Emergent vegetation communities on Baltic infralittoral muddy sediment

Summary

This habitat occurs at the land-water interface in sheltered areas of all the Baltic sub-basins although less common in The Sound. It is dominated by reed or sedges with dominance is determined by factors such as sediment type, exposure and nutrient levels. The habitat can support a high biodiversity, for example by providing nesting areas for birds, and shelter and spawning grounds for fish, but reeds in particular can also out compete and shade other plant species (including sedges) decreasing local biodiversity.

The expansion of reed belts has been accelerated by anthropogenic eutrophication, postglacial land upheaval and the lack of grazing on coastal meadows and attached shallow water areas, while pollution associated with drainage from farming and forestry, and other sources (like traffic and industry) are threats and deterioration factors. Other pressures arise from shipping, and the construction or enlargement of harbours and marinas in sheltered areas. Changes in the water flow due to hydrotechnical constructions, such as dams, cascades and river bank control, may also have adverse effects downstream. The environmental conditions in river mouths depend highly on inflows from local point sources as well as from the whole catchment area. They are therefore closely related to human activities on land.

In some areas, there is an active programme of reed removal to encourage re-establishment of the sedge dominated biotopes. Improvements in water quality are also beneficial although it should be noted that whereas increased eutrophication leads to reed replacing sedges, a later decrease in eutrophication does not necessarily facilitate a process where sedges come back.

Synthesis

Cycles of change have been evident in this habitat in some areas. In Matsalu Bay, Estonia, for example there was expansive growth of the reed beds in the middle of the last century followed by a decrease in the last 20 years. In the Gulf of Bothnia the habitat has steadily increased, due to the expansion of reed (while sedges have declined).The expansion has been attributed to a combination of natural processes such as the shoreline advance due to neotectonic land uplift and human activities, both indirect and direct from dredging and eutrophication. In recent decades enlargement has stopped and there are signs of deterioration, attributed to a combination of sea level rise and an increased storminess which is believed to have inhibited reed growth and therefore resulted in decline in some areas exposed to wave action. Changes in the dominant species have also taken place with reeds being able to outcompete the sedges in less muddy areas.

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 AA.H1A1 as Least Concern (A1) and AA.H1A2 as Near Threatened (A1). The overall assessment for this habitat type, based on expert opinion is Least Concern for both the EU 28 and EU 28+ as the area dominated by *Phragmites* (AA.H1A1) is large and not threatened in any way.

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

AA.H1A2 Baltic photic muddy sediment dominated by sedges (Cyperaceae).

Habitat Type

Code and name

Emergent vegetation communities on Baltic infralittoral muddy sediment

No characteristic photographs 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 muddy sediment according to the HELCOM HUB classification. Emergent vegetation covers at least 10% of the seabed and exceeds that of any other perennial attached erect groups. The habitat requires a salinity of less than 6 psu for the associated communities to develop and is encountered in sheltered areas down to a depth of 2 meters. Two associated biotopes with different dominant plant species have been identified. The common reed (*Phragmites australis*) forms the characteristic biotope in water depths of up to 2m and in moderately exposed conditions, whereas sedges such as *Schoenoplectus* spp., and *Bolbaschoenus maritimus* are generally present in more sheltered and shallower waters in areas of low to moderate salinity.

In the Baltic Sea, sedges form large biotopes in shallow areas typically in estuaries and inlets. It can be found in very sheltered lagoons and in some estuaries around the whole Baltic Sea, but occurs mainly in the north along the Swedish and Finnish coasts of the Bothninan Bay and Gulf of Finland. The species diversity is usually high because of the large variety and abundance of associated fish and birds. The benthic fauna consists mainly of soft-sediment invertebrates, such as polychaetes, crustaceans, bivalves and insect larvae. These shallow sheltered areas are of high biological productivity in a brackish environment. They form important breeding, resting, and feeding sites for water birds. The muddy substrate biotope dominated by the common reed (*Phragmites australis*) often occurs in the immediate vicinity of the biotope dominated by sedges and the two biotopes can form a mosaic. Nutrient levels play a part in affecting the balance between the two biotopes with reed dominated areas favoured by conditions of eutrophication.

