

(b.) *Heath of Ancient Dunes, Valleys of Rivers Freshwater and Rakiahua.*

Probably this formation has been frequently burnt, and a good deal of the manuka will be second or third growth. The manuka makes a continuous and close growth in places, in others it is scattered in clumps or individual plants. Where open, the sandy ground is covered with abundance of the alpine umbrella-fern (*Gleichenia alpina*), forming a close yellowish-green covering some 6 in. tall. The small wiry mats of a reddish colour of *Styphelia empetrifolia* are very abundant, and sometimes it is the dominant plant. There is the low-growing dark-green *Pentachondra pumila* here and there, tufts of the rush-like *Cladium Vauthiera*, young *Dracophyllum longifolium*, stunted *Hypolaena lateriflora*, stunted bracken fern (*Pteridium esculentum*), large breadths of the creeping club-moss (*Lycopodium scariosum*) straggling over the ground, and small *Blechnum capense* var. *minor*. Also fairly common are—*Coprosma repens*, *Drapetes Lyallii*, stunted *Luzuriaga marginata*, the small fern *Lindsaya linearis*, and *Celmisia longifolia*.

On the dunes in the Rakiahua Valley the dwarf pine, *Dracodidium laxifolium*, is very abundant, forming matted masses about 7 in. tall. Its slender cord-like brown stems, covered with green leaves near their extremities, are quite incapable of standing erect.*

The dune-heath is closely related to the neighbouring bog-formation, where the change in water-content has brought in some additional species. Probably the old dunes have been populated from the bogs rather than the contrary, the physiologically dry soil of the latter providing life-forms able to tolerate the physical dryness of the former.

(c.) *Mason Bay.*

The dry parts of the old dunes inland from Mason Bay are occupied by a heath, or steppe, differing a good deal from the foregoing. My notes say nothing as to any manuka being present, but it is plentiful in the adjacent dune-bogs.

Uncinia rubra is very abundant, and its red colour gives a distinct appearance to the formation. In other places the leading plant is the steppe-grass, *Danthonia Raoultii*, forming its customary tussocks. Other plants noted were: *Phormium tenax*, *Blechnum penna marina*, *Poa pusilla* (abundant), *Libertia ixioides*, *Helichrysum filicaule*, *Geranium microphyllum*, *Carex ternaria*, *Nertera setulosa*, *Pteridium esculentum*, *Acaena novae-zelandiae*, *A. Sanguisorbae* var., *Veronica buxifolia*, *Cassinia Vauvilliersii*.

(d.) *Heath at Port Pegasus (Photo No. 39).*

This has been burnt in many places, but, as stated before, is being reproduced much in its normal condition. It consists principally of manuka. Where tall it is rather forest than heath, and shades off into the yellow-pine association. The soil is peat, and will contain humous acids.

3. BOGS AND SWAMPS.

(a.) *General.*

I am here, partly on account of their close relationship and partly because my observations are not sufficient, treating the vegetation of wet ground as a whole, and not separating that which is permanently covered with a more or less deep sheet of water from that which is merely usually in a state of saturation, and where at times small water-holes exist. Extensive bogs and swamps occupy much of the low-lying ground of the Freshwater and Rakiahua Valleys, those of the former extending along the course of the ancient strait to Mason Bay, where in the hollows and on the flat ground of the inland ancient dunes are many bogs. In the neighbourhood of Port Pegasus what are virtually subalpine bogs at almost sea-level are on all the open ground, and these, through burning of the manuka heath, are probably on the increase, the newcomers being all indigenous plants. Also along the Toitoi River, on the south-east of the island, are extensive swamps, but these I had no opportunity of investigating. There is a close relationship between the neighbouring bog vegetation and that of the sandy heath already described, the drier bog offering a transitional stage. The life-forms of the formations are, for the most part, strongly xerophytic.

(b.) *Freshwater and Rakiahua Valleys.*

The vegetation of the driest bogs in the Freshwater and Rakiahua Valleys consists of extensive masses of the pale-green alpine umbrella-fern (*Gleichenia alpina*) (Photo No. 36) and the darker green wiry-stemmed leafless *Hypolaena lateriflora*. On the barer ground the small green grasslike leaves of *Herpolirion novae-zelandiae* are everywhere, and in December the blue flowers close to the soil are there by thousands.† Velvety cushions of *Gaimardia ciliata*, soaked with water, and sometimes 9 in. in diameter and 3 in. from the ground (see Photo No. 21), are dotted about all over the wetter ground, together with patches of *Carpha alpina*, small plants of *Coprosma repens*, and mats of *Lycopodium ramulosum*, colonies of reddish *Drosera spathulata* and *Utricularia monanthos* more or less filling up the ground between. Where water lies in the Freshwater Valley are broad colonies of the coastal plant *Leptocarpus simplex*, its stiff erect rush-like stems massed together, the red colour rendering it conspicuous. Also in the wet ground and the numerous water-holes are *Cladium Gunnii*, *C. Vauthiera*, and stunted manuka.

On the bog proper the following are common: *Pentachondra pumila*, *Oreobolus strictus*, *Schizaea fistulosa* var. *australis*, *Cladium Vauthiera*, young *Dracophyllum longifolium*, *Thelymitra uniflora*, *Danthonia semiannularis*, *Coprosma acerosa* var., *Gaultheria antipoda*, and *Styphelia empetrifolia*.

* I did not note this plant in the Freshwater Valley, but it is recorded as growing there by Kirk (55).

† So spelt on the map. Should be "Toetoe."