The archaeological record indicates that many aspects of Aboriginal life and culture — tool kits, technology, use of raw materials, and modes of subsistence — changed throughout the period of Australian prehistory. In addition, although finding them archaeologically is difficult, it is acknowledged that changes occurred in the demographic, social, ideological and political aspects of life throughout this period. Stanner (1965: 4) believed Aboriginal society and culture were ‘the end-products of millennia of non-linear development’ and ‘were made up of forms and values far removed and transformed from an adaptive plane’. White and O’Connell (1982: 133) stated that the many varied life-ways recorded during the 18th and 19th centuries were ‘the end-result of a long history, but their final form was developed particularly during the last few thousand years’; and Lampert (1971a: 70) said that the archaeological record for the past 5000 years in south-eastern Australia shows the formation of ‘culture-areas’ within which similar changes seemed to have occurred.

It is thus accepted that changes in the archaeological record indicate significant social and cultural changes within hunter-gatherer societies (e.g., Mulvaney 1975: 120–2; McBryde 1977: 225; Bailey 1983a: 185–6; Lourandos 1985a: 385; David and Chant 1995: 513–6). However, the direct or indirect causal relationships between social and cultural changes and documented changes in the archaeological record are far from clear, and the nature of the cultural changes that may have occurred and the reason/s for them have been much debated. Are economic, technological or demographic shifts being reflected in the archaeological record, or social, political or ideological changes (e.g., Fletcher 1977a, 1977b: 49, 146–7; Conkey 1978, 1984; Gamble 1982, 1983; Bailey 1983d; Beaton 1983, 1985); or is it a combination of these various aspects of life which together represent a late Holocene intensification associated with increasing complexity in sociopolitical organisation, which was accompanied by population increase (Lourandos 1983a, 1984, 1985a, 1985b, 1987, 1988, 1993, 1997)? The ‘intensification debate’ (as it is often referred to) has become one of the most contentious debates in recent Australian archaeology, and has its proponents (e.g., Morwood 1984; Ross 1984; Williams...

Changing numbers of sites and artefacts are often involved in the proposed explanatory and interpretive models at a continental, regional or site level. Climatic and/or environmental changes are often involved in explanations as well, and, in this regard, regionalisation, risk minimisation and changes in mobility patterns are now used increasingly as contexts in which alternative models and hypotheses are proposed for changing numbers of sites and artefacts in association with other archaeological evidence. This chapter focuses on studies of the 1970s and 1980s in which changing numbers of sites and artefacts were the principal lines of evidence for claims of dramatic increases in population size (at a continental, regional or site-specific level), as well as part of the archaeological evidence on which the concept of late Holocene intensification was formulated.

In analysing archaeological evidence from the Upper Mangrove Creek catchment, I calculated several indices that document temporal changes in numbers of sites and artefacts. These indices are referred to as:

1. the rate of habitation establishment;
2. the number of habitations used; and,
3. the rate of artefact accumulation.

I refer to changes in these indices collectively as ‘the quantitative changes in’ or ‘the quantitative aspects of’ the archaeological record (for methods of calculation, see Chapter 6). These terms have not been employed by all researchers, and other terms used include changes in the number of sites occupied, increases through time in numbers of sites and artefacts, changes in the concentrations of artefacts, changes in discard rates, changes in the intensity of site use, and changes in intensity of occupation (with more sites, artefacts and people).

Many researchers proposed or accepted that in Australia there was a continuing increase over time in the number of archaeological sites (especially habitation sites) established and/or used in various regions, and/or in the number of artefacts accumulated in individual sites, particularly in the last 5000 years (Johnson 1979: 39; Bowdler 1981; Morwood 1984: 371, 1986, 1987; Ross 1984, 1985: 87; Beaton 1985: 16–18; Fletcher-Jones 1985: 282, 286; Lourandos 1985a: 393–411, 1985b: 38; White and Habgood 1985; see also discussion in Hiscock 1986). These late-Holocene increases were often relatively dramatic compared with earlier increases.

Many 1970s and 1980s explanations for these late-Holocene increases were based on the acceptance or assumption that, after an initial dramatic increase, the indices continued to increase until British colonisation. However, several researchers documented decreases in the rates of artefact accumulation at individual sites (e.g., Schrire 1972; Stockton and Holland 1974; Johnson 1979: 94, 111; Kohen et al. 1981; Moore 1981; Smith 1982; Ferguson 1985; Morwood 1986, 1987; Hiscock 1984, 1988b), while Hiscock (1986) claimed a decline in site numbers as well as in artefact discard rates. Hughes and Lampert (1982) acknowledged decreased implement accumulation rates in the last 1000 to 2000 years at some sites on the NSW south coast, but their conclusions suggest they assumed the general regional or continent-wide pattern was for implement accumulation rates, and thus population size, to continue increasing. Most researchers who identified a decrease in the indices put forward various interpretations and explanations, but general population decrease, as opposed to redistribution of populations at a local or regional level, was not advocated.
In studies of other parts of the world where examination of temporal changes in the quantitative aspects of the archaeological record were included, population increase, climatic/environmental change, intensification and increasing cultural and social complexity also featured in explanatory and interpretive models. Many overseas studies used quantitative data to describe processes involved in the change from a hunter-gatherer subsistence mode to a farming (agriculture/animal domestication) and usually more sedentary lifestyle, or change within post-hunter-gatherer periods (e.g., Willey 1953, 1956; Schwartz 1956; MacNeish 1964, 1973; Binford 1968; Barker 1975). Other studies investigated temporal change within the period of hunter-gatherer subsistence mode in Africa (Mazel 1989a, 1989b), Europe (Mellars 1973: 268–73; Conkey 1978: 75–80; Gamble 1982, 1983, 1984; Bahn 1983; Bailey 1983b, 1983c, 1983d; Bailey et al. 1983; Clark and Straus 1983; Davidson 1983; Straus and Clark 1983) and America (Streuver 1968; Bettinger 1977, 1981; M. Hall 1981), but the periods under study in Europe and Africa were at a much earlier time than in the Americas and Australia. In Europe, they concerned the transition from the Middle to the Upper Palaeolithic, and in Africa the periods from the time of ‘early tool-using hominids’ (ca two million years ago) to the late-Holocene.

The following review of Australian studies divides the interpretations and explanations of quantitative changes in the archaeological record into two main groups:

1. those that are based on the acceptance and/or assumption that the number of sites and/or artefacts continued to increase until contact;
2. those that are based on the acceptance that there was a decrease in the number of sites and/or artefacts in the late-Holocene.

Within each of these two groups, the interpretations and explanations proposed by previous researchers are discussed under three headings:

1. **Population change**: this refers to changes in the number of people or size of the population;
2. **Behavioural change**: changes in behaviour relating, for example, to tool manufacturing and subsistence practices, and use of space within a site (this excludes explanations that relate directly to demographic changes involving birth and death rates);
3. **Natural processes**: including geomorphological and biological processes which may have affected the archaeological record. These processes have been proposed as explanations only for the increases in the habitation indices (or to explain the lack of or low numbers of early sites).

The evidence used by Lourandos for population increase in his model of late-Holocene intensification is discussed under ‘Increases — population change’.

In the following review and discussions, I take a broad view of the term ‘population change’ and include not only explanations which proposed general or continent-wide population change, but also redistribution of regional and local populations, and changes in the number of people- or person-days spent in a site or region. The population-change explanations and most of those that come under behavioural change could be said to be based on two opposing assumptions.

1. The population-change explanations are based on an assumption that the ratio between the number of people (or number of person-days) and the number of habitations and/or artefacts remained relatively constant over time, and therefore the magnitude of the quantitative changes in the archaeological record is indicative of the magnitude of the changes in population size (national, regional, or site specific).
2. The assumption underlying many of the behavioural-change explanations is that the quantitative changes are the product of changes in behaviour associated with habitations and stone artefacts, while the population size remained relatively stable. That is, the ratio between the number of habitations and/or artefacts and the number of people changed.
Smith (1982: 114), in discussing temporal changes in the quantity of occupational debris within a site, referred to changes in the number of people per unit time (Assumption 1 above) as ‘simple functional change’, and to Assumption 2 as ‘a change in the rate of discard’, which he called ‘complex functional change’.

The dichotomy is not as extreme as these two assumptions imply. Some of the population-change advocates said that the magnitude of the changes in the archaeological record is not necessarily equivalent to the magnitude of the change in the population size; that is, the ratio between numbers of people and numbers of habitations/artefacts did not necessarily remain constant over time (e.g., Ross 1984: 235, 1985: 83). If this is the case, changes in behaviour associated with the use of habitations and/or artefacts must have occurred at the same time as the number of people increased or decreased. Changes in behaviour were probably associated with many of the population-change explanations (particularly those relating to redistribution of populations and ‘intensity of site use’), so the headings ‘Population change’ and ‘Behavioural change’ should not be taken too literally.

In some of the studies reviewed, data presented by the researcher do not necessarily support the trends perceived by the researcher and/or the conclusions they reached. However, in this chapter I am interested in how perceived trends were interpreted and explained, and the data used are examined later in Chapters 7 and 8.

‘Increases’ in the archaeological record

Most of the researchers who proposed interpretations and explanations for dramatic or substantial increases in the quantitative aspects of the archaeological record drew their conclusions from a specific set of regional data they had studied, although they often drew on data from other regions for support (e.g., Hughes and Lampert 1982; Lourandos 1983a, 1985a; 1987; Morwood 1984, 1986, 1987). The discussions under each of the following headings are therefore presented in terms of regions as much as being the conclusions of individual researchers.

Population change

Explanations involving changes in numbers of people at a continental or regional scale have been divided into General Population Increase, Redistribution of Populations, Increased Intensity of Site Use, and Intensification and Increasing Social Complexity.

