Communities on Baltic circalittoral clay and other hard substrata

Summary

This is a Baltic Sea benthic habitat in the aphotic zone with at least 90% coverage of hard clay, marlstonerock, ferromanganese concretions and/or peat. Circalittoral clay is restricted to areas where glacial residual sediments pierce the sediment surface and epibenthic bivalves settle. It is mainly found as small patches throughout the Baltic Sea except for the Gulf of Riga and the Bothnian Sea. Although mostly dominated by Mytilidae, there are areas on the sills of the Slupsk Furrow and Gdansk Deep that are dominated by *Astarte* spp. Sessile/semisessile epibenthic bivalves colonise some of the seabed. There may be no macrofauna but two associated biotopes with different dominant species of macrofauna have been described.

Eutrophication has posed a severe threat to the hard clay habitat dominated by *Astarte* spp. in the past and is likely to also affect the biotope in the future. Changes in salinity brought about by climate change is another threat especially where *Astarte* is the dominant species.

Synthesis

Current status and trends in quality of this habitat are mostly unknown although some areas of hard clay dominated by *Astarte* species have shown a significant decline in abiotic environmental quality due to an increasing exposure to oxygen depletion over the last 50 years.

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 three relevant Baltic associated biotopes (AB.B1E1, AB.C and AB.F) as Least Concern (A1), and Baltic aphotic hard clay dominated by *Astarte* spp. (AB.B1E4) was assessed as Endangered (B2c(ii)). Three other biotopes were not evaluated.

Due to general rarity of areas dominated by *Astarte* spp. and no evidence of a significant decrease in quantity over the last 50 years for areas dominated by Mytilidae, this habitat has been assessed as Least Concern for both 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

AB.B1E4 Baltic aphotic hard clay dominated by *Astarte* spp.

Habitat Type

Code and name

Communities on Baltic circalittoral clay and other hard substrata

Biotope AB.B1E4 Aphotic hard clay dominated by Astarte spp. (Photo Jan Warzocha)

Aphotic hard clay dominated by *Astarte* spp. (© J.Warzocha).

Habitat description

This is a Baltic Sea benthic habitat in the aphotic zone with at least 90% coverage of hard clay, marlstonerock, ferromanganese concretions and/or peat according to the HELCOM HUB classification. Hard clay substrates are known to occur mostly in high energy environments. Marlstone rock habitats have only been reported in the Baltic proper, Belt Sea and The Sound, and Ferromanganese concretions in the Baltic Proper, Gulf of Bothnia, Gulf of Finland and Gulf of Riga.

Sessile/semisessile epibenthic bivalves cover of at least 10% of the seabed and no perennial attached erect group has more than 10% coverage in this habitat. In some cases there may be no macrofauna but two associated biotopes with different dominant species of macrofauna have been identified: 'Baltic aphotic hard clay dominated by Mytilidae' (AB.B1E1) and 'Baltic aphotic hard clay dominated by *Astarte* spp.' (AB.B1E4). The latter is characterised by species preferring cold and saline water with *Astarte* spp. often making up between 70–90% of the total biomass.The near bottom water exhibits a salinity range between 10 and 15 psu, a temperature between 3 and 8°C and relatively good oxygen conditions. For ecological purposes, hard clay can be considered to be a hard substrate. Very few macrofauna species have the capacity to burrow into the substrate.

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. Diversity, abundance and biomass of the dominant species and associated fauna are potential indicators of quality of this habitat.
species and associated fauna are potential indicators of quality of this habitat

Characteristic species:

Mytilus spp., *Astarte borealis, Astarte elliptica*

Classification

EUNIS:

The closest correspondence in EUNIS (2004) level 4 is A4.4 Baltic exposed circalittoral rock, A4.5 Baltic moderately exposed circalittoral rock and A4.6 Baltic sheltered circalittoral rock.

Annex 1:

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

1160 Large shallow inlets and bays

1170 Reefs

1650 Boreal Baltic narrow inlets

MAES:

Marine - Coastal

MSFD:

Shallow sublittoral rock & biogenic reef

EUSeaMap:

Shallow aphotic rock or biogenic reef

IUCN:

9.2 Subtidal rock and rocky reefs

Other relationships:

Level 5 of the HELCOM HUB classification (2013):

AB.B1E Baltic aphotic hard clay characterised by epibenthic bivalves This habitat has two biotopes on HUB level 6; ‘Baltic aphotic hard clay dominated by Mytilidae’ (AB.B1E1) ‘Baltic aphotic hard clay dominated by *Astarte* spp.’ (AB.B1E4) AB.B1V–Baltic aphotic hard clay characterised by mixed epibenthic macrocommunity.

AB.B2T Baltic aphotic hard clay characterised by sparse epibenthic macrocommunity

AB.B4U Baltic aphotic hard clay characterised by no macrocommunity

AB.C Baltic aphotic marl (marlstone rock)

AB.F Baltic aphotic ferromanganese concretion bottoms

Does the habitat type present an outstanding example of typical characteristics of one

or more biogeographic regions?
No

Justification
Uncommon habitat in the Baltic Sea.

