

VEGETATION

Introduction

The purpose of this chapter is to describe the major plant communities represented in Assynt, highlighting species and localities of interest.

We have not used the terminology of the National Vegetation Classification, for two main reasons. Firstly, neither of us is versed in its methodology. Secondly, and more important, the vegetation of the whole of North West Sutherland, including Assynt, has been the subject of an extremely detailed survey by R.E.C. Ferreira, to which further reference is made in the chapter on the history of recording. His report (1995) uses the N.V.C. terminology and may be consulted for more information.

Our appreciation of the character of local plant communities has been acquired almost subliminally in the course of the flora survey. However, we have tried to bring some order to our impressions by consulting the relevant parts of Ferreira's report. We have made extensive use of his introductory sections and site descriptions, especially in regard to the geobotanical context of communities. This brief account can only summarise the diversity and subtlety of the communities present; for more, come and see for yourself!

The communities have been grouped as follows: coast and islands; woodland and scrub; heath, mire and crags; freshwater; limestone; upland; man-made or influenced. To preserve some sense of location in each category, notes on specific features or localities are ordered from Inverkirkaig in the south-west, north to the Point of Stoer, east to Unapool, and then south along the line of the limestone to Knockan in the south-east. Others, from the centre of the parish, are slotted in where they fit best.

Before getting into detail, there are some general considerations which apply to many or all of the categories. First is the influence of our oceanic climate, with relatively equable temperatures and high rainfall. As a consequence, species largely confined to woodland further to the south and east flourish here in the open. Second is our northern latitude which, contrariwise, means that species widespread further south may be confined to our coasts. Third is the mosaic character of our vegetation, particularly on the Lewisian gneiss, where there has developed over time a landscape of frequently changing altitude, mineral richness, soil type and depth, slope and aspect. Fourth are the often subtle but nevertheless pervasive effects of the activities of man over 5,000 years or more. This is most obvious on

the fertile ground of the coast and limestone areas, but may be found almost everywhere.

Coast and islands

Rocky shores

From Loch Kirkaig round to Lochinver, and from there north to Clachtoll, the coast, which is on Lewisian gneiss, is low and exposed. Here maritime plant communities may be compressed into a narrow band between high tide level and the lower edge of the coastal heathland. In the most exposed areas *Armeria maritima* is almost the only constant species. However, in more sheltered situations, to the leeward of headlands and in bays, a more luxuriant vegetation is developed. In crevices at the lowest level are the leathery fronds of *Asplenium marinum*, and above this, on shelves and in crevices, the bright green of *Ligusticum scoticum* and the fleshy rosettes of *Sedum rosea*, the last often abundant. Less common are the white-flowered tussocks of *Tripleurospermum maritimum* and *Silene uniflora*.

Higher, and where there is a greater depth of soil, a grassy sward develops, dominated by *Festuca rubra* and *Agrostis stolonifera*, often with *Plantago maritima* in quantity. Sheltered hollows support tall herb vegetation containing a wider variety of grasses and species such as *Angelica sylvestris*, *Luzula sylvatica* and often much *Primula vulgaris*. Flushes off mineral-rich parts of the gneiss are characterised by the grey tussocks of *Schoenus nigricans*. Stony ground on south-facing slopes has an open form of cliff grassland with much *Thymus polytrichus*, and fringing the uppermost edge of the cliffs there may be a form of maritime heath with *Empetrum nigrum* and the conspicuous silky leaves of *Salix repens*. *Sedum anglicum* is a frequent component of this community where the soil is shallow.

At Clachtoll the character of the rocky parts of coast begins to change as Torridonian sandstones take over from the gneiss. The dipping sandstones provide low cliffs from the Bay of Stoer north to Stoer Lighthouse, where there is a marked increase in height and steepness through to the Point of Stoer. Here the coast changes direction, the cliffs running south and then east to Rubh' an Dunain, this section being sheltered from the prevailing winds.

The communities of the lower sandstone cliffs are not markedly different from those on the gneiss, but where higher there are changes, although the cliffs are so steep that they can only be botanised through binoculars! In

the vicinity of sea-bird colonies there occurs a nitrogen-loving community with some 'ruderal' elements. *Cochlearia officinalis* may be abundant, as also *Stellaria media* and species of *Atriplex*. Nearer the top of the cliffs, where the fulmars nest, there is lush tall herb vegetation dominated by *Rumex acetosa* and *Silene dioica*, with *Luzula sylvatica* locally abundant. At Geodh' Dearg, about half way between Point of Stoer and Rubh' an Dunain, it is possible to climb down a steep gully to the base of the cliffs. In the shelter of this gully a whole range of cliff communities is developed, including vertical *Salix aurita* scrub, faces covered by *Hedera helix*, and in season the conspicuous flowers of *Lonicera periclymenum*.

At Port Achnacarnin the Torridonian gives way again to gneiss, the shelter afforded by this tiny bay allowing the development of a narrow band of scrub woodland just below the cliff-top, containing birch, rowan, hazel and aspen, and a ground flora of *Allium ursinum*, *Hyacinthoides non-scriptus* and *Stellaria holostea*. From this point eastwards, the gneiss provides a low, indented coastline all the way to the parish boundary on Loch Glencoul. It is rugged in places, with occasional cliffs of some height, as at Culkein Drumbeg.

One species found on these rocky coasts is quite restricted in its national as well as its local distribution. *Vicia orobus* displays its pink trusses of flowers on the seacliffs from Achmelvich round to Oldany Island, and also on crags up to three km. inland. In just one place it is accompanied by *Vicia sylvatica*, which is found locally at only one other site. Another species that extends, to our initial surprise, well over two km. inland, is *Asplenium marinum*, though only on high crags, hoared over with the grey maritime lichen *Ramalina siliquosa*, which catch the full force of the south-westerlies.

At Cirean Geardail, about a kilometre south-west of the Old Man of Stoer, a small population of the tiny twin-stemmed *Ophioglossum azoricum* occurs in short cliff-top turf dominated by *Plantago coronopus*. Just west of Rubh' an Dunain, in the short open grassy turf of cliff-top gulleys, is where we first found the tiny plants of *Anagallis minima*. We now know that it occurs widely, especially on the north coast of Assynt, but never far from the sea. An unexpected component of the cliff ledge flora nearby is *Orchis mascula*. The short sward on Rubh' an Dunain itself is a good example of vegetation shaped by a combination of exposure and heavy grazing; in late summer *Calluna vulgaris* and *Succisa pratensis* flower here at a height of only a few centimetres.

Extreme exposure is presumably also the factor that allows the tiny, normally montane, willow *Salix herbacea* to exist only 15 m. above sea level at Rubh' Dhubhard between Drumbeg and Nedd, apparently its lowest altitude on the British mainland.

Localised accumulations of shingle, sometimes quite sandy in composition, are found in small bays along these rocky coasts and also on islands such as Soyea. Characteristic of these are species of *Atriplex*, *Galium aparine*, *Potentilla anserina*, *Rumex crispus* and, rarely, as at Port Alltan na Bradhan, *Sonchus arvensis*. On a Torridonian storm beach at Clachtoll is our one remaining locality for *Mertensia maritima*, the few plants protected from grazing by wire mesh.

Dunes and machair

Assynt cannot rival in its dunes and associated habitats the huge systems elsewhere in West Sutherland, but those we have nevertheless contribute greatly to local diversity.

At Achmelvich, increasing erosion, by a combination of human pressures and great storms, as in 1983, led in 1984 to a substantial restoration scheme. Both here and at Clachtoll areas were stabilised and replanted with imported marram. There are smaller areas of dune and/or machair grassland enriched by shell sand at Stoer, Clashnessie and at Mol Bàn on the east side of Oldany Island.

The general pattern of the vegetation is similar in all of these places, but each has its own specialities. There is a sparse strandline community of *Atriplex* species, *Cakile maritima* and *Honkenya peploides*, moving up into dune proper where the sand is stabilised by *Ammophila arenaria*, fronted at Achmelvich by an impressive stand of *Leymus arenarius*. The latter species only otherwise occurs on rock, at Clachtoll and Culkein Drumbeg. *Elytrigia juncea* is sparse, but is found from Achmelvich round to Oldany Island.

In most places the areas dominated by *Ammophila* give way to semi-fixed dunes that are intensively used and grazed, and the most conspicuous elements of their vegetation are tough perennial herbs such as *Centaurea nigra* and *Heracleum sphondylium*, accompanied in places by *Daucus carota* and *Thalictrum minus*. In less stable areas, the running rhizomes of *Carex arenaria* may be seen.

At Achmelvich, Clachtoll and Stoer, these semi-fixed dunes grade almost imperceptibly into a heavily-grazed machair grassland, with *Galium verum* and *Lotus corniculatus* and, in fenced areas, *Crepis capillaris*. *Sedum acre* occurs in the sandy turf at Achmelvich and Stoer, and *Erodium cicutarium* at Stoer. *Ranunculus bulbosus*, which Ferreira mentions as a characteristic species of the Achmelvich grassland, only appears to have survived the 1980s restoration in one tiny area alongside a track, and that is the only place where it has been seen in Assynt. An unexpected discovery at Clachtoll in 1993 was *Astragalus danicus*, in an area of turf alongside the access road, to which it may have

been introduced with *Ammophila* in the course of restoration work.

Where the shell-rich sand has blown up on to the surface of gneiss or Torridonian outcrops a rich community may develop, as at Achmelvich, although here it is, again, heavily grazed. Three orchids occur, *Coeloglossum viride*, *Listera ovata* and *Orchis mascula*, with *Ophioglossum vulgatum*, and often the purple flowers of *Gentiana campestris*. Again at Achmelvich, in just such an area, alongside a lochan, is our only stand of *Scilla verna*.

Dune slacks, as such, hardly exist locally, but *Catabrosa aquatica* does occur in wet areas at Achmelvich and Clachtoll and sometimes invades the strandline at the latter locality. Two other uncommon species of the wetter areas of the machair, at Clachtoll and Stoer respectively, are *Sagina nodosa* and the brick-red orchid *Dactylorhiza incarnata* ssp. *coccinea*.

Saltmarsh

Small areas of saltmarsh are scattered along the coast in sheltered bays and sea-lochs, from Inverkirkraig to Unapool, the best developed examples being at Baddidarach, Lochan na Leobaig (east of Oldany Island) and around Lochs Nedd and Ardbhair.

However, we should perhaps first mention here our one wholly marine species, *Zostera marina*. Records date back to the mid-1950s, when it was found somewhere in the vicinity of Oldany Island. Washed-up leaves and rhizomes have been found by us on beaches from Achmelvich round to Port Dhrombaig, but we had not managed to locate a living stand of this elusive plant until late in 2001, when we were shown material collected just offshore at the last-named locality. The sources of the other material remain to be discovered.

Until recently our one brackish 'pondweed', *Ruppia maritima*, was only known from one locality at the head of Loch Roe. However it has now been found in quantity in the brackish loch at Duart.

The most salt-tolerant of the saltmarsh grasses, *Puccinellia maritima*, has also presented us with some difficulties locally, since the grazing pressure on our relatively small areas of such habitat means that it very rarely flowers. We have now learned to recognise it by its vegetative characters. Although almost certainly under-recorded by us, Ferreira indicates that it is the dominant species in the local saltmarsh turf, accompanied by varying amounts of *Armeria maritima*, *Glauca maritima* and *Plantago maritima*. The close-grazed turf of the *Puccinellia* zone in more sheltered bays, such as Lochan na Leobaig, has in places a golden-brown tint deriving from a diminutive fucoid seaweed referred to as *Fucus muscoides*. Two species of sedge are found at this level on the shore; *Carex*

viridula ssp. *viridula* is widespread, but *Carex extensa* less so, and often best seen on the edge of runnels.

