

inated by rainbow trout and brown trout respectively and two practically devoid of trout.

The *northern troutless area* includes the Northland and Coromandel peninsulas and possibly the tip of the East Cape region. Its location, and the absence of trout from waters which seem otherwise suitable, indicate that high temperatures have prevented the establishment of trout. The *eastern troutless area* includes nearly all of the North Island east coast river systems except those entering Hawkes Bay. These rivers lack the hard gravels which trout require for successful spawning.

The *rainbow trout area* comprises the central part of the North Island. It is bounded on the north and east by the troutless areas and on the south by an almost straight line from north Taranaki to southern Hawkes Bay. The *brown trout area* occupies the rest of New Zealand. Within each area the appropriate species is usually dominant and balanced stocks occur only near the dividing line. The chief exceptions are in some large South Island lakes, where rainbow trout dominate mixed stocks.

Although in each area the now dominant species was the first to be liberated, it seems likely that biological and not only historical

factors have determined the present distribution.

As a result of environmental differences, trout vary greatly in growth rate and in size usually reached. Hence, where controlling factors are distributed in a broad pattern, areas with characteristic trout stocks arise. In the South Island three such areas have been identified, but in the North Island the more complex structure prevents their appearance.

The *large fish area* comprises the South Island west of a line from Cape Campbell to Te Waewae Bay. The area is mainly mountainous and the characteristic occurrence of fish large in size but few on numbers seems related to the nature of the terrain. The *small fish area* occupies the rest of the South Island. The country is generally flat or rolling, and apparently as a result, trout are usually abundant but relatively small.

The *low yield area* is part of South Otago where the average angling catch is less than is usual in the rest of the South Island. It corresponds almost exactly with the area occupied by schist and it may be that the flattened schist gravels are less productive of the bottom fauna upon which trout feed than are the more rounded gravels which predominate in most other trout waters.

The Distribution of New Zealand Reptiles

Y. M. McCann

The Reptilia, in New Zealand, are represented by four groups: the marine turtles (Testudinales), the tuatara (Rhynchocephalia), the marine snakes (Ophidia), and the lizards (Sauria). The marine turtles and snakes being stragglers have little bearing on the subject.

The tuatara once inhabited almost the entire area, but today is more or less restricted to sixteen islands.

The lizards are represented by the Gekkonidae and the Scincidae. The endemic gekkonids are peculiar in that they are the only viviparous species known; *Gehyra oceanica*, a comparatively recent introduction to the fauna, is egg-laying.

The habits of some gekkos and skinks, including their ability to withstand long per-

iods of fast, are conducive to accidental transportation in cargo or on oceanic drift. The viviparity of the gekkonids suggests a long period of isolation which would be necessary for their evolution to have advanced so far.

Among the gekkos, one species, *Hoplodactylus pacificus*, is found almost throughout the area. *Hoplodactylus duvauceli*, our largest gekko, has a curious discontinuous range, some off-shore islands in the northern portion of the Dominion and some islands in Cook Strait, which suggests that this species, like the tuatara, once ranged throughout the North Island. Both *pacificus* and *duvauceli* are more or less terrestrial, seeking shelter under stones and logs. *Hoplodactylus granulatus* and *Naultinus elegans* are arboreal

during their active period, descending to shelter in the ground during the winter. As far as I am aware both species are restricted to the North Island and its offshore islands.

Apart from the ubiquitous *Hoplodactylus pacificus*, the South Island geckos belong to a different genus, *Heteropholis*. They are probably also arboreal. So far no species of this genus has been recorded from the North Island. Cook Strait appears to form an effective barrier for the animals ranging north and south of it. No geckos have been recorded from the Chatham Islands, though skinks abound.

The distribution of the skinks presents a slightly different picture. For some unaccountable reason, the 38° S. parallel forms an effective barrier to species north and south of this line. From below this line southwards, a single species, *Leiolopisma zelandica*, has succeeded in penetrating most of the area. The remaining species are more restricted in their distribution. Some are confined to the North Island and its offshore islands, while others are restricted to the South Island and its offshore islands. A few species are markedly local. The skinks of

the Chatham Islands are distinct, although nearly related to the New Zealand species.

The most widely distributed gecko, *Hoplodactylus pacificus*, and the most widely ranging skinks, *Leiolopisma zelandica*, are both inhabitants of the shingle and jetsam along our coasts; other species do not normally occur in such habitats. As jetsam is sometimes washed out to sea again it is conceivable that such littoral species could be carried to sea and rafted to some other area or across Cook Strait. Thus the Strait does not constitute an effective barrier to these two species. The normal habitat of the other species excludes them from the possibility of transport by this means. However, some species may, in time, succeed in extending their range as passengers in cargo.

To sum up, the 38° S. parallel forms a barrier to skinks but not to geckos. Cook Strait forms an effective barrier to both, except the two littoral animals *H. pacificus* and *L. zelandica*. The absence of geckos from the Chatham Islands may perhaps be explained by the absence of suitable wind currents to transport them from the New Zealand area, and skinks may conceivably have been carried there by birds.

