

Realignment of Penrhyn Quarry: lichen survey of the area outlined in blue on map supplied in email dated 11/01/2019

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Background

A proposal to re-align the quarry workings at Penrhyn Quarry, Bethesda, would involve increasing the permitted quarry area into open mountain moorland which forms part of a statutory nature conservation area, namely the Eryri Special Area of Conservation (SAC) and its associated Site of Special Scientific Interest (SSSI).

In 2010 Steve Chambers carried out a lichen survey of a broad area around the proposed extension (Cynefin Consultants Ltd 2010). The present survey is a new survey of a much more restricted area, namely an area of heathland adjacent to the present western extent of the quarry, which is proposed for stripping.

Key Findings

A total of 69 species were recorded, including two (*Bryoria fuscescens* and *Mycoblastus affinis*) graded as Vulnerable in the Welsh Red Data Book, and 6 Nationally Scarce species. In addition there are some lichens considered significant as examples of upland species which are relatively uncommon in Snowdonia, namely *Sphaerophorus fragilis*, *Umbilicaria polyphylla* and *U. torrefacta*.

Methods

The site was visited on 15 February 2019 in cool dry weather. All parts of the site are within hectad SH66 of the National Grid, in the botanical vice-county of Caernarvonshire (V.C. 49). All records were made in either grid square SH60.63 or 61.63.

Lichen species were regarded as 'notable' if they belonged to one or more of the following categories:

Wales Red List species (Critically Endangered, Near Threatened and Data Deficient, if practicable) (Woods 2010).

Nationally Rare and Nationally Scarce species (Woods & Coppins 2012).

International Responsibility (IR): British populations are considered to be of international significance; usually it is considered likely that Britain supports more than 10% of the extant European and/or world's population of these species.

Lichen nomenclature follows Smith *et al.* (2009), except for *Trapelia*, which follows Orange (2018).

A number of relevés (recorded samples of vegetation with estimates of cover-abundance of each species) were recorded to help characterise the vegetation. Lichen communities in the sense of named assemblages of species are poorly known in Britain, but some of the communities provisionally delimited and named by Orange (2009) are referred to below.

Field locality numbers, usually referring to a single boulder, are indicated by a number and are listed in Table 2. Numbers begin at 15 to avoid confusion with an adjacent area that was also surveyed. Location was by means of a hand-held GPS receiver, and was recorded as latitude and longitude converted to National Grid using the tool at <http://gridreferencefinder.com/batchConvert/batchConvert.php>.

Results

The site comprises well-drained fescue-bent (*Festuca-Agrostis*) grassland with local soft rush (*Juncus effusus*). There are numerous small to medium boulders, also a substantial stone sheepfold and a drystone wall.

A total of 69 species was recorded (Table 1). Unshaded more or less south-facing surfaces of boulders often support a community of crustose lichens including *Fuscidea cyathoides*, *F. lygaea*, *Lecidea lactea*, *Rhizocarpon geographicum*, *Schaereria fuscocinerea*, and sometimes small amounts of *Umbilicaria polyphylla*, *U. polyrrhiza* and *U. torrefacta* (SS A1 *Rhizocarpon geographicum-Fuscidea lygaea* community). More or less north-facing sides of boulders often have larger lichens including *Bryoria fuscescens*, *Parmelia omphalodes*, *P. saxatilis*, *Hypogymnia physodes*, *Sphaerophorus globosus*, and the crustose species *Ochrolechia tartarea*, *Ophioparma ventosa* and *Pertusaria corallina* (SS F2 *Parmelia saxatilis-P. omphalodes* community). Stands of *Parmelia omphalodes* and other large species also occurred on some boulder crests, where they may receive slight enrichment. A few boulder crests had a community related to enrichment by perching birds, with *Aspicilia caesiocinerea*, *Candelariella vitellina*, *Ramalina subfarinacea* and *Verrucaria fusconigrescens* (SS H1 *Candelariella coralliza-Aspicilia caesiocinerea* community). The large lichen *Lasallia pustulata* occurred occasionally in slightly nutrient-enriched rain-tracks (SS F4 *Lasallia pustulata* community). Lichens preferring rain-sheltered rocks were sparse, including *Lecanactis dilleniana*, *Lepraria ecorticata*, *L. incana*, *Opegrapha gyrocarpa* and *Psilolechia clavulifera* on a few overhanging faces or on stones below overhanging boulders.