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 overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the emergent plant species which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. In the case of this habitat the situation is further complicated because the reed dominated biotope is favoured by the deterioration of the sedge dominated biotope under conditions of eutrophication.

Characteristic species:

Phragmites australis, Schoenoplectus spp.*, Bolbaschoenus maritimus.*

Classification

EUNIS:

The closest correspondence in EUNIS (2004) level 4 is A5.54 Angiosperm communities in reduced salinity and A5.31 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:

9.5 Subtidal sandy-muddy

9.6 Subtidal muddy

Other relationships:

AA.H1A– Baltic photic muddy sediment characterized by emergent vegetation This habitat has two associated biotopes on HELCOM HUB level 6: 'Baltic photic muddy sediment dominated by common reed (*Phragmites australis*)' (AA.H1A1), and 'Baltic photic muddy sediment characterized by sedges (Cyperaceae)' (AA.H1A2).

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

No

Justification

Sedges as a dominant emergent vegetation along seashores are typical and characteristic of the Baltic Sea. Reeds are one of the most commonly widespread plants on the globe, and are commonly found along shorelines in sheltered bays and estuaries in brackish water all over world including the Baltic. The combined habitat is not a typical characteristic for the Baltic.

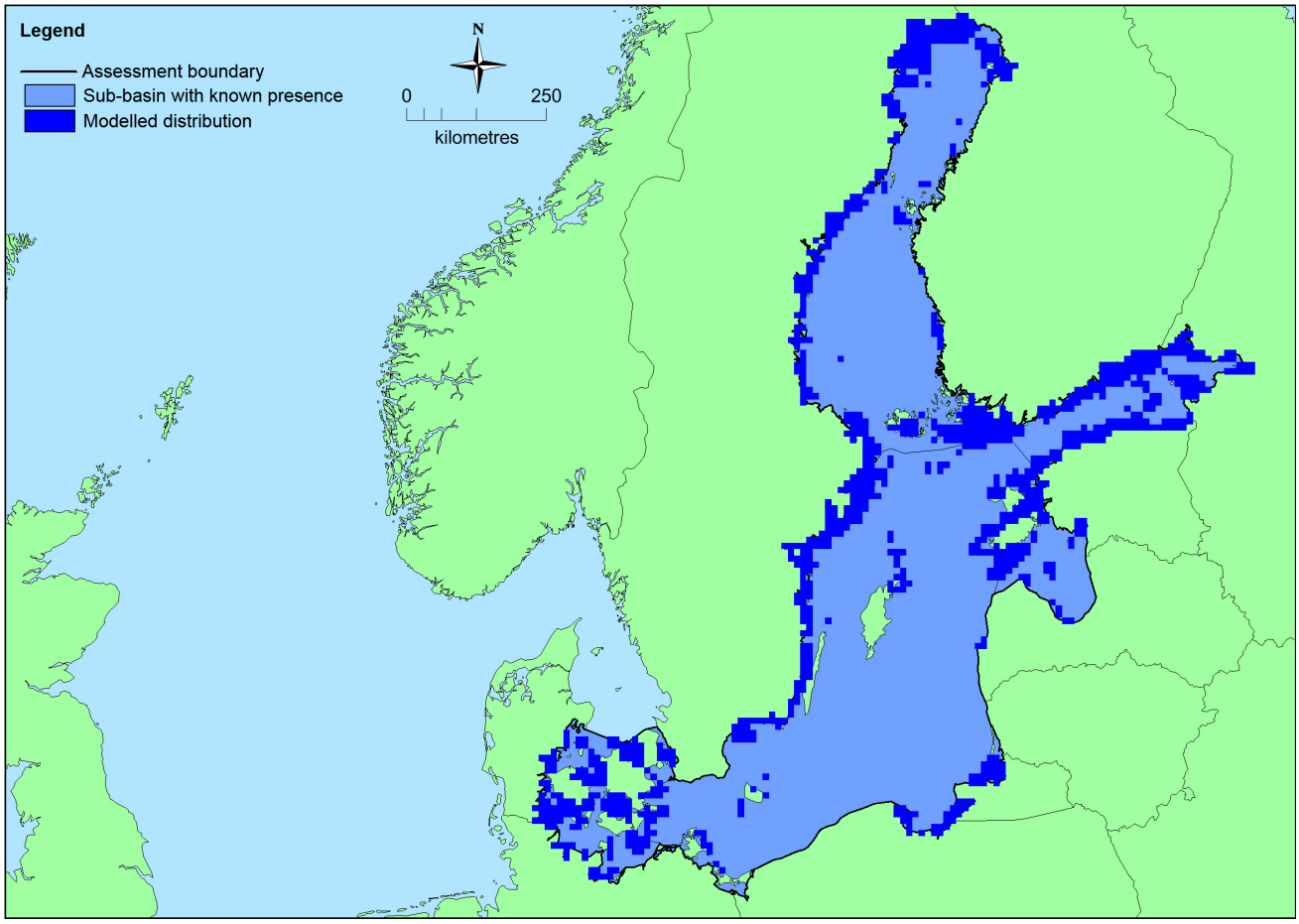
Geographic occurrence and trends

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	Increasing	Stable

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



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?

Defined as a Baltic habitat therefore 100% occurs in the Baltic Sea. Unknown what percentage is hosted by EU Member States in the Baltic.

Trends in quantity

The distribution of photic muddy sediment dominated by sedges (Cyperaceae) has decreased by an estimated 25-30% in the last 50 years. *Phragmites* dominated areas have increased since the last century. In other cases, such as Estonia, there has been considerable fluctuation with significant expansion between 1950-1970 followed by reduction. There also appears to have been a changing balance between the associated biotopes with sedge dominated communities declining and reed dominated communities increasing, most likely in response to eutrophication.

The distribution of photic muddy sediment dominated by common reed (*Phragmites australis*) is expected to increase by around 25% in the next 50 years. No trend estimates are available for the sedge dominated biotope but this may decrease if it is outcompeted by the reeds. Overall, the quanitity of this habitat is believed to be increasing.