General population increase

Some of the earliest explanations involving population increase were put forward to account for greater numbers of excavated sites with Bondaian assemblages than sites with pre-Bondaian assemblages in south-eastern NSW (Wade 1967; Megaw and Roberts 1974; Tracey 1974). (For terminology and dating of stone artefact assemblages in south-eastern NSW, see Table 3.6, and Chapter 3, Temporal sequences.) Other researchers postulated increasing population as the explanation, or part of the explanation, for increases in quantitative aspects of the archaeological record; the appearance of sites in less favourable and/or marginal areas in the latter half of the Holocene; and/or an increasing use of offshore islands (e.g., Hallam 1972: 15, 1979: 10–12, 34; Lampert and Hughes 1974; Flood 1976: 32, 1980: 281–2, 1999: 248–9; Lourandos 1980a, 1980b, 1983a, 1984, 1985a, 1985b, 1987; Ross 1981, 1982, 1984: 267, 1985; Blackwell 1982; Hall 1982; Hughes and Lampert 1982; Sullivan 1982b: 16; Beaton 1983, 1985; Morwood 1984: 369, 1987; Ferguson 1985: 453, 498; Williams 1985, 1988).
Wade (1967: 39) was one of the earliest to comment on an increase over time in the number of inhabited sites in the NSW south coast and Sydney region (I use the term ‘Sydney region’ to refer to land south of the Hawkesbury River, east of the Blue Mountains and north of Wollongong). Wade said that in the majority of sites excavated near Sydney, no evidence of habitation was found earlier than the Bondaian or ‘microlithic phase’. He considered the increase in site numbers to be ‘indicative of changes in settlement pattern probably due to an increase in population’. He discounted the argument that the patterning may be due to non-random selection of sites for excavation, and concluded that:

... the increased number of inhabited sites near Sydney indicates the exploitation of food resources near these new sites, due to the pressure of population increase. (Wade 1967: 39)

Megaw and Roberts (1974: 9) stated that the evidence tended to suggest that the Bondaian phase (which they called Phase II) was a key period for maximum population expansion.

Increasing implement and sediment accumulation rates at three sites on the NSW south and central coasts (Bass Point, Burrill Lake and Curracurrang 1CU5/-) were used by Lampert and Hughes (1974: 231–4) as a measure of ‘the intensity of site occupation’. Increases in these two indices were used to support their view that the sites were used more intensively over time which, in turn, they said, supported their hypothesis of population increase during the last 7000 to 5000 years along coastal NSW. They argued that the increase in stone-working coincided with the arrival of the Small Tool Tradition, but at the same time there was an increase in the rate of human-induced sedimentation. The concurrence of the increase in sedimentation and stone-working was seen as evidence supporting their hypothesis that the sites were being used more frequently, rather than the view that the increase in stone-working was simply due to the introduction of the Small Tool Tradition, that is, to qualitative changes in the artefact assemblages.

Lampert and Hughes (1974: 231) considered that within the past 7000 to 5000 years, two factors led to increased availability of marine food resources, which in turn would have led to the increase in population:

1. changes in coastal morphology resulting from the sea remaining at more or less its present level throughout the past 7000–5000 years, which extended the inter-tidal and tidal zone; and,
2. the introduction of new fishing methods.

Lampert and Hughes (1974: 231) hypothesised that if, along the NSW coast, it was generally true that hunter-gatherer population size was adjusted to the available subsistence resources, then there was a significant increase in the population of this area within the past 7000–5000 years. They (1974: 233) acknowledged that the archaeological evidence is equivocal with regard to demographic change, but believed it was outweighed by their ecological evidence. They concluded, however, that it may have been a purely local rather than a large-scale demographic episode, or it may simply reflect the arrival of coastal people at the present shoreline.

In a later paper, Hughes and Lampert (1982: 19, 24–6) used accumulation rates for implements and sedimentation as measures of the intensity of site occupation for five NSW south coast sites: Burrill Lake, Bass Point, Currarong 1 and 2 and Sassafras 1. They noted that it was after the sea reached its present position that the most dramatic increase took place — a six- to tenfold increase on average in the last 5000 years. At the same time, they noted that there is variation in the archaeological record at individual sites after 2000 BP:

... all of these sites show a marked intensification of site occupation during Holocene times that continued at least up until 2000 BP. After that time the trends diverged in that at some sites the
increase in intensity of site occupation continued but at others the intensity levelled off or there was a slight decline. (Hughes and Lampert 1982: 19)

In support of their argument for population increase, Hughes and Lampert argued, on the basis of 20 sites excavated in the Sydney area and on the NSW south coast, that there was an increase in the number of new shelters occupied over time. They stated that the increase in sites between 8000 BP and 6000 BP reflected ‘the arrival of the sea at its present level’ (1982: 20), and that the two- to threefold increase in the numbers of sites occupied in the last 5000 years does not simply reflect the destruction of earlier sites, or the establishment of sites on newly formed sandy landforms.

The two sets of evidence, they added, must represent population increase since increased accumulation rates also occur at sites away from the coast (e.g., Sassafras 1, which is 35km from the coast), and increasing site numbers are seen as far inland as Willandra Lakes in western NSW. After looking briefly at a series of alternative hypotheses to explain the numerical increases, they concluded that ‘only a rise in population provides an acceptable explanation’ and that the ‘postulated’ population increase ‘after 3000 BP’ cannot be explained in terms of environmental change as the coastline had essentially taken its present configuration by then (Hughes and Lampert 1982: 26). The decreases in artefact accumulation rates that occurred at some sites after 2000 BP does not appear to be taken into account in Hughes and Lampert’s population-increase models. The quote above is the only point in the paper where they referred to population increase ‘after 3000 BP’, as opposed to ‘in the last 5000 years’.

One of the explanations put forward by Flood (1976: 32–3, 1980: 281–2) for the archaeological evidence from the NSW southern uplands-tablelands built on Lampert and Hughes’ conclusions. Flood stated that the present evidence (i.e., the basal dates from habitation sites and the type of artefacts found) suggests the main period of occupation in the NSW southern uplands was within the last 5000 years. She hypothesised that the late occupation of the southern uplands was the result of population pressure on resources on the NSW south coast. This pressure followed the considerable population increase on the south coast, which occurred after the resources increased about 7000 BP to 5000 BP, when the sea-level stabilised. Consequently, there was a move to the less-favourable environment of the uplands. She (1976: 33) proposed that occupation of the south-eastern ‘highlands’ of Australia began with seasonal occupation of rockshelters on top of the coastal ranges (e.g., Sassafras 1, which has a basal date of 3770±150 BP, ANU-743). Seasonal hunting was then extended into the southern tablelands, the Canberra region and the Monaro; later still, the region was occupied all year round.

Subsequently, after the analysis of the materials from Birrigai, with its basal date of 21,000±220 BP (Beta-16886; Flood et al. 1987: 16, 22) and a fourfold increase in the rate of artefact accumulation ca 3000 BP, which was maintained until the present (1987: 18), Flood et al. concluded that in the NSW south-eastern highlands there is evidence for ‘an increased usage of individual sites (Birrigai), increased usage of marginal environments (highlands), and the increased establishment of new sites after 3000 BP’ (Flood et al. 1987: 23). They saw no evidence for a late-Holocene de-intensification period at Birrigai, but that ‘the evidence strongly suggests a redistribution of people through the landscape during the late Holocene’. They added:

For these predictions to hold true, two consequences should be visible after about 3000 years: (a) a decrease in site use and a decrease in the establishment of sites in favourable zones, and (b) an increase in site use and an increase in the establishment of sites in marginal environments.

If these conditions are met, then it is possible that the ‘intensification’ events initially identified by Lourandos entailed a re-organisation of human groups, and consequently a re-organisation of economic networks, through the landscape. Such a phenomenon may also have involved changes in population numbers, an issue which will have to be examined independently. (Flood et al. 1987: 23)
Redistribution of populations at regional and local levels

Hughes and Lampert’s arguments for general population increase on the NSW south coast (outlined in the previous section) relate more specifically to the changes after ca 5000 BP. However, they (Lampert and Hughes 1974: 233; Hughes and Lampert 1982: 20) say increases in implement and sediment accumulation rates that occur in sites before 5000 BP could be due to a purely local rather than a large-scale demographic event, or may simply reflect the inland movement of coastal people as the shoreline retreated to its present position. Ross’ and Flood’s models, which are outlined in the previous section, also include local shifts in populations.

Models proposed by two other researchers, Luebbers (1978, 1981, 1984) and Beaton (1985), differ from those above in that they explain temporal changes in the number of habitation sites in different environmental zones in terms of local shifts in population. General population increase was included by Beaton in his interpretations, whereas Luebbers (1984: 91–2) said population increases are inferred by the developments he proposed for the Coorong, but were not substantiated by available data.

Using changes in site distribution patterns and site numbers, Beaton (1985: 2) identified, described and dated changes in the local environment and associated changes in the occupation history of Princess Charlotte Bay in northern Queensland. Beaton (1985: 5, 9) considered the region was unoccupied until about 4700 BP, and that initial occupation of the area was in rockshelters near the coastal foreshore and was of a minor nature. Chenier-building associated with coastal progradation began about 4000 BP, but it was not until about 2000 years ago that occupation shifted to the chenier plain; the earliest evidence for occupation of the nearby islands dates to about the same time, 2500 BP. As consecutive cheniers formed, they too were camped on, but use of the older cheniers did not cease. Between 1200 BP and 800 BP, the shell mounds were more numerous and larger than in other periods. During the last 600 or 500 years, use of the mainland foreshore and islands continued; however, chenier formation virtually ceased and, though foraging continued in the mangroves, shell-mound deposition ceased on the chenier plain and it appears to have been abandoned as a significant camping location. He (1985: 5–11) considered abandonment of the camps on the cheniers to be due to the loss of Anadara granosa beds, which changed the human focus away from the chenier plains.

