

unless in such cases an even larger amount of shrinkage or loss takes place in the old wood or in the bark, it is evident that no room can be left for the deposit of new rings. Such decrease may have occurred either by imperceptible wearing away on the surface, or by an internal shrinkage from enfeebled vitality, but in the instances given, there was no visible loss in the smooth, regular, closely-fitting bark.

11. Can any reliable estimate of the age of very old trees be made by means of measurement? Certainly not in the case of trees which have long ceased to make appreciable increase in girth, or which are in a ruinous state from decay, and perhaps with difficulty even in the case of gnarled stems of ancient trees which are still apparently vigorous. But in the latter instances we may at least be enabled to say that they need not exceed a certain age, and thus check that tendency to exaggerate the antiquity of trees of extraordinary magnitude, which is very naturally fostered in our minds by our incapacity to appreciate by the eye their increase from year to year. As experiments which I have instituted on this subject are incomplete, I shall postpone its consideration until a future occasion.

*Notes on some of the Rarer Plants found on the Dovrefjeld, Norway, in July 1888.* By GEORGE BIRD.

(Read 13th December 1888.)

During a short tour in Norway this summer, I had the opportunity of making several excursions in search of alpine plants, and these notes are intended to call attention to some of the rarer species met with on the Dovrefjeld. I had in 1887 visited the western coast of Norway, in the neighbourhood of the Hardanger, with the view of forming an acquaintance with the flora, so far as this could be done in a limited time. In the plants which came under my notice then, there was an absence of many alpine species one would have expected to find in a country so far north. It was therefore with considerable expectation that I looked forward to exploring some of the mountains in a more northern part of Norway, where the alpine flora is better represented.

The Dovrefjeld range has long enjoyed the reputation of

having a rich alpine flora. It can be reached in a week from Leith, and this without any fatigue beyond constant travelling by steamer, railway, and posting; but when the journey can be done more leisurely the interest is much enhanced.

I proceeded by steamer to Christiania, spending a day at Christiansand on the way. The sail from Christiansand was most enjoyable, and the weather being fine, we were able to see a large extent of country as we steamed up the fjord to Christiania.

We devoted two days to the Norwegian capital, visiting the public institutions and parks, including a morning at the Botanic Gardens, where a good collection of native alpine plants is under cultivation, and including many of those we were afterwards to find in their native habitats.

Taking an early train from Christiania, we continued our journey, reaching Lille-elvedal late the same evening. Lille-elvedal is the point where the road is joined to reach the Dovrefjeld, and the distance, some 60 miles, is accomplished by driving, and generally occupies very pleasantly a whole day. There are stages in this drive where one could break the journey, but it is usual to push on until you are well in the heart of the Dovrefjeld. The road for many miles takes you through a wild and picturesque country, diversified by river, rocky scenery, woodland, and mountain. The valley on either side is bounded by mountains; and as the road has a steady upward incline almost the whole way, the elevation is not so much observed, but you gradually find that a very considerable ascent has been made, and the surroundings become more alpine in their character. The Dovrefjeld comprehends in its area some of the loftiest mountains in Norway, many of which, including the Snehetan, 7770 feet, have their summits and slopes whitened with eternal snow. The scenery has a great resemblance to many of the wilder parts of our Scottish Highlands, and consists of undulating table-lands of great extent, with lofty mountains rising from them. This immense plateau has an average elevation of about 3000 feet above sea-level, the mountains being from 5000 to 7000 feet.

