, their Table 9), which provide the distribution of orientations without providing individual site orientations (22 sites).

The data in Table 2.2 are grouped in 22.5º bins, shown as a histogram in Fig.2. 4a. The histogram reveals a clear preference for the S, SW, and W orientations. Table 2.2 contains 37 orientations in ordinal (N, S, E, W, NW, NE, SE, SW) directions, and only 11 in inter-ordinal

(NNE, ENE, etc.) directions. The low number of inter-ordinal orientations suggests either that the sites tend to be oriented on ordinal points, or that some authors rounded to the nearest ordinal point. To avoid a statistical bias in our results, we re-bin the data into the eight ordinal directions, dividing the counts of each inter-ordinal bin equally between the two neighbouring ordinal bins, resulting in eight 45º bins (Table 2.1, Figure 2.4b).

No.	Site Name	Location	Type	O	Az	Source
1	Kogan	−27.2, 150.5	1	W	270	Bartholomai (1961)
2	Gurah	−29.4, 149.4	1	E	90	Hopkins (1901)
3	Gurah 2	−27.5, 153.3	2	S	180	Steele (1984)
4	Wellington	−32.3, 148.6	2	E	90	Mathews (1894)
5	Gundabloui	−29.1, 148.5	1	WSW	240	Mathews (1894)
6	Wilpinjong Creek	−32.2, 149.5	1	SW	215	Mathews (1894)
7	Eurie Eurie Run	−29.6, 148.1	1	SW	225	Mathews (1894)
8	Bulgeraga Creek	−30.6, 147.3	1	SSW	202	Mathews (1896a)
9	Camden	−34.3, 150.4	1	NE	45	Mathews (1896b)
10	Murrumbidgee River	−35.5, 148.5	1	S	185	Mathews (1897a)
11	Terry Hie Hie	−29.5, 150.9	1	W	270	Mathews (1917)
12	Wyrallah	−28.5, 153.2	3	SSW	202	McBryde (1974)
13	Brackenridge	−27.2, 153.1	3	SE	135	McBryde (1974)
14	Weir River	−27.4, 150.4	1	WNW	298	Mathews (1907)
15	Casino	−28.5, 153.2	3	N	0	RRHS (1973)
16	Tucki Tucki	−28.6, 153.2	1	SW	225	RRHS (1973), AHIMS 04-4-0024
17	Lennox Head	−28.5, 153.4	3	NNW	315	RRHS (1973)
18	Somerset Dam		1			Satterthwait & Heather (1987)
19	Samsonvale		1			Satterthwait & Heather (1987)
20	Samford		1			Satterthwait & Heather (1987)
21	Canungra		1			Satterthwait & Heather (1987)
22	Kippa Creek		1			Satterthwait & Heather (1987)
23	Mt Esk Pocket		1			Satterthwait & Heather (1987)
24	Camira		1			Satterthwait & Heather (1987)
25	Purga Creek		1			Satterthwait & Heather (1987)
26	Oakey Creek		1			Satterthwait & Heather (1987)

No.	Site Name	Location	Type	O	Az	Source
27	Waraba Creek		1			Satterthwait & Heather (1987)
28	Buaraba		1			Satterthwait & Heather (1987)
29	Dayboro West		1			Satterthwait & Heather (1987)
30	Walli Creek		1			Satterthwait & Heather (1987)
31	Burleigh	−28.5, 153.3	1	SSW	202	Steele (1984)
32	Upper Coomera River		1			Satterthwait & Heather (1987)
33	Moggill		1			Satterthwait & Heather (1987)
34	Nudgee	−27.2, 153.5	1	W	270	Steele (1984)
35	Toorbul Creek		1			Satterthwait & Heather (1987)
36	Hilliard's Creek	−27.3, 153.2	2	E	90	Steele (1984)
37	Tamborine	−27.5, 153.7	1	S	180	Steele (1984)
38	Keperra		1			Satterthwait & Heather (1987)
39	Petrie		1			Satterthwait & Heather (1987)
40	Kippa Ring	−27.1, 153.5	1	SSW	202	Steele (1984)
41	Lowood		1			Satterthwait & Heather (1987)
42	Kipper Creek		1			Satterthwait & Heather (1987)
43	Woolloongabba		1			Satterthwait & Heather (1987)
44	Sandy Creek	−26.5, 152.4	1	S	180	Steele (1984)
45	Jerribribillum		1			Satterthwait & Heather (1987)
46	Wooyung	−28.3, 153.3	1	N	0	Bowdler (2001)
47	Kangaroo Flat	−31.1, 152.1	3	SW	225	Bowdler (2001), AHIMS 03-5-001
48	South Tweed Heads	−28.1, 153.3	3	W	270	Bowdler (2001), AHIMS 04-2-009
49	Bogangar	−28.2, 153.3	2	SW	225	AHIMS 04-2-0133
50	South Grafton	−29.4, 152.6	3	SSE	157	AHIMS 12-6-0115
51	Woolbrook	−30.6, 151.2	1	NW	315	AHIMS 20-6-0022
52	Diamond Flat/Petroi	−31.0, 152.4	1	S	180	AHIMS 21-5-007
53	Ruby Creek	−28.4, 152.1	1	S	180	Towle (1942), AHIMS 03-5-0006
54	Wheatley Creek	−28.5, 152.2	3	WNW	307	AHIMS 03-5-0011
55	Yellow Creek	−28.5, 152.2	1	W	270	AHIMS 03-6-0028
56	Nimbin Brookside	−28.4, 153.1	3	W	270	AHIMS 04-4-0037
57	Dyamberin Station	−30.2, 152.2	3	NNE	22	AHIMS 21-2-0006
58	Yooroonah	−30.3, 152.1	3	NE	45	AHIMS 21-5-0012
59	Timor Dam	−31.3, 149.2	2	W	270	AHIMS 28-2-0002

No.	Site Name	Location	Type	O	Az	Source
60	Richardson's Crossing	−31.1, 152.6	3	N	0	AHIMS 30-3-0001
61	Bundook	−31.5, 152.8	2	S	180	AHIMS 30-5-0011
62	Tyalgum	−28.2, 153.1	1	SW	225	Steele (1984)
63	Alberton	−27.4, 153.2	1	S	180	Steele (1984)
64	Amity Point	−27.5, 153.3	1	E	90	Steele (1984)
65	Glenore Grove	−27.3, 152.2	3	SSE	157	Steele (1984)
66	Milbong	−27.5, 152.4	1	S	180	Steele (1984)
67	Cedar Creek	−27.9, 153.2	1	SSE	158	Steele (1984)
68	Kunopia	−29.4, 149.4	1	SW	240	Mathews (1896a)

Table 2.2: *The Bora grounds that were selected after filtering the original data through the selection criteria. The coordinates given are approximate and do not reveal the exact location of the site. Data includes the site number (No.), name, and location. Also included is the site layout type: Type 1 consists of two circles and a pathway; Type 2 consists of two circles and one opening; Type 3 consists of one circle and an opening. All orientations (O) are given terms of cardinal, ordinal, or inter-ordinal points measured from the large ring to the small ring, with the specific azimuth (Az) given where applicable. SH do not give coordinates or azimuths – only orientations in the four cardinal direction bins (N, S, E, and W).*

A preferred orientation to the south is evident (28% of the total), with lesser but significant preferences to the SW (17%) and W (15%) bins as well. The combined S, SW, and W bins account for 61% of the total data points, while the remaining are evenly spread across the remaining bins. The highest peak of 12.5 orientations occurs in the S bin.

We compare this to the result from Satterthwait & Heather (1987) - hereafter referred to as SH. Unfortunately their data are only given in four quadrants, centred on the cardinal (N,S,E,W) points. We therefore re-bin our data to the four quadrants (Table 2.1) used by SH, resulting in Figure 2.4c. This reveals a strong preference for the southern quadrant and a lesser but significant preference to the western quadrant, which combined account for 74% of the 22 data points. The SH data (Figure 2.4d) is similar, with a significant preference for the southern quadrant (68% of the total data points), but an even distribution among the remaining quadrants. We then combine our data with the SH data, resulting in Figure 2.4e. A clear preference for the southern quadrant is evident, with 35 of the 68 orientations falling in the S bin. This result is consistent with the Love hypothesis.

To determine if this is a chance clumping of a random distribution of orientations, we conducted a Monte Carlo simulation, in which 68 orientations were distributed randomly in

each of the bins shown in Figure 2.4e. We repeated this process 100 million times. In only 303 of the 100 million runs did the number in any one bin equal or exceed 35, from which we can conclude that the likelihood of the peak in Figure 2.4b occurring by chance is about 3x10-6 or 0.0003%. We therefore conclude that this distribution is clearly not the result of chance, and that the builders of the Bora rings intentionally aligned most of them to the south quadrant.

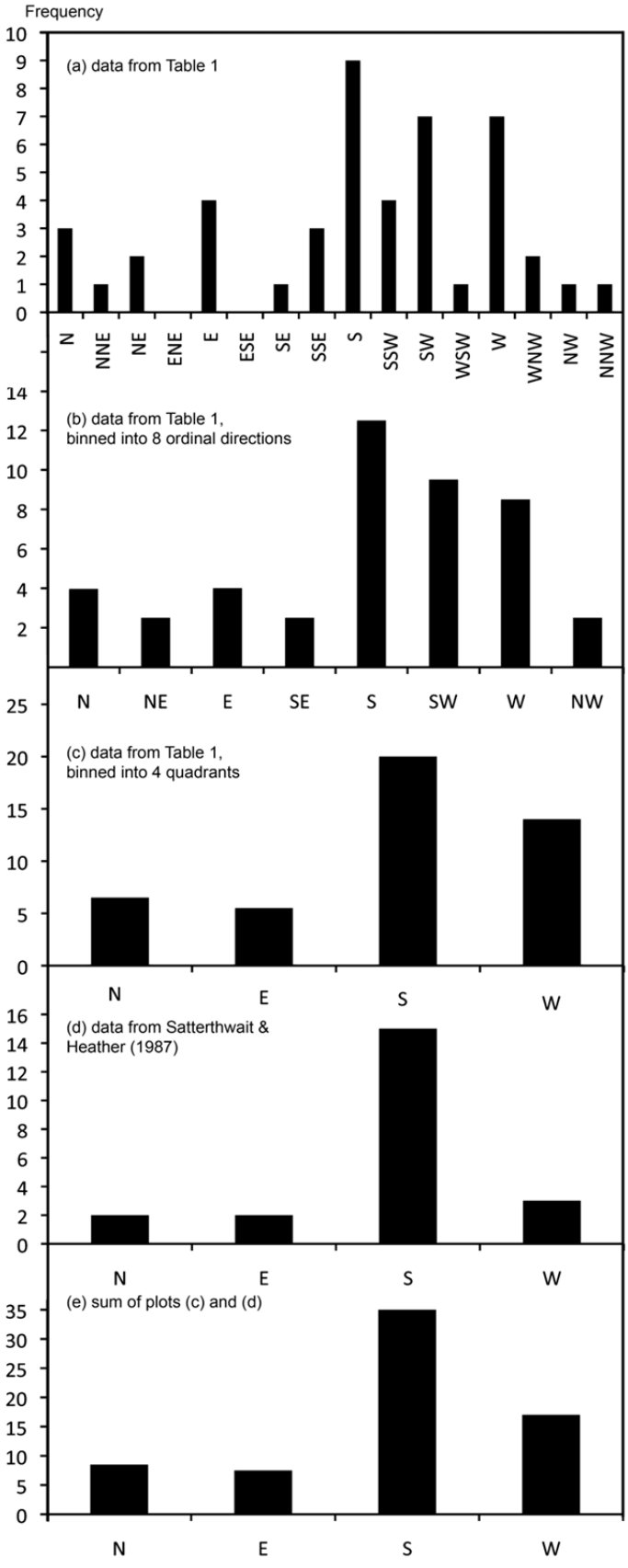

Figure 2.4: *Orientations of Bora sites using data from Table 1. Data in (a) is given in 22.5º bins, (b) is given in 45º bins, and (c)-(e) are given in 90º bins.*

2.4. Discussion & Conclusion

We have shown that the Bora grounds studied have a preferred orientation to southerly directions and that these orientations are not the result of chance, but were deliberate. The reason for this is not known, but it is consistent with the Love hypothesis that Bora ceremonial grounds in southeast Australia have a preferred orientation to the celestial emu in the Milky Way in the south-southwest skies. The celestial emu is in this position in the evening sky during the month of August, the time in which Winterbotham (1957) and Needham (1981) claim that Bora ceremonies are held. Hamacher et al. (2013) showed that linear stone arrangements in NSW also have a preferred orientation to the cardinal points, especially north-south orientations. Since many stone arrangements are ceremonial sites, this lends support to the claim that orientation is an important factor utilised by Aboriginal people when building ceremonial sites.

Although our analysis supports the Love hypothesis, it is not definitive evidence that Bora grounds are oriented to the Sky Bora. There is strong ethnographic evidence that the Milky Way is associated with the Bora ceremony but more ethnographic research is necessary to understand these links. We are currently engaged in further research projects to explore this.

In this paper we have shown that Bora grounds in QLD and NSW are predominantly oriented to the southern quadrant and that this preference is not the result of chance alignments. We present ethnographic evidence connecting the Bora sites to the Milky Way and consider it likely that Bora ceremonies were timed, and Bora sites oriented, such that the vertical Milky Way was visible above the path connecting the two circles during Bora ceremonies.

Acknowledgements

We acknowledge the Aboriginal elders and custodians, past and present, on whose land the Bora sites are located. For archaeological data and literature sources, we thank the Macquarie University Library, the State Library of New South Wales, the Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS), and the Aboriginal Heritage Information Management System (AHIMS) database, maintained by the NSW Office of Environment & Heritage. This research made use of the TROVE and JSTOR databases, Google Maps, and the Stellarium astronomical software package. Hamacher moved to UNSW from Macquarie University during the writing of this article.

Postface

When this study was done, based only on the literature, and without any discussion with later participants, among the conclusions was one that there must be some linkage between the proved orientation of *bora* sites to the southern quadrant, and something in the south at this time. The Emu in the Sky seemed to be a strong contender, as well as the Milky Way (in which the Emu is embedded). Further literature research didn't really add to this conclusion, but eventual ethnography with participants confirmed this theory.

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Pages 33-74 (chapter 3) of this thesis have been removed as they contain published material under copyright. Removed contents published as:

Fuller, R. S., Norris, R. P., & Trudgett, M. (2014). The astronomy of the Kamilaroi and Euahlayi peoples and their neighbours. *Australian Aboriginal Studies (Canberra)*, (2), pp. 3–27. doi/10.3316/ielapa.794463811676077

4

The Emu Sky Knowledge of the Kamilaroi and Euahlayi Peoples

4.1. Introduction

Cultural astronomy is the interdisciplinary study of how various cultures have understood and used astronomical phenomena, and the mechanisms by which this understanding is generated (Sinclair 2006; Iwaniszewski 2009). It is generally divided into archaeoastronomy (past cultures) and ethnoastronomy (contemporary cultures). Because cultural astronomy is a social science informed by the physical sciences (Ruggles 2011), the field has been dubbed the "anthropology of astronomy" (Platt 1991, p. S76).

Fuller, Norris & Trudgett (2014, pp. 3-4) reviewed of the history of cultural astronomy in the Australian Aboriginal context. They report that while there is a rich knowledge of Aboriginal astronomy, the literature on Kamilaroi and Euahlayi astronomy, based on ethnography from the 19th century, was often very limited in detail and contained many contradictions between the stories reported. For that reason, this project included an ethnographic phase to collect knowledge of the sky from current Kamilaroi, Euahlayi, and neighbouring communities. The ethnography comprised multiple interviews and recordings of stories during 2013 from eight participants with mostly mixed heritage from the Kamilaroi, Euahlayi, Ngemba, and

Murrawarri communities. Those participants are noted in the Acknowledgements. One participant, Michael Anderson, with both Euahlayi and Kamilaroi heritage, provided such a complete description of the "Emu in the Sky" as it related to his culture that he has been included as an author of this paper. The "Kamilaroi Project" (as we will continue to describe the study conducted by Fuller, Norris and Trudgett) confirmed the hypothesis that the knowledge gained could add to the current body of knowledge of Australian Aboriginal sky culture. Most of the data was released under the terms of the Ethics Approval by Macquarie University. This paper presents previously unpublished data from the Kamilaroi Project used to determine whether the knowledge about the Emu in the Sky collected through the larger project adds a deeper level of understanding into the sky culture of the Kamilaroi and the Euahlayi peoples.

Like most Aboriginal stories, those collected in the Kamilaroi Project do not just entertain and describe some physical object in the sky. Aboriginal culture is oral in nature, and oral transmission of knowledge is extremely important, particularly in regards to Law. Aboriginal Law governs all aspects of Aboriginal life, establishing a person's rights and responsibilities to others, the land, and natural resources (Law Reform Commission of Western Australia 2006, p. 64). Cultural stories transmit Law, and in this respect can have different levels of meaning. Sveiby & Skuthorpe (2006, pp. 45-51) describe four levels: one being for children (to explain nature), others being for relationships between people, relationships between the community and country, and ceremonial practices. A participant in the Kamilaroi project said that some stories could have up to "30 levels" of meaning, suggesting that most of those levels were secretive and ceremonial in nature. Here we avoid references to secret levels.

4.1.1. The Kamilaroi and Euahlayi Peoples

The Kamilaroi and Euahlayi peoples are an Australian Aboriginal cultural grouping located in the north and northwest of New South Wales (NSW). The Kamilaroi language groups are described as "Gamilaraay" and "Yuwaalaraay/Yuwaalayaay" (Ash et al. 2003, p. 1), while the Euahlayi have a similar but distinct language.

The geographical boundaries of the area defined for this study of the Kamilaroi and the Euahlayi are based on the language group boundaries reported by Austin (2008, p. 2), which is very similar to that proposed by Sveiby & Skuthorpe (2006, p. 25). Figure 4.1 shows the approximate area of the cultural group and languages. Participants in the Kamilaroi project have stated that the map is incorrect, in that Yuwaalayaay and Yuwaalaraay are gradations of

the same Kamilaroi clan dialect, that this clan grouping, indicated by the area “6”, is actually further north, and that the Euahlayi language group covers the area “7”, the southern part of area “6”, and westwards towards the Culgoa River. Discussion with several linguists has confirmed that a debate continues about the locations and names of some of the language groups in this area.

The population of this cultural grouping was estimated at 15,000 in 1788, and as low as 1,000 in 1842 (Sveiby & Skuthorpe 2006, pp. 25-26). A participant in the Kamilaroi project has speculated this could have been as large as 60,000 with the resources available in the area of the study. As a result of pressure from European settlers, there was a displacement of Aboriginal people in this group towards the northwest. The current population of people identifying as Kamilaroi and/or Euahlayi ancestry is approximately 29,000 (Kamilaroi Nation Applicant Board 2013, pers. comm. Board Chairman).

4.2. The Emu in the Sky across Australia

We searched for references to an Emu in the Sky (Emu) across Australian Aboriginal literature, and found them in the literature from cultures in South Australia (SA) (Nullarbor and central desert), West Australia (WA) (Kimberley, Tanami, and Murchison regions), Northern Territory (NT), Victoria (VIC), Queensland (QLD) (Gulf country and southeast), and NSW (Sydney basin).

