VIOLENT EPIDEMICS

Disease, conflict and Aboriginal population collapse as a result of European contact in the Riverland of South Australia.

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Except where otherwise acknowledged, this thesis represents my own work.

Peter J. Dowling
In dedication to Nita Dowling,
a pioneer of the Riverland whose struggle has just ended.
...syththan eastan hider
Engle ond Seaxe up becommen,
Ofer brad brimu...
Wlance wigsmithas,
Eorlas arhwate,
eard begeaton.

...since from the east hither
Angles and Saxons up did come,
Over the broad sea's brim...
Wise warsmiths,
Earls fame-loving,
and the land they seized.

(From the Anglo-Saxon poem The Battle of Brunnanburgh)
River Murray, South Australia.
Hatching indicates region of study.
Riverland region, South Australia
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Many researchers have recognized the value of investigating the history of race contact in Australia, but too few have sought to explain in detail why the Aboriginal population declined so much and so rapidly when colonization advanced across the continent.

The central aim of this thesis is to identify and assess the impact of the major causes of Aboriginal population collapse in the Riverland (Murray River) region of South Australia. It is estimated that prior to 1800 the population density of the Riverland was between 0.3 and 0.5 km² per person with a total population for the region of around 3000. In 1881 the South Australian State Census enumerated just 14 Aboriginal people for the Riverland region. The population collapse has been viewed in two stages. The first has been termed pathological contact and is considered to be the major cause of the collapse. Introduced venereal syphilis, gonorrhoea and smallpox spread ahead of the major European frontiers of South Australia causing extreme mortality among the Riverland Aborigines. The second stage began after European settlement of South Australia. Violent clashes were quick to erupt on the overland cattle route which linked the settlement of Adelaide with the Eastern settlements. The combined effect resulted in an increase in the mortality rate, a decrease in the fertility rate and social and economic disruption. The population was unable to recover.
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INTRODUCTION

This project stemmed from the realization that there have been few historical, archaeological or biological studies of Aboriginal life along the Murray River between the South Australian border and the north west bend where the river finally turns south to its mouth. From at least the terminal Pleistocene to the period of European involvement, this section of the Murray River must have been as intensely used and as densely occupied by Aborigines as the rest of the river; yet its human prehistory and cultural contact have hardly been examined.

This project intended to make a start at redressing this perceived imbalance in study by investigating the prehistoric biology of the Aboriginal occupants - the Jirawirung and Ngawait tribes - of the Riverland region of South Australia. This aim had to be largely modified when it was realised that the necessary source of data, the osteological material available from the region (see below), was not conducive to such a study.

During my initial investigations into the region, however, I soon realised that there was another story to tell. Prior to the arrival of Europeans in South Australia, just over 150 years ago, there was a large and affluent hunter-gatherer population living along the banks of the Murray River. Within eighty years it had largely disappeared. It had followed the fatal course that so many other Aboriginal
populations had when they faced up to European contact throughout the continent.

Many researchers have recognized the value of investigating the history of race contact in Australia, but too few have sought to explain in detail why the Aboriginal population declined so much and so rapidly when colonization advanced across the continent. Those that have done so have either concentrated on a continent-wide analysis paying little consideration to local environmental and historical differences (e.g. Smith 1975; Butlin 1983) or have examined Aboriginal population dynamics restricted within particular (and peculiar) European political boundaries (e.g. Barwick 1971). While these studies stand upon their own right in furthering our knowledge of demographic changes within Aboriginal societies caused by epidemics and frontier conflict, they are somewhat limited in terms of understanding the underlying mechanisms that have resulted in Aboriginal depopulation as a consequence of colonization. By concentrating at a regional level and examining in detail the events of contact, this current study has made an attempt at further comprehending the impact of introduced diseases, conflict and social disruption on Aboriginal populations at the time of colonization.
The central aim of this thesis is to identify the principal agents responsible for the decline in population and the individual role each played in the social and demographic destruction of the Jirawirung and Ngawait. In doing so, I present and examine theoretical and specific environmental, social, medical and epidemiological changes, which affected the Riverland region and its occupants at the period of contact between the Aborigines and Europeans.

Throughout this thesis I discuss two issues of biological anthropology. The first is that hunter-gatherer societies with no contact with the ideas, artefacts and representatives of European industrial societies tend to be well adapted to their environments and enjoy good levels of nutrition and health. Their population is in a state of homeostasis with natality, mortality and morbidity levels not threatening its internal state.

The second issue is a condition of rapid biological and social change. As soon as such societies have extensive and continuous contact with European colonization and experience sociocultural, medical and environmental changes, their adaptation is disrupted and their health jeopardised (Wirsing 1985: 303). The elements of change are severe and swift and there is no time for adaptation. The consequence is an imbalance to the processes of population homeostasis. Depopulation of the hunter-gather society results, often beyond the point of no recovery.
The objectives are:

1. To establish for the study region, an understanding of the Aboriginal population density prior to European contact, and the geographical extent of their occupation.
2. To make an assessment of diseases and major causes of death among the Aboriginal populations along the River Murray in South Australia in the period preceding European contact.
3. To describe and examine the major causes for their decline in population.
4. To propose a model of population decline for the region.

While the emphasis is mainly confined to the Riverland region of South Australia, the nature of Aboriginal and European contact described is analogous to that of many regions of Australia, and indeed to other parts of the world where the societies of eighteenth and nineteenth century Europe chose to colonise.

The Region

The geographical region of concern in this thesis is the Riverland district of South Australia. To the west of the border between South Australia and Victoria the River Murray temporarily leaves its westerly course and deviates firstly south and then north describing a long U-shaped bend named the Great Pyap Bend. The Riverland district covers the area within the Pyap Bend and extends between the major
towns of Renmark and Waikerie (Front maps). Today the region is a major focus of rural occupation and development within the state. Occupying this region in pre-European times were two Aboriginal tribes, the Jirawirung (Erawirung) and Ngawait (Tindale 1976).

The People

The Jirawirung and Ngawait people discussed in this thesis have ceased to exist as social entities. Today they are no longer represented by people who can claim a direct link to the original communities. There are most likely genetic remnants of the Jirawirung and Ngawait genomes existing in some people of Murray River descent but these are undetectable and untraceable. The European incursion into their territory resulted in their dispossession from the lands, a new form of violence and exotic lethal diseases, all of which struck at their social fabric until they no longer existed as a group or as individuals.

Tribal Boundaries

The concept and usage of the term 'tribe' when applied to Australian Aboriginal groups has been the subject of much criticism and debate (e.g. Peterson 1976). For the purpose of this thesis I use the term to describe the broadest level of Aboriginal social organization and have adopted Tindale’s (1974) description and tribal boundaries. He states,

The tribe is the largest consistently named and recognized unit known to aborigines. In practice it is composed of a few or many exogamous clans whose members, usually, but not consistently, live apart... A common bond of language is present... Generally speaking they
have a name, recognize a territorial boundary, linguistic bonds and a common system of kinship (1974: 32).

Further breakdown of the definition, taking into account other factors such as differing mythological and religious beliefs and practices has not been attempted. To delineate the territory of the Jirawirung and Ngawait I have adopted Tindale's boundaries (Fig I).

Historical Sources

There are several written records dealing with the first years of contact between Europeans and the Jirawirung and Ngawait people of the Riverland region of South Australia. They come mainly from a handful of explorers, travellers and settlers and are scattered throughout the period starting from the first contact in 1830 to the time of first settlement of the Riverland some 50 years later. Many Europeans came in contact with the Jirawirung and Ngawait but few attempted to write of these experiences. Most were more concerned with the unknown hazards of a foreign environment that often pushed their abilities to the limit and so they had little or no time, nor the inclination, to write in detail of their experiences with the Aborigines. Others, for the sake of their reputations and careers, wished to conceal their confrontations and chose not to mention them, or when they did write of them, presented sanitized versions.
FIGURE I

Jirawirung and Ngawait tribal territories, Riverland, South Australia (from Tindale 1976)

The Jirawirung and Ngawait were part of a major linguistic group, the Meru, which extended downstream along the River Murray to Lake Alexandrina.
Historical information of the Jirawirung and Ngawait has been taken mainly from journals, letters and diaries of Europeans who passed through, or resided in the Riverland. Newspaper sources have come mainly from the *South Australian Register*, of Adelaide, and the *Murray Pioneer*, from the Riverland region. Other sources include South Australian and British Parliamentary Papers and Reports, official census reports, records of the Protector of Aborigines, records of the Commissioner of Police and letters, papers and diaries held in the Public Records Office and State Library of South Australia, the National Library of Australia and the Australian Institute of Aboriginal Studies, Canberra.

The principal weakness of many of the ethnohistorical accounts is the tendency for European values and concepts to cloud the observers' perceptions. For example, two observers described the physical characteristics of the Jirawirung and Ngawait. In 1830, near the South Australian and Victorian border, Charles Sturt observed the Aborigines living on the Murray:

>[The men] are, generally speaking a clean-limbed and powerful race, much stouter in the bust than below, but withall active, and in some respects intelligent...*(Sturt 1833:126).*

Eleven years later Major O'Halloran, the South Australian Commissioner of Police, led an armed expedition through Jirawirung and Ngawait lands. He wrote a brief, but differing description:
All the blacks that we have seen on the Murray thus far have been small, and by no means powerful men, with hollow backs, large bellies and rumps (O'Halloran 1841).

Such observations have to be considered not only within the context of their time, but with regard to the often widely different perceptions and attitudes the observers had of the Aborigines (McBryde 1979: 140). Consideration must also be given to the circumstances that brought the European observers face to face with the Aborigines. This is apparent in the two brief descriptions above. Both Sturt and O'Halloran were well educated men and were among the first of few Europeans who observed and wrote of the Aborigines they encountered in the Riverland. Yet their descriptions leave us with two conflicting images: one of a tall, well-built and strong people, the other of a small, disproportionate and weak people. I doubt whether the discrepancies can be accounted for by the fact that they were made some ten years apart.

The circumstances surrounding O'Halloran's meeting and observations of the Aborigines were different to Sturt's. O'Halloran was leading a large mounted and well-armed expedition along the Murray with the intent of engaging the Aborigines further upstream, pacifying them and thereby securing the safety of the overland cattle route to Adelaide. He considered any Aborigines living along the Murray route a threat to the security of his expedition and made little effort towards conciliatory meetings with them. In fact he rode across Ngawai lands with his expedition in
"battle formation" expecting attack at any moment. Under these conditions it is hardly likely that he would write any carefully considered description. Rather, his perception of their physical appearance would have been tempered by his distrust and fear of them.

Sturt, on the other hand, could be considered a highly qualified and astute observer (McBryde 1979: 141). He was on an expedition of discovery into the Australian interior and concerned himself directly with observing and commenting upon the environment and the inhabitants he encountered. He made a more conscientious and greater effort than O'Halloran at describing accurately what he saw.

While it is not difficult to make judgements concerning the reliability of the above examples, it has not always been as easy to separate ‘fact’ from ‘fiction’ when examining other ethnohistorical material from the region. I have therefore relied considerably on the observations of those people who went among the Aborigines with the conscientious objective of recording as accurately as possible what they saw, rather than the casual and opportunistic observations and reminiscences (often written many years later) by travellers and settlers.

Archaeological Sources

Previous to this project there had been no formal archaeological research undertaken in the Riverland region. In fact, the archaeology of the Murray valley from the South
Australian border, downstream to the prehistoric sites of Roonka, Devon Downs and Fromme's Landing on the Lower Murray, remains largely unknown. During the course of this investigation a number of sites have been identified and placed on the site listings of the South Australian Department of Environment and Planning (Aboriginal Heritage Unit), but the majority of existing sites within the floodplains and above the cliff line of the river valley still await examination, listing and interpretation.

With a view to ascertaining the extent of Aboriginal occupation, archaeological surveys were conducted within the river valley and floodplains, and the mallee areas north and south of the valley. During the 1960's and 1970's casual investigations of the archaeological sites on the western reaches of the Pyap Bend and around Lake Bonney were done on an opportunistic basis by two interested local residents: the late Mr. D. Bannear and Mr. G. Woolmer. The results of their committed efforts formed a basis for the only published reference to Aboriginal history in the region: *Riverland Aborigines of the Past - An Aboriginal history of the Barmera Region* (Woolmer 1984).

Woolmer and Bannear also compiled a map (South Australian Department of Environment and Planning, Aboriginal Heritage Section, Archaeological Site Listings) and a listing of archaeological sites within the river valley for the same area. I have used this map to relocate many of the sites that still exist and to plot sites that have since been
destroyed by natural erosion or European practices. Several unlisted sites were located during the course of this research.

Archaeological surveying of the mallee region presented two major problems. Archaeological visibility was restricted to areas free from loose sand, low vegetation and leaf litter. The dense stands of mallee, the dominant feature of this area, precluded the idealized transects laid out over randomly selected areas that are favoured by archaeologists. It was therefore decided that investigations would utilize existing vehicle tracks through the mallee and erosion depressions adjacent to these tracks together with those bordering a major highway. Each area was surveyed on foot by one or more individuals. The area of the transects varied according to the length and width of the tracks, access to private property and the size of the erosional features. The tracks surveyed averaged five metres in width and a combined length of 7.5 kilometres. The erosional depressions varied in area, the smallest measuring 6 x 8 metres and the largest (a series of depressions) 110 x 400 metres. Distance from the river valley varied from a minimum of 0.5 to 4 kilometres. A total of seven separate areas were searched and numbered M1 to M7 by the order in which they were carried out.

During preliminary investigations in the Riverland region in 1987 a series of occupation sites within the Loch Luna Game Reserve south of Overland Corner were examined. This
area contains hearth sites located along the margins of a dry swampland, shell middens, living sites within aeolian dune structures, scarred trees, burials and a large chert quarry. It is one of the few remaining areas within the Riverland displaying a wide range of archaeological components associated with a hunter-gatherer economy. The area has been placed on the Register of the National Estate for its Aboriginal cultural and economic significance to the Riverland region (Dowling 1987). Another significant site in the Riverland is the Memdelbuik chert quarry east of Lake Bonney, also on the Register of the National Estate.

Osteological Evidence

An immediate problem associated with this regional study is the sampling difficulty brought about by the nature of recovered skeletal material. For the Riverland I have located a series of thirty seven individual crania. Seven individuals are from a private collection whereas the remainder are part of the South Australian Museum Human Biological Collection.

Most specimens were recovered by residents or uncovered by local government excavation during the past eighty years. Some were handed over to the police, thus finding their way to the museum collection, while others remained in local collections. Stratigraphical, chronological or other archaeological information is largely absent for the series, and in most cases precise provenance is vague. Nevertheless, it was determined that all of the specimens
were Aboriginal and were recovered from the Riverland region.

In order to make some judgements about the diseases affecting the Jirawirung and Ngawait before and after European contact, the crania were examined first, for two systemic stress indicators - cribra orbitalia and enamel hypoplasia (Webb 1984). This was followed by an examination for signs of post-contact disease - syphilis and smallpox (Hackett 1976; Jaques 1983). Finally any other visible pathological lesions were noted.

Thesis Organisation

This thesis has been organised into two parts. The first deals with the Riverland environment and the Jirawirung and Ngawait people who lived there before European contact. The second deals with the process of population decline after European contact.
PART ONE

When I first came amongst the aboriginals about fifty years ago, I do not suppose a happier, more contented lot of people existed (Schell 1914).

In these days game was plentiful. There were kangaroos, emus, wild dogs prowling round at night, ducks of all kinds and water fowl in millions (Schell 1919).

The blacks were very numerous and constantly met with (Eyre 1838).
CHAPTER ONE
The Physical Environments

1.1 Geography and Geomorphology.

From its source in the Eastern Highlands, the River Murray flows 2,500 Km to its mouth in Lake Alexandrina at Encounter Bay, southeast of Adelaide. The river and its tributaries form the largest river system in Australia with a total catchment area that covers approximately 1,036,000 square kilometres or nearly one-seventh of the total area of the continent (River Murray Commission 1970: 5). Upland regions, where annual precipitation exceeds 750mm, provide the main catchment, an area of only 54,000 square Km, or one fifth of the total catchment area. This feature determines a predictable annual flood in the spring when the highland snow melts and a low discharge rate for the rest of the year.

After it emerges from the highlands, the Murray flows across extensive plains. Once within the South Australian border, the river meanders slowly across the incised Riverland floodplain, between 5 and 10 kilometres wide, falling less than 22 metres over the 640 kilometres to Lake Alexandrina (Fig 1.1).

From the eastern extent of the Great Pyap Bend to Overland Corner, the river is incised in easily eroded Loxton and Parilla sands of Pliocene age (Cole 1978). The deep alluvial valley formed (Fig 1.2) is characterized by source-
FIGURE 1.1

The River Murray, Riverland region of South Australia.

Wide flood plains with extensive wetlands are a characteristic of the river within the Great Pyap Bend. West of the bend when the river becomes confined within high gorges the wetlands are reduced considerably to small narrow swamps.
bordering sand dune formations and extensive wetlands. The latter consist of abandoned river loops preserved as arcuate lagoons, swamps and lakes which, prior to flow control, were subjected to the seasonal rise and fall of water levels in the main channel (Twidale et al. 1978: 30). Pressey describes this category of wetlands as including,

...sections of former river channels or anabranches which no longer function as major routes for flow through the system and distributory channels which disperse high flows within the confines of the recent floodplain (Pressey 1986: 25).

Of the several lakes within the floodplain, the largest is Lake Bonney, covering 1700 ha and only 8m above sea level. During the initial years of European occupation of South Australia, this lake dried up several times. Much of the surrounding wetlands, however, are affected by substantial inflows of ground water, and even at periods of low water in the main river channel, sections of the wetlands retained water (Pressey 1986).

At Overland Corner the character of the river valley changes dramatically. During the late Pliocene, the Norwest Bend formation of fossiliferous oysterbanks and sands was deposited by a phase of the Murrian Gulf marine incursion (Twidale et al. 1978: 31). The distribution of this formation is restricted to a narrow depression extending from Overland Corner to the western margin of the Murray Basin and south towards the present coastline. For the major part of its remaining progression to Lake Alexandrina
FIGURE 1.2

Topographic relief of the Murray River flood plain within the Great Pyap Bend, Riverland, South Australia.

The wide alluvial valley is characterized by dissected streams, lakes and lagoons forming extensive areas of wetlands. Source bordering sand dune formations, the only areas of high relief, are dotted throughout the valley.
the river has cut deeply into these deposits forming a steep-sided gorge. The gorge varies throughout the length of the river, but is typically 30 to 40 metres deep from the cliff tops to the valley floor and between 600 and 1400 metres wide (Twidale et al 1978: 27). Within the gorge, the river forms long, narrow back-waters. These wetlands are smaller than those within the Great Pyap Bend.

The Murray Plains of South Australia, through which the river flows, provide a stark contrast to the wetland areas within the floodplain. To the north and south of the river valley the landscape is characterised by low linear east-west orientated aeolian sands and dune fields formed under the prevailing Quaternary wind regime (Bowler & MaGee 1978: 6). The dune fields overlie a sequence of porous marine limestone sediments of Tertiary origin. The swales are broad flats of sandy and fine-grained clay loams which are often associated with pans of calcrete or carbonate (Bowler & MaGee 1978: 10). The plains are well drained and hold little permanent surface water or stream channels except in the west where streams drain from the Mount Lofty Ranges to the river.

1.2 Climate

The climate of the Riverland of South Australia can be summarized as one of hot and dry summers with relatively mild nights and cold but not severe winters. From December to February it is generally warm to hot with maximum daily temperatures usually exceeding 29 °C, and often over 38 °C.
During March the temperature begins to fall from a mean maximum of around 28.7 and continues to do so until July which is the coldest month.

The Riverland lies between the 225 and 275 mm annual rainfall isohyets (Fig 1.3) and receives the majority of its rainfall in the cooler months; January and March are the driest. Because of the extensive eastern drainage basin that feeds the Murray and minimal local drainage into the river, the rainfall pattern in the Riverland has little bearing on the river levels. Unreliable seasonal rainfalls make droughts common. The worst years last century were in the early 1850's and between 1863 and 1867.

The Riverland’s average index of mean relative humidity is approximately 45 to 55% during the summer months and 70 to 80% during winter. The annual evaporation rate lies between 2200-2300 mm (Commonwealth Bureau of Meteorology 1955 cited in Pressey 1986).
Mean annual rainfall isohyets, Murray River, South Australia.

The local rainfall pattern has little effect on the river level which is fed mainly from the eastern highland regions. Unreliable seasonal rainfall makes droughts common in the semi-arid region of the Riverland.
1.3 Vegetation

Much of the land and vegetation of the Riverland today bears little resemblance to its state prior to the settlement and agricultural activities of European occupation. Intensive use of the water resources by damming and irrigation, land clearance and urban development have caused a major salinity problem and permanently changed a major part of the landscape. It should be noted, however, that the Aborigines during their occupancy could also have had an impact on the endemic vegetation of the river valley and plains, specifically through the wide-spread practice of seasonal burning.

The vegetation of the Riverland can be divided into two differing environmental zones - the Murray River valley, including the flood plains and landscapes below the cliff line and the surrounding arid to semi-arid Murray plains. Vegetation in the river valley is best referred to as woodland (Laut et al. 1970). River red gum (*Eucalyptus camaldulensis*), callitris pine (*Callitris murrayensis*) and box (*E. largiflorens*) dominated much of the main stream banks and wetlands, often with an understory of native grasses and dense stands of reeds (*Phragmites australis*) and bullrush (*Typha sp.*) in the water.

Dense stands of lignum (*Muchlenbeckia cunninghamii*) clustered on the saline clays adjacent to the water channels. Milfoil (*Myriophllum sp.*) and water primrose
(Ludwigia peploides) grew in the water, and duckweed (Asolla sp.) upon the surface of the low-flow channels and swamps.

Further back from the wetland regions of the flood plain, the vegetation thins to shrubland. Remnant source-bordering sand dunes and intruding Holocene aeolian sand dunes form high points on the flat flood plain. The majority of their surface area is protected by a stabilising cover of saltbush (Atriplex resicaria) and grasses. In most of the dunes, however, there are large parabolic areas of erosion caused jointly by wind action and human occupation.

On the plateau above the river valley a sharp change in vegetation takes place. The main feature in this area was (and largely is today) open scrub or the mallee formations from which the area acquires its name. The mallee is characterized by Eucalypts which have several stems originating from an underground root stock. They form scrubby trees varying in height from about 2-12 metres and dominate this extensive semi-arid zone of calcareous and largely infertile sandy soils. The main species are red mallee (E. socialis & E. oleosa), yorrell (E. gracilus) and white mallee (E. dumosa). Open areas within the mallee are covered by an understory of sclerophyll or chenopod shrubs, mainly saltbush (Atriplex sp. & Enchlaena tomentosa), bluebush (Maireana sp.) and hummock grasses (Triodia sp.) (Laut et al. 1970).
1.4 Fauna

The very nature of the Murray River Valley, bisecting the extensive semi-arid plateau, makes it a unique zoogeographical region. The range of wildlife species associated with the river and wetlands comprises a major segment of the total faunal assemblage of the south-east of the continent (Frith 1974). It is not the intention of this section to list in detail the faunal distribution of the river valley (Frith 1974 & Keast et al. 1959 provide general discussions of the riverine zoogeography of Australia and include this section of the Murray). Rather, emphasis will be placed in the next chapter on those species that have been represented in archaeological deposits and those considered to have been of economic significance to the local Aboriginal groups.

The first written record of the Riverland environment comes from the observations of the explorer Captain Charles Sturt in 1830, during his expedition by boat along the Murray. He and his crew were the first Europeans to enter the region. The description begins at the beginning of the Great Pyap Bend.

From the spot last spoken of, the river held on a due south course for the remainder of the day; and at the same time changed its character. It lost its sandy bed and its current together, and became deep, still, and turbid, with a muddy bottom. It increased considerably in breadth, and stretched away before us in magnificent reaches of from three to six miles in length. The cliffs under which we passed towered over us, like maritime cliffs, and the water dashed against their base like waves of the sea. They became brighter and brighter in colour, looking like dead gold in the sun's rays; and formed an unbroken wall of a mile or two in length... The reader may form some idea of the height of
these cliffs, when informed that the king of the feathered race made them his sanctuary. They were continuous on both sides of the river, but retired, more or less, from it, according to the extent of the alluvial flats. The river held a serpentine course down the valley through which it passed, striking the precipices alternately on each side. The soil on the flats was better, and less mixed with sand than it had been, but the flats were generally covered with reeds, though certainly not wholly subject to flood at any time. The polygonum still prevailed upon them in places, and the blue-gum tree alone occupied their outskirts. From the several elevations we ascended, the country, to the N.W. appeared undulating and well wooded; that to the eastward, seemed to be brushy and low. Certainly there was a great difference in the country, both to the eastward and to the westward (Sturt 1833: 147-148).

Fourteen years later Sturt again passed through the Riverland on his way inland along the Murray and Darling Rivers. His expedition arrived at Lake Bonney on 30th August 1844 and camped at the junction of the lake and Chambers Creek. John Harris Browne, the medical officer of the expedition wrote in his journal.

The lake is covered with wild fowl, amongst them a great number of Pelicans. They are black and white with enormous beaks and heads...This is a terribly cold place; there have been several frosts every night since we have been on the river. (Browne, edited by Finnis 1966).

It would not be specious to portray the Riverland as a permanent oasis of life within extensive arid lands (Table 1.1). Prior to the construction of the locks controlling the water levels, the seasonal movement of groundwater would have been a major environmental influence on the floral, faunal and human ecology of the area. Spring snowmelts and high winter rainfall in the catchment of the Murray River resulted in seasonal flood levels in the large lakes and
wetlands periodically increasing the ground water and extending shorelines. This was very much the situation during the latter half of 1989 when extensive rainfall over much of the Murray catchment filled the major dams of the river and raised the water level above the locks. The wetlands were flooded and access over much of the river valley in the Riverland was only achieved by wading between points of higher land (Plate 1.1).

The combined effect of this nutrient rich ground water flowing into the Riverland has led to the development of a wide variety of riverine biota and a concentration of terrestrial species dependent upon the water resources in an otherwise arid environment. As well as being an attraction for the native flora and fauna the Riverland was a focus for human populations. The seasonal reliability of accessible water, together with the cyclic rise and fall of the water table constantly regenerating the wetlands, made available the resources upon which a large human population could be sustained (Plates 1.2 & 1.3).
Flooding of the River Murray floodplains, Riverland, South Australia.

Following high seasonal rainfall in the eastern catchment during 1989, the water level of the Murray River rose and extended over a large proportion of the floodplain. The cyclic rise and fall of the water table before artificial control, regenerated the wetland flora and made available the resources that could support a large human population.
Flooding of the Great Pyap Bend between Berri and Lake Bonney, River Murray, South Australia, 1956.

During 1956 the water level rose 1.55 metres above pool level submerging the floodplains and leaving small sand dune islands rising above the water. Flooding of the River Murray to this extent may have been common before artificial control of the water levels. High flood levels were recorded in 1870 when the water reached a peak of 11.23 meters above pool level and again during 1890 when the water rose 9.36 metres (Photograph - Dept. of Lands, South Australia).
PLATE 1.3

Low water level in the main channel of the River Murray near Waikerie, South Australia, in 1916.

Although it has never been known to dry completely, during periods of drought and low rainfall in the catchment area, the Murray River in South Australia was occasionally reduced to a series of shallow streams and pools.
| **Mean Temperatures (°C)** | Jan. max. 33  
|                           | min. 15  
|                           | Jul. max. 15  
|                           | min. 3  
| **Rainfall (mm)** | Jan. 10  
|                           | Jul. 25  
|                           | Av. Annual 250-300  
| **Average Annual Run Off (cm)** | 1.25  
| **Average Annual Evaporation (mm)** | 2000  
| **Vegetation** | Plains - Open scrub; tall shrubs >2m; 10-30% cover.  
|                           | River Valley - Woodland; low to high trees >10m; 10-30% cover.  
| **Surface Geology** | Plains - Aeolian quartz sand inland dunes; some gypsum, calcrete.  
|                           | River Valley - Lacustrine sand, cracking clay, halite, gypsum, carbonate.  
| **Present Landuse** | Grape, stone & citrus fruits; vegetables; wheat; sheep grazing.  

Table 1.1 Environmental summary of the Riverland Region of South Australia.
CHAPTER TWO

The Aboriginal Environments

Aboriginal social organization and subsistence regimes along the Murray River in South Australia have been documented by several early observers (e.g. Teichelmann 1841; Eyre 1845; Taplin 1879). Most of these descriptions are however, centred on the inhabitants of the lower river regions and the coast - the regions most frequented by European observers during the first decade of settlement. Even then, they were recorded at a period when Aboriginal cultures along the River Murray and settled areas of the colony were under great stress and change. Hence, little is known of their social systems before European settlement (Foster & Gara 1986).

Historical evidence relating to the Aborigines of the Riverland is limited. This section describes what little is known and what can be reconstructed of the Jirawirung and Ngawait social structure and subsistence regimes. The sources used include those mentioned above, together with the accounts of explorers, settlers and government officials who passed through, or resided in the Riverland.

2.1 Social Organization

Although there was a fundamental similarity among the cultures of Aboriginal Australia, there were also areas of significant variation in their social systems, religious beliefs and technology. Ellis (1978: 1) and Peterson (1976: 50-71) suggest the existence of three major cultural areas
from the recent past extending into South Australia (Fig 2.1). The Murray/South East cultural area, part of the much larger cultural complex of the Murray/Darling Basin, encompassed the tribes of the Murray River as well as the Coorong and the tribes east and south of the Mount Lofty Ranges. The Jirawirung and Ngawait were part of a major linguistic group, the Meru, which extended west along the Murray River from the Pyap Bend and south towards Lake Alexandrina (Tindale 1974) and included the Ngaiawang, Nganguruku and Ngintait speakers.

The Jirawirung and Ngawait people lived in social groups similar to those recorded for other regions of Aboriginal Australia. Several families consisting of a group of related males, their wives, children, other relatives and often friends lived together in bands from 50 to 75 individuals. A band was primarily an economic entity providing mutual benefit in the daily hunting and gathering activities. The territory over which a band moved has been defined by Stanner as the 'range'.