At slightly higher levels *Agrostis stolonifera* and *Festuca rubra* take over from *Puccinellia*, and *Triglochin maritima* is frequently found at this level. Higher still, the brackish grassland may have appreciable amounts of *Leontodon autumnalis*, a surprisingly adaptable species. *Hydrocotyle vulgaris* is a frequent component of wetter coastal grassland, although it also occurs for some distance inland.

Where the shore is stony, the composition of the vegetation on the upper parts of the shore may be slightly different, with *Juncus gerardii*, often accompanied by *Glauca maritima* and, less often by *Blysmus rufus* and *Eleocharis uniglumis*. *Cochlearia scotica* is also found in this sort of situation at Baddidarach and elsewhere.

Finally, in sheltered bays above normal high tide level, but where the wrack is piled up by storms, there develops a tall marsh community dominated by *Iris pseudacorus*, accompanied by *Urtica dioica*. Both of these are, of course, found further inland, but several species which grow amongst them are not, or only rarely. One is *Scutellaria galericulata*, which also occurs at the upper levels of stable shingle; a second is *Lycopus europaeus*, of which there are some fine stands at Baddidarach. Also found amongst the *Iris*, but elsewhere in crevices on rocky shores as far north as Stoer Lighthouse, is the large umbellifer *Oenanthe crocata*, here at its northernmost site in the British Isles. All three species are found far inland further south and their maritime preferences here may be more to do with January isotherms than saltwater.

Islands

None of the small islands off the coast of Assynt have ever been inhabited, since they are lacking in both shelter and fresh water. However, many were grazed until quite recently. Nowadays, their most conspicuous inhabitants are gulls and geese. Soyea is the largest and has a good range of communities, from stable shingle to dense *Calluna* and *Salix aurita* scrub. A large flat area in the centre of the island is completely dominated by watercress (we cannot be more precise, since on our visits none of it has been in flower or fruit); we suspect that roosting geese are responsible for its luxuriance.

Soyea also has the local distinction of at least two populations of the robust sedge *Carex otrubae*, growing at the edge of small brackish pools well within the splash zone. This is a rare and exclusively coastal species in the north of Scotland, and is known to occur in similar situations at Duartbeg, to the north of Assynt, and on Eilean Mór, just to the south, in West Ross. Of the other islands, Eilean Chrona has a reasonably diverse flora for its size, but nothing out of the ordinary.

The smallest island visited, because it was the only land in its tetrad, was Sgeir Liath, west of the mouth of Loch Nedd; it yielded just eight species of flowering plants, but, happily, one uncommon maritime moss, *Tortella flavovirens*.

Oldany, our largest island, is so close to the mainland that it can be accessed on foot at very low tides. It has a full suite of habitats, including a good range of maritime communities, both along its most exposed north-west coast and associated with the sand spit at Mol Bàn on its sheltered eastern side.

Woodland and scrub

Most of Assynt's natural woodland is confined to a strip within five km. of the coast, with outliers along Loch Assynt and on the south side of Loch Urigill. However, there are small areas of woodland scattered across the rest of the parish, often only narrow strips along ravines or groups of trees around waterfalls. These scraps have a botanical significance out of all proportion to their size.

Two main factors appear to have determined where woodland is found today. One is exposure, especially to salt-laden south-westerly gales; most of our woodlands are in the shelter of valleys or ravines, or on the north sides of ridges or crags (with the apparent exception of some of our birch/oak woodland, see below). The other is people. The coastal strip contains most of the fertile ground in the parish, and, predictably, is also the most densely populated. All available level ground has in the past been used for growing crops. As a result, woodland is virtually confined to steep or rocky ground.

The general pattern of woodland in the parish seems to have been established by the time of Home's survey in 1774 (Adam 1960), perhaps because the remaining woodlands were recognised as a valuable resource and, until recently, managed as such. The state of our existing woodlands varies greatly. Some are now showing serious signs of senescence, others are regenerating, and the interested reader is referred to the recent study by Noble (2000) for a more detailed account of this topic.

However, few woodlands are fenced, and browsing by domestic stock and deer severely restricts regeneration, as does poorly-managed muirburn. This is demonstrated in those areas where neither grazing nor muirburn occur. Vertical crags are not ideal for the establishment of trees, but they support significant numbers, and the larger islands in lochs are often conspicuously wooded.

Planted woodland is described in the section on 'man-made' habitats; the comments that follow relate solely to natural woodlands.

Geological factors

The structure and composition of our woodlands are largely determined by properties of the underlying rocks, in particular the degree of base-richness. The great majority are situated on the gneiss, which in Assynt, may be acidic, basic or intermediate in character, although as Ferreira points out, it is generally more basic than the gneiss further to the north.

So far as other rock types are concerned, the generally acidic Torridonian sandstones do not support much woodland locally. On the Stoer peninsula they are too exposed and intensively grazed to have anything other than occasional patches of scrub on inaccessible cliff faces, and where they occur inland, altitude and exposure both militate against woodland. The only exceptions are small areas on the south side of Cam Loch and north side of Loch Veyatie.

There are few local woodlands on Cambrian rocks, but they are of considerable interest. The largest, An Coimhleum, is situated on a sheltered north-facing slope composed of quartzite, with sills of Canisp porphyry exposed at its upper edge. It is generally acidic, but there is area of strongly basic springs in the middle of the woodland. The wooded ravine on the Allt a' Phollain in Cromalt is cut through acidic quartzite.

In contrast, the wooded ravines of the lower part of the Allt a'Chalda Mor, Allt Poll an Droighinn and Traligill River, at Inchnadamph, are cut through the Cambrian limestones, providing a substrate that is highly basic. The hanging woodland at Liath Bhaid is on Fucoid Beds and limestone. The only extensive area of woodland on the limestone further south is Doire Dhubh, at the western end of Loch Urigill. There is only one tiny ravine woodland on the acidic rocks of the Moine Schists, on the upper reaches of the Crom Allt.

To give some coherence to this account of the vegetation of our woodlands we have, following Ferreira, described the general character of those on acidic substrates, which are the more numerous, and then the variations introduced by degrees of base-richness. It should be emphasised that, on the gneiss in particular, these variations in substrate may be very local, resulting in a bewildering, but very interesting, mosaic of species with differing requirements and tolerances. Canopy and ground layer have been treated separately, followed by some notes on particular woodlands.

Canopy

The dominant tree species in almost all our woodlands is downy birch, accompanied by smaller quantities of rowan; the latter occurs as single trees on sheltered crags at higher altitudes than the birch. Silver birch is a rare planted tree in Assynt.

On acidic substrates, birch/rowan woodland may include aspen on the higher ground and hazel on the lower. Oak is also a significant component in some coastal areas and in a few places on the north side of Loch Assynt. Much of the birch/oak woodland occupies warm south-facing slopes, with particularly good examples at Baddidarach, where oaks are numerous, and at Pollachapuill. The majority of local oaks, incidentally, have characters intermediate between those of sessile and pedunculate, and they are also very heterogenous. The woodlands on the larger loch islands are also mostly acidic, with birch/rowan merging in more exposed parts into dry heath, in which large junipers may be a conspicuous feature.

On base-rich substrates there may be a much more varied canopy. Although still essentially birch/rowan or birch/hazel woodland, at times the hazel may predominate, as at Inverkirkaig and Nedd. Aspen may occur in quantity, and it is also widespread on individual crags and on the rocky margins of some sea lochs.

In places the birch/rowan/hazel/aspen woodland is further diversified by individual specimens of wych elm, goat willow and bird cherry. The best examples of this mixed woodland are on the gneiss in the vicinity of Achmelvich, Drumbeg and Nedd. Elsewhere it occurs in smaller amounts in ravines, such as those cutting through the gneiss on the Oldany River and at Creag an Spardain, and through the limestone on the Allt Poll an Droighinn and the Traligill River.

The status of ash, which might be expected to occur in such base-rich woodlands, is problematic in Assynt. It is present and regenerating freely on the Culag River and from Torbreck north to Rhicarn, but only occurs sparingly elsewhere. In contrast, holly is widespread, but usually as single trees, often on inaccessible crags, which may reflect its particular susceptibility to browsing.

In wet hollows in woods, and on the level areas at their base, there is often swampy woodland dominated by downy birch and either common or eared willow. Willow scrub, mainly of the lower-growing eared willow, also occurs around the margins of lochs and in sheltered areas on some offshore islands. Alder is mainly confined to the margins of watercourses, but also occurs on some loch islands.

Ground layer

Firstly, a word of warning, which relates to our oceanic climate. As has already been outlined, species confined to woodland further south in the British Isles frequently occur here outside it, in boulder scree, on shady north-facing slopes, or under bracken and other tall herbs. Examples include *Oxalis acetosella*, almost ubiquitous

wherever there is some shelter, *Anemone nemorosa*, frequently found under bracken and heather, and *Sanicula europaea*, which may occur in isolated areas of boulder scree. The latter two species may also indicate the former presence of woodland where they are now found. *Hyacinthoides non-scripta* may also occur in woodland, often in areas dominated by *Holcus mollis*, but also grows luxuriantly in the tall herb vegetation on sheltered ledges on parts of sea cliffs or inland crags that are inaccessible to grazing animals.

Likewise, luxuriant bryophyte communities occur both inside our woodlands, and elsewhere where there is a humid microclimate, even under dwarf shrub heath high on the hills. A frequent associate of the bryophytes in these situations is the tiny fern *Hymenophyllum wilsonii*.

The ground layer of the acidic woodlands varies with their slope and rockiness, but is often very species-poor. Higher areas are often dominated by *Vaccinium myrtillus* and *Deschampsia flexuosa*, with frequent *Oxalis acetosella*. Lower down, especially in the more humid woodlands, there may be fine bryophyte communities, dominated in places by hypnoid mosses, elsewhere by large oceanic liverworts. In broken ground, or on ledges inaccessible to grazing animals, a tall herb community develops, often dominated by *Teucrium scorodonia*, *Luzula sylvatica* or the larger ferns. Here also may be found some of the less common ferns, such *Dryopteris aemula*, *D. expansa* and *Gymnocarpium dryopteris*. Flushes with *Phegopteris connectilis* are signs of some slight base enrichment.

The ground layer of base-rich woodlands is, like the canopy, rather richer in species, with different communities occupying particular niches. Grazed slopes have *Ranunculus acris*, *Lysimachia nemorum* and, conspicuous in the late spring, *Primula vulgaris*. Strongly flushed areas, particularly where they are protected from grazing by boulder scree, may be occupied by sheets of *Allium ursinum*, with *Galium odoratum*, *Geum rivale* and *Sanicula europaea*. In drier more open situations, often on south-facing slopes, *Fragaria vesca* may become conspicuous, with the much rarer *Potentilla sterilis*. *Melica uniflora* is found on the basic and ultrabasic dykes which outcrop in some woodlands.

Ungrazed rocky ledges in such base-rich woodlands, whether on the gneiss or limestone, are often dominated by tall grasses such as *Brachypodium sylvaticum* or *Elymus caninus*. In wetter situations a tall herb community develops, with *Filipendula ulmaria*, *Angelica sylvestris*, *Geum rivale*, *Valeriana officinalis* and, occasionally, conspicuous patches of *Cirsium heterophyllum*. Where small burns cut through the crags the 'spiky' leaves of *Crepis paludosa* are often conspicuous.

Areas of special interest

All the woodlands from the Kirkaig valley round to Unapool are situated on the gneiss, and the examples that follow give some indication of the contribution that it makes to the local woodland flora.

In the Kirkaig woodlands there are small stands of *Epipactis helleborine* (most visible in the conifer plantings on the drive to Achins Bookshop), and there is also an old record for *Cephalanthera longifolia*.

The scattered woodlands stretching from Torbreck to Rhicarn and west to Ardroe and Achmelvich are probably the richest in the parish, with a high proportion of aspen and some very old hazel coppice stools. Along the roadside between Achadhantuir and Feadan there is a large population of *Cephalanthera longifolia*, here at its northernmost station in the British Isles, together with smaller quantities of *Epipactis helleborine*. Not far away, under hazel on the south side of Loch Dubh, is our only locality for the saprophytic orchid *Neottia nidus-avis*.

