H4.1 Snow pack

Summary

This habitat is an immobile mass of snow, found mainly in high latitudes or altitudes, concentrated in sunless situations like shady gorges, persistent within the limits of permanent snow but elsewhere susceptible to melting in hot summers, especially if the preceding snowfalls have been light. Some bryophytes can survive in such a habitat, an abundance of unicellular algae can colour the snow and certain insects feed on material released by melting. Air pollution and acid rain threaten the habitat and continuing decline is expected in whole EU due to the global warming. Direct pressures are tourism, mountaineering and skiing in some localities. Under good conditions (snow cover, cold summers and winters) the recovery of snow packs is possible.

Synthesis

The snow packs represent rare and limited habitats strongly dependent on climatic conditions. Under global warming they are generally considered as Vulnerable (VU) in Europe because of declines in area and quality. They are especially htreatened on the southern limit of occurrence, in the Alps and Pyrenees, where they might be locally assessed as Endangered or even Collapsed (or at least near to disappearance). However, there are no quantitative relevant data yet to support these higher levels of threat.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Vulnerable	A1, C/D1	Vulnerable	A1, C/D1

Sub-habitat types that may require further examination

No sub-habitats have been distinguished for further analysis.

Habitat Type

Code and name

H4.1 Snow pack

Cavity in a snow pack at the bottom of a deep gorge below Mt. Ľadový štít, High Tatra Mountains, West Carpathians, Slovakia (Photo: Milan Valachovič).

Melting snow pack in Malá Studená dolina Valley, High Tatra Mounains, West Carpathians, Slovakia (Photo: D. Dítě).

Habitat description

Snow packs are immobile near-permanent habitats that may persist in the limit of perpetual snow, in particular in avalanche corridors. However, they are susceptible to disappear completely during hot summers, thus excluding accumulation of ice. In spite of the extreme conditions of the habitat, some organisms do grow in this hostile habitat. This is the case of several cryosestonic unicellular algae, whose proliferation gives a reddish or greenish colour to snow packs. Some animals complete part of their life cycle on melting snow, e.g. chip snow (*Boreus hyemalis*, a Mecoptera) and several Coleoptera and Diptera, where they feed of pollen grains, frozen insects, etc. In Fennoscandia, reindeer gather on snow pack areas for the hottest summer days. Snow pack habitats are found mainly in high altitudes or latitudes. In Europe, the summits of the Alps, the Pyrenees, the Scandes, the Carpathian range, Balkan mountains and the Caucasus are concerned, as well as the arctic regions.

Indicators of good quality:

Quality indicators are difficult to propose for this habitat. Animal species cited below could be candidates.

Characteristic species:

Flora

Algae: *Chlamydomonas nivalis, Chrococcus sp.pl., Chlorogonium elongatum, Chloromonas alpine, Chloromonas brevispina, Chloromonas nivalis, Chloromonas pichinchae, Chloromonas platystigma, , Haematococcus pluvialis, Koliella nivalis, Koliella tatrae, Prasicola crispa, Stichococcus baciliaris, Trebouxia arboricola, Trebouxia jamesii*

Fungi: e.g. *Selenotila nivalis*

Fauna

Ascoliocerus hyperboreus (Elateridae), *Oreonebria bremii* (Carabidae), *Boreus hyemalis* (Mecoptera)

Classification

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

EUNIS:

H4.1 Snow packs

Euroveg Checklist:

Mesotaenion berggrenii Bültmann et Takeuchi in Bültmann et al. 2014
Annex 1:

8340 Permanent glaciers (this Annex 1 habitat type applies to a geographically and altitudinal wider range of snow or ice-dominated habitats. H4.1 is therefore narrower circumscribed than 8340)

Emerald:

-

MAES-2:

Sparsely vegetated land

IUCN:

-

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

Yes

Regions

Alpine

Boreal

Justification

The habitat is distributed in the highest altitudes of Alpine region and arctic part of Boreal biogeographical region, under specific climate conditions only.

