LIVING IN RAINFOREST:

the prehistoric occupation of North Queensland's humid tropics

Volume 1

Thesis submitted by

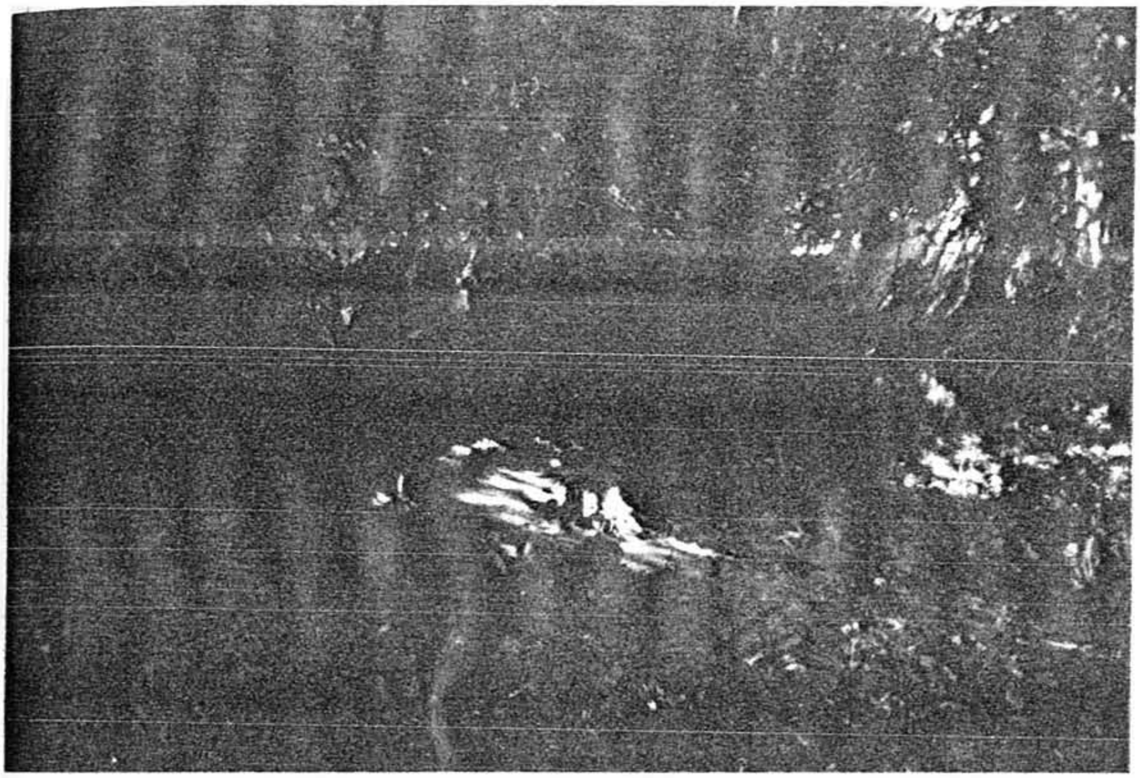
N. Horsfall BSc(Qld) BA(Hons)(Qld)

in March 1987

for the degree of Doctor of Philosophy

in the Department of Behavioural Science

at James Cook University of North Queensland



Jiyer Cave, a rockshelter in lowland rainforest on the Russell River, was first occupied over 5,000 years ago.

I, the undersigned, the author of this thesis, understand that James Cook University of North Queensland will make it available for use within the University and allow access to users in other approved libraries. All users consulting this thesis will have to sign the following statement:

> "In consulting this thesis I agree not to copy or closely paraphrase it in whole or in part without the written consent of the author; and to make proper written acknowledgement for any assistance which I have obtained from it."

Beyond this, I do not with to place any restriction on access to this thesis.

...21.3.87..

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

21.3.87

ABSTRACT

This thesis presents the results of an exploratory investigation into the prehistoric occupation of the tropical rainforests of northeast Queensland. The limited ethnographic data available for this region describes how the Aboriginal societies who lived in these rainforests exploited their environment. A major feature of this exploitation was the intensive use of several species of toxic plants (many of them restricted to this district) as food staples. These plants were rendered edible by a complex process of treatment which included leaching in running water. Similar processes have been used to treat toxic food plants in many regions of the world, and their use may have a considerable antiquity.

Although preservation of archaeological remains is not optimal in these humid tropics, numerous sites have been recorded, and excavations were undertaken at several of these. The oldest cultural deposits found so far are at Jiyer Cave (from 5100 BP), and an open site (Mulgrave River 2) was first occupied at about 2700 BP. Both of these sites contained remains of toxic and non-toxic food plants. Similar food plant remains were also recovered from other sites investigated by the author.

The link between these archaeological remains of toxic food plants and intensive Aboriginal exploitation of the rainforests is not clear. This is due partly to the poor preservation of organic material in the older deposits particularly, and partly to inter-site variations. At Jiyer Cave, plant remains clearly identified as belonging to toxic species are no more than about 1000 years old, while non-toxic and unidentified species are as much as 4000 years old. Stone artefacts possibly associated with the processing of toxic species occur throughout these deposits, though specialised processing tools appear to be less than 1000 years old. At Mulgrave River 2, toxic food plant species occur in deposits dated to about 2000 BP, although they are more prevalent in the most recent levels. However, stone artefacts which might be associated with complex treatment procedures are rare at this site.

The deposition rates of quartz artefacts are taken as possible indicators of intensity of site use. At Jiyer Cave, an increase of occupation is thus postulated for about 650 to 850 BP, whereas at Mulgrave River 2 the deposition of quartz artefacts peaks between 1800 and 1000 BP. In other words, there is no direct correlation between increased use of the sites and the presence of toxic plant remains, nor is there any correspondence between depositional histories of the two sites.

Areas which still need investigation or which have arisen as a result of this research are noted, and a number of suggestions for future research are made.

ACKNOWLEDGEMENTS

I would like to thank all those residents of northeast Queensland without whose interest and assistance this research would not have been possible: Ron and Deanna Stager, who showed me sites both on their cane-farm near Babinda and at Bramston Beach, and who gave me permission to excavate at the former and provided accommodation while I did so; Jack Morris, who gave me permission to excavate a site on his property near Gordonvale; Bruce Butler (Archaeology Branch Ranger, Department of Community Services, Cairns), who showed me several sites in the district, including the Mulgrave River sites 1 and 2; Don Soley and family, who provided assistance and support during field trips to Jiyer Cave; Graham Coutts for permission to excavate a midden on Glen Idle property at Bramston Beach; Shirley Harwood, Ned Maxwell, Terry Fisk, P. Swan and Stan St.Cloud, who all responded to my appeal in the local papers with information, directions, artefacts and hospitality; all those people who allowed me to examine their private collections of stone artefacts, i.e. the Stagers, L. and D.Coianiz, Chris Mansfield and family, Bevan and Glenda Domin of Beerburrum, Barry Struber and the Scrool, Nella and Stonehouse families and Doug and Maryann Irvine; my sister Vicky and her husband Martin Nakata for providing their house in Cairns as a base during my fieldwork; also Dorothy Jones, Clive Morton, Charlie McCracken, Dr.Steve and Marjorie Watsford, Tom Robertson, Ivy Zappala and Therese Turner.

I would also like to thank all my field assistants who persevered under often difficult conditions: Greg Arrowsmith: Wendy Beck; Michelle Bird: Ross Brown; Noelene Cole; Dean Collett; Jillian Comber; Larry Crook and Snapper John: Maureen Fuary: Merran Gray; Neil Harris: Marina Hurley; Sheila McKell; Brendan Marshall: Sue Mitchell; Claudia Mueller; Dr.Joe Reser; Fairlie Sandilands and John; Fiona and Deanna Stager; Paul Stevens: Barry Struber; Emre Turak; Leslie Wightman: and others including the 'pack mule' team.

I am also indebted to the following people who generously provided their expertise: Ken Aplin (School of Zoology, University of New South Wales) for identification and interpretation of bone remains; Dr.Mike Barbetti (N.W.G.Macintosh Centre for Quaternary Dating, University of Sydney) for radiocarbon dating; Dr.Tony Irvine (Division of Forest Research, Commonwealth Scientific and Industrial Research Organisation, Atherton) and Dr.Betsy Jackes (Botany Department, James Cook University) for botanical information and identification of archaeological plant remains: Dr.David Reid (then at the Department of Marine Biology, James Cook University, now at the British Museum (Natural History) London) and Bill Dowd (Department of Zoology, James Cook University) for identifying archaeological shell remains; Dr.Mike Rubenach (Department of Geology, James Cook University) for identifying rock types; Dr.Jerry van Tets (Division of Wildlife and Rangelands Research, C.S.I.R.O., Canberra) for identifying eggshell fragments.

Access to museum collections of rainforest stone artefacts was facilitated by: Dr.Ron Vanderwal (Victoria Museum, Melbourne); Dr.Ron Lampert (Australian Museum, Sydney); Richard Robins, Norma Richardson and Michael Quinnell (Queensland Museum); Professor Barrie Reynolds and May Abernathy (Material Culture Unit, James Cook University).

Information and other assistance was also provided by: Jeanette Covacevich (Curator of Reptiles, Queensland Museum), who arranged the walk along the Yidinjdji trail; George Davis of Atherton; Professor Bob Dixon (Department of Linguistics, the Faculties, Australian National University), who introduced me to some of his informants and also allowed me to use some of his unpublished data; Rob Hinxman (Yarrabah High School); Alec Rainey (now resident in France): Mollie Raymond of Malanda; Bob Smith (pilot for Helitrans); Mike Rowland (Field Archaeologist, Archaeology Branch, Department of Community Services).

Mireille Mardaga-Campbell drew the artefacts illustrated in Figures 6.19 and 9.5. The drawings in Figure 6.3 were originally sketched by Ross Brown. The original plan and profile of Jiyer Cave (Figure 6.1) were drawn by John Campbell. Photographs in Plates 3.1 to 3.10 were provided by the Queensland Museum. Plate 5.2 was supplied by Stan St.Cloud of Cairns. Photographs in Plates 4.3, 4.4, 6.9 to 6.13, 6.15 to 6.25, 7.4, 7.7, 7.8, 9.1 to 9.5, 9.7 to 9.14, 9.17 and 9.18 were taken by the Photography Section, James Cook University, who also prepared the plates. The remainder of the photographs were taken by myself or my field assistants.

Funding for this project was received from James Cook University (Special Research Grants and University Research Grants), the Australian Institute of Aboriginal Studies, and the Archaeology Branch, Department of Community Services (Queensland).

Thanks also to my fellow students, especially Maureen Fuary, Shelley Greer, James Knight and Mireille Mardaga-Campbell for support, discussion and last minute assistance in thesis preparation; and to Professor George Kearney and the office staff of the Department of Behavioural Sciences for their assistance. Dr.Wendy Beck and Richard Cosgrove read and commented on various draft chapters.

Finally, I must thank my supervisor Associate Professor John Campbell for his encouragement, support and assistance during the last six years, and also for allowing me to continue in his footsteps at Jiyer Cave.

CONTENTS

Contents (cont.)

Contents (cont.)

Contents (cont.)

Contents (cont.)

LIST OF FIGURES

List of Figures (cont.)

LIST OF TABLES

List of Tables (cont.)

LIST OF PLATES

List of Plates (cont.)

List of Plates (cont.)

ADDENDUM

Botanical nomenclature is constantly undergoing revision, particularly with the little known flora of the tropical rainforests. The following supplement to Appendix E includes some corrections and name changes brought to my attention since I submitted the thesis, as well as comments on distribution of some species.

Acmenospermum claviflora = *A.claviflorum* (Roxb.) E.Kausel

Amorphophallus galbra - in Cape York Peninsula

Antidesma dallachyanum = *A.bunius*

Capparis humistrata - in Rockhampton area

Cassytha glabella - in S.Qld, NSW, Vic. Probably *C.filiformis* or *C.pubescens* in N.Qld.

Cordyline terminalis = *C.petiolaris* (Domin) Pedley (S.Qld. N.NSW)
C.cannifolia R.Br. (N.Qld, NT)
C.manners-suttoniae F.Muell. (Cooktown - Rockhampton)

Cyathea australis - in S.Qld & N.NSW. Probably *C.cooperi* in N.Qld.

Desmodium umbellatum = *Dendrolobium umbellatum* (L.) Benth.

Elaeocarpus grandis (*E.sphaericus*) = *E.angustifolius* Bl.

Fenzlia obtusa = *Myrtella obtusa* (Endl.) A.J.Scott

Hibiscus rhodopetalus = *Abelmoschus moschatus* Medik.

Melia azedarach = probably *M.azedarach (L.) var australasica*. *M.dubia* in India & Ceylon.

Myristica muelleri = *M.insipida* R.Br.

Pandanus aquaticus - in Gulf of Carpentaria and Barkly Tableland.

Pandanus odoratissimus = *P.tectorius* Soland.ex Parts.

Pandanus pedunculatus - in S.Qld.

Podocarpus amarus = *Prumnopitys amara* (Blume) de Laubenfels

Psychotria simmondsiana - in S.Qld, N.NSW

Spilanthes acmella - in Malaysia, not known in Australia.

Syzygium grande - in SE.Asia. Probably *S.forte subsp. forte* (F.Muell) B.Hyland

Syzygium erythrocalyx = *S.cormiflorum* (F.Muell.) B.Hyland

Ternstroemia cherryi (*Garcinia cherryi*) = ? *G.dulcis* (Roxb.) Kurz

Xanthorrhoea sp. = probably *X.johnsonii*

CHAPTER 1

INTRODUCTION

1.1 The project

The largest tract of tropical rainforest in Australia occurs in northeast Queensland, between Ingham and Cooktown (Figure 1.1). These rainforests and their Aboriginal inhabitants have been the focus of much speculation and research since the earliest days of European contact. At different times various theories and suggestions have been put forward relating to the duration of human occupation of the rainforests. Prior to this project, however, very little archaeological research had been undertaken in the region which might allow these hypotheses to be tested, or new hypotheses to be proposed.

This study is presented as an archaeological exploration into the prehistoric occupation of the northeast Queensland rainforests. My research efforts were directed mainly towards the excavation and subsequent analysis of a number of archaeological sites, although in this thesis I also discuss the pattern of site location in the rainforest, and briefly examine some of the numerous surface collections of stone artefacts found in the district. To help in the interpretation of all this data, I also studied relevant literature on the Aboriginal occupants of the district, both the early sources and later studies by researchers in related disciplines.

One of the more interesting outcomes of my research has been the discovery that not only did the rainforest Aborigines reportedly depend heavily on toxic food plants for a considerable portion of the year, but also there was archaeological evidence for this in the form of identifiable plant remains and stone tools associated with their processing. This led me to examine various detoxification techniques used around the world, and to speculate on the antiquity of such techniques and their importance in expanding food resources. However, this was a secondary strand to my research, and my initial interest was in antiquity of Aboriginal occupation of the North Queensland rainforests.

1.2 Origins of the rainforest Aborigines

Speculations about the prehistoric occupation of Australian rainforests began in the 1940's, following the Harvard-Adelaide Universities Anthropological Expedition in 1938-39. During this survey, Norman Tindale and Joseph Birdsell described several groups of Aborigines in the rainforests near Cairns (Tindale 1940; Tindale and Birdsell 1941). The apparent differences of these groups from their near neighbours, and their apparent similarities in many respects to Tasmanian Aborigines, gave them an important position in Birdsell's subsequent hypothesis on the human colonisation of Australia (Birdsell 1949, 1957).

Birdsell suggested that there had been three waves of people who migrated to Australia: first the Barrineans, whose descendants are typified by the rainforest dwellers of North Queensland, and the Tasmanians; second, the Murrayians, typified by groups from the Murray River; and third, the Carpentarians, typified by Aborigines from northern Australia. Subsequent mixing of these three groups has supposedly produced the present-day diversity of physical types amongst Australian Aborigines.

The prominence of North Queensland rainforest Aborigines in this hypothesis derived from observations in three fields of anthropological study, namely physical anthropology, linguistics and material culture. The accuracy of most of the data available to Birdsell has since been challenged by other researchers, and his hypothesis is no longer regarded as viable by many (see Larnarch and MacIntosh 1970; Kirk 1973; Smith 1980:77-89; White and O'Connell 1982:77). Birdsell's arguments are presented briefly in the following (more details are given in Chapter 3, section 3.4).

The small stature of many of the rainforest-dwelling Aborigines in North Queensland, together with various other physical attributes, was taken to be indicative of a different genotype from the taller peoples occupying land adjacent to the rainforest district. Similar small physical types were noted in Tasmania and other heavily forested regions of Australia. Tindale in particular was quite scathing about the desirability of rainforest as a human habitat, and assumed that people would only live in such an environment if forced to by more powerful neighbours (Tindale 1940:149). Thus it was hypothesised that the ancestors of the rainforest dwellers were the first to inhabit Australia, and that they were subsequently pushed into the assumed marginal environments of the rainforests by later arrivals who were better 'adapted' to the open forests (Birdsell 1949, 1967).

This theory seemed to be supported by what was known at the time of one of the languages spoken in the district, which appeared to be an archaic type (Tindale and Birdsell 1941:7). In addition to these features of physical appearance and language, the rainforest groups maintained a distinctive set of material culture items and associated practices, which were assumed to be the result of a different cultural history.

The inadequacy of the data on which this hypothesis was based is discussed in more detail in Chapter 3 (section

3.4). It is sufficient to note here that skeletal and blood group studies do not clearly distinguish between rainforest Aborigines and other Queensland Aboriginal groups, that the languages spoken in the rainforest district are not aberrant and that many are related to dialects spoken in adjacent areas, and that much of the distinctiveness of the material culture items relates to the parameters of the rainforest environment itself, and is not necessarily linked to a separate tradition. A further argument against the integrity of rainforest 'culture' is the fact that there appears to be a split between northern and southern areas in terms of language affiliation and social structure.

One additional point that should be made here relates to Birdsell's timetable for the entry into Australia of the various groups of migrants. His reconstruction implied that the North Queensland rainforests not only existed and were occupied by 30,000 BP, but have existed and have been occupied continuously ever since. This is in fact a doubtful proposition. Kershaw's (1974, 1975b, 1978, 1983, 1986) examination of pollen deposits from the Atherton Tableland shows that there were significant fluctuations in the extent of rainforests in this region over the last 40,000 years (see Chapter 2, section 2.6). Aboriginal people may certainly have occupied the district throughout these changes, but in a fluctuating environment their techniques for survival must also have altered.

In almost every respect, therefore, Birdsell's hypothesis can no longer be upheld. Unfortunately, it appears to have become established as fact among the general public that the rainforest dwellers were there before other Aborigines (see for instance McManus 1982/3).

A very different approach to the antiquity of rainforest occupation in North Queensland was taken by David Harris (1978). Working from ethnographic, historical and ecological data, Harris produced a broad reconstruction of the pre-European economy and society in the tropical rainforest district of North Queensland. He concluded that the rainforest dwellers were well-adapted to the rainforest ecosystem, in demographic, if not evolutionary, terms. Although he recognised that archaeological research would be needed to test his supposition, he thought it quite possible that

> human populations were present on the Atherton Plateau before the establishment there of tropical rain-forests and that they then exploited the rain-forests for several millennia before the arrival of the Europeans (Harris 1978:132).

This hypothesis is operationally vague, but implies that as the rainforests increased in their extent from about 9,000 years ago (see Chapter 2, section 2.6), Aboriginal people living in the region adjusted their foraging techniques to cope with the changing environment, rather than retreat from it.

1.3 Previous archaeological research

Until this project began, there had been little archaeological research in northeast Queensland rainforests. Richard Wright (1971) reported briefly on excavations at a rockshelter (Bare Hill) just west of the present rainforest margin between Cairns and Mareeba. No dates have been published for the site, but there is evidence for the exploitation of the nearby rainforests in the form of bones of rainforest species (R. Wright, pers.comm). The rock art at Bare Hill was studied extensively by John Clegg (1978).

As part of her study of the Herbert/Burdekin district, Helen Brayshaw (1977) excavated a rockshelter (Kennedy A) in the rainforest region between Cardwell and Tully. The site contained stone artefacts, bones of rainforest animals, shells and human skeletal remains, and was dated to about 700 BP. However, the base of the occupation deposit was not reached, since excavation was stopped when the human bones were discovered (Brayshaw 1977:271). Another site (Jourama) near a patch of rainforest just south of Ingham, contained similar deposits, and was dated to about 1,450 BP.

More recently, John Campbell has sampled and examined a number of shell middens on Hinchinbrook Island and recorded several stone fishtraps around the coast (Campbell 1979, 1982a, 1982b). The oldest date obtained was about 2,000 BP. Campbell (1982a) also began excavations at Jiyer Cave on the Russell River, which have been extended by the research presented in this thesis (see Chapter 6).

Only two of these excavated sites (Kennedy A and Jiyer Cave) are actually located within rainforest, and both had only been subjected to small soundings which did not reach basal deposits. Rainforest products also appear to have been exploited from Bare Hill, but full excavation details for this site are not yet available. The Hinchinbrook sites, while containing a longer occupation sequence, provide information on coastal economies rather than rainforest exploitation per se. Clearly there was a need for a detailed study of rainforest archaeological sites in their context and this project has made a beginning.

1.4 Research aims

The primary aim of this study was to investigate the antiquity of human occupation of northeast Queensland rainforests. Since at the commencement of the study I was uncertain of the existence and preservation of sites, let alone their age, the first step was to search for archaeological sites which appeared to be suitable for excavation. If such sites could not be readily located, I was prepared to undertake a general site survey, but this would have required major alterations in my research aims and design.

Fortunately this did not become necessary.

Having found sites of reasonable depth and antiquity, I intended to examine the archaeological record for evidence of prehistoric activities, especially economic behaviour, and to analyse any changes that might have occurred through time in the pattern of rainforest exploitation.

Harris' reconstruction had provided a picture of a society that could well be characterised as having an 'intensified' gatherer-hunter economy (cf. Bender 1978, 1981; Lourandos 1983), with the mundane use of toxic food plants as a major feature. In a previous publication (Horsfall 1984a, attached as Appendix A) I pointed out that intensive economies, however defined, can be assumed to have been preceded by a less intensive strategy of exploitation, and that the difference (and therefore the timing of the 'intensification') might well be visible in the archaeological record.

The main thrust of my investigations was thus directed at examining the archaeological record, as evidenced in excavations undertaken during the course of this research. However, data were drawn from other sources, with special reference to the nature of Aboriginal exploitation of the rainforest at the time of European contact and to the location of archaeological sites.

Such sources were varied in type, quantity and quality, and included:

1. ethnographic and historical records describing aspects of Aboriginal society at and shortly after contact;
2. results of research in other areas of Aboriginal studies, e.g. linguistics, material culture, physical anthropology;
3. site records held by the Archaeology Branch of the Department of Community Services (Queensland);
4. stone tool collections held both in museums and privately;
5. local knowledge, especially of site locations.

Field work has been largely confined to the study area between Cairns, Atherton and Innisfail, but excluding Yarrabah Aboriginal Reserve. However, data obtained from the first four of the sources listed above apply to the entire northeast Queensland rainforest region.

One reason that archaeological research in North Queensland rainforests has been neglected has been the perceived difficulty of conducting fieldwork in the region. Not only is it a long way from most centres of archaeological research, but much of the terrain is very rugged and difficult to traverse, making site location difficult. Elsewhere in the region there has been extensive clearing and ploughing during the last 100 years. Even supposing that sites could be found, conditions for the preservation of archaeological deposits in the hot, wet rainforest environment would seem likely to be poor, especially for organic material, except in peaty swamps such as Lynch's Crater (Campbell in Coventry et al. 1980:402-7). Suitable limestone caves, which can provide a good preserving environment even under wet tropical conditions (e.g. see Coutts 1983) do not occur in the humid tropics of North Queensland. Certainly many of the sites examined during this study consisted of little more than a stone artefact or two (see especially Chapter 5, section 5.14 on the Yidinjdji Trail). Nevertheless, comparatively well-preserved sites do exist, and some of these have been excavated during the course of this project.

1.5 Contents of thesis

The present chapter has outlined previous research into the anthropology and archaeology of the rainforest district. In Chapter 2, the climate, geology, flora and fauna of the northeast Queensland rainforests are described. Tropical rainforests constitute an environment which is very different from the majority of ecosystems in Australia, so that a substantial part of this chapter is devoted to describing the major divisions of rainforests and their characteristics. Since my thesis examines rainforest exploitation specifically, rather than just the prehistory of the region, it is also necessary to discuss at some length the past history of the rainforests themselves.

Chapter 3 briefly describes the history of European colonisation in the region, and then discusses the sources of ethnographic information and their reliability. The main part of the chapter deals with the ethnographic data for the region, concluding with a brief discussion of 'intensification' as it might apply to these tropical rainforest societies.

The archaeological component of the study is presented in Chapters 4 to 8. Chapter 4 describes the methods used, and also some of the problems encountered. Chapter 5 discusses the various types of site which have been reported so far in the region. This chapter also describes the archaeological aspects of one of the traditional Aboriginal pathways through the rainforest, used by Yidinjdji people to move between the Atherton Tableland and the coastal plain.

Chapters 6, 7 and 8 contain the results of the excavations. The major excavations at Jiyer Cave are described in Chapter 6, Chapter 7 deals with excavations at two sites near the lower Mulgrave River, and Chapter 8 reports on an excavation of a shell midden at Bramston Beach, and on soundings at two sites near Babinda.

A study of rainforest archaeology such as this would not be complete without some reference to the enormous quantity of stone artefacts which have been recovered from the cultivated parts of the district. In Chapter 9 I present a description and classification of a small proportion of these artefacts, some of which have not been previously reported in the literature.

The ethnographic data suggested that toxic plants provided a major portion of the diet. Somewhat surprisingly, given my initial reservations about site preservation, I found numerous remains of nutshells in several of the sites which I excavated, some of which were subsequently identified as belonging to toxic species known to have been utilised for food. Stone tools of the kinds used in detoxification procedures were also found. In Chapter 10, therefore, I discuss the use of toxic food plants in North Queensland, their importance in the diet, and the possible relationship between the use of such plants and 'intensive' exploitation. Chapter 11 discusses the antiquity of complex processing techniques, both in Australia and other countries.

Finally, Chapter 12 summarises the excavation data and combines all these strands of knowledge into a new prehistory of the northeast Queensland rainforests.

CHAPTER 2

THE ENVIRONMENT: PRESENT AND PAST

2.1 Introduction

Rainforests in Australia occur somewhat patchily throughout the eastern seaboard, in western Tasmania, and in a few places across the northern tropics (Figure 2.1). Not all of these are the 'jungles' of popular imagination. Even the large tract between Cooktown and Ingham, in what is known as the humid tropics and within which the study area is located, includes not only a wide variety of rainforest types, but also areas of open sclerophyll forest and woodland, and other vegetation complexes such as paperbark and mangrove swamps. The diversity and distribution of these vegetation types depend on a number of climatic, topographic and edaphic factors, which are discussed in this chapter.

2.2 Climate

The humid tropical region lies well within the tropics (between 15^{o} and 19^{o} S), and includes the wettest part of Australia. For most of the year precipitation derives from the prevailing moist southeasterly winds as they meet the high mountain ranges. In summer the northwest monsoons bring additional rain, and rainfall is highest during these months (Figure 2.2).

precipitation is frequently heavy and may cause soil erosion. Cyclones occur irregularly, generally between December and March. They contribute to the annual precipitation, but are also associated with flooding and widespread destruction by high winds.

Variations in topography affect the amount of rainfall in different localities (see Figure 2.3, Table 2.1). There is no marked dry season in the wettest section between Babinda and Tully, and this area falls into Category Af in Köppen's system of climate classification (Gentilli 1972; Dick 1975). An average annual rainfall of more than 4000 mm has been recorded from both centres, while a recently established station on Mt Bellenden-Ker recorded an average of more than 8000 mm per year for six years (Tracey 1982:4)!

The coastal districts north and south of this very wet area have a slightly lower annual rainfall and a short dry season (Köppen's classification Am). Away from the coast on the Atherton Tableland, higher altitudes produce a slightly cooler climate. The dry season here is longer, but annual precipitation is still high (Köppen's classification Cw).

Temperatures in the humid tropics are not extreme, though high humidity (especially in coastal areas) can render the upper range uncomfortable. Average maximum and minimum temperatures for several localities are given in Table 2.2. Winter frosts may occur on the Atherton Tableland, though their occurrence at ground level in areas now cleared of rainforest is probably a recent phenomenon, since tropical rainforests normally prefer a frost-free environment.

There is evidence for climatic variation in the past, and this will be discussed below in section 2.6 on past environments.

2.3 Physiography and geology

The topography of the region is rugged and mountainous, and includes the highest mountains in Queensland. In the study area (Cairns-Atherton-Innisfail) there are five distinct physiographic units (de Keyser 1964:6). From east to west these are the continental shelf, low coastal ranges, coastal plains, a high central range and a lower plateau. A summary description of each unit follows (see also Figures 2.4 and 2.5):

1. The narrow continental shelf, which at present is below sea level, would have been dry land during the last glacial. It extends about 60 to 80 km off the present coastline, at depths ranging between 30 and 60 m below present mean sea level, and includes part of the Great Barrier Reef. Beyond the shelf the sea floor drops rapidly to more than 1200 m. A few small granitic islands occur on the shelf within the study area, and there are numerous shallow reefs as well.

2. The low coastal ranges rise to a maximum altitude of 1007 m at Bell's Peak. The northern section is granitic and the southern consists of metamorphic rocks (the Barnard Metamorphics).
3. The flat low coastal plains are comprised of thick alluvium, with some swampy lagoonal deposits and old beach sands.
4. The central highland area consists mainly of granite massifs, including the two highest peaks in Queensland, Mt Bartle Frere (1622 m) and Mt Bellenden Ker (1561 m). The remainder consists largely of metamorphic rock (the Barron River Metamorphics). Differential erosion has produced deeply incised valleys, precipitous mountain sides and steep narrow spurs. Some of the valleys (eg. the upper Mulgrave, Russell and Johnstone Rivers) have been partly filled with basalt from the Atherton Tableland.
5. The plateau of the Atherton Tableland is slightly lower than the central range, with an average altitude of 800m. It is mostly covered by late Cainozoic basaltic flows and pyroclasts (the Atherton Basalts). These fill depressions in the old land surface, producing a flat or undulating topography. To the southwest are the Herberton Highlands (the Glen Gordon Volcanics), which are somewhat higher, rising to about 1200m in the study area. There are numerous eruptive centres on the Atherton Tableland, a few of which probably date to

the Pliocene. Others are as recent as the late Pleistocene (possibly 20,000 BP or even 10,000 BP), and their eruptions could well have been observed by Aborigines then living in the region (see section 2.6). Some craters have provided sediments for pollen analysis (see again section 2.6).

North of Cairns the coastal plain becomes extremely narrow or disappears entirely. The coastal ranges are also absent, and the continental shelf narrows to about 45 km. The uplands are comprised mainly of metamorphics (the Barron River metamorphics or Hodgkinson Formation), but some of the higher portions such as the Windsor Tableland and Thornton Peak (1374 m) are granitic (Fardon and de Keyser 1964; Amos and de Keyser 1964). The Atherton Basalts are restricted to the vicinity of the Atherton Tableland, and are not present north of about Mareeba, or south of the South Johnstone River valley.

South of Innisfail the coastal plain widens, and there are few coastal ranges, mainly running out as spurs from the main range. The continental shelf is also wider and is clearly a continuation of the coastal plain. Numerous offshore islands are present, the largest and highest of which is Hinchinbrook Island. Both the islands and the mainland uplands are formed mainly of granites and acid volcanics (the Glen Gordon Volcanics) (de Keyser et al. 1965).

The soils of the region depend both on the parent rock (see Figure 2.5) and on rainfall and drainage. They range from highly fertile soils derived from basic rocks (e.g. basalt), through soils of medium fertility derived from mixtures of acid and basic rocks, to low fertility soils derived from acid rocks (e.g. granite) (Webb 1968:301).

2.4 Vegetation

The vegetation of the humid tropical region is predominantly rainforest, with areas of open sclerophyll forest and woodland and other vegetation communities occurring where conditions are less suitable for the growth of rainforest. Rainforest vegetation differs considerably from the more typical, sclerophyllous Australian landscape, in structure, flora and evolutionary history (Webb 1978:351). These differences have major implications for Aboriginal patterns of exploitation in this region, and so much of this chapter is devoted to describing rainforests.

2.4.1 Definition: what is a rainforest?

Rainforests are complex ecosystems and as such are not easily defined (see Webb 1978:350-352). The following is a basic definition:

> Rain forest ... is essentially a closed forest, with closely spaced trees generally arranged in several more or less continuous storeys, the uppermost of which (the canopy level) may be even or uneven. Rain forest is distinguished

> from other closed canopy forests by the prominence of life forms such as epiphytes and lianes, by the absence of annual herbs on the forest floor, and by its floristic complexity. (Webb 1959:552)

Rainforest is a broad term, including not only wet tropical jungles, but also other types of closed forest conforming to the above definition. They occur in cooler areas (high altitudes as well as high latitudes) and in quite dry regions. The patches of monsoon forest and vine thicket which are scattered across northern Australia are also included in the broader definition of rainforest (Werren and Kershaw 1984).

2.4.2 Distribution of rainforests

The world's rainforests occur mainly in the wet tropical regions of Africa, Asia and the Americas. Typical rainforests of these regions occur in a rainy tropical climate with a mean annual temperature of 27^{o} C, maximum temperature rarely above 38^{o} C, minimum temperature rarely below 18^{o} C, no frost and an annual rainfall generally over 2000 mm (Longman and Jenik 1974:10).

Although they are botanically very significant (e.g. see Australian Heritage Commission 1986), Australian rainforests now constitute only a very minor portion of the world's total. When European settlement began 200 years ago, rainforests covered only about 1% of the total Australian land surface. Since then, about three-quarters of this area has been cleared for various purposes, and the rainforests that remain would fit into an area only 80 km in diameter (Werren 1985:16). A significant proportion of this clearing has occurred in North Queensland.

In world perspective Australia's rainforests are marginal communities (Tracey 1982), often existing under limiting conditions of temperature and precipitation. The main factor affecting the distribution of rainforests is water. As the name implies, rainforests need rain, preferably delivered in quantity and without any marked dry season. Where rain is plentiful, soil and other climatic factors are rarely limiting. Thus luxuriant jungles may grow on soil that would be too poor for agriculture if the land was cleared; the nutrients are held in and continuously recycled through the plant biomass, and are lost when the forests are burnt and cleared.

Where precipitation is less than optimum, as is the case for most of Australia, edaphic and other factors (such as fire) become important in determining both the distribution and extent of rainforests (Webb 1959). Climatic and edaphic factors also influence the type of rainforest community in any given locality.

2.4.3 Classification of Australian rainforests

Webb (1959:552) groups the mature forests of eastern Australia into three formations, tropical, subtropical and temperate (see Figure 2.1). Note, however, that these do not include mixed communities of rainforest and sclerophyll forest elements, which may be important phases of rainforest succession and development, and are certainly significant in terms of Aboriginal exploitation. Details of Webb's groups are as follows:

1. Tropical rainforest is characterised by the prominence of robust woody lianes or vines and vascular epiphytes (orchids, ferns, aroids). Leaf margins are mostly entire, and leaves are often compound and of mesophyll size (12.5-25 cm) or larger. There is a complex flora of both phanerogams (vascular plants that produce seeds - includes gymnosperms and angiosperms) and cryptogams (seedless vascular plants, e.g. ferns). Some of the trees are deciduous.
2. Subtropical rainforest features the prominence of notophyll leaf sizes (7.5-12.5 cm), and the dominance of _Araucaria_ species.
3. Temperate rainforests occur at higher altitudes as well as higher latitudes, and are classified as either warm/submontane or cool/montane. They are characterised by the absence or rarity of lianes and the prominence of non-vascular epiphytes such

as mosses, lichens and filmy ferns. Leaf margins are often toothed, and the leaves themselves are mostly simple and of microphyll size (2.5-7.5 cm) or smaller (i.e. nanophyll). There are few tree species but a rich cryptogamous flora.

Tropical and subtropical forests can be lumped together under the term 'vine forest', since lianes are a major characteristic. Warm temperate and cool temperate rainforests are sometimes referred to as 'fern forests' and 'mossy forests' respectively, according to the presence of these typical features.

Tropical, subtropical and temperate rainforest communities can be further divided and classified using a number of physiognomic and structural features. These include the height and depth of canopy closure, the size and shape of the leaves, the periodicity of leaf fall, the presence of stilt roots, spreading surface roots, or special life forms or growth forms (see Webb 1959, 1978). Such a classification system is used in Table 2.3. Various climatic and edaphic factors (also given in Table 2.3) are associated with each physiognomic-structural category. The correlation is quite close, and physiognomic-structural features can be used to define either the forest structural types or the broad environmental factors.

Conversely, it should be possible to infer the distribution of structural types from climatic and edaphic factors. However, this is not always so, and Webb (1968:304) points out that another potent ecological factor may be involved, namely fire.