The next major area of woodland stretches from Oldany to Loch Dhrombaig. This contains much aspen and hazel, but the main interest is the considerable age of some of the trees, including ancient oak coppice stools at Pollachapuill and some huge goat and grey willows, some of them ancient pollards. *Ceratocarpus claviculata* occurs at the edge of the Drumbeg woodland and again in the Nedd woodlands.

The Nedd woodlands are largely on croft in-bye and contain substantial stands of hazel, much of it as large coppice stools, some huge specimens of grey willow, scattered oaks and almost as many specimens of bird cherry as there are in all the rest of the parish. There is a rich basiphile ground flora, especially in areas of large boulder scree. Their continuation up the valley of the Leireag River is noted for its riverine alders and is one of only two locations for *Carex remota*.

Further woodland extends, patchily, along the coast from Gleann Leireag to Unapool, often in ravines. It is mainly on the acidic side, with notable exceptions, such as at Creag na Spardain, where there is a fine mixed canopy together with *Festuca altissima* at its northernmost locality in the British Isles.

We now move on to a few woodlands of note on substrates other than the gneiss, bearing in mind that the woodland at Liath Bhad and the wooded ravines on the limestone are covered in the section on limestone.

An Coimhleum, on quartzite and Canisp porphyry, is a acid birchwood chiefly noteworthy for its survival in part of the parish otherwise very poorly wooded, and for its bryophytes, but the crags along its upper edge are an isolated locality for *Dryopteris expansa*.

The largest of the wooded islands in Cam Loch, Eilean na Gartaig, is a unique study in contrasts. The island is underlain by quartzite and the upper parts are a good example of ungrazed acidic woodland. Round the edge of the island, however, is a flood zone extending up to two metres above the normal summer levels of the loch, whose feeder rivers drain off limestone. This flood zone is occupied by birch/rowan woodland containing goat, grey and eared willow, beneath which there is a remarkable stand of *Allium ursinum*, accompanied by *Scrophularia nodosa*, *Orchis mascula* and *Ranunculus auricomus*, the last found in only one other locality in West Sutherland.

A tiny crag woodland on Torridonian sandstones at the edge of the western end of Cam Loch is the only locality for *Orthilia secunda*.

The extensive but elderly birch woodland on the limestone at Doire Dhubh is disappointingly poor in woodland species, probably because the limestone is here covered by a thick layer of peat. Finally, the three wooded ravines not far away in the Cromalt area are attractive, but rather acidic, noteworthy mostly for their bryophytes.

Heath, mire and crags

The coast road from Lochinver to Unapool provides a constantly changing panorama of rocky landscapes, set with small lochs. Outwith the crofting settlements, with their close-grazed in-bye, these 'cnoc and loch' landscapes are a patchwork of colour, particularly in the late summer.

The heath and mire vegetation which makes up most of this patchwork changes abruptly with variations in aspect or slope, and is everywhere interrupted by outcrops, crags and screes of the Lewisian gneiss which underlies the area. Road cuttings reveal great variation in the gneiss itself, from a hard pinky quartz-rich type, through the typical banded form, to dark, often crumbling base-rich mineral layers. The same cuttings also show that, between the outcrops, the underlying soil-making material may be glacial till or peat, the latter often lying on the former.

Looking a little closer, we begin to notice in this apparently 'natural' landscape almost ubiquitous signs of the activities of man. Close to the road, and often also far from it, peat has been dug for centuries. Blackened stems of heather, or bleached *Sphagnum* hummocks mark areas of recent muirburn. Old walls snake across the hillsides, delineating the boundaries of ancient sheilings. More subtle are the signs of grazing; although sheep are now virtually confined to areas under crofting tenure, there is still a large red deer population.

All of these factors contribute to a small-scale mosaic of vegetation types that it is fascinating to explore, but whose character is very difficult to summarise. Perhaps the best way to give something of its flavour is to describe a short walk, in late summer, through an area not far from the footpath that runs up Gleann Leireag. It lies at an altitude of 70-140m. and was, until the early 19th century, part of the hill ground of the settlement at Glenleraig, after which it was farmed with sheep until about thirty years ago.

At first sight the rolling peaty ground appears to be covered by a rather monotonous carpet of wet heath, dominated by *Trichophorum cespitosum*, *Calluna vulgaris* and *Molinia caerulea*, with locally frequent *Myrica gale* and scattered *Erica tetralix* and *Narthecium ossifragum*. Shallow channels and seepage areas are almost solid *Molinia*, with scattered *Potentilla erecta* and *Succisa pratensis*. Steeper slopes are covered by dense *Calluna*, with occasional patches of *Erica cinerea*.

Inside the wall of an old sheiling, abandoned as such nearly two centuries ago, there is grassland composed of *Agrostis* spp., *Holcus lanatus* and *Anthoxanthum odoratum*, with scattered fronds of *Pteridium aquilinum*. On closer inspection, this grassland proves to have quite a varied herb content, including *Galium saxatile*, *Plantago lanceolata*, *Prunella vulgaris*, *Trifolium repens* and *Viola riviniana*. This is the community we call 'sweet' grassland.

In the boggy bottom of a flat valley nearby the vegetation reverts to *Trichophorum* and *Calluna*, but open runnels are edged with *Schoenus nigricans* and *Rhynchospora alba*, with the shiny leaves of *Potamogeton polygonifolius* in the water itself. Below a gneiss outcrop at the edge of this valley there is small flush with a stand of *Eleocharis quinqueflora*, occasional plants of *Carex hostiana* and *Eriophorum latifolium*, and the starfish-like rosettes of *Pinguicula vulgaris*.

Climbing up through wet heath and over a saddle, we drop down a gentle well-drained slope beneath a higher line of outcrops. Here, amongst the *Calluna* and *Erica cinerea*, there are more patches of sweet grassland matted by hypnoid mosses, with damper areas marked out by *Achillea ptarmica*, *Alchemilla vestita*, *Euphrasia* sp., *Leontodon autumnalis* and *Ranunculus acris*.

Contouring across to the nearest crag, we find shelves occupied by *Teucrium scorodonia* and little else except a few plants of *Primula vulgaris*, but running along a tight crevice under an overhang are the whorled leaves of *Galium odoratum*. In gritty grassland just at the base of the crag there is *Hypochaeris radicata* and *Thymus polytrichus*. With the *Galium*, they are indications that the gneiss of the crag, although superficially rather dour-looking, is in fact quite base-rich.

The scree immediately below the crag has two of the usual ferns, *Polypodium vulgare* and *Oreopteris limbosperma* and tucked into a damper area the neat fronds of *Phegopteris connectilis*. The base-rich character of the gneiss is confirmed by the tall herb community in the flushed lower parts of the scree, where there is *Filipendula ulmaria*, *Geum rivale*, *Lysimachia nemorum* and *Trollius europaeus*.

An open flush at the base of the scree has the tiny pink flowers of *Pinguicula lusitanica* and nearby some straw-coloured shoots of *Selaginella selaginoides*. Above us, on another, small, creviced crag, is a tightly-hugging plant of *Hedera helix* and in the rocks beneath it one scraggy sapling of *Sorbus aucuparia*. As we make our way down into the river valley below we begin to notice small bushes of *Salix aurita* that have so far escaped grazing amongst the tall *Calluna*. Alongside the river, flat areas in its flood plain are dominated by tussocky *Molinia* interspersed with the almost ubiquitous *Calluna*.

Our initial impressions of this area might have been of colourful, but run-of-the-mill wet heath and mire communities in the damper areas, with dry heath and grassland on the better drained slopes. However, the base-rich gneiss outcrops and the water draining off them add substantially to the range of communities and species. And this small area is only a sample of the overall variation and interest.

Two particular species should be mentioned here, because of the impact they can make on the landscape. Bracken, *Pteridium aquilinum*, is a frequent component of dry heath, either as scattered fronds, or forming small patches in sheltered hollows. However, on well-drained mineral soils it can dominate large areas. Areas of such soils have been prime candidates in the past for enclosure and cultivation, either as sheilings up in the hills or as croft in-bye. In the past the bracken was kept in check by cutting, livestock and ploughing. Now there are few checks to its growth and spread, although much of it does not produce spores. In its favour, it does provide, when not too dense, shelter for a number of smaller herbs.

The other species is gorse, *Ulex europaeus*, which dominates large areas of south-facing slopes in, for instance, the Kirkaig valley, and Glen Canisp. There is some suggestion that it is an introduction, originally brought in as browse, and the young shoots are certainly eaten by both sheep and deer. Its thickets may have glades into which grazing animals cannot penetrate, but its main value is to the smaller animal life that it shelters.

Heath communities: grazing and muirburn

Heath communities have been materially affected in most parts of Assynt under crofting tenure, and

elsewhere, by grazing and muirburn, particularly the latter. The results of over-grazing by sheep are well-illustrated by the vegetation on either side of the fence that prevents their access to the higher parts of the cliffs west of Rubh' an Dunain. There is high *Calluna* on the seaward side, and a very short sward on the landward.

The immediate effects of muirburn are obvious enough alongside the coast road in a number of places, and can be even more striking inland. It often appears to be carried out without any regard to recommended guidelines and as a result gets out of hand and can wreak havoc. Areas of dry heath are burned back to the underlying peat, and it sweeps across mires, scorching the *Sphagna*, and up screes and crags, killing scrub and regenerating woodland and blackening the very rocks. Muirburn that got out of hand, or was accidentally or even maliciously started, has affected large areas of the parish, with hair-raising tales of fires in the past that burned the whole of the south flank of Quinag, or raged westwards from Elphin almost all the way to Lochinver. Although a few species, notably *Ajuga pyramidalis*, may become locally more abundant following such burns, the long-term damage and nutrient-impoverishment are a high price to pay for this fleeting benefit.

For these reasons the best examples of heathland vegetation in Assynt are found in the more remote areas, where muirburn has not occurred recently or so frequently, and also on loch islands. Inland from Stoer and Clachtoll for instance, in the vicinity of Loch Poll Dhaidh and Loch an Aon Aite, there is a striking number of well-grown bushes of *Juniperus communis*, a species peculiarly susceptible to muirburn, and this area also has much *Arctostaphylos uva-ursi*. *Juniperus* is also a conspicuous feature of many loch islands in the area north of Loch Assynt, such as Loch Beannach, sharing them with tall *Calluna*, *Vaccinium myrtillus* and *A. uva-ursi*.

Mires

The influence of base-rich elements in the gneiss on flushes and mires has been touched on in the description of part of Glenleraig given above. It is even more strikingly manifested in a series of minerotrophic mire communities (those fed by groundwater), in which *Schoenus nigricans* is a major component. Ferreira considers these to be amongst the most interesting and unusual in North-West Sutherland, and they are well represented in Assynt. He calls them the 'Schoenus fen complex', and we give here a summary of just a few of his examples.

At Achadh Mór, *Schoenus* tussock swamp has developed over a broad terrace flushed from nearby strongly basic gneisses and at one end there are the larger tussocks of *Carex paniculata*, a species only found locally at five sites. Near Lochan Fearna

(Brackloch) a *Schoenus* tussock swamp is overtopped by the saw-leaved tussocks of the large fen-sedge *Cladium mariscus*. The ribbons of *Schoenus* that snake down into a *Carex lasiocarpa* mire at Mòinteach na Dubha Chlaise house a population of the rare orchid *Dactylorhiza lapponica*, with the even rarer *D. incarnata* ssp. *cruenta* in the *C. lasiocarpa* mire itself. This is thought to be the only place in the British Isles where the orchids occur together.

Rather different is a large area of sloping ground not far from the north coast of the parish, where extensive *Schoenus* mires and stony flushes support another population of *D. lapponica*, accompanied by *Platanthera bifolia*, *Gymanadenia conopsea* and *D. incarnata* ssp. *incarnata* and *pulchella*.