The range was the tract or orbit over which the group, including its nucleus and adherents, ordinarily hunted and foraged to maintain life (Stanner 1965: 2).

A band's composition, however, was in a constant state of flux with individuals and family groups often moving freely from one band to another.

Each person also belonged to a particular descent group or clan. A band would have members belonging to several
Aboriginal cultural areas, South Australia.

Although there was a fundamental similarity among the Aboriginal cultures of Australia, there were areas where social systems, languages, religious beliefs and technologies differed. The Jirawirung and Ngawait were part of the Murray/South East Cultural Area of Australia.
Central Lakes Culture Area

Western Desert Culture Area

Murray/South East Culture Area

200km
different clans. Clan members had spiritual and mythological ties to a particular tract of land, their own territory or 'estate'. Stanner defined a clan estate as a

...traditionally recognized locus ('country', 'home', 'ground', 'dreaming place') of some kind of patrilineal descent group forming the core or nucleus of the territorial group (Stanner 1965: 2).

The clan therefore, had specific ownership rights, based on a spiritual mandate, to certain tracts of land. A Ngawait clan estate included a substantial frontage of river (perhaps 2 Kilometres) and stretched across the floodplains, up the cliffs and scarps and out into the mallee for some 30 Kilometres, or a walking distance of one to two days (Howitt 1904: 52). Likely inclusions in a clan estate would have been valuable natural resources such as stone quarries or ochre deposits, access to which would have been controlled by senior clan members. Three clans of the Ngawait, the Barmerara Meru, the Narwijerook (Eyre 1845: 219) and the Karsinbola (Eyre 1842), had tracts of land bordering the shore of Lake Bonney which was called Barmera or alternatively Nookampka. Other clans that have been identified in the Riverland were the Willoo, Rankbirit and Yerraruk (Taplin 1879: 28). These three clans were Jirawirung speakers and owned estates upstream from Lake Bonney.

The boundaries of a clan's estate were mutually established and respected. Schell, one of the few European settlers who had contact with the Jirawirung and Ngawait and who recounted his experiences, observed,
The blacks were very particular regarding their tribal [clan] boundaries. Heaps of stones were used as letter boxes, and if one tribe wanted to meet another, at a corroboree, sticks in which notches and cuts had been made would be left at the stone letterboxes (Murray Pioneer 30 April 1914).

Permission had to be obtained from a clan member before any individual or band could enter and utilise the resources in another clan's estate.

No individual of any neighbouring family or tribe could hunt or walk over the land of another without permission from the head of the family group which owned it, and a stranger on it might legally be put to death (Howitt 1904: 52).

Movement of individuals was not entirely restricted to the range or tribal boundaries. Eyre (1845: 219-222) documented a meeting at his residence at Moorundie on the lower Murray between a number of Ngawait (mainly from the Narwijeroook clan) and the Lower Murray people. The purpose of the gathering was to perform the initiation ceremonies for several young boys belonging to both tribes and apparently to avenge the deaths of several Narwijeroook. Eyre's accounts of the Murray tribes indicate that there was considerable social and ceremonial contact along the River with regular movement of large groups of individuals. Hawden, Eyre and Sturt followed well used Aboriginal pathways along the course of the river and Sturt recounts a meeting with an elder near the western border of Jirawirung land:

In the course of the afternoon the old man joined us, and got into the boat. As far as we could understand from his signs, we were at no great distance from some remarkable change or other....he pointed due south, as
if to indicate that such would be our future course; and he concluded his information, such as it was, by describing the roaring sea, and the height of the waves. It was evident this old man had been upon the coast, and we were therefore highly delighted at the prospect thus held out to us of reaching it (Sturt 1833: 142).

2.2 Subsistence Regimes

Aboriginal economic life patterns along the Murray River system have been discussed by several authors. Lawrence (1969), using historic accounts, environmental and archaeological evidence, discussed the habitats and economies over the majority of the Murray/Darling drainage basin but stopped short at the South Australian border. Smith (1977; 1982) and Paton (1983) adopted a more regional methodology and, using archaeological evidence, analysed Aboriginal economies for the Lower Murray regions. Even though there are substantial archaeological deposits remaining along the river between the areas examined by these researchers (in particular the Riverland region), there have been few further archaeological examinations to complement theirs.

It is not the aim of this thesis to provide a comprehensive investigation of the Riverland's archaeological deposits. The aim of the archaeological survey was to assess the degree of exploitation of the river valley and mallee environments within the Riverland. The results have then been discussed with reference to several previous archaeological and ethnographic investigations of resource and environmental exploitation from the Lower Murray regions.
Table 2.1 and Figure 2.2 display the extent of archaeological sites within the river valley and Table 2.2 and Figure 2.3 show the results of the surveys carried out above the valley and in the mallee.

Table 2.1 Archaeological sites located between Overland Corner and Katarapko Island, Riverland, South Australia (After G. Woolmer n.d.).

<table>
<thead>
<tr>
<th>Site Complex No.</th>
<th>Local Name</th>
<th>Archaeological Components/Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Banrock Ck.</td>
<td>Shell, stone adzes, hammers millstones, burials. Major living area.</td>
</tr>
<tr>
<td>A2</td>
<td>Good Times</td>
<td>Chert flakes, millstones, handaxes, 2-3 burials. Major living area.</td>
</tr>
<tr>
<td>A3</td>
<td>Red Sandhills Loch Luna</td>
<td>Numerous flakes, worn adzes burnt clay hearths, shell burials. Major living area.</td>
</tr>
<tr>
<td>A4</td>
<td>'Joe Taylors'</td>
<td>Several types of stone implements, burials. Major living area.</td>
</tr>
<tr>
<td>A5</td>
<td>Drogemuller Island</td>
<td>Large deposits of ash and shell, numerous stone implements. Major meeting place. Cultivated.</td>
</tr>
<tr>
<td>A6</td>
<td>North Lake</td>
<td>Shell, hammerstones, adzes, hearths.</td>
</tr>
<tr>
<td>A7</td>
<td>Tuit's Ridge</td>
<td>Shell middens, hearths, millstones, core tools, adzes. Well used area. Cultivated.</td>
</tr>
<tr>
<td>A8</td>
<td>Roger's Point</td>
<td>Shell, hearths, burials, Cultivated.</td>
</tr>
<tr>
<td>A9</td>
<td>Point Bend</td>
<td>Hearths, adzes, hammers, millstones, burials.</td>
</tr>
<tr>
<td>A10</td>
<td>West Lake</td>
<td>Several types of stone implements, shell, microliths. Major living area.</td>
</tr>
<tr>
<td>A11</td>
<td>Pelican Point</td>
<td>Millstones, hammers, adzes, pirri point(?), hearths, shell, burials. Major living area.</td>
</tr>
</tbody>
</table>
Table 2.1 (Cont.)

<table>
<thead>
<tr>
<th>Code</th>
<th>Site Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A12</td>
<td>Setterburg Point</td>
<td>Occupation sites near lake shore, burials. Major living area.</td>
</tr>
<tr>
<td>A13</td>
<td>Loveday Point</td>
<td>Several types of stone implements.</td>
</tr>
<tr>
<td>A14</td>
<td>Dunk Sand-hill</td>
<td>Several types of stone implements (large millstone approx 30Kg found).</td>
</tr>
<tr>
<td>A15</td>
<td>Spectacle Lakes</td>
<td>Shell, hearths, stone flakes.</td>
</tr>
<tr>
<td>A16</td>
<td>Blackfellow's Creek</td>
<td>Shell, worked flakes, hearths.</td>
</tr>
<tr>
<td>B2,B3</td>
<td>Macintosh Canal</td>
<td>Shell, worked flakes, hearths.</td>
</tr>
<tr>
<td>B4</td>
<td>Trussel Lagoon</td>
<td>Microliths. Long occupation.</td>
</tr>
<tr>
<td>B5</td>
<td>Nockburra</td>
<td>Large midden, hearths, millstone, adzes, flakes, scarred trees (canoe). Major living area.</td>
</tr>
<tr>
<td>B6</td>
<td>McFarlane's Rise</td>
<td>Millstones uncovered when ploughed. Under cultivation</td>
</tr>
<tr>
<td>B8,B9</td>
<td>Spectacle Lakes</td>
<td>Hearths, stone flakes in erosion depressions.</td>
</tr>
<tr>
<td>B11</td>
<td>Hotel</td>
<td>Glass chippings, glass pirri point.</td>
</tr>
<tr>
<td>B7,D1</td>
<td>Doug Bannear, Snooks</td>
<td>Millstones, adzes, pirri points.</td>
</tr>
<tr>
<td>B15</td>
<td>Bowie Point</td>
<td>Oven mound, shell, stone flakes. Partly destroyed.</td>
</tr>
<tr>
<td>B16</td>
<td>Greenwood</td>
<td>Glass flake, stone flakes.</td>
</tr>
<tr>
<td>B17</td>
<td>Loch Luna Swamp</td>
<td>Series of hearths, shell &amp; stone flake deposits bordering ephemeral swamp.</td>
</tr>
<tr>
<td>E5</td>
<td>Drogemuller's Reach</td>
<td>Shell midden</td>
</tr>
</tbody>
</table>

Major Burial Grounds

<table>
<thead>
<tr>
<th>Code</th>
<th>Site Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Nitschke Sandpit</td>
<td>Graves in white sand. Hundreds removed from sandpit. Destroyed.</td>
</tr>
<tr>
<td>C3</td>
<td>East Lake Knoll</td>
<td>Small burial ground. Density unknown. Destroyed.</td>
</tr>
<tr>
<td>C4</td>
<td>Moorook Swamp</td>
<td>Concentrated burials. Largest known in district. Destroyed.</td>
</tr>
<tr>
<td>C13,C8</td>
<td>Overland Corner</td>
<td>Deep burials below hotel (1859) &amp; red sand.</td>
</tr>
<tr>
<td>K1</td>
<td>Katarapko Is.</td>
<td>High density of exposed burials (&gt;25). Discrete hearth complex.</td>
</tr>
</tbody>
</table>
Table 2.1 (Cont.)

<table>
<thead>
<tr>
<th>Quarries</th>
<th>Rockshelters</th>
<th>(?)Pleistocene Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1 Overland Corner</td>
<td>H1 Warne’s Cave</td>
<td>F1 Napper’s</td>
</tr>
<tr>
<td>G2 Sugarloaf Hill</td>
<td>H2 Black Oak Creek</td>
<td>F2 Cane Grass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F3 Old Redoubt</td>
</tr>
</tbody>
</table>

Two erosion depressions in sand dune. Eroded burials. Discrete hearth & shell remains.

Ochre

Chert outcrops. Worked extensively.


At the site of old Accommodation House. Ancient chopping implements.

Numerous chopping implements.

Many crude chopping implements.

Table 2.2 Details of selected transects conducted within the mallee environment of the Riverland in South Australia.

<table>
<thead>
<tr>
<th>Transect</th>
<th>Dist. from River Valley (Km)</th>
<th>Area (M)</th>
<th>Cultural Remains</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>0.5</td>
<td>110x400</td>
<td>mussel shell, hearths, chert flakes</td>
</tr>
<tr>
<td>Morgan Rd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td>0-3.3</td>
<td>5x3300</td>
<td>3 chert flakes</td>
</tr>
<tr>
<td>Spectacle Lakes Rd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td>1.5</td>
<td>6x8</td>
<td>nil</td>
</tr>
<tr>
<td>W. of Gerard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td>1.0</td>
<td>6x10</td>
<td>nil</td>
</tr>
<tr>
<td>W. of Gerard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M5</td>
<td>0.8</td>
<td>15x100</td>
<td>2 Fossil oyster shell flakes</td>
</tr>
<tr>
<td>N. of Devlins Pound</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 2.2

Archaeological sites located on the western reach of the Great Pyap Bend, Riverland, South Australia.

See Table 2.1 for a key and a brief description of these sites. The sites located within the river valley fall into five broad categories: open-air occupation sites, major burial grounds, quarries, rockshelters and suspected Pleistocene sites. The density of sites in the north western section of the map is most likely due to archaeological preservation and visibility rather than reflecting a denser cluster of sites in a section of the wetlands preferred by the Aborigines.
Table 2.2 (Cont.)

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
<th>Depth</th>
<th>Group</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6</td>
<td>Golden Downs</td>
<td>5.0</td>
<td>12x120</td>
<td>nil</td>
</tr>
<tr>
<td>M7</td>
<td>Morgan Rd.</td>
<td>4.5</td>
<td>10x80</td>
<td>5 Fossil oyster shell flakes</td>
</tr>
<tr>
<td>M8</td>
<td>Morgan Rd.</td>
<td>0.5</td>
<td>12x18</td>
<td>nil</td>
</tr>
<tr>
<td>M9</td>
<td>Morgan Rd.</td>
<td>0.5</td>
<td>8x15</td>
<td>nil</td>
</tr>
<tr>
<td>M10</td>
<td>Morgan Rd.</td>
<td>0.5</td>
<td>8x10</td>
<td>nil</td>
</tr>
<tr>
<td>M11</td>
<td>Morgan Rd.</td>
<td>1.0</td>
<td>10x20</td>
<td>nil</td>
</tr>
</tbody>
</table>

During the pre-contact period there appears to have been no great social or geographic barriers to movement along the Murray corridor. The many tribes that occupied the riverine environments west of the Great Divide adopted a broadly similar economic pattern designed for efficient exploitation of the food resources available (Allen 1972; Peterson 1976; Tindale 1976; Pretty 1977). For this reason it is reasonable to expect that the localised economies of the Jirawirung and Ngawait were broadly similar to those adopted and subsequently described upstream and downstream.

Arguably the most detailed first-hand observations of traditional Aboriginal subsistence activities along the Murray are those of Eyre (1845) during his residency at Moorundie on the Lower Murray. He described at some length the methods of collection and preparation of the riverine and terrestrial species that formed the Aboriginal diet. His descriptions remain today one of the most valuable
FIGURE 2.3

Locations of archaeological surveys carried out in the mallee above the river valley, Riverland, South Australia.

See Table 2.2 for a key and a brief description. Little trace of occupation was found in these transects suggesting that the mallee region was not exploited to the same degree as the river valley. Until detailed investigation has been undertaken in this area, the use of the limited mallee resources will remain equivocal.
written sources. There are however, problems in using Eyre's observations. The many historical and ethnohistorical accounts that address the subject of Aboriginal economic activities (e.g. Teichlemann 1841; Taplin 1879) were made at a time when many of the Aborigines had been alienated from the majority of the river's food resources. His is no exception. From the time of commencement of land grants along the lower reaches of the Murray in 1839 and the sudden impact of Europeans and their herds along the stock routes of the upper reaches, the Aborigines had been pushed back from the river and forced to abandon the most productive components of their traditional land tracts and ranges. They were often forced to congregate in groups for mutual protection against Europeans and to exploit the few and ever reducing areas of the river valley that were available to them. Our knowledge of the lifeways of the Murray tribes based on historical evidence may, therefore, lack vital components.

Several pre-contact subsistence models for the Murray Valley have been constructed (Bickford 1966; Lawrence 1968; Wundersitz 1971; Smith 1971, 1982). These models agree on the importance of riverine foods in the yearly Aboriginal diet while arguing that more emphasis was placed on them during the warmer months than at other times of the year. In the winter months terrestrial species would be more significant in the diet necessitating some movement away from the river valley.
Bickford argues,

*It can be seen that in all habitats in the Murray area the staple foods eaten were fish, vegetables, waterfowl and land animals.... Fish (and crayfish and mussels) were eaten more often, on a yearly basis, than any other items, but I do not think it valid to call the Murray Valley aborigines fish eaters for vegetables waterfowl and land animals were almost equally as important* (Bickford 1966: 85-86).

Lawrence, relying on archaeological data as well as ethnohistoric sources, makes a similar comment.

*... probably only a small proportion of the total population hunted and collected these [riverine] foods throughout the year.... For the greater part of the year their activities would have been concerned with hunting land animals* (Lawrence 1968: 100).

While no detailed estimates of food sources consumed are given (apart from Smith 1977) these models broadly propose that riverine food (fish, crayfish, mussels) make up approximately one quarter to one third of the total resources available with land animals and vegetables equally contributing to the remainder. Not withstanding personal preferences, the Jirawirung and Ngawait diet would most likely have consisted of every conceivable edible food available in the area. For this reason an inventory of the larger native species would give a fair indication of the food resources utilized by them (Table 2.3). It is also likely that the many small species like insects, insect larvae, tadpoles and several species of water grasses were as well liked and eaten as the larger species.
Table 2.3 Animal food species available to Aborigines in the Riverland of South Australia (Kreft 1865; Smith 1977; Pressy 1986).

<table>
<thead>
<tr>
<th><strong>Riverine</strong></th>
<th><strong>Mammals</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Murray Cod</td>
<td>Echidna</td>
</tr>
<tr>
<td>Golden Perch</td>
<td>Platypus</td>
</tr>
<tr>
<td>Redfin Perch</td>
<td>Western Grey Kangaroo</td>
</tr>
<tr>
<td>Silver Perch</td>
<td>Red Kangaroo</td>
</tr>
<tr>
<td>Macquarie Perch</td>
<td>Rat Kangaroo</td>
</tr>
<tr>
<td>Freshwater Catfish</td>
<td>Rufous Rat Kangaroo</td>
</tr>
<tr>
<td>Bony Bream</td>
<td>Brown Hare Wallaby</td>
</tr>
<tr>
<td>Australian Smelt</td>
<td>Nail Tail Wallaby</td>
</tr>
<tr>
<td>Rainbow Fish</td>
<td>Hairy-nosed Wombat</td>
</tr>
<tr>
<td>Gudgeon</td>
<td>Ringtail Possum</td>
</tr>
<tr>
<td>Freshwater Hardyhead</td>
<td></td>
</tr>
<tr>
<td>Short Finned Eel</td>
<td></td>
</tr>
<tr>
<td>Prawns</td>
<td></td>
</tr>
<tr>
<td>Yabby</td>
<td></td>
</tr>
<tr>
<td>Common Freshwater Mussell</td>
<td></td>
</tr>
<tr>
<td>Freshwater Mussell</td>
<td></td>
</tr>
<tr>
<td>River Snail</td>
<td></td>
</tr>
<tr>
<td>Birds</td>
<td></td>
</tr>
<tr>
<td>Australian Pelican</td>
<td>Echidna</td>
</tr>
<tr>
<td>Great Egret</td>
<td>Platypus</td>
</tr>
<tr>
<td>Whitefaced Heron</td>
<td>Western Grey Kangaroo</td>
</tr>
<tr>
<td>Grey Teal</td>
<td>Red Kangaroo</td>
</tr>
<tr>
<td>Musk Duck</td>
<td>Rat Kangaroo</td>
</tr>
<tr>
<td>Bluebilled Duck</td>
<td>Rufous Rat Kangaroo</td>
</tr>
<tr>
<td>Silver Gull</td>
<td>Brown Hare Wallaby</td>
</tr>
<tr>
<td>Pied Cormorant</td>
<td>Nail Tail Wallaby</td>
</tr>
<tr>
<td>Purple Swamp Hen</td>
<td>Hairy-nosed Wombat</td>
</tr>
<tr>
<td>Yellowbilled Spoonbill</td>
<td>Ringtail Possum</td>
</tr>
<tr>
<td>Black Swan</td>
<td></td>
</tr>
<tr>
<td>Sacred Ibis</td>
<td></td>
</tr>
<tr>
<td>Masked Lapwing</td>
<td></td>
</tr>
<tr>
<td>Blacktailed Native Hen</td>
<td></td>
</tr>
<tr>
<td>Great Cormorant</td>
<td></td>
</tr>
<tr>
<td>Maned Duck</td>
<td></td>
</tr>
<tr>
<td>Strawnecked ibis</td>
<td></td>
</tr>
<tr>
<td>Emu</td>
<td></td>
</tr>
<tr>
<td>Crested Pigeon</td>
<td></td>
</tr>
<tr>
<td>Brolga</td>
<td></td>
</tr>
<tr>
<td>Mallee Fowl</td>
<td></td>
</tr>
</tbody>
</table>

**Riverine**
- Murray Cod
- Golden Perch
- Redfin Perch
- Silver Perch
- Macquarie Perch
- Freshwater Catfish
- Bony Bream
- Australian Smelt
- Rainbow Fish
- Gudgeon
- Freshwater Hardyhead
- Short Finned Eel
- Prawns
- Yabby
- Common Freshwater Mussell
- Freshwater Mussell
- River Snail

**Birds**
- Australian Pelican
- Great Egret
- Whitefaced Heron
- Grey Teal
- Musk Duck
- Bluebilled Duck
- Silver Gull
- Pied Cormorant
- Purple Swamp Hen
- Yellowbilled Spoonbill
- Black Swan
- Sacred Ibis
- Masked Lapwing
- Blacktailed Native Hen
- Great Cormorant
- Maned Duck
- Strawnecked ibis
- Emu
- Crested Pigeon
- Brolga
- Mallee Fowl

**Mammals**
- Echidna
- Platypus
- Western Grey Kangaroo
- Red Kangaroo
- Rat Kangaroo
- Rufous Rat Kangaroo
- Brown Hare Wallaby
- Nail Tail Wallaby
- Hairy-nosed Wombat
- Ringtail Possum

- Macropus fuliginosus
- Macropus rufus
- Bettongia spp.
- Aepyprymnus rufescens
- Lagorchestes leporides
- Onychogalea froenato
- Lasiorhinus latifrons
- Pseudocheirus peregrinus
Table 2.3 (Cont)

<table>
<thead>
<tr>
<th>Animal Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Footed Antechinus</td>
<td>Antechinus flavipes</td>
</tr>
<tr>
<td>Brush-tailed Phascogale</td>
<td>Phascogale tapoatafa</td>
</tr>
<tr>
<td>Red-tailed Phascogale</td>
<td>P. calura</td>
</tr>
<tr>
<td>Fat-tailed Sminthopsis</td>
<td>Sminthopsis crassicaudata</td>
</tr>
<tr>
<td>Common Sminthopsis</td>
<td>S. murina</td>
</tr>
<tr>
<td>Antechinomys</td>
<td>Antechinomys laniger</td>
</tr>
<tr>
<td>Western Native Cat</td>
<td>Dasyurus geoffroii</td>
</tr>
<tr>
<td>Numbat</td>
<td>Myrmecobius fasciatus</td>
</tr>
<tr>
<td>Short-nosed Bandicoot</td>
<td>Isoodon obesulus</td>
</tr>
<tr>
<td>Pig-footed Bandicoot</td>
<td>Chaeropus ecaudatus</td>
</tr>
<tr>
<td>Barred Bandicoot</td>
<td>Perameles bougainville</td>
</tr>
<tr>
<td>Bilby</td>
<td>Macrotis lagotis</td>
</tr>
<tr>
<td>Eastern Water-rat</td>
<td>Hydromys chrysogaster</td>
</tr>
<tr>
<td>Gould’s Mouse</td>
<td>Pseudomys gouldii</td>
</tr>
<tr>
<td>Sandy Inland Mouse</td>
<td>P. hermannsburgensis</td>
</tr>
<tr>
<td>Brown Desert Mouse</td>
<td>P. desertor</td>
</tr>
<tr>
<td>Stick-nest Rat</td>
<td>Leporillus sp.</td>
</tr>
<tr>
<td>Mitchell’s Hopping Mouse</td>
<td>Notomys mitchelli</td>
</tr>
<tr>
<td>Dingo</td>
<td>Canis familiaris dingo</td>
</tr>
</tbody>
</table>

Reptiles

<table>
<thead>
<tr>
<th>Lizard Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue-tongue Lizard</td>
<td>Tiliqua scincoides</td>
</tr>
<tr>
<td>Stump-tailed Lizard</td>
<td>Trachydosaurus rugosus</td>
</tr>
<tr>
<td>Bearded Dragon</td>
<td>Amphibolurus viticeps</td>
</tr>
<tr>
<td>Short-necked Tortoise</td>
<td>Emydura macquarii</td>
</tr>
<tr>
<td>Long-necked Tortoise</td>
<td>Chelodina longicollis</td>
</tr>
<tr>
<td>Broad-shelled Tortoise</td>
<td>C. expansa</td>
</tr>
</tbody>
</table>

Smith (1977, 1982) analysed the faunal material excavated from the Devon Downs rock shelter on the Lower Murray (Hale & Tindale 1930; Tindale 1957) and found that 61.5% of the total energy at the site came from mammals, 4.8% from reptiles, 9.6% from birds and 24.1% from riverine sources (fish 16.1%, shellfish & crustacea 8.0%). His results agreed with those of Lawrence (1968) and Wundersitz (1971) and indicated that riverine resources, while being important, did not make up the major component of the diet. Smith however, wondered

Considering the location of Devon Downs on the banks of the Murray, it is curious that riverine species account for so little of the meat and energy at this site, especially since the ethnography for the area contains many passages describing the exploitation of abundant...
river foods such as fish, shellfish and crustacea (Smith 1977: 20).

A possible reason for this may be because the site was mainly used in the colder months of the year when the riverine food species were less in number and the river level was lower (Smith 1982: 115).

Paton (1983) proposed an alternative model of subsistence. Drawing a comparison with Allen's (1972; 1974) depictions of the Bagundji people of the Darling being largely reliant on riverine food sources, Paton argues that a much greater emphasis (around 50% of the total diet) was placed on riverine resources in the Lower Murray. He supports this with archaeological evidence. A series of site surveys were undertaken within the floodplain of the river, on the plateau overlooking the river valley and several sites in the mallee together with excavations at Roonka Flat (Pretty 1977) and McBean Pound rock shelter. The open sites were shown to contain large amounts of shellfish and little terrestrial fauna (Table 2.4). The excavations at Roonka flat also showed predominant riverine faunal components.

The McBean Pound rock shelter site was unlike the others. Paton states

...McBean Pound has a large number of mammal, fish, crustacean and reptile remains, although shell is also present. The faunal assemblage can be described as representative of the modern fauna found in the region, and is comparable with that excavated from Devon Downs and Fromm's Landing (Paton 1983:88).
<table>
<thead>
<tr>
<th>Species</th>
<th>Meat Weight (Kg)</th>
<th>% Total</th>
<th>Energy Man/Days</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverine</td>
<td>13.0</td>
<td>73.3</td>
<td>6.16</td>
<td>67.1</td>
</tr>
<tr>
<td>Terrestrial</td>
<td>4.76</td>
<td>26.7</td>
<td>3.45</td>
<td>35.9</td>
</tr>
<tr>
<td>Rockshelter (McBean Pound)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riverine</td>
<td>13.9</td>
<td>11.7</td>
<td>10.1</td>
<td>11.0</td>
</tr>
<tr>
<td>Terrestrial</td>
<td>104.0</td>
<td>88.3</td>
<td>82.2</td>
<td>89.0</td>
</tr>
</tbody>
</table>

Table 2.4 Combined riverine and terrestrial food sources from Murray River sites in South Australia (Paton 1983).

The mallee sites investigated were devoid of faunal remains except one, a fireplace surrounded by quartz flakes, which contained a portion of wombat (*Lasiorhinus latifrons*) pelvis. Charcoal samples from two hearths exposed on the surface at Cragies Plain, thirty kilometres from the river, were radio carbon dated to 6,220 BP plus or minus 120 (ANU 3769) and 2,510 BP plus or minus 360 (ANU 3777) (Paton Pers.Comm).

Paton interprets the conflicting site component differences as reflecting a seasonal dichotomy of site use and resource exploitation. Open sites were used more in the warmer months and the rockshelters in the colder, wetter months (Smith 1982). In winter the biomass of the river would fall and more emphasis would then be placed on the terrestrial species occurring near the river.

The use of the Devon Downs rockshelter was assessed by Smith as being ephemeral over the 6,000 years of its use,
rather than sustained occupation over that time and therefore, may not represent the subsistence strategies of its occupants. He states:

*In situations such as this, the food remains at a site need not necessarily reflect any significant part of the prehistoric subsistence pattern* (Smith 1982: 113).

While some regions of the mallee have most likely been occupied for at least the last 6,000 years, opinions on its use are equivocal. In the Riverland occupation was confined mainly to the river valley and its margins (Fig 2.1 & Table 2.1). Little trace of occupation was found in the mallee transects. Several open sites on the Lower Murray have been investigated but have been found to contain mainly stone with little food remains (Paton 1983: 64). The mallee regions away from the river may have been exploited during winter when the biomass was at its greatest and standing water was available (Bickford 1966; Lawrence 1968; Wundersitz 1971; Allen 1972; Ross 1982). However, archaeological evidence for this is limited as only a few sites in the mallee have been investigated. Even in the winter the biomass would still have been relatively poor compared to the river valley during the same season (Laut 1977) and sustained seasonal exploitation would be difficult and risky.

Even though it is a difficult area to move about in, the mallee may have been exploited on a limited basis, not for its food resources but for its stone (Paton 1983: 65).
Kefous (1982) suggests that the mallee areas in Western Victoria may have been occupied while the river people exploited the stone resources which were scare along the river valley. Although this hypothesis remains to be tested in the Riverland I do not think it can be applied to the Jirawirung and Ngawait. The Riverland is one of the few areas along the Murray which does have substantial stone resources (Tindale 1976; Woolmer 1984). There was no economic need for the Jirawirung or Ngawait people to leave the river and enter the mallee for this resource.

Population pressure may also have forced small groups to use the mallee. If the population level along the Murray was high enough to put pressure on resources over the winter months, or for any other period, the Jirawirung and Ngawait may have been forced to enter the mallee either as small groups for extended periods, or for short hunting forays. Indicators of dietary related stress on the populations along the Murray River have been investigated in skeletal material (Webb 1985, 1989). Webb suggested that during the mid-Holocene, population numbers along the Murray rose to a point where food resources became inadequate and health was adversely affected forcing the people to adapt by intensifying existing methods of resource exploitation and adopting new ones. One of these adaptations may have been more regular incursions into the mallee in search of food resources.
The question of mallee exploitation by the Jirawirung and Ngawait will remain largely unresolved until further archaeological investigations of the region have examined sufficient surface and stratified sites on which to base a constructive argument.