Rainforest species are remarkably fire sensitive, especially when compared to most species of sclerophyll vegetation in Australia, which are fire-adapted. In northeastern Australia, fires are generally restricted to sclerophyll or sclerophyll-dominated vegetation, and only burn the outer edges of undisturbed vine forest (Webb 1968:306). A constant regime of fire could be expected to maintain the rainforest/open-forest boundaries, and perhaps slowly alter them in favour of the sclerophyll vegetation. What little evidence there is so far suggests that Aboriginal people protected the rainforests from fire (J.B. Campbell pers.comm. for the Tully district), but this may not have been the case in all districts and at all times.

2.4.4 Vegetation of northeast Queensland

Not all Australian rainforest vegetation types are represented in the humid tropical region between Cooktown and Ingham. Furthermore, as noted above, non-rainforest vegetation communities are also present in the region. The vegetation types of the humid tropics have been mapped and described in detail (Tracey and Webb 1975; Tracey 1982). They are listed in Table 2.3, together with the environmental conditions in which they are found. The distribution of the major vegetation types within the immediate study area is shown in Figure 2.6.

These different types of environment normally occur within some tens of kilometres of each other (see Figure 2.6), and they would therefore have been physically readily accessible to most rainforest Aboriginal groups. Of course, it is likely that there were social constraints on movement and exploitation, but little is known of these.

There are 1161 species of higher plants recorded so far from the rainforest communities between Cooktown and Townsville, and 247 species of ferns and fern allies (Australian Heritage Commission 1986). A significant proportion of these are restricted to the region (435 species of higher plants, 92 species of ferns and fern allies), and many have quite narrow distributions even within this area. Some are botanically extremely interesting, such as the several species of primitive angiosperms.

Included in Table 2.3 are some of the plant species which are typically found in each vegetation type and which are known to have been exploited by the Aborigines living in these rainforests. Several of these species were of major economic importance as food plants. Some occur in other parts of Australia (e.g. Castanospermum australe and Cycas media) and were utilised throughout much of their range. Others, such as Beilschmiedia bancroftii and Endiandra palmerstonii, occur only in the humid tropics of North Queensland, sometimes at specific altitudes or on particular soil types.

A significant proportion of staple food plants in the humid tropics are toxic (including those referred to in the above paragraph), and require various methods of treatment to render them fit to eat. This topic is dealt with in more detail in Chapter 3 (section 3.4.5) and in Chapter 10.

2.5 Fauna

Although the biomass of animals in a rainforest environment is much less than that of the plants, and typically less than that of animals in many non-rainforest terrestrial environments, the species diversity is extremely large. The rainforests of northeast Queensland, although occupying about 0.1% of Australia, contain a high proportion of the continent's faunal species. A recent report (Australian Heritage Commission 1986:21-39) lists 87 species of mammals, 128 species of birds, 47 species of frogs and about 160 species of reptiles in the wet tropics between Cooktown and Townsville. These figures correspond to 30% of Australia's marsupial species, 60% of the bat species, 18% of the bird species, 30% of the frog species and 23% of the reptile species. The number of species of insects and spiders in the region is unknown. Over 5,000 species of insects and over 300 species of spiders were found at only five sites along a 10 km transect from the Russell River to the Bellenden Ker Range (Australian Heritage Commission 1986:37).

The 87 mammalian species (2 monotremes, 37 marsupials, 15 rodents and 33 bats) found in the Cooktown/Townsville region are listed in Table 2.4, together with the dingo and the dugong. Many of these species, especially the macropods, are found in sclerophyll forests or other communities, and not in rainforests at all. Winter (1984:28) lists 29 flightless mammals, including the dingo, which are found within the rainforests of this region. Sixteen of these are dependent on the rainforest environment for their existence, and eight are found only in North Queensland. Distribution of many species is actually even more restricted than this. For example, the two Tree-kangaroos do not appear to overlap in their range, with Dendrolagus bennettiana occurring between Cooktown and Mossman, and D.lumholtzi between Mossman and Ingham (see Australian Heritage Commission 1986: Map 2c). The Atherton Antechinus (Antechinus godmani) is restricted to an area of 600 km^2, and the Thornton Peak Rat (Melomys hadrourus) is found only at Thornton Peak within an area less than 250 km^2 (A.H.C. 1986: Map 2e).

Altitude is often a restricting factor, with species such as the Green Ringtail Possum, the Herbert River Ringtail Possum and the Lemuroid Ringtail Possum found only above 300 m (Australian Heritage Commission 1986: Map 2b).

Similar distribution patterns occur amongst the birds, the frogs, the reptiles, the insects and the spiders (Werren and Kershaw 1984; Australian Heritage Commission 1986).

The majority of faunal species (such as insects and spiders) in the region were probably of little significance to the Aboriginal occupants of the rainforests, though larvae of several insect species were relished. Larger terrestrial and arboreal species were hunted for food, as were numerous riverine and marine species (e.g. fish, molluscs, crustaceans). Several species served as indicators of changing seasons. These and other forms of Aboriginal exploitation are described further in Chapter 3 (section 3.4).

2.6 Past environments

About 50 million years ago, rainforests similar to those found today in the humid tropics were widespread throughout the Australian continent. Increasing aridity over the next tens of millions of years led to the development of Australian sclerophyll flora and to the shrinking of the rainforests, so that well before the first human colonists reached the continent (currently reckoned at 40,000 to 50,000 years ago), the rainforests had contracted to approximately their present dimensions, or even less. Even so, significant fluctuations in the extent of the rainforests have occurred over the last 200,000 years, as shown by pollen analysis of sediment cores (e.g. Kershaw 1986).

Much of our knowledge of past environmental conditions in northeast Queensland comes from analyses of pollen in Quaternary sediments from the Atherton Tableland (Figure 2.7). The longest sequence is from Lynch's Crater, covering more than 200,000 years (Kershaw 1974, 1976, 1978, 1983, 1985, 1986). Other sites, with sequences spanning the Holocene, are Lake Euramoo (Kershaw 1970), Quincan Crater (Kershaw 1971) and Bromfield Swamp (Kershaw 1975a). There is also a much older sequence (late Tertiary/early Quaternary) from Butcher's Creek (Kershaw and Sluiter 1982). The sediments supply a continuous record of past vegetation of the area, and by inference of past climatic conditions also (Kershaw 1975b, 1985, 1986; Coventry et al.1980; Singh et al.1981).

Until about 38,000 BP, the Atherton Tableland, at least near Lynch's Crater, was under rainforest. The earliest deposits analysed so far were laid down during the penultimate interglacial about 200,000 years ago, and indicate the dominance of various types of rainforest for most of the time represented. Between about 126,000 BP and about 78,000 BP the vegetation was complex rainforest of the types associated with a high effective rainfall. Following this there was a long phase of 40,000 years during which the presence of a high proportion of rainforest gymnosperms (Araucaria, Podocarpus) indicates a lower mean annual rainfall (probably about half that of the present).

Between 38,000 and 26,000 BP the araucarian forests were gradually replaced by sclerophyll vegetation (e.g. Casuarina, Eucalyptus). There was also an increase in the quantity of charcoal coming into the sediments, suggesting that fire was a major cause of this change, probably associated with an even lower, more variable rainfall. Human firing strategies may also have contributed (Kershaw 1978:160, 1986:48-49).

Sclerophyll vegetation remained dominant until about 9,000 BP, when the rainforests began to recolonise the Tableland from nearby refugia, possibly those shown in Figure 2.8 (see also Webb and Tracey 1981). The change occurred at different times at the different sites examined, depending on local conditions and distances from refugia (9,500-8,400 BP at Bromfield Swamp, 8,500 BP at Lynch's Crater, 7,500 BP at Lake Euramoo, 7,000-6,000 BP at Quincan Crater; see Kershaw 1975b:184). The primary cause appears to be an increase in precipitation, most likely associated with rising sea levels (Ash 1983).

From about 3,000 BP reduced rainfall, possibly associated with human-induced fires, allowed partial reinvasion by sclerophyll species. Changes in rainforest type on the Tableland (from temperate to sub-tropical) indicate a rise in temperature since about 6,000BP (Kershaw 1983:679).

Support for Kershaw's reconstruction of past vegetation distribution in North Queensland has come from a surprising source. In 1964, Dixon recorded an Aboriginal legend explaining the origin of three volcanic crater lakes on the Atherton Tableland (Lakes Eacham, Barrine and Euramoo). The account (Dixon 1972:29; see also Mjöberg 1918) is a plausible description of the volcanic eruptions which formed the craters probably about 20,000 to 10,000 years ago. In telling the story, Dixon's informant said that at the time, there was no 'jungle' (rainforest) nearby, just 'open scrub' (sclerophyll forest). Kershaw (1970) dates the revival of rainforest at Lake Euramoo to 7,500 BP. Here we have a legend apparently based on historical fact (volcanic eruptions), that has been transmitted orally for perhaps 20,000 years, and has provided a description of the environment at that time!

A similar scenario of sclerophyll dominance followed by rainforest expansion and later contraction was proposed earlier by Nix and Kalma (1972) as a result of hypothetical climate modelling (see Figure 2.9). Note the increased extent of rainforest at 8,000 BP predicted by this method, compared with the present distribution.

The suggested mean annual rainfall (see Figure 2.7) derived from pollen analyses correlates well with oxygen isotope and temperature curves obtained from deep sea cores (Kershaw 1978:160-161; Coventry et al. 1980:401; see also Shackleton and Opdyke 1973). The main factors affecting rainfall in this part of northeast Queensland appear to be changes in sea level and ocean temperature, especially the former (Coventry et al. 1980; Ash 1983).

The pollen analysis applies to the Atherton Tableland, and the degree to which Kershaw's interpretations can be successfully extrapolated to other parts of the humid tropics such as the coastal strip is unknown. Presumably the coast between Mossman and Ingham was affected by the same climatic changes as the Atherton Tableland, and it would certainly have been more directly affected by sea level changes. However, quite different past climatic changes have been proposed for the Townsville region some 100 km south of Ingham on the basis of geomorphological evidence (Hopley 1973).

The fluctuations in the extent of the rainforests in northeast Queensland during the last 40,000 years have implications for the topic of this thesis, the past Aboriginal occupation of the tropical rainforests. If, as appears probable, the rainforests were much reduced throughout the region, as they apparently were on the Tableland, then it is unlikely that rainforest products could have formed the basis of a major exploitation strategy between 38,000 and 9,000 BP, though they would have formed useful additions to an economy based on the more common open forest environment. If people were living in the area prior to 38,000 BP, they may have exploited the rainforest environment, but it would seem unlikely that such exploitation was intensive. It seems that tropical rainforests elsewhere in the world may not have been inhabited to any great extent until quite recently (Bellwood 1983), though the timing proposed for such occupations is variable, e.g. Upper Pleistocene for intensive occupation of West African rainforests (Isaac 1982), 10,000 BP for tropical forest horticulture in South America (Linares de Sapir and Ranere 1971) and at least 4,500 BP for occupation of the equatorial forests of Zaire by the Mbuti (Turnbull 1961).

It may be coincidence that the rainforests disappeared from the Tableland at about the same time as the first human colonists are thought to have arrived in

Australia (but see Kershaw 1986:48-49). However, fires of human origin would have hastened and extended the naturally occurring spread of sclerophyllous species in previously rainforested areas. The situation is altered in the Holocene. Not only did the rainforests expand to cover the Atherton Tableland (and nearby coastal areas), but they may well have extended much further north and south than in the present day (Nix and Kalma 1972:87), essentially creating a new niche for exploitation. Thus it can be postulated that the intensive utilisation and exploitation of the rainforest environment which was still occurring at the time of first European contact is strictly a Holocene phenomenon, and that it therefore has an antiquity of no earlier than 8-9,000 years. If this is the case, then the rainforest exploitation pattern in North Queensland would seem to be both recent and largely endogenous.

CHAPTER 3

THE RAINFOREST PEOPLE

3.1 Introduction

Any ethnographic data which purport to describe 'traditional lifeways' must be understood in the context in which they were gathered. In this chapter a brief outline of the contact history of the tropical rainforest region is presented (3.2), followed by an account of the major sources of ethnographic data (3.3). The ethnographic data are then presented in section 3.4. The final section (3.5) discusses various aspects of rainforest culture, especially in relation to the notion of intensification.

3.2 Contact History

The history of European exploration and settlement in the rainforest region is well documented. Three detailed volumes by Jones (1961, 1973, 1976) recount the minutiae of events at the local level, while a clear overview of the general history on North Queensland is given by Bolton (1970). Other authors have explored various aspects of early colonial life in the rainforest district. The most relevant of these for this thesis is a study by Loos (1982) of the relations between the Aborigines and the new colonists. These and other works should be consulted to augment the outline sketched below.

The first Europeans known to have ventured near the northeast Queensland rainforests were of course those with Captain James Cook, who sailed up the east coast of Australia in 1770. The next groups of visitors were mainly survey vessels charting the Australian coastline in the early nineteenth century (e.g. King in the Mermaid and later in the Bathurst, 1819-21; Blackwood in the Fly, 1843; Stanley in the Rattlesnake, 1848). As the inner reef waters became better known, more and more shipping began to use this route. Frequent shore visits were necessary in those days to obtain fresh water and other supplies, and the same places were regularly visited (e.g. Goold and Fitzroy Islands). Encounters with Aborigines became commonplace at these spots, some of them amicable, others hostile (King 1827; Jukes 1847; Macgillivray 1852).

The increasing amount of shipping in the reef waters was also associated with an increasing number of shipwrecks. Some survivors were taken in and looked after, as was the case for James Morrill, who was wrecked in 1846 near the present location of Townsville, 14 years before the first European settlement in North Queensland at Bowen (Morrill 1863). On the other hand, sometimes shipwrecked sailors who reached the shore were killed and, it was claimed, eaten. The series of events following the wreck of the Maria in 1872 provide a well documented example of the variety of receptions afforded to shipwrecked sailors (Johnstone 1904:18-46; Jones 1973). Europeans revenged themselves on such killings where they could, without much regard as to the rights and wrongs of a case, and this undoubtedly aggravated hostile feelings amongst Aborigines.

Some of the ships came to exploit local resources. By the 1860's, fishing for bêche-de-mer (sea cucumber or trepang) was an established industry off the North Queensland coast. Many skippers used Aboriginal and Melanesian labour (as did the luggers of the pearling industry further north). This labour force was largely kidnapped, at least in the early years of the industry, and hostilities frequently broke out amongst crews (but see also Anderson 1979:35).

The first Europeans who actually ventured away from the coast and into the rainforests were Edmund Kennedy and his party on their ill-fated trip to Cape York in 1848. Many of their later hardships were due to delays and difficulties experienced at the outset of the journey, when traversing the thick forests and swamps of the coastal strip, for which they were ill-prepared (Beale 1970a, 1970b). Their encounters with rainforest Aborigines were minor but not unfriendly, until Kennedy fired on a group near the upper Tully River (Carron 1849; Beale 1970b:174). However, reports of the expedition's general logistical problems discouraged immediate further exploration.

Meanwhile in the interior of North Queensland, the spread of pastoral settlement far outpaced that of the coast. By the early 1860's land was being taken up at the Valley of Lagoons on the upper Burdekin River, following Leichhardt's glowing reports of that district. Cardwell was founded in 1864 to provide a port, and with some difficulty a track was pushed through across the intervening ranges. Some exploration of the area adjacent to Cardwell followed, and some land was taken up.

Then in 1873 the North-East Coast Expedition set off to explore the inlets and rivers between Cardwell and Cooktown, under the leadership of G.E. Dalrymple. His report (Dalrymple 1874) gave a glowing account of the fertile soils and fine timber to be found in the district. Timber-getters quickly moved to exploit the latter, especially the stands of red cedar growing along several of the rivers (e.g. the Daintree, Mossman and Johnstone Rivers). Settlers moved into some areas and began clearing the land of its luxuriant forests. Cotton, bananas and sugar cane were planted, with varying degrees of success, and eastern Melanesians ('Kanakas') were brought in to work on the plantations.

Further inland, gold was discovered on the Hodgkinson

River in 1876, three years after the Palmer River goldrush. A port closer to the new goldfields than Cooktown was needed, and Port Douglas, Cairns and Innisfail (then called Geraldton) all vied for the position. Tracks were cut through the rainforest between settlements, with Sub-Inspector Douglas Douglas and Christy Palmerston prominent among the trailblazers. Gold was also discovered in several localities on the Mulgrave and Russell Rivers in 1879 and 1886, respectively.

The pastoral industry was also expanding in inland areas, and European settlement on the Atherton Tableland began with pastoral holdings. Tin was found there shortly after, in 1878. Tableland red cedar was exploited from the late 1880's, and a railway from Cairns to the Tableland was begun in 1886, finally reaching Mareeba in 1893 and Atherton in 1903. Tin was also discovered on the Annan and Bloomfield Rivers to the north (see Anderson 1979, 1983 for Aboriginal reactions).

By the 1880's, much of the more fertile land was in the process of being cleared and settled. Most of the clearing was done by Chinese, who were drifting down from the Palmer as the gold worked out, but who were excluded from many other goldfields (see May 1984 for the history of Chinese settlement in the district). Aborigines were still numerous in the rainforest district, but they were being placed under considerable pressure by the spread of new colonisation, which appropriated the most productive hunting and gathering grounds. As early as 1878, many Aborigines from the Mossman to the Mulgrave Rivers were starving (Loos 1982:93).

Initially, hostile encounters had been confined to the coast. As the rainforests were penetrated by Europeans, Aboriginal resistance to the invaders increased. Crops and other goods were stolen, animals speared, and sometimes settlers were killed. The Aborigines of this district gained a reputation for ferocity far beyond the actual number of deaths that can be attributed to them (Table 3.1; see also Loos 1982:191-247).

The density of the vegetation made it difficult for the Europeans to retaliate in their usual manner, though a number of reprisals did occur. On the Atherton Tableland an unusual scheme was initiated to supply the Aborigines with rations so that they would not raid the settlers (Loos 1982:109-110). In most other places food was not supplied until the Aborigines were reduced to submission. By 1897, food was being distributed from six centres in the rainforest district, and from the two missions at Yarrabah and Bloomfield (Tozer 1897).

Starving and displaced Aborigines drifted towards European settlements to become fringe dwellers. In 1897 over 2,000 Aborigines from the rainforests between Cooktown and Ingham (and at least 500 living just west of them) were being fed by the Government or local communities (Parry-Okeden 1897). Concern by various citizens, including the Reverend A. Meston, for the welfare of this 'dying race' led to the passing of the Queensland Aboriginal Protection and Sale of Opium Act of 1897, with the appointment of W.E. Roth as the Northern Protector. This Act enabled the forced removal of Aborigines to various missions and reserves, sometimes as far away as Fraser Island.

It had taken thirty years or less to change irrevocably the traditional Aboriginal modes of life in the rainforest district. By 1914, Mjöberg (1918) could report that there were few 'wild' Aborigines left. However, some groups were less affected by the new order. People from the upper Murray River south of Tully, for instance, were not moved to missions or reserves, and continued many of their traditions. Today they retain strong links with their land (Dixon 1972:35; Kumm 1980; Duke in prep.). At Wujal Wujal on the Bloomfield River, Aboriginal people have also retained considerable control over their own affairs, and maintain many links with past traditions (Anderson 1979, 1983, 1984). Other groups and individuals also have much knowledge about their country (e.g. at Yarrabah near Cairns).

3.3 Sources of the ethnographic record

It was against this background of coastal contact, beginning early and gradually increasing in intensity, followed by rapid penetration of the hinterland, that early observations of the rainforest Aborigines were made. Three different types of sources can be distinguished:

1. the coastal navigators;
2. rainforest explorers and early settlers;
3. early ethnographers.

To these must be added a fourth observational phase, that of recent, mainly professional, research, which generally makes use of these earlier resources in addition to newly obtained data. The cautions voiced by Lawrence (1968:23-37) with respect to early sources of ethnographic data are valid in this study as well.

3.3.1 Coastal navigators

These were best placed to observe the pre-contact way of life. However, although they were good observers, few were anthropologically inclined, and they generally made only brief comments about the Aborigines they encountered. Moreover, their visits were themselves brief and generally confined to the offshore islands. Sources include Wharton (1893), Beaglehole (1962), King (1827), Jukes (1847) and Macgillivray (1852).

3.3.2 Explorers and early settlers

These were often the first Europeans in a particular area, though not necessarily the first contact that the indigenous population made with European society and its products. Information from these sources is sporadic and uneven in quality, often revealing as much about the prejudices of the writers as about the Aborigines they were describing. Those who recorded their observations were on the whole not particularly interested in Aboriginal culture, except perhaps in what they perceived to be its more bizarre and macabre manifestations. Latecomers to the district documented indigenous societies which were undergoing rapid transformation, but unfortunately they did not always distinguish the different elements in those transformations.

The sources utilised in this account are those that include firsthand observations and which appear to be the most reliable and the least distorted, though all are biased in one way or another. They include: W. Carron's account of the Kennedy expedition of 1848 (Carron 1849; see also Beale 1970a, 1970b); G.E. Dalrymple's report on his expedition of 1873 (Dalrymple 1874); Sub-Inspector Douglas' exploration between Herberton and the coast (Douglas 1882); Christy Palmerston's diaries of his trail-blazing/prospecting expeditions on the Johnstone and Russell Rivers (Palmerston 1883, 1885-6, 1887); A. Meston's reports of his expeditions to the Bellenden-Ker Ranges (Meston 1889, 1904); a report by W.E. Parry-Okeden which included population numbers on a map (Parry-Okeden 1897); and the reports and memoirs of R.A. Johnstone, who first settled in the district in 1868, was a Sub-Inspector of the Native Police until 1881, and had accompanied Dalrymple on his 1873 expedition (Johnstone 1874, 1904).

3.3.3 Early ethnographers

There are three sources in this category: Carl Lumholtz (1889), a zoologist who spent 14 months collecting and recording on the Herbert River in 1882-3; Walter E. Roth (1898-1910), the Northern Protector of Aborigines between 1897 and 1905, undoubtedly the most prolific and detailed of all the ethnographic sources for the region; and Eric Mjöberg (1918, 1925), a Swede who visited the area in the second decade of the twentieth century, but whose main writings (1918) are only available in summary translation in English. All of these observers were relatively late on the scene. Nevertheless, they were interested in Aboriginal culture, although interpreting what they saw in terms of contemporary theories and attitudes. Roth in particular is the major source of ethnographic data on rainforest Aboriginal culture, though it is sometimes difficult to extract ethnographic data on the rainforest people from Roth's work, partly because localities are often not specified in sufficient detail, and partly because most of his writings tend to be catalogues of customs, artefacts etc., rather than ethnographic studies.

Most of the writers in the last two categories were aware of and often referred to each other's work, and it is not always easy to determine who is the primary source. Some also included generalities about aspects of Aboriginal society derived from other parts of Australia.

3.3.4 Recent research

This work can be divided into four categories: physical anthropology, sociocultural studies, material culture studies and linguistics.

Physical anthropology

Birdsell (1949, 1957, 1967, 1977) was the first contributor to this field, visiting the rainforest region with Tindale in 1938-39 (Tindale and Birdsell 1941). For the results of later research see Larnarch and Macintosh (1970) and Kirk (1973).

Sociocultural anthropology

Thomson (1939), Sharp (1938-39) and McConnell (1935, 1939), although all working further north in Cape York Peninsula, contributed information on the structure of rainforest society, as did Tindale (1940). More comprehensive recent studies have been undertaken by

Chris Anderson in the Bloomfield River district (1979, 1983, 1984), and by Anne Duke at Murray Upper near Tully (Duke in prep.; see also Kumm 1980). Dixon's linguistic work (see below) has also contributed to this field. There has been in addition a considerable amount of unpublished work, especially in the Tully district (J.B. Campbell pers.comm.).

Material culture

The distinctive material culture of the rainforest district has intrigued a number of amateur researchers (e.g. Colliver and Woolston 1966, 1980). The large quantities of stone tools found in the region excited early interest, and there are numerous descriptive papers on these (e.g. Roth, H.L. 1918; Kennedy 1949, 1950a, 1950b, 1953; Flecker 1954, 1955). The artefacts collected by W.E. Roth were examined and further described by Pope (1967), and McConnell (1935) described a number of rainforest wooden artefacts. Brayshaw's (1977) study of the material culture of the Herbert/Burdekin district included part of the rainforest district. A number of studies have been undertaken by students at the Material Culture Unit, James Cook University, such as a functional study of ooyurkas by Richard Cosgrove (1984), and an analysis of rainforest shields by May Abernathy (1980). Anne Duke's research (see above) also deals with material culture.

Linguistics

Early linguistic study in the region gave the mistaken impression of an extremely unusual language (Tindale and Birdsell 1941). Research by R.M.W. Dixon (1972, 1976, 1977), begun in 1964, has corrected this error, and supplied detailed studies of many of the languages and dialects in the region.

3.4 Ethnographic data

The ethnographic information contained in the remainder of this chapter has been drawn mainly from the sources referred to above. Much more detail could be provided than I have included, but that would constitute a separate thesis in its own right.

3.4.1 Tribes, territories and languages

The question of what constitutes a 'tribe' is a vexed one in the context of Aboriginal Australia, and there has been considerable discussion on the topic (e.g. Berndt 1959; Hiatt 1962; Stanner 1965; Peterson 1976). As used in Australia, the term 'tribe' generally refers to a cluster of bands or local groups with "some sense of collective identity, often expressed in terms of possessing a distinct language", yet whose social and spatial boundaries may exhibit considerable degrees of flexibility (Peterson 1976:1). This definition is applicable to the rainforest district as well (Dixon 1976).

According to Tindale (1974), the humid tropical region was occupied at contact by sixteen tribes (Figure 3.1). Tindale allocated twelve of these to a distinct 'rainforest culture' (see Table 3.2). In an early publication, the Barbaram (Mbabaram) tribe was included as one of the twelve (Tindale and Birdsell 1941), but in a revised account it was replaced by Madjandji (Tindale 1974).

This allocation of tribes to a 'rainforest culture' was based largely on physical appearance (Tindale and Birdsell 1941), but appeared to be supported by linguistic data available at the time and by other distinctive cultural features. Three tribes in the northernmost part of the humid tropics (Tindale's Jungkurara, Kokokulunggur and Irukandji) were not included in the 'rainforest culture', and neither was the group living on Hinchinbrook Island (Tindale's Bandjin). Two of these four (Irukandji and Bandjin) were, however, included in a peripheral rainforest grouping which according to Tindale and Birdsell (1941) was intermediate in physical appearance between the rainforest tribes and those living further west.

Later research by Dixon (1972, 1976, 1977) essentially confirms Tindale's location and nomenclature of the different groups south of Cairns, with minor variations (Figure 3.2, Table 3.2). However, as can be seen from Table 3.2, tribal names are derived from language names, and the two have often been confused. The confusion is added to by the use of different orthographies, and the fact that the distinction between language groups (= tribes) and smaller local groups is not always recorded.

The main difference between Figures 3.1 and 3.2 for the rainforest tribes south of Cairns is that Dixon locates the Wargamaygan between Cardwell and Ingham, whereas Tindale had placed them south of Ingham (his Warakamai). As well, Dixon (1977:4) points out that Madjay and Wanjur may be different names for the same dialect.

North of Cairns there is much less agreement on both the names of tribes and their location. Tindale located the Irukandji on the coast between Cairns and Port Douglas, with a group named Kokokulunggur in the Mossman district. Dixon places the former (Yirgandji) at Cairns (1977:5), with the Djabugandji closer to Mossman (1976:217). He also adds two language groups (Guluy and Nyagali) along the lower Barron River, stating however that these locations are based on a single source, and may be alternate names for either a local dialect or a tribal language (Dixon 1977:5; see also Sharp 1938-39:268 for location of Niakali).

In addition, Anderson (1979) has stated that the people occupying the area between Mt. Amos, south of Cooktown, and Cape Tribulation (Tindale's Jungkurara) are Kuku-Yalanji (Gugu-Yalandji) speakers. These people should not be confused with a similarly named group located further west (Tindale 1974; McConnell 1939:69; Sharp 1938-39:256). Anderson (1983) also locates another group, speaking Kuku-Nyungkui, in rainforest country on the headwaters of the Annan River.

There is obviously considerable uncertainty in reconstructing pre-contact boundaries many years after their disruption, and this is acknowledged by the principal researchers.

> By 1952 remembrance of [Irukandji] existence had almost died out and a mixed Tjapukai and Mamu group ... had usurped their territory (Tindale 1974:123).

> [Dyabugay] is said to have been originally the name of the dialect spoken on the coast, towards Port Douglas (Dixon 1977:6).

Boundaries clearly may alter as circumstances change, and this was most likely also the case in the past (e.g. see Dixon 1972:351 on the possible expansion of the Djirbalnan at the expense of the Mbabaram).

The initial linguistic assessment of the rainforest groups was based on Barbaram/Mbabaram (Tindale and Birdsell 1941), and in this they were mistaken twice over. First, Mbabaram is an 'aberrant' language, and though it has evolved from a normal type of Aboriginal language (Dixon 1972:26), it cannot be taken as representative of other dialects in the district.

Second, the Mbabaram occupied the drier areas of the Tableland, not the rainforests. And in fact, Tindale himself later excluded them from the rainforest groups.

There are several linguistic groupings within the Cooktown-Ingham district (see Table 3.2). Within Tindale's rainforest culture area, a major linguistic division occurs between the Djirbal group of dialects to the south, and the related groups of Yidinj and Djabugay dialects to the north (Dixon 1976:221).

There also appears to have been a difference between these northern and southern groups in societal structure. The southern Djirbal speaking groups (except perhaps the Ngadjandji) were divided into named patrilineal moieties and four named sections (Sharp 1938-39:439; Dixon 1972:31, 1976:221-222). To the north, speakers of Djabugay and Yidindj language groups had two named moieties but apparently no sections (Sharp 1938-39:268; McConnell 1939:69-70; Tindale and Birdsell 1941:6; Dixon 1976:221, 1977:7). The distinctions are not entirely clear (e.g. Dixon 1976:222), but seem to correspond approximately to the split in linguistic groupings. Clearly the rainforest culture area proposed by Tindale is not homogeneous in terms of either of these features.

3.4.2 Physical appearance

Many of the rainforest Aborigines are small-statured, and hence are sometimes referred to incorrectly as 'pygmies'. This feature and other distinctive physical characters ('crisp curly hair, and a tendency toward yellowish-brown skin colour') led Tindale and Birdsell (1941:1) to propose that the rainforest dwellers of northeast Queensland were more closely related to Tasmanian Aborigines than to their nearer neighbours. This assumption eventually formed part of the trihybrid theory of the colonisation of Australia referred to in Chapter 1 (Birdsell 1949, 1967; see also Horsfall 1984a reproduced here in Appendix A).

Subsequent research has not confirmed the proposed relationship (but see Birdsell 1977). Cranial studies (Larnarch and Macintosh 1970) and analyses of blood groups and other blood proteins (Kirk 1973, 1983:88-109) show no basis for regarding the rainforest Aborigines as genetically distinct from other Queensland Aboriginal populations.

In fact, the distribution and proportion of short-statured people amongst rainforest groups at contact is unclear. Some early observers reported quite tall individuals in different localities, e.g. Trinity Bay, the Johnstone, Russell and Herbert Rivers (Dalrymple 1874; Palmerston 1887; Lumholtz 1889:131). Those at Trinity Bay may have been Irukandji/Yirgandji, a group which Tindale excluded from the core rainforest area (presumably on the basis of such reports). However, the observations from the Russell and Johnstone Rivers in the heart of the rainforests imply a much greater diversity in physical types than Birdsell allows. Conversely, short-statured populations were described in other districts, e.g. Endeavour River (Wharton 1893:286).

3.4.3 Population numbers and movements

There are several indications of high population numbers in the rainforest district, including a number of references to gatherings of 300 or more. The first official census of the Aboriginal population was taken by Parry-Okeden (1897), but since it appears to relate to food distribution stations there is no reason to suppose that it is a complete record. There are difficulties in relating the group names used by Parry-Okeden to those in current use. Tindale (in Birtles 1967:Appendix B1) managed to correlate many names (see Table 3.3), sometimes on the basis of similar pronunciation, sometimes from the location given in Parry-Okeden's map.

Harris (1978) used Parry-Okeden's data to estimate the pre-contact population figures, but allocated the latter's named groups to tribes in a slightly different manner from Tindale (see again Table 3.3). He then estimated the 1880 population figures by the simple method of multiplying each figure by 2.5 and calculated population density using the tribal areas given by Tindale (Table 3.4). Given that none of the data (census numbers, allocation of census groups to tribes, areas of tribal territories) can be regarded as particularly reliable, the pre-contact estimates produced by this procedure must be regarded as tenuous at best, especially as the effects of European contact (violence, starvation and introduced disease) are unlikely to have been the same in each area. It does seem feasible though that population numbers in the rainforest district were high, and they may well have been as high as (or even higher than) the estimates given by Harris.

The rainforest Aborigines, like those elsewhere in Australia, moved between specific named campsites or groups of campsites at particular times of the year, to take advantage of seasonal productivity and preferred weather. Amongst the Yidinjdji, whose territory covered much of the study area, there were six local groups, named after the type of country with which each was associated (Dixon 1977:3). Each of these local groups spent most of the year in their own country, but at times the whole tribe would gather together.

Such gatherings were generally in the wet season according to Lumholtz (1889:139), probably because this time of the year was most suitable for producing the large quantities of food required for such large numbers of people. They were held every 10-14 days (Roth 1908b), and roughly 300 people might be present. The timing of population movements was geared to the availability of particular food species in different localities, which was indicated by 'calendar' species (Dixon 1977:9). For instance, when the black scrub locust first called out (December), it was time for coastal Yidinjdji to move to the Atherton Tableland to gather black pine nuts, Podocarpus amarus (Dixon 1977:10).

Campsites were often, but not invariably, located on the high banks of creeks and rivers (Plate 3.1), in clearings that may have been artifically produced, and were certainly artificially maintained. Gathering sites were similarly located, but were larger, with a central area where the ground was stamped hard (Plate 3.2). Shelters were located around the edges of these clearings, according to the direction of the home country of the occupants.

> We came on an open circular patch in the scrub of about 3 acres, every tree having been cut down with good axes or tomahawks, and a ring of fine lawyer-palm gunyas at intervals all round, with a post or tree opposite each, and devices cut on them - evidently a main corroboree ground, where each tribe had its allotted camp. The ground was beaten hard in the centre, and perfectly smooth (Douglas 1882:July 1st).

These places are widely referred to today as 'bora grounds', and many are marked as such on modern maps. Local Aboriginal names include 'borboby' for the

Herbert River (Lumholtz 1889:129) and 'prun' (or 'brun') for the lower Tully River (Roth 1902:15). The term 'bora' is of southern Queensland origin, where it refers to an initiation (Petrie 1904:48), and its use in North Queensland is therefore incorrect, although it has become thoroughly entrenched. However, Johnstone (1904:109) distinguished between sacred initiation grounds and everyday corroboree grounds.

Campsites and other frequently used locations were connected by tracks through the forest. There is no reference to the use of fires to maintain these tracks (as in Tasmanian rainforests, see Jones 1975), and the descriptions of explorers such as Palmerston suggest that they were kept open solely by use.

> There were many large paths leading from this pocket in many directions ....One path went east, veered north, and branched so many times that in 3 miles it became indistinguishable (Palmerston 1885-6:232).

Aboriginal campsite clearings or pockets were often used by European settlers as the starting point for their own clearing efforts, and many current place-names in the district reflect this origin (e.g. Waugh's Pocket). Aboriginal tracks were also taken over where they were suitable for European purposes, but they do not seem to have been used to assist with actual exploration (Douglas 1882; Palmerston 1883).

3.4.4 Diet

A number of observers noted that the rainforest Aborigines were largely vegetarian (Lumholtz 1889:140; Meston 1904:6). However, there are numerous species of animals available in the district, and many were in fact sought and eaten, though it is not always easy to connect the vernacular names used in the source literature with currently recognised species. Almost all the large and medium-sized animals listed in Table 2.4 appear to have been hunted for food, even the carnivores (Lumholtz 1889; Roth 1901b; Johnstone 1904; Meston 1904), and probably some of the smaller mammals were also eaten. Cassowaries (*Casuarius casuarius*), brush turkeys (*Alectura lathami*) and scrub fowl (*Megapodius reinwardt*) were sought both for their flesh and their eggs (Palmerston 1883, 1885-6; Lumholtz 1889; Roth 1901b; Johnstone 1904; Meston 1904). Other birds hunted included the swamp pheasant or pheasant coucal (*Centropus phasianinus*), pigeons such as the nutmeg or Torres Strait pigeon (*Ducula spilorrhoa*), white cockatoos (*Cacatua galerita*), metallic starlings (*Aplonis metallica*), geese (*Anseranas anseranas*), peewits or magpie larks (*Grallina cyanoleuca*), small parrots and ducks (Roth 1901b; Johnstone 1904). Reptiles hunted included both the saltwater and freshwater crocodiles (*Crocodilus porosus* and *C. johnstoni* respectively), lizards such as the eastern water dragon (*Physignathus lesueurii*) and Boyd's forest dragon (*Gonocephalus boydii*), marine turtles, probably freshwater turtles, snakes such as the amethystine and carpet pythons (Morelia amethistina, M. spilota) and frogs (Palmerston 1883, 1885-6; Lumholtz 1889; Roth 1901b; Meston 1904; Mjöberg 1918). Fish were pursued in both marine and riverine environments (see Johnstone 1904 for a partial list of common names), and freshwater eels were also popular (Roth 1901b; Lumholtz 1889). Crustaceans (shrimps, prawns, freshwater yabbies) were caught (Roth 1901b; Johnstone 1904), and shellfish collected from marine and estuarine environments (see species list in Roth 1901b). A number of insects were also reported to be eaten, and in particular several species of larvae found in rotting tree trunks were regarded as a delicacy (Palmerston 1883; Lumholtz 1889; Roth 1901b; Johnstone 1904; Mjöberg 1918). Honey was another eagerly sought item (Roth 1901b).