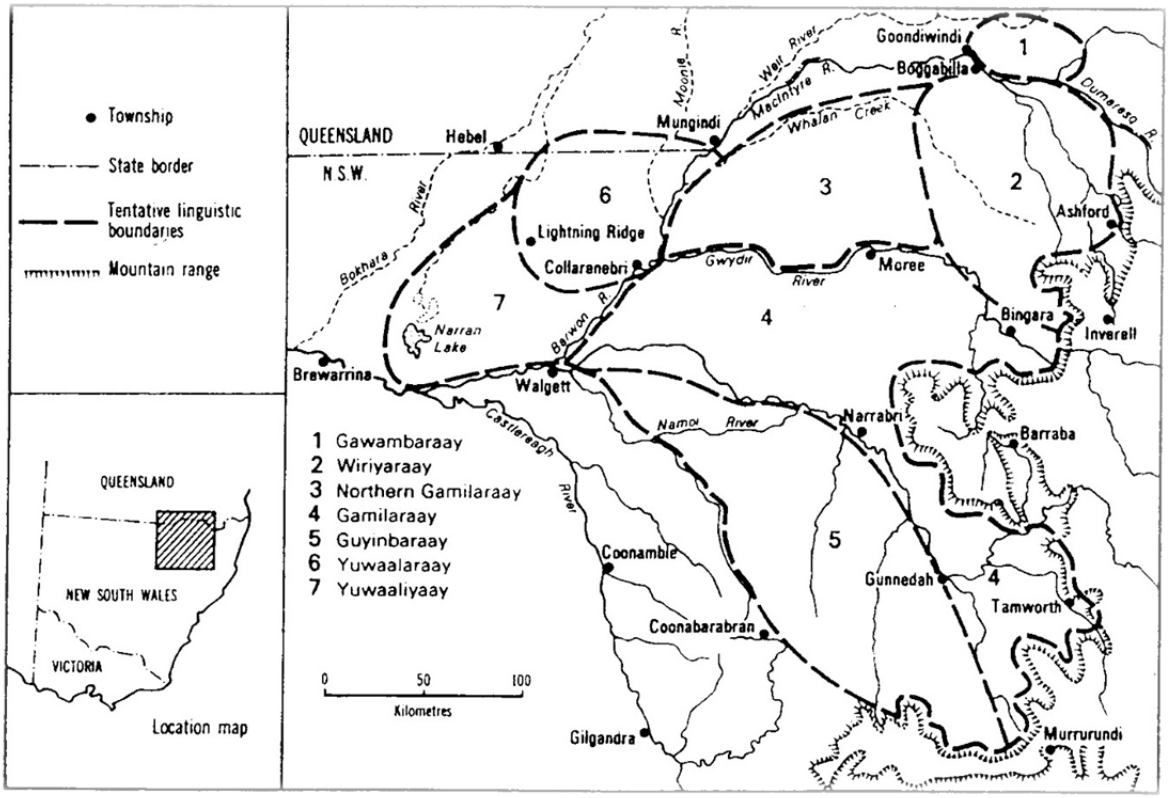

Figure 4.1*: Language location in northern New South Wales (Austin, 2008). Note: 1-7 are Kamilaroi dialects.*

The earliest reference to the Emu was by Stanbridge (1857, p. 139), who reported that the Boorong people of west central VIC said that an emu (*Tchingal*) resided in the dark patch (the Coalsack nebula) under the constellation Crux (commonly known as the Southern Cross). The next mention in the literature was by Ridley (1873, pp. 273-274), who spent an evening under the sky with an Aboriginal man from near Walgett, NSW called King Rory, who informed Ridley that there was an Emu (*gao-ergi*) in "the dark space under the tree", meaning the Coalsack (the tree being the Southern Cross). King Rory, who was most likely Euahlayi, used the term *gao-ergi*, which is phonetically very similar to the current Kamilaroi/ Euahlayi words *Gawarrgay/Gawarghoo* (Ash et al. 2003, p. 2). We have confirmed that *Gawarrgay/ Gawarghoo* is the correct word for the Emu, as *dhinawan* is used for the emu on Earth. Fuller, Norris & Trudgett (2014, p. 29) argued that King Rory had been taught this knowledge by his grandfather when he was around 15, and Ridley estimated him to be about 60 in 1871, so his description of the Emu was learned well before any European explorers or settlers had reached the Walgett area, giving strong support to the idea that the Emu is pre-European contact in origin. Ridley also gave King Rory's tribal name as *Ippai Dinoun*, *Ippai* being one of the Euahlayi marriage classes, and *Dinoun* being Ridley's spelling of the current *dhinawan*,

which is the emu's name in Kamilaroi/Euahlayi, and was his totem, so he should have been knowledgeable about the Emu.

Later references include Palmer (1885, p. 174) who has a reference from the Gulf country in QLD, Bates & Wilson (1972, pp. 59-60), and Bates (n.d., p. 13) who said that the emu in the "Yamminga times of long ago," went up into the sky and "became *Wej Mor* – the dark patch in the Milky Way". Bates is believed to have collected this story at Ooldea, SA, around 1904 from the Ngalea language group (Great Victoria Desert).

Basedow (1925, pp. 315, 332-334) has several references to the Emu from northern Australia. Some unknown Aboriginal groups from the Musgrave Ranges of the Tanami Desert (WA) spoke of a "resting emu" (*kaleya pubanye)* in the Coalsack. The Larrakia from near Darwin (NT) had a very complete view of the Emu which is remarkably like that of more recent investigations, and told Basedow that "the Coalsack was the head of a gigantic emu" which was made up of dark patches in the Milky Way as far as Scorpius, with the legs extending further.

In his field notes of an expedition to the Warburton Ranges, Tindale (1935, pp. 457-459) refers to a story from the Pitjantjatjarra (Central Desert) about an Emu called *Kalaia*. Worms (1940, p. 271) has a reference to the Emu from his work with a Kimberley (WA) group.

Love (1987, p. 4) refers to Ford (1985, Art. No. 3) by describing the Emu as follows: "to the Aboriginal this dark constellation was the Emu, its head being the Coalsack, its body being in Scorpius and its legs in Ophiuchus". In Hafner et al. (1995, 34) Ngitji Ngitji told of stories of the Emu and the Milky Way from northern SA. More recently, Cairns (1996, pp. 9-10) suggested that a rock engraving of an emu at the Elvina Track site in Kuringai National Park (NSW) could represent the Emu. Norris & Norris (2009, pp. 6-7) have shown that the engraving mirrors the Emu, in both shape and azimuth, in April, which is the time of the year when emus lay their eggs (Figure 4.2).

Cairns & Harney (2003) describe the "Cosmic Emu" of the Wardaman people and their neighbours in the area bounded by the Victoria and Daly Rivers of the NT, based on the knowledge of Bill Yidumduma Harney, a Wardaman elder. They connect the Emu to songlines and rock art, and to descriptions by previous writers.

4.3. The Emu of the Kamilaroi and Euahlayi

There are a limited number of written sources about the culture of the Kamilaroi and Euahlayi, mostly from the latter half of the 19th century. These were Ridley (1856, 1873, 1875), Fraser (1889), Greenway (1901), Greenway et al. (1878), and Fison & Howitt (1880). Mathews (1900 and 1904) is relevant to this study, as are papers by K. Langloh Parker, a contemporary of Mathews who lived on the Narran River in the late 1800's and collected a large body of folklore about the Euahlayi (Parker 1898, 1914; Parker & Lang 1897, 1905). Sveiby & Skuthorpe (2006) have more recently described the culture of the Nhunggabarra band of the Kamilaroi/Euahlayi language group.

It has been established that the idea of an Emu, as a cultural object used in stories, rather than the emu bird, existed across Australia at the time of European invasion. Basedow's information from the Larrakia, Ford's description, and the more recent investigation of the Kuringai people's stone engraving of an emu near Sydney (Figure 4.2), all point to at least some Aboriginal groups seeing the Emu as a long, stretched out figure in the dust clouds of the Milky Way from the Coalsack to beyond Scorpius. Six of the eight participants in the ethnographic phase of the Kamilaroi project referred to the Emu as an emu figure stretching from the Coalsack to Scorpius, and most could describe its appearance. However, the story from Anderson, as used in this study, is the only complete story collected, including linkage to the Kamilaroi/Euahlayi culture and resource management.

The Emu, as seen by the Kamilaroi and Euahlayi, changed in position from season to season, as the Milky Way containing the Emu changed position in the night sky. As the Emu changes position, it alters in appearance, and that appearance has connections to cultural and resource matters. All of the images of the Emu's appearance in this study are seen mid-evening, around 9:00PM local time, in the area of the study. The head of the Emu (the Coalsack) can be seen all year, as the Southern Cross is circumpolar when viewed from the latitude of the study, but the neck and the body of the Emu may or may not be visible at different times of the year, due to the rotation of the sky (which is the result of the tilt of the Earth from summer to winter, and the position of the Earth in its rotation around the Sun). We have used the computer planetarium program, Starry Night Pro®, adjusted to provide a non-light polluted sky to determine the various views of the Emu used in this study. Anderson described the cultural appearance of the Emu in the Milky Way as seen using Starry Night Pro. Through this, the authors were able to confirm that the appearance of the Emu began at the Coalsack under the

star α Crucis, which formed the Emu's head, then β and α Centauri, which form the start of the neck, down the dust lanes of the Milky Way to η Lupus and γ^2 Norma, at which point the dust lanes expand with the body of the Emu, reaching the maximum thickness with ε and λ Scorpii, and tapering towards 36-Ophiuchi and 3-Sagittarii, eventually ending near μ Sagittarii.

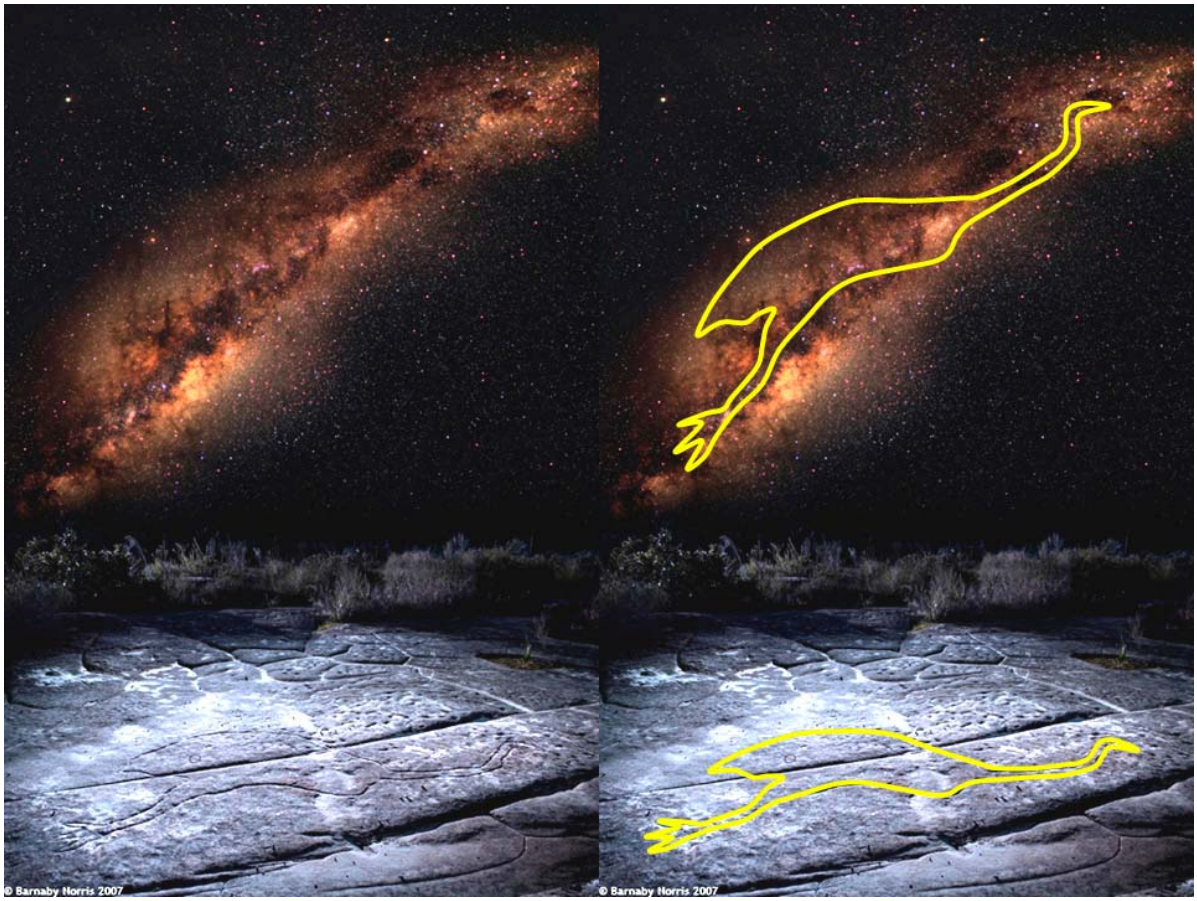

***Figure 4.2**: Kuringai Emu in the Sky (images courtesy Barnaby Norris and Ray Norris).*

While the head and neck of the Emu can be seen in the sky as early as March, it reaches its first appearance in full length after sunset in April and May, when it is seen stretching from the South to the southeast (Figure 4.3). At this time, the Kamilaroi and Euahlayi say the Emu has legs, and appears to be running. This reflects the behaviour of female emus, who chase the males during the mating season (NSW Department of Environment n.d.). Because emus are laying their eggs at this time, the appearance of the celestial Emu is a strong reminder to the Kamilaroi and Euahlayi people that eggs are available.

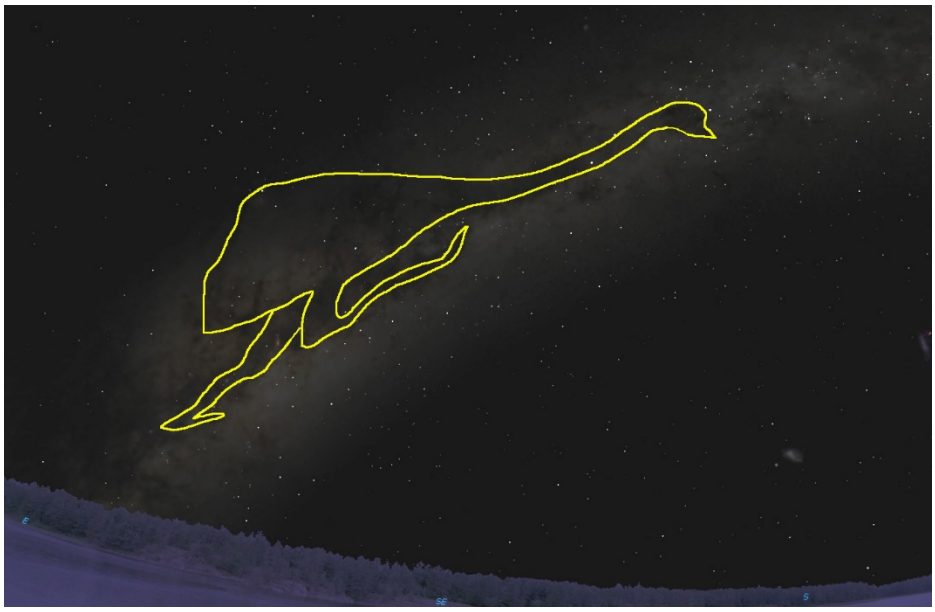

Figure 4.3: *The Emu in autumn (April-May), running after a mate (image courtesy Starry Night Education).*

In June and July, the appearance of the Emu changes. The legs disappear, and the Emu, which is now seen as male, is sitting on its nest, hatching the new chicks (Figure 4.4). After female emus lay the eggs, it is the males that broods the eggs (ibid). At this time, the eggs are still an available resource, and can be taken from the nest.

The Kamilaroi and Euahlayi have in common their male initiation ceremony, the *bora*. Many language groups in southeast Australia used a similar ceremony, sometimes using the borrowed Kamilaroi word, *bora*. For the Kamilaroi and Euahlayi, the preferred months for their *boras* are after August, according to participants in the Kamilaroi project, because the Milky Way was vertical in the sky to the southwest in August and early September.

The connection between the Milky Way and the *bora* could be linked to the culture hero, *Baiame*, who was common to many language groups in southeast Australia (Fraser 1889, p. 10). *Baiame's* son, *Daramulan,* was given to the people and it is through *Daramulan* that *Baiame* "sees all" (Fraser 1882, p. 208; Howitt 1884, p. 458). *Baiame* is worshipped at the *bora* ceremony (Ridley, 1873, p. 269) and *Daramulan* is believed to come back to the Earth by a pathway from the sky (Fraser 1882, p. 212). Eliade (1996, p. 41) reports that *Baiame* "dwells in the sky, beside a great stream of water (Milky Way)".

In late winter (August to September), the neck of the Emu becomes indistinct in the sky, leaving the body to represent an emu egg (Figure 4.6). This was taken, according to Anderson, as a sign that the emu chicks were hatching, and that the egg resource was no

longer available. Because the male emus look after the chicks (Eastman 1969), this has led to some speculation (Love 1987, p. 3) that this connects the Emu to the *bora* ceremony. As the male emu hatches and raises the chicks, so the Aboriginal elders nurture the male initiates. There is little literature on this subject, other than Winterbotham (1957, pp. 3-4), who reported on information from a southeast QLD Aboriginal elder, Gaiarbau, who indicated the link between the *bora* and sky. This reinforces Love's speculation.

Figure 4.4: *The Emu in winter (June-July), sitting on its nest (image courtesy of Starry Night Education).*

Fuller, Hamacher & Norris (2013, p. 36) tested the hypothesis that the orientations of *bora* ceremonial circles are aligned to the position of the Milky Way, which is vertical in the sky after sunset to the south-southwest in August and early September. Figure 4.5 shows the preference in orientation of 68 *bora* sites in NSW and southeast QLD where the orientation was known. The results show that the preference is strong in the southern quadrant, where the Milky Way is located in August and early September. To determine if this was a chance clumping of a random distribution of orientations, Fuller, Hamacher & Norris conducted a Monte Carlo simulation, in which 68 orientations were distributed randomly in each of the bins shown in Figure 4.5. They repeated this process 100 million times. In only 303 of the 100 million runs did the number in any one bin equal or exceed 35, from which they concluded that the likelihood of the peak in Figure 4.5 occurring by chance is about $3x10^{-6}$ or 0.0003%. They concluded that this distribution was clearly not the result of chance, and that the builders

of the *bora* rings intentionally aligned most of them to the southern quadrant. This lends support to the claims that bora ceremonies are linked to the Milky Way.

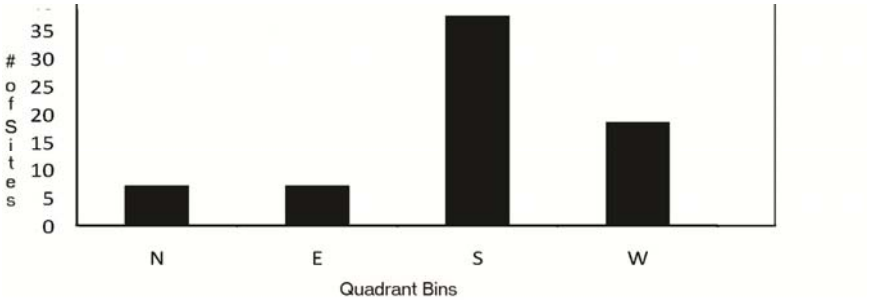

Figure 4.5: *Frequency of alignment of bora sites to cardinal quadrants (defined as a quarter of a circle; an arc of 90°, N being 0°, S being 180°)(Fuller et al. 2013).*

The head of the Emu is still visible in the sky in late winter, and together with the body, they appear to form a large and small ring in the Milky Way, which may be representative of the small and large *bora* rings that are laid out on the ground (Figure 4.6). The head represents the smaller, sacred, *bora* ring, and body the larger, public ring, and looking at the rings in the sky, they mirror the layout of the *bora* rings on the ground. If Fuller, Hamacher & Norris (ibid) are correct in their alignment hypothesis, this may be the reason that *bora* sites are aligned to the southern quadrant. At this time of year, Aboriginal people in the area of the study would be leaving their winter camps to travel to ceremonial sites for ceremonies including the *bora*.

