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BIRDS OF A FEATHER

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THE ROLE OF THE DOG IN THE ECONOMY OF THE NEW ZEALAND MAORI

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Introduction

Most interpretations of New Zealand prehistory have, in the past, been based on changes in artefact styles, or, more recently, in settlement patterns. Only in the last few years has use been made of the knowledge that food debris in middens reflects just as much culture-determined human choice as the artefacts made by man, and that New Zealand sites are capable of providing a much more sophisticated economic analysis than a simple division into 'hunter-gatherer' or 'agricultural'. The study of midden material provides a description, not only of foods eaten and their relative importance, but also indirectly of the society which organised its economic activity to obtain these foods, and of the cultural basis of that society.

The Polynesian dog of New Zealand held a unique place in the Maori economy; not only was it the only domesticated animal of the Maori, it was also the only land mammal of any size to be found in New Zealand during the prehistoric period. In the absence of any ungulate species in prehistoric New Zealand it was of particular importance as a food animal; moreover, since it lived in close association with man throughout the prehistoric period, one could expect changes in its distribution, physical form and diet to yield valuable evidence on wider changes in the Maori economy as a whole.

The Maori dog is now extinct in New Zealand as a separate identifiable breed, but is well represented in both Archaic and Classic Maori sites. This discussion is based on a study of over 2000 skeletal remains, representing a minimum of 338 individual dogs, from 90 archaeological sites ranging from the far north to the extreme south of New Zealand. There are also a number of ethnographic descriptions, of which those written in the period immediately following European contact are particularly valuable. The later the record, the more likely it is to be describing dogs with an admixture of introduced European breeds. Similarly the role of the dog in Maori society is likely to have been influenced by the social and economic impact of European culture. Maori culture underwent an abrupt and profound change following European contact. It is hard to distinguish, in later accounts, between descriptions of traditional Maori culture, and those of a culture, which, while still recognisably different from a European way of life, had been modified as a result of culture contact in ways which the observer himself often did not recognise.

Forster described the dogs of the Pacific Islands as

"... short, and their size varies from that of a lap-dog to the largest spaniel. Their head is broad, the snout pointed, the eyes very small,

the ears upright and the hair rather long, lank, hard and of different colours, but most commonly white or brown". (G. Forster, 1777: 378).

The elder Forster wrote a very similar description.

"... the dogs of the South Sea Isles are of a singular race, they mostly resemble the common cur, but have a prodigious large head, remarkably little eyes, prick ears, long hair, and a short bushy tail". (J. R. Forster, 1778, :189).

Crozet (1891), writing of the Polynesian dog of New Zealand, wrote:

"The dogs are a sort of domesticated fox, quite black or white, very low on the legs, straight ears, thick tail, long back, full jaws, but more pointed than that of the fox, and uttering the same cry: they do not bark like our dogs".

Anderson, who sailed with Cook on his third voyage, also described the New Zealand native dog as "a sort of fox dog" (Anderson 1784:809): while Cook, at Tolaga Bay near Gisborne, dismissed the Maori dog briefly as "very small and ugly".

All these descriptions of the New Zealand dog were written in the eighteenth century, at the time of the first European contact, and before the introduction of European dogs. Not until the nineteenth century do we read descriptions of a yellowish or reddish brown native dog in New Zealand. Dieffenbach, for instance, writes that the Maori dog "rather resembles the jackal; its colour is reddish brown, its ears long and straight". (Dieffenbach 1843). Colenso (1878) also described the Maori dog as yellowish or yellowish brown. However by the time he was writing it was almost certainly extinct. It is of interest as well to note that the majority of dogskin cloaks in New Zealand museums are black and/or white; these cloaks have no European innovations, such as sheep's wool, and are probably of pre-European or early post-European manufacture.

In summary, the ethnographic evidence would seem to indicate that the Polynesian dog of New Zealand was of small stature, brownish black, white or piebald in colour, with short legs and a relatively long body, its jaws broad at the molars but tapering sharply to a pointed snout, and with small eyes and large erect ears.

Skeletal Characteristics

Of more interest to the archaeologist are the skeletal characteristics by which Maori dog remains can be distinguished from those of introduced European breeds, or European crosses. Details of these diagnostic features are given in Appendix A: those of the cranium are a prominent sagittal crest, a narrow skull with a very long muzzle in relation to the length of the brain case, well-spaced teeth, occasional supernumerary alveoli, and the nasal bone typically ending level with the posterior borders of the maxillae. In the body skeleton there is the long narrow glenoid fossa of the scapula, and short legs in relation to body length.