Though the Dovrefjeld is usually described as tame and uninteresting, we did not find it so. It is not wanting in much that is grand and impressive, and in the traveller it

inspires a feeling of vastness. As a home of an alpine flora, it offers an extensive field for exploration. The Dovrefjeld was visited by the late Professor Blytt in 1824, and a complete list of the plants found at that time was published shortly thereafter. It has since become a favourite resort of Norwegian and Swedish botanists. Most of the alpine plants found in our Scottish Highlands occur on the Dovrefjeld as well as many of our lowland species, and many of the latter, such as *Geranium sylvaticum* and *Trientalis europæa*, are found on the higher elevations side by side with the alpine species. A very frequent plant by the roadside and in the meadows is *Lychnis alpina*, its rich rose-coloured flowers attracting attention. This species is rare in the Scottish Highlands, occurring only on the Clova mountains. *Silene acaulis*, *Cerastium alpinum*, *Astragalus alpinus*, *Saxifraga oppositifolia*, *Gentiana nivalis*, and *Primula farinosa* are all plentiful. *Saxifraga cernua* was in great abundance, usually near shady rocks or by streamlets, the specimens in many cases being tall (10 inches) and well flowered. This is also a rare plant with us, found only on Ben Lawers, and then seldom in flower. Some of the mountains are more favoured than others in respect of their flora; and perhaps the Kundshoë, 6700 feet, is one of those best known for its richness, as on its slopes are found many of the rarest plants. We had taken up our quarters at Kongsvold, and as Kundshoë is quite contiguous, we had ample opportunity of exploring it. I was fortunate in being joined in these excursions by a gentleman from Christiania who was thoroughly familiar with the botany of the district, having gone over it a few years previously. On the morrow we ascended Kundshoë to its summit, having previously made preparations for an early start; and, with every promise of fine weather we were full of anticipations. Taking a conveyance a few miles down the valley, we alighted by the river side to examine a shingly bank. We found *Papaver nudicaule* and *Artemisia norvegica*, both good plants, and characteristic of northern latitudes. These were also frequently met on the mountain side. We commenced to ascend the mountain at a point where there were overhanging rocks and ledges, which continued until we had reached a great height. It required very careful climbing, but in the examination of these rocks we were able

to note many alpine plants. Several hours were spent in this way, until we were well on the mountain slopes; and the higher we got, the view became more extended, which added very considerably to the interest of our ascent. The plants we had gathered were—*Thalictrum alpinum*, *Anemone vernalis*, *Draba alpina*, *Arabis alpina*, *Cerastium stellarioides*, *Sagina nivalis*, *Alsinella stricta*, *Phaca oroboides*, *Astragalus oroboides*, *Dryas octopetala*, *Alchemilla alpina* (sparingly), *Potentilla norvegica*, *Saxifraga stellaris*, *S. aizoides*, *S. nivalis*, *S. cæspitosa*, *Rhodiola rosea*, *Erigeron alpinum*, *Saussurea alpina*, *Valbergella apetala*, *Mulgedium alpinum*, *Gnaphalium supinum*, *Pedicularis Cæderi*, *Bartsia alpina*, *Veronica alpina*, *Oxyria reniformis*, *Salix herbacca*, and *Eriophorum alpinum*.

As we gained a higher elevation we got on to an immense moorland, entirely covered with lichens. We had now met the course of the stream, which rushed with great velocity down the mountain; and as we picked our steps amongst the huge boulders, we enjoyed the cool and bracing air and the alpine landscape which stretched away to the distant mountain peaks. Pursuing our upward course, the stream became smaller, indicating that we had almost reached its source; and this proved to be the case, for immediately above us, lying in a valley recess, and coming full in our view, were immense wreaths of snow of great depth. On the outer edge of the snow, in the damp ground, were found *Ranunculus glacialis* and *R. nivalis*, and these, occurring in great profusion and beauty, gave quite a charm to the scene. The recollection of this sight will long remain in my mind.

The summit of the mountain was now in the immediate distance, and after a steady climb it was reached at 4 P.M. Plant life had almost disappeared, though some of the species we had met farther down were found in a very stunted and diminutive form on the summit. There was still the covering of lichens, and growing amongst them we noted *Ranunculus glacialis*, *Draba alpina*, *Saxifraga cæspitosa*, *Pedicularis Cæderi*, *Salix polaris*, and *Luzula confusa*.

