

Somewhere along the main mountain axis of the South Island is a line dividing it into two major biological areas: east and west. Where grasses are concerned the present evidence seems to afford no justification for dividing the island in any other way, except perhaps for convenience of reference. The North Island is fundamentally uniform except for a small patch between Kaweka and Kaimanawa Mountains and perhaps also One-tapu, which are similar in every respect to east South Island.

The discrepancy mentioned as occurring north of 38° S. is relatively small, due to the low elevation of the land which passes almost wholly into the subtropical zone. Being of low elevation much of it lies in the tension zone where species of the adjoining zones mix. In the north there is present a distinct group of tropical grasses. Although

only six in number they are characteristic of the zone rather than "area." The dividing line along 38° parallel is based on this fact.

Each natural group of grasses, whether a genus or its subdivision, or a group of genera, has its own characteristic distribution according to the zones and areas just outlined. Within these the numbers of species always relate closely to the size of the area in which the particular group occurs. In this respect the tropical element behaves in just this manner.

This evidence deduced from the distribution of our grasses suggests that we have two natural areas: the North Island and the western South Island, and the eastern South Island. The other subdivisions used by botanists appear to be largely a matter of convenience.

## The Distribution of Beech Forests

*A. L. Poole*

An account of the distribution of any vegetation presupposes a satisfactory classification of it. Excepting a few small areas, no detailed analyses have been made of our plant communities; rather have we depended upon a somewhat general approach, following Cockayne who classified forests into communities named from their physiognomic dominants. He also drew attention to changes brought about by succession and maintained that changes, brought about by time, were the result of succession.

As a working classification Cockayne's forest communities serve their purpose but his theory of succession left much to be answered. J. T. Holloway introduced an hypothesis of comparatively rapid changes taking place within forests because of changes in climate ("Forests and Climate in the South Island of New Zealand," 1954) which must somewhat alter Cockayne's classification. Holloway who was working on a forest survey used "forest type" . . . "as being a simple forester's term denoting any clearly distinct unit of forest vegetation." According to his hypothesis a forest community or type could owe its presence to

the invasion of one community by another, and not to succession "in situ."

The distribution of natural communities of plants is usually decided by the various factors (climatic, physiographic, edaphic or soil and biotic) of the habitat. Recently the importance of historic factors has been strikingly shown in the natural vegetation that occupied the pumice showers of the central North Island. These migration patterns of plant communities show that there is a certain amount of luck in deciding which community occupied an area immediately after eruption.

Another matter appears important as the genetic nature of species becomes better known; as individual species migrate, geographic variations, known by botanical terms according to their genetical nature, are separated out, and opportunity for species hybridisation occurs. These phenomena give rise to new communities.

The greatest concentration of beech forest lies in the South Island, where it forms, and probably always did form, the bulk of the forests. In the central Nelson area occurs

the most intimate mixture of all nine species. It has been stated that beech forest reaches its most vigorous development in the forests of this region. In this area of intimate mixture it is difficult to sort out the main factors determining the presence or absence of a species on a particular site. As we move out of the district, however, the forests contain two or even one species only.

Thus to the eastwards as the climate becomes dryer, black beech is more common at lower, and mountain beech at higher, elevations. (These two species are connected by intermediates and until more taxonomic work is done it is often difficult in many stands to know what one is dealing with.) So-called black beech but usually an intermediate form is found in lowland Marlborough and Canterbury as far as 44 deg. S. Westwards, brown beech becomes more common until on the west coast it is the only species present, though it does no more than form limited pockets of forest. It does not occur south of the Taramakau River.

In the remainder of the South Island the distribution of beech forest and the beech species themselves are related to glaciation and recent climatic changes. On the west coast, between the Taramakau and Paringa, practically no beech occurs. It seems to be agreed that recent glaciation extinguished it in this region, and that subsequent migration, still taking place, has only reached the Taramakau and Paringa rivers in the north and south respectively, and has not been possible over the main Divide passes lying between these rivers. South of the Paringa River in the wetter parts and throughout western Otago and Southland is the home of the silver beech which forms much more extensive tracts of pure forest than any other beech species. Throughout Fiordland it is by far the most common forest tree from sea-level to timber line. East of the Divide the general form of the tree is sufficiently good for silver beech to be the main millable species. Throughout this area, silver beech is actively invading podocarp-broadleaf forest and Holloway describes many anomalous patterns of forest distribution

on this basis. Also in this area, as the climate becomes dryer, mountain beech grows plentiful and forms pure forests. In the subalpine forests its form is similar to that of mountain beech found elsewhere, but at low altitudes it is a medium-sized tree of very good form and straight trunk. In leaf form, however, it tends slightly towards black beech and requires close taxonomic scrutiny. The southernmost occurrence of red beech is not far south of Te Anau, but south of this, hybrids between it and mountain beech are found, indicating that the species has only recently disappeared from the area.

Workers in the Tararua Ranges in the North Island have distinguished altitudinal zones of vegetation into which the beech species there can be fitted. Throughout the warm temperate zone (up to 600 metres) occur mainly hard and black beeches while in the upper part of this zone and the lower part of the cold temperate zone, red beech grows. Silver beech is present throughout the cold temperate (600-1200 metres) zone. Mountain beech is absent.

North of the Tararuas, beech forest occurs mainly on the eastern North Island, south of latitude 38 deg. S. though black beech and hard beech occur as ridge stands in the north Taranaki forests and hard beech as stands, usually in mixture with kauri, as far north as Kaitaia. Mountain beech is found up to 38 deg. S. lat. and silver, red and black beech occur on Mount Te Aroha.

On more recent pumice eruptions beech forest occurs in the most intricate pattern obviously related to the volcanic history of the area. Up to the time of white settlement, or possibly Maori settlement, beech forest had been migrating slowly through tussock grassland. Forest formed a sharp boundary with grassland and the edge of the forest was usually a very specialised ecotone. One of the most common forms of this was a forest edge of silver beech which pioneered the way through tussock grassland for mixed red-silver beech forest. Black and mountain beech also pioneered for red beech.

---