Two species receive a grading in the Welsh Red Data Book:

Bryoria fuscescens is graded as Vulnerable, due to its marked decline in recent decades. This is probably largely a result of nitrogen deposition (particularly in upland areas) or ammonia production (lowland areas). It is rarely seen on rocks in Snowdonia. This specifically Welsh grading was probably not available when the 2010 survey was carried out. (Figs. 1, 3, 4, 5, 6).

Mycoblastus affinis is graded as Vulnerable, due to the small population in Wales. It is recorded from only four hectads in Wales, of which two are represented by pre-1960 records. Nationally it is recorded mainly on acidic bark, but sometimes on rock. Found on one boulder (Fig. 5).

Six species are Nationally Scarce in Great Britain:

Cladonia cyathomorpha – a widespread species of mossy upland rocks, probably still somewhat under-recorded.

Lecanactis dilleniana – a species of rain-sheltered rocks.

Miriquidica pycnocarpa f. *sorediata* – upland rocks, rather frequent.

Porpidia melinodes – upland rocks, probably a little under-recorded.

Psilolechia clavulifera – a species of rain-sheltered shady rocks.

Rhizocarpon subgeminatum – an uncommon species of nutrient-enriched rocks, known only from six hectads in Wales. Found on one boulder (Fig. 3).

Nationally Scarce species are not necessarily threatened. Probably of equal significance are some typically upland species which are widespread but rarely abundant in Snowdonia, *Sphaerophorus fragilis* (Fig. 6), *Umbilicaria polyphylla*, *U. polyrrhiza* (Fig. 2, 6) and *U. torrefacta* (Fig. 6).

Discussion

The site supports well-developed and typical lichen communities of upland areas in North Wales. The site is evidently not affected by any local sources of reactive nitrogen. However, there is only one species (*Bryoria fuscescens*) which is a Red Data Book species. Apart from *Rhizocarpon subgeminatum* the six Nationally Scarce species are of rather low significance in the context of Eryri SAC.

A number of significant species were recorded from boulders by Steve Chambers in 2010, which were not refound in 2019:

Notable species recorded on boulders in 2010, but not in 2019		
species	grading /rarity	notes
<i>Calvitimela aglaea</i>	NS	2010 record not localised.
<i>Clauzadeana macula</i>	NS	2010 record not localised.
<i>Lecidea confluens</i>	NS	2010 record not localised.
<i>Lecidea plana</i>	NS	SH60847.63712, west of the area visited in 2019
<i>Lecidea swartzioidea</i>	NS	A poorly understood taxon which has been included within <i>Lecidea lactea</i> in the 2019 survey
<i>Micarea coppinsii</i>	NS	2010 record not localised.
<i>Miriquidica pycnocarpa</i> f. <i>pycnocarpa</i>	NS	2010 record not localised.
<i>Protoparmelia atriseda</i>	NR, VU	'minute quantity' at SH60966.63957 and SH60948.63928.
<i>Stereocaulon delisei</i>	NS, NT, IR	SH60949.63953
VU = Vulnerable, NT = Near Threatened, IR = International Responsibility (Woods 2010). NR = Nationally Rare, NS = Nationally Scarce.		

Some of these species may have occurred in the other areas of boulders examined by Steve Chambers, for instance south of Llyn Owen-y-ddol, but some which were present in only

small quantity were probably simply missed in 2019 (*Protoparmelia atriseda*, *Stereocaulon delisei*). It is likely that they are still there.

References

Cynefin Consultants Ltd (2010) *Realignment of Penrhyn Quarry Environmental Impact Assessment Ecological Survey Report: Lichenised & Lichenicolous Fungi*. Unpublished report.