Despite this variety from the animal world, plants do in fact appear to have formed the bulk of the diet at most times, and those species known to have been eaten are listed in Table 3.5. The major items seem to have been a number of tree nuts, available in large quantities for much of the year, such as black walnut (Endiandra palmerstonii), yellow walnut (Beilschmiedia bancroftii), black pine (Prumnopitys amarus), black bean (Castanospermum australe), and Cycas media in the drier areas. Tuberous species such as yams (Dioscorea spp.), 'taro' (Colocasia sp.) and cunjevoi (Alocasia *macrorrhiza*) were also important. In addition there were many plants with edible fruits, and the shoots and buds of some plants were eaten.

Perhaps one of the most remarkable aspects of rainforest diet was the fact that several of the staple food plants are toxic. These require lengthy processing, generally including leaching in water, before they are safe to eat. The techniques used are described briefly in section 3.4.5 below. Further details are given in Appendix D, and the importance of such food plants is discussed in Chapter 10.

3.4.5 Technology

Tropical rainforest societies in north-east Queensland exhibited a number of distinctive technological features, many of which derived from the nature of the rainforest environment. The large asymmetrical shields typical of the rainforest district constitute just one example of the influence of the environment on material aspects of rainforest society. These shields were made from the buttress roots of certain rainforest figs (e.g. *Ficus variegata*, *F.congesta*, *F.albipila*; Colliver and Woolston 1980), and their shape was affected by the shape of the buttress. The distribution of the shields corresponds closely with the present-day distribution of the humid tropical rainforests, though painted motifs resembling shields have been recorded in the rock art of the Townsville region (Brayshaw 1977:206).

Other examples of the influence of the rainforest environment on Aboriginal societies could easily be cited, and some will become apparent in the following paragraphs, which deal with different aspects of rainforest economy and material culture. Table 3.6 lists some of the plant species utilised for non-food purposes.

Shelter

As might be expected in such a wet region, huts built in the rainforest were substantial and quite waterproof. A dome-shaped framework of bent saplings was erected, tied together with lawyer-cane (Calamus spp.), as shown in Plate 3.3. This was thatched with large leaves, palm leaves or grass (see Plates 3.1, 3.3, 3.4 and 3.10). Stones or cane lattices were used to protect the thatch against heavy rain and wind, and drainage ditches were sometimes dug. Huts were high enough for people to stand upright in, and often had more than one opening. Sometimes two or more huts might be connected with low passages. Structures often lasted for some years with only minor repairs. Temporary huts were erected when necessary, but these were smaller and less sturdy. References to huts and hut-building include: King (1827:12); Carron (1849); Dalrymple (1874); Johnstone (1904); Meston (1904); Roth (1910c); Mjöberg (1918, 1925) and Colliver and Woolston (1966).

Clothing and adornment

Clothing was minimal in the rainforest. 'Blankets' made from beaten bark were used as mats, as covers on cold nights or as raincoats. Roth (1898a:5-8) saw a special wooden implement shaped like a cricket bat being used in the Atherton district to flatten out the bark. Palmerston (1883) reported that on the Johnstone River the bark was pounded with a round stone. Other items of apparel included grass-bugle necklaces and chest ornaments and necklaces of pearlshell. For ceremonies men decorated their bodies and adorned themselves with headdresses of cockatoo feathers (see Plates 3.5, 3.6). Cicatrices were cut on chest and stomach during initiation rites (see again Plates 3.5, 3.6; see also Roth 1900:51; Dixon 1977:12).

Transport (water)

Three different types of watercraft were used along the coast and in the lower reaches of the rivers. These were log rafts, bark canoes and dugout canoes. Log rafts (Dalrymple 1874; Johnstone 1904; Roth 1908a, 1910a) were used to cross the lower reaches of rivers, especially during floods. They were made using from three to six logs or wild banana stems (Musa sp.), tied together with lawyer cane (Calamus sp.), and could carry up to 5 or 6 people each (Plate 3.7). Bark canoes (Dalrymple 1874; Johnstone 1874; Roth 1910a) were made from one or two pieces of bark, depending on the size of the bark sheets obtainable. Dugout canoes with a single outrigger (see Plate 3.8) were used along the coast south of Princess Charlotte Bay (Dalrymple 1874; Roth 1908a). North of this point two outriggers were apparently more usual (Roth 1910a). The canoes were buoyant, seaworthy craft even in rough seas, and could travel 24-32 km per day. In 1770 Cook's party had seen an outrigger canoe as far south as the Whitsunday Passage (Wharton 1893), but by the turn of this century Roth (1910a) was told by

> reliable natives ... that C.Grafton constitutes the southern limit of the dugout, and that any such vessels found below this are not of local manufacture.

It seems likely that considerable effort and organisation was needed to produce a dugout, and that this was one Aboriginal activity that was quickly affected by European presence. Dalrymple's (1874) report indicates the apparent use of metal implements for their manufacture as early as 1873.

Weapons

The most typical and distinctive fighting weapons in the rainforest district were the large shields referred to earlier, and 'swords' or fighting sticks (see Plates 3.5, 3.6). The latter were long flattened pieces of wood with a short handle at one end. They were used one-handed, being brought from over the shoulder to strike down on a waiting opponent with great force, the latter holding his shield up so as to defend against the blow. Colliver and Woolston (1980) supply a comprehensive and detailed review of these two implements (see also Abernathy 1980). Shields were decorated with large designs which marked clan affiliations (see again Plates 3.5, 3.6; Palmerston 1885-6; McConnell 1935). Smaller shields and swords, painted to match each other, were used in ceremonies and dances (McConnell 1935). Other weapons were also made and used. Of the four or five spear types in the Tully district, two were specifically for fighting (Roth 1909b; see also Dalrymple 1874). One was hand-thrown, while the other type gained extra thrust from a spearthrower. Fighting sticks, boomerangs and stone knives were also used (Roth 1909b; Johnstone 1904).

Hunting techniques

Methods of hunting varied according to the size of the animal and its habitat. Larger animals (macropods, cassowaries, crocodiles) were speared, generally after first being trapped in some way. Crocodiles were captured by means of a slip noose or by setting a trap in a tidal channel (Roth 1901b:24-25). Near Atherton, kangaroos were often caught in nets (Roth 1901b:28). Smaller species within the rainforests (e.g. padymelons, scrub turkeys) were caught in nets or basket traps, or in some areas in pit traps (Roth 1901b:26,27,29; Colliver and Woolston 1966:07). Birds and arboreal mammals were caught using different techniques. The tall rainforest trees were climbed with the assistance of a loop of lawyer cane (Lumholtz 1889; Mjöberg 1925). From the upper branches, possums and other arboreal animals could be flushed out of their holes and knocked to the ground for others to despatch with a club. Sometimes a long thin switch was carried up the tree by a loop hung round the neck or wrist. This was used to knock down roosting birds, birds on the wing and flying foxes (Roth 1901b:28,29). Switches were also used to knock over ducks and geese on both water and land, and Torres Strait pigeons were caught simply by lying in wait for flocks returning from their feeding grounds and then throwing ordinary sticks at them (Roth 1901b:27). Smaller birds were caught with bird lime (Roth 1901b:28).

Fishing techniques

A variety of techniques were used to catch fish and other aquatic animals (Roth 1901b:19-24; Banfield 1908; Hamlyn-Harris and Smith 1916; Mjöberg 1925). Turtle, dugong and large fish were captured using harpoons, sometimes with the assistance of a remora (sucker-fish) tied to a line to guide the harpoonist towards the prey (Roth 1901b:20,23,24; Banfield 1908). Fish were also caught with spears, both single- and multi-pronged spears being used, and at Cape Grafton and on the Bloomfield River a curved spear-thrower was used with fish spears (see Plate 3.8; Roth 1909b). Fish nets were commonly used, as were baskets and cages similar to those used to catch terrestrial species. The latter were often used in conjunction with stone dams or weirs (e.g. Johnstone 1904:8-9). Fish were also caught with hook and line. The hooks were crescent-shaped and unbarbed, made from shell, turtle shell or even a dry vine tendril. The manufacture of shell fishhooks has been described by Roth (1904:33), and specimens collected from Dunk Island by Banfield (1908) illustrate the stages in the manufacturing sequence (see Plate 3.9). Another method of catching fish was to stun them using one of a variety of fish poisons (Roth 1901b; Hamlyn-Harris and Smith 1916; see also Table 3.6).

Plant gathering and preparation

Many different implements were used in the collection and preparation of plant foods (see Palmerston 1883, 1885-6; Lumholtz 1889; Johnstone 1904; Roth 1898b, 1900, 1901b, 1904:21,22; Banfield 1908; Pope 1967). Gathering implements included digging sticks, sticks to pull down fruit from high branches and various containers (bags and baskets) to carry the foods back to camp. The typical rainforest bicornual baskets (see Plates 3.4, 3.10) were made from lawyer cane (_Calamus sp._), but other containers were made from such materials as grasses, palm leaf strips and fibre made from _Ficus_ bark (see Roth 1901a, 1904; Pope 1967). Many plant foods, especially fruits, could be eaten raw. The preparation of other plants was often complex (see Chapter 10 for a detailed account), involving a series of steps, beginning with roasting or steaming. For some foods this was sufficient. Others were alternately roasted and pounded between stones. The most toxic species (e.g. yellow walnut and cycads) were leached in running water after being roasted and then ground or sliced into small pieces (see Appendix D). Grinding was done with two stones:

> one large one being placed firmly on their cloth; the smaller one which is worn very smooth from continued friction, is held in the hand and worked in a sort of half roll (Palmerston 1883:Dec.27th).

Sometimes the kernels were sliced instead, using shell implements. The meal or fragments were then placed in a finely woven cane basket and placed in running water for up to three days or more, by which time the toxins had been leached out. The contents of the bag could then be eaten in that form, or baked once more. Other implements were also used in the preparation of plant foods. Special nut-cracking stones were used to extract the kernels of hard-shelled nuts. These were typically flat stones with walnut-sized depressions to hold the nut while it was cracked with a hand-held hammerstone. Open weave baskets were sometimes used to sift ground meal. Water was carried in containers made from bark, leaf scales, gourds or baler shells.

Food storage

There are reports of techniques for storing plant foods. Seeds of the black pine were roasted and "stored away for the winter" (Mjöberg 1925). Partially processed plant foods, such as nut meal, could be wrapped and buried for some time (George Davis pers.comm. 1984), a probable example being the packages found by Dalrymple (1874:628), tied up in banana leaves and containing a mixture "having the appearance of pounded potatoes".

Fire-making and cooking

Despite the wet conditions prevailing in the humid tropics, there are no records of any difficulty in producing fire. The rainforest Aborigines were well aware which sorts of wood would burn even when wet. Two sorts of firestick are recorded. The first consisted of two pieces of grasstree, one of which was split down the middle. This was used along the coast between Cairns and Rockhampton, and was similar to the type used in the Cape York Peninsula, though without the 'matchbox' container. The other type consisted of a flattened oval piece of wood and a thin stick (Roth 1904:10). McConnell (1935) also records the use of a shield in producing fire. Food was cooked either directly on coals or ashes, or else in a ground oven (Roth 1901b:7,8). For the latter method food was usually wrapped in leaves such as banana or ginger (Roth 1901b:8; Mjöberg 1925). In some localities eels or yams might be grilled over a fire by means of a grid of sticks placed about 50 cm above the ground (Roth 1900:24, 1901b:8).

Manufacturing implements

Most rainforest artefacts were made from wood, bark or lawyer cane. Their manufacture required the use of various cutting, scraping or piercing instruments, made from stone, shell or bone. Ground-edge axes (mainly hatchets, strictly speaking; see Dickson 1981) were important primary tools for cutting and shaping wood, and were generally hafted with a bent piece of cane (Roth 1904:19; Johnstone 1904:103; Seaton 1959). Old axes were often used as wedges to split timber (Roth 1904:18,19; see also Dickson 1981:84-85 on 'splitters'), and some museum specimens bear marks which could indicate other secondary functions (see Chapter 9, section 9.3). Pieces of quartz or shell were used for finer details of woodworking. Quartz appears to be almost the only type of rock available in the rainforest district which is suitable for a flaked artefact industry, though rhyolites may be found on the Atherton Tableland (see Chapter 9, section 9.2). Shells were frequently used for cutting and scraping (Roth 1904:21), and even the sharp edge of a broken candlenut shell might be pressed into service (Roth 1898a:5). Pumicestone or leaves from a sandpaper fig were used for the final smoothing of wooden artefacts (Roth 1904:9). Bone awls were used to pierce holes during the manufacture of bark blankets, canoes or water carriers, or to extract kernels from nuts (Roth 1904:25). Wooden awls could be used with softer materials such as bark and leaf scales.

Traditional materials for implements were rapidly replaced by European goods (especially metal and glass) as they became available. Steel axes in particular were prized and were in use as early as 1873 (Dalrymple 1874). By the turn of the century, stone implements were no longer in use, except for processing vegetable foods (Roth 1904:20; Mjöberg 1925), and for ceremonial purposes (J.B. Campbell pers.comm.). Information on the use of certain traditional artefact types found in the rainforest is therefore often sparse, and the function of some archaeological specimens is unknown (see again Chapter 9).

3.4.6 Trade and exchange

An elaborate system of exchange seems to have operated in the district (Roth 1910a). Table 3.7 summarises the items which the Gungganjdji people from Yarrabah exchanged with their neighbours. The list implies some degree of specialisation in the production of goods for exchange, since it seems likely that many items could have been easily made by the people who received them. Note also that the Gungganjdji received shields and swords from the Yidinjdji of the Mulgrave River, and also gave the same items to their northern neighbours. Roth (1910a) also recorded an exchange of food between the people of the lower Tully River and those at Clump Point; the former traded yellow walnuts (Beilschmiedia bancroftii) for spike rush (Eleocharis dulcis).

3.4.7 Rock art

A number of rockshelters containing paintings have been recorded in the region (see Chapter 5, section 5.2, also Table 5.1 and Figures 5.1, 5.2, 5.3). One of the first to be seen by a European is on the Johnstone River and was recorded by Palmerston (1885-6:238):

> ... a ledge or cave bearing every appearance of being the aborigines favourite rendezvous .... In some of these notches, painted in several colours, were rude delineations of frogs. Some of these amphibious designs were fully 15 ft high. They must have rigged stages to execute them.

Palmerston was also the first European to see and describe Jiyer Cave on the Russell River (see Chapter 6, Figure 6.3 and Plates 6.3, 6.4 and 6.5). Other painted rockshelters in the district include Bare Hill near Mareeba, recorded by Clegg (1978), and a number of sites in the Cardwell-Ingham area, recorded by Brayshaw (1977). Many of these paintings (possibly including Palmerston's amphibious designs) include depictions of the "Kennedy character" (Brayshaw 1977:206), an anthropomorphic figure reminiscent of the so-called 'quinkans' of the Laura district (Trezise 1971:9; see again Figure 6.3 and Plate 6.3). Other paintings include representations of shields and European ships (Seaton 1952). Most of the recorded painted rockshelters occur along the western margins of the rainforest (see again Chapter 5). The humid tropical climate is not the ideal environment for these paintings, as many are now faint and indecipherable, and some may soon fade away altogether.

3.4.8 Mortuary rites and cannibalism

The mortuary rites of the rainforest Aborigines have been described by a number of sources. Burial, cremation and dessication/mummification were all apparently practised (Roth 1900:68, 1907:388; Banfield 1908). Some sources reported that mummification was reserved for the corpses of prominent men (Roth 1907:388; Mjöberg 1925), others that women and children were also treated in this manner (Dalrymple 1874; Cairn and Grant 1890; Gribble 1933). The process involved setting the corpse on a wooden platform and slowly smoking it over a fire (Palmerston 1887; Lumholtz 1889; Roth 1907:388; Mjöberg 1925; Gribble 1933:83).

Portions of the deceased were sometimes ritually eaten (Palmerston 1887:Sept.24th; Roth 1907:388). The degree to which cannibalism was practised in the rainforest district is unclear. Ritual cannibalism certainly occurred in Australia, though it was not invariably practised (Meehan 1971; Brockwell 1977). However, the horrified fascination with which European observers often regarded any sort of cannibalism makes it hard to interpret their reports. Roth (1901b:30) stated that people were not killed for the purpose of eating them. Others portrayed the rainforest Aborigines as "wholesale habitual" cannibals (Dalrymple 1874), craving for flesh in their vegetarian diet (Palmerston

1883:557; Lumholtz 1889; Meston 1889), and some recent writers have been influenced by these accounts (e.g. Brayshaw 1977:301-304). It is likely that the role of cannibalism in rainforest society has been misinterpreted and/or exaggerated. Some mortuary practices may have been taken as the preparation of human flesh for consumption. Another important factor to be considered is that people were starving in the years following European settlement, and may have been forced to alter their customs. In addition, there is the likelihood that some Aboriginal informants, having discovered the horror with which Europeans regarded the eating of human flesh, exaggerated their accounts.

3.5 Discussion

The ethnographic data presented in the preceding section shows, among other things, that the tropical rainforest societies of northeast Queensland exhibited:

1. a relatively high population density, with frequent gatherings of large numbers of people;
2. heavy dependence on several species of toxic food plants, many restricted to this region;
3. semi-permanent huts and camps;
4. distinctive weapons for settling disputes by duelling;
5. the widespread use of traps for game and fish;
6. some degree of food storage;
7. extended trading links and apparent

specialisation in trade.

Most of these features could be taken as indicating a society which has 'intensified'. Intensification can be defined as 'increasing productivity per given area' (see Bender 1978:205). It may (but need not) be associated with increasing production. The apparently high population numbers in the rainforest district suggest that in this region the overall production may well have risen.

According to Bender (1981:154):

> increased productivity, permitting a cut-back in time spent in food procurement, should be seen as a concomitant of social intensification, in terms of increased interaction and obligations.

Some of the features listed above clearly relate to a more intensive exploitation of the environment (e.g. the use of toxic plants, which increases the amount of food available from a given area, and the use of traps to improve scheduling and reduce time spent in hunting). However, other features are more closely linked to more intensive social relations (e.g. the necessity for an adequate system of settling disputes arising from more frequent contact, and also the extensive trading networks and apparent specialisation in trade goods).

One of the questions addressed in this thesis is: When did these forms of intensification arise? Direct indicators of social intensification are rarely visible in the archaeological record, though it may be possible to trace extended trade and exchange links using stone artefacts (e.g. McBryde 1978, 1984). However, indicators of economic intensification (i.e. increased productivity) are more likely to be apparent in terms of both intensive use of resources and increased levels of occupation.

In other regions of Australia, evidence of intensive exploitation patterns has been observed within the last 5,000 to 4,000 years (e.g. Luebbers 1978; Lourandos 1980a, 1983, 1985; Ross 1981, 1985; Hughes and Lampert 1982; Beaton 1985; Williams 1985). Archaeological variables which act as indicators of intensification include:

1. increased use of individual sites (e.g. as indicated by increased deposition rates for cultural material or by increasing size of sites);
2. increased establishment of new sites;
3. use of previously unused or underused resources and environments;
4. more complex site economies;
5. more complex exchange systems.

I do not accept that North Queensland rainforests were ever a marginal habitat, as Lourandos (1983:87) implies for the temperate rainforests of Victoria and Tasmania. The former are much more diverse than the latter and contain many more readily exploitable resources (see also Horsfall 1984b, attached as Appendix C). I believe that what we are seeing here is an expansion of resources, based on the use of complex processing methods to exploit otherwise toxic plants for food. It remains to be seen when these complex processing methods were adopted or invented (see Chapter 11) and when they began to be exploited intensively, which is not necessarily the same thing.

CHAPTER 4

ARCHAEOLOGICAL METHODS

4.1 Introduction

Detailed accounts of archaeological methods are not always included in excavation reports, though there are exceptions (e.g. Jones 1985). In this chapter I have endeavoured to provide adequate details of my methods, especially where those have been adapted to suit the requirements and restrictions of the rainforest environment. I also describe here some of the difficulties encountered during my research.

4.2 Site Location Strategy

The aims of this thesis required that at least one stratified rainforest site be excavated, in the hope of finding reasonable preservation and sufficient antiquity to answer the questions posed in Chapter 1. In general, stratified deposits are better preserved in rockshelters than in open sites, though they may not be representative of other sites in the region. One rockshelter in the study area (Jiyer Cave in the Russell River valley) was known to contain occupational deposits. However, in case this turned out to be shallow or poorly preserved and also to obtain a larger sample, a search was made for other likely sites, both rockshelter and open-air.

There were five possible approaches for locating sites in the area:

1. A search through official site records;
2. A request for information on sites known to local residents (including Aborigines) and to researchers, but not yet officially recorded;
3. A search of early historical sources for the location of sites used during the contact period;
4. An examination of documentation of artefact collections in museums, to determine (where possible) the location of the sites which produced the material;
5. A field survey for sites as yet unknown.

The first two of these approaches yielded sufficient sites suitable for excavation, and the other three methods were therefore not explored fully, though they undoubtedly have potential, especially the last. Each approach is dealt with in more detail in the following paragraphs. The sites themselves are discussed in Chapter 5.

4.2.1 Recorded sites

A register of archaeological sites in Queensland is maintained by the Archaeology Branch of the Department of Community Services (previously the Department of Aboriginal and Islander Advancement). These site records were examined at an early stage of the project

(1982). At that time the records were in some confusion. Often two or more quite different sites were registered under the same site number. In other cases the same site appeared to have been recorded more than once and allocated more than one site number. Sometimes map grid references or directions for finding a site were not given, and its provenance could not be determined. Nevertheless, a careful reading of the records, together with some local knowledge, enabled me to plot 80 sites, with varying degrees of accuracy and reliability.

Since my initial search of the register, the site records have been reorganised and many of the anomalies have been removed. In the process, some site numbers have been changed (these are shown in Table 5.1). The problem of duplicate site records remains, however, as does the lack of grid references in some cases.

4.2.2 Sites not officially recorded

It was clear from preliminary investigations and discussions in relation to this project that many locally known sites (e.g. Jiyer Cave) had not yet been included on the Site Register. These included sites known to my supervisor, John Campbell, and others known to the Archaeology Branch Ranger based in Cairns, Bruce Butler. Both willingly shared their knowledge with me.

I also wrote to a number of local newspapers covering the northern rainforest region, asking residents for information on the location of Aboriginal sites in the area. Emphasis was placed on habitation sites with occupational deposits, and the search was restricted to the study region, that is, between Cairns, Innisfail and Atherton. This turned out to be a productive exercise, and I believe it has strong possibilities for future research in the district.

Another potential source of information on Aboriginal sites (archaeological and otherwise) exists amongst the Aboriginal people themselves. Although I did not utilise this source to any great extent, I was fortunate to be able to accompany George Davis of the Yidinjdji along a traditional route between the Atherton Tableland and the coastal plain, shortly after I had completed my fieldwork. This expedition gave me firsthand insights into the tremendous gap which exists in the rainforest district between the occurrence of Aboriginal sites and the level of their archaeological visibility (see Chapter 5, section 5.14).

4.2.3 Historical and museum records

The existence and location of Jiyer Cave was first recorded by a European observer in 1887, and it was this information which led to the expedition of 1979 during which the first archaeological investigations of the site were undertaken (see Chapter 6). At least one of the rainforest sites listed in Chapter 5, a shell midden on Dunk Island, was first mentioned in early historical sources (Banfield 1908). Early maps of the district also indicate the location of other Aboriginal campsites and gathering places (e.g. Jack 1888; Banfield 1908; Birtles 1967), but these and other sites recorded in the early literature have not been systemically investigated in the field. The task of re-locating many of these sites may, in fact, be quite as difficult as the discovery of new ones (see below), even for those which have survived the land management practices of the last hundred years.

There are also numerous collections of stone artefacts from the rainforest district, held in museums and private collections, and for several of these the original locations are recorded (e.g. Cosgrove 1980a; see also Chapter 9). Again, these sources have not been investigated in any detail in the present study.

4.2.4 Survey for new sites

Site surveys are generally designed to provide a representative sample of sites in a given region, usually by probability sampling techniques (Binford 1964; Redman 1974; Schiffer *et al*. 1978). However, it was not my aim to try to locate a statistically representative sample of sites, but rather to find a specific and no doubt rare site type, one which contained stratified deposits, the excavation of which would provide answers to my research aims. Probability sampling is not an efficient strategy for locating rare site types (Schiffer _et al_. 1978:1), and if it had become necessary to undertake a field survey for new sites, I would probably have utilised some kind of purposive survey strategy in order to increase my chances of finding suitable sites. An alternative would have been to alter my research aims, but this did not prove to be necessary.

There are many difficulties inherent in site surveying in the region, whatever sampling techniques are utilised. These factors (see section 4.3) should be taken into account in any future survey for sites in the region.

4.3 Problems of site survey in tropical rainforest

Factors affecting the discovery of archaeological sites include climate, land use practices, obtrusiveness and visibility of sites, and accessibility (Schiffer _et al_. 1978:4). In the rainforest district, these factors have a mainly adverse effect on the discovery of sites (see also Bowdler 1983; Anderson,J. 1984). Some feeling of the sorts of difficulties that may be encountered can also be gleaned from my account of the logistical problems met with during the excavations at Jiyer Cave (section 4.4).

4.3.1 Climate

The high temperatures and humidity encountered generally in the humid tropics contribute to the rapid decay of organic material. Heavy precipitation causes erosion on the slopes and flooding in the lowlands, which may destroy archaeological deposits. Flooding may, however, contribute to the build-up of deposits and the formation of certain kinds of stratified sites. In such a climate one might expect to find few surviving sites and minimal preservation of organic material within those sites. High rainfall and flooding may also make access to some areas more difficult, and this may happen at almost any time of the year.

4.3.2 Land use practices

During the last hundred years, Europeans have cleared and ploughed much of the rainforest district, especially in the coastal lowlands and on the Atherton Tableland, both of which have a flat or undulating topography and rich soils. These are also the regions most likely to have contained major occupation sites. The mountain ranges have been less affected by Europeans, but few areas have been left undisturbed. Even where the vegetation appears untouched, logging and mining have generally taken place.

It is true that clearing and burning may reveal sites which would otherwise have remained unnoticed.

Nevertheless, these practices, particularly ploughing, also cause destruction, and many sites have probably been obliterated without ever having been recognised as such. In other cases, stone artefacts were noticed, collected and their localities sometimes recorded (see Chapter 9). It is noteworthy, however, that the main excavation sites investigated in this thesis are not on cleared and ploughed land.

4.3.3 Visibility

The rainforest floor is not usually obscured by thick layers of leaf litter, because rapid decay of organic debris is promoted by the hot wet climate. Therefore, except during prolonged dry spells when deciduous species shed their leaves in quantity, the soil surface is generally more or less visible. However, because the trees are closely spaced, it is not usually possible to see for more than a few metres from the observer's position, and sites can easily be missed from only a short distance away. Ground visibility in cleared areas, on the other hand, is determined by the amount of grass, crop or shrub cover, and it is usually poor except in recently ploughed paddocks.

For a site to be visible, there must be visible remains on the soil surface. In the rainforests of North Queensland, these archaeological traces may be large stone tools such as grindstones or nutcracking stones, shell (in some sites), quartz artefacts (difficult to see because of their small size), charcoal (also difficult to see, but unlikely to occur naturally within the rainforest proper), and in the case of sites used since contact, glass, ceramic or metal fragments. Except for the larger implements, none of these signs are visible at a glance, and close examination of the soil surface of likely sites is normally necessary to determine their presence or absence. Shell is one of the most visible site indicators in these conditions, but unfortunately rarely occurs in non-coastal sites. The difficulty of recognising even known sites in the rainforest district will be made clear in the discussion of sites along the Yidinjdji trail (Chapter 5, section 5.14).

4.3.4 Accessibility

There is an inverse relationship between the accessibility of a locality and the extent to which it has been affected by European land management practices. In cultivated or pastoral areas, access to most areas is easy. Roads are numerous, the terrain is relatively flat and most of the vegetation has been cleared. In the less disturbed but very rugged mountainous regions, access is difficult, even when travel is confined to ridge tops or creek and river beds. Thick vegetation often obstructs movement, and although some tracks do exist, they are not necessarily connected with Aboriginal sites. It is also frequently difficult in the dense forests to determine one's location on a map. Thus when a site has been found, it may not be possible to plot its location accurately. Conversely it can also be difficult to relocate a site that has been recorded previously, unless clear directions are given.

All these factors need to be taken into account in planning a survey for sites in the humid tropics of North Queensland. At this stage I would favour a strong purposive component, designed to locate unobtrusive sites in particular microstrata, and I would obtain as much prior knowledge as was possible from local residents (both Aboriginal and European) before planning the field survey.

4.4 Logistical problems

Some of the difficulties that would be experienced in undertaking a comprehensive site survey in the region were manifested during expeditions to the major excavation site, Jiyer Cave, on the Russell River. They were sufficient to affect excavation techniques and therefore warrant a detailed account (see also Table 4.1).

Jiyer Cave is several hours walk from the nearest place that can be reached by vehicle. The most feasible route starts on the Atherton Tableland, though the site can also be reached by trekking upriver from the coastal plain. The latter route, however, while easily negotiated in times of low river level, is much more difficult during wet periods, since it involves frequent river crossings. This lower route was not regarded as suitable for packing supplies, equipment or finds, even during the so-called dry season.

The first section of the Tableland track follows an old disused Forestry road down to a crossing on the upper Russell River. From here the track is blazed and partly cleared for some distance, although regrowth has occurred and the blazes are not always visible, particularly in wet weather. Bends and kinks in the track generally occur at small creek crossings and delays may be experienced while searching for the next section. Fallen trees often obstruct the route, requiring detours to pick up the track on the other side, which may also take some time.

The track disappears about halfway between the site and the upper Russell crossing, and a compass course must then be set, parallel to the Russell River. After crossing Cave Creek (which reaches the river near Jiyer Cave), a steep ridge is followed down into the gorge. It is important to count the number of creeks crossed correctly, a difficult feat in wet weather when every gully becomes a flowing stream. If the wrong ridge is followed down to the river, extremely steep slopes must be negotiated, descent can be dangerous, and the journey is much longer.

This unblazed section of the route was marked each year with survey tape, which was removed at the end of the field season (where the local fauna had not already done so!). Preliminary trips had to be made each year to re-mark the track, which was not always a trouble-free task. Even after numerous visits to the site, I still find it easy to miss the best route, though one can hardly become totally lost, since the Russell River is always close by.

The necessity of carrying all supplies and equipment in by backpack placed certain restraints on archaeological activities. Although Campbell also went in on foot in 1979, he had the advantage of Army helicopter support for bringing in equipment and additional supplies. It was during that first archaeological expedition that the site plans and profile used in this study were drawn up. In my first field season in 1982, only the most basic equipment was taken in. Even the sieve was made on the spot from mesh, lawyer cane, wire and string. The following year more equipment was deemed necessary, including a pair of nested sieves, and as much equipment as possible was carried in during the preliminary trail-marking trip. Thanks to Campbell's earlier efforts, surveying and mapping equipment was not required.

Excavation periods, three in all, each lasted a fortnight. Since it was not possible to carry in more than about one week's supply of food at a time, arrangements were made for a second week's supply of food to be brought in halfway through the fortnight. This generally involved an extra walk by two of the field party back to the vehicle, to pick up supplies stored there or to drive to shops at Malanda. Such an expedition took two or three days. Food storage on the site was a major problem. It did not take long for the local fauna (rats, mice etc.) to discover our supplies and make nightly raids. Increasing ingenuity was required to foil their depredations and retain sufficient for ourselves.

Getting the finds out was also difficult. In 1982 much of the sorting was done on the spot, and the resultant relatively small amount of material was carried out a fortnight later by a team of two-legged 'pack-mules'. However, some of the larger stone artefacts were too heavy to carry out in this way and they were left in the backfill after measurements, photographs etc. were taken. In 1983, more material was collected, and less sorting was done on the spot. A helicopter was finally chartered to lift out about 400kg of excavated material, after some resistance from the University Administration which was not used to such expenditure by post-graduate students. I certainly recommend this method of transport to future researchers in Jiyer

Cave. Nonetheless, it was a tricky landing amongst large river boulders, and it could have been dangerous in bad weather.

During the excavations the team camped in the cave itself, as it was the only flat, sandy, reasonably dry and leech-free area for several kilometres in any direction. Special precautions were taken to avoid contamination of exposed excavation surfaces and the open pits were covered at night.

The other excavation sites were much more accessible. Vehicles could be brought to within ten minutes walking distance or less, and accommodation was usually at a nearby caravan park or camping ground.

4.5 Excavation techniques

The major excavation site was Jiyer Cave (JC, see Chapter 6), and a total of six weeks was spent at this site (two in 1982, four in 1983). Soundings were dug at four open sites during 1982, two on the Mulgrave River (MR1 and MR2, see Chapter 7), and two on a cane farm near Babinda (SF1 and SF2, see Chapter 8). One of these (MR2) was excavated more extensively in 1984 (see again Chapter 7). In 1983 excavations were also carried out at a shell midden near Bramston Beach (BBM1, see Chapter 8). Throughout this thesis I have used my own field codes, which readily identify the excavated sites. The site numbers allocated by the

Queensland Museum are as follows: S521 (JC); S522 (SF1); S523 (SF2); S524 (MR2); S596 (MR1); S597 (BBM1).

4.5.1 Excavations

Excavation methods varied slightly at the different sites, according to the nature of the site and the time and assistance available. The area of the excavation units was one of the main variables (see Table 4.2). Excavation was normally in 5 cm spits, except where thinner cultural or natural layers were observed. Depth measurements were made using either a water level (Jiyer Cave, soundings) or a dumpy level and staff rod (MR2/1984, BBM1).

At Jiyer Cave, the grid system previously set up by Campbell was followed, but a different main datum point was used. In 1982, the area of the excavation units was 1 m^2 for Square K14, and 1 m x 50 cm for the half-square K13S. In 1983, the squares were divided into quadrats (50 cm x 50 cm), and excavation proceeded in these units. At lower levels the quadrats were combined in pairs (1 m x 50 cm), for ease of excavation and since little cultural material was present. For the bottom few spits of G12 and H18 all four quadrats were taken out as a unit (Table 4.2). The division of squares into quadrats meant that material caught in the sieves could be assigned to a more specific location than when excavation was from a whole metre square.

However, in the analysis presented in this thesis, results have been combined for each spit within a square (or half-square).

For the main excavation at MR2, a grid of 1 m squares was laid out and a datum point established. A similar grid was set up at BBM1. Both sites were excavated in 1 m^2 units (see Table 4.2).

In the initial stages of excavations at Jiyer Cave, an attempt was made to record in three dimensions the location of all artefacts, following the practice of John Campbell (pers.comm.; see also Mardaga-Campbell and Campbell 1985) in his 1979 excavation at this site. Such a procedure was relatively easy in the upper sandy layer, but when the digging reached damper more clayey deposits at about 20 cm, it was difficult to identify artefacts unless the adhering soil was first washed off. This procedure slowed the work tremendously, and the situation was exacerbated by the fact that few of my assistants had archaeological training and most had difficulty in distinguishing artefacts from natural rock, of which there was a great quantity. Therefore, since my time was limited and I had no wish to carry out from the site any more material than was absolutely necessary, the three-dimensional recording of artefacts at Jiyer Cave was abandoned, except for the more obvious finds. The remainder were caught in the sieves. Similarly at the other sites, only major or unusual finds were recorded in three dimensions. However, organic material uncovered during digging was collected and bagged immediately at both Jiyer Cave and MR2, even though it was not always recorded in three dimensions. This procedure prevented any damage which might have occurred during sieving.

Charcoal samples for radiocarbon dating were collected either during excavation or later from the sieves. Samples were handled using forceps or a trowel and transferred to a package of aluminium foil or a clean plastic bag. This was then placed inside another bag with a label. The co-ordinates of charcoal samples found _in situ_ were recorded.

Soil samples (about 70 gm each) were collected at frequent intervals from the main excavations of Jiyer Cave and MR2. Soil pH was tested regularly during the digging. The weight of the excavated sediments was recorded for the three main excavations (JC/1983, MR2/1984, BBM1).

4.5.2 Sieving

In each case all excavated material was sieved at the site. For the first field season at Jiyer Cave, as stated in Section 4.3, a sieve was manufactured on the spot from 1 mm fly screen (Plate 4.1). This was not very satisfactory, mainly because the small mesh size retained too much sand and gravel. The following year, a pair of nested sieves (mesh size 6 mm and 3 mm) was used (Plate 4.2). Paired sieves were also used at MR2 (1984) and BBM1. However, a single sieve was used for the soundings. Mesh sizes are given in Table 4.2.

