form forbid the presence of competitors for the ground. For instance, the close rosettes of *Plantago Raoulii* may hinder all other growth on sandy soil; where tree-ferns are plentiful, there is but little on the floor beneath; the horizontal pinnae of the umbrella-ferns exclude the light, and forbid other ground-vegetation. There are certainly other and more subtle reactions of plant upon plant, but such a study is in its infancy so far as the higher plants are concerned.

Sea-spray and brackish water play some part in plant-distribution, but the former is usually of no great moment. *Asplenium obtusatum* and *Blechnum durum* of the coastal rocks both grow luxuriantly within the forest quite beyond the reach of spray. The effect of salt on plant-distribution in New Zealand generally is rather of an inhibitory than constructive nature, and there are very few of the true coastal plants which will not thrive excellently away altogether from the sea (Cockayne, 20).

B. ECOLOGY OF THE PLANTS.

1. General.

There is no intention here to deal with the ecology of the Stewart Island plants as a whole, but chiefly with those characteristic of the district. The bulk of the flora is common in many parts of New Zealand, and the majority of the plants doubtless owe their special forms and organs to a somewhat different environment from that of Stewart Island.

The plants may be either stationary (" spot-bound ") or wandering. To the former class belong most of the woody plants, though some, usually spot-bound, may wander, as in the case of the manuka dealt with further on. Others—*e.g.*, *Dacrydium Bidwillii*—are spot-bound when fully adult, but wandering in the juvenile stage. A large percentage of the herbaceous plants are wandering, and this habit and special mode of increase make them formidable in the struggle for existence with the spot-bound herbs. *Epilobium*, *Cotula*, *Liparophyllum*, *Gunnera*, *Helichrysum*, *Lagenophora*, *Hymenophyllum* are examples of genera with wandering species. The creeping stems may be under or above ground. The splendid *Stilbocarpa Lyallii* covers many square yards by means of its arching runners and the young plants produced at their extremities. Naked banks are rapidly covered by *Gunnera albocarpa* or *Gnaphalium trinerve*, and acre upon acre may owe its plant-covering and physiognomy to the wandering habit of some special plant, as in the case of the lowland bogs with *Gleichenia alpina*.

2. Life-forms.

(*a.*) *Trees.*

Of the seven species of tall trees, three (*Dacrydium cupressinum*, *Weinmannia racemosa*, *Metrosideros lucida*) are abundant, two (*Podocarpus Hallii*, *P. ferrugineus*) are common; and two (*P. dacrydioides*, *P. spicatus*) are very rare indeed, especially the last named.

The rimu (*D. cupressinum*) has much the same habit as in New Zealand generally. It is in Stewart Island an erect-growing tree, with a trunk from 1 ft. to 3 ft. in diameter, unbranched for its lower two-thirds or thereabouts. Its branching head is slender, the final branchlets drooping, thus giving a special character to the tree. The Stewart Island plant is smaller than that of the mainland in general. Its seedlings are rare in the forest but abundant in the open, though this does not say the plant is shade-loving, but in harmony rather with the special climate of the district.

The kamahi (*Weinmannia racemosa*) is an upright-growing tree, with a moderately large crown of spreading branches furnished with toothed, oblong, thick leaves of a pale yellowish-green colour, 2–3 in. long, and slightly crinkled on the margin. Their anatomy shows a cuticularised epidermis on both surfaces, beneath which is a water-tissue composed of one row of large cells on the under-surface and one row of moderate-sized cells on the upper surface, beneath which is a second row of large cells; beneath these is a 2-layered palisade, and then an open pneumatic tissue rather deeper than the palisade. This is a distinctly xerophytic structure.

In Stewart Island the base of the trunk is almost always most irregular owing to the tree having grown as a seedling either on a fallen log or a tree-fern trunk, and as it increased in size sent down roots to the ground in quest of water, which finally grew together into a great amorphous mass full of chinks and hollows, and from which branch-like roots spread out laterally, raised above the surface of the ground (see Photo No. 10). Enclosed within this " root-trunk " may sometimes be seen the remains of the log, which has often been a matai (*Podocarpus spicatus*). From this irregular base pass upwards usually two or even more branches, which are the true trunks, so that it looks as if two or more independent trees were growing closely.

The southern rata, or ironwood (*Metrosideros lucida*), is at times an erect tree, but usually has a more or less leaning or sometimes prostrate trunk. This latter habit is clearly the effect of excessive wind, but there may also be a natural (hereditary) tendency, under the stimulus of wind, towards the horizontal position, *since in a forest where all the neighbouring trees are erect the rata will frequently be semi-prostrate or prostrate.*

The southern rata is frequently epiphytic in its young state, and, like the kamahi, just noted, or its northern namesake (*M. robusta*), sends down roots to the ground, which, growing into one another, form a most irregular, frequently very thick composite root-trunk (see Photo No. 6). The branches are generally irregular in form, and of spreading habit. They are much-branched near their extremities, ending finally in a great number of close leafy twigs. Each branch system is distinct from its fellows, so that the crown of a tree consists of a number of small, rather flat heads of foliage, with considerable spaces between (so, too, with the northern rata—Cockayne, 25). (See Photo No. 40, on left.)