Kelp communities on Baltic infralittoral rock and mixed substrata (predominantly hard)

Summary

This habitat occurs off the coasts of Denmark, Sweden and Germany in the southern Baltic, only extending into the Baltic proper as far as the island of Bornholm. Its geographical extent, the area it occupies and condition is constrained by the extent of rocky substrate in areas where salinity and light levels are high enough to support the establishment and growth of kelp. On the Darss Sill boulder fields for example, the habitat extends from the surface to depths of around 18 m, in the Belt Sea it only occurs below 6 m, and in the Arkona Basin the kelp plants may only be a few centimetres high. The kelp species characteristic of this habitat is *Laminaria digitata*. The habitat also supports sessile and mobile species which include hydroids, bryozoans, molluscs and crustaceans as well as fish such as *Centolabrus rupestris* and *Gobisculus flavescens*.

There is information on the distribution of *Laminaria digitata* and the other kelps in the Baltic, but a lack of quantitative data on the extent and quality of the habitat. It is known to be vulnerable to nutrient enrichment and smothering by suspended sediment, as well as to activities such as coastal and offshore development, and fishing gears which disturb the seabed or dislodge kelp plants. Actions to improve water quality and reduce physical disturbance of the substrate are important for the conservation of this habitat. Predicted temperature and salinity changes associated with climate change are likely future threats as this will most likely reduce the spatial distribution of kelps in the Baltic Sea.

Synthesis

This habitat is only present in the EU 28 as it is only found in the southern Baltic Sea. There is a lack of quantitative data on extent and quality, therefore this Red List assessment has been based on expert opinion. Threats and pressures on this habitat have been identified but it is not considered to have declined in extent by more than 25% over the last 50 years. Modelling studies suggest that climate change effects (on sea temperature and salinity) could lead to a reduction in extent of this habitat in the future by affecting the reproductive success of the characteristic kelp species but this has not been quantified.

The overall assessment for this EUNIS level 4 habitat has been based on the HELCOM (2013) assessments for the associated HELCOM HUB biotopes. Draft assessments were derived using a weighted approach whereby the HELCOM assessment outcomes were assigned a score. This was averaged across the relevant biotopes. The outcomes were reviewed by Baltic experts to reach a final conclusion. HELCOM (2013) assessed the two relevant Baltic biotopes (AA.A1C4 and AA.M1C4) to be of Least Concern (based on Criterion A1). With no additional information on changes in extent or quality of this habitat, current expert opinion is that this habitat should be assessed as Least Concern in the EU 28 and EU 28+.

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

None.

Habitat Type

Code and name

Kelp communities on Baltic infralittoral rock and mixed substrata (predominantly hard)

No characteristic photograph of this habitat currently available.

Habitat description

This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is rock, boulders, stones and mixed (predominantly hard) substrates according to the HELCOM HUB classification. It is most common in wave exposed areas with kelp dominating the perennial algae and covering at least 10% of the seabed. *Saccharina latissima* and *Laminaria digitata* consitute at least 50% of the biovolume of such algae. Two associated biotopes have been identified. ''Baltic photic rock and boulders dominated by kelp' (AA.A1C4) and 'Baltic photic mixed substrate dominated by kelp' (AA.M1C4). To identify this habitat mapping should take place during the months when the vegetation is fully developed.

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. The lower depth limit of the kelp is a potential indicator of quality of this habitat.

Characteristic species:

The main species that creates kelp forests in the Baltic is *Laminaria digitata*. Other associated algae include *Chaetomorpha melagonium* and *Delesseria sanguinea*. Other associated species include hydroids, bryozoans, and molluscs. Kelp forests also provide an important habitat for fish such as *Centrolabrus rupestris* and *Gobisculus flavescens.*

Classification

EUNIS:

The closest correspondence in EUNIS (2004) level 4 is A3.4 Baltic exposed infralittoral rock, A3.5 Baltic moderately exposed infralittoral rock and A3.6 Baltic sheltered infralittoral rock

Annex 1:

The relationship between HUB biotopes and Annex 1 habitats has not yet been mapped by HELCOM, however the habitat may occur in the following Annex 1 habitats-

1160 Large shallow inlets and bays

1170 Reefs

1650 Boreal Baltic narrow inlets

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Shallow sublittoral rock and biogenic reef

EUSeaMap:

Shallow photic rock or biogenic reef

IUCN ecosystem:

9.7 Macroalgal/kelp

Other relationships:

Level 5 of the HELCOM HUB classification (2013):

AA.A1C Baltic photic rock and boulders characterized by perennial algae

AA.M1C Baltic photic mixed substrate characterized by perennial algae

This habitat has two sub-habitats on HELCOM HUB level 6;

AA.A1C4 Baltic photic rock and boulders dominated by kelp

AA.M1C4 Baltic photic mixed substrate dominated by kelp

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?
No

<u>Justification</u>
Kelp forests are a marginal habitat in the Baltic as they are more typically found in fully saline waters.

