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FORCES OF CHANGE:
ABORIGINAL TECHNOLOGY AND POPULATION
IN SOUTH WESTERN VICTORIA

HARRY LOURANDOS

Thesis submitted in fulfilment of
requirements for the degree of
Doctor of Philosophy, Department of Anthropology,
University of Sydney

April, 1980
Except where otherwise stated the material presented in this thesis has been derived from my own research. The author has no objection to part of this thesis being quoted provided that adequate acknowledgement is included.

Harry Lourandos
April, 1980
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This thesis examines prevailing theories which lay stress upon the stability of both population and technology throughout Australia's prehistory. An alternative viewpoint is put forward which indicates growth in extractive efficiency and population. A case study from temperate Australia, south western Victoria, is presented which provides suggestive evidence for both technological change and growth of population. The data from this region have been drawn from a number of sources, environmental, ethnohistorical and archaeological. The main emphasis of the thesis is upon the operation of hunter-gatherer economies and the dynamics promoting change within such systems.

Chapter 1 provides the theoretical setting for the discussion and critically examines current theories concerning Australian prehistory and the operation of hunter-gatherer economies. Chapter 2 is an introduction to the study area and to the ethnohistorical literature used in the thesis.

Chapter 3 examines the definition of hunter-gatherer economy as well as the environmental and resource potential of south western Victoria. This is done in order to establish a predictive model of hunter-gatherer subsistence and settlement. Chapter 4 brings forth new ethnohistorical information on the Aboriginal bands and tribes of the area, their location and composition. Chapter 5 also presents new ethnohistorical information on population sizes in the region, and these are compared to population estimates from other Australian and Tasmanian regions. Chapter 6 is a discussion of the Aboriginal subsistence economy practised in the district. Chapter 7 likewise, deals with the Aboriginal settlement pattern. Chapter 8 is concerned with the dynamics of local population interaction, large-scale meetings and competition for natural resources. Chapter 9 is a synthesis of the ethnohistorical data thus far examined by presenting a model of subsistence and settlement for the area.

Chapter 10 presents a predictive model based upon the results of Chapter 9 and designed for testing in the archaeological record. Chapter 11 tests some of these predictions using archaeological surface material from
the study area. Chapters 12 and 13 specifically examine two sites excavated during the course of this project, Seal Point and Bridgewater Caves South, in light of chapters 1, 3 and 10. These sites demonstrate coastal aspects of the economy practised in the region. Chapter 14 turns to Aboriginal land management practises foreshadowed in chapter 6. Here the site of Toolondo, an example of large-scale artificial water controls, is examined.

Chapters 15 to 17 draw together the varying arguments presented in the thesis. Chapter 15 discusses the role of environmental control within hunter-gatherer economies, and the factors promoting change. Chapter 16 compares the results obtained from the study area with other Australian regions, Tasmania and with New Guinea hunter-horticulturalists. Chapter 17 concludes the thesis by examining the results of the study in light of recent models which outline more dynamic processes within Australian prehistory. This chapter presents a speculative model, comparable to the above, to explain the findings of this analysis.
CHAPTER ONE

STATIC AND DYNAMIC MODELS

Some of the most influential theories forming the basis of Australian prehistory emphasise the stability of both population and technology (for example see Birdsell, 1953, 1957, 1968, 1971, 1977; Jones, 1973, 1977a, b; Peterson, 1971, 1976b). The occupation of the Australian continent including all its inhabitable environments, is seen by those who uphold this position, as a rapid process followed by a levelling off in population. Further population growth via increased extractive efficiency (see White, 1959) is not entertained. This model is therefore essentially static in form, and in this way shows many similarities with currently held theories concerning hunter-gatherers in general. I argue here that such basically static models are inherently limited and many of their premises erroneous. I begin by critically examining the arguments of Birdsell, Jones and Peterson, followed by a broader examination of some problems concerned with our understanding of hunter-gatherer societies. Finally, I look at the features of dynamic models and their application to Australian prehistory and more specifically to the area under study in this thesis.

More recently alternative viewpoints have been expressed to the above theories (e.g. Hallam, 1977a, b; Blainey, 1976; Bowdler, 1977; Lourandos, 1980), and these are discussed in chapter 17.

Defining the Problem

The theories of Birdsell which span almost the last 30 years, have been the most pervasive and consistent, and continue to influence opinions
concerning hunter-gatherers (see Stanner, 1965; Yengoyan, 1968; Codelier, 1975). They have also more recently come in for some vigorous criticism (e.g. Hiatt, 1968; Smith, 1976; Cohen, 1977; Hallam, 1977a; Cowlishaw, 1979). Here I will outline what I consider to be some of the more relevant aspects of Birdsell's theories and some of the more telling of the arguments that have been levelled against them.

Essentially, Birdsell provides a predictive model for hunter-gatherer population, size and density based upon environmental productivity, as measured by rainfall. His primary data are drawn from Australian Aboriginal case studies and his point of view concerning Australia is encapsulated in the following two quotations written some 20 years apart:

A hunting and collecting economy of the most generalised sort was present throughout the entire continent and the material culture upon which extractive efficiency was based showed only minor regional variations. In a more recent paper (1953) it was possible to demonstrate at a first level of approximation that aboriginal densities throughout Australia were in equilibrium with the resources of the local environment.

(1957:53)

It is now realised that these economically simple peoples, and all of the Pleistocene occupants of Greater Australia, lived in fact in a skilfully regulated state of homeostasis. Such peoples were in equilibrium with their environment and this balanced condition was maintained, despite some fluctuations, by a rather complex series of actions, beliefs and traditions.

(1977:149; see also Birdsell, 1953, 1968)

Birdsell's theory is also based on a number of further assumptions the first of which is that extractive efficiency was generally uniform and stable throughout the Australian mainland. This second point rested on the assumption that the Tasmanian populations were representative of the first wave of Australian colonists. On this basis the extractive efficiency of the technology of the original colonising population was seen as 30% lower than that of the later occupants, an estimation he intuitively deduced from the narrower range of eighteenth century Tasmanian technology as compared to that of the mainland (1957:61; see also ch.16).

Birdsell's empirical data consisted of the tribal area and assumed
population density of 123 tribes listed by Kryzwicki (1934) together with the size of Aboriginal tribal or territorial groups based on the work of Tindale (1940).

Although Birdsell's theory focuses upon population density, his primary data rest solely upon assumptions about this variable based upon size of tribal area. Supporting evidence for Birdsell's theories rests upon a high statistical correlation obtained between rainfall and size of tribal area in his sample (1953). From these results he estimated statistically that the average size of Australian Aboriginal tribes has a mean value of 500 persons, and that this figure was both stable and constant. This Australian estimate he then used as a universal model for all "generalised" hunter-gatherer populations, including those of the Pleistocene (Birdsell, 1968). The 500 estimate has been often quoted by others (see above references) and employed in estimating past hunter-gatherer population densities (e.g. Flood, 1976).

The thrust of criticism aimed against Birdsell's theory was initiated by Hiatt (1968) who did not consider the estimate of 500 persons per tribe applicable throughout Australia and he brought forth evidence to support his case. Other strong critics have since emerged. Smith (1976:101) for example, casts aspersions on the methods originally used in obtaining the "magic number" (as termed by Hiatt) of 500. He states that Birdsell did not obtain this estimate via ethnographic data as he later states (Birdsell, 1970) but by dividing Radcliffe-Brown's figure for the approximate population size of all Australia, 300,000 (see ch.5) by Tindale's estimation of the total number of Australian tribes (c.600).

Birdsell's model further states that Australia was rapidly colonised to the level of "carrying capacity" and that population stability followed. His fast rate of initial population expansion within the continent is based upon modern ethnographic case studies of small island-founder populations, such as those of Tristan da Cunha, Pitcairn Island and the Bass Strait Islands (Birdsell, 1957). This model of rapid continental saturation is also offered for universal application to Pleistocene colonisation in general. However, McArthur (1976) has recently demonstrated with computer simulation models that rapid growth of small founder populations would be most unlikely. Hallam (1977a) is also critical of Birdsell's methodology
and of the theoretical basis of his work. She points out that his original sample of tribal areas was selective, with problematic examples being cast aside (Hallam, 1977a:172). She also notes that tribal groups in well-watered regions, such as south eastern Australia, do not fit Birdsell's predictions and are also placed in a separate category. Hallam further draws our attention to the limitations imposed by the measurement of only one environmental variable, in this case rainfall, and to the important issue of the extent of man's impact on the environment, a fundamental factor Birdsell omits to consider (see ch.3, 6, 15).

Cohen is also sceptical of Birdsell's findings, and he interprets this information as an indication of uniformity of population density throughout certain arid Australian environments (Cohen, 1977:63). Cohen suggests that a mechanism of cultural control may lie behind this uniformity rather than a universal law as Birdsell would have it. Indeed, Birdsell's whole argument rests on the acceptance of a hypothetical "carrying capacity", a concept which Hayden has more recently convincingly argued as being methodologically redundant (Hayden, 1975; see also below).

Overall, therefore, Birdsell's theory has been shown to have many serious limitations in particular its environmental determinism, and its static form. In spite of this, many of the fundamental tenets of the model, together with some of its shortcomings, are still upheld by recent authors. The theories of Jones, for example, have been heavily influenced by Birdsell:

Birdsell has brilliantly shown for mainland Aborigines, that population density was proportional to bio-production, as measured most conveniently by effective rainfall.

(Jones, 1977b:367)

One of the most important results from the study of Aboriginal demography, has been to show that Aboriginal population levels were proportional to resources and not to technology.

(Jones, 1977a:202)

As a reinforcement of the above argument Jones had earlier stated: "by at least 25,000 B.P. the distinctive Australian economic system was already in train in some places" (1973:281; see also Meggitt, 1964; Shawcross, 1975:31).
By the term technology, Jones is basically referring to material culture (Jones, 1977a) as was Birdsell in his comparison between Tasmania and mainland Australia (1957). As well, Jones introduces archaeological data as representing past technology, with the inevitable emphasis upon stone tools. The general static model advanced by both Birdsell and Jones, and the use of archaeological data as a chronological measurement of technological change (or lack of it), is echoed by Peterson:

Changes in the technological tradition could have increased the range of exploitable foods or improved efficiency, thus leading to an increase in population, but from the archaeological record it is clear that little technological change has taken place.

(1971:290)

The main problems with these technological comparisons are the limitations imposed by both material culture and stone tools as markers of extractive efficiency. Recent discussions have clearly borne this out in relation to stone tools. For example, Golson has shown for Highland New Guinea, that flaked stone tool morphology has little relationship to the technological level of the economy (1977b). In the Highlands the most elementary flaked stone tools are employed within an intensive agriculturalist economy which supports relatively high population densities. Both Hayden (1977a) and White (1977) have also indicated the overall low variability and elementary morphology of south east Asian and Australasian flaked stone industries when compared with the Eurasian industries. This evidence suggests that no direct relationship exists between flaked stone tools and the extractive efficiency of the total economy. Material culture includes a wider set of variables, but it too is not a direct reflection of the total economy. As is explained in Chapter 3, an economy refers to a set of choices and therefore to the behaviour and organisation of a society. Extractive equipment is but one aspect of man's relationship to resources, for even within hunter-gatherer economies land and resource management strategies must be considered as pivotal mechanisms. I am suggesting therefore that a much broader perspective needs to be introduced when making chronological and cross-cultural comparisons of extractive efficiency. This argument is central to an understanding of the processes at work throughout the whole of Australian prehistory, and indeed in all hunter-gatherer economies, and is one of the main themes presented in this thesis.
In support of their theories of population and technological stability, both Jones and Peterson have developed detailed arguments with those of Jones being cast in a systemic framework and Peterson's relating to population biology. The theoretical basis and form of these arguments (including also those of Birdsell) are in many ways similar to the broad-based static model (above) which generally has served to explain the operation of hunter-gatherer economies. Such static models, as I will refer to them, have more recently come under heavy criticism (e.g. Bennett, 1975; Bray, 1976; Cowgill, 1975; Hassan, 1975). I will now discuss the shortcomings of these models in some detail with a view to returning to the problem of their application to Australian material.

The Static Model

Many of the theories and methods underlying this static model have been derived from ethological and ecological studies. Such studies mainly deal with small groups (both human and non-human) and over relatively short periods of time. These studies include those of hunter-gatherer societies which today exist in a cultural limbo, that is, divorced from the socio-economic context of which they were once part. Many of the ensuing problems with the model, in my opinion, stem from the above methodological context. The short time perspective together with the limited sample and type of societies studied, place restrictions upon the observance of long-term trends. These limitations result in the presentation of an erroneous picture of stability. Technological shifts therefore, within such a stable system are thus viewed as an attempt to increase the environmental fertility of an area (e.g. Binford, 1968). This approach serves to drive an artificial wedge between hunter-gatherer and food-producing economies, which only further exacerbates the problem of explaining changes in levels of energy extraction. A series of problem areas concerning the static model will now be discussed.

(a) Carrying Capacity

A basic assumption underlying many of these theories is that as hunter-gatherer populations are homeostatically regulated (see below) below the upper limit of environmental productivity in a given environment, few (if any) incentives exist for increasing the food supply (see Binford, 1968: 327). This hypothesis is based upon the theories of the ecologist Wynne-
Edwards (1962) who, like Carr-Saunders (1922) before him, saw populations as regulated around "optimum numbers" or population densities most adaptive to particular environments. On this analogy, drawn from non-human societies, the concept of carrying capacity has rested, along with the above-mentioned arguments concerning technological change. This particular argument is taken up by Jones:

No one sector of the economy can be divorced from the full interlocking system. There would be no advantage in increasing the yield from one food source if commensurate increases could not also be gained from other foods, at other times in the year, and during other seasons. (1977a:202)

Here the viewpoint is espoused that increases in extractive efficiency take place in order to increase productivity. However, as will be shown (below) such assumptions need not necessarily be supported.

(b) Terminology

Certain key terms which have been borrowed via General Systems Theory, where they were used in a mechanistic context, have led to serious misunderstanding. The terms, steady state, equilibrium and homeostasis are used interchangeably and often carry the connotation of stability (e.g. Birdsell, 1977; Jones, 1977a; see below). Such is not the case for states of equilibrium have a wide range of variation from stable equilibrium through unstable equilibrium to dynamic equilibrium (Clarke, 1968:48-51). As Clarke says, to merely state that a system is "in equilibrium" is to say nothing at all (1968:48). The term homeostasis is defined as "a process characterised by cycles of equilibrium and disequilibrium" (Bennett, 1975:277). The essential dynamism of the process can be better understood when the above is appreciated, together with the fact that a system may tend but does not necessarily have to return to a previous state (Bennett, 1975:273). This last point is central to the arguments being offered here.

(c) The band as a closed system

I have mentioned that isolated social units of analysis, in this case the band, tend to be divorced from the social milieu within which they once interacted. Today such bands perform in a halfway world which lies in between the economies they once used and those they now have to deal with.
These peculiarities of research orientation and the present circumstances of the hunter-gatherer groups have led to such communities being regarded as virtual closed systems. While such approaches allow for tidy analysis within ecological frameworks, they erroneously place an emphasis on band economic self-sufficiency (e.g. Peterson, 1976; Jones, 1977a). In fact, as will be shown (chs 3, 8, 15) local hunter-gatherer groups depend upon neighbouring groups for their economic survival, whether they are of the same economies or not. Economic reciprocity was the rule, and it could be proposed that obligations accrued in this way acted as a form of investment (i.e. economic storage) to be relied upon at a later date (see ch.15).

(d) Population Control

The debate concerning the mechanisms of population control among human groups, including hunter-gatherers, is heated and the literature on the subject vast (e.g. Hayden, 1972; Polgar, 1972). Given the inherent potential of human population growth it is accepted that both cultural and environmental factors must be considered as limiting factors. The latter would include cultural practices such as infanticide (see Cowlishaw, 1978), abortion, abstinence, nutrition, prolonged lactation, etc. I do not intend to discuss this complex topic but merely to point out that such limitations on population growth are not considered to have been absolutely effective. As well, factors promoting population growth, within hunter-gatherer groups, would also have existed. For example in Australian Aboriginal society, status-seeking older males sought out many wives and desired many children, especially males who would follow them into the ritual life (Hiatt, 1965). Such population promoting factors are not often credited for hunter-gatherer populations because of the few economic advantages they offered in the face of resource depletion which may have ensued (e.g. Hassan, 1975; Peterson, 1971, 1976a). In relation to long-term trends another important point should be appreciated here. Cowgill points out that very minor population increases, for example one per thousand per annum for a population of one hundred people (given compound interest factors) could in 700 years result in a doubling of population (1975:509). If such a hypothetical example were to be accepted (in spite of McArthur's arguments above) an increase of this magnitude would be imperceptible at the level of the local population. We could conclude therefore, that population controls or limiting factors cannot be considered as totally
effective; and small population increases, would in the short term, not be perceived. Advocates of the Wynne-Edwards self-regulating theory (e.g. Peterson) state that increases in population would have been detected by band leaders as pressure was felt upon resources, and populations thus would be cut back to optimum sizes (Peterson, 1976a). Critics of this viewpoint (e.g. Cowlishaw, 1979; Annette Hamilton, pers.comm.) object, pointing out that as it is women and not men who directly control population, the abovementioned mechanisms of control are absent and have no obvious replacements. I would add, that as initial population increases could be imperceptibly small, that over time, increases could have been accommodated by cultural means. Without such adjustments, there would nevertheless have been no guarantee that population sizes would have been reduced to previous levels, if such estimates could be remembered, which is extremely doubtful. I am suggesting that hunter-gatherer populations had the potential to grow and that this process would have involved continual population oscillations (cf., Cowgill, 1975). The system need not have returned to previous population density levels as cultural adjustments may have allowed for higher or lower densities to exist. Such oscillating populations would still be considered as being homeostatically regulated, as they conformed to the model of dynamic equilibrium mentioned above. Birdsell also allowed for population oscillations and even the extinction of local populations, but unlike the above model, generally he saw population returning to prior optimum levels (1957).

Jones explicitly expresses this same viewpoint:

Australia is a capricious continent, and men who live there have to contend with the vagaries of abundance and of disaster, which even-out only over long spans of time. A society whose population level is geared to these long term trends, and whose available labour in good seasons has such a high proportion held in reserve, is well insured against the bad times.

(1977a:202)

One might ask how any population could be prepared for the unexpected, such as drought, whose occurrence, duration and intensity is unpredictable. The question is how do such supposed self-regulated systems operate? Are we to believe that individuals will forego their independent desires of gaining an advantage because of some remote possibility of future hardship? In a competitive situation (see below) local population collapses could be
expected to have been replaced or replenished by neighbouring populations.

(e) Reasons for change

Those adhering to a stable system of equilibrium (e.g. Binford, 1968; Jones, above) tend to see economic changes within hunter-gatherer economies as attempts to increase productivity as I have already mentioned. But this need not be the case, for the reasons behind the modification of existing techniques could be varied. The latter would also include attempts to stabilise or regulate resource yields, as well as a whole range of cultural reasons (including status, prestige etc.). This emphasis on conservative factors fits well with certain general biological principles such as Romer's Rule (see Bray, 1977:238; ch.15; see also Jochim, 1976:

The static model, being anchored in cybernetic principles, lends itself to mechanistic interpretations, which often involve explanations relating to the efficiency of the system as a whole, and, therefore, to its adaptive value. Such explanations tend to be highly idealised, and almost to imply an inbuilt altruism within the socio-economic system. The desires of individuals and minorities are seen to be subsumed automatically for the common good.

Jones, in attempting to explain the technological differences observed between Tasmania and mainland Australia (also see Birdsell, above; ch.16), exemplifies the above theoretical position:

The siphoning off of the man hours gained by the deployment of a new technology into non-productive activities can, in this context, be seen as a powerful homeostatic mechanism, ensuring that the labour thus released is not invested into some positive feedback system, whose results might at best be anarchic to the social order and, at worse, disastrous for the long term balance of the community and its resources.

(1977a:202)

In casting his explanation in the terms of the static model, Jones has revealed many of the faults of that model as have been already discussed. Change is now viewed as anarchic, a threat to an assumed ideal state.

In contrast to the rather utopian theoretical frameworks are schools of thought which place a greater emphasis on the internal dynamics
of the society. Faris, arguing from a Marxist perspective places greater emphasis on the power relationships which involve the forces of production (1975; Godelier, 1975). Cowgill (1975) while sympathetic to Marxist points of view, diverges somewhat from these and regards the desires of influential individuals or minorities as the determining factor regarding choice of action. Groups are therefore seen to be dynamic with internal power structures affecting the course of events. I would add that the variables stressed by Cowgill, given a competitive inter-group situation (see below) would exert a strong influence in the direction of change, rather than a static or steady state.

The static model can be seen to have been supported also by the widely held view that competition for resources was not a marked feature of hunter-gatherer societies. The steady state theorists argue that:

> Since everyone knows where the food is, in effect the environment itself is the storehouse; and since everyone knows the movements of everyone else, there is a lack of concern that food resources will fail or be appropriated by others.

(Lee and DeVore, 1968:12)

Examples, however, do exist of competition for land and resources (e.g. see Lourandos, 1977a) and this important issue is discussed further below (chs. 8, 15).

Idealised models, such as those under criticism here, have tended to play down the role of intraspecific competition. The latter may have influenced the self-regulation of the species as Wynne-Edwards suggests (1962:20), but it would also have provided a powerful mechanism for culture change. Seen in the context of oscillating population sizes, and individual self interest, the model being developed here is substantially different to the more generally accepted hunter-gatherer model such as that of Lee and DeVore (1968).

The erroneous belief in a low level or an absence of economic competition within and between hunter-gatherer groups is complemented by the general assumption of their egalitarianism. As I have already mentioned, differences in status and power must have also existed. For example one of the most glaring instances of this relates to diet where it has been reported for small-scale societies, such as hunter-gatherers, that the
nutrition of women and children is less than that of adult males (e.g. Dornstrech, 1973:404; Rappaport, 1968:79-80; Bowdler, 1976). Disproportionate labour expenditure based upon sex, age and status lines also applies here.

Sahlins' ironic concept of "the original affluent society" in describing the hunter-gatherer, also avoids distinguishing between populations (1974). For, clearly in terms of inter-group economic competition, some groups would have been more "affluent" than others.

Related to these idealised viewpoints is the notion that hunter-gatherers tend towards a conservation of effort (Peterson, 1976; Jochim, 1976; Sahlins, 1974). While this rule may have a general application, its emphasis tends to support a static state, and to disguise exceptions to the rule.

In conclusion, therefore, I suggest that such static models have a limited application and in general should be replaced by dynamic models, along the lines of dynamic equilibrium (Clarke, 1968:50-1), which would incorporate the following features.

The Dynamic Model

Local populations, while homeostatically regulated, could be expected to oscillate in size and density, there being no foolproof population controls. While equilibrium states would at times be achieved, these could occur at higher or lower levels than the original. As population densities oscillated, there would be strong pressure for cultural regulation or modification thus leading to change. Minor local environmental fluctuations would also influence this process. The socio-economic system could therefore be seen as inherently unstable and continually undergoing minor modifications (see also ch.16). These modifications perhaps predominantly took the form of rearrangements of existing patterns rather than the introduction of major innovations.

Populations must be seen in a competitive context, and individual local populations could be expected to increase and expand at times at the expense of neighbouring populations. Varying rates of growth could therefore be assumed.
At times, however, a cultural modification could, given favourable circumstances, radically alter the original form and begin to establish a trend, for example in the direction of increased extractive efficiency. As Flannery (1968) has pointed out the initial "kick off" factor may bear little relationship to the outcome. Populations, therefore, need not have been attempting to increase productivity for such a trend to develop; extractive efficiency need not be directly linked to population density (see also Cowgill, 1975). One could expect, then, a whole host of "innovations" in man/land relationships in hunter-gatherer economies, the origins of which would have borne little resemblance to their final outcome (see also Binford, 1968).

Finally, in relation to long-term trends, whereas the static model supposes that population oscillations returned to prior levels of stability, we could expect, over large areas, population growth together with increased extractive efficiency. In time, less efficient methods would be weeded out. Rates of change, however, would vary from area to area.

**Intensification**

One of the most detailed models of economic intensification among hunter-gatherers, is that of Harris (1977a). He outlines five major avenues of expansion for hunter-gatherer economies, basing his theories on a review of present-day and ethnohistorical hunter-gatherers. These "pathways", as he terms them, relate to the following classes of resources:

(a) harvesting of grass and forb seeds;
(b) harvesting of tree nuts;
(c) harvesting of roots and tubers;
(d) fishing and hunting aquatic mammals;
(e) exploitation of social ungulates.

Of these five possible growth areas, Harris points out that only three led to domestication, that is, a, c and e.

On the basis of Harris' model and the dynamic model offered above, we could assume that hunter-gatherer economies, amongst others, were expanding at various rates along these above avenues. Domestication of plants and
animals could be expected to have occurred at various stages along these pathways, and to have appeared in a plurality of forms, especially at their elementary levels. The latter proposition is testable using evidence from both past and recent hunter-gatherer societies.

Conclusions

Traditional theories which form much of the theoretical basis of Australian prehistory have been shown as being static in form. Both technology and demography, in these models, were viewed as fluctuating in the short-term but returning to previous optimum levels. Evidence for past technology had been derived from the archaeological record (primarily stone tools) and interpreted as depicting only negligible variation over the past 40,000 or so years of Australian prehistory. Such theories were shown to equate closely with current explanations concerning the operation of hunter-gatherer economies, and to share many of their limitations. Most of the problems appeared to lie in the use of short-term ecological and ethological models for the interpretation of long-term historical processes. In place of these a model of dynamic equilibrium was suggested which viewed economies as inherently unstable, and more readily accommodating growth and expansion of population and technology.

This model will now be applied, together with Harris' five avenues of economic expansion, to a temperate region in south eastern Australia, south western Victoria, by the use of environmental, ethnohistorical and archaeological data. The emphasis of the study will be on variables promoting economic change together with the intensification of some extractive techniques. Population density will be used as a broad measure of extractive efficiency.
CHAPTER TWO

STUDY AREA

Some people have observed in reference to the natives occupying their own country, what could they do with it? The answer is plain they could live upon it, and enjoy the pleasures of the chase, as do the rich of our own nation.

(Robinson, 16 July, 1841)

Australian Aboriginal societies that have received the most attention from anthropologists have been those from tropical and arid environments. Historical factors have determined this somewhat biased selection for the survival of traditional Aboriginal societies from regions closer to European settlement was shortlived. Our information on Australian societies is therefore derived mainly from a limited sample with only a scant knowledge existing of those groups from more temperate environments. An attempt to rectify such an imbalance was one of the instigating factors behind this research. My choice of study area, in south eastern Australia, was partly influenced by this problem and also because of this area's geographical proximity to the island of Tasmania. South western Victoria therefore, seemed a likely region to provide information of two kinds: on temperate Australian Aboriginal society, and comparative data on Aboriginal adaptations to both temperate mainland and island regions. These two problems therefore, form the basis of the study presented in this thesis set within the theoretical framework outlined in Chapter 1.

At the time of embarking upon this project little previous work had been carried out on either the ethnohistory or archaeology of south western Victoria or the Western District as it is often called. This is not to say that the region was terra incognita but that solid frameworks on which to
base my own research were lacking. Pioneering archaeological work had been carried out by Mulvaney (1957, 1962, 1964) and also by Gill (e.g. 1971, 1976). As well many less rigorously scientific, but nevertheless important, contributions had also come from other enthusiastic field workers (e.g. Massola, 1969). Few excavated sites existed however, and no archaeological cultural sequence for the region had been attempted. No more than a brief effort had been made to define the archaeological evidence and problems of the region (see Mulvaney, 1964). The situation was further complicated by the fact that little was known of the prehistory of Victoria as a whole, and cultural sequences for this wider area were also lacking.

While short accounts of the ethnohistory of traditional Aboriginal societies in south western Victoria have appeared more recently (e.g. Mulvaney, 1964; Corris, 1968; West, 1974), no major analysis of the topic has taken place. Knowledge has rested upon the early ethnography of Dawson (1881) and references in Smyth (1876). In contrast to this situation important studies exist of the Aboriginal-European confrontation of the mid 1800's (Corris, 1968) and of the social history of the European settlers (Kiddle, 1961). Barwick has also carried out an extensive study of the Aboriginal population in Victoria from the time of contact with Europeans (1963, 1971).

Approach

My methodological approach to the study area and its subject matter has been the following. Instead of the usual dig first then research the ethnohistorical literature later, I have chosen to reverse this order of events. I thus began with a study of the environment and resources of the region, followed by a review of the ethnohistorical data on traditional Aboriginal society. Archaeological investigation came later. The main themes that I was interested in fell in line with the theoretical emphasis of the project (ch.1). These features included: Aboriginal territorial organisation (bands, tribes etc.); population, subsistence and settlement; Aboriginal environmental controls, interaction between local populations. Essentially, therefore, the research consists of three forms of data, environmental, ethnohistorical and archaeological. The methods I employed were to construct a series of predictive models which could be tested by independent data. Firstly, general predictions were derived from an
analysis of the district's resource potential and these were then tested by ethnohistorical data. Secondly, a model of subsistence and settlement was constructed from both the environmental and ethnohistorical information and a number of testable predictions was derived from this. Finally, aspects of the latter were tested in the archaeological record, using both surface and excavated sites.

Ethnographers

A review of the more important ethnohistorians has already been carried out by Corris (1968), so rather than retread familiar ground, I will discuss the ethnohistorical sources as they directly apply to this thesis. The principal new data produced in this research came from the manuscript journals of George Augustus Robinson, Chief Protector of Aborigines in the Port Phillip District (Victoria) from 1839 to 1849 (Robinson, 1839-1849). His account begins only a few years after the establishment of the new settlement; his expedition of 1841, on which much of this analysis is based, taking place only seven years after the settlement of Portland and six years after that of Melbourne. His writings then, deal with the earliest phase of European contact, and apart from scattered letters and documents that still remain to be studied, they stand alone as representative of this early period in the Western District. Although a short official report of Robinson's expedition to the Western District in 1841 was published (Kenyon, 1928), this is the first systematic attempt to evaluate the significant body of data on the Aborigines that these voluminous works contain. Robinson made a number of visits to south western Victoria, but his principal and most detailed account is of his trip in 1841. Throughout these journeys, I have calculated that in the Western District, Robinson must have met personally with around 1,500 Aborigines.

In style and attention to detail Robinson's writings compare favourably with his Tasmanian journals (Plomley, 1966) which have served as the basis for the reconstruction of the Tasmanian Aboriginal tribes by Jones (1974). The most important aspects of Robinson's Victorian journals concerning this thesis are the detailed accounts of the location, numerical composition and interaction of local populations and of subsistence behaviour. Robinson collected this information as part of a plan of carrying out a census of Aboriginal population in the district. His journals are
most detailed in this regard and the early date of his writings adds to their value. Robinson's years spent in the bush with Tasmanian Aborigines had provided him with a trained eye and his passionate interest in the welfare of these Aboriginal peoples imbued his observations and treks with a zeal seldom found in the accounts of other early Australian chroniclers.

The next main ethnohistorian, in chronological order, is Dawson (1881) and unlike Robinson his information was gathered from aging Aboriginal informants a generation after their traditional society had all but disappeared. Dawson, however, befriended these people and studied their culture with a great interest. Based in Camperdown, he produced a detailed published work on the Western District Aborigines, which establishes him as one of the earliest ethnographers. His is the main source work for the area, but unfortunately his credibility has been marred because of his over-enthusiastic treatment of the subject of Aboriginal hereditary leadership. But it should also be noted that Dawson was not the only observer to make such claims (see ch.4). Because of this problem I have used Dawson's information cautiously, cross-checking his data with those of Robinson and others. The results of this analysis showed that apart from that one area of discontent mentioned above, his information overall appears to be extremely accurate and invaluable. Following this estimation I was confident enough to place a greater reliance on this important early ethnography.

Although Mitchell's journals (1836) are the earliest accounts concerning the Western District (see also Stapylton's journals, Douglas and O'Brien, 1974) there is surprisingly little information provided on the Aborigines of the area. While crossing the wide and open plains of south western Victoria, Mitchell met with few Aborigines, which is perhaps more telling a statement of his general relationship with these people than of the size of their population (see ch.5).

Smyth's work (1876) is generalised, and is from a later period. It refers to Victoria as a whole as well as to other Australian regions. These volumes by Smyth contain much valuable information and I have used them in a comparative way, cross-referencing as much as possible. Smyth also includes very useful and detailed information from other local field workers (e.g. Bulmer) who had more intimate knowledge of Aboriginal culture.
I have also used the information of lesser sources. Howitt's evidence (1904) is based on his research on the Gippsland region and has its individual problems (see Corris, 1968:11-6). Howitt makes some reference to the Western District, for example the information by Stähle from Lake Condah. Bride's collection of early Western District settlers' accounts is a mine of information, but needs to be carefully interpreted as not all observers are like-minded. The controversial testimony of William Buckley as recorded by Morgan (1852) is a collage of 30 years of experiences which have been contracted into a picareseque adventure. Nevertheless, there is much worthwhile ethnohistorical information in this work and I have used only those parts that could be checked against the reports of other authors.

The Pastoral Invasion

It is not possible to appreciate the ethnohistorical evidence which is presented here, let alone the context in which it was being recorded, without some statement being made on the impact of Europeans upon the Aborigines. Victoria received a relatively late settlement which was spearheaded from the colony of Launceston in Tasmania in a search for further grazing land. This move was not intended as the establishment of another penal colony. The new settlers arrived with ambitions to establish themselves as landed gentry, for this was a pastoral invasion. Lured by Mitchell's descriptions of lush and already cleared pastures (Australia Felix), this land grab spread from Portland in the west and Melbourne further east, in a matter of a few years into the Western District. By 1840 (only six years after the establishment of the first settlement) there were over 10,000 Europeans in the new colony and hundreds of thousands of sheep (Victorian Year Book, 1973:31). The new settlers moved in a wave north and north west through the relatively open terrain of the western plains, staking their claim with flocks of sheep of from 500-1,000 head, under the care of a shepherd (Peel, 1974). By 1840 substantially large areas of the district had been denuded of their Aboriginal populations. Robinson recorded that "there is but a paucity of aborigines in the vicinity of the Barwon, the Colijans (Kolakngat) consisting of 40 individuals" (Kenyon, 1928:138). Whole bands had already disappeared in the region behind Warrnambool and Port Fairy and two bands in the Portland area had been reduced to three individuals (ch.5).
Within a few years of occupation the sheep had literally eaten the original owners out of house and home. Sheep ousted the native fauna and destroyed the balance of plant species upon which the Aboriginal people were dependent (ch.6). Robinson records that because of the presence of European pastoralists Aborigines were no longer permitted access to the open plains to hunt and to harvest roots and tubers (23 July, 1841). Aboriginal firing practices which were used to facilitate such harvests, were also causes of conflict. "But this burning is a fault charged against them by the squatters" (Robinson, 24 July, 1841). It seems that the Aborigines' livelihood was being attacked from all sides, and Aboriginal concepts of reciprocal rights misunderstood by Europeans.

There is not a station home or outstation but the men and master have kangaroo dogs to hunt kangaroos. Now the blacks state if the sheep belong to the white fellow surely the kangaroo belong to the blackfellow. Yet the white man take the blackfellow's kangaroo but wont give him sheep for it.

(Robinson, 24 July, 1841)

Reprisals followed such circumstances from both sides, Aboriginal and European (see Corris, 1968). It was at this point that Robinson was employed to mediate, and that he journeyed to the Western District as conciliator. With or without his desire to assist an increasingly complex situation, the Aboriginal population continued to decline, helped along by disease, the gun and more devious methods such as arsenic placed in a bag of flour. To an estimated 8,000 Aborigines in 1841 (ch.5) we can add the rapidly declining statistics as provided by Corris (1968:5-6). By 1852 the Aboriginal population of the Portland Bay District had been reduced to 700. It should be noted that in 1851 gold was discovered in Victoria and the European population rose from 77,000 in that year to 540,000 in 1861, fed by new arrivals from the north and Britain (Peel, 1974). By 1871 the Aboriginal population of the Western District was down to 362 and by 1877 it was a mere 272, of whom 147 were full bloods. The most serious decline in Victoria was at this stage occurring in the Western District (Barwick, 1971:298). Almost 100 years later by the middle 1960's, the Western District had witnessed an increase in the population claiming Aboriginal descent, to 700 (Barwick, 1963:29, 53, 272-3). This was but a whimper when compared to the 8,000 of 1841.

Much has been made of the genocide of the Tasmanian Aborigines, but it should not be forgotten that other Australian regions suffered just as
badly, and because of the different nature of European settlement, decimation proceeded at a faster rate. The Western District, unfortunately, can be placed among these.
CHAPTER THREE
ENVIRONMENT AND RESOURCES

In this chapter I will describe the environment of south western Victoria and examine the area's resource potential in relation to hunter-gatherer economic strategies. From the latter a broad-based predictive model of hunter-gatherer subsistence and settlement is established which will be tested by both ethnohistorical and archaeological data in the remaining chapters of this thesis. Before this can be done, however, it is necessary to discuss the definition of hunter-gatherer economies and some of the mechanisms by which they operate.

Hunter-Gatherer Economy

I have already discussed how most of the successful recent approaches to hunter-gatherer economies are cast in ecological frameworks, as well as pointing out some of the limitations of such approaches. I will continue this discussion here by examining one of the most explicit accounts of hunter-gatherer subsistence and settlement, that of Jochim (1976). This work is of interest in that it encompasses both the strengths and weaknesses of such studies. Jochim sets up a model which he derives from economic anthropological theory together with ethnographic studies of hunter-gatherer societies, and he later tests this model by using a set of archaeological data.

Jochim draws his initial definition of economy from Polanyi (1959) who "defines formal economics as referring to a definite situation of choice among the different uses of means, induced by a scarcity of these means" (Jochim, 1976:3; see also Burling, 1962; Herskovits, 1952). Choice, therefore, is seen as the main factor in economies, and Jochim views this
as affecting subsistence and settlement in the following way:

Choices of usable resources, decisions as to their proportional use and time of utilization, and the demographic and spatial arrangements chosen in order to accomplish the exploitation, all allot human time and energy and are visualised as structuring the subsistence and settlement patterns of a human group.

(1976:4)

Human economic behaviour, he sees fundamentally as "choices among competing or mutually exclusive activities" (1976:4). Such choices either operate as long-range plans or are immediate and opportunistic, and hunter-gatherer economies, he considers as following the former. Scarcity is defined in terms of time and energy spent in subsistence activities. In general, hunter-gatherer economies are defined as organised strategies, dependent on a wide-ranging series of choices and decisions.

In the application of his model, Jochim turns to an assessment of the resource potential of individual environments, on the assumption that decisions would be based on such factors. The variables he includes in the evaluation of individual resources are: weight; density; aggregate size (sociability); mobility; fat content; non-food yields (e.g. materials for artefacts etc.). This formula, which is based on ethnographic data (1976:23) is aimed at quantifying resource potential. In this way, an estimation can be obtained of likely choices made between competing resources.

There are, however, problems with this approach. Firstly, we must allow that decision-making would also involve culturally defined values. Without knowing such value systems it is extremely difficult to deal with the decision-making structures of lapsed societies. It cannot be merely assumed that all economic decisions operate via one set of universal laws. Secondly, quantifiable data of the kind used by Jochim, are difficult to retrieve, especially from past environments. Assuming for the moment that such information is retrievable, then in terms of the whole exercise, the ends should at least justify the means. But do they? The conclusions Jochim derives at the archaeological level are generalised (1976:165-88) for such is the nature of the data. As well, given that the original model is essentially static in form, it cannot allow for or predict temporal changes. This situation, therefore, accentuates generalities, for the
dynamic elements within the subsistence-settlement model are thus overlooked. Because of these problems, it is difficult to justify the elaborate quantitative data presented in the early part of the procedure (1976:22-79). More problems also exist, for to simplify what would be an almost insurmountable task, Jochim has been highly selective in his choice of data. He discusses mainly animal resources (plants are not included at all) and restricts himself to low density, highly mobile, boreal hunting societies whose economy is centred upon migratory herds. It therefore seems fair to raise the doubt of just how applicable his model and set of procedures are to a wider range of economies such as the broad-based gatherer-fisher-hunter economies under study in this thesis.

Because of these problems I have chosen to limit myself to a generalised approach to the resource potential of south western Victoria. I would argue that if general results are to be achieved, then there is no call for over-sophisticated procedures. As well, my aim is essentially different to that of Jochim, and similar approaches, being the investigation of the dynamics of hunter-gatherer economies. I have therefore followed Jochim in theory but not in practice. I have roughly measured resource potential by three variables: productivity, reliability and ease of access. Productivity relates to generalised energy yields, reliability to low variability, and ease of access to both technological and spatial factors. These three variables therefore cover the spatial-temporal distribution of resources together with their level of fertility. For example, a high ranking resource is a species that congregates seasonally in large numbers and, given the existence of certain procurement methods and equipment, is relatively easily harvestable, such as eels in autumn in south western Victoria. A low ranking resource is, for example, a solitary, nomadic and small-sized species of mammal living in a rugged habitat, such as some small macropods. In this way, resources have been roughly ranked according to these three variables. As the procedure employed here is a generalised one, no attempt is made to quantify the data, if indeed this were possible given the complexity of the environment under study.

Like Jochim (see also Lourandos, 1968, 1970, 1977b; Poiner, 1976) I have assumed that the connection between economic decisions and resource potential affects settlement patterns as well as subsistence strategies. By the former I refer to both the location and nature of settlement. This
includes the degree of stability of settlement in terms of levels of sedentism and nomadism, as well as the size of the group. It has been shown that most hunter-gatherer societies, as well as hunter-horticulturalists, undergo continual redistribution of population at base camps (see Chs 4, 16). Dornstreich records that group size among the Gado-Enga, hunter-horticulturalists of Highland New Guinea, fluctuates on a four to eight day cycle and is closely linked to subsistence factors (1973:300). We could assume, therefore, that similar patterns were occurring in south western Victoria and there is evidence to suggest this (Chs 4, 7). By sedentism, therefore, I am assuming a certain degree of stability of population but by no means a static situation.

Environment (Fig. 3:1)

Physical (see also McAndrew and Marsden, 1973)

South western Victoria consists of four major physiographic divisions: the coastal plains (incorporating the Glenelg River system and the Lakes area around Colac); the volcanic plains; the Otway Ranges; the Western Highlands (including the Grampians and Dundas Highlands).

(A) Plains

The Western District plains stretch from Werribee to Camperdown, Hamilton to Portland.

i) Volcanic: (See Ollier, 1967; Ollier and Joyce, 1973). Covering an area of 2,300 square kilometres, these are regarded as the third largest volcanic plains in the world. They extend from Colac to Warrnambool on the coast, and back to the Grampians. The plains are almost horizontal with a slight southward inclination. Their composition is of Pliocene and Holocene basalt flows together with some basalt ash. Volcanic cones such as Tower Hill near Warrnambool, and Mount Napier, dot the plains, and the scoriaceous basalt of the Stony Rises is linked with Mount Purdon. Crater lakes have been formed in some cones. Drainage systems such as the Hopkins River have incised narrow valleys, but in many cases rainfall drains into shallow lakes, such as Lake Corangamite, or underground. Lake filled maars (e.g. Lake Keilambete) are common especially along the southern fringe of the plains. Many areas, such as Mount Napier and the Condah Swamp, were collections of swamps and shallow lakes. These areas I have termed wetlands. In the past, before the area was drained
Fig. 3:1

AUSTRALIA

Study Area

Tasmania
by Europeans, large stretches of the plains were inundated in winter months forming large water-logged marshlands (e.g. see Mitchell, August, September, 1836).

ii) Coastal: The coastal plain extends from Torquay to Warrnambool, inland to Colac, and further to the Glenelg area. This low lying and undulating area is basically the uplifted surface of Tertiary sedimentary rocks, such as limestone. Quaternary dune limestone and sands are secondary features, as are small channels cut by streams. Caverns are formed in the underlying limestones and these act as aquifers for ground water.

(B) Highlands

i) Western Highlands: These are an extension of the Central Victorian Highlands, a part of the Great Dividing Range. The Central Highlands have been produced by upwarping movements and faulting during late Tertiary times. The Western Highlands are comparatively low in elevation and appear as hills with rugged areas, such as gorges, occurring near fault scarps. Valleys are generally broad. The maximum elevation is about 600 metres at Ballarat, and igneous structures such as Mount Macedon and Mount Cole are higher still. Upper Tertiary basalt covers some areas (e.g. Ballarat) and has rich soils.

The Grampians are strike ridges of hard sandstone reaching 1,200 metres in height, and rise impositively from the basalt plains lying to the south. The Dundas Range is the western edge of the Western Highlands and is a warped plateau formed of Lower Palaeozoic rocks capped with laterite. The Glenelg River system drains this region.

ii) Otway Ranges: The Otways are the western extremity of the Southern Uplands which extend to West Gippsland and Wilson's Promontary. They include the Barrabool Hills near Geelong. This is a steep mountainous region which has been formed by upwarping and faulting and is separated from the Eastern Highlands by the Gippsland plains. These mountains are formed of freshwater Cretaceous sandstones and mudstones, and the topography is rounded due partly to extensive land-slipping and structural weakness in these rocks.
Climate (see Hills, 1975).

The source of most rain is the westerly winds and cold fronts and these are most common in the winter months. Rainfall is therefore highest in winter and lowest in summer (see Table 3:1). The Western District together with Gippsland has the lowest variability in rainfall of all Victorian environments. Within the Western District, the coastal region has the most reliable rainfall (Victorian Year Book, 1976:87-93). Annual rainfall averages over 1,400 mm in the Otway Ranges and less than 600 mm in drier parts of the plains. Figure 3:2 presents a generalised picture of the original surface water resources. On this figure areas of water excess include perennial streams, lakes and swamps; areas of water balance have some seasonal runoff; and areas of water deficiency have negligible surface water. Today pasture growth is at a maximum in winter and spring and lowest in summer, the main limiting factory being drought in summer and cold in winter. In general, marine influences temper extremes in temperatures.

Due to the overall reliability in rainfall, major droughts would have a less severe effect upon the Western District than upon other Victorian regions further inland. Since the time of European settlement, droughts of varying intensity have occurred in Victoria and the Victorian Year Book of 1976 records 15 major droughts since 1865 (pp.91-2; see also Bulletin No.43, Bureau of Meteorology, Victoria, 1957). January and February are the hottest months of the year with temperatures under 24°C along the coast. July has the lowest temperature averaging around 13°C near the coast. Night temperatures average 13°C-15°C in coastal areas in January-February. Although frosts can occur at any time of the year in the mountainous regions, they are rare along the exposed coastline. Winds are predominantly from the west, although these arrive from both the cooler south west or warmer north west.

Vegetation

Much of the Western District has been cleared today to the extent that native Flora is almost non-existent. Introduced pasture grasses dominate together with the odd introduced tree established to serve as a windbreak. This situation is truest on the fertile basalt plains and less so in areas too marginal for purposes of grazing, cultivation or forestation. Scrubland and forest can still be found in the undulating
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(a) Legend: 1. Average monthly rainfall in mm (for all available years of record to 1974).  
2. Average daily maximum temperature (°C) (for all years of record to 1973).  
3. Average daily minimum temperature (°C) (for all years of record to 1973).  

Information from Victorian Year Book 1976:94
Original surface water resources (generalized)

Fig. 3:2
rugged area behind Portland, and of course in the more humid Grampian and Otway Ranges. Vegetation as it existed at the time of European contact, therefore, depends upon reconstruction and here the ethnohistorical sources are invaluable. I will briefly outline the main vegetation communities and their estimated distribution (see Willis, 1974; Victorian Year Books, 1962, 1973; Fig. 3:3).

**Grassland and Savanna Woodland**

Grasslands ranging from treeless grassy plains to open park-like woodlands extended across much of the inner basalt plains of the Western District. Relatively treeless plains occurred in areas of lowest rainfall (430-500 mm) and tussocks of Kangaroo-grass (*Themeda australis*) predominated together with Spear-grasses (*Stipa spp.*) and Wallaby-grasses (*Danthonia spp.*). Perennial herbs, especially the *Compositae* were abundant where burning was frequent. River Red Gum (*Eucalyptus camaldulensis*) lined the banks of streams.

Savanna woodlands occurred in slightly wetter areas (rainfall 760 mm), and areas which were frequently burned. River Red Gum dominated the drier areas and Manna Gum (*E. viminalis*) wetter areas. The volcanic hills were devoid of trees or lightly timbered with She-oak (*Casuarina paludosa*) or Manna Gum. Yellow Gum (*E. leucoxylon*) was also an important species. Further north towards the Wimmera, Buloke (*Casuarina luehmannii*) and Grey Box (*E. microcarpa*) were common.

Fire can therefore be seen as an important agent in both maintaining and extending these relatively open savanna regions. The role of Aboriginal man and his fire-lighting activities are of significance here, and the *Compositae* mentioned above formed some of their basic food plants (see Chs 3, 6, 15, Appendix 2).

**Dry sclerophyll forest and woodland**

These plains Robinson described as "... a vast country and resembled one vast park" (7 May, 1841).

Both grassy and heathy forest are included within these communities which occurred in areas of 630-1,000 mm rainfall. Eucalypts predominate reaching heights of 30 metres, with grassy forest on better soils and heathy forest on the poorer. On the impoverished sandstone soils of the
SW VICTORIA - Predominant original vegetation (generalized).

Fig. 3:3
Grampians and Portland area, Messmate (*E. obliqua*), Brown Stringy Bark (*E. Baxteri*) occur with rich understories of Common Heath (*Epacris impressa*) and Grass-trees (*Xanthorrhoea australis*). Many forests were relatively open, and following European occupation, have regenerated with previously grassed areas becoming scrub-covered. From this evidence we can assume that Aboriginal patterns of burning must have assisted in maintaining the original conditions of disclimax.

**Wet sclerophyll forest**

These forests of tall trees and undergrowth occur in areas over 1,000 mm rainfall. They also extend into altitudes of beyond 1,000 metres. In regions such as the Otway Ranges forests attain heights of over 100 metres. The wet open forests, with their understories of ferns, are found also in the Grampians, and the wettest gullies of Mount Cole and near Portland. These forests are also susceptible to firing and have suffered in recent times because of this.

**Rain forest**

These dense Beech (*Nothofagus cunninghamii*) forests occur in wet gullies (rainfall over 1,400 mm) and mountain slopes (rainfall over 1,800 mm). These forests are densely canopied with fern-covered understories, and thus prevent easy access. Rainforest is distributed in the Otway Ranges and parts of the Grampian Ranges.

**Heathlands and coastal scrub**

These communities occur on poor coastal sands with Tea-tree (*Leptospermum spp.*) and Dwarf She-Oak (*Casuarina pusilla*) dominating. They extend from Portland in the west to East Gippsland, and have a rich flora. Wet heath occurs in areas of impervious subsoil such as the Portland area and the Grampians. Scrubby heathlands extend along the calcareous dunes of this western coastline.

**Resources**

The resource potential of the Western District is now assessed in accordance with the scheme outlined above.
Plant Foods

A number of recent studies have been carried out on plant foods used in temperate Australian regions. Attenbrow (1976) has presented an extensive coverage of the Bega area on the extreme south coast of New South Wales, while Poiner (1971) has dealt with the same coastline as far as the Sydney region. The other studies include: Hope and Coutts (1971) on Wilson’s Promontory; Jones (1971a) on north western Tasmania; Lampert and Sanders (1973) on the Beecroft Peninsula (N.S.W.). Both Poiner and Attenbrow conclude that in general the biomass of edible plants was greatest in the warmer months, with winter being the most depleted season. According to Attenbrow, species providing bulbs, roots and tubers were the most populous, followed by those from which were used the fruit and berries, leaves and shoots, seeds, nectar and pith (1976:69-86). On Table 6:1 I have set out the main plant foods eaten in south western Victoria (as distinct from all edible plants), and I have included the seasonal availability of as many of these as I was able. It can be seen from this table that the conclusions reached by the above two authors also broadly hold true for south western Victoria. Here, bulbs, roots and tubers made up the greater part of the plants eaten (see also Ch.6), and while obtainable throughout the year, plant foods as a group peaked in warmer months (spring-early summer) and were in lower quantities during autumn-winter. However, certain important climatic differences between this western Victorian region and the southern coast of New South Wales exist which would have influenced plant availability. Winter rainfall in western Victoria, as opposed to summer rainfall in New South Wales, as we have seen, meant that Victorian winters were also included within the growing season. Colder Victorian winter temperatures must also be taken into consideration.

On closer inspection of the data, the situation is even more complex. Age and season govern the quality of the underground parts of plants. During periods of growth their organs are fleshy while at other times they can be tough, fibrous and dry (Cribb and Cribb, 1974:137). Plants whose bulbs, tubers and roots were used are most easily detected during seasons of flower growth but they are also available at other times as the above evidence suggests (see also Attenbrow, 1976:76). As a group, therefore, such plants would have a much longer period of availability than would at first be thought if only the flowering period were considered. In most
studies carried out to date it is generally the latter season that has been taken into consideration, and indeed, this is so for the table presented here. This issue raises important questions relating to Aboriginal plant harvesting and management strategies (see Ch.6).

Attenbrow has also considered in some detail the distribution of edible plant species in her area in relation to habitat. The results she produces broadly can be applied also to south western Victoria, inspite of some environmental differences between the two area. The area of greatest frequency and diversity of plant species in all seasons was dry sclerophyll forest, with woodland and heath in second place. Plants whose bulbs, tubers and roots were used, were more numerous in the above habitats and also in grasslands. The latter environment, however was lacking in fruit and berries.

From this evidence it can be seen that plants in general could have formed a dependable resource base, and that plants providing bulbs, tubers and roots, were the most represented group and therefore the more likely to have been collected. The habitats where these plants were most numerous would, therefore, have been given most attention. The latter, of course, would also depend upon both the selecting process and the methods of harvesting.

Fish

Along the coast and estuaries, depending on the fishing methods employed, spring and summer would have been the seasons of greatest availability of fish species and numbers (Table 3:2). I have, in general, avoided the deeper water Pelagic fish which would have been beyond the reach of Aboriginal technology. Poineer (1976) and Attenbrow (1976) have come to similar conclusions for their respective areas in coastal New South Wales.

For economies that did not include offshore fishing, the western Victorian coast provides few protected fishing stations. Estuaries are few and tend to be small, and the coastline is for the most part open and exposed with few protected rocky bays and coves. High seas in winter would have made coastal fishing both less profitable and more precarious. Of the estuaries that do exist, those of the Rivers Surry, Eumeralla, Moyne,
<table>
<thead>
<tr>
<th>Species</th>
<th>Season</th>
<th>Species</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthopagrus australis</td>
<td>winter in estuaries</td>
<td>Mugil dobula</td>
<td>autumn</td>
</tr>
<tr>
<td>Black Bream</td>
<td></td>
<td>Navodon skottowei</td>
<td>estuaries, common</td>
</tr>
<tr>
<td>Acanthopagrus butcheri</td>
<td>estuaries</td>
<td>Platycephalus fuscus</td>
<td>summer, estuaries, coastal</td>
</tr>
<tr>
<td>Southern Bream</td>
<td></td>
<td>Pseudolabrus gymnogenis</td>
<td>coastal</td>
</tr>
<tr>
<td>Achoerodus gouldii</td>
<td>common in estuaries</td>
<td>Sillago ciliata</td>
<td>spring, summer, estuaries, coastal</td>
</tr>
<tr>
<td>Blue Groper/wrasse</td>
<td></td>
<td>Sillago schomburgki</td>
<td>summer, estuaries, coastal</td>
</tr>
<tr>
<td>Aldrichetta forsteri</td>
<td></td>
<td>Trachurus declivis</td>
<td>summer-autumn, coastal</td>
</tr>
<tr>
<td>Yellow-eye Mullet</td>
<td>common, coastal</td>
<td>Usacaranx nobilis</td>
<td>spring, estuarine, ocean</td>
</tr>
<tr>
<td>Caranx forsteri</td>
<td>spring, summer, autumn</td>
<td>Zeluco atelodus</td>
<td>summer, coastal</td>
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<tr>
<td>Trevally</td>
<td></td>
<td>Zeus australis</td>
<td>summer, estuarine, coastal</td>
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<tr>
<td>Chrysocephalus auratus</td>
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<td>Schnapper</td>
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<tr>
<td>Chrysocephalus gullulatus</td>
<td>spring, summer, autumn</td>
<td></td>
<td></td>
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<tr>
<td>Schnapper</td>
<td></td>
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<tr>
<td>Engraulis australis</td>
<td>common, estuaries</td>
<td></td>
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<tr>
<td>Whitebait</td>
<td></td>
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</tr>
<tr>
<td>Girella tricuspidata</td>
<td>autumn, estuaries,</td>
<td></td>
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<tr>
<td>Luderick, Black-fish</td>
<td>rocky foreshores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liza argentea</td>
<td>year round, estuaries,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flat-tailed Mullet</td>
<td>rocky foreshores</td>
<td></td>
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</tbody>
</table>

**Table 3.2 Availability of Coastal and Estuarine Fish Species in South Western Victoria**
Hopkins, Curdies, Gellibrand, Aire and Parker must be included.

Freshwater fishing would have been dependent upon seasonal availability of water and, therefore, the condition of inland waterways and wetlands. While autumn-spring provided periods of water excess, drought set-in in summer which dried up and considerably slowed down many of the waterways. Inland fishing would in general, therefore, have been most favourable during the autumn-spring seasons. Water temperatures, adequate sunlight, vegetation growth, together with the size of insect populations, would have been factors governing the availability of most freshwater fish species. All four variables were at their most favourable in spring, when the winter rainfall and rising temperatures result in an increase in vegetation growth. Fishing strategies would have had to be attuned to changes in temperature as well as distribution and levels of water in the district. The wide variation in these factors would have provided opportunities for a wide variety of freshwater fishing methods.

Migratory fish available in great quantity such as eels (*Anguilla australis*) (one of the most numerous and widely distributed inland fish), and Mullet (*Aldrichetta forsteri*) in the estuaries, provided conditions for harvesting fish on a large scale. Eels migrate principally in autumn with the coming of the rains. Some of the more common freshwater fish species in the drainage systems to the south of the Great Divide, apart from eels, include (see also Barnham): Black Fish (*Gadopsis marmoratus*); Freshwater Herring (*Potamalosa richmondia*); Australian Smelt (*Retropinna semoni*); Freshwater Hardyhead (*Craterocephalus fluviatilis*); Big-Headed Gudgeon (*Philypnodon grandiceps*); Carp Gudgeon (*Hypseleotris compressus*); Striped Gudgeon (*Gobiomorphis australis*); Western Carp Gudgeon (*Hypseleotris klunzingeri*); Chequered Gudgeon (*Mogurnda adspersa*).

Shellfish

Coastal and estuarine species of shellfish can generally be harvested throughout the year although the breeding cycle of many species affects the quality and size of the meat content. Rough seas especially in the winter months would impede access to species of the lower intertidal zone which include many of the larger and more fleshy species such as abalone (*Notahaliotis ruber*) and Turban (*Subninella undulata*). Access to species of the open sandy shore such as pipi (*Plebidonax deltoides*) may also have been limited by high winter seas.
Freshwater shellfish such as Mussell (*Uniood spp.*) which are plentiful in inland waterways, would have been procurable all year. For a list of the main marine molluscs of Victoria see Macpherson and Gabriel (1962).

**Crustaceans**

Crustaceans such as crayfish and crabs would have been most plentiful and accessible in rocky coastal, sandy beach and estuarine habitats. Species of crab are found in all three habitats. Seasonal limitations on these resources were similar to those imposed on coastal fishing and shell-fishing, that is high winter seas. Inland crustaceans, such as Freshwater Crayfish (*Euastacus sp.*) would have been available throughout the year.

**Land Mammals**

Although numerous in species this group of animals, apart from the larger macropods, is not markedly gregarious and so, apart from exceptional circumstances, would not have been amenable to being hunted or captured in large quantities. For a list of the main land mammal species see Wakefield, (1974). As well, while seasonal and climatic factors would limit both distribution and numbers of individual species, the above estimation would generally still hold. Many of the larger herbivores (e.g. macropods) would be attracted to areas of fresh pasture, which would be linked to the growing seasons of winter and spring. These ideal conditions could also be encouraged by firing (see above and Ch.6). All early ethnographers described the large mob sizes and numerous macropod populations in the lush, open parts of the Western District:

> Kangaroos were more numerous in this part of the country, than in any other that we had traversed. I counted twenty-three in one flock, which passed before me, as I stood silently by a tree. Two of the men counted fifty-seven in another flock.  
> (Mitchell, 7 September, 1836)

In the above situations, effective trapping and hunting methods could have been employed. The smaller macropods also offered some opportunities for trapping and driving. The Swamp Wallaby (*Wallabia bicolor*) is distributed in rainforest, wet schlerophyll and to a lesser extent, in dry schlerophyll forest and woodland, for example in the Otway Ranges. It could, therefore, have been captured in scrub-covered gullies.
Wallabies which resided in rocky, scrubby habitats, such as the Brush-tailed Wallaby (*Petrogale penicillata*) and Red-bellied Pademelon (*Thylogale billardieri*) also could have been trapped in this way. Burrowing animals such as the Brush-tailed Rat-kangaroo (*Bettongia gaimardi*) would have been easily detectable and thus could have been captured in some quantity.

From the list of mammalian species found in the Western District as provided by Wakefield (1974) it can be seen that environments carrying the most species and numbers would have been grasslands, savanna grasslands, coastal heaths, woodland and forests. Wet sclerophyll forest would have included fewer species such as: Swamp Wallaby; Potorou (*Potorous tridactylus*), also found in rainforest; Long-nosed Bandicoot (*Perameles nasuta*); Ring-Tailed Possum (*Pseudocheirus peregrinus*); Sugar Glider (*Petaurus breviceps*); Brown and Dusky Phascogale (*Antechinus stuartii*), (*Antechinus swainsonii*).

**Marine Mammals**

Before European sealers penetrated the Bass Strait, including the western Victorian coastline, in the early 1800's, seals appear to have been numerous over the whole region. Today only a depleted remnant of seal species remain and our knowledge of the pre-1800 situation is fragmentary. One hopeful avenue for research in the latter problem is via archaeological data (see Ch.12). The most numerous species today is the Fur Seal (*Arctocephalus pusillus doriferus*). It has a colony on Lady Julia Percy Island, lying eight kilometres off the coastline west of Port Fairy, and is a frequent visitor to rocky foreshore areas and beaches along the whole western Victorian coastline including the Cape Otway and Portland regions. The New Zealand Fur Seal (*Arctocephalus forsteri*) is an occasional visitor to the area, as is the Australian Sea-lion (*Neophoca cinerea*), both of which have rookeries further west, for example on Kangaroo Island. Both species also regularly haul out at Lady Julia Percy Island. Species of the family *Phocidae* are rare today, being represented mainly by stragglers from Antarctic waters. Of these the Southern Elephant Seal (*Mirounga leonina*) was once much more common in these waters. It has been sighted, however, more recently at Portland Bay, and Lady Julia Percy Island and is presumed to come from the very large breeding colonies at Macquarie Island. One individual was also quite recently stranded on a beach near Port Fairy. Another rare species today is the Leopard Seal (*Hydrurga leptonyx*), and an
even rarer species, the Crab-eater Seal (*Lobodon carcinophagus*) (Wakefield, 1974; Victorian Year Book, 1963:1-23; Warneke n.d.).

The above evidence suggests that seal species were much more common in the past on the western Victorian coastline, presumably with more colonies established, and with fairly regular hauling out stations. These facts would indicate that as a resource, seals, which are relatively easy to capture once grounded, might have provided a regular and constant contribution to the diet in coastal areas especially at certain times of the year. The latter would include: for seal colonies, the breeding, winter haulout and moulting seasons; and for visiting seals, haulouts which could take place throughout the year but which were more likely to occur in the winter months when seas were roughest. This issue is discussed further in Chapter 12, and indicates that seals would have generally been available throughout the year, with a peak period from early spring to summer.

Whales and dolphins are common in western Victorian waters and strandings of many of these species are quite frequent. A list of the most common species and recorded strandings occurs on Table 3:3. The cause of strandings is complex but appears to be produced by interference to the animals' acoustic system. For example, shallow waters near gently sloping shores are common places for strandings, and the Port Fairy-Warrnambool region appears to be such an area. Fishing expeditions and the appearance of predators can also cause strandings. Being gregarious species with a strongly developed social organisation and co-operative behaviour, a stranded member is often followed on shore by the whole school. In some cases 300 and 400 stranded individual whales (e.g. Sperm Whale, Pilot Whale, False Killer Whale) have been recorded (pers.comm. Dr R. Warneke, Fisheries and Wildlife Division, Victoria).

The autumn-winter period, a time of turbulent seas, is a common season for strandings of whales and dolphins along the western Victorian beaches. Some species, such as the above, appear seasonally in these waters, but there is no evidence to suggest regularity in annual movements or migrations. In terms of Aboriginal economy, therefore, whale and dolphin strandings would have been erratic in time, perhaps location and numbers involved, although these would have occurred most frequently
Table 3:3 Recorded Strandings of Whales and Dolphins in South Western Victoria (after Wakefield 1974:44-5)

Family Balaenidae

Right Whale (*Eubalaena glacialis*)
Originally a seasonal visitor to the bays. Last recorded July 1942, in Portland Bay.

Pigmy Right Whale (*Caperea marginata*)
A stranding recorded, in Portland Bay, 1946.

Family Balaenopteridae

Blue Whale (*Balaenoptera musculus*)
A stranding recorded for Anglesea in April 1955, and one in Portland Bay about 1957.

Minkie Whale (*Balaenoptera acutorostrata*)
A young calf was stranded in Portland Bay in October 1846.

Family Physeteridae

Spermwhale (*Physeter catadon*)
Occasional visitor to coastal waters. Single strandings recorded at Bridgewater Bay in October 1944, and Nelson Bay in July 1954.

Family Ziphiidae

Strap-tooth Whale (*Mesoplodon layardi*)
One was stranded at Port Fairy, June 1961.

Andrews Beaked Whale (*Mesoplodon bowdoini*)
A stranding near Horden Vale, May 1968.

Bottle-nosed Whale (*Hyperoodon planifrons*)
A stranding at Cape Bridgewater (west end Bridgewater Bay), July 1950.

Family Globicephalidae

Killer Whale (*Orcinus orca*)
Often encountered in near-coastal seas, according to Port Fairy fishermen.

Pilot Whale (*Globicephala melaena*)
One stranded near Port Campbell, January 1967.

Family Delphinidae

Common Dolphin (*Delphinus delphis*)
Plentiful in near coastal seas.

Bottle-nosed Dolphin (*Tursiops truncatus*)
Not uncommon in near-coastal seas, according to Port Fairy fishermen. A stranding at Port Fairy, May 1967.
during the winter months. Their occurrence would have allowed for sizeable population increases in these localities.

Birds

Birdlife was extremely varied in the Western District, and because of the large areas of perennial wetlands, the region carried in the past, large populations of migratory birds. Waterfowl were especially common. Lists of bird species found in south western Victoria can be found in Middleton, (1974) and the Victorian Year Book (1966:1-28).

Today most species of duck breed in the Murray-Darling region and use perennial swamplands in the Western District as areas of summer refuge. With the existence of larger stretches of wetlands in the past, we could expect that ducks may have also used these regions for purposes of breeding, and that spring-summer duck populations would have been much larger. Of the larger water birds, swans were once numerous and their egging season in early spring, together with the resultant fledglings, would have provided a large harvest. The moulting season (spring) also allowed for easy access and capture of waterfowl.

Water birds which would have been available throughout the year included most Ibises (Plegadidae); Herons (e.g. *Nycticorax caledonicus*); Egrets (e.g. *Egretta alba*), which rest in colonies. Moor hens (e.g. *Calidula tenebrosa*) and Coots (*Fulica altra*) were also available, and like the above species, were relatively easy prey.

Two species of geese were found in the district. The rare Cape Barren Goose (*Cereopsis novaehollandiae*) which breeds on the islands of that name off the north east coast of Tasmania, summer in western Victoria. Although today it is principally a northern bird, the Magpie Goose (*Anseranas semipalmata*) was once relatively common in the region.

Of the larger game birds of the more open country, which includes the wide treeless plains, three are the most important and in the past were very numerous. The Emu (*Dromaius novaehollandiae*) is the largest, and previously roamed in large flocks. As well, Emu eggs could have been collected in August. As with the larger macropods, the size and group behaviour of the birds offered opportunities for trapping and hunting in
some quantity. The Bustard or Plains Turkey (*Eupodotis australis*) was also numerous and was often mentioned by early European writers. For example, below the Serra Range, Robinson recorded seeing up to one hundred turkeys spread out on the grassy plains, areas which had been flooded at the time Mitchell passed through (25 June, 1841). The third species is the Crane or Brolga (*Grus rubicundus*) which was once very numerous and found in large flocks, especially in wetter areas. Gregarious and populous species also included parrots, cockatoos and lorikeets, and thus offered opportunities for capture. Many of the other species of birds, however, were generally small in size and more dispersed in distribution, and provided less attractive targets.

Birds of the coastline were generally dispersed in distribution, with a few exceptions such as the Mutton-bird (*Puffinus tenuirostris*) which is migratory but establishes rookeries in the Bass Strait, for example on Green Island, just off Port Fairy. Small penguins (e.g. *Eudyptula minor*) also beach and nest in some quantity.

**Reptiles and Amphibians**

In general reptiles are more common in spring and summer following the "hibernation" of the colder months. It is during the warmer weather that they are most obvious and therefore accessible. Of the reptiles, some of the larger lizards and snakes may have offered prime targets, with the smaller species forming a fairly constant supply of snack foods.

Frogs could have been relatively easily captured throughout the year but would have been most numerous in spring and early summer when insect populations were largest. For a list of the main Amphibians and Reptiles see the Victorian Year Book (1971:1-35).

**Insects**

Insect species could have been more readily available as pupae, as in the case of some species of ant. At these times they could have been collected in some quantity especially during the colder months before maturation took place during the warmer weather.

Other insects would include Lerps (*Psyllidae*) which exude a sugary manna to be found in quantity on Eucalypts, and cicadas (*Homoptera*) which emerge in late spring.
Discussion

The analysis of the resource potential of the study area indicates certain key limiting factors for hunter-gatherer occupation. The most important of these concern the marked seasonality in climate, which produced variance in temperature, light and rainfall, thus affecting the spatial and temporal distribution of all resources. In general, the season of greatest resource productivity was spring-early summer (September-December) and the leanest season winter (June-early August). Reliable winter rainfall and subsequent plant growth would have partly offset the full effect of lower winter temperatures.

Sustained rainfall together with warmer temperatures and increased light produced a resurgence of vegetation in early spring which in turn was felt throughout the entire food chain. The overall fertility of this season lasted until high temperatures coincided with diminished rainfall at the height of summer (January-February). Generally, resources continued to fall off in autumn although the beginning of the rains at this time stimulated aquatic species, in particular migratory fish such as eels, and promoted new vegetation growth for herbivores.

This pattern of autumn-winter rainfall which resulted in the inundation of many low-lying areas of the district, would have limited Aboriginal settlement as would the high-summer drought. Low winter temperatures would also have restricted Aboriginal settlement and movement, especially on the exposed coastline where high seas as well would have depleted resources.

Habitats which offered productive, dependable and accessible resources would have been the most likely to maintain the largest and most sedentary Aboriginal populations. Estuaries and wetlands, composed of perennial lakes, ponds and marshes, would have been the prime locations fulfilling the three above criteria in all seasons.

A closer examination reinforces these above conclusions. Estuaries are one of the most fertile of all ecosystems and the wetlands especially marshes, are also naturally fertile (Odum, 1975:174-5). Rates of energy flow in estuaries are maintained at higher levels than contiguous environments (the sea and freshwater) by five main mechanisms: (a) tidal
action which rapidly circulates nutrients and food and removes wastes; (b) a diversity of plant species (phytoplankton, benthic microfauna, large plants such as seaweeds) providing continuous photosynthesis; (c) their operation as efficient nutrient traps; (d) a succession of "crops" providing year-round primary production; (e) close contact maintained between autotrophic and heterotrophic layers (see Odum, 1975:174-5).

In marshes the obvious lack of tidal action is in part replaced by periodic fluctuations in water levels brought about by seasonal and annual rainfall, which assists in maintaining long-range stability and fertility. Fires clean out and deepen dried-out marsh basins by removing sediments and undecayed organic matter. Man can interfere in this process of ecological succession by firing during dry periods and also by controlling water levels with dikes etc. (see Ch.15). In other aspects, marshes operate similarly to estuaries (above) (Odum, 1975:183-4).

Shallow lakes and ponds, which generally fill geologically young basins, tend to be more fertile than deep ones (Odum, and on the whole, more so than streams and rivers. The latter act as drains and thus do not allow for substantial build-up of phytoplankton; as ecosystems they are incomplete in that a portion of their energy flow, in terms of organic matter, is imported from nearby terrestrial ecosystems, including lakes. Waterways that exhibit sluggish conditions, such as occur seasonally in the Western District, ecologically resemble a series of ponds where phytoplankton levels are higher and subsequently also are those of insects and fish (Odum, 1975:175-7).

Locations where wetlands coincided with a mosaic of terrestrial habitats, such as grasslands, savanna woodlands, forest and coastal heath, would have been the most fertile locations, as all three key variables (above) would have been increased. Such a complex pattern of micro-environments ecologically is a most productive environment (see Flannery, 1964). These environmental complexes occurred most commonly in the area of the coastal strip and for a distance of perhaps up to 60-70 kilometres inland. Beyond this hinterland fringe, the open treeless plains are more predominant, and are dissected by waterways and smaller mosaic wetland habitats such as those described above. The prime habitats would therefore have been distributed along the coastal fringe, decreasing in size and frequency further inland towards the base of the ranges. In the west,
this situation was altered by the rugged hilly and wooded region, including the Dundas Highlands, through which the Glenelg river flowed, and in the east by the humid Otway Ranges and forests.

The littoral would have offered prime conditions for both group size and sedentism in spring and summer, with a period of winter fall-off. However, fertile wetland regions in close proximity to the coast, provided these conditions throughout the year. Such locations would include the coastal strip between Portland and Warrnambool. It is almost superfluous to point out the fertility of the seashore which in this case included a high energy sea together with its constantly renewable resources from nutrients and phytoplanktons to fish and sea mammals.

In contrast to this complex of productive habitats, grasslands, savanna grasslands, woodlands and forests would have provided a wide range of resources but ones spatially distributed more broadly. As well, areas such as the open grasslands would have been highly vulnerable to summer drought. Occupation of the latter areas, we can presume, would have resulted in more mobile economies and more dispersed populations. The areas of lowest resource potential were the rainforests such as those of the Otway and Grampian Ranges. Resources here were sparsely distributed and access limited.

From these results we could therefore propose the following general predictive model of Aboriginal subsistence and settlement for the Western District:

(a) The densest populations could be expected in areas of perennial wetlands, waterways and fertile coastal (e.g. estuarine) regions.

(b) The highest levels of sedentism would be associated with optimum resource zones, such as those described above.

(c) A more nomadic organisation would be associated with environments such as grasslands, savanna woodlands and forests.

(d) Areas of wet schlerophyll forest and rainforest would have the lowest populations.

The information on the seasonal distribution of resources would allow a more detailed model of subsistence and settlement to be proposed, as follows:
(a) The highest levels of population density and sedentism would be linked to the seasons of spring-early summer, and to optimum resource areas (above).

(b) Increased nomadism and smaller group sizes would occur at the height of summer and during late autumn-winter.

(c) Optimum resource zones (above) would also retain relatively sedentary and sizeable populations throughout the year.

(d) Location and duration of settlement would be influenced by summer drought and autumn-winter inundation.

In the former case, settlements would be expected to cluster at permanent water and in the latter on higher ground.

This settlement pattern could be expected to vary according to local environmental conditions, but in general a dichotomous coastal/inland pattern emerges:

(a) In fertile coastal regions/optimum conditions would apply throughout the year, except that the focus of economic attention would shift to the littoral in spring-summer and to the hinterland in autumn-winter.

(b) Inland perennial waterways and wetlands would maintain year-round optimum conditions, lessening in the winter months; while ephemeral wetlands, open plains and forests would be subject to greater nomadism and be hardest hit by summer droughts and winter lows.

Predictions can also be made concerning resource strategies:

(a) Plants, being the most dependable food resource (in terms of numbers, constancy and accessibility) may be expected to have formed the dietary base.

(b) Shellfish, insect larvae, bird's eggs, perhaps crustaceans, were also relatively dependable and may have formed secondary stand-bys.

(c) Fishing, on the whole, would have been a less dependable strategy, although at certain times, for example during the migratory season, it would have been a profitable pursuit. The seasonal availability of fish would also have allowed for a wide range in extractive techniques.

(d) Hunting of land mammals would have been generally a high risk strategy, with the exception of infrequent hunting drives.

(e) Capture of marine mammals would have been most profitable during certain seasons involving relatively low risk.

