# THE VEGETATION OF BEINN LAOIGH.

Donald Patton.

January 1923.

Photo. D. Patton.

# Beinn Laoigh.

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# THE VEGETATION OF BEINN LAOIGH.



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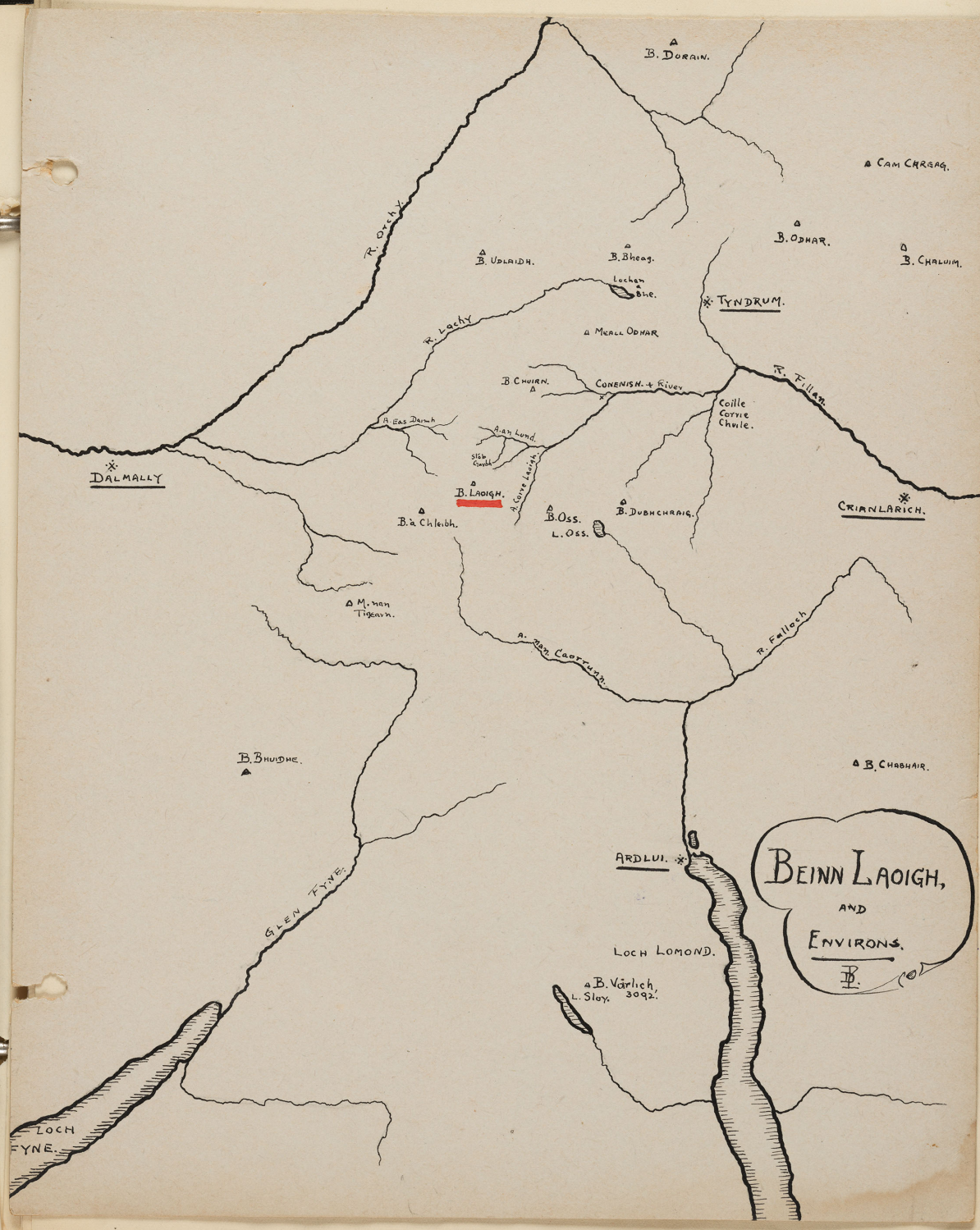
N.B. A Herbarium of typical Beinn Laoigh plants, collected, etc., by the writer, accompanies this Thesis. — Also certain from Lawers, & Meas gan nich to illustrate the last Chapter.

D.P.


B. Dorain.
Cam Chreag.
B. Odhar.
B. Chaluim.
R. Orchy
B. Udlaidh.
B. Bheag.
Lochan a Bhe.
Tyndrum.
R. Lochy
Meall Odhar
R. Fillan
B. Chuirn.
Conenish + River
Coille Coryie Chuile.
A. Eas Dairnh
A. an Lund.
Slab Sneabh
A. Corre Laoigh.
Dalmally
B. Laoigh.
B. a' Chleibh.
B. Oss.
L. Oss.
B. Dubhchraig.
Crianlarich.
M. nan Tigearn.
A. nan Caorruinn.
R. Falloch
B. Bhuidhe.
B. Chabhair.
Ardlui.
Glen Fyne.
Loch Lomond.
B. Vorlich
L. Sloy. 3092'.
Loch Fyne.
Beinn Laoigh, and Environs.
B.

BEINN LAOIGH, or as it is sometimes written, Ben Lui, is situated on the borders of Argyllshire and Perthshire (Lat. 56° 24′ N Long. 4° 48′ W.), the actual summit being in the latter county. According to H. C. Watson's subdivision of Scotland the area under consideration lies partly in vice-county 98 (Argyll) and partly in 88 (Mid Perth). Beinn Laoigh is the highest of a group of four mountains at the western extremity of the Breadalbanes, and the 26th. highest in Scotland. From west to east these summits are :-

| | |
|---|---|
| Beinn a Chliebh, | 3008 ft. |
| Beinn Laoigh, | 3708 ft. |
| Beinn Oss, | 3347 ft. |
| Beinn Dubh Chraige, | 3204 ft. |

The Summit of Beinn Laoigh is five miles distant from Tyndrum, six miles from Dalmally and eight from Crianlarich or Ardlui. It is easiest of access from Tyndrum either by way of the Conenish Valley or by the Tyndrum-Dalmally road.

So much have the natural and ancient conditions of the vegetation of the British Isles been interfered with at the hands of man as well as by his flocks and herds, that the idea of making an ecological study of any area in these islands has oft been ridiculed. However, if there be a district where one would expect to be far from the influence of man it is to be found in the recesses of the Highlands of Scotland and such an

area as that indicated affords an example. Greater floristic migrations have perhaps been the result of the presence of the unscrupulous collector than of the proximity of the nearest farm. True it is that since 1741 the lead veins in this neighbourhood have, though somewhat intermittently, been exploited. This is evident to the N.E. of Beinn Laoigh in the ruined walls of the old mine premises, the mine shafts in Allt an Lund and the moss covered bings where fragments of the weathering ore may yet be picked up. But it is a long time since these mines were worked though even to-day there are signs of renewed activity hard by. Meantime the Sphagnum and its peat have already healed up many of these old scars and the old mine road is slowly becoming part of the moor. Perhaps it is otherwise with regard to the deer and the sheep, although to some extent these animals, especially the latter, may be regarded as belonging to these parts. This, of course applies to their manner of feeding as well as to their agency in the dispersal of seeds and in fertilising the soil. Where sheep have not access to the high lands occupied by the ~~sheep~~ deer, as obtains in the Island of Jura, the vegetation is coarse and rank; but the sheep pastures, although occupying a similar situation and growing on like soil, are of a lusher green, (a more tender herbage), and contain species not found in the deer forest. On Beinn Laoigh sheep and deer are not artificially kept apart. Then, in the range of which Beinn Laoigh is the chief peak, there is no cultivation. The mountain sides are very steep; their drainage is natural. Only in the lower reaches of the main valleys has there been any attempt at artificial drainage. Thus 'mong the crags and corries of these mountain fastnesses

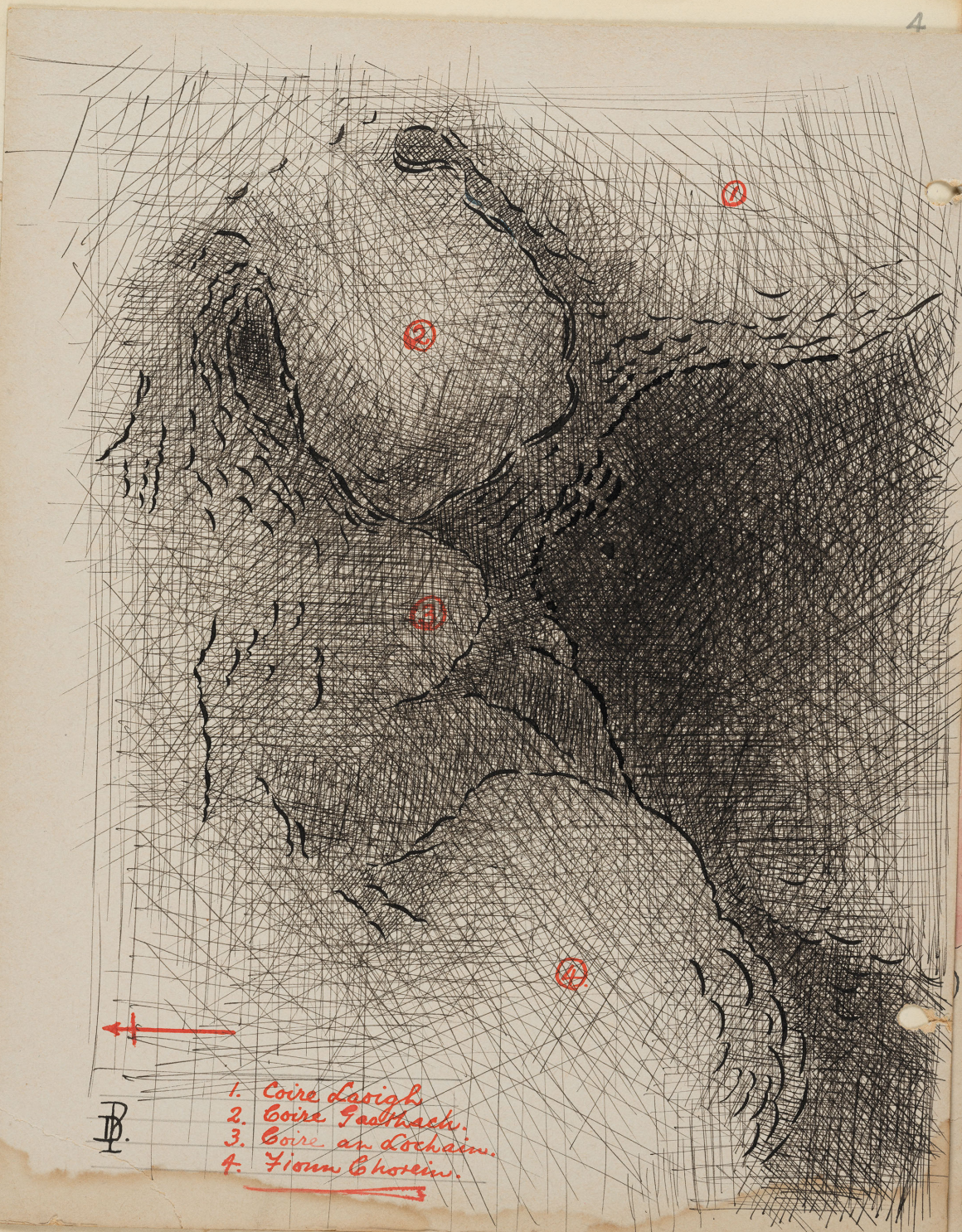
"Pleasant were many scenes, but most to me
The solitude of vast extent, untouched

By hand of art, where Nature sowed, herself,
And reaped her crops; whose garments were the clouds;
Whose minstrels, brooks;----------
Whose banquets, morning dews; whose heroes, storms;
Whose warriors, mighty winds; whose lovers, flowers;
Whose orators, the thunderbolt of God." (Pollok).

If we may judge from the literature extant, Beinn Laoigh was discovered botanically only within the last 50 years. In his "Flora of Perthshire" Buchanan White lays claim to the glory conjointly with Col. Drummond Hay. But there are living to-day not a few who recall the controversies to which that claim gave rise. Lightfoot, in his "Flora Scotica", makes no mention of Beinn Laoigh, though some of the plants submitted to him may have come from that mountain. The following quotation from a note by Mr.Peter Ewing in "The Journal of Botany", (1889 p.51), is significant :-

"Mr.Druce's description of this mountain (JOurn. Bot.1888. p.9) is only too graphic. I gave, in No.223 of Science Gossip", a list of the plants I saw in the district; the result of which is that all the rarer plants have been nearly exterminated."

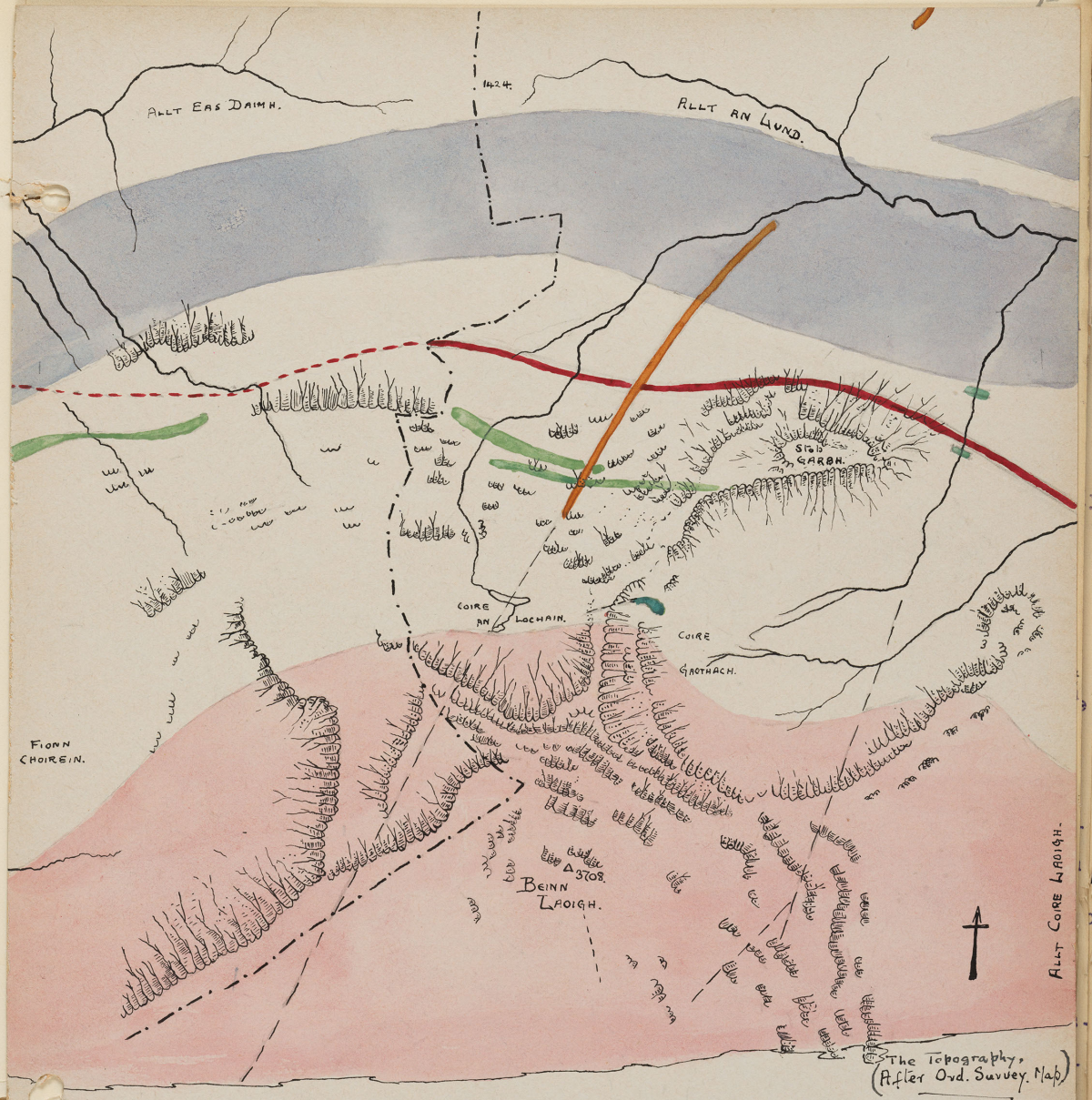
My own acquaintance with Beinn Laoigh dates from June 1911 when I was one of a Botanical Excursion Party from Glasgow University, conducted by Professor Bower. But from the end of the Great War until now I have visited the Ben at all seasons and have seen it in all its vicissitudes.




1. Coire Laoigh
2. Coire Faobhach.
3. Coire an Lochain.
4. Fionn Choreim.

CONFIGURATION OF BEINN LAOIGH.

Beinn Laoigh owes its existence to the fact that the Glacial Period terminated when it did. We see from the configuration of the mountain that the agencies of ice had a grip upon it. Vast, well-defined corries are gouged out from the very summit, and the base is overwhelmed in morainic detritus and boulder clay. Truncated spurs are a common feature, whilst the mountain-top detritus indicates the denuding power of the successive freezing and thawing which continued round the summit while yet the valleys were occupied by glaciers. With regard to the corries, the largest, Fionn Choirein, between Beinn-a-Chleibh and Beinn Laoigh, faces the N.W., and Corrie Laoigh, between Beinn Laoigh and Beinn Oss, faces N.E. At a greater altitude and between these two, the grandest, the Perthshire Corrie or Coire Gaothach, also lies to the N.E., and to it the spurs of Stob Garbh and Stob an Tighe Airde give the striking Sphinx-like appearance. Higher up still, between the Perthshire and the Argyllshire corries, Coire an Lochain faces due north. It is under snow for the greater part of the year. To the east is Coire ant Sneachda overlooking Allt Coire Laoigh. This stream with its tributary, Allt an Lund which drains the northern crags of Laoigh, forms the headwaters of the River Tay. The N.W. slopes are drained by Allt Eas Daimh, a tributary of the Lochy which flows into Loch Awe, while the southern hogback of Laoigh lies in the Clyde drainage area.




The Topography, (After Ord. Survey Map)

GEOLOGY.

Members of the Geological Survey of Scotland are at present working out the interrelation of the various rock formations in the metamorphic structure of the Highlands of Scotland. But the historic position of the various schists, grits and limestones does not materially alter the manner in which an approach may be made to the study of the rocks on Laoigh in connection with the vegetation. The sequence may differ in Laoigh and Lawers and other members of the Breadalbanes but what remains is that we have the rocks in situ and their derivatives to go upon irrespective of their position in geological time.