Geographic occurrence and trends

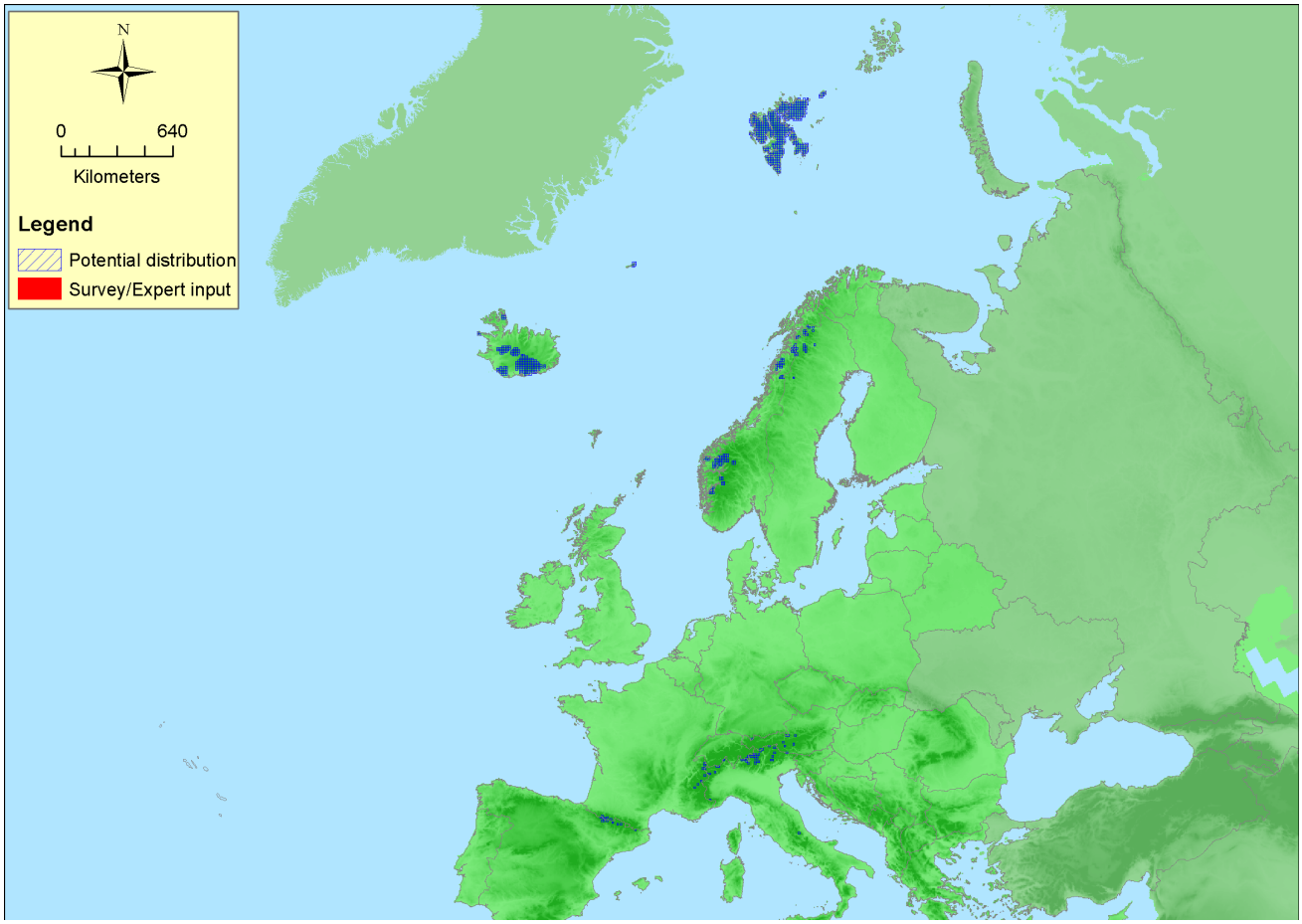
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Austria	Present	Unknown Km^2	Decreasing	Decreasing
Bulgaria	Present	0.5 Km^2	Decreasing	Decreasing
Finland	Finland mainland: Present	3.5 Km^2	Decreasing	Decreasing
France	France mainland: Present	Unknown Km^2	Unknown	Unknown
Germany	Present	0.4 Km^2	Decreasing	Decreasing
Italy	Italy mainland: Present	Unknown Km^2	Decreasing	Decreasing
Romania	Present	0.1 Km^2	Decreasing	Decreasing
Slovakia	Present	0.01 Km^2	Decreasing	Decreasing
Slovenia	Present	0.06 Km^2	Decreasing	Decreasing
Spain	Spain mainland: Present	Unknown Km^2	Decreasing	Decreasing
Sweden	Present	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
Montenegro	Present	Unknown Km^2	Decreasing	Decreasing
Norway	Norway Mainland: Present	Unknown Km^2	Unknown	Unknown
Switzerland	Present	Unknown Km^2	Decreasing	Decreasing

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	1840350 Km^2	102	Unknown Km^2	
EU 28+	5944150 Km^2	1022	Unknown Km^2	

Distribution map



No distribution data is available. The distribution of glaciers is given as the potential distribution. Data: Art17, BOHN.

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

The current distribution is (or is expected) in these 11 EU28 countries: AT, BG, DE, ES, FI, FR, IT, RO, SE, SI, SK, and in 4 EU28+ countries: CH, IS, ME, NO, where data from Norway and Switzerland could play a important portion of the whole area of snow packs (30 %?). Outside EU28+, the type is found in Greenland, Russia (Polar Ural, Caucasus Mts).