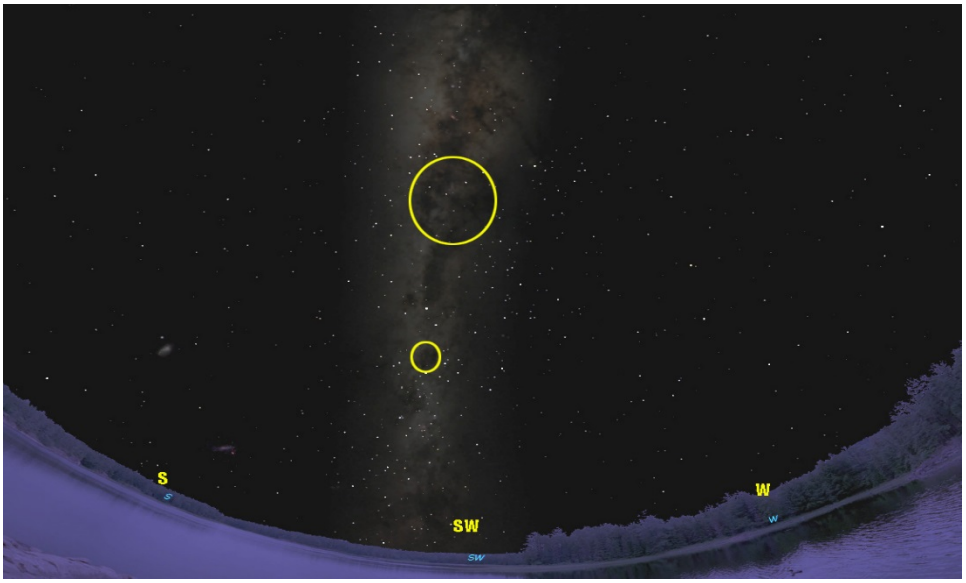

Figure 4.6*: Emu in late winter (August-September) over the south-southwest (image courtesy Starry Night Education).*

In the spring, around November, the Emu once again is transformed (Figure 4.7). For the Kamilaroi and Euahlayi, the Emu is also *Gawarrgay/Gawarghoo*, a featherless emu who travels to waterholes and looks after everything that lives there. Come November, the Emu is now (along with the Milky Way it inhabits) low on the horizon in the evening. Due to atmospheric extinction, the neck and the head are difficult to see, so the body of the Emu seems to be "sitting" on the horizon. According to Anderson, this is because the Emu is now believed to be sitting in a waterhole, and as a consequence, the waterholes in country are believed to be full (which would normally be the case in southeast Australia after the winter rains). The Kamilaroi have another name for the emu bird: *ngurran.gali* (*Euahlayi: dthnarwon.gulli*). This translates to "an emu sitting" or "emu in the water", which may well relate to this view of the celestial Emu.

Later in the summer, the Milky Way and the Emu have dipped even lower, and the Emu has become almost invisible on the horizon (Figure 4.8). At this time, the Emu is believed to have left the waterholes, and because of this, the waterholes in country are dry, which may well be the case in the summer. The Emu will not be visible again until its head peeks above the horizon in February, followed by the body in March.

Some of the major themes of the Kamilaroi Project, such as "what's up there is down here", are reflected in the Kamilaroi/Euahlayi stories of the Emu. A few participants, including Anderson, commented on their belief that, at one time, the sky and everything in it was "down here", and what is now "down here" was in the sky. For that reason, what is seen in the sky now is also on the ground, and the varying views of the Emu also have close connections with things on the ground, in particular the emu bird, which was an important resource. The view of the Emu was closely connected to the resource management of the emu, possibly the ceremonial aspects of the male initiation ceremony, and in regards to waterholes, and the management of country.

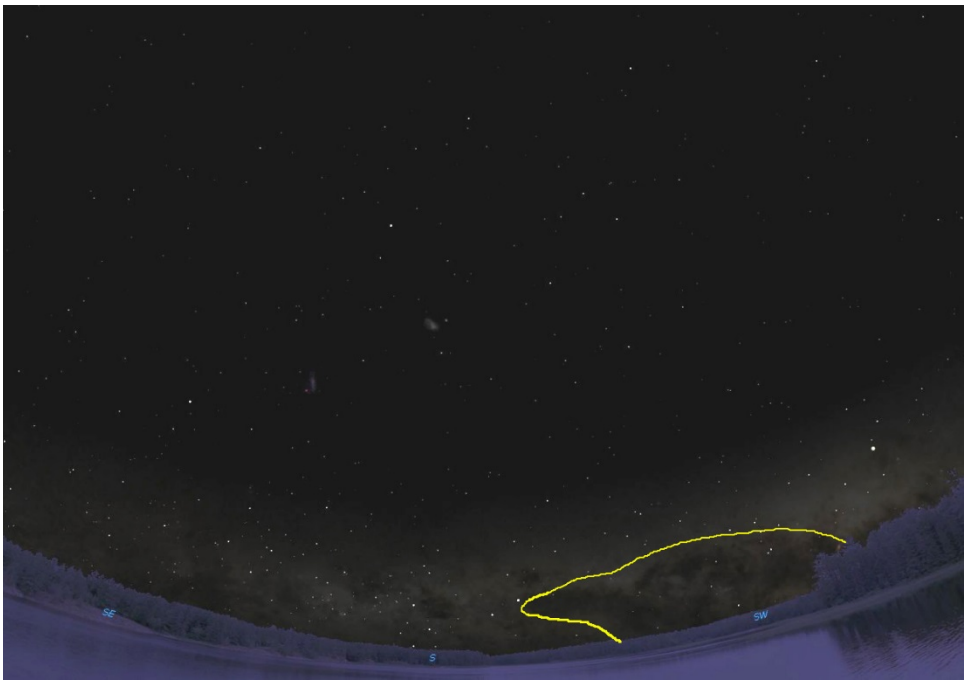

Figure 4.7: *The Emu sitting in a waterhole in spring (November) (image courtesy Starry Night Education).*

Figure 4.8: *Summer, when most of the emu is below the horizon (image courtesy Starry Night Education).*

4.5. Conclusions

We show that the Emu in the Sky is an important cultural figure in many different parts of Aboriginal Australia. While many of the reports in literature have only the barest details, where traditional knowledge still exists, there is the possibility of working with the knowledge holders to restore a more complete understanding to the public record. The support

of the participants in the Kamilaroi Project has provided a very detailed picture of how the Emu in the Sky fitted into the sky knowledge and culture of the Kamilaroi, Euahlayi, and possibly their Murrawarri and Ngemba neighbours. This would appear to be the first Aboriginal cultural grouping in Australia where this knowledge was brought together into a unified description. We believe the knowledge gained in this one aspect of culture meets the aims of the hypothesis of the Kamilaroi Project to add to the overall understanding of the sky knowledge of the Kamilaroi and Euahlayi peoples. This information may also be used in future research to strengthen the understanding of how Australian Aboriginal culture linked the behaviour of cultural objects in the sky with animals and resources on the land.

Acknowledgements

We acknowledge and pay our respects to the traditional owners and elders, both past and present, of the Kamilaroi, Euahlayi, Ngemba, and Murrawarri peoples. We thank the participants of the Kamilaroi project, Michael Anderson, Rhonda Ashby, Lachie Dennis, Paul Gordon, Greg Griffiths, Brenda McBride, Jason Wilson, and one anonymous person, for their stories and those of their families. We particularly thank Michael Anderson for his detailed story on the Emu, which is central to this study. This paper was originally presented at the 2013 Australian Space Sciences Conference at the University of New South Wales. We also thank the two anonymous referees and the guest editor, Duane Hamacher, for their feedback.

Postface

This article, which was developed from a presentation, was the first opportunity after the completion of the study and reporting in the main article, to look at a particular aspect of Kamilaroi astronomy and examine it in further detail. Michael Anderson, the participant who was becoming the major source of knowledge, was feeling more comfortable with the study after reading the main article, and began to support the project enthusiastically. One example was a more detailed description of the role of the Emu in the Sky in Kamilaroi culture which formed this more detailed report used in the presentation and article. Out of this description came one of the first complete descriptions of how a sky cultural object, such as the Emu, played a role in many aspects of culture, including resources, ceremony, and management of country. In the ceremonial aspect, the hypothesis that the Emu was significant in the alignment of *bora* sites was confirmed, as well as Love's hypothesis that the Emu had a ceremonial role in the *bora* itself. Cairns', and later, Norris', hypotheses about the Emu

having a resource role in determining when emu eggs are collected, were clearly confirmed. The overall cultural importance of a sky object, while not unknown in previous research in Australia, was shown to be still known and accessible through ethnography with contemporary knowledge holders, and this is surely an important lesson for current research on Indigenous cultural astronomy.

5

Star Maps and Travelling to Ceremonies: The Euahlayi People and Their Use of the Night Sky

5.1. Introduction

Cultural astronomy is defined as the study of the effect of astronomical knowledge or theories on ideologies or human behaviour (Campion 2004, p. xv). Fuller, Norris & Trudgett (2014, pp. 3-4) report that while there is a rich knowledge of Aboriginal astronomy, the literature on Kamilaroi and Euahlayi astronomy, based on ethnography from the 19th century, is limited and contains many contradictions. They collected knowledge of the sky from current Kamilaroi, Euahlayi, and neighbouring communities, including many interviews and recordings of stories during 2013 from eight participants from those communities. Those participants, referred to in the texts as P1…P8, are noted in the Acknowledgements. One participant, Michael Anderson, with both Euahlayi and Kamilaroi heritage, provided such a complete description of star maps as it related to his culture that he is included as an author of this paper.

Fuller, Norris & Trudgett (2014) confirmed the hypothesis that the knowledge gained could add to the current body of knowledge of Australian Aboriginal sky culture. Most of the data

were released under the terms of Ethics Approval 5201200462 by Macquarie University. This paper presents previously unpublished data from the study used to determine whether the knowledge about star maps collected through the larger project adds a deeper level of understanding into the sky culture of the Kamilaroi and the Euahlayi peoples.

The stories collected by Fuller, Norris & Trudgett (2014) do not just entertain and describe some physical object in the sky. Aboriginal culture is oral in nature, and oral transmission of knowledge is extremely important, particularly in regards to Law. As Aboriginal Law governs all aspects of Aboriginal life, it establishes a person's rights and responsibilities to others, the land, and natural resources (Law Reform Commission of WA 2006, p. 64). Cultural stories transmit Law, and in this respect may have different levels of meaning. Sveiby & Skuthorpe (2006, pp. 45-51) described four levels; one being for children (to explain nature), others being for relationships between people, relationships between the community and country, and ceremonial practices. A participant in the project said that some stories could have up to "30 levels" of meaning. While we have avoided reference to the ceremonial levels of meaning in this study, in the case of the use of the sky for travelling to ceremonies, we may reference ceremonial matters where permission has been received from the owners of such ceremonial knowledge.

5.2. The Euahlayi People

The Euahlayi people are an Australian Aboriginal cultural group located in the northwest of New South Wales (NSW). Ash et al. (2003, p. 1) have described the Euahlayi language as "Yuwaalayaay", but Euahlayi participants in the project maintain that "Yuwaalayaay" is a clan language of the neighbouring Kamilaroi people, and that Euahlayi is a separate language (P2). Mathews (1902, p. 137) described the "Yualeai" language as:

> *The natives speaking this language are located upon a tract of country in southern Queensland, including the Bokhara, Birrie, Narran, Ballonne and Moonie Rivers, and extend some distance within the New South Wales frontier, where they are met by the Kamilaroi nation.*

When this area was described by Sim and Giacon (1998, pp. vii, xii), Sim described the language in the area as "Yualeiai", while Giacon (the Editor) changed this to Yuwaalayaay, so there have been a number of interpretations of the name over the years. Figure 5.1 shows the area of the Euahlayi language group (labelled "Juaaleiai").

The population of the Kamilaroi and Euahlayi cultural grouping was estimated at 15,000 in 1788 although participants point out that the resources available could maintain a population as large as 60,000. This may have dropped to as low as 1000 in 1842 (Sveiby & Skuthorpe 2006, pp. 25-26). As a result of pressure from European colonisers, there was a movement of Aboriginal people in this group towards the northwest. The current population of people identifying as Kamilaroi and/or Euahlayi ancestry is approximately 29,000 (estimates from Kamilaroi Nation Applicant Board). The same source estimates the current number of people with Euahlayi ancestry as being "around 3000", implying that the population at the time of European invasion was small.

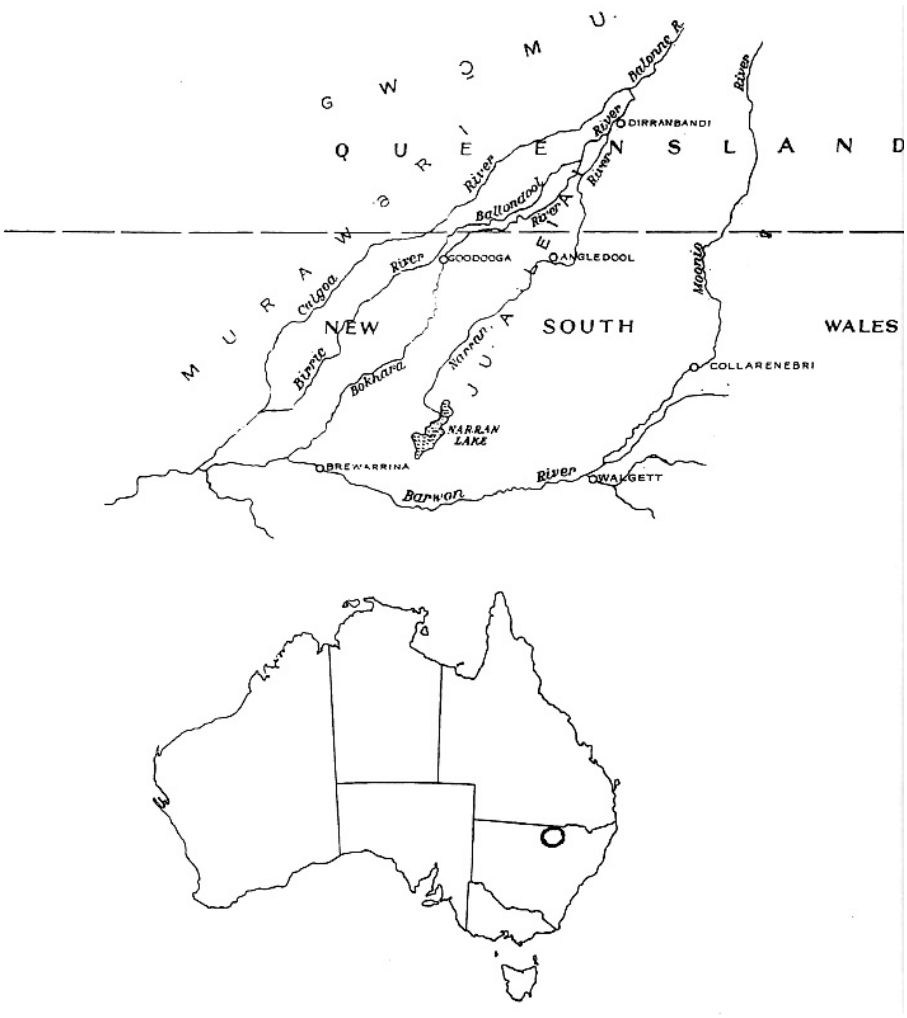

Figure 5.1: *Location of the Euahlayi language group (after Sim & Giacon 1998).*

5.3. Aboriginal travel and navigation using the stars

5.3.1. Navigation at night

Haynes & Haynes (1996, pp. 7-8) described the difference between Aboriginal and European astronomy:

> *Astronomy, in the sense of a comprehensive and coherent body of knowledge about the stars, was an integral component of Aboriginal culture. Like the Newtonian-based system of Western science, it represented an attempt to construct a view of the Universe as an ordered and unified system, but in most ways it was fundamentally different. It was relational rather than mathematically-based, and it was concerned with similarity rather than with difference, with synthesis rather than analysis, with symbiosis rather than separation […] For the Aborigines, the stars not only evoked wonder, they predicted and explained natural occurrences and provided celestial parallels with tribal experiences and behavioural codes.*

A common question is: Do Aboriginal people use the stars for navigation at night? Norris & Harney (2014) show that Wardaman people prefer to travel at night, and use the stars for navigation. Maegraith (1932, p. 25) stated that Aboriginal people of the Central Desert were unable to navigate at night, notwithstanding their detailed knowledge of the night sky. Lewis (1976, pp. 273-274), as a part of a project in Aboriginal route-finding with Walbiri and Pintupi people in the Simpson Desert, found that his participants did not use the stars for navigation, and were disoriented at night when unable to see landscape features. The answer to this question therefore seems to vary from one language group to another.

One of the participants (P2) stated that while Aboriginal people had a clear understanding of the sky at night, and could use stars and other objects for directions, they had no interest or purpose in travelling at night.

Kerwin (2010, pp. 68-69) lists anecdotal stories from participants in his research showing Aboriginal peoples' ability to navigate in their country using the stars at night. Cairns & Harney (2003, p. 9) describe the Dreaming Track in the sky that helps navigation on the ground, and Norris & Harney (2014) give other examples.

There is much evidence in the literature about the Aboriginal use of the night sky for predicting when resources would be available. Fuller, Norris & Trudgett (2014) have shown how the Emu in the Sky, an important object outlined by the dust clouds in the Milky Way, governed the Euahlayi peoples' timing of the use of the emu egg resource on the ground. Almost all the literature on Aboriginal astronomy refers to the central role of the night sky in Aboriginal cultural stories. Sveiby & Skuthorpe (2006, p. 41) describe Aboriginal storytelling as "dramatic art", and one can imagine that many of the stories collected since colonisation were told at night, using the key cultural figures and animals of the Dreaming that were connected to objects in the sky. These stories had many levels (ibid, pp. 42-50), from children's stories to entertain or describe natural phenomena, to levels describing spiritual action and ceremonies.

5.3.2. Travel

Research on Aboriginal culture in the last two centuries has brought a change in the original view by colonists that Aboriginal peoples were nomadic hunter-gatherers eking out a subsistence existence. As early as the 1840's Curr speculated that Aboriginal people in Victoria (VIC) had an excess of leisure time after fulfilling their needs (Sahlins 1972, p. 24). Sahlins (ibid, pp. 9-32) coined the description "The Original Affluent Society" for hunters and gatherers, including Australian Aboriginal peoples, and used data from early ethnographic studies in Australia to show that they were able to meet their needs with adequate time to spare for leisure, and that travel was limited to a need to access resources. Kerwin (2010) made a strong case that Aboriginal people travelled mainly for trade and ceremony, but that otherwise, most Aboriginal people living in the better-resourced parts of Australia lived sedentary lives in clearly defined territories. He and earlier writers, such as McBryde (2000, pp. 157-164), Mulvaney & Kamminga (1999, p. 95), and Flood (1983, pp. 235-236), described a vast network of trade routes throughout Australia, trading in goods, ceremonies, and stories. These included well-established trade routes connecting the inland with coastal Queensland (QLD), and down the Dividing Range to the Snowy Mountains. Commodities traded included bunya nuts, pituri (a nicotine- based narcotic), stone axes, ochre, and wooden implements. Stories and ceremonies were also traded along the same routes, and people from different language groups attended and participated in ceremonies, such as the Bora initiation ceremony of the southeast of Australia. Reynolds (1981, pp. 11-2)

described the "large ceremonial gatherings (that) provided the venue for gossip, trade and cultural interchange".

5.3.3. Songlines and Dreaming tracks

Stories and ceremonies were traded along particular routes across Australia. Kerwin (2010, pp. 113-120) and McBryde (2000, pp. 157-164) showed that trade routes were as important as songlines and Dreaming tracks. In some cases, stories were also traded along trade routes, and eventually that trade route became a storyline or Dreaming track, and the route was incorporated into the story. For example, the Two Dog Dreaming story (Kerwin 2010, pp. 37, 90) describes how the ancestral emu, Kuringii, was chased by two ancestral dingoes along a trade route from Cape York to South Australia (SA) through the Queensland Channel Country. Kuringii was eventually killed at the foot of the Flinders Ranges, and his blood is the source of the prized red ochre from Parachilna in SA. In this way, the ochre traded on this route became part of the story in such a way that the route is now a songline for the song that relates the story. A Dreaming track is another way to express the meaning of a story that is a part of a traditional Dreaming story that travels down a trade route. Kerwin (ibid, pp. 113-114) says that a Dreaming story or songline can change from one end of the track to the other, but still has the same basic theme. The language of the story will also change as it moves through different language groups along the track, but as the story is sung, the "melody" remains the same; only the language changes. A person can recognise the story without understanding the language (P2). Kerwin also says that as the story travels over the landscape it will have changes relating to the local country of those singing the story, but the original theme remains the same.

