Epifaunal communities of Baltic upper circalittoral muddy sediment

Summary

This is a Baltic Sea benthic habitat in the aphotic zone where at least 90% of the substrate is muddy sediment. Sessile/semi-sessile epibenthic species cover at least 10% of the seabed and it is typically found below approximately 20 m in low to moderate energy exposure conditions. Six different biotopes associated with this habitat have been described. These are characterised by epibenthic bivalves, crustaceans, polychaetes and cnidarians, as well as biotopes with a mixed or sparse epibenthic community. This habitat occurs in all the Baltic Sea sub-basins although some associated biotopes have a more restricted distribution (e.g. areas dominated by *Haploops* spp. and by tube-building polychaetes which only occur in the Belt Sea and The Sound).

The main pressures and threats to this habitat are eutrophication, and activities which disturb the seabed such a demersal trawling. A potential future threat is climate change with possible consequences for changing patterns of water stratification in the Baltic. Beneficial management measures include improvements in water quality, and the establishment of protected areas including restrictions on activities which cause direct damage to the seabed.

Synthesis

There has been significant decline in quantity of some of the associated biotopes and the possibility of future decline in the most extensive biotope (dominated by Mytilidae) has also been identified. Reductions in the density of the characteristic species (*Modiolus* and *Haploops*) are also an indication of decline in quality. Overall this habitat is considered to have declined in both quantity and quality 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 AB.H1E1 and AB.H1K1 as Least Concern (A1) and AB.H1I12 as Endangered (A1). On the basis of these assessments and expert opinion, this habitat is assessed as Near Threatened for both the EU 28 and EU 28+, since there has been a significant decline in the area of some of the biotopes with the overall decline estimated to be between 25-30%.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Near Threatened	A1	Near Threatened	A1

Sub-habitat types that may require further examination

AB.H1I12 Baltic aphotic muddy sediment dominated by *Haploops* spp.

Habitat Type

Code and name

Epifaunal communities of Baltic upper circalittoral muddy sediment

Baltic aphotic muddy sediments characterised by mixed epibenthic bivalves, Ornö, Stockholm Archipelago, Sweden (© AquaBiota Water Research).

Habitat description

This is a Baltic Sea benthic habitat in the aphotic zone where at least 90% of the substrate is muddy sediment according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic species cover at least 10% of the seabed and it is typically found below approximately 20 m in low to moderate energy exposure conditions. Six different biotopes associated with this habitat have been described. These are characterised by epibenthic bivalves, crustaceans, polychaetes and cnidarians, as well as biotopes with a mixed or sparse epibenthic community. Some of these biotopes have a restricted distribution in the Baltic e.g. those characterised by epibenthic polychaetes, or which have a sparse epibenthic macrocommunity which are only reported from The Belt Sea and The Sound. Aphotic muddy sediments characterised by epibenthic cnidarians are present in all the Baltic Sea sub-basins.

Water movement is relatively limited in deep muddy areas and this creates a favourable environment for small tube-building amphipods such as *Haploops* spp. which can be visible as a dense mat of tubes on the surface of the sediment. These are important feeding grounds for many species of fish including cod. Where seapens such as *Virgularia mirabilis* and *Pennatula phosphorea* dominate the epibenthos, for example in parts of the Kattegat trench and the Djupa Rännan trench, they also provide food and shelter for many other species, including commercially imporant fish.

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 amount of sediment covering the hard surfaces and the diversity, abundance and biomass of associated fauna are potential quality indicators for this habitat.

Characteristic species:

There are different characteristic species depending on the biotope. These include *Mytillus* spp. *Hediste diversicolor* , *Gammarus* spp.. *Haploops* spp., the Ostracod *Philomedes brenda,* the brittlestar *Ophiura robusta,* several species from the taxa Maldanidae and Terebellida, the seapens *Virgularia mirabilis* and *Pennatula phosphorea.*

Classification

EUNIS:

The closest correspondence in EUNIS (2004) level 4 is A5.41 Sublittoral mud in low or reduced salinity.

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:

1130 Estuaries

1160 Large shallow inlets and bays

1650 Boreal Baltic narrow inlets

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Shallow sublittoral mud

EUSeaMap:

Shallow muds

IUCN:

9.6 Subtidal Muddy

Other relationships:

EUNIS (2004) A5.378 Baltic muddy bottoms of the aphotic zone.

Level 5 of the HELCOM HUB classification (2013):

AB.H1E Baltic aphotic muddy sediments characterised by mixed epibenthic bivalves This habitat has one biotope on HUB level 6; 'Baltic photic shell gravel dominated by Mytilidae' (AA.E1E1).

AB.H1I Baltic aphotic muddy sediment characterised by epibenthic crustaceans

AB.H1K Baltic photic muddy sediment characterised by epibenthic polychaetes This habitat has one biotope on HUB level 6; 'Baltic aphotic muddy sediment dominated by tube building polychaetes' (AB.H1K1).