None of these characteristics is enough in isolation to distinguish a Maori from a European dog, since each feature (except possibly the position of the

posterior end of the nasal bone and the supernumerary alveoli) is also found in various European breeds. They are, however, most unlikely to occur together in any but a Polynesian dog, the accuracy of the identification increasing with the number of observable features.

Although the physical appearance of the Maori dog seems to have been similar to that of the dog of tropical Polynesia, there are some interesting differences in skull and jaw formation, in particular the presence of a marked sagittal crest in the Maori dog skull. The presence of a prominent sagittal crest, although characteristic of the Maori dog, is not unique to it, being found in any breed of dog with massive jaws and powerful jaw musculature. However it is not present in the Polynesian dogs of the Pacific Islands, which mainly ate a soft vegetable diet.

The skull of the Tahitian dog is described by Luomala (1967), as "slender and delicate in appearance". Wood-Jones, (1931), discussing skulls of the Hawaiian native dog, states that, consequent to a diet of soft vegetable matter, the skulls became shorter, rounder, and devoid of sagittal crests. The muzzle of the Hawaiian dog is described as short and rounded, and the palate as short and broad, markedly different to the long, powerful jaw of the Maori dog.

No dog skulls of the tropical Polynesian type have been found in New Zealand, although presumably they exist since the dog was introduced into New Zealand by Polynesians from this area. It is difficult to estimate the length of time it took for the different environment and diet of New Zealand to produce changes in skull formation, but presumably at least the first generation of Polynesian dogs in New Zealand would have had the rounded skull and broad palate typical of tropical Polynesia. The presence of such dog skulls in a New Zealand site would be a strong indication that the site represented one of the first New Zealand settlements.

Although the morphological features of the Maori dog material studied showed considerable uniformity, there seems to have been a marked size difference among adult individuals. This is clearly shown in Figure 11.1, which gives the range of cranial, long bone and mandible lengths in the prehistoric dog population.

It was of interest to establish whether this heterogeneity was found within a single site, or whether sites contained a relatively uniform population with wide inter-site variation, and if the latter case, whether size variation had any regional or chronological significance.

Sites were placed in crude chronological order, according to their earliest date (where this was known), and according to their cultural associations (Archaic or Classic). Measurements from each site, and the mean measurement (shown by a solid bar) were plotted on a graph. Since intact crania and long-bones were too few to give a meaningful average length for any one site, the condylo-symphysis length of the mandible was used. The results are shown in Figure 11.2.

It is evident that the range of variation within each site is wide (over 3.5 cm., or 30% of the mean length, at Kaikais Beach for example), while the difference in average lengths in different sites is less pronounced and shows no