There are some first hand accounts of Jirawirung and Ngawait subsistence strategies within the river valley. Schell describes two.

At fishing I think they must have been as expert as any people in the world. Cod they would catch with a Mungo pole and great hauls were caught with their nets. These were made from reeds, all of which had to be chewed with their teeth so that they became pliable, they were often thirty to forty yards long. Cod fish live in hollow logs under the water, and the native with a small hand net would dive away down to one of these big old logs, place the net over the end of it, and gently tap, tap the log with a piece of wood. The cod frightened, would swim out and be caught in the net and brought to the surface. A native could keep under water for a long while...

At snaring the wild duck they were equally expert and made their reed nets fifty yards long by about ten deep. One of theses they would stretch from tree to tree across some of the fairly narrow creeks. [They] would then start driving the ducks towards the trap net which would hang fairly low. As soon as the covey would fly close an aboriginal would fling a piece of bark high into the air, and the birds, thinking it was a duck hawk, would swoop down and be trapped. I have seen great numbers caught by means of the net (Schell 1914).

The subsistence regime of the Jirawirung and Ngawait was practised for the most part within the river valley. The environment was managed by means of the social systems in operation and the methods of food exploitation. Foraging bands of up to 75 individuals moved over defined clan estates capable of supplying the majority of food and
technological resources required. Some food resources within the floodplains may have occasionally been limited in times of severe and prolonged drought or rising population, but the wide range of riverine and terrestrial species in the Riverland environment available to the Jirawirung and Ngawait and the option of extending into the surrounding mallee would have ensured that prolonged food deficiency was rare.

2.3 Burials

This thesis is not the place to examine in detail the burials in the Riverland nor to interpret the social complexities involved. This will have to wait until further field investigations have been conducted and the many sites containing burials fully surveyed. I do, however, wish to describe briefly a particular burial site and quickly compare it to others in the Riverland to make the point that as well as spending the majority of their lives close by the river and waterways of the Murray, the Jirawirung and Ngawait also buried their dead within the confines of the floodplain.

Table 2.1 and Figure 2.2 show the location of burial sites on the southern and western reaches of the Great Pyap Bend. Several of these, for example Nitschke Sandpit and Moorook Swamp, are now largely destroyed due to commercial and farming activities. The biggest site remaining within the Great Pyap Bend is the larger of two sites (KAT1) on Katarapko Island (Fig 2.4 & 2.5). Today it remains largely
FIGURE 2.4

Katarapko Island and the location of KAT1 burial site, Riverland, South Australia.

The KAT1 site is situated within a source-bordering sand dune system which is the only area of high relief on the island. The island was subjected to seasonal flooding over most of its surface before artificial control of the water levels of the River Murray.
untouched by European activity, suffering only from the processes of natural erosion.

Katarapko Island is a large island (4,087 hectares) lying opposite the town of Loxton in the southeast of the Great Pyap Bend. The eastern and southern boundaries are formed by the River Murray and the western boundary is formed by Katarapko Creek, an anabranch of the Murray. The KAT1 burials are located within a saucer-shaped, wind eroded depression forming part of a source dune complex which rises above the floodplain in the south of the island (Fig 2.4).

The bones visible on the surface are highly eroded. At least twenty five burials have been exposed by wind and water erosion below the western rim of the depression. The weathered bone forms a triangular-shaped scatter on the slope of the depression covering an area of approximately 50 square metres (Fig 2.5). The burials form a discrete concentration of intact and partly exposed bones together with larger and smaller fragments. Ten burials are partly in situ, breaking up on the surface and adding further bone fragments to the scatter. Sexing and ageing of the burials was difficult because of the fragmentation of the bones, but one adult male, two adult females and two infants were positively identified.

On the southeastern side of the depression is an area of highly eroded and scattered baked clay nodules. This area is separate from the burials and may represent a complex of
FIGURE 2.5

Plan of the KAT1 burial site, Katarapko Island, South Australia.

The burials are confined to the eastern slope of a concave erosion depression within a sand dune complex. As the burials are exposed by wind and water action they fragment and scatter down-slope towards the bottom of the depression. An area of baked clay nodules in the south eastern corner of the depression is the remains of hearths. B1 to B8 represent burials from which bone was removed for radiocarbon dating. The age of the burials spans a period from approximately 4,840 BP to 150 BP.
hearth used for cooking food while the funeral ceremony and internment of the body was taking place 10 to 15 metres away. Mixed within the scatter of baked clay nodules were small fragments of freshwater mussel (Velesunio ambigua) and chert flakes.

The KAT1 site differs from the majority of other occupation sites containing human bone in several ways. The number of individuals buried (at least 25) and the density of the burials is much greater at KAT1 than elsewhere. Several occupation sites were recorded within eroded sandune depressions (Table 2.1 & Figure 2.2) and a number of these contained human bone. The number of burials in these sites are limited to one or two individuals and are often found within 10 to 20 centimetres, or within scatters of flaked chert, shell and clay nodules. In no instance are the burials as discrete from the occupation debris as they are at KAT1.

At the request of the local Aboriginal community, bone samples were collected from eight of the burials and taken to the Australian National University for radiocarbon dating. The aim was to establish the antiquity of the burials and if possible, a minimum continuity of use of the site as a place of burial. On this basis bone was selected from different individuals (B1 to B8) spread throughout the area of burials (Fig 2.5). Table 2.5 lists the results of the radiocarbon dating.
The relative paucity of burials in the majority of other sand dune complexes, compared to those of KAT1, suggests that this site on Katarapko Island, along with other areas of the Riverland, was used exclusively for the burial of the dead. The bodies were brought to the island and buried in a particular section of the sand dune, separate from the occupational area. Adults and children of both sexes were buried on the island and fresh graves were dug close to (and in all probability on top of) older ones. The antiquity of the site reaches back to almost 5,000 years and continuity of its use as a place of burial extends from then to possibly 150 years ago. The nature of the KAT1 complex, so far examined, fits neatly into the archaeological definition of cemeteries (proposed by Pardoe 1987), as distinct entities in Aboriginal prehistory defined by the number of burials, their density, the boundedness of the site and its relation to living areas.

<table>
<thead>
<tr>
<th>Sample</th>
<th>ANU No.</th>
<th>Age BP</th>
<th>Plus/Minus</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAT1B1</td>
<td>6894</td>
<td>1,070</td>
<td>200</td>
</tr>
<tr>
<td>KAT1B2</td>
<td>6895</td>
<td>1,560</td>
<td>200</td>
</tr>
<tr>
<td>KAT1B3</td>
<td>6896</td>
<td>4,700</td>
<td>140</td>
</tr>
<tr>
<td>KAT1B4</td>
<td>6897</td>
<td>contaminated</td>
<td></td>
</tr>
<tr>
<td>KAT1B5</td>
<td>6898</td>
<td>contaminated</td>
<td></td>
</tr>
<tr>
<td>KAT1B6</td>
<td>6899</td>
<td>350</td>
<td>200</td>
</tr>
<tr>
<td>KAT1B7</td>
<td>6900</td>
<td>contaminated</td>
<td></td>
</tr>
<tr>
<td>KAT1B8</td>
<td>6901</td>
<td>590</td>
<td>220</td>
</tr>
</tbody>
</table>

Table 2.5 Radiocarbon ages of human bone samples from Katarapko Island, Riverland, South Australia.
CHAPTER THREE

The Population

THIS TRIBE MUST HAVE BEEN ONE OF THE MOST NUMEROUS ON THE BANKS OF THE MURRAY (Sturt 1833: 135)

Human population size and density over any territory is in a constant state of variability. There are a host of different factors (endemic and introduced) varying over time that are intimately linked with the rises and falls of population numbers in any ethnic group. Major factors include a group's culture, social structure, history and the resources of the environment in which they live. These factors will be discussed in the following section. Any attempt to state a definitive figure for the pre-contact Aboriginal population of the Riverland would be premature. Rather, an attempt will be made to arrive at a reasonable estimate of the Jirawirung and Ngawait population of the Riverland.

The basic approach to this discussion derives from ethnohistoric and environmental evidence. At present these approaches are the most practical despite some obvious difficulties and attention is focussed upon them in this study. Because of the nature of the available skeletal evidence from the Riverland (previously discussed), there is little that can be contributed to the present discussion from this source. The archaeological evidence, on the other hand, probably holds much more promise for future estimates of population numbers and densities. It is hoped that in
the future, small site studies along the thalweg and floodplain of the river and above the cliff-line, together with analysis of their relative context to the habitation of the area, will reveal more on population density.

In the *Official Year Book of Australia* for 1930, Radcliffe-Brown published his classic estimates of Australian Aboriginal population numbers and densities prior to European colonization. He commented.

...to form an accurate estimate of the size of the original population... is a task beset with very great difficulties, for the data are scanty and for the most part unreliable (Radcliffe-Brown 1930: 687).

This statement has been relevant to all attempts to assess the pre-contact Aboriginal populations of Australia since. Infectious epidemics swept along the Murray River prior to the arrival of the first Europeans and the severe mortality endured by the population affects some of the estimates of population that are to follow (particularly those based on ethnography). Some may well be short of the mark by between 50 and 75 percent or more (Dobyns 1966: 411; Butlin 1983: 175).

3.1 Population Density along the Murray - A discussion of methods.

Aboriginal population density varied throughout the continent and the main determinants appear to have been reliable water and food sources. In the arid and semi-arid regions of South Australia the population density was understandably low. On the other hand, the well-watered
Murray River corridor was an especially favourable environment for hunters, fishers and collectors, supporting a wide variety of reliable food sources able to sustain much higher densities (Eyre 1845: 372; Radcliffe-Brown 1930: 688; Webb 1987: 385-406). Sturt commented,

The province of South Australia could never at any time have been thickly inhabited. There are some numerous tribes on the sea-coast at the head of the Gulfs and in Encounter Bay, as well as on the Murray river, but with the exception of a few scattered families on the northern hills, and in the scrub, the mountain ranges are, and it appears to me have been, almost uninhabited... (Sturt 1833: 282).

Ethnohistory of the Riverland begins with the early explorers. Charles Sturt and his crew passed through Jirawirung and Ngawait lands in the summer of 1830, followed eight years later by Joseph Hawdon and Edward Eyre, the first of many to drive cattle overland along the River Murray to Adelaide.

Throughout his journey down the Murrumbidgee and Murray rivers, Sturt recorded his encounters with Aboriginal groups. Table 3.1 lists the stated numbers of Aborigines Sturt encountered from the Murrumbidgee in the vicinity of the Murray junction, to the eastern extent of the Riverland.

After Sturt's party encountered a group of 120 on the Murrumbidgee above its junction with the Murray they saw no more for several days.
It appeared singular that we should not have fallen in with any for several successive days, more especially at the junction of the two rivers, as in similar situations they generally have an establishment (Sturt 1833: 88).

It is not known why Sturt saw no Aborigines at the junction of those two rivers although he did see the effects of fire on the landscape and concluded correctly that the countryside near the river was only temporarily deserted.

After entering the Murray, and proceeding downstream, Sturt began to make contact with the groups living along the course of the river.

Our intercourse with the natives had now been constant. We had found the interior more populous than we had reason to expect; yet as we advanced into it, the population appeared to increase... The country throughout which we passed on the 26th [January, 1830], was extremely low, full of lagoons, and thickly inhabited... From the size and number of the huts, and from the great breadth of the foot-paths, we were still further to conclude that we were passing through a very populous district. What the actual numbers of the inhabitants was is impossible to say but we seldom communicated with fewer than 200 daily (ibid: 124-126).
The regularity of these meetings suggests two salient points about the population and its distribution along the Murray downstream from the Murrumbidgee junction. Firstly, the population numbers along the Murray were most likely increasing as Sturt suggests in his journal. West of its junction with the Murrumbidgee, the Murray flows over a wide flood plain forming several large wetland complexes (Pressey 1986: 24-26) capable of supporting a permanent and reliable source of vegetable and animal food for large groups of hunter-gatherers. Secondly, the Aborigines were most likely making their presence known to Sturt and his party by congregating in the large numbers at the borders of their clan estates to observe (and occasionally challenge) the passage of the strange visitors. The frequency of observations suggests that the clan estates were more numerous and therefore smaller, but still able to support a similar number of members.

The early eye witness accounts of the Jirawirung and Ngawait do not leave us with a clear idea of the population and its distribution within the Riverland. The accounts that have survived are in the main vague as to the actual number of people seen. While they are useful in a qualitative sense, for the most, little reliance can be placed on them for quantitative population estimates.
<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Number</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 1830</td>
<td>near Renmark</td>
<td>60</td>
<td>Sturt 1883</td>
</tr>
<tr>
<td>Jan. 1830</td>
<td>S. of Renmark</td>
<td>270</td>
<td>Sturt 1883</td>
</tr>
<tr>
<td>Jan. 1830</td>
<td>Cobdogla</td>
<td>'large assemblage'</td>
<td>Sturt 1883</td>
</tr>
<tr>
<td>Mar. 1838</td>
<td>near Renmark</td>
<td>about 90</td>
<td>Hawdon 1952</td>
</tr>
<tr>
<td>Mar. 1838</td>
<td>Lake Bonney</td>
<td>163 (mainly women &amp; children)</td>
<td>Hawdon 1952</td>
</tr>
<tr>
<td>Jun. 1838</td>
<td>near Berri</td>
<td>'many hundreds'</td>
<td>Eyre 1984</td>
</tr>
<tr>
<td>Jun. 1838</td>
<td>Cobdogla</td>
<td>'very numerous'</td>
<td>Eyre 1984</td>
</tr>
<tr>
<td>Aug. 1841</td>
<td>Lake Bonney</td>
<td>105</td>
<td>Moorehouse in Register Sep 11 1841</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct. 1839</td>
<td>Overland Corner</td>
<td>at least 200</td>
<td>McLeod in Register Nov 16 1839</td>
</tr>
<tr>
<td>Nov. 1839</td>
<td>near Renmark</td>
<td>'a good many'</td>
<td>Buchanan 1922</td>
</tr>
<tr>
<td>Jun. 1841</td>
<td>Lake Bonney</td>
<td>'about 150'</td>
<td>O'Halloran 1903-04</td>
</tr>
<tr>
<td>Aug. 1844</td>
<td>near Renmark</td>
<td>'a lot of natives'</td>
<td>Browne in (Finnis 1966)</td>
</tr>
<tr>
<td>1880's</td>
<td>Overland Corner</td>
<td>&gt;300 women</td>
<td>Cooper n. d.</td>
</tr>
</tbody>
</table>

Table 3.2 Eye witness observations of Jirawirung and Ngawait numbers in Riverland region of South Australia.

The explorer and later Protector of Aborigines, Edward Eyre, and the Reverend George Taplin had unrivalled opportunities to form estimates of pre-contact Aboriginal population along the Murray. Taplin was concerned mainly with the Narrinyeri (Ngarrindjeri) from the Lower Murray Lakes and coastal regions of South Australia. He estimated that the Narrinyeri numbered 3200 in 1842. He states

*I myself, in 1849, saw 500 fighting men of these Narrinyeri; I was also told by a former Government officer, that he saw 800 fighting men in 1842...*(Taplin 1879: 43).

Taplin used a simple formula for his calculation. He multiplied the number of 'fighting men' he observed by a factor of four, which can be expressed mathematically as:
\[ P = F \times 4 \]

where \( P \) is the estimated population and \( F \) is the number of armed and able-bodied males observed.

Relying on his own observations and knowledge of the Narrinyeri, he used this factor as the average estimate of the ratio of able-bodied males to others in the total society. Dawson (1881: 3) also used a similar method of population estimate for western Victoria. He stated that for every 'able-bodied warrior' he observed at 'pitched battles', at least three other members were absent, as the women, children and old men did not participate in conflict. More recently the same method has been used to reconstruct Amerindian populations along the north coast of Texas (Aten 1983: 45).

Taplin's method can be applied in the Riverland, although with some qualifications. There is one eye witness account near Lake Bonney of a gathering that can be interpreted as a group of armed males. McLeod (Register, November 30 1839), who overlanded cattle through the Riverland, was confronted with a group of "at least 200" he assumed were hostile. He subsequently led an attack against them (discussed in a later chapter). A more precise count was given by Hawdon in 1838 (1952: 50). He counted a group of 163 Ngawait comprising mainly women, children and old men on the shore of Lake Bonney. Hawdon states that he was informed by this group that the majority of their men had left and 'were to the north' fighting with another tribe.
By using the inverse of Taplin's method:

\[ P = \frac{4X}{3} \]

where \( P \) is the estimated population, and \( X \) is the population less the armed and able-bodied males, the estimated population represented by the group observed by Hawdon is 217. Because of the large numbers sighted by the early explorers and overlanders (Table 3.2) this figure is too small to represent the total population of the Riverland, or indeed the population of the Ngawait. Rather, it is probably representative of a band or one of the clans who owned land bordering the shore of Lake Bonney.

During the early 1840's Edward Eyre was Resident Protector of Aborigines at Moorundie on the Lower Murray. He was an astute observer and had had frequent and close contact with the tribes along the Murray and lower Darling rivers (Eyre 1845: 147). He was able to make some approximation of the population density and estimated that there were between 1.9 and 2.5 persons per kilometre of river.

However, there are complications here. Measuring the length of the Murray thalweg within the tribal boundaries of the Jirawirung and Ngawait is problematic in two ways. Firstly, before control of the levels by the existing series of locks, the course of the river would have varied considerably spatially and temporally, increasing and decreasing its lineal distance across the width of its floodplain. The floodplain within the Riverland is up to 10
kilometres in width and there are many abandoned river scrolls, cut-off meanders and arcuate swamps, remnants of the transient course of the river.

The second problem with this method is determining precisely the tribal boundaries of the Jirawirung and Ngawait and translating them to lines on a map. This is difficult to do for a number of reasons. One of the main difficulties is that boundaries were not static but were subject to relocation over time, were not always based on geographical features and were permeable to the movement of people, language and cultural change (Peterson 1976: 1-11; Birdsell 1976: 95-120; Dixon 1976: 216-238).

For the purpose of using Eyre's estimate of density I have determined the boundaries as follows: the downstream extent at the present town of Waikerie and the upstream extent at Bunyip Reach northwest of Renmark (see front map). The latter is the eastern extent of the Jirawirung as determined by Tindale's (1974) map of tribal boundaries and the former is within the western extent of the Ngawait boundary. The majority of the river between these two points lays within the Pyap Bend and the wetland complex. These points are 593Km (Waikerie) and 382Km (Bunyip Reach) from the mouth of the river (South Australian Government 1975). The estimated lineal length of the river within the Jirawirung and Ngawait lands is 211Km.
Calculations of pre-contact Aboriginal population using estimates of personal density per unit of area are common throughout the literature (e.g. Jones 1971 for Tasmania; and Radcliffe-Brown 1930; Birdsell 1953; Lawrence 1971; Tindale 1976 and Smith 1975 for mainland Australia). These estimates are based on ethnographic observations as well as the theoretical capacities of their respective environments to maintain finite densities of people practicing a hunter-gatherer economy. The most densely populated areas of Aboriginal Australia were the tropical north and temperate east coasts, the southeastern coast and hinterlands and the inland waterways. Of them all, the Murray/Darling river system with its associated hydraulic components was the most densely populated region of the continent (Sturt 1833: 135; Radcliffe Brown 1930: 690). It is interesting to note that the present European population densities follow a similar pattern with most people living along the eastern seaboard, the southeast and the inland river systems (Macquarie World Atlas 1984: 172).

Table 3.3 displays a collection of population density estimates for northern, eastern and southeastern Australian environments.
<table>
<thead>
<tr>
<th>Km² per person</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawrence (1971)</td>
<td>North Cape York, coastal</td>
</tr>
<tr>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>Sydney area, coastal</td>
</tr>
<tr>
<td>7.8</td>
<td>Western New South Wales</td>
</tr>
<tr>
<td>Radcliffe-Brown (1930)</td>
<td>Portland, Victoria, coastal</td>
</tr>
<tr>
<td>5.8</td>
<td>Cape River, Queensland</td>
</tr>
<tr>
<td>6.5</td>
<td>Goulburn-Murray Junction, Victoria</td>
</tr>
<tr>
<td>6.5 to 7.8</td>
<td>Northern Rivers, New South Wales</td>
</tr>
<tr>
<td>7.8</td>
<td>Western Port, Victoria, coastal</td>
</tr>
<tr>
<td>19.4</td>
<td>Melbourne region, coastal/inland</td>
</tr>
<tr>
<td>24.3</td>
<td></td>
</tr>
<tr>
<td>Lourandos (1980)</td>
<td>Southwestern Victoria, coastal</td>
</tr>
<tr>
<td>1.4 to 2.5</td>
<td></td>
</tr>
<tr>
<td>2.5 to 3.3</td>
<td>Southwestern Victoria, inland</td>
</tr>
<tr>
<td>Lourandos (1988)</td>
<td>Western Victoria, coastal</td>
</tr>
<tr>
<td>1.5 to 6.3</td>
<td></td>
</tr>
<tr>
<td>2.6 to 3.9</td>
<td>Western Victoria, inland</td>
</tr>
<tr>
<td>Luebbers (1981)</td>
<td>Lower Murray/Lake Albert</td>
</tr>
<tr>
<td>1.8 to 2.5</td>
<td>&quot;</td>
</tr>
<tr>
<td>1.0 to 1.4</td>
<td>&quot;</td>
</tr>
<tr>
<td>0.5 to 0.8</td>
<td>Lower Murray/Lake Alexandrina</td>
</tr>
<tr>
<td>0.6 to 0.8</td>
<td>Coorong, Coastal South Australia</td>
</tr>
<tr>
<td>1.8 to 2.5</td>
<td>&quot;</td>
</tr>
<tr>
<td>2.5 to 5.0</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

Table 3.3 Densities of Aboriginal populations throughout Australia.

The outstanding factor limiting population density in these cases is the availability of reliable water resources. The highest population densities are seen in the northern tropics which receive the highest continental rainfall, in excess of 1200mm per annum (Macquarie World Atlas 1984: 162) and the Lower Murray Lakes region which has a much lower rainfall but receives a large annually renewable intake of freshwater from the river.

The combined Jirawirung and Ngawait tribal area unit has been estimated utilising Tindale’s (1974) descriptions of
their boundaries and the 1:100 000 scale NATMAP topographic map series (Renmark 7029 & Moorook 6929). The eastern and western extents of the tribal lands are those noted above. The tribal area extending from either side of the main thalweg has been confined to the total area of the flood plain, the low lying areas of present irrigation and a distance of no more than one kilometre away from the cliff line. Although these parameters do not represent the total tribal area of the Jirawirung and Ngawait according to Tindale (i.e. he extends the boundaries to some 20Km of semi-arid mallee either side of the river), they do represent an environment more favourable to permanent and stable occupation. The area unit is conservatively estimated as 1086Km².

Birdsell (1953: 171-207) provided a predictive model for hunter-gatherer population density (Fig 3.1a). Using a measure of local environmental productivity he calculated a formula based on the exponential relationship between local mean annual rainfall and size of tribal territory and expressed as an equation for density as follows:

$$D = 0.0703037/X^{1.58451}$$

where $D$ is the density and $X$ is the mean annual rainfall.

He asserted that the higher the mean annual rainfall, the smaller the tribal area and therefore, the greater population density. He cited in support a strong statistical correlation coefficient ($r = 0.81$) between rainfall and size of tribal area in his sample based on an
FIGURE 3.1

(a) Relationship between Australian Aboriginal tribal area and mean annual rainfall for inland Australia (from Birdsell 1953).

(b) Aboriginal tribal area ratios and distance from the mouth of the River Murray (from Birdsell 1953).
Number of tribes = 123

\[ Y = 7112.8x^{-1.58451} \]

Distance from river mouth (Hundreds of miles)

Tribal area (hundreds of square miles)
average tribal size constant of 500 persons. The latter figure was arrived at simply by dividing the estimated continental population of 300,000 provided by Radcliffe Brown (1930) by the number of tribes (574) suggested by Tindale (1940).

This average tribal population number (one of those "magic" numbers often used in prehistoric population theory) has been accepted by several authors and is central to many discussions on pre-contact Aboriginal demography (e.g. Brown 1930; Kryzwicki 1934; Elkin 1954; Berndt & Berndt 1964; Tindale 1976). Criticism of its use, however, has come from several directions. For example, Hiatt (1968: 245-246) argues that such a consistency of tribal population size throughout Australia is more myth than reality. He refers to the difficulties in defining some tribes as dialectal units and correctly points out that the range of tribal populations varies from between 100 to 1500 and 2000 persons; a view shared by others (Smith 1976: 101; Lourandos 1985: 387). Nevertheless, the "magic" number of 500 is a useful figure in Birdsell's model as he points out that "in this assumption the existence of a marked central tendency is more important than the absolute size of the estimate (Birdsell 1953: 197).

Birdsell eliminated from his original sample tribes having factors other than mean annual rainfall affecting population density and made his calculations on 123 tribes whose resources were primarily terrestrial in origin and whose
territories were watered by local precipitation. This latter point is relevant to this present discussion on Riverland population.

Local mean annual rainfall is not always a useful determinant of available surface water. Birdsell recognized that the water that falls in one tribal area may be utilized by the people in another. This "unearned water" is a phenomenon of the large Murray/Darling river system which displays substantial seasonal drainage from areas of high annual rainfall to those with a much lower mean. The mean annual rainfall of the Riverland lies between 225mm and 275mm, but the water it receives originates in the eastern Highlands characterised by means of 500mm to above 800mm per annum. The runoff from this drainage system is sufficient to sustain a high biomass within the floodplains and wetlands in a landscape that would otherwise be arid and relatively deficient in its biota.

High human population density would then be expected on the riverine frontages. This was noted by Birdsell when he extended his analysis to include the Murray River environment. He calculated area ratios (ibid: 185) representing the deviations of the measured area of the tribal territory divided by the area predicted by the basic equation for its value of rainfall. From this result he then calculated the reciprocal, calling it the density ratio and considered it to indicate the ratio of the actual tribal
density compared to the density predicted from the basic equation (Table 3.4).

<table>
<thead>
<tr>
<th>Sample</th>
<th>Area Ratio</th>
<th>Density Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Lowest Murray tribes</td>
<td>0.058</td>
<td>17.33</td>
</tr>
</tbody>
</table>

Table 3.4 Deviation ratios of tribal area and density based on Birdsell's basic equation for "unearned surface water" environments (After Birdsell 1953: 185).

An area ratio of 0.05, for example, indicates the actual tribal area is only 0.05 of that calculated from the basic equation based on mean annual rainfall. Similarly, the density ratio indicates that the Murray River tribes' maximum density is 17.33 times that expected from the rainfall equation. The equation is then modified:

$$17.33(0.0703037/x^{-1.5845})$$

resulting in a population density of 0.3 - 0.5 KM$^2$ per person for the Riverland Region.

Figure 3.1b shows the area ratios along the Murray and Darling rivers plotted against the distance from the mouth of the Murray. It reveals a consistent decline from the high values at the head waters of the two rivers to extraordinary low values at the mouth of the Murray. Relating these values to population reveals relatively lower population densities in the upper reaches of the rivers and high population densities in the mid to lower reaches; an observation made and commented upon by Sturt as he made his way downstream in 1830.
Riverland Population Estimates

Table 3.5 displays estimates of probable ranges of the combined Jirawirung and Ngawait populations using density estimates for the Murray River.

<table>
<thead>
<tr>
<th>Source</th>
<th>Method/Density</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyre 1845</td>
<td>1.9 - 2.5 per river Km</td>
<td>400 - 528</td>
</tr>
<tr>
<td>Taplin 1879</td>
<td>$P = F \times 4$ (&gt;200 ?warriors)</td>
<td>800</td>
</tr>
<tr>
<td>Luebbers 1981</td>
<td>1.8 - 2.5, 1.0 - 1.4, 0.5 - 0.8, 2.5 - 5.0</td>
<td>603 - 434, 1086 - 776, 2172 - 1356, 434 - 217</td>
</tr>
<tr>
<td>Birdsell 1953;</td>
<td>Average tribe of 500</td>
<td>1000</td>
</tr>
<tr>
<td>Tindale 1976</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birdsell 1953</td>
<td>0.3 - 0.5</td>
<td>3620 - 2172</td>
</tr>
</tbody>
</table>

Table 3.5 Estimated ranges of combined Jirawirung and Ngawait population in Riverland region of South Australia.

The estimate of population density made by Eyre is too low for the Riverland. It is based solely on the length of river frontage being able to support a high biota and does not take into consideration the extensive areas of other surface water in the Riverland floodplains. Eyre also made his estimate after initial contact along the Murray and accordingly it reflects the period of social and economic disruption that followed.

Luebbers' (1981) calculations of density are derived from the direct observations of the Narrinyeri from the Lower Murray Lakes and Coorong by George Taplin (1879) in the later decades of the nineteenth century. Although they are
more precise than Eyre’s estimate, they probably also underestimate the pre-contact population densities for much the same reasons. Taplin’s observations were made at the time of missionary involvement and pastoral settlement in the region when tribes were being continually forced from their traditional land by squatters and encouraged to live within the confines of mission settlements. Moreover, neither Eyre’s nor Taplin’s estimates take into consideration the severe depopulation among the Murray tribes brought about by the exposure to foreign pathogens before the arrival of the first Europeans to their regions. Table 3.5 presents amended ethnographic estimates for the Riverland based on previously proposed population loss due to infectious disease epidemics of 50 percent of the population (Butlin 1983: 175).

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimate</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyre 1845</td>
<td>400 - 528</td>
<td>800 - 1056</td>
</tr>
<tr>
<td>Luebbers 1981</td>
<td>434 - 603</td>
<td>868 - 1206</td>
</tr>
<tr>
<td>(Taplin 1879)</td>
<td>776 - 1086</td>
<td>1552 - 2172</td>
</tr>
<tr>
<td></td>
<td>1356 - 2172</td>
<td>2712 - 5424</td>
</tr>
<tr>
<td></td>
<td>217 - 434</td>
<td>434 - 868</td>
</tr>
</tbody>
</table>

Table 3.6 Modified ranges of combined Jirawirung and Ngawait population in Riverland region of South Australia.