(f) Capture of birds would also in general have been a risky pursuit, as would have that of reptiles.
These models have been constructed so as to be testable by two forms of data, ethnohistorical and archaeological. This procedure is carried out in the following chapters of this thesis. Before I proceed, however, a number of qualifications should be pointed out concerning these models which are static in form. As I have indicated in Chapter 1, when considering long-term trends such static situations must be expected to alter. Two main variables could be proposed here as agents of change. Firstly environmental factors such as climate can be assumed to have altered, and for this region there is evidence of this (ch.15). For example, increased aridity would have both heightened summer drought, shrinking areas of perennial wetlands and thus affecting overall subsistence and settlement. As well, economic strategies, involving land management practices and extractive techniques can also be expected to have altered in response to environmental oscillations (e.g. see above and ch.15, Appendix1). More efficient extractive techniques may also have been devised (ch.1). Such issues will be discussed further below.
CHAPTER FOUR

BAND AND TRIBE

Evidence for traditional Aboriginal local organisation and population from south eastern Australia is extremely rare. European occupation of this region brought about a rapid decline in Aboriginal numbers and disintegration of their societies. Detailed scientific investigation of the region came too late. The evidence presented in this chapter comes from a body of ethnohistorical material not previously investigated. The detailed information of George Augustus Robinson on western Victoria is therefore an important addition which provides a unique set of data. Robinson's information is most detailed on aspects of spatial organisation and interaction of local populations. The discovery of this information places south western Victoria as one of the best documented regions in this regard, in south eastern Victoria. Here I analyse Robinson's material on local group organisation and relate it to the wider Australian context (see also Lourandos, 1977a).

Apart from Robinson the most significant early ethnographic information on the topic comes from Dawson (1881), on whom most later accounts are based. Howitt (1904) relies principally on Dawson, as do Davidson (1938a, 1938b) and Tindale (1940, 1974). Robinson's manuscripts and papers were either unknown or overlooked by the later writers.

I have organised the material under two convenient headings - band and tribe, which I define more closely below.
Band

The debate concerning the definition of the Australian local group or band, has been a heated one (Hiatt, 1962, 1966; Stanner, 1965; Birdsell, 1970). The complexity of its arguments is extensive and clearly beyond the level of evidence employed here. Nevertheless, the following discussion can serve to clarify certain broad elements of Australian local group composition and function by presenting data from south eastern Australia, which is a region neglected, due to lack of data, by other reviews of these issues (e.g. Hiatt, 1962).

In defining the local group in south western Victoria I have distinguished between the terms band and clan, that is, between the land-using and land-owning units (Stanner, 1965). Following Stanner, I distinguish between land used by the band and labeled as the country, and land owned by the clan, labeled as the estate. I use the term band to refer to the local population unit or local group (see Maddock, 1972:32). In doing so I employ the latter strictly to describe the land-using unit. The reasons for this are the following. Most of the data used here are from Robinson and like most early observers he did not distinguish between the economic (land-using) and the ritual (land-owning) aspects of these groups. In fact, he employs the one term to cover both features of the local population. I have intentionally avoided inferences of land ownership (estates) for the sake of maintaining uniformity in my argument, but, as will become evident, such inferences can be drawn from Robinson's account.

Robinson described the local population units by their given name or names (as a small percentage of named groups have two or more names) followed by a group term such as conedeet, bulluc and sometimes, corroke. For example the Tappoc Conedeet were located near to and took their name from Mount Napier which was called Tappoc. Likewise, the Burrumbeet Bulluc took their name from Lake Burrumbeet where they chiefly resided. The group term conedeet appears to have been used principally in the southern coastal areas of the Western District, for example, for bands belonging to the Manmeet area. Bulluc and to a lesser extent corroke were employed in the northern inland areas of the Western District, such as for bands of the Tjapwurong and northern Wathaurung areas. This geographical form of classification is a common feature of Australian Aboriginal societies (e.g. Howitt, 1904:41).
The evidence of Dawson and Smyth is broadly in agreement with that of Robinson. Dawson spells the group term as *kuurndit* which he describes as meaning "a member of" (1881, 1-2). Smyth interprets the same terms, although spelled somewhat differently, of *goon deetch* and *bulluk* as "people" and "men" (1876, 2:154). Dawson's data, however, lack the fine detail which is provided by Robinson, and this can be attributed to the lateness of his testimony. Dawson's local populations are described as much larger units than those of Robinson, and they appear to be dialect groupings. For example, one of Dawson's groups is the Peek Whuurong Kuurndit around the Port Fairy area for which Robinson has located 14 separate bands. It is such groups that Dawson labels as *tribes* and *kuurndit*. He seems to have had no awareness of the small local groups (bands) described by Robinson, which amalgamated together would have constituted one of his own dialect groups. By the time Dawson was writing the mere remnants of the smaller local bands must have regrouped themselves within wider linguistic units for social survival. This is not to suggest that these larger "dialectic" groupings did not exist also, as aggregations of bands, in the pre-contact period. A parallel situation can be found in Smyth's material for south western Victoria which is contemporary with Dawson's writings (Smyth, 1876, 1, *tribal map*). Smyth's local groups are also much larger geographic units than those instanced by Robinson.

Robinson recorded his information on bands in a number of ways. Bands were named and located when he came upon them in the field or when they were alluded to by his Aboriginal informants. Formal lists were also made by Robinson of individual bands and their members. These lists were provided for him by local Aboriginal informants who had first-hand knowledge of these people. For example when in the Port Fairy region (Peek Whuurong) Robinson was provided with a list of 43 Manmeet bands, which included complete details of band personnel), as well as reference to defunct bands (27, 28 April, 1841).

I have listed the bands as recorded by Robinson in Table 4:1. A longer more detailed list which included variations in spelling, alternative names and full locational details could have been provided, but I have avoided this here. Individual bands recorded by Robinson have also been documented by other writers which adds further credibility to his observations (Dawson, 1881; Smyth, 1876, 2:154).
<table>
<thead>
<tr>
<th>Table 4:1</th>
<th>List of south western Victorian Bands as recorded by Robinson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bands are listed here according to their geographical location within Tindale's tribes. Numbers refer to their location on Fig. 4:1.</td>
<td></td>
</tr>
</tbody>
</table>

**Manmeet** (Gunditjmara)

<table>
<thead>
<tr>
<th>Number</th>
<th>Band Name (Chamber)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All.lo.conedeet.bart</td>
<td>(b) 30. Milan (a)</td>
</tr>
<tr>
<td>2</td>
<td>All.lo.killing</td>
<td>(c) 31. Num.mer (a)</td>
</tr>
<tr>
<td>3</td>
<td>Al.lom.e.gare</td>
<td>(c) 32. Ome.be.gare.re.geen (b)</td>
</tr>
<tr>
<td>4</td>
<td>Al.lo.mut.ton</td>
<td>(d) 33. Pat (c)</td>
</tr>
<tr>
<td>5</td>
<td>Ar.tit (Art)</td>
<td>(a) 34. Peer.rac.re (d)</td>
</tr>
<tr>
<td>6</td>
<td>Art.cone.de.yeer.roec</td>
<td>(b) 35. Tappoc (a)</td>
</tr>
<tr>
<td>7</td>
<td>Bite bor.ron</td>
<td>(b) 36. Tarn.de.teer.re (b)</td>
</tr>
<tr>
<td>8</td>
<td>Buller.bul.le.cort</td>
<td>(b) 37. Tare.re (a)</td>
</tr>
<tr>
<td>9</td>
<td>Can.can.corro</td>
<td>(c) 38. Tar.rone (a)</td>
</tr>
<tr>
<td>10</td>
<td>Care.re</td>
<td>(c) 39. Til.lac (b)</td>
</tr>
<tr>
<td>11</td>
<td>Cart (Cart.be.are)</td>
<td>(a) 40. Tone (c)</td>
</tr>
<tr>
<td>12</td>
<td>Cart.bo.nong</td>
<td>(b) 41. Too.rac (a)</td>
</tr>
<tr>
<td>13</td>
<td>Cart.corang</td>
<td>(b) 42. Ure (Eurite) (a)</td>
</tr>
<tr>
<td>14</td>
<td>Cor.ry</td>
<td>(d) 43. Worn (c)</td>
</tr>
<tr>
<td>15</td>
<td>Dan.de.yal.lum</td>
<td>(b) 44. Ware.rang.un (b)</td>
</tr>
<tr>
<td>16</td>
<td>How.weet</td>
<td>(c) 45. Ware.rone.cone (c)</td>
</tr>
<tr>
<td>17</td>
<td>Kart</td>
<td>(a) 46. Way.wac (c)</td>
</tr>
<tr>
<td>18</td>
<td>Killare</td>
<td>(a) 47. Weer.ram.mer.re (d)</td>
</tr>
<tr>
<td>19</td>
<td>Meen</td>
<td>(c) 48. Wol.lore.re (a)</td>
</tr>
<tr>
<td>20</td>
<td>Merri</td>
<td>(a) 49. Wornabul (a)</td>
</tr>
<tr>
<td>21</td>
<td>Min.yee.rook.connewurt</td>
<td>(c) 50. Woorten.wan (d)</td>
</tr>
<tr>
<td>22</td>
<td>Mo.per.rer</td>
<td>(c) 51. Wore.rome.killing (c)</td>
</tr>
<tr>
<td>23</td>
<td>Mor.done.ne</td>
<td>(c) 52. Wune Cone.deet.burn (b)</td>
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<td>24</td>
<td>Mor.ro</td>
<td>(c) 53. Wur.cur.rf (a)</td>
</tr>
<tr>
<td>25</td>
<td>Mort</td>
<td>(c) 54. Yal.lone (a)</td>
</tr>
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<td>26</td>
<td>Mum</td>
<td>(b) 55. Yam.beet (c)</td>
</tr>
<tr>
<td>27</td>
<td>Mundurrong</td>
<td>(c) 56. Yar.re (a)</td>
</tr>
<tr>
<td>28</td>
<td>My.al</td>
<td>(c) 57. Yi.yar (Born.born) (a)</td>
</tr>
<tr>
<td>29</td>
<td>N.el.gal</td>
<td>(b) 58. Yowen.nillum (Yowen) (a)</td>
</tr>
</tbody>
</table>

**Tjapwurong**

<table>
<thead>
<tr>
<th>Number</th>
<th>Band Name (Chamber)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bar.conedeet</td>
<td>(a) 17. Parn (a)</td>
</tr>
<tr>
<td>2</td>
<td>Beerripmo</td>
<td>(b) 18. Peer.re.pur (b)</td>
</tr>
<tr>
<td>3</td>
<td>Bon.mer</td>
<td>(c) 19. Poeng.ort (b)</td>
</tr>
<tr>
<td>4</td>
<td>Bulluc Bur.re.r</td>
<td>(a) 20. Pup.pe.len.neer.ring (b)</td>
</tr>
<tr>
<td>5</td>
<td>Collor.er</td>
<td>(a) 21. Putteneer (a)</td>
</tr>
<tr>
<td>6</td>
<td>Cup.pone.net</td>
<td>(c) 22. To.lo.ar.re (c)</td>
</tr>
<tr>
<td>7</td>
<td>Cur.rac</td>
<td>(a) 23. Tone.do.jarrer (a)</td>
</tr>
<tr>
<td>8</td>
<td>Jacalet (Tacalet)</td>
<td>(b) 24. To.ol (a)</td>
</tr>
<tr>
<td>9</td>
<td>Jazzy Jazzy</td>
<td>(b) 25. Too.org (a)</td>
</tr>
<tr>
<td>10</td>
<td>Kone.gil.wer.ring</td>
<td>(a) 26. Tupe.too.rut (d)</td>
</tr>
<tr>
<td>11</td>
<td>Konennencen</td>
<td>(a) 27. Ural (b)</td>
</tr>
<tr>
<td>12</td>
<td>Larnaget</td>
<td>(b) 28. U.tow.el (a)</td>
</tr>
<tr>
<td>13</td>
<td>Moor.moor.good.deet</td>
<td>(b) 29. Wane.mol.ie Choke (a)</td>
</tr>
<tr>
<td>14</td>
<td>Mutter Choke</td>
<td>(c) 30. Ween.tap.poc (c)</td>
</tr>
<tr>
<td>15</td>
<td>Nee.sheer.e</td>
<td>(a) 31. Weeriprar (c)</td>
</tr>
<tr>
<td>16</td>
<td>Netcunde</td>
<td>(c) 32. Wotten.ne.er (a)</td>
</tr>
</tbody>
</table>

(a) = location known
(b) = location approximate
(c) = location general
(d) = location unknown
Table 4:1 (continued)

Wathaurung (Northern)

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<td>Berrejin</td>
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<tr>
<td>4.</td>
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<tr>
<td>5.</td>
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<tr>
<td>6.</td>
<td>Carninje</td>
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<td>Cone.ne.cut</td>
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<td>Corerpongeilite</td>
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<tr>
<td>9.</td>
<td>Corrin Corrin</td>
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<tr>
<td>10.</td>
<td>Cor.rin.gum</td>
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<tr>
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<td>Ly.je.wor.roke</td>
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</tr>
<tr>
<td>12.</td>
<td>Moijerre</td>
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</tr>
<tr>
<td>13.</td>
<td>Mone</td>
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<td>17.</td>
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<td>18.</td>
<td>Yare.rin.bor.rin</td>
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<td>Yarem.bur.gur.rum</td>
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Wathaurung (Southern)

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Kirrae

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<td>Gan Gan</td>
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Bunganditj (Glenelg Area)

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Jaara

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Jaadwa

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<td>2.</td>
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</table>

Jaadwa
Compiling this information proved no easy task mainly due to the replication of information which is spelled in a variety of ways, as well as occurring in alternative forms. My final decision on the choice of a particular spelling and form of a name is often quite arbitrary. In these lists, however, and elsewhere in this thesis, I have not attempted to change Robinson's original spelling and have preferred to present the material as he recorded it. Where multiple names exist, for example Yi.Yar or Born.Born Conedeet for the same band, I have arbitrarily selected one as the main name. Where there is ambiguity in the number of bands of an area, I have opted for the lowest number, and in some cases have amalgamated two bands into one. For example, the Cart and Cart.be. are Conedeets, and the Yowen and Yowen nil lum Conedeets have each been reduced to one band.

For convenience I have located the bands within Tindale's tribal boundaries (Tindale, 1974). Although I later suggest that there exists a case for modifying some of these boundaries I felt that leaving them in their original form does not detract from the arguments I am presenting. Because of the approximate nature of some of these boundaries however, the allocation of bands in these affected areas to a particular tribal group could prove troublesome. But this is not a serious problem.

The most detailed information is for the area delineated by Howitt and Tindale as part of the Gunditjmara (Howitt, 1904:69; Tindale, 1974:204). This area was known to Robinson as that of the Manmeet which is spelled in a variety of ways (Monemeet, Mam mote, Monmate etc.). The name Gunditjmara referred only to a local group, that of Lake Condah, whereas the name Manmeet referred to the language and people of this whole tribal area (see below) and is therefore a more accurate label. In contrast to this situation, as can be seen in Fig. 4:1 the areas of the southern Wathaurung, Kolakngat, Kirrae and Katubanut, are seriously lacking in information on local bands. Robinson's information is therefore incomplete and we must treat the final number of bands deduced for the area as a below minimum one only.

Most of the bands recorded by Robinson have been located geographically, although some more specifically than others. In Table 4:1 I have attempted to distinguish between levels of information concerning the
**Fig. 4:1  ABORIGINAL BANDS IN SOUTH WESTERN VICTORIA**

Data: Robinson, 1841; Lourandos, 1977a.
geographical location of bands. An *approximate* location of a band refers to a description such as, "near or at Port Fairy", and a *general* location to a description such as, "north of Mount Rouse".

**Territory**

The relationship of a band to a specific territory (range) was described in the following way: "The natives have the ground parcelled out among themselves and the owner or proprietor can expel any other native" (Robinson, 10 August, 1841).

Dawson's description is similar:

> The territory belonging to a tribe is divided among its members. Each family has the exclusive right by inheritance to a part of the tribal lands, which is named after its owner; and his family and every child born on it must be named after something on the property. When the boundaries with neighbours meet at lakes and swamps celebrated for game, well-defined portions of these are marked out and any poaching or trespassing is severely punished. No individual of any neighbouring tribe or family can hunt or walk over the property of another without permission from the head of the family owning the land. A stranger found trespassing can be put to death. (1881:7)

These accounts of territorial rights from the Western District accord with those of William Thomas and Howitt for the neighbouring areas around Melbourne, and Gippsland.

> ... according to his observations, the Aborigines invariably adopted natural boundaries for their territories, as rivers, creeks, and mountains. The Wawoorong or Yarra tribe claimed the lands included within the basin of the River Yarra; all waters flowing into it were theirs, and the boundaries were the dividing ranges on the north, east and south. The Boonoorgong or coast tribe claimed in the same way all the country lying to the south of the southern rim of the Yarra Basin, eastwards from the Tarwin River to Port Phillip Bay, and southwards to the sea. (Smyth, 1876, 1:32)

Thomas adds: "All the tribes beyond the district of their friends are termed wild blackfellows, and when found within the district are immediately killed" (Bride, 1898:401).

Howitt observed:
A distinction is drawn by tribes between themselves and aliens by some term applied to the latter, either of contempt or fear. Thus while the Kurnai (Gippsland, Victoria) speak of themselves as "men", they give the name of Brajerak, from 'bra', "man", and 'jerak', "rage" or "anger", to their neighbours... those living in the Western Port District of Victoria they call Thurung or tiger-snakes, because, as I have heard them say, 'they came sneaking about to kill us'.

Robinson provides sketch maps of the locations of neighbouring bands in the area of the Pyrenees. The first of the two examples shows the positions of the neighbouring Pel.ler.win, Bar.conedeet, Cur.rac and Beeripmo bullucks located along the river at the headwaters of the Hopkins. The second is a continuation of the first showing the positions of the Too.ong, Konennenicen and Wane.mol.le.choke bullucks immediately to the south of the Bar.conedeet along the River Hopkins, for a distance of about 16 kilometres. No mention is made, however, of whether such boundaries related to ritualistic or economic contexts.

Examples

From all descriptions provided, bands are not only associated with specific geographic ranges, but function as economic units, as units of defence and aggression, with a fluidity of membership. Bands as well as un-named local groups whose compositions were recorded, often included individuals from other neighbouring bands as well as members of the local population. A series of examples to illustrate some of these points follows.

About 20 kilometres inland from Port Fairy is an area of rich swamplands (Tarrone, on the Moyne Swamp) which Dawson described as delineating the boundary between the coastal Peuk Whuuroong population and that of the inland Kuurn Kopan Noot (Dawson, 1881:1-2) both of which are dialect groups and can be included within Robinson's Manmeet. In this location Robinson recorded in some detail his contact with the local population, none of whom he had met in the coastal area between Warrnambool and Port Fairy:

The country belongs to the Yowennillums, a section of the Monemeet nation. Two of this tribe, fine tall young men now with me, are natives of this place. They said that was their country and white men steal it. There are some fine water holes at this spot and the water is said to be of the best
description. From conversation I had with the natives it appeared as if this was a favourite spot. It was the home of several families. Took me to several spots where they had resided and had worms or huts. He also took me to a very fine and large were (weir) and went through with several other of the natives the process of taking eels and the particular spot where he himself stood and took them. I measured this were with a tape 200 feet (long), five feet high and it turned back at each end.

(Robinson, 30 April, 1841)

A day or two later and a few kilometres north east of Tarrone Robinson made contact with a party of some 40 men, women and children camped around a favourite marsh. "The natives constantly frequented it for roots." Drovers of large kangaroo were seen grazing on the surrounding rich herbage together with a group of bustards. Most of these people were Yowen Conedeet (or Yowen.nillum) members of the local band. Names and ages for 31 of these individuals are provided of whom some were members of at least four other bands. Most of these other bands appear to have been neighbouring ones (Art.cone.de.yeer.roec, How.weet, Meen) but one (Mo.per. xcr) is stated to have been located much further to the north. This group had not had previous contact with Europeans (Robinson, 1, 2 May, 1841), and Robinson observed:

The men were armed, and the women after their custom adorned by a profusion of red ochre rubbed over their face, and a thick reed thrust through the cartilage of their noses. Some of the men were finely formed and the whole were submissively obedient.

(Kenyon, 1928:147)

At the Great Swamp (Mt. Napier area) an extensive inland region of marsh land some 50 kilometres north east of Portland Bay, Robinson encountered the local band, the Tappoc Conedeet, the stated owners of the land:

The country had been burnt around the rushes and the swamp and the young grass . . . had attained to a growth of 7 or 8 inches and a most verdant appearance. The land around the swamp is elevated and undulating, of good quality and lightly timbered; it is very fine country and the scenery beautiful.

(Robinson, 10 May, 1841)

The swamp was further described by Robinson as abounding in rushes
and roots (tar.roke and myrnong) most favoured by the people, and native turkeys and parrots were abundant. Signs of holes in trees where possums had been caught and bird traps were numerous. At the southern end of the Great Swamp was located another band, the Nilan Conedeet.

The Tappoc Conedeet, camped around the margins of the swamp, numbered at least 59 individuals, and possibly as many as 72, as here the account is unclear. This number consisted of one or two groups of 13 individuals, one of 20 and another of 26. Robinson on two occasions at first came across parties of women and children harvesting rushes, roots and grubs (?)¹ along the borders of the swamp before encountering the main body of people:

They came with lighted torches in their hands; the weather is cold and this is their custom while travelling to keep themselves warm. A common practice concerning the natives of Van Diemans Land.

Two of the groups, including the one of 26 individuals, combined at one camp towards evening. The group of 26 was composed of three males, aged around 50, 36 and 30 years, and their families. The older man had one wife and three children, the second had two wives and four children. As well, a young man and two women were also in the party. At the close of the day this group was joined by two other women and their infants, and later by a man and his family (9 in all). The other groups of Tappoc Conedeet recorded were of similar composition.

Around the Great Swamp in the open forest, were numerous well-built huts and hut clusters. At one "village" Robinson describes a group of 13 well constructed and permanent huts belonging to this band. On another occasion he passed around 20 well-built huts at various places around the swamp. Occupation of this district seems to have been semi-sedentary (Robinson, 9-12 May, 1841) (see Ch.7).

In the above groups of Tappoc Conedeet no mention was made of the presence of other bands. Two weeks later, however, in the area just north of the Fitzroy River, which lies about 30 kilometres south west of the Great Swamp, Robinson met with a group of 18 people, some of whom were

¹ The orthography is extremely poor here. This word (i.e. "grubs") could also be "myrnong", strange though it may seem.
Tappoc Conedeet and whom he had met before on their home range. The latter included Cor.rome.wur.rer.min and his wife and children. Two other men in the group, one of whom was a "chief" of Wol.lore.rer Conedeet (located about 30 kilometres or more to the north of this area) had relatives (two wives and one child) staying at Konung.i.yoke a part of the Great Swamp within the territory of the Tappoc Conedeet (Robinson, 29 May, 1841).

It can be deduced then, that in both these bands, Tappoc and Wol.lore.rer Conedeets, a degree of fluidity of membership took place, and that members of each could at times form composite groups such as those above, which could be located outside the territories of either band. Examples of this composite form of group follow.

So far, the examples given indicate that bands consisted principally of adult males from the local area together with their wives and children, and that visitors from other bands were also accommodated. The band core then could be seen as a series of "hearth groups" (see Maddock, 1972:33) which habitually camped together within a particular range, which often included visitors from other bands, and whose members distributed themselves at times between other neighbouring bands. The two main local groups so far discussed had not had previous contact with Europeans and were not residing in areas directly affected by the European. Thus, they could be regarded as fairly representative of traditional bands.

Further evidence is now presented from the northern regions of the Western District to support these findings. On the northern fringes of the coastal plain, at the foot of the Grampian and Pyrenees ranges, Robinson encountered groups of bands in seven locations and a larger composite group of bands assembled at an eighth. At each of these places the band was composed of members from far flung areas across the whole region including both eastern and western ranges together with the area of the northern plains. This interaction of band members is shown on Fig. 4:2. In this reconstruction male members of bands have been chosen as it is often difficult to distinguish between wives and other females, and wives always have originated from other bands. A list of these composite bands is provided in Table 4:2. The members comprising these groups came from bands of four tribal areas, Tindale's Tjapwurong, Jaara, Jaadwa and northern Wathaurung. Robinson emphasised in a number of places
Fig. 4:2  Tribal Boundaries and Band Movements in South Western Victoria

Data: Tribes - Tindale, 1974; Movements - Robinson, 1841; Dawson, 1881; Lourandos, 1977a
### Table 4:2 List of Composite Bands

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>No. of Indiv.</th>
<th>Band of Origin of Male Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.A. Robinson</td>
<td>Crampians-Pyrenees</td>
<td></td>
<td>Gal.Gal; Nee.sheer.e; Teer.rel; Tone.do.jarrer</td>
</tr>
<tr>
<td>15 July, 1841</td>
<td>Mount Burrumbeep</td>
<td>19</td>
<td>Bar.conedeeet; Bul.luc. Bur.re; Putteneeer; Tupe.too.rut; U.tow.el.</td>
</tr>
<tr>
<td>27 July, 1841</td>
<td>Fiery Creek area</td>
<td>19</td>
<td>Bar.conedeeet; Gal.gal</td>
</tr>
<tr>
<td>30 July, 1841</td>
<td>Allanvale (Elmhurst area)</td>
<td></td>
<td>Beeripmo; Bon.re; Bul.luc Bur.re; Cur.rac; Larnaget; Murrer.murrer; Nee.sheer.e; Parn; Poit; U.tow.el; Wotton.neer</td>
</tr>
<tr>
<td>30 July, 1841</td>
<td>Mount Burrumbeep</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>5 Aug., 1841</td>
<td>St. Enochs</td>
<td>14</td>
<td>Beeripmo; Bul.luc.Bur.re; Moijerre</td>
</tr>
<tr>
<td>5 Aug., 1841</td>
<td>Mount Emu</td>
<td>20</td>
<td>Beeripmo; Mon.e; U.tow.el; Yare.rin.bor.rin</td>
</tr>
<tr>
<td>6 Aug., 1841</td>
<td>Mount Emu</td>
<td>21</td>
<td>Beeripmo; Cur.rac; Mon.e; Tone.do.jarrer; U.tow.el</td>
</tr>
<tr>
<td>5 Aug., 1841</td>
<td>Carngham</td>
<td>37-39</td>
<td>Bar.conedeeet; Beeripmo; Bon.re; Borum; Cur.rac; Car.re.gal; Gal.gal; U.tow.el</td>
</tr>
<tr>
<td>9 Aug., 1841</td>
<td>Linton area</td>
<td>31</td>
<td>Bare.bare; Beer.re.gnart; Berrejin; Carninje; Corrin Corrin; Moijerre</td>
</tr>
</tbody>
</table>

### G.A. Robinson: Manmeet Area

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>No. of Indiv.</th>
<th>Band of Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 May; 1841</td>
<td>Moyne River</td>
<td>40</td>
<td>Art.cone.de.yeer.roec; How.weet; Meen; Mo.per.reer; Y Owen.nillum (Y Owen)</td>
</tr>
<tr>
<td>9-12 May, 1841</td>
<td>Mount Napier</td>
<td>59-72</td>
<td>Tappoc; Wol.lo.re.rer</td>
</tr>
<tr>
<td>29 May, 1841</td>
<td>North of Fitzroy River</td>
<td>18</td>
<td>Tappoc; Wol.lo.re.rer</td>
</tr>
</tbody>
</table>
the amicable relationship between bands of this inland region centred on the Dividing Ranges:

These natives are in amity with the natives extending over an extensive region of the interior from the Loddon east to the Wannon west and from Boloke on the south to beyond the Grampians and Pyrenees and beyond the Wimmera.

(19 July, 1841)

I have calculated the distances that visiting band members would have travelled from their given band of origin to the band or group with whom they were residing at the time this information was recorded by Robinson (Table 4:3). Bands from both northern and southern regions of the Western District are included. This information can provide us with the approximate catchment area from which such bands generally drew their members. For each of the bands that was seen I have recorded the occurrence of a particular visiting band member but I have not included the number of members from each visiting band. From Table 4:3 the following results can be obtained. Of the 52 observations there is a range of distances from 0-110 kilometres. Most of the distances (88.5%) fall within the much more limited range of 0-50 kilometres. From these results we could make the following general statements. It could be expected that most bands in the Western District would have been composed of a mixed collection of male members from the local area and from within a general radius of 50 kilometres. Over half of these people would have come from a much smaller area which we could approximate as within a radius of 30 kilometres. As well it could be expected that a small percentage (about 10%) of male members may have come from a distance of as far as 100 kilometres.

When we look more closely at individual band compositions we find that there is quite a large range of variation. While bands from the northern area (northern Tjapwurong and northern Wathaurung) tended to draw their members from a wide region, those from the coastal areas (Manmeet) tended to have a more restricted catchment area with members being derived from the more immediate area.

There are two possible explanations for this division. As has been noted, the coastal area is richer in resources with a slightly higher population density and perhaps, level of sedentism (chs. 5, 7) than the inland area around the Grampian and Pyrenees Ranges. This may have
<table>
<thead>
<tr>
<th>Distance (km)</th>
<th>No. of observations</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 30</td>
<td>28</td>
<td>54</td>
</tr>
<tr>
<td>0 - 50</td>
<td>46</td>
<td>88.5</td>
</tr>
<tr>
<td>51 - 110</td>
<td>6</td>
<td>11.5</td>
</tr>
<tr>
<td>Total</td>
<td>0 - 110</td>
<td>52</td>
</tr>
</tbody>
</table>
resulted in a greater stability of population aggregates with less fluidity in membership along the coast, and in contrast, in populations with greater mobility of membership from the inland region. A second explanation or factor could be found in the more rapid spread of pastoralism in the north. Although this movement had only taken place a few years before Robinson's visit a certain dislocation of Aboriginal population had already taken place. This process may have intensified the tendency towards a more fluid band composition. A combination of both these factors can plausibly account for these observed differences in local group composition.

Leadership, Aggression, Marriage

The band was led by one or two prominent males:

These chiefs or delegates were shrewd and discreet men, and great deference was observed towards them by the members of other tribes. (Robinson, 3 August, 1841)

Movement of local groups or bands was directed by prominent males and older people in general (Smyth, 1876, 1:137). Both Dawson and Stähle wrote of a hereditary transference of power (Dawson, 1881:5; Howitt, 1904: 305-6). Dawson's claims concerning the exercising of authority are obviously prone to exaggeration as here he is attempting to defend the status of the Aborigine in the face of European prejudice (see Corris, 1968:35-7). This is not to say that Dawson's statements are necessarily false and Stähle's account must be seen as supporting evidence as also must inferences drawn from other sources of evidence. Such evidence would include the region's high population density (Ch.5) and the complexity of co-operative activities undertaken (Ch.8) which involved substantial marshalling of manpower. The latter may have allowed for greater exertion of power than is credited by some writers (e.g. Pilling, 1968).

Acts of aggression, including homicide occurred between bands and often between bands from different tribal groups (see also Ch.8). Examples of such acts of homicide exist especially in the area of the Grampian and Pyrenees. A Po.bib.ber.rer Balluc was reported who "killed Pellerwin and Gul Gul Bullucs" (Robinson, 25 July, 1841). There are also three other reports, one of a Borum Bulluc male whose parents had been killed by the Moor.moor good.deet, and two young sisters (Bar.conedeet) whose
parents had been killed by the Wor.ner.re.r.gare.rer (Robinson, 29, 31 July, 1841). The third is a statement that the "natives said the Barrabulluc (Bare.bare Bulluc) had killed plenty of Colijans (Kolakngat)" (Robinson, 10 August, 1841).

Some of these confrontations also involved male raiding parties such as that of a large armed party from near Geelong (Barrabal), which attacked bands on the south eastern border of the Tjapwurung (Robinson, 27 July, 1841).

Dawson, Stühle and Howitt state that in the Western District a system of matrilineal descent operated, having classes associated with several totems (Dawson, 1881:26; Howitt, 1904:120-5). Corris has already covered this topic effectively (1968:31-4). The Western District was distinguished from the neighbouring coastal region around Melbourne, which had a patrilineal system.

Exogamy was invariably practised in the region and Robinson's account includes much evidence to support this. His most detailed evidence comes from the area at the foot of the Grampians and Pyrenees. Here he recorded the names of band members together with their wives and the band from which the latter had originated. Working from this data a pattern of marriages can be deduced which indicates that marriages were exogamous and that wives came from bands covering this whole mountainous region. This area included four tribal groups, Tindale's Tjapwurung, Jaara Jaadwa and Wathaurung (see Fig. 4:2), which is an indication of the degree of interaction which took place here (Robinson, 15-24, 27, 31 July; 2-7 August, 1841).

**Tribe**

The term *tribe* has been much criticised (Berndt, 1959) and so I employ it here merely as a descriptive label. Such labels inevitably take on socio-political connotations which are not intended nor directly relevant here. Rather than discuss the subtleties of the arguments surrounding this controversy I have preferred to adopt Peterson's definition which helps to clarify the Victorian evidence and at the same time avoids many of the pitfalls. Peterson's is an environmentally based model (Peterson, 1976b). He distinguishes between two levels of Australian population grouping, the
band, and the culture area population which he bases on the major drainage
divisions. Intermediate population groupings he sees as having boundaries
determined by economic, topographic and cultural factors, and therefore
being subject to change. If we apply this model to south western Victoria
we can distinguish a number of levels of population grouping. The
district as a whole forms a broad unit, being part of a wider coastal
drainage basin, which spreads east to west and is distinguishable from
the larger inland drainage basin population bordering it along the Dividing
Ranges. The Western District itself forms a distinct but by no means
isolated coastal geographic unit. To the east it is bordered by the
collection of populations centres around Port Phillip Bay, and to the west,
by those populations centred around the Glenelg-Mount Gambier areas which
interacted with peoples of the Coorong coast further to the north west.
Above the level of band, two other main population groupings existed, the
first based on main language divisions, and the second around dialects of
these.

Tindale's tribal classification is based on the main language
groups, his chief source being Dawson. Dawson included four main languages,
These have been reconstructed as Tindale's Tjapwurong, Wathaurung, Kolakgnat
and Gunditjmara. Tindale's source for the latter is Howitt (1904:69).
Tindale has also amalgamated the other dialect groups mentioned by Dawson
within these larger groupings. Tindale has created a further tribe by
incorporating Dawson's Kirrae Wuurong (Mount Shadwell) and Warn Talliin
(Camperdown) with part of the area to the south where a separate language
or dialect was spoken (Wirngill gnatt tallinanong), to form the Kirrae
Tribe. Dawson's Katubanuut of Cape Otway is also classified as a tribe
by Tindale.

Robinson's data basically agree with Dawson's language groups.
He distinguished between three main languages:

... I shall merely refer to the declension of the Wodouros,
the Coligans, and the Jarcoorts, in-habiting that fertile
region over which I had previously travelled. The language of
these people differ. They have distinct forms of government,
and are subject to their own laws.

(Kenyon, 1928:143)
These three language groups are related geographically to Tindale's Wathaurung, Kolakngat and northern Kirrae. The latter Robinson knew by another name. While taking his bearings from Lake Colac he stated:

The Jarcoorts, 58 in number, occupy the country to the westwards and north-westward for 50 miles, and the Wodouros, with a large population, occupy an extensive country to the northwards and north-eastward. (Kenyon, 1928:138)

Murray (Bride, 1898:103) also refers to a population surrounding the Colac people whom he calls "Jancourt".

Robinson also has a name for a fourth language group, the Manmeet, which can be related geographically to Tindale's Gunditjmara. Robinson also distinguishes between the Glenelg language and those of the Grampians and Pyrenees. As well as referring to bands as "tribes", these larger groupings of bands, such as the Manmeet, he refers to as "nations". The Pyrenees bands he assigns to the Jarjowerong nation, which can be equated with Tindale's Jaara or Jarjowerong (Kenyon, 1928:162). Robinson, however, does not provide a general name for the bands occupying the area of the northern coastal plains which lies between the Grampian and Pyrenees ranges. This language he found to be quite distinct from the others he had experienced. While conversing with a group of the latter speakers near Mount Burrumbeep, he records:

I spoke of Tapper (Tappoc) Coneeet and Collorrer Coneeet and spoke in the Manmeet. They however said they did not talk that way. I spoke of Pellerwin Bulluc and Gal Gal Bulluc, tribes to the north of the Pyrenees and soon found I had not touched the right thing.

(15 July, 1841)

A short time later in the same area he records: "Took down a list of words from the natives whose language differs totally from the other native languages" (19 July, 1841).

This area can be equated with Tindale's Tjapwurong. Dawson had described this area as two separate dialects, a northern Pirt Kopan Noot and a southern Chaap Wuurong (Dawson, 1881:1).

Therefore, there appears to be a general agreement between the two basic sources, Robinson and Dawson, and also between Robinson's data and Tindale's tribal model. There are, however, some differences. Tindale's
Kirrae are not distinguished by Robinson, although, as has already been noted, he did isolate a separate language in the northern half of the area (Jarcoort). The chief bands of the latter he located near Lake Conengulac and Lake Burrumbeet, both situated in the north eastern area of Tindale's Kirrae. Robinson's data also implies that in the southern half of Tindale's Kirrae there was perhaps a separate group located in the area of Lake Elingamite (Robinson's Ellengermote). The latter appears to have had more contact with the coastal Manmeet of the Warrnambool area. Dawson's three-way division of this Kirrae region would tend to support Robinson's information. Tindale's Kirrae, therefore, may not be one distinct group but made up of two or three separate parts, each with its separate allegiances.

Furthermore, there is no evidence to suggest that the Kolakngat have a coastal outlet as Tindale has proposed. Murray, an early settler of the Colac region, located the Colac population in the following way:

The extent of their country was radius of about 10 miles from Lake Colac except on the south, where in the extensive Cape Otway Ranges there was no other tribe.

(Bride, 1898:103)

The data of both Robinson and Dawson support the above description of a spatially restricted Kolakngat. In fact the densely forested stretch of coastline between Colac and the coast would have been extremely difficult to approach from the area of inland lakes around Colac. Robinson found it difficult enough traversing the forests south of Lake Keilambete on his way to Lake Elingamite. It would be best, therefore, to consider this narrow coastal corridor as isolated from the inland population, and a possible extension of the coastal Katubanut of Cape Otway, or less likely as a remote extension of the coastal people of the southern Kirrae, whose range was environmentally similar. In support of the latter possibility is Dawson's information which perceived this isolated forested country from the River Hopkins eastwards towards Cape Otway as one dialect area (1881:1-2).

Robinson's data suggest that the northern part of Tindale's Wathaurung seems to have had closer contact with the neighbouring Tjapwurong and Jaara bands, and on these grounds should perhaps be regarded as separate to the southern Wathaurung, which was centred around the coastal
Geelong area. Murray also distinguishes between the population of this northern area which he calls "Wardy Yalloak", after the river of that name, and the "Barrabool" of Geelong (Bride, 1898:103).

On Fig. 4:2 I have incorporated the information of Robinson, Dawson and Tindale. Tindale's boundaries are represented with broken lines to indicate their approximate nature and areas which are particularly suspect, such as the coastal Kolakngat area, are signified with a question mark. Rather than alter these boundaries I have preferred to leave them as Tindale has designed, and to refer to them as approximating the language areas of the region. Dawson's dialect groups may perhaps be more indicative of local population clustering. The information on the interaction between bands as measured by the movements of band members which I have depicted in Fig. 4:2 brings this point out clearly. Most interaction between bands takes place, here, within dialect areas. Robinson's information on the Manmeet throws further light on this problem. Because of the importance of this issue I deal with the information here in some detail.

**Dialect Areas: The Manmeet Example**

In size and location the Manmeet is similar to Tindale's Gunditjmara except for its western and northern borders which are difficult to define clearly. A series of examples from Robinson will illustrate how he perceived the boundaries encompassing the Manmeet and the separate dialect groups that composed the whole. Of the Manmeet's eastern and northern borders the following information was recorded. The eastern border appears to have been in the vicinity of the Hopkins River. Eurodep, Robinson's Jarcoort guide, told him that the country about the Hopkins belonged to the "Manmote", and was inhabited by a section called Bul.ler.bul.ler.cort. "They died about the time when the first white men came - from disease" (Robinson, 23 April, 1841).

As Robinson's party approached the Hopkins on their way to the Warrnambool area, his Jarcoort guides grew fearful, for they were now on alien ground. The following day the party came upon a group of people, 19 in all. Five men, four women two youths, eight children and a "small lean dog" made up the group. Apart from their weapons (fighting shields, spears) the men carried a snare or shield with which to catch native
turkeys. Of these people, Robinson added: "These natives belong to the Monmate nation" (24, 25 April, 1841).

The northern border was most probably around Mount Rouse, whose inhabitants are not clearly distinguished as Manmeet or otherwise by Robinson. The western and north western borders are most difficult to define clearly. Concerning the western boundary, Robinson stated:

As far as my enquiry and observation has gone I have reason to believe that the Monmeet nation exists to the west as far as the Glenelg and that one language is spoken. . . .

(27 May, 1841).

Although he records many details from the latter area, as well as contact between different bands (Fig: 4:2) some of which are known to have been Manmeet, he does not mention that there were linguistic differences between this area to the east of the Glenelg and the Manmeet. On these grounds it is more likely that if any linguistic difference existed, it was merely dialectal. To illustrate this point further, at the Fitzroy River Robinson met a group of people of Yi.yar, Cart and Millan Conedeets (all western Menmeet) and he made the observation that they spoke the same language as the Glenelg natives (27 May, 1841). This evidence would suggest that Tindale's western border of the Gunditjmara is too conservative and should be extended as far as the Glenelg.

As well, Robinson considered the Wol.lore.rei and N.el.gal. bands of the Hamilton area and the Wur.cur.ri, located towards Mount Sturgeon, as Manmeet (27, 28 April, 8 May, 1841). These bands are located some 10-20 kilometres beyond Tindale's north western border, which again casts doubt on his location of boundary.

One reason why these two borders, west and north west, are so problematic is perhaps because they lacked definite geographical features and therefore were more open to fluctuation. Strict definition of bands in these areas was probably difficult to maintain. This appears to have been a common feature in the district and most borders within such undefined geographical zones are difficult to define clearly (for example, those of the northern Wathaurung, Kolakngat and Kirrae). Obvious geographical features, such as the Hopkins or Glenelg rivers, being resource rich zones, would have been highly sought after by competing bands, thus forming natural demarcation points.
Within the area of the Manmeet Robinson distinguished three dialect and cultural areas. His three sub-divisions centre around three main areas: the two coastal regions of Port Fairy and Portland, and the inland region centred around the swamplands of Mount Napier. Apart from differences in dialect he also records differences in artefacts, ritual dances and dress between these groups. For example, the Tappoc Conedeet of the Mount Napier area spoke differently from the coastal Manmeet of the Port Fairy area and the women had large circular mats for carrying rushes like the women from the Glenelg and Wannon River bands (12 May, 1841). Robinson noted that the Cart Conedeet from Mount Clay in the greater Portland area, wore different ceremonial dress during their ritual dances than other Manmeet (17 May, 1841).

To these dialect groups observed by Robinson we can add those of Dawson. The latter does not record the western Manmeet groups but writes of three dialect areas in the east. These are the coastal Peek Whurong, around Port Fairy (which Robinson also distinguished) and two inland groups - the Morpor Kuundit based at the rivers and plains around Spring Creek, and the Kuurn Kopan Noot, centred around the rivers, swamps and plains south of Mount Rouse. Dawson's and Robinson's descriptions together fit well Stähle's division of the Gunditjmara into four geographical units: "water", "mountain", "swamp" and "river" (Howitt, 1904:69). The subdivision of the Manmeet (Gunditjmara) into four or five dialect groups also agrees with the evidence for areas of band movements (Fig. 4:2) the main interactions taking place within these dialect areas.

In further support of these tribal divisions is the list of 43 Manmeet bands which was collected by Robinson from local Aboriginal informants in the Port Fairy area (27, 28 April, 1841). The list is detailed for much of the Manmeet area, including descriptions of bands and locations, but is vague concerning the locations of those bands to the north west of the Port Fairy area. Bands from the far-flung Portland area are not included at all. Here, then, is evidence on the extent of local knowledge in the Peek Whurong area (Port Fairy) concerning the wider Manmeet region, and therefore the degree of interaction between bands from this coastal area. As band interaction in Fig. 4:2 shows, the Peek Whurong appear to have been confined to a specific coastal region (see also Ch.8).
The subdivision of other tribal groups into dialect areas centred on the main resource zones is further discussed below.

**Environmental Determinants**

Concerning the relationship between environment and distribution of population units in south western Victoria, we can draw the following conclusions. For the whole region there appears to have been a general correlation between language and dialect areas with main ecological zones. We could interpret these zones in the light of Peterson's findings that main population groupings could be expected to be associated geographically with principal drainage basins (Peterson, 1976b). As the web of all terrestrial life is intimately linked with the distribution of water, this proposition should not appear as too remarkable. A closer examination of individual groups and their environments is provided below. It should be pointed out, however, that this neat fit between populations and main environmental zones is often complicated by the lack of distinct natural boundaries. The language and dialect groups could therefore be described as clustering around the main resource areas, and for the most part having indistinct boundaries. Cultural factors also impinge upon this population distribution, and this is discussed more fully in Chapter 8. In contrast, there is also evidence to suggest that where territorial boundaries coincided with important resource areas (e.g. valued lakes and swamps) these boundaries were well defined. A similar situation has been described for the resource-rich coastal strip of north eastern Queensland (Dixon, 1976:209).

Having established both the cultural and environmental context of the units designated as tribes, I will now outline these features in greater detail for each of the main tribal units of the Western District.

The Manmeet (Gunditjmara) can be seen as a collection of four or five dialect groups oriented around the richest coastline of the district, a region incorporating an equally fertile hinterland of marshes and open forests. Each dialect group was centred around a focal resource zone, in this case two coastal areas (Peek Whuurong, Portland) and three inland areas (Mount Napier, Kuurn Kopan Noot, Kii Wuurong), with the latter incorporating marshland, plain and riverine environments. The Manmeet was separated from the next dense coastal population of the Bunganditj to
the west by a buffer zone of undulating and forested country bordering the eastern banks of the Glenelg River. I have not dealt in detail with the Bunganditj excepting its northern and western populations which had the closest contact with other Western District tribes. If we follow Tindale, however, the Bunganditj could be seen as five dialect groups geographically located in the following areas: south and south west, at Mount Gambier and Lake Wallace; north, around the border with the Jaadwa and Tjapwurong; and west at the Wannon River (Tindale, 1974:210).

In contrast, the land-locked Tjapwurong were organised around the headwaters of the Hopkins River drainage basin, and its open plains and swamplands, at the foot of the Grampian and Pyrenees ranges. Its two dialect areas, the northern Pirt Kopan Noot and southern Chaap Wuurong, were aligned along the north-south axis of the Hopkins River, as were its individual bands. Fertile and coveted Lake Bolac formed the Tjapwurong's south eastern boundary, and conforms to Dawson's description of a focal resource area dictating the location of tribal boundaries, in this case the frontier of three tribal groups (Tjawurong, northern Wathaurung, northern Kirrae or Kirrae Wuurong). Amicable interaction chiefly took place between bands of the northern Tjapwurong with those from neighbouring inland tribal groups, Jaadwa, Jaara and northern Wathaurung. Archaeological data reinforces this interpretation. The Grampians region is now known for its Aboriginal art sites (painting in rock shelters), which are perhaps the finest in Victoria. This archaeological and ethnographic evidence suggests that this mountainous inland region, along the northern border of the Western District, may have been a self-contained cultural area separated from coastal populations which surrounded it on three sides, west, south and south east. Conversely, these inland peoples can be viewed as simultaneously surrounded and contained by populations occupying more favourable environments (see Ch.8). There is no evidence that these inland groups had a coastal outlet. Indeed, this population distribution contravenes the proposition of the coincidence of local human populations and drainage basins. For here in the drainage basin of the central Hopkins River we have two main language groups, Tjapwurong and Manmeet, both clearly territorially demarcated. As will be explained in Chapter 8 this distribution of inland and coastal populations is best described in terms of territorial competition.
Both the Kolakngat and the northern Kirrae were organised around the fertile lake country which was located between the Otway and Dividing ranges. The Kolakngat's territory appears to have been quite restricted, with no coastal access, and possibly in a state of contraction (Ch. 8). The northern Kirrae were subdivided into two dialect groups, Kirrae Wuurong and Jarcoort with the latter centred on the central lakes. As has been discussed, the relationship between the above two dialect groups and the southern Kirrae is problematic, with the latter interacting amicably with coastal Mammeet groups. The southern Kirrae occupied the thickly forested coastal zone between Mammeet and Cape Otway populations, and was by inference, a thinly populated area.

To the extreme east, the Wathaurung was subdivided into two main regions, and perhaps dialects. The southern group centred upon the Barwon River drainage basin and the coastal peninsula around Geelong, and the northern group was established around the rivers which drained into the inland lakes, such as Lake Corangamite, and which includes the Woady Yallock River. As has been discussed, the northern bands had close contact with bands from neighbouring tribal groups in the area of the ranges, while the southern Wathaurung maintained contacts with the Kolakngat and groups further east (towards Melbourne) (Morgan, 1852; Mulvaney, 1976; Smyth, 1876; 1:12). The differentiation of the Wathaurung from other Western District populations along descent lines and its affinity in this regard with populations to the east (above), reinforces this pattern of interaction.

The only population in the Western District which was isolated by natural geographic boundaries (the Otway rainforests) was the Katubanut which bordered the narrow coastal strip of heathland and wet schlerophyll forests of Cape Otway. The extent of these people's contact with groups such as the southern Wathaurung and possibly southern Kirrae, to my knowledge is not documented.

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1 Robinson referred to the Cape Otway band as Banguwrer. Another band is also mentioned, Cor.reeng.it, but its connection with Cape Otway is ambiguous (1842, A7039, Vol.18:127).
Conclusions

It has been shown that the evidence on Aboriginal spatial organisation from south western Victoria in general agrees with currently accepted definitions for tropical and arid zone Australian Aboriginal societies. An examination of the local group or band from this temperate, coastal region, and its interrelationship with other social groups, has indicated the following. Band membership was fluid, and a feature common to many hunter-gatherer societies (Lee and DeVore, 1968; Turnbull, 1968; Woodburn, 1968). There was a tendency for groups of bands to be interrelated, and to occupy a loosely bounded geographical area, distinguishable from neighbouring areas in dialect and culture. This evidence is consistent with the models proposed for Australian Aboriginal societies by both Hiatt (1962) and Meggitt (1962).

A problem that arises out of this evidence concerns the possible existence of groupings larger than the band in south western Victoria, composed of groups of bands. Both Hiatt and Meggitt refer to the presence of such social groups which they class as "communities", in their region of coastal Arnhem Land and central Australia. In western Victoria, such groups coincide with European settlement. From all evidence available, these groups would have traditionally come together at times of resource abundance and for ceremonial purposes and the like. Whether such "communities", perhaps in the more fertile tracts of the Western District, also formed the local social unit rather than the smaller band, is a matter for further consideration.

It has been shown that Robinson's data, with a few exceptions, broadly correspond with Tindale's tribal scheme. Some areas of disagreement between these two bodies of information concern the location of certain tribal boundaries, in particular the western boundary of the Gunditjmara (Manmeet) which according to Robinson possibly extended to the Glenelg River, and the disputed coastal access of the Kolakngat, for which there appears to be no supporting evidence. The incorporation of the information of both Robinson and Dawson, has resulted in a much closer definition of dialect areas and the interaction of local groups within and between them.
Tribal (language) areas and dialect areas in general, can be associated with individual ecological zones. Where no clear natural features existed, the boundaries were less distinct, and therefore possibly less stable. Where boundaries coincided with resource rich areas, territorial rights were imposed and enforced. The most marked ecological division appears to have been between coastal and inland populations, and this is discussed further in Chapter 8.
CHAPTER FIVE

POPULATION

Estimates for population densities from south eastern Australia are generally extremely varied, inconsistent and poorly documented. Smith's recent review of Australian population densities bears this out quite clearly (1976:93-103). To quote one example of this tendency, for the Sydney area Maddock produces a density of 13-26 persons per square kilometre (1972:23), while for the same area Lawrence gives 1:9 persons per square kilometre (1968:187). Maddock does not quote his references or basis for such an estimate. At the other extreme we have the testimony of Mitchell who assessed the entire Aboriginal population of south eastern Australia at a conservative 6,000 (Smyth, 1876:317). The situation for estimates of population from south western Victoria is equally as contradictory. Here I attempt to re-examine this problem in the light of the new and detailed evidence from George Augustus Robinson's manuscripts, and to construct approximate estimates of population size and density for the area.

Early Estimates

Firstly it must be borne in mind that before Victoria was explored or settled by Europeans, its Aboriginal population (together with that of much of south eastern Australia) had been decimated by European diseases, such as small pox which had been introduced at earlier points of contact and settlements on the Australian continent (see Smyth, 1876, 1:XIX,253). All subsequent estimates of population, including those of Robinson must therefore be seen as conservative.

Estimates of population size for the Western District have varied
from 1,800 (Mulvaney, 1964:427) to 3,000-4,000 (Fyans in Bride, 1898:191; Radcliffe-Brown, 1930:692-3; Corris, 1968:2). For the whole Victorian region Smyth deduced a population of 3,000, while William Thomas estimated 6,000 as a minimum figure (Smyth, 1876,1:32, 35). Of these estimates, Fyans and Thomas are the only sources from the early period of European contact. All other estimates have not been based on any hard data obtained from this early period. Instead they have been constructed from calculations of the size of the remnant Aboriginal populations that withstood the sudden European occupation. Once the colony of Port Phillip had been established, there was no way available to accurately evaluate the European impact on Aboriginal numbers. In fact, it would have been in the interests of many original observers, especially the pastoralist and his European servants, to claim that the native population had originally been relatively small. For the miniscule size of remnant Aboriginal groups now stood as testimony to the magnitude of depopulation, and to the European role in its execution.

It is not surprising to note that estimates of Aboriginal population were often coloured by the contexts in which they appear. The writings of two prominent pastoralists bear this argument out quite clearly. Thomas Manifold, highly successful "land-baron" of the swiftly depopulated and rich Camperdown district (still known as "Manifold country"), claimed, "with respect to their number at the time the country was first occupied, it has been, in all accounts I have seen, very much overrated" (Bride, 1898:139). In contrast to this attitude, Thomas Winter, successful financier and speculator in livestock, whose endeavours were frustrated by Aboriginal resistance, wrote:

The natives are numerous and troublesome, indeed, they are the greatest drawback to the colony, since they cannot be trusted. Several murders have been committed by them, but not lately, and they seem to fear the white-man's revenge.

(Bride, 1898:395)

Between these two extreme assessments, there seemed to be no point of reconciliation.

If any of these early estimates are to be respected they would have to be those of Fyans and Thomas, both of whom, as public servants, spent much time with Aborigines. Fyans was a police magistrate and travelled widely in the Portland Bay District. It must be stressed, however, that
neither of these two accounts is based either on a population count or full knowledge of the numbers and sizes of all local Aboriginal groups. The two estimates are in fact impressionistic, and neither observer had full access to the facts. The assessments would have had to contend with the ever present problem of the waxing and waning of local Aboriginal group sizes, as well as the observers own lack of familiarity with all individuals within these groups. Added to these difficulties was the day to day decimation of the Aboriginal population which would have tended to reinforce any concept of low population size.

There are also further problems with the accounts of these two observers. Firstly, Thomas was either witnessing a situation different to that of the semi-sedentary Western District or an Aboriginal lifestyle affected by European contact. He wrote of highly mobile and small populations (Bride, 1898:398-440), and was both surprised and excited by early reports of settled Aboriginal "villages" in the Western District, a region with which had had little contact (Smyth, 1876, 1:125-6; Thomas, see ch. 7). Thomas' estimates are merely a generalisation for the whole of Victoria. A further problem with Fyans' estimation of 3,000 is that he does not define the boundaries of his region, thus making it difficult to calculate population density. When all these issues are taken into account these population estimates would have to be viewed as highly conservative, and should be regarded as below-minimum figures.

Dawson calculated that "21 tribes" attending the summer festivals at the centre of the Western District would have had a population of 2,520 people (Dawson, 1881:3), (Ch.8). His figures are reconstructions and not based on direct observation. He also adds that settlers of the area thought his estimate too low. His figure only relates to the groups of this inland region which covers an area of around 15,000 square kilometres. It cannot be taken as an estimate for the whole Western District as others have assumed (e.g. Corris, 1968:2). When calculations of population density are constructed from Dawson's figures this results in an approximate 6 square kilometres per person, for the area of the inland plains. We could consider this as an early conservative estimate for this inland region of the district.

My own calculations are based principally on Robinson's data (see
also Lourandos, 1977a). The final conclusions that I reach are of higher densities than previously deduced. A comparison of these new estimates, however, for the area of the inland plains with Dawson's for the same region does not show too great a variance, although my own estimates are higher. When it is also remembered that Dawson's estimates were considered highly conservative by local settlers, this lack of agreement can be better appreciated.

I have used a number of variables in reconstructing population size and density, but the analysis is mainly centred on the number of local groups (Ch.4) and the estimation of their average size. The fragmentary nature of the data, and the decline in population which had already begun by the time Robinson was collecting his material, are limiting factors. All estimates obtained therefore, should be considered as conservative.

**Band Size**

The average size of bands has been calculated from the following evidence: ethnographic reports and sightings of band sizes; numerical lists of bands; ethnographic descriptions of huts, their sizes and numbers; archaeological evidence. Robinson's information on size of groups (other than occasions when many bands were present) range from about 15-20 individuals to 100 or more, with an upper limit set by one problematic observation of 172 individuals. Fyans also mentions a group of over 150 individuals from an early account (Bride, 1898:183). This last figure (together with Robinson's example of 172 people) could be taken as an approximate upper limit.

I will now examine Robinson's evidence in some detail.

i) Reports of band size

These are reports of band sizes known to Robinson and in some cases personally observed by him, as distinct from his numerically listed bands (below). Robinson provides us with six main examples (Table 5:1). At the Tarrone Swamp he met a band composed principally of Yowen.Nillum (Yowen Conedeet) and numbering about 40 individuals (Robinson, 1, 2, May, 1841: see also Ch.4). This figure could be taken as a conservative lower limit for the size of this band. At Mount Napier, in the environs of the Great Swamp, Robinson met with the Tappoc Conedeet, who numbered at least
Table 5:1  List of Reported Band Sizes

<table>
<thead>
<tr>
<th>Reference</th>
<th>Band</th>
<th>Location</th>
<th>No. of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robinson 1, 2, May, 1841</td>
<td>Yowen.nillum (yowen)</td>
<td>Tarrone Swamp</td>
<td>at least 40</td>
</tr>
<tr>
<td>Robinson 9-12 May, 1841</td>
<td>Tappoc</td>
<td>Mount Napier (Great Swamp)</td>
<td>59-72 (at least)</td>
</tr>
<tr>
<td>Kenyon 1928:146</td>
<td>Bul.luc.Bur.rer</td>
<td>Lake Bolac</td>
<td>&quot;less than 80&quot;</td>
</tr>
<tr>
<td>Kenyon 1928:146</td>
<td>Tare.rer</td>
<td>Swamp east of Port Fairy</td>
<td>&quot;less than 60&quot;</td>
</tr>
<tr>
<td>Kenyon 1928:150</td>
<td>Cart</td>
<td>Mount Clay (Portland area)</td>
<td>c. 70-80</td>
</tr>
<tr>
<td>Kenyon 1928:150</td>
<td>Yi.yar (Born.born)</td>
<td>Mount Ekersley (Portland area)</td>
<td>c. 70-80</td>
</tr>
</tbody>
</table>
59 and possibly 72 or more individuals (Robinson, 9-12 May, 1841; see also Ch.4). Robinson states that the Bul.luc Bur. rer from Lake Bolac "are less than eighty", and that the Tare. rer Conedeet, located at a large swamp of that name "a few miles east of Port Fairy", are less than sixty" (Kenyon, 1928:146).

Robinson's final example comes from the Portland area, where there had originally been four main bands. In 1841 these four bands, together numbered 158 individuals. Of the latter, four individuals (two each) were the sole survivors of two of the bands, Ure (Eurite) and Killare (Kil.care. er) Conedeet:

The Eurite occupied the locality of the township of Portland. Two individuals, Wor.ip.mo.un.deen - a venerable old man (whom I saw) - and his son are the only survivors, and of the once powerful Kil.care. er, who inhabited the country between Portland and the Surray River, two young men, Pol.like.un.nuc and Yare.rer.yare rer, survive.

(Kenyon, 1928:150)

As the Portland area had been settled early, its Aboriginal population had declined rapidly. The remaining two bands (Cart Conedeet and and Yi.yar [Born.born] must have together numbered 154 individuals or between 70-80 individuals each. Of the Cart Conedeet [located at Mount Clay] Robinson personally met with 46 members (Robinson, 18 May, 1841). Taking into consideration the approximate nature of their upper and lower limits, these six examples fall within the range of 40-80 individuals.

ii) Sightings of band size

These references to group size are of local groups, in most cases, seen by Robinson but for whom he did not provide or imply any "band" name. Three of the twenty references are of group sizes reported to Robinson. Just over half of these observations come from the northern area of the Western District in the territories of the Tjapwurong, northern Wathaurung, and Jaara. Because they lack a "band" name I have differentiated between them and the "numerically listed bands". Some or all may refer to aggregates of people from various local bands who have formed a short-term alliance rather than to core groups of bands. Reference has already been made to the differences in composition between these northern bands and those examples known from the coastal regions of the district (Ch.4).
These local groups, their location and size are listed on Table 5:2. Many of these observations are of full descriptions of the groups, including names, ages and sex of their members. Apart from those observations in the general region of the Grampians and Pyrenees, examples have also come from the coastal region around Warrnambool (Manmeet, Gunditjmara), from the Fitzroy River and the area to the north of the Fitzroy (Manmeet), and from Tahara near the Wannon River (Bunganditj ?). The sizes of these twenty groups range from 15 to 100 individuals. I have not included references of groups below 15 individuals as these were obviously parts of larger groups. It became more difficult to distinguish between segments of groupings and total groupings above this figure of 15. Some of the smaller sizes therefore will refer to segments and not to whole groups.

The results of this analysis of sizes appears on Table 5:3. Of the total size range, 60% (12 observations) were of groups of between 30 and 100 individuals, and the remainder, 40% (8 observations) were of groups of between 15 and 27 individuals. The overall mean was 43 individuals.

iii) Numerical list of "bands"

This group of references consists of the detailed lists of named "bands", provided by Robinson, which usually contain details of all adult males, their wives and children. Names of the males are given and sometimes of the wives and children. Ages and often sex of individuals are also provided. The lists sometimes appear more than once, for example in the journals themselves and again in the separate books of "vocabularies" that accompany them. Most of this information is consistently reproduced by Robinson, but certain inaccuracies also exist. I have attempted to overcome as many of the latter as possible. As has been indicated, Robinson took care in collecting such information, and double-checked his data by resorting to a number of different informants (Ch.4). Much of the material contained in these lists is consistent with that recorded by him elsewhere (for example in the earlier lists I have presented). It will now be shown that information on group size is in agreement with these.

The list of 22 observations of "bands" is to be found on Table 5:4, and the results on Table 5:3. The group sizes of these 22 observations range from 17 to 172 individuals. As with the earlier list, examples below a certain number (in this case 17) were not included. Of the total 64%
Table 5.2  Ethnographic Sightings of Band Sizes

All references are from G.A. Robinson

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>No. of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Aug. 1841</td>
<td>Caringham</td>
<td>37-39</td>
</tr>
<tr>
<td>27 July, 1841</td>
<td>Fiery Creek area</td>
<td>19</td>
</tr>
<tr>
<td>26 May, 1841</td>
<td>Fitzroy River</td>
<td>100</td>
</tr>
<tr>
<td>27 May, 1841</td>
<td>Fitzroy River</td>
<td>40</td>
</tr>
<tr>
<td>27 May, 1841</td>
<td>Fitzroy River</td>
<td>15</td>
</tr>
<tr>
<td>2 Apr. 1841</td>
<td>Lake Bolac</td>
<td>18</td>
</tr>
<tr>
<td>29 May, 1841</td>
<td>North of Fitzroy River</td>
<td>18</td>
</tr>
<tr>
<td>15 July, 1841</td>
<td>Mount Burrumbeep area</td>
<td>19</td>
</tr>
<tr>
<td>17 July, 1841</td>
<td>Mount Burrumbeep area</td>
<td>27</td>
</tr>
<tr>
<td>17 July, 1841</td>
<td>Mount Burrumbeep area</td>
<td>60</td>
</tr>
<tr>
<td>2 Aug. 1841</td>
<td>Mount Burrumbeep area</td>
<td>47</td>
</tr>
<tr>
<td>3 Aug. 1841</td>
<td>Mount Burrumbeep area</td>
<td>c.100</td>
</tr>
<tr>
<td>6(?) Aug. 1841</td>
<td>Mount Emu</td>
<td>20</td>
</tr>
<tr>
<td>8 Aug. 1841</td>
<td>Mount Emu</td>
<td>41</td>
</tr>
<tr>
<td>4 May, 1841</td>
<td>Mount Rouse</td>
<td>30</td>
</tr>
<tr>
<td>2 June, 1841</td>
<td>Wannon River</td>
<td>c.70</td>
</tr>
<tr>
<td>3 June, 1841</td>
<td>Wannon River</td>
<td>c.50</td>
</tr>
<tr>
<td>25 Apr. 1841</td>
<td>Warrnambool area</td>
<td>19</td>
</tr>
<tr>
<td>27 Apr. 1841</td>
<td>Warrnambool area</td>
<td>100 +</td>
</tr>
<tr>
<td>9 Aug. 1841</td>
<td>Woady Yalock</td>
<td>31</td>
</tr>
</tbody>
</table>
Table 5:3  
Size of Bands

(a) Numerically listed bands  
(b) Sightings of bands

<table>
<thead>
<tr>
<th>No. of individuals</th>
<th>No. of observations</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 - 27</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>32 - 106</td>
<td>13</td>
<td>59</td>
</tr>
<tr>
<td>107 - 172</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 - 172</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(b)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15 - 27</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>30 - 100</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15 - 100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
## Table 5:4 Numerical List of Bands

<table>
<thead>
<tr>
<th>Reference</th>
<th>Band</th>
<th>Number of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.A. Robinson, 1841</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 May</td>
<td>Al.lo.conedeet.bart</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Ar.tit</td>
<td>40</td>
</tr>
<tr>
<td>16 May</td>
<td>Borrumbeet</td>
<td>38</td>
</tr>
<tr>
<td>8 May</td>
<td>Can.can.corro</td>
<td>17</td>
</tr>
<tr>
<td>18 May</td>
<td>Cart</td>
<td>70 – 80</td>
</tr>
<tr>
<td>16 May</td>
<td>Konenengulluc</td>
<td>19</td>
</tr>
<tr>
<td>8 May</td>
<td>Merri</td>
<td>19</td>
</tr>
<tr>
<td>20 July</td>
<td>Murrer.murrer</td>
<td>27</td>
</tr>
<tr>
<td>23 June</td>
<td>Nar.cur.reer</td>
<td>53</td>
</tr>
<tr>
<td>15 July</td>
<td>Nee.sheer.e</td>
<td>18</td>
</tr>
<tr>
<td>23 June</td>
<td>Net.net.yune</td>
<td>106</td>
</tr>
<tr>
<td>10 May</td>
<td>Nilan</td>
<td>32</td>
</tr>
<tr>
<td>23 June</td>
<td>Pal.lap.nue</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>Pone.dal</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Po.mung.deet</td>
<td>172</td>
</tr>
<tr>
<td>8 May</td>
<td>Tappoc</td>
<td>59 *</td>
</tr>
<tr>
<td>23 June</td>
<td>Tare Bung</td>
<td>27</td>
</tr>
<tr>
<td>15 July</td>
<td>Tone.do.jarrer</td>
<td>21</td>
</tr>
<tr>
<td>23 June</td>
<td>Wor.car.re</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Yal.lo</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Yi.yar</td>
<td>35</td>
</tr>
<tr>
<td>2 May</td>
<td>Yowen</td>
<td>40 *</td>
</tr>
</tbody>
</table>

* direct sighting.

All other references are of either partial sightings or based on information from Aboriginal informants.
(14 observations) were of groups of between 32 and 172 individuals. The remainder, 36% (8 observations) were of groups of between 17 and 27 individuals. The overall mean was 51 individuals.

The two groups of observations, "sightings of bands" and "numerical list of bands" are compared in Table 5:3. It can be seen that there is a basic agreement. In both cases around 60% of observations were of groups of between 30 and 100 individuals or more. The means of both groups are comparable being 44 and 51 respectively. There is only one instance of a group size much greater than 100 individuals, that of 172. As I have already indicated, this last figure is supported by a similarly high figure from Pyans. The six instances of reported band size (above) also fall within this range. The majority of band sizes in the Western District could therefore be expected to have been composed of between 20 and 100 or more individuals. Of these the majority would have been of bands of 30 to 100 or more individuals, with an upper limit of around 150 individuals.

It should be pointed out that there exist two important factors which affect these results. Firstly, as has already been mentioned, by the time of the collection of his data, 1841, significant population loss had already occurred. Secondly, all Robinson's observations took place in the autumn-winter period, a time when in general group sizes would have been smaller and more dispersed than in the months of spring and summer when resources were more plentiful (Ch.7). Both these factors, together with the difficulty of distinguishing between parts of and entire groups of bands, would bias the sample so that groups appear smaller than they perhaps were. We should consider these estimates, then as conservative.

Further corroborating evidence, however, can be obtained from ethnographic and archaeological data on hut groupings.

iv) Sizes of hut-groups

These data are discussed in detail in Chapter 7 and I will merely refer to the results here. The range of hut sizes together with an approximate estimate of the number of individuals occupying each hut, can serve as an indicator of local group sizes. This body of evidence can be employed as an independent check against the above information derived from other sources. The information on the size of groups of huts
indicates that most references are to groups of between 2 and 5 huts. Of this range about 20% or so of observations referred to groups of between 6 and 13 huts with a few references to between 20 and 30 huts. I have excluded reference to inter-tribal gatherings where hut numbers are much greater. As will be shown, many of these references are to solidly built huts which had been set up as permanent dwellings, and indicated stability of residence.

The number of individuals occupying huts in hunter-gatherer societies, where groups wax and wane, and where friends and relatives are often asked to share cramped quarters, is difficult to determine. Such flexibility of hut occupancy has been well noted even today, for example in Central Australia (pers.comm. Jim O'Connell). I have allowed for such fluctuations and have assumed a conservative average hut occupancy of 8 persons. Robinson quotes a figure of 7-8 persons per hut (16 April, 1841), but other observers quote higher figures (e.g. Thomas, MSS. Item 28, Ch.11). It must be also remembered that not all huts (especially the well-constructed fixed residences) would have always been occupied simultaneously. In spite of these difficulties, the size of hut groups plus the assumed average occupancy can serve as an approximate indicator of residential group size.

Having based my calculations on these premises, it can be seen that these data basically fall within the range of between c.20-100 or more individuals. This information is therefore essentially in agreement with that concerning the observed and reported sizes of local groups (above). The upper limit of between 150-250 individuals is based only on two observations of hut groupings. One reference is from secondary information obtained by William Thomas (Thomas, MSS. Item 28, Ch.11; Smyth, 1876, 1:125), and the second an observation by Thomas Manifold (Bride, 1898:139). There is the possibility that both observations are generalised, providing no more than approximate estimates. The observers may also have been viewing groups composed of more than one local group. Even so, estimates of 150 individuals or more also agree with the upper limit derived from the information on the size of local groups, which is an indication that this evidence should not necessarily be seen as exaggerated.

v) Archaeological data

Archaeological evidence of residential structures from pre-contact sites in Victoria has so far only been detected at one site, Seal Point
at Cape Otway (Lourandos, 1976, 1977a). The Seal Point evidence is discussed in detail in Chapter 12. At one location within this extensive shell midden a cluster of at least 10 (perhaps 13) structures, conforming to ethnographic descriptions of hut-pits, were still preserved at ground level. Assuming an approximate occupancy of 8 individuals per hut, an approximate population size of c.80-100 individuals is obtained. This archaeological evidence, therefore, also falls within the above general range of sizes of local groups.

vi) Results

All five forms of data have shown a basic agreement, which indicates that in general local groups in south western Victoria were between 20-100 or more individuals, with an upper limit of around 150 individuals. As has been discussed, these are conservative estimates. Given the overall quality of the data, however, in order to construct approximate population sizes for the Western District I have used an estimate of between 40-60 individuals per "band". This approximate size-range is based upon the means derived from the "sightings of band sizes" and "numerical list of bands" (Tables 5:2, 5:4), and with some allowance made to their conservative nature.

**Population Size**

I have constructed population densities and sizes for the Western District in the following way. The number of bands in an area is multiplied by the average band size which has been deduced as between 40-60 individuals. As convenient, arbitrary delineations of tribal area I have used Tindale's estimates (1974) (see Ch.4). For areas smaller than the tribal territory I have followed Dawson's geographical descriptions (for example the Peek Whuuron). Wherever possible I have compared estimates derived in this way with those obtained from independent data.

I will now outline how these estimates were constructed. As the information on band numbers for many areas of the district is poor, I have chosen to restrict the estimation of population sizes to those better documented regions, such as those of the Manmeet and northern Tjapwurong. Examples are chosen from both coastal and inland populations, and finally an approximate population size for the entire Western District is arrived at. The results can be found on Table 5:5.
<table>
<thead>
<tr>
<th>Cultural Group</th>
<th>Area square miles</th>
<th>Area square km</th>
<th>Number of Bands</th>
<th>Individuals per band</th>
<th>Population</th>
<th>Density square miles per person</th>
<th>Density square km per person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manmeet (Gunditjmara)</td>
<td>2,700</td>
<td>6,993</td>
<td>58-62</td>
<td>40-60</td>
<td>2,320-3,480</td>
<td>0.8 - 1.2</td>
<td>2.0 - 3.0</td>
</tr>
<tr>
<td>Peek Whu wurong (Port Fairy area)</td>
<td>500</td>
<td>1,295</td>
<td>14</td>
<td>40-60</td>
<td>560-840</td>
<td>0.6 - 0.9</td>
<td>1.5 - 2.3</td>
</tr>
<tr>
<td>Northern Tjapwurung</td>
<td>1,700</td>
<td>4,403</td>
<td>28</td>
<td>40-60</td>
<td>1,120-1,680</td>
<td>1.0 - 1-5</td>
<td>2.6 - 3.9</td>
</tr>
<tr>
<td>Western District</td>
<td>11,000</td>
<td>28,490</td>
<td>c. 130-200</td>
<td>40-60</td>
<td>c. 7,900</td>
<td>c. 1.4</td>
<td>c. 3.6</td>
</tr>
<tr>
<td>North West Tasmania</td>
<td>1,300</td>
<td>3,367</td>
<td>9-10</td>
<td>40-50</td>
<td>400-500</td>
<td>2.4 - 3.3</td>
<td>6.7 - 8.4</td>
</tr>
<tr>
<td>Tasmania</td>
<td>26,000</td>
<td>67,340</td>
<td>70-80</td>
<td>40-50</td>
<td>3,000-5,000</td>
<td>5.2 - 8.7</td>
<td>13.5-22.4</td>
</tr>
</tbody>
</table>

Table 5:5 A comparison between south western Victorian and Tasmanian population densities. (Tasmanian data after Jones, 1974.)
Tindale has denoted an area of 6,993 square kilometres for the Gunditjmara (Manmeet). Within this area Robinson described and located at least 58 bands (and possibly as many as 62). If the lower number of bands is used, this gives an approximate population density of 2.0 - 3.0 square kilometres per person. This estimate is supported in general by other evidence. The coastal stretch between Port Fairy and Warrnambool, together with its hinterland of marshes and lakes, is possibly the most fertile zone within the territory of the Manmeet. Along this coastline Robinson met with two separate groups together numbering well over 400 people who assembled in only a matter of hours at his request (Robinson, 26-28 April, 1841, Ch.8). This group represented a significant proportion of the local population of the region (Dawson's Peek Whuurong). Robinson does not mention that other than local people attended. As well, population had already begun to decline in the area, and Robinson refers to several local groups which had become extinct.

If we assume an approximate population for the area of 500 people residing within some 1,300 square kilometres, this gives a density of 2.6 square kilometres per person or 9 persons per kilometre of coastline. Calculations could also be based on the number of bands in this Peek Whuurong area, in this case 14. This would be perhaps a more accurate measurement than that employed above. The results from the latter provide a higher density estimate of between 1.5 - 2.3 square kilometres per person. Given the richness of this coastal area, it might be expected that population densities here would have been slightly higher than the Manmeet average.

For the neighbouring coastal area around Portland it has already been shown that two bands had a population of 154 individuals. Four bands originally occupied this area of c.1,000 square kilometres so if the above figure of 154 is doubled a conservative estimate of 300 individuals is obtained for this population. This data gives a coastal density of 3.5 square kilometres per person.

Compared with the population density for the Peek Whuurong, these estimates are lower. The latter could be explained in part as due to differences in the environmental productivity of the two areas. While the Portland region has in places a rich coastline, its hinterland of rugged limestone plateau and dense sclerophyll forest is not comparable in
productivity to the rich dark volcanic soils and relatively open terrain which make up the hinterland of the Peek Whuurong. It is also relevant that these calculations for the Portland region, based on explicit band sizes observed by Robinson, are higher than the estimates derived in the standard way I have devised, that is by multiplying the recorded number of bands by average band-size.

Another explanation for this discrepancy between coastal population estimates, could relate to the fact that the Portland region had had a long period of contact with Europeans, beginning with Bass Strait whalers at the turn of the century and long before the establishment of the Hentys. Evidence of earlier lesser bands in the region may have vanished and therefore not have been available at the time of Robinson's visit. Robinson mentions that only the last survivors remained of the two bands in the immediate vicinity of Portland itself, and he was not provided with the detailed information on bands, their numbers and composition, as he had been in the neighbouring coastal region of the Peek Whuurong.