The changes in site distribution patterns in the last 2500 or 2000 years, which involve an initial increase and subsequent decrease in site numbers on the chenier ridges, are related by Beaton to changing coastal morphology and resource availability. Beaton placed the initial occupation of Princess Charlotte Bay in the context of a wider trend which saw increasingly dense coastal populations in the late-Holocene. He postulated that the coastal economy was a recent adaptation, similar to the widespread incursions into previously marginal zones which Lourandos (1980a: 259) saw as a geographical and ecological expansion of the hunter-gatherer niche. Thus Beaton viewed the increase in coastal populations as ‘an expression of the incorporation of yet another class of resource community into the total foraging economy of Australia’, which he suggested happens in the late Holocene rather than late Pleistocene and ‘is due primarily to increasingly dense populations’ (Beaton 1985: 18).

Three projects were undertaken by Luebbers (1978, 1981, 1984) in the coastal areas of south-eastern South Australia. One project involved an area referred to as the ‘lower south-east’ South Australia (1978) and the other two projects were on the Younghusband Peninsula (northern and southern Coorong) (1981, 1984).

In lower south-east South Australia (between Robe and Cape Banks), Luebbers (1978) documented change in the character of sites which is associated with a change in site distribution patterns. He (1978: 108) identified an Early and Late Cultural Horizon on the basis of site content, morphology and stratigraphy. The Early Horizon lasts from ca 10,000 BP to ca 6000 BP; the Late Horizon is divided into an Early and Late Phase. He (1978: 307–9) claimed
that significant changes in population and economic organisation occurred during the Late Horizon, that is, the last 6000 years, and that the formation of the coastal economy was a relatively recent event. The population changes postulated by Luebbers did not necessarily involve a general population increase, but rather there was a local shift in population with increases in some geographic and/or environmental areas, and decreases in others.

The early-Holocene occupation was widespread across eastern South Australia — along the coast, the lower Murray River, and associated with swamps, such as Wyrie (Luebbers 1978: 108). Luebbers (1978: 209–11) maintained that the site distribution pattern changed during the Early Phase (ca 5800 BP to ca 1300 BP) and again during the Late Phase (ca 1300 BP to contact). During the Early Phase, there was a low level of occupation, which was predominantly in the coastal hind-dunes with small numbers of sites in the sandhills 2km inland. Occupation appears to have been transitory and to have consisted of short-duration visits by shellfish gatherers. In the Late Phase, the character of the coastal economy shifted towards more intensive occupation, which was concentrated on the cliff tops and sandhills, with a few visits as far as 12km inland, and near the lagoon. More intensive use of marine resources and a more diversified economic focus on the coastal margin itself were seen along with a recurrent use of sites, more sedentary settlement and establishment of a network of communications and trade. Whereas microliths are associated with the Early Phase sites, they are rare or absent from the Late Phase sites.

According to Luebbers (1978: 302–3, 307), the increased occupation of the coastal strip occurred at a time of severe disequilibrium — some lagoons and environments were deteriorating and becoming less productive, while in other areas swamps and lakes were forming and/or increasing. However, Luebbers (1978: 215–16) said the differences in the archaeological record of the two phases indicate that the change was not related entirely to environmental factors, but that the differences suggest that reorganisation of subsistence strategies occurred on a large scale, which may have involved an increase in population, a higher frequency of visitation, or both. He added that this may have been accomplished by seasonal visits of longer duration, or by intensifying exploitation by more effective organisation and procurement skills, which then allowed more resources to be included in the menu.

Luebbers (1978: 303) related the postulated changes in the coastal strip to the wider geographic area and to general environmental changes. He referred to inland swamp areas such as Wyrie Swamp, which have been documented as being important to early-Holocene economies. He postulated that when conditions became drier after 3000 BP, and particularly between 2000 BP and 500 BP when swamps were completely dry and biomass was drastically reduced, the traditional way of life around the swamps could no longer be maintained and people were forced to find an alternative food supply. He (1978: 306) added that the environmental change would have affected the total southern drainage — during wetter conditions and in the mid-Holocene, Aboriginal people could have inhabited a wide range of well-watered habitats and presumably occupation densities increased accordingly. With the emergence of the dry phase, populations would have been forced towards more productive areas along the rivers and the coast. For the lower south-east, this meant concentrating on the swamps along the Woakwine Range and in the coastal margin itself. Solutions also involved construction of eel traps and the large habitation mounds of western Victoria, and the extensive fish weirs in South Australia. He (1978: 308) concluded that marine economies emerged in south-eastern South Australia 2000 to 1300 years ago as a result of substantial changes in the regional demographic structure after a major reduction in inland swamp-side resources.
Head (1983: 78–9) was critical of Luebbers’ interpretation on the grounds that the lesser number of Early Phase sites in the coastal zone may be due to their destruction by coastal erosion. Luebbers (1978: 215) accepted that some Early Phase shell middens had been lost, but said the patterns of campsite distribution characterising each phase were still detectable.

For the Younghusband Peninsula/southern and northern Coorong (which is north-west of the lower south-east), Luebbers (1981, 1984) proposed a different explanation for temporal variations in site distribution patterns, site characteristics (e.g., their morphology, size and contents) and the age of different site types. However, he still associated archaeological changes in different geographic zones with environmental changes. The latter are associated with the formation of the Coorong, a shallow relict estuary bounded by the mainland on one side and the Younghusband Peninsula on the other. Luebbers studied the area in terms of three zones: the mainland, the peninsula’s estuarine shore and the peninsula’s ocean shore.

Luebbers (1981: 3, 32–3) related changes in the archaeological evidence to the biological productivity of the Coorong, which he said decreased in the past 6000 years. During this period, geomorphological processes closed the estuarine exits to the sea and changed the Younghusband Peninsula from an island (or island chain) to an area of continuous land joined to the mainland. While this gave people greater access to ocean marine resources, closure of the tidal gaps caused the Coorong to gradually silt up and estuarine resources to decline in abundance.

By the end of his 1984 study, Luebbers (pp. 3–4, 91–3) identified four phases of Aboriginal settlement. The earliest phases of coastal occupation focused on the mainland shores of the estuary and inland swamps (Luebbers 1981: 32). The peninsula (islands, at that time) was initially occupied about 6000-5000 BP by groups based on the mainland who made short visits. Visitors swam or canoed across the Coorong. As the barrier formed and dunes developed, occupation of the peninsula increased and a more diverse range of resources was exploited, including marine shellfish (Plebidonax syn. Donax sp.), which were transported from the ocean shore to camps on the estuarine shore (Luebbers 1981: 3–4, 32–3, 43–5, 1984: 91–3). The use of Plebidonax continued to increase and, from about 2000 BP, very large middens (mounds) representing recurrent occupation of preferred locations were formed, which Luebbers interpreted as signs of increased sedentism. Camps were occupied along both the ocean front and the Coorong shore.

Luebbers thus interpreted temporal changes in the character and distribution of habitation sites on the Younghusband Peninsula as local shifts in population between the mainland and the peninsula in response to environmental changes which affected the reliability and availability of food supplies in the Coorong. At the same time, the environmental changes enabled greater access to ocean resources and ultimately increased sedentism and more permanent occupation of the Younghusband Peninsula. Luebbers (1984: 91) believed the change in land-use patterns and the magnitude of the increase in the size of some sites (mounds) cannot be explained by increased sedentism alone. He argued for a net increase in the resident population at the coast, due possibly to migration. The role of population increase, he said, is a matter for conjecture.

In a different explanatory context, Bowdler (1981: 108–10, 1993: 130) interpreted the increasing amounts of archaeological materials at individual sites in the NSW Blue Mountains, the New England tablelands (NSW) and the Queensland uplands, and the late date for the initial establishment of sites in the NSW southern uplands, all of which occurred after 5000 BP or 4000 BP, as the ‘first successful highlands occupation’. She explained that the reason for this increased occupation was the result of an increase in ceremonial activities which were focused in the highland regions of eastern Australia. The ‘highlands or higher regions’ were the venue for the ‘rituals of exclusion’ to which the women and children were not allowed to go. These
activities were associated with the adoption of what Beaton (1982: 57) called ‘communion food’ — in particular, *Macrozamia* sp., *Microseris scapigera* (daisy yam) and *Agrotis infusa* (bogong moths) — which enabled large rituals/ceremonial gatherings to be held.

Bowdler, along with Jones (1977: 201–2) and Beaton (1982: 57–8), linked increases in quantitative aspects of the archaeological record to the introduction of the Small Tool Tradition and to increased ritual and ceremonial activities. Bowdler (1981: 108–10) concluded that the first successful exploitation of the highland regions of eastern Australia was part of the transformation of Aboriginal society some 4000 years ago, for which the Small Tool Tradition could be used as an indicator.

Increased ‘intensity of site use’

Many researchers interpreted increased rates of artefact (or implement) accumulation at individual sites as ‘increased occupation’, ‘an increase in the intensity of occupation’, ‘an increase in the intensity of site use’ or ‘increased human activity on the site’ (Lampert and Hughes 1974; Stockton and Holland 1974; Moore 1981; Hughes and Lampert 1982; Smith 1982; Flood et al. 1987). The increases in the artefact accumulation rates were seen to reflect changes in:

1. the number of people using the site, that is, variation in group size; and/or,
2. frequency of visits to the site; and/or,
3. the length of time spent at the site during each visit

(e.g., Smith 1982: 114; Ross 1985: 83).

The net effect of any one of these circumstances is that more person-days were spent at an individual site. Smith (1982: 114) referred to this as Simple Functional Change.

As outlined above, some researchers have used changes in artefact (or implement) accumulation rates at individual sites as evidence for general population increase (e.g., Hughes and Lampert 1982; Lampert and Hughes 1974 — see above), or redistribution of populations at a local or regional level (e.g., Jones 1985: 296; Lampert and Hughes 1974 for the period before ca 5000 BP). Lourandos (1985b: 38) suggested that ‘greater usage of individual sites in a restricted area may merely represent more intensive usage of the region by broadly similar numbers of people’ or that local group sizes were larger. Lourandos’ phrase ‘more intensive usage’ could mean the same number of people visited more often or stayed for longer periods on each visit, or that more activities were carried out or a greater effort was spent on the same activities by the same number of people in the same period of time. His explanation could be seen as ‘redistribution of local populations’ or some smaller-scale event/s, but one of the outcomes is that there was a change in the number of person-days spent in an area over a particular period of time.

