H3.1a Boreal and arctic siliceous inland cliff

Summary

These are siliceous rock faces and cliffs, mostly of hard crystalline rocks, soft mica schist and some volcanics, in the boreal and arctic biogeographical regions, though not including sea cliffs with salt spray influence or very wet, dripping vertical rock faces. The vegetation consists of a limited vascular flora growing in crevices and on ledges, with epilithic bryophytes, lichens as well as micro-algae on rock faces, overhangs and in all kinds of sheltered microsites. Although the rock types are all base-poor, they show marked variation in their chemical composition and stratigraphy and can harbor a great diversity of vascular plants and cryptogams in many different assemblages, disposed in many microhabitats. The habitat has been destroyed in some places and quality is affected by logging of neighbouring slopes (which brings a different microclimate) and by atmospheric nitrogen deposits (which increase the density of vegetation).

Synthesis

Despite missing territorial data from Norway and Sweden, this habitat type is labelled as Least Concern (LC), because Finnish data are of very good quality and it is possible to extrapolate them to Norway, based on information from the Norwegian Red List of Ecosystem (Least Concern status).

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Least Concern	-	Least Concern	-

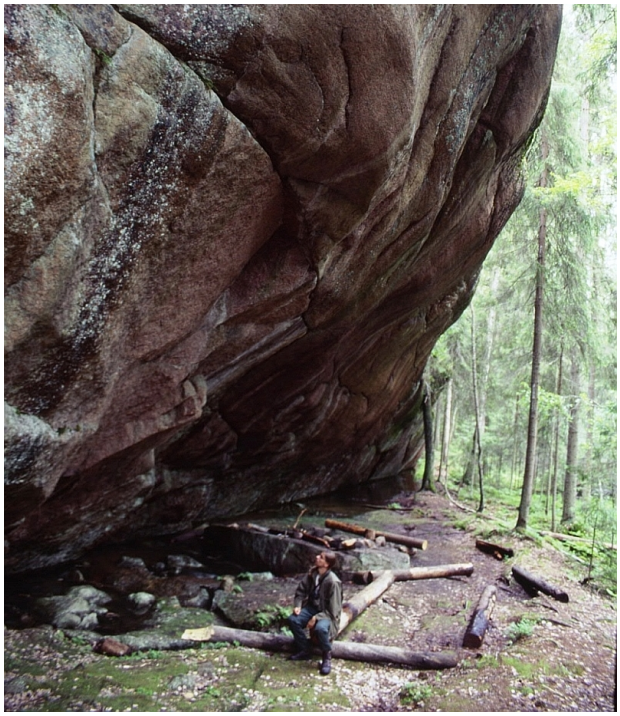
Sub-habitat types that may require further examination

Finnish experts indicate that rock outcrops once sculpted by ice (i.e. glaciated rocks, "roches moutonnées") have an international importance (international responsibility of Finland).

Habitat Type

Code and name

H3.1a Boreal and arctic siliceous inland cliff



An overhanging siliceous rock face, Pirunkirkko, Heinola, Finland (Photo: Jari Teeriaho).

A sunny lichen-dominated siliceous cliff on a lake-side, Haukkavuori, Hirvensalmi, Finland (Photo: Jari Teeriaho).

Habitat description

Siliceous (rich in quartz and silicate minerals such as mica or feldspar) rock walls and cliffs in the boreal and arctic biogeographical regions, excluding supralittoral cliffs adjacent to the sea with salt spray influence (habitat B3.1) as well as very wet, dripping vertical rocks (habitat H3.4). These siliceous cliffs in the North chiefly consist of granite, gneiss and other kinds of hard crystalline acid rock. Soft mica schist is also common. Volcanic rocks occur locally.

The vegetation consists of a limited number of vascular plants in rock crevices and on ledges, while epilithic bryophytes, lichens as well as micro-algae occur on dry or wet rock faces, overhangs and in all kinds of sheltered microsites. Although these rock types are all base-poor, they show marked variation in their chemical composition and can harbor hundreds of different lichens and bryophytes and a range of plant communities. For example, lichen communities on quartzite and diorite are composed largely of different species. The most base-poor rocks include sandstone and quartzite, followed by granites, gneisses, and granulites. Rocks with reduced acidity include phyllite, mica schist, gabbro, and diorite; they host species that are slightly more nutrient demanding. In the boreal zone, diabase and amphibolite represent more base-rich rock types that form transitions between base-poor and base-rich habitats (this type and H3.2a). However, in most cases these cliffs do not host remarkable calciphilous communities, like on limestone cliffs.