Orange, A. (2009) *Saxicolous lichen and bryophyte communities in upland Britain*. JNCC Report 404. ISSN 0963 8091.

Orange, A. (2018) A new species-level taxonomy for *Trapelia* (*Trapeliaceae*, *Ostropomycetidae*) with special reference to Great Britain and the Falkland Islands. *Lichenologist* **50**: 3-42.

Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. (2009) *The Lichens of Great Britain and Ireland*. London: British Lichen Society.

Woods, R.G. (2010) *A Lichen Red Data List for Wales*. Salisbury: Plantlife.

Woods, R.G. & Coppins, B.J. (2012) *A Conservation Evaluation of British Lichens and Lichenicolous Fungi*. Plantlife. http://jncc.defra.gov.uk/pdf/Lichens_Web.pdf.

Table 1. Species recorded

name	notes
<i>Acarospora fusca</i>	On boulders and walls, frequent.
<i>Aspicilia caesiocinerea</i>	On boulders, usually on nutrient-enriched crests near bird perches.
<i>Aspicilia cinerea</i>	On gently sloping boulders, rare.
<i>Bryoria fuscescens</i>	On steep north faces of boulders, occasional. 18, 22, 23, 27.
<i>Buellia aethalea</i>	On boulders, especially on crests near bird perches.
<i>Candelariella coralliza</i>	On crests of boulders by bird perches, rare.
<i>Cetraria muricata</i>	In groove in low boulder, rare. 22.
<i>Cladonia cervicornis</i>	On low boulders, occasional.
<i>Cladonia coccifera</i>	On rocks, occasional.
<i>Cladonia crispta</i> var. <i>cetrariiformis</i>	On mossy rocks, rare. Near 20.
<i>Cladonia floerkeana</i>	On rocks, rare.
<i>Cladonia gracilis</i>	On low boulder, rare.
<i>Cladonia luteoalba</i>	On low boulder in very small quantity. 21.
<i>Cladonia polydactyla</i>	On rocks, rare.
<i>Cladonia subcervicornis</i>	On low boulders, occasional.
<i>Diploschites scruposus</i>	On sheep fold, rare.
<i>Fuscidea cyathoides</i>	On rock, frequent.
<i>Fuscidea kochiana</i>	On boulders, rare.
<i>Fuscidea praeruptorum</i>	Overhanging and north-facing faces of boulders, occasional.
<i>Halecania cf. spodomela</i>	On rocks, rare, in small quantities. Resembles <i>H. spodomela</i> but epithecium is brown and K -. 22, 24.
<i>Hypogymnia physodes</i>	On crests and north sides of boulders, occasional to frequent.
<i>Lasallia pustulata</i>	On gently sloping boulders, especially in slightly nutrient-enriched rain tracks.
<i>Lecanactis dilleniana</i>	On stone below boulder, and on sheep folds.
<i>Lecanora gangaleoides</i>	On steep faces, rare.
<i>Lecanora intricata</i>	On boulders, frequent in small quantities.
<i>Lecanora polytropa</i>	On boulders, especially on nutrient-enriched crests, occasional.
<i>Lecidea lactea</i> s.l.	On boulders, occasional.
<i>Lepraria ecorticata</i>	On very rain-sheltered surfaces below boulders and on walls, rare.
<i>Lepraria incana</i>	On rain-sheltered rock below boulder and on sheep fold.
<i>Melanelixia fuliginosa</i>	On boulders and walls, occasional.
<i>Micarea leprosula</i>	On moss over rock, rare.
<i>Miriquidica leucophaea</i>	On boulders and walls, frequent.
<i>Miriquidica pycnocarpa</i> f. <i>sorediata</i>	On boulders, sometimes in good quantity on sloping north faces.
<i>Mycoblastus affinis</i>	On N side of boulder; rare. 23.
<i>Ochrolechia androgyna</i>	On north sides of boulders, occasional.

