NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

NEW ZEALAND JOURNAL OF ARCHAEOLOGY

A Review of Economic Patterns During the Archaic Phase in Southern New Zealand

Atholl Anderson

Anthropology Department, University of Otago

ABSTRACT

The economic adaptations of the early Maori (Archaic phase) to southern New Zealand, a region beyond the limits of horticulture, are poorly documented and understood. As a step towards elucidating these, the evidence of faunal and artefactual remains is reviewed, some broad patterns defined, and explanations attempted. A semi-quantitative analysis indicates that there were two broad subsistence foci, one upon inland resources which is represented by specialised moa hunting sites, and one upon coastal resources which is represented by multi-function, restricted-function, and specialised sites. The relationship between the foci was probably one of systematic mobility. Chronologically, the large moa hunting and multi-function sites seem to have been occupied during the early Archaic phase and were mainly concerned with big game hunting. By the later Archaic phase, when fish and small game were predominant, there were mainly restricted-function sites along the coast and small moa hunting camps throughout the interior. The explanation of this economic transformation, which has generally been cast in terms of over-exploitation of the larger game, may need to consider, as well, social and territorial factors of adaptation. Attempting this will require further study of the material culture.

Keywords: ARCHAIC PHASE, SOUTHERN NEW ZEALAND, SUBSISTENCE ECONOMIES, COASTAL FOCUS, INTERIOR FOCUS.

INTRODUCTION

Southern New Zealand is that part of the South Island lying to the south of Banks Peninsula (44°S), along with Stewart Island (Fig. 1). Field archaeology, of a rudimentary kind, began in this region with fossicking at Awamoa by Walter Mantell in 1848 (McDonnell 1888), but the more significant beginning lay in later excavations by Julius von Haast (1871) and his contemporaries in Canterbury. Unlike Mantell, who exhibited an anthropological interest in the past, if only, at Awamoa, in a somewhat jocular vein, Haast regarded sites from an almost palaeontological point of view; as "beds" which could produce osteological and cultural fossils in support of various propositions about the antiquity of settlement, the association of man and moa, and the elucidation of stages in a cultural sequence.

Haast's influence upon the subsequent course of southern archaeology was a profound one. For nearly a century, to the extent that excavation had an investigative purpose, it was propelled by the issues he raised. Anthropological questions, such as how the pre-European southern Maori managed their economic and social affairs, were scarcely broached, and none were specifically investigated until the 1960s when seasonality was considered by Charles Higham (1968) and the territorial implications of implement similarity by Foss Leach (1969a).

The new leads which such research opened have not yet been explored to the point that there is more than conjectural value in devising comprehensive hypotheses about the structure and dynamics of prehistoric social and economic systems in southern New Zealand. A great deal of the potentially relevant evidence was lost during the depressingly long period over which archaeological field techniques and criteria for the recovery of remains stagnated at, and often fell below, the standards of the 1870s (Leach 1972), and even the data collected during the last 15 years are

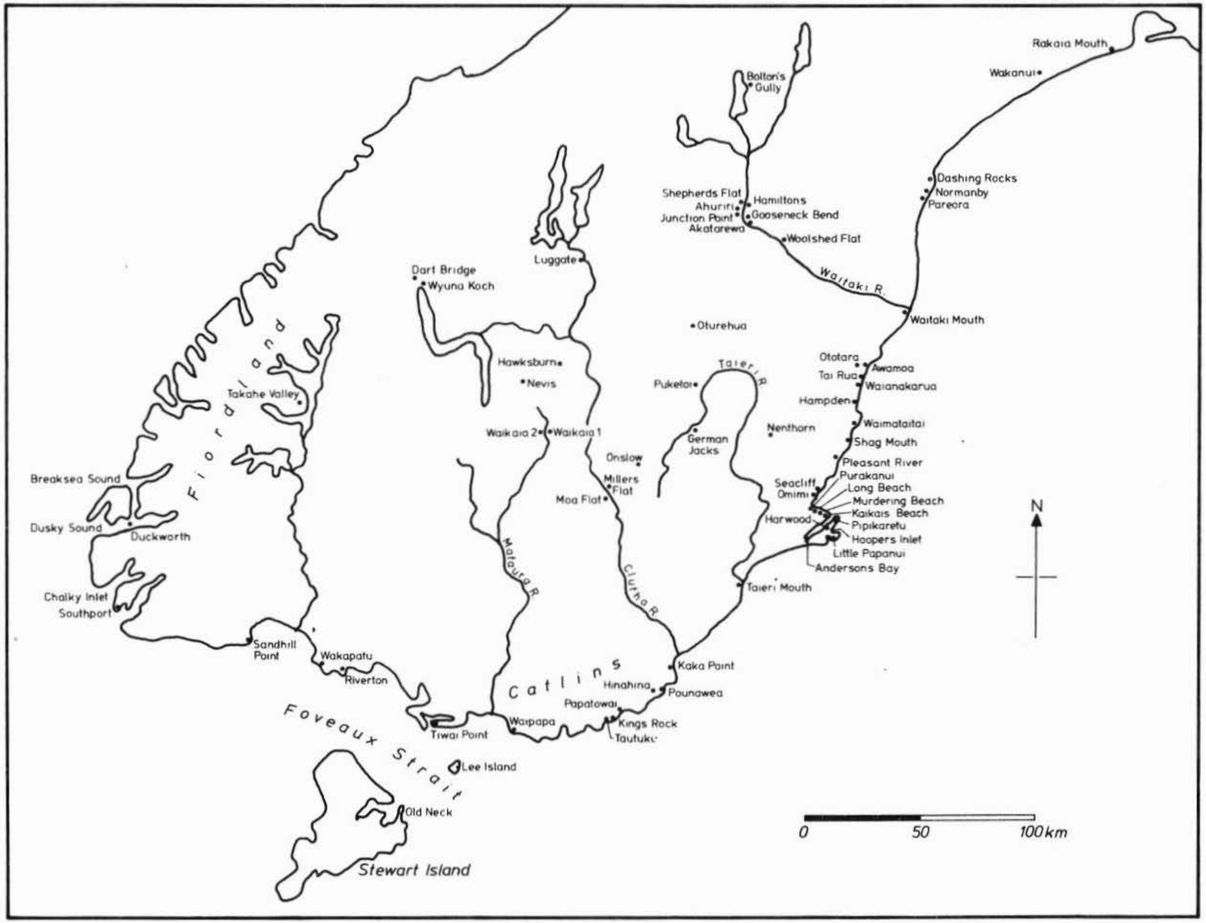

Figure 1: Southern New Zealand showing the sites and features mentioned in the text.

not without problems, such as the uncertainties of radiocarbon dating, a scarcity of seasonal evidence, and extremely small sample sizes.[1]

This paper is not, therefore, an attempt to reconstruct the nature of prehistoric economic systems in southern New Zealand. Rather, it is a review of how the evidence which has accumulated over the years, and especially that of recent years, might be ordered in terms of subsistence and settlement patterns, and a consideration of where the evidence falls short of what will be needed to embark upon the more ambitious task. It is confined to the "Archaic Phase", which is here broadly defined by either, or both, evidence of moa hunting or the distinctive artefacts of this assemblage (Golson 1959). Given the wide chronological range those encompass in southern New Zealand, it is tempting to refer this material to a unit entitled something like "The Pioneer Phase", on the one hand to mark the retention of ancestral east Polynesian artefactual traits and the exploitation of a fauna most abundantly available to the earliest settlers, and on the other to express the view that these features are not necessarily early in the absolute sense but typical of an early adaptational phase in each district. However, until our schemes of cultural typology are thoroughly re-worked, it is probably best to retain the term "Archaic Phase" in the expectation that most archaeologists will understand what is intended by it.

CHRONOLOGY

The chronology of the southern Archaic is at present in a state of some confusion because radiocarbon dating in this region sometimes produces estimates up to 300 years apart for similar layers depending upon the material processed (Trotter 1968, McCulloch and Trotter 1975). The result is that we have a long, charcoal-based chronology and a shorter one obtained on collagen and marine shell (Fig. 2). To what extent this discrepancy is a real one is unknown since few sites have been carefully dated by a range of materials and many of the earlier dates were obtained on charcoal from wood of unknown age. Looking at the estimates as a whole, however, two points stand out. First, since most of the recently obtained charcoal dates, for example, those from Papatowai (Hamel 1978), Pounawea (Hamel 1980) and Long Beach (Hamel and Leach 1979) and some of the earlier dates, such as those from Oturehua (Leach 1969b) were certainly obtained on material of short lifespan, there are no convincing grounds for rejecting a chronology which extends to 800-900 years B.P., unless some more intractable problems of charcoal dating (McCulloch and Trotter 1975:8) can be proven to exist. Secondly, if there is a materials-dependent difference, then it is not a uniform one, since there are some cases where the same result has been obtained on different materials (e.g. Waimataitai), and the later dates for Archaic occupation as a whole cluster at about 400-500 B.P. on either chronology.

Given that the charcoal dates are thus acceptable the Archaic phase extends from about A.D. 950 to about A.D. 1500 along the coast and in the eastern interior. Further west, there is an eighteenth century date associated with moa hunting (Duff 1952, 1977).

ENVIRONMENT

Southern New Zealand is, by oceanic standards, an immense area (100,000 km^2) and it is one which is unusually variable in its environment and resource availability. Along the coasts the climate is of a cool maritime type with mean annual temperatures of 10 °C, but whereas mean annual rainfall is about 800 mm in the east and south, it reaches 6000 mm in the west. In the interior it may be as low as

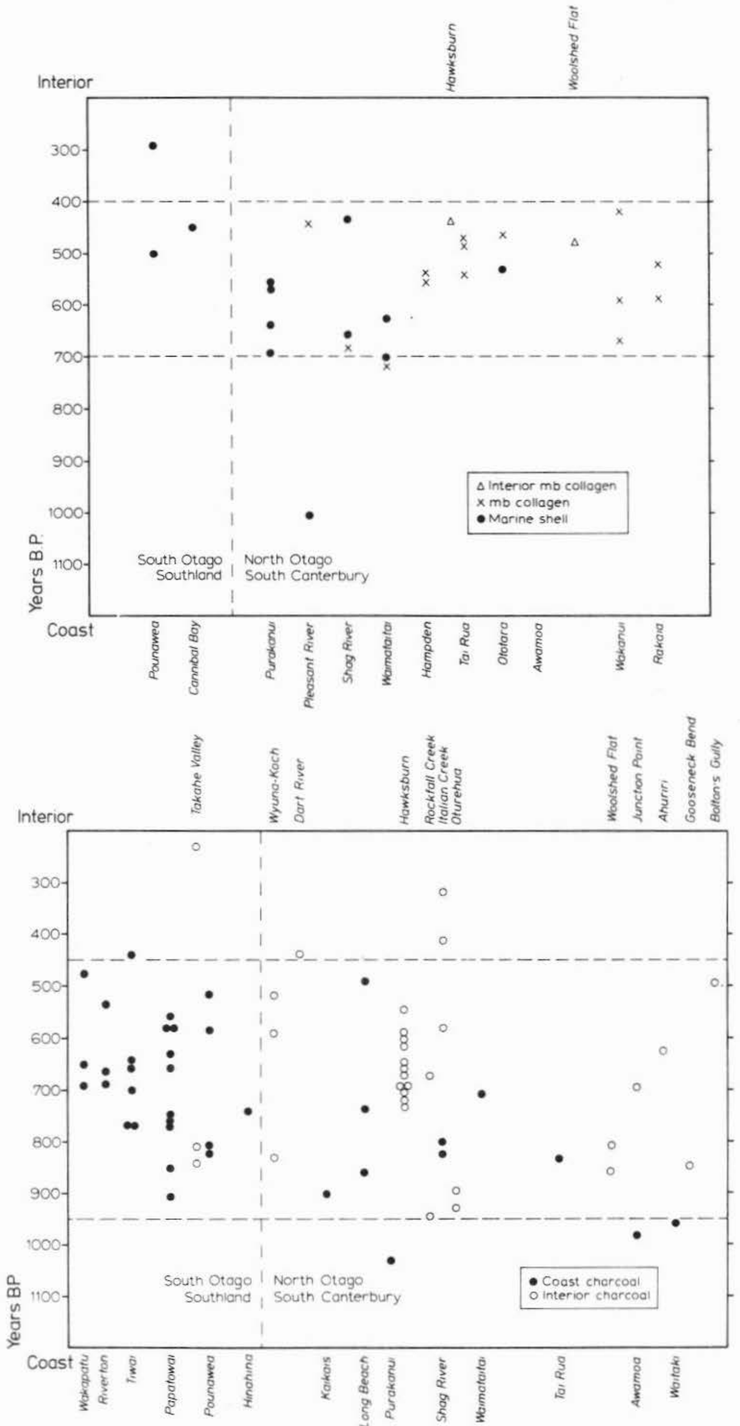

Figure 2: **Radiocarbon dates for southern Archaic sites: collagen and shell dates (top), charcoal dates (bottom).**

250 mm and there are sharp seasonal temperature differences indicative of a continental climatic regime.