Statements of actual population numbers (such as in the Portland, and Port Fairy-Warrnambool areas) therefore, has been shown to have provided reliable minimum estimates. These numerical data stand in support of the methods employed here in estimating population sizes and have in some instances shown that the results produced in this way may be quite conservative.

As an indicator of inland population densities I have chosen the region of the northern Tjapwurong where the data are most plentiful. In general the density for this area is slightly lower than the total estimates for the coastal Manmeet, but is comparable to those from the coastal Portland area. The northern Tjapwurong encompassed an area of c.4,400 square kilometres, and had 28 bands. This gives a population of between 2.6-3.9 square kilometres per person. For the entire area of the Tjapwurong of 7,000 square kilometres and between 33-34 bands, an estimate of 3.4-5.1 square kilometres per person is arrived at. The Tjapwurong, although an inland tribe with little chance of mass access to the coast, was located on rich volcanic soils, and its northern region encompassed the high rainfall area of the Grampians. As will be shown (Chs 6, 14), the northern Tjapwurong also employed very intensive fishing techniques. Although I do
not wish to introduce technological arguments at this stage, the above factors can possibly explain the relatively high population densities of this inland region which, as has been shown, appear to have been comparable to those of the coastal Portland region.

In order to reconstruct an approximate population size for the whole Western District I have taken the mean density of 3.6 square kilometres from the coastal and inland figures (Manmeet and Tjapwurong). For the whole district of c.28,500 square kilometres an approximate population size of some 7,900 people is derived. This figure is significantly higher than earlier estimates. Using the above information it could be deduced that the Western District would have contained between 130-200 bands. These estimates are supported by the fact that in the list of bands provided by Robinson (Ch.4), which cover an area larger than 28,500 square kilometres, over 170 bands are included.

Population densities in the Western District, therefore, can be seen to have varied between areas of differential environmental productivity, such as between parts of the coast and inland. The most densely populated region was that of the extremely fertile coastal strip of the Peek Whuurong (Port Fairy-Warrnambool area). Population densities in the inland region of the northern Tjapwurong were lower than the latter area, but comparable to those of the coastal Portland area, a region environmentally less productive than the neighbouring area of the Peek Whuurong.

**Comparative Australian Population Densities**

Two neighbouring and comparable regions where fairly reliable data on population sizes exist are the Goulburn River area (northern Victoria) which adjoins the River Murray, and the Coorong coastal region at the Murray's mouth in South Australia.

Curr lived with the Bangerang tribe (Tindale's Pangerang) of the Goulburn River area for over ten years, and "knew well every member of the tribe", together with their language and culture (Curr, 1833:230). He estimated that in 1841 "the whole Bangerang race numbered not less than twelve hundred individuals" (Curr, 1833:234). He based his estimate on first-hand knowledge, and following discussions with several other Europeans who had even better knowledge and experience of the Aboriginal people.
Tindale has calculated an area of some 6,800 square kilometres for the Bangerang (Pangerang) (1974:207) which, using Curr's population figures, gives a density of 5.6 square kilometres per person. Curr instances the rapid decline of the Bangerang population during his stay in the area, which goes to strengthen his observation that his population estimate was a minimum one. The population density deduced for this area falls just below that of the northern Tjapwurung (south western Victoria). Considering the conservative nature of the Bangerang figure this would tend to support the Tjapwurung estimate, as both estimates refer to inland populations in relatively well watered areas.

In contrast the coastal Coorong area was occupied by the Tanganekald (see also Ch.8). This area of 2,000 square kilometres has some 22 "hordes" (bands) (Tindale, 1974:218). From these data an approximate estimate of 90.9 square kilometres per band can be obtained. A comparable coastal region is that of the Port Fairy area (south western Victoria) where 14 bands occupied an area of 1,300 square kilometres, giving a density of 92.5 square kilometres per band. This closeness in density estimates from both coastal areas indicates a certain similarity in population density.

Recent reviews of Australian population densities have been produced by Meggitt (1964), Hiatt (1962), Yengoyan (1968), Lawrence (1968), and Jones (1977a). Before accepting any of the estimates for individual areas, a rigorous examination should be made concerning the reliability of the observation, and the extent of the influence of culture contact on numbers. In Table 5:6 I have compared the south western Victorian population densities with those from a cross-section of Australian environments. Only reliable population densities have been included. These include the following areas: Bentinck Island (Northern Australia); coastal north east Arnhem Land; Gulf of Carpentaria (coastal); The Pilbara (Western Australia); Central Australia. Selected coastal and inland population densities from south western Victoria, based on my own estimates, are also included on this table.

Excluding the Victorian estimates, the Australian range is from 90.6 square kilometres per person in arid zones (Walbiri, Central Australia) to 1.3 square kilometres per person in fertile tropical areas such as east Arnhem Land (Gidjingali) and on the Gulf of Carpentaria. When this range is compared with the south western Victorian population densities it can be
### Table 5.6 Comparative Australian Population Densities

<table>
<thead>
<tr>
<th>Social Group</th>
<th>Km² per person</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaiadilt</td>
<td>1.5</td>
<td>Tindale, 1962:304</td>
</tr>
<tr>
<td>Bentinck Island (N. Australia)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gulf of Carpentaria (N. Australia) coastal</td>
<td>1.3</td>
<td>Thomson, 1934</td>
</tr>
<tr>
<td>Gidjingali (north east Arnhem Land) coastal</td>
<td>1.3</td>
<td>Hiatt, 1965:17</td>
</tr>
<tr>
<td>Kariera (Pilbara, W. Australia) coastal</td>
<td>13.0</td>
<td>Radcliffe-Brown, 1931</td>
</tr>
<tr>
<td>Aranda (Central Australia)</td>
<td>32.4</td>
<td>Spencer &amp; Gillen, 1899</td>
</tr>
<tr>
<td>Walbiri (Central Australia)</td>
<td>90.6</td>
<td>Meggitt, 1962:32</td>
</tr>
<tr>
<td>Peek Whuurog (south western Victoria) coastal</td>
<td>1.5 - 2.3</td>
<td>Lourandos, 1977a</td>
</tr>
<tr>
<td>Northern Tjapwurong (south western Victoria) inland</td>
<td>2.6 - 3.9</td>
<td>Lourandos, 1977a</td>
</tr>
</tbody>
</table>
seen that the latter are approximately equal to those at the highest end of the Australian range. For example, densities from the Port Fairy area (Peek Whuurong) of between 1.5–2.3 square kilometres per person compare favourably with those of the Gidjingali and the Gulf of Carpentaria. Population densities, therefore, from a south eastern Australian region have been shown to be roughly equivalent to the highest densities from tropical coastal regions. This evidence serves to contradict the recent claim that coastal population densities across the Australian continent are closely related to latitude with the highest densities occurring on the tropical coastline, and conversely, the lowest in temperate zones (Jones, 1971a:371). Explanations for these results will be offered later in the thesis (Ch.16).

The above conclusions suggest that for fertile temperate regions comparable population densities were the norm. As with the Victorian region, the rapid decline of the Aboriginal population in most areas of south eastern Australia would have obscured these facts.

**Tasmania**

A region closely related environmentally to south western Victoria is the island of Tasmania located over 200 kilometres to the south east. As will be shown (Ch.16) the Tasmanian prehistoric data suggest that the island had been culturally isolated for around 10,000. As one of the aims of this thesis is the comparison between the two above areas, I have separated the Tasmanian population densities from those of continental Australia, and compared them to those from south western Victoria in Table 5:6.

To achieve uniformity of argument in this comparison, when producing the Victorian estimates I have followed similar methods to those employed by Jones (1974) in his estimation of the Tasmanian densities. Estimates in both areas have been calculated by multiplying the known number of bands (or named local groups) for each sub-region (tribe or linguistic group) by the average numerical size of bands. It is particularly fortuitous that both south western Victorian and Tasmanian estimates have essentially been based on the accounts of the same observer, George Augustus Robinson. This endows both sets of data with a substantial degree of internal consistency. The Victorian data are more complete as Robinson made his
observations within 6-7 years of European settlement as compared to 26-30 years after the settlement of Tasmania. By the time of his Port Phillip account, Robinson would also have been more familiar with Aboriginal customs and behaviour.

The results of the comparison indicate that the south western Victorian population densities are significantly higher than the Tasmanian. The latter range from between 13.5-22.4 square kilometres per person for the whole island of 67,000 square kilometres, to between 6.7-8.41 square kilometres per person for the most fertile habitat, coastal north west Tasmania (Jones, 1974:326). This range compares with c.3.6 square kilometres per person for the Western District of c.28,500 square kilometres, and between 1.5-2.3 square kilometres per person for the most fertile habitat, the Port Fairy-Warrnambool area (Peek Whruurong). Population densities of the last group are therefore four times those from north west Tasmania.

From the figures provided, Jones (Table 5:5) it can also be observed that there existed a general correlation between population density and environmental productivity for all Tasmanian populations in this complex environment. For example, in comparison to the high rainfall region of the coastal north west corner, the drier open forested region of the Oyster Bay tribe had a considerably lower population density of between 10.6-14.2 square kilometres per person.

The comparison between Western Victoria and Tasmania can be restated in a more simple way. Comparisons can be made merely of the number of local groups (bands) per area, with no assumptions being made as to population size. Table 5:7 compares the density of bands from the two areas. The calculations are based on the estimated mean density of bands in any one region. In the case of the Western District the number of bands has been constructed differently to other estimates (see above), so in this case the mean number of bands in 158. The results of the comparison are quite clear. In south western Victoria there existed a significantly greater density of local groups or bands than in Tasmania. For example, for the whole Western District the density of bands is 180 square kilometres per band, while in Tasmania the density is 893 square kilometres per band. In this case the

1 I have adjusted Jones' original figures because of an obvious error in calculation.
<table>
<thead>
<tr>
<th>Cultural Group</th>
<th>Area Km²</th>
<th>No. of Bands</th>
<th>Km² per Band</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S.W. Victoria</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western District</td>
<td>28,500</td>
<td>c.130-200</td>
<td>180</td>
</tr>
<tr>
<td>Manmeet</td>
<td>7,000</td>
<td>58-62</td>
<td>117</td>
</tr>
<tr>
<td>Peek Whuuroong</td>
<td>1,300</td>
<td>14</td>
<td>93</td>
</tr>
<tr>
<td>Northern Tjapwurong</td>
<td>4,400</td>
<td>28</td>
<td>157</td>
</tr>
<tr>
<td>Tjapwurong</td>
<td>7,000</td>
<td>33-34</td>
<td>209</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tasmania</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasmania</td>
<td>67,000</td>
<td>70-80</td>
<td>893</td>
</tr>
<tr>
<td>Tasmania (occupied area only)</td>
<td>45,300</td>
<td>70-80</td>
<td>604</td>
</tr>
<tr>
<td>north west Tasmania</td>
<td>3,360</td>
<td>9-10</td>
<td>354</td>
</tr>
<tr>
<td>Oyster Bay (south east Tasmania)</td>
<td>8,550</td>
<td>15</td>
<td>570</td>
</tr>
</tbody>
</table>
Victorian density is five times that of Tasmania. When the band densities of the Western District are compared with the occupied area of Tasmania (as distinct from the whole), the latter density is 604 square kilometres per band. In this case the Victorian densities are 3.4 times that of Tasmania. Comparisons between the most fertile environments from both regions indicate: 93 square kilometres per band (Peek Whuurong, Victoria) compared with 354 square kilometres per band (north west Tasmania). In this case the Victorian densities are 3.8 times that of Tasmania.

These calculations of population density, therefore, for south western Victoria contradict Jones' recent claim that Tasmanian population densities were equivalent to those from coastal south eastern Australia, the environment most comparable to Tasmania (Jones, 1977a:200). The explanation of these findings and their relationship to differences in levels of extractive efficiency between these two regions, will be discussed further on in this thesis.

Some remarks remain to be made concerning the calculation of both sets of data, Victorian and Tasmanian. At all stages of calculating the Victorian densities I have worked only from the lowest estimates, avoiding upper limits wherever possible. As I have already stated, the Victorian estimates derived are therefore conservative. Such is not always the case with the calculation of the Tasmanian estimates. For example, it would be quite justifiable to assume that the north western Tasmanian population had a larger territory than that calculated by Jones. The country of this group backed onto rainforest, the exact extent of which is difficult to calculate. Such an alteration would significantly lessen the population density estimated for this region.

Conclusion

Population density for south western Victoria can generally be correlated with environmental productivity, coastal areas having the highest densities. These Victorian estimates have been shown to be comparable to the highest Australian population densities which are documented for certain tropical coastal regions such as east Arnhem Land. Population densities from neighbouring and environmentally comparable Tasmania have been shown to be significantly lower and therefore not equivalent to those from
coastal south eastern Australia, as recently proposed. These results are discussed below (Ch.16).

The evidence suggests that areas such as south eastern Australia which were quickly occupied by Europeans, had larger Aboriginal populations than was generally admitted or perceived by early chroniclers. This argument further suggests that the total Australian Aboriginal population which Radcliffe-Brown (1930) estimated at 300,000 should be revised upwards, perhaps by a factor of two or three, if the Victorian examples are an indication. Radcliffe-Brown originally intended his estimate merely as a minimum number, but through usage it has come to be quoted as the average (e.g. Maddock, 1972:22; Clark, 1977:474).
CHAPTER SIX

SUBSISTENCE

The predictive subsistence model established in Chapter 3 is here tested against the ethnohistorical data. The aspects which are discussed include: the main procurement systems that were employed - plant food collection, fishing, hunting and the lesser strategies; attempts to stabilise, and at time perhaps to increase, the productivity of resources.

Plant Foods

The significance of plant foods in the Aboriginal diet from southern Australian latitudes has generally been played down in the literature (e.g. Hiatt, 1967-8; see also Blainey's criticism, 1975:168-70). Comparisons drawn between the copious range of edible plant species from tropical areas (Golson, 1971) as distinct from those of the temperate zones, have lent support to this viewpoint. Abundance, however, is not merely the product of species diversity, and as has been shown in Chapter 3, plant foods were plentiful in all seasons in southern latitudes. The seasonal variance in availability of plant foods which is a feature pointed out for temperate areas (Ch.3), also applies to the tropics (for example, see Thomson, 1939).

The ethnohistorical data presented here, although lacking in quantitative details, support the viewpoint that for south western Victoria plants formed one of the chief (if not the chief) food staple throughout the year. Plant foods are shown to have been the reliable base of the diet to which people turned when the more risky economic strategies failed (see below). These conclusions could perhaps also be extended to other areas
of mainland south eastern Australia with little difficulty, and
information from some other regions is included in the following account.
Because of these findings I am beginning a discussion on Aboriginal
subsistence with plant foods. I have also so far omitted reference to
semi-arid Australian regions, for which it is now generally agreed that
at least for the last 15,000 years, cereals have played a leading role
in Aboriginal diet (Ch.17).

For south western Victoria all authors that I have consulted agree
with a marked consistency, that plants, especially roots and tubers,
formed the dietary base in all seasons. Of these, orchids, lilies,
Bul-rushes and Bracken Fern are some of the most important groups. Of
all plants, however, one was singled out by all observers as the most
significant, the Yam Daisy or Native Dendelion, Microseris scapigera.
This particular species was commonly known by one of its Aboriginal names
and variously spelled as Murnong, Mirr-n’yoong etc. It was collected in
large quantities mainly by women but also by children, from the open
plains where it was more easily detectable in spring and summer.

Robinson's descriptions of the collection and consumption of this
species are clearest during these seasons. From the area of Mount Macedon
near the Loddon River in Central Victoria Robinson observed:

... he had seen thirty women on the plains at a time digging
murnong whilst the men went into the forest to hunt kangaroo
and opossum which are abundant.

   (14 February, 1840)

From the area of the Pyrenees, Robinson writes of the Gal Gal Bullucus:

I sat down among them at their camp. They had a good supply
of murnong (see Mitchell). This they had roasted and I eat
some with them. This pleased them much. This root when in
season is a staple article of sustenance, it is very
nutritious and tolerably palatable. They roast them in
ovens. ... The whites call them yams. The root might be
cultivated in gardens. They had also fresh water mussel ... .

   (27 February, 1840)

He had earlier observed that murnong has a tuberous root also and
a yellow flower. "Captain H. is cultivating murnong in his garden"
(14 February, 1840).
On February 28th of that year he recorded, "Eat murnong with the native women at Learmonth's sheep station."

Along the coast at Port Fairy, and in the marshlands of the Great Swamp region, Robinson wrote that roots were an important food:

There is a large swamp to the east of the Port Fairy River where the natives get their chief support roots.

(28 April, 1841)

To the south of this lake separated by a ridge of dry elevated land 3 or 400 yards wide and along which were old camping places of the natives where they had baked roots was an old ready swamp, the head of the Great Swamp.

(7 May, 1841)

Robinson's description of the diet from Lake Hindmarsh was also similar:

. . . consisted of frogs, shrimps, grubs and roots. The latter their chief support was being cooked among heated stones and not ashes.

(April-May, 1845; Lake Hindmarsh; Official Report, Vol.59, A7080:126)

Robinson records that tubers were dug up with digging sticks:

Wallen.duc the name of the lava stone, used by the native women for sharpening their murnong sticks. I saw one of them at work preparing a murnong stick. This they do by first chopping with a tomahawk or another sharp instrument. The stick giving to it a chisel edge. They then harden it in the fire and give it the finishing touch with the lava stone.

(7 March, 1840)

This description was recorded by Robinson when observing the Bara Bullocs, and he adds:

Lar - ironstone. They use this ironstone for making or building their minne or ovens for baking their murnong. The Wowerongs (Wathaurung) call murnong Parm. (See below)

Dawson's description is complementary:

They depend for food almost entirely on animals and roots, which are more abundant than in the interior, where the seed of the nardoo occasionally forms the chief sustenance of the aborigines.

(1881:15)
Of roots and vegetables they have plenty. The muurang, which somewhat resembles a small parsnip, with a flower like a buttercup, grows chiefly on the open plains. It is much esteemed on account of its sweetness, and is dug up by the women with the murrang pole. The roots are washed and put into a rush basket made on purpose, and placed in the oven in the evening to be ready for next morning's breakfast, when several families live near each other and cook their roots together, sometimes the baskets form a pile three feet high. The cooking of the murrang entails a considerable amount of labour on the women, inasmuch as the baskets are made by them; and as these often get burnt, they rarely serve more than twice. The murrang root, when cooked is called yuwatch. It is often eaten uncooked.

(Dawson, 1881:19-20)

Smyth's account is also similar and he makes a most important statement concerning the role of plants within the overall economy. He states that when the more precarious subsistence strategies of hunting and fishing failed the people fell back on "some of the various vegetable productions which are common" (1876, 1:143).

Murr-nong or Mirr-n'yong, a kind of yam (Microseris Forsteri), was usually very plentiful and easily found in the spring and early summer, and was dug out of the earth by the women and children. It may be seen growing on the banks of the Moonee Ponds, near Melbourne. The root is small, in taste rather sweet, not unpleasant, and perhaps more like a radish than a potato. This plant grows throughout the greater part of extra-tropical Australian - and in Tasmania and New Zealand; and it has been traced up to the summit of our Alps. At 6,000 feet, in alpine pastures it assumes much larger dimensions than in the lowlands, and the roots are quite suitable for food. Indeed, the plant is one which might be cultivated for food in cold countries.

(Smyth, 1876, 1:209)

As Smyth implies, this species may have been important in Aboriginal economies throughout mainland south eastern Australia. Curr's account from near Echuca on the Murray River exemplifies this and he also describes a situation which would not have been out of place in the Western District.

... yams were so abundant, and so easily procured, that one might have collected in an hour, with a pointed stick, as many as would have served a family for a day. The wheels of our dray used to turn them up by the bushel as it went over the loose ground. Indeed several thousand sheep, which I had at Colbinabbin (Station), not only learned to root up these vegetables with their noses, but they for the most part lived on them for the first year, after which the root began gradually to get scarce. Besides yams, there were also in
the same country several other sorts of roots in more or
less abundance. . . .

(1886, I:240)

curr's reference to the decimation of root plants after the
first year of sheep grazing, can be seen as a major influence on aboriginal-
european conflict in the initial period of european settlement (see ch.2).

Mrs Smith wrote of the diet of the Booandiks (Bunganditj): "their food
consisted chiefly of kangaroo, fish, emu, opossum, fine roots, candar-seed,
"Meenatt", and honey suckle (1880:xi). Her description of the cooking and
eating of plants accords with those of robinson and dawson:

They made up their oven, gathered their roots, roasted and
ate them, and lived happy. At length, one day, they had made
up their oven, put their roots on the stones, covered them up
with earth, and went to rest.

(1880:14)

in his lengthy account, Buckley makes reference to the eating of
roots more often than any other food, and in one case specifies that the
main root eaten was "murnong" (morgan, 1852:65).

According to dawson (1881:20), in winter the collection of murnong
gives way to other plants. He mentions two in particular, both referred
to as taaruuk and one of which was the more important:

The bulb of the Clematis, "taaruuk", is dug up in winter,
cooked in baskets, and kneaded on a small sheet of bark into
dough, and eaten under the name of murpit. The root of the
native convolvulus, also called taaruuk, is cooked in the same
way, and forms the principle vegetable food in winter, when
muurang is out of season.

The former appears to be of the genus Clematis (family Ranunculaceae),
woody climbing plants, and the latter Convolvulus erubescens, (Pint
bindweed), a widespread mainly temperate species (Galbraith, 1967:59, 117).

Robinson also mentions taaruuk or "tar.roke" as he spelled it,
and he observed its use during the colder months from the same general
area as dawson, the manmeat region around the great swamp, so he was
probably referring to the same plants. "there is another root also they get
from the swamp called Tar.roke" (11 May, 1841). But Robinson unlike dawson
fails to distinguish between the two species of taaruuk.

Robinson provides us with quite a deal of evidence of plant collection, in the autumn-winter months. Some of his descriptions, however, though explicit in methods of collection and even quantities of plants collected, are ambiguous as regards the species of plant. Robinson in a number of accounts refers to the collection of murnong during this season. But either he failed to correctly identify the plants being gathered, assuming they were the same as those he had observed collected in the same way the previous summer, or Dawson stands to be corrected. A middle road, however, may exist, as murnong may have continued to be collected in winter together with the taaruuk plants which made up the bulk of the winter diet as Dawson stipulates. A closer study needs to be made of the relevant plants, their availability and nutritional value in each season before these questions can be more fully answered:

For the autumn-winter months, Robinson states:

Plenty of murnong brought in by the native women who process it from the plain north of Kilambete.

(18 April, 1841)

From the Mount William area of the Tjapwurong he described:

The native women of the country had been digging murnong.

(8 July, 1841)

Yesterday and today the native women were scattered over the plain collecting punimim or murnong and other roots, a privilege which would not be permitted if I was not present.

(23 July, 1841; at the base of the Pyrenees)

Today the native women were spread out over the plain as far as I could see them, collecting punimim, murnong. I inspected their bags and baskets on their return and each had a load as much as she could carry. They burn the grass, the better to see those roots.

(24 July, 1841; same location as the latter)

The use of fire as an aid in gaining access to favoured plant species and its wider ecological effects is discussed below.
It is also likely that some confusion has arisen due to the fact that similar or identical words were sometimes used in reference to different plant species in the various languages and dialects of the area. For example, in a quotation (above) Robinson mentions that Parm was the Wathaurung term for murnong, but later he contradicts this statement.

Parm - a tuberous root eaten by the natives. It is unlike pun-mim or murnong, as parm resembles an onion both in the stalk and root. The latter is hard and is the part eaten by the natives. They roast it.

(Vocabularies, Vol.59 A7086, Part 2:248)

Initialled next to the above key word are Jc, M and P, standing for Jarcoort, Manmeet and Pyreens languages. Parm, therefore may have referred to murnong in one context but not in another, and as Robinson's diaries are unedited, the term itself remains ambiguous.

Tuberous roots of the Bulrush (Typha augustifolia) were also an important plant food from wetland environments, river banks, lagoons, lakes, marshes, and appear to also have been eaten in winter. Smyth lists two species (1878, I:213) but today these are classed as the same (Willis, 1962:62).

The Great Swamp abounds in rushes the sorts of which are edible and afford the natives an ample supply and is one of their chief supports when roasted in the fire (it) is meally and white like flour . . . the mats Mitchell mentioned are used for carrying rushes in.

(11 May, 1841)

These large circular mats, themselves woven of rushes, were worn by women on the back or on the head, as Robinson observed from the area of the Grange Burn:

The native women I observed wore the round mat, by them called Peer.rac on their heads like a Gipsey hat. These mats are used as baskets, like carpenter's baskets- and they also use them to sit on.

(4 June, 1841).

They were used by these western Manmeet groups, those of the Sungandit, as well as by other groups in South Australia.

From the headwaters of the River Hopkins, Barconedeet country Robinson observed:
The river was a favourite resort of the natives. The large water holes afforded them mussels and other foods and the bulrush was abundant. The root of which the natives eat.

(30 July, 1840)

Robinson's account from the Mount Gamgier region (Bunganditj) was also similar:

The country abounds with lagoons and morasses from where these aquatic people derive their chief sustenance molusca and the roots of the bulrush.

(May, 1845; Official Report, Vol.59, A7080:146)

Dawson mentions another important species whose distribution is widespread in most Victorian environments and numbers prolific, Bracken Fern (*Pteridium esculentum*): (A kind of bread is made of the root of the common fern, roasted in hot ashes, and beaten into a paste with a stone" (1881:20). Use of this plant is also reported by Bulmer and Hogan (Smyth) 1876, I:210).

Roots of other plants were also recorded as having been eaten, but these are more difficult to identify. For example, Robinson writes of willoyang (Manmeet) known as muttone in the Pyrenees area (Vocabularies, Vol.59 A7086, Part 2:248), and also "...purum-pun, tuercorn (roots eaten by the natives);" (Kenyon, 1928:159; northern Tjapwurung area). Dawson was more explicit and he makes reference to some other tuberous plants which were eaten and for which he provides the Aboriginal name. I have not been able to identify these plants and instead will reproduce his information:

The weakk, resembling a small carrot, is cooked in hot ashes without a basket. . . . A tuber, called puewan, about the size of a walnut, and resembling the earthnut of Europe, is dug up, and eaten roasted. It has no stalk or leaf to mark its locality, and is discovered from the shallow holes scraped by the bandicoots in search of it, and from a scarcity of herbage in the neighbourhood.

(1881:20)

The inner heart or pith of the trunk of the Tree-fern (*Dicksonia antarctica*) was eaten (Bulmer in Smyth, 1876, I:210; Smyth, 1876,1:213) as were the young shoots, bases of leaves, and young flower-stalk and
spike of the Grass-tree (*Xanthorrhoea australis*) (Hogan in Smyth, 1876, 1:210; Smyth, 1876, 1:213): Grass trees was broken which they (the natives) had been eating and the refuse strewed about" (Robinson, 3 July, 1841).

An important food and source of carbohydrate was the gum of certain acacias and it was collected and stored in some quantity at the end of summer:

The gum of the acacia, or common wattle tree, is largely consumed as food, as well as for cement; and each man has an exclusive right to a certain number of trees for the use of himself and family. As soon as the summer heat is over, notches are cut in the bark to allow the gum to exude. It is then gathered in lumps, and stored for use.

(Dawson, 1881:21)

Buckley mentions the collection of gum as food a number of times and in one instance specifies that an expedition was undertaken to procure this commodity which was then in great abundance, on another group's home ground (Morgan, 1852:22; also 25, 66). Robinson also makes reference to this resource although not as explicitly as those above: "Saw a large quantity of wattle trees on my way which the Port Fairy people had stripped" (30 April, 1841). Smyth indicates that two of the species whose gum was milked in this was were *Acacia decurrens* and *Pittosporum phillyraeoides* (1878, 1:213).

Mushrooms of several species, fungus and a large underground fungus called "native bread" (*Mylitta australis*) were collected especially in the colder seasons (Dawson, 1881:20). Smyth mentions seeing pieces of the latter species "weighing several pounds, and in some localities occasionally a fungus weighing fifty pounds is found" (1876, 1:209). In the area of the Great Swamp in late autumn Robinson observed that large quantities of "fungus" were eaten, and that it produced considerable swelling in the abdomen. In this way he was at first misled by the appearance of the local women, imagining them all to be pregnant:

My people when at the great lake collected a quantity of fungus. They are particularly fond of it. This fungus contains a great quantity of air - is particularly springy.

(16 May, 1841)

Sweetened beverages were produced from various flowers, honey, gums
and from a kind of manna, "perhaps after a slight fermentation to some extent intoxicating" (Smyth, 1876, 1:210; Dawson, 1881:20). Manna, a sweet whitish substance produced by Lerp insects (Psyllidae) and found deposited or dropped from leaves and small branches of eucalypts for example Eucalyptus viminalis, was collected along the River Hopkins and near Melbourne (Smyth, 1876, 1:211; Dawson, 1881:20). Dawson refers to it as "buumbuul" and like Smyth says it was prepared in large wooden bowls:

... but as they consume great quantities of gum and manna dissolved together in hot water, a wooden vessel for that purpose is formed of the excrescence of a tree, which is hollowed out sufficiently large to contain a gallon or two of water. This vessel is placed near enough to the fire to dissolve the contents, but not to burn the wood. It is called 'yuuruu', and must be valuable, from the difficulty of procuring a suitable knob of wood, and from the great labour of digging it hollow with a chisel made of the thigh bone of a kangaroo.

(Dawson, 1881:14)

Smyth refers to these bowls as "tarnuks", and also to another drink called "beal" made by immersing the flowers of Banksia ornata in water (1876, 1:210).

Smyth provides a lengthy list of plants eaten in Victoria which I present on Table 6:1. I have only included those plants which are known from south western Victoria, and also I have updated the names of plants which are listed. The list, together with the examples I have already discussed, cover a wide range of the edible plants found in the area. Apart from those species already discussed in this chapter it can be seen from Table 6:1 that much use was made of the species from the Lily (Liliaceae) and Heath (Epacridaceae) families, and of certain native fruits. According to Dawson one species of fruit provided the basis for seasonal concentrations of people at the mouth of the Glenelg River (see also Ch.8). The most likely species to fit the description Dawson provides is Nitraria schoberi, the Nitre-bush.

The southern portions of Australia are remarkably deficient in native fruits and the only kind deserving the name is a berry which the aborigines of the locality call "nurt", resembling a red-cheeked cherry without the pip, which grows abundantly on a creeper amongst the sand on the hummocks near the mouth of the River Glenelg. It is very much sought after, and, when ripe, is gathered in great quantities by the natives, who come from long distances to
<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Part Eaten</th>
<th>Season</th>
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<tbody>
<tr>
<td>Dicksoniaceae</td>
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<tr>
<td><em>Dicksonia antarctica</em></td>
<td>Tree Fern</td>
<td>inner heart of trunk</td>
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<td>Dennstaedtiaceae</td>
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<tr>
<td><em>Pteridium esculentum</em></td>
<td>Bracken Fern</td>
<td>rhyzome</td>
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<td>Typhaceae</td>
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<tr>
<td><em>Typha angustifolia</em></td>
<td>Bulrush</td>
<td>tuberous rhyzome</td>
<td>autumn-winter, spring, summer</td>
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<tr>
<td>Juncaginaceae</td>
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<tr>
<td><em>Triglochin procera</em></td>
<td>Water ribbons</td>
<td>tuberous rhyzome</td>
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<tr>
<td>Cyperaceae</td>
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<tr>
<td><em>Eleocharis spp.</em></td>
<td>Spike rush</td>
<td>rhyzome</td>
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<tr>
<td><em>Eleocharis sphacelata</em></td>
<td>Sea club-rush</td>
<td>rhyzome</td>
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<tr>
<td><em>Scirpus maritimus</em></td>
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<tr>
<td>Liliaceae</td>
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<tr>
<td><em>Xanthorrhoea australis</em></td>
<td>Grass tree</td>
<td>base of inner leaves, shoots,</td>
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<td></td>
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<td>flower stalk, spike</td>
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<tr>
<td><em>Anguillaria dioica</em></td>
<td>Early Nancy</td>
<td>rhyzome</td>
<td>spring</td>
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<tr>
<td><em>Arthropodium milleflorum</em></td>
<td>Pale Vanilla Lily</td>
<td>rhyzome</td>
<td>spring-summer</td>
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<tr>
<td><em>Bulbine bulbosa</em></td>
<td>Bulbine Lily</td>
<td>rhyzome</td>
<td>spring</td>
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<tr>
<td><em>Burchardia umbellata</em></td>
<td>Milkmaids</td>
<td>rhyzome</td>
<td>spring-summer</td>
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<td>Twining Fringe Lily</td>
<td>rhyzome</td>
<td>spring-summer</td>
</tr>
<tr>
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<td>Common Fringe Lily</td>
<td>rhyzome</td>
<td>spring-summer</td>
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<tr>
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<td>sweet flowers</td>
<td>spring-summer</td>
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<tr>
<td>Species</td>
<td>Common Name</td>
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<tr>
<td>Orchidaceae</td>
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<tr>
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<tr>
<td>Microtis spp.</td>
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<td>Prasophyllum spp.</td>
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<td>tubers</td>
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<tr>
<td>Pterostylis spp.</td>
<td>Orchid</td>
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<tr>
<td>Thelymitra spp.</td>
<td>Orchid</td>
<td>tubers</td>
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<td>Proteaceae</td>
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<tr>
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<td></td>
<td>fruit</td>
<td>spring-autumn</td>
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<tr>
<td>Santalaceae</td>
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<tr>
<td>Exocarpos cupressiformis</td>
<td>Cherry Ballarat</td>
<td>fruit</td>
<td>winter-spring</td>
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<tr>
<td>Exocarpos aphylla</td>
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<td>Exocarpos strictus</td>
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<tr>
<td>Rhagodia</td>
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<tr>
<td>Carpobrotus rossii</td>
<td>Pige face</td>
<td>fruit, leaves</td>
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<td>Ranunculaceae</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pittosporum spp.</td>
<td>Weeping Pittosporum</td>
<td>gum</td>
<td>spring</td>
</tr>
<tr>
<td>P. phillyraeoides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>Species</td>
<td>Food Source</td>
<td>Season</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------</td>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Rosaceae</td>
<td><em>Rubus parvifolius</em></td>
<td>Native raspberry</td>
<td>spring-summer</td>
</tr>
<tr>
<td></td>
<td><em>Rubus rosifolius</em></td>
<td>Native raspberry</td>
<td>summer-autumn</td>
</tr>
<tr>
<td>Mimosaceae</td>
<td><em>Acacia spp.</em></td>
<td>Wattle</td>
<td>late summer</td>
</tr>
<tr>
<td></td>
<td><em>Acacia decurrens</em></td>
<td>Early Black Wattle</td>
<td>late summer</td>
</tr>
<tr>
<td>Geraniaceae</td>
<td><em>Geranium spp.</em></td>
<td>Geranium</td>
<td>tuber</td>
</tr>
<tr>
<td></td>
<td><em>Nitraria schoberi</em></td>
<td>Nitre bush</td>
<td>fruit</td>
</tr>
<tr>
<td>Myrtaceae</td>
<td><em>Eucalyptus viminalis</em></td>
<td>Manna gum</td>
<td>sweet gum</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus pumifera</em></td>
<td>Muntries</td>
<td>fruit</td>
</tr>
<tr>
<td></td>
<td><em>Eugenia Smithii</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epacridaceae</td>
<td><em>Epacridae spp.</em></td>
<td>Heath</td>
<td>fruit</td>
</tr>
<tr>
<td></td>
<td><em>Styphelia spp.</em></td>
<td>Heath</td>
<td>fruit</td>
</tr>
<tr>
<td>Convolvulaceae</td>
<td><em>Convolvus erubescens</em></td>
<td>Pink Birnweed</td>
<td>tuber</td>
</tr>
<tr>
<td>Solanaceae</td>
<td><em>Solanum aviculare</em></td>
<td>Kangaroo Appel</td>
<td>fruit</td>
</tr>
<tr>
<td>Caprifoliaceae</td>
<td><em>Sambucus guadichaudiana</em></td>
<td>White Elderberry</td>
<td>fruit</td>
</tr>
<tr>
<td>Compositae</td>
<td><em>Microseris scapigera</em></td>
<td>Yam Daisy</td>
<td>tuber</td>
</tr>
</tbody>
</table>
feast on it, and reside in the locality while it lasts. In collecting the berries they pull up the plants, which run along the surface of the sand in great lengths, and carry them on their backs to their camps to pick off the fruits at their leisure. On the first settlement of the district by sheep owners these berries were gathered by the white people, and they made excellent jam and tarts.

(Dawson, 1881:22)

In conclusion, therefore, plant foods have been shown to have formed an important part of the Aboriginal diet in the region, along with the protein obtained from animal, fish and insect species (below). Plant foods would have made up the larger part of the carbohydrate content in the diet. Even from the sketchy ethnohistorical data that is available, plants appear to have formed the dietary staple to which other foods were incorporated (see above). The main plants eaten in the district were tubers and roots as distinct from cereals which were key elements in the diets or more arid areas including the region immediately to the north of the Western District. A wide variety of plant species was exploited although all writers agree that the strongest emphasis was placed on one particular species Microseris scapigera, the Yam Daisy. Although spring and summer were the seasons of plant abundance, plant foods continued to be important throughout the colder months as well as is demonstrated in particular by Robinson’s information. The collection of plants took place in most key environmental zones throughout the year.

Many of the species needed the minimum of preparation before being eaten as many were eaten raw, others were lightly steamed, and the tougher tubers roasted for longer periods in earth ovens. Some species, such as the Bracken Fern (Pteridium esculentum), needed more elaborate preparation; starch was obtained from the root by pounding, and the final product baked in the ashes and eaten as a form of "bread". The latter technique would presumably leave behind archaeologically detectable evidence in the form of grinding stone equipment (see Ch.12).

Fishing

Fish is recorded as having formed one of the chief food resources in the Aboriginal diet, and to have been procurable throughout the year. In certain seasons it was caught in large quantities. Fishing methods and
equipment were extensive and elaborate and much admired by early European observers. In fact this technology and its observed efficiency were some of the only aspects of Aboriginal culture deemed comparable to the generally accepted "superior" European culture (e.g. Smyth, 1876, 1:201, 389).

Some of the more important species of fish eaten are listed on Table 6:2. I have constructed this information from that provided by Smyth (1876, 1:203-4). As his data are mainly from the Gippsland region of Victoria I have made allowance for this by only including information applicable to south western Victoria. The fishing methods provided were also obtained from Gippsland and therefore may not be entirely applicable to our study area. Dawson's statement however, that "Eels are prized by the Aborigines as an article of food above all other fish" is echoed by most other writers.

The following information I have arranged according to the main methods of fishing employed in the district, with special attention given to those concerned with eels (Anguilla australis). On Table 6:3 I have set out the main seasonal fishing methods and environments, based on the ethnographic information that follows in this section.

**Fish Traps, Weirs**

These devices were employed in harvesting many species of fish, in particular eels, Mullet (Aldrichetta forsteri) and large numbers of small fish in the estuaries (Dawson, 1881:94). Bulmer states that the latter took place in summer (Smyth, 1876, 1:142). Large, elaborate and permanent traps and weirs of stone and brushwork were constructed across waterways throughout the district. The principle by which these constructions operated was to capitalise on the movement of water (floods, recessions during the dry, tides) thereby forcing the fish en masse into the traps where they could quite easily be harvested. Artificial flows of water were also created by "constructing dams, or excavating the outlet of a lake or lagoon" (Smyth, 1876, 1:201). This discussion together with that concerning the construction of artificial drainage systems for fishing is continued below.
Table 6:2  Fish Commonly Eaten in Southern Victoria
(Smyth, 1876, 1:203-4)

<table>
<thead>
<tr>
<th>General:</th>
<th>Also:</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gadopsis marmoratus</em></td>
<td>conger eel</td>
</tr>
<tr>
<td>Black Fish</td>
<td>flounder</td>
</tr>
<tr>
<td><em>Chrysophrys sp.</em></td>
<td>shark</td>
</tr>
<tr>
<td>Bream</td>
<td>skate</td>
</tr>
<tr>
<td><em>Mustela sp.</em></td>
<td>schnapper</td>
</tr>
<tr>
<td>Dog-Fish</td>
<td>sting-ray</td>
</tr>
<tr>
<td><em>Anguilla australis</em></td>
<td></td>
</tr>
<tr>
<td>Eel</td>
<td></td>
</tr>
<tr>
<td><em>Hemirhamphus australis</em></td>
<td></td>
</tr>
<tr>
<td>Sea Garfish</td>
<td></td>
</tr>
<tr>
<td><em>Platycephalus fuscus</em></td>
<td></td>
</tr>
<tr>
<td>Dusky Flathead</td>
<td></td>
</tr>
<tr>
<td><em>Galaxias sp.</em></td>
<td></td>
</tr>
<tr>
<td>Gudgeon</td>
<td></td>
</tr>
<tr>
<td><em>Protoroctes maraena</em></td>
<td></td>
</tr>
<tr>
<td>Australian Greyling</td>
<td></td>
</tr>
<tr>
<td><em>Sillago maculata</em></td>
<td></td>
</tr>
<tr>
<td>Trumpeter Whiting</td>
<td></td>
</tr>
</tbody>
</table>

Species taken in Gippsland, and method of capture:

- Schnapper .......... with bone-hook
- Gurnet .......... in the net; seldom with hook
- Flounder .......... speared
- Gar-fish .......... spear and hook
- Large flat-head .... with spear and hook
- Flat-head .......... speared
- Bream ..............
- Perch .............. with the bone-hook
- Travalla ..........
- Sand mullet .......
- Fat mullet .......... in net made of grass
- Sea trout .......... with the bone-hook
- Golden perch ....... in the net
- Silver perch .......
- Large perch ....... speared
<table>
<thead>
<tr>
<th>Season</th>
<th>Method</th>
<th>Main environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>night fishing</td>
<td>ponds, lakes</td>
</tr>
<tr>
<td>(Sept.-Nov.)</td>
<td>general</td>
<td>the coast, estuaries, inland waterways</td>
</tr>
<tr>
<td>Summer</td>
<td>night fishing</td>
<td>ponds, lakes</td>
</tr>
<tr>
<td>(Dec.-Feb.)</td>
<td>traps, weirs (eels,</td>
<td>estuaries</td>
</tr>
<tr>
<td></td>
<td>mullet)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>spear (eels)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>by hand</td>
<td>shallow pools</td>
</tr>
<tr>
<td></td>
<td>general</td>
<td>shallow pools</td>
</tr>
<tr>
<td>Autumn</td>
<td>weirs, traps (eels,</td>
<td>inland, coast</td>
</tr>
<tr>
<td>(March-May)</td>
<td>other fish)</td>
<td>inland (Mount William area)</td>
</tr>
<tr>
<td></td>
<td>excavated drains (eels,</td>
<td>coastal areas</td>
</tr>
<tr>
<td></td>
<td>other fish)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>night fishing</td>
<td>estuaries, rivers</td>
</tr>
<tr>
<td></td>
<td>dredges</td>
<td></td>
</tr>
<tr>
<td></td>
<td>general</td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>line and hook</td>
<td>estuaries</td>
</tr>
<tr>
<td>(June-Aug.)</td>
<td>dredges</td>
<td></td>
</tr>
<tr>
<td></td>
<td>grass nets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>general</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>rivers, estuaries</td>
</tr>
</tbody>
</table>
Line Fishing

Fishing rods and lines were used, the rod consisting of a long supple pole, with the line or cord being made from the bark of the "prickly acacia". These lines were baited with worms (no hooks were used) and large freshwater fish were hauled up in this way (Dawson, 1881:94). Bone fishhooks were used in Gippsland (Victoria) but not in the Western District. In the Geelong area, however, a double pointed fish gorge was used for catching Bream (*Acanthopagrus butcheri*). The latter may also have been used in other parts of south western Victoria although I have seen no ethnographic accounts which support this (see Dawson, 1881:94; Morgan, 1852:32; Smyth, 1876, 1:202, 391; also Ch.12). Bait was procured by women with the use of a small hand-net stretched on a bow. These were employed in the Gippsland area and Smyth mentions that they were formerly used throughout Victoria (1876, 1:390).

Fishing by Hand

When water levels were low, such as in seasons of drought, fish were caught by hand after wading into the shallow water of pools, lagoons and anabranches of rivers. In deep waterholes fish were caught by hand at night with the use of a torch (see below) Dawson, 1881:95; Smyth, 1876, 1:199).

Night Fishing

At deep ponds and lakes fishing stages were constructed of wood, grass and earth a metre or more from the bank and near to the surface of the water. Torches were used or fires lit on the bank to attract the fish (including eels) which were caught by spear or hand (Dawson, 1881:95; Smyth, 1876, 1:388). At the water-fall about eight kilometres north of Port Fairy, Robinson observed six such fishing stations placed around a lagoon and built of wood and stones, which were used for catching eels and other fish (29 April, 1841). In the coastal area around Port Fairy Robinson observed similar fishing methods in operation involving night fishing and eeling during the autumn months (April, 1842). Such fixed fishing stations were quickly destroyed by the first European settlers.

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1 Bulmer states that in Gippsland (Vic.) this was a winter fishing strategy when fish were scarcer (Smyth, 1876, 1:142).
such as those in the region of the Koroit Valley, near the Wannon River (Robinson, 7 June, 1841).

At shallow lakes and marshes torches comprising of long bundles of dry ti-tree twigs some three to four metres in length, were used together with spears on very dark nights:

The fishers wade through the water in line, each with a light in one hand and a spear in the other. Fish of various kind are attracted by the light, and are speared in great numbers. (Dawson, 1881:95; see also Morgan, 1882:32)

**Dredges, Nets**

Fish dredges in the form of a dragnet were drawn through the waters of lagoons by two people and by this method a variety of fish were caught (Dawson, 1881:91). At Lake Keilambete Robinson described the following:

Saw a dredge for catching small fish - the manufacture same as that employed in making baskets but the shape like a canoe - it was 5 feet long and 18 inches deep. The bottom was sharp and worked from a stick and called by the Jarcote natives l.neer.ry.yer, 2. Mole.

(20 April, 1841)

From this area he also describes a fishing bucket which was also made from basketry and used for catching fish. (Robinson Vocabularies, Vol.59, A7086, Part 2).

Further east in coastal Victoria around the Yarra River and Gippsland areas, fishing nets of very high workmanship were used for the same purpose. Two people in canoes dragged the net through the water while others drove the fish into it (Smyth, 1876, l:389). Buckley described "shrimp" being caught in very large quantities with nets in the Geelong area (Morgan, 1852:38). Bulmer states that fishing with grass nets was a winter strategy (Smyth, 1876, l:142).

**Canoes**

Fishing from canoes was carried out throughout Victoria. Age-old River Red Gums (*Eucalyptus camaldulensis*) still display scars from where such canoes were cut in the Toolondo region where part of the fieldwork
for this thesis took place (Ch.14). Robinson observed that at Lake Hindmarsh in north western Victoria frail canoes were used to cross the muddy lake and gain access to aquatic birds (1845:126). No mention is made of whether these canoes were used in fishing, and I have been unable to obtain firm evidence for the use of canoes in the Western District proper.

Coastal Fishing

There are few references to coastal fishing, although that is perhaps more representative of the limitations of the ethnohistorical material than of the state of the Aboriginal coastal economy. Robinson, however, does describe the richness of the coastal fisheries of both Port Fairy and Portland. Port Fairy: "Fish (salmon and bream) are abundant on the river and the passage between the island (Griffith's Island) and the main" (29 April, 1841). At Portland Bay he states that salmon, bream, eels and schnapper were "easily got in the bay" (16 May, 1841). Buckley also describes large estuarine shoals of bream in the Barwon River area (Morgan, 1852:64, 74) and coastal night fishing taking place in autumn (above). From this evidence, however slight, it would appear that the most productive fishing took place in estuarine situations or at least that the main emphasis was directed towards these areas. Buckley's descriptions of the coastal area in winter lend support to this general interpretation. He writes of the scarcity of fish, the difficulties in gaining access to shell fish because of rough seas and the general hardships imposed by cold winds and rains along the coast during this season (Morgan, 1852:19, 64, 111).

Eel Procurement

I have already mentioned that eels (Anguilla australis) were the principle freshwater fish caught in the Western District, and the most desired. Fishing methods were attuned to the seasonal and life cycles of the eel which I describe more fully in Chapter 14. I will devote some time in discussing the procurement of this species as this example forms the basis of later arguments which I develop concerning management of species and natural environments (Chs. 14, 15).

Throughout the year eels were caught mainly by spear, and during their annual migrations in March and April or at the start of the wet
season, they were harvested by traps, weirs and by large-scale artificial drainage systems.

a) By spear

This method was employed in all seasons, and Robinson describes how eels were caught from fishing stages at deep ponds (29 April, 1841), or by wading into shallow water during the height of summer. A description of the latter method and its effectiveness in terms of yield, is provided by him from the Melbourne area:

This afternoon 2 native blacks of Boonerang tribe (Bumerong) - Niggererinal and a lad named Dol. ler came to my office and went to a lagoon about a quarter of a mile distant in the paddocks, and in a very short time caught about 40 pounds (18 kilograms) of eels. I saw them catching or rather spearing them of which they are very expert. They each had two spears called by them l. Toke.in, 2. yoke.wil.loke - by the Warwerong (Wurundjeri, Woiworung) l. Nare.rup, and by the Wad.daw.werong (Nathaurung).

l. Tar.rei.ware.rei. . . Having the two spears grasped by the right hand, they go into the water and keep walking about at the same time jabbing their seaps into the mud in a sloping direction . . . if they jab in the spear which is ascertained by the feel they then turn it (the eel) up on the end of the spear. The second spear is jabbed into it while the first holds it down and then kills it. If not quite dead they bite the head and throw it on shore.

(29 January, 1841)

Dawson provides a similar description (1881:95). He also clearly describes the eel spear:

The eel spear is formed of a peeled ti-tree sapling, of the thickness of a little finger and about seven feet long, pointed with the leg bone of the emu, or with the small bone of the hind leg of the large kangaroo ground to a long, sharp point, and lashed to the shaft with the tail sinews of the kangaroo.

(1881:87)

b) Traps, weirs

The main forms of fish-trap and weir which were built across natural waterways, were constructed of stone (Robinson, 25 April, 1841) and of brush-work and wood. Detailed examples of the latter, their construction and methods of operation were described by Robinson from two locations, the lower Hopkins River region (24 April, 1841) and the Tarrone Swamp area which is about 30 kilometres inland from Port Fairy (30 April, 1841; Plate 6:1).
6:1 Fish weirs and eeling after Robinson, 30 April 1841
Head and put to one that fingered a small stick with a knot of the big fur or of near the banks, he then turned and the fishing is carried on in the fishing season.

Section of a gereal and fishing

Front of a gereal or near a el pot in arrangement

Figure a stick for placing the el pot upon

Aer valve or el pot

Made of strand of Phelk rushes, with a Willew handle and having a
The former example was described in the following way:

At a creek connecting with the Hopkins. Here I observed a large were at least 100 yards in length and though the first I had seen I was amazed by its structure and its situation before I reached it that it was the work of the aboriginal natives. I called to Peavy my V.D.L. (Tasmanian) (?) who had passed it with one of the Jarcoort natives and pointed it out to him. He evinced surprise at it and the native said it was made by blackfellows for catching eels when big water came and was called by them yere.roc. He said they got plenty eels and then showed us how they did it by biting their heads and throwing them on shore. The were (weir) was made of stout stick from 2 to 3 inches thick drove into the ground and vertically fixed - and other sticks interleaves in a horizontal manner. A hole is left in the centre and a long eel pot made of basket or matting is placed before it and into which the eels gather and are thus taken. It is probable that 2 or 3 pots are left in large were. This were must have been 100 yards long at least and made with wings or curved pieces at the ends thus... .

At Tarrone, the description is similar, but more detailed:

He also took me to a very fine and large were and went through with several other of the natives the process of taking eels and the particular spot where he himself stood and took them. I measured this were with a tape 200 feet (long) 5 feet high and it turned back at each end. The eel pots are places over the holes and the fisher stands behind the yere.roc or were and lays hold of the small end of the Arrabine or eel pot - and when the eel makes its appearance he bites it on the head and puts it on the lingeer a small stick with a knob at the end... or if near the banks he throws them out. The fishing is carried on in the rainy season... there yere.roc or were are built with some attention to the principles of mechanics. Those erected on a rocky bottom have the sticks indented in a groove made by removing the small stones so as to form a groove. The were is kept in a straight line. The small stones are laid against the bottom of the sticks. The upright sticks are supported by transverse sticks, resting on forked sticks as shown above. The sticks are 3, 4 and 5 inches in diameter. Some of the smaller were are in the form of a segment of a circle, the concave side against the current.

A description of the principles of operation of such seasonal devices has already been given (above). The examples described here were obviously most effective during wet periods and the autumn-early spring seasons would have seen their most sustained operation.

Lake Bolac: The most renowned fishing or eeling ground in the Western District was Lake Bolac. Both Robinson and Dawson wrote that
large numbers of people gathered at this season which lasted from one to two months, semi-permanent and temporary villages were established and ceremonies were held.

At Lake Boloke, during the eelng season, from eight hundred to one thousand natives at one time have been seen. . . . These masses are a collection of representative tribes, and the eelng . . . seasons are wisely taken advantage of by them for holding their great social and political meetings. . . . This spot (Bolac), celebrated for its eels and its central situation, appears to have been fixed upon by general consent for the great annual meeting of the tribes of the interior.

(Kenyon, 1928:146)

When Robinson arrived at Lake Bolac, the eeling season had just ended and the great majority of people had returned to their respective "countries". Evidence of their presence, however, was still plentiful:

The water in the lake was nearly dried up; the shore resembled the shore on the sea. Dead eels were strewn along the beach. Counted 100 dead and large, from 2 to 3 feet and a half long and 3 inches thick. . . . The natives tracks on the beach were as thick as sheep tracks. Saw numerous fresh tracks and small wells where natives had got water. Native camp. A stick called "lingeer" for stringing fish on; a stick with a bit of root on and grass on it.

(Robinson, 31 March, 1841)

The numerous Aboriginal encampments and hut forms around the lake (see Ch.7) stand in support of Robinson's estimates for attendance sizes at this time of year. Evidence for overfishing to a large extent during this eeling season was vividly recorded by Robinson.

And at the old camping places of the natives, the dead eels lay in heaps; dead eels lay in mounds, thousands of dead eels, and very large ones too, strewed the ground around the lake. Found several under jaws of the fish I had seen yesterday. It was about 5 inches wide.

(1 April, 1841)

Dawson's account complements that of Robinson:

Lake Bolac is the most celebrated place in the Western District for the fine quality and abundance of its eels; and, when the autumn rains induce these fish to leave the lake and go down the river to the sea, the aborigines gather there from great distances. Each tribe has allotted to it a portion of the stream, now known as the Salt Creek; and the usual stone barrier is built by each family, with the eel
basket in the opening. Large numbers are caught during the fishing season. For a month or two the banks of the Salt Creek presented the appearance of a village all the way from Tuureen Tuureen, the outlet of the lake, to its junction with the Hopkins. The Boloke tribe claims the country round the lake, and both sides of the river, as far down as Hoxham, and consequently has the exclusive right to the fish. No other tribe can catch them without permission, which is generally granted, except to unfriendly tribes from a distance, whose attempts to take the eels by force have often led to quarrels and bloodshed.

(1881, 94-5)

Such territorial claims and the penalties involved in breaching them are discussed in some detail in Chapter 8.

Buckley also details large-scale activities associated with eeling during this same season. Morgan records that messengers were sent out inviting Buckley's people to the eponymous Buckley's Falls (Geelong area) and to a stream called "Boonea" after the eels with which it abounded. The river was in flood and by the use of fishing torches eels were caught by the "dozen" in pools. The small eels were said to be "inexhaustible". The people had established their huts near to the river and were later joined by some one hundred men, women and children (1852:58).

c) Artificial drainage systems

Two main forms of man-made drainage system were described by Robinson from the Mount William region which lies towards the base of the Grampian Range some 100 kilometres inland. The first form is the most elaborate and Robinson's description of it deserves to be quoted at some length, although the text is not altogether clear:

At the confluence of this creek with the marsh observed an immense piece of ground, trenches and banks resembling the work of civilised man but which on inspection (were) found to be the work of the Aboriginal natives. Purpose consisted for catching eels, a specimen of art of the same extent I had not before seen and therefore required some time to inspect it and which the observing of the nature of the transect enabled me to do. These trenches are hundreds of yards in length. I measured in one place in one continuous triple line for the distance of 500 yards. The triple water course led to other ramified and extensive trenches of a most tortuous form. An area of at least 15 acres (6 hectares) was thus traced over. The whole reminded one of the extensive circumvolution of Christian Ministry (?) Lands of which works at an early period of my life I have been engaged under that section Engineer
Colonel de A (?) for seven years. These works must have been executed at great cost of labour to these native people. The only artificial device (?) being the lever, the application and invention of which force being necessity. This lever is a stick chisel (?) sharpened at one end, by which force they threw up clods of soil and thus formed the trenches, smoothing the water churning (?) with their hands, the soil displaced went to form the embankment. On just seeing these works the V.D.L. (Tasmanian) natives were struck with amazement and exclaimed - Tarlewinem Peener, oh? look at that, Blackfellow never tried. To me it was new and peculiarly interesting and evidence of great perseverance and industry on the part of these aborigines.

This description of work is called by the natives crocupper. . . . The plan of these ramifications were extremely perplexing and I found it difficult to commit it to paper in the way I could have wished in all its varied form, curious curvilinear windings and angles of very line? and shape and parallel. At intervals small apertures (were) left and were placed there arabinne or eel pots. These gaps were supported by pieces of the bark of trees and sticks. In single measurement there must have been some thousands of yards of this trenching and banking. The whole of the water from the mountain rivulets is made to pass through this trenching ere it reaches the marsh. It is hardly possible for a single fish to escape. I observed at some distance higher up minor trenches too, and one through which part of the water ran in its course to the more extensive works. Some of the more extensive works were 2 feet in height, the most of them a foot and the hollow a foot deep by 10 or 11 inches wide. The main branches were wide.

(Plates 6:2, 6:3)

The two above Plates appear to show aspects of these drainage systems. Plate 6:2 appears to be a part of the whole, while Plate 6:1 might represent the entire 15 acres of drainage.

Robinson was travelling with local Aborigines as well as Aboriginal friends or guides whom he had brought from Tasmania (Van Diemens Land) and who from the above description were as incredulous as he upon confronting these earthworks. Robinson's account continues:

Around these entrenchments are a number of large ovens or mounds for baking. These were at least (?) in the immediate neighbourhood. They were the largest I had seen. The one I measured was 31 yards long, 2 yards high and 19 yards broad. They cook their food on these. Here numerous fragments of quartz which they had used for sharpening and preparing their implements lay strewed about.

(9 July, 1841; Plate 6:4a, b)
Robinson's sketch of the Aboriginal drainage system near Mount William (9 July 1841). This appears to be the right hand section of the total plan (Plate 6:3)
6:3 The total plan of the Aboriginal drainage system of some 4 ha. at Mount William after Robinson, 9 July 1841
It is hardly possible for a single line of subsidence at that distance, rising up from a trench near, to have thrown which part of the water men into Cannabis to the European mere, Cataracts are rocky shores of the banks were 3 feet in height, the mouth of the river 4 feet and the bed deep; 5 feet deep, by 10 or 12 inches wide; these rivers, canals, etc., build.
6:4a  Plan of 13 earth mounds located near to the Mount William drainage system (Robinson, 9 July 1841)

6:4b  Ground plan of the earth mounds (Fig.6:4a) (Robinson, 9 July 1841)
A drawing of the Aboriginal drainage system near Mount William by Aboriginal informants at Mount Burrumbeep (Robinson, 19 July 1841)
Robinson also mentioned that these mounds and "baking hills" were used for camping during fine weather, and 13 of these are depicted in Plates 6:4a, b. Such camping sites are discussed further in the following chapter and also in Chapter 11.

Robinson pursued his enquiries concerning the Mount William drains and was provided with more information by Aboriginal informants at Mount Burrumbeep. "The natives informed me in reference to the trenches at Mount William, for catching eels, they called them Vam... The natives made a rude drawing of the Vams... (19 July, 1841; Plate 6:5).

The meeting at Mount Burrumbeep was composed of representatives from the wider northern Tjapwurong region, and from even further beyond. All these people seemed familiar with the Mount William vam, and their relationship with each other was highly amicable. We could therefore draw some broad conclusions from this pattern of interaction and suggest that eeling at Mount William included a fairly large population which drew its numbers from this general northern Tjapwurong area.

Robinson also described a less elaborate form of trenching which was also used for eels. The following example he observed in the marsh area just west of the Mount William vam.

Saw numerous old native ovens, large some 15 feet in diameter. Passed several dikes dug by the natives for draining the small lagoon into the larger ones for the purpose of catching eels. These channels were from 1 foot to 18 inches deep and from 81 to 300 yards in length.

(8 July, 1841)

In summation, fishing appears to have contributed much to the diet throughout the year in both coastal and inland areas. At certain times it was the central strategy around which all other activities appear to have been organised, for example in inland areas in autumn. At these times, fishing formed the focal point of subsistence and allowed for lengthy periods of sedentism, large groups of people, and for the holding of annual ceremonies. At other times of the year it served perhaps as an auxiliary procurement strategy, for example along the coast in spring and summer and perhaps in estuaries in the winter months.
A large and varied range of equipment and techniques were employed, some of which necessitated large inputs of labour such as the construction of fixed weirs, traps and large-scale drainage systems in the Mount William area at the base of the Grampian Ranges.

**The Hunt**

A wide variety of methods and equipment were used in the capturing of terrestrial game. At times hunting would play a dominant role in subsistence strategies, for example during communal hunting-drives and hunting forays out into the open plains or expeditions into more forested areas. Whereas plants appear to have formed the mundane and relatively dependable base of the diet, hunting was, like fishing, a predominantly auxiliary activity. The hunt was in essence an opportunistic strategy which helped to supplement the diet with protein from a wide variety of sources.

In general, men hunted the larger game, with women, the aged and even children contributing in the capture of smaller prey. People of all ages assisted in hunting drives especially in the large-scale events.

So as to provide a summary and at the same time avoid repetition I discuss the methods of hunting under broad environmental categories. I have also attempted to save space by grouping the main references at the end of each section. Under the category of "hunting" I have subsumed a wide variety of retrieving devices including snares, traps and the like.

**Savanna Grasslands, Open Woodlands**

Large macropods such as the Grey Kangaroo (Macropus major) which roamed in large mobs in the open plains and savanna woodlands (Ch.3) were captured by various methods.

a) **Dogs**

Dingos (Canis familiaris) were raised in a domestic situation and also were taken as pups from wild parents. Dawson records that their principal use was in hunting the large macropods for which they were trained (1881:89; see also Morgan 1852:64). They would have been most effective as a hunting device in more open country such as the plains and
open forests. The last point may help to explain why some Aboriginal groups in the Western District possessed so few dogs. Although Dawson stressed the widespread distribution of the dog in the pre-contact period (1881:89), Robinson observed that the coastal Manmeet of the Port Fairy region had few dogs. "The Monomeets have scarcely any dogs. Most of the tribes have none" (Robinson, Vocabularies, Vol.65, A7086).

Perhaps this lack of dogs could be explained by the natural terrain of the coastal Manmeet region. This was in general a forested area broken up by vast stretches of marshland. While the use of dogs as hunting aids could have been effective in the open plains and forests of the central and northern portions of the Western District, this would have applied to a far lesser extent along the coast. Tindale describes a comparable situation from the Sydney region where at Botany Bay dogs were not used or owned. He also mentions that this animal was rare in South Australia (Tindale, 1974:109).

b) Stalking

A man, given general support by his wives and children, as well as men in pairs, often stalked large macropods with a hunting spear, and at times with the dog (Dawson, 1881:89; Smyth, 1876, 1:184). The hunting spear was described in the following ways:

The hunting spear, 'narmall', is about seven feet long, and is made of a peeled ti-tree sapling, with a smooth, sharp point; to balance the weapon it has a fixed butt-piece formed of the stalk of the grass tree, about two feet long, and with a hole in the pith in its end to receive the hook of the spear thrower; but, as the hook of the spear thrower would soon destroy the light grass tree, a piece of hard wood is inserted in the end, and secured with a lashing of Kangaroo sinew.

(Dawson, 1881:87)

Buckley also describes the hunting spear from the Geelong area, but this description also includes hafted stone:

There is also a smaller kind, the Daar spear, used in hunting, it is made of two pieces of wood, fastened together with the sinews of the kangaroo. They are very sharp at the point, and have a white flint stone on each side, fastened in, and on, with gum. These they throw an amazing distance and with great force. . . .

(Morgan, 1852:45-6)

In open areas where cover was scarce, the hunter used a round shield of boughs (up to one metre in diameter) to conceal himself, dragging his
spear between his toes, till he was in throwing distance of his quarry (Dawson, 1881:89; Smyth, 1876, l:185). Smaller macropods such as wallabies, were hunted with dog and spear in environments such as scrub covered gullies and clumps of bush (Dawson, 1881:90. There is no direct reference, however, to nets being used for hunting in the Western District.

c) Hunting drives

Communal hunting drives composed of a large number of members from many bands took place both on open ground and in scrub-covered country (Smyth, 1876, l:185; see also Ch.8). Smaller versions of these were carried out as fire drives with the men forming a circle. Every animal and reptile captured in this way was eaten (Morgan, 1852:72; Smyth, 1876, l:185; see also Ch.8).

d) Smaller game

Most if not all the smaller mammals appear to have been eaten (Dawson, 1881: 89-91; Smyth, 1876, l:183-91). Included amongst these were: marsupial carnivores (Dasyuridae); rats and mice (Muridae); Bats (Molossidae). The smallest animals were captured by women. Of these the Rat-Kangaroo (Bettongia spp.) was extremely plentiful especially in the open plains where it was an important item of food (Dawson, 1881:18). Many areas, such as those south of the Grampian Ranges, were exclusively resorted to for hunting this animal which was dug out of its burrow (Robinson, 11 June, 28 July, 1841). In the Glenelg River region a special spear was used for killing this species. "Saw a spear with a bone point used for killing rats called wil.long" (Robinson, 23 June, 1841). Bandicoots (Peramelidae) and the echidna (Tachyglossus aculeatus) were also taken with clubs from their burrows, and the dingo was also captured and eaten (Smyth, 1876, l:191). Wombats (Vombatidae) were extremely plentiful in the Western District where the soft volcanic soils provided easy burrowing. Children were sent down into these burrows to signal the location of the animal to the hunters waiting above (Dawson, 1881:90-1; Smyth, 1876, l:190).

Forests

Tree dwellers, the possums, especially the more common Ring-Tailed and Brush-Tailed Possums (Pseudocheirus peregrinus, Trichosurus vulpecula) and the koala (Phascolarctos cinereus) were prized fare. Trees which
were observed to carry signs of possum were marked with a ground edge axe and later returned to. Such trees were climbed and the animals literally chopped out of their nests. Possums appear to have provided an important, plentiful and easily acquired food source in these forested areas, and they are mentioned repeatedly by all writers. Treks were often made into forests especially to hunt possum (Dawson, 1881:90; Morgan, 1852; Robinson, 10, 13, 14 May, 8 July, 1841; Smyth, 1876, 1:188-9).

**Birds**

The plentiful bird-life of the Western District as was recorded by most early observers (Ch.3) can broadly be divided into the following environmental groups; aquatic; savanna grasslands; forest and coastal. The breeding and moulting seasons were key harvesting times but birding techniques were also employed throughout the year.

**Savanna Grasslands**

The three most important bird species, due to their body size and general abundance, were the Emu (*Dromaius novaehollandiae*), Plains Turkey or Bustard (*Eupodotis australis*) and the Native Companion of Brolga (*Grus rubicundus*). Both emu and turkey ranged in large flocks (Ch.3) and the emu was hunted in a variety of ways. It was tracked and speared much like the large macropods and sometimes a screen of boughs was used to camouflage the hunter. Dogs were used to run emu down, and in dry weather traps in the form of a 7 metre wide hole were dug in swamps. "This trap, if at a distance from the camp, is visited every two or three days to remove the birds" (Dawson, 1881:92). Emu look-outs were constructed up in trees in gullies (Robinson, 26 June, 1841; Smyth, 1876, 1:191-3). Emu meat was considered a great delicacy but a tabu existed which allowed it only to be eaten by men and "grey haired women" (Dawson, 1881:92). The time for emu eggs was heralded by the appearance of the star Canopus on the horizon in July, and territorial rights were established over eggig grounds (Ch.8). Young emus were captured in August (Robinson, 30 March, 3 July, 1841).

The Plains Turkey was stalked and captured by means of a screen made of boughs which was carried by the hunter, together with a long pole with a noose attached. A decoy was strapped to the end of this pole and sometimes took the form of a living small bird, a mock bird or
butterfly. From his place of concealment in long grass a hunter could club turkeys with a waddy (Dawson, 1881:91; Robinson, 25 April, 9, 10, May, 1841; Smyth, 1876, 1:192).

In the area of the Pyrenees, bundles of reeds were tied around the hunter's neck and fully covered the body as a hide used in stalking birds (Robinson, 30 July, 1841). In the breeding season traps were set near the nests which were designed to catch mother bird plus her eggs (Dawson, 1881:91). Native companions were taken by means of a boomerang or waddy, and individuals were struck down as flocks flew low at dusk (Smyth, 1876, 1:193).

Aquatic Birds

The chief species captured have been listed in Table 6:4 and included the favoured swan, and a wide range of ducks and smaller waterfowl. Traps and snares were set up around marshes and Robinson noticed many such traps in marshlands in the Grange, Koroi Valley and Pigeon Ponds areas (9 May, 8 June, 1841): "Saw a water hole with boughs all around the edge - the bent stretcher, and a little hut for the bird catcher, all perfect" (Robinson, Pigeon Ponds, 15 June, 1841).

Swans and ducks were generally taken with boomerangs, waddies and spears, and often by wading among the marsh reeds. Ducks and small waterfowl were also captured near the reedy banks sometimes with a noose and rod, the hunter screened by a hide of boughs. The latter were also captured in quantity during the breeding season in spring while hatching their eggs, and during the succeeding moulting season when they were unable to fly. Upon invitation large numbers of people moved to egging grounds in late winter, early spring and in some cases, as with swans' eggs, strict territorial rights were enforced (see Ch.8):

About four miles from the shore is a small island (Vaughan Island on Lake Corangamite) about two miles square. . . . On this island we found an immense number of swans and other wild birds. We made our huts a short distance from the tribe who had invited us to visit them, and here we had as many swans eggs as we could consume. . . . On arriving there (the island) we found it literally covered with eggs, so that we very soon filled all our rush baskets; they were laying about in heaps, there being nothing like nests. Our friends whom we visited, allowed us to fill our baskets first, and then they loaded theirs. This continued for several days, and each night we had a Corrobberee.

(Morgan, 1852:36)
Table 6:4  Aquatic, Forest and Coastal Birds Eaten in South Western Victoria

<table>
<thead>
<tr>
<th>Aquatic</th>
<th>Parrots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swan</td>
<td>Eastern Rosella</td>
</tr>
<tr>
<td><em>Cygnus atratus</em></td>
<td><em>Platycercus eximius</em></td>
</tr>
<tr>
<td>Goose</td>
<td>King Parrot</td>
</tr>
<tr>
<td><em>Anseranas semipalmata</em></td>
<td><em>Aprosmictus scapularis</em></td>
</tr>
<tr>
<td>Black Duck</td>
<td>Superb Parrot</td>
</tr>
<tr>
<td><em>Anas superciliosa</em></td>
<td><em>Polytelis swainsoni</em></td>
</tr>
<tr>
<td>Mountain Duck</td>
<td>Rainbow Lorikeet</td>
</tr>
<tr>
<td><em>Casarca tadoroides</em></td>
<td><em>Trichoglossus moluccanus</em></td>
</tr>
<tr>
<td>Pink-eyed Duck</td>
<td>Ground Parrot</td>
</tr>
<tr>
<td><em>Malacorhynchus membranaceus</em></td>
<td>Ground Parrot</td>
</tr>
<tr>
<td>Yellow-billed Spoonbill</td>
<td><em>Pezoporus wallicus</em></td>
</tr>
<tr>
<td><em>Platlea flavipes</em></td>
<td>Crimson Rosella</td>
</tr>
<tr>
<td>Musk Duck</td>
<td><em>Platycercus elegans</em></td>
</tr>
<tr>
<td><em>Biziura lobata</em></td>
<td>Sulphur-crested Cockatoo</td>
</tr>
<tr>
<td>Wood Duck</td>
<td><em>Kakatoë galerita</em></td>
</tr>
<tr>
<td><em>Chenonetta jubata</em></td>
<td>Long-billed Corella</td>
</tr>
<tr>
<td>Teals</td>
<td><em>Kakatoë tenuirostris</em></td>
</tr>
<tr>
<td><em>Anas spp.</em></td>
<td></td>
</tr>
<tr>
<td>Little Pied Cormorant</td>
<td></td>
</tr>
<tr>
<td><em>Phalacrocorax melanoleucos</em></td>
<td></td>
</tr>
<tr>
<td>Large Black Cormorant</td>
<td></td>
</tr>
<tr>
<td><em>Phalacrocorax carbo</em></td>
<td></td>
</tr>
<tr>
<td>Pacific Gull</td>
<td></td>
</tr>
<tr>
<td><em>Larus pacificus</em></td>
<td></td>
</tr>
</tbody>
</table>

(Information after Smyth, 1876, 1:193-7)
Eggs were generally cooked in the ashes, but sometimes swans' eggs were eaten raw (Dawson, 1881:93; Smyth, 1876, 1:208).

In the summer, marsh grasses were burnt to attract feed for birds (Dawson, 1881:93), and Robinson mentions that certain creeks (such as in the Grange area) were favourite summer resorts for catching birds (9 May, 1841). Another form of trap was to surround a waterhole with a brush fence, a device employed in capturing large numbers of pigeons. Quails (Coturnix pectoralis, Synoicus australis) were caught mainly in the breeding season with a bough-shield plus noose, and smaller birds were captured by young boys with sharp rods (Dawson, 1881:93-4).

Forest and Coastal Birds

The chief bird species are listed in Table 6:4. Included are a large number of parrot species. Cockatoos (Kakatoeidae) as they flew in large flocks, were knocked down with waddies and boomerangs. Birds' nests, such as those of the eagle were raided for fledgelings and eggs (Dawson, 1881:93-4). Robinson entered a large cave on the Wannon River (Wannon Falls) whose sandy floor was covered in numerous human footprints, and which bore other signs indicating that the cave had been occupied to raid "swallows" nests (8 June, 1841). Some groups at least did not touch the Pelican (Pelecanus conspicillatus) or its eggs both of which were considered too fishy (Dawson, 1881:19). Dawson states that "a great many kinds of sea fowls" were eaten (1881:18-9). Of these one of the key species was the Mutton Bird (Puffinus tenuirostris).

Coastal Exploitation

I have gathered a wide range of varying resources under this heading rather than treating them independently, as littoral exploitation would have formed a specialised economic strategy from one of those already discussed. Few direct ethnohistorical references exist of the use of coastal resources, and Robinson's statements are some of the most explicit.

There is a large swamp on the east of the Port Fairy River (Moyne River) where the natives get their chief support roots — and near to a small eminence on the edge of the swamp called by the Campbell's men Tavern (Tanner) hill is a native village — an assemblage of huts and along the
coast near to the shepherds hut are reefs of rocks abounding with the haliotis mutton fish, numerous crawfish and which must have afforded them a good supply as the camping place of the natives in the beautiful forest of banksia abound with disused shells.

(28 April, 1841)

Robinson's description of the rich fisheries at Port Fairy and Portland has already been discussed (above). Buckley also mentions the collection of shellfish in the coastal Geelong area, and its importance as a resource (Morgan, 1852: 43, 73, 76). Collection of shellfish and crustaceans (crabs, crayfish) was carried out by both sexes and was easiest in the warmer months (see above). Crustaceans were collected from reefs and often searched for by the toes, then thrown into a basked worn slung across the shoulders (Dawson, 1881:95; Smyth, 1876, 1:205).

Seals were caught and clubbed to death after they hauled up on beaches to rest (Smyth, 1876, 1:204). The seal colonies of Lady Julia Percy Island which lies some 10 kilometres off the coast south east of Port Fairy, was considered by Robinson as in general too precipitous for the regular exploitation of seal (29 April, 1841). Buckley, however, described an island seal colony in the area of the mouth of the Barwon River, and also the capturing and eating of a seal in this area. The female Aborigine accompanying him rubbed herself all over with the fat of the seal (Morgan, 1852:17, 76). Two species of seal that were eaten were recorded by Smyth; the Leopard Seal (*Hydrurga leptonyx*), and the Fur Seal (*Arctocephalus* sp.) (1876, 1:203).

Whales, and sometimes dolphins, were commonly stranded along the western Victorian coast especially during high winter seas. Upon invitation large groups of people concentrated on the coast during a stranding (Ch.8; Robinson, 29 April, 14 May, 1841). Whale meat was buried to preserve it and then eaten in a slightly tainted state by the Peek Whuurong (Dawson, 1881:18; Smyth, 1876, 1:203; see below).