Songlines can also be seen in the sky at night. Euahlayi people (P2) know of a songline stretching from Heavitree Gap at Alice Springs to Byron Bay on the East Coast. This is the songline of *Mulliyan-ga* (the eaglehawk), and runs from the star Achernar in the West overhead to Canopus, to Sirius, and then to the East. *Mulliyan-ga* fought, and was defeated by the caterpillar, *Yipirinya*, at Alice Springs after travelling from the East, and his spirit remains in Achernar. This is a songline that connects the Arrernte people of Alice Springs with the Euahlayi people of northwest NSW, and it is possible the Arrernte have a story that connects to *Mulliyan-ga*. The Euahlayi (ibid) also know of the Black Snake/Bogong Moth songline, which connects Normanton on the Gulf of Carpentaria with the Snowy Mountains near

Canberra. This songline in the sky follows the Milky Way and intersects with the *Mulliyan-ga* songline over Euahlayi country.

5.4. Star maps and travelling to ceremonies

Cairns (1996; 2005) speculated that small depressions in the sandstone, known as cupules, at the Elvina Track site north of Sydney might represent maps of the stars in the sky. However, Bednarik (2008), an expert in rock art, has been very sceptical that cupules are anything other than natural phenomena in all but very limited cases.

Another use of the term "star map" describes the use of patterns of stars to represent routes of travel on land. During the summer months, Aboriginal people travelled through their own country, and often the country of other clans and language groups, to trade in goods and stories, and in particular, to attend and participate in ceremonies. These ceremonies often took place at special sites, such as *bora* grounds, that had been used for such purposes for long periods of time, and usually marked a story or event of spiritual significance that took place at that location during the Dreaming. Early ethnographers documented these ceremonies in sufficient detail that we are able to find examples of ceremonies where it was clear that people from a wide area attended. Mathews (1894, pp. 106-109) describes a *bora* ceremony at Gundabloui (near Collarenebri NSW) in 1894 where the attendees travelled up to 160 km on foot to attend. The camp was broken down into three sections, one being people from the Mogil Mogil, Collarenebri, and Walgett areas (most likely the Euahlayi language group), another from the Kunopia, Mungindi, and Welltown areas, and the last from the Moonie and St. George (QLD) areas. The latter two groups were possibly Kamilaroi and Bigambul language groups. According to Mathews, messengers were sent out after the *bora* ceremony at Kunopia (near Mungindi NSW) two years prior to invite people to the Gundabloui *bora*. As the time for the *bora* approached, the people attending commenced travelling, with one of the messengers as a guide. They travelled by day and camped at night. In this case (ibid, p. 124), the ceremonies were held between 12 February and 10 March, but attendees began arriving a month before. *Bora* ceremonies took place over a wide range of months (Fuller, Hamacher and Norris 2013, p. 31), but it appears that they were normally held during the summer months.

Fuller, Hamacher & Norris (2013) studied *bora* grounds in the northwest and north central area of NSW and over the border in south central QLD, which consist of a large circle of

cleared earth or stone, connected by a cleared pathway to a smaller circle of cleared earth or stone. The larger circle was considered to be the "public" circle, where all participants could attend, and the smaller circle was the "sacred" circle, where only the initiates and elders were allowed. Mathews (1894, pp. 106-109) suggested that Euahlayi people travelled long distances to attend *bora* ceremonies so that people from individual clan groups would have had a need to know how to navigate through a very large area possibly using the Dreaming tracks described above. We are not aware of any actual portable "maps" having been found in Australia, and the only suggestions of way-finding devices have been stone or clay "*cyclons*" in NSW, "*toas*" (decorative objects in various materials from Central Australia), and message sticks, but the function of these objects for travel is not clear (Kerwin 2010, pp. 74-78).

A different use of the sky is provided by a co-author (Anderson), and confirmed in part by the participants P4, P7, and P8. For the Euahlayi, and for the Kamilaroi and neighbouring language groups, there was another way to use the stars for travelling which was not a form of navigation by the stars. This was the use of patterns of stars ("star maps") to teach people how to travel in and outside of their country. Knowledge in Aboriginal culture is transmitted orally, so this technique could be considered a memory aid to assist in teaching and as a reminder for future travel. Initiated men, including the messengers mentioned by Mathews, would be the holders of this knowledge. It is possible women were also included, as knowledge of travel was not necessarily ceremonial in nature. In Euahlayi country, the winter months of May, June, and July would be used for planning the travel to ceremonies during the summer months, starting as early as September. The people planning to travel would already know where they had been invited, as the messengers would have arrived with the invitations. A part of the early winter activities would be the travel plan, and at this time, young men (and perhaps women) would be taught how to travel using the songlines or Dreaming tracks described by the star maps. The knowledge holder would use a clear night at the right time of the year and point out the directions for travel, using the patterns of stars in the star map in the sky to guide the intended traveller from place–to–place on the ground using the stars as what we now call "waypoints" in terrestrial navigation. To the Aboriginal person, these waypoints could be a bend in a river, a waterhole, a marked tree, or a stone arrangement. Eventually the star map would lead to the destination, which would be the ceremonial ground. It must be clear at this point that the pattern of stars used as the map for teaching is just that, a teaching aid, and the actual directions taken at the waypoints are not necessarily related to the pattern of stars, but taught as a part of the process by the knowledge holder. Anderson says that there

were often signs at the waypoints on the ground, such as marked trees or stone arrangements, which would show the direction to the next waypoint. This information was presumably passed on during the teaching.

An example, based on mid-May in the late evening, would be a star map leading to Carnarvon Gorge in QLD, which is a known ceremonial centre. This is a trip of over 600km. Looking at the southeast sky, the winter camp in Euahlayi country where the planners are located is represented as an area in the constellation Sagittarius bounded by the stars Epsilon Sagittarii, Beta Sagittarii, W Sagittarii, Delta Sagittarii, and the star cluster M7. This area would have also incorporated Kamilaroi and Murrawarri peoples. The star map to Carnarvon Gorge would proceed from the winter camp to the stars Gamma Scorpii (representing Dirranbandi, QLD), Kappa Scorpii (St. George, QLD), Theta Scorpii (Surat, QLD), Eta Scorpii (Roma, QLD), and Zeta Scorpii (Carnarvon Gorge). This is represented in Figure 5.2.

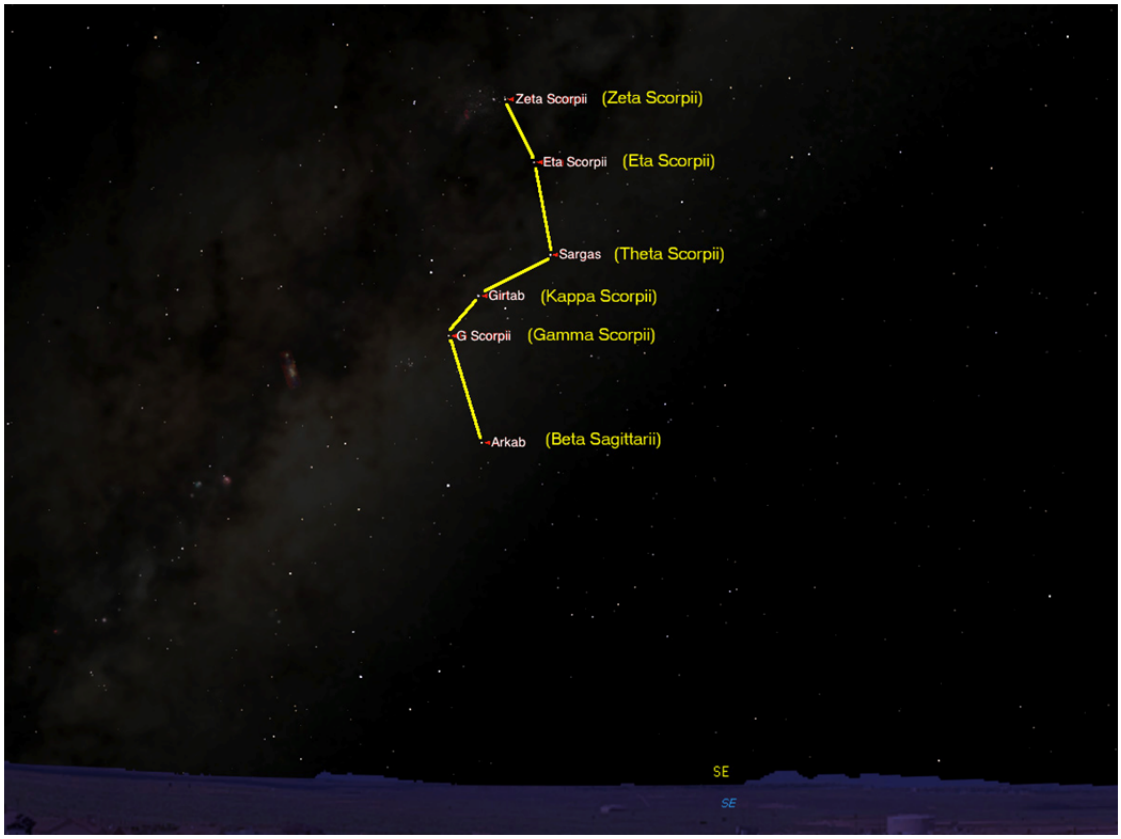

Figure 5.2: *Goodooga to Carnarvon Gorge star map (image courtesy of Starry Night Education).*

If the travel was to the Bunya Mountains (which was the source of the prized bunya nuts), the traveller would turn at Theta Scorpii (Surat, QLD), to Sigma Arae (Chinchilla, QLD), to Alpha Arae (Dalby, QLD), then to Beta and Gamma Arae (Bunya Mountains). This is

represented in Figure 5.3. The travel to share in bunya nuts with the language groups whose country was the Bunya Mountains is well documented by Ridley (1875, p. 159) and Pietre (1904, p. 11).

The same travel is represented on the ground by red lines in Figure 5.4. The actual ground routes are only loosely similar in direction to the star maps because the star maps do not represent a navigation aid in terms of direction and distance, but just a memory aid to the waypoints. In September, when the travel might commence, the same stars can be seen (higher in the sky and to the southwest), but they have rotated to the point where they would be difficult to use as a navigation aid. It is interesting to note that many main roads (yellow lines in

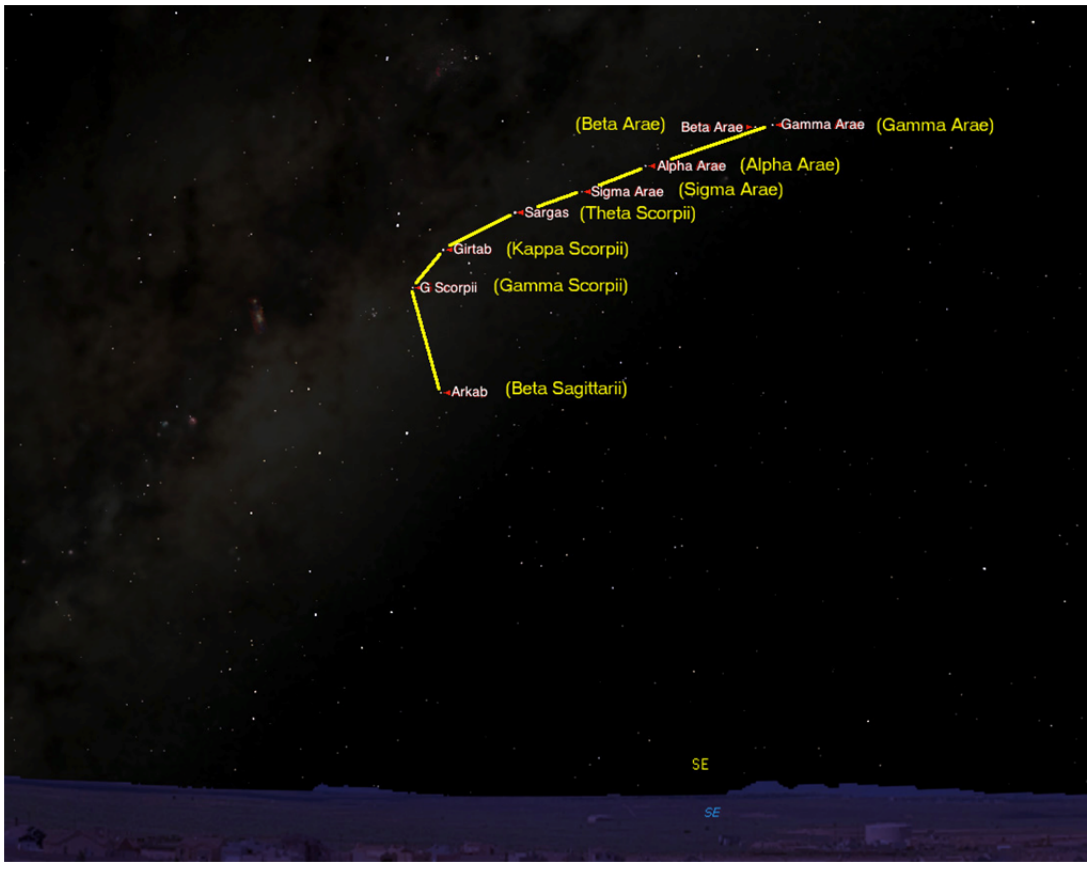

Figure 5.3: *Goodooga to Bunya Mts. star map (image courtesy of Starry Night Education.)*

Figure 5.4) appear to align with the Aboriginal travel routes and some towns appear at the Aboriginal waypoints. According to Kerwin (2010, pp. 159-163) and Norris & Harney (2014), many Aboriginal trading routes became routes of travel for Europeans and stock routes for the movement of animals. These routes later became main roads, and where they turned or split, towns often appeared.

The concept that these Aboriginal routes were also storylines or Dreaming tracks is reinforced by one of the waypoints on Figure 5.4, Dirranbandi (Noondoo). This point is actually 25 km east of the town of Dirranbandi, at a point called Noondoo Ridge, which is the highest point in the area, and provides a clear view to the south. Anderson has confirmed that the storylines had their beginning at this point because the Southern Cross (Crux) could be clearly seen from this point, and the stories themselves had their origin in the night sky around Crux.

Figure 5.4: *Ground travel routes to Carnarvon Gorge and Bunya Mts. (image Google Earth).*

There were other star mapped routes used by the Euahlayi, including one which travelled to the northwest to a waterhole near Quilpie, QLD which was a ceremonial centre for Aboriginal people from a wide area, including the Arrernte people from the Central Desert (a distance of over 900 km). The star map started from the winter camp (Beta Sagittarii [Goodooga]) to X Sagittarii (Hebel, QLD), to 51 Ophiuchi (Ballon, QLD), to Eta Ophiuchi (Cunnamulla, QLD), to Zeta Ophiuchi (Yowah, QLD), then to Epsilon Ophiuchi (waterhole northwest of Quilpie, QLD). Figure 5.5 shows the star map, and Figure 5.6 shows the ground route. The fact that other Aboriginal groups came to such ceremonial meeting points suggests that they also used star maps for teaching travel, but that their star maps were different to those used by the

Euahlayi, other than reaching the same point on land. It may also be that the songlines of the Euahlayi routes connected to the songlines of the other groups at the ceremonial places.

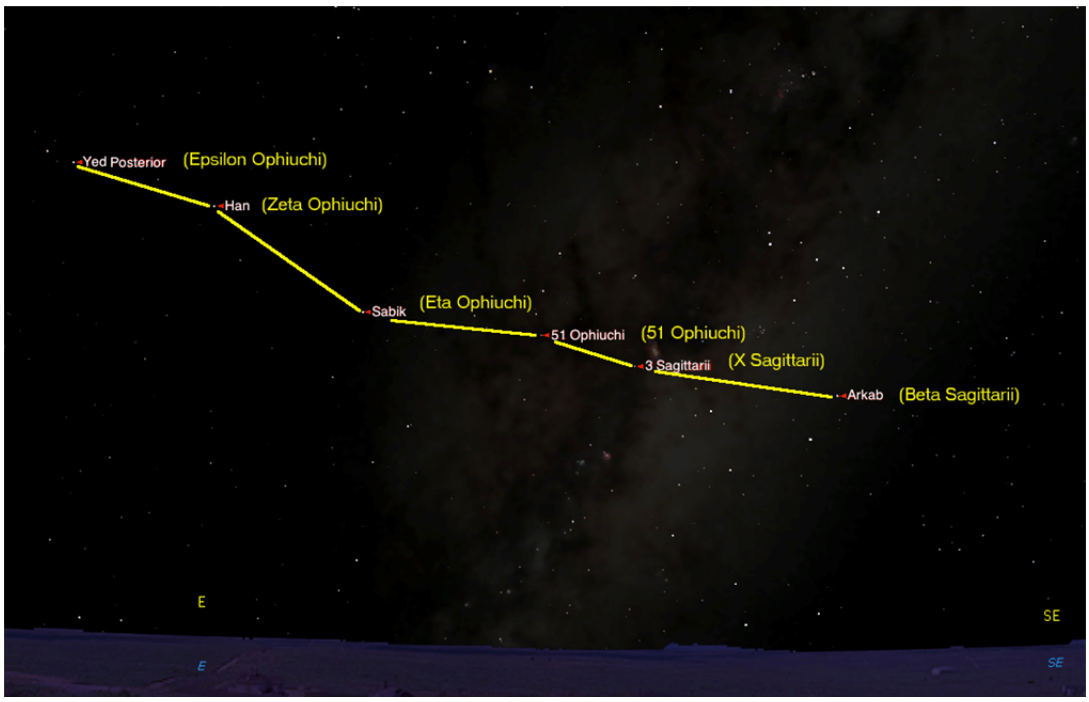

Figure 5.5: *Goodooga to Quilpie waterhole star map (image courtesy of Starry Night Education).*

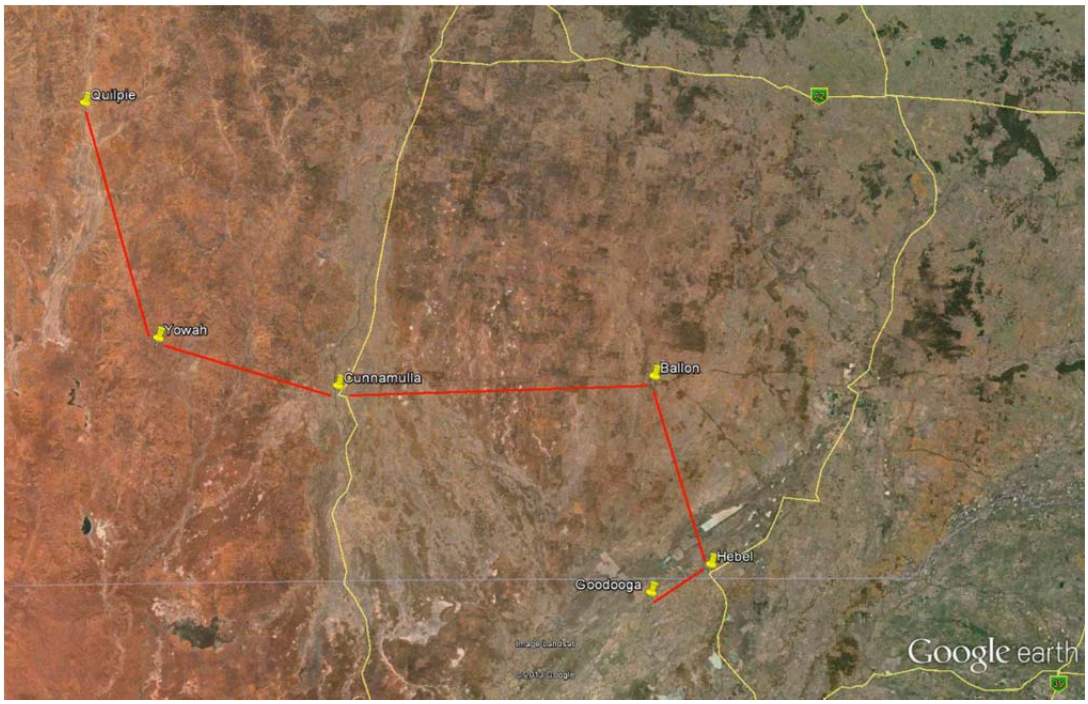

Figure 5.6: *Ground travel routes Goodooga to Quilpie waterhole. (Image Google Earth).*

There were a number of ceremonial sites in QLD and NSW where the Euahlayi people travelled, and the final star map in this study must have been used to educate people about them and their general location. This star map is not a map of waypoints and travel, but simply a representative map of mainly Bora grounds. Figure 5.7 shows the star map, and Figure 5.8 shows the equivalent ground map.