Excavated material was wet sieved at the two sites where water was readily available (Jiyer Cave and MR2). This procedure was particularly necessary at Jiyer Cave, where all of the matrix except the top 10-20 cm was damp and clayey. Unfortunately much of the charcoal in this site was very fragile, and readily washed through the sieves. Large samples of black charcoal-rich matrix were therefore collected from several in situ occurrences to make certain that sufficient would be available for radiocarbon dating.

At BBM1, the sandy excavated matrix was dry sieved without difficulty. Dry sieving was also carried out at MR1, SF1 and SF2 with few problems being experienced.

In each case the material passing through the sieve(s) was retained for backfilling. This was possible even where material was wet sieved, since at Jiyer Cave much of the matrix was trapped in small rock pools in Cave Creek, and at MR2 sieving was done on a small sandy beach in a backwater.

4.5.3 Sorting

At Jiyer Cave during the first field season, sorting was done immediately in the sieve. All cultural material was retrieved (charcoal, bone, shell, eggshell, glass, metal, stone artefacts) and also all quartz fragments. This was a tedious task, since the light was poor, and the small fly-screen mesh retained large quantities of sand and natural rock. The following year, when two standard sieves were used, the upper sieve was sorted on the spot, with the natural rock component being weighed and retained for backfilling. The contents of the lower sieve were bagged in their entirety for sorting later in the laboratory.

At MR1 sieved material was sorted on the spot and all non-cultural material discarded. Sieve contents from the other three soundings were placed in plastic bags for treatment in the laboratory. The same procedure was carried out with contents of both sieves from MR2 (1984) and BBM1.

4.5.4 Storage

All material collected, whether from the excavations or the sieves, was stored in plastic bags containing cardboard or metal labels, with due care being taken to minimise damage to fragile specimens.

No difficulty was experienced with the use of cardboard labels at Jiyer Cave, despite the damp environment, and the unavoidable delay in getting material to the laboratory. Neither were there any problems with cardboard labels at the four sounding sites. However, at BBM1, cardboard tags became illegible within a week, possibly owing to the acidic nature of the deposits, and much of the material from one of the excavated squares had to be discarded without examination (see Chapter 8, section 8.1.2). Metal tags were subsequently used for the main excavation at MR2.

At Jiyer Cave (1983), the contents of the lower sieve were allowed to drain overnight on paper cloth, since these residues would not reach the laboratory for some weeks. Owing to the high humidity at the site, the material did not dry in this time, and the growth of fungus, mould and even seedlings in these bags was unavoidable. Even without wet sieving, the dampness of the sediments would probably have allowed this to occur. The problem was exacerbated by the fact that many of these finds had to be stored on the site for up to two months until the helicopter lift. However, charcoal and other organic materials taken either direct from the excavation or sorted from the upper sieve were carried out at the end of each fortnight's session, and contamination was not observed subsequently in these samples.

At MR2, wet-sieved residues were dried overnight at the caravan park which was our base. Contamination by fungus or other growths was not observed, partly because a reasonable state of dryness was achieved, and partly because the material reached the laboratory within a fortnight. Some sorting was also carried out while the material was being dried.

4.6 Laboratory analysis

Material was transported to Townsville, where everything was dried immediately on arrival. Finds were washed (or rewashed) as necessary. Sieve residues from Jiyer Cave and MR2 were generally rewashed before drying. Material from the shell midden (BBM1) was washed and dried (upper sieve) or merely dried (lower sieve). Soil samples and charcoal samples for dating were also carefully dried.

All material was sorted into basic categories: charcoal, bone, shell, eggshell, glass, metal, quartz and other stone. Each category was then re-examined and in some instances further subdivided. The quantity of each category was weighed for each spit, and where appropriate, the number of items was counted.

4.6.1 Radiocarbon dating

Samples of charcoal selected for dating were submitted to the N.W.G. Macintosh Centre for Quaternary Dating at the University of Sydney. The Centre then forwarded some of these samples to Beta Analytic Inc. in Florida (U.S.A.) for quicker results whenever this was deemed necessary in order to make decisions about further fieldwork.

4.6.2 Charcoal and nutshells

Material initially identified as charcoal was found to include numerous fragments of charred nutshell, so identified by the curvature of both inner and outer surfaces. Quantities of charcoal and nutshell were weighed (separately) for each excavation unit, omitting the samples of charcoal-rich matrix which had been collected from some spits at Jiyer Cave (see section 4.5.2).

The larger nutshell fragments were tentatively identified with the assistance of Tony Irvine of the Division of Forest Research, Commonwealth Scientific and Industrial Research Organisation, Atherton (see Plates 4.3 and 4.4). However, the reliability of these identifications is uneven, since they depended not only on the nature of the nutshell but also on the degree of preservation exhibited at different levels. The Johnstone River almond (Elaeocarpus bancroftii) produces thick-shelled nuts which tend to break into even segments with a regularly dimpled outer surface. These are impossible to mistake even when broken into quite small pieces. Nutshells of the poison walnut (Cryptocarya globella) have a deeply ribbed outer surface and are equally easy to recognise. However, the seed of this plant does not appear to have been eaten by the rainforest Aborigines (see Table 3.5). Fragments of *Pandanus* drupes are also quite distinctive and readily recognised.

The main difficulty was in identifying the numerous small charred fragments of nutshell with few differentiating features. Yellow walnut (*Beilschmiedia bancroftii*) has a large shell with marked protuberances at either end. Archaeological fragments showing this characteristic were readily assigned to the species. Charred pieces of fairly thin nutshells with a somewhat pimpled appearance were identified as hairy walnut (*Endiandra pubens*). However, shells of the black walnut (*Endiandra palmerstonii*) have few distinguishing characteristics, though they are slightly thicker than either yellow or hairy walnut shells. The presence of this species was inferred from the large numbers of small hard fragments with curved inner and outer surfaces present in many samples. However, the majority of nutshell remains could not be assigned to a species, however tentatively, and no attempt has been made to quantify the species present.

4.6.3 Faunal remains

The only significant finds of bone were from Jiyer Cave. These were identified by Ken Aplin of the School of Zoology, University of New South Wales, but the remains are too few to warrant the calculation of minimum numbers. Proportions of burnt, unburnt and calcined bone were calculated for each square, and the results give some indication of the stratigraphic integrity of the upper deposits.

Shell fragments were predominantly marine, even at the relatively inland site of Jiyer Cave. Specimens from JC, MR1 and MR2 were identified by David Reid, then of the Department of Marine Biology, James Cook University, and now at the British Museum (Natural History), London. Specimens from BBM1 were identified by Bill Dowd of the Department of Zoology, James Cook University.

Eggshell fragments were found only at Jiyer Cave. These were identified by Jerry van Tets of the Division of Wildlife and Rangelands Research, Commonwealth Scientific and Industrial Research Organisation, Canberra.

4.6.4 Stone artefacts

Each piece of stone brought to the laboratory was examined to determine if it was an artefact or merely a piece of natural rock. The artefacts were then grouped into two categories, quartz and non-quartz (mainly basalts and metamorphics), each of which was analysed separately.

Quartz

Quartz artefacts in each spit were graded by size into six groups, using squares marked on a piece of graph paper (squares measured 10 mm, 15 mm, 20 mm, 30 mm and 40 mm along the side). The number and weight of artefacts in each group were recorded. This gave an indication of the variation in both size range and total quantity of quartz artefacts per spit, and therefore through time.

Artefacts greater than 15 mm in their maximum dimension were given a catalogue number, and individual weights and measurements were recorded for each, as well as the presence of bipolar crushing and pebble cortex. Retouch/use-wear was difficult to recognise with any certainty, and was in any case rare.

Quartz artefacts larger than 15 mm from selected squares were analysed according to the method of Witter (1984, pers.comm.), in order to determine whether there were any changes in reduction technology during the time-span represented. This analytic method is based on the use of a reduction chart, in which artefact thickness is plotted against the square root of the product of its length and breadth (i.e. a function of area). This provides a measure of the relative thickness of the artefacts and also indicates the positions of the artefacts in a reduction sequence (see Figure 4.1). Plots of different assemblages or portions of assemblages may reveal variations in stone-working parameters. A plot may also include information on the proportion and size of various artefact types present, such as cores, retouched flakes and 'lammelates'. Lammelates (flat thin pieces of quartz) frequently occur in quartz assemblages and can be produced either by the use of a multi-faceted core or by the splitting of bipolar cores (Witter 1984:2; see also Knight 1986:92-103).

Non-quartz

This group of artefacts was sub-divided into a number of morphological categories, based on size, shape and the nature of any modifications. For each artefact, weight, measurements and a brief description were recorded. Several artefact categories were recognised (see also section 4.7 and Chapter 9), though not all were present at every site. They included grindstones, anvils, utilised pebbles, ground or polished artefacts and flaked artefacts, some exhibiting retouch or use-wear. Unmodified pebbles were also recovered from the excavations, and most of these were regarded as probable manuports (Leakey 1971:3,8).

4.7 Surface collections of stone artefacts

As part of my research I also examined a number of collections of stone artefacts found in the district. These had been discovered earlier during clearing, logging and ploughing activities, and consisted mainly of large implements such as ground-edge axes, grindstones and nutcracking anvils. My reason for studying these collections was to gain an idea of some of the types of stone artefacts which were made and used in the rainforest district, and which might be encountered during my excavations. It was appreciated from the start that these collections, whether held privately or in museums, had all been obtained by uncontrolled and inconsistent methods, and were biased in favour of large and easily recognisable artefacts. They did not warrant a detailed analysis for my purpose, and my study of them was therefore brief and descriptive rather than comprehensive and statistical.

I examined a total of over 1200 artefacts contained in 12 collections (see Chapter 9). A brief description of each implement was recorded, and the shape of the implement was traced by drawing an outline on a piece of paper (except for items held at the Material Culture Unit, James Cook University). The type of raw material was recorded in most instances, though I was not always able to distinguish between the different rock types, particularly in the early stages of the study. As well, many artefacts were too weathered to enable easy identification of the raw material. Attributes recognised and recorded included the position and type of use-wear (especially for utilised pebbles and grindstones), manufacturing techniques (mainly for ground-edge implements), damage (though not that caused by plough shares, which was very common) and weathering. Unusual features and multiple functions were also noted. Length, breadth and thickness were measured directly for some collections. For others, artefact dimensions were later estimated from the drawn outline. These are less accurate, but sufficient for present purposes. Artefact weight was also recorded for some collections. Artefacts were then classified into several groups, as described in Chapter 9 (section 9.2).

CHAPTER 5

SITES IN NORTHEAST QUEENSLAND RAINFOREST DISTRICT

5.1 Introduction

Over one hundred sites have now been recorded either within the rainforest district or just west of the present rainforest margins (see Table 5.1, Figures 5.1, 5.2 and 5.3). The existence of the majority of these sites (No.1-80 in Table 5.1) had been reported to the State Archaeology Branch prior to this research, though not all were allocated register numbers, and few of them had been subjected to professional archaeological investigation. Twelve sites were added to the register as a result of my research. Ten of these (No.85-94) were already known to local residents and other researchers. The other two (No.110, 111) were discovered during my fieldwork. Four sites (No.81-84) were added to the register by others during the time between my two consultations of it. The location of fifteen additional sites (No.95-109) is given by Campbell (1982b, pers.comm.). Several sites (No. 112-115) were located by M. Rowland (Field Archaeologist, Archaeology Branch, D.C.S.) in 1985. The Yidinjdji trail (No.116), a complex of related sites, has also recently been added to the register.

Information about many of the sites listed in the register is not entirely reliable, as was indicated in Chapter 4. However, it was not necessary for this project for me to visit each site in the field to check the accuracy of the register. Therefore the data presented here (especially for those sites not allocated D.C.S. Site Numbers) must be regarded as provisional. However, I have visited many of the sites, particularly those in the study area, where I concentrated on locating suitable sites for the excavation programme.

The sites (with the exception of those along the Yidinjdji trail) have been grouped into 12 types, which are listed in Table 5.2, together with the number of sites in each. Because of the uncertainty of some site identifications I have included maximum and minimum numbers in this table. The total figure is greater than 115, because a single site number may include more than one similar site, and some sites are counted under more than one category. A brief discussion of each site type follows.

5.2 Rockshelters

These are the most common type of recorded site (totalling between 44 and 46), most of them containing paintings. The preponderance of rockshelters in the site register is probably a reflection of observer bias, both in terms of recognition of sites and of survey strategies. Many are located in the more open forests to the west of the rainforests, where both access and visibility are good, and most of them have been reported by Honorary Wardens of the Archaeology Branch. Other rockshelters are deep within the rainforest and more difficult to reach (see Chapter 4, section 4.3 on access to Jiyer Cave).

Nineteen of these rockshelters contain occupation deposits or surface artefacts, as well as paintings. Three such shelters were excavated by earlier researchers, namely:

Bare Hill, No.21 (Wright 1971);

Kennedy A, No.72 (Brayshaw 1977);

Jiyer Cave, No.89 (Campbell 1982a).

The last is located in dense rainforest on the Russell River. This site was chosen for my excavation programme, since Campbell's sounding had been shallow but promising (Campbell pers.comm.). Another factor in the choice of Jiyer Cave for further excavation was that the site, being a shelter, was more likely to contain stratified deposits than an open site. Excavation results from this site are presented in Chapter 6.

5.3 Shell middens

Shell middens were the next most common type of site (n=23). The term shell midden is usually used to refer to a site in which shells are a major component of the deposit (Meehan 1982:2), and as used here includes both large dense deposits and small shell scatters. Shell also occurs in other sites (e.g.No.86-88), but not as the major component. For those sites I have not visited I have followed the terminology of the recorder. Most of the recorded shell middens are naturally located along the mainland coast or on offshore islands. The exception is No.5 on the upper Daintree River, which is one of the less reliable reports. I have not seen this site, and cannot comment further on it.

The high number of shell middens (and also tidal fishtraps) is largely the result of Campbell's study of Hinchinbrook Island and its environs (Campbell 1979, 1982b), recently supplemented by Rowland's interest in coastal sites (Rowland pers.comm.). I chose to excavate one midden located within the study area (No.92, Bramston Beach Midden, or BBM1) in order to examine the relationship between rainforest and coastal exploitation patterns (see Chapter 8 for results). Although Brayshaw (1977) and Campbell (1979, 1982b) both investigated shell midden sites on Hinchinbrook Island (No.76, 78), these had apparently contained no indication of the exploitation of rainforest products.

5.4 Stone fishtraps (tide-operated)

Fifteen of these have been recorded. Most are located on islands, with a few on adjacent mainland coasts, and a shell midden often occurs nearby. Fishtraps have not been recorded in any of the rivers, though stone weirs were reportedly common, e.g. in the Mulgrave River (see also Chapter 3). The latter were, however, inevitably washed away every wet season and had to be rebuilt annually.

5.5 Stone artefact finds and scatters

Sites consisting of stone artefacts, either single finds or scatters, formed a significant proportion of recorded sites (n = 12). The majority were recognised by the presence of a nutcracking stone containing one or more walnut-sized depressions in a flat surface (see also Chapter 9). One such site (No.14) consists of an area of flat rocky creekbed containing over 300 depressions. Such sites are sometimes located near a group of nut-bearing trees. Nutshells of the Johnstone River almond (Elaeocarpus bancroftii) were noted at site No.29, and candlenut (Aleurites moluccana) and 'walnut' trees grew nearby (probably black walnut, Endiandra palmerstonii, or yellow walnut, Beilschmiedia bancroftii). One stone scatter was exposed on an old track near Babinda (No.91, Stager Farm 1 or SF1). A sounding was excavated here but unfortunately this was not very productive (see Chapter 8).

5.6 Grinding grooves and engraved rocks

Site No.59 consists of several axe-grinding grooves located on the beach and covered at high tide (see Plate 5.1). It is the only unequivocal axe-grinding site in the area. I now have doubts as to the Aboriginal origin of a site which I recorded myself on the top of Mt. Bartle Frere (No.111), where there is a piece of local granite with a smoothed rectangular area, not quite like either an axe-grinding groove or a grindstone. A second examination showed that the smoothness may actually be merely a variation in the texture of the granite. I have not seen the other two sites (No.20 and 26).

5.7 Open sites

Five open sites have been recorded for the region, all of which have been added to the register during this project. These sites may include stone artefacts such as nutcracking anvils, but they also contain other remains such as charcoal and shell. Test pits dug at two neighbouring open sites (No.86 and 87, Mulgrave River 1 and 2, or MR1 and MR2) indicated that these were nut-processing sites, and more extensive excavations were subsequently carried out at the latter site (No.87, see Chapter 7).

5.8 Campsites

Four campsites have been recorded, three of them at Yarrabah (No.33). These can also be classified as open sites, but they differ from those described above in that they are campsites known historically to have been used in the recent past. I have not seen any of these sites and therefore cannot say whether they contain archaeological remains.

5.9 'Bora grounds'

Six so-called 'bora grounds' have been recorded, generally on the basis of recent (post-contact) knowledge about their use. They are generally difficult to recognise nowadays as archaeological sites, even where the clearing still remains. Most have been disturbed by subsequent European activity. No.58 is now a grassed paddock, and No.81 was utilised by timber-getters, as evidenced by the remains and modifications at the site. Others (not recorded) have been reported from ploughed paddocks, where the central area of packed dirt affected agricultural yields for years until the soil became thoroughly loosened again (e.g. in the Russell River valley, S.Harwood pers.comm.).

5.10 Carved trees

Two of the eight carved tree sites are associated with 'bora grounds' and others may have been associated with campsites (see Chapter 3). One site I visited (No.83) consisted of several carved trees with no clearing visible in the vicinity, but there were a few quartz artefacts on the forest floor. The carvings were geometric designs reminiscent of those painted on shields.

5.11 Stone arrangements

The four stone arrangements listed here may not be Aboriginal in origin. I was shown one of these arrangements (No.44) by a tin miner who had worked in the vicinity some decades ago. He was certain that the stones had not been placed by Europeans in the area, though I found it equally difficult to envisage them as being of traditional Aboriginal design. The site consisted of several groups of stones forming low U-shaped walls, placed around the edge of a low rise (Plate 5.2). Two other arrangements (No.17, 43) are apparently the result of Army activity in the area during the Second World War (B.Butler, pers.comm.). The location and origin of the fourth (No.32) is uncertain.

5.12 Burials

As has already been indicated, a number of sites in the register have been recorded on the basis of local knowledge of their past use. This is also the case for the eight burial sites, all of which are apparently post-contact. Human remains have been found in Site No.72 (Kennedy A, see Brayshaw 1977) as well, but not in any other excavated site in the region.

5.13 Sites of 'significance' (story places)

Six sites of significance to Aboriginal people have been included in Table 5.1. These are by no means the total number existing in the region, but such sites are rarely recorded. Significant sites are usually associated with Aboriginal legends (story places) and may or may not include archaeological remains. Some, such as No.4, are natural features of the landscape.

5.14 The Yidinjdji trail

Another group of sites recognised on the basis of indigenous knowledge is found along the Yidinjdji trail (No.116 in Figure 5.2). This is a route traversing part of the Yidinjdji territory (see Chapter 3), linking the Atherton Tableland to the coastal plain. The sites along this trail cast an interesting light on the difficulty of archaeological recognition of sites in the region generally.

George Davis, a descendant of the Yidinjdji people, had used this trail during his youth, and had acquired considerable knowledge about traditional Aboriginal culture from his grandparents. In 1983 he escorted several biologists along the trail (Davis and Covacevich 1984), and the following year was accompanied by another group, of which I was a member. Details of most aspects of this route will be published elsewhere (Davis et al. in prep.). In this account I wish to discuss the placement of sites and their archaeological evidence.

The route traverses rainforest on the Tableland, drops down to the coastal plain via a steep lightly timbered ridge and then continues out to the Mulgrave River valley through a mixture of rainforest and open sclerophyll woodland (Figure 5.4). The section of the route which we covered is relatively unaffected by European development, though the Tableland forests are logged. The upper Mulgrave valley is now under sugar cane cultivation, and there is an abandoned gold mine near one part of the route.

Although the portion of the trail which we followed is only about 12 km, there are at least seven campsites, some of which we occupied ourselves. I examined each of these sites for archaeological evidence, but found very little, and most of the sites would probably not have been recognised as such during an archaeological survey. A brief description of each site follows (site numbers are as in Figure 5.4).

Site 1. This campsite is located on a raised bank in rainforest at the junction of two creeks. The only archaeological evidence I could find consisted of traces of charcoal in the surface dirt, under the ferns, after I had spent several minutes searching. A practised eye might have noticed the relatively flat ground and the young trees which had only recently taken hold. (N.B. I take charcoal to be a probable indicator of human activity within the rainforest, since it is extremely unusual for fires to occur naturally in this environment.)

Site 2. This site was also in rainforest, about half an hour downstream from Site 1. Here archaeological recognition was much easier. Remains of glass bottles and potsherds indicated that this was a post-contact camp. Charcoal and quartz artefacts were also present. This site was on the edge of the gorge, with a steep scramble up from the creek.

Site 3. This plateau site in rainforest was once near the source of a small creek, but this water supply is no longer available, presumably under the combined impact of logging and feral pigs. Several artefacts were noted at this site, including a rusty steel axehead. There were also a few flat stones and some pebbles, probably manuports. A 'morah' (grooved grindstone) was reportedly stored here (Davis pers.comm.), but we did not relocate it on this occasion.

Site 4. The actual descent from the Tableland to the coastal valleys is made between Sites 3 and 4. Not far from Site 3, the trail leaves the rainforest, and then follows a steep narrow ridge to the confluence of two major creeks. Site 4 is located here, again on a raised creek bank. There was nothing to indicate that this was an archaeological site, except perhaps the presence of several large mango trees, which had been watered and tended by Aborigines using the site. At least two post-contact burials are located here.

Site 5. From Site 4, the trail follows the creek downstream, keeping mainly to the high ground on one or other bank. A detour down to the main creek led to Sites 5 and 6. Site 5 was not on the creek bank, but on a sandy beach, and not surprisingly there were no archaeological traces (see also Brayshaw 1975:14).

Site 6. This site, located on a high bank, again seemed to contain no archaeological evidence, although Davis said it had once been an important occupation site.

Site 7. This large flat area had once been a major corroboree ground. It is also located high above the creek on land sloping back to the hills. Earlier in the century it was apparently open and grassed, but now the whole area is covered with sclerophyll woodland. I walked over much of the area during the trek in 1984, but found only a few stone artefacts. One of these was a flat, apparently unmodified, slab of rock which Davis used to demonstrate cycad processing. Another was the pebble he used as a topstone, which showed smoothing use-wear on the edge of one face (prior to his re-use), similar to that on many museum specimens and on implements from Jiyer Cave (see Chapters 6 and 9; also Palmerston 1883: Dec.27th, quoted in Chapter 3, section 3.4.5). A large grove of Cycas media grows nearby, and this was said to have provided the food required for large numbers of people (300 or more) who came to the gatherings.

Other features of the trail included a named waterfall, visible from one place on the steep ridge, which is incorporated in a legend, and a particular grassy ridge at lower altitude where wallabies (possibly Red-legged Pademelons) were regularly hunted. Although we saw both these places from a distance only, they are unlikely to be recognisable archaeologically.

This brief summary of sites on the Yidinjdji trail gives some indication of actual site density in parts of the rainforest district at least, and serves as a warning that even the best designed surveys are not likely to locate more than a very small proportion of rainforest sites. Methods such as soil testing may, however, increase the number of sites recognised, though such procedures will add to the time and money spent.

5.15 Discussion

Because of the non-systematic methods used to find most of the above sites, it is not possible to infer from them the prehistoric pattern of site distribution in the rainforest district. The obvious exception is the Yidinjdji trail, which indicates that sites were comparatively numerous, often close together, and frequently on high banks beside a permanent creek. This last observation accords with the ethnographic data (see Chapter 3, section 3.4.3, also Plate 3.1). It should be noted here that three open sites in the lower Mulgrave River valley (No.86-88) are even closer together, and are also placed on high creek banks (see Chapter 7).

It is more than likely that many as yet unknown sites still exist in the rainforest district, especially in relatively undisturbed areas. Whether they can be readily located is another matter. Sites towards the coast (e.g. No.86-88, 112) often contain marine or estuarine shell, which is readily visible on the forest floor. Sites further inland, such as those on the Yidinjdji trail, are less likely to have shell incorporated in the deposits. Unless a close search is made for charcoal and stone artefacts (including small flakes of quartz), many sites may go unrecognised.

Locating sites in cleared and/or ploughed areas is even more problematic. On the one hand, when trees are cleared and the soil is often bared, artefacts and other debris are more easily noticed. Such areas are also more readily accessible. On the other hand, ploughing and clearing produce quite major disturbance to the soil, and in many instances the larger stone artefacts are already removed from their original positions (see Chapter 9). Unless deposits are deep (40 cm or more), it is unlikely that any material will remain in situ at these sorts of sites.

CHAPTER 6

EXCAVATIONS: JIYER CAVE

6.1 Description of site

Jiyer Cave (Frontispiece) is a rockshelter deep in the rainforests along the Russell River, on the southern slopes of Mt. Bartle Frere (site 89 in Figure 5.2). It is situated on the north bank of the river, beside a waterfall on Cave Creek (Figure 6.1). The area is one of the wettest parts of Australia, and even under much drier conditions in the past, this rugged valley would have afforded a refuge area for fire sensitive communities (see Figure 2.8). Present vegetation in this area is Complex Mesophyll Vine Forest Type 1a (see Table 2.3). Plants in the area include several species utilised by Aborigines (Table 6.1). Animals currently found in the locality include black bream, eels, turtles and yabbies in the river, waterdragons on the banks, dingoes and various rodents, as well as possums at slightly higher altitudes.

The cave was formed in a basalt flow which has been undermined in earlier times, probably by erosion from the river. Much of the cave floor is covered with squarish chunks of roof fall. An irregularly shaped area of sand in the central part serves as living space for visitors at the present time (Figure 6.2; Plate

6.1). An inner dripline, produced by faulting in the roof, bisects this sandy area. Water seeping through this fault produces damp areas in the centre of the cave (see again Plate 6.1), and also trickles down the back wall and across the cave floor in wet weather. The front of the cave is well lit, considering it is under closed canopy forest, but it is exposed to some wind and rain. The back of the cave is much darker, especially during rain, but despite the seepage it is generally drier than the front.

About a dozen large grindstones with accompanying topstones lie scattered around on the cave floor, some partially buried (Figure 6.2; Plate 6.2). They are described below in section 6.4.10. Also visible on the surface of the floor are fragments of shell, glass and quartz artefacts.

The back wall of the cave was once an extensive art gallery. Local informants say that less than twenty years ago there was a frieze of paintings still visible along most of the rear wall. However, there do not appear to be any recordings of the artwork. An attempt to photograph the surviving work in 1979 was unsuccessful (B.Reynolds, pers.comm.), though the site plan drawn at that time shows that paintings still existed along most of the back wall (J.Campbell, pers.comm.). During my first field visit in 1982, only four paintings were still clear, with traces of a fifth just visible. In other places it was difficult to distinguish ochre from streaks of moisture and mould growth. The five motifs were sketched during my first excavation season in 1982 (Figure 6.3), and attempts at photography were moderately successful in three cases (Plates 6.3, 6.4 and 6.5).

The anthropomorphic figures (II and IV in Figure 6.3) are similar to the 'Kennedy character' recorded by Brayshaw (1977) at several other rainforest sites, and also to those at Bare Hill (Clegg 1978). They also bear some resemblance to the 'quinkan' figures of the Laura sandstone district (Trezise 1971:9). Similarities of style between the two districts have previously been noted by Brayshaw (1977), who observed that such figures were only seen north of the Herbert River.

6.2 History of the site

The first European to see the cave was Christy Palmerston, a late nineteenth century prospector and explorer. In 1886, while prospecting (successfully) for gold along the upper Russell River, Palmerston had come across the site:

> in a vertical wall of volcanic rock of artificial regularity. The cave is crescent in shape, about 100 feet long by 60 feet or more in breadth, with water dripping from its roof in some places, although its interior is mostly dry (Palmerston 1887:346).

Later he again visited the cave with the government geologist, Robert Logan Jack:

> Where we crossed the river a vertical wall of basalt 50 to 100 feet high overhung the left bank. In one place the bottom of the basalt formed the roof of a great cavern, which was covered with ... native drawings in charcoal. A creek west of the cave forms a fine waterfall over the basalt (Jack 1888).

The name 'Jiyer' is from Palmerston's (1887) account, where it was also spelt 'Jiger'. However, Mollie Raymond, an elderly Ngajan speaker who visited the area once in her youth, refers to it as liyer. It is possible that Palmerston's publication had been incorrectly transcribed.

According to local accounts, the cave was a favoured residence during the economic depression of the 1930's for both black and white unemployed. Today it is still utilised occasionally by local residents and bushwalkers who are prepared to hike in for several hours. Frequency of use appears to have increased since the first scientific expedition in 1979 and its accompanying publicity, though modern visitors are careful to leave few traces of their occupancy.

6.3 Previous archaeological investigation

The site was first excavated in 1979. The previous year, Les Hiddins (Field Force Battle School, Townsville) had identified the cave as the one seen by Palmerston, and in 1979 he supervised 'Exercise Logan Jack', a joint Army/civilian scientific investigation of the ecology and archaeology of the area. During this expedition John Campbell of the Department of Behavioural Sciences at James Cook University excavated a shallow sounding in Jiyer Cave. Quantities of bone and shell fragments, stone artefacts (mainly quartz), charcoal and pieces of bottle glass were collected, and a date of 200 ± 80 BP (Beta-2471) was obtained on charcoal in association with the glass (Campbell 1982a:62,64). This suggested early access to European goods, possibly from ships wrecked along the coast prior to the first white settlement at Cardwell in 1864. Campbell was not able to follow up this initial sounding owing to other field commitments, but he kindly made the results of his investigations available to me.

6.4 Excavation results

My excavation pits were placed in three different parts of the shelter (see Figure 6.2). Campbell's sounding in K14 was re-opened in 1982 and excavated further. As increasing depth made access awkward, a half-metre square was added (K13S). The maximum depth reached in the time available was 72 cm, unfortunately not the base of the deposit (logistical constraints are discussed in Chapter 4, section 4.4).

In 1983 it was decided not to continue with K14, since its location beneath an inner dripline suggested that neither occupation of the area nor preservation of deposits would be optimum. Accordingly, one pit (G12 +

G11S) was dug at the back of the shelter where it was thought that disturbance by flooding would have been minimal and deposits might have remained relatively dry. A second pit (H18 + H19N) was opened near the front of the shelter, where the light was better and more activity could be expected to have occurred. In both locations digging concentrated on a single 1x1m square, and a half square (1x0.5m) was added to facilitate access. A third quadrat (0.5x0.5m) was begun in G11, but this was an extremely rocky area and excavations were not continued beyond 30 cm. The material from this quadrat has not been included in the following analysis.

In G12, sterile deposits appeared at about 140 cm, with excavations continuing to 190 cm. The maximum depth reached in H18 was 91 cm, still within the occupational deposit. Again, time and logistical constraints did not allow the base of this square to be reached. Methods of excavation, recording and analysis have been outlined in Chapter 4 (sections 4.5, 4.6).

Preliminary results of the 1982 field season were reported in Horsfall (1983, attached as Appendix B). At that time it was argued that the deposits in Jiyer Cave demonstrated an increase in site utilisation about 200 years ago, around the time of initial European colonisation of the rainforest region (1983:175). More detailed analysis of the 1982 material, together with the results of the 1983 excavations, has revealed a more complex situation.

6.4.1 Stratigraphy

In 1982 the stratigraphy appeared straightforward. K14 and K13S showed three distinct layers (see Figure 6.4). Layer 1 was formed of clean brown sand which was fine and mobile. Layer 2 consisted of darker red-brown sand containing lenses of charcoal and ash. In K13S, where excavation units had followed the natural layers visible in the profile, the upper surface of Layer 2 was very uneven. A careful examination showed that practically all glass and metal was restricted to Layer 1. Layer 3 consisted of dark red-brown clayey sand with relatively few stone artefacts and little organic matter, except for several large pieces of charcoal at a depth of 40-45 cm which appeared to derive from a single fire.

The other squares subsequently revealed a more complex stratigraphy (Figures 6.5, 6.6; Plates 6.7 and 6.8). There was still a thin layer (A) of clean fine sand (dark brown, Munsell 10YR 4/3) at the surface, equivalent to Layer 1 in K14 + K13S. Below this was a thick deposit (Layer B) of intercalated layers of sand/clay mixtures with different grades and proportions of sand. This layer is probably equivalent to Layers 2 and 3 in K14 + K13S. Because of its dampness, it appeared to be much darker than Layer 1, but was mainly the same dark brown (Munsell 10YR 4/3 and 10YR 3/3). The upper portion contained numerous hearth-like lenses of charcoal-rich sand (very dark greyish brown, Munsell 10YR 3/2) and some lenses of grey ash, especially in G12 + G11S. The lower levels contained increasing quantities of coarse sand interleaved between other strata. These tended to a dark yellowish brown (Munsell 10YR 4/6). At the base of G12 there was a layer (C) of sticky, stone-free and archaeologically sterile clay (light brownish grey, Munsell 2.5Y 6/2).

6.4.2 Radiocarbon results

Three charcoal samples from K14 were dated (Table 6.2). Beta-2471 (200 ± 80 BP) was from Campbell's (1982a) sounding, apparently from Layer 1 (Campbell's interpretation of the upper stratigraphy did not quite correspond to mine). Beta-5800 (100 ± 60 BP) appears to have come from Layer 2, though given the uneven nature of the Layer1/2 interface, it may in fact be associated with Layer 1. The two ages are not significantly different, and the apparent inversion is what one would expect for samples from the twentieth and nineteenth centuries, respectively (M.Barbetti, N.W.G.Macintosh Centre for Quaternary Dating, University of Sydney, pers.comm.). Beta-5801 (2160 ± 60 BP) was from Layer 3, about 45cm below the surface. This was the first indication that sites of reasonable antiquity might survive in tropical rainforest conditions in Australia.

Nine charcoal samples for dating were submitted following the 1983 excavations (Table 6.2), five from G12, one from G11S and three from H18. The choice of samples was restricted by the availability of sufficient material.

Dates for each square are internally consistent (Figure 6.7), and demonstrate the same gradient throughout the upper 60 - 70 cm of the deposit (spanning approximately the last 4000 years). Thus, between 500 BP and about 4000 BP, sediments accumulated at an average rate of 2 cm per 100 years. Below about 70 cm in Square G12, a much steeper gradient is shown, indicating a more rapid rate of sediment accumulation (about 10 cm per 100 years). A similar rate of deposition may obtain for the lower levels of H18, but only small amounts of charcoal were recovered from these levels, unfortunately insufficient for conventional radiocarbon dating.

Prior to 3000 BP, annual precipitation in the region was apparently higher than at present (see Chapter 2, section 2.6), and the floor of the cave would have been well below the modern surface. Flooding would consequently have been more frequent, probably resulting in regular deposition of sand and silt, and this may account for the increased rate of sediment deposition at lower levels. Even today it has been reported to me by local residents that floodwaters occasionally lap the edge of the shelter, and much of the deposit has probably been built up by this means.

The quantities of excavated materials other than stone artefacts are presented in Tables 6.3 - 6.8. Data on quartz artefacts are given in Tables 6.12 - 6.16. In squares K14 + K13S, H18 + H19N and the upper part of G12 + G11S, the quantity of material present per 5 cm spit corresponds approximately to the quantity per unit time. However, below about 60 cm in G12 (and possibly also in H18) this correlation does not hold. Therefore, for G12 only, the age-depth curve in Figure 6.7 has been used to calculate deposition rates for charcoal and quartz artefacts (see Table 6.17, Figure 6.14).

6.4.3 Charcoal

Charcoal was moderately plentiful in the deposit, though an unknown proportion was sufficiently fragile to have washed through the sieves. Weight of charcoal has been plotted against depth for all squares (Figure 6.8). A bimodal distribution is apparent in the full squares (G12, K14, H18), but not in the half squares. A third peak is apparent towards the base of G12. Deposition rates for each of these peaks in G12 is similar (Figure 6.14).

6.4.4 Nutshells

Fragments of charred nutshells were mixed with the wood charcoal. These were sorted and weighed separately (Tables 6.3 - 6.8). As with the charcoal, fragments became more weathered with increasing depth, and recognition correspondingly less accurate. The oldest clearly recognisable piece of nutshell came from G12 spit 13 (about 4000 BP), but it was too weathered for further identification.

In the upper levels preservation was good enough to permit identification of at least some of the material (Table 6.9). Each of the five species recognised is known to have been eaten by the Aborigines of the region (see Table 3.5), and at least two are toxic (Beilschmiedia bancroftii and Endiandra pubens), requiring to be roasted and leached before consumption (see Chapter 10). The oldest identifiable fragments are from H18 spit 11 (Elaeocarpus bancroftii, an edible nut) at about 3000 to 3250 BP, and from H18 spit 12 (possibly Endiandra sp.) at about 3250 to 3500BP. Unfortunately it is not possible to identify the latter any further to determine whether it was a toxic species. The remainder of the identifiable fragments are all from the upper 40 cm of the deposit, and thus are probably less than 1000 years old.