Starting with the summit of the Beinn, - the mountain-top detritus already referred to rests upon its parent the Garnetiferous Mica Schist which in this area covers a wide range. It descends only to 3200 ft. in Coire an Lochan but in its extent to the west it descends to 1700 ft. in Beinn a' Chleibh which it likewise tops. On the east it descends in Coire Gaothach to 2400 ft. and in Allt Coire Laoigh to about 1300 ft. On the flank of Beinn Oss across Allt Coire Laoigh it is faulted down to an altitude of 1200 ft.

Underlying the Garnetiferous Mica Schists are the more or less Calcareous Mica Schists which extend down to the base of the mountain and the valley of the Conenish. In Allt an Lund it is seen overlying the Black Schist. The escarpment of Stob Garbh presents a fine section. With regard to these schists, the upper escarpments on the northenn buttress of Laoigh, and underlying the Garnetiferous Mica Schists, are of the nature of Calc-Sericites. To the N.W. and especially in Allt Coire Laoigh there are a series of faultings which present exposures

of Quartz Mica Schists. Still on the northern escarpment of Laoigh there is, at an altitude of from 1400 ft. on the east in Fionn Choirein extending to 2600 ft. in Stob Garbh, an exposure of Hornblende Schist. This schist also appears in two outcrops in the western stream from the Coire Gaothach, the lower at about 1500 ft. the other about 100 ft. higher. It is found, too, for a considerable distance in Coire ant Sneachda at 1800ft. Black Schist occupies the floor of the valleys from Conenish Farm via Ciochan Beinn Laoigh towards Dalmally.

In addition the area is traversed by an E and W Basalt dyke which outcrops on the northern escarpment of Laoigh at the County boundary at a height of 2200 ft. and continues westward to a height of 1600 ft. in the Allt Coire Ghaothaich which exposes a fine section. The dyke disappears under the soil on the west side of this stream but can be picked up again further east in Beinn Oss and it can also be traced to the west down the valley of the Allt Eas Daimh. Again, to the east of the Allt Coire an Lochain a Felsite Dyke running NE and SW forms a feature in the Ben. An exposure of Epidiorite appears between Coire an Lochain and Coire Gaothach outcropping from the Sericite; another large exposure forms a prominence in the valley of the Conenish just west of the junction of Allt an Lund and Allt Coire Laoigh.

Boulder Clay occupies the valleys and moraines are frequent in most cases topped by peat. Screes and the downcreep of the disintergrating rock form the link between mountain and boulder clay.

It is the calcareous rocks underlying the Garnetiferous Mica Schist which bear the richest of the alpine flora. The crags here contain the western extension of the famous "Lawers-Canlochan Schist" which has made Lawers and Clova each the

Mecca of British Alpine Botanists. Such names as Cam Craig, Beinn Heasgarnich, The Ptarmigans near Killin, The Craig an Lochain Cliffs at Lochan a Larige, to mention only a few, are themselves inspiring. Ben Vrackie, too, at Pitlochry is a link in this grand chain. These mountains, together with those of Clova, are among the many visited in connection with the Botanical Survey of Beinn Laoigh.

PHOTOS. D. PATTON.

"Frost and
Morning Mists
enshroud the Ben.

THE CLIMATE.

Many botanists have been disappointed on arriving at Tyndrum Station to find a thin mist driving down the glen and not a ben visible. Repeated visits show that this is the rule rather than the exception. (The hot, dry summers of 1901, 1911, 1921- strange sequence - gave the botanist a favourable opportunity of visiting the recesses of the mountain tops though they did not reveal the usual conditions under which the plants live.) In these mountains, snow lies all the winter and even by May it has hardly receded above the 2000 ft. contour. The upper corrie has been known to retain its snow until August; here, too, miniature glaciers are often seen. Specially severe are the conditions of those ledge and crag plants (Comophytes) which do not become covered with snow during the winter but which are exposed to the biting winds of temperature below freezing point as well as to the disturbing influence of a very considerable range of temperature according to the measure of insolation. During Spring and Summer the days are invariably wet. The mist clings to the mountains, and the valleys are drenched with a drizzling rain. The plants rear themselves within a continued precipitation and their roots gravitate into a sodden soil and into brimming crevices whilst a continuous film of water seeks the streamlets through the lower leaves. The season of our mountain flora is brief and it is shortened as we ascend. The snow fills the springs, the rocks disintegrate to form a porous soil, the soil is rich in minerals, and, although the low temperatures produce a quasi-physiological drought, during the period before flowering the vegetation is lush and the slopes are green. The catchment areas are small; the mountain sides are steep; the rivers pulsate in sympathy with the climatic conditions. Even

when no rain falls the wind plays its part, for, gathering the water from the upland tarns it hurls it against the overhanging cliffs, or, as the runnels discharge over the precipices, the breeze bears off the waters and the adjacent crags are drenched. This area cannot, for reasons to be considered later, be called a "land of brown heath and shaggy wood" but it is essentially a "land of the mountain and the flood". According to The Journal of the Scottish Meteorological Society, vol.x.(3rd.series), the average annual rainfall for the area for 25 years (1866-90), is over 100 inches and it may even exceed 130. For, the return for Glencroe gives an average annual rainfall of 128 ins., and for the Bridge of Orchy 118 ins. Beinn Laoigh lies between these two stations and perhaps experiences a heavier rainfall. During the year April, 1920-21 record was kept of the number of wet days at Tyndrum :-

| | | | | | |
|---|---|---|---|---|---|
| 1920, | Apr. | 21. | Aug. | 26. | Dec. 12. |
| | May, | 18. | Sept. | 18. | Jan. 24. |
| | June, | 6. | Oct. | 19. | Feb. 20. |
| | July, | 19. | Nov. | 14. | Mar. 29, 1921. |

Total number of wet days, 226/366.

The number at Beinn Laoigh would be greater and account must also be taken of the mists which very often envelop the mountain when no rain falls at Tyndrum. The relation between these mists and insolation has also to be reckoned with in connection with the growth of the vegetation. The question of insolation is a most important one not only in this connection but also in relation to the configuration of the mountain and to other factors, etc., and will be considered later with regard to the localities most concerned.

The following records have been taken from the Journ. Scot.

Meteor. Socy. vol. xi. (1895-98) :-

Tyndrum, 56 26 N. 4 43 W.

792 ft. above Sea Level.

Barometer, 9 a.m. and 9 p.m. 1857-95.

Temperature.

Mean monthly and annual records:-

| | | |
|---|---|---|
| Jan. | 29.794. | 35.6 F |
| Feb. | 29.858. | 36.4 |
| Mar. | 29.824. | 37.5 |
| Apr. | 29.889. | 42.1 |
| May, | 29.936. | 47.2 |
| June, | 29.939. | 53.0 |
| July, | 29.870. | 55.4 |
| Aug. | 29.851. | 54.2 |
| Sept. | 29.856. | 51.5 |
| Oct. | 29.803. | 44.4 |
| Nov. | 29.820. | 39.0 |
| Dec. | 29.808. | 36.6 |
| Annual, | 29.854. | 44.4 |

In this region snow occasionlly falls late in the year.

On 4th. May 1921 snow fell at Tyndrum.

THE FACTORS AT WORK.

As already mentioned, Beinn Laoigh is not on the regular beaten track of the excursionist. It is considerably inaccessible. Even agriculture does not reach its slopes although the influence of sheep has to be considered. There exists, too, on the approach to the ben at Tyndrum, a remnant of the ancient Caledonian Forest which has afforded some isteresting botanising in the past chiefly to the bryologist and to fungologist.

In discussing the Vegetation of Beinn Laoigh it is proposed to subdivide the area into the following localities and to treat them seriatim :-

I. Conenish.

Around the confluence of the Conenish River and Allt Eas Anie, and westward to the confluence of Allt an Lund and Allt Coire Laoigh.

II. The Head Valleys.

Allt an Lund,

Allt Coire Laoigh,

Allt Eas Daimh.

III. Stob Garbh and the Northern Scarps.

IV. The Corries,

The Perthshire Corrie, (Coire Gaothach).

The Argyllshire Corrie, (Fionn Choirein).

The NW. (Upper) Corrie, (Coire an Lochan).

V. The Grasslands of the Upper Slopes.

VI. The Mountain Top.

Photos. D. Patton.

The Upper Conenish.

I. AROUND CONENISH.

Conenish Farm, with its adjacent "Shepherd's House" from which most of the excursions to the area were made, stands at the confluence of the R. Conenish and Allt Eas Anie. It is essentially a sheep farm. All the tillage that is done is confined to a very small walled-in area which is given up to the cultivation of natural hay, a few turnips and potatoes. The farm buildings are considerably sheltered by high morainic accumulations. Here the Boulder Clay deeply overlies the Quartz Mica Schist which is being eroded and corroded by the rivers. In spite of the presence of the sheepfarm and in spite of the previous occupation of a small area in the near vicinity by a small lead working community (the miners resided at Tyndrum, then called Clifton.) there is very little evidence of introduced plants. Typical weeds of the farm are found only within the retaining wall already mentioned. The Common Daisy, abundant on Lawers up to an altitude of 2800ft. is here a rarity. The writer knows only one locality for it (the roadside at Conenish) within the past twelve years; and he has never seen it grow on Beinn Laoigh. The margins of the path leading from the farm to the shepherd's house produce:-

Polygonum Aviculare,
Rumex crispus,
R. Acetosa,
R. Acetosella,

The last two Rumexes are, of course, very abundant around the sheepfanks where they are only, and only at times, subdominant to Urtica dioica which on Beinn Laoigh grows unaccompanied by Pteris.

PHOTOS. D. PATTON.

(a). Tree remains in Peat. (Allt an Lund.).

(b). Peat overlying Boulder Clay, Upper Conemish. (in section cut by stream).

Allt Eas Anie and the Conenish River join below the farm. The vegetation of the one valley stands out in striking contrast with that of the other. At the close of the Ice Age these two valleys were left with a somewhat similar floor; for it may not be considered that the Boulder Clay deposited therein came from the slopes that the streams now drain. However that may be, the accumulation of Boulder Clay and morainic material in these valleys afforded an excellent substratum for the development of moorland. An investigation of the peat which now rests upon the Boulder Clay would doubtless shew interesting divergent series of succession until the present vegetation is reached. So that, to-day the valley of the Allt Eas Anie, fed by water from the Quartz Mica Schist of Beinn Chuirn and the Quartzites of Meall Odhar both exceedingly poor in mineral salts, is a Calluna-Vaccinium Moor. On the other hand, the valley of the Conenish, watered by the head-springs of the River Tay which well from the calcareous flanks of Beinn Laoigh rich in minerals, luxuriate as a Grass Moor. (For the flora of this valley see the subjoined table.) Lower down the Conenish Valley, where it bends round towards Crianlarich, the Ancient Caledonian Forest persists and at no very remote period it existed at the upper reaches. To-day, the roots of the pines are being dug out of the peat for firewood at Conenish. In the forest mentioned above and on the knolls arising from its swampy floor are to be found such plants as Trientalis europaea, Pyrola media, and Listera cordata; while in the sphagnum marshes of the wood, (Coille Coire Chuile), there is great abundance of Vaccinium Oxycoccus, Carex pauciflora, and Rynchospora alba. At Conenish however, the forest has gone and the broken peaty moorland is

not relieved by any trees save an occasional rowan or birch by the side of the river and only where the stream has corroded deeply. Just above the confluence of the streams, in the sphagnum marshes of Allt Eas Anie, there is a wealth of Drosera rotundifolia interspersed with D.anglica; here the hybrid, D.obovata grows.

Above Conenish the Boulder Clay has been deeply corroded by the Conenish River and the great erosion of past years has resulted in extensive stretches of alluvium. At places the channel has for the time reached its base level of denudation, so that during floods the wide alluvial tracts are silted, and fresh young grass and sedges render them a fertile pasturage in the summer months, simulating in this respect, though in miniature, the grassy holms of the Upper Clyde Valley; species of course differ. Here are found, in the drier areas, Agrostis canina, A.tenuis, Anthoxanthum odoratum, Festuca ovina, Cynosurus cristatus, with Prunella vulgaris, Lotus corniculatus, Potentilla erecta, Euphrasia officinalis. In the wetter places the grasses are more or less replaced by Junci and members of the Cyperaceae. These also predominate where the alluvium is dissected by tributary streams.

On the old river terraces and on the higher slopes of the boulder clay by the streamsides, all stages in the formation of peat are found. The vegetation is similar to that described under "The Head Valleys" save that in the wetter localities there is a greater abundance of Erica Tetralix and Scirpus caespitosus. Myrica Gale is locally abundant here, but it is exceedingly rare above the confluence of Allt an Lund and Allt Coire Laoigh.

The gravel stretches of the river, at altitudes around 900 ft., support, in addition to the general vegetation, such

plants of the Ben as :-

Saxifraga oppositifolia, Oxyria digyna,
S. aizoides, Silene acaulis,
Alchemilla alpina.

Seeds of these - more probably whole plants - have been brought down from the upper reaches and the higher altitudes, and growth has been maintained at this lower level on account of the continuance of their former ecological conditions. These plants can be traced farther down the Conenish and into Strath Fillan (below 600 ft.) in similar localities. There is, too, in this Upper Conenish Valley, a waterfall which has carved out a sheltered gorge. Here, arctic-alpines from the Ben luxuriate, flower and fruit often a month earlier than they do on the upland crags, viz :-

Trollius europaeus, Geranium sylvaticum,
Solidago Virgaurea, Galium boreale,
Rubus saxatilis, Thymus Serpyllum,
Sedum roseum, Saxifraga aizoides,
Thalictrum alpinum, S. oppositifolia,
Lycopodium selago, S. stellaris, etc.

Mention must be made of the straggling, storm-buffeted larch which rears itself within the precincts of Conenish Farm.

For a complete list of the plants of this area (and of the succeeding areas) see appendix.

Photos. D. Patton.

(a). Head-Waters, Allt Coire Laoigh.

(b). Dissected Flank of same. (Ben Oss side).

(c). Allt An Lund. (below old mine.)

(d) Lower Allt Eas Dainh and Glen Lochy. (Looking towards Cruachan.)

## II. THE HEAD VALLEYS.

The Conenish River is formed by the junction of Allt Coire Laoigh and Allt an Lund. The old mine workings can be traced out along the banks of the latter near the confluence and at the base of the mountain proper. In the valley below these remains, the peat hags reveal an abundance of the bleached roots of an ancient forest. Water lies long here, and the vegetation is scanty, consisting chiefly of tussocks of grass and sedge. Large boulders appear half-buried in the peat and, on sheep horns which are found lying in the shelter of these, Onygena occurs frequently.

### (a) Allt an Lund.

The valley of this stream is more or less terraced presenting two outstanding series of terraces, a wet series nearer the stream and, higher, a dry series which is being encroached upon by the screes and by the general downcreep of soil from the Ben. Characteristic of the former area are the following plants :-

Eriophorum vaginatum, d.
E. angustifolium, d.
Scirpus caespitosus, l. d.
Juncus squarrosus, l. d.
Molinea coerulea, l. d.
Juncus conglomeratus,
J. sylvaticus,
J. articulatus,
Luzula congesta,
Anthoxanthum odoratum,
Festuca ovina,
Carex echinata,
C. flava,
C. pulicaris,
Ranunculus Flammula,
Viola palustris,
Linum catharticum,
*Lysimachia nemorum,
Trifolium repens,
Pinguicula vulgaris,
*Pedicularis palustris,
Crepis paludosa,
Taraxacum officinale,
*Erica Tetralix, } sparingly,
*Calluna vulgaris, }
*Triglochin palustre,
Drosera rotundifolia,
Parnassia palustris,

Equisetum palustre,
E. sylvaticum,
Narthecium ossifragum,
*Malaxis paludosa.

In addition to the above (omitting those marked with an asterisk which either are absent at the higher altitude or are not so frequent), and occupying the drier areas up to 1300 ft. the following plants are to be found :-

Festuca ovina, f. vivipara,
Nardus stricta,
Cynosurus cristatus,
Sieglingia decumbens,
Agrostis tenuis,
A. canina,
Alchemilla alpina,
A. vulgaris,
Thymus Serpyllum,
Galium saxatile,
G. boreale,
Geum rivale,
Rhinanthus Cristta-galli,
Thalictrum alpinum,
Viola canina,
V. sylvatica,
Cardamine hirsuta,
Pedicularis sylvaticum,
Oxalis acetosella,
Potentilla erecta,
Vaccinium Myrtillus,
Euphrasia officinalis,
Polygonum viviparum,
Tofieldia palustris,
Prunella vulgaris,
Erica cinerea,
Anemone nemorosa,
Tussilago Farfara,
Hypochoeris radacata,
Angelica sylvestris,
Saxifraga hypnoides,
Primula vulgaris,
Polypodium vulgare,
Blechnum Spicant,
Cystopteris fragilis,
Phegopteris Polypodioides,
P. Dryopteris,
Dryopteris montana,
Deschampsia flexuosa,
D. caespitosa.

As the valley of the Conenish is ascended beyond the confluence, it rapidly narrows. The slopes towards the stream are dissected by numerous natural tributaries. Thus the drainage is not impeded to any great extent by the moss and peat,

and an abundant rainfall flushes the bogland. Add to this the fact that the waters from the Ben have traversed the region of the calcareous schists. Hence a grassy moorland type of vegetation occupies the valley. Myrica Gale, frequent below the confluence, now disappears. Sphagnum is very abundant on the lower terraces, especially where these are broad and level, and here Malaxis paludosa grows. Here, too, occasional bare patches of peat are exposed, which for the greater part of the year lie under water.

(b). Allt Eas Daimh.

The vegetation of this valley is similar to that of Allt an Lund. The calcareous schist escarpments extend beyond the col right down to the point where the stream traverses the lower slopes of the Argyllshire Corrie. In the lower reaches, before it flows under the railway to join the River Lochy, there is a series of kames where, on account of the nature of the deposits, the soil is more acid. Here are to be found a few clumps of Pteris; but they are local, the main character of the vegetation being that of a grassland, closely resembling that of the Upper Conenish. Boggy in places, this area is rich in mosses, ledges and bosses of Polytrichum commune and Sphagnum spp. - chiefly S. cymbifolium and S.acutifolium. These are conspicuous, especially in the late autumn, when the surrounding vegetation has died down. Here, too, are a few scattered birches; but they are lichen- and moss-clad and are slowly succumbing to the attack of fungi.