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)
Baltic Sea	Belt Sea: Present The Sound: Present Baltic Proper: 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	max 78,300 Km^2	max 552	Unknown Km^2	EOO and AOO are based on HELCOM mapping in 100 x 100km cells that were converted to 10 x 10 km cells. The values therefore represent a maximum as the habitat may not occur in all these 10 x 10 km cell
EU 28+	max 78,300 Km^2	max 552	Unknown Km^2	not present in EU28+ in the Baltic

Distribution map
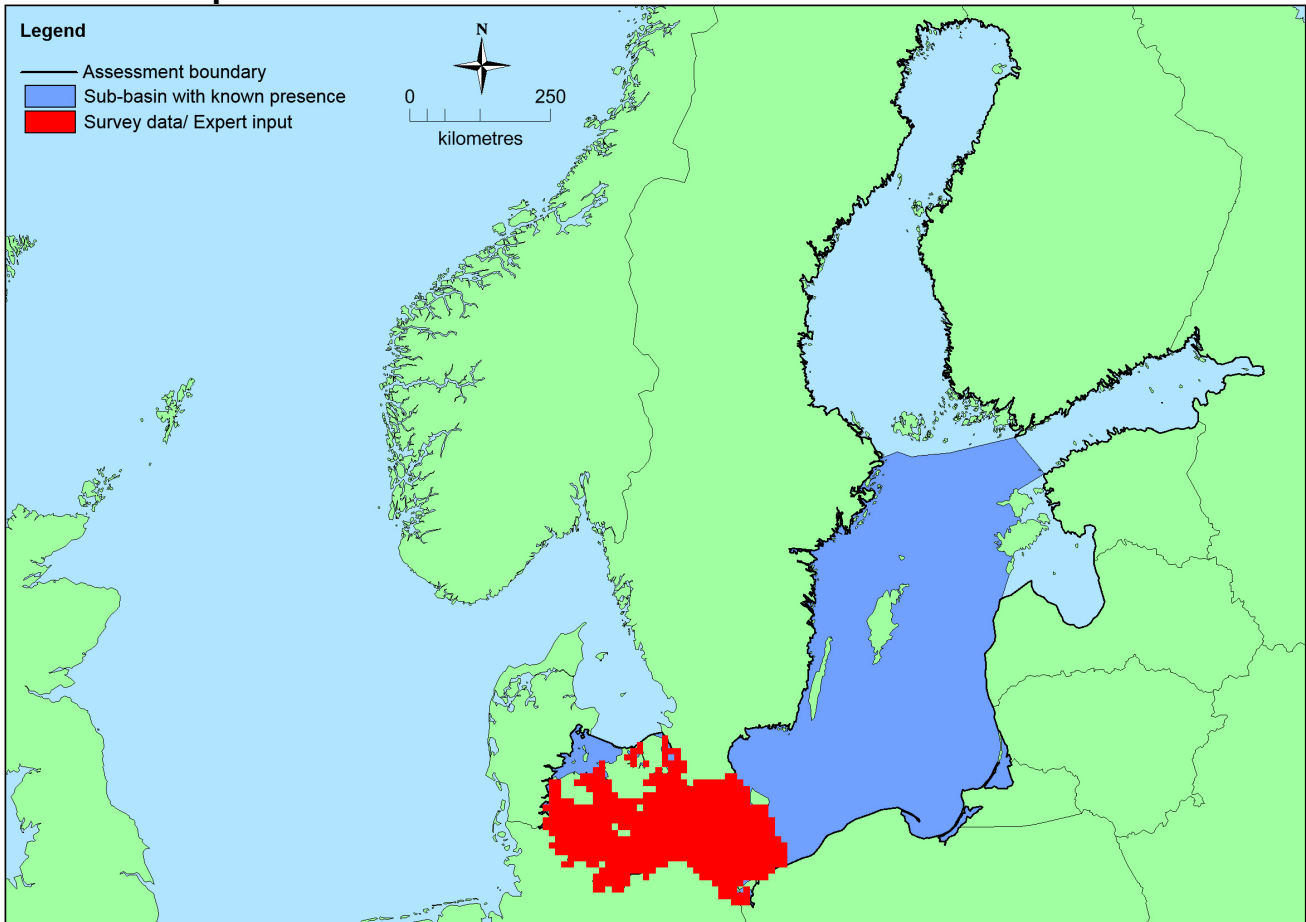
This map is based on HELCOM mapping of the presence of this habitat in 100 x 100km cells that were converted to 10 x 10 km cells. The calculated EOO and AOO values therefore represent a maximum based on current information as the habitat may not occur in all these 10 x 10 km cells.

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

This habitat type does not occur in the Russian Baltic Sea area therefore 100% is hosted by EU28. A similar habitat occurs in the North East Atlantic Regional Sea.

Trends in quantity

The area of this habitat has not been quantified but expert opion is that declines of less than 25% have taken place over the last 50 years. Modelling studies forecast a future decrease in kelp dominated habitats in some areas over the next 100 years particularly where the kelp forest is established in shallow waters.