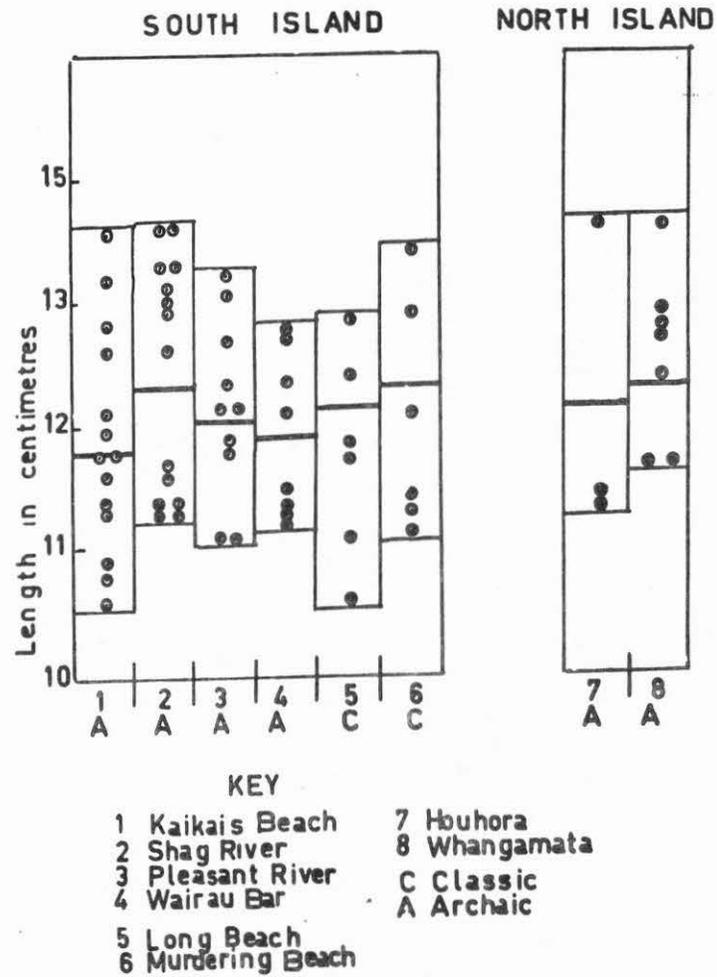


Fig. 11.2 Condylo-symphysis length of mandible

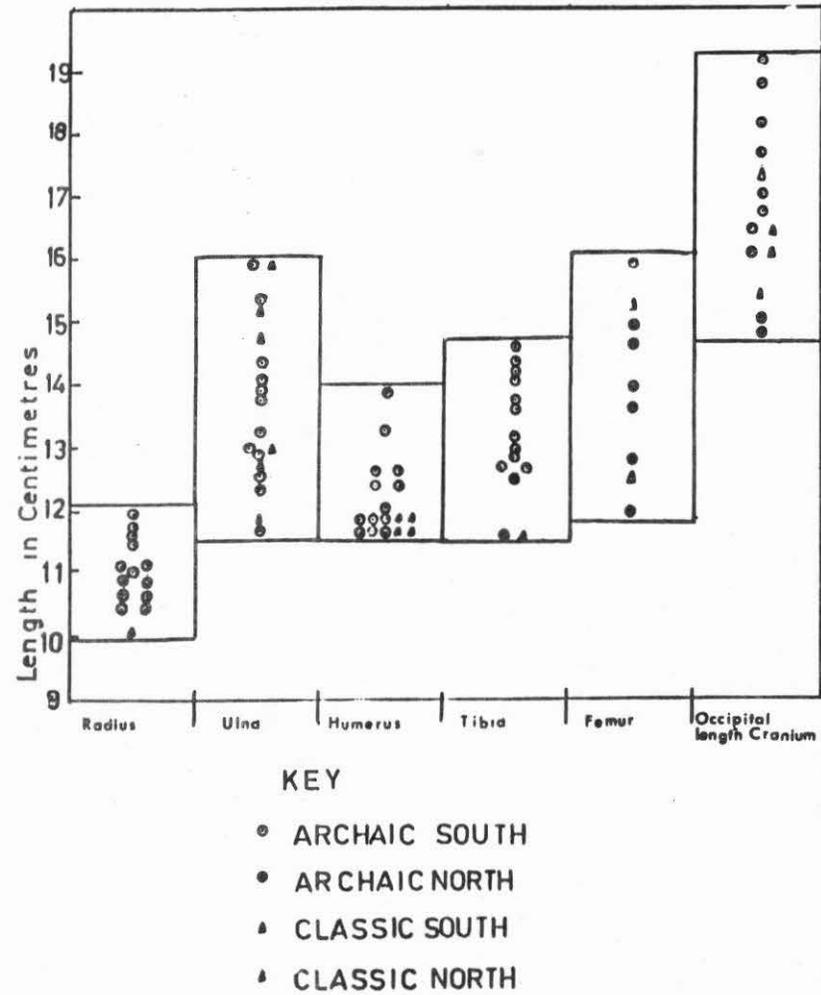


Fig. 11.1 Maximum length of Adult Skeletal Remains

obvious time/space distribution. The variation in size within a site may be explained partly by sexual dimorphism (male dogs are generally larger than females of the same breed), and partly by differences in age. Although all mandibles recorded on the graph possessed adult dentition, this only means that they were over seven months old, and some additional growth probably occurred after this stage.

There is no evidence in the skeletal measurements of the two separate breeds of Maori dog sometimes described in (late) ethnographic literature (e.g. Best 1913, Skinner 1914). Although a few exceptionally large dogs are present in some sites (e.g. Kaikais Beach), it is unlikely that the small number of dogs represented could constitute a separate breeding population; they are probably only the outer limits of the normal size variation found in any population.