(c). Allt Coire Laoigh.

The head-waters of this valley drain an area poorer in calcareous schists, the rocks being more quartzose. However, the rocks are steeper and more deeply dissected by tributary streams.

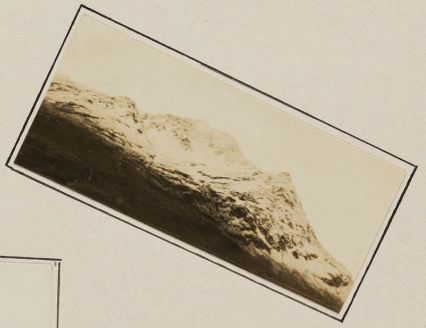
They are much drier and the lush vegetation is more confined to the margins of the numerous runnels. Away from these a rich vegetation is also maintained which is due, no doubt, to the gravitating water in the subsoil. Further, and owing to the nature of the weathering of the schists, the debris of the mountain, brought down and scattered over the lower ground, though tending locally to be stiff, is well aerated and contains an abundant salt supply. The dominant vegetation is again of the grassy type. Calluna vulgaris is very scarce and, where found, is associated but sparingly with Erica Tetralix in the wetter places, and rarely with E.cinerea in the drier areas; but there is no attempt at a Calluna-Moor Association such as obtains in Allt Eas Anie.

These head-valleys are strewn with boulders and rock-masses from the overhanging crags. Such rocks, as well as the debris on the screes where it has come to the angle of repose, are gradually colonised by species of algae, lichens and bryophytes, the vegetation depending upon the time during which these rocks have been exposed to the working of the various ecological factors. An outstanding feature here, as with the rocks in situ, is to be found in the nature of the weathering of the different schistose rocks. Boulders of quartz-mica-schist may be practically barren, but where the quartz predominates the chief colonists are lichens, e.g., Rhizocarpon geographicum, DC., others of note here are, Platysma Fahlunense, Nyl., Gyrophora cylindrica, Ach., Lecanora sulphurea, Ach., etc., whilst around the base of the boulders Rhacomitrium lanuginosum is the most frequent moss. The garnetiferous-mica-schist affords a better surface for bryophytes and are usually mottled with lichen and moss, species of Rhacomitrium (R.aciculare, R.heterostichum, R.fasciculare,) and

species of Andreaea. The Calcareous Schists weather more readily than the above. They crumble away and leave a porous, friable surface which in wetter parts is the habitat of angiosperms as well as bryophytes, algae and lichens. Of the last mentioned these are of note :- Lecanora tartarea, Ach., L. parella, Ach., Aspicilia poriniformis, A.L.Sm., Rhizocarpon calcareum, T.F., R. petraeum, Mass., Arthopyrenia allogena, A.L.Sm.

Further, plants have been brought down from the heights by the tributary streams, so that along the main streams in each of the three head-valleys, the following species are to be found growing on the escarpments overhanging the water :-

Selaginella selaginoides,
Saxifraga oppositifolia,
S. aizoides,
S. stellaris,
Silene acaulis,
Spiraea Ulmaria,
Solidago Virgaurea,
Galium boreale,
Oxyria digyna,
Plantago maritima,
P. lanceolata,
Pyrus Aucuparia,
Geranium sylvaticum,
Trollius europaeus,
Lycopodium selago,
Angelica sylvestris,
Heracleum Sphondylium,
Avena alpina.



Photos. D. Patton.

The fertile zone below the Lip of Coire Gaothach.

## III. STOB GARBH AND THE NORTHERN SCARPS.

Before dealing with the vegetation of the escarpments, which is the scope of this section, mention must be made of the grassy slopes which descend to the levels already described. Most noteworthy are those leading from Coire Gaothach which are watered, drained and soil-besprinkled by the two large streams issuing therefrom. The north-eastern exposure and the gradient of the slopes contribute towards a strong insolation during the greater part of the summer day. In the morning, however, the shadows of Ben Oss limit the range, as, in the evening, do the shadows of the Ben itself. The position of the corrie-lip causes the water-table to contribute to the slopes - reducing its head by percolating through the rocks underlying the slopes and causing moist hollows to appear, which are lush and rich in many of the characteristic flowers of the mountain. The soil is rich in lime content. A notable addition to the flora is found in Kobresia bipartita and here, too, Juncus triglumis, J. castaneus and Carex saxatilis are frequent. In the pockets of the sides of the cataracts, and at various altitudes, plants of the Stob Garbh escarpment are found, notably Vaccinium uliginosum, Sedum roseum, Saxifraga oppositifolia and even Bartsia alpina.

Stob Garbh rears itself to an altitude of about 2600 ft. from which height, to the north, east and west, there descend steep precipices and gullies. These continue from the Stob as bluffs and cliffs overhanging the Allt Eas Daimh, where they present a pseudo-terraced aspect. Mainly an outcrop of the Calcareous Schists, except where interrupted as previously described, by dykes, etc., it is, throughout its entire height, where soil accumulates, practically masked by the deoris from

1.

2.

3.

4.

5.

6.

1. Stob Garbh.
2. & 4. The fertile Screes and Crags of the Calcareous Schists.
3. The barren Quartzite Scree and Scarp of Beinn a Hourn (N. of. Laoigh.).
5. Typical Lawers-Carnlochan Schist.
6. Grass covered Scree - Calc. Schist.

PHOTOS. D. PATTON.

the disintegrating calcareous schists. This specially refers to the small exposure of felsite. Where the felsite outcrops extensively, as it does on the summit of Ben Oss, it gives rise, on weathering, to angular fragments of a slabby nature and forms unstable, barren screes. (Cf., The Tinto Hills). Its vegetatio simulates that of the quartzite. Where the Hornblende Schist outcrops, the vegetation is very much richer.

Stob Garbh is for the most part shunned by the sun's rays for the greater part of the year. The night frosts of the early summer hold throughout the day even although the sun may shine through an unclouded sky, and the icicles, pendulous from rock and vegetation alike, may only be thawed by the circulating atmospheric currents. Many places in the escarpment never receive the direct rays of the sun. On the other hand, where the more prominent ledges outcrop, the vegetation of the pockets, crags and crevices experience an intense, if somewhat limited insolation; the atmosphere is warmed but the subsoil may be ice-bound. Alpine conditions obtain. The outcrop has its maximum vertical extent on the northern escarpment of Stob Garbh and gradually disappears E and W under morainic material and peat. Successive freezing and thawing cause many falls of rock in the spring. Hence, the exposures present all stages of plant invasion from the newly-formed, barren rock-faces over which the oozing water soon accounts for the presence of Nostoc, Trentepholia, etc., to the densely clad bosses with well established arctic-alpines. The nature of the escarpment - the lie of the fold - lends itself to the formation of pockets; for the outcrop here has a dip downwards into the mountain and ledges are formed

"Icicles
pendulous from
rock and vegetation,"
on Laogh.

PHOTOS. D. PATTON.

which unfortunately aid the unscrupulous collector. The revers is obvious on Lawers where, on that account, pockets are not so well developed, and cases are extant where rare plants have at times disappeared from ledges simply by falling away with the soil that bears them. Nevertheless the comophytes of Lawers, though more frequently seen than those of Laoigh, gladden the heart - afar off! Mention has already been made of the mode of weathering of the schistose rocks. The sericite itself not only offers a resting place for a luxuriant vegetation but it gives to the pockets and ledges a rich soil not merely with regard to its chemical elements but also from the fact that it disintegrates to a porous soil with a suitable water-holding capacity and adequate aeration. The secret of its fertility may be due largely to these facts together with the influence of the biotic factor active in the accumulating humus. Since the less fertile rocks are besprinkled with the debris from the overlying decomposing calcareous outcrops, the general tendency is for the vegetation to become more uniformly distributed, the water supply being the chief differentiating factor. One point must not be lost sight of regarding the colonisation of these scarps and gullies, and that is, that members of diverse plant communities vary not only on account of the climatic, edaphic, topographic and biotic factors, nor even on account of competition, but also because of the chances that a grain of any seed has of falling to the ground.

Typical cushions of Silene acaulis and Arenaria sedoides, straggling outgrowths of Sedum roseum, Saxifraga oppositifolia, Alchemilla alpina and Dryas octopetala and, where the rock ledges are more extensive and cushions more compact and intergrown, Bartsia alpina, Trollius europaea, Pyrola rotundifolia, P. sec-

unda, Geranium sylvaticum, Botrychium Lunaria, are common. Other plants are :-

| | |
|---|---|
| Arabis petraea, f. grandiflora, | Solidago Virgaurea, |
| Draba incana, | Campanula rotundifolia, |
| Potentilla Crantzii, | Asplenium viride, |
| Saussurea alpina, | Hypericum pulchrum, |
| Saxifraga aizoides, | Cochlearia alpina, |
| S. nivalis, | Cerastium alpinum, |
| Lycopodium selago, | C. vulgatum, var. alpinum, |
| Geum rivale, | Carex flava, |

Armeria maritima.

Where the vegetation is more established owing to the soil being more stable, as on the more extensive ledges, these plants are to be found :-

| | |
|---|---|
| Vaccinium Myrtillus, | Angelica sylvestris, |
| V. Vitis-Idaea, | Heracleum Sphondylium, |
| V. uliginosum, | Rhinanthus Crista-galli, |
| Arctostaphalos Uva-Ursi, | var Drummond-Hayi, |
| Cerastium vulgatum, | Polygonum viviparum, |
| Salix arbuscula, | Geum rivale, |
| S. Myrsinites, | Plantago maritima, |
| Carex atrata, | Hieracium anglicum, |
| C. Oederi, | Deschampsia alpina, |
| C. binervis, | Festuca rubra, |
| Galium sylvestre, var.glabrum, | Empetrum nigrum, |

Avena alpina.

And growing in some of the broader, moss-covered crevices in the crags :- Cystopteris montana, C. fragilis, Polystichum Lonchitis and Blechnum Spicant. The first mentioned is still to be found in great abundance among the scarps of the northern face.

On the more established screes at the base of Stob Garbh there is a wealth of Saxafraga hypnoides, (and associated with it, S. quinquefida,), also Cnicus heterophyllos, Euphrasia spp. Rhinanthus spp., Sagina sagimoides and Potentilla erecta, the whole merging down into the vegetation of the valley. The lichen Cerania vermicularis, S.F.Gray, is common here, and a rarity the moss, Orthothecium rufescens, fruits here.

In sheltered crannies throughout these cliffs the following are met with :-

Adoxa Moschatellina, Anemone nemorosa,
Cardamine hirsuta, Oxalis Acetosella,
Chrysosplenium oppositifolium, Saxifraga stellaris

and among the mosses and liverworts, overtopping them and tending to oust them out, the lichen Solorina saccata Ach. is common.

The habit of the vegetation of the more favoured gullies is most characteristic. Thanks to the shelter afforded them, the plants, in a kindly soil, develop a luxuriant foliage. Alchemilla vulgaris assumes a larger leaf and a more profuse inflorescence than it does by the streamsides in the lower valleys. A similar contrast is seen in plants at the same altitude, (a) in sheltered gullies, (b) on exposed ledges; e.g. :-

Solidago Virgaurea, Geranium sylvaticum,
Sedum roseum, Vaccinium uliginosum,
Saussurea alpina, Habenaria viride,
Cochlearia micacea, Heracleum Sphondylium.

The glory of Dryas and Pyrola, blooming on the ledges of Stob Garbh, is never to be forgotten, nor are the magnificient festoons of Saxifraga oppositifolia nor the blooms of this Saxifrage peeping through the snow.

"Upon the mountain ledges green
The Saxifrage's purple sheen
In many a splendid patch is seen,
Salix herbacea floreat!"

In 1921, at an altitude of 2000ft., twenty seven plants of Saussurea alpina were seen growing in one narrow pocket, all in full bloom. What beauty! What fragrance!

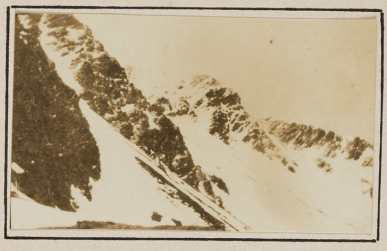
Plants of the sea-side are to be found here:-

Cochlearia officinalis, (f. alpina,) Plantago maritima, Armeria maritima, Sedum roseum,

No doubt, on the retreat of the ice at the close of the glacial period, because they had adapted themselves to experience a condition of physiological drought, they had a choice of undergoing it either at the sea-side in a halophyte habitat or in the vicinity of snow and ice. The manner in which these plants of the mountain overcome the difficulties attending this physiological drought, be it due to cold or to colloidal substances in the soil, is seen markedly in the development of the root system, not only in the crevices where the comophytes develop long roots often branching repeatedly and invested with great felts of rootlets, but also in the pockets where the plants may penetrate through the frozen zone or extend widely in a soil which the biotic factors render habitable. Birds, as seed dispersing agents, may aid in the distribution of these sea-side plants.

The type of vegetation found on the northern exposures of Stob Garbh resembles very closely that which is so notable a feature of the escarpments of biotite-mica schist in the vicinity of Finse, which overlook the Hardanger Glacier in Norway, (visited in July, 1914; and described in a paper read to the Botanical Society of Edinburgh, - Proc. Bot. Soc. Edin., Feb. 1915

1915), much more than it does that on the limestone crags of the Swiss Alps, (visited July, 1922).



Photos. D. Patton.

In and around

Coire Gaothach.

IV. THE CORRIES.

A. Coire Gaothach, - The Perthshire Corrie.
B. Fionn Choirein, - The Argyllshire Corrie.
C. Coire an Lochain, - The N.W.(Upper) Corrie.

A. Coire Gaothach.

Here there is great variety. From the edge of the corrie extending halfway back between the outstretched limbs of the "Sphinx" of B. Laoigh lies a very hummocky area consisting of morainic material, debris from the cliffs, and rocks outcropping from situ. This area is very fertile and is drained by streams which go to feed the two large burns that issue from the corrie. The vegetation of the tops of the knolls is stunted and consists chiefly of :-

| | |
|---|---|
| Festuca ovina.f.vivipara, | Potentilla Sibbaldi, |
| Luzula spicata, | Antennaria dioica, |
| Lycopodium alpinum, | Salix herbacea, |
| Cochlearia micacea, | Gnaphalium supinum, |

Alchemilla alpina.

Cetraria icelandica is one of the commonest lichens here. On the slopes are found :-

| | |
|---|---|
| Vaccinium Myrtillus, | Viola palustris, |
| V. uliginosum, | Carex Oederi, |
| Euphrasia spp., | Rumex Acetosa, |
| Veronica serpyllifolium, | Festuca rubra, |
| var. humifusum, | Rumex Acetosella, |
| Epilobium anagallidifolium, | Nardus stricta. |

Well up within the corrie the period of the vegetation is more limited still. The season is shortened on account of the lingering mantle of snow. Amongst the looser and larger rocks

at the base of the screes Alchemilla alpina and Galium saxatile form a dense intergrowth and there is local abundance of Phegopteris Dryopteris, P. Polypodioides, Cystopteris fragilis, Lycopodium selago, L. clavatum and Cryptogramme crispa. But it is on the screes themselves that the Parsley Fern luxuriates. It dominates the lower screes and its extent can easily be traced from a distance; e.g., from Conenish its characteristic yellow-green can be seen contrasting strongly with the colour of the surrounding vegetation and scree. The lower flushes, where the water wells out from the screes into the fresh green of the subjacent slopes, are characterised by a wealth of Juncus castaneus. The cliffs uprising from the screes are not so rich as those of Stob Garbh already described - the Garnetiferous-Mica Schist here appearing on top. The walls of the corrie, because of its north-eastern exposure, shut out the direct rays of the sun from more than half of the corrie for the greater part of the day and at all seasons. Hence it is that, apart from the edaphic factor, the shadowed area of the south-eastern scarps of the corrie are comparatively barren and limited in species, whilst the southern and south-eastern slopes and crags of Stob Garbh are luxuriant and the vegetation is more varied. The most striking of the arctic-alpines upon these more or less bare escarpments is Arabis petraea, var. grandiflora, Druce.

The composition of the rock, its mode of weathering, the short period of insolation made shorter by the prevalence of mists, and above all the exposure to an atmosphere in spring when the temperature is, oftener than not, below freezing point, though about midday it may be very considerably higher, (the dormant vegetation of the corrie-floor lying buried under snow,) - all these account for the barrenness of the rocky walls of the corrie from an altitude of 2600ft. to one of 3700ft. Add to

these the fact that, higher up in the corrie, the screes are ever on the move, and that storms are very frequent. Ledges there are in the Garnetiferous-mica Schist where, in the height of summer, some species, e.g., Alchemilla alpina, Gnaphalium supinum, Salix herbacea, Luzula spicata, Festuca ovina.f.vivipara, and curiously enough, Cardamine hirsuta, and C. pratense manage to subsist; but they lack the floristic wealth of the sericite crags of Lawers at a similar altitude.

B. Fionn Choirein.

The Argyllshire Corrie is disappointing after working the Perthshire Corrie. Its exposure is more to the north-west. Larger and less corrie-like it descends to a lower altitude. Boggy at its exit into Allt Eas Daimh it produces several items of interest, e.g., Carex pauciflora and Malaxis paludosa. The lower flanks of this corrie are associated with the rich calcareous schists, and the vegetation varies accordingly.. Higher up its western side(Beinn a Chliebh) is precipitous and bears the richest flora, simulating that of the corresponding walls of Coire Gaothach. Its eastern slopes are more rounded, grassy slopes giving place to extensive screes as the ascent is made to the summit. These expanses are of unstable, barren blocks and slabs down-slipping from the mountain-top detritus. The lower reaches of the corrie floor are a grass moor where the following grasses are locally dominant and often closely associated, interspersed with cushions of Polytrichum commune in the drier and Sphagnum spp. in the wetter areas.

Deschampsia flexuosa, Festuca ovina,
Festuca rubra, Agrostis canina,
Agrostis vulgaris.

and also Juncus squarrosus, Carex flava, C. Oederi.

The Corrie vegetation at its lower altitudes gradually merges into that of the lower reaches of Allt Eas Daimh already described.