Small-scale movements of people and social reasons were proposed as explanations for changes in artefact accumulation rates as well, rather than widespread general population increase or movement of the local population from one environmental zone to another. By ‘small-scale movement of people’, I mean people using one site in preference to another within the same locality or environmental zone. This includes changes either from one habitation site type to another type (say, from rockshelters to bark shelters in open settings) or from one habitation site to another of the same type because of either preference or local environmental changes.

At sites in the Hunter River and the Macdonald River valleys, Moore (1981: 414–15) noted that at three sites the ‘maximum occurrence’ of stone artefacts was in levels dating from ca 2300 to ca 1700 BP. He interpreted this as a ‘period of maximum activity’ or as ‘apparent intensification of occupation in sites at both ends of the Boree Track about 2000 BP’ (Moore 1981: 414–15, 423). He associated the ‘intensification’ to an apparent late occupation of the Hunter Valley and subsequent establishment of contact between the different tribes at both ends of the track.
In the NSW Blue Mountains, Stockton (1970a: 297) noted that the sites without Bondi points (an artefact he considered to be diagnostic of the Bondaian phase) were not as deep and large as the ‘caves’ with Bondi points. He initially considered that this indicated either that the Bondi point was a domestic rather than a hunting tool, or that the Bondaian flourished in a period when the climate was comparatively cold and wet and shelter was in greater demand. After more extensive excavations, Stockton and Holland (1974: 56, 60) described ‘peak concentrations’ in stone artefacts in the Middle Bondaian levels of several sites: ‘increasing abundance of flaked material in rock shelters reaching a peak of concentration at about 1000 BP’. They proposed that:

In the absence of factors likely to disrupt steady deposition at a site … such concentration seems to indicate increased human activity on the site. Where this is verified at a number of neighbouring sites at the same time, one is led to consider a peak population and/or a peak of preference for cave dwelling. (Stockton and Holland 1974: 56)

They concluded that the growing importance of the Bondaian industry and its subsequent regression in the last 1000 years may well be a response to climatic factors:

The concentration at the middle Bondaian levels may denote weather conditions which either demand permanent shelter or render mountain dwelling more attractive; subsequent regression again may signify either worsening mountain climates or decreased dependence on permanent shelter. (1974: 60; see also Stockton 1977c: 343)

Bark shelters may have come into more general use in the Late Bondaian corresponding with lessened dependence on rockshelters (hence greater mobility). (Stockton and Holland 1974: 58)

In his reanalysis of the Devon Downs stone artefact assemblage, Smith initially queried whether quantitative changes in stone artefact assemblages at Devon Downs were principally due to:

… variation in the amount of stone working carried out on site. This affects the total amount of stone in a deposit and is related to the availability of suitable stone and the intensity of occupation. (Smith 1982: 110)

However, after analysis of all materials from the site (i.e., faunal remains and ochre, as well as stone artefacts), and looking at alternative explanations, he concluded:

The increased quantities of a wide range of archaeological remains — stone, retouched artefacts, emu egg-shell, ochre and animal bone — as primary or de-facto refuse [Schiffer 1976: 30–4] at Devon Downs shelter, suggests an increase in the intensity of occupation between 2000 and 4000 years ago. (Smith 1982: 114)

The types of changes likely to be associated with changes in the rate of discard (availability of stone, amount of on-site knapping, changes in reduction processes, changes in seasonality, economic changes) do not account for the observed changes in quantity of occupational debris at this site. We are justified therefore, in interpreting this as simple functional change. The shelter was used more intensively between 2000 and 4000 years ago. (Smith 1982: 114)

Smith considered that there was an increase in the number of person-days spent at the site. He (1982: 115) stated that changes in both group size and the frequency of visits may have been responsible for the observed variations, but ‘the link between increased use of a site … and population increase is unclear’. (The decrease in archaeological materials in the last 2000 years at Devon Downs is discussed below under Decreases in the Archaeological Record, Behavioural Change.)
Intensification and increasing social complexity

Lourandos (1980a, 1980b, 1983a, 1984, 1985a, 1985b) included quantifiable temporal changes in the archaeological record as support for his hypothesis for intensification during the last 5000 to 4000 years. He included general population increase, redistribution of populations and increases in ‘intensity of site use’ as part of his arguments.

In his use of the term, Lourandos saw intensification as a broad concept that referred generally to increases in both productivity and production, but he followed Bender (1978) in allowing the concept to refer to social as well as economic factors (Lourandos 1983a: 81; 1985a: 389–90). Thus the definition of intensification used by Lourandos was broader than that accepted by some researchers (e.g., Beaton 1983: 95). In addition, while intensification is usually viewed as a relatively short-term process, Lourandos (1985a: 391) considered it justifiable to extend its usage to include any perceivable long-term increases in the frequency of selected variables in the archaeological record.

Lourandos (1984: 30) argued that social forces were the primary element or influence which brought about late-Holocene changes in economic and habitation behaviour — it was a restructuring of social relations at the inter-group level, specifically associated with ceremony and exchange, which placed continually increasing demands on economy and production (Lourandos 1983a: 81, 1985a: 386). He suggested these dynamic processes may have resulted in increases in the complexity of social relations and economic growth, semi-sedentism and, by inference, population sizes. In emphasising a ‘social’ mechanism to explain late-Holocene change in Australian prehistory, Lourandos’ approach contrasts with those studies which emphasise environmental and demographic factors as agents of change. However, although Lourandos (1985a: 403, 412) argued that the development of increasingly more complex social networks and alliance systems lies closely behind these processes of intensification, he also saw them stimulated in some ways by environmental and climatic changes and perhaps influencing, as well as being influenced by, ‘the more elusive factor of demography’. Even so, he said neither environmental nor demographic changes provide adequate explanations for the late-Holocene archaeological changes in Australia (1984: 32, 1985a: 403), and he believed demographic change was just as much a consequence of other factors as a causal agent itself, and could not be regarded as a prime mover or considered separately from cultural or environmental influences.

Lourandos (1985a: 411) proposed that during the last 5000 or 4000 years, mainland Australia experienced a period of cultural expansion which was characterised by:
1. rearrangements in settlement and economic patterns (towards more sedentary and intensive economies);
2. an expansion in exchange networks; and,
3. significant changes in other variables such as art and stone artefacts.

In some regions in south-eastern Australia, he considered that the changes in ‘the intensity of occupation’ appeared to have become progressively more marked throughout the late-Holocene (1985a: 411).

The main archaeological variables which Lourandos (1983a: 82, 92, 1985a: 391, 400) claimed to be general indicators (direct or indirect) of intensification during the last 5000 or 4000 years — and to suggest expanding economies (in terms of land and resources), increasing sedentism as sites and locales became more intensively used (i.e., a trend towards the establishment of longer-term base camps) and more intensive inter-group relations (exchange, ceremonies) — are:
1. intensity of site usage (measured by sediments and cultural remains);
2. rate of establishment of new sites;
3. usage of marginal environments (arid, montane, rainforest and swampland);
4. complexity of site economy (resource management strategy and wide range of resources and activities represented);
5. complexity of exchange systems and ceremonial events.

He pointed out that the above characteristics appeared not only on the coastal strip but inland as well, and, as support, quoted the evidence from the NSW south coast, the Mangrove Creek Dam storage area, the NSW southern highlands, central Queensland highlands, NSW Blue Mountains, the lower Murray Valley, south-eastern South Australia and the Victorian Mallee, as well as western NSW, Koonalda Cave, the Strzelecki Desert, south-western Western Australia, Arnhem Land and Tasmania (Lourandos 1985a: 392–401). At this time, he (1985a: 403) said his interpretation suggested a general (but not necessarily uniform) population increase over time in most environments.

Although his investigations began in order to explain the presence and development of Aboriginal drainage systems and the cultural complexity documented in the 19th-century historical records of south-western Victoria (1976, 1977, 1980a), Lourandos built up a hypothesis which he considered was applicable Australia-wide. He saw the strength of the intensification model lying ‘in the general consistency of the independent results obtained by a large number of researchers from a wide set of archaeological variables and ranges of Australian environment’ (1985a: 403). Given the breadth of the evidence, he found it difficult to explain these archaeological patterns in terms other than a general amplification of socioeconomic behaviour. In his later writings, Lourandos acknowledged more recent archaeological studies and developed his model, placing the broad series of cultural changes within the last 4000 years or so and especially the last 2000 years (Lourandos 1987: 157, 1988: 149, 158) or the last 3000 to 2000 years (Lourandos 1993: 79, 80). He admitted that ‘while the more recent processes of socio-economic intensification are becoming increasingly evident, their genesis, presumably in the mid-Holocene and earlier, is less clear’ (1988: 160). More recently, in Continent of Hunter-Gatherers, he proposes what he calls a ‘socio-demographic model’ of cultural change (1997: 243, 318–21, 327–30).

As a package along with other evidence, Lourandos (1983a: 92, 1984: 31–2, 1985a: 391) thus saw quantitative changes in the archaeological record as indicators of intensification, and suggested (1985a: 402) that it would not be implausible for there to be an association between the archaeological data and demographic patterns (though he said all interpretations must be inferential [1983a: 92]). In this sense, one can say he believed population increase was instrumental in bringing about the quantitative changes in the archaeological record, though social change was the prime mover for intensification.