Usually, the highest diversity of species is found in cliffs with the highest geomorphological diversity. Especially lichen and bryophyte communities vary according to microhabitats like rock slopes, vertical and overhanging rock faces, cavities, shelves, and ledges, as well as crevices of different size or fissures on walls. For example, the most bare and sunny walls are dominated by crustose and foliose lichens and small cushion-forming bryophytes, whereas shady vertical surfaces are covered by mat- or cushion-forming bryophytes. The gloomiest cavities may harbor fan-like bryophytes (e.g. *Neckera* spp.), powdery lichens or algae. Crustose and foliose lichens are well represented with numerous genera; particularly species-rich are, e.g., *Lecanora*, *Parmelia* s.l., *Rhizocarpon*, *Stereocaulon,* and *Umbilicaria*. Among the mosses, numerous species of *Grimmia*, *Racomitrium*, *Schistidium*, *Andreaea* and many other genera occur. The vegetation of vascular plants is rather poor but small ferns (*Asplenium* spp.) may occur, except in the far north.

Specific plant communities can be recognized on Fe and Cu sulphide-rich rocks, where the specialized flora includes copper moss *Mielichhoferia elongata* and lichens that favour iron-containing rocks (e.g. *Acarospora sinopica, Lecanora epanora, Lecidea silacea, Miriquidica atrofulva, Tremolecia atrata*). Bird nesting cliffs (excl. coastal bird cliffs) have also a special species composition, as they gain extra nutrients from guano and host so-called ornithocoprophilous plants.

Boreal and arctic siliceous cliffs occur in Iceland, northern Scotland, the Shetland, Orkney and Faroe Island groups, Svalbard, Fennoscandia and the northern Baltic region, moreover in Greenland, northern Russia and circumpolar in North Siberia and North America. In the boreal lowlands, cliffs are usually small and low and located in forest environments, whereas in the Scandinavian Mountain range and in the arctic zone the most massive cliffs occur on open mountain slopes and may be hundreds of meters high and kilometers long.

Indicators of good quality:

Boreal and arctic siliceous cliffs are of particular importance for cryptogams, in particular for lichen and bryophyte diversity. The biodiversity varies between regions, phytogeographic zones and altitudinal belts. The species diversity varies enormously also in entirely natural communities in cliff habitats. Usually, the smallest rock formations with monotonous microtopography and little variation in rock types show low diversity, whereas larger cliff complexes with heterogeneous geomorphology and varying rock types may represent local biodiversity hotspots. Therefore, low species diversity or absence of rare species should not as such be interpreted as an indicator of low habitat quality, unless it is caused by anthropogenic influence.

The following characteristics may be used as indicators for assessing trends in quality:

- Occurrence of rare species of lichens, bryophytes and phytogeographically significant vascular plant taxa,
- Presence of sizable open exposed rock with species-rich bryophyte carpets and lichen crusts, and of different aspects of rock walls, different exposure to insolation, moisture and rock structures such as overhangs, cavities, rock shelters, ledges
- Presence of indicators of good air quality, e.g. usneoid lichens or Lobaria spp.
- Contact with natural habitats such as screes, boulder fields, and pioneer grasslands
- Absence of quarrying and control structures
- Absence of garbage dumping and anthropogenic nutrient input from above the cliff
- Absence of rock climbing facilities
- Absence of alien species

Characteristic species:

Flora:

Vascular plants: *Alchemilla alpina, Arabidopsis thaliana, Arenaria norvegica (common in Iceland), Asplenium septentrionale, A. trichomanes, Astragalus alpinus, Campanula rotundifolia, Cardaminopsis petraea (Iceland), Cerastium alpinum, Cystopteris fragilis, Draba incana, D. norvegica, Epilobium collinum, Festuca ovina, Geranium robertianum, Gymnocarpium drypteris, Hieracium schmidtii, Hylotelephium maximum, Moehringia trinervia, Phegopteris connectilis, Poa glauca, P. nemoralis, Polygonatum odoratum, Polypodium vulgare, Potentilla argentea, Rumex acetosella, Saxifraga cotyledon, Sedum* spp.*, Silene rupestris, Solidago virgaurea* subsp. *minuta, Stellaria graminea, Veronica fruticans, Viola tricolor, Viscaria alpina, Viscaria vulgaris, Woodsia alpina, Woodsia ilvensis*

