GEOFF MOON

The insect-eating grey warbler was originally classified as a warbler because it resembles 'Old World' species with similar shape and habits. It was not related to them, however. DNA testing now links the grey warbler with the corvid songbirds which evolved separately in the southern hemisphere.

It seems likely that at least five major groups — grebes, ducks, pigeons, parrots and passerines — arose in the southern hemisphere and did not spread to the northern hemisphere until about 25 million years ago. Though increasingly isolated by the widening of the Tasman Sea during the last 80–85 million years, New Zealand was at the edge of a major centre of bird evolution and was able to share in the 'adaptive radiation' of some major groups of birds.

Over half of the nearly 10,000 living species of birds are passerine or 'perching' birds. Included in the order Passeriformes are most of the smallish singing birds, such as sparrows, thrushes and honeyeaters, that live in or around trees and bushes. Their feet, with three toes running forward and a fourth toe opposed, are adapted for gripping a perch. At hatching the young are blind, more or less naked and helpless.

Evidence is mounting that the passerine birds arose in Gondwana. Circumstantial evidence for this is the great diversity of primitive passerines (like the New Zealand wrens) now present in the southern hemisphere. Direct evidence comes from recent fossil finds, especially the discovery at Murgon, south-east Queensland, Australia, of fossil fragments of two forms that appear to be passerines, dated at about 55 million years old. If correctly identified these are the oldest passerine fossils.

Songbirds, a grouping of the passerines, are tremendously successful as indicated by their diversity — some 4600 species worldwide, the most diverse single group of birds. Those in the northern hemisphere fall fairly obviously into families based partly on the shape of their bills as adaptations for feeding. For example, the seed-eating 'sparrows' (Ploceidae) and 'finches' (Fringillidae) and the insect-eating 'warblers' (Sylviidae) and 'flycatchers' (Muscicapidae), are all untroublesome groupings. Songbirds of the greater Australasian region, however, have never sat properly in these families. Our common garden songster, the grey warbler, was put in the warbler family (Sylviidae), and the acrobatic fantail in the flycatcher family (Muscicapidae) because their feeding behaviour and beak-shape suggested this.

However, there is an interesting phenomenon called convergent evolution that can confuse our attempts to classify organisms. Usually, species with similar structures are closely related and have each acquired their shared feature by descent from a common ancestor. However, natural selection may give unrelated animals similar structures if they exploit the environment in a similar way. A classic example is the streamlined body-shape and solid, rounded fins of the sharks (cartilaginous fish), ichthyosaurs (extinct reptiles) and dolphins (mammals), unrelated animals moulded by natural selection to a similar shape because swimming fast in the sea is (or was) a require-

Double Invasions

Among New Zealand terrestrial birds there are pairs of closely related species in which one member of the pair is either larger, or less able to fly, or darker, or a combination of these characteristics. These pairs of species represent double invasions of New Zealand by the same ancestral stock.

The descendants of the earlier invasions evolved into distinct species which, in the absence of snakes and mammalian predators, sometimes became larger and less adept at flying. The second invasion was often so recent that the descendants are little different from their relatives in Australia. Double invasion has been an important mechanism for generating new species among New Zealand birds. It is speciation by the separation of populations in time. In continents it is more usual for speciation to be by the separation of populations in space (geographically).

The pairs of species most likely to represent double invasions (with the result of the earlier invasion given first) are:

- weka — banded rail
- takahe (two species) — pukeko
- black stilt — pied stilt
- Antipodes Island parakeet — red-crowned parakeet
- New Zealand robin — New Zealand tomtit

Other pairs that perhaps stem from double invasions (result of earlier invasion first):

- moas — kiwis
- Dieffenbach's rail — banded rail
- Chatham Island rail — banded rail
- Hodgen's rail — black-tailed native-hen
- giant coots (two species) — Eurasian coot
- giant Chatham Island snipe — Chatham Island snipe
- New Zealand dotterel — banded dotterel
- kakapo — kaka and kea
- laughing owl — morepork
- Chatham Island warbler — grey warbler

Below: weka (left), banded rail (right). Descendants from common ancestral stock, through different invasions?

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