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**Saxicolous lichen and bryophyte communities  
in Upland Britain**

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## Summary

Phytosociological data were collected to describe the terrestrial lichen and bryophyte vegetation of rock or saxicolous habitats within 14 Special Areas of Conservation (SAC) within upland Britain, with special reference to four saxicolous habitats listed in Annex I of the EU Habitats Directive. Additional data were available from other surveys within upland Britain, giving a total of 1539 relevés available for analysis. Data were analysed using TWINSpan, combined with manual sorting. A total of 83 communities were distinguished, including 56 on siliceous rock and 27 on limestone. A description and floristic table is provided for each community, along with a key for the placement of individual relevés is provided. As is commonly experienced in phytosociological work, delimitation of communities was not straightforward; this was attributed to the existence of variation in composition of vegetation in response to many independent environmental variables, precluding a simple system of classification. Despite these problems, the classification proposed is a major advance on earlier phytosociological knowledge of the lower plant communities of the British uplands.

The two Annex I scree habitats are easily defined by their physical structure, and include fine screens, block screens, and stony ground on ridges and summits. Siliceous screes are a major saxicolous habitat, as 29 of the 56 communities delimited on siliceous rock occurred here at least once, including a small number of communities mainly confined to this habitat. Limestone screes were of less significance than siliceous screes when compared to bedrock, with no communities largely confined to limestone scree, although a number of species preferred this habitat to bedrock.

The two Annex I habitats comprising 'rocky slopes with chasmophytic vegetation' can only be defined by the presence within them of stands of vegetation considered to be chasmophytic. Chasmophytic cryptogamic vegetation can in part be defined as stands restricted to fissures, but the same communities can often be found on more open areas of rock which provide some of the conditions found in fissures (such as shelter from direct rainfall). A definition of these Annex I habitats using a combination of physical features of the site, and presence of characteristically 'chasmophytic' communities, whether or not in discrete fissures, seems the best approach.

The British uplands have two groups of lichen species of outstanding conservation interest: 1) species of western oceanic areas and 2) species of calcareous rock at high altitudes. The most characteristically oceanic of the communities delimited in the present study are SS E1 on siliceous rock and SL 15 on limestone. Samples from high altitude calcareous rocks were few in the present survey, but Community SS X1 from Eryri, the Ben Nevis range and Beinn Heasgarnich includes some examples.

Most of the samples recorded were from treeless, grazed upland sites. A cessation of grazing in these areas would be a potential concern, likely to result in shading or engulfment of rocks by vascular plant vegetation or robust bryophytes. Recreational pressures are also known to be a potential threat in some upland habitats.

## 1. Introduction

The lichen and bryophyte flora of rock habitats in Great Britain is well known, but the phytosociology of the communities in which they occur is poorly known. Floristic publications treating the flora of individual sites or regions often contain lists of species which are characteristic of particular habitats or microhabitats, but there are very few publications which attempt to define communities by gathering original data and using phytosociological methods. Orange (2002) reviewed the sparse literature relating to rock communities in Britain. James *et al* (1977) gave a valuable overview of lichen communities in Britain; they listed seven associations on limestone and 23 associations (with mention of some additional 'noda') on siliceous rock (excluding freshwater and maritime rock). This publication is still the standard reference for lichen communities in Britain; the overview of communities is apparently largely based on the considerable field experience of the authors, and few original data in the form of relevés were presented. While British lichenologists have often used the names of epiphytic communities, saxicolous communities have been much more rarely referred to by name in survey work.

A number of workers have collected a limited amount of lichen relevé data during surveys, including Pentecost (1980) and McCarthy (1983) but these studies were limited in scope and not primarily designed to produce a system of named communities. Fryday (2001a) studied the lichens of snow-beds by means of relevés, but again did not intend to produce a widely applicable classification of communities. Averis (1998a) gave a classification of bryophyte-dominated vegetation in Scottish Highland woodlands; other bryophyte-dominated assemblages have been mentioned in single-site survey reports including Averis (1998b, 2000) and Averis & Averis (1999). In contrast to the situation in lower plant-dominated vegetation, vegetation dominated by vascular plants is well covered by the National Vegetation Classification (NVC) (Rodwell 1991-2000), which provides a framework for the classification of the vegetation of all major habitats and regions within Great Britain, and which is based on original analyses of large numbers of vegetation samples. Saxicolous cryptogams are largely excluded from this work, but the communities OV39 and OV40 partially cover bryophyte-rich crevice communities.

The present work aims to improve our knowledge of the lichen and bryophyte communities of rock habitats in upland Great Britain, with particular regard to certain habitats, which have importance in nature conservation legislation. The work had the following main objectives:

1. To describe the lower plant assemblages of Annex I rock habitats in selected sites, which are Special Areas of Conservation (SACs).
2. To provide a preliminary classification of the lower plant communities of rock habitats in upland Britain (excluding freshwater habitats).

These objectives were achieved by extensive sampling of rock habitats, using phytosociological methods, within selected SACs. Those visited were, in Wales: Brecon Beacons, Cadair Idris, Eryri and Berwyn and South Clwyd Mountains; in Scotland: Ben Heasgarnich, Ben Lui, Ben Nevis, Glen Coe, Inchnadamph, Strath and Rassal, and in England: South Pennine Moors, Peak District Dales, Ingleborough Complex, Lake District High Fells and North Pennine Moors (Table 1, Figures 1-37). Approximately 1500 relevés were recorded. Following analysis, 83 communities were recognized. Some of these communities can be identified with vegetation units previously reported for Britain, but many

are newly recognized. The results of the survey represent a significant advance in knowledge of upland saxicolous vegetation.

## 1.1 Annex I habitats

The EU Habitats Directive requires the establishment of a Europe-wide system of Special Areas of Conservation (SAC), which will make a significant contribution to the conservation of certain habitat types and species, which are considered to be most in need of conservation in Europe. These habitats and species are listed in Annexes I and II respectively, of the Habitats Directive (McLeod *et al.*, 2005).

The vegetation of most of the Annex I habitats is covered by the NVC, but five upland rock habitats were considered to have significant importance for lower plants, growing in communities not covered or inadequately covered by the NVC. These habitats, with their code numbers, are:

H8110	Siliceous scree of the montane to snow levels ( <i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i> )
H8120	Calcareous and calcshist screes of the montane to alpine levels ( <i>Thlaspietea rotundifolii</i> )
H8210	Calcareous rocky slopes with chasmophytic vegetation
H8220	Siliceous rocky slopes with chasmophytic vegetation
H8240	Limestone pavements



## **2. Methods**

### **2.1 Site selection**

Surveys of 14 SACs (Table 1) were required by the contract. All these sites are within upland Britain in the sense of Averis *et al* (2004), i.e. within those parts of Britain with an Index of Climatic Severity of 0.15 or more (Averis *et al*, 2004: Figs. 1 and 6), and including high ground in south-west England, much of Wales, north-west England and the Southern Uplands of Scotland (but excluding the coastal zones), and most of the Scottish Highlands apart from the eastern coastal strip. Sites covered a range from low to high altitudes, and a variety of climatic conditions (Table 2). Within each SAC, suggested areas for survey where the relevant Annex I habitats were likely to occur were indicated on maps supplied by the client. At most sites a number of localities were specified except for South Pennine Moors SAC where only one locality was specified. It was usually not possible to visit all the suggested localities due to lack of time. Sometimes, additional localities were visited.

Significant numbers of additional samples were collected by the writer from additional sites, not part of the contract, or were derived from earlier surveys by the author, and were incorporated into the analysis. These additional sites (Carn Ingli, Beinn Heasgarnich and Inchnadamph) are also listed in Table 1. A small number of additional samples recorded during the period of the contract, often only one or a few per locality, has also been included in the analysis, but are not listed in Table 1.

**Table 1:** Main sites from which samples are available

Country/Site	Special Area of Conservation	Vice-county	Hectads	Rock type	Number of samples	Site code	Recorded as part of present contract
<b>Wales</b>							
Brecon Beacons	Brecon Beacons	42	22/92, 32/02	Siliceous	94	BB	Yes
Carn Ingli SSSI	-	45	22/03	Siliceous	64	-	No
Cadair Idris	Cadair Idris	48	23/71	Siliceous	86	CI	Yes
Eryri	Eryri	49	23/65, 66, 76	Siliceous	220	E	Part (87 samples)
Berwyn (Mynydd Eglwyseg)	Berwyn and South Clwyd Mountains	50	33/24	Limestone	74	BE	Yes
Various	-	41-43, 45-49	Various	Siliceous	52	-	No
<b>England</b>							
Leek Moors SSSI	South Pennine Moors	39	33/96, 43/06	Siliceous	51	LM	Yes
Derbyshire Dales	Peak District Dales	57	43/15, 16, 17	Limestone	102	DD	Yes
Ingleborough	Ingleborough Complex	64	34/77	Limestone	86	ING	Yes
Lake District	Lake District High Fells	69, 70	35/10, 11, 12, 20, 21, 31	Siliceous	183	LD	Yes
Lake District	-	69	34/29	Siliceous	1	-	No
Northern Pennines	North Pennine Moors	69, 70	35/62, 63, 72, 73, 82	Siliceous, Limestone	125	NP	Yes
<b>Scotland</b>							
Beinn Heasgarnich	Ben Heasgarnich	88	27/43	Siliceous	51	BH	No
Ben Nevis	Ben Nevis	97	27/16, 17	Siliceous	70	BN	Yes
Glen Coe	Glen Coe	98	27/15	Siliceous	60	GC	Yes
Ben Lui	Ben Lui	98	27/22	Siliceous	59	BL	Yes
Strath	Strath	104	18/51, 62	Limestone	56	ST	Yes

Rassal	Rassal	105	18/84	Limestone	65	R	Yes
Inchnadamph	Inchnadamph	108	29/21, 22	Limestone	37	INC	No
Various	-	88, 104, 105	Various	Siliceous	3	-	No
Total number of samples					1539		

**Table 2:** Climate of sites\*

Site	January mean temperature (°C)	July mean temperature (°C)	Annual rainfall (mm)	Wet days	Climatic severity	Oceanicity
Berwyn	3-4/4-5	16-17	750-1000	120-180	0.1-0.15	10-15
Derbyshire Dales	3-4	16-17	750-1000/1000-1500	120-180	0.1-0.15	10-15
Leek Moors	3-4	16-17	750-1000	120-180	0.15-0.2	10-15
Ingleborough	3-4	15-16	>1500	120-180/180-220	0.2	15
Carn Ingli	4-5/5-6	15-16	>1500	120-180	0.15	15-20
Brecon Beacons	4-5	16-17	>1500	180-220	0.15-0.2	15-20
North Pennines	<3	15-16	1000-1500	180-220	0.2	15-20
Lake District	3-4	15-16	>1500	180-220	0.2	15-20
Cadair Idris	4-5	15-16	>1500	180-220	0.2	15-20/20
Eryri	4-5	15-16	>1500	180-220	0.2	15-20/20
Ben Nevis	<3/3-4	<14	>1500	>220	0.2-0.4	20-25
Glen Coe	<3/3-4	<14	>1500	>220	0.2-0.4	20-25
Ben Lui	<3	14-15	>1500	180-220	0.2-0.4	20-25
Strath	4-5	<14	>1500	180-220	0.2-0.4	20-25
Rassal	3-4	<14	>1500	>220	0.2-0.4	20-25
Beinn Heasgarnich	<3	14-15	>1500	180-220	0.4	15-20
Inchnadamph	3-4	<14	>1500	>220	0.4	20-25

\*Major climatic variables were estimated from maps in Averis *et al* (2004). Sites are listed in approximate order of increasing oceanicity and climatic severity.

## 2.2 Field methods

All types of saxicolous vegetation were regarded as suitable for sampling, except freshwater habitats and stands dominated by vascular plants. Particular attention was paid to the rock habitats of Annex I.

Sampling followed standard phytosociological procedures, as outlined by Rodwell (1991-2000). Homogeneous stands were identified, and were sampled by means of subjectively placed relevés or quadrats. A homogeneous stand was a patch of lower plants growing together on an area of rock containing no obvious internal vegetation boundaries. The study was undertaken with few assumptions about the composition of cryptogamic communities, and no stands were rejected as ‘atypical’ or ‘intermediate’. Two basic quadrat sizes were used, 25 × 25 cm and 50 × 50 cm; in general, the smaller quadrat was used for stands dominated by crustose lichens and small bryophytes, and the larger for stands dominated by macrolichens or large bryophytes. In some cases, both quadrats were used on the same stand, the smaller nested within the larger, to provide two alternative sets of data. When two data sets were recorded in this way, the smaller was designated ‘A’ and the larger ‘B’. This allowed a choice of size to be deferred until the data were analysed. The differences between the records for the two quadrat sizes were generally small. Small, fragmentary stands were generally ignored, but when certain communities occurred only as such small stands, they were sometimes recorded, using a smaller than usual quadrat size. Occasionally, two very close but non-contiguous stands were combined, for instance when recording vegetation in crevices. All lichens, bryophytes and vascular plants occurring within the quadrat were recorded using the Domin scale:

10	91-100 % cover
9	76-90
8	51-75
7	34-50
6	26-33
5	11-25
4	4-10
3	< 4, many individuals
2	< 4, several individuals
1	< 4, few individuals

Algae (eukaryotic algae) and cyanobacteria were recorded as the group when they formed macroscopically visible colonies, and occasionally macroscopic colonies were identified to species. Nomenclature follows Coppins (2002) for lichens, but with amendments mentioned in Appendix 1; Blockeel & Long (1998) for bryophytes, John *et al* (2002) for algae and cyanobacteria, and Stace (1997) for vascular plants.

Data recorded for each quadrat included location, grid reference (recorded using a hand-held GPS receiver, but sometimes ‘corrected’ by later reference to a map), altitude, the slope and aspect of the rock surface, the slope and aspect of the surrounding ground, and subjective estimates of the degree of shade, ‘run-off’, and shelter from direct rain. Notes on the apparent relationship to nearby communities and to ecological factors were made. ‘Run-off’ was regarded as the amount of water reaching the quadrat from adjacent rock or soil; for instance a quadrat at the apex of a boulder receives no run-off, whereas one at the base of an extensive

sloping rock face receives 'strong' run-off. Quadrats were given a unique number based on the year in which they were recorded, for instance '2003-1', '2003-2' and so on.

Rock type was recorded when possible, but identification was often difficult in the field, and the complexity of the geology of some sites made geological maps of limited use in identifying the rock type at a locality. However, limestone was readily identifiable in the field. Calcareous siliceous rocks could be distinguished by their flora.

The locations of the quadrats on the sites are given in Figures 1-37.

Samples of taxa, which could not be reliably identified in the field, were collected for later examination. This material often comprised small fragments, as the taxa in question were often present in small quantity, and because the removal of large fragments would usually cause unsightly and persistent scarring of the rock surface. Fragments of lichens were often removed with the point of a knife and placed within a small fold of paper, which was placed within a larger packet. Many lichen samples were analysed by thin-layer chromatography (TLC).

The writer recorded most samples; other botanists who recorded samples on their own or together with the writer include: Alan Fryday, Vince Giavarini, Oliver Gilbert and Marcus Yeo.

### 2.3 Analysis

Data were entered from the field notebook into a FileMaker Pro database, to which laboratory identifications were added later. This is a convenient format for storage of quadrat data, as the data are searchable and it is possible to add field notes and notes on identification.

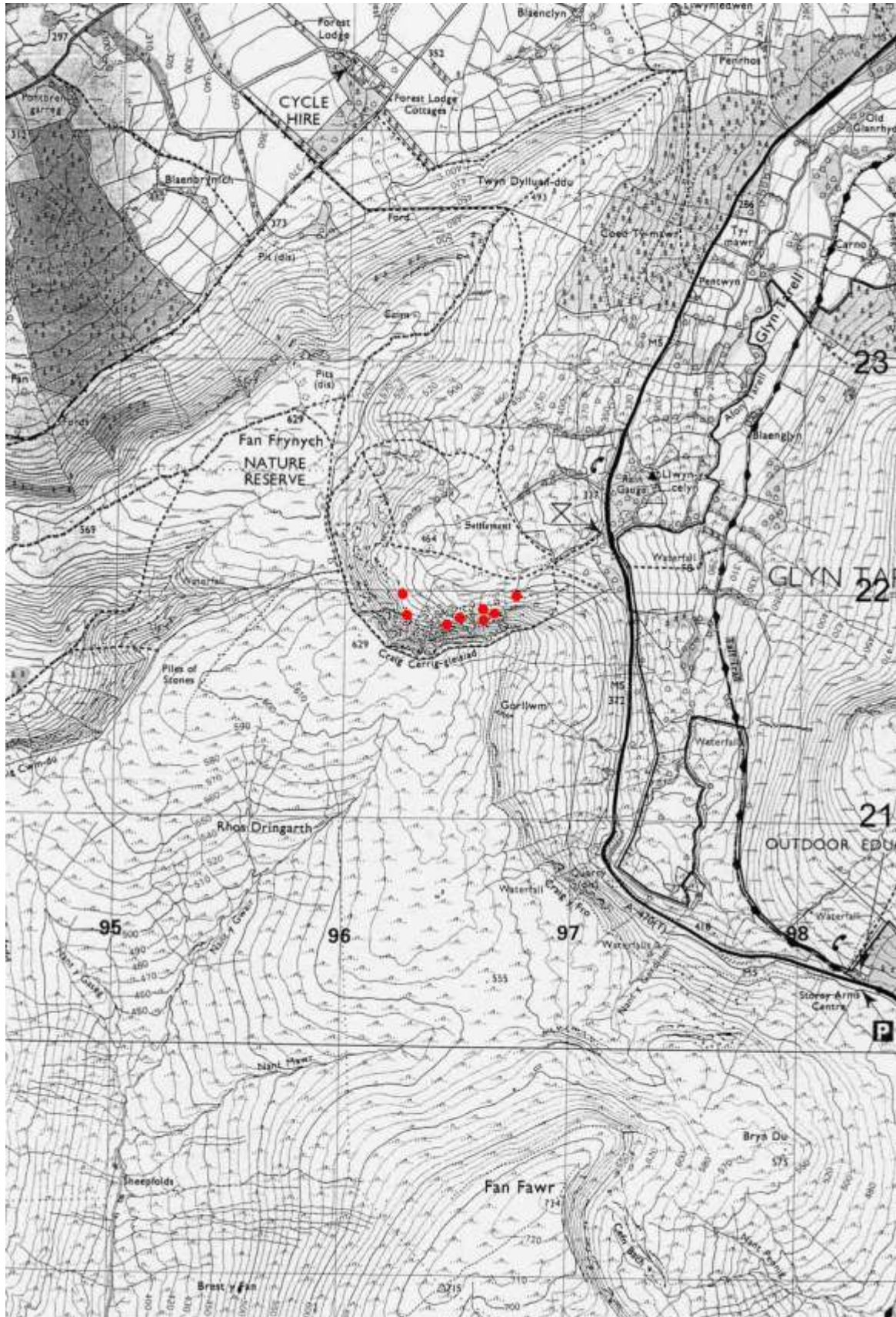
The data were analysed by two-way indicator species analysis implemented by the computer programme TWINSpan (Hill 1979), contained in the VESpan computer package (Malloch 1997). Where uncertainties existed in identifications, taxa were combined before analysis (for instance, *Verrucaria fuscella* and *V. polysticta* were combined as they were not recognized as separate species at the time the survey began). The main combinations of taxa used are listed in Appendix 2. All vascular plants were omitted from the analyses.

Initial trials were carried out by analysing subsets of the data (principally Lake District SAC and North Pennines SAC combined), using different settings for some of the analysis parameters. These trials suggested that it was convenient to use four pseudospecies, with cut-levels set at 0.1, 3.1, 5.1, 7.1, corresponding to the following Domin values:

Pseudospecies level	Domin values
1	1-3
2	4-5
3	6-7
4	8-10

Pseudospecies weighting was found to give apparently more meaningful results than no weighting, and for most of the analyses was set as 1, 10, 20, and 20. That is, records of

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**Figure 1:** Brecon Beacons (west): distribution of quadrat samples

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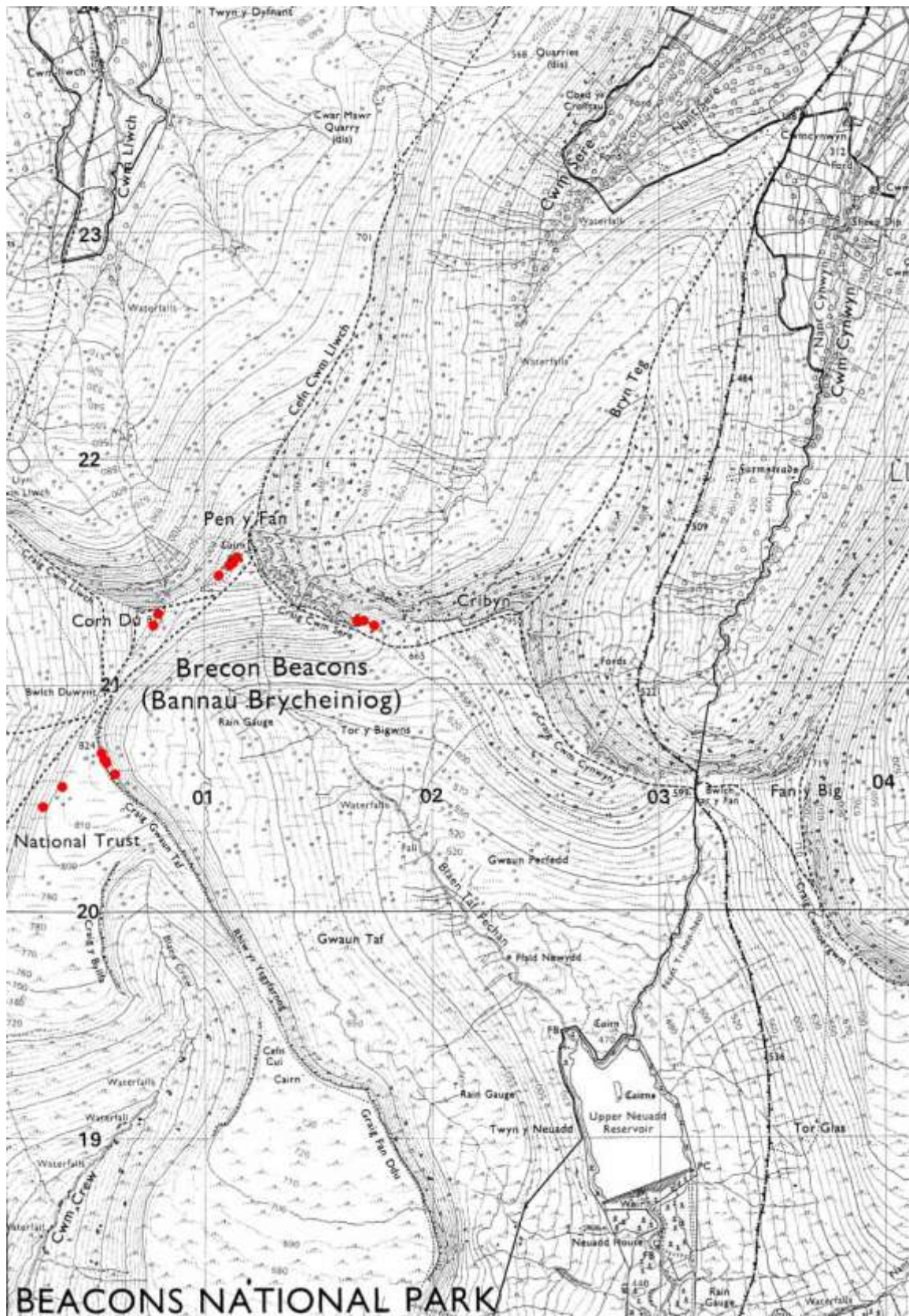
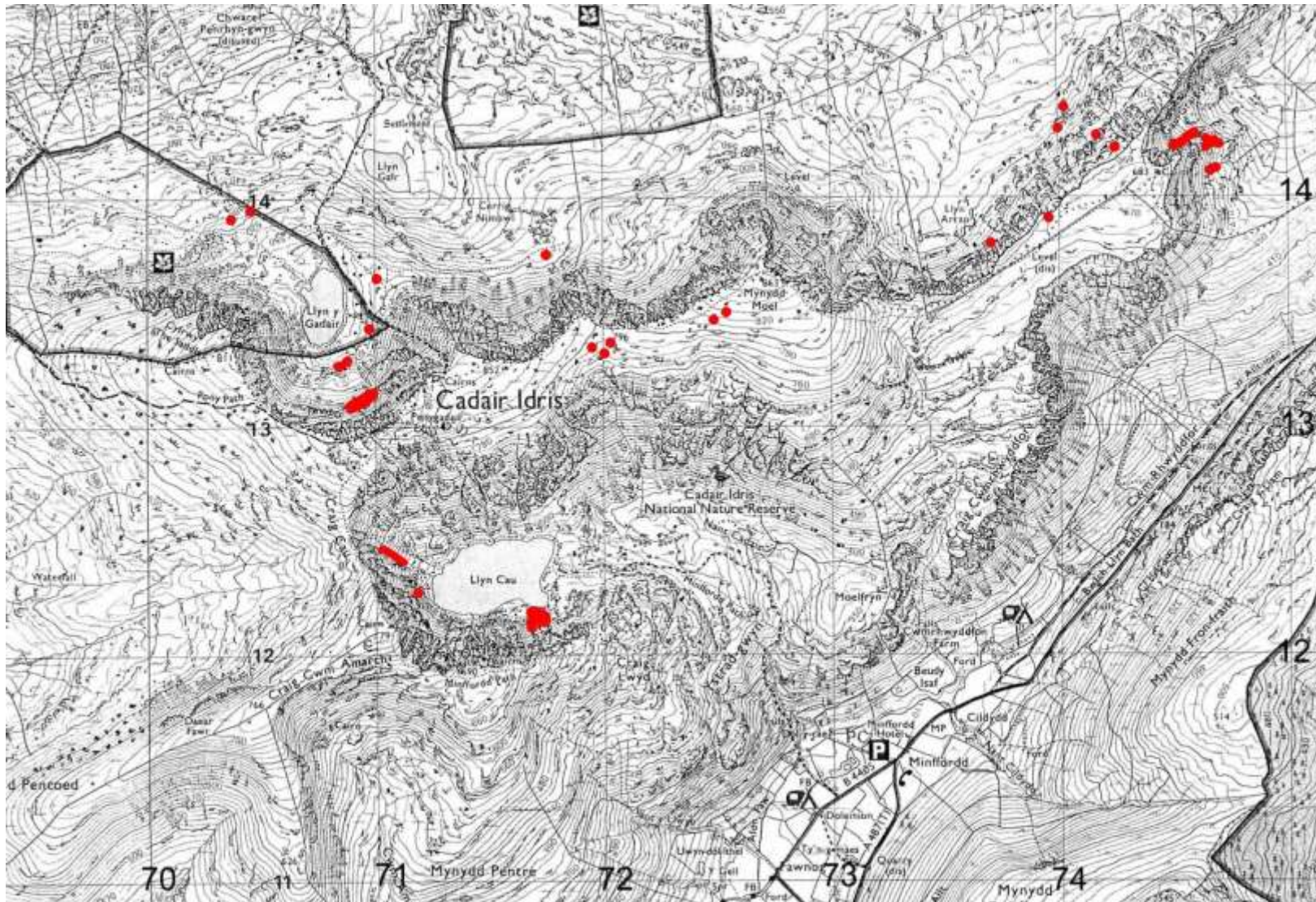


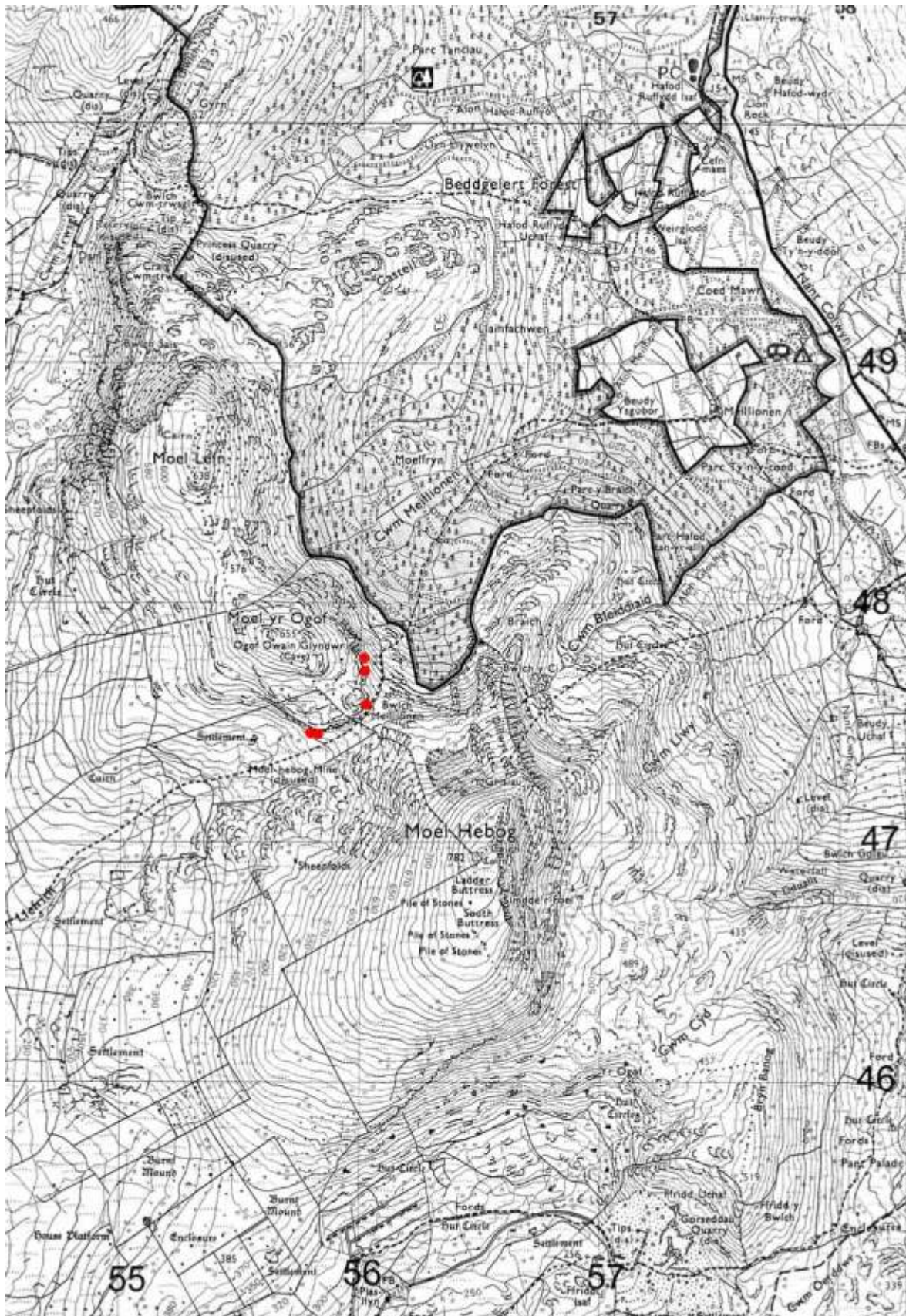
Figure 2: Brecon Beacons (east): distribution of quadrat samples

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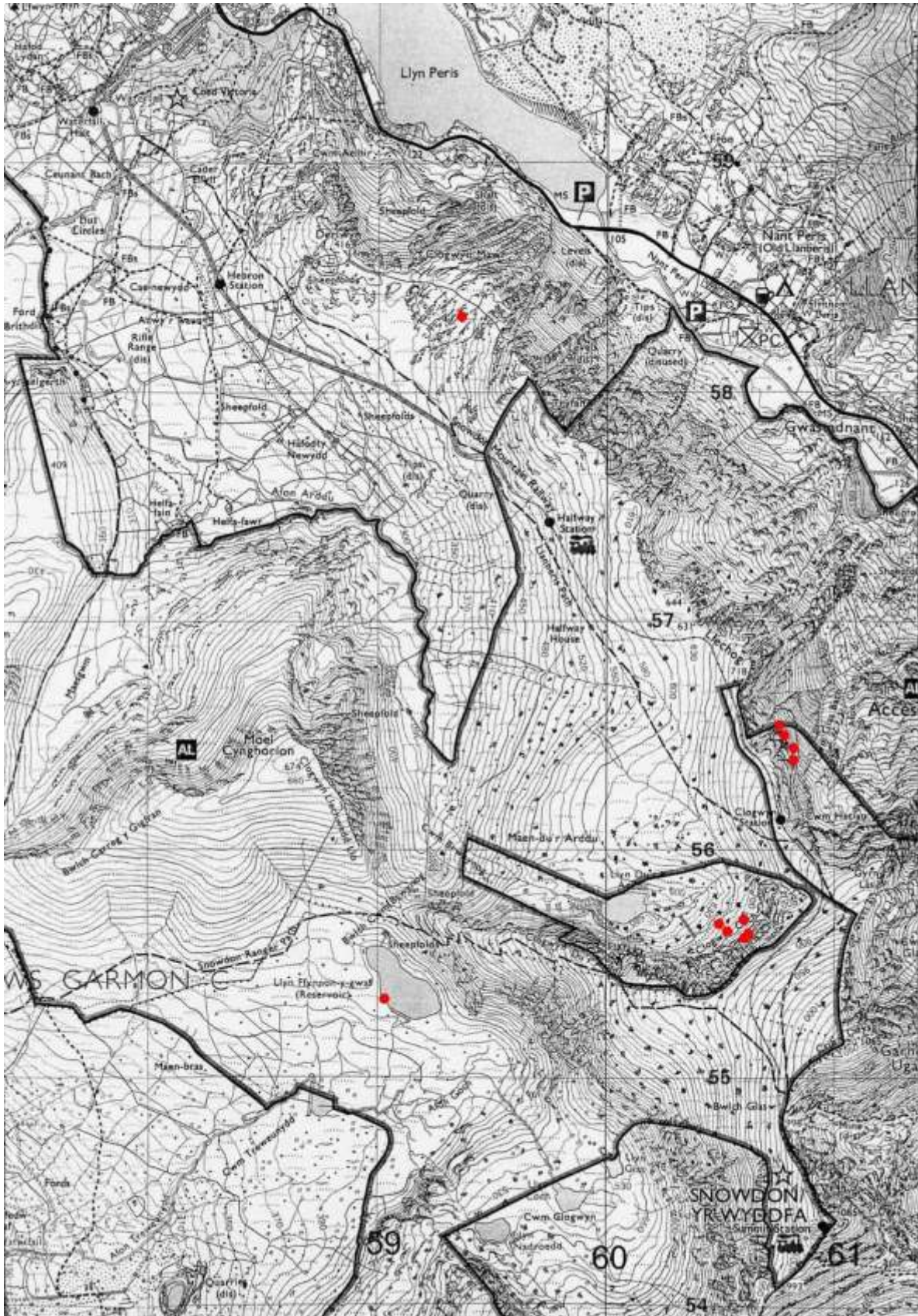
**Figure 3:** Cadair Idris: distribution of quadrat samples





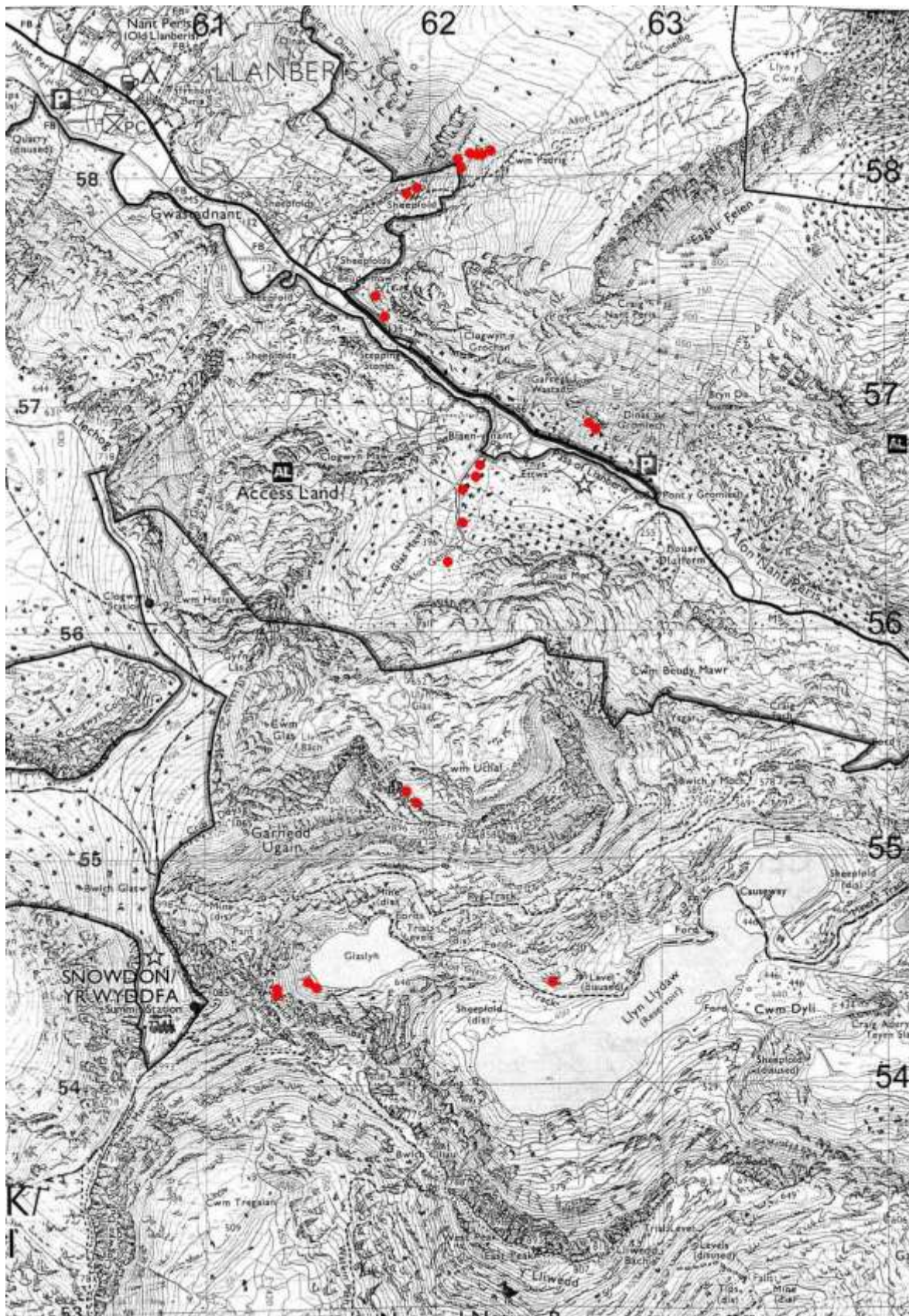
**Figure 4:** Eryri (Moel Hebog SSSI): distribution of quadrat samples

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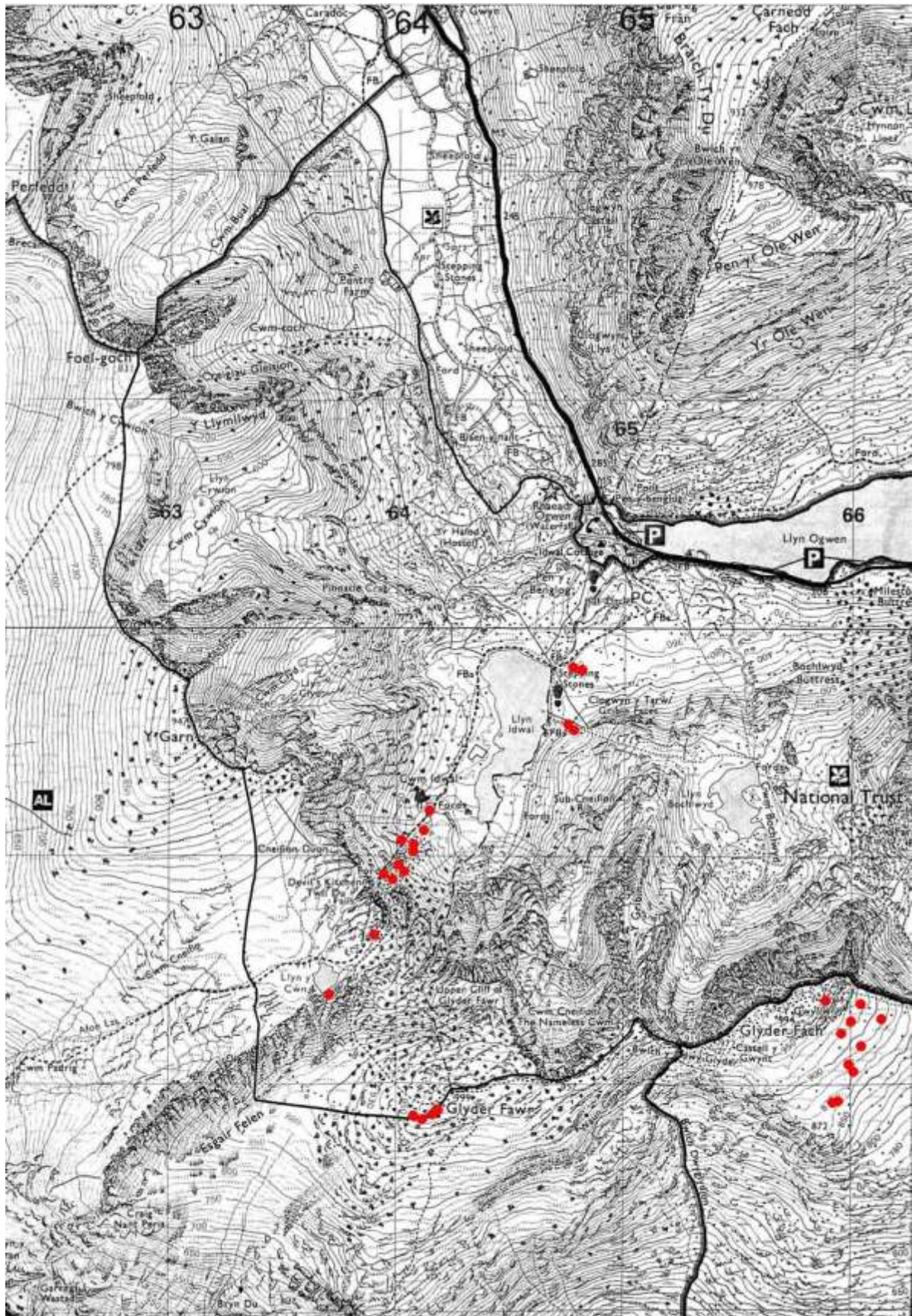
**Figure 5:** Eryri (N and NW of Yr Wyddfa): distribution of quadrat samples

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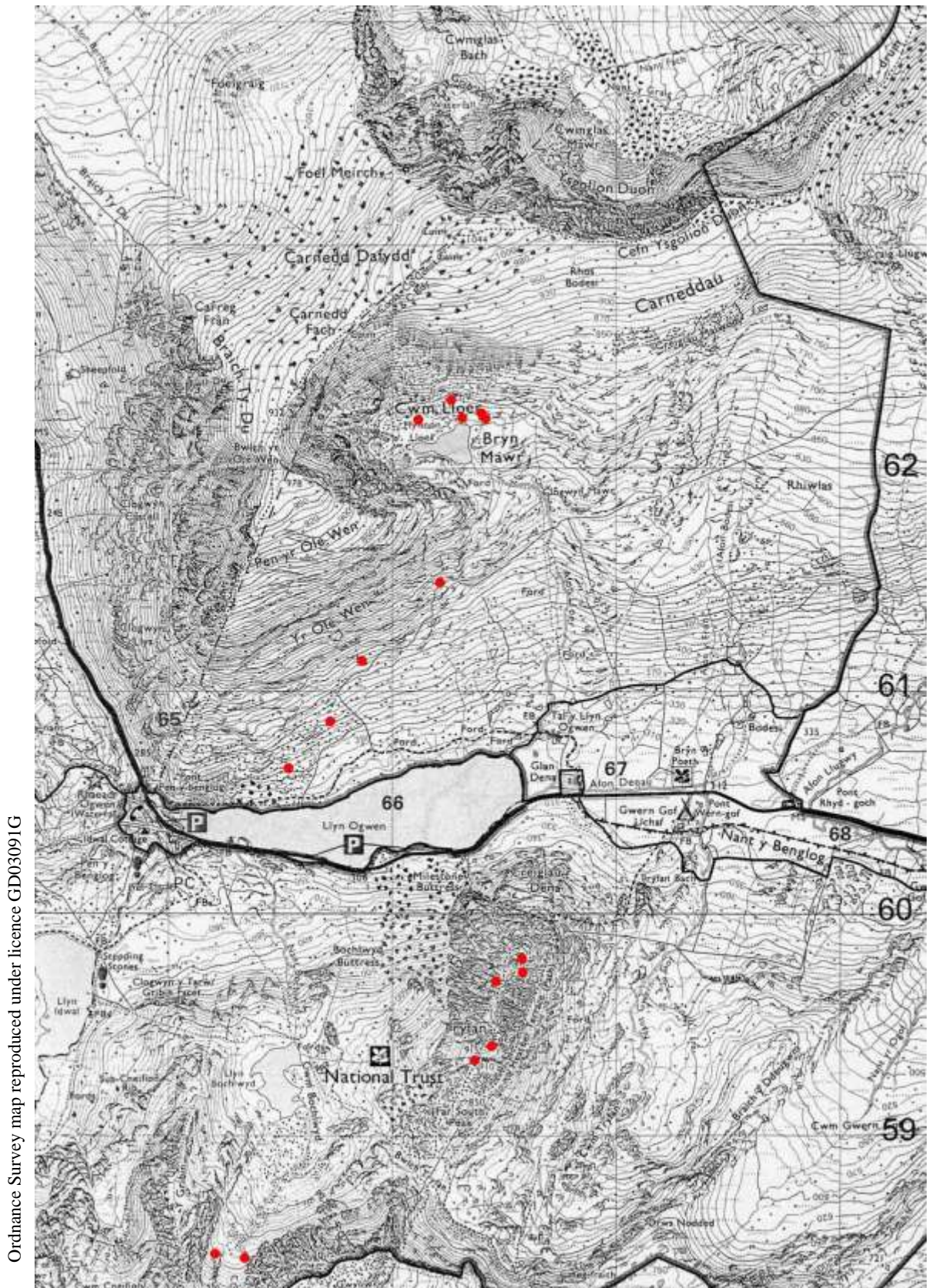


**Figure 6:** Eryri (Glaslyn, Cwm Glas, Afon Las): distribution of quadrat samples

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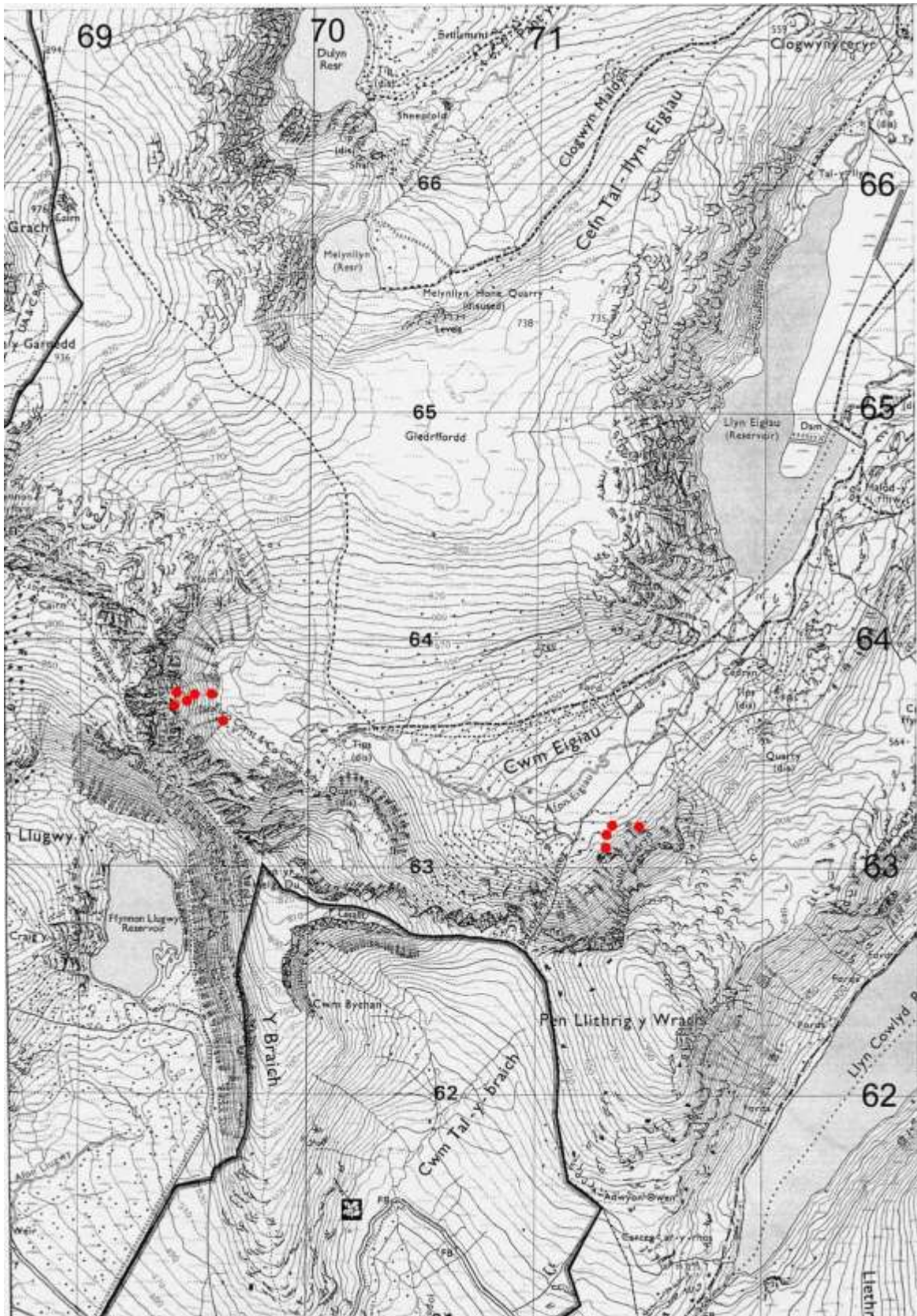


**Figure 7:** Eryri (Cwm Idwal, Glyder Fawr, Glyder Fach): distribution of quadrat samples



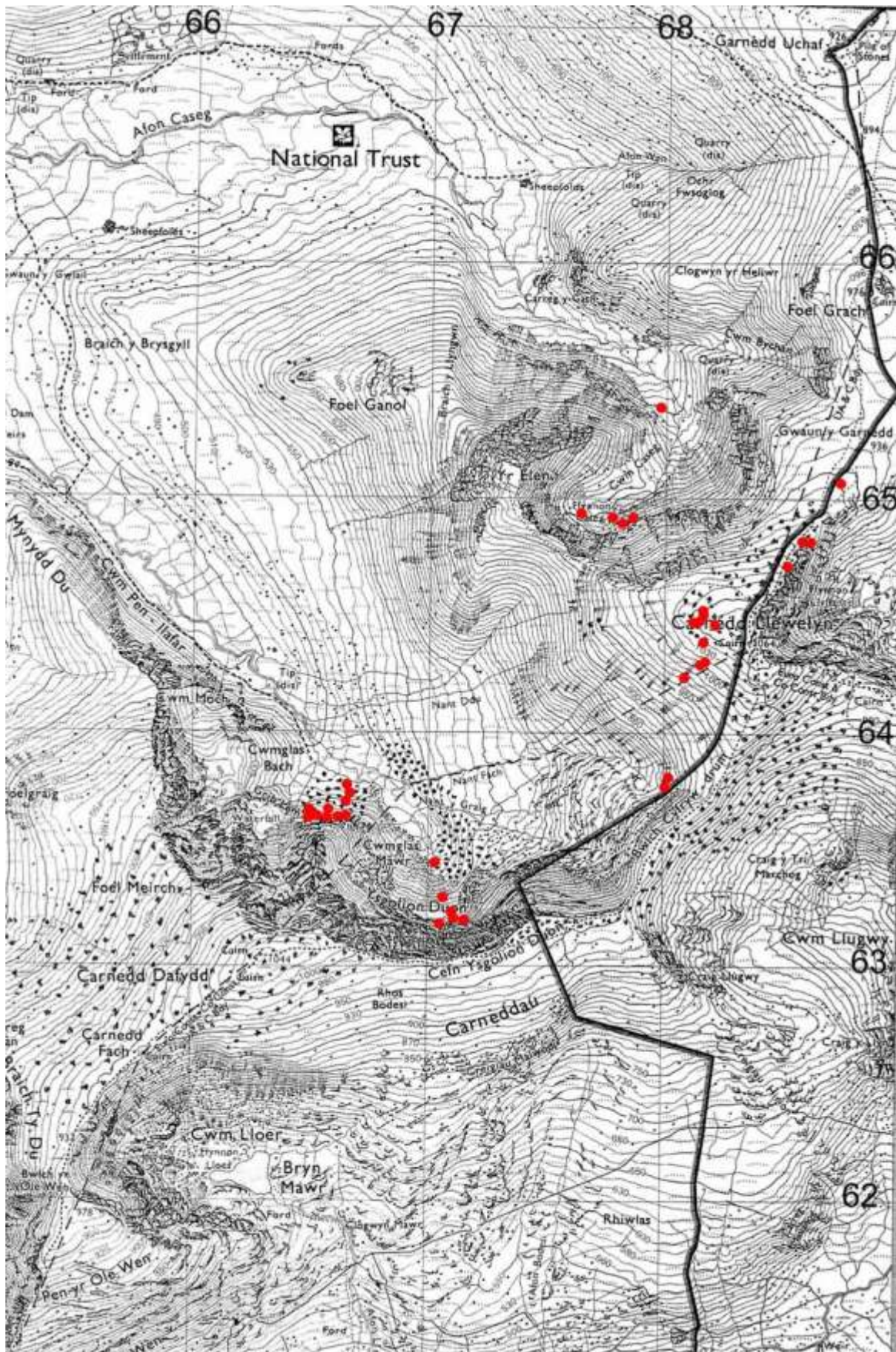
**Figure 8:** Eryri (Tryfan, Cwm Lloer): distribution of quadrat samples

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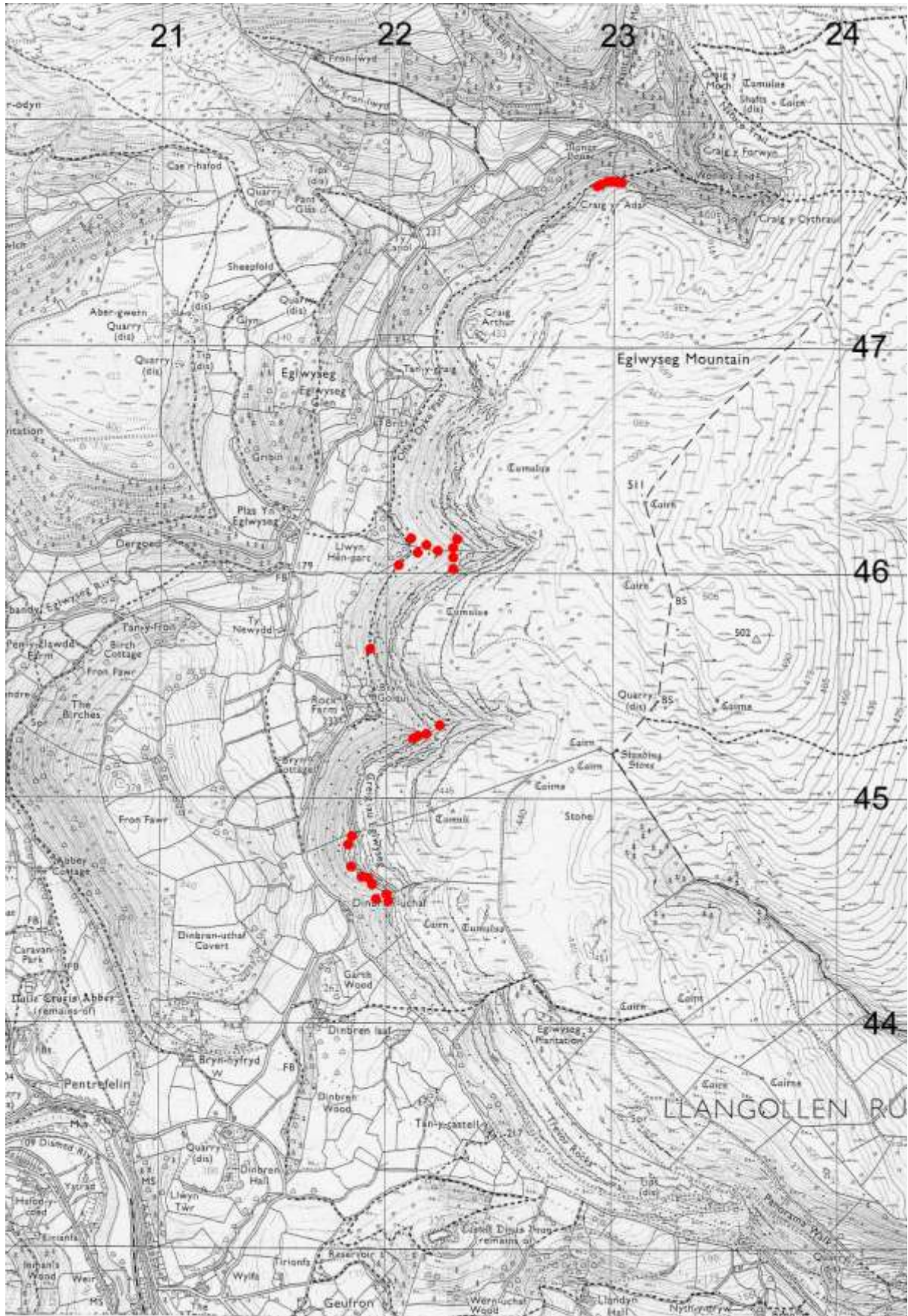


**Figure 9:** Eryri (Cwm Eigiâu): distribution of quadrat samples

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**Figure 10:** Eryri (Ysgolion Duon, Carnedd Llewelyn): distribution of quadrat samples

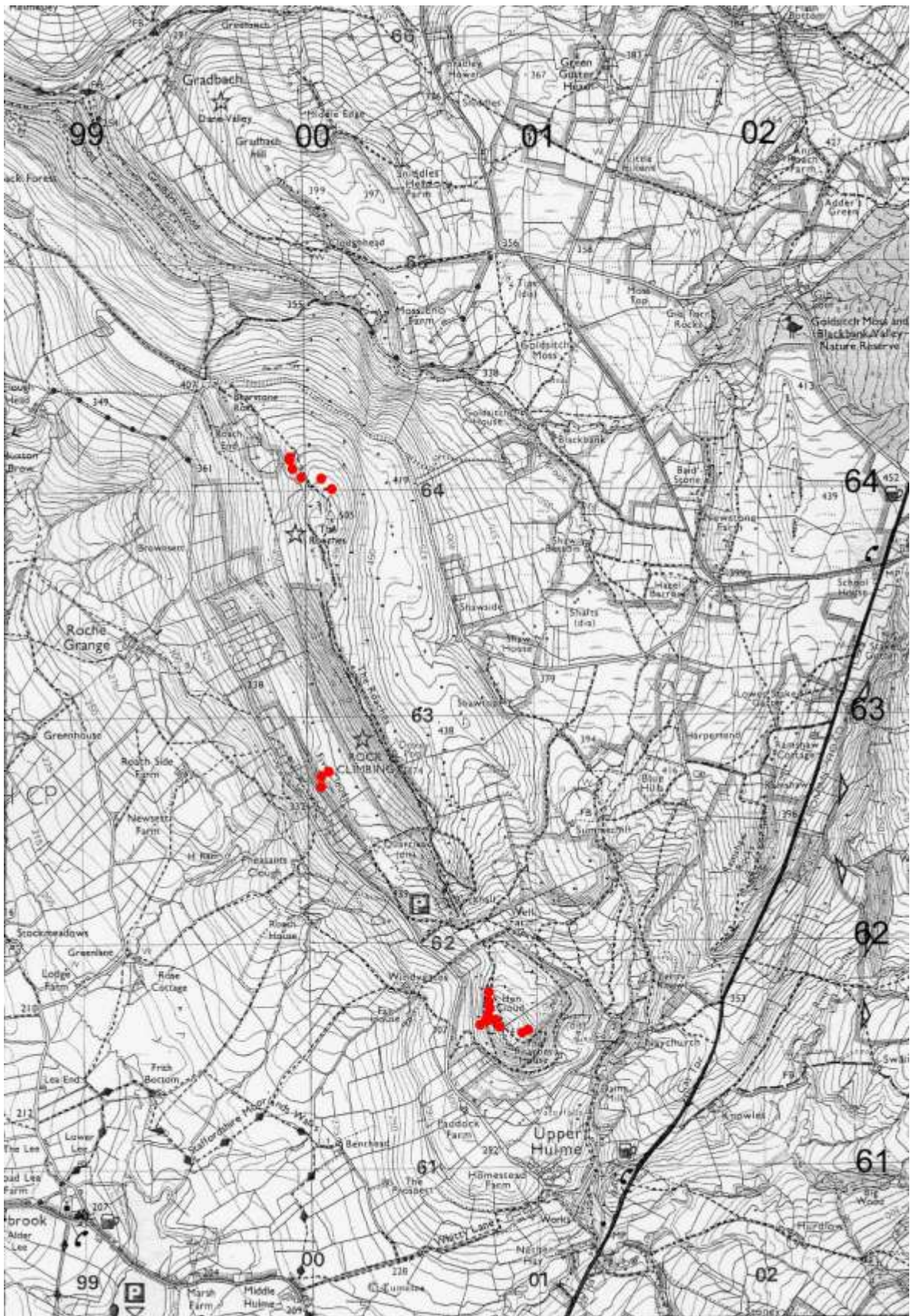


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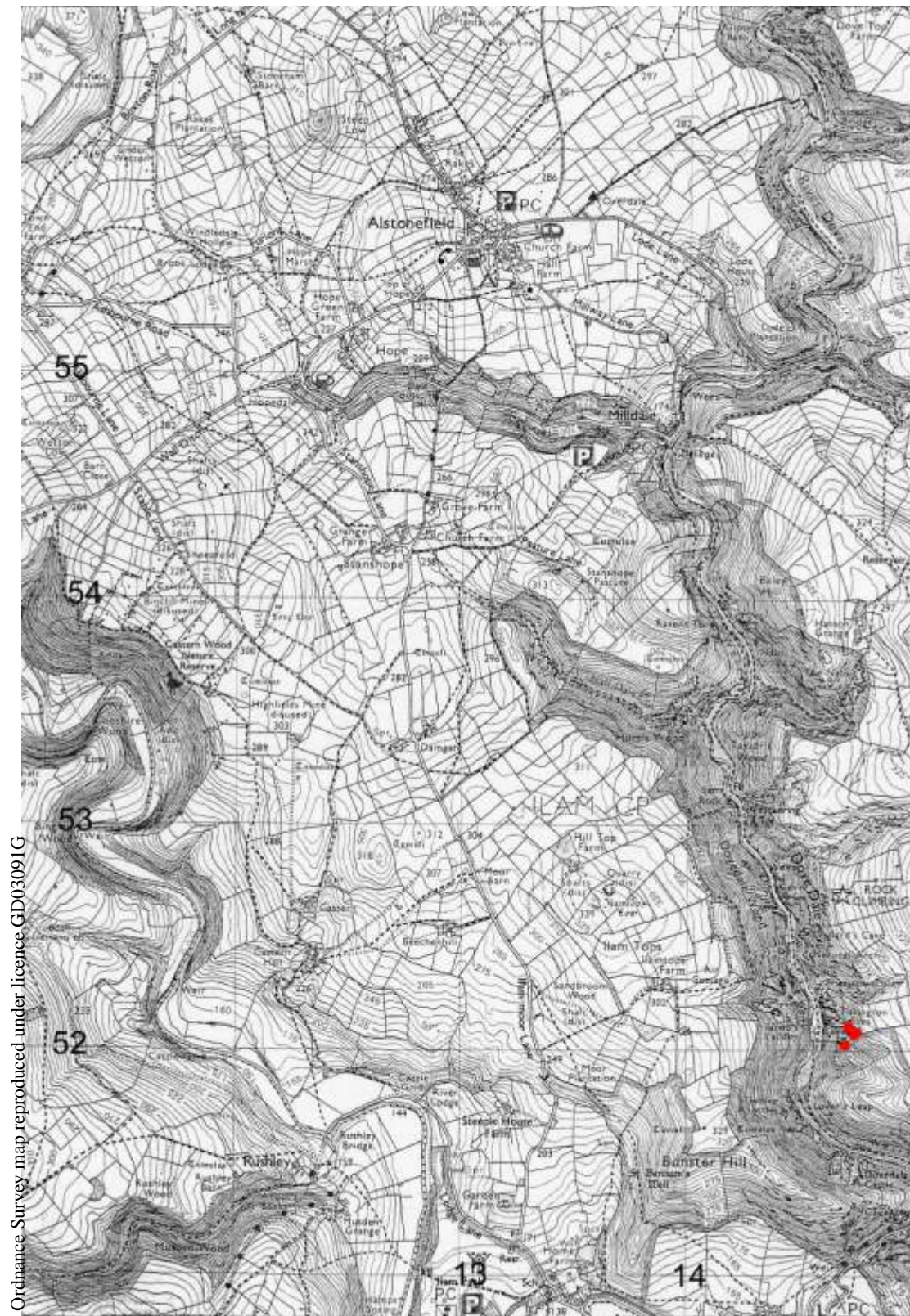
Figure 11: Berwyn: distribution of quadrat samples



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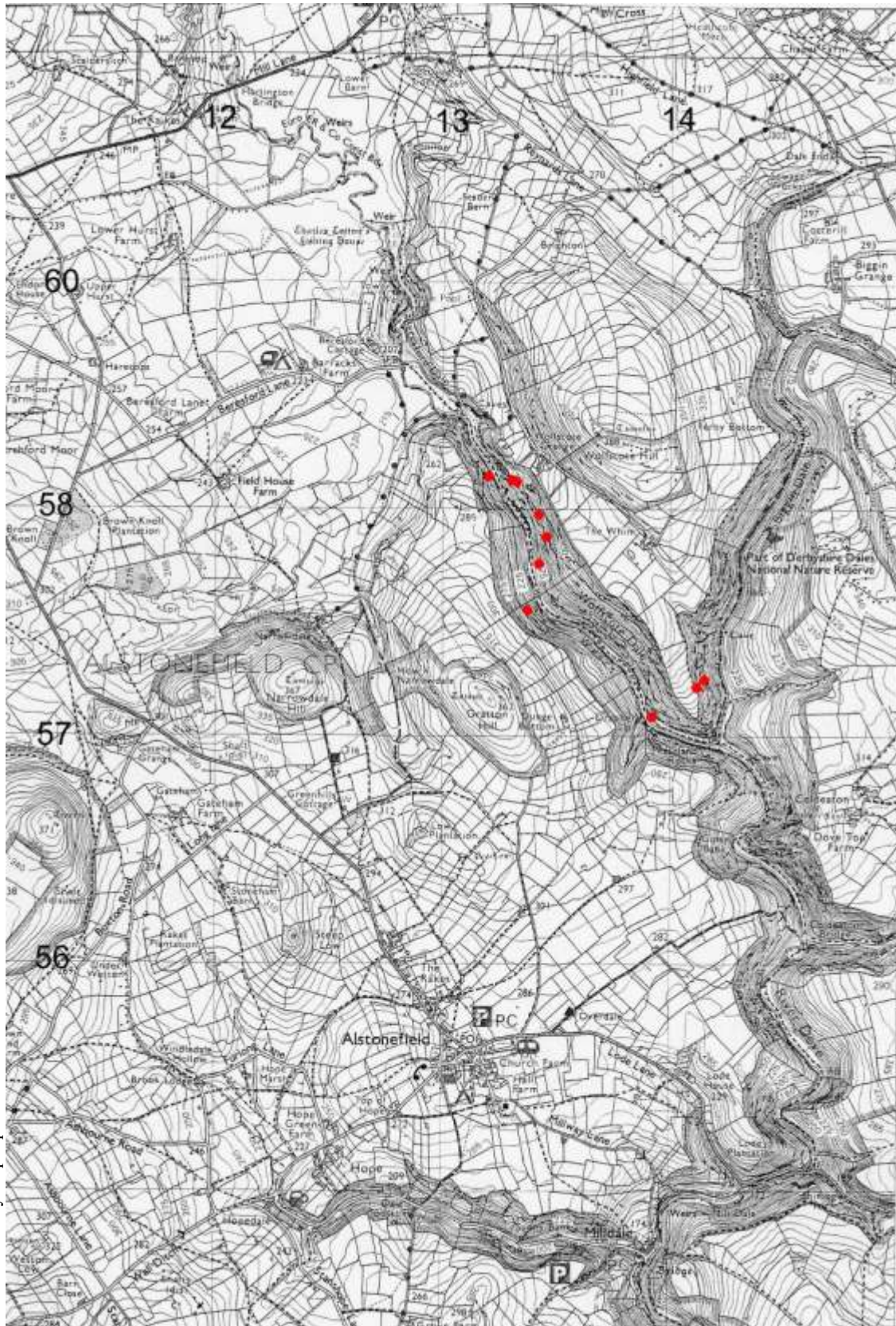


**Figure 12:** South Pennine Moors (Leek Moors): distribution of quadrat samples



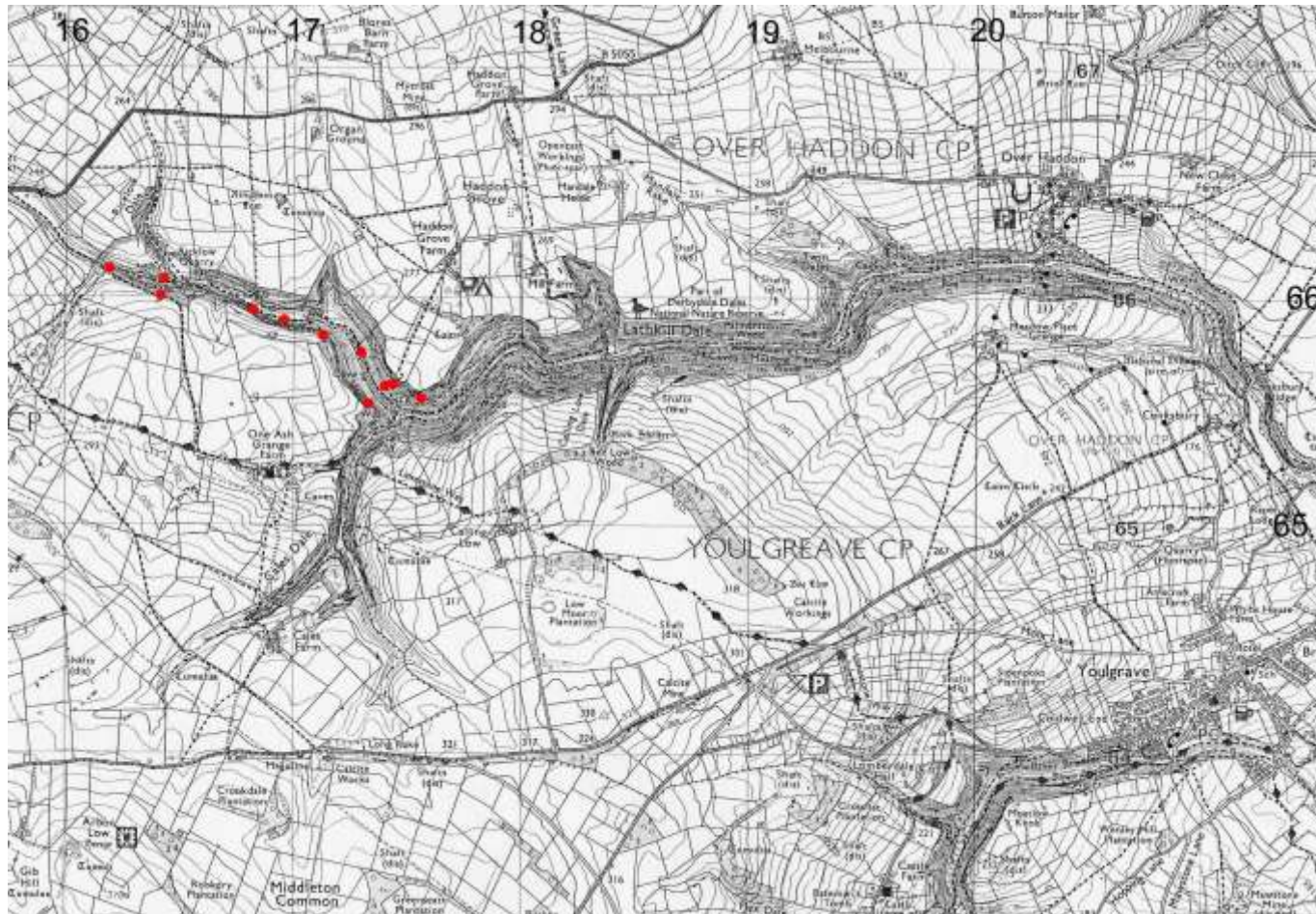
**Figure 13:** Peak District Dales (Dove Dale): distribution of quadrat samples

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**Figure 14:** Peak District Dales (Wolfscote Dale and Biggin Dale): distribution of quadrat samples

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**Figure 15:** Peak District Dales (Lathkill Dale): distribution of quadrat samples

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**Figure 16:** Peak District Dales (Monk's Dale): distribution of quadrat samples

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**Figure 17:** Peak District Dales (Cressbrook Dale): distribution of quadrat samples

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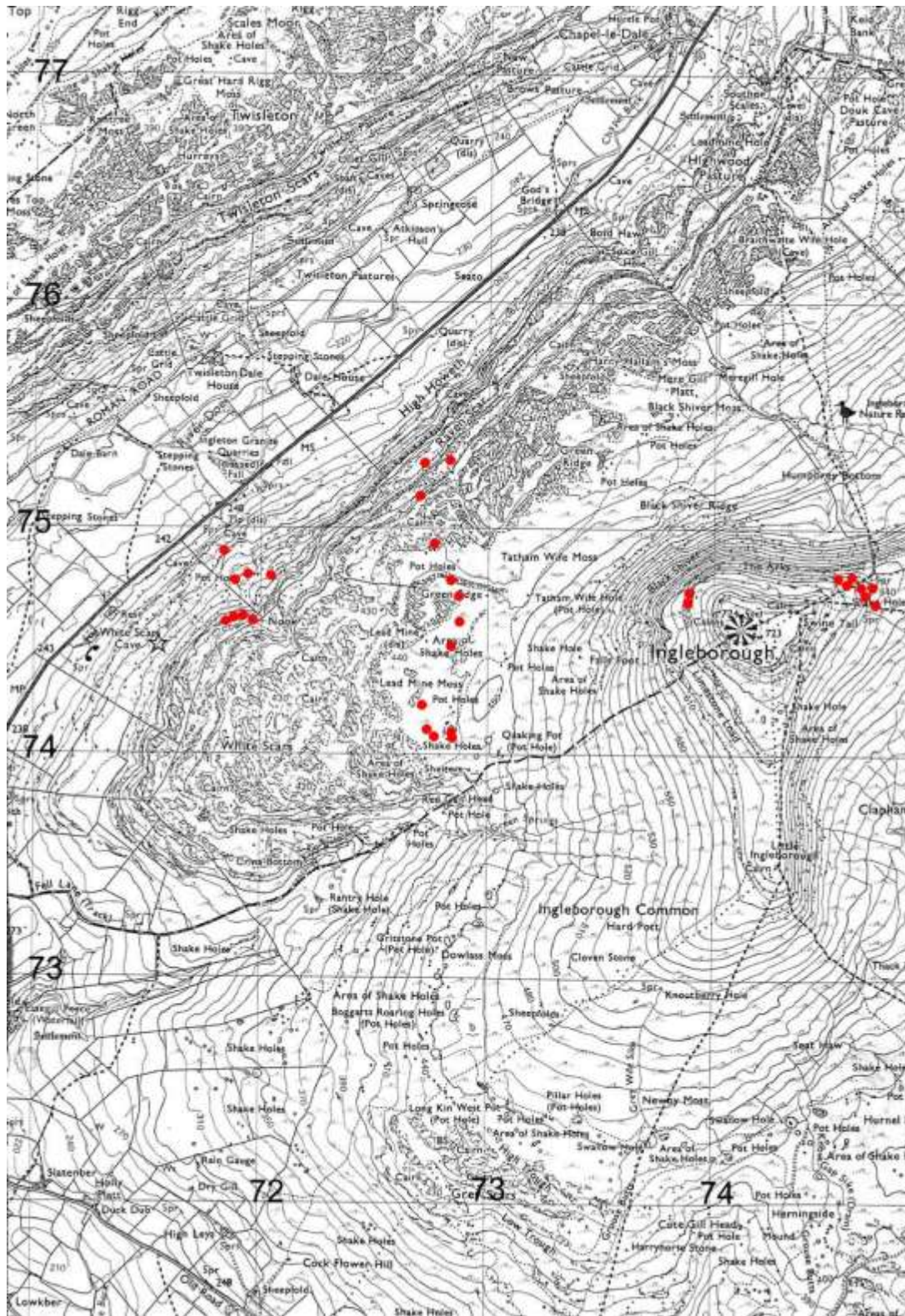


Figure 18: Ingleborough (west): distribution of quadrat samples

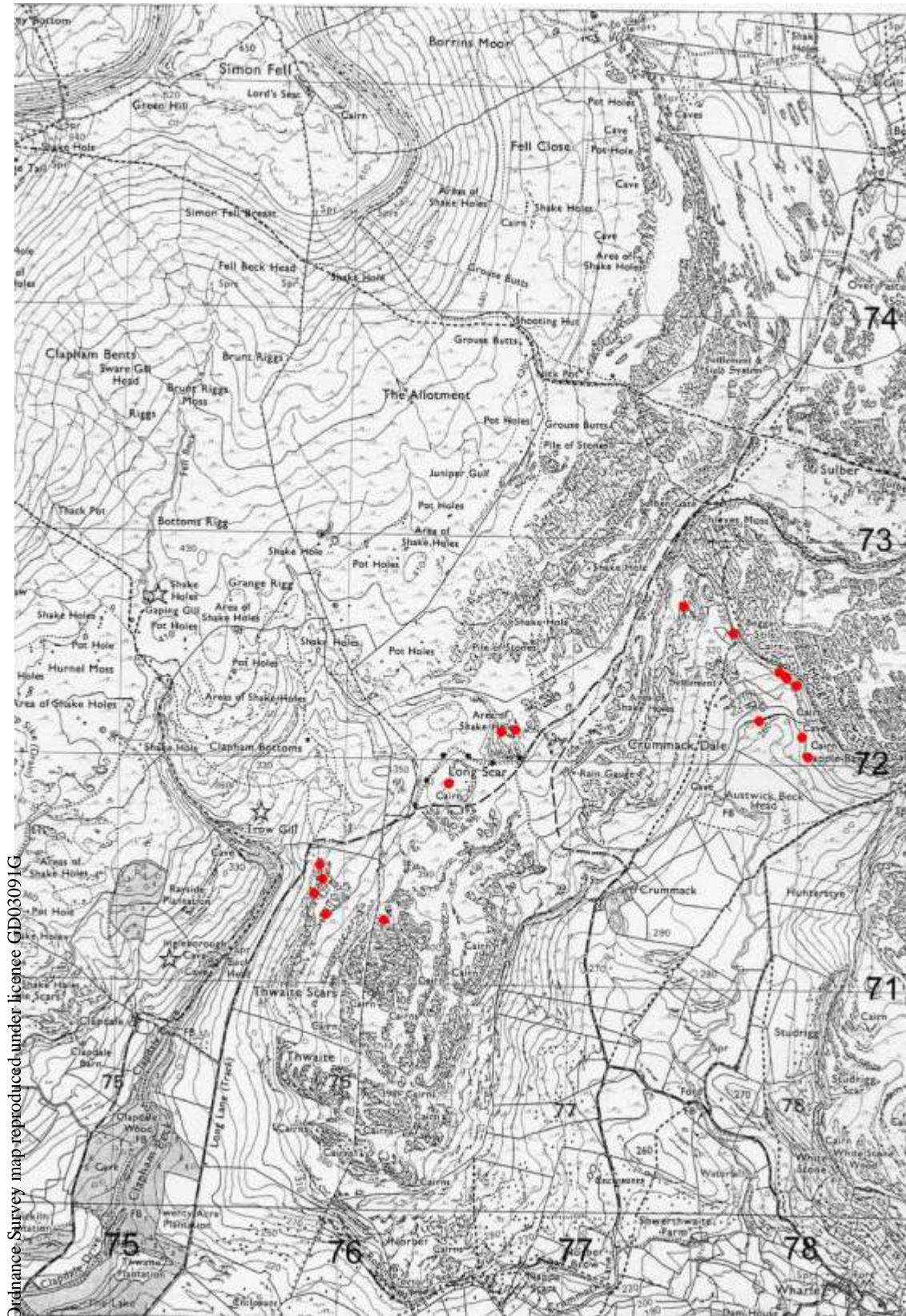
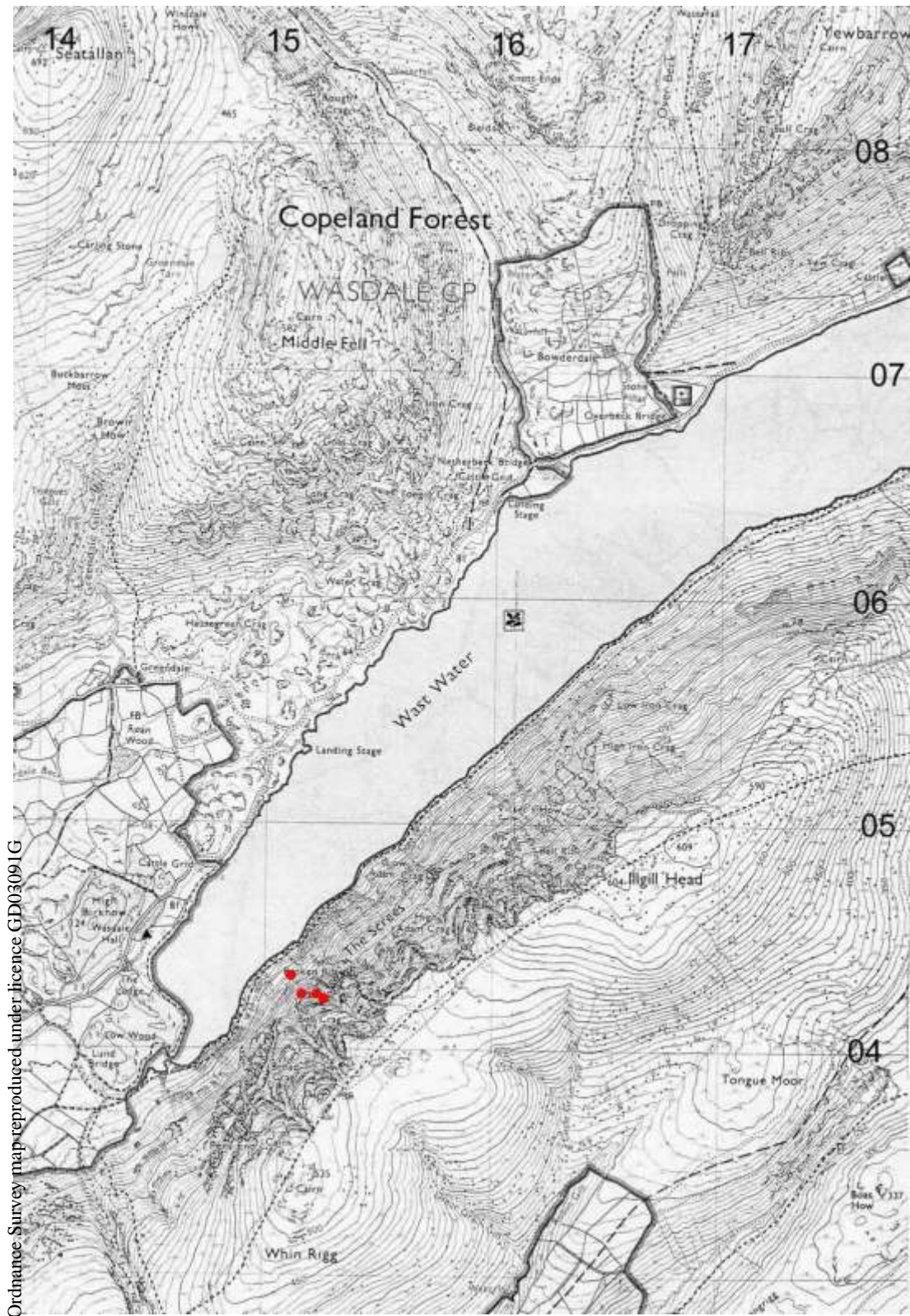


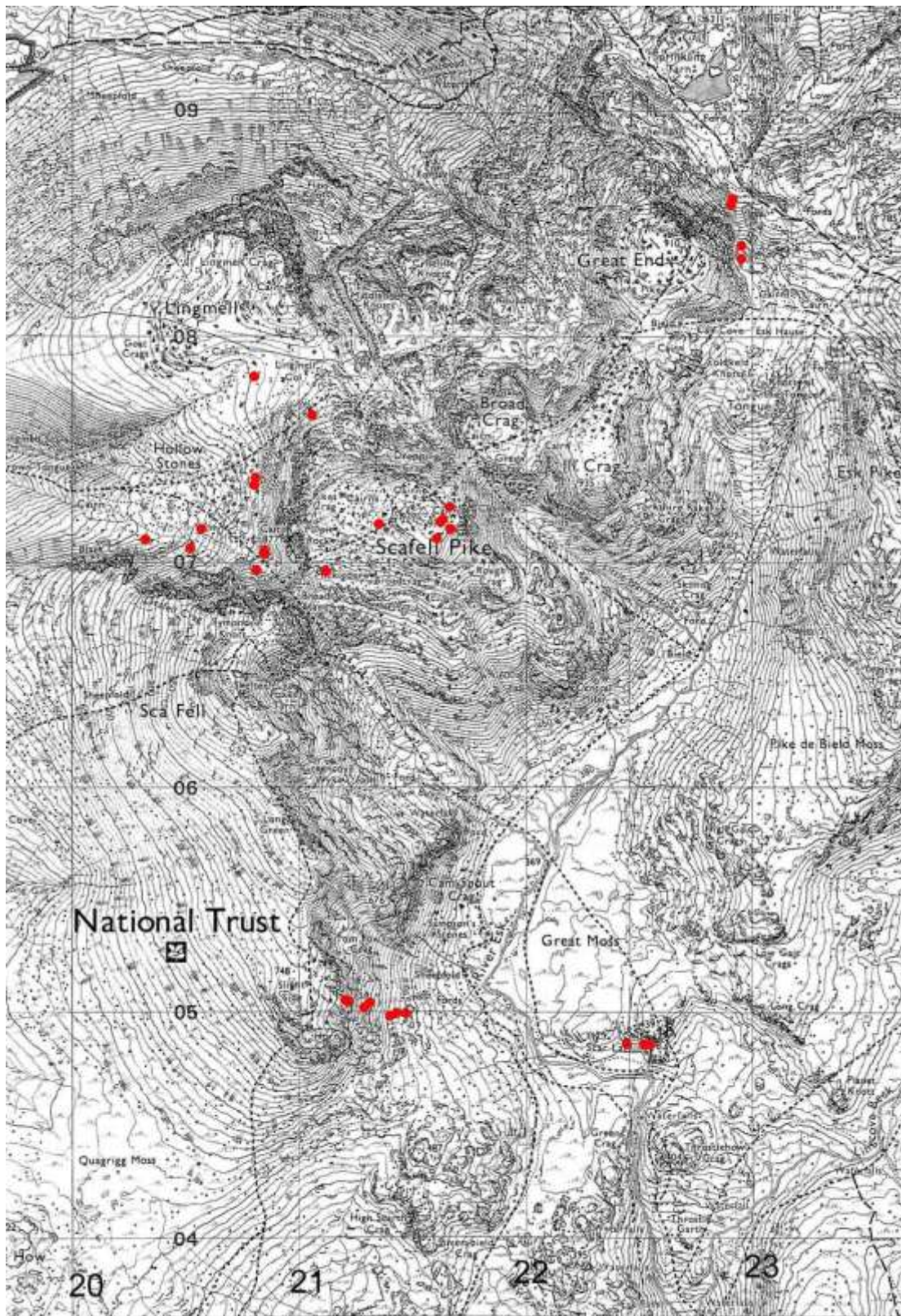
Figure 19: Ingleborough (east): distribution of quadrat samples



