

A1.44: Mediterranean mediolittoral caves and overhangs

Summary

Mediolittoral caves and overhangs are found on most rocky shores regardless of wave exposure. The shaded nature of caves and overhangs diminishes the amount of desiccation suffered by biota during periods of low tides which allows certain species to proliferate. Algal growth is restricted to a very few species and canopy-forming macroalgae are absent. In the Mediterranean Sea it supports several rare and protected species including the critically endangered Mediterranean monk seal (*Monachus monachus*), and as acts as a nursery area for fish, especially groupers (*Epinephelus marginatus*).

The characteristic species of this habitat are highly resistant to environmental stress however man-induced alterations like harbour or dock constructions in nearby areas can change the hydrodynamics with consequences for the associated assemblages. Invasive non native species, pollution and discharges from coastal urban areas are also current pressures and temperature and sea level rise might threaten the habitat in the future. A evaluation on Mediterranean MPA in 2008 has shown that around 56% of the Mediterranean MPAs include marine caves. Further work is needed to identify appropriate conservation measures.

Synthesis

This habitat has a widespread distribution in the Mediterranean. It is present within Marine Protected Areas but accurate numbers and the ecological status of these caves is generally unknown. Localised studies have been conducted at different sites mostly in the Western Mediterranean, but the earliest data were only published in 1940-50. Consequently, there is a lack of quantitative data on trends although expert opinion is that habitat quality has most likely decreased in response to pressures such as habitat destruction associated with coastal development

This habitat has a large EOO and AOO, and therefore qualifies as Least Concern under criterion B. However the habitat is assessed as Data Deficient both at the EU 28 and EU 28+ levels because of a lack of information on any trends in quantity and quality.

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

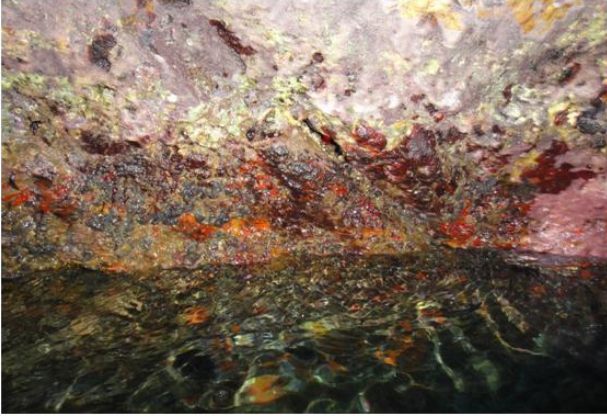
Sub-habitat types that may require further examination

Marine cave habitats are characterised by very distinctive biocenoses, fauna and ecological features and a with a high degree of variability. More detailed studies are needed to elucidate if there is a general pattern of distinct sub-habitats within this complex environment. However, caves of the anchialine type should be further studied and protected.

Habitat Type

Code and name

A1.44: Mediterranean mediolittoral caves and overhangs



Habitat of mediolittoral caves and overhangs in the Catalan coast. (© Littoral Cartography Group, CEAB, CSIC).



Barnacles encrusting the rock surface on a mediolittoral cave, Aegean Sea (© V.Gerovasileiou).

Habitat description

Mediolittoral caves and overhangs are a special habitat whose main distinctive trait is the low irradiance. The habitat can be found on most rocky shores regardless of wave exposure. The shaded nature of caves and overhangs diminishes the amount of desiccation suffered by biota during periods of low tides which allows certain species to proliferate.

Algal growth is restricted to a very few species that can withstand low light levels, low to high hydrodynamism, and extended periods of desiccation. Canopy-forming macroalgae are absent whilst encrusting rhodophytes are dominant. Some variation in the species composition of the individual caves must be expected depending on local conditions although in general the communities are very poor in species. At the entrance to mediolittoral caves where there is sufficient light red algae may be present, particularly an association of non-calcified encrusting red algae *Hildenbrandia rubra* and *Phymatholiton lenormandii*, under the red alga *Lithophyllum byssoides*.