C. Coire an Lochain.

In this upper corrie the vegetative season is shorter than in any other area. At the end of May, 1921, it was still almost completely filled with snow and ice. Miniature glaciers descended to the snow-covered lochan, while round the margin, where the soil had been laid bare, the black remains of decomposing vegetation suggested by their smell, cast up seaweed. Does the process of decay contribute any towards raising the temperature of the surrounding soil? There, were cushions of Silene acaulis of last year, and trailing branches of Alchemilla alpina, last season's stems of Luzula spicata, Poa alpina and of Festuca ovina. "Solvitur acris hiems grata vice veris et Favoni". The belated spring brought on a wealth of blooms, notably Saxifraga nivalis, in the more sheltered gullies; and on the more stable screes plant growth was abundant; by August the snow had disappeared and in vegetation this area simulated, though not so richly, the Perthshire corrie.

Although there is a sequence in time of flowering on the lower scarps, in the corrie the limited time demands almost an arctic condition - simultaneous flowering.

NOTE.

Coire Aonaich due south of the summit, and Coire ant Sneachda due East have not been discussed under the above heading since they are not in the same category as corries; but their vegetation is considered along with the other areas as, according to altitude, it conforms to that of the Mountain Top, The Upper Grassland and The Head Valleys.

V. THE GRASSLAND OF THE UPPER SLOPES. (General.)

The transition from the vegetation of the Head Valleys to that of the upper slopes is, in most areas around the Ben, very gradual. Though it may be expected that the more or less abrupt change in inclination where these areas abut should, because of the corresponding change in the drainage, bring about a corresponding change in the vegetation, still the flushing of the upper limits of the valley slopes by the water draining from off the mountain during periods of Heavy rainfall scatters fine deposits of the weathered calcareous schists on the lower slopes. As already pointed out, these are also well drained. Hence the vegetation of the Upper Grasslands merges gradually into that of the valley. The altitudes at which this grassland actually commence vary not only with the configuration of the mountain but also with the direction of the exposure. To the north-west and north-east it descends almost to moorlands already described (cir. 2000 ft.), but to the south it has a higher range. There the heath and moor formations of the upper Loch Lomond Drainage Area, which extend to Laoigh from Glen Falloch by way of Gleann nan Caorrunn, give place to the Eriophorum and Grass Moor Associations which extend to an altitude of about 2500 ft.

V. THE GRASSLANDS OF THE UPPER SLOPES.

Owing to the configuration of Beinn Laoigh and to the weathering of its outcrops, the area under grass is greatly restricted. Nevertheless, because of the fertility of the soil, the grassland is rich where the weathering detritus has come to the angle of repose. This is utilised for the grazing of sheep, and the hill is much frequented by deer. To the west the mountain-top detritus graduates down into a more or less barren scree extending all along the upper eastern slopes of the Argyllshire Corrie to a considerable and varying depth. Below this, however, the grassland becomes more and more established and is soon dense and luxuriant; the most representative species are, Festusa ovina, Agrostis canina, A. tenuis, Deschampsia flexuosa, and Anthoxanthum odoratum, locally abundant being Juncus squarrosus which shows its characteristic habit in its spreading leaves. The grassland extends round to the northern flank of Laoigh and carpets the broad shelves which top the successive precipices. Where the ground is more broken owing to corrosion and erosion attending the flushing brought about by heavy rainfall, the ledges show large bright green tufts of Polytrichum commune associated with other bryophytes; and where the water is more or less held up, cushions of Sphagnum with Junci are common. Alchemilla alpina is universal in this zone,

"Tha trusgan faciliah air cruitan aonich."

Where the Alchemilla is replaced by Potentilla Sibbaldi, the contrast is most striking. This is well marked on the drier and more barren stretches where the pale green leaves of the former tend to become yellow whilst the latter, usually bluish-green in colour, is very often purple or deep crimson. Associated here with the grasses are :-

Ranunculus acris, Taraxacum officinale,
Viola Riviniana, Thymus Serpyllum,
Potentilla erecta, Prunella vulgaris,
Alchemilla alpina, Euphrasia officinalis,
Lotus corniculatus, Plantago lanceolata,
Linum catharticum, ~~Plantago lanceolata,~~
Galium saxatile, Rumex Acetosa,
Narthecium ossifragum, Luzula spicata, to mention the chief.

To the north the escarpments are too frequent; denudation is ever altering the surface conditions. The broad ledges, however, bear a similar carpet to that already described save that, in addition, plants of the scarps have become established therein, notably :- Solidago Virgaurea, Saxifraga hypnoides, S. quinquefida, Sagina Linnaei, S.procumbens, and Cnicus heterophyllus.

In Allt Coire Laoigh and on the southern flanks conditions are more favourable and there are well established grassy slopes - alpine grasslands. Festuca ovina, f.vivipara is dominant, with Anthoxanthum odoratum, Agrostis canina, A.vulgaris, Deschampsia flexuosa, and, locally, Deschampsia alpina, Sieglingia decumbens, Molinia coerulea and Nardus stricta. Other plants most common to this area are :-

Ranunculus repens, Campanula rotundifolia,
Cerastium vulgatum, Vaccinium Myrtillus,
C. alpinum, Plantago lanceolata,
Potentilla erecta, Thymus Serpyllum,
Alchemilla vulgaris, Luzula spicata,
Galium saxatile, Juncus squarrosus,
Polygala vulgaris, Carex capillaris,

and Carex rigida, and occasionally :-

Thalictrum alpinum,
Trifolium repens,
Sagina procumbens,
Scabiosa succisa,
Rumex Acetosa,
R. Acetosella,
Luzula multiflora,
Habenaria viridis.

Photos. D. Patton.

The Summit,
Beinn Laoigh.

VI. THE MOUNTAIN TOP.

Higher up the dominant plant still is Festuca ovina, but there is a greater abundance of Juncus trifidus, Luzula spicata, and Carex rigida. Mosses and lichens fill in the gap,- or rather exclude the phanerogams because of their greater adaptibility to the conditions obtaining. As the ascent is made to the top, the pockets become emptier, and the accumulation of the mountain-top detritus assumes a honeycombed appearance, - block upon block, with no soil save in the smaller nooks and crannies where, wind-borne or snow-borne or formed in situ on the boulder, sufficient earth has accumulated to enable the hardiest plant to obtain a roothold. Here, lichens are dominant, Solorina crocea being most in evidence. Rhacomitrium lanuginosum is the most abundant moss and associated with it are dwarfed specimens of Salix herbacea, Carex rigida, and Festuca ovina, ff.

Near the summit, where the soil has accumulated in larger areas it is either barren or clad with vegetation; barren, because the surface soil of a preceding autumn has with its vegetation been displaced or plucked away by the winter's superincumbent and down-creeping snow. There are many such saucers, into which, on account of the inability of most species to set seed at this altitude, neighbouring plants take long to encroach vegetatively. Where the soil is carpeted with vegetation, moss and lichen prevail; but there is also scattered throughout this another flora, - trailing growths of Salix herbacea, and Galium saxatile, dense cushions of Silene acaulis deeper in colour than the flowers on the lower crags, and clumps of Gnaphalium supinum. Over this assemblage of plants wave the inflorescences of Deschampsia flexuosa, Festuca ovina and Luzula spicata, whilst through it Carex rigida threads its way.

In the lists appended the species recorded for the mountain-top, (60 in all), are those found within the altitudes of 3250 ft. and 3708 ft. (the summit).

In this habitat the most important ecological factor is the water supply. Plants which exist here are only such as can withstand long periods of drought. As the summit is approached, standing-water and streams become less frequent and do not often occur within 100 ft. of the top, even when there is no drought. The plants which grow in this area are dependent, for their water-supply, upon what rises by capillarity from the water table, upon rain, and upon mists. In dry seasons, such as occurred in the summer of 1901, 1911 and 1921, the supply from the water table is soon cut off and even for some time afterwards any surface water that may accumulate is unable to establish continuity with the water underneath owing to the fact that the soil and rock intervening have the interspaces filled with air. The surface water soon evaporates, if the drought continues, and relief to the plants is only temporary. The majority of the plants of the mountain-top are therefore dependent for their existence upon rain and mists. The adaptations which these species adopt to meet such conditions are chiefly confined to the underground portions. These are relatively very much more developed than the sub-aerial parts and ramify in all directions, penetrating deeply into the subsoil in order to tap a large mass of it, or, following, for comparatively great distances, the joints and fissures in the rocks upon which they grow so as to be in the vicinity of the water which oozes the more readily that way. The roots and rootlets are in the latter case often densely felted and thus enable the plant to retain for a long time any excess of moisture which

reaches it.

In the case of the Phanerogams and higher Cryptogams the sub-aerial portions, but especially the leaves, are more adapted to prevent excessive transpiration. (With regard to the mosses, liverworts and lichens which constitute such a large portion of the mountain-top flora, their sub-aerial parts have to a very large extent also to do with water supply.) The leaf formation, hairs, etc., are very varied in the arctic-alpine species. This has been fully considered in recent years, the most up-to-date publication applicable to the conditions obtaining on Beinn Laoigh appears in "The Scottish Mountaineering Club Guide", vol. I, Section A, by Professor F.O.Bower, on "Scottish Mountain Botany, with special Reference to the Flowering Plants" where he concludes, "These are then the salient features. ----- A low, supine, often woody or succulent, glaucous or hairy vegetation it is, stunted and apparently ill-used so far as its leafy shoot is concerned, and often avoiding the production of flowers by the side alley of vegetative reproduction, called vivipary." A striking feature, as the ascent is made towards the mountain top, is that the aquatic plants decrease in number until they would appear to be ousted out by the species which at lower altitudes are found growing well away from wet conditions. These, e.g., Cochlearia and Cardamine, above the 3000 ft. contour, are found by the mountain runnels.

Insolation and temperature, together with the considerable rarification of the atmosphere at these altitudes, have their effect upon the vegetation. The foliage has already been regarded in the light of transpiration but it is further modified to meet difficulties of ~~transpiration~~ respiration and of carbon assimilation brought about by the climate. Add to these the shortness of

the open season. All these demand what has been observed in sections cut, - a more intense green due to the increased amount of chlorophyll granules present in the cells of the mesophyll, a thicker lamina due to the deeper layer of the palisade parenchyma, a thicker cuticle and a more strongly developed parenchyma, and, area for area, (when leaves of the plants of the mountain-top are compared with leaves of the same species of the valley, even in this short range of altitudes), a greater number of stomata per unit of surface in the plants found at the highest altitudes. These go to shew that carbon assimilation and respiration proceed more rapidly and in measure tend to counteract the shortness of the vegetative season. The influence of the lower ranges of temperature has already been discussed for other areas. The cold dry air and the winds have a drying effect upon the plant tissues. The power of endurance is inversely proportional to the amount of contained water within the plant cells. In spite of it all, leaves of grasses and sedges may be incased in icicles, yet when the thaw comes they are found to be carrying on their vital processes. Arctic-alpine plants on Beinn Laoigh have been seen to continue to bud and flower though repeatedly retarded by frost and snow, being sometimes ice-bound for days.

The influence of light in connection with the size, colour, and the perfume of the flowers, the red pigmentation of stem, petiole and leaf, and the shade plants , need only be mentioned again here, as also the action of the wind at these altitudes and its bearing not only upon transpiration and the general habit of the plants, but also upon its distribution of soil and detached portions of vegetation from other areas. Such action as the last can easily be observed on snow which has been lying for some time on the mountain.

Edaphic factors also come into play with regard to the vegetation of the mountain-top, especially if a comparison be made, (See ~~next~~ concluding chapter.), with the plant life on other, e.g., quartzite, summits, the influence being due to the physical as well as to the chemical properties of the soil. For, on Beinn Laoigh, the disintegrating garnetiferous-mica-schist which forms the mountain-top detritus, although not so rich in minerals as the soil from the calcareous schists of lower altitudes, affords an ample source of calcium, magnesium and potassium; but it also weathers into a soil porous and suitable, in its water-holding capacity, for arctic-alpine plants, - a soil rich also in humus and its associated bacteria and other lower forms which aid as the biotic factor in making life possible to the boreal vegetation.

SUMMARY.

The Vegetation of the Areas may be summarised as follows:-

I. AROUND CONENISH.

(a) Allt Eas Anie.

Closed Moorland Associations, belonging to the Moor and Heath Formations.

(b) Upper Conenish,

Scirpus Moor Associations,
Cottongrass Moor Associations, } Moor Formation.
Grass Moor Association,

II. THE HEAD VALLEYS.

Grass Moor Associations of the Moor Formation.

III. STOB GARBH AND THE NORTHERN SCARPS.

Chomophyte Formation.

(a) Open Communities on exposed Rock Faces.

(b) Associations of Sheltered Ledges.

(c) Associations of Shade Comophytes.

(d) Association of Hydrophilous Chomophytes.

IV. THE CORRIES.

(a) Perthshire and the Upper Corries.

i. Chomophyte Formation, as above.

ii. Arctic-alpine Grassland.

(b) Argyllshire Corries.

i. Chomophyte Formation.

ii. Arctic-alpine Grassland.

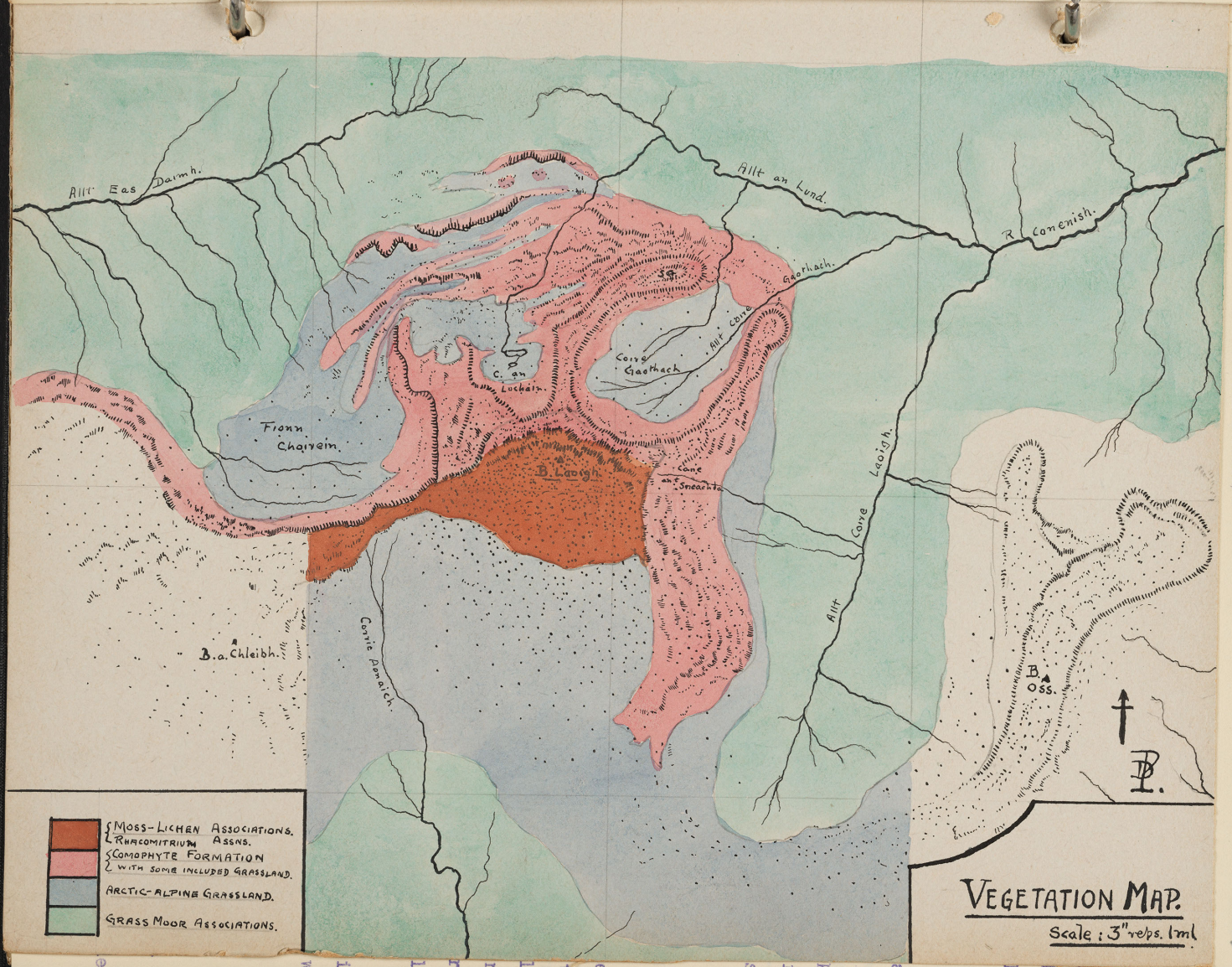
iii. Grass Moor Association, (Lower down).

V. THE GRASSLANDS OF THE UPPER SLOPES.

Arctic-alpine Grassland.

VI. THE MOUNTAIN TOP.

i. Moss Lichen Association. ii. Rhacomitrium Associations.




# VEGETATION MAP.

Scale: 3" reps. 1ml.

GENERAL OBSERVATIONS.

43.

P. Ewing, in "Trans. Nat. Hist. Soc. Glasgow, -1902", reports on "The State of the Alpine Flora in Breadalbane during the last week of July, 1902." Here he refers to the fact that "owing to the prevalence of easterly winds and the want of sunshine during the greater part of the spring and summer months, the growth of vegetation was very greatly retarded". Similar conditions obtained in 1912 and again, strange sequence, in 1922, which again appeared to be adverse to the growth of arctic-alpines. The observation is no doubt correct, but a further consideration falls to be made. It is noteworthy, in each of the three instances mentioned above, that the year preceding the one under review, (1901, 1911, 1921,), was one of great summer heat, intense insolation on the mountain slopes, a very low summer rainfall and a comparative absence of the prevalent mists. To the writer it seems that the backward state of the vegetation in the years 1902, 1912, and 1922, although influenced by adverse weather conditions during the early parts of these years, was primarily due to the drought of the year preceding. During 1911 there was a great display of flowers on Beinn Laoigh, and again in 1921. The surrounding mountains likewise shewed a wealth of blooms. On Lawers, Saxifraga cernua was specially abundant and flowered lavishly, - a very unusual occurrence, for it seldom flowers. During the years of drought the plants used up their reserve material in their effort to produce seed. Their perennating parts were depleted of their store, and the succeeding year found them weak. Some did not survive the drought. The important point which is brought out by the recurrence of years of drought is that the stability of the life of the vegetation of the mountain-top is interfered with and this should be borne

in mind, in conjunction with the gradual amelioration of the climate, when the question of the survival of an arctic-alpine flora in Scotland falls to be discussed.

