

found along the eastern coast of the South Island. In the North Island even coastal sites are not common, with very few moa-hunter sites known from inland. However, other factors may have had a bearing on the apparent lack of moa-hunter sites in the north.

A clear association between moa remains and a definite material culture – then known as ‘moa hunter’ – was not established until schoolboy Jim Eyles’ discovery of the Wairau Bar burials in Marlborough in 1939. Archaeologists now prefer to call the early stage of Polynesian colonisation of New Zealand the Archaic phase, and tend to downplay the role of moa in the diet of these early people. In both islands the evidence for direct hunting of the moa is highly variable from area to area. Although in general it appears that *Dinornis* was the most common moa hunted in the North Island, and *Eurypteryx* in the South, the pattern is quite irregular. At one time, for example, it was thought that the moa had been a rare bird in the North Island by the time the Polynesians arrived, but as archaeologist Janet Davidson explains in *The Pre-history of New Zealand*: ‘It now appears that in parts of the North Island a greater range of moa species was available for longer than in much of the South Island. Even so, there were other parts of the North Island in which moa seem never to have been at all important in the diet’.

Maori traditions

Some hunting techniques are recalled in Maori traditions recorded last century. The moa was said to stand on one leg when attacked, holding the other leg close to the body, poised to strike. A hunter struck by a kick from the bird was likely to be killed. The moa was ‘quite clever at warding off thrusts made at it, with the upraised leg . . . One very effective way was to strike the leg the bird stood on with a long heavy pole which usually brought it down, when it was killed by spears or clubs’. Other traditional methods included netting, snaring and pit-trapping, which made use of the forest paths of the moa.

The earliest investigations of moa kill sites left scientists aghast at the sheer quantity of the remains, and the area which they covered. Near the Rakaia rivermouth in 1869 Haast found an area of over ten hectares ‘covered with ovens, and moa and other midden bones, together with large numbers of flake knives of flint’. At some coastal sites the ploughing of the pioneers is said to have turned the fields white with bones. While the large kill sites of the eastern coast might represent several centuries of hunting, the general impression has still been that large numbers of moa were killed over a short space of time, with considerable waste of both flesh and bone.

What did moa meat taste like?

Moa flesh was surprisingly fatty, judging by the greasy residues of moa meals found in old ovens. It shared this quality with kiwi flesh, which is dark and was much favoured by the pioneers and pro-

spectors of last century. According to American ornithologists Austin Rand and Thomas Gilliard, ‘Cassowary flesh is prized and we found it dark, rich and tasty, quite unlike that of most birds.’ Sir Robert Falla thought roasted moa would have resembled roast ox.

A nesting moa may well have been an especially attractive food source, assuming that the moa stored up fat reserves for the long incubation in the way that the male emu does. On the nest, two generations of moa were at risk, and it is highly likely that the moa was doomed as equally by nest robbing as it was by hunting. During the season – most likely in early spring – moa nests would have been fairly easy to locate.

Repeated year after year, nest robbing would soon lead to a whole generation of birds being lost in any one area, as large birds tend to adopt what biologists call the K strategy of small broods and long lives, especially if they have few predators. Opportunistic hunting of the remaining adult and juvenile moa might see the local extinction of these birds in no more than a century. In this manner it is not difficult to imagine relatively small numbers of people eliminating the moa – and other ground-nesters – over large areas.

Although eggshell fragments are not commonly found with moa bones at archaeological sites, in 1865 at Puketoi in Central Otago, W. D. Murison saw a long line of old ovens, and in them an enormous quantity of eggshell fragments. Geologist Alexander Mackay said in 1905 that at one of his collecting spots near Wellington he had found “gallons” of eggshell fragments, which had plainly been cooked, and the contents doubtless eaten.

A moa egg would have made a good meal. ‘As a rough guess, I may say that a common hat would have served as an egg-cup for it: what a loss to the breakfast table!’ exclaimed Walter Mantell, who could be considered New Zealand’s first archaeologist for his excavations at Kaupokonui in 1847. But a moa egg was also a useful container and an item of trade. The moahunter burials uncovered on the Wairau Bar in the 1940s turned up 11 moa eggs that had been interred with other artefacts. Thus the eggs played a significant role in the simple economy of the early Maori, just as did the bones, when no longer green, and the bird’s skin and feathers.

Dog and rat

Although hunting and nest robbing might explain many local extinctions, the moa had also to contend with the dog and the rat. Whether the dog roamed wild is still in dispute. It is significant that kuri bones, though common in middens, are quite unknown from any natural deposit of animal bones in caves or elsewhere, and that the moa bones found in middens or ovens are only very rarely gnawed. From this latter observation Haast deduced that the moa-hunters did not have dogs, because the animals ‘would not have refrained from attacking the remains of their masters’ feasts’.

However, Hector remarked in 1872 that the wild dogs seen in the Otago interior in the 1850s were ‘not to be confounded with the true wild dogs of New Zealand, of which only a few specimens have been obtained, and always in dense bush as the district between the Maitara and Waikawa’. Archaeologist Atholl Anderson believes the southern Maori bred their kuri especially for hunting large birds, and cites the marked neck and jaw muscle development discernible in the remains of these southern dogs. Maori use of dogs for hunting kiwi and kakapo in the early days of European contact has been recorded in many accounts, and Heaphy noted in 1846 that the Maori of the upper Buller attributed the local extinction of the kakapo to wild dogs.

It has been suggested that the kiore could also have affected moa, damaging their breeding success by harassing the birds on the nest. Kiore have actually been observed to kill nesting sea birds on an atoll in the Cook Islands, but the lack of other protein on the island has been put forward as the most likely cause. In New Zealand the kiore has been regarded as predominantly vegetarian, with naturally a much wider choice of food than that on an infertile coral island. Nevertheless its presence on some offshore islands of New Zealand corresponds with a marked decline in numbers of large insects, seabirds and tuatara on these particular islands.

The fires of Tamatea

Other pressures on the moa developed with the arrival of the Polynesians. Soil horizons and pollen analyses have revealed that after Polynesian settlement, large areas of both islands, especially in Hawkes Bay, Marlborough, Canterbury, and Otago were set alight. Only a thousand years ago almost the whole of the country was in forest, or at least in scrubland. Even the swamps, then far more extensive, had their own cover of forest. Only alpine altitudes and those areas freshly disturbed by volcanic action appear to have been open country, apart from some persisting open areas in Central Otago, where charcoal from natural fires dates back to 6,000 BC. With these exceptions, permanent forest clearance began about one thousand years ago, with the most dramatic phase occurring about 1250 A.D. Even by that time however, as Atholl Anderson points out, the most intensive period of moa hunting was over, at least in southern New Zealand, suggesting that moa numbers were already significantly reduced. Although some very favourable habitats – vast tracts of rich podocarp forest – had been destroyed in these fires, it is also obvious that immense refuges of forest still remained on both islands, especially on the wetter western side of both islands. Yet moa disappeared from these unfired forests too.

There is also a widespread Maori tradition that ‘the fires of Tamatea’ were chiefly responsible for the demise of the moa, although sources vary as to whether these fires were natural or induced, and as to their main purpose. A tradition recurrent in the South Island, noted in the 1840s and 1850s, was that the moa were child-stealers, and the fires were a revenge involving all the tribes.