This is because kelp species will not be favoured by any increasing sea water temperatures associated with climate change.

- <u>Average current trend in quantity (extent)</u>
  EU 28: Unknown
  EU 28+: Unknown
- <u>Does the habitat type have a small natural range following regression?</u>
  Unknown
  Justification
  The maximum EOO (based on HELCOM data using 100 x 100 km grid squares) is 78,300 km^2. The true EOO is likely to be less as this habitat is not present in the aphotic zone which has not been excluded from the grid squares.
- <u>Does the habitat have a small natural range by reason of its intrinsically restricted area?</u>
  Unknown
  Justification
  The maximum EOO (based on HELCOM data using 100 x 100 km grid squares) is 78,300 km^2. The true EOO is likely to be less as this habitat is not present in the aphotic zone which has not been excluded from the grid squares.

Trends in quality

There is insufficient information on which to assess the current quality of this habitat or any historical trends. Modelling studies predict a reduction in extent of the habitat due to climate change effects in the future. An associated reduction in quality in such areas is therefore also likely to occur.

- <u>Average current trend in quality</u>
  EU 28: Unknown
  EU 28+: Unknown

Pressures and threats

Eutrophication as a result of nutrient enrichment (N, P or organic matter) reduces light penetration and consequently the depths to which kelp habitats can thrive. At the same time the upper distributional limit of this habitat is restricted by the low salinity conditions in much of the Baltic which hinders the establishment of kelp. Increasing siltation caused by eutrophication as well as increased turbidity arising from dumping, marine offshore construction activities, and bottom trawling may also damage existing areas as well as prevent the settlement of kelp and therefore the occurrence of this habitat. Bottom trawling and other activities may also have a direct effect by destroying reefs and dislodging kelp plants.

Climate change is a current and future threat. Low and fluctuating salinity, such as that which is typical for inner Danish waters, may contribute to relatively low production as osmotic stress can exert physiological stress on kelps. Temperature is also known to affect the establishment and growth rate of kelp. Future pressures and threats are therefore likely to reduce the extent of this Baltic habitat.

List of pressures and threats

Pollution

> Pollution to surface waters (limnic, terrestrial, marine & brackish)
>> Nutrient enrichment (N, P, organic matter)

Natural System modifications

> Human induced changes in hydraulic conditions
>> Siltation rate changes, dumping, depositing of dredged deposits

Other human induced changes in hydraulic conditions

Climate change

Changes in abiotic conditions
Temperature changes (e.g. rise of temperature & extremes)
Changes in biotic conditions
Habitat shifting and alteration

Conservation and management

Current approaches to the conservation and management of this habitat type include the establishment of protected areas, reduction of nutrient inputs to improve water quality and rock placement for reef habitat creation. Similar actions are likely to be continue to be beneficial to this habitat.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving water quality

Measures related to marine habitats

Other marine-related measures
Restoring marine habitats

Conservation status

Annex 1:

1160: MBAL U2

1170: MBAL U1

1650: MBAL U2

HELCOM (2013) assessments:

1160: VU C1

1650: VU C1

1170: VU C1

Sub habitats AA.A1C4 and AA.M1C4 were assessed as LC (A1) by HELCOM 2013.

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

Harvesting experiments have shown that sugar kelp has a relatively quick recolonization response following removal from an area. Improvements in water quality where this is a reason for decline (e.g. through sedimentation/eutrophication) and rock replacement have been used to allow this habitat to become re-established. Timescales vary depending on conditions but recovery could potentially occur naturally within 10 years.

Effort required

10 years
Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	<25 %	unknown %	unknown %	unknown %
EU 28+	<25 %	unknown %	unknown %	unknown %

This habitat is only present in the EU 28. Precise figures are not available but expert opinion is that there has not been a significant reduction (>25%) in the quantity of this habitat over the last 50 years. This habitat has therefore been assessed as Least Concern under Criteria A for both the EU 28 and EU 28+.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	max 78,300 Km²	Unknown	Unknown	unknown	max 552	Unknown	Unknown	unknown	unknown
EU 28+	max 78,300 Km²	Unknown	Unknown	unknown	max 552	Unknown	Unknown	unknown	unknown

EOO and AOO calculations are based on the current known distribution of *L. digitata* which is characteristic of this habitat. These are considered likely to be maximum figures as the habitat is not present in the aphotic zone but such occurrences could not be excluded from the calculations due to limitations with the underlying data. Although some potential trends have been identified, there is also a lack of information on which to base any estimation of future trends in geographical distribution or threatening processes. Experts therefore consider this habitat to be Data Deficient under Criteria B for both the EU 28 and EU 28+.

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%

Eutrophication and sedimentation have been reported as pressures on the characteristic species (kelps). Such pressures may have had some effect on the quality of the habitat but this has not been quantified. Modelling studies suggest that climate change effects (on sea temperature and salinity) could lead to a

reduction in extent of this habitat in the future by affecting the reproductive success of the characteristic kelp species but experts consider there to be insufficient data on which to assess 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 to estimate 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	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	LC	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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