The writer had expected to make some observations on the relation of the size of the vascular system to the sub-aerial bulk of the boreal plants on Beinn Laoigh, more especially since Bonnier has found that with increase of altitude there is a corresponding increase in the thickness of the cortex in proportion to the thickness of the stele. The plants are perennial, storage material is essential, and, although the vital processes are more rapid at higher altitudes, the leaves are smaller and the stele is reduced. But the range of altitudes is so limited on Beinn Laoigh compared with the Alps that, although section after section was cut from the same species collected,

(a), above 3500 ft.

(b), in Allt an Lund - 2000 ft., lower down,

satisfactory proportions could not be established to come to any definite finding.

There are one or two factors which apply to the vegetation of Beinn Laoigh as a whole, and fall to be considered because of their bearing upon plant distribution. The influence of man has already been referred to; and sheep have been mentioned as being responsible for the eradication and the introduction of species.

But the part played by insects is an important one, not so much in connection with pollination directly, since most of the plants of the Ben are perennial or are adapted on account of their limited season to reproduce vegetatively, but because insects, too, have to perpetuate their species. Galls are common on the vegetation (see Professor Trail, in Ann. Scott. Nat. Hist. - 1879-1880 - on "Scottish Galls") and insect larvae are abundant in the capitula of many of the Compositae. Saussurea alpina, (to instance one example), was observed by the writer to flower profusely on Beinn Laoigh, but the fact that the flowers seemed to wilt prematurely and to produce no seed was at first put down to the early advent of winter conditions. Closer observation, however, revealed the true cause - very few of the capitula examined during 1920, 21 and 22 were found to be free from larvae.

Perhaps the greatest enemies to the plant life of this mountain are the fungi; and perhaps there is no other area better suited for the study of the Uredineae, both hosts of each heteroecism occurring in close proximity. What is the significance of this? Are the Arctic-alpines tending towards extinction on account of these fungi? Approach another way. Is it the case that the ecological factors are in a sense adverse to these boreal plants and that there is, (apart from the fungal attacks), a growing disability for them to maintain their exist-

ence; or, in other words, is this another reason for the disappearance of the rarer and more arctic of the mountain flora? If that is so, are these plants by nature less immune to fungal attack than they would be in more northern latitudes? One thing is obvious and that is, that where these species are found at home in the vicinity of the Dovre Fjeld in Norway they are comparatively free from fungi. The answer then is apparent.

So far the following have been identified by the writer:-

On Thalictrum alpinum,

Puccinia septentrionalis, Juel., (Aecidia.)

Puccinia borealis, Juel., (Aecidia.)

On Saxifraga oppositifolia,

Melampsora alpina, Juel., (Aecidia.)

On Alchemilla alpina,

Uromyces alchemilla, (Uredospores and Teleutospores)

On Campanula rotundifolia,

Coleosporium campanulae, Lev., (Uredospores.)

On Polygonum viviparum,

Puccinia Polygoni-amphibii, Pers., (Teleutospores)

Puccinia septentrionalis, Juel., (Teleutospores)

On Salix arbuscula,

Melampsora alpina, Juel., (Uredospores)

On Salix herbacea,

Melampsora alpina, Juel., (Uredospores)

On Anthoxanthum odoratum,

Puccinia Anthoxanthi, Fckl., (Uredospores)

On Anemone nemorosa,

Puccinia fusca, Wint., (Teleutospore)

An interesting comparison may be made between the Arctic-Alpine Flora of Beinn Laoigh and the Arctic Flora as described by Sir Joseph Hooker in Trans. Linn. Soc. vol.xxiii, p. 256., and the Scottish Arctic-Alpine Flora, (Professor Bower, on "Scottish Mountain Botany"). The species found on Beinn Laoigh may be classified thus :-

Arctic species,

| | |
|---|---|
| According to Hooker's Arctic List. ... ... | 302. |
| (All these found in Arctic Europe.) | |
| According to Hooker's Arctic List, but not found in Arctic Europe, although in other Arctic areas; see Note 1, at end of Appendix A. ... .. | 2. |
| According to Hooker's "Students' Flora of the British Islands". (Note 2) ... .. | 10. |
| Total number of Arctic species, | 314. |

Alpine species,

| | |
|---|---|
| Of the above species over 300 are found on the Alps, Pyrenees or Caucasus. | |
| In addition, according to Hooker's "Students' Flora" (Note 3), ... ... | 8. |
| Total Arctic-Alpine Species, ... | 322. |
| Non-Arctic-Alpines, (Note 4) ... | 50. |
| Doubtful Species, (Note 5.) ... | 16. |
| Total for Beinn Laoigh, ... ... ... ... ... ... | 388. |

Ratio of Arctic-Alpines to all Species on Laoigh = .87 : 1 .

Further, Hooker gives a list of the most arctic plants of general distribution that are found in all the arctic areas. Of these, 36 are in the British flora and 25 are found on Beinn Laoigh. In a second list he includes 23 species which occur in all the chief arctic areas around the pole but usually do not attain such high latitudes as the foregoing. Of these, 17 are in the British flora and 10 are found on Beinn Laoigh. Thus of the 84 most arctic plants, 53 are in the British flora and 35 grow on Beinn Laoigh. (See Note 6.)

Another interesting feature is that the following 35 species are found at all altitudes on Beinn Laoigh :-

| | |
|---|---|
| Thalictrum alpinum, | Polygonum viviparum, (1), |
| Ranunculus acris, | Oxyria digyna, (1), |
| Viola palustris, (2), | Rumex Acetosa, |
| Silene acaulis, (1), | R. Acetosella, |
| Sagina procumbens, | Juncus squarrosus, |
| Geranium sylvaticum, | Luzula multiflora, (2), |
| Oxalis Acetosella, | Carex echinata, |
| Potentilla erecta, | Anthoxanthum odoratum, |
| Alchemilla alpina, | Deschampsia caespitosa, (1), |
| Saxifraga stellaris, (1), | D. flexuosa, |
| S. aizoides, | Molinia coerulea, |
| Sedum roseum, (1), | Festuca ovina, (1), |
| Galium saxatile, | Nardus stricta, |
| Taraxacum palustre, (1), | Blechnum Spicant, |
| Vaccinium Myrtillus, | Lastrea Filix-mas, |
| Veronica serpyllifolia, | Phegopteris polypodioides, |
| Thymus Serpyllum, | Lycopodium Selago, |
| Plantago lanceolata. | |

(1) These are in Hooker's list of 61 most arctic plants.
(2) These are in Hooker's second list of 23.

The following table gives the number of species and varieties recorded for the various districts of Beinn Laoigh :-

| | |
|---|---|
| (a) Bienn Laoigh, aggregate, | 388. |
| (b) Upper Conenish Valley, | 185. |
| (c) The Head Valleys, | 191. |
| (d) Argyllshire Corrie, | 226. |
| (e) Perthshire Corrie | 114. |
| (f) North (Upper) Corrie, | 68 |
| (g) Stob Garbh Crags, | 245. |
| (h) Upper Grasslands, | 86. |
| (i) The Summit Flora, | 60. |

Details of the above are found in Appendix A.

A list of the distribution of the species of the larger Natural Orders is found in Appendix A (Note 7), and of the relations between the Genera belonging to the larger Natural Orders in the British Flora and the Genera belonging to these Orders found on Beinn Laoigh, in Note 8.

The Flora of Beinn Laoigh may be summed up thus :-

| | | | | |
|---|---|---|---|---|
| Phanerogams, | 350. | Musci, | 191. | See App. B. |
| Filicales, | 25. | Hepaticae, | 114. | See App. C. |
| Lycopodiales, | 4. | | | |
| Equisetales, | 9. | | | |

The ratio of Monocotyledons to Dicotyledons is 117/233 or 1 : 2.

According to Hooker, the ratio for Arctic Europe is 1 : 2.3 and for the Arctic as a whole, 1 : 2.6.

Further, the relations of Genera to Species and Orders to Species are :-

| | Gen.. to Spp. | Ord.. to Spp. |
|---|---|---|
| Arctic Flora, | 1 : 2.3, | 1 : 10.8 . |
| Arctic Europe, | 1 : 2.3, | 1 : 9.6 . |
| Beinn Laoigh, | 1 : 2.7, | 1 : 7.8 . |

## A COMPARISON WITH OTHER MOUNTAINS.

The botanist travelling in the highlands of Scotland is struck by the sharp contrast which he finds in the colour of the mountains. Some are green from base to summit; others are purple with heather. Some may exhibit a luxuriance of vegetation, whereas others are more or less barren. This contrast is seen right along the line already indicated from Jura to Clova. Where large bosses of quartzite and quartzose rocks outcrop the vegetation is poor both in species and luxuriance. The Paps of Jura, Schiehallion, - to mention only two areas, - illustrate this. That it is not due to climatic conditions is patent from the fact that the adjacent green hills where the Lawers-Canlochan Schist is exposed are rich alike in species and in luxuriance. The nature of this schist has already been noted. On the other hand the chemical composition of the quartzite and quartzose rocks - poor in salts, the friable nature of these rocks, and the instability of the screes, all tend to bring about the poverty of the vegetation of the purple hills. Meall Odhar, N.E. of Beinn Laoigh, is in striking contrast with that mountain, presenting quite a distinct flora, e.g., the summit of the former is in places carpeted with thick growths of Loiseleuria procumbens, a plant which is not found on Laoigh. Heath is dominant and its moorlands are of the acid type.

P. Macnair, in Trans. Perth. Soc. Nat. Science., vol.II., 1898., "On the Alpine Plants of Perthshire.", concludes his paper thus :- "Our contention is that in this band of sericite schist, whose position we have just described, we have one of the most important factors in determining the distribution of our alpine plants and that wherever this band of schist rises to a sufficient altitude, there these plants have been enabled to

maintain existence in the great struggle which has exterminated them from the plains."

H.C.Watson, in his Cybele Britannica, vol.I., p.121, speaking of Limestone Plants, says :- "These may be ultimately be taken as a small group of themselves, whose geographical areas are modified by the nature of the rocks on which they grow, more than by the climate."

But it is when a consideration is made of the floras within the outcrops of the Lawers-Canlochan schists from east to west of the country that other differences are apparent. If three distinct areas be taken, the differences are more obvious, e.g.,

1. Beinn Laoigh,
2. Ben Lawers,
3. The Mountains of Clova.

The problem of Laoigh is the problem of Lawers and the problem of Clova. It is not intended here to go into any detailed comparison of the respective floras; at the same time, it is worth while commenting upon the variation of their vegetation.

A very large number of Scottish Alpine Plants are common to the three areas. To mention a few :-

| | |
|---|---|
| Salix herbacea, | Alchemilla alpina, |
| Silene acaulis, | Caltha palustris, |
| Saxifraga stellaris, | Galium saxatile, |
| S. oppositifolium, | Armeria maritima, |
| Oxyria digyna, | Thalictrum alpinum, |
| Luzula spicata, | Gnaphalium supinum, |
| Juncus triglumis, | Vaccinium Myrtillus, |
| Juncus trifidus, | Eriophorum angustifolium, |
| Juncus squarrosus, | E. vaginatum, |

Draba incana, Festuca ovina, Empetrum nigrum.

Before proceeding further, two items must be mentioned although they have to be considered in their proper perspective. Firstly, and to quote H.C.Watson again, "Sheep and the dealers in specimens are fast destroying the scarcer alpine species." Dryas octopetala is said to have been recorded from Lawers, many years ago. Last year, a great many specimens of the rare Carex ustulata were, from the same mountain, bundled off. The Sow of Athole suffered in a like manner.

Secondly, enthusiastic field botanists and others have transplanted species from area to area. In this instance, too, sheep may be added and with greater certainty. Do Aquilegia vulgaris and Thlaspi alpestre come under the same category ? As far as the writer has been able to ascertain, Don makes no mention of the latter as a Clova plant, yet it is frequent in Canlochan to-day.

Certain it is that these two items add to the difficulty of comparing the floras of the different areas.

Several plants are found on Lawers and not on Laoigh, e.g.,

| | |
|---|---|
| Saxifraga cernua, | Myosotis alpina, |
| S. rivularis, | Erigeron alpinum, |
| Veronica saxatilis, | Gentiana nivalis, |
| Phleum alpinum, | etc., whereas Lawers is |

without the following plants found on Laoigh :-

Arabis petraea, v. grandiflora,
Dryas octopetala.
Bartsia alpina,
Kobresia caricina.

When the formation of the two mountains is considered it is seen that the sericite outcrops on Laoigh at its base whereas on Lawers it occupies the higher altitudes up to the summit, (3986'). Thus, Lawers has the more alpine species.

The sericite in Clova is exposed to more rigorous arctic-alpine conditions. On the west the precipitation is much greater than on the east. In the west, the summits are rugged and more of the nature of isolated peaks or stobs. In the east the processes of sub-aerial denudation have not dissected the original peneplane of the Highlands to the same extent. The elevated tableland still exists in the east with summits, mounds rather than peaks, uprising from it. This extensive mass of land reared above 2700' would therefore be much colder than the isolated peaks of the west. Further, the prevailing winds (S.W.) are chilled as they make for the east of Scotland; the Clova massifs are farther from the Atlantic. Thus, in addition to the more alpine plants of Lawers, Clova has :- Alopecurus alpinus, Mulgedium alpinum, Oxytropus campestris, Lycopodium annotinum, etc. The edaphic factor accounts also for species peculiar to Clova. There, the geological formation reveals that the sericite has associated with it rocks which are not present in either the Laoigh or the Lawers area. To instance one example, Lychnis alpina grows on a rounded, windswept summit, (Little Gilrannoch), in the shelter of tussocks of Armeria maritima, Cochlearia alpina, Cerastium semidecandrum and Carex rigida, on a soil formed from a decomposing serpentine.

It is also a significant fact that Arabis petraea, var. grandiflora, of Laoigh, is not found to the east, but where the calcareous schists outcrop in Ben More in Mull, this variety grows abundantly. Kobresia, sparsely distributed throughout the western Breadalbanes, thins out towards the east. Draba incana, var. confusa, rare on Laoigh, is the common form in Canlochan. As the Lawers-Canlochan schist is traced from west to east it is found that the arctic alpines grow at lower altitudes, and that the higher altitudes on the east possess a

a more boreal vegetation

From a consideration of the above, it would seem that the conditions which obtain on Laoigh are less favourable to arctic-alpines than those which obtain on the east. Add to this the considerations relative to the fluctuation of the climatic conditions from year to year discussed on pages 43 and 44. Add also the statements already put forth regarding the activity of fungi especially on the arctic-alpines of Beinn Laoigh, and the fact that, while Buchanan White and Drummond Hay gloried in the wealth of Laoigh, P. Ewing, in his wider experience of the Ben, noted that as the years went on the richness of Laoigh decreased; but he set this down to the rapacity of collectors. The writer is inclined to think that, without rulling out the activity of collectors, the slow and persistent working of the ecological factors is making it more and more difficult, as the years go on, for the boreal vegetation to survive on Beinn Laoigh. But Nature works with exceeding slowness. And, however renowned Beinn Laoigh has been in the past, he is still a grand mountain, girt about with a galaxy of glorious alpines, and crowned still with the hardy relics of a more rigorous clime. Beinn Laoigh long will be the haunt, the Mecca, of Scottish Alpine Botanists who revel in his riches as do the Scottish Mountaineers glory in his buttresses and his snow-filled, cornice corries.

"The setting and the rising sun do him homage. Peace loves to dwell within his shadow; but high among the precipices are the halls of the storms."

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# A P P E N D I X  A.

PHANEROGAMS, etc.
Arranged after,
"THE LONDON CATALOGUE."
10th. Edition.

A. I.

## LIST OF PLANTS AND THEIR LOCALITIES.

I. PHANEROGAMS etc. (After London Catalogue 10th Editio

(a) Aggregate,
(b) Upper Conenish Valley,
(c) Allt an Lund, Allt Coire Laoigh and Allt Eas Daimh,
(d) Argyllshire Corrie,
(e) Perthshire Corrie,
(f) North (Upper) Corrie,
(g) Stob Garbh Crags,
(h) Upper Grasslands,
(i) Summit Flora.

NOTE.