Figure 5.7: *regional Bora star map (image courtesy of Starry Night Education).*

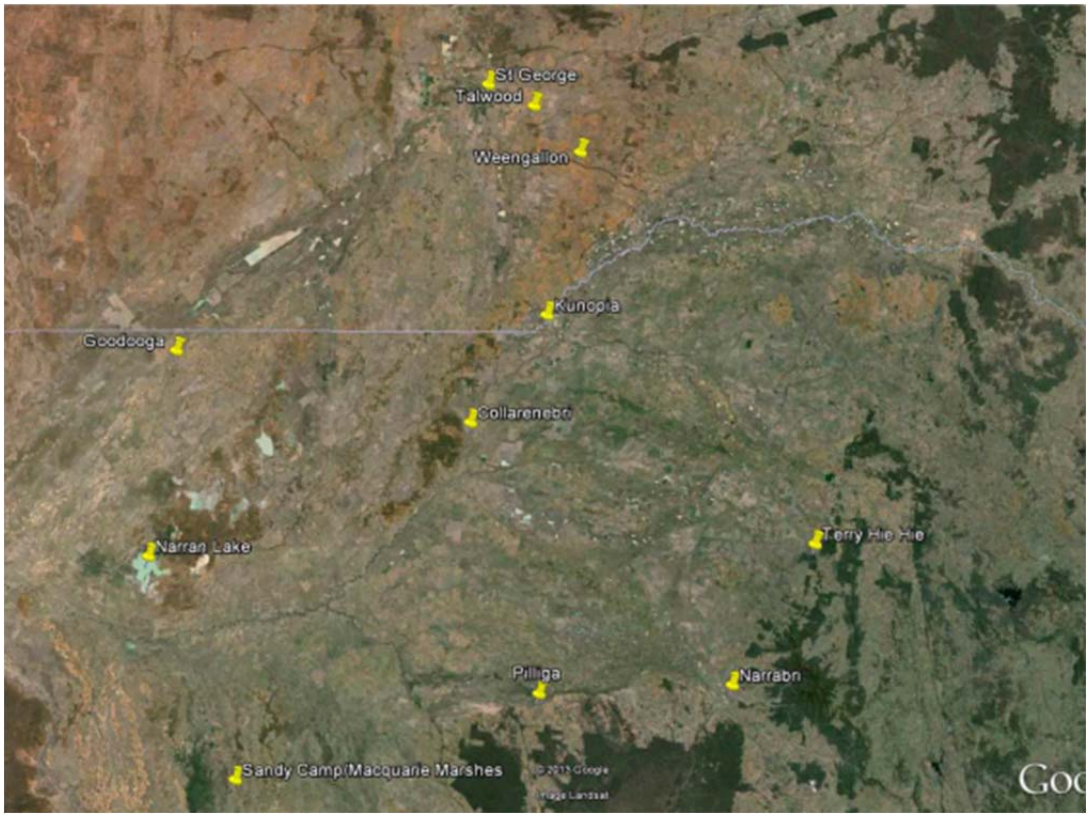

Figure 5.8: *regional Bora ground map (image Google Earth).*

The Euahlayi, Kamilaroi, and Bigambul people used the Bora grounds in this map, but at Sandy Camp a number of language groups joined for ceremonies, including the Euahlayi, Kamilaroi, Murrawarri, Ngemba, Wiradjuri, Wongaibon, and Wailwon.

There is some symmetry between the star map and the ground map if you turn the star map image about 45° to the right, but it was probably not intended to be used as an exact representation, and certain locations, such as Narran Lake, are clearly out of place.

All the stars identified for the star maps described in this study have been checked to see if (1) they are visible in mid-August from north central NSW, and (2) if they are sufficiently bright that they can be seen with the naked eye. In both cases, this was correct. In the second case, from a dark sky location as no doubt existed prior to the light pollution brought by Europeans, the visual limiting magnitude (dimness able to be perceived) is 7.5-8.0 (Bortle 2001, pp. 126-127). All the stars in the star maps are significantly brighter than the visual limiting magnitude.

5.5. Conclusions

Aboriginal people in Australia have a rich and well-developed knowledge of the night sky, which they use in their culture of oral transmission of knowledge, and as a means of assisting in their management of resources. The Euahlayi language group is a relatively small language group located in north central NSW and south-central QLD, and shares many cultural aspects with the Kamilaroi and other surrounding language groups.

We have shown that while many Aboriginal cultural groups have a rich knowledge of the night sky, this does not necessarily mean that they all use the stars and night sky for actual navigation in the sense of European celestial navigation. This could be because they have no need to travel at night, or could be related to cultural reasons, such as the difference in the use of astronomy between Aboriginal and European peoples.

There is clear evidence that before the European invasion (and after), there was a very well-established and extensive network of trade routes in Australia, used extensively by Aboriginal people for trading in goods, ceremonies and stories, and that these trade routes were aligned with songlines and Dreaming stories, many of which covered vast distances across the Australian continent. These songlines sometimes had their equivalents in the night sky, also crossing great distances, while the connections between the songlines on the ground and in the night sky are yet to be confirmed. That the Euahlayi and Kamilaroi peoples had the same belief in the Dreaming as other Aboriginal cultural groups is clear from their stories of Dreaming tracks and songlines, many of which appear to be in common with the other cultural groups.

There is no evidence that Aboriginal people possessed portable maps of the night sky, other than some way-finding devices, the purposes of which remain unclear. However, the Euahlayi people used a known pattern of stars in the night sky to teach and remember a number of waypoints on a route to a destination, often a ceremonial gathering place. This star map was used in winter during the planning for the summer travel, and we have identified at least three routes from Euahlayi country to ceremonial or resource destinations. A further star map identified the general location of many of the Bora ceremonial grounds in north central NSW and south-central QLD, but was not used for actual travel. These Bora grounds linked at least three language groups in that area, but one ceremonial site was identified as a place for gatherings of up to seven language groups.

Further research on the use of star maps for travel by other language groups, particularly those who might have met the Euahlayi peoples at common ceremonial locations, may lead to a clearer understanding of the Aboriginal use of the night sky for travel.

Acknowledgements

We acknowledge and pay our respects to the traditional owners and elders, both past and present, of the Kamilaroi, Euahlayi, Ngemba, and Murrawarri peoples. We thank the participants of the Kamilaroi project, Michael Anderson, Rhonda Ashby, Lachie Dennis, Paul Gordon, Greg Griffiths, Brenda McBride, Jason Wilson, and one anonymous person, for their stories and those of their families. We particularly thank Michael Anderson for his detailed story on the star maps, which is central to this study. Michael has acknowledged Gheedjar (Walter Sand) and Jack McCrae as his sources for this knowledge, who told him they were taught by Boobar (Fred Reece) and Jack Murphy. Anderson was also told that Jack Murphy was taught by a descendant of King Rory from Walgett, who taught Ridley his knowledge of the sky in 1872.

Postface

While the knowledge gained and reported about the Emu in the Sky in Chapter 4 was an expansion of knowledge from the main study, the information about star maps was a completely new area of knowledge, only hinted at from other sources, such as Bill Harney, the Wardaman culture man. There had been a few comments from Michael Anderson earlier about such a method of teaching travel, and in my sessions with a couple of other participants, I asked them whether they had heard of it. Both indicated they had, so I returned to Anderson for more details. When he was able to describe not only the method, but the actual star patterns used, it suddenly became a new subject of research deserving reporting. In looking for other instances in Australia, the links with songlines and Dreaming tracks became apparent, and were confirmed by Anderson. This article describes in detail the method used by the Euahlayi (and confirmed by participants from other language groups), and the fortuitous discovery of a source on trading routes, songlines, and Dreaming tracks (Kerwin) led to a more complete understanding of the importance of this knowledge in overall Aboriginal culture. This field of study shows a lot of promise for further research, and it will be interesting to see if there are further linkages with other studies.

6

Additional Findings

6.1. Background to Additional Findings

The journal articles which form the basis of Chapters 2-5 were presented in the order they were written. Reading the four chapters in order shows a logical progression in the acquisition of knowledge about the astronomy of the Kamilaroi and Euahlayi peoples and their neighbours. As described in the Methodology section (Chapter 1), the overall process was one of defining the project, carrying out a literature survey and creating a database, collecting stories from participants, and writing the journal articles. This chapter, Additional Findings, has been created to record information which may not have, in itself, been sufficient to add to a published article, but may help a future researcher in this field. In addition, the Kamilaroi and Euahlayi peoples and their neighbours, by supporting this project, deserve to have a record of their knowledge more detailed than the planned Giving Back materials.

The Additional Findings has been broken down as follows:

- Information related to ceremonial and spiritual matters.
- Information related to the subject of "What's up there" and songlines.
- Detailed information on objects not otherwise reported.

- Some suggestions for future research.

For access to the complete literature database, and the stories collected by ethnography, the Macquarie University Human Research Ethics approval requires storage of material for five years by the researcher, followed by storage at Macquarie University. With certain limitations in access to ethnographic material, access to this material is possible upon application to Macquarie University.

6.2. Additional Findings

6.2.1 Information related to ceremonial and spiritual matters

Other than a few cases, such as Mountford's *Nomads of the Australian Desert* (1976), restricted ceremonial matters are not seen in the literature on Australian Indigenous culture, and Mountford's book was subject to legal action by the people referenced. Early ethnographers, such as Howitt and Matthews, were not reticent in describing ceremony. However, there is some evidence that both were initiated by Aboriginal language groups in southeast Australia, and as a result, understood the line between a description of a ceremony, and the underlying meaning. There has been plenty of speculation in the literature regarding the meaning of Aboriginal ceremonies, both by ethnographers and religious researchers, and one of the contested subjects in the study of the culture of southeast Australian Aboriginal language groups is whether *Baayami* is a culture figure from before European invasion, or a result of early contact with missionaries. The participants in this study had very strong views, and in the course of this literature study, I found several very interesting bits of evidence of discussion with the local Aboriginal people on the subject of *Baayami* by early European travellers to the west of NSW near what is now Wellington. One such reference (Henderson 1832, p. 147) refers to a discussion which may have taken place in 1830 where *Piame* (*Baayami*) was mentioned. As the Church Mission Society was founded in Wellington in 1832, this reference to *Baayami* may be before missionary contact with the local Aboriginal people.

In discussing aspects of astronomy related to ceremony with participants in this study, a very clear line was made by the participants regarding information which was descriptive of ceremony, and that which was only available to the authorised knowledge holders. An ethical approach to this research meant that there was no attempt to delve deeper than the story

provided. In one case, a participant asked that a story be withheld from the research after discussing it their family, which was done.

With the above as background, there was significant information from the ethnographic part of this study regarding the role astronomy played in Kamilaroi and Euahlayi ceremony. While there was practically no description of the ceremonies (other than the *bora* ceremony, which is well described in the literature), there was significant information about the connection between the night sky and the ceremony, and what some of the non-ceremonial meanings of the connections were (such as law and country).

6.2.1.1. Morning Star Ceremony

In Chapter 2, the Morning Star Ceremony was discussed based on early ethnography in this study, and it was assumed, because Venus is used by the Yolngu people of Arnhem Land in their Morning Star Ceremony, that Venus was also used by the Kamilaroi and Euahlayi. After discussing with the Euahlayi participant how the ceremony was used for determining when the Sacred Fire was lit and extinguished, a study of the motions of Venus was made (Venus having a five-year cycle of motions in the night sky). It became apparent, particularly after showing the participant the cycle of Venus, that I had made an incorrect assumption in the case of Venus. The use of Venus by the Yolngu is very different than that of the Kamilaroi and Euahlayi, as the Yolngu incorporate Venus into a funeral ceremony connected to the rising of Venus on the Arnhem Land coast (Norris and Norris 2009: pp. 18-22). The Morning Star Ceremony described by the Euahlayi participant in this study does not appear to be related to the Yolngu ceremony, and is called that because an "Evening Star" and a "Morning Star" are used, when rising (in the evening), and setting (in the morning) to signal the lighting and extinguishing of the Sacred Fire, which itself is related to ceremonial detail not available. In this case, given the information that the Morning and Evening Stars are reddish (and are clearly identified as the same star or planet), and looking at the visibility of Mars over several years, Mars is one of several candidates of objects reddish in colour which might rise in the evening and set in the morning. As the participant was quite adamant that the "star" used for lighting and extinguishing the Sacred Fire was Mars, an examination of the visibility of Mars is warranted.

Mars has a very long cycle of movement (780 days) before returning to a new cycle, so it is very unlikely that, like the Yolngu with Venus, the Euahlayi would have planned the Morning Star Ceremony to connect to the time of visibility of Mars.

However, the participant supporting this story says that the Sacred Fire is lit and extinguished for any ceremony, and as Mars is visible half the year, even though it might not be visible until after midnight, it is still used as the guide to lighting and extinguishing the Sacred Fire. In any case, the use of Mars as the Evening and Morning Star for this ceremony was confirmed by further information that the ochre colour used on the Morning Star pole by the Kamilaroi and the Euahlayi was that colour because it matched the red of Mars.

6.2.1.2. The Red Kangaroo

During the ethnographic phase of this study, there were a few references by two of the participants to a red kangaroo in the sky. A request for more information was met by the response that this was ceremonial knowledge, so the subject wasn't pursued. Much later, it was volunteered that the red kangaroo was a star low in the western sky after sunset, and it was very important in ceremony. The emphasis was that it was a red star, and it was hard to see, and only there "some of the time". It should be pointed out that this red kangaroo does appear to have a relationship to the Kangaroo under the Emu in the Sky, as that kangaroo was clearly identified as a *bandaarr*, the red kangaroo (this is a correction of the error in Chapter 2, where *bandaarr* is identified as a grey kangaroo).

After some futile searching for stars that frequently set around the time of sunset (due to the "rotation" of the sky over the year, that is unlikely), the planet Mercury came to mind. Looking at the visibility of Mercury in the western sky around sunset, there is little variability from year to year, and taking 2014 as an example, it can be seen in four periods of about a month each over the year.

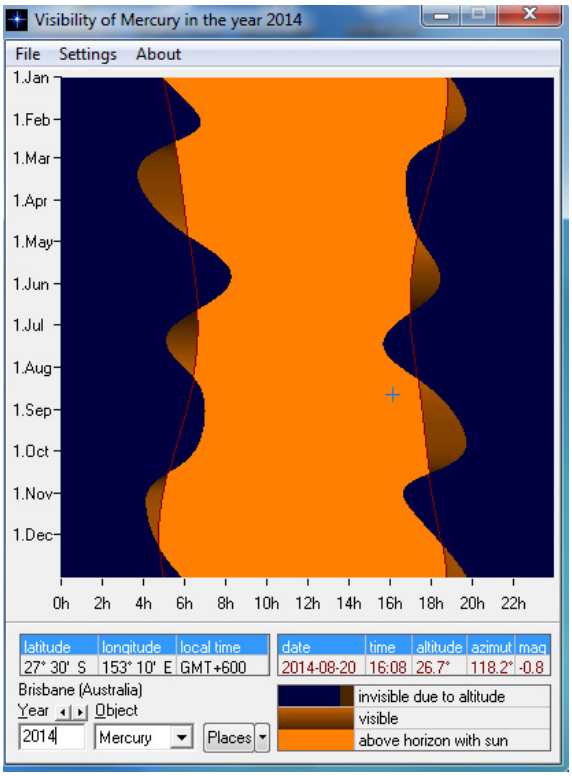

Figure 6.1: *Mercury visibility in 2014. The vertical axis is the time of the year, the horizontal is the time of day, and the brown area shows when Mercury is visible (courtesy Alcyone Software)*

The height above the horizon would be critical, as Mercury is a very small object to see with the naked eye. In the above example, it reaches a height of 10º in January-February, 13º in May-June, 25º in August-October, and 19º in December. While a sharp eye with a low horizon (which is common in Kamilaroi and Euahlayi country, being mostly grasslands) could see all the appearances, certainly the August-October and December appearances should be easily seen. While Mercury is not locked in any way to the Earth's orbit, and therefore has no cycle, there are always four or three and a fraction periods of appearance per calendar year, meaning that Mercury should be visible near sunset frequently enough to have a connection to ceremony. The Red Kangaroo is sighted and spoken of during the period that the Kamilaroi and Euahlayi are travelling to ceremony

6.2.1.3. Orion and *Baayami*

There were a number of contradictions in the original research regarding the relationship between Orion and *Baayami*, with some participants saying that Orion was not *Baayami*, and that *Baayami* was not in the night sky because you could not see *Baayami*. From other participants, there was a complete description of *Baayami* as Orion, down to the Belt of Orion being *Baayami's buurr* (hair string belt used in the *bora* ceremony). This became confusing,

and was put down to the fact that different families or subgroups of the Kamilaroi and Euahlayi had different stories, so no clear statement was made in the journal articles on this matter. It wasn't until a trip was made into Wiradjuri country (Parkes, NSW) to deliver a lecture on Aboriginal astronomy, that an answer to this question became obvious. Trevor Leaman (2014, pers. comm., 1 Aug) mentioned a story of *Baayami* that the Wiradjuri tell:

> *Once, when Baayami was on Earth, he was hiding at a lagoon, and speared an emu. The emu took off with the spear, and Baayami chased it. As he ran, he tripped over a log and fell face-first, with his arms in front of him. In the bora ceremony, Baayami is shown not as he is in Bulimah, but as he was on Earth, lying flat on the ground with his arms stretched out in front. This is how the mud sculpture done for instruction to the initiates along the bora path is done when showing Baayami.*

Mathews (1896a, p. 300) describes this story, and confirms it as being from the Wiradjuri. There is a collection of photographs of a *bora* ceremony, possibly staged by Wiradjuri, taken by Charles Kerry in the 1890's. Fig 6.2 illustrates how *Baayami* was depicted as a ground sculpture, with *Baayami* lying face-down with his arms forward.

Figure 6.2 *Baayami ground sculpture (source: National Library of Australia; Charles Kerry Collection, ca. 1895)*

Upon reflection it became apparent that Orion was only *Baayami* in connection with the *bora* ceremony, and that *Baayami's* story of falling outstretched to the ground was used in the ceremony, and illustrated by the ground sculpture. As Orion does come to the ground in the late evening during the period February to April, which could coincide with the *bora* ceremony, and as Orion can be seen as the stick figure of a man, with two legs and two arms, Orion/*Baayami* does appear to be falling towards the western horizon with his arms outstretched, and could be used as an illustration of *Baayami* falling over the log while chasing the emu. Chapter 4 illustrates the likely connection between the *bora* ceremony and the Emu in the Sky, so it may all fit into a single story.