The distribution of nutshells between the three excavated areas (Table 6.10) shows that the smallest quantities are present in the back squares G12 + G11S (presumed to be the driest), and that the oldest identifiable pieces are in the front squares H18 + H19N (presumed to be wetter). It is possible that the assumptions about wet/dry conditions are not valid. Alternatively, discard patterns may vary in different parts of the cave, but the quantities of nutshells recovered are too small to draw any valid conclusions of this sort.

6.4.5 Bone

Bone was found only in the upper levels of the deposit, mostly in the top 25 cm (Tables 6.3 - 6.8; Figure 6.9). The material is well preserved in this upper part but is progressively degraded with depth, which accounts for some consistent changes in the assemblage with increasing depth, i.e. the decrease in total quantity of bone, the decrease in the proportion of fish bone, the increase in the proportion of burnt and then calcined bone (Figure 6.10a), and the absence of fragile material (e.g. frog) at lower levels.

The material was examined by Ken Aplin (School of Zoology, University of New South Wales), who identified the species represented (see Table 6.11), and kindly provided much of the interpretation presented here. The assemblage represents a range of rainforest animals, all still occurring in the region today. Mammals include Green Ringtail Possum (Pseudocheirus archeri), a small wallaby (probably Thylogale or Petrogale), White-tailed Rat (Uromys caudimaculatus), Cape York Rat (Rattus leucopus), Musky Rat-kangaroo (Hypsiprymnodon moschatus), Platypus (Ornithorhynchus anatinus), bandicoot, fruit bat and dog (Canis familiaris). Fish bones are most abundant in the upper levels, and include at least two types, one of them identified as Black Bream (probably Hephaestus fuliginosus). Lizards are represented by a large agamid (perhaps the Eastern Water Dragon, Physignathus lesueurii), and snakes included both pythons (Boidae) and some elapids or colubrids. Frogs are present, but not common. In view of the small quantities of diagnostic bone, minimum numbers have not been estimated.

Given the burnt character of much of the assemblage most of it is probably of archaeological origin, though a small proportion (small murids, frogs etc.) could possibly be from natural deaths. Some disturbance of the deposit is indicated in the upper 20 cm or so of Squares H18 + H19N and K14 + K13S, which show a fairly constant ratio of unburnt:burnt:calcined bone (Figure 6.10b,c). This is not surprising in view of the softness of the sand and the frequency of recent visits.

6.4.6 Shell

Shell fragments were recovered from the upper levels of all three pits (Tables 6.3 - 6.8; Figure 6.11). Much of the material was too fragmented or weathered to be identifiable. However, specimens of the mangrove cockle (Polymesoda (Geloina) coaxans) and 'pearlshell' (Isognomon ephippium) were identified by David Reid (Biological Sciences, James Cook University, now at the British Museum (Natural History), London). Two types of land snails were present as well, and possibly a marine gastropod. The shell remains are all within the upper 20 cm of the deposits and were probably deposited within the last few hundred years. Greatest quantities were discarded towards the front of the shelter (Table 6.10).

Both Polymesoda (Geloina) and Isognomon inhabit mangrove swamps. The nearest mangroves to Jiyer Cave are located at the mouth of the Russell River, 27 km distant as the crow flies, perhaps twice that overland. It is possible that the shells in this site represent the remains of meals. Polymesoda in particular is extremely dessication resistant in the shell and should remain viable for some time after removal from its environment (David Reid, pers. comm.). It could thus be transported considerable distances and remain edible. Note that Polymesoda shells were also present at Kennedy A (site 72 in Figure 5.3; see Brayshaw 1977), a similar distance from the coast, as well as at similarly located sites near Townsville (Jourama and Hervey Range B, see Brayshaw 1977; Turtle Rock, see Mardaga-Campbell and Campbell 1985:109).

It is more likely, however, that the shells were transported to Jiyer Cave as raw materials for artefact production, since not only were there only small quantities of shell present in the site, but also two shell artefacts were recovered during the excavations (see section 6.4.8).

6.4.7 Eggshell

Considerable quantities of eggshell were found in the upper levels of all three pits, in terms of numbers of fragments, if not gross weights (Tables 6.3 - 6.8; Figure 6.12). These were examined by G.F.van Tets (Division of Wildlife and Rangelands Research, CSIRO, Canberra) and identified as scrub turkey (*Alectura lathami*), nest mounds of which are still found near the cave today. As with the marine shells, material is confined to the upper 20 cm of the deposit, and greatest quantities were found towards the front of the shelter.

6.4.8 Bone and shell artefacts

Three implements made from bone or shell were found in the upper levels of the Jiyer Cave deposits.

1. A bone point made from a wallaby fibula (*Thylogale* or *Petrogale*) was recovered from K14, spit 4

(Plate 6.9). The tip was broken during excavation, but both pieces were retrieved. The point was standing upright in loose sand, a position that would have allowed ready vertical movement through the deposit.

2. A disc of shell with a central hole was found in G11, spit 2 (Plate 6.10). The shell used was probably one of the mangrove species mentioned above, *Isognomon ephippium*. This shell ring may represent a stage in the manufacture of shell fishhooks (as described by Roth 1904:33; see also my Plate 3.9). Its presence in the site could demonstrate not only the use of hook and line to catch fish in the nearby Russell River, but also the manufacture of hooks at Jiyer Cave from raw materials (or possibly rough blanks) brought in from the coast.
3. The third artefact was a shell scraper from H18, spit 3 (Plate 6.11). This specimen is an almost entire valve of *Polymesoda (Geloina) coaxans*, with use-wear along the outer margin. Similar artefacts have been reported from excavations at Kennedy A near Cardwell and Jourama south of Ingham (Brayshaw 1977), Princess Charlotte Bay (Beaton 1985) and sites in the Northern Territory (Schrire 1982). The use of shell scrapers in North Queensland was documented by Roth (1904) and Thomson (1936).

6.4.9 Quartz artefacts

Flaked quartz artefacts were found throughout the archaeological deposits. The quality of the quartz ranged from clear to milky to stained and severely flawed quartz. There are also three small quartz crystals. Apart from a few small unused flakes of rhyolite, quartz is the only raw material occurring in the assemblage which readily lends itself to flaking and produces sharp durable edges.

The majority of the quartz artefacts were under 40 mm in their maximum dimension (Tables 6.12 - 6.16). The assemblage appears to have been produced largely by bipolar techniques, i.e. by using an anvil. This is perhaps to be expected in view of the small size of most of the artefacts, anvilling being a useful method of reducing cores that are too small to hold safely in the hand during flaking. The necessity for anvilling may have arisen from the small size of the initial pieces of quartz, many of which appear to have been small water-worn pebbles. A high proportion of the artefacts have cortical surfaces. However, some of the flakes in the assemblage have clearly been produced by hand-flaking and exhibit conchoidal fracturing. Other artefacts, classified as bipolar flakes or cores, show scars from earlier reduction efforts, probably also by hand-flaking. One of the features of bipolar reduction of quartz is the production of 'lammelates' or flat thin pieces of quartz (Witter 1984, pers.comm.), and these formed a significant proportion of the Jiyer Cave quartz assemblage.

Quartz artefacts were recovered in much greater quantities from the upper levels of the deposit than from the lower ones. This variation is illustrated in Figure 6.13 for numbers of quartz artefacts greater than 15 mm in their maximum dimension, but similar changes are apparent in other parameters of the assemblage (see Tables 6.12 - 6.16). Calculation of deposition rates per 100 years for G12 (Table 6.17, Figure 6.14) do not show any significant variations within lower levels.

Following the 1982 excavation of K14, I had suggested that the increase in the quantity of quartz artefacts occurred at about 200 BP, and that this might indicate increased utilisation of the site at about the time of (and possibly in response to) first European colonisation of the region (Horsfall 1983; see Appendix B). However, further analysis suggests that the increase in quartz artefacts may have begun earlier than this date. If we look at the quantity of quartz artefacts in squares G12, K14 and H18 (see Tables 6.12, 6.14, 6.16 and Figure 6.13), we see a significant increase in quantities at spits 4/5, 6 and 4, respectively. These depths correspond to approximately 850 BP, 800 BP and 650 BP, respectively (as calculated from my age-depth curves for each square, see Figure

6.7). In H19, the increase occurs at spit 6, which, if the age-depth curve for H18 is used, is dated to about 1250 BP. In G11, the increase in quartz artefacts occurs at spit 4. It is difficult to extrapolate a date for this, but it is above a radiocarbon sample (SUA-2244) which was dated at 2650 $\pm$ 160 BP.

Confining the discussion to the three squares for which age-depth curves have been drawn, it would seem that from around 650 to 850 BP significantly more quartz artefacts were made and discarded at Jiyer Cave than previously. It is difficult to be certain about this date, however, since these upper levels have been subjected to unknown amounts of disturbance and trampling in recent years.

In order to determine whether the increased deposition rate was accompanied by other changes, e.g. in manufacturing techniques, I undertook further analysis. There did not appear to be any major variation in artefact size with depth (see Tables 6.12 - 6.16), though larger artefacts are apparently absent from the lower levels. However, this may be a function of reduced numbers, rather than a reflection of reality. Neither did there appear to be any other significant variation in quartz artefact attributes at different depths as determined by visual examination of the assemblage.

Methods of examining variation in artefact technology are being developed by Witter (1984, pers.comm.) and Hiscock (1986). Witter's method, which is more applicable to a quartz industry, was applied to the artefacts retrieved from G12 (see Chapter 4, section 4.6.4 for details of method and interpretation). Reduction charts were drawn up for two portions of the quartz assemblage from G12. Figure 6.15 plots parameters for all quartz artefacts from spits 4 and 5, and Figure 6.16 does the same with all quartz artefacts found in spit 14 and below. The reduction charts show marked similarity. The majority of artefacts in each case fall in the range of 'fine duty tools' and approximately half are 'lammelates'. The similarity between upper and lower levels suggests that similar reduction techniques were used to produce similar assemblages.

In the upper levels of the deposit, the greatest quantities of quartz artefacts were found at the front of the shelter (H18 + H19N). As already pointed out, this location receives the most light, and it would therefore be a preferred area for making and using stone artefacts. The least numbers of quartz artefacts were found in the back of the shelter where it is darkest (G12 + G11S), with moderate numbers in K14 + K13S. In the lower levels, however, as far as can be ascertained, quantities are similar at both the back and front of the shelter.

6.4.10 Other stone artefacts

Artefacts made from volcanic and metamorphic rocks, frequently much larger than 40 mm, also occurred throughout the deposits. These included surface modified artefacts such as grindstones and pebble tools (e.g. hammerstones and topstones), as well as flaked artefacts such as choppers. The volcanic rocks consist almost entirely of basalts, some artefacts having been made from the parent rock of the site. The metamorphic rocks also occur locally.

Grindstones

Thirteen grindstones were recorded on or partly buried in the floor of the shelter (see Figure 6.2, Table 6.18). Eleven of these, including two in excavated squares, had been pecked over an entire face (Plate 6.12), a procedure which produced a roughened surface, probably necessary for efficient grinding. In some specimens the pecked area is concave, whilst in others it is flat. Sometimes the pecking has been partly erased by grinding with a topstone, resulting in a smooth central area. One specimen (1 in Figure 6.2) had apparently been used to prepare pigment and still retained a residue of red ochre and black charcoal (Plate 6.6). The main use for these grindstones, however, is most likely to have been the preparation of plant foods, such as the crushing of nuts prior to baking or leaching (see Chapters 3, 10). A twelfth surface grindstone (biii, see Plate 6.2, rear) was similar in size and shape to the pecked implements (see Table 6.18), but it did not exhibit pecking, smoothing or any sign of use or preparation.

The thirteenth surface specimen (a in Figure 6.2) is a piece of the columnar basalt native to the shelter, which has a natural hollow which appears to have been smoothed by grinding. It was found associated with a pebble topstone, but this may have been the work of one of the modern visitors to the site. A similar piece of naturally hollow basalt was recovered from the excavations (K14 spit 13). This had obviously been used to prepare ochre, and residues were still present in the hollow (Plate 6.13). Another artefact classified as a grindstone (from G11 spit 7) exhibited some minor pecking and smoothing on a flat surface (Plate 6.14). The pecking in this case may be indicative of use as an anvil.

Only four grindstones were recovered from the excavated squares, two at the surface and two lower down. However, there were a few large flat-surfaced metamorphic cobbles and cobble fragments which would have been suitable for this purpose, though none showed any clear indications of surface preparation or use.

Anvils

Typical nutcracking stones such as that illustrated in Plate 9.11 were not found at Jiyer Cave. However, there were two fragments of large cobbles which appear to have been used as anvils, possibly for knapping artefacts or for cracking nuts (from H18 spit 2, K14 spit 4). Each has a small pecked area about 2cm in diameter on a flat or convex surface (Plate 6.15).

Pebble artefacts

A large number of river-worn pebbles was collected during the excavations. Forty-one were whole or nearly whole (Table 6.19), and there were forty-three pieces of split or broken pebbles, many apparently fire-shattered (Table 6.20). Twenty-two of the whole pebbles and seven of the fragments exhibit use-wear, including smoothing (Plate 6.16), possibly due to grinding use; battering damage on the edges (Plate 6.17), possibly due to use as a hammerstone; and small indentations (Plate 6.18) similar to those on nutcracking anvils (see Chapter 9, section 9.5). The remainder of the pebbles and pebble fragments exhibit no use-wear. They are probably manuports, but it is possible that some were brought in by floods. Numerous whole pebbles, many with use-wear, were also noted lying on the floor of the cave, often in association with the grindstones. Several of these were located on and near the grindstones in Square G11 (see Plate 6.2).

The whole pebbles tended to be oval in shape and symmetrical with a slightly flattened cross-section, although spherical, assymetric oval, triangular and trapezoidal forms were also present. Weights of utilised pebbles varied from 196 gm to 1970 gm (see Figure 6.17). Figure 6.18 plots use-wear type by depth. It is apparent that most of the utilised pebbles occur in the upper 25 cm of the site, and they therefore date to less than 1000 BP. The oldest utilised pebbles are from H18 and are probably older than 4000 BP.

Ground or polished artefacts

A small basalt flake (from G11 spit 14) was bifacially edge-ground into a miniature axe or chisel (Figure 6.19), possibly a toy (see Dickson 1981:10, 82, 83). Four fragments with smooth ground surfaces may be from either edge-ground axes or smoothed pebble artefacts (see Table 6.21). These were found in both upper and lower levels. One implement, a natural piece of basalt, had areas of smooth shiny polish on one face and along one flattened edge (Plate 6.19).

Flaked non-quartz artefacts

The site contained numerous flakes and flaked pieces of material other than quartz. Many of these were made from the particular basalt which formed the shelter (as were two of the grindstones, see above). It was often difficult to distinguish artefacts made from this material from the natural rock debris in the site. Other kinds of basalt were also represented, as well as different types of metamorphic rocks and three pieces of rhyolite. All these raw materials could well occur locally, though precise sources, other than the nearby riverbed, are not known.

Fourteen retouched or used implements were identified (see Table 6.22), and over 100 'waste' flakes and flaked pieces (Table 6.23). The retouched implements consist of two 'choppers', four pieces of native basalt with some minor flake removal to produce a working edge, and eight flakes and flaked pieces with retouched edges (see Plates 6.20, 6.21, 6.22, 6.23). A reduction chart for the artefacts from G12 (Figure 6.20) demonstrates the differences between these artefacts and the quartz assemblage from this square. There also appears to be little variation in the distribution of the non-quartz flaked artefacts with depth.

6.4.11 Ochre

Ochre was collected from all levels of the excavations (Tables 6.3 - 6.8). Pieces were regarded as ochre if they were relatively soft and able to mark white paper. Many seemed to be weathered lumps of basalt, and as such may have occurred naturally in the site. Two pieces (from H19 spit 5 and G12 spit 28) had rubbed facets (Plate 6.24), as if they had been either used directly as a crayon on some surface or rubbed on a coarse 'palette' or grindstone to produce an ochreous powder or paste. Two such grindstones apparently used for ochre preparation have been described above. In addition, a small slab of basalt (10 x 7 cm) with a residue of red ochre adhering to its surface was recovered from square G12 spit 28.

6.4.12 Glass

Numerous fragments of old bottle glass occurred in the upper layer of all three pits. The distribution of these fragments by depth for each square is given in Tables 6.3 - 6.8. As noted above for K14 + K13S, the glass appears to be restricted to the extreme upper layer of the deposit. All of it seems to be old, i.e. not deposited in the last few decades. The fragments are thick brown or green glass, mostly with heavy patination. A proportion of it has been retouched and/or used.

The distribution of glass between the three excavated areas is given in Table 6.11. Much greater quantities were recovered from K14 + K13S than from either of the other two areas. This could indicate that the drier sandy areas at the front and back of the shelter were the main living areas at the time of deposition, and that the rocky central portion under the inner dripline was used more as a discard area, at least for dangerous material such as glass.

6.4.13 Metal

A few pieces of metal were recovered from the upper levels also (Tables 6.3 - 6.8). A fishhook in G12 spit 1 was only slightly rusted and was probably deposited within the last decade. The other fragments are very rusted bits iron or steel and probably date from the earlier part of the century. Much of it consists of flat matchbox-sized pieces. The most interesting specimen is a nail bent round to form a near circle (Plate 6.25) from K13 spit 3. It has the same circular shape as the traditional shell fishhooks, quite unlike the shape of most European hooks.

6.4.14 Other European materials

In addition to very recent modern material found in the surface layer (matches, bits of foil and plastic), a pearlshell button was found in K13 spit 3, and two pieces of clay pipe were recorded from the floor of the shelter, a stem from H19 and part of a bowl from E12.

6.5 Discussion

The earliest archaeological deposits at Jiyer Cave were laid down just over 5100 years ago. At that time, both the probably higher annual precipitation and the lower floor level would have permitted regular flooding of the shelter to occur, possibly until about 3000 BP. These flooding episodes appear to have contributed greatly to the build-up of deposits, though runoff and seepage from higher up the slope must also have added to the sediments. Charcoal was recovered from throughout the deposit. Small quantities of charred nutshell fragments were also recovered, presumably the result of food preparation at the site. While recognisable nutshell fragments date to as much as 4000 BP, most of the identifiable fragments are much younger, and the earliest definite date for a toxic species is less than 1000 BP. Faunal material has survived in small quantities, mainly in the upper, modern layers. All animal species identified still occur in the region of the shelter today, except for the marine shells which were brought from the coast, probably mainly as raw material for artefact manufacture.

Stone artefacts were found at all levels of the archaeological deposit. Flaked quartz artefacts, however, occur in much greater quantities in the upper levels. The latter are small, tending to measure less than 40 mm in their maximum dimension. The larger artefacts include grindstones and pebble implements made from locally available basalts and metamorphic rocks. Many of these are probably associated with plant food preparation, and they occur in both upper and lower levels. The oldest such implement is a broken pebble with smoothing use-wear, dated to about 4000 BP. Flaked non-quartz artefacts include 'heavy duty' tools such as choppers, as well as small unused flakes. The only ground-edge tool found was a small basalt flake, possibly a toy.

There are two main factors to be considered here. Firstly, what conclusions can be drawn about the use of toxic food plants at Jiyer Cave? Secondly, what is the significance of the rapid increase in the quantity of quartz artefacts, apparently shortly after 1000 BP?

Unfortunately the preservation of organic material in Jiyer Cave is too poor to draw any definite conclusions about the earliest use of toxic food plants at the site, though they were clearly utilised in more recent times (i.e. since about 1000 BP). Non-toxic nuts were being exploited by at least 3000 BP, and recognisable nutshell fragments were present in 4000 year old deposits. Remains of less durable plant materials (roots, seeds without hard nutshells) were not recovered.

The use of toxic food plants can also be assumed if stone tools associated with the detoxification process can be identified in stratified contexts. The stone artefacts found in the Jiyer Cave deposits include grindstones, anvils, hammerstones and topstones, all of which might have been used for the complex processing of toxic food plants. Of course, they could also have been used to prepare non-toxic foods or ochre (as at least some of them obviously were), or to manufacture stone artefacts. In the three excavated areas a total of four definite grindstones have been recovered, two from the upper 30 cm (i.e. younger than 1000 BP), and two others from deposits dating to approximately 3000 BP. One of the latter was clearly used for ochre, but the other may have been used for preparing food plants. The working surfaces of the upper two grindstones had been carefully prepared by pecking, as had several others recorded in other parts of the shelter. It is difficult to extrapolate from such a small sample of excavated material, but it would seem that the specially prepared grindstones were only manufactured during the later phase of occupation at the site.

Pebble artefacts, however, have been found at deeper levels, and two fragments in H18, dated to about 4000 BP, exhibit smoothing use-wear consistent with use as a topstone to grind plant material. While they may have been used to process toxic species, the evidence from Jiyer Cave is not conclusive, and it is possible that the use of toxic food plants, in large quantities at least, was a relatively late addition to the rainforest diet.

The increased deposition of quartz artefacts in the upper spits appears to have begun about 800 to 650 years ago. It occurs in all three excavated areas, and so may represent increased occupation of the site as a whole (rather that variation of quartz-working areas within the site). However, the increase does not appear to correlate with the occurrence of toxic plant remains, the latter having been identified at older levels. These findings do not allow a correlation to be made between increased use of the site (as inferred from increased artefact deposition) and the use, intensive or otherwise, of toxic food plants. It should be noted that there is no corresponding increase in the deposition of non-quartz artefacts (except possibly pecked grindstones), and it may be that the increased numbers of quartz artefacts indicates a change in the use of the site unrelated to any increase in site usage.

CHAPTER 7

EXCAVATIONS: MULGRAVE RIVER SITES

7.1 General description

About 20 km southeast of Gordonvale, three open sites are located close to each other along an un-named creek (Numbers 86, 87 and 88 in Figure 5.2). These Mulgrave River (MR) sites, to which I have allocated the field codes MR1, MR2 and MR5 respectively, appear similar to each other in content and location. Each is situated on a high creek bank, the surface soil is black with charcoal, and marine shell fragments and nutcracking anvil stones can be seen exposed amongst the leaf litter. Two of the sites, MR2 and MR5, are on the lower western slopes of the granitic Malbon Thompson Range. MR1 is located at the base of the slope on the old floodplain of the Mulgrave River. Stone artefacts have also been ploughed up in nearby paddocks (G. Morris, pers.comm.).

The flat valley lands have been cleared and planted with sugar-cane, but they would originally have been covered with Mesophyll Vine Forest Type 2a or Complex Mesophyll Vine Forest Type 1a (see Table 2.3: also Tracey and Webb 1975). Vegetation in the vicinity of the uphill sites is Mesophyll Vine Forest Type 2a.

Some of the plant species identified in the vicinity of the sites during fieldwork are listed in Table 7.1. Few animals were seen during work on the sites, but cassowary footprints were noted in the sandy creekbed near MR5.

7.2 Site description: MR1

This site was first brought to the attention of the Cairns-based Archaeology Branch Ranger (B. Butler, pers.comm.) several years ago when a local company removed most of the underlying sand for construction. Little of the deposit now remains except in a narrow ridge beside a small gully (Figure 7.1), and the original extent and height of the deposit is uncertain. The deposit consists of a black charcoal-rich band containing fragments of marine shell and small quartz artefacts, overlying clean sand (Plate 7.1). Larger stone artefacts were present on the surface of the disturbed portion, including a nutcracking rock with a single depression, a fragment of a grooved slate grindstone and a flaked chopper-like implement (see section 7.10.1 below).

7.3 Site description: MR2

This site presented a much better excavation prospect than MR1. It is located about 10 minutes on foot upstream from the latter and is on a high mound on the north bank of the creek (Plate 7.2). The deposit appears undisturbed except for minor erosion down the slope towards the creek. The site covers an area of about 70 m^2 and would originally have been clear of trees. Young saplings have grown up over it in recent years (Plate 7.3). Three or four mango trees (Mangifera indica, an introduced species) grow on the edges of the site. These are larger than the central saplings, and may have been planted or watered by the post-contact occupants of the site (as was the case for mango trees occurring at sites on the Yidinjdji trail, see Chapter 5, section 5.13).

The site is initially recognisable by the presence of stone artefacts and shell fragments in the forest litter. On closer examination one finds that the soil is black with charcoal and there are a few fragments of old bottle glass and rusty metal here and there on the surface of the site. The surface stone artefacts are described in more detail in section 7.10.2 below. They include several nutcracking stones and several flat rocks which may have been used as grindstones. One putative shell artefact was noted on the surface. This is a single valve of the mangrove cockle Polymesoda (Geloina) coaxans, which has had a central portion removed in such a way as to leave a flaked edge along one part of the whole (Plate 7.4). Its possible use as a slicer can be readily envisaged. Slicers used in the preparation of vegetable foods were recorded at the turn of the century as being made from snail shells (Roth 1904:21), but the use of Polymesoda for this purpose is also quite feasible.

7.4 Fieldwork schedule

Initially, soundings were dug at sites MR1 and MR2 in November 1982. Moderate quantities of nutshells were recovered from both sites, indicating that nut-processing was an important activity in this locality. During September 1984, more extensive excavations were carried out at MR2. Site MR5 was recorded during this field trip, and it appears similar in appearance to MR2 except that few saplings have grown up, and glass or metal remains were not observed. It has not been further investigated.

Access to this group of sites was much less difficult than in the case of Jiyer Cave. A dirt road runs right past MR1, and from there it is a ten minute scramble up a rocky creekbed to MR2. The third site (MR5) is about the same distance again further upstream.

7.5 Results from MR1 sounding

A 50 cm square (coded X1) was laid out on a lightly grassed portion of the northern edge of the remaining deposits (Figure 7.1), and excavated in 5 cm spits to a depth of 105 cm. The northern slope of the deposit (parallel to the small gully) was nearly vertical at this point, and was cleaned and straightened prior to excavation, enabling the base of the deposit to be reached in spite of the small area excavated.

7.5.1 Stratigraphy

Occupation deposits extended to a depth of one metre before sterile light brown sand was reached (Figure 7.2). Three stratigraphic layers could be distinguished:

Layer 1, about 45 cm thick, was very dark grey (Munsell 10YR 3/1) and contained small amounts of shell, quartz artefacts and charcoal;

Layer 2, between 45 and 65 cm below the surface, was similar in colour and content, but contained diffuse areas of lighter coloured sand;

Layer 3, from 65 cm to the base of the deposit, was similar to Layer 1, but the lower portions were mottled and merged into clean, yellowish brown basal sand (Munsell 10YR 5/4).

The depth of deposit in the sounding is in marked contrast with that visible in the exposed profile on the southern side (Figure 7.2), and it would seem that X1 is located at the edge of the original mound, as might be inferred from its position in relation to the wet gully on the northern side of the site.

7.5.2 Radiocarbon results

Two samples of charcoal were submitted for dating (Table 7.2). The first, from 40 to 45 cm below the surface, was dated to 240 ± 60 BP (SUA-2285). The second sample was made up of charcoal from two spits, 60 to 70 cm below the surface, and was shown to be modern.

Given these results, plus the apparent position of the sounding on the edge of the mound and the fact that most of the deposit had previously been mined, it seems likely that the upper two layers may consist of recently re-deposited occupational material, mixed with some clean sand to produce the lighter areas in Layer 2. Layer 3 may still be in situ (Figure 7.2), but if this were the case, it would probably contain material spilled from the top of the mound, and its stratigraphic integrity would therefore be minimal.

In view of the disturbance of the excavated deposits, quantitative analysis has little meaning, and only qualitative results are given here.

7.5.3 Floral remains

Up to 10 gm of charcoal was found per spit. Nutshells were present in smaller amounts (less than 2 gm per spit). Some fragments of the latter were sufficiently well preserved to be identifiable and three species have been recognised (see Table 7.3). The significance of these remains is discussed in section 7.11.

7.5.4 Faunal remains

Small quantities of shell (up to 20 gm per spit) were recovered. All identifiable fragments were Polymesoda (Geloina) coaxans, a mangrove inhabiting species. The nearest mangroves to the site are in the lower reaches of the Mulgrave River, approximately 9 km downstream.

Four fragments of burnt or calcined bone were recovered. One has been tentatively identified as a fragment of pelvis from a large mammal (K. Aplin, pers.comm.).

7.5.5 Stone artefacts

Less than 80 stone artefacts larger than 15 mm in their maximum dimension were recovered from the sounding. Most of these were made of quartz and were less than 30 mm long. There were also two flaked pieces of basalt, some small chunks of ochre and several fragments of granite pebbles, none of which showed any sign of modification or use, but which were presumably transported into the site. The material is similar in appearance to the MR2 assemblage.

7.6 Results from MR2 sounding

A 50 cm square (F9) was laid out near the track leading down to the creek, on the southern part of the site (Figure 7.3; note that the sounding is not aligned with the subsequent main excavation grid). Excavation was in 5 cm spits to a depth of 60 cm, at which point the increasing number and size of granite boulders made it too difficult to continue digging.

7.6.1 Stratigraphy

Two stratigraphic layers were distinguished (see Figure 7.4). The upper 35 cm (layer A) consisted of very dark grey sandy soil (Munsell 5YR 3/1). Roots (averaging 5 cm in diameter) and rootlets were plentiful in the top 10 cm. Some of the roots dripped copious quantities of milky sap into the excavation when cut.

At a depth of about 30 cm, the black soil gradually became browner, grading almost imperceptibly into a lower layer (B) of dark greyish brown soil (Munsell 10YR 4/2) which in turn rested on boulders of decomposing granite. As pointed out above, the presence of these, presumably derived from bedrock, made it impossible to continue digging below 60 cm in such a small area. However, small quantities of charcoal and quartz artefacts were still being recovered at this depth in the interstices between the boulders. The quantities of material recovered from each spit are tabulated in Table 7.4 and plotted in Figures 7.7 and 7.8.

7.6.2 Radiocarbon results

A charcoal sample from 25 to 30 cm below the surface was submitted for dating and yielded an age of 780 ± 50 BP (Beta-9137; see Table 7.2).

7.6.3 Floral remains

Moderate quantities of charcoal were present in the upper levels, decreasing rapidly with increasing depth (see Table 7.4; Figure 7.8). Nutshell fragments, most of them charred, were present in much greater amounts than the charcoal, and a similar but more dramatic decrease with depth occurred (see again Table 7.4 and Figure 7.8). The species identified are listed in Table 7.3, and include both toxic and non-toxic species. A discussion of their significance is reserved until section 7.11.

7.6.4 Faunal remains

All identifiable shell remains were attributable to Polymesoda (Geloina) coaxans. Quantities were greatest in the upper 15 cm, with few fragments occurring below this level (Table 7.4; Figure 7.7). No bone fragments were found in the sounding.

7.6.5 Stone artefacts

Low numbers of small quartz artefacts (less than 30 mm in their maximum dimension) were recovered from most spits (Table 7.4). Some of the material has probably been anvilled, as there are bipolar flakes. However, changes through time cannot be recognised as there are so few artefacts.

A very weathered flake and a flaked piece of metamorphic stone were recovered from the sounding.

Four pebbles and pebble fragments were also found, three of them in granite. The surfaces of all are weathered and crumbling, but smoothing, possibly from grinding use, was discernible on one of them. They do not appear to be simply lumps of bedrock, despite their weathered appearance.

7.7 Summary of soundings

It was clear from these preliminary investigations that only the periphery of the original deposit remained at MR1, and that further work at this site was unlikely to be very productive in terms of the aims of the present study. However, the contents of the more intact site at MR2 appeared very similar, and probably resulted from the same range of activities. MR5 also appears to be the same type of site, though I had not yet located it at the time when these soundings were carried out.

The high proportion of nutshells found in MR2 was particularly interesting. It seems that nut-processing was an important activity at this site (and possibly also at MR1), and that both toxic and non-toxic species were being utilised. The results from Jiyer Cave have indicated that nuts had been utilised in the district for possibly 3500 to 4000 years (see Chapter 6, section 6.4.4). While MR2 did not appear to cover this time span, it did seem to be an ideal site from which to obtain a better idea of the archaeological debris associated with extensive processing of toxic nuts.

7.8 Main excavations at MR2

Three one metre squares (E11, E13, H14) were therefore excavated at MR2 (see Figure 7.3), each in 5 cm spits. A basal deposit of decomposing granite was reached in all three squares, the deepest of which (E13) reached a maximum of 75 cm below the surface. Small amounts of charcoal were still being recovered at this level, but the matrix was very hard and rocky. As the parent rock is granite, the deposits were acidic, with a surface pH of 6.0 increasing to 3.5 at a depth of 35 cm below the surface.

7.8.1 Stratigraphy

Three layers can be distinguished in the sections (see Figure 7.5, also Plate 7.5):

Layer 1 is between 15 and 20 cm thick, consisting of very dark grey granular soil (Munsell 5YR 3/1). In some sections a distinction could be drawn between an upper portion containing numerous rootlets and a lower portion with fewer rootlets but otherwise of the same texture and colour. Larger roots were frequently encountered in this layer (see Plate 7.6).

Layer 2 is a thick band of very dark greyish brown sandy soil (Munsell 10YR 3/2) containing visible fragments of charcoal. Roots and rootlets occur less frequently.

Layer 3 is not clearly demarcated from the one above. The soil becomes mottled and less grey with depth, and contains increasing quantities of decomposing granite. The basal matrix is dark brown (Munsell 10YR 4/3).

Layers 1 and 2 appear to correlate with Layer A in the sounding F9, while Layer 3 is clearly equivalent to Layer B in F9.

7.8.2 Radiocarbon results

Four charcoal samples were submitted for dating, three from the lower levels of H14 and one from the upper part of E13 (see Table 7.2). The choice of samples was restricted by the availability of sufficient charcoal. The resulting ages are in sequence, and when age is plotted against depth, the points produce an almost straight line (see Figure 7.6). However, the position of the lowest point suggests some flattening of the curve towards the base of the excavation, implying a lower rate of deposition at this level. The date obtained from sounding F9 (Beta-9137) fits the curve closely. The oldest date now to hand from this site is 2690 $\pm$ 100 BP (SUA-2284), which is much greater than the age previously obtained from the MR2 sounding.

7.8.3 Floral remains

Charcoal and charred nutshells were found throughout the deposit, though in decreasing quantities in the lower levels (see Tables 7.5 - 7.7; Figure 7.8). The relatively large amounts still occurring in the lowest spit of H14 suggest that in this square at least the base of the deposit has not been reached. At the time of excavation it appeared that occupational debris was down to a minimum by this level, and the excavation was therefore closed at that point, since time was running short.

The distribution of charcoal against depth is bimodal (see Figure 7.8), with peaks located in the top 15 cm of each square (approximately 200 to 250 years BP) and again between 30 and 50 cm in each square (approximately 1000 to 1800 years BP).

Distribution of nutshell fragments does not show the same degree of bimodality. A large peak occurs in the upper 15 cm of all three squares, but the lower peak is visible only in squares E11 and E13, and is greatly reduced. This effect may be a function of preservation, since with increasing depth it became correspondingly difficult to allocate charred fragments to the nutshell category, as they were generally smaller and more weathered. It is also possible that many fragments of nutshell were initially incompletely charred, which would have rendered them more liable to decay. Certainly several fragments from the upper spits exhibited little or no charring, though some of these at least may be from the last season's fruiting by nearby trees.

Identifiable nutshell fragments belonged to the same species as those previously recorded from F9 (see again Table 7.3 and section 7.11).

7.8.4 Faunal remains

The only faunal remains in the deposits consisted of shell fragments identified as Polymesoda (Geloina) coaxans). These were restricted to the upper 20 cm (see Tables 7.5 - 7.7; Figure 7.7). Again, as with the sounding at this site, no bone fragments were found in the main excavations.

7.8.5 Quartz artefacts

The quartz artefacts recovered from the deposits were generally small, with few larger than 40 mm in maximum length (Table 7.8). When the numbers of quartz artefacts greater than 15 mm in size are plotted against depth, it can be seen that there is a marked reduction in the topmost three spits (Figure 7.9). This contrasts greatly with the distribution patterns for both shell and charcoal (Figure 7.7 and 7.8, respectively), and so it cannot be equated with abandonment of the site. However, bottle glass occurs almost solely in these upper spits (see Table 7.5; also section 7.8.8), and it appears that this material was available in sufficient quantites during the last (post-contact) phase of site occupation to have largely replaced quartz for the production of flaked implements.

In Squares E11 and E13, the bulk of the quartz artefacts occurs in the same spits as the secondary charcoal peak (approximately 25 to 50 cm below the surface). However, a similar correlation cannot be so clearly demonstrated for Square H14. In order to determine whether the increased deposition of quartz artefacts was associated with a technological change, the artefacts from E13 were analysed according to Witter's (1984) method (see Chapter 4, section 4.6.4). The resulting reduction charts for spits 6 and 7 (Figure 7.10) and spits 9 to 15 (Figure 7.11) do not reveal any great variation, although the number of artefacts is quite low, especially for the lower spits. The reduction charts shown in Figures 7.10 and 7.11 are quite similar to those obtained for quartz artefacts from Jiyer Cave (Figures 6.15 and 6.16), and this would appear to indicate that similar reduction methods were used. Note, however, that the proportion of 'lammelates' (see Chapter 4, section 4.6.4) in the Mulgrave River assemblage is only about half of that at Jiyer Cave (Chapter 6, section 6.4.9), a feature which may be a function of the quality of the quartz used.