The estimate of 800 based on Taplin’s formula \((P = F \times 4)\) is also problematic. McLeod (1839) does not state that the group he confronted, and which he subsequently attacked, was comprised solely of armed men. If it had included women and children then the formula is no longer applicable. On the
other hand, if the group was entirely made up of armed males, then the figure of 800 should also be regarded as representing a minimum figure for the Riverland.

The major problem in attempting to assess pre-contact populations is the absence of a factual basis, capable of test, from which to work. This has been obvious so far in the estimates based on ethnographic sightings. In all the cases the observers were seeing, quite often without realizing, Aboriginal populations that had been decimated by pathogenic agents and/or severely depleted and socially disrupted by European intrusion. Their estimates do not reflect the population densities before European contact. Their usefulness goes only as far as providing a minimum estimate of population density, or at best a reasonable estimate only at the time the observations were made.

Considering the difficulties with these estimates, the method developed by Birdsell (1953), and employed here, provides a more realistic pre-contact population estimate for the Riverland. As discussed above, it has as its basis the most vital life-sustaining element in any environment - the amount of available freshwater. Above all else it is the year round access to surface water that determines, in terms of human needs, the productivity of any environmental region. Unearned surface water originating in the eastern catchments and flowing through the Murray/Murrumbidgee river systems into the Riverland is the major factor determining the Aboriginal population density. The population density
of the Riverland determined by Birdsell’s equation, after converting the results from imperial to metric measurements, is 0.3 - 0.5 Km² per person, or between 2172 and 3620 people. This is among the highest in Australia, comparable to the high densities of the northern tropical and eastern temperate coasts.
CHAPTER FOUR
Pre-contact Morbidity and Mortality on the Great Bend

For most of its history the continent of Sahul (Australia and New Guinea) has been isolated from the rest of the world. It drifted away from the great southern land mass of Gondwanaland some 90 million years ago and its flora and fauna subsequently evolved in isolation into highly distinctive forms. Consequently the unique Australian wildlife has developed largely with its own suite of pathogens.

Humans first arrived in Australia at least as early as 50,000 B.P., migrating from the Asian continent. Entering northern Australia, the succession of human arrivals must have brought with them most of the endemic Asian pathogens and parasites that could be transmitted directly person to person. They would have left behind those that required vectors found only in their homelands, or those failing to adapt to the new environments, or to new vectors.

They would also have encountered new infections in Australia. The animals already established on the continent, for millions of years, would have had numerous forms of viruses, intestinal pathogens and parasitic helminths some of which could be readily transmissible, and able to adapt to the physiology of the new human host. These pathogens would have been few at first because, until
the arrival of humans, there had been no co-evolution
between zoonotic pathogens and primate species in Sahul.

As the humans moved across the continent and eventually
arrived in the Riverland, they would have encountered
differing climates and environments as the latitudes
increased. In each, the animals and their infections would
have differed as would the zoonotic infections acquired by
the humans. The Sahul pathogens and zoonoses would have
infected the newly arriving humans but would not have
necessarily produced symptoms recognized as illness. Others
would have at times affected their health and lessened their
strength and resilience. Occasionally, low grade
infestations and infections would have flared up into fatal
complications whenever serious injury or other severe stress
upset the human host's homoeostasis. These would however,
have been restricted mainly to the individual and
particularly the very old and the very young.

4.1 Disease in Hunter-Gatherer Societies - Jirawirung and
Ngawait.

4.1.1 Non-infectious disease.

Chronic degenerative diseases would have contributed only
a small proportion of morbidity among the Murray River
populations due mainly to shorter longevity (Prokopec 1979:
17) and lack of associated environmental risk factors in the
peoples' lives. Some of these disorders like
cardiovascular, cerebrovascular, renal disease and malignant
neoplasms, which have reached epidemic proportions in many
modern western societies, were virtually absent from hunter-gather and tribal societies (Polunin 1977:17).

Genetic disorders and congenital anomalies, which attain high frequencies in isolated communities, would also have been rare. The high population density of the Riverland was matched in other centres along the Murray River, namely the Lower Murray and Lakes regions downstream (Leubbers 1981) and in the Lake Victoria region upstream (Webb 1984). Constant genetic flow between these populations, and indeed along the majority of the Murray corridor (Pardoe 1984: 197), might well have reduced many of the potentially deleterious alleles from the Murray genome. Infanticide would also have accounted for a low incidence of recognized genetic defects in children from these populations.

Given the wide ranging and seasonable reliability of edible flora and fauna, diseases related to a nutritionally poor or inadequate diet were unlikely to have been a major factor among the Jirawirung and Ngawait. Prolonged droughts would have periodically limited some of the food resources available to them and caused passing dietary related stress, particularly in infants. More pressure may have come from migration to the river valley from the tribes occupying the arid mallee areas to the north and south during such droughts (Gerstaecker 1853: 437), but within an individual's lifetime, periods of prolonged hunger would have been few if any.
As part of a continent-wide survey of prehistoric pathology Webb (1984, 1989) examined a skeletal sample from the Rufus River and Lake Victoria region. The sample was drawn from the Murray Black Collection, most of which is poorly provenanced and undated. The region was occupied by the Ngintait and Maraura tribes (Tindale 1974) and is approximately 50Km upstream from the Jirawirung boundary. Lake Victoria, a large ephemeral lake, is fed by a small creek running from the main channel of the Murray River. The wetland environment and range of edible species is similar to the Riverland, although not as extensive.

Webb examined the skeletal material for pathologic indicators of dietary stress, namely cribra orbitalia, an indication of anaemia, particularly iron deficiency anaemia (Webb 1982: 148), and enamel hypoplasia, a developmental defect of the forming tooth enamel thought to be caused by a variety of metabolic disturbances during childhood (Hillson 1986: 131). The frequency of cribra orbitalia, over 60% in juveniles and 25% in adults, in the Rufus population was high compared with other southern and coastal samples (Webb 1984: 36). These frequencies are more characteristic of populations leading a crowded, sedentary lifestyle under nutritional stress than of those usually found in hunter-gatherer communities (Goodman et al. 1983).

The frequencies of enamel hypoplasia in the Rufus sample present a different picture. They were among the lowest in the survey. Males showed a frequency of 25% and females 15%
compared with a continental average of 40% and 28.5% respectively (Webb 1984: 57-58). The hypoplasia results, taken on their own at face value, would indicate that the Rufus children were under much less dietary stress compared to the rest of the Australian samples.

The frequencies of cribra and enamel hypoplasia appear at first to be in conflict. Comprehension of the aetiology of cribra, however, is not clear-cut. Anaemia can be caused by any of several conditions related to environmental, social and/or pathological factors resulting in disruption to homeostasis (Robbins 1967: 322-342). In fact, differing and altogether unrelated factors over an unknown period of time may be responsible for this condition and its high frequency in the Rufus people. Webb concluded that although there was a high incidence of this pathology, especially in the infants, the recovery rate was high and subsequent survival into adulthood was good.

Examination of the same pathological markers among the skeletal samples from the Riverland as a part of this current project, revealed two individuals in a sample of 37 with cribra orbitalia lesions. An infant (1 to 2 years old - A20608) had porotic cribra consistent with category two defined by Webb (1982: 148-149). Clusterings of small foramina covered an area of up to two thirds of both orbits with the densest areas towards their centre. Shallow channelling connecting foramina in the centre of each orbit was observed under magnification (x10). No indication of
healing was apparent. A second individual, an adult female (A20603), showed category one cribra (the mildest form) in both orbits with indications of healing.

One individual, an adult male (A57899), showed one hypoplasia lesion on the upper right first incisor and two lesions on the upper left incisor. No other teeth were involved. The distance from the cemento-enamel junction to the hypoplasia lines was measured on each tooth and an age range at which the metabolic disruption occurred was estimated at between 2 to 2.5 years of age (Goodman et al. 1980: 520).

The nature of the Riverland sample enables no specific conclusions regarding dietary deficiencies of the Jirawirung and Ngawait to be made. The two cases of cribra orbitalia and the single case of enamel hypoplasia do suggest that dietary stress and homeostasis disruption during early childhood occurred among the Jirawirung and Ngawait. The infant (A20608) may have died as a result of the same systemic disruption that caused the cribra orbitalia lesions. The rate of survival of the adolescents to adulthood is unknown.

Webb also found a high rate of trauma among the Murray River populations (ibid: 186). Thirty per cent of crania examined from the Murray River had depressed fractures inflicted by heavy blunt weapons which he attributed to domestic violence. The pattern of the fractures was
identical for both men and women. The majority of the lesions were to the frontal bone and left parietal indicating a blow delivered from the front by a right-handed person. Attacks from behind, damaging the right parietal and occipital, were rare. Violent attacks appear to have been equally common to both sexes. The pattern of frontal trauma would appear to be linked with direct aggressive, hand to hand intergroup confrontation involving both sexes and occurring frequently. A predominance of parrying fractures (fractures involving the radius and ulna sustained in warding off blows to the head) in the Rufus males also supports the impression of frequent violent confrontations along the Murray (see also Prokopec 1979: 21 for Lower Murray).

In the Riverland sample one adult female cranium (A57897) showed evidence of similar violence. This individual has two healed depressed fracture lesions on the superior-posterior regions of the left and right parietals. Both lesions are ovoid in shape and are consistent with a blow from behind by a sword-shaped fighting club or digging stick typical of those used by the Murray Aborigines (South Australian Museum 1989: 24-25). No internal fracturing of the cranial table was detected. Localised periostitis around the wound on the right parietal suggests minor inflammation of the scalp occurred in association with the trauma. The fact that both fractures had healed indicates that the blows to this female had not been fatal. Violence of this type involving women may have been a result of
intra-group fighting rather than conflict between rival tribes.

A skeleton of a young female (A57745) showed more evidence of trauma. A partially uncovered skeleton in a shallow grave was discovered on Sugarloaf Hill (Chamber’s Creek) in 1970 by two campers. It was reported to the South Australian Museum and a rescue excavation was organized. The body had been buried in a prone position with the knees flexed. The head and neck had been severed at the seventh cervical vertebra. The head had then been placed on the back of the body on its right side, overlying the middle thoracic vertebra. The articulated cervical column had then been lain at right angles to the first thoracic vertebrae forming a 'T' with the remainder of the vertebral column. The radius and ulna of both arms had also been severed but were not placed with the body. The bones of the left hand were in articulation, but had been placed against the distal articular surface of the left humerus. The hand was palm uppermost with the phalanges pointing distally. The carpal bones of the right hand had been placed underneath the distal end of the right humerus with the phalanges orientated in a superior aspect and at an angle of 45 degrees to the shaft of the humerus (Chilman & Chilman 1970; The Murray Pioneer March 5th 1970). Whether death occurred at or before decapitation can not be determined.

The nature of the remains suggests that the body, either alive or dead, had fallen face-downwards, the head and neck
severed and then placed in position. The severing of the lower arms may have been done before or after death. The hands were then placed in position next to the remains of the upper arm. The lower arms were disposed of separately. The body was then buried where it laid.

Violent deaths would have had a profound demographic effect on the Murray tribes. Not only were many males dying from violent confrontations but equally so were women. Although the death of males does of course reduce the population, the long-term demographic effect of their deaths is not severe (particularly in a society that practices polygyny). What is important in terms of population numbers is the amount of violent acts involving women. A high loss of women from any population reduces the future birth rate (as well as adding to the present death rate) and acts as a restraint to population growth.

4.1.2 Infectious disease.

The epidemiology of infectious diseases in pre-agricultural tribal societies has been frequently discussed (Cockburn 1971; McNeill 1976; Black 1980; Fenner 1980). Black (1980: 42-54) classified pathogenic agents on the basis of their epidemiology in hunter-gatherer societies into three groupings: Group I epidemic diseases; Group II endemic diseases and Group III the zoonoses. Table 4.1 presents the diseases that were likely to have existed among the Jirawirung and Ngawait within these groups.
Group I diseases, the epidemics, occur mainly in high density sedentary populations, in sharp, temporally limited outbreaks, and were generally absent in pre-contact Aboriginal Australia. The following chapter deals in detail with this group.

Endemic or exogenous diseases are those that persist in a population over a long period of time and infect, at one time or another, a high percentage of the population. The causative organisms maintain themselves in either human or non-human host reservoirs. Such infections tend to survive well in hunter-gather populations because they are well adapted to their human host’s physiology and confer a low case/fatality rate within the host population.

### Table 4.1 Epidemiological classification of infectious agents and diseases present, or likely to have been present, in Jirawirung and Ngawait people pre and post-contact (After Black 1980: 48).

<table>
<thead>
<tr>
<th>Group I Epidemic</th>
<th>Group II Endemic</th>
<th>Group III Zoonosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent or occurring in sharp temporally limited outbreaks</td>
<td>Many persons in small communities infected at early ages</td>
<td>Infection dependent on contact with non-human reservoir</td>
</tr>
</tbody>
</table>

- Influenza
- Smallpox
- Tuberculosis
- Poliomyelitis
- Syphilis
- Gonorrhea
- Respiratory
- Measles
- Mumps
- (?) HSV1
- (?) EBV
- Varicella-zoster
- Hepatitis B
- (?) Yaws
- E. coli
- Trachoma
- Trichuris spp.
- Ascaris spp
- Strongyloides spp.
- Enterobius spp
- Streptococci spp.
- Salmonellosis
- Botulism
- Group A Arbovirus
- Group B Arbovirus
- Psittacosis
- Dermatophilosis
- Tinea
- Leptospirosis
- (?) Q Fever
- (?) Hydatids
- Tick Typhus

Group I diseases, the epidemics, occur mainly in high density sedentary populations, in sharp, temporally limited outbreaks, and were generally absent in pre-contact Aboriginal Australia. The following chapter deals in detail with this group.
Zoonoses or exogenous diseases are those which are symptomatic within non-human hosts and which can be transmitted to humans under natural conditions. Most of the present infections and parasitic diseases of humans have originated in animals (Van der Hoeden 1964: 1). The effects produced in humans are mainly determined by the invasive capacity of the pathogen, the human host’s relationship with the animal host and the effectiveness of the humans’ immune system against the pathogen. Several zoonoses can be equally harmful to humans and animals. Others may severely affect human homeostasis but rarely, or only slightly, impair the health of animals, while others have the reverse effects in respect to the human and non-human hosts (Van der Hoeden 1964: 2).

The epidemiology and mortality of infectious diseases and their effects on the demography of hunter-gatherer societies are inextricably linked to their social systems and the ecosystem in which they exist. Many of the diseases of Groups II and III, on their own, or collectively, would have contributed to mortality among the Jirawirung and Ngawait mainly to the very young and the elderly. Only under exceptional circumstances, if ever, would they have reached epidemic proportions and caused widespread mortality among the population. Their effect can be generalized in terms of the ecological diversity of the Murray environment and the social organization of the Jirawirung and Ngawait.
The concept of species diversity has been developed by Odum (1971) and is well known to ecology. Briefly, it relates to the range of species and their relative population densities within a particular environment.

Of the total number of species in a trophic component, or in a community as a whole, a relatively small per cent are usually abundant (represented by large numbers of individuals, a large biomass, productivity or other indication of "importance") and a large per cent are rare (have small "importance" values) (Odum 1971: 148).

The ratio between the number of distinct species and the population levels of each species is referred to as the species diversity index (Odum 1971: 144-145) and can be applied to different ecosystems. For example, the species diversity index in an ecosystem like the semi-arid mallee region of South Australia is low - there are few species of mallee trees but many individuals per species. In the well watered Murray River valley the index is high, with many more species of plants and animals, but relatively fewer individuals.

From the point of view of human infecting pathogens the diversity index must have a profound influence on the epidemiology of infectious diseases. The prevalence, incidence, demographic distribution, effectiveness of pathogen transmission, vector abundance and primary and secondary host abundance are all influenced by the species diversity index (Dunn 1978: 117).
A hostless environment is a dangerous place for a pathogen. In order to survive it must be able to find a favourable environment, usually a living host. To compete with the rigours of natural selection the pathogen must evolve a means of spreading from host to host. Spread can be 'horizontal' in a species. One individual can infect another by close personal contact, airborne transmission or by insect vectors and so on. Alternatively, the spread can be 'vertical', parents infecting their offspring via sperm, ovum, the placenta or the milk (Mims 1982: 3). In all cases it is to the evolutionary advantage of both the infectious agent and the infected host to adapt to each other and achieve a symbiotic or commensal relationship.

In Aboriginal Australia, isolated from the rest of the world for most of its history, human infectious agents were well established. They had generally reached a state of balanced pathogenicity in their hosts and caused minimum damage, compatible with their need to enter, multiply and be discharged from the body. Possible exceptions are the zoonoses which had established a similar balance with their non-human hosts. Their degree of pathogenicity in humans, an alternate host, is of no evolutionary consequence and so they have the potential to cause high mortality among humans. Infectious zoonoses like psittacosis and possibly hydatids (Thompson & Kumaratilake 1982) were, therefore, likely to have been responsible for more deaths than the endemic diseases.
The Jirawirung and Ngawait social system would have had a profound effect upon the epidemiology of infectious diseases. Table 4.2 contrasts this social system with that of modern European society living in the Riverland today by reference to parameters which have a potential to influence the nature and spread of infectious disease patterns. Many of these social characteristics are interrelated but the most important features with respect to the spread of infectious diseases, are the size of the individual communities, their spatial distribution, the number of such communities, the extent of individuals' movements between them (Fenner 1970: 50). All reduce the amount of personal contact within the communities and have a regulatory effect on the transmission of infective pathological agents within and between human communities.
Population Distribution - Lower population density
- Smaller residential/foraging groups
- Wider spatial distribution
- Large group aggregation occurs infrequently
- Greater residential mobility
- Shorter range of individual movements
- More contact with fewer people

Stability - Greater resistance to changes
- Greater vulnerability to external influences

Complexity - Fewer formal roles and occupations
- More rigidity in maintaining social and subsistence roles
- Simpler technology

Ecology - Closer association and adaptations to ecosystem
- Less association with other animal species
- Less degradation of ecosystem

Table 4.2 Major characteristics of the Jirawirung and Ngawait social system (compared to modern Europeans) exerting an influence on the pattern of infectious disease (after Polunin 1977).

4.1.3 Other pathology and anomalies observed in the Riverland


Supernumerary cusps (Carabelli and Protostylid) were present in the dentition of three individuals (A20599, A38866 & A20608). Third molar reduction (pegged) and third molar agenesis occurred with two others (P1 & A20603). A partially open canal on the dorsal surface of the sacrum (spina bifida) occurred in one young adult male (A25897).

b. Dental.

Heavy tooth attrition was a feature of all adult dentitions. This is a frequent finding in most hunter-gatherer populations (Brothwell 1981: 71; Ortner & Putschar
1981: 454) and is particularly severe among Australian Aborigines (Campbell 1925: 64). The heaviest attrition was found on the first molars, the next were the premolars and the second molar. In several individuals (P3, P5, P7, A25897 & A57867) severe attrition had exposed the pulp cavity and resulted in infection. In turn, this led to periapical periodontitis and abscessing of the alveolar bone. Heavy attrition of the molars in two individuals (A25711 & A20607) is associated with malocclusion and arthritis of the glenoid fossa and flattening of the mandibular head.

Caries attacks, not associated with pulp exposure, occurred in six individuals (A20629, A57867, A27600, A20603 A57597 & A57626). Whilst dental caries was certainly present in early human populations, a frequency (16%) such as this found in the Riverland can be considered as unusually high for a hunter-gatherer group living on traditional food sources (Prokopec 1979: 25; Brothwell 1981: 153). This then leads to the conjecture that at least some of the individuals with carious lesions may have been living during the period of European contact and had started to consume cariogenic food items, such as the sugar and flour, which were issued monthly by government outposts along the Murray from the late 1830s.

c. Other anomalies.

Auditory exostoses were observed in one adult female (A20607) and three adult male crania (A910, A984 & A985).
This condition is characterised by distinct bony 'pearls' or irregular masses growing on the wall of the external auditory canal and are located near the lateral end of the bony meatus (Steinbock 1976: 332). Partial, and in some cases, complete occlusion of the auditory canal occurs probably resulting in impairment of hearing. Causes for auditory exostosis have ranged from genetic traits, chronic infection or inflammation of the external acoustic meatus, to persistent exposure to cold water particularly through diving (Kennedy 1986: 402). The latter is likely to be the cause in the Riverland since the exostoses occur in much higher frequencies in the river valleys of southeast Australia, where diving for aquatic food sources is more common than in the arid interior regions (Kennedy 1986: 412).

Table 4.3 is a summary by individual of bone and teeth anomalies observed among the sample. Twenty four out of a total of thirty seven individuals examined showed signs of osteological and/or enamel anomalies. At first glance this seems excessive and could lead the unwary to jump to the conclusion that there was something seriously wrong with the medical state of the Jirawirung and Ngawait. Closer examination however, reveals that most of the anomalies (with the exception of course of treponemia and perhaps enamel hypoplasia) are not significant to a low state of health. The genetic abnormalities of the teeth would hardly
<table>
<thead>
<tr>
<th>Number</th>
<th>Sex</th>
<th>Age</th>
<th>Anomaly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A910</td>
<td>M</td>
<td>Adult</td>
<td>Auditory exostoses</td>
</tr>
<tr>
<td>A911</td>
<td>M</td>
<td>Adult</td>
<td>Treponemia (see text); enamel hypoplasia</td>
</tr>
<tr>
<td>A984</td>
<td>M</td>
<td>Adult</td>
<td>Auditory exostoses</td>
</tr>
<tr>
<td>A985</td>
<td>M</td>
<td>Adult</td>
<td>Auditory exostoses</td>
</tr>
<tr>
<td>A987</td>
<td>M</td>
<td>Adult</td>
<td>Auditory exostoses</td>
</tr>
<tr>
<td>A20599</td>
<td>M</td>
<td>Adult</td>
<td>Protostylid</td>
</tr>
<tr>
<td>A20600</td>
<td>F</td>
<td>Subadult</td>
<td>Dental caries; antemortem loss of lower first molars; Carabelli’s cusp; Protostylid cusp; enamel malformation of upper first molars</td>
</tr>
<tr>
<td>A20603</td>
<td>F</td>
<td>Adult</td>
<td>Caries; Pegged lower right fourth molar</td>
</tr>
<tr>
<td>A20607</td>
<td>F?</td>
<td>Adult</td>
<td>Auditory exostoses; temporomandibular arthritis</td>
</tr>
<tr>
<td>A20619</td>
<td>M</td>
<td>Adult</td>
<td>Caries</td>
</tr>
<tr>
<td>A25711</td>
<td>F</td>
<td>Adult</td>
<td>Periapical abscess</td>
</tr>
<tr>
<td>A25897</td>
<td>M</td>
<td>Subadult</td>
<td>Caries; periapical abscess; ante-mortem loss of right maxillary premolars and first molar; spina bifida occulta</td>
</tr>
<tr>
<td>A38866</td>
<td>M</td>
<td>Subadult</td>
<td>Protostylid</td>
</tr>
<tr>
<td>A57597</td>
<td>F</td>
<td>Adult</td>
<td>Caries</td>
</tr>
<tr>
<td>A57626</td>
<td>M?</td>
<td>Adult</td>
<td>Caries</td>
</tr>
<tr>
<td>A57745</td>
<td>F</td>
<td>Subadult</td>
<td>Traumatised (see text)</td>
</tr>
<tr>
<td>A57867</td>
<td>F</td>
<td>Adult</td>
<td>Caries; periapical abscess</td>
</tr>
<tr>
<td>A57897</td>
<td>F</td>
<td>Adult</td>
<td>Traumatised (see text)</td>
</tr>
<tr>
<td>A57899</td>
<td>M</td>
<td>Adult</td>
<td>Enamel hypoplasia</td>
</tr>
<tr>
<td>P1</td>
<td>F</td>
<td>Adult</td>
<td>Agenisis and pegged molars</td>
</tr>
<tr>
<td>P3</td>
<td>F</td>
<td>Adult</td>
<td>Antemortem tooth loss</td>
</tr>
<tr>
<td>P4</td>
<td>M</td>
<td>Adult</td>
<td>Treponemia (see text)</td>
</tr>
<tr>
<td>P5</td>
<td>M</td>
<td>Adult</td>
<td>Caries; periapical abscess</td>
</tr>
<tr>
<td>P7</td>
<td>M</td>
<td>Adult</td>
<td>Periapical abscess</td>
</tr>
</tbody>
</table>

Table 4.3 Pathological and congenital bone and enamel anomalies observed in Jirawirung and Ngawait skeletal sample from the Riverland of South Australia.

be noticed by the individuals in the course of their daily activities. Excessive enamel attrition, periapical abcessing and associated tooth loss are to be expected in hunter-gatherer populations who place a high biomechanical stress on their dentition from using their teeth to prepare fibrous vegetable plants for cordage (e.g. fishing nets, dilly bags), finish stone and wooden tool edges, and
masticate fibrous and often gritty foods. The resulting tooth loss and perhaps associated temporomandibular arthritis are therefore a common feature of advancing old age.

For the period of their occupancy, the Jirawirung and Ngawait people had adapted to the riverine environment of the Riverland. The means for this adaptation had its roots deep within the social and biological past of the ancestral human societies from which they came. In all, a very good state of health can be implied. They were largely free from non-infectious diseases and lived in a state of balance with infectious pathogens. Table 4.4 summarises a hypothetical pattern of group II and III diseases among the Jirawirung and Ngawait.

The next chapters are concerned with the sudden changes that occurred in the Riverland with the arrival of a foreign culture together with its exotic pathogens and the destruction caused to the Jirawirung and Ngawait.
Riverland Ecosystem - High species diversity index

* Many species of plants and animals
* Few individuals per species
* Many species of parasitic and infectious organisms in humans and other animals - low level of contact
* Many species of potential vectors and primary/intermediate hosts for pathogens - low intensity of infection
* Sexual infections: many kinds due to many species of organisms - low intensity of infection - low worm burden
* Asexual infections: many kinds due to many species - low prevalence
* Direct asexual infections producing good partial or permanent immunity: appearing in human population at long intervals
* Direct asexual infections producing little or no immunity: low prevalence
* Genetic disorders: low prevalence
* Chronic degenerative diseases: low prevalence
* Dietary stress: High prevalence in infants but a high rate of recovery
* High prevalence of trauma and death associated with conflict
* Predation: many species of venomous and noxious reptiles - and arthropods but low incidence of bites

Table 4.4 Hypothetical pattern of pathology in Jirawirung and Ngawait populations of the Riverland region, South Australia (after Dunn 1978).
Under any circumstances, however, they have but little respite from inconvenience and want (Eyre 1845).

Wherever the European had trod, death seems to pursue the aboriginal. We may look to the wide extent of the Americas, Polynesia, the Cape of Good Hope, and Australia, and we find the same result (Darwin 1829).
CHAPTER FIVE

Pathological Contact - The Epidemics

...AN ENGLISHMAN IS A CURSE TO THE ABORIGINES OF ANY COUNTRY.
(Brock 1844)

In this and the following chapters I have viewed the process of contact between the Jirawirung and Ngawait and the European colonists in two stages. Face to face contact between the two societies began with the arrival of Captain Charles Sturt and his expedition in the summer of 1830 and continued later after the colony of South Australia was established. However, before the arrival of the first colonists in South Australia the Jirawirung and Ngawait experienced a contact with Europe of a more remote and different nature. This is the subject matter of this chapter.

Certain pathogens that had been a part of European society for centuries were foreign to the populations of Aboriginal Australia. They arrived with the first colonists who settled on the east coast but spread throughout many of the Aboriginal populations of Australia at a speed far greater than that of pastoral expansion. Their spread was in the form of highly contagious epidemics (group I diseases) that had previously been unknown in the hunter-gatherer societies along the Murray, and their results were lethal. The first pathogens preceeded the arrival of the Europeans in the Riverland and persisted throughout the phases of pastoral expansion and settlement. Their effect was to disrupt profoundly and permanently the social and biological
adaptations that the Jirawirung and Ngawait had developed over the thousands of years of their occupation of the Riverland. Venereal diseases and smallpox were the first of these transoceanic pathogens to arrive in epidemic form in the Riverland. They were to be followed later by epidemics of respiratory, intestinal and helminthic diseases.

5.1 Syphilis

Syphilis is a complex venereal disease of humans caused by the spirochete *Treponema pallidum*. Other closely related spirochetes which infect humans through non-venereal means are *T. pertenue*, believed to be the causative agent of yaws, and *T. carateum* which causes pinta. Despite extensive biological, chemical and immunological studies, however, the differences between the three spirochetes (if indeed there are differences) remain unknown. They are generally believed to be the separate aetiological agents for the treponemal diseases exhibiting different clinical features in the host and having different modes of transmission (Hackett 1978). This view is by no means unanimous (Hudson 1963, 1965; Baker & Armelagos 1988).

Syphilis first appeared in epidemic form in Europe in the 15th century in the army which the French King, Charles VIII, led against Naples (McNeill 1979: 202). After the dispersal of the army, the disease spread far and wide throughout Europe and beyond. A pandemic known as the Great
Pox ravaged Europe and was present in India, China and Japan by the first decade of the 16th century.

The origin of the disease has been debated for many years (for a comprehensive review of its antiquity see Baker & Armelagos 1988). The arguments basically come down to whether the disease was imported into Europe from the New World by the sailors of Christopher Colombus, or whether the spirochete was endemic to Europe and changed character as a result of urban growth and migration. Which ever was the case, the disease in its epidemic form was considered to be a new disease in Europe after the return of Colombus and was well established among most of the urban and rural population of Europe by the seventeenth century.

Its entry into Australia is less speculative. There seems little doubt *T. pallidum* was brought to Southeastern Australia by European (predominately Anglo-Celtic) migrants and convicts. The disease may also have been introduced along the northern coast by Maccassan trepang traders (Basedow 1932: 10). Collins observed its presence among the Aboriginal communities in and around the Port Jackson settlement as early as 1789 (Collins 1789).

