H3.5a Limestone pavement

Summary

Limestone pavements are geomorphological landscapes resulting from dissolution processes exerted on hard limestone tables probably formed by ancient glacial erosion and subsequent weathering. They occur in or around the Alps and the Apennines and in northern Atlantic and Baltic regions and comprise flat or sloping surfaces of limestone separated by a network of vertical fissures. The size, shape and regularity of the blocks vary according to the local character of the bedrock and the climate and much of the surface is bare but slowly accumulating soil and the shelter of crevices provides a variety of situations for colonisation. Drought-resistant communities of cushions of lichens and bryophytes and fragments of dry tufted grasslands can occur in exposed situations with more luxuriant vegetation of ferns, herbs, shrubs and trees in shelter. Wind and herbivores often curtail any surface spread. The composition of the flora contrasts markedly between the major areas of occurrence. Mining and quarrying, construction of ski resorts and other tourist activities threaten the physical character of the habitat and abandonment of pastoral farming can allow the spread of scrub and woodland.

Synthesis

Though this habitat has a patchy distribution, it is assessed as Least Concern (LC) at the European scale since reductions in quantity (around 6%) and quality (moderately strong decline with a severity of 60%, affecting 10% of the extent of the habitat) over the past 50 years have been fairly small and resulted in limited degradation. This outcome is an average of different regional situations, each of them deserving to be assessed separately.

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

Each biogeographical region should be assessed seperately to better reflect very different contexts. This could lead to a Near Threatened or Vulnerable status in some regions. The relevant regions are: (1) Atlantic limestone pavements in Ireland, the UK and Portugal (having a significant past reduction in quantity), (2) Baltic limestone pavements in Estonia and Sweden (probably Data Defficient), Alpine and Balkan limestone pavements (a significant reduction in quality could be supported by more complete and consistent data across countries).

Habitat Type

Code and name

H3.5a Limestone pavement

Limestone pavement of the Burren, Western Ireland (Photo: Joop Schaminée).

An alpine limestone pavement at Entlebuch, Switzerland (Photo: E. Morard).

Habitat description

Limestone pavements are geomorphological landscapes resulting from dissolution processes exerted on hard limestone tables probably formed by glacial erosion. They consist of usually gently-sloping platforms with blocks of limestone separated by a network of vertical fissures. The size, shape and regularity of the blocks vary according to the local features of the bedrock and of the climate, but the regular mosaic of contrasting microhabitats is a common feature to all limestone pavements. This unit has a purely geomorphologic definition. It occurs from sea level up to 3000 m in the Alps and extends to a wide range including different karstic regions of Europe, where it receives different local names: lapiaz, karren, limestone pavement, alvar. This specific geomorphology is apparently linked to glacial origins. Karstic outcrops occurring in the Mediterranean region are often less typical. Only large tabular surfaces showing typical dissolution features come into consideration for habitat H3.5a.
The rock surface of the pavement is almost devoid of soil, with a resulting vegetation cover well under 30%. Spots of thin soil allow locally the presence of drought-resistant communities: cushions of lichens and bryophytes, fragments of dry tufted grasslands. Most of the vascular plants root in the fissures, where rubble and fine sediment, including aeolian and organic matter, accumulate, sometimes also the long-weathered remnants of pre-Quaternary deposits. These fissures (called grikes or Kluftkarren) offer a sheltered microclimate, favoring ferns and macroforb communities; heath and scrub can also occur (wooded pavements belong to other units). Espaliered plants, with their stems expanding at the rock surface, are also a typical component of the mosaic but exposure to wind and grazing by wild herbivores or farm stock may limit expansion of vegetation from the fissures.
According to the diversity of climates encountered in the large range of this unit, the floristic composition is variable and not very helpful for the identification: the communities occurring in the pavement mosaic are not the same in the Alps as in Britain. Anyway, none of those communities is unique to limestone pavements. What is characteristic is the pattern of contrasting microhabitats, and the resulting mosaic of small patches of different vegetation types.

Indicators of good quality:
Typical limestone pavements are large and uniformly level, sub-horizontal tables of blocks made of unfragmented frost-resistant hard stone. The vegetation covers less than 30%. Trees are absent or very scattered. Limestone outcrops of small extent (less than 1000 m^2) or not showing the typical pattern are excluded. This habitat does not recover after quarrying and other extractive activities.

Characteristic species:
Flora
The flora varies greatly according to the climate of the region and the exact conformation of the limestone surface.

Classification

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

EUNIS:

H3.511 Limestone pavements

EuroVegChecklist:

Not relevant because of a very large number of alliances are likely to occur in this habitat.

Annex 1 :

8240 Limestone pavements (include Mediterranean karsts)

Emerald :

H3.511 Limestone pavements

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
Alpine
Atlantic
Boreal

Justification
This habitat is typical of limestone regions where glaciers once shaped the landscape, such as the Alps, the Pyrenees, the northern-Atlantic and the Boreal regions.