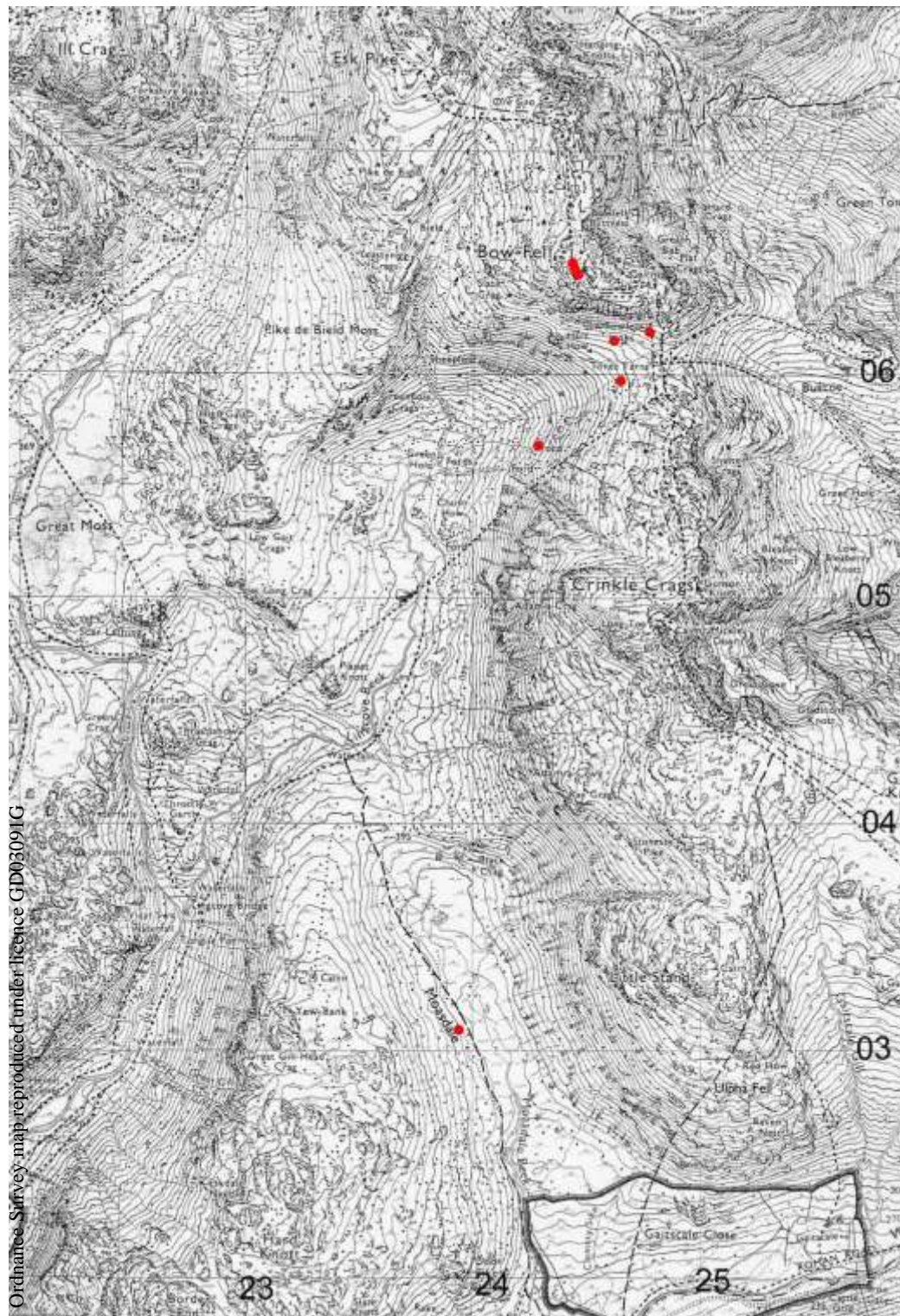


**Figure 20:** Lake District (Wast Water): distribution of quadrat samples

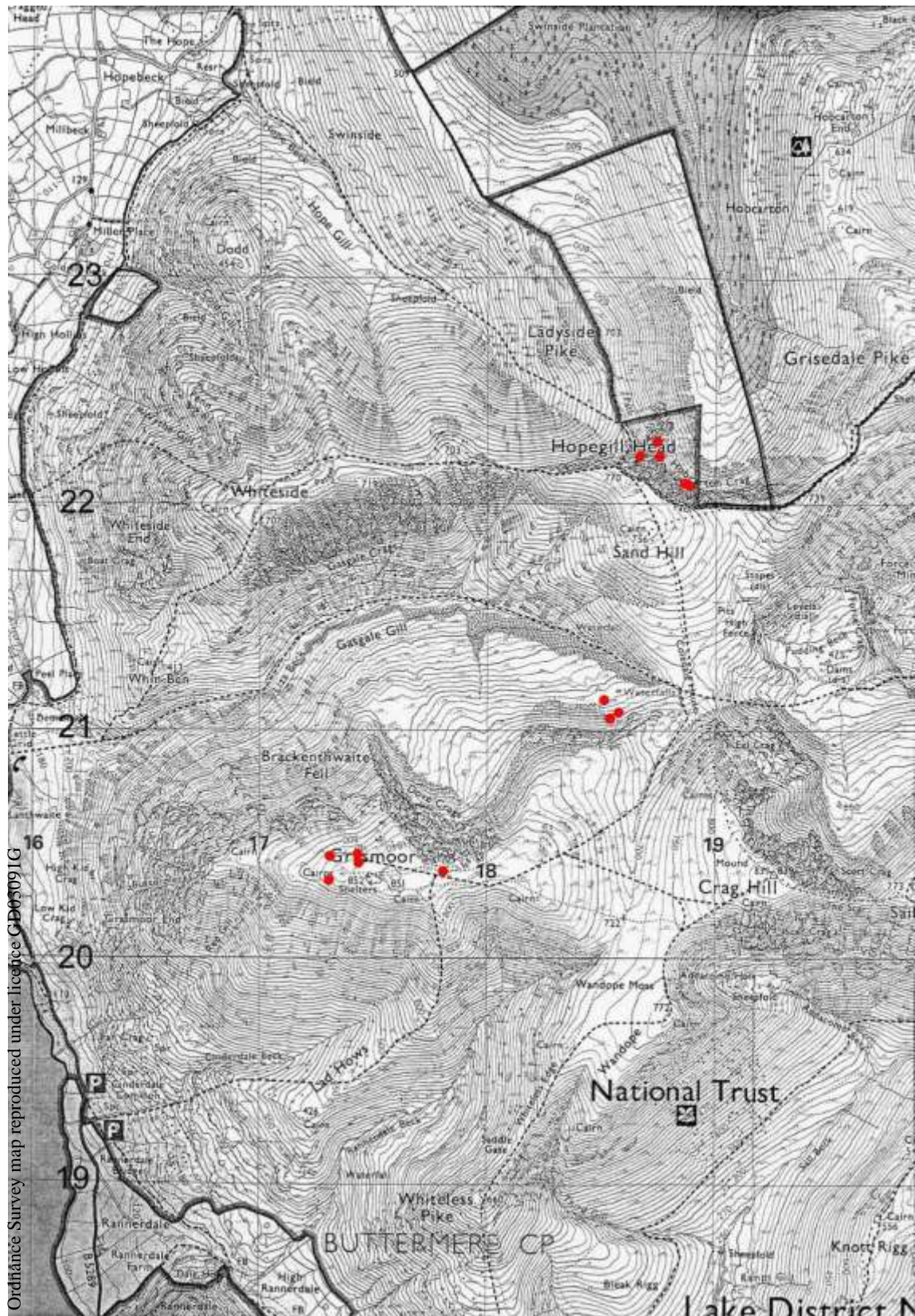
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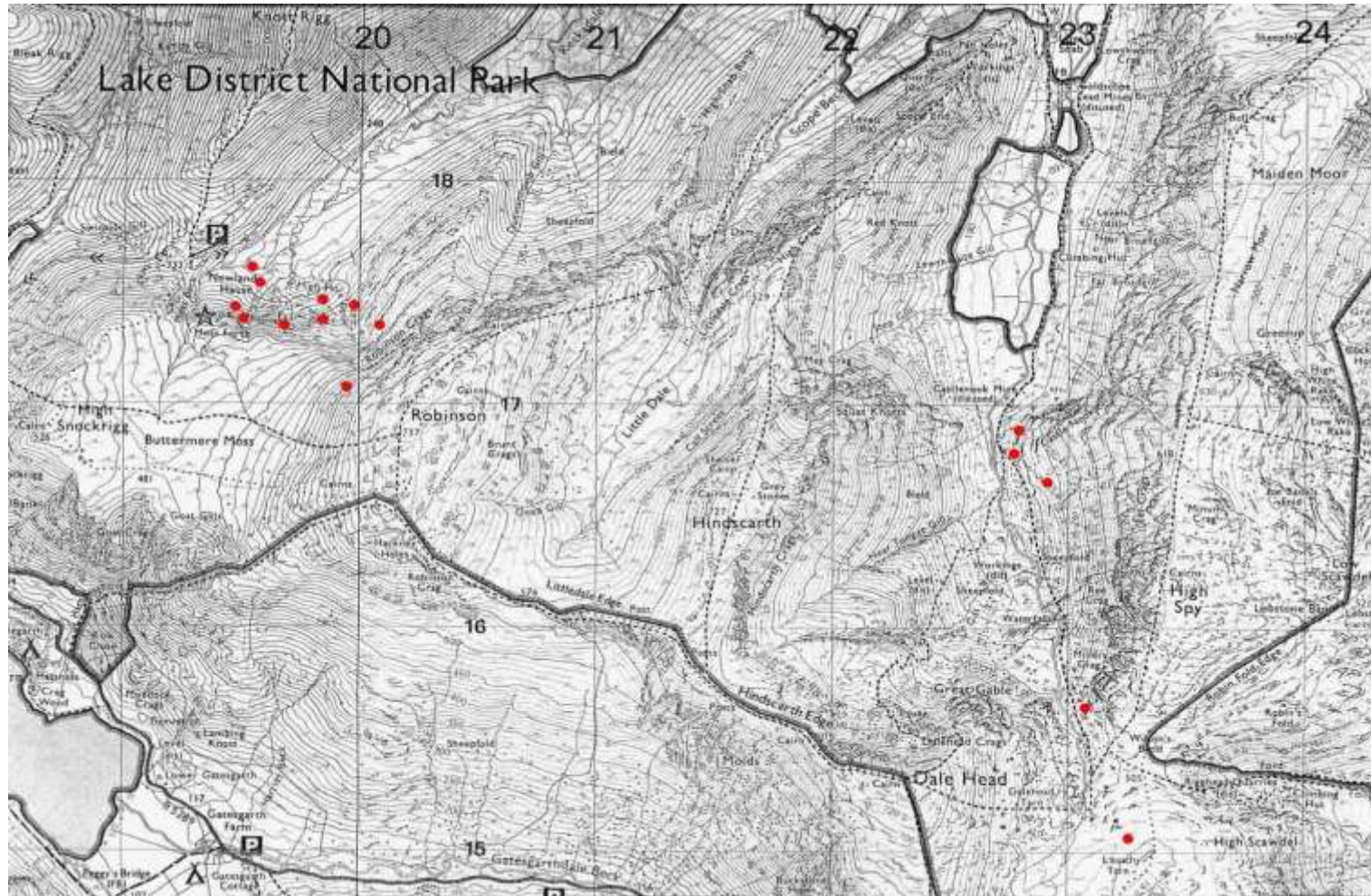
**Figure 21:** Lake District (Scafell Pike, Eskdale): distribution of quadrat samples



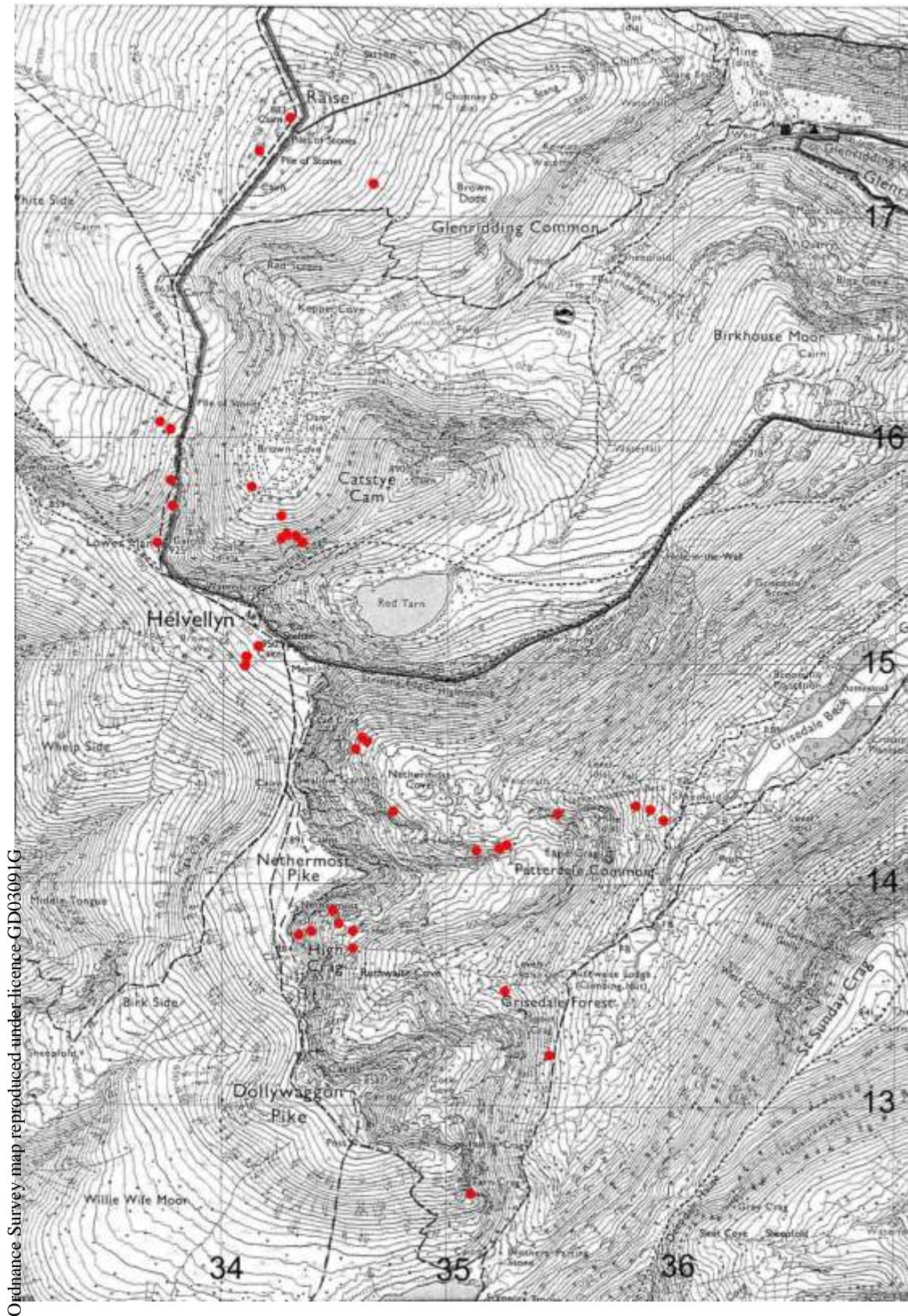
**Figure 22:** Lake District (Bow Fell): distribution of quadrat samples



**Figure 23:** Lake District (Grasmoor): distribution of quadrat samples



**Figure 24:** Lake District (Dale Head): distribution of quadrat samples



**Figure 25:** Lake District (Helvellyn): distribution of quadrat samples

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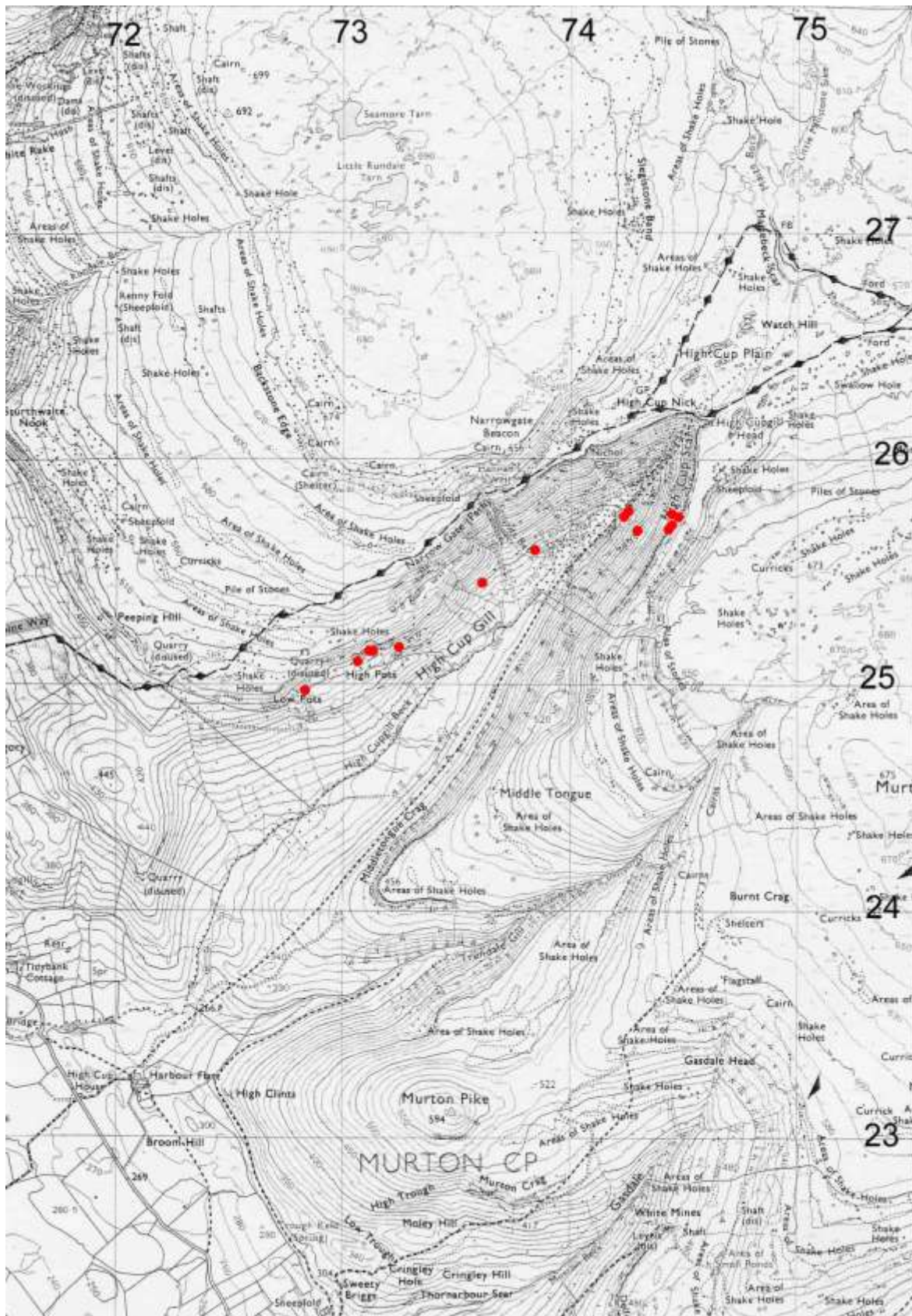
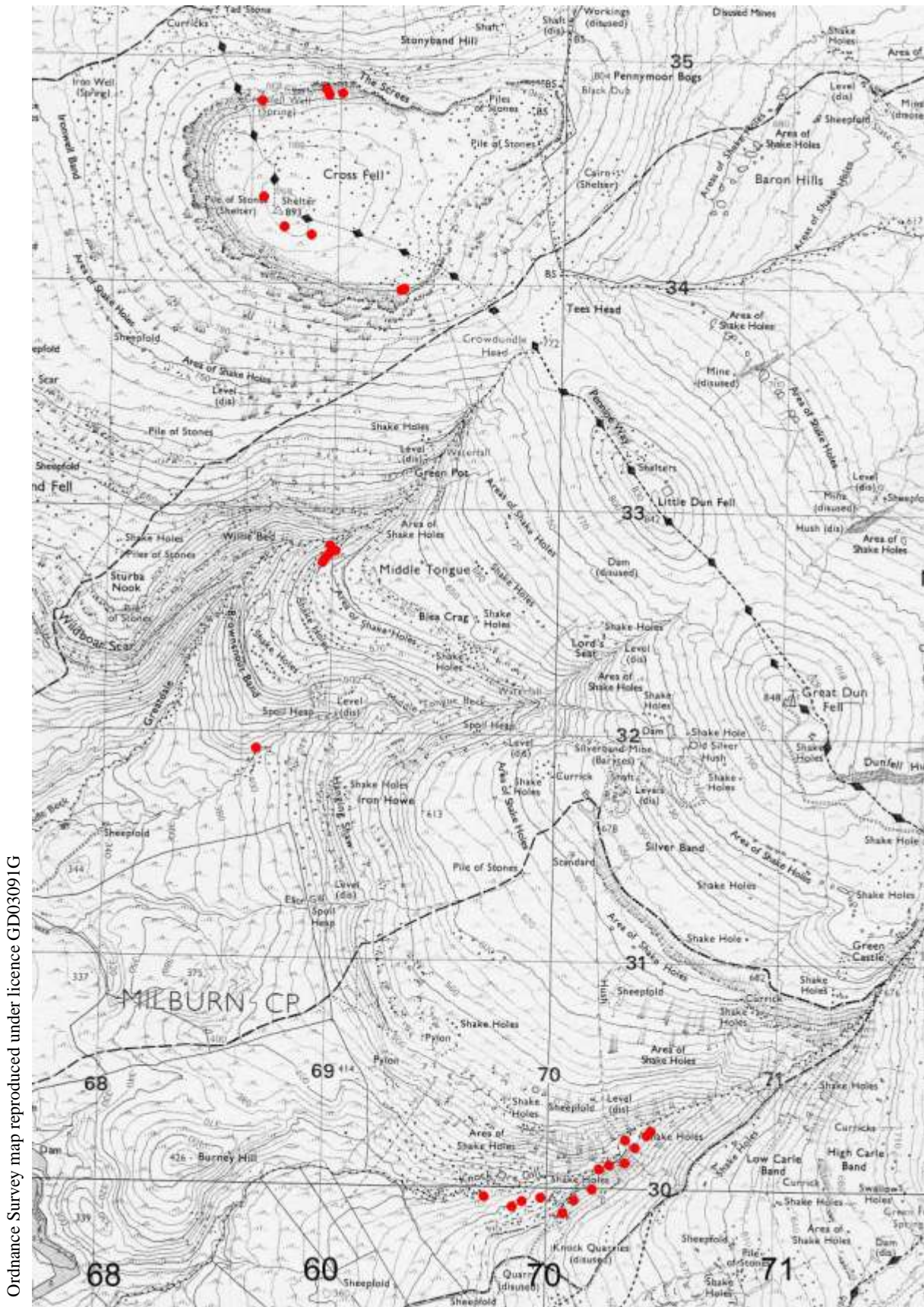


Figure 26: North Pennines (High Cup Gill): distribution of quadrat samples



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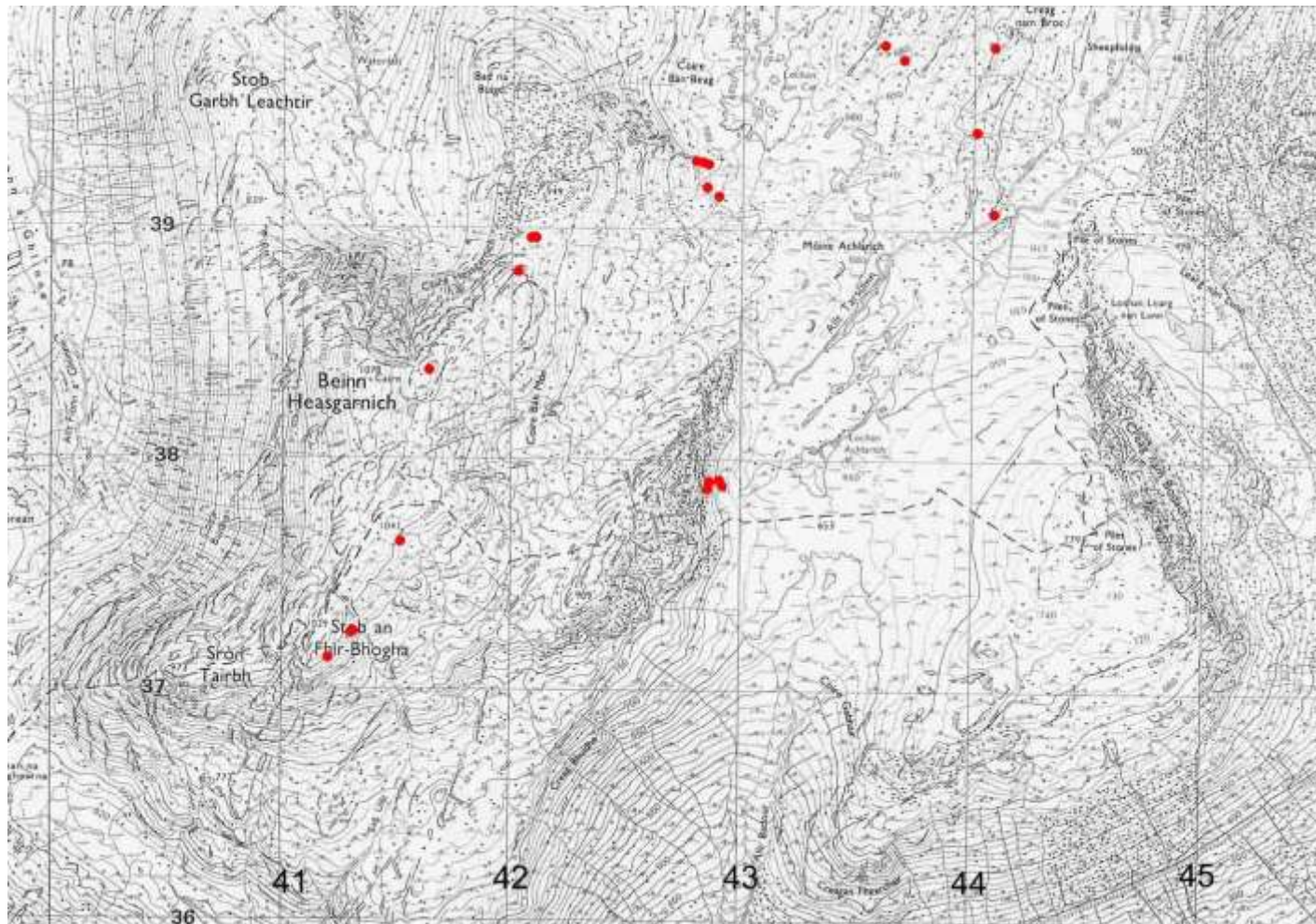
**Figure 27:** North Pennines (Cross Fell, Knock Ore Gill): distribution of quadrat samples





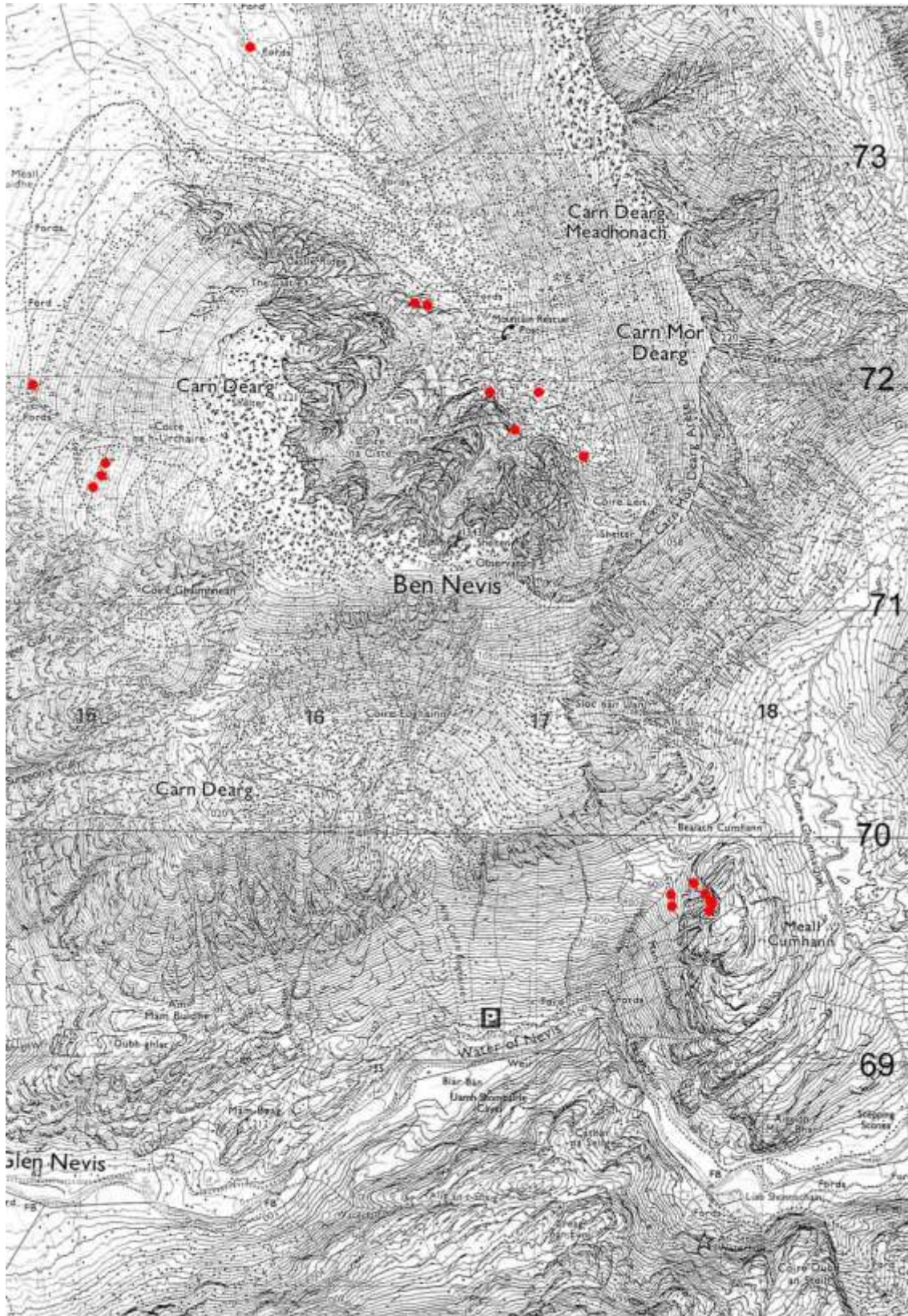
**Figure 28:** North Pennines (Falcon Clints): distribution of quadrat samples

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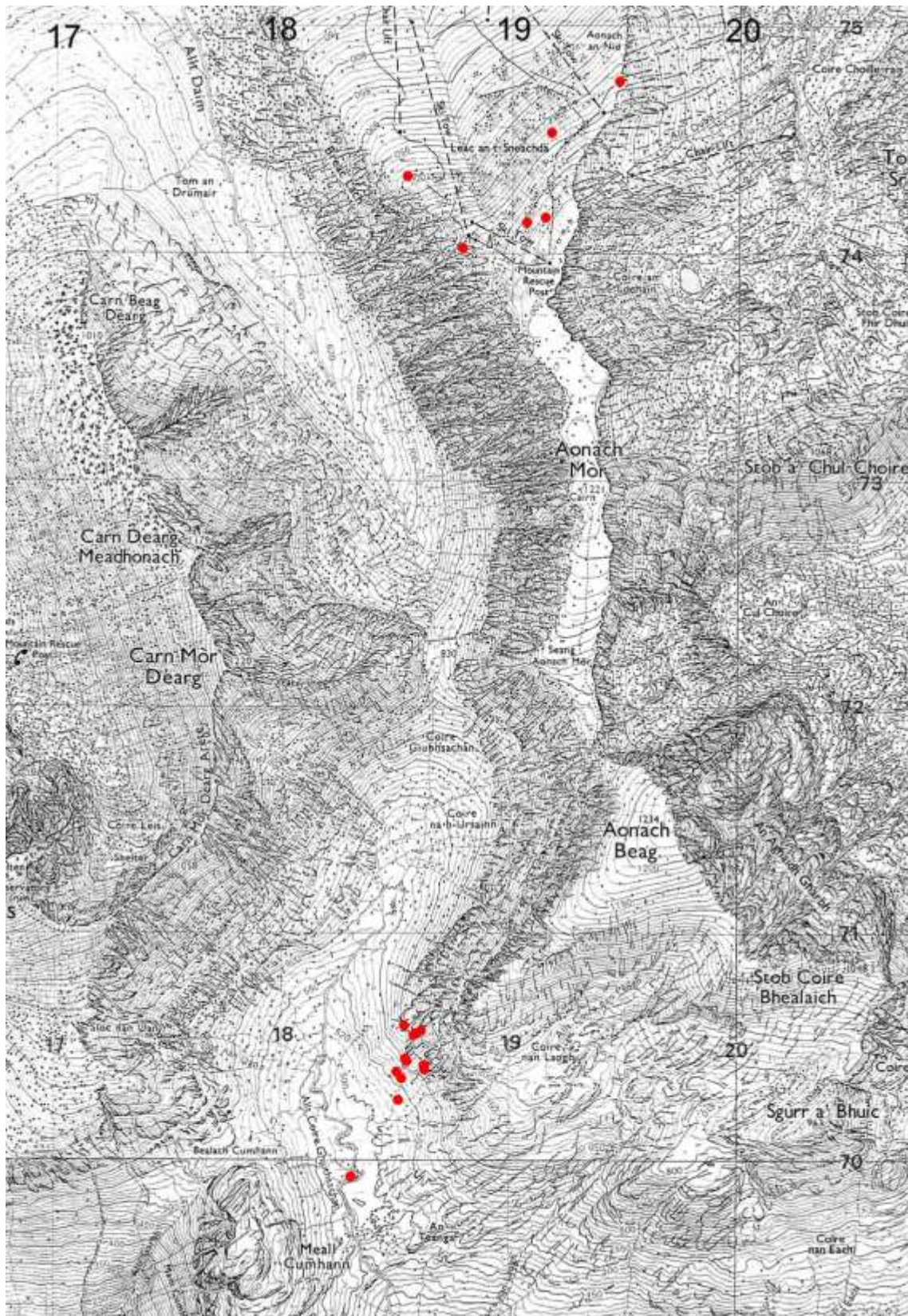
**Figure 29:** Beinn Heasgarnich: distribution of quadrat samples

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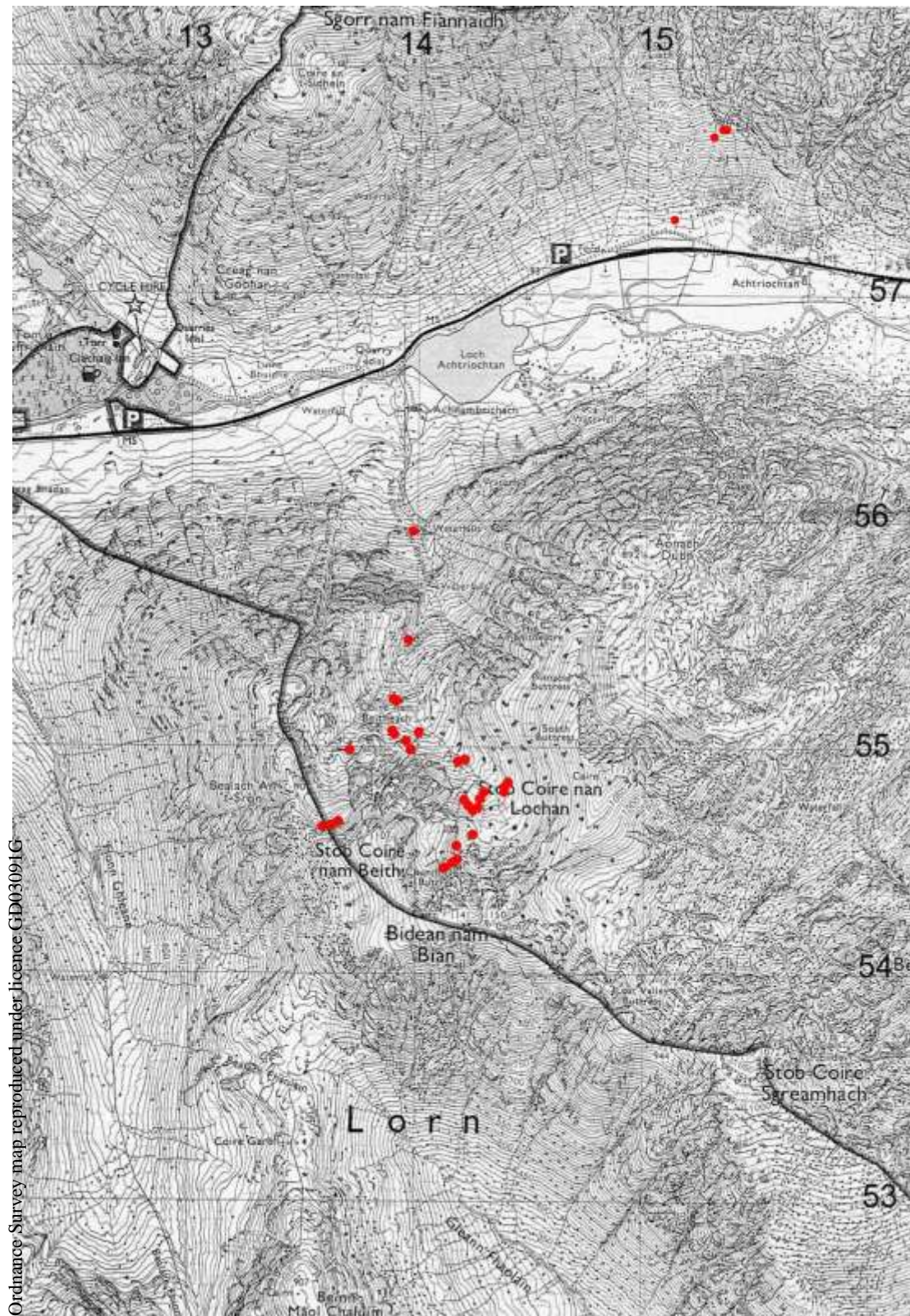


**Figure 30:** Ben Nevis (west): distribution of quadrat samples

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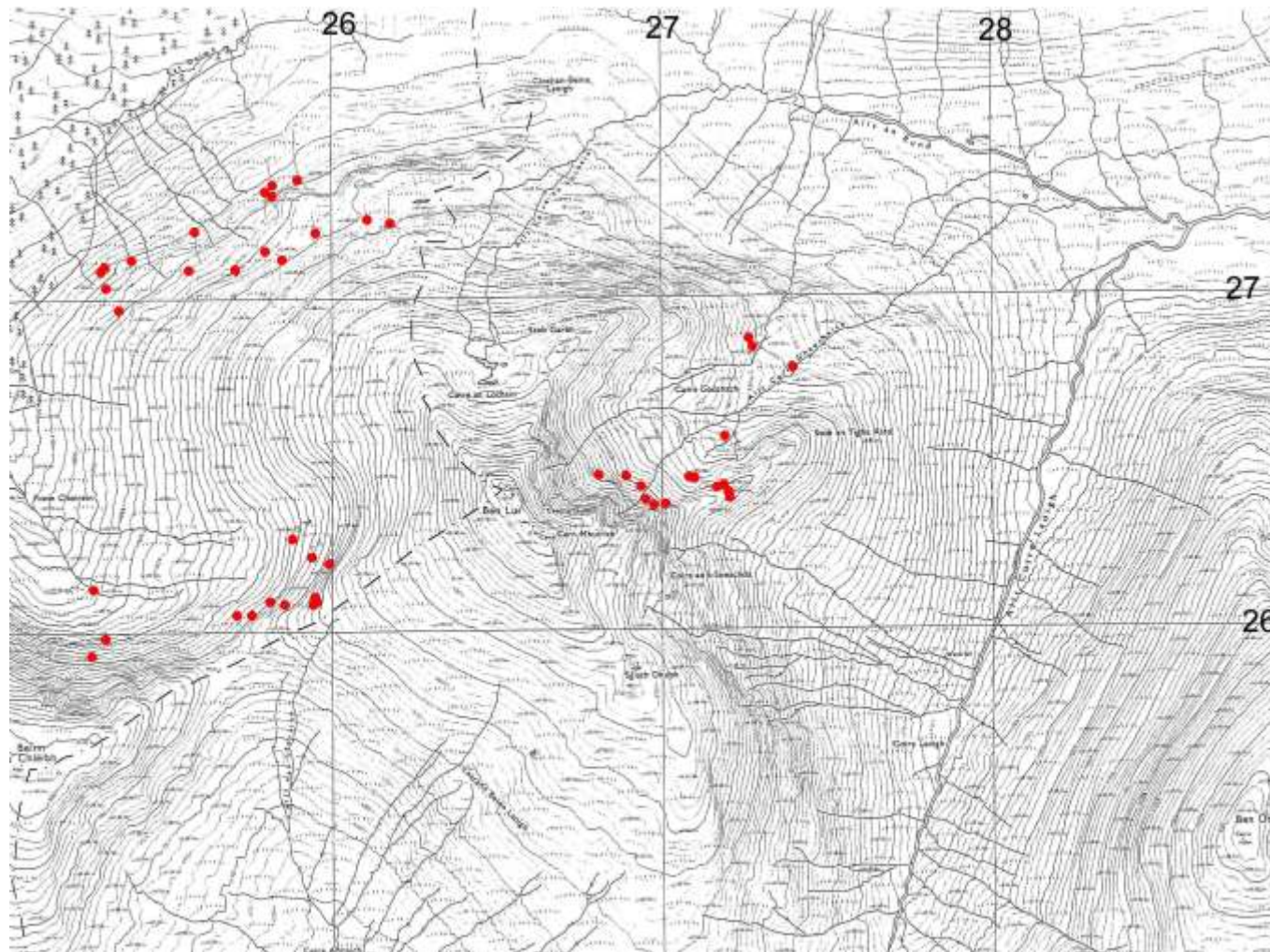
**Figure 31:** Ben Nevis (east): distribution of quadrat samples



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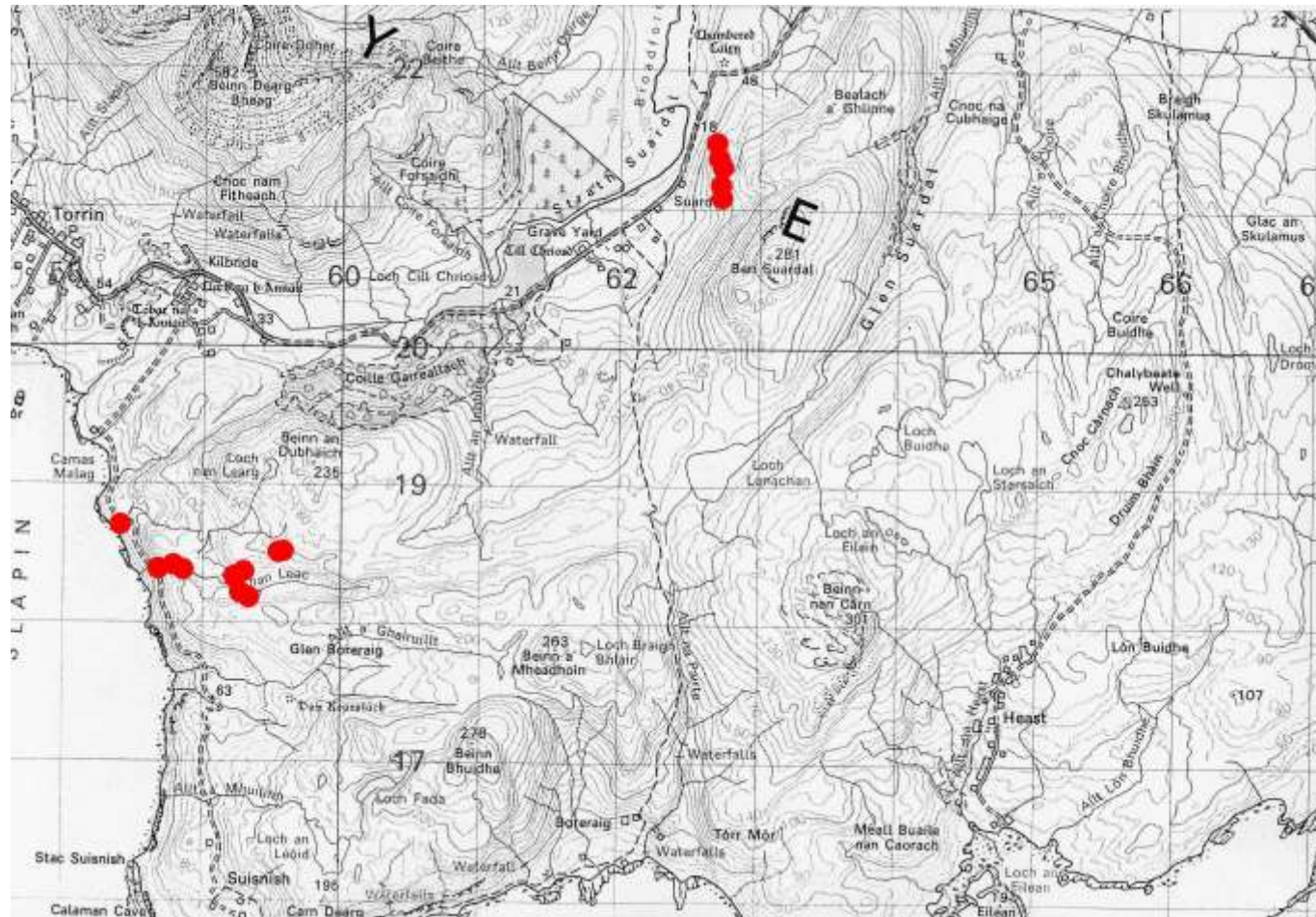
**Figure 32:** Glen Coe: distribution of quadrat samples

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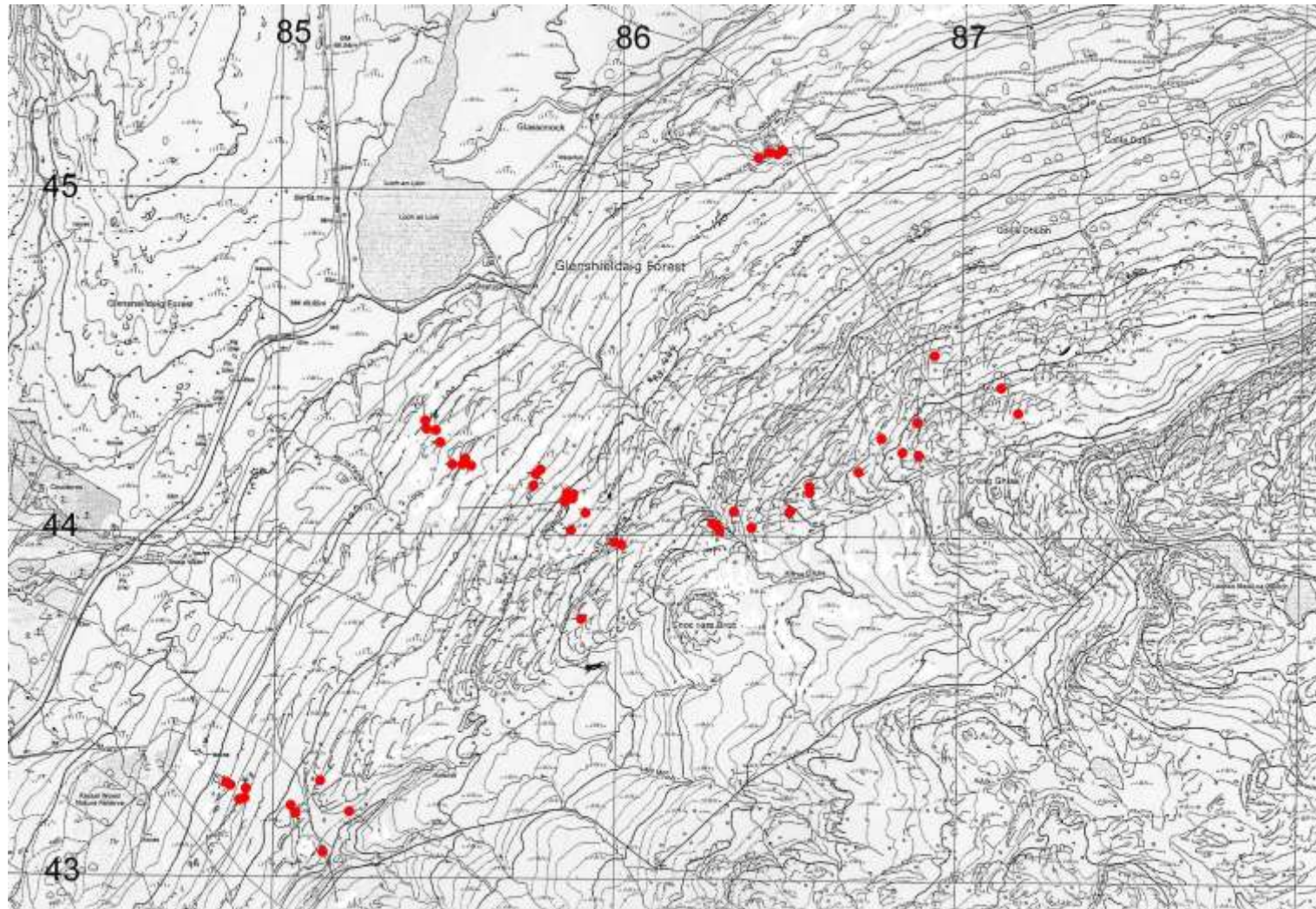
**Figure 33:** Ben Lui: distribution of quadrat samples

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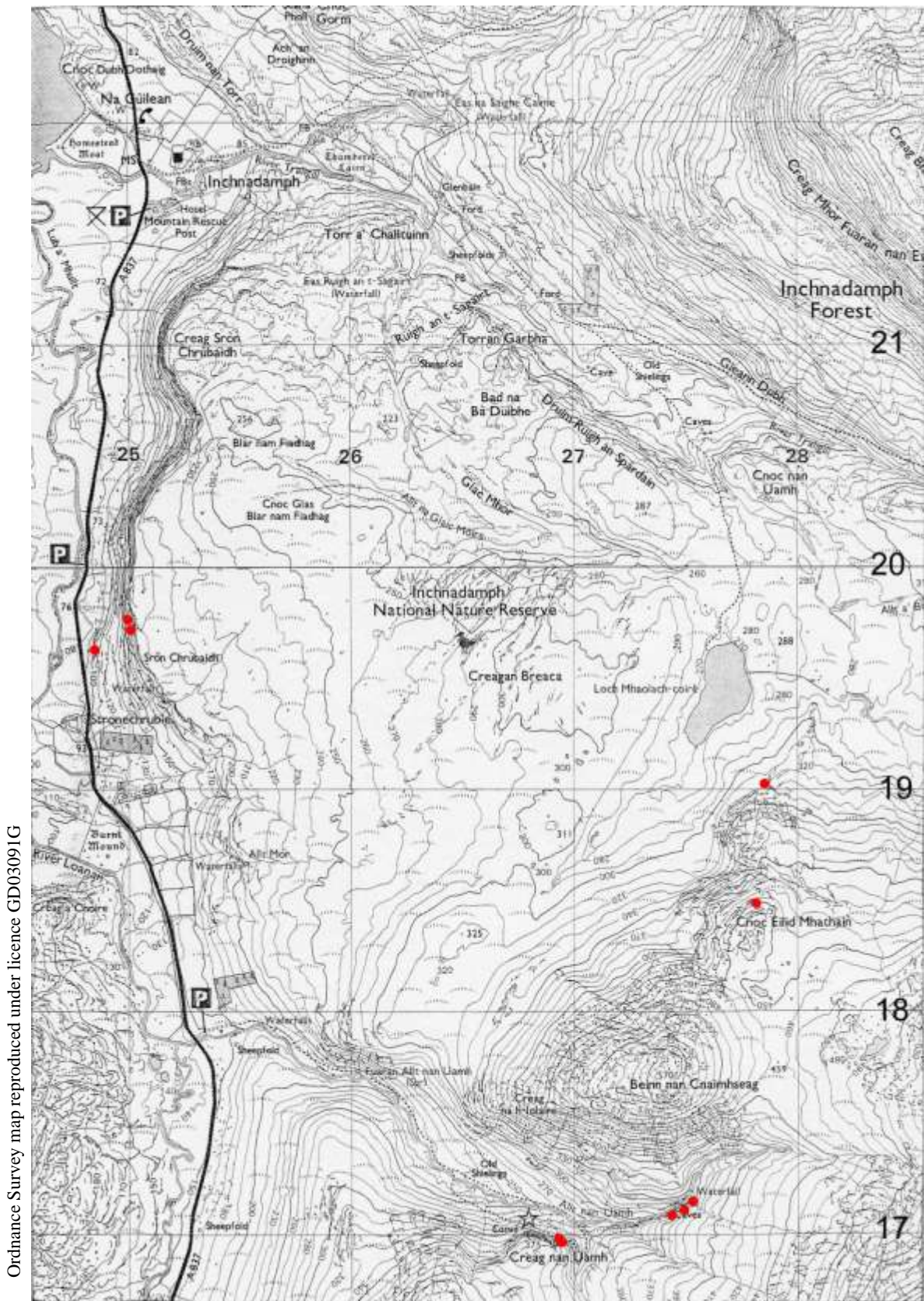
**Figure 34:** Strath: distribution of quadrat samples

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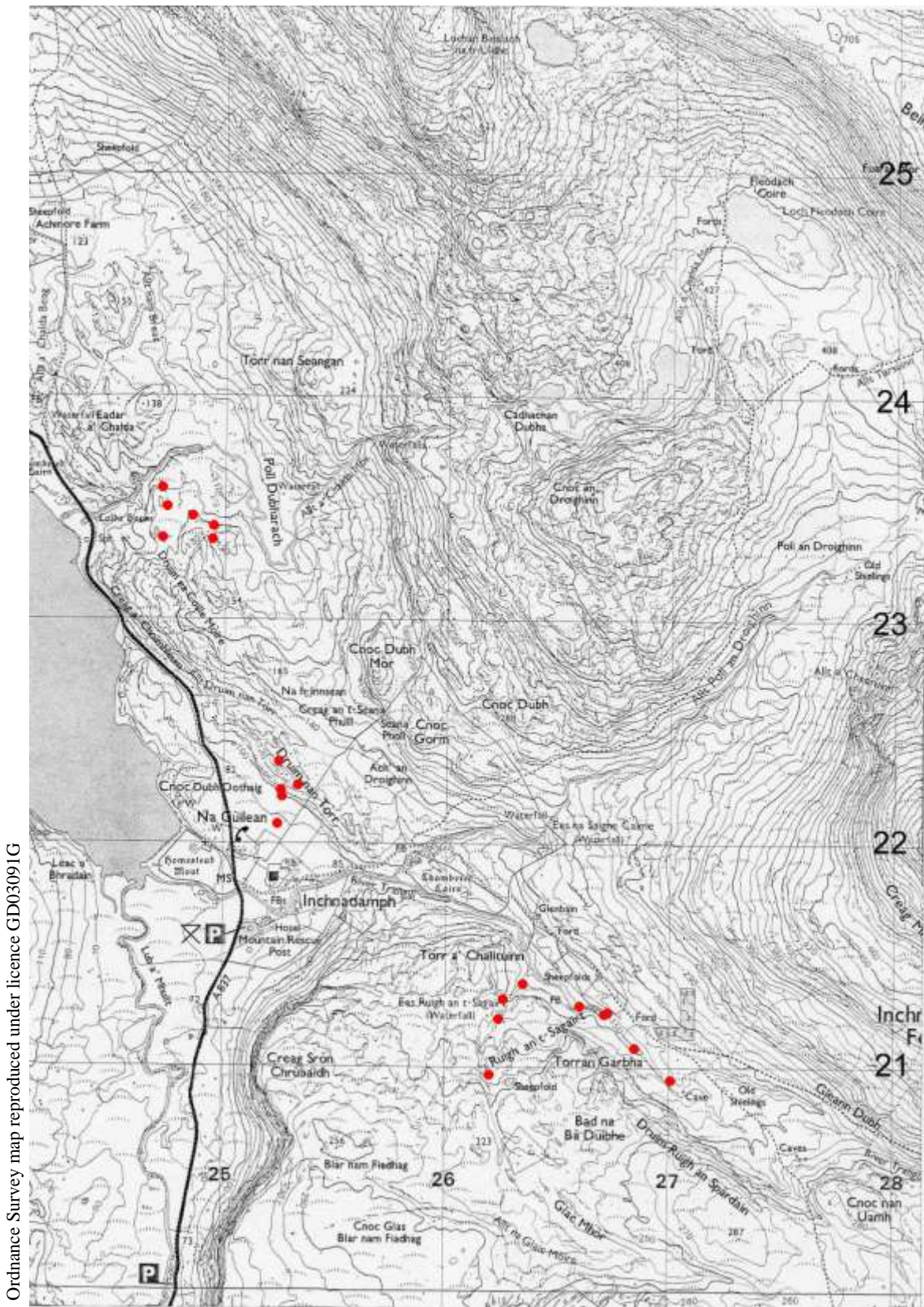
**Figure 35:** Rassel: distribution of quadrat samples





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**Figure 36:** Inchnadamph (south): distribution of quadrat samples



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Figure 37: Inchnadamph (north): distribution of quadrat samples

Pseudospecies Level 2 was given ten times the weight during analysis than Level 1, and Levels 3 and 4 were given twenty times the weight.

The data set for all sites was too large to combine into a single analysis. Consequently, the data were first broken manually into groups, and each of these analysed in turn. The initial trials carried out previously had suggested that the pattern of divisions produced by TWINSpan often corresponded broadly to provisional communities identified subjectively in the field, so this initial manual sorting appeared to be justified. However, closely following the results of TWINSpan to delimit communities was found to give unsatisfactory results, as many individual samples were considered as misclassified. All the samples from limestone were analysed together, and subgroups produced by that analysis were reanalysed in turn. The samples from siliceous rock were divided manually (by sorting hard copies of individual quadrat records) into 19 groups, each comprising a set of samples considered to be floristically and/or ecologically similar. Then, one of these groups was chosen (that corresponding to SS A1 and SS A2 was considered a convenient group to begin with) and analysed by TWINSpan. The main trends and groupings suggested in the table were identified, and the characteristic species of each group were identified. The quadrat samples used for that analysis were manually sorted according to the groupings suggested by TWINSpan, and as a result of this process the groupings were either rejected, or accepted as the basis of one or more provisional nodes. For each provisionally accepted node, a floristic table was prepared in Excel. Samples not adequately classified in the analysis, or which appeared to deviate too greatly from the others, but added to another, related group for the next analysis. In this way a series of overlapping analyses was carried out, and many samples were included in more than one analysis. Manual sorting was continued by inspection and reordering of the floristic tables, until the final communities were delimited.

In summary, the analysis comprised the following stages.

1. All the quadrat records were sorted manually into groups of broadly similar samples.
2. Each of the groups was analysed in turn and a TWINSpan table produced.
3. The main trends and groupings suggested in the TWINSpan table were identified and the characteristic species of each group were identified.
4. The quadrat samples in the analysed group were manually sorted according to the groupings suggested by TWINSpan. Floristic tables were prepared in Excel, and provisional communities were delimited.
5. Samples not adequately classified were added to related groups and reanalysed.
6. Manual readjustment was continued until the final communities were produced.

## **2.4 Data archive**

All the original quadrat data and the complete floristic tables for each community are supplied in CD format together with this report. Small discrepancies may have arisen between the quadrat data and tables, due to changes in identification during the project, in which case the individual quadrat records should be regarded as definitive. The following files are supplied:

1. A FilemakerPro database containing all quadrat records used in the report.
2. An Excel file prepared by exporting from the FilemakerPro file: this is not at all user-friendly but is supplied in case the FilemakerPro file cannot be accessed.
3. Excel files containing all the quadrat data tabulated by community.

### 3. Results

#### 3.1 General

A total of 1198 samples were collected during the project, and a further 341 were available from other sites, giving a total of 1539 samples available for analysis. This number does not include a very few samples which were abandoned due to problems with identification (where vouchers collected in the field proved inadequate, for instance).

Of the 1539 samples analysed, 78 remained unplaced in a community (5% of the total samples). In most cases these did not appear to represent additional communities, or transitions between communities, but instead often appeared to represent mixtures.

A total of 83 provisional communities were identified, of which 56 occur on siliceous rock (sometimes slightly calcareous) while 27 are confined to limestone and highly calcareous siliceous rock. Three communities were based on samples collected outside the 14 SACs visited. The provisional communities were assigned a code number and are described below. Code numbers of communities are prefixed either by 'SS' (Saxicolous Siliceous) or 'SL' (Saxicolous Limestone) to avoid confusion with NVC codes. The additional letters used in the codes of siliceous samples result from an early sorting of samples into groups during analysis and have been retained for convenience as they aid memory (they often draw together communities into similar groups: for instance communities labelled 'K' are from rain-sheltered habitats). Table 3 lists the communities, with a very simplified indication of some ecological factors, to allow a rapid overview of the types of community. Table 4 lists communities of siliceous rock recorded at each site while Table 5 lists communities of limestone recorded at each site. A floristic table is presented for each community. Tables 6-61 give the floristic tables for communities of siliceous rock, while Tables 62-88 give the floristic tables for communities of limestone. Where four or fewer samples were available, data for all the samples in that community are tabulated. In the floristic tables, lichens, bryophytes and algae are listed together in order of frequency and abundance, followed by rock or soil, and then vascular plants.

The frequency of each species in a community is indicated by the convention used in Rodwell (1991-2000):

V	81-100% frequency in samples	constant
IV	61-80%	constant
III	41-60%	frequent
II	21-40%	occasional
I	1-20%	scarce

**Table 3:** List of communities on siliceous rocks and on limestone and other highly calcareous rocks divided into broad categories with ecological factors given on a three-point scale\*

Siliceous rocks (SS)		Dominant group	Base-richness	Degree of run-off	Nutrient-enrichment	Heavy metal richness
Community code	Broad habitat groups/Community name					
	<b>Lichen-dominated communities of exposed dry rock</b>					
SS A1	<i>Rhizocarpon geographicum-Fuscidea lygaea</i> community	Lichens	+	++	++	+
SS A2	<i>Rhizocarpon geographicum-Miriquidica leucophaea</i> community	Lichens	+	++	++	+
SS A3	<i>Lecanora gangaleoides-Fuscidea cyathoides</i> community	Lichens	+	+ / ++	++	+
SS B1	<i>Fuscidea kochiana-F. intercincta</i> community	Lichens	+	+ / ++	+	+
SS B2	<i>Fuscidea praeruptorum-F. cyathoides</i> community	Lichens	+	++	++	+
SS B3	<i>Fuscidea lygaea-Porpidia tuberculosa</i> community	Lichens	+	++	++	+
SS C1	<i>Pertusaria corallina-P. pseudocorallina</i> community	Lichens	+	++	++	+
SS D1	<i>Porpidia tuberculosa-Rhizocarpon reductum</i> community	Lichens	+	++	++	+
SS D2	<i>Acarospora sinopica-Rhizocarpon oederi</i> community	Lichens	+	++	++	+++
SS D3	<i>Acarospora fuscata-A. nitrophila</i> community	Lichens	+	++	+++	+
SS D5	<i>Porpidia macrocarpa-P. striata</i> community	Lichens	+	++	++	+
SS D8	<i>Porpidia tuberculosa</i> community	Lichens	+	++	++	+
SS D9	<i>Lecidea promixta-Trapelia involuta</i> community	Lichens	+	++	++	+
SS D4	<i>Lecidea lithophila</i> community	Lichens	+	++	++	+
SS H1	<i>Candelariella coralliza-Aspicilia caesiocinerea</i> community	Lichens	+	++	+++	+
	<b>Lichen-dominated communities containing macrolichens</b>					
SS F1	<i>Rhizocarpon geographicum-Umbilicaria cylindrica</i> community	Lichens	+	++	++	+
SS F2	<i>Parmelia saxatilis-P. omphalodes</i> community	Lichens	+	++	++	+

SS F3	<i>Xanthoparmelia conspersa</i> community	Lichens	+	++	+++	+
SS F4	<i>Lasallia pustulata</i> community	Lichens	+	++	+++	+
SS F5	<i>Umbilicaria deusta</i> community	Lichens	+	++/+++	++	+
SS T1	<i>Ramalina siliquosa-R. subfarinacea</i> community	Lichens	+	++	++	+
	<b>Lichen-dominated communities of rain-sheltered rocks</b>					
SS K1	<i>Lecanora ecorticata</i> community	Lichens	+	+	++	+
SS K2	<i>Lepraria incana-Cystocoleus ebeneus</i> community	Lichens	+	+	++	+
SS K3	<i>Lecanactis latebrarum</i> community	Lichens	+	+	++	+
SS K4	<i>Lepraria humida-Diplophyllum albicans</i> community	Lichens	+	+	++	+
SS K5	<i>Opegrapha gyrocarpa-Enterographa zonata</i> community	Lichens	+	+	++	+
SS K6	<i>Tylothallia biformigera-Opegrapha gyrocarpa</i> community	Lichens	+	+	++	+
SS K8	<i>Lecanora orosthea-Enterographa zonata</i> community	Lichens	+	+	++	+
SS K7	<i>Coccotrema citrinescens-Porpidia tuberculosa</i> community	Lichens	+	+	++	+
SS K9	<i>Lecanora epanora-Lepraria elobata</i> community	Lichens	+	+	++	+++
SS K10	<i>Psilolechia leprosa</i> community	Lichens	+	+	++	+++
	<b>Lichen and bryophyte dominated communities of moist or flushed, exposed rocks</b>					
SS D6	<i>Porpidia irrigua-Rhizocarpon lavatum</i> community	Lichens	+	+++	++	+
SS D7	<i>Ainoa mooreana-Marsupella emarginata</i> community	Lichens	+	+++	++	+
SS E1	<i>Andreaea rupestris-Ionaspis odora</i> community	Mixed	+	++	++	+
SS E2	<i>Andreaea rupestris-Stereocaulon vesuvianum</i> community	Mixed	+	++	++	+
SS E3	<i>Andreaea rupestris-Gymnomitrium</i> community	Bryophytes	+	++/+++	++	+
SS L1	<i>Andreaea rothii-Porpidia irrigua</i> community	Mixed	+	+++	++	+
SS M	<i>Andreaea alpina-Marsupella emarginata</i> community	Bryophytes	+	+++	++	+
SS L2	<i>Racomitrium aquaticum</i> community	Bryophytes	+	+++	++	+
SS O2	<i>Philonotis fontana-Scapania undulata</i> community	Bryophytes	+	+++	++	+

	<b>Bryophyte-dominated communities of exposed, dry rocks</b>					
SS F6	<i>Campylopus flexuosus</i> - <i>Barbilophozia floerkei</i> community	Bryophytes	+	++	++	+
SS F7	<i>Racomitrium fasciculare</i> - <i>R. heterostichum</i> community	Bryophytes	+	++	++	+
	<b>Bryophyte-dominated communities of crevices and block scree</b>					
SS P1	<i>Diplophyllum albicans</i> - <i>Hypnum jutlandicum</i> community	Bryophytes	+	+ / ++	++	+
SS P2	<i>Hypnum jutlandicum</i> - <i>Mnium hornum</i> community	Bryophytes	+	+ / ++	++	+
SS O1	<i>Pellia epiphylla</i> - <i>Mnium hornum</i> community	Bryophytes	+	+ / ++	++	+
SS P3	<i>Mylia taylorii</i> - <i>Racomitrium lanuginosum</i> community	Bryophytes	+	++	++	+
SS Q1	<i>Racomitrium lanuginosum</i> community	Bryophytes	+	++	++	+
	<b>Algal community</b>					
SS I1	<i>Trentepohlia iolithus</i> community	Alga	+	++	++	+
	<b>Bryophyte and lichen dominated communities of slightly calcareous rocks</b>					
SS N1	<i>Amphidium mougeotii</i> - <i>Anoetangium aestivum</i> community	Bryophytes	++	++ / +++	++	+
SS N2	<i>Blindia acuta</i> - <i>Amphidium mougeotii</i> community	Bryophytes	++	++ / +++	++	+
SS N3	<i>Grimmia torquata</i> community	Bryophytes	++	++ / +++	++	+
SS F8	<i>Frullania tamarisci</i> - <i>Schistidium strictum</i> community	Bryophytes	++	++ / +++	++	+
SS V1	<i>Staurothele succedens</i> - <i>Thelidium papulare</i> community	Lichens	++	++ / +++	++	+
SS W1	<i>Dermatocarpon intestiniforme</i> - <i>Collema flaccidum</i> community	Lichens	++	++ / +++	++	+
SS X1	<i>Catapyrenium lachneum</i> - <i>Collema glebulentum</i> community	Lichens	++	++ / +++	++	+
	<b>Woodland community of bryophytes and lichens</b>					
SS U1	<i>Isothecium myosuroides</i> - <i>Sphaerophorus globosus</i> community	Mixed	+	++	++	+

Community code	Broad habitat groups/Community name					
	Lichen-dominated communities of rain-sheltered rocks					
SL 1	<i>Caloplaca saxicola-Lecanora albescens</i> community	Lichens	+++	+	++	+
SL 2	<i>Dirina massiliensis-Caloplaca saxicola</i> community	Lichens	+++	+	++	+
SL 3	<i>Botryolepraria lesdainii-Leproplaca chrysodeta</i> community	Lichens	+++	+	++	+
SL 4	<i>Lepraria nivalis</i> community	Lichens	+++	+	++	+
SL 24	<i>Lepraria eburnea</i> community	Lichens	+++	+	++	+
SL 7	<i>Caloplaca citrina</i> community	Lichens	+++	+	++	+
	Lichen-dominated communities of exposed rocks					
SL 5	<i>Aspicilia calcarea-Caloplaca citrina</i> agg. community	Lichens	+++	++	++	+
SL 6	<i>Aspicilia calcarea-Caloplaca flavescens</i> community	Lichens	+++	++	++	+
SL 11	<i>Protoblastenia rupestris-Verrucaria baldensis</i> community	Lichens	+++	++	++	+
SL 13	<i>Hymenelia prevostii-Porina linearis</i> community	Lichens	+++	++	++	+
SL 14	<i>Gyalecta jenensis-Opegrapha dolomitica</i> community	Lichens	+++	++	++	+
SL 15	<i>Hymenelia epulotica-Opegrapha rassalensis</i> community	Lichens	+++	++	++	+
SL 22	<i>Metamelaena umbonata-Porina linearis</i> community	Lichens	+++	++	++	+
SL 23	<i>Porina linearis-Belonia nidarosiensis</i> community	Lichens	+++	++	++	+
SL 20	<i>Lempholemma cladodes-L. botryosum</i> community	Lichens	+++	++	++	+
SL 9	<i>Phaeophyscia orbicularis-Xanthoria parietina</i> community	Lichens	+++	++	+++	+
SL 10	<i>Caloplaca decipiens-Xanthoria calcicola</i> community	Lichens	+++	++	+++	+
	Bryophyte and macrolichen dominated communities					
SL 12	<i>Schistidium crassipilum-Collema fuscovirens</i> community	Mixed	+++	++	++	+
SL 8	<i>Syntrichia intermedia-Homalothecium sericeum</i> community	Bryophytes	+++	++	++	+
SL 17	<i>Homalothecium sericeum-Porella platyphylla</i> community	Bryophytes	+++	++	++	+
SL 16	<i>Hypnum lacunosum-Tortella tortuosa</i> community	Bryophytes	+++	++	++	+
SL 25	<i>Ctenidium molluscum</i> community	Bryophytes	+++	++	++	+



SL 18	<i>Neckera crispa-Scapania aspera</i> community	Bryophytes	+++	++	++	+
SL 19	<i>Trichostomum brachydontium-Eurhynchium hians</i> community	Bryophytes	+++	++/+++	++	+
SL 26	<i>Gymnostomum aeruginosum</i> community	Bryophytes	+++	+++	++	+
SL 27	<i>Conocephalum conicum-Gymnostomum aeruginosum</i> community	Bryophytes	+++	+++	++	+
SL 21	<i>Seligeria trifaria</i> community	Bryophytes	+++	+++	++	+

\*Ecological factors are shown on a three-point scale (+ to +++); these are greatly oversimplified to allow an overview of the communities.

**Table 4:** Communities of siliceous rock with numbers of quadrats recorded at each site

Community code	Numbers of quadrats recorded from each site (for abbreviations, see Table 1)*										
	LM	Carn Ingli	BB	NP	LD	CI	E	BN	GC	BL	BH
SS A1	2	3	1	3	12	5	17	8	1	4	3
SS A2	2	4	10	15	5	5	7		1		1
SS A3	5	3		3	3		2				
SS B1				7	2	3	14	7	1	4	
SS B2	8										
SS B3	2	9		1	5	6	4			1	
SS C1a	2	12	4	5	2	4	10	4	1	1	2
SS C1b			1			3	2		1	1	
SS D1			3	3	23	7		4	1		
SS D2							1				
SS D3	4										
SS D4				1	1						
SS D5					1						
SS D6			2		4		1		2		1
SS D7				1		1			1	1	
SS D8			1		3					1	
SS D9			2				1				
SS E1				4	17		5	9	13	7	6
SS E2a				1	2						
SS E2b				9	2		4	1			4
SS E2c			1	1	4	1	2	1			2
SS E3				4	8	7	8	1	4	1	1
SS F1		1		4	1	1	7	2	1		
SS F2a	14	6	4	5	8	2	11	2			2
SS F2b					1	1		1			3
SS F3		2			1		3				
SS F4							2				
SS F5				1	1						
SS F6	3				3	1				1	
SS F7			5	1	7	1	4			1	1
SS F8					2		3	3	2	3	2
SS H1		8			1	1	6				
SS I1				5							
SS K1					1	1	1				
SS K2	3	2	1	2	1	1			1		
SS K3					1						
SS K4			1		2	2		1			
SS K5			5	3	5	3	5		1		1
SS K6						2	2			1	
SS K7							1		3	4	
SS K8	1				3		4				
SS K9							9				

SS K10											
SS L1		6	8	4	15	7	15			3	1
SS L2					1						
SS M1a					2		11	1	5		3
SS M1b					2	1	8	4	4	4	
SS M1c				1	3		1				
SS N1			6	1	5	4	13	7	4	7	5
SS N2			1							1	
SS N3			1		1		1			1	
SS O1					1		2			2	
SS O2				1	1	1	1				
SS P1			3	2	10	8	19	5	8	6	1
SS P2					3						
SS P3				1					3	1	
SS Q1				1	2		1	1	1		1
SS T1		4									
SS U1											
SS V1			4								
SS W1				1			3				
SS X1							5	3			5

\*Note that additional communities may be present at the site, even though no samples were recorded.

**Table 5:** Communities of limestone with numbers of quadrats recorded at each site

Community code	Numbers of quadrats recorded from each site (for abbreviations, see Table 1)*						
	BE	DD	ING	NP	ST	R	INCH
SL 1	4	5					
SL 2	3	4					
SL 3	3	5	1				
SL 4	3	6	3	1	2		
SL 5	1	4	2	2			
SL 6	5	17	4	4			
SL 7		1					1
SL 8	2	2		1			
SL 9	1		2	1	1	2	2
SL 10	1						
SL 11a		4	8	1	1	2	
SL 11b			2		4	1	1
SL 11c	5	6	5	4	1		
SL 11d	12	31	22	9	11	10	4
SL 12a	1	1	3	1	3	3	2
SL 12b					14	4	
SL 12c	4	2	5	1	1		
SL 13	5		6	1	1		
SL 14	1		6		1	4	1
SL 15						6	14

SL 16a					1	2	
SL 16b			1	2		7	3
SL 17	1	4					
SL 18	5						
SL 19	7		6		7	6	
SL 20			5				
SL 21			1			1	
SL 22						5	2
SL 23	8	4	3		1	3	2
SL 24							2
SL 25		1			1		
SL 26				1	1		
SL 27						4	1

\*Note that additional communities may be present at the site, even though no samples were recorded.

### 3.2 Key to saxicolous lichen and bryophyte communities

The following key is designed to assign individual samples to the relevant community. Since all the communities are variable, and grade into other communities, the key must be used with caution, and in conjunction with the floristic tables and community descriptions.

1.	On siliceous rock (including base-rich igneous rock and slightly calcareous rocks)	2
	On limestone or highly calcareous siliceous rock	62
Note: this distinction will be difficult to apply in the case of calcareous siliceous rocks, and is based on the presence or absence of strong calcicola rather than on the identification of rock type. The second alternative in the couplet is intended to include all limestone and those siliceous rocks, which are calcareous enough to carry a flora similar to limestone. Most samples on basic siliceous rocks such as basalt will be identified by following the first alternative. The calcicoles which would indicate the second alternative in the couplet are too numerous to list individually, but include <i>Belonia nidarosiensis</i> , <i>Botryolepraria lesdainii</i> , <i>Dirina massiliensis</i> and <i>Lepraria nivalis</i> (lichens of dry overhangs), <i>Caloplaca citrina</i> agg., <i>Lecanora dispersa</i> , <i>Protoblastenia rupestris</i> (lichens of exposed rocks) and the bryophytes <i>Homalothecium sericeum</i> and <i>Neckera crispa</i> .		
2(1)	Dominated by the orange-coloured alga <i>Trentepohlia iolithus</i> (Domin 6 or more); crustose lichens sparse	SS I1 <i>Trentepohlia iolithus</i> community
	Dominated by lichens or bryophytes	3
3(2)	Dominated by crustose lichens	4
	Dominated by bryophytes, or macrolichens present at Domin 4 or more	32
4(3)	Persistently sterile, leprose or byssoid lichens dominant ( <i>Lepraria</i> spp., <i>Lecanora ecorticata</i> , or <i>Lecanactis latebrarum</i> )	5

	Not so	10
5(4)	<i>Psilolechia leprosa</i> dominant, usually on copper-rich rocks	SS K10 <i>Psilolechia leprosa</i> community
	<i>Psilolechia leprosa</i> absent or scarce	6
6(5)	<i>Lecanactis latebrarum</i> dominant	SS K3 <i>Lecanactis latebrarum</i> community
	Not so	7
7(6)	<i>Lecanora ecorticata</i> dominant	SS K1 <i>Lecanora ecorticata</i> community
	Not so	8
8(7)	<i>Lecanora epanora</i> present (Domin 4 or more)	SS K9 <i>Lecanora epanora</i> - <i>Lepraria elobata</i> community
	Not so	9
9(8)	Preferential species include <i>Lepraria elobata</i> and <i>L. incana</i>	SS K2 <i>Lepraria incana</i> - <i>Cystocoleus ebeneus</i> community
	Preferential species include <i>Diplophyllum albicans</i> , <i>Lepraria atlantica</i> , <i>L. crassissima</i> and <i>L. humida</i> .	SS K4 <i>Lepraria humida</i> - <i>Diplophyllum albicans</i> community
	<i>L. crassissima</i> and <i>L. humida</i>	SS K4 <i>Lepraria humida</i> - <i>Diplophyllum albicans</i> community
10(4)	With one or more of <i>Blindia acuta</i> , <i>Catapyrenium lachneum</i> , <i>Collema</i> spp, <i>Placynthium</i> spp, <i>Racomitrium ellipticum</i> , <i>Staurothele succedens</i> and <i>Thelidium papulare</i> present, on base-rich rocks	11
	Not so	12
11(10)	Preferential species include <i>Catapyrenium lachneum</i> , <i>Collema glebulentum</i> , <i>Koerberiella wimmeriana</i> , <i>Placynthium</i> spp, <i>Porpidia superba</i> and <i>Racomitrium ellipticum</i>	SS X1 <i>Blindia acuta</i> - <i>Thelidium papulare</i> community

	Preferential species include <i>Gymnostomum aeruginosum</i> , <i>Hygrohypnum luridum</i> , <i>Opegrapha dolomitica</i> , <i>Staurothele succedens</i> and <i>Verrucaria viridula</i>	SS V1 <i>Staurothele succedens</i> - <i>Thelidium papulare</i> community
12(10)	Dominated by one or more of the following taxa: <i>Coccotrema citrinescens</i> , <i>Diploschistes scruposus</i> , <i>Enterographa zonata</i> , <i>Haematomma ochroleucum</i> , <i>Lecanora orosthea</i> , <i>L. subcarnea</i> , <i>Opegrapha gyrocarpa</i> and <i>Tylothallia biformigera</i> ; stands usually on steep or overhanging faces with some shelter from rain	13
	Dominated by other taxa (including <i>Fuscidea</i> , <i>Lecidea</i> , <i>Pertusaria</i> , <i>Porpidia</i> , <i>Rhizocarpon</i> and others)	16
13(12)	<i>Coccotrema citrinescens</i> present at Domin 5 or more	SS K7 <i>Coccotrema citrinescens</i> - <i>Porpidia tuberculosa</i> community
	<i>Coccotrema citrinescens</i> absent or sparse	14
14(13)	<i>Tylothallia biformigera</i> present at Domin 4 or more	SS K6 <i>Tylothallia biformigera</i> - <i>Opegrapha gyrocarpa</i> community
	Not so	15
15(14)	<i>Haematomma ochroleucum</i> , <i>Lecanora orosthea</i> or <i>L. subcarnea</i> abundant	SS K8 <i>Lecanora orosthea</i> - <i>Enterographa zonata</i> community
	Not so	SS K5 <i>Opegrapha gyrocarpa</i> - <i>Enterographa zonata</i> community
16 (12)	<i>Candelariella coralliza</i> or <i>Xanthoria candelaria</i> present and often dominant, rarely sparse but then with <i>Aspicilia caesiocinerea</i> or <i>Rinodina atrocinerea</i> ; on bird perches	SS H1 <i>Candelariella coralliza</i> - <i>Aspicilia caesiocinerea</i> community (p.p.)
	Not so	17

17(16)	Dominated by one or more of <i>Fuscidea</i> spp, <i>Lecanora gangaleoides</i> , <i>L. intricata</i> , <i>Lecidea lactea</i> , <i>L. lapicida</i> , <i>L. pycnocarpa</i> , <i>L. swartzioidea</i> , <i>Miriquidica leucophaea</i> , <i>Pertusaria</i> spp, <i>Rhizocarpon geographicum</i> , <i>Schaereria fuscocinerea</i> , <i>Tephromela atra</i> and <i>Tremolechia atrata</i>	18
	Dominated by one or more of <i>Acarospora</i> spp, <i>Ainoa mooreana</i> , <i>Ionaspis</i> spp, <i>Lecidea lithophila</i> , <i>Miriquidica griseoatra</i> , <i>Porpidia</i> spp, <i>Rhizocarpon hochstetteri</i> , <i>R. lavatum</i> , <i>R. reductum</i> and <i>Trapelia</i> spp	24
18(17)	<i>Pertusaria</i> spp present at Domin 4 or more, rarely sparse and then with <i>Micarea subnigrata</i> or <i>Ophioparma ventrosa</i>	SS C1 <i>Pertusaria corallina</i> - <i>P. pseudocorallina</i> community
	Not so	19
19(20)	One or more of the following present: <i>Fuscidea kochiana</i> , <i>F. intercincta</i> , <i>F. gothoburgensis</i> and <i>F. praeruptorum</i>	20
	One or more of the following present: <i>Lecanora gangaleoides</i> , <i>L. intricata</i> , <i>Lecidea lactea</i> , <i>L. lapicida</i> , <i>L. swartzioidea</i> , <i>Miriquidica leucophaea</i> , <i>Rhizocarpon geographicum</i> , <i>Tephromela atra</i> and <i>Tremolechia atrata</i>	21
20(19)	<i>Fuscidea praeruptorum</i> abundant (Domin 5 or more), sometimes with <i>F. cyathoides</i> but not other <i>Fuscidea</i> spp	SS B2 <i>Fuscidea praeruptorum</i> - <i>F. cyathoides</i> community
	<i>Fuscidea praeruptorum</i> scarce, no more than Domin 4; <i>F. kochiana</i> , <i>F. intercincta</i> or <i>F. gothoburgensis</i> abundant	SS B1 <i>Fuscidea kochiana</i> - <i>F. intercincta</i> community
21(19)	Dominated by one or more of <i>Fuscidea cyathoides</i> , <i>F. lygaea</i> , <i>Porpidia tuberculosa</i> and <i>Tremolechia atrata</i> , but the following scarce and at Domin <4: <i>Lecanora gangaleoides</i> , <i>L. intricata</i> , <i>Rhizocarpon geographicum</i> , <i>Lecidea lactea/swartzioidea</i> and <i>Tephromela atra</i>	SS B3 <i>Fuscidea lygaea</i> - <i>Porpidia tuberculosa</i> community
	Dominated by various species, but one or more of the following at Domin 4 or greater: <i>Aspicilia</i> spp, <i>ecanora gangaleoides</i> , <i>L. intricata</i> , <i>Rhizocarpon geographicum</i> , <i>Lecidea fuscoatra</i> , <i>L. lactea</i> /	22

	<i>swartzioidea</i> , <i>Ophioparma ventosa</i> and <i>Tephromela atra</i>	
22(21)	<i>Lecanora gangaleoides</i> dominant, present at Domin 5 or more, more abundant than <i>Rhizocarpon geographicum</i> when present	SS A3 <i>Lecanora gangaleoides</i> - <i>Fuscidea cyathoides</i> community
	<i>Lecanora gangaleoides</i> scarce, or when present at Domin 5 or more then cover equalled or exceeded by the combined cover of <i>Acarospora</i> spp., <i>Miriquidica leucophaea</i> , <i>Rhizocarpon geographicum</i> and <i>Tephromela atra</i>	23
23(22)	The following species are preferential: <i>Fuscidea cyathoides</i> , <i>F. lygaea</i> , <i>Rhizocarpon geographicum</i> , <i>Schaereria fuscocinerea</i> and <i>Tremolechia atrata</i>	SS A1 <i>Rhizocarpon geographicum</i> - <i>Fuscidea lygaea</i> community
	The following species are preferential: <i>Lecanora gangaleoides</i> , <i>L. polytropa</i> , <i>L. soralifera</i> and <i>Tephromela atra</i>	SS A2 <i>Rhizocarpon geographicum</i> - <i>Miriquidica leucophaea</i> community
	This distinction is likely to be difficult. Stands where <i>Miriquidica leucophaea</i> is abundant are provisionally placed in A2 unless this conflicts with the preferential species.	
24(17)	Species poor stands dominated by <i>Acarospora fuscata</i> or <i>A. nitrophila</i>	SS D3 <i>Acarospora fuscata</i> - <i>A. nitrophila</i> community
	Not so	25
25(24)	Dominated by <i>Ainoa mooreana</i> (Domin 6 or more)	SS D7 <i>Ainoa mooreana</i> - <i>Marsupella emarginata</i> community
	<i>Ainoa mooreana</i> scarce	26
26(25)	<i>Lecidea promixta</i> or <i>Trapelia</i> spp. abundant	SS D9 <i>Lecidea promixta</i> - <i>Trapelia involuta</i> community
	Not so	27



27(26)	<i>Porpidia macrocarpa</i> and/or <i>P. striata</i> dominant in species-poor stands; <i>P. tuberculosa</i> absent	SS D5 <i>Porpidia macrocarpa</i> - <i>P. striata</i> community
	<i>Porpidia macrocarpa</i> and <i>P. striata</i> either absent or exceeded in cover by other lichens	28
28(27)	<i>Lecidea lithophila</i> dominant, in species poor stands	SS D4 <i>Lecidea lithophila</i> community
	<i>Lecidea lithophila</i> absent or exceeded by other lichens	29
28(27)	<i>Acarospora sinopica</i> or <i>Lecanora handelii</i> present at Domin 4 or more	SS D2 <i>Acarospora sinopica</i> - <i>Rhizocarpon oederi</i> community
	Not so	30
30(29)	<i>Porpidia tuberculosa</i> overwhelmingly dominant (Domin 7 or more), usually present as a morph with thick, often fertile, thallus; other species rarely achieving Domin 4; on steep, north-facing rock faces	SS D8 <i>Porpidia tuberculosa</i> community
	<i>Porpidia tuberculosa</i> often abundant, but not dominant to the exclusion of most other species	31
31(30)	Preferential species include: <i>Lecanora soralifera</i> , <i>Rhizocarpon reductum</i> , <i>Stereocaulon leucophaeopsis</i> and <i>Trapelia coarctata</i>	SS D1 <i>Porpidia tuberculosa</i> - <i>Rhizocarpon reductum</i> community
	Preferential species include: <i>Amygdalaria pelobotryon</i> , <i>Ionaspis lacustris</i> , <i>I. odora</i> , <i>Porpidia contraponenda</i> , <i>P. irrigua</i> and <i>Rhizocarpon lavatum</i>	32
32(31)	Preferential species include <i>Andreaea alpina</i> , <i>Ionaspis lacustris</i> and <i>Porpidia irrigua</i>	SS D6 <i>Porpidia irrigua</i> - <i>Rhizocarpon lavatum</i> community
	Preferential species include <i>Andreaea rupestris</i> , <i>Ionaspis chrysophana</i> , <i>I. odora</i> , <i>Rhizocarpon anaperum</i> , <i>R. sublavatum</i> , <i>Stereocaulon plicatile/tornense</i> and <i>Trentepohlia iolithus</i>	SS E1 <i>Andreaea rupestris</i> - <i>Ionaspis odora</i> community (lichen rich stands)
33(4)	Lichens dominant, <b>or</b> when both lichens and bryophytes are significant, macrolichens are present, represented by taxa including one or more of <i>Allantoparmelia</i> , <i>Catapyrenium</i> , <i>Collema</i> ,	34

	<i>Dermatocarpon</i> , <i>Hypogymnia</i> , <i>Hypotrachyna</i> , <i>Lasallia</i> , <i>Lempholemma</i> , <i>Parmelia</i> , <i>Ramalina</i> , <i>Sphaerophorus</i> , <i>Umbilicaria</i> and <i>Xanthoparmelia</i> ( <i>Cladonia</i> species may also be present in addition to these)	
	Bryophytes dominant, or when both lichens and bryophytes are significant, macrolichens are absent or represented by taxa including <i>Cladonia</i> and <i>Stereocaulon</i>	43
34(33)	<i>Ramalina</i> species dominant	35
	<i>Ramalina</i> species absent	36
35(34)	<i>Ramalina subfarinacea</i> and/or <i>R. siliquosa</i> dominant	SS T1 <i>Ramalina siliquosa</i> - <i>R. subfarinacea</i> community
	<i>Ramalina polymorpha</i> dominant	SS H1 <i>Candelariella coralliza</i> - <i>Aspicilia caesiocinerea</i> community (p.p.)
36(34)	One or more of the following present: <i>Catapyrenium</i> , <i>Collema</i> , <i>Dermatocarpon</i> and <i>Lempholemma</i> ; base-rich communities	37
	Not so	38
37(36)	Preferential species include <i>Blindia acuta</i> , <i>Catapyrenium lachneum</i> , <i>Collema glebulentum</i> , <i>Koerberiella wimmeriana</i> , <i>Lempholemma radiatum</i> , <i>Placynthium</i> spp. and <i>Porpidia superb</i>	SS X1 <i>Blindia acuta</i> - <i>Thelidium papulare</i> community
	Preferential species include <i>Collema flaccidum</i> , <i>Dermatocarpon intestiniforme</i> , <i>D. Miniatum</i> and <i>Pseudoleskeella catenulata</i>	SS W1 <i>Dermatocarpon intestiniforme</i> - <i>Collema flaccidum</i> community
38(36)	Containing one or more of: <i>Flavoparmelia caperata</i> , <i>Hypotrachyna laevigata</i> , <i>H. taylorensis</i> , <i>Isothecium myosuroides</i> and <i>Scapania gracilis</i> ; in woodland	SS U1 <i>Isothecium myosuroides</i> - <i>Sphaerophorus globosus</i> community
	Not so	39
39(38)	<i>Lasallia pustulata</i> dominant	SS F4 <i>Lasallia pustulata</i> community

	Not so	40
40(39)	<i>Xanthoparmelia conspersa</i> dominant	SS F3 <i>Xanthoparmelia conspersa</i> community
	Not so	41
41(40)	<i>Umbilicaria deusta</i> dominant	SS F5 <i>Umbilicaria deusta</i> community
	Not so	42
42(41)	Preferential taxa (some of them rare in this community) include <i>Allantoparmelia alpicola</i> , <i>Cornicularia normoerica</i> , <i>Pseudephebe pubescens</i> , <i>Umbilicaria cylindrica</i> , <i>U. polyphylla</i> and <i>U. torrefacta</i> ; bryophytes rare to occasional, including <i>Andreaea</i> , <i>Gymnomitrium</i> and <i>Kiaeria</i>	SS F1 <i>Rhizocarpon geographicum-Umbilicaria cylindrica</i> community
	Preferential taxa include <i>Hypogymnia</i> , <i>Parmelia omphalodes</i> , <i>P. saxatilis</i> , <i>Platismatia</i> , <i>Pseudevernia</i> and <i>Tuckermannopsis</i> ; bryophytes rare to occasional, including <i>Hypnum</i> and <i>Racomitrium</i>	SS F2 <i>Parmelia saxatilis-P. omphalodes</i> community
43(33)	<i>Hypnum andoi</i> dominant (Domin 7 or greater)	SS F2 <i>Parmelia saxatilis-P. omphalodes</i> community, sub-community
	<i>Hypnum andoi</i> absent or very sparse	44
44(43)	Bryophytes represented principally by one or more of <i>Andreaea</i> , <i>Anthelia</i> , <i>Campylopus atrovirens</i> , <i>Gymnomitrium</i> , <i>Marsupella</i> , <i>Mylia</i> and <i>Racomitrium</i> (other than <i>R. ellipticum</i> )	45
	Bryophytes represented principally by one or more of <i>Amphidium</i> , <i>Anoetangium</i> , <i>Barbilophozia</i> , <i>Blindia</i> , <i>Campylopus flexuosus</i> , <i>Conocephalum</i> , <i>Diplophyllum</i> , <i>Distichium</i> , <i>Frullania</i> , <i>Grimmia</i> , <i>Hymenostylium</i> , <i>Hypnum</i> , <i>Isothecium</i> , <i>Mnium</i> , <i>Racomitrium ellipticum</i> and <i>Schistidium</i>	54
45(44)	<i>Racomitrium lanuginosum</i> or <i>Mylia taylorii</i> present at Domin 6 or more	46
	Not so	47

46(45)	<i>Racomitrium lanuginosum</i> dominant, lacking hepatics other than <i>Barbilophozia</i> , <i>Diplophyllum</i> or <i>Nardia</i>	SS Q1 <i>Racomitrium lanuginosum</i> community
	<i>Racomitrium lanuginosum</i> accompanied by abundant <i>Mylia taylorii</i> , and sometimes hepatics including <i>Anastrophyllum donnianum</i> , <i>Bazzania tricrenata</i> and <i>Plagiochila carringtonii</i>	SS P3 <i>Mylia taylorii</i> - <i>Racomitrium lanuginosum</i> community
47(45)	<i>Racomitrium affine</i> , <i>R. aquaticum</i> , <i>R. fasciculare</i> or <i>R. heterostichum</i> present at Domin 5 or more; <i>R. sudeticum</i> absent or present at Domin 4 or less	48
	Not so	49
48(47)	<i>Racomitrium aquaticum</i> dominant	SS L2 <i>Racomitrium aquaticum</i> community
	Other <i>Racomitrium</i> species more abundant than <i>R. aquaticum</i>	SS F7 <i>Racomitrium fasciculare</i> - <i>R. heterostichum</i> community
49(47)	<i>Andreaea alpina</i> , <i>A. rothii</i> , <i>Anthelia julacea</i> , <i>Campylopus atrovirens</i> , <i>Marsupella alpina</i> or <i>M. emarginata</i> abundant	50
	These species absent or together exceeded by <i>A. rupestris</i> , <i>Gymnomitrion</i> or <i>Racomitrium sudeticum</i>	52
50(49)	<i>Marsupella alpina</i> abundant	SS D6 <i>Porpidia irrigua</i> - <i>Rhizocarpon lavatum</i> community (bryophyte-rich stands)
	<i>Marsupella alpina</i> absent or exceeded by other bryophytes	51
51(50)	<i>Andreaea rothii</i> exceeding <i>A. alpina</i> and other bryophytes	SS L1 <i>Andreaea rothii</i> - <i>Porpidia irrigua</i> community
	<i>Andreaea rothii</i> absent or scarcer than <i>A. alpina</i> , <i>Anthelia</i> , <i>Campylopus atrovirens</i> or <i>Marsupella emarginata</i>	SS M1 <i>Andreaea alpina</i> - <i>Marsupella emarginata</i> community

52(49)	<i>Gymnomitrium crenulatum</i> or <i>G. obtusum</i> present at Domin 5 or more (some borderline samples are Domin 4)	SS E3 <i>Andreaea rupestris</i> - <i>Gymnomitrium</i> community
	<i>Gymnomitrium</i> species scarce	53
53(52)	<i>Racomitrium sudeticum</i> abundant (Domin 5 or more) and in greater quantity than <i>Andreaea rupestris</i> and <i>Stereocaulon vesuvianum</i> ; crustose lichens sparse	SS E2 <i>Andreaea rupestris</i> - <i>Stereocaulon vesuvianum</i> community, sub-community c
	<i>Racomitrium sudeticum</i> exceeded by crustose lichens, or equalled or exceeded by <i>Andreaea rupestris</i> , <i>Cladonia subcervicornis</i> or <i>Stereocaulon vesuvianum</i>	54
54(53)	Preferential species include <i>Ionaspis chrysophana</i> , <i>I. odora</i> , <i>Marsupella adusta</i> , <i>Rhizocarpon lavatum</i> , <i>Stereocaulon plicatile</i> , <i>S. tornense</i> and <i>Trentepohlia iolithus</i>	SS E1 <i>Andreaea rupestris</i> - <i>Ionaspis odora</i> community
	Preferential species include <i>Cladonia diversa</i> , <i>Miriquidica leucophaea</i> and <i>Rhizocarpon geographicum</i>	SS E2 <i>Andreaea rupestris</i> - <i>Stereocaulon vesuvianum</i> community
SS E1 differs from SS E2 in a greater abundance of species that prefer damp conditions; however, many different combinations of species occur and the distinction is likely to be difficult. If the preferential species noted above are absent or inconclusive, choose SS E2.		
55(45)	<i>Grimmia torquata</i> dominant (Domin 6 or more)	SS N3 <i>Grimmia torquata</i> community
	Not so	56
56(55)	One or more of the following taxa are dominant; <i>Amphidium</i> , <i>Anoetangium</i> , <i>Blindia</i> , <i>Distichium</i> , <i>Frullania</i> , <i>Hymenostylium</i> , <i>Mnium thomsonii</i> and <i>Schistidium strictum</i>	57
	One or more of the following taxa are dominant: <i>Barbilophozia</i> , <i>Campylopus</i> , <i>Conocephalum</i> , <i>Diplophyllum</i> , <i>Eurhynchium hians</i> , <i>Hypnum jutlandicum</i> , <i>Mnium hornum</i> , <i>Pellia</i> , <i>Philonotis</i> , <i>Rhizomnium</i> and <i>Scapania</i>	59

57(56)	Containing one or more of <i>Brachythecium plumosum</i> , <i>Frullania tamarisci</i> and <i>Schistidium strictum</i>	SS F8 <i>Frullania tamarisci</i> - <i>Schistidium strictum</i> community
	Not so	58
58(57)	<i>Amphidium mougeotii</i> and <i>Anoetangium aestivum</i> together more abundant than <i>Blindia acuta</i>	SS N1 <i>Amphidium mougeotii</i> - <i>Anoetangium aestivum</i> community
	<i>Amphidium mougeotii</i> and <i>Anoetangium aestivum</i> together less abundant than <i>Blindia acuta</i>	SS N2 <i>Blindia acuta</i> - <i>Amphidium mougeotii</i> community
59(56)	Dominated by relatively small bryophytes including <i>Barbilophozia</i> , <i>Campylopus flexuosus</i> , <i>Diplophyllum</i>	60
	Dominated by relatively robust bryophytes including <i>Conocephalum</i> , <i>Mnium hornum</i> , <i>Pellia</i> and <i>Rhizomnium</i>	61
60(59)	Dominated by <i>Barbilophozia floerkei</i> and/or <i>Campylopus flexuosus</i>	SS F6 <i>Campylopus flexuosus</i> - <i>Barbilophozia floerkei</i> community
	Dominated by <i>Diplophyllum albicans</i> and/or <i>Hypnum jutlandicum</i>	SS P1 <i>Diplophyllum albicans</i> - <i>Hypnum jutlandicum</i> community
61(59)	Containing <i>Conocephalum</i> , often with other calcicoles including <i>Ctenidium molluscum</i> , <i>Orthothecium rufescens</i> and <i>Pellia endiviifolia</i>	SL 27 <i>Conocephalum conicum</i> - <i>Gymnostomum aeruginosum</i> community
	Not so	62
62(61)	With species including <i>Bryum pseudotriquetrum</i> , <i>Dichodontium pellucidum</i> , <i>Dicranella palustris</i> , <i>Jungermannia exsertifolia</i> , <i>Philonotis Fontana</i> and <i>Scapania</i>	SS O2 <i>Philonotis fontana</i> - <i>Scapania undulata</i> community
	Not so	63

63(62)	Preferential taxa include <i>Heterocladium heteropterum</i> , <i>Pellia epiphylla</i> , <i>Pseudotaxiphyllum elegans</i>	SS O1 <i>Pellia epiphylla</i> - <i>Mnium hornum</i> community
	Preferential taxa include <i>Hypnum jutlandicum</i> and <i>Dicranum scoparium</i>	SS P2 <i>Hypnum jutlandicum</i> - <i>Mnium hornum</i> community
<b>Limestone and highly calcareous rocks</b>		
64(1)	Crustose lichens dominant	65
	Bryophytes or macrolichens (sometimes only minutely fruticose) a significant part of the vegetation, together scoring at least Domin 5	80
65(64)	Dominated by powdery sterile crustose lichens in the genera <i>Botryolepraria</i> , <i>Lepraria</i> or <i>Leproplaca</i>	66
	Not so	68
66(65)	Dominated by <i>Lepraria eburnea</i>	SL 24 <i>Lepraria eburnea</i> community
	Not so	67
67(66)	Dominated by <i>Lepraria nivalis</i> or <i>Leproplaca xantholyta</i>	SL 4 <i>Lepraria nivalis</i> community
	Dominated by <i>Botryolepraria lesdainii</i> and <i>Leproplaca chrysodeta</i>	SL 3 <i>Botryolepraria lesdainii</i> - <i>Leproplaca chrysodeta</i> community
68(65)	Preferential taxa include <i>Aspicilia calcarea</i> , <i>Caloplaca</i> , <i>Clauzadea</i> , <i>Diplotomma</i> , <i>Dirina</i> , <i>Lecanora albescens</i> , <i>L. dispersa</i> , <i>Polyblastia</i> , <i>Protoblastenia</i> , <i>Thelidium decipiens</i> , <i>Verrucaria baldensis</i> and <i>V. nigrescens</i>	69
	Preferential taxa include <i>Belonia nidarosiensis</i> , <i>Gyalecta jenensis</i> , <i>Hymenelia epulotica</i> , <i>H. melanocarpa</i> , <i>Opegrapha dolomitica</i> , <i>O. rassalensis</i> , <i>Porina linearis</i> , <i>Metamelaena umbonata</i> and <i>Sagiolechia protuberans</i>	75
Note: <i>Hymenelia prevostii</i> is not strongly preferential, but species-poor stands dominated by this species should be keyed to the second alternative in this couplet.		