At A.D. 1000 forest cover was complete from sea to timberline on the west coast. In the south and along the eastern coast up to North Otago there was abundant podocarp/mixed broadleaf forest interspersed, especially north of Otago Peninsula, with small patches of shrubland and tussock (Davies 1980). In the arid interior and probably on the drier interfluves of the Canterbury plains, the landscape presented a mosaic of open grasslands, shrublands and forest. Just how extensive forest was in these latter areas at the end of the first millennium is not precisely known. There was abundant forest on the Canterbury downlands, but Central Otago seems to have been substantially open ground well before the arrival of the first people (Anderson n.d.a.). Some data from the latter area indicate the existence of a narrow and probably discontinuous band of totara/beech forest between 700-1100 m a.s.l. on the mountain slopes of the central interior (Burrell 1965, Wells 1972). Westward, at the large lakes, a closed forest cover of beech began and stretched both west into the main divide and northward along the eastern ranges of the Canterbury high country (Molloy 1969).

Since southern New Zealand is almost equally distributed about the 45th parallel, it exhibits a mixed range of fauna typical of temperate regions. In the ocean, warm coastal water, in part of Australian origin, flows northward inshore, but it is replaced offshore by cool subantarctic water which reaches up to the Subtropical Convergence Zone lying east of central New Zealand (Knox 1975). The subantarctic influence brings a marked southern element to the maritime fauna. Amongst important species are the fur seal, which breeds as far north as Otago Peninsula today and once did so much further north (Smith 1978), the elephant and leopard seals and the sea lion, various albatrosses and penguins, some of which breed on the mainland, and a wide variety and large populations of petrels and shearwaters, many of which also breed in southern New Zealand.

Although gannets, kahawai and, on the west coast, albacore and skipjack tuna reach southern waters, fauna more typical of northern New Zealand and the south Pacific are mainly terrestrial. Important Maori subsistence species include the pigeon, parakeets and the ratites. Other notable resources, which are found throughout New Zealand, included barracouta, eels, lamprey, rails, and ducks.

Almost as pertinent as what was available in southern New Zealand is what was not, and this is especially true of the potential plant foods. Of the *ti*, only one species *(Cordyline australis)* reached the south and the karaka, nikau palm, tawa and titoki trees were also missing south of Banks Peninsula. Compounding this relative poverty was the fact that introduced cultigens were unable to be grown in southern New Zealand. Kumara was cultivated as far south as Banks Peninsula in the 19th century and there is sufficient archaeological and traditional evidence to verify its existence in the northern South Island during the later prehistoric period (Law 1969). For the early period there are several indications of horticulture along the east coast as far south as the Kaikoura district (Trotter and McCulloch 1979, McFadgen 1980), but nothing beyond there. Even in the early cave sites on Banks Peninsula there is no evidence of cultigens or cultivation implements amongst the fibrous and wooden materials recovered.

Southern New Zealand, at the arrival of Polynesians, was thus a land for hunting, fishing and gathering, more or less in that order. The high primary productivity of the southern ocean, which is almost five times as high as that in northern New Zealand (Brodie 1973), promoted maritime fauna to the top of the resource array, but they were closely followed by the moa which, judging by the evidence of their exploitation, probably had their main province and highest densities in the eastern South Island.

SUBSISTENCE ACTIVITIES

Elucidating the nature of Archaic subsistence is clearly dependent upon the validity of assumptions about the representativeness of the archaeological evidence. While the availability of cultigens can be discounted, except to the degree that they may have arrived as articles of exchange, the same is not the case for other vegetable foods. *Ti* was an important part of the early protohistoric diet, both as immediately collected food and in its preserved form *(kauru)*. There are, particularly from Otago Peninsula to the north and through the interior, numerous structures believed to have been *ti* cooking pits (Knight 1966). Very few of them have been excavated and none dated. Nor do we know which, if any, surviving implements were associated with this activity. A similar problem exists in the case of fern root, another widely important article of historical Maori diets, although perhaps less prominent than *ti* in southern New Zealand. Stone implements of the form of fern root beaters have been found at Shag Mouth (Skinner 1924a) and wooden examples of them are known from certain of the Banks Peninsula Archaic sites (Skinner 1924b); but it is doubtful whether their general rarity can be translated into conclusions about the value of fern root to the Archaic diet. Generally missing, both from early and late archaeological evidence as well, are the bones of a wide variety of small inshore and freshwater fish (particularly flounders, eels and lamprey), and the remains of berries.

It may be unduly pessimistic, however, to put all these lacunae down to problems of survival or analysis. The comparison of Archaic with protohistoric subsistence patterns does need to take into account the fact that important Archaic resources are equally absent or rare in later times. Moa and other extinct birds are missing, of course, and seals, despite their apparent abundance in the 18th century, do not seem to have been exploited to the same extent as earlier. In other words, it may be reasonable to assume that an Archaic focus upon these big game was accompanied by a comparatively low emphasis upon alternative resources and that the ethnographic analogy is not therefore an entirely fair one.

TYPES AND DISTRIBUTION OF SUBSISTENCE ACTIVITIES

Marine shellfish are common in southern New Zealand sites, and in those areas where soft shore species could be readily obtained there are dense Archaic shell middens. These are not common, but they certainly exist at Pounawea, Papatowai, and Purakanui and are probably of this phase at Shag Mouth and Hinahina (Lockerbie 1959). Freshwater molluscs, of which only *Hyridella* sp. are significant, were taken in small numbers, mainly on inland sites. Dogs, presumably from domestic populations (although feral dogs were found in the historic period, Anderson 1981a), were more important along the coast, and they are especially prominent amongst the fauna from Pounawea (Hamel 1980), Purakanui (Anderson 1981b), Pleasant River (Teal 1975) and Tai Rua (Trotter 1979).

Overall, however, the main resources represented in the middens were derived from fishing, small fowling, moa hunting and sealing.

Fishing: Quantitative faunal data exist for the sites of Omimi (Hamel 1977b), Purakanui (Anderson 1981b), Long Beach (Fyfe pers. comm.), Pounawea (Hamel 1980), Lee Island (Coutts and Jurisich 1972), Riverton (Leach and Leach 1980), Wakapatu (Higham 1968) and the prehistoric sites or layers, many of which are possibly of Archaic age, at Sandhill Point, Chalky Inlet, Dusky Sound and Breaksea Sound

(Coutts 1972, 1975). Judging largely from these, the main species caught along the coast of Otago as far south as the Catlins were barracouta, red cod and ling, in that order. In Foveaux Strait Archaic sites, red cod and ling become comparatively rare and barracouta remains are less common than those of blue cod and *Pseudolabrus* sp. In the western sounds barracouta is found in any numbers only at post-contact levels and blue cod and *Pseudolabrus* are the main species, followed by sea perch and tarakihi (Coutts 1975). The fishing gear follows a similar pattern with bait and trolling hooks both prominent in Otago assemblages, but the latter rare, except at post-contact levels, in the Fiordland sites. Of the bait hooks, one-piece types are much more common in the Otago assemblages than they are on the south and west coasts, and of the trolling hooks, only the barracouta type has been found in southern Archaic sites west of Tiwai Point (with the curious exception of the minnow lure shank at Dart Bridge, Anderson and Ritchie 1981). The faunal differences probably reflect environmental constraints more than anything else. In the west and south the open coasts are very exposed so that offshore bait and lure fishing would have been a more hazardous pursuit than along the east coast. In the west, in fact, there is little evidence of offshore fishing at all; both the species and the gear reflect activities within the comparatively sheltered waters of the sounds (Coutts 1975). The prominence of blue cod and *Pseudolabrus* sp. there and along Foveaux Strait suggest that fishing was mainly conducted from the shore and this inshore emphasis is also reflected in the greater abundance of crayfish and sea eggs in the Fiordland sites. Both are absent or very rare in the south and east coast middens.

Regarded overall, one of the most striking features of the fishing patterns is the scarcity of evidence of the netting-trapping complex which is so prominent historically in northern New Zealand and elsewhere in Polynesia. Leaving aside sinkers, which might have been employed in either hook or net fishing, direct evidence of netting is confined to a few fragments of nets and floats in the Fiordland rockshelters (Coutts 1975). Indirectly, it is worth noting the widespread absence of butterfish and moki, which are common around the southern New Zealand coast and are normally taken in set nets, as well as the rarity of the main estuarine netting species of flounder and mullet. Conger eel and crayfish, frequently taken in pots, are equally rare or absent. The apparent rarity of netting may be put down to a variety of factors: the few and small estuaries in southern New Zealand, the scarcity of the abundant northern harbour species of snapper, shark and grey mullet, the unreliability of weather and sea conditions, and perhaps the ease with which other fish could be obtained by hook and line.

Small Fowling: There are useful data regarding small fowling from ten Archaic coastal sites between Wakapatu and Ototara. From eight of these where minimum numbers are reported, plus Ototara where they can be calculated from Trotter's diary (Trotter n.d.) and Tai Rua, where bone numbers were recorded (Trotter 1979), the broad patterns can be seen in Table 1.[2] Marine species (penguins, albatrosses, petrels, shearwaters and shags) are the most commonly represented throughout, followed by forest birds, amongst which pigeons and parakeets were more frequently taken than any others. Wetland species, mainly ducks, are more common in sites north of Otago Peninsula, but otherwise the variations are local rather than regional.

Immature individuals are generally rare amongst the small birds, with the notable exception of Tiwai Point, where specialised muttonbirding is apparent (Sutton and Marshall 1980). This suggests that in most places small fowling was an opportunistic pursuit rather than an organised assault upon the breeding colonies, at least in the case of the marine birds. In the case of forest birds, the barbed bird spear, which is

TABLE 1
OCCURRENCE OF SMALL FOWL IN ARCHAIC SITES

Site*	Marine %	Forest/ Forest Edge %	Wetlands %	Common Species
Ototara	20	30	50	Brown Teal, Duck, Shoveller
Tai Rua	83	6	11	Mollymawk, Little Blue Penguin, Shag
Pleasant River	43	23	33	Ducks, Penguins
Omimi	63	25	12	Little Blue Penguin, Pigeon
Purakanui	72	26	2	Spotted Shag, Mollymawk, Weka
Pounawea	47	46	6	Pigeon, Spotted Shag, Parakeet
Papatowai (TT1)	71	21	7	Fiordland and Rockhopper Penguins
Tiwai Point	69	24	7	Sooty Shearwater, Parakeet
Riverton	59	33	7	Little Blue Penguin, Pigeon
Wakapatu	20	80	0	Parakeet, Storm Petrel

*All Archaic layers combined

thought to have been one of the principal implements employed, has been reported from various southern Archaic sites, but its distribution does not seem to be clearly correlated with forested districts. It was found at Normanby (Griffiths 1941), Ototara (Trotter 1965) and Shag Mouth and was unusually common in the lower layers at Little Papanui (Simmons 1967). South and west of Otago Peninsula, however, it has been seldom recovered, although it occurred in an Archaic context at Taieri Mouth (Teviotdale 1932) and in the Catlins in late or post-Archaic levels (Lockerbie 1959).[3]

Moa hunting: Moa hunting was certainly one of the principal activities of Archaic subsistence and, at all events, the most widespread. Just how important it was is difficult to determine because so many of the key sites were badly damaged by early fossicking and poorly recorded excavations. Pictures of the early work in the Catlins show numerous moa bones stacked up, as Leach (1972) has commented, like firewood, on the edges of the holes. At each of Shag Mouth (Haast 1874, Teviotdale 1924), Waitaki Mouth (Teviotdale 1939) and Rakaia Mouth (Haast 1871, Trotter 1972), the early investigators believed that hundreds of moa had been butchered. Moa bone was also conspicuously abundant in the large inland sites they discovered at Puketoi (Murison 1871) and Hawksburn (Lockerbie 1959). In short, all the main sites of the southern New Zealand Archaic, whatever their location, appear to have been characterised by faunal arrays in which moa were either the primary or, next to seals, the second most important object of the food quest.