5.1.1 Treponemal disease in the Riverland.

All the Riverland crania and postcranial specimens were examined for evidence of treponemal disease. Diagnosis was determined using Hackett's (1976) sequence of diagnostic criteria for treponematoses in dry bones. These criteria
make it possible to differentiate treponemal lesions in bone from other similar pathologically derived lesions (e.g. metastatic neoplasm and tuberculosis) and those caused by post-mortem damage (pseudopathology). They are not able to distinguish between the clinical forms of treponemal disease and therefore, positive diagnoses between venereal syphilis, endemic (non-venereal) syphilis and yaws was (and still is) not possible.

No evidence of syphilitic sequestra (e.g. periostitis, osteoperiostitis or gummatous osteomyelitis) was observed in the postcranial material.

Two adult male crania (A911 & P4) were diagnosed as infected by treponema. Infection of A911 involved the frontal and right parietal bones (Plates 5.1, 5.2 & 5.3). Located above the lateral margin of the right orbit is an irregular centre of serpiginous cavitation (caries sicca sequence 6, Hackett 1976: 42) involving the rim of the orbit and extending obliquely towards the midline for a distance of 4cm. The lower margin of the cavity has a sharp edge and the upper margins are slightly raised and rounded. The walls of the cavity are concave and the diploe and inner table have been perforated. No indication of bone remodelling was observed. Further up the frontal bone two further centres of cavitation have united to form a crescent shaped region (4 x 1cm) with sharp edges and concave walls. Three shallow circular depressions (sequence 4 to 5) form a line parallel to the coronal suture. The centre of the
PLATE 5.1

A911, adult male cranium with syphilis, anterior aspect.

Two large cavitation centres of caries sicca and sclerotic bone caused by syphilitic gummata are visible on the frontal. One (caries sicca sequence 6) extends from the rim of the right orbit towards the midline and a second crescent-shaped confluence of two centres of cavitation (sequence 6) extends from the midline towards the left zygomatic arch. Other centres (sequence 4 to 5) are visible on the left and right parietals near the coronal suture. Gummatous destruction begins on the external surface of the calvarium and is caused by infection extending from the soft tissues of the pericranium. The frontal bone is frequently the first bone involved.

PLATE 5.2

A911, adult male cranium with syphilis, right lateral aspect.

Note the deep and extensive bone erosion and resorption (caries sicca sequence 6) on the inferior-posterior section of the right parietal caused by syphilis. Destruction of the diploe within each centre has resulted in perforation of the entire thickness of the calvarium.
PLATE 5.3

A911, adult male with syphilis, left lateral aspect.

Syphilitic lesions are visible on the frontal bone (see Plate 5.1). Erosion of the cranial vault by gummata has spread from the infected area lower down on the frontal bone forming two centres of erosion near the coronal suture. The lesion nearest the midline equates to caries sicca sequence 4 and the one lower down, bordering the coronal suture, equates to sequence. Destruction of the diploe has began to occur but neither centre has penetrated to the inner table of the calvarium.

PLATE 5.4

P4, adult male cranium with syphilis, superior aspect.

Note the large cavitation centre (caries sicca sequence 3) on the parietal below bregma and two smaller centres (caries sicca sequence 3) on each parietal bordering the saggital suture. Two opposing biological processes have been occurring. Gummatous infection has eroded the calvarium and has began to attack the diploe. While this destructive process has been occurring in the depressions, a regenerative process has taken place around the circumference laying down new bone.
three has a sharp, ridged margin and is deeper with radial scarring beginning. The two other depressions have less defined and flattened margins. No thickening of the inner surface of the frontal was noted below the depressions nor were there any other changes to this surface. Parietal involvement in this individual was more severe. Two shallow depressions, similar to those on the frontal, and at the same stage of development (sequence 4 to 5), are located on the superior-anterior aspect of the right parietal between bregma and vertex forming a line at right angles to the sagittal suture. The more medial depression borders, but does not cross, the suture line. Both depressions have flattened rims. No radial scarring or inner table involvement was observed. On the posterior half of the right parietal a confluence of clustered pits leading into serpiginous castrations has resulted in bone destruction and perforation of the diploe and inner cranial surface in four distinct places (sequence 6). The upper table edges of the cavities are sharp with sloping sides leading down to the perforations of the inner table the edges of which are also sharp. Another similar series of five castrations has penetrated the dorsal half of the parietal resulting in considerable bone destruction. Clustered pits (sequence 1) surround the areas of penetration.

Cranium P4 has a series of at least five superficial cavitation foci (sequence 3) involving the frontal and parietal bones (Plate 5.4). Each lesion appears as an irregular shallow pit, the inner edges of which have been
rounded and smoothed by a border of sclerotic build-up. The base of each is the cancellous tissue of the diploe. No changes to the inner table of the cranium were observed. Other regions of the cranium show signs of previous bone disturbance followed by healing resulting in irregular thickening and bulges on the ectocranial surface.

5.1.2 Yaws, or venereal syphilis?

Yaws is a highly contagious, non-venereal disease flourishing in the hot, humid lowlands of Africa, Asia, Central America (Cahill 1975: 160), New Guinea (Kranendonk 1958) and northern Australia (Hackett 1976: 16). It is customarily spread by touch-contact among children, or in some cases from an infected infant to its mother, but is not congenital (Robbins 1967: 306). It is characterized by an initial cutaneous ulcer, particularly in moist areas of the skin. This is followed by wide-spread non-destructive secondary ulcers. A rare third phase of yaws, which may develop within five years of initial infection, involves destruction of both skin and bone and produces permanent damage. Children are most likely to contract the disease at an early age if the disease is locally prevalent and experience the first two phases. Recovery then is usually spontaneous and a solid immunity to further infection is acquired. Internal organs are not involved (Robbins 1967: 306; Cahil 1975: 160-164).

Hudson (1963) and Hackett (1976) recognize another form of non-venereal treponematosis as endemic syphilis (non-
venereal syphilis or treponarid). This form of the disease is transmitted in a similar manner to yaws primarily among children. Hackett (1976: 16, 104) limits its range to the desert regions of Central Australia. Apart from primary lesions rarely being manifested in endemic syphilis, its aetiology is similar to that of yaws.

Venereal syphilis, on the other hand, is transmitted by sexually active adults and is also congenital. The disease has three stages which are related to the time of initial infection (Youmans et al. 1980: 482-484). A primary ulcer (chancre) develops at the site of entry of the spirochete, usually perigenital, during the first two to four weeks following infection and lasts for between ten to fourteen days before healing spontaneously. The second stage of syphilis begins from two to four weeks later when localised or general mucocutaneous eruptions appear. The disease then enters a latent period of some years with no outward clinical signs. If untreated by this stage tertiary syphilis develops involving destruction of the cardiovasucular, central nervous, and musculoskeletal systems, and gummas (large necrotic granulomas) may develop at any point in the body. During the tertiary stage blindness and insanity often result together with a slow deterioration of homeostatic processes eventually leading to death.

Treponemal lesions in Aboriginal crania have been diagnosed in museum samples from most areas of Australia
(Hackett 1976: 26-102; Webb 1989: 74-98). In a continent-wide survey of paleopathology, Webb (1984; 1989) found that the highest prevalence of treponemal disease was among the Murray Valley populations. The prevalence of the disease in the Riverland samples of this study are compared with the results for the collections studied by Webb (Table 5.1).

<table>
<thead>
<tr>
<th>Area/Region</th>
<th>n</th>
<th>No. infected</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverland</td>
<td>37</td>
<td>2</td>
<td>5.4</td>
</tr>
<tr>
<td>Rufus River</td>
<td>205</td>
<td>13</td>
<td>6.3</td>
</tr>
<tr>
<td>Central Murray</td>
<td>398</td>
<td>32</td>
<td>8.0</td>
</tr>
<tr>
<td>East Coast</td>
<td>219</td>
<td>4</td>
<td>1.8</td>
</tr>
<tr>
<td>South Coast</td>
<td>261</td>
<td>7</td>
<td>2.7</td>
</tr>
<tr>
<td>Central Desert</td>
<td>183</td>
<td>9</td>
<td>4.9</td>
</tr>
<tr>
<td>Tropical North</td>
<td>154</td>
<td>4</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Table 5.1 Cranial Treponemal infection (male & female) by area in Australia (after Webb 1989: T20).

While it has been established that treponematosis was certainly present among the Murray River tribes, it cannot be determined just which disease it is. Is it yaws, endemic among the populations for a considerable period of time, or are we looking at the victims of an introduced epidemic of venereal syphilis in a virgin-soil population? There are two ways of trying to answer these questions. The most satisfying way would be to date using radiocarbon some of the crania or postcranial material diagnosed as treponemal. This would then lead into establishing the extent and prevalence of treponemal disease in pre- and post-contact Australia. So far this has not been done. The method is destructive and custodians are understandably reluctant to sacrifice valuable skeletal material for this cause.
Although less satisfactory, a second way is to examine the historical accounts of diseases seen among the Murray Aborigines by some of the first explorers and settlers. This evidence is equivocal and often confusing as many of the accounts of disease were made by those who had no medical qualifications. Nevertheless, many would have been familiar with the disease, having observed the clinical manifestations of syphilis in Europe as well as among colonists and convicts in Australia. Their accounts are worth due consideration.

In 1830 Sturt reported on the presence of a disease that was most likely an epidemic of syphilis among the Aborigines he saw along the Murray River. Upstream from the Murray-Darling junction a group of 35 Aborigines joined his camp one evening. Sturt states

The most loathsome diseases prevailed among them. Several were disabled by leprosy, or some similar disorder and two or three had entirely lost their sight (Sturt 1833: 96).

Near the Rufus River junction Sturt was again struck by the prevalence of disease

The most loathsome of diseases prevailed throughout the tribes, nor were the youngest infants exempt from them. Indeed, so young were some, whose condition was truly disgusting, that I cannot but suppose they must have been born in a state of disease; but I am uncertain whether it is fatal or not in its results, though, most probably it hurries many to a premature grave. How these diseases originated it is impossible to say. Certainly not from the colony, since the midland tribes alone were infected. Syphilis raged amongst them with fearful violence; many had lost their noses, and all glandular parts were considerably affected. I
distributed some Turner's cerate to the women, but left Fraser to superintend its application. It could do no good, of course, but it convinced the natives we intended well towards them, and, on that account, it was politic to give it, setting aside any humane feeling (ibid: 125).

His observations were the same when he entered the Riverland and saw the prevalence of disease among the Jirawirung and Ngawait. He saw over 200 men, women and children about whom he states

Their sameness of appearance, the disgusting diseases that raged among them, their abominable filth ... all combined to estrange us from these people, and to make their presence disagreeable (ibid: 131).

Sturt and his party continued to observe the presence of this same state of disease among the Aborigines after they passed the North West Bend and approached the mouth of the Murray River. Finally he comments on the tribes of the Lower Murray

It would disgust my readers were I to describe the miserable state of disease and infirmity to which these tribes were reduced. Leprosy of the most loathsome description, the most violent cutaneous eruptions, and glandular affections, absolutely raged through the whole of them...(ibid: 148).

Sturt's descriptions are those of a lay person with no formal medical education or practice. His use of the terms 'syphilis' and 'leprosy' are in themselves no firm indicator that either of these diseases existed among the tribes he saw. Sturt was shocked at the state of disease he encountered and has undoubtedly deliberately refrained from any attempt to describe them in more detail. In these
Victorian times venereal diseases were seen by many as evidence of a degenerate life style and so open to moral condemnation. The 'disgusting' and 'loathsome' diseases referred to by Sturt may well then mean syphilis. Nevertheless, he was a careful observer and if we look at the descriptions he did make in an aetiological and epidemiological context, several points emerge which indicate an epidemic of some introduced disease was raging among the Murray River populations. This disease was most likely to have been venereal syphilis.

- The infected people Sturt saw were living in a region far removed from any European settlements in a land that was largely unexplored.
- The disease (or diseases) he observed were spread between a point upstream of the Murray-Darling junction (between the towns of Robinvale and Mildura) and the mouth of the Murray at Lake Alexandrina.
- Population centres east of the former point were free of the infection.
- By Sturt's implication the prevalence of the infection was high among the groups he saw.
- Both sexes and all age groups (infants, adolescents, adults and elderly) were infected.
- Infection was severe among all ages.
- Infection may have been congenital in some cases.
- Areas of the body involved were: integument tissue over most of the body, soft tissue and bone of the nasal region.
Blindness resulted in some cases.

The generalised depiction of the Murray populations given by Sturt when he passed among them leaves little doubt that their state of health was very poor. I contend that the disease that he observed was an epidemic of venereal syphilis and not yaws for the following reasons:

1. The temperate climate of the Riverland is not suitable for endemic yaws. The yaws treponema is a fragile organism outside of its host, highly intolerant of climatic changes particularly heat, cold or lowered humidity. The optimum environment for the organism and the disease to become endemic in human populations is the humid equatorial, lowland rainforests where all months have a mean temperature exceeding 18°C and a rainfall exceeding 65mm (Pirie 1972: 188). The contemporary world-wide distribution of yaws is restricted to equatorial climates and is not present in temperate regions. There is no firm evidence that it existed along the Murray River before or after European contact (Basedow 1932: 13; Cleland 1928: 141). Yaws certainly appears to have been common until recent times in Australian Aboriginal populations but its distribution is restricted to the tropical zone. Long standing endemicity of the disease has been noted by Cleland (1928: 144) in tropical northern Australia, by Hackett (1936) among the Aranda of northern central Australia, and by Basedow (1932) in the Kimberley region of Western Australia.
2. The diseased state of the Aborigines along the middle and lower Murray River described by Sturt is indicative of an epidemic of venereal syphilis actively spreading through virgin-soil populations. Sturt does not mention its presence among the population of the upper Murray. The infection is not limited mainly to children, as would be the case in yaws, but appears to be spread among all age groups and in various stages of advancement. The disease is in its tertiary stage (rare in yaws) in many of the individuals who are suffering from severe bone destruction particularly in the nasal region as well as destructive involvement to the eyes resulting in blindness.

3. There is as yet no firm evidence of yaws or endemic syphilis in River Murray skeletal material conclusively dated before European contact. Crania excavated from several burial sites in the Murray Valley between Mildura and Renmark and Lake Victoria (Blackwood & Simpson 1973) showed no changes attributable to treponemal disease (Sandison 1973: 173). The antiquity of the burials ranged between 4000 and 6000 BP (dated on organic content of the bone and charcoal intimately associated with one burial).

Prokopec (1979) made no mention of treponemal lesions in 120 skeletons examined from the Roonka Flat burial site on the Lower Murray, the horizons of which are dated from 18,000 BP to recent (Pretty 1977: 297-319).
In a recent reexamination of the Roonka material \((n = 144)\) Pretty and Kricun (1989) observed periostitis, osteitis, osteoperiostitis and chronic osteomyelitis in postcranial bones of six individuals and cranial lesions in one individual from the Roonka III horizon dated between 4000 and 220 BP. The most likely etiology given by them was either yaws or endemic (non-venereal) syphilis. All these postcranial osseous changes however, can be grouped together as nonspecific infections caused by various kinds of pathogenic microorganisms (e.g. *Staphylococcus* sp.) reacting with the bone (Steinbock 1976: 60) and are not peculiarities attributed only to treponemal infection. The main bones infected were the longbones of the arms and legs all of which are susceptible to non-specific hematogenous osteomyelitis caused by primary and/or secondary infection. The single case of cranial lesions diagnosed as yaws is not described by the authors nor has this individual been firmly dated. While treponemal infection can be given as one cause of these osseous changes it is by no means the only cause. The authors have not attempted any discussion on differential diagnoses. Therefore, I remain unconvinced that yaws or non-venereal syphilis is the etiological agent.

4. A considerable degree of immunity to venereal syphilis is acquired in regions where yaws and non-venereal syphilis are endemic (Garruto 1981: 561). Until yaws was largely eradicated in many Pacific Island populations as a result of concentrated medical campaigns, venereal syphilis was virtually unknown even after close contact between the
aboriginal populations and Europeans had been well established (Pirie 1972: 192). If treponemal infection had been present along the Murray before European contact we would expect to see a low prevalence and incidence of venereal syphilis among the Aboriginal populations. History tells us otherwise.

5. Venereal syphilis was common among the Aborigines of South Australia after the arrival of Europeans. George Taplin, who spent from 1859 to 1879 among the Narrinyeri of the Lower Murray and Lakes region, writes

*I have seen cases, even bad cases, of syphilis amongst the natives. I am sure the disease was imported among them; they knew nothing of it before the advent of whites - this is the testimony of the natives. I have known fatal cases, also cases where the tibia was affected, and bony excrescences on the skin, with atrocious neuralgic pain; I have also seen buboes in the groin* (Taplin 1879: 46).

During his residency at Moorundie from 1841 to 1843 Eyre observed many Aborigines inflicted with venereal syphilis. He did not wish to offend the sensitivities of his readers with a clinical description of syphilis so he wrote in Latin, but translated (Cleland 1928: 142) it is revealing.

*Of the diseases from which they suffer since the arrival of the Europeans by far the most frequent and the most deadly is the venereal strain... They themselves say that it was long before brought from the East, from which it seems very probable that it had its origin in Europe, and from hence from tribe to tribe was carried throughout the whole continent. Nor is there any doubt that the disease among those tribes with which the Europeans do not mingle, is neither frequent nor severe, but that through this intermingling it increases to a terrible degree* (Eyre 1845: 379).
Eyre then continues with a description of the symptoms:

Among the natives this disease manifests itself in the same way as in many Europeans, yet for various causes it is even more hateful, especially because round pustules, commonly the size of an ounce weight, rise at the same time from the skin. The centre of these is gradually filled with flowing pus, then as they grow larger and larger and disperse, the surface of the whole body is affected with wasting and scab which cause horror and disgust to those near them. These ulcers sometimes may persist for six or eight months; but generally when irritants or caustics are applied locally they are cured within three weeks... After the first or second year the disease disappears, but sometimes causes death (Ibid: 379).

In a critical examination of the better known and more accessible historical references to syphilis throughout Australia, Hackett (1936) concluded that most could be attributed to descriptions of yaws. Referring to the descriptions of Sturt, he concluded that the disease 'might very well be that of a widespread epidemic of yaws' and not venereal syphilis (ibid: 734). For support he evokes the incidence of the disease among children, but fails to mention the descriptions of the tertiary stages among the adults. He also claims (citing his own 1936 paper) that treponemal lesions in Aboriginal skeletal material from South Australia were diagnosed as yaws. In a later study (1976) using skeletal material from Europe and Australia (including the same samples from South Australia) he concluded that differential diagnoses between yaws, endemic syphilis and venereal syphilis using only bone lesions cannot be elicited with certainty. Finally, Hackett uses environmental data (average annual rainfall) from Adelaide, and not from the semi-arid Murray Valley (where the average
annual rainfall is often less than half that of the coast), to support his argument for endemic yaws along the Murray. As discussed above, the non-venereal transmission of yaws requires a humid climate with minimal variation in annual temperatures. In his 1976 publication (page 16) he restricts the distribution of yaws in Australia to the tropical north, endemic syphilis to the centre and venereal syphilis to the southeast and southwest temperate regions.

When observed by Sturt in the summer of 1829-1830 the extent of syphilis among the middle and lower Murray populations suggests that it was introduced on the south coast of South Australia and was even then spreading upstream towards the east. The initial carriers of the disease to South Australia may have been the seal and whale hunters who began setting up bases on Kangaroo Island and conducting periodic trips to the mainland in the first decade of the nineteenth century. A letter from John Mcfarlane (1837), head of the South Australian Company's Rosetta Head fisheries, sheds light on such an introduction of syphilis to the southern coastal regions of South Australia. He writes to Edward Stephens relating the difficulties of keeping men employed and the inconvenience incurred by their absconding from his service.

There are two more of my men which have run away, Mr. Morgan and Richard Ralph, which I trust you will punish without any leniency as they have left me in a very disgraceful manner. Richard Ralph was ill with the venereal disease some considerable time and in fact gave the same to some of the poor natives about here which are now a spectacle of horrible misery to which Mr. Cooper can testify. As for the lad Morgan which is only
a boy I assure you brought the disgrace from Van Diemen Land and gave the same to some of the poor creatures here. I used almost all my medicines upon him, made him well after which he went again with them, which served him right for his own disorder given back to him. I do assure you the Blacks are quite enraged about it here (Mcfarlane 1837).

Although written several years after Sturt described the disease among the Jirawirung and Ngawait, the important point of this letter is the manner and means by which infection could be spread from the eastern regions of Australia where colonial settlements were being established, to the isolation (from the European standpoint) of South Australia. In theory it would need only one of the early sailors or escaped convicts, who made up the sealing and whaling community, to be infected with syphilis to communicate the disease to the Aboriginal population.

In all probability, venereal syphilis was introduced to the Aborigines on the south coast and Murray mouth regions of South Australia by several European carriers over a period of thirty years or more, since sealing and whaling began on Kangaroo Island in 1806. In January 1819 Captain Sutherland of the brig ‘Governor Macquarie’ arrived at Kangaroo Island and stayed in its vicinity for seven months. He had ample time to observe the European occupants of the island and comments in a report to the committee in London formed for the purpose of colonizing South Australia.

Several Europeans assembled there; some who have run from ships that traded for salt, others from Sydney and Van Diemen’s land, who were prisoners of the Crown. These gangs joined after a lapse of time, and became the terror of ships going to the island...being little better than pirates... They have carried their daring
acts to extremes, venturing on the mainland in their boats, and seizing on the natives, particularly the women, and keeping them in a state of slavery, cruelly beating them on every trifling occasion, and when at last some of the marauders were taken off the island by an expedition from New South Wales, these women were landed on the main with their children and dogs, to procure a subsistence, not knowing how their own people would treat them after a long absence (Moore 1923: 121).

It seems that neither the 'pirates', sealers, nor those in charge of the expedition from Sydney, had little concern for the welfare and health of the mainland Aboriginal women and their children. Arriving back on the mainland and rejoining their tribes, the women and their children would have acted as vectors and as reservoirs for venereal disease. By 1830 Sturt had seen the extent of its spread along the Murray River.

5.2 Smallpox

Up until the early decades of this century smallpox was a highly contagious and often fatal systemic human disease. Today the disease does not exist, the last known naturally occurring case developed in Somalia in 1977 (Fenner et al. 1988: vii). Variola virus, the causative agent of the disease (now existing only in designated laboratories) belongs to a complex group of viruses of the genus Orthopoxvirus.

In the majority of cases, humans are infected by implantation of variola virus on the oropharyngeal or respiratory mucosa from excreting lesions in the mouth, nose and pharynx of the source case during the first week of
infection. Other portals of entry are inoculation through the skin, and placental transmission. During the incubation period of the disease, which lasts up to 10 to 14 days after initial infection, the virus replicates and spreads throughout the body via the lymphoid organs (spleen, bone marrow and lymph nodes) (Fenner et al. 1988: 187). After the incubation period, fever and malaise are followed by the development of focal eruptions on the mucous membranes and surface of the skin, which spread and develop to the later stage lesions of vesicules and pustules covering the face and often to a lesser extent the trunk and limbs. If the victim survives after the second or third week of infection the lesions begin to form scabs, and as healing continues the scabs form the characteristic scars or pock marks, particularly on the face, which identify a survivor of the disease.

The case-fatality rate of smallpox ranges from between 20 to 50% (Fenner et al. 1988: 175; Benenson 1976: 429) or higher. It is particulary severe in children and pregnant females. Where smallpox is endemic it usually infects very young children who, if they survive, are immunologically protected for the rest of their lives. Where the disease is introduced to a population with no immunological protection, the disease flares to epidemic proportions exhibiting high prevalence and incidence and acute fatality. During epidemics, lack of patient care and the disregard of usual sanitation practices often result in weaker resistance and secondary infection increasing the case-fatality levels.
The origins of the disease in humans is not clear. It most likely developed around the time when agricultural based societies grew sufficiently large enough to provide a supporting human reservoir for the virus. Descriptions of the disease have come from China during the 4th century AD and in the 7th century from south-west Asia. One of the earliest victims of the disease may have been Rameses V of Egypt who died in 1157 BC (Fenner et al. 1988: 209-211). As large centres of population developed in Europe, Asia and Africa and movement of people increased, smallpox developed from occasional epidemics to an established endemic disease.

The disease has had a lethal history in Aboriginal Australia. In 1789, just a year after the arrival of the First Fleet, Aborigines in the vicinity of the new settlement of Sydney Town began to die from what has generally (but by no means conclusively) been accepted as an outbreak of smallpox (Cumpston 1914: 1-6; Butlin 1983: 19; Watt 1989: 145). The disease appears to have spread rapidly among the Aboriginal population of south-east Australia (Cumpston 1914; Butlin 1983; Campbell 1983, 1985; Barwick 1983). The origin of the disease and its point of entry into Australia has never been absolutely determined but two possibilities have been canvassed. Butlin (1983; 1985) supports its entry at Port Jackson in 1788 by the European colonists and Campbell (1983; 1985) argues for its introduction, sometime earlier, along the northern coastline by Macassan trepang traders. Wherever its point of entry
may have been, an extensive epidemic of smallpox had began to spread through much of the Aboriginal population of south-east Australia in 1829-1831.

5.2.1 Smallpox in the Riverland.

Skeletal evidence of smallpox (osteomyelitis variolosa) is found mainly in the three long bones that form the elbow joint (Zimmerman & Kelley 1982: 109; Jaques 1983: 75). However, small necrotic foci involving the spine, sternum and bones of the wrist and ankle have been attributed to the disease. Osteomyelitis variolosa is characterized by a disruption of the area around the metaphyses of the humerus, ulna and radius which may lead to detachment or destruction of the epiphyses. Restriction in longitudinal growth of the bones can then result and in severe cases ankylosis of the elbow joint can occur.

The skeletal sample from the Riverland was examined for evidence of osteomyelitis variolosa but no evidence was found. This result was not entirely unexpected because of the nature of the disease and its effect on the bone. Smallpox, particularly in an immunologically inexperienced population, will often kill its victims before osteological involvement occurs, so that very few cases (2 to 5 percent) of osteomyelitis variolosa result (Zimmerman & Kelley 1982: 109). Also, the severity of the disease in the individual has no bearing on the extent of bone changes and bone
involvement is almost entirely restricted to children under the age of fifteen.

The lack of evidence of osteomyelitis variolosa in the Riverland does not mean that smallpox was absent. Ethnohistorical evidence strongly suggests that it was present. Smallpox was active among the Aboriginal populations in the settled districts west of the Blue Mountains in 1830-31 and in the unsettled Riverina by the early 1830s (Campbell 1985: 338-346) and was beginning to spread west along the Murray River corridor. The time of its arrival among the Jirawirung and Ngawait and tribes further downstream on the Lower Murray was most likely sometime after. Although he described the state of disease among these tribes during his river journey in 1830 (as discussed above), Sturt (1982) never considered smallpox, a disease he was surely familiar with, to be present among these tribes. Several years later in 1838, when he was overlanding cattle to Adelaide, he was joined by Aborigines near the junction of the Murray and Edward rivers. He states

...in the course of the forenoon we were joined by various parties from different quarters that when united formed a considerable body of athletic and well proportioned men. They came evidently with the most peaceable intentions and several of them assisted us in our work. I observed many of them as if pitted by the Small Pox, or that would appear as the disease which was having such a fearful effect upon them when I was on the banks of the Darling in 1828 and of the Hume in 1829 had been universal. It must have committed dreadful havoc amongst them, since on this journey I did not see hundreds to the thousands I saw on my former expeditions (Sturt 1838: 147).
On February 11th 1838 Hawdon met a group of Aboriginal men near Swan Hill on the first overland journey along the Murray to Adelaide.

In the evening some of the Blacks came to Swan Hill, where we were encamped. After holding a little conversation with us across the river, they swam over to us. They were fine, well-made men about five feet eleven inches in height. Their faces were nearly all marked with smallpox, but otherwise their features were pleasing (Hawdon 1838: 27).

The next day Hawdon saw 52 men, accompanied by their women and children and described them as ‘not a good-looking set of men’ and many of them ‘blind in one eye’ (ibid: 28). Hawdon makes no further mention of smallpox after he left Swan Hill among the many other groups along the Murray he came in contact with.

Some ten years after Sturt’s expedition along the Murray, Eyre was in residence at Moorunde and recorded,

A disease very similar to the small-pox, and leaving similar marks upon the face, appears formally to have been very prevalent, but I have never met with an existing case... (Eyre 1845: 379).

There is strong evidence that the disease had reached the lower populations of the Murray well before European settlement on the Adelaide Plains in 1836. The social boundaries that existed between the lower Murray people and those of the Adelaide Plains (McBryde 1984) most likely shielded the latter from smallpox until the settlement of
Adelaide. Taplin, who spent twenty years among the Narrinyeri, wrote in 1879,

They have a tradition that some sixty years ago a terrible disease came down the River Murray and carried off the natives by hundreds. This must have been smallpox, as many of the old people now have their faces pitted who suffered the disease in childhood. The destruction of life was so great as to seriously diminish the tribes. The natives always represent that before this scourge arrive they were much more numerous. They say that so many died that they could not perform the funeral rites for the dead, but were compelled to bury them at once out of the way. I think there must have been more than one visitation of this kind, judging from the age of those who were pockmarked (Taplin 1879: 44-45).

If the disease was smallpox as Taplin suggests then it was present on the Lower Murray before 1820 (that is some sixty years before Taplin was writing in 1879 and eighteen years before the settlement of Adelaide). This is too early for smallpox to have reached this region from the east, but as discussed above, syphilis was active along the lower and middle Murray corridor at this time and the two diseases were most likely being confused (if indeed they were even recognised by some Aborigines as being two separate diseases).

Smallpox, travelling along the Murray corridor from the east, may not have reached the populations west of the Mount Lofty Ranges. Historical, archaeological and linguistic evidence emphasise a long period of cultural and social isolation between the Murray and coastal groups and those inhabiting the plains bordering on Saint Vincent’s Gulf (Tindale 1974; McBryde 1984). Every so often in times of socioeconomic hardship limited contact and the exchange of
goods may have occurred, but they remained strangers to each other with no enduring social ties ever developing (Tindale 1974: 73). For smallpox to have crossed the ranges it would have needed contact between these populations at the time of the epidemic. From all accounts this did not occur, and while it cannot be unequivocally ruled out, the populations west of the Mount Lofty ranges escaped the ravages of smallpox.