Amphibians and Reptiles

Reptiles were most plentiful during the warmer months (Smyth, 1876, 1:140) but continued to contribute to the diet well into autumn (Robinson, 1843:137). Freshwater tortoise (*Chelodina longicollis*) was highly favoured
together with its eggs and was recorded as being very numerous in the rivers (such as the Hopkins), lagoons and swamps of the Western District (Dawson, 1881:96; Robinson, 19 July, 1841; Smyth, 1876, 1:197). The eggs of other reptiles were also eaten (Smyth, 1876, 1:208). Frogs were plentiful in waterholes following heavy rainfall (Robinson, 29 July, 1841) and a number of species were eaten (Smyth, 1876, 1:199). At times reptiles together with other game, were rounded up and captured during a fire drive (Morgan, 1852:72).

Insects

Insects formed an important food source especially in the winter months. They were collected in large quantities and emphasis was placed on the pupae of ants. Buckley described a month-long sojourn by a lake where the pupae of large ants formed the principle food of the group. These ants were

... called kalkeeth, which are found in hives within hollow trees. In order to ascertain where they are, the trees are struck with a tomahawk, and, at the noise, they show themselves at the hole. ... they are taken out and put into baskets, being, at the proper season, as fat as a marrow. These creatures are prepared for eating, by placing them on slips of bark about three feet long and one foot wide, and so, burnt or roasted. It is only for about one month in each year they can be had, for after that time they are transformed to large flies.

(Morgan, 1852:56-7)

These ant pupae were prepared by being mixed with the dry bark of the "stringy bark" tree (Smyth, 1876, 1:207).

Robinson's description from the plains south of the Pyrenees Ranges during winter is similar to the above accounts:

... at one family, the man was winnowing - if I may so speak - the rotting wood dust from a quantity of small grubs 3 or 4 quart which he called Cal.keet. They were contained in a piece of bark and he was shaking them by the fire and blowing away with his mouth the light wood dust. At the time I arrived he had cleaned one lot and a large supply not cleaned was heaped upon another piece of bark. These grubs they eat and say they are very nutritious.

(28 July, 1841)
Dawson also recorded a range of insects eaten in quantity which included the pupae of "large green processional caterpillars", which were grubs cut out of trees of dead timber:

Those found in the trunks of the common wattle are considered the finest and sweetest. Every hunter carries a small hooked wand, to push into the holes of the wood, and draw them out. With an axe and an old grub-eaten tree, an excellent meal is soon procured; and when the women and children hear the sound of chopping, they hasten to partake of the food, which they enjoy above all others.

(1881:20-1)

Sizeable grubs in quantity on the banks of marshes were gathered after they had been flushed out by floods. Robinson described this activity in a number of locations - the Mount Napier area (Great Swamp), the Mount Abrupt area, and the Pyrenees Ranges (10, 11 May, 30 June, 3 August, 1841). Earth worms were also eaten (Smyth, 1876, 1:208).

Freshwater Shellfish and Crustaceans

The Freshwater Mussel (Uniood spp.) was commonly collected from inland rivers, creeks and lakes:

When the water beetle is seen swimming on the surface of the water in great numbers, it is a sign that there are 'plenty of mussels there'. Hence the water beetle is called the 'mother of mussels'.

(Dawson, 1881:95; see also Smyth, 1876,1:205)

In the Koroit Valley Robinson observed:

The flats along the banks of the rivulet and waterholes, numerous spots were visible where the natives had camped and roasted the mussel, or had broken up ground on the flats and along the acclivity of the hills to dig out rats.

(7 June, 1841)

In the upper reaches of the Hopkins River he noted:

Passed numerous mounds. The mussel shell lay strewn about. The river was a favourite resort of the natives. The large water holes afforded them mussels and other foods and the bulrush was abundant. The root of which the natives eat.

(30 July, 1841)

In the rivers of the Pyrenees Ranges (about 15 kilometres north of Mount Cole) Robinson noted that mussels were also obtained by the local people (1 August, 1841).
Freshwater Crayfish (*Eustacus sp.*) were also common in creeks, lakes and marshes, and were considered as "excellent food" (Smyth, 1876, 1:205).

**Conservation of Resources**

As has already been pointed out (Chs 1, 3), technological control of resources is a complex issue and one generally omitted from static models of hunter-gatherer subsistence and settlement. This topic will be discussed in greater detail in Chapter 15, but an introduction to the evidence from the Western District is necessary at this point.

Environmental controls can cover a wide and subtle range, including complex land management strategies which would have involved many individual species. Here I look at the ethnohistorical information concerning: processing of food stuffs; storage; conservation of resources; extension and increase of resources.

The processing of plants, in particular of the starchy rhizomes of plants such as Bracken Fern, have already been mentioned (above). Few species appear to have been processed in this manner, but such attempts as were carried out would have effectively extended access to these important food sources.

A short-term storage was employed of some resources that were available in large quantities during restricted seasons. These resources include, eels, whale meat, land-mammal meat, delicacies such as brains and acacia gum. The latter were all highly esteemed foods. It should be noted that in the case of eels, whales and to a lesser extent acacia gum, such storage coincided with large groups of people, and in some cases with ceremonies (see Ch.15).

Dawson states that eels were "buried in the ground until slightly tainted, and then roasted" (1881:18). Eels must have lasted for some time after capture as they were seen by Robinson being carried around in baskets at some distance from the eeling grounds (April, 1841), and they were also traded with other peoples (Morgan, 1852:38). The meat of stranded whales was also buried, "till quite rotten" and then eaten by the Peek Whuurong (Dawson, 1881:18). Meat, such as that of possum, was preserved
by being carefully stuffed with herbs and then cooked. In this way it was carried for some time while travelling through areas where food was scarce. Brains of the kangaroo, were considered a delicacy and were also kept "for a long time" after being cooked (Dawson, 1881:17-8).

It has already been mentioned (above) that acacia gum was collected in quantity following the head of summer, and was stored in large lumps for use as food and cement. This example indicates that non-perishable plant foods such as gum were stored. However, here it is fitting to raise the possibility of "in-field" storage of plants. As has been shown above, tubers could remain in the ground for a number of seasons before being harvested. Harris (1977a) in his discussion on Melanesian and South East Asian root crop economies, has already raised this concept. He notes that:

Tuberous plants with underground organs for food storage are adapted to survive dry or cold seasons and to grow quickly to maturity once the rains return or the ground warms up again. They achieve this by accumulating starch in their roots or stems during the growth period. . . .

(1977a:209)

Regarding storage of tubers he says: "The simplest technique of storage is to leave the root in the ground and to dig it out when required for consumption or exchange" (1977a:211).

This possibility has not as yet been raised for Australian tuber-using economies, let alone for those from south eastern Australia. But given the above context of conservation and land-management, the employment of this practice should be considered as having been a strong possibility, especially in areas such as the Western District which displayed such a heavy reliance on tuberous plants. By "storing" or leaving the tubers in the ground until needed, their season of availability would be effectively extended, and possibly in this case, up to many months. In terms of human consumption, the overall productivity of tubers, would have been thereby considerably increased. This possibility, although now difficult to test in south western Victoria, must be raised as an indication of how hunter-gatherer societies could, under such circumstances, increase the potential yield of key resources.

Conservation of scarce resources has also been documented.
Robinson mentions the construction of reservoirs during times of drought (Official Report 1845, Vol.59, 87080:131), and Dawson describes how vessels for carrying water included bark buckets and a small water bag made from the pouch of the kangaroo. For carrying water over greater distances a bag called "kowape" was used, made of the skin of a male wallaby, the neck forming the mouth of the bag. Dawson adds:

For keeping a supply of water in dry weather, a vessel called 'torrong' - 'boat' - is made of a sheet of bark stripped from the bend of a gum tree, about four or five feet long, one foot deep, and one wide, in the shape of a canoe. To prevent dogs drinking from it, it is supported several feet from the ground on forked posts sunk in the earth. A wooden torrong is often used in the same way, and is formed from a bend of a gum tree, hollowed out large enough to hold from five to six gallons.

(1881:14-5)

The issue of conservation in relation to the large-scale artificial drainage systems that Robinson observed near Mount William, are discussed in Chapters 14 and 15.

In contrast to these conservation practices, during times of abundance, heavy wastage of resources was also witnessed. The example concerning overfishing of eels at Lake Bolac provided by Robinson (above), is the best example of this.

The most obvious and effective agent in extending the range of plant species and by so doing, their productivity, was fire. The opening up of forested and scrub country and its subsequent replacement by savanna and grasslands would have enhanced the increase of herbivores. This important issue is discussed at some length in Chapter 15 and Appendix 1. Here I wish to merely point out some of the uses of fire that were recorded for the Western District. In connection with plants it has been shown above that fire was used to assist in their detection. By burning-off in such a way, competing species could also be eliminated, and the target species, such as the tuberous plants most often involved here, extended in range and numbers. Very seldom do Australian Aboriginal informants, even today, give direct ecological explanations, such as the above, for their patterns of burning (pers.comm. Peter Latz). Fire was also used to remove marsh scrub and thereby expose feed for birds (above; ch.3). Such a practice is in line with that already mentioned, of extending more open habitats and their plant
communities. The impact of burning upon the Western District plains is borne out by the comments of Mitchell. For passing through the district at a time before its European occupation, he was witness to traditional Aboriginal patterns of land management. Wherever he went a smoky ring of Aboriginal fires lining the horizon, greeted him. Looking south from Mount Napier he observed:

Smoke arose from many parts of the lower country, and shewed that the inhabitants were very generally scattered over its surface . . . and the smoke now ascended in equal abundance from the furthest verge of the horizon.

(10 September, 1836)

From this brief ethnohistorical evidence we could broadly assume, therefore, that Aboriginal patterns of burning in the Western District were equal to those observed in other Australian areas.

Environmental controls as have been briefly outlined here, can be seen as dynamic elements in the ecological relationship between man and land. In the short term they could be viewed as basically conservative in purpose (see Ch.15), but in the long term, they could have had far-reaching effects by altering the natural environment. The most conspicuous effect is the use of fire which produces vegetation disclimaxes such as those described above. These long term effects could be both beneficial and detrimental to the ecosystem as a whole. This important issue will be taken up later (Chs 15, 17) and here it suffices to point out that the static subsistence-settlement model presented here, should be viewed also within such a dynamic context.

Seasonal Hardship

A statement needs to be made concerning hardship incurred by seasonal depletion in resources. Many authors point out that in contrast to the warmer months, winter produced discomfort and certain hardships. Accounts, however, are more than often tinged with European ethnocentrism (e.g. Smyth, 1876, 1:140). These accounts of winter misery and squalor in Aboriginal camps reveal more than a general adherence to the nineteenth century model of "savagery" which these writings as a whole, uphold. Often these writers are dealing with Europeanised situations, where demoralisation has already become entrenched. "Starvation" during these seasons is mentioned but is
not supported by any hard evidence (e.g. Smyth, 1876, 1:140). Reverend
Bulmer, a missionary from Lake Tyers, Gippsland, Victoria, who was a
careful observer, is more explicit. He says, that when hunting failed
"they would have to allay hunger by eating some of the various vegetable
productions which are common" (Smyth, 1876, 1:143).

On his evidence we can assume then that when pressures were
placed on favoured resources, attention was turned by necessity to
secondary foods, and also that famine was not common.

Robinson, whose observations are predominantly of the autumn-winter
seasons, fails to mention such extreme accounts of hardship. In fact, the
only time that he refers to pressures placed on the population during the
colder seasons, is in the area of the exposed open plains, south of the
Pyrenees (15 July, 1841). At the time of his observations, such
conditions would have been exacerbated by the presence of European
pastoralists (see Ch.2).

It has already been mentioned that inclement weather imposed
restrictions on coastal occupation during the winter months. During these
times, Buckley described how people sought shelter in caves, rock shelters
and even in hollow trees (Morgan, 1852:111). Buckley also mentions the
relative hardships, in terms of cold and hunger, of winter as opposed to
the warmer months. He describes how fish were scarcer and the problems
of acquiring and retaining fire during the wet seasons (Morgan, 1852:19,
64, 68).

In conclusion, therefore, given the many statements of resource
abundance in the Western District (above), winter in contrast to the summer
months, could be viewed as having at times imposed hardship and in extreme
cases, caused fatalities, as we must assume also would have the seasons of
summer drought. In general, however, little evidence exists to suggest
serious resource depletion in any season. Exceptional events, such as
long term drought, would, however, have substantially altered average
conditions.
Conclusions

In general, the results obtained regarding the procurement systems employed throughout the Western District, conform to the predictions outlined in Chapter 3. The main resources exploited seasonally in the area are listed on Table 6:5. Plants appear to have formed the dependable resource base to which other, more risky subsistence strategies, were grafted. Such conclusions have been derived also by other researchers. For example, Dornstreich, from his study of the Cadio-Enga, a hunter-horticulturalist people of the New Guinea Highlands, found that although hunting was a highly esteemed occupation, it carried a high risk factor and was therefore not so reliable as an economic strategy (1973:272). Meehan drew similar results from her extensive study of the contemporary diet of the Anbara, a Gidjingali-speaking people, from the mouth of the Blyth River, Arnhem Land, who practised a broadly hunter-gatherer economy. She states:

The foraging strategy employed by the Anbara had two major components. On the one hand, there were opportunistic activities which involved various degrees of luck, skill and strength. These included most of the mammal hunting, and many types of fishing. The other component in the strategy depended on low-key pursuits such as shellfish and vegetable gathering, and some forms of line fishing. The food provided from these activities was dependable and could be used as a last resort when the more flamboyant and less reliable part of the subsistence strategy had failed.

(1977:527)

In south western Victoria fishing, especially that associated with seasonal migratory species (e.g. eels) was a well-developed and seasonally important subsistence strategy, which employed a wide range of specialised equipment. However, as well, mechanisms existed within the Western District economy which acted as environmental controls, such as the use of fire. These had the effect of conserving, increasing the availability and promoting the increase of individual resources.
Table 6:5  Main Seasonal Resources Exploited in South Western Victoria

<table>
<thead>
<tr>
<th>Season</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring (Sept.-Nov)</td>
<td>Vegetables and fruit (plentiful)</td>
</tr>
<tr>
<td></td>
<td>Aquatic birds and birds' eggs</td>
</tr>
<tr>
<td></td>
<td>Fish (plentiful)</td>
</tr>
<tr>
<td></td>
<td>Marine Resources</td>
</tr>
<tr>
<td></td>
<td>Some land mammal hunting</td>
</tr>
<tr>
<td>Summer (Dec.-Feb.)</td>
<td>Vegetables and fruit (plentiful)</td>
</tr>
<tr>
<td></td>
<td>Fish (plentiful, especially in estuaries and on the coast)</td>
</tr>
<tr>
<td></td>
<td>Marine mammals</td>
</tr>
<tr>
<td></td>
<td>Marine resources</td>
</tr>
<tr>
<td></td>
<td>Reptiles</td>
</tr>
<tr>
<td></td>
<td>Some land mammal hunting</td>
</tr>
<tr>
<td>Autumn (March-May)</td>
<td>Land mammal hunting important</td>
</tr>
<tr>
<td></td>
<td>Fishing - especially eels</td>
</tr>
<tr>
<td></td>
<td>Some vegetables (bulbs, tubers, acacia gum)</td>
</tr>
<tr>
<td>Winter (June-Aug.)</td>
<td>Land mammal hunting important</td>
</tr>
<tr>
<td></td>
<td>Inland fishing (mainly riverine)</td>
</tr>
<tr>
<td></td>
<td>Insects (pupae)</td>
</tr>
<tr>
<td></td>
<td>Marine Mammals (strandings)</td>
</tr>
<tr>
<td></td>
<td>Some vegetables (bulbs, tubers)</td>
</tr>
</tbody>
</table>
CHAPTER SEVEN

SETTLEMENT

A connection between patterns of settlement and the spatial-temporal distribution of resources has already been drawn in Chapter 3. Here, the predictive models established in that chapter are tested against the ethnohistorical data as was done in relation to subsistence in the previous chapter. The main aspects covered here are: (a) the location of settlements; (b) the effect of seasonality upon settlement in relation to location, size and length of occupation. Settlement forms are described as huts, earth mounds, and generalised camping places. One of the main issues being investigated here is the observation made by many ethnographers, that settlement in the Western District generally tended to be semi-sedentary.

Settlement Forms

I have for convenience divided the settlement forms into four main categories: hut types, earth mounds, shell middens and rock shelters/caves. The most detailed evidence exists for the first two categories.

Hut types

A range of hut forms existed in the Western District from well-built and durable structures of ephemeral lean-tos. These forms in general reflected both seasonal factors and duration of occupancy and therefore also are indicators of the degree of stability of residence in a particular area. These structures were described by early observers, in particular Robinson, whose large number of references form the greater part of the material analysed in this chapter.
Seasonal hut forms were recorded generally for the Victorian region, for example in such areas as Port Phillip and Gippsland. The more durable huts were often thatched and well made and built to withstand winter rains and cold while more flimsy shelters were used in warmer weather. We could relatively easily apply this seasonal division to the hut forms of the neighbouring Western District and one reference by Robinson supports this interpretation. He noted that many of the huts located at Lake Keilambete were flimsy structures and that with a change in the weather these shelters were quickly modified. "The Natives since the rain have covered their huts with turf" (14 April, 1841).

a) Well-built huts

This particular hut form can be considered as an indicator of both stability of residence and colder seasons. That is to say, such huts were permanent fixtures and indicated relatively continuous use of a particular area and secondly they were constructed to be used also during inclement weather, in particular the seasons of autumn to early spring. Sizeable groups of huts were often observed by early writers, and when these were composed of more durable structures they were classed as "fixed residences, or villages or homesteads" (Robinson, 3 May, 1841).

This hut form was described by Robinson from the inland area of the Great Swamp, near Mount Napier:

This place previous to its occupation by white men was a favourite resort of the natives and as this was the only permanent supply of water a village had been formed. I counted 13 large huts built in form of a cupola. When seen at a distance they have the appearance of mounds of earth. They are built of large sticks closely packed together and covered with turf grass-side inwards. There are several varieties. Those like a cupola are sometimes double and have two entrances. Others again are like a niche. Then there are some made of boughs and grass and last the common screens. The permanent huts are those in form of a cupola. Three of these huts had been occupied a day or two previous to my visit.

(10 May, 1841)

In his official account of his trip of 1841, Robinson added the following to this example from the Great Swamp:

The people who occupy this country have fixed residences... One hut measured 10 feet in diameter by 5 feet high, and sufficiently strong for a man on horseback to ride over.

(Kenyon, 1928:15)
As well as this "village" Robinson also came across individual huts and clusters of huts around the Great Swamp. On one morning's excursion he came across some 20 huts at different locations. Some of these were positioned on river margins, some on hills and one was set atop an artificial mound of earth (9-12 May, 1841; see also Ch.4).

The general size of this hut form as indicated above, is repeated by Robinson in a number of examples: Lower Hopkins River area, the Great Swamp, and Koroit Valley (24 April, 10 May, 7 June, 1841). In one case he estimates that these huts could have contained around 7 or 8 people each (16 April, 1841).

Saucer-shaped pits which were used as camping places were dug into soft ground and from Robinson's description from Lake Bolac during the eeling season, huts were probably also set in such pits.

Saw a vast number of aboriginal native encampments and huts called in the language of the country "worn". The top of the sand bank (lunette) and at the base of the bank on the edge of the lake were the sites chosen. On the top of the bank the natives had dug out round holes in the sand like a saucer (sketch) and after the manner of the west coast (Tasmania) natives. And what with the appearance of the plants and sand, it fancifully brought to my recollection various scenes I have engaged in in Van Diemens Land.

(1 April, 1841)

The Tasmanian examples Robinson referred to were of permanent, well-constructed huts set in similar saucer-shaped pits (Jones, 1971b; Lourandos, 1968, 1970).

In the Koroit Valley, some 70 kilometres from Portland Bay, Robinson came across a group of 6 hut-pits, 3.5 metres in diameter by one metre deep, which were located on a spur overlooking the valley. "This seems to have been chosen by the natives for a look-out" (7 June, 1841). A few kilometres behind the coastal dunes at Warrnambool, in an open plain abounding with kangaroo, Robinson observed: "... down a declivity where there are a large number of worn hut holes" (26 April, 1841).

Other early writers such as Thomas and Mitchell provided corroborating descriptions of durable and permanently established structures in the Western District:
Another instance of a superior tribe in Port Phillip by Mustons and the Scrubby Creek to the westward, there was on the first settlers arriving in that locality a regular Aboriginal settlement, this settlement was about 50 miles north east of Port Farey there was on the banks of the creek between 20 and 30 huts of the form of a beehive or sugar loaf, some of them capable of holding a dozen people, these huts were about six feet high or little more, about 10 feet in diameter, an opening about 3 feet 6 inches high for a door which they closed at night if they required with a sheet of bark, an aperture at the top of 8 or 9 inches to let out the smoke which in wet weather they covered with a sod. These buildings were all made of a circular form, closely worked and then covered with mud, they would bear the weight of a man on them without injury. . . . In 1840 a sheep station was formed on the opposite banks of the creek to this Aboriginal village or town. . . in 1841 or the end of 1840 my informant stated that the grass got bare or scarce on the side of the creek where the sheep station was, and one day while the Blacks were from their village up the Creek seeking their daily fare the white people set fire to and demolished the Aboriginal settlement and it afterwards became the sheep farmers run. What became of the blackfellows he could not tell but at the close of 1841 when he went again shepherding in that locality he could not trace a single hut along the whole creek.  

(William Thomas, Collected Papers, 214, Mitchell Library, Item 28, Ch.11, 13 July, 1858)

On the White Lake in the general Toolondo area (Upper Glenelg River) Mitchell noted huts:

. . . large, circular and made of straight rods meeting at an upright pole in the centre; the outside had been first covered with bark and grass and then entirely covered with clay. The fire appeared to have been nearly in the centre; and a hole at the top had been left as a chimney. 

(July, 1836)

Towards the Mount Napier area, Mitchell noted the following description:

Rich flats then extended before us, and we arrived at an open grassy valley, where a beautiful little stream, resembling a river in miniature, was flowing rapidly. Two very substantial huts showed that even the natives had been attracted to the beauty of the spot, and as the day was showery, I wished to return, if possible, to pass the night there, for I began to learn that such huts, with a good fire before them, make very comfortable quarters in bad weather.

(4 September, 1836)
Mitchell came across a similar hut form at the mouth of the Surry River (Portland area) (30 August, 1836).

In country such as the Stony Rises of the basalt plains where stone was plentiful and timber scarce, huts were constructed with sub-structures of stone. Around a swamp in this area Robinson observed many "ash hills" (earth mounds) and huts "... of dirt and others built of stone" (1842:58). Smyth also mentioned existing stone "mia-mys" (huts) south of Lake Purrumbete, on the western margin of the Stony Rises (1876, 2:234). The remains of circular stone structures, some of which were built as wind breaks, were observed by many Europeans in these open areas. Examples were also known from the wooded and marshland region of Lake Condah where a group of such stone-based huts still exist and appear to date from the early period of European contact (Kenyon, 1930).

Europeans quickly disbanded Aboriginal society and permanent huts and villages were some of the first features to disappear: "Shortly after the Europeans came to occupy Victoria the natives ceased to build huts, and they no longer assembled in villages" (Smyth, 1876:1-128). The swiftness of this process could well account for the loss of information on the stability of Aboriginal settlement.

b) Ephemeral Camps

Short term camps consisted of easily constructed lean-tos of bark, saplings or were improvised around existing limbs of trees. Towards Lake Keilambete Robinson noted that "their huts were a mere shelter of boughs similar to the natives of East Van Diemens Land" (6 April, 1841). These structures, as I have already mentioned, were used during the drier, warmer months. This point is reinforced by Robinson’s description of a large number of temporary huts in the area of the ranges towards the Loddon River in mid-summer:

... had a parklike appearance. We saw the remains of from 30 to 40 screens or shelters of boughs where the natives had been, also several of the native ovens or fire places where they had baked their murnongs. (14 February, 1841)
Earth Mounds

These structures were artificial mounds consisting of "accumulations of ashes, stones, or lumps of burnt clay and the debris of food" (Curr, 1883, 3:675). These mounds were also referred to as "oven mounds" or "mirrmong heaps" by early observers. Stone tools were sometimes also found within them (Smyth, 1866, 1:239; Robinson, 9 July, 1841, see Ch.6). The mounds ranged in size from small ones less than 50 centimetres in height and a few metres in diameter to very substantial structures of over three metres high and well over 30 metres in diameter.

Earth mounds were generally located in groups, and Smyth provides a good illustration of five substantial mounds located around the overflow outlet of Lake Connewarren, near Morlake (1876, 2:233). These structures were described by many early European landowners and the detailed accounts of Robinson, Dawson, Smyth and Curr display a high degree of consistency. Robinson's description of 13 large mounds in the Mount William area has already been discussed (Ch.6).

I will now present a selection of the descriptions of these early writers:

[They] . . . were the sites of large, permanent habitations which formed homes for many generations. The great size of some of them, and the vast accumulation of burnt clay, charcoal and ashes which is found in and around them, is accounted for by the long continuance of the domestic hearth, the decomposition of the building materials, and the debris arising from their frequent destruction by bush fires.

(Dawson, 1881:103)

Robinson's descriptions are similar and his observation of permanent huts sitting atop earth mounds in the Mount Napier area has already been mentioned (above). In the area of the lower Hopkins River he stated:

. . . saw a large mound of earth at least 4 feet high and 10 feet long and 5 feet wide. My native companions said it was a blackman's house a large one like whiteman's house. There were pieces of round sticks among the earth about 3 inches in diameter and it appeared that the whole had been burnt down. A short distance from this about 200 yards was the remains of another hut of similar description.

(24 April, 1841)
These references to permanent dwellings also reinforce the conclusions reached earlier in this chapter. Smyth adds that the Mount Emu people called the mounds "moornung" and others "mirnyong" (1976, 2:233), a name by which they were commonly known to Europeans, and which linked them to the baking of one of the district's food staples, the "mirnong" or yam daisy (Ch.6).

Dawson observed that:

They never were ovens, or original places of interment, as is generally supposed, and were only used for purposes of burial after certain events occurred while they were occupied, as sites of residences - such as the death of more than one of the occupants of the dwelling at the same time, or the family becoming extinct; in which instance they were called 'muuru kowuutuung' by the Chaa(p) wuуюong tribe, and 'muuruup Kaakee' by the Kuurn kopan noot tribe, meaning 'ghostly place', and were never afterwards used as sites for residences, and only as places for burial.

(1881:103)

Although Dawson claimed that they were not used as ovens, which were in fact deep holes dug in the ground often away from the main camp, Robinson, Curr and Smyth all referred to food being cooked upon the mounds (Robinson, 9 July, 1841; Smyth, 1876, 2:232-4). Curr, in fact, was one of the few European writers who had seen the mounds used by Aborigines.

"I have seen them in use at many places long distances apart, and constantly at Colbinabbin for nearly 10 years" (1883, 3:675). He adds that when cooking took place on them, "The food when cooked was not eaten at the oven, but taken to the camp, often 200 yards off." It has already been mentioned (Ch.6) that Robinson described certain mounds as day-time camps. Curr includes a further important description: "In other districts, however, when the ground was wet, the blacks used sometimes to camp as well as cook on these ovens or ash heaps" (1883, 3:675).

Having reviewed the available information, we could draw the following conclusions concerning the earth mounds as settlement forms. They can be generally described as artificial in origin, varying in size and often found in groups located near to permanent water. Permanent huts were built upon them, and domestic and tool maintenance activities including cooking, were carried out also on the mounds. They were sometimes
used as earth ovens, most probably due to their soft, dry nature, and also used as fair weather camping spots, and as places of burial. One of their more interesting and important features concerns the advantages they offered during humid conditions and seasons. Being elevated and of dry composition they allowed for direct human occupation of waterways and wetlands at these times. As has been shown (Chs 3, 6) the wetlands were prime resource areas, but quickly became waterlogged, with extensive quagmires being produced, soon after the rains set in. Such conditions would have seriously impeded human access to the potentially rich and varied resources of these areas. The earth mounds must therefore be viewed as a fundamental adaptation to wetland conditions, which allowed for potential year-long human occupation of these productive resource zones. These conclusions will be discussed further in Chapter 16.

One final statement needs to be made concerning the construction or accumulation of the earth mounds. Dawson's explanation in terms of their use as places of long-term habitation with consequent decay and build-up of organic material, appears the most acceptable. It must be taken into consideration that permanent shelters were constructed not only of wooden boughs but also of sizeable quantities of sods of earth and clay, and that clay lumps were also used to retain heat in the larger ovens. Given time, the breakdown and rebuilding of these structures and amenities would have resulted in sizeable quantities of earth and clay being deposited with the resultant mounded appearance, in much the same way as "tells" are accumulated in the Middle East, in northern Africa and other areas of the world. The earth mounds of western Victoria therefore could be seen as hunter-gatherer equivalents of these "classical" archaeological and ethnographic examples of living sites.

Shell middens

Little direct information exists concerning these living sites. Most writers mention the existence of sizeable shell middens along the south western Victorian coastline, and in particular the Cape Otway region (e.g. Dawson, 1881:19; Smyth, 1876, i:240) but there are few examples of sites being used. Perhaps the best examples of the latter are supplied by Robinson for both coastal and fresh-water locations, and these have already been provided in Chapter 6. From Robinson's descriptions coastal middens or those located near to coastal lagoons had semi-permanent huts
and were associated with a broad-based although marine oriented range of resources.

Rock shelters/caves

References to the occupation of caves and rock shelters are likewise few and far between. One reason would be the relative scarcity of such places of habitation in the Western District, with a few exceptions such as the Grampian and Pyrenees Ranges. On the other hand the evidence that exists suggests that shelters and caves were seldom frequented and usually for a short duration. Robinson refers to a cave being visited and perhaps occupied on an over-night basis in order to rob the birds' nests found there. Buckley wrote of caves and shelters being occupied during times of inclement weather. Both these references have already been presented in Chapter 6.

Levels of Sedentism and Nomadism

Two forms of settlement that indicate permanent or fixed occupation, perhaps on a semi-sedentary or seasonal basis, have been identified; those consisting of durable huts or hut-pits and those of earth mounds. In order to establish whether such settlements could have withstood as consistent and lengthy periods of occupation as was claimed by early ethnographers, I have listed the ethnographic sightings of all settlement forms on Table 7:1. Recorded on this table is the form of settlement, the number of units (huts, mounds etc.) and the environment in which they were located (lagoon, river, marsh etc.). The hypothesis that was advanced in this analysis is that it could be expected that the more permanent settlements would be located in areas of greatest resource fertility and availability. Most of the data come from Robinson but examples have been obtained also from Smyth, Mitchell, Thomas and Manifold.

Settlement forms have been grouped under the following categories: "well built" (durable, large, fixed residences); "hut-pits" (implying some permanency); "Ephemeral" (lean-tos, flimsy shelters); "cave" (one reference only); together with three other categories all unspecific in their information, "huts", "camps" and "resorts".
<table>
<thead>
<tr>
<th>Reference</th>
<th>Type</th>
<th>Number</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robinson, G.A:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Feb. 1840</td>
<td>ephemeral</td>
<td>30-40</td>
<td>Ranges towards Loddon River</td>
</tr>
<tr>
<td>1 Apr. 1841</td>
<td>well-built</td>
<td>&quot;vast number&quot;</td>
<td>Lake Bolac</td>
</tr>
<tr>
<td>6 Apr. 1841</td>
<td>ephemeral</td>
<td>&quot;many&quot;</td>
<td>Near Lake Keilambete</td>
</tr>
<tr>
<td>16 Apr. 1841</td>
<td>well-built</td>
<td>9</td>
<td>Black River, Narroget Hill</td>
</tr>
<tr>
<td>17 Apr. 1841</td>
<td>well-built</td>
<td>&quot;some&quot;</td>
<td>Lake Elinganite</td>
</tr>
<tr>
<td>21 Apr. 1841</td>
<td>well-built</td>
<td>plural</td>
<td>Lake Keilambete</td>
</tr>
<tr>
<td>24 Apr. 1841</td>
<td>well-built</td>
<td>2</td>
<td>Lower Hopkins River</td>
</tr>
<tr>
<td>27 Apr. 1841</td>
<td>hut-pits</td>
<td>&quot;large number&quot;</td>
<td>Lower Hopkins River</td>
</tr>
<tr>
<td>28 Apr. 1841</td>
<td>well-built</td>
<td>&quot;village&quot;</td>
<td>Port Fairy area (Swamp Tower Hill)</td>
</tr>
<tr>
<td>29 Apr. 1841</td>
<td>camp</td>
<td>?</td>
<td>Lagoon, 13 km inland from Port Fairy</td>
</tr>
<tr>
<td>30 Apr. 1841</td>
<td>camp</td>
<td>?</td>
<td>Port Fairy River (Wayne River)</td>
</tr>
<tr>
<td>1 May, 1841</td>
<td>huts</td>
<td>plural</td>
<td>Wayne River area (c. 30 km behind Port Fairy)</td>
</tr>
<tr>
<td>3 May, 1841</td>
<td>camps</td>
<td>&quot;large number&quot;</td>
<td>River (upper Merri River area)</td>
</tr>
<tr>
<td>7 May, 1841</td>
<td>camps</td>
<td>plural</td>
<td>Rivers, waterholes (Upper Merri River area)</td>
</tr>
<tr>
<td>9 May, 1841</td>
<td>well-built</td>
<td>one</td>
<td>Lake Linlithgow</td>
</tr>
<tr>
<td>9 May, 1841</td>
<td>well-built</td>
<td>&quot;several&quot;</td>
<td>Swamp, head of Great Swamp</td>
</tr>
<tr>
<td></td>
<td>camps</td>
<td>?</td>
<td>Grange Burn area</td>
</tr>
<tr>
<td></td>
<td>&quot;village&quot;</td>
<td>&quot;numerous&quot;</td>
<td>Grange Burn area</td>
</tr>
<tr>
<td>10 May, 1841</td>
<td>well-built</td>
<td>13 huts</td>
<td>Great Swamp (Mount Napier)</td>
</tr>
<tr>
<td></td>
<td>camp</td>
<td>1 hut</td>
<td>Great Swamp (Mount Napier)</td>
</tr>
<tr>
<td>11 May, 1841</td>
<td>well-built</td>
<td>20 (not together)</td>
<td>Great Swamp (west of swamp)</td>
</tr>
<tr>
<td></td>
<td>camp</td>
<td>1</td>
<td>Great Swamp (Mount Napier)</td>
</tr>
<tr>
<td>7 June 1841</td>
<td>hut-pits</td>
<td>6</td>
<td>Overlooking Koroiit Valley and River</td>
</tr>
<tr>
<td>8 June 1841</td>
<td>shell middens</td>
<td>1</td>
<td>Wannon River Falls</td>
</tr>
<tr>
<td>11 June 1841</td>
<td>huts</td>
<td>3</td>
<td>Dundas Range area (creeks nearby)</td>
</tr>
<tr>
<td></td>
<td>resort</td>
<td>?</td>
<td>Spring, Dundas Range area (creeks nearby)</td>
</tr>
<tr>
<td>21 June 1841</td>
<td>well-built</td>
<td>2</td>
<td>Emu Creek</td>
</tr>
<tr>
<td></td>
<td>huts</td>
<td>2</td>
<td>Emu Creek</td>
</tr>
<tr>
<td>1 July 1841</td>
<td>huts</td>
<td>plural</td>
<td>Swamps, Victoria Range area</td>
</tr>
<tr>
<td>2 July 1841</td>
<td>ephemeral</td>
<td>plural</td>
<td>Stream, Victoria Range area</td>
</tr>
<tr>
<td>3 July 1841</td>
<td>camps</td>
<td>2</td>
<td>Swamps, Victoria Range area</td>
</tr>
<tr>
<td></td>
<td>huts</td>
<td>6</td>
<td>Swamps, Victoria Range area</td>
</tr>
<tr>
<td>7 July 1841</td>
<td>huts</td>
<td>plural</td>
<td>River, Victoria Range area</td>
</tr>
<tr>
<td>10 July 1841</td>
<td>camps</td>
<td>plural</td>
<td>Marshes, Mount William area</td>
</tr>
<tr>
<td>11 July 1841</td>
<td>huts</td>
<td>&quot;numerous&quot;</td>
<td>Creeks, north each of Mount William</td>
</tr>
<tr>
<td>15 July 1841</td>
<td>camp</td>
<td>?</td>
<td>Plains, Upper Hopkins River</td>
</tr>
<tr>
<td>26 July 1841</td>
<td>camp</td>
<td>?</td>
<td>Plains, Upper Hopkins River</td>
</tr>
<tr>
<td>30 July 1841</td>
<td>huts</td>
<td>plural</td>
<td>Upper Fiery Creek area</td>
</tr>
<tr>
<td></td>
<td>camps</td>
<td>&quot;numerous&quot;</td>
<td>Headwaters of Hopkins River</td>
</tr>
<tr>
<td>Reference</td>
<td>Type</td>
<td>Number</td>
<td>Location</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------</td>
<td>---------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>5 Aug. 1841</td>
<td>camps</td>
<td>1</td>
<td>Creeks, Mount Emu area</td>
</tr>
<tr>
<td>12 Aug. 1841</td>
<td>camps</td>
<td>1</td>
<td>Upper Woddy Yaloak River area</td>
</tr>
<tr>
<td>14 Aug. 1841</td>
<td>ephemeral</td>
<td>6 - 7</td>
<td>Buckley's Falls, Barwon River</td>
</tr>
<tr>
<td>Mar-Apr. 1841</td>
<td>well-built</td>
<td>&quot;plenty&quot;</td>
<td>Swamp, Stony Rises</td>
</tr>
<tr>
<td>Manifold (Bride</td>
<td>mia mia</td>
<td>c. 30</td>
<td>Camperdown area</td>
</tr>
<tr>
<td>1898:139</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomas (Smyth,</td>
<td>village</td>
<td>20 - 30</td>
<td>80 km north east of Port Fairy (creek)</td>
</tr>
<tr>
<td>1871, 1:125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell:</td>
<td>well-built</td>
<td>plural</td>
<td>White Lake, Upper Glenelg area</td>
</tr>
<tr>
<td>Aug. 1836</td>
<td></td>
<td>1</td>
<td>Mouth of Surry River</td>
</tr>
<tr>
<td>30 Aug. 1836</td>
<td>well-built</td>
<td>2</td>
<td>River, near Mount Napier area</td>
</tr>
<tr>
<td>4 Sept 1836</td>
<td>well-built</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth Mounds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robinson:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Feb. 1840</td>
<td>earth mound</td>
<td>&quot;several&quot;</td>
<td>Ranges towards Loddon River</td>
</tr>
<tr>
<td>18 Apr. 1841</td>
<td>earth mound</td>
<td>plural</td>
<td>Lake Elingsite</td>
</tr>
<tr>
<td>24 Apr. 1841</td>
<td>mound + hut</td>
<td>2</td>
<td>Lower Hopkins River</td>
</tr>
<tr>
<td>9 May, 1841</td>
<td>earth mound</td>
<td>1</td>
<td>Creeks, Grange Burn area</td>
</tr>
<tr>
<td>10 May, 1841</td>
<td>mound + hut</td>
<td>1</td>
<td>Great Swamp</td>
</tr>
<tr>
<td>8 July 1841</td>
<td>earth mound</td>
<td>&quot;numerous&quot;(large)</td>
<td>Swamps, Mount William area</td>
</tr>
<tr>
<td>9 July 1841</td>
<td>earth mound</td>
<td>13 (large)</td>
<td>Swamps, Mount William area</td>
</tr>
<tr>
<td>30 July 1841</td>
<td>earth mound</td>
<td>&quot;numerous&quot;</td>
<td>Upper Hopkins River</td>
</tr>
<tr>
<td>11 Aug. 1841</td>
<td>earth mound</td>
<td>plural (large)</td>
<td>Tributary of Woddy Yaloak River</td>
</tr>
<tr>
<td>Mar-Apr 1842</td>
<td>earth mound</td>
<td>&quot;plenty&quot;</td>
<td>Swamp, Stony Rises</td>
</tr>
<tr>
<td>Smyth:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1876, 2:232</td>
<td>earth mound</td>
<td>5 (large)</td>
<td>Lake Connewarren (Mortlake area)</td>
</tr>
<tr>
<td>1876, 1:240</td>
<td>earth mound</td>
<td>8 - 9</td>
<td>Marsh, near Mount Elephant</td>
</tr>
</tbody>
</table>

| Table 7:1 Ethnohistorical Sightings of Settlement Forms in south western Victoria |
The results (Table 7:2) show that of the 72 observations collected, 58 or 81\% were of settlements directly associated with waterways, lakes and marshes.

The remaining 14 (20\%) observations were also connected with water although not as directly. Some of the latter were located within well watered regions (although not specifically at a creek, lagoon etc.) and the other observations were generalised and lacking in sufficient detail, although they too were broadly associated with sources of water. These observations covered a wide range of environments, including wetlands, coastal regions, drainage basins, open forest, grasslands and wooded ranges.

These conclusions, therefore, lend support to the general statements of ethnographers such as Smyth who stated that: "All that is known of the original condition of the natives of Victoria points to this: that the rivers were their homes." Of the Western District he adds: "The banks of all the lakes, rivers and creeks were frequented by them . . ." (1876, 1:34).

More specifically, of the sample of 72 observations, 37 (51\%) were of durable, fixed settlements and of these, with one minor exception, all were of settlements directly located at permanent water sources. It should be pointed out that all examples of earth mounds were located on permanent water. The one exception was of a group of 6 hut-pits located on a spur overlooking the fertile Koroit Valley whose creeks were lined with shell middens and other native camps (Robinson, 7 June, 1841). This settlement was also within close proximity to water although not directly at the source.

The large number of observations of fixed settlements would also lend support to the ethnographers' assessments of the existence of a significant degree of stability of residence within the district as a whole. It also supports the hypothesis raised at the beginning of this section which links fixed settlements to areas of greatest resource fertility and dependability. The observations of fixed residences, it should be noted, came from a wide cross-section of regions throughout the district.

The coverage of seasonal observations, however, is by no means uniform. As can be noticed from Table 7:1 most of the observations are from the autumn and winter months. One obvious conclusion that can be
Table 7:2  Location of Aboriginal Settlements in South Western Victoria

<table>
<thead>
<tr>
<th>Settlement Type</th>
<th>No. of References</th>
<th>Location</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-permanent settlement</td>
<td>37</td>
<td>perennial waterways, lakes, marshes</td>
<td>51</td>
</tr>
<tr>
<td>Ephemeral and unspecified settlement</td>
<td>21</td>
<td>waterways, lakes, marshes, lagoons</td>
<td>29</td>
</tr>
<tr>
<td>Ephemeral and unspecified settlement</td>
<td>14</td>
<td>generally associated with waterways, lakes, marshes</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Ethnohistorical data on which this table is based is listed on Table 7:1
reached from this evidence is that fixed bases were used at these times, but this evidence alone does not preclude the same bases having been used during the warmer months as well. In fact other ethnographic evidence exists to support this (see below). One reference is from the summer period, from an open plain in the ranges towards the Loddon River. Here Robinson observed between 30-40 ephemeral huts (14 February, 1840). This evidence fits quite well with the spring-summer settlement pattern that is discussed below.

Size of Settlements

Before a discussion on settlement patterns can proceed it is necessary firstly to attempt some assessment of settlement size. On Table 7:3 are the results of the latter analysis which is based on the information listed on Table 7:1. As the overall size of the sample (72 observations) is not a large one, only a general impression of sizes can be gauged. Earth mounds ranged from 1-13 mounds and this agrees broadly with the evidence for permanent settlements which also range between 1-13 huts. There is, however, also one reference to between 20-30 well-built huts (Smyth, 1876, 1:125) which is a secondary source and could therefore be a generalised statement. Without further evidence it is difficult to resolve this problem and we should perhaps concede that at times larger fixed villages could have been established. Of the ephemeral and unspecified observations the range of sizes fell into two groups of between 1-6/7 and 30-40 huts. The difference revealed here can best be explained as due to seasonal factors, for the smaller hut range is from autumn-winter observations while the higher range is a summer observation. This seasonal settlement dichotomy, or at least range of variation, is explained below.

In Chapter 5 I have calculated approximate population sizes on the basis of these sizes of settlement, and the results were shown to be comparable to the observed range of sizes of local populations. Most of the latter were also mainly autumn-winter observations which maintains a certain consistency in calculation.
Table 7.3  Size of Aboriginal Settlements in South Western Victoria

<table>
<thead>
<tr>
<th>Settlement Type</th>
<th>No. of Observations</th>
<th>No. of Individual Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Mounds</td>
<td>12</td>
<td>1 - 13</td>
</tr>
<tr>
<td>Semi-permanent settlements</td>
<td>25</td>
<td>1 - 13 (1-20/30?)</td>
</tr>
<tr>
<td>Ephemeral and unspecified settlements</td>
<td>35</td>
<td>1 - 6/7 (30-40)</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td></td>
</tr>
</tbody>
</table>

Ethnohistorical data on which this table is based is listed on Table 7:1
Settlement Patterns

In order to outline a general seasonal settlement pattern for the Western District I have incorporated the conclusions derived in Chapter 6 with the above data (Table 7:1) together with information from other ethnographers. The most important of the latter are Smyth (1876, 1:141-2) and Bulmer (in Smyth, 1876, 1:139-41), both of whom provide generalised but valuable seasonal information for two Victorian regions. I discuss their data and indeed the annual round in the Western District in greater detail in Chapter 9. Here I have produced a simplified settlement model on Table 7:4. It only attempts to detail the main trends in each season and because of this I have deleted all secondary details.

The results of this study indicate that two main settlement pattern models can be abstracted for the district - coastal and inland. These separate models are outlined below. The more general features which apply district-wide are the following. Sedentism and the largest group sizes were linked to the most fertile and dependable habitats, inland and coastal wetlands and the coastal strip. Seasonal productivity levels allowed for year-round sedentary or semi-sedentary occupation of wetlands while the littoral received its most intense period of habitation in spring and summer. In contrast to these environments, savanna grasslands and open forest which provided dispersed resources and were also subject to summer drought, carried more nomadic, dispersed populations.

Spring and early summer were the seasons of increased sedentism, and greater sizes of local groups, inter-group ceremonies and freedom of movement of individuals between groups. These conditions were encouraged by the wide, varied and generally more abundant range of resources available during this time. Summer droughts restricted group size, confined settlement to areas of permanent water and promoted nomadism.

Autumn was a more restricted season in terms of resources with a greater emphasis on hunting which also encouraged nomadism. Inland and estuarine fish, however, were important autumn resources and supported sedentary conditions, and large inter-group assemblies and ceremonies. In contrast, winter was the leanest season with a narrow and less productive range of resources. Movement between groups was restricted and while semi-sedentary conditions were maintained, overall group sizes were more
<table>
<thead>
<tr>
<th>Season</th>
<th>Settlement Location (Inland)</th>
<th>Settlement Location (Coastal Region)</th>
<th>Group Movement</th>
<th>Habitations</th>
<th>Settlement Size</th>
<th>Large groups Ceremonies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring (Sept.-Nov.)</td>
<td>wetlands (low ground)</td>
<td>the littoral, estuaries</td>
<td>increase</td>
<td>ephemeral</td>
<td>medium</td>
<td>increasing group sizes</td>
</tr>
<tr>
<td>Summer (Dec.-Feb.)</td>
<td>wetlands (low ground) open plains</td>
<td>the littoral, estuaries</td>
<td>Increase-maximum</td>
<td>ephemeral</td>
<td>large-small (20-30 huts maximum)</td>
<td>main ceremonial season, very large groups</td>
</tr>
<tr>
<td>Autumn (Mar.-May)</td>
<td>wetlands (high ground)</td>
<td>estuaries, the hinterland</td>
<td>decrease</td>
<td>semi-permanent, earth mounds</td>
<td>medium, some large (10-13 huts maximum)</td>
<td>some ceremonies, very large groups (800-1,000 individuals)</td>
</tr>
<tr>
<td>Winter (June-Aug.)</td>
<td>wetlands (high ground)</td>
<td>estuaries, the hinterland</td>
<td>minimum</td>
<td>semi-permanent, earth mounds</td>
<td>medium(?) -small</td>
<td>some large coastal groups (800-1,000 individuals)</td>
</tr>
</tbody>
</table>

Table 7:4 General Settlement Model for South Western Victoria
limited and nomadism encouraged by more dispersed resources and an emphasis on hunting.

It can be deduced from the above that three factors were related to higher levels of sedentism - fertility, reliability and access to resources. Where greater variety in resources was also associated with these factors, sedentism was increased. Wetland environments in close proximity to a wide range of microenvironments provided such favourable situations. In these cases the factors promoting increased sedentism operated over a greater part of the year. Diminution in any of these variables, promoted increased nomadism, for example, in areas of more dispersed resources such as savanna grasslands and open woodlands. These results, therefore, largely correspond with the predictions outlined in Chapter 3. Faced with fluctuations in the availability of resources, an elastic settlement strategy was thereby produced which attempted to maintain a balance between population and resources by varying degrees of sedentism and nomadism.

A closer definition of aspects of this settlement model can now be attempted. Robinson's reports from the Great Swamp in the Mount Napier area provide us with a pattern of winter settlement in an inland wetland region. In some ways this evidence could serve as a model of land-use in similar environments. This example has already been presented in some detail in Chapter 4. Around this swamp the local group, the Tappoc Conedect of between 5-72 or more people, worked in smaller groups of around 13 or more gathering rushes, roots and grubs. A large number of well-built huts was observed located around this vast swamp, some in groups and others of single examples. Groups of people such as these occupied some of the permanent huts as they worked their way around the swamp and its environs. At one village consisting of 13 well-built huts Robinson observed that 3 of them had recently been occupied (3-16 May, 1841).

A settlement pattern derived from this information would have the following features. A population in such a fertile environment would continually redistribute itself, between a network of fixed bases at different rates throughout the year. Redistribution would allow for regeneration of resources, and given their productivity and variety, a
population such as this could maintain itself within the same general area in all seasons. Single huts and ephemeral shelters would have been employed when temporary stops occurred during forays into areas of more dispersed resources such as open forests and savanna grasslands. In the warmer months, when resources were more plentiful and varied, temporary shelters would be used to take advantage of these circumstances by allowing for both flexibility of movement and population size. Periods of resource abundance would also be dealt with in a similar fashion whether this necessitated the invitation of neighbours or the acceptance of an offer to share in someone else's fortune. Population was thereby re-distributed more evenly in tune with resource availability (see Ch.8). The length of occupancy or size of population at any one base camp would have depended on the availability of the resources together with the subsistence strategy in exploiting these.

The above settlement model can be further reduced to two broad regional models so as to emphasise the differences in patterns of coastal and inland environments.

a) Coast

In the spring and summer months when marine resources were at their most plentiful and accessible, the emphasis in coastal settlement would have been towards the littoral itself, and also in the bays, estuaries and lagoons close by. The diversity and fertility of resources would have at these times allowed for high levels of sedentism in such locations. Less dependable strategies such as hunting played a lesser role in procurement activities. Coastal hinterland areas, apart from wetlands, would have supported fewer and more nomadic populations.

In the autumn-winter seasons settlement predominantly took place in the coastal hinterland, in wetlands and protected bays and estuaries. At these times the exposed coast was generally depleted of resources and climatically unpleasant. Large strandings of marine mammals, however, brought very large groups to the coast for short periods. In the wetlands and estuaries semi-sedentary conditions occurred in autumn, the season of migratory fish. During winter semi-sedentary settlement could have been maintained in the same areas but at the expense of freedom of movement and large group sizes. The overall autumn-winter decrease in resources led to
increased hunting and, therefore, nomadism. That rather dense populations were residing quite near to the coast in the colder months we have Robinson's description from along the coast between Port Fairy and Warrnambool (see Ch. 4).

b) Inland

In spring and early summer settlements could have been larger, more sedentary and freedom of movement greatest. Wetlands would have carried the highest, most sedentary populations. Summer drought forced settlement upon permanent waterways, swamps and lakes, and increased nomadism in other areas. Autumn produced a decrease in resources and a greater emphasis on hunting but settlement became large and semi-sedentary in association with migratory fish. Winter resource depletion led to semi-sedentism, around wetland bases, with smaller groups and more restricted personal movement. Settlement was confined to higher ground or to artificial earth mounds to avoid the waterlogged conditions. Increased hunting led to greater nomadism.

These settlement models are discussed in greater detail in Chapter 9.
CHAPTER EIGHT

INTERACTION AND COMPETITION

It is as if the superstructures of these societies had been eroded, leaving only the bare subsistence rock, and since production itself is readily accomplished, the people have plenty of time to perch there and talk about it. I must raise the possibility that the ethnography of hunters and gatherers is largely a record of incomplete cultures. Fragile cycles of ritual and exchange may have disappeared without trace, lost in the earliest stages of colonialism, when the intergroup relations they mediated were attacked and confounded. If so, the "original" affluent society will have to be rethought again for its originality, and the evolutionary schemes once more revised.

(Sahlins, 1974:38)

As this quotation from Sahlins suggests, the dynamic relationship between local populations which often found its expression in elaborate, large-scale ritualistic gatherings, has been largely deleted from the present day world of the hunter-gatherer, because of historical accident. I have argued (Ch.1) that their inter-group aspects, which involved significantly large groups of people, are also largely absent from current hunger-gatherer models (e.g. Lee and DeVore, 1968). Local groups or bands are viewed as predominantly economically self-sufficient. Individual food procurement is stressed at the expense of group procurement. Another related aspect which is also overlooked is that of competition between populations which may also have involved land and natural resources. It is these two aspects of interaction and competition that are discussed in this chapter, firstly within south western Victoria and then in the wider Australian context.
Interaction

Most of the tribes have intercourse or hold a kind of alliance with three or four neighbouring ones, with whom they barter for lubras, etc. They generally once a year at least unitedly assemble. There are many disputes, imaginary or real, to settle which cannot be done without some fighting. When all is settled they will corroboree night after night till they separate.

(William Thomas in Bride, 1898:401)

The major patterns of interaction are shown on Figs 4:2 and 8:1. In Fig. 4:2 I have used Robinson's information (1841). Most individual movements have been deduced from the composition of local groups for whose members Robinson has provided a band origin, and secondly from stated movements of individuals and bands. For Fig. 8:1 I have used information on band movement from both Robinson and Dawson where they have provided details on the composition of inter-tribal gatherings. From these diagrams it can be seen that interaction occurs at both band and tribal levels. Most band interaction seems to have taken place within dialect areas. The fluid composition of the band allowed for interaction across dialect and tribal boundaries, and this is shown clearly in the area at the foot of the Grampians and Pyrenees.

Interaction concerned with reciprocal access to food resources was accelerated during seasons of resource abundance. It was customary for "friendly" groups to be invited to share in a particularly abundant supply of food (Morgan, 1852:43). Such seasons were those of: eels and other migratory fish, birds' eggs, stranded whales, fruits (e.g. native berries at the mouth of the Glenelg river, possibly Nitraria schoberi) and perhaps, seals. General seasonal abundance in particular resource zones would have had the same effect. Seasonally rich areas were the marshlands of coastal and inland areas, the coastal strip, and fertile stretches of inland grassland, during spring and early summer. At these times large sized groups were recorded, composed of representatives from many bands. These occasions were also seized upon as times to hold ceremonies, trading meetings, and regional social gatherings. This association between seasonal resource abundance and inter-group gatherings is a common feature of Australian Aboriginal societies and hunter-gatherers in general (see Lee and DeVore, 1968). A series of examples which illustrate these seasonal events follows (see also Ch. 6). The main examples have been listed on Table 8:1.
Fig. 8.1 MAIN CEREMONIES AND MOVEMENTS OF BAND MEMBERS IN SOUTH WESTERN VICTORIA

Data: Dawson, 1881; Robinson, 1841; Lourandos, 1977a
<table>
<thead>
<tr>
<th>Location</th>
<th>Population size</th>
<th>Nature</th>
<th>Season</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Western District</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barwon River (Otway Ranges)</td>
<td>80+</td>
<td>trade</td>
<td>?</td>
<td>Morgan, 1852:38</td>
</tr>
<tr>
<td>Colac area</td>
<td>?</td>
<td>ceremonies</td>
<td>?</td>
<td>Morgan, 1852:39</td>
</tr>
<tr>
<td>Hopkins River (Kuurnawarn)</td>
<td>1,000?</td>
<td>?</td>
<td>?</td>
<td>Dawson, 1881:73</td>
</tr>
<tr>
<td>Lake Bolac</td>
<td>800–1,000</td>
<td>ceremonies (eels)</td>
<td>March</td>
<td>Kenyon, 1928:146</td>
</tr>
<tr>
<td>Lake Keilambete</td>
<td>200–300</td>
<td>ceremonies</td>
<td>May</td>
<td>Robinson, 14 April 1841</td>
</tr>
<tr>
<td>Loddon River area</td>
<td>30–40 huts</td>
<td>?</td>
<td>mid-summer</td>
<td>Robinson, 14 February 1840</td>
</tr>
<tr>
<td>(c. 200–300 people)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirraewuæ (Caramut area)</td>
<td>2,500?</td>
<td>ceremonies (hunting)</td>
<td>summer</td>
<td>Dawson, 1881:3</td>
</tr>
<tr>
<td>Noorat (Terang area)</td>
<td>many</td>
<td>trade</td>
<td>?</td>
<td>Dawson, 1881:78</td>
</tr>
<tr>
<td>Port Fairy-Warrnambool</td>
<td>400</td>
<td>impromptu</td>
<td>May</td>
<td>Robinson, 26–27 April 1841</td>
</tr>
<tr>
<td>Portland area</td>
<td>many</td>
<td>whales</td>
<td>May</td>
<td>Robinson, 17 April 1841</td>
</tr>
<tr>
<td>Tare.rer</td>
<td>800</td>
<td>whales</td>
<td>May</td>
<td>Kenyon, 1928:146</td>
</tr>
<tr>
<td><strong>Port Phillip Bay</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>near Melbourne</td>
<td>800</td>
<td>ceremonies</td>
<td>?</td>
<td>Smyth, 1876, 1:124</td>
</tr>
<tr>
<td>Merri Creek</td>
<td>?</td>
<td>ceremonies</td>
<td>?</td>
<td>Bride, 1898:96</td>
</tr>
</tbody>
</table>

Table 8:1 Large-scale Gatherings and their Group Sizes
During the annual migratory season of eels in early autumn, between 800-1,000 people were recorded as having been seen at Lake Bolac (located at the centre of the Western District) (Kenyon, 1928:146; see also Ch.6 for details). Likewise, during the season of stranded whales (autumn–winter), up to 800 people were noted in the coastal area east of Port Fairy. The location of this gathering was at Tare.rer, a large coastal swamp. Of these two social occasions, at Lake Bolac and Tare.rer, Robinson stated:

These masses are a collection of representative tribes [bands], and the eeling and whaling seasons are wisely taken advantage of by them for holding their great social and political meetings. But for this singular provision such masses could not subsist; for during the other parts of the year, there is bare support for the tribe [bands] of the locality.

(Kenyon, 1928:146)

Portland Bay was also another favoured location for stranded whales and large numbers of people were often reported in this area during this season (e.g. Robinson, 17 April; 14 May, 1841). Robinson reported incidents that had broken out between the local Aborigines and the European whalers (the Henty Brothers) in the area over individual whales. To the Hentys' chagrin the Aborigines claimed the whales which had entered the bay, to escape rough winter seas, as their own. Dawson also records a meeting which took place just before European settlement, by four "tribes" at a favourite swamp (Kuunawarn) on the east bank of the river Hopkins which had been called together by the "chief" of the Kirrae Wurrung (Dawson, 1881:73). Dawson calculated that about 1,000 people attended this gathering. Even if his method of calculation can be queried, there is no reason to doubt that a very sizeable meeting took place.

The size of these seasonal population aggregates does not seem unreasonable given the high population density of the area. For example, two groups which together numbered well over 400 people collected in a matter of hours along the coast between Port Fairy and Warrnambool (Robinson, 26–27 April, 1841). The first group of men, women and children numbered "at least 100" people. Robinson described them as "... a large body of natives" with weapons, spears, waddies and boomerangs "and their spears had been newly sharpened."

Of the second group, he recorded: "... came in sight of 2 large groups of natives sitting on the ground on the side of the road." Males
composed one group, women and children the other. "I estimated the number at 300, or if having (?), I should not be far out of the way if I had estimated the entire number at 400."

These were the groups that provided Robinson with the detailed list of 43 Manmeet bands. There is no mention that they were other than the local population (Dawson's Peek Whuurong). In support of this assumption is the fact that a few days later in the region around the Tarrone Swamp (about 30 kilometres inland from Port Fairy), Robinson met with the local band comprised principally of Yowen Condeet (see Ch. 4). None of these people had been with them on the coast near Port Fairy those few days before.

Further supporting evidence for these large group sizes comes from just east of the Western District on the outskirts of the then small town of Melbourne. Here Smyth records a careful description from William Thomas of an inter-tribal meeting which conforms in size and description to those from south western Victoria:

In a great encampment formed on a hill about three miles north east of Melbourne, there were assembled, more than thirty years ago, eight tribes - in all about eight hundred blacks - and they arranged their camps according to the following plan.

(1876, 1:124)

Dawson wrote of the fruit season near the Glenelg where large numbers of people gathered to collect a kind of berry (perhaps *Nitaria schoberi*) (see ch. 6). If my identification of this plant (above) is correct the season for collection would have been summer.

Co-operation in the food quest between bands including those from
other "tribal" groups) led to the harvesting of large quantities of food. Co-operative subsistence activities included the organisation of large-scale hunting drives. Robinson records incidents leading up to one large hunting drive which was originally well-planned at least three weeks in advance and was attended by a large number of people from different bands in the area of the east bank of the Glenelg. The local people had agreed to go with Robinson to the Glenelg River "on the condition that they were to call at Winters' (Wannon River) and join them in a hunting expedition" (Robinson, 9 June, 1841). This hunt was to be held near the Wannon River. A week before this event, which was causing great interest, he notes: "In eight days the natives are to meet, (in number) at Koy.yong to hunt Kangaroo" (24 June, 1841).

Dawson provides a vivid description of just such a hunting drive:

When it had been agreed by the chiefs of the associated tribes to have a grand battue, messengers were sent all round to invite everybody to join. As each tribe left its own country, it spread out in line, and all united to form a circle of fifteen or twenty miles in diameter. By this means the kangaroos and emus were enclosed, in order to be driven to an appointed place — usually on Muston's Creek, a few miles from its junction with the River Hopkins. To this place the old people, women, and children of the several tribes had previously gone, and were there encamped. At a fixed time the circle was perfected by arranging the men so that they stood about two hundred yards apart. The circle then began to contract. As they drew near to the central camp both young and old joined them a line too compact to allow the escape of the game; which, frightened and confused with the yells and shouting all around, were easily killed with clubs and spears.

(1881:79)

Of these "great public hunts" Smyth and Buckley (Morgan, 1852:29, 53, 72) provide similar descriptions. Smyth's description lacks the large-scale aspects of Dawson's account but then he is not referring to the wide open plains of the Western District. Smyth also shows that these drives were well-planned and led by prominent males:

On great occasions, a large number of natives assemble to form a hunting party. This hunt is always under the guidance of experienced persons, who direct the mode of procedure and assign the hunters their places. An area of perhaps half a mile or more in diameter is encircled by the sportsmen. . . .

(1876,1:185)
He adds that such hunts took place in open country (small plains) as well as in scrub country.

In coastal areas (e.g. Port Fairy) Robinson mentions that the hunting strategy was to drive large numbers of game over the coastal cliffs (March, 1842). Buckley describes a large kangaroo hunt which included apart from the Wathaurung, bands from the Bunurong "tribe" (south east of Melbourne", and from the You Yang mountains (Morgan, 1852:29, 53). He further described a mass hunt involving a large circle of fire. All animals, birds, reptiles captured in this way were eaten (Morgan, 1852:72).

Other co-operative economic activities must have called for substantial inputs of labour. Large stone, brushwork or clay fish weirs up to several hundred metres in length required construction and continual maintenance (Ch. 6). The most spectacular constructions of all, however, were the artificial drainage systems dug as a form of swamp management and primarily associated with eeling and fishing (Chs 6, 14).

Apart from the examples already described at Lake Bolac and Tare. rer, the main ceremonial events in the district appear to have been the following. All of these occasions involved the coming together of band members from varying tribal groups. These examples appear on Fig. 8:1 and they show the main patterns of band movement to the meeting places.

Dawson states that:

... the number of friendly tribes met annually in mid-summer for hunting, feasting and amusements. ... These meetings were held at Mirraewu, a large marsh celebrated for emus and other kinds of game, not many miles to the west of Caramut. This place was selected on account of its being a central position for the meetings of the tribes occupying the districts now as the Wannon, Hamilton, Dunkeld, Mount William, Mount Rouse, Mount Napier, Lake Condah, Dunmore, Tarrone, Kangatong, Spring Creek, Pambleringa, Lake Boloke, Skipton, Flat-topped Hill, Mount Shadwell, Darlington, Mount Noorat, Campedown, Wardy Yallock and Mount Elephant ... none of the sea coast tribes attended these. They were afraid of treachery and attack.

(1881:3)

From this list we can see that representatives from these 21 "tribes" or groups of bands included those of the Tjapwurong, northern Kirrae, northern Wathaurung and the northern half of the Manmeet (Gunditjmara). Dawson adds
that these 21 "tribes" would have numbered about 2,520 people. He based his estimates on 30 males to each "tribe" plus 30 each for the remaining categories of old men, women and children. His estimates are based on one incident where 30 males were mustered from each "tribe" when two "tribes" had at one time come to battle. Even if the latter incident could be accepted as evidence and Dawson's calculations respected, his deduction that all the population actually attended these meetings is perhaps over-optimistic.

Other writers support Dawson's statement that spring and especially summer were the chief seasons for seasonal congregations in Victoria. For central Victoria this is recorded by Smyth (1878, 2:295). Parker in Smyth (1978, 2:154) states that spring or summer was the season for meetings to collect stone for axes on the territory of the Jaara (Ja.jow.er.ong). Morgan also records that this was the season in the Western District when swans' eggs were numerous and allowed for congregations of people (1852:36). (For further references see Mulvaney, 1976).

Trade

The most important trading meeting has also been described by Dawson. Again it took place towards the centre of the district but this time closer to the coastal areas from where goods were traded.

At the periodical great meetings trading is carried on by the exchange of articles peculiar to distant parts of the country. A favourite place of meeting for the purpose of barter is a hill called Noorat, near Terang. In that locality the forest kangaroos are plentiful, and the skins of the young ones found there are considered superior to all others for making rugs. The aborigines from the Geelong district bring the best stones for making axes, and a kind of wattled gum celebrated for its adhesiveness. This Geelong gum is so useful in fixing the handles of stone axes and the splinters of flint in spears, and for cementing the joints of bark buckets, that it is carried in large lumps all over the Western District. Greenstone for axes is obtained also from a quarry on Spring Creek, near Goodwood; and sandstone for grinding them is got from the salt creek near Lake Boloke. Obsidian or volcanic glass, for scraping and polishing weapons, is found near Dunkeld. The Wimmera country supplied the maleen saplings, found in the mallee scrub, for making spears. The Cape Otway forest supplies the wood for the bundit spears, and the grass-tree stalk for forming the butt piece of the light spear, and for producing fire; also a red clay, found on the sea coast, which is used
as a paint, being first burned and then mixed with water, and laid on with a brush formed of the cone of the banksia while in flower by cutting off its long stamens and pistils. Marine shells from the mouth of the Hopkins River, and freshwater mussel shells, are also articles of exchange. (1881:78)

Robinson's data are partially in agreement with Dawson's above description, for he wrote in some detail of nearby Lake Keilambete which was located some 4 kilometres to the north west of Noorat.

Kilambete is neutral ground. The tribes (anterior to its occupation by white men) met here to settle their disputes and transact other business connected with their political relations.

Of the 200-300 people he observed in attendance at Lake Keilambete were included representatives from Warrnambool (Manmeet), Lake Elingamite (southern Kirrae), Lake Corangamite (northern Kirrae), and Lake Bolac (Tjapwurong) (Robinson, 14 April, 1841).

Buckley provides two examples of exchange. Following the request of a messenger from a foreign band, Buckley and the people with whom he lived, met up with 80 men, women and children who had assembled on the Barwon River (perhaps in the Otway Ranges). Here eels were exchanged for "roots", the fish being carried in kangaroo skins. Two men carried the eels and roots on bark sheets balanced on their heads while the transactions took place. A corroboree followed, fights over women ensued and an agreement was made to meet again for further exchange. Some months later Buckley's people returned but to a place north east of Colac where they carried kangaroo to exchange (Morgan, 1852:38-9). Here we have an example of exchange by band members from two tribal groups, presumably from their location, southern Wathaurung and Kolakngat who originally met perhaps on common ground, near the tribal boundary for exchange (Barwon). Following this successful transaction a Wathaurung band was granted permission to enter the heartland of the Kolakngat (Colac) for further exchange.

It can be seen then, that such common meeting grounds were located close to boundaries between the heartlands of several tribes. This geographical location provided band members with easy routes of access with a minimum of trespass on foreign ground. In this way the central meeting
ground around Caramut, Mirraewuwe and Muston's Creek lay near the boundaries of the Manmeet (Gunditjmara), Tjapwurong and Kirrae. The meeting places of Lake Keilambete and Noorat were again within easy access of these three 'tribal' groups, this time granting easier passage to coastal bands. The famed eel-fisheries at Lake Bolac and their associated social gatherings were close to the borders of the Tjapwurong, Kirrae and northern Wathaurung. In fact the location of this most favoured lake may have influenced the position of these three boundaries. As already mentioned (Ch.4), boundaries around an important and concentrated resource were often well defined.

Visiting Rights

Approaches towards the territories of distant bands were highly formalised and sanctioned through the use of messengers:

Messengers are attached to every tribe, and are selected for their intelligence and their ability as linguists. They are employed to convey information from one tribe to another, such as the time and place of great meetings, korroborae, marriages, and burials, and also of proposed battles; for, if one tribe intends to attack another, due notice is always honourably given. Ambuscades are proceedings adopted by civilized warriors. As the office of messenger is of very great importance, the persons filling it are considered sacred while on duty; very much as an ambassador, herald, or bearer of a flag of truce is treated among civilized nations.

To distinguish them from spies or enemies, they generally travel two together, and they are painted in accordance with the nature of the information which they carry. When the information is about a meeting, a korroborae, a marriage, or a fight, their faces are painted with red and white stripes across the cheeks and nose. When the information relates to a death, their heads, faces and hands, their arms up to the elbows, and their feet and legs up to the knees, are painted with white clay. Thus the appearance of the messengers announces the nature of their news before they come to the camp. If their appearance indicates a death, lamentation and disfigurement begin immediately. On arriving at the camp they sit down without speaking, apparently unobserved; and, after a little time, one of them delivers the message in a short speech with intoned voice.

(Dawson, 1881:74)

Robinson describes a number of times the formal mode of greeting observed before guests were admitted to a foreign camping place. Sanctioned decoration and face make-up for both men and women and hosts and visitors
were necessary, as indications of group affiliation. For example, Robinson mentions that just prior to making contact with the Tappoc Conedeet of Mt Napier, the people travelling with him carried out the ceremony which they called "yar.pin".

Later Robinson wrote:

I observed that my natives had as of yesterday put a reed through the cartilages of their nose and Eurodap on this occasion had doubled his head with clay.

(10 May, 1841)

The greeting ceremony also consisted of a formal and lengthy standard pattern of behaviour:

Immediately the ground was selected for the camp, my native attendants sat themselves down looking on the ground and apparently not noticing the strangers (the Tappoc Conedeet).

(11 May, 1841)

Similar descriptions of greeting behaviour are provided by Robinson (18 May, 1841) in the Portland region, and also by Smyth (1876, 1:135).

A further example of this territorial behaviour can be seen in the formation of all camping places on foreign ground. "Each tribe, on its arrival, erects its wuurns (huts), and lights its fires in front of them, on the side of the camp next to their own country" (Dawson, 1881:72). Smyth provides a complementary example:

Mr. (William) Thomas says that he was often struck with astonishment when, on approaching a large encampment occupied by several tribes, he observed how carefully they had grouped the miams (huts). Most often he could see at once, from the position of any one group, from what part the natives had come. The groups were arranged indeed as if they had been set by compass.

(1876, 1:124)

**Conflict**

As has been shown (Ch.4), hostility between bands was common, and it flared up at inter-tribal gatherings. At the large meeting at Lake Keilambete, according to a custom of the Lake Bolac band, the latter posted a sentry who beat two sticks at intervals the whole night, being occasionally relieved by his companions. This was to let his friends know that he was still awake and served as a precaution against attack from other hostile bands (Robinson, 18 April, 1841).
Perhaps as a safeguard during such tense gatherings, a stylised form of wrestling involving groups of pairs, was a favourite sport:

Seven or eight couples at a time have thus been engaged. Some of the finest attitudes formes, at times representing Hercules and Antaeus, the formed lifting the latter from the ground by sheer power of muscle and throwing him on his back.

Robinson observed that this wrestling took on different forms in eastern and western Victoria (Kenyon, 1928:162-3).

William Thomas provides a similar description of wrestling from eastern Victoria, complete with Classical overtones:

... certainly everyone who has ever seen them at this exercise has acknowledged that it is equal to any description given of the ancients ... The aborigines' is sheer, fair wrestling.

(Bride, 1898:402-3)

**Summation**

Patterns of interaction at the band and "tribal" levels could be seen as regulating and distributing population in relation to variation in resource availability (see also Yengoyan, 1976). The lack of self sufficiency of the band would necessitate a reliance on neighbouring bands in times of economic stress, and this could be extended to tribal levels also. Patterns of reciprocal access to resources would cut across major cultural and political boundaries, which were often areas lacking clear environmental definition (Ch.4). Support from neighbouring and often distant bands was necessary both at times of scarcity as well as abundance, if a more equitable distribution of resources was to be achieved. Short periods of resource abundance were often a local occurrence and sharing at these times also would have allowed for a general relaxing of pressures on subsistence staples over a wider area.

The frequency of band interaction appears to have been maintained by both ecological and demographic factors. The general productivity of food resources throughout the district, and in particular in the wetland and fertile coastal zones, allowed most local groups to lead a semi-sedentary lifestyle in close proximity to their neighbours (Ch.7). Groups in the latter resource abundance allowed for large-scale inter-tribal gatherings mainly in the spring-summer period, but also in the autumn-winter months
(e.g. eels, whales). For south western Victoria then, we can go some of the way in supplying the empirical data on high frequency interaction which has been predicated by some writers (e.g. Yengoyan, 1976) for coastal areas of south eastern Australia.

**Competition**

Group interaction could also be seen in terms of competition between populations. No matter how subtle or slight, competition would at times have involved natural resources. As mentioned in Chapter 1 such competition for land and resources has not been an issue widely discussed in the literature, in fact theories favouring a distinct lack of competition have predominated (e.g. Lee and DeVore, 1968:12). Writers, such as the latter, see the reciprocal ties between neighbouring bands as obviating competition for resources. This viewpoint, however, does not take into consideration the wider context of band interaction and reliance at greater levels, including those of the band and beyond. In this wider context a more complex system of regulating the interaction between population and resources would have been called for. Because of the larger population involved here, competition could not have been so easily controlled. Whereas individuals could be accommodated by neighbouring groups (for example, in times of scarcity), larger groupings, at certain times, could not. These constraints on the system of economic reciprocity are not generally included in accounts explaining its operation (e.g. Yengoyan, 1976).

Wynne-Edwards (1962) points out that social mechanisms of formal competition have been developed in social animals (including man) which help to prevent over-exploitation of resources. I am not arguing against this viewpoint, and indeed institutions such as the ceremonial gatherings, would no doubt have served such formal functions. But all formal behavioural systems can be affected by the unexpected, such as environmental fluctuations (e.g. drought), or by displays of individual self interest by members. For example, disadvantaged groups, at times, could be expected to become antagonistic towards those they considered more favoured. The following examples illustrate these points more clearly.

Competition for natural resources (including food as well as raw materials) involved resources that were highly prized, and scarce. The latter would include resources which were available in abundance but
restricted in locality and season. In the Western District such resources were eels, emu and duck eggs, acacia gum and raw materials for stone axes. Competition often led to fixed territorial rights, and when laws were breached, to bloodshed.

Of territorial rights concerning eels, emu and duck eggs, and acacia gum Dawson wrote:

The Boloke tribe claims the country round the lake, and both sides of the river, as far down as Hexham, and consequently has the exclusive right to the fish. No other tribe can catch them without permission, which is generally granted, except to unfriendly tribes from a distance, whose attempts to take the eels by force have often led to quarrels and bloodshed.

(1881:94-5)

... every member of a tribe must return home, and no eggs (emu) must be taken from the grounds of a neighbouring tribe. If any person is caught trespassing and stealing the eggs, he or she can be put to death on the spot.

(1881:92)

The penalty for robbing a swan's nest in a marsh belonging to a neighbouring tribe is a severe beating.

(1881:93)

The gum of the acacia, or common wattle tree, is largely consumed as food, as well as for cement; and each man has an exclusive right to a certain number of trees for the use of himself and family.

(1881:21)

Greenstone used for ground-edge axes was highly prized, and Buckley wrote that treks to obtain the stone were often hazardous and "... required an armed party of resolute fighting men" (Morgan, 1852:57).