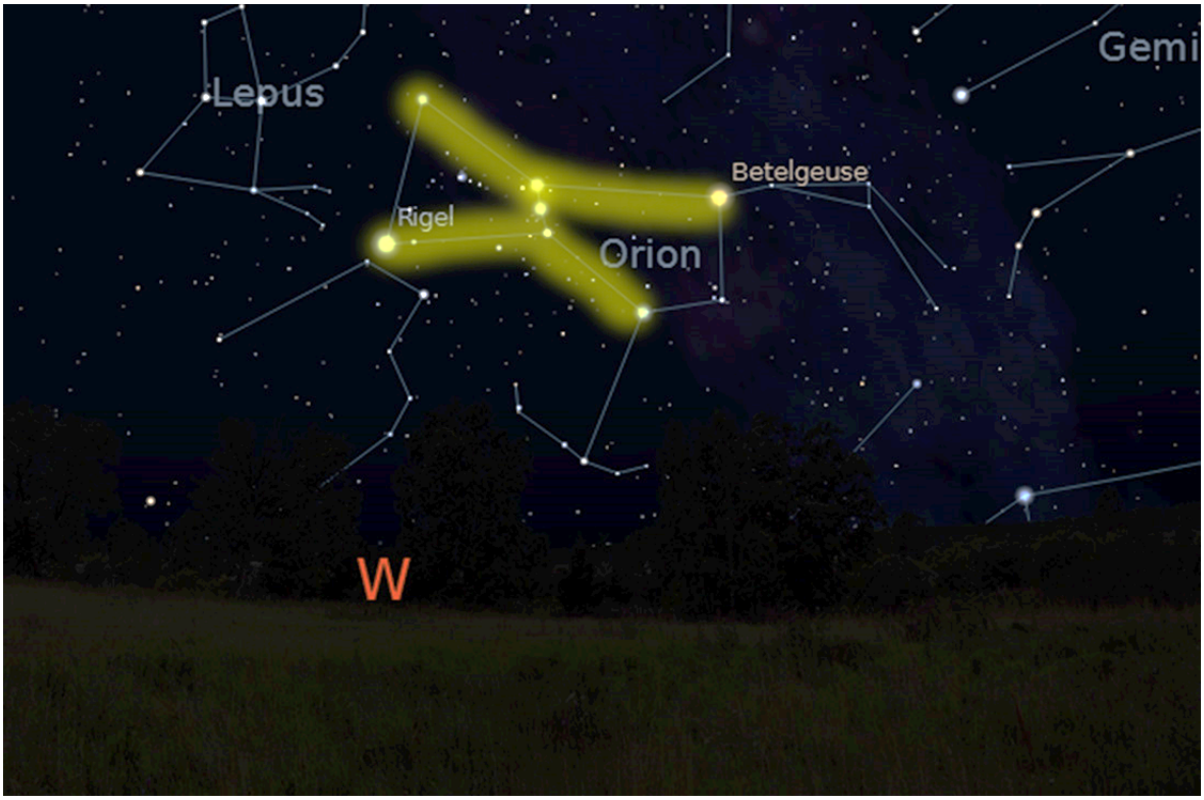

Figure 6.3 *Orion dipping to the western horizon (image courtesy of Stellarium)*

6.2.1.4. Blue Moon

One of the participants mentioned that if there was a "Blue Moon", this would be a signal during ceremonies that things should be sped up and finished up as soon as possible. "Blue Moon", of course, is a Western (European) expression, which has more recently been defined as a second full moon in a calendar month, which in itself has recently been shown to be an incorrect interpretation of a discussion of the origins of the expression. Olson et al. (2006) say that:

> *Seasonal Moon names are assigned near the spring equinox in accordance with the ecclesiastical rules for determining the dates of Easter and Lent. The beginnings of summer, fall, and winter are determined by the dynamical mean Sun. When a season contains four full Moons, the third is called a Blue Moon.*

When this was presented to the participant, he said that the clever men knew when "two moons were too close together". This meant that the Moon is coming down to Earth, and hunting with his dogs, which means more snakes are around (so not so good for travelling). Chapter 3 explains the relationship between the Moon, his dogs, and snakes.

As the length of the lunar month (full Moon to full Moon) is a fixed 29.53 days, and there is no evidence that this varies, the meaning of "two moons were too close together" is unclear, and is subject to further research.

6.3. "What's up there (is down here)"

6.3.1. The Dreaming and the fall of *Bulimah*

Michael Anderson, the Euahlayi knowledge holder who participated in this study, has written an as-yet unpublished story (Anderson n.d.) of *The Creation (The Dreaming)* from Euahlayi oral history, and in it there is a more detailed account of how the night sky and the Earth once swapped places. This was mentioned in Chapter 3 in the Discussion, but at the time of writing that paper the story was not clear enough to describe in any detail. The following is an excerpt from his story:

> *When we speak about The Dreaming, we mean two great eras: the time of The Creation and a pre-existing state of all being. A time before time as we now know it, even before what present-day science calls the big bang. For the Euahlayi tribe this being existed at a place called Bullima. Bullima was located on the banks of the Wurrum-boorrool, the Great River in the sky now called Milky Way. At that time all beings – humans, animals, plants and everything we know – were one. Everything existing had the same form, spoke the same language and was able to communicate with all others. It was a peaceful coexistence. There was no hardship, no illness, wars or death. But suddenly suspicion and mistrust arose, envy and jealousy spread and created space for hatred and rage. Anarchy ruled from then on in Bullima. The beings damaged each other, lied to and stole from each other. They had lost their spirituality and hence the sense of their lives. They were no longer linked to each other and stopped being one.*
>
> *The Creator Bhiamie and his four wives decided to end this form of being. He focussed all the evil forces of anarchy and the negative energy of all the evil that existed on one point. With an almighty explosion everything that had existed until then ceased to be and only the pure spirits of all beings remained. The Creator then stood the world on its head. Everything that was on the banks of the Wurrum-boorrool dropped away into the space created by the explosion and Bullima itself became a spirit world. Bhiamie caught the biggest rocks with the roots protruding into space from a tree by the Wurrumboorrool to keep them positioned until such time as everything had returned to the old values. When all people have learnt the old rules as well as the natural and spiritual laws, everything will revert to its origin: space back to its original state and everything existing back to Wurrum-boorrool, where they will live in peace.*
>
> *Bhiamie and two of his four wives, Birring-oolloo and Ghunnum-biellie, travelled through the entire cosmos. And while they inspected the devastation caused by a*

world being stood on its head, they looked for a place in which to create a new world. At the centre of this creation a world was to come into being where all those who had done wrong during The Dreaming were to serve as warning reminders of the natural or spiritual law they had broken. In this way they were to carry the responsibility for the destruction of the old world and serve people as warners.

The Creators chose one of the huge rocks to settle on, then wandered the Dthouri (country). The Euahlayiburrah, the people of the Euahlayi tribe, still recount where the travels of The Creators took them. The senior tribal elders always said Bhiamie and his two women companions had come down to the Dthouri where the water meets the land and when saying this they always pointed with raised arm to the northeast. The creators rested at a place the Euahlayi call Wolli. From there they came inland to begin their work. They determined the borders, created the tribes and their languages and set the spiritual connections all creatures were to have with the country assigned to them through the plants and trees in it.

And so The Creators established the countries of the tribes and within them set out the boundaries of the various clans. They invited the leaders of all spirit families of the pre-existent world to help them set up their future places in the new world. In contrast to the old world, where everything had the same form of being, the life forms of the new world needed their very specific environment. The spirits of the kangaroo beings became kangaroos, the spirits of the eucalyptus beings became the eucalyptus trees. The spirits of the echidnas helped to create the sand hills in which they would live, the spirits of the mussels helped with the rivers, the spirits of the swallows with the cliffs.

And when everything had found its counterpart, the spirits planted their children into all that had been created and returned to Bullima.

And since in the creation of the new world all things had been made in such a way that they were again interconnected like they had been before, Bhiamie and his wives spread the lost harmony and balance across the country to keep everything in universal equilibrium. Nothing that existed was to be without a partner from then on and there should be no balance without that partner.

The laws and teachings of the Euahlayi state that this balance must be maintained to ensure the survival of all things occurring in nature. Regardless of their size, all eco systems interact. Ignoring this most important of all rules puts the life cycle in jeopardy. When we consider that The Creators made the new world in their image and from their flesh, so that everything that exists is a part of their physical selves, every one of our actions or those of someone else that disturbs this earth or what lives on or in it, that we allow to happen, is an assault on the bodies of The Creators themselves.

Note: the spellings in this story are as the writer considers are correct according to Euahlayi language.

Based on that Euahlayi story, it is now clear how the Euahlayi (and possibly the Kamilaroi) people see the connection between their culture objects in the night sky, and stories, locations, and songlines on the ground. What's up there is truly what's down here, because what's down here was once up there (in the sky). When everyone knows the law and rules again, then everything will revert to where it was in the Warrambul.

6.3.2. The songlines in the sky

In the same theme of "what's up there" is the story of songlines in the sky. These have been discussed in the journal articles, but here I go into more detail. Songlines have been discussed in some detail in Chapter 5, and the songline of Mulliyan-ga, the eaglehawk, in the sky west to east from Alice Springs to Byron Bay, and the songlines of the Black Snake/Bogon Moth from north to south from the Gulf of Carpentaria to the Snowy Mountains were described. Another version has the north-south songline of Wahn, the crow and the Black Snake. In Euahlayi country, the songlines cross over a place called Carcool on the Narran Lake (this appears to be a station name to the northwest of the lake). In the sky directly overhead, where the songlines cross, are clusters of stars (possibly the star clusters M6 or M7) representing two sandhills on the ground at Carcool. The significance of the songline in the sky east to west is that *Baayami* and his son/associate, *Durramulan*, went from east to west on this line with the Creation story. More practically, the cross created in the sky by the crossing songlines represents the four totemic (skin) groups of the Kamilaroi and Euahlayi and their neighbours. On the east side of the north-south songline is *greymutan*, where the light comes from, and on the west side is *wigala*, where the dark comes from. These are also the light and dark blood groups in Kamilaroi and Euahlayi society (these two words are represented in the Gamilaraay dictionary by *guwaygaliyarr* and *guwaymadhan*, respectively). In Kamilaroi and Euahlayi marriage rules, light people have to marry into the dark people group, and vice versa. Further, the four quadrants formed by the cross in the sky represents the totem or skin groups, *Gambil, Gambuu*, *Marrii*, and *Yibaay*, which further control marriage through the rule not to marry in one's own skin group. Those skin names are for men, and women have corresponding names for the same quadrant. This description of the marriage rules resembles the Star Maps in Chapter 5, a convenient method of teaching a complicated marriage system, one which stays in the night sky, and is available whenever needed.

There is a further connection with the songlines in the sky, in that *Kurreah*, the Crocodile(s) come down the same north-south songline to Cuddy Springs, NSW, where there is believed to

be a spiritual connection between *Kurreah*, and some megafauna crocodiles that have been discovered by palaeontologists (Gillespie and David, 2001). Further to the description of the Milky Way in Chapters 3 and 4, *Kurreah* is the keeper of the summer sky. At that time the Emu in the Sky is walking the Earth in the form of the black emu bird.

6.4. Some stories and details not included in the journal articles

6.4.1 Mulliyan-ga and the eyes of Baayami

Mulliyan-ga, the eaglehawk, has an important place in Kamilaroi and Euahlayi culture. He actually has a dual nature, resulting from the early days, when he lived in a tree and ate people. Eventually, for his misdeeds, his tree home was burned, and he ended up in the sky, but as two different versions of Mulliyan; Mil-Mulliyan, who is Baayami's eyes during the day (watching everyone on Earth), and Mulliyan-ga, Baayami's eyes during the night. Mil-Mulliyan is identified with the stars Vega and Arcturus, although why this is so (not being able to see them in the day) is not known. Mulliyan-ga is identified with Venus and Mars at night, and presumably this is when Mars is low in the western sky and near Venus after sunset (and conversely, in the morning before sunrise when there can be a similar conjunction). These conjunctions are not on a regular basis, so cannot be used to signal a particular ceremony, but in any case, Euahlayi ceremony identifies one "eye" as red (Mars), and the other as green and blue (Venus). Because Venus can scintillate (twinkle) when it is very low to the horizon, it can show a range of colours, including green and blue, while the natural colour is blue-white. A regular ceremony takes place near Quilpie, QLD, (according to P2), and this is the location of the destination of one of the Star Map routes described in Chapter 5, where the Euahlayi meet with people from Alice Springs. Those people bring a red stone, no doubt from the central desert area, and the Euahlayi bring a green and blue stone (possibly an opal), with the two representing *Mulliyan-ga* and the eyes of *Baayami.*

The Ngemba have a story about *Mulliyan* that when he was burned out of his tree, he flew across the country, and the flames, sparks, and smoke from his burning feathers became the Milky Way. He put out the fire in Narran Lake, and now he's a lot smaller, so he can't kill people.

6.4.2 Comets

Comets as a subject didn't come up very often in this study. Parker (2007: p. 74) said (they were a) "spirit of evil supposed to drink up the rain-clouds, causing a drought; their tails being huge families all thirsty". P2 said that comets were a sign that a great leader had died if the comet had a long tail, otherwise the Euahlayi don't differentiate between comets and meteors.

6.4.3 Eclipses

Other than a mention in Chapter 3 when discussing ethnoscience, the only reference to eclipses in this study was again from P2, who said a solar eclipse foretold a change coming. A "big eclipse" (total eclipse?) meant a change of climate, as "old fella putting out fire, going away, new fella starts his". In regards to a lunar eclipse, the red colour is "fella hiding in darkness ("red-eye" fella) then coming to Earth". This is the *ghineet* spirit, which is represented by the curlew, which sings out "ghineet, ghineet".

6.4.4 Auroras

There was a mention by a participant that auroras were known in Kamilaroi country, and that women used the colours of an aurora as a guide for art. There is evidence that the Aurora Australis has been seen as far north as the QLD border (Sydney Morning Herald 20 March 1950), so it is likely that they are seen in the area of the study.

6.5. Future Research

As a conclusion to this Chapter, the following research questions are proposed for the consideration of future scholars:

- Are there more identifiable connections between Star Maps, trading routes, songlines, and Dreaming tracks?
- Can the many songlines identified as being in the sky be further detailed, and connected to the culture of the Kamilaroi and Euahlayi peoples and their neighbours?
- Can examples of Kamilaroi and Euahlayi art (engravings and painting on rock; art on other materials) be found that connect to cultural astronomy?
- Are there further examples of ethnoscience other than eclipses, in particular, those examples linked to the movements of planets?

- Can the hypothesis that King Rory's stories told to Ridley be further proven to be pre-Contact through examining possible transmission of European ideas through Aboriginal sources already in contact with Europeans?
- In regards to the *bullis* in Northwest NSW, can these be confirmed as geological features, in particular, lakes, which might have cultural significance?

The following chapter will summarise how this thesis has successfully managed to detail a large and rich cultural astronomy of the Kamilaroi and Euahlayi peoples and their neighbours. Future scholarly research within this cultural grouping will provide opportunities for expanding on a successful understanding of Australian Aboriginal cultural astronomy.

7

Discussion and Conclusions

7.1 Discussion

In this study on the cultural astronomy of the Kamilaroi and Euahlayi peoples and their neighbours, a process was followed to search for, and record, one aspect of the culture of a large Australian Aboriginal cultural group. This process is described in the Introduction, and for the most part, the study gradually built up a body of information, both from the literature and from participants, that was used to develop the publications which make up part of this thesis. From an initial position that there might be sufficient knowledge from all sources to create a body of knowledge that will form a thesis, to a current position where not only is there a large body of knowledge, but the possibility of more forthcoming from participants, this study has had a very positive outcome for the researchers and the participants. With the development of the Giving Back component of the study, there will be a positive outcome for the entire Kamilaroi, Euahlayi, Ngemba, and Murrawarri communities, who will have gained a resource for community pride, as well as an aid to teaching this culture to this and future generations of students, both Indigenous and non-Indigenous.

The means of acquiring knowledge of Aboriginal culture has not changed much in the 160 years since William Ridley sat down with King Billy and discussed the night sky.

Researchers look at the existing literature, and with varying levels of success, attempt to convince Aboriginal participants to share their knowledge of their culture. They then put the knowledge together, and hopefully publish it in a sensitive manner which doesn't exceed the limits put on the research by the participants. Given the cases where permission on publishing ceremonial matters was ignored (e.g. Mountford 1996) it is unsurprising that Indigenous peoples are suspicious of researchers (Smith 1991). It may be time to start looking at other techniques for acquiring and preserving such knowledge, where the knowledge holders themselves make the decisions on which knowledge can be put into the public record, and which can be preserved, but in a wholly secure manner. There has been some discussion about on-line (Web based) databases, where knowledge holders can contribute directly, with control over access. In any case, the important thing is that there is a recognition that some aspects of Australian Indigenous knowledge may be in danger of being lost along with the many language groups who have disappeared without a trace of their culture remaining. The important issue in preserving culture is the ability to transmit it to the following generations. In developing the Giving Back strategy for this study, the emphasis has been creating a useful tool for education of Indigenous young persons. In the case of this study, hopefully one significant component of the overall cultural knowledge package may be preserved for future generations.

This study started by posing two hypotheses:

- Hypothesis 1: that knowledge from these language groups could add to the current body of knowledge of Aboriginal sky culture, and;
- Hypothesis 2: that the Kamilaroi and Euahlayi peoples and their neighbours had an ethnoscientific knowledge of the night sky through observation and experience.

In the case of Hypothesis 1, I argue that the answer is "yes" (that the knowledge could add to the current body of knowledge of Aboriginal sky culture), for the following reasons:

- 13 sky objects were selected for detailed description from the database and reported upon in Chapter 3.
- One major cultural object, the Emu in the Sky, was examined in detail, and linked to resource management, ceremony, and management of country.

- An entirely new area of use of the sky, star maps, was described and linked to major cultural knowledge, including songlines, trade routes, and Dreaming tracks.
- A number of areas of sky knowledge, including linkage to ceremonial matters and the background to "what's up there is down here", were examined.

This knowledge is a significant addition to the current knowledge.

In the case of Hypothesis 2, several arguments confirm that the Kamilaroi and Euahlayi peoples and their neighbours had an ethnoscientific knowledge of the night sky:

- Parker's story of the Euahlayi understanding of solar eclipses confirms that language group's ethnoscientific understanding of this phenomena.
- One definition of ethnoscience is for a people to "classify their universe" (Sturtevant 1964, p. 100). This could be further defined as a spiritual cosmology, which attempts to explain the origin and organisation of the universe as it appears. There is little doubt that the stories that make up a large part of the sky knowledge of the Kamilaroi and Euahlayi people and their neighbours are in the form of a spiritual cosmology. The story of *Baayami and the fall of Bulimah* in Chapter 6 is every bit as sophisticated in explaining why everything is where it is, as the story of the Creation in the Christian *Genesis*.
- If an understanding of the motions, characteristics, and cycles of objects in the sky is another definition of ethnoscience, then the Kamilaroi and Euahlayi understanding of the movements of planet meets this definition. The use of the Morning and Evening Star (in this case, Mars) in determining the time to light and extinguish the sacred fire shows a clear understanding of the nature and cycles of this planet.

7.2 Conclusions

The Kamilaroi, Euahlayi, Ngemba, and Murrawarri peoples of north central and northwest NSW were and still are a strong Australian Aboriginal cultural group. Their culture, which has survived through displacement from country, and the many pressures of European invasion, is characterised by a strong spiritual link to country, and a cosmology based on an extensive and extremely detailed knowledge of the sky. Like other Australian Aboriginal language groups, their knowledge of the sky was closely linked to resource management, ceremony, and management of country. Their languages, which are among only 20 still in

use in NSW, form a significant link to their cultural astronomy through the naming of many objects seen in the night sky. The knowledge retained by culture persons today can be shown to link to ancestors who shared this knowledge with the very first Europeans in the area, and these links are evidence of a cultural knowledge of the sky unchanged since before European invasion.

This study resulted in a large database of knowledge from the literature, and from participants, about the cultural astronomy of these Aboriginal language groups. This database was used to confirm the hypothesis that there was a significant body of knowledge of cultural astronomy to add to the existing body of knowledge of other Aboriginal language groups. Furthermore, the knowledge gathered added further confirmation of an ethnoscientific understanding of the sky to that already available. Finally, the study unexpectedly added significant knowledge about a number of matters which had not been previously understood or reported.

In summary, besides the collection of knowledge about the cultural astronomy of the Kamilaroi and Euahlayi peoples and their neighbours in a large database, the following new areas of knowledge were added:

- A clear description of the location of the "Kangaroo" and the "Crocodiles" in the Milky Way as seen by this cultural group (Chapter 3).
- Cultural stories about the Magellanic Clouds (Chapter 3).
- The connection between the Southern Cross, river trees, and *Baayami's* travels as a roadmap in the sky (Chapter 3).
- The story of *Wilbaarr*, who comes to Earth as the "willy willy" in September, from dark spots in Scorpius (Chapter 3).
- The connection between Venus (and Mars) and *Muliyan-ga* (the eaglehawk, and *Baayami's* eyes at night) and certain waterholes near Glengarry, and stones used in ceremony (Chapters 3 and 6).
- A strong proposition that much of the sky culture knowledge collected had pre-European invasion origin through the examination of Ridley's reporting of King Rory's knowledge (Chapter 3).