Many Europeans saw the characteristic pock-marks on the faces of the South Australian Aborigines but none observed active smallpox in those early years as the disease had already flared and subsided before settlement. Stirling (1911) however, recorded first-hand oral evidence of the epidemic. His informant was an elderly Narrinyeri woman named Kontinyeri who had lived on the southern shore of Lake Alexandrina and who could recall the epidemic sweeping through the communities when she was very small.

*With much gesture she described how the faces of those affected with the disease came out all over with spots, and how that many died of it, including many children. She herself escaped, but her aunt, who is still living, and who, she says, is considerably older than herself, caught the disease and has her face marked. She told us of the remedies they sought, one being young reed shoots pounded and administered from a mussel (Unio) shell used as a spoon; another was the boiled leaves of mallee eucalypts gathered in the scrub (Stirling 1911: 18).*

Stirling cites more oral evidence, this time from three old Aborigines living near Swanport. They recollect a smallpox epidemic that
...caused a great sickness which, when they were quite young, fell upon the natives along the river, causing their deaths in such numbers and with such rapidity that the living were at their wits' end to know how to dispose of the dead quickly enough and they also described how in the sickness they came out all over spots and quickly died... (Stirling 1911: 16).

By estimating the ages of the informants together with incidences recalled in their recollections, Stirling fixes the date of the epidemic on the Lower Murray and Lakes districts as not earlier than 1830. Given the high population densities along the Murray (Chapter 3), the movement of groups between clan and language boundaries (Chapter 2) and the highly infectious nature of smallpox the disease would have spread rapidly along the Murray, inflicting the Jirawirung and Ngawait in the first years of the 1830s just after Sturt had passed through. The disease then appears to have died out by 1837 when Adelaide was settled leaving only the scarred survivors to act as testimony to its passing.

5.3 Gonorrhoea

Gonorrhoea is an infectious disease primarily involving the genitourinary tract. The disease is caused by the diplococcus Neisseria gonorrhoeae, an extracellular parasite whose only host is human. Gonorrhoea is prolific throughout the world and remains a major public health problem in Australia today (National Health and Medical Research Council 1982).
Gonorrhoea has had a long association with human history. It is thought to have been known to the ancient Egyptians and Assyrians and the early Japanese and Chinese civilizations. The disease was given its name in the second century by the physician Galen and means ‘flow of seed’. Until 1879, when the pathogen causing gonorrhoea was finally identified (the etiological spirochete of syphilis was later identified in 1905), gonorrhoea and syphilis were not perceived to be separate diseases caused by different organisms. Gonorrhoea was long thought to be an early symptom of syphilis (Spink 1978: 309). Because of this, many pre-twentieth century accounts confuse the two and do not differentiate between gonorrhoea and syphilis, but instead, apportion the separate symptoms observed in individuals to a generalised diagnosis of ‘venereal disease’.

Transmission of gonorrhoea is primarily by the venereal route and infection is usually restricted to sexually active adults, although the pathogen can be passed to the neonate during passage of the birth canal of an infected mother. In this case severe eye infection usually develops leading to permanent blindness (Bender 1975: 47; Youmans et al. 1980: 501).

The acute disease is manifested by a purulent urethritis in the male and if untreated can lead to the further complications of urethral stricture, chronic prostatitis and septic arthritis. The disease, however, often recedes spontaneously (Youmans et al. 1980: 502; National Health and...
Medical Research Council 1982: 25-26). While gonorrhoea is not nearly as damaging to the infected individual as syphilis, it can be described as a 'wickedly damaging disease in women' (Morton 1966: 60). Thirty percent of females infected with *N. gonorrhoeae* remain asymptomatic and thus personally unaware of the disease but at the same time acting as carriers (asymptomatic females may act as a reservoir for the pathogen). Active gonorrhoea in females involves infection of the reproductive tract which may result in pelvic inflammatory disease producing a chronic debilitating infection that can cause partial or complete occlusion of the uterine tubes. If the lumina of the tubes are completely blocked the woman is unable to become pregnant and, if permanent damage has occurred, will remain sterile for the rest of her life (Bender 1975: 46; Youmans et al. 1980: 502).

Unlike the treponema causing syphilis, *N. gonorrhoeae* has a short incubation period of two to eight days (though it may be as brief as 24 hours or as long as a month), enabling an extremely rapid spread of the disease through a sexually active community (National Health and Medical Research Council 1982: 25). Promiscuity is its greatest agency. In Aboriginal Australia, from the beginning of pathogenic contact where those infected largely went untreated, reinfection would have been frequent making the effects of the disease more serious and occurring in a higher proportion of cases.
Gonorrhoea most likely entered Australia very early during European colonization and was quickly transmitted to the Aboriginal population by sexual liaisons between European males and Aboriginal women. It was almost certainly present among the Jirawirung and Ngawait. Although there is no historical evidence for it, the disease was most likely introduced to the Aborigines on the south coast of South Australia in the first two decades of the 1800s by the same sealers who introduced syphilis. Because of their similar modes of transmission the two diseases often accompany each other spreading in epidemic forms throughout populations. In such cases the incidence of gonorrhoea is ten times more than syphilis (Spink 1978: 312-315). It arrived in the Riverland probably by the same route and at the same time as syphilis, moving north and east along the the Murray River populations from its southern point of introduction. Its presence was concealed from Sturt and from the explorers and settlers who were to follow by the more invidious symptoms of syphilis. Further, it is doubtful if they would have recognised it as they would have been unaware that gonorrhoea was a separate venereal disease to syphilis which they knew so well. So they failed to comment on it.

5.4 Other epidemic diseases

Table 5.2 lists other major introduced diseases that, in epidemic form, have infected Aboriginal populations in South Australia.
Respiratory

Pulmonary tuberculosis high incidence among all ages
Influenza high incidence among all ages
Bronchitis high incidence - non specific
Pneumonia high incidence - non specific
Emphysema low incidence
Asthma low incidence

Intestinal infections

Typhoid fever persistent
Salmonella high incidence under two years
Dysentery high incidence - non specific
Gastroenteritis high incidence - non specific
Diarrhoea high incidence - non specific

Helminthiasis

*Hymenolepis nana* high incidence - reduced physical fitness and dietary stress

Nematode worms *Strongyloides, Ascaris, Trichuris, Enterobius* - high incidence and increased loads due to crowded and unsanitary living conditions - children having higher rates of infection than adults

Hydatids high incidence - strain using cattle-sheep-dog life cycle - disabling and often fatal

Table 5.2 Major disabling and fatal diseases in epidemic forms among Aborigines living in crowded and unsanitary conditions in South Australia (after Black 1975).

In the main these diseases occurred when Aboriginal groups were compelled to forfeit their traditional lands and lifestyles and live in crowded conditions on the fringes of the European settlement of Adelaide, government settlements and church sponsored missions. The sanitary, health and dietary status of Aboriginal fringe dwellings and mission settlements has been discussed frequently in the past (e.g. Cleland 1928; Basedow 1932; Moodie 1973; Hetzel & Frith 1976; Gracey 1977; Kaimen 1978; Beck 1985; Dowling 1987) and
need not be described further here. It would suffice to say that the crowded living conditions, lack of many of the basic hygiene facilities, lack of medical facilities, and poor diets that still exist in certain settlements today certainly existed last century and may have been worse. Early records suggest that respiratory diseases such as pulmonary tuberculosis and influenza were the major causes of death in Aborigines living under these conditions (Taplin 1879, 1879(a); Basedow 1932). Taplin, writing from the Port McLeay mission states

*My observations have led me to the following views of the principal disease from which the natives suffer, which is evidently tuberculosis in its different forms. I think that a large number of deaths arise from this cause - of fifty deaths of adults which occurred here between 1859 and 1869 twenty-five were caused by tubercular consumption* (Taplin 1879: 44).

Tuberculosis may certainly have been a major contributor to Aboriginal deaths. In the early years of settlement of South Australia it was also widely spread in the European population, yet it was only one of a number of potentially fatal pathogens of high incidence in the settlements. Any of the diseases listed in Table 5.2 have on their own the potential to kill their host or at least place an individual's immune system under extreme stress thus enabling pulmonary tuberculosis to be the major (or the most obvious) contributor to death.

To what degree the Jirawirung and Ngawait were exposed to these diseases is not known. I have been unable to ascertain with any certainty if any of them lived either
temporarily or permanently in missions and government sponsored settlements. The records are not clear on this point; most just refer to Aborigines from 'the Murray'. I do, however, feel sure that many of the Jirawirung and Ngawait who survived the earlier epidemics of venereal disease and smallpox found their way to the fringe settlements and most likely to the missions where they came in contact with many of the pathogens. Certainly Aborigines from Lake Bonney were known to live on the banks of the Torrens River in Adelaide during the winter months of the early years of settlement (*The Register* July 23, 1858), and so were likely to come into contact with other individual carriers and so were infected.

5.5 A one-way exchange

The exchange of epidemic disease was a one-way transaction. European colonists passed on their diseases to the Aborigines, there was no epidemic disease in the European populations in Australia that could be traced to contact with the Aborigines. Yet, as we have seen in Chapter Three, the Aboriginal populations along the Murray and south coast of South Australia, and in particular the Riverland, were dense. Living conditions within the floodplains were likely to have been crowded (Webb 1986) and thus able to support the epidemic spread of European diseases. Why then had no diseases evolved in the Aboriginal populations that could be transferred by human contact to Europeans? The Murray River had been densely occupied for five to six thousand years, which would seem to
be time enough for the required process of disease evolution from animal infection to endemic and epidemic human disease. It had happened in Europe, why had it not happened in Australia? While the origins of human diseases may have causes yet to be identified, the answer to these questions lies, I believe, in the relative lack of close association and interactions with animals (apart from dingos) by the Aborigines, their social behaviour, and the lack of closely related mammals able to support the same pathogens.

Previously I have discussed the ecological principle of species diversity and its role in infectious diseases among the hunting and gathering groups of the Murray (Chapter 4) and their social environment (Chapter 2). The European colonists who came in contact with the Aborigines, however, had come from a culture which had for several thousand years lived in close association with domesticated animals under crowded living conditions, often sharing the same sleeping and eating quarters with their beasts. When they had converted from a hunting and gathering economy to an agricultural based one they had altered the ecological index of their environment. By concentrating their economic activities on a few selected plant and animal species, and in doing so increasing their population and living densities, they had changed their environment from one with a high species index to one that was low. Contact between humans and their preferred animals and humans with other humans was then much closer and more common than it ever had been in the past. This then created the ideal conditions...
which allowed for the evolution of pathogens into zoonoses and then into the epidemic forms of disease in the human populations.

It is possible, however, that given more time and further isolation from the rest of the world's population, economic and social conditions among Aborigines, especially the dense populations living along the Murray River, would have followed a similar path. It may already have began. The Aboriginal importation of the dingo somewhere between 7,000 and 10,000 years ago (Newsome 1982: 1959) led to its semi-domestication and close association with them. Hydatid may have first entered Australia by this means (Thompson & Kumaratilake 1982: 16), survived with marsupials as part of its life cycle, and infected humans. It is then theoretically possible that epidemic forms of animal originated human infections may have risen within Aboriginal populations. In turn these would have been passed on to the newly arriving European colonists. The epidemic exchange would then have been both ways. That it evidently did not happen like this is merely a fact of human biological, cultural and social history.

As a result of this review it can be seen that severe epidemic disease occurred along the River Murray corridor beginning from the time European whalers and sealers touched the mainland coast of South Australia. While it is difficult to evaluate fully the impact of epidemic disease upon the Jirawirung and Ngawait people, it simply cannot be
doubted that they suffered severely beginning from the late 1820's onwards. The inference of major contagious events having severe demographic repercussions is unavoidable and is similar to the experiences of Aboriginal populations in other areas of Australia and elsewhere in the world where European colonization impacted with indigenous peoples.
CHAPTER SIX
Conflict of Contact

ONCE AGAIN THE OVERLANDERS SHOT DOWN THEIR WOULD-BE AVENGERS, AND THE WAILS OF ABORIGINAL WOMEN AND CHILDREN MOURNING THEIR DEAD COULD BE HEARD ALONG THE HIGH BANKS OF THE MURRAY FROM MOORUNDIE TO THE RUFUS.
(Clark 1973: 78)

Contact and conflict between Aborigines and Europeans in South Australia began long before the British colony was established at Holdfast Bay in 1836. The Aborigines of South Australia experienced initial culture shock with their meeting of sealers and whalers who arrived on Kangaroo Island in 1806. Many were the misfits of European society, convicts and ex-convicts who had little regard for the law and order that even then was only in its infancy in Australia and administered from another side of the continent, hundreds of miles distant. Some brought Aboriginal women with them from Van Diemans Land, others abducted them from the adjacent mainland of South Australia (Moore 1923). These first contacts, while often violent, were in most cases brief, the sealers returning to the island after a day or two.

Permanent settlement of South Australia commenced with the landing of the first colonists on 28 December 1836. They quickly took up land allotments and spread along the coastal inlets and over the fertile Adelaide Plains. They found the Aboriginal inhabitants, the Kaurna, friendly enough but further south the Aborigines of Rapid Bay and Encounter Bay were more hostile (Abbie 1958).
This may have been a response to previous experiences with the sealers. A short time after settlement the social fabric of the Kaurna ceased to function and many of them died. In August 1837 the first European was killed near Encounter Bay and three years later at Lacepede Bay the shipwrecked survivors of the brig 'Maria' were massacred by a group of Milmenrura people (The Register August 15 1840; Jenkin 1979: 56-62).

For many Aboriginal groups living along the banks and waterways of the Murray River, the first encounters with Europeans and their alien ways were traumatic experiences of conflicting social and cultural values followed by competition for the rich river valley resources (Gale 1969; Hemming 1983). The Jirawirung and Ngawait people of the Riverland never recovered from the shock of European contact. They resisted at first, but as contact between the two cultures intensified with more and more Europeans arriving in their land, their social system weakened and in the space of one lifetime completely and terminally collapsed. The collapse of the Jirawirung and Ngawait lifestyle is viewed here in three phases. The first phase relates to the initial contact between European explorers and overland cattle drivers, the second to the conflict between the Aborigines and the overlanders, and finally a third phase of settlement of the Riverland by pastoralists.
6.1 Contact

The first Europeans to see the Jirawirung and Ngawait were Captain Charles Sturt and members of his expedition travelling downstream on the Murray River. Sturt crossed the boundary into the lands of the Jirawirung from the neighbouring territory of the Ngintait and entered the Great Pyap Bend on the afternoon of January 28th 1830. The weather had been poor for several days and Sturt had not seen many Aborigines on the river banks since he had passed Lindsey Creek further upstream.

Throughout Sturt’s journey down the Murray River he had often noticed and encouraged small groups of Aborigines to proceed on land ahead of him to announce the expedition’s arrival to the next group. Although perhaps unaware of it, Sturt was in fact acting in accordance with the widely established meeting rituals practiced by Aboriginal tribes over most of the continent (Mulvaney 1989: 1-7). Aboriginal diplomacy required that before two tribes or foreign groups met, both parties should be properly prepared for the meeting.

Soon after he entered the Jirawirung lands a group of about sixty viewed his passage from the banks of the river but he passed them by without acknowledgement.

*Nevertheless they deputed two of their men to follow us, who overtook us just as we stopped for the purpose of pitching our tents before the clouds should burst, that just then bore the most threatening appearance. The blacks seemed to be perfectly aware what kind of night we should have,*
and busied themselves preparing a hut and making a large fire (Sturt 1982: 134).

The next day Sturt met a group of 270 Jirawirung.

They were extremely quiet, and kept away from the boat; in consequence of which I distributed a great many presents among them. This tribe was almost the only one that evinced any eagerness to see us. The lame had managed to hobble along, and the blind were equally anxious to touch us. There were two or three old men stretched upon the bank, from whom the last sigh seemed about to depart; yet these poor creatures evinced an anxiety to see us, and to listen to a description of our appearance, although it seemed doubtful whether they would be alive twenty-four hours after we had left them. An old woman, a picture of whom would disgust my readers, made several attempts to embrace me. I managed, however, to avoid her, and at length got rid of her by handing her over to Fraser, who was no wise particular as to the object of his attention (ibid p. 135).

While among this group of Jirawirung Sturt fired at a kite and killed it. He had made it a point during the journey of displaying the effects of his firearms to the Aborigines in the belief that it would impress upon them the capacity of his party's self-defence and deter any attempt at attack. Even though they were standing next to Sturt none of the Jirawirung showed any alarm at the loud report of the firearm nor surprise of its ability to kill so effectively. There appears to be little doubt that the runners who preceded Sturt's party along the river, alerting the other tribes, also bore a description of the firearms carried by the strangers and of their abilities to bring down game from a long distance. The Jirawirung, though, were equally determined to demonstrate to Sturt and his party their "firmness of nerve and self-command" (ibid p. 135).
For the next two days, as Sturt’s party made their way first south, then north around the Great Pyap Bend, they saw no more of the Aborigines. On the last day of January they met the same group again who this time introduced them to a larger assembly.

On asking them how they had passed us, they pointed directly east to the spot at which we had departed. By crossing from one angle of the river to the other, they had performed in little more than half a day, a journey which it had taken us two long days to accomplish (ibid p. 138).

The first group of Jirawirung had followed a well established trail that cut across the land north of the bend, crossed into Ngawait land and had met up again with Sturt’s party on the northern leg of the Great Pyap Bend. This was the route that Joseph Hawdon, the first to drive cattle overland to Adelaide, was to follow eight years later.

While Sturt’s voyage down the Murray River had been peaceful it had on several occasions teetered on the edge of violence. The confrontation and almost fatal disaster at the Murray/Darling junction was only a few days in the past and still fresh in the memory of all the party. Near disaster for both sides had only just been averted by seconds as Sturt and his crew had faced overwhelming numbers. The next meeting with the Riverland Aborigines came just two days later, and bore similar potential. It
occurred with the Ngawait on the western reach of Great Pyap Bend (Fig 6.1).

After our usual distribution of presents, we pushed away from the bank; though not without some difficulty, in consequence of the obstinacy of the natives in wishing to detain us; and I was exceedingly vexed to find, while we were yet in sight of them, that we had proceeded down a shallow channel on one side of an island instead of the further and deeper one; so that the boat ultimately grounded. A crowd of blacks rushed into the water, and surrounded us on every side. Some came to assist us, others, under a pretence of assisting, pulled against us, and I was at length obliged to repel them by threats. A good many of them were very much disposed to annoy us, and, after the boat was in deep water, some of them became quite infuriated, because we would not return. Had we been within distance, they would assuredly have hurled their spears at us (ibid pp. 138-139).

This incident must have puzzled Sturt because until then, of all the tribal groups he had met, the Riverland groups had been the most amicable. The party was followed along the river bank by thirteen Ngawait to its next camp (Fig 6.1).

They kept rather apart from us, and kindled their fire in a little hollow about fifty paces to our right; nor did they venture to approach the tents unless we called to them, so that by their quiet and unobtrusive conduct they made up in some measure for the unruly proceedings of others of their tribe (ibid p. 139).

Sturt was concerned by the northerly course of the river and attempted to gain information from the thirteen Ngawait of his position in relation to the sea.

It was to no purpose, however, that I questioned these stupid people. They understood perfectly, by
FIGURE 6.1

North western reach of Great Pyap Bend, River Murray, South Australia.

This map is a reproduction of an original sketch drawn by Captain Charles Sturt in 1830 during his inland river exploration. The arrows (added for the purpose of this thesis) depict the places along the river bank where Sturt and his crew met the Ngawait. These were the first places of contact between the Aborigines of the Riverland and the European colonizers of Australia.
my pointing to the sky, and by other signs, that I was inquiring about large waters, but they could not, or would not, give any information on the subject (ibid p. 139).

Sturt left the Riverland with the impression of a savage, dirty, repugnant and stupid people who always bordered on the edge of treachery. Yet to his credit, his dealings with the Jirawirung and Ngawait and the other tribal groups he encountered were always humane and placatory. This was probably because he was always aware of his vulnerability to attack by the Aborigines which at best could result in the abandonment of his various expeditions, or at worse his own death.

Sturt passed quickly through the Riverland on his return upstream anxious to end his journey. It was to be another eight years before the Jirawirung and Ngawait confronted another European.

On the morning of March 12th 1838 Joseph Hawdon and Charles Bonney arrived at the eastern limits of the Great Pyap Bend. They were driving a herd of cattle overland along the Murray River to the new settlement of Adelaide. In so doing they were pioneering a route that would link the new colony of South Australia overland with the eastern settlements. Bonney (1901: 89) noted in his diary that they observed a "well-beaten native path" that led northwest from away from the southerly course of the river. On the insistence of Bonney the party left the comparative security of the river and followed the path
which led away through thick bush and sandy soil. By leaving the course of the river Hawdon and Bonney considerably shortened their journey and bypassed much of the Jirawirung land. Towards sunset of the same day they came to the northern shore of Lake Bonney. It was at this spot that they made their camp for the night and met the Ngawait.

The Blacks were encamped further along the Lake, and from the noise they made, we knew they must have noticed our arrival. It was a beautiful moonlight night, and I strolled out along the edge of the lake to shoot some ducks which were seen on the water in thousands. On discharging our guns, the echo of the report rolled along the water magnificently...we could now and then catch the distant noises of a tribe of Natives as they were disputing, with much emotion about this our extraordinary inroad upon their territory (Hawdon 1952: 48-49).

During their journey along the Murray and Murrumbidgee rivers Hawdon and Bonney had learnt a lot about dealing with the Aborigines they met, but like Sturt and the many who were soon to follow along their overland cattle route, they never came to any real understanding of the cultures they encountered. Their meetings were always brief and, although peaceful, at times they could have very well led to conflict. An incident at Lake Bonney the morning after their arrival could well have developed into an explosive situation.

They afforded us a good deal of amusement during our halt. Our dogs did not like to see so much familiarity between us and the Blacks, but although they did not interfere so long as the Natives kept a respectful distance, yet whenever one of the tribe laid his hands upon a single article belonging to us, one or the other of our canine friends would be sure
to catch him by the heels; and when the fellow, on recovering himself, lifted up his spear and in his rage endeavoured to kill the dog, two or three of his companions would promptly interfere, and hold his arms until his passion had cooled down (ibid p.50).

Hawdon and Bonney left the Ngawait lands with no shots being fired other than those that had echoed across Lake Bonney. As they reached the fossil beds of Overland Corner three of the Ngawait passed the overlanding party to acquaint the Ngaiawang, the next tribe downstream, of their approach.

As they passed me, trotting along their native path, they saluted me with a laugh and their native "Menera": We are friends. The language of these tribes is different from that of the tribes near the junction of the Murrumbidgee, and the people are of a much milder and more friendly disposition (ibid p.51).

Three months after Hawdon and Bonney had departed Edward Eyre, leading a small party of six men and three hundred head of cattle, approached the eastern boundary of the Jirawirung. Large groups of Aborigines had been continually following the overlanders since they had left the Darling River junction. Eyre, at all times wary, had not felt threatened by them even when the already large numbers accompanying him had increased to "many hundreds" when they reached the junction of the Rufus River (Eyre 1984: 157). Relations between the two groups were affable and some Aboriginal men assisted Eyre and his party in driving the cattle.
When the overlanding party crossed the boundary into the territory of the Jirawirung the situation changed suddenly.

...we fell in with a numerous and very troublesome tribe of natives who were most impertinent and pertinacious in crowding around us and the drays and in handling everything they could get near, so that our whole time and attention was taken up in watching them and in trying to keep them off. We were, moreover, so small a party, only six Europeans (Baxter away looking for a lost cow) amongst hundreds of blacks, all of whom were well armed, and I could not but feel anxious at such overbearing conduct and at once took measures to check it. I insisted upon their leaving the drays and going to a little distance - upon which they formed a semicircle around us a few yards off, making little fires in front of them little by little and thus gradually closing in nearer and nearer to us. I was then obliged to go over to them and intimate that they must remove further off - upon which they made gestures of defiance and shook their spears at us. It was now high time to take some decisive measures and I at once called the men together under arms, under shelter of the drays. I then again went over to the natives and, drawing a line on the ground between them and my party, intimated very plainly that if they crossed it the men would fire upon them. They well knew the power of firearms - even during the day they had seen me shoot five crows at a single shot. My threat, therefore, was not without effect. For a long time they remained doggedly around us with their little fires in front of them, but without coming any nearer until at last, about sundown, they all crossed to the other side of the lagoon and formed their encampment for the night (ibid pp.157-158)

The next morning, knowing that the Jirawirung would resume the confrontation, Eyre aroused his small party before daybreak, loaded the drays and prepared to collect the herd which had scattered amongst the lagoons overnight.

Nor was the precaution unnecessary for the moment there was the least streak of dawn the canoes kept
plying across the lagoon loaded with men, and by the
time it was daylight we had them all ranged opposite
to us again with arms in their hands (ibid p.158).

Eyre was now once again confronted with several hundred
seemingly hostile and well armed warriors and separated
from his cattle. His actions no doubt avoided imminent
conflict.

Having armed all the party I sent out four men and
one of my two blacks to collect the stock, remaining
myself with one man and the other black to guard the
drays. We each took our station at the drays, gun in
hand, fronting and watching the large semicircle of
natives around us. They talked a good deal amongst
themselves but did not make any attack or come any
nearer to us. The time passed slowly and anxiously
for about two hours, the natives still keeping their
position. At length the cattle, horses and oxen were
brought up and fortunately all right. When the teams
were yoked and all ready to move I went, alone and
unarmed, to the assembled natives and distributed
pieces of iron hoop cut and sharpened so as to make
chisels and other little gifts. They seemed greatly
pleased with the presents, gave a tremendous shout
and we were all very good friends again. After which
they brought over a net, begging to have a tommy-hawk
in exchange - a request I readily complied with as I
was anxious to shew that we wished to have an
amicable intercourse with them in every way we
possibly could (ibid pp.158-159).

The overlanding party was allowed to continue with an
escort of Jirawirung men. About thirty kilometres
further on they were again confronted by a large
contingent of Aborigines and were once again fortunate to
avoid conflict.

The passages of Sturt, Hawdon and Eyre through the
territory of the Jirawirung and Ngawait were free from
physical violence although at times bloody attacks
initiated by either side could have erupted. All three European leaders were very much aware of the large numbers of Aborigines and their own vulnerability. For each, their main concerns were the safety of the men under them, the success of their expeditions and a safe passage along the Murray. They were aware that handing out gifts to the many groups they met and keeping their relationships brief would in most cases lead to friendly encounters or, as in Eyre's encounter, defuse potentially violent ones.

The Jirawirung probably saw such gifts as a payment in kind the Europeans made for safe conduct through their land. The incident between Eyre and the Jirawirung may have been a demand of payment for access rather than a deliberate attempt by the Aborigines to provoke conflict. He may not have been aware of it at the time, but Eyre had behaved in a manner that was to be expected by the Jirawirung. During the confrontation Eyre had observed the rules of Aboriginal protocol regarding the meeting of hosts and visitors. Throughout Australia, Aboriginal societies carried out highly structured and formal rituals when two groups met (Mulvaney 1989: 1-7). These meetings required that strict obligations of exchange and formalised conduct were to be exercised by both the visitors and the hosts before any other social activities could begin. Eyre himself was to witness such ritualised protocol several years later when he described a meeting between a large group of Jirawirung from Lake Bonney and
another from Moorundie assembled near his residence (Eyre 1845, vol I: 219-222). Even though the main purpose of this assembly was to conduct prearranged initiation ceremonies of young boys from both tribes, several hours were spent in highly formalised conventions of meeting. Overlanding parties who were to follow in later years were to pass through many clan territories and were often pressed for time, having little of it to spare for lengthy meetings with the Aborigines. Misunderstanding and ignorance of the proper behavioural rules and individual roles were later to result in conflict.

The first expeditions of overlanding cattle to Adelaide by Hawdon, Eyre and later Sturt met with great financial success. The small settlement of Adelaide needed fresh reserves of sheep and cattle to build up and maintain the small herds that existed. Shipment along the southern coastline was costly and slow and for the entrepreneurs in the east the overland route was quicker and promised more financial reward with less loss of cattle. Eyre wrote in the Register,

...I would remark that though the line of road between this colony and New South Wales is far from being favorable [sic] for the emigration of sheep, yet I consider it by no means an impracticable one, and think that if they are brought in small flocks and a favorable season of the year selected, the experiment may be safely and successfully attempted...(Register July 21 1838).

These first overlanders also warned that the success of any further expeditions along the Murray route depended on exercising caution with their relationships with the
Aborigines while at the same time having strong defences against them. Sturt commented in the Register after his first overland expedition

...and where they are in any numbers they are forward and insolent, and I fear that they will sooner or later commit some act of violence. I mention this to prevent misfortune by timely warning (Register September 1 1838).

To those who were to follow Eyre also issued a stern warning:

I would strongly impress upon future travellers the necessity of the utmost care and vigilance on their party and would caution them by no means to rely too much on the exhibition of a friendly disposition on the part of the natives, as they are both cunning and treacherous, and frequently refrain from acts of violence only from the dread of a superior force (Register March 2 1839).

6.2 Conflict

Violent confrontation between the Riverland Aborigines and the Europeans was not long in coming. The overlanders who were to bring more sheep and cattle along the Murray route to Adelaide failed to comprehend that to the Jirawirung and Ngawait, a people now threatened, a showing of force was an act to which they could see no other alternative.