This section would not be complete without mention of the ombrotrophic mires (those fed solely by rainwater) on deep peat, which are often referred to as blanket or raised bogs. The topography of the gneiss is such that large areas of deep peat have not often developed. However, there are on the north-east sides of Fionn Loch and Loch Veyatie examples of level blanket bog with some incipient raised bog, on either side of the River Inver some good raised bog and, inland of Clachtoll and Stoer, some smaller examples.

The most striking developments of this habitat in the parish are, however, over basic syenites and marbled limestones to the south of Lochs Borralan and Urigill and on the north side of Cnoc na Sròine, and also at slightly higher altitudes on the limestones east of Beinn an Fhuarain, across the plateau south-east of Inchnadamph and at Lairig Unapool. Ferreira points out that deeper peat has developed over the limestone than any of the other rock types in Assynt, and discusses the reasons for this.

The communities developed on these deep peats are not very diverse, the main one being forms of *Calluna/Eriophorum vaginatum* mire, with *Rubus chamaemorus* on the higher slopes, or *Trichophorum/E. vaginatum* mire. Pool systems are not common on these deep peats, but those in a clearing on the forested ridge between Lochs Borralan and Urigill, recently the subject of restoration measures, have an impressive development of the hummocks of the acid-loving species of *Sphagna*, *S. fuscum* and *S. austinii*.

Cliffs and crags

Finally, some mention should be made of the inland cliffs, crags and screes, at relatively low altitudes, which are such a feature of the gneiss landscape. These are most interesting, predictably, when the gneiss is basic or is cut by basic or ultrabasic intrusions.

The accessible lower parts of these exposures, particularly where there are damp crevices or

overhangs, house a variety of small ferns. The most frequent are *Asplenium adiantum-nigrum* and *A. trichomanes*, but others may occur. A good example is on the east side of Cnoc Gorm, where a basic dyke outcrops on both sides of a small valley. On the south-west side is a shaded crevice with *A. viride*, and just across the valley, on a well-lit crag, *A. ruta-muraria*, both species that are much commoner on the limestone. The only occurrence of *Phyllitis scolopendrium* on the gneiss, in a deep crevice on the shore of Loch na h-Uidhe Doimhne, is another example.

Quite the most striking manifestation of this phenomenon, however, is in a remote ravine south of Suilven, Gleannan a' Mhadaidh, one of the magical places in Assynt! It stretches for some two kilometres, with a small boulder-choked west-flowing burn at one end and a loch at the other. According to Ferreira, the ravine follows the line of a shear zone and many of its rocks are strongly calcareous. Although not wooded, it does contain one large wych elm, and other isolated trees include goat willow and bird cherry. On the ledges in places are found all four species of *Asplenium* mentioned above, together with *Cystopteris fragilis*.

However pride of place must go to a flourishing population of *Asplenium septentrionale* on the south-facing side of the gully. Ferreira points out that this scarce species has a most interesting distribution in the British Isles, since most of its stations are on hard, dark, mainly basic (but not calcareous) igneous and metamorphic rocks, in sites fully exposed to the sun. He suggests that it may, like *Schoenus nigricans*, have a preference for substrates with relatively high magnesium levels, or of one or more of the metal-liferous elements that are found in these rocks. It was previously found by him at one locality inland from Scourie, north of Assynt, and we have now found it in three other places in Assynt. Gleannan a' Mhadaidh is also the only place in the parish where any species of *Pyrola* has so far been found, *P. media*, under tall *Calluna* not far from the *Asplenium septentrionale*.

One especially rich and not uncommon community occurs in open dry heath on sunny south-facing rocky slopes, below base-rich gneiss crags. It is characterised by the abundance of *Thymus polytrichus*, accompanied by *Antennaria dioica*, *Hypochaeris radicata*, *Linum catharticum* and *Lotus corniculatus*, and often a range of *Euphrasia* spp. This is the preferred habitat of *Ajuga pyramidalis*, whose flat, pale green rosettes are tucked into gritty corners, often alongside the very edge of the crags.

Further interesting communities are found in the vicinity of the ultrabasic rocks which outcrop in Assynt, though much more sparingly than the basic ones. We are, once more, indebted to Ferreira for bringing them to our notice. The rocks themselves can be very distinctive; they are often brown, finely fissured and,

close up, weathered into either a scatter of small pock marks or into a coarse honeycomb pattern that is exceedingly rough on the hands.

The surfaces of these ultrabasic outcrops may be strikingly devoid of higher plants, apart from fronds of *Asplenium adiantum-nigrum* in crevices with, occasionally, *Galium boreale*. Their interest is provided by the herb-rich *Calluna* heath and grassland which develops in their vicinity. These share commoner species with those mentioned above for basic crags, but have in addition *Carex flacca* and *Polygala vulgaris*, species otherwise mainly associated with the limestone.

It is perhaps no coincidence that two of the best examples of these communities are on old sheilings, at Achadh' an Ruighe Choinich on the path north of Suileag, and at Clach Airigh to the north-east of Suilven. In grassland at the former site there is a small population of the rare *Equisetum pratense*, and in flushes associated with these outcrops elsewhere in the parish there are isolated occurrences of the equally rare *Equisetum hyemale* and *E. variegatum*. *Melica nutans* is another species which seems to have an affinity for these outcrops, and the communities associated with them are, as Ferreira says, worthy of further study.

Freshwater

Lochs and lochans

Some 680 lochs and lochans are shown on the 1:50,000 map of Assynt. They vary in size from less than 50 m. across to the 6 km. long Loch Veyatie and 10 km. long Loch Assynt, and even more are shown at the 1:25,000 scale. As Ferreira says, 'when viewed from one of the higher hills...on a summer afternoon they provide a truly incredible spectacle of myriads of small lochans glistening in the sunlight'. Exposed shores on the five largest lochs are subject to considerable wave action and they are therefore of limited interest from a botanical point of view, except in sheltered bays. This account will therefore concentrate on the smaller ones, which we will refer to, for convenience, as lochans.

The great majority of these lochans (nearly 550) lie, for topographical reasons, on the Lewisian gneiss. According to the basicity of the rocks feeding them, they provide a full spectrum of nutrient status from strongly oligotrophic (nutrient-poor) through mildly oligotrophic and mildly eutrophic to strongly eutrophic (nutrient-rich). Most of those at lower altitudes fall into the two middle categories. Following Ferreira, the descriptions of the vegetation that follow use these categories, but it should be emphasised that some species show a wide degree of tolerance, a good example being *Littorella uniflora*. Lochans on geological substrates other than the gneiss are included in the appropriate nutrient category.

One caveat applies throughout the descriptions, and that relates to submerged aquatics. Our recording necessarily focussed on species that are identifiable from the shallows, together with evidence from washed-up material. Ferreira confined himself to floating and emergent vegetation. The Scottish Loch Survey (1988) included submerged aquatics, and we have scanned their records to supplement our own observations. However, there must remain significant gaps in our knowledge of the distribution of these species.

Strongly oligotrophic lochans

The precise composition of the emergent vegetation of these lochans, as all others, depends on their depth and the nature of the bottom, but the range of species present is fairly limited. At the margins of the stonier ones *Ranunculus flammula* is typical, with the dainty flowers of *Lobelia dortmanna* obvious in season. Submerged aquatics include both species of *Isoetes* and *Subularia aquatica*. *Littorella uniflora* is almost ubiquitous since, as mentioned above, it tolerates a wide range of nutrient status.

In slightly deeper water, there may be *Carex rostrata*, *Menyanthes trifoliata* or *Equisetum fluviatile* and, in the deepest areas, the floating aquatics *Nymphaea alba*, *Potamogeton polygonifolius* and *Sparganium angustifolium*, the strap-like leaves of the last sometimes fanning out over a wide area. In peatier lochans, *Carex rostrata* is more often accompanied by *Eriophorum angustifolium*. In high level lochans of this type the dominant species may be *Equisetum fluviatile*, with the aquatic form of *Juncus bulbosus*, or in the most extreme cases just *Eriophorum angustifolium*.

Most of the few low-level lochans that have developed on the Torridonian are in this category, while the high level corrie lochans on this substrate are often devoid of emergent vegetation. The same applies to lochans on the quartzite, often very exposed, which tend to be exceptionally acid and nutrient-poor.

Mildly oligotrophic lochans

In these, some of the ground water arises from slightly calcareous bands in the gneiss. They are particularly typical of the Assynt area and support a wide range of communities. A characteristic species, other than those already mentioned, is *Schoenoplectus lacustris*, either in pure stands, or in association with *Nymphaea*, and in deeper water, with *Potamogeton natans*. In the shallows there may be the fine leaves of *Carex lasiocarpa*, either in pure stands or with *C. rostrata*, and at the water's edge the ascending shoots and nodding heads of *Carex limosa*, although the last is also typical of miry pools.

Two species of spike-rush are found in this type of lochan, the commoner being the open stands of

Eleocharis multicaulis, although denser stands of *E. lacustris* may also occur. In lowland examples of these lochans there may be a marginal swamp community containing *Potentilla palustris*. Another marginal species, especially on grassy shelves, is *Deschampsia setacea*, although in Assynt this seems to be confined to sites within five kilometres of the coast.

Loch an Achaidh, a shallow loch on the Torridonian rocks of the Stoer peninsula, probably falls in to this category, with mats of *Menyanthes*, *Potentilla palustris* and scattered *Equisetum fluviatile*. The margins are one of the places where the vegetative characters of the two bur-reeds *Sparganium angustifolium* and *S. emersum* may be compared.

Mildly eutrophic lochans

These have, according to Ferreira, a well-marked relationship with distinctly calcareous or dolomitic bands in the gneiss. In addition to the communities found in mildly oligotrophic lochans, they may also contain *Phragmites communis*, and less commonly, as in a number of the smaller lochans north of Loch Assynt, the robust stems of *Cladium mariscus*. In two small lochans, near Camasnafriaraich and Strathcroy, the *Cladium* grades landwards through *Carex lasiocarpa* into *Schoenus nigricans*, a significant association.

One of the few lochs on Torridonian rocks that falls into this category is Loch na Claise, on the Stoer peninsula, which is probably enriched by a combination of calcareous bands in the Torridonian and wind-blown shell sand originating from Balchladich beach. It has large areas of tall reedswamp composed of *Phragmites* and *Schoenoplectus*, much *Nymphaea* and is also a site for both *Hippuris vulgaris* and *Sparganium emersum*.

Loch Awe, north of Ledmore, has little emergent vegetation other than a large bed of *Schoenoplectus* at the southern end, and from a distance looks fairly unprepossessing. However, the Furoid Beds outcrop on its eastern margins and it also receives water from limestones to the east. The rich tall herb vegetation on its margins is an indication of raised base status, as may also be some of the species on its islands, such as *Ajuga reptans*, *Pseudorchis albida*, *Platanthera chlorantha* and an old record of *Paris quadrifolia*. It is also one of only a handful of localities on the British mainland for the Red Data Book pondweed *Potamogeton rutilus*.

Also in this category are two lochs that owe their nutrient status as much to the rivers which feed them as the rocks on which they are situated. Loch Borrallan lies on syenites, but is fed by burns off marbled limestones. It has a well-developed reedswamp, and also houses one of only two populations in Assynt of the scarce aquatic fern *Pilularia globulifera*, which is locally abundant on silt in the shallows at its eastern end. The other is Cam

Loch, downstream of Loch Borralan, which has the other population of *Pilularia* and where the rich flood zone vegetation on Eilean a' Gartaig (see above in the woodland section) is also evidence of the base-richness of its waters. So also is the locally frequent occurrence of *Trollius europaeus* on its more sheltered shores.

Strongly eutrophic lochans.