Tindale provides a similar example. He states that the north eastern border of the Bunganditj, in the region around Toolondo, was being forced southward by Jaadwa people, towards the region around Casterton, some 80 kilometres away. This was occurring around the time of European contact. The main object of this territorial shift was to gain access to the stone quarries near Harrow (35 kilometres south west of Toolondo) and the black flint of the Chape Northumberland beaches (1974:210). Howitt states that the Mt. William greenstone quarries (north of Melbourne) were under the proprietorship of one family. "If, however, people came and took stone
without leave, it caused trouble and perhaps a fight... Sometimes men came by stealth and stole stone..." (1904:312)

Land was also fought over:

East of Western Port (Victoria) there is a tract of wild country - debatable ground - which was the scene of many battles in former times. It is said that it was held sometimes by the Western Port blacks and sometimes by the tribes inhabiting Western Gippsland.

(Smyth, 1876, 2:14)

Turning to the wider Australian scene, a number of parallel examples of territorial conflict and competition serve to strengthen these Victorian examples.

From Central Australia, Meggitt details two instances, one of territorial possession, the other of trespass:

Until then (1909), the Waringari had claimed the ownership of the few native wells at Tanami and the country surrounding them, but in a pitched battle for the possession of the water the Walbiri drove the Waringari from the area, which they incorporated into their own territory. By desert standards the engagement was spectacular, the dead on either side numbering a score or more.

(1962:42)

The men's descriptions made it clear that the Warramunga (and Waringari) trespasses were not merely hunting forays impelled by food-shortages in the invaders' own territory but rather were raids undertaken to combine hunting for sport and the abduction of women.

(1962:38)

Tindale also provides an example from Central Australia. He records several shifts in the territories of the Ngadadjara, Pitjandjara and Jangkundjara (1974: 212, 217, 250). Prompted by a major drought in 1914-16 the Pitjandjara claimed the eastern Musgrave Ranges from the Jungkundjara who in 1917 were pushed southwards to the Everard Ranges and Ooldea. Subsequently, The Warara (Ngadadjara) took over the Petermann Ranges which had been vacated by the north western band of the Pitjandjara.

This evidence throws light on another example relating to territorial encroachment which comes again from the Western District of Victoria. Murray writes of the Colac people (Kolakngat):
From their own account, they were once numerous and powerful, but from their possessing a rich hunting country, the Barrabool, Leigh, Wardy Yalloak, and Jancourt tribes surrounding, made constant war upon them, and the tribe, from having been the strongest, became the weakest.

(Bride, 1898:103)

The periodic inter-tribal meetings in the Western District could be viewed in the above context. The summer meetings held at the centre of the district are of interest, in that populations covering a wide area attended, while the coastal groups were excluded (Fig. 8:1). In this way the meeting cut across an existing tribal area, by excluding the coastal half of the Gunditjmara. The meeting would have served to form reciprocal ties mainly between bands occupying the open plains, a broadly uniform environment, and one subject to irregular variations in resources (e.g. drought). The well watered coastal strip was not so exposed to these variations in resources, and therefore would have provided a refuge area in times of need. However, some regulation of visiting populations would have been required. The ceremonial gatherings at the centre of the district could be seen, in part, as fulfilling this purpose by regulating populations in competition for the most favoured resource area, the coast. In this way, the zone of stress between inland and coastal populations, becomes the area of compromise. This explanation, however, is not meant to exclude the influence of other factors, pertaining to the group's culture, which may have shaped the form and structure of these ceremonies.

A comparable example of economic competition under climatic duress and over the favoured and well-watered coastal strip, comes from the nearby, and environmentally comparable region of the Coorong (South Australia). This coastal area lies about 180 kilometres north west of the Glenelg River which serves as the convenient western boundary of the Western District. Writing of the "grass and scrub-covered ... landward shore of the Coorong," Tindale states:

It was their (the Tanganekald's) favourite wintering area because of the availability of firewood and the shelter of the scrub. It was somewhat exposed to ambush by inland strangers, the less favoured tribes people called the Ngarkat, who normally wandered in the Mallee tree lands beyond ('lerami), the belt of inland scrub and swampland country which the Tangane (Tanganekald) used mainly for hunting kangaroos, emus, and water birds. In wintertime they felt reasonably safe,
for the inlanders were apt to trespass chiefly in summer
when their precarious water supplies became low and their
land intolerable.

(Tindale, 1974:61)

It was not only desert areas, therefore, that experienced such acts
of territorial transgression, as Meggitt (1962:42) suspected.

The above example lends support to the interpretation of territorial
conflict between coastal and inland populations in the Western District. It
also shows that the boundaries between tribes could be composed of areas
mutually used by both groups.

Key resources (other than water) in other Australian regions were
also a cause for trespass. Examples follow of two of the most well known
Australian seasonal resources which provided the staple base for large-scale
seasonal gatherings and ceremonies. The territory of the Wakawaka of the
Bunya Mountains of Queensland was encroached upon illegally by other groups
during the triennial harvest of the Bunya pine (*Araucaria bidwillii*)
(Tindale, 1974: b/w. plate 45). Similarly, during the well-attended summer
Bogong moth festivals on the Southern Highlands, fighting sometimes broke
out between competing groups, which could at times develop into a "pre-
arranged battle in which the vanquished lost their supply of moths for
the season" (Flood, 1976:43).

Conclusion

From these examples it can be seen that competition between
neighbouring populations for resources (including land) was a factor that
influenced societies from a wide range of Australian environments (coastal
and highland south eastern Australia, tropical Queensland and Central
Australia). Such competition has been shown to have affected the stability
and location of boundaries between populations, to have stimulated conflict,
and been responsible for loss of numbers. It was also a potential influence
on inter-tribal meetings, their location, timing and functioning. As well,
it would have influenced the scheduling of subsistence behaviour, as bands
in affected areas would have had to re-arrange their time-tables, and in the
case of appropriation of land, their ranges. Its role as a promoter of
change is discussed in Chapter 15.
Further examples of such competitive economic behaviour may have been quelled by the presence of Europeans. Once local groups had established themselves around European bases a new form of economic security would have been established. The unpredictable climatic oscillations which were often the stimuli for inter-group competition over resources, would have thereby largely diminished. Groups leading a basically traditional life-style could always fall back on mission rations. This new socio-economic system with its sizeable resident populations would have retained and perhaps increased the forms of conflict with which we are most familiar, for example, those centred around the acquisition of females (Hiatt, 1965).
CHAPTER NINE

THE ANNUAL ROUND

Here I draw together the evidence on Western District Aboriginal economy which has been presented in Part 2 of this thesis. I begin by presenting a broad based behavioural model of seasonal subsistence and settlement. This model, or aspects of it, can be further tested by archaeological data, and this step is taken in the following chapters (Part 3). I conclude with a summation on Western District Aboriginal economy.

The Model

The main features of this model have already been presented and discussed in Chapter 7. Here I have integrated as well the information from Chapter 6, together with the generalised but useful seasonal models of Smyth and Bulmer. Smyth's account refers to the whole Victorian region but is also applicable to the Western District (1876, 1, 139-41), while that of Bulmer is based upon his own observations at Lake Tyers in Gippsland (Smyth, 1876, 1:141-2). Parts of the latter are also relevant to south western Victoria. So as to avoid repetition, whenever information has been derived from either Smyth or Bulmer I have inserted (S) and (B) respectively. All other material can be found in previous chapters of this thesis. The model I present is also generalised and not designed to refer specifically to the activities of any one local band, but to the district as a whole, or in some cases a subdivision.
Spring (September–November)

This was the season of resource regeneration and was heralded by the blooming of the acacias (S). Following upon winter rains and low temperatures, plant growth was now at a peak with vegetables and fruits in plentiful supply and variety (B). This last feature continued well into summer. Movement between groups was now facilitated, and Aboriginal settlement returned to previously water-logged areas and coastal resorts (B, S). Groups were larger, and settlement semi-sedentary at both inland and coastal bases. Wetlands were a prime focus of settlement where fishing and birding were emphasised (B, S). Fish were now plentiful, and fishing selective with poorer examples being thrown away (B). Night fishing was performed (B), and as wild fowl were now abundant, swans and ducks were caught in large quantities, especially during the moulting season. Bird's eggs (e.g. swan's eggs) were collected in large numbers (B, S). Reptiles became more numerous following the winter period of semi-hibernation (S) and hunting of mammals took place in savanna grasslands and woodlands. Exploitation of coastal resources was now more profitable, with fish, shellfish and crustaceans more numerous and accessible. Migratory coastal species, such as seals and mutton birds now return, and some terrestrial and forest game was hunted. Procurement equipment was similar to that used in early summer.

Summer (December–February)

Resource abundance continued until the dry weather set in towards the last half of summer. Summer was the time of large inter-tribal gatherings and ceremonies with up to 1,000 people meeting to take advantage of the surfeit of resources. Aboriginal settlement was semi-sedentary at coastal and inland bases with small groups venturing into more remote places without having to bother about constructing shelters (S).

The Coast: Coastal settlements were located principally on the littoral or at the entrance of lakes and estuaries (B). Here fish were most plentiful returning to and from the sea (B). Eels and fat mullet were principal catches (B), and night fishing took place with torch and spear by men whose days were spent resting and occasionally fashioning spears and towards evening making their fishing torches (B). Coastal resources were similar in range to those in spring, but shelters were less elaborate, and quickly covered with grass and sods if wet weather set in (B, S). Reptiles
were plentiful (S), and for an occasional change in diet, hunting expeditions set out into scrub country after wallabies (B). Vegetables were important items in the diet, and included tree fern, roots, bulbs and fruit (B, S). In certain areas, kangaroo apples were "staples" (B), but the main district-wide warm weather favourite was the Yam Daisy. Concerning procurement equipment, we could assume therefore, from the range of activities above, that there would have been a higher production and use of marine oriented equipment such as fishing spears, than of hunting equipment such as spears, perhaps clubs, and their related maintenance tools (flaked stone scrapers etc.).

Inland: Groups with no coastal connections retreated to permanent wetlands and waterways. Economic activities were comparable to those on the coast with an emphasis on plant foods, fishing, aquatic birds, with some hunting in grasslands and forested areas (S).

**Summer Drought (end January-February)**

This was the season of high bush-fire danger and drought (S). Aboriginal settlement is more restricted to sources of permanent water (perennial wetlands, waterways, coastal marshlands) (S). More emphasis was now placed on hunting in grasslands and open forests (S). Fishing methods changed to trapping fish in shallow ponds as water levels receded, and spearing eels in the shallows or in dried out waterways. Trapping of animals and birds around the remaining waterholes would now have been facilitated. Inland regions, such as the drier areas of the open plains, would have been the most severely affected regions. The resource abundance of spring and early summer was now at an end.

**Autumn (March-May)**

The drought of late summer was broken by the onset of colder weather and the coming of the rains. Range and quantity of resources begins to fall off (S) but this was still a season of activity, inter-group movement and ceremonies. Settlement moves from water-logged areas but remains close to perennial wetlands and waterways, and was located at fixed bases. Emphasis was now on hunting as well as inland fishing (B, S). Coastal resources are less productive and populations in these areas move to more protected hinterland freshwater fisheries and hunting grounds (B). Shelters are more substantial with durable, well built huts being constructed (B, S).
The migratory season for eels now begins with this species available in super-abundance (S). This season is one of the high points in the annual round, and for one to two months semi-sedentary populations gathered in large numbers (up to 800-1,000), at individual fisheries and ceremonies were held. Specialised fishing equipment includes, weirs, traps and large-scale artificial drainage.

Plant foods collected included roots of marsh plants (e.g. Typha sp.) Tree Fern, and the gum of the acacia which was collected and stored in quantity following the summer heat (S).

Procurement equipment would have a larger emphasis on hunting than in the previous seasons with wooden gear produced and maintained by flaked stone tools.

**Winter (June-August)**

Winter is a time of some reduction in resources (S). Plant growth is restricted by lowered temperatures but also stimulated by the constant rainfall. Settlement is semi-sedentary and located at permanent waterways and seasonal marshlands at fixed bases where well-built huts were established in clusters, resembling villages (S). The population, now in smaller groups, redistributed itself between these camps. Settlement is impeded by waterlogging of the lowlands and takes place on higher ground or on artificial earth mounds close to the waterways and wetlands. These wet conditions restricted contacts between groups and movement in general. Emphasis is now on aquatic resources, birds and fish in traps and fish by line. Smaller, dispersed groups formed hunting parties, and burrowing animals were dug up and captured. The latter were main activities (B, S). The pupae of ants and other insects were collected in quantity and formed an important part of the diet in some areas. Marshgrowing plants and a variety of roots were collected from the plains in great quantities. The Yam Daisy was replaced by the winter "staple", the convolvulus (*Convulvulus erubescens*).

The coast was at its most unproductive and because of the weather use was now made of caves and rock shelters. The latter were also used inland. Coastal populations remained at protected semi-sedentary hinterland camps, from which fishing and hunting could take place. These were
generally located at wetlands and waterways. However, during strandings of whales, large inter-group assemblies took place along the coast.

Conclusions

A broad agreement has been shown to exist between the predictive subsistence-settlement model established in Chapter 3 and the ethno-historical data presented in the following chapters. From these results the following conclusions can be drawn. Seasonality appears to have been the main limiting factor (see Odum, 1971:106-38) on Aboriginal occupation, with winter being the leanest and spring-early summer the most fertile seasons. In this case, the depth of winter or a severe high-summer drought would have placed the most strain on populations. In the long-term, extremes in either of the above two variables would have increased these limitations. The pattern of droughts, that have been recorded over the last one hundred years, is an indication that this would have been a key controlling factor. The coastal strip was the least affected region receiving more reliable rainfall.

Certain variables, however, offset the effect of resource depletion in autumn-winter, such as the seasonal abundance of migratory eels in autumn, stranded whales, and generally dependable rainfall which stimulated plant growth. In general, statements concerning winter hardship appear to have been somewhat exaggerated by European observers.

Aboriginal settlement was closely associated with perennial wetlands and waterways, and in these locations was most permanent and group sizes the largest. Abundance, reliability and accessability of resources were factors controlling levels of sedentism and size of groups. Resources dispersed both spatially and temporally promoted nomadism and population dispersion. Winter, therefore, would have been a season of greatest nomadism and smallest group sizes, with spring-early summer being the most sedentary seasons with the largest groups. Very large groups (up to 1,000 people) were associated with seasonal resource abundance (e.g. the seasons of migratory eels, stranded whales, mass hunts), and ceremonies were held at these times.

The coastal strip was most productive in spring-early summer, and
at these times would have maintained the highest levels of sedentism and largest group sizes. During autumn and winter coastal peoples would have resorted to hinterland waterways and estuaries. Inland populations would have resided at permanent wetlands and waterways throughout the year, and settlement of grasslands, woodlands and forests would have been relatively more nomadic with smaller group sizes.

Population mobility, together with fluidity of band membership, helped to overcome the problems of resource distribution. The latter also encouraged the regeneration of local resources by not over-taxing the resources of any one region (see also Poiner, 1976). Few local groups would have been fortunate enough to maintain themselves permanently on their own limited ranges, and therefore, redistribution of population both during times of scarcity and abundance, allowed for a more equitable distribution of resources. Reciprocal obligations thereby widened the net of security, and energies exerted in this direction could be seen as being "stored" for future use. The establishment and maintenance of ceremonies, which allowed for such obligations to be established, must be viewed within this context (see Ch.15). The maintaining of sedentary or semi-sedentary conditions together with larger sizes of local groups, would also have served similar purposes, with reciprocal obligations being established. Access to resources, therefore, also entailed diplomatic control of social relationships. This leads us to the issue of conflicting interests, for not all populations would receive equal treatment, given the uneven distribution of resources. In the Western District separate inland and coastal economies were practised by different populations. As well, coastal tribal or linguistic groups (such as the Manmeet) were themselves divided into coastal and hinterland populations, distinguishable by dialect. In the latter case a certain amount of population interchange occurred related to sharing of resources, but in general hinterland populations do not appear to have had more than general access to the coast, which was the most fertile environment. Inland populations, such as the Tjapwurong, had no access to the coast, although we can assume that a small proportion of their members would have been granted this permission via kinship ties in border areas.

As with premium resource areas, like the above, prized resources together with their environs, were objects of inter-group competition and
rivalry. Territorial rights and boundaries were established in these locations, and disputes commonly occurred. Such resources and areas included: eels; swans and their eggs; whales; acacia gum; raw stone materials; and the coastal strip in summer.

A broad-based economy was practised in the region involving a wide range of specialised seasonal food-procuring equipment. The main economic strategies were the collection of plants (tubers predominating), fishing and the hunting of terrestrial and marine mammals. Insect foods formed important resources in certain seasons (e.g. winter) as did aquatic birds, amphibians and reptiles were secondary targets. Co-operative procurement activities, such as mass-hunts, enlisted the labour of many individuals, as perhaps did the construction of fishing devices such as traps, weirs and the digging of lengths of artificial drains. The sexual economic division of labour existed in the traditional form with women (children and the aged) gathering and capturing small game, and men hunting and spear-fishing, but as well substantial overlap in roles took place, for example in the wide range of fishing methods employed.

A limited and short-term storage was practiced of resources such as eels and whalemear, with acacia gum being perhaps the most storable item which provides an important carbohydrate source in autumn and winter. Protracted methods of harvesting may also have allowed for a more efficient use (including partial "storage") of roots and tubers. Conservation of water resources was also practised, and during glut periods, such as the eeling season, substantial wastage of resources was allowed to occur. A limited exchange of food resources (such as eels and tubers) was carried out between groups, and raw materials such as stone, were traded far beyond the boundaries of the Western District.

In relation to the five most likely areas of expansion within the economy as have been outlined by Harris (Ch.1), the following can be deduced. Two of these five possibilities were available in south western Victoria: (i) roots and tubers, (ii) fishing and aquatic mammals. Both these resource complexes indicate intensification. Heavy emphasis was placed on roots and tubers and selectivity of species practised. Methods of harvesting (above) together with the use of firing techniques, may have acted as effective plant management procedures. The latter issues,
however, need further investigation. Fishing involved an extensive range of specialised methods and equipment, such as those involved with migratory species like the eel. These techniques mainly were used, however, in freshwater and estuarine locations, for the opportunities offered by coastal fishing do not appear to have been developed to any large degree, and off-shore fishing was not attempted. Exploitation of marine mammals, although composed of important economic strategies, appears to have been limited to strandings of whale and to capturing of beached seals. Some exploitation may have also been attempted of seal colonies, but regrettably little is known of sealing procedures.
CHAPTER TEN

ARCHAEOLOGICAL PREDICTIONS

Here a set of testable hypotheses are proposed based upon the existence and settlement model outlined in Chapter 9. These hypotheses are established in such a way as to be testable in the archaeological record, and the first steps in this direction are taken in the following chapters (11, 12, 13). A similar approach has been successfully undertaken by a number of prehistorians of whom Thomas (1972) has produced some of the most elaborate and detailed results (see also Bettinger, 1977). The latter studies are based on more detailed and smaller-scale ethnohistorical models than that used here from south western Victoria. In consequence, the archaeological predictions proposed in this study are of a more general nature (see also White and Peterson, 1969).

The following hypotheses can be proposed:

(a) A higher density of sites will be associated with areas of resource dependability and fertility such as perennial waterways, marshlands, and fertile stretches of coastline.

(b) Settlements indicating higher levels of sedentism and higher population density will be located in the above premium environments.

(c) Archaeological site-types, indicative of the latter settlement forms will be coastal and inland sites which display some of the following features: exploitation of varied seasonal resources; artefact assemblages indicative of varied exploitative techniques; evidence of production, use and maintenance of exploitative artefacts; evidence of well-constructed huts, hut-pits and earth mounds.

(d) A lower density of sites will be found in areas of less dependable or dispersed resources such as parts of the open plains and wooded ranges.
(e) A large percentage of sites in the latter areas (including less productive seasonal zones of generally fertile areas such as the coast) will be of ephemeral task-specific (specialised) sites.

(f) The latter sites will display features of limited, specialised resource exploitation and short-term residence.

(g) Caves and rock shelters will have evidence that they were mainly occupied during seasons of inclement weather Autumn-winter).

The Coast and its Hinterland

Coastal sites established on the littoral will be of two forms: (a) specialised; (b) seasonal. The former will display task-specific features, such as intensive shellfish exploitation with few other activities represented. The latter will be located in more fertile areas and display a wide range of reasonable resources and activities mainly from the seasons of spring-early summer, and in some cases aspects of semi-sedentism (see point (c) above).

Seasonal spring-summer coastal sites will have the following features:

i) a chiefly marine economy supplemented by some terrestrial game. The hunting of the larger species (e.g. the larger macropods) will play a lesser role.

ii) a substantial proportion of bone tools, and a generally lower proportion of flaked stone tools.

Autumn-winter sites (and some task-specific warm weather sites) will show:

i) higher proportions of terrestrial resources (e.g. mammals), and a higher proportion of the larger species.

ii) a higher proportion of production, use and maintenance of stone tools.

iii) a tendency for sites with an emphasis on the hunting of the larger species to be more ephemeral in nature.

Support for these predictions by archaeological data would stand as general support for the ethnological model which has been constructed for this area. However, such general support could not be taken as verification of this complex model as a whole. This erroneous final step has
been taken by some writers (e.g. Thomas, 1972; Bettinger, 1977).

A final cautionary note should be sounded. The above predictions refer to a predominantly static model which refers to a situation pertaining in time to the early nineteenth century. The temporal factor has therefore, for convenience, been omitted in both the ethnohistorical model, and the above predictions. Time and its effect, however, are the unique contribution that archaeological data has to offer, and these aspects are discussed more fully also in the following chapters (12, 13).
CHAPTER ELEVEN
SETTLEMENT PATTERNS

Some of the predictions outlined in the previous chapter (10) are tested here by archaeological data. The main emphasis is upon general settlement patterns, by which I mean the distribution of settlement forms in relation to natural resources. These settlement forms are specific archaeological sites which I define more clearly below. The distribution of these is viewed in relation to the main environmental zones that have been outlined in Chapter 3. The archaeological data used here consists of evidence which has been collected during my field project in the study area (1973-74) together with comparative material of another field worker. As well as excavations (see chs 12, 13, 14) I also carried out extensive field surveys in many areas of the Western District. These study areas include much of the coastal strip from the Bridgewater Lakes area east to Geelong, and selected inland areas which include, Darlot's Creek, the Great Swamp, Mount William, Lake Bolac, Toolondo and parts of the Grampian Ranges. The extremely large size of the district as a whole precluded more detailed sampling given the constraints imposed by this doctoral project.

Settlement Form and Type

1. Form

Three main forms of settlement or site were identified:
(a) concentrations of material which often had some depth of deposit;
(b) linear scatters of negligible stratigraphic depth, and
(c) shallow scatters, also of limited depth.
Such forms were more obvious where shell was associated, and so shell middens conform closely to the above three forms. Stone tool assemblages, composed of a variety of raw materials and artefact types, also conform to this pattern. It was often difficult to distinguish between surface scatters and those which had been produced by erosion. Examples classified as surface sites therefore, must be regarded as ambiguous.

2. Type

Site types have been identified as the following:

(a) shell middens
(b) rock shelters/caves
(c) lunette deposits
(d) earth mounds
(e) open sites

Of the above, two types, earth mounds and lunette deposits, need further comment. Earth mounds generally conform to the description of ethnohistorical examples as have been outlined in Chapter 7. Today many of the mounds have been ploughed under and thus have disappeared. As well a substantial number have been reduced in size by ploughing. Typical extant examples now stand no more than about 30-50 centimetres in height. Lunette deposits refer to stratified cultural horizons within lunettes or fossil dunes.

In relation to sedentary or nomadic factors, the sites which are more likely to represent more sedentary settlements are earth mounds and concentrations of both shell midden and artefact assemblages. It can be assumed that the greater the degree of cultural complexity in both artefact types and economic features, the greater the level of sedentism (see also chs 7, 10).

Distribution

For convenience I have divided the sample into both inland and coastal distributions of sites.

1. Inland

As representing a cross-section of living sites throughout the Western District I have used a sample of sites reported by one observer,
Massola (1969). Massola had extensive knowledge of Aboriginal sites and artefacts and was a keen observer. He also managed to travel to most parts of the Western District and so his is quite a comprehensive sample. His main emphasis was upon living sites and so he has included a broad range of examples. In order to assure myself of Massola's accuracy of description and location of sites, I revisited a number of the locations he reported. On Table 11:1 I include a selection of Massola's references to Western District sites together with my own observations which also include a few extra sites.

This sample consists of the following site types: earth mounds, lunette deposits and open sites, which make up the bulk of the references, plus one rock-shelter, a cave complex, two stone quarries and two stone weirs. Many of the references are of generalised locations and include a number of sites, the number of which is often unspecified. Because of this I have counted each reference separately. Where individual sites are mentioned I have also included these separately. In all, therefore, there are 65 references made up of individual references and sites. This sample therefore, consists of many more than 60 or so sites, more likely three even four times that amount.

The results that can be deduced from this sample indicate the following. Overall there is a general district-wide distribution of sites (see also Lourandos, 1977a), but the proportional distribution of sites indicates preferential locations. Earth mounds tended to be located in groups and all are close to permanent waterways (lakes, swamps, waterways). Lunette deposits, by their very nature, also indicate settlement close to permanent water. Open camps as well, in the main, were located in similar habitats. We can therefore deduce that most settlements, and those of a more permanent nature (as represented by earth mounds and concentrated sites) were positioned near to permanent wetlands and waterways. If we are now to employ the models of site-use such as those labled as site-catchment analysis (see Higgs and Vita-Finzi, 1972), the following can be deduced. Such models state that hunter-gatherers exploited an area within a radius of 10 kilometres from their home base. If such a 10 kilometre radius is superimposed upon the location of the abovementioned sites in the sample, it can be deduced that they would not only have been located close to permanent water but also to a wide variety of microenvironments, such as
<table>
<thead>
<tr>
<th>Table 11:1</th>
<th>Inland Sites, South Western Victoria</th>
</tr>
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<tbody>
<tr>
<td><strong>Colac</strong></td>
<td></td>
</tr>
<tr>
<td>1. huge earth mounds, south west of Lake</td>
<td>(p.26)</td>
</tr>
<tr>
<td><strong>Otway Ranges</strong></td>
<td></td>
</tr>
<tr>
<td>2. small open camps. Tomahawk creek</td>
<td>(p.27)</td>
</tr>
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<td><strong>Hamilton</strong></td>
<td></td>
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<tr>
<td>3. earth mounds near town</td>
<td>(p.52)</td>
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<td>4. Lake Linnithgow lunette</td>
<td>(p.52)</td>
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<tr>
<td>5. Lake Kennedy lunette</td>
<td>(p.52)</td>
</tr>
<tr>
<td>6. Great Swamp, open camps all around swamp</td>
<td>(p.53)</td>
</tr>
<tr>
<td>7. Caramut and Muston’s Creek open camps</td>
<td>(p.55)</td>
</tr>
<tr>
<td>8. Barrembool and Gray’s Creek greenstone quarries, Hopkins River</td>
<td>(p.56)</td>
</tr>
<tr>
<td>9, 10 *</td>
<td>West of Mount Sturgeon, 2 open camps</td>
</tr>
<tr>
<td><strong>Byaduk caves</strong></td>
<td>(L)</td>
</tr>
<tr>
<td><strong>Wannon River, near Cavendish open sites</strong></td>
<td>(p.56)</td>
</tr>
<tr>
<td><strong>Lake Bolac, lunette</strong></td>
<td>(L)</td>
</tr>
<tr>
<td><strong>Camperdown</strong></td>
<td></td>
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<td>14 - 16.</td>
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<tr>
<td>(a) Lake Corangamite, open camps</td>
<td></td>
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<tr>
<td>(b) mouth of Pirron Yalloo</td>
<td></td>
</tr>
<tr>
<td>(c) Garkee Ponds Creeks *</td>
<td>(p.60)</td>
</tr>
<tr>
<td>17. Woody Yalloo, open camps</td>
<td>(p.60)</td>
</tr>
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<td>18 - 19.</td>
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<tr>
<td>Lake Purrumbete, 2 open camps</td>
<td>(p.61)</td>
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<td>20. Cobrico Swamp, open camp</td>
<td>(p.61)</td>
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<td>21. Lake Elingamite, open camp</td>
<td>(p.61)</td>
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<tr>
<td>22. Lake Connewarren, large earth ovens</td>
<td>(p.63)</td>
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<tr>
<td>23. Lake Colangulak, weirs near lake</td>
<td></td>
</tr>
<tr>
<td><strong>Ballarat</strong></td>
<td></td>
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<tr>
<td>24. Lake Burrumbeet, lunette</td>
<td>(p.68)</td>
</tr>
<tr>
<td>25. Cockpit Lagoon, lunette</td>
<td>(p.68)</td>
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<td>26. Lake Learmonth, lunette</td>
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<td>27. Lake Goldsmith, lunette</td>
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<td>28. Mount Egerton area, lunette</td>
<td>(p.70)</td>
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<td>29 - 32.</td>
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<tr>
<td>Carnegie-Heredit area:</td>
<td></td>
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<tr>
<td>(a) Wood-Burnie Creek;</td>
<td></td>
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<tr>
<td>(b) Coolebarghurk Creek;</td>
<td></td>
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<tr>
<td>(c) Native Hut Creek;</td>
<td></td>
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<tr>
<td>(d) Moorabool River</td>
<td>earthmounds</td>
</tr>
<tr>
<td>33, 34.</td>
<td>Durdidwarra, north east of Heredit, 2 open camps *</td>
</tr>
<tr>
<td>35. North of latter, swamp and lunette</td>
<td>(p.71)</td>
</tr>
</tbody>
</table>

Page references (Massola, 1969);  
L = Lourandos, personal observation;  * = microliths associated
grasslands and mixed forests. For as has been shown (chs 2, 3) these wetlands and waterways were situated within such ecologically complex situations.

Overall, this sample shows that there was a lower density of sites in the more forested areas, and in the open plains and grasslands. These last findings, however, need to be tested by further archaeological reconnaissance. Rainforest areas (e.g. the Grampians, the Otways) appear to have the lowest density of sites. Some sites are known from areas of wet sclerophyll forest along waterways which extend into areas of rain forest (e.g. south of Colac).

Some observations can also be made concerning the composition of some of the sites. Complex artefact assemblages, which have been found at some inland sites (e.g. open camps, lunette deposits), indicate a wide range of activities and perhaps a wide resource base involving a number of procurement strategies. Such assemblages include a variety of flakes stone artefacts, flaking floors and grinding stones.

2. The Coast

The coastal sites which are included on Table 11:2 have all been derived from my own archaeological reconnaissance. The sites which are listed include the following types: shell middens, rock shelters/caves, lunette deposits, open sites, stone quarries.

The results from this survey show that the coastline and its hinterland were quite densely occupied in the more fertile areas such as between Bridgewater and Warrnambool. The Cape Otway coastline also has a large number of sites. Site forms and the composition of sites also are indicative of the nature of occupation. Large and complex shell middens with a high quantity of stone material are found in certain areas, usually the more productive locations associated with rich intertidal rock platforms and estuaries. Such locations include parts of the dunes of Discovery Bay and also those between Bridgewater Bay and Discovery Bay, the area around the Craigs as well as the Koroit Beach region. In the last area, a wide range of both terrestrial and marine fauna (seal, fish) was also present. Some of the sites (e.g. the Craigs) had little faunal material remaining (apart from shell) due to quite extensive erosion. More specialised shell middens
Table 11:2  Coastal Sites, South Western Victoria

**Discovery Bay - Portland**

1. Shell midden at southern end of dune ridges  
   \( \text{(R; F1)} \)

2. Swan Lake, lunette? Flaking floors. Microliths

3. Extensive area of dune "blow-outs" north west of Bridgewater Caves. Many exposed shell middens  
   \( \text{(B; F1)} \)

4. Bridgewater Road. Shell midden  
   \( \text{(B; F1)} \)

5. Amos Road. Shell midden  
   \( \text{(B; F1)} \)

6. Bridgewater Beach. Shell midden extensive  
   \( \text{(B; F1)} \)

7 - 10. Bridgewater Beach, western corner  

(a) Flint stone quarry (Aboriginal)  

(b) Shell midden  
   \( \text{(R; B; F1)} \)

(c) Shell midden, extensive  
   \( \text{(R; B; many F1)} \)

(d) Shell midden lenses along cliffs  
   \( \text{(R; F1)} \)

11. Amos Property. Extensive dune "blow-outs"  
   \( \text{(B; F1)} \)

12. "Blowholes". Area of eroding shell midden along cliff tops  
   \( \text{(R; F1)} \)

13 - 14. Point Danger  

(a) Flint stone quarry (Aboriginal)  

(b) Shell midden. Extensive  
   \( \text{(R; F1)} \)

15 - 20. Nelson Bay  

(a) Shell midden. Mussel shell  
   \( \text{(F1)} \)

(b) Flint stone quarry (Aboriginal)  

(c) Shell midden. Dune ridges  
   \( \text{(R; F1)} \)

(d) Flaking floors in dunes  

(e) Cape Nelson Road. Shell midden  
   \( \text{(R; F1)} \)

(f) Similar to (e)

**The Craigs - Warrnambool**

21. Many eroded shell middens in this area  
   \( \text{(R; F1)} \)

22. The Craigs. Shell midden  
   \( \text{(R; F1)} \)

23 - 24. Small rockshelters. Shell middens within  
   \( \text{(R; F1)} \)

**Tower-Hill Beach**

25. One continuous shell midden. "Blow-outs"  
   Land and marine mammal remains  
   \( \text{(R; F1)} \)

26. West of Pickering Point (Warrnambool). Shell middens. Extensive area  
   \( \text{(R; F1)} \)

**Cape Otway area**

27. Johanna River. Shell midden  
   \( \text{(R; F1)} \)

28. Brown's Creek. Shell Midden  
   \( \text{(R; F1)} \)

29. Point Franklin area. Shell middens in dunes at each rocky headland  
   \( \text{(R; F1)} \)

30. Rock Shelter. Shell midden within. Mussel Shell  
   \( \text{(F1)} \)

31 - 32. Two small rock shelters. Shell middens within. Mussel Shell  
   \( \text{(F1)} \)

33. Shell midden in dunes behind coast.  
   \( \text{(Many F1)} \)

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Data from personal observation  
R = ocean rock platform shell species  
B = ocean sandy beach shell species  
F1 = flakes
also exist which have few other variables (e.g. stone, bone) associated. Such middens are found along the full length of the coastline in particular in less productive areas, such as open sandy beaches (e.g. Discovery Bay, Portland Bay). These specialised task-specific sites also exist in both concentrated and scatter forms.

The general results that can be deduced from this overview are of a settlement pattern broadly approximating the predictive model outlined in Chapter 10. These conclusions therefore, stand in general support of this model which has been derived from both environmental and ethnohistorical data (chs 3, 9, 10), but as has already been mentioned, such support by no means confirms all the complex features of the model. These results (see also Lourandos, 1976; 1977a, 1980) also complement the findings of other workers whose research has been cast in different terms and sometimes uses other forms of data (e.g. McBryde, 1978).

In order to more closely investigate settlement patterns in a coastal hinterland area I chose a suitable location, Darlot's Creek, a perennial waterway connecting the Condah Swamp area to Portland Bay. This creek which in winter floods the surrounding plain to form a series of wetlands, lies some 15 kilometres east of Portland. Today the area is open savanna on both sides of the creek with scrub and open sclerophyll forest behind (Fig.11:1). Along this creek, between 5-10 kilometres from the coast, are still to be found a series of earth mounds, located in three groups. There are seven mounds altogether in clusters of twos and threes, located from a distance of some 3 kilometres along the banks of the creek. The largest of these measured approximately 13 metres in diameter and 0.7 metres in height. During the wet season, such mounds would have been positioned amidst the swampy riverine plain. In terms of distance, this central location would have served as a strategic point providing easy access to most of the plain as well as to the coastal strip, all attainable within a radius of 10 kilometres. Shell middens (mainly composed of sand dwelling species such as pipi) are found along these coastal dunes (Fig.11:1). This example reinforces two points: that inland or hinterland base camps (e.g. earth mounds) were positioned in prime areas which offered access to a wide series of microenvironments, that earth mounds were adaptations to wetland conditions.
Although general agreement has been arrived at between models derived from all three forms of data, environmental, ethnohistorical and archaeological, much more data are needed before this detailed settlement model (ch.9) can be considered complete. Unfortunately most of the new dates received from sites containing Carbon 14-polished stone have all been recent, that is of the last 2000 years BP. Other investigators (e.g. Coote et al., 1976) also point to recent contexts such as the Woodend Tool I site. Radiocarbon dates from recent periods in the history of Western Australia also have evidence of more scattered occupation during these periods. In contrast, on the coastline of the plain (cf. p.75) a more continuous occupation is indicated, with slight differences in the dates of shell middens and sites denoting occupation. The river-fringe deposits of artifacts have evidence of occupation extending back to 15,000 years BP or more, in the case of the Murray River (Cox, 1973, 1976). The Murray River also has roughly continuous occupation, covering much of this time span. We must therefore presume that occupation in this region has been fairly continuous and that the subsistence-settlement pattern outlined in this chapter for south western Victoria is consistent with dates from this region, including Tasmania, support this view (e.g., King, 1976). Late Holocene details regarding the nature of certain sites of this subsistence-settlement pattern are discussed in the following chapter (12).
Time

Although general agreement has been arrived at between models derived from all three forms of data, environmental, ethnohistorical and archaeological, much more data are needed before this detailed subsistence-settlement model (ch.9) can be convincingly traced back into the past. Dates received from sites conforming to this settlement pattern have all been recent, that is of the last few thousand years (see chs 12, 13, 14; Coutts et al., 1976). Chronological markers associated with these sites also point to recent contexts. Such markers are the stone tools of the Small Tool Tradition as have been coined by Gould (1971) which include microliths (Tables 11:1, 11:2, ch.13). Such stone industries generally date from around 4 - 5,000 B.P and more recent periods in the wider south eastern Australian region. As yet, a firm sequence of stone tool types has not been derived from Western Victoria, so analogous chronologies must suffice. In contrast to inland sites, coastal shell middens from this area have been dated to 7,000 B.P. (Gill, 1972), but these sites appear to have been lenses of material rather than deeply stratified sites. These last dates also did not come from archaeological excavations.

In contrast to these relatively recent dates there is evidence on the coastal Victorian plain (of which this study area is a part) of much earlier occupation. The river-terrace deposits of Keilor have evidence of human occupation extending back to c.30-40,000 B.P. (Mulvaney, 1975:146; Bowler, 1976:64). This complex site also has roughly sequential evidence of occupation covering much of this time span. We must therefore presume that occupation of this region has been fairly continuous and that the subsistence-settlement pattern outlined in this thesis for south western Victoria is but of recent origin. Recent dating of Archaeological sites in the south eastern Australian region, including Tasmania, support this viewpoint (e.g. see Bowdler, 1977).

More specific details regarding the nature of certain sites of this subsistence-settlement pattern are discussed in the following chapters (12, 13, 14).
CHAPTER TWELVE

SEAL POINT

The site of Seal Point is an extensive coastal shell midden located some two kilometres east of the Cape Otway lighthouse. This chapter presents an analysis of the archaeological remains from excavations that I carried out at the site. The main emphasis of the study is upon the dynamics of Aboriginal coastal economy. I deal with the inter-relationships between natural resources and the scheduling of economic strategies together with their relationship to group size and sedentism. This chapter is not offered as a complete site report, but rather as an archaeological case study within the theoretical framework set out in Parts 1 and 2 of this thesis. This example is also used to test certain of the coastal aspects of the subsistence-settlement model presented in Chapter 10.

Environment

A general description has already been provided of the Cape Otway area (Ch.3; see also Royal Society of Victoria Proceedings, Vol.89, Pts 1 and 2, 1977). The Cape Otway peninsula has no coastal plain to speak of but merely a narrow undulating fringe behind which are banked the mountains of the Otway Range, the highest point being Mount Cowley (670 m). In the area immediately west of the Cape Otway lighthouse where the site of Seal Point is located (Figs 12:1, 12:2), the coastline is made up of recent dunes with shifting sandy areas backing onto long beaches towards Point Franklin. The site is stratified atop one of these dunes which is for the most part still well stabilised and which appears to rest upon Quaternary aeolianite (see Douglas, 1977; Gill, 1977).
The area surrounding the site is now farmed and has been extensively ploughed and sewn with introduced pasture grasses. A few kilometres to the east and west of the site, however, the original coastal vegetation is still preserved and consists of heathland together with some open dry sclerophyll forest behind. Dry sclerophyll also fringes the paddocks in which the site is located, which is only a few hundred metres from the littoral. It could be presumed that these vegetation forms were predominant prior to European occupation. The dry sclerophyll forest today extends for more than a kilometre behind the coast and is interspersed with farmland. The impact of Aboriginal firing in the past would have helped to keep such areas in a state of disclimax (see Chs 3, 6, 15). Wet sclerophyll and rainforest predominate in that order behind this relatively more open coastal fringe, but pockets of wet forest also exist much closer to the coast.

Rainfall is very reliable in this area with the highest annual average occurring along the main ridge of the Otway Ranges (in excess of 1800 mm). A rain shadow exists to the north east, extending over much of the inland plains of the Western District. On the average between 60% and 65% of the rain falls in the May–October period, but heavy falls can also occur in mid-summer. Temperatures tend to be more moderate along the Otway coast in both summer and winter than in inland areas.

The Site

The archeological site is situated some metres above sea level. It skirts the eastern portion of a rocky bay which appears to have no official name but is known locally as either Crayfish Bay, Stinky Bay (a reference to large accumulations of kelp) and The Planks (Plate 12:1a). The latter name recalls the presence of debris from ship-wrecks which often gets carried into the bay by heavy swells. The Cape Otway coastline has since initial European contact, been notorious as a graveyard for ships. In spite of these colourful names, I chose to call the site after the nearby headland of Seal Point, which more closely fits the site's description. The site overlooks an extensive intertidal rock platform (Plates 12:1a, 12:2b) which extends at one point for several hundred metres out into the bay. This rocky platform is completely covered at high-tide but when exposed presents a network of protected pools and rock ledges
12:1a The site of Seal Point looking south-west towards Cape Otway

12:1b The site of Seal Point during excavation looking east. Ranging poles define the perimeter of a hut-pit
rich in shellfish, crustaceans and small fish. Also at low-tide two excellent freshwater springs are exposed on the sandy beach immediately below the site.

To my knowledge, this site had not been reported before, although general reference to shell middens at Cape Otway goes back to Smyth (Ch. 7). I came upon the site during an archaeological reconnaissance of the Cape Otway area in August, 1973.

In form the site is extensive covering an area of over 400 metres in length and 100 metres in width. Erosion has set in along its sea face, especially in the eastern area with the eastern headland being degraded to the extent that little stratified material now remains. Here the midden forms a scree of debris of shell, stone and bone spilling down a sharp incline. Apart from this damage, however, most of the midden is intact. Today, erosion has been intensified by the presence of cattle and the plough. Given the exposed, precipitous nature of this coastline, it must be assumed that a certain amount of erosion would also have taken place prehistorically. If this is so, then the archaeological site could be seen as being eroded along its sea face and therefore being increasingly deposited further inland. On these grounds, the very earliest deposit could be expected to now be lost. However, the site has primarily been deposited laterally along the cliff top.

During my reconnaissance of the Otway peninsula most of the archaeological sites that I came across were small and were located within less than half a kilometre from the littoral. Most sites had shell associated and a few, it has been reported, included backed blades (see Ch.13). However, none of these sites was comparable in terms of size, and density of material (shell, stone and bone) to Seal Point. From these field results it would, therefore, be fair to presume that the latter was the largest and predominant of recent coastal sites on this southern tip of the Otway.

In relation to this southern portion of the peninsula Seal Point was well placed from an economic point of view. I have already discussed the general application of site-catchment methods (Ch.11). If we therefore consider the ten kilometre radius as approximating the area in which most
day to day economic activity would take place and apply it to Seal Point, the following results are obtained. Such a catchment area with Seal Point at its centre if superimposed upon Fig. 12:1 (showing the site in relation to the Otway peninsula) indicates that the greater part of the southern portion of this area could have been exploitable from the site. Such an area would encompass the coast to the east past Blanket Bay, west past the mouth of the Aire River and inland to just beyond Hordern Vale. The latter area would have bordered the wet sclerophyll forests. Thus Seal Point was opportunely located for exploiting the greater portion of the most productive of the Otway environments (marine and terrestrial). These important deductions can be better appreciated once the economy of the site has been described (below).

Excavations

In an area of the eastern portion of this extensive site was a hillock composed of midden material and which formed part of the total midden complex (Plate 12:1b). Upon this rise was a series of circular depressions or pits which reminded me of ethnographical descriptions of hut pits which were common throughout the Western District (see below, also Chs. 5, 7), and of similar structures on shell middens along the northern half of the west coast of Tasmania (Lourandos, 1968, 1970). I therefore decided to excavate in the area of these structures upon the hillock (Fig. 12:3). It should be mentioned that another possible cluster of pits can be detected at a distance of some 200 metres west of the latter. Excavations took place over two field seasons in the former area, the summers of 1974-5, 1975-6. As the site was large, I chose to sample as broad an area as possible, so as to avoid obvious sampling errors which would have resulted from too limited a sample. The method of excavation I selected was to superimpose a grid composed of one metre squares upon this area of the site and then to excavate selected squares or pits, as they subsequently became. The squares on Fig. 12:3 I have numbered alphabetically according to the chronological sequence in which they were excavated. During the first season, pits A-E were excavated and pits D-J in the following season (Plate 12:2a). The only square which did not conform to the above dimensions was E (Plate 12:2b), which is two square metres in size. The reason behind the latter is that here I was attempting to investigate the nature of a pit structure rather than follow the normal sampling procedures.
Fig. 12:3
12:2a Seal Point, the excavated pits F, G, H, I, J.

12:2b Seal Point, Pit E showing the excavated floor of the hut-pit structure. In the background the inter-tidal rock platform being covered by high tide
I achieved this by cross-sectioning approximately one quarter of the structure, and because of this I have only removed the topmost 15-20 centimetres of the deposit.

All remaining pits or squares were excavated in two ways: (a) by arbitrary levels of 5 and 10 centimetres in depth; (b) by stratigraphic layers. The former method proved to be the most satisfactory, as it was extremely difficult to follow extensive stratigraphic features when excavating down upon a living floor, as was the case here. My excavations were therefore exploratory and now that preliminary analysis has taken place, perhaps more stratigraphically oriented approaches can follow. Within pits stratigraphic features such as hearths and loose rubbish dumps (see below) were treated separately.

Pits A-F have been excavated by arbitrary levels (or spits) to a depth of 5 centimetres, and Pits G-J in spits of 10 centimetres depth. I originally chose the smaller spit size in order to place as much control upon the excavation procedures as possible. During the latter laboratory analysis I found that this step was not necessary given the overall aims of the research, and that the larger 10 centimetre spits were quite adequate. I therefore excavated the remaining pits by the latter method.

During excavation all material was passed through sieves of two fractions, 6 mm and 3 mm respectively to facilitate sorting. The contents of these fractions were sorted into organic material (excluding shell), silicious stone (including the smallest flakes), together with a selection of sandstone artefacts. The latter were bagged separately and returned to the laboratory. I realised that all stone in this artificial midden must be considered as manuports, but transportation and storage problems precluded the collection of all sandstone and shell. Therefore, a selection of sandstone pieces which bore signs of modification (see below) was made together with that of both shell and solid samples (see below).

Stratigraphy, Composition, Chronology

The midden complex as a whole rested upon sterile dune and had a depth of between 0.8 and 1.5 metres. Tests were made with a soil auger to a depth of several metres but no evidence of further occupation was detected.
SEAL POINT — Key.

- topsoil
- very loose shell
- loose shell
- compact shell
- grey brown compact shell
- charcoal matrix
- hearth lenses
- yellow sand
- abalone shell
- mussel shell
- charcoal
- bone
- wood
- rock
12:3a  Seal Point, Pit I

12:3b  Seal Point, Pit B
Fig. 12:8, Total Composition of Pit F
6 mm Fraction

A = Subninella; B = Cellana; C = Abalone;
D = Mussel; E = all other shell; F = Stone;
G = bone/charcoal
Fig. 12:9, Proportional weights of sieve fractions.

A = 6 mm; B = 3 mm; C = 1 mm; D = < 1 mm.

Fig. 12:10, Bird Bone Weight, Pits F, G, I, J.
The stratigraphy of the site in some ways is complex but generally
two main phases of shelly midden accumulation can be detected, an upper
more loosely composed complex and a lower more compacted humic horizon.
These two upper and lower phases are separated in some pits by an horizon
composed of a matrix of ashy hearths, sand, and broken shell grit, with
an overall low frequency of shell, stone and bone. This is especially so
in Pit I, partially in Pits G, H and J and to an even lesser extent in
Pit F (Figs 12:4, 12:5; Plates 12:3a). In the remaining pits this inter-
vening stratigraphic feature is not clearly evident in the recorded
section drawings, but similar trends were detected and recorded during
excavation (Figs 12:6, 12:7; Plate 12:3b). In these pits the clear-cut
two-part stratigraphy described above, is confused by the appearance of
many more shelly, ashy and humic lenses in all phases of the deposit. It
will be shown below that this basic two-part sequence is supported by
the excavated archaeological material.

The overall composition of the site consisted of a dense shelly
matrix together with varying degrees of humus, ash and charcoal. As
mentioned, in general the lower third of the deposit tended to be darker
in colour and superficially to have a higher humic content. Differential
drying out of the deposit as excavation took place could also have added
to this impression.

The analysis of the solid and shell samples from Pit F can be found
on Figs 12:8, 12:9 and the procedures followed here are described below.
Fig. 12:8 presents the total composition of the midden, and Fig. 12:9
sets out the proportional representation of weights of the contents of
three sieve fractions through which the samples were passed. It clearly
shows that the lower half of the site was composed of relatively finer
materials (i.e. sand, humus; sieve fractions 3 mm, 1 mm, < 1 mm), while
the upper half of the deposit consisted of larger-sized material (i.e.
whole broken shell; sieve fraction 6 mm). These conclusions agree with the
general impression gained during the excavation of all pits, that the upper
half of the deposit was composed of more porous shelly midden which
included many whole shells, while the lower half was more humic and sandy
in nature.

A radiocarbon C14 date was taken from a sample of charcoal lying
at the base of Pit G, where the shell midden meets the sterile sand dune. This sample produced a date of 1420 ± 130 B.P. (SU5 552). We can presume therefore that the site spanned a period of roughly one and a half thousand years, and that the uppermost levels are roughly contemporary with the time of European contact, although this will have to be more firmly established by further dates. One of the more important aspects of the dating of this site concerns the accumulation of such a large midden in such a relatively short space of time.

Structures, Activity Areas

The most conspicuous features were loose porous lenses of mainly whole shell and bone with little humic content, and denser more humic lenses containing a higher percentage of broken shell. These occurred throughout the deposit. In some cases the latter form included "floors" of shattered shell fragments, ash and much humus. From excavations I carried out in Tasmania on the shell midden at Little Swanport (Lourandos, 1970) and from a joint excavation I performed with Dr Rhys Jones at the Rocky Cape site (see Jones, 1971a) an interpretation can be provided for this variation in depositional features. Loose porous shell lenses can be equated in general with rubbish dumps which have accumulated haphazardly and have subsequently remained relatively undisturbed. The more humic lenses containing broken shell and ash can be seen as living floors, the product of treadage, scuffage, hearths and other activities. Variations between these two extremes would explain the intermediary lenses (see also Jones, 1971a:214-5).

Hearths and fireplaces also formed discrete features. Most often hearths were represented by ashy lenses (including pieces of charcoal), sometimes with sandstone blocks loosely in association which may have formed stone sub-structures. In some levels a series of ashy lenses formed hearth complexes. This feature is most obvious in Pit I where a sequence of ashy lenses appears to intersect the upper and lower phases of the deposit in a series of thick grey ashy bands interspersed with charcoal lenses, sand and humus (Fig. 12:4; Plate 12:3a). This complex extends across the entire pit to a depth of c.30 centimetres, but is not entirely composed of hearths. In fact the preservation of the hearths here can possibly be explained by their coincidence with the horizon of increased sand and humus and low frequency of shell, stone and bone. In the other
squares, even adjacent ones such as H, J and G, the ash and hearth content of this horizon is much reduced. A quantity of wood (in a very soft and decaying condition) was also found in association with this hearth complex in Pit I.

Another discrete structural feature relates to the pit structures detectable at ground level (see below). The latter appear to have had their stratigraphic equivalents represented as saucer-shaped lenses which roughly had the same dimensions as the pits, that is about two metres in diameter and 20 or so centimetres in depth. As my excavated squares were but one square metre, only a portion of the whole lens could be seen in any one section. These lenses can be seen at the very top of the deposit (filled with sterile soil) and as shell-filled lenses in Figs 12:6 and 12:7, and Plate 12:3b. Therefore, it appears as if the pits were either filled with sterile soil at ground level or with loose midden as the deposit accumulated around and over them. Hut-pits, therefore, presumably were excavated throughout the history of the midden's occupation. Comparison has already been made with the Tasmanian site of West Point (above), but although it has not been indicated before, a closer study of Plate 3 as produced by Jones (1966) reveals similar saucer-shaped stratigraphic lenses in the excavated sections of that site also.

While these above structures are interesting features in themselves and tell us much about the domestic and demographic (see below) aspects of these sites, they also present problems for the excavator. They point to a considerable amount of prehistoric adulteration, which must be taken into consideration when methods of excavation of these sites is being contemplated. Other related problems also come to mind, such as the presence of non-human predators, for example the dingo (see below) which would have been an added source of interference of both structural and organic remains. These broader problems concerning the nature of archaeological remains have been broached by Schiffer (1976). It is often easy to avoid considering such problems as the above when attempts are being made to directly translate the archaeological data into models of economy and behaviour (see also below).

With these reservations in mind we can generally conclude that a number of activity areas have been defined by stratigraphic features throughout the Seal Point deposit: (a) hut-pits; (b) hearths and
hearth-floor complexes; (c) well-trodden living areas; (d) loose, porous midden dumps. Other activities such as the butchering and consumption of mammals, and industrial areas such as flaking floors, were more difficult to isolate although concentrations of both flaked stone and bone could be considered as indications of these. The latter mainly occurred in association with well-worn living floors rather than loose shell dumps, as would be expected. It could be assumed from this lack of clear patterning that admixture of activity areas frequently took place at the site thereby blurring the distinction between separate functions and areas.

As has been mentioned, upon the hillock at ground level was a cluster of circular depressions. Figure 12:3 shows ten of these, however, there may have been as many as 13, including one extra on the apex of the hillock and two others on the terrace below Pits E and B. These last three were not as distinct as those located on the above plan, and so I have omitted them. The latter may also have represented earlier (older) pits, although this is difficult to determine. In size the pits measured about two metres in diameter, and at ground level they appeared to be less than 20 centimetres in depth. Upon excavation (Pit E) it was found that one of these structures was only about 12-15 centimetres deep. This excavation indicated that recent soil had filled in the depressions to quite a degree. This recent infill was composed of a deep black soil devoid of shell and other midden material. It therefore must have post-dated the occupation of the site, and can plausibly be linked to recent ploughing. This ploughing could also probably explain the overall shallowness of the pits, for the comparative Tasmanian example are on unploughed ground and are deeper than those at Seal Point and are surrounded by a rim or talus of midden refuse (also pers. comm. Don Ransom). Ploughing at Seal Point would have flattened any such rim that may have been present around the pits, and also may have been responsible for the very faint second complex of depressions lying to the west of the hillock. The excavation of Pit E also revealed a group of sandstone blocks towards the centre of the presumed hut-pits, which may have represented a stone sub-structure of a hearth subsequently disturbed by the plough. It was not possible to clearly distinguish bone and flaked stone material upon this floor with that from the underlying midden layer.

In shape these pits resemble the hut-pits described by Robinson
(Ch.7) in which durable domed wattle and daub structures were built and which were used as open camping places. Given the equally, blustery climate of Cape Otway (even in mid-summer) it would be in order to presume that huts were constructed also within such structures at Seal Point. This settlement pattern of a group of closely packed huts resembling a small "village", also closely fits the ethnohistorical data (Ch.7). Dawson's description is most apt:

When several families live together, each builds its wuurn facing one central fire. This fire is not much used for cooking, which is generally done outside. Thus in what appears to be one dwelling, fifty or more persons may be accommodated, when, to use the words of the aborigines, they are 'like bees in a hive'.

(1881:10)

The hearth complex in the area of Pits I and J may be partially explained by Dawson's account.

Such a hut complex also enables an approximate estimation of population to be made. This assumes that all huts are contemporary which may not altogether be the case for one of the 10 pits indicated around the hillock slightly overlaps another two pits. The remaining 9 pits however, are clearly set apart. If we assume an approximate occupancy of 8 persons per hut as was mentioned by Robinson (Ch.7) then a group of c.9-13 huts would approximate a population of around 70-100 persons. Such an estimate must also take into consideration the unstable nature of hunter-gatherer group sizes (see Chs 3, 6, 7) where continual turnover of population is occurring and where groups wax and wane according, among other things, to resource availability. As well, more or less than 9 or 10 huts may have been occupied at any one time, and these may have also included visitors using temporary accommodation which would be more difficult to detect archaeologically. In spite of all these qualifications the structural evidence does provide us with a pattern of settlement and an approximate model of the population structure of the site. The latter I would consider as a more accurate estimate than one attempted from an analysis of the dietary potential of the site's faunal remains. The structural evidence suggests that at Seal Point there was a core-group of c.70-100 people, a figure closely approximating the average size of bands in the Western District (Ch.4). It would not therefore, be too unreasonable to suggest that this large site formed a seasonal coastal base camp of the local Cape
Otway band. This hypothesis can be tested further by an analysis of the archaeological data from the site (below). The extensive size of the site could be explained by assuming that such "villages" or bases were periodically relocated at different places along the cliff-top overlooking Crayfish Bay. Aboriginal groups relocated their huts and camps for a variety of reasons, including death, sickness, hygiene. In this case we must also include structural reasons for it would not have been possible to accumulate the bulk of midden material from this huge site, except in such a linear fashion. The apparent existence of a second, less distinct, pit cluster to the west of the hillock, supports this general site-settlement model.

Vertebrate Faunal Remains

Analytical Procedure

The vertebrate fauna from Pits D, F, G, I and J has been analysed in two ways - by weight and by the estimation of minimum numbers of individuals. These procedures are carried out for each vertebrate faunal sub-grouping: land mammal, marine mammal, fish, bird and reptile. Before weighing, all faunal remains were washed and dried to remove dirt, charcoal and shell fragments adhering to them. The remains were then subdivided into the above groups and weighed separately. Calculations of weight were made for each sub-group in each spit. This was done so for the five abovementioned pits.

Minimum numbers of individuals were estimated by selecting diagnostic and frequently occurring bones of individual species or families. Maxillae, mandibles and teeth were the most numerous and easily recognisable remains and have been used the most frequently in the analysis. More than one anatomical feature was often chosen to isolate individuals because of the low frequency of single bones. In the application of all minimum number techniques one key problem arises, that of spatially isolating an individual within the sample. Due to both depositional and post-depositional factors individual carcasses or parts of these can be scattered far and wide, on both vertical and horizontal planes. To adequately overcome this problem a thorough study of the post-depositional structure of each site and sample would have to be carried out. In this analysis due to the constraints imposed by the project, I have only partially
confronted this problem. In order to retain a measure of control over the analysis and to achieve a certain uniformity, I have estimated minimum numbers in the following way. The material from each pit was treated separately, and within pits the diagnostic parts pertaining to an individual were arbitrarily taken to lie within a unit of three 10 centimetre spits. Each pit was not, however, merely divided into faunal units of 30 centimetres depth. Instead, each individual was treated separately and its relevant diagnostic bones taken to lie within the above arbitrary volume. To have considered depths greater than 30 centimetres, except where intrusive structures such as pits were evident, would have been inconsistent with the stratigraphy of the site.

While this method has attempted to overcome the problem of spatial distribution of individual remains within pits it has not taken into consideration, with the exception of seal, their distribution between pits. The combined minimum number results from Pits F, G, I and J (Table 12:1) therefore are an addition of the results from each separate pit. In some ways, therefore, these combined results will tend to over-represent certain individuals who may have been distributed more widely across more than one pit. This tendency would be offset in part by my selection of a 30 centimetre depth cut off point. The selection of a smaller volume for analysis would have compounded the problem still further.

The seals were treated separately. Their large size and consequent lower number of individuals necessitated the amalgamation of all four pits for an analysis of their minimum numbers. The results therefore, of the estimated numbers of seals and those of the other vertebrate faunal sub-groups, are not directly comparable. For the latter groups are presumably slightly over-represented. This would not be true of the minimum numbers of the labrid fish which are based on the calculation of only one bone, the pharyngeal. A more accurate comparison of representative proportions of all faunal sub-groupings in this case would be that based on weight of bone. The weight of all faunal classes is to be found on Table 12:2.

It should be pointed out here that both these variables - weight and minimum numbers, are dealing with the products of both depositional and post-depositional factors as well as the analyst's sampling and methodological techniques (see Schiffer, 1976:42). In this way they are
<table>
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<th>Species</th>
<th>F</th>
<th>G</th>
<th>I</th>
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<tr>
<td>medium</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>small</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td><strong>Kangaroo-rat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Bettongia sp.</em></td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Koala</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Phascolarctos cinereus</em></td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Ring-Tailed Possum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pseudocheirus peregrinus</em></td>
<td>10</td>
<td>9</td>
<td>13</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td><strong>Brush-Tailed Possum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Trichosurus vulpecula</em></td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td><strong>Possum (unspecificated)</strong></td>
<td></td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Bandicoot</strong></td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><em>Peramelidae sp.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rat (Rattus spp.)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>large</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>small</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td><strong>Marsupial Mouse</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Dasyuridae sp.</em></td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td><strong>Dingo</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Canis familiaris</em></td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>27</td>
<td>28</td>
<td>25</td>
<td>12</td>
<td>92</td>
</tr>
</tbody>
</table>
Table 12:2  Weight (gms) of Vertebrate Faunal Remains - Seal Point - Pits F, G, I, J

<table>
<thead>
<tr>
<th>Spit</th>
<th>Level (cm.)</th>
<th>Seal</th>
<th>Land Mammal *</th>
<th>Fish</th>
<th>Bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>0</td>
<td>247.6</td>
<td>27.3</td>
<td>15.7</td>
<td>1.5</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>303.9</td>
<td>91.3</td>
<td>50.4</td>
<td>1.7</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>351.1</td>
<td>51.5</td>
<td>75.9</td>
<td>4.3</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>285.2</td>
<td>76.5</td>
<td>93.8</td>
<td>1.4</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>219.6</td>
<td>56.4</td>
<td>33.9</td>
<td>0.7</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
<td>263.9</td>
<td>34.4</td>
<td>54.1</td>
<td>4.3</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
<td>536.8</td>
<td>26.6</td>
<td>18.7</td>
<td>3.7</td>
</tr>
<tr>
<td>7</td>
<td>70</td>
<td>710.8</td>
<td>39.0</td>
<td>22.6</td>
<td>1.9</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
<td>997.1</td>
<td>38.4</td>
<td>34.4</td>
<td>0.4</td>
</tr>
<tr>
<td>9</td>
<td>90</td>
<td>508.0</td>
<td>25.5</td>
<td>72.9</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
<td>270.8</td>
<td>34.2</td>
<td>24.5</td>
<td>3.4</td>
</tr>
<tr>
<td>11</td>
<td>110</td>
<td>84.0</td>
<td>11.6</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>120</td>
<td>42.0</td>
<td>16.4</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>13</td>
<td>130</td>
<td>30.8</td>
<td>2.1</td>
<td>-</td>
<td>0.3</td>
</tr>
</tbody>
</table>

* includes reptile
quite a few steps removed from the desired information on prehistoric economy and diet. I employ these procedures here, therefore, as an approximate indication of changes of frequency within and between the various faunal classes over time. While doing so I have attempted to maintain a certain internal consistency of method. Having considered these data at this level, I only then proceed to discuss them in relation to economy.

Land Mammals

Possums are the most densely represented sub-group within the land mammals. Two main species are included, the Brush-Tailed Possum (*Pseudocheirus peregrinus*), and the Ring-Tailed Possum (*Trichosurus vulpecula*). Within the Cape Otway region, however, one other species, morphologically very similar to the latter, may also have resided, namely the Greater Glider (*Schoinobates volans*). Working from limited comparative collections I found it extremely difficult to clearly distinguish between the two latter species so I have included within the Ring-Tailed Possum category the possibility that the second species, the Greater Glider, may also be represented. Minimum numbers were estimated on the basis of maxillae and mandibles of these species. Other anatomical parts of both species were also included within the sample.

Of the total sample analysed (Pits F, G, I and J) possums consisted of 50 individuals which is 54% of all land mammals. Of these, Ring-Tailed Possum is represented by 36 individuals (39% of land mammals), and Brush-Tailed Possum by 13 (14%). Also included is one unspecified individual possum.

Macropods (*Macropodidae*) make up the second largest sub-group within the land mammal category. Unlike the possums whose various anatomical parts were well represented within the sample, the macropod remains, especially those of larger individuals, are more fragmentary. I have estimated minimum numbers from maxillae, mandibles and teeth (mainly incisors), but as well broken macropod longbones or parts of these have an even wider distribution throughout the sample. In a very few cases (i.e. four) I have also used longbones in estimating minimum numbers when other pieces were unavailable. Maxillae and mandibles were often fragmented and because of this I was unable to accurately identify the species of most
of the macropods, which consisted of Wallabies (*Wallabia*). In order to extract more information from these fragmentary remains I have grouped the wallabies in size classes, small, medium, large. The large category would be equivalent to an adult male Red-Necked Wallaby (*Wallabia rufogrisea*). Because I was unable to clearly distinguish between the wallabies and the larger Grey Kangaroo (*Macropus major*), individuals of the latter may be within the sample which I was unable to detect.

One individual Brush-Tailer Rat-Kangaroo (*Bettongia sp.*) was also included within the macropod group in the sample. The mandible was used as the distinguishing characteristic in this case. In all, macropods consist of 16 individuals or 17% of the total sample of land mammals.

The next group of any significant representation within the land mammals were species of rat (*Rattus*). Mandibles and maxillae together with the distinctive lower incisor teeth, were used in the detection of these individuals. I have roughly attempted to break down this group even further, into large and small individuals.

The remaining species of land mammals were represented by fewer individuals. These include: the Koala (*Phascolarctos cinereus*), which was detected from a mandible and molars (3 individuals); species of Bandicoot (*Peramelidae*), recognised from mandibles and maxillae (4 individuals); Marsupial Mouse species (*Dasyuridae*), detected by a mandible and a tibia (2 individuals).

**Marine Mammals**

Marine mammals in the sample (Pits F, G, I, J) have been identified as belonging to two species of seal, the Australian Fur Seal (*Arctocephalus pusillus doriferus*) and the Southern Elephant Seal (*Mirounga leonina*). This material has been identified and analysed by Dr David Horton of the Australian Institute of Aboriginal Studies.

Of the Fur Seal remains the most commonly represented were canines and post-cranial bones. Both of these were used for the estimation of minimum numbers, and the reason relates to the stratigraphical distribution of the remains (Table 12:3). All canines were distributed in the upper half of the midden (spit 7-1) while only in the lower half were post-cranial
<table>
<thead>
<tr>
<th>10 cm Spit</th>
<th>Excavated Spit</th>
<th>Age</th>
<th>Sex</th>
<th>Minimum No.</th>
<th>Diagnostic Bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G1</td>
<td>yearling</td>
<td>M</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>I2</td>
<td>very old</td>
<td>M</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>12</td>
<td>F</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>I4</td>
<td>very old</td>
<td>F</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>5</td>
<td>F10</td>
<td>?</td>
<td>F</td>
<td>&gt;1</td>
<td>PC</td>
</tr>
<tr>
<td>6</td>
<td>F10</td>
<td>yearling</td>
<td>F</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>7</td>
<td>J6</td>
<td>yearling</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>J7</td>
<td>very young (pup)</td>
<td>?</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>9</td>
<td>I7</td>
<td>?</td>
<td>F</td>
<td></td>
<td>PC</td>
</tr>
<tr>
<td>10</td>
<td>G16</td>
<td>yearling</td>
<td>?</td>
<td>1</td>
<td>PC</td>
</tr>
<tr>
<td>11</td>
<td>G19</td>
<td>?</td>
<td>F</td>
<td></td>
<td>PC</td>
</tr>
<tr>
<td>12</td>
<td>J10</td>
<td>yearling</td>
<td>?</td>
<td></td>
<td>PC</td>
</tr>
<tr>
<td>13</td>
<td>J11</td>
<td>mature (c.7 yrs)</td>
<td>M</td>
<td>1</td>
<td>PC</td>
</tr>
</tbody>
</table>

Total: 9

M = Male
F = Female
C = Canine
PC = Post Cranial
<table>
<thead>
<tr>
<th>10 cm Spit</th>
<th>Excavated Spit</th>
<th>Age</th>
<th>Sex</th>
<th>Minimum No.</th>
<th>Diagnostic Bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F1</td>
<td>c.3 yrs</td>
<td>M</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>G3</td>
<td>c.3 yrs</td>
<td>F</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>3</td>
<td>G5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>J3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>F9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>F9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>F9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>J5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
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<tr>
<td>6</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>J7</td>
<td>c.1 yr</td>
<td>F</td>
<td>-</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>G13</td>
<td>c.1 yr</td>
<td>M</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>F13</td>
<td>c.1 yr</td>
<td>F</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>G13</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td>8</td>
<td>G14</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td>9</td>
<td>I9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>I9</td>
<td>c.3 yrs</td>
<td>F</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>G16</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>I9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td>10</td>
<td>F18</td>
<td>c.3 yrs</td>
<td>F</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>G18</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>I10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>J10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td>11</td>
<td>J11</td>
<td>c.3 yrs</td>
<td>M</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>G21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td>G21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td>12</td>
<td>G23</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>OC</td>
</tr>
<tr>
<td>13</td>
<td>G24</td>
<td>c.1 yr</td>
<td>M</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Total: 8

M = Male
F = Female
C = Canine
OC = Otic Capsule
remains found. Such a distribution has two explanations: (a) that remains of individual seal were very widely scattered across the site; (b) that there was significant upward and downward movement of material. As there does not seem to be evidence to support the latter the first explanation would in this case appear the more plausible. Therefore the selection of only one bone category (canine or post-cranial) in this analysis would have produced misleading results.

Of the Elephant Seal remains two diagnostic parts were more plentiful - canine teeth and otic capsules. I have used the former in this estimation of minimum numbers, for they also provide information on the age and sex of individuals. The canines however were often poorly preserved, and so only approximations of age and sex has been attempted. Otic capsules which are located in the area of the ear, are numerous distributed throughout the site. Otic capsules in an individual occur in pairs, so in an analysis left and right capsules are distinguished. This procedure is complicated by the fact that capsules often appear broken and that these fractures can take place in two different ways. In Table 12:4 I have included the distribution of otic capsules together with canines, although I have not provided full details of the former. The reason for this relates to the overall distribution of Elephant Seal throughout the deposit which would have been obscured if only canines were considered.

In both Tables 12:3 and 12:4 I have included Horton's estimation of age and sex gradings for each species. These results demonstrate the following. Of the minimum number of 9 Fur Seals the age/sex distribution was: 1 pup, sex unknown; 4 yearlings, 2 male, 1 female, 1 of unknown sex; 2 mature individuals, a male and a female; 2 very old individuals 1 male, 1 female. The minimum number of Elephant Seals was 8 and their age/sex distribution was the following: 3 yearlings, 2 male and 1 female, 5 individuals of approximately 3 years of age, 2 males and 3 females. These results for both Fur and Elephant Seal are discussed below.

Preservation of seal bone, it should be mentioned, was relatively poor throughout the site. Due to its light porous nature, damp seal bone, once exposed by excavation dried quickly and broke up into a mass of honeycombed pieces. The smallest of these pieces simply passed unnoticed through the sieves, thereby lowering the overall weight count. Recognition
of much bone was also thereby lost which must have influenced estimates of minimum numbers of seals. As well, evidence of seal bone, in whatever condition, was plentiful in all spits excavated.

Fish

Remains of fish were well preserved including delicate fish scales. Four species of fish occur in the sample and of these the most numerous was the Wrasses ("parrot fish", Labridae). Minimum numbers for the wrasses were estimated by counting the number of pharyngeal bones (see Leach and Anderson 1978:5) found in the sample. The results of this analysis can be found on Table 12:5. There are an estimated 91 wrasse individuals which make up 85.8% of the total individual fish in the sample.

Black fish (Luderick; Girella tricuspidata) were represented by 8 individuals or 7.5% of total fish. The remaining two species were even more sparsely represented: Leatherjacket (Aluteridae spp.) 3 individuals (2.8%); Bream (Acanthopagrus butcheri) 2 individuals (1.9%). Minimum numbers of Black fish and Bream were estimated from the dentary and premaxillary respectively and Leatherjacket from its dorsal spine.

The distribution of the species was also of interest. Blackfish and Bream only occur in the top half of the deposit between spits 2 and 6, while Leatherjacket occurs only in the lower half between spits 12 and 13. This distribution may be the result of the small size of the sample (apart from the wrasses), but in any case this issue is raised again below.

Birds

Very few and fragmentary remains of bird occur in the sample. So small is the bird sample that it does not register on the main comparative graph (see below) but can be found instead on Fig. 12:10. The fragmentary nature of the bone does not allow for identification by species.

Reptiles

Six individual reptiles have been recongised in the deposit although this material also did not allow for identification by species. Individuals were detected by the ball and socket of the reptilian vertebra, and minimum numbers were estimated by the stratigraphic distribution of these.
<table>
<thead>
<tr>
<th>Species</th>
<th>F</th>
<th>G</th>
<th>I</th>
<th>J</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parrot fish (Labridae)</td>
<td>31</td>
<td>21</td>
<td>15</td>
<td>24</td>
<td>91</td>
<td>85.8</td>
</tr>
<tr>
<td>Bream (Acanthopagrus butcheri)</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1.9</td>
</tr>
<tr>
<td>Black fish (Girella tricuspidata)</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>7.5</td>
</tr>
<tr>
<td>Leatherjacket (Aluteridae spp.)</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2.8</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1.9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>106</td>
<td>100</td>
</tr>
</tbody>
</table>
Dog

Dingo (*Canis familiaris*) individuals were detected from teeth and minimum numbers were estimated from their stratigraphic distribution. Three individual dingos were found in the sample.

Invertebrate Faunal Remains

Shellfish

In carrying out the shell analysis on the Seal Point sample I have followed certain procedures of midden analysis which have been developed in the Australasian region, in particular New Zealand and Tasmania (Coleman, 1966; Terrell, 1967; Lourandos, 1970; Jones, 1971a; Bowler, 1979). As I have already elaborated on these procedures elsewhere (Lourandos, 1970) I will only summarise here. Column samples were taken from the Seal Point site from Pits F and D. These samples consisted of fixed volumes in this case 5 x 5 x 25 centimetres, excavated at chosen levels from each pit. The samples were solid, that is consisting of the total matrix and its constituents. No material was removed from the sample before it was bagged. Given the overall size of the site, and the small number of pits analysed, the few samples taken in this way could only be expected to yield general results in terms of the site as a whole.

In the laboratory each sample was treated according to a standard procedure. The samples were firstly dehydrated, in this case air dried, all at the same temperature. This was to remove any moisture that the samples may have contained before they were sieved and weighed. I have attempted to conform to the call for standardising the sieve fractions used in this form of analysis (see Bowler, 1979) and in this case I have used a nest of three sieves of 6 mm, 3 mm and 1 mm fractions. At the time of analysis I was unable to obtain the larger 12 mm sieve, and so omitted this step in the procedure. This omission does not affect the results obtained here.

Each sample was then passed through the nest of sieves, and the contents of each fraction, in this case four, were analysed and weighed. The fourth fraction was the residue of the 1 mm fraction. The results of this analysis follows. As I am not attempting to carry out a detailed analysis here, I have concentrated upon the larger fraction of 6 mm.
A discussion on the total midden composition which involves all four fractions, has already been referred to above, and so here I will merely discuss the shell sample.

The most detailed analysis has been carried out for Pit F. The proportional distribution of the main shellfish species determined from Pit F can be found on Fig. 12:11, and the list of main shellfish species together with their weights and minimum numbers on Table 12:6. I will merely be concentrating here upon weights as an indication of the representation of each species (see Terrell, 1967) but I have also included the estimated minimum numbers for those who may be interested in this variable. The minimum numbers for the individual species have been estimated in the following way. For Turban (*Subninella undulata*) I have calculated by counting the number of opercula present; for Mussel (*Brachidontes rostratus*) I have used the hinge; Cellana (*Cellana spp.*) the top or apex of the shell; and for Chiton (*Chitonida*) the end plates. The remaining species were in smaller quantities and caused few problems in the calculation of individual members.

Figure 12:8 shows that the most populous shellfish category as determined by weight, is that of subninella, which made up between 53% and 70% of the sample. In this case the sample includes all shellfish plus stone, bone and charcoal. Cellana was the next most represented species (13-19%); followed by abalone (1-18%); mussel (1-13%); and all other shellfish species combined (1-6%). A similar proportional distribution can also be gauged from the weight of shellfish species in Pit D samples (Fig.12:12). That this distribution holds equally true for both Pits F and D is supporting evidence for applying these conclusions generally to the sample (and perhaps site) as a whole. The evidence also indicates selectivity of species especially in the case of subninella. The low representation of abalone, which in fact diminishes over time, appears to be an indication of avoidance by choice. For even today abalone are fished from the reefs near the site and are quite plentiful, while subninella are numerous in exposed rock pools at low tide. Abalones on the whole are hidden beneath rocky ledges and in many cases would have to be dived for. This difference would help to explain why preference was expressed for the one (see also below).
Fig. 12:11 Shell Pit F 6 mm fraction.