69(68)	Dominated by <i>Caloplaca citrina</i> s.s. on rain-sheltered surfaces	SL 7 <i>Caloplaca citrina</i> community
	Not so	70
70(69)	Dominated by <i>Caloplaca chlorina</i> or <i>C. flavovirescens</i> ; nutrient-enriched rocks	SL 9 <i>Phaeophyscia orbicularis</i> - <i>Xanthoria parietina</i> community (pp)
	Not so	71
71(70)	Some of the following taxa present: <i>Aspicilia calcarea</i> , <i>Caloplaca aurantia</i> , <i>C. cirrochroa</i> , <i>C. flavescens</i> , <i>C. saxicola</i> , <i>Dirina massiliensis</i> and <i>Lecanora albescens</i>	72
	These species absent or very scarce; dominated by combinations of taxa, principally <i>Hymenelia prevostii</i> , <i>Placynthium nigrum</i> , <i>Polyblastia</i> , <i>Thelidium</i> , <i>Protoblastenia</i> and <i>Verrucaria</i>	SL 11 <i>Protoblastenia rupestris</i> - <i>Verrucaria baldensis</i> community
72(71)	<i>Dirina massiliensis</i> abundant, with higher cover than <i>Caloplaca saxicola</i> when present	SL 2 <i>Dirina massiliensis</i> - <i>Caloplaca saxicola</i> community
	Not so	73
73(72)	Preferential taxa include <i>Caloplaca obliterans</i> , <i>C. saxicola</i> , <i>Diplotomma alboatrum</i> and <i>Dirina massiliensis</i>	SL 1 <i>Caloplaca saxicola</i> - <i>Lecanora albescens</i> community
	Preferential taxa include <i>Aspicilia calcarea</i> , <i>Caloplaca aurantia</i> , <i>Verrucaria Baldensis</i> and <i>V. nigrescens</i>	74
74(73)	<i>Aspicilia calcarea</i> dominant, Domin 7 or more	SL 5 <i>Aspicilia calcarea</i> - <i>Caloplaca citrina</i> agg. community
	<i>Aspicilia calcarea</i> Domin 6 or less	SL 6 <i>Aspicilia calcarea</i> - <i>Caloplaca flavescens</i> community



75(68)	<i>Metamelaena umbonata</i> present at Domin 4 or more	SL 22 <i>Metamelaena umbonata</i> - <i>Porina linearis</i> community
	Not so	76
76(75)	<i>Gyalecta jenensis</i> present at Domin 5 or more	SL 14 <i>Gyalecta jenensis</i> - <i>Opegrapha dolomitica</i> community
	<i>Gyalecta jenensis</i> scarce, or equalled or exceeded by <i>Hymenelia epulotica</i> or <i>Sagiolechia protuberans</i>	77
77(76)	Preferential taxa include <i>Hymenelia epulotica</i> , <i>H. melanocarpa</i> , <i>Opegrapha rassalensis</i> and <i>Sagiolechia protuberans</i>	15 <i>Hymenelia epulotica</i> - <i>Opegrapha rassalensis</i> community
	Preferential taxa include <i>Belonia nidarosiensis</i> , <i>Hymenelia prevostii</i> , 'Pink Unknown' and <i>Porina linearis</i>	78
78(77)	<i>Hymenelia prevostii</i> or 'Pink Unknown' present, together exceeding <i>Porina linearis</i> when present; <i>Belonia nidarosiensis</i> absent	SL 13 <i>Hymenelia prevostii</i> - <i>Porina linearis</i> community
	These species equalled or exceeded by <i>Porina linearis</i> when present; <i>Belonia nidarosiensis</i> sometimes abundant	SL 23 <i>Porina linearis</i> - <i>Belonia nidarosiensis</i> community
77(64)	<i>Lempholemma botryosum</i> or <i>L. cladodes</i> dominant in very species-poor stands	SL 20 <i>Lempholemma cladodes</i> - <i>L. botryosum</i> community
	These species absent or sparse, occurring with numerous more abundant species	80
80(79)	Macrolichen or placodioid taxa present, including <i>Caloplaca decipiens</i> , <i>Candelariella medians</i> , <i>Phaeophyscia</i> , <i>Physcia</i> and <i>Xanthoria</i>	81
	Not so	82
81(80)	<i>Caloplaca decipiens</i> and/or <i>Xanthoria calcicola</i> abundant	SL 10 <i>Caloplaca decipiens</i> - <i>Xanthoria calcicola</i> community

	Not so	SL 9 <i>Phaeophyscia orbicularis</i> - <i>Xanthoria parietina</i> community (pp)
82(80)	The following taxa preferential: <i>Collema</i> , <i>Dermatocarpon miniatum</i> , <i>Grimmia dissimulata</i> , <i>Leptogium gelatinosum</i> , <i>Orthotrichum anomalum</i> , <i>O. cupulatum</i> and <i>Schistidium</i> ; a community of small to medium bryophytes and/or cyanophilic macrolichens	SL 12 <i>Schistidium crassipilum</i> - <i>Collema fuscovirens</i> community
	The following taxa preferential: <i>Conocephalum</i> , <i>Ctenidium molluscum</i> , <i>Fissidens dubius</i> , <i>Gymnostomum aeruginosum</i> , <i>Homalothecium sericeum</i> , <i>Hypnum lacunosum</i> , <i>H. resupinatum</i> , <i>Porella platyphylla</i> , <i>Scapania aspera</i> , <i>Seligeria</i> , <i>Syntrichia Intermedia</i> and <i>Trichostomum</i>	83
83(82)	Dominated by <i>Seligeria trifaria</i> or <i>S. patula</i>	SL 21 <i>Seligeria trifaria</i> community
	Not so	84
84(83)	<i>Syntrichia intermedia</i> dominant, sometimes with <i>Homalothecium sericeum</i> or <i>Porella platyphylla</i> , but equalling or exceeding these	SL 8 <i>Syntrichia intermedia</i> - <i>Homalothecium sericeum</i> community
	Not so	85
85(84)	One or more of the following at Domin 5 or more: <i>Conocephalum</i> , <i>Gymnostomum aeruginosum</i> and <i>Orthothecium rufescens</i>	86
	Not so	87
86(85)	<i>Gymnostomum aeruginosum</i> dominant, with only small quantities of other species	SL 26 <i>Gymnostomum aeruginosum</i> community
	<i>Gymnostomum aeruginosum</i> absent or exceeded by other bryophytes	SL 28 <i>Conocephalum conicum</i> - <i>Gymnostomum aeruginosum</i> community

87(85)	<i>Neckera crista</i> abundant (at least Domin 5), dominant or growing with taxa including <i>Breutelia</i> , <i>Hylocomium brevirostre</i> , <i>Rhytidiadelphus</i> and <i>Thuidium</i>	SL 18 <i>Neckera crista</i> - <i>Scapania aspera</i> community
	<i>Neckera crista</i> absent or exceeded by taxa including <i>Frullania tamarisci</i> , <i>Homalothecium sericeum</i> , <i>Hypnum lacunosum</i> and <i>H. resupinatum</i>	88
88(87)	<i>Homalothecium sericeum</i> dominant, equalling or exceeding other bryophytes; <i>Porella platyphylla</i> often present	SL 17 <i>Homalothecium sericeum</i> - <i>Porella platyphylla</i> community
	<i>Homalothecium sericeum</i> absent or exceeded by species including <i>Frullania tamarisci</i> , <i>Hypnum lacunosum</i> and <i>H. resupinatum</i> ; <i>Porella platyphylla</i> absent	89
89(88)	Preferential species include: <i>Fissidens dubius</i> , <i>Mnium marginatum</i> , <i>M. thomsonii</i> , <i>Orthothecium intricatum</i> , <i>Plagiochila porelloides</i> , <i>Preissia quadrata</i> , <i>Trichostomum Brachydontium</i> and <i>T. crispulum</i> ; stands dominated mainly by small or medium bryophytes below overhangs; <i>Ctenidium molluscum</i> frequent but not dominant	SL 19 <i>Trichostomum brachydontium</i> - <i>Eurhynchium hians</i> community
	The preceding species absent or scarce	90
90(89)	Dominated by robust bryophytes including one or more of <i>Antitrichia curtipendula</i> , <i>Frullania tamarisci</i> , <i>Hypnum lacunosum</i> and <i>H. resupinatum</i>	SL 17 <i>Hypnum lacunosum</i> - <i>Tortella tortuosa</i> community, sub-community b
	Not so	91
91(90)	<i>Ctenidium molluscum</i> dominant and abundant (Domin 8 or more); without <i>Cladonia pocillum/pyxidata</i>	SL 25 <i>Ctenidium molluscum</i> community
	<i>Ctenidium molluscum</i> less abundant (Domin 7 or less), usually equalled or exceeded by other bryophytes; <i>Cladonia pocillum/pyxidata</i> present	SL 16 <i>Hypnum lacunosum</i> - <i>Tortella tortuosa</i> community, sub-community a
SL 16a comprises stands on exposed rocks dominated by <i>Ctenidium</i> , <i>Tortella</i> and <i>Cladonia</i> ; SL 25 comprises mainly species-poor stands dominated by <i>Ctenidium</i> , often in shade.		

### 3.3 Communities on siliceous rock

#### 3.3.1 SS A1 *Rhizocarpon geographicum*-*Fuscidea lygaea* community (Table 6)

##### Synonyms

*Umbilicarietum cylindricae* (Frey) Frey “nodum 1” (James *et al.*, 1977).

##### Constant species

*Rhizocarpon geographicum* and *Porpidia tuberculosa*.

##### Description and ecology

Crustose lichens dominate this community, including the yellow *Rhizocarpon geographicum*, grey *Porpidia tuberculosa*, dull brown *Fuscidea lygaea*, the rust-coloured *Tremolechia atrata*, and others including *Lecidea swartzioidea*, *Miriacidica leucophaea* and *Schaereria fuscocinerea*. Macrolichens including *Umbilicaria* spp. may be present at low cover (10% or less), but bryophytes are typically absent. Stands are often conspicuous due to the presence of *R. geographicum*.

The community typically occurs on hard, acidic rocks on unshaded, rain-exposed and well-drained surfaces of outcrops, boulders and small rocks. It avoids situations of prolonged dampness, so in areas of damp climate it is often confined to rock crests and boulder tops, avoiding both damp surfaces close to the ground and extensive areas of bedrock, which may be damp from run-off. The community is probably encouraged by slight nutrient-enrichment. Fine scree is too unstable (and perhaps often too damp) for this community to develop, but it can be found on scree where the stones attain a certain degree of stability (entering on stones 15–20 cm long at Ben Nevis), where the characteristic species can be found mixed with a few damp-rock lichens typical of E1. This community is very common and widespread in upland Britain.

##### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is abundant in siliceous block scree and occurs on scree with stones as small as 15-20 cm long. The community is not found on very fine scree and is increasingly restricted to well-drained (and often larger) rocks in damper regions.

##### Conservation interest

The typical species of this community are widespread. The Near Threatened *Sporastatia polyspora* was recorded once in the present survey.

##### Differentiation from other communities

The community grades into B3 on more nutrient-poor rocks, where *Rhizocarpon geographicum* is absent or of very low cover, and *Fuscidea lygaea* is often dominant. On slightly more basic or more nutrient-enriched siliceous rocks the community grades into A2 and the distinction can be difficult. The following are preferential for A1: *Fuscidea*

*cyathoides*, *F. lygaea*, *Rhizocarpon geographicum* (more frequently absent in A2 than in A1), *Schaereria fuscocinerea* and *Tremolechia atrata*, and the following are preferential for A2: *Lecanora gangaleoides*, *L. polytropa*, *L. soralifera* and *Tephromela atra*. However, these species can be found together in various combinations. *Miriquidica leucophaea* is frequent in both A1 and A2, but stands where this species is abundant have been placed in A2 unless this conflicts with the other preferential species. F1 can be very similar but *Umbilicaria cylindrica* and other macrolichens cover more than 10% of the sample.

### Coverage and integrity

The community was relatively well covered by the sampling. One sample of A1 had *R. geographicum* replaced by the superficially similar *R. alpicola*, which is restricted to montane sites, and could be regarded as representing a separate community.

**Table 6:** Floristic and environmental data for SS A1 *Rhizocarpon geographicum*-*Fuscidea lygaea* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Rhizocarpon geographicum</i>	V (1-7)
<i>Porpidia tuberculosa</i>	IV (1-7)
<i>Fuscidea lygaea</i>	III (1-8)
<i>Lecanora intricata</i>	III (1-4)
<i>Lecidea lactea/swartzioidea</i>	III (1-8)
<i>Miriquidica leucophaea</i>	II (1-5)
<i>Tremolechia atrata</i>	II (1-5)
<i>Lecanora polytropa</i>	II (1-5)
<i>Umbilicaria cylindrica</i>	II (1-5)
<i>Schaereria fuscocinerea</i>	II (1-7)
<i>Tephromela atra</i>	II (1-5)
<i>Rhizocarpon reductum</i>	II (1-4)
<i>Racomitrium sudeticum</i>	I (1-4)
<i>Fuscidea cyathoides</i>	I (1-7)
<i>Immersaria athrocarpa</i>	I (1-4)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (1-8)
<i>Micarea lignaria</i>	I (1-2)
<i>Clauzadeana macula</i>	I (2-6)
<i>Stereocaulon vesuvianum</i>	I (1-2)
<i>Fuscidea intercincta</i>	I (1-7)
<i>Andreaea rupestris</i>	I (2-4)
<i>Umbilicaria torrefacta</i>	I (1-4)
<i>Pseudephebe pubescens</i>	I (1-2)
<i>Lecidea lapicida</i>	I (2-5)
<i>Fuscidea kochiana</i>	I (1-5)
<i>Rhizocarpon lavatum</i>	I (1-5)
<i>Acarospora fuscata</i>	I (1-4)
<i>Aspicilia grisea</i>	I (2-5)
<i>Aspicilia cinerea</i> agg.	I (1-5)

<i>Acarospora nitrophila</i>	I (3-4)
<i>Miriquidica complanata</i>	I (2-4)
<i>Cornicularia normoerica</i>	I (1-4)
<i>Pertusaria corallina</i>	I (1-4)
<i>Micarea subnigrata</i>	I (1-3)
<i>Umbilicaria proboscidea</i>	I (1-2)
<i>Ionaspis odora</i>	I (2-5)
<i>Protoparmelia badia</i>	I (4)
<i>Lecidea lithophila</i>	I (2-4)
<i>Porpidia flavocruenta</i>	I (2-4)
<i>Buellia aethalea</i>	I (1-4)
<i>Ionaspis chrysophana</i>	I (1-4)
<i>Pertusaria pseudocorallina</i>	I (1-4)
<i>Porpidia cinereoatra</i>	I (1-4)
<i>Amygdalaria pelobotryon</i>	I (2)
<i>Aspicilia epiglypta</i>	I (1-2)
<i>Lecanora soralifera</i>	I (1-2)
<i>Parmelia saxatilis</i>	I (1-2)
<i>Racomitrium lanuginosum</i>	I (1-2)
<i>Rimularia gyrizans</i>	I (1-2)
<i>Stereocaulon evolutum</i>	I (1-2)
<i>Stereocaulon spathuliferum</i>	I (1-2)
<i>Porpidia contraponenda</i> [?]	I (1)
<i>Rhizocarpon alpicola</i>	I (8)
<i>Aspicilia</i> spp.	I (5)
<i>Fuscidea praeruptorum</i>	I (5)
<i>Ropalospora lugubris</i>	I (5)
<i>Fuscidea austere</i>	I (4)
<i>Porpidia irrigua</i> ined.	I (4)
<i>Sporastatia polyspora</i>	I (4)
<i>Fuscidea recens</i>	I (3)
<i>Aspicilia caesiocinerea</i>	I (2)
<i>Fuscidea lygaea</i> (sorediate)	I (2)
<i>Lecanora sulphurea</i>	I (2)
<i>Ophioparma ventosum</i>	I (2)
<i>Parmelia discordans</i>	I (2)
<i>Placopsis lambii</i>	I (2)
<i>Porpidia striata</i>	I (2)
<i>Racomitrium aquaticum</i>	I (2)
<i>Rhizocarpon polycarpum</i>	I (2)
<i>Stereocaulon plicatile/tornense</i>	I (2)
<i>Trapelia placodioides</i>	I (2)
<i>Trentepohlia iolithus</i>	I (2)
<i>Andreaea rothii</i>	I (1)
<i>Buellia uberior</i>	I (1)
<i>Calvitimela aglaea</i>	I (1)
<i>Cladonia diversa</i>	I (1)
<i>Claurouxia chalybeoides</i>	I (1)

<i>Diplophyllum albicans</i>	I (1)
<i>Epigloea medioincrassata</i>	I (1)
<i>Kiaeria blytii</i>	I (1)
<i>Lepraria caesioalba</i> agg.	I (1)
<i>Porpidia crustulata</i>	I (1)
<i>Pseudevernia furfuracea</i> var. <i>ceratea</i>	I (1)
<i>Rhizocarpon anaperum</i>	I (1)
<i>Scoliciosporum umbrinum</i>	I (1)
<i>Stereocaulon leucophaeopsis</i>	I (1)
<i>Tephromela grumosa</i>	I (1)
<i>Trapeliopsis flexuosa?</i>	I (1)
<i>Usnea flammea</i>	I (1)
Rock	V (2-8)
Slope (degrees)	44 (0-95)
Aspect (degrees)	
Shade	None
Run off	None to moderate
Drainage	(Poor to) moderate to good
Rain shelter	None (to slight)
Altitude (m)	772 (300-1120)
Number of samples	59

### 3.3.2 SS A2 *Rhizocarpon geographicum*-*Miriquidica leucophaea* community (Table 7)

#### Synonyms

None are known.

#### Constant species

*Lecanora intricata*, *Miriquidica leucophaea* and *Rhizocarpon geographicum*.

#### Description and ecology

Crustose lichens dominate this community, including *Lecanora gangaleoides*, *L. intricata*, *Miriquidica leucophaea*, *Rhizocarpon geographicum* and *Tephromela atra*. Stands are often a colourful mixture of the yellow *R. geographicum*, together with yellowish green and pale grey species, but *R. geographicum* is sometimes absent.

The community is found on unshaded, rain-exposed and well-drained surfaces of outcrops, boulders and small rocks. It avoids situations of prolonged dampness, and is often found on rock crests and boulder tops. It is most commonly found where there is slight nutrient-enrichment, for instance from bird perching, and particularly where the rock is slightly base-rich, for instance dolerite. Fine scree is too unstable for this community to develop.

The community shares many species with A1; see A1 account for species which are preferential to A1. Species found more commonly in A2 than A1 are *Aspicilia caesiocinerea*, *A. grisea*, *Lecidea fuscoatra* and *Schaereria cinereorufa*.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is abundant on block scree on medium to large boulders; rarely some stands which are more or less transitional to others occur on fine scree.

#### Conservation interest

The typical species of this community are widespread.

#### Differentiation from other communities

The distinction from A1 may be difficult, see A1 account for details.

#### Coverage and integrity

The community is relatively well covered by samples. However, A1 and A2 collectively represent a widespread and variable type of vegetation, and it is possible that a different arrangement of the samples could be found, especially if more become available. Currently the best arrangement is two separate communities.



**Table 7:** Floristic and environmental data for SS A2 *Rhizocarpon geographicum-Miriquidica leucophaea* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Rhizocarpon geographicum</i>	IV (1-7)
<i>Miriquidica leucophaea</i>	IV (1-8)
<i>Lecanora intricata</i>	IV (1-6)
<i>Tephromela atra</i>	III (1-6)
<i>Porpidia tuberculosa</i>	III (1-5)
<i>Lecanora polytropia</i>	II (1-6)
<i>Lecanora soralifera</i>	II (1-5)
<i>Aspicilia</i> spp.	I (5)
<i>Fuscidea praeruptorum</i>	I (5)
<i>Lecanora gangaleoides</i>	I (4-7)
<i>Acarospora fuscata</i>	I (4-6)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (4-5)
<i>Schaereria cinereorufa</i>	I (4-5)
<i>Porpidia irrigua</i> ined.	I (4)
<i>Fuscidea intercincta</i>	I (4)
<i>Porpidia melinodes</i>	I (4)
<i>Rimularia furvella</i>	I (4)
<i>Rhizocarpon reductum</i>	I (1-4)
<i>Tylothallia biformigera</i>	I (4)
<i>Protoparmelia badia</i>	I (3-5)
<i>Fuscidea recens</i>	I (3)
<i>Calvitimela aglaea</i>	I (3)
<i>Lecidea fuscoatra</i>	I (2-5)
<i>Trapelia involuta</i>	I (2-5)
<i>Porpidia cinereoatra</i>	I (2-4)
<i>Ochrolechia androgyna</i>	I (2-3)
<i>Placopsis lambii</i>	I (2)
<i>Amygdalaria pelobotryon</i>	I (2)
<i>Porpidia striata</i>	I (2)
<i>Grimmia donniana</i>	I (2)
<i>Umbilicaria polyphylla</i>	I (2)
<i>Candelariella coralliza</i>	I (2)
<i>Carbonea vorticosa</i>	I (2)
<i>Rhizocarpon lecanorinum</i>	I (2)
<i>Pertusaria lactea</i>	I (2)
<i>Ophioparma ventosum</i>	I (1-8)
<i>Aspicilia grisea</i>	I (1-6)
<i>Aspicilia caesiocinerea</i>	I (1-6)
<i>Immersaria athrocarpa</i>	I (1-6)
<i>Fuscidea cyathoides</i>	I (1-6)
<i>Micarea subnigrata</i>	I (1-6)
<i>Fuscidea lygaea</i>	I (1-5)

<i>Tremolechia atrata</i>	I (1-5)
<i>Buellia aethalea</i>	I (1-5)
<i>Lecidea lactea/swartzioidea</i>	I (1-4)
<i>Stereocaulon vesuvianum</i>	I (1-4)
<i>Andreaea rupestris</i>	I (1-4)
<i>Pertusaria corallina</i>	I (1-4)
<i>Racomitrium sudeticum</i>	I (1-4)
<i>Umbilicaria cylindrica</i>	I (1-4)
<i>Fuscidea kochiana</i>	I (1-4)
<i>Pertusaria pseudocorallina</i>	I (1-4)
<i>Pertusaria aspergilla</i>	I (1-4)
<i>Lecidea lapicida</i>	I (1-3)
<i>Lepraria caesioalba</i> agg.	I (1-3)
<i>Scoliciosporum umbrinum</i>	I (1-3)
<i>Micarea lignaria</i>	I (1-2)
<i>Porpidia macrocarpa</i>	I (1-2)
<i>Lecidea lithophila</i>	I (1-2)
<i>Cladonia diversa</i>	I (1-2)
<i>Rhizocarpon hochstetteri</i>	I (1-2)
<i>Rhizocarpon oederi</i>	I (1-2)
<i>Parmelia saxatilis</i>	I (1-2)
<i>Micarea coppinsii</i>	I (1-2)
<i>Micarea leprosula</i>	I (1-2)
<i>Rhizocarpon lavatum</i>	I (1)
<i>Rhizocarpon polycarpum</i>	I (1)
<i>Usnea flammea</i>	I (1)
<i>Schaereria fuscocinerea</i>	I (1)
<i>Pseudephebe pubescens</i>	I (1)
<i>Racomitrium lanuginosum</i>	I (1)
<i>Stereocaulon evolutum</i>	I (1)
<i>Kiaeria blytii</i>	I (1)
<i>Campylopus flexuosus</i>	I (1)
<i>Carbonea</i> sp.	I (1)
<i>Cephaloziella</i> spp.	I (1)
<i>Cladonia portentosa</i>	I (1)
<i>Gymnocolea inflata</i>	I (1)
<i>Pohlia nutans</i>	I (1)
<i>Racomitrium heterostichum</i>	I (1)
<i>Cladonia subcervicornis</i>	I (1)
<i>Sphaerophorus globosus</i>	I (1)
<i>Aspicilia cinerea</i> agg.	I (1)
<i>Coccotrema citrinescens</i>	I (1)
Rock	V (2-7)
Slope (degrees)	43 (0-95)
Aspect (degrees)	
Shade	None
Run off	None to slight (to moderate)

Drainage	(Poor to) moderate to good
Rain shelter	None
Altitude (m)	265-1060
Number of samples	48

### 3.3.3 SS A3 *Lecanora gangaleoides*-*Fuscidea cyathoides* community (Table 8)

#### Synonyms

None are known.

#### Constant species

*Lecanora gangaleoides*.

#### Description and ecology

Crustose lichens dominate this community; *Lecanora gangaleoides* is nearly always the most abundant species, covering 30–90% of the sample (rarely less on sparsely colonised rock faces). This species is also found in A2, but unlike most of the other species of that community, it is able to form species-poor stands on dry rocks. Various other species typical of overhangs can be present, including *Fuscidea cyathoides* (less restricted to acid nutrient-poor rocks than other common species in the genus), *Enterographa zonata* and *Opegrapha gyrocarpa*. *Lecanora rupicola* is rarely abundant (on Carn Ingli in S.W. Wales) and perhaps represents an additional nodum. *Rhizocarpon geographicum* is only occasional and at low cover.

Stands are developed on steep or slightly overhanging siliceous rock faces, which are often well lit and have slight shelter from rain; the community occurs on surfaces, which are less acidic and nutrient-poor than those occupied by B1, which can occur on similar steep faces. It has been recorded on intermediate (tonalite) and basic igneous rocks (dolerite). The community is found on cliffs and the side of boulders, and is often locally abundant, forming extensive stands. As well as unshaded rocks, it can also be found in woodland. With a slight increase in rain-shelter the community grades rapidly to stands dominated by *Opegrapha gyrocarpa* (K5).

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community occurs occasionally on the sides of large boulders in block scree. Siliceous rocky slopes with chasmophytic vegetation: the community may occur in overhangs, but these are usually rather open and doubtfully chasmophytic habitats.

#### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

This community approaches A2 in species composition on more exposed rocks, and overhang communities such as K5. It is distinguished from other communities by the dominance of *Lecanora gangaleoides*; when this species is abundant in A2 others including *Acarospora fuscata*, *Miriquidica leucophaea* and *Rhizocarpon geographicum* accompany it.

### Coverage and integrity

This community is reasonably well covered by samples. Although this community is defined mainly on the dominance of a single species, this dominance is a feature repeated many times at various sites.

**Table 8:** Floristic and environmental data for SS A3 *Lecanora gangaleoides-Fuscidea cyathoides* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Lecanora gangaleoides</i>	V (5-9)
<i>Fuscidea cyathoides</i>	III (1-6)
<i>Rhizocarpon geographicum</i>	III (1-4)
<i>Opegrapha gyrocarpa</i>	II (2-5)
<i>Enterographa zonata</i>	II (2-4)
<i>Lecanora rupicola</i>	I (5-8)
<i>Porpidia tuberculosa</i>	I (5)
<i>Pertusaria aspergilla</i>	I (5)
<i>Lepraria membranacea</i>	I (4-5)
<i>Lepraria borealis</i>	I (4)
<i>Porpidia flavocruenta</i>	I (4)
<i>Tylothallia biformigera</i>	I (4)
<i>Fuscidea praeruptorum</i>	I (2-5)
<i>Lepraria incana</i>	I (2-4)
<i>Porina lectissima</i>	I (2-4)
<i>Lecanora soralifera</i>	I (2)
<i>Lecidea fuliginosa</i>	I (2)
<i>Candelariella coralliza</i>	I (2)
<i>Cynodontium bruntonii</i>	I (2)
<i>Hypotrachyna revoluta</i>	I (2)
<i>Lecanora polytropa</i>	I (2)
<i>Lecidea swartzioidea</i>	I (2)
<i>Metzgeria furcata</i>	I (2)
<i>Neofuscelia verruculifera</i>	I (2)
<i>Parmelia saxatilis</i>	I (2)
<i>Lecanora intricata</i>	I (1-5)
<i>Melanelia fuliginosa</i> subsp. <i>fuliginosa</i>	I (1-4)
<i>Acarospora fuscata</i>	I (1-4)
<i>Pertusaria pseudocorallina</i>	I (1-2)
<i>Lecanora orosthea</i>	I (1-2)

<i>Ophioparma ventosa</i>	I (1)
<i>Diploschistes scruposus</i>	I (1)
<i>Frullania tamarisci</i>	I (1)
<i>Grimmia trichophylla</i>	I (1)
<i>Lecidea lactea</i>	I (1)
<i>Lepraria rigidula</i>	I (1)
<i>Microlejeunea ulicina</i>	I (1)
<i>Miriquidica leucophaea</i>	I (1)
<i>Psilolechia lucida</i>	I (1)
<i>Ramalina subfarinacea</i>	I (1)
<i>Tephromela grumosa</i>	I (1)
Rock	V (2-9)
Slope (degrees)	83 (25-100)
Aspect (degrees)	
Shade	None to moderate
Run off	Slight to moderate
Drainage	Good
Rain-shelter	(None to) Slight to moderate
Altitude (m)	40-690
Number of samples	18

### 3.3.4 SS B1 *Fuscidea kochiana*-*F. intercincta* community (Table 9)

#### Synonyms

None are known.

#### Constant species

*Fuscidea kochiana*.

#### Description and ecology

This is a crustose lichen community dominated by the dull grey thalli of *Fuscidea* spp., including at least 10% cover of *F. gothoburgensis*, *F. intercincta*, or *F. kochiana*. *Fuscidea cyathoides* and *F. lygaea* may be present, but are less restricted to this community. *Porpidia tuberculosa* is frequent.

Samples can be divided into two weakly separated groups:

- a) *Fuscidea gothoburgensis* constant, *F. intercincta* rare, and *F. kochiana* occasional; this group is perhaps more confined to overhangs than the next, so certain overhang species are sparsely present, including *Fuscidea recensa* and *Pertusaria flavicans*.
- b) *F. gothoburgensis* is rare, and of a lower cover than *F. intercincta*; this group can be found on rain-exposed surfaces.

*Fuscidea intercincta* and *F. gothoburgensis* have often been regarded as a fertile, non-soresiate and a non-fertile (in Britain) soresiate species respectively, but soresiate morphs of

*F. intercincta* are frequent, raising a potential difficulty of distinguishing the two species when sterile.

The community is developed on hard, acidic and very nutrient-poor rocks. Stands frequently occur on steep or slightly overhanging faces. However, it is likely that the nutrient-poor conditions of steep faces are more important than rain-shelter, as stands can sometimes be found on sloping exposed surfaces. The community can be locally abundant, dominating rock faces and block scree. At other sites the community is confined to steep faces, and sloping faces are either apparently too nutrient-rich and are occupied by A1, or too flushed and occupied by L1.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is often abundant and dominant on block scree, typically on medium to coarse blocks but occasionally on blocks as small as 0.3 m long.

Siliceous rocky slopes with chasmophytic vegetation: this community sometimes occurs on overhanging rock faces, but these are doubtfully chasmophytic.

### Conservation interest

Amongst the frequent species of this community, *Fuscidea intercincta* and *F. gothoburgensis* are Nationally Scarce. The scarce *F. austera* is Near Threatened.

### Differentiation from other communities

B3 differs in the scarcity of the more ecologically demanding *Fuscidea* species (*F. gothoburgensis*, *F. intercincta* and *F. kochiana*) and the abundance of *F. lygaea*.

### Coverage and integrity

This community is fairly well covered by samples.

**Table 9:** Floristic and environmental data for SS B1 *Fuscidea kochiana*-*F. intercincta* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Fuscidea kochiana</i>	IV (1-9)
<i>Fuscidea cyathoides</i>	III (2-8)
<i>Fuscidea intercincta</i>	III (1-9)
<i>Fuscidea gothoburgensis</i>	III (1-8)
<i>Fuscidea lygaea</i>	III (1-7)
<i>Porpidia tuberculosa</i>	III (1-5)
<i>Opegrapha gyrocarpa</i>	II (1-5)
<i>Fuscidea recens</i>	II (1-5)
<i>Pertusaria corallina</i>	II (1-5)
<i>Rhizocarpon geographicum</i>	II (1-4)
<i>Micarea lignaria</i>	II (1-3)

<i>Trentepohlia iolithus</i>	I (6)
<i>Fuscidea austere</i>	I (5-6)
<i>Gymnomitrium obtusum</i>	I (5)
<i>Haematomma ochroleucum</i> var. <i>porphyrium</i>	I (5)
<i>Porpidia flavocruenta</i>	I (5)
<i>Racomitrium lanuginosum</i>	I (5)
<i>Tylothallia biformigera</i>	I (4-5)
<i>Allantoparmelia alpicola</i>	I (4)
<i>Porpidia superba</i>	I (4)
<i>Lecanora gangaleoides</i>	I (4)
<i>Rimularia intercedens</i>	I (4)
<i>Acarospora nitrophila</i>	I (3)
<i>Ophioparma ventosum</i>	I (3)
<i>Pertusaria lacteal</i>	I (2-5)
<i>Pertusaria flavicans</i>	I (2-5)
<i>Micarea coppinsii</i>	I (2-4)
<i>Ochrolechia androgyna</i>	I (2-4)
<i>Coccotrema citrinescens</i>	I (2-4)
<i>Tephromela atra</i>	I (2-4)
<i>Trapelopsis flexuosa</i>	I (2-3)
<i>Acarospora fuscata</i>	I (2)
<i>Grimmia trichophylla</i>	I (2)
<i>Lecania baeomma</i>	I (2)
<i>Lepraria nivalis</i>	I (2)
<i>Marsupella emarginata</i>	I (2)
<i>Miriquidica leucophaea</i>	I (2)
<i>Scoliciosporum umbrinum</i>	I (2)
<i>Lepraria atlantica</i>	I (2)
<i>Andreaea rupestris</i>	I (1-4)
<i>Diplophyllum albicans</i>	I (1-4)
<i>Fuscidea praeruptorum</i>	I (1-4)
<i>Rhizocarpon reductum</i>	I (1-4)
<i>Cladonia diversa</i>	I (1-2)
<i>Cystocoleus ebeneus</i>	I (1-2)
<i>Frullania tamarisci</i>	I (1-2)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (1-2)
<i>Parmelia saxatilis</i>	I (1-2)
<i>Cladonia subcervicornis</i>	I (1)
<i>Diploschistes scruposus</i>	I (1)
<i>Amphidium mougeotii</i>	I (1)
<i>Arthrorhaphis citrinella</i>	I (1)
<i>Cladonia bellidiflora</i>	I (1)
<i>Cladonia macilenta</i>	I (1)
<i>Frullania fragilifolia</i>	I (1)
<i>Hypnum andoi</i>	I (1)
<i>Lecanora intricate</i>	I (1)
<i>Lecanora soralifera</i>	I (1)
<i>Lecidea lapicida</i>	I (1)

<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	I (1)
<i>Lecidea swartzioidea</i>	I (1)
<i>Lepraria elobata</i>	I (1)
<i>Lepraria jackii</i>	I (1)
<i>Mycoblastus sanguinarius</i>	I (1)
<i>Pertusaria aspergilla</i>	I (1)
<i>Pertusaria pseudocorallina</i>	I (1)
<i>Pseudephebe pubescens</i>	I (1)
<i>Racomitrium ellipticum</i>	I (1)
<i>Racomitrium sudeticum</i>	I (1)
<i>Stereocaulon vesuvianum</i>	I (1)
<i>Tremolechia atrata</i>	I (1)
<i>Lepraria borealis</i>	I (1)
<i>Porpidia rugosa</i>	I (1)
<i>Rhizocarpon lavatum</i>	I (1)
Rock	V (2-6)
<i>Alchemilla alpina</i>	I (4)
<i>Agrostis vinealis</i>	I (2)
<i>Thymus polytrichus</i>	I (2)
<i>Viola riviniana</i>	I (2)
Slope (degrees)	84 (10-125)
Aspect (degrees)	
Shade	None to Ssight (to moderate)
Run off	None to slight
Drainage	(Poor to) moderate to good
Rain shelter	None to moderate
Altitude (m)	340-980
Number of samples	39

### 3.4.5 SS B2 *Fuscidea praeruptorum*-*F. cyathoides* community (Table 10)

#### Synonyms

None are known.

#### Constant species

*Fuscidea cyathoides* and *F. praeruptorum*.

#### Description and ecology

Crustose lichens dominate this community, principally the dull brownish *Fuscidea praeruptorum*, sometimes accompanied by *Fuscidea cyathoides* and *Micarea lignaria*.

This community is developed on gently sloping and rain-exposed, to slightly overhanging faces of Millstone Grit, and is recorded only from Leeks Moors in the Peak District. It is a species-poor community developed on rocks, which have experienced a long period of atmospheric pollution, but where there has probably been some amelioration of pollution in



recent decades. Here it was widespread and frequent enough to be worthy of description, but it is unlikely to be found on natural rock faces in areas of relatively low pollution. Stands often have the appearance of bare rock from a short distance. The community can grow close to *Acarospora*-dominated stands (D3) on gently sloping surfaces, and close to stands with *Lecanora gangaleoides* (A3) on steep faces.

### Annex I habitats

The community was not found to be associated with any Annex I habitats.

### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

This community is distinguished by the abundance of *Fuscidea praeruptorum* associated with few other species.

### Coverage and integrity

This community is reasonably well covered by samples and is based largely on the abundance of one species at a site where lichen communities generally are much simplified and modified by pollution; it could represent a transient pioneer community.

**Table 10:** Floristic and environmental data for SS B2 *Fuscidea praeruptorum*-*F. cyathoides* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Fuscidea praeruptorum</i>	V (5-8)
<i>Fuscidea cyathoides</i>	IV (1-7)
<i>Micarea lignaria</i> var. <i>lignaria</i>	III (2-5)
<i>Lepraria caesioalba</i>	III (2-4)
<i>Arctoparmelia incurva</i>	II (1-2)
<i>Lecanora gangaleoides</i>	I (4)
<i>Trentepohlia</i> spp. (short constricted filaments)	I (4)
<i>Acarospora fuscata</i>	I (2)
<i>Rhizocarpon geographicum</i>	I (1)
<i>Placynthiella icmalea</i>	I (1)
<i>Cladonia polydactyla</i>	I (1)
Rock	V (4-8)
Slope (degrees)	74 (20-100)
Aspect (degrees)	
Shade	None (to slight)
Run off	Slight to moderate
Drainage	(Moderate to) good

Rain-shelter	None (to slight)
Altitude (m)	
Number of samples	8

### 3.3.6 SS B3 *Fuscidea lygaea*-*Porpidia tuberculosa* community (Table 11)

#### Synonyms

*Umbilicarietum cylindricae* (Frey) Frey “nodum 1”p.p. (James *et al.*, 1977).

#### Constant species

*Fuscidea lygaea* and *Porpidia tuberculosa*.

#### Description and ecology

Crustose lichens dominate this community, particularly *Fuscidea lygaea*, often also with *Fuscidea cyathoides* and *Porpidia tuberculosa*. The community shows a gradation from stands with *Fuscidea lygaea* and sometimes with *Porpidia tuberculosa* and *Tremolechia atrata*, to stands where *F. cyathoides* is more abundant than *F. lygaea* and where *F. lygaea* may be absent. *Fuscidea cyathoides* as a species seems more abundant at higher levels of nutrients and pH than *F. lygaea*.

Stands occur in nutrient-poor situations on gently sloping to vertical unshaded rocks, which are not or scarcely sheltered from, rain. The more ecologically exacting species of *Fuscidea* of B1 are scarce or absent. At the more acid pole of B3, stands can grade into A1, and represent places where nutrient supply apparently becomes too weak to support A1, for instance on the steep side of a boulder which supports A1 on its upper surface.

On well-drained surfaces on the summit of Bow Fell (Lake District) and doubtless in many other places, B3 is frequent as stands of inconspicuous dull grey *F. lygaea* with much bare rock, the rock looking bare from a few metres distance. Stands with abundant *F. cyathoides* are sometimes equivalent to a nutrient-poor extreme of A2. Stands of B3 can give way to *Opegrapha gyrocarpa* (K5) as rain-shelter increases. Stands of B3 occur on bedrock and on boulders, and much less frequently on stones in semi-stable scree; on the summit of Cadair Idris scree with stones 6–15 cm long were sometimes observed to carry this species-poor community, but screes of this type at other sites, and other parts of this site, were more likely to carry D1 or E1.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is frequent on medium to large blocks in scree, while it occurs only rarely on fine scree.

#### Conservation interest

The typical species of this community are widespread.

#### Differentiation from other communities

See under A1.

### Coverage and integrity

This community is fairly well covered by samples.

**Table 11:** Floristic and environmental data for SS B3 *Fuscidea lygaea*-*Porpidia tuberculosa* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Fuscidea lygaea</i>	IV (5-10)
<i>Porpidia tuberculosa</i>	IV (1-8)
<i>Fuscidea cyathoides</i>	III (2-8)
<i>Miriquidica leucophaea</i>	II (1-5)
<i>Tremolechia atrata</i>	II (1-5)
<i>Rhizocarpon geographicum</i>	II (1-3)
<i>Micarea lignaria</i>	II (1-2)
<i>Stereocaulon vesuvianum</i>	II (1-2)
<i>Lecanora soralifera</i>	I (5)
<i>Fuscidea praeruptorum</i>	I (4)
<i>Porpidia irrigua</i>	I (4)
<i>Rhizocarpon lavatum</i>	I (4)
<i>Opegrapha gyrocarpa</i>	I (3-5)
<i>Acarospora fuscata</i>	I (2-5)
<i>Micarea subnigrata</i>	I (2-4)
<i>Andreaea rupestris</i>	I (2)
<i>Cladonia subcervicornis</i>	I (2)
<i>Diplophyllum albicans</i>	I (2)
<i>Lecidea fuliginosa</i>	I (2)
<i>Lepraria borealis</i>	I (2)
<i>Melanelia fuliginosa</i> subsp. <i>fuliginosa</i>	I (2)
<i>Micarea coppinsii</i>	I (2)
<i>Ophioparma ventosa</i>	I (2)
<i>Porpidia contraponenda</i>	I (2)
<i>Racomitrium lanuginosum</i>	I (2)
<i>Fuscidea kochiana</i>	I (1-4)
<i>Pertusaria pseudocorallina</i>	I (1-4)
<i>Tephromela atra</i>	I (1-4)
<i>Lecanora intricate</i>	I (1-3)
<i>Lecanora gangaleoides</i>	I (1-3)
<i>Rhizocarpon reductum</i>	I (1-2)
<i>Parmelia omphalodes</i>	I (1-2)
<i>Porpidia cinereoatra</i>	I (1-2)
<i>Immersaria athrocarpa</i>	I (1-2)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (1-2)
<i>Rhizocarpon oederi</i>	I (1-2)

<i>Lecanora polytropa</i>	I (1)
<i>Gymnomitrium crenulatum</i>	I (1)
<i>Racomitrium sudeticum</i>	I (1)
<i>Candelariella coralliza</i>	I (1)
<i>Clauzadeana macula</i>	I (1)
<i>Gymnomitrium obtusum</i>	I (1)
<i>Micarea leprosula</i>	I (1)
<i>Pertusaria albescens</i>	I (1)
<i>Porpidia flavocruenta</i>	I (1)
<i>Porpidia macrocarpa</i>	I (1)
<i>Usnea flammea</i>	I (1)
Rock	V (2-8)
Slope (degrees)	58 (15-100)
Aspect (degrees)	
Shade	None
Run off	None to slight
Drainage	Good
Rain-shelter	None to slight
Altitude (m)	220-950
Number of samples	28

### 3.3.7 SS C1 *Pertusaria corallina*-*P. pseudocorallina* community (Table 12)

#### Synonyms

*Pertusarietum corallinae* Frey p.p. (James *et al.*, 1977).

#### Constant species

*Pertusaria corallina* and *Porpidia tuberculosa*.

#### Description and ecology

Crustose lichens dominate this community with samples including at least one of *Pertusaria aspergilla*, *P. corallina*, *P. lactea* or *P. pseudocorallina*. Particularly, *P. corallina* can be a conspicuous species, the thalli giving a white-speckled appearance to basic cliffs, in contrast to more acidic rock-types nearby.

This community develops on unshaded, well-drained rocks of relatively high base-status, such as andesite, basalt, basic tuff, dolerite and tonalite. The community can occur on gently sloping surfaces, especially in drier regions, but it is frequently restricted to steep or overhanging faces, which provide relatively dry conditions. Some stands have been seen to be dry following several hours of rain. The community can develop on any stable surface, including cliffs and outcrops, boulders and on small blocks 0.3–0.6 m long. The community can occur adjacent to several others; it grades readily into A2 and E1, and flushing can result in its replacement by L1 or M4 with no other obvious change in conditions.

Stands where the principal *Pertusaria* species is *P. lactea* tend to be developed on damp faces; these can be distinguished as a sub-community SS C1b.

Sub-community SS C1a: preferential species include *Pertusaria corallina*, *Miriquidica leucophaea* and (in small quantities) *Parmelia saxatilis* and *Rhizocarpon geographicum*.

Sub-community SS C1b: preferential species include *Pertusaria lactea*, *Opegrapha gyrocarpa* and *Fuscidea recensa*.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): sub-community SS C1a is frequent in block scree while sub-community SS C1b can occur on very large blocks

### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

This community can grade rapidly into others, and isolated, sometimes large, thalli of *Pertusaria* spp. sometimes appear to be placed within a different community, making the selection of homogeneous stands difficult. A2 is distinguished by *Pertusaria* spp. occurring at no more than 10% cover. Preferential species for A2 include *Tephromela atra*, *Lecanora polytropa*, *L. soralifera* and *Rhizocarpon geographicum*. *Opegrapha gyrocarpa* is preferential to C1b, although it is often an incidental species resulting from the frequent occurrence of C1 on steep faces. On wetter faces, which support bryophytes and algal colonies, the margins of *P. corallina* thalli often have an eroded appearance

### Coverage and integrity

There is a reasonable cover of samples for this community. The limits between this community and others such as A2 and E1 are not easy to define, but pale stands of *Pertusaria* are often distinctive in the field and appear to represent a good nodum.

**Table 12:** Floristic and environmental data for SS C1 *Pertusaria corallina*-*P. pseudocorallina* community and sub-communities

Species/Environmental factor	Constancy class (min-max cover)/Environmental data		
	Sub-community SS C1b	Sub-community SS C1a	Community SS C1
<i>Pertusaria corallina</i>	II (5-6)	V (1-8)	IV (1-8)
<i>Porpidia tuberculosa</i>	IV (2-7)	IV (1-7)	IV (1-7)
<i>Pertusaria pseudocorallina</i>	I (2-4)	IV (1-8)	III (1-8)
<i>Pertusaria lactea</i>	V (5-8)	I (1-5)	II (1-8)
<i>Opegrapha gyrocarpa</i>	I (1-5)	I (1-5)	II (1-5)
<i>Andreaea rupestris</i>	I (1)	II (1-5)	II (1-5)
<i>Miriquidica leucophaea</i>		III (1-5)	II (1-5)

<i>Pertusaria amara</i>		I (7)	I (7)
<i>Haematomma ochroleucum</i>		I (6)	I (6)
<i>Pertusaria excludens</i>	I (5)		I (5)
<i>Fuscidea austera</i>		I (5)	I (5)
<i>Schaereria cinereorufa</i>		I (5)	I (5)
<i>Tylothallia biformigera</i>		I (5)	I (5)
<i>Pertusaria flavicans</i>	I (5)	I (4-7)	I (4-7)
<i>Lecanora gangaleoides</i>		I (4-5)	I (4-5)
<i>Lecidea fuscoatra</i>		I (4-5)	I (4-5)
<i>Lecidella scabra</i>	I (4)		I (4)
<i>Calvitimela aglaea</i>		I (4)	I (4)
<i>Ephebe lanata</i>		I (4)	I (4)
<i>Gymnomitrium obtusum</i>		I (4)	I (4)
<i>Lecidea swartzioidea</i>		I (4)	I (4)
<i>Pertusaria albescens</i>		I (4)	I (4)
<i>Porina lectissima</i>		I (4)	I (4)
<i>Ropalospora lugubris</i> (sorediate)		I (4)	I (4)
<i>Tephromela pertusarioides</i>		I (4)	I (4)
<i>Tremolechia atrata</i>		I (4)	I (4)
<i>Fuscidea gothoburgensis</i>		I (3-5)	I (3-5)
<i>Racomitrium heterostichum</i>		I (3-4)	I (3-4)
<i>Rimularia furvella</i>		I (3)	I (3)
<i>Stereocaulon leucophaeopsis</i>		I (2-6)	I (2-6)
<i>Porpidia cinereoatra</i>	I (5)	I (2-5)	I (2-5)
<i>Cladonia subcervicornis</i>	I (2)	I (2-4)	I (2-4)
<i>Melanelia fuliginosa</i> subsp. <i>fuliginosa</i>		I (2-4)	I (2-4)
<i>Aspicilia grisea</i>		I (2-4)	I (2-4)
<i>Frullania fragilifolia</i>	I (2)		I (2)
<i>Micarea coppinsii</i>		I (2)	I (2)
<i>Trapeliopsis flexuosa?</i>		I (2)	I (2)
<i>Andreaea rothii</i> ssp. <i>rothii</i>		I (2)	I (2)
<i>Lecanora orosthea</i>		I (2)	I (2)
<i>Lepraria incana</i>		I (2)	I (2)
<i>Trapelia coarctata</i>		I (2)	I (2)
<i>Amphidium mougeotii</i>		I (2)	I (2)
<i>Arthrorhaphis citrinella</i>		I (2)	I (2)
<i>Campylopus atrovirens</i>		I (2)	I (2)
<i>Gymnomitrium crenulatum</i>		I (2)	I (2)
<i>Lecidea phaeops</i>		I (2)	I (2)
<i>Micarea leprosula</i>		I (2)	I (2)
<i>Porina mammillosa/sudetica</i>		I (2)	I (2)
<i>Racomitrium ellipticum</i>		I (2)	I (2)
<i>Trapeliopsis granulosa</i>		I (2)	I (2)
<i>Pertusaria aspergilla</i>	I (5)	I (1-7)	I (1-7)
<i>Fuscidea cyathoides</i>		I (1-6)	I (1-6)
<i>Ophioparma ventosa</i>		I (1-6)	I (1-6)

<i>Porpidia macrocarpa</i>		I (1-6)	I (1-6)
<i>Rhizocarpon lavatum</i>	I (1-5)	I (1-2)	I (1-5)
<i>Coccotrema citrinescens</i>	I (1-5)		I (1-5)
<i>Fuscidea recensa</i>	I (1-2)	I (2-5)	I (1-5)
<i>Lecanora intricata</i>		I (1-5)	I (1-5)
<i>Stereocaulon vesuvianum</i>		I (1-5)	I (1-5)
<i>Micarea subnigrata</i>		I (1-5)	I (1-5)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>		I (1-5)	I (1-5)
<i>Enterographa zonata</i>		I (1-5)	I (1-5)
<i>Porpidia rugosa</i>	I (4)	I (1)	I (1-4)
<i>Fuscidea lygaea</i>	I (2-4)	I (1-4)	I (1-4)
<i>Trapelia placodioides</i>	I (1)	I (4)	I (1-4)
<i>Racomitrium sudeticum</i>	I (1)	I (1-4)	I (1-4)
<i>Fuscidea praeceptorum</i>	I (1)	I (1-4)	I (1-4)
<i>Parmelia saxatilis</i>		II (1-4)	I (1-4)
<i>Rhizocarpon geographicum</i>		I (1-4)	I (1-4)
<i>Ochrolechia androgyna</i>		I (1-4)	I (1-4)
<i>Rhizocarpon reductum</i>		I (1-4)	I (1-4)
<i>Diplophyllum albicans</i>		I (1-4)	I (1-4)
<i>Porpidia melinodes</i>		I (1-4)	I (1-4)
<i>Protoparmelia badia</i>		I (1-4)	I (1-4)
<i>Ionaspis lacustris</i>	I (1-3)	I (1)	I (1-3)
<i>Ramalina subfarinacea</i>		I (1-3)	I (1-3)
<i>Trapelia involuta</i>		I (1-3)	I (1-3)
<i>Lepraria eburnea</i>	I (2)	I (1)	I (1-2)
<i>Lepraria atlantica</i>	I (1-2)	I (1-2)	I (1-2)
<i>Cystocoleus ebeneus</i>	I (1-2)		I (1-2)
<i>Scoliciosporum umbrinum</i>	I (1)	I (2)	I (1-2)
<i>Micarea lignaria</i>		II (1-2)	I (1-2)
<i>Immersaria arthroocarpa</i>		I (1-2)	I (1-2)
<i>Lepraria caesioalba</i>		I (1-2)	I (1-2)
<i>Usnea flammea</i>		I (1-2)	I (1-2)
<i>Lecanora polytropia</i>		I (1-2)	I (1-2)
<i>Lepraria borealis</i>		I (1-2)	I (1-2)
<i>Cladonia diversa</i>		I (1-2)	I (1-2)
<i>Lecanora soralifera</i>		I (1-2)	I (1-2)
<i>Candelariella coralliza</i>		I (1-2)	I (1-2)
<i>Racomitrium fasciculare</i>		I (1-2)	I (1-2)
<i>Rhizocarpon oederi</i>		I (1-2)	I (1-2)
<i>Acarospora smaragdula</i>	I (1)		I (1)
<i>Aspicilia cinerea/grisea</i>	I (1)		I (1)
<i>Frullania tamarisci</i>	I (1)		I (1)
<i>Grimmia torquata</i>	I (1)		I (1)
<i>Rhizocarpon hochstetteri</i>		I (1)	I (1)
<i>Parmelia omphalodes</i>		I (1)	I (1)
<i>Andreaea alpina</i>		I (1)	I (1)
<i>Aspicilia cinerea</i> agg.		I (1)	I (1)

<i>Cornicularia normoerica</i>		I (1)	I (1)
<i>Cystocoleus ebeneus/Racodium rupestre</i>		I (1)	I (1)
<i>Diploschistes scruposus</i>		I (1)	I (1)
<i>Epigloea soleiformis</i>		I (1)	I (1)
<i>Fuscidea kochiana</i>		I (1)	I (1)
<i>Grimmia donniana</i>		I (1)	I (1)
<i>Isothecium alopecuroides</i>		I (1)	I (1)
<i>Lecanora rupicola</i>		I (1)	I (1)
<i>Lecidea lactea</i>		I (1)	I (1)
<i>Ochrolechia tartarea</i>		I (1)	I (1)
<i>Parmelia sulcata</i>		I (1)	I (1)
<i>Placopsis lambii</i>		I (1)	I (1)
<i>Stereocaulon cf. tornense</i>		I (1)	I (1)
<i>Toninia thiopsora</i>		I (1)	I (1)
<i>Xanthoria candelaria</i>		I (1)	I (1)
Rock	V (2-7)	V (2-8)	V (2-8)
<i>Asplenium trichomanes</i>		I (1)	I (1)
Slope (degrees)	92 (70-110)	72 (5-145)	76 (5-145)
Aspect (degrees)			
Shade	None to slight	None to slight	None to slight
Run off	None to slight	None to slight	None to slight
Drainage	Good	Moderate to good	(moderate to) Good
Rain shelter	Slight to moderate	None to slight (to strong)	None to slight (to strong)
Altitude (m)	440-700	205-1140	205-1140
Number of samples	8	45	54

### 3.3.8 SS D1 *Porpidia tuberculosa*-*Rhizocarpon reductum* community (Table 13)

#### Synonyms

*Huilletum crustulatae* (Klem) James *et. al.* p.p. (James *et al.*,1977).

#### Constant species

*Lecanora soralifera*, *Porpidia macrocarpa*, *P. tuberculosa*, *Rhizocarpon reductum* and *Stereocaulon leucophaeopsis*.

#### Description and ecology

This is a community of crustose lichens, which are rapid colonisers of newly exposed surfaces, including the constant species and also *Porpidia striata* and *Rhizocarpon anaperum*. The mosses *Andreaea rupestris*, *Grimmia donniana* and *Racomitrium sudeticum* are occasional to frequent, but usually at low cover (up to 10%; *R. sudeticum* rarely 10–25%).

Most samples are from fine scree, stony ground on summits, or fans of material washed down gullies by storms, but some are from boulders where the surface is unstable and composed of



freshly exposed rock. The substrate is too unstable for *Rhizocarpon geographicum* to be more than very sparse, but this species (as a component of A1 or A2) enters as the size and stability of the stones increases. Most of the fine material on extensive scree slopes is too unstable for lichen colonization, and this community is often confined to the edges of scree patches. The community represents relatively dry conditions, and moisture-loving species are less prominent than in E1. Samples with abundant *Lecanora soralifera* may represent slightly more base-rich or nutrient-rich conditions. A higher base-status is shown by a sample on andesite from Glen Coe, which completely lacked *Porpidia tuberculosa*, but contained *Buellia ocellata* and *Catillaria atomarioides*.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this is one of the principal communities of fine siliceous scree (stones in the range 2-25 cm long) and occurs on small blocks as well.

### Conservation interest

Stands of this community regularly contain small quantities of uncommon lichens of fine scree, including *Micarea angulosa ad int.* (an undescribed species), *M. marginata*, *M. ternaria* and *Rhizocarpon anaperum*.

### Differentiation from other communities

The community grades into E1 with increasingly moist conditions, for instance in areas of damper climate. The distinction is not easy to make, but compared with D1, E2 contains a greater frequency of a number of crustose lichens which prefer damp rock, including *Ionaspis odora*.

### Coverage and integrity

This community is fairly well covered by samples, but more samples from a wider area and on a greater variety of rock types should be collected.

**Table 13:** Floristic and environmental data for SS D1 *Porpidia tuberculosa*-*Rhizocarpon reductum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Porpidia tuberculosa</i>	V (3-8)
<i>Rhizocarpon reductum</i>	V (1-6)
<i>Lecanora soralifera</i>	IV (1-6)
<i>Stereocaulon leucophaeopsis</i>	IV (1-5)
<i>Porpidia macrocarpa</i>	IV (1-5)
<i>Porpidia striata</i>	III (1-6)
<i>Racomitrium sudeticum</i>	III (1-5)
<i>Trapelia coarctata</i>	III (1-3)
<i>Stereocaulon plicatile/tornense</i>	II (1-5)
<i>Rhizocarpon anaperum</i>	II (1-4)

<i>Racomitrium lanuginosum</i>	II (1-5)
<i>Stereocaulon vesuvianum</i>	II (1-4)
<i>Andreaea rupestris</i>	II (1-2)
<i>Placopsis lambii</i>	II (1-5)
<i>Grimmia donniana</i>	II (1-4)
<i>Micarea lignaria</i>	II (1-3)
<i>Diplophyllum albicans</i>	II (1-4)
<i>Racomitrium fasciculare</i>	II (1-4)
<i>Trapelia placodioides</i>	II (1-2)
<i>Porpidia irrigua ined.</i>	II (1-5)
<i>Cladonia diversa</i>	II (1-2)
<i>Lecanora polytropa</i>	I (1-2)
<i>Buellia aethalea</i> (all morphs)	I (2-5)
<i>Rhizocarpon hochstetteri</i>	I (2-5)
<i>Porpidia melinodes</i>	I (2-5)
<i>Aspicilia caesiocinerea</i>	I (4)
<i>Pilophorus strumaticus</i>	I (4)
<i>Amygdalaria pelobotryon</i>	I (2-4)
<i>Tremolechia atrata</i>	I (1-4)
<i>Porpidia flavocruenta</i>	I (1-4)
<i>Lecidea lithophila</i>	I (1-4)
<i>Lecanora intricata</i>	I (1-4)
<i>Buellia ocellata</i>	I (3)
<i>Catillaria atomarioides</i>	I (3)
<i>Lecidella carpathica</i>	I (3)
<i>Pertusaria flavicans</i>	I (3)
<i>Polytrichum piliferum</i>	I (3)
<i>Trapelia obtegens</i>	I (1-3)
<i>Rhizocarpon oederi</i>	I (1-3)
<i>Polytrichum alpinum</i>	I (1-3)
<i>Lecidea promixta</i>	I (2)
<i>Ionaspis odora</i>	I (2)
<i>Porpidia flavocruenta</i>	I (2)
<i>Pogonatum urnigerum</i>	I (2)
<i>Aspicilia cinerea</i> agg.	I (2)
<i>Cladonia bellidiflora</i>	I (2)
<i>Fuscidea lygaea</i>	I (2)
<i>Micarea marginata</i>	I (2)
<i>Lecanora gangaleoides</i>	I (2)
<i>Micarea subnigrata</i>	I (2)
<i>Polytrichum formosum</i>	I (2)
<i>Porpidia cinereoatra</i>	I (2)
<i>Porpidia superba</i> f. <i>superba</i>	I (2)
<i>Ptychomitrium polyphyllum</i>	I (2)
<i>Trapelia involuta</i>	I (1-2)
<i>Micarea angulosa</i> ad int.	I (1-2)
<i>Rhizocarpon geographicum</i>	I (1-2)
<i>Porpidia contraponenda</i>	I (1-2)

<i>Baeomyces rufus</i>	I (1-2)
<i>Cladonia subcervicornis</i>	I (1-2)
<i>Aspicilia grisea</i>	I (1-2)
<i>Pohlia nutans</i>	I (1-2)
<i>Lecidea plana</i>	I (1-2)
<i>Micarea marginata</i>	I (1-2)
<i>Rhizocarpon lavatum</i>	I (1-2)
<i>Rhizocarpon infernulum</i>	I (1-2)
<i>Lophozia sudetica</i>	I (1-2)
<i>Porpidia crustulata</i>	I (1-2)
<i>Protothelenella corrosa</i>	I (1-2)
<i>Acarospora smargadula</i>	I (1-2)
<i>Cladonia cervicornis</i>	I (1-2)
<i>Hypnum jutlandicum</i>	I (1-2)
<i>Micarea ternaria</i>	I (1-2)
<i>Porpidia soledizodes</i>	I (1-2)
<i>Baeomyces carneus</i>	I (1)
<i>Rhytidiadelphus loreus</i>	I (1)
<i>Lecidea swartzioidea</i>	I (1)
<i>Andreaea rothii</i> (either subsp.)	I (1)
<i>Cetraria aculeate</i>	I (1)
<i>Cladonia cyathomorpha</i>	I (1)
<i>Lepraria elobata</i>	I (1)
<i>Micarea coppinsii</i>	I (1)
<i>Epigloea soleiformis</i>	I (1)
<i>Miriquidica leucophaea</i>	I (1)
<i>Micarea paratropa</i>	I (1)
<i>Rhizocarpon polycarpum</i>	I (1)
<i>Trapeliopsis flexuosa</i>	I (1)
<i>Bryum capillare</i>	I (1)
<i>Campylopus atrovirens</i>	I (1)
<i>Campylopus flexuosus</i>	I (1)
<i>Cladonia crispata</i> var. <i>cetrariiformis</i>	I (1)
<i>Cladonia uncialis</i>	I (1)
<i>Dicranum scoparium</i>	I (1)
<i>Ionaspis lacustris</i>	I (1)
<i>Lecidea fuscoatra</i>	I (1)
<i>Lecidea phaeops</i>	I (1)
<i>Lepraria rigidula</i>	I (1)
<i>Micarea botryoides</i>	I (1)
<i>Micarea leprosula</i>	I (1)
<i>Micarea sylvicola</i>	I (1)
<i>Nardia scalaris</i>	I (1)
<i>Ochrolechia tartarea</i>	I (1)
<i>Oligotrichum hercynicum</i>	I (1)
<i>Pertusaria aspergilla</i>	I (1)
<i>Pertusaria corallina</i>	I (1)
<i>Pertusaria pseudocorallina</i>	I (1)

<i>Pilophorus strumaticus</i>	I (1)
<i>Porpidia platycarpoides</i>	I (1)
<i>Porpidia superba</i> f. <i>sorediata</i>	I (1)
<i>Pseudotaxiphyllum elegans</i>	I (1)
<i>Rhytidiadelphus squarrosus</i>	I (1)
<i>Scoliciosporum umbrinum</i>	I (1)
<i>Sphaerophorus globosus</i>	I (1)
<i>Stereocaulon evolutum</i>	I (1)
Rock	V (3-8)
<i>Festuca ovina</i> /filiformis	I (1-5)
<i>Vaccinium myrtillus</i>	I (1-5)
<i>Vaccinium vitis-idaea</i>	I (2-4)
<i>Festuca vivipara</i>	I (2)
<i>Galium aparine</i>	I (2)
<i>Salix herbacea</i>	I (2)
<i>Cryptogramma crista</i>	I (1)
<i>Deschampsia flexuosa</i>	I (1)
Slope (degrees)	30 (0-90)
Aspect (degrees)	
Shade	None
Run off	None to slight (to moderate)
Drainage	(Moderate to) good
Rain shelter	None
Altitude (m)	130-1065
Number of samples	41

### 3.3.9 SS D2 *Acarospora sinopica*-*Rhizocarpon oederi* community (Table 14)

#### Synonyms

*Acarosporium sinopicae* Hil. (James *et al.*, 1977).

#### Constant species

*Acarospora sinopica*, *Placopsis lambii*, *Porpidia tuberculosa* and *Rhizocarpon oederi*.

#### Description and ecology

This is a community of crustose lichens growing on siliceous rocks, which are rich in iron or other heavy metals. Species in this community, which are known to be tolerant of metal-rich substrata, include *Acarospora sinopica*, *Lecanora subaurea* and *Rhizocarpon oederi*. The remaining species are mostly characteristic of unstable substrata and are also found in D1.

The three samples available were taken from a boulder 1 m long in a natural scree in Eryri, from shaly stones on a spoil-heap at a disused metal mine (with abundant *Lecanora subaurea*) and from stones in a dry stone retaining wall. At the last site the sheltered sides of the blocks carried stands of *Lecanora epanora* (K9).

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community can occur on block scree where this is metal-rich.

### Conservation interest

*Lecanora epanora* and *L. subaurea* are Nationally Scarce.

### Differentiation from other communities

D1 is similar to D2 but lacks *Acarospora sinopica*, *Lecanora subaurea* and other species, which are mostly confined to metal-rich rocks, although metal tolerant species such as *Rhizocarpon oederi* may be present. One sample (not shown) from iron-rich rock in Scotland contained the metal-tolerant *Lecidea silacea*, but otherwise the stand resembled A1.

### Coverage and integrity

More samples are needed to adequately cover the variation in this community.

**Table 14:** Floristic and environmental data for SS D2 *Acarospora sinopica*-*Rhizocarpon oederi* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data		
	373	425	15
<i>Placopsis lambii</i>	7	2	2
<i>Porpidia tuberculosa</i>	4	5	3
<i>Acarospora sinopica</i>	4	5	1
<i>Rhizocarpon oederi</i>	4	4	2
<i>Porpidia macrocarpa</i>	2	6	
<i>Stereocaulon vesuvianum</i>	4	2	
<i>Rhizocarpon reductum</i>		3	2
<i>Grimmia donniana</i>	3	1	
<i>Lecanora subaurea</i>			5
<i>Lecanora soralifera</i>			2
<i>Lecanora epanora</i>	2		
<i>Rhizocarpon infernulum</i>			1
Rock	4	4	8
Slope (degrees)	70	60	30
Aspect (degrees)	300	310	180
Shade	None	None	None
Run off	Slight	Slight	None
Drainage	Good	Good	Good
Rain shelter	None	None	None
Altitude (m)	10		280
Quadrat size (cm)	25 x 25	25 x 25	50 x 50
Vice-county	48	49	46
Grid ref.	23/7098.1940	23/6057.5564	22/8083.7486

Date	12 Sep 2002	20 Sep 2002	20 Mar 2005
SAC/site code	-	E	-

### 3.3.10 SS D3 *Acarospora fuscata*-*A. nitrophila* community (Table 15)

#### Synonyms

None are known.

#### Constant species

*Acarospora nitrophila*.

#### Description and ecology

This is a species-poor community dominated by the crustose lichens *Acarospora fuscata* and *A. nitrophila*. The only records are from Leek Moors in the Peak District, on Millstone Grit rocks, which have experienced a long period of atmospheric pollution, but where there has probably been some amelioration of pollution in recent decades. Stands comprise extensive colonies of *Acarospora*, on the sloping upper surfaces of bedrock and boulders. They probably indicate nutrient-enrichment. The rocks at this site mostly have fragmentary communities of lichens and are often apparently bare.

#### Annex I habitats

The community was not found to be associated with any Annex I habitats.

#### Conservation interest

There are currently few British records of *Acarospora nitrophila*, but it is likely to be under-recorded.

#### Differentiation from other communities

This community is distinguished by the abundance of *Acarospora* with few associated species.

#### Coverage and integrity

This species-poor community may be a transient phase in recolonisation of rocks affected by pollution, but more samples are necessary to assess its distribution and relationship to more natural communities.

**Table 15:** Floristic and environmental data for SS D3 *Acarospora fuscata*-*A. nitrophila* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data			
	208	236	243	247
<i>Acarospora nitrophila</i>		9	6	9
<i>Acarospora fuscata</i>	9		5	
<i>Micarea lignaria</i> var. <i>lignaria</i>		2	4	
<i>Fuscidea praeruptorum</i>			4	1
Rock	5	5	6	5
Slope (degrees)	60	30	40	15
Aspect (degrees)	260	0	220	130
Shade	None	None	None	None
Run off	Moderate	Moderate	Moderate	None-slight
Drainage	Good	Good	Good	Moderate
Rain-shelter	None	None	None	None
Altitude (m)				
Quadrat size (cm)	25 x 25	25 x 25	25 x 25	25 x 25
Vice-county	59	59	59	59
Grid ref.	43/0079.6162	33/9993.6417	33/9998.6404	43/0012.6398
Date	25 June 2002	26 June 2002	26 June 2002	26 June 2002
SAC/site code	PD	PD	PD	PD

**3.3.11 SS D4 *Lecidea lithophila* community (Table 16)****Synonyms**

None are known.

**Constant species**

*Lecidea lithophila*.

**Description and ecology**

This species-poor community is dominated by the crustose lichen *Lecidea lithophila*, accompanied by other crustose lichens including *Lecidea plana* and *Porpidia macrocarpa*. Stands are mottled rusty-orange and grey due to the colour of *L. lithophila*.

This is a pioneer community of recently exposed siliceous rock surfaces. The two samples available are from on blocks on sloping ground, which had probably fallen over, exposing either the underside or a surface previously buried in the soil. On one block, another face of the boulder was occupied by *Rhizocarpon geographicum*, *Lecidea lithophila*, *Rhizocarpon lavatum* and *Tephromela atra*. This apparently represents a less recently exposed face with a community that is more or less referable to A2.

## Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is recorded from boulders in block scree, but many blocks are probably too stable for this pioneer community.

### Conservation interest

This pioneer community is species-poor and probably contains few scarce species.

### Differentiation from other communities

*Lecidea lithophila* can occur in D1 and E1, but D4 is distinguished by the dominance of this species. Screens of D1 and E1 are distinguished by the lesser amounts of *L. lithophila* and the greater species-richness of most samples.

### Coverage and integrity

Only two samples were available for this community, partly because disturbed rocks are not a feature of most of the protected sites, which were surveyed. Disturbed stones beside tracks and in quarries are likely to carry further examples of this community and more samples are necessary to characterise the community more fully.

**Table 16:** Floristic and environmental data for SS D4 *Lecidea lithophila* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data	
	51	101
<i>Lecidea lithophila</i>	8	8
<i>Rhizocarpon lavatum</i>	1	1
<i>Lecidea plana</i>	4	
<i>Porpidia macrocarpa</i>		4
<i>Porpidia tuberculosa</i>		2
<i>Rhizocarpon reductum</i>		1
<i>Stereocaulon vesuvianum</i>	1	
Rock	7	5
Slope (degrees)	55	55
Aspect (degrees)	100	290
Shade	None	None
Run off	None-slight	None
Drainage	Good	Good
Rain-shelter	None	None
Altitude (m)	575	560
Quadrat size (cm)	25 x 25	25 x 25
Vice-county	69	69
Grid ref.	35/3513.1414	35/6901.3281
Date	23 Apr 2004	18 Jun 2005
SAC/site code	LD	NP



### 3.3.12 SS D5 *Porpidia macrocarpa*-*P. striata* community (Table 17)

#### Synonyms

*Huilletum crustulatae* (Klem.) James *et al*, p.p. (James *et al*, 1977).

#### Constant species

*Porpidia macrocarpa* and *P. striata*.

#### Description and ecology

This is a species-poor community of damp, recently exposed siliceous rocks and dominated by the crustose lichens *Porpidia macrocarpa* and *P. striata*.

Two samples are available, from small and low patches of stones or bedrock exposed beside footpaths in acid grassland. Both stands were damp or wet from water seeping from the adjacent peaty soil. This community may have been under-recorded during the survey, but disturbed ground is rare in most of the protected sites visited. Although *P. macrocarpa* is regarded as a common species, it is not particularly prominent in undisturbed places. Although it is a common species, it is actually very handsome in appearance.

#### Annex I habitats

The community was not found to be associated with any Annex I habitats.

#### Conservation interest

This pioneer community is species-poor and is likely to contain few or no scarce species.

#### Differentiation from other communities

This community is distinguished by the dominance of *Porpidia macrocarpa* and *P. striata*. Stands of D1 on scree differ in the greater number of species and the usually smaller amounts of these two *Porpidia* species.

#### Coverage and integrity

This community is easier to distinguish in the field than it is from tabulated data. Many more samples of disturbed rock, including naturally disturbed rock, need to be studied to assess its relationship with scree communities and with some *Porpidia*-dominated stands on faces of bedrock.

**Table 17:** Floristic and environmental data for SS D5 *Porpidia macrocarpa*-*P. striata* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data	
	197	229
<i>Porpidia macrocarpa</i>	6	7
<i>Porpidia striata</i>	4	5
<i>Rhizocarpon reductum</i>	2	2
<i>Dicranella heteromalla</i>		1
<i>Porpidia irrigua</i>		1
Rock	6	6
<i>Agrostis canina</i>	2	
<i>Nardus stricta</i>	7	
Slope (degrees)	30	10
Aspect (degrees)	260	200
Shade	slight	None
Run off	Strong	Moderate
Drainage	Moderate	Poor-moderate
Rain-shelter	None	None
Altitude (m)	675	500
Quadrat size (cm)	25 x 25	25 x 25
Vice-county	70	42
Grid ref.	35/2464.0598	22/8453.2069
Date	16 Sep 2005	6 Oct 2005
SAC/site code	LD	Nant y Llyn

**3.3.13 SS D6 *Porpidia irrigua*-*Rhizocarpon lavatum* community (Table 18)****Synonyms**

None are known.

**Constant species**

*Porpidia irrigua*.

**Description and ecology**

This is a community dominated by crustose lichens, on unshaded, damp siliceous rocks. The lichens *Porpidia irrigua*, *P. macrocarpa*, *P. tuberculosa*, and *Rhizocarpon lavatum* are constant or frequent, sometimes accompanied by other crustose species of damp rock including *Amygdalaria consentiens*, *A. pelobotryon*, *Ionaspis lacustris*, *Lecidea phaeops*, *Pilophorus strumaticus* and *Porpidia contraponenda*. Bryophytes are generally absent or present only at low cover and include *Andreaea alpina* and *Marsupella alpina*, but the latter can occur up to Domin 7 in abundance.

The community develops on outcrops and cliffs which are usually rather strongly flushed; one stand was on a boulder below a groove collecting rainwater.

## Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): one record of the community was from a boulder in block scree, but most records were from bedrock.

## Conservation interest

Nationally Scarce species, which occur in this community, include *Amygdalaria consentiens*, *Pilophorus strumaticus*, *Porpidia contraponenda* and *P. irrigua*.

## Differentiation from other communities

Some samples are closely related floristically to M1 and stands of D6 can occur near to M1. M1 differs from D6 in the high cover of bryophytes other than *Marsupella alpina*. E1 differs in the greater abundance of *Andreaea rupestris* and *Racomitrium sudeticum*, or in the greater frequency of crustose lichens including *Ionaspis chrysophana*, *I. odora*, *Rhizocarpon anaperum*, *R. sublavatum* and *Stereocaulon plicatile/tornense*. Some samples of D6 are similar to stands occurring in freshwater, but the latter have *Ephebe lanata* and *Porpidia hydrophila* as preferential species, whereas *Amygdalaria pelobotryon*, *Lecidea phaeops*, *Porpidia irrigua* and other terrestrial species are preferential for D6.

## Coverage and integrity

This community is represented by few samples. The community is rather heterogeneous, but cannot be divided at present.

**Table 18:** Floristic and environmental data for SS D6 *Porpidia irrigua*-*Rhizocarpon lavatum* community

Species/Environmental factor	Constancy class (min-max cover)
<i>Porpidia irrigua</i>	IV (2-7)
<i>Porpidia tuberculosa</i>	III (2-5)
<i>Rhizocarpon lavatum</i>	III (1-8)
<i>Porpidia macrocarpa</i>	III (1-5)
<i>Marsupella alpina</i>	II (4-7)
<i>Rhizocarpon hochstetteri</i>	II (2-4)
<i>Racomitrium fasciculare</i>	II (2)
<i>Ionaspis lacustris</i>	II (1-5)
<i>Amygdalaria pelobotryon</i>	II (1-4)
<i>Racomitrium sudeticum</i>	II (1-4)
<i>Andreaea rupestris</i>	II (1-2)
<i>Andreaea rothii</i> subsp. <i>falcata</i>	II (1-2)
<i>Gymnomitrium crenulatum</i>	II (1)
<i>Porpidia striata</i>	I (6)
<i>Andreaea alpina</i>	I (5)
<i>Lecidea phaeops</i>	I (5)
<i>Amygdalaria consentiens</i>	I (5)

<i>Immersaria athrocarpa</i>	I (5)
<i>Porpidia islandica</i>	I (5)
<i>Lecidea lithophila</i>	I (4)
<i>Marsupella adusta</i>	I (4)
<i>Stereocaulon plicatile/tornense</i>	I (4)
<i>Pilophorus strumaticus</i>	I (2)
<i>Acarospora smaragdula</i>	I (2)
<i>Andreaea mutabilis</i>	I (2)
<i>Campylopus atrovirens</i>	I (2)
<i>Cladonia diversa</i>	I (2)
<i>Fuscidea lygaea</i>	I (2)
<i>Lecanora soralifera</i>	I (2)
<i>Marsupella emarginata</i>	I (2)
<i>Stereocaulon vesuvianum</i>	I (2)
<i>Porpidia contraponenda</i>	I (1-5)
<i>Racomitrium aquaticum</i>	I (1-4)
<i>Cladonia subcervicornis</i>	I (1)
<i>Diplophyllum albicans</i>	I (1)
<i>Ephebe lanata</i>	I (1)
<i>Micarea lignaria</i>	I (1)
<i>Micarea paratropa</i>	I (1)
<i>Porina lectissima</i>	I (1)
<i>Stereocaulon leucophaeopsis</i>	I (1)
<i>Tephromela atra</i>	I (1)
<i>Trapelia coarctata</i>	I (1)
<i>Blindia acuta</i>	I (1)
<i>Miriquidica complanata</i>	I (1)
<i>Opegrapha gyrocarpa</i>	I (1)
<i>Pohlia drummondii</i>	I (1)
Rock	V (4-6)
Slope (degrees)	67 (40-90)
Shade	None
Run off	(Slight to) moderate to strong
Drainage	Good
Rain-shelter	None
Altitude (m)	735 (520-920)
Number of samples	10

### 3.3.14 SS D7 *Ainoa mooreana*-*Marsupella emarginata* community (Table 19)

#### Synonyms

None are known.

#### Constant species

*Ainoa mooreana*, *Marsupella emarginata* and *Stereocaulon vesuvianum*.