Ross (1984: 199–201, 238) proposed population increase as the most probable explanation for a tenfold increase in sites in the southern Mallee (western Victoria) during the late-Holocene period. A decrease in, or less substantial use of, the northern Mallee (Raak Plains and Lake Tyrrell) is proposed in the late-Holocene (Ross 1984: 180–2). Changes in site numbers are the principal evidence Ross used for her interpretation of the archaeological record in the Mallee, where she (1984: 15–16, 177, 182–4, 228, 265–6) saw two phases of occupation:
1. the first phase, dating from ca 12,000–10,000 to ca 6000 BP: occupation concentrated in the northern part of the Mallee, around Raak Plains and Lake Tyrrell; the southern Mallee was rarely visited prior to 4500 BP;
2. the second phase, after 4500 BP: more widespread occupation occurred throughout the study area and a tenfold increase in sites occurred in the south; the evidence suggests only short-term, small-scale use of Raak Plains in the northern Mallee at this time.

Ross (1981: 153; 1984: 15–16, 198, 266) linked the first phase of occupation in the northern Mallee to the early-Holocene when, she stated, lake levels were high and freshwater
availability was greater than at present, and people based on the Murray River expanded their range. The second phase of occupation, she said, occurred during a period of environmental decline — after ca 6000 BP, the northern Mallee became more arid and the water sources became saline. At this time, the population retreated back to the Murray River and occupation was less frequent (Ross 1984: 198, 265). The south also became drier and thus, according to Ross (1984: 227), the increase in sites in the southern Mallee must lie away from general ecological or environmental explanations. She stated (1984: 238, 267) that the most likely explanation for the late-Holocene increase in sites in the southern Mallee is general population increase associated with intensification and social change in south-western Victoria.

Ross (1984: 236) proposed that the evidence from the Mallee may be an initial test of Lourandos’ model of alliance network growth in south-western Victoria since:

Any increase in population density in the wetlands is likely to have provided a trigger for expansion into more northerly districts. It may therefore be suggested that population growth in south western Victoria led to population expansion into the southern Mallee. (Ross 1984: 236–7)

... archaeological evidence from elsewhere in south eastern Australia is certainly suggestive of a general increase in numbers of people in the late Holocene, it is most likely that the principal factor involved in population increase in north western Victoria was population expansion from the better watered areas outside the region. (Ross 1984: 236; see also Ross 1981: 152–3)

Ross (1984: 234) did not consider population change ‘as an independent variable or a prime mover causing change’, rather it was ‘one element of the wider subject of social change, possibly associated with the development of complex alliance networks’. In this respect, Ross as well as Williams and Morwood (see below) were influenced by Lourandos.

Population increase was seen by Williams (1985, 1988) to be associated with the formation of mound sites in the late-Holocene in western Victoria. Mounds first appear after 2500 BP, that is, in the late rather than the mid-Holocene (Williams 1985: 5, 311; 1987: 318–19; 1988: 2, 216). All but one mound site are dated to later than 2000 BP (Williams 1985: iii, 316; 1987: 319; 1988: Fig. 10.1). Williams (1985: 310, 316; 1988: 218–21) concluded that the appearance of mounds about 2500 BP suggests their appearance was in part related to climatic changes, being an adaptation to a more waterlogged environment, and was not related to technological change (i.e., to the Small Tool Tradition).

In 1985 (iii, 5), Williams proposed that population increase, shifts in alliance networks leading to intensification, as well as an environmental shift to a wetter climate about 2000 years ago, contributed to the changes; that is, the changes involved complex interaction between climatic shifts, demographic pressure and social variables. Williams (1985: 325) also stated that, because the formation of mounds may have been related in part to a shift in climatic conditions, it is difficult to separate the relative contributions of environmental factors from social and economic ones. However, in subsequent publications, Williams (1987: 319; 1988: 221) argued that the formation of mounds was associated primarily with changes in social networks, that climatic and environmental shifts played only a minor role in triggering change, and population increase occurred only after other major changes had taken place. It was changes in alliance networks in the region after 3000 BP (associated with expanding redistribution and alterations in social relations) that triggered increases in production (intensification), which was achieved by shifts in organisation of labour and settlements, and a more sedentary occupation of sites. The archaeological evidence Williams associated with these changes was the appearance of mounds and an increase in the number of sites in the late-Holocene (Williams 1988: 220–1). Evidence for the increase in population was an ‘increase in sites at this time’ (Williams 1988: 221).
For his study of the central Queensland highlands, Morwood (1984) synthesised the archaeological work undertaken by himself and several other researchers (Clegg 1965, 1977; Mulvaney and Joyce 1965; Beaton 1977, 1982; Morwood 1979, 1981). The archaeological evidence for the central Queensland highlands spans a minimum of 22,000 years, and Morwood (1984: 371) considered substantial changes occurred ca 4300 BP in the technology and range of stone artefacts as well as the rock art of the region. At the same time, he (1984: 358, 369, 371) said there was an increase in the intensity of occupation in sites with long sequences, this being measured by rates of artefact, ochre and sediment deposition. The evidence suggested to him (1984: 371) that all the changes were sudden. Because change occurred in these several types of evidence, Morwood (1984: 369) said the ‘more intensive occupation’ cannot be explained just in terms of changes in knapping behaviour.

He (1984: 369–71) believed the evidence from the central Queensland highlands supports Lourandos’ interpretations, and required fundamental changes in Aboriginal social relations and mechanisms for exchange of resources, knowledge and genes, as well as an associated increase in the scope of ceremonial gatherings. Morwood (1984: 358) said that if the increased number of sites containing artefacts belonging to the Small Tool Tradition is a guideline, then Aboriginal use of the central Queensland highlands appears to have become more extensive. After reviewing some of the evidence from other regions, he (1984: 369) argued that ‘the evidence from all mainland areas indicates that the earliest occupation of any intensity only occurred with the elaboration of stone artefact assemblages circa 4500 to 3000 BP’. He saw an ‘abrupt increase’ in site numbers applying to both rockshelters and open sites in diverse environments (NSW coastal and sub-coastal areas, Blue Mountains and Darling River). Morwood (1984: 369) concluded that ‘In some (perhaps all) regions the sudden increase in site numbers and occupation intensity is best explained in terms of population increase’.

Morwood (1987) considered that some aspects of the archaeological record in south-eastern Queensland are explicable in terms of a model for increases in population and social complexity, and saw environmental change leading to greater resource availability as part of the model. Morwood (1987: 343) proposed that in the past 6000 years changes in climate and sea-level ‘allowed extensive estuarine and mangrove areas of concentrated biological productivity to develop’, which ‘provided scope for an accelerating increase in population in the region, especially after 4000 bp’. He suggested that population increases were triggered initially by the expanded resource base, but later increases resulted from the development of social and demographic mechanisms which increased the effective carrying capacity of regional resources. The archaeological criteria for identifying population increases, he said, could include:

(i) increases in the rate of site formation;
(ii) increases in occupational intensity at sites; and,
(iii) more intensive economic exploitation as indicated by the use of new habitats, resource types, extractive technologies and management strategies, etc. (Morwood 1987: 343)

The archaeological criteria for development of social and demographic complexity which he included were:

(i) increases in the number of sites concerned with symbolic activities (e.g., art sites, bora rings);
(ii) changes in site content (e.g., the appearance of exotic materials and technologies); and,
(iii) increased status differences and restrictions on access to knowledge and specific localities, as reflected in a reduction in occupational intensity at some sites, or developments in technological and organisational complexity. (Morwood 1987: 343)

Morwood (1987: 343–7, Fig. 4) considered that the results of his own fieldwork and archaeological data gained by other researchers (e.g., Hall 1982; Lilley 1984; Nolan 1986)
showed increasing site numbers and increasing complexity in the archaeological record in south-eastern Queensland. He believed the evidence from Gatton, Maidenwell and Bishops Peak (rockshelters with art and deposits) supported his claims for increases in social complexity. Morwood (1987: 346) said these sites were ‘first utilised at 4300±300 bp right at the point of inflection in the site frequency curve, and associated with the appearance of new technologies and artefact types of diverse origin’, and that ‘it seems that more people were interacting more intensively and in new ways’. From other regional studies, Morwood saw accelerating increases in site numbers from about 4300 BP, which were associated with an increase in artefact discard rates at sites with long occupational sequences, as well as other changes in technology, artefact assemblages and economic activities. On the basis of this evidence, Morwood (p. 347) argued that major changes in population density and the scale and intensity of social interaction throughout Australia are indicated.

In an earlier article presenting the evidence from Gatton and Maidenwell, Morwood (1986: 117) was more cautious in his conclusions. He stated: ‘If the growth of site numbers over time provides a general measure of population increase, then more people were obviously interacting more intensively, and in new ways.’ He added (1986: 118), ‘The question still remains open as to whether these recent developments in S.E. Queensland were environmentally, demographically and/or socially determined.’

However, in 1987 Morwood (1987: 348) concluded that the available evidence indicates that significant demographic and social changes occurred in south-eastern Queensland from mid-Holocene times at the same time as marked changes in post-Pleistocene resource levels and character. He explained:

The increased population potential resulted not only from the development of new maritime resources in Moreton Bay but also from the now complementary nature of seasonal food abundances. The occurrence of inland, summer bunya crops and coastal, winter fish runs must have promoted the development of finely-honed, demographic flexibility and the required reciprocity network. Such developments would have led to continuing increases in carrying capacity, while increases in population would have led to an increased potential for the development of more complex patterns of exchange, and so on.

If this scenario is correct, then these social changes, involving more effective use of available resources, would have diffused into adjacent areas, even where there was no quantitative Holocene increase in resource base. It is possible that the social, demographic and technological changes that swept through mainland Australia c.4000 BP were triggered in ‘key’ areas by the post-Pleistocene emergence of new resources and resource configurations. South-east Queensland is likely to have been such a key area. (Morwood 1987: 348)

Further comments on explanations involving population increase

The above explanations, which involve increasing numbers of habitations being established or used over time, and increasing numbers of artefacts accumulating over time, concentrate on population increase, intensification, increasing sociopolitical organisation and increased ceremonial activities. Many of the researchers saw the archaeological evidence reflecting general population increase; others related the increases in archaeological evidence in particular environmental zones to redistribution of local or regional populations, though general population increase is still seen by some to be part of the local movements or as a matter for conjecture. A change in preference for particular habitation sites (i.e., increased or decreased use of a site of the same type or of a different type), environmental or climatic change as well as the introduction of new subsistence technology are also included as part of the explanations for the increases in archaeological evidence.
All the ‘population-change’ explanations were based on the assumption that an increase in the numbers of sites and/or artefacts reflects an increase in the numbers of people who were using a region, or an increase in the number of person-days spent in a site or region. Of the studies reviewed, only Lampert and Hughes (1974) and Hughes and Lampert (1982) used implements as the units of measurement rather than all artefacts in the total assemblage, and used the sites as well as the implements as evidence.

