H3.2e Boreal ultramafic inland cliff

Summary

This ultramafic inland cliff habitat occurs in the boreal zone of Scandinavia only. Though the total distribution is still unclear, it is considered very rare. It is characterised by a boreal flora of vascular plants and ferns specialised for the serpentine substrate with its distinctive mineral content and by bryophyte and lichen assemblages that are partly typical of calcareous habitats, though not here forming any luxuriant cover. Although the condition of the habitat is poorly known, it is threatened by climate change, degradation of soils due to intensive pasturing and fertilisation of soils, mining and quarrying and afforestation.

Synthesis

The habitat has been assessed as Data Deficient (DD) due to missing detailed information on distribution, area and trends. Due to a lack of important data from Sweden and Norway, the calculation of trends in quality and quantity was not possible. Therefore, these criteria have not been evaluated.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Data Deficient	-	Data Deficient	-

Sub-habitat types that may require further examination

The habitat type corresponds partly with serpentine rock outcrops and screes or with mountain ultramafic bedrock outcrops and boulder fields; therefore, some sub-types which require further examination can be expected. In the Nordic classification, this habitat corresponds with type 7.1.3 Klippvegetation på serpentinbergarter. In Finland for example, this habitat type corresponds with 6.3 Serpentine rock outcrop and scree (excl. 6.3.5 Serpentine scree (block and gravel fields)) and partly with 8.9.4 Mountain ultramafic bedrock outcrops and boulder fields.

Habitat Type

Code and name

H3.2e Boreal ultramafic inland cliff

Serpentine cliff in eastern Finland, Kaavi (Photo: Tytti Kontula).

Habitat description

Boreal ultramafic inland cliffs are habitats which host unique serpentine plant communities. The concept *ultramafic* refers to rock types that have a low content of silica and rather high content of magnesium and iron. This kind of rock, in particular serpentinite, produces extreme edaphic conditions with low calcium-to-magnesium ratio, severe scarcity of essential nutrients such as nitrogen, potassium, and phosphorus, and often also high levels of heavy metals such as nickel, chromium or cobalt. As a consequence of these chemical conditions, vegetation is often very scarce with large spots of bare rock. As an adaptation to harsh environment some species have developed morphological features of dry site plants.

Some plants have adapted to these harsh conditions. In the Boreal region, this group includes *Arenaria pseudofrigida, Asplenium adulterinum, A. viride, Cerastium alpinum, C. fontanum* ssp. *vulgare*, *Dianthus superbus, Minuartia biflora, Sagina nodosa* and *Viscaria alpina* var. *serpentinicola.* In addition to these special plants, some common plants also grow in serpentine environments, e.g. *Calluna vulgaris, Juniperus communis, Deschampsia flexuosa, Festuca ovina* and *Sedum telephium.*

Bryophyte and lichen communities of serpentine cliffs often show a special mixture of calciphilous and other species. Typical bryophytes include *Campyliadelphus chrysophyllus, Encalypta streptocarpa, Sanionia uncinata, Schistidium apocarpum* coll., *Tortella tortuosa* and *Weissia controversa*, but in contrast to calcareous cliffs they do not form luxuriant turfs. Both bryophyte and lichen vegetation cover is generally lower than on other kinds of rocks and large areas on rock walls are entirely unvegetated.

The relationship between serpentine plant communities and rock types is under discussion. All ultramafic rock types do not host distinct serpentine plant communities. For example, communities on unchanged peridotite usually resemble those of ordinary siliceous cliffs more than serpentine cliffs.

Ultramafic cliffs with serpentine plant communities occur from the lowlands of eastern Finland to the middle alpine zone of the Scandinavian mountains. Two vegetation types have been recognized: the more widespread *Asplenium viride – Arenaria norvegica*–type (with a variant without *A. norvegica* in the eastern parts of the region) and the oceanic *Asplenium adulterinum*–type.

Indicators of good quality:

- bedrock intact (no quarrying)
- presence of natural disturbance regime (relevant especially in forested areas: forest fires are prevented, which means that vegetation coverage is slowly increasing; on the other hand, intensive forestry and particularly clearcutting causes abrupt changes in microclimate, which destroy plant communities adapted to stable humid conditions)
- absence of alien species

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 be interpreted by itself as an indicator of low habitat quality, unless it is caused by anthropogenic influence.

Characteristic species:

Flora:

Vascular plants: *Agrostis stolonifera, Arenaria humifusa, A. norvegica, A. pseudofrigida, Asplenium adiantum-nigrum, A. adulterinum, A. trichomanes, A. viride, Calluna vulgaris, Campanula rotundifolia, Cardaminopsis petraea, Cerastium alpinum* and its subspecies, *C. fontanum* var. *kajanense, C. nigrescens* subsp. *nigrescens, Festuca ovina, Juncus trifidus, Luzula spicata, Minuartia biflora, M. rubella, Molinia caerulea, Rumex acetosa* var. *serpentinicola, Silene dioica, S. uniflora, Trichophorum caespitosum, Viscaria alpina* var. *serpentinicola* (=*Silene suecica var. serpentinicola*).