In a few cases plants (mostly critical species) have not been personally observed on the Ben. Numbers (as under) are used to indicate the authority:-

1. A. Bennet.
2. C. Bucknall.
3. G.C.Druce
4. P. Ewing
5. F.J.Hanbury.
6. E.S.Marshall.

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| RANUNCULACEAE. | | | | | | | | | |
| Thalictrum alpinum, Linn. | × | × | × | × | × | × | × | × | × |
| Anemone nemorosa, Linn. | × | × | × | × | × | | | × | |
| Ranunculus hederaceus, Linn. | × | × | | | | | | | |
| R. Flammula, Linn. | × | × | × | × | | | × | × | |
| R. acris, Linn. | × | × | × | × | × | × | × | × | × |
| R. Nathorstii, A.Berl. | ×[3] | | | | | | | | |
| R. repens, Linn. | × | × | × | × | | | × | × | |
| R. Ficaria, Linn. | × | × | × | × | | | × | | |
| Caltha palustris, Linn. | × | × | × | × | | × | × | | |
| C. pal. v. minor, Syme. | × | | | × | × | × | × | | |
| C. radicans, Forster. | ×[3] | | | | | | | | |
| Trollius europaeus, Linn. | × | × | × | × | × | | × | | |
| CRUCIFERAE. | | | | | | | | | |
| Radicula Nasturtium-aquaticum, R.& B. | × | × | | × | × | | × | | |
| Arabis petraea, Linn. | × | | | × | × | × | × | | × |
| A. pet. v. grandiflora, Druce. | × | | | × | × | | × | | |
| A. hirsuta, Scop. | × | | | × | | | × | | |
| Cardamine pratensis, Linn. | × | × | × | × | × | | × | | |
| C. palustris, Peterm. | × | | | | × | | | | |
| C. hirsuta, Linn. | × | × | × | × | × | | × | | |
| C. flexuosa, With. | × | × | × | × | × | | × | | |
| Draba incana, Linn. | × | | | × | × | | × | | |
| D. Inc. v. confusa, (Ehrh.) | × | | | | × | × | × | | |
| D. rupestris, Br. | × | | | | | | × | | |
| Erophila verna, E.Meyer. | × | | | × | | | × | | |
| Cochlearia alpina, Wats. | × | | | × | × | × | × | × | × |
| C. micacea, Marshall. | × | | | × | × | × | × | | |
| Sisymbrium Thalianum, Gay. | × | | | | | | × | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| VIOLACEAE. | | | | | | | | | |
| Viola palustris, Linn. | × | × | × | × | × | × | × | × | × |
| V. Riviniana, Reichb. | × | × | × | × | | | × | | |
| V. canina, Linn. | × | × | × | × | | | × | | |
| V. lutea, Huds. | × | × | × | × | | | × | | |
| V. lutea, Huds.f.amoena.(Symons). | × | × | × | × | × | | × | × | |
| POLYGALACEAE. | | | | | | | | | |
| Polygala vulgaris, Linn. | × | × | × | × | | | × | | |
| P. serpyllacea, Weihe. | × | | | × | | | × | | |
| CARYOPHYLLACEAE. | | | | | | | | | |
| Silene acaulis, Linn. | × | × | × | × | × | × | × | × | × |
| Lychnis dioica, Linn. | ×⁴ | | | | | | | | |
| L. Flos-cuculi, Linn. | ×⁴ | | | | | | | | |
| Cerastium viscosum, Linn. | × | × | × | | | | × | | |
| C. vulgatum, Linn. | × | × | × | × | × | | × | | |
| C. alpinum, Linn. | × | | | × | × | × | × | × | × |
| C. alp. v. pubescens, Syme. | × | | | | × | × | × | × | × |
| Stellaria media, Linn. | × | | | × | | | × | | |
| S. Holostea, Linn. | ×⁴ | | | | | | | | |
| S. graminea, Linn. | × | × | × | | | | × | | |
| S. uliginosa, Murr. | × | × | × | × | × | | × | | |
| Arenaria sedoides, Froel. | × | | | × | × | × | × | | × |
| Sagina procumbens, Linn. | × | × | × | × | × | × | × | × | × |
| S. saginoides, D.T. | × | | | × | × | × | × | × | × |
| S. Scotica, Druce. | ×³ | | | | | | | | |
| PORTULACEAE. | | | | | | | | | |
| Montia fontana, Linn. | × | × | × | × | | | × | | |
| HYPERICACEAE. | | | | | | | | | |
| Hypericum pulchrum, Linn. | × | × | × | × | | | × | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| LINACEAE. | | | | | | | | | |
| Linum catharticum, Linn. | × | × | × | × | × | | × | × | |
| GERANIACEAE. | | | | | | | | | |
| Geranium sylvaticum, Linn. | × | × | × | × | × | × | × | × | × |
| G. pratense, Linn. | ×⁴ | | | | | | | | |
| G. robertianum, Linn. | × | × | × | | | | | | |
| Oxalis Acetosella, Linn. | × | × | × | × | × | × | × | × | × |
| LEGUMINOSAE. | | | | | | | | | |
| Trifolium pratense, Linn. | × | × | | | | | | | |
| T. repens, Linn. | × | × | × | × | × | | × | × | |
| Lotus corniculatus, Linn. | × | × | × | × | × | | × | × | |
| ROSACEAE. | | | | | | | | | |
| Spiraea Ulmaria, Linn. | × | × | × | × | | | × | | |
| Rubus saxatilis, Linn. | × | × | × | × | × | | × | | |
| Dryas octopetala, Linn. | × | | | × | × | | × | | |
| Geum rivale, Linn. | × | × | × | × | | | × | | |
| G. urbanum, Linn. | × | × | | | | | | | |
| Potentilla Crantzii, G.Beck. | × | | | × | × | | × | | |
| P. erecta, Hampe. | × | × | × | × | × | × | × | × | × |
| P. palustris, Scop. | × | × | × | | | | | | |
| P. Sibbaldi, Hall.fil. | × | | | × | × | × | × | × | × |
| Alchemilla vulgaris, Linn. | × | × | × | × | × | × | × | × | |
| A. vul. v. alpestris (Schmidt). | × | | × | × | × | × | × | × | |
| A. alpina, Linn. | × | × | × | × | × | × | × | × | × |
| Pyrus Aucuparia, Ehrh. | × | × | × | × | | | × | | |
| SAXIFRAGACEAE. | | | | | | | | | |
| Saxifraga oppositifolia, Linn. | × | × | × | × | × | | × | | |
| S. nivalis, Linn. | × | | | × | × | × | × | | × |
| S. stellaris, Linn. | × | × | × | × | × | × | × | × | × |

A. V.

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Saxifraga aizoides, Linn. | × | × | × | × | × | × | × | × | × |
| S. hypnoides, Linn. | × | | × | × | | | × | × | |
| S. quinquefida. | × | | | × | | | × | | |
| Chrysosplenium oppositifolium, Linn. | × | × | × | × | × | × | × | × | |
| C. alternifolium, Linn. | × | × | | | | | × | | |
| Parnassia palustris, Linn. | × | × | × | × | | | × | | |
| CRASSULACEAE. | | | | | | | | | |
| Sedum roseum, Scop. | × | × | × | × | × | × | × | × | × |
| S. anglicum, Huds. | × | | | | | | × | | |
| DROSERACEAE. | | | | | | | | | |
| Drosera rotundifolia, Linn. | × | × | × | × | | | × | | |
| D. anglica, Huds. | × | × | × | | | | | | |
| D. ang.x.rot.(obovata,M.& K.) | × | × | × | | | | | | |
| ONAGRACEAE. | | | | | | | | | |
| Epilobium montanum, Linn. | × | × | × | × | × | | × | | |
| E. montanum.x.E.palustre. | × | | × | | | | × | | |
| E. tetragonum, Curt. | × | × | | | | | × | | |
| E. palustre, Linn. | × | × | × | | | | × | | |
| E. alsinefolium, Vill. | × | | | × | × | | × | | |
| E. anagallidifolium, Linn. | × | | | × | × | × | × | × | × |
| UMBELLIFERAE. | | | | | | | | | |
| Hydrocotyle vulgaris, Linn. | × | × | × | | | | × | | |
| Conopodium majus, Loret. | × | × | × | × | | | × | | |
| Angelica sylvestris, Linn. | × | × | × | × | | | × | | |
| Heracleum Sphondylium, Linn. | × | × | × | × | | | × | | |
| CORNACEAE. Cornus suecica, Linn. | ×⁴ | | | | | | | | |
| CAPRIFOLIACEAE. | | | | | | | | | |
| Adoxa Moschatellina, Linn. | × | | | × | | | × | | |
| RUBIACEAE. | | | | | | | | | |
| Galium boreale, Linn. | × | × | × | × | × | | × | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Galium verum, Linn. | × | × | | | | | | | |
| G. saxatile, Linn. | × | × | × | × | × | × | × | × | × |
| G. asperum, Schreb. | × | × | × | × | | | × | | |
| G. asp. v. nitidulum, (Thuill). | × | | | × | | | × | | |
| G. palustre, Linn. | × | × | × | × | | | × | | |
| G. pal. v. Witheringii (Sm). | × | × | × | × | | | × | | |
| G. pal. v. glabrum, Koch. | ×[3] | | | | | | | | |
| Asperula odorata, Linn. | × | × | | | | | | | |
| VALERIANACEAE. | | | | | | | | | |
| Valeriana officinalis, Linn. | × | × | × | × | | | × | | |
| DIPSACEAE. | | | | | | | | | |
| Scabiosa Succisa, Linn. | × | × | × | × | | | × | × | |
| COMPOSITAE. | | | | | | | | | |
| Solidago Virgaurea, Linn. | × | × | × | × | | | × | | |
| S. Vir. v. cambrica, (Huds). | × | × | × | × | | | × | | |
| Bellis perennis, Linn. | × | × | | | | | | | |
| Antennaria dioica, Gaertn. | × | × | × | × | | | × | | |
| Gnaphalium supinum, Linn. | × | | | × | × | × | × | × | × |
| Achillea Millefolium, Linn. | | | | | | | | | |
| Tussilago Farfara, Linn. | × | | × | | | | × | | |
| Carduus crispus, Linn. | × | × | | | | | | | |
| Cnicus palustris, Willd. | × | × | × | | | | | | |
| Cn. heterophyllus, Willd. | × | | × | | | | × | | |
| Cn. arvensis, Hoffm. | × | × | | | | | | | |
| Saussurea alpina, DC. | × | | | × | | | × | | |
| Centaurea nigra, Linn. | | | | | | | | | |
| Crepis taraxacifolia, Thuill. | × | × | × | × | | | × | | |
| C. capillaris, Wallr. | × | × | × | × | | | × | | |
| C. biennis, Linn. | × | × | × | × | | | × | | |