These are rare, but one of the best examples is Loch an Aigeil, by the roadside between Clachtoll and Stoer, which is enriched by shell sand originating from the nearby Bay of Stoer. There is a considerable variety of emergent communities, with *Eleocharis palustris* and *Caltha palustris* close to the shore, and a locally unique stand of the pink-flowered *Persicaria amphibia*. Elsewhere in the lochan are extensive beds of *Phragmites* and *Schoenoplectus*, and another of the few local populations of *Sparganium emersum*. The loch also has a fine range of submerged aquatics including *Potamogeton alpinus*, *P. filiformis* and the rare hybrid *P. x nitens*.

Two of the few lochs in Assynt associated with the limestone come into this category, but they both lack extensive areas of emergent vegetation. Loch Urigill overlies marbled limestones, but much of it is too deep or too exposed for emergents. However, there are sheltered lagoons, bays and ox-bows around the mouth of the Crom Allt in the south-east corner, with well-developed reedswamp, consisting of *Schoenoplectus*, *Eleocharis palustris* and, unusually, *Sparganium erectum*. Other species of interest in the vicinity are *Hippuris vulgaris* and *Veronica anagallis-aquatica*; the latter is found nowhere else in the parish.

Loch Mhaolach-Coire (the Gillaroo Loch) also overlies limestone and is distinctly eutrophic. It is too high and exposed to have much emergent vegetation other than *Carex rostrata*, but has a dense population of pondweeds including *Potamogeton perfoliatus* and *P. praelongus*. In a peaty swamp on its inflow burn is one of few stands in Assynt of *Carex paniculata*.

Burns and rivers

The river systems of Assynt are short in Scottish terms and, taking into account their large in-stream lochs, the watercourses themselves even shorter. The two longest are the Loanan/Traligill/Inver system, containing Loch Assynt, which is some 30 km. from source to sea, and the Ledmore/Kirkaig system, containing Loch Urigill, Cam Loch, Loch Veyatie and Fionn Loch, which is about 25 km. The one other westward-draining system, out of Lochan Fada south of Canisp, is about 14 km., and the three longest on the north coast are those of the Oldany River at about 9 km., and the Leireag River and Unapool Burn at about 6km.

Although their in-stream lochs may have some ameliorating effect, the watercourses in these systems and others have steep gradients and are subject to sudden and vigorous spates. As a result they do not support substantial communities of higher plants, either aquatics or reedswamp species. This deficiency is compounded in the case of the limestone feeders to the longest system, the Allt nan Uamh and the Traligill river, since these spend much of their time underground. Characteristic species in the faster flowing stretches are *Myriophyllum alternifolium* and *Potamogeton polygonifolius*.

The exceptions to the general rule are noteworthy. At Luban Croma, on the headwaters of the Ledbeg River, there is a series of well-vegetated meanders (along the county boundary with Wester Ross), with a curious assemblage of species, including *Callitriche hamulata*, *Equisetum fluviatile*, *Glyceria fluitans*, *Sparganium natans* in quantity and the charophyte *Nitella flexilis*. *Callitriche hamulata* is particularly characteristic of the upper reaches of burns along the eastern boundaries of the parish, often forming large three-dimensional masses in pools.

More conventionally 'lowland' in character is the stretch of the Ledmore River between Loch Borralan and Cam Loch. This has, for Assynt, quite unusually lush vegetation, with *Potamogeton alpinus* and *P. gramineus* in the watercourse, *Sparganium erectum* and *Carex aquatilis* at the edge and *Carex curta* in the flood plain marsh. The lowest part of Allt na Braclaich, meandering through a *Molinia*-dominated floodplain, also has *Carex vesicaria* in its only local station.

The lower reaches of two of the burns flowing into Loch Urigill, the Allt nam Meur and Crom Allt are exceptional in having extensive populations of *Hippuris vulgaris*, associated with *Sparganium erectum*. Na Luirgean, which drains Loch Urigill, has an initial gently graded section with *Schoenoplectus* and *Subularia*.

However, the lack of level stretches in our local watercourses is amply offset by the interest of the ravines and waterfalls on many of them, both from the point of view of higher plants and, more important, the bryophytes. Some of the wooded ravines have already been mentioned in the section on woodlands, but where waterfalls occur in open country, the vegetation associated with them can be quite lush. An example is provided by a small fall on the headwaters of the Traligill. Here the tall herb vegetation developed in the splash zone includes *Angelica sylvestris*, *Caltha palustris*, *Chamerion angustifolium*, *Epilobium alsinifolium*, *Trollius europaeus*, *Valeriana officinalis* and huge trailing stems of *Cochlearia officinalis*, at one of only two inland sites in the parish.

Limestone

The term limestone has been used here rather loosely for two main groups of rocks, the dolomitic (magnesium-rich) mudstones and shales of the Fucoïd Beds and the limestones and dolomites of the three lowest formations of the Durness Group that outcrop in Assynt. Although the vegetation associated with them is broadly similar, some species are restricted to one or the other. There are, in addition, marbled limestones at Ledbeg, around and to the south of Loch Urigill; these are very hard slow-weathering rocks and in the latter area largely overlain by peat, so their effect on the vegetation is both localised and reduced. Limestone loch communities are described in the section on aquatic habitats.

Fucoïd Beds

The most striking development of the vegetation on the Fucoïd Beds is at Liath Bhaid on the south-west side of Loch Glencoul, just inside the parish (continued for a short distance eastwards and also across the loch, in Eddrachillis). There is also some limestone at this site. Hanging on the crags of the outcrop is a narrow strip of mixed woodland, with birch, rowan, hazel, aspen, wych elm, goat willow and some holly.

Underneath there is a rich tall herb ledge community containing, besides commoner species, *Galium odoratum*, *Lapsana communis*, *Sanicula europaea*, *Scrophularia nodosa* and *Silene dioica*. There is also a tall grass ledge community dominated by *Brachypodium sylvaticum*, with *Bromus ramosus* and *Elymus caninus*. In crevices are *Cystopteris fragilis*, *Polystichum aculeatum* and *Scolopendrium vulgare*. *Allium ursinum* occurs in flushes and, below and around the crags, herb-rich grassland with *Coeloglossum viride*, *Listera ovata*, *Orchis mascula* and much *Trollius europaeus*.

Elsewhere the Fucoïd Beds are conspicuous as rusty-coloured, lichen-encrusted low crags, surrounded by basic grassland, a good example being just to the east of the road at Lairig Unapool. *Cystopteris fragilis* is a consistent feature of these crags, as are a number of calciphile mosses. Interestingly, *Dryas octopetala* is quite absent, although locally abundant on the nearby limestone.

On a narrow rib of the Fucoïd Beds crossing the Allt a' Bhealach, at the foot of Conival, occurs our largest population of *Equisetum pratense*, although it is also found in limestone flushes and, rarely, on other substrates. Alongside the headwaters of this burn, in the Bealach Traligill, the Fucoïd Beds outcrop in several places. In a narrow ravine cut through them at the eastern end of the Bealach there are both the montane willowherbs *Epilobium alsinifolium* and *E. anagallidifolium*, with *Saxifraga oppositifolia*. Above the highest point of the Bealach, at about 530m., a rib of

this rock slants obliquely upwards, and there supports a good stand of the arctic-alpine grass *Poa glauca*, accompanied by *Alchemilla wichurae*.

The limestone proper

Most limestone species are found throughout the area in which it outcrops, from Lairig Unapool south through Inchnadamph and the Sròn Chrùbaidh cliffs to Allt nan Uamh, along the flanks of Beinn an Fhuarain to Ledbeg, and at Elphin and Knockan. Others are only found on the higher outcrops of Cnoc Eilid Mhathain and in the Bealach Traligill. The brief notes that follow can only give an indication of the richness of the flora of the limestone; for a delightful and more discursive account see John Raven's contribution to *Mountain Flowers* (Raven and Walters 1956).

Dryas octopetala is the most striking component of what have been described as calcareous heaths, accompanied by *Carex flacca*, *C. rupestris* or, less commonly and at higher altitudes, the tight hummocks of *Silene acaulis*. Off the outcrops and crags, this heath grades into calcareous grassland, which may contain much *Alchemilla alpina* or *Thymus*. Associated with these heath and grassland communities is a suite of species that has enchanted visiting botanists for over 200 years. They include the sedge *C. capillaris*, the grasses *Briza media* and *Helictotrichon pubescens*, small herbs such as *Galium sternerii*, *Persicaria vivipara*, *Polygala vulgaris* and *Viola canina*, and the orchids *Coeloglossum viride*, *Orchis mascula* and *Listera ovata*.

In shady crevices in the limestone, particularly along the usually dry watercourses, two ferns occur frequently, *Asplenium viride* and *Polystichum lonchitis*. There too may often be found the fragile stems of *Circaea x intermedia*, although this does turn up again nearer the coast. In drier situations on boulders and ledges are *Botrychium lunaria* and *Draba incana*, and in thinly vegetated limestone 'gravel' the tiny eyebright *Euphrasia ostenfeldii*. Flowering spikes of *Epipactis atrorubens* are found in small numbers throughout the limestone area, usually on ledges and in boulder scree where they are protected from grazing.

Springs and flushes, the latter often stony, are a predictable feature of the porous limestone. A conspicuous feature of the springs is the bright-green moss *Palustriella commutata*. The flushes are dominated by sedges and their relatives, including *Schoenus nigricans*, *Carex dioica*, *C. hostiana* and *C. oedocarpa* ssp. *brachyrhyncha*, but they are often painted yellow in season by the flowers of *Saxifraga aizoides*. *Carex pulicaris* and *Thalictrum alpinum* are associated in some flushes, and a feature of nutrient-enriched flushes at Inchnadamph and Elphin is *Veronica beccabunga*.

A characteristic shrub of the limestone is *Salix myrsinites*, which occurs widely in small ravines and other places where it has some protection from grazing. However it only shows its full potential in the older enclosure on Glac Mhór, where there are some magnificent bushes. Another shrub that appears to be virtually restricted to the limestone in Assynt in its 'wild' state is *Crataegus monogyna*; isolated and often ancient bushes are scattered along the crags from Sròn Chrùbaidh to Ardvreck Castle.

The wooded ravines on the limestone around Inchnadamph have a rich flora, which resembles that of the hanging woodland at Liath Bhaid described above. The best examples are on the Traligill River and its tributary the Allt Poll an Droighinn. The canopy includes splendid examples of goat willow and wych elm, as well as hazel, birch, rowan and grey willow. On dry ledges there is the tall grass community dominated by *Brachypodium sylvaticum* and *Elymus caninus*, with some *Bromus ramosus*, but also found here is one of the Inchnadamph specialities, 'Don's Twitch'. Once thought to be a distinct species, it is now regarded only as a variety of *Elymus caninus*, with which it grows. Moist ledges support species-rich tall herb vegetation, with wet flushes dominated by *Crepis paludosa* or *Allium ursinum*.

A little further north is a rather more open ravine on the Allt a'Chalda Mor. This supports birch-hazel woodland, with rowan and wych elm, and a ground flora which includes *Epipactis helleborine* and *Listera ovata*.

These wooded ravines have other features of interest. One is a wealth of *Hieracia*, especially of the Section Cerinthoidea, another is *Ajuga reptans*, which is markedly less common in Assynt than its nationally scarce relative *A. pyramidalis*.

We conclude this section with some other specialities of particular areas of the limestone. In this context we should first mention the Inchnadamph 'zoo'. On a fissured outcrop at the eastern end of Glac Mhor there is an assemblage of species alien to the area, obviously introduced, but by whom, when, and to what end (other than to provoke unsuspecting botanists) is not known. The grykes house a flourishing population of *Phyteuma scheuchzeri*, which occurred elsewhere in the British Isles only on the walls of an Oxford college, but is there no longer. In shallow soil on shelves *Erinus alpinus* and *Campanula cochleariifolia*, both common species in cultivation, are doing well. There are also a few plants of *Silene quadrifida*, otherwise only known as an introduction on Ben Lawers, and of *Gentiana verna*, native on the limestone elsewhere in the British Isles.

Returning to our native flora, the isolated outcrop at Lairig Unapool has an impressive population of *Epipactis atrorubens*, when the deer allow it to flower. Ardvreck peninsula is the only inland station for

Astragalus danicus, and also, rather surprisingly, the only confirmed site for *Dactylorhiza fuchsii*.

