

components of the original habitat in which the specialization of these species has taken place (food, nesting requirements, etc.). Secondly, the breeding capacity of these species has been kept high for some reason and does not now succumb to added mortality factors. This should also apply to the habitat modified only by the activities of naturalized predatory mammals.

Some evidence for the first aspect was obtained in the present study, but the second aspect requires evidence obtainable only in the past. However, certain deduction is possible from the early records (cf. Buller, 1870, 1873; Potts, 1869, 1870, 1873; Reischek, 1884, 1887; Henry, 1903; Guthrie-Smith, 1910) that the forest birds now rare or nearly extinct had smaller breeding capacity and were either restricted in distribution or at least not as numerous as the species that survived introduced influences. Examples from the passerine species may be seen in Table XVIII.

New Zealand has undergone climatic changes in recent geological times, and especially during Pleistocene glaciation and the post-glacial period the birds that survived until the present must have been affected by climatic instability. Those species which maintained a high reproductive capacity probably responded more successfully to the expansion and shrinkage of forest under the influence of climatic change. Other species whose specialization was not favourable for survival in the subsequent period of changed climate probably became extinct, and this was perhaps accelerated in the most recent climatic change at which time human activities became influential in New Zealand (e.g., Moa-hunters). When the distribution of mortality factors changes suddenly as a result of the introduction of new factors either by man or by relatively fast natural changes in environment, the species that normally has a high mortality rate (hence having a high reproductive capacity in a stable population) is less likely to suffer a greater mortality than the species that normally has a low mortality rate (hence having a low reproductive capacity in a stable population). For the added pressure on the former species may only take a portion of the population which is normally eliminated by other mortality factors. The species, such as the Fantail and Grey Warbler, which have wide distribution with different densities in different habitats, and which maintain a high reproductive rate, probably have a constant struggle to colonize or increase in less favourable habitats and the surplus individuals are more readily eliminated. On the other hand, the species such as the Kokako and Piopio, which were specialized in one habitat, or maintained the population under very little predatory pressure in the past, have a low reproductive rate and do not produce many surplus individuals. In the latter species, a new factor may replace an old one in greater proportion than in the case of the former species and it may eliminate more individuals which are not surplus. What we see today is the result of such a dynamic change which is probably still in progress in many parts of New Zealand, and therefore we are not dealing with the populations whose birth-rate and death-rate have been in balance for many years under comparatively stable conditions.

Anomalies observed in soil formation (Raeside, 1948) and distribution of vegetation (Speight, 1910; Holloway, 1954) in the South Island have been interpreted to mean that slight but significant climatic changes took place in the post-glacial period in New Zealand (cf. Fleming, 1963). The distribution of birds may only reflect the present pattern of vegetation. If so, the stabilized populations of birds in podocarp forest in the past may be beginning to disappear today with retreating podocarp forest, especially when the destruction of the forest is aided by man. At the same time, the species with wide ecological distribution and a high reproductive capacity will probably survive the modified conditions, even after disease or predation has had serious effects on local populations.