A. VII.

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Crepis paludosa, Moench. | × | × | × | × | | | × | | |
| Hieracium Pilosella, Linn. | × | × | × | × | | | × | | |
| H. anglicum, Fr. | × | | | × | | | × | | |
| H. ang. v. acutifolium, Backh. | × | | | × | | | × | | |
| v. longibracteatum, F.J. Hanb. | × | | | × | | | × | | |
| v. cerinthiforme, Backh. | × | | | × | | | × | | |
| H. flocculosum, Backh. | ×5 | | | | | | | | |
| H. iricum, Fr. | ×5 | | | | | | | | |
| H. holosericeum, Backh. | × | | | × | × | | × | | |
| H. curvatum, Elfstrand. | ×3 | | | | | | | | |
| H. lingulatum, Backh. | ×5 | | | | | | | | |
| H. senescens, Backh. | ×5 | | | | | | | | |
| H. sinuans, F.J. Hanb. | ×5 | | | | | | | | |
| H. nigrescens, Willd. | ×5 | | | | | | | | |
| H. Oreades, Fr. | ×1 | | | | | | | | |
| H. callistophyllum, F.J. Hanb. | | | | | | | | | |
| var. glandulosum, F.J. Hanb. | ×6 | | | | | | | | |
| H. variicolor, Dahlst. | ×6 | | | | | | | | |
| H. ciliatum, Almq. | ×6 | | | | | | | | |
| H. Pictorum, Linton. | ×6 | | | | | | | | |
| H. Pictorum, Linton. | | | | | | | | | |
| var. dasythrix, Linton. | ×3 | | | | | | | | |
| H. crebridens, Dahlst. | ×6 | | | | | | | | |
| H. rivale, F.J. Hanb. | ×5 | | | | | | | | |
| H. petrocharis, Linton. | ×6 | | | | | | | | |
| H. sagittatum, Lindeb. | | | | | | | | | |
| var. lanuginosum, Lönnr. | ×6 | | | | | | | | |
| H. duplicatum, Almq. | | | | | | | | | |
| var. stenophyes, W.R. Linton. | ×6 | | | | | | | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Hieracium anfractiforme, E.S. Marshall. | x[6] | | | | | | | | |
| H. vulgatum, Fr. | x | | | x | | | x | | |
| H. Dewari, Bosw. | x[5] | | | | | | | | |
| H. stictophyllum, Dahlst. | x[6] | | | | | | | | |
| H. sparsifolium, Lindeb. | x[5] | | | | | | | | |
| Hypochoeris radicata, Linn. | x | x | x | x | | | x | x | |
| Leontodon hispidum, Linn. | x | x | x | x | | | x | | |
| L. autumnale, Linn. | x | x | x | x | | | x | | |
| L. aut. v. pratense, (Koch). | x[4] | | | | | | | | |
| Taraxacum officinale, Weber. | x | x | x | x | x | | x | | |
| T. palustre, DC. | x | x | x | x | x | x | x | x | x |
| CAMPANULACEAE. | | | | | | | | | |
| Campanula rotundifolia, Linn. | x | x | x | x | x | | x | x | |
| C. rot. v. lancifolia, M.& K. | x | | | x | x | | x | | |
| VACCINIACEAE. | | | | | | | | | |
| Vaccinium Vitis-Idaea, Linn. | x | | | x | | | x | x | |
| V. uliginosum, Linn. | x | | | x | x | | x | | |
| V. Myrtillus, Linn. | x | x | x | x | x | x | x | x | x |
| Oxycoccus quadripetala, Gilib. | x | x | x | | | | | | |
| ERICACEAE. | | | | | | | | | |
| Arctostaphylos Uva-ursi, Spreng. | x | | | x | | | x | | |
| Calluna vulgaris, Hull. | x | x | x | | | | | | |
| Erica Tetralix, Linn. | x | x | x | | | | | | |
| E. cinerea, Linn. | x | x | x | | | | | | |
| Pyrola rotundifolia, Linn. | x | | | | | | x | | |
| P. secunda, Linn. | x | | | x | | | x | | |
| PLUMBAGINACEAE. | | | | | | | | | |
| Statice maritima, Mill. | x | | x | x | | | x | | |
| S. mar. v. planifolia. | x | | | x | | | x | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| PRIMULACEAE. | | | | | | | | | |
| Primula vulgaris, Huds. | × | × | × | | | | | | |
| Lysimachia nemorum, Linn. | × | × | × | | | | × | | |
| GENTIANACEAE. | | | | | | | | | |
| Gentiana campestris, Linn. | × | × | | | | | | | |
| G. cam. f. alba. | × | × | | | | | | | |
| G. Amarella, Linn. | × | × | | | | | | | |
| BORAGINACEAE. | | | | | | | | | |
| Myosotis caespitosa, Schultz. | × | × | | | | | | | |
| M. scorpioides, Linn. | × | × | | | | | | | |
| SCROPHULARIACEAE. | | | | | | | | | |
| Veronica serpyllifolia, Linn. | × | × | × | × | × | × | × | × | × |
| V. humifusa, Dickson. | × | | | × | × | × | × | × | × |
| V. officinalis, Linn. | × | × | | × | | | × | | |
| V. Chamaedrys, Linn. | × | × | | × | | | × | | |
| Euphrasia officinalis, Linn. | × | × | × | × | × | × | × | × | |
| E. Rostkoviana, Hayne. | $\times^3$ | | | | | | | | |
| E. brevipila, B.& G. | $\times^2$ | | | | | | | | |
| E. gracilis, Fr. | × | | | | × | | × | × | |
| E. curta, Wettst. | $\times^2$ | | | | | | | | |
| E. cu. v. glabrescens, Wettst. | $\times^2$ | | | | | | | | |
| E. foulaensis, Towns. | $\times^3$ | | | | | | | | |
| Bartsia alpina, Linn. | × | | × | × | | | × | | |
| Pedicularis palustris, Linn. | × | × | × | × | | | | | |
| P. sylvatica, Linn. | × | × | × | × | | | × | | |
| Rhinanthus Crista-galli, Linn. | × | × | × | × | | | × | | |
| R. borealis, Druce. | × | | | × | × | | × | | |
| R. Drummond-Hayi, Druce. | × | | | × | × | | × | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Melampyrum pratense, Linn. | × | × | × | × | | | × | | |
| M. pr. v. montanum, Johnst. | × | | | × | | | × | | |
| LENTIBULARIACEAE. | | | | | | | | | |
| Utricularia intermedia, Hayne. | ×[3] | | ×[3] | | | | | | |
| Pinguicula vulgaris, Linn. | × | × | × | × | | | × | | |
| P. vulg. v. bicolor, Nordstedt. | × | | | × | | | × | | |
| LABIATAE. | | | | | | | | | |
| Thymus Serphyllum, Linn. | × | × | × | × | × | × | × | × | × |
| T. Chamaedrys, Fr. | ×[3] | | | | | | | | |
| Prunella vulgaris, Linn. | × | × | × | × | | | | | |
| PLANTAGINACEAE. | | | | | | | | | |
| Plantago maritima, Linn. | × | × | × | × | × | × | × | × | |
| P. lanceolata, Linn. | × | × | × | × | × | × | × | × | × |
| POLYGONACEAE. | | | | | | | | | |
| Polygonum viviparum, Linn. | × | × | × | × | × | × | × | × | × |
| P. aviculare, Linn. | × | × | | | | | | | |
| Oxyria digyna, Gilib. | × | × | × | × | × | × | × | × | × |
| Rumex obtusifolius, Linn. | × | × | | | | | | | |
| R. crispus, Linn. | × | × | | | | | | | |
| R. Acetosa, Linn. | × | × | × | × | × | × | × | × | × |
| R. Acetosella, Linn. | × | × | × | × | × | × | × | × | × |
| EUPHORBIACEAE. | | | | | | | | | |
| Mercurialis perennis, Linn. | × | × | × | × | | | × | | |
| URTICACEAE. | | | | | | | | | |
| Urtica dioica, Linn. | × | × | × | | | | | | |
| MYRICACEAE. | | | | | | | | | |
| Myrica Gale, Linn. | × | × | × | | | | | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| **CUPULIFERAE.** | | | | | | | | | |
| Betula alba, Linn. | × | × | × | × | | | | | |
| Alnus glutinosa, Gaertn. | × | × | | | | | | | |
| **SALICACEAE.** | | | | | | | | | |
| Salix aurita, Linn. | × | × | × | | | | | | |
| S. nigricans, Sm. | × | | × | × | | | × | | |
| S. phylicifolia, (Linn) Sm. | × | | | × | × | | × | | |
| S. arbuscula, Linn. | × | | | × | | | × | | |
| S. arbuscula x herbacea. | ×⁶ | | | | | | | | |
| S. repens, Linn. | ×⁴ | | | | | | | | |
| S. rep. f. ascendens, (Sm). | ×⁴ | | | | | | | | |
| S. myrsinites, Linn. | × | | × | × | × | | × | | |
| S. myr. x. nigricans. | × | | × | × | | | × | | |
| S. myr. x. phylicifolia. | ×⁶ | | | | | | | | |
| S. herbacea, Linn. | × | | | × | × | × | × | × | × |
| S. herb. x. reticulata. | × | | | | | | × | | |
| S. reticulata, Linn. | × | | | | | | × | | |
| **EMPETRACEAE.** | | | | | | | | | |
| Empetrum nigrum, Linn. | × | | × | × | | | × | | |
| **ORCHIDACEAE.** | | | | | | | | | |
| Malaxis paludosa, Sw. | × | | × | × | | | | | |
| Listera cordata, Br. | | | | | | | | | |
| Orchis mascula, Linn. | × | × | × | × | | | × | | |
| O. maculata, Linn. | × | × | × | | | | | | |
| Habenaria conopsea, Benth. | × | × | × | × | | | | | |
| H. viridis, Br. | × | | | × | × | | × | × | |
| H. vir. v. bracteata, A.Gray. | × | | | × | | | × | | |
| **LILIACEAE.** | | | | | | | | | |
| Narthecium ossifragum, Huds. | × | × | × | × | | | × | × | |
| Tofieldia palustris, Huds. | × | | | × | | | × | × | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| JUNCACEAE. | | | | | | | | | |
| Juncus bufonius, Linn. | × | × | × | | | | | | |
| J. trifidus, Linn. | × | | × | × | × | × | × | × | × |
| J. squarrosus, Linn. | × | × | × | × | × | × | × | × | × |
| J. compressus, Jacq. | × | × | × | × | | | × | | |
| J. effusus, Linn. | × | × | × | × | | | × | | |
| J. conglomeratus, Linn. | × | × | × | × | | | × | | |
| J. bulbosus, Linn. | × | × | × | × | | | × | | |
| J. articulatus, Linn. | × | × | × | | | | | | |
| J. alpinus, Vill. | ×6 | | | ×6 | | | | | |
| J. sylvaticus, Reich. | × | × | × | × | | | × | | |
| J. castaneus, Sm. | × | | | | × | | × | | |
| J. biglumis, Linn. | × | | | | × | × | × | | |
| J. triglumis, Linn. | × | | × | × | × | × | × | × | |
| Luzula pilosa, Willd. | × | × | × | | | | × | | |
| L. sylvatica, Gaud. | × | × | × | | | | × | | |
| L. spicata, DC. | × | | × | × | × | × | × | × | × |
| L. campestris, DC. | × | × | × | | | | | | |
| L. multiflora, DC. | × | × | × | × | × | × | × | × | × |
| L. mul. v. congesta, (Lej). | × | × | × | | | | | | |
| L. mul. v. sudetica, (DC). | × | | × | | | | | | |
| NAIADACEAE. | | | | | | | | | |
| Triglochin palustre, Linn. | × | × | × | × | | | × | | |
| Potamogeton polygonifolius, Pourr. | × | × | × | | | | | | |
| CYPERACEAE. | | | | | | | | | |
| Eleocharis palustris, R.& S. | ×4 | | | | | | | | |
| Scirpus pauciflorus, Lightf. | × | | | | | | × | | |
| S. caespitosus, Linn. | × | × | × | × | | | × | | |
| S. setaceus, Linn. | × | | | | | | × | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Eriophorum vaginatum, Linn. | × | × | × | × | | | | | |
| E. angustifolium, Roth. | × | × | × | × | | | | | |
| Rynchospora alba, Vahl. | × | × | × | | | | | | |
| Schoenus nigricans, Linn. | × | | | × | | | × | × | |
| Kobresia bipartita, D.T. | × | | × | | | | | | |
| Carex dioica, Linn. | × | | × | × | | | × | | |
| C. pulicaris, Linn. | × | × | × | × | | | × | × | |
| C. pul. f. montana. | × | | | × | | | × | × | |
| C. pauciflora, Lightf. | × | × | × | × | | | | | |
| C. echinata, murr. | × | × | × | × | × | × | × | × | × |
| C. curta, Good. | × | | × | | | | | | |
| C. leporina, Linn. | × | | × | | | | | | |
| C. atrata, Linn. | × | | | × | | | × | | |
| C. gracilis, Curt. | ×[4] | | | | | | | | |
| C. rigida, Good. | × | | × | × | × | × | × | × | × |
| C. Goodenowii, Gay. | × | × | × | | | | × | | |
| C. Goo. v. juncella, (Fr). | × | | | × | | | × | | |
| C. flacca, Schreb. | ×[4] | | | | | | | | |
| C. fla. v. stictocarpa, Druce. | ×[4] | | | | | | | | |
| C. limosa, Linn. | × | | | × | × | | × | | |
| C. pilulifera, Linn. | × | × | | | | | | | |
| C. pallescens, Linn. | × | | × | × | | | × | | |
| C. panicea, Linn. | × | | × | × | × | | × | × | |
| C. vaginata, Tausch. | × | | | × | | | × | | |
| C. capillaris, Linn. | × | | | × | × | | × | × | |
| C. pendula, Huds. | ×[4] | | | | | | | | |
| C. binervis, Sm. | × | | × | × | | | × | × | |
| C. bin. v. Sadleri, (Linton). | ×[3] | | | | | | | | |
| C. fulva, Host. | × | | | × | | | × | × | |
| C. flava, Linn. | × | | × | × | | | × | × | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Carex flava, v. pumila, Anders. | x³ | | | | | | | | |
| C. fla. v. lepidocarpa (Tausch). | x⁴ | | | | | | | | |
| C. fla. v. pygmaea, Anders. | x³ | | | | | | | | |
| C. fla. x Oederi. | x³ | | | | | | | | |
| C. fla. x. pulla. | x³ | | | | | | | | |
| C. Oederi, Retz. | x | x | x | x | | | x | x | |
| C. inflata, Huds. | x⁴ | | | | | | | | |
| C. inf. v. brunnescens, E.S.M. | x³ | | | | | | | | |
| C. vesicaria, Linn.v. alpigena, Fr. | x³ | | | | | | | | |
| C. vesic. v. dichroa, Anders. | x³ | | | | | | | | |
| C. saxatilis, Linn. | x | | | x | x | | x | x | |
| GRAMINEAE. | | | | | | | | | |
| Anthoxanthum odoratum, Linn. | x | x | x | x | x | x | x | x | x |
| Alopecurus geniculatus, Linn. | x | x | | | | | | | |
| Phleum pratense, Linn. | x | x | | | | | | | |
| P. pra. v. nodosum, (Linn) | x⁴ | | | | | | | | |
| Agrostis canina, Linn. | x | x | x | x | x | | x | x | |
| A. tenuis, Sibth. | x | x | x | x | x | | x | x | |
| A. pumila, Linn. | x | | | x | | x | x | x | |
| Deschampsia caespitosa, Beauv. | x | x | x | x | | x | x | x | x |
| D. cae. v brevifolia. | x | | | x | | | x | x | |
| D. cae. v. pseud-alpina. | x | | | x | | | x | x | |
| D. alpina, R.& S. | x | | | x | x | | x | x | |
| D. flexuosa, Trin. | x | x | x | x | x | x | x | x | x |
| D. fle. v. montana, Hook. fil. | x³ | | | | | | | | |
| Holcus mollis, Linn. | x⁴ | | | | | | | | |
| H. lanatus, Linn. | x | x | | | | | | | |
| Avena pratensis, Linn. | x | | x | x | | | x | | |
| A. pra. v. alpina, (Sm). | x | | | x | | | x | | |
| A. pra. v. longifolia, (Parn). | x⁶ | | | | | | | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Sieglingia decumbens, Bernh. | × | × | × | × | | | × | × | |
| Sesleria coerulea, Ard. | × | | | × | | | × | × | |
| Cynosurus cristatus, Linn. | × | × | × | | | | | | |
| Koeleria cristata, Pers. | × | | × | × | | | × | × | |
| Molinia coerulea, Moench. | × | × | × | × | × | × | × | × | × |
| Poa annua, Linn. | × | × | × | | | | | | |
| P. ann. v. supina, Gaud. | ×[3] | | | | | | | | |
| P. alpina, Linn. | × | | | × | × | × | × | × | × |
| P. glauca, Vahl. | ×[4] | | | | | | | | |
| P. pratensis, L. var. humilis, (Ehrh). | ×[4] | | | | | | | | |
| P. Balfouri, Parn. | ×[4] | | | | | | | | |
| P. Bal. v. montana, (Parn). | ×[6] | | | ×[6] | ×[6] | | | | |
| P. nemoralis, L. | × | | | × | | | × | × | |
| P. nem. v. montana, Gaud. | ×[3] | | | | | | | | |
| P. nem. v. glaucantha, Reichb. | ×[6] | | | | | | | | |
| Glyceria fluitans, Br. | × | × | | | | | | | |
| Festuca bromoides, Linn. | ×[4] | | | | | | | | |
| F. ovina, Linn. | × | × | × | × | × | × | × | × | × |
| F. ov. v. supina, Hackel. | ×[4] | | | | | | | | |
| F. ov. v. glauca, Hackel. | ×[4] | | | | | | | | |
| F. rubra, Linn. | × | | × | × | × | × | × | × | |
| F. rubra, v. grandiflora, (Hackel). | ×[3] | | | | | | | | |
| F. rubra, v. pruinosa, Hackel. | ×[4] | | | | | | | | |
| Nardus stricta, Linn. | × | × | × | × | × | × | × | × | × |
| FILICES. | | | | | | | | | |
| Hymenophyllum H. peltatum, Desv. | × | | | × | | | × | | |
| Pteris aquilina, Linn. | × | | × | | | | | | |
| Criptogramme crispa, Br. | × | | | × | × | | | | × |
| Blechnum Spicant, With. | × | × | × | × | × | × | × | × | × |
| Asplenium Adiantum-nigrum, Linn. | × | × | × | | | | × | | |
| A. viride, Huds. | × | × | × | × | × | | × | | |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Asplenium Trichomanes, Linn. | × | × | × | | | | × | | |
| Athyrium Filix-foemina, Roth. | × | × | × | | | | | | |
| A. alpestre, Milde. | × | | | × | × | × | × | × | × |
| Woodsia alpina, Gray. | × | | | | | | × | | |
| Cystopteris fragilis, Bernh. | × | × | × | × | × | | × | | |
| C. fra. v. dentata, Hook. | × | | | × | × | | × | | × |
| C. montana, Desv. | × | | | × | | | × | | |
| Polystichum Lonchitis, Roth. | × | | × | × | × | × | × | × | × |
| P. aculeatum, Roth. | × | × | × | | | | × | | |
| Lastrea montana, T.M. | × | × | × | | | | × | | |
| L. Filix-mas, Presl. | × | × | × | × | × | × | × | × | × |
| L. F-m. v. pumila, T.M. | × | | | | | | × | | |
| L. spinulosa, Presl. | × | | | × | | | × | | |
| L. aristata, R.&B. | × | | | × | × | × | × | × | × |
| L. ari. v. dumetorum | ×[3] | | | | | | | | |
| Polypodium vulgare, Linn. | × | × | × | × | | | × | | |
| Phegopteris Dryopteris, Fee. | × | × | × | × | × | | × | | |
| P. polypodioides, Fee. | × | × | × | × | × | × | × | × | × |
| Botrychium Lunaria, Sw. | × | | | × | | | × | | |
| EQUISETACEAE. | | | | | | | | | |
| Equisetum arvense, Linn. | × | × | × | × | | | × | | |
| E. pratense, Ehrh. | × | | × | × | | | × | | |
| E. prat. v. alpestre, ~~Linn.~~ Wahl. | ×[4] | | | | | | | | |
| E. sylvaticum, Linn. | × | | × | × | | | × | | |
| E. palustre, Linn. | × | × | × | × | | | × | | |
| E. pal. v. polystachyon. Weigel. | × | × | | | | | | | |
| E. limosum, Linn. | × | | × | | | | | | |
| E. lim. v. fluviatile, (Linn). | ×[4] | | | | | | | | |
| E. variegatum, Schleich. | ×[4] | | | | | | | | |
| LYCOPODIACEAE. | | | | | | | | | |
| Lycopodium Selago, Linn. | × | × | × | × | × | × | × | × | × |

| | a | b | c | d | e | f | g | h | i |
|---|---|---|---|---|---|---|---|---|---|
| Lycopodium clavatum, Linn. | × | | | × | × | | × | | |
| L. alpinum, Linn. | × | | | × | × | × | × | × | × |
| SELAGINELLACEAE. | | | | | | | | | |
| Selaginella selaginoides, Gray. | × | | | × | × | | × | × | |
| | 388. | 185. | 191. | 226. | 114. | 68. | 245. | 86 | 60. |

A. XVIII

NOTE 1.

List of Species not included as Arctic Europe Species, but included in other of the Arctic areas by Hooker:-

| | |
|---|---|
| Galium saxatile, | in Arctic Greenland. |
| | in Iceland. |
| | in the Alps. |
| Glyceria fluitans, | in Arctic West America. |
| | in Arctic East America. |
| | in Arctic Greenland. |

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NOTE 2.

List of Species not included in the List of Hooker's Arctic plants, but classified as such in his "Students' Flora of the British Islands":-

| | |
|---|---|
| Arabis petraea, | Hieracium flocculosum, |
| Geranium pratense, | H. holosericeum, |
| Crepis paludosa, | H. lingulatum, |
| Luzula sylvatica, | H. senescens, |
| Carex pilulifera, | H. Dewari. |

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NOTE 3.

Species not included as Arctic Europe or in any other of the Arctic divisions, in Hooker's lists, but classified as Alpine in the "Students' Flora".

| | |
|---|---|
| Arenaria sedoides, | Hieracium anglicum, |
| Carex pulicaris, | H. ang. v. acutifolium, |
| C. glauca, | v. longibracteatum |
| C. gl. v. strictocarpa, | v. cerintheforme. |

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A. XIX

NOTE 4.

List of Plants not included either as Arctic or as Alpine in the Lists of Hooker or in his "Students' Flora" :-

Erophila verna,
Stellaria Holostea,
Hypericum pulchrum,
Chrysosplenium oppositifolium,
Sedum anglicum,
Hydrocotyle vulgaris,
Conopodium majus,
Heracleum Sphondylium,
Galium verum,
G. asperum,
G. asp. v. nitidulum,
Asperula odorata,
Bellis perennis,
Cnicus arvensis,
Crepis taraxacifolia,
C. biennis,
C. capillaris,
Hieracium Pilosella,
Hypochoeris radicata,
Leontodon hispidus,
Erica Tetralix,
E. cinerea,
Primula vulgaris,
Lysimachia nemorum,
Pedicularis sylvatica,
Rumex obtusifolius,
R. crispus,
Mercurialis perennis,
Salix aurita,
S. repens,
Orchis mascula,
Potomogeton polygonifolium,
Scirpus setaceus,
Schoenus nigricans,
Carex pendula,
C. binervis,
C. fulva,
Holcus lanatus,
H. mollis,
Avena pratensis,
A. p.v. alpina,
A. p.v. longifolia,
Sieglingia decumbens,
Sesleria ceorulea,
Cynosurus cristata,
Koeleria cristata,
Festuca bromoides,
Hymenophyllum peltatum,
Asplenium Adiantum-nigrum,
A. Trichomanes.

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NOTE 5.

Of the 29 Hieracia recorded for Beinn Laoigh, the following are not included in the calculations on p.47 etc, because, for them, the data as to distribution are not available :-

H. curvatum,
H. crebridens,
H. sinuans,
H. Oreades,
H. callistophyllum,
v. glandulosum,
H. variicolor,
H. ciliatum,
H. anfractifolium,
H. sparcifolium.
H. Pictorum,
H. Pict. v. dasythrix,
H. rivale,
H. petrocharis,
H. sagittatum,
v. lanuginosum,
H. duplicatum,
v. stenophyes,
H. stictophyllum,

0000000000000000000000000

A.XXI.

NOTE 6.

Sir Joseph Hooker's list of the most Arctic plants of general distribution that are found far north in all the Arctic areas.

Ranunculus nivalis,
(S). R. auricomus,
R. pygmaeus,
Papaver nudicaule,
Braya alpina,
Cardamine bellidifolia,
(L)(S). C. pratensis,
Draba alpina,
D. androsacea,
D. hirta,
D. muricella,
(L). (S). D. incana,
(L). (S). D. rupestris,
(L). (S). Cochlearia officinalis,
(S). C. anglica,
(L). (S). Silene acaulis,
Lychnis apetala,
(S). Arenaria verna,
A. arctica,
Stellaria longipes,
(L). (S). Cerastium alpinum,
Potentilla nivea,
P. frigida,
(L). (S). Dryas octopetala,
Epilobium latifolium,
(L). (S) Sedum rhodiola,
(L). (S). Saxifraga nivalis,
(L). (S). S. stellaris,
S. flagellaris,
(S). S. Hirculus,
Antennaria alpina,
(S). Erigeron alpinum,
(L). (S). Taraxacum Dens-leonis,
Cassiopeia tetragona,
Pedicularis hirsuta,
P. sudetica,
(L). (S). Oxyria reniformis,
(L). (S). Polygonum viviparum,
(L). (S). Empetrum nigrum,
(L). (S). Salix herbacea,
(L). (S) S. reticulata,
(S). Luzula arcuata,
(L). (S). Juncas biglumis,
Carex fuliginosa,
(S). C. aquatilis,
Eriophorum capitatum,
(L). (S). E. polystachion,
(S). Alopecurus alpinus,
Deyeuxia Lapponica,
(L). (S). Deschampsia caespitosa,
Phippsia algida,
Colpodium latifolium,

(L).(S). Chrysosplenium alternifolium,
(L).(S). Saxifraga oppositifolia,
(S). S. caespitosa,
(S). S. cernua,
(S). Saxifraga rivularis,
(L).(S). Poa flexuosa,
(L).(S). P. pratensis,
(L).(S). P. nemoralis,
(L).(S) Festuca ovina,

In the above list those species marked with (S) are in the British Flora and those marked (L), in addition, are found on Beinn Laoigh.

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Hookers second list of species which occur in all the chief Arctic areas round the Pole but usually do not attain such high latitudes as the foregoing.

Ranunculus Lapponicus,
(L) (S). Draba rupestris,
(L).(S). Viola palustris,
(S) Honkenya palustris,
(S) Epilobium angustifolium,
(L). (S). E. alpinum,
(S). Hippuris vulgaris,
Artemisia borealis,
(L). (S). Vaccinium uliginosum,
(L). (S). V. Vitis-Idaea,
Ledum palustre,
(S). Polemonium coeruleum,
Pedicularis Lapponica,
(L). (S). Armeria vulgaris,
(S). Betula nana,
(S) Salix lanata,
(S). S. glauca,
S. alpestris,
(L) (S). Luzula campestris,
(L). (S). Carex vesicaria,
(L) (S) Eriophorum vaginatum,
Atropis maritima,
(L). (S). Pyrola rotundifolia.

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NOTE 7.

SPECIES of the larger NATURAL ORDERS on Beinn Laoigh.

| Order. | London Catalogue. | a. | b. | c. | d. | e. | f. | g. | h. | i. |
|---|---|---|---|---|---|---|---|---|---|---|
| Compositae. | | 50 | 17 | 17 | 21 | 4 | 2 | 23 | 3 | 2. |
| Cyperaceae, | | 45 | 10 | 18 | 22 | 6 | 2 | 22 | 12 | 5. |
| Graminea, | | 42 | 15 | 14 | 21 | 11 | 9 | 20 | 18 | 7. |
| Filices, | | 25 | 12 | 14 | 16 | 11 | 6 | 21 | 6 | 8. |
| Juncaceae, | | 20 | 13 | 17 | 11 | 7 | 6 | 14 | 5 | 4. |
| Scrophulariaceae, | | 19 | 8 | 7 | 13 | 6 | 3 | 13 | 4 | 2. |
| Caryophyllaceae, | | 15 | 6 | 6 | 8 | 8 | 6 | 11 | 5 | 6. |
| Cruciferae, | | 15 | 4 | 3 | 11 | 11 | 4 | 14 | 1 | 2 |
| Rosaceae, | | 13 | 9 | 9 | 11 | 8 | 5 | 11 | 5 | 3. |
| Salicaceae | | 13 | 1 | 4 | 6 | 3 | 1 | 8 | 1 | 1. |
| Ranunculaceae, | | 12 | 9 | 7 | 9 | 5 | 4 | 8 | 5 | 2. |
| Saxifragaceae. | | 9 | 6 | 6 | 8 | 5 | 4 | 9 | 4 | 3. |
| Rubiaceae, | | 9 | 7 | 5 | 6 | 2 | 1 | 6 | 1 | 1. |

NOTE 8.