## Description and ecology

The crustose lichen *Ainoa mooreana* dominates this community growing on damp siliceous rock. This species forms conspicuous orange-brown or rusty orange colonies on unshaded rocks which are somewhat flushed and experience prolonged dampness. Stands recorded during the survey occurred on sloping bedrock, particularly at the foot of rock faces adjacent to the ground, but in other sites have been seen on damp stones.

## Annex I habitats

The community was not found to be associated with any Annex I habitats.

## Conservation interest

*Ainoa mooreana* is Nationally Scarce.

## Differentiation from other communities

This community is distinguished by the abundance of *Ainoa mooreana*.

## Coverage and integrity

Few samples are available. This community is distinguished by the abundance of a single species, and an alternative arrangement would be to divide the samples according to the less abundant species. One stand is close to E1 and another to D6.

**Table 19:** Floristic and environmental data for SS D7 *Ainoa mooreana*-*Marsupella emarginata* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data			
	308	97	258	192
<i>Ainoa mooreana</i>	6	7	7	6
<i>Stereocaulon vesuvianum</i>	1	1	4	1
<i>Marsupella emarginata</i>	4	2	4	
<i>Andreaea rupestris</i>	1			5
<i>Porpidia tuberculosa</i>	4		4	
<i>Porpidia macrocarpa</i>		1	2	
<i>Stereocaulon plicatile/tornense</i>			2	1
<i>Amygdalaria pelobotryon</i>			5	
<i>Trapelia placodioides</i>		5		
<i>Andreaea alpina</i>			4	
<i>Amygdalaria consentiens</i>				4
<i>Micarea ternaria</i>				4
<i>Anthelia julacea</i>			4	
<i>Diplophyllum albicans</i>		2		
<i>Marsupella adusta</i>			2	
<i>Cephaloziella</i> spp.	2			

<i>Cladonia diversa</i>		2		
<i>Ditrichum zonatum</i> var. <i>scabrifolium</i>			2	
<i>Nardia scalaris</i>			2	
<i>Rhizocarpon lavatum</i>				1
<i>Cladonia subcervicornis</i>	1			
<i>Rhizocarpon hochstetteri</i>				1
<i>Blindia acuta</i>			1	
<i>Baeomyces rufus</i>		1		
<i>Placopsis lambii</i>				1
Rock	7	6	-	4
Slope (degrees)	75	70	75	60
Aspect (degrees)	10	300	10	290
Shade	None	None-slight	None	None
Run off	Slight-moderate	Moderate-strong	Moderate	Slight-moderate
Drainage	Good	Good	Good	Good
Rain-shelter	None	None-slight	None	None
Altitude (m)	600	560	800	880
Quadrat size (cm)	25 x 25	25 x 25	25 x 25	25 x 25
Vice-county	48	69	88	98
Grid ref.	23/7087.1327	35/6897.3279	27/2719.2643	27/1365.5467
Date	21 Jul 2003	18 Jun 2005	19 Jun 2002	19 May 2003
SAC/site code	CI	NP	BL	GC

### 3.3.15 SS D8 *Porpidia tuberculosa* community (Table 20)

#### Synonyms

None are known.

#### Constant species

*Porpidia tuberculosa*.

#### Description and ecology

Dominated by the crustose lichen *Porpidia tuberculosa*, this community occurs on steep siliceous rock faces. Although *P. tuberculosa* is a widespread and abundant species found in many different communities, including pioneer communities, here it becomes dominant on stable rocks. The community occurs on steep or slightly overhanging faces of bedrock or on cliffs which are more or less north facing. *P. tuberculosa* often occurs here as a thick, fertile form, different in appearance to the thinner sorediate forms often seen elsewhere. The relationship between these morphs needs further study.

#### Annex I habitats

Siliceous rocky slopes with chasmophytic vegetation: this community occurs on slightly overhanging faces, but these are not chasmophytic stands.

### Conservation interest

Most species of the community are widespread although there are single records of the Nationally Rare *Ropalospora lugubris* and the Nationally Scarce *Lithographa tesserata* and *Porpidia irrigua*.

### Differentiation from other communities

This community is distinguished by the dominance of *Porpidia tuberculosa* occurring at Domin 7 or above, with only sparse associated species.

### Coverage and integrity

This is a community based on the abundance of a single widespread species, and is potentially closely related to several other communities. However, it can form extensive stands of a characteristic appearance, which are difficult to refer elsewhere. It is possible that *P. tuberculosa* comprises more than one taxon in this community. The thick fertile form of *P. tuberculosa* is often found in this community and is characteristic.

**Table 20:** Floristic and environmental data for SS D8 *Porpidia tuberculosa* community

Species/Environmental factor	Constancy class (min-max cover)
<i>Porpidia tuberculosa</i>	V (7-9)
<i>Stereocaulon vesuvianum</i>	III (2)
<i>Opegrapha gyrocarpa</i>	II (2-4)
<i>Micarea lignaria</i>	II (1-3)
<i>Gymnomitrium concinnatum</i>	II (1-2)
<i>Acarospora smaragdula</i>	I (2)
<i>Andreaea rupestris</i>	I (2)
<i>Diplophyllum albicans</i>	I (2)
<i>Immersaria athrocarpa</i>	I (2)
<i>Ionaspis lacustris</i>	I (2)
<i>Lecanora polytropa</i>	I (2)
<i>Marsupella emarginata</i>	I (2)
<i>Rhizocarpon lavatum</i>	I (2)
<i>Aspicilia grisea</i>	I (1)
<i>Gymnomitrium crenulatum</i>	I (1)
<i>Lithographa tesserata</i>	I (1)
<i>Pertusaria pseudocorallina</i>	I (1)
<i>Pogonatum urnigerum</i>	I (1)
<i>Porpidia irrigua</i>	I (1)
<i>Racomitrium aquaticum</i>	I (1)
<i>Ropalospora lugubris</i>	I (1)
<i>Rhizocarpon geographicum</i>	I (1)
<i>Stereocaulon leucophaeopsis</i>	I (1)
Rock	V (5-7)
Slope (degrees)	90 (75-110)
Aspect (degrees)	

Shade	None
Run off	Slight to moderate
Drainage	Good
Rain-shelter	None to slight
Altitude (m)	710-870
Number of samples	5

### 3.3.16 SS D9 *Lecidea promixta*-*Trapelia involuta* community (Table 21)

#### Synonyms

None are known.

#### Constant species

*Trapelia involuta*.

#### Description and ecology

Dominated by crustose lichens this community occurs on recently exposed rock surfaces. *Lecidea promixta* and *Trapelia involuta* are characteristic species, accompanied by various other species of damp rock. Samples were recorded from bedrock adjacent to turf, which may have been recently exposed, and from a shaded boulder.

#### Annex I habitats

The community was not found to be associated with any Annex I habitats.

#### Conservation interest

*Lecidea promixta* is currently regarded as Nationally Rare, but is under-recorded.

#### Differentiation from other communities

This community is distinguished by the dominance of *Lecidea promixta* and/or *Trapelia involuta*.

#### Coverage and integrity

Few samples are available for this community. Many more are necessary to adequately determine the composition of this community and its relation to other communities.



**Table 21:** Floristic and environmental data for SS D9 *Lecidea promixta*-*Trapelia involuta* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data		
	95	112	44
<i>Trapelia involuta</i>	5	4	7
<i>Lecidea promixta</i>	5	7	
<i>Cladonia diversa</i>	3	4	
<i>Campylopus flexuosus</i>	4	2	
<i>Gymnocolea inflata</i>	2	2	
<i>Lepraria caesioalba</i>	2	2	
<i>Trapelia obtegens</i>	2	1	
<i>Trapelia placodioides</i>			6
<i>Parmelia saxatilis</i>	4		
<i>Marsupella emarginata</i>			3
<i>Placynthiella icmalea</i>	3		
<i>Trapelia coarctata</i>			3
<i>Cephaloziella</i> spp.		2	
<i>Dicranum scoparium</i>		2	
<i>Lecanora polytropa</i>	2		
<i>Micarea botryoides</i>	2		
<i>Porpidia macrocarpa</i>		2	
<i>Pohlia nutans</i>		1	
<i>Porpidia cinereoatra</i>			1
Rock	4	5	4
Slope (degrees)	30	(0-)35	75
Aspect (degrees)	80	100	330
Shade	None	None	Moderate
Run off	Moderate	Slight-moderate	
Drainage	Moderate	Moderate	
Rain-shelter	None	None	
Altitude (m)	820	820	750
Quadrat size (cm)	25 x 25	25 x 25	25 x 25
Vice-county	42	42	49
Grid ref.	32/0054.2078	32/0055.2072	23/664.596
Date	23 Apr 2002	23 Apr 2002	23 Sep 1997
SAC/site code	BB	BB	E

**3.3.17 SS E1 *Andreaea rupestris*-*Ionaspis odora* community (Table 22)****Synonyms**

None are known.

**Constant species**

*Andreaea rupestris* and *Racomitrium sudeticum*.

## Description and ecology

This is a variable community of crustose lichens and small bryophytes. The mosses *Andreaea rupestris* and *Racomitrium sudeticum* are constant, but are often at very low cover, and this is rarely more than 25%. The macrolichen *Stereocaulon vesuvianum* and the widespread crustose lichen *Porpidia tuberculosa* are frequent. Various species indicative of damp conditions are scarce to frequent, including the crustose lichens *Ionaspis chrysophana*, *I. odora*, *Porpidia contraponenda*, *Rhizocarpon lavatum*, *Stereocaulon plicatile*, *S. tornense*, the small hepatic *Marsupella adusta*, and the orange-coloured alga *Trentepohlia iolithus*. The montane mosses *Andreaea mutabilis* and *Kiaeria falcata* are conspicuous in a few samples.

Many samples are developed on fine scree (stones 10–250 mm long), but also on boulders in block scree and on damp faces on cliffs. Screes with this community in W. Scotland are often speckled with the green or blackish cushions of mosses, in contrast to the drier screes of D1, where mosses are scarce. Block scree at Scafell Pike and locally at Helvellyn (Lake District) is frequently tinged reddish by *Trentepohlia iolithus*. On the summit of Scafell Pike *Ionaspis chrysophana* is particularly abundant in the present community. A number of samples of E1 from a snow-bed on Beinn Heasgarnich contained some typical snow-bed species including *Lecanora leptacina* and *Miriquidica griseoatra*.

## Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this is an important community of fine to coarse scree.

## Conservation interest

This is an important community of oceanic areas. Numerous uncommon species occur in this community, including the lichens *Amygdalaria consentiens*, *Ionaspis chrysophana*, *Micarea paratropa*, *Porpidia contraponenda*, *Protothelenella corrosa*, *Rhizocarpon sublavatum*, *Stereocaulon plicatile*, *S. tornense*, and the bryophyte *Andreaea mutabilis*. One anomalous sample with abundant *Andreaea rupestris* contained the Red Data Book lichen *Catolechia wahlenbergii*.

## Differentiation from other communities

E2 differs from E1 in the scarcity of species of damp conditions. Species that are preferential for E1 include *Ionaspis chrysophana*, *I. odora*, *Marsupella adusta*, *Rhizocarpon lavatum*, *Stereocaulon plicatile*, *S. tornense* and *Trentepohlia iolithus*. Species that are preferential for E2 include *Cladonia diversa*, *Miriquidica leucophaea* and *Rhizocarpon geographicum*. However, many different combinations of species occur in both E1 and E2 and the distinction is likely to remain complex. D1 also represents drier conditions than E1, with less abundant bryophytes, and lacking some of the damp-loving crustose lichens of E1.

## Coverage and integrity

Numerous samples of this community are available, but further study might reveal a more satisfactory way of classifying the differing stands included here.

**Table 22:** Floristic and environmental data for SS E1 *Andreaea rupestris*-*Ionaspis odora* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)</b>
<i>Andreaea rupestris</i>	IV (1-7)
<i>Racomitrium sudeticum</i>	IV (1-7)
<i>Rhizocarpon lavatum</i>	III (1-8)
<i>Porpidia tuberculosa</i>	III (1-7)
<i>Rhizocarpon hochstetteri</i>	III (1-7)
<i>Ionaspis odora</i>	III (1-6)
<i>Stereocaulon vesuvianum</i>	III (1-5)
<i>Stereocaulon plicatile/tornense</i>	II (1-8)
<i>Trentepohlia iolithus</i>	II (1-7)
<i>Porpidia contraponenda</i>	II (1-6)
<i>Rhizocarpon anaperum</i>	II (1-5)
<i>Immersaria arthrocarpa</i>	II (1-5)
<i>Porpidia macrocarpa</i>	II (1-5)
<i>Marsupella adusta</i>	II (1-4)
<i>Racomitrium lanuginosum</i>	II (1-4)
<i>Rhizocarpon reductum</i>	II (1-4)
<i>Catolechia wahlenbergii</i>	I (5)
<i>Pilophorus strumaticus</i>	I (5)
<i>Porpidia islandica</i>	I (5)
<i>Porpidia lowiana</i>	I (5)
<i>Campylopus atrovirens</i>	I (4)
<i>Micarea ternaria</i>	I (4)
<i>Miriquidica leucophaea</i>	I (4)
<i>Porpidia melinodes</i>	I (4)
<i>Porpidia cinereoatra</i>	I (3)
<i>Rhizocarpon sublavatum</i>	I (2-6)
<i>Porpidia crustulata</i>	I (2-5)
<i>Porpidia flavocruenta</i>	I (2-4)
<i>Baeomyces carneus</i>	I (2-3)
<i>Lecanora polytropa</i>	I (2-3)
<i>Lecanora leptacina</i>	I (2)
<i>Barbilophozia floerkei</i>	I (2)
<i>Fuscidea lygaea</i>	I (2)
<i>Pohlia nutans</i>	I (2)
<i>Ephebe lanata</i>	I (2)
<i>Gyalidea hyalinescens</i>	I (2)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (2)
<i>Micarea marginata</i>	I (2)
<i>Nardia scalaris</i>	I (2)
<i>Porpidia pachythallina</i>	I (2)
<i>Rhizocarpon cinereovirens</i>	I (2)
<i>Rhizocarpon polycarpum</i>	I (2)
<i>Umbilicaria cylindrica</i>	I (2)

<i>Frutidella caesioatra</i>	I (1-7)
<i>Ionaspis chrysophana</i>	I (1-7)
<i>Ionaspis lacustris</i>	I (1-7)
<i>Miriquidica griseoatra</i>	I (1-7)
<i>Porpidia irrigua</i> ined.	I (1-6)
<i>Protothelenella corrosa</i>	I (1-6)
<i>Lecidea lithophila</i>	I (1-5)
<i>Amygdalaria consentiens</i>	I (1-5)
<i>Kiaeria falcate</i>	I (1-5)
<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	I (1-5)
<i>Andreaea mutabilis</i>	I (1-5)
<i>Lecidea phaeops</i>	I (1-5)
<i>Marsupella alpina</i>	I (1-5)
<i>Marsupella emarginata</i>	I (1-5)
<i>Lophozia sudetica</i>	I (1-4)
<i>Micarea lignaria</i>	I (1-4)
<i>Amygdalaria pelobotryon</i>	I (1-4)
<i>Racomitrium fasciculare</i>	I (1-4)
<i>Stereocaulon leucophaeopsis</i>	I (1-4)
<i>Cladonia subcervicornis</i>	I (1-4)
<i>Porpidia striata</i>	I (1-4)
<i>Micarea paratropa</i>	I (1-4)
<i>Jungermannia sphaerocarpa</i>	I (1-4)
<i>Diplophyllum albicans</i>	I (1-3)
<i>Trapelia involuta</i>	I (1-3)
<i>Lecanora soralifera</i>	I (1-3)
<i>Marsupella emarginata</i>	I (1-3)
<i>Lecanora intricata</i>	I (1-3)
<i>Kiaeria blytii</i>	I (1-2)
<i>Placopsis lambii</i>	I (1-2)
<i>Tremolechia atrata</i>	I (1-2)
<i>Cladonia diversa</i>	I (1-2)
<i>Lepraria neglecta</i>	I (1-2)
<i>Rhizocarpon geographicum</i>	I (1-2)
<i>Trapelia coarctata</i>	I (1-2)
<i>Andreaea alpina</i>	I (1-2)
<i>Acarospora smargadula</i>	I (1-2)
<i>Epigloea soleiformis</i>	I (1-2)
<i>Lepraria caesioalba</i>	I (1-2)
<i>Polytrichum alpinum</i>	I (1-2)
<i>Rhizocarpon infernulum</i>	I (1-2)
<i>Rhytidiadelphus loreus</i>	I (1-2)
<i>Cladonia cervicornis</i>	I (1-2)
<i>Gyalideopsis</i> Species A	I (1-2)
<i>Andreaea rothii</i> subsp. <i>falcata</i>	I (1-2)
<i>Baeomyces rufus</i>	I (1-2)
<i>Dicranum scoparium</i>	I (1-2)
<i>Gymnomitrium obtusum</i>	I (1-2)

<i>Micarea leprosula</i>	I (1-2)
<i>Pertusaria corallina</i>	I (1-2)
<i>Stigonema</i> spp.	I (1-2)
<i>Trapelia placodioides</i>	I (1-2)
<i>Trapeliopsis flexuosa</i>	I (1-2)
<i>Tritomaria quinquedentata</i>	I (1-2)
<i>Verrucaria</i> spp.	I (1-2)
<i>Cladonia bellidiflora</i>	I (1)
<i>Epigloea soleiformis</i>	I (1)
<i>Grimmia donniana</i>	I (1)
<i>Hylocomium splendens</i>	I (1)
<i>Pogonatum urnigerum</i>	I (1)
<i>Stereocaulon spathuliferum</i>	I (1)
<i>Anastrepta orcadensis</i>	I (1)
<i>Aspicilia grisea</i>	I (1)
<i>Cetraria islandica</i>	I (1)
<i>Cladonia bellidiflora/diversa</i>	I (1)
<i>Cladonia furcata</i>	I (1)
<i>Cladonia pyxidata</i>	I (1)
<i>Ditrichum zonatum</i> var. <i>scabrifolium</i>	I (1)
<i>Gyalideopsis</i> sp.	I (1)
<i>Gymnomitrium concinnatum</i>	I (1)
<i>Gymnomitrium crenulatum</i>	I (1)
<i>Hypnum andoi</i>	I (1)
<i>Kiaeria starkei</i>	I (1)
<i>Lecidea lapicida</i>	I (1)
<i>Lecidea paupercula</i>	I (1)
<i>Lecidea plana</i>	I (1)
<i>Lecidea swartzioidea</i>	I (1)
<i>Lophozia opacifolia</i>	I (1)
<i>Opegrapha gyrocarpa</i>	I (1)
<i>Plagiothecium denticulatum</i> var. <i>obtusifolium</i>	I (1)
<i>Plagiothecium undulatum</i>	I (1)
<i>Pohlia nutans</i>	I (1)
<i>Polytrichum piliferum</i>	I (1)
<i>Porpidia rugosa</i>	I (1)
<i>Porpidia superba</i>	I (1)
<i>Pseudotaxiphyllum elegans</i>	I (1)
<i>Racomitrium aquaticum</i>	I (1)
<i>Rhizocarpon oederi</i>	I (1)
<i>Rhizocarpon submodestum</i>	I (1)
<i>Trichostomum tenuirostre</i>	I (1)
<i>Umbilicaria deusta</i>	I (1)
Rock	V (2-8)
<i>Deschampsia flexuosa</i>	I (1-2)
<i>Galium saxatile</i>	I (1-2)
<i>Cryptogramma crispera</i>	I (1-2)
<i>Festuca vivipara</i>	I (1-2)

<i>Vaccinium myrtillus</i>	I (4)
<i>Saxifraga stellaris</i>	I (2)
<i>Nardus stricta</i>	I (1)
<i>Oxalis acetosella</i>	I (1)
Slope (degrees)	33 (0-75)
Shade	None
Run off	None to slight (to moderate)
Drainage	Poor to good
Rain shelter	None
Altitude (m)	870 (480-1145)
Number of samples	62

### 3.3.18 SS E2 *Andreaea rupestris*-*Stereocaulon vesuvianum* community (Table 23)

#### Synonyms

None are known.

#### Constant species

*Andreaea rupestris*, *Cladonia diversa*, *Racomitrium sudeticum* and *Stereocaulon vesuvianum*.

#### Description and ecology

This is a variable community comprising combinations of the small bryophytes *Andreaea rupestris* and *Racomitrium sudeticum*, the macrolichen *Stereocaulon vesuvianum*, and crustose lichens including *Micarea lignaria*, *Porpidia tuberculosa*, *Rhizocarpon geographicum*, and *R. hochstetteri*.

The community occurs (rarely) on fine scree, on isolated boulders, boulders in block scree, and steep bedrock faces. Stands are variable in appearance, from boulder tops speckled with the green or blackish cushions of *R. sudeticum*, to damp rock faces with sparse *Andreaea rupestris*, *Micarea lignaria* and abundant dull-coloured colonies of algae. Occasionally *A. rupestris* forms extensive blackish colonies on flushed rocks, forming stands with a similar appearance to L1 and with many of the same associated species, including *Porpidia irrigua*. The community requires a certain amount of dampness, either from a humid climate or from a relatively water-retentive rock surface; it avoids hard acid rocks, and is often best developed on basic igneous rocks such as dolerite, in close proximity to A2, C1 and others.

The community is divided into three sub-communities to take account of the variation in composition and appearance of stands of this community. This treatment was partly supported by a TWINSPLAN analysis performed on this group of quadrats, which showed a division into a group which had *Andreaea rupestris* and *Stereocaulon vesuvianum* preferential (equivalent in part to E2a and E2b) and a group with *Racomitrium sudeticum* and *Cladonia subcervicornis* preferential (equivalent in part to E2c). Stands of the sub-communities often occur closely together.

Sub-community SS E2a: *Andreaea rupestris* is dominant, but *Racomitrium* and *Stereocaulon* are absent or very sparse. This is based on three samples were on damp rock, two of them containing *Porpidia irrigua*.

Sub-community SS E2b: *Andreaea rupestris*, *Racomitrium sudeticum* and *Stereocaulon vesuvianum* are all constant, occurring in various combinations of abundance.

Sub-community SS E2c: *Racomitrium sudeticum* occurs at Domin 5 or more, and exceeds *Stereocaulon* and *Andreaea* in abundance.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community is frequent on block scree, rarely on fine scree.

### Conservation interest

The Nationally Scarce *Porpidia irrigua* is occasional, and there are a few records of other Nationally Scarce species including *Aspicilia epiglypta* and *Lithographa tesserata*.

### Differentiation from other communities

E1 differs in the presence of a number of species which indicate damp rock, see under that community for details. F2 differs from sub-community E2c in the occurrence of additional species of *Racomitrium*, especially *R. affine* and *R. heterostichum*.

### Coverage and integrity

A reasonable number of samples are available, but the variation in this community is difficult to understand. It is possible that other ways of dividing this group could be as informative as the division used here.

**Table 23:** Floristic and environmental data for SS E2 *Andreaea rupestris*-*Stereocaulon vesuvianum* community

Species/Environmental factor	Constancy class (min-max cover)/Environmental data			
	Sub-community SS E2a	Sub-community SS E2b	Sub-community SS E2c	Community SS E2
<i>Andreaea rupestris</i>	V (5-7)	V (1-7)	V (1-5)	V (1-7)
<i>Racomitrium sudeticum</i>		IV (1-5)	V (5-8)	IV (1-8)
<i>Stereocaulon vesuvianum</i>	II (1)	IV (2-8)	III (1-4)	IV (1-8)
<i>Cladonia diversa</i>	V (1-4)	IV (1-4)	IV (1-2)	IV (1-4)
<i>Rhizocarpon geographicum</i>	II (4)	II (1-4)	III (2-5)	III (1-5)
<i>Porpidia irrigua</i>	IV (5)	III (1-5)	III (2-5)	III (1-5)
<i>Porpidia tuberculosa</i>	II (4)	IV (1-5)	III (1-4)	III (1-5)
<i>Micarea lignaria</i> var. <i>lignaria</i>	II (3)	III (1-3)	II (1-3)	III (1-3)
<i>Cladonia subcervicornis</i>		II (3-6)	IV (1-5)	II (1-6)
<i>Racomitrium lanuginosum</i>		I (1-5)	III (1-5)	II (1-5)
<i>Miriquidica leucophaea</i>		II (2-5)	III (1-4)	II (1-5)
<i>Pertusaria corallina</i>		II (1-5)	I (1)	II (1-5)
<i>Micarea leprosula</i>	II (2)	II (1-5)		II (1-5)

<i>Rhizocarpon reductum</i>	II (1)	I (1)	III (1-4)	II (1-4)
<i>Lecanora intricata</i>		I (2-4)	III (1-2)	II (1-4)
<i>Rhizocarpon hochstetteri</i>		III (1-4)	II (2-4)	II (1-4)
<i>Trapelia coarctata</i>	V (1-2)	I (1-4)	II (1-2)	II (1-4)
<i>Stereocaulon evolutum</i>		I (6-7)		I (6-7)
<i>Aspicilia epiglypta</i>			I (5)	I (5)
<i>Aspicilia cinerea</i>		I (5)		I (5)
<i>Aspicilia caesiocinerea</i>			I (4)	I (4)
<i>Grimmia curvata</i>			I (4)	I (4)
<i>Lecidea fuscoatra</i>			I (4)	I (4)
<i>Stereocaulon plicatile/tornense</i>			I (4)	I (4)
<i>Lithographa tessarata</i>	II (4)			I (4)
<i>Porpidia macrocarpa</i>		I (4)	II (2-5)	I (2-5)
<i>Cladonia cyathomorpha</i>			II (2-5)	I (2-5)
<i>Lepraria caesioalba</i>		I (2-4)	I (2)	I (2-4)
<i>Andreaea rothii</i> subsp. <i>rothii</i>		I (4)	I (2)	I (2-4)
<i>Trapelia involuta</i>	II (2)	I (2)	I (2-3)	I (2-3)
<i>Ionaspis odora</i>			I (2)	I (2)
<i>Diplophyllum albicans</i>	II (2)	I (2)	I (2)	I (2)
<i>Cladonia macilentata</i>		I (2)	I (2)	I (2)
<i>Polytrichum piliferum</i>		I (2)	I (2)	I (2)
<i>Buellia aethalea</i> (all morphs)			I (2)	I (2)
<i>Marsupella emarginata</i>			I (2)	I (2)
<i>Miriquidica complanata</i>			I (2)	I (2)
<i>Arthrorhaphis citrinella</i>	II (2)	I (2)		I (2)
<i>Campylopus atrovirens</i>		I (2)		I (2)
<i>Cladonia bellidiflora</i>		I (2)		I (2)
<i>Gymnomitrium crenulatum</i>		I (2)		I (2)
<i>Lecidea lapicida</i>		I (2)		I (2)
<i>Micarea subnigrata</i>		I (2)		I (2)
<i>Porpidia islandica</i>		I (2)		I (2)
<i>Porpidia melinodes</i>		I (2)		I (2)
<i>Micarea coppinsii</i>	II (2)	I (1)		I (2)
<i>Fuscidea recensa</i>	II (2)			I (2)
<i>Lepraria atlantica</i>	II (2)			I (2)
<i>Pogonatum urnigerum</i>	II (2)			I (2)
<i>Racodium rupestre</i>	II (2)			I (2)
<i>Trapeliopsis granulosa</i>	II (2)			I (2)
<i>Lecidea swartzioidea</i>			III (1-5)	I (1-5)
<i>Racomitrium fasciculare</i>		I (1-5)	II (2-4)	I (1-5)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>		I (1-5)	I (2)	I (1-5)
<i>Immersaria athroocarpa</i>		I (1-4)	II (1-2)	I (1-4)
<i>Tephromela atra</i>		I (1)	I (2-4)	I (1-4)
<i>Kiaeria blytii</i>		I (1-4)	I (1-2)	I (1-4)
<i>Lecidea lithophila</i>		I (4)	I (1-2)	I (1-4)
<i>Gymnomitrium obtusum</i>		I (2-4)	I (1)	I (1-4)
<i>Trapelia placodioides</i>	IV (1)	I (1-4)	I (1)	I (1-4)
<i>Fuscidea lygaea</i>		I (1-4)	I (1)	I (1-4)



<i>Lecanora soralifera</i>	II (1)	I (2-4)		I (1-4)
<i>Stereocaulon leucophaeopsis</i>			II (1-3)	I (1-3)
<i>Lecanora polytropa</i>		I (1-2)	III (1-2)	I (1-2)
<i>Trapelia obtegens</i>			I (1-2)	I (1-2)
<i>Amygdalaria pelobotryon</i>		I (1-2)	I (1)	I (1-2)
<i>Lecidea phaeops</i>		I (1)	I (2)	I (1-2)
<i>Rhizocarpon lavatum</i>		II (1-2)	I (1)	I (1-2)
<i>Cladonia alpina</i>		I (1-2)	I (1)	I (1-2)
<i>Cladonia cervicornis</i>	II (2)	I (2)	I (1)	I (1-2)
<i>Micarea angulosa ad int.</i>		I (2)	I (1)	I (1-2)
<i>Epigloea soleiformis</i>	II (1)	I (1-2)		I (1-2)
<i>Placopsis lambii</i>			I (1)	I (1)
<i>Pohlia nutans</i>			I (1)	I (1)
<i>Cetraria aculeata</i>			I (1)	I (1)
<i>Dicranum scoparium</i>			I (1)	I (1)
<i>Hypnum andoi</i>			I (1)	I (1)
<i>Lecidea confluens</i>			I (1)	I (1)
<i>Ochrolechia androgyna</i>			I (1)	I (1)
<i>Parmelia saxatilis</i>			I (1)	I (1)
<i>Porpidia crustulata</i>			I (1)	I (1)
<i>Racomitrium heterostichum</i>			I (1)	I (1)
<i>Scoliciosporum umbrinum</i>			I (1)	I (1)
<i>Sphaerophorus fragilis</i>			I (1)	I (1)
<i>Sphaerophorus globosus</i>			I (1)	I (1)
<i>Umbilicaria cylindrica</i>			I (1)	I (1)
<i>Andreaea rothii subsp. falcata</i>		I (1)		I (1)
<i>Aspicilia grisea</i>		I (1)		I (1)
<i>Aspicilia intermutans</i>		I (1)		I (1)
<i>Baeomyces rufus</i>		I (1)		I (1)
<i>Cladonia floerkeana</i>		I (1)		I (1)
<i>Coccotrema citrinescens</i>		I (1)		I (1)
<i>Fuscidea kochiana</i>		I (1)		I (1)
<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>		I (1)		I (1)
<i>Lepraria borealis</i>		I (1)		I (1)
<i>Lepraria nivalis</i>		I (1)		I (1)
<i>Marsupella adusta</i>		I (1)		I (1)
<i>Racomitrium affine</i>		I (1)		I (1)
<i>Tremolechia atrata</i>		I (1)		I (1)
<i>Cystocoleus ebeneus</i>	II (1)			I (1)
<i>Andreaea megistospora</i>			I (3)	I (3)
<i>Porina lectissima</i>			I (3)	I (3)
<i>Gymnomitrium concinnatum</i>	II (3)			I (3)
Rock	V (4-8)	V (4-8)	V (4-6)	V (4-8)
Slope (degrees)	55 (10-80)	55 (15-90)	36 (0-110)	49 (10-110)
Shade	None	None (to slight)	None (to slight)	None (to slight)

Run off	Slight to moderate	None to slight (to moderate)	None to slight (to moderate)	None to moderate
Drainage	(Poor-) moderate to good	Poor to good	(Poor-) moderate to good	Moderate to good
Rain shelter	None	None (to slight)	None	None
Altitude (m)	387 (250-550)	597 (250-1140)	766 (280-1050)	250-1140
Number of samples	3	20	12	35

### 3.3.19 SS E3 *Andreaea rupestris*-*Gymnomitrium* community (Table 24)

#### Synonyms

None are known.

#### Constant species

*Andreaea rupestris*, *Cladonia subcervicornis*, *Gymnomitrium obtusum*, *Micarea lignaria*, *Porpidia tuberculosa* and *Stereocaulon vesuvianum*.

#### Description and ecology

This community is dominated by small bryophytes, including *Andreaea rupestris* and *Racomitrium sudeticum*. These are found in related communities, but the present community is defined by the presence of one of the small hepatics *Gymnomitrium crenulatum* and *G. obtusum* (with at least 4% cover and usually more than 10%).

The community develops on unshaded and well-drained rocks, mostly typically on steep faces, which receive a certain amount of run-off, so that they are often damp, but not strongly flushed. Stands are often dull grey and brown from the abundance of *Gymnomitrium*. The community is found on boulders in block scree or amongst turf, and on bedrock and cliff faces. It can grade rapidly into others with a slight change in conditions: into L1 on more strongly flushed faces, and into A1, A2 and C1a on less damp surfaces.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community is frequent on block scree, but is more typical of bedrock and large isolated boulders.

#### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

E3 is distinguished from E1 and E2 by the presence of *Gymnomitrium crenulatum* or *G. obtusum* at >4% (borderline) or >10% cover. Other species that are preferential for E3 are few but include *Arthrorhaphis citrinella* (at very low cover) and *Toninia thiopsora* (scarce).

### Coverage and integrity

This community is reasonably well covered by samples. The community is based mainly on the abundance of a single genus, but this community was separated reasonably well from related stands in the TWINSPAN analysis. Samples often contain only one species of *Gymnomitrium*, but they can occur together in samples, and there seems no firm ground for dividing the present community into two based on the occurrence of one or the other of the species.

**Table 24:** Floristic and environmental data for SS E3 *Andreaea rupestris*-*Gymnomitrium* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Andreaea rupestris</i>	IV (1-7)
<i>Stereocaulon vesuvianum</i>	IV (1-6)
<i>Micarea lignaria</i>	IV (1-3)
<i>Gymnomitrium obtusum</i>	IV (1-7)
<i>Porpidia tuberculosa</i>	IV (1-7)
<i>Cladonia subcervicornis</i>	IV (1-5)
<i>Gymnomitrium crenulatum</i>	III (3-8)
<i>Racomitrium sudeticum</i>	III (1-7)
<i>Arthrorhaphis citrinella</i>	II (1-2)
<i>Cladonia diversa</i>	II (1-2)
<i>Diplophyllum albicans</i>	II (1-4)
<i>Micarea leprosula</i>	II (1-4)
<i>Marsupella emarginata</i>	II (2-6)
<i>Pertusaria coralline</i>	II (1-4)
<i>Lepraria caesioalba</i>	II (1-5)
<i>Campylopus atrovirens</i>	II (1-4)
<i>Marsupella adusta</i>	I (1-4)
<i>Toninia thiopsora</i>	I (1-4)
<i>Trapelia placodioides</i>	I (1-4)
<i>Lepraria atlantica</i>	I (1-4)
<i>Porpidia cinereoatra</i>	I (1-4)
<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	I (1-3)
<i>Trapelia involuta</i>	I (1-3)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (2-4)
<i>Gymnomitrium concinnatum</i>	I (1-4)
<i>Racomitrium fasciculare</i>	I (1-4)
<i>Porpidia irrigua</i> ined.	I (1-2)
<i>Baeomyces rufus</i>	I (1)
<i>Porpidia rugosa</i>	I (1-5)

<i>Andreaea rothii</i> subsp. <i>falcata</i>	I (1-4)
<i>Rhizocarpon lavatum</i>	I (1-4)
<i>Micarea coppinsii</i>	I (2-3)
<i>Lecidea phaeops</i>	I (2)
<i>Cephaloziella</i> spp.	I (1-2)
<i>Kiaeria blyttii</i>	I (1-2)
<i>Lithographa tesserata</i>	I (1-2)
<i>Ochrolechia androgyna</i>	I (1-2)
<i>Porpidia macrocarpa</i>	I (1-2)
<i>Racomitrium lanuginosum</i>	I (1)
<i>Trapelia coarctata</i>	I (1)
<i>Coccotrema citrinescens</i>	I (1-5)
<i>Lepraria borealis</i>	I (2-4)
<i>Stigonema</i> spp.	I (2-4)
<i>Amygdalaria pelobotryon</i>	I (1-4)
<i>Cladonia cervicornis</i>	I (1-4)
<i>Racomitrium ellipticum</i>	I (1-3)
<i>Fuscidea cyathoides</i>	I (2)
<i>Stereocaulon leucophaeopsis</i>	I (2)
<i>Ainoa mooreana</i>	I (1-2)
<i>Andreaea alpina</i>	I (1-2)
<i>Andreaea rothii</i> (both subsp.)	I (1-2)
<i>Baeomyces placophyllus</i>	I (1-2)
<i>Trapeliopsis granulosa</i>	I (1-2)
<i>Epigloea soleiformis</i>	I (1)
<i>Fuscidea gothoburgensis</i>	I (1)
<i>Fuscidea lygaea</i>	I (1)
<i>Lophozia sudetica</i>	I (1)
<i>Pertusaria pseudocorallina</i>	I (1)
<i>Fuscidea intercincta</i>	I (5)
<i>Rhizocarpon geographicum</i>	I (5)
<i>Rhizocarpon hochstetteri</i>	I (5)
<i>Calvitimela aglaea</i>	I (4)
<i>Catolechia wahlenbergii</i>	I (4)
<i>Lecanora intricata</i>	I (2)
<i>Marsupella alpina</i>	I (2)
<i>Micarea subnigrata</i>	I (2)
<i>Placopsis lambii</i>	I (2)
<i>Polytrichum alpinum</i>	I (2)
<i>Porpidia melinodes</i>	I (2)
<i>Protothelenella corrosa</i>	I (2)
<i>Rhizocarpon reductum</i>	I (2)
<i>Sphaerophorus globosus</i>	I (2)
<i>Andreaea rothii</i> subsp. <i>rothii</i>	I (1)
<i>Cladonia alpina</i>	I (1)
<i>Cladonia macilenta</i>	I (1)
<i>Ditrichum zonatum</i> var. <i>zonatum</i>	I (1)
<i>Fuscidea praeruptorum</i>	I (1)

<i>Fuscidea recensa</i>	I (1)
<i>Lecanora gangaleoides</i>	I (1)
<i>Lecanora soralifera</i>	I (1)
<i>Massalongia carnosia</i>	I (1)
<i>Opegrapha gyrocarpa</i>	I (1)
<i>Parmelia saxatilis</i>	I (1)
<i>Pertusaria lactea</i>	I (1)
<i>Pilophorus strumaticus</i>	I (1)
<i>Polytrichum piliferum</i>	I (1)
<i>Porpidia contraponenda</i>	I (1)
<i>Porpidia speirea</i>	I (1)
<i>Protopannaria pezizoides</i>	I (1)
<i>Racomitrium affine</i>	I (1)
<i>Sphaerophorus fragilis</i>	I (1)
<i>Trapeliopsis flexuosa</i>	I (1)
Rock	V (1-7)
<i>Deschampsia flexuosa</i>	I (1)
Slope (degrees)	74 (40-100)
Aspect (degrees)	
Shade	None
Run off	Slight to moderate
Drainage	(Moderate to) good
Rain shelter	None to slight
Altitude (m)	230-925
Number of samples	33

### 3.3.20 SS F1 *Rhizocarpon geographicum*-*Umbilicaria cylindrica* community (Table 25)

#### Synonyms

*Umbilicarietum cylindricae* (Frey) Frey “typical” (James *et al*, 1977).

#### Constant species

*Lecanora intricata*, *Miriquidica leucophaea* and *Rhizocarpon geographicum*.

#### Description and ecology

This is a community containing macrolichens including *Cornicularia normoerica*, *Melanelia commixta*, *Pseudephebe pubescens*, *Umbilicaria cylindrica* and *U. torrefacta*. These individually do not occupy more than 25% of the sample and crustose lichens are also present, including *Lecanora intricata*, *L. polytropa*, *Rhizocarpon geographicum* and *Tephromela atra*.

The community occurs on unshaded and often gently sloping surfaces on the upper surfaces of outcrops of bedrock, isolated boulders, and boulders in block scree. Stands are sometimes weakly associated with a bird-perch; at other sites (for instance Cross Fell) the sharply drained conditions at the apices of boulders seem to be more important than increased nutrient supply.

*Allantoparmelia alpicola* and *Melanelia commixta* (at Cross Fell, North Pennines) seem to indicate a more montane community than stands with *Umbilicaria cylindrica*, but there are insufficient samples to allow a division of this community at present.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community sometimes occurs on boulders in block scree.

### Conservation interest

*Allantoparmelia alpicola* and *Melanelia commixta* are Nationally Scarce.

### Differentiation from other communities

Many stands are very similar to A1 and A2; the present community is defined by the characteristic macrolichens occurring at >10% cover. F2 differs in the dominance of species of the macrolichens *Hypogymnia*, *Parmelia*, *Pseudevernia* and others.

### Coverage and integrity

Few stands of this community are available, and at many sites it was genuinely rare. Many more samples need to be studied, especially from the central and eastern Highlands, where communities like this are likely to be well developed.

**Table 25:** Floristic and environmental data for SS F1 *Rhizocarpon geographicum*-*Umbilicaria cylindrica* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Rhizocarpon geographicum</i>	V (4-5)
<i>Lecanora intricata</i>	IV (1-5)
<i>Miriquidica leucophaea</i>	III (1-5)
<i>Umbilicaria cylindrica</i>	III (2-5)
<i>Porpidia tuberculosa</i>	III (2-5)
<i>Racomitrium sudeticum</i>	III (2-5)
<i>Lecanora polytropa</i>	III (1-4)
<i>Tephromela atra</i>	II (2-5)
<i>Pseudephebe pubescens</i>	II (1-5)
<i>Umbilicaria torrefacta</i>	II (2-5)
<i>Lecidea swartzioidea</i>	II (1-5)
<i>Schaereria fuscocinerea</i>	II (1-5)
<i>Andreaea rupestris</i>	II (1-4)
<i>Micarea lignaria</i>	II (1-2)
<i>Melanelia commixta</i>	II (2-5)
<i>Parmelia omphalodes</i>	II (2-4)
<i>Rhizocarpon hochstetteri</i>	II (1-4)

<i>Cornicularia normoerica</i>	I (2-5)
<i>Sphaerophorus globosus</i>	I (1-5)
<i>Adelolechia pilati</i>	I (7)
<i>Fuscidea cyathoides</i>	I (4-7)
<i>Lecanora gangaleoides</i>	I (5-6)
<i>Parmelia saxatilis</i>	I (5)
<i>Allantoparmelia alpicola</i>	I (4-5)
<i>Umbilicaria polyphylla</i>	I (4-5)
<i>Fuscidea kochiana</i>	I (2-5)
<i>Miriquidica lulensis</i>	I (4)
<i>Racomitrium lanuginosum</i>	I (4)
<i>Trentepohlia iolithus</i>	I (2-4)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (2-4)
<i>Ochrolechia tartarea</i>	I (2-4)
<i>Fuscidea lygaea</i>	I (1-4)
<i>Gymnomitrium obtusum</i>	I (1-4)
<i>Umbilicaria proboscidea</i>	I (1-4)
<i>Aspicilia caesiocinerea</i>	I (3)
<i>Kiaeria blyttii</i>	I (2)
<i>Rhizocarpon copelandii</i>	I (2)
<i>Acarospora fuscata</i>	I (2)
<i>Andreaea rothii</i>	I (2)
<i>Micarea subnigrata</i>	I (2)
<i>Ochrolechia androgyna</i>	I (2)
<i>Porpidia cinereoatra</i>	I (2)
<i>Rimularia furvella</i>	I (2)
<i>Tetralophozia setiformis</i>	I (2)
<i>Trapelia involuta</i>	I (2)
<i>Schaereria cinereorufa</i>	I (1-2)
<i>Stereocaulon vesuvianum</i>	I (1-2)
<i>Pertusaria coralline</i>	I (1-2)
<i>Lecidea lacteal</i>	I (1)
<i>Protoparmelia badia</i>	I (1)
<i>Rhizocarpon reductum</i>	I (1)
<i>Stereocaulon evolutum</i>	I (1)
<i>Cladonia diversa</i>	I (1)
<i>Cladonia subcervicornis</i>	I (1)
<i>Clauzadeana macula</i>	I (1)
<i>Immersaria athroocarpa</i>	I (1)
<i>Micarea leprosula</i>	I (1)
<i>Ochrolechia frigida</i>	I (1)
<i>Placynthiella icmalea</i>	I (1)
<i>Rhizocarpon lecanorinum</i>	I (1)
<i>Stereocaulon leucophaeopsis</i>	I (1)
Rock	V (2-7)
Slope (degrees)	33 (10-55)
Aspect (degrees)	
Shade	None

Run off	None to slight
Drainage	Moderate to good
Rain-shelter	None
Altitude (m)	315-890
Number of samples:	17

### 3.3.21 SS F2 *Parmelia saxatilis*-*P. omphalodes* community (Table 26)

#### Synonyms

*Parmelietum omphalodis* DR. (James *et al*, 1977), *Pseudevernetum furfuraceae* (Hil.) Kalb. (James *et al*, 1977)

#### Constant species

*Parmelia saxatilis*.

#### Description and ecology

A community dominated by macrolichens including *Parmelia discordans*, *P. omphalodes*, *P. saxatilis*, *Platismatia glauca* and *Pseudevernia furfuracea*, often mixed with or replaced by the pleurocarpous moss *Hypnum andoi*. A few crustose lichens indicative of slight enrichment may occur, including *Acarospora fuscata* and *Candelariella coralliza*, but macrolichens usually dominate to the exclusion of most crusts. Stands frequently contain areas where patches of macrolichens or moss have fallen away to expose bare rock; these areas are sometimes colonised by pioneer crustose lichens including *Trapelia involuta*, but in most cases it appears that the relatively fast-growing macrolichens or mosses re-establish before a well-developed crustose community can develop. There is no evidence that there is a cyclical succession of communities here.

The community develops on the upper surface of low outcrops or on boulders, usually where there is some nutrient-enrichment from bird perching or other sources, or on low bedrock receiving run-off from adjacent turf. It may occur adjacent to H1, but outside the zone of intense enrichment experienced by that community. Other communities including A1, A2, and E2 may surround the community. *Hypnum andoi* is often seen forming a green 'cap' on boulders, but it is frequently mixed with *Parmelia saxatilis* and other species, so such stands are included here. The development of *Hypnum* is restricted by exposed conditions, but within woodland it is often abundant on similar boulders. On pollution-stressed rocks in the Peak District, some stands of the community were poorly developed, with *Parmelia* species at low cover (25% or less), together with other species including *Lepraria caesioalba* and *Ochrolechia androgyna*, the latter sometimes occurring in a zone nearer to the source of enrichment than *Parmelia*-rich areas. Species-poor stands from the Peak District, with *Arctoparmelia incurva*, are also provisionally included in F2. A stand in Eryri (2002-435) had an unusually well-developed macrolichen community for this region, containing *Bryoria fuscescens* and *Tuckermannopsis chlorophylla* in addition to *Parmelia saxatilis* and other species. The stand occurred below a bird perch (with H1) but on a high face; possibly the unusual combination of exposure and enrichment were responsible for the presence of the stand.



Samples were recorded from 190 m to 890 m (in Eryri) altitude. The community is best developed at relatively low altitudes.

Two sub-communities are recognized:

SS F2a: *Hypnum andoi* <Domin 7, not exceeding the cover of macrolichens.

SS F2b: *Hypnum andoi* dominant, at Domin 7 or greater, and exceeding the cover of macrolichens.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community occurs occasionally on boulders in block scree.

### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

F3 is closely related to F2 but differs in the abundance of *Xanthoparmelia conspersa*. F7 is another community found on the tops of boulders, but *Racomitrium* spp. are prominent in this community.

### Coverage and integrity

This community is reasonably well covered by samples, but the relationships of this community need more study because at present there are extremely few constant or frequent species. The distinction between the *Pseudevernetum furfuraceae* and the *Parmelietum omphalodes* made by James *et al* (1977) may well indicate a real distinction, but no distinction could be made on the basis of the samples in this study.

**Table 26:** Floristic and environmental data for SS F2 *Parmelia saxatilis*-*P. omphalodes* community

Species/Environmental factor	Constancy class (min-max cover)/Environmental data		
	Sub-community SS F2a	Sub-community SS F2b	Community SS F2
<i>Parmelia saxatilis</i>	IV (1-9)	II (1-4)	IV (1-9)
<i>Parmelia omphalodes</i>	III (1-8)	I (5)	III (1-8)
<i>Hypnum andoi</i>	II (1-6)	V (7-8)	III (1-8)
<i>Lecanora polytropa</i>	III (1-5)	II (1-4)	III (1-5)
<i>Ochrolechia androgyna</i>	II (1-7)	I (1)	II (1-7)
<i>Pseudevernia furfuracea</i>	II (1-6)		II (1-6)
<i>Platismatia glauca</i>	II (1-8)	II (1-5)	II (1-6)
<i>Trapelia involuta</i>	II (1-5)	I (3)	II (1-5)
<i>Rhizocarpon geographicum</i>	II (1-5)	I (1)	II (1-5)
<i>Miriquidica leucophaea</i>	II (1-5)	I (2)	II (1-5)
<i>Lecanora intricata</i>	II (1-4)	II (2-4)	II (1-4)

<i>Fuscidea cyathoides</i>	I (1-4)	I (2)	II (1-4)
<i>Cladonia diversa</i>	II (1-4)	I (1)	II (1-4)
<i>Arctoparmelia incurva</i>	I (6)		I (6)
<i>Parmelia discordans</i>	I (5-7)		I (5-7)
<i>Bryoria fuscescens</i>	I (2-5)		I (5)
<i>Sphaerophorus fragilis</i>	I (5)		I (5)
<i>Tuckermannopsis chlorophylla</i>	I (5)		I (5)
<i>Cystocoleus ebeneus</i>	I (4)		I (4)
<i>Cladonia floerkeana</i>	I (4)		I (4)
<i>Cornicularia normoerica</i>	I (4)		I (4)
<i>Kiaeria blytii</i>	I (4)		I (4)
<i>Lecanora soralifera</i>	I (4)		I (4)
<i>Lepraria rigidula</i>	I (4)		I (4)
<i>Rimularia mullensis</i>	I (4)		I (4)
<i>Rinodina atrocinnerea</i>	I (4)		I (4)
<i>Scapania gracilis</i>	I (4)		I (4)
<i>Stereocaulon leucophaeopsis</i>	I (4)		I (4)
<i>Umbilicaria torrefacta</i>	I (4)		I (4)
<i>Cladonia pyxidata</i>		I (4)	I (4)
<i>Lepraria incana</i>		I (4)	I (4)
<i>Stereocaulon evolutum</i>	I (3)	I (1)	I (3)
<i>Barbilophozia attenuata</i>	I (3)		I (3)
<i>Umbilicaria cylindrica</i>	I (3)		I (3)
<i>Lasallia pustulata</i>	I (2-8)	I (6)	I (2-8)
<i>Dicranum scoparium</i>	I (2-5)	IV (2-5)	I (2-5)
<i>Diplophyllum albicans</i>	I (2-4)		I (2-4)
<i>Placynthiella icmalea</i>	I (2-4)		I (2-4)
<i>Racomitrium affine</i>	I (2-4)		I (2-4)
<i>Umbilicaria polyphylla</i>	I (2-4)		I (2-4)
<i>Andreaea rupestris</i>	I (2)	III (1-2)	I (2)
<i>Polytrichum piliferum</i>	I (2)		I (2)
<i>Cladonia chlorophaea</i>	I (2)		I (2)
<i>Fuscidea kochiana</i>	I (2)		I (2)
<i>Trapeliopsis flexuosa</i>	I (2)		I (2)
<i>Cladonia furcata</i>			I (2)
<i>Lophozia ventricosa</i>			I (2)
<i>Acarospora sinopica</i>	I (2)		I (2)
<i>Andreaea rothii/megistospora</i>	I (2)		I (2)
<i>Arctoparmelia incurva</i>	I (2)		I (2)
<i>Cladonia polydactyla</i>	I (2)		I (2)
<i>Hypotrachyna revoluta</i>	I (2)		I (2)
<i>Ochrolechia inaequatula</i>	I (2)		I (2)
<i>Opegrapha gyrocarpa</i>	I (2)		I (2)
<i>Placynthiella icmalea</i>	I (2)		I (2)
<i>Polytrichum juniperum</i>	I (2)		I (2)
<i>Grimmia trichophylla</i>		I (2)	I (2)
<i>Rhytidiadelphus squarrosus</i>		I (2)	I (2)
<i>Parmelia sulcata</i>	I (1-7)	I (1)	I (1-7)

<i>Sphaerophorus globosus</i>	I (1-6)	I (1)	I (1-6)
<i>Aspicilia caesiocinerea</i>	I (2-6)	I (1)	I (1-6)
<i>Lepraria caesioalba</i>	I (1-5)		I (1-5)
<i>Racomitrium sudeticum</i>	I (1-5)	III (1-4)	I (1-5)
<i>Hypogymnia physodes</i>	I (1-5)	I (1)	I (1-5)
<i>Acarospora fuscata</i>	I (1-5)		I (1-5)
<i>Racomitrium fasciculare</i>	I (1-5)	III (1-5)	I (1-5)
<i>Cladonia squamosa</i> var. <i>squamosa</i>	I (1-5)		I (1-5)
<i>Usnea flammea</i>	I (1-5)		I (1-5)
<i>Racomitrium heterostichum</i>	I (1-4)	I (2)	I (1-4)
<i>Porpidia tuberculosa</i>	I (1-4)	I (2)	I (1-4)
<i>Campylopus flexuosus</i>	I (1-4)		I (1-4)
<i>Candelariella coralliza</i>	I (1-4)		I (1-4)
<i>Rhizocarpon reductum</i>	I (1-4)	I (2)	I (1-4)
<i>Tephromela atra</i>	I (1-4)	III (1)	I (1-4)
<i>Hypogymnia tubulosa</i>	I (1-4)	I (2)	I (1-4)
<i>Melanelia fuliginosa</i> subsp. <i>fuliginosa</i>	I (1-4)	I (1)	I (1-4)
<i>Pertusaria corallina</i>	I (1-4)	I (1)	I (1-4)
<i>Aspicilia grisea</i>	I (1-4)		I (1-4)
<i>Porpidia irrigua</i> ined.	I (1-4)		I (1-4)
<i>Rimularia furvella</i>	I (1-4)		I (1-4)
<i>Cladonia subcervicornis</i>	I (1-4)	II (1-2)	I (1-4)
<i>Pertusaria pseudocorallina</i>	I (1-4)	I (1)	I (1-4)
<i>Ochrolechia tartarea</i>	I (1-4)	I (1)	I (1-4)
<i>Xanthoparmelia conspersa</i>	I (4)		I (1-4)
<i>Mycoblastus sanguinarius</i>	I (1-4)		I (1-4)
<i>Fuscidea lygaea</i>	I (4)	I (1)	I (1-4)
<i>Porpidia macrocarpa</i>	I (1-2)		I (1-2)
<i>Cladonia alpina</i>	I (1-2)		I (1-2)
<i>Protoparmelia badia</i>	I (1-2)		I (1-2)
<i>Lecidea swartzioidea</i>	I (1-2)	II (1-2)	I (1-2)
<i>Andreaea rothii</i> subsp. <i>falcata</i>	I (1)		I (1-2)
<i>Micarea lignaria</i> var. <i>lignaria</i>	I (1-2)	I (1)	I (1-2)
<i>Cladonia cyathomorpha</i>	I (1-2)		I (1-2)
<i>Cladonia macilenta</i>	I (1)	I (2)	I (1-2)
<i>Trapelia coarctata</i>	I (1)		I (1-2)
<i>Racomitrium lanuginosum</i>	I (2)	IV (1-4)	I (1-2)
<i>Micarea coppinsii</i>	I (2)	I (1)	I (1-2)
<i>Trapeliopsis granulosa</i>	I (1)		I (1)
<i>Lecidea lacteal</i>	I (1)		I (1)
<i>Buellia aethalea</i> (all morphs)	I (1)		I (1)
<i>Cladonia bellidiflora</i>	I (2)	I (4)	I (1)
<i>Cetraria muricata</i>	I (1)	I (1)	I (1)
<i>Porpidia crustulata</i>	I (1)	I (1)	I (1)
<i>Barbilophozia floerkei</i>			I (1)
<i>Stereocaulon vesuvianum</i>			I (1)
<i>Cephaloziella</i> spp.	I (1)		I (1)

<i>Cetraria aculeate</i>	I (1)		I (1)
<i>Diploschistes scruposus</i>	I (1)		I (1)
<i>Fuscidea intercincta</i>	I (1)		I (1)
<i>Gymnocolea inflata</i>	I (1)		I (1)
<i>Lecidea fuscoatra</i>	I (1)		I (1)
<i>Lecidea lapicida</i>	I (1)		I (1)
<i>Lepraria borealis</i>	I (1)		I (1)
<i>Orthodontium lineare</i>	I (1)		I (1)
<i>Porina lectissima</i>	I (1)		I (1)
<i>Pseudephebe pubescens</i>	I (1)		I (1)
<i>Ramalina subfarinacea</i>	I (1)		I (1)
<i>Rhizocarpon lavatum</i>	I (1)		I (1)
<i>Rhizocarpon polycarpum</i>	I (1)		I (1)
<i>Schaereria fuscocinerea</i>	I (1)		I (1)
<i>Trapelia placodioides</i>	I (1)		I (1)
<i>Trentepohlia aurea</i>	I (1)		I (1)
<i>Aspicilia</i> sp.		I (4)	I (1)
<i>Bryum capillare</i>		I (1)	I (1)
<i>Hypnum jutlandicum</i>		I (1)	I (1)
<i>Porpidia cinereoatra</i>		I (1)	I (1)
<i>Antitrichia curtispindula</i>		I (1)	I (1)
Rock	V (2-8)	V (2-5)	V (2-8)
<i>Deschampsia flexuosa</i>		I (1)	I (1)
<i>Festuca vivipara</i>			I (1)
Slope (degrees)	40 (0-90)	33 (0-80)	39 (0-90)
Shade	None (to slight)	None	None (to slight)
Run off	None to slight (to moderate)	None-slight	None to slight (to moderate)
Drainage	(poor to) Moderate to good	Moderate-good	(Poor to) moderate to good
Rain shelter	None	None	None
Altitude (m)	479 (190-820)	558 (250-700)	490 (190-890)
Number of samples	54	6	60

### 3.3.22 SS F3 *Xanthoparmelia conspersa* community (Table 27)

#### Synonyms

*Parmelietum glomelliferae* Hil. (James *et al.*, 1977).

#### Constant species

*Fuscidea cyathoides*, *Lecanora intricate* and *Xanthoparmelia conspersa*.

#### Description and ecology

This community is dominated by the yellowish grey foliose lichen *Xanthoparmelia conspersa*, accompanied by crustose lichens and sometimes small quantities of other

macrolichens (including *Parmelia saxatilis*) or mosses (including *Racomitrium heterostichum*). Crusts developed in the community that are indicative of nutrient-enrichment include the frequent *Candelariella coralliza* and the occasional *Rinodina atrocineria*.

The community develops on nutrient-enriched and sometimes rather poorly drained surfaces of unshaded bedrock and the tops of boulders. Nutrient-enrichment is derived from bird perching and sometimes probably from sheep dung. Stands can occur near to H1. This is a relatively low-altitude community; samples have been recorded up to 400 m altitude.

### Annex I habitats

The community was not found to be associated with any Annex I habitats.

### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

This community is close floristically to F2, which differs in the absence or low cover of *Xanthoparmelia*. Few species are preferential for F3 rather than F2, but *Hypogymnia physodes*, *Platismatia glauca* and *Pseudevernia furfuracea* are preferential for F2.

### Coverage and integrity

Few samples are available. Although this community is close to F2 the separation seems justified at present. No stands have been seen where *Xanthoparmelia* mixes freely with characteristic species of F2, although fragments of both these communities can occur on the same boulder.

**Table 27:** Floristic and environmental data for SS F3 *Xanthoparmelia conspersa* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Xanthoparmelia conspersa</i>	V (5-8)
<i>Fuscidea cyathoides</i>	IV (1-6)
<i>Lecanora intricata</i>	IV (1-3)
<i>Candelariella coralliza</i>	III (1-4)
<i>Trapelia involuta</i>	III (1-4)
<i>Rinodina atrocineria</i>	II (4-5)
<i>Lecidea lactea/swartzioidea</i>	II (3-7)
<i>Racomitrium aquaticum</i>	II (3-5)
<i>Aspicilia caesiocinerea</i>	II (2-4)
<i>Parmelia omphalodes</i>	II (2-4)
<i>Melanelia fuliginosa</i> subsp. <i>fuliginosa</i>	II (2-3)
<i>Rhizocarpon geographicum</i>	II (2-3)
<i>Miriacidica leucophaea</i>	II (2)
<i>Racomitrium heterostichum</i>	II (1-5)
<i>Hypnum andoi</i>	II (1-4)

<i>Parmelia saxatilis</i>	II (1-4)
<i>Andreaea rothii</i> subsp. <i>rothii</i>	II (1-2)
<i>Neofuscelia verruculifera</i>	I (5)
<i>Hypogymnia tubulosa</i>	I (4)
<i>Andreaea rothii</i> subsp. <i>falcata</i>	I (3)
<i>Protoparmelia badia</i>	I (3)
<i>Acarospora fuscata</i>	I (2)
<i>Andreaea rupestris</i>	I (2)
<i>Buellia aethalea</i> (all morphs)	I (2)
<i>Lecanora polytropa</i>	I (2)
<i>Pertusaria pseudocorallina</i>	I (2)
<i>Porpidia cinereoatra</i>	I (2)
<i>Porpidia rugosa</i>	I (2)
<i>Porpidia tuberculosa</i>	I (2)
<i>Rhizocarpon oederi</i>	I (2)
<i>Schaereria fuscocinerea</i>	I (2)
<i>Trapelia coarctata</i>	I (2)
<i>Umbilicaria torrefacta</i>	I (2)
<i>Andreaea rothii</i> (either subsp.)	I (1)
<i>Aspicilia grisea</i>	I (1)
<i>Cladonia cyathomorpha</i>	I (1)
<i>Cladonia macilenta</i>	I (1)
<i>Hypotrachyna revolute</i>	I (1)
<i>Umbilicaria polyphylla</i>	I (1)
Rock	V (4-6)
<i>Festuca ovina</i>	I (2)
Slope (degrees)	23 (0-45)
Aspect (degrees)	
Shade	None
Run off	None to slight
Drainage	Poor to good
Rain shelter	None
Altitude (m)	165-400
Number of samples	8

### 3.3.23 SS F4 *Lasallia pustulata* community (Table 28)

#### Synonyms

Lecanoretum sordidae Hil p.p. (James *et al.*, 1977).

#### Constant species

*Lasallia pustulata* and *Parmelia omphalodes*.

## Description and ecology

This community is dominated by the macrolichen *Lasallia pustulata*, often accompanied by other species of boulder-tops or indicative of slight nutrient-enrichment, including *Candelariella coralliza*, *Parmelia omphalodes* and *P. saxatilis*.

*Lasallia* grows on nutrient-enriched rocks, and often in rain tracks, although it can occur on the well-drained crests of boulders. The distribution of *Lasallia* often seems to be independent of other species. It can occur with *Xanthoparmelia conspersa* (in F2) or *Candelariella coralliza* (in H1) in association with bird-perches, but then frequently follows the path of nutrient-enriched water down the rock, the colonies of *Lasallia* often 'outrunning' most of the other species that occurred higher up. The broad thalli of *Lasallia* are not closely appressed to the rock, and this species can form dense colonies which exclude most other species. Few samples were seen during the course of the survey, but in some parts of upland Britain, *Lasallia* can form impressive and extensive stands.

## Annex I habitats

The community was not found to be associated with any Annex I habitats.

## Conservation interest

The typical species of this community are widespread.

## Differentiation from other communities

*Lasallia* can occur in other communities including H, F1 and F2, but in smaller quantities.

## Coverage and integrity

Few samples are available. The abundance of *Lasallia* in some stands, and the way in which it occurs more or less independently of other species, suggest that stands in which it is abundant merit recognition as a community.

**Table 28:** Floristic and environmental data for SS F4 *Lasallia pustulata* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data		
	382	110	432
<i>Lasallia pustulata</i>	8	7	6
<i>Parmelia omphalodes</i>	1	3	2
<i>Parmelia sulcata</i>	2	6	
<i>Fuscidea cyathoides</i>	2		5
<i>Candelariella coralliza</i>	1	4	
<i>Hypnum andoi</i>	1	4	
<i>Lecanora polytropa</i>		2	4
<i>Miriquidica leucophaea</i>			5
<i>Tephromela atra</i>			5
<i>Xanthoparmelia conspersa</i>	5		
<i>Protoparmelia badia</i>			4

<i>Rhizocarpon geographicum</i>			4
<i>Aspicilia caesiocinerea</i>		3	
<i>Lecanora intricata</i>			3
<i>Umbilicaria torrefacta</i>			3
<i>Buellia aethalea</i> (all morphs)	2		
<i>Rhizocarpon reductum</i>	2		
<i>Umbilicaria polyphylla</i>	2		
<i>Ophioparma ventosa</i>			1
<i>Pertusaria corallina</i>			1
<i>Racomitrium aquaticum</i>		1	
<i>Rimularia furvella</i>			1
<i>Scoliciosporum umbrinum</i>		1	
<i>Stereocaulon evolutum</i>			1
Rock	4	3	4
Slope (degrees)	30	35	10
Aspect (degrees)	210	68	220
Shade	None	None	None
Run off	Moderate		None
Drainage	Moderate		
Rain shelter	None	None	None
Altitude (m) (m)	285	420	
Quadrat size (cm)	50 x 50	25 x 25	100 x 25
Vice-county	48	49	49
Grid ref.	23/7468.3259	23/590.553	23/5936.5835
Date	13 Sep 2002	10 May 1998	20 Sep 2002
SAC/site code	-	E	E

### 3.3.24 SS F5 *Umbilicaria deusta* community (Table 29)

#### Synonyms

*Umbilicarietum deustae* Frey; *Umbilicarietum cylindricae* “nodum 6” (James *et al*, 1977).

#### Constant species

*Umbilicaria deusta*.

#### Description and ecology

A community dominated by the foliose lichen *Umbilicaria deusta*. Only two samples are available, one from a low boulder beside a pool in the Lake District, and one from a poorly drained rock surface in block scree on Cross Fell (North Pennines). According to James *et al* (1977) this nodum is ‘well-developed by the sides of upland mountain streams’.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is recorded from block scree.



**Conservation interest**

*Umbilicaria deusta* is Nationally Scarce.

**Differentiation from other communities**

This community is distinguished by the dominance of *Umbilicaria deusta*.

**Coverage and integrity**

Many more samples need to be studied. Although this community is presently based on a single species, stands are conspicuous. Common species of *Umbilicaria* other than *U. deusta* are found on well-drained rocks, rather than the poorly drained rocks of F5. They are likely to belong to a different community.

**Table 29:** Floristic and environmental data for SS F5 *Umbilicaria deusta* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data	
	197	160
<i>Umbilicaria deusta</i>	6	6
<i>Rhizocarpon reductum</i>	3	2
<i>Lecanora intricata</i>		5
<i>Trentepohlia iolithus</i>		5
<i>Aspicilia grisea</i>	4	
<i>Porpidia macrocarpa</i>		4
<i>Porpidia tuberculosa</i>	3	
<i>Andreaea rupestris</i>	2	
<i>Cladonia diversa</i>	2	
<i>Immersaria athroocarpa</i>	2	
<i>Pertusaria corallina</i>	2	
<i>Rhizocarpon geographicum</i>	2	
<i>Tephromela atra</i>	2	
<i>Tremolechia atrata</i>	2	
<i>Cladonia alpina</i>	1	
<i>Lecanora soralifera</i>	1	
<i>Racomitrium sudeticum</i>	1	
<i>Racomitrium fasciculare</i>	1	
Rock	5	5
Slope (degrees)	20	5
Aspect (degrees)	230	240
Shade	None	None
Run off	None	Slight
Drainage	Moderate	Poor
Rain shelter	None	None
Altitude (m)	565	850

**3.3.25 SS F6 *Campylopus flexuosus*-*Barbilophozia floerkei* community (Table 30)****Synonyms**

None are known.

**Constant species**

*Barbilophozia floerkei*, *Campylopus flexuosus*, *Cladonia diversa* and *Lepraria caesioalba*.

**Description and ecology**

A community dominated by medium-sized bryophytes, mainly the hepatic *Barbilophozia floerkei* and the moss *Campylopus flexuosus*. Species of *Cladonia* including *C. diversa*, *C. polydactyla* and *C. subcervicornis* can be present at low cover, but other genera of macrolichens are usually absent.

The community develops on acid rocks which are moist from run-off, poor drainage, or proximity to the ground. However, stands can also be found on steep rock faces (more or less north-facing, or on north-facing slopes) which apparently receive little run-off, and it is not always clear why these occur. Once established, the cushions of bryophytes retain enough water after rain to prolong moist conditions in these stands; the base of one stand on a steep face was wet enough to support a colony of the moss *Campylopus atrovirens*, which would not normally be found on a steep and unflushed face of this sort. The community is rare at most of the sites studied.

**Annex I habitats**

The community was not found to be associated with any Annex I habitats.

**Conservation interest**

The typical species of this community are widespread.

**Coverage and integrity**

This community is more likely to be found in somewhat shaded sites and is rare in many unshaded upland sites. Additional samples from both shaded and unshaded sites are necessary to understand the variation of this community.

**Table 30:** Floristic and environmental data for SS F6 *Campylopus flexuosus*-*Barbilophozia floerkei* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Campylopus flexuosus</i>	IV (4-7)
<i>Cladonia diversa</i>	IV (1-5)
<i>Barbilophozia floerkei</i>	IV (5-6)
<i>Lepraria caesioalba</i>	IV (1-4)

<i>Andreaea rupestris</i>	III (2-5)
<i>Racomitrium lanuginosum</i>	III (2-5)
<i>Cladonia subcervicornis</i>	III (2-4)
<i>Hypnum jutlandicum</i>	III (2)
<i>Diplophyllum albicans</i>	II (4-5)
<i>Racomitrium sudeticum</i>	II (2-5)
<i>Cladonia polydactyla</i>	II (3-4)
<i>Hypnum andoi</i>	II (2-4)
<i>Trapelia involuta</i>	II (2-4)
<i>Ptilidium ciliare</i>	II (1-4)
<i>Stereocaulon vesuvianum</i>	II (1-4)
<i>Micarea lignaria</i> var. <i>lignaria</i>	II (2)
<i>Rhytidiadelphus loreus</i>	II (2)
<i>Scapania gracilis</i>	II (2)
<i>Andreaea rothii</i>	I (1-2)
<i>Cladonia furcata</i>	I (1-2)
<i>Lophozia sudetica</i>	I (1-2)
<i>Porpidia tuberculosa</i>	I (1-2)
<i>Trapelia coarctata</i>	I (1-2)
<i>Racomitrium heterostichum</i>	I (6)
<i>Polytrichum piliferum</i>	I (5)
<i>Racomitrium fasciculare</i>	I (5)
<i>Campylopus atrovirens</i>	I (4)
<i>Dicranum majus</i>	I (4)
<i>Marsupella emarginata</i>	I (4)
<i>Nardia scalaris</i>	I (4)
<i>Plagiothecium undulatum</i>	I (4)
<i>Polytrichum alpinum</i>	I (4)
<i>Cephalozia bicuspidata</i>	I (2)
<i>Cladonia uncialis</i>	I (2)
<i>Dicranum scoparium</i>	I (2)
<i>Hypogymnia physodes</i>	I (2)
<i>Kiaeria falcate</i>	I (2)
<i>Lophozia incise</i>	I (2)
<i>Lophozia ventricosa</i>	I (2)
<i>Opegrapha gyrocarpa</i>	I (2)
<i>Pellia epiphylla</i>	I (2)
<i>Placynthiella icmalea</i>	I (2)
<i>Porpidia irrigua</i>	I (2)
<i>Racomitrium affine</i>	I (2)
<i>Rhizomnium punctatum</i>	I (2)
<i>Rhizocarpon reductum</i>	I (2)
<i>Sphaerophorus globosus</i>	I (2)
<i>Trapeliopsis granulosa</i>	I (2)
<i>Baeomyces rufus</i>	I (1)
<i>Barbilophozia atlantica</i>	I (1)
<i>Cetraria aculeate</i>	I (1)
<i>Cladonia cyathomorpha</i>	I (1)

<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	I (1)
<i>Micarea leprosula</i>	I (1)
<i>Moerckia blytii</i>	I (1)
<i>Parmelia saxatilis</i>	I (1)
Rock	V (2-7)
<i>Deschampsia flexuosa</i>	I (2)
<i>Galium saxatile</i>	I (2)
<i>Huperzia selago</i>	I (2)
<i>Saxifraga stellaris</i>	I (1)
Slope (degrees)	66 (40-90)
Aspect (degrees)	
Shade	None (to slight)
Run off	None to Moderate
Drainage	Moderate to good
Rain shelter	None
Altitude (m)	310-870
Number of samples	8

### 3.3.26 SS F7 *Racomitrium fasciculare*-*R. heterostichum* community (Table 31)

#### Synonyms

None are known.

#### Constant species

*Racomitrium fasciculare*.

#### Description and ecology

This is a bryophyte-dominated community usually with at least 10% cover of one or more of the mosses *Racomitrium affine*, *R. fasciculare* or *R. heterostichum*. *Cladonia* species may be present, including *C. cyathomorpha* (frequent in this community and rather characteristic of slightly flushed moss mats), *C. diversa* and *C. subcervicornis*. *Racomitrium lanuginosum* is frequent, but less abundant than other species of the genus, and *R. sudeticum* is only occasional, occurring at low cover. *R. affine* and *R. heterostichum* are closely related species, and difficult to separate in the field; collectively they are frequent. They are relatively low-altitude species, recorded in samples from 360 m to 820 m (Brecon Beacons). At higher altitudes they are replaced by *R. fasciculare*, which is present in samples recorded up to 1050m (Eryri).

The community is found on unshaded surfaces on isolated boulders or boulders in block scree, or on faces of bedrock, especially where damp.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community occurs in block scree as well as in other habitats.

### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

This community is distinguished from E4 by the abundance of *Racomitrium* species other than *R. sudeticum*.

### Coverage and integrity

As defined here the community is variable. A sample from Ben Lui, containing *R. fasciculare* with the montane moss *Kiaeria falcata*, has little in common with more lowland samples. However, it is difficult to divide the community at present, except in an arbitrary way.

**Table 31:** Floristic and environmental data for SS F7 *Racomitrium fasciculare*-*R. heterostichum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Racomitrium fasciculare</i>	IV (4-8)
<i>Racomitrium lanuginosum</i>	III (1-5)
<i>Cladonia diversa</i>	III (1-4)
<i>Porpidia tuberculosa</i>	III (1-4)
<i>Racomitrium affine/heterostichum</i>	III (4-9)
<i>Andreaea rupestris</i>	III (1-5)
<i>Cladonia cyathomorpha</i>	III (2-4)
<i>Trapelia involuta</i>	III (1-3)
<i>Micarea lignaria</i>	III (1-2)
<i>Porpidia irrigua</i>	II (1-6)
<i>Diplophyllum albicans</i>	II (2-5)
<i>Cladonia subcervicornis</i>	II (1-5)
<i>Stereocaulon vesuvianum</i>	II (1-5)
<i>Racomitrium affine</i>	II (4-9)
<i>Porpidia macrocarpa</i>	II (1-5)
<i>Hypnum andoi</i>	II (2-5)
<i>Pohlia nutans</i>	II (1-5)
<i>Rhizocarpon reductum</i>	II (1-4)
<i>Parmelia saxatilis</i>	II (1-5)
<i>Racomitrium sudeticum</i>	II (2-4)
<i>Cladonia alpina</i>	II (1-4)
<i>Miriquidica leucophaea</i>	II (1-2)
<i>Racomitrium heterostichum</i>	I (5-7)
<i>Polytrichum piliferum</i>	I (1-6)
<i>Campylopus flexuosus</i>	I (2-5)
<i>Ochrolechia androgyna</i>	I (1-4)
<i>Pertusaria coralline</i>	I (1-4)
<i>Trapelia coarctata</i>	I (1-4)

<i>Lepraria caesioalba</i>	I (1-3)
<i>Marsupella emarginata</i>	I (2)
<i>Lecanora polytropa</i>	I (1-2)
<i>Trapeliopsis granulosa</i>	I (1-2)
<i>Racomitrium aquaticum</i>	I (2-6)
<i>Lophozia sudetica</i>	I (4-5)
<i>Pseudotaxiphyllum elegans</i>	I (4)
<i>Trapelia placodioides</i>	I (1-3)
<i>Cladonia cervicornis</i>	I (2)
<i>Cladonia crispata</i> var. <i>cetrariiformis</i>	I (2)
<i>Cladonia ramulosa</i>	I (2)
<i>Hypnum jutlandicum</i>	I (2)
<i>Racomitrium aciculare</i>	I (2)
<i>Dicranum scoparium</i>	I (1-2)
<i>Micarea leprosula</i>	I (1-2)
<i>Porina lectissima</i>	I (1-2)
<i>Rhizocarpon lavatum</i>	I (1-2)
<i>Rhizocarpon geographicum</i>	I (1)
<i>Porpidia rugosa</i>	I (7)
<i>Bacidia fuscoviridis</i>	I (5)
<i>Kiaeria falcata</i>	I (5)
<i>Lepraria rigidula</i>	I (5)
<i>Leptodontium flexifolium</i>	I (5)
<i>Polytrichum alpinum</i>	I (5)
<i>Porpidia crustulata</i>	I (5)
<i>Cynodontium bruntonii</i>	I (4)
<i>Grimmia curvata</i>	I (4)
<i>Ionaspis odora</i>	I (4)
<i>Ochrolechia tartarea</i>	I (4)
<i>Pertusaria lactea</i>	I (4)
<i>Porpidia platycarpoides</i>	I (4)
<i>Andreaea rothii</i>	I (2)
<i>Barbilophozia floerkei</i>	I (2)
<i>Cephaloziella</i> spp.	I (2)
<i>Cladonia macilenta</i>	I (2)
<i>Cladonia pyxidata</i>	I (2)
<i>Grimmia donniana</i>	I (2)
<i>Gymnomitrium obtusum</i>	I (2)
<i>Isothecium myosuroides</i> var. <i>myosuroides</i>	I (2)
<i>Lecanora soralifera</i>	I (2)
<i>Lecidea phaeops</i>	I (2)
<i>Lepraria borealis</i>	I (2)
<i>Pertusaria pseudocorallina</i>	I (2)
<i>Porpidia superba</i>	I (2)
<i>Racomitrium ericoides</i>	I (2)
<i>Rhizocarpon anaperum</i>	I (2)
<i>Sphaerophorus globosus</i>	I (2)
<i>Stereocaulon plicatile/tornense</i>	I (2)

<i>Amygdalaria pelobotryon</i>	I (1)
<i>Baeomyces rufus</i>	I (1)
<i>Breutelia chrysocoma</i>	I (1)
<i>Cetraria aculeate</i>	I (1)
<i>Cetraria muricata</i>	I (1)
<i>Cladonia bellidiflora</i>	I (1)
<i>Cladonia squamosa</i> var. <i>squamosa</i>	I (1)
<i>Epigloea soleiformis</i>	I (1)
<i>Fuscidea lygaea</i>	I (1)
<i>Kiaeria starkei</i>	I (1)
<i>Lecanora intricata</i>	I (1)
<i>Micarea coppinsii</i>	I (1)
<i>Placynthiella icmalea</i>	I (1)
<i>Porpidia melinodes</i>	I (1)
<i>Rhizocarpon hochstetteri</i>	I (1)
<i>Rhizocarpon oederi</i>	I (1)
<i>Rhizocarpon sublavatum</i>	I (1)
<i>Rhytidiadelphus loreus</i>	I (1)
<i>Sphaerophorus fragilis</i>	I (1)
<i>Sphaerophorus globosus</i>	I (1)
<i>Trapeliopsis pseudogranulosa</i>	I (1)
<i>Xanthoparmelia conspersa</i>	I (1)
Rock	V (2-6)
<i>Festuca ovina</i>	I (4)
<i>Deschampsia flexuosa</i>	I (2-4)
<i>Agrostis capillaris</i>	I (1)
<i>Festuca vivipara</i>	I (1)
<i>Galium saxatile</i>	I (1)
Slope (degrees)	49 (0-90)
Aspect (degrees)	
Shade	None to slight
Run off	None to moderate (to strong)
Drainage	Moderate to good
Rain shelter	None (to slight)
Altitude (m)	360-1050
Number of samples	19

### 3.3.27 SS F8 *Frullania tamarisci*-*Schistidium strictum* community (Table 32)

#### Synonyms

None are known.

#### Constant species

*Frullania tamarisci*.

## Description and ecology

This is a bryophyte-dominated community characterised by the brown hepatic *Frullania tamarisci* and the reddish moss *Schistidium strictum*. These species are often accompanied by the mosses *Amphidium mougeotii* and *Blindia acuta*, while some stands contain some *Brachythecium plumosum*, *Grimmia curvata*, *Plagiochila porelloides* or *Racomitrium ellipticum*. Some drier stands have conspicuous *Tortella tortuosa* or *Trichostomum brachydontium*.

The community is developed on unshaded, damp, usually flushed, base-rich faces of bedrock, though it also occurs rarely on boulders in block scree. It can occur close to C1 (on drier faces), and to N2 (on wetter faces).

## Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community occurs occasionally on large boulders in block scree, but is more typical of bedrock; and occurs on somewhat calcareous rocks.

## Conservation interest

This community can contain uncommon species; during the survey the bryophytes *Amphidium lapponicum*, *Molendoa warburgii*, *Scapania degenii*, and the Near Threatened lichen *Fuscopannaria praetermissa* were recorded in stands of this community.

## Differentiation from other communities

Like F8, N2 also occurs on wet, basic rock faces, but is dominated by *Blindia acuta* and other acrocarpous mosses, while *Frullania* and *Schistidium* are absent or very sparse. SL 19 differs in the lack of numerous species of siliceous rocks. The community is also related to some moss communities of freshwater.

## Coverage and integrity

Suitable wet, base-rich rock faces were very local in the sites surveyed, and many more samples of this community need to be studied to understand its variation.

**Table 32:** Floristic and environmental data for SS F8 *Frullania tamarisci*-*Schistidium strictum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Frullania tamarisci</i>	IV (3-8)
<i>Racomitrium ellipticum</i>	III (2-6)
<i>Blindia acuta</i>	III (2-5)
<i>Racomitrium lanuginosum</i>	III (1-6)
<i>Schistidium strictum</i>	III (1-5)
<i>Amphidium mougeotii</i>	III (1-5)
<i>Andreaea alpina</i>	III (1-5)



<i>Racomitrium fasciculare</i>	III (1-5)
<i>Rhizocarpon lavatum</i>	III (1-4)
<i>Porpidia macrocarpa</i>	III (1-4)
<i>Campylopus atrovirens</i>	III (1-2)
<i>Tortella tortuosa</i>	II (2-8)
<i>Brachythecium plumosum</i>	II (2-6)
<i>Cladonia pyxidata</i>	II (2)
<i>Trichostomum brachydontium</i>	II (1-6)
<i>Plagiochila porelloides</i>	II (1-5)
<i>Porpidia rugosa</i>	II (1-5)
<i>Protopannaria pezizoides</i>	II (1-5)
<i>Tritomaria quinquedentata</i>	II (1-4)
<i>Racomitrium aciculare</i>	II (1-4)
<i>Pertusaria lactea</i>	II (1-2)
<i>Micarea lignaria</i> var. <i>lignaria</i>	II (1-2)
<i>Lecidea phaeops</i>	I (5)
<i>Stigonema</i> spp.	I (5)
<i>Porpidia islandica</i>	I (4-5)
<i>Grimmia curvata</i>	I (4)
<i>Brachythecium populeum</i>	I (4)
<i>Gymnostomum aeruginosum</i>	I (4)
<i>Hypnum andoi</i>	I (4)
<i>Nephroma parile</i>	I (4)
<i>Polyblastia cruenta</i>	I (4)
<i>Porpidia tuberculosa</i>	I (3-4)
<i>Nostoc</i> spp.	I (3)
<i>Polyblastia melaspora</i>	I (3)
<i>Isothecium myosuroides</i> var. <i>brachythecioides</i>	I (2-4)
<i>Porpidia superba</i> f. <i>sorediata</i>	I (2-4)
<i>Thelidium papulare</i>	I (2-4)
<i>Fissidens dubius</i>	I (2)
<i>Pogonatum urnigerum</i>	I (2)
<i>Anoetangium aestivum</i>	I (2)
<i>Radula complanata/lindenbergiana</i>	I (2)
<i>Trapelia coarctata</i>	I (2)
<i>Agonimia tristicula</i>	I (2)
<i>Amphidium lapponicum</i>	I (2)
<i>Amygdalaria consentiens</i>	I (2)
<i>Breutelia chrysocoma</i>	I (2)
<i>Cololejeunea calcarea</i>	I (2)
<i>Dichodontium pellucidum</i>	I (2)
<i>Didymodon insulanus</i>	I (2)
<i>Ephebe lanata</i>	I (2)
<i>Fissidens viridulus</i>	I (2)
<i>Hypnum lacunosum</i>	I (2)
<i>Moelleropsis nebulosa</i>	I (2)
<i>Peltigera rufescens</i>	I (2)
<i>Porina lectissima</i>	I (2)

<i>Pterygynandrum filiforme</i>	I (2)
<i>Racomitrium ericoides</i>	I (2)
<i>Racomitrium sudeticum</i>	I (2)
<i>Rhytidiadelphus triquetrus</i>	I (2)
<i>Scapania aequiloba</i>	I (2)
<i>Scapania degenii</i>	I (2)
<i>Trapeliopsis wallrothii</i>	I (2)
<i>Trentepohlia aurea</i>	I (2)
<i>Marsupella emarginata</i>	I (1-6)
<i>Racomitrium aquaticum</i>	I (1-5)
<i>Grimmia torquata</i>	I (1-4)
<i>Peltigera membranacea</i>	I (1-4)
<i>Scapania aspera</i>	I (1-3)
<i>Stereocaulon vesuvianum</i>	I (1-3)
<i>Cladonia subcervicornis</i>	I (1-2)
<i>Ctenidium molluscum</i>	I (1-2)
<i>Anomobryum julaceum</i>	I (1-2)
<i>Baeomyces rufus</i>	I (1-2)
<i>Cladonia pocillum</i>	I (1-2)
<i>Dicranum scoparium</i>	I (1-2)
<i>Lejeunea patens</i>	I (1-2)
<i>Lepraria eburnean</i>	I (1-2)
<i>Trichostomum tenuirostre</i>	I (1-2)
<i>Cladonia cervicornis</i>	I (1)
<i>Amygdalaria pelobotryon</i>	I (1)
<i>Bryum capillare</i>	I (1)
<i>Andreaea rupestris</i>	I (1)
<i>Bryum pseudotriquetrum</i>	I (1)
<i>Cephaloziella</i> spp.	I (1)
<i>Cladonia floerkeana</i>	I (1)
<i>Cladonia furcata</i>	I (1)
<i>Diplophyllum albicans</i>	I (1)
<i>Encalypta ciliate</i>	I (1)
<i>Fuscopannaria praetermissa</i>	I (1)
<i>Gymnomitrium obtusum</i>	I (1)
<i>Isothecium myosuroides</i> var. <i>mysuroides</i>	I (1)
<i>Lecanora intricate</i>	I (1)
<i>Lecidea hypnorum</i>	I (1)
<i>Lejeunea cavifolia</i>	I (1)
<i>Lophozia sudetica</i>	I (1)
<i>Peltigera hymenina</i>	I (1)
<i>Peltigera leucophlebia</i>	I (1)
<i>Pertusaria albescens</i>	I (1)
<i>Pertusaria coralline</i>	I (1)
<i>Pohlia cruda</i>	I (1)
<i>Polyblastia theleodes</i>	I (1)
<i>Porina guentheri</i> var. <i>guentheri</i>	I (1)
<i>Preissia quadrata</i>	I (1)

<i>Parmelia saxatilis</i>	I (1)
Rock	V (2-5)
<i>Alchemilla alpina</i>	I (1-2)
<i>Thymus polytrichus</i>	I (1-2)
<i>Calluna vulgaris</i>	I (4)
<i>Epilobium brunnescens</i>	I (4)
<i>Silene acaulis</i>	I (4)
<i>Campanula rotundifolia</i>	I (2)
<i>Festuca ovina</i> agg.	I (2)
<i>Hieracium</i> spp.	I (2)
<i>Plantago maritima</i>	I (2)
<i>Saxifraga oppositifolia</i>	I (2)
<i>Selaginella selaginoides</i>	I (2)
<i>Thalictrum minus</i>	I (2)
<i>Viola riviniana</i>	I (2)
<i>Cystopteris fragilis</i>	I (1)
<i>Euphrasia</i> spp.	I (1)
<i>Sedum rosea</i>	I (1)
Slope (degrees)	72 (50-100)
Aspect (degrees)	
Shade	None
Run off	(None to) slight to strong
Drainage	(Poor to) good
Rain shelter	None to slight
Altitude (m)	568 (340-690)
Number of samples	15

### 3.3.28 SS H1 *Candelariella coralliza*-*Aspicilia caesiocinerea* community (Table 33)

#### Synonyms

*Candelarielletum corallizae* Massé (James *et al.*, 1977).

#### Constant species

*Candelariella coralliza*.

#### Description and ecology

The community is dominated by lichens which are tolerant of high levels of nutrients, including the crustose lichen *Candelariella coralliza* and the squamulose *Xanthoria candelaria*. These two species form conspicuous bright yellow colonies.

The community develops mainly on the crests of boulders used as bird perches, but occasionally also on sloping sides of boulders or on bedrock where nutrients are washed down. Often the community is restricted to a very small enriched area. On bird perches where there is intense enrichment at one spot, there may be bare rock or colonies of the green alga *Prasiola crispa*, surrounded by the present community. In some samples from Carn Ingli in S.W. Wales, the uncommon and conspicuous macrolichen *Ramalina polymorpha* is present.

Samples with less *Candelariella* but with abundant *Aspicilia caesiocinerea* or *Lecanora intricata* indicate slightly less enriched conditions. With less enrichment, the community rapidly grades into F2, F3 and other communities. The existence of the community depends largely on the abundance and distribution of perching birds, and it is more abundant at low altitudes. It is likely that in high rainfall areas the enrichment caused by bird droppings will also be more diffuse. Enrichment by agriculturally derived nutrients does not necessarily encourage the development of this community.

### Annex I habitats

The community was not found to be associated with any Annex I habitats.

### Conservation interest

*Ramalina polymorpha* is Near Threatened.

### Coverage and integrity

The community is reasonably well covered by samples.