Bryophytes: *Amphidium* spp.*, Anastrophyllum* spp.*, Andreaea rothii, Andreaea rupestris, Barbilophozia* spp.*, Bartramia* spp.*, Brachythecium* spp.*, Cnestrum schisti, Cynodontium* spp.*, Dicranum scoparium, Ditrichum zonatum, Dryptodon patens, Grimmia affinis, Grimmia alpestris, Grimmia apiculata, Grimmia arenaria, Grimmia caespiticia, Grimmia curvata, Grimmia donniana, Grimmia elatior, Grimmia elongata,*

Grimmia funalis, Grimmia incurva, Grimmia muehlenbeckii, Grimmia ovalis, Grimmia torquata), Gymnomitrion concinnatum, Hedwigia ciliata, Homalia trichomanoides, Homalothecium sericeum, Hylocomium splendens, Hypnum spp.*, Isopterygium* spp.*, Lophozia* spp.*, Neckera* spp.*, Orthodicranum montanum, Orthrotrichum* spp.*, Paraleucobryum longifolium, Plagiomnium cuspidatum, Plagiothecium* spp.*, Pleurozium schreberi, Pohlia* spp.*, Polytrichum* spp.*, Pterigynandrum filiforme, Ptilidium ciliare, Racomitrium fasciculare, Racomitrium heterostichum, Racomitrium lanuginosum, Racomitrium microcarpon, Racomitrium sudeticum, Rhabdoweisia fugax, Sanionia uncinata, Schistidium* spp.*, Ulota curvifolia, Tetralophozia setiformis*

Lichens: *Arctoparmelia* spp.*, Aspicilia leucophyma, Aspicilia moroides, Aspicilia caesiocinerea, Catolechia wahlenbergii, Cornicularia normoerica, Ephebe lanata, Haematomma ochroleucum, Lecanora bicincta, Lecanora cenisia, Lecanora frustulosa, Lecanora intricata, Lecanora nephaea, Lecanora polytropa, Lecanora reagens, Lecanora rupicola, Lecanora subcarnea, Lecanora swartzii, Lecidea* spp.*, Lepraria latebrarum, Lepraria membranacea, Lepraria neglecta, Lithographa tesserata, Melanelia* spp.*, Micarea intrusa, Ophioparma ventosa, Parmelia disjuncta, Parmelia incurva, Parmelia omphalodes, Parmelia panniformis, Parmelia saxatilis, Parmelia stygia, Phylliscum demangeonii, Placopsis gelida, Polychidium muscicola, Porpidia pseudomelinoides, Porpidia speirea, Porpidia superba, Porpidia tuberculosa, Protoparmelia badia, Pseudephebe minuscula, Pseudephebe pubescens, Ramalina capitata, Rhizocarpon alpicola, Rhizocarpon atroflavescens, Rhizocarpon badioatrum, Rhizocarpon caeruleoalbum, Rhizocarpon copelandii, Rhizocarpon distinctum, Rhizocarpon eupetraeum, Rhizocarpon geographicum, Rhizocarpon hochstetteri, Rhizocarpon obscuratum, Rhizocarpon oederi, Rhizocarpon polycarpum, Rhizocarpon umbilicatum, Stereocaulon dactylophyllum, Stereocaulon leucophaeopsis, Stereocaulon pileatum, Thelidium aeneovinosum, Trapelia coarctata, Trapelia involuta, Tremolecia atrata, Umbilicaria cinereorufescens, Umbilicaria cylindrica, Umbilicaria crustulosa, Umbilicaria hirsuta, Umbilicaria leiocarpa, Umbilicaria nylanderiana, Umbilicaria polyphylla, Umbilicaria polyrrhiza, Umbilicaria torrefacta, Umbilicaria vellea*

Classification

This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS:

H3.1 Acid siliceous inland cliffs

EuroVegChecklist:

Asplenion septentrionalis Gams in Oberd. 1938
Saxifragion cotyledonis Nordhagen ex Mucina et Chytrý in Mucina et al. 2014

Annex 1:

8220 Siliceous rocky slopes with chasmophytic vegetation

Emerald:

H3.1 Acid siliceous inland cliffs

MAES-2:

Sparsely vegetated land

IUCN:

6. Rocky areas

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?
Yes

Regions
Boreal

Justification
As it is described, this habitat type occurs almost exclusively in the Boreal region, excepting northern Scotland which is part of the Atlantic region.