One quartz crystal was found (Plate 7.7), similar in size to the three recovered from Jiyer Cave. A much larger crystal (about 10 cm long) with a gum handle is illustrated by McCarthy (1941-2; 1976:Figure 56) who recorded it as a 'magic' or 'ritual' stone.

7.8.6 Other stone artefacts

No flaked non-quartz stone artefacts were found. There were three stone artefacts with modified surfaces (as opposed to flaked edges), and a number of manuports and other potential artefacts, all described below (see Table 7.9 for details; refer also to section 7.10).

Whole pebbles.

A total of five medium-sized pebbles (whole or broken) was recovered from the deposits. Only one of these was clearly utilised, with a smoothed area on one face continuing around towards one of the long edges, as if used with a grindstone. The remainder were unmodified but were most likely humanly transported into the site, possibly from the upper reaches of the Mulgrave River.

Anvils and grindstones.

One large flattened cobble had a lightly pecked area in the centre of one face, and may have been used as an anvil. Another large flattened cobble and two flat slabs were also found. These would have been suitable for use as grindstones or anvils, but no wear or modification indicating such a function was visible.

Polisher.

This unusual artefact was a multi-faceted piece of hard red stone, most surfaces of which were striated and partly polished (see Plate 7.8). Its function is unknown, but it bears a resemblance to some of the ooyurka-like implements described in Chapter 9 (sections 9.7, 9.8).

7.8.7 Ochre

Pieces of red and yellow ochre were found fairly consistently throughout the deposits, though only in small quantities (see Tables 7.5 - 7.7).

7.8.8 Pumice

A single piece of pumice was found in E11. It must have been transported to the site, possibly from a beach on the eastern side of the Malbon Thompson Range. Pumice was used as an abrasive in finishing off wooden tools (see Chapter 3), and is relatively common on North Queensland beaches. Pieces were also found in the Bramston Beach Midden BBM1 (see Chapter 8).

7.8.9 Glass

Small quantities of green and clear bottle glass were recovered from the upper spits of all squares to a depth of 15 cm (Tables 7.5 - 7.7). As stated above (section 7.8.5), it appears that glass artefacts replaced quartz ones during the post-contact occupation of the site, since very few quartz artefacts were found in these spits. Two glass fragments showed part of a manufacturer's stamp, but their origin has not yet been determined.

7.8.10 Metal

Several fragments of rusty metal were found in the upper 15cm of Square E13 (see Table 7.6). Most were flat, as if deriving from a small box. One piece appeared to be an old nail or bolt.

7.9 Summary of main excavations at MR2

Three squares were excavated, all having a similar stratigraphy and cultural content. The oldest date from the site now stands at about 2700 years ago, but it is possible that even older deposits are still *in situ* in the interstices of the bedrock. Faunal material unfortunately has not been well preserved in the very acid environment. Shell is present only in the upper 15 cm and no bone was found. Floral remains, both wood charcoal and the nutshells of food species, have been better preserved. Several species of nuts were identified, ranging from those edible raw, to those which need to be cooked, to those which need more complex treatment to render them edible. In two squares (E11 and E13) quantities of charcoal and quartz artefacts peak between about 1000 and 1700 BP. Results from H14 are less clear-cut, but there appears to be a peak of charcoal at the same depth, though not of quartz. In the upper 15 cm of the site there is another charcoal peak, apparent in all three squares and associated with glass and metal (but not quartz). This level of the deposit probably derives from a post-contact occupation phase, and a radiocarbon date of 140 years (or virtually modern) obtained from a depth of 10-15 cm is in agreement with this assumption. No changes in quartz reduction technology are apparent through time.

These results would seem to indicate only relatively minor use of the site until about 1700 years ago, at which time increased deposition of quartz artefacts in E11 and E13 suggest increased usage of the site. However, there is no similar increase in H14. The increase in quartz artefacts is associated with greater quantities of charcoal in the deposit, a phenomenon which is also visible in H14. Then at around 1000 BP, the quantities of both charcoal and quartz artefacts decrease. In modern times, charcoal deposits again increase, but the quartz artefacts are replaced by glass and metal artefacts. The apparent fluctuations in the occupation of this site do not coincide with those at Jiyer Cave (see Chapter 6), and it is difficult to draw any firm conclusions from these results about intensity of occupation of rainforest sites in general.

7.10 Surface artefacts

As noted earlier in this chapter, stone artefacts were found on the surface of both MR1 and MR2. In the case of MR1, the artefacts could originally have been deposited within the occupation debris, but they cannot now be considered to be in situ. At MR2, however, the surface artefacts do not appear to have been disturbed since the site was last occupied.

7.10.1 MR1 surface artefacts

This material is not the result of a systematic survey or collection, but consists of artefacts collected or observed during a number of visits to the site. A nutcracking anvil (a large pebble with a single nutcracking depression) was noted in 1981, but not collected. A small fragment of a 'morah' (i.e a grooved slate grindstone) was collected in 1982. One used pebble of metamorphic rock was collected the same year. This exhibits battering on both ends and around the edges, has a shallow depression in the centre of each face, and also some smoothing on one face.

A flaked artefact, probably a chopping implement, was collected by R. Cosgrove in 1979 and passed on to me. It consists of a large metamorphic pebble which has been bifacially flaked both at the narrow end and to a much greater extent at the wider end. Several pieces of red ochre were also collected by him in 1979.

7.10.2 MR2 surface artefacts

The positions of all the large stones on the surface of MR2 were plotted during the initial site recording (see Figure 7.12). Each was later examined more closely to determine whether or not it was an artefact (see also Table 7.10). Many in fact showed no sign of use or modification, but were potential artefacts by virtue of their size and shape. River pebbles were probably transported to the site, but their source is not known. The Mulgrave River is less than one kilometre from the site, but it is sandy rather than pebbly in its lower reaches.

Anvils.

The most obvious surface artefacts were the nutcracking anvils (e.g. Plate 7.9). Five were clearly this type of implement, with walnut-sized depressions on one or both faces. Two more exhibited rather shallow depressions but were not typical nutcracking anvils, though they are clearly artefacts. The large rock forming the western edge of the site also contained several nutcracking hollows, though we had to clear away a considerable amount of 'wait-a-while' or 'lawyer cane' (*Calamus* sp.) to discover them.

Grindstones.

None of the eight large flattish rocks found on the surface of the site (e.g. Plate 7.10) were indisputably grindstones. There were no examples of grooved, pecked or smoothed surfaces. Three rocks had slightly concave faces which could have been utilised as grindstones, and the other five had flat surfaces which could have been similarly used.

Pebbles.

No utilised pebbles were found among the surface stones. Two unused pebbles were noted, both suitably sized for use as a hammerstone or top grindstone. A much larger unmodified pebble was also present, which might have been considered suitable for use as an anvil or a grindstone.

7.10.3 Summary of surface artefacts

The presence of nutcracking anvils at both sites is to be expected given the quantities of nutshell remains found in the deposits, especially those of the Johnstone River almond (Elaeocarpus bancroftii). A large tree of this species was observed close to MR2, and was probably one reason for the location of the site. These nuts (about the size and shape of a four-sided almond, see Plate 4.3) are edible raw, but they are extremely hard-shelled and difficult to open without crushing. The nutcracking anvils are efficent devices for extracting the kernels.

The pebble tool found at MR1 may have been used as a hammerstone for cracking nuts, in conjunction with an anvil. Although no hammerstones have been identified at MR2, they must have been utilised along with the nutcracking anvils, and the apparently unmodified pebbles found at this site may well have been brought in for this purpose.

The occurrence of a 'morah' and a pebble with smoothing use-wear at MR1 clearly indicate that grinding was carried out at the site. Besides the toxic nuts identified in the deposits, other food plants may have been prepared on such grindstones, as well as ochre for body or artefact decoration.

Pebbles with smoothing use-wear were also recovered from the excavation at MR2. Unfortunately, there were no recognisable grindstones at this site. However, it may be that the flat and concave stones present were utilised as grindstones. Another possibility is that many of the toxic nuts were not comminuted by grinding, but were sliced or chopped into small pieces (see Chapter 3; also Roth 1901b:10). Some support for this suggestion comes from the discovery of a possible shell slicer at the site. A third alternative may be that the roasted, husked kernels were taken by the Aboriginal occupants from MR2 to another site such as MR1 for grinding and leaching. A less likely possibility is that surface material such as grindstones had already been removed from the site by European visitors prior to my excavations, though this seems less likely for MR2 than for MR1, which is right by the road.

7.11 Discussion

The archaeological evidence (charred nutshells and stone artefacts associated with plant processing, lack of bone and small quantities of shell) strongly suggests that activities at MR1 and MR2 (and by inference at MR5) focussed on the collection and processing of several species of rainforest nuts, some of which were toxic (see Chapter 3, section 3.4.4 and Chapter 10). The quantities recovered from MR1 were small, and only three species were identified. However, greater quantities and a wider variety of species were found at MR2. A major feature of this site was a huge living specimen of *Elaeocarpus bancroftii* just near the site.

Some of the species recognised at MR2 were found only in the surface debris, and the nut of one of these (*Cryptocarya globella*) does not appear to have been eaten by Aborigines, though the outer flesh may have been (see Table 3.5). Many of these specimens (and some of the other surface remains, generally all uncharred) had been gnawed by rodents and may be natural accumulations on the forest floor. The other two species found only on the surface are, however, known to have been used for food (see Chapters 3 and 10). *Omphalea queenslandiae* is a thin-shelled edible nut. It was found only in the upper spits, and the thin shell is unlikely to preserve well. The other four species were found throughout the deposits, and were probably utilised during the whole of the occupation of the site. Two of these (Beilschmiedia bancroftii and Endiandra pubens) require leaching, and Endiandra palmerstonii is also sometimes leached. Elaeocarpus bancroftii is edible raw, but it is difficult to extract the kernel from the extremely thick shell without the use of implements such as the nutcracking anvils already described.

Stone tools associated with the preparation of these foods were also found. Nutcracking anvils occur at all three sites, and would have been utilised to open all the hard-shelled nuts, whether toxic or non-toxic. Grindstones would most likely have been utilised to grind or crush vegetable material, including toxic species which would have been subsequently leached in running water (available all year round at these sites). The apparent absence of such implements at MR2 might indicate that nuts collected and husked on the site were further processed elsewhere, though such a conclusion can only be tentative. No toxic species were identified at MR1, yet it contained a fragment of a grindstone.

The oldest artefact which might be associated with the complex processsing of food plants is a smoothed pebble found 15-20 cm below the surface (approximately 500 years old). However, nutshells belonging to toxic species are found through most of the deposits at MR2, suggesting a minimum date of nearly 2000 BP for the use of toxic species. Greatest quantities were recovered from the upper 15 cm (in association with glass, metal and a date of 140 BP). However, it is difficult to disentangle factors affecting preservation from deposition rates. Most of the nutshell fragments were charred, but there were several pieces in the upper layers which were not, and there is no reason to suppose that the nutshells were intentionally burnt. The charring may result from the initial roasting of the whole nuts, or to later (accidental) burning of the shell refuse. The absence of a peak in the quantity of nutshell to coincide with the lower (1500 BP) peak in both charcoal and quartz artefacts could possibly suggest that nuts were a less significant component of the diet prior to about 1200 BP (compare with a date of less than 1000 BP for earliest clear appearance of toxic nutshells at Jiyer Cave (Chapter 6, section 6.4.4). However, it is equally possible that poor preservation conditions have prevented identifiable fragments of toxic species from surviving.

CHAPTER 8

EXCAVATIONS: BRAMSTON BEACH AND BABINDA SITES

The first part of this chapter presents the results of excavations at a midden at Bramston Beach (BBM1). Mention is also made of other sites in the same locality. The last part of the chapter describes soundings made at two sites near Babinda (SF1 and SF2), which were undertaken at the beginning of this project.

8.1 Bramston Beach Midden 1 (BBM1)

This site (No.92 in Figure 5.2) was shown to me by a local cane-farmer, R. Stager. It is located between the beach and Wyvuri Swamp, not far from the mouth of the creek which drains this swamp. It was first noticed some years ago during the construction of a drainage canal along the eastern edge of the swamp, and it was reported to have been partly disturbed by the construction (R.Stager, pers.comm.).

Vegetation in the vicinity of the site is mainly open sclerophyll forest, which occurs between the swamp and the beach. Much of this part of the property was cleared some time ago for a cattle fattening project, which is no longer operating. Wyvuri Swamp, west of the site, contains predominantly paperbarks (<u>Melaleuca quinquenervia</u> - vegetation type 15a in Table 2.3). Peaty soils occur within the swamp, but to my knowledge no palynological studies have been undertaken here. A study by Mike Gagan (Department of Geology, James Cook University) of the geological processes which formed the swamp has shown that Wyvuri Swamp was formed about 5400 to 5900 years ago. The sandy ridge containing BBM1 was probably in place by at least 4000 BP (M.Gagan, pers.comm.).

In immediately pre-contact times, vegetation near the site probably included rainforest species, although little more remains today than a single black bean tree (<u>Castanospermum australe</u>) which still survives near the site. Otherwise, the rainforest proper is only a few kilometres to the north and west (Types 2a and 12c; see Table 2.3). Mangroves occur in nearby creek estuaries both north and south of the site.

<u>8.1.1 Description of site</u>

Surface manifestations of past human occupation of this midden consist mainly of black sandy soil with marine shell fragments visible in some places. The midden is extensive, covering nearly 1,000 square metres (see Figure 8.1), but shell deposits do not appear to be particularly dense. On the western side towards the canal/creek there is a low ridge of midden material (Figure 8.2), and this is probably the portion disturbed and heaped up during canal construction. The surface of the site is obscured by thick vegetation in many areas, particularly over the shelly deposits (Plate 8.1), and small dense stands of trees occur on the southern and western parts (Plate 8.2).

8.1.2 Excavations

Excavations were carried out in October 1983, during two three-day weekends. Three one metre squares were excavated in 5 cm spits (see Figure 8.1 for their location). Square M10 was located in the shelly area on the western edge of the site. It contained little shell (see below), and so a second square (M7) was dug some metres to the west where the surface shell density was much greater. This is the area which was recognised as probably disturbed (see above), and the stratigraphy of the deposit appears to confirm this assessment. Unfortunately, many of the cardboard labels used during the first weekend for material from M10 and the upper part of M7 became illegible within a week, and a complete analysis of samples from these squares could not be carried out. All the upper spits of M7 were affected, and also spits 3, 6, 8 and 9 in M10. The third square, M28, was on the eastern side of the site, where shell was again visible in surface deposits. This square and the lower part of M7 were dug on the second weekend, and were thus not affected by the problem of deteriorating labels.

All material from these three squares was passed through a pair of sieves (see Chapter 4), but only material from the upper, coarser sieve (mesh size 6 mm) has been sorted and analysed for this thesis, as it was felt that this would provide quite an adequate sample for the purposes of this project.

8.1.3 Stratigraphy

In M10 there was one lens of shell and black soil along the western edge of the square in the upper 10 cm (see Figure 8.3). Black charcoal-rich soil (Munsell 10YR 2/1) containing only small quantities of shell was found to a depth of 45cm below the surface, overlying dark brown, culturally sterile, sandy soil (Munsell 10YR 3/3). Rootlets were numerous in the upper levels.

The stratigraphic sequence visible in M7 was quite different. Black shelly layers alternated with black or grey layers containing little or no shell (see again Figure 8.3). The pattern can be identified as a disturbed deposit, with the lower two black layers probably still in situ, but the upper three representing deposits removed from another portion of the site, presumably the western edge. It was the material from the upper half of this square which was most affected by the problem of illegible labels.

M28 was excavated to a maximum depth of 30cm (see

Figure 8.3 and Plate 8.3). Black soil containing numerous shell fragments occurred to a depth of 20cm. Below this was a shell-free, dark brown sandy soil. Some burrows were noted in this layer, filled with shell and black soil matrix from the upper deposits. The size of the burrows suggests that they were dug by crabs.

In all squares the shelly matrix had a pH of 8.0 and the basal dark brown soil a pH of 6.0 - 6.5. In M10, a sample of black shell-free soil gave a pH of 5.0.

8.1.4 Radiocarbon results

Two samples of shell from M28 were submitted for dating. Although one was from the base of the deposit and one from the top, both provided essentially the same age, approximately 700 years (uncorrected date on pipi shell, see Table 8.1). Either there has been extreme disturbance by burrowers such as crabs (e.g. see Specht 1985), or the midden was built up in a very short time and then abandoned. A sample of charred nutshell from near the base of the deposit in M10 was then submitted for dating, and this yielded an age of 520 ± 50 BP. This would appear to confirm that site occupation commenced relatively recently. It does not seem at this stage that occupation continued into the post-contact era, since no European materials such as glass or metal artefacts were found.

Two further samples have been submitted for dating, both from the same apparently undisturbed level in M7 (see again Table 8.1). These form part of a separate project to investigate the oceanic reservoir correction (ORC) factor applicable to shell dates from this region of North Queensland. Both samples gave the same (uncorrected) age, which is however similar to the ages obtained from the other squares. It appears that the ORC factor for this area may be much less than the 450 years (approximately) estimated for other regions (Gillespie and Polach 1979:411), but the deposits may in fact be more disturbed than was realised at the time of excavation. In any event, the deposits at BBM1 were clearly accumulated over a time span of no more than a few hundred years, and they can be regarded as essentially contemporaneous.

8.1.5 Floral remains

Charcoal was moderately plentiful throughout the deposits (Table 8.2). Some of the charred fragments were identified as remains of edible species, though the quantities were quite small (see again Table 8.2). The food plants identified were the Johnstone River almond (*Elaeocarpus bancroftii*), which produces a hardshelled nut which is edible when raw, and *Pandanus sp.*, which also contains edible seeds. The recognisable fragments consisted of nutshell and drupe fragments, respectively. There were also fragments of at least one other type of nutshell which it has not been possible to identify so far.

8.1.6 Faunal remains

Marine shells constituted the main component of the coarse sieve residues (see Table 8.2). Of these shells, by far the greatest proportion were identified as pipis (*Donax* sp., probably *D. faba*) by B. Dowd (Department of Zoology, James Cook University). These are still to be found in quantity today on the nearby ocean beach. Much smaller quantities of other shells were also present (Table 8.3). These included species from mangrove habitats (*Polymesoda (Geloina) coaxans*, *Anadara granosa*); oysters from rocky or mangrove habitats (possibly *Saccostrea sp.*); and several species more frequently associated with coral reef habitats (*Thais bufo*, *Nerita sp.*, *Melo sp.*, *Oliva sp.*), though some of these may also occur on rocky shores. A few pieces of coral were also present in the deposit.

Specimens of landsnails (*Xanthomelon sp.*) were also identified, many of them showing the same degree of weathering and ageing as the marine shells. There were also a few fresh unweathered fragments, which were probably modern.

Small quantities of very fragmentary bone were recovered from Squares M7 and M28, but not from M10 (see Table 8.2). Some fragments were recognised as turtle and others belonged to a medium sized macropodid (neither identified further). Fish bone was not present in the deposits sampled.

8.1.7 Stone artefacts

Most of the stone recovered from the site was non-artefactual (see Table 8.2) and was probably naturally occurring. However, some of the fire-shattered schist pebbles included in this category may be manuports. The artefacts were all made of quartz, except for a single piece of flaked basalt from M10 spit 4, which possibly has a residue of resin on a flat cortical surface. The basalt itself is similar to the columnar basalt fragments found at Jiyer Cave. The nearest possible source is about 10 km to the south (see Figure 2.5).

There were 28 quartz artefacts over 15 mm in maximum length from the excavated samples which have been analysed (see Table 8.4). The largest was 44 mm long, making the size range similar to that of quartz artefacts from the other two excavation sites (JC and MR2; see Chapters 6 and 7). The quartz itself was of variable quality, but included several pieces of unflawed milky quartz. The sample is extremely small, but the artefacts are probably contemporaneous. They were analysed according to Witter's (1984) method (see Chapter 4, section 4.6.4), and the resultant reduction chart (Figure 8.5) exhibits a similar pattern to those constructed for the quartz artefacts from Jiyer Cave and Mulgrave River 2. The percentage of lammelates is just over 50%, similar to that found at Jiyer Cave.

8.1.8 Ochre

Small pieces of ochre occurred regularly throughout the deposits (Table 8.2), most of them orange-red in colour. The ochre may have been used to decorate implements or bodies.

8.1.9 Pumice

Pumice also occurred throughout the deposits, though in much greater quantities in the lowest levels of M28 (Table 8.2). Pumice is common on many North Queensland beaches and is readily blown over neighbouring dunes and ridges. However, its presence in a site which is located 10 minutes walk from the beach through an open woodland indicates that some of it at least was probably humanly transported to the site, whether inadvertently with other material or for a specific purpose (e.g. finishing off wooden artefacts, see Chapter 3, section 3.4.5 and Roth 1904:9). The larger quantities at the base of M28 could possibly be naturally occurring remnants from a time when the ridge was closer to the beach.

8.1.10 Discussion

Bramston Beach Midden 1 appears to have been occupied for no more than a few hundred years, from about 500 to 700 years ago. However, only a small proportion of the total site has been excavated, and it is possible that other areas were occupied either earlier or later. On the other hand, modern materials (e.g. glass, metal) have not been observed, so it is likely that the site was abandoned by at least 200 years ago.

The major constituents of the deposit were marine shells, dominated by pipis (Donax sp., probably D. faba). This species would have been collected from the nearby ocean beach, where it still is plentiful today. The other shellfish species found in the site derive from slightly more distant areas, namely the mangrove estuaries at the mouths of nearby creeks, rocky platforms and coral reefs.

Bone was scarce in the deposits, but fragments of turtle plastron and macropodid remains were identified. Fish bones were, surprisingly, entirely absent in the samples examined, though the acid soil conditions might have contributed to this state of affairs.

Plant remains found in the deposits included nutshells of Elaeocarpus bancroftii and drupe fragments of Pandanus sp., both species having edible nuts/seeds. Remains of toxic food plants were not identified, though the small fragments of an unidentified nutshell which were present might belong to a toxic species.

Stone artefacts were sparse in the midden, and consisted mainly of small pieces of quartz, similar to the quartz artefacts found at Jiyer Cave and the Mulgrave River sites. Stone implements for cracking the hard-shelled nuts of E. bancroftii were not found, though one would have expected to find at least one such artefact on the surface of the site, given the shallowness of the deposits and the size of such an implement.

8.2 Other sites at Bramston Beach

A systematic survey for new archaeological sites in the Bramston Beach area has not been undertaken. Nevertheless, several other sites are known in the locality (Nos. 59, 60, 93 and 94 in Figure 5.2). Site 59 is a set of axe-grinding grooves (see Plate 5.1). Site 60 consists of a nutcracking anvil stone and was reported to be at the mouth of 'Bramston Creek' (D.C.S. site records). However, it is not clear whether this is the creek near BBM1 (as shown in Figure 5.2) or Joyce Creek which is at the southern end of Bramston Beach. The site has not been relocated.

Sites 93 and 94 are both shell scatters. No. 93 consists of a few pieces of baler shell (Melo sp.) and a piece of flaked quartz. It is located in a cane paddock close to the beach on sandy soil and may once have been more extensive.

Site 94 has also been disturbed by European activity. When I first inspected it in 1983, I found a small deposit of shell and black soil located on the southern part of the beach where a ridge abuts onto the sand, close to the mouth of Joyce Creek. Very little of the deposit appeared to have been left *in situ*. It seemed to have been pushed to the side of the road during roadworks. I revisited the site in 1986 and found that recent earthmoving in the area, following the occurrence of Cyclone Winifred early in 1986, had completely obliterated what little had remained of the site.

In 1983 I had collected a small bag of shells from this site (BBM3) in order to sample the species present. Although the sample collected was very small, there is one striking difference when the material is compared with shells found at BBM1. Pipis (*Donax* sp.) are almost entirely absent from the BBM3 collection, whereas they are by far the most common species at BBM1. It is possible that material at the former site has been so thoroughly disturbed that smaller shells, such as the pipis, have decayed more rapidly and disappeared, leaving only fragments of the more robust species. Another explanation is that the variation might reflect differences in the immediate environments at each site. BBM3 is close to a small mangrove-lined creek where many of the species in the sample could have been collected, and it is located at the sheltered southern end of the beach, which would have been the least suitable portion for pipis. BBM1 is located centrally along the beach, where pipis would have thrived (as they still do today).

8.3 Babinda sites

At an early stage of this project soundings were dug in two open sites (Stager Farm 1 or SF1 and Stager Farm 2 or SF2) on R. Stager's cane farm near Babinda. These are described briefly below.

8.3.1 SF1

SF1 (No.90 in Figure 5.2) consisted of a scatter of quartz artefacts exposed on a dirt track on the top of a small hillock close to the foothills of the Bartle Frere Range. Ground-edge axes and other stone artefacts have been found at the site (R. Stager, pers.comm.), but none were visible at the time of my visit. The hilltop has been cleared of rainforest vegetation, and ground cover now consists of shrubs and long grass (Plate 8.4). The extent to which the ground surface was disturbed by this clearing activity is unknown, but it may have been considerable. Patches of rainforest are still standing on part of the hill though the surrounding low ground is now mostly under cane. A small creek winds round the eastern part of the hill.

Excavations consisted of two soundings 10 m apart placed to one side of the track (see Figure 8.5). The first of these (A) was 1 m square and was located in an area relatively free of ground cover, but somewhat downslope from the exposed scatter. As only a few quartz artefacts were recovered in a total of four spits (dug to a maximum depth of 20 cm), this sounding was abandoned, and a second one (C) was begun in a location closer to the exposed artefacts, but covered with thicker vegetation. This was 60 cm square and was excavated to a total depth of 30 cm (6 x 5 cm spits).

The stratigraphic sequence exposed in both soundings was essentially a soil profile, with 10 cm of dark brown loamy soil overlying a reddish clayey soil (see Figure 8.6). The only organic material recovered from the soundings consisted of two fragments of charred nutshell (_Elaeocarpus bancroftii_) in C at a depth of 15 to 20 cm. Charcoal was not present.

Moderate quantities of stone were present in the deposits, most of it non-artefactual. The artefacts were all made of quartz, which varied in quality from unflawed clear or milky quartz to very flawed opaque material. Some of the more flawed quartz pieces were discarded as non-artefactual. The quantities of quartz artefacts (greater than 15 mm in maximum dimension) in each spit are given in Table 8.5. This assemblage is similar in appearance and content to those from Jiyer

Cave and Mulgrave River 2, but given the small sample size it has not been further analysed.

8.3.2 SF2

SF2 (No.91 in Figure 5.2) is located within a cane paddock. It was noticed some years previously when the top metre or so of soil on the crest of a small hill was removed to create a flat area suitable for cultivation (R. Stager, pers.comm.). This procedure uncovered several stone artefacts, and the presence of charcoal in the soil was also noted. During my preliminary inspection of the site I collected several more stone artefacts, including a broken ground-edge axe, a very weathered basalt blade and several quartz flakes. I also collected some wood charcoal fragments which probably derive from the Aboriginal occupation of the site rather than from a cane fire.

At present the site is surrounded by cane paddocks and is not located near water. I am informed, however, that a small creek originally flowed past the foot of the hillock, but that this was filled in to create more cultivable land (R. Stager, pers.comm.). At the time of my field trip, the paddock was under cane, with only a short distance between the rows, and it was not possible to dig an adequate sounding amongst the cane. I therefore decided to dig two soundings in the open area between the cane and the fence, about 5 m east of the surface finds (see Figure 8.7 and Plate 8.5).

Each sounding was 60 cm square, and excavations reached a maximum depth of 30 cm. Two stratigraphic layers were recognised (Figure 8.8). An upper layer of reddish clayey soil contained most of the cultural material. The lower layer consisted mainly of a rubble of decomposing granite. A few fragments of charcoal were recovered from the top 10 cm of sounding X. No other organic material was recovered. Quartz artefacts in small numbers were found in both soundings (see Table 8.5).

8.3.3 Discussion

Site SF1 contained both quartz artefacts and fragments of nutshells. The Johnstone River almond (Elaeocarpus bancroftii) has particularly hard-shelled nuts, and it is most probable that nutcracking anvils and hammerstones were used to crack them. However, no such implements were found, though the thick vegetation precluded a detailed search. It is also possible that surface artefacts were removed during the original clearing of the hilltop. The absence of such artefacts for nut-processing from the soundings is not surprising given the small area excavated. The presence of nutshells of E. bancroftii) in SF1 was the first indication that organic material might be better preserved in rainforest sites than was originally thought. However, the deposits were sparse and partly disturbed by previous forest clearance.

Soundings at site SF2 contained quartz artefacts only and no significant organic material, in spite of the fact that larger non-quartz stone artefacts and charcoal have been found nearby in the cane paddock. It is now apparent that further excavations could be worthwhile at SF2 within the area where surface artefacts were noted, especially if the deposits extend more than 30 cm below the present surface (i.e. the depth to which disturbance is caused by a modern plough). However, shortly after these soundings were dug, my attention was redirected to other open sites (e.g. MR1 and MR2) which seemed likely to be more productive in the terms of my research aims. SF2 has not therefore been reexamined for this project.

The locations of both SF1 and SF2 conform to the ethnographic description of rainforest campsites (see Chapter 3, section 3.4.4 and Chapter 5, section 5.14), being located on high ground close to running water. The full extent of either site has not been ascertained, but they may not have been very large and were perhaps smaller even than MR2. Unfortunately, both have been disturbed by European activity.

These two sites were recognised and reported because the owner of the property was sufficiently interested in Aboriginal history to do so. They are unlikely to be the only sites existing amongst the canefields of the coastal plain. Quartz artefacts have also been found in a nearby paddock, and Rainey (1984 and pers.comm.) has reported finding quartz artefacts associated with charcoal on a farm near Tully. Large stone artefacts are frequently found in ploughed land throughout the rainforest district (see Chapter 9: also Cosgrove 1980a), though association with quartz or charcoal is rarely noticed. Clearly a comprehensive survey of cleared paddocks (preferably when not under cultivation) could yield considerable information about site distribution on the coastal plain, though whether any such new sites would be fully suitable for excavation and or dating would remain to be seen.

CHAPTER 9

SURFACE COLLECTIONS OF STONE ARTEFACTS

9.1 Introduction

Large numbers of stone artefacts have been discovered throughout the rainforest region since European contact, mainly by farmers clearing and ploughing their paddocks (Roth, H.L. 1918; Colliver and Woolston 1966; Cosgrove 1980a, 1980b). During the course of my research, I examined many of these stone artefacts, some of which were held in museums, others in private collections. This was not a major part of the project, but I felt it was necessary to gain some idea of the kinds of artefacts that might occur in the sites I selected for excavation. In fact, while most of the stone artefact types present in the surface collections were represented in the material I excavated, there appeared to be significant differences between the two kinds of assemblages (see discussion in section 9.12).

In all, I examined 1234 items, from five museums and seven private collections (see Table 9.1). These constitute only a tiny fraction of the material that has been accumulated over the last century by collectors. Dickson (1981:12) estimates that about 20,000 ground-edge hatchets have been collected from an area of about 7500 km^2 in the northeast Queensland rainforests. On the basis of the present study, in which approximately half the artefacts examined were ground-edge implements, this estimate could mean that about 40,000 large stone artefacts have been collected from this region.

9.2 Provenance of the collections

Most of the artefacts have been found during the clearing and ploughing of land for sugar cane and other crops. Stones, whether artefactual or naturally occurring, are a nuisance to farmers, being a source of damage to machinery, and so they are usually removed from ploughed land as they are found. In many instances, artefacts so removed from the paddocks were kept by the farmer, and in this way some substantial collections have been made over the years. Some artefacts have also been collected from logging areas and occasionally from undisturbed forests.

On the whole, only those artefacts readily identified as tools (mainly ground-edge implements, generally larger than 100 mm in maximum dimension) were kept by the various finders. Some have found their way to museums in Australia and overseas. Many more have been kept by farmers as private collections. In several instances, the artefacts have been used as paving stones, doorstoppers or paperweights. However, many stone artefacts uncovered by the plough probably went unrecognised and were simply discarded or used as landfill.

These surface or near-surface artefacts were not scattered randomly over the landscape, but were generally confined to discrete localities (e.g. see Cosgrove 1980a). Some paddocks continued to yield large quantities of stone artefacts for years, always from the same area (C. Scrool, pers.comm.), implying that such areas were major occupation sites. In other cases artefacts were found singly or only in small quantities. This is especially true of surface material collected by forestry workers and others working in the uncleared forests.

Although many of these artefacts were ploughed up from sub-surface strata, their stratigraphic context was rarely, if ever, recorded. Smaller stone artefacts (less than 60 mm long) were only occasionally collected, though this is probably to be expected given the usual circumstances of discovery. There are at least two sites where charcoal and small flaked quartz artefacts occur on farmland in association with larger implements, one near Babinda (Site SF2 - see Chapter 8) and another near Tully (Rainey 1984 and pers.comm.). I have also observed small quartz artefacts in a freshly ploughed cane paddock near Babinda, and Cosgrove (1980a:41) notes the occurrence of small quartz artefacts together with 'axe heads, incised grinding plates [and] nut stones' at two sites at Waugh's

Pocket. No doubt many more such occurrences would be revealed by a comprehensive survey, though that was beyond the resources and purposes of this present study.

As noted in Chapter 4 (section 4.2.3), collections such as these may be a source of information about the location of archaeological sites (see again Cosgrove 1980a). Such extrapolation depends on the amount of documentation about the source of the artefacts, and for many museum specimens this is often meagre. Some are recorded simply as being from 'North Queensland', or 'Cairns District', which could mean almost anywhere in the northeast of the State and not necessarily in the rainforest district. For some museum artefacts the information is more specific, identifying the farm on which the implements were found. In other cases, the provenance recorded is merely the location of the artefact when it was acquired by the museum. For instance, it is highly unlikely, given the limited distribution of all other 'ooyurkas' (Cosgrove 1984; see also section 9.7 below), that specimen E60155 in the Australian Museum is actually from the location given, Coen (central Cape York Peninsula). There is a possibility that it was a pre-contact trade item, but there is no direct evidence to support this.

For many of the artefacts held in private collections, on the other hand, the exact point of discovery is still known at least to the nearest paddock, though the information is rarely recorded in writing. Others are less well provenanced, and for many the specifics of their original location is no longer known. Although these limitations make many specimens of doubtful value in reconstructing either distribution patterns of tool-types or the movement of raw materials, the collections nevertheless provide material for study which would not otherwise be available.

For instance, replication and use-wear studies may enable the functions of the artefacts to be determined, though few such studies have been undertaken for this region. Dickson (1981) studied the manufacture and use of ground-edge implements in Australia, and his findings are relevant to the rainforest district. The only other studies of rainforest stone artefacts are those by Cosgrove, on the typology and rock sources of ground-edge axes (1980a) and the distribution, form and function of 'ooyurkas' (1980a, 1980b, 1984; see also section 9.7 below).

The latter implements comprise one of the more unusual tool-types that have been recorded among these collections in the past (see also Casey 1936; McCarthy 1944, 1952; Kennedy 1949, 1950a; Mack 1961; Flecker 1954, 1955, 1956). Another distinctive rainforest tool-type is the grooved slate grindstone or 'morah' (Hamlyn-Harris 1916; Mjöberg 1918; McCarthy 1941; see section 9.4 below). Also included in the rainforest collections are the largest ground-edge axes in Australia (Roth, H.L. 1918; McCarthy 1940; Noone 1949; Kennedy 1950b, 1953; Dickson 1981; see also section 9.3) and special anvils for cracking nuts (e.g. Woolston and Colliver 1973; see also section 9.5). Other unusual artefact types, previously unreported, are also found in these collections.

The majority of the artefacts examined were made from either basalt or metamorphic rock. Some small quartz artefacts had also been collected. These raw materials are available locally (see Chapter 2), and Cosgrove (1980a) reports that of 259 metamorphic axes examined by him, 258 were made from rock types available within 20 km of the site of discovery. He found basalt more difficult to pinpoint by petrographic analysis, but again local materials appeared to have been used.

In the present study I found no firm evidence that non-local materials were utilised. One axe from a private collection on the Atherton Tableland was made from greenish rhyolite, a rock type which was quite different from all the other rainforest artefacts. The specific source for this specimen is not known, but dykes of the material do occur in the area (M.Rubenach, pers.comm.), and so it could well be of local manufacture. The only other use of rhyolites I have encountered in the rainforest district consists of three small flaked pieces (each of different colour and texture) found in the Jiyer Cave excavations (Chapter 6, section 6.4.10). Rhyolite (again a different variety) also appears to have been commonly used for flaked artefacts in the open forests west of Atherton and Ravenshoe (Horsfall 1985), where it is readily available locally. However, there is no evidence so far that this particular rock type was transported eastwards.