- The knowledge concerning the background to the cultural belief of "What's up there is (or was) down here", and the story of the reversal of the Warrumbul and Earth (Chapters 3 and 6).
- A complete understanding of how the Emu in the Sky is seen by this cultural group at different times of the year, and how these appearances are linked to resource and country management, and ceremony (Chapter 4).
- Confirmation of the proposition made in Chapter 2 regarding the alignment of *bora* ceremonial sites to the Emu in the Sky and the Warrumbul (Chapter 4).
- The discovery of a new area of knowledge, the use of star maps to teach Aboriginal travellers how to navigate to ceremonies and other locations (Chapter 5).
- The close connection between songlines in the sky, songlines and Dreaming tracks on the ground, trading routes, and star maps (Chapter 5).
- The knowledge that the Morning Star ceremony is related to the planet Mars, and is dissimilar to that practised by the Yolngu people (Chapter 6).
- The knowledge that there is a Red Kangaroo (not the Kangaroo in the Milky Way) related to ceremony, and it is likely the planet Mercury (Chapter 6).
- The Euahlayi, at least, have the same story about *Baayami* chasing an emu and falling over a log that the Wiradjuri people report, and that it is used in the *bora* ceremony connecting a ground sculpture and the constellation Orion.

This research has been a collaboration between the researcher and the Kamilaroi, Euahlayi, Murrawarri, and Ngemba communities, through their participants. This successful partnership has produced a body of cultural astronomy knowledge which will be both a resource for community cultural education and for further academic research.

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Appendices

Appendix 1

Appendix 1 is a database in table format of the outcome of the literature study that made up the initial part of this study. It contains 151 entries referencing to 49 objects in the night sky, and was used extensively in the development of Chapter 3. It is arranged by subject in alphabetical order, with the story or vocabulary item in the next column, followed by the source in the last column. This has been included in the thesis as a guide to literature sources and individual stories for other researchers.

Table A.1 *Literature Study Database*

SUBJECT	STORY or INFORMATION	SOURCE
Agenor	Bungula and Agenor (Pointers) are Murrai (cockatoos)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Aldebaran	Legend of the Kamilaroi that they were at war with groups in the mountains, and messenger sent for a discussion. Messenger falls in love with woman from other group that he can't marry, and then he creates all kind of mischief to get them together. In the end the mountain people attacked the coast (?) people, and afterwards a priest caused the woman and others to go into the sky with the messenger. They halted becoming the Pleiades, but the man was sent on, becoming the lonely Aldebaran.	Peck, C, 1925, Australian Legends: Tales Handed Down from the Remotest Times by the Autochthonous Inhabitants of our Land, pp. 1-2
Alpha Crucis	Each clan or section of a tribe was associated with an animal, a plant, or a place (Mathews, 1905). So α Crucis along with kangaroos, fire, the non-stinking turtle, the plover, and the laughing jackass were the totems of the Pattangal (Pelican) clan of the Ngemba people of Western Victoria (? - NW NSW).	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 74
Altair	Vega and Altair are the two old eagles springing up to watch their nest.	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286

Altair	Also, Ridley says that Altair occurs as an eagle. Vocabulary (presumably Ridley) has Kamilaroi for eagle and hawk.	MacPherson, P, 1882, Astronomy of the Australian Aborigines, pp. 75-6, 80
Altair	Ridley recorded that the stars of Corona Borealis were an eagle's nest, the male and female eagle, respectively. Also that Altair means "eagle in action", implication being that the parents appear in the sky shortly after the nest to protect their young.	Fredrick, S, 2008, The Sky of Knowledge, p. 109
Altair	Along the Darling River, stars were divided between kinship classes. Two large stars in tail of Scorpio belonged to Kpungurra division, as did Jupiter. Altair belonged to the Mukungurra division, as did Antares. Each clan or section of a tribe was associated with an animal, a plant, or a place (Mathews, 1905). So α Crucis along with kangaroos, fire, the non-stinking turtle, the plover, and the laughing jackass were the totems of the Pattangal (Pelican) clan of the Ngemba people of Western Victoria (NW NSW).	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 74
Antares	Antares is Guddar (lizard)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Antares	Altair belonged to the Mukungurra division, as did Antares. Each clan or section of a tribe was associated with an animal, a plant, or a place (Mathews, 1905).	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 74
Aquila	Aquila was a great hunter, his boomerang is Corona Borealis	Mathews, R, 1905, Ethnological Notes on the Aboriginal Tribes of New South Wales and Victoria, F.W. White, p. 81
Arcturus	Arcturus is Guembila, also Guebilla (bright red)	Ridley, W, 1873, Australian Languages and Traditions, p. 274-5
Benemasch (sic) Benetnasch	Benetnasch and the next star in the Great Bear are Ngung-gu (white owls)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Benetnasch	Benetnasch, which is very low to the horizon, is called Zuz-gu (the owls, like eyes flying through the trees)	Ridley, W, 1873, Australian Languages and Traditions, pp. 274-5

Bungula (Rigel Kentaurus)	Bungula and Agenor (Pointers) are Murrai (cockatoos)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Canopus	Canopus is Womba, the Mad Star, the Weedah of old, who losing his loves, went mad and was sent to the sky, where they (?) pursue him still.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 672
Canopus	Story of Weedah, who is wombah (deaf), become new star Wombah	Parker, K, 1898, More Australian Legendary Tales, pp. 9-12
Canopus	Canopus is Wumba (deaf)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Centauri (Alpha & Beta)	Alpha and Beta Centauri (Pointers) are Murrai (cockatoos)	Ridley, W, 1873, Australian Languages and Traditions, pp. 274-5
Corona Borealis	α Aquila was a hunter, Wukkarno. His boomerang is the Northern Crown (Corona Borealis).Darling River from Bourke to Louth.	Mathews, R, 1904, Ethnological Notes on the Aboriginal Tribes of NSW and Victoria, p. 283
Corona Borealis	Ridley recorded that the stars of Corona Borealis were an eagle's nest, the male and female eagle, respectively.	Fredrick, S, 2008, The Sky of Knowledge, p. 109
Corona Borealis	Northern Crown = Mullion wollai (eagles camp)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Corona Borealis	Aquila was a great hunter, his boomerang is Corona Borealis	Mathews, R, 1905, Ethnological Notes on the Aboriginal Tribes of New South Wales and Victoria, F.W. White, p. 81
Castor & Pollux	Two hunters of long ago to some tribes.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 72
Coalsack	Gowargay, the featherless emu, is devil of waterholes, but goes to his sky-camp at night, in the Coalsack.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 73
Coalsack	Ridley said that the Kamilaroi thought that the Coal Sack was an emu sitting underneath a ti-tree shrub, the Southern Cross, and the two Pointers are cockatoos	Fredrick, S, 2008, The Sky of Knowledge, p. 70
Coalsack	Coalsack is gao-ergi (emu)	Ridley, W, 1873, Australian Languages and Traditions, pp.

		273-4
Comets	Spirit of evil supposed to drink up the rain-clouds, causing a drought; their tails being huge families all thirsty.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 74
Comets	Story of performance of "karabari" (cooroboree) on account of comet in 1845 or 1846 at Dungog	Fraser, J, 1882, The Aborigines of New South Wales, p. 23
Corvis	Corvus is the kangaroo.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 73
Dark space in Scorpio	dark space in Scorpio is Wurrawiburu (demon)	Ridley, W, 1873, Australian Languages and Traditions, pp. 273-4
Eclipses	Yhi, the sun, a wanton woman, overtakes her enemy, the Moon, and tries to kill, but wirreenuns prevent it. Alt; Yhi tries to ensnare Bahloo, the moon, but he wants none of it, and she chases him across the sky	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 73
Eclipses	Langloh Parker recorded two stories from the Kamilaroi, both suggesting as to how and why eclipses occur (1905). Both stories state that the Sun is a woman who chases the Moon across the sky after he refuses her advances and the eclipse is caused by the Sun overtaking the Moon.	Fredrick, S, 2008, The Sky of Knowledge, p. 102
Fomalhaut	Fomalhaut is Guni (small iguana)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Gemini	Muruwari called Gidera Gulga, twins who had been told that they must always remain bound together	Mathews, J, The Opal That Turned Into Fire: and other stories from the Wangkumara, p. 46
Hyades	Hyades are Giwir (man)	Ridley, W, 1873, Australian Languages and Traditions, p. 274-5
Jupiter	Jupiter was a Kilpungurra man called Wurnda-wurnda-yarroa, who lived on roasted yams, hence got his reddish colour from the fire (?).	Mathews, R, 1904, Ethnological Notes on the Aboriginal Tribes of NSW and Victoria, p. 283

Jupiter	Story (a Kamilaroi version by Fraser 1901) of young boy wandering around heavens, disliked by mother, the Sun, who sends men to spear him when he is low in western sky. Fear of people is that in dry years the grasses may not set seed, and if the Sun woman injures her son this will happen. If he were killed, all people would become ill, become blind, and die. Even the Moon man could become blind. Reflects experience with drought and effects of severe malnutrition.	Tindale, N, Celestial Lore of Some Australian Tribes, in Chamberlain, V, 2005, Songs from the Sky, p. 367
Jupiter	Aboriginal groups on the Darling River said that Jupiter was a man who lived on roast yams and went red because he spent so much time over the fire (more likely Mars).	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 84
Jupiter	Kamilaroi version of tribal story that Jupiter is a young boy wandering about in the heavens, and is disliked by his mother, the Sun, so much that she sends men to spear him when he is low in the western sky (source: Fraser 1901 - can't find this anywhere).	Tindale, D, The Celestial Lore of Some Australian Tribes, pp. 372-3
Jupiter	Jupiter was a great man of the olden days who lived on roasted yams, and got his reddish colour from the fire (maybe Mars?)	Mathews, R, 1905, Ethnological Notes on the Aboriginal Tribes of New South Wales and Victoria, F.W. White, p. 81
Jupiter	Two large stars in tail of Scorpio belonged to the Kpungurra division, as did Jupiter	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 74
Kangaroo	Ridley, in a series of articles (1873 x 2, 1875, 1878), in one said that the Kamilaroi say there is a kangaroo in the sky.	Fredrick, S, 2008, The Sky of Knowledge, p. 108
Magellanic Clouds	These are the Bralgah (Brolga), who were a mother and daughter, who were changed to birds.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 73
Magellanic Clouds	Story of Bralgah and her daughter, chased by Daens, captured by Wurrawiberoo, turned into Brolgas, and when they died, went to the sky and became the Clouds	Parker, K, 1898, More Australian Legendary Tales, pp. 21-7
Magellanic Clouds	Reference to Kamilaroi myth of Magellanic Clouds being male native companion and the smaller being female equivalent (being brolgas). (Source Austin & Tindale 1985).	Clarke, P, 1997, The Aboriginal Cosmic Landscape of Southern South Australia, p. 135
Magellanic Clouds	Says the Kamilaroi believe that the spirit of a man when he dies goes to dark patch in the Magellanic Clouds, which they call Maianba, meaning endless water or river.	Howitt, A, 1904, The Native Tribes of South-east Australia, p. 439

Magellanic Clouds	Repeat of Howitt on Kamilaroi belief that dead go to the Magellanic Clouds	Eliade, M, 1966, Australian Religions: An Introduction, Part 1, p. 247
Magellanic Clouds	Ridley and Langloh Parker both recorded that the Kamilaroi thought that the Magellanic Clouds were Brolgas. Langloh Parker also tells a story that they were mother and daughter, being chased by an evil being who wanted to kill the mother and keep the daughter, but their people sang them both into the sky.	Fredrick, S, 2008, The Sky of Knowledge, p. 79
Magellanic Clouds	Magellanic Clouds are two buralga (brolgas)	Ridley, W, 1873, Australian Languages and Traditions, p. 273-4
Mars	Mars is Gumba (fat)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Mars	Mars was known as Gumba, meaning "fat"	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 84
Meteors	Euahlayi story. If big meteor falls followed by thunderclap, sign that great man has died. Should a number of stars shoot off from falling star, sign that man has died leaving large family. When star seen falling in daytime, sign that one of the Noongahburra tribes has died.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 69
Meteors	Meteors always mean death; should a trail follow them, the dead person has left a large family.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 74
Meteors	Story of hunter from the "basalt country where the Waratah does not grow" (could refer to western ranges of Dividing Range in Kamilaroi country). Wanders around chasing a wallaby, fights with another tribe, re-joins tribe, then sorcerer in tribe realised missing people had become waratahs, and big fight with other tribe. Then a great "bright light, burning blue, travelling at enormous rate" wiped out opposing tribe. Waratahs still stood, so Aboriginal people bring waratahs to early blacksmiths, as they thought sparks from anvil were the same as the fire from the sky. The shooting of stars is now sign that waratahs are being stolen.	Peck, C, 1925, Australian Legends: Tales Handed Down from the Remotest Times by the Autochthonous Inhabitants of our Land, pp. 1-5

Meteors	Another story from same area as basalt country, is about a very hot day, followed by a night when the heavens literally split up, and the star groups, loosened from their holds, came flashing to earth, with millions of pieces of molten objects, leaving burning holes. These red holes became the waratahs.	Peck, C, 1925, Australian Legends: Tales Handed Down from the Remotest Times by the Autochthonous Inhabitants of our Land, pp. 1-2
Meteors	Story from Muruwari (Morowari) describes catastrophic event that Mathews (1994:60) interprets as a meteorite impact. Story of fire falling from sky, and Gien, the man responsible, fled to the sky and became the moon. Mathews also cites a nearly identical story from the nearby Ngemba peoples; a fireball landing on a camp and killing everyone. A Wailwon story repeated by other groups, including Kamilaroi, tells of large star falling to earth, lighting up all the surrounding land. There are other legends in surrounding areas, including an impact near Wilcannia, creating a deluge, but there is no ground evidence.	Hamacher, D, 2010, Australian Aboriginal Geomythology: Eyewitness Accounts of Cosmic Impacts,
Milky Way	The Milky Way is Warrambool, or water overflow, the stars are fires, the haze is smoke from them, which spirits of the dead have lit. A man in the Milky Way was a rainmaker; when he moves with the Milky Way, it will rain. A waving dark shadow is Kurreah, the crocodile.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, pp. 71-2
Milky Way	Story of two boys who were carried into the sky, and are near the Milky Way, and known as Wurrawiberoo.	Parker, K, 1898, Australian Legendary Tales, Project Gutenberg/D Nutt, pp. 41-2
Milky Way	Story of Baiame told to adolescent Kamilaroi, that he welcomes people to the great "Warrambool" (watercourse and grove) in the sky, the Milky Way.	Hartland, E, 1898, The "High Gods" of Australia, p. 301
Milky Way	Kamilaroi myth concerning the Milky Way is that Baiami, in the beginning of creation, cast off from himself a prodigious amount of light, life giving, and starlight material, in the form of myan (a river). The stream proceeded from Baiami, as it were; Burribian, milk. Hence it is called Burribian or Myanbah.	Greenway, C, 1902, Burribian or Myanbah, p. 52
Milky Way	Milky Way is Warambul or warrambool	Ridley, W, 1873, Australian Languages and Traditions, pp. 273-4

Milky Way	Investigation into the rainbow serpent in southeast Australia. The Kamilaroi and Yualarai (Euahlayi) tribes called it Kuria (actual rainbow was yuluwiri). Other recorders translated this as "crocodile" or "alligator", but really rainbow serpent. Parker spoke of the "waving dark shadow" in the Milky Way which is said to be the Kuria. Also a myth where the Kuria swallows the wives of Baiame, who recovered them and restored them.	Radcliffe-Brown, A, 1930, The Rainbow-Serpent Myth in South-East Australia, pp. 342-4
Milky Way	When moved to West, the Milky Way is now associated with Gabela Barn, a gigantic water snake (Rainbow Serpent?), and body of emu now is army of warriors trying to stop Gabela Garn	Mathews, J, The Opal That Turned Into Fire: and other stories from the Wangkumara, p. 46
Milky Way	Milky Way is a Warrambool or water overflow, where the stars are fires and the haze is the smoke from those fires. The fires have been lit by the spirits of the dead as they travel across the sky.	Giacon, J, and Betts, M, 1999, Yaama Maliyaa, Yuwaalaraay-Gamilaraay, An Aboriginal Languages Textbook, pp. 80-1
Moon	When see a halo around the Moon, say "going to rain; Bahloo building a house to keep dry".	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, pp. 73-4
Moon	Story of Bahloo the Moon, and his dogs (snakes), and how people became able to die	Parker, K, 1898, Australian Legendary Tales, Project Gutenberg/D. Nutt, pp. 9-10
Moon	Story of Bahloo the Moon, and Mooregoo, the Mopoke	Parker, K, 1898, Australian Legendary Tales, Project Gutenberg/D Nutt pp. 33-4
Moon	Story of Moon from Muruwari (may not be in Kamilaroi community, check), who called him Gien, who was handsome young man who drowned and then revived, then massacred those who left him to drown. When survivors identified him as a murderer, he escaped into the sky, and still live there today - Gien, the moon. During eclipse, colour is often red, which is his blood. The Ngemba have a very similar story, and use same word for moon.	Mathews, J, The Opal That Turned Into Fire: and other stories from the Wangkumara, pp. 58-60
Moon	Story of Wahn (the crow) and Bahloo, the Moon god, where Wahn tricks Bahloo into climbing tree and was lifted into the sky. Also tells story of how Yhi, the Sun goddess fell in love with him, and story of why Moon plays such a large part in creating the girl spirit babies.	Reed, A, 1965, Myths and Legends of Australia, pp. 58-62

Moon	Story of waxing and waning moon, where Bahloo falls out of a canoe, drowns, and then does not die, but comes back each month.	Reed, A, 1965, Myths and Legends of Australia, pp. 63-65
Moon	Story of Blue Fish and the Moon. Happy man and miserable man; happy man ended up going to Baiame's home, where he was turned into Bahloo, the Moon.	Reed, A, 1965, Myths and Legends of Australia, pp. 55-7
Moon	Euahlayi story of Bahloo the Moon, who was the maker of girl babies. Dispute with Wahn the Crow, who helped Bahloo. Wahn wanted to stop men from dying, but Bahloo wouldn't help, so Wahn tricked Bahloo into the top of a tree, which then grew into the sky, trapping Bahloo in the sky. Bahloo can come to earth as an emu, but still makes girl babies. Wahn changes them into young women later.	Parker, K, 1953, Australian Legendary Tales, Angus & Robertson ed., pp. 31-4
Moon	Use of the word "balu" for Moon in 12 places in S.E. Australia, with Euahlayi being the southernmost. Strong suggestion that this usage is because Moon has strong belief in controlling factor in lives. Evidence that usage comes down Dividing Range for 1500km, and survives amongst other groups that use "giwong" and cognates (Kamilaroi?)	Tindale, N, Celestial Lore of Some Australian Tribes, in Chamberlain, V, 2005, Songs from the Sky, p. 367
Moon	Some discussion about block of peoples using Balu for moon, and that this may be a very old usage, also linked to Sky Being and Daramulan belief.	Tindale, D, The Celestial Lore of Some Australian Tribes, pp. 372-3
Moon	Bark carvings, Kamilaroi, object represents Moon or Sun	Mathews, R, 1896, Australian Ground and Tree Drawings, p. 43
Mundewur	S-shaped line of stars between Northern Crown and Scorpio (notches cut in tree to enable climbing - possible reference to story of Baiame and first people)	Ridley, W, 1873, Australian Languages and Traditions, pp. 274-5
Northern Crown	See Corona Borealis	
Orion	Orion's Sword and Belt are the Berai-Berai, boys who love the Meamai (Pleiades), but were rejected. They died of love, and spirits put them in Orion where they hunt by day and dance to a cooroboree at night (music from Pleiades).	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 72

Orion	Berryberry (Greenway used the correct Beriberi in 1878) is designation of the constellation Orion among some Kamilaroi tribes, and it is said that he is superior to all other Murri in fighting, hunting, and dancing, that Baayami placed him in the sky, and that the constellation is considered masculine, while the Pleiades are feminine.	Greenway, C, 1901, Berryberry, Aboriginal Myth, p. 168
Orion	Orion is Berai-Berai	Ridley, W, 1875, Kamilaroi, and other Australian Languages, pp. 24-6
Orion	Kamilaroi stories. Mayi-mayi were seven sisters with long hair and bodies of icicles. A large family of young men, the Berai-berai (Orion) followed them.	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 116
Orion	Muruwari recognised that Orion wore a belt, carried a shield and stone tomahawk. Called Orion Jadi Jadi, which means either "strong man" or "cyclone".	Mathews, J, The Opal That Turned Into Fire: and other stories from the Wangkumara, p. 46
Orion's Belt	Seems to be glossary or words in different languages - in this case birai birai, which is Euahlayi or Kamilaroi (source: Mathews, Ridley)	Worms, E, 1957, Australian Mythological Terms: Their Etymology and Dispersion, p. 742
Orion's Belt	The boys who loved the sisters the most (Seven Sisters) were the Birray Birray or Orion's Belt and Sword. They would hunt and provide for the Ice Maidens but their love was rejected. When the Ice Maidens went to the sky the Birray Birray were heartbroken and died. The spirits feeling sorry for them placed them in the sky near the singing Ice Maidens where they hunt by day and dance by the fires at night.	Giacon, J, and Betts, M, 1999, Yaama Maliyaa, Yuwaalaraay-Gamilaraay, An Aboriginal Languages Textbook, pp. 80-1
Peacock	star in Peacock's head is Murgu (night cuckoo)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Pleiades	Pleiades are Worrul (bee's nest)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p 286
Pleiades	Beliefs of Kamilaroi that Pleiades are Worrul (bee's nest)	Tindale, D, The Celestial Lore of Some Australian Tribes, pp. 372-3