<i>Ochrolechia tartarea</i>	On steep north sides of boulders, occasional.
<i>Opegrapha gyrocarpa</i>	On overhanging faces on boulders and walls, occasional.
<i>Ophioparma ventosa</i>	On steep north sides of boulders, occasional.
<i>Parmelia omphalodes</i>	On crests and north sides of boulders and on tops of walls, abundant.
<i>Parmelia saxatilis</i>	On crests and north sides of boulders and on tops of walls, abundant.
<i>Parmelia sulcata</i>	On rocks, frequent.
<i>Pertusaria aspergilla</i>	On rocks, occasional.
<i>Pertusaria excludens</i>	On slightly overhanging face of boulder; rare. 15.
<i>Pertusaria pseudocorallina</i>	On rocks, rare.
<i>Platismatia glauca</i>	On steep north sides of boulders, occasional.
<i>Porpidia cinereoatra</i>	On boulders, rare, and locally frequent on walls.
<i>Porpidia melinodes</i>	On boulders and drystone walls, occasional.
<i>Porpidia tuberculosa</i>	On rock, rare.
<i>Pseudevernia furfuracea</i>	On crests and north sides of boulders and on tops of walls, frequent.
<i>Psilolechia clavulifera</i>	On stone below overhanging boulder; rare. 25.
<i>Psilolechia lucida</i>	On stone below boulder, rare.
<i>Ramalina subfarinacea</i>	On crests of boulders by bird perches, rare.
<i>Rhizocarpon geographicum</i>	On mainly south sides of boulders and walls, frequent.
<i>Rhizocarpon subgeminatum</i>	On slightly nutrient-enriched boulders, rare. 18.
<i>Schaereria fuscocinerea</i>	On boulders, occasional.
<i>Sphaerophorus fragilis</i>	On boulders, rare. 18, 21,
<i>Sphaerophorus globosus</i>	On rocks, occasional.
<i>Stereocaulon evolutum</i>	On boulders, occasional. 15, 21,
<i>Stereocaulon vesuvianum</i>	On rocks, rare.
<i>Tephromela atra</i>	On rocks, occasional.
<i>Trapelia involuta</i>	On tops of boulders on rock recently exposed by loss of larger lichens, occasional.
<i>Tremolechia atrata</i>	On rocks, occasional.
<i>Tuckermanopsis chlorophylla</i>	On wall at top of site.
<i>Umbilicaria polyphylla</i>	On boulders, rare. 22, 23, 24.
<i>Umbilicaria polyrrhiza</i>	On gently sloping surfaces of low boulders. 15 (3 boulders).
<i>Umbilicaria torrefacta</i>	On gently sloping boulders, rare. 21.
<i>Verrucaria fusconigrescens</i>	On crests of boulders by bird perches, rare, poorly developed.
<i>Xanthoparmelia conspersa</i>	On boulders on poorly drained surfaces or in rain tracks, occasional.
<i>Xanthoria candelaria</i>	On crests of boulders by bird perches, rare, in small quantities.

Table 2. Localities.

number	GPS reading: latitude	GPS reading: longitude	quoted accuracy (m)	alt.	National Grid: easting	National Grid: northing
15	53.15475	-4.08050	3	369	260978	363980
16	53.15453	-4.08065	5	373	260968	363955
17	53.15447	-4.08078	5	370	260959	363949
18	53.15428	-4.08105	5	372	260940	363928
19	53.15429	-4.08097	4	368	260945	363929
20	53.15433	-4.08138	4	367	260918	363935
21	53.15415	-4.08133	4	366	260921	363915
22	53.15406	-4.08105	6	372	260939	363904
23	53.15392	-4.08125	4	375	260926	363889
24	53.15376	-4.08116	4	375	260931	363871
25	53.15355	-4.08135	3	379	260918	363848
26	53.15363	-4.08148	6	376	260909	363857
27	53.15330	-4.08181	5	376	260886	363821
28	53.15298	-4.08076	4	394	260955	363783