In general, the biomass and diversity of algal species found in upper and mid-shore littoral caves decreases with increasing depth into the cave as the light levels diminish. Fauna usually only occur on the lower and mid-level walls of the caves and generally comprise barnacles, anemones and tube-forming polychaetes.

Indicators of quality:

Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.

There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.

Characteristic species:

Rhodophyta (red algae) - *Hildenbrandia rubra*, *Phymatholiton lenormandii*, *Gymnothamnion elegans*, *Ellisolandia elongata*, *Lithophyllum byssoides*.

Anthozoa - *Actinia equina*.

Isopoda - *Ligia italica*.

Cirripedia - *Perforatus perforatus*, *Chthamalus stellatus*, *Chthamalus montagui*.

Classification

EUNIS (2007):

Level 4. A sub-habitat of 'Features of littoral rock' (A1.4)

Annex 1:

8330 Submerged or partially submerged sea caves

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Littoral rock and biogenic reef

EUSeaMap:

Not mapped.

IUCN:

Rocky shoreline

Barcelona Convention (RAC/SPA):

II. 4. 3. Mediollittoral caves

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

Unknown

Justification

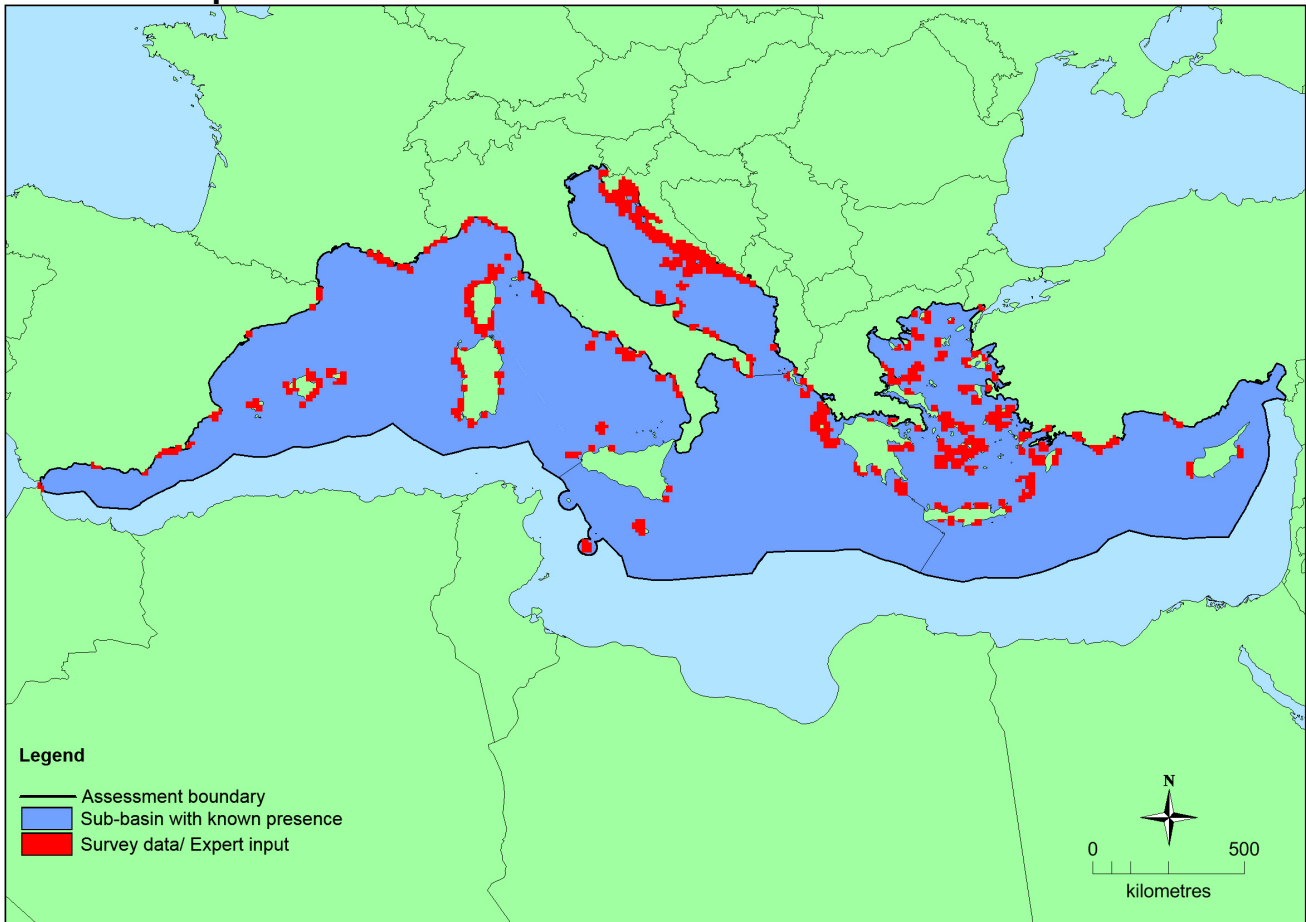
Geographic occurrence and trends

Region	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Mediterranean Sea</i>	Adriatic Sea: Present Aegian-Levantine Sea: Present Ionian Sea and the Central Mediterranean Sea: Present Western Mediterranean Sea: Present	76,721 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	2,208,454 Km ²	1,063	75,436 Km ²	EOO and AOO have been calculated on the available data. Although this data set is known to be incomplete the figures exceed the thresholds for threatened status.
EU 28+	2,430,332 Km ²	1,519	76,721 Km ²	EOO and AOO have been calculated on the available data. Although this data set is known to be incomplete the figures exceed the thresholds for threatened status.

Distribution map



This map has been generated using data from IUCN based on Giakoumi S. *et al.* (2013) and V. Gerovasileiou, and supplemented with expert opinion. EOO and AOO have been calculated on the available data presented in this map however these should be treated with caution as expert opinion is that this may not indicate the full distribution of the habitat.