Pleiades	Berryberry (Greenway used the correct Beriberi in 1878) is designation of the constellation Orion among some Kamilaroi tribes, and it is said that he is superior to all other Murri in fighting, hunting, and dancing, that Byamee placed him in the sky, and that the constellation is considered masculine, while the Pleiades are feminine.	Greenway, C, 1901, Berryberry, Aboriginal Myth, p. 168
Pleiades	More vocabulary from Ridley. Orion is Berai-Berai ;Pleiades are Miai-Miai or Murun-Muran; Venus is I/Jaije-kindamawa or I/Jindi-kin-dawa	Ridley, W, 1875, Kamilaroi, and other Australian Languages, pp. 24-6
Pleiades	Ngemba story. When Pleiades rise about 3 or 4 AM, old men take glowing coals from fire, and cast towards Pleiades to prevent spirit women from making it too cold.	Mathews, R, 1904, Ethnological Notes on the Aboriginal Tribes of NSW and Victoria, p. 280
Pleiades	Story from Ngemba tribe. Talks about stars are men, Ngintu (with his dogs) who guards the everlasting water, and Crow-man, carrying the wounded Hawk-man. There is the Serpent, Thurro, and Kapeetah, the Moon-man. Also the Pleiades making cold frost, and call out "mai, mai, mai" when they see your fire.	Robinson, R, The Nearest a White Man gets: Aboriginal narratives and poems of NSW, p. 51
Pleiades	Pleiades were a lot of young women searching for yams and a whirlwind put them in the sky.	Mathews, R, 1904, Ethnological Notes on the Aboriginal Tribes of NSW and Victoria, p. 283
Pleiades	The Pleiades are seven sisters, two dimmer ones were seized by Wurrunnah and tried to melt their ice. All desired on earth, but bright five rain untouched.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 72
Pleiades	Full story of Wurrunnah and the seven sisters, and two he tried to keep	Parker, K, 1898, Australian Legendary Tales, Project Gutenberg/D Nutt, pp. 22-5
Pleiades	Very complete Kamilaroi story of the Pleiades - Mei-mei. Very detailed version but similar to standard Kamilaroi version with Werrinah stealing two sisters, etc.	Greenway, C, 1901, The Constellation Pleiades - Mei-mei, p. 190
Pleiades	Story of Pleiades, or where the frost comes from. About the Meamei, and the Berai-Berai	Parker, K, 1898, More Australian Legendary Tales, pp. 73-5
Pleiades	The Pleiades or Miai Miai lived on earth and were extraordinary beauties. Orion, "Beriberi" (meaning young men) pursued them, and the Miai Miai prayed for deliverance. Bhaiami and Turramulan granted their request, and were lifted into the sky. One is not as beautiful as the rest, and hides behind. Beriberi, as leader, also	Greenway, C, 1878, Australian Language and Traditions, p. 243

	went into the sky, and is Orion, with his burran (boomerang) and ghutur (belt).	
Pleiades	Another version of a Pleiades story, presumably of the Cheipara tribe of QLD, somewhat similar to 3C, but more complex, but Peck says it is even known to the Kamilaroi	Peck, C, 1925, Australian Legends: Tales Handed Down from the Remotest Times by the Autochthonous Inhabitants of our Land, pp. 1-5
Pleiades	Story of the seven beautiful Ice Maidens. Slightly different to the different Parker versions, but clearly the Euahlayi story. Also includes Berai Berai, but D'Arcy says that Bunjil put them in the sky, which is a Victorian Baiame (mixed metaphors?)	D'Arcy, P, 1997, The Hunter in the Sky: stories about Aborigines and the day and night skies, pp. 18-9
Pleiades	Different story of Pleiades from usual Kamilaroi. Still called Meamei, but story was that they had the gift of fire, but would not share it with people. Wahn the crow tricked them into letting him have fire, but he was selfish, and kept it from people. Baiame told the people to take it from him, so they did, and Baiame made Wahn as black as the wood in his fire. There was a further Meamei story that a young hunter (always a hunter!) carried off one of the sisters to be his wife, but the others sent cold wintry weather to earth until he released her. Meamei bring hot weather when they first come, then cold to remind men not to carry off women. The same hunter steals a wife, and the husband burns the hunter's tree where he is hiding, and he is carried into the sky to become Aldebaran, pursuing the Pleiades.	Reed, A, 1999, Aboriginal Stories: with word list, pp. 81-3
Pleiades	Reports on Ridley's work re the Pleiades being represented as a group of young women near the Barwon. Also, Ridley says that Altair occurs as an eagle. Vocabulary (presumably Ridley) has Kamilaroi for eagle and hawk.	MacPherson, P, 1882, Astronomy of the Australian Aborigines, pp. 75-6, 80

Pleiades	Kamilaroi story of Meamei or Mayi-Mayi, seven sisters with long hair and bodies of ice. Before leaving earth they travelled into the mountains causing springs to feed rivers so there would be water forever. A young hunter, Karambal, fell in love with one sister and carried her off. Other sisters send cold, wintry weather to force him to release her, but later relented and made way into sky in search of the summer sun to melt snow and ice. Thus the Pleiades appear in the summer each year, bringing warm weather. Afterwards they travel west and winter returns as a reminder that it is wrong to carry off women who belong to a totem forbidden them. Karambal ascended with them and still pursues them as the star Aldebaran, which follows closely (Ridley 1875). In related versions of the story a family of young men, the Berai-Berai (the stars of Orion) pursued the Meamei, wishing to marry them, but an old man, Wurunna, stole two of the girls before they escaped to be reunited with their sisters.	Haynes, R, Astronomy and the Dreaming, in Astronomy Across Cultures, Selin, H, 2000, p. 78
Pleiades	Two versions of Kamilaroi and Darling people's myth of Pleiades. Kamilaroi was that female ancestors became the Pleiades when cutting bark from two trees that grew higher and higher, pushing them into the sky (source: Greenway). The Darling River myth was that the Pleiades were a lot of young women searching for yams on a plain and were picked up by a whirlwind and depositing them in the sky (source: Mathews). Third story (source Mathews) was the one of the Ngemba who threw coals towards the Pleiades in the early morning to stop it getting too cold.	Clarke, P, 2007, An Overview of Australian Aboriginal Archaeoastronomy, p. 52
Pleiades	The Pleiades (Miyaymiyaay) or Seven Sisters were ancient Ice Maidens who roamed the earth. Their father was a Rocky Mountain, their mother an Ice Stream. They had long ice crystal hair. Five of the sisters travelled into the sky but two were captured by the Wurrunnah.	Giacon, J, and Betts, M, 1999, Yaama Maliyaa, Yuwaalaraay-Gamilaraay, An Aboriginal Languages Textbook, pp. 80-1
Pointers	Story of the first two men and one woman, and death of one man, who was lifted to the Milky Way in a giant yarran (gumtree), the four stars are the eyes of Yowee, the Spirit of Death, and the eyes of the first man to	Parker, K, 1914, A Kamilaroi Legend of the Southern Cross, p. 8

	die. The tree was followed by the cockatoos, who are the pointers, or Monyi.	
Pointers	Another version of the Kamilaroi story about how the Southern Cross was made, being the one of Baiame making two men and one woman, one dying, and being taken into the big white gum tree (where the spirit of Death lived), which then took off into the sky, followed by two cockatoos, who nested in the tree. The Southern Cross is made up of the two eyes of Death, and the two of the first man to die, and the Pointers are the two cockatoos. Southern Cross known as Place-of-the-White-Gum-tree-in-the-Sky, and Baiame left it there to remind people that Death had come to earth. (source: Parker)	Wolkowsky, M, 1968, Australian Adventure, pp. 102-4
Pointers	Muruwari story of Bida-Ngulu (Baiame) and the Sacred Fires, which a neighbouring tribe tried to steal. The fires, some Muruwari, and the neighbours were lifted into the sky, and in open, dark country, they can all be seen as the Southern Cross is rising and low in the sky. The Pointers are two of the guards, Gidiuba: mbi and Dhadeba: mbi. Probably from the Culgoa River area.	Mathews, J, The Opal That Turned Into Fire: and other stories from the Wangkumara, p. 6-7
Pointers	White Cockatoos who used to roost in Minggah, then followed it to the sky.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 73
Pointers	Ridley said that the Kamilaroi thought that the Coal Sack was an emu sitting underneath a ti-tree shrub, the Southern Cross, and the two Pointers are cockatoos	Fredrick, S, 2008, The Sky of Knowledge, p. 70
Saturn	Saturn is Wungal (a small bird)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p 286
Serpens	refer to Mundewur	
Sirius	Sirius is called Zazari at Burburgate	Ridley, W, 1873, Australian Languages and Traditions, p. 274-5
Scorpio	dark space in Scorpio is Wurrawiburu (demon)	Ridley, W, 1873, Australian Languages and Traditions, p. 273-4

Scorpio	2 stars in tail of Scorpio, larger is a crow. α Scorpii is an eaglehawk.	Mathews, R, 1904, Ethnological Notes on the Aboriginal Tribes of NSW and Victoria, p. 283
Scorpio	Mathew's stories from the Darling river (Bourke to Louth). Larger of two stars in the tail of Scorpio is a crow.	Mathews, R, 1905, Ethnological Notes on the Aboriginal Tribes of New South Wales and Victoria, F.W. White p. 81
Scorpio	To get to Warrambool, the Wurrawiberoo, two dark spots in Scorpio, have to be passed, which are devils to catch spirits of the dead.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 72
Scorpio	Two large stars in tail of Scorpio belonged to the Kpungurra division, as did Jupiter	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 74
Spica Virginis	Spica Virginis is Gurie (small crested parrot)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Southern Cross	Southern Cross is Zuu (Nguu) (tea tree)	Ridley, W, 1873, Australian Languages and Traditions, p. 273-4
Southern Cross	The first Minggah, or spirit tree, which was the medium for translation of the first man on earth to die to the sky.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 73
Southern Cross	Story of the first two men and one woman, and death of one man, who was lifted to the Milky Way in a giant yarran (gumtree), the four stars are the eyes of Yowee, the Spirit of Death, and the eyes of the first man to die. The tree was followed by the cockatoos, who are the pointers, or Monyi.	Parker, K, 1914, A Kamilaroi Legend of the Southern Cross, p. 8
Southern Cross	Another version of the Kamilaroi story about how the Southern Cross was made, being the one of Baiame making two men and one woman, one dying, and being taken into the big white gum tree (where the spirit of Death lived), which then took off into the sky, followed by two cockatoos, who nested in the tree. The Southern Cross is made up of the two eyes of Death, and the two of the first man to die, and the Pointers are the two cockatoos. Southern Cross known as Place-of-the-White-Gum-tree-in-the-Sky, and Baiame left it there to remind people that Death had come to earth. (source: Parker)	Wolkowsky, M, 1968, Australian Adventure, pp. 102-4

Southern Cross	Almost identical story, probably from earlier source.	Robinson, R, 1968, Wandjina, children of the Dreamtime: Aboriginal Myths & Legends, p. 77
Southern Cross	Muruwari story of Bida-Ngulu (Baiame) and the Sacred Fires, which a neighbouring tribe tried to steal. The fires, some Muruwari, and the neighbours were lifted into the sky, and in open, dark country, they can all be seen as the Southern Cross is rising and low in the sky. The Pointers are two of the guards, Gidiuba: mbi and Dhadeba: mbi. Probably from the Culgoa River area.	Mathews, J, The Opal That Turned Into Fire: and other stories from the Wangkumara, p. 6-7
Southern Cross	The Southern Cross was the first Mingga, or spirit tree, a huge Yarran (river red gum) which transported the first man who died on earth to the sky. The white cockatoos, who would roost in this tree, followed it into the sky and are still following it as Mouyi (Muyaay), the pointers.	Giacon, J, and Betts, M, 1999, Yaama Maliyaa, Yuwaalaraay-Gamilaraay, An Aboriginal Languages Textbook, pp. 80-1
Southern Crown	Mullyan, the eagle-hawk.	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 73
Stars	Story of two black fellows throwing down fire like stars from a hill to give fire. They are now in the clouds - you can see them like stars.	Fraser, J, 1882, The Aborigines of New South Wales, p. 58
Stars	Stars = miri	Greenway, C, 1878, Australian Language and Traditions, p. 236-7
Sun	Sun is yarai	Ridley, W, 1873, Report on Australian Languages and Traditions, p. 286
Sun	Story how the Sun was made with the help of Gougourgahgah	Parker, K, 1898, More Australian Legendary Tales, pp. 22-30
Sun	One legend tells of the Sun - Yaay, who after many lovers, wanted Baaluu the Moon but he would have none of her so she chases him across the sky.	Giacon, J, and Betts, M, 1999, Yaama Maliyaa, Yuwaalaraay-Gamilaraay, An Aboriginal Languages Textbook, pp. 80-1
Vega	Vega is also called Mullion-ga (as is Altair)	Ridley, W, 1873, Australian Languages and Traditions, p. 274-5
Vega	Vega and Altair are the two old eagles springing up to watch their nest.	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p 286

Venus	Wailwun - Venus was Ngindigindoer, meaning "you are laughing"	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 84
Venus	Venus is Ngindigindoer (you are laughing)	Ridley, W (in Smyth 1878), Traditions of the Australian Aborigines on the Namoi, Barwon, and tributaries of the Darling, p. 286
Venus	Venus is I/Jaije-kindamawa or I/Jindi-kin-dawa	Ridley, W, 1875, Kamilaroi, and other Australian Languages, pp. 24-6
Venus	Venus is Zindigindoer (higher up Namoi: Goiangummer)	Ridley, W, 1873, Australian Languages and Traditions, p. 273
Venus	Kamilaroi stories. Mayi-mayi were seven sisters with long hair and bodies of icicles. A large family of young men, the Berai-berai (Orion) followed them. Venus is a relative of the Mayi-mayi and when he saw Wurunna stole two of them, but was defeated, he laughed with pleasure, hence the "Laughing Star". Thunder in the winter is the Pleiades bathing and playing.	Johnson, D, 1998, Nights Skies of Aboriginal Australia: a Noctuary, p. 116
Venus	Mathew's stories from the Darling river (Bourke to Louth). Venus was a man named Mirnkabuli, who lived in a hut and subsisted on mussels and crayfish.	Mathews, R, 1905, Ethnological Notes on the Aboriginal Tribes of New South Wales and Victoria, F.W. White p. 81
Venus	Venus = Zaijikindamawa	Greenway, C, 1878, Australian Language and Traditions, p. 236-7
Venus	1872 letter reference to Kamilaroi usage of name of Venus, "Yindigindowa" and "Yaigindowa", meaning literally "you laugh" and "I laugh". Interesting comment that Venus in Western usage is goddess of laughter (not according to Google).	Mackenzie, A, 1874, Specimens of Native Australian Language, p. 250
Venus	Venus was a man Mirnkabuli who lived in a gurli, or hut, and lived on mussels and crayfish.	Mathews, R, 1904, Ethnological Notes on the Aboriginal Tribes of NSW and Victoria, p. 283
Venus	Venus is the laughing star, a rude old man, who scintillates (laughs).	Parker, K, 2007, The Euahlayi Tribe: A Study of Aboriginal Life in Australia, p. 71
Venus	Story of Mullyan who became Mullyangah, the Morning Star	Parker, K, 1898, Australian Legendary Tales, Project Gutenberg/D Nutt, pp. 31-2

Venus	Story of Mullian, the Earle-hawk, who lived in a giant yarran (gum) tree near the Barwon, and who hunted people for food. Some young men managed to set his home on fire, and he died, becoming Mullian-ga, the Morning Star, with a faint star (?) by his side	Reed, A, 1965, Myths and Legends of Australia, pp. 79-82
Venus	Ridley and Langloh Parker both recorded that the Kamilaroi thought that Venus had some connection with laughing. Ridley said the name meant "you are laughing", and Parker said that Venus was an old man who once said something rude and has been laughing at his own joke ever since. This is at odds with Parkers earlier account (1954) that Venus was Mullian, the Eaglehawk, who lived at the top of a high tree with his wife, mother in law, and another woman. He had to live apart because he was a cannibal and would attack other people. The community climbed to the top of the tree and burnt his hut. He burned his arm, and the women died, then all went into the sky, where he became Mullian-ga, the Morning Star, on one side is a little star, his arm, and on the other side a larger star, his wife. Some strange aspects to the story.	Fredrick, S, 2008, The Sky of Knowledge, p. 84-5
Venus	Muruwari (may not be in Kamilaroi community, check) story about Venus laughing when low in the sky (changing colour).	Mathews, J, The Opal That Turned Into Fire: and other stories from the Wangkumara, p. 46
Venus	To the Yuwaalaraay people Venus is the Laughing Star - Murrudhi Gindamalaa. It is a man and his laughing about something rude.	Giacon, J, and Betts, M, 1999, Yaama Maliyaa, Yuwaalaraay-Gamilaraay, An Aboriginal Languages Textbook, pp. 80-1
2 stars in Ursa Major	Ridley recorded (presumably Kamilaroi) that two stars represented the eyes of an owl as it looked out through trees and shrubs.	Fredrick, S, 2008, The Sky of Knowledge, p. 108

Appendix 2

Ethics Approval Ref: 5201200462 follows:

From: Ethics Secretariat <ethics.secretariat@mq.edu.au>
Sent: Wednesday, 27 June 2012 2:21 PM
To: Dr Michelle Trudgett
Cc: Mr Bob Stevens Fuller
Subject: Approved- Ethics application- Trudgett (Ref No: 52101200462)

Dear Dr Trudgett

Re: "The Astronomy of the Kamilaroi People" (Ethics Ref: 5201200462)

The above application was reviewed by the Human Research Ethics Committee at its meeting on 22-Jun-12 . The Committee wanted to commend you for the high quality of your application. Final Approval of the above application is granted, effective 27 June 2012, and you may now commence your research.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/e72.pdf.

The following personnel are authorised to conduct this research:

Dr Michelle Trudgett
Mr Bob Stevens Fuller
Mr Raymond Norris

NB. STUDENTS: IT IS YOUR RESPONSIBILITY TO KEEP A COPY OF THIS APPROVAL EMAIL TO SUBMIT WITH YOUR THESIS.

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).

2. Approval will be for a period of five (5) years subject to the provision of annual reports.

Progress Report 1 Due: 27 June 2013
Progress Report 2 Due: 27 June 2014
Progress Report 3 Due: 27 June 2015
Progress Report 4 Due: 27 June 2016
Final Report Due: 27 June 2013

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are

also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/
human_research_ethics/forms

3. If the project has run for more than five (5) years you cannot renew
approval for the project. You will need to complete and submit a Final Report and submit a new
application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-
review research in an environment where legislation, guidelines and requirements are continually
changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form
available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/
human_research_ethics/forms

5. Please notify the Committee immediately in the event of any adverse
effects on participants or of any unforeseen events that affect the continued ethical acceptability of the
project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University.
This information is available at the following websites:

http://www.mq.edu.au/policy/

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/
human_research_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project it is your
responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy
of this email as soon as possible. Internal and External funding agencies will not be informed that you
have final approval for your project and funds will not be released until the Research Grants
Management Assistant has received a copy of this email.

Please retain a copy of this email as this is your official notification of final ethics approval.

Yours sincerely
Dr Karolyn White
Director of Research Ethics
Chair, Human Research Ethics Committee

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