Fig. 12:12 Shell Pit D 6 mm faction

A = Subrinella; B = Cellana; C = Mussel;
D = Abalone.
<table>
<thead>
<tr>
<th>5 cm Spit</th>
<th>Subrinella undulata</th>
<th>Cellana spp</th>
<th>Brachidontes rostratus</th>
<th>Notahaliots ruber</th>
<th>All other Shell</th>
<th>Bone/Charcoal</th>
<th>Stone</th>
<th>Total Weight</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>weight</td>
<td>%</td>
<td>weight</td>
<td>%</td>
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<td>%</td>
<td>weight</td>
<td>%</td>
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<tr>
<td>2</td>
<td>1,250.0</td>
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</tr>
<tr>
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<tr>
<td>16</td>
<td>865.0</td>
<td>67.6</td>
<td>160.0</td>
<td>12.5</td>
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<td>14.0</td>
<td>0.7</td>
<td>350.0</td>
<td>17.6</td>
</tr>
</tbody>
</table>
In general, therefore, it can be seen that the shellfish from the site are all ocean rock-platform species, and thus could have been collected from reefs lying immediately below the site. The extensive size of the entire midden together with its relatively short time-span, however, suggests that shellfish also may have been gathered from a much wider series of rocky reefs such as those which line the Otway coastline.

**Crustaceans**

Crustaceans were recognisable from the tips of claws as well as from a number of other plates. These remains were distributed throughout the deposit and in most spits. Division into species and minimum numbers has not yet been carried out.

**Stone Assemblage**

Stone material was particularly abundant throughout the excavated sample. I have divided the assemblage into two groups, that of Flaked Stone, in which I include all fine-grained siliceous stone, and that of Sandstone, which includes all coarse grained material derived from the local calcareous sandstone. Before I discuss these two categories, however, I will firstly look at the raw materials of which the assemblage is composed.

**Raw Materials**

The siliceous stone assemblage can be further divided into three main categories: flint, quartz and quartzite. All three raw materials appear to be of local origin and are easily available. Water worn, fist-sized nodules of flint can be picked up along the rocky foreshores of the Otway peninsula. Flint in nodule form is derived from limestone deposits that make up much of this western Victorian coastline and nodules are often washed up and therefore easily accessible along the beaches. On these beaches I also came across water worn cores in pebble form of quartz and also quartzite.

I have estimated the weights of these raw materials from Pits G, F, and I (Table 12:7). Proportionally flint was the most numerous siliceous stone throughout the deposit making up 49.3% of the total sample analysed, with quartz (38.2%) and quartzite (12.5%) coming in second and third place (Table 12:8). The distribution of these three materials (Fig.12:13) indicates that these proportions were in general maintained throughout the site's period of occupation. This graph also shows fluctuations in the materials at different times, the most noticeable feature being the proportional increase of both flint and quartz between spits 11 and 7. In terms of weight however, the most plentiful stone material in the site was
<table>
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<tr>
<th>Raw Materials</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flint</td>
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<td>564.7</td>
<td>328.9</td>
<td>283.6</td>
<td>628.2</td>
<td>421.9</td>
<td>464.5</td>
<td>907.6</td>
<td>515.1</td>
<td>442.8</td>
<td>280.5</td>
<td>188.9</td>
<td>277.3</td>
<td>209.6</td>
<td>6088.6</td>
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<td>Quartzite</td>
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<td>99.1</td>
<td>194.7</td>
<td>112.9</td>
<td>17.9</td>
<td>180.5</td>
<td>79.2</td>
<td>171.3</td>
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<td>57.0</td>
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<td>Quartz</td>
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<td>218.6</td>
<td>307.1</td>
<td>288.3</td>
<td>379.6</td>
<td>548.9</td>
<td>601.2</td>
<td>641.4</td>
<td>676.2</td>
<td>229.9</td>
<td>121.6</td>
<td>44.0</td>
<td>126.7</td>
<td>4719.9</td>
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<td>Calcareous Sandstone</td>
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<td>2078.9</td>
<td>2006.1</td>
<td>3442.1</td>
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<td>1483.7</td>
<td>2814.5</td>
<td>22067.8</td>
<td>5699.9</td>
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<td>0.1</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>23.3</td>
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<tr>
<td>Misc.</td>
<td>9.1</td>
<td>18.0</td>
<td>-</td>
<td>-</td>
<td>59.7</td>
<td>11.5</td>
<td>9.1</td>
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<td>14.2</td>
<td>11.0</td>
<td>19.8</td>
<td>12.0</td>
<td>202.0</td>
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</table>
Fig. 12:13. Weight of Flaked Stone Raw Materials. Pits G, F, I.

Fig. 12:15  Frequency of Bipolar Fracture on Raw Materials:
A = Quartz; B = Flint; C = Quartzite.
local calcareous sandstone (acolianite). Figure 12:14 presents the distribution by weight of all sandstone artefacts together with those of flakes stone (flint, quartz, quartzite) (Tables 12:7, 12:8). Sandstone, which is derived from the local limestone is found in the immediate area in a variety of forms, from rather soft flaking material to quite strong and more densely compacted stone. It was the latter that was more often found in the deposit and all pieces which appear to have been used or modified in some form were of this type of material. I must add that not all the sandstone material from the deposit was collected as this would have entailed a sizeable quantity which would have provided considerable problems involving transportation and storage. I chose instead to retain only pieces which, in the field, appeared to have been modified in some way before or during use. Pieces of red ochre were also found throughout the deposit. These tended to be quite tiny (less than 1 mm square), although a few larger pieces were also found.

Flaked Stone

Although abundant throughout the site the flaked stone assemblage is composed of but few typological categories. Its main characteristics are a high waste content (primary flakes and cores), and a very low representation of retouched and utilised pieces. The sample analysed here has been derived from Pits F, G and I.

I have categorised this assemblage in the following way. The total sample was firstly divided into three main groups - cores, flakes and a third group which I was forced to introduce and which I have called core-fragment. The first two categories conform to standard definition, a core being the parent body from which smaller fragments of stone (flakes) were derived. Cores bore signs of flake scars and negative bulbs of percussion. Flakes were recognised by the bulb of percussion and by their conchoidal appearance. The nature of the raw material (described below) was such, that a clear-cut definition between these two categories was not always possible. Cores, upon impact, could shatter into a number of fragments not all of which conformed to the above description. Because of this I had to devise the intermediary category of core-fragment. Semantically flakes are of course also fragments of a core, but in this case I have used the term flake quite specifically as defined above. The category core-fragment was a

FIG. 12:14
Table 12:8  Proportional Weight of Siliceous Stone Materials - Seal Point - Pits F, G, I

<table>
<thead>
<tr>
<th>Raw Materials</th>
<th>Total Weight</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flint</td>
<td>6,088.6</td>
<td>49.3</td>
</tr>
<tr>
<td>Quartz</td>
<td>4,719.9</td>
<td>38.2</td>
</tr>
<tr>
<td>Quartzite</td>
<td>1,543.7</td>
<td>12.5</td>
</tr>
<tr>
<td>Total</td>
<td>12,352.2</td>
<td>100</td>
</tr>
</tbody>
</table>
more ambiguous one into which all pieces not readily classifiable as either core of flake went. Core-fragments were chunky, somewhat like cores themselves, and bore a number of negative flake scars. It was not possible to determine however, whether these were the core nuclei themselves or parts of cores shattered during percussion. Experiments with similar raw materials (mainly flint) which had been collected in the area showed the latter to be the case. Cores would literally break up into a number of chunky fragments after only one blow of a hammerstone. Whereas one flake derived from this blow might bear a bulb of percussion, the remaining flakes and core-fragments did not show these signs at all as they had not come directly in contact with the hammerstone. Because of the nature of this raw material it was extremely difficult to control percussion in terms of the size of flakes desired.

These three basic categories (core, flake and core-fragment) are next divided into a further three groups: bipolar, retouched, and utilised. Bipolar refers to a technique of removing flakes from a core which results in signs of crushing occurring at opposable ends of the core. It is presumed that such cores were rested upon a hard surface such as an anvil, and were then struck from above. Flakes were thereby produced from both ends of the core simultaneously, from the points of contact with the hammer and with the hard surface on which they rested. Cores resulting from this percussion technique are often referred to as fabricators but I have avoided this term preferring the more descriptive bipolar. Flakes also show signs of bipolar fracture. This most often occurs at one end, approximately where the bulb of percussion would normally be situated. Some flakes also show these fractures on opposite ends. Bipolar cores are illustrated on Fig. 12:17.

The bipolar technique is considered to have been used in order to reduce large cores, thus producing sizeable numbers of small flakes. The technique lends itself to this, as in a short time a core can be reduced to a pile of such small fragmentary remains. Experiments that I carried out with similar raw materials to those used in this site, bore this out. The technique is considered by many prehistorians to have been used primarily for the production of quartz flakes, as this raw material is most economically and efficiently flaked in this manner. The mechanical structure of quartz crystals prevents effective flaking of this material.
FIG. 12:16A

SEAL POINT, RETOUCHEO FLAKES

FIG. 12:16B

SEAL POINT, RETOUCHEO FLAKES
Fig. 12:16b

Seal Point,
Retouched Flakes

Fig. 12:17

Seal Point, Bipolar Cores
by the traditional percussion technique (see Dickson, 1977). Lithic assemblages from sites throughout south eastern Australia that have been excavated over the past 15 or so years tend to support this correlation between this bipolar technique and quartz. This association between raw material and technique also holds true for Seal Point. Figure 12:15 and Table 12:1 present the distribution of artefacts by their fracture throughout the site (Pits F and G), and also that the largest proportion of these was made from quartz. In terms of percentage, 78.4% were of quartz, 13.8% of flint and 3.8% of quartzite. These data show that at this site, early humans were creating in this manner other siliceous stones when available. We could assume that here, where the Early man manufacture of stone tools was an important activity and where raw materials are plentiful, the technique was also transferred to other available materials. The flaking qualities of the local flint would also lend themselves to the use of this technique especially if small flakes were the objective.

In support of this interpretation of the connection between quartz and bipolar technique, for this temperate site I have used in this study the Bridgewater Gaves (Ch.13). At that site the lithic assemblage was almost entirely of a local flint. There is no indication of bipolar technique whatsoever on artefacts from this assemblage. Therefore we could conclude that at Bridgewater where quartz is absent so too was bipolar technique. A third possibility also exists, that the production of small quartz core flakes was not a main component of the bipolar method. The Bridgewater Gaves and Bridgewater could therefore be sites for site formation in this case that small core flakes were manufactured at the site.

Retouched artifacts were those which were particularly retouched in some way by further flaking. As in this case we are concerned with very elementary examples, it is not always easy to clearly distinguishing between retouch and other forms of modification. At one end of the range there is a retouch category grades into that of utilisation. As well, retouched pieces also bore signs of utilisation. The derivation of this modification can have a number of
by the traditional percussion technique (see Dickson, 1977). Lithic assemblages from sites throughout south eastern Australia that have been excavated over the last 15 or so years tend to generally support this correlation between the bipolar technique and the use of quartz. This association between manufacture and technique and raw material also holds true for Seal Point. Figure 12:15 and Table 12:9 show the distribution of artefacts with bipolar fracture throughout the deposit (Pits F and G), and also that the largest proportion of these was made from quartz. In terms of percentage, 78.4% were of quartz, 15.8% of flint and 5.8% of quartzite. These results show that at this site, not only quartz was treated in this manner but the other siliceous stone materials also. We could assume that here, where primary manufacture of stone artefacts was an important activity and where raw materials are plentiful, the bipolar method was also transferred to other available materials. The generally poor flaking qualities of the local flint would also lend themselves to the use of this technique especially if small flakes were the objective.

In support of this interpretation of the connection between quartz and bipolar fracture, is the evidence from the comparative site I have used in this study, the Bridgewater Caves (Ch.13). At that site the lithic assemblage was almost totally of a local flint. There is no indication of bipolar fracture whatsoever on artefacts from this assemblage. Therefore we could conclude that at Bridgewater where quartz is absent so too was bipolar fracture. Of course a third possibility also exists, that the production of small flakes was the main aim behind the use of the bipolar method. The absence of both quartz and bipolar fracture at Bridgewater could therefore also be explained in terms of site function, in this case that small flakes were not manufactured at that site.

Retouched artefacts were those which had been modified in some way by further flaking. As in this case we are often dealing with very elementary examples, it is not always so easy to clearly distinguish between retouch and other forms of modification. At one end of the range therefore, the retouch category grades into that of utilisation. As well, many retouched pieces also bore signs of utilisation.

Utilised refers to all other pieces which showed signs of edge modification. The derivation of this modification can have a number of
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<td>5</td>
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<tr>
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<tr>
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</tr>
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<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>75</td>
<td>190</td>
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sources, and again it is not always possible to clearly isolate one from the next. Use of the tools produce a number of wear patterns, detectable at microscopic and macroscopic levels. An entire specialised area of study is now developing around these problems (e.g. Kammenga, 1978). A third possible source of edge damage can be related to secondary or extraneous factors such as treadage and scuffage and general prehistoric wear and tear. In terms of attempting to unravel the functional attributes of the artefacts the latter could be classed as the noise in the system. I have attempted to eliminate a possible fourth cause of edge damage, that of recent adulteration, by wrapping each artefact separately upon excavation, and carefully storing them prior to laboratory analysis.

A final category, Miscellaneous, was included into which all odd bits and pieces, generally broken ends of flakes and cores, were grouped.

The results of this classification are found on Table 12:10. I will now discuss each category of artefact in greater detail.

(a) Cores

Cores were derived from water worn nodules of flint, and from water rolled pebbles of quartz and quartzite. Flint nodules which were more or less complete with few if any flakes detached, tended to have a spongy porous and irregular shape, and were honeycombed with air pockets. The outer patina was chalky to feel, and in appearance, and generally white or off-white in colour. Cores averaged around 8 x 7 x 4 centimetres in dimension, and 150 grammes in weight and therefore were rather small in size. Most examples in the sample, however, are stumps of cores at various stages of reduction and so tend to be smaller then the above model. They average around half that size, and their most obvious characteristic is their chalky white outer patina which is still evident on most examples and which betrays their origin as nodules.

The above description refers to cores reduced by percussion, that is, showing large irregular negative flake scars struck from various platforms and angles around the core itself. Flint bipolar cores and bipolar cores in general tended to be much smaller in size, with the smallest examples being around 2 x 2 x 2 centimetres, and averaging but a few grammes (Fig. 12:17). These smaller cores and bipolar cores did not have any outer
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Table 12:10 Frequency of Flaked Stone Classes - Seal Point - Pits F, G, I
patina present. From this general range of sizes therefore, a plausible sequence of core reduction could be suggested: (1) percussion of flint nodules until the outer patina was removed and cores had been reduced by more than half; (2) further reduction of core until it was little more than the size of a discarded stump, by bipolar fracture. The latter technique would have allowed for the reduction of pieces too small for hand-held percussion. Such an explanation would more appropriately fit the data than to view bipolar cores as tools such as fabricators.

Quartz cores were derived in the main from small water rolled pebbles which had the appearance of a large hen's egg. In general size then, these cores may have been even smaller than the flint nodules. Almost all quartz cores appear to have been reduced by bipolar fracture, and most of the larger quartz flakes or core fragments bore signs of the outer water rolled core surface.

Quartzite is present in smaller quantities than either flint or quartz and like the flint appears to have been reduced from the original water worn pebble stage by percussion and then further reduced by bipolar fracture. The sample, however, was not large enough to confirm this impression.

(b) Flakes

Large flint flakes tended to be irregular in shape and most often had the outer patina on their dorsal surfaces. This is an indication that large flakes were the first stage in the reduction of a core. Smaller flint flakes often bore signs of bipolar fracture. The quartz flakes tended to be smaller than the flint, and almost all had signs of bipolar fracture. The smaller quartz cores were often prone to split while being reduced, and so parts of cores (core-fragments) are quite plentiful.

(c) Retouch

A selection of cores, core-fragments and flakes have been identified as having secondary retouch. The retouched assemblage is only a small one, some 31 artefacts out of a total of 4,203 in the sample. The problems of distinguishing retouch from edge damage, derived from primary manufacture, were at first considerable. My final choice in placing pieces within this
restricted category was a harsh one and artefacts which in any way appeared ambiguous were automatically rejected. In this way what at first appeared to be a sizeable retouched assemblage was whittled down to the present size.

I arrived at certain guidelines by experimenting with the raw materials myself. It quickly became apparent that repeated rejuvenation of cores produced patterns of wear superficially resembling retouch. Upon closer inspection I observed that such rejuvenation in fact produced rather blunted edges and could be described roughly as "bashing". Under the microscope this type of edge wear or damage was quite different from that reported from studies of use wear (e.g. Kamminga, 1978). The latter studies reveal that use wear is visible by a number of features such as edge rounding, use fracturing, etc. Not all of the retouched artefacts in this assemblage in fact showed signs of use wear, but the pattern of their edge modification was quite distinct and fell outside the range of that produced by primary manufacture. Clearly this aspect of lithic studies needs to be further developed, together with an appropriate terminology.

One outcome of this albeit preliminary analysis is to cast a certain doubt upon the conventional archaeological classification of retouched artefacts. A strong note of caution therefore is raised. It seems to me that in regard to these issues we need to go back to basic principles of classification.

(d) Utilised

I have already discussed the definitions behind the category of utilised artefacts and generally how individual artefacts are recognised. For this thesis I have attempted only a most elementary use wear analysis of the retouched and utilised artefacts. A more detailed analysis on these Victorian assemblages will follow. Here the artefacts were examined both macroscopically and microscopically with the use of an electron microscope (see Kamminga, 1978). Next, an attempt was made to isolate some patterns of use wear or edge damage, in order to more closely define the forms of function that the tools served. In this I have been partially successful and the results have been discussed in Chapter 13.

(e) Types

The term type can be defined as a class of things, according to the
standard dictionary definition. In relation to stone tools, however, the term can have two main levels of meaning. Firstly, stone tools are employed by prehistorians to investigate temporal and spatial differences within and between sites and regions. This is generally regarded as the culture-history approach. In this way individual stone tools are viewed as corresponding to cultural markers. Secondly, stone tools are regarded in a technological sense, and thus classes of tools are distinguished according to their function. It is this second approach that is the concern of this study (see also Lourandos, 1970; 1977b).

My main interest, therefore, is to analyse the tools along functional lines and to relate these results to the assemblage as a whole. In this way phases within sites, sites and groups of sites, can be related according to their functional differences. Patterns of activity can thereby be established within and between sites and finally regional models in terms of these variables can be established (Lourandos, 1977b). Such an approach allows for the integration of all variables, faunal, artefact, settlement patterns and the like, and for viewing the dynamic relationships with them.

In the case of the Seal Point stone assemblage these classificatory problems were compounded by the fact that tools as such were only sparsely modified. The only category of flaked stone tools that exists in the assemblage is a series of what can be conveniently classed as scraper edges, and even these have not been retouched or utilised to any marked degree. In focusing upon the scraper edge, rather than the artefact as a whole, I am here following upon the conclusions derived from my own analysis of essentially scraper industries from south eastern Tasmania (Lourandos, 1970) and upon the much more detailed analyses on mainland industries by Allen (1972) and Jones (1971a). The main point at issue here is that the individual scraper edge becomes the unit of analysis rather than other variables associated with the artefact. An individual artefact may also possess more than one scraper edge.

I will now discuss Jones's Tasmanian study in greater depth in order to demonstrate some of the strengths and shortcomings of this type of approach. In his lengthy analysis of the Rocky Cape stone assemblage Jones classified his scrapers according to edge morphology. He thus produced a
number of scraper edge types, for example: round edge scraper, small steep edge scraper, large steep edge scraper, notched scraper etc. His statistical analysis supported his original classification which had been produced intuitively. Jones's classification is clearly useable for cross-cultural purposes as has been discussed above. Difficulties lie, however, in applying his results to technological issues. Jones assumes that his morphological categories also have their technological equivalents. Herein lies the crux of the problem concerning such industries. For it could be asked just what relationship tool morphology has to tool function. Can we accept that the definition of the former will automatically lead to an understanding of what function the tool served?

Recent ethnoarchaeological studies offer some disquieting results. In his study of present day usage of flaked stone, Hayden made a number of important observations (1977b:185). Primary flakes were used in shaving down wooden spear shafts but when these flakes were sharpened or retouched this was often done in a number of different ways even though similar results were desired. Retouched scraper edges, notches and denticulated edges were interchangeably produced in this way, and used to perform the same task. Denticulates were the result of a repetition of notches along one edge. Flakes with the characteristics of burins were used also for the same purpose. Hayden's fieldwork shows therefore that morphological differences in these scraper forms are not necessarily related to functional differences:

All of these can be used for shaving down and sharpening the ends of wooden shaft implements, particularly spears, throwing sticks, digging sticks, adze shafts and even parts of Western Desert spear-throwers.

(Hayden, 1977b:185)

Hayden does allow, however, that the different retouch forms may also have served more specialised functions, for example notches may have been used to sharpen the ends of spears.

Returning to the Rocky Cape assemblage it can be seen therefore that Jones's stylistic categories need not necessarily equate with functional ones. Further problems also come to mind at this point. It could be supposed that between the stages of primary flake and discarded tool there would be a series of intermediary steps each involving stylistic modification of the flake. Presumably an artefact, or in this case tool,
could be discarded at any point in this hypothetical sequence. If we also include within this sequence Hayden's observation of interchangeable edge forms unrelated to function, the range in morphological possibilities is thus widened. A simple flake could therefore be modified in a variety of ways all with the same end in mind. In terms of the archaeological remains that would be likely to result from such a sequence of manufacture, retouch and use, the conclusions are obvious. It could be expected that flaked artefacts would be found archaeologically that bore the same wide range of variation. As well various stages of this technological sequence would be detectable upon the one artefact. This technological model therefore would apply to all sites with a high scraper content.

Turning now to Seal Point with these issues in mind, it is easier to face the problems concerning the retouched flakes. Essentially these problems are the same as those already mentioned and this equally applies to the Bridgewater assemblage (Ch.13). All retouched flaked stone in both sites falls within the range of stylistic variations as have been described by Jones and Hayden. The artefacts consist of a series of scraper edges which also include concave forms, notches and in a few cases denticulates. Because of the problems already mentioned I have decided to treat these forms functionally as one group. Secondly I have begun a use-wear analysis upon them. Thus, here I have eschewed the classical typological analysis which would have been beyond the scope (and given the above problems) of the particular interests of this thesis.

I will now describe the retouched flakes from Seal Point in greater detail. The main forms have been illustrated on Fig. 12:16.

Retouch is present on a wide variety (in terms of shape and size) of flakes, cores and core-fragments. As I have mentioned the artefacts have been only lightly retouched, that is without the removal of many flakes from one edge. Scraper edges of not too steep an angle predominate. By this I mean that retouch or usage has not proceeded, except in a few examples, to the point where the edge is undercut or stepped (see Ch.13). Concave edges, notches, double notches and denticulate forms, are all present. Some artefacts have more than one retouched edge and these consist of a variety of the above forms.
If we employ as a model the technological sequence described above, we could conclude that at Seal Point artefacts were only lightly retouched and subsequently discarded relatively early on in the hypothetical sequence of manufacture and use. The abundance of raw materials at the site presumably would have influenced the above trend. It is also possible that given these plentiful raw materials, flakes were used and discarded without further retouch. These would be more difficult to detect unless a microscopic edge wear analysis of all flakes were undertaken.

Function of retouched artefacts: the procedures and results of the preliminary use wear analysis are discussed in the following chapter, and I will only refer to the results here. Few artefacts from Seal Point in fact had noticeable use wear or utilisation fracture. Of the few that did, the patterns of wear were similar to those detected in the Bridgewater assemblage (Ch.13), and from comparative use wear studies this would indicate that light duty wood working, along the lines described by Hayden (above) would have been the most likely function performed. As well, notched scrapers may at times have been used to sharpen up spear tips, as is also suggested by Hayden.

Therefore, in terms of activities performed at the site, it could be inferred that retouched flaked tools were used for the manufacture and maintenance of wooden tools.

The low frequency of retouched tools and their elementary form is an indication of their infrequent use at the site. Wooden tools also could have been made elsewhere and then transported to the site. But if we are to infer that Seal Point is a base camp and was subject to relatively high levels of sedentism we must also allow for the maintenance of tools actually used in relation to activities carried out at the site. A closer inspection of the subsistence activities will help to clarify this point. A quick overview of the site's economy indicates that few subsistence activities needed specialised wooden equipment. The collection of shellfish did not require such implements. Digging sticks of course would have been used in plant collection and clubs in the capture of possums, koalas as well as the small land mammals and reptiles. Seal also could have been easily taken with a club (see Hiatt, 1967-8, for a description of sealing by Tasmanian Aborigines). Depending on the methods used in fishing, spears
may have been employed in this task. Therefore it was only in the taking
of larger game, e.g. wallabies, that spears would have been necessary and
perhaps also for fishing. The hunting of such game, as has been shown,
was not a major preoccupation at the site.

On this evidence therefore it might be opportune to suggest that
the low percentage and elementary form of retouched artefacts at Seal
Point, in some ways correlate with the relatively infrequent maintenance
and use of equipment necessary for hunting, such as spears etc. Of course,
other wooden artefacts could also have been manufactured at the site, for
example, elaborately decorated shields, clubs and spears, which were
commonly used for display and combat throughout Victoria (see Smyth, 1876,
1:330-9). This possibility, however, through lack of supporting data,
will have to be left unexplored.

Results

On the basis of the frequency of flaked stone categories some
general statements concerning the whole assemblage can now be made. Of
the total assemblage (excluding retouched, utilised artefacts) 3,592
artefacts (85.5%) were flakes which were derived from primary and secondary
working, and 464 (11%) were cores or core fragments. Of these cores and
core-fragments 210 or 5% of the total assemblage displayed signs of bipolar
fracture. Therefore 96.5% of the total assemblage consists of primary
manufacturing debris of cores and flakes which would normally be placed
in the category of waste. Added to this is 2.4% of miscellaneous material
which are either the products of primary manufacture and/or use. Of the
total sample of 4,203 artefacts, therefore, only just over 1% were of
retouched and utilised pieces.

The occurrence of this large percentage of primary lithic debris
needs to be discussed further. At first glance this dichotomy between
high wastage and low utilisation is perplexing, but this dilemma becomes
less troublesome once the nature of the raw materials themselves are more
closely considered.

Apart from the fact that a sizeable proportion of the assemblage
is derived from quartz, which is itself a difficult raw material to work
with, the predominant influencing factor is the quality of the local flint.
Upon closer inspection of waste core and flake material, and following upon experimentation with flint collected from the environs of the site, the following features emerge. The flint nodules have quite a large range of variation in terms of their quality as a flaking medium. This ranges from very inferior to excellent grades. Unfortunately the former appears to be most numerous. Much of the flint contains carbonate inclusions, some of which are quite sizeable, and range up to one centimetre or more in diameter. These features create internal weakness in the material which then flakes with unpredictable and irregular fracturing. Flakes with unusual fracture surface morphology are thus produced. As well, flint nodules are heavily weathered as has been mentioned, their outer surface covered with a thick chalky patina. This feature together with the internal carbonate inclusions quite often results in almost useless material, which can only be evaluated once reduction of the core has taken place. The end product, given this situation, is of a high wastage factor with the only compensation being the general abundance and easy availability of the raw materials.

Seal Point could therefore be seen as a factory site adjacent to local stone quarries, the beaches, where flint and quartz and to a lesser extent quartzite blanks were produced. The proximity to sizeable quantities of raw materials and their generally inferior quality resulted in a very high proportion of lithic industrial waste. Given the nearness of the raw materials and the relatively affluent economy of the site or base camp (discussed below), transportation of large quantities of raw materials to the site for manufacture may have proven a profitable exercise in spite of a low return. The possibility also exists that quality blanks may have been carried inland or to other coastal and hinterland sites themselves deficient in raw materials. Blanks may also have been traded as was the case for all high grade lithic materials, including flint, throughout western and central Victoria. The poor overall quality of the material would have obviated the transportation of nodules and other large cores from the site, whereas the transportation of quality blanks would have provided an efficient system of distribution.

Edge-Ground Axes

Two edge-ground artefacts were excavated both fitting the category of edge-ground axe.
(a) The most impressive, if not beautiful, example of these is illustrated on Fig. 12:18. Its dimensions are 10.3 x 7.5 x 3.5 centimetres. It is manufactured from greenstone. It has firstly been flaked over all surfaces (multi facial) to produce the general shape and next the entire surface has been ground. In this way sharp flake scars have been smoothed over. Only one end has been treated more carefully and in this case it has been finely ground down to a sharp V-shaped edge. The form of grinding around this cutting edge appears like a glassy polish. Signs of abrasion and pecking of the flat dorsal faces of the axe are indications that it was subsequently used as an anvil stone or mortar. Signs of crushing along its thin margins may also indicate use as a hammer stone. Typologically this artefact fits well the description of edge-ground axes distributed widely over south eastern Australia. Dating of these examples especially from Victoria has not been easily forthcoming, and therefore this evidence from Seal Point may help to rectify this situation. The stratigraphical location of this item was in Spit 6 from Pit A, that is some 30 centimetres below the surface which would place it chronologically around 500 years from the present.

Spectrographic analysis carried out on a sample taken from this axe by Dr Isobel McBryde and Mr A. Watchman showed that the raw material which was used is similar to that from the Cambrian greenstone quarries of the Hopkins River area (Berrambool, Baronga) in the Western District. The detailed work of McBryde and Watchman (1976) on the distribution of greenstone axes in south eastern Australia has shown a complex network of patterns. These they interpret as distribution networks in raw materials and axes that extend far beyond local culture areas such as that of south western Victoria. It is interesting to note therefore that the remote and isolated Cape Otway region also took part in this interchange.

(b) The second edge-ground example is less elaborate in form (Fig. 12:19). It has been fashioned from a water worn pebble only one of whose ends has been modified. Flaking at this position is bifacial, and the flake scars have been subsequently ground down to produce the final product, of the sharp V-shaped cutting edge. In comparison with the first example flaking and grinding are here less refined which could have been caused by attempts to retrim the tool. This can be deduced from the fact that one face is more finely ground while the other shows large negative flake scars which have only been ground down lightly. A further indication of reworking
Fig. 12:18  SEAL POINT, EDGE-GROUND AXE

Fig. 12:19  SEAL POINT, EDGE-GROUND AXE
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can be found along the same face where one long side of the tool has been used as a new striking platform off which one very large flake and a number of smaller flakes have been detached (see Fig. 12:19). As with the first example this is also an indication of recycling. A new cutting edge has been formed on the original edge-ground tool which has converted the relatively sophisticated axe into a common chopper. Pecking and crushing on its flat surfaces would also indicate use as an anvil.

I have not been able to identify the raw material used in this case. It is fine grained, siliceous and green-grey in colour and not unlike a fine quartzite. The artefact's dimensions are 12 x 8 x 3.2 centimetres. The stratigraphical location of the tool is Spit 12 in Pit J which would give it an approximate date close to 1,400 B.P.

**Sandstone**

Sandstone artefacts which bore signs of utilisation have been divided up into a number of categories. The terminology I employ is rather cumbersome as overlapping categories exist. That is, individual artefacts can have characteristics of more than one category. Rather than arbitrarily allocate these examples to a specific category I have placed them into a separate composite class. The sample comes from Pits F and I (Table 12:11).

(a) Flaked Pounder (Fig. 12:20): This is by far the most interesting of the categories, and examples were quite numerous throughout the deposit. Together with the composite category, flaked pounder/mortar, they make up 5.5% of the total sandstone sample which predominantly was composed of flakes and miscellaneous lumps. Given the sizeable proportion of the latter groups (86.2%), the representation of the flaked pounders is quite large with 55 individual artefacts coming from only a two-pit sample.

These artefacts were constructed from a water worn sandstone pebble such as are found today along the sandy beach below the site. They range in size from average examples around 13 x 10 x 4 centimetres to quite small examples half this size. They are in fact a variation on a pebble chopper except that in this case they should more rightly be called pebble pounders. One or more sides of the pebble is flaked to produce a long flat and moderately steep retouched or bevelled edge. Through use as a hammerstone or large pestle this edge is worn down producing a flat ridge along
the top of the flake side of the pebble. When more than one side or end of the pebble has a corresponding original shape to this way, the pebble tends to have a rectangular appearance (Fig. 12:20). Because of the shape, I have termed them as they appear to be the vertical action of the pebble used to support a surface. Exposure associated with local wear is then needed to support these results.

Hence, flakes from the production of these artefacts and production at rejuvenation in a perceivable proportion of the flaking. One artefact was not used as a flat tool, but plucking wood and given the edge frequency, the possibilities of reusing the function were thus substantially reduced. It would associate it functionally with another sandstone type, the mortar, which is also relatively common, one that making up a pestle and mortar set. Flaked pounders were often used as mortars also (see below). The bowl was not used in wood working and as its specialised form seems inappropriate for use in association with animal foodstuffs, plant foods appear to be the most likely alternative.

In Chapter 6.5, it was determined that root and tuber plant foods (the most numerous vegetable type) required little preparation other than some form of chopping. This is not true, however. For all plant foods derived from the modern species at Okato. A few site widely used species had the thorny or starchy parts eaten. The starch before the latter was bashed. One of the most important vegetables for which was this processing technique was necessary, the Bracken Fern. One species that was harvested. A search through the modern plant species, their distribution and numbers in the area reveals the following information. Beachegrass, *Ampelodesmos maritimus*, and woody shrubs and woodland are important. The woodland in the Cape Otway area, with a high plant diversity, has many of the hardy edible plant species (see Chapter 1.), and included in these some of the shrubs whose thyrsomes were eaten (e.g. *Boronia* and *L. latifolia*). The thorny *Eucalyptus*), but *Orchids* (Gymnostomes) whose tubers are important as they are very rare, as are the two most important tuberous plants eaten in the Western District, *Microseris* scapigerum and *Carpobrotus arborescens*. The former is not rare only at Cape Otway itself but generally throughout the region.

**Fig. 12:20** SEAL POINT  
*a* - mortar  
*b* - flaked pounder-mortar
the top of the flaked side of the pebble. When more than one side or end of the pebble (depending on the original shape) is modified in this way, the pebble takes on a rather rectangular appearance (Fig. 12:20). Because of this characteristic use wear I have termed them pounders, as they appear to have been used with a vertical action straight down upon a surface. Experiments I carried out with local materials tended to support these results. Waste sandstone flakes from the initial production of these artefacts and perhaps from attempts at rejuvenation made up a sizeable proportion of the assemblage (38.5%).

As this artefact type was not used as a chopper for planing wood and given its high frequency, the possibilities concerning its function were thus substantially reduced. I would associate it functionally with another sandstone type, the mortar, which is also relatively numerous, the two making up a pestle and mortar set. Flaked pounders were often used as mortars also (see below). As this artefact was not used in wood working and as its specialised form seems inappropriate for use in association with animal foodstuffs, plant foods appear to be the most likely alternative. In Chapter 6 it was determined that most root and tuber plant foods (the most numerous vegetable foods) required little preparation other than some form of cooking. This was not true, however, for all plant foods derived from the underground parts of plants. A few quite widely used species had the rhizome pounded to extract the starch before the latter was baked. One of the most widely used species for which this processing technique was necessary, was the prolific Bracken Fern (*Pteridium esculentum*). A search through a survey list of plant species, their distribution and numbers in the Cape Otway peninsula reveals the following information (Beauglehole, *et al.*, 1977; Parsons, *et al.*, 1977). Heaths and woodlands are important plant communities in the Cape Otway area with a high plant diversity, but in spite of this many of the main edible plant species (see Chapter 6) are not included in lists from the area. Heaths (*Epacridaceae*) providing fruits are common as are some of the Liliaceae whose rhizomes were eaten (e.g. *Burchardia umbellata*; *Thysanotus tuberosus*), but Orchids (*Orchidaceae*) whose tubers were important crops were very rare, as are the two most important tuberous plants eaten in the Western District, *Microseris scapigera* and *Convulvulus erubescens*. The former in fact is not reported from the Otway region. In contrast to this situation the Bracken Fern is very common not only at Cape Otway itself but generally throughout the region.
We could infer from this evidence that Bracken Fern would have been an important and reliable item of diet in Cape Otway. Today it grows abundantly in all cleared areas on the peninsula, for example where pasture land meets open sclerophyll forests. From my own observations in the area the plant is most numerous following some form of clearing such as fire. Given the concept of plant management that was discussed in Chapter 6, the importance of Bracken Fern as a reliable and abundant resource would be even more enhanced.

I have already established that processing of the plant by pounding was a common and necessary practice and so on this basis we could suppose that lithic equipment for this purpose would be archaeologically visible. The specialised pestle (flaked pounder) and mortar artefact types fit this description quite well. Analogous evidence can be brought forward to support these assumptions. Kamminga has demonstrated by a use wear study that a broadly similar bevelled edge stone pounder was used to extract starch from a related species of Bracken Fern (*Blechnum indicum*) in the coastal region of northern New South Wales and southern Queensland (Kamminga, 1978). There were also supporting ethnographic data concerning this.

I will merely summarise the remaining descriptions of the sandstone categories.

(b) Mortar: Broadly these were water worn sandstone pebbles varying in size and shape whose flat surface showed a form of abrasion and often pecking, which had resulted from a hammering or pounding of the surface (Fig. 12:20). They could be classed as anvil stones. A few examples had red ochre still adhering to their abraded surface. These stones ranged in size from average examples from around 13 x 10 x 5 centimetres to extremely large stone carried up from the beach below and measuring between 30-40 centimetres in length. An example of one of these is to be found on Plate 12:4a.

The outer perimeter of these mortars was also often abraded which indicates that they had also been used as hammerstones or pounders. Many of the examples are broken, probably as a result of percussion or contact with fire, and to support this observation broken pieces are often mixed in with hearth debris.
12:4a Large sandstone mortar (scale is 18 cm in length) in situ

12:4b An excavated "floor" (Pit H) showing articulated seal vertebrae, a broken sandstone mortar/pounder, flint and quartz flakes, shells (scale is 18 cm in length)
(c) Flaked Pounder/Mortar: This is a multi-purpose tool or composite of the above two categories.

(d) Pounder: This category is made up of sandstone pebbles varying widely in size or condition (e.g. broken etc.). Their edges show signs of abrasion resulting from percussion, and they often appear bruised or crushed, indicating that they were used as a hammer stone or pestle.

(e) Pounder/Mortar: This category includes artefacts which have characteristics of both groups, pounders and mortars and should, therefore, be seen as multi-purpose tools.

(f) Flakes: Such coarse-grained material as this sandstone used at Seal Point does not of course produce easily recognisable flakes. These artefacts were detected by their broadly conchoidal shape bruising at the point of percussion and often water-worn dorsal surfaces. Experimentation with raw materials from the area produced similar waste flakes. We can presume that these flakes are the by-products of the production of flake pounders and of percussion activity.

Discussion

Concerning the stone artefacts at Seal Point the following conclusions can be deduced of the flaked stone tools, the main characteristics of the assemblage were:

(a) a high waste factor;
(b) a low frequency of retouched and utilised artefacts.

The most plausible explanation of these features relate to the overall poor quality of raw materials which are available in some abundance. The site may also have functioned as a factory with quality blanks being transported to other areas.

Retouched and utilised artefacts were elementary in form, consisting of a series of scraper edges. These can functionally be associated with generalised light duty wood working and therefore can be linked to maintenance activities of equipment such as spears (see also Ch.13). The low frequency of these tools broadly correlates with that of hunting at
the site which is the main procurement activity requiring such maintenance equipment.

The use of the bipolar technique, principally on quartz, but also on other raw materials, appears to have been related to the reduction of cores to a small size and, therefore, also to the production of small flakes. The latter may have been hafted as barbs on spears for such artefacts were used for hunting purposes in the Western District as well as in the Geelong area which is close to Cape Otway (see Ch.6; also Smyth, 1876, 1:304, Fig.68). These small flakes may also have been transported from the site for use in other areas.

Sandstone artefacts had a relatively high frequency and typologically consist of both specialised and more generalised pestle and mortar forms, which can plausibly be linked to the processing of plant foods such as Bracken Fern.

Edge-ground artefacts, of which two were found at this site, were generally prestige items, owned by males, traded widely and used for male-oriented activities (see Smyth, 1876, 1:365-78). The examples found at the site also appear to have doubled as pestle and mortar equipment.

Bone Tools

An assemblage of 26 bone tools are included in the total sample (Pits A-J). A representative selection of these has been illustrated and appear on Fig. 12:21. Within this assemblage, 11 of the artefacts were bi-points, and the remaining 15 had been broken prehistorically in a number of ways. The latter group morphologically fall within the range of the bi-points, and therefore, may represent broken examples of these.

Bone points were distributed throughout the sample, especially between Spits 1-2 and 5-11. There is also a high frequency (8) in Pit D. I have listed all 26 examples together (with two surface finds) on Table 12:12, and have also included the maximum length/breadth measurements of the unbroken artefacts. Morphologically the latter range from finely made, long thin bi-points (e.g. Spit D16) to very short bi-points (e.g. (Spit F10). Points have been manufactured on seal, land mammal and
Fig. 12:21  BONE TOOLS - SEAL POINT (A, B FROM BRIDGEPATER CAVES SOUTH)
Table 12.12  
Length/Breadth of Bone Tools - 
Seal Point

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<tr>
<th>Unbroken Bone Tool</th>
<th>Broken Bone Tool (not measured)</th>
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<tr>
<td>Pit</td>
<td>Spit</td>
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perhaps bird bone, and as I have indicated, the quality of workmanship varies greatly. Most examples have flattened surfaces or planes which show signs of abrasion to indicate that the artefacts had been ground down upon a rough surface, such as sandstone. Some of the tips have also been fashioned in the above way, but others have been more carefully rounded off and polished as has most of the total surface of the better-made examples. Many of the tools are a mixture of both techniques having both finely and coarsely wrought tips.

In general, this assemblage bears a close similarity to a surface collection from the site of Gorman's Lane, near Koroit Beach, west of Warrnambool (Mitchell, 1958). From the artefacts and fauna described from this site, it also appears to have been a shell midden rich in land mammals (including the larger macropods) and fish. I have also personally observed seal bone at this site, which indicates that marine mammals were also collected. The site appears to have once consisted of a number of rich shell midden horizons within a series of coastal dunes (see also Gill, 1971) and thus would appear to have been less intensive or more dispersed examples of coastal camps, in some ways resembling Seal Point.

The range in morphology of the bi-points at Seal Point would indicate that they served more than one function. But a look at the ethno-historical evidence (Ch.6) will indicate that even tools of the same basic form shared a variety of functions. The latter ranged from spear barbs and points used for both fishing (e.g. eeling) and hunting of land mammals, double-pointed fish gorges, to nose-bones used in personal adornment. We are faced therefore, with the problem of a limited bone tool morphology and a wide variety of functions. The Seal Point assemblage could also be expected to have served a variety of purposes. Fishing, for example, with its selectivity of species (i.e. labrid fish) does not appear to have required the use of specialised equipment such as barbed fish spears or fish gorges (see also below). Given these problems and the lack of more supporting evidence, these problems will for now be left unexplored.
Time Trends

Changes or rather trends over time which cover the two thousand year period of the site's occupation will be discussed for each independent variable of both the faunal and artefact assemblages.

Fauna

Figure 12:22 represents the distribution over time of seal, land mammal and fish weights from Pits F, G, I and J. The most obvious feature to emerge is the bimodal distribution of the weights of seal bone. Two increases in seal are evident, the first and the most marked at Spit 9 and the second at Spit 3. Through time, therefore, there is a tendency for the weight of seal bone to increase and this is greatest in the lower half of the site followed by a diminished increase in the upper half of the deposit. Seal also appears to decrease in the final phase of the site's occupation. Graphs of the weight of land mammals and fish also depict bimodal features although these are much reduced in comparison to seal. The overall temporal trends in these two variables, however, is in reverse to that of seal and shows an overall increase in weight over time. The weights of both land mammal and fish bone show an increase in the top half of the site as compared to their weights in the lower half. Therefore, as seal decreases so land mammals and fish increase. As there is no general decrease in bone weight in the lower half of the deposit, (seal bone is more plentiful here) preservation of organic material need not be introduced as an explanation of these trends.

Similar temporal trends can be noted if the weights of seal, land mammal and fish are graphed separately for each of the Pits F, G, I and J (Figs 12:23, 24, 25, 26). In all four graphs the main features depicted are: a bimodal distribution of seal, indicating a decrease over time; increases in land mammal and fish through time; decreases in all variables in the top levels of the deposit. Certain variations on this general pattern such as the distribution of fish in Pit J and that of seal in Pit I, can perhaps be explained by the smallness of these individual samples which would tend to exaggerate minor features. In order to test these conclusions further I have graphed the weights of seal, land mammal and fish also from a fifth pit, D (Fig. 12:27). The results from this pit are also similar and indicate overall increases in both land mammal and fish over time.
SEAL POINT - Bone Weights. Pits F, G, I, J.  

Fig. 12:22
Fig. 12:23. Weight of Bone. Pit F

Fig. 12:24. Weight of Bone. Pit G
Fig. 12:25. Weight of Bone. Pit I

Fig. 12:26. Weight of Bone. Pit J
Fig. 12:27. Weight of Bone. Pit D

Fig. 12:28. Frequency of Land Mammal Bone Weight. Pits F, G, I, J.
I have taken into consideration both weight and minimum numbers. Figure 12:28 depicts the distribution of weight of land mammals through time and Fig. 12:29a the temporal distribution of their estimated minimum numbers. In both cases the steady increases in both these variables, from the earliest occupation of the site are indicated with a fall off in both in the most recent level. I have also distinguished between macropods and possum which are the two main constituents of the land mammal category. Figure 12:29b graphs the estimated minimum numbers of macropod and Fig. 12:29c those of possum (Brush Tail and Ring Tail) throughout the sequence. In both cases increases over time are indicated with a fall off in the very last phase of the site's occupation. The bimodal distribution of land mammal in the master sequence of weights (Fig. 12:22) is also borne out by the distribution of the minimum number of possum and to a lesser extent by those of macropod.

In Fig. 12:30a I have graphed the distribution of fish bone weight and in Fig. 12:30b that of their estimated minimum numbers through time. Both graphs depict a bimodal distribution, an increase through time and a fall off in the last phase of occupation. It should be noted here that the highest point of increase in fish occurs slightly earlier than that of land mammals, around Spits 3 and 4, and that the subsequent fall off also begins earlier, in Spit 3.

Figure 12:31a presents the distribution of the estimated minimum number of seals. As the overall sample is a small one I have presented the same information in two ways on these histograms, so as to clarify the overall time trends. Figure 12:31b is therefore a contraction of information presented in Fig. 12:31a. These histograms quite clearly depict two peaks with a greater concentration of individuals in the lower half of the deposit.

Distributions of the estimated minimum numbers of Fur and Elephant seals are shown on Figs 12:31c and 12:31d. The results are of interest for the distribution of the two species are in fact complementary. Elephant seals appear to have two separate periods of distribution: an early intense phase followed by a later less intense period. There are no individual Elephant seals represented between Spits 3-6. This, however, introduced a slight distortion of the facts for the remains of Elephant seals, although in diminished quantity, were found in the latter spits
Fig. 12:29. Estimated Minimum Numbers of Land Mammals.
Pits F, G, I, J.

a = Total
b = Macropods
c = Possums
Fig. 12:30a. Weight of Fish Bone. Pits F, G, I, J.

Fig. 12:30b. Estimated Minimum Numbers of Fish. Pits F, G, I, J.
SEAL POINT - Distribution of Fur and Elephant Seal.
Pits F, G, I, & J.
(Table 12:4). The method of estimation of minimum numbers has tended to mask these facts. This information, however, does not alter the overall two-phased distribution of Elephant seal.

In contrast, the distribution of individual Fur seals shows a marked increase through time with the majority occurring in the upper half of the site. In the site's lower half therefore, there is a preponderance of Elephant seal with some Fur seal represented, and in the upper half a reversal in the representation of each species. As well, Elephant seals appear to diminish in quantity for the greater part of the upper half of the deposit (Spits 3-6) and to increase again only in the topmost level (Spits 1-2).

Although the overall sample is small, the weight of bird bone also shows an increase in the upper levels of the site with a decrease in the uppermost level (Fig. 12:10).

**Summation**

It seems appropriate now to draw together some of the results presented above. Enough evidence exists to suggest two main phases of resource use throughout the occupation of the site: a lower or earlier Phase 1 (Spits 14-7) and an upper or recent Phase 2 (Spits 6-1). The earliest phase is characterised by a larger increase in the weight of seal bone in the upper half and a predominance of Elephant seal over Fur seal. As well, there appears to be an initial slightly earlier increase in the weight of both fish and land mammal bone which is quickly offset by the rise in seal. A decrease in fish and land mammal follows and towards the end of Phase 1 a significant decline in seal also.

The second or later phase again sees an increase in the weight of seal bone but this time in diminished quantity. Fur seal is now more numerous than Elephant seal, although the latter begins to increase in the most recent occupation layers. Land mammal and fish also show increases this time more marked than in Phase 1. A decline in all three resource groups occurs in the topmost level of occupation.

The overall trend, therefore, over 1,500 years of occupation at Seal Point, is for oscillations to occur in all three key resources. Together
all three resource groups, seals, land mammals and fish have two main periods of increase, a period in both phases of 1 and 2. The second phase, however, is less intense than the first. Together the three variables also have three periods of low representation, at the start, middle and end of occupation. Rhythmic cycles of resource increase and depletion are therefore indicated by the distribution of these faunal remains. Both bone weight and estimated minimum numbers have borne this out. The second process to be noticed is the complementarity between resources produced during periods of oscillation. Through time, seal decreases while land mammal and fish increase (Fig. 12:22), Elephant seal is largely replaced by Fur seal. Land mammal and fish also show rises and decreases independently of each other which suggests further complementarity.

The significance of these resource oscillations in relation to scheduling practices, sedentism/nomadism and the roles played by predation and environmental factors, must also be considered. Before this can be done, however, an examination must be made of the temporal distribution of the other faunal and artefact assemblages that make up the deposit.

Shellfish

Figures 12:11, 12 show the temporal distribution of shellfish weight in Pits F and D. Upon comparison it will be noted that distributions occur for subulinella are dissimilar. While bimodal distributions occur for this species in both pits, for pit F there is a considerable decrease in the centre of the sequence (Spits 4–10) which is not apparent for Pit D. As well, whereas subulinella weight increases in Spits 2 and 3 of Pit F, there is a considerable decrease in these spits in Pit D. The explanation for this must lie in methods of sampling employed here. As has been shown above, the deposit consisted of a complex matrix of shelly, ashy and humic lenses. Factors of function (i.e. activity areas, see above), could explain many of these differences and a small number of solid samples included in this analysis may in fact be a biased one. In this way, differences observed in the sequence could well be due to spatial and not temporal factors. The collection of a more extensive series of column samples would have reduced the incidence of such discrepancies. Overall, the deposit in Pit F tended to be relatively loose and porous, as opposed to the more complex and dense lenses of Pit D. It is these local differences which are
most probably apparent in the shell sequences from each pit.

Figures 12:11, 12 show the total distribution of shell in Pits F and D (6 mm fraction). These graphs bear a close resemblance to those depicting the distribution of subbinella (above). These results show two quite different distributions, one almost a reversal of the other. If we now assume that the information on each graph is amalgamated the resulting composite graph would be of a fairly constant frequency of shell in all layers showing a slight increase in total volume over time. As we are only dealing with limited samples here this generalised impression will have to suffice although it may not be altogether satisfactory.

As well, both cellana and mussel increase over time, especially in Phase 2. To add an extra complexity to this pattern, abalone decreases over time being more numerous in the early part of Phase 1. Grouped together the remaining shell species show little temporal variation in frequency.

At the very broadest level we could therefore conclude that shell distribution appears to be fairly constant showing a slight overall increase through time. The temporal sequence for the distribution of shellfish therefore does not appear to conform to either those of seal or land mammal/fish/bird.

Lithic Assemblage

The temporal distribution of the total stone assemblage from this site is represented in a series of six graphs (Figs 12:13, 14, 15, 32, 33, 34). The over-riding impression to be obtained from all of these is of a two peak distribution indicating a greater quantity of stone in the lower half of the midden reaching a high point around Spits 8-10. There is an indication that stone also increases in the final levels of the site. This general trend can be gauged from all major lithic variables and these will now be discussed in turn. Figure 12:14 indicates the distribution by weight of flaked stone and of sandstone assemblages. The graph for the sandstone assemblages basically conforms to the model trend outlined above, while that for flakes stone showed the largest increase in Phase 1 but implies a decline in frequency in Phase 2 and a final rise towards the last phase of occupation. Figure 12:13 helps to clarify the latter
Fig. 12:32. Frequency of Retouched/Utilised Flaked Stone. Pits G, F, I.

Fig. 12:33. Frequency of Flakes and Cores. Pits F, G, I.
impression. The most intense use of raw material, flint, quartz and quartzite, is in the latter half of Phase 1 (Spits 8-11) with a subsequent decline and then rise, although diminished, in Spits 1 and 2. Figure 12:33 shows a similar trend with a marked increase in flakes between Spits 6-10. The frequency of retouched and utilised flakes (Fig.12:32) is similar but less dramatic with only a slightly larger frequency in Phase 1. Out of 47 artefacts, 25 were in Phase 1 and 22 in Phase 2. The frequency of the two basic sandstone artefact groups: (a) those including flake pounders plus mortars; (b) those including pounders and mortars, broadly correlates with the distribution of raw materials (Fig. 12:13) and the distribution of flaked stone (Fig. 12:14), together with the major increase in Phase 1 and rise in the upper final layers of the site. It is interesting that weight and frequency of sandstone are at variance in the upper levels, for whereas weights are low, frequency is high.

If we treat these trends as generalisations we can ignore some of the minor variations seeing them as caused by minor depositional factors. In this way, correlations between the temporal trends of the lithic assemblage can be made with other key variables. The lithic distribution in time shows strong similarities with one other of the site's main assemblages - the mammals. Of the latter the distribution of seals both in weight and minimum numbers appears to be the most similar. Furthermore this correlation serves to strengthen the chronological division of the site into two phases. On the basis of this evidence we are now in a position to consider the operation of site-use, resources and resource strategies at Seal Point during its full sequence of occupation.

**Economy, Sedentism and Time**

In Chapter 3 I discussed the concept of economy as applied to hunter gatherer societies and some of the principles governing the operation of subsistence strategies. I will now analyse the Seal Point data in the light of that discussion.

Firstly, we must consider the problem of extracting economic information from archaeological data. Here I make no pretence of viewing this information as an accurate reflection of the prehistoric economy or diet. Many variables have intervened between these facts and the excavated
material before us. It is by now acknowledged that individual archaeological sites reflect only a portion of economic activity. From studies of present-day hunter-gatherer societies it has been shown that food is consumed as it is collected or captured by both sexes and all ages, and that only a portion is brought back and shared at the base camp (e.g. see Meach, 1977). The potential economic information represented at Seal Point therefore would be but a biased sample of the total. Secondly, factors of differential deposition and preservation of organic remains must also be taken into consideration. Finally there are the problems of sampling bias and those related to the estimation of a prehistoric faunal population such as minimum numbers.

Because of these difficulties I have used the archaeological data as an approximation or model of economic activity. General trends will therefore be looked for rather than hard and fast quantitative information.

**Procurement Strategies**

In Chapter 3 it was determined that accessibility, productivity and predictability were the qualities that resources possessed which most affected procurement strategies. Levels of sedentism and nomadism it was acknowledged would also have been affected. Resources which ranked high in these categories were deemed to be the most profitable in relation to energy expenditure. I will now look at the resource base of the prehistoric economy at Seal Point in terms of these three variables. As measured by weight and frequency, shellfish was the most important food source at the site. Plant foods we may assume also played an important role, if we accept the lithic processing equipment and its frequency as evidence. It has already been shown (Ch. 6) that these two elements provided a relatively stable hunter-gatherer resource base as they successfully met the criteria on which the three key variables above are dependent.

In terms of weight, seal was by far the next most numerous category. Seal bone weight has also been under-represented because of preservation factors (above). Weights of land mammal and fish follow in roughly equal proportions. Bird and reptile are in last place being found in very small quantities.
Percentage representation based on the estimated minimum numbers of these categories is as follows: seal 17 (7.7%); land mammal 92 (41.6%); fish 106 (48%); reptile 6 (2.7%). These figures must also be evaluated against body size if an estimation no matter how approximate of meat contribution to diet is to be assessed. The importance of seal can be appreciated when the weight of individual seals is considered. Although apparently few in numbers of individuals, the weight of mature individuals is sizeable. For example, King records that adult male Elephant seals are 6-7 metres in length and 3.5 tonnes in weight, while females are 3-4 metres in length and 1 tonne in weight (1964:78-81). Adult male Australian Fur seals are 2 metres in length, and on comparison with the weight of New Zealand Fur seals of slightly larger build, the Australian Fur seal would weigh over 100 kg. Female Fur seals are some 30 centimetres shorter than males.

This evidence so far supports the original predictions concerning the three variables most likely to affect the choice of individual resources. As far as these variables go, seals rate highly in terms of the first two, accessibility and productivity. Seals could have been easily captured (see Chs 3, 6) along the beaches fronting the Otway peninsula, and those beaches immediately adjacent to the site. In terms of predictability we have less evidence available for this would have depended on the nature and frequency of beaching as well as the numbers of species involved. The problem here concerns whether individual beaching took place or whether colonies or parts of these were involved. It will be seen that the archaeological data can provide certain answers to these questions.

As we have seen (Chs 3, 6) land mammals on the whole rate lower in terms of the three variables affecting choice of resources. Accessibility is hampered by both the mobility and lack of sociability of most of these species. The hunting or capturing of these animals would therefore have involved solitary targets with a high risk factor attached. Because of these problems selectivity of species appears to have taken place. For example, of all land mammals possums make up the largest sub-group, there being 50 individuals or 54% of the total. Of the possums, Ring-Tailed are the most numerous, with 36 individuals or 39% of all land mammals. Widely distributed in habitats ranging from open woodland to rainforest,
possums would have been plentiful in the well forested region of Cape Otway but their frequency at the site is suggestive of selectivity. The ethnohistorical sources support the archaeological data for they have shown (above) that effective methods of detecting and capturing possums were employed, and that these species were exploited in large numbers.

As a group, fish may be seen as being a plentiful resource but their effective exploitation depends very much on the level of technology employed. The species of fish caught at Seal Point provide the evidence needed to evaluate this issue. Most fish caught at the site were of one species, Parrot fish (Labridae) which make up 85.8% of all fish. Again, it seems as if we are dealing with selectivity of species. Of all fish in the Otway region and around the environment of the site, this species is perhaps one of the easiest if not the easiest to catch. As locals in the area will tell you: "you can catch them in your hands". Notwithstanding the exaggeration implicit in this comment, we could assume therefore that the Aboriginal fishing methods used at the site need not have been elaborate. Supporting evidence comes from Leach and Anderson (1978) who have recently shown that while the exploitation of Labrid fish was widespread in prehistoric New Zealand economies, it served an auxiliary role rather than being the main focus of economic attention. Secondly, methods of extending or intensifying fishing as a strategy do not, apart from a few other individual fish species represented, appear to have been attempted at Seal Point.

Further information concerning fishing methods can be gauged from the archeological data. Coleman (1978) has recently proposed a model which relates fishing techniques to size of fish, species, and diversity of species (see also Kefous, 1977; Bowdler, 1979). Coleman considers five main methods: fixed-fill nets; seine nets; traps; poison; spearing. To employ this model fish size has firstly to be determined for the Seal Point sample. The size of the labrds, using the maximum length of the pharyngeal, is shown on Fig. 12:35. This indicates that most fish had pharyngeals of between 15-35 millimetres, with the peak around 15-25 millimetres. These figures can be compared with fish sizes and this information I have obtained from Dr Sandra Bowdler. From a sample of eight labrds caught at Hunter Island, the sizes ranged from 25-40 centimetres, and by average standards none of these can be considered as large labrds.
\[ a = \text{Flaked pounder} + \text{Flaked pounder/mortar} \]
\[ b = \text{Mortar, pounder, pounder/mortar} \]

Fig. 12:34. Frequency of Sandstone Classes.

Fig. 12:35. Sizes of Pharyngeal Bones of Labrid Fish. Pits F, G, I.
when the Seal Point figures are compared with the latter, it can be seen that they fall at the lower end of the range, indicating that most labrids caught at the site were small. The overall Seal Point sample therefore, indicates selectivity of both species and size of fish. This description fits two of Coleman's models: (a) fixed gill nets; (b) traps such as drum nets; and of these the former would be the more likely method given the open reef conditions at the site. In contrast to the above, spearing, according to Coleman, would have been selected for a wide range of species and large sized fish.

Sea birds, unless we are dealing with exceptionally gregarious and colonising species such as Mutton Bird (Puffinus tenuirostris), do not readily fulfil the criteria for being considered as prime target resource groups. Neither do reptiles. The extremely low representation of these two groups bears this out. How much this reflects selectivity, albeit in this case negative, remains to be answered.

**Seasonality**

As yet we have not broached the problem of the exact season or seasons of occupation of the site. A closer examination of the archaeological seal population may assist in this regard. The Elephant seal remains are of yearlings and three-year olds of both sexes. Such a distribution may represent the non-breeding part of a population being exploited either (a) on the fringes of a breeding colony, or (b) individuals beaching outside of the breeding season. Of the Fur seals there is a wide range of ages in both sexes. In Phase 1 there is one mature male seal and three yearlings (both sexes). Approximately between Phases 1 and 2 is included a Fur seal pup, while in Phase 2 there are two very old individuals (male and female) plus one yearling male and one three-year old female. The old individuals, the mature female and pup are from the breeding part of the colony while the others could have been caught anywhere. Because of the small sample therefore, the evidence is ambiguous and so it is not clear whether we are dealing with the exploitation of: (a) breeding colonies; (b) individual beaching seals, or (c) a mixture of both. This situation is further complicated by the presence of two different species.

This information also does not allow for an accurate estimation of
the time of year that these animals were caught. According to Jones (1966:7; see also King, 1964:78-81), seasons for mating, giving birth and moulting of Elephant seals occur in August-November, September-December, November-April, respectively: that is, the spring-summer-autumn months. For King Island, however, he also records that July-August was the breeding season. The winter haul out season for young individuals was March-August, or autumn and winter. King (1964:32-4) records that Australian Fur seal males congregate at the end of October, with pups born at the end of December. Her information on this species is slight, but to this we could also add her data on Tasmanian Fur seals (Arctocephalus tasmanicus) which live in colonies of up to 5,000 in the Lady Julia Percy Island area near Port Fairy. Adults of this species gather in October-November, pups are born mid November- mid December, and suckling of pups may take up to six months.

From the broad based information concerning the seals it is therefore fair to assume that Seal Point could have been occupied during any season of the year. This generalised picture may be somewhat clarified if the seasonality of the other key resources is also taken into consideration. I have shown (Chs 6, 7) that marine resources (shellfish, crustaceans, fish) were most accessible and plentiful in spring-summer, and that high seas, among other things, limited their availability during winter months. On these grounds we could suppose that the site was at least occupied during the warmer months when seals also would have been available. It does not rule out the possibility, however, that the site was also occupied on and off during the winter months when beaching seals may have been an attraction in spite of limited fishing and shellfishing opportunities.

Some mention must be made here of climate. The fact that winters tend to be warmer at Cape Otway than further inland may have made it an attractive place to visit also during this season. Blustery conditions at the site of Seal Point would, however, have been far from comfortable. But these ethnocentric observations are not grounds in themselves for assuming that the site was not occupied during winter. Some observations concerning the total annual round in the Otway region may help to clarify this issue.

The Annual Cycle

We have established that Seal Point was at least an important if
not the most important spring-summer base on the Otway peninsula, and that possibly it was also used at other times of the year. Concerning the full annual economic cycle, we could draw upon the models developed for coastal western Victoria in general (Chs 6, 7 and 9) taking into consideration the peculiarities of the Cape Otway area. As we have seen, the coastal pattern was the following: spring-summer coastal bases with sizeable populations, and hinterland camps together with increased nomadism in winter. Seal Point fits the spring-summer segment of this model well. From this general model and data from the site itself, we may be safe in assuming that it was also occupied on and off in autumn-winter by smaller groups and for shorter periods. The less dependable and less productive resource base during these seasons would indicate this. The point at which the Otway subsistence/settlement pattern diverges from the general model is in regard to geographic factors and distribution of resources. Settlement in the Otway area is restricted by the Otway Ranges and would therefore have been tightly coastal. The Otway rainforest, offering low yielding and dispersed resources would have also posed a limit on settlement (see Chs 4, 11). Annual movement would therefore have taken place, we can presume, along the coastline especially in spring-summer with winter refuge being sought in protected bays and estuaries such as Johanna River, the Aire River, the Parker River and Apollo Bay. From these protected winter bases sorties could have been made to lucrative coastal resource areas, such as Seal Point and other areas.

Long Term Trends

So far, the economic strategy or series of strategies has been viewed in rather a static state with each variable being seen as a complementary part of the system as a whole. The situation is rather difficult when observed across a wider canvas, in this case the 1,500 years of occupation of the site. Both cultural and environmental variables will now be placed in dynamic relationship to each other, as will be subsystems within the economy. Such a situation enables us to more closely analyse the economic response to what may be interpreted as a changing resource base, and in some ways to measure its impact upon the environment.

I will discuss the main features of the archaeological sequence in turn. Perhaps the main trend apparent at the site is the correlation between the temporal distribution of certain faunal variables, in this
case seal, and the total stone assemblage. It has been shown that the other main faunal variables which were archaeologically visible, such as shell fish, land mammal and fish, are not correlated in the same way. Two conclusions that may be drawn from this evidence are (a) that the intensity of occupation of the site, as measured by the amount of lithic and faunal remains, was prone to fluctuations and (b) that these are related in some way to the presence of seal. In light of the above discussion the latter is not a proposition too difficult to accept, for it has been shown that apart from shellfish and plant foods, seal was the next faunal variable to be considered as a prime (profitable) resource.

An Economic Model: The above evidence provides us with enough information on which to establish a working economic model for the Seal Point site, which can be tested further by archaeological data. We can hypothesise therefore, that a coastal economic strategy which was centred upon a set of accessible, plentiful and relatively predictable resources such as certain plants, shellfish and seals, could maintain itself in the same general area and even at the same central base camps, at the times of year these three variables were considered to be most profitable. Such a situation would enhance the possibilities for increased sedentism and size of local groups (see below). This extractive complex would be dependent upon the constancy and productivity of the three resources and we could assume that attempts would be made to shore up the insecurities of the resource base via an auxiliary set of subsistence strategies. In this case, the latter included the exploitation of land mammals, fish and to a lesser extent reptiles and birds. This whole set of procurement strategies therefore, could be regarded as one dynamic economic suite. Inputs of labour can be expected to have been expended into subsidiary systems as soon as a strain was felt upon one of the three key variables, shellfish, plants and seals. Sedentism and size of groups would correspondingly wax and wane in concert with oscillations in the three key resource variables around which this seasonal strategy was organised. Increased nomadism and population dispersion would be mechanisms by which pressure could be relaxed upon the prime resources. I have already discussed (Chs 1, 3) how the increase of group size, and perhaps sedentism would also act as an investment of sorts widening the system's frame of economic reference through the exploitation of a larger network of reciprocal obligations. Inbuilt incentives would therefore exist for
maintaining such a system which was organised around stable and at times populous coastal seasonal base camps in the Cape Otway area. This seasonal strategy itself could be viewed as part of a wider annual economy involving a number of such centralised base areas and sites.

This hypothetical model can now be tested against the remaining archaeological data from Seal Point. Firstly, as a measure of the degree of sedentism we could take intensity of occupation. As has been shown, the latter would be represented archaeologically by peak periods of occupation or increases in the density of faunal or artefact assemblages. Figures 12:14, 22 indicate two major peaks, the most intense in Phase 1, followed by a less intense period in Phase 2. During both these increases there are concomitant rises in the frequency and weight in both flaked and sandstone artefacts together with that of seal bone. Increases in these two lithic classes could be taken as representing intensification of two main activities: (a) the production and use of flaked stone artefacts which are also used as maintenance equipment for wooden tools such as were employed in hunting, and (b) the production and use of sandstone artefacts presumably employed principally in the processing of plant foods. Increases were also registered in fish and land mammal bones. The evidence of the fish remains deserves further consideration. The presence of other species of fish apart from the Labrids in the sample, may also point to changes in fishing strategies at various times throughout the sequence. The presence of these species also occurs during periods of low resource availability, for example, the very earliest layers of the site, and Phase 2, when seal is generally lower. If such switches in fishing strategies may be presumed then this process could also be seen as a form of intensification, that is, an attempt to widen and increase the resource base.

Shellfish on the whole appear to remain fairly constant. However, certain shellfish species are not represented uniformly throughout the deposit. For example, both cellana and mussel show increases over time (e.g. in between Phases 1 and 2) and abalone is most numerous only in the first third of the deposit. In general these fluctuations may also imply scheduling to compensate for oscillations in the availability of other resources. For example, when abalone is at its most numerous, fish is extremely low, and as abalone declines so fish increases. Bowdler has argued for north western Tasmania, that fishing and harvesting of abalones
were interchangeable strategies (1979). Perhaps the same situation applies at Seal Point. The low numbers of abalone throughout the upper two-thirds of the deposit cannot simply be explained as due to environmental factors.

We could therefore accept that the two peaks registered by the graphs represent increases in periods of intensity of occupation of the site implying both increased sedentism and population size. During these times plant foods, seals, shellfish form the resource base and were augmented by fish and land mammals. Flakes stone artefacts were produced in quantity, as were sandstone artefacts.

Conversely, low points of the graphs could be viewed as representing a decrease in occupation, and therefore in sedentism and size of groups. At these times all key faunal and artefact variables are present in low frequency and weight. The availability of seal therefore appears to have been one of the controlling factors of the sequence, along with plants and shellfish. The point to be made here is that the latter two resources alone could not support the level of intensity of occupation at the site.

Examination of the occupation in Phase 2 tells us much more about the operation of the overall economy. In this phase there is a second period of intensification but it can be observed that seal has been reduced in weight, numbers and species. The replacement of Southern Elephant seal by the smaller Fur seal is a loss not only in numbers (for there are few seals) but in meat weight. This reduction in the frequency of seal appears to be related to two other changes in the overall nature of the occupation: (a) the density of stone artefacts, both flaked and sandstone is lower; (b) there is an increase both in weight and numbers of land mammals and fish. There also appears to be a third change, an increase in two shellfish species, cellana and mussel. The former trend (a) is an indication of the decrease in occupation of the site, and by implication in the level of sedentism and size of population. The increase in certain resources (b) appears to represent compensation for the decreasing amount of seal. As such, the latter could be viewed as adjustments to the system; inputs of labour invested in lesser sub-systems in an attempt to support a core strategy engendered by the reduction of a key resource, seal.

In broad terms, therefore, the archaeological data fit the predicted
model. The availability of seal appears to be a factor controlling the economic strategy of the site as a whole. Increases in seal resulted in increased site occupation and presumably sedentism, while decreases in the same resulted in a reverse situation. Compensation for the loss of seal was attempted by increases in the hunting of land mammals, fishing and the collection of certain shellfish species.

These archaeological data also provide information on the social dynamics of labour at the site. If we assume that economic activities were occurring along sex and age lines similar to those throughout the Western District, the following could be deduced. Plant collection and processing, shellfishing, perhaps sealing (if Tasmanian parallels can be used), see Ch.6), as well as low intensity fishing (e.g. labrids), were all principally women's work, which formed the economic base. The latter would also include the capturing of smaller game. Hunting of larger land mammals was mainly men's work, although possums appear to have fallen to both sexes. As the economic base of the site tightened we can see that the increased workload fell on both sexes, women presumably for fishing and capturing of smaller game and men in hunting. Generally, as we have seen, (Ch.6) men played a low-key economic role at rich coastal sites, but as this archaeological evidence shows, as productivity decreased, so did the male contribution to labour increase.

Causal Factors

The total sequence at Seal Point is more complex than that represented above, for although there are two peak periods represented, this is offset by three lows. The sequence in fact begins and ends in decline. Having established the mechanisms by which the economic system maintains itself it now remains to look further at the forces producing these apparent states of disequilibrium. There are two possible explanations for the rhythmic oscillation evident in the sequence, environmental and cultural. For the relatively short 1,500 years of occupation at Seal Point there is no obvious cyclic environmental process by which the site's sequence might be explained. The investigation might be more rewarding if the key variable of change, in this case presumably seal, is considered. Not only do seals increase and decrease in bone weight and numbers throughout the sequence, but a change is also registered in the frequency of individual species. Southern Elephant seal predominate
in Phase 1 and are largely replaced by the smaller Fur seal in Phase 2. Elephant seal also begins to increase in the uppermost levels of the site.

It is difficult to produce an effective environmental explanation of firstly the decline in seal and secondly the juxtaposition of the two seal species in time. One possibility to consider concerns changes in the formation of beaching areas, such as sandy beaches now present in the area, due for example to variations in tidal patterns. If such were the case the territory lost by the former species (Elephant seal) might have been reclaimed more speedily by the Fur seal as ideal environmental conditions were established. This would explain the sequential pattern of species recorded at the site. At present, however, there does not seem to be any supporting evidence for this theory.

Another possibility concerns the long term affect of predator upon prey. Predator-prey relationships are an important area of ecological study (see Pianka, 1978:202). The theory behind these relationships supposes that each population, predator and prey, is limited by the other and over time this relationship is expressed as a series of oscillations representing increases and decreases in both populations. For example, a cycle starts with a prey population increasing until it is checked by that of the predator whose population expands at the prey's expense. The consequent decline in the prey population at this time produces a subsequent decline in that of the predator. The cycle can then repeat itself beginning with an increase in the prey population. The evidence from Seal Point, concerning the long term effect of man's exploitation of seal, may in some ways be a reflection of such predator-prey oscillations. In relation to this, for example, the temporal sequence at Seal Point is the following: Phase 1 (a) decrease in seal and occupation of the site; (b) increase in seal and intensity of occupation; (c) decrease in site and site occupation; Phase 2 (d) increase in seal and site occupation; (e) decrease in both variables. This sequence appears to fit the above ecological model quite well. That is, the length and duration of man's predation and site-use is dependent on the size and constancy of seal populations present. One other possible affect of this resource cycle concerns the limitation it would have placed upon human population in the area. Furthermore, it raises the problem of just how long such oscillating sequences continue. The main difficulty with this analogy is that
ecological studies are short-term whereas the archaeological sequence covers more than one thousand years. While there are inbuilt advantages brought about by the increased perspective offered by the archaeological material, the problem remains, whether we are in fact comparing like phenomena. The presence of two seal species increases the complexity of the situation even further.

Conclusions

In terms of the predictions concerning seasonal coastal base camps as set out in Chapter 10, the interpretation of the site at Seal Point has measured up very closely. The main features of the site can be briefly summarised in the following way. In form the site was of a very extensive seasonal base camp. At least occupied during the spring-summer season, it may also have been visited during the winter months for the exploitation of beached seal. Sedentary or semi-sedentary features were a group of possibly 13 hut-pit depressions at ground level, stratigraphic features resembling these hut-pits within the deposit and evidence of intensive periods of occupation in the temporal sequence of the site. Group size can possibly be best estimated by the cluster of hut-pits which would indicate a band-size core population between 70 to 100 people. Such a population could be expected to have increased and decreased according to resource availability.

The economy was composed in the main of marine resources, principally shellfish and seals, and also presumably of plant foods such as Bracken Fern. Auxiliary economic strategies were hunting of land mammals, fishing and to a lesser extent the capturing of birds and reptiles.

While the flaked stone assemblage is extensive, retouched and used implements are few and very elementary in form. Their functional attributes suggest the maintenance of wooden tools. The low frequency of retouched tools may in some ways be associated with the production of wooden tools which would mainly have been used in hunting, itself a strategy of fairly low frequency. Substantial primary flaking debris suggests that the site also served as a factory possibly for the production of flint blanks together with quartz flakes. Specialised pestle and mortar stones appear to have been used for the processing of plant remains.
The temporal sequence is composed of a series of oscillations in the intensity of occupation of the site and the availability of key resources. The presence of seal appeared to be associated with peak periods of occupation and presumably of sedentism. The explanation for these oscillations may be related to a predation cycle involving man and seal.

The most important aspects of this interpretation of archaeological data that are offered here are the insights it casts upon the mechanisms of operation of a hunter-gatherer economy, and how it maintains itself in the long term in the face of fluctuations in key resources. This study also views the roles of sedentism within this process and the factors by which it too is controlled. Overall this example focuses upon the dynamic relationships within the hunter-gathered subsistence economy as was discussed in Chapter 1, and demonstrates how and why the system alters. On this basis, one of the main results indicate that the economic pattern, in terms of proportional representation of strategies and resources, at the start of the site's occupation is substantially different from that towards its termination. We could presume therefore from this evidence, that hunter-gatherer economies were continually undergoing modification due to changes in local resources among other things, and that once altered, no matter how slightly, the system need not have returned to its original form. These conclusions derived from the archaeological data are directly in line with the theoretical arguments presented in Chapter 1.
CHAPTER THIRTEEN

BRIDGEWATER CAVES SOUTH

Here I briefly examine a contrasting site to that discussed in Chapter 12. The main emphasis is similar to that of the previous chapter. The economy of the site, together with aspects of this reflected in the artefact assemblages, are discussed in light of the predictions outlined in Chapter 10. This chapter is not intended, therefore, to represent a full site report.