Bryophytes: *Brachythecium velutinum, Bryum nitidululm, Campyliadelphus chrysophyllus, Ditrichum flexicaule, Encalypta streptocarpa*, *Sanionia uncinata, Schistidium apocarpum* coll., *Tortella tortuosa*, *Weissia controversa, Zygodon* spp.

Lichens: Lichens of serpentine cliffs are not well known in the Boreal zone. These species were found to be characteristic in the Finnish studies of serpentine cliffs:

Calvitimela aglaea, Fuscopannaria leucophaea, Micarea erratica, Miriquidica complanata, Phaephyscia endococcina, Physconia muscigena, Protopannaria pezizoides.

Additionally on slightly more calcareous serpentine cliffs: *Botryolepraria lesdainii, Caloplaca obliterans, Candelariella vitellina, Fuscopannaria praetermissa, Heterodermia speciosa, Physcia tenella, Physconia perisidiosa, P. detersa, Protoparmeliopsis muralis, Ramalina pollinaria, Xanthoparmelia somloënsis, Xanthoria elegans*

Classification

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

EUNIS:

H3.2 Basic and ultra-basic inland cliffs

EuroVeg Checklist:

Asplenion serpentini Br.-Bl. et Tx. ex Eggler 1955

Annex 1:

8220 Siliceous rocky slopes with chasmophytic vegetation (The Annex 1 habitat type 8220 is defined as to

correspond, among others, to the unit “713 Klippvegetation på Serpentinbergarter“ of the Nordic classification).

Emerald:

H3.2 Basic and ultra-basic inland cliff

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
Ultramafic cliffs with serpentine plant communities occur from the lowlands of eastern Finland to the middle alpine zone of the Scandinavian mountains.

Geographic occurrence and trends

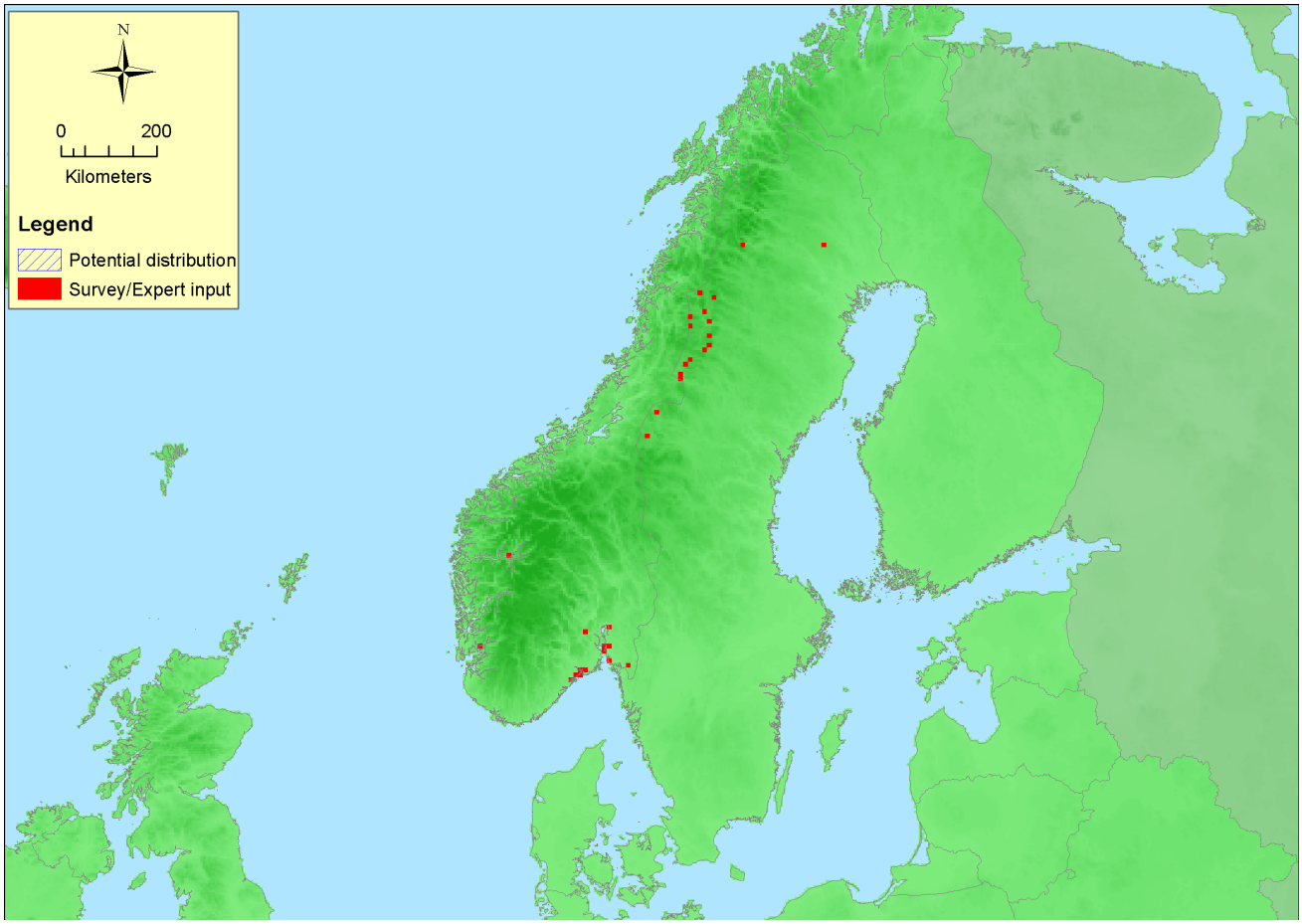
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Finland	Finland mainland: Present	2.5 Km^2	Stable	Stable
Sweden	Present	400 Km^2	Unknown	Unknown