Geographic occurrence and trends

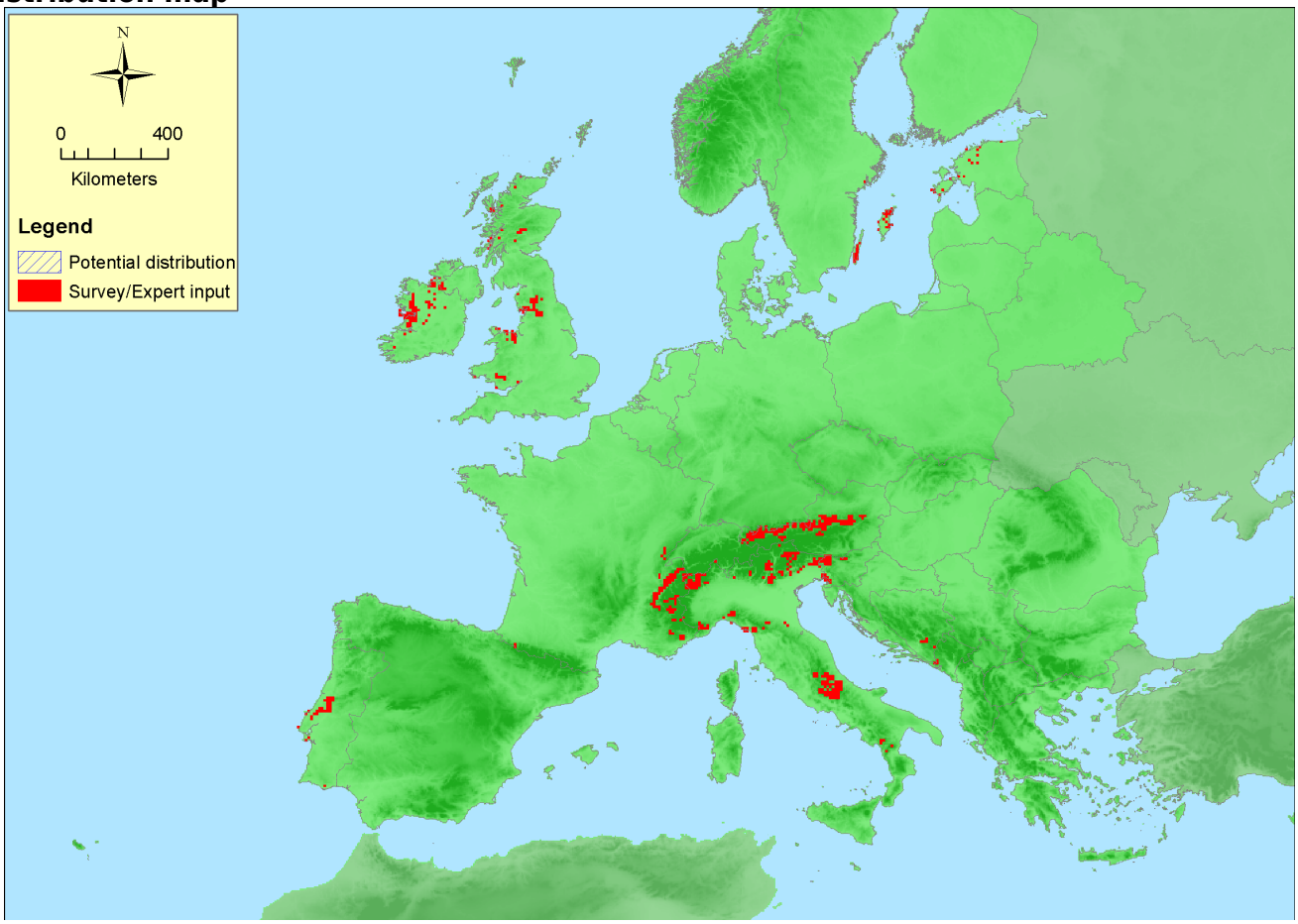
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Austria	Present	525 Km^2	Stable	Stable
Estonia	Present	unknown Km^2	Unknown	Unknown
France	France mainland: Present	112 Km^2	Stable	Stable
Ireland	Present	320 Km^2	Decreasing	Increasing
Italy	Italy mainland: Present	262 Km^2	Stable	Stable
Portugal	Portugal mainland: Uncertain	14 Km^2	-	-
Slovenia	Present	30 Km^2	Stable	Stable
Spain	Spain mainland: Present	unknown Km^2	Unknown	Unknown
Sweden	Present	unknown Km^2	Unknown	Unknown
UK	United Kingdom: Present	28 Km^2	Stable	Increasing

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Switzerland	Present	200 Km^2	Stable	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	4891100 Km^2	628	1283 Km^2	Missing data from Estonia and Sweden
EU 28+	5019650 Km^2	636	1483 Km^2	Missing data from Estonia and Sweden

Distribution map



The map is rather complete, except for occurrences in Switzerland and the Balkan (Croatia, Montenegro, Serbia, Macedonia). Data sources: Art17, NAT.