Another assumption made in many archaeological studies, and one which still requires investigation, is that there was a direct relationship between the location of artefact use and artefact discard (Binford 1973: 242–3; Foley 1981b: 165). Hiscock (1981: 31–2) queried whether the ‘number of stone implements per unit time’ adequately measures the ‘intensity of site usage’, saying it is unclear whether using implement counts is any better than using the entire assemblage. He also questioned what these indices measure:

What is being measured in this intensity index (of the number of implements per unit time) is mainly a reflection of technology; it will not necessarily indicate the numbers of people who are knapping, eating, sleeping, or walking in the site, nor the duration of those activities. If we require a general measure of ‘intensity’, that is one which involves more than one type of behaviour, we will have to measure more than one type of archaeological debris ... Ultimately, however, the usefulness of the exercise will not be measured in the cleverness or skill with which we produce a measurement, but in the strength of arguments defining the concepts of usage, intensity and their causal relationships to chipped stone accumulation rates. (Hiscock 1981: 32)

The use of more than ‘one measure of intensity’ was increasingly adopted by researchers (e.g., Morwood 1984, 1986, 1987; Smith 1982; Hall and Hiscock 1988a; Hiscock 1984, 1988b). Smith (1982: 114), however, cautioned against accepting quantitative changes in archaeological deposits as changes in the ‘intensity of site use’ and then stating in turn that they reflect broader changes in population size or settlement patterns.

**Behavioural change**

Explanations which do not involve an increase in population size (general, regional/local or site specific) were proposed for the increasing rates of stone artefact accumulation and habitation establishment over time. Many of these interpretations and explanations were put forward simply as suggestions without much discussion. Most alternative explanations were proposed in opposition to the idea that the increases in the archaeological record were produced by increases in the size of the population. Many explanations, however, were of a general nature and can be used to explain decreases in archaeological evidence as well as increases; for example, Hiscock’s (1986: 48) ‘underlying changes in the structure of discard behaviour, settlement patterns and economy’.

**Increases in site numbers**

Explanations involving behavioural change that were proposed for dramatic increases in site numbers, that is, for the lack of early sites, included:

1. in the latter half of the Holocene, sites were located in different situations to those of earlier periods and in these new situations the sites are more likely to have survived and/or to be visible today (Hughes and Lampert 1982: 24);
2. increased mobility (Attenbrow 1982a: 76; Rowland 1983: 73); people inhabited more sites within the same area, spending less time at each site, and perhaps travelling
shorter distances between sites than in the previous period; that is, the number of
movements within the locality increased. This may or may not have been associated
with movements between other resource zones or over longer distances;
3. changes in hunting and gathering techniques (Attenbrow 1982a: 76–7);
4. greater site visibility due to an increase in the number of stone artefacts
manufactured by each person, which meant more artefacts were discarded and thus
evidence for Aboriginal occupation (in the form of stone artefacts) for some periods
is more abundant (Attenbrow 1982a: 77). (This would have involved a change in the
ratio of people to artefacts);
5. ‘more sites … may merely represent more intensive use of the region by broadly
similar numbers of people’ (Lourandos 1985b: 38).

Increases in the number of stone artefacts accumulated
Alternative explanations for increases in the number of stone artefacts accumulated involve
qualitative changes in the stone artefact assemblages, changes in discard behaviour and
changes in as yet undefined behavioural processes. The explanations involving qualitative
changes in the stone artefact assemblages relate to changes in the number and range of
artefacts and/or implement types manufactured, changes in the stone technology and
changes in the stone materials used (i.e., typological, technological and raw material changes).
Except for changes in discard behaviour and post-depositional breakage patterns, these
changes are assumed to increase the number of stone artefacts or implements (tools) per
person, thereby producing a change in the ratio of numbers of artefacts to numbers of people.
1. Technological changes which produced more manufacturing debris (Hiscock 1981;
Ross 1984: 200);
2. different technologies may produce different numbers of implements (Hiscock 1981:
32; Ross 1985: 83);
3. changes in stone tool technology, that is, ‘when the maintenance tools of the core tool
and scraper tradition were joined by a mixture of maintenance and extractive tools of
the small tool tradition’ (Hughes and Lampert 1982: 24–5; see also Ross 1984: 200);
4. the adoption of new stone-working processes or reduction processes (e.g., blade
technology) (Smith 1982: 114);
5. a change in the stone material available or preferred, which affected discard rates
(Smith 1982: 110–11; Hiscock 1982b: 43; Ross 1985: 83);
6. increased range of activities for which stone tools were used, for example, the
barbing of spears (Ross 1984: 200);
7. shifts in technology which occurred about 2000 years ago when backed artefacts
tended to drop out of assemblages and were replaced by quartz artefacts which are
mostly unretouched. Williams (1985: 327–8) proposed this as a reason for a
continuing increase in artefact numbers and not for the postulated increase at the
beginning of the Small Tool Tradition.

The above explanations assume that the typological, technological and raw material changes
resulted in more implements and/or more manufacturing debris being left in habitations, and
that the number of people visiting or the number of person-days spent in the habitations
remained the same. That is, it was the amount or type of activity that changed (see discussions in
Smith 1982; Ross 1984, 1985). The raw material changes include changes in the percentage
frequency of certain raw materials as well as the introduction of different raw materials.

Lourandos’ (1985b: 38) statement that there was ‘greater usage of individual sites in a
restricted area’ (presumably referring to sites where a greater number of artefacts accumulated
over time) may simply mean a region was being used more often by broadly similar numbers of people and not that the general population increased. In this context, it may mean that a greater range of activities was carried out, or a greater effort (greater amount of time) was spent on the same activities by the same number of people, but the period of time (i.e., the number of person-days) spent at the site/s was the same as in the previous period/s.

Documented changes in the artefact accumulation rates in individual sites may also represent changes in the ‘location of discard’ (Smith 1982: 114; Hall and Hiscock 1988a: 54), changes in site use which increased post-depositional breakage through trampling (Hall and Hiscock 1988a: 58), or in the ‘location and use of hearths’ which thermally fractured artefacts and thus affects artefact counts (Hall and Hiscock 1988a: 59; Hiscock and Hall 1988: 101). Smith included changes in discard location under Complex Functional Change, which he said occurred when the rate of discard or amount of debris per person varied (though I would regard changes in the location of discard as Simple Functional Change). To invoke a change in the location of discard suggests that one assumes there was little or no change over time in (1) the ratio of artefacts to people, (2) the number of person-days spent at the location, and (3) the range of activities undertaken at the site. That is, people were simply discarding their debris in different parts of the site in different periods because they altered the locations within the site at which particular activities were carried out.

Natural processes
Several natural processes were proposed as explanations for the increases in the number of sites over time. These include geomorphological processes, the decomposition and degradation of materials, and the formation of palimpsests, as well as environmental changes and the rise in sea-level associated with climatic changes.

Geomorphological processes
Geomorphological processes were proposed as an explanation for the lack of early sites. These processes are said to have operated in several ways, all of which directly affected the archaeological materials, in contrast with other explanations which involve indirect agents of change.

1. Some early sites or early habitation levels in sites (in all situations, including the coast and inland, and rockshelter and open sites) were destroyed by erosional processes, and there will always be fewer sites the earlier ones goes back in time.
2. The rate of site destruction decreased in recent times due to less erosion associated with climatic or other environmental change.
3. Early sites have been buried by alluvial deposits or obscured by vegetation growth and are not visible today unless some form of disturbance occurs to the ground and/or vegetation.


The rise in sea-level, climatic changes and associated environmental changes
The low numbers of pre-8000-year-old coastal sites, shell middens in particular, were acknowledged by many as being due to the post-glacial rise in sea-level, which would have inundated many sites associated with the earlier shorelines (e.g., Hughes and Lampert 1982: 19; White and O’Connell 1982: 52, 99; Godfrey 1989). Rowland (1989: 38–9) considered that even after the sea-level stabilised ca 6000 BP, minor changes in sea-level and coastal erosion by storms and cyclones could have destroyed many shell middens and could account for the large difference in the number of sites pre- and post-2000 BP along parts of the Queensland...
coast. He also argued, in contrast with Lourandos, that even if Holocene sea-level and climatic changes were relatively small-scale and local by comparison with those of the Pleistocene, they may nevertheless have had very significant effects on Aboriginal populations, resulting in dispersion and a great diversity of economic and social adaptations, as well as population increase (Rowland 1983: 63, 71–4). Rowland proposed that such movements could account for the marked increase in artefact numbers and numbers of sites after 4000 BP.

Decomposition and degradation of materials
In the case of the absence or lower numbers of earlier coastal shell middens, organic materials such as shell are unlikely to have survived, particularly at locations which were infrequently used or were single-occupation sites (Hughes and Lampert 1982: 19; Rowland 1983: 73; Hall and Hiscock 1988b: 11). Degradation of shell will have led to the total disappearance of sites which consisted solely of shell, or to lower visibility of sites where only stone artefacts remain. The end result is greater numbers of more recent shell middens.