The lack of any differentiation in body size and skeletal characteristics between dogs of the Archaic and Classic Maori period, implying that all Maori dogs are descended from a common stock, has interesting archaeological implications. New Zealand prehistory, at present, essentially consists of two polarised periods of Maori culture, which differ consistently in artefact and ornament styles. The connection between the two has not yet been defined, but presumably if the culture of the later period arose from a second migration to New Zealand of Polynesians bearing proto-Classic Maori culture, they would also bring with them dogs which should show some variations from those descended from the dogs originally introduced to New Zealand. The fact that there is no indication of such differences would seem to support the concept of an internal development within New Zealand of Classic Maori culture, suggested also by the number of artefact types common to both Archaic and Classic Maori culture (barbed one-piece fish hooks, bird spears, tattooing and round-sectioned working chisels, barracouta points, bone awls etc.), and the fact that Classic Maori culture seems to have no parallels elsewhere in Polynesia.

Although there seems to be no significant genetic change over space and time, there were interesting differences in phenotype between dogs of the North and South Island, notably with regard to dentition. Periodontal disease, an infection of the soft tissues of the mouth and subsequently of the alveolar bone, usually caused by attrition or irritation, was found in six jaws from Archaic sites and in four from Classic sites in the South Island, but was absent from all North Island material, including the large sample of ninety-four mandibles from Whangamata and Houhora. Another abnormality of the dentition, tooth loss before death with subsequent ossification of the alveolus (in most cases the result of trauma) was found in eight dog jaws from the South Island, while only one example was found in the North Island (see Allo 1971). Although the incidence of such pathological abnormalities was low, their almost complete absence in dogs from the North Island may indicate some difference in diet, in particular a less resistant diet with a higher proportion of vegetable foods.

This is also indicated by the difference in tooth wear between dogs of the North and South Islands. The degree of wear of the mandibular dentition was recorded for the Maori dog skeletal material according to a five point scale (see Appendix B). The results are shown in Table 11.1, and it is evident that the pattern of extreme tooth wear is found only among dogs of the South Island.

Table 11.1 Tooth wear in the Maori Dog

Site	Rate of Tooth Wear									
	.5	1	1.5	2	2.5	3	3.5	4	4.5	5
<u>Archaic South</u>										
Heaphy River	x									
Kaikais Beach	xxx	xxx	xx	xxx	xxx			x	x	x
Marfells Beach	xxx			xxx						
	xx	xxx	x	xx	x	x				
Pleasant River		xxx								
	x	xx	x	xx		xx		x	xxx	x
Tairua			xx	x						
Wairau Bar		xxx		xxx						
	x	xxx		xxx						
		xxx	xxx			xx		x		
		xxx		x						
<u>Classic South</u>										
Long Beach										xxx
	x	xxx	x	x	x		x			x
Murdering Beach		xx		x	x	xx	x		x	xx
<u>Archaic North</u>										
Houhora	xx	xx		x	x	xxx	x	xx		
Whangamata	xx	x	x	x	x	xx				
<u>Classic North</u>										
Houhora		x		xx	x		x	x		

If the average age at death of the dogs from the two areas was the same, these results would indicate conclusively that dogs of the South Island ate a more resistant diet, but since tooth wear is a product of age as well as diet, the higher frequency of heavily worn teeth in South Island sites may indicate an older population. On the other hand, it seems unlikely that there were no aged dogs in the North Island, and it seems probable that the different tooth wear patterns are at least partly related to diet.

These indications of dietary differences between dogs of the north and South Islands are of considerable archaeological interest in view of the unresolved controversy concerning the presence of agriculture during the Archaic period. There is no direct evidence of the prehistoric Maori cultigens; since these are all root crops such evidence is unlikely ever to be found, and the presence of prehistoric agriculture must be based on indirect evidence. Duff (1956), who first defined the Archaic period in New Zealand prehistory, believed that Classic Maori culture was an outside intrusion, and that not until this event was agriculture introduced into New Zealand. He bases this claim largely upon traditional evidence. This view was brought into some question by the discovery of an alleged agricultural soil in the Bay of Islands, dated at 800 A.D., and a (possible) agricultural storage pit in an early Archaic midden at Sarahs Gully in the Coromandel peninsula (Groube 1967 :21, Golson 1959). The division of New Zealand prehistory into agricultural (Neolithic) and non-agricultural (Mesolithic) may therefore be less chronological than geographical; Polynesian root crops cannot be grown in most of the South Island.

The Maori dog presumably shared the diet of its master, and the fact that there are probably diet-related differences in dentition between the dogs of the North and South Island, but no such differences between Archaic and Classic Maori material in the North Island, may imply that some dependence on vegetable foods was not confined to the Classic period, but was a feature also of the Maori economy in the North Island during the Archaic period.