The occurrence in sites of the eight kinds of moa available to southern hunters (taxonomy after Hamel 1977a) is shown in Table 2. The commonest taken was *Euryapteryx gravis*, followed by *Emeus crassus*. According to recent research by Smith (n.d.), these medium-sized moa had an adult live weight of 50-60 kg, providing some 35 kg of meat per average individual. *Pachyornis elephantopus*, a much more heavily built species, provided about double that and the smaller moa *(Anomalopteryx* and *Megalapteryx* sp.) about one-third of it. The largest moa were of the *Dinornis* genus and they ranged from 125 kg live weight up to the huge *D. maximus* at about 230 kg.

There is little in either natural or cultural bone assemblages to suggest that some species preferred different habitats to others (Hamel 1977a), although *Pachyornis*

TABLE 2
MOA SPECIES IN ARCHAIC SITES

ARCHAIC SITES / MOA SPECIES	*Dinornis maximus*	*Dinornis robustus*	*Dinornis torosus*	*Pachyornis elephantopus*	*Euryapteryx gravis*	*Emeus crassus*	*Emeus huttoni*	*Anomalopteryx*	*Megalapteryx*
Coast									
Duckworth (Dusky Sound)					x				
Old Neck (Stewart Island)					x				
Tiwai Point					x	x			
Waipapa						x	x		
Tautuku		x	x		x				
King's Rock		x			x				
Papatowai	x	x	x	x	x	x	x	x	x
Hinahina						x			
Pounawea	x			x	x	x	x	x	x
Kaka Point					x	x			
Taieri Mouth	x								
Anderson's Bay	x				x				
Hooper's Inlet					x	x	x		
Little Papanui	x	x		x	x	x	x		
Papanui Inlet	x			x				x	
Harwood				x	x	x	x	x	
Pipikaretu							x		
Kaikai's Beach					x				
Murdering Beach						x			
Long Beach						x			
Purakanui	x					x			
Omimi						x	x	x	
Seacliff	x		x		x	x	x	x	x
Pleasant River				x	x	x			
Shag Mouth		x	x	x	x	x		x	
Waimataitai				x	x	x			
Hampden					x				
Tai Rua				x	x				
Awamoa	x		x	x		x			
Ototara					x				
Waitaki Mouth		x	x	x	x	x	x	x	
Wakanui					x	x			
Rakaia Mouth				x	x	x		x	
Inland									
Takahe Valley									x
Luggate	x			x					
Hawksburn		x	x	x	x	x	x	x	x
Puketoi	x	x							x
Woolshed Flat				x	x				x
Gooseneck Bend				x					x
Ahuriri									x

Data from: Ambrose (1970), Anderson (n.d.a.), Davies (1980), Hamel (1977a, 1977b, 1980). Scarlett (1979, pers. comm.), Sutton and Marshall (1980).

elephantopus and *Megalapteryx* do appear to have been more commonly found in the interior and *Emeus crassus* along the coast (Table 2). The niche differentiation of the various species, their feeding and breeding habits and their mobility are all matters for which information is very hard to find. Some evidence from the North Island suggests that breeding rates were low — perhaps only one egg per clutch for *Anomalopteryx* sp. (Falla 1962) — and comparatively small clutch sizes are general amongst extant Australasian ratites (Hamel 1979). Various investigations of crop contents (Burrows 1980, Burrows *et al.* 1981), and of the divaricating habits of New Zealand shrubs (Greenwood and Atkinson 1977), point to a preferred habitat along forest fringes and in shrubland country where there was access to the leaves and berries of forest litter. Although some seasonal movements are likely, it is doubtful whether moa moved far in the course of a lifetime (Scarlett pers. comm.).

How they were hunted is a mystery. None of the butchery sites are found near obvious "jump site" localities and neither corralling nor the use of trapping pits, with one speculative exception (Skinner 1934), can be envisaged in southern New Zealand. Traditional evidence refers to ambush along moa trails and to the use of snares, and although all these accounts are from late in the protohistoric period (summarised in Duff 1956), they express two of the more likely techniques. Other means might have included the use of hunting dogs (Anderson 1981a), and perhaps driving into cul de sac situations at river mouths. In the case of the latter, however, it is quite as probable that these locations reflect no more than their advantages for canoe landings and fishing. It might also be noted that ratites generally are competent at swimming. A good deal of light would be thrown on the matter if moa hunting implements could be recognised amongst Archaic assemblages. At one time, Skinner (1924a) thought some of the large blades, particularly those with hafting modifications, might have been spear points, but he later changed his mind (Skinner and Teviotdale 1927), and, in any case, these are not common in the large butchery sites and are entirely missing from some of the smaller sites which, being rich in crop stones, are probably at or very close to kill locations (e.g. Waikaia 2).

In terms of processing on the other hand, the frequent occurrence of four of the Archaic artefacts in sites where moa bone is prominent suggests that they are closely associated with this resource. These are the large oven or *umu*; generally a pit 1-2 m in diameter packed with broken ovenstones, charcoal and bone fragments, the large blades which are usually of silcrete or porcellanite, and the "ulu" and "teshoa". The latter are of similar form, although the ulu was normally ground from slate and the teshoa struck from a greywacke cobble. The distribution of these two types is interesting in that the ulu is confined to inland sites and to coastal sites south of Normanby in southern New Zealand, whereas the teshoa is mainly found in Canterbury with but a few examples reaching as far south as Shag Mouth. They may, therefore, form a class of homologous implements in which the particular type is dependent upon the availability of materials or upon subregional technological traditions.

Sealing: The main seal available to southern Maori throughout the pre-European period was the locally-breeding New Zealand fur seal, followed, in the Archaic phase, by the sea lion and elephant seal. Archaic sealing was concentrated about the Catlins, although important sealing sites extend from Tiwai Point to Pleasant River (Table 3). To the west of Tiwai Point, there were virtually only fur seals taken, and in small numbers, and north of Pleasant River seals are much less common in the faunal spectra of the Archaic sites, except at the small site of Dashing Rocks (Mason and Wilkes 1963).

The distribution of seal remains probably reflects the availability of suitable stretches of coast for seals to haul out for breeding, in the south, and during their winter migration further north. Outside the main sealing area such places are confined to Fiordland and to a few headlands, of which Dashing Rocks is one, north of Shag Point. There are no known sealing weapons amongst the Archaic assemblages.

Although the harpoon may have been used against marine mammals at sea, historical information from New Zealand and the Chathams suggests that seals were generally clubbed on the shore. Wooden clubs were probably used in southern New Zealand since no stone clubs, except those which were probably root beaters, have been found in Archaic sites.

TABLE 3
OCCURRENCE OF SEALS IN SOUTHERN ARCHAIC SITES
(Minimum Numbers)

Site*	Fur Seal	Sea Lion	Elephant Seal	Leopard Seal	Total
Waitaki Mouth	1		1		2
Waianakarua	1				1
Pleasant River	5	3	6		14
Omimi				1	1
Purakanui	2		1		3
Long Beach (bottom)	2	1	2		5
Pounawea	11	6	3		20
Papatowai (TT1)	8	3	1	1	13
Tiwai Point	21	4	6		31
Lee Island	11	2			13
Riverton	2	4			6
Wakapatu	2				2
Sandhill Point 1 +	1				1
Southport 4 +	2				2
Southport 5 +	2	1			3
Southport 10 +	4	2			6
Long Island 1 +	1				1
Breaksea Sound 1 +	5				5
TOTAL	81	26	20	2	129

*All Archaic layers combined

+ Possible Archaic layers (Coutts 1972)

Data from Smith (pers. comm.)

TABLE 4
MOA:SEALS REPRESENTATION

Site*	Minimum Number Moa	Minimum Number Seals	Moa:Seals Ratio
Tai Rua	—	—	20:1[1]
Pleasant River	13	14	1:1
Omimi	5	1	5:1
Purakanui	2	3	1:1
Long Beach (bottom)	1	5	1:5
Pounawea	13	20	1:2
Papatowai (TT1)	10	13	1:1
Tiwai Point	11	31	1:3

*All Archaic layers combined

[1]Estimate by Trotter (1979)

In view of the "moa hunter" model of the Archaic, the relative abundance of seals to moa ought to be briefly considered here. Along the southern New Zealand coast there is a north-south gradient in their relative abundance in sites and it extends in both directions beyond the sites shown in Table 4. Thus, moa are uncommon in sites west of Tiwai Point and seals, Dashing Rocks aside, are rare in sites north of Tai Rua. Bearing in mind, however, that a medium-sized moa and an average fur seal would produce about the same amount of flesh, but an elephant seal up to 33 times as much (Smith pers. comm.), it can be concluded that coastal hunting as a whole was directed at least as strongly at seals as at moa.

COASTAL AND INTERIOR FOCI

The way in which these subsistence activities were combined into regional patterns cannot be explored without quantification of the data, but since it is impossible to estimate minimum numbers of either fauna or artefacts for more than a small fraction of the southern Archaic sites, a semi-quantitative approach has to be adopted. At the most simple level, and ignoring the biases inherent in data of such variable quality, some indication of regional differences may be obtained by examining the simple presence/absence of components. But the problem with this kind of comparison is that it reduces all evidence of frequency, however imprecisely expressed, to the same status; thus, for instance, evidence of one lure hook at Dart Bridge scores the same as evidence of hundreds of these at Little Papanui. Moreover, since even the least explicit of the site reports generally make some reference to the relative abundance of the main components, it would do less than justice to the evidence to ignore the quantity factor entirely. To a modest degree, it can be taken into account by distinguishing components regarded as common, in respect of any particular site, from those which were merely present. Since no numerical criteria can be advanced for this distinction, the attribution of "common" in Table 5, which shows the distribution of 42 components for 44 southern Archaic sites, reflects either statements to that effect in the site reports or my own estimate based on the overall frequency of any component and its occurrence relative to the size of the site in which it was found. Because this procedure has a strong subjective element, only the broad patterns of frequency distribution can be discussed with any confidence.

The most obvious is the distinction between coastal and inland sites. Table 5 shows that the whole maritime complex is almost entirely missing from the inland sites and that most other fauna and artefacts are less frequently represented in them as well. However, closer inspection of the data suggests that while the inland faunal and artefactual assemblages are much the same throughout, there is a noticeable difference between the coastal sites to the south of about Awamoa and those to the north. These two groups have been designated "Coastal A" (Wakapatu to Ototara) and "Coastal B" (Awamoa to Rakaia Mouth) in Table 6 where the weighted data (from Table 5) for the main components in them, and in the inland sites, have been summed and converted to percentages of the possible maximum score. As a whole, Coastal B sites have very little evidence of fishing gear, hook and adze manufacture, or hearths, and contain few remains of seals, fish, shellfish or small birds. In these respects they are similar to the inland sites and the similarity is continued through a high frequency of large *umu* and large blades as well as a predominance of moa remains. At least two of them, Waitaki Mouth and Rakaia Mouth, are also like the inland sites in the marked degree to which their moa bone has been burnt and fragmented (e.g. Anderson 1979). This phenomenon may be attributable to the extraction of fat from moa bone for flesh preservation; a need less pressing in coastal