Resting a while in this lofty region, we could form a better idea of the surrounding country. In front of us, at a considerable distance in a western direction, we had an imposing

view of the snow-clad Snehattan, a principal feature in the landscape. To the north the extensive range of mountains seemed to be covered in their higher reaches with snow; while to the east, peak above peak, with their bare outline, stood out clearly against the horizon. A dull, leaden sky was overhead, but the occasional glinting of the sun as it penetrated the hanging cloud threw its shadow on hill and valley.

We descended the mountain in a different direction, walking many miles over lichen-covered ground, and as we came to a favourable spot now and again we made a careful search for plants. In one locality there were large quantities of *Campanula uniflora*, rather an interesting species; and we also gathered *Alsinella biflora*, *Petasites frigida*, *Andromeda hypnoides*, *A. polifolia*, *Azalea procumbens*, *Menziesia cœrulea*, *Arctostaphylos alpina*, *Pedicularis lapponica*, *Betula nana*, &c. As we got lower down there were many species of willow, including *Salix lapponica* and *S. Myrsinites*; but the other plants were much the same as in the earlier part of the day, though not in such variety.

Part of the enjoyment of a stay in the Dovrefjeld is due to the excellent accommodation to be had at the various inns or stations. The most convenient are Jerken, Kongsvold, and Drivstuen, these being at distances of about 10 miles from each other on the main road, and they afford every comfort a traveller could wish. We remained principally at Kongsvold, which has the advantage of being well situated in a good plant district, and it has also attractions in the way of scenery equal to many of the more favoured parts of Norway. To those who may be disinclined for mountain climbing, there is ample opportunity of occupying oneself with the botany of the lower ground, where many species of alpine and other plants cover the rock ledges and river side.

We next removed to Drivstuen, a station a few miles farther on. The road from Kongsvold to Drivstuen was one of the finest drives we had. It was a deep ravine, and as we passed along the overhanging rocks were covered with alpine plants. At Drivstuen the flora was less alpine on the lower ground, but on the mountains adjoining there were many of the rarer forms we had found at Kongsvold.

*Mulgedium alpinum* was in great abundance. We also got *Polemonium cæruleum*, *Ranunculus aconitifolius*, *Menziesia cærulea*, *Linnaea borealis* (the latter very plentiful throughout Norway), and *Saxifraga Cotyledon*—a species which is more abundant amongst the mountains on the western coast. We spent the morning on the heights on the western side above Drivstuen, but in consequence of their steepness the ascent was rather difficult, requiring a wide detour to be made to clear the chasms and perpendicular rocks. The inducement to undertake this excursion was the hope of finding *Diapensia lapponica*, which was said to grow on the edge of the cliffs. Looking down from these dizzy heights on the valley below, the sensation was a very curious one. The neighbouring hills seemed to be quite dwarfed; the hotel and contiguous houses, though considerable in their way, appeared as mere specks; and the river, which flowed in heavy flood, looked like a streamlet. We were pleased to have seen this alpine view, though we found it almost more tedious to get down from the steep cliffs, with snow lying in their recesses, than to make the ascent. This mountain climb formed a fitting conclusion to our visit to the Dovrefjeld, and the pleasure of finding *Diapensia* in fine flower added another gratifying association with its alpine flora.

*On the Occurrence of Zostera nana, Roth, in the Firth of Forth.* By WILLIAM EVANS, F.R.S.E.

(Read 14th March 1889.)

*Zostera nana*, Roth, has not, so far as I am aware, been hitherto recorded from the Forth district. It is not mentioned in the second edition of Balfour and Sadler's *Flora of Edinburgh*, and Professor Bayley Balfour informs me that the only Scottish districts given for it in Watson's *Topographical Botany* are Ayr, Forfar, Argyle, and Clyde Isles.

I first recognised it on the mud-flats of Aberlady Bay in September 1884, and the specimens (in seed) now exhibited were collected by me there on the 24th of that month. Since then I have observed it in abundance on the mud-flats near Torryburn, and also at a short distance to the west of the mouth of the Almond at Cramond. The living speci-