The Dog as a Food Animal

Where bones on an archaeological site represent food remains they generally bear clear indications of the fact, both in postmortem damage and in their distribution. They are often burnt, broken, or carry the marks of butchering implements, and are scattered round the site, especially in cooking and eating areas. There is extensive evidence that throughout New Zealand prehistory the dog was used as a food animal.

Out of a minimum total of 335 dogs from New Zealand sites, only two were found articulated and nearly complete. The bones of the rest were widely scattered over the site, indicating that they were dismembered for eating. The removal of the posterior part of the cranium, presumably for the extraction of the brain, was a common feature on all sites, being found in 169 out of 204 crania (83%). The skull of the dog is very strong and unlikely to split cleanly in half across the parietals by accident, especially since the breakage did not follow a cranial suture. On some skulls there was even a clear indication of a heavy blow, probably made with a stone, on the supraoccipital or right parietal. These marks of percussion were always on the right side of the cranium, indicating the skull was held steady by the snout in the left hand in order to give

a right handed blow. The relatively few cuts found on the bones (apart from those of recent origin) would indicate that the dog was cooked whole rather than dismembered immediately after slaughtering. A few bones do bear shallow cuts, however, almost certainly made by stone knives. These cuts, nearly always on the long bones, may have been made in butchering the animal, or as a preliminary stage in manufacturing a bone artefact.

Carbonised bones were relatively common in some sites, but completely absent in others. Since the Maori in both the Archaic and Classic periods used the haangi, or earth oven, where the food is cooked by hot stones and never comes into direct contact with fire, the burning of bones is probably not a result of cooking, but is accidental.

The archaeological evidence that most Maori dogs were used for food is well supported by ethnographic evidence. There are several descriptions of the dog as a food animal. Crozet, for instance, who gave one of the first descriptions of the Maori dog, wrote in 1772: "It appears that the savages only raise them [i.e. dogs] for food". (Crozet, 1891). The elder Forster, in 1778, commented that "[Maori dogs] are kept by the natives chiefly for the sake of their flesh, of which they are very fond, preferring it to pork".

Although we know that the dog was killed for food, it is difficult to evaluate its economic importance in terms of the amount of dog meat eaten in relation to other foods. Owing to the lack of time control over the skeletal material, and the relatively small sample that excavated sites represent, it is impossible to estimate, from archaeological evidence, the dog population in New Zealand at any one time, but the distribution of skeletal material would seem to indicate that dogs were relatively more common during the Archaic period. The reduction in the number of dogs in Classic sites is difficult to establish quantitatively, since few sites were totally excavated, but it seems significant that there has been no pre-European Classic site excavated in the North Island with more than two or three dogs; and there have been numerous carefully excavated Classic Maori sites where all skeletal material has been kept and which lack dog bones completely; e.g. Station Bay (Motutapu), Hamlin's Hill (Auckland Isthmus), Bald Hill (South Auckland). It must be remembered, however, that there are also Archaic sites with little dog bone, mostly in the North Island; the site of Tairua, on the Coromandel Peninsula, for instance, has only two dogs. On the other hand we have North Island Archaic sites with plentiful dog material, such as Whangamata and Houhora.

It seems that the keeping of dogs was a common, although not universal feature in Archaic times, but rare during the North Island Classic period. There was apparently a general decline in numbers of dogs with the adoption of Classic Maori culture in the North Island. Yet it would be unwise to advance from this a simple explanation that the dog was relatively unimportant in Classic Maori culture. The available ethnographic evidence would seem to indicate that Classic Maori culture placed a high value upon dogs. The elder Forster (1778) wrote "The New Zealanders continually living on fish are glad when they can get a dog or bird to eat, which with them always is reckoned a dainty". Similarly Anderson, on Cook's third voyage, wrote, at Queen Charlotte Sound: "They also breed considerable numbers of the dogs mentioned before for food, but these cannot be considered as a principal article of diet". (Cook 1784:809)

Cruise, who lived for nearly a year in New Zealand in the early nineteenth century, describes the "... dogs, which themselves are sometimes eaten, and are considered a great delicacy". (Cruise, 1823:185).

The most comprehensive description of the dog as a food animal in the Classic Maori period (though perhaps unreliable because of the late date of the observations), is given by Best (1902:47)

"The domestic dog (kuri) was not numerous enough to form an important item in the native bill-of-fare, but its flesh was highly esteemed. This dish, however, only appeared on important occasions, as at a feast, or when prepared for a distinguished visitor.