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

The vast majority of marine caves recorded are located in the northern Mediterranean basin with 2,543 caves (89% of the known Mediterranean caves) lying within the EU 28. The highest number of caves are found in the Adriatic Sea, followed by the Tyrrhenian Sea, the Aegean Sea, and the Algero-Provencal Basin.

Trends in quantity

The nature of this habitat means it can be ephemeral and subject to significant natural fluctuations as a result of patterns of erosion and deposition on the shore and climatic conditions.

Marine caves and overhangs had remained almost totally unexplored until the middle of the last century. Since then, the studies have focused primarily on their faunal composition and community structure and almost no information seems to exist regarding trends of this habitat. The number of known caves in the Mediterranean is 2,867 (EU 2,543 caves) however this value could be higher as much of the south Mediterranean Sea remains unexplored.

- 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

The habitat is present along the whole Mediterranean basin. The EOO exceeds 50,000km² therefore it does not have a small natural range.

- Does the habitat have a small natural range by reason of its intrinsically restricted area?

No

Justification

The habitat is present along the whole Mediterranean basin and the EOO exceeds 50,000km². The EOO exceeds 50,000km² therefore it does not have a small natural range.

Trends in quality

Most literature on marine caves has been focused on species composition, distribution patterns and ecological features and less on the processes determining spatial and temporal variation on the habitat. The high complexity of the processes, even for the shallowest caves and overhangs, is still largely unknown and therefore trends in quality cannot be assessed at the present time.

Deterioration in quality of some caves have been reported, particularly breeding areas use by the critical endangered Mediterranean monk seals.