TABLE 5
WEIGHTED DISTRIBUTION OF ARTEFACTUAL AND FAUNAL COMPONENTS IN ARCHAIC SITES

ARCHAIC SITES*	ARTEFACTS																					FAUNA																				
COMPONENTS	Harpoon	One-piece bait hook	Two-piece bait hook	Trolling lure	Sinker	Hook manufacture	Large blade	Ulu	Teshoa	Large umu	Bird spear	Type 1 adze	Type 4 adze	Adze manufacture	Nephrite	Scoop hearth	Stone hearth	Posthole	Reel	Pendant	Needle	Whales	Seals	Pelagic fish	Demersal fish	Inshore fish	Freshwater fish	Soft shore shellfish	Rocky shore shellfish	Penguins	Albatrosses/Mollymawks	Petrels/Shearwaters	Shags	Dog	Moa	Moa eggshell	Other extinct birds	Ducks	Rails	Pigeon	Parrots	Freshwater shellfish
Coast																																										
Wakapatu		1		1									1			1				1		1	1	2	2	2	1	1	2	1		1	1	1						2	2	
Riverton							2	1		1		2	2	2		1							1		1	1	1	1	2	2		2	1				1	1	1	2	1	
Tiwai Point			1	1		1				1		1	1	2		1		1	1	1			2	1	1			2	1	1	1	2	2	1	2		1	1	1	2	2	
Papatowai		2	1	1	1	2	1	1		1		1	1	1	1	1			1	1	1		2	2	1			2	1	2	1	1	1	2	2	2				1		
Pounawea		2	2	1		2	2	1				1	1	1		1		2	1	1			2	2	2	1		2	1	2	1	2	2	2	2	2	1	1	1	2	2	
King's Rock		1	2	2	2	2		1				i			1		1			1		2	1	2	2			2	2	1		1		1	2		1				1	
Little Papanui	1	2	2	2	2	1	2	1		1	2	2	1		2	1	1	1			1	1	2	1	1			1	1	1	1			1	2							
Long Beach		1	1	1		1	1					1		1		1							1	2	2	1		1	1	1	2	1	1		1			1		1	1	
Purakanui		1	2	2	1	1	1					1			1	1			1				1	2	2	1		2	2	1	2	1	2	2	1			1	1	1		
Omimi		1				1	-							1		1							1					1	2	1		1	1	1	2			1		1		
Pleasant River					1	1	1								1	1			1				1	1	1			2	1	1	1		1	2	2	1	1	1	1	1	1	
Shag Mouth	1	2	2	2	2	2	2	1	1	1	1	2	2		2	2	2		2	2	1	1	2	1	1			2	2		1			2	2	1						
Waimataitai	1	1	1	1	1	1	1													1	1			1				2	1	1	1		1	1	2		1	1				
Hampden				1		1	1					1				1												1	1	1				1	2							
Tai Rua	1	2	2	2	1	2			2					1	1	2		2	1	1		1	2	2		1		1	2	2	2	1	2	2	2	1	1	1	1			1
Ototara			1	1			1				1								1			1	1	1	1		1	1	2	1	1	1	1	1	1		1	2		1	1	1
Awamoa							1			1						1			1	1								1	1	1			1	1	2	2	1	1		1	1	1
Waitaki Mouth	1			1	1	1	2	2	1	2		2	2		2	1	1	1	1	1			1						1					1	2	1						
Pareora				1	1		2	1		2					1				1	1															2							
Normanby 1	1	1	1	1			2		2	2	1	1			1						1	1	1	1				1	1					1	1	1						
Normanby 2	1	1	1	1			1	1	2	2	1	1			1				1			1	1					1	1					1	1	1						
Dashing Rocks						1			2			1	1		1								2	1					2		1	1	1	1	1		1	1				
Wakanui	1			1					2	2		1	1		1																				2	1						1
Rakaia Mouth				1	1		2		2	2		1	1		1				1	1		1	1						1		1		1	1	2	2	1	1	1			1
Inland																																										
Takahe Valley																																			1							
Wyuna Koch							1					1				1		1																	1							
Dart River				1			1	1		2		1			2		1																		1							
Luggate										1																									1							
Waikaia 1							1	1		2																									2							
Waikaia 2							2	1		1							2																		2							
Nevis							2			2					1		1																		2							
Hawksburn							2	2		2		2			1		1		1															1	2	1	1	1	1		1	1
German Jacks							1			1		1																							1							
Puketoi							2			2		1			1																1	1		1	2	2	1		1		1	
Onslow							1																												1							
Woolshed Flat							2	1		2																								1	2							1
Waitangi							2	1		2					1		1		1																2	1						
Gooseneck Bend																			1										1			1			1	1		1	1			2
TeAka Tarewa							2			2		1					1																		2							
Shepherd's Flat							1										1																		2							
Junction Point																			1	1																1						1
Ahuriri							1													1												1	1		1	1		1	1			1
Hamiltons							1																												1			1			1	1
Bolton Gully										1																									1							

NOTE: 1 = Present 2 = Common * All Archaic layers combined
DATA SOURCES: See references in text plus Ambrose (1970), Trotter (1969, 1970), Hamel (1978, 1980), Hamilton (1894), Gillies (n.d.), Bagley (1973), Scarlett (1979).

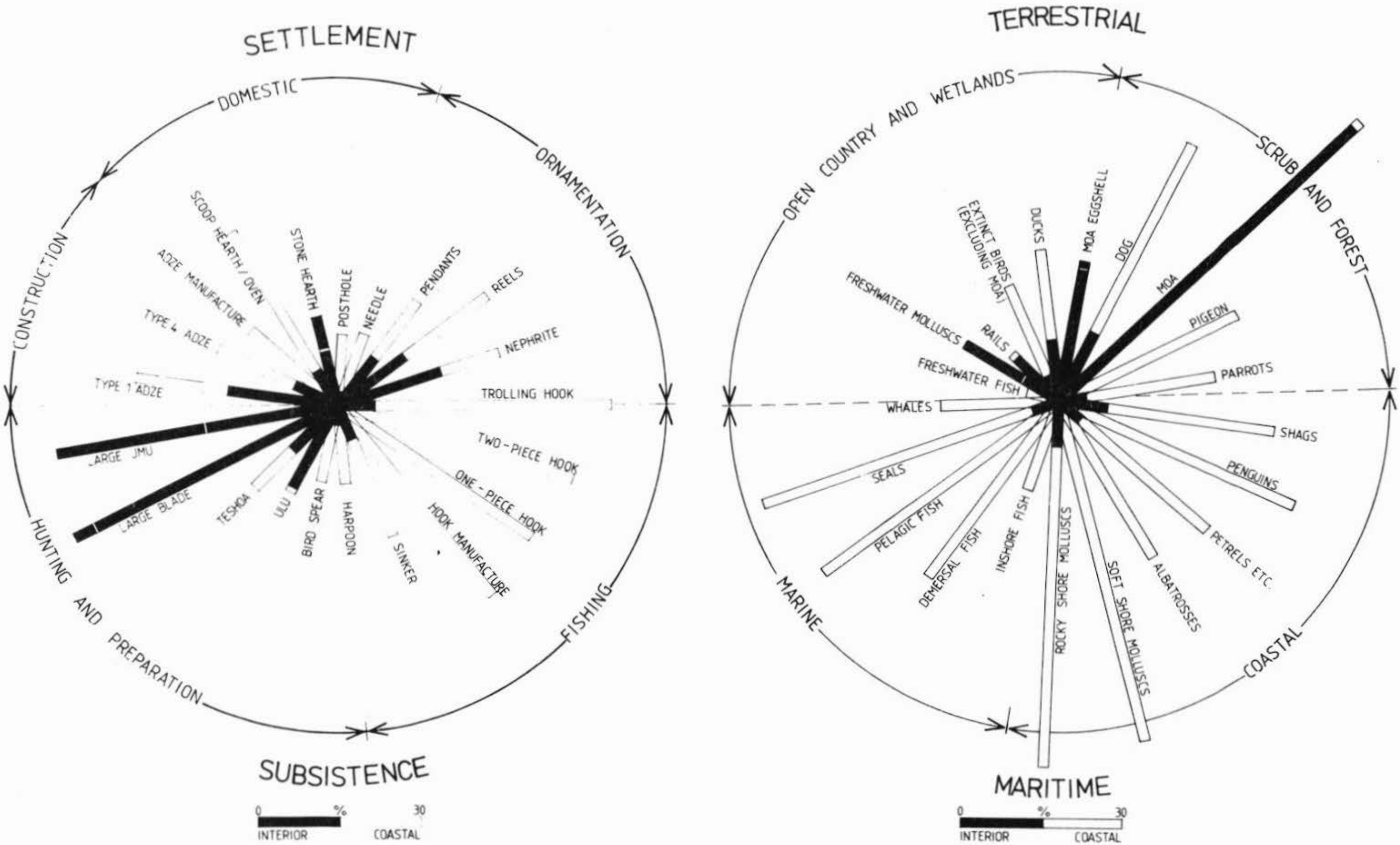

Figure 3: Percentage occurrence of artefactual (left) and faunal (right) components in coastal and interior foci. Note that the latter includes the coastal sites at Waitaki and Rakaia Mouths (see text).

TABLE 6
REPRESENTATION OF MAIN COMPONENTS (WEIGHTED DATA) IN GROUPED ARCHAIC SITES*

Coastal A		Coastal B		Inland	
Trolling lure	56%	Large umu	81%	Large blade	55%
Hook manufacture	56%	Teshoa	69%	Large umu	50%
Two-piece bait hook	53%	Large blade	63%		
One-piece bait hook	50%	Nephrite	50%		
Moa	78%	Moa	81%	Moa	70%
Soft shore shellfish	75%	Moa eggshell	50%		
Rocky shore shellfish	75%				
Seals	63%				
Dog	63%				
Pelagic fish	63%				
Penguins	59%				
Demersal fish	53%				
Shags	50%				

* Scores of 50% +

sites generally where fat from other sources was more readily available and where moa bone had an alternative value as raw material for fish hooks.

In any event, there is a case for hypothesising that two distinct subsistence foci (cf. Willey and Phillips 1958) are represented by the data; one which includes all the inland sites as well as Waitaki and Rakaia Mouth sites, which can be called the "interior focus", and another which embraces all the remaining sites and can be called the "coastal focus". If more detailed information had been available, it is quite probable that Wakanui (Duff 1977) and perhaps the Normanby sites (Griffiths 1941, 1942), Pareora (Griffiths 1955) and Awamoa (Duff 1977) would be seen to belong more naturally in the interior focus as well, with Dashing Rocks remaining in the coastal focus.

The differences between the two foci, as outlined here, are shown in Figure 3 where the weighted data for each component and focus have been converted to percentages of the possible maximum score, as above. Overall, the main difference is that the coastal focus reflects broad spectrum hunting, fishing, and gathering activities, whereas the interior focus was specifically directed towards the hunting of moa. What significance this basic difference in the combination of activities had for the organisation of Archaic economies depends upon what may be deduced about the settlement patterns.

SETTLEMENT PATTERNS

At the most fundamental level the subsistence orientations of coast and interior can be correlated with preferences in settlement location. Leaving aside the Rakaia and Waitaki Mouth sites which, in this respect, form a rather special class (below), the interior focus sites are situated in places where moa densities were probably highest. Most of the larger sites are found along the margins of the inland ranges between 500-800 m a.s.l. and others are located beside large rivers or, more rarely, at altitudes of 1000-1200 m a.s.l. Forest fringe and scrubland was probably most abundant in these areas and they are presumed, in turn, to have formed the principal moa habitats (Anderson n.d.a.).

Coastal focus sites may be found in a variety of environmental situations, but the larger sites are typically located at river mouths which breach stretches of rocky shore. Here there was access to the resources of the open sea, soft and hard shores, estuaries, wetlands and coastal forest (e.g. Hamel 1977a). Although the location of some sites such as Shag Mouth and Tiwai Point at the entrance to river valleys striking directly into the interior may have taken that wider access into account, this is not the case with Archaic sites in the Catlins (Hamel 1977a) or around Otago Peninsula and it was probably not, therefore, a general consideration of settlement location.

SITE TYPES AND FUNCTIONS

Considering locational preferences together with evidence of subsistence activities enables three broad types of functionally distinct sites to be discriminated. At the least complex end of the range are sites for which only a single nuclear function need be assumed. These include all the interior focus sites from moa kill localities, hardly ever recognised on the ground, up to the immense river mouth sites at Waitaki and Rakaia. In the case of the latter, it has long been recognised that these sites were, ". . . probably not permanent villages but hunting camps occupied for a brief period each year" (Teviotdale 1939:170). Teviotdale noted the scarcity of domestic implements at Waitaki Mouth and the almost complete lack of evidence for any activity except moa hunting. The hut sites he professed to see proved, upon excavation, to contain neither hearths nor postholes (with one doubtful exception) and had no concentration of the kind of material usually associated with dwellings. His observations, and subsequent investigations and aerial photography (Knight and Gathercole 1961, Anderson n.d.b.) show Waitaki Mouth to be composed of numerous discontinuous patches of ovens and moa bone middens, a pattern also observed at Rakaia Mouth by Haast (1871). In short, they are sites of frequently repeated temporary occupation.