The hind quarters of the kuri are said to have been the best eating". This account indicates that the dog was highly valued and limited in quantity, and that dog meat seems to have had an almost ritual importance in Classic Maori culture. As with the other main non-marine source of protein, forest birds, it was treated with ceremony and eaten only on important occasions.

Colenso writes (1878:151):

"The flesh of the dog was not only deemed a dainty but it was also a tapu (or sacred) dish. A dog was always killed for the priest to eat on performing certain tapu or religious ceremonies over the children of chiefs, and on other great and formal occasions; also as food for the tohunga-toa-moko, or tattooer, when operating on chiefs".

Augustus Earle (1966), the painter, who travelled through New Zealand in the early nineteenth century, gives an interesting description of a feast at Pakanae on the Hokianga. Dog meat had been chosen for this feast, in spite of the availability of fish foods and European meat animals; there were also pigs in the village.¹

Considering these accounts, it would seem that Classic Maori society suffered from a shortage of dogs; presumably dogs would have been preferred as a regular food resource rather than as an occasional delicacy if their numbers had permitted. Concurrently the Classic Maori period also saw the growth of large fortified sites, indicating the emergence of warfare; the appearance of cannibalism; and a very marked increase in the exploitation of shell-fish (See, e.g. Lockerbie 1959, Groube 1967). All these factors may indicate a growing population in a situation of some economic scarcity; a situation which was exacerbated by the decline in moa during the Classic period. The decrease in the number of dogs during the Classic period may be a related factor, in that the dog population in a settlement would be regulated largely by the food surplus available to feed them. Competition for scarce resources may have thus reduced the food available to feed a dependant dog population.

Although the resource exploitation at a single site cannot be assumed to represent a general economic pattern, the site of Whangamata Beach in the North Island, one of the very few New Zealand sites with both Archaic and Classic Maori remains, offers an interesting example of changes in dog exploitation over time. The site lies at the head of a large estuary, which opens out onto a long ocean beach: at the present day both types of littoral have very dense shellfish populations. The site contains two distinct cultural levels separated by over a metre of sterile sand, the later (Classic Maori) level consisting

of a thick midden layer. Three main types of edible fauna were found on the site: dogs, shellfish, and man (burnt and shattered human bones were probably evidence of cannibalism). The total midden excavated was retained for analysis and the faunal material translated into the minimum number of individuals and meat weights they represented. (Allo, 1971, 1972). Results are shown in Figure 11.3.

Since only twenty-four square metres were excavated in a site of unknown extent, any results must of course be tentative. However, it would appear that dog meat in the Archaic period constituted the major article of diet: shellfish were very rare although presumably the same nearby shellfish beds existed as today. In the Classic period dogs declined abruptly in importance, and the major source of protein seems to have been shellfish.

It is interesting to compare with Whangamata the Classic Maori site of Galatea Bay (Ponui Island). Shellfish were by far the most important food found in the midden (representing an estimated 4224 kg of meat), with fish second in importance (c. 136 kg of meat). A single dog was found on the site, representing only 5.6 kg of meat, (See Shawcross, 1967).

The Dog in Maori Technology

The dog also played an important role in Maori technology. The working of long bones of dogs into bone needles and points was a feature in Maori culture throughout the prehistoric period, and long bones, particularly the radius, are typically under-represented on sites (see Allo 1970:170-175). One of the two articulated prehistoric dog skeletons, that from Wairau Bar, was intact except for the tibiae and femora, which had been removed, presumably for the manufacture of artefacts. The manufacture of fish-hooks from the mandibular bone and canines seems to have been characteristic of the Classic rather than the Archaic period (see Allo *ibid*).

Dogs also provided skins for highly prized dogskin cloaks. The value of these cloaks seems to have been ceremonial rather than functional. All the clothing worn by the prehistoric Maori could be woven out of the native flax (Phormium tenax), and the use of dogskin did not incorporate any functional advance (except possibly as protection against spear thrusts); the dogskin cloak consisted basically of decorative strips of dogskin laid over a flax cloak base. The dogskin cloak had a significance, however, far beyond that of utilitarian efficiency, since it served as an indicator of social rank. Only chiefs were permitted to wear dogskin cloaks. Mead (1969:24) writes that "The cloak of dogskin is a concrete symbol of chieftainship, a badge of office".