Just north of Inchnadamph, rabbit-nibbled grassland around one rib of the limestone has the rare lady's-mantle *Alchemilla glaucescens*. Off the Traligill valley, the lowest reaches of its tributary the Allt na Glac Móire are fringed by flushed turf containing *Equisetum variegatum* and *Tofieldia pusilla*.

South of Inchnadamph are the magnificent Sròn Chrùbaidh cliffs, the upper parts of which have never been scaled by a botanist, so far as we know. However, the lowest crags and shelves are accessible with care, and support a fine range of communities and species already mentioned. In addition, the scree at their base has the hybrid fern *Polystichum x illyricum* in one of its few British localities, and on one shelf there is a small but healthy stand of *Gymnocarpium robertianum* in its most northerly station in the British Isles. Scattered along the lower crags, in places where they are safe from browsing, are two groups of *Sorbus rupicola*, at one of only two localities in West Sutherland.

The 'high limestone' at Cnoc Eilid Mhathain is renowned for its *Dryas*-dominated grassland, crevice and ledge communities, and has a range of less common species found sparingly, if at all, lower down, including some more generally distributed montane species. They include *Arenaria norvegica*, *Minuartia sedoides*, *Potentilla crantzii*, *Saussurea alpina* and *Silene acaulis*. In flushes east of the outcrop are *Tofieldia pusilla* and *Saxifraga oppositifolia*.

Higher still, in the Bealach Traligill, the limestone reaches its highest altitude in West Sutherland, at about 530m., and *Arenaria norvegica*, *Potentilla crantzii* and *Tofieldia* occur again in small quantity, with two of our four populations of *Saxifraga hypnoides*.

Returning to lower ground, the Allt nan Uamh valley again supports a good range of the limestone communities and species, with a number of the calcicole *Hieracia*. The crag immediately to the east of the caves has fine tall herb vegetation with some hazel scrub in its most sheltered crevices and on its summit are found *Arenaria norvegica*, *Epipactis atrorubens* and *Potentilla crantzii*.

The southernmost limestone outcrops, at Elphin and Knockan, are heavily grazed in places, and difficult to access in others. The crumbling slopes above the road are noteworthy for the amount of *Silene acaulis*, and have a conspicuous *Allium ursinum* flush. East of the townships, on the edge of the Abhainn a' Chnocain, there is flushed grassland with *Equisetum variegatum* and, in one flush nearby, with *Carex dioica* and *Eleocharis quinqueflora*, the rare hybrid horsetail *Equisetum x trachyodon*. Where this river enters Loch Veyatie, a few yards inside the parish (and county)

boundary, we found in late summer 1996 a few flowers of *Parnassia palustris*; this has been recorded more widely in the parish, but not for some decades.

Upland

As a working definition of 'upland', we will take land above the 300m. (1000ft) contour. On the ground this contour line marks, approximately, the lower limit of species such as *Arctostaphylos alpinus*, *Diphasiastrum alpinum* and *Salix herbacea*, though there are exceptions.

Included are all the major hills in Assynt, Quinag, Canisp and Suilven in the west, and the broken ridge from Cnoc na Creige to Breabag in the east, taking in Glas Bheinn, Beinn Uidhe and Conival. Zigzagging between these, from the eastern end of Loch Assynt southwards, are the lower hills of Beinn Gharbh and Beinn Reidh, Meallan Liath Mor, Beinn nan Cnaimhseag and Beinn Fhuarain, Cnoc na Leathaid Buidhe and Bhig, Cnoc na Sròine and the Cromalt Hills.

Within this substantial area of the parish, rock type, aspect and slope are the main factors determining the nature of the upland vegetation, together with altitude in some cases. The higher outcrops of the Fucoid Beds and limestone have already been covered in the relevant section, which leaves us, so far as the substrate is concerned, with the gneiss, Torridonian, quartzites, Moine and igneous rocks. The first three of these are major components of the single largest hill in the parish, Quinag, and it therefore serves as a good example.

One of the glories of Quinag is an area known to few other than botanists because it is well off any route to the summits. At the foot of the massive north-facing buttress of Sàil Gorm, the gneiss extends upwards to a height of 530m., forming dark crags, wet and overhanging in places, with substantial areas of boulder scree below. According to Ferreira, the gneiss at this point 'contains bands of hornblendic rock and additionally is strongly calcareous in the vicinity of the crush-zone of a fault'.

Tall herb vegetation is widespread on ledges inaccessible to deer, characterised by the presence of *Geum rivale*, *Saussurea* and *Trollius* with, in addition, *Coeloglossum viride*, *Orchis mascula* and *Rubus saxatilis*. Between the ledges may be found cushions of *Silene acaulis*, the hanging stems of *Saxifraga oppositifolia* and in flushes, *S. aizoides*. Wet crevices have *Oxyria digyna* and drier ones the ferns *Asplenium viride*, *Cystopteris fragilis*, *Dryopteris expansa*, *Polystichum aculeatum* and *P. lonchitis*. The crags and adjacent boulder scree are also very rich in bryophytes, including many species of the oceanic-montane hepatic-mat community such as *Mastigophora woodsii*.

Echoes of this species-rich basic upland vegetation occur elsewhere on Quinag, in the vicinity of narrow calcareous bands in the lower parts of the Torridonian sandstones. There is some development of these communities at the eastern side of the mouth of Bathaich Cuinneige, the large corrie between Sàil Gorm and Sàil Gharbh, but the best examples are on some east-facing crags above Lochan Bealach Cornaidh. Here in crevices may be found *Cystopteris fragilis* and *Polystichum lonchitis*, on shelves the tall herb community, with frequent *Sedum rosea* and *Trollius*, and, beneath the crags, flushes with *Thalictrum alpinum* and species-rich grassland.

The higher areas of Quinag are clothed with much more usual acid-loving upland vegetation, often species-poor. In places it is grassland, dominated by *Nardus*, or by *Agrostis* and *Festuca*, with *Alchemilla alpina*. Elsewhere there is montane heath, with *Calluna*, *Carex bigelowii*, *Empetrum hermaphroditicum* and the moss *Racomitrium lanuginosum*. In the most exposed areas, in the Bealach a' Chornaidh and elsewhere on the hill, there has developed an open fell-field community with *Juncus trifidus*, *Loiseleuria* and *Salix herbacea*. Finally, on the broad ridge of Sàil Gharbh, north of the quartzite summit, there is, on highly eroded ground, a scattered community of *Armeria maritima*, *Salix herbacea* and *Silene acaulis*, with *Luzula spicata*, occasional *Euphrasia frigida* and a very small amount of *Gnaphalium supinum*.

The Cambrian quartzites which cap the highest part of the ridge of Sàil Gharbh (808m.) lack most of these species, being almost bare fell-field on the windward side and a solid mat of *Racomitrium lanuginosum* on the leeward side. Quartzites also make up the summit of Spidean Coinich (764m.) and extend all the way down to the road on its east, and these areas are almost devoid of botanical interest, except for the very wind-pruned upland *Calluna* heath, with frequent dwarf *Juniperus* and occasional *Loiseleuria*.

None of the other hills have such a wide range of communities and species as Quinag, particularly those favouring base-rich habitats, but there are features of interest on most of them, including some truly montane species. To deal with the larger hills first, Canisp (846m.) has some similarities with Quinag. It is capped with quartzite, and the long slope between the summit and Loch Awe is an almost unrelieved slab of the same rock, encompassing the tetrad with fewest species in Assynt.

However, in an area of reddish fine-textured 'soil' just west of the summit, there is one of only two local populations of *Luzula arcuata*, accompanied by *L. spicata*. Further down the eastern slopes there is, in sheltered areas, a fine development of dwarf shrub heath with *Arctostaphylos alpinus*, *A. uva-ursi* and *Vaccinium uliginosum*, sheltering *Hymenophyllum wilsonii* and a

range of bryophytes; *Betula nana* has once been found in this area. Even lower down this slope, in broken fell-field on the quartzites, are a small stand of *Lycopodium annotinum* and a very much larger one of *Diphasiastrum issleri*. Finally, at the base of Torridonian crags on the north side of Canisp, there is a good development of tall herb ledge vegetation, with *Oxyria* and *Saussurea* and, on gneiss/porphyry below the crags, flushes containing frequent *Juncus triglumis*.

Suilven, the best-known of the Assynt hills, is, at 731m., not so high as either Quinag or Canisp, and does not have their mass, so it lacks some of their diversity. The path up to the bealach on the north side has gneiss faulted quite high up into the Torridonian, with frequent *Cornus suecicus*, *Epilobium anagallidifolium* in mossy flushes, and *Pseudorchis albida* on shelves with *Trollius*. The flat terrace on the summit of Caisteal Liath is almost solid *Salix herbacea* in places, with a little *Gnaphalium supinum* and *Euphrasia frigida*.

Suilven's chief claim to fame, however, is the recently-discovered flora of the steep-sided gully between Meall Meadhonach and Meall Beag at the eastern end, where a combination of faulting and sills of Canisp porphyry has apparently resulted in a considerable degree of base-richness. Here G.P. Rothero found in 1999, in a crack on an almost inaccessible vertical face at about 600m., just three plants of *Saxifraga nivalis*, never before recorded in Assynt. In its vicinity and further down the gully are *Cochlearia officinalis*, *Saxifraga oppositifolia*, *S. hypnoides* and a number of other basiphilous species.

We turn now to the hills down the eastern borders of the parish. Cnoc na Creige (593m.) has been little explored, except by A.G. Kenneth, who found there the alpine hawkweed named after him, *Hieracium kennethii*. In the northern corries of Glas Bheinn, the gneiss outcrops over quite an area in the lower and middle parts, although the upper parts and summit (776m.) are quartzite. There are basic bands in the gneiss, which yield good tall herb vegetation on ledges and, beneath the crags, base-rich flushes and flushed grassland. As a result the hill as a whole musters a respectable list of the upland species found locally, with some very good bryophytes. At the edges of watercourses draining two of the delightful corrie lochs, *Alchemilla glomerulans* and *A. wichurae* have each been recorded once, and in a curious stony flush on the north-western lip of Coire Dearg occurs *Deschampsia caespitosa* ssp. *alpina* in one of its two local stations.

The summit ridge of Beinn Uidhe (740m.) is perhaps the dourest hill in Assynt, for much of its length unrelieved, broken, wobbly quartzite, with a striking lack of vegetation of any kind other than cushions of *Racomitrium lanuginosum*. However in Bealach na h-Uidhe at its north-western end, where porphyry bands outcrop, *Hieracium alpinum* was discovered new to

West Sutherland. *Silene uniflora* is in one of its two montane stations in Assynt on the south-western flank of the ridge, and at its south-eastern end a high outcrop of gneiss introduces a welcome element of diversity, albeit without any surprises.

From Bealach a' Mhadaidh, at the south-eastern end of Beinn Uidhe, south to the start of the ridge leading to the summit of Conival, there extends for some three kilometres an extensive area, rising from 600 to 850m. above the crags of Na Tuadhan, which we have not explored as fully as we might have done. The underlying geology is complex; on the geological map the quartzites are shown as interleaved with bands of the Fucoïd Beds and Salterella Grit and also by sills of intrusive igneous rocks, although this diversity is not immediately apparent on the ground!

In gravelly patches on the ridge to the south-west of Loch nan Cuan there is a reasonable selection of montane species, including *Gnaphalium supinum*. Just to the south, on mossy burns flowing into Lochan nan Caorach, occur both the upland willowherbs, *Epilobium alsinifolium* and *E. anagallidifolium*, with *Veronica serpyllifolia* ssp. *humifusa* and a strikingly large-flowered form of *Cerastium fontanum*. On the edges of the burn flowing out of this lochan are *Alchemilla glomerulans* and *Persicaria vivipara*, which testify to local base-enrichment, perhaps from Imir Fada, the area draining into this lochan. So also do the presence at its northern end, in an area called 'Aeroplane Flats', of *Coeloglossum viride* and *Trollius* at an altitude of about 650m.