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Norway	Norway Mainland: Present	38 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	17 Km^2	50050	Unknown Km^2	
EU 28+	31 Km^2	271250	Unknown Km^2	

Distribution map



The map gives an underestimate of the distribution due to data gaps. Data from Finland is lacking completely. Data sources: LIT, GBIF.

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

The habitat type occurs only in Finland, Norway, and Sweden. The stated current area in Sweden is only a raw estimate based on data by Rune (1953). It is not possible to provide a percentage quotation due to a lack of data.

Trends in quantity

These specific cliffs and ridges are supposed to have a relatively stable trend in quantity, although some threats, e.g. degradation due to intensive pasturing and fertilisation near rocky outcrops may reduce the total area of the habitat. The calculation of trends was not possible due to a lack of relevant data.

- Average current trend in quantity (extent)
  EU 28: Stable
  EU 28+: Stable
- Does the habitat type have a small natural range following regression?
  Unknown
  Justification
  A small local decline can be registered, but generally is more or less stable. There is no information available concerning EOO.
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  Yes
  Justification
  This habitat type has only local and small occurrence inside of the relatively large total distribution.

Trends in quality

The calculation of trends in quality was not possible due to a lack of important data. The ultramafic rocks host a lot of specialists and stenoendemic plant species. Therefore, there is a high probability that a negative future trend will lead to a decrease in the species pool.

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

Pressures and threats

Serpentine soils are rich in heavy metals, they are calcium-poor, and nutrient availability is very limited, therefore they represent very special isolated habitats for plants. The spatial isolation may make it much more difficult for plant species to successfully migrate when conditions (such as climate) will change. Under stable conditions, this habitat shows also a stability and edaphic endemism. If generalists can move through continuous habitats to reach a newly suitable habitat, specialists, such as serpentine endemics must make large jumps to disperse from one suitable habitat patch to another. They have to cross areas of unsuitable habitats and have to deal with a decreasing likelihood of successful dispersal (Damschen et al. 2012). The most significant threats are: (1) environmental changes, e.g. climate changes; (2) degradation of soils due to intensive pasturing and fertilisation of soils; (3) mining and quarrying as a direct liquidation of rocks; (4) afforestation.

List of pressures and threats

Agriculture

Intensive grazing
Fertilisation

Sylviculture, forestry

Forest planting on open ground (native trees)

Mining, extraction of materials and energy production

Mining and quarrying

Transportation and service corridors

Roads, paths and railroads

Conservation and management

The habitats on ultramafic rocks are relatively stable, although some threats, e.g. degradation due to intensive pasturing and fertilisation near rocky outcrops can reduce the total area of the habitat. The management of those habitats requires an exclusion of direct inputs such as climbing and trampling. The best management policy is to protect these habitats as natural reserves.

List of conservation and management needs

No measures

No measure known / impossible to carry out specific measures

Measures related to spatial planning

Legal protection of habitats and species
Manage landscape features

Conservation status

Annex 1 types:

8220: BOR FV

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

if severely demaged, the recovery of the habitat will take a very long time, more than 200 years.

Effort required

200+ years
Naturally

Red List Assessment

Criterion A: Reduction in quantity

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

Trend data have been reported only from Finland (-5% decline). Therefore no reliable European trend could be estimated more EU28 (especially Swedish data needed) or EU28+ (Swedish and Norwegian data needed).

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50000 Km^2	Unknown	Unknown	Unknown	unknown	Unknown	Unknown	Unknown	Unknown
EU 28+	>50000 Km^2	Unknown	Unknown	Unknown	>50	Unknown	Unknown	Unknown	Unknown

The provided AOO and EOO are very low (AOO < 50), but very few data were available for the distribution map. It is expected that with better data EOO values are larger than the thresholds for criterion B1 and B2. The same goes for the AOO value for the EU28+, but this is less certain for the EU28 (and therefore indicated as unknown). Also the number of locations is higher than the threshold for B3.

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	unknown %	unknown %	Unknown %	Unknown %	Unknown %	Unknown %
EU 28+	unknown %	unknown %	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 %

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 %

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%

The calculation of trends in quality was not possible due to absence of reliable data.

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	DD	DD	DD	DD	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	DD	DD	DD	DD	LC	LC	LC	DD	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
Data Deficient	-	Data Deficient	-

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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