**Table 33:** Floristic and environmental data for SS H1 *Candelariella coralliza*-*Aspicilia caesiocinerea* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Candelariella coralliza</i>	V (2-9)
<i>Lecanora intricata</i>	III (2-6)
<i>Lecanora polytropa</i>	III (2-4)
<i>Aspicilia caesiocinerea</i>	III (2-8)
<i>Ramalina polymorpha</i>	II (5-8)
<i>Xanthoria candelaria</i>	II (1-8)
<i>Parmelia omphalodes</i>	II (1-4)
<i>Parmelia saxatilis</i>	II (1-4)
<i>Ramalina subfarinacea</i>	II (1-4)
<i>Aspicilia cinerea</i> agg.	I (1-4)
<i>Parmelia sulcata</i>	I (1-4)
<i>Melanelia fuliginosa</i> subsp. <i>fuliginosa</i>	I (4)
<i>Xanthoparmelia conspersa</i>	I (4)
<i>Pertusaria pseudocorallina</i>	I (2-4)
<i>Racomitrium heterostichum</i>	I (1-3)
<i>Fuscidea cyathoides</i>	I (1)
<i>Rinodina atrocinerea</i>	I (7)
<i>Pertusaria corallina</i>	I (5)
<i>Trapelia involuta</i>	I (5)
<i>Caloplaca arenaria</i>	I (4)
<i>Lasallia pustulata</i>	I (4)
<i>Lecanora muralis</i>	I (4)
<i>Racomitrium sudeticum</i>	I (4)

<i>Hypotrachyna revolute</i>	I (3)
<i>Umbilicaria polyphylla</i>	I (3)
<i>Verrucaria fusconigrescens</i>	I (3)
<i>Miriacidica leucophaea</i>	I (2)
<i>Prasiola crispa</i>	I (2)
<i>Ramalina siliquosa</i>	I (2)
<i>Hypogymnia tubulosa</i>	I (1)
<i>Neofuscelia loxodes</i>	I (1)
<i>Tephromela atra</i>	I (1)
Rock	V (2-7)
Slope (degrees)	21 (0-60)
Aspect (degrees)	
Shade	None
Run off	None to slight
Drainage	Moderate to good
Rain shelter	None
Altitude (m)	165-820
Number of samples	17

### 3.3.29 SS I1 *Trentepohlia iolithus* community (Table 34)

#### Synonyms

None are known.

#### Constant species

*Trentepohlia iolithus*.

#### Description and ecology

The community comprises dense colonies of the orange filamentous alga *Trentepohlia iolithus*, usually excluding more than a low cover of poorly developed lichens. The community was recorded only on the summit of Cross Fell (North Pennines), where *T. iolithus* is abundant on Millstone Grit block scree, and visible as a reddish band from 2.5 km away. The dense colonies of this community develop close to (or over) stands of A1 and B1, and species of these communities appear incidentally in the samples. The only species that appeared to be regularly associated with *T. iolithus* was the crustose lichen *Rhizocarpon reductum*, which usually formed extremely poorly developed thalli. *T. iolithus* was locally present on damp rocks at other sites, but not so abundantly as to exclude lichens. The alga is apparently widespread, and has been reported forming conspicuous growths on painted and concrete surfaces of buildings in Galway (Rindi & Guiry 2002).

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community is only recorded from block scree, at one site.

**Conservation interest**

*T. iolithus* is apparently widespread.

**Coverage and integrity**

This community is defined here only by the abundance of one species of alga, so is outside the main scope of this study. However, it grows with and competes with lichen communities, and seems worthy of recognition.

**Table 34:** Floristic and environmental data for SS I1 *Trentepohlia iolithus* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data				
	145	147	150	153	154
<i>Trentepohlia iolithus</i>	9	8	6	8	9
<i>Rhizocarpon reductum</i>		5	5	5	
<i>Fuscidea intercincta</i>	1	4	4		
<i>Rhizocarpon geographicum</i>	4		2		
<i>Andreaea rupestris</i>					2
<i>Cladonia diversa</i>				1	
<i>Lepraria neglecta</i>					1
<i>Micarea lignaria</i> var. <i>lignaria</i>				1	
<i>Pseudephebe pubescens</i>		1			
Rock	4	5	7	5	5
Slope (degrees)	30	50	50	50	40
Aspect (degrees)	190	200	210	220	0
Shade	None	None	None	None	None
Run off	Slight	None	Slight-moderate	None	None-slight
Drainage	Poor-moderate	Good	Good	Poor	Moderate
Rain shelter	None	None	None	None	None
Altitude (m)	840	840	840	840	850
Quadrat size (cm)	25 x 25	25 x 25	25 x 25	25 x 25	25 x 25
Vice-county	70	70	70	70	70
Grid ref.	35/6928. 3398	35/6927. 3397	35/6927. 3397	35/6927. 3396	35/6866. 3480
Date	21 Jun 2005	21 Jun 2005	21 Jun 2005	21 Jun 2005	21 Jun 2005
SAC/site code	NP	NP	NP	NP	NP

**3.3.30 SS K1 *Lecanora ecorticata* community (Table 35)****Synonyms**

*Leprarietum incanae* James *et al* p.p. (James *et al*, 1977).

**Constant species**

*Lecanora ecorticata*, *Lepraria incana* and *Opegrapha gyrocarpa*.

**Description and ecology**

The sterile, powdery crustose lichen *Lecanora ecorticata*, which formerly would have been included in a very broadly delimited '*Lepraria incana*' species, dominates this very species-poor community. It forms pale yellow crusts on stones and bedrock below dry siliceous overhangs which are strongly sheltered from rain. This species extends further into crevices than perhaps any other British saxicolous lichen, with only free-living green algae noted further into overhangs. *Lepraria incana* is recorded in some samples, but although thalli of this species can be contiguous with those of *Lecanora ecorticata*, *L. incana* is restricted to the less sheltered parts of any stand.

With slightly less rain-shelter, stands can grade into communities comprising *Enterographa zonata* (K5, K8), *Opegrapha gyrocarpa* (K5) or *Lecanora orosthea* (K8). Stands of K1 are widespread in north and west Britain; it is common, for instance, in semi-natural oak woods in Merioneth (N.W. Wales), and in this region it is sometimes conspicuous on dry stone walls, picking out the sheltered cavities around each stone. In the treeless uplands it is less abundant due to the scarcity of suitable sheltered overhangs; in the present survey it was recorded in N. Wales and the Lake District, but no stands were seen in W. Scotland.

**Annex I habitats**

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is found in cavities formed by boulders in block scree.

**Conservation interest**

The typical species of this community are widespread.

**Coverage and integrity**

More samples should be recorded to confirm the composition of this community.

**Table 35:** Floristic and environmental data for SS K1 *Lecanora ecorticata* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data			
	17	478	347	149
<i>Lecanora ecorticata</i>	6	9	5	6
<i>Lepraria incana</i>	4		5	
<i>Opegrapha gyrocarpa</i>			1	4
<i>Enterographa zonata</i>	3			
<i>Hypogymnia physodes</i>	1			
<i>Lecanora subcarnea</i>	1			
Rock	7	4	7	8
Slope (degrees)	40	45	70	30
Aspect (degrees)	170	270	310	320

Shade	Strong	Slight-moderate	Slight-moderate	Moderate-strong
Run off	None	None	None-slight	None-slight
Drainage		Good	Good	Moderate-good
Rain shelter	Strong		Strong	Strong
Altitude (m) (m)	480	100	470	160
Quadrat size (cm)	25 x 25	25 x 25	25 x 25	25 x 25
Vice-county	49	49	48	70
Grid ref.	23/658.611	23/6481.5158	23/7473.1412	35/1515.0426
Date		4 Nov 2002	24 Jul 2003	30 Jun 2004
SAC/site code	E	-	CI	LD

### 3.3.31 SS K2 *Lepraria incana*-*Cystocoleus ebeneus* community (Table 36)

#### Synonyms

*Leprarietum incanae* James *et al* 1977 (James *et al*, 1977); *Racodietum rupestris* Schade (James *et al*, 1977).

#### Constant species

*Lepraria incana*.

#### Description and ecology

This community contains the pale blue-grey (occasionally dull orange) powdery lichen *Lepraria incana*, sometimes replaced by the morphologically very similar *L. elobata*. The minutely filamentous lichens *Cystocoleus* and *Racodium* (indistinguishable in the field) are frequent, forming sooty-black colonies.

The community develops on rain-sheltered acidic faces below rock overhangs or in dry cavities in block scree. Stands comprising almost pure colonies of *L. incana* can occur, especially in less humid situations or in pollution-stressed sites. *Cystocoleus* and *Racodium* require overall slightly damper conditions than *L. incana*. The community is widespread in upland Britain, but is less abundant in high rainfall areas; at Glen Coe the only sample found was in a deep cavity below a large boulder.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community is found in cavities in block scree.

Siliceous rocky slopes with chasmophytic vegetation: this community is found below overhangs on bedrock.

#### Conservation interest

The typical species of this community are widespread.



**Coverage and integrity**

Species poor stands containing *Lepraria incana* are also found on bark, but may be worthy of recognition as a separate community because the associated species are different to those on rock.

**Table 36:** Floristic and environmental data for SS K2 *Lepraria incana*-*Cystocoleus ebeneus* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Lepraria incana</i>	V (4-10)
<i>Cystocoleus ebeneus</i>	II (2-6)
<i>Opegrapha gyrocarpa</i>	II (2)
<i>Racodium rupestre</i>	I (4-8)
<i>Lepraria caesioalba</i>	I (6)
<i>Lepraria elobata</i>	I (4-6)
<i>Cladonia diversa</i>	I (5)
<i>Lecanora ecorticata</i>	I (5)
<i>Micarea botryoides</i>	I (4-5)
<i>Cladonia subcervicornis</i>	I (4)
<i>Diplophyllum albicans</i>	I (4)
<i>Pertusaria corallina</i>	I (4)
<i>Porpidia tuberculosa</i>	I (4)
<i>Micarea lignaria</i>	I (2-4)
<i>Lecanora orosthea</i>	I (3)
<i>Pertusaria lactea</i>	I (3)
<i>Trentepohlia aurea</i>	I (3)
<i>Arthonia arthonioides</i>	I (2)
<i>Lecanora gangaleoides</i>	I (2)
<i>Parmelia saxatilis</i>	I (2)
<i>Pseudotaxiphyllum elegans</i>	I (2)
<i>Enterographa zonata</i>	I (1-2)
<i>Dicranoweisia cirrata</i>	I (1)
<i>Diploschistes scruposus</i>	I (1)
<i>Psilolechia lucida</i>	I (1)
<i>Racomitrium fasciculare</i>	I (1)
Rock	V (4-7)
<i>Digitalis purpurea</i>	I (1)
Slope (degrees)	77 (15-135)
Aspect (degrees)	
Shade	Slight to strong
Run off	None to moderate
Drainage	Good
Rain shelter	Moderate to strong
Altitude (m)	40-640
Number of samples	12

**3.3.32 SS K3 *Lecanactis latebrarum* community (Table 37)****Synonyms**

None are known.

**Constant species**

*Lecanactis latebrarum*.

**Description and ecology**

A community dominated by the lichen *Lecanactis latebrarum*, which forms soft dull pink crusts on rain-sheltered siliceous rocks below overhangs, frequently in woodland. *L. latebrarum* grows in association with species including *Lepraria incana* and *Racodium rupestre*, but it appears to require greater shelter than these, so that colonies of these species are often contiguous rather than mixed.

**Annex I habitats**

Siliceous rocky slopes with chasmophytic vegetation: this community is recorded from overhangs, some of which may possibly be regarded as chasmophytic (see Discussion).

**Conservation interest**

*Lecanactis latebrarum* is Nationally Rare.

**Differentiation from other communities**

This community is distinguished by the abundance of *L. latebrarum*.

**Coverage and integrity**

Only two samples are available. This is a provisional community closely related to K2 and K4.

**Table 37:** Floristic and environmental data for SS K3 *Lecanactis latebrarum* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data	
	476	208
<i>Lecanactis latebrarum</i>	7	5
<i>Cynodontium bruntonii</i>	4	1
<i>Opegrapha gyrocarpa</i>	5	
<i>Lepraria crassissima</i>	4	
<i>Lepraria incana</i>		4
<i>Enterographa zonata</i>		2
<i>Racodium rupestre</i>	2	
<i>Lecanora ecorticata</i>		1
<i>Lecanora gangaleoides</i>		1

Rock	6	8
Slope (degrees)	110	110
Aspect (degrees)	330	310
Shade	Moderate	Slight
Run off	None-slight	Slight
Drainage	Good	Good
Rain shelter		Moderate
Altitude (m)	100	250
Quadrat size (cm)	30 x 20.8	25 x 25
Vice-county	48	70
Grid ref.	23/6051.4921	35/2280.1690
Date	25 Oct 2002	3 Sep 2004
SAC/site code	-	LD

### 3.3.33 SS K4 *Lepraria humida*-*Diplophyllum albicans* community (Table 38)

#### Synonyms

*Leprarietum incanae* James *et al*, 1977 (James *et al*, 1977); *Racodietum rupestris* Schade (James *et al*. 1977).

#### Constant species

*Diplophyllum albicans*.

#### Description and ecology

This is a community containing *Lepraria atlantica*, *L. crassissima* or *L. humida*, often growing with bryophytes including *Diplophyllum albicans*, on shaded and rain-sheltered rocks. The black filamentous lichen *Cystocoleus ebeneus* is frequent.

The community occurs on rain-sheltered but rather damp or humid faces on upland cliffs or on rock faces in semi-natural woodland. The community is variable, but represents slightly damper conditions than those of K2. Stands with *Lepraria membranacea* and the moss *Cynodontium bruntonii* represent a slightly less damp facies of rock faces in woodland. Another stand was unusual in the abundance of *Lepraria bergensis*.

#### Annex I habitats

Siliceous rocky slopes with chasmophytic vegetation: this community is found in cavities below boulders and recesses on outcrops. Many stands are on overhanging cliffs which cannot be regarded as chasmophytic habitats, but which may hold chasmophytic communities.

#### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

K4 differs from K2 in the presence of species of *Lepraria* other than *L. elobata* and *L. incana*, and in the greater abundance of bryophytes.

### Coverage and integrity

More samples need to be studied, including samples from woodlands. The classification of samples in K2, K3 and K4 is provisional and a better arrangement might be found. The taxonomy of *Lepraria* has improved greatly in recent years, and in older phytosociological accounts most of the species mentioned above would have been included within *L. incana*.

**Table 38:** Floristic and environmental data for SS K4 *Lepraria humida*-*Diplophyllum albicans* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
( <i>Lepraria</i> spp.)	V (2-9)
<i>Diplophyllum albicans</i>	IV (1-7)
<i>Lepraria humida</i>	III (2-8)
<i>Opegrapha gyrocarpa</i>	III (2-6)
<i>Cystocoleus ebeneus</i>	III (1-5)
<i>Lepraria crassissima</i>	II (5-9)
<i>Lepraria atlantica</i>	II (2-7)
<i>Porpidia tuberculosa</i>	II (2-5)
<i>Isothecium myosuroides</i>	II (1-6)
<i>Micarea subviridescens</i>	II (1-4)
<i>Baeomyces rufus</i>	II (1-2)
<i>Lepraria membranacea</i>	I (5-6)
<i>Lepraria bergensis</i>	I (5)
<i>Racodium rupestre</i>	I (4-7)
<i>Micarea lutulata</i>	I (4-6)
<i>Enterographa zonata</i>	I (4)
<i>Cladonia polydactyla</i>	I (4)
<i>Lecanactis abietina</i>	I (4)
<i>Lecanactis dilleniana</i>	I (4)
<i>Lecanora gangaleoides</i>	I (4)
<i>Pohlia elongata</i> var. <i>elongata</i>	I (4)
<i>Micarea lignaria</i>	I (3)
<i>Brachydontium trichodes</i>	I (3)
<i>Melanelia fuliginosa</i> subsp. <i>glabratula</i>	I (3)
<i>Metzgeria temperate</i>	I (3)
<i>Pohlia annotina</i>	I (3)
<i>Cynodontium bruntonii</i>	I (2-7)
<i>Diphyscium foliosum</i>	I (2-4)
<i>Cladonia caespiticia</i>	I (2)
<i>Racomitrium affine</i>	I (2)
<i>Trapeliopsis pseudogranulosa</i>	I (2)

<i>Arthrorhaphis citrinella</i>	I (2)
<i>Cladonia diversa</i>	I (2)
<i>Cladonia squamosa</i> var. <i>squamosa</i>	I (2)
<i>Diploschistes scruposus</i>	I (2)
<i>Frullania tamarisci</i>	I (2)
<i>Fuscidea recensa</i>	I (2)
<i>Lepraria lobificans</i>	I (2)
<i>Lepraria rigidula</i>	I (2)
<i>Micarea myriocarpa</i>	I (2)
<i>Microlejeunea ulicina</i>	I (2)
<i>Mnium hornum</i>	I (2)
<i>Parmelia saxatilis</i>	I (2)
<i>Racomitrium aquaticum</i>	I (2)
<i>Thamnobryum alopecurum</i>	I (2)
<i>Tylothallia biformigera</i>	I (2)
<i>Lepraria incana</i>	I (1-5)
<i>Porpidia rugosa</i>	I (1-5)
<i>Dicranum scoparium</i>	I (1-2)
<i>Micarea botryoides</i>	I (1-2)
<i>Pseudotaxiphyllum elegans</i>	I (1-2)
<i>Amphidium mougeotii</i>	I (1-2)
<i>Bryum capillare</i>	I (1)
<i>Cladonia coniocraea</i>	I (1)
<i>Cladonia squamosa</i> var. <i>subsquamosa</i>	I (1)
<i>Enterographa hutchinsiae</i>	I (1)
<i>Heterocladium heteropterum</i>	I (1)
<i>Hypnum jutlandicum</i>	I (1)
<i>Lecanora polytropa</i>	I (1)
<i>Lophocolea bidentata</i> subsp. <i>Rivularis</i>	I (1)
<i>Lophozia sudetica</i>	I (1)
<i>Pohlia nutans</i>	I (1)
<i>Porina chlorotica</i>	I (1)
<i>Psilolechia lucida</i>	I (1)
<i>Rhabdoweisia crispate</i>	I (1)
Rock	V (2-8)
Soil	I (2)
<i>Deschampsia flexuosa</i>	I (2)
Slope (degrees)	92 (0-120)
Aspect (degrees)	
Shade	Slight to moderate (to strong)
Run off	None to slight (to moderate)
Drainage	Good
Rain shelter	Slight to moderate (to strong)
Altitude (m)	40-915
Number of samples	19

### 3.3.34 SS K5 *Opegrapha gyrocarpa*-*Enterographa zonata* community (Table 39)

#### Synonyms

*Opegraphetum horistico-gyrocarpae* Wirth (James *et al.*, 1977).

#### Constant species

*Opegrapha gyrocarpa*.

#### Description and ecology

A community dominated by crustose lichens, mainly *Enterographa zonata* and *Opegrapha gyrocarpa*. Some samples included in K5 contain significant amounts of *Diploschistes scruposus* or *Lecanactis dilleniana*.

The community develops on rain-sheltered siliceous rocks in overhangs and on the sides of boulders. *O. gyrocarpa* in particular has a rather wide ecological tolerance, and can be found on both acid and slightly calcareous rocks; it is also tolerant of flushing and (in another community) it can be abundant on rocks which are wet for prolonged periods. With slightly less shelter from rain the community can give way to *Fuscidea* spp. (B1, B3), and with increased shelter it can grade into *Lepraria incana* (K2).

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community is found in cavities below boulders in block scree, but most recorded stands are from outcrops.

Siliceous rocky slopes with chasmophytic vegetation: the community is found in overhangs and recesses, but many stands are from overhanging faces which are not truly chasmophytic.

#### Conservation interest

The typical species of this community are widespread.

#### Differentiation from other communities

*Opegrapha gyrocarpa* can enter various communities of rain-sheltered rock, and occasionally can in addition grow on flushed rock faces. The present community lacks the dominant species of related communities including K1, K2, K3, K6 and also species of wet rock faces.

#### Coverage and integrity

Coverage of this community is still relatively poor, and elucidation of the variation will require samples from woodland as well as exposed sites. The community is interpreted broadly here to avoid having to assign additional communities dominated by a single species, but samples with *Diploschistes scruposus* or *Lecanactis dilleniana* may need to be reassigned.

**Table 39:** Floristic and environmental data for SS K5 *Opegrapha gyrocarpa-Enterographa zonata* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Opegrapha gyrocarpa</i>	IV (1-8)
<i>Porpidia tuberculosa</i>	III (1-6)
<i>Enterographa zonata</i>	II (1-8)
<i>Diploschistes scruposus</i>	II (2-6)
<i>Lepraria incana</i>	II (1-4)
<i>Cystocoleus ebeneus</i>	II (1-5)
<i>Lecanactis dilleniana</i>	I (5-6)
<i>Psilolechia clavulifera</i>	I (1-6)
<i>Andreaea rupestris</i>	I (5)
<i>Arthonia arthonioides</i>	I (5)
<i>Pertusaria pseudocorallina</i>	I (5)
<i>Porina lectissima</i>	I (5)
<i>Preissia quadrata</i>	I (5)
<i>Lecanora gangaleoides</i>	I (4-5)
<i>Porpidia rugosa</i>	I (4-5)
<i>Micarea lutulata</i>	I (2-5)
<i>Porpidia macrocarpa</i>	I (1-5)
<i>Racodium rupestre</i>	I (1-5)
<i>Fuscidea gothoburgensis</i>	I (1-5)
<i>Lecanora soralifera</i>	I (1-5)
<i>Bryum pseudotriquetrum</i>	I (4)
<i>Caloplaca chlorine</i>	I (4)
<i>Fuscidea recensa</i>	I (4)
<i>Lepraria caesioalba</i>	I (4)
<i>Lepraria elobata</i>	I (4)
<i>Polyblastia cupularis</i>	I (4)
<i>Porpidia irrigua</i>	I (4)
<i>Trentepohlia aurea</i>	I (4)
<i>Lepraria vouauxii</i>	I (3-4)
<i>Lepraria atlantica</i>	I (2-4)
<i>Psilolechia lucida</i>	I (2-4)
<i>Amphidium mougeotii</i>	I (3)
<i>Caloplaca obliterans</i>	I (3)
<i>Diplophyllum albicans</i>	I (3)
<i>Fuscidea kochiana</i>	I (3)
<i>Lepraria diffusa</i>	I (3)
<i>Trichostomum brachydontium</i>	I (3)
<i>Fuscidea lygaea</i>	I (2)
<i>Andreaea rothii</i> subsp. <i>falcata</i>	I (2)
<i>Coccotrema citrinescens</i>	I (2)
<i>Dicranum scoparium</i>	I (2)
<i>Dirina massiliensis</i> f. <i>sorediata</i>	I (2)

<i>Gymnomitrion obtusum</i>	I (2)
<i>Lithographa tesserata</i>	I (2)
<i>Parmelia saxatilis</i>	I (2)
<i>Placynthiella icmalea</i>	I (2)
<i>Porpidia cinereoatra</i>	I (2)
<i>Pseudotaxiphyllum elegans</i>	I (2)
<i>Rhizocarpon petraeum</i>	I (2)
<i>Micarea botryoides</i>	I (1-2)
<i>Racomitrium fasciculare</i>	I (1-2)
<i>Racomitrium sudeticum</i>	I (1-2)
<i>Rhizocarpon reductum</i>	I (1-2)
<i>Baeomyces rufus</i>	I (1)
<i>Amygdalaria consentiens</i>	I (1)
<i>Anoetangium aestivum</i>	I (1)
<i>Catillaria chalybeia</i>	I (1)
<i>Fuscidea praeruptorum</i>	I (1)
<i>Gymnomitrion crenulatum</i>	I (1)
<i>Lecanora intricate</i>	I (1)
<i>Lecidea phaeops</i>	I (1)
<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	I (1)
<i>Lecidea pycnocarpa</i> f. <i>sorediata</i>	I (1)
<i>Lecidea swartzioidea</i>	I (1)
<i>Lepraria eburnean</i>	I (1)
<i>Micarea lignaria</i>	I (1)
<i>Miriacidia leucophaea</i>	I (1)
<i>Pertusaria corallina</i>	I (1)
<i>Porpidia contraponenda</i>	I (1)
<i>Rhizocarpon geographicum</i>	I (1)
<i>Scapania aspera</i>	I (1)
<i>Tortella tortuosa</i>	I (1)
Rock	V (2-8)
Slope (degrees)	91 (10-120)
Aspect (degrees)	
Shade	None to strong
Run off	None to slight (to moderate)
Drainage	Good
Rain shelter	Slight to strong
Altitude (m)	130-865
Number of samples	22

### 3.3.35 SS K6 *Tylothallia biformigera*-*Opegrapha gyrocarpa* community (Table 40)

#### Synonyms

None are known.

#### Constant species

*Opegrapha gyrocarpa* and *Tylothallia biformigera*.



### **Description and ecology**

A community dominated by crustose lichens, containing *Tylothallia biformigera*, which is usually growing with *Opegrapha gyrocarpa*. *Cystocoleus ebeneus* and *Fuscidea recensa* are frequent.

The community develops on rain-sheltered rocks on cliffs, often where these are slightly basic. With greater shelter it can grade into stands of *Haematomma ochroleucum* (K8)

### **Annex I habitats**

Siliceous rocky slopes with chasmophytic vegetation: the community is recorded from a fissure in rocks, but most stands are from overhanging faces.

### **Conservation interest**

*Tylothallia biformigera* is Nationally Scarce.

### **Differentiation from other communities**

This community is distinguished from other overhang communities by the presence of *Tylothallia*.

### **Coverage and integrity**

Few samples are available.

**Table 40:** Floristic and environmental data for SS K6 *Tylothallia biformigera*-*Opegrapha gyrocarpa* community

Species/Environmental factor	Constancy class (min-max cover) /Environmental data	Sample number with cover values for species and rock/Environmental data				
		36	349	293	333	344
<i>Tylothallia biformigera</i>	V (4-9)	8	8	9	4	5
<i>Opegrapha gyrocarpa</i>	IV (4-5)	4		5	5	5
<i>Fuscidea recensa</i>	III (2-4)		4		4	2
<i>Cystocoleus ebeneus</i>	III (1-3)	3			3	1
<i>Porpidia tuberculosa</i>	II (2-3)	3	2			
<i>Fuscidea praeruptorum</i>	I (5)		5			
<i>Haematomma ochroleucum</i>	I (4)			4		
<i>Pertusaria pseudocorallina</i>	I (4)	4				
<i>Racodium rupestre</i>	I (3)				3	
<i>Lepraria borealis</i>	I (2)					2
<i>Micarea lignaria</i>	I (2)				2	
<i>Parmelia saxatilis</i>	I (2)	2				
<i>Pertusaria albescens</i>	I (2)					2
<i>Diplophyllum albicans</i>	I (1)					1
<i>Diploschistes scruposus</i>	I (1)	1				
<i>Lepraria eburnea</i>	I (1)				1	
<i>Lepraria elobata</i>	I (1)					1
<i>Lepraria humida</i>	I (1)				1	
<i>Pertusaria corallina</i>	I (1)				1	
<i>Scolicosporum umbrinum</i>	I (1)		1			
<i>Toninia thiopsora</i>	I (1)	1				
<i>Trentepohlia aurea</i>	I (1)				1	
Rock	V (2-7)	?	3	2	7	7
Slope (degrees)	113 (85-145)	85	110	145	110	115

## Saxicolous Lichen and Bryophyte Communities in Upland Britain

Aspect (degrees)		270	80	300	30	90
Shade	None to strong	Strong	None	None-slight	None	None-slight
Run off	None to slight		None-slight	Slight	Slight	None-slight
Drainage	Good		Good	Good	Good	Good
Rain shelter	Slight to moderate			Slight-moderate	Slight	Moderate
Altitude (m)	490-710	680	710	540	630	490
Quadrat size (cm)		25 x 25	25 x 25	25 x 25	25 x 25	25 x 25
Vice-county		49	49	98	48	48
Grid ref.		23/664.622	23/6132.5441	27/2536.2697	23/7104.1245	23/7053.1394
Date		9 Aug 1997	5 Sep 2002	22 Jun 2003	22 Jul 2003	23 Jul 2003
SAC/site code		E	E	BL	CI	CI
Number of samples	5					

**3.3.36 SS K7 *Coccotrema citrinescens*-*Porpidia tuberculosa* community (Table 41)****Synonyms**

None are known.

**Constant species**

*Coccotrema citrinescens* and *Porpidia tuberculosa*.

**Description and ecology**

A crustose-lichen dominated community in which *Coccotrema citrinescens* is abundant, usually growing with *Porpidia tuberculosa*. *Opegrapha gyrocarpa* is frequent.

The community occurs on vertical or slightly overhanging faces on cliffs; these are well drained and have some shelter from rain, but nearby parts of the cliff may be damp. The community occurs on slightly basic rocks, including andesite and mica-schist; it was recorded only in Eryri (rare), and at Ben Lui and Glen Coe.

**Annex I habitats**

The community was not found to be associated with any Annex I habitats.

**Conservation interest**

*Coccotrema citrinescens* is Nationally Scarce.

**Coverage and integrity**

More samples from a wider geographic area would be useful to better define this community.

**Table 41:** Floristic and environmental data for K7 *Coccotrema citrinescens*-*Porpidia tuberculosa* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Coccotrema citrinescens</i>	V (5-9)
<i>Porpidia tuberculosa</i>	IV (1-8)
<i>Opegrapha gyrocarpa</i>	III (2-5)
<i>Andreaea rupestris</i>	III (2-4)
<i>Micarea lignaria</i>	III (2)
<i>Racomitrium sudeticum</i>	II (1-2)
<i>Porpidia islandica</i>	II (5)
<i>Fuscidea lygaea</i>	II (1-5)
<i>Porpidia macrocarpa</i>	II (1-5)
<i>Pertusaria corallina</i>	II (4)
<i>Rhizocarpon lavatum</i>	II (2-4)
<i>Stereocaulon vesuvianum</i>	II (1-2)

<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	II (1)
<i>Pertusaria lacteal</i>	I (5)
<i>Porpidia rugosa</i>	I (5)
<i>Acarospora smaragdula</i>	I (2)
<i>Amygdalaria pelobotryon</i>	I (2)
<i>Gymnomitrium obtusum</i>	I (2)
<i>Pertusaria aspergilla</i>	I (2)
<i>Trentepohlia aurea</i>	I (2)
<i>Blindia acuta</i>	I (1)
<i>Diplophyllum albicans</i>	I (1)
<i>Fuscidea recensa</i>	I (1)
<i>Gymnomitrium crenulatum</i>	I (1)
<i>Hypnum andoi</i>	I (1)
<i>Pertusaria flavicans</i>	I (1)
<i>Porina lectissima</i>	I (1)
<i>Rhizocarpon geographicum</i>	I (1)
<i>Rhizocarpon reductum</i>	I (1)
Rock	V (2-4)
Slope (degrees)	107 (80-140)
Aspect (degrees)	
Shade	None to slight
Run off	Slight to moderate
Drainage	Good
Rain shelter	None to moderate
Altitude (m)	640-870
Number of samples	8

### 3.3.37 SS K8 *Lecanora orosthea*-*Enterographa zonata* community (Table 42)

#### Synonyms

*Lecideetum orostheae* (Hil.) Wirth (James *et al.*, 1977).

#### Constant species

None of the species are constants.

#### Description and ecology

This community consists of crustose lichens dominated by one or more of *Haematomma ochroleucum*, *Lecanora orosthea* or *L. subcarnea*. The community is developed on unshaded, vertical or overhanging faces of slightly calcareous rocks, often in relatively dry and well-lit places which are less humid than sites occupied by K5 and K2. The community was recorded at a relatively low altitude in Wales and N. England, but not from Scotland. It is also locally abundant in semi-natural woodland in Wales.

### Annex I habitats

Siliceous rocky slopes with chasmophytic vegetation: some stands occur in overhangs and could be regarded as chasmophytic, but many occur on rain-sheltered but rather open faces which are not strictly chasmophytic.

### Conservation interest

The typical species of this community are widespread.

### Differentiation from other communities

This community is distinguished from K5 by the abundance of *Haematomma ochroleucum*, *Lecanora orosthea* or *L. subcarnea*.

### Coverage and integrity

Few samples are available. The community needs more study, as there are currently no constant species. Single species often dominate stands of this community. These are provisionally included together in this community to avoid the description of communities based on the abundance of single species, although this may prove to be justified after further study.

**Table 42:** Floristic and environmental data for SS K8 *Lecanora orosthea-Enterographa zonata* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Lecanora orosthea</i>	III (2-9)
<i>Enterographa zonata</i>	III (2-8)
<i>Opegrapha gyrocarpa</i>	III (1-6)
<i>Haematomma ochroleucum</i>	II (5-8)
<i>Lecanora gangaleoides</i>	II (4-5)
<i>Rhizocarpon geographicum</i>	II (1-4)
<i>Fuscidea recensa</i>	II (1-2)
<i>Lecanora subcarnea</i>	I (9)
<i>Trentepohlia aurea</i>	I (1-3)
<i>Lepraria incana</i>	I (1-2)
<i>Ochrolechia parella</i>	I (7)
<i>Cystocoleus ebeneus</i>	I (4)
<i>Pertusaria lactea</i>	I (4)
<i>Tylothallia biformigera</i>	I (4)
<i>Lecanora dispersa</i>	I (3)
<i>Fuscidea kochiana</i>	I (2)
<i>Lecanactis dilleniana</i>	I (2)
<i>Rhizocarpon polycarpum</i>	I (2)
<i>Caloplaca citrina</i> agg.	I (1)
<i>Gymnostomum aeruginosum</i>	I (1)

<i>Ophioparma ventosa</i>	I (1)
Rock	V (1-6)
<i>Asplenium ruta-muraria</i>	I (1)
Slope (degrees)	93 (60-120)
Aspect (degrees)	
Shade	None to slight
Run off	None to slight
Drainage	Good
Rain shelter	Moderate to strong
Altitude (m)	260-540
Number of samples	10

### 3.3.38 SS K9 *Lecanora epanora*-*Lepraria elobata* community (Table 43)

#### Synonyms

*Lecanoretum epanorae* Wirth (James *et al*, 1977).

#### Constant species

*Lecanora epanora* and *Lepraria elobata*.

#### Description and ecology

A community dominated by crustose lichens, on vertical or overhanging siliceous rocks which are rich in heavy metals. The bright yellow *Lecanora epanora* and the grey powdery *Lepraria elobata* are constant, while the rusty orange squamules of *Acarospora sinopica* are frequent.

Stands develop on rain-sheltered rocks. The four samples recorded all occurred on man-made or disturbed surfaces: on dry stone walls, on rocks exposed beside a track, and on a partly quarried rock face in woodland. Adjacent to one sample, rock faces which were not rain-sheltered carried D2.

#### Annex I habitats

The community was not found to be associated with any Annex I habitats.

#### Conservation interest

*Lecanora epanora* is Nationally Scarce.

#### Coverage and integrity

More samples are required.

**Table 43:** Floristic and environmental data for SS K9 *Lecanora epanora*-*Lepraria elobata* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data			
	41	329	300	374
<i>Lecanora epanora</i>	4	7	5	8
<i>Lepraria elobata</i>		5	6	2
<i>Acarospora sinopica</i>			2	4
<i>Acarospora smaragdula</i>	6			
<i>Lepraria incana</i>	5			
<i>Rhizocarpon oederi</i>			5	
<i>Scoliciosporum umbrinum</i>		5		
<i>Cladonia cervicornis</i>			4	
<i>Lepraria caesioalba</i>			3	
<i>Campylopus introflexus</i>			2	
<i>Cephaloziella</i> spp.			2	
<i>Rhizocarpon reductum</i>			2	
<i>Dicranella heteromalla</i>			1	
Rock	7	5	5	5
Slope (degrees)	95	85	160	60
Aspect (degrees)	170	130	160	300
Shade	None	Slight	None	None
Run off		None-slight	Slight	Slight
Drainage		Good	Good	Good
Rain shelter		Slight	None-slight	Slight
Altitude (m)	230	50	130	10
Quadrat size (cm)	25 x 25	30 x 20.8	30 x 20.8	25 x 25
Vice-county	49	48	48	48
Grid ref.	23/626.569	23/5958.4627	23/6454.4051	23/7098.1940
Date	22 Sep 1997	8 Aug 2002	24 Jul 2002	12 Sep 2002
SAC/site code	E	-	-	-

**3.3.39 SS K10 *Psilolechia leprosa* community (Table 44)****Synonyms**

*Lecideetum inopis* Purvis 1996 (small part only).

**Constant species**

*Psilolechia leprosa*.

**Description and ecology**

A community dominated by the lichen *Psilolechia leprosa*, which forms soft pale green patches below siliceous overhangs, usually where there is evidence of copper mineralization. There are no other consistently associated species. Samples were recorded from natural rock



exposures (including one with no additional evidence of heavy metal enrichment), trial diggings for copper, and on copper-rich rocks exposed by the construction of a track.

### Annex I habitats

Siliceous rocky slopes with chasmophytic vegetation: there is one record from an overhang formed by a boulder, but most are from (overhanging) bedrock.

### Conservation interest

The typical species of this community are widespread.

### Coverage and integrity

More samples would be useful to better define this community.

**Table 44:** Floristic and environmental data for SS K10 *Psilolechia leprosa* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Psilolechia leprosa</i>	V (5-9)
<i>Micarea bauschiana</i>	II (2-4)
<i>Amphidium mougeotii</i>	I (5)
<i>Lepraria eburnea</i>	I (4)
<i>Micarea tuberculata</i>	I (4)
<i>Psilolechia lucida</i>	I (4)
<i>Cephaloziella</i> spp.	I (2)
<i>Lepraria incana</i>	I (2)
<i>Lepraria vouauxii</i>	I (2)
<i>Phlyctis argena</i>	I (2)
<i>Stigonema</i> spp.	I (2)
<i>Thelidium pyrenophorum</i>	I (2)
<i>Cladonia</i> spp.	I (1)
<i>Plagiochila porelloides</i>	I (1)
<i>Stereocaulon vesuvianum</i>	I (1)
Rock	V (4-8)
Slope (degrees)	94 (65-120)
Aspect (degrees)	
Shade	Slight to strong
Run off	None to slight
Drainage	Good
Rain shelter	Slight to strong
Altitude (m)	150-480
Number of samples	5

### 3.3.40 SS L1 *Andreaea rothii*-*Porpidia irrigua* community (Table 45)

#### Synonyms

None are known.

#### Constant species

*Andreaea rothii* subsp. *falcata*.

#### Description and ecology

A community distinguished by the blackish tufts of the moss *Andreaea rothii* subsp. *falcata* (occasionally subsp. *rothii*). The squamules of the lichens *Cladonia cervicornis*, *C. diversa* and *C. subcervicornis* are occasional to frequent, and the crustose *Porpidia irrigua* is frequent and is characteristic of this community. The crustose colonies of *Lepraria caesioalba* are occasional, and can be conspicuous, appearing white against the blackish moss.

The community develops on unshaded siliceous rocks which are flushed in wet weather, but which are dry at other times. Rock types include acid tuff, granite, and tonalite. Stands are often conspicuous at a distance as black streaks and patches following the path of run-off down the rock. The community is most frequently found on bedrock which receives run-off from turf or from areas of rock above, but it can occur on damp boulders. The surrounding unflushed community is often A1. Damper stands, which experience a more prolonged supply of moisture, contain bryophytes including *Andreaea alpina* and *Campylopus atrovirens*, and often grade into M1 and M2. Flushed stands on vertical rock may occasionally be dry enough for a little *Arthrorhaphis citrinella* or *Lepraria bergensis*.

The community also occurs on rocks beside streams, where it is occasionally inundated by high flows (a small study in Merioneth suggested it was immersed <10% of the time in an average year); these streamside stands can contain a number of characteristic species including the brown squamulose lichen *Massalongia carnosa*. In this situation the development of the community may also be influenced by the mechanical force or abrasion of the current: at Lingcove Beck (Lake District) *A. rothii* was sharply confined to the downstream side of a boulder, with the upstream side occupied by *Rhizocarpon geographicum* and *Lecidea lactea* agg. (A1).

The community is widespread and frequent on acid rocks in high rainfall areas, but becomes sparse in sites with lower rainfall or slightly calcareous rocks. It reaches 950 m on Scafell Pike (Lake District), but is conspicuously absent from higher altitudes in western Scotland: in Coire nam Beitheach (Glen Coe) it was seen only at approximately 250 m, and at Ben Nevis it was noted only in woodland at 200m.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community is occasional on boulders in block scree, but is more typical of bedrock.

### Conservation interest

Nationally Scarce species include *Pilophorus strumaticus*, *Porpidia contraponenda* and *P. irrigua*.

### Differentiation from other communities

L2 differs in the abundance of *Racomitrium aquaticum*, and M1 and M2 differ in the abundance of *Andreaea alpina* and *Campylopus atrovirens* respectively.

### Coverage and integrity

The community is reasonably well covered by samples, although there are very few samples from beside streams. The community is united by the presence of *Andreaea rothii*; otherwise samples might be distributed between two or more communities.

**Table 45:** Floristic and environmental data for SS L1 *Andreaea rothii*-*Porpidia irrigua* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
( <i>Andreaea rothii</i> / <i>megistospora</i> all taxa)	IV (2-9)
<i>Andreaea rothii</i> ssp. <i>falcata</i>	IV (1-9)
<i>Porpidia irrigua</i> ined.	III (1-7)
<i>Cladonia subcervicornis</i>	III (1-6)
<i>Porpidia tuberculosa</i>	III (1-5)
<i>Cladonia diversa</i>	III (1-4)
<i>Lepraria caesioalba</i> agg.	II (1-6)
<i>Campylopus atrovirens</i>	II (1-6)
<i>Trapelia involuta</i>	II (1-4)
<i>Rhizocarpon lavatum</i>	II (1-5)
<i>Racomitrium sudeticum</i>	II (1-5)
<i>Micarea lignaria</i> var. <i>lignaria</i>	II (1-4)
<i>Porpidia macrocarpa</i>	II (1-8)
<i>Rhizocarpon reductum</i>	II (1-5)
<i>Trapelia coarctata</i>	II (1-5)
<i>Racomitrium aquaticum</i>	II (1-7)
<i>Andreaea rupestris</i>	II (1-5)
<i>Cladonia cervicornis</i>	II (1-5)
<i>Pilophorus strumaticus</i>	I (1-8)
<i>Andreaea rothii</i> subsp. <i>rothii</i>	I (2-8)
<i>Stereocaulon evolutum</i>	I (1-7)
<i>Andreaea rothii</i> / <i>megistospora</i>	I (5-6)
<i>Rhizocarpon hochstetteri</i>	I (2-6)
<i>Stereocaulon vesuvianum</i>	I (1-6)
<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	I (1-6)
<i>Gymnomitrium crenulatum</i>	I (1-6)
<i>Porpidia contraponenda</i>	I (1-6)

<i>Massalongia carnosa</i>	I (1-6)
<i>Aspicilia caesiocinerea</i>	I (1-6)
<i>Porpidia rugosa</i>	I (5)
<i>Cladonia bellidiflora</i>	I (5)
<i>Leptoloma membranaceum</i>	I (5)
<i>Racomitrium aciculare</i>	I (5)
<i>Umbilicaria hirsuta</i>	I (5)
<i>Andreaea megistospora</i>	I (4-5)
<i>Lepraria bergensis</i>	I (4-5)
<i>Racomitrium affine</i>	I (2-5)
<i>Rhizocarpon geographicum</i>	I (1-5)
<i>Andreaea alpina</i>	I (1-5)
<i>Fuscidea lygaea</i>	I (1-5)
<i>Ionaspis lacustris</i>	I (1-5)
<i>Micarea leprosula</i>	I (1-5)
<i>Stereocaulon leucophaeopsis</i>	I (1-5)
<i>Amygdalaria pelobotryon</i>	I (1-5)
<i>Aspicilia grisea</i> agg.	I (4)
<i>Cladonia furcata</i>	I (4)
<i>Polytrichum alpinum</i>	I (4)
<i>Porpidia superba</i> f. <i>superba</i>	I (4)
<i>Pseudepeheb pubescens</i>	I (4)
<i>Pyrenopsis subareolata</i>	I (4)
<i>Scapania compacta</i>	I (4)
<i>Schistidium strictum</i>	I (4)
<i>Verrucaria margacea</i>	I (4)
<i>Polytrichum piliferum</i>	I (2-4)
<i>Cladonia cyathomorpha</i>	I (2-4)
<i>Ephebe lanata</i>	I (2-4)
<i>Racomitrium heterostichum</i>	I (2-4)
<i>Ditrichum zonatum</i> var. <i>scabrifolium</i>	I (2-4)
<i>Fuscidea cyathoides</i>	I (2-4)
<i>Racomitrium lanuginosum</i>	I (1-4)
<i>Marsupella emarginata</i>	I (1-4)
<i>Trapelia placodioides</i>	I (1-4)
<i>Diplophyllum albicans</i>	I (1-4)
<i>Campylopus flexuosus</i>	I (1-4)
<i>Arthrorhaphis citrinella</i>	I (1-4)
<i>Racomitrium fasciculare</i>	I (1-4)
<i>Trapeliopsis granulosa</i>	I (1-4)
<i>Lecanora polytropa</i>	I (1-4)
<i>Lecanora soralifera</i>	I (1-4)
<i>Miriquidica leucophaea</i>	I (1-4)
<i>Opegrapha gyrocarpa</i>	I (1-4)
<i>Porpidia cinereoatra</i>	I (1-4)
<i>Lecidea swartzioidea</i>	I (1-4)
<i>Barbilophozia floerkei</i>	I (3)
<i>Cladonia polydactyla</i>	I (3)

<i>Hedwigia integrifolia</i>	I (3)
<i>Lophozia ventricosa</i>	I (3)
<i>Mycoblastus caesius</i>	I (3)
<i>Scytonema</i> spp.	I (3)
<i>Kiaeria blyttii</i>	I (1-3)
<i>Cephaloziella</i> spp.	I (1-3)
<i>Fuscidea recensa</i>	I (2)
<i>Pogonatum urnigerum</i>	I (2)
<i>Rhizocarpon infernulum</i>	I (2)
<i>Bryum alpinum</i>	I (2)
<i>Cladonia alpina</i>	I (2)
<i>Cladonia caespiticia</i>	I (2)
<i>Cladonia macilenta</i>	I (2)
<i>Dicranum scoparium</i>	I (2)
<i>Fuscidea intercincta</i>	I (2)
<i>Gymnomitrium obtusum</i>	I (2)
<i>Hypnum andoi</i>	I (2)
<i>Isothecium holtii</i>	I (2)
<i>Marsupella alpina</i>	I (2)
<i>Parmelia omphalodes</i>	I (2)
<i>Pertusaria corallina</i>	I (2)
<i>Porina lectissima</i>	I (2)
<i>Xanthoparmelia conspersa</i>	I (2)
<i>Porpidia crustulata</i>	I (1-2)
<i>Amygdalaria consentiens</i>	I (1-2)
<i>Cladonia gracilis</i>	I (1-2)
<i>Lecanora intricata</i>	I (1-2)
<i>Pertusaria pseudocorallina</i>	I (1-2)
<i>Placopsis lambii</i>	I (1-2)
<i>Racomitrium ellipticum</i>	I (1-2)
<i>Sphaerophorus globosus</i>	I (1-2)
<i>Baeomyces rufus</i>	I (1)
<i>Epigloea soleiformis</i>	I (1)
<i>Grimmia donniana</i>	I (1)
<i>Cladonia crispata</i> var. <i>cetrariiformis</i>	I (1)
<i>Immersaria athroocarpa</i>	I (1)
<i>Lophozia sudetica</i>	I (1)
<i>Cetraria aculeata</i>	I (1)
<i>Cladonia squamosa</i> var. <i>squamosa</i>	I (1)
<i>Cynodontium bruntonii</i>	I (1)
<i>Dicranodontium uncinatum</i>	I (1)
Green algae	I (1)
<i>Lecidea lactea</i>	I (1)
<i>Lecidea lithophila</i>	I (1)
<i>Parmelia saxatilis</i>	I (1)
<i>Polysporina simplex</i>	I (1)
<i>Schaereria fuscocinerea</i>	I (1)
<i>Trapelia obtogens</i>	I (1)

<i>Trentepohlia</i> sp.	I (1)
<i>Umbilicaria polyphylla</i>	I (1)
<i>Zygonium ericetorum</i>	I (1)
Rock	V (2-7)
<i>Festuca ovina</i>	I (2)
<i>Festuca vivipara</i>	I (1)
<i>Nardus stricta</i>	I (1)
Slope (degrees)	53 (0-105)
Aspect (degrees)	
Shade	None (to slight)
Run off	(Slight to) moderate to strong
Drainage	(Poor to) moderate to good
Rain shelter	None
Altitude (m)	185-950
Number of samples	64

### 3.3.41 SS L2 *Racomitrium aquaticum* community (Table 46)

#### Synonyms

None are known.

#### Constant species

*Racomitrium aquaticum*.

#### Description and ecology

There is one sample only, from an unshaded rock face receiving prolonged run-off from turf ledges above. The sample was dominated by the moss *Racomitrium aquaticum*, growing with *Bryum alpinum* and *Andreaea rothii*. The sample was associated with L1, and differs from that in the prolonged moisture supply.

#### Annex I habitats

The community was not found to be associated with any Annex I habitats.

#### Conservation interest

The typical species of this community are widespread.

#### Differentiation from other communities

This community is distinguished at present only by the abundance of *Racomitrium aquaticum*. *R. aquaticum* can be abundant on flushed rock faces in woodland, but the relationship of such stands to the present sample is unknown.

**Coverage and integrity**

Many more samples are needed, including from woodland.

**Table 46:** Floristic and environmental data for SS L2 *Racomitrium aquaticum* community

Species/Environmental factor	Sample number with cover values for species and rock/ Environmental data
	169
<i>Racomitrium aquaticum</i>	7
<i>Bryum alpinum</i>	5
<i>Andreaea rothii</i> subsp. <i>falcata</i>	4
<i>Campylopus atrovirens</i>	4
<i>Polytrichum piliferum</i>	4
<i>Racomitrium affine</i>	4
<i>Lepraria bergensis</i>	2
<i>Lepraria lobificans</i>	2
<i>Cladonia cervicornis</i> ssp. <i>cervicornis</i>	1
<i>Cladonia cyathomorpha</i>	1
<i>Hedwigia integrifolia</i>	1
<i>Pseuotaxiphyllum elegans</i>	1
Rock	2
Slope (degrees)	60
Aspect (degrees)	210
Shade	None
Run off	Strong
Drainage	Good
Rain shelter	None
Altitude (m)	360
Quadrat size (cm)	50 x 50
Vice-county	70
Grid ref.	35/2254.0487
Date	2 Jul 2004
SAC/site code	LD

**3.3.42 SS M1 *Andreaea alpina*-*Marsupella emarginata* community (Table 47)****Synonyms**

None are known.

**Constant species**

*Andreaea alpina* and *Marsupella emarginata*.

## Description and ecology

Bryophytes dominate this community on wet rocks. The most abundant bryophytes are *Andreaea alpina*, *Anthelia julacea*, *Campylopus atrovirens* and *Marsupella emarginata*; these are either robust species or form rather thick and extensive mats. The community is variable, with the main species occurring in various combinations. Lichens are generally unable to compete with the bryophytes, but where bryophyte cover is not complete, there are various crustose lichens. These include species characteristic of wet rock, including *Amygdalaria consentiens*, *Lecidea phaeops*, *Porpidia contraaponenda*, *P. irrigua* and *Rhizocarpon lavatum*, as well as ecologically widespread species including *Porpidia macrocarpa* and *P. tuberculosa*. The dark, minutely shrubby lichen *Ephebe lanata* can be abundant, often occupying areas that are apparently too wet for the characteristic bryophytes, although *Ephebe* is also more drought-tolerant.

The community develops on unshaded rocks which receive enough run off from rocks or turf above to be moist for prolonged periods. L1 grades into this community as conditions become moister and the possibility of severe drought becomes less. Thus M1 occupies areas of rock which receive run off from adjacent turf, the turf acting as a reservoir, whereas L1 will occur further down the face where moisture supply is less constant.

The community is variable but it is difficult to subdivide. The three provisional subcommunities below are largely defined by the dominant species present, although the remaining species do not readily support this simple distinction.

Sub-community SS M1a: *Andreaea alpina* occurs at a cover of 10–75%, exceeding any *Campylopus atrovirens* which may be present. *Anthelia* and *Marsupella emarginata* are absent or at <10% cover. *A. alpina* forms extensive dark reddish-brown colonies on flushed faces of bedrock and on dripping cliffs. Stands may be small, or large and visible from a distance as extensive black streaks. The sub-community is often developed on base-rich rocks including basalt and andesite.

Sub-community SS M1b: *Andreaea alpina* is absent or is exceeded in abundance by other bryophytes. The presence of *Marsupella emarginata* and *Anthelia julacea* tends to suggest a stand which experiences more constant moisture than stands with *A. alpina* alone. The bryophyte mats tend to be thicker than in M1a, and can be invaded by vascular plants. *M. emarginata* often occurs as a robust morph with reddish brown shoots; this species can outcompete *A. alpina* on wet faces. The reddish hepatic *Herbertus stramineus* is present in one sample.

Sub-community SS M1c: Samples are dominated by *Campylopus atrovirens*, with *Andreaea alpina* and *Marsupella emarginata* absent or at <10% cover. Some samples are close to L1 and may represent drier conditions than experienced by the other two sub-communities.

## Annex I habitats

The community was not found to be associated with any Annex I habitats.

## Conservation interest

The typical species of this community are widespread.



**Coverage and integrity**

The community is reasonably well covered by samples, but more sampling might produce a better arrangement of the sub-communities of this community.

**Table 47:** Floristic and environmental data for SS M1 *Andreaea alpina*-*Marsupella emarginata* community

Species/Environmental factor	Constancy class (min-max cover)/Environmental data			
	Sub-community SS M1a	Sub-community SS M1b	Sub-community SS M1c	Community SS M1
<i>Andreaea alpina</i>	V (4-9)	IV (1-7)	II (2-4)	V (1-9)
<i>Marsupella emarginata</i>	IV (2-4)	V (2-9)	II (1-4)	IV (1-9)
<i>Ephebe lanata</i>	IV (1-7)	II (2-7)	II (2-4)	III (1-7)
<i>Racomitrium lanuginosum</i>	I (1-2)	IV (1-8)	III (2-5)	III (1-5)
<i>Anthelia julacea</i>	I (1-3)	IV (1-8)		II (1-8)
<i>Campylopus atrovirens</i>	II (1-6)	III (1-6)	V (5-7)	III (1-7)
<i>Rhizocarpon lavatum</i>	III (1-6)	II (1-4)	II (1-4)	II (1-6)
<i>Porpidia tuberculosa</i>	II (1-5)	I (1-4)	II (2)	II (1-5)
<i>Diplophyllum albicans</i>	I (1-2)	II (1-4)	I (5)	II (1-5)
<i>Cladonia subcervicornis</i>	II (1-5)	I (1-2)	I (2)	II (1-5)
<i>Porpidia macrocarpa</i>	II (1-5)	II (1-5)	I (1)	II (1-5)
<i>Racomitrium aquaticum</i>	I (1-4)	II (1-2)	III (1-2)	II (1-4)
<i>Nardia compressa</i>		I (5)		I (5)
<i>Marsupella alpina</i>	I (5)		I (4)	I (4-5)
<i>Frullania tamarisci</i>	I (4)	I (5)		I (4-5)
<i>Porpidia hydrophila</i>	I (4)	I (4)		I (4)
<i>Biatora</i> sp.		I (4)		I (4)
<i>Porpidia contraponenda</i>	I (5)	I (2)	II (4)	I (2-5)
<i>Stigonema</i> spp.		I (2)	I (5)	I (2-5)
<i>Herbertus stramineus</i>	I (2)	I (5)		I (2-5)
<i>Blindia acuta</i>		I (2-5)		I (2-5)
<i>Porpidia rugosa</i>	I (5)	I (2)		I (2-5)
<i>Porpidia islandica</i>	I (5)	I (2)		I (2-5)
<i>Pilophorus strumaticus</i>		I (2)	I (4)	I (2-4)
<i>Polytrichum alpinum</i>	I (2)	II (2-4)		I (2-4)
<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>		I (2-4)		I (2-4)
<i>Oligotrichum hercynicum</i>	I (2)	I (2-4)		I (2-4)
<i>Trapelia involuta</i>			II (2)	I (2)
<i>Gymnomitrium obtusum</i>	I (2)	I (2)		I (2)
<i>Radula complanata/lindenbergiana</i>		I (2)		I (2)
<i>Schistidium strictum</i>	I (2)	I (2)		I (2)
<i>Ctenidium molluscum</i>		I (2)		I (2)
<i>Plagiochila porelloides</i>		I (2)		I (2)

<i>Ainoa mooreana</i>		I (2)		I (2)
<i>Andreaea rothii</i> subsp. <i>rothii</i>		I (2)		I (2)
<i>Pertusaria coralline</i>		I (2)		I (2)
<i>Placopsis lambii</i>		I (2)		I (2)
<i>Brachythecium plumosum</i>	I (2)			I (2)
<i>Lejeunea cavifolia</i>	I (2)			I (2)
<i>Lophozia sudetica</i>	I (2)			I (2)
<i>Racomitrium ellipticum</i>	I (1-6)	I (4)		I (1-6)
<i>Andreaea rothii</i> subsp. <i>Falcate</i>	I (5)		III (1-5)	I (1-5)
<i>Amygdalaria consentiens</i>	I (1)	I (1-2)	II (1-5)	I (1-5)
<i>Porpidia irrigua</i>	I (4-5)	I (1)	II (1-4)	I (1-5)
<i>Andreaea rupestris</i>	I (1-2)	I (1-5)	I (5)	I (1-5)
<i>Ionaspis lacustris</i>	I (1)	I (1-4)	I (5)	I (1-5)
<i>Racomitrium sudeticum</i>	II (1-5)	I (1)	I (5)	I (1-5)
<i>Scapania undulate</i>	I (1)	II (1-5)		I (1-5)
<i>Stereocaulon vesuvianum</i>	I (1-5)	I (2-5)		I (1-5)
<i>Scytonema</i> spp.	I (1-3)	I (1-5)		I (1-5)
<i>Lecidea phaeops</i>	I (1-5)	I (1-4)		I (1-5)
<i>Fuscidea lygaea</i>	I (1-5)			I (1-5)
<i>Amygdalaria pelobotryon</i>	I (2)	I (1-4)	II (1-2)	I (1-4)
<i>Opographa gyrocarpa</i>	I (1-4)		II (1-2)	I (1-4)
<i>Tritomaria quinquedentata</i>	I (1)	I (2-4)		I (1-4)
<i>Gymnomitrium crenulatum</i>	I (1)	I (2-4)		I (1-4)
<i>Tortella tortuosa</i>	I (1-2)	I (1-4)		I (1-4)
<i>Amphidium mougeotii</i>	I (1)	I (1-4)		I (1-4)
<i>Micarea lignaria</i>	I (2)	I (2)	II (1-3)	I (1-3)
<i>Racomitrium fasciculare</i>	I (1-3)	I (1)	II (2)	I (1-3)
<i>Bryum alpinum</i>		I (3)	I (1)	I (1-3)
<i>Pohlia nutans</i>		I (3)	I (1)	I (1-3)
<i>Pogonatum urnigerum</i>	I (3)	II (1-3)		I (1-3)
<i>Trichostomum tenuirostre</i>	I (3)	I (1)		I (1-3)
<i>Sphagnum denticulatum</i>		I (1-2)	II (1-2)	I (1-2)
<i>Trapelia placodioides</i>	I (1)	I (1)	I (2)	I (1-2)
<i>Hypnum jutlandicum</i>	I (1)		I (2)	I (1-2)
<i>Cladonia cervicornis</i> ssp. <i>cervicornis</i>	II (1-2)	I (1)	I (1)	I (1-2)
<i>Arthrorhaphis citronella</i>	I (2)		I (1)	I (1-2)
<i>Kiaeria falcate</i>	I (1-2)	I (2)		I (1-2)
<i>Ditrichum zonatum</i> var. <i>scabrifolium</i>	I (1-2)	I (1-2)		I (1-2)
<i>Rhizocarpon reductum</i>	I (1)	I (1-2)		I (1-2)
<i>Breutelia chrysocoma</i>		I (1-2)		I (1-2)
<i>Ionaspis odora</i>		I (1-2)		I (1-2)
<i>Racomitrium affine</i>	I (2)	I (1)		I (1-2)
<i>Cladonia diversa</i>	I (1)		II (1)	I (1)
<i>Trapelia coarctata</i>	I (1)		I (1)	I (1)
<i>Baeomyces rufus</i>			I (1)	I (1)

<i>Micarea coppinsii</i>			I (1)	I (1)
<i>Dicranella heteromalla</i>		I (1)		I (1)
<i>Marsupella adusta</i>		I (1)		I (1)
<i>Pellia epiphylla</i>		I (1)		I (1)
<i>Grimmia curvata</i>		I (1)		I (1)
<i>Bazzania tricrenata</i>		I (1)		I (1)
<i>Catolechia wahlenbergii</i>		I (1)		I (1)
<i>Fissidens osmundoides</i>		I (1)		I (1)
<i>Fuscidea gothoburgensis</i>		I (1)		I (1)
<i>Gyalidea fritzei</i>		I (1)		I (1)
<i>Gymnomitrium concinnatum</i>		I (1)		I (1)
<i>Kiaeria blytii</i>		I (1)		I (1)
<i>Micarea paratropa</i>		I (1)		I (1)
<i>Philonotis tomentella</i>		I (1)		I (1)
<i>Polyblastia cruenta</i>		I (1)		I (1)
<i>Porina lectissima</i>		I (1)		I (1)
<i>Porpidia superba</i>		I (1)		I (1)
<i>Protothelenella corrosa</i>		I (1)		I (1)
<i>Ptilidium ciliare</i>		I (1)		I (1)
<i>Sphagnum papillosum</i>		I (1)		I (1)
<i>Stereocaulon plicatile</i>		I (1)		I (1)
<i>Thuidium tamariscinum</i>		I (1)		I (1)
<i>Micarea leprosula</i>	I (1)			I (1)
<i>Peltigera rufescens</i>	I (1)			I (1)
<i>Pertusaria lacteal</i>	I (1)			I (1)
<i>Agonimia tristicula</i>	I (1)			I (1)
<i>Campylium stellatum</i>	I (1)			I (1)
<i>Frullania fragilifolia</i>	I (1)			I (1)
<i>Nostoc</i> spp.	I (1)			I (1)
<i>Pertusaria pseudocorallina</i>	I (1)			I (1)
<i>Porina guentheri</i> var. <i>guentheri</i>	I (1)			I (1)
<i>Racomitrium aciculare</i>	I (1)			I (1)
<i>Rhizocarpon hochstetteri</i>	I (1)			I (1)
<i>Rhytidiadelphus loreus</i>	I (1)			I (1)
Rock		V (1-5)	V (2-4)	V (1-6)
<i>Agrostis stolonifera</i>			I (5)	I (5)
<i>Festuca rubra</i>		I (4)		I (4)
<i>Carex binervis</i>		I (2)		I (2)
<i>Deschampsia cespitosa</i>		I (2)		I (2)
<i>Campanula rotundifolia</i>		I (2)		I (2)
<i>Festuca ovina</i>		I (2)		I (2)
<i>Saxifraga stellaris</i>		I (2)		I (2)
<i>Pinguicula vulgaris</i>		I (2)		I (2)
<i>Festuca vivipara</i>		II (1-4)		I (1-4)
<i>Agrostis capillaries</i>		I (1-4)		I (1-4)
<i>Agrostis vinealis</i>		I (1-4)		I (1-4)
<i>Alchemilla alpina</i>		I (1-4)		I (1-4)

<i>Nardus stricta</i>		I (1-2)	I (1)	I (1-2)
<i>Deschampsia flexuosa</i>		I (1)	I (2)	I (1-2)
<i>Galium saxatile</i>	I (1)	I (2)		I (1-2)
<i>Huperzia selago</i>	I (1)	I (2)		I (1-2)
<i>Sedum rosea</i>	I (1)	I (1)		I (1)
<i>Molinia caerulea</i>	I (1)		I (1)	I (1)
<i>Silene acaulis</i>		I (1)		I (1)
<i>Diphasiastrum alpinum</i>		I (1)		I (1)
<i>Ranunculus acris</i>		I (1)		I (1)
<i>Selaginella selaginoides</i>		I (1)		I (1)
<i>Thymus polytrichus</i>		I (1)		I (1)
Slope (degrees)	59 (5-90)	57 (10-90)	55 (35-70)	58 (5-90)
Aspect (degrees)				
Shade				(slight to) None
Run off				Moderate to strong
Drainage				Moderate to good
Rain shelter				None
Altitude (m)	737 (470- 1010)	330-940	170-685	682 (170- 1010)
Number of samples	22	23	5	50

### 3.3.43 SS N1 *Amphidium mougeotii*-*Anoetangium aestivum* community (Table 48)

#### Synonyms

OV40 *Asplenium viride*-*Cystopteris fragilis* community p.p. (Rodwell 1991-2000).

#### Constant species

*Amphidium mougeotii*, *Anoetangium aestivum*, *Ctenidium molluscum* and *Plagiochila porelloides*.

#### Description and ecology

Species-rich stands of small bryophytes dominate this community in damp, slightly calcareous overhangs. The two acrocarpous mosses *Amphidium mougeotii* and *Anoetangium aestivum* are the most characteristic species, which form bright green cushions and turfs. Numerous other bryophytes are occasional to frequent, including *Fissidens dubius*, *Distichium capillaceum*, *Isopterygiopsis pulchella*, *Mnium thomsonii*, *Orthothecium intricatum* and *Tortella tortuosa*. The moss *Blindia acuta* is frequent, but typically grows on the wetter parts of the rock surface rather than mixed with the more characteristic species. Lichens are usually few and only incidentally present on small areas of bryophyte-free rock, but *Lepraria eburnea* is frequent, responding to the base-rich and rain-sheltered conditions, and the uncommon lichens *Dictyonema interruptum*, *Solorina saccata* and *Strigula stigmatella* have been recorded rarely.

Stands of this community are most frequently found below damp overhangs of slightly calcareous siliceous rock. Small ferns are often present, especially *Asplenium viride* and *Cystopteris fragilis*.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): this community occurs rarely in cavities below large boulders in block scree.

Siliceous rocky slopes with chasmophytic vegetation: this is an important community of damp crevices and overhangs, and mostly confined to this habitat; conditions are somewhat calcareous, but not as much so as SL 19. The community is included here as the rock type is siliceous, although the distinct calcareous influence could arguably allow it to be included under Calcareous rocky slopes with chasmophytic vegetation.

### Conservation interest

This is an attractive and species-rich community which contains a number of uncommon species, including the bryophytes *Mnium thomsonii* and *Scapania aequiloba*, and the lichens *Dictyonema interruptum*, *Solorina saccata* and *Strigula stigmatella*.

### Differentiation from other communities

SL 19 shares a number of species with N1, but differs in the absence or rarity of *Amphidium mougeotii* and *Anoetangium aestivum*, and the greater frequency of *Thamnobryum alopecurum*, *Trichostomum brachydontium* and *T. crispulum*. Additional preferential species are *Blindia acuta*, *Distichium capillaceum*, *Lepraria eburnea* and *Mnium hornum* for N1, and *Ditrichum gracile*, *Gyalecta jenensis*, *Neckera crispa*, *Pellia endiviifolia*, *Solorina saccata* and *Thamnobryum alopecurum* for SL 19.

### Coverage and integrity

The community is well covered by samples. On strongly calcareous siliceous rock there are stands which are transitional to SL 19, but generally the two communities separate well. N1 overlaps with the NVC community OV40 but is not quite equivalent: some stands of N1 do not contain the characteristic vascular plants of OV40. Also, some stands of OV40 have more robust bryophytes, referable to SL 27, or lack bryophytes.

**Table 48:** Floristic and environmental data for SS N1 *Amphidium mougeotii*-*Anoetangium aestivum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Amphidium mougeotii</i>	V (1-8)
<i>Anoetangium aestivum</i>	IV (2-9)
<i>Ctendium molluscum</i>	IV (1-5)
<i>Plagiochila porelloides</i>	IV (1-4)
<i>Blindia acuta</i>	III (1-6)
<i>Lepraria eburnea</i>	III (1-5)

<i>Tortella tortuosa</i>	III (1-5)
<i>Fissidens dubius</i>	III (1-4)
<i>Distichium capillaceum</i>	II (1-6)
<i>Mnium hornum</i>	II (1-5)
<i>Frullania tamarisci</i>	II (1-5)
<i>Aneura pinguis</i>	II (1-5)
<i>Opegrapha gyrocarpa</i>	II (1-5)
<i>Pohlia cruda</i>	II (1-4)
<i>Tritomaria quinquedentata</i>	II (1-4)
<i>Rhizomnium punctatum</i>	II (1-4)
<i>Diplophyllum albicans</i>	II (1-4)
<i>Trentepohlia aurea</i>	II (1-3)
<i>Hymenostylium recurvirostrum</i>	I (5-7)
<i>Lepraria diffusa</i>	I (5)
<i>Lepraria sylvicola</i>	I (5)
<i>Mnium stellare</i>	I (5)
<i>Palustriella commutate</i> var. <i>commutata</i>	I (5)
<i>Pertusaria albescens</i>	I (4)
<i>Cratoneuron filicinum</i>	I (4)
<i>Lecidea pycnocarpa</i> f. <i>pycnocarpa</i>	I (4)
<i>Leproloma vouauxii</i>	I (3-4)
<i>Philonotis fontana</i>	I (3)
<i>Fissidens taxifolius</i>	I (3)
<i>Jungermannia atrovirens</i>	I (3)
<i>Preissia quadrata</i>	I (2-5)
<i>Conocephalum conicum</i> agg.	I (2-5)
<i>Plagiopus oederianus</i>	I (2-5)
<i>Pellia endiviifolia</i>	I (2-5)
<i>Marsupella emarginata</i>	I (2-4)
<i>Dicranum scoparium</i>	I (2-4)
<i>Bartramia pomiformis</i>	I (2-4)
<i>Orthothecium rufescens</i>	I (2-4)
<i>Racomitrium lanuginosum</i>	I (2-4)
<i>Hypnum cupressiforme</i>	I (2-4)
<i>Trapelia coarctata</i>	I (2-4)
<i>Porina lectissima</i>	I (2)
<i>Barbilophozia floerkei</i>	I (2)
<i>Calypogeia fissa</i>	I (2)
<i>Dichodontium pellucidum</i>	I (2)
<i>Encalypta streptocarpa</i>	I (2)
<i>Fissidens adianthoides</i>	I (2)
<i>Fissidens pusillus</i>	I (2)
<i>Fuscidea lygaea</i>	I (2)
<i>Isothecium alopecuroides</i>	I (2)
<i>Leiocolea bantriensis</i>	I (2)
<i>Lepraria</i> Species A	I (2)
<i>Leproplaca chrysodeta</i>	I (2)
<i>Neckera complanata</i>	I (2)

<i>Neckera crispa</i>	I (2)
<i>Peltigera praetextata</i>	I (2)
<i>Pertusaria corallina</i>	I (2)
<i>Polyblastia</i> sp. (2003-509)	I (2)
<i>Polytrichum alpinum</i>	I (2)
<i>Protopannaria pezizoides</i>	I (2)
<i>Pseudotaxiphyllum elegans</i>	I (2)
<i>Racomitrium fasciculare</i>	I (2)
<i>Radula</i> cf. <i>complanata</i>	I (2)
<i>Rhytidiadelphus triquetrus</i>	I (2)
<i>Schistidium strictum</i>	I (2)
<i>Thelidium minutulum</i>	I (2)
<i>Mnium marginatum</i>	I (1-6)
<i>Verrucaria</i> spp.	I (1-6)
<i>Mnium thomsonii</i>	I (1-5)
<i>Metzgeria conjugata</i>	I (1-5)
<i>Porpidia macrocarpa</i>	I (1-5)
<i>Porpidia rugosa</i>	I (1-5)
<i>Thuidium tamariscinum</i>	I (1-5)
<i>Plagiomnium undulatum</i>	I (1-5)
<i>Scapania aequiloba</i>	I (1-4)
<i>Eurhynchium hians</i>	I (1-4)
<i>Gymnostomum aeruginosum</i>	I (1-4)
<i>Bryum pseudotriquetrum</i>	I (1-4)
<i>Isopterygiopsis pulchella</i>	I (1-4)
<i>Scapania aspera</i>	I (1-4)
<i>Cladonia pocillum</i>	I (1-4)
<i>Porpidia speirea</i>	I (1-4)
<i>Trichostomum brachydontium</i>	I (1-4)
<i>Lejeunea cavifolia</i>	I (1-4)
<i>Lejeunea lamacerina</i>	I (1-4)
<i>Porpidia platycarpoides</i>	I (1-4)
<i>Rhizocarpon reductum</i>	I (1-4)
<i>Fissidens osmundoides</i>	I (1-4)
<i>Lepraria incana</i>	I (1-4)
<i>Plagiobryum zierii</i>	I (1-4)
<i>Plagiochila spinulosa</i>	I (1-4)
<i>Seligeria recurvata</i>	I (1-4)
<i>Dictyonema interruptum</i>	I (1-4)
<i>Solorina saccata</i>	I (1-4)
<i>Orthothecium intricatum</i>	I (1-3)
<i>Thamnobryum alopecurum</i>	I (1-3)
<i>Leiocolea alpestris</i>	I (1-3)
<i>Scapania undulata</i>	I (1-3)
<i>Eurhynchium praelongum</i>	I (1-3)
<i>Leptogium gelatinosum</i>	I (1-3)
<i>Saccogyna viticulosa</i>	I (1-3)
<i>Nostoc</i> spp.	I (1-2)

<i>Porpidia tuberculosa</i>	I (1-2)
<i>Cladonia pyxidata</i>	I (1-2)
<i>Bazzania tricrenata</i>	I (1-2)
<i>Brachythecium plumosum</i>	I (1-2)
<i>Enterographa zonata</i>	I (1-2)
<i>Hylocomium splendens</i>	I (1-2)
<i>Lepraria lobificans</i>	I (1-2)
<i>Pellia epiphylla</i>	I (1-2)
<i>Plagiothecium succulentum</i>	I (1-2)
<i>Pogonatum urnigerum</i>	I (1-2)
<i>Polyblastia melaspora</i>	I (1-2)
<i>Bryum capillare</i>	I (1-2)
<i>Cladonia cyathomorpha</i>	I (1-2)
<i>Ditrichum gracile</i>	I (1-2)
<i>Lejeunea patens</i>	I (1-2)
<i>Rhytidiadelphus loreus</i>	I (1-2)
<i>Trichostomum tenuirostre</i>	I (1-2)
<i>Blepharostoma trichophyllum</i>	I (1-2)
<i>Breutelia chrysocoma</i>	I (1-2)
<i>Bryum pallens</i>	I (1-2)
<i>Campylopus atrovirens</i>	I (1-2)
<i>Cephaloziella</i> spp.	I (1-2)
<i>Cololejeunea calcarea</i>	I (1-2)
<i>Cololejeunea calcarea</i>	I (1-2)
<i>Hypnum jutlandicum</i>	I (1-2)
<i>Hypnum lacunosum</i>	I (1-2)
<i>Isothecium myosuroides</i> var. <i>myosuroides</i>	I (1-2)
<i>Plagiomnium rostratum</i>	I (1-2)
<i>Porpidia superba</i>	I (1-2)
<i>Racomitrium ellipticum</i>	I (1-2)
<i>Baeomyces rufus</i>	I (1)
<i>Micarea botryoides</i>	I (1)
<i>Trapelia placodioides</i>	I (1)
<i>Grimmia torquata</i>	I (1)
<i>Catillaria chalybeia</i> var. <i>chalybeia</i>	I (1)
<i>Cystocoleus ebeneus</i>	I (1)
<i>Encalypta ciliate</i>	I (1)
<i>Eurhynchium pumilum</i>	I (1)
<i>Gyalecta jenensis</i>	I (1)
<i>Hookeria lucens</i>	I (1)
<i>Racomitrium aciculare</i>	I (1)
<i>Rhizocarpon lavatum</i>	I (1)
<i>Scapania gymnostomophila</i>	I (1)
<i>Brachythecium rivulare</i>	I (1)
<i>Campylium stellatum</i>	I (1)
<i>Cladonia furcata</i>	I (1)
<i>Cladonia subcervicornis</i>	I (1)
<i>Eurhynchium striatum</i>	I (1)



<i>Hypnum resupinatum</i>	I (1)
<i>Ionaspis lacustris</i>	I (1)
<i>Isothecium myosuroides</i> var. <i>brachythecioides</i>	I (1)
<i>Lecidea hypnorum</i>	I (1)
<i>Lepraria atlantica</i>	I (1)
<i>Lepraria rigidula</i>	I (1)
<i>Micarea lignaria</i>	I (1)
<i>Miriquidica leucophaea</i>	I (1)
<i>Molendoa warburgii</i>	I (1)
<i>Pertusaria lacteal</i>	I (1)
<i>Pohlia melanodon</i>	I (1)
<i>Porpidia cinereoatra</i>	I (1)
<i>Porpidia soledizodes</i>	I (1)
<i>Racomitrium aquaticum</i>	I (1)
<i>Rhizocarpon petraeum</i>	I (1)
<i>Rhytidiadelphus squarrosus</i>	I (1)
<i>Riccardia chamedryfolia</i>	I (1)
<i>Scoliosprum umbrinum</i>	I (1)
<i>Stigonema</i> spp.	I (1)
<i>Strigula stigmatella</i>	I (1)
<i>Tortula subulata</i> var. <i>subulata</i>	I (1)
<i>Weissia</i> spp.	I (1)
Rock	V (2-7)
<i>Cystopteris fragilis</i>	III (1-4)
<i>Asplenium viride</i>	II (1-5)
<i>Alchemilla alpina</i>	II (1-4)
<i>Festuca rubra</i>	II (1-4)
<i>Oxalis acetosella</i>	II (1-4)
<i>Campanula rotundifolia</i>	II (1-4)
<i>Dryopteris filix-mas</i>	I (4)
<i>Luzula sylvatica</i>	I (4)
<i>Polystichum setiferum</i>	I (4)
<i>Taraxacum</i> Sect. <i>naevosa</i>	I (3)
<i>Saxifraga oppositifolia</i>	I (2-4)
<i>Saxifraga stellaris</i>	I (2)
<i>Solidago virgaurea</i>	I (2)
<i>Cardamine pratensis</i>	I (2)
<i>Saxifraga hypnoides</i>	I (2)
<i>Silene acaulis</i>	I (2)
<i>Thalictrum minus</i>	I (2)
<i>Chrysosplenium oppositifolium</i>	I (1-5)
<i>Epilobium brunnescens</i>	I (1-5)
<i>Festuca ovina</i> agg.	I (1-5)
<i>Asplenium trichomanes</i>	I (1-4)
<i>Viola riviniana</i>	I (1-4)
<i>Festuca vivipara</i>	I (1-4)
<i>Agrostis canina</i>	I (1-4)
<i>Agrostis vinealis</i>	I (1-4)

<i>Anemone nemorosa</i>	I (1-4)
<i>Festuca filiformis</i>	I (1-4)
<i>Carex pulicaris</i>	I (1-3)
<i>Sagina procumbens</i>	I (1-3)
<i>Selaginella selaginoides</i>	I (1-2)
<i>Galium saxatile</i>	I (1-2)
<i>Agrostis capillaries</i>	I (1-2)
<i>Sedum rosea</i>	I (1-2)
<i>Calluna vulgaris</i>	I (1-2)
<i>Deschampsia cespitosa</i>	I (1-2)
<i>Deschampsia flexuosa</i>	I (1-2)
<i>Thymus polytrichus</i>	I (1-2)
<i>Anthoxanthum odoratum</i>	I (1-2)
<i>Asplenium adiantum-nigrum</i>	I (1-2)
<i>Hieracium</i> spp.	I (1-2)
<i>Minuartia verna</i>	I (1-2)
<i>Saxifraga aizoides</i>	I (1-2)
<i>Pinguicula vulgaris</i>	I (1)
<i>Oxyria digyna</i>	I (1)
<i>Dryopteris affinis</i>	I (1)
<i>Hymenophyllum wilsoni</i>	I (1)
<i>Alchemilla glabra</i>	I (1)
<i>Alchemilla</i> sp.	I (1)
<i>Angelica sylvestris</i>	I (1)
<i>Arabis hirsute</i>	I (1)
<i>Bellis perennis</i>	I (1)
<i>Cardamine flexuosa</i>	I (1)
<i>Cerastium</i> sp.	I (1)
<i>Digitalis purpurea</i>	I (1)
<i>Dryopteris dilatata</i>	I (1)
<i>Epilobium montanum</i>	I (1)
<i>Euphrasia</i> spp.	I (1)
<i>Geranium robertianum</i>	I (1)
<i>Holcus lanatus</i>	I (1)
<i>Huperzia selago</i>	I (1)
<i>Luzula campestris/multiflora</i>	I (1)
<i>Prunella vulgaris</i>	I (1)
<i>Rumex acetosa</i>	I (1)
<i>Succisa pratensis</i>	I (1)
<i>Taraxacum</i> spp.	I (1)
<i>Vaccinium myrtillus</i>	I (1)
Slope (degrees)	80 (20-140)
Shade	None to moderate (to strong)
Run off	Slight to moderate
Drainage	Moderate to good
Rain shelter	(Slight to) moderate to strong
Altitude (m)	572 (230-870)
Number of samples	54

**3.3.44 SS N2 *Blindia acuta*-*Amphidium mougeotii* community (Table 49)****Synonyms**

None are known.

**Constant species**

*Blindia acuta*.

**Description and ecology**

This is a moss-dominated community on wet calcareous rock. The narrow-leaved acrocarpous moss *Blindia acuta* is present, sometimes accompanied by *Gymnostomum aeruginosum*, *Hymenostylium recurvirostrum* or small amounts of *Amphidium mougeotii*. Lichens are few and present at only low cover. The community occurs on calcareous siliceous rocks, on flushed faces or on damp cliffs.

**Annex I habitats**

Siliceous rocky slopes with chasmophytic vegetation: one sample was from a damp recess, the others were from more or less non-chasmophytic habitats.

**Conservation interest**

One stand contained the Nationally Scarce *Scapania aequiloba*.

**Differentiation from other communities**

V1 differs in the greater amounts of lichens and lower cover of mosses. SL 26 and SL 27 differ in the absence of *Blindia*, although *Gymnostomum* may be present.

**Coverage and integrity**

A provisional community based on only three samples.

**Table 49:** Floristic and environmental data for SS N2 *Blindia acuta*-*Amphidium mougeotii* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data		
	300	191	30
<i>Blindia acuta</i>	7	5	7
<i>Amphidium mougeotii</i>	2	4	
<i>Pellia epiphylla</i>		4	1
<i>Porpidia macrocarpa</i>	2		2
<i>Lepraria eburnea</i>	1		1
<i>Hymenostylium recurvirostrum</i>	6		
<i>Gymnostomum aeruginosum</i>		5	

<i>Diplophyllum albicans</i>			5
<i>Ctenidium molluscum</i>		4	
<i>Anoetangium aestivum</i>	3		
<i>Dichodontium pellucidum</i>			2
<i>Lepraria atlantica</i>			2
<i>Orthothecium rufescens</i>	2		
<i>Pogonatum urnigerum</i>			2
<i>Porpidia tuberculosa</i>			2
<i>Scapania aequiloba</i>	2		
<i>Anomobryum julaceum</i>			1
<i>Trapelia placodioides</i>	1		
<i>Trentepohlia aurea</i>	1		
<i>Marsupella emarginata</i>			1
<i>Polyblastia melaspora</i>		1	
<i>Baeomyces rufus</i>		1	
<i>Bryum pseudotriquetrum</i>			1
<i>Frullania tamarisci</i>	1		
<i>Nostoc</i> spp.	1		
<i>Riccardia chamedryfolia</i>			1
<i>Stereocaulon vesuvianum</i>			1
<i>Tritomaria quinquedentata</i>	1		
Rock		5	5
<i>Saxifraga aizoides</i>	1		1
<i>Festuca vivipara</i>			2
<i>Alchemilla alpina</i>			2
<i>Campanula rotundifolia</i>	2		
<i>Epilobium brunnescens</i>			2
<i>Galium saxatile</i>		2	
<i>Saxifraga oppositifolia</i>	2		
Slope (degrees)	90	70	90
Aspect (degrees)	300	30	330
Shade	None	Slight	None
Run off	Moderate- strong	Slight	Moderate
Drainage	Good	Moderate- good	Good
Rain shelter	None		None-slight
Altitude (m)	690	700	
Quadrat size (cm)	50 x 50	30 x 20.8	50 x 50
Vice-county	98	42	69
Grid ref.	27/2618.2722	32/0176.2126	35/?
Date	22 Jun 2003	20 Jun 2002	21 Apr 2004
SAC/site code	BL	BB	LD

**3.3.45 SS N3 *Grimmia torquata* community (Table 50)****Synonyms**

None are known.

**Constant species**

*Amphidium mougeotii*, *Frullania tamarisci*, *Grimmia torquata* and *Tortella tortuosa*.

**Description and ecology**

A community characterised by the present of the moss *Grimmia torquata*. This species grows on vertical or slightly overhanging surfaces on base-rich cliffs; these are somewhat sheltered from rain and are dry for much of the time, but they are flushed by run-off from rocks and vegetated slopes above the stand. The dull green, rounded cushions of *G. torquata* are distinctive.

**Annex I habitats**

The community was not found to be associated with any Annex I habitats.

**Conservation interest**

The typical species of this community are widespread.

**Coverage and integrity**

Only three samples are available. The community is based on the abundance of a single species, but stands are distinctive in appearance and occur in the same microhabitat.

**Table 50:** Floristic and environmental data for SS N3 *Grimmia torquata* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data		
	33	179	252
<i>Grimmia torquata</i>	7	6	6
<i>Tortella tortuosa</i>	4	2	5
<i>Frullania tamarisci</i>	4	2	2
<i>Amphidium mougeotii</i>	4	4	2
<i>Opegrapha gyrocarpa</i>		1	5
<i>Lepraria eburnea</i>		3	4
<i>Trapelia placodioides</i>	1	2	
<i>Trentepohlia aurea</i>		1	2
<i>Porpidia platycarpoides</i>		4	
<i>Porpidia speirea</i>			4
<i>Blindia acuta</i>	3		
<i>Porpidia rugosa</i>	3		
<i>Cololejeunea calcarea</i>			3

<i>Anoetangium aestivum</i>			2
<i>Cladonia pocillum</i>		2	
<i>Anomobryum julaceum</i>	2		
<i>Distichium capillaceum</i>			2
<i>Lepraria vouauxii</i>	2		
<i>Neckera crispa</i>		2	
<i>Thelidium pyrenophorum</i>			2
<i>Porpidia tuberculosa</i>			1
<i>Rhizocarpon lavatum</i>	1		
<i>Nostoc</i> spp.			1
<i>Amphidium lapponicum</i>	1		
<i>Isothecium myosuroides</i> var. <i>myosuroides</i>		1	
<i>Pohlia cruda</i>			1
<i>Polyblastia theleodes</i>	1		
<i>Acarospora smaragdula</i>	1		
<i>Lejeunea cavifolia</i>		1	
<i>Porpidia superba</i> f. <i>superba</i>	1		
<i>Fuscidea lygaea</i>			
<i>Grimmia funalis</i>			
<i>Micarea lignaria</i> var. <i>lignaria</i>			
<i>Ionaspis lacustris</i>			
<i>Cladonia subcervicornis</i>			
<i>Pertusaria albescens</i>			
<i>Pertusaria pseudocorallina</i>			
Rock	6	7	5
Slope (degrees)	100	95	125
Aspect (degrees)	120	0	340
Shade		None	None-slight
Run off		Slight- moderate	Slight
Drainage	Good	Good	Good
Rain shelter			Slight
Altitude (m)	780	450	530
Quadrat size (cm)	25 x 25	50 x 50	50 x 50
Vice-county	49	42	98
Grid ref.	23/618.552	22/9652.218 8	27/2581.273 1
Date	8 Aug 1997	19 Jun 2002	18 Jun 2003
SAC/site code	E	BB	BL

### 3.3.46 SS O1 *Pellia epiphylla*-*Mnium hornum* community (Table 51)

#### Synonyms

OV40 *Asplenium viride*-*Cystopteris fragilis* community p.p. (Rodwell 1991-2000).

**Constant species**

*Pellia epiphylla*.

**Description and ecology**

This is a community of relatively robust bryophytes occurring on rock below acidic overhangs. The thallose hepatic *Pellia epiphylla* is present, often with the dull green acrocarpous moss *Mnium hornum*. These are capable of growing on thin soil, and in some samples formed turfs up to 100 mm thick, including soil. Some associated species were found to be more restricted to bare rock surfaces, including *Heterocladium heteropterum* and *Marsupella emarginata*.

The community is developed below acid overhangs and in cavities between boulders in block scree where the main species are more robust and more soil dwelling than those of P1. The recorded stands are related to communities occurring commonly in woodland habitats. The community grades rapidly into communities dominated by vascular plants.

**Annex I habitats**

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community occurs in cavities between boulders in block scree.

Siliceous rocky slopes with chasmophytic vegetation: the community occurs in cavities and crevices on rock faces.

**Conservation interest**

The typical species of this community are widespread.

**Coverage and integrity**

Few samples are available, and more need to be recorded to understand the variation in this community, including samples from lowland and woodland habitats.