Conival, for all that it is the highest hill in the parish, at 987m., is disappointing so far as Assynt botany is concerned. The parish boundary runs up the northern ridge to the summit and then drops straight down into Bealach Traligill. Apart from a narrow strip of broken stony ground along the path to the summit, the western side of the hill is so steep that it has, to our knowledge, never been botanised. However, G.P. Rothero found in 1998, on both sides of the path, just north of the summit, a small population of *Luzula arcuata*, in almost certainly the same place in which it was first discovered in 1833. Nearby is a second stand of *Deschampsia caespitosa* ssp. *alpina*.

South of the Bealach Traligill, which cuts a deep gash in these eastern hills, they rise again to the 4km. long, undulating ridge known as Breabag. The northern part, as far as the headwaters of the Allt nan Uamh, is almost unrelieved quartzite and extremely dour. South of that point the quartzite is interleaved, as in Imir Fada, with bands of the Fucoïd Beds and porphyroid igneous intrusive rocks. Where these latter rocks have broken down, on the gently sloping western edge of the ridge, into something approaching angular gravel, a good selection of the usual montane species reappears. In addition there are two hollows, at either end of this

section of the ridge, where snow probably lies late. Here, in hummocks of moss beside the headwaters of burns, are two localities for *Sibbaldia procumbens*.

There remain the minor hills which run south from Loch Assynt to the southern boundary of the parish in the Cromalt Hills. The lowest of the Torridonian crags on the north face of Beinn Gharbh, particularly at Creagan a' Chait, have some affinities with those of Bealach a' Chornaidh on Quinag. Their basicity is revealed by the presence of *Asplenium viride*, *Coeloglossum viride*, *Orchis mascula* and the only stand of *Salix myrsinites* in Assynt off the limestone. There is in addition, cutting through the gneiss at the foot of these crags, a most imposing ultrabasic dyke, whose lava-like rock provides a foot-hold only for impressively large plants of *Asplenium adiantum-nigrum*, with *Polygala vulgaris* typically ornamenting the grassland at its foot.

The summits of Beinn Gharbh (540m.), Beinn Reidh (567m.) and the undulating plateau, at between 400 and 500m., that extends south from between them to Meallan Liath Mór, do not muster a long list of montane species, with occasional *Loiseleuria* and *Salix herbacea*. What is impressive, especially towards the southern end of this plateau, is the amount of *Arctostaphylos alpinus* on the broken Canisp porphyry and quartzites. This forms quite a luxuriant dwarf shrub heath in places, with *A. uva-ursi* and prostrate *Juniperus communis*. *A. alpinus* and *S. herbacea* reach almost their lowest altitude locally on the summit of Cnoc an Leathaid Bhuidhe, at 369m.

To the east, across the Loanan valley, are the outliers of Torridonian sandstone and quartzite of Beinn nan Cnaimhseag (568m.) and south of it, Beinn an Fhuarain (499m.). The former has, as its name suggests (*cnaimhseag* = bearberry), a large stand of *A. alpinus* on its northern flank, with in addition a small population of the delightful alpine hawkweed *Hieracium holosericeum*. The latter occurs again on the summit of Beinn an Fhuarain, as does *Silene uniflora* in one of only two inland localities, and on the northern flank of this hill is the only known local site for the hybrid willow *Salix x cernua*.

The twin granite hills of Cnoc na Sròine (390 and 397m.) yield no montane species except a luxuriant population of *Diphysastrum alpinum*. There are, however, slightly basic flushes on both sides which have some species of interest.

To conclude, we should mention the exposed ridges of the Cromalt Hills, at the remote southernmost extent of Assynt. These lie on the Moine schists, which locally are rather dour, and we suspect that they have rarely before been visited by botanists. Some indication of their character is given by the name of the furthest south, Meall a' Bhuirich Rapaig (the hill of the stormy roaring). There is deep peat on the easternmost of these

hills, cut back in places to bleached rock, and no upland species. At the highest point of the ridge, Meall Coire an Lochain (516m.), *Salix herbacea* makes an appearance, and below the summit, on wet north-facing crags overlooking Loch a' Phris, there is *Asplenium viride* and *Saussurea*, indicating some base-richness in the schists. Finally, at Meall an Dearcag Beag (388m.), and Cnoc an t-Sasunnaich (386m.), both *A. alpinus* and *S. herbacea* reappear, in an area with the most glorious views. And what better place for botanists from south of the border to draw this section to a close!

Man-made or influenced habitats

The impact of man on the Assynt landscape may be appreciated at different levels of detail. The 1:50,000 map shows little more than the pattern of roads and settlements. However, antiquities such as cairns and duns, although few, remind us that use of the landscape dates back thousands of years. At a scale of 1:25,000 maps are more informative. They show, for example, the location of isolated buildings or ruins, walls and banks, sheilings and other structures concerned with the management of stock. Finally, on the ground may be seen the signs of activities that are not mapped at all. These include peat cuttings and drains, areas of recent and older muirburn and the more diffuse evidence of intensive grazing, whether by domestic stock or deer.

It should also be noted that apparently 'natural' features such as woodlands may have had their boundaries and character considerably modified by management over the centuries.

What follows are examples of species whose distribution and abundance are either dependent on, or have been substantially modified by, human activity. We have made no attempt to assign them to any hierarchy of communities, since no work has been done on this aspect of the vegetation of this area.

Roads and tracks

Roads and tracks increase the species diversity of parts of Assynt out of all proportion to the small area they actually cover, particularly away from areas of habitation. However, since roads are mainly located on the lower more fertile ground, care should be taken in interpreting the distribution maps; the species concerned may be quite incidentally inhabiting the same corridors of land. Small roadside quarries, cuttings, embankments, drains and culverts, created when the roads were built over a century ago, all provide niches for plants. More recently, there has been extensive road widening (with some new cuts), re-hauling and the creation of many new lay-bys; these have sometimes involved the importation of material foreign to the immediate area, such as Ledmore marble or topsoil. Most of our roads are heavily salted and gritted in icy or

snowy weather and piles of grit and salt are deposited in the autumn at the edge of the road in hilly places.

Double track roads have a characteristic flora in the gritty band, immediately adjacent to the carriageway, where there are raised verges (the verges on single track roads are often level with the carriageway). They include, predictably, species like *Juncus bufonius*, *Matricaria discoidea*, *Plantago major* and *Polygonum arenastrum* and, less predictably perhaps, *Gnaphalium uliginosum*, *Spergularia marina* and *S. rubra*. Salt tolerance, which probably accounts for the last two species, may also explain the fringe along many roads of *Plantago maritima* and what appear to be glaucous 'coastal' varieties of *Festuca rubra*. Other coastal species found on roadsides include *Daucus carota* at Achadhantuir, *Sagina nodosa* on a verge south of Newton, and *Carex arenaria* in a layby on Skiag, where it may have been introduced with sand. Two other more generally distributed species may also be conspicuous at the edge of the verge, *Poa humilis* and *Potentilla anserina*.

The verges themselves get a variety of treatments. Although many stretches of the double track roads are now fenced to discourage access by sheep, this has little effect on the deer. The rest of the double track and most of the single track roads are unfenced and often close-grazed by what a visitor once referred to as 'loose' sheep. They not only maintain a short sward but also dung it, so these verges are often appreciably more fertile than the adjacent land. Additionally verges on the double track roads are mown at least once a year.

These short, sometimes stony, swards have in places a distinctive and colourful flora, although it is not at all obvious why particular species occur where they do. For example, parts of the verges of the A837 east of Lochinver are yellow with *Galium verum* in summer, punctuated by occasional patches of the blue of *Campanula rotundifolia*. The former is otherwise a plant of coastal grasslands, the latter, a rare plant locally, has only once been found away from roads, on limestone. On the A894 descending from Skiag to the Drumbeg turn there are alternating stands of *Gentianella amarella* and *G. campestris*, which occur otherwise in, respectively, basic and heath grassland.

Other more robust species may occur towards the back of our few lush verges, presumably introduced during construction or maintenance, such as *Festuca arundinacea* around Inchnadamph. *Elytrigia repens* is, happily for gardeners, an uncommon plant of such roadside verges in Assynt. A staple of verges further south, *Anthriscus sylvestris*, occurs on only one, at Elphin. Other species probably introduced by machinery are *Epilobium hirsutum*, which appeared in 1999 in the ditch of the hill leading down into Lochinver, and *Sanguisorba minor*, which turned up in a parking area and on a nearby verge at Ardvar. One

final, even more bizarre introduction of this kind is *Lemna minor*, which was found in a newly cleaned-out ditch at Elphin. None of these three species had ever before been found in Assynt.

Where soil-rich spoil has imported to level verges a strikingly alien flora may be introduced. Some of it consists of short-lived weed species such as *Arabidopsis thaliana* and *Euphorbia peplus*; the tall spires of *Verbascum thapsus* which appeared in 2001 on a verge at Baddidarach probably come into this category. Another tall biennial, characteristic of disturbed rocky verges, is *Digitalis purpurea*, which can form impressive banks of colour, but disappears as the sward closes over. Other obvious imports are permanent, such as *Cirsium arvense*. It remains to be seen whether a species that recently turned up on a roadworks site at Nedd is also in this category, the sprawling var. *sativus* of *Lotus corniculatus*.

Patches of unfamiliar colour on verges brings us into the realm of garden throw-outs and other dumped material, which can introduce a further exotic element. Garden throwouts include a number of species traditionally cultivated in local gardens, such as *Alchemilla mollis*, *Crocsmia x crocosmiflora*, *Myrrhis odorata* and *Pentaglottis sempervirens*. A surprise was *Lamium album*, which was found amongst builders' rubble at the top of the hill leading down into Achmelvich; it only occurs elsewhere in Assynt in one local garden!

Road embankments introduce an element of well-drained scree into the local landscape and are often ornamented in spring with the golden clumps of *Dryopteris affinis*. Elsewhere they harbour dense banks of *Juncus effusus* which, although unremarkable from a floristic point of view, do provide a highly desirable micro-habitat for field voles. Some shrubby members of the rose family are also characteristic of rocky embankments, especially those with a southerly aspect. *Rubus fruticosus* appears to be near its climatic limit in Assynt and such embankments are its favoured habitat. Again, species of *Rosa* often flower and fruit more freely on road embankments than elsewhere, though why this should be so we have no idea. The most widespread of these, *R. pimpinellifolia*, can occur in impressive roadside thickets.

Most of the small roadside quarries that were excavated in the 19th century to build or extend our single track roads, have now been colonised with native species, but they do spring occasional surprises. An example is a small population of *Juncus tenuis* on the wet floor of one at Glenleraig, possibly brought in on car tyres; its only other locality in Assynt is on a track at Oldany. The quarry at Skiag, favoured parking for those climbing Quinag, also produced one year the hybrid thistle *Cirsium x celakovskianum*. A much larger quarry on a cut-off of the A837 west of Little Assynt, presumably opened or enlarged when this road was

'doubled' in the 1980s, has the locally rare *Epilobium ciliatum* and one of our few weed populations of *Chamerion angustifolium*. There's excitement for you!

The peat and stalkers' tracks that were made into the interior of the parish in the late 19th or early 20th centuries were built to a standard almost equal to that of the roads, although they have never been surfaced. Their flora is essentially that of the area they are passing through, but one characteristic plant is the curious variety *spiralis* of *Juncus effusus*, which appears to be spread by stock.