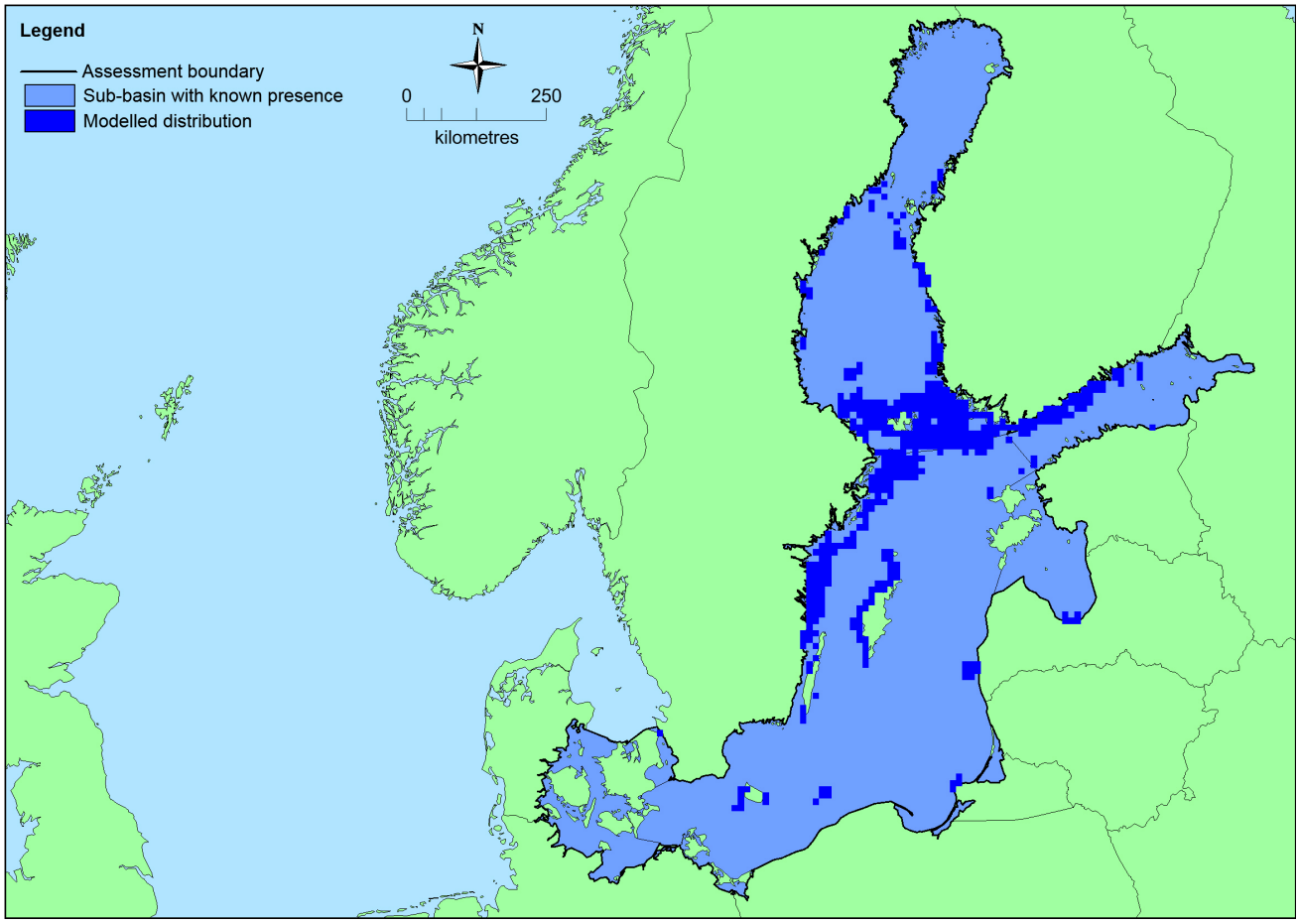
Geographic occurrence and trends

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	Baltic Proper: Present Belt Sea: Present Gulf of Bothnia: Present Gulf of Finland: Present Gulf of Riga: Present The Sound: Present	86,343 Km^2	Decreasing	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	>50,000 Km^2	>50	86,343 Km^2	The area estimate for this habitat has been derived from a synthesis of EUNIS seabed habitat geospatial information for the European Seas but is recognised as being an underestimate.
EU 28+	>50,000 Km^2	>50	86,343 Km^2	The area estimate for this habitat has been derived from a synthesis of EUNIS seabed habitat geospatial information for the European Seas but is recognised as being an underestimate.

Distribution map



There are insufficient data to provide a comprehensive and accurate map of the distribution of this habitat. This map has therefore been generated using the modelled data available on EMODnet for EUNIS level 3 habitats in the Baltic Sea (EMODnet, 2010). This means it indicates potential areas in which this habitat may occur, not the actual distribution of this EUNIS level 4 habitat. EOO and AOO cannot be calculated at the present time, although the habitat is known to occur in all the Baltic Sea sub-basins.