**Table 51:** Floristic and environmental data for SS O1 *Pellia epiphylla*-*Mnium hornum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Pellia epiphylla</i>	V (2-7)
<i>Mnium hornum</i>	III (6-9)
<i>Heterocladium heteropterum</i>	III (2-4)
<i>Pseudotaxiphyllum elegans</i>	III (1-4)
<i>Marsupella emarginata</i>	II (2-4)
<i>Polytrichum commune</i>	II (2-4)
<i>Eurhynchium hians</i>	II (1-4)
<i>Plagiothecium undulatum</i>	II (1-4)
<i>Diplophyllum albicans</i>	II (2-3)
<i>Hypnum jutlandicum</i>	II (1-3)

<i>Porpidia tuberculosa</i>	II (1)
<i>Rhizomnium punctatum</i>	I (7)
<i>Plagiothecium succulentum</i>	I (5)
<i>Oligotrichum hercynicum</i>	I (5)
<i>Opegrapha gyrocarpa</i>	I (3)
<i>Conocephalum conicum</i>	I (2)
<i>Lepraria incana</i>	I (2)
<i>Polytrichum alpinum</i>	I (2)
<i>Racomitrium lanuginosum</i>	I (2)
<i>Pseudotaxiphyllum elegans</i>	I (2)
<i>Sphagnum denticulatum</i>	I (2)
<i>Scapania undulata</i>	I (2)
<i>Rhytidiadelphus loreus</i>	I (1)
<i>Bartramia pomiformis</i>	I (1)
<i>Dicranum scoparium</i>	I (1)
<i>Hylocomium splendens</i>	I (1)
<i>Andreaea rupestris</i>	I (1)
<i>Calypogeia arguta</i>	I (1)
<i>Campylopus atrovirens</i>	I (1)
<i>Lecanora orosthea</i>	I (1)
<i>Lepraria atlantica</i>	I (1)
<i>Micarea lignaria</i>	I (1)
<i>Porpidia rugosa</i>	I (1)
Rock	V (2-5)
<i>Oxalis acetosella</i>	III (2-4)
<i>Chrysosplenium oppositifolium</i>	II (2-4)
<i>Cystopteris fragilis</i>	II (1-2)
<i>Agrostis capillaris</i>	II (1)
<i>Dryopteris dilatata</i>	I (4)
<i>Agrostis canina/vinealis</i>	I (4)
<i>Nardus stricta</i>	I (2)
<i>Deschampsia flexuosa</i>	I (2)
<i>Anthoxanthum odoratum</i>	I (2)
<i>Festuca ovina</i> agg.	I (2)
<i>Galium saxatile</i>	I (2)
<i>Cryptogramma crista</i>	I (1)
<i>Digitalis purpurea</i>	I (1)
<i>Juncus effusus</i>	I (1)
<i>Vaccinium myrtillus</i>	I (1)
<i>Huperzia selago</i>	I (1)
<i>Hymenophyllum wilsoni</i>	I (1)
<i>Asplenium trichomanes</i>	I (1)
<i>Epilobium brunnescens</i>	I (1)
Slope (degrees)	30 (0-90)
Aspect (degrees)	
Shade	Slight to strong
Run off	Slight to moderate
Drainage	Moderate to good



Rain shelter	Moderate to strong
Altitude (m)	540-630
Number of samples	5

### 3.3.47 SS O2 *Philonotis fontana*-*Scapania undulata* community (Table 52)

#### Synonyms

M32 *Philonotis fontana*-*Saxifraga stellaris* spring p.p.(Rodwell 1991-2000).

#### Constant species

*Bryum pseudotriquetrum*, *Philonotis fontana* and *Scapania undulata*.

#### Description and ecology

This is a community of robust bryophytes on wet rocks. The distinctive upright shoots of *Philonotis fontana* are conspicuous in some stands, and in others there are mats of the hepatics *Jungermannia exsertifolia* and *Scapania undulata*, or swollen cushions of *Dicranella palustris*.

Stands develop only on siliceous rocks in constantly wet conditions, including on dripping cliffs and associated with a rivulet running over a rock outcrop. Vascular plants are frequent, including *Saxifraga stellaris*. The community as defined here is included within a vascular plant community in the NVC.

#### Annex I habitats

The community was not found to be associated with any Annex I habitats.

#### Conservation interest

The typical species of this community are widespread.

#### Coverage and integrity

Few samples are available. The community is defined from the perspective of cryptogams, but the NVC community M32 may give adequate coverage. However, it is possible that some stands with few vascular plants could remain under-represented there.

**Table 52:** Floristic and environmental data for SS O2 *Philonotis fontana*-*Scapania undulata* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data			
	362	339	46	118
<i>Philonotis fontana</i>	3	2	7	6
<i>Scapania undulata</i>	5	7	4	
<i>Bryum pseudotriquetrum</i>	1		4	5
<i>Jungermannia exsertifolia</i>	7			5
<i>Dichodontium pellucidum</i>	5			4
<i>Palustriella commutata</i> var. <i>commutata</i>		5		4
<i>Dicranella palustris</i>		7		
<i>Marsupella emarginata</i>			5	
<i>Blindia acuta</i>		2		
<i>Cratoneuron filicinum</i>				2
<i>Gymnostomum aeruginosum</i>				2
<i>Pellia endiviifolia</i>				2
<i>Pellia epiphylla</i>	2			
<i>Plagiomnium elatum</i>				2
<i>Amphidium mougeotii</i>	1			
<i>Aneura pinguis</i>	1			
<i>Conocephalum conicum</i>				1
<i>Didymodon spadiceus</i>				1
<i>Fissidens adianthoides</i>				1
<i>Racomitrium aquaticum</i>			1	
<i>Rhizomnium punctatum</i>	1			
<i>Rhytidiadelphus squarrosus</i>		1		
Rock	4	-		2
<i>Saxifraga stellaris</i>	4	2	5	
<i>Alchemilla glabra</i>	2			1
<i>Holcus mollis</i>			5	
<i>Festuca rubra</i>				2
<i>Festuca ovina</i>	2			
<i>Deschampsia flexuosa</i>			2	
<i>Ranunculus acris</i>	2			
<i>Cerastium</i> ssp.	2			
<i>Agrostis stolonifera</i>				1
<i>Agrostis vinealis</i>		1		
<i>Angelica sylvestris</i>	1			
<i>Crepis paludosa</i>	1			
<i>Stellaria alsine</i>	1			
<i>Oxyria digyna</i>	1			
<i>Cerastium fontanum</i>				1
<i>Cochlearia pyrenaica</i>				1
Slope (degrees)	70	70	90	75
Aspect (degrees)	0	10	340	290

Shade	None	None	Moderate	None
Run off	Strong	Strong	Strong	Strong
Drainage	Good	Good	Good	Moderate-good
Rain shelter	None	None	Slight	None
Altitude (m) (m)	720	580	480	550
Quadrat size (cm)	50 x 50	50 x 50	100 x 25	75 x 33.3
Vice-county	49	48		
Grid ref. (prefix 35/)	23/6704.631	23/7112.124	35/3550.143	35/7446.256
	8	0	1	9
Date	6 Sep 2002	22 Jul 2003	23 Apr 2004	19 Jun 2005
SAC/site code	E	CI	LD	NP

### 3.3.48 SS P1 *Diplophyllum albicans*-*Hypnum jutlandicum* community (Table 53)

#### Synonyms

None are known.

#### Constant species

*Diplophyllum albicans*.

#### Description and ecology

A community dominated by the hepatic *Diplophyllum albicans* and other bryophytes, in shaded acid crevices. The mosses *Hypnum jutlandicum*, *Mnium hornum* and *Racomitrium lanuginosum* are frequent. Other characteristic species include the mosses *Pohlia nutans*, *Polytrichum alpinum* and *Pseudotaxiphyllum elegans*. Lichens are usually scarce and mostly comprise small amounts of tolerant species such as *Cladonia subcervicornis*.

Stands are developed in the cavities in acid block scree, occasionally in crevices in bedrock or on damp vertical rock faces. Stands in scree are often heavily shaded and usually sheltered from rain; there is typically no water supply other than rainwater running off the adjacent blocks. Due to the nature of block scree, in most samples there was a strong gradient of shading and rain-shelter across the sample, and the substrate was often somewhat heterogeneous, comprising stones forming the floor of the cavity, sometimes with a thin soil accumulation, but also well-drained vertical or overhanging faces. However, it was rarely possible to sample the small differing areas separately. *Diplophyllum* is tolerant of shade, and is a very common species in shaded acid habitats. *Racomitrium lanuginosum* was restricted to better-lit stands, or to better-lit parts of stands.

Stands of this community are frequently species-poor, but occasionally some less common species are present, including *Anastrophyllum minutum*, *Bazzania tricrenata*, *Isothecium myosuroides* var. *brachythecioides*, *Plagiothecium denticulatum* var. *obtusifolium*, and *Tetrodontium brownianum*. The community is clearly related to similar types of vegetation which are widespread and abundant on shaded acid rocks in woodland and ravines.

### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): most samples of this community are found in cavities in block scree.

Siliceous rocky slopes with chasmophytic vegetation: this community occurs occasionally in crevices and overhangs on rock faces.

### Conservation interest

The typical species of this community are widespread. Scarce occurrences of more uncommon species include *Brachydontium trichodes*, *Campylopus setifolius* and *Plagiothecium denticulatum* var. *obtusifolium*.

### Differentiation from other communities

O1 represents a more terricolous community growing on a greater accumulation of soil, with greater amounts of *Mnium hornum* and *Pellia epiphylla*, and less *Diplophyllum albicans* and *Hypnum jutlandicum*; in O1 the combined cover of the first and second of these species exceeds that of the third and fourth species.

### Coverage and integrity

The community is well covered by samples. The sharp gradients across most stands means that some samples include species that may not be so strongly associated when more extensive stands of the characteristic species are sampled, for instance on shaded rocks in woodland. However, the vegetation of these acidic cavities in block scree is often remarkably constant between different sites. Rare species-rich samples may need to be distinguished when more are available.

**Table 53:** Floristic and environmental data for SS P1 *Diplophyllum albicans*-*Hypnum jutlandicum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Diplophyllum albicans</i>	V (4-9)
<i>Hypnum jutlandicum</i>	III (1-7)
<i>Racomitrium lanuginosum</i>	III (1-6)
<i>Mnium hornum</i>	III (1-7)
<i>Rhytidiadelphus loreus</i>	III (1-5)
<i>Pseudotaxiphyllum elegans</i>	III (1-7)
<i>Polytrichum alpinum</i>	III (1-5)
<i>Dicranum scoparium</i>	II (1-5)
<i>Pohlia nutans</i>	II (1-4)
<i>Marsupella emarginata</i>	II (1-6)
<i>Plagiothecium undulatum</i>	II (1-4)
<i>Tritomaria quinquedentata</i>	II (1-4)
<i>Cladonia subcervicornis</i>	II (1-5)
<i>Mylia taylorii</i>	II (1-5)

<i>Pellia epiphylla</i>	I (1-5)
<i>Heterocladium heteropterum</i>	I (1-7)
<i>Thuidium tamariscinum</i>	I (1-6)
<i>Barbilophozia floerkei</i>	I (1-6)
<i>Lophozia sudetica</i>	I (1-6)
<i>Pohlia elongate</i> var. <i>elongata</i>	I (5)
<i>Trichostomum brachydontium</i>	I (5)
<i>Bartramia pomiformis</i>	I (4-5)
<i>Isothecium myosuroides</i> var. <i>brachythecioides</i>	I (4-5)
<i>Polytrichum commune</i>	I (2-5)
<i>Nardia scalaris</i>	I (2-5)
<i>Dicranum majus</i>	I (2-5)
<i>Polytrichum formosum</i>	I (2-5)
<i>Cephalozia bicuspidate</i>	I (2-5)
<i>Racomitrium sudeticum</i>	I (1-5)
<i>Campylopus flexuosus</i>	I (1-5)
<i>Oligotrichum hercynicum</i>	I (1-5)
<i>Sphagnum denticulatum</i>	I (4)
<i>Scapania gracilis</i>	I (4)
<i>Biatora tetramera/vernalis</i>	I (4)
<i>Brachydontium trichodes</i>	I (4)
<i>Campylopus setifolius</i>	I (4)
<i>Ctenidium molluscum</i>	I (4)
<i>Hypnum andoi</i>	I (4)
<i>Kiaeria blytii</i>	I (4)
<i>Lepraria jackii</i>	I (4)
<i>Philonotis fontana</i>	I (4)
<i>Pohlia drummondii</i>	I (4)
<i>Pohlia ludwigii</i>	I (4)
<i>Porpidia platycarpoides</i>	I (4)
<i>Rhabdoweisia crispate</i>	I (4)
<i>Scapania undulata</i>	I (4)
<i>Lepraria eburnea</i>	I (3-4)
<i>Rhizomnium punctatum</i>	I (2-4)
<i>Dicranella heteromalla</i>	I (2-4)
<i>Anastrophyllum minutum</i>	I (2-4)
<i>Dicranodontium uncinatum</i>	I (2-4)
<i>Porpidia tuberculosa</i>	I (1-4)
<i>Bazzania tricrenata</i>	I (1-4)
<i>Micarea lignaria</i> var. <i>lignaria</i>	I (1-4)
<i>Trichostomum tenuirostre</i>	I (1-4)
<i>Gymnomitrium obtusum</i>	I (1-4)
<i>Hylocomium splendens</i>	I (1-4)
<i>Plagiothecium denticulatum</i> var. <i>obtusifolium</i>	I (1-4)
<i>Cladonia cyathomorpha</i>	I (1-4)
<i>Lepraria atlantica</i>	I (1-4)
<i>Opegrapha gyrocarpa</i>	I (1-4)
<i>Polytrichum piliferum</i>	I (1-4)

<i>Plagiochila porelloides</i>	I (1-3)
<i>Pohlia cruda</i>	I (1-3)
<i>Trapelia involuta</i>	I (1-3)
<i>Pogonatum aloides</i>	I (1-3)
<i>Anastrepta orcadensis</i>	I (2)
<i>Sphagnum subnitens</i>	I (2)
<i>Amphidium mougeotii</i>	I (2)
<i>Calypogeia muellerana</i>	I (2)
<i>Cladonia crispate</i> var. <i>cetrariiformis</i>	I (2)
<i>Cladonia pyxidata</i>	I (2)
<i>Cystocoleus ebeneus</i>	I (2)
<i>Dounia ovata</i>	I (2)
<i>Eurhynchium praelongum</i>	I (2)
<i>Lepidozia pearsonii</i>	I (2)
<i>Lepraria elobata</i>	I (2)
<i>Lophozia incise</i>	I (2)
<i>Lophozia opacifolia</i>	I (2)
<i>Scapania nimbose</i>	I (2)
<i>Scapania ornithopodioides</i>	I (2)
<i>Sphaerophorus globosus</i>	I (2)
<i>Sphagnum russowii</i>	I (2)
<i>Tetrodontium brownianum</i>	I (2)
<i>Trapelia coarctata</i>	I (2)
<i>Plagiochila spinulosa</i>	I (2)
<i>Baeomyces rufus</i>	I (1-2)
<i>Cladonia diversa</i>	I (1-2)
<i>Andreaea rupestris</i>	I (1-2)
<i>Cladonia furcata</i>	I (1-2)
<i>Isothecium myosuroides</i> var. <i>myosuroides</i>	I (1-2)
<i>Porpidia macrocarpa</i>	I (1-2)
<i>Stereocaulon vesuvianum</i>	I (1-2)
<i>Pleurozium schreberi</i>	I (1-2)
<i>Racodium rupestre</i>	I (1-2)
<i>Cephaloziella</i> spp.	I (1-2)
<i>Cladonia squamosa</i> var. <i>squamosa</i>	I (1-2)
<i>Kiaeria falcate</i>	I (1-2)
<i>Ainoa mooreana</i>	I (1-2)
<i>Campylopus atrovirens</i>	I (1-2)
<i>Hypnum callichroum</i>	I (1-2)
<i>Kiaeria starkei</i>	I (1-2)
<i>Fissidens dubius</i>	I (1)
<i>Micarea botryoides</i>	I (1)
<i>Lophozia ventricosa</i>	I (1)
<i>Micarea subviridescens</i>	I (1)
<i>Omphalina ericetorum</i>	I (1)
<i>Pilophorus strumaticus</i>	I (1)
<i>Racomitrium fasciculare</i>	I (1)
<i>Anoetangium aestivum</i>	I (1)

<i>Anthelia julacea</i>	I (1)
<i>Bryum capillare</i>	I (1)
<i>Cladonia alpina</i>	I (1)
<i>Cladonia bellidiflora</i>	I (1)
<i>Cladonia polydactyla</i>	I (1)
<i>Cladonia uncialis</i>	I (1)
<i>Enterographa zonata</i>	I (1)
<i>Lejeunea cavifolia</i>	I (1)
<i>Lepraria borealis</i>	I (1)
<i>Micarea bauschiana</i>	I (1)
<i>Micarea lutulata</i>	I (1)
<i>Moerckia blytii</i>	I (1)
<i>Pertusaria corallina</i>	I (1)
<i>Pertusaria pseudocorallina</i>	I (1)
<i>Plagiothecium succulentum</i>	I (1)
<i>Porina guentheri</i> var. <i>guentheri</i>	I (1)
<i>Porpidia glaucophaea</i>	I (1)
<i>Rhizocarpon reductum</i>	I (1)
<i>Rhytidiadelphus squarrosus</i>	I (1)
<i>Diphyscium foliosum</i>	I (1)
Rock	V (0-7)
<i>Huperzia selago</i>	II (1-5)
<i>Galium saxatile</i>	II (1-4)
<i>Deschampsia flexuosa</i>	I (1-4)
<i>Vaccinium myrtillus</i>	I (1-2)
<i>Cryptogramma crista</i>	I (1-5)
<i>Dryopteris dilatata</i>	I (4-5)
<i>Alchemilla alpina</i>	I (1)
<i>Hymenophyllum wilsonii</i>	I (4)
<i>Oxalis acetosella</i>	I (1-4)
<i>Agrostis capillaries</i>	I (1-2)
<i>Deschampsia cespitosa</i>	I (1-2)
<i>Agrostis vinealis</i>	I (2)
<i>Nardus stricta</i>	I (1-2)
<i>Saxifraga stellaris</i>	I (1-2)
<i>Viola riviniana</i>	I (1-2)
<i>Chrysosplenium oppositifolium</i>	I (2)
<i>Phegopteris connectilis</i>	I (2)
<i>Anthoxanthum odoratum</i>	I (1)
<i>Calluna vulgaris</i>	I (1)
<i>Festuca vivipara</i>	I (1)
Slope (degrees)	35 (0-100)
Aspect (degrees)	
Shade	Slight to strong
Run off	Slight to moderate
Drainage	Moderate to good
Rain shelter	Slight to moderate (to strong)

Altitude (m)	400-1050
Number of samples	61

### 3.3.49 SS P2 *Hypnum jutlandicum*-*Mnium hornum* community (Table 54)

#### Synonyms

None are known.

#### Constant species

*Dicranum scoparium*, *Hypnum jutlandicum* and *Mnium hornum*.

#### Description and ecology

The moss *Hypnum jutlandicum* dominates this community. The community is developed in cavities between boulders in block scree. Other mosses, which may be present, include *Campylopus flexuosus*, *Dicranum scoparium* and *Mnium hornum*. Stands of this community are more exposed and less shaded than in P1.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): all three samples were from block scree.

#### Conservation interest

The typical species of this community are widespread.

#### Coverage and integrity

This is a provisional community based on only three samples.

**Table 54:** Floristic and environmental data for SS P2 *Hypnum jutlandicum*-*Mnium hornum* community

Species/Environmental factor	Sample number with cover values for species and rock/ Environmental data		
	55	56	115
<i>Hypnum jutlandicum</i>	7	8	8
<i>Mnium hornum</i>	6	4	1
<i>Dicranum scoparium</i>	4	2	5
<i>Campylopus flexuosus</i>	2	4	
<i>Racomitrium sudeticum</i>	2	2	
<i>Cladonia subcervicornis</i>	1	2	
<i>Cladonia cyathomorpha</i>	1	1	
<i>Plagiothecium denticulatum</i> var. <i>obtusifolium</i>	4		
<i>Polytrichum formosum</i>		4	



<i>Racomitrium lanuginosum</i>		4	
<i>Cladonia furcata</i>		2	
<i>Diplophyllum albicans</i>			2
<i>Heterocladium heteropterum</i>	2		
<i>Pleurozium schreberi</i>			2
<i>Pseudotaxiphyllum elegans</i>	2		
<i>Cladonia alpina</i>		1	
<i>Plagiothecium succulentum</i>			1
<i>Pohlia nutans</i>		1	
<i>Racomitrium fasciculare</i>			1
<i>Tritomaria quinquedentata</i>			1
Rock	2	2	-
<i>Cryptogramma crista</i>	4		
<i>Agrostis capillaris</i>	2		
<i>Galium saxatile</i>		2	
<i>Festuca rubra</i>			1
<i>Geranium robertianum</i>			1
Slope (degrees)	20	30	30
Aspect (degrees)	120	120	320
Shade	Slight-moderate	Moderate-strong	None-slight
Run off	Slight	Slight	Moderate
Drainage	Moderate	Moderate-strong	Moderate
Rain shelter	Slight-moderate	Slight-strong	None-slight
Altitude (m)	670	690	470

### 3.3.50 SS P3 *Mylia taylorii*-*Racomitrium lanuginosum* community (Table 55)

#### Synonyms

‘Mixed hepatic mat’ p.p. (Ratcliffe 1968).

#### Constant species

*Diplophyllum albicans*, *Mylia taylorii* and *Racomitrium lanuginosum*.

#### Description and ecology

A community dominated by robust bryophytes, especially *Mylia taylorii*, often with the moss *Racomitrium lanuginosum*. Scarce but characteristic species include *Anastrepta orcadensis*, *Anastrophyllum donnianum*, *Bazzania tricrenata* and *Plagiochila carringtonii*.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): the community often occurs in block scree.

### Conservation interest

Some stands contain scarce oceanic hepatics which are characteristic of the ‘Northern mixed hepatic mat’ (Ratcliffe 1968, Rothero 2003).

### Coverage and integrity

Few samples are available. Those recorded were regarded as saxicolous, but such stands grade rapidly into healthy vegetation covered by the NVC.

**Table 55:** Floristic and environmental data for SS P3 *Mylia taylorii*-*Racomitrium lanuginosum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Mylia taylorii</i>	V (6-8)
<i>Racomitrium lanuginosum</i>	V (3-8)
<i>Diplophyllum albicans</i>	V (4-6)
<i>Polytrichum alpinum</i>	III (2-4)
<i>Hylocomium splendens</i>	III (1-4)
<i>Cladonia furcata</i>	III (1-2)
<i>Dicranum scoparium</i>	II (1-4)
<i>Omphalina ericetorum</i>	II (2)
<i>Lophozia opacifolia</i>	II (1-2)
<i>Bazzania tricrenata</i>	I (6)
<i>Anastrophyllum donnianum</i>	I (4)
<i>Lophozia sudetica</i>	I (4)
<i>Polytrichum commune</i>	I (4)
<i>Polytrichum strictum</i>	I (4)
<i>Sphagnum subnitens</i>	I (4)
<i>Anastrepta orcadensis</i>	I (2)
<i>Hypnum jutlandicum</i>	I (2)
<i>Pellia epiphylla</i>	I (2)
<i>Plagiochila carringtonii</i>	I (2)
<i>Polytrichum formosum</i>	I (2)
<i>Rhytidiadelphus loreus</i>	I (2)
<i>Sphagnum quinquefarium</i>	I (2)
<i>Sphagnum tenellum</i>	I (2)
<i>Cladonia bellidiflora</i>	I (1)
<i>Cladonia diversa</i>	I (1)
<i>Cladonia uncialis</i>	I (1)
<i>Cladonia subcervicornis</i>	I (1)
<i>Plagiothecium undulatum</i>	I (1)
Rock	-
<i>Deschampsia flexuosa</i>	III (1-5)
<i>Huperzia selago</i>	III (1-2)
<i>Vaccinium myrtillus</i>	II (1-4)
<i>Galium saxatile</i>	II (2)

<i>Nardus stricta</i>	I (4)
<i>Hymenophyllum wilsonii</i>	I (3)
<i>Agrostis capillaris</i>	I (2)
<i>Blechnum spicant</i>	I (1)
<i>Oxalis acetosella</i>	I (1)
<i>Rumex acetosa</i>	I (1)
Slope (degrees)	10-30
Aspect (degrees)	
Shade	None to slight
Run off	None to moderate
Drainage	Moderate
Rain shelter	None to slight (to moderate)
Altitude (m)	580-850
Number of samples	5

### 3.3.51 SS Q1 *Racomitrium lanuginosum* community (Table 56)

#### Synonyms

None are known.

#### Constant species

*Diplophyllum albicans* and *Racomitrium lanuginosum*.

#### Description and ecology

This is a community often comprising almost pure colonies of the moss *Racomitrium lanuginosum*, which forms extensive mats and cushions amongst the boulders in block scree, where it can be conspicuous and abundant. There may be slight soil accumulation beneath the moss, but stands dry out readily. In shallow open cavities in block scree, where there is more shelter, a more species-rich stand can develop, with bryophytes including *Barbilophozia floerkei* and *Polytrichum alpinum*. In conditions of more prolonged moisture, the community can give way to P3. Where there is greater soil depth, it can grade rapidly into grass or heath. Occasionally the community occurs on the tops of single boulders, as on Beinn Heasgarnich.

#### Annex I habitats

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): all samples were taken from block scree.

#### Conservation interest

This is a species-poor community with no rare species.

#### Differentiation from other communities

P3 differs in the presence of *Mylia taylorii*.

**Coverage and integrity**

Although this community is based on a single species, the species-poor mats of this community are widespread and frequent.

**Table 56:** Floristic and environmental data for SS Q1 *Racomitrium lanuginosum* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Racomitrium lanuginosum</i>	V (7-10)
<i>Diplophyllum albicans</i>	IV (1-4)
<i>Porpidia tuberculosa</i>	III (2-4)
<i>Polytrichum alpinum</i>	II (3-5)
<i>Cladonia diversa</i>	II (1-2)
<i>Barbilophozia floerkei</i>	I (5)
<i>Polytrichum formosum</i>	I (4)
<i>Porpidia macrocarpa</i>	I (4)
<i>Fuscidea kochiana</i>	I (2)
<i>Dicranum scoparium</i>	I (2)
<i>Nardia scalaris</i>	I (2)
<i>Racomitrium sudeticum</i>	I (2)
<i>Stereocaulon vesuvianum</i>	I (2)
<i>Cladonia furcata</i>	I (2)
<i>Hylocomium splendens</i>	I (2)
<i>Cladonia subcervicornis</i>	I (1)
<i>Hypnum jutlandicum</i>	I (1)
<i>Porpidia irrigua</i>	I (1)
<i>Rhytidiadelphus loreus</i>	I (1)
<i>Micarea marginata</i>	I (1)
<i>Micarea lignaria</i> var. <i>lignaria</i>	I (1)
<i>Omphalina ericetorum</i>	I (1)
<i>Plagiothecium undulatum</i>	I (1)
<i>Rhizocarpon reductum</i>	I (1)
<i>Trapelia coarctata</i>	I (1)
<i>Trapelia placodioides</i>	I (1)
Rock	V (2-5)
<i>Huperzia selago</i>	II (1)
<i>Cryptogramma crista</i>	I (5)
<i>Deschampsia flexuosa</i>	I (4)
<i>Festuca ovina</i>	I (4)
<i>Vaccinium myrtillus</i>	I (4)
<i>Oxalis acetosella</i>	I (2)
<i>Alchemilla alpina</i>	I (2)
Slope (degrees)	19 (0-30)
Shade	None to slight
Run off	None to slight
Drainage	Moderate to good

Rain shelter	None (to moderate)
Altitude (m)	803 (670-930)
Number of samples	7

### 3.3.52 SS T1 *Ramalina siliquosa*-*R. subfarinacea* community (Table 57)

#### Synonyms

*Ramalinetum scopularis* Klem. (James *et al.*, 1977).

#### Constant species

*Lecanora intricata*, *Ramalina siliquosa* and *R. subfarinacea*.

#### Description and ecology

A community dominated by the macrolichens *Ramalina siliquosa* and *R. subfarinacea*. Stands were developed on exposed tors and boulders, often close to minor bird perches. Samples are available only from Carn Ingli (S.W. Wales), a site on the borders of upland Britain, and close to the sea. *R. siliquosa* can be found far inland in a few sites in Britain, but it is principally a coastal species.

#### Annex I habitats

This community was not recorded in these habitats during the survey.

#### Conservation interest

The typical species of this community are widespread.

#### Coverage and integrity

Few samples are available. This community is of borderline relevance to upland sites.

**Table 57:** Floristic and environmental data for SS T1 *Ramalina siliquosa*-*R. subfarinacea* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data			
	212	226	273	278
<i>Ramalina subfarinacea</i>	6	4	4	2
<i>Ramalina siliquosa</i>		7	8	7
<i>Lecanora intricata</i>	6		4	3
<i>Pertusaria pseudocorallina</i>	5			1
<i>Candelariella coralliza</i>	4	4		
<i>Xanthoria candelaria</i>	1	4		
<i>Lecanora gangaleoides</i>	1			4
<i>Acarospora fuscata</i>			2	
<i>Parmelia omphalodes</i>	2			

<i>Prasiola crispa</i>		1		
Rock	3	5	7	7
Slope (degrees)	60	95	?	40
Aspect (degrees)	140	275	?	350
Shade	None	None	None	None
Run off		None		
Drainage		Good		
Rain shelter	None			None
Altitude (m)	300	280	220	
Quadrat size (cm)	25 x 25	25 x 25	25 x 25	25 x 25
Vice-county	45	45	45	45
Grid ref.	22/051.373	22/041.370	22/048.379	22/047.379
Date	19 Sep 1998	20 Sep 1998	24 Sep 1998	24 Sep 1998
SAC/site code	Carn Inqli	Carn Inqli	Carn Inqli	Carn Inqli

### 3.3.53 SS U1 *Isothecium myosuroides*-*Sphaerophorus globosus* community (Table 58)

#### Synonyms

*Parmelietum laevigatae* James *et al.*, (James *et al.*, 1977).

#### Constant species

*Cladonia squamosa*, *Dicranum scoparium*, *Isothecium myosuroides* and *Sphaerophorus globosus*.

#### Description and ecology

This is a community of robust bryophytes and macrolichens of acid rocks and trees in woodland. Five samples are available from rock in western and north-western Wales. In addition to the constant species, important species included the hepatic *Scapania gracilis* and the foliose lichens *Hypotrachyna laevigata*, *H. revoluta* and *H. taylorensis*.

Samples occurred on boulders and bedrock in semi-natural *Quercus petraea* woodland. The community is widespread in high-rainfall areas of northern and western Britain, where it is abundant on bark and also occurs on rocks within the woodland.

Twenty-three additional samples were available from acid bark in north-western Wales; these differed from the saxicolous samples in a number of ways, including the greater abundance of the bryophytes *Frullania tamarisci* and *Hypnum andoi*.

#### Annex I habitats

This community was not recorded in Annex I rock habitats during the survey.

### Conservation interest

This is one of the most important communities in semi-natural woodland in upland Britain, and it contains a number of uncommon species, including the lichen *Hypotrachyna taylorensis*.

### Coverage and integrity

Few samples are available from rock. The relationship of this community to other woodland rock communities, including mossy stands similar to this community but with few lichens, needs to be studied.

**Table 58:** Floristic and environmental data for SS U1 *Isothecium myosuroides*-*Sphaerophorus globosus* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data	
	Samples from rock	Samples from rock and bark
<i>Hypnum andoi</i>	II (2-4)	IV (2-7)
<i>Flavoparmelia caperata</i>	II (1-4)	IV (1-7)
( <i>Cladonia squamosa</i> both vars.)	IV (1-4)	IV (1-5)
<i>Cladonia polydactyla</i>	III (1-3)	IV (1-4)
<i>Isothecium myosuroides</i>	IV (4-8)	II (4-8)
<i>Sphaerophorus globosus</i>	IV (1-6)	II (1-6)
<i>Hypotrachyna taylorensis</i>	II (6-8)	III (5-8)
<i>Hypotrachyna laevigata</i>	I (5)	III (2-6)
<i>Dicranum scoparium</i>	IV (1-5)	III (1-5)
<i>Cladonia squamosa</i> var. <i>squamosa</i>	III (1-4)	III (1-5)
<i>Parmelia saxatilis</i>	II (2-4)	III (1-5)
<i>Microlejeunea ulicina</i>	I (2)	III (1-4)
<i>Frullania tamarisci</i>		II (2-5)
<i>Hypotrachyna revoluta</i>	II (1-6)	II (1-6)
<i>Parmelinopsis horrescens</i>	I (1)	II (1-6)
<i>Hypogymnia physodes</i>		II (1-5)
<i>Ochrolechia androgyna</i>		II (1-5)
<i>Usnea flamma</i>	II (2)	II (1-4)
<i>Cladonia coniocraea</i>	I (1)	II (1-4)
<i>Trapelia corticola</i>		II (1-4)
<i>Micarea xanthonica</i>	II (1)	II (1-3)
<i>Anisomeridium ranunculosporum</i>		I (5)
<i>Micarea viridileprosa</i>		I (5)
<i>Ochrolechia tartarea</i>		I (5)
<i>Hypotrachyna britannica</i>	I (4)	I (4)
<i>Lophozia ventricosa</i>	I (4)	I (4)
<i>Trapelia involuta</i>	II (3)	I (3)

<i>Metzgeria temperata</i>		I (3)
<i>Scapania gracilis</i>	III (2-5)	I (2-5)
<i>Menegazzia terebrata</i>		I (2-4)
<i>Lepraria membranacea</i>	II (2-3)	I (2-3)
<i>Polytrichum formosum</i>	II (2)	I (2)
<i>Barbilophozia attenuata</i>	I (2)	I (2)
<i>Diplophyllum albicans</i>	I (2)	I (2)
<i>Enterographa zonata</i>	I (2)	I (2)
<i>Lepraria elobata</i>	I (2)	I (2)
<i>Ptilidium ciliare</i>	I (2)	I (2)
<i>Trapelia placodioides</i>	I (2)	I (2)
Indet. lichen crusts		I (2)
<i>Megalaria pulverea</i>		I (2)
<i>Pertusaria amara</i>		I (2)
<i>Cladonia digitata</i>		I (2)
<i>Lecanora expallens</i>		I (2)
<i>Micarea synotheoides</i>		I (2)
<i>Rhaphidocyrtis trichosporella</i>		I (2)
<i>Usnea cornuta</i>		I (2)
<i>Cetrelia olivetorum</i>	I (2)	I (1-5)
<i>Micarea prasina</i>		I (1-5)
<i>Mycoblastus fucatus</i>		I (1-5)
<i>Campylopus flexuosus</i>	II (1-4)	I (1-4)
<i>Cladonia furcata</i>	II (1-4)	I (1-4)
<i>Cladonia squamosa</i> var. <i>subsquamosa</i>	II (1-2)	I (1-4)
<i>Lepidozia reptans</i>	II (1)	I (1-4)
<i>Placynthiella icmalea</i>	II (1)	I (1-4)
<i>Trentepohlia abietina</i>		I (1-4)
<i>Evernia prunastri</i>		I (1-4)
<i>Loxospora elatina</i>		I (1-4)
<i>Platismatia glauca</i>		I (1-4)
<i>Cladonia ochrochlora</i>	I (1)	I (1-3)
<i>Cladonia chlorophaea</i>		I (1-3)
<i>Mycoblastus caesius</i>		I (1-3)
<i>Cladonia caespiticia</i>	II (1-2)	I (1-2)
<i>Trapeliopsis granulosa</i>	II (1)	I (1-2)
<i>Melanelia fuliginosa</i> subsp. <i>glabratula</i>	II (1)	I (1-2)
<i>Cephaloziella</i> spp.	I (1)	I (1-2)
<i>Cladonia diversa</i>	I (1)	I (1-2)
<i>Omphalina ericetorum</i>	I (1)	I (1-2)
<i>Lepraria rigidula</i>		I (1-2)
<i>Dimerella lutea</i>		I (1-2)
<i>Lepraria sylvicola</i>		I (1-2)
<i>Lepraria incana</i>		I (1-2)
<i>Cladonia norvegica</i>	I (1)	I (1)
<i>Baeomyces rufus</i>	I (1)	I (1)



<i>Cystocoleus ebeneus</i>	I (1)	I (1)
<i>Diploschistes scruposus</i>	I (1)	I (1)
<i>Lecanora gangaleoides</i>	I (1)	I (1)
<i>Psilolechia lucida</i>	I (1)	I (1)
<i>Racomitrium fasciculare</i>	I (1)	I (1)
<i>Rhizocarpon reductum</i>	I (1)	I (1)
<i>Plagiochila porelloides</i>	I (1)	I (1)
<i>Cladonia</i> spp. (PD + red)		I (1)
<i>Leucobryum juniperoideum</i>		I (1)
<i>Normandina pulchella</i>		I (1)
<i>Parmotrema chinense</i>		I (1)
<i>Dimerella pineti</i>		I (1)
<i>Graphis scripta</i>		I (1)
<i>Lophocolea bidentata</i>		I (1)
<i>Micarea peliocarpa</i>		I (1)
<i>Pertusaria hemisphaerica</i>		I (1)
<i>Pertusaria pertusa</i>		I (1)
<i>Plagiochila punctata</i>		I (1)
<i>Ropalospora viridis</i>		I (1)
<i>Usnea rubicunda</i>		I (1)
Bark		V (0-6)
Rock	V (2-5)	I (2-5)
<i>Deschampsia flexuosa</i>	II (2-4)	I (2-4)
<i>Sedum anglicum</i>	I (2)	I (2)
<i>Polypodium vulgare</i>	I (1)	I (1-2)
<i>Umbilicus rupestris</i>	I (1)	I (1)
Slope (degrees)	64 (40-80)	
Aspect (degrees)		
Shade	Slight to moderate	
Run off	Slight to moderate	
Drainage	Good	
Rain shelter	None	
Altitude (m)	50-200	
Number of samples	5	28

### 3.3.54 SS V1 *Staurothele succedens*-*Thelidium papulare* community (Table 59)

#### Synonyms

None are known.

#### Constant species

*Staurothele succedens*.

#### Description and ecology

A community dominated by crustose lichens on damp calcareous rock. The crustose pyrenocarpous lichens *Staurothele succedens* and *Thelidium papulare* are constant and

frequent respectively; *Opegrapha dolomitica* and *Verrucaria viridula* are occasional. Bryophytes are absent or present only at low cover, with *Blindia acuta* the most frequent species. Stands of this community were recorded on limestone and calcareous sandstone; on damp cliffs, flushed bedrock, stones in a small stream, and on stones on flushed rock surfaces.

### Annex I habitats

This community was not recorded in these habitats during the survey.

### Conservation interest

This community includes several Nationally Scarce species, including *Staurothele rugulosa*, *S. succedens* and *Thelidium papulare*.

### Differentiation from other communities

N2 differs from other communities in the abundance of *Blindia acuta* and other bryophytes. Some freshwater stands are close floristically to V1 but are provisionally distinguished by the presence of *Polyblastia cruenta*, or by the greater abundance of the distinctly freshwater species *Staurothele fissa* and freshwater species of *Verrucaria* (*V. aethiobola*, *V. latebrosa* and others). X1 is somewhat more montane in character and includes the lichen species *Catapyrenium lachneum*, *Collema glebulentum*, *Koerbeiella wimmeriana* and *Placynthium* spp., and the moss *Racomitrium ellipticum*. W1 differs in the scarcity of pyrenocarpous lichens and the presence of at least small amounts of macrolichens including *Collema* and *Dermatocarpon* species. SL 14 differs mainly in the abundance of *Gyalecta jenensis*.

### Coverage and integrity

Few samples are available.

**Table 59:** Floristic table for SS V1 *Staurothele succedens*-*Thelidium papulare* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Staurothele succedens</i>	V (4-7)
<i>Thelidium papulare</i>	IV (1-7)
<i>Gymnostomum aeruginosum</i>	III (1-4)
<i>Verrucaria viridula</i>	II (5-6)
<i>Blindia acuta</i>	II (4-5)
<i>Verrucaria margacea</i>	II (4)
<i>Gyalecta jenensis</i>	II (2-6)
<i>Trentepohlia aurea</i>	II (2-3)
<i>Opegrapha dolomitica</i>	II (1-6)
<i>Hygrohypnum luridum</i>	II (1-5)
<i>Ctenidium molluscum</i>	II (1)
<i>Trapelia coarctata</i>	II (1)
<i>Porpidia rugosa</i>	I (7)
<i>Bryoerythrophyllum recurvirostrum</i>	I (4)

<i>Rivularia haematites</i>	I (4)
<i>Staurothele rugulosa</i>	I (4)
<i>Trapelia placodioides</i>	I (4)
<i>Porpidia macrocarpa</i>	I (3)
<i>Seligeria recurvata</i>	I (3)
<i>Eucladium verticillatum</i>	I (2)
<i>Polyblastia melaspora</i>	I (2)
<i>Polyblastia theleodes</i>	I (2)
<i>Metamelaena umbonata</i>	I (2)
<i>Thelidium fontigenum</i>	I (2)
<i>Verrucaria hydrela</i>	I (2)
<i>Aneura pinguis</i>	I (1)
<i>Jungermannia atrovirens</i>	I (1)
<i>Lejeunea cavifolia</i>	I (1)
<i>Placynthium tremniacum</i>	I (1)
<i>Preissia quadrata</i>	I (1)
<i>Seligeria trifaria</i>	I (1)
<i>Thelidium pluvium</i>	I (1)
<i>Verrucaria aethiobola</i>	I (1)
Soil	I (4)
Rock	V (1-8)
<i>Festuca vivipara</i>	I (1)
<i>Pinguicula vulgaris</i>	I (1)
Slope (degrees)	52 (0-105)
Aspect (degrees)	
Shade	None-slight(-moderate)
Run off	None-strong
Drainage	Poor-good
Rain shelter	None-slight
Altitude (m)	452 (160-700)
Number of samples	11

### 3.3.55 SS W1 *Dermatocarpon intestiniforme*-*Collema flaccidum* community (Table 60)

#### Synonyms

None are known.

#### Constant species

None.

#### Description and ecology

A provisional community containing macrolichens on flushed calcareous rocks. The macrolichens *Collema flaccidum* and *Dermatocarpon intestiniforme* and the crustose *Porpidia rugosa* are frequent.

Three of the few samples available were from flushed, but seasonally dry, basalt rock faces in a single locality; with increased flushing these rapidly graded into stands of SL 1 or SL 2. Two other samples are from flushed limestone and dolerite cliffs, and contain at least small amounts of macrolichens and mosses (both contain some *Dermatocarpon miniatum* and *Pseudoleskiella catenulata*).

### Annex I habitats

This community was not recorded in any Annex I habitats during the survey.

### Conservation interest

Two samples contained the Nationally Scarce moss *Pseudoleskiella catenulata*.

### Differentiation from other communities

V1 differs in the scarcity of macrolichens and bryophytes. X1 also occurs on damp calcareous rocks, but has a different suite of species, including *Catapyrenium lachneum* and *Collema glebulentum*. *D. intestiniforme* is sometimes found on intermittently inundated rocks in the flood zone of rivers.

### Coverage and integrity

This is a provisional community based on very few samples, three of which were from the same locality. Many more samples are needed to understand this community more fully.

**Table 60:** Floristic and environmental data for SS W1 *Dermatocarpon intestiniforme*-*Collema flaccidum* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data				
	111	112	113	125	84
<i>Dermatocarpon intestiniforme</i>	6	7	4		
<i>Porpidia rugosa</i>	4	1		5	
<i>Collema flaccidum</i>	3	1		5	
<i>Amphidium mougeotii</i>		4	4		
<i>Tortella tortuosa</i>				4	2
<i>Pseudoleskiella catenulata</i>				4	1
<i>Dermatocarpon miniatum</i>				2	2
<i>Porpidia speirea</i>	2	1			
<i>Schistidium apocarpum</i>				5	
<i>Thelidium papulare</i>					4
<i>Porpidia macrocarpa</i>			4		
<i>Didymodon spadiceus</i>					4
<i>Rhizocarpon lavatum</i>			3		
<i>Agonimia tristicula</i>				3	
<i>Racomitrium ellipticum</i>			3		
<i>Bryum alpinum</i>			3		

<i>Pertusaria lactea</i>	2				
<i>Ephebe lanata</i>			2		
<i>Trentepohlia aurea</i>					2
<i>Anomobryum julaceum</i>			2		
<i>Gyalecta jenensis</i>					2
<i>Andreaea rothii</i> subsp. <i>rothii</i>			2		
<i>Campylopus atrovirens</i>			2		
<i>Catapyrenium pilosellum</i>	2				
<i>Collema auriforme</i>					2
<i>Cololejeunea calcarea</i>					2
<i>Hypnum lacunosum</i>				2	
<i>Koerberiella wimmeriana</i>			2		
<i>Lempholemma cladodes</i>					2
<i>Radula complanata</i> / <i>lindenbergiana</i>				2	
<i>Schistidium strictum</i>		2			
<i>Frullania tamarisci</i>				1	
<i>Gymnostomum aeruginosum</i>					1
<i>Acarospora sinopica</i>				1	
<i>Bryum capillare</i>					1
<i>Catillaria chalybeia</i>				1	
<i>Clauzadea monticola</i>					1
<i>Dicranum scoparium</i>		1			
<i>Frullania fragilifolia</i>	1				
<i>Lecidella scabra</i>				1	
<i>Leptogium gelatinosum</i>				1	
Rock	8	8	7	6	9
<i>Sedum rosea</i>		1			
Slope (degrees)	85	70	50	80	75
Aspect (degrees)	190	190	265	260	30
Shade	None	None	None	None	None
Run off				Moderate	Moderate
Drainage		Good		Good	Good
Rain shelter		None		None	None
Altitude (m)	510	510	510	550	300
Quadrat size (cm)	25 x 25	25 x 25	25 x 25	100 x 25	25 x 25
Vice-county	49	49	49	69	108
Grid ref.	23/	23/557. 474	23/558. 474	35/7444. 2575	29/2695. 1698
Date	12 May 1998	12 May 1998	12 May 1998	19 Jun 2005	18 May 2004
SAC/site code	E	E	E	NP	INCH

### 3.3.56 SS X1 *Blindia acuta*-*Racomitrium ellipticum* community (Table 61)

#### Synonyms

None are known.

#### Constant species

*Blindia acuta*.

#### Description and ecology

This community occurs on unshaded, damp, base-rich, montane rock. The moss *Blindia acuta* is constant but does not become dominant, and the moss *Racomitrium ellipticum* and the crustose lichen *Thelidium papulare* are frequent. Species which are only occasional or scarce, but which are more or less faithful to this community include *Catapyrenium lachneum*, *Collema glebulentum*, *Koerberiella wimmeriana*, *Lempholemma radiatum*, *Placynthium asperellum*, and *P. pannariellum*.

Samples were recorded at 430-1000 m altitude, on siliceous rocks including basic tuff and mica-schist, on cliffs and on low outcrops that are seasonally flushed. Some stands were dark in colour from the presence of abundant cyanobacteria and are probably wet for most of the year.

#### Annex I habitats

This community was not recorded in these habitats during the survey.

#### Conservation interest

This is a significant community likely to contain uncommon species. Those found during the survey included *Lempholemma radiatum*, *Placynthium asperellum* and *P. pannariellum* (Near Threatened), and *Catapyrenium lachneum* and *Koerberiella wimmeriana* (Nationally Scarce).

#### Coverage and integrity

The community is rather heterogeneous as defined here, with only one constant species (also found in other communities) and few frequent species. Many more samples are needed to understand this community.

**Table 61:** Floristic and environmental data for SS X1 *Blindia acuta*-*Racomitrium ellipticum* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max over)/ Environmental data</b>
<i>Blindia acuta</i>	IV (1-7)
<i>Racomitrium ellipticum</i>	III (1-5)
<i>Thelidium papulare</i>	III (1-4)
<i>Catapyrenium lachneum</i>	II (2-6)
<i>Placynthium flabellum</i>	II (2-6)
<i>Ephebe lanata</i>	II (2-4)
<i>Frullania tamarisci</i>	II (2-3)
<i>Rhizocarpon lavatum</i>	II (1-7)
<i>Rhizocarpon petraeum</i>	II (1-7)
<i>Collema glebulentum</i>	II (1-6)
<i>Porpidia superba</i> f. <i>superba</i>	II (1-4)
<i>Amphidium mougeotii</i>	II (1-3)
<i>Amygdalaria consentiens</i>	I (5)
<i>Pertusaria lactea</i>	I (4-6)
<i>Grimmia torquata</i>	I (4)
<i>Lempholemma radiatum</i>	I (4)
<i>Koerberiella wimmeriana</i>	I (3-4)
<i>Racomitrium sudeticum</i>	I (3-4)
<i>Collema tenax</i>	I (3)
<i>Placynthium asperellum</i>	I (3)
<i>Trichostomum brachydontium</i>	I (3)
<i>Ionaspis lacustris</i>	I (2-5)
<i>Porpidia islandica</i>	I (2-5)
<i>Gyalecta jenensis</i>	I (2)
<i>Tortella tortuosa</i>	I (2)
<i>Trentepohlia aurea</i>	I (2)
<i>Agonimia tristicula</i>	I (2)
<i>Andreaea rupestris</i>	I (2)
<i>Anomobryum julaceum</i>	I (2)
<i>Eurhynchium myosuroides</i> var. <i>brachytheციoides</i>	I (2)
<i>Fuscidea lygaea</i>	I (2)
<i>Lempholemma cladodes</i>	I (2)
<i>Marsupella emarginata</i>	I (2)
<i>Molendoa warburgii</i>	I (2)
<i>Plagiochila porelloides</i>	I (2)
<i>Polyblastia theleodes</i>	I (2)
<i>Porina lectissima</i>	I (2)
<i>Racomitrium aquaticum</i>	I (2)
<i>Scapania undulate</i>	I (2)
<i>Schistidium strictum</i>	I (2)
<i>Staurothele succedens</i>	I (2)
<i>Tritomaria quinqueidentata</i>	I (2)

<i>Polyblastia cruenta</i>	I (1-5)
<i>Porpidia rugosa</i>	I (1-5)
<i>Polyblastia melaspora</i>	I (1-4)
<i>Staurothele rugulosa</i>	I (1-4)
<i>Cololejeunea calcarea</i>	I (1-2)
<i>Cladonia subcervicornis</i>	I (1)
<i>Collemopsidium caesium</i>	I (1)
<i>Amphidium lapponicum</i>	I (1)
<i>Didymodon ferrugineus</i>	I (1)
<i>Diplophyllum albicans</i>	I (1)
<i>Fissidens dubius</i>	I (1)
<i>Fissidens osmundoides</i>	I (1)
<i>Lecidella stigmataea</i>	I (1)
<i>Pyrenopsis grumulifera</i>	I (1)
<i>Pyrenopsis</i> sp. (BH)	I (1)
<i>Racomitrium aciculare</i>	I (1)
<i>Rhizocarpon amphibium</i>	I (1)
<i>Rhizocarpon reductum</i>	I (1)
<i>Scoliciosporum umbrinum</i>	I (1)
<i>Stereocaulon plicatile/tornense</i>	I (1)
<i>Trapelia placodioides</i>	I (1)
Rock	
<i>Festuca vivipara</i>	I (1)
<i>Huperzia selago</i>	I (1)
<i>Minuartia verna</i>	I (1)
<i>Poa alpina</i>	I (1)
Slope (degrees)	35-95 (73)
Shade	None-slight
Run off	Moderate-strong
Drainage	Good
Rain shelter	None(-slight)
Altitude (m)	430-1000 (612)
Number of samples	13

### 3.4 Communities on limestone and highly calcareous siliceous rock

#### 3.4.1 SL 1 *Caloplaca saxicola*-*Lecanora albescens* community (Table 62)

##### Synonyms

*Dirinetum stenhammeriae* (DR) James *et al* 1977 p.p. (James *et al*, 1977).

##### Constant species

*Caloplaca citrina* agg., *C. saxicola*, *Diplotomma alboatrum* and *Lecanora albescens*.



## Description and ecology

Lichens dominate this community occurring on dry calcareous rock faces. The dominant species are yellow *Caloplaca* and whitish *Lecanora*. The yellow, minutely lobed thalli of *Caloplaca saxicola* and the whitish thalli of *Diplotomma alboatrum* and *Lecanora albescens* are constant and often conspicuous, sometimes with the yellow *C. flavescens*, *C. obliterans* (on siliceous rock) and the pale *L. crenulata* and *L. dispersa*. *C. flavescens* can be conspicuous, but it is usually better developed on less rain-sheltered rocks.

Stands are developed on steep or overhanging, well-lit or lightly shaded cliffs of limestone or calcareous siliceous rocks; they are typically partly sheltered from direct rainfall and receive at most slight run off from rocks higher up. Trees lightly shade some stands. Stands can grade rapidly into other communities with slight changes in the slope of the rock surface and degree of run off received. With slightly greater rain-shelter the community grades into SL 2, while in more humid overhangs SL 3 replaces it. This is a relatively lowland and southern community, recorded from limestone in North Wales (Berwyn) and northern England (Derbyshire Dales), and from a south-facing siliceous cliff at one locality in the Lake District.

## Conservation interest

*Caloplaca obliterans* is Nationally Scarce; *Lecanora agardhiana* is Nationally Rare but probably misunderstood taxonomically and somewhat under-recorded as a consequence.

## Differentiation from other communities

SL 2 is close, differing in the dominance of *Dirina massiliensis*, while SL 1 is defined as *Dirina* being of lower cover than *Caloplaca saxicola* where both species occur in a sample.

## Coverage and integrity

A fairly distinct and well-characterised community, but doubtless there is much additional variation to be studied; the relationship to species-poor stands dominated by *Lecanora albescens* (frequent on walls) is unclear.

**Table 62:** Floristic and environmental data for SL 1 *Caloplaca saxicola*-*Lecanora albescens* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Lecanora albescens</i>	V (2-8)
<i>Caloplaca saxicola</i>	V (2-6)
<i>Diplotomma alboatrum</i>	IV (1-5)
<i>Caloplaca citrina</i> agg.	IV (1-2)
<i>Lecanora crenulata</i>	III (2-5)
<i>Caloplaca flavescens</i>	III (1-5)
<i>Dirina massiliensis</i> f. <i>sorediata</i>	II (2-5)
<i>Caloplaca obliterans</i>	I (5)
<i>Lecanora agardhiana</i>	I (3)
<i>Lecanora dispersa</i>	I (2-4)

<i>Caloplaca holocarpa</i>	I (2)
<i>Verrucaria</i> spp.	I (1-5)
<i>Aspicilia calcarea</i>	I (1-4)
<i>Verrucaria nigrescens</i>	I (1-2)
<i>Verrucaria fusconigrescens</i>	I (1)
<i>Lecania inundata</i>	I (1)
<i>Grimmia pulvinara</i>	I (1)
<i>Acrocordia conoidea</i>	I (1)
<i>Lecania turicensis</i>	I (1)
<i>Thelidium decipiens</i>	I (1)
<i>Tortula muralis</i>	I (1)
Rock	V (4-8)
Slope (degrees)	90 (80-100)
Shade	None to slight (to moderate)
Run off	None to slight
Drainage	Good
Rain shelter	Slight to strong
Altitude (m)	350-380
Number of samples	10

### 3.4.2 SL 2 *Dirina massiliensis*-*Caloplaca saxicola* community (Table 63)

#### Synonyms

*Dirina stenhammeri* (DR) James *et al* 1977 p.p. (James *et al*, 1977).

#### Constant species

*Caloplaca flavescens*, *C. saxicola* and *Dirina massiliensis* f. *sorediata*.

#### Description and ecology

A community dominated by the pale crustose lichen *Dirina massiliensis* f. *sorediata*. Most other species are shared with SL 1, including *Caloplaca saxicola* and *Lecanora albescens*.

#### Conservation interest

*Lecanora agardhiana* is Nationally Rare but probably misunderstood taxonomically and somewhat under-recorded as a consequence.

#### Differentiation from other communities

SL 1 is close, differing in the absence or low cover of *Dirina*, while SL 2 is defined as *Dirina* being of higher cover than *Caloplaca saxicola* in cases where both species occur in a sample. With slightly less rain-shelter the community grades into SL 1. This is a relatively lowland and southern community, recorded from limestone in North Wales (Berwyn) and northern England (Derbyshire Dales), and from a south-facing siliceous cliff at one locality in the Lake District.

### Coverage and integrity

This is a relatively well-characterised community. Very close in floristics to SL 1, but the conspicuous dominance of *D. massiliensis* in some stands seems to justify the separation of the two communities.

**Table 63:** Floristic data for SL 2 *Dirina massiliensis-Caloplaca saxicola* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Dirina massiliensis</i> f. <i>sorediata</i>	V (4-9)
<i>Caloplaca saxicola</i>	V (2-5)
<i>Caloplaca flavescens</i>	IV (1-3)
<i>Lecanora albescens</i>	III (1-4)
<i>Lecanora crenulata</i>	III (1-3)
<i>Diplotomma alboatrum</i>	II (1-3)
<i>Lecanora dispersa</i>	II (1-2)
<i>Aspicilia calcarea</i>	I (4)
<i>Leproplaca chrysodeta</i>	I (3)
<i>Diploicia canescens</i>	I (1)
<i>Caloplaca citrina</i> agg.	I (2)
<i>Verrucaria</i> spp.	I (2)
<i>Lecanora agardhiana</i>	I (2)
<i>Lecania inundata</i>	I (2)
<i>Catillaria lenticularis</i>	I (1)
<i>Lepraria lesdainii</i>	I (1)
<i>Verrucaria baldensis</i>	I (1)
Rock	V (5-8)
Slope (degrees)	93 (75-115)
Aspect (degrees)	
Shade	None to slight (to moderate)
Run off	None to slight
Drainage	Good
Rain shelter	Slight to strong
Altitude (m)	
Number of samples	8

### 3.4.3 SL 3 *Botryolepraria lesdainii*-*Leproplaca chrysodeta* community (Table 64)

#### Synonyms

*Leproplacetum chrysodetae* James *et al* 1977 p.p. (James *et al.*, 1977).

#### Constant species

*Botryolepraria lesdainii* and *Leproplaca chrysodeta*.

## Description and ecology

A community dominated by two sterile lichen species of humid calcareous overhangs. *Botryolepraria lesdainii* forms green, soft, spongy thalli, and *Leproplaca chrysodeta* forms dull orange powdery colonies. The narrow-leaved pleurocarpous moss *Rhynchostegiella tenella* is frequent.

The community develops in recesses, typically at the base of cliffs and outcrops of limestone and calcareous siliceous rocks, which are rain-sheltered and often strongly shaded, but which are more or less humid. *L. chrysodeta* is apparently less confined to humid microhabitats than *B. lesdainii*, and dominates some of the more exposed stands. The community is more frequent in areas of drier climate, and was recorded during the survey from Cadair Idris, Berwyn, Derbyshire Dales and Ingleborough, but not from the more northerly limestone sites. The community is widespread in Britain, and occurs on shaded walls as well as natural rock.

## Conservation interest

No uncommon species were recorded.

## Coverage and integrity

This is a reasonably well-characterised community.

**Table 64:** Floristic data for SL 3 *Botryolepraria lesdainii*-*Leproplaca chrysodeta* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Botryolepraria lesdainii</i>	V (1-8)
<i>Leproplaca chrysodeta</i>	IV (1-8)
<i>Rhynchostegiella tenella</i>	III (2-5)
<i>Porina linearis</i>	II (2-4)
<i>Thamnobryum alopecurum</i>	II (1-4)
<i>Eurhynchium hians</i>	I (7)
<i>Eucladium verticillatum</i>	I (5)
<i>Neckera crispa</i>	I (4-5)
<i>Didymodon insulanus</i>	I (4)
<i>Verrucaria baldensis</i>	I (4)
<i>Caloplaca citrina</i> (s.s.)	I (3)
<i>Caloplaca citrina</i> agg.	I (3)
<i>Diplotomma alboatrum</i>	I (3)
<i>Caloplaca flavescens</i>	I (2-4)
<i>Lepraria eburnea</i>	I (2-4)
<i>Collema auriforme</i>	I (2)
<i>Lecanora albescens</i>	I (2)
<i>Lepraria lobificans</i>	I (2)
<i>Lepraria diffusa</i>	I (2)
<i>Pohlia cruda</i>	I (2)
<i>Protoblastenia rupestris</i>	I (2)

Verrucariaceae indet. spp.	I (2)
<i>Lepraria nivalis</i>	I (1-4)
<i>Acrocordia conoidea</i>	I (1-3)
<i>Belonia nidarosiensis</i>	I (1-2)
<i>Neckera complanata</i>	I (1-2)
<i>Verrucaria nigrescens</i>	I (1-2)
<i>Heterocladium heteropterum</i>	I (1)
<i>Isothecium myosuroides</i>	I (1)
<i>Lecania inundata</i>	I (1)
<i>Plagiochila porelloides</i>	I (1)
Rock	V (4-7)
Soil	I (4)
<i>Asplenium trichomanes</i>	I (4)
<i>Trichomanes speciosum</i> (gametophyte)	I (1)
<i>Urtica dioica</i>	I (1)
Slope (degrees)	80 (45-100)
Shade	(Slight to) moderate to strong
Run off	None to slight
Drainage	Moderate to good
Rain shelter	Moderate to strong
Altitude (m)	To 590
Number of samples	10

### 3.4.4 SL 4 *Lepraria nivalis* community (Table 65)

#### Synonyms

*Leproplacetum chrysodetae* James *et al* 1977 p.p. (James *et al*, 1977).

#### Constant species

*Lepraria nivalis*.

#### Description and ecology

A community dominated by the white, soft, sterile thalli of *Lepraria nivalis* on rain-sheltered calcareous rock faces. The bright yellow *Leproplaca xantholyta* is sometimes conspicuous, and may occur without *Lepraria nivalis*. Bryophytes are very scarce, the lichens occurring directly on rock.

The community develops on steep or overhanging faces on cliffs and outcrops of limestone and on calcareous siliceous rock where there is some shelter from rain. It avoids exposed and drought-prone microhabitats, occurring under the shelter of trees or on more or less north-facing outcrops. As rain-shelter becomes less, stands can grade rapidly into bryophyte-dominated communities.

**Conservation interest**

No uncommon species were recorded.

**Coverage and integrity**

This community is distinguished by the abundance of a single species, while associated species can vary greatly between stands. However, the recognition of this community seems to be justified.

**Table 65:** Floristic data for SL 4 *Lepraria nivalis* community

<i>Species/Environmental factor</i>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Lepraria nivalis</i>	V (4-8)
<i>Porina linearis</i>	III (2-5)
<i>Belonia nidarosiensis</i>	II (2-5)
<i>Leproplaca chrysodeta</i>	II (1-5)
<i>Gyalecta jenensis</i>	II (1-5)
<i>Clauzadea monticola</i>	I (5)
<i>Verrucaria calciseda</i>	I (5)
<i>Verrucaria viridula</i>	I (5)
<i>Leproplaca xantholyta</i>	I (4-7)
<i>Clauzadea immersa</i>	I (4)
Pink unknown lichen	I (4)
<i>Trichostomum brachydontium</i>	I (4)
<i>Ctenidium molluscum</i>	I (3)
<i>Lepraria lesdainii</i>	I (2-4)
<i>Frullania tamarisci</i>	I (2)
<i>Gymnostomum aeruginosum</i>	I (2)
<i>Haematomma ochroleucum</i>	I (2)
<i>Neckera crispa</i>	I (2)
<i>Opegrapha gyrocarpa</i>	I (2)
<i>Opegrapha</i> spp. indet.	I (2)
<i>Orthothecium intricatum</i>	I (2)
<i>Rhynchostegiella tenella</i>	I (2)
<i>Solenopsora candicans</i>	I (2)
<i>Verrucaria fuscella/polysticta</i>	I (2)
<i>Verrucaria baldensis</i>	I (1-5)
<i>Verrucaria nigrescens</i>	I (1-4)
<i>Caloplaca citrina</i> agg.	I (1-4)
<i>Caloplaca flavescens</i>	I (1-3)
<i>Acrocordia conoidea</i>	I (1-2)
Rock	V (5-8)
<i>Geranium robertianum</i>	I (1)
Slope (degrees)	96 (75-130)
Aspect (degrees)	
Shade	None to moderate

Run off	None to slight
Drainage	Good
Rain-shelter	Slight to moderate
Altitude (m)	75-470
Number of samples	16

### 3.4.5 SL 5 *Aspicilia calcarea-Caloplaca citrina* agg. community (Table 66)

#### Synonyms

*Caloplacetum heppiana* DR. p.p. (James *et al*, 1977).

#### Constant species

*Aspicilia calcarea* and *Caloplaca citrina* agg.

#### Description and ecology

A community dominated by the white crustose lichen *Aspicilia calcarea* occurring on limestone near the crests of outcrops and on boulders. This species is abundant on sunny, exposed, slightly nutrient-enriched limestone, where it can form extensive and conspicuous white colonies which exclude most other species. Although it can occur on more or less level surfaces, it disappears in poorly drained hollows. It is often associated with mild nutrient enrichment from bird perches.

#### Conservation interest

No scarce species were recorded.

#### Differentiation from other communities

This community is very close to SL 6, which differs in the absence or lower cover of *Aspicilia calcarea* (Domin <7).

#### Coverage and integrity

This community is based on the abundance of a single species, but since this species is commonly dominant, it seems to merit recognition.

**Table 66:** Floristic data for SL 5 *Aspicilia calcarea-Caloplaca citrina* agg. community

<i>Species/Environmental factor</i>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Aspicilia calcarea</i>	V (7-9)
<i>Caloplaca citrina</i> agg.	V (1-4)
<i>Caloplaca aurantia</i>	III (2-5)
<i>Lecanora albescens</i>	III (1-3)

<i>Caloplaca flavescens</i>	III (1-2)
<i>Verrucaria calciseda</i>	II (5-6)
<i>Physcia adscendens</i>	II (4-5)
<i>Verrucaria nigrescens</i>	II (1-4)
<i>Lecanora dispersa</i>	II (1-4)
<i>Verrucaria caerulea</i>	II (1-3)
<i>Collema fuscovirens</i>	II (1)
<i>Grimmia pulvinata</i>	II (1)
<i>Tortula muralis</i>	II (1)
<i>Dirina massiliensis</i> f. <i>sorediata</i>	I (5)
<i>Verrucaria baldensis</i>	I (4)
<i>Syntrichia intermedia</i>	I (4)
<i>Caloplaca saxicola</i>	I (4)
<i>Xanthoria parietina</i>	I (4)
<i>Caloplaca holocarpa</i>	I (3)
<i>Clauzadea immersa</i>	I (3)
<i>Lecania erysibe</i>	I (3)
<i>Thelidium decipiens</i>	I (2)
<i>Agonimia tristicula</i>	I (1)
<i>Xanthoria calcicola</i>	I (1)
<i>Thelidium papulare</i>	I (1)
<i>Bryum capillare</i>	I (1)
<i>Hypnum lacunosum</i> var. <i>lacunosum</i>	I (1)
Rock	V (2-5)
<i>Asplenium ruta-muraria</i>	I (1)
Slope (degrees)	45 (0-90)
Aspect (degrees)	
Shade	None
Run off	None to slight
Drainage	Moderate to good
Rain shelter	None
Altitude (m)	300-430
Number of samples	9

### 3.4.6 SL 6 *Aspicilia calcarea*-*Caloplaca flavescens* community (Table 67)

#### Synonyms

*Caloplacetum heppiana* DR. p.p. (James *et al.*, 1977).

#### Constant species

*Aspicilia calcarea*, *Caloplaca citrina* agg., *C. flavescens*, *Lecanora albescens* and *Verrucaria nigrescens*.

#### Description and ecology

Crustose lichens dominate this community on well-lit exposed limestone. Stands are often colourful, with yellow *Caloplaca aurantia*, *C. citrina* agg., *C. flavescens*, and white *Aspicilia*



*calcarea* and *Lecanora albescens*. The pyrenocarpous lichens *Verrucaria baldensis* and *V. nigrescens* are frequent and constant respectively. Foliose lichens and bryophytes are scarce or absent. *Caloplaca cirrochroa* was present on some steep faces.

The community is developed on well-lit surfaces which are typically not or slightly rain-sheltered and which receive little or no run-off, on cliffs, boulders and low rocks level with the ground. With slightly increased rain shelter it can grade into SL 1. Stands are probably often slightly nutrient-enriched from bird perching or from slight flushing. The community is common in warm southerly sites, and was recorded from Wales (Berwyn) and northern England (Derbyshire Dales, Ingleborough and North Pennines) but not from the limestone sites in Scotland (Strath and Inchnadamph).

### Conservation interest

Nationally Rare species recorded in this community include *Verrucaria calciseda* (an under-recorded species); Nationally Scarce species include *Caloplaca ochracea*, *Collema multipartitum*, *Polyblastia albida*, *P. deminuta* and *Staurothele caesia*.

### Differentiation from other communities

SL 2 is close, differing in the dominance of *Dirina*, and defined as *Dirina* being of higher cover than *Caloplaca saxicola* where both species occur in a sample. SL 11 is also closely related, but differs in the absence or scarcity of *Aspicilia calcarea*, *Caloplaca aurantia* and *C. flavescens*; in addition *Caloplaca citrina* agg., *Lecanora albescens* and *Verrucaria calciseda* are preferential for SL 6. Although *C. flavescens* is preferential for SL 6, it is a tolerant species which can sometimes occur in unexpected places, for instance in shaded overhangs, where it is associated with other communities.

### Coverage and integrity

This community is fairly well covered by samples and is a somewhat variable community.

**Table 67:** Floristic data for SL 6 *Aspicilia calcarea*-*Caloplaca flavescens* community

<i>Species/Environmental factor</i>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Caloplaca citrina</i> agg.	V (1-5)
<i>Verrucaria nigrescens</i>	V (1-5)
<i>Aspicilia calcarea</i>	IV (2-6)
<i>Caloplaca flavescens</i>	IV (1-7)
<i>Lecanora albescens</i>	IV (1-6)
<i>Caloplaca aurantia</i>	III (1-7)
<i>Verrucaria baldensis</i>	III (1-6)
<i>Staurothele caesia</i>	II (2-6)
<i>Thelidium decipiens</i>	II (1-5)
<i>Catillaria lenticularis</i>	II (1-4)
<i>Lecanora dispersa</i>	II (1-3)
<i>Verrucaria calciseda</i>	I (4-5)

<i>Caloplaca cirrochroa</i>	I (4)
<i>Belonia nidarosiensis</i>	I (4)
<i>Polyblastia diminuta</i>	I (4)
<i>Verrucaria</i> spp. indet.	I (4)
<i>Physcia adscendens</i>	I (3-4)
<i>Homalothecium sericeum</i>	I (3)
<i>Xanthoria calcicola</i>	I (3)
<i>Candelariella aurella</i>	I (3)
<i>Acrocordia conoidea</i>	I (2-5)
<i>Phaeophyscia orbicularis</i>	I (2-5)
<i>Aspicilia contorta</i> subsp. <i>hoffmanniana</i>	I (2-4)
<i>Lecidella stigmataea</i>	I (2-4)
<i>Protoblastenia rupestris</i>	I (2-4)
<i>Lecanora crenulata</i>	I (2-3)
<i>Verrucaria fuscella/polysticta</i>	I (2-3)
<i>Aspicilia contorta</i> subsp. <i>contorta</i>	I (2)
<i>Verrucaria caerulea</i>	I (2)
<i>Lecania erysibe</i>	I (2)
<i>Grimmia pulvinata</i>	I (2)
<i>Tortula muralis</i>	I (2)
<i>Thelidium papulare</i>	I (2)
<i>Caloplaca flavovirescens</i>	I (2)
<i>Caloplaca lactea</i>	I (2)
<i>Collema crispum</i>	I (2)
<i>Collema multipartitum</i>	I (2)
<i>Placynthium garovaglii</i>	I (2)
<i>Psora lurida</i>	I (2)
<i>Sarcogyne regularis</i>	I (2)
<i>Schistidium crassipilum</i>	I (2)
<i>Caloplaca holocarpa</i>	I (1-5)
<i>Porina linearis</i>	I (1-5)
<i>Clauzadea immersa</i>	I (1-4)
<i>Solenopsora candicans</i>	I (1-4)
<i>Caloplaca ochracea</i>	I (1-4)
<i>Collema fuscovirens</i>	I (1-3)
<i>Diplotomma alboatrum</i>	I (1-3)
<i>Agonimia tristicula</i>	I (1-2)
<i>Syntrichia intermedia</i>	I (1-2)
<i>Lecanora flotowiana</i>	I (1-2)
<i>Orthotrichum anomalum</i>	I (1-2)
<i>Polyblastia albida</i>	I (1-2)
<i>Verrucaria hochstetteri</i>	I (1-2)
<i>Caloplaca saxicola</i>	I (1-2)
<i>Hymenelia prevostii</i>	I (1-2)
<i>Lecanora agardhiana</i>	I (1-2)
<i>Protoblastenia cyclospora</i>	I (1-2)
<i>Staurothele rupifraga</i>	I (1)
<i>Xanthoria parietina</i>	I (1)

<i>Bryum capillare</i>	I (1)
<i>Arthonia lapidicola</i>	I (1)
<i>Caloplaca alociza</i>	I (1)
<i>Candelariella medians</i>	I (1)
<i>Collema auriforme</i>	I (1)
<i>Dermatocarpon miniatum</i>	I (1)
<i>Gyalecta jenensis</i>	I (1)
Indet. lichen crusts	I (1)
<i>Leptogium gelatinosum</i>	I (1)
<i>Leptogium turgidum</i>	I (1)
<i>Placynthium nigrum</i>	I (1)
<i>Porella platyphylla</i>	I (1)
<i>Protoblastenia calva</i>	I (1)
<i>Trichostomum crispulum</i>	I (1)
<i>Verrucaria pinguicula</i>	I (1)
<i>Verrucaria viridula</i>	I (1)
Rock	V (3-8)
<i>Asplenium ruta-muraria</i>	I (1-2)
<i>Sedum acre</i>	I (2)
<i>Festuca ovina</i>	I (1)
<i>Koeleria macrantha</i>	I (1)
<i>Thymus praecox</i>	I (1)
Slope (degrees)	55 (0-130)
Aspect (degrees)	
Shade	None (to slight)
Run off	None to slight (to moderate)
Drainage	(Poor to) moderate to good
Rain shelter	None to slight
Altitude (m)	230-470
Number of samples	30

### 3.4.7 SL 7 *Caloplaca citrina* community (Table 68)

#### Synonyms

None are known.

#### Constant species

*Caloplaca citrina*.

#### Description and ecology

A community dominated by the crustose lichen *Caloplaca citrina*. This forms conspicuous yellow stands in rain-sheltered and somewhat shaded limestone overhangs. The taxon involved is *C. citrina sensu stricto*. The community was rare in the sites studied, but is probably frequent in some lowland areas, including on walls.

**Conservation interest**

The typical species of this community are widespread.

**Differentiation from other communities**

The community is distinguished by the dominance of *Caloplaca citrina sensu stricto*.

**Coverage and integrity**

Distinguished only by the abundance of a single species; the two available samples have no other species in common.

**Table 68:** Floristic data for SL 7 *Caloplaca citrina* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data	
	73	67
<i>Caloplaca citrina</i> (s.s.)	5	7
Indet. lichen crust with <i>Trentepohlia</i>		5
<i>Lecanora albescens</i>	3	
<i>Diplotomma alboatra</i>	2	
<i>Tortula muralis</i>	2	
<i>Didymodon sinuosus</i>		1
<i>Eurhynchium crassinervium</i>		1
<i>Homalothecium sericeum</i>		1
<i>Lecania</i> sp.		1
<i>Amblystegium serpens</i>		1
Rock	8	5
<i>Cardamine hirsuta</i>	1	
Slope (degrees)	80	20
Aspect (degrees)	250	140
Shade	Slight	Slight-moderate
Run off	None	Slight
Drainage	Good	Poor-moderate
Rain shelter		Moderate-strong
Altitude (m)		
Vice-county	57	108
Quadrat size (cm)	25 x 25	25 x 25
Grid ref.	43/1737.7383	29/2525.2208
Date	11 Apr 2002	16 May 2004
SAC/site code	DD	INCH

**3.4.8 SL 8 *Syntrichia intermedia*-*Homalothecium sericeum* community (Table 69)****Synonyms**

None are known.

**Constant species**

*Caloplaca dichroa/flavocitrina*, *Collema fuscovirens*, *Homalothecium sericeum*, *Lecanora albescens* and *Syntrichia intermedia*.

**Description and ecology**

A community dominated by the large acrocarpous moss *Syntrichia intermedia*. This species forms conspicuous cushions on well-lit limestone cliffs and boulders, often where narrow cracks in the rock supply additional moisture to the stand (although the species does not occur within cracks). There is often enough moisture for vascular plants to occur, and *Sedum acre* is constant. Although this is essentially a bryophyte community, many lichens typical of SL 6 occur between the moss cushions. The hepatic *Porella platyphylla* occurs in some stands. With slightly moister conditions the community can give way to stands of the moss *Homalothecium sericeum* (SL 17).

**Conservation interest**

The typical species of this community are widespread.

**Coverage and integrity**

This is a narrowly defined community, but seems to represent one recognisable community intermediate between lichen- and bryophyte dominance.

**Table 69:** Floristic data for SL 8 *Syntrichia intermedia*-*Homalothecium sericeum* community

<i>Species/Environmental factor</i>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Syntrichia intermedia</i>	V (5-8)
<i>Lecanora albescens</i>	V (1-2)
<i>Caloplaca dichroa/flavocitrina</i>	IV (2-3)
<i>Homalothecium sericeum</i>	IV (1-5)
<i>Collema fuscovirens</i>	IV (1-2)
<i>Aspicilia calcarea</i>	III (4)
<i>Verrucaria calciseda</i>	III (2-4)
<i>Verrucaria nigrescens</i>	III (2-4)
<i>Caloplaca flavescens</i>	III (2-3)
<i>Verrucaria fuscella/polysticta</i>	III (1-2)
<i>Acrocordia conoidea</i>	II (4-5)
<i>Porella platyphylla</i>	II (4-5)
<i>Caloplaca aurantia</i>	II (4)
<i>Verrucaria baldensis</i>	II (2-5)

<i>Catillaria lenticularis</i>	II (2)
<i>Agonimia tristicula</i>	II (1-2)
<i>Caloplaca lactea</i>	II (1-2)
<i>Rinodina bischoffii</i>	II (1-2)
<i>Porina linearis</i>	II (1)
<i>Leptogium gelatinosum</i>	I (5)
<i>Aspicilia contorta</i> subsp. <i>hoffmanniana</i>	I (4)
<i>Caloplaca ochracea</i>	I (4)
<i>Schistidium crassipilum</i>	I (4)
<i>Clauzadea immersa</i>	I (3)
<i>Diplotomma alboatrum</i>	I (2)
<i>Hypnum lacunosum</i> var. <i>lacunosum</i>	I (2)
<i>Lecania erysibe</i>	I (2)
<i>Orthotrichum anomalum</i>	I (2)
<i>Orthotrichum cupulatum</i>	I (2)
<i>Protoblastenia incrustans</i>	I (2)
<i>Thelidium decipiens</i>	I (2)
<i>Toninia sedifolia</i>	I (2)
<i>Verrucaria caerulea</i>	I (2)
<i>Dermatocarpon miniatum</i>	I (1)
<i>Grimmia pulvinata</i>	I (1)
<i>Hymenelia prevostii</i>	I (1)
<i>Nostoc</i> spp.	I (1)
<i>Protoblastenia calva</i>	I (1)
<i>Protoblastenia rupestris</i>	I (1)
<i>Rhynchostegiella tenella</i>	I (1)
<i>Thelidium papulare</i>	I (1)
<i>Tortella tortuosa</i>	I (1)
<i>Weissia controversa</i>	I (1)
Rock	V (3-7)
<i>Sedum acre</i>	IV (1-5)
<i>Geranium robertianum</i>	III (1-4)
<i>Cardamine hirsuta</i>	II (2-3)
<i>Festuca ovina</i>	I (4)
<i>Campanula rotundifolia</i>	I (4)
<i>Poa pratensis</i> agg.	I (3)
<i>Agrostis capillaris</i>	I (2)
<i>Festuca rubra</i>	I (2)
<i>Leucanthemum vulgare</i>	I (1)
<i>Helianthemum nummularium</i>	I (1)
Slope (degrees)	74 (50-90)
Aspect (degrees)	
Shade	None
Run off	(None to ) slight
Drainage	(Moderate to) good
Rain-shelter	None
Altitude (m)	350-400
Number of samples	5

**3.4.9 SL 9 *Phaeophyscia orbicularis*-*Xanthoria parietina* community (Table 70)****Synonyms**

*Physcietum caesia* Mot. (James *et al.*, 1977).

**Constant species**

*Caloplaca citrina* agg., *Collema fuscovirens* and *Lecanora albescens*.

**Description and ecology**

This a lichen-dominated community of limestone rocks enriched by bird perching. The constant species of this community are widespread species found in several other communities, but the grey foliose lichens *Phaeophyscia orbicularis* and *Physcia adscendens* and the yellow foliose *Xanthoria parietina* are frequent and characteristic. Other species which are favoured by nutrient-enrichment, and which can be abundant in individual samples are *Caloplaca chlorina*, *C. flavovirescens*, *Candelariella medians* and *Physcia caesia*.

Stands were recorded on or near the tops of limestone rocks and boulders up to 1.8 m high; most stands showed some manuring by small perching birds, but one stand was on a cairn used by a buzzard. The community was present but rare at most of the limestone sites, perhaps reflecting generally low nutrient levels (possibly due in part to an absence of intensive agriculture nearby, or to low stocking levels), so that bird dung was the only significant source of the nutrients necessary to sustain this community. Similar stands are frequent in lowland Britain on limestone and concrete structures.

**Conservation interest**

The typical species of this community are widespread.

**Differentiation from other communities**

This community is distinguished by the presence of a number of lichens known to be associated with high nutrient-levels, such as species of *Physcia*, *Physconia* and *Xanthoria*.

**Coverage and integrity**

More samples are necessary to understand the variation in this community, and to relate it to similar lowland communities.

**Table 70:** Floristic data for SL 9 *Phaeophyscia orbicularis*-*Xanthoria parietina* community

<i>Species/Environmental factor</i>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Lecanora albescens</i>	IV (1-4)
<i>Caloplaca citrina</i> agg.	IV (1-5)
<i>Collema fuscovirens</i>	IV (1-4)
<i>Verrucaria nigrescens</i>	III (1-5)

<i>Physcia adscendens</i>	III (2)
<i>Xanthoria parietina</i>	III (5-7)
<i>Phaeophyscia orbicularis</i>	III (2-5)
<i>Catillaria lenticularis</i>	III (1-4)
<i>Verrucaria baldensis</i>	II (4-5)
<i>Aspicilia calcarea</i>	II (4-5)
<i>Caloplaca holocarpa</i>	II (2-4)
<i>Leptogium gelatinosum</i>	II (1-4)
<i>Candelariella aurella</i>	II (1-2)
<i>Lecanora dispersa</i>	II (1-2)
<i>Homalothecium sericeum</i>	II (4-5)
<i>Verrucaria pinguicula</i>	II (2-4)
<i>Syntrichia intermedia</i>	II (1-4)
<i>Verrucaria caerulea</i>	II (2)
<i>Protoblastenia rupestris</i>	II (1-2)
<i>Diplotomma venustum</i>	II (1)
<i>Caloplaca chlorina</i>	I (7)
<i>Caloplaca flavovirescens</i>	I (7)
<i>Candelariella medians</i>	I (7)
<i>Physcia caesia</i>	I (6)
<i>Verrucaria calciseda</i>	I (5)
<i>Collema cristatum</i>	I (4)
<i>Aspicilia contorta</i> subsp. <i>hoffmanniana</i>	I (4)
<i>Grimmia pulvinata</i>	I (4)
<i>Lecania erysibe</i>	I (4)
<i>Protoblastenia calva</i>	I (4)
<i>Tortella tortuosa</i>	I (4)
<i>Tortula muralis</i>	I (4)
<i>Bryum capillare</i>	I (2)
<i>Ctenidium molluscum</i>	I (2)
<i>Schistidium robustum</i>	I (2)
<i>Agonimia tristicula</i>	I (2)
<i>Aspicilia contorta</i> subsp. <i>contorta</i>	I (2)
<i>Hymenelia epulotica</i>	I (2)
<i>Hymenelia prevostii</i>	I (2)
<i>Lecanora gangaleoides</i>	I (2)
<i>Orthotrichum anomalum</i>	I (2)
<i>Schistidium crassipilum</i>	I (2)
<i>Caloplaca lactea</i>	I (1)
<i>Collema auriforme</i>	I (1)
<i>Lecanora xanthostoma</i>	I (1)
<i>Orthotrichum cupulatum</i>	I (1)
<i>Placynthium nigrum</i>	I (1)
<i>Verrucaria fuscella/polysticta</i>	I (1)
Rock	V (4-7)
Slope (degrees)	10-50
Aspect (degrees)	
Shade	None



Run off	None
Drainage	(Poor to) moderate to good
Rain shelter	None
Altitude (m)	90-440
Number of samples	9

### 3.4.10 SL 10 *Caloplaca decipiens*-*Xanthoria calcicola* community (Table 71)

#### Synonyms

*Physcietum caesia* Mot. p.p. (James *et al.*, 1977).

#### Constant species

Only one sample is available.

#### Description and ecology

This is a very provisional community for a single sample dominated by the bright orange lichens *Caloplaca decipiens* and *Xanthoria calcicola*. The stand occurred on vertical limestone at the foot of a cliff, in a sheep lie area, enriched by sheep dung. No similar stands were seen during the survey. It is unlikely to be frequent in upland areas.

#### Conservation interest

No uncommon species were present.

#### Differentiation from other communities

SL 10 lacks the species of *Physcia* and *Phaeophyscia* found in SL 9. SL 9 also contains species of *Caloplaca* and *Xanthoria* and occurs in nutrient-enriched places, but differs from SL 10 in the absence of *C. decipiens* and *X. calcicola*.

#### Coverage and integrity

Only one sample is available. This is distinguished from SL 9 as it not only contains species not recorded in SL 10, but also occurred on vertical rocks rather than on the apex of bird perching sites, but many more samples are necessary to decide if SL 10 is sustainable.

**Table 71:** Floristic data for SL 10 *Caloplaca decipiens*-*Xanthoria calcicola* community

Species/Environmental factor	Sample number with cover values for species and rock/ Environmental data
	3
<i>Caloplaca decipiens</i>	6
<i>Xanthoria calcicola</i>	5
<i>Lecanora albescens</i>	4
<i>Collema auriforme</i>	1

<i>Caloplaca flavescens</i>	1
<i>Lepraria lesdainii</i>	1
<i>Syntrichia intermedia</i>	1
Rock	5
Slope (degrees)	90
Aspect (degrees)	210
Shade	Slight
Run off	None-slight
Drainage	Good
Surface	Even
Rain shelter	Slight
Altitude (m)	c. 350
Quadrat size (cm)	50 x 50
Vice-county	50
Grid ref.	33/2194.4480
Date	10 Mar 2003
SAC/site code	BE
Number of samples	1

### 3.4.11 SL 11 *Protoblastenia rupestris*-*Verrucaria baldensis* community (Table 72)

#### Synonyms

*Caloplacetum heppiana* DR. p.p. (James *et al.*, 1977), *Placynthietum nigri* Klem. (James *et al.*, 1977).

#### Constant species

*Protoblastenia rupestris*.

#### Description and ecology

A variable community dominated by crustose lichens on well-lit exposed limestone, including limestone pavement. Overall *Protoblastenia rupestris* is the only constant species, but *Catillaria lenticularis* and the pyrenocarpous lichens *Verrucaria baldensis* and *V. nigrescens* are frequent. *Caloplaca citrina* agg. is occasional, but other yellow species of *Caloplaca* are rare or absent. Macrolichens and bryophytes are scarce or absent.

Stands are developed on rock faces, boulders, and on fine scree, typically where well-lit and with little or no rain-shelter. The community is very variable, and the frequent species occur in many combinations, so that there is little overall pattern and the community is difficult to divide, even though pairs of samples can be found which have few or no species in common. Some stands clearly experience damper conditions than others, where there is some flushing or poor drainage, but it does not seem possible to divide the community into damp and dry sub-communities. Some poorly defined groups suggested by TWINSpan analysis are presented as provisional sub-communities:

SL 11a: The lichens *Collema fuscovirens* and *Placynthium nigrum* are constant; frequent species include *Farnoldia jurana*. Stands are often rather dark in colour and are damp from poor drainage or flushing.

SL 11b: The pyrenocarpous lichens *Polyblastia albida* and *Thelidium incavatum* are constant; these species also appear to favour damp microhabitats.

SL 11c: The lichen *Clauzadea immersa* is constant; *Porina linearis* is frequent and *Protoblastenia cyclospora* is occasional; the last two species are preferential for this sub-community. Stands often occur on well-drained and rather steep faces.

SL 11d: This is the very variable sub-community similar to SL 12. Species which sometimes become dominant or conspicuous include *Placynthium subradiatum* and *Solenopsora candicans*. Where cracks provide extra moisture the squamulose species *Catapyrenium rufescens*, *Squamarina cartilaginea* or *Toninia sedifolia* can enter. Fine scree, where it is sufficiently stable for lichen growth, has a usually sparse lichen cover with *Collema fuscovirens*, *Protoblastenia rupestris* and *Verrucaria nigrescens* as constant species, and *Hymenelia prevostii*, *Polyblastia albida*, *Thelidium decipiens* and *Verrucaria baldensis* are frequent. Species which are preferential for fine scree compared to other types of rock include the small cyanophilic lichens *Lemmopsis arnoldiana*, *Leptogium massiliense* and *L. turgidum* (all scarce, or occasional).

### **Conservation interest**

A number of uncommon species occur, including *Staurothele bacilligera* (Near Threatened), *Leptogium massiliense* and *Protoblastenia cyclospora* (Nationally Rare) and *Farnoldia jurana* (Nationally Scarce).

### **Coverage and integrity**

A large number of samples were available, but the community is still very variable and difficult to subdivide. The sub-communities are very provisional and indicate only a small part of the variation in this community.