Geographic occurrence and trends

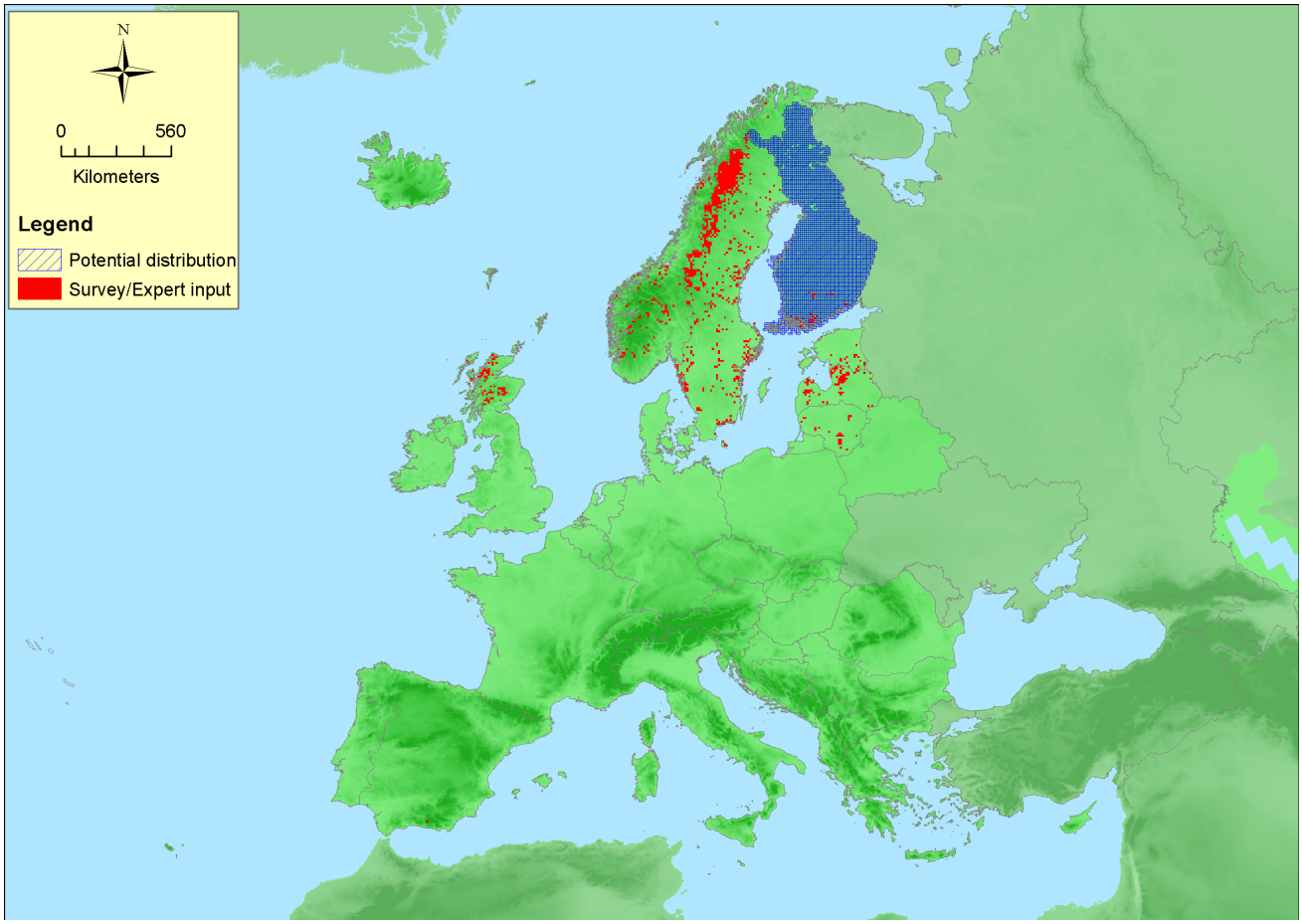
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Estonia	Uncertain	Km^2	-	-
Finland	Finland mainland: Present	2000 Km^2	Stable	Stable
Latvia	Uncertain	Km^2	-	-
Lithuania	Uncertain	Km^2	-	-
Sweden	Present	unknown Km^2	Unknown	Unknown
UK	United Kingdom: Uncertain	unknown Km^2	Unknown	Unknown

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Iceland	Present	unknown Km^2	Unknown	Unknown
Norway	Norway Mainland: Present	unknown Km^2	Unknown	Unknown

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	4378900 Km^2	4557	2000 Km^2	Data only for Finland (open cliffs and sparsely wooded rocks outcrops)
EU 28+	4481550 Km^2	4674	2000 Km^2	Data only for Finland (open cliffs and sparsely wooded rocks outcrops)

Distribution map



The map is rather complete for the EU28, but lacks data for Iceland, Norway. The high density of grid-cells in Finland is probably due to a sampling method different from other countries (a geology-based method *vs.* habitat survey) and has been indicated as potential distribution. This habitat type is distributed throughout Finland but the reported area is smaller than in Sweden.