Trends in quantity

Especially in mountain ranges at lower latitude, e.g. at Bulgaria, Italy, Spain, the decrease of area of the snow packs is huge. In Grand Sasso (IT) the existence of Calderone Glacier (it is not the true glacier but permanent snow deposition = neviera) is expected max to the year 2020. Similar situation is in Pyrenees (ESP), and also in Carpathians (RO, SK) etc. It is a direct result of global warming. For decline there is no real data on the past changes but it is assumed that the area of snow packs has declined, e.g., in Finland at least 20% from the 1950s and that the decline has accelerated in recent years; in Germany the decline is of about 40%, in Switzerland 50% and more to the south, in Slovenia 90% (see territorial data).

- Average current trend in quantity (extent)
  EU 28: Decreasing
  EU 28+: Decreasing
- Does the habitat type have a small natural range following regression?
  No
  Justification
  The habitat has a large natural range, although following regression. No quantitative data are available for this habitat with high inter-annual variability. During years with hot summer temperatures in

combination with relatively lower snowfalls, the snow packs can be near disappearing. On average, snow packs tend to melt earlier than before. A reasonable assumption could be to conform with habitat H4.2 trends, but snow packs habitats have reduced less than permanent ice, because the cool years with sufficient snowfall give chance for its revitalisation. Continuing decline is expected due to global warming.

- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  No
  Justification
  The habitat has a large natural range, although the actual covered surface can be rather restricted. Especially in mountain ranges at lower latitude, e.g. at Bulgaria, Italy, Spain, the decrease of area of the snow packs is huge. In Grand Sasso (IT) the existence of Calderone Glacier (it is not the true glacier but permanent snow deposition = neviera) is expected max to the year 2020. Similar situation is in Pyrenees (ESP), and also in Carpathians (RO, SK) etc. It is direct result of global warming.

Trends in quality

No recent and accurate data are available, nevertheless the decrease of these habitats is expected and registered in all countries. Probably, hand by hand, the quality of habitats, e.g. degradation of populations of some invertebrates or full disappearance of some plant and animal taxa is near to reality. Continuing decline is expected due to global warming.

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

Pressures and threats

Snow patches have been categorized as EN in the assessment of threatened habitat types in Finland (Norokorpi et al. 2008) and this trend is significant for all of the EU countries. The main pressure is warming climate, solar radiation and changes in precipitation (snow cover). Those parameters can oscillate from year to year (interannual variability), but longer trends during several decades indicate a decrease of the snow packs habitats. Beside global increase of summer temperatures, the air pollution of snow packs due to microparticles from industry and transport, and acid rain (pH changes) could be a reason for threats. The direct pressure is represented by tourism, mountaineering and skiing in some localities.

List of pressures and threats

Human intrusions and disturbances

Mountaineering & rock climbing

Pollution

Acid rain

Natural biotic and abiotic processes (without catastrophes)

Erosion
Silting up

Climate change

Temperature changes (e.g. rise of temperature & extremes)

Conservation and management

Snow packs have geographically and climatically limited distribution. Increasing temperature and

decreasing of snow precipitation are a limitation for persistence of this habitat and can not be regulated by special management. Usually, these habitats are concentrated on suitable localities e.g. shady gorges, deep valleys at north facing slopes at higher altitudes, where a total exclusion of access of human beings is recommended.

List of conservation and management needs

No measures

No measure known / impossible to carry out specific measures

Measures related to urban areas, industry, energy and transport

Urban and industrial waste management

Conservation status

Annex I:

8340 (partly): ALP U2, BOR XX

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

The existence of snow packs is strongly related to winter and summer temperature regime. Under good conditions (snow cover, cold summers and winters) the recovery of snow packs is possible, and these environment sustains also specialized chionophile algae, bryophytes and invertebrates.

Effort required

50+ years	200+ years
Naturally	Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-30 %	-30 %	unknown %	unknown %
EU 28+	-30 %	-30 %	unknown %	unknown %

Decline in habitat area cannot accurately be quantified because no relevant data is available. Especially area information is lacking. Some territorial experts assessed the decline by indicating huge ranges, e.g. between 10-90 %, which does not allow a robust assessment. The average trend without any correction for area is about -45% decline, and therefore it is likely that the overall decline is more than 30%. An even higher trend may be expected for the future, but no quantitative data are available.

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

Restriction of geographical distribution can not accurately be quantified because no distribution data are

available. It is likely however that the EOO is larger than the thresholds for criterion B1 for both EU28 and EU28+. For the AOO the EU28+ value is also likely to be higher than 50, but for the EU28 this is uncertain. 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	51 %	77 %	Unknown %	Unknown %	Unknown %	Unknown %
EU 28+	51 %	77 %	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%

The data provided by the territorial experts, although not complete, allowed the calculation of a severe qualitative decline (around 51% in extent, with a severity of 77%), qualifying this habitat type as Near Threatened based on Criteria C/D.

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.

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	VU	VU	DD	DD	LC	DD	LC	VU	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	VU	VU	DD	DD	LC	LC	LC	VU	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
Vulnerable	A1, C/D1	Vulnerable	A1, C/D1

Confidence in the assessment

Medium (evenly split between quantitative data/literature and uncertain data sources and assured expert knowledge)

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