**Table 72:** Floristic data for SL 11 *Protoblastenia rupestris*-*Verrucaria baldensis* community

Species /Environmental factor	Constancy class (min-max cover) for sub-communities and community/Environmental data				
	Sub- community SL 11a	Sub- community SL 11b	Sub- community SL 11c	Sub- community SL 11d	Community SL 11
<i>Protoblastenia rupestris</i>	III (1-4)	II (1-4)	III (1-4)	IV (1-6)	IV (1-6)
<i>Placynthium nigrum</i>	IV (4-7)	II (1-3)	II (1-3)	II (1-4)	II (1-7)
<i>Hymenelia prevostii</i>	IV (1-5)	I (4)	III (1-5)	II (1-6)	II (1-6)
<i>Collema fuscovirens</i>	IV (1-4)	II (1-2)	II (1-2)	II (1-5)	II (1-5)
<i>Farnoldia jurana</i>	III (2-6)	I (3)	I (1)	I (1-5)	I (1-6)
<i>Thelidium incavatum</i>	I (1-2)	IV (5-7)	I (1)	I (1-4)	I (1-7)
<i>Polyblastia albida</i>	II (1-7)	IV (1-5)	I (1-4)	I (1-4)	I (1-7)
<i>Clauzadea immersa</i>	I (2-5)		V (2-7)	I (1-2)	II (1-7)
<i>Porina linearis</i>	I (5)	I (5)	III (1-6)	II (1-5)	II (1-6)
<i>Protoblastenia cyclospora</i>			II (2-5)	I (1-3)	I (1-5)
<i>Verrucaria baldensis</i>	III (1-5)	I (3)	IV (2-7)	III (1-7)	III (1-7)
<i>Verrucaria nigrescens</i>	III (2-5)	II (2-4)	IV (1-5)	IV (1-6)	III (1-6)
<i>Catillaria lenticularis</i>	II (1-2)	I (2)	III (1-2)	III (1-6)	III (1-6)
<i>Caloplaca citrina</i> agg.	II (1-2)		II (1-2)	III (1-7)	II (1-7)
<i>Thelidium decipiens</i>	I (1-5)	I (2)	I (2-5)	II (1-7)	II (1-7)
<i>Verrucaria caerulea</i>		I (4)	I (2-5)	II (1-6)	II (1-6)
<i>Protoblastenia calva</i>	II (1-3)	II (1-4)	III (1-5)	II (1-6)	II (1-6)
<i>Rhizocarpon umbilicatum</i>				I (5)	I (5)
<i>Hymenostylium insigne</i>		I (5)			I (5)
<i>Staurothele bacilligera</i>				I (4)	I (4)
<i>Rhytidium rugosum</i>				I (3)	I (3)
<i>Verrucaria calciseda</i>			I (2)	I (2-6)	I (2-6)
<i>Aspicilia contorta</i> subsp. <i>contorta</i>	I (4)			I (2-5)	I (2-5)

<i>Collema callopismum</i>			I (3)	I (2-5)	I (2-5)
<i>Toninia sedifolia</i>			I (2)	I (2-5)	I (2-5)
<i>Rhizocarpon petraeum</i>				I (2-5)	I (2-5)
<i>Collema cristatum</i>			I (4)	I (2-4)	I (2-4)
<i>Placynthium garovaglii</i>			I (2-4)		I (2-4)
<i>Leptogium massiliense</i>				I (2-3)	I (2-3)
<i>Lecanora flotowiana</i>			I (2)	I (2)	I (2)
<i>Leptogium teretiusculum</i>				I (2)	I (2)
<i>Arthopyrenia saxicola</i>				I (2)	I (2)
<i>Caloplaca cirrochroa</i>				I (2)	I (2)
<i>Collema crispum</i>				I (2)	I (2)
<i>cyanobacteria</i>				I (2)	I (2)
<i>Distichium capillaceum</i>				I (2)	I (2)
<i>Homalothecium lutescens</i>				I (2)	I (2)
<i>Lecanora agardhiana</i>				I (2)	I (2)
<i>Leproplaca xantholyta</i>				I (2)	I (2)
<i>Opegrapha rassalensis</i>				I (2)	I (2)
<i>Polyblastia melaspora</i>				I (2)	I (2)
<i>Porella platyphylla</i>				I (2)	I (2)
<i>Rinodina immersa</i>				I (2)	I (2)
<i>Lepraria lesdainii</i>			I (2)		I (2)
<i>Orthothecium rufescens</i>		I (2)			I (2)
<i>Scapania undulata</i>		I (2)			I (2)
<i>Scytonema spp.</i>		I (2)			I (2)
<i>Didymodon vinealis</i>	I (2)				I (2)
<i>Mnium marginatum</i>	I (2)				I (2)
<i>Tortula muralis</i>			I (1)	I (1-8)	I (1-8)
<i>Verrucaria pinguicula</i>	I (5)	I (1)	I (5-6)	I (1-7)	I (1-7)
<i>Verrucaria hochstetteri</i>	II (1-4)		I (2)	I (1-6)	I (1-6)
<i>Staurothele caesia</i>	I (1)		II (1-4)	I (2-6)	I (1-6)
<i>Staurothele hymenogonia</i>				I (1-6)	I (1-6)

<i>Aspicilia calcarea</i>	I (4)		I (2-4)	I (1-5)	I (1-5)
<i>Clauzadea monticola</i>	I (1)		I (2)	I (1-5)	I (1-5)
<i>Protoblastenia incrustans</i>	I (1)	II (2-4)	III (1-5)	I (1-4)	I (1-5)
<i>Verrucaria dufourii/pinguicula</i>	I (2)		II (2-4)	I (1-5)	I (1-5)
<i>Placynthium subradiatum</i>	II (1)	II (2-4)	I (1-2)	I (1-5)	I (1-5)
<i>Acrocordia conoidea</i>			I (1-4)	I (1-5)	I (1-5)
<i>Ctenidium molluscum</i>	I (1)	II (1-2)	I (2)	I (1-5)	I (1-5)
<i>Polyblastia deminuta</i>	I (4-5)	II (1-4)	II (1-5)	I (1-4)	I (1-5)
<i>Staurothele rupifraga</i>	I (1-4)	II (1-2)	I (1-4)	I (1-5)	I (1-5)
<i>Caloplaca ochracea</i>	I (1)		I (1-4)	I (1-5)	I (1-5)
<i>Solenopsora candicans</i>				I (1-5)	I (1-5)
<i>Gyalecta jenensis</i>	II (2-5)	II (1-2)	I (1-2)	I (1-2)	I (1-5)
<i>Squamarina cartilaginea</i>			I (1-5)	I (1-5)	I (1-5)
<i>Verrucaria macrostoma</i>	II (1-5)			I (1-4)	I (1-5)
<i>Lecanora albescens</i>	I (2)		I (3)	II (1-4)	I (1-4)
<i>Tortella tortuosa</i>	I (1)		II (1-4)	I (1-4)	I (1-4)
<i>Schistidium crassipilum</i>	I (2)		I (1)	I (1-4)	I (1-4)
<i>Aspicilia contorta</i> subsp. <i>hoffmanniana</i>		I (4)	I (2)	I (1-4)	I (1-4)
<i>Caloplaca flavescens</i>			I (2)	I (1-4)	I (1-4)
<i>Fissidens dubius</i>	II (1-2)	I (1)	I (1-4)	I (1-4)	I (1-4)
<i>Hymenelia epulotica</i>	II (1-2)	II (1-2)	I (1-2)	I (1-4)	I (1-4)
<i>Caloplaca aurantia</i>				I (1-4)	I (1-4)
<i>Staurothele guestphalica</i>		I (2)	I (2-4)	I (1-3)	I (1-4)
<i>Orthotrichum anomalum</i>			I (1)	I (1-4)	I (1-4)
<i>Verrucaria viridula</i>		I (1)		I (1-4)	I (1-4)
<i>Didymodon rigidulus</i>	I (2)		I (1)	I (1-4)	I (1-4)
<i>Lecidella stigmataea</i>	I (1)		I (1)	I (1-4)	I (1-4)
<i>Psora lurida</i>	I (2)		I (4)	I (1-2)	I (1-4)
<i>Collema multipartitum</i>				I (1-4)	I (1-4)
<i>Thelidium papulare</i>				I (1-4)	I (1-4)

<i>Scapania aspera</i>	II (1-2)		I (3)	I (2-4)	I (1-4)
<i>Thelidium impressum</i>				I (1-4)	I (1-4)
<i>Trichostomum crispulum</i>	I (1-3)		I (1-4)	I (4)	I (1-4)
<i>Catapyrenium rufescens</i>	I (4)	I (1)	I (1)		I (1-4)
<i>Leptogium schraderi</i>	I (1-4)		I (1)		I (1-4)
<i>Agonimia tristicula</i>	I (1)		II (1-2)	I (1-3)	I (1-3)
<i>Leptogium gelatinosum</i>			I (1-3)	I (1-2)	I (1-3)
<i>Verrucaria fuscella/polysticta</i>			I (1)	I (1-3)	I (1-3)
<i>Acarospora cervina</i>	II (2)		I (1-2)	I (1-3)	I (1-3)
<i>Petractis clausa</i>	I (2)		I (1-3)	I (1-2)	I (1-3)
<i>Neckera crispa</i>	I (2-3)		I (1-2)	I (1-3)	I (1-3)
<i>Caloplaca lacteal</i>				I (1-3)	I (1-3)
<i>Lepraria nivalis</i>			I (1-3)	I (1)	I (1-3)
<i>Clauzadea metzleri</i>	I (1)		I (1)	I (1-2)	I (1-2)
<i>Toninia verrucarioides</i>	II (1-2)			I (1-2)	I (1-2)
<i>Homalothecium sericeum</i>		I (1)	I (1-2)	I (1-2)	I (1-2)
<i>Hypnum lacunosum</i> var. <i>lacunosum</i>			I (1)	I (1-2)	I (1-2)
<i>Leptogium turgidum</i>	I (1)			I (1-2)	I (1-2)
<i>Caloplaca holocarpa</i>				I (1-2)	I (1-2)
<i>Lecanora dispersa</i>	I (1)			I (1-2)	I (1-2)
<i>Physcia adscendens</i>				I (1-2)	I (1-2)
<i>Syntrichia intermedia</i>			I (1-2)	I (1-2)	I (1-2)
<i>Polyblastia cupularis</i>			I (2)	I (1-2)	I (1-2)
<i>Dermatocarpon miniatum</i>				I (1-2)	I (1-2)
<i>Diplotomma alboatrum</i>				I (1-2)	I (1-2)
<i>Lecanora crenulata</i>				I (1-2)	I (1-2)
<i>Toninia aromatica</i>				I (1-2)	I (1-2)
Pink unknown lichen	I (1-2)			I (2)	I (1-2)
<i>Encalypta streptocarpa</i>			II (1-2)	I (1-2)	I (1-2)
<i>Ditrichum gracile</i>	I (1)		I (2)	I (1-2)	I (1-2)
<i>Leptogium plicatile</i>			I (2)	I (1-2)	I (1-2)

<i>Verrucaria muralis</i>		I (1)		I (1-2)	I (1-2)
<i>Rinodina bischoffii</i>	I (1)			I (1-2)	I (1-2)
<i>Caloplaca alociza</i>				I (1-2)	I (1-2)
<i>Bryum capillare</i>	I (1-2)		I (2)	I (1)	I (1-2)
<i>Cladonia pocillum</i>			I (1)	I (2)	I (1-2)
<i>Collema tenax</i>			I (1)	I (2)	I (1-2)
<i>Collema auriforme</i>			I (2)	I (1)	I (1-2)
<i>Trichostomum brachydontium</i>			I (2)	I (1)	I (1-2)
<i>Pseudoleskeella catenulata</i> var. <i>catenulata</i>	I (2)	I (1)			I (1-2)
<i>Orthotrichum cupulatum</i>	I (1)		I (1)	I (1)	I (1)
<i>Lemmopsis arnoldiana</i>	I (1)			I (1)	I (1)
<i>Neckera complanata</i>				I (1)	I (1)
<i>Opegrapha saxatilis</i>				I (1)	I (1)
<i>Scleropodium purum</i>				I (1)	I (1)
<i>Bryoerythrophyllum recurvirostrum</i>			I (1)	I (1)	I (1)
<i>Collema tenax</i> var. <i>ceranoides</i>			I (1)	I (1)	I (1)
<i>Opegrapha dolomitica</i>	I (1)	I (1)		I (1)	I (1)
<i>Pyrenocollema caesium</i>		I (1)		I (1)	I (1)
<i>Barbula unguiculata</i>				I (1)	I (1)
<i>Belonia nidarosiensis</i>				I (1)	I (1)
<i>Calliergonella cuspidata</i>				I (1)	I (1)
<i>Campylium chrysophyllum</i>				I (1)	I (1)
<i>Cladonia furcata</i>				I (1)	I (1)
<i>Collema polycarpon</i>				I (1)	I (1)
<i>Didymodon sinuosus</i>				I (1)	I (1)
<i>Eurhynchium crassinervium</i>				I (1)	I (1)
<i>Grimmia pulvinata</i>				I (1)	I (1)
Indet. lichen crusts				I (1)	I (1)
<i>Leproplaca chrysodeta</i>				I (1)	I (1)
<i>Leptogium diffractum</i>				I (1)	I (1)



<i>Myxobilimbia lobulata</i>				I (1)	I (1)
<i>Opegrapha calcarea</i>				I (1)	I (1)
<i>Placynthium ?hungaricum</i>				I (1)	I (1)
<i>Sagiolechia protuberans</i>				I (1)	I (1)
<i>Sarcogyne regularis</i>				I (1)	I (1)
<i>Schistidium robustum</i>				I (1)	I (1)
<i>Thamnobryum alopecurum</i>				I (1)	I (1)
<i>Verrucaria elaeina</i>				I (1)	I (1)
<i>Weissia controversa</i>				I (1)	I (1)
<i>Xanthoria parietina</i>				I (1)	I (1)
<i>Leproloma diffusum</i> var. <i>diffusum</i>			I (1)		I (1)
<i>Verrucaria phaeosperma</i>			I (1)		I (1)
<i>Catapyrenium pilosellum</i>			I (1)		I (1)
<i>Anomobryum filiforme</i>		I (1)			I (1)
<i>Hymenelia heteromorpha</i>		I (1)			I (1)
<i>Staurothele succedens</i>		I (1)			I (1)
<i>Trentepohlia aurea</i>		I (1)			I (1)
<i>Verrucaria hydrela</i>		I (1)			I (1)
Rock					V (2-10)
Soil					I (2)
<i>Festuca ovina</i>	I (4)				I (1-4)
<i>Thymus polytrichus</i>	I (2)				I (1-2)
<i>Asplenium ruta-muraria</i>					I (1)
<i>Geranium robertianum</i>					I (1-4)
<i>Festuca rubra</i>		I (1)			I (1-2)
<i>Potentilla sterilis</i>					I (1-2)
<i>Galium sternerii</i>					I (1)
<i>Arrhenatherum elatius</i>					I (2)
<i>Asplenium trichomanes</i>					I (2)
<i>Carex viridula</i>		I (2)			I (2)
<i>Desmazieria rigida</i>					I (2)

Saxicolous Lichen and Bryophyte Communities in Upland Britain

<i>Geranium lucidum</i>					I (2)
<i>Oxalis acetosella</i>					I (2)
<i>Plantago lanceolata</i>					I (2)
<i>Pteridium aquilinum</i>					I (2)
<i>Sedum acre</i>					I (2)
<i>Calluna vulgaris</i>					I (1)
<i>Carex flacca</i>					I (1)
<i>Helictotrichon pratense</i>					I (1)
<i>Koeleria macrantha</i>					I (1)
<i>Leucanthemum vulgare</i>					I (1)
<i>Lotus corniculatus</i>					I (1)
<i>Plantago maritima</i>		I (1)			I (1)
<i>Sesleria albicans</i>	I (1)				I (1)
<i>Teucrium scorodonia</i>					I (1)
<i>Trisetum flavescens</i>					I (1)
Slope (degrees)	38 (15-80)	28 (10-65)	65 (0-90)	47 (0-95)	52 (0-95)
Shade	None	None (to slight)	None	None to slight	None (to slight)
Run off	None to moderate	None to strong	None to moderate	None to moderate	None to moderate (to strong)
Drainage	Poor to good	Poor to good	(Poor to) good	Poor to good	Poor to good
Rain-shelter	None to slight	None	None to slight	None to slight	None to slight
Altitude (m)	360-640	30-650	60-440	45-650	290 (30-650)
Number of samples	13	8	21	99	141

### 3.4.12 SL 12 *Schistidium crassipilum*-*Collema fuscovirens* community (Table 73)

#### Synonyms

None are known.

#### Constant species

*Protoblastenia rupestris* and *Schistidium crassipilum*.

#### Description and ecology

This is a community with significant quantities of macrolichens and small mosses occurring on boulders and bedrock of limestone, including limestone pavement and occasionally calcareous siliceous rock. Crustose lichens are constant (*Protoblastenia rupestris*) or frequent (*Placynthium nigrum*, *Verrucaria baldensis*, *V. nigrescens*), but these also occur in SL 11. Bryophytes found in SL 12 include *Schistidium crassipilum* (constant), *Orthotrichum anomalum*, *O. cupulatum* and *Tortella tortuosa*. Macrolichens include *Collema cristatum*, *C. fuscovirens*, *C. multipartitum* and *Leptogium gelatinosum* (all containing cyanobacteria as the photobiont), and *Dermatocarpon miniatum*. The community is variable, and can be split into the following provisional sub-communities:

SL 12a: *Collema cristatum* (often dominant), *C. fuscovirens*, *Placynthium nigrum* (sparse) and *Protoblastenia rupestris* are constant, with frequent species including *Collema fuscovirens* and *Leptogium gelatinosum*. The blackish thalli of *Collema* spp. are conspicuous. Bryophytes are relatively scarce. Mostly on unshaded rocks which are seasonally damp from poor drainage or proximity to the ground, but in some high rainfall areas stands also occur on the crests of boulders. This sub-community probably experiences less prolonged dampness than bryophyte-rich sub-communities.

SL 12b: The lichens *Collema fuscovirens*, *Leptogium gelatinosum* and *Verrucaria baldensis*, and the mosses *Orthotrichum anomalum* and *Schistidium crassipilum* are constant. Other significant species include *Collema multipartitum*, *C. polycarpon*, *Dermatocarpon miniatum*, and *Tortella tortuosa*. Stands occur on low bedrock or on the crests of small boulders; some stands are poorly drained, but the community seems also to be encouraged by bird perching. Samples are recorded only from W. Scotland (Strath and Inchnadamph).

SL 12c: The mosses *Schistidium crassipilum* and *Tortella tortuosa* are constant. Macrolichens are less important here than in SL 12b; the most frequent ones are the occasional *Collema fuscovirens* and *Leptogium gelatinosum*. Stands occur on the tops of low boulders and outcrops, on bedrock adjacent to the ground, and on small ledges on vertical faces. Most samples are from limestone, with a few from calcareous siliceous rock. Apparently SL 12c represents drier conditions than SL 12b. Samples were recorded mainly from Wales and northern England.

#### Conservation interest

This community includes a few uncommon species, including the lichens *Collema multipartitum*, *Lempholemma polyanthes*, and the mosses *Grimmia dissimulata* and *Pseudoleskiella catenulata*.

**Differentiation from other communities**

SL 11 differs in the scarcity of bryophytes and macrolichens.

**Coverage and integrity**

This community is reasonably well-covered, but variable and difficult to divide satisfactorily.

**Table 73:** Floristic data for SL 12 *Schistidium crassipilum-Collema fuscovirens* community

Species/ Environmental factor	Constancy class (min-max cover) for sub-communities and community/Environmental data			
	Sub-community SL 12a	Sub-community SL 12b	Sub-community SL 12c	Community SL 12
<i>Schistidium crassipilum</i>	III (1-4)	IV (1-5)	V (2-6)	IV (1-6)
<i>Protoblastenia rupestris</i>	V (1-5)	III (1-2)	IV (1-4)	IV (1-5)
<i>Collema cristatum</i>	IV (4-6)	III (1-5)		II (1-6)
<i>Collema fuscovirens</i>	IV (2-7)	IV (2-6)	II (1-4)	III (1-7)
<i>Placynthium nigrum</i>	IV (1-4)	III (1-7)	II (1-3)	III (1-7)
<i>Leptogium gelatinosum</i>	III (1-5)	IV (1-5)	II (2-5)	III (1-5)
<i>Orthotrichum anomalum</i>	II (1-4)	IV (1-4)	II (1-2)	II (1-4)
<i>Collema multipartitum</i>	I (2)	III (2-7)	I (2)	II (2-7)
<i>Dermatocarpon miniatum</i>	I (2)	III (1-6)	I (1)	I (1-6)
<i>Tortella tortuosa</i>	II (2)	III (1-6)	V (1-7)	III (1-7)
<i>Verrucaria baldensis</i>	III (4-5)	IV (1-6)	III (1-5)	III (1-6)
<i>Verrucaria nigrescens</i>	III (1-6)	II (2-4)	III (3-4)	III (1-6)
<i>Agonimia tristicula</i>	III (1-3)	III (1-2)	III (1-3)	III (1-3)
<i>Bryum capillare</i>	II (1-2)	I (3)	III (2-6)	II (1-6)
<i>Caloplaca citrina</i> agg.	I (1-2)	I (1-4)	II (2-3)	II (1-6)
<i>Catillaria lenticularis</i>	III (2-5)	II (1-5)	II (1-3)	II (1-5)
<i>Verrucaria caerulea</i>	II (2-4)	III (1-4)	II (1-2)	II (1-4)
<i>Protoblastenia calva</i>	II (1-4)	III (1-4)	I (1-2)	II (1-4)
<i>Grimmia dissimulata</i>			I (5-6)	I (5-6)
<i>Squamarina cartilaginea</i>			I (5)	I (5)
<i>Zygodon viridissimus</i>		I (4-5)		I (4-5)
<i>Caloplaca aurantia</i>			I (4)	I (4)
<i>Cladonia pyxidata</i>			I (4)	I (4)
<i>Trentepohlia aurea</i>			I (4)	I (4)
<i>Collema tenax</i> var. <i>vulgare</i>				I (4)
<i>Placynthium garovaglii</i>				I (4)
<i>Catapyrenium rufescens</i>			I (2)	I (2-4)
<i>Collema crispum</i>				I (2-4)
<i>Verrucaria hochstetteri</i>	II (2-3)			I (2-3)
<i>Toninia verrucarioides</i>	I (2-3)	I (2)		I (2-3)
<i>Scapania aspera</i>			I (2-3)	I (2-3)
<i>Caloplaca lactea</i>			I (2)	I (2)
<i>Neckera crispa</i>		I (2)	I (2)	I (2)

<i>Encalypta streptocarpa</i>			I (2)	I (2)
<i>Nostoc</i> spp.			I (2)	I (2)
<i>Lecidea hypnorum</i>	I (2)			I (2)
<i>Schistidium robustum</i>	I (2)			I (2)
<i>Bacidia sabuletorum</i>		I (2)		I (2)
<i>Chromatochlamys muscorum</i>		I (2)		I (2)
<i>Cladonia ramulosa</i>			I (2)	I (2)
<i>Hygrohypnum luridum</i>			I (2)	I (2)
<i>Hypnum lacunosum</i> var. <i>tectorum</i>		I (2)		I (2)
<i>Leptogium turgidum</i>			I (2)	I (2)
<i>Myxobilimbia lobulata</i>			I (2)	I (2)
<i>Myxobilimbia sabuletorum</i>			I (2)	I (2)
<i>Polyblastia cupularis</i>			I (2)	I (2)
<i>Polyblastia dermatodes</i>			I (2)	I (2)
<i>Pseudoleskeella catenulata</i>			I (2)	I (2)
<i>Rhizocarpon petraeum</i>			I (2)	I (2)
<i>Solenopsora candicans</i>			I (2)	I (2)
<i>Trichostomum crispulum</i>			I (2)	I (2)
<i>Clauzadea immersa</i>	I (1-5)		I (1-6)	I (1-6)
<i>Thelidium papulare</i>	I (1-6)		II (1-4)	I (1-6)
<i>Gyalecta jenensis</i>	I (1)	I (1)	I (1-6)	I (1-6)
<i>Aspicilia calcarea</i>	I (1-4)		III (1-5)	I (1-5)
<i>Thelidium decipiens</i>	I (1)	II (1-4)	II (1-5)	I (1-5)
<i>Orthotrichum cupulatum</i>	II (2)	I (4-5)	I (1-4)	I (1-5)
<i>Ctenidium molluscum</i>	I (5)	I (1-5)	II (1-5)	I (1-5)
<i>Staurothele caesia</i>	II (2-5)		I (1-2)	I (1-5)
<i>Syntrichia intermedia</i>	I (2)		II (2-5)	I (1-5)
Indet. Verrucariaceae	I (1-5)	I (1)	I (1-2)	I (1-5)
<i>Verrucaria calciseda</i>		I (3)	II (1-5)	I (1-5)
<i>Collema auriforme</i>			I (1)	I (1)
<i>Hymenelia prevostii</i>	II (1-4)	I (1-3)	II (1-3)	I (1-4)
<i>Lecanora albescens</i>	II (1-4)	I (2-4)	I (2-3)	I (1-4)
<i>Hypnum lacunosum</i> var. <i>lacunosum</i>	I (2-4)	I (1)	II (1-4)	I (1-4)
<i>Placynthium subradiatum</i>	II (1-4)	I (1-2)		I (1-4)
<i>Thelidium incavatum</i>	I (4)	I (2)	I (1-4)	I (1-4)
<i>Petractis clausa</i>	I (1-3)	II (1-4)		I (1-4)
<i>Homalothecium sericeum</i>	I (2)		II (1-4)	I (1-4)
<i>Verrucaria viridula</i>	I (1)		II (1-4)	I (1-4)
<i>Cladonia pocillum</i>			II (1-4)	I (1-4)
<i>Collema polycarpon</i>		II (1-4)		I (1-4)
<i>Ditrichum gracile</i>			II (2-4)	I (1-4)
<i>Verrucaria pinguicula</i>	I (4)	I (1)		I (1-4)
<i>Didymodon rigidulus</i>	I (1)		I (2-4)	I (1-4)
<i>Polyblastia deminuta</i>	I (1)	I (2)	I (4)	I (1-4)
<i>Lempholemma polyanthes</i>		I (1-4)		I (1-4)
<i>Grimmia pulvinata</i>			I (4)	I (1-4)

Indet. crustose lichens		I (1-4)		I (1-4)
<i>Lecidella stigmataea</i>			I (4)	I (1-4)
<i>Polyblastia albida</i>			I (1-4)	I (1-4)
<i>Psora lurida</i>			I (1)	I (1)
<i>Protoblastenia incrustans</i>	II (1-3)	I (1-2)	I (1)	I (1-3)
<i>Staurothele rupifraga</i>	II (1-2)		I (1-3)	I (1-3)
<i>Tortula muralis</i>			II (1-3)	I (1-3)
<i>Acarospora cervina</i>			I (1-3)	I (1-3)
<i>Lecanora dispersa</i>			I (1-3)	I (1-3)
<i>Clauzadea monticola</i>	I (2)	I (1-2)	I (1-2)	I (1-2)
<i>Aspicilia contorta</i> var. <i>contorta</i>			III (1-2)	I (1-2)
<i>Aspicilia contorta</i> var. <i>hoffmanniana</i>			II (1-2)	I (1-2)
<i>Farnoldia jurana</i>	II (1-2)			I (1-2)
<i>Acrocordia conoidea</i>			I (1-2)	I (1-2)
<i>Fissidens dubius</i>		I (2)	I (1)	I (1-2)
<i>Verrucaria dufourii</i>			I (1-2)	I (1-2)
<i>Verrucaria phaeosperma</i>		I (1-2)	I (1)	I (1-2)
<i>Porella platyphylla</i>	I (2)		I (1)	I (1-2)
<i>Caloplaca flavescens</i>	I (1)		I (2)	I (1-2)
Pink unknown lichen	I (1)		I (2)	I (1-2)
<i>Caloplaca holocarpa</i>		I (2)	I (1)	I (1-2)
<i>Hymenelia epulotica</i>		I (1-2)		I (1-2)
Indet. endolithic Verrucariaceae		I (2)	I (1)	I (1-2)
<i>Sarcogyne regularis</i>			I (1-2)	I (1-2)
<i>Staurothele guestphalica</i>		I (1)	I (1)	I (1)
<i>Clauzadea metzleri</i>	I (1)		I (1)	I (1)
<i>Lecanora crenulata</i>			I (1)	I (1)
<i>Verrucaria fuscella/polysticta</i>			I (1)	I (1)
<i>Verrucaria muralis</i>		I (1)	I (1)	I (1)
<i>Frullania tamarisci</i>	I (1)			I (1)
<i>Peltigera membranacea</i>	I (1)			I (1)
<i>Phaeophyscia orbicularis</i>	I (1)			I (1)
<i>Bryum argenteum</i>			I (1)	I (1)
<i>Calliergonella cuspidata</i>		I (1)		I (1)
<i>Cephaloziella</i> spp.			I (1)	I (1)
<i>Hypnum resupinatum</i>			I (1)	I (1)
<i>Lecanora flotowiana</i>			I (1)	I (1)
<i>Micarea lignaria</i>			I (1)	I (1)
<i>Physcia adscendens</i>			I (1)	I (1)
<i>Porina linearis</i>			I (1)	I (1)
<i>Staurothele bacilligera</i>			I (1)	I (1)
<i>Toninia aromatica</i>		I (1)		I (1)
<i>Toninia sedifolia</i>			I (1)	I (1)
<i>Tortula subulata</i> var. <i>subulata</i>				I (1)
<i>Xanthoria parietina</i>		I (1)		I (1)
Rock	V (4-8)	V (3-8)	V (3-8)	V (3-8)

<i>Asplenium ruta-muraria</i>	I (1)		I (1)	I (1)
<i>Sedum acre</i>			I (4)	I (4)
<i>Asplenium trichomanes</i>				
<i>Cardamine</i> cf. <i>hirsuta</i>			I (2)	I (2)
<i>Geranium robertianum</i>			I (2)	I (2)
<i>Holcus lanatus</i>			I (1)	I (1)
<i>Poa pratensis</i> agg.			I (2)	I (2)
<i>Festuca ovina</i>	I (1)		I (1-4)	I (1-4)
<i>Sedum acre</i>			I (1)	I (1)
<i>Sesleria albicans</i>			I (2)	I (2)
<i>Thymus polytrichus</i>	I (1)		I (1-2)	I (1-2)
Slope (degrees)	21 (0-65)	28 (5-60)	35 (0-95)	33 (0-95)
Shade	None (to slight)	None (to slight)	None (to slight)	None to slight
Run off	None to slight	None to slight	None to slight	None to moderate
Drainage	Poor-good	Poor-good	Poor-good	Poor-good
Rain shelter	None	None	None	None (to slight)
Altitude (m)	60-410	75-160	75-700	30-700
Number of samples	14	18	16	48

### 3.4.13 SL 13 *Hymenelia prevostii*-*Porina linearis* community (Table 74)

#### Synonyms

None are known.

#### Constant species

*Hymenelia prevostii*, 'Pink Unknown' lichen and *Porina linearis*.

#### Description and ecology

A community dominated by crustose lichens on steep north-facing rocks. The pale pinkish *Hymenelia prevostii* and the *Trentepohlia*-containing lichens *Porina linearis* and 'Pink Unknown' lichen are constant. *Ionaspis epulotica* is characteristic of this community. Stands are often dull in colour and mottled grey and pale pink, sometimes on a ground of rock blackish from cyanobacteria, and at first glance may sometimes appear to be devoid of lichens. The 'Pink Unknown' species has a sterile immersed thallus containing *Trentepohlia*; it is possible that it represents poorly developed *Ionaspis epulotica*, but it is very uniform in appearance and no intermediates have been seen.

The community occurs on cliffs and rock faces. Stands are sometimes flushed but are also well-drained and sometimes slightly sheltered from rain, but the mainly northerly aspect (north-west to north-east) means that they avoid extremes of heat and dryness.

### Conservation interest

There are a few records of uncommon species, including *Hymenelia heteromorpha* (Vulnerable), and *H. epulotica* (Nationally Scarce).

### Coverage and integrity

This appears to be a fairly well-defined community. The identity of the 'Pink Unknown' lichen needs to be established, perhaps using molecular methods.

**Table 74:** Floristic data for SL 13 *Hymenelia prevostii*-*Porina linearis* community

<i>Species/Environmental factor</i>	<b>Constancy class (min-max cover)/ Environmental data</b>
Pink unknown lichen	V (2-7)
<i>Hymenelia prevostii</i>	V (1-6)
<i>Porina linearis</i>	IV (1-6)
<i>Protoblastenia calva</i>	III (1-5)
<i>Hymenelia epulotica</i>	II (1-5)
<i>Lepraria nivalis</i>	II (1-4)
<i>Thelidium decipiens</i>	II (1-4)
<i>Collema fuscovirens</i>	II (1-4)
<i>Polyblastia diminuta</i>	II (2-5)
<i>Placynthium nigrum</i>	II (2-4)
<i>Solenopsora candicans</i>	II (1-4)
<i>Protoblastenia incrustans</i>	II (2)
<i>Protoblastenia rupestris</i>	II (1-2)
<i>Verrucaria nigrescens</i>	II (1-2)
<i>Catillaria lenticularis</i>	II (1)
<i>Gyalecta jenensis</i>	I (1-4)
<i>Verrucaria baldensis</i>	I (2)
<i>Clauzadea monticola</i>	I (1-2)
<i>Agonimia tristicula</i>	I (1-2)
<i>Acarospora cervina</i>	I (1-2)
<i>Belonia nidarosiensis</i>	I (1-2)
<i>Fissidens dubius</i>	I (1)
<i>Verrucaria dufourii/pinguicula</i>	I (4)
<i>Acrocordia conoidea</i>	I (4)
<i>Caloplaca flavescens</i>	I (4)
<i>Staurothele caesia</i>	I (4)
<i>Verrucaria macrostoma</i>	I (4)
<i>Ctenidium molluscum</i>	I (3)
<i>Opegrapha dolomitica</i>	I (3)
<i>Scapania aspera</i>	I (2)
<i>Encalypta streptocarpa</i>	I (2)
<i>Placynthium subradiatum</i>	I (2)
<i>Dermatocarpon miniatum</i>	I (2)
<i>Farnoldia jurana</i>	I (2)



<i>Hymenelia heteromorpha</i>	I (2)
<i>Polyblastia albida</i>	I (1)
<i>Trentepohlia aurea</i>	I (1)
<i>Schistidium crassipilum</i>	I (1)
<i>Collema auriforme</i>	I (1)
<i>Clauzadea immersa</i>	I (1)
<i>Caloplaca citrina</i> agg.	I (1)
<i>Opegrapha calcarea</i>	I (1)
<i>Placynthium garovaglii</i>	I (1)
<i>Toninia sedifolia</i>	I (1)
Rock	V (4-9)
Slope (degrees)	80 (55-90)
Aspect (degrees)	
Shade	None to slight
Run off	None to moderate
Drainage	Good
Rain shelter	None to slight (to moderate)
Altitude (m)	75-410
Number of samples	12

#### 3.4.14 SL 14 *Gyalecta jenensis*-*Opegrapha dolomitica* community (Table 75)

##### Synonyms

None are known.

##### Constant species

*Ctenidium molluscum* and *Gyalecta jenensis*.

##### Description and ecology

This community contains the crustose lichen *Gyalecta jenensis* on moist rocks. The lichen *Opegrapha dolomitica* is frequent. Bryophytes are often present at low cover, including *Ctenidium molluscum* (constant), *Gymnostomum aeruginosum* and *Tortella tortuosa*. The community occurs on faces of bedrock which experience rather prolonged moist conditions from combinations of run-off, seepage and shelter. Stands occur on the sides of gullies, in shake holes (Ingleborough) and in the wet climate of western Scotland (Inchnadamph) also occur on gently sloping exposed bedrock.

##### Conservation interest

This community includes a few records of Nationally Scarce species, including *Opegrapha dolomitica*, *Polyblastia albida* and *Thelidium papulare*.

##### Coverage and integrity

The community is defined largely by the presence of one species. More samples are needed to understand the variation and the delimitation from related communities.

**Table 75:** Floristic data for SL 14 *Gyalecta jenensis*-*Opegrapha dolomitica* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Gyalecta jenensis</i>	V (5-7)
<i>Ctenidium molluscum</i>	V (1-4)
<i>Opegrapha dolomitica</i>	III (1-6)
<i>Placynthium nigrum</i>	III (1-4)
<i>Tortella tortuosa</i>	III (1-4)
<i>Agonimia tristicula</i>	II (1-2)
<i>Fissidens dubius</i>	II (1-3)
<i>Gymnostomum aeruginosum</i>	II (2)
<i>Verrucaria hochstetteri</i>	II (5-6)
<i>Thelidium papulare</i>	II (1-5)
<i>Clauzadea monticola</i>	II (2-4)
<i>Verrucaria dufourii/pinguicula</i>	II (1-2)
<i>Protoblastenia rupestris</i>	I (5)
<i>Hymenelia epulotica</i>	I (2-5)
<i>Polyblastia albida</i>	I (2-4)
<i>Scapania aspera</i>	I (1-4)
<i>Cololejeunea calcarea</i>	I (1-4)
<i>Trentepohlia aurea</i>	I (2-3)
<i>Collema fuscovirens</i>	I (2)
<i>Anomobryum julaceum</i>	I (2)
<i>Ditrichum gracile</i>	I (2)
<i>Mnium marginatum</i>	I (2)
Pink unknown lichen	I (1-2)
<i>Plagiochila porelloides</i>	I (1-2)
<i>Hymenelia prevostii</i>	I (1)
<i>Collema tenax</i>	I (1)
<i>Staurothele rupifraga</i>	I (2-5)
<i>Verrucaria caerulea</i>	I (5)
<i>Myxobilimbia lobulata</i>	I (5)
<i>Protoblastenia calva</i>	I (4)
<i>Collema cristatum</i>	I (4)
<i>Clauzadea immersa</i>	I (4)
<i>Leptogium schraderi</i>	I (4)
<i>Trichostomum brachydontium</i>	I (4)
<i>Schistidium robustum</i>	I (2)
<i>Toninia verrucarioides</i>	I (2)
<i>Schistidium crassipilum</i>	I (2)
<i>Didymodon fallax</i>	I (2)
<i>Didymodon rigidulus</i>	I (2)
<i>Distichium capillaceum</i>	I (2)
<i>Jungermannia</i> spp.	I (2)
<i>Encalypta streptocarpa</i>	I (1)

<i>Verrucaria viridula</i>	I (1)
<i>Thelidium fontigenum</i>	I (1)
<i>Bryum argenteum</i>	I (1)
<i>Jungermannia atrovirens</i>	I (1)
<i>Leptogium turgidum</i>	I (1)
Rock	V (4-8)
<i>Asplenium ruta-muraria</i>	I (1)
<i>Taraxacum</i> spp.	I (1)
Slope (degrees)	63 (20-95)
Aspect (degrees)	
Shade	None to slight
Run off	Slight to moderate
Drainage	Moderate to good
Rain shelter	None to slight
Altitude (m)	75-650
Number of samples	12

### 3.4.15 SL 15 *Hymenelia epulotica*-*Opegrapha rassalensis* community (Table 76)

#### Synonyms

None are known.

#### Constant species

*Hymenelia epulotica*.

#### Description and ecology

Crustose lichens dominate this community, which occurs where there is a high-rainfall. *Hymenelia epulotica* is constant; other characteristic lichens include *Hymenelia melanocarpa*, *Opegrapha rassalensis* (a provisional name used by Dr Brian Coppins for an undescribed species) and *Sagiolechia protuberans*. All these species contain *Trentepohlia* as the photobiont.

The community occurs on bedrock, including limestone pavement, or on blocks, sometimes on distinctly flushed but seasonally dry surfaces but sometimes on low rock outcrops with little or no run-off, while one wet stand was in a rivulet. Two samples occurred on fine scree, one dominated by *Hymenelia epulotica* and *Staurothele succedens* and the other by *H. epulotica* and *Polyblastia albida*. One stand with *Hymenelia melanocarpa* received run-off from a large area of low bedrock, but started to dry out rapidly following a shower. The community was only recorded from the Durness Limestone of Rassal and Inchnadamph in NW Scotland.

#### Conservation interest

The community contains a number of uncommon species: Nationally Rare species are *Hymenelia melanocarpa* (Red Data Book, Vulnerable) and *Sagiolechia protuberans*; Nationally Scarce species include *Hymenelia epulotica* and *Staurothele succedens*.

*Opegrapha rassalensis* is currently known only from Inchnadamph and Rassal. The restriction of this community to high-rainfall areas suggests it is of interest at a national level.

### Coverage and integrity

Fairly well covered, but samples from additional sites would be useful in defining this community.

**Table 76:** Floristic data for SL 15 *Hymenelia epulotica*-*Opegrapha rassalensis* community

<i>Species/Environmental factor</i>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Hymenelia epulotica</i>	V (1-7)
<i>Opegrapha rassalensis</i> ad int.	III (1-6)
<i>Protoblastenia rupestris</i>	III (1-5)
<i>Sagiolechia protuberans</i>	III (1-5)
<i>Clauzadea monticola</i>	III (1-2)
<i>Gyalecta jenensis</i>	II (2-5)
<i>Opegrapha dolomitica</i>	II (2-5)
<i>Protoblastenia calva</i>	II (2-5)
<i>Polyblastia albida</i>	II (1-6)
<i>Thelidium incavatum</i>	II (1-6)
<i>Verrucaria dufourii/pinguicula</i>	II (1-5)
<i>Tortella tortuosa</i>	II (1-2)
<i>Placynthium nigrum</i>	II (1-2)
<i>Hymenelia melanocarpa</i>	I (5-8)
Indet. foveolate Verrucariaceae	I (5)
<i>Rhizocarpon petraeum</i>	I (5)
<i>Scytonema</i> spp.	I (5)
<i>Verrucaria margacea</i>	I (5)
<i>Arthopyrenia saxicola</i>	I (4)
<i>Thelidium fontigenum</i>	I (4)
<i>Polyblastia cupularis</i>	I (2-4)
<i>Schistidium robustum</i>	I (2-4)
<i>Ctenidium molluscum</i>	I (2)
<i>Toninia verrucarioides</i>	I (2)
<i>Schistidium crassipilum</i>	I (2)
<i>Orthothecium rufescens</i>	I (2)
<i>Verrucaria caerulea</i>	I (2)
<i>Placynthium subradiatum</i>	I (2)
<i>Staurothele succedens</i>	I (1-5)
<i>Collema fuscovirens</i>	I (1-4)
<i>Staurothele rupifraga</i>	I (1-4)
<i>Catillaria lenticularis</i>	I (1-2)
<i>Protoblastenia incrustans</i>	I (1-2)
<i>Verrucaria baldensis</i>	I (1-2)
<i>Collema auriforme</i>	I (1)
<i>Verrucaria viridula</i>	I (1)

<i>Trichostomum crispulum</i>	I (1)
<i>Agonimia tristicula</i>	I (1)
<i>Verrucaria hochstetteri</i>	I (1)
<i>Scapania aspera</i>	I (1)
<i>Trentepohlia aurea</i>	I (1)
<i>Encalypta streptocarpa</i>	I (1)
<i>Acrocordia conoidea</i>	I (1)
<i>Collema cristatum</i>	I (1)
<i>Ditrichum gracile</i>	I (1)
<i>Hymenostylium insigne</i>	I (1)
<i>Lempholemma cladodes</i>	I (1)
<i>Leptogium gelatinosum</i>	I (1)
<i>Orthothecium intricatum</i>	I (1)
<i>Collemopsidium caesium</i>	I (1)
<i>Staurothele rugulosa</i>	I (1)
<i>Verrucaria hydrela</i>	I (1)
Rock	V (5-9)
<i>Festuca rubra</i>	I (4)
<i>Viola riviniana</i>	I (2)
<i>Thymus polytrichus</i>	I (1)
Slope (degrees)	45 (0-95)
Aspect (degrees)	
Shade	None
Run off	None to strong
Drainage	(Poor to) moderate to good
Rain shelter	None to slight
Altitude (m)	120-450
Number of samples	20

### 3.4.16 SL 16 *Hypnum lacunosum*-*Tortella tortuosa* community (Table 77)

#### Synonyms

None are known.

#### Constant species

*Cladonia pocillum/pyxidata*, *Frullania tamarisci*, *Hypnum lacunosum* and *Tortella tortuosa*.

#### Description and ecology

Robust mosses dominate this community which occurs on the tops of rock outcrops, including limestone pavement, and boulders. Stands often form conspicuous golden-green caps of bryophytes, occurring on low bedrock or on the crests of outcrops up to 1 m high, or on boulders. Characteristic species include the mosses *Homalothecium sericeum*, *Hypnum lacunosum* and *H. resupinatum* and the hepatic *Frullania tamarisci*. The moss *Antitrichia curtipendula* was abundant in one sample. The mature bryophyte mats are often not tightly attached to the rock, and there are often areas of bare rock where bryophytes have fallen

away. In one sample a fungus had killed extensive areas of moss. The bare patches sometimes have a few crustose lichens, but it is likely that the patches are usually recolonised fairly rapidly by mosses. Lichens are few, but *Chromatochlamys muscorum*, *Cladonia pocillum/pyxidata* (constant) and *Lecidea hypnorum* are able to grow over the moss cushions. *Ctenidium molluscum* is frequent overall but is less characteristic of this community than other bryophytes; it is constant in sub-community SL 16a. *Neckera crispa* was also conspicuous in some samples but is not characteristic of this community as a whole.

The community is apparently best developed in high-rainfall regions (Rassal and Inchnadamph), where there is sufficient precipitation to maintain the community on unflushed surfaces. The only sample recorded from Ingleborough was on a low area of cracked bedrock, damp enough to be colonised by *Festuca ovina*.

Sub-communities are defined as follows:

SL 16a: this sub-community represents a less well-developed form of the community than SL 16b; constants include *Ctenidium molluscum* and *Tortella tortuosa*, but most of the robust bryophytes of SL 16b are absent.

SL 16b: the more typical sub-community dominated by robust mosses.

### Conservation interest

This is an attractive community but is dominated by widespread species. The lichen *Lecidea hypnorum* is Nationally Scarce.

### Differentiation from other communities

SL 12b and SL 12c differ in the presence of smaller bryophytes including *Schistidium* and *Orthotrichum*, and the scarcity of the more robust species including *Frullania*, *Homalothecium* and *Hypnum*.

### Coverage and integrity

The community is fairly well covered by samples.

**Table 77:** Floristic data for SL 16 *Hypnum lacunosum-Tortella tortuosa* community

Species/ Environmental factor	Constancy class (min-max cover) for sub-communities and community/ Environmental data		
	Sub-community SL 17a	Sub-community SL 17b	Community SL 17
<i>Tortella tortuosa</i>	V (3-5)	IV (2-4)	V (2-5)
<i>Cladonia pocillum/pyxidata</i>	V (5)	V (1-5)	V (1-5)
<i>Ctenidium molluscum</i>	V (4-7)	III (1-5)	III (1-7)
<i>Frullania tamarisci</i>	II (5)	IV (2-6)	IV (2-6)
<i>Hypnum lacunosum</i> var. <i>lacunosum</i>		V (1-9)	IV (1-9)
<i>Homalothecium sericeum</i>		IV (2-6)	III (2-6)

<i>Hypnum resupinatum</i>		III (1-8)	III (1-8)
<i>Scapania aspera</i>	V (2-4)	III (1-3)	III (1-4)
<i>Leptogium gelatinosum</i>	IV (2-4)	II (1-2)	III (1-4)
<i>Racomitrium lanuginosum</i>		IV (1-2)	III (1-2)
<i>Ditrichum gracile</i>	IV (1)	III (1-2)	III (1-2)
<i>Protoblastenia rupestris</i>	IV (1)	II (1-2)	III (1-2)
<i>Bryum capillare</i>	II (3)	II (1-5)	II (1-5)
<i>Schistidium crassipilum</i>		II (1-4)	II (1-4)
<i>Verrucaria nigrescens</i>		II (1-2)	II (1-2)
<i>Lecidea hypnorum</i>	II (1)	II (1-2)	II (1-2)
<i>Clauzadea monticola</i>		II (1)	II (1)
<i>Antitrichia curtipendula</i>		I (8)	I (8)
<i>Neckera crispa</i>		I (5-6)	I (5-6)
<i>Dicranum scoparium</i>		I (5)	I (5)
<i>Cyanobacteria</i>	II (5)		I (5)
<i>Ochrolechia androgyna</i>		I (4)	I (4)
<i>Schistidium apocarpum</i>		I (2-4)	I (2-4)
<i>Chromatochlamys muscorum</i>		I (2)	I (2)
<i>Cladonia ramulosa</i>		I (2)	I (2)
<i>Didymodon rigidulus</i>		I (2)	I (2)
<i>Diploschistes muscorum</i>		I (2)	I (2)
<i>Verrucaria elaeina</i>		I (2)	I (2)
<i>Cephaloziella</i> spp.	II (2)		I (2)
<i>Clauzadea immersa</i>	II (2)		I (2)
<i>Placynthium subradiatum</i>	II (2)		I (2)
<i>Protoblastenia incrustans</i>	II (2)		I (2)
<i>Schistidium</i> spp.	II (2)		I (2)
<i>Trichostomum brachydontium</i>	II (2)		I (2)
<i>Aspicilia contorta</i> subsp. <i>hoffmanniana</i>		I (1-4)	I (1-4)
<i>Verrucaria baldensis</i>	IV (1-4)	I (2)	I (1-4)
<i>Collema auriforme</i>	IV (1-4)		I (1-4)
<i>Protoblastenia calva</i>		II (1-2)	I (1-2)
<i>Thelidium decipiens</i>	II (1)	I (1-2)	I (1-2)
<i>Agonimia tristicula</i>		I (1-2)	I (1-2)
<i>Caloplaca citrina</i> agg.		I (1-2)	I (1-2)
<i>Catillaria lenticularis</i>		I (1-2)	I (1-2)
<i>Orthotrichum cupulatum</i>		I (1-2)	I (1-2)
<i>Verrucaria caerulea</i>		I (1-2)	I (1-2)
<i>Micarea lignaria</i>	II (1)	I (2)	I (1-2)
<i>Cladonia furcata</i>	II (1)	I (1)	I (1)
<i>Plagiochila porelloides</i>		I (1)	I (1)
<i>Polyblastia albida</i>		I (1)	I (1)
<i>Cladonia cervicornis</i>		I (1)	I (1)
<i>Hylocomium splendens</i>		I (1)	I (1)
<i>Hymenelia prevostii</i>		I (1)	I (1)
<i>Lecanora albescens</i>		I (1)	I (1)
<i>Myxobilimbia sabuletorum</i>		I (1)	I (1)
<i>Placynthiella icmalea</i>		I (1)	I (1)

<i>Rhytidiadelphus squarrosus</i>		I (1)	I (1)
<i>Schistidium robustum</i>		I (1)	I (1)
<i>Staurothele hymenogonia</i>		I (1)	I (1)
<i>Tortula muralis</i>		I (1)	I (1)
<i>Verrucaria hochstetteri</i>		I (1)	I (1)
<i>Verrucaria phaeosperma</i>		I (1)	I (1)
<i>Verrucaria pinguicula</i>		I (1)	I (1)
<i>Farnoldia jurana</i>	II (1)		I (1)
Rock		V (1-5)	V (1-5)
<i>Asplenium trichomanes</i>		I (5)	I (5)
<i>Festuca ovina</i>		I (5)	I (5)
<i>Festuca rubra</i>		I (4)	I (4)
<i>Geranium robertianum</i>		I (4)	I (4)
<i>Poa annua</i>		I (4)	I (4)
<i>Thymus polytrichus</i>		I (4)	I (4)
Slope (degrees)	35	33 (10-55)	33 (10-55)
Shade	None	None	None
Run off	None	None to slight	None to slight
Drainage	Moderate to good	(Poor to) moderate to good	(Poor to) moderate to good
Rain shelter	None	None	None
Altitude (m)	45	110-440	45-440
Number of samples	3	13	16

### 3.4.17 SL 17 *Homalothecium sericeum*-*Porella platyphylla* community (Table 78)

#### Synonyms

None are known.

#### Constant species

*Cladonia pocillum*, *Homalothecium sericeum*, *Porella platyphylla* and *Verrucaria nigrescens*.

#### Description and ecology

This community is dominated by robust bryophytes, mainly *Homalothecium sericeum*, although the hepatic *Porella platyphylla* is also constant. The community develops on limestone rocks where there is sufficient moisture or where the stand avoids extremes of drought, as on lightly shaded or poorly drained surfaces, on the basal parts of outcrops, or where narrow cracks supply moisture to the surface of the rock face. The community occurs on rock faces, or less commonly on boulders. *Homalothecium* can be dominant and exclude most other species, but in some stands the bryophytes follow cracks in the rock, and crustose lichens occur between the moss colonies. However, the presence of the moss can provide niches for additional lichens, such as *Cladonia pocillum* or *Lepraria diffusa*. The community can occur adjacent to SL 8, and represents a more developed bryophyte cover under



conditions of less drought stress. Samples were recorded from Wales and northern England but not from the Scottish sites.

### Conservation interest

The typical species of this community are widespread.

### Coverage and integrity

Few samples were recorded, and more need to be studied to understand the variation. Similar stands are likely to be found in light shade in wooded lowland sites.

**Table 78:** Floristic data for SL 17 *Homalothecium sericeum*-*Porella platyphylla* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Homalothecium sericeum</i>	V (5-9)
<i>Porella platyphylla</i>	IV (2-5)
<i>Cladonia pocillum</i>	IV (1-5)
<i>Verrucaria nigrescens</i>	IV (1-4)
<i>Tortella tortuosa</i>	III (2-4)
<i>Verrucaria baldensis</i>	III (2-4)
<i>Aspicilia calcarea</i>	III (1-4)
<i>Caloplaca flavescens</i>	III (1-2)
<i>Thelidium papulare</i>	III (1-2)
<i>Syntrichia intermedia</i>	II (2-5)
<i>Tortula muralis</i>	II (1-4)
<i>Lepraria diffusa</i>	II (3)
<i>Schistidium crassipilum</i>	II (3)
<i>Porina linearis</i>	II (2-3)
<i>Bryum capillare</i>	II (2)
<i>Protoblastenia rupestris</i>	II (2)
<i>Caloplaca lactea</i>	II (1-2)
<i>Verrucaria caerulea</i>	II (1-2)
<i>Agonimia tristicula</i>	II (1)
<i>Leptogium gelatinosum</i>	I (5)
<i>Clauzadea immersa</i>	I (4)
<i>Myxobilimbia sabuletorum</i>	I (4)
<i>Neckera crispa</i>	I (4)
<i>Cladonia pyxidata</i>	I (3)
<i>Collema auriforme</i>	I (3)
<i>Acrocordia conoidea</i>	I (2)
<i>Caloplaca flavocitrina</i>	I (2)
<i>Collema crispum</i>	I (2)
<i>Eurhynchium crassinervium</i>	I (2)
<i>Grimmia pulvinata</i>	I (2)
<i>Neckera complanata</i>	I (2)
<i>Physcia adscendens</i>	I (2)

<i>Reboulia hemisphaerica</i>	I (2)
<i>Belonia nidarosiensis</i>	I (1)
<i>Caloplaca variabilis</i>	I (1)
<i>Catillaria lenticularis</i>	I (1)
<i>Diplotomma alboatrum</i>	I (1)
<i>Fissidens dubius</i>	I (1)
<i>Lecanora albescens</i>	I (1)
<i>Lecidella stigmataea</i>	I (1)
<i>Lepraria eburnea</i>	I (1)
<i>Lepraria lobificans</i>	I (1)
<i>Leptogium turgidum</i>	I (1)
<i>Thelidium decipiens</i>	I (1)
<i>Verrucaria calciseda</i>	I (1)
<i>Verrucariaceae</i> indet. spp.	I (1)
Rock	V (2-7)
<i>Festuca ovina</i>	III (2-4)
<i>Cardamine hirsuta</i>	III (1-3)
<i>Sedum acre</i>	II (2-4)
<i>Dactylis glomerata</i>	II (2)
<i>Arenaria serpyllifolia</i> ssp. <i>serpyllifolia</i>	I (2)
<i>Campanula rotundifolia</i>	I (2)
<i>Cerastium semidecandrum</i>	I (2)
<i>Saxifraga tridactylites</i>	I (2)
<i>Veronica hederifolia</i>	I (2)
<i>Erophila verna</i>	I (1)
<i>Festuca rubra</i>	I (1)
<i>Geranium molle</i>	I (1)
<i>Koeleria macrantha</i>	I (1)
<i>Thymus praecox</i>	I (1)
Slope (degrees)	69 (10-85)
Aspect (degrees)	
Shade	None to moderate
Run off	None to slight
Drainage	Moderate-good
Rain-shelter	None
Altitude (m)	?
Number of samples	6

### 3.4.18 SL 18 *Neckera crispa*-*Scapania aspera* community (Table 79)

#### Synonyms

None are known.

#### Constant species

*Neckera crispa*.

## Description and ecology

A community dominated by the robust pleurocarpous moss *Neckera crispa*. The community develops on steep faces which are usually well-drained and not or only slightly flushed, but which avoid extremes of drought by slight shade or a northerly aspect. *N. crispa* can form extensive stands in suitable places, often with few associated species. The moss *Ctenidium molluscum* is frequent, but this species is much less able to colonise steep faces than *N. crispa*. On steep faces the shoots of *Neckera* can create enough rain-shelter for lichens including *Lepraria eburnea* to enter. On less steep rocks more species-rich stands can develop, where the *Neckera* is accompanied by species including the hepatic *Apometzgeria pubescens* and the mosses *Hylocomium brevirostre*, and *Rhytidiadelphus triquetrus*; these richer stands can form deep cushions, and grade rapidly into mossy turf. One such stand contained the large foliose lichen *Peltigera leucophlebia*.

## Conservation interest

The typical species of this community are widespread.

## Coverage and integrity

Few samples are available. The available samples are variable, and more samples should be studied, including those from shaded habitats.

**Table 79:** Floristic data for SL 18 *Neckera crispa*-*Scapania aspera* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Neckera crispa</i>	V (5-9)
<i>Ctenidium molluscum</i>	III (1-4)
<i>Scapania aspera</i>	III (2-4)
<i>Lepraria nivalis</i>	III (1-4)
<i>Plagiochila porelloides</i>	II (1-2)
<i>Rhytidiadelphus triquetrus</i>	II (2-4)
<i>Amphidium mougeotii</i>	II (1-4)
<i>Fissidens dubius</i>	II (2)
<i>Gyalecta jenensis</i>	II (1-2)
<i>Hylocomium brevirostre</i>	II (2-5)
<i>Hypnum lacunosum</i> var. <i>lacunosum</i>	II (1)
<i>Lepraria lesdainii</i>	II (1-4)
<i>Lepraria diffusa</i>	II (1-4)
<i>Neckera complanata</i>	II (2-3)
<i>Porina linearis</i>	II (1-2)
<i>Porpidia platycarpoides</i>	II (1-2)
<i>Thamnobryum alopecurum</i>	II (3)
<i>Trichostomum brachydontium</i>	II (1)
<i>Verrucaria nigrescens</i>	II (1-2)
<i>Acrocordia conoidea</i>	I (2)
<i>Apometzgeria pubescens</i>	I (4)

<i>Myxobilimbia sabuletorum</i>	I (5)
<i>Peltigera leucophlebia</i>	I (5)
<i>Breutelia chrysocoma</i>	I (4)
<i>Dicranum bonjeanii</i>	I (4)
<i>Grimmia torquata</i>	I (4)
<i>Hypnum jutlandicum</i>	I (4)
<i>Lepraria eburnean</i>	I (4)
<i>Thelidium decipiens</i>	I (4)
<i>Thuidium tamariscinum</i>	I (4)
<i>Tortella tortuosa</i>	I (4)
<i>Ditrichum gracile</i>	I (3)
<i>Caloplaca flavescens</i>	I (2)
<i>Cladonia pocillum</i>	I (2)
<i>Dicranum scoparium</i>	I (2)
<i>Frullania tamarisci</i>	I (2)
<i>Lejeunea cavifolia</i>	I (2)
<i>Polytrichum formosum</i>	I (2)
<i>Rhytidiadelphus squarrosus</i>	I (2)
<i>Sanionia uncinata</i>	I (2)
<i>Schistidium crassipilum</i>	I (2)
<i>Trentepohlia aurea</i>	I (2)
<i>Tritomaria quinquedentata</i>	I (2)
<i>Verrucaria caerulea</i>	I (2)
<i>Aspicilia calcarea</i>	I (1)
<i>Bryum capillare</i>	I (1)
<i>Calliergonella cuspidata</i>	I (1)
<i>Caloplaca flavocitrina</i>	I (1)
<i>Cladonia portentosa</i>	I (1)
<i>Collema fuscovirens</i>	I (1)
<i>Eurhynchium hians</i>	I (1)
<i>Eurhynchium striatum</i>	I (1)
<i>Hylocomium splendens</i>	I (1)
<i>Hymenelia prevostii</i>	I (1)
<i>Lecidella stigmatea</i>	I (1)
<i>Metzgeria conjugata</i>	I (1)
<i>Orthothecium intricatum</i>	I (1)
<i>Placynthium nigrum</i>	I (1)
<i>Plagiomnium affine</i>	I (1)
<i>Plagiomnium undulatum</i>	I (1)
<i>Pohlia cruda</i>	I (1)
<i>Porpidia macrocarpa</i>	I (1)
<i>Protoblastenia calva</i>	I (1)
<i>Rhytidiadelphus loreus</i>	I (1)
<i>Verrucaria baldensis</i>	I (1)
Rock	V (2-5)
<i>Asplenium trichomanes</i>	III (1-2)
<i>Festuca rubra</i>	III (2-4)
<i>Scabiosa columbaria</i>	III (1-4)

<i>Campanula rotundifolia</i>	III (1-2)
<i>Asplenium ruta-muraria</i>	II (1-2)
<i>Thymus polytrichus</i>	II (2-4)
<i>Agrostis capillaris</i>	I (1)
<i>Avenula pratensis</i>	I (2)
<i>Cystopteris fragilis</i>	I (4)
<i>Festuca rubra</i>	I (4)
<i>Geranium lucidum</i>	I (4)
<i>Hieracium</i> spp.	I (1)
<i>Mycelis muralis</i>	I (1)
<i>Oxalis acetosella</i>	I (1)
<i>Polygala</i> spp.	I (1)
<i>Viola riviniana</i>	I (1)
Slope (degrees)	75 (50-95)
Aspect (degrees)	
Shade	None to slight
Run off	None to slight (to moderate)
Drainage	Moderate to good
Rain shelter	None to slight
Altitude (m)	
Number of samples	9

### 3.4.19 SL 19 *Trichostomum brachydontium*-*Eurhynchium hians* community (Table 80)

#### Synonyms

OV39 *Asplenium trichomanes*-*A. ruta-muraria* community p.p.; OV40 *Asplenium viride*-*Cystopteris fragilis* community p.p. (Rodwell 1991-2000).

#### Constant species

*Ctenidium molluscum*.

#### Description and ecology

Bryophytes dominate this community of moist crevices in limestone. The only constant species is the moss *Ctenidium molluscum*, but this is frequent in other communities. Frequent species here include *Eurhynchium hians*, *Trichostomum brachydontium* and *Scapania aspera*. Other species that are preferential for this community include *Mnium marginatum*, *M. thomsonii*, *Preissia quadrata* and *Trichostomum crispulum*.

Stands occur in crevices and recesses, typically at the foot of cliffs and rock faces and it occurs in limestone pavement. The community is variable, in part because conditions of shade, moisture and shelter are likely to vary rapidly over short distances within the crevices. *Trichostomum* spp. represent slightly more open conditions and potentially drier conditions than species such as *Eurhynchium hians*, *Orthothecium intricatum* and *Mnium thomsonii*, but it is not practicable to subdivide the community because the species occur in various combinations. The wettest samples contain the moss *Orthothecium rufescens*, and are close to SL 27. The community is usually confined to limestone, and develops rarely on calcareous

siliceous rocks. The community is widespread and is recorded from Wales, northern England and western Scotland, but stands were often scarce and small in extent.

### Conservation interest

This community contains some uncommon species, including *Mnium thomsonii*.

### Differentiation from other communities

N1 shares many species with SL 19, but differs in the scarcity of *Trichostomum* spp. and the presence of *Amphidium mougeotii* or *Anoetangium aestivum*. SL 27 differs in the predominance of bryophytes of wet habitats.

### Coverage and integrity

The community is reasonably well covered by samples.

**Table 80:** Floristic data for SL 19 *Trichostomum brachydontium*-*Eurhynchium hians* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Ctenidium molluscum</i>	IV (2-8)
<i>Scapania aspera</i>	III (2-4)
<i>Gyalecta jenensis</i>	III (1-2)
<i>Trichostomum brachydontium</i>	III (2-6)
<i>Eurhynchium hians</i>	III (1-6)
<i>Tortella tortuosa</i>	III (1-4)
<i>Thamnobryum alopecurum</i>	II (2-5)
<i>Fissidens dubius</i>	II (1-5)
<i>Plagiomnium undulatum</i>	II (1-4)
<i>Preissia quadrata</i>	II (1-6)
<i>Neckera crispa</i>	II (2-5)
<i>Ditrichum gracile</i>	II (1-4)
<i>Plagiochila porelloides</i>	II (1-6)
<i>Solorina saccata</i>	I (1-6)
<i>Orthothecium intricatum</i>	II (1-7)
<i>Encalypta streptocarpa</i>	II (1-4)
<i>Pellia endiviifolia</i>	II (1-5)
<i>Lepraria nivalis</i>	II (2-4)
<i>Trichostomum crispulum</i>	I (4-8)
<i>Mnium thomsonii</i>	I (5-7)
<i>Porina linearis</i>	I (1-3)
<i>Gymnostomum aeruginosum</i>	I (1-5)
<i>Conocephalum conicum</i> agg.	I (1-4)
<i>Fissidens taxifolius</i>	I (1-4)
<i>Trentepohlia aurea</i>	I (1-4)
<i>Leiocolea alpestris</i>	I (1-4)

<i>Orthothecium rufescens</i>	I (1-6)
<i>Anoetangium aestivum</i>	I (5)
<i>Mnium marginatum</i>	I (4-5)
<i>Pohlia cruda</i>	I (3-5)
<i>Neckera complanata</i>	I (2-5)
<i>Lepraria eburnea</i>	I (1-5)
<i>Lepraria lobificans</i>	I (4)
<i>Bryum pallens</i>	I (4)
<i>Calliergonella cuspidata</i>	I (4)
<i>Campylium</i> sp.	I (4)
<i>Eucladium verticillatum</i>	I (4)
<i>Mnium stellare</i>	I (4)
<i>Pohlia melanodon</i>	I (3-4)
<i>Riccardia chamedryfolia</i>	I (2-4)
<i>Collema tenax</i>	I (1-4)
<i>Jungermannia</i> spp.	I (1-4)
<i>Didymodon fallax</i>	I (3)
<i>Verrucaria viridula</i>	I (3)
<i>Verrucaria baldensis</i>	I (2-3)
<i>Opegrapha dolomitica</i>	I (1-3)
<i>Nostoc</i> (rounded colonies)	I (1-3)
<i>Thelidium decipiens</i>	I (1-3)
<i>Bryoerthyrophyllum recurvirostrum</i>	I (2)
<i>Bryum pseudotriquetrum</i>	I (2)
<i>Eurhynchium praelongum</i> var. <i>praelongum</i>	I (2)
<i>Dicranella varia</i>	I (2)
<i>Didymodon insulanus</i>	I (2)
<i>Amphidium mougeotii</i>	I (2)
<i>Bacidia bagliettoana</i>	I (2)
<i>Catillaria lenticularis</i>	I (2)
<i>Clauzadea immersa</i>	I (2)
<i>Cololejeunea calcarea</i>	I (2)
<i>Fissidens gracilifolius</i>	I (2)
<i>Placynthium nigrum</i>	I (2)
<i>Protoblastenia calva</i>	I (2)
<i>Rhytidiadelphus loreus</i>	I (2)
<i>Seligeria trifaria</i>	I (2)
<i>Cladonia pocillum</i>	I (1-2)
<i>Lepraria lesdainii</i>	I (1-2)
<i>Leproplaca chrysodeta</i>	I (1-2)
<i>Rhytidiadelphus squarrosus</i>	I (1-2)
<i>Thuidium tamariscinum</i>	I (1-2)
<i>Clauzadea monticola</i>	I (1-2)
<i>Myxobilimbia sabuletorum</i>	I (1-2)
<i>Plagiomnium</i> spp. indet.	I (1-2)
<i>Protoblastenia incrustans</i>	I (1-2)
<i>Rhizomnium punctatum</i>	I (1-2)
<i>Scleropodium purum</i>	I (1-2)

<i>Tolypothrix tenuis</i> var. <i>calcarata</i>	I (1-2)
<i>Amblystegium serpens</i>	I (1)
<i>Fissidens viridulus</i>	I (1)
<i>Collema auriforme</i>	I (1)
<i>Protoblastenia rupestris</i>	I (1)
<i>Acrocordia salweyi</i>	I (1)
<i>Breutelia chrysocoma</i>	I (1)
<i>Bryum capillare</i>	I (1)
Indet. foveolate Verrucariaceae (sterile)	I (1)
<i>Placynthium garovaglii</i>	I (1)
<i>Seligeria</i> spp.	I (1)
<i>Verrucaria caerulea</i>	I (1)
<i>Verrucaria</i> spp. indet.	I (1)
<i>Acrocordia conoidea</i>	I (1)
<i>Belonia nidarosiensis</i>	I (1)
<i>Bryum</i> spp.	I (1)
<i>Distichium capillaceum</i>	I (1)
<i>Farnoldia jurana</i>	I (1)
<i>Hylocomium splendens</i>	I (1)
<i>Lecania cuprea</i>	I (1)
<i>Lecania turicensis</i>	I (1)
<i>Lempholemma polyanthes</i>	I (1)
<i>Leptogium gelatinosum</i>	I (1)
<i>Myxobilimbia lobulata</i>	I (1)
<i>Placynthium tremniacum</i>	I (1)
<i>Plagiomnium rostratum</i>	I (1)
<i>Polyblastia albida</i>	I (1)
<i>Polyblastia melaspora</i>	I (1)
<i>Racomitrium ericoides</i>	I (1)
<i>Reboulia hemisphaerica</i>	I (1)
<i>Verrucaria dufourii/pinguicula</i>	I (1)
Rock	V (2-5)
<i>Asplenium trichomanes</i>	III (1-5)
<i>Festuca rubra</i>	III (1-5)
<i>Thymus polytrichus</i>	III (1-4)
<i>Oxalis acetosella</i>	III (1-4)
<i>Asplenium viride</i>	II (1-5)
<i>Viola riviniana</i>	II (1-4)
<i>Cystopteris fragilis</i>	II (1-4)
<i>Carex flacca</i>	II (1-4)
<i>Festuca ovina</i>	II (1-4)
<i>Asplenium ruta-muraria</i>	II (1-2)
<i>Primula vulgaris</i>	I (1-4)
<i>Taraxacum</i> spp.	I (1-2)
<i>Selaginella selaginoides</i>	I (1-2)
<i>Geranium robertianum</i>	I (1)
<i>Epilobium brunnescens</i>	I (4)
<i>Carex pulicaris</i>	I (4)



<i>Hieracium</i> sp.	I (2)
<i>Agrostis capillaris</i>	I (2)
<i>Bromus ramosus</i>	I (2)
<i>Campanula rotundifolia</i>	I (2)
<i>Filipendula ulmaria</i>	I (2)
<i>Linum catharticum</i>	I (2)
<i>Polygonum viviparum</i>	I (2)
<i>Pteridium aquifolium</i>	I (2)
<i>Agrostis canina</i>	I (1)
<i>Avenula pratensis</i>	I (1)
<i>Dryas octopetala</i>	I (1)
<i>Dryopteris filix-mas</i>	I (1)
<i>Festuca filiformis</i>	I (1)
<i>Hypericum</i> sp.	I (1)
<i>Molinia caerulea</i>	I (1)
<i>Polystichum lonchitis</i>	I (1)
<i>Potentilla sterilis</i>	I (1)
<i>Stachys officinalis</i>	I (1)
Slope (degrees)	63 (0-90)
Aspect (degrees)	
Shade	(None to) slight to moderate (to strong)
Run off	Slight to moderate
Drainage	Moderate to good
Rain shelter	Slight to strong
Altitude (m)	60-640
Number of samples	27

### 3.4.20 SL 20 *Lempholemma cladodes* - *L. botryosum* community (Table 81)

#### Synonyms

*Placynthietum nigri* Klem. '*Lempholemma botryosum* nodum' (James *et al.*, 1977).

#### Constant species

*Lempholemma cladodes*.

#### Description and ecology

This is a specialized and species-poor community containing the minute branching thalli of the cyanolichens *Lempholemma cladodes* or *L. botryosum*. The community occurs in solution hollows (kamenitzas) on the surface of unshaded limestone bedrock, which hold rain water. The *Lempholemma* either covers the bottom of the hollow or more frequently forms a zone around the inside towards the bottom; the bottom of the hollow often contains water for too long to support *Lempholemma*, and is either bare rock, or has colonies of cyanobacteria, or contains decaying moss fragments. The community was noted only at Ingleborough.

**Conservation interest**

*Lempholemma cladodes* is Near Threatened.

**Differentiation from other communities**

*Lempholemma* spp. can occur on damp limestone in other communities, but there numerous associates accompany them.

**Coverage and integrity**

A very simple community, but additional samples from other sites would help to define its limits and variation.

**Table 81:** Floristic data for SL 20 *Lempholemma cladodes*-*L. botryosum* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Lempholemma cladodes</i>	IV (3-7)
<i>Collema fuscovirens</i>	II (1-2)
Indet. brown crustose cyanolichen	I (7)
Cyanobacteria	I (4)
<i>Lempholemma botryosum</i>	I (4)
<i>Placynthium nigrum</i>	I (2)
<i>Thelidium decipiens</i>	I (2)
Rock	V (7-9)
Slope (degrees)	0
Aspect (degrees)	
Shade	None
Run off	Slight
Drainage	Poor
Rain shelter	None
Altitude (m)	300-440
Number of samples	5

**3.4.21 SL 21 *Seligeria trifaria* community (Table 82)****Synonyms**

None are known.

**Constant species**

*Seligeria trifaria*.

### Description and ecology

The community is based on two samples dominated by the small acrocarpous moss *Seligeria trifaria*, which grows on damp limestone. One sample was from the shaded and flushed side of a sinkhole at Ingleborough, where it grew with the filamentous cyanobacterium *Stigonema*, and the other was on permanently wet rock in a seepage at Rassal (western Scotland), growing with the hemispherical colonies of the cyanobacterium *Rivularia*.

### Conservation interest

*Seligeria trifaria* s.l. is uncommon. It has recently been shown to comprise two species in Britain, *S. trifaria* s.s. and *S. patula*, of which *S. trifaria* s.s. is the rarer. These species are distinguished on characters of the sporophyte. *S. trifaria* s.s. This species was confirmed from one of the quadrat samples (Rassal), but material from the second quadrat is sterile and unassignable.

### Coverage and integrity

This community is only based on two samples, which have no species in common other than *Seligeria*.

**Table 82:** Floristic data for SL 21 *Seligeria trifaria* community

Species/Environmental factor	Sample number with cover values for species and rock/ Environmental data	
	170	440
<i>Seligeria trifaria</i>	8	8
<i>Stigonema</i> sp.	6	
<i>Rivularia haematites</i>		4
<i>Fissidens dubius</i>	2	
<i>Leiocolea alpestris</i>	2	
<i>Scytonema</i> sp.		2
<i>Cololejeunea calcarea</i>	1	
Rock	4	5
Slope (degrees)	100	20
Aspect (degrees)	40	310
Shade	Moderate	None
Run off	Moderate-strong	Strong
Drainage	Good	Poor-moderate
Rain shelter	Moderate	None
Altitude (m)		
Quadrat size (cm)	30 x 20.8	25 x 25
Vice county	64	105
Grid ref.	34/7271.7423	18/8575.4416
Date	12 Apr 2003	28 Aug 2003
SAC/site code	ING	R

**3.4.22 SL 22 *Metamelaena umbonata*-*Porina linearis* community (Table 83)****Synonyms**

None are known.

**Constant species**

*Metamelaena umbonata*.

**Description and ecology**

A community dominated by the crustose cyanolichen *Metamelaena umbonata*. Stands are often species-poor, and occur on flushed or inundated rocks which are seasonally dry, including rocks beside streams, flushed bedrock and vertical faces on cliffs. *Porina linearis* is frequent. The black crusts of *Metamelaena* are often difficult to see against rocks which are blackish from free-living cyanobacteria. Samples are only available from western Scotland (Rassal and Inchnadamph).

**Conservation interest**

*Metamelaena umbonata* is Nationally Scarce.

**Coverage and integrity**

A poorly defined community based on the abundance of a single species in a small number of samples. It is possible that the samples comprising this community would be better arranged amongst SL 23 and in freshwater communities. As it stands, the community is poorly defined, and based on the abundance of a single species.

**Table 83:** Floristic data for SL 22 *Metamelaena umbonata*-*Porina linearis* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Metamelaena umbonata</i>	V (4-8)
<i>Porina linearis</i>	II (4-5)
<i>Hymenelia epulotica</i>	II (2-4)
<i>Gyalecta jenensis</i>	II (2-4)
<i>Scytonema</i> spp.	II (2-3)
<i>Verrucaria hydrela</i>	I (4)
<i>Polyblastia albida</i>	I (4)
<i>Collemopsidium caesium</i>	I (4)
<i>Trentepohlia aurea</i>	I (2)
<i>Clauzadea monticola</i>	I (2)
<i>Placynthium nigrum</i>	I (2)
<i>Verrucaria aethiobola</i>	I (2)
<i>Hygrohypnum luridum</i>	I (2)
<i>Verrucaria baldensis</i>	I (2)
<i>Verrucaria viridula</i>	I (2)

<i>Sagiolechia protuberans</i>	I (2)
<i>Hymenelia epulotica</i>	I (2)
<i>Cololejeunea calcarea</i>	I (1)
<i>Trentepohlia aurea</i>	I (1)
<i>Psora lurida</i>	I (1)
<i>Staurothele rupifraga</i>	I (1)
Rock	V (4-9)
Slope (degrees)	56 (25-85)
Aspect (degrees)	
Shade	None
Run off	(Slight to) moderate to strong
Drainage	Moderate to good
Rain shelter	None to slight
Altitude (m)	45-160
Number of samples	7

### 3.4.23 SL 23 *Porina linearis*-*Belonia nidarosiensis* community (Table 84)

#### Synonyms

None are known.

#### Constant species

*Porina linearis*.

#### Description and ecology

Crustose lichens dominate this community occurring on usually steep and somewhat sheltered faces of limestone. *Porina linearis* is constant, and *Belonia nidarosiensis* is frequent; both these species contain *Trentepohlia* as photobiont, and stands are often pinkish in colour, although the thallus of *Porina* may be blackened. In some stands the rock surface is covered by the free-living *Trentepohlia* cf. *umbrina*, which is reddish in colour. Stands are often sheltered from rain and often receive little or no run-off, but extremes of drying are often prevented by shade from trees or by a northerly aspect. With greater shelter stands can (but not invariably) grade into SL 4. Stands occur on bedrock including limestone pavement and occur frequently at the base of cliffs.

#### Conservation interest

The typical species of this community are widespread.

#### Coverage and integrity

Although there are a reasonable number of samples available, they are still insufficient to divide this variable community into sub-communities.

**Table 84:** Floristic data for SL 23 *Porina linearis*-*Belonia nidarosiensis* community

<b>Species/Environmental factor</b>	<b>Constancy class (min-max cover)/ Environmental data</b>
<i>Porina linearis</i>	IV (2-8)
<i>Belonia nidarosiensis</i>	III (1-8)
<i>Caloplaca citrina</i> agg.	II (1-3)
<i>Lepraria nivalis</i>	II (2-5)
<i>Catillaria lenticularis</i>	II (1-4)
<i>Acrocordia conoidea</i>	II (1-5)
<i>Verrucaria nigrescens</i>	II (1-4)
Pink unknown lichen	I (2-5)
<i>Verrucaria baldensis</i>	I (2-5)
<i>Leproplaca xantholyta</i>	I (2-4)
<i>Collema fuscovirens</i>	I (1-4)
<i>Placynthium nigrum</i>	I (1-4)
<i>Thelidium decipiens</i>	I (1-2)
<i>Hymenelia prevostii</i>	I (2-6)
<i>Protoblastenia rupestris</i>	I (1-4)
<i>Clauzadea monticola</i>	I (1-2)
<i>Fissidens dubius</i>	I (1-2)
<i>Gyalecta jenensis</i>	I (1-2)
<i>Lecanora albescens</i>	I (1-2)
<i>Leproplaca chrysodeta</i>	I (1-2)
<i>Verrucaria dufourii/pinguicula</i>	I (1-2)
<i>Caloplaca flavescens</i>	I (4-5)
<i>Diplotomma alboatrum</i>	I (2-4)
<i>Protoblastenia rupestris</i>	I (1-4)
<i>Acarospora cervina</i>	I (3)
<i>Verrucaria caerulea</i>	I (2-3)
<i>Tortella tortuosa</i>	I (2)
<i>Agonimia tristicula</i>	I (1-2)
<i>Collema callopismum</i>	I (1-2)
<i>Protoblastenia calva</i>	I (1-2)
<i>Orthothecium rufescens</i>	I (1-2)
Green algae	I (6)
<i>Placynthium garovaglii</i>	I (6)
<i>Hymenelia epulotica</i>	I (6)
<i>Polyblastia albida</i>	I (5)
<i>Verrucaria viridula</i>	I (5)
<i>Lecania rabenhorstii</i>	I (5)
<i>Lecanora agardhiana</i>	I (5)
<i>Staurothele caesia</i>	I (4)
<i>Thelidium incavatum</i>	I (4)
<i>Thelidium papulare</i>	I (4)
<i>Verrucaria calciseda</i>	I (4)
<i>Placynthium subradiatum</i>	I (3)

<i>Caloplaca saxicola</i>	I (2)
<i>Schistidium crassipilum</i>	I (2)
<i>Aneura pinguis</i>	I (2)
<i>Caloplaca ochracea</i>	I (2)
<i>Nostoc</i> spp.	I (2)
<i>Pseudoleskeella catenulata</i>	I (2)
<i>Schistidium robustum</i>	I (2)
<i>Aspicilia contorta</i> var. <i>hoffmanniana</i>	I (1)
<i>Clauzadea immersa</i>	I (1)
<i>Lecanora crenulata</i>	I (1)
<i>Lepraria lesdainii</i>	I (1)
<i>Neckera crispa</i>	I (1)
<i>Opegrapha dolomitica</i>	I (1)
<i>Scapania aspera</i>	I (1)
<i>Verrucaria fuscella/polysticta</i>	I (1)
<i>Collema multipartitum</i>	I (1)
<i>Lempholemma cladodes</i>	I (1)
<i>Lempholemma polyanthes</i>	I (1)
<i>Solenopsora candicans</i>	I (1)
Rock	V (2-8)
<i>Asplenium viride</i>	I (1)
Slope (degrees)	84 (35-115)
Aspect (degrees)	
Shade	None to moderate
Run off	None to moderate
Drainage	Good
Rain shelter	None to strong
Altitude (m)	75-340
Number of samples	20

### 3.4.24 SL 24 *Lepraria eburnea* community (Table 85)

#### Synonyms

None are known.

#### Constant species

*Lepraria eburnea*.

#### Description and ecology

The sterile powdery lichen *Lepraria eburnea* dominates this community, which occurs in rain-sheltered calcareous overhangs. Stands are damp from seepage but sheltered from rain, and occur in overhangs in cliffs. The community occurs mostly on calcareous siliceous rocks, and the only records from limestone are from Inchnadamph.

### Conservation interest

The typical species of this community are widespread. *Lepraria eburnea* is currently Nationally Scarce but is under-recorded.

### Differentiation from other communities

This community is distinguished by the abundance of *Lepraria eburnea*. *L. eburnea* is frequent at low cover in SS N1. Some samples are related to SL 23.

### Coverage and integrity

Few samples are available and more need to be studied to understand the variation in and limits of the community. Although this community is based on the abundance of a single species it appears to be worthy of recognition.

**Table 85:** Floristic data for SL 24 *Lepraria eburnea* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Lepraria eburnea</i>	V (5-8)
<i>Gymnostomum aeruginosum</i>	III (2-4)
<i>Trentepohlia aurea</i>	III (2-4)
<i>Porina linearis</i>	II (4-7)
<i>Gyalecta jenensis</i>	II (1-2)
<i>Cololejeunea calcarea</i>	II (1)
<i>Tortella tortuosa</i>	I (6)
<i>Opegrapha dolomitica</i>	I (5)
<i>Blindia acuta</i>	I (4)
<i>Polyblastia cupularis</i>	I (3)
<i>Belonia nidarosiensis</i>	I (2)
<i>Cystocoleus ebeneus</i>	I (2)
<i>Frullania tamarisci</i>	I (2)
<i>Scapania aspera</i>	I (2)
<i>Amphidium mougeotii</i>	I (1)
<i>Ctenidium molluscum</i>	I (1)
<i>Hymenelia epulotica</i>	I (1)
<i>Mnium hornum</i>	I (1)
<i>Porina lectissima</i>	I (1)
<i>Rhizocarpon lavatum</i>	I (1)
<i>Seligeria donniana</i>	I (1)
<i>Trichostomum tenuirostre</i>	I (1)
Slope (degrees)	96 (55-110)
Aspect (degrees)	
Shade	Slight to moderate
Run off	None to slight
Drainage	Good
Rain shelter	Moderate to strong



Altitude (m)	150-700
Number of samples	5

### 3.4.25 SL 25 *Ctenidium molluscum* community (Table 86)

#### Synonyms

None are known.

#### Constant species

Only two samples are available.

#### Description and ecology

This is a very provisional community defined by two samples dominated by the moss *Ctenidium molluscum*. The community occurs on shaded limestone rocks where similar stands are likely to be frequent.

#### Conservation interest

The typical species of this community are widespread.

#### Coverage and integrity

The community will be best developed on shaded limestone and many more samples from this habitat are necessary to understand it.

**Table 86:** Floristic data for SL 25 *Ctenidium molluscum* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data	
	281	76
<i>Ctenidium molluscum</i>	8	9
<i>Neckera complanata</i>	5	
<i>Plagiochila porelloides</i>	4	
<i>Scapania aspera</i>	4	
<i>Tortella tortuosa</i>		4
<i>Agonimia tristicula</i>		2
<i>Fissidens dubius</i>		2
<i>Gyalecta jenensis</i>		2
<i>Leproloma diffusum</i>	2	
<i>Neckera crispa</i>		2
<i>Verrucaria baldensis</i>	2	
<i>Zygodon viridissimus</i> var. <i>viridissimus</i>		2
<i>Lempholemma polyanthes</i>		1
<i>Schistidium crassipilum</i>		1

Rock	2	3
<i>Festuca ovina</i>	5	
<i>Brachypodium sylvaticum</i>	4	
<i>Campanula rotundifolia</i>	2	
<i>Fraxinus excelsior</i> (seedlings)	2	
<i>Galium saxatile</i>		2
<i>Arabis hirsute</i>	1	
Slope (degrees)	60	65
Aspect (degrees)	20	40
Shade	Moderate-strong	Moderate
Run off	Slight-moderate	None
Drainage	Good	Good
Altitude (m)		75
Vice-county	57	104
Quadrat size (cm)	50 x 50	50 x 40
Grid ref.	43/1470.5212	18/588.184
Date	28 June 2002	2 Nov 2001
SAC/site code	DD	ST
Number of samples	1	1

### 3.4.26 SL 26 *Gymnostomum aeruginosum* community (Table 87)

#### Synonyms

None are known.

#### Constant species

*Gymnostomum aeruginosum*.

#### Description and ecology

This very provisional community is defined by only three samples, dominated by the moss *Gymnostomum aeruginosum*. One occurred on the side of a shaded, seeping crevice in limestone pavement, another below a wet limestone overhang, and a third on a cliff of soft, damp, calcareous sandstone.

#### Conservation interest

The typical species of this community are widespread.

#### Differentiation from other communities

SL 26 differs from SL 27 in the dominance of *Gymnostomum aeruginosum*.

#### Coverage and integrity

This is a very provisional community, based on three samples.

**Table 87:** Floristic data for SL 26 *Gymnostomum aeruginosum* community

Species/Environmental factor	Sample number with cover values for species and rock/Environmental data		
	82	143	76
<i>Gymnostomum aeruginosum</i>	8	6	8
<i>Gyalecta jenensis</i>		1	1
<i>Nostoc</i> spp.		5	
<i>Trentepohlia aurea</i>			4
<i>Ctenidium molluscum</i>	2		
<i>Riccardia chamedryfolia</i>	2		
<i>Eurhynchium hians</i>	2		
<i>Jungermannia pumila</i>			2
<i>Jungermannia</i> sp.		2	
<i>Seligeria acutifolia</i>		2	
<i>Conocephalum conicum</i>		2	
<i>Staurothele succedens</i>			2
<i>Lepraria nivalis</i>		2	
<i>Encalypta streptocarpa</i>			2
<i>Isopterygiopsis pulchella</i>	1		
<i>Scapania aspera</i>	1		
filamentous cyanobacteria	1		
<i>Fissidens dubius</i>		1	
Rock	4	8	
<i>Asplenium viride</i>	4	2	
<i>Epilobium brunnescens</i>			2
<i>Festuca vivipara</i>			2
<i>Geranium robertianum</i>	2		
<i>Dryopteris affinis</i> ssp. <i>borreri</i>			1
<i>Dryopteris</i> sp.		1	
Slope (degrees)	100	95	90
Aspect (degrees)	340	320	20
Shade	Moderate-strong	Moderate	None-slight
Run off	Moderate-strong	Moderate	Slight-moderate
Drainage	Good	Good	Good
Rain shelter		Strong	None-slight
Altitude (m)	60	430	670
Year	2001	2005	2006
Number of samples	1	1	1

### 3.4.27 SL 27 *Conocephalum conicum* - *Gymnostomum aeruginosum* community (Table 88)

#### Synonyms

OV40 *Asplenium viride*-*Cystopteris fragilis* community p.p. (Rodwell 1991-2000).

**Constant species**

*Conocephalum conicum*.

**Description and ecology**

Robust bryophytes dominate this community occurring on damp limestone rock, including limestone pavement. *Conocephalum conicum* agg. is constant (absent in only one sample dominated by *Orthothecium rufescens*) and the small moss *Gymnostomum aeruginosum* is frequent. Other bryophytes which are occasional and are conspicuous in some stands include *Orthothecium rufescens*, *Palustriella commutata*, *Pellia endiviifolia*, *Plagiomnium undulatum* and *Rhizomnium punctatum*.

The community can be divided into two poorly defined sub-communities:

SL 27a. These are somewhat drier stands and are widespread.

SL 27b. These are wetter stands, with species including *Gymnostomum aeruginosum*, *Hymenostylium insigne*, *Orthothecium rufescens*. These occur in western Scotland (Inchnadamph and Rassal).

The community develops on limestone or calcareous sandstone that is more or less continuously damp, and occurs under overhangs and in seeping crevices in rock faces, rarely below boulders.

**Differentiation from other communities**

SL 27 differs from SL 26 in the presence of additional, more robust bryophytes, including *Conocephalum* or *Orthothecium rufescens*.

Wetter stands of SL 19 are close to SL 27, but differ in the presence of bryophytes of drier rocks, including *Eurhynchium hians*, *Mnium* spp., *Trichostomum* spp. and *Scapania aspera*.

**Coverage and integrity**

A provisional community based on rather few samples. Apart from the constancy of *Conocephalum*, the community is very variable and could be divided differently when more samples are available.