During the 1840’s and through to the next two decades the impact of Europeans on the Riverland landscape began to seriously effect the Jirawirung and Ngawait subsistence economies. The financial success of the
first overlanding expeditions along the Murray and the dire need for more head of stock for the Adelaide herds encouraged others to follow. They did so in ever increasing numbers. The Murray overland route became a busy highway, often with two or three parties travelling together, or a day or two apart. The stock numbers increased. When driving sheep alone, a single party could consist of 8,000 to 12,000 sheep, being driven in successive flocks of about 1,000 each. In the first quarter of 1840 alone, following on from the forty thousand head of stock that had already reached Adelaide, 7,000 head of cattle, 25,000 sheep and 100 horses were overlanded (Grey 1842). In 1865 the Surveyor General of South Australia, Goyder, estimated that some 350,000 sheep a year were driven through the Riverland (cited in Lamshed 1952: 13). These large numbers of stock on the move required feeding along the way. The effect on the vegetation along the river and wetlands would have been particularly severe. Much of the available areas of grasses and low shrubs were quickly destroyed. In 1844 John Harris Browne, accompanying Sturt wrote,

Made Lake Bonney about noon by a native path... The surrounding country is miserable, covered with low scrub and polygonum close to the lake. A little distance back from it are Pines and Gum brush; scarce a blade of grass to be seen...(Browne, edited by Finnis 1966: 26).

The loss of vegetation and the constant movement of large and noisy herds would have resulted in the disappeareance of many of the endemic animal species that
had been part of the Aboriginal diet. The Jirawirung and Ngawait were now faced with direct competition for their food resources.

The overlanders who were to follow heeded the warnings of Eyre and Sturt. They were fully aware of the violent confrontations that had already occurred in the eastern regions of Australia where cattle drovers and Aborigines had come into conflict. They came along the Murray in well armed groups intent on protecting their herds, not only from the rigours of the long journey, but from the continuing threat from the Aborigines along the way.

The most hostile and treacherous blacks I have ever met were on the lower Murray. When travelling with cattle down the Murray, some years ago, the party I was with was followed for more than a week by hundreds of black warriors, all armed and eager to attack us night or day if we gave a chance. For nearly a month on that journey we got very little sleep as we knew, that the blacks were watching us all the time (Gormly 1906: 40).

One party, led by Byrne in 1839, was responsible for the death of at least nineteen Aborigines west of Gundagai on the Murrumbidgee and was involved in another confrontation in the vicinity of Lake Victoria where an unspecified number of Aborigines were killed (Byrne 1848).

Like many of the tribes along the Murray the Jirawirung and Ngawait clashed with armed parties of Europeans on more than one occasion. The first conflict involving the
Riverland Aborigines took place on October 21 1839 in the vicinity of Lake Bonney (O'Halloran 1841). An account of the incident and the altercations that followed were documented by McLeod (Register, November 30 1839).

Towards the end of 1839 an overlanding party led by P. Snodgrass was attacked by a group of Ngawait and 300 sheep were driven off from the main herd. A small group from the overlanding party pursued the Ngawait and succeeded in recovering about 250 of the sheep. The account does not state if any shots were fired nor if there were any human casualties. The recovered sheep were placed under the protection of another overlanding party led by Langhorne who was following close behind Snodgrass. Shortly after, the Aborigines reformed, and by now numbering at least 200, advanced towards Langhorne's party. Warning shots were fired above their heads, but had no effect in deterring them. At this point further conflict might have been avoided if someone from the overlanding party had approached the Ngawait as Eyre had done several months earlier and demonstrated a peaceful intent. But Langhorne's group now saw itself under direct threat. The rifle barrels were brought down, and the overlanders fired directly into the oncoming group. McLeod states that after the first volley of fire several of the Ngawait fell wounded but claims none were killed. One member of Langhorne’s party then mounted his horse and charged into the main body of Ngawait which quickly dispersed but reformed almost
immediately after he had passed. The rider then turned and made a second charge eventually forcing them to break off their attack. The Ngawait retreated and the overlanders were able to collect their herd without further disturbance. Langhorne’s party was allowed to continue towards Adelaide with no further incidents.

Just five or six days later in the same area another overlanding party met with aggression from the Ngawait and the first European was killed. Thomas Young, an overseer to a party led by Mackinnon, had been making his way from the grazing herd back to the main camp by the river when he was approached by a group of Ngawait. Words were spoken and Young was attacked. He died from his wounds two days later. The Register recounted the incident, calling it cold-blooded murder. The details most likely came from Mackinnon who learnt from Young before he died.

Having knocked him down, they thrust their spears through his body in several places. When found there were ten wounds on various parts of his body which had apparently been inflicted with spears and waddies. There was also a cut on his face seemingly inflicted with a knife, most probably by his own, which he had drawn in self-defence, but which was taken from him when he was overpowered (Register Nov 30 1839).

Young was buried between two large tree trunks on the river flat near to where he fell. Some two years later the South Australian Commissioner of Police, Major O’Halloran, referred to the incident and location in his diary,
[We] are encamped at a spot where several parties have been attacked...and where a European was killed by the natives and was buried between 2 trees with an F upon one, this man belonged to Mr McKinnon's party. I shall therefore distinguish our present encampment as the 'deadman's flat' (O'Halloran 1841).

The attack on Young may have been intended as a reprisal measure by the Ngawait for the previous shooting of those who had confronted Langhorne's party and may have planned no further attacks on the overlanders moving through their land. Mackinnon and his men, however, saw the incident as an unprovoked attack. He makes no mention of any further action taken by his party against the Ngawait, but several years later a member of Sturt's inland expedition who was crossing Deadman's Flat refers back to the incident,

...I descended into one of the flats, which not many years since was the scene of strife and blood, between the natives and an overland cattle party. One European fell from it beneath a shower of spears, and his grave was dug close by where he fell. How many of the opposite party were killed was not known but they were beaten off (Brock 1844: 10).

If Mackinnon's party did engage the Ngawait after the attack on Young as implied by Brock, then the Aborigines would may have felt obligated to retaliate further. On October 29th, just eight days after they had driven off the sheep from the Snodgrass party, further conflict occurred. A small group of Europeans was travelling from Adelaide east along the Murray with provisions for an overlanding party led by Captain Finniss. They expected to rendezvous at the Darling River junction. Before they
reached their destination they were attacked by the
Ngawait, most likely the same group who had confronted
Mackinnon. On the morning of the 29th October 1839, the
party led by McLeod had just broken camp and was
travelling east when they were surprised by a large group
of Ngawait who had lain hidden in the long grass and
behind trees;

[The Ngawait] effectually prevented our proceeding,
and attacked us in a most determined manner.
Unfortunately we had very few fire-arms, and those
principally ineffective. Those that were serviceable
the men were obliged to fall back with, covering the
unarmed portion of the party, and protecting
themselves from the spears and waddies which were
flying about in every direction. After about half an
hour's sharp firing which the natives stood
admirably, we drove them from the drays, and finally
into the river; but had it not been, I suspect, for
one or two well told shots, the result would have
been very different. Two of the men were struck, but
not materially hurt (Register November 16 1839).

McLeod was not prepared to risk the lives of his small
group nor the property on the drays and retreated from
the area. Once again there is no indication of
Aboriginal casualties but the "well told shots" coming
from McLeod's party suggest that several fell.

There are no further records of conflict between the
overlanders and the Aborigines of the Riverland after
these attacks. In April 1841, further attacks on the
overlanders happened upstream in the vicinity of Rufus
River (Clyne 1981: 98) which lead to several punitive
expeditions leaving from Adelaide and making their way to
that area, passing through the Riverland on their way.
These attacks and their repercussions have been well documented (British Parliamentary Papers. Papers Relating to Australia 1842-1844: 267-303). Whether any further conflict occurred between the Jirawirung and Ngawait and the overlanders is of course open to conjecture but relationships between the two groups were likely to have been tense. A comment on the conduct of the overlanders along the Murray route was, however, aired in a letter by a concerned resident of Adelaide and signed "A colonist of 1836".

There has seldom been an arrival by land from Port Phillip or Sydney, which on its first reaching Adelaide, did not bring some tale of boasting and butchering the natives on the way. There are few in Adelaide who have communicated with the degraded ruffians employed in driving stock to this country, who have not heard them recant of their exploits in shooting or "peppering" the natives in their route. And there are well authenticated instances where both the stock keepers and their masters have related tales of their shooting or hunting down the natives, which they have promptly recanted when it was ascertained that they were affording grounds for a dangerous enquiry into their conduct (The Register October 3, 1840).

Charles Sturt was also concerned by the unrestrained violence occurring along the overland route. Arriving at Lake Bonney on his overland expedition in 1844 he reflected:

...I fear that the great havoc made amongst the natives by the overland parties must have been fearful, and in many instances wanton (Sturt 1849: 39)
6.3 Settlement

As pastoral settlements moved out from the Adelaide Plains and into the new regions the clashes continued. In 1842 on Eyre Peninsula a series of attacks by Aborigines began on shepherds, stock and property that was to last intermittently for ten years (Summers 1986: 294). The attacks came mainly in the autumn and winter months, a time when traditional foods were scarce. The Aborigines, who were steadily being excluded from the land they once owned, may have had little other option open to them than to raid the small huts and homesteads of the shepherds and settlers. Although references to Jirawirung and Ngawait are few for this period, there appears to be little doubt that the situation in the Riverland was similar.

By 1840 the overland route along the Murray was well established and frequently used by parties supplying valuable stock numbers for the increasing Adelaide herds. Pastoral expansion had begun east of the Mount Lofty Ranges and along the Lower Murray and was advancing upstream towards the Riverland. Through the 1840-50’s the first European settlers began to arrive in Jirawirung and Ngawait lands establishing stock runs along the water ways with herds brought from the Lower Murray, as well as the strays they could round up from previous overlanded herds. One of the first established runs in the Riverland was Cobdogla Station located on the flood plains between the River Murray and Lake Bonney.
The Europeans came to the Riverland with the same concept of *Terra nullius* that had served as the justification for the settlement of the lands along the Adelaide Plains and indeed for much of the settlement of the Australian continent since 1788. They had no idea that the land, which they assumed was waste and uncultivated, and therefore without owners, had in fact been subjected to complex land ownership contracts for many centuries before them. The prevailing concept of the time was aptly summarised by the editor of the newly established Adelaide newspaper the *Southern Australian*:

> We do not think that the blacks have any exclusive property in the soil; and we should hereafter endeavour to demonstrate that we are here on the basis of that common right with which the law of nature invests all her children, where labour has not intervened and introduced its necessary consequences....Our right to be here is a right of brotherhood; a dedication of our origin from one common ancestor (*Southern Australian* November 3, 1838).

The editor, however, contended that the Aborigines should be treated with "gentleness and mercy...and that we must bear with them as with younger brethren."

In 1855 a police post was established at Overland Corner at the urgings of the settlers, overlooking the river on the overland route to Adelaide (Woolmer 1986: 21). Like the already existing police post at Moorundie its function was to safeguard the overland stock route and to offer protection to the small homesteads along the river. The latter function is salient to inter-racial relations during this period. The police force presence
in the newly settled districts of South Australia was never intended to offer protection for the Aborigines against the abuse and violence inflicted upon them from the overlanders and settlers. Rather it was the other way around. The administration in Adelaide was primarily concerned with control (however stringent) of the Aborigines, and the punishment of any that indulged in offences against the settlers or their property (Clyne 1981: 109). In this way it was naively believed that the inevitable abuse directed against the Aborigines could at least be contained to some reasonably acceptable level.

The full nature of inter-racial relationships during this period of initial settlement is obscure. The few available sources were written by those who sought to be on amiable terms with the Jirawirrung and Ngawait they encountered, and therefore present a somewhat empathetic but unbalanced view of racial relations. In the main however, it appears that the conflict and savagery that had already occurred in the early days of overlanding continued into at least the initial years of settlement. One of the early European pioneers of the Riverland spoke of this:

*Often I have heard men boasting of how they shot a nigger down, but never once have I seen it done. Nevertheless, although I am ashamed to say it, many of the blacks were undoubtedly murdered by bad unscupulous whites (J.T. Schell, Murray Pioneer, January 22, 1914).*
There is no evidence of any European in the area being charged with the killing or wounding of a Jirawirung or Ngawait but one of the first duties of the constables at the Overland Corner station was to actively pursue and capture "Black Billy", an Aborigine who had caused the residents and travellers some degree of "trouble" (Woolmer 1973: 10).

A clash between the Ngawait and an armed party of Europeans may have occurred in the early years of the 1840's near the present township of Cobdogla. Like the incidents that took place in and around Deadman's Flat it involved a strongly armed group of Europeans and an unknown number of Aborigines. Unlike the Deadman's Flat incidents the details are obscure and are derived from hearsay evidence from a single source. William Morris, a relative of James Trussell who was one of the first European settlers in the Riverland region, mentioned the incident which had taken place on his property some years after the Deadman's Flat conflict (Murray Pioneer December 24 1925). The incident involved a "punitive expedition" sent along the river route from Adelaide. The personnel making up the expedition are unknown as is their destination and objective, but Morris states that some were uniformed soldiers. If this is the case, then the expedition referred to may have been one of the four that were sent from Adelaide in 1841 "to deal with" the Aborigines at Rufus River (Clyne 1981: 92). The expedition came across a group of Ngawait at Cobdogla and
engaged them, catching and killing many in their fire. Just how many were killed is unknown but the shooting by the expedition was described by Morris as "promiscuous and under no control". He claims that many of the Ngawait who were killed were buried under what was, in the 1920's, orange groves and grape vines. The only remaining evidence of the incident, if indeed it can be seen as evidence, is a bayonet together with two uniform buttons which Morris dug up in his garden some 50 years later and sent to the Adelaide Museum.

Today there are several local stories of European initiated atrocities against the Jirawirung and Ngawait that may or may not have taken place. Occuring in the initial years of settlement several of the stories relate to the rounding up of the remnants of the Aboriginal groups that still existed on the edges of European settlements. Some tell of executions by shooting, or of forcing men, women and children over high cliffs. They cannot be substantiated and must remain just stories passed on verbally, but they do have parallels with other similar and well documented incidents in other places and in other times (e.g. Mulvaney 1989).

Attacks on Europeans were not uncommon although there appears little doubt that many of the aggressive confrontations between the two races were instigated by the Europeans. Disputes over Aboriginal women were one of the major causes of conflict between the two races.
I think in almost all encounters with natives we were more or less to blame... Many of the whites who were murdered by blacks courted disaster by interfering with their women (Schell, Murray Pioneer, January 22, 1914).

The Jirawirung and Ngawait people in general, and the male hunters in particular, were seen by the settlers as a rural nuisance, responsible for killing sheep and cattle and always imposing a threat on the safety of the settlers and their families. Two labouring men who were travelling from one pastoral property to another in August of 1853 were attacked and killed in the vicinity of Chowilla. Their bodies were dismembered and parts were buried. The overseer of one property discovered the legs (with boots on) and a portion of the body from one of the victims. There is no account of action taken by the European settlers, although the Commissioner of Police in Adelaide despatched an "intelligent active Constable" to assist in the pursuit of the Aborigines and bring the perpetrators to a speedy justice (Tolmer 1853).

One of the few European women living in the Riverland area around 1885 wrote of an experience that may have led to further violence.

Another time while mother was getting breakfast ready, after father had left home to look for work, the pieces of blanket that was hung in the doorway to serve as a door was thrown aside and a blackfellow stepped in. Mother jumped up and grabbed the gun that stood in the corner of the room (thinking to frighten him) but he only smiled and said "Puttem down that one gun Missis, that one no good, him no
carry cap. What for you frightened?" He was only making a friendly call (Kerridge 1845).

As the pastoral movement became established in the Riverland and the small settlements developed into townships, the remaining Jirawirung and Ngawait were excluded from the land. A fringe camp grew up around the police post and hotel at Overland Corner where monthly issues of flour and blankets were dispensed by government officials and food and liquor could be obtained. Some small groups were, however, able to remain on their traditional land assisting the pastoralists, particularly during the gold rush period when many Europeans left their holdings for the gold fields of Victoria and New South Wales. The Protector of Aborigines, E.B. Scott, commented in the Register on June 26th, 1852:

The squatters of the Murray can also bear witness to the great and important services the natives have rendered them during the scarcity of labour: and, on several occasions, natives have been left sole charge of the squatters' property; and it is gratifying to state, that in no instance has the confidence placed in them been taken advantage of.

Others were tolerated by the pastoralists and allowed to hunt. William Napper occupied a section of the Cobdogla station and operated a small hotel on the overland route. Although he left no personal record of his encounters with the Aborigines he is seen as one who was sympathetic towards them. In the brief reminiscences of their pioneering lives, Napper's daughters refer to his benevolence:
One day 'Scrubber', 'Fisherman Jimmy' and others came up to the hotel leading a very old black who was quite blind. The young fellows all wanted to go hunting and asked father to take care of the old black for the day. Father told the old fellow, who had white hair to sit down in the sun. He fed him, and the black dozed most of the day. At night the hunters returned, and as they walked past the hotel one behind the other, a voice called 'Cobdogla, Cobdogla'. The old black got up and joined his tribe (Murray Pioneer 20 December 1929).

Once the European population grew and became established in the Riverland any attack on them by the Jirawirung and Ngawait would have quickly been met with harsh reprisals. It is safe to assume that the Aborigines knew this only too well, recalling the violence that had already occurred near Lake Bonney and further upstream on the Rufus River. Even if it could have been instigated, further organized resistance aimed against the European occupation of their land would have been futile.

By the last decade of the nineteenth century, just sixty years after their first contact with Sturt's expedition, the Jirawirung and Ngawait tribes had ceased to function as social entities. Many members had been killed during the conflicts or died later of wounds. Others were forced to abandon long-held economic activities and leave their traditional land tracts to the pastoralists. They joined with other fragmented groups along the Murray to congregate and eventually die on the fringes of European settlements and around the police
post at Overland Corner and further downstream at Moorundie. The next chapter examines the dispersion and decline of the Jirawirung and Ngawait population in the Riverland.
CHAPTER SEVEN
The Pathway of Decline

HAVE THE TRIBES BEEN BLOTTED OUT OF EXISTENCE WHICH NOT MANY YEARS AGO SO NUMEROUSLY LINED THE BANKS OF THIS TRULY NOBLE RIVER?
(Brock 1844)

Depopulation of aboriginal people has been one of the most serious and common sequels to European colonization. Throughout the 17th, 18th, and 19th centuries colonizers from Europe entered in turn America, Africa, Polynesia, Australia, New Zealand and Melanesia. In all these places a fall in population occurred which often ended in the disappearance of ethnic groups (McArthur 1967). Notably in Australia, those who failed to recover from the impact of colonization were the Tasmanians (Jones 1971), the mainland tribes who bore the initial impact of the European colonists in and around the major settlements of Sydney, Melbourne and Adelaide (Barwick 1971; Smith 1975), and tribes whose lands were to become of particular economic interest to the colonisers.

7.1 Epidemic smallpox and population decline in America.

Introduced diseases from Europe have often been cited as the major factor leading to the depopulation and disappearance of indigenous groups in the New World (Crosby 1972, 1986; Cook 1973; McNeill 1976; Dobyns 1976, 1983; Meister 1976; Palkovich 1978; Snow & Lanphear 1988;
Ubelaker 1988) and the Pacific (Cilento 1928; Scrugg 1957; McArthur 1967; Moody 1973; Butlin 1983, 1985; Campbell 1983, 1985). In these cases drastic population changes and the accompanying disruption of long-standing social systems has resulted from the introduction of exotic epidemic pathogens.

One of the most widely cited examples is the case of the American Indians. Old World pathogens were chiefly responsible for sweeping aside Indian societies and cultures of the New World and opening up the new European colonies for demographic take-over. The diseases that reached epidemic levels among the Indian populations were smallpox, measles, diphtheria, influenza, tuberculosis, whooping cough, bubonic plague, typhoid fever and scarlet fever (Crosby 1972: 35-38; Cook 1973: 485-495). Here I will limit the discussion to a brief review of the course of smallpox and its demographic effect. Apart from being the most deadliest of all the transoceanic diseases and in many cases the first, smallpox is the one most relevant to this thesis. Its spread throughout the indigenous populations of America and its effect on the population was later strikingly reflected among the Aborigines of Australia. There seems little doubt today that it was the dominant factor responsible the Spanish conquest of South America and the defeat of the Indian nations in North America.
Smallpox first crossed into the New World at the end of 1518 or early 1519 (Crosby 1986: 196). It was brought into South America by the Conquistadores and killed a large proportion of the Aztec and Inca populations. Smallpox soon entered North America, probably crossing from Cuba to Florida with the movement of European colonists. Once introduced it spread rapidly among the inhabitants far ahead of contact with the colonizing Europeans (Ramenofsky 1987). One of the first reactions of a community faced with an epidemic of smallpox for the first time is for the healthy to flee from the sickness they see all around them. Because of the incubation period of the pathogen (10-14 days) many of those who flee unknowingly carry the latent infection with them, later succumbing to the disease and spreading it to other communities who in turn panic and flee. By the early 1830s smallpox had reached the northeast coast of United States (Snow & Lanphear 1988: 23) and had ravaged the populations of the Americas from the Great Lakes to the Pampas.

The first recorded epidemic of smallpox in North America erupted among the tribes of Massachusetts between 1633 to 1639 (Cook 1973: 491; Crosby 1986: 198), although it may have been present there as early as 1617 (Cook 1973: 487). In 1630 the ship Talbot arrived from England in Boston carrying Puritans several of whom were ill with smallpox on landing (Duffy 1953: 43; Josselyn 1673 in Cook 1973: 491). The disease caused repeated epidemics
among the European colonists of Boston. One of the most severe was between 1750 and 1752 resulting in the deaths of up to one fifth of the population (Duffy 1953: 58).

Smallpox had an astounding death rate among the Indians of America (Crosby 1972; Cook 1973; Ewers 1973; Dobyns 1976, 1983; Ubelaker 1988):

...whole towns of them were swept away, in some not so much as one sole escaping destruction (Duffy 1951: 327).

By the end of the seventeenth century, one hundred years after its introduction in the New World, smallpox was largely responsible for reducing the population of Central Mexico to only three percent of its 1520 level (Snow & Lanphear 1988: 16). In just two decades after the introduction of smallpox in the northeast of United States the Indian populations had been severely reduced from between 67 percent to 95 percent (Table 7.1).

<table>
<thead>
<tr>
<th>Group</th>
<th>Preepidemic population</th>
<th>Postepidemic population</th>
<th>Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maliseet</td>
<td>7,600</td>
<td>2,500</td>
<td>67</td>
</tr>
<tr>
<td>Eastern Abenaki</td>
<td>13,000</td>
<td>3,000</td>
<td>78</td>
</tr>
<tr>
<td>Western Abenaki</td>
<td>12,000</td>
<td>250</td>
<td>98</td>
</tr>
<tr>
<td>Massachusett</td>
<td>44,000</td>
<td>6,400</td>
<td>86</td>
</tr>
<tr>
<td>Mohegan-Pequot</td>
<td>16,000</td>
<td>3,000</td>
<td>81</td>
</tr>
<tr>
<td>Pocumtuck</td>
<td>18,400</td>
<td>920</td>
<td>95</td>
</tr>
<tr>
<td>Quiripi-Unquachog</td>
<td>29,900</td>
<td>1,500</td>
<td>95</td>
</tr>
<tr>
<td>Mahican</td>
<td>6,400</td>
<td>500</td>
<td>92</td>
</tr>
<tr>
<td>Mohawk</td>
<td>8,100</td>
<td>2,000</td>
<td>75</td>
</tr>
</tbody>
</table>

Table 7.1 Native population change in the Northeast of United States from 1610 to 1650 (Snow & Lanphear 1988).
The massive depopulation of the Northeast was reflected in other regions of the United States (Table 7.2).

<table>
<thead>
<tr>
<th>Area</th>
<th>Preepidemic population</th>
<th>Postepidemic population</th>
<th>Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arctic</td>
<td>73,770</td>
<td>35,000</td>
<td>53</td>
</tr>
<tr>
<td>Subarctic</td>
<td>103,400</td>
<td>45,500</td>
<td>56</td>
</tr>
<tr>
<td>Northwest Coast</td>
<td>175,330</td>
<td>26,000</td>
<td>89</td>
</tr>
<tr>
<td>California</td>
<td>221,000</td>
<td>10,000</td>
<td>95</td>
</tr>
<tr>
<td>Southwest</td>
<td>454,200</td>
<td>158,000</td>
<td>65</td>
</tr>
<tr>
<td>Great Basin</td>
<td>37,500</td>
<td>11,800</td>
<td>69</td>
</tr>
<tr>
<td>Plateau</td>
<td>77,950</td>
<td>18,000</td>
<td>77</td>
</tr>
<tr>
<td>Plains</td>
<td>189,100</td>
<td>62,000</td>
<td>67</td>
</tr>
<tr>
<td>Southeast</td>
<td>204,000</td>
<td>60,000</td>
<td>71</td>
</tr>
</tbody>
</table>

Table 7.2 Native population change in United States from contact to twentieth century (Ubelaker 1988).

From the sixteenth century and into the nineteenth and early twentieth centuries, smallpox continued to break out among the Indian groups, seemingly arising whenever enough susceptibles had been born since the last epidemic to support a new one. The effects were continued deaths, although probably never reaching the scales of morbidity and mortality that occurred when smallpox struck for the first time.

7.2 A model for decline

Throughout America, the Pacific and its littoral all or most of the populations that have come into contact with European colonial expansion have gone through three stages of demographic change:

1. Rapid decline.

2. Partial adjustment but still with a falling population.
3. Either complete adjustment with an increase in numbers, or lack of adjustment and annihilation (Cilento 1932: 480-481).

In the remainder of this chapter these factors will be discussed in relation to the path of decline and ultimate disappearance of the Jirawirung and Ngawait.

The difficulties incurred by colonial governments in conducting census counts and their accuracy in enumerating Aborigines in rural South Australia during the last century, and into the first half of this century, have often been discussed and criticised. For example Smith writes,

*The most difficult aspect of the South Australian census data is that people in remote areas in the north and west of the state seem periodically to have been omitted altogether, not only from enumeration, but also from estimated totals* (Smith 1975: 191).

This comment can be readily applied to the eastern frontier of the state. The censuses of 1851, 1861, 1866, 1871 and 1891 were quite deficient in their coverage of Aboriginal numbers throughout the state and completely ignored the Riverland populations. However, one census, that of 1881 (Table 7.3), did include the Riverland Aborigines under the province of Hamley and appears to be the only time the Jirawirung and Ngawait were ever officially counted.
Province of Hamley

<table>
<thead>
<tr>
<th>Adults</th>
<th>Children</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 8</td>
<td>F 4</td>
<td>M 1</td>
</tr>
<tr>
<td>F 1</td>
<td>F 1</td>
<td>F 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

Table 7.3 Aboriginal population of the Riverland extracted from the 1881 South Australian Census (South Australian Parliamentary Papers No.74 vol.3).

In Chapter Three I discussed the population density of the Riverland prior to European colonisation of the Australian continent and calculated a likely population of Jirawirung and Ngawait of 3000. Because of the near absence of census data for the Riverland Aborigines it is not possible to calculate any other demographic parameters (e.g. crude birthrate, crude deathrate or life expectancy etc) during the period beginning with their contact with European pathogens to that of the census of 1881. It is, however, possible to hypothesize on the pathway (or velocity) of the decline in population numbers.

While the population total of 14 arrived at in the 1881 census may be inaccurate it discloses a startling reality. In a period of just eighty one years (quite conceivably within the living memory of one individual) the Jirawirung and Ngawait, who had one of the most highest population densities in Australia, had declined to a level where not only would they have been unable to adjust and increase, but had reached the edge of annihilation.
Figure 7.1 is a representation of the path of population decline of the Jirawirung and Ngawait population in the Riverland. The $x$ axis (time) begins in 1800, before the arrival of the first foreign European pathogen, when none of the population were infected and so their crude birth and death rates were unaffected by transoceanic disease. It ends in 1881 when the population level was at its lowest known ebb. The $y$ axis indicates the fall of the population from a level of approximately three thousand to fourteen. Although the precise day on which the last of the Riverland Aborigines died will remain unknown, I am convinced that by 1881 (or very soon thereafter) the population had reached its nadir. The fragment of population remaining would have been living under severe medical, dietary and psychological stress, exhibiting a crude death rate exceeding the birthrate, and could therefore, no longer sustain an increase in numbers.

Having established the beginning and end points, the pathway and velocity of population decline of the Jirawirung and Ngawait between 1800 and 1881 has been estimated in the following way. The decline from 1800 to 1830 simulates the demographic effects of introduced venereal diseases (Butlin 1983: 77-79, Wright & Pirie 1984: 54-72). In Chapter Five I argued that the period from 1800 to 1830 saw the introduction and spread of gonorrhoea and syphilis among the Jirawirung and Ngawait. In this case, the diseases would have had an increasing
Beginning in 1800 before pathogenic contact the Aboriginal population of the Riverland is assumed to be stable at approximately 3000. After 1800 the population began to decline towards an unrecoverable low of 14 individuals enumerated in the official state census of 1881. Introduced epidemic diseases proceeding ahead of colonial expansion were the principle causes for the decline.
Riverland Model

Population

Year

1800-1881 - venereal disease
1830-1837 - smallpox
1838-1881 - frontier conflict
1848-1881 - seasonal movement
effect in reducing fertility. A decline in population is therefore proposed, beginning at a factor of 10 percent for the first decade after introduction and increasing by a further 10 percent each decade until 1830. This method arrives at a population reduction of 48 percent by the 1830s. Similar, and more severe, population declines due to introduced venereal diseases have been noted in the Pacific Islands (e.g. Pirie 1972; Scragg 1954; McArthur 1967). For example Pirie (1972: 198) cites a population decline of 58 percent over eight years for Kusaie, an island in Micronesia which was a favourite port for whalers last century.

The arrival of epidemic smallpox between 1830 and 1837 increased the velocity of decline and, together with the reduced fertility caused by the present venereal diseases, further reduced the population. The demographic effect of smallpox on the American Indians has been briefly discussed above. Severe mortality figures were experienced throughout the continent ranging from 50 to 95 percent. In some cases 100 percent mortality would have resulted for some smaller groups. In reviewing the evidence for the epidemics in New England Cook stated that

*It will not be unreasonable to consider 75 percent as the mortality, or the factor of reduction, associated with the epidemics of the early seventeenth century which affected the total population over a substantial expanse of territory* (1973: 501).
For the period between 1830 and 1837 I have adopted as a working hypothesis the factor of population reduction of 75 percent for the Jirawirung and Ngawait.