Teviotdale (1939:170) concluded that,

> . . . the *moa* hunters came from their homes by sea . . . made their headquarters near the mouths, drove the birds in from the surrounding country, and preserved the flesh in *poha* or kelp bags . . . . Later, as the birds became scarcer near the sea-coast, the hunters would lay up their canoes and, tramping inland, would camp at some suitable spot in the upper reaches of the river, secure and preserve the birds as before, and then return down the rivers on *mokihis* . . . to their canoes . . . .

Of course, he envisaged the inland movement as being a later Archaic development, but if we assume that it occurred regularly throughout the Archaic, his statement would still adequately cover the known facts. In the light of this interpretation, the large number of Archaic adzes from Waitaki Mouth is not easily disposed of. However, it is fair to point out that the approximately 400 adzes came from a site of 60 hectares, giving an adze frequency per area 20 times less than that of Shag Mouth, for example. Furthermore, many of the Waitaki adzes seem to have been deposited in caches (Willetts pers. comm.), and this, in itself, suggests temporary settlement during which, in the course of some hundreds of years of repeated occupation, some were never relocated on the return of the inland hunting parties.

Other single purpose sites include the silcrete quarries, as at Oturehua and Nenthorn (Trotter 1961), the isolated *ti* cooking ovens, and at least some of the as yet undated porcellanite and nephrite quarries or working floors. To this category as well belong several of the small coastal sites such as Hampden (Trotter 1967), and the adze manufactories at Riverton and Tiwai Point (area B).

At the other end of the scale is a group of sites, or rather the lower layers of sites, which can be called multi-function bases. These are the basal layers of the large coastal sites which include practically the whole of the sparse domestic structural evidence of this focus, assuming that the hearths at Shag Mouth are more or less contemporary with the radiocarbon dates and that the bottom layer at Little Papanui is of a similar age.[4] Furthermore, although it is a difficult matter to quantify, Archaic artefacts of all kinds, especially flake and blade tools, adzes and fishhooks along with manufacturing implements and other evidence of their construction, appear to be most abundant in lower levels at the stratified sites of Pounawea (Hamel 1980:32), Little Papanui (Simmons 1967:26-32), and Papatowai (Hamel 1977a:221-223).

At Shag Mouth the same may be the case; certainly Teviotdale (1924) commented on the comparative dearth of artefacts in the presumably later shell middens there.[5] If the greater range of species attributed to the lower levels at Papatowai (Hamel 1977a:249) and Pounawea (Hamel 1980) is also taken into account, the overall impression is of a string of large multi-function settlements which came closest of all the southern Archaic sites to the category of "villages". The lower layer at Hinahina and possibly also the Pleasant River site may be others of the same kind.

All the remaining sites can be provisionally regarded as belonging to a broad category of restricted-function camps; places at which more than one activity was of significance, but which do not exhibit the wide range of fauna and artefacts or the size of the multi-function bases.[6] Typical of them are the fishing and fowling sites at Wakapatu and Waimataitai (Trotter 1955), the fowling, sealing and adze manufacturing site at Tiwai Point (area X), and the sealing, fishing and fowling camp at Long Beach (lower layer). To this category as well may belong the upper layers at Papatowai and Pounawea and possibly the shell middens at Shag Mouth. Some sites on the boundaries of this category are difficult to distinguish from those of the other two groups. Thus, Tai Rua contained more evidence of dwellings than was found in most of the multi-function bases and the marked specialisation towards fishing at Purakanui and Long Beach (middle layer), and towards fowling at Ototara, place them close to the single purpose group.

The distribution of these site types exhibits some interesting differences between the northern part of our region (north of Otago Peninsula) and that to the south. Most strikingly there is a lack of large staging camps, as exemplified by Waitaki Mouth, along the southern coast. The reason for this may be that the main southern rivers, such as the Clutha and Mataura, are navigable for 80 km or more inland so that such sites ought to be sought at the head of canoe navigation rather than along the coast. It is possible that they are represented, on the Clutha, by the large moa butchery and oven sites at Moa Flat (Hector 1871), Beaumont and Millers Flat (Bagley 1973).[7] There is also a marked scarcity of Archaic sites of any kind in the once forested hills and plains of Southland. This may also be accounted for by the navigability factor, or by low moa density in the closed forest, or perhaps by non-recognition of some other kinds of single purpose sites connected with forest-fowling or eeling. Whatever the reasons for such differences, it is clear that any refinement of my initial functional typology will need to take local variation into account.

SETTLEMENT PERMANENCE AND SEASONALITY

The nature of the relationships between these site types and between the coastal and interior foci hinges in part on the questions of whether southern New Zealand was permanently occupied during the Archaic and at what time of the year various resources were exploited, and in part on the degree to which the site types can be regarded as contemporary (next section). In considering the first question, the central issue, and it may be thought one of particular importance in the relatively cool south, is where are the Archaic houses?

On present evidence, the answer is a peculiar one. If scoop hearths without accompanying postholes or other structural remains are left aside on the grounds that they might only be culinary features, the probable houses are found more commonly in the interior than along the coast. Stone hearths, assumed to represent dwellings, are known from at least seven interior sites (Table 5) but from only five coastal sites. Moreover, in the case of the latter, such important sites as Pounawea and Papatowai had only one hearth a piece, there were two in the lower layer at Little Papanui, and one at Kings Rock (Lockerbie 1940). Only at Shag Mouth, where there were 36 of probable, but by no means certain Archaic age, does a number of hamlets or a single village appear to be represented.[8] Even adding the scoop hearths with associated postholes at Tai Rua, and the enigmatic posthole rows at Pounawea, it is difficult to account for this odd distribution. If it is not explained by factors of survival, for example at Papatowai and Pounawea by riverine erosion,[9] then it must be assumed that either the dwellings were of a nature not yet recognised in the evidence or there were sites where they were not closely associated with the middens.

In view of the Palliser Bay evidence, where some of the best defined houses were located a kilometre or more up the valleys from the exposed coastal middens (Leach and Leach 1979), the latter may be regarded as a distinct possibility; the more so if the large southern coastal sites were occupied during the winter. By the same token, the more frequent existence of rudimentary house remains directly on or beside the inland midden sites would be explicable by assuming, as environmental constraints suggest, that most inland sites were occupied during the warmer months when the need to seek particularly sheltered locations or build substantial structures was considerably less.

But explain it as we may, the fact remains that until many more Archaic houses are located or recognised in southern New Zealand, it would be unwise to reject out of hand Teviotdale's proposition of 50 years ago that the southern moa hunters came south only on a seasonal basis from homes in the northern South Island (Teviotdale 1932:91). Indeed, had Teviotdale reconsidered the evidence some two decades later, he might have expressed the same opinion more emphatically by observing the marked contrast between the rarity of burials in the Southern Archaic and the spectacular cemetery at Wairau Bar.

On what grounds, then, can it be argued that the south was occupied on a year round basis during the Archaic phase? Firstly, the largest South Island sites with the most complex stratigraphy and the most comprehensive ranges of fauna and artefacts are predominantly situated from Banks Peninsula south. Secondly, such ubiquitous southern implements as the large silcrete and porcellanite blades are extremely rare north of Banks Peninsula.[10] Thirdly, there is a growing body of evidence, primarily from the analysis of seal bones, to suggest that certain of the main coastal sites were occupied for the greater part of the year. At Papatowai, Pounawea and Pleasant River seal remains of pup, juvenile, sub-adult and adult age ranges (Smith pers. comm.) together with bird and fish remains, imply exploitation spread over the period summer to mid-winter (but not necessarily continuously).[11]

In further considering seasonality, it must first be noted that evidence of this has proved difficult to find and interpret in southern New Zealand because most species were residential and those which were not, such as some of the petrels and shearwaters, were favoured for preservation as early as the 13th century (Sutton and Marshall 1980). Where comparative seasonal abundance and degrees of osteological maturity have been taken into account, the fact that most fauna were more readily available during the period late spring to autumn has produced seasonal inferences

TABLE 7
HISTORICAL EVIDENCE OF RESOURCE SEASONALITY

Resource	Exploitation Period	Habitat
Fur seal	December-July	Rocky shore
Barracouta	November-April	Open sea
Hapuku	November-June	Open sea
Flounders	May-October	Estuaries
Eels	January-May	Rivers/Estuaries
Lamprey	September-November	Rivers
Whitebait	October-November	Rivers/Estuaries
Muttonbirds	March-May	Islands
Ducks	December-March	Rivers/Estuaries
Weka	April-July	Plains/Forest
Kaka	April-August	Forest
Tui	April-August	Forest
Pigeon	April-August	Forest
Rat	April-August	Forest
Fernroot	April-October	Plains
Ti root	October-January	Plains

Data from: Beattie (1920, 1954), Best (1929, 1942), Leach (1969), Taylor (1946).

strongly skewed towards the summer half of the year. Of the coastal focus sites, Pounawea seems to have been mainly occupied during November to June (Hamel 1980), Papatowai from October to May (Hamel 1977a), Tiwai Point from October to May (Higham 1976, Anderson 1981c), Wakapatu from October to March (Higham 1976), and Purakanui from November to April (Anderson 1981b). In addition, the low temperatures of the inland winter and the comparative unavailability of most historically exploited resources during that time, the weka excepted, point to occupation during the warmer half of the year in the dry areas of the interior (Central Otago and the Mackenzie Country) as well.

The resolution of this problem needs to be considered at two levels: whether there could be a single seasonal strategy which sequentially incorporated the main resources of coast and interior, and whether socio-economic organisation is likely to have followed it. The first is certainly possible. As can be seen in Table 7, the principal maritime resources of seals, fish and colonial birds were most abundant between November and April and some terrestrial resources could also be gathered along the coast at this time: *ti* and fernroot along the forest fringe, ducks from the lagoons during the summer moult and eels from the streams during summer and from the estuaries during the autumn migration. From winter to spring the main attractions were terrestrial. According to Best's (1942:83) South Island informant, this was the main period of fernroot digging; and pigeon, tui and parrots in the forest, weka in the open country and lamprey in the middle reaches of the rivers drew the food quest into the interior. It would fit this pattern neatly if moa hunting in the inland basins then occupied the period late spring to summer before the return to the coast. Nothing is known of the seasonality of the moa breeding cycle, but if it followed that of most other terrestrial birds in southern New Zealand, it would have begun during this time, and it is worth pointing out in this connection that moa eggshell is comparatively common on inland sites and that moa chick remains were recovered from Hawksburn (Anderson n.d.c.). At any rate, this would be a suitable time for occupation of the dry interior because the hills are generally free of snow by October, and the rivers, down which preserved moa flesh may have been taken by *mohiki*, remain full until mid-summer.

In terms of organisation, however, it is improbable that the Archaic population followed such a simple transhumant round. For one thing, the spatial distribution of resources was not as clear cut as this implies. Forest birds, ducks, eels, fernroot, *ti* and probably moa were available in the same seasons in both coastal and interior habitats. For another, the fact that the best yields of most resources occur for periods of weeks rather than months would require movements to take advantage of them more frequently than from season to season. In addition, the fact that most resources were capable of preservation must have provided a source of release from continuous subsistence tasks which could be manipulated according to social commitments, adverse climatic conditions or other such factors. In fact, the historical evidence indicates that there were complex and locally variable subsistence schedules which involved task-specific trips to exploit coastal and interior resources throughout the year overlying a basic pattern of kin-group dispersion during the summer half of the year and nucleation during the late autumn and winter when preserved foods were consumed (see, for example, Anderson 1980). At present the reconciliation of such patterns with the archaeological data is simply not possible since, to take only one example, the apparent occupation of multi-function bases from summer to early winter could reflect a nucleation phase, or their continued use during this time despite the dispersal of most of the population at camps elsewhere, or the same degree of occupation throughout, or some other pattern entirely.

