

SEED-DISPERSING BIRDS IN NEW ZEALAND

In a recent note Norton (1982) stated that plants such as *Pseudowintera*, *Myrsine* and the podocarps, all of which have fleshy fruits suited for bird dispersal, were present in New Zealand before the arrival of frugivorous birds.

Norton apparently deduced from a paper by Fleming (1962) that birds arrived in New Zealand in the Miocene, c.25 million years ago. This is a misinterpretation, because Fleming clearly stated that the three endemic families of New Zealand birds (NZ Wrens, Wattle Birds and NZ Thrushes) were probably of early Tertiary origin and that the two endemic orders (Kiwis and Moas) probably dated from the Upper Cretaceous.

Although there are no known land-bird fossils from New Zealand older than the Upper Miocene (Fleming 1975), Cretaceous feather impressions confirm that birds were present in Australia about 125 million years ago (Talent *et al.* 1966). This is well before New Zealand separated from Australia in the Upper Cretaceous, perhaps 80 million years ago (Stevens 1980). Cracraft (1973) has stated that the diversity of birds known from the early Tertiary suggests that 'the class Aves, much as we know it today, was present on all continents in the Cretaceous.' There is no reason to doubt that New Zealand was already well-populated with birds, including frugivorous species, when the Tasman Sea started to form, or that it continued to be colonised by flying species after this event. Moas must be included among the frugivores (and potential seed dispersers) of probable Cretaceous origin, since they are known to have eaten the fruits and seeds of several plants, including *Myrsine divaricata* and *Podocarpus spicatus* (Burrows 1980).

The rise of the angiosperm plants, which now dominate the flora of New Zealand, dates from the Cretaceous (Fleming 1975), and so angiosperms such as *Pseudowintera* and *Myrsine* have probably evolved in the presence of birds throughout their history. The same is not true of the podocarps, which date back to the Triassic (Fleming 1975), before birds evolved. Nevertheless, New Zealand podocarps and their ancestors have probably coexisted with birds for over 100 million years, providing ample opportunity for the development of bird-adapted seed dispersal systems.

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