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

Of the current distribution of the habitat, 80% lies within the EU 28, the remaining 20 % being in Switzerland and Balkan countries outside the EU28. Karst landforms are found elsewhere in the world, but limestone pavements such as these occurring in Europe have a restricted distribution.

Trends in quantity

The current trend in quantity is stable at the European scale because this habitat is either found within mountainous regions - and therefore it is weakly affected by human activities - or it is largely part of managed sites networks like in Ireland and the UK. The trend over the last 50 years is slightly decreasing at the European scale (-6,2% EUR28, -5,6% EUR28+), but this trend hides strong differences among

biogeographical regions. It is almost stable in alpine countries (around -1%) - reflecting local destructions by mining and quarrying and construction of ski resorts (grinding of pavements, sealing of cracks and holes) – whereas it reaches -20% and -7% in Ireland and the UK respectively – reflecting quarrying, clearance for agriculture, and abandonment.

- 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 is widespread from southern Baltic countries, to Portugal and the Balkan.
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  No
  Justification
  Although the surfaces occupied by this habitat are naturally limited by the occurrence of suitable limestone strata near or at the soil surface (ancient geomorphological process of erosion by glaciers), the overall range is not small.

Trends in quality

The current trend in quality is stable or even increasing in some places thanks to conservation measures recently put in place, like in the Burren in Ireland. A relatively significant reduction in quality (60% severity) has occurred over the last 50 years in the EU28, but fairly spatially limited (10% of the extent of the habitat). More or less the same pattern is observed among most countries. The development of ski resorts is the main threat in alpine countries. Holes and tall cracks in pavements are very often sealed for security reasons - hindering animals' movements - when they are not simply destroyed by grinding. In Ireland and the UK, the reduction in quality is mainly due to land abandonment and encroachment of hazel scrubs. Data from the boreal region is missing as well as from Switzerland.

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

Pressures and threats

High-mountain limestone pavements are threatened mainly by the construction of ski resorts and ski runs. Pavements at lower altitude may be destroyed by mining, quarrying and the storage of materials. Bioceonotic succession (slow encroachment of scrub) and invasive plant species may also affect those pavements at low altitude.

List of pressures and threats

Mining, extraction of materials and energy production

Mining and quarrying
Mining and extraction activities not referred to above

Urbanisation, residential and commercial development

Discharges
Storage of materials

Human intrusions and disturbances

Sport and leisure structures

Skiing complex

Natural biotic and abiotic processes (without catastrophes)

Biocenotic evolution, succession

Conservation and management

There is no management need for this highly natural habitat to remain but leaving it undisturbed and undamaged. Natural succession is very slow because of the extreme edaphic conditions. Therefore, it should not be considered as a conservation problem. Conservation is then effective when free evolution is possible, like within protected areas. The suggested 'Manage landscape features' measure refers to the need to better protect in land-use planning this kind of habitat that shows a high degree of naturalness, especially when no other specific regulation can be applied (no protected species or habitat, outside a protected area, outside a N2000 site).

List of conservation and management needs

Measures related to spatial planning

Manage landscape features

Measures related to special resouce use

Regulating/Management exploitation of natural resources on land

Conservation status

Annex I:

8240: ATL U1, BOR U1, MED U1, ALP FV, CON FV

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

No recovery is possible after destruction. Limestone pavements were shaped in a time when glaciers covered much part of northern Europe and the Alps.

Effort required

200+ years
Unknown

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-6.2 %	unknown %	unknown %	unknown %
EU 28+	-5.6 %	unknown %	unknown %	unknown %

There has been a slight reduction in quantity at the EU 28 and EU 28+ levels in the past 50 years. Calculations were based on territorial data only. There is no available quantitative data on historical or future reductions in quantity and this habitat is therefore assessed as Least Concern under Criterion A.

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	>10	>50	No	No	>10	>10
EU 28+	>50000 Km^2	No	No	>10	>50	No	No		

The habitat has an EOO larger than 50,000 Km^2 and an AOO larger than 50 and is therefore assessed as Least Concern under 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 %	60 %	unknown %	unknown %	unknown %	unknown %
EU 28+	10 %	60 %	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%

There has been a reduction in quality with a relatively strong impact (approximately 60% severity) affecting 10% of the extent of the habitat in the last 50 years. The values reported above were calculated using territorial data. There is no information on historical or future trends in quality for this habitat. It is therefore assessed as Least Concern under Criteria C/D1.

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 and it is therefore assessed as Data Deficient under Criterion E.

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+

Overall Category & Criteria			
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Least Concern	-	Least Concern	-

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

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