ECONOMIC CHANGE

The possibility of economic change presents a further complicating factor in the inference of settlement patterns, particularly since the nature and timing of it are by no means straightforward. The only sites in which quantified faunal data can be tied to a radiocarbon dated stratigraphic sequence embracing the greater part of the Archaic phase are Pounawea and Papatowai TT1 (Hamel 1977a), and even in the former of these, Hamel (1980) has some misgivings about the interpretation of the stratigraphy. That aside, the evidence of these sites indicates an early concentration upon big game (moa and seals), followed by a marked decrease in moa, and somewhat later seal, exploitation accompanied by a switch of emphasis towards small birds, fish and shellfish. Tying other sites to this framework involves assumptions about their age and contents from evidence of questionable validity. Layers which may have been rich in the remains of big game have been radiocarbon dated on charcoal to 800 B.P. or older at Awamoa and Shag Mouth, and sites with similar faunal spectra at Pleasant River, Tai Rua, Waimataitai, Pareora and the bottom layer at Little Papanui are regarded as approximately contemporary by Simmons (1973). Certainly those which have been dated and others of his groups 1 and 2, such as Kaikais Beach, along with the lower layer at Long Beach and the middens at Tiwai Point suggest an approximate period 650-900 B.P. during which all the multi-function bases were occupied and the main phase of big game hunting ran its course. Towards the end of this period and throughout the remainder of the Archaic, only restricted function sites or layers are found in the coastal focus and their emphasis on fishing, shellfishing and small fowling is plain, as in the upper levels of Papatowai and Pounawea, the late Archaic layer at Long Beach, and at Ototara, Purakanui, Wakapatu and Riverton (Fig. 4).

Although big game hunting throughout the Archaic was the only activity of significance in the interior focus, some changes appear to have occurred there as well. If sites such as Nevis (George 1937) and Puketoi date to the period 650-850 B.P. as do such other large sites as Waitaki Mouth (Anderson n.d.b.), Woolshed Flat (Trotter 1970) and Hawksburn (Anderson 1981d), and this may be regarded as probable at Puketoi, at least, because of the frequency of forest bird remains there,[12] then the large eastern interior sites spanned a period similar to the multi-function bases of the coastal focus. Very few interior sites have been dated to the later Archaic, but if they are representative, then a pattern of smaller hunting camps (perhaps with a broadening of functions to include *ti* gathering, as at Dart Bridge) extending into the lakes district of the western interior may be proposed.

SUMMARY AND EXPLANATIONS

It has been argued that two broad economic foci can be recognised in the Archaic evidence from southern New Zealand. One is a coastal focus comprising a broad-spectrum subsistence strategy which was conducted from sites located in ecotonal situations along the faunally-rich rocky shore. The other is an interior focus which

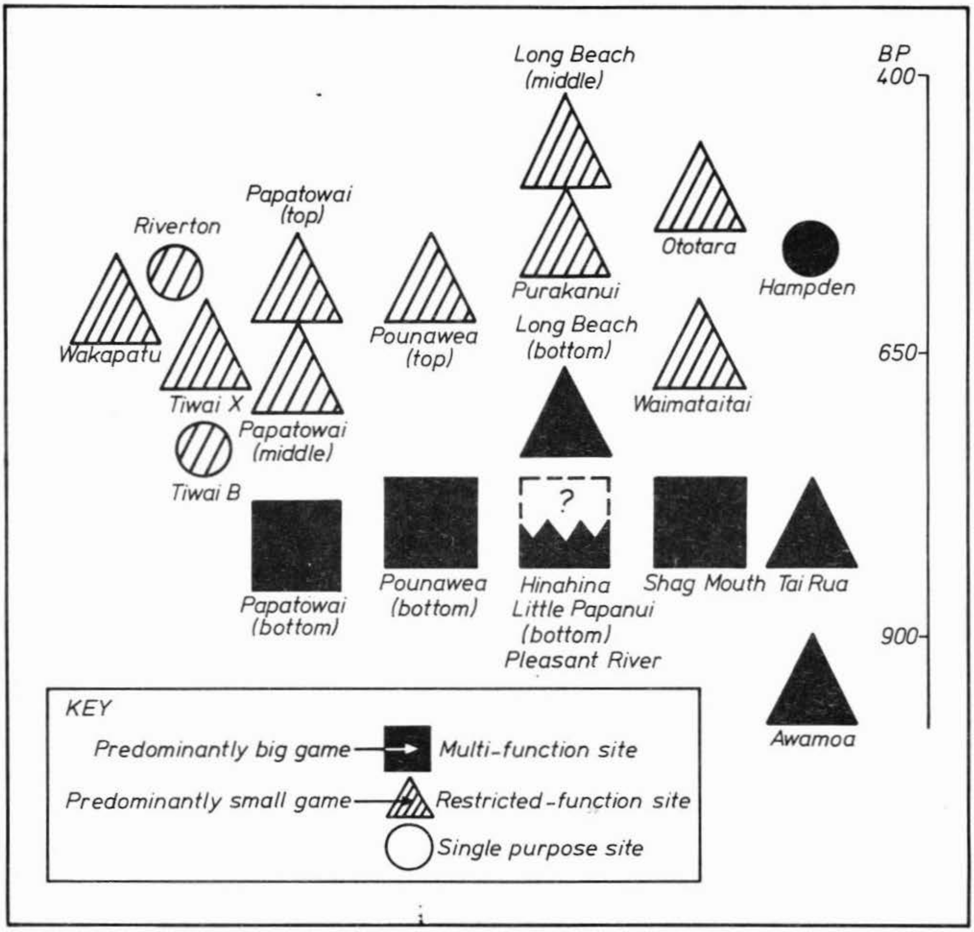

Figure 4: Approximate chronological distribution of site types in the coastal focus.

was concerned with terrestrial hunting from sites which were mainly located along the margins of the inland forest. In subsistence terms, all the sites of the interior focus can be regarded as serving the single purpose of moa hunting. These include staging camps at river mouths where hunters bound to and from the interior broke their journeys and their loads, small transit camps along inland routeways, and base camps, hunting camps, kill sites and quarries in the hills and basins of the hunting grounds. Sites of the coastal focus can be divided into three functional types. There are a few single purpose sites of a kind similar to those of the interior focus; some six to eight multi-function bases in which the size of the sites and the wide range of activities represented in them suggest that they were settlements of, or akin to, a village type; and a broad category of sites or layers where a more restricted range of functions is evident.

Chronologically, the multi-function bases can be assigned to the early Archaic (*circa* 650-900 B.P.) and they have an emphasis upon big game hunting. Restricted function sites are mostly of the later Archaic (*circa* 400-650 B.P.) and reveal a switch towards small game, including fish and shellfish. Single purpose sites were occupied throughout the sequence.

The relationship between the interior and coastal foci was probably one of systematic mobility, but of what kind is difficult to tell. While there is a degree of summer-coastal, winter-interior spread in the availability of resources, the most effective exploitation strategy for people with a proven food preservation technology would most likely have involved intra-seasonal, task-specific expeditions to both areas throughout the year, rather than regular seasonal transhumance. Amongst major elements of uncertainty in the delineation of these patterns are the unknown nature of the moa breeding cycle and the scarcity of direct evidence, such as houses and cemeteries, indicative of year round occupation in southern New Zealand.

ECONOMIC EXPLANATIONS

At a regional level, explanation of the economics of the southern Archaic has centred upon the issue of change; the transition from big game hunting to fishing and the significance of this for the occupation of the interior. All such hypotheses have been founded upon ecological causation and have primarily revolved around the degree to which direct predation, indirect cultural interference or climatic change may have been responsible for the depletion of big game, especially moa (e.g. Lockerbie 1959, Simmons 1968).

At present, direct predation appears to have the strongest support from a variety of considerations. Firstly, from evidence that the retreat of the interior forest had begun long before Polynesians got the chance to fire it, and secondly, from the view that forest burning would, for a time at least, have promoted rather than destroyed just the kind of forest fringe and shrubland habitats that moa seem to have preferred. Thirdly may be added the fact that both moa and seals were unusually vulnerable to the arrival of Polynesians. They were the only large game in New Zealand and unused to terrestrial predation. They were also comparatively immobile and probably had low rates of gross productivity. Fourthly, the predation hypothesis is supported by the fact that moa became extinct at about the same time in areas well beyond the range of forest retreat, and lastly, perhaps also by the very lack of obvious weapons in Archaic sites; the early Maori had to exert no technological ingenuity beyond what they arrived with to annihilate big game of species which were substantially novel to them.

Although at present we have no means of demonstrating the point, rapid

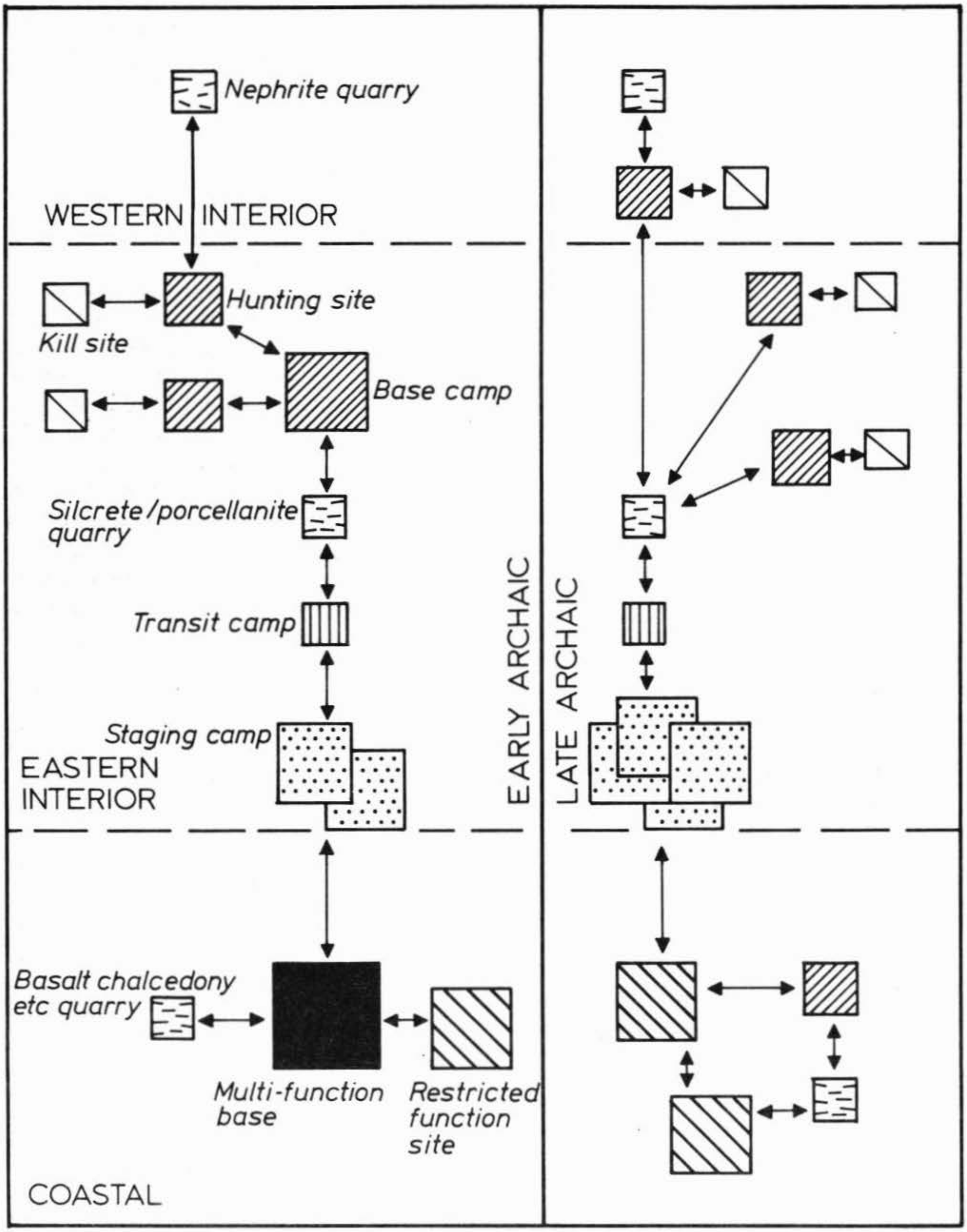

Figure 5: Hypothetical outline of settlement patterns in the early and late Archaic phase.

population growth is a likely consequence of the early devastation of the readily available big game reserves, and population growth together with over-exploitation plausibly account for the later Archaic transformation towards small game, fish and gathered resources. Population pressure, as a consequence of declining relative abundance of the more efficiently exploited food resources, also provides an attractive explanation for changing settlement patterns during the Archaic. These, idealised in Figure 5, comprise the abandonment of multi-function bases and the fragmentation of their activities amongst restricted-function and specialised sites, the abandonment of eastern interior base camps and the dispersal of hunting camps over the whole interior, and the accretionary growth of the staging camps which occupy the interface between coastal and interior settlement.