An immense amount of labour was invested in each cloak; firstly a closely woven flax cloak was made, with taaniko embroidered borders along the side edges, and sometimes along the neck border. Subsequent methods of manufacture then depended on the type of cloak to be made, but usually long narrow strips of dogskin, about one inch wide, were sown to the cloak in a vertical position with a fine flax thread and bone needle. The hairy side, of course, faced outwards.

Most ethnographic descriptions portray the Maori dog as a food animal, indicating that its role as a provider of skins for cloaks was a subsidiary one.

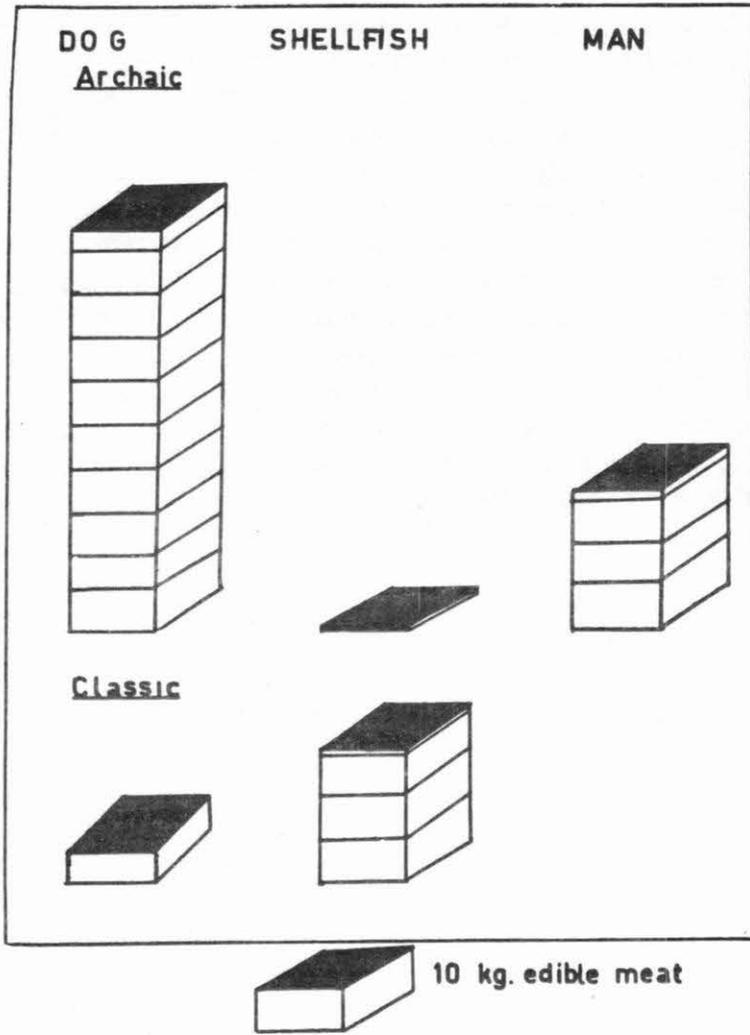


Fig. 11.3 Calculated meat weights of foods at Whangamata

Brunner (1848:281), who travelled through the South Island in the first half of the nineteenth century, stated that "... they [the Maori] never kill a dog unless for its skin". By this time, however the Maori dog was probably extinct, and European dogs were not used for food; moreover dogskin cloaks were being made extensively as trade goods.

Whether the Maori regarded the dog primarily as a source of food or of valuable clothing is not known, but in any case the dogskin cloak was of sufficient traditional importance to impart a certain ceremonial status to the dog, quite apart from its role as a highly regarded food animal. Evans-Pritchard (1940) has suggested that the ceremonial importance of a food resource among primitive people can be directly related to its economic importance. In terms of its calorific contribution to the Maori economy, the dog seems to have been of major importance only during the Archaic period. However the economic importance of a particular food resource cannot be measured simply in quantitative terms. As the only domesticated animal, the dog was the only source of animal protein whose distribution was governed by human movement; other animal resources could only be exploited by human movement to them. Furthermore, apart from the rat and the bat, it was the only mammal living in prehistoric New Zealand, and after the extinction of the moa was the only land animal of any size available for exploitation.

