

NEW ZEALAND BEECH FORESTS.

Abstract of Mr. G.M. Smith's talk on February 18th, 1946.

To ensure the regeneration of our beech forests for all time the New Zealand forester must learn to domesticate the native species of *Nothofagus*. His present knowledge and treatment of beech trees may be compared with what the prehistoric races knew of wheat when they first began to cultivate it. It is likely to be centuries before all the problems are satisfactorily solved.

Even the present distribution of the species is not yet known in full detail, and records that could be made by members of botanical societies might well add useful information. There are five indubitable species and a host of hybrid forms amongst which it is possible that other good species remain unrecognized.

*Nothofagus truncata*, a species clearly defined only in 1924, is the only beech found north of Auckland, where it occurs in considerable quantity on Little Barrier Island, and as scattered trees further north. In the South Island it is milled in the vicinity of Lake Brunner, which is probably near its southern limit. It is not known in the South Island east of a line near the Pelorus River.

*N. menziesii* occurs on Mt. Te Aroha, on the Mamaku Plateau, at low altitudes on the Kaimanawa Range east of Taupo, also at low altitudes near Ruapehu, but higher on the mountains nearer Wellington. Except on the Mamaku Plateau the silver beech does not occur in the North Island in commercial stands, i.e. in stands where it is dominant and growing at its best. In the northern part of the South Island (e.g. at Mt. Arthur) the silver beech belongs to the montane forest where it does not grow to the well-formed tree attractive to the sawmiller. A curious case is seen at Grassy Creek near Murchison where on a river flat *N. menziesii* is (or was) dominant both ecologically and commercially just as it is in the Southland forests.

Silver beech has a broken distribution down the west side of the Alps. In the east it occurs sparingly as a solitary riparian tree. Behind Dunedin are many remnant pockets (eighteen described by Scott Thomson and Simpson); there is a band on the east side of Mt. Maungatua, and a large patch in the Oatlands. The species is missing then until west of the Aparima River where the great longwood forest offers good prospects for domestication, in spite of the unfavourable circumstance that here too are found all the major pests of Silver beech.

*N. cliffortioides* has the most irregular and difficult distribution to map. Undoubted occurrences of *N. cliffortioides* should always be recorded. The square-cut truncate leaf base and greater breadth in proportion to length in leaves of the fully mature tree distinguish this from the other entire-leaved species, *N. solandri*, which has a cuneate (wedge-shaped) leaf base.

*N. fusca* extends south from Mamaku Plateau. It is closely related to *N. truncata*. A constant and little-known difference is that seeds of *N. truncata* are always pink in mass, while those of *N. fusca* are always straw-coloured. Phials of seeds illustrated this point.

*N. solandri*, commonly but not everywhere called black beech, is difficult to identify certainly. Besides the leaf shape mentioned above, characteristic features are wide sap, acid hard heart, red flowers and dark ridged and very fibrous bark. Its northern and southern limits are both still uncertain, nor is it known how far west this predominantly eastern species extends.

The areas occupied by the different species overlap considerably. In one forest area of 20,000 acres behind Motueka and 30-40 miles from Nelson, large representative stands of all five species (with innumerable hybrids) may be seen, each in its appropriate situation.

*N. menziesii* shows a series of characteristics that set it apart from all other New Zealand species. It has much in common with certain exotic species with which it might form a sub-group of sub-generic rank.

1. The form and texture of the leaf is very constant in spite of differences in size. The double crenation of the leaf margin is very typical.

2. The cotyledons (as demonstrated by specimens) are always entire, whereas in other New Zealand species they are deeply notched.

3. The cupules enclosing the seed bear lines of glandular hairs as do those of the South American N.dombeyi (Specimens shown).

4. The wood of N.menziesii seasons evenly, but is not durable, and is suitable only for inside use. The wood of the other New Zealand species seasons very unevenly, but is very durable in the ground.

5. The detailed structure of the pollen grain of N.menziesii has been shown by Miss Cranwell to be quite different from that seen in other New Zealand species.

6. Though the other species hybridize in various combinations there is still no evidence that N.menziesii crosses with anything else. This might be accounted for in part by the late flowering of N.menziesii of which pollen usually appears six weeks after that of any other species in the same district.

7. N.menziesii alone amongst our beeches is subject to infection by the honey fungus Armillaria mellea.

8. Cyttaria gunnii, the strawberry fungus, has been found in New Zealand only on silver beech, though another species forms burrs also on the N.moorei of Queensland.

9. The large red-flowered mistletoe, Elytranthe colensoi, is on N.menziesii and on N.menziesii alone, and in very significant quantities. At the edge of a forest in the Longwood district it forms a mantle 20-30 feet long. Trees are killed by the hundred, though they are millable, if killed from above, for three to four years after death. Other beeches carry E.flavida.

10. A small mite causes "witches' broom" on N.menziesii but does not affect the other species.

Points 6, 7, 8, 9 all require further extensive observations and records.

N.cunninghamii of Tasmania and Victoria, N.moorei of Queensland, and N.dombeyi of South America should probably be grouped with N.menziesii.

Several species of beech have been grown here from seed obtained from S. America 8-10 years ago. Specimens showing foliage and bark came from plants growing in the Otaki Valley. In several unexpected ways these foreigners contrast strongly with our native spp. Growth at Otaki has been very fast, e.g. height of 30 feet and D.B.H. 4-5 inches at ten years from seed. On the ever green N.dombeyi and the deciduous N.obliqua and N.procera opposum damage has been severe whereas it is negligible in local species. N.procera and probably the other two species send up coppice shoots from the base, as does Fagus; our Nothofagus usually produce no short shoots when a tree is cut. Rare in New Zealand species but common in these introduced ones are epicormic branches, i.e. branches that, although lower on the tree are younger than those above them. The diversity in leaf size on one species is striking, the more so as the big leaves tend to be towards the distal ends of stems, not in shaded parts of the tree where we would expect them on N.Z. species of the genus.

The native cicada gives little trouble in native beeches, but in trees of S. American species it has caused considerable damage, allowing rot to set in at the point of injury and reducing resistance to wind. Hepialus, the large green ghost moth, has attacked almost every tree leaving the characteristic holes that we associate rather with puriri and lacebark and makomako than with beech trees.

The practical significance of root grafts in beech saplings is still obscure, but it may be considerable. The mycorrhizal relations of beech roots have not been worked out. Much still needs to be known about the soil relationships of all species of the genus; tests already made show a very low pH (4.2-4.7) indicating a very acid soil. Though many such problems remain to be solved the most formidable obstacles in the domestication of New Zealand beeches are on the administrative side.