(b.) Effect of Wind and Soil.

Wind and soil conditions are the chief factors with regard to non-hereditary variation so far as Stewart Island plants are concerned, altitude also playing some part. That exposure to wind leads to a general stunting, &c., of the vegetation can occasion no surprise, and would be hardly worthy of comment; but when forms of the same plant have an absolutely different appearance, and even special adaptations in harmony with the change of circumstances, the matter is one for careful examination and record. *Coprosma areolata* and *C. rotundifolia* are two forest-shrubs with numerous slender branchlets more or less interlacing, and given off from the larger branches at a right angle or thereabouts. Within the forest the density of growth is slight, but at its outskirts, near the seashore, the shrubs have the densest habit imaginable, forming close, rounded, wiry masses of twigs. This dense form is normal in the shrubby ribbonwood (*Plagianthus divaricatus*) of salt-meadows. In the ribbonwood (*P. betulinus*) there is also an interlacing, twiggy form, but it is confined to the earlier years of the tree's life, which finally assumes the ordinary tree-form.

The leaves of *Suttonia chathamica* (the Chatham Island matipo) growing near the sea at Wilson Bay vary according to their position on the low tree. Those of the periphery are only $\frac{7}{8}$ x $\frac{1}{4}$ in., while those sheltered within the tree are $2\frac{1}{2}$ x $1\frac{3}{8}$ in.

The common forest-trees are in the subalpine scrub much reduced in size and changed in aspect. The rimu (*Dacrydium cupressinum*), a tall tree no longer, remains still of the tree-form, and erect, but in height only 12 ft. or 15 ft., resembling in appearance the pyramidal trees of old-fashioned German boxes of toys. On the other hand, in the southern rata (*Metrosideros lucida*) and the kamahi (*Weinmannia racemosa*) the tree-form is never reached, the plants remaining as branching shrubs.

Excessive wind causes certain plants to assume the mat-habit, and become depressed close to the ground, this being aided to some extent by the wet nature of the sour saturated soil. The mountain-pine (*Dacrydium Bidwillii*) and *Olearia Colensoi* (mentioned above as a tree) are fairly frequent, depressed mat-like to the ground on the wind-swept subalpine meadows.

The manuka (*Leptospermum scoparium*) is an especially striking case. This extremely common New Zealand plant is quite frequent in certain parts of the Stewart Island forest as a tree. On the coast-line it is a shrub. It is specially abundant in the lower subalpine region, forming a belt above the forest-line, and extending thence as a shrub into the subalpine scrub, reaching finally the boggy meadow, when its appearance, and even habits, are altogether changed.

The manuka just above the forest line is a small tree, at times more than 20 ft. tall, with a stout erect trunk half a foot in diameter, some of its bark hanging in long strips. At the upper third a few branches are given off, which are much branched at their extremities, finally forming small dense flat heads of foliage. In contradistinction to the above, the manuka of the boggy ground is absolutely prostrate, branches and twigs lying pressed closely to the soil, and forming a somewhat fan-shaped dense mass (see Photo No. 16). The final leafy twigs, which are $1\frac{1}{4}$ in. in length at the most, through turning to the light, are erect, and, growing closely together, form a close sward, which *puts down roots into the ground, and can thus spread vegetatively.* Frequently the main stem is without bark, and bleached white, and in any case it functions chiefly as an anchor. Here, then, is a complete change in habit and behaviour from the upright tree, the presence of self-rooting shoots hardly to be expected, since cuttings of the manuka are by no means easy to "strike." That the turf-forming plant is identical with the tree is amply demonstrated by the gradual merging of the one into the other through every degree of intermediate.*

Still more remarkable is the behaviour of *Dracophyllum politum.* This shrub—one of the commonest constituents of boggy meadow formations—is, when growing in the open, a low cushion or mat plant, whose stout, hard, woody stem and general branch system are hidden by the quite short, erect stems covered with dead and near their apices with living, closely imbricating, stout, horny leaves, and whose shoots pressed together make a hard but rather springy turf. Where sheltered the habit changes, and long branching and densely leafy trailing shoots are given off 8 or 9 in. in length. *Thus, instead of a close mat or low cushion, is a trailing shrub.*

Again, when growing in the partial shelter of a "scrub island," or of very low, open subalpine scrub, the plant forms huge cushions (see Photo No. 13), sometimes flattened, sometimes rounded, and which one could hardly connect with the bog plant were it not for the frequent occurrence of long shoots such as those described above. As far as I can see, the cushion form here depends upon shelter and drier ground allowing a more vigorous growth in the first place, while at the same time the wind checks the formation of long shoots, reducing the internodes, and so causing the dense habit.

4. Prolonged Juvenile Forms; Heterophylly.

The following plants have either a juvenile form distinct from the adult, and which persists for a number of years, *the adult and juvenile frequently belonging to distinct ecological classes*, or they show a marked heterophylly, the juvenile stage being often reproduced on an adult plant: (Taxaceae) *Podocarpus spicatus, P. dacrydioides, Dacrydium biforme, D. Bidwillii, D. cupressinum, D. intermedium, D. laxifolium;* (Polygonaceae) *Muehlenbeckia australis, M. complexa;* (Ranunculaceae) *Clematis indivisa, Ranunculus Lyallii;* (Cunoniaceae) *Weinmannia racemosa;* (Rosaceae) *Rubus schmidelioides;* (Elaeocarpaceae) *Aristotelia fruticosa;* (Malvaceae) *Plagianthus betulinus;* (Violaceae) *Hymenanthera dentata* var. *alpina;* (Halorrhagaceae) *Myriophyllum elatinoides, M. propinquum* var. *tenuifolium;* (Araliaceae) *Nothopanax simplex, N. Edgerleyi, N. parvum, N. anomalum, Schefflera digitata, Pseudopanax*

* This prostrate form is the variety *prostrata* of Hooker. It is clear that it is not a floristic variety at all, and it is an example of how unsatisfactory are descriptions based merely on herbarium specimens, the life-history of the plant being unknown. And yet superficially it seems more distinct from the type than are many species from one another.