The formation of palimpsests
The formation of palimpsests may also be the reason for an apparent lack of early sites, particularly in areas predominated by open surface artefact scatters. By palimpsests, I mean assemblages in which the elements or artefacts from one or more periods have been mixed (Foley 1981b: 172–3; Robins 1997: 23; Holdaway et al. 1998: 1–2, 16). Palimpsests may result from geomorphological processes (e.g., erosion, deflation or conflation) or lack of sediment accumulation. The problem in dating the materials in such contexts in most areas of Australia arises principally because there are no artefacts which are temporally diagnostic of the ‘early’ Australian assemblages (the erroneously called ‘Core Tool and Scraper Tradition’, Mulvaney and Kamminga 1999: 44–7; Hiscock and Allen 2000: 103; Bird and Frankel 2001). Early artefact forms continued to be made after the appearance of ‘new’ tools associated with Holocene assemblages. These ‘new’ tools, particularly backed artefacts, are often taken as indicators of the now challenged concept of the ‘Small Tool Tradition’ (Hiscock and Attenbrow 1998: 59) or, in eastern NSW, as indicating the Bondaian phase of McCarthy’s Eastern Regional Sequence. On originally unstratified or deflated open deposits (i.e., surface artefact scatters), where artefacts of several periods are mixed, it usually is not possible to distinguish artefacts which may be Pleistocene in age from those of a Holocene assemblage. As a result, in the absence of datable material, a whole site or assemblage is likely to be classified as Holocene in age.

Similar circumstances may occur in the basal levels of stratified deposits in rockshelters. If few artefacts were discarded during an early phase of use with limited sediment accumulation, later assemblages could become indistinguishably mixed with the earlier materials (Hughes and Lampert 1982: 19–20; Schrire 1982: 152).

‘Decreases’ in the archaeological record
Most 1970s and 1980s explanations for ‘decreases’ in the archaeological record related to rates of artefact accumulation (often referred to as decreased densities of artefacts) rather than to numbers of sites, and concern decreases in the late Holocene rather than earlier periods. However, decreased numbers of sites and artefacts at the end of the Pleistocene and during the early-Holocene in some parts of Australia were discussed; for example, by Hallam (1977) for western NSW, and by Ferguson (1985) for south-western Western Australia.

Hiscock (1986: 40) was one of the few to acknowledge a decline in site numbers in the late-Holocene. Hiscock did not put forward any one interpretation or explanation for the
decreases he documented in both site numbers and the artefact accumulation rate in the last 800 years BP in the NSW Hunter Valley. He believed that late-Holocene Australian prehistory cannot be explained by population change, and that changes in the structure of settlements and technology may be better descriptions of what happened.

Several other researchers put forward explanations for decreases in artefact accumulation rates in individual sites, which are outlined below. No natural processes were proposed as explanations for the decreases in the late-Holocene, or the early-Holocene decreases in the arid zones, and the examples below are discussed under the headings ‘population change’ and ‘behavioural change’.

**Population change**
The population-change explanations for decreases in the archaeological record of eastern Australia related to redistribution of populations and changes in the ‘intensity of site use’.

*Redistribution of populations*
In the NSW Blue Mountains, Stockton and Holland (1974: 55) pointed out that there is a sterile gap between the Capertian and Bondaian assemblages in all stratified sites, somewhere between 6050 BP and 3360 BP, though the dates for these sterile layers are not the same at all sites. In support of their views, they referred to disconformities at Kenniff Cave, Noola and Capertee, all of which are highland sites. They interpreted the ‘hiatus’ as a gap in occupation at those sites (1974: 55) and a ‘vacation of the mountains’ (1974: 60). They suggested this may signify a response to or a worsening of the climate or might merely reflect social factors as yet unknown (1974: 46). Epidemic and cultural upheaval are mentioned (1974: 55).

Stockton and Holland concluded that population decline may have occurred in the Blue Mountains during two periods — between ca 6000 BP and ca 3500 BP and within the last 1000 years. The earlier decline, they indicated, may have been more widespread in other highland areas of eastern Australia, but it is presented in terms of redistribution of the local population (movement out of the Blue Mountains) rather than general changes in population size. The hiatus in Blue Mountains sites was refuted by Johnson (1979: 10, 23, 111), who said such sterile or relatively sterile zones may relate purely to use of the specific site and not to the general area.

Hallam (1977: 10) proposed that the large number of Pleistocene sites and the few late sites in the Willandra Creek system (NSW) are evidence that increasingly arid regions could not maintain their high Pleistocene population levels. Ferguson (1985: 1, 3) argued that the early to mid-Holocene archaeological record in south-western Western Australia is evidence of a progressive abandonment by a formerly large population, and, that from about 6000 BP to about 4000 BP, the entire region was virtually depopulated; a process which he said began about 10,000 BP. Ferguson (1985: 490–1) based his argument on a ‘drop in artefact numbers’ during the mid-Holocene at some seven, possibly nine, sites across south-western Western Australia (an area of about 220,000 sq km). Ferguson (1985: 493–7) acknowledged that rising sea-levels must have enforced a pattern of relocation to the east and the north. However, since the pattern appears to have been maintained in areas not directly affected by the rising sea, he (1985: 4) postulated that an increase in the distribution of thick sclerophyll forest due to climatic change moved the focus of human exploitation into adjacent desert areas, which would have been made more productive by the increased rainfall of the period.

*Decreased ‘intensity of site use’*
One of Morwood’s (1987, see above) criteria for ‘development of social and demographic complexity’ was ‘a reduction in occupational intensity at some sites reflecting increased status
differences and restrictions on access to knowledge and specific localities’. Morwood (1986, 1987) documented a decrease in stone artefact deposition rates about 1000 BP at two sites in south-eastern Queensland: Maidenwell and Gatton. At Maidenwell, since there was very little bone, and the charcoal as well as stone decreased in the uppermost deposits, Morwood (1986: 96, 98) suggested there was ‘a significant reduction in the intensity of site use’ after 1000 BP, though he considered that artistic activities continued. For the decreases at Gatton, Morwood (1986: 117) proposed a different interpretation — see below under Behavioural Change, Qualitative Changes to Artefact Assemblages.

Stockton and Holland (1974: 56) (as stated previously) interpreted trends in the NSW Blue Mountains sites as either a ‘peak population and/or a peak of preference for cave dwelling’. If one accepts the former, this implies that they saw a population decrease in the last 1000 years; if the latter, then there was a change in the type of location that people preferred to inhabit; for example, a change from rockshelters to bark huts in open locations (1974: 48, 58; Stockton 1981: 13). Stockton and Holland (1974: 48) suggested, in addition, that increased mobility must also be considered as an alternative to the foregoing proposal. Johnson (1979: 111) suggested the marked fall-off in artefact concentrations in the last 500 to 1000 years at Capertee 3 may reflect not so much ‘a shift in Aboriginal exploitation of the area but simply in the sporadic occupation of the site’ [my emphasis]. He added that such sterile or relatively sterile levels in sites may be the norm rather than the exception and that they need not be regarded ‘as hiatuses of occupation … dense concentrations of artefacts may reflect length of stay and group size/composition rather than intensity of occupation of the area as a whole’ (see comments above as well).

At Devon Downs (on the lower Murray River, South Australia), Smith (1982: 114–15) argued for a decrease ‘in intensity of site use’ or a ‘decline in use of the shelter’, as well as for a ‘change in site function’ after 2000 BP. He (1982: 114) based this on the ‘marked decline in quantity of occupational debris and the utilisation of proportionately more shellfish in units 1 and 2’. Smith suggested:

The absence of a marked decrease in the amounts of stone and bone in the upper levels of Fromms Landing No. 2 suggests that the decrease noted at Devon Downs shelter is the result of local factors. (Smith 1982: 115)

This interpretation contrasts with Mulvaney’s (1960) earlier more general explanation (see below). The local factors suggested by Smith were migrations of the main river channel, which changed the suitability of the shelter as a campsite. He suggested the function of the site therefore changed:

… the consumption of more shellfish and the use of less stone on-site are consistent with more ephemeral use of the shelter as a ‘dinner-time’ camp by people exploiting the resources available in the nearby river. (Smith 1982: 115)

In this interpretation of the decreased artefact accumulation rates, Smith provided a more complex set of reasons, in which decreased intensity of site use was associated with changes in the local environment as well as subsistence patterns (i.e., behavioural change).

**Behavioural change**

Explanations for decreases in the archaeological record involving behavioural changes relate to changes in:

1. qualitative aspects of the artefact assemblages — artefact types and raw materials;
2. subsistence strategies, methods and/or technologies; and,
3. intra-site discard patterns.
Qualitative changes in artefact assemblages

Qualitative aspects of the artefact assemblages include the types of implements made as well as the types of raw materials used in making items of material culture, and the explanations incorporate changes in both raw materials and subsistence methods/technology.

Several researchers proposed that decreased artefact accumulation rates in the upper levels of sites were due to a change in the raw materials being used, but the change was not simply from one type of stone material to another; it was a change from stone to another type of raw material. Mulvaney (1960: 74) and Ross (1985: 83) proposed that a change from stone (a durable material) to organic materials (e.g., bone, shell or wood, which have not survived) would leave a record which suggests that there was a decrease in the implements/artefacts manufactured. In his explanation for the sequences at Devon Downs and Fromms Landing 2, Mulvaney (1960: 74–5) suggested that organic materials replaced stone. He suggested that a switch to a greater use of wood, reeds and fibre in manufacturing artefacts (as described in the objects used at contact) was part of adapting to a riverine environment and may have been the reason for the decline in stone- and bone-working and deterioration of stone-working in the upper levels at these sites. He (1975: 243, 1969: 91–2) later adopted a more universal explanation which related to south-eastern Australia generally: ‘a move towards the use of local organic raw materials and a decline in both the quality and quantity of stone utilisation’.

Schrire (1972: 664–6) pointed out that in the upper level at Borngolo (Arnhem Land) there was an abrupt drop in the density of stone and bone tools, but that it was not associated with a decline in the overall density of faunal debris. She (1972: 665–6) interpreted this as foraging continuing, and explained that the decline in stone tools ‘may have resulted from the introduction of iron, for use as spear tips and knives’, which was introduced by Macassan traders. No iron was discovered in the upper levels of Borngolo, but Schrire explained its absence by saying it was probably a rare and valuable commodity that was seldom discarded or mislaid.