Environment

(Figs 13:1, 13:2)

The Bridgewater area which is part of the wider Portland region consists of Quaternary limestones called the Bridgewater Formation (see Boutakoff, 1963). Extensive dune ridges line Disaster Bay and today many of these are eroded and mobile. Behind these dunes were a series of dune-barred lagoons such as the Bridgewater Lakes. Further behind the coast the area part of the Dundas Tablelands is rugged and hilly. The vegetation consists of coastal scrub with dry to wet sclerophyll forest and pockets of rainforest close to the coast.

The Site

The site is a part of the limestone Bridgewater Formation, a completely sapridified Quaternary dune which forms an exposed escarpment overlooking the picturesque Bridgewater Lakes, some two kilometres from the sea (Plates 13:1a, b). There are two main caverns with signs of occupation in this formation, one at either end of the exposed face, and I have called these Bridgewater Caves, north and south. Excavations took place in both
13:1a  Bridgewater North Cave looking south-east

13:1b  Bridgewater South Cave looking east
caves, but the north cave, a spectacular stalactite-hung cavern (Plate 13:1a) was disappointing in that most of its deposit had been badly disturbed in recent times. The main excavation took place therefore, in the south cave which is the subject of this chapter.

The Bridgewater Caves were well-known as archaeological sites and were the amateur archaeologist's delight. An earlier trial excavation was carried out at the site by Mulvaney (1964). We were able to detect auger holes from the latter excavation during the present investigations.

Unlike the northern cave, Bridgewater Caves South (Plate 13:1b) appears to be of a more recent origin in that its inner walls are still flaking and have a fresh clean appearance, and lack secondary features such as stalactites etc. The cave is deep (see dimensions Fig. 13:3) and its dusty floor continually trampled by tourists as well as animals that use the cave. Bone, charcoal, shells and flakes are scattered about this floor but not profusely.

The excavations took place just inside the drip-line and out across the talus in front of the cave. A series of ten pits, each 1 metre square were excavated and numbered chronologically as they were dug (i.e. A-K, excluding E). The slope on which the floor and talus of the cave lie, is extremely steep and caused difficulties in excavation. Spits were dug in arbitrary 5 and 10 centimetre levels, and stratigraphic features were also taken into consideration. As with Seal Point (Ch.12), for the purposes of calculation I have amalgamated all excavated spits into 10 centimetre units. That is, 5 centimetre spits were grouped in the following way: the surface spit plus spit 1 equals 10-centimetre Spit 1; spits 2 and 3 equal 10-centimetre Spit 2, and so on.

Stratigraphy, Composition, Chronology

The composition and stratigraphy of the deposit were complex and I will only provide a brief outline here. Basically the deposit was quite different inside and outside the cave proper with the drip-line as a boundary. This could be explained as due to water action together with more rapid build-up of material out on the talus slope. Inside the drip-line (Pits A-D), the deposit was extremely dry and powdery, and difficult to
excavate as sections threatened to collapse once exposed to sunlight. Outside the drip-line (Pits F-K), the deposit was wet, dank with a higher humic content, as well as large numbers of rocks, indicating substantial rock fall.

The stratigraphy of the site can be interpreted as three main phases - A, B, C (see Figs 13:4, 5, 6). The upper Phase C was composed of a rich shell midden and hearth lenses. The intermediary Phase B consisted of sterile rock fall, and the lower Phase A was a complex of lime-coated lenses. The latter phase had a very low shell content but plentiful bone and in some cases, flaked stone. Charcoal, apart from the odd speck, was almost non-existent in Phase A. This lower stratigraphic unit rested upon sterile dune. Auger holes were made through this basal dune to some depth but no trace of further cultural deposit was detected. All artefacts from Phase A (stone, bones, shell) were covered in a coating of lime, making detection of items such as small flakes, extremely difficult.

Inside the cave (pits B-D), there is no evidence for Phase B, instead the upper Phase C is clearly distinguishable from the lower A by a series of distinct hearths that stretched across the floor area just inside the drip-line (Fig.13:5). Below this layer in Phase A hearths were less distinct, charcoal very scarce, and the deposit covered in a white lime coating.

A radiocarbon C14 date was obtained from a charcoal sample near the base of Pit K (Spit or Level 28) some 2-8 metres from ground level (see Fig. 13:6). The date received was 1,845 ± 160 B.P. (SUA 551). I was unable to retrieve enough charcoal from Phase A in Pits F-I, J to use for dating purposes. The date obtained from Pit K indicates a rapid build-up of deposit outside the cave proper, probably due to rock falls, and earth wash from the high slopes above the cave complex. The talus deposit, especially Phase B, was filled with such debris, including broken stalactites. Before the above date was received, one would have guessed, from the 3 metres of deposit in Pit K, a much larger period of occupation.

While the upper shell midden (Phase C) is relatively easy to interpret, the characteristics of the lower unit (Phase A) are less so. It could be that prior to the rock fall (an indication also of roof collapse) the lip of the shelter or cave extended further out than at present, and that occupation
13:2a  Bridgewater South Cave, Pit C

13:2b  Bridgewater South Cave, Pits F, G, H, J, looking west
BRIDGEWATER - South Cave, Pit C.

Fig. 13:5 Pit C - West-north, North-east Sections
BRIDGEWATER South Cave

PIT K

Fig. 13:6 Pit K - west-north, north-east sections
would therefore have taken place beyond the present drip-line. While the bone and flaked stone material from Phase A in part supports this hypothesis, the absence of charcoal from this phase is perplexing. Absent also is most shell and the smaller animal bones, and therefore, the smaller species (see below). Perhaps water percolation has removed the smaller items, but due to lack of supporting evidence I will leave this problem unsolved for now. Presentation of organic materials was excellent in all levels of the deposit.

Two solid samples from Phase C (Pit F) have been analysed following similar procedures to those outlined in Chapter 12 (Table 13:1). The results indicate that in the 6 millimetre fraction, shell makes up between 50% and 53% of the deposit, bone between 3.3% and 7.8%, charcoal 2.4% and 4.2%, and flint 2.1% and 2.9%. There was also a large percentage of limestone including mainly fragments of roof-fall, which made up between 38.7% and 42.4% of these above samples. Compared to Seal Point (Ch.12), Phase C here could not be seen as representing a dense shell midden.

Vertebrate Faunal Remains

Procedures

In the analysis of the vertebrate faunal remains from this site I have followed similar procedures to those carried out at Seal Point (Ch.12). Pits B, C, F and G were chosen for analysis from the Bridgwater sample. The material from each pit was treated separately and then the results combined. The sample in each pit has also been subdivided chronologically into Phases A and C, as has the combined vertebrate faunal sample. The material from Phase I in Pits F and G, which lay beyond the drip-line of the shelter, were easily distinguishable from those of the later phase, being heavily carbonised. Phase A faunal remains from Pits B and C were lightly coated in a white lime powder but were not encrusted in the same way as the latter. All material was washed and cleaned superficially before being weighed and identified but because of the limitations in time, I did not venture to remove the outer encrusted coating from the Phase A material of Pits F and G. Failure to do so has resulted in these remains being over-represented in weight as the limey coating considerably added to the weight of individual bones. This factor must be taken into consideration when comparisons are being made between pits. Because of this I have separated the two sets of
### Table 13.1  Solid Samples, Bridgewater Caves South (Pit F, 6 mm samples)

<table>
<thead>
<tr>
<th></th>
<th>Sample F4</th>
<th></th>
<th>Sample F6</th>
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<tbody>
<tr>
<td></td>
<td>Weight</td>
<td>%</td>
<td>Weight</td>
<td>%</td>
</tr>
<tr>
<td>Pipi <em>Plebidonax deltoides</em></td>
<td>196.4</td>
<td>46.7</td>
<td>170.6</td>
<td>48.1</td>
</tr>
<tr>
<td>Beaked Mussel <em>Brachidontes rostratus</em></td>
<td>24.7</td>
<td>5.9</td>
<td>6.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Cellana sp.</td>
<td>1.5</td>
<td>0.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Triton <em>Cymatiidae</em></td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Bone</td>
<td>7.8</td>
<td>1.9</td>
<td>11.6</td>
<td>3.3</td>
</tr>
<tr>
<td>Charcoal</td>
<td>15.7</td>
<td>4.2</td>
<td>8.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Flint</td>
<td>12.0</td>
<td>2.9</td>
<td>7.3</td>
<td>2.1</td>
</tr>
<tr>
<td>Limestone</td>
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<td>38.7</td>
<td>150.4</td>
<td>42.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>420.8</strong></td>
<td><strong>100</strong></td>
<td><strong>354.8</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
pits, B, C, and F, G when presenting the weight of bone (Figs 13:7, 8). Also, given these problems with bone weight I have relied on estimated minimum numbers for much of the analysis. The estimation of minimum numbers has been carried out as at Seal Point. So as to avoid repetition I will only refer to aspects of the procedure which have not already been covered. A discussion of the composition of the sample follows.

By far the most represented faunal class at the site was composed of land mammals. The following calculations refer to estimated minimum numbers. Out of a total 140 individuals in Phase A, 134 (95.7%) were of land mammals and in Phase C, of a total 532 individuals the frequency of land mammals was 518 (97.4%). The remaining species belonged to reptile, bird, seal and fish, and together these made up but 4.3% in Phase A and 2.6% in Phase C of all individuals.

Land Mammals

The main problem concerning this assemblage relates to its origin. It is evident that at least two predators are responsible for the accumulation of these faunal remains in the deposit, man and predatory birds. The artefact remains together with shell midden debris and hearths attest to the presence of the former and clues to the latter can be gained from another cavern in the Bridgewater cave system. Today the larger cathedral-like cavern, Bridgewater Caves north, is occupied by a pair of Nankeen kestrels. While carrying out excavations in that cave we were besieged by these birds every day at twilight as they returned at that time to their nest. Their presence could also be detected from pellets which they had disgorged and which were lying across the floor at one end of the cave. In addition, quite a sizeable deposit of small faunal remains had accumulated in that part of the cave or shelter and from the species present obviously had derived from decayed pellets. I collected a sample from both pellets and deposit and after they were analysed both were seen to be composed predominantly of small to medium size rodents and marsupial mice (*Dasyuridae*).

The latter evidence would help to explain a large part of the faunal assemblage from Bridgewater Caves south. In Table 13:3 which details the frequency of estimated minimum numbers from Phase C of the site it can be seen that a sizeable proportion consists of individuals of large and small rat (*Rattus spp.*), Bat (*Molossidae*), Pygmy Possum (*Cercartetus nanus*) and
Fig. 13:7. Weight of Bone. Pits C and B.
Fig. 13:8. Weight of Bone. Pits F and G.
### Table 13.2 Estimated Minimum Numbers of Vertebrate Faunal Remains - Bridgewater Caves South - Phase A (Pits B, C, F, G)

<table>
<thead>
<tr>
<th>Land Mammal</th>
<th>B</th>
<th>C</th>
<th>F</th>
<th>G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray Kangaroo ((Macropus major))</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Medium-small Wallaby</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Potoroo ((Potorous tridactylus))</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Ring-Tailed Possum ((Pseudocheirus peregrinus))</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Brush-Tailed Possum ((Trichosurus vulpecula))</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Wombat ((Vombatidae sp.))</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
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<td>Bandicoot ((Peramelidae sp.))</td>
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<td>1</td>
<td>1</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Long-Nosed Bandicoot ((Perameles nasuta))</td>
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<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Native Cat ((Dasyuridae sp.))</td>
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<td>Large Rat ((Rattus sp.))</td>
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<td>1</td>
<td>19</td>
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<td>48</td>
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<td>1</td>
<td>2</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Pygmy Possum ((Cercartetus nanus))</td>
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<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
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<td>2</td>
<td>2</td>
<td>25</td>
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### Other

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<th>C</th>
<th>F</th>
<th>G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Reptile ((Varanus sp.))</td>
<td></td>
<td></td>
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<td></td>
<td>1</td>
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<tr>
<td>Bird</td>
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<td></td>
<td></td>
<td>-</td>
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<tr>
<td>Small Bird</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Seal</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Fish ((Acanthopagrus butcheri))</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>89</td>
<td>15</td>
<td>10</td>
<td>140</td>
</tr>
</tbody>
</table>
small dasyurids. Together this group adds up to 459 individuals or 86.3% of all land mammals present. As well, some of the small reptiles and the two very small birds could probably also be included within this group. In Phase A there are 104 individuals or 74.3% of all land mammals.

The problem, however, is more complex still, for the cut off point between the two faunal assemblages, that of man and that of bird, is not so easy to determine. We know from ethnohistorical information (Ch.6) and from the evidence at Seal Point that small species and individual land mammals were included within the human diet. For example, the small and medium sized rats from Seal Point are little different in size from some of the individual remains that I observed from the recent pellets of carnivorous birds found in the northern cave. This problem has cropped up in other sites, for example at Cave Bay cave, Hunter Island. Here Bowdler has attempted to deal with the problem by devising a specific methodology (Bowdler, 1979). Such a course of action is beyond the interests of this thesis and so I have largely avoided the issue of differentiating between the two faunal assemblages here. Instead I have assumed a degree of overlap between the two faunal groups. I have also assumed that a percentage of individuals from the area of overlap would also have been derived from human predation. Man's contribution to the diet in this case may also have included medium to small sized rats and perhaps the odd marsupial mouse and reptile. Such a procedure does not overcome let alone directly confront this archaeological problem, but in terms of the level of analysis presented here, is quite a workable solution.

So as to approximately calculate the representation of individual species in this assemblage, based on their minimum numbers, I have grouped together all land mammals excepting those in the ambiguous categories of rat, bat, marsupial mouse and pygmy possum. While this solution reduces the size of the sample somewhat it also avoids the problem of the overlap between the two faunal assemblages as described above.

Macropods (Macropodidae) were identified from mandibles, maxillae and teeth. Broken long bones of large macropods were found throughout the deposit especially in Phase A. The condition of the bone together with limited comparative collections made the identification of species difficult. The results, however, indicate that the Large Grey Kangaroo (Macropus major)
was hunted. Of 14 individual macropods in Phase A were included 3 individuals of the latter (21.4%) and in Phase C of 18 macropods there were 4 Greys (22.2%). Apart from this species medium to small wallabies together with the 3 Potoroo (Potorous tridactylus), make up the remainder of the macropods. In Phase A there are 8 wallabies or 57.2% of all macropods, while in Phase C the wallabies are 6 in number (33.3%) and Potoroo 8 (44.4%).

Possums are represented by two species, Ring-Tailed Possum (Pseudocheirus peregrinus) and Brush-Tailed Possum (Trichosurus vulpecula). Both were identified by mandibles and maxillae. For comments concerning the identification of Ring-Tailed Possum and the possibilities of the inclusion of a second gracile species of Possum see Chapter 12. The distribution of possum is the following. In Phase A out of 5 individuals or 16.6% of all land mammals, two are Ring-Tailed and 3 Brush-Tailed. Conversely in Phase C, possums increase to 18 individuals (30.5%), with 16 individual Ring-Tailed and 2 Brush-Tailed. Chi-square tests were carried out to see if there were any significant differences between the frequency of potoroo between Phases A and C. and between that of possum between the same phases. The results showed that no significant differences existed.

Wombats (Vombatidae) were well distributed throughout the site, their easily detectable broken long bones and teeth being found in most spits. I have used mandibles, maxillae and teeth for identification and these results showed that there are 5 individuals from each phase of occupation.

Bandicoots (Peramelidae) were also recognised from maxillae, mandibles and teeth and in one case I was able to clearly distinguish the species Long-Nosed Bandicoot (Perameles nasuta). In Phase A there are 5 individual bandicoot or 16.6% of all land mammals, while in Phase C their frequency increases to 18 or 30.5%. One individual Native Cat (Daspyurus maculatus) was detected in Phase A, recognised from teeth. Chi-square tests were carried out to determine if there was a significant difference between the frequencies of bandicoot in Phases A and C. The results of the tests showed that there was such a difference. Chi-square had a value of 41.75
Rats (*Rattus spp.*) were extremely numerous and were made up from more than one species. Minimum numbers were estimated from the number of mandibles. I have divided the rats up into large and small sub groups. In Phase A of a total 67 rats there were 19 large and 48 small, while in Phase C a substantial increase is suggested with a total 309 rats, 70 large and 239 small.

Marsupial Mice (*Dasuyridae*) were also quite plentiful and minimum numbers were estimated from mandibles. In Phase A there are 25 mandibles and in Phase C this increases to 77. Pygmy Possum (*Cercartetus nanus*) was also recognised by the mandible. In Phase A there were 8 individuals represented and 37 in Phase C. The minimum number of Bats (*Molossidae*) was also calculated by the mandible. Of the latter 4 individuals were in Phase A and 36 in Phase C.

Echidna (*Tachyglossus aculeatus*) was represented by a solitary quill. Use of such quills as artefacts is recorded by Smyth (1876, 1:350). He states that they were used as lancets for bleeding and extracting thorns, pieces of quartz etc. The example he illustrates is identical to the quill found in the site. As there is no other anatomical evidence of this species in the sample I have not included this individual in the land mammal calculations.

**Reptile**

Reptiles form only a small sub-group within the whole vertebrate faunal assemblage. They were mainly recognised from their peculiar ball and socket vertebrae. One individual Goanna (*Varanus sp.*) was also identified. There were 3 reptiles in Phase A and 8 in Phase C.

**Marine Mammals**

Only one group of marine mammal was represented, that of seal. Although 2 individuals have been estimated, one from each phase of occupation, the remains were exceedingly scanty. Only a few isolated bones of seal individuals have been found, which I was unable to place in individual species. These few remains would indicate a very low occurrence of seal at the site.
Fish

As with seal, the evidence for fish is sparse. Again 2 individuals have been estimated, one in each phase. This was done so on the basis of the premaxillary. But apart from these particular bones there were few other remains of fish in the sample. The species of fish identified was of Bream (Acanthopagrus butcheri).

Birds

Some examples of very small birds were found, and possibly can be associated with the remains of predatory bird food. They have been included within the land mammal category, and have not been treated separately.

Phases A and C: Vertebrate Fauna: The samples from the two phases of the site will be considered both in terms of weight and estimated minimum numbers. Figs 13:7, 8 show the distribution of bone weight in all four pits B, C, F and G. The distributions in three of the pits, B, C and G show the two periods is at Pits 5, 6 and 7 respectively. The differences in stratigraphic position can be interpreted as due to differential accumulation during occupation. For example, the deposit from Pit B seems to be more contracted than in Pit C. As well, the three pits suggest two peaks of occupation also in Phase A. For Pit F this two part occupation is less obvious. Stratigraphically, Phase A in this pit which is indicated by the heavily carbonised faunal remains, begins around Spit 6. On the graph (Fig. 13:8) this is less evident. Overall in Pit F, Phase A has less bone present than Phase C. This could partially be explained by the presence of large rocks which took up much of the space in the lower half of this pit. Conversely the increase of bone weight in Phase A of Pit G can be accounted for by the weight of the lime coating.

In terms of the bone weight therefore, the overall results are not entirely clear. While Pit C shows an increase in bone in Phase C, Pit B shows a decrease. Bone is heavier in Phase A of Pits F and G and so is not directly comparable with that of Pits B and C.

Because of these problems I have relied more heavily on the results that can be derived from the estimated minimum numbers. In terms of the latter, Phase C has a much higher total frequency of individuals
than Phase A, with 532 as opposed to 140. The frequency of land mammals, by far the largest group, from these two phases has already been given.

I will now draw together the main differences between faunal assemblages from the two phases. Firstly, the group of species which was determined as having largely been derived from predatory birds is present in diminished quantity in Phase A. Also there are spatial differences in the frequency of this group. In Phase A there is a lower frequency in Pits F and G than in Pits B and C. Of rats, pygmy possum, marsupial mouse and bats, 89 individuals came from B and C (85.6% of the Phase A sample) and 15 (14.4) from F and G. Explanations for this have already been discussed. Secondly, there are also fewer of the larger land mammals (see above). Overall therefore, frequency of individuals is greater in the later Phase C than in the earlier Phase A.

These results are supported strongly by those obtained from the invertebrate faunal remains. Shellfish were by far more plentiful in Phase C whereas in Phase A shell was extremely sparse and fragmentary. Even without quantitative data, these differences were obvious to the eye while excavation was taking place. We could conclude therefore that fauna in general increases in Phase C of the deposit even though weights of bone are ambiguous overall.

Turning more specifically to individual species it has been shown that increases occurred in Phase C in certain species rather than across the board to all species. Even though the sample was a small one, it was apparent that bandicoot shows an increase. A number of explanations could be proposed here to explain the change. Firstly environmental factors could be taken into consideration as possible influential variables. Long-nosed bandicoot has a geographical range which is principally restricted to rainforest and wet sclerophyll (Marlow, 1965). One possible effect therefore influencing this increase in these animals over time may relate to an increase in the above habitats due to a slight climatic shift towards a more humid climate. More data, however, both environmental and archaeological would have to be collected if this possibility is to be more strongly supported. A second possible explanation for the increase in this species in Phase C could also relate to cultural factors by which I am referring to a change in subsistence strategy.
This possibility will be discussed below once the stone assemblages have been reviewed.

Invertebrate Fauna

A brief discussion of the invertebrate fauna is based on two solid samples from Phase C which have been referred to already (Table 13:1). These samples indicate that the faunal composition of the upper shell midden consisted predominantly of two main species. Pipi (*Plebidonax deltoides*) made up the greater part of the shell measured by weight, between 88.2% and 96.3%. Mussel (*Brachidontes rostratus*) was the second most populous shell species with a representation of between 3.4% - 11.1%. The remaining shell species in this case Cellana (*Cellana sp.*) and Triton (*Cymatiidae*) made up less than 1% of the total. While excavating this upper midden, individual examples of abalone and subninella were also noticed.

These figures indicate that selectivity of species has taken place, for the predominant species have been collected from two habitats, the sandy shore (pipi) and ocean rock platform (mussel and the other species mentioned). An extensive intertidal rock platform exists in the eastern corner of Bridgewater Bay, and the whole of Disaster Bay is one long stretch of sandy beach.

Phase C, in contrast, has very scanty shellfish remains, as has already been mentioned. The majority of these, which were noted during excavation, were also of pipi.

Stone Assemblage

Siliceous stone material was relatively plentiful in both phases of occupation (Tables 13:3, 4). Limestone material derived from the parent rock out of which the cave or shelter was weathering, was extremely abundant, but I have omitted it in this analysis. The reason for this is because of the difficulty of distinguishing signs of use or retouch upon this type of rock. In general, its relatively soft nature may have precluded its use as a raw material. But, not all of the limestone present
<table>
<thead>
<tr>
<th>Land Mammal</th>
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<th>C</th>
<th>F</th>
<th>G</th>
<th>Total</th>
</tr>
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<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><em>(Macropus major)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium-small Wallaby</td>
<td>3</td>
<td></td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Potoroo</td>
<td>2</td>
<td>3</td>
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<td>2</td>
<td>8</td>
</tr>
<tr>
<td><em>(Potorous tridactylus)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring-Tailed Possum</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>16</td>
</tr>
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<td><em>(Pseudocheirus peregrinus)</em></td>
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<td></td>
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</tr>
<tr>
<td>Brush-Tailed Possum</td>
<td>1</td>
<td>1</td>
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</tr>
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<td><em>(Trichosurus vulpecula)</em></td>
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<td>13</td>
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</tr>
<tr>
<td>Bat</td>
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<td>12</td>
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**Other**

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</table>

<p>| Total          | 80 | 136| 218| 98 | 532   |</p>
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<th>C</th>
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<th>F</th>
<th>G</th>
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<td>102</td>
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<td>94</td>
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| Retouched         |   | 3  |    |    | 2  | 5     |
| Utilised          | 1 |     |    |    |    | 2     |
| Blade core        |   |     |    |    | 1  | 2     |
| Retouched blade   |   |     |    |    | 2  | 2     |
| Total             | 1 | 3  |    |    | 5  | 9     |

| Total Assemblage  | 229 | 129 | 105 | 31 | 99 | 593   |
Table 13:5  Frequency of Flaked Stone - Bridgewater Caves South - Phase C - (Pits B, C, D, F, G)

<table>
<thead>
<tr>
<th>Category</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>G</th>
<th>Total</th>
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<tr>
<td>Core fragment</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Core</td>
<td></td>
<td></td>
<td>7</td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Flake</td>
<td>139</td>
<td>221</td>
<td>342</td>
<td>377</td>
<td>474</td>
<td>1553</td>
</tr>
<tr>
<td>Blade</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>3</td>
<td></td>
<td>6</td>
<td>6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td>225</td>
<td>342</td>
<td>389</td>
<td>493</td>
<td>1592</td>
</tr>
</tbody>
</table>

| Retouched        | 1  | 6  | 3  | 14 | 17 | 41    |
| Utilised         | 1  | 1  | 1  | 4  | 11 | 18    |
| Blade core       | 1  |    |    | 1  |    | 2     |
| Retouched blade  | 2  |    | 1  | 1  |    | 4     |
| Total            | 5  | 7  | 4  | 19 | 30 | 65    |

Total Assemblage  148  232  346  408  523  1657
was so friable, and may have been used for a variety of purposes.

Raw Materials: In general the local flint was the predominant siliceous stone used at the site. In many ways it fits the description of that from Seal Point and the Cape Otway region. At Bridgewater, however, it ranges broadly in quality and while much of the material is of as poor a quality as at Seal Point, there also appears to be quite a sizeable proportion of high grade fine grained material as well. This is especially so in Phase C where it appears as if selection for quality flint had taken place before the material was transported up to the site. In Phase A this high quality blue-grey flint is not as evident and in its place is a lighter colour inferior type much resembling chert. It ranges from speckled white to hues of orange in colour. Material in Phase A was also patinated making detection of raw materials more difficult. Aboriginal stone quarries are still evident in the Portland area, for example one extensive quarry occurs on the littoral at Cape Nelson (pers. observation)

A few tiny pieces of quartz and flakes of a fine grained opalised material were also included within the assemblage.

The distribution of categorised flaked stone for pits B, C, D, F and G are found on Tables 13:4, 5). For both phases the siliceous flaked stone assemblage has been divided into three main categories much the same as at Seal Point. The primary categories are core flake and core fragment. The introduction of the latter category was also necessary in this assemblage for the same reasons as at Seal Point. These three categories are further divided into: retouched, utilised and blade. The first two of these categories are based on similar criteria to those at Seal Point. The class blade, however, is a new element not found in the previous assemblage. A well known term employed in both classical European and Australian stone industries, blade refers to long narrow flakes. The term also refers to a specialised sequence of manufacture with stages ranging from blade core to retouched blades. All aspects of this sequence are found at the site including: blade, core, blade blank, and retouched blade. The three classes above are therefore treated separately and I will now discuss each of these in turn.

Cores: Cores from this particular sample tended to be relatively small
multi-faceted. All had been reduced by the percussion technique. Most still bore the outer patina crust which is an indication that they had been derived as flint nodules, picked up along the nearby local beaches or from the quarry sites in the area. Core fragments had similar characteristics to those described from Seal Point.

Flakes: Like those examples from Seal Point the larger flakes also had traces of crusty patina on their dorsal surfaces, an indication that they had been produced from flint nodules. Smaller flakes and chips were also plentiful and suggested that either these were produced intentionally or were the by-products of secondary manufacture and use of tools at the site. A few edge-rejuvenation flakes were also present, which had been struck from the working edges of tools and had signs of utilisation and secondary retouch. It was easy to confuse the latter with common rejuvenation flakes produced during the process of core reduction. The latter flakes were also removed from edges which bore signs of edge-damage, with negative flake scars apparent. However, as has been mentioned in Chapter 12, this form of damage is distinguishable from that produced by use wear, utilisation and secondary retouch.

Blade Core: Examples of blade cores are illustrated on Figs 13:11. These were small flint cores which bore a series of negative blade flake scars. The latter had generally been detached from one main platform of the core and appeared to form a sequence of long thin blade scars down one or two faces of the core. In size these flake scars were similar to blade blanks and retouched blades in the sample. Four examples exist in the sample, and their sizes are listed on Table 13:6.

Blade Blank: Only a few undisputed examples of these were found in the sample. They are long thin blades within the range of retouched blades, having a bulb of percussion but no obvious signs of retouch.

Retouched Blades: Six of these are in the sample. In form they are quite typical, if such a term may be used, of classic south eastern Australian microliths, more commonly called backed blades. The main retouched blade types are illustrated on Fig. 13:11. All have the bulb of percussion and striking platform removed and this end had been blunted by a series of
very small negative flake scars. All but one of the examples has subsequent retouch. In all five of the remaining examples this retouch is along half of one side of the blade, in this case towards the end furthest away from the striking platform. A series of very small flakes has been removed here from all examples. One of these five blades also has further retouch or use wear but because of the small size of the flakes is difficult to determine. This retouch or wear has been removed from the remainder of the retouched side and also from the opposite long side. The sharp end in this case has also been broken. The dimensions (length, breadth, width) of these retouched blades are on Table 13:6. The occurrence of blade cores, blanks and retouched blades (and including perhaps utilised forms) suggests that the full sequence of manufacture and use of these types of artefact took place at the site. The generally low frequency as compared to that of retouched edges would imply that it was a secondary activity. Blade cores and retouched blade numbered 9 and were thus 12.2% of all retouched artefacts.

Utilised: The criteria used in categorising these artefacts are the same as those described at Seal Point. Here a distinction was made between use-wear and other signs of utilisation and a third category of possible utilisation was also introduced. Certain retouched artefacts needless to say also had signs of the above three forms of utilisation. Of the 74 retouched artefacts in the sample 23 or 31.1% were of the utilised category excluding those retouched artefacts which also had signs of utilisation.

Retouch: Apart from the retouched blades the same procedures were involved in distinguishing the remaining retouched artefacts as has been described for the Seal Point assemblage. Similar problems were also confronted. The discussion concerning retouched artefacts is taken up at length in the following section.

Discussion

I have treated the stone material from each of the two phases of the site as separate assemblages. This is to enable temporal changes to be viewed throughout the deposit. Of 1,592 artefacts in Phase C, 1,553 or 97.6% were flakes. In Phase A of 584 artefacts 579 or 99.1% were flakes. Therefore, flakes were the overwhelmingly predominant variable in both phases. In contrast, cores and core fragments would have made up less
<table>
<thead>
<tr>
<th>Category</th>
<th>Spit</th>
<th>Length (cm)</th>
<th>Breadth (cm)</th>
<th>Width (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade Cores</td>
<td>B4</td>
<td>4.6</td>
<td>2.6</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>G5</td>
<td>3.4</td>
<td>2.6</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>J4</td>
<td>4.0</td>
<td>2.8</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>J4</td>
<td>4.0</td>
<td>2.8</td>
<td>2.3</td>
</tr>
<tr>
<td>Retouched Blades</td>
<td>B2</td>
<td>3.8</td>
<td>1.6</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>B5</td>
<td>2.9</td>
<td>1.5</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>F6</td>
<td>2.9</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>G2</td>
<td>3.1</td>
<td>1.4</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>G7</td>
<td>2.4</td>
<td>1.7</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>G8</td>
<td>3.7</td>
<td>1.5</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>H8</td>
<td>2.4</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>J3</td>
<td>2.2</td>
<td>1.4</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>J6</td>
<td>2.4</td>
<td>1.4</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>J7</td>
<td>3.2</td>
<td>1.5</td>
<td>0.7</td>
</tr>
</tbody>
</table>
than 7% and 3% respectively in each phase. Retouched and utilised tools consisted of 65 in Phase C (5.9% of the total assemblage) and 9 in Phase A (or 1.5% of the total). A chi-square test was performed to examine whether a significant difference existed between the frequencies of retouched and utilised tools in Phases A and C. The test showed that the observed differences were significant with chi-square having a value of 7.52.

These results, therefore, indicate that retouch/use increases slightly in the upper phase of the deposit.

As at Seal Point, we are again dealing with a high wastage factor in terms of the percentage of flaked stone material at Bridgewater. This could be explained in the same way as at the former site, that is, in terms of the overall indifferent quality of the raw materials. Differences between the two assemblages appear to be the ratio of cores to flakes. At Seal Point cores were relatively plentiful while in this sample from Bridgewater they are few in number. The most obvious explanation for this difference would be to suppose that whereas raw materials were flaked on the spot at Seal Point, flint was transported to the Bridgewater caves already in the form of flakes. This may in part be so, but it is not the full answer. A higher proportion of cores was excavated at Bridgewater from pits or squares lying below those included in this analysis, that is Pits H, I, J and K. The Cores found in the latter pits were also heavier and larger than those in Pits B, C, D, F and G, and the overall frequency and weight of flakes was high. One explanation for these differences in the spatial distribution of the assemblage would appear to relate to the steep slope upon which the talus of the cave had been deposited. Heavier materials, both lithic and faunal, would have rolled further down the slope than lighter ones. The latter explanation fits the distribution of materials in this example quite well. Cores, some of which were quite large and weighing a few hundred grammes, were present at the site and are an indication of primary manufacture. Overall, however, unlike Seal Point, Bridgewater could not be considered as a large scale factory site but a place where primary manufacture, at times, took place.
Types

I have already discussed the problems associated with this concept and the procedures followed in the analysis of both the Seal Point and Bridgewater flaked stone assemblages in the previous chapter. Here I will describe the retouched artefacts from this site. A selection of the main forms of the latter has been illustrated on Figs 13:9, 10, 11.

The Bridgewater retouched assemblage has essentially the same features as that of Seal Point. That is, the assemblage is composed of a series of scraper edges. The one difference between the two sites is that at Bridgewater artefacts appear to have been subjected to more retouch.

The morphological characteristics of the Bridgewater assemblage are similar to those described at Seal Point. In describing the edge forms from Bridgewater we can successfully employ Jones's terminology (1971a). Round edge, flat straight edge, notched as well as concave and nosed features are present (see Figs 13:9, 10, 11). Also included are notched and denticulate features and size also varies. As well, the steepness of the angle of retouch on these tools is more pronounced than that from Seal Point.

In order to further investigate the latter feature I have measured the angle of the retouched edges of a sample of scrapers from both sites (Fig.13:12). In this I have followed the procedures outlined by Jones (1971a: 331-4). The sample here includes 19 scraper edges from Seal Point and 54 from Bridgewater Caves South. The results show that the Bridgewater angles ranged between 75 and 125 degrees with two main peaks at 85 and 100 degrees respectively. For Seal Point the range was between 75-130 degrees with one main peak at 100 degrees. The results therefore are quite clear. At both sites an equivalent range of edge-angles and both assemblages show peaks at 100 degrees which is a relatively low angle of retouch. As well Bridgewater peaks at 85 degrees which is a steep angle of retouch. On the one hand these results conform to those of Jones who also deduced two principal scraper edge forms - both low and steep using the same criteria as the above. On the other hand these results from Seal Point and Bridgewater conform with the technological sequence which was originally modelled in Chapter 12. We could infer from this that the more a flake is used and retouched the steeper the edge angle would become. The differences between the type or amount of retouch on artefacts from the two sites supports this
Fig. 13:9A  BRIDGEWATER CAVE SOUTH, RETOUCHED FLAKES
FIG. 13:9B  BRIDGEWATER CAVERNS SOUTH, RETOUCHEO FLAKES
Fig. 13:9c BRIDGEWATER CAVES SOUTH, RETOUCHEO FLAKES
Fig. 13:9d BRIDGEWATER CAVES SOUTH, RETOUCHEO FLAKES
Fig. 13:9e  BRIDGEWATER CAVES SOUTH, RETOUCHEFLAKES
FIG. 13:10A

BRIDGEMEATER CAVES SOUTH, RETOUCHED CORES
FIG. 13:10B   BRIDGEWATER CAVES
SOUTH, RETOUCHEO CORES
Fig. 13:10c

BRIDGEWATER CAVES
SOUTH, RETOUCHEO CORE
Fig. 13:12. Angle of Retouched Edges of Scrapers from Bridgewater South Cave (A) and Seal Point (B).
general model. For lightly retouched forms at Seal Point generally have a low angle of retouch whereas at Bridgewater, where overall retouch is more extensive, so too are retouched forms. The only problem is the two peaks. Are we observing two functional classes as Jones would have it or are these peaks somehow related to the technological sequence described above? This issue needs further study before a decision can be arrived at either way.

Overall, therefore, we could infer that artefacts were more extensively used and maintained at Bridgewater than at Seal Point. The frequency of retouched artefacts is also higher at Bridgewater which supports the latter point.

The morphology of both retouched assemblages therefore in part supports the general model advanced in Chapter 12. That is, that these stone assemblages conform to varying degrees of one general technological sequence of scraper edge production and use. The Seal Point assemblage represents a smaller range of this sequence than does that of Bridgewater. These results support the argument that morphological differences in scraper edges are part of one continuum. Also, using Hayden's data (1977b), stylistic forms (scraper edge, notched, denticulate) could be viewed as variants of the same tool. In the above analysis I have not included notched scrapers.

It has been mentioned in Chapter 12, that a preliminary use-wear analysis was carried out upon the flaked stone assemblages from both sites. The results of this indicate that the micro-edge-morphology generally corresponds with that produced by light wood working (see Kamminga, 1978:34-7, 340-4; 613-29). Dr Kamminga assisted me during this analysis. Examples of these use-wear, edge damage and patterns from these assemblages appear on Plates 13:a,b; 4. Such wear or edge-damage was recognised on scraper edges as well as the edges of primary flakes. More work now needs to be done in delineating and describing the wear patterns along the lines outlined by Kamminga (above). The results obtained here, therefore, must be regarded as preliminary.

Blades (retouched, cores, blanks) are mainly found in Phase C and are low in frequency. Because of the latter I have conveniently considered
13:3a Utilisation damage, consistent with wood-working, showing step fracturing (x 42)

13:3b Steeply retouched scraper edge with no obvious use-wear (x 21)
Use fracturing (utilisation), showing shallow feather and step fractures (x 21)
them functionally less important and therefore have not taken them into consideration when discussing site function.

Bone Tools

Two examples of bone tools were found at the site. These included one point, which may have been from a broken bi-point made from land mammal bone. The second example was the broken point made upon a larger flatter bone which also appears to be from land mammal. The point of the latter was not rounded as in the former case but flat. Both examples came from Phase C, the shell midden, from Pits F and G. The former example is comparable to similar points from Seal Point (ch.12).

Site Function

It is now appropriate to review all the data in relation to the two phase occupation of the site in order to discuss the likelihood of cultural difference as has already been suggested. I will firstly look at the main characteristics of each phase in turn.

(a) Phase A:

During this phase there is an over-riding emphasis on land mammals which consisted of a substantial proportion of macropods (including the grey kangaroo) and wombat. There was correspondingly very little representation of marine foods. Apart from scattered pieces of shell of both sandy beach and ocean rock platform species there was evidence of one seal and one fish. Flaked stone was in low frequency with proportionally fewer retouched artefacts than in the following phase.

(b) Phase C:

Overall this phase represents more intense occupation and a wider resource base. While the emphasis is still on land mammals, with macropods (including the grey kangaroo) and wombat remaining proportionally similar to Phase A, there is now an increase in some smaller animals, in this case bandicoot. There is also an increase in shell with a sizeable shell midden being established and composed of both sandy beach and ocean rock platform shell species. Charcoal is plentiful to indicate the presence of hearths and the latter are clearly visible just behind the dripline of
the shelter (Pits B and C). As in Phase A there is only one fish and one
seal present. Together with the overall increase in faunal diversity
there is a corresponding increase in variety of artefacts. Flaked stone
is more plentiful than in the previous phase together with a higher
percentage of retouched artefacts. Two bone tools also come from this
phase as does the one example of a stone mortar. The latter may be
associated with the processing of plant foods (see ch.12).

It has already been suggested that the differences observable here
could relate to a change in subsistence strategy which could take one of
three forms:

1. change in overall annual strategy
2. change in site use
3. change in seasonal use of site

The first explanation is by far the most important but would need more
supporting evidence from other excavated sites in the area before it could
be accepted. The second would seem plausible if a re-arrangement of
strategies is enacted in which the Bridgewater Caves play a different role.
Explanation number 3 is an extension of the latter, and more specifically
suggests a seasonal change in site use. We will further consider this
third possibility. Phase A suggests an inland or hinterland economic
strategy centred upon the capturing of land mammals (in some case large
macropods) and an ephemeral settlement pattern. This occupation may
represent fleeting visits by hunting parties.

In contrast, Phase C has a similar emphasis but with a larger
marine component (although this should not be over-stressed). Overall a
wider range of resources was exploited. There appears to be a growing
emphasis on capturing small animals. Occupation of the site was now more
intense, although still ephemeral, and the range and number of tools
increased. Phase C therefore, also is oriented around hinterland and
inland exploitation but involving a wider catchment area which also makes
more use of coastal resources.

If seasonal models are to be introduced we should resort now to
the original predictive models established in Chapters 8 and 9. Phase A
at Bridgewater would fit well with the autumn-winter model, which
predicted small nomadic groups exploiting land mammals in the hinterland
areas of the coastal region. Phase C would also fit this model but its wider resource base may also represent a slight change in season, for example early autumn or spring occupation as opposed to the coldest or wettest season. Other features of the site also fit the above model. Use of caves or shelters mainly took place during inclement weather and access to marine resources was impeded by winter swells (ch.8). The latter may explain the relatively sparse representation of marine foods in both phases and the inclusion of a wide range though low frequency of shellfish. Substantial quantities of mussel may be due to the fact that more lucrative shellfish targets such as turban or abalone which are found in the lower littoral were out of reach during the heavy winter seas. Their place was taken therefore by more easily accessible mussels and pipis. The almost total exclusion of marine and freshwater fish can also be more readily explained if a seasonal model is advanced.

The main point at issue here is that while the site lies within a few kilometres of the coast both phases of occupation indicate a marked avoidance of coastal resources. On these and other grounds neither phase can be viewed as representing base camp conditions nor coastal occupation during the height of spring and summer. There exists also the further possibility that the site may have served as a spring/summer hinterland camp used by small hunting parties which had set out from base camps located in close proximity to the littoral. There is supporting evidence for the latter as extensive shell middens are to be found in the dunes behind the coast in this region and also around the Bridgewater Lakes. The problem here is that these sites are within a few hundred metres of the caves which would seem to preclude the necessity for having a hinterland satellite camp so close by. These facts, together with the peculiar assortment and low frequency of marine resources, would more strongly support the original theory that the deposit represents off-peak seasonal occupation (autumn-winter) of the coastal hinterland. The exact season or seasons of occupation and the possibility of seasonal changes between phases, must remain unanswered questions at this time.

Conclusions: Bridgewater and Seal Point Compared

Both sites, Bridgewater Caves South and Seal Point cover a short time span and are separated by a considerable distance of some 200 kilometres.
At the time of European contact the sites were clearly differentiated by cultural factors, with the Bridgewater Caves situated in the territory of the western Manmeet and Seal Point in that of the Katubanut. These sites, therefore, can tell us much about recent Aboriginal economy and settlements in terms of the models outlined earlier in the thesis (chs 6, 7, 9, 10) as well as providing a certain amount of culture-historical information. Of the latter the following can be stated.

In broad terms, both sites appear to have shared in a common flaked stone tradition based principally upon a scraper industry. The characteristics of the latter consists of a series of scraper edges including steep and low angled retouch as well as notched forms. Such edges appear on a wide variety of flakes, cores and core fragments which does not indicate a fine degree of selectivity as to size, shape etc. Poor quality raw materials must also be seen as factors influencing the latter.

The differences between scraper edge morphology from each site is best described as the product of functional (technological) factors. That is more use was made of flaked stone tools at Bridgewater than at Seal Point, and therefore the former had a larger frequency and range in variation.

The above description is of a more complex set of traits than was described for this region by Mulvaney (1962). Working from a limited sample from the Glen Aire rock shelter at Cape Otway, Mulvaney pointed out the generally amorphous nature of the flaked stone industries of this recent period. The existence of such basically formless scraper industries in these temporal contexts may indicate a trend in the direction of simplicity, as Mulvaney suggested. Indeed, similar characteristics have been described from other cultural contexts in the Australasian region, such as from Highland New Guinea (White et al., 1977). Until more assemblages are excavated and analysed from south western Victoria, and more detailed comparisons made with earlier Victorian industries (e.g. Green Gully, Wright, 1970) these problems must remain outstanding.

Differences in the lithic assemblages of Bridgewater and Seal Point which are more difficult to solve are those relating to microliths and to bi-polar fracture. The former were only found at Bridgewater and in the upper shell midden phase, with one exception coming from the top of the
lower Phase A. Conversely, bi-polar fracture is only found at Seal Point where its presence has been explained as due to its association with quartz. The problem remains whether these differences can be explained merely by fractional factors which differentiate the two sites, or by cultural factors as well.

The sandstone assemblage at Seal Point and its absence at Bridgewater would be best explained as serving particular functions only found at the former site. The bone tool assemblage at Seal Point also can be explained in the same way, although one comparable example of bone tool was also found at Bridgewater. In general, these south western Victorian bone tool industries share similarities with industries excavated from coastal sites, such as those in New South Wales.

In relation to the wider models of subsistence and settlement established in earlier chapters, the results from these two excavated sites have in general given support to the predictive model (ch.10). Seal Point broadly conforms to the model of a large semi-sedentary seasonal coastal base with a broad, mainly marine oriented, economy. Bridgewater Caves South is more problematic, but would fit the model of an ephemeral coastal hinterland site and possibly autumn-winter occupation. The most important aspects of the results derived from these excavations have been the evidence on the dynamics of the coastal economic strategies.
CHAPTER FOURTEEN

TOOLONDO: HUNTER-GATHERER WATER CONTROLS

The problem of hunter-gatherer land and resource management which includes the manipulation of the natural environment, together with the related problem of resource intensification, has already been introduced (chs 1, 6). Here, and in the following chapter, I wish to pursue these issues further and in this chapter I do so by approaching them from the point of view of the archaeological evidence. In the study of Australian prehistory the majority of the sites that have been excavated and investigated in order to gain information of an economic and ecological kind, have been living-sites, comprising usually of rock-shelters, caves, shell middens, lunette deposits, alluvial deposits etc. However, suggestions of man's large-scale manipulation of the environment are unlikely to be obtained readily from such sites. Because of this I have abandoned tradition and aimed my investigations at a type of site not previously examined let alone contemplated. The use of large-scale drainage systems in association with fishing (principally eelling) by inland populations of the Western District has already been discussed (Ch.6). The site described here is of such a drainage complex, located a few kilometres south of the village of Toolondo.

I would like to point out that a similar methodological problem has recently developed in New Guinea studies where Golson (1977a, b), has undertaken a change in emphasis from living-sites to agricultural drainage systems in order to investigate shifts in resource (including agricultural) intensification.

Traditionally, sizeable drainage systems have been associated by the
anthropologist and prehistorian with agricultural societies, and their
development has been viewed within the context of increasing social
complexity. The recent evidence from both New Guinea and Victoria there-
fore calls into question many of these earlier preconceptions. With these
issues in mind, here I discuss the south western Victorian material as an
example of resource intensification within a hunter-gatherer economy.

The Site

The site of Toolondo is an archaeological example of large-scale
water-control by hunter-gatherers, and in this aspect is quite unusual.
The site consists of nearly 4 kilometres of artificial drains which appear
to have been used predominantly for fishing (especially eelcing). Toolondo
is located at the base of the Great Dividing Range, in the extreme north
west of the Western District (Fig.8:1).

In this chapter the site and the excavations that we carried out
there are described together with a discussion on the function and
ecological implication of the drainage system.

Location

The Toolondo region lies on the boundary between the Western District
and the drier Wimmera plains which stretch to the north. Here rainfall is
lower than the Western District average, at around 500 mm per annum.
Toolondo is situated close to the base of the Black Range, which is part
of the Great Dividing Range. The vegetation of the area is mainly open
savanna woodland. Natural water courses are not well developed owing to
the low relief of the area's topography, and scattered swamps and seasonal
marshes form during the wet season wherever slight depressions occur. The
area, therefore, is damp with bog conditions in autumn-winter, while
subject to drought in summer.

The Toolondo region was incorporated within the Jaadwa tribe at the
time of European contact. The name "Toolondo" appears to have been derived
from "Dallundeer" which was the Wembawemba name for the latter tribe
(Tindale, 1974:204; Stone, 1911). Toolondo was located on the boundary
of three tribal areas, Jaadwa, Bunganditj and Tjapwurong and lies on the
track leading to the stone axe quarry at Harrow, to the south. As has
been mentioned (Ch.8) at the time of contact, pressure was being placed by the Jaadwa peoples from this area upon Bunganditj land lying to the south west.

Some 7 kilometres south west of the present village of Toolondo is the archaeological site, which is composed of 3.75 kilometres of artificial drainage. The drains connect two main swamps, the Budgeongutte and the Clear Swamp, to an area of seasonal marshland which lies in between. In this locality, as has been mentioned for the area in general, the topography is of so low a relief that no natural watercourses, in the form of creeks and streams, have been incised. Rainfall occurring during the autumn-winter months either soaks into an upper soft sand layer which lies atop an impermeable clay layer (see below) or collects in hollows as swamps and marshes.

The archaeological site was first described by Massola (1962). His description has been significantly modified by the present fieldwork. He in fact, was unaware of the full extent of the drainage system, and assumed that the drains merely served to connect the Clear Swamp to the nearby Green Swamp (Fig. 14:1) and therefore covered a relatively small distance. This erroneous picture was obtained because of the short time he spent at the site (one afternoon) and his lack of contact with local informants.

The following description is based upon four visits to the site, the first in December 1974, followed by a short visit in May 1975, and two seasons of excavation in February 1976 and February 1977.

History of the Site

The Officer family, who are still in residence at the Mount Talbot Station, established their land holdings in this area soon after its alienation by Europeans in the 1840s. Until quite recently the land, including the drainage systems which we investigated, were a part of the Mount Talbot property. The drainage system has always been known to the family as "the Aboriginal fish-trap", and to have been constructed by local Aboriginals and used for fishing. It is important that their knowledge of the site, which goes back to the time of European contact, when it was still in operation, should generally fit the description of those described
TOOLOONDO

A ground plan of the site is shown in Fig. 14.1. The plan incorporates what can be interpreted as three lengths of drains. The first (a) draining into the Clear Swamp from the area of rarely open hills, contains Budgeongutte Swamp (Plates 15.7a, b; 14.2) and the second (b) draining into the Swamp in the inter-stations area. The land between the two swamps is comprised of dark-brown "bark dust" or "kuit" which is typical soil feature of this region. To the east of these areas are remnants of a large "cleared" area on the west bank of the Dry Creek (Plate 15.7c). The third drainage (c) extends into the latter swamp and takes water into it. Axial photographs taken in 1915 before any drainage system had been constructed in the region, support this (Plate 14.1). I could not adequately trace the western extent of drainage down to the loss of recently ploughed ground, and therefore do not have the full extent of these drainage systems which could...
by Robinson near Mount William and purported to have been designed primarily for fishing (Ch.6).

The paddocks on which the drains are found had until the 1960s not been "developed" for pastoral purposes which accounts for the survival of the drains. Unfortunately since that time major stretches of the drains have been ploughed under by local farmers, and to quote one explanation for this from a farmer, "because they served no purpose." In spite of this damage to the systems, important lengths are still intact, such as that at the Clear Swamp end which has been preserved by Mr Doug. McKenry, the present owner of the land. Most of the system can still be detected and we were greatly aided in this task by the help of Mr McKenry and Mr D. Miller on whose properties the full extent of the drainage system lies.

Description of the Site

A ground plan of the site is shown in Fig. 14:1. This plan incorporates what can be interpreted as three lengths of drainage, the first (a) draining into the Clear Swamp from the area of marshy higher ground lying between it and the Budgeongutte Swamp (Plates 14:1a, b; 14:2). This intermediate area of marshland between the two swamps is composed of natural depressions which are often marked by rush growth. These depressions are referred to as "gilgai" or "crab holes" (Blackburn and Gibbons, 1956:17-9), and are a typical soil feature of this region. In the rainy season these "crab holes" are inundated and form a chain of marshes. The ground survey that I carried out in this area showed that the Aboriginal drain had been designed to connect up this series of marshes or depressions. By connecting one "crab hole" to the next an "irregular" drainage pattern had been produced.

The second length of drain (b) (Fig.14:1) is connected to the first channel but is designed to take run off from the central marshy ground down into the Budgeongutte Swamp (Plates 14:3; 14:7b). The third section (c) appears to circle the western end of the latter swamp and empties into it at the same point of entry as drain (b) (Plate 14:7b). Aerial photographs taken in 1948 before modern agricultural drains had been constructed in the region, support this (Plate 14:1). I could not adequately trace the western extent of drain (c) because of recently ploughed ground. We therefore do not know the full extent of these drainage systems which could
14:1a The Aboriginal drain looking north towards the Clear Swamp

14:1b The Aboriginal drain towards the Clear Swamp looking south
Aerial photograph of the Clear Swamp end of the Aboriginal drain (Lands and Survey Department, Melbourne, 1948)
14:3 Aerial photograph of the Budgeongutte end of the Aboriginal drain (Lands and Survey Department, Melbourne, 1948)
14:4a Toolondo, cross-section of Pit T II.
Clear Swamp in background

14:4b One of the subsidiary drains (T IV)
after excavation
14:5a Cross-section T II

14:5b Cross-section T II, plus wooden stake in situ
14:6a Cross section T 4

14:6b Cross section T 6
14:7a Cross-section T VI, located on the rise between the two swamps

14:7b The Aboriginal drain just before it enters the Budgeongutte Swamp, looking west
plausibly have been much more extensive and linked a much wider network of swamps and seasonal wetlands.

The above plan of the site has been reproduced from aerial photographs. As well as this procedure, I carried out a full ground survey of the site using a theodolite (Table 14:1; see also Fig. 14:2). The survey clearly showed that the area of seasonal marshland ("crab holes") between the Clear and Budgeongutte swamps lies along a slight rise. The seasonal marshland area is situated 3.2 metres above the Budgeongutte Swamp and 7.2 metres above the Clear Swamp. This information reinforces the idea that the purpose of the channels was to drain off the area of central marshland into the two natural swamps. As fishing, and principally eelimg, were considered to have been the drain's main features, we can assume therefore that a connection would have been provided via these channels for eels to travel between the two swamps; as they can move across humid ground (see below).

**Dimensions**

The length of drainage is 3.75 kilometres and traverses an area of some 3 kilometres or more, for as has been stated the full extent of the original drainage system is not known. The drain is at its widest at the two locations where it begins to enter the Clear and Budgeongutte swamps. As will be shown (below) in these locations the volume of water would have been greatest. At ground level the dimensions of the drains are slightly deceptive for the sides have more recently collapsed and therefore incorrectly suggest a much wider and shallower structure (see Fig. 14:3; Plate 14:4).

After excavations had been carried out the dimensions of the prehistoric drain were determined to be 2.5 metres wide and over 1 metre deep at its widest point along the main channel in the area towards the Clear Swamp (Fig. 14:3). In other locations (such as on the top of the divide between both swamps) its dimensions were approximately 40-50 centimetres wide by approximately 40 centimetres deep. The latter are more like the size of most of the drains at Mount William as recorded by Robinson (Ch.6).

**Multiple Drains**

About 400 metres south of the Clear Swamp is the most interesting
### Table 14:1 Toolondo - Survey of Aboriginal Drainage System

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<th>Height above datum</th>
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Datum point established entree 340 metres south of Clear Swamp and 25 metres east of drain.

See Fig. 14:1 for location of A, B, C.
FIG. 14:3 TII - EAST-WEST SECTION, PLUS KEY TO TOOLONDO FIGURES
structural feature of the whole complex. Here is a grid incorporating a number of smaller drains (Fig. 14:2). The main channel is here divided into two channels which run parallel to each other for a distance of at least 45 metres (their southern end having been destroyed by the construction of a modern roadway. Off the eastern end of the twin channels run at least four or five subsidiary drains, the longest of these for a length of some 12 metres. These auxiliary drains which diagonally run off the main channels would have served the purpose of increasing the flow along the main channels and secondly of complicating the drainage system, a feature which may have facilitated fishing (see below) and which was shared by the Mount William drainage complex.

Overall, the entire Toolondo drainage system was not constructed to a regular straight plan as are the present-day European drains, but tends to meander across the paddocks (Fig.14:2). One reason has already been provided to explain this feature: natural marshy depressions or "crab holes" had been connected, thereby accounting for certain irregularity in form. Secondly, it should also be remembered that the region was more densely wooded than at present. Even today very large, thick-trunked, River Red Gums (*Eucalyptus camaldulensis*) and other species grow in the area and some still surround the drain and are likely to date from the time that the drain was being used and possibly constructed. One enormous tree, which once grew beside the drain, today lies fallen across it. The shape of the drain was therefore affected by the distribution of these large trees, the drain being dug around and between these obstacles with its resulting meandering form.

**Excavations**

In February 1976 and 1977 excavations were carried out on these structures helped by students from the University of Sydney. The purpose of these investigations was to ascertain the following:

a) whether the drains were natural features or man-made structures;
b) whether their construction was Aboriginal or European;
c) the dimensions of the drains;
d) the form of construction;
e) the purpose of the structures;
f) the age of the system.
The strategy of the excavation was carried out in the following way. Fig. 14:2 shows the location of the excavation squares. Ten locations were chosen for investigation by excavation and all except one were along the 400 metre stretch of drain which empties into the Clear Swamp. The tenth trench or square was opened at a point on the divide between the Clear and Budgeongutte Swamps III (Fig. 14:7, Plate 14:7). The excavated trenches numbered T1-TV (1976) and T4-T8 (1977). The sizes of the trenches ranged from about two metres to over five metres, and these dimensions related to the width of the section of drain being investigated. Before the results of these excavations can be discussed it is necessary to firstly describe the geomorphology and soils of the area.

**Geomorphology and Soils**

Most of this section, together with much of the following two sections has been based on the field analysis of Mr P. Macumber, geologist with the Mines Department, Melbourne, Victoria, whose assistance proved invaluable during this fieldwork.

The soils of the region consist of an upper soft sand (solodic) layer and a lower dense clay. Subsoil clay occurs from between 5-45 centimetres. The upper sand is generally white in colour, and is largely aeolian, as can be seen from the way it accumulates as lunettes (dunes) around lakes and marshes (Fig. 14:1). The source of the sand is probably the underlying marine Parilla Sand which can be seen outcropping in places, for example around the present Lake Toolondo. The Parilla Sand has a ferruginous cap in places, often detected as ironstone pebbles.

Erosion of the Parilla Sand releases the sand which is remobilised, especially by wind into sand sheets. The Big and Little Deserts (immediately to the north of the Toolondo area) have originated in this way. During the wet season this upper sand layer becomes semi-fluid, and is described by locat farmers quite graphically as being "like spew".

The clays appear to have been deposited by streams and/or lakes, and are typical of north western Victoria. North-south oriented ridges of Parilla Sand have clays deposited in the interfluves. In areas to the north similar clays are called the Blanchetown Clays, and are usually considered to be Middle Pleistocene in age. Both these layers can be seen in the excavated sections of the site (Figs 14:3-8).
Fig. 14:4 T6, South-west, West-north, East-south sections
Fig. 14.5  T4, SOUTH-WEST SECTION
Fig. 14:7  T IV - SOUTH-NORTH SECTION;  T III - EAST-WEST SECTION
FIG. 14:8 TV, SOUTH-NORTH SECTION
Operation and Construction of the Drains

The drainage channels are clearly cut into the aeolian sands and therefore post date the bulk of the aeolian activity. In their deeper sections the drains have been cut in a "V" shape through the upper sand layer and into the lower clay subsoil. This can be observed most markedly in cross-sections TII, T4 and T5 (Figs 14:3, 5, Plates 14:5a,b; 14:6a) where the clay layer has been penetrated to depths of between 40-50 centimetres. Cuts into the clay subsoil can be observed to a lesser degree in cross-section T6 (Fig. 14:4). The smaller diagonal drains such as TV (Fig. 14:8) and the section of the drain along the divide, TIII (Fig. 14:7) do not penetrate as far as the clay.

As has already been shown the excavations also revealed a greater complexity of drainage channels than could be observed at ground level. In trenches TV, T6 (north west and east south sections), T7 (west north section) and T8 (west north section) these subsidiary drains measured between 30-50 centimetres wide by 20-30 centimetres in depth (Plate 14:4b). In TV what appeared from the ground to be a single drain was, following excavation, revealed as two parallel drains. The same can be seen in sections T7 and perhaps T6 (east south section) and T8 (west north section). It is not possible to determine whether these represent contemporaneity or re-cuttings.

Depressions cut into the sub clay layer in T8 are likely postholes. They were cross-sections during excavation and were found to have the dimensions of post holes (i.e. 15 x 8 centimetres) as distinct from tunnels left by tree roots. Such impressions may have been left behind by posts or stakes which we can assume formed part of the wooden or brush-work fish traps and weirs. Massola mentioned that sticks had originally been observed as protruding from this section of the drain (1962). The structure of this grid-like region of the drains also suggests that a further function was taking place here. From the analogy of the Mount William system we could infer that fish traps and harvesting devices were possibly set up at this point. Ethnographic examples of these brush-work trapping devices can be seen in chapter 6. The auxiliary drains running off the main channels at this point also may have served as trapping devices much as Robinson has described for the maze-like structure of the Mount William drains.
Periods of Activity

The cross-sections very clearly indicate two main periods of activity in the life of the drains. These periods can be interpreted as a lower stage when the drain was operative, and a subsequent upper period when the drain fell into disuse. These two stratigraphical units can be seen most clearly in sections TII and T4 – T6 (Figs 14:3-5).

The lower unit is represented by cut and fill deposits made up of lenses of relatively coarser-grained sands, including those of ironstone "buckshot" (see T5, Fig. 14:5). These lower lenses also included lumps of clay and charcoal, and often had a banded appearance with a variety of colour changes - orange, white and grey. T6 (Fig. 14:4) and Plate 14:5b is an excellent example of these features showing a well-developed series of banded lenses. Recutting of the channel can also be seen, and this is most clearly shown in the latter section, T6, where the channel has been recut straight through the previously deposited banded lenses. Dual cuttings of the channel can also be seen in sections T5 (Fig. 14:6), T7 and T8. This feature is indicated by the discovery of dual channel depressions approximately located side by side.

These cut and fill deposits could only have been produced during a time of substantial flow along the channel. In contrast to this situation, the upper stratigraphic unit composed of white and grey sand fill shows no similar evidence of scouring by a flowing water system. It appears to have been produced by sheet wash from the banks of the drain (the sand being of similar composition to that of the upper sand layer lying above the subclay). There may have also been an aeolian component.

All cross-sections show a clear division between the two fill-deposits, indicating a clear cut-off point in time. This can be interpreted as a distinction between the time when a high energy cut and fill deposition formed while the channel was an active water carrier, followed by a period of disuse. Recuttings and dual cuttings of the lower fill indicate periods of higher energy flow and/or deliberate attempts to re-dig or clean-out the old drain. The dual cuttings into the subclay layer (T5, Fig. 14:6) would almost certainly have been caused by the latter.
Dating the Drains

A radiocarbon C\(14\) date was obtained from the lower stratigraphic unit in section T5 (Fig. 14:6). At this level a large lump of wood (River Red Gum) was found well preserved and provided material for dating. The sample gave a date of 210 ± 120 B.P. (GX - 4785). The wood was located upon the lense of "buckshot" which was in turn lying at the base of the drain on the subclay layer. At this particular location the lower stratigraphic unit, representing the period of high water flow, is only some 8 centimetres thick as compared to 30 centimetres in T6 (Fig. 14:4). From this evidence we could perhaps safely interpret the C\(14\) sample as dating the last stage of the drain's operation, prior to its abandonment and subsequent period of low to nil activity as a water channel.

Operation of Drain

The drain would most plausibly have operated as an effluent drain, much like an open agricultural drain, which gets the bulk of its water by lateral seepage through the upper white sandy layer when it is saturated. Under these conditions it would be expected that the system would be at its most efficient in mid-winter but also still active from around April to September when the rainfall of this area exceeds the potential rate of evaporation. This would mean that water availability would be limited towards either extreme of the winter months.

Origin of Drain

In answer to the question of whether the drain was of natural or human origin the following evidence can be provided in support of the latter. As has already been mentioned no natural water courses in this immediate area incise channels because of the relatively flat topography. Moreover a natural watercourse would have tended to strip away the soft and semi-fluid upper white sand layer and would have produced a wide shallow channel. Instead, the channels studied are all roughly "v" shaped and the deeper ones are cut to a depth of at least 50 centimetres down into the "concrete-hard" and relatively impermeable subclay layer. The main channel does not merely drain into two natural swamps, but passes over a rise between these. It should not be necessary to stress the high probability of two natural watercourses actually meeting on a rise.
Finally, the structure of the drains does not conform to that of a natural watercourse. Dual parallel channels exist in the "gridded" area towards the Clear Swamp, with secondary drains running diagonally to these. Excavations subsequently revealed more secondary channels in this and other areas of the system. On this above evidence it seems reasonable to accept the Toolondo drainage system as being of artificial origin.

Aboriginal or European?

The testimony of the European family at the Mount Talbot Station that the drains were Aboriginal and used in fishing is quite consistent with the observations furnished by Robinson from the Mount William region. The scale of the Toolondo system is also supported by the latter ethnographic example. There is no reason to suppose that Robinson's accounts had any influence on the state of knowledge at Mount Talbot, for he was the only ethnographer to record such structures in detail and as mentioned, his writings were largely unappreciated until quite recently.

The family at Mount Talbot has occupied the property since the earliest days. It is, therefore, extremely unlikely that any other European, could have constructed the drains without their knowledge. In structure, the drains are not European. The latter are invariably dug in straight lengths with a general uniformity of width and depth. As has been demonstrated, the Toolondo example provides a strong contrast with the above description, being irregular in both ground plan and dimensions.

Supporting evidence comes from the fact that during the excavations, Aboriginal artefacts - flaked pieces of quartz together with quartz cores - were found in most trenches. These generally were found lying at the base of the drains and within the lower fill unit. In T6 five pieces including three large pieces were found, and all bore signs of having been chipped or modified. None of the Quartz chips and cores showed signs of having been water-rolled, all had fresh sharp edges. The latter is an indication that these artefacts were dropped or carried into the drains as a by-product of human activity in the immediate area, and not transported in a secondary fashion from distant archaeological sites by water action. In contrast to this situation, no European artefacts were found in the lower stratum of the drains. Such artefacts, for example cartridges and lead
"buckshot" are commonly found in the European contact levels of archaeological sites, including surface sites in this region.

The Aboriginal artefacts were similar to those from assemblages found stratified within both the lunettes of the Clear and Green swamps. Similar quartz artefacts are found throughout the district, especially within lunette deposits. Large quantities of quartz artefacts together with other artefacts were detected by our survey of the swamps immediately to the north of the Clear Swamp. For example, Lake Jalumba, near Lake Toolondo, was an exceptionally rich lunette deposit.

In general, on the strength of all the above evidence it is reasonable to consider the drain as of Aboriginal origin.

Labour Costs

Some assessment no matter how approximate, should be attempted concerning the amount of labour expended in constructing the Toolondo drainage system. In order to arrive at such an estimate I have used a set of figures on labour rates in the construction of present-day drainage systems in the New Guinea Highlands. These figures were generously provided by Professor Jack Golson and Dr Phillip Hughes and were collected by Professor Axel Steensburg. These data are from an ethno-archaeological investigation, which formed a part of the Kuk archaeological project (see below). Following two sets of experiments, the New Guinea results showed that two cubic metres per man per hour was the average rate of labour investment achieved by local men when steel spades were used. When traditional and now obsolete wooden paddle spades were constructed and employed the rate dropped to 0.6 cubic metres per man per hour. In my calculations for the Toolondo site I have used the latter rate of labour investment but with the following reservations. South western Victorian drains were dug with traditional digging sticks, long pointed staffs, which while efficient would not have been equal to a spade. That is to say, use of a digging stick would still require removal of all earth by hand. As well the season of excavation must somehow be taken into consideration. While excavation during the wet winter months could be achieved under semi-fluid topsoil conditions (with all their attendant problems), similar attempts during the warmer months would have had to penetrate a sun-baked, solidified surface. The underlying clay layer
which was dug into in the deeper sections, is "concrete-hard" at all times. It would be wisest to therefore consider the lower estimate from Kuk as a minimum rate of labour investment for Toolondo.

I have calculated the labour estimates in the following way. Of the total length of the Toolondo complex (3.75 kilometres), 0.8 kilometres were of relatively wide and deep drains and the remainder of small shallow ones. For the larger drains I have estimated an average two metres wide by one metre deep, and for the smaller, 45 centimetres wide by 40 centimetres deep on the average. In this way a figure of 7,644 cubic metres is derived from the existing Toolondo system, which is equivalent to 12,740 man hours. Put another way, if we assume an average four hours of labour per day, a figure consistent with known hunter-gatherer inputs (Sahlins, 1974:1-39), 106 persons would take 30 days to complete the job. Maintenance of the drains which would require the annual removal of infill, plant debris, vegetation growth etc., would have to be added on to these estimates as would the construction of fish-traps and the like. The sex and age of the individuals who dug the drains, as I have already indicated, was not specified by Robinson. The implications of this labour expenditure are discussed in Chapter 15.

Before we can proceed to a discussion of the function of the drains, however, it is necessary to outline the behaviour and general biology of the principle species associated with these drainage systems - the eel.

The Eel

The many species of Anguilla are oceanic fish which spend the greater part of their growth period in freshwater, finally returning to the sea to spawn. Their migration (catadromous) contrasts with that of the salmon (well known to anthropologists and prehistorians) which feed in saltwater and migrate (anadromous) to spawn in freshwater locations.

Distribution

Species of Anguilla are found in all continents and in general display similar behavioural patterns. In south eastern Australia there are two species: the short-finned, temperate Anguilla australis and the long-finned, predominantly tropical Anguilla reinhardtii (Schmidt,
1927-8:194-5; Sinha and Jones, 1975:2). *A. australis* is distributed from around Brisbane to south western Victoria, and also throughout Tasmania. The Glenelg River in south western Victoria is *A. Australis*’s most westerly point of inland penetration. Individuals, however, have also been found as far west as the headwaters of the Murray River which they reach by travelling at night over wet grass from adjacent Victorian waterways (Roughley, 1968:150). Cold ocean currents perhaps, prevent them from colonising areas further west. This species is also found in New Zealand.

*A. reinhardtii* is essentially tropical and is distributed from Cape York to eastern Victoria (Gippsland). In the latter area it is found only in small quantities, and it is not found in western Victoria or South Australia.

**Growth Cycle (see Fig. 14:9)**

Comparatively little research has been carried out on the Australasian species of eel mainly because of their low commercial importance. In contrast eels are considered a delicacy in Europe and Asia (especially Japan) and post-war European migrants in Australia have stimulated commercial interest in the species. Scientific interest is now following in the wake of this trend, especially in Victoria (as well as New Zealand) which had the largest Australian biomass of eels (Usui, 1974:91).

The following account is based upon a general description of all eel species (see Bertin, 1956; Sinha and Jones, 1975; Tesch, 1977; Moriarty, 1978).

Eels spawn in tropical waters; for example the European and north American species favour the Sargasso Sea of the Atlantic. The tiny prelarvae develop into transparent, leaf-shaped leptocephalae larvae and are carried away on ocean currents towards the land masses which they will later colonise. The leptocephalus stage is followed by those of the glass eel and then the elver, in that order.

The drifting phase varies in time with each species and according to the distance from spawning grounds. For example, elvers enter coastal Australian rivers in the following sequence. In Queensland the season is
Fig. 14:9. The Life-cycle of the Freshwater Eel (after Sinha and Jones, 1975:7).

Fig. 14:10. Seasonal Arrival of Elvers at Eastern and Southeastern Australian Coastal River Systems (data: USI, 1974: 91).
winter, in New South Wales early spring, and in Victoria they arrive in spring (Fig. 14:10).

Before entering coastal river systems the leptocephalae metamorphose into slim elvers. The latter enter freshwater river mouths in huge quantities; some 26,000,000 elvers are recorded as entering the River Bann (Ireland) each year (Usui, 1974:82). In this way, elvers invade the coastline and begin to colonise the inland waterways, lakes and marshes, moving against the current. Elvers travel by night, resting and hiding by day, and make their way as far as the headwaters of the coastal river systems. By the time the upper headwaters have been reached, however, most elvers have successfully colonised the lower reaches of these coastal drainage systems. On their journey, elvers climb over obstacles such as waterfalls and dams by wriggling up the wet, mossy borders. The coming of the elvers is still considered to be an annual event at the Hopkins Falls in south western Victoria.

For a number of years the elvers grow and develop into the yellow eel stage, living on a varied carnivorous diet which includes insects, fish, crustaceans, molluscs and even birds. They also live in brackish estuaries. Although eels are aquatic animals they have also adapted to drought conditions. In dry seasons and areas eels can exist in mud and wriggle from dessicated marshes across wet grass at night (Roughley, 1968:151).

Slow flowing, muddy rivers, alkaline lakes (fenland), drainage ditches and coastal lagoons are the favoured locations for eels and have the highest population densities. In contrast, fast flowing and rocky rivers have the lowest population densities (Usui, 1974:24).

Migration

Migratory behaviour in eels is diverse varying in time and intensity and in response to local environmental factors. The various factory triggering off migration are still under scientific investigation. At the time of migration yellow (or brown) eels metamorphose to the silver state. At this time they take on physical characteristics which enable them to cope with the change from fresh to salt water. For example, the eyes of the silver eel are larger, scales more conspicuous and fat accumulates in the subcutaneous tissue (Sinha and Jones, 1975:87-9).
Once on a migratory run, the eel no longer feeds but gains it source of energy from its stored fat. In this state it travels for many months until it arrives, in a somewhat emaciated condition, at spawning grounds in warmer waters.

The Australian female silver eel (*A. australis*) reaches a maximum size of 95 centimetres and weight of 2.5 kilograms (Usui, 1974:114). Male and female silver eels migrate at different times, although in the same season. For *A. australis* statistics from Lake Yambuk in eastern Victoria show that female silver eels migrate in February–March, with average lengths of 70 centimetres, 600 grammes in weight and about 22 years of age. The male silver eel migrates in January–February, is 45 centimetres in length, 200 grammes in weight and about 14 years old (Usui, 1974:115). These ages have been taken from New Zealand examples of the same species, and should only be regarded as approximations. This basic seasonal pattern could be expected to vary according to local environmental conditions. In western Victoria the inland migration period appears to have been associated with the beginning of the wet season which begins around March. The general dimensions of the silver eels agree quite well with sizes of eels described as caught during the Aboriginal eeling season by the early ethnographers such as Robinson. If trapped in ponds, eels can live up to 85 years (Usui, 1974:24).

Eel migration appears to be associated with a number of complex factors — floods, lower temperatures, the phases of the moon, dark stormy nights (Sinha and Jones, 1975:87-99). For example, in some ways an increased flow of water activates migration. Eels are caught in large numbers in canals when water flow is increased, and in contrast few are caught when the water is not flowing. They tend to migrate in the direction of the flow of water (Sinha and Jones, 1975:95). These last few points should be borne in mind when explanations are sought for the operation of the Aboriginal drainage systems in western Victoria. Rates of eel migration differ, but these fish can distance between 15-70 kilometres in 24 hours. They travel at night, resting by day.

**Eel Fisheries**

To-day great commercial quantities of silver eels are captured by large-scale traps and weirs placed across river systems along eel migration
routes. The method of harvesting is essentially a simple one, that of channelling the eels into eel pots. In general structure and often in size, these eel traps or fisheries are little different to those employed by Aborigines in western Victoria (see Ch.6). (For examples of modern eel fisheries see Bertin, 1956; Sinha and Jones, 1975:100-23; Usui, 1974). Such eel fisheries are set up permanently in many European countries and Japan (e.g. the River Bann in northern Ireland). In this way all migratory eels within a particular river system can be captured without impairing the size of future eel populations for migratory eels still manage to successfully escape from lesser coastal waterways, and the magnitude of the returning elvers adequately replenishes the overall supply. We must imagine that Aboriginal predation on the species had a similar effect. In contrast, artificial eel fisheries, stocked with wild elvers (caught elsewhere) are also in use to-day, especially in Japan (Usui, 1974). This concept of restocking also applies to a certain degree to the western Victorian data as we shall see below.

Nutrition

Commercially, silver eels are to-day preferred to yellow (brown) eels, because of their high oil content and superior tasting flesh. The Victorian Aborigines had similar preferences. Silver eels are in fact more nutritious than salmon and most sea fish. Silver eels have a fat content of 33.9% compared with the salmon's 17.8%, and a calorific value per kilogram of 3,597 as compared with 2,376 for the salmon (Sinha and Jones, 1975:100).

Eels and Aboriginal Fishing

From the above general description of the biology and ecology of the eel a number of points relevant to Aboriginal fishing strategy has emerged and can be restated here. The eel, especially the migratory silver eel has certain inherent advantages for any fishing society. During the migration season it is harvestable in very large quantities, without any major impairing of its numbers. Added to this is the superior nutritional value of the silver eel when compared to other fish, and the fairly high predictability of the time and size of the silver eel harvest. These facts when taken all together would have rendered eeling during this migratory season a most profitable exercise in terms of energy expended to energy gained, and in this way superior to all other hunter-fisher strategies available at this time (see Ch.3).
In relation to Aboriginal fishing methods and in particular the artificial drainage systems, the following points are relevant. Firstly, eel migration is enhanced by an increased flow of water. Secondly, drainage ditches are favoured eel habitats with some of the highest known eel population densities. The final point relates to predictability, which is one of the key factors determining profitability of eel harvesting. Some locations would have provided marginal and less predictable eel yields. Such regions would include the extreme ends of the eel's terrestrial range, areas more susceptible to climatic oscillations. It is to these areas that we now again turn our attention.