AB.H1V Baltic aphotic muddy sediment characterised by mixed epibenthic macrocommunity

AB.H2T Baltic aphotic muddy sediment characterised by sparse epibenthic macrocommunity This habitat has one biotope on HUB level 6; 'Baltic aphotic muddy sediment dominated by sea pens' (AB.H2T1).

AB.H1G Baltic aphotic muddy sediment characterised by epibenthic cnidarians.

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

Regions
Baltic

Justification
Large areas of muddy sediments covered by bivalves, such as *Mytilus edulis* and/or *Modiolus modiolus* are a typical habitat in the Baltic Sea.
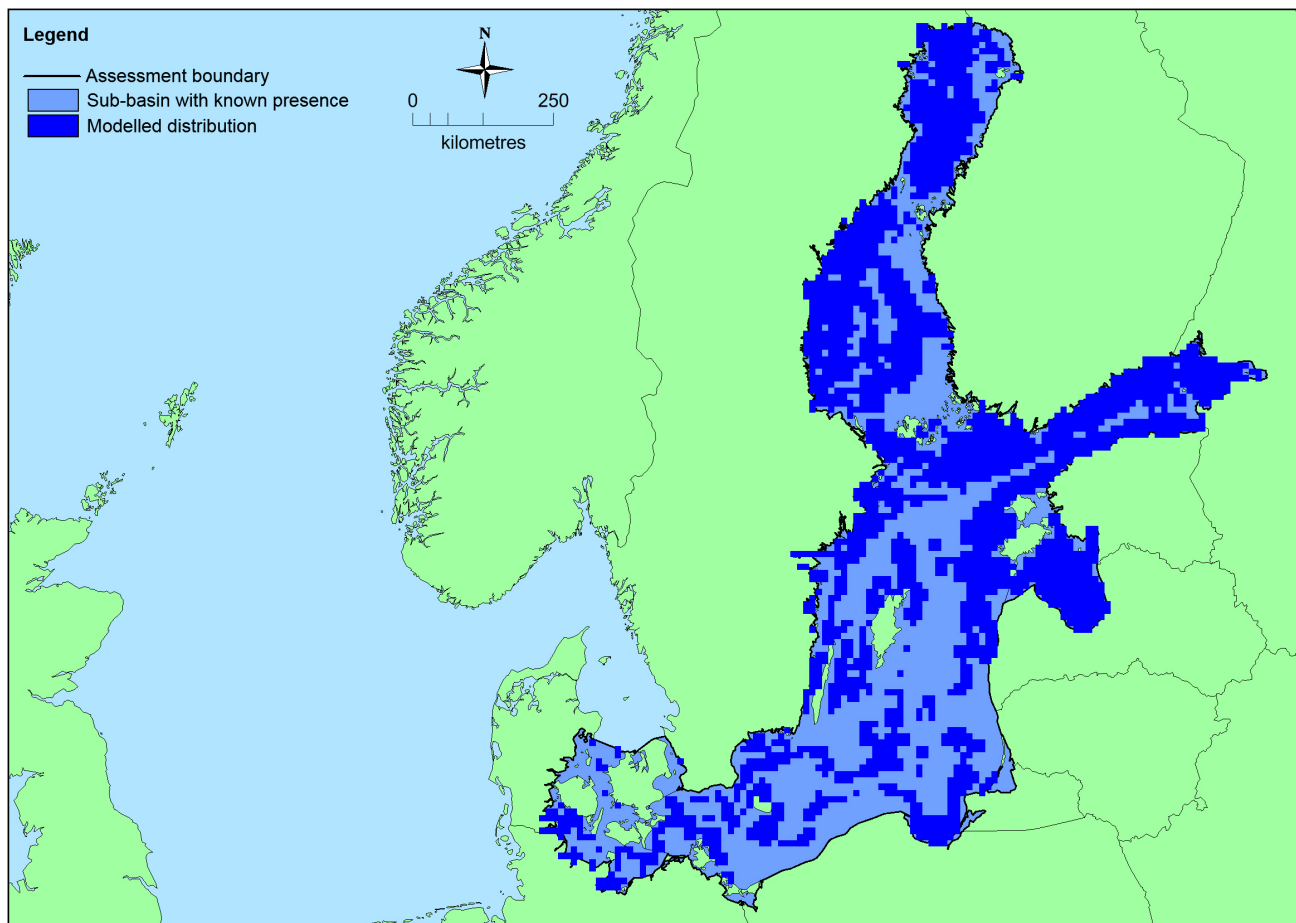
Geographic occurrence and trends

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	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	>50,000 Km^2	Unknown	Unknown Km^2	This habitat is present in all the Baltic sub-basins however there is insufficient information for accurate calculation of EOO and AOO.
EU 28+	>50,000 Km^2	Unknown	Unknown Km^2	This habitat is present in all the Baltic sub-basins however there is insufficient information for accurate calculation of EOO and AOO.

Distribution map

Legend
— Assessment boundary
▨ Sub-basin with known presence
▨ Modelled distribution

N

0 — 250
kilometres

There are insufficient data to provide a comprehensive 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?