- Average current trend in quality

EU 28: Unknown

EU 28+: Unknown

Pressures and threats

The characteristic species of this habitat are highly resistant to environmental stress however man-induced alterations like harbour or dock constructions in nearby areas can change the hydrodynamics with consequences for the associated assemblages. Invasive non-native species, pollution and discharges from coastal urban areas are also current pressures and temperature and sea level rise might threaten the habitat in the future. Uncontrolled diving, snorkeling or even speleology can be additional pressures on this habitat.

List of pressures and threats

Transportation and service corridors

Marine constructions

Urbanisation, residential and commercial development

Urbanised areas, human habitation

Discharges

Human intrusions and disturbances

Speleology

Recreational cave visits
Scuba diving, snorkelling

Pollution

Pollution to surface waters (limnic, terrestrial, marine & brackish)
Marine macro-pollution (i.e. plastic bags, styrofoam)

Invasive, other problematic species and genes

Invasive non-native species

Climate change

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

Conservation and management

Marine cave habitats are protected by the EU Habitats Directive (92/43/EEC) under the name “Submerged or partially submerged sea caves” (Habitat code 8330). Semidark and dark cave communities have been included in two Action Plans by UNEP-MAP-RAC/SPA (2008 and 2015 respectively), adopted by contracting parties of the Barcelona Convention specifically aiming at their conservation. An evaluation on Mediterranean MPA in 2008 has shown that around 56% of the Mediterranean MPAs include marine caves although, the accurate number of marine caves within designated MPAs remains unknown.

The creation of a Marine Caves' Register at the country level with an assessment of their ecological status, adequate regulations to protect these environments and further research to understand its diversity and function are recommended.

List of conservation and management needs

Measures related to marine habitats

Other marine-related measures

Measures related to spatial planning

Other spatial measures
Establish protected areas/sites
Legal protection of habitats and species

Conservation status

Annex 1:

8330: MMED U1.

Marine caves are also habitat for some species of endangered bats and they are also a significant habitat for resting and reproduction of the endangered Mediterranean monk seal (*Monachus monachus*). As such, breeding and resting caves in countries like Turkey, have been designated as a First Degree Natural Asset, stopping part of the coastal development and destruction of caves in certain areas.

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

The habitat might be able to recover to certain environmental stresses, however depending of the factor it might not be able to recover easily or no at all (e.g. when invaded by invasive algae or when building works take place in the surrounding area).

Effort required

10 years
Unknown

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 %

Although several studies have described the biodiversity of this habitat and its importance for some of the associated endangered species, there is limited information on trends in quantity. This habitat has therefore been assessed as Data Deficient under criterion A.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50,000 Km ²	Unknown	Unknown	No	>50	Unknown	Unknown	No	No
EU 28+	>50,000 Km ²	Unknown	Unknown	No	>50	Unknown	Unknown	No	No

This habitat has a large natural range in the Mediterranean region. The precise extent is unknown however as EOO >50,000km² and AOO >50, this exceeds the thresholds for a threatened category on the basis of restricted geographic distribution. Trends are unknown. The distribution of the habitat is such that the identified threats are unlikely to affect all localities at once. This habitat has therefore been assessed as Least Concern under criteria B1(c) B2 (c) and B3 and Data Deficient for all other criteria.

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 %
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 assessment of reduction in abiotic and/or biotic quality is not possible due to the lack of studies and data on past state conditions of marine cave habitats for most Mediterranean areas. However the quality of this habitat can be affected by uncontrolled visitation by SCUBA divers, coastal and harbour development, water temperature rise, presence of alien species and marine pollution. Some degraded examples have been reported in the biotic and abiotic conditions but overall it is assessed as Data Deficient under Criterion 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 to estimate the probability of collapse of this habitat type. Therefore the habitat type is 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	DD	DD	DD	DD	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	NE
EU28+	DD	DD	DD	DD	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	NE

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

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

Assessors

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Reviewers

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10/01/2016

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