Function of the Drains

Returning to the Toolondo site, we can now re-examine its key features. The drains have been constructed in such a way as to produce a fast current, fed by run-off and seepage water, and terminating in the two natural swamps, the Clear and Budgeongutte Swamps. This is illustrated by the elevated location of the marshy ground between the two swamps, the gradients of the two main drains, and the deeply incised cuttings and re-cuttings of the main drain as observed from the excavated areas towards the Clear Swamp.

With the coming of the rains in March-April, eels (and other fish) would have been flushed out of the seasonal marshlands and down towards the two swamps, Clear and Budgeongutte (Fig. 14:2). As I have indicated above, the artificial increased flow of water would have encouraged silver eels to begin their migratory run. As eels migrate in the direction of the flow, at Toolondo a sizeable proportion of eels would have been channelled inland towards the Clear Swamp, that is, diverting them from their normal southward migratory route. By this elaborate series of diversionary tactics eel harvesting could be maximised by taking advantage of both the rains, together with the migratory behaviour of this species.

Before they reached the two swamps, eels could have been harvested by a series of traps constructed along the main drains. The Mount William example included such a series of inbuilt traps. As I have already indicated, one likely area for the fish traps at Toolondo is the "gridded" zone of parallel main drains together with diagonal smaller auxiliary
drains some 400 metres south of the Clear Swamp (Fig. 14:3). In this "maze" fish could have been trapped and even retained.

This principle of artificially producing a flow of water for fishing (a basic and efficient use of hydraulic energy) was employed throughout Aboriginal Australia in association with fishing (see examples in Roughley, 1968) but nowhere to such a spectacular degree. Both Toolondo and Mount William drains would have been most effective during the annual migratory eel season when a high volume of high quality protein was literally on the move. Fishing, however, could have continued to take place throughout the winter months while the drains were operable.

Mount William

Before we proceed with the discussion on the function of the drains it is firstly necessary to recapitulate on the form and operation of the drainage system at Mount William which was described by Robinson (Ch.6). This system appears to have operated differently to that described above for Toolondo. The essential feature of Mount William was that mountain streams and creeks were channelled artificially through a series of long parallel drains (a triple system) some hundreds of metres in length, then through a highly complex 6 hectares of maze-like man-made drains, and finally into a natural swamp. Eel traps were constructed at various vantage points along the artificial drains. Although Robinson did not describe it in this way, perhaps the man-made drains also served to drain off seasonal marshlands which existed between the stipulated mountain streams and swamp. If this were so then the Mount William systems may have functioned in some ways like that at Toolondo. The highly complex nature of the drains, however, points to further operational differences. Harvesting of eels and other fish could have been facilitated by this system but its size would have provided ideal living conditions for a large eel biomass throughout most seasons. A form of large-scale artificial eel habitat had thus been created.

In overall scale these two main systems of Toolondo and Mount William appear comparable, even though their form is so dissimilar. Quite sizeable inputs of labour would have been necessary to construct and maintain both systems.
Other Drains

Robinson indicated that smaller drainage systems (on the Toolondo plan) existed in swamplands immediately west of Mount William (Ch.6). More diminutive drains also exist in the Toolondo area. At a swamp some two kilometres due south of the site of Toolondo were the remains of a very small series of drains. Local farmers directed us to the site and claimed that the drains were known to have been constructed and used by local Aboriginal people for fishing, principally eeling at the time of European contact. This structure was no more than 100 metres in length and drained into the natural swamp being located towards its north western end. It was difficult, without actually excavating, to see whether auxiliary drains ran off the main channel. It was also difficult to determine the drain's width and depth but neither of these approached in any way the maximum size of those at Toolondo.

Location of the Water Controls

We can now return to the problem of the wider function of both complexes of drains, Toolondo and Mount William. Certain insights can be gained from the geographical location of these sites.

The Toolondo drains are positioned across the divide between two major river systems, the coastal Glenelg and the inland Murray systems. While the southern Budgeongutte Swamp is connected to the coastal river system the northern Clear Swamp is not. Overflow from the latter drains into a chain of swamps to the north and there is no natural connection between the two swamps. Thus the artificial linking of the two swamps would have provided access for eels (and other fish) into marshlands further inland to the north. As eels travel via moist ground such a connection would have been operable throughout most of the year. Elvers reaching the headwaters of the Glenelg in spring could thereby have continued their migration along these artificial drains which presumably would have been functioning at this time of year, and thus have colonised more northerly swamplands which would otherwise have been largely out of reach. In this way the territorial range of the species would have been effectively extended at these marginal outer zones of its distribution. An extension of range would also have produced subsequently an increase in the eel biomass in this area.
Once the colonising elvers had gained access to the Clear Swamp they would have distributed themselves well beyond their "natural" range of which the Budgeongutte Swamp area was the northern limit. The magnitude of this artificial extensive in eel range is now difficult to determine but some estimate can be obtained from known densities of eels. Such population densities would of course depend on local environmental factors among other things. Figures from Lake Ellesmere in the south island of New Zealand which is 260 kilometres square and 2.3 metres in depth produces 300 tonnes of eels annually (Usui, 1974:90). This is perhaps an atypical example, as is that of Lake Bolac in south western Victoria (Ch.6). Other figures obtained show that artificial fish ponds produce between 1-4 kilograms of eels per square metre depending on pond size and other factors (Usui, 1974:117). The estimates provided should be considered as above the upper limit of eel carrying capacity in the Victorian region under study, but they give some indication of the potential increase in eel biomass in these northern regions once further marshlands are colonised by fresh elver stock.

I am not suggesting here that the extension of eel range was the principal or original objective in the construction of these Aboriginal drains. The processes involved in the origin and development of these drainage systems are discussed in Chapter 15.

Swamp Management

The scale of these drainage systems together with their form of construction point to their operation as more than mere eel harvesting devices. Being artificial water controls the Toolondo and Mount William drains would have operated as a form of swamp management. By the latter term I am implying an artificial control over the natural drainage of the marshlands. Such management would have produced the following results. In the wet season excess water would have been drained off, and conversely during dry seasons and years ground water would have been retained by the drains.

Oscillations in humidity in the region, however, would have affected the operation of the drainage systems significantly. Table 14:2 lists information on rainfall and general climatic data for the Toolondo area covering a ten year period which I obtained from local farmers. The
information provided here is of course relative and must be viewed against the average rainfall for the area which has been mentioned above.

<table>
<thead>
<tr>
<th>Year</th>
<th>Climate</th>
<th>Swamps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968</td>
<td>very dry</td>
<td>Budgeongutte Swamp dry</td>
</tr>
<tr>
<td>1973-75</td>
<td>very wet</td>
<td>Swamps full, extensive flooding of paddocks, roads</td>
</tr>
<tr>
<td>1976-77</td>
<td>very dry</td>
<td>Clear Swamp dry, Budgeongutte Swamp low</td>
</tr>
</tbody>
</table>

Table 14:2 Oscillating availability of water in the Toolondo area 1968-1977

The above table shows that between 1968-77 two very dry periods have been experienced in the Toolondo area which considerably affected local availability of water. During these dry periods marshlands, including the Clear and Budgeongutte Swamps, began to dry out. While in the field in February 1977 we were surprised to find a dessicated Clear Swamp in place of what for the two preceding years had been a green oasis, abounding in bird-life, amidst an expansive and parched savanna. Conversely, during the 1973-75 period extensive flooding had been experienced in the wet season.

It must also be noted, however, that water availability in the region today has been reduced due to extensive deforestation together with the planting of water absorbent clover grasses. Even so, taking into consideration the last point, the ten year climatic cycle mentioned above, is an indication of the degree of climatic oscillation experienced by the region. We must imagine that Aboriginal drainage-based fishing was also subjected to similar fluctuations.

The Toolondo water controls have already been shown to have plausibly counteracted the full affect of climatic oscillations in rainfall in the area. In this way they would also have positively affected
the distribution and therefore the availability of eels (and other fish) in these marginal areas. The effect of minor fluctuations in water availability upon the local biomass of eels would have been most severely felt in the latter areas, as the size of the eel population here would have been already restricted. We could, therefore, assume that these Aboriginal water controls would have helped to regulate (i.e. stabilize) the size of the eel population in the Toolondo area.

The Mount William drainage system is likewise located in a comparable situation to that of the Toolondo drains. The Mount William region also lies at the extreme northern marginal ends of eel distribution. Both Toolondo and Mount William areas, in fact, are the only two locations along the Great Dividing Range where the headwaters of the two major drainage systems (coastal and inland) are close enough to be artificially connected (Fig. 14:1). This evidence suggests that the location of these two examples, one archaeological and the other ethnographic is not merely coincidental. Further, it stands in support of the interpretation of the operation of the Toolondo system provided above.

While in the field I attempted to locate the Mount William drains but all efforts proved fruitless. There appeared to be no local knowledge of the existence of such a site or of such structures, which was a direct contrast to the situation at Toolondo. Explanations for this finding could involve the fact that the Mount William area, unlike Toolondo, has received a large turnover in population. Any local knowledge of the drainage systems observed by Robinson in 1841 would have been subsequently lost. Having failed in the field, I attempted to search for the structures using aerial photographs of the Mount William area. This device also drew negative conclusions. European land-use of this area has been intensive since last century and includes the heavy ploughing and seeding of the plains. Relatively shallow structures such as those observed by Robinson could have offered little resistance to such practices. The Toolondo area, as I have mentioned, had not been ploughed until quite recently. Aerial photographs taken under different seasonal and light conditions might prove more rewarding in the future. In spite of these limitations a fair approximation of Robinson's drains can be gauged using the geographical information he provides. This has been attempted in constructing the above map (Fig. 14:1).
Large-scale gatherings and ceremonies

We have seen that at Lake Bolac (Ch.6) and presumably at other fertile and favoured eel fisheries, the migratory eeling season coincided with large-scale gatherings of people and ceremonies. For the drainage systems at Mount William we have plausible evidence for the occurrence of similar practices. The 13 large earth ovens which Robinson described close to the drainage complex as camping grounds of local bands is evidence for sizeable population aggregates at the site. Further evidence is provided by Robinson’s meeting with groups of local bands at Mount Burrumbeep who carefully and proudly described for him the structure and operation of the Mount William "vam" (Ch.6). The inference here is of a local eel fishery resorted to and at least seasonally occupied by a sizeable population composed of groups of bands located in the wider northern Tjapwurong region.

This model of seasonal eel harvesting in association with large-scale gatherings and possibly ceremonies could also be transferred to the Toolondo site. I have already mentioned that Toolondo was on the borders of three tribal groups (above) and also that such locations, especially when they coincided with resource-rich areas and seasons were favoured places for the holding of inter-band and inter-tribal meetings (Ch.8). Although as yet there has not yet been found direct archaeological evidence for large group sizes at Toolondo, as I have stated above, there are plentiful archaeological sites in the immediate area. The relevance of these drainage systems to inter-group occasions is discussed below in Chapter 15.

Living Sites

I have mentioned above that lunette deposits in the Toolondo area contained artefactual material, including the lunettes of the Green and Clear Swamps. Oven mound sites or earth ovens also existed in the area. One example is still to be found alongside the road just south of the south western tip of the Clear Swamp lunette. A group of two or three mounds exist within the forested area lying within one kilometre of the Toolondo Aboriginal drain to the north east of the Clear Swamp. As we have shown (Ch.7) the size of this type of site has been affected by European grazing and ploughing. The size of these particular examples measured approximately 3-4 metres in diameter by 50 centimetres in height. There appeared to be no artefacts or obvious charcoal associated with these deposits.
There is no evidence so far of a large complex of earth mounds around the Toolondo site, such as that described by Robinson for Mount William.

Secondary Advantages

Operating as water controls the Toolondo and Mount William drains would also have played important secondary roles. At Toolondo, water levels in both Clear and Budgeongutte Swamps would have been maintained at higher than normal levels, which was important in areas such as this which were subject to fluctuations in rainfall. In this way aquatic resources could be conserved. Even during the dry summer months moisture would have been retained in the soil of the drains, as it continues to be even today after the drains have fallen into disuse. Such a situation would have provided ideal conditions for water-loving plants (e.g. Typha species). Plant staples such as the daisy yam (*Microseris scapigera*) which grows prolifically in open areas (Ch.6) would also have been favoured by these factors. Rushes can still be seen today growing in clumps within the preserved sections of the drain places. Freshwater crustaceans and other aquatic species (birds, tortoises etc.) would also have been encouraged by the presence of the drains.

Such secondary aspects should be seen as in these examples as side benefits. Given a different set of circumstances such "spin-offs" may have begun to play a more dominant role in the subsistence cycle associated with the drains. This aspect of the systemic argument is discussed further below (Ch.15).

Ethnographic Parallels

Reference has already been made to the traditional association between large-scale drainage systems and agricultural societies. It is only fitting, therefore, to compare the south western Victorian examples with those from other documented archaeological, ethnographic and ethno-historical contexts.

Archaeological examples of drainage systems (water controls) presumably used for agricultural purposes are known from c. 6000 B.P. (and perhaps earlier) in Kuk, Wahgi Valley, Central Highland New Guinea
(Golson, 1977a, b). In some ways the earliest examples of the latter are comparable in scale to those from within a hunter-gatherer economy in south western Victoria. The early Kuk drainage system covers an area of c. 3 kilometres (Golson, 1977a:615) and therefore compares well with the Toolondo drains which are of equal distance. In terms of labour input, however, the Toolondo system was not as intensive at that at Kuk, where the larger channels ran for over one kilometre and were around two metres wide and deep. Only the more extreme margins of the Toolondo complex, where the drains begin to enter the Clear and Budgeongutte Swamps, are similar dimensions achieved. Nevertheless, other features between the two systems are comparable. The earliest Kuk complex was composed of a network of small basins which had been linked by little channels, in much the same way as the Toolondo system. Further, the Kuk drains operating as a water control like that of Toolondo, served to retain water in dry seasons and channel off the excess in wetter years. Later Kuk drainage systems were increasingly more complex and therefore more labour intensive.

Large-scale irrigation systems were also employed by the Paiute of the Owens Valley, California within an economy that straddled hunting-gathering and food production. Observations of these systems have been largely reconstructed from ethnographic and ethnohistoric data (Lawton, et al., 1976). The drains were used to irrigate indigenous and naturally growing grasses which served as a staple crop. No attempts were made to plant these species. In scale the two largest drains described by Lawton et al., are 3.2 kilometres and approximately 5 kilometres in length. As I have shown, the Toolondo drains in length compare favourably with the shorter of the two Paiute drains. In terms of my argument it is relevant to observe that these Paiute drains were also used for fishing. In fact it has been theorised that they may have originated for this purpose and later have been directed more specifically towards the irrigation of plants. No elaborate social organisation was developed to construct this drainage; male co-ordinators were elected annually to supervise the task, and labour was supplied by band members (Lawton, et al., 1976:18-42). The western Victorian drains should perhaps be viewed in a similar light. But unlike the Victorian examples, the possibility of contact with nearby agriculturalists cannot be ruled out in a discussion on the development of the drainage systems at Owens Valley.
In conclusion therefore, the Toolondo site represents a rather unique hunter-gatherer example of technology and land management. This archaeological evidence complements the description by Robinson of large-scale eeling practices performed in these inland regions at the base of the Dividing Ranges. Furthermore, it throws up a number of questions relating to the growth and maintenance of intensive extractive techniques, their role in and effect on the overall subsistence economy and subsequently upon human population densities. These issues are discussed in the following chapter.
CHAPTER FIFTEEN
ENVIRONMENTAL CONTROLS

As has been shown in earlier chapters (1, 3, 6) the manipulation of the environment was a factor in hunter-gatherer economies and was practised in south western Victoria at the time of European contact. Such practices in general can be viewed as attempts to stabilize resource yields, but at times they may also have had the effect of increasing productivity (ch.1). In this chapter I wish to discuss the implications of such hunter-gatherer land and resource management practices, and to specifically look at the example of water controls in south western Victoria which was discussed in the previous chapter. To this end I will examine the context in which the latter operated and suggest likely mechanisms by which they may have developed. Such an approach allows for a closer examination of the processes by which hunter-gatherer economies may expand by methods other than domestication, although the latter must also be seen as a related process.

Environmental Controls Employed in Australia

In Appendix 1 I list and discuss a range of resources which were in some ways managed by Aboriginal societies. These are listed under four categories -

(a) resource increase;
(b) access to a resource;
(c) extension of the season of supply of a resource, and
(d) animal domestication.

The results of this short review can be summarised in the following way.
The wide range of Australian species, environments and methods used in the above-mentioned examples suggests that resource management was a fundamental mechanism of Australian Aboriginal economies. Introduced species were also involved in this process. These methods were also employed throughout the major Australian environments, including those of tropical, temperate and arid zones. Notwithstanding the generally poor quality of the data, it can be observed that such management affected the distribution and/or the productivity of various species, plant, animal, bird, fish, insect. All methods would have been most effective in the short-term by helping to stabilise (regulate) resource yields. Examples of the latter were the planting of tubers in northern Australia and seeds in western New South Wales. The planting of yams on offshore islands in the Lockhart area (Qld) also would have extended the distribution of that plant. However, the use of fire appears to have been the most influential and versatile method of management. Firing of vegetation produced ecological disclimaxes, and in this way increased the distribution of species and in certain cases, their productivity (e.g. Cycad nuts in Cape York, and Macrozamia species in northern New South Wales). As well, the productivity of whole environments, could have been increased by the use of fire. Firing also assisted in increasing herbivorous populations by extending areas of forage. In all methods relating to management, it is difficult to evaluate the relevant labour inputs. The example of large-scale water controls from south western Victoria would indicate the necessity for sizeable efforts, but in general most practices discussed appear to have been rather less labour intensive. We may, however, be deluding ourselves in accepting this form of data. For example, methods of harvesting (e.g. plants and fish) were quite intensive, involving large numbers of people. Labour inputs of equivalent size may have also been expended in management practices and have been omitted by observers whose accounts overall are rather scanty.

Management was also extended to various insect species (grubs in various regions, bees) with the effect of increasing the productivity of the species. Water controls in the form of dams and weirs were constructed, which resulted in providing stability of aquatic environments and their resources.

In general, it appears as if the aim or result of the majority of
management methods was to ensure the stability of resource yields, in
the fact of the unpredictable oscillations which continually occur. This
argument is also supported by the interpretation of Aboriginal increase
ceremonies, which are associated with key resources and are principally
conservationist in intent (Meggitt, 1964). In certain cases, as has been
mentioned, the productivity of species was also enhanced.

South Western Victoria

The examples of resource management from this area (chs 6, 14)
appear to be consistent with the above range of Australian cases. The
water controls from Toolondo and Mount William areas involved the management
of aquatic environments and in particular the eels which were an important
seasonal resource. This management would have resulted in the stabilisation
of resource yields and the increase in distribution (and therefore
abundance) of the eels (ch.14).

The other instances of conservation and management of resources
have already been mentioned (chs 6, 14), and these generally conform to
accounts from other Australian environments.

The Development of Water Controls in Victoria

It now remains to examine the development of these water controls.
Here we have a clear example of a shift (amplification) in one sub-system
within the overall hunter-gatherer economic system (see Flannery, 1968).
The south western Victorian examples appear to have been an adaptation to
local conditions. It would seem unnecessary to invoke diffusion or the
like to explain the origin of these water controls which have no known
equivalents in south eastern Australia nor on the entire Australian
continent.

Because of their size, we could assume that these water controls
would have demanded a higher expenditure of energy in their construction
and maintenance than other existing fishing methods (traps, weirs etc.,
see also ch.14). As we have discussed, the development of these systems
would have made for greater control (management) over the local environment,
certain of its resources, and by implication their yield. In this way, these water controls can be seen as a form of artificial economic expansion. The model which is most suitable for explaining the development of these water controls, is a systemic one (see ch.1) which allows for the complex interaction of many influential factors, and has the advantage of eschewing unicausal explanations and the emphasis upon prime movers (see Clarke, 1968; Flannery, 1968; Bray, 1976). Bearing this model in mind, a number of related factors could be proposed in this case to explain the change, neither of which in itself is viewed here as necessarily predominant.

Firstly, there is evidence to suggest that environmental changes played an influential role. Bowler (1976:73) has demonstrated that variations have occurred in the availability of water in the area at least over the last 10,000 years (Table 15:1). On this table Bowler records data which are based upon oscillations during the above period in water levels from Lake Keilambete, situated at the centre of the Western District. Generally he shows that this lake which had been dry before 10,000 B.P. rose to a high level around that time. This rise in water levels he relates to a worldwide increase in precipitation for which evidence exists at the time (see Bowler, 1976). Water levels begin to fall again by 5,500 B.P. Sedimentary records accord with those of hydrology, at this time, to indicate a drier climate similar to that of the present. Water levels rose again around 1,900 B.P. Today water levels are close to the lowest reached over the last 10,000 years. This general climatic pattern Bowler interprets as a series of "oscillations diminishing in magnitude since the major events of 15,000 B.P. and earlier".

Reduced water levels would have also had the effect of reducing the availability of aquatic species, including eels, in the marginal (northern) zones of the coastal plain. In the latter areas this species was at its most extreme limit of colonisation, and therefore vulnerable to reductions in water availability. The development or intensification of these systems could have been in part a response to these climatic oscillations. For, as has been shown, water controls assist in both situations of reduced as well as excess water availability, and thus in regulating resource yields.
**Table 15.1** Oscillations in Water Levels from Lake Keilambete - south western Victoria (after Bowler, 1976:73)

<table>
<thead>
<tr>
<th>Time</th>
<th>Water level</th>
<th>Climate</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre 10,000 B.P.</td>
<td>lake dry</td>
<td>drier</td>
</tr>
<tr>
<td>10,000 B.P.</td>
<td>high level</td>
<td>increase in precipitation</td>
</tr>
<tr>
<td>5,500 B.P.</td>
<td>levels fall</td>
<td>drier</td>
</tr>
<tr>
<td>3,100 B.P.</td>
<td>minimum levels</td>
<td>dry, similar to today</td>
</tr>
<tr>
<td>1,900 B.P.</td>
<td>levels rise</td>
<td>more humid</td>
</tr>
<tr>
<td>present . . .</td>
<td>levels fall</td>
<td>dry (equivalent to minimum levels reached over last 10,000 years)</td>
</tr>
</tbody>
</table>
A second factor is demographic change. It has been strongly argued that increased sedentism enhances population growth (e.g. Binford, 1968). The relatively sedentary and resource rich coastal zone of western Victoria may have periodically undergone such population growth. Both Toolondo and Mount William lie on the border between the humid coastal strip and drier inland plains with their more mobile economies. The latter situation resembles Binford's "population frontier or adaptive tension zone" (1968:332) where he predicts that more rapid cultural changes could be expected.

There is also evidence to suggest a possible third factor. The change may have also occurred within the context of interaction and competition between local groups (e.g. bands, groups of bands, linguistic groups). Such social interaction may have also involved the holding of ceremonies (which are known to have taken place in association with eelling) at Lake Bolac (ch.6).

The Mount William area which Robinson described, was inhabited by representatives from bands distributed across the northern Tjapwurong region, neighbouring Jaadwa and northern Wathaurung. This was a population basically different from that using the rich eel fisheries at Lake Bolac some 45 kilometres to the south. This is not to exclude the likelihood of a small degree of population exchange between the two groups. Lake Bolac, lying on the boundaries of three tribal groups would have also received population from the central area of the Western District, including representatives from the northern Kirrae, possibly from the Kolakngat and northern Manmeet. This spatial factor, the distribution of population in relation to available resources, cannot be ignored as possibly providing incentives for change. Without the elaborate water controls which ensured against periodic variations in water availability in these marginal areas, the local Mount William population would have been denied its resource base for holding large-scale seasonal gatherings and possibly ceremonies (on the Lake Bolac Model). Climatic variations in precipitation, as have been shown to have occurred in the area (above), would have aggravated this situation even further. We cannot rule out the possibility also of added incentives such as prestige and status, which would have existed for influential individuals to maintain and encourage eelling (and its associated social interaction and ceremonies) in their "country" during this important season (see Cowgill, 1975:516).
The Toolondo example can also be viewed in a similar context of population interaction, as it is located directly on the borders of three tribal areas (Tjapuwrong, Jaadwa and Bunganditj). Inter-tribal gatherings and ceremonies tended to be held in close proximity to tribal boundaries so as to facilitate ease of movement (ch.8, Lourandos, 1977a). Also, pressure in terms of competition for resources was recorded for this Toolondo border region (ch.8).

This association between inter-group ceremonies and cultural change deserves further comment. Such elaborate ceremonies were widespread across mainland Australia, and have been seen by some in terms of their adaptive value (e.g. Yengoyan, 1968). Yengoyen points out that the elaboration of such ceremonies and the kinship systems which form their social matrix, can be related to economic and environmental factors. Such ceremonies and complex social systems he sees as mechanisms of economic control, which provided a wide network of social contacts and obligations to be relied upon in times of economic hardship (see also ch.1). In support of his arguments he points out that the arid zones of Australia had the most complex kinship system as opposed to fertile coastal areas where less complex systems existed. Complexity of social system is inversely related to environmental productivity.

Given these arguments it can be seen therefore that the maintenance of such social systems via ceremonies would have been obligatory for all participants. This last point reinforces my arguments concerning eelng and the related water controls in western Victoria. It also introduces another relevant factor, that of the economic base for such large-scale ceremonies. While in south western Victoria such a base was provided by elaborate harvesting devices, in other parts of Australia labour-intensive subsistence methods were also employed involving individual resources (see also Appendix 1; ch.17). An important point to remember here is that the elaborate processing of plants (e.g. cycads) and storage of plants (e.g. seeds, tubers) was also associated with such ceremonies, that is within economic contexts beyond the level of the band. The reasons for this are somewhat clear. The ethic of reciprocity may have inhibited large-scale storage for individual bands, but may have promoted such practices in terms of the larger group where the maintaining of obligations was more precarious. It is not out of place to recall that other
competitive inter-group contexts have been considered as promoting change, for example trade (Flannery, 1965). Ceremonies which gave people access to otherwise unobtainable resources could also be seen therefore as mechanisms of resource redistribution. I would suggest that such mechanisms within hunter-gatherer economies be considered as likely factors of economic change. In such contexts as these, steady-state models (ch.1) which have been based upon the band have less relevance, and thus the dynamism of the wider hunter-gatherer social universe can be better appreciated.

The development or intensification of these water controls, then could plausibly be viewed in relation to climatic oscillations which have occurred over the last 10,000 years and more in this region. Such environmental instability would have endangered the annual reliability in the yield of eels in marginal areas, those located at the base of the Dividing Ranges, and therefore would have produced stress upon a socio-economic system dependent on this localised resource base for its annual autumn social gatherings and ceremonies. Slight shifts in demography, and competitive interaction between local populations (which may also have been related factors) would have aggravated such a situation even further.

Problems arise if we proceed beyond 10,000 years in this investigation, for sea level changes would have affected both population, due to loss of territory, and the distribution of eels which would have been affected prior to this by the exposure of the Bass Strait land bridge connecting Victoria to Tasmania. Given the last factor, the whole growth of eeling in south western Victoria may in fact be a post-glacial phenomenon, but due to lack of evidence at this time this matter must remain in the realms of speculation.

Conservation and Change

I will now relate this example to the wider problem of explaining change within a hunter-gatherer economy. In Chapter 1 I discussed the prevailing tendency in recent analyses to regard shifts in levels of extractive efficiency within hunter-gatherer economies as attempts to increase environmental productivity. As I have shown in this and other chapters (including ch.1), the more conservative response of stabilising
or regulating resource yields would be the more plausible overall explanation, without necessarily negating the possibility that attempts to increase resources also may have occurred. Such a situation agrees more closely with basic ecological principles (ch.1). This explanation fits the south western Victorian data well, for in this example resource increase may have been a bi-product of the overall process. We could assume also that similar processes were at work in the early stages of intensification which in some cases led to food production.

It would be difficult to demonstrate whether or not these Victorian environmental controls had an immediate effect upon local population sizes. Instead it is more plausible to assume that examples such as this may have affected long-term population trends by providing greater stability in resource availability, and secondly by relaxing economic pressures on neighbouring environments which may otherwise have been exploited. The latter are important mechanisms by which hunter-gatherer economies could expand. We cannot merely assume that amplification of sub-systems would have had no effect upon the system as a whole (as Jones argues), for by definition, it must. By employing management practices such as those discussed in this and other chapters (e.g. 6, 14), limitations in the overall system could over time have been reduced. For example the south western Victorian water controls would have been used principally in autumn which was a season of depleted resources. These eeling devices, therefore, would have assisted in shoring up this one limiting factor or season in the whole annual strategy. My interpretation of the south western Victorian economy as it was observed at the time of European contact, is the following. We have seen that its principal features were relatively high population density, sedentism and a wide range of extractive and land and resource management practices. As such it would be best viewed as representing shifts or intensification in many extractive techniques, along the lines of the examples discussed here. The avenues along which such expansion may have occurred have already been outlined above (ch.9). The alternative proposition would be to consider that in terms of population size and extractive levels, given a similar environment, the economy has remained essentially unaltered for the last 30-40,000 years or so, in tune with the theories of Birdsell and Jones (above).
CHAPTER SIXTEEN
HUNTER-GATHERERS AND BEYOND

Levels of extractive efficiency within hunter-gatherer economies was a feature of the dynamic model discussed in Chapter 1. I discuss this issue here in relation to the wider Australian context (see also Lourandos, 1980). As a measure of extractive efficiency I employ population density (see ch.5), although a 1:1 relationship between these two variables should not be expected. In order to distinguish between levels of population density, and given the approximate nature of the estimates presented, I have taken as significant an arbitrary difference of approximately 50% (in terms of people per square kilometre) between any two compared populations. Comparisons are drawn, in this chapter, between levels of extractive efficiency within Australia and also between Australia and New Guinea.

Firstly, I discuss the south western Victorian evidence concerning economy, settlement and population, in terms of mainland Australia, and secondly in relation to Tasmania. I argue here that the differences in levels of population density between Tasmania and south western Victoria, as presented in Chapter 5, can be explained as a correlate of technological differences, that is, differences of extractive efficiency. The alternative explanation offered by Jones is also discussed. Finally, I compare the Australian and Tasmanian data to a series of contemporary hunter-horticulturalist societies from nearby New Guinea. Such an approach helps to more clearly delineate the differences between the strategies of hunting-gathering and food production and also the process by which intensification takes place. This last issue, I feel, is closely related to the problem of explaining technological changes within hunter-gatherer economies.
South Western Victoria and Mainland Australia

It has been shown (ch.5) that population densities in south western Victoria compared well with those from other fertile Australian regions including other temperate areas, as well as the tropical coast of Arnhem Land. We could conclude from these findings, therefore, that roughly similar levels of extractive efficiency existed between these economies. Another related feature of the south western Victorian economy was the relatively high level of sedentism. It would be of interest, therefore, to investigate whether other high population density Australian societies also were equally as sedentary. Sedentism and settlement patterns have shown to be related features (chs 3, 6, 7) and so these aspects will also be discussed.

(a) Temperate Regions

A review of a number of temperate regions, which have been quite well documented, indicate that relatively high levels of sedentism had been achieved. For example in the Mount Gambier area of South Australia, a part of the Bunganditj region which extends into western Victoria, Robinson records comparable sedentary conditions to those from areas such as the Great Swamp (Mount Napier area) in the Western District (1945). Both regions are associated with perennial wetlands.

Further north west in the same fertile coastal region, which shares many environmental similarities with south western Victoria, lies the Coorong, which has been referred to a number of times in this thesis. Tindale's descriptions of seasonal patterns of settlement and subsistence in this area (1974:51-2) are vivid and support the models of such features established for coastal western Victoria, especially for the Peek Whuurong (Manmeet) (chs. 6, 7). Because of this I will treat this example in some detail.

The Tanganekald inhabited the long estuary of the Coorong, which was bounded by the Great Southern Ocean to the south and the Tengi shore to the north. In summer they frequented the southern seaward shore of the estuary, a region of extensive scrub-covered sand dunes. Freshwater springs supported them and attracted birdlife on which they depended together with marine foods. Women collected shellfish from the ocean beach and deposited most of the waste shells in dumps in the shore. In the winter months
camps were moved across the Tengi shore, to their favourite winter quarters, where they could take advantage of the protection provided by the scrub, and ample supply of firewood. Here substantial winter huts were constructed with "mud walls and supporting timbers". Fish was their basic food source, and fish traps of stone were constructed along the shores with fish nets stretched across the Coorong lagoon to catch mullet. Hunting of kangaroo, emu and water birds took place in the hinterland of scrub and swamplands to the north.

The above general features depicting peak occupation of the coast in spring-early summer and general relocation away from the coast in winter, find parallels also in subsistence/settlement models established for the south coast of New South Wales (Poiner, 1976; Attenbrow, 1976). Semi-sedentary settlement patterns associated with seasons of resource fertility have also been recorded for inland regions such as the resource-rich Murray river area (Bickford, 1966).

The remaining comparative areas of mainland Australia I will treat even more summarily.

(b) Tropical regions

A brief description of a few examples from fertile tropical areas demonstrates that similar patterns of sedentism and settlement were operating in these environments also. Thomson's now classical ethnography of the seasonal cycle of the Wik Monkan of eastern Cape York exemplifies this semi-sedentary lifestyle (Thomson, 1939). Sedentism in the latter area was associated with seasons of resource abundance, in this case the wet season (spring-summer), and nomadism with times of dispersed and reduced resources such as the dry season (autumn-winter). Sedentary base camps were established for months at a time and were re-established annually within the same general area. The size of groups was also larger during the dry season. A similar pattern has been described for coastal Arnhem Land (White and Peterson, 1969). Both the more recent studies of Peterson (1971) and Meehan (1977) also demonstrate that groups within the general coastal region of eastern Arnhem Land were relatively sedentary and used a low number of base camps throughout the year. In the last two case studies we must also allow for influences due to acculturation such as rations, medicines etc. Around the large coastal-hinterland marshes of the Arafura
Swamp, large artificial earth mounds were constructed and lived upon, some of which are now being investigated archaeologically by Drs Betty Meehan and Rhys Jones (pers.comm. Rhys Jones). These mounds which are located so close to natural wetlands, are reminiscent of the south western Victorian examples which allowed for semi-sedentary occupation of waterlogged and resource-rich environments (ch.7). As has been mentioned (ch.7) such earth mounds were common features throughout fertile regions of south eastern Australia.

Taking a broad perspective therefore, these scant but wide-ranging data indicate that levels of sedentism were high throughout the more fertile areas of temperate and tropical Australia which were regions carrying the densest populations. Broadly similar levels of extractive efficiency could also therefore be presumed from these areas.

Tasmania

Since the time of initial European contact differences have been perceived between the technologies of Tasmania and the Australian mainland (see Birdsell's view, Ch.1; Jones, 1979a; Hiatt, 1967-8). In general the Tasmanian technology was sparser, depleted in many items of material culture and had a narrower range of extractive strategies. For example, fish were not eaten by recent Tasmanians and the processing of plant foods known on the mainland was more restricted. Objections might be raised concerning the last point in view of the fact that processing of plant foods was, in general, also restricted in temperate Australian regions such as those discussed in this thesis. However, the selectivity of plant species (such as that of the tubers, the yam daisy in particular) and also the large quantities in which these were consumed, is unknown from Tasmania (e.g. see Hiatt, 1967-8). Fixtures such as permanent traps, snares and the like, were unknown, except for some references to these on the west coast of Tasmania (Lourandos, 1970). In general, the Tasmanian settlement pattern was more mobile than in comparable mainland coastal areas. This last feature was especially pronounced in areas where resources were most dispersed such as in the east and south east of the island. Conversely, where resources were more plentiful and concentrated, such as on the west coast and especially its northern half, settlement was more stable and sedentary along the coast, but these areas also lacked sedentary features
such as earth mounds inland (Lourandos, 1968, 1970, 1977b). The latter areas also carried the densest populations in contrast to the south east which carried the lowest (see ch.5).

Given this situation, an island culturally isolated for some 10,000 years (see Jones, 1977b) and with a less complex technology than in comparable areas of mainland Australia, one would expect a lower level of extractive efficiency. Comparative population densities, which have been used as an expression of population size, have borne this out. South western Victorian densities were some four times those of Tasmania (ch.5). Environmentally, the two areas share many similarities, in particular the south western Victorian and northern and north western Tasmanian coastal regions. A comparison of the population densities from these two areas produced similar results (ch.5). This latter magnitude of variance between the two areas would be difficult to uphold on purely environmental grounds, given the fertility of the Tasmanian region. The latter has a high biomass of saltwater and freshwater fish (including eels) which were unexploited, and of other marine and terrestrial resources (see Jones, 1971a). It would be extremely difficult to show that the coastal fringe of western Victoria was better endowed. This littoral was, as has been shown above, generally exposed and lacking in protected bays, estuaries and sizeable areas of intertidal rock platforms, a contrast to north west and west Tasmania. Given the comparable population densities (to those of the Western District) from neighbouring rivers (Murray area) and Coorong regions (ch.5), it is reasonable to suggest that rich areas such as Gippsland (eastern Victoria) should also have carried similarly dense populations. Robinson's descriptions of the Gippsland area report semi-sedentary populations with a marked fishing bent to their economy, so strong an emphasis on fish in fact that he called them "ichthyofagist" (fish-eaters) (Mackness, 1941:11). This description is quite dissimilar to coastal northern and north western Tasmanians.

The most plausible explanation, therefore, for these differences between Tasmanian and south western Victoria would have to be attributed to technology. These conclusions are in line with the arguments discussed in Chapter 1, but they contradict those of Jones who argues for similar population densities between equivalent south eastern Australian and Tasmanian environments (see ch.5). On these grounds Jones infers that
similar extractive levels were operating in these comparable Australian and Tasmanian areas, in spite of the more limited Tasmanian technology. In an attempt to explain this "paradox", as he called it, Jones allowed that the more elaborate technology of the Australian mainland was more efficient but that the extra energy so gained was channelled into unproductive pursuits such as religion, thus maintaining optimum (i.e. lower) population densities (see ch.1). More efficient technology, he argues, allowed for more leisure time (Jones, 1977a). By this neat manipulation of the systemic model Jones has attempted to preserve in tact the credibility of his steady-state model (ch.1). Objection could be raised however, by asking for a description of the mechanisms by which this proposed feedback loop operates. As well, more effective explanations for the existence and maintenance of religious ceremonies can be proposed (see ch.15). The most telling evidence, however, is that of population densities from south western Victoria, which removes the key to Jones' arguments (ch.5). Elaborate social pressure values are unnecessary when increased extractive efficiency can be adequately explained in terms of population increase (see also ch.1).

The acceptance that different levels of extractive efficiency existed in south eastern Australia (including Tasmania) at the time of European contact supports the arguments I presented in Chapter 1 and runs contrary to the arguments of Birdsell, Jones and Peterson (see ch.1). Further, it also allows for a range of technologies to have existed within Australia throughout its prehistory. This last point is discussed further in the following chapter.

Gatherer-Hunters and Hunter-Horticulturalists

If we are to presume that all economies are intensifiable, and that expansion can take place at various rates in various directions, then a general model is needed to accommodate these conditions. The simplest and most effective of these is that of the cline or continuum (see also Bray, 1976, 1977; Bronson, 1975). This model presupposes an overlapping series of economies spanning hunting-gathering and small-scale food production progressing to higher extractive levels. It is therefore essentially evolutionary but not necessarily unilinear. I have already demonstrated that Tasmanian hunting-gathering and south western Victorian hunting-gathering-fishing are but two loci along such a continuum. I will now demonstrate one more.
These additional examples come from a region which shares quite a few environmental similarities with Australia, or in this case its tropical fringe (e.g. see Golson, 1971). New Guinea and Australia, at times during the Pleistocene, were one land mass. Today the island of New Guinea is occupied by a complex series of food-producing societies which range from small-scale hunter-horticulturalists to intensive high density agriculturalists. Of these I will direct my attention to the former.

Recent studies of hunter-gatherers have tended to avoid close comparisons with food producing economies. This has resulted in strengthening the dichotomy between these two forms of economy (see ch.1). A few studies have been less cautious and a couple of these have been referred to in this thesis (e.g. Dornstreich, 1973; Morren, 1973). The data produced by such research is eminently suitable for comparison with studies of hunter-gatherer economies such as the one presented in this thesis. The importance of such comparisons is that they allow for the examination of the processes by which such small-scale economies expand. In this case it allows for some examination of the "classical" shift from hunting-gathering to food-producing strategies. I will now carry out a short comparison along these lines.

My first point relates to extractive efficiency. On Table 16:1 I have laid out a representative sample of economies covering both hunting-gathering and food production, taking my examples from Tasmania, Australia and New Guinea. I have also included their population densities. What this table indicates is an unbroken continuum of extractive levels spanning hunting-gathering and food production. The main point to note is that high density Australian populations, such as the Gidjingali (east Arnhem Land) overlap in population density with New Guinea hunter-horticulturalists (e.g. the Baktaman of central New Guinea). High density temperate Australian economies (e.g. Peek Whuurong, south western Victoria) are very close behind the latter. The Tasmanian population densities (above) are lower. In New Guinea this cline continues with much higher population densities being reached, and I have only included the lower half of the New Guinea range (see Modjeska, 1977:37). If consideration is also taken of societies in coastal and inland environments from the two areas (Australia and New Guinea) this basic comparison in densities still holds, with the Australian densities being slightly lower than those of New Guinea.
Table 16:1 A comparison of population densities of some Australian (including Tasmanian) hunter-gatherer and New Guinea shifting agricultural societies, showing an unbroken continuum of energy harnessing technologies.

<table>
<thead>
<tr>
<th>Population</th>
<th>Population Density (persons per km²)</th>
<th>Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South east Tasmania (Oyster Bay) (coastal)</td>
<td>0.09-0.07</td>
<td>hunting-gathering</td>
</tr>
<tr>
<td>North west Tasmania (coastal)</td>
<td>0.2-0.1</td>
<td></td>
</tr>
<tr>
<td>South west Victoria (Northern Tjapwurong) (inland)</td>
<td>0.4-0.3</td>
<td></td>
</tr>
<tr>
<td>South west Victoria (Peek Whuurong) (coastal)</td>
<td>0.7-0.4</td>
<td>h/gathering/fishing</td>
</tr>
<tr>
<td>North east Arnhem Land (Gidjingali) (coastal)</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>New Guinea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baktaman (Central New Guinea)</td>
<td>0.75</td>
<td>shifting cultivation (taro), h/gathering</td>
</tr>
<tr>
<td>Saiyolof (Central New Guinea)</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Wonio (Trans-Fly)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Southern Hewa (Central New Guinea)</td>
<td>1.8</td>
<td>shifting cultivation (sweet potato), hunting</td>
</tr>
<tr>
<td>Oksapmin (Central New Guinea)</td>
<td>8-10</td>
<td>shifting cultivation (taro, sweet potato)</td>
</tr>
<tr>
<td>Duna (Central New Guinea)</td>
<td>10-40</td>
<td>intensive shifting cultivation, mounded sweet potato.</td>
</tr>
</tbody>
</table>

Data: Tasmania (after Jones 1974:326); Victoria (after Lourandos 1977a); Arnhem Land (after Hiatt 1965:17); Trans-Fly (after Ohtsuka 1977); Central New Guinea (after Modjeska 1977:37)
This evidence points to commensurate levels of extractive efficiency for high density Australian hunter-gatherer and New Guinea food-producing economies. It is an indication that similar population density can be achieved by different means. As such it reinforces the conclusions arrived at in this thesis, that high population density Australian societies were products of complex land and resource management strategies together with efficient extractive techniques (Lourandos, 1980).

These results further raise the problem of explaining the differences between these forms of economy, hunting-gathering and food-production. A closer examination of two hunter-horticulturalist societies from Highland New Guinea helps us to understand the operation of hunter-gatherer economies even more. This is especially so in regard to land and resource management strategies. The two studies I will briefly look at here are those of the Myanmar by Morren (1973) and the Gadio-Enga by Dornstreich (1973). Both the latter are low population density societies, each consisting of a small band-sized group. The Myanmar had a population density of less than seven persons per square kilometre, and the Gadio-Enga a population of 85 people or 4.7 per square kilometre. In general, subsistence and settlement of both economies is associated with the distribution of natural resources, and attempts are made to stabilise productivity by (a) limiting the impact upon the local environment, (b) restricting the form and intensity of procurement and (c) creating disclimaxes and other forms of artificial habitat thus enhancing the productivity of some prey populations (Morren, 1973:98). More specifically the following results were obtained by both researchers. Population is continually in flux, with most congregations of longer than a week taking place at resource rich areas such as gardens and sago swamps, that is of managed resources locations. The latter strategy assists in increasing sedentism (Morren, 1973:36). Only during ceremonial periods is the camp continually occupied (Dornstreich, 1973:306-10). Morren also suggests that movement takes place because of diet, in this case, to balance protein intakes (Morren, 1973:2-10).

Reciprocity is a key mechanism with plants being placed in another's garden to seal the contract. Gardens simulate natural rainforest ecosystems and are often placed near to hunting grounds (Dornstreich, 1973:187, 199). The Gadio-Enga strategy attempts to produce heterogeneous environments as these are ecologically the most stable (Dornstreich, 1973:69). In terms of diet, women and children appear to be the most deprived of protein (Dornstreich, 1973:404; see also ch.6).
Grubs formed an important item of diet and were a managed resource in sago swamps (Dornstreich, 1973: 205, 213, 26).

This broad profile of two hunter-horticulturalist economies is similar in many instances to that outlined for south western Victorian hunter-gatherers in this thesis. Settlement and economy are dependent on resource distribution and attempts are made to stabilise the latter by a series of land management practices. Other practices, such as continual population distribution and reciprocity serve to minimise the impact upon resources.

Overall, Dornstreich points out that the economic strategy promoted high extractive diversity which is one reason for the low growth rate and potential of such economies. "According to most ecological theoreticians, relatively greater amounts of energy are required to change the organisation of 'diverse' systems" (Dornstreich, 1973:460). In reference to the last point, Dornstreich refers to the work of Margalef (1963). This last point would also apply to hunter-gatherer economies (see also Lourandos, 1980) and would help to explain their low rate of growth.

Dornstreich also points out that increased specialisation within any economy results in greater expenditure of group effort:

As the system becomes increasingly 'artificial', a greater proportion of system output must go to management and support functions, meaning that less energy is available for new growth.

(1973:80)

He refers to this as Margalef's principle that "energy required to maintain an ecosystem is inversely related to complexity" (1963:373). In the long-term the process involved in this trend towards specialisation leads to increasing instability (Dornstreich, 1973:82). Rappaport has stated:

... it is apparent that in ecosystems dominated by man the trend of what can be called successive anthropocentric stages is exactly the reverse of the trend in natural ecosystems. The anthropocentric trend is rather in the direction of simplicity rather than complexity, or fragility rather than stability.

(1971:130)

From the above we may conclude that small-scale hunter-horticulturalists such as those examined here can be viewed as generally more stable (although
not static), low energy-expenditure, low growth rate systems. The final model described above, of the drift towards simplicity and instability recalls the model established in Chapter 1, and will be discussed further in the following chapter.

A final issue can be introduced here relating to the growth of Australian hunter-gatherer economies. The question of the avoidance of food-producing techniques by northern Australian societies has long been mooted, even though contact was maintained between these areas and food-producing peoples further north (e.g. Torres Strait Islands). Explanations have often been sought unfortunately without firstly attempting to establish a firm theoretical framework (e.g. White, 1971). Seen in the context of the above arguments, this problem becomes less difficult to unravel. If more complex artificial economic strategies require greater expenditure of effort, and if extractive efficiency is already high (as broadly measured by population density) and comparable to that of small-scale hunter-horticulturalists (above), the adoption of more intensive food-producing strategies would have provided few if any benefits for economies already practising a wide range of low intensity, land management practices (see also White and O'Connell, 1979; Lourandos, 1980).
CHAPTER SEVENTEEN

CONCLUSIONS: DYNAMIC EQUILIBRIUM AND AUSTRALIAN PREHISTORY

In this final chapter I draw together the main arguments that have been presented in this thesis and relate them generally to cultural processes in Australian prehistory.

General

The main results of this investigation have included the following. Traditional theories of Australian prehistory, which see both technological and demographic change as negligible, have been shown to be erroneous at both the theoretical and methodological levels. In their place has been suggested a model of dynamic equilibrium which by definition allows for change in both of the above variables.

Australian Aborigines have been viewed as a broadly homogeneous group and as representing "generalised" hunter-gatherers (Birdsell, 1968, 1977; Jones, 1973; Peterson, 1976b, Lee and DeVore, 1968). In contrast to this viewpoint, I am arguing that a more heterogeneous set of cultures and economies existed in recent times and that economic specialisation had occurred at the regional level. The examination of a case study from temperate south western Victoria, based upon environmental, ethnohistorical and archaeological data, supports the basic tenets of the latter model. The main features to emerge from this study indicate relatively high population density and sedentism for the area and an economy which was controlled on the one hand by the distribution of natural resources and on the other by attempts to stabilise productivity via land and resource management practices. The main examples of the latter that have been focused upon here are of water controls in the form of large-scale artificial
drainage systems, the use of fire for producing vegetation disclimaxes and perhaps harvesting practices concerned with local plant foods in particular roots and tubers.

In the long-term such conservation measures as the latter have been viewed as possibly leading to further amplification or intensification of individual economic strategies due to a variety of reasons. Such causal factors may have included the lack of self-sufficiency of local populations which at times may have led to competition between populations for scarce resources. Technological change may have been stimulated by such competition, and under these circumstances population growth may at times have been promoted. The south western Victorian data (relating to the most recent period of occupation of the last few thousand years) has been interpreted as reflecting an increase in extractive efficiency and also in population. This interpretation was reinforced by comparing south western Victorian population densities with those from environmentally comparable Tasmanian regions where technology was known to have been less complex. In this way the evidence supports the model of dynamic equilibrium and contradicts the traditional static model. It has also been shown that although growth rates in such heterogeneous economies are inherently slow, the overall process is the same for all growing economies, that of a gradual drift towards increasing ecosystem simplicity and instability.

These broad conclusions, derived from the Victorian data, will now be tested out more fully upon the archaeological data comprising Australia's prehistory, to see if similar processes were operating. Firstly, I will review some of the more recent theories which also run contrary to the traditional static model.

The Models

Hallam (1977a, b) argues strongly against Birdsell's model of Australian prehistory (ch.1). She proposes an alternative model based upon two sources of information. Firstly she looks at the density of stone artefact distributions in a number of Australian regions (e.g. the Perth area, Western Australia; the Murray drainage basin) and shows that Pleistocene occupation patterns are substantially different to more recent patterns, being heavily associated with now defunct drier areas. Secondly,
she closely follows the model advocated for the Pleistocene occupation of North America by Alford (1970). Hallam presumes, based on her archaeological observations (above), that population continued to increase in Australia right up to the present, the most intense later increases occurring in more humid areas. The earliest Australian populations she sees as highly mobile, small groups firstly occupying resource rich areas such as coasts, rivers, savannas, and lastly more forested regions. For the north she speculates that the collection of plant foods would have been more important as compared to hunting in more open areas and around the arid heart of the continent, with broader-based economies in richer coastal areas. In her second article (1977b) she opts for gradual rather than sudden reduction of faunal species, following Merrilees's results (1968), and in this process stresses the role of fire. She makes the important point that large areas of Australia (e.g. forests) would have been opened up to herbivores, through the use of fire, which both improved and degraded savanna areas. Although the key features of Hallam's models are strong, weaknesses lie in her delineation of certain aspects. For example, she does not explain why inland populations should have such a marked orientation towards hunting, nor the significance of arid zone adaptations. Her use of surface archaeological data also lacks sufficient clarity.

Bowdler (1977) offers a model which in some ways is comparable to that of Hallam. She, too, is critical of Birdsell, and of his bow-wave theory which presupposes an explosive colonisation across the continent from end to end irrespective of environment. She also criticises the catastrophist theories (e.g. Jones, 1969). Bowdler envisages a peripheral occupation of the continent with the earliest population concentrated upon coastal and riverine areas, and a later occupation of more marginal areas such as arid and highland zones. She brings forward archaeological data to support this model which I discuss below. Inland Pleistocene economies she views as based upon the smaller land animals. This last argument centres upon archaeological data but given the overall complexities of the problems associated with the Australian megafauna (see Hope, 1978) may be difficult to accept. Bowdler's model, however, does not distinguish between dispersal of population and population density, that is, once environments have been occupied there is no allowance made for further population growth within these via increased extractive efficiency. I discuss this last aspect further below.
Blainey (1976:117-21), also argues against the static model, and Birdsell's theories, using ethnohistorical data. Essentially he sees local populations in conflict and population growth as a likely factor.

**Dynamic Equilibrium**

I have elsewhere outlined an argument along dynamic lines for Australian prehistory (Lourandos, 1980, also ch.1), which closely follows the arguments presented in this thesis. In spirit, if not also in some of the details, the latter is complementary to the above three points of view. Following upon the results of the south western Victorian case study presented here, the cornerstone of the model I advocate rests upon the assumption of both technological and population growth. In this regard it tends to be more explicit than the above models. This theory can also be tested by ethnohistorical, ethnographic and archaeological data. In this discussion I have omitted the New Guinea region which involves a different set of problems.

Firstly, as I have mentioned above and elsewhere (ch.1), lithic assemblages are not necessarily accurate markers of economic change. Because of this we should look to more conclusive data. Land and resource management strategies I have shown (above) are far more powerful mechanisms of technology. Evidence for the latter has been presented from both ethnographic and ethnohistorical sources (chs 6, 14, Appendix 1). Such environmental controls were wide-ranging and involved indigenous species. Potentially therefore, such strategies could be local developments of some antiquity. The examination of population densities as approximate indicators of levels of extractive efficiency, also helps to reinforce my argument. It has been demonstrated that complementarity existed in both technology and population density between high density Australian hunter-horticulturalists. The conclusions to be derived from this evidence are that changes in the technology of resource manipulation occurred in Australia, and contrary to the static model, that this has influenced population size to the degree that a population and technological cline existed between Tasmania, Australia and New Guinea (ch.16). The varied and elaborate range of Australian fresh and saltwater fishing methods, attuned to local fishing conditions, must also stand as an indication of intensification.
One other example is also provided by the archaeological data. Grass-seed economies were widespread in semi-arid areas of Australia, a region covering a substantial part of the continent, in recent times (Allen, 1974; Tindale, 1974). Type artefacts associated with these economies (i.e. grinding stones) however, have not been found in these areas prior to 15,000 B.P. (Allen, 1974) although occupation in some locations (e.g. the Willandra Lakes, N.S.W.) goes back 30–40,000 B.P. This evidence suggests that an economic change within this environment has taken place at a much later date than the initial occupation of the area. This evidence may suggest that population levels were maintained in an area beset by growing aridity as Allen implies (1974), but if this is so, then it is also an indication of intensification and population increase. For as environmental productivity fell (i.e. with increasing aridity), so too should have human population levels if the old steady-state was to have been maintained. This evidence, albeit tentative, raises the possibility that the shift to grass seeds provided a more stable resource base. Supporting evidence comes from recent Aboriginal population densities for semi-arid areas which appear to have been high (see Allen, 1974 on the Darling Basin; W. Jones, 1979 on the Cooper's Creek area). The shift to cereals around 15,000 B.P. therefore, can be seen in terms of economic expansion and perhaps population growth.

As regards the archaeological data, the following predictive model could be proposed. As population increase is one of the prime assumptions we could expect earlier Pleistocene occupation of the continent to have been sparser than that of more recent periods. Such a situation would be expressed archaeologically by the following. In the presumed earlier phases, we could expect a lower density and perhaps smaller size of sites, together with less intense occupation of individual sites. Later phases would show an amplification of all three variables, density, size of intensity of occupation. Finer archaeological details would be dependent upon the nature of the economic strategies employed at various times. I am well aware of the problems of attempting to measure the intensity of human occupation by the density of archaeological materials, and no 1:1 association is being entertained here. However, a relationship between broad overall density of archaeological material and population density is not an unfair assumption to make.
An archaeological pattern closely resembling the above has already been demonstrated, but interpreted differently from the explanation I have already offered. I am referring to the Australia-wide review of archaeological data as presented by Bowdler (1977). She has shown that evidence of occupation of Pleistocene sites (including Pleistocene occupation levels within sites) is scanty and geographically restricted to coastal and riverine areas, in contrast to later occupation which is both more intense and widespread and includes more marginal environments such as arid and montane zones. These data, I would suggest, are more fully explained in terms of an increase in population size and therefore density. This evidence allows for the interpretation of a lower, sparser Pleistocene population which may or may not have been narrowly or broadly dispersed across most environmental zones. This last point would be dependent upon the form of occupation, and therefore the nature of the economy. A more mobile, low population density and low impact technology, would leave behind little archaeological evidence even in the most marginal environment, as compared to later denser occupation. The coastal or riverine oriented Pleistocene economies that Bowdler interprets may in fact be seasonal aspects of such low intensity economies as described above (see below). Such seasonal aspects, taking place in the richer environments offered by coastlines and rivers, could be expected to leave behind more conspicuous archaeological traces.

Recent Pleistocene archaeological data would appear to support the point of view I offer here. The famed Willandra Lakes deposits (western New South Wales) dated around 30,000 years or more, consist essentially of small isolated shell middens, often not especially rewarding to archaeologists as recent researchers have painfully discovered. There are very few large shell middens from this early period but the middens increase in both size and density after about 15,000 B.P. (Allen, 1972; pers.comm. Michael McIntyre). A similar sequence of scanty earlier (presumably Pleistocene) sites as compared to more prolific terminal Pleistocene and recent sites, has recently been detected in the arid Cooper's Creek Basin by Dr Philip Hughes (pers.comm. P. Hughes). From the arid Pilbara near Newman (Western Australia) some 300 kilometres inland, a rock shelter has recently revealed fragmentary evidence of occupation (a few hearths) which have been dated to around 20,000 B.P. (pers.comm. Leslie Maynard). The first occupation of the Australian highlands areas also appears to
have been scanty, but in this case apparently late terminal Pleistocene (Bowdler, in press).

Such evidence, as the above, would therefore suggest an early but low intensity occupation of both semi-arid and arid environments, followed by a more intense late Pleistocene occupation. The archaeological data can be seen, therefore, to generally support the model being offered here. On the strength of these findings it is fitting to proceed further, and to outline a speculative model that more fully fleshes out this evidence in line with the arguments presented earlier in this chapter and thesis. The advantage of such models is that they provide testable propositions.

A Speculative Model of Intensification

Firstly, we will assume that changes of technology, population size and regional population density have occurred throughout Australia's prehistory. The magnitude of the differences estimated between recent south western Victorian and Tasmanian populations, in this case a factor of four, provides us with some estimate of the possible size of such an increase. The latter estimate is only offered as an approximate point of reference. Not only could it be expected that inhabitable environments throughout the continent were occupied, but that ecological niches (see Pianka, 1978) over time were expanded by an increase in technology and subsequent population growth. Even semi-arid and perhaps some arid environments witnessed early occupation, as recent archaeological evidence suggests. In this case we must envisage the latter to have been carried out by sparse populations practicing low intensity economies. Small groups of highly mobile people are brought to mind (as Hallam also suggests). A likely ethnohistorical model for such a situation is that of south eastern Tasmanian Aborigines who were highly mobile and few in number (Lourandos, 1968, 1970, 1977b; ch.16; Jones 1974). Unlike Hallam's model, however, these economies do not necessarily have to be envisaged as big-game hunters, nor conversely as small-game hunters as Bowdler suggests. The range of economic possibilities even within this narrow spectrum (i.e. high mobility, small population size) need not be so polarised, and we could expect that a range of economies may have existed. Future archaeological evidence can be used to test this theory further. In more fertile areas (coasts, estuaries, riverine areas) the economic situation may have been even more complex as Hallam has also suggested.
The shift to grass seed economies around 15,000 B.P. may have allowed for population increase in semi-arid and arid environments, and this appears to be supported by recent archaeological evidence of site sizes and densities. In the more fertile (e.g. higher rainfall) environments as well, intensification and presumably population increase would have been facilitated by the firing of vegetation to produce disclimax, together with the management and occupation of wetlands and waterways by the construction of dams, weirs, and earth mound camping sites. To these factors could also be added, general land and resource management strategies (including the use of fire and protracted harvesting methods of indigenous plants) and improved extractive technologies (e.g. fishing, perhaps nets in hunting). The range of possibilities in the latter class is extensive, with the most important being low labour-intensive land and resource management strategies. Larger local group sizes and higher levels of population density and sedentism can thus have been produced in the more fertile areas.

We could suppose also that more complex social mechanisms may have been developed to regulate conditions of increased population density, such as the large-scale ceremonies that dominated recent Australian Aboriginal societies (see chs 8, 15). Recent more complex archaeological lithic assemblages (e.g. the Small Tool Tradition, Gould, 1971) may in some ways reflect this increased economic specialisation and network of social interaction, brought about by increased population sizes and densities. Likewise, the older core and scraper tradition which dominated Pleistocene and more recent archaeological contexts, may reflect, in some ways, more generalised technologies and economies. The more recent tools may also imply greater regionalisation as White and O'Connell suggest (1979), which could be viewed as a function of progressively higher regional densities and more sedentary populations practising a wider range of economies. The perhaps more recent emphasis upon and intensification of local resources including Bunya nuts, cycad nuts, begong moths (Flood, 1976; Beaton, 1977) eels, roots and tubers in south western Victoria, and their association with ceremonial occasions, is indicative of such regionalisation (see also ch.15). Thus, in spite of my early objections concerning the use of lithic assemblages as markers of technological change, even the Australian stone tool traditions may be seen as a correlate of the technological and demographic growth which is advocated here.
Overall, therefore, in spite of the fragmentary archaeological evidence at our disposal, the cultural processes which have occurred over the past 40,000 years or more in Australia are becoming increasingly apparent. In an attempt to stabilise or regulate the environment it seems most likely that Aboriginal communities experienced both technological change and demographic increase, for both variables were part of an open and expansive system. Advocates of the static model have idealised these short-term objectives and have raised them to paradigmatic status. The processes at work within these Australian hunter-gather economies are qualitatively little different to those of food-producing economies. Rates of change, however, may be viewed as slower in the former societies, but as has been shown, this was also the case in small-scale food-producing economies such as those of hunter-horticulturalists.

Ecological processes within Aboriginal Australia can therefore be recognised as an overall drift towards a simpler ecosystem, produced by a series of vegetation disclimaxes and in this case, species extinctions, with resultant increased instability (see ch.16). The relatively small size of Australian populations, and in world terms, the "stability" of the socio-economic system as a whole, should not be allowed to mask these processes. Within such a dynamic context lies not only the opening up of the continent but also a process of environmental degradation. As whole vegetation complexes succumbed to simpler ecosystems (e.g. forests to grasslands) so species extinctions also have taken place. The megafaunal problem (see Hope, 1978) is related to this last process. However, it should not be viewed in isolation but as part of a long chain of extinctions which cover the full span of Australian prehistory (see also Merillees, 1968). Both direct and indirect association with man can be expected here. Thus practices such as firing, which may have been conservationist or productive in the short-term, would have led to degradation in the long-term. By 1800 A.D. in Australia, the ecological drift towards monoculture had long since begun.
APPENDIX ONE

AUSTRALIAN ABORIGINAL ENVIRONMENTAL CONTROLS

This issue is discussed in Chapters 1, 6, 15, especially in the latter chapter. Here the evidence is organised under four headings:

1. Resource increase
2. Access to a resource
3. Extension of the season of supply of a resource, and

Many of the examples used here have been obtained from Campbell (1965), Irvine (1970) and Harvey (1945).

Resource Increase

The starchy tubers of yams (of various species including Dioscorea spp.) formed staple resources throughout much of humid northern Australia. Yam heads commonly were inserted into holes in the ground once the plant had been harvested, as a method of plant regeneration. This practice has been described from areas covering the length of the northern Australian coastline: Cape York, Archer River area and further north (McConnel, 1957:2; Campbell, 1965); eastern Cape York (Hall and Tindale, 1933; Harris, 1977:437) Arnhem Land (18 species; Specht, 1958:481): Groote Eylandt and the west coast of Australia (Gregory, 1904). From the Lockart area of eastern Cape York Harris (1977b:437) reports "that yams were sometimes planted on off-shore islands to extend their distribution and to ensure a 'reserve' supply". Harris regarded yams planted in this way as a managed resource "without the labour involved in tillage and the higher yields per plant that cultivation affords".
It should also be pointed out here that vegetal propagation of the
form practices in northern Australia was the commonest technique for yam
cultivation employed in the general Oceanic region. This method allowed
for harvesting and replanting to take place at the same time and for the
selection of suitable plants for regeneration. It thus forms a type of
cloning (see Harris, 1977b).

Seeds of various species were also planted: Thomas (1906:113) claims
that Purslane (Portulaca oleracea) was grown on low raised mounds (like
melons). Before they were fully ripe, the plants were sundried, the seeds
collected, ground and made into cakes. This species formed a nutritious
staple in the diet (Dadswell, 1934; Maiden, 1898:350). Unfortunately
Thomas does not fully document this example.

Hyam (1939:117) suggests that seeds of the Bunya pine (Araucaria
bidwillii) were sometimes deliberately planted so as to maintain reliable
yields. This plant formed an important triennial staple and was the basis
for large-scale intertribal ceremonies, in a restricted region to the north
of Brisbane (see ch.8). A closed season was also associated with this
species to ensure expected yields.

Campbell (1965:209) suggests that Aboriginal seed planting may
account for the location of an isolated cabbage palm grove near Orbost. This
species was highly prized.

The accounts of Gilmore (1934, 1935), based upon her childhood
experiences in New South Wales, are more detailed than those of Thomas and
Hyam.

Gilmore states that following a bushfire seeds were planted to assist
in the regeneration of these plants:

When the earth was cool enough to walk upon, the women gathered
(seeds) from untouched shrubs and planted them where the
destroyed ones stood. The little boys were requested to moisten
them with urine. Grass seed was gathered, a heavy kind, the
separated seed was sorted, the unsound or small was rejected and
the best planted in the burnt area but very lightly covered.

Gilmore adds that planting of seeds did not have to coincide with
bushfires:
... often seen the blacks set individual seeds as well as replace where the plant grew, those of what they ate. But the former was usually done where they themselves first made a small fire of twigs in order to prepare the earth by heating it. Whenever they gave me the fruit of the ground-berry as we call it - and they always gave me the best they found - I was invariably asked for the seed, which was immediately planted beneath the growth from which it came.

She also mentions that the seed of the Quandong tree (*Eucarya acuminata*) was planted. She adds that artificial fertilization was carried out of flowers of a grove of quandong trees by transferring flowers from another grove. There does not seem to be sufficient reason for doubting such accounts of seed planting as these which coincide closely with the widely documented evidence on the yam planting from north Australia.

The importance of firing of vegetation has already been mentioned (chs 6, 15; see also Jones, 1969; Mellars, 1976). Firearming of vegetation produces disclimaxces, by removing the understorey of vegetation, and produces a number of important effects; promoting species diversity; increasing overall productivity of individual species; and facilitating in the harvesting of vegetable foods (see Mellars, 1976:30-1). Long term affects of firing would have been to halt the ecological cycle of succession by favouring the extension of open forests and grasslands.

As has already been mentioned (chs 6, 15) the firing of vegetation was commonly practiced throughout Australia and Tasmania. We can assume therefore, that similar results to those described above, were produced, and differentially affected individual environments and species.

Harris argues that the distribution and productivity of the seasonal staple *Cycas media* were increased by regular firing of woodlands in the tropical region of Cape York and Arnhem Land. Firearming, in these cases, both facilitated harvesting and stimulated asexual reproduction.

Beaton (1977) reports that firing of stands of the staple *Macrozamia* sp. resulted in increased productivity. Seed production, in this case, appears to have been synchronised and possibly increased seven or eight times.

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1 See also Hallam, 1975.
A comparable example to these have been reported by Grey of a species of flag which was managed in Western Australia "to the extent of burning it in order to improve the next crop" (Thomas, 1906).

Firing also affected the distribution and productivity of animal species (Mellars, 1976). Firing generally tended to improve the quantity and nutritional quality of herbaceous forage. This is especially true of forested environments, where herbivorous populations have shown marked increases following forest fires (Mellars, 1976:18-24). Apart from plant foods there is evidence that other species were also managed. Certain species of insect appear to have been cultivated in order to increase their productivity. Petrie (1904) reported from southern Queensland (Brisbane River, Breakfast Creek, North and South Pine Rivers, Maroochy and Mooloolah Rivers) that a species of grub (called cobra) was cultivated in logs which were exposed to salt water. They -

... took good care to have plenty (of cobra) coming on by cutting swamp oak saplings and carrying these onto a mud bank dry at low water, and piling them up there. These piles were some two feet high and six feet wide. These piles would be dry at low water always, and covered at high, and the natives would visit them in about a year's time making fresh ones to take their place.

Grey described a comparable example (Smyth, 1876). A species of Cerambyx (Witchetty grub) was cultivated by breaking open the tops of grass trees which simulated decay. Each man was in possession of his own supply (see ch.8). Once the trees had decayed, they were felled with between 50-100 grubs being collected from individual trees.

Bees were cultivated in a similar way with hives being encouraged to develop in suitable locations. Duncan-Kemp provides such an example from the inland of Queensland:

Bees hovered near and buzzed persistently over a hallow high in the side of a tree. Aboriginal women wishing the bees to settle there had carried the scented bush five miles and soon reaped the reward of their labours. (1961)

Water controls were also employed to maintain constant water levels and presumably thereby stabilise the productivity of aquatic resources. In the region of the Roper River, dams were constructed during the dry season to divert water from a perennial channel back into the large Waggon Lagoon which was in danger of dessication during this season. A series of dams
were constructed in a variety of ways across small natural water channels. The methods used included: felled trees sometimes supported by fills of earth and stick; stakes driven into the mud and backed up by sheets of paper-bark. The reasons provided by Aboriginal informants for this artificial maintenance of water levels, was to provide stable conditions for a variety of aquatic plants and birds (Campbell, 1965:206-7).

Access to a Resource

Certain species of plant from most major Australian environments required labour-intensive processing before they could be eaten. Some were noxious prior to preparation. A series of examples follows.

In the tropical Lockhart region of Eastern Cape York Harris describes the preparation of two tubers, the Yam (*Dioscorea sp.*) and "Polynesian arrowroot" (*Tacca leontopetaloides*). Both these species are rich in protein and have higher calorific values than alternative yams which did not need such preparation. These two bitter tubers were peeled, mashed and leached in water before being cooked and eaten. Harvey (1945:192) describes a complementary example from the Karawa of the Wearyan and MacArthur Rivers, Borroloola district, Northern Territory."'Poisonous' varieties of yam were preserved, and rendered edible by this 'ripening process'". The yams were shredded with the broken tip of a freshwater snail shell, and then "dried and made into cakes for bulk-handling, moistened if necessary with saliva. This yam mixture can then be soaked and recooked when required".

The processing of plant foods (tubers, roots, nuts, fruit) in temperate Australia is generally in accord with some of the methods outlined in Chapter 6.

Grass seeds formed a subsistence base throughout semi-arid and parts of arid Australia and included labour-intensive processing (Meggitt, 1964: 30). Allen has described how seeds of native Millet (*Panicum sp.*) were collected in large quantities in western New South Wales before they were fully ripe and were later either sun dried or roasted. Different methods of threshing and harvesting were employed (see also Tindale, 1974:105-6; W. Jones, 1979). The grain was dry or wet ground on millstones, then made into cakes and cooked.
Seeds of Purslane (*Portulaca oleracea*) were also an important food throughout arid Australia. The plants are placed in heaps (2 or 3 metres across), surrounded with a ring of stones or logs, where they ripen in a day or two, and thereby release their seeds. These seeds are then winnowed and cleaned and finally ground and prepared like the panicum seeds (Tindale, 1974:95-6).

**Extension of the Season of Supply of a Resource**

Storage was carried out of a wide range of foods, vegetable, mammal, fish and insect, and appear to have served two main purposes:

(a) to extend the availability of seasonal foods, and

(b) to support large groups of people for ceremonial occasions (see ch.15).

Stores foods were also traded. Harvey (1945) describes the preservation of a number of plant foods by the Karawa of Arnhem Land. Dehydration was the method used and two forms of preservation of the Cycad palm nut were employed. The nut was also cooked and eaten without such preparation. Nuts were sliced and sun dried for two to three days, then rolled in cylinders of paper bark. The processed nut was thus kept for months being used as an item of exchange during ceremonial gatherings which were held at the increase-centre for the Cycad palm near the mouth of the MacArthur River.

The roots and stems of rushes (*Mura Walja*) were crushed, dried and then pounded into cakes and kept for long periods. In this form they were called Tu-dama and when required for eating were soaked, remade into cakes and cooked (Harvey, 1945:192).

In Queensland the Kabi buried seeds of the bunya pine in bags as a form of storage (Irvine, 1970:280). The fruit of the quandong was pounded and partially dried, then pressed into cakes and kept for long periods (Finlayson, 1936:84). In Arnhem Land fruit of *Buchanania muelleri* were partially sun dried, covered with red ochre, sun dried again, wrapped in parcels of tea-tree bark, stored for weeks or months, and then pulverised later with seeds. Fruits of "wild plum" (*Parinari nonda*) were stored in deep pits dug in dry sand. Once desiccated the seed was treated like the last example, being pounded and soaked (Irvine, 1970:280).
Seeds and nuts in arid and semi-arid Australia, were stored in cashes. Two bushels of seeds of Purslane were found in a grass case daubed with mud near Lake Lipson in South Australia (Howitt, 1876:302). Allen records that seeds were stored in Wallaby and kangaroo skins after good harvests, and that in Central Australia a cashe of nearly a ton (1,000 kg) was held in 17 large wooden dishes (1.5 metres long by 30 centimetres deep) (1974:313-4). Allen also states that seeds of Panicum decompositum were stored for up to two months in hay ricks along the Darling River. Tindale also mentions that seeds of water-lily were stored in paper bark-lined pits in caves for several years for use in times of need, by the Alawa of the Hodgson River, Northern Territory (1974:95, 104). Macrozamia nuts were stored in a similar way in Western Australia (Irvine, 1970:280).

In Arnhem Land sugar is collected from the Salmon Gum as "manna" by cutting and drying the leaves. The sugar is pressed into large balls which are stored, carried and traded (Harvey, 1945:192). A wider range of foods was also preserved and stored. Examples from south western Victoria have been described (ch.6). Harvey (1945) reports that in Arnhem Land meat was preserved by cooking, Flying Foxes were cooked whole and carried as a reserve meat. She states that the Djingali of the central desert shred kangaroo meat into fine strips, press them into bark dishes and dry them on hot stones. Before use they are soaked. She also records that in Arnhem Land eggs of turtles, sea and land birds, were preserved during their season of abundance. The eggs were broken into a shallow dish, beaten, poured into cylindrical paper-bark containers and then cooked. This hardened mass was then sealed in paper bark and was subsequently transported and traded.

Animal Domestication

The dingo was the principal domesticated species but other species also shared a quasi-domesticated relationship with man. Dingos were used for hunting in certain environments such as open country (see ch.6) and were also employed as watchdogs to guard against enemy attack. Dingos also serves as pets and were used for companionship and warmth at night. Large groups of dogs were camp followers of some Aboriginal groups (e.g. Pitjandjara) and lived by scavanging. Other Aboriginal groups possessed few dogs (see ch.6). In Victoria wild dingo were hunted and Tindale states that in other areas the hunting of pups for food was an important seasonal
activity (1974:109). Domesticated dogs do not appear to have been eaten, except under the most extreme circumstances (Tindale, 1974:109).

From the rainfall region of the Atherton Tableland, Queensland, Tindale records how birds were raised and eaten. Cassowary chicks were captured, tethered and tamed, and were allowed to wander freely about the camp for up to a year. Tindale's Kungkandji informant said that "such birds were always eaten when they grew large and fat enough to provide a feast" (Tindale, 1974:109).

A closed season operated in some areas on individual bird species that were used principally for their eggs. In the southern parts of the Western District and in the Murray Valley the Mallee Fowl (*Leipoa ocellata*), and on Groote Eylandt the Scrub Hen (*Megapodius freycinet*), were spared in this manner (Tindale, 1974:109). In general such tending of birds to ensure species regeneration, was not employed in all areas (see ch.6).

Another method of species conservation was recorded by Gilmore:

To assist in replenishment of areas possums would be caught in the land of plenty and when rains came these were loosed in the trees in places too far for them to travel back from. This was done in order that they might breed in the renewing locality.

(Campbell, 1965:210)

The use of fire (above) was another, although more potent, instrument of management of species. The keeping as pets of a wide range of bird species was also a widespread practice (Campbell, 1965:210). Tindale observed that a native Euro was reared among the dogs in the camp at Kulikuli and that similar customs were practised in areas where settlement was less nomadic (Tindale, 1974:109). Pet animals were carried by children and women from camp to camp. In King Sound small ringtail possums were carried by women as pets and sometimes suckles by them (Campbell, 1965:210).

The results of this brief survey of environmental controls are discussed in Chapter 15.
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