Considering that many of these propositions remain to be tested; those of population growth, levels of exploitation and seasonal settlement patterns to mention only the more obvious ones, and that the data required to embark upon these tasks are scarce indeed, it is tempting simply to observe the general plausibility of the ecological hypothesis and let the matter of explanation rest until such problems are resolved. Yet to do so would ignore a fundamental flaw in the ecological model which, in my view, lies at the heart of present difficulties in understanding the economics of the southern Archaic. This is the assumption that economics are substantially circumscribed by the relationships between consumers and their food resources; an argument which, however valuable it is for an initial formulation of economic relationships, comes dangerously close to nutritional reductionism. Any more realistic interpretation of southern Archaic economies and their transformation must eventually reject such deliberate naivety and attempt to deal with those influential factors which universally mediate the resources-consumption relationship: technology, territoriality, social structure, wealth and exchange.

I am not suggesting that the ecological hypothesis is invalid, much less that it ought to be abandoned, but rather that we also need a second level of economic analysis which seeks to demonstrate how basic ecological relationships interacted with the social dimensions of Polynesian culture in southern New Zealand. Undoubtedly the key to this analysis lies in the study of material culture. Superficially that view brings us full circle since artefacts were the first and most enduring interest of southern archaeology, but it is not only typology that is required. The sources of the materials used, the production techniques, functional and non-functional attributes and the numerical distribution of all these variables in time and space need to be considered. Together they may provide the clues to patterns of wealth, exchange and territoriality and these, in turn, to quite different hypotheses of socio-economic structure and change.

For instance, it is possible already to dimly perceive that there is something unusual about the material culture of the early Archaic. It seems to be particularly elaborated in types not directly concerned with the hunting of big game which is thought to have characterised contemporary subsistence. Amongst these may be noted numerous forms and a marked abundance of large, fully finished and unused (or refurbished) adzes; abundant, finely made, large fish hooks of a wide variety of forms including some for which a prosaic function is difficult to imagine, and a wide variety of necklace and pendant forms. If the shelter paintings of the eastern South Island also belong to this period, it may be asked why the small population of earliest settlers expended so much energy on a material culture apparently unrelated to their daily subsistence needs and one which declined in quantity and variety by the later Archaic.[13]

It is conceivable that what we have is evidence of the re-structuring of Polynesian society to New Zealand life. A small population, and very probably an asymmetric one in terms of the social structure from which it derived, would have been intent upon establishing new systems of political power and prestige as the "colonial effect" struck home: the release from traditional social stratification and sources of wealth. Competition by small groups, perhaps centred on the multi-function bases, for new territories, a different "pecking order" and a new scale of material values could have involved conspicuous consumption of big game, territorial marking by painting and the display of technological virtuosity (and thereby wealth) in decorative artefactual styles.

At present, such a scenario is no more than speculation and my point is not to claim that it is in any significant way supported by the evidence. Rather, it is to suggest that such lines of enquiry inevitably lead along different paths of economic analysis and to different explanations than arise from inferring what went down the alimentary canal. But even if the value of reconsidering material culture in terms of socio-economic explanations of adaptation and change has yet to be tested, the manifest uncertainties evident in this review about simply ordering the evidence we already have provide the necessary incentive to bring the spectacular collections languishing in our museums back to the field of archaeological research. Only a dialogue between hypotheses arising from different propositions, and one conducted with a full range of the evidence available, is likely to provide durable explanations of the early lifeways of the southern Maori.

ACKNOWLEDGEMENTS

The information freely provided by Roger Fyfe, Ian Smith and Ron Scarlett is gratefully acknowledged. My thanks also to Janet Davidson and Jill Hamel, who provided valuable comments upon an earlier draft of this paper, to Ann Trappitt for the typing and Martin Fisher for the illustrations.

Notes

1. Excavations since 1967 at Rakaia Mouth, Waitaki Mouth, Pounawea, Papatowai and Hawksburn provide a sample of only 0.02 percent of the combined site areas.

2. Hamel (pers. comm.) feels that the Omimi sample is unlikely to be a representative one, but I have included it because of the general paucity of data.

3. Recent radiocarbon dates indicate that the upper layers of some of the Catlins sites fall within the Archaic phase.

4. An assumption based upon Simmons' (1973) comparison of the artefactual assemblages.

5. Haast (1874) believed the shell middens overlay the moa beds.

6. It is difficult to be confident about some of these. At Papatowai and Pounawea there is an apparent depletion in the range of artefacts from the lower to upper layers, but there, and in many other sites, not all artefacts can be securely provenanced to layers. It should also be noted that Hamel (1980) argues for "diagonal stratigraphy" at Pounawea which, if it can be demonstrated, would mean that the differences between the upper and lower layers had little significant chronological meaning.

7. Such sites may not exist at all on the other southern rivers because, unlike the Clutha, Waitaki and Rakaia, they usually have navigable tributaries. Canoe-borne hunters could thus have diffused their landing points among a number of places.

8. At Shag Mouth the hearths shown in Teviotdale (1924) can be regarded as forming a single group or 2-4 separate groups.

9. This is conceivable since adzes were concentrated along the inland edge of the Papatowai site (Hamel 1977a) and they might imply a living area which has almost disappeared.

10. But if these were butchering implements and the south was the big game hunting region for people living elsewhere, they may have had no need to take such implements away with them. Obsidian and chert, more accessible towards the north, provide better edges for finer work or domestic use.

11. The possibility of permanent settlement in the interior can be discounted on the grounds that the one site suggested as representing it (Dart Bridge), by Simmons (1969), looks to have had a different function according to more recent investigation (Anderson and Ritchie 1980).

12. Assuming that the existence of forest birds in the interior represents occupation before the widespread burning of the inland forests (Ambrose 1970).

13. Similar arguments might be advanced in the case of the Classic phase during which an elaboration of nephrite working into decorative forms, increased decoration of hook points and, perhaps, the development of a muttonbird exchange and feasting system, occurred during a time of intense territorial and political competition. So-called "baroque" artefactual styles and meeting houses could reflect similar processes during the protohistoric era.

APPENDIX 1

SCIENTIFIC NAMES OF PLANTS AND ANIMALS MENTIONED IN THE TEXT
(in alphabetical order by common name for each category)

PLANTS:	
Bracken fern	*Pteridium aquilinum var. esculentum*
Karaka	*Corynocarpus laevigatus*
Kumara	*Ipomoea batatas*
Nikau palm	*Rhopalostylis sapida*
Tawa	*Beilschmiedia tawa*
Ti	*Cordyline* spp.
Titoki	*Alectryon excelsus*
FISH AND SHELLFISH:	
Albacore	*Thunnus alalunga*
Barracouta	*Thyrsites atun*
Blue cod	*Parapercis colias*
Butterfish	*Odax pullus*
Conger eel	*Conger verreauxi*
Crayfish	*Jasus edwardsii*
Eel	*Anguilla* spp.
Flounder	*Rhombosolea* spp.
Grey mullet	*Mugil cephalus*
Hapuku	*Polyprion oxygeneios*
Kahawai	*Arripis trutta*
Lamprey	*Geotria australis*
Ling	*Genypterus blacodes*
Moki	*Latridopsis ciliaris*
Mullet (yellow-eyed)	*Aldrichetta forsteri*
Red cod	*Pseudophycis bachus*
Sea egg	*Evechinus chloroticus*
Sea perch	*Helicolenus papillosus*
Snapper	*Chrysophrys auratus*
Skipjack tuna	*Katsuwonus pelamis*
Tarakihi	*Cheilodactylus macropterus*
Whitebait	*Galaxias* spp.
BIRDS:	
Albatross (and mollymawk)	Diomedeidae
Brown teal	*Anas aucklandica chlorotis*
Duck	Anatidae
Fiordland crested penguin	*Eudyptes pachyrhynchus*
Gannet	*Sula bassana serrator*
Kaka	*Nestor meridionalis*
Little blue penguin	*Eudyptula minor*
Moa	Dinornithidae
Parakeet	*Cyanorhamphus* spp.
Parrot	Nestoridae
Penguin	Spheniscidae
Petrel (and shearwater)	Procellariidae, Pelecanoididae

Pigeon	*Hemiphaga novaeseelandiae*
Rail	Rallidae
Rockhopper penguin	*Eudyptes crestatus*
Shag	Phalacrocoracidae
Shoveller	*Anas rhynchotis*
Sooty shearwater (muttonbird)	*Puffinus griseus*
Spotted shag	*Stictocarbo punctatus*
Storm petrel (white-faced)	*Pelagodroma marina*
Tui	*Prosthemadera novaeseelandiae*
Weka	*Gallirallus* spp.
MAMMALS:	
Dog	*Canis familiaris*
Elephant seal	*Mirounga leonina*
Fur seal (New Zealand)	*Arctocephalus forsteri*
Leopard seal	*Hydrurga leptonyx*
Rat	*Rattus exulans*
Sea lion	*Phocarctos hookeri*

REFERENCES

Ambrose, W. 1970. Archaeology and rock drawings from the Waitaki Gorge, central South Island. *Records of the Canterbury Museum* 8:383-437.

Anderson, A. J. 1979. Excavations at the Hawksburn moa-hunting site: an interim report. *New Zealand Archaeological Association Newsletter* 22:48-59.

Anderson, A. J. 1980. Towards an explanation of protohistoric social organisation and settlement patterns amongst the southern Ngai Tahu. *New Zealand Journal of Archaeology* 2:3-23.

Anderson, A. J. 1981a. Pre-European hunting dogs in the South Island, New Zealand. *New Zealand Journal of Archaeology* 3:15-20.

Anderson, A. J. 1981b. A fourteenth-century fishing camp at Purakanui Inlet, Otago. *Journal of the Royal Society of New Zealand* 11:201-221.

Anderson, A. J. 1981c. The value of high latitude models in South Pacific archaeology: a critique. *New Zealand Journal of Archaeology* 3:143-160.

Anderson, A. J. 1981d. Radiocarbon dates for Archaic sites at Purakanui and Hawksburn, Otago. *New Zealand Archaeological Association Newsletter* 24:63-64.

Anderson, A. J. n.d.a. Habitat preferences of moa in Central Otago, 1000-1500 A.D. according to palaeobotanical and archaeological evidence. Unpublished manuscript, University of Otago.

Anderson, A. J. n.d.b. Excavations at Waitaki Mouth. Manuscript in preparation, University of Otago.

Anderson, A. J. n.d.c. Prehistoric hunting of moa (Aves: Dinornithidae) in the high country of southern New Zealand. Unpublished manuscript, University of Otago.

Anderson, A.J. and Ritchie, N. A. 1981. Excavations at the Dart Bridge site, Upper Wakatipu region: a preliminary report. *New Zealand Archaeological Association Newsletter* 24:6-9.

Bagley, S. 1973. Clutha Valley Hydro Electric Power Development. Historical and Archaeological sites in the Clutha Valley. Report to New Zealand Historic Places Trust 9/1.

Beattie, H. J. 1920. Nature-lore of the Southern Maori. *Transactions of the New Zealand Institute* 32:53-77.

Beattie, H. J. 1954. *Our Southernmost Maoris*. Otago Daily Times and Witness, Dunedin.

Best, E. 1929. *Fishing Methods and Devices of the Maori*. Dominion Museum Bulletin 12.

Best, E. 1942. *Forest Lore of the Maori*. Dominion Museum Bulletin 14.

Brodie, J. W. 1973. The Ocean Environment. *In* Williams, G. R. (Ed.), *The Natural History of New Zealand*: 61-92. A. H. and A. W. Reed, Wellington.

Burrell, J. P. 1965. Ecology of *Leptospermum* in Otago. *New Zealand Journal of Botany* 3:3-16.

Burrows, C. J. 1980. Some empirical information concerning the diet of moas. *New Zealand Journal of Ecology* 3:125-130.