This habitat occurs in the EU 28+ (Russia). The percentage hosted by EU2 8 is therefore less than 100% but there is insufficient information to establish the proportion. This habitat may be present in other European regional seas.

Trends in quantity

This habitat is defined by the fauna which is present there, and a reduction in the area occupied by the characteristic species represents a reduction in quantity of the habitat. While there has possibly been some increase (10%) in *Mytilus* dominated areas the *Haploops* dominated biotopes have declined by between 50-70% during the past 50 years. A significant decline in density of the *Haploops* spp. has also been reported from some locations (e.g. from approx 4000 individuals/m^2 to around 97 individuals/m^2 in two monitoring stations outside Helsingborg between 1947 and 2009). The density of *Modiolus* in these monitoring stations has also decreased (from around 160/m^2 upto 1947 to around 6 indiviudal/m^2 in 2009). There was insufficient information on which to determine trends in quantity of the other associated biotopes and no historic data or estimates that might be used to indicate future trends.

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

Trends in quality

A significant decline in density of the *Haploops* spp.dominated biotope has also been reported from some locations The density of *Modiolus* spp. in these monitoring stations has also decreased. A qualitative reduction of 10% is estimated for some Mytilidae dominated areas in the next 50 years.

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

Pressures and threats

Eutrophication, contaminant pollution and bottom trawling have been identified as current and future threats to this habitat. If climate change effects water stratification and therefore the extent and duration of anoxic conditions, this will also pose a threat. Bottom trawling has a direct impact on the substrate and is believed to have caused the decline of the *Haploops* spp. communities to some extent in the Belt Sea and Kattegat area. Bottom trawling is, however not likely to be the only cause for the past decline as it is currently forbidden in the area. Another likely cause for the declin is periodic anoxia, which occurs within the distribution of the habitat. In this area anoxia is probably caused by restricted water movement and unusual water stratification, possibly due to changing climatic conditions. Increasing temperatures have been noted in the area. Furthermore the deep muddy biotopes dominated by *Haploops* spp. can be threatened by pollution of various hazardous substances, as accumulation bottoms generally occur on the same deep muddy bottoms as the *Haploops* spp. dominated areas.

List of pressures and threats

Pollution

   Pollution to surface waters (limnic, terrestrial, marine & brackish)
Nutrient enrichment (N, P, organic matter)
Input of contaminants (synthetic substances, non-synthetic substances, radionuclides) - diffuse sources, point sources, acute events

Climate change

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

Conservation and management

Bottom trawling restrictions in Öresund and Kattegat need to be enforced, so that any sporadic illegal trawling activities are stopped. In order to facilitate monitoring, Automatic Identification System (AIS) should become mandatory for all trawling fishing vessels. Bottom areas deeper than 20 m in Öresund should be protected from invasive fishing and other similar activities. The small area in Öresund where the *Haploops* spp. biotope occurs should be included in the Knähaken marine protected area south of the Helsingborg municipality border. Furthermore, the bottom areas around Ven island should be mapped and potentially protected. More generally, efforts to reduce eutrophication will benefit this habitat.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving water quality

Measures related to spatial planning

Other spatial measures
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:

1130: MBAL U2

1160: MBAL U2

1650: MBAL U2

HELCOM (2013) assessments:

1130 CR C1

1160 VU C1

1650 VU C1

HELCOM (2013) assessed AB.H1E1 and AB.H1K1 as LC(A1). AB.H1I12 was assessed as EN(A1) and AB.H1V and AB.H1G were not evaluated.

 'Baltic aphotic muddy sediment dominated by sea pens' (AB.H2T1) is listed on the OSPAR list of threatened biotopes: Sea-pen and burrowing megafauna communities. This biotope occurs in the OSPAR Region II (including Kattegat) and is listed as threatened and/or in declining in this region.

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

Unknown

Effort required

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	25-30 %	Unknown %	Unknown %	Unknown %
EU 28+	25-30 %	Unknown %	Unknown %	Unknown %

There has been a significant decline in the quantity of some of the associated biotopes of this habitat, with

the overall reduction estimated to be between 25-30%. This species is therefore assessed as Near Threatened under Criterion A for both the EU 28 and EU 28+. There is no information on historic or future reductions in quantity for this habitat.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50,000 Km^2	Yes	Unknown	Unknown	Unknown	Yes	Unknown	Unknown	Unknown
EU 28+	>50,000 Km^2	Yes	Unknown	Unknown	Unknown	Yes	Unknown	Unknown	Unknown

This habitat is found in all the Baltic sub-basins therefore EOO exceeds 50,000 km^2 however with no quantitative data on habitat extent or area, accurate calculation of EOO and AOO is not possible at the present time. There has been a signiicant historical decline which is likely to continue. This habitat has therefore been assessed as Least Concern under cirterion B1a 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%

There has been a decline in quality of this habitat but insufficient data to quantify this. Experts have therefore assessed this habitat as Data Deficient under 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 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	NT	DD	DD	DD	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	NT	DD	DD	DD	LC	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
Near Threatened	A1	Near Threatened	A1

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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Reviewers
M.Calix.

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Date of review
18/2/16

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