APPENDIX A. SKELETAL CHARACTERISTICS OF THE MAORI DOG.²

1. The cranium has a very prominent sagittal crest, a feature characteristically associated with a powerful bite and heavy jaw musculature. This was an almost universal feature in the Maori dog skull, and was found in 106 out of the 110 crania (96%). Only four adult crania were found with a reduced sagittal crest, giving the back of the skull a rounded juvenile appearance. Two of these, from Matatoki and Hawkes Bay, were surface finds, while a third comes from a site, Oruarangi, which contained early European dogs, or of mixed Maori-European breed.
2. The glenoid fossa, where the scapula articulates with the humerus, is relatively long and narrow in the Maori dog, and tends to be broader and more circular in most European breeds.
3. The limb bones are proportionally short compared to head and body size: this was particularly marked in the radius, ulna, and to a lesser extent, the tibia (see Allo 1970:69-76).
4. The nasal bone of the Maori dog characteristically ends in a relatively anterior position, level with the posterior borders of the premaxillas. In contrast the nasals of all observed modern breeds, both brachycephalic and dolichocephalic, end some distance behind the maxillas.
5. Present in the dentition of some Maori dogs are supernumerary alveoli, representing either additional teeth or the double roots of a normally single-rooted tooth. These alveoli are usually found behind the third molar of the mandible, although sometimes they are also present, in both mandible and cranium, between the first premolar and the canine. They are not a normal feature of Maori dog dentition—they are found in less than 1% of Archaic South Island mandibles—but where present in a site they are usually fairly common. They do not seem to be found in European dogs, even in breeds with a long jaw and well-spaced teeth (see e.g. Crawford 1937:216).
6. The teeth of the Maori dog are well-spaced in a long tooth row: tooth crowding was very rare, and in every case involved simply the lack of a diastema between premolars and never the overlapping of teeth. The tooth crowding index proposed by Degerbøl (1961), in which the combined lengths of the premolars are compared to the distance from the posterior edge of the alveolus of the canine to the anterior border of the alveolus of the carnassial, gave uniformly low results, indicating a very well-spaced tooth row. Results ranged from 75 to 81, similar to the indices of free-ranging wolves.
7. The Maori dog seems to have had a long, narrow skull, slightly broader than that of the modern grey-hound. The cephalic index, measuring the relation of head length to head width, of the few completely intact skulls ranged from 51 to 62: this can be compared to dolichocephalic, mesati-

cephalic and brachycephalic breeds such as the grey hound, fox terrier and pug with cephalic indices of 50, 70 and 90 respectively.

8. The palate of the Maori dog has a very characteristic shape: it is wide at the molars and narrows abruptly at the third molar into a narrow snout. This feature was also observed by Luomala (1967) in the prehistoric dog of Tahiti. She describes the marked constriction of the muzzle just in front of the fourth premolar or carnassial.
9. The snout of the Maori dog was very long compared to the length of the braincase. This is shown by the high cranio-facial index of the Maori dog cranium, measuring the relation of the distance between the nuchal crest and the fronto-nasal suture to the length of the nasal bone. The cranio-facial index of the Maori dog ranged from 10:6.5 to 10:8.5 (median 10:8). The cranio-facial index tends to increase with length of head, but that of a dolichocephalic breed such as the grey-hound is only 10:7, while that of the pug is 10:3. The high cranio-facial index of the Maori dog is even more remarkable considering the characteristic anterior position of the posterior end of the nasal bone.

APPENDIX B. TOOTH WEAR STAGES IN THE MAORI DOG

1. Some abrasion on the inner surface of the carnassial, but this very slight. The incisors still have the 'fleur-de-lys' shape.
2. The cusps on the carnassials and first and second molars show signs of wear. The 'fleur-de-lys' shape of the incisors begins to disappear.
3. The carnassials are very worn, and there is partial disappearance of the lingual cusps on the upper first molar. The canine shows signs of wear, and the 'fleur-de-lys' shape disappears from the incisors. In the European dog this stage occurs at c. two years.
4. The cusps are worn flat on the second molar, and on the third molar in the lower jaw, also the posterior cusps of the lower carnassial. There is extensive wear on the crowns of the incisors and premolars.
5. The incisors are worn almost flat to the original gum surface, while wear on the canine produces a spatulate flat top to the crown. The carnassials and molars are worn to a smooth concave surface, and the large anterior cusps of the premolars are worn completely away.

NOTES

1. The partiality of the Maori to dog meat does not seem to have extended to the European dog, which was said by the Maori to be "perfectly unpalatable". (See Dieffenbach, 1843; also Thomson, 1859:155; Wullerstorff-Urbair 1861-2:116).
2. For detailed measurements of the skeletal material see Allo 1970.

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