Built-up areas, buildings and walls

The nearest approximation to a 'built-up' area in Assynt is Lochinver, which houses about half the parish's population, much of it in the relatively new Inver Park area, and has extensive recent harbour works. Its weed flora was well documented by A.J. Wilmott and M.S. Campbell in 1943/44, and is still unusually varied for this area. *Scrophularia nodosa* is unexpectedly abundant in places, for example behind the buildings on Main Street and in the abandoned garden of the Culag Hotel. The sea wall at the south end of Main Street is rapidly being colonised by saplings of *Acer pseudoplatanus* and *Fraxinus excelsior*, and also by *Tanacetum parthenium*. Elsewhere disturbed ground supports weed populations of *Tussilago farfara*, normally a plant of river gravels in Assynt, and rare casuals such as *Alliaria petiolata*.

Older mortared walls in Lochinver have been colonised by *Asplenium trichomanes*, as have those of ruined houses elsewhere in the parish, as at Nedd. Other spleenworts are very uncommon on walls, a striking exception being the outbuildings of the old school at Drumbeg, where there is a flourishing population of *A. ruta-muraria*. The record for ferns was a long-unoccupied house at Rhicarn, whose walls bore in 1988 six species including *Phyllitis scolopendrium*; this last has only been seen on one other building, at Ardvar.

Free-standing dry-stone walls are not good habitat for higher plants, and the only frequent species is *Polypodium vulgare*. Where topped by turf, which was the practice in the past, they are often colonised by species that can withstand desiccation, such as *Aira praecox* and *Sedum anglicum*.

Cultivated ground

As has been pointed out in the chapter on the history of the landscape, cultivated ground, even at the scale of a 'tattie' patch, is now quite a rare sight in Assynt. Where ground is turned over, even after several decades fallow, 'traditional' arable weeds may reappear, such as *Chrysanthemum segetum*, *Euphorbia helioscopia* and *Silene alba*. Vegetable patches on the lighter soils of the coast have afforded some interesting records during

the present survey. Examples are *Fumaria bastardii*, *F. officinalis* and *Polygonum boreale* at Clachtoll. Of the five species of dead-nettle recorded, only one, *L. purpureum*, is widespread. The other four have been found sparingly in gardens, *L. album* and *L. hybridum* at Achmelvich, *L. confertum* at Clachtoll and *L. amplexicaule* at Clachtoll and Culkein Stoer. Disturbance of some ground just behind the beach at the last locality also produced records of *Anchusa arvensis* and *Viola arvensis*.

The weed flora of our own garden at Nedd has intrigued us at times. We have inadvertently introduced, in sinks and pots, exotic but surprisingly persistent species such as *Geranium lucidum* and *Valerianella carinata*. *Anisantha sterilis*, *Linum bienne*, *Senecio viscosus* and *Thlaspi perfoliatum* appeared briefly, but did not last. Other local species have surprised us with their nuisance value; they include *Montia fontana* and *Stellaria uliginosa*.

All the species so far listed are annuals; some of the perennial 'thugs' commoner elsewhere are worthy of note this far north. They include all three species of *Calystegia*, of which only *C. sepium* has been recorded more than once. Their close relative *Convolvulus arvensis* has only been found once, in a garden at Baddidarach, where it had a tenuous hold on existence. Another 'thug', albeit an annual, *Impatiens glandulifera*, is however showing ominous signs of colonising ability at Clashnessie and Nedd. Another plant with this ability, though not such a menace, is *Veronica filiformis*, first recorded in 1957 and now found in mown grass in nine tetrads.

Cultivated species that have established themselves in the vicinity of gardens, sometimes long-abandoned, are another category of some interest. *Tolmiea menziesii* has spread up a wet crag at Kerrachar, and *Tropaeolum speciosum* escaped into a blackthorn thicket at Strathcroy. They may be of relatively recent origin, but an older generation of escapes includes *Fallopia japonica* which, from its occurrence in long-abandoned croft gardens, appears to have been regarded as a very desirable acquisition in the late 19th century.

Aromatic or colourful escapes include *Tanacetum vulgare*, six 'varieties' of *Mentha*, and four of *Mimulus*, the last two genera having tested our taxonomic skills, as well as those of previous generations of botanists. *Aegopodium podagraria* is so widespread that, despite its well-deserved reputation as an almost ineradicable weed, it must once have been cultivated. We wonder if the same is true of *Glechoma hederacea*, which occurs far from present-day cultivation at Rientraid. More of a mystery, though a short-lived one, was the appearance in 1995 of *Datura stramonium* in a long-disused unheated greenhouse at Glenleraig.

Two older introductions are found at either end of Loch Assynt. *Narcissus pseudonarcissus* still survives on the site of the old garden at Ardvreck Castle, which was abandoned at the end of the 18th century. More intriguing is the occurrence of the former medicinal herb *Peucedanum ostruthium* on the tiny Eilean Assynt, associated with what are thought to be medieval buildings.

In-bye and sheilings

Much of the richer grassland in Assynt is found on the in-bye ground of the crofting townships which extend round the coast from Inverkirkaig to Unapool and again on the limestone at Elphin and Knockan. Prior to the Second World War this ground grew crops or hay. In some places it has been abandoned to bracken or rushes, in others it is now intensively grazed, by sheep or cattle. Although we have, of course, recorded from it, we have not looked at its composition in any detail. When the grazing pressure is reduced, the grassland sometimes proves to be very rich. A good example is a field at Clashmore, which in 2000 was grazed by only four bullocks. That summer it produced at least 30 spikes of *Platanthera bifolia*, eleven of *P. chlorantha*, and two colour varieties of *Gentianella campestris*. Another is a small area of grassland alongside the former school at Unapool. After being fenced from sheep, this produced in 2001 both *P. chlorantha* and an impressively large spike of the hybrid *Dactylorhiza maculata* x *purpurella*.

Other widespread components of the local landscape that were once much more intensively used are former settlements and sheilings. They were often abandoned nearly two hundred years ago, by choice or under duress, but are still easily identifiable by a variety of features, walls, clearance cairns, cultivation ridges and drains, ruins of houses, barns, byres and sheep fanks. In their vicinity relics of grassland improvement or stock feeding such as *Lolium perenne* may persist in now remote areas, such as Dubharlann on Loch na Loinne. Similarly, clumps of *Urtica dioica* mark the site of nutrient enrichment surely long since exhausted.

In many cases the only persistent changes to the local vegetation are rectangles of brighter green, where bracken has reclaimed the better-drained land. In places, the sweet grassland inside sheiling boundary walls contains species such as *Ophioglossum vulgatum*; it is impossible to know whether they would be present if the area had not been more intensively used in the past.

Plantings and plantations

There are several species of deciduous trees which although undoubtedly 'native' elsewhere in the British Isles, are usually not found far from habitation in Assynt. Obvious examples are *Salix viminalis*, planted no doubt for creel making, and *Sambucus nigra*, planted

perhaps for superstitious reasons (as also was *Sorbus aucuparia* by remote houses). We just once found a bird-sown example of *Sambucus*, on scree below Creag Sròn Chrùbaidh. More localised is *Salix pentandra*, which is abundant on croft in-bye at Strathan and Badnaban and occasional elsewhere. Since all the trees appear to be male, it must have been propagated or propagate itself vegetatively. There is no one now alive who remembers the planting of these species, and the reason for the establishment of the last, other than for its decorative value, is not known.

At least two local shrubs are on the borderline of 'nativeness'. *Crataegus monogyna* is obviously, although infrequently, planted in a few places around habitation, and occurs in some numbers on the hillside behind Lochinver, presumably bird-sown. However, bushes of considerable size and obvious antiquity are also scattered along the limestone crags from Stronechruvie north to Ardvreck Castle, and the species may there be native. Similarly most of the local stands of *Prunus spinosa* are in the vicinity of past or present habitation, as at Inverkirkaig, Lochinver and on Strone Brae. However, it also occurs in scrub on the south-facing slopes of Cnoc na Sròine, where woodland is shown in Home's map for 1774, and it seems extremely unlikely that it was planted there.

Other shrubs that must originate from gardens and are no doubt bird-sown are *Cotoneaster simonsii* and all three species of *Ribes*, although *R. rubrum* appears to be a fairly long-established component of the local flora.

One of our trees, the ash, also falls into this category of borderline 'native', although it reproduces itself vigorously by seed. There is no doubt about the status of sycamore, although its saplings may occur far from any obvious plantings. Even oak, which appears to be completely native on south-facing slopes and crags from Inverkirkaig round to Unapool, may have been planted in places, such as on the in-bye at Nedd, where there is one tree on each croft.

The earliest conifer plantings, accompanied by non-native deciduous species such as beech, were made in the mid-19th century in the vicinity of Lochinver, where they occupied previously wooded areas on Cnoc na Doire Daraich (Culag Woods) and along the lower reaches of the River Inver (see the list in the section on the history of the landscape). The few silver birch that occur at the latter site are also almost certainly planted. Both areas retain elements of their native flora.

In the earlier part of the 20th century a number of small conifer plantings were established by the Assynt Estate between Inchnadamph and Ledmore, and in the 1980s substantial commercial plantings were made by the Forestry Commission on the north side of Loch Urigill. Neither of these two categories of plantation has any floristic interest, but they are important, of course, from

landscape and faunistic points of view. Much more informative are the deer exclosures on the N.N.R. at Inchnadamph, the oldest dating back to the late 1950s, which show just what the native vegetation can achieve with a reduction in grazing pressure.

The purchase, in 1993, of the North Assynt Estate by the Assynt Crofters' Trust, has allowed the development of a number of crofter forestry schemes, which are, of course, fenced against deer. Located between Achmelvich and Culkein Drumbeg, and also at Knockan, they have mainly used 'native hardwoods', but also some conifers, such as *Pinus sylvestris*. More may follow; in time they will have a significant effect on the local vegetation, but so far their effect is minimal. The Assynt Estate has also fenced off, for natural regeneration and planting, two extensive areas on the south side of Loch Assynt, one at An Coimhleum and the other on a site further to the west.

Water management, peat cutting and muirburn

Devices for the management of water levels on our burns, rivers and lochs are spread thinly throughout Assynt. The oldest are works associated with small horizontal mills, which were abandoned during the 19th century. In the early 20th century a number of local lochs were dammed to raise the water level, presumably to improve the fishing, but these dams have broken down. In neither case does there seem to have been any long-term effects on the vegetation in their vicinity, although no doubt there was some at the time they were in use.

On a different scale is the large sluice constructed later in the 20th century to control the level of Loch Assynt. However, its only contribution to the local flora has apparently been to provide a habitat, on retaining walls, for one of our rarest native shrubs, *Viburnum opulus*. Long-term effects of the damming of several local lochs for the hydro-electric scheme below Loch Poll, which

was constructed during the 1990s, remain to be seen, although the resultant fluctuations in the level of Loch na Loinne have created a substantial area of draw-down, where the former vegetation has died off.

It just remains for us to consider the effects of two long-standing activities, peat-cutting and muir-burn. Peat is still cut in a few places, but the practice was in the past very widespread, since in an area generally lacking woodland, peat was the only readily available source of fuel. The straight lines of ancient peat banks may be found in remote areas. In some townships, all the available peat within the boundaries appears to have been removed by the early part of the 20th century, if not earlier, and the inhabitants had to travel further afield for their fuel. The long-term effect on the vegetation is difficult to gauge, since the top cut was returned to the worked-over area, but there must have been some local impoverishment of the flora (see also the account of bryophyte communities).

Muirburn has been discussed in the section on heaths, mires and crags, but merits another mention. It is still being actively practised in some crofting townships, if only by a few individuals. A recent study (Hamilton *et al.* 1997) has described muirburn in the Assynt area as typically on a larger scale and more frequent than recommended in the guide-lines, poorly-controlled, and 'at least partly over areas that should be fire-free'.

Two woody species, *Arctostaphylos uva-ursi* and *Juniperus communis*, provide us with a good indication of the scale and extent of muirburn over a long period. It cannot be a coincidence that flourishing populations of both only now occur on ground that is remote from habitation. Some of the recent problems with muirburn arise from an increasing shortage of man-power. It is perhaps time that this destructive practice was abandoned, at least until it can be carried out in a properly controlled manner, and then only after due consideration of the environmental consequences.