Changes in subsistence strategies/technology

In Morwood’s (1986) explanation for decreased artefact accumulation rates at Gatton, qualitative changes in the artefact assemblages (i.e., disappearance of backed artefacts) were seen to be associated with changes in subsistence behaviour. At Gatton, faunal remains, charcoal and sediment deposition did not decrease at the same time as the number of stone artefacts decreased about 1000 BP (Morwood 1986: 117). Morwood said the decreases in stone artefact deposition rates and the disappearance of backed artefacts and barbs, if taken in isolation, suggest a late decrease in the activity range and occupational intensity. However, he argued that the increased rates of faunal, charcoal and sediment deposition in the upper levels indicate the site was being used more intensively, while late increases in faunal diversity show a broadening of the resource base. He (1986: 117) concluded that ‘If changes in the artefactual and faunal sequences are functionally related, then general changes in the technology of predation are indicated’. Morwood suggested there was a change in emphasis from ‘individual pursuit strategies … in which both spears and macropods featured prominently to use of both individual pursuit and co-operative hunting strategies using nets’.

Morwood’s explanation contrasts with that of Smith (1982: 114), who also associated the ‘decline in occupational debris in the upper levels’ at Devon Downs with a change in subsistence. Smith believed that change in ‘the type of food consumed’ on site after 2000 BP (from mammals to shellfish, i.e., food in smaller packages), appears to reflect a significantly different use of the shelter after 2000 BP. For Devon Downs, Smith (1982: 114) concluded that, although the decrease in occupational debris in the upper levels was associated with a change
in the type of food consumed, there was also a change in the occupational intensity of the site (see previous discussion under Decreased Intensity of Site Use).

**Changes in intra-site discard behaviour**

It has been proposed that changes in the location of discard within a site may have produced apparent decreases in artefact accumulation rates (Johnson 1979; Smith 1982: 114; Hiscock 1984: 134). For Capertee 3, Johnson (1979: 94–5) said, ‘The presence of a relatively sterile zone between the last major Capertian horizon and the succeeding Bondaian occupation does not necessarily imply any out-of-the-ordinary abandonment of the area’ (see above sections), but it may ‘reflect shifting patterns of site usage, so that any one part of the shelter was only used sporadically as a dumping or knapping zone’; that is, the locations of discard changed at the intra-site level (i.e., Bailey’s [1983d: 127] functional change).

**Discussion**

Many interpretations and explanations proposed in the 1970s and 1980s for changes over time in the number of sites inhabited and the number of artefacts accumulated in individual sites centred on population increase, or population increase associated with intensification and increasing social and political complexity. There was, however, an increasing awareness that factors other than demography accounted for or were involved in these quantitative changes in the archaeological record.

In the studies reviewed above, increases in populations were often seen as part of a general continent-wide event, but the redistribution of people from one environmental zone to another (without necessarily involving general population increase) was also given as an explanation for an increase in either the number of sites or the amount of material at individual sites in a particular zone. Changes in the amount of material in individual sites (often referred to as changes in the ‘intensity of site use’) were also interpreted as reflecting smaller-scale changes within the same environmental zone; for example, a change from the use of one habitation type to another (rockshelter to open), or from one site to another of the same type, although it was often not explicitly stated. More ‘intensive’ use of a region by similar numbers of people was proposed also as an explanation for increased numbers of sites and greater amounts of material in individual sites, as well as an expansion into the ‘eastern highlands’ associated with increased ceremonial activities.

Other interpretations and/or explanations for increasing archaeological evidence included changes in the typology, technology or raw materials in the stone artefact assemblages (which I refer to as qualitative changes), changes in hunting and gathering techniques/methods/strategies (including mobility), as well as environmental, geomorphological and other site formation processes. Climatic or environmental changes were frequently seen as contributing factors for a significant or dramatic increase in the number of sites at a particular time, though some researchers gave these changes a determining role. Climatic and/or environmental changes were seen as agents in arguments for general population increase (where they were seen as influential or contributing factors), redistribution of populations from one zone to another (where they played a more ‘determining’ role) and changes in the preference for one habitation type over another. Many researchers proposed that a combination of factors may have led to the present archaeological record. The population-change advocates usually include environmental and behavioural factors in their models, with variations between their models occurring because of the prominence given to different factors.
Decreases in site numbers and artefacts were less often acknowledged. Part of the reason for this may be the scale at which people viewed the archaeological record; that is, they were looking for differences between the pre-5000 and post-5000-year period or the pre-4000 and post-4000-year period (e.g., Bowdler 1981; Ross 1985). Such broad divisions are unable to reveal a decrease that occurred in the last 1000 or 2000 years BP. Most interpretations and explanations for ‘decreases’ were similar to those given for ‘increases’, although Stockton and Holland (1974: 46, 48, 55, 60) also suggested a changing preference for open campsites (bark huts) rather than rockshelters, ‘social factors as yet unknown’ and ‘epidemic and cultural upheaval’. Morwood (1987: 343) proposed ‘increased status differences and restrictions on access to knowledge and specific localities’ and Mulvaney (1960, 1969, 1975) and Schrire (1972) suggested changes from one raw material (stone) to another which has not been preserved (organic) or one which was not left behind (iron). The presence of organic materials (shell or bone artefacts and food refuse) which survive in the upper levels of many sites has allowed more complex and/or plausible behavioural explanations to be proposed for decreases in stone artefacts in the late-Holocene (e.g., Mulvaney 1960, 1975; Smith 1982; Schrire 1972; Morwood 1986, 1987), than for low artefact numbers and accumulation rates in early-Holocene and late-Pleistocene levels. Most of the alternative explanations for population increase or ‘increasing intensity of site use’ were given as brief, relatively general statements which were not investigated in any detail.

Although the idea of population increase appears to have acquired prominence in the literature in the 1980s, the concept of population decrease, albeit usually regional, was not missing in earlier work; for example, Stockton and Holland (1974) in eastern Australia, and Hallam (1977) and Ferguson (1985) for other parts of Australia. The explanations put forward by Stockton and Holland (1974: 55, 60) for the excavated sequences in the NSW Blue Mountains included suggestions that there was an early-Holocene hiatus or population decline between ca 6000 BP and ca 3500 BP, a middle Bondaiian peak in occupation between ca 3500 BP and ca 1000 BP, and that, after ca 1000 BP, there was a decline in the population of the Blue Mountains. Stockton and Holland interpreted their evidence as shifts in population from one area to another. Hiscock (1986: 47) said that while the decline in artefact accumulation rates could be interpreted as either a reversal of intensification or a decrease in population, it need not imply any devolution — it may simply reflect changes in nature and structure of settlement, technology or resource use. In most studies advocating population increase, the evidence was an increasing number of habitations established and/or used. In contrast, apart from Hiscock (1986), studies including population decrease based their interpretations on a decrease in the number of artefacts or in the artefact accumulation rates at sites.

In studies where continuing population increase was claimed, a long-term increase was usually implied — slow at first but with a more dramatic rate of increase in the mid- or late-Holocene; the population size at contact was assumed to be the maximum reached throughout the history of Aboriginal occupation of Australia (Lourandos 1980a: 245, 1985b; Morwood 1984; Ross 1984: 202–6; Beaton 1985: 16). Some (e.g., Birdsell 1977: 149; Ross 1985: 81) accepted that short-term fluctuations occurred, although they did not indicate the length of the period over which they assumed a short-term decrease would have extended. Beaton (1985: 17) acknowledged that population changes in Australia may have been different at different times in different places, but he (1983: 96) argued that something on a continental scale happened in the mid-Holocene. He claimed a simple population increase model would adequately account for all the archaeological expressions (increase in number of sites, increased use of some sites, increased use of marginal environments, and an apparent increase in communication) without reference to social transformations or restructured economies. He stated:
If the gross volume and overall distribution of archaeological remains even roughly reflects the numbers and distribution of people then what we already know about the abundance of mid-to late-Holocene archaeological sites should be sufficient justification for us to hypothesise that the Australian population had its significant growth period beginning about 4000 or 5000 years ago. (Beaton 1983: 96)

Beaton’s model for population increase contrasts with some of the models, such as Birdsell’s (1957, 1977), which had the ‘ceiling’ being reached early in prehistory (ca 2000 years [1957] or ca 5000 years [1977] after colonisation) and then population size remaining stable for the greater part of Aboriginal occupation (see discussions in Lourandos 1980a: 256; Beaton 1983, 1985; Ross 1984: 202–7). Beaton’s (1983: 96) conclusion that ‘the Australian population had its significant growth period beginning about 4000 or 5000 years ago’ could be right, but is too simplistic.

The 1970s and 1980s studies document both decreases and increases in artefact accumulation rates, habitation establishment rates, and the numbers of habitations used in the late-Pleistocene, early-Holocene and late-Holocene archaeological records of many regions, although they were documented more often for the latter half of the Holocene. If one assumes these quantitative changes in the archaeological record by themselves indicate variations in population size, then the evidence suggests that population levels in some regions may have altered quite significantly before 5000 BP as well as after 5000 BP, and that changes in both periods included population decreases as well as increases. The assertions of continuously increasing population sizes in some regions in the late-Holocene are not sustainable, and whether postulated redistributions in local and regional populations had any relationship to overall continental trends cannot be determined. Equally, if one assumes that the quantitative changes are indicative of changes in different behaviours, then the demographic trends of pre-colonial Australia are still open to debate, and the reasons for the increases and decreases in numbers of sites and artefacts require further investigation.

The foregoing studies were the context in which the archeological material from the Upper Mangrove Creek catchment was analysed. In the past decade or so, many regional studies have built on concepts introduced in the 1970s and 1980s — particularly those relating to technological systems, the reorganisation of subsistence strategies including mobility patterns, and the restructuring of social relations. These recent studies are incorporated into discussions in the final chapters.