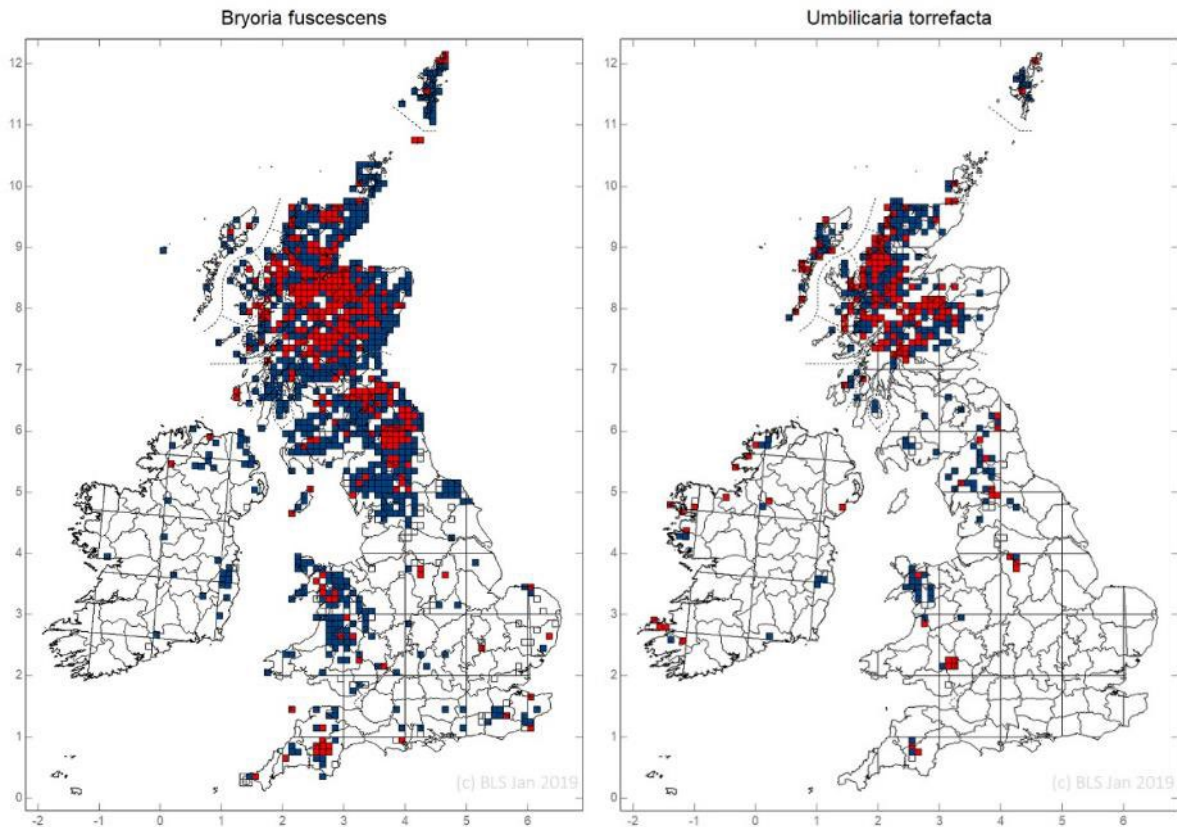


Fig. 1. Distribution maps of two species suggested for possible tranlocation. Dates of records: red = post 2000, blue = 1960–1999, white = 1959 or earlier. Since recording coverage is not perfect, not every blue square indicates a loss of a species; nevertheless, the known decline in *Bryoria* is well-indicated by the map. Maps © British Lichen Society.



Fig. 2. Boulder 15, one of three at this spot supporting *Umbilicaria polyrrhiza*.



Fig. 3. Boulder 18, supporting *Bryoria fuscescens* and *Rhizocarpon subgeminatum*.



Fig. 4. Boulder 22, supporting *Bryoria fuscescens*.



Fig. 5. Boulder 23, supporting *Bryoria fuscescens* and *Mycoblastus affinis*.