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

Unknown with some differences in the distribution of associated biotopes. For example modelling suggests that around 95% of the hard clay is hosted by EU 28, and estimated 100% of the marlstone rock and an unknown percentage where the substrate is ferromanganese concretions.

Trends in quantity

Circalittoral clay is restricted to areas where glacial residual sediments pierce the sediment surface and epibenthic bivalves settle. It is mainly found as small patches throughout the Baltic Sea except for the Gulf of Riga and the Bothnian Sea. Although mostly dominated by Mytilidae, there are areas on the sills of the Slupsk Furrow and Gdansk Deep that are dominated by *Astarte* spp. There are no quantitative data on past quantity of this habitat in the Baltic nor any estimates of likely future trends. Over the last 50 years there is believed to have been some decline in the area covered by the latter biotope but no evidence for declines in the Mytilid dominated biotope.

- 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
  This habitat occurs in all the Baltic Sea sub-basins so does not have a small natural range.

- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  No
  Justification
  One of the associated biotopes, AB.B1E4 Baltic hard clay dominated by *Astarte* spp., is restricted to the sills of the Słupsk Furrow that connects the Bornholm Deep with the Gotland Deep and Gdańsk Deep. Overall this habitat does not have a small natural range as it occurs in all the Baltic Sea sub-basins.

Trends in quality

The current status and trends in quality of this habitat are mostly unknown although some areas of hard clay dominated by *Astarte* species have shown a significant decline in abiotic environmental quality due to an increasing exposure to oxygen depletion.

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

Pressures and threats

Eutrophication has posed a severe threat to the hard clay habitat dominated by *Astarte* spp. in the past and is likely to also affect this biotope in the future. Climate change is a potential future threat. In the Baltic Sea region climate change is predicted to increase the amount of rain which in turn may cause the salinity to drop in the Baltic Sea. Also, a predicted warmer mean temperature may adversely affect the *Astarte* spp. as they require oxygenated and rather cold and saline water. Dredging can cause more direct damage and the development of an industry for the extraction of ferromanganese concretions from the seabed is a possible future threat.

List of pressures and threats

Mining, extraction of materials and energy production

Mining and quarrying

Pollution

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

Natural System modifications

Human induced changes in hydraulic conditions
Removal of sediments (mud...)
Extraction of sea-floor and subsoil minerals (e.g. sand, gravel, rock, oil, gas)

Climate change

Changes in abiotic conditions
Temperature changes (e.g. rise of temperature & extremes)
Flooding and rising precipitations

Conservation and management

All actions that reduce the level of eutrophication in the Baltic Sea will benefit this habitat. These include measures to reduce the diffuse run off of nutrients from agriculture and tackling point source pollution by installation of waste water treatment plants. Restoring/improving water quality and establishing protected areas can benefit this habitat as can introducing controls on activities such as bottom trawling, sand, gravel and mineral extraction which cause direct damage to the substrate and the associated

communities.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving water quality

Measures related to spatial planning

Establish protected areas/sites

Measures related to hunting, taking and fishing and species management

Regulation/Management of fishery in marine and brackish systems

Measures related to special resouce use

Regulating/Managing exploitation of natural resources on sea

Conservation status

Annex 1:

1160: MBAL U2

1170: MBAL U1

1650: MBAL U2

HELCOM (2013) assessments:

1160 VU C1

1170 VU C1

1650 VU C1

HELCOM (2013) assessed three of seven relevant Baltic biotopes (AB.B1E1, AB. C and AB.F) as LC (A1). AB.E1E4 Baltic aphotic hard clay dominated by *Astarte* spp. was assessed as EN (B2c(ii)). Areas with sparse or no macrocommunity (AB.B1V, AB. B2T and AB.B4U) were not evaluated by HELCOM (2013).

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

Where the dominant species is *Mytilus edulis* recovery may be possible within 5-10 years. *Astarte* spp. have a life span of 20-40 years and the colonies on hard clay are subject to seasonal oxygen depletion throughout its range. This means that recruitment may fail due to the higher sensitivity of larvae and juveniles against oxygen depletion, or need significantly more time for a fully recovery of associated communities.

Effort required

20 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 %

There has been some decline in the quantity of this habitat over the last 50 years however expert opinion is that this does not reach the threshold for a Near Threatened assessment under criterion A. This habitat has therefore been assessed as Least Concern under criterion 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	>50,000 Km^2	Unknown	Unknown	unknown	>50	Unknown	Unknown	unknown	unknown
EU 28+	>50,000 Km^2	Unknown	Unknown	unknown	>50	No	No	unknown	unknown

The habitat is present in small patches in all Baltic Sea sub-basins. Therefore EOO exceeds 50,000km^2 and AOO is assumed to be > 50. However, with no quantitative data on habitat extent or area, accurate calculation of EOO or AOO is not possible at the present time. This habitat has therefore been assessed as Data Deficient 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	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%

Experts considered 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	DD	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)

Assessors
S. Gubbay and N. Sanders.

Contributors
HELCOM RED LIST Biotope Expert Team 2013 and Baltic Sea Working Group for the European Red List of Habitats 2014 and 2015.

Reviewers
A.Darr.

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29/01/16

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