**Table 88:** Floristic data for SL 27 *Conocephalum conicum*-*Gymnostomum aeruginosum* community

Species/Environmental factor	Constancy class (min-max cover)/ Environmental data
<i>Conocephalum conicum</i>	V (5-8)
<i>Gymnostomum aeruginosum</i>	III (1-5)
<i>Eurhynchium hians</i>	II (1-7)
<i>Orthothecium rufescens</i>	II (1-7)

<i>Ctenidium molluscum</i>	II (2-5)
<i>Pellia endiviifolia</i>	II (1-5)
<i>Jungermannia atrovirens</i>	II (1-4)
<i>Rhizomnium punctatum</i>	II (2-5)
<i>Aneura pinguis</i>	II (1-3)
<i>Pohlia melanodon</i>	II (2)
<i>Fissidens taxifolius</i>	II (1-2)
<i>Plagiochila porelloides</i>	II (1-2)
<i>Fissidens dubius</i>	I (4-5)
<i>Amphidium mougeotii</i>	I (2-5)
<i>Palustriella commutata</i>	I (2-5)
<i>Plagiomnium undulatum</i>	I (2-5)
<i>Anomobryum julaceum</i>	I (2-4)
<i>Mnium hornum</i>	I (2-4)
<i>Hymenostylium insigne</i>	I (1-4)
<i>Bryum pseudotriquetrum</i>	I (2-3)
<i>Dicranella varia</i>	I (2-3)
<i>Preissia quadrata</i>	I (2)
<i>Nostoc</i> spp.	I (1-2)
<i>Didymodon insulanus</i>	I (1-2)
<i>Trentepohlia aurea</i>	I (1-2)
<i>Hyocomium armoricum</i>	I (5)
<i>Isopterygiopsis pulchella</i>	I (4)
<i>Blindia acuta</i>	I (4)
<i>Leiocolea alpestris</i>	I (4)
<i>Mnium stellare</i>	I (4)
<i>Scapania aspera</i>	I (2)
<i>Dicranella palustris</i>	I (2)
<i>Encalypta streptocarpa</i>	I (2)
<i>Eurhynchium praelongum</i>	I (2)
<i>Fissidens adianthoides</i>	I (2)
<i>Thamnobryum alopecurum</i>	I (2)
<i>Tortella tortuosa</i>	I (2)
<i>Trichostomum brachydontium</i>	I (2)
<i>Riccardia chamedryfolia</i>	I (1)
<i>Gyalecta jenensis</i>	I (1)
<i>Amblystegium serpens</i>	I (1)
<i>Bryum pallens</i>	I (1)
<i>Collema auriforme</i>	I (1)
<i>Dichodontium pellucidum</i>	I (1)
<i>Didymodon rigidulus</i>	I (1)
<i>Ditrichum gracile</i>	I (1)
<i>Jungermannia pumila</i>	I (1)
<i>Lepraria eburnea</i>	I (1)
<i>Philonotis fontana</i>	I (1)
<i>Plagiothecium succulentum</i>	I (1)
<i>Polyblastia melaspora</i>	I (1)
<i>Protoblastenia rupestris</i>	I (1)

<i>Solorina saccata</i>	I (1)
<i>Staurothele succedens</i>	I (1)
<i>Thuidium tamariscinum</i>	I (1)
Rock	IV (0-5)
Soil	II (4-5)
<i>Cystopteris fragilis</i>	IV (1-5)
<i>Asplenium viride</i>	III (2-5)
<i>Oxalis acetosella</i>	II (1-4)
<i>Chrysoplenium oppositifolium</i>	II (1-5)
<i>Epilobium brunnescens</i>	II (1-5)
<i>Festuca rubra</i>	II (2-4)
<i>Geranium robertianum</i>	II (1-4)
<i>Pinguicula vulgaris</i>	II (1-2)
<i>Hieracium</i> sp.	I (2)
<i>Asplenium trichomanes</i>	I (1)
<i>Cardamine flexuosa</i>	I (2)
<i>Carex flacca</i>	I (2)
<i>Holcus mollis</i>	I (2)
<i>Sedum rosea</i>	I (2)
<i>Thymus polytrichus</i>	I (2)
<i>Viola riviniana</i>	I (2)
<i>Dryopteris</i> sp.	I (1)
<i>Asplenium ruta-muraria</i>	I (1)
<i>Circaea x intermedia</i>	I (1)
<i>Crepis paludosa</i>	I (1)
<i>Deschampsia cespitosa</i>	I (1)
<i>Dryopteris affinis</i>	I (1)
<i>Epilobium montanum</i>	I (1)
<i>Fragraria vesca</i>	I (1)
<i>Hypericum pulchrum</i>	I (1)
Slope (degrees)	50 (10-90)
Aspect (degrees)	
Shade	Slight to strong
Run off	Slight to strong
Drainage	Poor to good
Rain shelter	Slight to strong
Altitude (m)	150-610
Number of samples	10

### 3.5 Communities of Annex I habitats

McLeod *et al* (2005) provide a short description of each of the five Annex I rock habitats considered in the present survey, and interpreted them in terms of the NVC as follows:

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*): principally represented by U18 *Cryptogramma crista*–*Athyrium distentifolium* snow-bed community and U21 *Cryptogramma crista*–*Deschampsia flexuosa* community. Other forms of siliceous scree dominated by cryptograms are also encompassed by the habitat.

Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*): some low-lying examples are referable to OV38 *Gymnocarpium robertianum* – *Arrhenatherum elatius*. OV40 *Asplenium viride* – *Cystopteris fragilis* community is occasionally developed in scree. Other forms of calcareous and calcshist scree vegetation are not described by the NVC.

Calcareous rocky slopes with chasmophytic vegetation: includes OV39 *Asplenium trichomanes* – *Asplenium ruta-muraria* community and OV40 *Asplenium viride* – *Cystopteris fragilis* community, but other forms are not described by the NVC.

Siliceous rocky slopes with chasmophytic vegetation: some forms are referred to U21 *Cryptogramma crispa* – *Deschampsia flexuosa* community, but this habitat is poorly covered by the NVC.

Limestone pavements: a range of heath, grassland, scrub and woodland NVC types and NVC types associated with calcareous rock can occur on limestone pavement.

The interpretation of each of these habitats in terms of cryptogamic communities is not straightforward. Screes are relatively easy to define by their physical structure, and include gently sloping stony ground on summits, as well as block scree and finer mobile material on steeper slopes. Chasmophytic vegetation is more easily defined in terms of vascular plant communities, where plants need fissures in which to root. Cryptogams are not so restricted, so the definition of this habitat must be based either on the topography of the rock, the type of community, or a combination of both. Stands that grow in distinct fissures are easily defined as chasmophytic, especially when they occur with small ferns and other species usually regarded as chasmophytic, but there is a gradation from such fissures through larger recesses and overhangs to simply overhanging rock faces, which may be tall and exposed. Fissures are likely to provide one or more of the following conditions when compared to rock surrounding the fissure:

- shelter from direct rainfall;
- shade;
- reduced evaporation and higher humidity;
- moisture from seepage;
- protection from physical disturbance; and
- protection from extremes of temperature.

One approach to defining the Annex I habitat would be to assess which communities are largely confined to microhabitats providing some of these conditions, and to use the presence of these communities as a guide to the occurrence of the habitat. The communities involved are mainly moss-dominated communities relying on seepage, and lichen-dominated communities on surfaces sheltered from rain.

### **3.5.1 Siliceous scree of the montane to snow levels**

Screes vary from those composed of small and mobile stones to block screes comprising large and stable boulders. Thus a wide range of microhabitats occurs, and the larger boulders can provide some of the microhabitats which are also found on bedrock, such as overhanging faces, shaded cavities, and lightly flushed surfaces. Of the 56 communities delimited on

siliceous rock in this survey, 29 were recorded at least once on scree, making this a habitat of major importance. A small number of communities were recorded predominantly in association with scree. D1 represents a community of unstable surfaces, and is one of the most frequent communities on fine scree, sometimes also occurring on larger rocks where the surface is unstable or recently exposed. In wetter regions of Britain it is often replaced on fine scree by E1, which also occurs on block scree.

Fine siliceous scree (stones mostly in the range 5–20 cm long) is physically a fairly uniform habitat. In the sites studied it was always unshaded, on fairly gentle slopes, and well-drained. The stones were usually easily dislodged and were clearly mobile. Large areas of scree were too mobile for a well-developed lichen or bryophyte community, and only the more stable areas were recorded (more mobile stones may have traces of lichens but they are too poorly developed for practical identification). Most samples were from scree patches on slopes. Other samples represent stony ground on ridges and summits, where the stones are also unstable, but where there is little general downhill movement. A few samples represented material washed down by storms from gullies, although some of these samples are derived from screes further up the slope.

Figure 38 shows a condensed version of the table resulting from a TWINSPLAN analysis of all samples that were recorded on fine siliceous scree (this was run after the main analyses were completed and the samples were already assigned to communities). The most important gradient in the samples apparently relates to climate. Division 001 of the table comprises samples from Ben Lui, Ben Nevis and Glen Coe, the coolest, wettest and most oceanic of the siliceous sites visited. Species which are more frequent or more abundant here than in the other fine scree samples include the lichens *Amygdalaria pelobotryon*, *Ionaspis chrysophana*, *I. odora*, *Rhizocarpon lavatum*, *Stereocaulon plicatile/tornense* and the bryophytes *Andreaea mutabilis*, *A. rupestris*, *Kiaeria* spp., and *Marsupella adusta*. In contrast, *Lecanora soralifera* is absent. The samples in this division were mostly assigned to E1. The remaining samples represent fine screes mostly from England and Wales, and are mostly assigned to D1. The last sample in the table, which is separated from all other samples at the first division, represents base-rich andesite scree at low altitude in Glen Coe, containing a number of species not found in any other samples, including *Buellia ocellata*, *Catillaria atomarioides*, and *Lecidella carpathica*. This possibly represents a distinct community or sub-community, but was retained in D1 as no similar samples were available.



	EBBBBBBBBGBGB	LCLLLLLLCLNLLLLLLLLL	BCBLLCCCLLLCCLLBNLNG	
	NNNNLLNNCNCN	DIDDDDDIDPPDDDDDDDD	NINDDIIIDDDIIDDNDPC	
	EEEEEEEEEEEE	DDDDDDDDDDDDDDDDADD	ABDDDDDDDDDDDDDDDD	
	1112111111111	11111111111111211	13111111111111111	
Porp cont	-1---11-11-2	--1--11-----	-1-----11-----	000100
Leci lith	-12---11---1	--1-1-1---1---	-1-----1-----	000101
Amyg pelo	-11---1-1-1-	-----1-----	-----1-----	000110
Andr muta	-1---1--11-	-----1-----	-----1-----	000110
Kiae falc	-----1--12	-----1-----	-----1-----	000110
Kiae blyt	-1-2--11--1	-----1-----	-----1-----	000110
Mars adus	-11--1-211111	-----1-----	-----1-----	000110
Iona odor	-11111111211	-----1-----	-----11-----	000110
Rhiz lava	-12-1111211-1	--1-----1---	-1-----1-----1--	000111
Loph sude	-1--211-111	-----1-----	-----1-----	000111
Ster plic	3-12222211113	1--21111-----	-1--11--1-1111-11--1	001010
Andr rupe	-1221-1221222	11-----1--111	1--11111--111----	001011
Buel aeth	-----1-----	-----1-----	-122-1-----1-----	0101
Rhiz oede	-----1-----	-----1-----	-111-1-----1-----	0101
Porp macr	-112331332-22	424133333223	2222--1-11123111111111-1	01101
Rhiz anap	2---11111111	22-1-11-1--1-	1--111--1-1--11-1-1--	01101
Grim donn	-1-----1-----	1-111-11-----	-122--1--1--1-1--	01110
Leca sora	1-----1-----	1122333122-11	222222--11-1-2221111-11-	01111
Iona chry	-1-----1-----	-----1-----	-----2-----	100000
Baeo carn	-1-----1-----	-----1-----	-----1-----	100001
Raco sude	112322222221	1222--21-----	1--111--12111222212--11	100110
Mica angu	-----1-----	-----11-----	-----1-----	10100
Trap obte	-----1-----	-----11-----	-----1-----	10100
Ster leuc	--121-11-2-1	211212111--1-	2---1-1-112111111-1-111-	101011
Porp tube	-22-111222211	322222222222	22212133333343233222222	101100
Rhiz redu	-1-11-1-11--	112111111112	11111111111122211111211-2	101100
Rhiz geog	-----1-----	-----1-----	1112--2-----1-1--	101101
Ster vesu	-22---211--1-	--1-----1---	1-112111-1--11111-11--1	10111
Aspi gris	-----1-----	-----1-----	-1-11-----1-1--	1101
Porp irri	-----1-----	-----1-----	-----1--12--21-11--	111000
	000000000000	000000000000000000	11111111111111111111	
	000000000000	11111111111111111111	000000000000000000	1
	011111111111	000000000000011111	000000011111111111	
	001111111111	000000001111000011	000001100000000001	
	0000000011	00011111000110111	01111 0000111111	
	01111111	01101111001 001	0111 0111000011	

**Figure 38:** TWINSpan table of analysis of samples which occurred on fine siliceous scree. Only selected species are shown in the figure, otherwise all sites and species are in the order produced by TWINSpan, without rearrangement. Top two rows indicate site, second two rows indicate community (already determined before this analysis). Numbers in table refer to the four pseudospecies levels (see Methods).

P1 was largely confined to block scree, but also occurred in crevices below boulders and in bedrock. Figure 39 shows a condensed version of the table resulting from a TWINSpan analysis of all samples of P1 that were recorded on scree (this was run after the main analyses were completed and the samples were already assigned to communities). The main gradient in the table relates to variation in the community composition relating to factors such as shade and shelter. Thus group 1 represents samples with bryophytes including *Hypnum jutlandicum*, *Mnium hornum* and *Pellia epiphylla*, these last two species represent conditions of greater soil accumulation; this part of the variation grades into P2 and O1. Group 0 appears to be divided mainly according to differences in abundance of common species, but within this, group 01011 represents a small group with a greater frequency of the hepatics *Bazzania trilobata* and *Mylia taylorii*; here there are also occurrences of relatively uncommon species which are rare in P1, including *Dicranodontium uncinatum*, *Hypnum callichroum* and

*Scapania ornithopodioides*. Three of these samples are from Glen Coe, and one each from Ben Nevis and Ben Lui. Many samples of this community, however, are species-poor and comprise very common species. More interesting species can be found, but are scattered, including *Anastrophyllum minutum*, *Campylopus setiformis* and *Dicranodontium uncinatum*. The present survey was aimed at describing communities, and floristic surveys are likely to reveal a greater frequency of uncommon species. Conditions change rapidly over short distances within crevices in block scree, and it is likely that some species will be marginal to the species-poor core of P1.

Some samples of P3 occurred on block scree. Few stands of this community were seen during the survey, but the richer stands represent at least fragmentary examples of the 'Northern mixed hepatic mat', which has particular conservation significance (see section 4.2).

Community I1 was recorded only on block scree, but only at one site (Cross Fell in the North Pennines). Q1 was recorded only in block scree.

Other communities which are frequent in block scree include E1, particularly on basic igneous rocks, and A1, A2 and C1a; these are also frequent on boulders and bedrock. In wetter regions A1 and A2 are often restricted to the larger, drier blocks in block scree. Where blocks in scree are large enough they can provide conditions for some of the communities restricted to rain-sheltered surfaces, including K1, K2 and K8. Conditions which are rarely provided in scree include surfaces which are strongly flushed, and overhangs which receive seepage from the rock, and the corresponding communities are rare or absent.

### **3.5.2 Calcareous and calcschist screes of the montane to alpine levels**

As in siliceous scree, the components of limestone scree can vary from fine, mobile fragments to large blocks. Of the 27 communities distinguished on limestone, only 5 to 6 were recorded from scree, although some of these are very variable communities. Fine screes (stones in the range 3–25 cm), are often too unstable to support a well-developed plant cover, and the recorded samples are from more stable areas, often near the edges of the scree patch.

Figure 40 shows a condensed version of the table resulting from a TWINSpan analysis of all samples that were recorded on fine limestone scree (this was run after the main analyses were completed and the samples were already assigned to communities). Two samples from Inchnadamph, in the wet oceanic west of Scotland, contain lichens of damp limestone, including *Hymenelia epulotica* and *Staurothele succedens*, and the northern moss *Schistidium robustum*. These two samples are assigned to SL 15, a community of limestone in high



rainfall areas. This community was mostly recorded on bedrock, and during the survey was recorded only from Inchnadamph and Rassal. The remaining samples on fine scree are assigned to SL 11, a very widespread and very variable community which is abundant on bedrock as well as scree. In SL 11 on fine scree, *Collema fuscovirens* (always <4% cover), *Protoblastenia rupestris* and *Verrucaria nigrescens* are constant, and *Polyblastia albida*, *Thelidium decipiens* and *Verrucaria baldensis* are frequent. Leaving aside some narrow groupings, the analysis in Figure 40 suggests that most of the samples can be divided into two groups (0100 and 0101), which appear to represent damper and drier conditions respectively. Species preferential for 0100 (the damper group) include *Acarospora cervina*, *Farnoldia jurana*, *Hymenelia prevostii*, *Petractis clausa* and *Verrucaria hochstetteri*, and species preferential for 0101 (the drier group) include *Aspicilia contorta* (both subspecies) and *Caloplaca citrina* agg. However, these groups are poorly defined, suggesting that the samples at any one site do not all fall easily into one or other of the damp and dry categories.

More stable blocks in limestone scree may carry communities more often found on bedrock and boulders. These include SL 5, SL 6, SL 9 and SL 12c.

Few species seem to be confined mainly to calcareous scree. Some which appear to favour calcareous scree, at least at some sites, include *Aspicilia contorta* subsp. *hoffmaniana*, *Lemmopsis arnoldiana*, and the small *Leptogium* species *L. diffractum*, *L. massiliense* and *L. turgidum*.

### 3.5.3 Siliceous rocky slopes with chasmophytic vegetation

The definition of this Annex I habitat requires the presence of chasmophytic communities, but encompasses the other associated communities of the rocky slopes in which they occur. Which communities and stands can be regarded as chasmophytic in character is discussed below; at any particular site the rocky slopes in which these occur must be regarded as belonging to this qualifying habitat. Aside from the chasmophytic communities, there are no communities which are particularly characteristic of this habitat.

N1 is the most characteristically chasmophytic of the siliceous communities. Stands occur in damp overhangs, recesses and crevices, less commonly on damp but more or less exposed vertical or slightly overhanging faces which can scarcely be regarded as crevices. However, since typical occurrences of the community are in distinct overhangs or crevices, it is convenient to regard most occurrences of this community as indicative of this Annex I habitat.

Stands of N1 vary according to the wetness of the substratum and the degree to which the rock is calcareous, but there does not seem to be any clear gradient which can be related to region or climate. Figure 41 shows a condensed version of a TWINSPAN table resulting from an analysis of samples which had already been assigned to N1. The samples in Group 000 are united in part by the possession of species which can grow on wet rock, including *Brachythecium plumosum*, *Frullania tamarisci*, *Racomitrium ellipticum* and *Scapania undulata*, but these usually occur at low cover, and inspection of individual quadrat records

	DDD	DD	DB	II	DDDD	ID	BB	III		
	DDD	DD	EN	NN	DDDD	N	DEE	P	NN	
			GGG			G		CC		
Calo aloc								1		000000
Rino imme								1		000000
Thel inca							1	2		000000
Lept mass							1	1		000000
Aspi cont h							11	1	1	000001
Clau imme							1	1		000010
Aspi cont c							1	11		000010
Calo citr							1	1	11	000010
Pori line									12	000010
Clau metz							1	1	1111	000011
Hyme prev							1	111	111	000100
Lemm arno							1	1		000100
Poly demi							11	11		000100
Petr clau							111	1	1	000101
Acar cerv							1	1		000101
Farn jura							11	1111		000101
Gyal jene							1	1		000101
Verr hoch							111	1		000101
Pink Unkn							1			000101
Lept turg	1						1	1	1	00011
Aspi calc	1						1			001000
Rino bisc	1									001000
Schi cras							11			001001
Thel deci							12	1	1	001001
Calo lact							11	111		001011
Coll fusc							11111	1	1111	00110
Verr nigr							22	1111	11111111	00111
Prot rupe							1111111	12	1111111111	0100
Verr bald							22	11	1	0101
Plac nigr							1	11	111	01100
Poly albi							1	1	1111	1101
Poly thel									1	111100
Thel papu									1	111100
Stau succ									12	111101
Schi robu									11	111101
Hyme epul									23	11111
										00000000000000000011
										000111111111111111101
										01100000000000000001
										01000000011111111
										011111100000001
										000001000001

**Figure 40:** TWINSpan table of analysis of samples which occurred on fine limestone scree. Only selected species are shown in the figure, otherwise all sites and species are in the order produced by TWINSpan, without rearrangement. Top three rows indicate site. Numbers in table refer to the four pseudospecies levels (see Methods).

suggests this group is not worthy of recognition as a sub-community. Groups 001 and 01 are broadly similar to each other, with the former perhaps representing wetter stands (*Blindia acuta* preferential). These groups share constant *Anoetangium*, and occasional species include *Aneura pinguis*, *Mnium marginatum*, *Preissia quadrata* and *Scapania aequiloba*, in contrast to Group 1000 which has sparser *Anoetangium* and has occurrences of *Diplophyllum albicans* and the crustose lichens *Opegrapha gyrocarpa* and *Porpidia rugosa*; possibly 1000 represents more acidic, poorer stands. Group 100 includes a few samples with *Trichostomum brachydontium* from the Brecon Beacons and Eryri, which possibly represent a southern element tending towards SL 19. However, all these groups are relatively trivial and mostly dependent on local conditions or even chance. Although this is predominantly a bryophyte community, some notable lichens occurred, including *Dictyonema interruptum* and *Strigula stigmatella*.

N1 is confined to microhabitats where there is some calcareous influence, often where the effects of the relatively high base-status of the rock are augmented by flushing. This could be used to justify the placement of N1 under ‘calcareous rocky slopes’. However, it is suggested that the distinction between siliceous rocky slopes with chasmophytic vegetation and calcareous rocky slopes with calcareous vegetation should be regarded as corresponding to the division between N1 and SL 19. These communities are relatively well separated (although they both contain calcicoles which are preferential for neither community, including *Ctenidium molluscum*, *Fissidens dubius* and *Plagiochila porelloides*), and they correspond well to siliceous rock and limestone respectively.

P1 also occurs in crevices and below overhangs in bedrock (see under ‘siliceous scree’).

There are a number of communities that require shelter from direct rainfall, and which can be found in crevices and overhangs. However, these communities are often also common on slightly overhanging cliffs and rock faces (including the faces of boulders), which may be well-lit and exposed. Thus not all occurrences of these communities can reasonably be regarded as belonging to the Annex I habitat. In some cases, gullies which are large enough to walk into help to provide shelter, and these could be regarded as chasmophytic sites. The communities include:

- K1: very dry surfaces are dominated by *Lecanora ecorticata*, recorded in cavities below boulders, and in block scree; also occurs on rock faces in sheltered sites (such as woodland);
- K2: stands are dominated by *Lepraria*, in overhangs and cavities below bedrock and boulders; also in block scree and on dry cliffs;
- K4: stands are also dominated by *Lepraria*, in similar places to K2; often in woodland;
- K5: occurs on overhanging faces, often chasmophytic, but also on slightly overhanging faces;
- K9: grows with *Lecanora epanora* on metal-rich rocks; the few samples recorded were from overhangs or cavities below boulders, often where quarried, with one from crevices of a lowland wall;
- O1: related to P1 but with more soil accumulation; the few samples were either chasmophytic in rock crevices, or found in block scree.

In addition, at least one sample of each of K3, K6 and K8 were recorded in crevices or small overhangs.



### 3.5.4 Calcareous rocky slopes with chasmophytic vegetation

The definition of this Annex I habitat requires the presence of chasmophytic communities, but encompasses the other associated communities of the rocky slopes in which they occur. Which communities and stands can be regarded as chasmophytic in character is discussed below; at any particular site the rocky slopes in which these occur must be regarded as belonging to this qualifying habitat. Aside from the chasmophytic communities, there are no communities which are particularly characteristic of this habitat.

SL 19 is the most distinctly chasmophytic of the calcareous communities, and is the calcareous counterpart of N1. Stands occur in damp overhangs and crevices on cliffs or low outcrops, and one sample was recorded in a crevice below a boulder; all these can be regarded as chasmophytic in the sense of the Annex I habitat. Only one sample from the side of a shake hole should probably be excluded. The community was recorded from Berwyn, Ingleborough, Rassal and Strath, but was very local in all these sites due to the scarcity of suitable crevices; most of the site at Berwyn was also rather dry and exposed. The community was not recorded from the Derbyshire Dales. Stands were often small in extent and correspondingly variable in composition, and overall variation related to climate is difficult to discern. Two stands on seeping rocks at Rassal contained significant amounts of *Orthothecium rufescens*, but these are tending towards SL 27. Samples from Berwyn, climatically one of the drier sites, clustered together in TWINSPAN, but the differences in vegetation composition between this site and the others appear to be small and not indicative of a broad trend.

SL 27 is a counterpart of SL 19, dominated by more robust bryophytes, on wetter rocks. Stands occur in overhangs on rock faces, and usually contain small ferns.

Rain-sheltered communities which can occur in overhangs and crevices include SL 3, SL 4 and SL 24; all are dominated by sterile lichens of the genera *Lepraria*, *Botryolepraria* and *Leproplaca*. In suitable localities, for instance on north-facing cliffs or in the shade of trees, SL 4 can occur on steep faces which are only slightly sheltered by small overhangs, and which can doubtfully be described as chasmophytic. As would be expected, these three communities were absent or scarce in the three wettest sites visited (Strath, Rassal and Inchnadamph), but the scarcity of high cliffs in these sites is also partly responsible for this.

### 3.5.5 Limestone pavements

Limestone pavement is characterised by the presence of an extensive horizontal or gently inclined rock surface. This is commonly cut up by vertical crevices or grikes into a series of pavement blocks, or clints. At Rassal the clint and grike structure is poorly developed because the grikes are largely filled with soil and vegetation.

Eight communities have been recorded from limestone pavement. These are SL 11, SL 12, SL 15, SL 16, SL 19, SL 23, SL 26 and SL 27. None are restricted to limestone pavement and they can also occur on boulders, cliff faces or in overhangs. SL 11 and SL 12 appear to be the most characteristic communities of limestone pavement, with frequent records from limestone pavement.



## 4 Discussion

### 4.1 Analysis and delimitation of communities

With the aid of TWINSPAN and much manual sorting, it has been possible to group 95% of the samples into communities. It is hoped that these can provide the basis of a framework for understanding the diversity of vegetation on rock in upland Britain. These communities have been newly delimited on the basis of the samples available. Although some are broadly in agreement with communities previously reported from Britain, many are not. However, the delimitation of communities has not been an easy process, and it is not certain that the most suitable arrangement has been arrived at.

TWINSPAN was useful in sorting samples. It was not possible to analyse all samples in a single analysis, as the number of samples was too great. Instead, samples were first sorted manually into broadly similar groups and each was analysed in turn. After each analysis, the more 'marginal' samples were added to a related group and reanalysed, so that the initial manually sorted groups were subjected to overlapping analyses.

During each analysis, most of the major divisions of each TWINSPAN table could be recognized as ecologically meaningful, delimiting groups of samples corresponding to subjective categories recognized in the field, such as 'well-lit rocks in southern sites', 'damp or north-facing stands dominated by crustose lichens', 'stands with small acrocarpous mosses and/or cyanolichens' and 'boulder-tops dominated by robust mosses'. As expected, these categories overlapped on the table in a complex way, so that distinct communities could not easily be delimited. However, these major divisions of TWINSPAN were treated as suggestions which could then be tested. Species that were preferential for one or other sides of a division were identified by inspection of the table. This gave a broad idea of the composition of the groups and the way in which they differed. Then, each quadrat sample was examined in turn, to decide whether it appeared to comply with that composition, or whether it deviated too greatly and should be excluded. Because the number of samples needing reassignment was considerable, the size and composition of these groups themselves developed during this process.

When individual samples from each division were examined in this way, it was found that samples considered to have little in common had very often been classified together. In addition, certain *noda*, subjectively defined by the writer in the field, were not recognised at any level of division that was used. Re-analysis of the data, using a greater number of levels of division, did not usually solve this latter problem. One approach to these seemingly anomalous results would be to assume that TWINSPAN is revealing ecologically or geographically significant patterns that are not immediately obvious to the field worker, and that these should take precedence over subjective impressions based on field observations. This would be an acceptable, and even welcome, outcome, but it appears not to be the case.

In some cases, species of low cover appeared to be responsible for drawing samples together into the same group. When pseudospecies weighting is not applied, species occurring at low cover have a disproportionately large influence on the outcome of the analysis. These species may occur as very small fragments within the quadrat. Thus it is likely that they may represent species which are not suited to the conditions within the quadrat, and which are merely 'stragglers' from nearby communities. Also, species at very low cover may be missed in the field, or be unidentifiable, so that their recording is less consistent than more abundant

species. To overcome this problem pseudospecies weighting was applied to the analysis. This appeared to give better results, but only in so far as it better confirmed the arrangement of samples that the writer found intuitively more correct. There are some substrates, such as fine scree, where most species occur at low cover and weighting will have less influence on the results. Also, there will be some species, some of them of conservation significance, which always occur at low cover.

TWINSPAN appears to emphasise species which are shared between samples, and single deviating samples may be classified with others on the basis of these, even though other species may be different. The deviating sample is often difficult to spot in the TWINSPAN table, but manual sorting of individual quadrat records shows that it cannot reasonably be classified with the others. Some provisional communities were more easily identified in the field than from TWINSPAN tables. SS D5 is a species-poor community of damp stones, the samples of which are easily 'lost' amongst others in the table. This community is defined as much by the species it lacks as by those it contains.

Some groupings are likely to have little ecological meaning because they reflect chance combinations of species, or because a particular community is represented by too few samples for TWINSPAN to find links between them.

A sample is likely to be classified differently by TWINSPAN depending on the other samples that are run with it. Thus analyses of slightly different sets of samples will give different results. For this reason also, it is not wise to accept the TWINSPAN classification without question.

Despite the misclassification of individual samples, it could be argued that it would be possible to use directly the major divisions of TWINSPAN as the basis for communities, using the preferential species as a way of assigning new samples to these communities, and drawing up frequency tables directly from the TWINSPAN table. This was rejected for two main reasons: 1. the degree of misclassification was sometimes so great that it was impossible to have confidence in the divisions, except as providing a very broad view of the variation, and 2. to provide a workable system of communities it was considered necessary to be able to assign individual samples to the final communities, using specific criteria which could be expressed in keys and tables.

Although TWINSPAN was sometimes disappointing as a source of insights into the pattern of variation in the data, the results served at least as a reminder that a division of vegetation into communities (which sometimes seems relatively straightforward in the field) cannot be achieved easily. The process of data collection is subjective in phytosociological work, and it appears that the delimitation of communities must also be a subjective process, though TWINSPAN can be used as a tool for sorting. It seems unlikely that using other methods of analysis would produce a better classification into communities. Sorting the data manually, by inspection or by experimentation with spreadsheets, suggests that it is the pattern of variation in the samples which precludes an easy division into communities, not a deficiency in analysis.

In addition to the identity of the species present, the physiognomy of the vegetation and the abundance of each species were regarded as important in community delimitation. Pseudospecies weighting emphasises the abundance of a species as well as its presence. It is possible to conceive of two vegetation samples which have the same list of species, but which

have different dominant species, perhaps a moss in one sample and a crustose lichen in the other. From a floristic point of view these would be identical, but in the field would have a very different appearance. It seems intuitively correct to recognise these two cases as separate communities or sub-communities, if the pattern of dominance is something which occurs frequently, or relates to ecological conditions. This approach was followed with E2c. Here, the moss *Racomitrium sudeticum* is often abundant, forming conspicuous green mats, although this and many other species are shared with E2b. Of course, the dominance of one species is usually accompanied by other small differences in the communities; in E2c the abundance of moss provides a substrate for macrolichens including *Cladonia cyathomorpha*.

Several of the communities described above are defined mainly by the dominance of single species (for instance, F4, F5, K1, and K6). In some cases this may be due to too small a number of samples for analysis. For instance SL 21 comprises only two samples; these are united by the abundance of the moss *Seligeria trifaria*, but have nothing else in common. In other cases the community does appear to reflect the situation in nature, where a single species may frequently cover large areas of rock as species-poor stands. It is useful to make some judgements in the field when selecting stands for recording; here it is possible to observe whether a species-poor stand is typical or not.

A similar problem occurred with species which appeared to the writer to have particular ecological significance. For instance, species indicating nutrient enrichment were regarded as significant and given an intuitive weighting during manual sorting, although samples with such species did not always cluster together in the TWINSpan table. Possibly this problem would be overcome by a larger data set, as such species were rare in the samples available. The occurrence of macrolichens also appeared worthy of note, even though they may have occurred in a particular sample at low cover (for instance 4–10%). The conspicuous nature of these species may make them appear more important, whereas there are crustose lichens which can scarcely be identified in the field, and which are less likely to influence subjective impressions in the field. Samples with macrolichens did cluster together in TWINSpan, but the decision to use their presence to separate communities (for instance A1 and F1) is likely to have been influenced by a subjective weighting. Species weighting is possible in TWINSpan, but was considered too difficult to apply in a consistent way.

All communities described by phytosociology share the problem that vegetation varies in response to many different variables, including degree of moisture, degree of shade, rock chemistry, and so on. Thus the problem is not simply that two communities may intergrade, but that almost any community can grade into any other, producing variation which is difficult to classify in a simple way. It is likely that rock vegetation is typically more variable than terricolous vascular plant vegetation, as rock surfaces are frequently very uneven and conditions change rapidly over short distances. Under these conditions it is likely that truly homogeneous stands, where all parts of the quadrat experience similar environmental conditions, will be uncommon. Because of the heterogeneity of habitat, species which have little in common ecologically can occur in the same community, though usually at low cover and low frequency. Conversely, a species which is characteristic of a site can intrude into several different noda at low cover. The macrolichen *Usnea flammea* appears incongruously in several noda, but all the samples with this species were recorded at Carn Ingli, where the species was common. This is to be expected when communities occur so close together, and the presence of this species does not indicate a close relationship between the samples in which it occurs.

Some published phytosociological studies seem to be based on too few samples from too few sites. When considering a single locality, in the field the boundaries between putative communities can seem sharp, but the distinction may break down when more sites are considered. The collection of large numbers of samples, as done for some of the communities in this study, does not guarantee a clear classification, but it does guard against an oversimplified scheme being proposed.

One problem with plant communities defined by phytosociological methods is that it is not always clear for what purpose the classification is being made. Intuition has played a part in the delimitation of the communities described here, hence the decision to manually reclassify many samples, and the decision to regard dominance as an important criterion. The results may be useful in allowing one to comprehend the diversity of vegetation in the uplands, but for many purposes other types of classification may be better. For conservation purposes site-specific floristic data will be important, as some stands of any of the communities will be dull and species-poor.

## 4.2 Conservation importance of upland communities

The lichen and bryophyte vegetation of upland Britain is poorly known in terms of (phytosociological) communities, but floristically it is well-known. It has to be admitted, that for most cryptogamists, the definition of communities in the sense in which they are used in this report, is not particularly relevant either to finding rare species or to assessing the conservation value of sites. Authors may speak of ‘assemblages’ of rare species, but this often means a suite of interesting species found in a particular mountain range or on a particular rock type; they may often be widely scattered or occur in more than one community.

The British uplands have two groups of lichen species of outstanding interest:

- i. species of western oceanic areas;
- ii. species of calcareous rock at high altitudes.

Fryday (2001a, 2002) emphasised the uniqueness of the oceanic vegetation of the British Isles. Fryday (2001a) described the vegetation of snow-beds in the Scottish Highlands. He noted that many lichen species found there were species of damp habitats generally. Also, the conditions within snow-beds in the eastern Highlands simulate oceanic conditions by their combination of dampness and shelter (by snow cover) from extremes of cold. The assemblage of species noted within snow-beds on small rocks and pebbles is thus widespread on heaths in the oceanic west, and in damp corries throughout the Highlands. *Stereocaulon tornense* was noted as one of the most characteristic species here. In Fryday’s relevés it was not practicable to separate the lichens of small rocks from terricolous species, but the saxicolous species shown in his Table 2 from the relatively oceanic Creag Meagaidh suggest an assemblage equivalent to some of the samples included in E1 in the present study; in contrast to many samples of E1, however, mosses were almost absent and the lichens *Porpidia tuberculosa* and *Rhizocarpon lavatum* were notably scarce (probably due in part to the stones being embedded in soil in contrast to the situation in screes). Fryday also described the vegetation of the tops of boulders within a snow bed (cf. his Table 7). His relevés resemble moss-rich stands of E1, but there are also distinctive chionophilic species including *Lecanora formosa*, *L. leptacina*, *Miriquidica griseoatra* and *Toninia squalescens*. In the present study, a few similar samples (with *Lecanora leptacina* and *Miriquidica griseoatra*) were recorded in a snow bed on Beinn Heasgarnich, and referred provisionally to E1. He

pointed out that the species present are found outside Britain, but do not associate in a distinctive snow-bed community in other countries. In similar conditions of snow-cover duration in Norway, communities far less chionophilic in character are present, and the author ascribed this to the more oceanic British climate. The explanation appears to be that the typical British snow-bed species are not responding to duration of snow-cover as such, but to the climatic amelioration and damp conditions provided by snow-cover; in Norway the climate is likely to be more severe, even in places with a similar duration of snow-lie, and is unsuitable for these species.

Thus, on siliceous rocks, E1 appears to be one of the most characteristically oceanic of the communities described in the present study. It contains several species listed by Fryday (2002) as having a pronounced oceanic distribution in the British Isles, including *Micarea paratropa*, *Rhizocarpon anaperum*, *Stereocaulon plicatile* and *S. tornense*, as well as one occurrence of the rare *Catolechia wahlenbergii*. The community is most abundant in the damper climates of oceanic areas, and contains species of damp rock, which are not necessarily strongly oceanic in distribution, including *Immersaria athrocarpa*, *Ionaspis odora* and *Porpidia contraponenda* s.s. (the latter may prove to be oceanic). Other communities containing oceanic lichen species in Fryday's list include E3 (*Lithographa tesserrata*, *Toninia thiopsora*), D7 (*Ainoa mooreana*), K6 (*Tylothallia biformigera*) and K7 (*Coccotrema citrinescens*).

The flora of limestone in highly oceanic areas is also distinctive. Some of the colourful species of less oceanic sites (*Aspicilia calcarea* and *Caloplaca* spp. of SL 6 and others) are rare or absent, so that outcrops can appear very bare at first glance. SL 15 was confined to Rassal and Inchnadamph; the Vulnerable *Hymenelia melanocarpa* occurs in this community at Inchnadamph, and at both sites the undescribed species *Opegrapha rassalensis* is widespread. This species is currently known to occur only at these sites. SL 12 is best-developed at the more oceanic sites.

At a national level, montane (rather than merely upland) habitats are important for lichen conservation; Church *et al* (2001) noted that 'Nearly a third of the Red List lichens are montane species found chiefly above 800 m and confined mainly to the Scottish Highlands'.

The montane flora of Britain is, of course, best developed in Scotland, but outliers in northern England and North Wales are regionally important. Fryday (1996) compared the lichen floras of several montane areas of Britain, dividing species into four zones related to broad zones of vascular plant dominated vegetation: Upland/Montane, Low-montane, Mid-montane and High-montane. Glen Coe was significantly richer than North Wales in Mid- and High-montane species; the latter category was virtually absent in North Wales. In turn, North Wales was richer than the Lake District. The richness of Glen Coe was attributed in part to the greater oceanicity of the site, resulting in montane species being able to occur at lower altitudes, and thus being able to utilise a larger area and greater diversity of rock types than in North Wales.

The richest site for montane calcicolous lichens in Britain is Ben Lawers. Gilbert *et al* (1988) ascribed the richness to a combination of calcareous bands within the mica-schist, the severe climate, and the rugged topography that provides a diversity of rocky habitats up to the summit. According to Gilbert *et al* the lichen flora of Ben Lawers could be considered as an impoverished example of that occurring in the more continental basic mountains of parts of Scandinavia, but was better regarded as a rich southern outlier of that type of vegetation, and

thus of international importance. Other examples of lichen-rich calcareous mountains mentioned by Gilbert *et al* are Beinn Heasgarnich, Carn Gorm, cliffs in Corrie Cheathaich on Creag Mhòr, Caenlochan (all mica-schist), Ben Hope (hornblende-schist), and an outcrop of sugar limestone on Ben Alder, the latter described by Gilbert *et al* (1982). Gilbert *et al* (1992) noted that the oceanic Ben Nevis range also carried some of the calcicole lichens previously thought to be restricted to the mica-schist mountains of the central Highlands.

At many of these sites, the montane calcicolous lichens are present in small quantity and rich areas are difficult to find. Phytosociological information on the communities in which they occur is almost lacking, represented only by lists of species mentioned as typical of certain habitats in certain sites. Montane calcicole lichens were poorly represented in samples made during the present survey. X1 represents some base-rich samples from the Ben Nevis range, and other more or less calcicolous species are scattered in several communities.

Important assemblages of bryophytes follow the same pattern. Britain has an internationally important oceanic bryophyte flora, much of which is found in upland Britain. Major habitats for oceanic bryophytes are deciduous woodland and oceanic-montane heath (Rothero 2003). The latter is the habitat for the 'Northern Atlantic mixed hepatic mat', where large hepatics can occur in dwarf-shrub heath or on block scree and cliffs (Ratcliffe 1968: 381). This community is unique to the British Isles, and several species found here have a very restricted world distribution (Rothero 2003). In the present survey, this assemblage was represented by some samples of SS P3, comprising stands over rock. Many examples of this hepatic assemblage are not distinctly saxicolous and are covered by NVC communities, mainly H20c and H21b, and also H14, U17 and U18 (Averis *et al*, 2004).

Montane base-rich rocks are a major habitat for rare bryophytes (Church *et al*, 2001). In the present survey, bryophyte-rich communities on calcareous siliceous rock include N1 and F8, but these do not cover the high-altitude calcareous habitats that are important for many Red Data Book bryophytes.

It should be stressed that the present survey was aimed at recording typical samples of vegetation, with no requirement to target rare species. The floristic tables should not be taken as a guide to the importance of each community for rare species.

The SACs visited contain some of the most important areas of rock habitat within upland Britain. Thus, leaving aside species and communities that are rare on a national scale, they are also essential for the conservation of British saxicolous vegetation in general. However, the SACs visited represent only a selection of those SACs which have Annex I rock habitats as qualifying features, or which are otherwise important for saxicolous vegetation. Also, there was insufficient time to visit more than a small part of some of the SACs, so that the notes below give at most a very brief comparison of the sites.

No two of the SACs visited carry the same range of saxicolous vegetation, and together they provide a range of conditions across climatic gradients and different rock types. Considering the Annex I habitats, on fine siliceous scree communities D1 and E1 represented the poles of a gradient between localities in areas of drier and of wetter climate respectively. E1 tended to predominate in western Scotland, but both were frequent in the Lake District. The siliceous chasmophytic community N1 was widespread, but was scarce at some sites apparently due to an absence of suitable crevices rather than differences of climate. This community was local

at all sites, dependent on suitable microtopography and on the presence of base-rich rock, so that a single SAC could not contain all the diversity shown in this community.

For these reasons, it is difficult to rank the SACs visited in terms of conservation importance. Within England, three of the SACs visited contained siliceous rocks and three contained limestone. Within the siliceous sites, only Leek Moors was visited within South Pennine Moors SAC, and the rock habitat here is still recovering from severe industrial pollution. Of the two other SACs, Lake District and North Pennines, the former is larger and much more varied in topography than the latter, and thus of greater importance for saxicolous communities, but in the North Pennines a montane element was recorded (provisionally within F1) which was not seen in the Lake District, apparently due to the colder and drier conditions on Cross Fell when compared to the Lake District. Dolerite was also well-represented in the North Pennines localities visited, giving a greater proportion of community grading from A2 to A1 in the samples recorded. Of the limestone-containing sites visited, Ingleborough and the Peak District Dales represent climatically damper and drier areas respectively, and thus complement each other. Ingleborough contained SL 13, SL 14 (crustose communities of cool, moist rocks) and SL 19 (moss-rich crevice community), not recorded in the Peak District, while the latter contained SL 1 and SL 2 (two communities of dry vertical or overhanging faces), not seen at Ingleborough. Limestone recorded at the North Pennines site was more similar to Ingleborough than to the Peak District Dales in terms of communities, but was less varied.

Within Wales, of the three SACs visited with siliceous rocks, Eryri is clearly the most important due to its greater area, more varied topography and greater area of high ground than Cadair Idris or the Brecon Beacons. Communities best developed in Eryri amongst these three sites include E1 (scree in areas of damp climate), W1 and X1 (two communities on base-rich rock). Cadair Idris can be regarded as an important outlier of the high ground of Eryri. The Brecon Beacons differs from the other two sites in the somewhat drier and warmer climate (reflected in the absence or scarcity of communities M1 and L1, for instance), and less rugged topography with smaller rock exposures. However, community V1 (a lichen community of damp and often soft calcareous rock) was recorded in the Brecon Beacons but not the other two sites.

The four siliceous sites in Scotland all contain an excellent range of communities, but reliable comparisons are difficult as only small parts of each could be covered. Beinn Heasgarnich and Ben Nevis were notable for base-rich montane communities placed here in X1. Of the three limestone sites visited in Scotland, Rassal and Inchnadamph were notable for the occurrence of SL 15, a crustose lichen community of high-rainfall regions.

### 4.3 Management

Saxicolous communities are generally less affected by grazing levels than terricolous communities, but indirectly the effects can be profound. Levels of grazing by domestic animals and deer can occasionally have a direct effect on saxicolous lichens. Fryday (2001b) reported browsing by sheep on the saxicolous macrolichen *Sphaerophorus globosus*, and mentioned that there are other cases where there is indirect evidence of damage. Gilbert (2000) described how macrolichens on boulders in an enclosure with domestic reindeer in Scotland had a severely reduced cover of macrolichens due to grazing. He also noted that the biomass of ground-living macrolichens was reduced, although cover and species diversity were unaffected. Fryday (2001b) described the indirect effects of grazing by examining the

(few) experimental grazing enclosures that were available in the uplands of Scotland, northern England and North Wales. For terricolous macrolichens, he found an increase of biomass with reduced grazing. The relationship of diversity with grazing level was less clear, but there was a relationship between vegetation height and species-richness. Tall grasses and tussock-forming bryophytes outgrew most lichens. In particular, the numbers of crustose species were reduced in taller vegetation, as low rocks and pebbles could be completely covered by vegetation. At Inchnadamph NNR he noted that 'limestone boulders and outcrops are prominent features outside the enclosures whereas inside they are submerged beneath a luxuriant cover of predominantly calcifuge vegetation'. Coppins (2003) also emphasised the negative effects of grazing enclosures, citing an example at Rassal Ashwood NNR where in addition to the effects on trees, rocks are smothered by ivy. Similar negative effects have been seen in woodlands in North Wales (pers. obs.) where grazing animals have been excluded.

Thus reduction of grazing is likely to affect small outcrops and boulders, and the bases of rock faces, by direct shading or engulfment by vascular plants and robust bryophytes. If heath is established, then there is an increased risk of damage by fire at some sites which are presently dominated by grassland. Fine screes are likely to be reduced in extent, due to stronger growth of vegetation, and reduction of physical disturbance by animals. In areas below the tree line, the establishment of woodland would be likely to affect most of the cryptogamic habitats present, with only the upper parts of tall cliffs and extensive block screes remaining unaffected. In unwooded sites, the presence of a single small tree can have a notable influence on the nearby vegetation, most obviously by causing an increase in the cover of bryophytes. If woodland or scrub becomes established, bryophyte-dominated communities are likely to become established at the expense of lichen communities on the upper surfaces of rocks; below overhangs it is possible that lichen-dominated communities which require shelter from rain will increase due to the additional shelter from wind and rain provided by trees. While some tree cover may increase the diversity of habitat available, any potential benefits need to be assessed on a site-by-site basis, especially since any new shade communities of a long-unwooded site may be species-poor.

Recreation pressures are a threat in some sites and habitats. Fryday (2001a) mentions disturbance from snow-boarders as a threat to snow bed vegetation, exacerbated at Ciste Mhearad by the proximity of the Cairngorm Chairlift. The provision of stone-built footpaths in popular areas is a successful way to reduce erosion by visitors, but near Wasdale Head in the Lake District in 2004, nearby block scree was being used as the source of stone. Blocks were being transported by helicopter, creating substantial gaps in the scree and damaging other blocks. SNH has developed a protocol to minimise damage due to the sourcing of stone locally for pathworks on statutory sites.

Non-native species are locally a potential threat. *Cotoneaster integrifolius* is a serious threat to limestone sites (e.g. Strath on Skye), and is likely to be almost impossible to control once established. It has the potential to bury all but the largest outcrops under thick mats of branches. Grazing is insufficient to control it, as it survives close grazing in turf as very low inconspicuous mats. In siliceous block scree, healthy saplings of Sitka Spruce (*Picea sitchensis*) have been seen great distances from mature specimens of this species.



#### 4.4 Further work

The provisional classification of upland vegetation samples into communities, presented in this report, is based on visits to a small number of upland sites. A more robust treatment which could equal the degree of coverage achieved by the NVC would require many more samples from a much wider area. Some regions and habitats particularly poorly covered by the present survey include:

- the central and eastern Highlands, to contrast with the strongly oceanic sites in western Scotland already surveyed;
- montane base-rich siliceous rock, a very restricted habitat, but of major conservation significance;
- macrolichen communities: well-developed communities with taxa such as *Bryoria* and *Umbilicaria* were poorly developed at most sites visited;
- streams and lakes: the freshwater habitat is of considerable conservation significance;
- rock outcrops in woodland: a habitat of major conservation importance in upland Britain; a large part of the area surveyed in the present survey was below the natural tree line. Some of the scarce habitats in the treeless uplands would be better understood when compared with the more frequent examples in woodland.

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## Appendix 1 List of species recorded during the survey

### Lichens

Nomenclature follows Coppins (2002) unless noted below

*Acarospora cervina*  
*Acarospora fuscata*  
*Acarospora nitrophila*  
*Acarospora sinopica*  
*Acarospora smaragdula*  
*Acrocordia conoidea*  
*Acrocordia salweyi*  
*Adelolechia pilati*  
*Agonimia tristicula*  
*Ainoa mooreana*  
*Allantoparmelia alpicola*  
*Amygdalaria consentiens*  
*Amygdalaria pelobotryon*  
*Arctoparmelia incurva*  
*Arthonia arthonioides*  
*Arthonia lapidicola*  
*Arthopyrenia saxicola*  
*Arthrorhaphis citrinella*  
*Aspicilia caesiocinerea*  
*Aspicilia calcarea*  
*Aspicilia cinerea*  
*Aspicilia contorta* subsp. *contorta*  
*Aspicilia contorta* subsp. *hoffmanniana*  
*Aspicilia epiglypta*  
*Aspicilia grisea*  
*Aspicilia intermutans*  
*Bacidia bagliettoana*  
*Bacidia fuscoviridis*  
*Bacidia sabuletorum*  
*Baeomyces carneus*  
*Baeomyces placophyllus*  
*Baeomyces rufus*  
*Belonia nidarosiensis*  
*Biatora tetramera/vernalis*  
*Botryolepraria lesdainii*  
(*Lepraria lesdainii* in 2002 checklist)  
*Bryoria fuscescens*  
*Buellia aethalea*  
*Buellia ocellata*  
*Buellia uberior*  
*Caloplaca alociza*  
*Caloplaca arenaria*  
*Caloplaca aurantia*

Two apparently different morphs were sometimes observed growing together.

<i>Caloplaca chlorina</i>	
<i>Caloplaca cirrochroa</i>	
<i>Caloplaca citrina</i>	This species in the sense of the 2002 checklist has been revised by Arup (2006); most records made during the survey refer to the aggregate species (Community SL 7) is based on <i>C. citrina s.s.</i>
<i>Caloplaca decipiens</i>	
<i>Caloplaca dichroa</i>	Arup (2006); formerly included in <i>Caloplaca citrina</i> ; probably frequent at some sites visited during the survey.
<i>Caloplaca flavescens</i>	
<i>Caloplaca flavocitrina</i>	Mostly not distinguished from <i>C. citrina</i> during the survey.
<i>Caloplaca flavovirescens</i>	
<i>Caloplaca holocarpa</i>	
<i>Caloplaca lactea</i>	
<i>Caloplaca obliterans</i>	
<i>Caloplaca ochracea</i>	
<i>Caloplaca saxicola</i>	
<i>Caloplaca variabilis</i>	
<i>Calvitimela aglaea</i>	
<i>Candelariella aurella</i>	
<i>Candelariella coralliza</i>	
<i>Candelariella medians</i>	
<i>Carbonea vorticosa</i>	
<i>Catapyrenium lachneum</i>	
<i>Catapyrenium pilosellum</i>	
<i>Catapyrenium rufescens</i>	
<i>Catillaria atomarioides</i>	
<i>Catillaria chalybeia</i> var. <i>chalybeia</i>	
<i>Catillaria lenticularis</i>	
<i>Catolechia wahlenbergii</i>	
<i>Cetraria aculeata</i>	
<i>Cetraria islandica</i>	
<i>Cetraria muricata</i>	
<i>Cetrelia olivetorum</i>	
<i>Chromatochlamys muscorum</i>	
<i>Cladonia alpina</i>	
<i>Cladonia bellidiflora</i>	
<i>Cladonia caespiticia</i>	
<i>Cladonia cervicornis</i> ssp. <i>cervicornis</i>	
<i>Cladonia chlorophaea</i>	
<i>Cladonia coniocraea</i>	
<i>Cladonia crispata</i> var. <i>cetrariiformis</i>	
<i>Cladonia cyathomorpha</i>	
<i>Cladonia digitata</i>	
<i>Cladonia diversa</i>	
<i>Cladonia floerkeana</i>	
<i>Cladonia furcata</i>	
<i>Cladonia gracilis</i>	

*Cladonia macilenta*  
*Cladonia pocillum*  
*Cladonia polydactyla*  
*Cladonia portentosa*  
*Cladonia pyxidata*  
*Cladonia ramulosa*  
*Cladonia squamosa* var. *squamosa*  
*Cladonia squamosa* var. *subsquamosa*  
*Cladonia subcervicornis*  
*Cladonia uncialis*  
*Claurouxia chalybeoides*  
*Clauzadea immersa*  
*Clauzadea metzleri*  
*Clauzadea monticola*  
*Clauzadeana macula*  
*Coccotrema citrinescens*  
*Collema auriforme*  
*Collema callopismum*  
*Collema crispum*  
*Collema cristatum*  
*Collema fuscovirens*  
*Collema glebulentum*  
*Collema multipartitum*  
*Collema polycarpon*  
*Collema tenax* (including var. *ceranoides*)  
*Collemopsidium caesium*  
(*Pyrenocollema caesium* in 2002 checklist)  
*Cornicularia normoerica*  
*Cystocoleus ebeneus*  
*Dermatocarpon miniatum*  
*Dictyonema interruptum*  
*Dimerella lutea*  
*Dimerella pineti*  
*Diploicia canescens*  
*Diploschistes muscorum*  
*Diploschistes scruposus*  
*Diplotomma alboatrum*  
*Diplotomma venustum*  
*Dirina massiliensis* f. *sorediata*  
*Enterographa hutchinsiae*  
*Enterographa zonata*  
*Ephebe lanata*  
*Epigloea medioincrassata*  
*Epigloea soleiformis*  
*Evernia prunastri*  
*Farnoldia jurana*  
*Flavoparmelia caperata*  
*Frutidella caesioatra*  
*Fuscidea austera*  
*Fuscidea cyathoides*

<i>Fuscidea gothoburgensis</i>	
<i>Fuscidea intercincta</i>	Sorediate morphs occur.
<i>Fuscidea kochiana</i>	
<i>Fuscidea lygaea</i>	
<i>Fuscidea praeruptorum</i>	
<i>Fuscidea recensa</i>	
<i>Fuscopannaria praetermissa</i>	
<i>Graphis scripta</i>	
<i>Gyalecta jenensis</i>	
<i>Gyalidea fritzei</i>	
<i>Gyalidea hyalinescens</i>	
<i>Gyalideopsis</i> sp.	This is an apparently undescribed species.
<i>Haematomma ochroleucum</i>	
var. <i>ochroleucum</i>	
<i>Haematomma ochroleucum</i>	
var. <i>porphyrium</i>	
<i>Hymenelia epulotica</i>	
<i>Hymenelia heteromorpha</i>	
<i>Hymenelia melanocarpa</i>	
<i>Hymenelia prevostii</i>	
<i>Hypogymnia physodes</i>	
<i>Hypogymnia tubulosa</i>	
<i>Hypotrachyna britannica</i>	
<i>Hypotrachyna laevigata</i>	
<i>Hypotrachyna revoluta</i>	
<i>Hypotrachyna taylorensis</i>	
<i>Immersaria arthrocarpa</i>	
<i>Ionaspis chrysophana</i>	
<i>Ionaspis lacustris</i>	
<i>Ionaspis odora</i>	
<i>Koerberiella wimmeriana</i>	
<i>Lasallia pustulata</i>	
<i>Lecanactis dilleniana</i>	
<i>Lecanactis latebrarum</i>	
<i>Lecania baeomma</i>	
<i>Lecania cuprea</i>	
<i>Lecania erysibe</i>	
<i>Lecania inundata</i>	
<i>Lecania rabenhorstii</i>	
<i>Lecania turicensis</i>	
<i>Lecanora agardhiana</i>	
<i>Lecanora albescens</i>	
<i>Lecanora crenulata</i>	
<i>Lecanora dispersa</i>	
<i>Lecanora ecorticata</i>	
<i>Lecanora epanora</i>	
<i>Lecanora expallens</i>	
<i>Lecanora flotowiana</i>	
<i>Lecanora gangaleoides</i>	
<i>Lecanora intricata</i>	



*Lecanora muralis*  
*Lecanora orosthea*  
*Lecanora polytropa*  
*Lecanora rupicola*  
*Lecanora soralifera*  
*Lecanora subaurea*  
*Lecanora subcarnea*  
*Lecanora sulphurea*  
*Lecanora xanthostoma*  
*Lecidea confluens*  
*Lecidea fuliginosa*  
*Lecidea fuscoatra*  
*Lecidea hypnorum*  
*Lecidea lactea*  
*Lecidea lapicida*  
*Lecidea lithophila*  
*Lecidea paupercula*  
*Lecidea phaeops*  
*Lecidea plana*  
*Lecidea promixta*  
*Lecidea pycnocarpa* f. *pycnocarpa*  
*Lecidea pycnocarpa* f. *sorediata*  
*Lecidea swartzioidea*  
*Lecidella carpathica*  
*Lecidella scabra*  
*Lecidella stigmataea*  
*Lemmopsis arnoldiana*  
*Lempholemma botryosum*  
*Lempholemma cladodes*  
*Lempholemma polyanthes*  
*Lempholemma radiatum*  
*Lepraria atlantica*  
*Lepraria bergensis*  
*Lepraria borealis*

Recently recorded from Britain, not in 2002 checklist.  
Now considered distinct from *L. caesioalba*, but some records of that species made during survey may not be identifiable now.

*Lepraria caesioalba*  
*Lepraria crassissima*  
*Lepraria diffusa* (*Lepraria*  
*diffusum* in 2002 checklist)  
*Lepraria eburnea*  
*Lepraria elobata*  
*Lepraria humida*  
*Lepraria incana*  
*Lepraria lobificans*  
*Lepraria membranacea*  
(*Lepraria membranacea* in 2002 checklist)  
*Lepraria neglecta*  
*Lepraria nivalis*  
*Lepraria rigidula*

Described by Bayerová & Orange (2006).

*Lepraria vouauxii* (*Leproloma  
vouauxii* in 2002 checklist)

*Leproplaca chrysodeta*

*Leproplaca xantholyta*

*Leptogium diffractum*

*Leptogium gelatinosum*

*Leptogium massiliense*

*Leptogium plicatile*

*Leptogium schraderi*

*Leptogium teretiusculum*

*Leptogium turgidum*

*Lithographa tesserata*

*Loxospora elatina*

*Massalongia carnosa*

*Megalaria pulvereae*

*Melanelia commixta*

*Melanelia fuliginosa* subsp. *fuliginosa*

*Melanelia fuliginosa* subsp. *glabratula*

*Menegazzia terebrata*

*Micarea angulosa* Coppins *ad int.* This is an undescribed species with angular conidia of a unique shape.

*Micarea bauschiana*

*Micarea botryoides*

*Micarea coppinsii*

*Micarea leprosula*

*Micarea lignaria* var. *endoleuca*

*Micarea lignaria* var. *lignaria*

*Micarea lutulata*

*Micarea marginata*

*Micarea myriocarpa*

*Micarea paratropa*

*Micarea peliocarpa*

*Micarea prasina*

*Micarea subnigrata*

*Micarea subviridescens*

*Micarea sylvicola*

*Micarea ternaria*

*Micarea tuberculata*

*Miriquidica complanata*

*Miriquidica griseoatra*

*Miriquidica leucophaea*

*Miriquidica lulensis*

*Moelleropsis nebulosa*

*Mycoblastus caesius*

*Mycoblastus sanguinarius*

*Myxobilimbia lobulata*

*Myxobilimbia sabuletorum*

*Neofuscelia loxodes*

*Neofuscelia verruculifera*

*Nephroma parile*

*Normandina pulchella*  
*Ochrolechia androgyna*  
*Ochrolechia frigida*  
*Ochrolechia inaequatula*  
*Ochrolechia parella*  
*Ochrolechia tartarea*  
*Omphalina ericetorum*  
*Opegrapha calcarea*  
*Opegrapha dolomitica*  
*Opegrapha gyrocarpa*  
*Opegrapha rassalensis* Coppins  
*ad int.*

This is an undescribed species, which probably does not belong in *Opegrapha*.

*Opegrapha saxatilis*  
*Ophioparma ventosa*  
*Parmelia discordans*  
*Parmelia omphalodes*  
*Parmelia saxatilis*  
*Parmelia sulcata*  
*Peltigera hymenina*  
*Peltigera leucophlebia*  
*Peltigera membranacea*  
*Peltigera praetextata*  
*Peltigera rufescens*  
*Pertusaria albescens*  
*Pertusaria amara*  
*Pertusaria aspergilla*  
*Pertusaria corallina*  
*Pertusaria excludens*  
*Pertusaria flavicans*  
*Pertusaria hemisphaerica*  
*Pertusaria lactea*  
*Pertusaria pertusa*  
*Pertusaria pseudocorallina*  
*Petractis clausa*  
*Phaeophyscia orbicularis*  
*Phlyctis argena*  
*Physcia adscendens*  
*Physcia caesia*  
*Pilophorus strumaticus*  
Pink Unknown lichen

This is an unidentified species, apparently distinct and not a poorly developed form of a common species; the thallus is completely endolithic, pinkish, and sometimes with very inconspicuous pycnidia with short, rod-shaped conidia.

*Placopsis lambii*  
*Placynthiella icmalea*  
*Placynthium asperellum*  
*Placynthium flabelliforme*

<i>Placynthium garovaglii</i>	This species has been confused with <i>P. hungaricum</i> , but some material has recently been confirmed by P.M. Jørgensen.
<i>Placynthium hungaricum</i>	Recently recorded for Britain; material determined by P.M. Jørgensen.
<i>Placynthium lismorensense</i>	The distinction of this species from <i>P. subradiatum</i> is uncertain, and it has been mostly included within that species in the floristic tables, but material has recently been confirmed by P.M. Jørgensen.
<i>Placynthium nigrum</i>	
<i>Placynthium subradiatum</i>	Some material recently confirmed by P.M. Jørgensen.
<i>Placynthium tremniacum</i>	
<i>Platismatia glauca</i>	
<i>Polyblastia albida</i>	
<i>Polyblastia cruenta</i>	
<i>Polyblastia cupularis</i>	
<i>Polyblastia deminuta</i>	
<i>Polyblastia dermatodes</i>	
<i>Polyblastia melaspora</i>	
<i>Polyblastia theleodes</i>	
<i>Polysporina simplex</i>	
<i>Porina chlorotica</i>	
<i>Porina guentheri</i> var. <i>guentheri</i>	
<i>Porina lectissima</i>	
<i>Porina linearis</i>	
<i>Porina mammillosa/sudetica</i>	
<i>Metamelaena umbonata</i>	
<i>Porpidia cinereoatra</i>	
<i>Porpidia contraaponenda</i>	
<i>Porpidia crustulata</i>	
<i>Porpidia flavocruenta</i>	Recently described by Fryday (2005); for most of the survey this was included within <i>P. macrocarpa</i> . Some material was available for checking, but the distinction between this and <i>P. macrocarpa</i> proved to be difficult and may need more study.
<i>Porpidia hydrophila</i>	
<i>Porpidia irrigua</i> Orange <i>ad int.</i>	This is an undescribed species with a similar chemistry to <i>P. contraaponenda</i> ; the two species were separated throughout the survey.
<i>Porpidia islandica</i>	Recently described by Fryday (2005); for much of the survey this was included within <i>P. macrocarpa</i> .
<i>Porpidia lowiana</i>	
<i>Porpidia macrocarpa</i>	
<i>Porpidia melinodes</i>	
<i>Porpidia pachythallina</i>	Recently described by Fryday (2005).
<i>Porpidia platycarpoides</i>	
<i>Porpidia rugosa</i> ( <i>Porpidia glaucophaea</i> in 2002 checklist)	
<i>Porpidia soledizodes</i>	
<i>Porpidia speirea</i>	

<i>Porpidia striata</i>	Recently described by Fryday (2005); for much of the survey this was included within <i>P. macrocarpa</i> .
<i>Porpidia superba</i> f. <i>sorediata</i>	
<i>Porpidia superba</i> f. <i>superba</i>	
<i>Porpidia tuberculosa</i>	
<i>Protoblastenia calva</i>	Not separated from <i>P. lilacina</i> (see below) for most of the survey.
<i>Protoblastenia cyclospora</i>	
<i>Protoblastenia incrustans</i>	
<i>Protoblastenia lilacina</i>	Only recently recognised in Britain; many records of <i>P. calva</i> are likely to refer to this species.
<i>Protoblastenia rupestris</i>	
<i>Protopannaria pezizoides</i>	
<i>Protoparmelia badia</i>	
<i>Protothelenella corrosa</i>	
<i>Pseudephebe pubescens</i>	
<i>Pseudevernia furfuracea</i> var. <i>ceratea</i>	
<i>Psilolechia clavulifera</i>	
<i>Psilolechia leprosa</i>	
<i>Psilolechia lucida</i>	
<i>Psora lurida</i>	
<i>Pyrenopsis subareolata</i>	
<i>Racodium rupestre</i>	
<i>Ramalina polymorpha</i>	
<i>Ramalina siliquosa</i>	
<i>Ramalina subfarinacea</i>	
<i>Rhizocarpon alpicola</i>	
<i>Rhizocarpon anaperum</i>	
<i>Rhizocarpon cinereovirens</i>	
<i>Rhizocarpon copelandii</i>	
<i>Rhizocarpon geographicum</i>	
<i>Rhizocarpon hochstetteri</i>	
<i>Rhizocarpon infernulum</i>	
<i>Rhizocarpon lavatum</i>	
<i>Rhizocarpon lecanorinum</i>	
<i>Rhizocarpon oederi</i>	
<i>Rhizocarpon petraeum</i>	
<i>Rhizocarpon polycarpum</i>	
<i>Rhizocarpon reductum</i>	
<i>Rhizocarpon sublavatum</i>	
<i>Rhizocarpon umbilicatum</i>	
<i>Rimularia furvella</i>	
<i>Rimularia gyrizans</i>	
<i>Rimularia intercedens</i>	
<i>Rimularia mullensis</i>	
<i>Rinodina atrocinerea</i>	
<i>Rinodina bischoffii</i>	
<i>Rinodina immersa</i>	
<i>Ropalospora lugubris</i> (sorediate)	
<i>Sagiolechia protuberans</i>	

*Sarcogyne regularis*  
*Schaereria cinereorufa*  
*Schaereria fuscocinerea*  
*Scoliciosporum umbrinum*  
*Solenopsora candicans*  
*Solorina saccata*  
*Sphaerophorus fragilis*  
*Sphaerophorus globosus*  
*Sporastatia polyspora*  
*Squamarina cartilaginea*  
*Staurothele bacilligera*  
*Staurothele caesia*  
*Staurothele guestphalica*  
*Staurothele hymenogonia*  
*Staurothele rugulosa*  
*Staurothele rupifraga*  
*Staurothele succedens*  
*Stereocaulon evolutum*  
*Stereocaulon leucophaeopsis*  
*Stereocaulon plicatile*  
  
*Stereocaulon spathuliferum*  
*Stereocaulon tornense*  
  
*Stereocaulon vesuvianum*  
*Strigula stigmatella*  
  
*Tephromela atra*  
*Tephromela grumosa*  
*Tephromela pertusarioides*  
*Thelidium decipiens*  
*Thelidium fontigenum*  
*Thelidium impressum*  
*Thelidium incavatum*  
*Thelidium minutulum*  
*Thelidium papulare*  
*Thelidium pluvium*  
*Thelidium pyrenophorum*  
*Toninia aromatica*  
*Toninia sedifolia*  
*Toninia thiopsora*  
*Toninia verrucarioides*  
*Trapelia coarctata*  
*Trapelia involuta*  
*Trapelia obtogens*  
*Trapelia placodioides*  
*Trapeliopsis flexuosa*  
*Trapeliopsis granulosa*  
*Trapeliopsis pseudogranulosa*  
*Trapeliopsis wallrothii*

Most material was sterile and could not be separated from *S. tornense*

Most material was sterile and could not be separated from *S. plicatile*.

The varieties separated in the 2002 checklist are currently not recognised.

*Tremolechia atrata*  
*Tuckermannopsis chlorophylla*  
*Tylothallia biformigera*  
*Umbilicaria cylindrica*  
*Umbilicaria deusta*  
*Umbilicaria hirsuta*  
*Umbilicaria polyphylla*  
*Umbilicaria proboscidea*  
*Umbilicaria torrefacta*  
*Usnea flammea*  
*Verrucaria aethiobola*  
*Verrucaria baldensis*  
*Verrucaria caerulea*  
*Verrucaria calciseda*  
*Verrucaria dufourii*

Some records were not distinguished from  
*V. pinguicula*.

*Verrucaria elaeina*  
*Verrucaria fuscella*

Taxonomy and nomenclature follows Orange (2004);  
not separated from *V. polysticta* during most of the  
survey.

*Verrucaria fusconigrescens*  
*Verrucaria hochstetteri*  
*Verrucaria hydrela*  
*Verrucaria macrostoma*  
*Verrucaria margacea*  
*Verrucaria muralis*  
*Verrucaria nigrescens*  
*Verrucaria phaeosperma*  
*Verrucaria pinguicula*  
*Verrucaria viridula*  
*Verrucaria polysticta*

Some records were not distinguished from *V. dufourii*.

Taxonomy and nomenclature follows Orange (2004);  
not separated from *V. fuscella* during most of the  
survey.

*Xanthoparmelia conspersa*  
*Xanthoria calcicola*  
*Xanthoria candelaria*  
*Xanthoria parietina*

## **Bryophytes**

### **Bryophyte names follow Blockeel & Long (1998)**

*Amblystegium serpens*  
*Amphidium lapponicum*  
*Amphidium mougeotii*  
*Anastrepta orcadensis*  
*Anastrophyllum minutum*  
*Andreaea alpina*  
*Andreaea megistospora*  
*Andreaea mutabilis*

*Andreaea rothii* ssp. *falcata*  
*Andreaea rothii* ssp. *rothii*

Sterile material was not always distinguishable from *A. megistospora*.

*Andreaea rupestris*  
*Aneura pinguis*  
*Anoetangium aestivum*  
*Anomobryum julaceum*  
*Anthelia julacea*  
*Antitrichia curtispindula*  
*Apometzgeria pubescens*  
*Barbilophozia atlantica*  
*Barbilophozia attenuata*  
*Barbilophozia floerkei*  
*Barbula unguiculata*  
*Bartramia pomiformis*  
*Bazzania tricrenata*  
*Blepharostoma trichophyllum*  
*Blindia acuta*  
*Brachydontium trichodes*  
*Brachythecium plumosum*  
*Brachythecium populeum*  
*Brachythecium rivulare*  
*Breutelia chrysocoma*  
*Bryoerythrophyllum recurvirostrum*  
*Bryum alpinum*  
*Bryum argenteum*  
*Bryum capillare*  
*Bryum pallens*  
*Bryum pseudotriquetrum*  
*Calliergonella cuspidata*  
*Calypogeia arguta*  
*Calypogeia fissa*  
*Calypogeia muellerana*  
*Campylium chrysophyllum*  
*Campylium stellatum*  
*Campylopus atrovirens*  
*Campylopus flexuosus*  
*Campylopus introflexus*  
*Campylopus setifolius*  
*Cephalozia bicuspidata*  
*Cephaloziella* spp.  
*Cololejeunea calcarea*  
*Conocephalum conicum*  
  
*Cratoneuron filicinum*  
*Ctenidium molluscum*  
*Cynodontium bruntonii*  
*Dichodontium pellucidum*  
*Dicranella heteromalla*  
*Dicranella palustris*

The recently described *C. salebrosum* was not distinguished during the survey.



*Dicranella varia*  
*Dicranodontium uncinatum*  
*Dicranoweisia cirrata*  
*Dicranum bonjeanii*  
*Dicranum fuscescens*  
*Dicranum majus*  
*Dicranum scoparium*  
*Didymodon fallax*  
*Didymodon ferrugineus*  
*Didymodon insulanus*  
*Didymodon rigidulus*  
*Didymodon sinuosus*  
*Didymodon spadiceus*  
*Didymodon vinealis*  
*Diphyscium foliosum*  
*Diplophyllum albicans*  
*Distichium capillaceum*  
*Ditrichum gracile*  
*Ditrichum zonatum* var. *scabrifolium*  
*Ditrichum zonatum* var. *zonatum*  
*Dounia ovata*  
*Encalypta ciliata*  
*Encalypta streptocarpa*  
*Eucladium verticillatum*  
*Eurhynchium crassinervium*  
*Eurhynchium hians*  
*Eurhynchium praelongum*  
*Eurhynchium pumilum*  
*Eurhynchium striatum*  
*Fissidens adianthoides*  
*Fissidens dubius*  
*Fissidens gracilifolius*  
*Fissidens osmundoides*  
*Fissidens pusillus*  
*Fissidens taxifolius*  
*Fissidens viridulus*  
*Frullania fragilifolia*  
*Frullania tamarisci*  
*Grimmia curvata*  
*Grimmia dissimulata*

Recently recorded from Britain, not in the 1998 checklist.

*Grimmia donniana*  
*Grimmia funalis*  
*Grimmia pulvinata*  
*Grimmia torquata*  
*Grimmia trichophylla*  
*Gymnocolea inflata*  
*Gymnomitrium concinnatum*  
*Gymnomitrium crenulatum*  
*Gymnomitrium obtusum*

*Gymnostomum aeruginosum*  
*Hedwigia integrifolia*  
*Herbertus stramineus*  
*Heterocladium heteropterum*  
*Homalothecium lutescens*  
*Homalothecium sericeum*  
*Hookeria lucens*  
*Hygrohypnum luridum*  
*Hylocomium brevirostre*  
*Hylocomium splendens*  
*Hymenostylium insigne*  
*Hymenostylium recurvirostrum*  
*Hyocomium armoricum*  
*Hypnum andoi*  
*Hypnum callichroum*  
*Hypnum cupressiforme*  
*Hypnum jutlandicum*  
*Hypnum lacunosum*  
*Hypnum resupinatum*  
*Isopterygiopsis pulchella*  
*Isothecium alopecuroides*  
*Isothecium holtii*  
*Isothecium myosuroides* var. *brachythecioides*  
*Isothecium myosuroides* var. *myosuroides*  
*Jungermannia atrovirens*  
*Jungermannia exsertifolia*  
*Jungermannia pumila*  
*Jungermannia sphaerocarpa*  
*Kiaeria blyttii*  
*Kiaeria falcata*  
*Kiaeria starkei*  
*Leiocolea alpestris*  
*Leiocolea bantriensis*  
*Lejeunea cavifolia*  
*Lejeunea lamacerina*  
*Lejeunea patens*  
*Lepidozia pearsonii*  
*Lepidozia reptans*  
*Leptodontium flexifolium*  
*Lophocolea bidentata* subsp. *rivularis*  
*Lophozia incisa*  
*Lophozia opacifolia*  
*Lophozia sudetica*  
*Lophozia ventricosa*  
*Marsupella adusta*  
*Marsupella alpina*  
*Marsupella emarginata*  
*Metzgeria conjugata*  
*Metzgeria furcata*  
*Metzgeria temperata*

*Microlejeunea ulicina*  
*Mnium hornum*  
*Mnium marginatum*  
*Mnium stellare*  
*Mnium thomsonii*  
*Moerckia blytii*  
*Molendoa warburgii*  
*Mylia taylorii*  
*Nardia compressa*  
*Nardia scalaris*  
*Neckera complanata*  
*Neckera crispa*  
*Oligotrichum hercynicum*  
*Orthodontium lineare*  
*Orthothecium intricatum*  
*Orthothecium rufescens*  
*Orthotrichum anomalum*  
*Orthotrichum cupulatum*  
*Palustriella commutata* var. *commutata*  
*Pellia endiviifolia*  
*Pellia epiphylla*  
*Philonotis fontana*  
*Philonotis tomentella*  
*Plagiobryum zieri*  
*Plagiochila porelloides*  
*Plagiochila punctata*  
*Plagiochila spinulosa*  
*Plagiomnium affine*  
*Plagiomnium elatum*  
*Plagiomnium rostratum*  
*Plagiomnium undulatum*  
*Plagiopus oederianus*  
*Plagiothecium denticulatum* var.  
    *obtusifolium*  
*Plagiothecium succulentum*  
*Plagiothecium undulatum*  
*Pleurozium schreberi*  
*Pogonatum aloides*  
*Pogonatum urnigerum*  
*Pohlia annotina*  
*Pohlia cruda*  
*Pohlia drummondii*  
*Pohlia elongata* var. *elongata*  
*Pohlia ludwigii*  
*Pohlia melanodon*  
*Pohlia nutans*  
*Polytrichum alpinum*  
*Polytrichum commune*  
*Polytrichum formosum*  
*Polytrichum juniperum*

*Polytrichum piliferum*  
*Porella platyphylla*  
*Preissia quadrata*  
*Pseudoleskeella catenulata* var. *catenulata*  
*Pseudotaxiphyllum elegans*  
*Pterygynandrum filiforme*  
*Ptilidium ciliare*  
*Ptychomitrium polyphyllum*  
*Racomitrium aciculare*  
*Racomitrium affine*  
*Racomitrium aquaticum*  
*Racomitrium ellipticum*  
*Racomitrium ericoides*  
*Racomitrium fasciculare*  
*Racomitrium heterostichum*  
*Racomitrium lanuginosum*  
*Racomitrium sudeticum*  
*Radula complanata/lindenbergiana*  
*Reboulia hemisphaerica*  
*Rhabdoweisia crispata*  
*Rhizomnium punctatum*  
*Rhynchostegiella tenella*  
*Rhytidiadelphus loreus*  
*Rhytidiadelphus squarrosus*  
*Rhytidiadelphus triquetrus*  
*Rhytidium rugosum*  
*Riccardia chamedryfolia*  
*Saccogyna viticulosa*  
*Sanionia uncinata*  
*Scapania aequiloba*  
*Scapania aspera*  
*Scapania compacta*  
*Scapania degenii*  
*Scapania gracilis*  
*Scapania gymnostomophila*  
*Scapania nimbosea*  
*Scapania ornithopodioides*  
*Scapania undulata*  
*Schistidium apocarpum*  
*Schistidium crassipilum*  
*Schistidium robustum*  
*Schistidium strictum*  
*Scleropodium purum*  
*Seligeria acutifolia*  
*Seligeria donniana*  
*Seligeria recurvata*  
*Seligeria trifaria*  
*Sphagnum denticulatum*  
*Sphagnum papillosum*  
*Sphagnum russowii*



*Asplenium adiantum-nigrum*  
*Asplenium ruta-muraria*  
*Asplenium trichomanes*  
*Asplenium viride*  
*Avenula pratensis*  
*Bellis perennis*  
*Brachypodium sylvaticum*  
*Bromus ramosus*  
*Calluna vulgaris*  
*Campanula rotundifolia*  
*Cardamine flexuosa*  
*Cardamine hirsuta*  
*Cardamine pratensis*  
*Carex binervis*  
*Carex flacca*  
*Carex pulicaris*  
*Cerastium fontanum*  
*Cerastium semidecandrum*  
*Chrysoplenium oppositifolium*  
*Circaea × intermedia*  
*Cochlearia pyrenaica*  
*Crepis paludosa*  
*Cryptogramma crispa*  
*Cystopteris fragilis*  
*Dactylis glomerata*  
*Deschampsia cespitosa*  
*Deschampsia flexuosa*  
*Digitalis purpurea*  
*Diphasiastrum alpinum*  
*Dryas octopetala*  
*Dryopteris affinis*  
*Dryopteris dilatata*  
*Dryopteris filix-mas*  
*Epilobium brunnescens*  
*Epilobium montanum*  
*Erophila verna*  
*Euphrasia spp.*  
*Festuca filiformis*  
*Festuca ovina*  
*Festuca rubra*  
*Festuca vivipara*  
*Filipendula ulmaria*  
*Fragaria vesca*  
*Fraxinus excelsior* (seedlings)  
*Galium aparine*  
*Galium saxatile*  
*Geranium lucidum*  
*Geranium molle*  
*Geranium robertianum*  
*Helianthemum nummularium*

*Hieracium spp.*  
*Holcus lanatus*  
*Holcus mollis*  
*Huperzia selago*  
*Hymenophyllum wilsoni*  
*Hypericum pulchrum*  
*Juncus effusus*  
*Koeleria macrantha*  
*Leucanthemum vulgare*  
*Linum catharticum*  
*Luzula campestris/multiflora*  
*Luzula sylvatica*  
*Minuartia verna*  
*Molinia caerulea*  
*Mycelis muralis*  
*Nardus stricta*  
*Oxalis acetosella*  
*Oxyria digyna*  
*Phegopteris connectilis*  
*Pinguicula vulgaris*  
*Plantago maritima*  
*Poa alpina*  
*Poa pratensis agg.*  
*Polygala spp.*  
*Polygonum viviparum*  
*Polypodium vulgare*  
*Polystichum lonchitis*  
*Polystichum setiferum*  
*Potentilla sterilis*  
*Primula vulgaris*  
*Prunella vulgaris*  
*Pteridium aquifolium*  
*Ranunculus acris*  
*Rumex acetosa*  
*Sagina procumbens*  
*Salix herbacea*  
*Saxifraga aizoides*  
*Saxifraga hypnoides*  
*Saxifraga oppositifolia*  
*Saxifraga stellaris*  
*Saxifraga tridactylites*  
*Scabiosa columbaria*  
*Sedum acre*  
*Sedum anglicum*  
*Sedum rosea*  
*Selaginella selaginoides*  
*Sesleria albicans*  
*Silene acaulis*  
*Solidago virgaurea*  
*Stachys officinalis*

*Stellaria alsine*

*Succisa pratensis*

*Taraxacum* spp.

*Thalictrum minus*

*Thymus polytrichus*

*Umbilicus rupestris*

*Vaccinium myrtillus*

*Vaccinium vitis-idaea*

*Veronica hederifolia*

*Viola riviniana*



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## Appendix 2: Amalgamation of species used during TWINSPAN analysis

Amalgamation of recorded taxa before TWINSPAN analysis was necessary when:

1. distinct taxa were not consistently separated due to changes in taxonomy, or misidentification of some samples;
2. when a proportion of material could not be identified as it was juvenile or sterile.

Vascular plants, and most algae, were omitted from analyses.

The table below lists most of the aggregations used before analysis.

<b>Taxon as recorded</b>	<b>Aggregated with</b>
<b>Siliceous samples</b>	
<i>Andreaea megistospora</i> <i>Andreaea rothii</i> <i>Andreaea rothii</i> subsp. <i>falcata</i> <i>Andreaea rothii</i> subsp. <i>rothii</i> <i>Andreaea rothii/megistospora</i>	<i>Andreaea rothii/megistospora</i>
<i>Anomobryum filiforme</i> <i>Anomobryum filiforme</i> var. <i>concinatum</i> <i>Anomobryum julaceum</i> <i>Anomobryum julaceum</i> var. <i>julaceum</i>	<i>Anomobryum julaceum</i>
<i>Aspicilia cinerea</i> <i>Aspicilia cinerea</i> agg. <i>Aspicilia cinerea</i> agg./ <i>grisea</i> <i>Aspicilia cinerea/grisea</i> <i>Aspicilia epiglypta</i> <i>Aspicilia intermutans</i>	<i>Aspicilia cinerea</i> agg.
<i>Aspicilia grisea</i> <i>Aspicilia grisea</i> agg.	<i>Aspicilia grisea</i> agg.
<i>Bryum capillare</i> var. <i>capillare</i> <i>Bryum capillare</i>	<i>Bryum capillare</i>
<i>Catillaria chalybeia</i> <i>Catillaria chalybeia</i> var. <i>chalybeia</i>	<i>Catillaria chalybeia</i>
<i>Cephaloziella</i> cf. <i>divaricata</i> <i>Cephaloziella</i> spp.	<i>Cephaloziella</i> spp.
<i>Cladonia cervicornis</i> <i>Cladonia cervicornis</i> ssp. <i>cervicornis</i>	<i>Cladonia cervicornis</i>
<i>Cladonia alpina</i> <i>Cladonia macilenta</i>	<i>Cladonia alpina/macilenta</i>
<i>Cladonia pocillum</i> <i>Cladonia pyxidata</i>	<i>Cladonia pocillum/pyxidata</i>
<i>Cladonia squamosa</i> var. <i>squamosa</i> <i>Cladonia squamosa</i> var. <i>subsquamosa</i>	<i>Cladonia squamosa</i>

<i>Conocephalum conicum</i> <i>Conocephalum salebrosum</i> <i>Conocephalum conicum/salebrosus</i>	<i>Conocephalum conicum/salebrosus</i>
<i>Haematomma ochroleucum</i> (green)  <i>Haematomma ochroleucum</i> (grey) <i>Haematomma ochroleucum</i> var. <i>ochroleucum</i> <i>Haematomma ochroleucum</i> var. <i>ochroleucum</i> <i>Haematomma ochroleucum</i> var. <i>porphyrium</i>	<i>Haematomma ochroleucum</i> (var. <i>ochroleucum</i> )
<i>Lecidea lactea</i> <i>Lecidea lactea/swartzioidea</i> <i>Lecidea swartzioidea</i>	<i>Lecidea lactea/swartzioidea</i>
<i>Lepraria borealis</i> <i>Lepraria caesioalba</i>	<i>Lepraria caesioalba</i> agg.
<i>Marsupella emarginata</i> <i>Marsupella emarginata</i> var. ? <i>pearsonii</i> <i>Marsupella emarginata</i> var. <i>emarginata</i>	<i>Marsupella emarginata</i>
<i>Micarea lignaria</i> <i>Micarea lignaria</i> var. <i>endoleuca</i> <i>Micarea lignaria</i> var. <i>lignaria</i>	<i>Micarea lignaria</i>
<i>Palustriella commutata</i> <i>Palustrillea commutate</i> var. <i>commutata</i>	<i>Palustriella commutata</i>
<i>Porpidia crustulata</i> <i>Porpidia flavocruenta</i> <i>Porpidia islandica</i> <i>Porpidia macrocarpa</i> <i>Porpidia macrocarpa</i> f. <i>macrocarpa</i> <i>Porpidia macrocarpa</i> f. <i>nigrocruenta</i> <i>Porpidia striata</i>	<i>Porpidia macrocarpa</i> agg.
<i>Pseudevernia furfuracea</i> var. <i>ceratea</i> <i>Pseudevernia furfuracea</i> var. <i>furfuracea</i>	<i>Pseudevernia furfuracea</i>
<i>Radula</i> cf. <i>complanata</i> <i>Radula complanata/lindenbergiana</i>	<i>Radula complanata/lindenbergiana</i>
<i>Schistidium apocarpum</i> <i>Schistidium apocarpum</i> agg.	<i>Schistidium apocarpum</i> agg.
<i>Stereocaulon tornense</i> <i>Stereocaulon plicatile</i> <i>Stereocaulon plicatile/tornense</i>	<i>Stereocaulon plicatile/tornense</i>
<i>Stigonema mamillosum</i> <i>Stigonema ocellatum</i> <i>Stigonema</i> spp.	<i>Stigonema</i> spp.

<b><i>Limestone samples</i></b>	
<i>Acarospora cervina</i> <i>Acarospora glaucocarpa</i>	<i>Acarospora cervina</i>
<i>Bryum capillare</i> <i>Bryum capillare</i> var. <i>capillare</i>	<i>Bryum capillare</i>
<i>Caloplaca citrina</i> <i>Caloplaca dichroa</i> <i>Caloplaca flavocitrina</i> <i>Caloplaca citrina</i> sl. lat.	<i>Caloplaca citrina</i> sensu lato
<i>Cladonia pocillum</i> <i>Cladonia pyxidata</i>	<i>Cladonia pocillum</i>
<i>Conocephalum conicum</i> <i>Conocephalum salebrosum</i> <i>Conocephalum conicum/salebrosus</i>	<i>Conocephalum conicum/salebrosus</i>
<i>Hypnum lacunosum</i> <i>Hypnum lacunosum</i> var. <i>lacunosum</i>	<i>Hypnum lacunosum</i>
<i>Lecanora xanthostoma</i> <i>Lecanora flotowiana</i>	<i>Lecanora flotowiana</i>
<i>Orthotrichum cupulatum</i> <i>Orthotrichum cupulatum</i> var. <i>cupulatum</i>	<i>Orthotrichum cupulatum</i>
<i>Placynthium garovaglii</i> <i>Placynthium hungaricum</i>	<i>Placynthium garovaglii</i>
<i>Protoblastenia calva</i> <i>Protoblastenia lilacina</i>	<i>Protoblastenia calva</i>
<i>Verrucaria dufourii</i> <i>Verrucaria pinguicula</i>	<i>Verrucaria pinguicula</i>
<i>Verrucaria fuscella</i> <i>Verrucaria polysticta</i> <i>Verrucaria glaucina</i>	<i>Verrucaria fuscella</i>