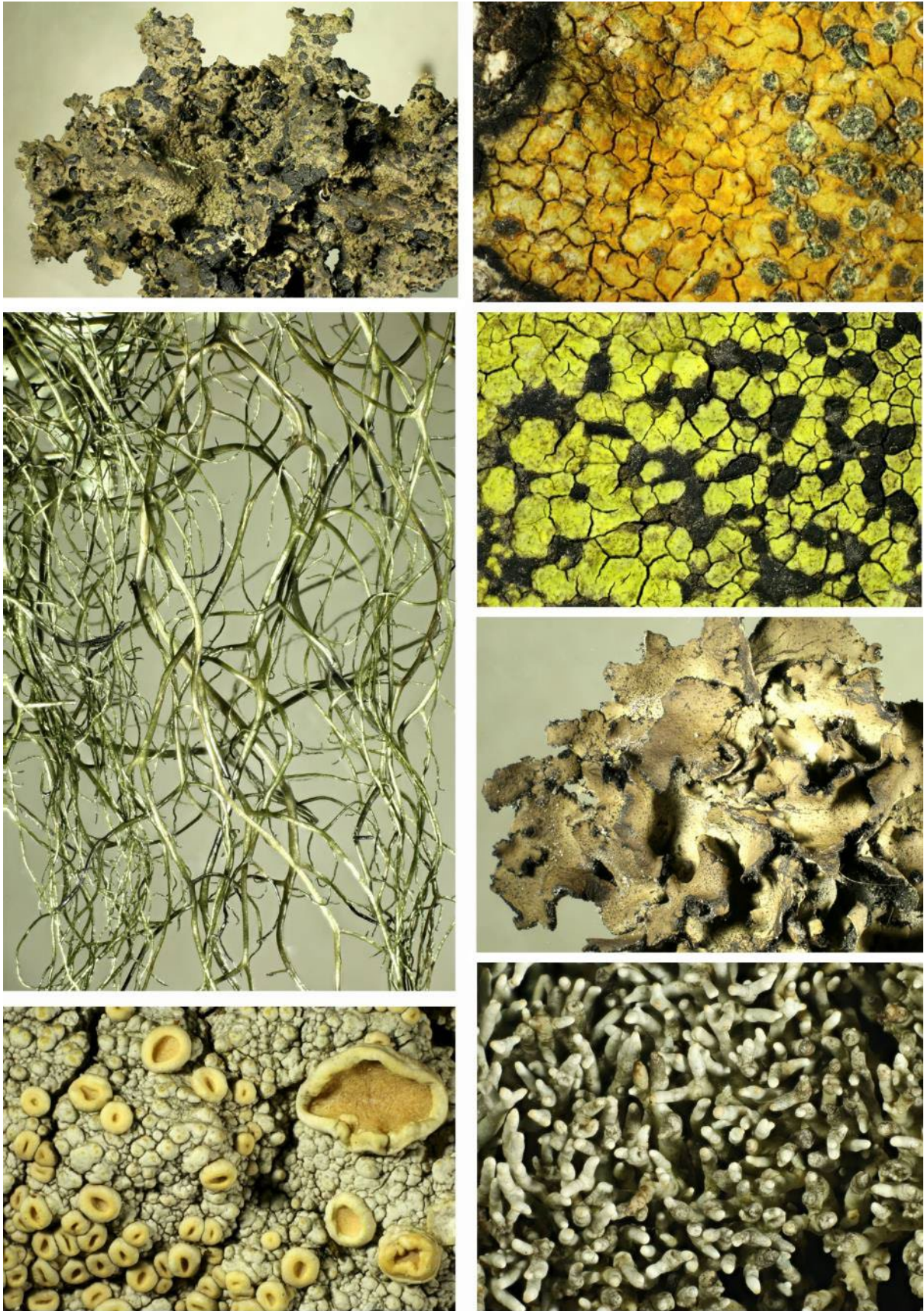


Fig. 6. Examples of lichens at the site (not to same scale). Clockwise from top left: *Umbilicaria torrefacta*, *Porpidia melindoes*, *Rhizocarpon geographicum*, *Umbilicaria polyrrhiza*, *Sphaerophorus fragilis*, *Ochrolechia tartarea*, *Bryoria fusescens*.