(β.) *The Moist Sand-plain or Hollow.*

In Canterbury, western Wellington, and occasionally in Auckland, the damp sand is early occupied by the curious round mats, 3 ft. to 6 ft. in diameter, of *Gunnera arenaria*, the small, thick, pale-green leaves flattened to the ground. When the short erect racemes of orange-coloured drupes are present in quantity, raised well above the foliage, the plant is both pretty and conspicuous. The sand-sedge (*Carex pumila*), *Scirpus cernuus*, *Epilobium nerterioides*, *E. Billardierianum*, *Cotula coronopifolia*, *Ranunculus acaulis*, and *Crantzia lineata* are more or less common in both main Islands. *Lobelia anceps*, *Myriophyllum Votschii*, and *Limosella aquatica* are abundant in the northern and central botanical provinces.

In places water lies during winter, but these are frequently quite dry in summer, and have at times in western Wellington a surface temperature of 100° Fahr., and probably more, notwithstanding which certain moisture-loving plants grow—*e.g.*, *Epilobium Billardierianum*, *E. nerterioides*, *Cotula coronopifolia*, and *Limosella aquatica*—and remain quite healthy. It seems almost incredible that these plants, whose structure fits them for a wet environment, can tolerate such extremes; but one must remember that the wet sand just below the surafce is at a very much lower temperature than the dry crust above, and that it never becomes dry.

Should the hollow continue moist—*i.e.*, should there be no invasion of sand—the salt-marsh plant, *Leptocarpus simplex*, will appear and finally take complete possession, in many places acres occurring at a time, its stiff, erect, yellowish or reddish stems 2 ft. or more tall rendering it very conspicuous. It is quite well known to the settlers under the term "yellow rush," and they set fire to it constantly to make way for more nutritious plants. Other salt-meadow plants also appear, especially the fleshy-leaved and creeping *Selliera radicans*, which has generally more rounded and smaller leaves than the typical form. Tussocks of *Scirpus nodosus* are also common in many localities.

On the dunes of north-western Auckland *Leptocarpus* in many places forms out of its rhizomes great trunks after the manner of *Carex secta* (the niggerhead). The rhizomes, sometimes 10 in. in length, are bunched together and vertical in position, but branch laterally, the branches when above ground curving towards the sand. Masses of *Leptocarpus*, but wanting trunks, growing closely and covering some acres, are a great feature of the Wellington dunes; but I did not see anything of the same extent on those of Auckland. *Schoenus nitens* var. *concinnus* is very common in some of the hollows of Canterbury and Wellington. *Elaeocharis neo-zelandica* forms considerable patches, which catch a little sand, in many parts of the western Auckland dunes, as far south, at any rate, as the Muriwai Stream. It has a moderately stout and wiry rhizome, and erect dark-green stems 2 in. or so tall.

As the sand-hollow becomes drier, and where *Leptocarpus* or other plants do not occupy all the space, there is sometimes, on the dunes of western Wellington especially, even in close proximity to the sea, quite a number of fair fodder plants, especially white clover (*Trifolium repens*), yellow suckling (*T. dubium*), some cocksfoot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), and meadow poa (*Poa pratensis*). The greater part of the introduced plants are, however, of little or no value—*e.g.*, the melilot (*Melilotus arvensis*), marsh painted-cup (*Bartsia viscosa*), the toothed medic (*Mendicago denticulata*), the sorrel (*Rumex Acetosella*), the soft brome-grass (*Bromus hordeaceus*), the harestail-grass (*Lagurus ovatus*), and the silver hair-grass (*Aira caryophyllea*). In a similar position, abutting right on the sea-shore some miles north of Ahipara, north-west Auckland, I noted *Poa pratensis*, *Festuca bromoides*, *Trifolium repens*, and *Trifolium dubium*—which, with various other introduced and indigenous plants, made a close turf. In other cases where the stability of the sand-plain has been considerable there will be heath.

(γ.) *Manuka Heath.*

Where the water-content is not too great, or perhaps rather where there is a certain amount of dry sand on the surface, there will be in many parts of the dune-areas a heath association, with the manuka (*Leptospermum scoparium*) as the dominant plant. In such a station there are frequently small dunes, arising from sand-invasion, and the surface is quite irregular. In this case there is virtually little difference between heath of this character and that of the higher hills.

In Auckland many of the ordinary heath-plants will be present, especially *Styphelia fasciculata*, *Leptospermum ericoides*, *L. lineatum*, *Pomaderris phylicaefolia*, *Styphelia Fraseri*, and *Pimelea laevigata*. *Cassinia retorta* will be plentiful, but never flattened to the ground like most of the above shrubs. There will probably be *Phormium tenax* and *Arundo conspicua*.

Wetter sand-plains than the last described are common in western Wellington, where the sand-plains are much more extensive than elsewhere in New Zealand—*i.e.*, they are in proportion to the greater breadth of the dune-area. Such an association will contain a fairly large number of indigenous species, of which the following may be the most conspicuous: The manuka (*Leptospermum scoparium*), the cabbage-tree (*Cordyline australis*), the common libertia (*Libertia ixioides*), the New Zealand flax (*Phormium tenax*), *Mariscus ustulatus*, *Hydrocotyle pterocarpa*, *Viola Cunninghamii*, *Eleocharis Cunninghamii*, *Ranunculus macropus*, *Potentilla anserina* var. *anserioides*, *Scirpus inundatus*, *Carex secta*, *Carex ternaria*, *Olearia Solandri*, *Mazus pumilio*, and *Coprosma propinqua*.

In Canterbury the heath will be almost pure *Leptospermum scoparium*, or there may be a good deal of wild-irishman (*Discaria toumatou*). (See Photo No. 37.)

I have no notes as to similar heath in Southland.

In Stewart Island the hollows amongst the dunes are filled with a dense shrubby growth of *Senecio rotundifolius*.

This shrubby sand-plain vegetation may arise either directly from bare ground occupied first by *Gunnera arenaria*, &c., followed by *Leptocarpus simplex*, or it may be the concluding stage of a series next to be mentioned, commencing with a shallow lake or pond and followed by a swamp. At any rate, no matter what its origin, when it becomes drier, through the incursions of cattle chiefly, it makes fair grazing-land, and allows a good many grasses and leguminous plants to enter the association.