



Did the moa look like this depiction of a giant moa, *Dinornis*, the tallest bird ever to have lived? The illustration, by artist Chris Gaskin, is from the book *Moa, the story of a fabulous bird*, written by Philip Temple and reproduced with the kind permission of the authors and the publishers, Collins.

bird. However, gizzard stones and bones show that moas travelled to alpine areas in summer. J.C. Andersen, author and Turnbull librarian, saw moa stones at around 1660m in the Mt Cook area, in 1909, while in the 1860s Captain Fraser discovered enormous slaughter-heaps of moa bones at about 1500m on the Carrick tops in Central Otago.

A scientific report in 1971 gave an intriguing account of the excavation of at least five species of moa from a cave near Mt Owen, in the Murchison area, at an altitude of about 1305m, not far above the subalpine shrub belt. The moas, it seems, made summer forays to the tops to feed on the subalpine vegetation, and the authors wondered if 'the abundance of mountain plants bearing coloured and

fleshy fruits in summer could be explained in part as a response to the presence of moas.' The implication is that moas aided seed dispersal of some alpine plants. No other scientist since appear to have taken up this challenge, while others have cautiously explained the remains of moas at higher altitudes in terms of refugees from forest fires, or declining bushlines. The Mt Owen report maintained that 'plant remains found with the bones indicate the vegetation of the area has been consistently subalpine to alpine throughout the period of deposition.' (Bell and Bell).

Browsing effects

Such speculation opens up a much broader, ecological perspective on the inti-

mate association of moas with New Zealand's plant life over tens of millions of years. Such an approach came with the 1977 suggestion by two New Zealand scientists that moa browsing had influenced the growth patterns of our native flora, by encouraging the divaricating habit in many plants.

An unusual number of native plants (around 10%) have a close, thicket-like juvenile stage. Examples are weeping matipo, pokaka and coprosma species. The moa browsing theory has had some support from gizzard findings and nutrient analyses. Lancewood (*Pseudopanax*), for instance, has been shown to undergo a marked increase in protein content and soluble carbohydrates when the sapling reaches around 4m in height — just beyond reach of *Dinornis*, perhaps. However the moa browsing theory has since been rebutted by other arguments which favour a climatic explanation for the divaricating habit.

Dr Falla, with his view of moas as mainly grassland creatures, believed their affect on the New Zealand landscape would have been similar to that of sheep now, especially if — and this is doubtful — moas were gregarious. Certainly, moas with their heavy feet and prodigious digestive processes were long term soil conditioners. A more obvious role would be that of seed dispersal of such native trees as the miro, tawa, taraire and karaka. This important commission now rests with the wood pigeon, the only native bird which can swallow intact the large fruits of these trees. Passage through the pigeon gut has been shown to improve germination rates also, so it is likely that fruit-bearing native trees benefited in more than one way from the presence of moas.

Dr Phil Millener's doctoral thesis summarises extensive fieldwork in the dune-lands of the Far North, and with cave deposits in the King Country. In the extreme north of the North Island, for example, he established that with the exception of the kaka, moas outnumbered all other birds, in total numbers. The most common moa of the four genera present was *Euryapteryx*, with 367 of the 530 individual remains identified to this genus. Ponderous *Pachyornis* was present in good numbers (118 individuals), and *Dinornis* reasonably so. Only five *Anomalopteryx* remains were found.

A similar sample (607 individuals) of the caves of the King Country revealed a different balance of species. Three times the number of *Dinornis* moas were discovered (126 vs 40 in the Far North), whereas *Euryapteryx* and *Pachyornis* were present in much reduced numbers (94 and 44 respectively). Dominating the field, as *Euryapteryx* had done in the Far North, was *Anomalopteryx*, with the remains of 343 individuals.

The weka was the next most common bird in the north, the kakapo in the King Country.

Rugged landscape

Two other points emerged from the King Country study: that this area had been deeply forested for the duration, and that