Only one quarry from the region has been reported, at Mt. Mackay near Tully (Roth, H.L. 1918:18). W.E. Roth also suggested that a source for rainforest 'axe-heads' might exist near Charters Towers (cited in Roth, H.L. 1918:19), but this seems unlikely given the ready availability of suitable local rock and Cosgrove's findings. However, petrographical sourcing might clarify this point, and ascertain whether long-distance trading did occur. Some evidence of the latter is provided by Cosgrove (1980a:25).

Not all of the items I examined were obviously artefacts, though many (such as unmodified river pebbles) may have been manuports in that they did not occur naturally at the sites where they were found. Each item was examined and recorded as described in Chapter 4 (section 4.7). Subsequently, each was placed in one of eight categories described below. This classification system is not entirely satisfactory, but it is sufficiently practical and convenient for the purposes of this study. Except in the case of the collections held in the Material Culture Unit at James Cook University, it was not possible for me to re-examine the particular artefacts, and the results presented here must be regarded as provisional.

The categories into which the items from the collections were placed were as follows:

1. Ground-edge axes and other similar implements (i.e. in which the ground face was oblique to the median or longitudinal plane of the artefact), divided into three subcategories,
   a. specimens which were clearly edge-ground,
   b. specimens in which the grinding was less obvious, but which were clearly axes, and
   c. specimens which were probably once edge-ground, but which were too broken and weathered for this to be certain;
2. Grindstones, generally large flattish stones, with grooved, pecked or smoothed surfaces;
3. Nutcracking anvils, containing one or more walnut-sized depressions on one or more surfaces;
4. Whole pebbles, divided into two subcategories,
   a. those with modified surfaces (smoothed, polished, battered, pecked), and
   b. those with no modification (these are not, strictly speaking, artefacts, but could be

manuports);

5. 'Ooyurkas', T-shaped or triangular artefacts with a ground edge which is perpendicular to the median or longitudinal plane of the artefact;
6. Other artefacts with flat ground surfaces or edges;
7. Flaked artefacts, divided into two subcategories,

   a. large (including 'choppers'), most specimens over 100 mm in length,

   b. small (small flakes, cores, flaked pieces), generally less than 80 mm in length;
8. Pieces of non-artefactual stone.

Table 9.1 lists the various collections examined by me. It gives both the total number of items in each collection, and the number in each of the above categories. The artefacts in each category are described in more detail below.

In Table 9.2 the artefacts are listed by recorded locality, grouped into districts. The last three groups in the table include artefacts that are morphologically similar to those from the other areas listed, but that come either from uncertain localities or from regions just beyond the rainforest margins. Fewer artefacts are listed for the region south of Tully, but this reflects the fact that most of the private collections which I examined for this study are from the Innisfail-Babinda area (my field study area, see Chapter 1, section 1.4). This result should not therefore be taken to indicate that fewer stone artefacts occur in the south. There are many private collections in both the Tully and Ingham districts (J.B.Campbell, R.Cosgrove, D.Jones, pers.comms.), but time did not permit me to examine more. Because of the uneven geographical distribution of the collections described no firm conclusions can be drawn from the data presented here as to the distribution of tool-types.

9.3 Ground-edge axes & similar ground-edge implements

A total of 677 definite ground-edge implements were identified (subcategory 1a; see also Table 9.1), with another 101 being classified as probably having a ground edge (subcategory 1b). Of these 778 tools, 503 were whole specimens, and the remainder were damaged or broken. A further 31 specimens were recognised as possible ground-edge axes, but these were so weathered or damaged that they were placed in a third subcategory, 1c (e.g. see Plate 9.6). The implements can be subdivided into a number of functional groups, based on size, shape and position of the ground edge (see Dickson 1981:72-94).

Six artefacts which were ground along one of the longer edges were classified as knives (Plate 9.1). All were larger than both a knife illustrated by Etheridge

(1890) and one made by Dickson (1981:75; see also Table 9.3). One of them appears to have been modified from a fragment of a much larger implement, possibly a splitter (see below). It would be difficult to haft these implements, and they were presumably used unhafted.

There were two possible chisels in the collections, with similar measurements to those described by Dickson (1981:78; see my Table 9.4). Both exhibited some butt damage consistent with being used as a hand-held chisel. Alternatively, they may have been used as small, narrow-bladed axes. Chisels characteristically have a biassed edge (Dickson 1981:76), but this attribute was not recorded in the present study.

Dickson classified all ground-edge artefacts weighing over 2 kg into a category he called splitters, and suggested that such implements may have been used to split large logs.

> Experiment shows that the most effective start is to grasp the splitter with both hands at the butt, lift it as high as possible and ... drive it into the trunk close to the end....If a split has been started the next step is to hammer the wedge in until the split has widened enough to accommodate its thickness. A piece of wood or stone can now be inserted to hold the split open and the operation is repeated further along the trunk (Dickson 1981:84-85).

A handle was sometimes attached, which served to hold the splitter steady while it was hammered in.

In his study (which included some of the material examined here), hatchets (the technical term for short-hafted axes used single-handed, see Dickson 1981:86-89) and splitters were fairly well separated, with the former weighing between 200 gm and 1600 gm and the latter weighing over 2 kg. Very few implements fell in the intermediate range. When 248 of the ground-edge implements in this study were plotted by weight, a slightly different picture emerged (see Figure 9.1). Most of the artefacts were between 200 gm and 1800 gm, with a much smaller group weighing between 1800 gm and 2.3 kg. The largest weighed 4.7 kg. There was no clear distinction between Dickson's categories of hatchets and splitters, though clearly the larger items would be too large to use as a single-handed chopping tool.

Twenty-nine ground-edge artefacts heavier than 2 kg were found in these collections, and a further twenty-eight (unweighed, some broken) are large enough to be included in this category. Many of these implements show great care in their manufacture, and the grinding has been continued around the entire edge of the artefact (see Plate 9.2). However, only the working edge is ground to a sharp edge, the sides and butt being bevelled and ground flat. The amount of work put into these particular artefacts does not seem compatible with the suggested function of splitting logs. Some are entirely undamaged and have pointed butts which show no trace of having been hammered with a wooden billet as suggested by Dickson, or indeed, of having been hit with anything.

Ground-edge artefacts weighing less than 200 gm were regarded by Dickson (1981:113) as more suitable for toys or chipping tools. There appeared to be none in the collections I examined, but a small ground-edge flake was found in the excavations at Jiyer Cave (see Chapter 6, section 6.4.10).

The principles involved in the manufacture of ground-edge implements in general have been described thoroughly by Dickson (1981), including methods of hafting. An account of the local method of making and hafting an axe is given by Seaton (1959). Some specimens in these collections are made on pebbles, with little modification except for the ground edge. For others, hammer dressing is a common technique to produce the desired shape, but some artefacts have been flaked before grinding, and a few have been both flaked and hammer dressed. Some of the last two groups may have been made from quarried material, and the collections include possible 'axe blanks' (these have been classified as <u>Large flaked artefacts</u>, see section 9.9 below).

Ten of the museum specimens were hafted with bent pieces of lawyer cane or sticks tied together with lawyer cane strips and generally secured with resin (as described by Seaton 1959; Dickson 1981:158-162). At least two of these hafts were attached to axe heads uncovered by ploughing, as indicated by the surface damage and weathering of the stone. One of the latter was also grooved.

A further 153 specimens were grooved (Plates 9.3, 9.4. 9.5). Eight of these had two grooves, and one specimen had three. Grooves appear in the main to have been pecked into the stone, which according to Dickson (1981:150) is the easiest method of grooving. Two hatchets were double-ended, with ground edges at both ends (Plate 9.5). Both have a centrally placed groove.

Twenty-one implements were waisted or notched (Plate 9.6), and some appeared to have been shouldered (see Plate 9.7), two of them showing a notch on one side and a shoulder on the other. Three specimens, neither waisted nor grooved, had areas of smoothing at the central portions of each long edge (i.e. at the waist). It is possible that these last were once hafted as adzes, although such hafting has only been reported in Australia for northern Cape York Peninsula (Roth 1904:18). Waisting would also facilitate such hafting.

Many otherwise intact axes showed considerable butt modification, ranging from minor bruising to severe flaking. In some specimens the butt end was flattened, as well as battered. The damage appears to be consistent with use of the butt end as a hammer or pounder (e.g. see McCarthy 1976:47; Lampert 1983). Some of the more damaged specimens may have been used as wedges or splitters, perhaps for extracting edible larvae from rotting trunks (e.g. see Mjöberg 1918).

Some of the artefacts show signs of secondary functions apart from use as hammers or wedges. Twelve appear to have been used as anvils, as they have lightly pecked areas on one flat face (Plate 9.8). Five appear to have flat ground facets on one of the long edges, similar to the working edge of an 'ooyurka' (see section 9.7), though some of these may be natural 'crenulation' surfaces. In two of these, the flat edge was bisected by a groove around the implement.

Many of the implements are severely weathered, and a considerable proportion have been damaged by plough shares. Some are probably not rainforest implements, strictly speaking, particularly those from marginal localities such as Cooktown, Herberton etc. Three axes from Cooktown are more typical of those from western Cape York Peninsula, which are small and relatively thick and which have a straight steep-angled edge (J.C. Taylor, pers.comm.).

9.4 Grindstones

A total of 87 grindstones and grindstone fragments were recognised during this study. The most common type was the 'morah', a flat piece of slaty rock with grooves engraved in parallel lines across the surface (Plate 9.9). There were 22 whole specimens and 36 fragments of 'morahs' in the collections examined. Four were grooved on both faces, one exhibited 15 nutcracking holes on the reverse face, and three appeared to have artificially smoothed areas on the reverse face.

These grooved grindstones have been previously described (Hamlyn-Harris 1916; Mjöberg 1918; McCarthy 1941, 1976). It was suggested by these authors that the grindstones were used in the preparation of toxic food plants and that the grooves were made in order to allow the poisonous juices from the crushed vegetable material to drain away readily. However, many of these grindstones have a concave working surface, which would tend to collect any liquids. In fact, it seems more likely to me that the grooves were made to produce a rough surface on the otherwise smooth slate in order to allow more efficient crushing. In any case, the noxious substances would have been removed at a later stage of processing (see Chapter 3, section 3.4.5 and Chapter 10; also Woolston and Colliver 1973:118).

The quality of the grooving is variable. Some 'morahs' are barely scratched, and the lines run at differing angles. Several, however, have deep, strictly parallel, evenly separated grooves and appear to represent much more manufacturing effort and skill. A typical feature of many 'morahs' is a small area at one end of the grindstone in which a series of short grooves has been carved at right angles to the remainder. The grooves themselves are rectangular in cross-section. The method of producing them is unknown, but it has been suggested to me (R. Stager, pers.comm.) tnat a quartz crystal of suitaple size would be adequate for the purpose. A bone gouge is another possibility.

Many specimens show considerable wear which practically erases the grooves, presumably from use with a muller or topstone. This generally occurs in the central portion of the working surface and is associated with a deeper concavity (unworn surfaces are usually flat or only slightly concave). All grooved grindstones in these collections were found north of the Tully River. However, this distribution pattern may be misleading. I have been given a photograph of one 'morah' found at Blencoe Falls in the Herbert Gorge, about 40 km west of Cardwell, and I have also been told of other 'morahs' from sites between Tully and Cardwell (J.B. Campbell, D. Jones, pers.comms.).

Four of the grindstones in the collections have working surfaces that have been prepared by hammer dressing, resulting in a roughened working surface. They are similar to the pecked grindstones found at Jiyer Cave (see Chapter 6, section 6.4.9 and Plate 6.11). All were collected in the Babinda-Innisfail region.

The remaining 25 grindstones showed varying degrees of smoothness on one or both faces, often within a concave depression (see Plate 9.10). They tended to be made from coarse-grained metamorphic rocks. Distribution of this type appears to be widespread, and examples were found as far south as the Murray River (between Tully and Cardwell) and on Dunk Island.

Maximum length of whole grindstones ranged from 130 mm to 610 mm. None of the 'morahs' was more than 65 mm thick, though the other specimens tended to be considerably thicker. This probably relates to the raw material used, as 'morahs' are invariably made of slaty or schisty rock which cleaves into thin blocks or leaves. The other two types of grindstone are generally made from large pebbles or thick blocks of harder metamorphic rock.

9.5 Nutcracking anvils

These are moderately large stones (190 mm to 350 mm maximum dimension) which contain walnut-sized depressions in one or both faces (Plate 9.11; see also Plate 7.9). Hard-shelled rainforest nuts can be placed in these hollows and then cracked using a hammerstone

(Woolston and Colliver 1973). These implements are well known locally and are in fact extremely practical for this purpose.

There are twelve specimens in the collections examined here. Eleven were found in the Babinda-Innisfail area and one is from Mossman. However, similar anvils, some larger than 350 mm, are known from sites along both sides of the Tully River (J.B. Campbell, D. Jones, pers.comms.). Several of the recorded sites listed in Table 5.1 also contain nutcracking anvils (see Chapter 5, section 5.4)

Up to eight depressions were noted on each of the 12 anvils in these collections, ranging in size from 20 mm to 35 mm in diameter with corresponding depths to form a hemispherical hollow. Four of the anvils also contain depressions on the opposite face, and three have smoothed areas on the reverse, possibly from alternative usage as grindstones.

9.6 Whole pebble artefacts

The collections contained 177 waterworn pebbles, 115 of which showed various kinds of surface modification, presumably resulting from different functional applications. Three main types of apparent use-wear can be distinguished:

1. Smooth, sometimes almost polished regions, probably resulting from use as a muller or

top-grindstone. The smoothed areas were most commonly on one face of the pebble, often extending around the curve towards one of the long edges (Plate 9.12);

2. Battered areas, generally on the ends or edges of the pebble and probably related to use of the pebble as a hammerstone (see Plates 6.17, 6.18);
3. Small pecked areas or hollows usually placed centrally on a flattish face of the pebble. Some may possibly result from use as an anvil for flaking stone, others may have been used as nutcracking hammerstones or even anvils (Plate 9.13).

A fourth feature occurring on a few pebbles was a flat edge or bevel (Plates 9.14, 9.15). Some of the flat edges were clearly ground in a similar fashion to the flat edge of an 'ooyurka', and it is possible that a functional relationship may exist. In other cases grinding was not apparent, but the flat edge did not appear to be natural. The bevelled edges did not appear damaged in any way, and the implements do not appear to have been used in the manner of a 'bungwall basher' (Gillieson and Hall 1982).

Smoothing occurred on 67 of the pebbles, battered ends and edges on 59 and pecked areas on 32, and 10 had a bevel or ground facet. In many cases more than one type of use-wear was present on a single implement. One pebble had two small areas of regular parallel striations on one face (Plate 9.16).

Only 62 unmodified pebbles were recorded during this study, and some or all of them may be manuports. Some of the collectors I spoke to volunteered the information that river pebbles did not occur naturally in the sites from which they were collected. The proportion of unmodified to modified pebbles in the sites was probably originally much higher than these figures suggest (e.g. compare with Jiyer Cave figures given in Chapter 6, section 6.4.10). Some of the larger private collections which I examined did in fact contain unmodified pebbles which I took to be natural and did not include in this account. In addition, over 166 items, many of them pebbles, had been discarded from the Taylor Collection (Material Culture Unit, James Cook University) prior to my examination of the material, apparently on the grounds that they were unmodified and unprovenanced (though most were recorded in the register as coming from Innisfail, and some were even listed as utilised).

The weight of used pebbles ranges from 100 gm to 1700 gm (see Figure 9.2), and the maximum length from 60 mm to 220 mm. Unmodified pebbles fell into a similar weight range (see Figure 9.3), indicating that they could well have been acquired for similar purposes.

9.7 'Ooyurkas'

These artefacts are the most unusual of the rainforest stone tools, and they have often been considered something of a puzzle. Even the name has probably been incorrectly applied (Cosgrove 1984:7-10). 'Ooyurkas' are T-shaped or triangular implements with a flat ground edge which is at right angles to the median or longitudinal plane of the tool (see Plate 9.17). They have been recovered from a very small part of the rainforest district, centred on the Babinda-Millaa Millaa-Tully area (Cosgrove 1984:11-12).

The collections described here contained 49 'ooyurkas', 27 of which had been included in Cosgrove's (1984) study of the stylistic and functional aspects of this tool-type. Cosgrove undertook use-wear experiments in an attempt to identify the function of this unusual tool-type. He eliminated several hypotheses (nut crushing, wood burnishing, resin application) and suggested that the tool was most likely used

> on a soft, fibrous plant in association with resin without the artificial introduction of abrasives (Cosgrove 1984:78).

He also ascertained that the ground working face was prepared before use. No major secondary function was detected by use-wear analysis.

9.8 Other ground artefacts

While 'ooyurkas' appear to form a distinct tool-type as defined by Cosgrove, there are a number of other artefacts in the collections with similar or related characteristics. I have already mentioned ground-edge axes with a flat ground surface on a long edge and pebbles with a ground facet along one or more edges. Other artefacts in the collection have similar flat, narrow ground facets along one or more edges, though in some cases the degree of grinding is indeterminate (as already pointed out, some in fact may be naturally flat edges or crenulation surfaces).

Two kinds of narrow ground edges can be distinguished. One is 'ooyurka'-like in that the flat edge is perpendicular to the adjoining faces (Figure 9.4a). In the other, the flat surface is formed between two convergent faces (Figure 9.4b). Whether these two kinds are functionally related to each other or to 'ooyurkas' as presently defined remains a question for a future study which would of course need to include more use-wear analyses.

Also assigned to this category were two split pebbles whose broken flat surfaces had been ground (Plate 9.18), and several pieces of stone with multiple ground or polished faces. These may have functioned as whetstones and/or polishers, but further analyses would need to be carried out in order to determine this.

9.9 Large flaked artefacts

This category contains chopping tools with flaked edges, some of which may be quarried blanks for ground-edge axes. It also includes some possible ground-edge axes that have damaged or re-worked edges. Several have characteristics already described for ground-edge axes (section 9.3); six have traces of grinding or pecking on the faces, three are grooved and three are waisted (see Plate 9.19). It is not possible to clarify this category further without re-examining the material. However, it is worth noting here that the Irvine Private Collection from South Cairns contains a high proportion of large flaked artefacts, some of them clearly chopping tools (Table 9.1). Many of these were made from a different (unidentified) type of metamorphic rock not represented in other collections, and at least one was waisted.

In addition to chopping tools, there was one waisted non-ground implement (Plate 9.20) similar to the waisted hammers of the Mackay district (Lampert 1983). This one was found near Babinda.

9.10 Small flaked artefacts

As noted earlier, the collections consisted almost entirely of large implements made from local basaltic and metamorphic rocks. Ten smaller artefacts were, however, also included, though most were not from farm collections. Three were flakes (basalt and metamorphic) and were listed as knives in the museum records. Two of these had retouched/used edges.

The other seven small artefacts were made of quartz. Five were from Dunk Island and were probably collected by Banfield (1908) from the same site ('Tool-guy-ah') as his collection of shell fishhooks (illustrated in Plate 3.9). Two of these were identified in the museum catalogue as quartz drills and may have been used to bore holes in shells during fishhook manufacture (see also Roth 1904:33). Another was a steeply retouched scraper-like implement, and the other two were small triangular flaked pieces. A sixth quartz flake was found on a walking track at Lake Barrine. The seventh piece was a core of good quality quartz which was found in a ploughed paddock near Babinda (Figure 9.5).

9.11 Non-artefacts

Twenty-three of the examined items did not appear to me to be artefacts. Many of these were large flat or concave slabs which might have been used as grindstones but which had no visible sign of use-wear or modification. There were stones shaped rather like axes, but which clearly had not been modified, and there were also two stones with central holes which did not appear to have been manufactured.

9.12 Discussion

The most common implements in these collections were ground-edge axes, which constituted over half the items examined. However, no axes were recovered from any of my excavation sites, although a small ground-edge flake and some possible axe fragments were found at Jiyer Cave (Chapter 6, section 6.4.10). 'Ooyurkas' were also not recovered from the excavations, even though the latter were all carried out within the known distribution area for these artefacts. Bevelled pebbles were also missing from the excavated deposits. A fragment of a grooved grindstone ('morah') was found at Mulgrave River 1, but unfortunately not in stratigraphic context (Chapter 7, section 7.10.1). Each of the other artefact types described in this chapter is represented in excavation material (see Table 9.5). However, they are present in quite different proportions, the most striking instance being the quartz artefacts, which by far outnumber all other artefacts in the excavated sites.

There appears to be a major qualitative difference between the two kinds of assemblage (i.e. 'surface' collections and excavated material). Several factors contribute to this apparent difference:

1. Criteria for collecting specimens: all artefacts found in the excavated deposits were collected; however, in the case of the surface collections, artefacts were only collected if they were

recognised as such and if they were thought worth collecting. Small flaked artefacts appear to have been recognised only in rare instances, and they would not have greatly affected agricultural machinery in the first place. There may have been a bias against collecting extremely large and heavy artefacts as well.

2. Area of land from which artefacts were collected: the surface collections were gathered from extensive areas, much larger than the areas which were excavated (no more than a few square metres at each site).
3. Location of sites: the two main excavation sites (Jiyer Cave and Mulgrave River 2) are located in rocky terrain in the foothills of rugged ranges, whilst the majority of the surface collections come from areas currently under cultivation, with flat or undulating terrain and generally rich soils, on both the coastal plain and the Atherton Tableland. This could mean that different resources were exploited in the different areas, requiring different artefact assemblages.

The presence of waisted implements in these collections deserves further discussion. Waisted implements (or waisted axes or blades, the terminology varies) have been recovered from Pleistocene deposits in several sites in New Guinea. The oldest of these are from the

Huon Peninsula, where unifacially flaked waisted tools are estimated to be at least 40,000 years old (Muke 1984; Groube _et_ _al_. 1986:454). At Kosipe, waisted implements have been dated to about 23,000 to 26,000 BP (White _et_ _al_. 1970:167). Most of these have flaked edges, but two are possibly ground, though they are too heavily weathered to be certain. At Yuku (Bulmer 1977) waisted implements, both flaked and ground-edge, have been dated to about 12,000 BP.

It is tempting to draw parallels between these Pleistocene implements from New Guinea and Australian waisted implements, but there is no reason to assume that tools of similar form were contemporaneous or even that they had similar functions. Lampert (1981:78) uses other criteria to associate waisted implements collected as surface finds from Kangaroo Island with the Pleistocene Kartan industry. The only other two parts of Australia where waisted tools have been found are Mackay (McCarthy 1949, 1976; Lampert 1983) and the humid tropics between Cooktown and Ingham.

In neither locality have any been found in stratified contexts. Both regions, however, presently support a predominantly rainforest vegetation. If the waisted tools from North Queensland were used for purposes related to the exploitation of the rainforests, they can be no older than about 9,000 years (see Chapter 2, section 2.6). If they are indicative of intensive exploitation of these regions, they are probably younger still.

The large quantities of stone artefacts found in surface and near-surface situations between Cooktown and Ingham suggests that a significant proportion of them at least (if not all) were discarded relatively recently. Unfortunately none of the unusual and distinctive rainforest artefact types (e.g. 'ooyurkas', 'morahs', or even nutcracking anvils) have yet been found in a stratigraphic context. Those artefacts that have been found in excavated deposits to date are all less than 5,000 years old.

There is clearly a great deal of scope for further investigation into these artefact collections. A more representative sample of private collections might allow the differential distribution of artefact types to be examined, if such variations exist for artefacts other than 'ooyurkas'. It might also be possible to examine the extent to which 'rainforest' artefacts were utilised beyond the rainforest boundary. Cosgrove (1980a) has pioneered the study of raw material sourcing in this region, but much more could be done along these lines. A search for relatively intact sites from which some of the surface collections have been obtained needs to be undertaken. Excavation at such sites might yield evidence which could allow the dating of some of the more distinctive rainforest artefacts (e.g. 'ooyurkas', 'morahs'), which in turn might allow an estimate of the beginnings of intensive exploitation of the rainforest environment. Finally, replication and use-wear experiments (again pioneered in this district by Cosgrove 1980a, 1984) could examine both manufacturing techniques (e.g. 'morahs') and artefact function (e.g. utilised pebbles).

CHAPTER 10

POISONOUS FOOD PLANTS IN NORTHEAST QUEENSLAND

10.1 Introduction

Many species of plants occurring in the North Queensland rainforests are poisonous to a greater or lesser degree, and the Aborigines occupying the region were well aware of their toxic properties. Several poisonous species were used in catching fish, as stated in Chapter 3, section 3.4.5 (see especially Table 3.6; also Roth 1901b:19-20; Hamlyn-Harris and Smith 1916). Other toxic plant species undoubtedly figured in the Aboriginal pharmacopaeia (see again Table 3.6; also Webb 1948, 1960). However, my intent in this chapter is to describe those toxic species used for food and the methods employed to avoid any ill-effects, and to discuss the significance that the use of such plants has for exploitation of the rainforest environment.

Up to this point I have referred to toxic and non-toxic food plants without defining precisely what is meant by these terms, except to imply that toxic plants require some form of processing before they can be eaten safely. In fact, there are different kinds of toxicity and a range of processing techniques. Beck (1985:26-29) distinguished between plants that are toxic (i.e. contain substances that cause harmful effects or death), those that are unpalatable (i.e. have unpleasant tastes or odours that do not appear to be particularly deleterious) and those that are indigestible (i.e. are hard or ligneous and may damage the digestive system mechanically). She used the term 'noxious' to cover all three types of effects. My interest is mainly in those plants containing harmful toxic substances. However, a single species may be unpalatable and indigestible as well as toxic, and it is not always easy to distinguish between the different effects. The following discussion therefore incorporates a wider range of plants than simply the dangerously toxic.

10.2 Noxious food plants

The greater proportion of species in Table 3.5 (83 out of 124) are not known to contain toxic substances (e.g. see Beck 1985:Appendix 1). Several species reportedly contain toxic substances yet were apparently eaten raw by Aborigines (Table 10.1), such as the kernels of Hicksbeachia pinnatifolia which give a positive reaction for hydrocyanic acid (HCN). In some instances, a toxin may be present, but not in the part eaten. For example, the cocky apple (Planchonia careya) provides edible fruit, but the bark and roots supply a fish poison (Tables 3.5, 3.6; see also Beck 1985:68). In other species, the toxin may only be present in small amounts, or not take effect unless large quantities of the plant product are ingested.

This is probably also the case with some or all of the species in Table 10.2, which were reportedly eaten either raw or roasted. The candlenut (Aleurites moluccana) is generally eaten raw only in small quantities, large amounts causing purging. Roasting apparently renders the nut innocuous, though the mechanism of this effect is unknown (as with most of the rainforest species, no experimental toxicity studies, either before or after treatment, have been undertaken so far). The high fat content of the candlenut is markedly reduced after treatment (see Table 10.6), and this may be a factor in removing the purgative effect of eating too many raw nuts. The finger cherry (Rhodomyrtus macrocarpa) is reported to cause blindness on some occasions, possibly when eaten before it is fully ripe (Cribb and Cribb 1975:53; see also Johnstone 1904:50).

Some food plants, particularly underground rhizomes or roots, were subjected to a process of alternate roasting and pounding, which served to break down the indigestible fibrous portions and possibly assisted in releasing the starch content. Although these are clearly examples of Beck's category of 'indigestible plants', some species are reported to contain toxic substances (see Table 10.3). Ingestion of raw cunjevoi (Alocasia macrorrhiza) produces a burning sensation in the mouth, followed by swelling of affected parts, intense pain and gastric irritation (Jackes 1981:10). Some of these symptoms can be attributed to the calcium oxalate crystals present in the plant, but the more severe effects are probably due to additional substances (Everist 1974).

The species listed in Table 10.4 are those which require more complex processing methods, involving washing or leaching in water. Most are known to contain toxic substances, and many have quite severe effects (illness or even death) if eaten without sufficient treatment. Douglas and his party discovered this the hard way when they ran out of food while attempting to find a way from Herberton down to the coast at Innisfail.

> Just below ... some blacks were camped. We rushed the camp to get any food, but they heard us, and had cleared out, leaving only some half-cooked nuts in the camp.... Advised Redman and McLennan not to eat any of the nuts, but it appears they did, for about 9pm heard them and two of the troopers vomiting fearfully and rolling about in great agony, evidently poisoned (Douglas 1882:May 11).

Whether from starvation or from the poisoning, Redman was still "very bad" nearly a fortnight later (Douglas 1882:May 22). Other examples of early explorers experiencing the adverse effects of toxic food plants are given by Beaton (1977:142-146).

There have been relatively few studies of the noxious properties of the species in Table 10.4. The severe toxicity of most cycads is well established (e.g. see Beaton 1977, 1982 and references; also Beck 1985), and the primary toxins have been identified as azoxyglycosides in which the azoxy component is methylazoxymethanol (MAM). Ingestion produces gastrointestinal and liver injury, disorders of the central nervous system and death. Less is known of the two species restricted to the northeast Queensland rainforests, Bowenia spectabilis and Lepidozamia hopei, but the former at least is poisonous to stock, and both probably contain similar toxins to other cycad genera (see Beaton 1977:158).

The noxious principles of 'cheeky' yams have also been studied (see Beck 1985:115-120), though little was known about Australian species until recently. In Australia, Dioscorea bulbifera var. bulbifera does not appear to be acutely toxic and is lacking in dioscorine, a toxic alkaloid isolated from other, non-Australian species of Dioscorea (Webster et al. 1984). However, diosbulbins (bitter-tasting terpenoids) have been found to be present, and these are destroyed or removed by a processing treatment which includes leaching.

Tacca leontopetaloides does not appear to contain toxins, though one test for alkaloids gave a doubtful positive result (see Table 10.4). The processing methods recorded for this plant in North Queensland are diverse (see Appendix D), and only some incorporate washing in water. The procedures are probably designed to treat for the presence of indigestible substances, since all of them include either mashing, pounding or grating.

The two mangrove species which were eaten (Avicennia marina and Bruguiera gymnorhiza) contain tannins, which are very bitter and toxic in large quantities.

Little is known about the toxic substances in most of the rainforest species in Table 10.4, and as pointed out above few studies have been undertaken. An exception is the black bean or Moreton Bay chestnut (Castanospermum australe) which has been found to contain the alkaloid castanospermine (Hohenschutz et al. 1981). Even the occurrence of toxicity in some species has been difficult to ascertain from the early literature, partly owing to problems of identification and partly to inadequate recording of processing techniques. Thus, black walnut (Endiandra palmerstonii) was recorded by Roth (1901b:11) as poisonous, requiring to be leached, and by Palmerston (1885-6:242) as only needing to be roasted. The toxicity of black pine (Podocarpus amarus) is similarly not made clear in the early literature (see Appendix D, and section 10.3 below).

10.3 Food processing methods

A range of techniques can be used to reduce or eliminate the effects of the noxious substances referred to above, ranging from simply selecting a part of the plant which does not produce ill-effects (e.g. Planchonia careya), to heating (e.g. Aleurites moluccana), to more complex procedures which result in the destruction or removal of the noxious substances. Some of these complex techniques are described below (see also Appendix D). However, as mentioned in the preceding section, there are conflicting accounts, and not all sources can be regarded as equally reliable. Many of the descriptions may in fact be second-hand. Most of the food plant preparation was done by the women, and the male observers of another society may have had only limited opportunities to record their methods. Current ethnobotanical research by Bob Dixon (Linguistics Department, Australian National University) and Tony Irvine (Division of Forest Research, Commonwealth Scientific and Industrial Research Organisation, Atherton) will surely clear up much of the confusion.

10.3.1 Alternate roasting and pounding

This technique was used on the six species listed in Table 10.3. Roth (1901b) gives few details of the procedure for these particular plants, though he says that Cayratia (Vitis) clematidea was pounded between stones (1901b:16). The technique is widely used elsewhere on the tuberous rhizomes or roots of a number of species (e.g. Blechnum orientale, Hibiscus brachysiphonius, H. rhodopetalus, Ipomoea uniflora, Scirpus littoralis, Typhonium angustilobium and T. brownii in various parts of Cape York Peninsula, see Roth 1901b), and the process has been described in more detail for some of these, e.g.:

> [Tubers of Typhonium brownii] are roasted for a minute or two on the ashes, then pounded between two stones, roasted again and pounded, and so alternately for a good ten minutes or more until they come out finally of the consistency of a piece of indiarubber (Roth 1901b:16).

Blechnum indicum was also eaten in southern Queensland, where it was processed by pounding either between stones or with a sharp stone on a wooden anvil (e.g. see Petrie 1904:92). In the Moreton Bay region a distinctive tool-type associated with this latter process has been described (Gillieson and Hall 1982), but equivalent artefacts have not been recognised in North Queensland (see Chapter 9, section 9.6).

10.3.2 Washing and leaching

The plants in Table 10.4 were almost invariably subjected to treatment procedures which included washing in water (see Table 10.5, also Appendix D). There are two main variations on the use of water for food plant processing recorded in this district, namely washing in fixed quantities of water and leaching in running water. A third method, fermentation (prolonged soaking in water), was used for cycads in other regions (see Beaton 1977; Smith 1982; Beck 1985), but this technique has not been recorded for the rainforest district of northeast Queensland. In fact a range of techniques has been described for processing cycads (Meehan and Jones in Beaton 1977:Appendix IV; Beck 1985:187-190), but these are not utilised for other toxic plants and are not relevant here. In recent times, boiling has sometimes been adopted as a substitute for roasting, washing and even leaching in less toxic species such as Dioscorea bulbifera (see Hale and Tindale 1933:113), but the more toxic species must still be leached.

Both washing and leaching generally involved preliminary cooking, the exceptions being some methods of preparing Tacca leontopetaloides, and Carron's (1849) account of the preparation of black bean (Castanospermum australe), which differs in a number of ways from that of later sources (see Appendix D). The cooked product was then divested of its shell or skin where this was necessary, and ground, sliced or (for Tacca leontopetaloides in Cape York Peninsula) grated. Sometimes nut kernels were removed from the shell prior to the initial cooking. Grinding was done between two stones (e.g. Palmerston 1885-6:243). Slicing was done either with a sharp shell (e.g. at Atherton, see Roth 1901b:10) or with a specially prepared snail-shell slicer reportedly used only in the Tully River district and neighbouring islands (Roth 1904:21; Banfield 1908:176). The choice of slicing or grinding appears to have been a cultural preference, but may have been influenced by factors such as the size of the seeds or kernels and the availability of suitable stones or shells.

Washing involved placing the prepared plant part in a container and rinsing it in freshwater one or more times. Sometimes the material was contained in a woven bag which could be squeezed to remove the water (e.g. Avicennia marina in Roth 1901b:9). Another method was to allow the material to settle and then to decant the surface water (e.g. Bruguiera gymnorhiza and Dioscorea bulbifera in Roth 1901b:10-12). Washing appears to have been used mainly with those species containing bitter substances rather than dangerously toxic ones, and was reportedly more prevalent in the Bloomfield River district and other parts of Cape York Peninsula than in the main part of the rainforest district.

Leaching is clearly a technique most suitable for a region with abundant supplies of running water. The prepared plant is put in a fine-woven basket made from lawyer-cane (Calamus sp.) which is then placed in a flowing creek. When Cycas media is prepared, a stream of water is directed into the bag to make certain that water is continuously flowing through it. The bag is generally kept in the creek overnight and sometimes for longer.

Some of the methods described in Appendix D refer to a period of soaking, but it is not usually clear whether the material is soaked in standing or running water. Some techniques incorporate a period of drying, and sometimes the final washed or soaked product is recooked.

As Appendix D indicates, a single species may apparently be successfully treated with one of a range of procedures. In some instances the variations in methods are slight, but others are markedly different. This diversity of methods may be in part at least the result of inaccurate or incomplete observations, as mentioned above. In the case of Endiandra palmerstonii, it appears that roasting is sufficient treatment, as stated by Palmerston, but that the nuts may also be leached (A. Irvine, pers.comm.). Similarly, although the elaborate preparations methods described for Podocarpus amarus by Roth (1901b:15) and Dixon (1977:10) do not appear to include leaching, the kernels are indeed toxic and must be so treated.

In Johnstone's (1904) memoirs it is not always clear when he is drawing upon his own or others' experiences and when he is citing Roth. Forster (in Johnstone 1904) describes an extra phase of soaking for Castanospermum australe, but omits to specify whether running water was used. At the time (1873) he had just escaped the _Maria_ shipwreck, and was dependent on local Aborigines (near Bramston Beach) for sustenance. Carron's account of the treatment of the same plant is quite different from that of Roth (1901b:10) for the same region (Tully district), and includes a method of baking on a stone grill which is not recorded elsewhere. Did customs change so much in the intervening decades or are Carron's observations in fact unreliable? We may never know.

10.4 Distribution of toxic food plants of northeast Queensland

Not all of the plants listed in Table 10.4 are rainforest species. _Cycas media_, for instance, grows amongst sclerophyll forest in the drier areas, and is common in the upper part of the Mulgrave River valley and in the Bloomfield district. The genus is also widespread across northern Australia, and other cycad genera occur elsewhere in Australia and throughout the tropical regions of the world. _Tacca leontopetaloides_ is also found in sclerophyll forests and is widespread in the tropics. The two mangrove species referred to above, _Avicennia marina_ and _Bruguiera gymnorhiza_, similarly have a world-wide tropical distribution.

