

belt of dense *Phyllocladus alpinus* 50-300 yards wide with scattered *Dacrydium bidwillii* as a small tree and a marginal underscrub of *Dacrydium subulatum* and *Pittosporum anomalum* which is locally common. The *Phyllocladus* on its inner margin is drawn up and frequently dead, while beech saplings are common. At first sight this suggests a rapidly advancing ecotone, but the slow growth-rate of *Phyllocladus* (110 rings to 1 in) shows that the marginal fringe is a long-standing one.

(3) SILVER/MOUNTAIN BEECH ECOTONE. Mountain beech takes the place of silver beech in the Kaweka Range to the east and in most of the Central Kaimanawa Range to the south. The ecotone with the Kaweka stretches beyond the Oamaru boundary into that range, but the southern ecotone makes the complete transition in the length of the Waiotapuritia Valley (4 miles).

Mountain beech first appears (apart from small swamp communities and scattered trees on stream and forest margins) on the peaks above the Kaipo Valley where it is mainly associated with silver beech but forms pure stands in limited areas above 4,100ft. A similar pattern occurs to the west at the head of the Waimarino River. On Maungarahi though pure silver beech forms the timberline on the western side, mountain beech forms the timberline on the east. Going south from the trig. mountain beech appears within half a mile, at first as a narrow belt of young pole timber, which widens until four miles south at the end of the ridge it is dominant above 3,600ft and common below this (Fig. 2). Silver beech may dominate on shady faces up to 4,000ft but usually in groups of overmature trees.

Above 3,600ft the pattern is of younger mountain beech replacing older silver beech in the canopy, but at the same time saplings and seedlings of the latter frequently dominate the undergrowth below a mountain beech canopy. The same pattern has been noted on the Kaweka side of the ecotone and elsewhere at about 4,000-4,200ft.

The lower forest margins along the tussock valley also show the progressive entry of mountain beech from 3,400ft at the head to 3,250ft at the confluence where the Ngaruroro River begins.

The *Phyllocladus/Dacrydium* margin of silver beech forest which has been previously mentioned ceases abruptly at the incoming of mountain beech, whose saplings give on to tussock mixed with a good deal of *Dracophyllum subulatum*. *Phyllocladus* persists, however, in the narrow gullies that intersect the pumice terraces at intervals and in these forms pure stands (Fig. 2). One curious feature of the junction joint of silver beech and mountain beech margins is the repeated occurrence of a few saplings of hybrids between the latter and red beech although red beech is only a minor constituent of the immediate forest.

Red beech dominates in limited areas lower down the valley but the belt of mountain beech broadening both from above and below pinches both red and silver beech out on the western side beyond which mountain beech is a pure dominant for the whole length of the Central Kaimanawas. Silver beech at its extreme limit on the western side of the Ngaruroro confluence is in a narrow wedge of all-aged trees, saplings and seedlings, at an altitude of 3,600ft.

Below the confluence the outlying forest island under Tapui o Marua Hine, the prominent peak across the Ngaruroro Valley from the Oamaru Saddle, contains all three species of beech distributed by altitude.

SUB-ALPINE SCRUB. The flat summit of Maungarahi (4,717ft) is the only area of any extent that lies above the timber line. There is also a small area on Pikiawatea. Maungarahi is covered by a low scrub of particular interest in that in January, 1939, there was evidence near the trig. of a recent fire, leaving an open community dominated by a *Hebe* swarm, consisting of *Hebe odora*,