

culare. Here also the purple-flowered *Epilobium erectum* is plentiful, making almost a zone in the shallow water, and extending on to the drier ground. Where the springs gush from the lava are masses of *Helichrysum bellidioides* (Photo. No. 28) and luxuriant *Hierochloa redolens*. On the banks of rivers, close to the water's edge, is frequently a close growth of *Celmisia glandulosa*, *Pratia angulosa*, *Veronica cataractæ*, *Helichrysum bellidioides*, *Gunnera dentata*, *Epilobium macropus*, the small *Epilobium* as above, and *Ourisia Colensoi*. Small and rather deep streams, such as occur on the margins of wide river-beds, originating in springs, have frequently an abundant vegetation, whose presence is manifest at a distance by lines of the reddish-coloured sedge *Schoenus pauciflorus*. Right in the water are close colonies of the brown-leaved *Gunnera dentata*, and side by side with it abundance of *Ranunculus rivularis* (its leaves floating), *Juncus antarcticus*, *Myriophyllum Votschii*, and *Drosera spatulata*; but these last three in the shallower, muddy parts. *Epilobium macropus*, too, is extremely abundant, and very showy when in full bloom; also *Montia fontana*, and in some places *Claytonia australasica*. These river-bed streams frequently give rise to veritable bogs and water-holes, where *Carex ternaria* and *Schoenus pauciflorus* are dominant, while the reddish-brown leaves of *Potamogeton natans* float on the water-holes or on the sluggish streams. On the boggy ground, where not occupied by taller growths, is *Craspedia uniflora* var. *minor* and *Vertera depressa*; *Ranunculus rivularis* and *Epilobium macropus* will also be present in greater or lesser abundance.

At a lower elevation—say, about 3,000 ft., as in the bed of the Oturere just where the forest ends—are sphagnum bogs with *Leptospermum scoparium*, *Arundo conspicua*, *Carex ternaria*, *C. virgata*, and, especially on the sphagnum itself, *Viola Cunninghamii* and *Gunnera prorepens*. Unfortunately, I have no notes of this interesting association, and am trusting merely to memory.

(b.) WINTER-BOGS.

Between ground which is exposed to a considerable wetting during the melting of the winter snow or after heavy rain, and veritable bog, where the ground is always saturated with water and springy to the tread, and where frequently water-holes are present, are many transitions. At first, indeed, it looks as if the bog-plants were constituents of the desert or steppe associations, and, in fact, to some extent, certain of the xerophytes are. The close cushions, made up of the distichous, equitant, small, hard leaves of *Oreobolus pectinatus* above and peat from its decay beneath, grow frequently where there can be no bog conditions at any time, while, as noted before, *Gleichenia dicarpa* and *Dacrydium laxifolium*, two of the most frequent of shrub-steppe plants, are usually denizens of wet and boggy ground elsewhere, as on the Southern Alps. During the time of my visit, but for the presence of *Carpha alpina*, *Oreobolus*, *Celmisia glandulosa*, *Viola Cunninghamii*, and *Hypolaena lateriflora* var. *minor*, to quote some examples, one could not have conjectured that the ground in which they grew could ever be wetter than that of the surrounding country, so dry was the season. These "winter bogs," then, to give them a descriptive title, subject their plants to most extreme conditions, and it is not hard in this case to explain how such an intensely xerophytic structure as that of the *Oreobolus* should be a great advantage to its possessor. *Gleichenia alpina*, too, is abundant in such situations, but it is the grass-like *Carpha alpina*, with its pale-green leaves, withered, twisted, and straw-coloured at their extremities, which gives the stamp to all the bogs of the district, no matter their water-content.

(c.) BOGS.

The bogs proper are frequently on the bottoms of shallow side gullies leading into dry creeks and "wash-outs," at an altitude of 4,000 ft. and upwards. A small stream may feed them, and probably below is much underground soakage from the scoria slopes, which hinders the surface water sinking, and allows, under these wet conditions, the accumulation of decaying vegetable matter. The ground is covered in a typical case with a close turf, made up of *Carpha alpina*; the dark-green *Liparophyllum Gunnii*, whose very thick pale rhizome extends far through the spongy ground and forms close matted masses; *Utricularia monanthos*; *Drosera arcturi*, with its reddish leaves; *Scirpus lenticularis*; *S. aucklandicus*; silvery mats of *Gnaphalium paludosum*; tufts of *Celmisia longifolia*; cushions of the species of *Centrolepis*. In such a turf the innumerable white starry flowers of *Liparophyllum*, tiny though they are, and the rather showy purple ones, fading to white, of *Utricularia*, give a distinct character to the bog, while the white flower-heads of *Celmisia longifolia* may add to the colour. Where water lies will be *Potamogeton natans*, *Hypolaena lateriflora* var. *minor*, and *Carex echinata*; and the leaves of the first-named may cover the wet ground with a reddish mat even where no actual water is visible. Encircling such a bog will be a zone of *Gleichenia alpina* or *G. dicarpa* extending on to the steppe or to the scrub. Other frequent members of the bog association are *Juncus antarcticus*, *Craspedia uniflora* var. *minor*, *Ourisia Colensoi*, *Celmisia glandulosa*, *Gentiana bellidifolia*, *Forstera Bidwillii*, *Coprosma repens*, *Carex ternaria*, *Aciphylla squarrosa*, *Danthonia Raoulii*, *Calamagrostis setifolia*, *Schoenus pauciflorus*.

Towards the central saddle is much wettish ground on the slopes, and there *Hypolaena* and *Gleichenia* are in great abundance, the warm-brown colour of the former and the pale-green fronds of the latter marking the physiognomy. With these are the usual steppe-shrubs, much dwarfed, and raised slightly on mounds above the general level, and above all are numerous attenuated examples of *Danthonia Raoulii*, not more than 28 in. tall.

The bog-waters are much charged with iron, and ground or plants are frequently covered with a rusty coating.

(d.) ECOLOGY.

As for the adaptations of the bog-plants, these are diverse, some being distinct hygrophytes, such as *Potamogeton*, and other xerophytes, as *Liparophyllum* and *Oreobolus pectinatus*. Even such a typical xerophyte as *Aciphylla squarrosa*, with its *Yucca*-form, is quite at home. Another similar example is afforded by the luxuriant growth of *Luzula Colensoi*, a denizen of the most arid scoria slopes, and of the highest altitudes, so far as the North Island mountains go, but yet which,