Scirpus nodosus forms close tussocks about 30 in. tall, made up of terete, stiff, flexible, pale-green stems arranged closely together, and given off from a short, straight, woody rhizome ⅜ in. in diameter.

The *leaves* are represented by sheathing scales at the base of the stems, which latter function as leaves. The *roots* are wiry and of medium length. The *inflorescence* is a solitary globose head ⅜ in. in diameter, of numerous crowded spikelets subtended by a rigid bract, 1 in. or more in length, continuous with the stem.

The tussock-form, stiff isolateral stems, and absence of leaves fit this plant for very dry stations, and so it is very common on the dunes themselves, but is quite absent where the sand drifts to any extent, since it has no sand-binding properties and gets buried.

(*μ.*) Leptocarpus simplex (*the Yellow Rush*).

Found only in New Zealand, common on the coast, except in the Kermadec and Subantarctic Islands; occurring principally in salt marshes and sand plains.

Leptocarpus simplex forms dense tussocks of quite erect, slender, terete, stiff, wiry, flexible, rush-like stems of a dull green, but more frequently reddish or yellowish colour, according to the intensity of the light, being at times, when fully exposed, bright red or orange.

The *leaves* are reduced to short blackish sheathing scales clasping the stem at distances of 1 in. to 4 in. The *rhizome* is stout, woody, creeping. The *roots* are wiry and of medium length. The *flowers* are dioecious, the male inflorescence panicled, and the female arranged in compact rounded glomerules.

(*ν.*) Gunnera arenaria (*the Sand Gunnera*).

Found only in New Zealand, extending along the coast, but confined to dune hollows, from the northern floristic province to Stewart Island.

Gunnera arenaria is a very low-growing herb, forming large round flat patches a yard or more in diameter, the leaves flattened down to the ground.

The *rhizome* is stout and much-branching. The *leaves* are of the ovate type, 1 in. or 2 in. long, including the petiole, thick, coriaceous, and of a dull green colour. The *flowers* are monoecious. The female peduncle lengthens as the fruit ripens, finally becoming 2 in. or 3 in. in length, and so much raised above the foliage. The *drupes* are yellowish-red, and crowded on the upper part of the peduncle.

(*d.*) Methods of Spreading of Dune Plants.

The distribution of the special dune plants takes place most likely by means of coastal currents, for, no matter how far separated are the dunes, their typical flora has gained small dune areas remote from others, and isolated islands where the amount of sand is trifling. Perhaps succulent fruits may be carried by land-birds, but these latter are rare on dunes, there being little to attract them.

As for the spread of the plants on the dune area itself, this is chiefly the work of the wind. Especially are the ball-like infrutescences of *Spinifex hirsutus* suitable for wind-carriage. Caught by the breeze, these hop over the sand on their long spines as if endowed with life, until eventually, falling to pieces, they come to rest, and the seeds are buried ready for germination. In this manner originate the embryonic dunes of the upper foreshore.

The "seeds" of *Festuca littoralis*, *Carex pumila*, *Calystegia Soldanella*, *Coprosma acerosa*, and *Pimelea arenaria* are cast in great numbers near the bases of the plants, and can there germinate, or are more frequently driven when dry along with the surface sand. Generally speaking, however, there are very few seedlings on the sandhills themselves. It is in the hollows that seeds, even those of the sand-binding grasses, germinate, the seedlings of these, on receiving a sand-supply, building dunes. On the hills seedlings are extremely scarce, the increase there being altogether by vegetative means, which amply suffices under favourable conditions to cover the ground.

(D.) THE DUNE PLANT ASSOCIATIONS OF WESTERN WELLINGTON.

General.*

The comparative simplicity in the progress of dune development, its rapidity, and the ease with which it can be observed, as stated already in Section II, makes a genetic study of the vegetation of a dune area much more easy than that of a series of land forms whose evolution is extremely slow. Beginning with the foredune and ending with the fixed dune, a gradual change may be noted in harmony with the increasing stability of the sand, a condition which is in large part the work of the plants themselves. Also certain stages enter in where a new class of associations branch off, which may be either transitory and doomed to obliteration, or become permanent, their persistence depending upon the stability of the dune area as a whole. The above is important from the economic standpoint, since where Nature has brought stability and inserted shrubby associations in the midst of dunes originally unstable, so too can afforestation be carried on artificially, but with greater ease, or the better land be used without danger for certain agricultural purposes.

The various plant associations may receive either a physiographic or a botanical name, the two exactly coinciding, each association forming a definite step in the progress of events whose final goal is stability.

The dunes under consideration may be taken as typical of those of the central floristic province of New Zealand — that is, from latitude 38° S. to latitude 42° S. — although, of course, local

* By no means full details as to the species present in the associations are given, as I propose to give a list of dune plants indigenous and introduced in the continuation of this report, which also will contain a full account of foreign trees, shrubs, &c., suitable for dune-planting.