

flora, *Podocarpus Hallii*, *Libocedrus*, *Dacrydium Bidwillii*, *Blechnum discolor*, *Coprosma Colensoi*, *C. Banksii*, *Nothopanax anomalum*, *Flacocarpus Hookerianus*, *Polypodium novæ-zealandiæ*. Where most luxuriant the undergrowth is about 8 ft. tall, *C. fetidissima*, *C. tenuifolia*, *Nothopanax Colensoi*, *N. simplex*, and beech saplings being the tallest growth, but these latter are most abundant where the illumination is strongest, when they easily become dominant and are taller. The trees themselves vary in distance from one another by from a yard or two to as much as 20 yards, but this latter is exceptional. Their crowns mostly meet, but light comes through in fair abundance. The ground is usually covered with mosses and liverworts, into which the feet sink, making walking rather laborious. There are many fallen trees, some much decayed, and on them in the lower part of the formation plenty of the creeping fern *Polypodium novæ-zealandiæ*, its dark-green deeply-cut fronds a foot or more in length given off here and there from its long, thick, scale-covered rhizome. On the forest-floor are colonies of the broad-leaved grass *Microtana avenacea*; a great abundance of *Astelia montana*; large breadths of *Hymenophyllum multifidum*; the shrub *Styphelia fasciculata*, not erect as usual, but closely hugging the ground; *Myrtus pedunculata*, of similar habit; *Luzuriaga*, its wiry stems creeping through the mosses; the grass-like leaves of *Libertia pulchella*, 4 in. or 5 in. tall; tussocks occasionally of the sedge *Gahnia pauciflora*, the leaves 3 ft. long; large colonies at times of the umbrella fern (*Gleichenia Cunninghamii*). As the altitude increases, *Nothofagus cliffortioides* seedlings put in an appearance, *Coprosma cuneata* becomes abundant, and an occasional young plant of *Libocedrus Bidwillii* and *Podocarpus Hallii* appear. Finally *N. cliffortioides* becomes dominant, and a new zone begins.

The following from my notebook describes a piece of *N. Menziesii* forest which occupies a deep gully on the east of Tongariro between the Waiho-honu and the Oturere, and which is rather a conspicuous object in the landscape. The quotation shows how the above-described and this latter piece of forest resemble one another, the one owing its presence to its southerly position on Ruapehu, and the other to the shelter of a gully enclosed on all sides by steppe.

"The forest stands in part upon the hilly slope, and descends in part into the rather deep gully. The tall trees, 60 ft. or so tall and sometimes 3 ft. in diameter, are altogether *Nothofagus Menziesii*. There is a much closer and richer undergrowth than in the mountain subalpine forests of *N. cliffortioides*. This, together with the short branching of the trees and their numerous and still shorter lateral branches on the trunks, which are more or less moss-clad, gives a distinct stamp to the formation. The forest-floor is rarely bare, but covered frequently with a strong growth of *Hymenophyllum multifidum* and especially large quantities of *Polytrichum dendroides*. Besides the usual shrubs, certain subalpine-scrub shrubs enter into the formation—e.g., *Aristotelia fruticosa*, *Phyllocladus alpinus*, and *Olearia nitida* (which in this region is rather a forest-plant than one of the scrub).

"The undergrowth may be man-high, but generally it reaches to about one's middle. The sparsely branched *Coprosma fetidissima* is dominant. Young plants of *Nothofagus Menziesii* are almost equally abundant. *Suttonia divaricata* and *Nothopanax simplex* are quite common. *Myrtus pedunculata*, not found in the *Nothofagus cliffortioides* forest, is fairly abundant. *Coprosma parviflora*, *C. microcarpa*, and *C. cuneata* are frequent, especially the first-named. There is some *Drimys colorata*. *Rubus australis* is present where strong sunlight can penetrate, and occasionally has thick, rope-like stems. There is a good deal of *Nothopanax Colensoi*, some *Aristotelia fruticosa*, *Griselinia littoralis*, and *Pittosporum Colensoi*, and an occasional young plant of *Veronica salicifolia*. As for ferns, they are especially abundant in the gullies, where *Poly-stichum vestitum*, with short trunks, and *Hypolepis millefolium* are plentiful. There is also a small amount of the crape fern (*Isoetes superba*).

"The trees are not very close, except where they are saplings. The old trees are tall and of considerable diameter. The bark of these is furrowed, as opposed to the smooth bark of younger trees. The leaves are bright-green, shining, small, and inserted closely together on the flanks of the final twigs, which are arranged in a somewhat flabellate manner. Besides mosses and lichens, there are frequently *Hymenophyllum* mats on the trunks, and *Asplenium flaccidum* depends in close, drooping masses from the lower boughs. Many of the old trees are in a state of decay, and there is much fallen *débris* on the ground. In short, the forest is at the present time undergoing a natural process of rejuvenation."

(f.) THE TOOTHED-LEAVED-BEECH (*NOTHOFAGUS FUSCA*) FOREST (Photo. No. 12).

At an altitude of 2,100 ft. or rather more, to the south and west of Ruapehu, the magnificent taxad forest of the Waimarino gives place to a zone in which the toothed-leaved beech (*Nothofagus fusca*) is the dominant tree, though a great deal of *N. Menziesii* is mixed with it. At first a large percentage of the shrubs and small trees of the taxad forest are present, but with increase of altitude certain species vanish or become scarce—e.g., *Melicytus lanceolatus*, *Rapanea salicina*, *Olea lanceolata*, *Melicytus ramiflorus*, *Hoheria sexstylosa*, *Coprosma grandifolia*, *Beilschmiedia tawa*, *Podocarpus ferrugineus*, *Dacrydium cupressinum*, *Aristotelia racemosa*, *Fuchsia excorticata*, *Nothopanax arboreum*, *Parsonsia heterophylla*, *Astelia nervosa*, *Blechnum lanceolatum*, *Hypolepis tenuifolia*, *Dicksonia squarrosa*, *D. fibrosa*, *D. lanata*. The *Nothofagus fusca* trees, at first frequently exceeding 80 ft. in height and 6 ft. in diameter, become gradually smaller in size, though it is remarkable how at 3,000 ft. and more altitude many still are of large dimensions.

The tender green of the leaves and the open character of the foliage, giving it a lacelike appearance, mark the physiognomy of this formation as quite different from that of those already described, while the thick and buttressed trunks (Photo. No. 13), with their flaking and furrowed bark, still more accentuate the difference.

There is a distinct second tier of shrubs or small trees with slender stems, frequently moss-clad, and short rather scanty lateral branches, and whose general direction is out of the perpen-