Number of GENERA on Beinn Laoigh compared with the number of Genera in the British Flora.

| Order, | Genera, London Catalogue. 10th. Ed. | Species etc. | Beinn Laoigh. Genera | Species &c. |
|---|---|---|---|---|
| Ranunculaceae, | 15 | 64. | 5 | 12. |
| Cruciferae, | 28 | 114. | 7 | 15. |
| Caryophyllaceae, | 14 | 110 | 6 | 15. |
| Leguminosae, | 19 | 117. | 2 | 3. |
| Rosaceae, | 14 | 419. 73 (omitting Rosae & Rubi). | 7 | 13. |
| Umbelliferae, | 40 | 77. | 4 | 4. |
| Compositae, | 46 | 468 184 (omitting Hieracia). | 15 | 50. |
| Ericaceae & Vacciniaceae, | 13 | 29. | 6 | 10. |
| Primulaceae, | 10 | 26. | 2 | 2. |
| Boraginaceae, | 10 | 33. | 1 | 2. |
| Scrophulariaceae, | 16 | 119. | 6 | 19. |
| Labiatae, | 20 | 100. | 2 | 3. |
| Orchidaceae, | 16 | 65. | 4 | 6. |
| Liliaceae, | 19 | 40. | 2 | 2. |
| Gramineae, | 48 | 239. | 16 | 42. |
| Filices, | 20 | 86. | 12 | 25. |
| | | | | |
| Saxifragaceae | 4 | 34. | 3 | 9. |
| Rubiaceae, | 4 | 30. | 2 | 9. |
| Salicaceae, | 2 | 97. | 1 | 13. |
| Juncaceae, | 2 | 37. | 2 | 20. |
| Cyperaceae, | 9 | 181. | 7 | 45. |

B.

# A P P E N D I X  B.

MUSCI.

Arranged after,

"The Students' Handbook
of British Mosses."
H.N.Dixon, & H.G.Jamieson.

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Those listed have been
confirmed by the writer.

# LIST OF MOSSES RECORDED FROM BEINN LAOIGH.

## SPHAGNALES.

Sphagnum cymbifolium, Ehrh.
S. papillosum, Lindb.
S. rigidum, Schp.
S. tenellum, Ehrh.
S. subsecundum, Nees.
S. squarrosum, Pers.
S. acutifolium, Ehrh.
S. a. var. rubellum, Russ.
S. a. var. elegans, Braithw.
S. a. var. quinquefarium, Lindb.
S. a. var. deflexum, Schp.

## ANDREAEALES.

Andreaea petrophila, Ehrh.
A. alpina, Smith.
A. falcata, Schp.
A. crassinervia, Bruch.

## BRYALES

Tetraphis pellucida, Hedw.
T. Browniana, Grev.
Catharinia undulata, Web. & Mohr.
Oligotrichum hercynium,
Polytrichum nanum, Neck.
P. aloides, Hedw.
P. urnigerum, Linn.
P. alpinum, Linn.
P. sexangulare, Ehrh.
P. strictum, Banks.
P. commune, Linn.
P. c. var. humile, Schp.

P. c. var. fastigiatum, Lyle.

Diphyscium foliosum, Mohr.

Ditrichum homomallum, Hampe.
D. flexicaule, Hampe.

Swartzia montana, Lindb.

S. inclinata, Ehrh.

S. recurvata, B.& S.

Ceratadon purpureus, Brid.

Rhabdoweisia fugax, B. & S.

R. denticulata, B.& S.

Cynodontium virens, Schp.

Dicranella heteromalla, Schp.

D. subulata, Schp.

D. squarrosa, Schp.

Dicranoweisia crispula, Lindb.

Campylopus Schwartzii, Schp.

C. flexuosus, Brid.

C. f. var. paradoxus, Wils.

C. fragilis, B.& S.

C. atrovirens, De Not.

Dicranum fulvellum, Smith.

D. falcatum, Hedw.

D. Starkei, W.& M.

D. schistii, Lindb.

D. molle, Wils.

D. Bonjeani, De Not.

D. scoparium, Hedw.

D. majus, Turn.

D. fuscescens, Turn.

Fissidens osmundoides, Hedw.

F. adiantoides, Hedw.

Grimmia apocarpa, Hedw.

G. funalis, Schp.

G. torquata, Hornsch.

G. pulvinata, Smith.

G. patens, B.& S.

G. trichophylla, Grev.

G. decipiens, Lindb.

G. Doniana, Sm.

Rhacomitrium aciculare, Brid.

R. protensum, Braun.

R. fasciculare, Brid.

R. heterostichum, Brid.

R. h. var. gracilescens, B.& S.

R. sudeticum, B.& S.

R. lanuginosum, Brid.

R. canescens, Brid.

Ptychomitrium polyphyllum, Furn.

Hedgwigia ciliata, Ehrh.

Tortula muralis, Linn.

T. subulata, Hedw.

Barbula fallax, Hedw.

B. rigidula, Mitt.

B. convoluta, Hedw.

B. unguiculata, Hedw.

Leptodontium flexifolium, Hpe.

Weisia viridula, Hedw.

W. mucronata, B.& S.

W. rupestris, C.M.

W. curvirostris, C.M.

W. c. var. commutata,

W. c. var. scabra.

Trichostomium tortuosum, Dixon.
T. fragile, Dixon.
Encalypta ciliata, Hoffm.
E. commutata, N.& H., var. imberbis.
E. rhabdocarpa, Schwgr.
Zygodon lapponicus, B.& S.
Z. Mougeotii, B.& S.
Ulota Bruchii, Hornsch.
U. B. var. intermedia, Brid.
U. crispa, Brid.
U. phyllantha, Brid.
Orthotrichum leiocarpum, B.& S.
O. Lyelii, H.& T.
O. affine, Schrad.
ŒEdipodium Griffithianum, Schwgr.
Splachnum sphaericum, Linn. fil.
Tetraplodon mnioides, B.& S.
Tayloria lingulata, Lindb.
Funaria hygrometrica, Sibth.
Amblyodon dealbatus, P.Beauv.
Meesia trichoides, Spruce.
Aulacomnium palustre, Schwgr.
Catoscopium nigritum, Brid.
Conostomum boreale, Swartz.
Bartramia ŒEderi, Sw.
B. ithyphylla, Brid.
B. pomiformis, Hedw.
B. Halleriana, Hedw.
Philonotis fontana, Brid.
P. f.falcata, Brid.
P. calcarea, Schp.

Breutelia arctuata, Schp.

Webera acuminata, Schp.

W. polymorpha, Schp.

W. elongata, Schwgr.

W. cruda, Schwgr.

W. nutans, Hedw.

W. annotina, Schwgr.

W. carnea, Schp.

Plagiobryum Zierii, Lindb.

Bryum filiforme, Dicks.

B. pendulum, Schp.

B. inclinatum, Bland.

B. pallens, Sw.

B. schleicheri, Schwgr.

B. turbinatum, Schwgr. v.latifolium,B.& S.

B. pseudo-triquetrum, Schwgr.

B. pallescens, Schleich.

B. caespiticium, Linn.

B. capillare, Linn.

B. erythrocarpum, Schwgr.

B. alpinum, Huds.

B. argentium, Linn.

Mnium undulatum, Linn.

M. hornum, Linn.

M. serratum, Schrad.

M. punctatum, Linn.

Neckera crispa, Hedw.

N. pumila, Hedw.

N. complanata, Hubn.

Homalia trichomanoides, Brid.

Antitrichia curtipendula, Brid.

Thuidium tamariscinum, B.& S.

T. delicatulum, Mitt.

Cylindrothecium concinnum, Schp.

Orthothecium rufescens, B.& S.

O. intricatum, B.& S.

Isothecium myurum, Brid.

Pleuropus sericeus, Dixon,

Brachythecium rutabulum, B.& S.

B. rivulare, B.& S.

B. Starkei, B.& S.

B. plumosum, B.& S.

B. purum, Dixon.

Eurhynchium Swartzii, Hobkirk.

E. myosuroides, Sop.

Plagiothecium pulchellum, B.& S.

P. denticulatum, B.& S.

P. undulatum, B.& S.

Amblystegium Sprucei, B.& S.

A. filicinum, De.Not.

Hypnum stellatum, Schreb.

H. uncinatum, Hedw.

H. revolvens, Sw.

H. comutatum, Hedw.

H. falcatum, Brid.

H. cupressiforme, Linn.

H. hamulosum, B.& S.

H. molluscum, Hedw.

H. crista castrensis, Linn.

H. ochraceum, Turn.

H. scorpioides, Linn.

H. trifarium, W.& M.

Hypnum cordifolium, Hedw.

H. gigantium, Schp.

H. sarmentosum, Wahl.

H. cuspidatum, Linn.

H. Schrebri, Willd.

Hylocomium splendens, B.& S.

H. loreum, B.& S.

H. squarrosum, B.& S.

H. triquetrum, B.& S.

C.

# A P P E N D I X  C.

HEPATICAE.

Arranged after,

"The Students' Handbook
of British Hepatics."
S.M.Macvicar.

Compiled from Records
which have appeared in
various "Transactions",
"Journals", etc.

# LIST OF HEPATICAE RECORDED FROM BEINN LAOIGH.

MARCHANTIALES.

Targionia hypophylla, Linn.

Conocephalum conicum, (Linn.) Dum.

Preissia commutata, Nees.

Marchantia polymorpha, Linn.

JUNGERMANNIALES,

ANACROGYNAE,

Aneura pinguis, (Linn.) Dum.

A. multifida, (Linn.) Dum.

A. sinuata, (Dicks.) Dum.

Metzgeria furcata, (Linn.) Dum.

M. conjugata, Lindb.

M. hamata, Lindb.

M. pubescens, (Schrank.) Raddi.

Pallavicinia Lyellii, (Hook.) Gray.

Moerkia Blyttii, (Moerch.) Brockm.

Pellia epiphylla, (Linn.) Corda.

P. Neesiana, (Gottsche.) Limpr.

P. Fabbroniana, Raddi.

Blasia pusilla, Linn.

ACROGYNAE.

Gymnomitrium concinnatum, (Lightf.) Corda.

G. obtusum, (Lindb.) Pears.

G. corallioides, Nees.

G. crenulatum, Gottsche.

G. adustum, Nees.

G. varians, (Lindb.) Schiffn.

G. crassifolium, Carr.

G. alpinum, (Gottsche.) Schiffn.

Marsupella Sprucei, (Limpr.) Bernet.

M. aquatica, (Lindenb.) Schiffn.

M. emarginata, (Ehrh.) Dum.

Alicularia compressa, (Hook) Nees.

A. scalaris, (Schrad.) Corda.

A. Geoscyphus, De Not.

Eucalyx obovatus, (Nees.) Breidl..

E. hyalinus, (Lyell.) Breidl.

Aplozia crenulatum, (Sm.) Dum.

A. c. gracillima, (Sm.)

A. sphaerocarpa, (Hook.) Dum.

A. cordifolia, (Hook.) Dum.

A. riparia, (Tayl.) Dum.

A. pumila, (With.) Dum.

Jamesoniella Carringtoni, (Balf.) Schiffn.

Gymnocolea inflata, (Huds.) Dum.

Lophozia Muelleri, (Nees.) Dum.

L. ventricosa, (Dicks.) Dum.

L. alpestris, (Schleich.) Evans.

L. a. gelida, (Tayl.)

L. incisa, (Schrad.) Dum.

L. quinquedentata, (Huds.) Cogn.

L. lycopodioides, (Wallr.) Cogn.

L. Hatcheri, (Evans.) Steph.

L. Floerkii, (Web. et Mohr.) Schiffn.

L. barbata, (Schmid.) Dum.

Sphenolobus minutus, (Crantz.) Steph.

S. politus, (Nees.) Steph.

S. exsectus, (Breidl.) Steph.

Plagiochila asplenioides, (Linn.) Dum.

P. a. minor, Lindenb.

P. spinulosa, (Dicks.) Dum.

Leptoscyphus Taylori, (Hook) Mitt.

L. anomalus, (Hook.) Mitt.

Lophocolea bidentata, (Linn.) Dum.

L. cuspidata, Limpr.

L. heterophylla, (Schrad.) Dum.

Chiloscyphos polyanthus, (Linn.) Corda.

Harpanthus Flotowianus, Nees.

Saccogyna viticulosa, (Sm.) Dum.

Cephalozia bicuspidata, (Linn.) Dum.

C. Lammersiana, (Hüb.) Spruce,

Hygrobiella ~~arbescens~~ laxifolia, (Hook.) Spruce.

Pleuroclada albescens, (Hook.) Spruce.

Odontoschisma Sphagni, (Dicks.) Dum.

O. denudatum, (Nees.) Dum.

Calypogeia Trichomanis, (Linn.) Corda.

C. fissa, (Linn.) Raddi.

Bazzania trilobata, (Linn.) Gray.

B. tricrenata, (Wahl.) Pears.

B. triangularis, Pears.

Lepidosia reptans, (Linn.) Dum.

L. setacea, (Web.) Mitt.

Blepharostoma trichophyllum, (Linn.) Dum.

Anthelia julacea, (Linn.) Dum.

A. Juratzkana, (Limpr.) Trevis.

Herberta adunca, (Dicks.) Gray.

Mastigophora Woodsii, (Hook.) Nees.

Ptilidium ciliare, (Linn.) Hampe.

Trichocolea tomentella, (Ehrh.) Dum.

Diplophyllum albicans, (Linn.) Dum.

D. taxifolium, (Wahlenb.) Dum.

Scapania compacta, (Roth.) Dum.

S. aequiloba, (Schwaegr.) Dum.

S. gracilis, (Lindb.) Kaal.

S. g. laxifolia, Carr.

S. aspera, Bernet.

S. nemorosa, (Linn.) Dum.

S. nimbosa, Tayl.

S. ornithopodioides, (With.) Pears.

S. dentata, Dum.

S. undulata, (Linn.) Dum.

S. uliginosa, (Swartz.) Dum.

S. paludosa, K. Müll.

S. irrigua, (Nees.) Dum.

Radula complanata, (Linn.) Dum.

R. Lindbergii, Gottsche.

R. L. germana, (Jack.)

Pleurozia purpurea, (Lightf.) Lindb.

Madotheca laevigata, (Schrad.) Dum.

M. platyphylla, (Linn.) Dum.

M. rivularis, Nees.

Lejeunea cavifolia, (Ehrh.) Lindb.

L. patens, Lindb.

Frullania germana, Tayl.

F. Tamarisci, (Linn.) Dum.

F. T. atrovirens, Carr.

F. fragifolia, Tayl.

F. dilatata, Dum.

# A P P E N D I X  D.

## BIBLIOGRAPHY.

D. I.

Bonnier. G.

"Adaptation des Plantes au Climat Alpine."

Annales des Sciences Naturelles,

7e Serie, Botanique, Vol. xx. 1895.

Bower. F. O.,

"Scottish Mountain Botany, with special Reference to the Flowering Plants."

Scottish Mountaineering Club Guide,

Vol. i. Section A. 1921.

Buchan. Alex.,

"The Monthly and Annual Rainfall of Scotland."

Journ. Scot. Meteorol. Soc.,

3rd. Series, Vol. x. 1894.

"The Mean Atmospheric Pressure and Temperature of the British Isles."

Ibid. Vol. xi. 1898.

Druce. G. C.,

"Notes on the Flora of Ben Laoigh, etc."

Journ. Bot. 1888.

"Notes on the Flora of Perthshire."

Annals Scot. Nat. Hist. 1900.

And various other Notes, etc., in these Publications.

Ewing. P.,

"Report on the State of the Alpine Flora in Breadalbane during the last Week of July, 1902."

Trans. Nat. Hist. Soc. Glasgow, 1902.

"Notes on Some Alpine Plants from Forfarshire and Aberdeenshire."

Ibid. 1886.

And various other Notes, etc., in these Publications:-

Journ. Bot., Annals Scot. Nat. Hist., and the above.

E wing. P., (Contd.)

"Flora of Ben Laoigh."

Science Gossip. No. 223. 1883.

Hooker. Sir J. D.,

"On the Distribution of Arctic Plants."

Trans. Linn. Soc. Vol. xxiii. 1860.

"The Students' Flora of the British Islands." 1884.

Macnair. P.,

"On the Alpine Plants of Perthshire."

Trans. Perth. Soc. Nat. Sc. Vol. ii.

Patton. D.,

"The Vegetation of Beinn Laoigh."

Report, Brit. Assoc. (Section K) Cardiff, 1920.

"A Few Norwegian Plant Associations"

Proc. Bot. Soc. Edin. 1915.

"An Example of River Action and its Relation to Plant Distribution."

Trans. Glasgow Geol. Soc. 1922.

Smith. R.,

"Plant Associations of Tay Basin."

Trans. Perth. Soc. Nat. Sc. Vols. ii & iii

"Botanical Survey of Scotland" Part ii. N. Perthshire.

Scot. Geogr. Mag. Aug. 1900.

Smith. W. G.,

"Arctic-Alpine Vegetation."

Being Chap. xiii. of "Types of British Vegetation."

Tansley. A. G.,

"Types of British Vegetation." 1911.

Thomson. G.,

"The Meteorology of the Scottish Mountains."
The Scottish Mountaineering Club Guide.
Vol. i. Section A. 1921.

Watson. H. C.,

"Cybele Britannica." 1847-1859.

White. F. B.,

"Flora of Perthshire." 1897.

"Notes on a Botanical Excursion to the Breadalbane Mountains, Perthshire."
Trans. Perth. Nat. Soc. 1871.
(In conjunction with Drummond Hay.)

And various subsequent Papers in the above Publication, and in The Scottish Naturalist, (Annals Scot Nat. Hist.).

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