In the final stages of decline, between 1838 and 1881, the Jirawirung were still suffering from venereal disease as well as frontier conflicts against Europeans, dislocation from homelands and exposure to several other introduced diseases. I have estimated their cumulative effect on population reduction to be 50 percent over subsequent decades. This estimate is based on Aboriginal population trends shown by census data enumerating Aboriginal populations in South Australia (Fig. 7.2a) (South Australian Parliamentary Papers 1860 No. 165 vol. 2 appendix p.iv)) together with regional data of the Buandik tribe from the southeast of the state (Fig. 7.2b) (Campbell 1939: 34). The former displays an overall decline of Aboriginal numbers in South Australia of 59.2 percent between 1841 and 1851 and a further 56.2 percent up to 1856.

The Buandik were selected because of similarities to the Riverland region. Firstly, both groups lived in rich environments and had high population densities. Secondly, they both suffered from the same epidemics and were later displaced from their lands, initially suffering violence from overlanding parties and later by settlers. Thirdly, neither population exists today. The
FIGURE 7.2

(A) State wide population decline of Aborigines in South Australia 1841 to 1855.

There was an overall decline in population of 59.2% between 1841 and 1851 and a further 56.2% to 1856. Although not shown in this figure the Aboriginal population of South Australia has risen since 1920. Based on official census data of South Australia (SAPP 1860, No. 5, appendix p. iv).

(B) Population decline of the Buandik of the Southeast of South Australia.

The Buandik population decline averaged 50% every five years from 1861 to 1876. The Buandik died out. By 1895 probably only two members remained and by 1900 these had died.
Buandik data reveal a population decline averaging around 50 percent every five years from 1861 to 1876.

Both these sets of data reveal an initial rapid decline of population immediately after initial contact with Europeans followed by a levelling or slowing in the velocity of decline during the following years. Although not shown here the Aboriginal population for South Australia has risen since 1920. By 1981 it had reached a total approaching ten thousand and is still increasing (Price 1987: 4).

The Buandik Aborigines did not survive. Campbell reports

As the century drew to its close, we see the same rapid disappearance holding sway as was shown above by the series of census returns [Fig 7.2b]. In 1876 the population was about 55; twenty years later, by 1895, it is well known that probably only two full-blooded aboriginals of the South-East remained; and before 1900 the Buandik were completely gone (Campbell 1934: 35).

The proposed model of population decline of the Jirawirung and Ngawait is based on estimates of the rate of population decline offered by the above data. I believe this to be a safe assumption because today we have the benefit of a number of studies of Aboriginal population decline based on census data, most of which demonstrate a generalised but similar population decay trajectory of concave form. In the case of the Jirawirung and Ngawait the trajectory has been modified
to compensate for the specific nature of the epidemics, hostilities resulting from contact, and migration.

7.3 The epidemics

Before discussing the diseases responsible for the severe decline in the population of the Jirawirung and Ngawait, an important distinction between their epidemiological behaviour in European populations and their effect on immunologically inexperienced populations must be made. In her examination of population changes in Pacific island populations McArthur noted,

For an epidemic to initiate a sustained decline in an initially stable population, age-selective mortality is a pre-requisite, because although the number of births might decrease after an epidemic relatively more than the population decreased as a result of it, uniform mortality throughout all ages would preserve the age structure of the pre-epidemic sector of the population so that within very few years the birth and death rates could return to their former levels. If the population had been increasing before the epidemic, in the absence of any other epidemic outbreaks it would begin to increase again within a few years, and would suffer a setback to its growth only when they would normally be responsible for relatively more births than women of other ages (McArthur 1967: 347).

An immunologically susceptible population coming into contact with a foreign pathogen for the first time would most likely experience severe mortality on the outbreak of the epidemic. As some immunity to the disease is built up within the surviving population a period of reduced mortality and population recovery may later result. If, however, continued susceptibility to the initial epidemic, or even the introduction of another
foreign pathogen causing a new epidemic disease, is simultaneously experienced, the already depleted population has little time, nor the immunological resilience, to recover. A higher age-selective mortality (e.g. among neonates and infants) would then result in a continued and probably unrecoverable decline in the population. I believe this situation led to the decline in the population displayed in Figure 7.1.

7.3.1 Venereal disease.

The first of the epidemics introduced into Australia to reach the Jirawirung and Ngawait were the venereal diseases of syphilis and gonorrhoea. In Chapter Five I showed how the Murray River populations came into contact with syphilis and gonorrhoea soon after the establishment of sealing and whaling off the south coast of South Australia in 1806. Their transmission along the Murray corridor was well advanced by 1830 and both diseases would have been chronic among the Jirawirung and Ngawait from at least that time.

It is rare to find concise information on the prevalence and effect on fertility of introduced venereal diseases among Australian Aborigines (Moodie 1973: 163). Wright and Pirie (1984) examined the cumulative increase in the incidence of syphilis and gonorrhoea among American negroes from the days of slavery through Emancipation to World Wars I and II. They estimated the physiological impact of venereal disease to have
accounted for 56 percent of the decline in the total fertility rate from 7.4 to 2.6 births per woman during the period from 1810 to 1936. While it would be precarious to attribute directly the same figure to the Aborigines of the Murray River, I nevertheless think it plausible (and indeed probable) to accept a similar epidemiological and demographic effect of the diseases.

The parallels are:

1. Both groups have had a short history of exposure to the diseases.
2. Both lived in poor socio-economic circumstances (this at first was not the case with the Jirawirung and Ngawait but as colonial expansion continued in South Australia the economic and social conditions of the Murray Aborigines deteriorated).
3. Both groups lacked efficient antibiotic treatment for the disease (for the Jirawirung and Ngawait there was almost no treatment).
4. Lack of understanding of the etiology of the disease thus assisted its spread throughout the population.
5. There was a high degree of sexual promiscuity in both groups.

While syphilis and gonorrhoea do not immediately lead to the death of the infected individual, if left untreated, they will soon begin to influence the crude birth rate and infant survival of the population. Syphilis itself does not inhibit the ability of a woman
to conceive, nor a man to impregnate her, but its effect on fertility can be profound. It is well established that a syphilitic mother, particularly within the first two years of infection, is likely to transmit the treponeme via the placenta to the foetus after the first five months of gestation (Robbins 1967: 305). The results are commonly late abortion (early abortions due to syphilis are uncommon), stillbirth, or death of the neonate soon after birth. In some cases where infants are carried to term it remains as a latent infection carrying with it varying degrees of damage to the liver, lungs and bone tissue which may prevent their survival or lower their resistance to other risks of mortality (Robbins 1967: 30).

The effects of gonorrhoea on fertility and population decline of the Jirawirung and Ngawait were most likely more severe than syphilis. In a society where sexual mores often tolerated frequent intercourse involving a variety of partners for at least a segment of the population (e.g. young Aboriginal women becoming prostitutes for European males), the setting is primed for a high incidence of gonorrhoea. Because no immunity to further infections of gonorrhoea is acquired after the initial infection, and because of a short incubation period (as low as three days), the incidence of the disease can be up to ten times greater than that of syphilis in an untreated population (Spink 1978: 312). Among women, about 15 percent of all cases will result in
the secondary complication of pelvic inflammatory disease (Bender 1975: 46). This condition reduces the chances of conception and renders the victim completely sterile in 20 to 30 percent of all cases (Wilcox 1964: 679). Among untreated males, epididymitis occurs in about 20 percent of cases resulting in extensive destruction of the organ and in some 30 percent of all cases complete sterility results.

Among the Riverland Aborigines, a population stricken with high levels of chronic venereal disease, a change in fertility pattern would result severely inhibiting their fecundity and reducing the total fertility rate. The two major factors which would influence the decline in their population would be a high level of childlessness and an unusual trend in age-specific fertility. In any given population there will be a small number of women physiologically incapable of bearing children. In a population continually subjected to recurrent venereal disease, particularly gonorrhoea, the number of childless women would increase. (In New Ireland Scragg (1954) found up to thirty percent of females to be infertile due to sterility caused by tubal occlusion from repeated infections of gonorrhoea). Those women in the population capable of conception ran a further risk of abortion late in their term thus increasing their birth spacing, and/or producing stillborn or neonates who died soon after delivery.
In a population not suffering the deleterious effects of venereal disease the age-specific fertility rate is usually highest in the second and third quinquennium of the reproductive age range, from 20 to 29 years of age, peaking in the 20-24 year age group. In a population subjected to chronic venereal disease the typical pattern is of high levels in the first quinquennium (15 to 19 years of age) tapering noticeably thereafter (Wright & Pirie 1984: 13). This pattern reflects sexual behaviour characterised by an increased early commencement, high activity and little or no attempt at contraception. The result is initially a high level of fertility at a young age. This, however, increases the proportion of young potential parents exposed to venereal disease and its associated fecundity-inhibiting sequelae, thus progressively and permanently reducing fertility.

7.3.2 Smallpox

The epidemic of smallpox reached the Jirawirung and Ngawait around 1830 (Chapter 5) at the same time that the diseases of syphilis and gonorrhoea had established themselves and were leading to a slow but steady decline of the population. Smallpox remained only a short time, just seven years, and then it burnt itself out before the first European settlers arrived to establish Adelaide in 1837.
The disease classified as smallpox is really two related diseases - *variola minor* and *variola major* - caused by viruses with distinctive characteristics (Fenner et al. 1988: 2-68). *Variola minor*, the less serious of the two diseases, has a negligible case fatality rate (less than one percent). In contrast, the types of *variola major* classified by the World Health Organization (based on the type of lesions formed and the progression of the disease) have quite different case fatality rates: ordinary-discrete, <10%; ordinary-semiconfluent, 25-50%; ordinary-confluent, 50-75%; flat, >90%; and haemorrhagic-type, almost 100% (Koplan & Foster 1979: 440; Fenner et al. 1988: 5).

In his model of Aboriginal population decline Butlin (1983: 65) suggested an overall deathrate due to smallpox as considerably in excess of 50 percent of the total population based on estimates among Indian populations on the West coast of the United States. Though it is impossible to quantify directly the mortality rate inflicted by the disease among the Jirawirung and Ngawait, there is a strong presumption that it would have followed the patterns of other smallpox epidemics introduced by colonists into immunologically susceptible aboriginal populations elsewhere in the world (e.g. Dobyns 1983; Snow & Lanphear 1988). The very high case fatality rate of smallpox among aboriginal populations in other non-endemic countries has been well documented in the past (Fenner et al. 1988: 1069-1102). We may
reasonably assume, then, that during the 1830's epidemic the populations along the Murray River were also severely affected with a high morbidity and case fatality rate.

Mortality from smallpox is both age and sex specific. The age incidence depends mainly on the acquired immunity of the exposed population, whether due to vaccination or prior natural infection. If smallpox is endemic, as it was in the larger cities of Europe and on the Indian subcontinent, it is mainly a disease of childhood. After recovering from the disease the child is then usually immunologically protected from further infection for life and so mortality in the adult population is low. In virgin soil populations previously unexposed to smallpox, the age incidence is somewhat altered. On first exposure to the epidemic all age groups are immunologically susceptible and the case fatality rate ranges at a high level throughout (Black 1975: 517). Even then, there is usually a higher case fatality level among neonates, infants and the aged because of the low or reduced capability of their immunological system to combat the infection. In any population, continued exposure to smallpox will later result in high case fatality rates remaining in the young, particularly the immunologically susceptible neonates, and a levelling off in the adults. Table 7.4 displays the age specific case fatality rates of smallpox in India.
<table>
<thead>
<tr>
<th>Age</th>
<th>Cases No.</th>
<th>%</th>
<th>Case Fatality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>725</td>
<td>36.8</td>
<td>45.7</td>
</tr>
<tr>
<td>5-14</td>
<td>897</td>
<td>45.5</td>
<td>12.4</td>
</tr>
<tr>
<td>15-39</td>
<td>265</td>
<td>13.4</td>
<td>20.7</td>
</tr>
<tr>
<td>40 +</td>
<td>84</td>
<td>4.3</td>
<td>27.8</td>
</tr>
</tbody>
</table>

Table 7.4 Unvaccinated age distribution of Smallpox in six states of India, 1974-75 (Fenner et al. 1988: 176).

It should be stressed that smallpox was endemic at the time and the figures do not reflect that of a virgin soil population such as the Jirawirung and Ngawait which would have a much higher case fatality rate overall.

Smallpox is more severe in pregnant women than in non-pregnant women or in men. Flat-type and haemorrhagic-type smallpox, inflicting case fatality rates of 90 and 100 percent respectively, occur more commonly in pregnant women (Fenner et al. 1988: 54). In a society with a high pregnancy rate, and at the same time under stress from venereal disease, this would create a relatively large group at risk to smallpox. A further heavy reduction in the total fertility rate of the population would be experienced with those young women able to conceive becoming pregnant and together with their unborn children succumbing to a particularly fatal type of smallpox.
7.3.3 Conflict

Precisely how many Jirawirung and Ngawait deaths resulted from European violence is impossible to determine because it is highly probable that many were never officially reported or discovered. Nevertheless I believe, as I have argued in the previous chapter, that death resulting from violent confrontations with Europeans was a common occurrence among the Aborigines of the Riverland. Beginning in October of 1839, when the overlanding party led by Langhorne engaged the Aborigines near Lake Bonney, and continuing through to the early years of European settlement of the Riverland at the end of the century, violent deaths were chronic.

While deaths due to personal conflict are a feature of all human societies, they do not always have a significant or permanent effect on population decline. For example, the simultaneous deaths of several Aboriginal males capable of reproducing would not alter substantially the fecundity of the women, nor the crude birthrate of their society. Widowed wives would be readily able, after a suitable period of mourning, to find new husbands and continue their reproductive life. The crude birth rate of their society would not be significantly altered. On the other hand, the death of a female during or before her reproduction age has a far greater effect on the size of the population. Therefore, if women are also being killed along with men in the
violent confrontations with Europeans, their deaths will have a crucial effect on the overall fecundity of their society and result in a reduction of the crude birth rate.

While, understandably, none of the accounts of Aboriginal/European hostilities in the Riverland discussed in the previous chapter refer to women being involved, quite likely they were. In the inquest that followed the now infamous Rufus River confrontations, Mathew Moorehouse, the leader of the expedition from Adelaide, was the only one of the members questioned to state that women were among the Aboriginal assembly that had formed to attack the Europeans (*British Parliamentary Papers* (Australia) 7: 299). It is then probable that Jirawirung and Ngawait women also accompanied their men, or were within close proximity of the hostilities with the overlanding parties, and were subsequently amongst those killed.

In all likelihood the mortality rate of the Jirawirung and Ngawait was substantially increased after 1839 by chronic violence in clashes with European overlanding parties and settlers. If this were the case then their deaths would have further added to the already falling birth rate and population decline brought about by exposure to infectious epidemics.
7.4 Migration

So far I have argued for the population decline in the Riverland being due to introduced pathogens and the hostility related violence between the Jirawirung and Ngawait and the colonial Europeans. While I believe these to be the principle causes of depopulation, there is a third factor of population dynamics to be considered here, namely migration. The impact of foreign pathogens and colonial expansion along the Murray River threw the Jirawirung and Ngawait social and economic systems into chaos. The Jirawirung and Ngawait were suffering deprivations that were previously unknown to them. Food was becoming increasingly scarce, malnutrition and possibly outright starvation were being experienced, exposure to the weather and bad sanitation were common, all of which rendered them more susceptible to disease and led to an all-pervasive feeling of despair. On top of this was the ever-present risk of violence from Europeans who had little need to account for their actions. Some safety and succour were to gained by leaving the Riverland and living in the Aboriginal camps on the Torrens River in Adelaide.

In 1854 the Protector of Aborigines, Mathew Moorehouse, wrote in his quarterly report:

On the first of July seventy three Natives came from the Murray to take up winter quarters near Adelaide; during the month they were joined by eighty others who remained until September and then they returned. Their residing in Town affords them opportunities of getting into contact with Public Houses and many are
apt to indulge in liquor. Four were fined in the Police Court for drunkenness. Three paid the fine, and one in default was imprisoned 24 hours (Moorehouse 1854).

The winter months were the most difficult for the Jirawirung and Ngawait on the river. By the early 1850's a seasonal migration trend had began from the Riverland to the Adelaide encampments.

The encampment of aborigines still continues on the bank of the bank of the Torrens near to the Company's Mill. It consists of about 120 persons of all ages. There appear to be very few children among them. They belong to the Lake Bonney tribe, and have come into town to obtain supplies of various kinds - blankets, twine for nets, fishhooks, tomahawks etc. They have received liberal supplies of those articles ... The intention of the tribe was to remain in their present locality during the winter season. This course being very undesirable, because of the facilities afforded near to town for acquiring habits of intoxication and mendacity. They have been persuaded by presents and by promises of supplies being forwarded to them at the Overland Corner Police station to move off [to] their own place. It is expected they will leave on Monday next (Register July 23 1858).

There are three points worth noting in the above passages. Firstly, by 1858 it was already noticeable to European observers that the numbers of Aboriginal children were beginning to decline. Secondly, by living in Adelaide the Riverland Aborigines were facing further hazards to their health. Alcohol, as well as tobacco, became newly desired commodities, and each was readily obtained from the European community by prostitution. This would then have resulted in further stress on already weakened immune systems and a continuance of the spread of venereal disease among them. The crowded and
unsanitary conditions of the encampments would also have promoted further the spread of respiratory, intestinal and helminth diseases.

Thirdly, the South Australian Government came under increasing pressure from some Adelaide residents to remove the Aborigines. The encampments were located on the banks of the Torrens River near the only bridge that linked the city centre to the more influential residencies of North Adelaide. In their daily travel from one place to the other the residents of Adelaide came face to with the disease and squalor of the encampments and often were confronted by Aboriginal men demanding money or women soliciting for alcohol and tobacco (Register February 4 1843; December 7 1844; July 23 1858). Sensitivities were affronted.

*Europeans as a mass cannot exist in comfort or indifference with such an accumulated nuisance, such a pestiferous conglomeration of filth, putridity, and disease as a black encampment beneath their very noses, although there are some of our dear countrymen whose tastes and habits would readily assimilate (Register December 8 1847).*

Another resident complained:

*Allow me, through the medium of your valuable journal, to call to the attention of the authorities to a glaring evil which, to my knowledge, has been in practice for some months. I refer to the blacks being allowed to encamp in the bed of the river between the Froom Bridge and the fording place at the back of Government House. This disgusting evil might be easily remedied if the police would only use a little trouble, for the provisions of the Police Act give them full power to remove the nuisance they daily see in passing over the footbridge in their way to and from North Adelaide...(Register August 19 1848).*
In order to dissuade the Jirawirung and Ngawait from leaving the Riverland in the winter months and making the journey to the Adelaide encampments, the police post at Overland Corner began irregularly issuing flour, sugar and blankets. In the six months ending on June 30th 1860 over one thousand blankets had been issued (South Australian Parliamentary Papers 1860 no. 165). The number of individual recipients would, however, have been much lower than this figure because of the habit among the Aborigines of trading the blankets they received and returning again for the next issue.

The supplying of provisions may have had some effect in retaining the Jirawirung and Ngawait people in the Riverland during winter but it also had the effect of increasing the population density. Dislocated groups from further upstream on the Murray and from the Darling River gravitated to the Riverland to receive the provisions they could no longer obtain from their homelands and to offer their labour to the pastoralists (Grosvenor 1979: 8; Woolmer 1984: 17-19).

During the 1870’s large numbers would congregate at Overland Corner.

They used to camp on the high ground just behind the hotel and around the Police Station when the river was high. At other times they camped along the river bank and around the mouth of the creek leading to a lagoon in the flat within sight of the hotel... The natives used to punt their canoes with a pole and
hundreds came to Overland Corner during the shearing seasons in these craft, up to 1,500 camping there at times. Later the Government issued groups with proper wooden boats to enable them to travel more efficiently (Woolmer 1984: 18)

Although 1,500 may be an overestimate of the numbers camping at Overland Corner at any one time, it does indicate a large and seasonal migration into the Riverland from other regions of the river valley. In the early winter 1861 over 300 Aboriginal women remained camped at Overland Corner to catch a glimpse of the first European woman, Mrs W. Brand sen., to live at the hotel (Woolmer 1984: 16). Such seasonal population increases put further strain upon the disappearing natural food resources of the Riverland and would have added further to the dietary stress and poor health of the Jirawirung and Ngawait.

Figure 7.1 displays an overall continuous trend of population decline of the Jirawirung and Ngawait with different phases exhibited in the variations in the velocity of decline. The decline began with the introduction of venereal diseases in the first decade of the 1800's. The diseases soon became chronic among the Jirawirung and Ngawait and would have remained so until the end. The population would have had little or no time to adjust to the effects of gonorrhoea and syphilis before the arrival of smallpox.

This second epidemic arrived soon after, probably in 1830. The effect on mortality and the population decline
was immediate and severe. Mortality would have been spread throughout all ages of the population in the first instance and then mainly confined to the immunologically susceptible young children. The disease appears to have burnt itself out among the Murray populations by late 1836 or early 1837 because no known active case was observed by European colonists. The impact of smallpox increased the velocity of decline.

After the disappearance of smallpox another epidemic arrived. Violent deaths resulting from hostilities with Europeans began in the Riverland soon after the commencement of the overland cattle route from the eastern settlements to Adelaide. The first deaths occurred in 1839 and were to continue for the next eighty years. This third epidemic most likely had its highest mortality among the adult males who clashed with the overlanding parties, but there is every reason to suspect that mortality was also high among women and children.

Another aspect of the overlanding period was the denuding of the natural vegetation on the flood plains by the large herds crossing through the Riverland. Competition for the Riverland’s resources between the Jirawirung and Ngawait and the Overlanders became intense from 1840. This led to chronic periods of malnutrition further reducing the Aborigines’ state of health and further weakening already stressed immune systems.
The large numbers of Aborigines reported in the Riverland from the 1870's give a false depiction of the decline of the Jirawirung and Ngawait. Those that have been documented as living at Overland Corner were made up of people from several Murray River groups as well as fragmented social entities from the lower Murrumbidgee and Darling Rivers. They, together with the Jirawirung and Ngawait, formed a mobile population moving up and down the river systems, congregating and dispersing under a seasonal regime.

While there were some reductions to the velocity of population decline, there would never have been any long lasting periods of adjustment to the overall trend of decline. One epidemic followed closely on the heels of another. For the period between 1803 and 1881 the Jirawirung and Ngawait suffered the ever present effects of venereal diseases, slowly but continuously diminishing their fecundity. In addition, between 1830 and 1837 they suffered the devastating effects of smallpox and later, from 1839, death from a new form of violence. If this were not enough, migration from the Riverland to Adelaide led to contact with further epidemic diseases. Tuberculosis and influenza which were inflicting high mortality rates on the populations gathered in the encampments of Adelaide and missionary settlements of the lower Murray would also have taken their toll on the few remaining Jirawirung and Ngawait.
The epidemics were continuous. Their combined effect was to strike at all age and sex groups within the population, but those most severely infected, and having the highest mortality rates would have been the neonates and infants. The group most severely affected by low fecundity were young women. Under these circumstances, which were to prevail for eighty years, there was to be no reversal of the trend. The once large and affluent population of the Riverland which had existed from the late Pleistocene came rapidly and finally to its end.
CHAPTER EIGHT
Conclusions and Afterthoughts

WHITEMAN COME, KANGAROO GO.
(Anon)

This thesis has attempted to examine the mechanisms of introduced epidemics of infectious disease and hostilities and their roles, singularly and collectively, in the depopulation of two Aboriginal tribes living side by side under the same environmental conditions. The central aim has been to identify and examine the major causes of the rapid depopulation in the Riverland of South Australia and to propose a model for the course of the decline.

8.1 Conclusions

The Jirawirung and Ngawait lived in an environment rich in available flora, fauna and year-round water resources. It has been estimated that their population density at the beginning of the nineteenth century of between 0.3 and 0.5 Km² per person would have been among the highest anywhere else in Australia. Such a high density of people living in what is a semi-arid region of South Australia can be attributed to the amount of unearned water flowing down the Murray River from its large catchment area, particularly the much wetter eastern highland regions. One may estimate the combined population total of the two Riverland tribes immediately prior to the incursions of sealers and whalers on the south coast of South Australia at between 2,172 and 3,620. Averaging and rounding off these figures a total population for the Riverland region of 3,000 is suggested.
This is much higher than estimations of early observers who were seeing, without realising, populations along the Murray River already seriously reduced by introduced epidemic diseases and frontier violence.

The overall health status of the Jirawirung and Ngawait before the advent of colonization was very good. They were largely free from non-infectious diseases like cardiovascular, cerebrovascular and renal anomalies, and malignant neoplasms would have been few. They lived in a state of homeostatic balance with the human and zoonotic pathogens sharing the environment. This balance had its roots within their social and biological background reaching back to the late Pleistocene when the first humans entered Australia and later (circa 30,000 BP) with their arrival in the Riverland. During their occupation of the Riverland there may have been occasional localised epidemics arising from an endemic (Group II) or a zoonotic (Group III) pathogen but these would have had a low case-fatality rate (relative to introduced Group I epidemics) and would not have had a serious effect on the population level. Complete population re-adjustment would have followed these events. A constant genetic flow along the Murray River corridor and south coast of South Australia together with the common practice of infanticide would have eliminated many potential deleterious alleles and reduced the incidence of genetic anomalies. Probably the greatest cause of adult death among the Jirawirung and Ngawait was intra-tribal and inter-tribal conflicts.
There is yet no firm evidence of endemic (non-venereal) syphilis or yaws among pre-contact Murray River Aborigines in South Australia. The few crania displaying lesions diagnosed as treponematoses have not been conclusively dated; they could well be post-contact. Periostitis, osteitis, osteoperiostitis and osteomyelitis (observed in a minority of postcranial bones from the Murray River of South Australia) are non-specific infections and are at best inconclusive evidence of treponemal infection. The high incidence of syphilis, frequently referred to in historical sources, together with unfavourable environmental conditions along the Murray River for yaws or non-venereal syphilis strongly suggests that the population had acquired no immunity to the disease from previous exposure to the treponeme.

Venereal infections and smallpox were the diseases most responsible for the decline and destruction of the Jirawirung and Ngawait. The continuous decline in population began with exposure to transoceanic pathogens in the first decade of the 1800’s. The first of these diseases to arrive were gonorrhoea and syphilis. Introduced via the southern coast of South Australia by sealers and whalers soon after 1806 they travelled upstream from the mouth of the Murray River to the Riverland. These two venereal diseases persisted among the Murray River populations severely reducing fecundity and laid the foundation for further and more severe depopulation.
Smallpox made its way from population centres upstream of the Riverland and swept through the Jirawirung and Ngawait population between 1830 and 1837. Mortality from this epidemic would have been severe, probably in the order of at least 50% of the population. Although case fatality rates would have been high in all age and sex groups from initial exposure to the pathogen, mortality would have been most severe among pregnant women (along with their unborn children) and neonates.

The establishment of the overland cattle route in 1838, passing as it did through the Riverland, also had a profound effect on the Jirawirung and Ngawait population. The potential for violent clashes with armed European parties crossing Jirawirung and Ngawait lands without the proper protocol being observed was present when Sturt, Hawdon and Eyre passed through the Riverland. Clashes began to occur later in 1839, when the overlanding period intensified, and continued well into the permanent settlement of the Riverland. Another effect of the overland route was the disruption of economic and social practices. The constant flow of cattle through the region, together with the persistent threat from aggressive stockmen primarily concerned with the protection of their valuable herds, resulted in the loss of grasslands, the exclusion of much of the native terrestrial fauna, and competition for space along the banks of the river and waterways.
The combined effect of European incursions into the Riverland was to start the population on a downward curve to annihilation. That there was to be no recovery derived from the severe and chronic effects of mortality on the unborn, neonates and infants, and the irrecoverable losses of fertile women from chronic venereal diseases and later from smallpox and frontier violence.

8.2 An afterthought

Having examined the causes of depopulation in the Riverland and the ultimate extinction of the Jirawirung and Ngawait, a question is begging. Why did some of the Murray River tribes, like the Jirawirung and Ngawait, die out and not others, like those of the Lower Murray? While I think the answers to this question are complex and deserve to be fully researched especially on a continent-wide scale, I offer here some reasonings pertaining to the Murray River populations.

1. The epidemiology of introduced diseases in populations with no immunity is often complex, especially when they range over a wide area and a number of years. Some regions feel the full brunt of the disease, and mortality is extremely high. Other regions are affected much less so, while others escape almost completely. The ‘Black Death’ that ravaged Medieval Europe displayed an irregular pattern although it caused the death of many thousands.
2. Many Aborigines lived far away from European settlements and would have received little or no effective treatment for the introduced epidemics thus allowing the diseases to remain unchecked, in the population with most individuals becoming infected and often reinfected several times over.

3. Violence from Europeans would have remained largely unchecked in frontier regions far beyond the reaches of the law and order being enforced more resolutely in the established settlements. In such cases violence would have been more severe and more prolonged. The acts of frontier violence that did come to the notice of the new colonial governments would often be quietly ignored. In the case of South Australia, the overland route from the east had to be maintained in order to feed and finance the growing populations of Adelaide and the settled districts. Anyone who over-zealously protected his herds would be unlikely to be called upon to answer for his actions or subjected to the punishment specified by the law. A point in case was the inquiry into the Rufus River incidents of 1841.

4. A part of being out of reach of law and order was that tribes like those of the Riverland had no immediate access to local refuges provided by missionary settlements. Although mortality rates in these settlements were high, especially from respiratory diseases, they did provide some protection together with various forms of medical treatment (not always successful), and went some way in reducing the
effects of psychological stress from living under the threat of violence.

These answers hardly address such a question fully, but they may provide the future basis of a much broader inquiry into the biological and medical consequences of European colonization on the Australian Aborigines.
Abbreviations
AO - Archaeology in Oceania.
APAO - Archaeology and Physical Anthropology in Oceania.
RGSASA - Proceedings of the Royal Geographic Society of Australasia, South Australian Branch.


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