Burrows, C. J., McCulloch, B. and Trotter, M. M. 1981. The diet of moas based on gizzard contents samples from Pyramid Valley, North Canterbury, and Scaifes Lagoon, Lake Wanaka, Otago. *Records of the Canterbury Museum* 9:309-336.

Coutts, P. J. F. 1972. The Emergence of the Foveaux Strait Maori from Prehistory: a study of culture contact. Unpublished PhD thesis, University of Otago.

Coutts, P. J. F. 1975. Marine fishing in archaeological perspective: techniques for determining fishing strategies. *In* Casteel, R. W. and Quimby, G. I. (Eds) *Maritime Adaptations of the Pacific*: 265-306. Mouton, The Hague.

Coutts, P. J. F. and Jurisich, M. 1972. Results of an Archaeological Survey of Ruapuke Island. *Otago University Monographs in Prehistoric Anthropology* 5.

Davies, F. J. 1980. The prehistoric environment of the Dunedin area: the approach of salvage prehistory. Unpublished M.A. thesis, University of Otago.

Duff, R. 1952. Recent Maori occupation of Notornis Valley, Te Anau. *Journal of the Polynesian Society* 61:90-119.

Duff, R. 1956. *The Moa-Hunter Period of Maori Culture*. 2nd edition. Government Printer, Wellington.

Duff, R. 1977. *The Moa-Hunter Period of Maori Culture*. 3rd edition. Government Printer, Wellington.

Falla, R. A. 1962. The moa, zoological and archaeological. *New Zealand Archaeological Association Newsletter* 5:189-191.

Fyfe, R. Assistant Director, Taranaki Museum, New Plymouth.

George, P. 1937. A Maori stone dagger from the Nevis. *Journal of the Polynesian Society* 46:123-129.

Gillies, K. B. n.d. Report on the Archaic site of German Jacks. Unpublished manuscript, University of Otago.

Golson, J. 1959. Culture change in prehistoric New Zealand. *In* Freeman, J. D. and Geddes, W. R. (Eds) *Anthropology in the South Seas*: 29-74. Thomas Avery and Sons Ltd, New Plymouth.

Greenwood, R. M. and Atkinson, I. A. E. 1977. Evolution of divaricating plants in New Zealand in relation to moa browsing. *Proceedings of the New Zealand Ecological Society* 24:21-33.

Griffiths, G. 1941. Discovery and excavation of an Old Maori (No. 1) Camp near Normanby, Timaru. *Journal of the Polynesian Society* 50:211-231.

Griffiths, G. 1942. Excavation of Maori No. 2 Camp near Normanby, Timaru. *Journal of the Polynesian Society* 51:115-125.

Griffiths, G. 1955. South Canterbury Maori Camps, No. 3. Investigations at Pareora. *Journal of the Polynesian Society* 64:233-236.

Haast, J. von. 1871. Moas and Moa Hunters. *Transactions of the New Zealand Institute* 4:66-107.

Haast, J. von. 1874. Notes on the Moa-hunter Encampment at Shag Point, Otago. *Transactions of the New Zealand Institute* 7:91-98.

Hamel, G. E. 1977a. Prehistoric Man and his Environment in the Catlins, New Zealand. Unpublished PhD thesis, University of Otago.

Hamel, G. E. 1977b. Salvage Work at Omimi. Report to the New Zealand Historic Places Trust 138.

Hamel, G. E. 1978. Radiocarbon dates from the moa-hunter site of Papatowai, Otago, New Zealand. *New Zealand Archaeological Association Newsletter* 21:53-54.

Hamel, G. E. 1979. The breeding ecology of moas. *In* Anderson, A. J. (Ed.) *Birds of a Feather*: 61-66. British Archaeological Reports, International Series 62.

Hamel, G. E. 1980. Pounawea: the last excavation. Report to the New Zealand Historic Places Trust.

Hamel, G. E. Anthropologist, Otago Museum, Dunedin.

Hamel, G. E. and Leach, H. M. 1980. Radiocarbon dates from Long Beach, Otago, New Zealand. *New Zealand Archaeological Association Newsletter* 22:128.

Hamilton, A. 1894. On the feathers of a Small Specimen of Moa (Megalapteryx) found in a Cave at the Head of the Waikaia River; with a Notice of a Moa-hunter's Camping-place on the Old Man Range. *Transactions of the New Zealand Institute* 27:232-238.

Hector, J. 1891. Recent moa remains in New Zealand. *Otago Daily Times*, September 15, 1871.

Higham, C. F. W. 1968. Prehistoric research in Western Southland. *New Zealand Archaeological Association Newsletter* 11:155-164.

Higham, C. F. W. 1976. The economic basis of the Foveaux Straits Maori in prehistory. *In* Sieveking, G. de G., Longworth, I. H. and Wilson, K. E. (Eds) *Problems in Economic and Social Archaeology*: 221-223. Duckworth, London.

Knight, H. 1966. Umu-ti. *Journal of the Polynesian Society* 75:332-347.

Knight, H. and Gathercole, P. 1961. A reconnaissance at the Waitaki River Mouth, Otago. *New Zealand Archaeological Association Newsletter* 4:133-136.

Knox, G. A. 1975. The marine benthic ecology and biogeography. *In* Kuschel, G. (Ed.), *Biogeography and Ecology in New Zealand*: 353-403. Junk, The Hague.

Law, R. G. 1969. Pits and kumara agriculture in the South Island. *Journal of the Polynesian Society* 78:223-251.

Leach, B. F. 1969a. The concept of similarity in prehistoric studies. *Otago University Studies in Prehistoric Anthropology* 1.

Leach, B. F. 1969b. Radiocarbon dates for the Oturehua Quarry site, Central Otago. *New Zealand Archaeological Association Newsletter* 12:52.

Leach, H. M. 1969. Subsistence Patterns in Prehistoric New Zealand. *Otago University Studies in Prehistoric Anthropology* 2.

Leach, H. M. 1972. A hundred years of Otago archaeology: a critical review. *Records of the Otago Museum* (Anthropology) 6.

Leach, B. F. and Leach, H. M. (Eds) 1979. Prehistoric Man in Palliser Bay. *National Museum of New Zealand Bulletin* 21.

Leach, H. M. and Leach, B. F. 1980. The Riverton site: an Archaic adze manufactory in Western Southland. *New Zealand Journal of Archaeology* 2:99-140.

Lockerbie, L. 1940. Excavations at Kings Rock, Otago, with a discussion of the fish-hook barb as an ancient feature of Polynesian Culture. *Journal of the Polynesian Society* 49:393-446.

Lockerbie, L. 1959. From Moa-Hunter to Classic Maori in Southern New Zealand. *In* Freeman, J. D. and Geddes, W. R. (Eds), *Anthropology in the South Seas*:75-110. Thomas Avery and Sons Ltd, New Plymouth.

Mason, G. M. and Wilkes, O. R. 1963. Excavations at Dashing Rocks, Timaru. *New Zealand Archaeological Association Newsletter* 6:95-98.

McCulloch, B. and Trotter, M. M. 1975. The first twenty years. Radiocarbon dates for South Island moa-hunter sites, 1955-74. *New Zealand Archaeological Association Newsletter* 18:2-17.

McDonnell, Lt. Col. 1888. The Ancient Moa-hunters at Waingongoro. *Transactions of the New Zealand Institute* 21:438-441.

McFadgen, B. G. 1980. A stone row system at Okoropunga on the southeast Wairarapa coast and inferences about coastal stone rows elsewhere in central New Zealand. *New Zealand Journal of Science* 23:189-197.

Molloy, B. P. J. 1969. Recent History of the Vegetation. *In* Knox, G. A. (Ed.), *The Natural History of Canterbury*: 340-360. A. H. and A. W. Reed, Wellington.

Murison, W. D. 1871. Notes on moa remains. *Transactions of the New Zealand Institute* 4:120-124.

Scarlett, R. J. 1979. Avifauna and Man. *In* Anderson, A. J. (Ed.), *Birds of a Feather*: 75-90. British Archaeological Reports, International Series 62.

Scarlett, R. J. Former Osteologist, Canterbury Museum, Christchurch.

Simmons, D. R. 1967. Little Papanui and Otago Prehistory. *Records of the Otago Museum* 4.

Simmons, D. R. 1968. Man, moa and the forest. *Transactions of the Royal Society of New Zealand* (General) 2:115-127.

Simmons, D. R. 1969. Economic change in New Zealand prehistory. *Journal of the Polynesian Society* 78:3-34.

Simmons, D. R. 1973. Suggested periods in South Island prehistory. *Records of the Auckland Institute and Museum* 10:1-58.

Skinner, H. D. 1924a. Results of excavations at the Shag River sandhills. *Journal of the Polynesian Society* 33:11-24.

Skinner, H. D. 1924b. Archaeology of Canterbury, 2: Monck's Cave. *Records of the Canterbury Museum* 2:151-162.

Skinner, H. D. 1934. A pit in peat, Central Otago. *Journal of the Polynesian Society* 43:293.

Skinner, H. D. and Teviotdale, D. 1927. A classification of implements of quartzite and similar materials from the moa-hunter camp at Shag River mouth. *Journal of the Polynesian Society* 36:180-193.

Smith, I. W. G. 1978. Seasonal sea mammal exploitation and butchering patterns in an Archaic site (Tairua N44/2) on the Coromandel Peninsula. *Records of the Auck-*

land Institute and Museum 15:17-26.

Smith, I. W. G. n.d. Estimated meat weights of moa. Unpublished manuscript, University of Otago.

Smith, I. W. G. Research student, Anthropology Department, University of Otago.

Sutton, D. R. and Marshall, Y. M. 1980. Coastal hunting in the subantarctic zone. *New Zealand Journal of Archaeology* 2:25-49.

Taylor, W. A. 1946. *Waihora: Maori associations with Lake Ellesmere.* The Ellesmere Guardian, Leeston.

Teal, J. 1975. Pleasant River excavations, 1959-1962. Unpublished B.A. Hons. dissertation, University of Otago.

Teviotdale, D. 1924. Excavations near the mouth of the Shag River, Otago. *Journal of the Polynesian Society* 33:4-10.

Teviotdale, D. 1932. The material culture of the moa-hunters in Murihiku. *Journal of the Polynesian Society* 41:81-120.

Teviotdale, D. 1939. Excavation of a moa-hunter camp near the mouth of the Waitaki River. *Journal of the Polynesian Society* 48:167-185.

Trotter, M. M. 1955. First excavation of a moa hunter camp site at Waimataitai mouth, Katiki. *Journal of the Polynesian Society* 64:295-303.

Trotter, M. M. 1961. A quartzite source near Nenthorn, Central Otago. *New Zealand Archaeological Association Newsletter* 4:29-32.

Trotter, M. M. 1965. Excavations at Ototara Glen, North Otago. *New Zealand Archaeological Association Newsletter* 8:109-114.

Trotter, M. M. 1967. Excavations at Hampden Beach, North Otago. *New Zealand Archaeological Association Newsletter* 10:56-61.

Trotter, M. M. 1968. On the reliability of charcoal for radiocarbon dating in New Zealand archaeology. *New Zealand Archaeological Association Newsletter* 11:86-88.

Trotter, M. M. 1969. *Lake Pukaki survey.* Archaeology Department Publication, Canterbury Museum.

Trotter, M. M. 1970. Archaeological investigations in the Aviemore area, South Island. *Records of the Canterbury Museum* 8:439-453.

Trotter, M. M. 1972. A moa-hunter site near the mouth of the Rakaia River, South Island. *Records of the Canterbury Museum* 9:129-150.

Trotter, M. M. 1979. Tai Rua: a moa-hunter site in North Otago. *In* Anderson, A. J. (Ed.), *Birds of a Feather*:203-230. British Archaeological Reports, International Series 62.

Trotter, M. M. n.d. Excavation diaries. Unpublished manuscripts. Otago Museum, Dunedin.

Trotter, M. M. and McCulloch, B. 1979. *Prehistory at Clarence Bridge.* Kaikoura Coastal Reserves Board Publication.

Wells, J. A. 1972. Ecology of *Podocarpus hallii* in Central Otago, New Zealand. *New Zealand Journal of Botany* 10:399-426.

Willetts, S. Former landowner at Waitaki Mouth.

Willey, G. R. and Phillips, P. 1958. *Method and Theory in American Archaeology.* University of Chicago Press, Chicago.

Received 2 December 1981