Most of the species in Table 10.4 do however prefer rainforest habitats. 'Cheeky' yams (_Dioscorea bulbifera_) and matchbox bean (_Entada phaseoloides_) occur across northern Australia, generally in the drier rainforests. Noxious species of Dioscorea also occur in other regions of the world, and matchbox bean is found in Southeast Asia and the Pacific.

The other plants in Table 10.4 are restricted in their distribution to the rainforests of eastern Australia. Yellow walnut (Beilschmiedia bancroftii), black walnut (Endiandra palmerstonii), black pine (Podocarpus amarus), Macadamia whelanii, Lepidozamia hopei and Bowenia spectabilis are all found only in northeast Queensland (see Table 10.4). Black bean or Moreton Bay chestnut (Castanospermum australe) and hairy walnut (Endiandra pubens) have somewhat wider distributions, also occurring in southeast Queensland and northern New South Wales. However, only the first of these is known to have been utilised by southern Aborigines. Thus the majority of toxic plant species used for food in the rainforest district of northeast Queensland are to be found only in that district.

10.5 Dietary importance of toxic species

Beck (1985:71-74, Appendix 1) listed 691 species of plants eaten in Australia. Some form of processing was invariably applied to 307 of these, but complex processing (defined as any procedure taking over half a day, but generally incorporating leaching; see Beck 1985:67) was applied to only 22 species (or 3.2% of the total). In the rainforest district of North

Queensland, 124 species of food plants have been recorded (see Table 3.5). At least fifteen (or 12%) of these were subjected to complex processing techniques involving washing or leaching (Table 10.4). A direct comparison between percentages from these two lists is not entirely valid, since Beck's (1985) Appendix 1 lists Endiandra insignis and Endiandra pubens as two species, omits Podocarpus amarus, and does not record Bowenia spectabilis, Lepidozamia hopei and Prunus turnerana as requiring complex processing. Nevertheless, it seems clear that a much higher proportion of toxic plants was utilised for food in the tropical rainforest district than elsewhere in Australia.

Where the species in Table 10.4 were eaten, they were frequently important components in Aboriginal diets. The main nutritional value of these plants is as a source of carbohydrate, though some also supply small amounts of protein and fat (see Table 10.6). It is, in fact, unlikely that such time-consuming procedures would be employed unless the returns were correspondingly high.

The use of cycads as a staple (i.e. forming an important component of the diet for at least part of the year) has been recorded in Arnhem Land, on the coast of Western Australia, the south coast of New South Wales (in winter) and the central east coast of

Australia as well as in North Queensland (Beaton 1977:164; see also Beck 1985:182). Since cycads can produce fruit in great abundance, they were frequently exploited as integral parts of large ceremonies, and Beaton has given the term 'communion' food to this kind of use (Beaton 1977:165; see also Meehan and Jones in Beaton 1977:Appendix IV).

In some areas, such as Cape York Peninsula, mangroves (in particular _Avicennia marina_ and _Bruguiera gymnorhiza_) were major sources of food in the wet season (Thomson 1939:215; Moore 1979:19). Some sources suggest that they were only used when other foods were scarce, e.g.

> They resort to that sort of food during the wet season when precluded from searching for any other (Thozet 1866 for Cape Cleveland near Townsville).

However, this is misleading and probably reflects European tastes. At Princess Charlotte Bay, mangroves

> were eaten with evident enjoyment when other food is scarce (Hale and Tindale 1933:113).

Tacca leontopetaloides was also a major food in other regions, e.g. Cape York Peninsula (Thomson 1939:215). However, occurrence of a species in a region does not necessarily mean it was used for food there. For instance, neither mangroves nor _T. leontopetaloides_ were eaten on Groote Eylandt (Levitt 1981).

'Cheeky' yams (_Diosocorea bulbifera_) were widely eaten in Australia, and were often used as a staple food, e.g. in Arnhem Land (Levitt 1981:136; Beck 1985:121) and Cape York Peninsula (Thomson 1939).

In northeast Queensland the toxic food plants were major dietary components as well, though it is uncertain how important species such as the mangroves and 'cheeky' yams were to Aborigines in the rainforest district. It is clear from early sources, however, that the use of several of those plants requiring complex processing was an everyday occurrence for large portions of the year:

> Kadjera [Cycas media] constitutes during this season of the year, from October to December, the principal food of the blacks, tobola [probably Podocarpus amarus] and koraddan [Pothos longipes], other fruits, being what they chiefly live upon from January to March (Lumholtz 1889:181 for the Herbert River district).

> I found these blacks living through the wet season almost exclusively on two kinds of nut, "Cankkee" [Beilschmiedia bancroftii] and "Tekkel" [Endiandra palmerstonii] .... The Morton [sic] Bay chestnut, called there "Bindee", is more extensively used for food than in any other locality known in all my experience (Meston 1904:6 for the Bellenden-Ker Range).

> ...a pine [Podocarpus amarus] which furnished them with an abundant supply of food (Bailey in Meston 1904:16).

Many of these species may be available for a number of months (see Table 10.7) and often yield large quantities in season, as other early sources imply, e.g.:

> Clambering ... up to one's ankles in crackling nut shells (Palmerston 1883:November 10).

> I believe there was a hundredweight of newly

> crushed meal heaped up (Palmerston 1883:December 26).

Underground tubers also occurred in quantity in certain localities:

> These Tara [sic; probably Alocasia macrorrhiza, possibly Colocasia sp.] beds were here and there grubbed up over considerable patches by the blacks (Dalrymple 1874:628 for the Johnstone River).

Non-toxic plants such as the Johnstone River almond (Elaeocarpus bancroftii) were also important in rainforest diet.

> The almond [Eleaocarpus bancroftii] forms one of the principal articles of food for the blacks, and as it ripens in the wet season is highly prized by them (Johnstone 1904:48).

The main advantage of toxic or noxious food plants is that, once techniques to render them edible are available, greater quantities of food can be extracted from a given area than would otherwise be the case. If the species requiring processing are available at times when little other food is available, they could increase the 'carrying capacity' of the land, and allow a larger population to be supported through the lean time.

If the plants produce in large quantities, they can be used to provide food for relatively large groups of people as long as the supply lasts, and thus may be regarded as a 'communion' food as described by Beaton (1977). If the plants also continue to yield for a considerable length of time, they may become staples.

Management techniques may increase either the yield or the duration of the season. As Beaton (1977) has demonstrated, cycads can be managed by fire so as to increase the yield of fruit by synchronising the production of several trees.

Some plant products also lend themselves to storage, such as the black pine (Podocarpus amarus) in the rainforest district, which as noted previously was processed and "stored away for the winter" (Mjoberg 1925:16). Storage techniques such as burying in sand were used for a number of processed foods in the district (G. Davis, pers.comm.), although it is not clear how long food thus stored could be preserved. The hard shell of many of the rainforest nuts meant that storage of unprocessed material was also possible, though rats and other animals no doubt competed with the Aborigines for the nuts.

The species in Table 10.4 were not exploited to the same degree in every part of the rainforests (see Table 10.8), though where evidence of use is absent, it is difficult to know whether this is merely because it was never recorded. For instance, compare the two lists of species recorded for the Tully district in Table 10.8, and note that Roth (1901b:9) stated:

> The aboriginal names are those applied in the different localities where they have been collected, and do not necessarily imply that such and such a plant is used as food, or met with, only in the particular district or districts

mentioned.

In part, the variations in utilisation were undoubtedly influenced by the distribution of the different species, as well as by the availability of other less toxic food plants. Nevertheless, cultural preferences also operated. Thus in the Bloomfield River district, Castanospermum australe and Entada phaseoloides were apparently "not relished" (Roth 1901b:10,12; see also Appendix D). The latter species was also unpopular further north but was used as a standby (Thomson 1939).

In the Tully area, however, black bean (Castanospermum australe) was (and still is) a favoured food (A. Duke, pers.comm.), but Entada phaseoloides and Macadamia whelanii were apparently not regarded as edible, though they occur in the district. In the Djirbal languages spoken in this area, edible plants are distinguished by the use of the definite article 'balam', which is not used with the names for these two species (R.M.W. Dixon and A. Irvine, pers.comm.). Another plant not exploited throughout its range was the candlenut (Aleurites moluccana), which was apparently eaten on the coast, but not on the Tableland.

The use of toxic species to expand the diet can be seen as a form of intensification, i.e. the exploitation of new resources (Lourandos 1983:81), enabling more intensive use of certain environments. Lourandos regards rainforests themselves as marginal environments, the exploitation of which is another form of intensification (1983:81). However, while this may be true for the temperate rainforests of southern New South Wales, Victoria and Tasmania (see also Horsfall 1984b, reproduced here as Appendix C), the tropical rainforests of northern Queensland (and probably also the sub-tropical rainforests of southern Queensland and northern New South Wales) have most likely always been important resource zones.

Nonetheless, without the exploitation of toxic plants, it is unlikely that the northeast Queensland rainforests could have been inhabitated to the extent that they were at contact. Thus, the rainforest societies were dependent on the use of toxic plants (see also Harris 1978), possibly much more so than other Aboriginal societies which did not use toxic plants to the same extent.

If the use of toxic food plants is a form of intensification, the next question is when did this transformation occur? How long ago were the techniques for processing noxious plants adopted in the northeast Queensland rainforests, were they invented locally, introduced in recent millennia or brought with the first Aboriginal colonists, and when did they become everyday techniques? The next chapter deals with these topics.

CHAPTER 11

FOOD PLANT PROCESSING IN PREHISTORY

11.1 Introduction

The investigation of food plant processing in prehistory requires that either remains of the plants themselves or artefacts that can be associated with processing techniques be recovered from archaeological deposits in a datable context. Neither of these two kinds of evidence is readily found. Material of organic origin, especially soft plant parts, does not generally preserve well, though there are notable exceptions, even from early Paleolithic sites (e.g. in the Acheulian floor VI at Kalambo Falls in Africa, White 1969:216). Stone or ceramic artefacts, on the other hand, are more likely to be recovered from excavated sites, but their use in the processing of food plants cannot always be determined with any certainty.

In this chapter I deal with the evidence for prehistoric processing of food plants in Australia (section 11.2), and then I go on to describe some of the evidence from other countries (section 11.3). Although my interest is focussed on toxic food plants, reference will also be made to food plants that are processed in order to deal with indigestible or unpalatable substances. As stated in the previous chapter, it is not always possible to draw a clear distinction between these. The final section of the chapter (11.4) speculates on the origins of food processing techniques.

11.2 Antiquity of food processing in Australia

Evidence for the use of toxic food plants in Australian prehistory was, until this project, restricted to the cycads. The husks of cycad seeds are relatively resistant to decay, and their remains have been found in several archaeological sites in various parts of Australia. The oldest such remains appear to be nuts and kernels of Macrozamia ridlei found in a prehistoric pit excavated at Cheetup Rockshelter in southern Western Australia, the pit itself having been sealed by material dated at about 13,000 BP (Smith 1982:119). The archaeological finds conform to post-contact descriptions of the use of cycads in the region, where it appears that the outer flesh surrounding the husk was eaten, not the kernel contained in the husk, as is the case in northern Australia (Smith 1982:119; see also Beaton 1977:155-159 for a discussion on the variation in toxicity between different plant parts). The treatment of the fruit was, however, similar to that used for processing kernels (see Chapter 10, section 10.3.2), and included soaking in still water or long term burial (Smith 1982:119).

Prior to the discovery of these late Pleistocene cycad remains, the topic of cycad use in Australian prehistory had been thoroughly addressed by John Beaton (1977, 1982; see also comments above in Chapter 10). He excavated three rockshelters in the central Queensland highlands (Rainbow Cave, Wanderer's Cave and Cathedral Cave), the oldest dating back to about 4300 BP. Remains of the cycad *Macrozamia moorei* were found in large quantities in all three sites. Earlier archaeological research at two other nearby sites (Kenniff Cave and The Tombs; see Mulvaney and Joyce 1965; Mulvaney 1975) had shown that prehistoric occupation of the region began at least 19,000 years ago, and had documented a comparatively abrupt technological change at around 5000 to 3500 BP (i.e. the appearance of the Small Tool Tradition). *Macrozamia hopei* remains had been found in the upper levels of both sites, dating from about 3000 BP. Cycad remains have also been recovered from other excavated sites in the Northern Territory and New South Wales, in deposits dated within the last few thousand years (e.g. see Beaton 1977:197; Smith 1982:Table 1).

Beaton's sites were comparable to the upper levels of the Kenniff/Tombs sequence, with similarities in age, stone tool assemblages and the presence of cycad remains. Beaton saw a correlation between the presence of cycads in these sites, "a significant increase in the amount of late archaeological material being deposited" (1977:192) and the introduction of the Small Tool Tradition. However, he dismissed the hypothesis that cycads might have been exploited at these sites in a mundane manner, as an additional source of food at a possibly lean time of the year. Rather, he suggested that the cycads were used to support "unusually large gatherings of Aborigines" (1977:194), and he therefore hypothesised that they could be regarded as a 'communion food' in this context. From the data available at the time, he concluded that the adoption of a "Basic Leaching Technology" might be quite recent in Australia, and might be associated with the appearance of the Small Tool Tradition (1982:56-57).

> It is very likely that the technology arrived in Australia complete, with all the necessary subtleties of leaching and fermenting well under control (1977:201).
>
> It is certain that the technology arrived in Australia some four and one half thousand years ago in nearly the same form in which it is applied today (1977:202).

However, the excavation of cycad husks apparently dated to more than 13,000 BP in Western Australia (see above) indicates that Beaton's proposal may need to be re-examined.

In the present study, remains of toxic food plants and stone artefacts possibly related to their processing treatment have been recovered from archaeological sites in the rainforests of northeast Queensland. The plant remains consist of hard-shelled nuts, which like cycad husks are more likely to be preserved than softer plant parts. Unfortunately, climatic and soil conditions would seem to have partly negated this potential, and nutshells recovered from my excavations exhibit rapid weathering with increasing depth, making identification of the fragments difficult (see Chapter 4, section 4.6.2). Nutshells identified as belonging to toxic species have been found in deposits dated to about 2000 BP (Chapter 7, section 7.11), and some nutshell fragments are possibly as old as 4000 BP (Chapter 6, section 6.4.4), though it is not certain that these latter belonged to toxic species.

Several types of stone artefacts may be associated with the processing techniques used in the rainforest district, including grindstones and pebble topstones, though it cannot be assumed that these were used solely for toxic species. Likewise, the typical nut-cracking anvils (see Chapter 9, section 9.5) are likely to be associated mainly with the thick-shelled edible nut Elaeocarpus bancroftii, rather than with the thinner-shelled toxic and unpalatable species. The oldest artefacts possibly associated with food processing in this area were two pebble fragments with 'smoothing' use-wear (Chapter 6, section 6.4.10), found in deposits about 4000 years old. Two grindstones were found at levels dated to about 3000 BP, one of which had clearly been used for ochre. Other grindstones with carefully prepared surfaces were dated at less than 1000 years old. There is also an increase in the deposition of quartz artefacts at about 1000 years ago, but whether this is associated with the use of toxic food plants is not clear (see discussion in Chapter 12, section 12.2.3).

11.3 Antiquity of food processing in other countries

As noted in Chapter 10, a number of the species and genera eaten after processing in northeast Queensland occur (and were often eaten) in other regions of Australia. Many of these are also found in other countries, especially in Southeast Asia (Table 11.1; see also Burkill 1935; Barrau n.d.; Golson 1971). The processing methods used to produce edible products from these plants are similar to those already described for North Queensland, with the addition of boiling in a number of cases, often in several changes of water.

The following examples are drawn from Burkill (1935). In Sulawesi (Celebes), seeds of one mangrove (Avicennia) were boiled and soaked in water for a fortnight to remove acridity. Radicles of another mangrove (Bruguiera) were cooked, soaked all night and then eaten. In Guam, cycad seeds (Cycas circinalis) were pounded and soaked in several changes of water, then ground and baked. In Indonesia, seeds of Entada phaseoloides were roasted until the skins burst and then eaten, or roasted seeds were soaked for 24 hours and then boiled. More examples can be found in Burkill

(1935), as well as in Whiting (1963), Monsalud *et al*.(1966), Beaton (1977:Tables 50,51) and Beck (1985). As was noted in the previous chapter, it is not always easy to determine which plants underwent complex processing from the often rather brief descriptions of food preparation given in many sources.

Additional toxic and otherwise noxious species also occur and were utilised for food in other countries, and again similar techniques were generally used to extract the food from them. In New Zealand, seeds of *Corynocarpus laevigatus* were a major food, undergoing a process of steaming and leaching in running water (Crowe 1981), or being placed in still water for three weeks (Best 1942). Two other species (*Elaeocarpus dentatus* and *Beilschmiedia tawa*) were also given complex treatment, though it is not clear whether these were toxic. Seeds of *Pangium edule*, eaten in Southeast Asia and New Guinea, were cooked, chopped up and placed in a bag, leached in running water for 12 hours and finally cooked again (Henty 1980; see also Monsalud *et al*.1966). There are many other toxic plants which were used for food, but the best known are probably acorns (from oak trees, *Quercus* spp.) in Europe and North America, and bitter manioc or cassava (*Manihot esculenta*) in South America.

Oak trees (*Quercus* spp.) occur in temperate and sub-tropical regions of all the continents except

Australia. In California acorns were used as a staple food, after complex treatment involving soaking, leaching or long-tèrm burial to remove unpalatable and indigestible tannins (see Kroeber 1953). Acorns were similarly treated and eaten elsewhere in North America, but they do not appear to have been staples in these places. In Europe acorn flour was still used quite recently, especially in times of famine (Clark 1954:59), although boiling was apparently substituted for leaching. Some have argued that such use implies that acorns provided human food in prehistoric times (e.g. see again Clark 1954:59), and oak trees were certainly dominant in the European forests of late Mesolithic times .

Bitter manioc or cassava (<u>Manihot esculenta</u>) appears to have originated in lowland South America, where it is now cultivated as a root crop (Renvoize 1972). There are two kinds of manioc, bitter and sweet. Both kinds contain cyanogens (producing hydrocyanic acid, HCN), but whereas in sweet manioc these occur mainly in the outer skin of the root which can be peeled and discarded, in the bitter varieties the cyanogens occur throughout the roots (Rogers 1963). Where bitter manioc is cultivated, it is the major source of carbohydrate and a preferred food, while sweet manioc is generally of secondary importance as a contributor of carbohydrate (Rogers 1965). Hydrocyanic acid in small quantities can be expelled by heat, and so for sweet manioc this is a sufficient method of treatment. However, bitter manioc requires a more complex type of processing, and one which is quite different from most other detoxifying methods.

> The aboriginal treatment was first to shred the root into a pulp on a board studded with stones or thorns or against a roughened pottery slab. The juices were then squeezed from the pulp, the most typical device for this purpose being a long basketry cylinder, known as a tipiti, one end of which was suspended from overhead while the other was attached to a lever which, when pressed downward, elongated the basket, narrowed its diameter, and compressed the pulp. After this the pulp was either toasted in the native form of cakes, known as beiju, or dried to form farinha.... The cakes and flour could be stored or consumed at once (Steward and Faran 1959:293).

A large flat circular pottery griddle with a sharply raised rim was commonly used for toasting or drying the squeezed pulp (Reichel-Dolmatoff 1965).

Little is known about the antiquity of most noxious plants as foods. Remains of several potentially toxic genera, including Aleurites, have been identifed in deposits from Spirit Cave in Thailand, dated at about 7600 to 11,500 BP (Gorman 1970). The remains of acorns have been found in several archaeological sites in Europe and the Middle East, including Neolithic sites in Greece (Clark 1954:60) and Jarmo in Iraq, the last dated to about 9000 BP (Helbaek 1960:102).

Direct evidence for the prehistoric use of manioc has been provided by the presence of stem tissues of Manihot esculenta in coprolites from the Tehuacan valley in Mexico, dating back to 2900 to 2200 BP (Callen 1967:286-288; see also Lathrap 1970:55-56). These plant remains provide the oldest Mesoamerican evidence for the use of M. esculenta, although the plant was presumably originally introduced from South America (see also Bray 1977). Fragments of the pottery griddles associated with the processing of bitter manioc have been recovered from Momil I in northern Columbia aged around 2700 BP, together with many small splinters of flint, similar to those set into wooden grating boards for grating bitter manioc (Reichel-Dolmatoff 1965). Pottery griddle fragments, possibly as old as 4800 BP, have also been found at Rancho Peludo in Venezuela (Rouse and Cruxent 1963:49; Lathrap 1970:56). Renvoize (1972:354) provides a maximum age of 7000 BP for these fragments, and points out that

> Although the positive correlation between the presence of griddles and manioc is justified, their absence need not necessarily preclude the crop, because preparation methods exist even for bitter manioc where no griddle is used....cultivated manioc ... may have been present at an even earlier date than the evidence suggests.

In fact Lathrap (1970:57) suggested that cultivation of manioc may date back to about 7000 to 9000 BP, which would place its use as a wild plant even earlier. However, there are indications that bitter manioc was developed from an originally sweet variety (Lathrap 1970:51).

11.4 Discussion

The preceding section has provided evidence of the widespread occurrence of washing and leaching methods of treating toxic and/or unpalatable plant foods. There are also indications that the antiquity of these methods in other countries may be considerable, possibly even predating the cultivation of plants. Certainly the 13,000 year old cycad remains from Western Australia are among the oldest in the world.

Nevertheless, the knowledge and use of such techniques does not necessarily imply their exploitation on a large scale. Neither does the kind of intensive utilisation of toxic plants that has been documented in the archaeological record of central and northeast Queensland need to be seen as the first manifestation of such techniques in these regions.

Beaton's (1982:57) strictures about casual experimentation with cycads are correct. But it is simple to envisage the occasional use of unpalatable plants such as mangroves or acorns, and some experimental washing to remove the bitterness. Fermentation and leaching could be seen as extensions of washing, the first where water is relatively scarce or the storage possibilities implicit in the method are required, the second where sufficient water is available to avoid the need for repeated washings by hand. However, the 'how' of processing technology is less important than the 'why'.

Many of the toxic food plants referred to in this discussion, both for North Queensland and elsewhere, were used as staples for at least part of the year, probably because they would have been good sources of carbohydrates, and therefore of energy. Most also display one or more of the following characteristics:

1. They often occur in abundance;
2. Many of them are available for extended periods;
3. Storage is often possible (either untreated or after processing);
4. Some are available at times of the year when non-toxic food plants are in short supply.

These characteristics help to explain why the effort of preparing food from toxic plants (and in the case of cycads at least, the risk as well) was seen to be worthwhile by the peoples who utilised them. The use of toxic plants for food entailed a more intensive exploitation of the environment, and also permitted a larger population to be supported in a particular area than would otherwise have been the case.

As food, toxic plants may have been utilised for millennia. Who originated the techniques and how did they spread? Three hypotheses can be put forward regarding the origins of complex processing techniques:

1. One can suppose that methods of removing dangerous or unpalatable substances are easily developed and were frequently 'invented' (similarities between leaching and the use of fish poisons have been noted, e.g. Lathrap 1970:50). If this was the case, then it would appear to be fortuitious that similar processing methods were used in widely separated regions.

2. Alternatively, it may be that the technique was only 'invented' once and the knowledge was subsequently diffused around the world. In this case one can speculate on when the technique was developed.

   (a) Was it early enough so that, like cooking, it was part of everyone's 'cultural baggage', and if so, how was the knowledge of the technique transmitted at times when it was not necessary for survival?

   (b) If it was a relatively late development, what were the mechanisms which enabled the spread (and the acceptance) of the knowledge around the world?

It is not my intention here to choose between or elaborate upon these hypotheses, but I see no reason why some form of the washing/leaching technique could not have been known and used in Australia since the time when the first colonists arrived from Southeast Asia. After all, as Golson (1971) shows, many plant species (toxic, unpalatable, indigestible and innocuous) are the same in both regions, and would have been familiar to the early migrants. However, intensive utilisation of toxic plants may have developed much later in time, as and when required. The data from central Queensland suggests that this 'intensification' was about 4500 years ago. In northeast Queensland, many of the toxic food plants utilised are restricted to rainforest habitats and only occur in this district, and thus their exploitation probably post-dates the expansion of the rainforests from 9000 BP. Intensive utilisation is probably more recent, and this topic is discussed in the following (and final) chapter.

CHAPTER 12

CONCLUSION AND SUMMARY

12.1 Antiquity of rainforest sites

As stated in Chapter 1 (section 1.4), a primary aim of this study was to investigate the antiquity of human occupation of the northeast Queensland rainforests. Prior to my research, the oldest date for a tropical rainforest site in Australia was 700 BP at Kennedy A (Brayshaw 1977), with the next oldest a date of 200 BP from Jiyer Cave (Campbell 1982a), neither sample from the base of the deposits. Middens on Hinchinbrook Island (within the broader tropical rainforest district) had, however, been found to be as old as 2000 BP (Campbell 1982a).

The results presented in this thesis have greatly extended the known age of tropical rainforest occupation in Australia. Cultural deposits from the base of Jiyer Cave have been dated to 5100 BP, and one of the open sites examined, Mulgrave River 2, has been shown to have been first occupied by 2700 BP. Both of these sites continued to be occupied until well into the post-contact era, as evidenced by the presence of European materials such as glass and metal in the upper levels of each. A third site, Bramston Beach Midden 1, appeared to have been occupied more recently and for a much shorter time span, between 700 and 500 BP approximately.

These results do not support theories of Pleistocene occupation of the district. There are, however, other indications that occupation of the region may be much older than suggested by the excavated deposits (see Chapter 2, section 2.6). Firstly, analysis of the sediments in Lynch's Crater has revealed an increase in the deposition of charcoal from 38,000 BP that may be partly due to Aboriginal firing strategies (Kershaw 1978:160, 1986:48-49). Secondly, there is the story recorded by Dixon (1972:29) apparently describing volcanic eruptions at three centres (now Lakes Barrine, Eacham and Euramoo), which would seem to indicate that people were occupying the Atherton Tableland around 10,000 to 20,000 years ago.

Moreover, archaeological research in nearby regions has revealed that Aborigines were living at Walkunder Arch Cave near Chillagoe, 140 km to the west of the study area, by 19,000 BP (Campbell 1982a:63), and at Early Man Rockshelter near Laura, 260 km to the northwest, by 15,000 BP (Rosenfeld et al.1981:12). Both these last-named sites are located in drier areas more conducive to long-term preservation of occupation deposits, in limestone and sandstone shelters respectively. Although it may be difficult to find late Pleistocene deposits still preserved in the humid tropics, the possibility remains, and there are a number of rockshelters now known (see Chapter 5) which could be investigated for this purpose.

However, it is unlikely that intensive exploitation of rainforest products predates 9000 BP, and late Pleistocene inhabitants of the present-day rainforest district may not, in fact, have lived in a rainforest environment. Kershaw's palynological research suggests that rainforests did not constitute a major component of the environment between 38,000 and 9000 BP (see again Chapter 2, section 2.6). Aboriginal ancestors may have arrived in Australia as long ago as 60,000 BP (Wright 1986), though a date of 50,000 to 40,000 BP is still considered more generally acceptable (White and O'Connell 1982; Flood 1983). North Queensland is relatively close to the presumed points of entry (see Birdsell 1977; Rhoads 1980; Campbell 1984), and it is feasible that Aboriginal people settled in the vicinity of the study area soon after first colonisation. Depending on when this actually was, they may have encountered a rainforest environment, but the extent to which they would have exploited it remains to be established (see Chapter 2, section 2.7).

As the rainforests became reduced in extent following 38,000 BP, they probably would not have constituted a large enough resource base to allow a 'rainforest culture' either to have developed or to be maintained. On the other hand, even a reduced rainforest would certainly have been exploited for its products, just as the relict patches of rainforest throughout northern Australia are important resource zones today (e.g. see Chase and Sutton 1981; Levitt 1981; Russell-Smith 1985).

Subsequently, as sea levels and temperatures rose in the early Holocene, the rainforests expanded their range. Kershaw shows that they were re-establishing on the Atherton Tableland from about 9500 BP (see Chapter 2, section 2.6), but expansion may have been even earlier on the coastal plains. By 6000 BP, the rainforests probably covered much the same territory as they do now, and Aboriginal groups living in the area would have had to adapt their foraging techniques (and perhaps also their social relationships) or move to other areas. It is clear that at least some chose to live in the rainforests, and eventually developed the intensive economy observed at contact. Dixon's (1972:351) linguistic studies in the region, especially of Mbabaram, suggest that some others may have moved away.

12.2 Aboriginal adaptation to the rainforest environment

It is unlikely that all of the features of the immediately pre-contact 'rainforest culture' appeared overnight, and therefore another main aim of this study was to examine the archaeological record for evidence of change in prehistoric behaviour patterns, especially changes in the economy. It was pointed out earlier (Chapter 3, section 3.5) that the 'rainforest culture', as documented at and shortly after European contact, exhibited many characteristics that might be associated with an 'intensified' society. These included:

1. dependence on complex processing of toxic plants for food;
2. semi-sedentism and semi-permanent dwellings;
3. possibly a relatively high population density;
4. specialisation in the manufacture of goods for trade and exchange;
5. elaborate weapons for settling disputes by duel;
6. some storage of food.

However, there does not appear to have been an associated change in the use of labour, as Lourandos (1980b) and Williams (1985) suggest for the western district of Victoria.

Does the archaeological record which I have so far examined show the development of this 'intensification'? Archaeological manifestations that might be expected (mainly related to the economy) include:

1. remains of toxic food plants, deposited in increasing quantities over time;
2. stone artefacts associated with the processing of toxic food plants, also deposited in increasing quantities;
3. indications of more intensive site use such as an increase in the deposition rate of stone artefacts;
4. a high proportion of relatively young sites.

Examination of the last point requires more dated sites than are currently available for the rainforest district, though it is noteworthy that no site has yet been found to be very old. Data relating to the first three points are summarised below.

12.2.1 Toxic plant remains

The remains of toxic food plants have been recovered from the two main sites (JC and MR2) in dated sequences. Unfortunately, the poor preservation of these remains at the lower levels of the deposits, especially in the former site, prevents accurate identification and makes it difficult to extrapolate deposition rates. At Jiyer Cave, almost all the nutshell remains identified as belonging to toxic species come from the uppermost 40 cm of the deposit, and thus are less than about 1000 years old. Remains possibly belonging to toxic species have been found at 55-60 cm (about 3250 to 3500 BP), but these cannot be identified to species level with any certainty.

However, as little charcoal was preserved in these deposits, it cannot be taken for granted that toxic food plants were not used at earlier times. Their remains may have simply decayed beyond recognition.

At Mulgrave River 2 the picture is more complex. Much greater quantities of nutshell remains were recovered from this site than from Jiyer Cave, and toxic species were found through most of the deposit, suggesting a minimum date of nearly 2000 BP for their use. The vertical distribution of charcoal at this site showed two peaks, one at about 1500 BP, the other associated with glass and metal from post-contact occupation. The vertical distribution of nutshells showed a similar upper peak clearly, but the lower one was barely in evidence, suggesting that either the original deposition of nutshells had been much less at this level, or else that many of the nutshells had rapidly decayed beyond recognition.

The pattern of nutshell deposition at each site suggests that absence/reduction of remains at the lower levels is at least as likely to be due to the processes of decay as it is to be due to a lower level of utilisation of these plants.

12.2.2 Stone artefacts associated with complex processing

Stone artefacts used to process toxic food plants include nutcracking anvils, hammerstones, grindstones and topstones. However, any of these tools can be used for other tasks, such as cracking open non-toxic nuts, beating bark for blankets, flaking and anvilling stone artefacts, and grinding non-toxic plants or ochre. It is therefore difficult to assert that the presence of any of these artefacts indicates beyond doubt the use of toxic food plants, though use-wear experiments, organic residue analyses and replication studies might enable finer discrimination within these artefact categories. Even so, it is seems likely that any one tool could have been used for several purposes.

Nevertheless, it is possible to discern some pattern in the deposition of these artefact types. At Jiyer Cave, there were at least a dozen large grindstones visible on the floor of the shelter, almost all of which exhibited carefully prepared, pecked surfaces. Some were partially buried, but were still associated with the modern deposits. Two of the latter were located in excavated squares. Two additional grindstones were recovered from older deposits, but they did not show this kind of surface preparation, and no worn or broken specimens of carefully prepared grindstones were found in the deposits. It therefore seems likely that the pecked grindstones may be a recent addition to the rainforest tool-kit.

A comparison may be made with the grindstones of arid Australia (Smith 1986). Smith distinguished between specialised formal seed-grinding implements and expedient grindstones, and suggested that the appearance of the former in the archaeological record about 3000 years ago indicated a more intensive exploitation of seeds, possibly as a response to environmental stress (1986:38). The parallel I wish to draw with the North Queensland rainforest grindstones is this: the manufacture of specialised formal grindstones such as the pecked grindstones from Jiyer Cave (and probably also the grooved grindstones or 'morahs' found throughout the region) may equally be indicative of more intensive utilisation of plants such as the toxic nuts which require to be ground as part of the complex detoxification process. The absence of these artefact types in the older deposits and the occasional presence of 'expedient' grindstones may mean that intensive use of such plants is represented only in the uppermost deposits, probably within the last 1000 years. Note that this does not necessarily imply that use of toxic species did not occur prior to that date, merely that their intensive exploitation is a recent development. However, such a conclusion may be premature, given that only comparatively small volumes of two nut-processing sites have been excavated.

The apparent absence of grindstones at Mulgrave River 2 has already been discussed (see Chapter 7, section 7.10.3). Also puzzling is the apparent absence of hammerstones (or even useful looking pebbles) for use with the nutcracking anvils to open the hard-shelled nuts of Elaeocarpus bancroftii, remains of which occur throughout the deposits. Again, excavation of a greater portion of the site may resolve this enigma.

Pebbles used as both hammerstones and topstones are relatively common at Jiyer Cave, and specimens with smoothing use-wear have been found in levels approximately 4000 years old. As already noted, however, these need not have been used with toxic species, but could have been.

To conclude this section, it must be stated that the vertical distribution of stone artefacts possibly associated with complex processing appears to indicate that intensive use of toxic plants is relatively recent (i.e. within the last millennium). However, more casual use of such plants prior to this time has not been excluded, and it may be that further excavations will alter the distribution and chronological patterns.

12.2.3 Deposition rates of stone artefacts

Increased discard rates of cultural material, especially stone artefacts, are often taken to indicate increased occupation at a site (Ross 1981, 1985; Hughes and Lampert 1982; Lourandos 1983; but see Hiscock 1981). At Jiyer Cave, the deposition of quartz artefacts increased markedly in the upper 20 to 30 cm, during a period ranging from 650 to 850 BP in different excavation squares. This is slightly later than the date of 1000 BP for the earliest definite use of toxic plants, suggesting that there is no direct correlation between the use of toxic plants and increased occupancy of the site (i.e. as indicated by increased deposition of quartz artefacts). It is possible, however, that the increased occupancy is linked to the more intensive use of such plants.

At Mulgrave River 2, the deposition rate of quartz artefacts reached a maximum at about 1800 to 1000 BP in two of the excavation squares, but not in the third. The most recent deposits are lacking in quartz artefacts, though the presence of quantities of charcoal and nutshells indicates continued use of the site, and glass appears to have been substituted for quartz in these levels. Major occupancy of this site, therefore, as determined by the presence of quartz artefacts, occurs well before the increased use of Jiyer Cave. This 1800 to 1000 BP peak in quartz artefacts appears to coincide with the lower peak of charcoal, though as stated above there is no corresponding peak in nutshell deposition, possibly because of poor preservation factors.

12.3 A summary prehistory of northeast Queensland rainforests

The earliest known age for rainforest occupation in northeast Queensland is now placed at 5100 BP at Jiyer Cave on the Russell River in the heart of the rainforest district. Both this site and Mulgrave River 2 contain remains of toxic nuts which were eaten by the rainforest Aborigines after complex processing methods to remove or destroy the toxins. This is the first archaeological evidence for the use of toxic food plants other than cycads in Australian prehistory. With regard to the adoption of the leaching technique in Australia, the archaeological evidence presented here does not provide an unequivocal indication of the first use of these toxic plants or of any definitely increasing intensity in their use.

If one were to reconstruct the prehistory of the rainforest district from the results of the Jiyer Cave excavations, the final model would be quite different from a prehistory derived from the results of the excavations at Mulgrave River 2. Clearly neither site is necessarily representative of rainforest occupation patterns as a whole, any more than the excavated deposits are necessarily representative of the entire site. Both intra- and inter-site variations occur, and more excavations at more sites are required to reveal more fully the prehistory of this environmentally complex region. Results presented in this thesis suggest that intensive exploitation of rainforest products (indicated by the presence of identifiable nutshells and specialised grindstones) may only have developed in the last thousand years or less. However, several factors (difficulty of identifying older nutshells, inter-site variation and comparatively small excavations in difficult conditions) mean that this can only be regarded as an interim interpretation until further work has been done. This project has been a pioneering study of prehistory in the northeast Queensland rainforests, and as such it has raised as many questions as it has answered.