How much of the current distribution of the habitat type lies within the EU 28?

A third (approximately 33%). Following the description, this habitat type is found across the entire boreal zone in the northern hemisphere. We assume a reasonable proportion to be located in the EU28 because there are many mountainous areas.

Trends in quantity

No other country than Finland has reported data for this habitat type. Finland has reported a very small decline (in southern Finland) after destruction of some occurrences e.g. due to quarrying or various construction projects, but the proportion of the area destroyed is very small. Based on information from the Norwegian Red List of Ecosystems, it is nevertheless possible to extrapolate Finnish data to Norway.

- Average current trend in quantity (extent)
  EU 28: Unknown
  EU 28+: Unknown
- Does the habitat type have a small natural range following regression?
  No
  Justification
  This habitat is widespread in the boreal region and has not suffered from a recent significant decrease.
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  Yes
  Justification

This habitat type occurs naturally only on small spots. It does have an intrinsically restricted area.

Trends in quality

No other country than Finland has reported data for this habitat type. Finland has indicated a slight decrease in quality (30% severity) over an extent of about 5 to 10%. Species communities on shady cliffs in forest environments have suffered from forestry, e.g. clear-cutting that changes microclimate totally in cliff habitats. Some rock outcrops may also have become more vegetated in southern Finland due to the lack of forest fires, cessation of grazing, air-borne nitrogen deposit, etc. and some, on the other hand, show signs of intensive recreational use (trampling). Based on information from the Norwegian Red List of Ecosystems, it is nevertheless possible to extrapolate Finnish data to Norway.

- Average current trend in quality
  EU 28: Unknown
  EU 28+: Unknown

Pressures and threats

The estimation of pressures and threats is based on Finnish data only: forestry clearance affects microclimate, mines lead to the destruction of the habitat and dispersed habitation affects the habitat quality, nitrogen-input changes vegetation density and floristic composition, outdoor sports and leisure activities, recreational activities disturb the habitat in different ways. All pressures are of low importance in general.

List of pressures and threats

Sylviculture, forestry

Forestry clearance

Mining, extraction of materials and energy production

Mines

Urbanisation, residential and commercial development

Dispersed habitation

Human intrusions and disturbances

Outdoor sports and leisure activities, recreational activities

Pollution

Nitrogen-input

Conservation and management

As a highly natural habitat, this habitat type requires no specific management regarding its maintenance but to leave it undisturbed and undestroyed. Conservation is then effective when free evolution is possible, like within protected areas. ‘Manage landscape features’ refers to the need to better protect this kind of habitats with a high degree of naturalness in land-use planning, especially when no specific regulation can be applied (no protected species or habitat, outside a protected area, outside a Natura 2000 site).

List of conservation and management needs

Measures related to spatial planning

Manage landscape features

Conservation status

Annex 1 types:

8220: ALP FV, ATL XX, BOR FV, CON U1

When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?

At least for generalist rock plants, the natural recovery of this habitat is possible and fast when it is not isolated from habitats of the same type. The return of specialized nesting birds after strong disturbances is less easy for example. The same applies to specialist plants of rock micro-habitats.

Effort required

50+ years	200+ years
Naturally	Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	stable %	unknown %	unknown %	unknown %
EU 28+	stable %	unknown %	unknown %	unknown %

Based on information from the Norwegian Red List of Ecosystems (LC status), it is possible to extrapolate Finnish data to Norway. Despite missing data from Sweden, we consider it as a faithful figure for the Boreal region.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50000 Km^2	No	No	No	>50	No	No	unknown	unknown
EU 28+	> 50000 Km^2	No	No	No	>50	No	No	unknown	unknown

EOO and AOO largely exceed the thresholds for criterion B.

Criterion C and D: Reduction in abiotic and/or biotic quality

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	10 %	30 %	unknown %	unknown %	unknown %	unknown %
EU 28+	10 %	30 %	unknown %	unknown %	unknown %	unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %

Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%
EU 28+	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%

Based on information from the Norwegian Red List of Ecosystems (LC status), it is possible to extrapolate Finnish data to Norway. Despite missing data from Sweden, we consider it as a faithful figure for the Boreal region.

Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	unknown
EU 28+	unknown

There is no quantitative analysis available that estimates the probability of collapse of this habitat type.

Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	LC	DD	DD	DD	LC	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	LC	DD	DD	DD	LC	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Least Concern	-	Least Concern	-

Confidence in the assessment
Low (mainly based on uncertain or indirect information, inferred and suspected data values, and/or limited expert knowledge)

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