Natural Areas in the Distribution of Birds

R. A. Falla

It became apparent when this seemingly simple project was attempted that distribution maps of birds can be of several different kinds, and that furthermore there are several categories of birds for which they can be used. Thus a distribution map of an introduced species which may still be in the process of extending its range can have little in common with the surviving or relict distribution of a vanishing species. In all, nine different groups and categories were plotted without much success in disclosing a common denominator. There did appear to emerge one or two boundaries which coincided in more than one group, and this particular agreement had something in common with the map here presented, which shows a line approximately along the 38th parallel south latitude and another following in general the mountain divide from East Cape and carried through to include the eastern shore of Stewart Island. West of this line and bounded in the north (roughly) by the 38th parallel, lies the range of distribution of endemic genera of remote affinities and seden-

tary habits, either very recently extinct or only just surviving. The genera are *Strin-gops*, both islands; *Turnagra*, both islands; *Heteralocha*, North Island only; and *Xenicus*, both islands. These boundaries thus appear to have some distributional significance of fairly ancient duration. The same map, with some modifications, could be used to indicate the distribution of a sub-tropical rail (*Rallus philipensis*) which is well established with continuous distribution as far south as the 38th parallel area, with discontinuous pockets of establishment in Hawke's Bay, Taranaki, Nelson, ? South Westland, and Stewart Island. The whole concept, however, is considered to have strict limitations for detailed definition of areas. On the same map a shaded area has been used to indicate another type of distribution, that of the introduced Australian magpie as worked out in 1945 by L. M. McCaskill (N.Z. Bird Notes 1:86-104). This is considered to have no direct relation to the other line boundaries shown.

KEYS TO CLIMATE AND SOIL MAPS

MAIN CLIMATIC DISTRICTS

(See map)

- A. Very warm humid summers, mild winters. Annual rainfall 45-60 inches with maximum in winter. Prevailing wind south-westerly but occasional strong gales and heavy rain from east or northeast from Auckland northwards and about Coromandel Peninsula.
- A₂ Similar to type A but much wetter; rain-60-100 inches.
- B. Sunny, rather sheltered areas which receive rains of very high intensity at times from the northeast and north. Very warm summers and mild winters. Annual rainfall 40-60 inches with maximum in winter.
- C. Very warm summers, day temperatures occasionally above 90°F with dry Foehn NW wind blowing. Rainfall 40-60 inches per annum; marked decrease in amount and reliability of rain in spring and summer; moderate winter temperatures with maximum rainfall in this season.
- C₀ Drier than type C—rainfall 25-35 inches. Very sunny.
- C₂ Cooler and wetter hill climates. Very heavy rains at times from east or southeast; annual rainfall mainly 60-80 inches.
- D. West to northwest winds prevail with relatively frequent gales. Mean annual rainfall 35-50 inches; rainfall reliable and evenly distributed through the year. Warm summers, mild winters.
- D₂ Wetter than D—rainfall 50-80 inches.
- E. Mild temperatures, high rainfall increasing rapidly inland with height, minimum rainfall in winter especially in the south. Prevailing winds SW but gales not frequent at low levels in spite of exposed coastline.
- F. Low rainfall, 23-30 inches; in the south slightly more in summer than in other seasons. Warm summers with occasional hot Foehn north-

westerlies giving temperatures above 90°F, cool winters with frequent frosts and occasional light snowfalls. Prevailing winds NE near the coast, NW inland.

- F₂ Cooler and wetter hill climates. Rainfall 30-60 inches. NW winds prevail with occasional very strong gales specially along river courses. Snow may lie for several weeks in winter.
- F₀ Semi-arid areas, rainfall 13-20 inches. Very warm, dry summers; cold winters.
- G. Warm summers, cool winters. Rainfall 25-35 inches, evenly distributed except for slight falling off in winter.
- G₂ Wetter and slightly cooler than G climates; rainfall 35-50 inches; in coastal districts cloudy, windy conditions and frequent showers.
- M. High rainfall, mountain climate.

“NATURAL AREAS” OF NEW ZEALAND SOILS.
(Boundaries generalized from Soil Map of N.Z. 1948.)

SOILS IN WHICH THE ENVIRONMENT IS

FULLY EXPRESSED:

1. Soils of the cool semi-arid zone, developed under tussock grasses.
2. Soils of the mild sub-humid zone developed mainly under tussock grasses.
3. Soils of the humid zone developed mainly under forest.

SOILS IN WHICH THE ENVIRONMENT IS NOT FULLY EXPRESSED, DUE TO THE DOMINANCE OF CERTAIN FACTORS:

4. Skeletal soils on steep slopes dominated by the topography factor.
5. Recent soils from alluvium or volcanic ash, dominated by their youth—the time factor.
6. Soils from old volcanic ash, dominated by their abnormal parent material.
7. Soils from younger volcanic ash, dominated by their youth and their abnormal parental material.

Excursion

On Saturday, May 12th, there was an excursion by bus from Wellington, over the Rimutaka Range, to the southern portion of the Wairarapa district.

During the excursion stops were made at the following places:

1. Summit of Rimutaka Range: Mr. A. L. Poole and Mr. A. P. Druce pointed out features of the vegetation, which consists of scrub (manuka and some sub-alpine species) and remnants of the red beech and silver beech forest which formerly covered the area.

2. Western Lake Forest Reserve: Beech forest here comes down to the edge of Lake Wairarapa. Mr. Poole and Mr. Druce explained some features of the forest.

3. Lake Pounui: This is a small lake which is a bird sanctuary, and since the shooting

season was in progress considerable numbers of waterfowl were seen. A stop was made at this point for lunch.

4. Top of hill above Lake Onoke: From this point an excellent view was obtained of Palliser Bay, Lake Onoke, which is separated from the sea by a long narrow shingle spit, Lake Wairarapa, and the southern portion of the Wairarapa district, bounded on the east by the Aorangi Range.

5. Lake Onoke: Most of those present walked along the narrow spit and examined contrasting conditions on the seaward and landward sides.

From Lake Onoke the bus returned to Wellington over the same route. Commentaries on points of interest near the road were given throughout the excursion by various members, using the loudspeaker system in the bus.