- Average current trend in quantity (extent)
  EU 28: Increasing
  EU 28+: Increasing
- Does the habitat type have a small natural range following regression?

No

Justification

This habitat does not have a small natural range in the Baltic Sea as it occurs in all the sub-basins although less abundantly in the more saline Sound.

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

  No

  Justification

  This habitat does not cover an intrinsically restricted area as it occurs in all the sub-basins of the Baltic Sea although less abundantly in the more saline Sound.

Trends in quality

The biotope with sedges as the dominant plant has shown a severe decline in quality in 20% of the area and moderate decline in quality in 30% in the Gulf of Bothnia in the last 50 years. No data or future estimates are available for other sub-basins or for the biotope dominated by reed. The overall trend in quality of this habitat is considered stable.

- Average current trend in quality

  EU 28: Stable

  EU 28+: Stable

Pressures and threats

The expansion of reed belts has been accelerated by anthropogenic eutrophication, postglacial land upheaval and the lack of grazing on coastal meadows and attached shallow water areas, while pollution associated with drainage from farming and forestry, and other sources (like traffic and industry) are threats and deterioration factors. Other pressures arise from shipping, and the construction or enlargement of harbours and marinas in sheltered areas. Changes in the water flow due to hydrotechnical constructions, such as dams, cascades and river bank control, may also have adverse effects downstream. The environmental conditions in river mouths depend highly on inflows from local point sources as well as from the whole catchment area. They are therefore closely related to human activities on land.

The maximum growth depth of *Phragmites* (limited by oxygen transportation to the roots) is around 2m therefore sea level rise may lead to changes in extent and shifts in distribution. Some of these activities described above may increase the extent of the habitat or change the relatively dominance of reeds or sedges. For example, dredging of the tributary rivers of the Kasari delta, Estonia, in the 1920s–1930s caused a rapid seaward colonisation of the reed bed along the dredged channels by the dispersal and reburial of fragmented rhizomes at the channel banks and on the shallow sea bottom of Matsalu Bay.

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

Natural System modifications

Human induced changes in hydraulic conditions

Estuarine and coastal dredging

Modification of hydrographic functioning, general

Dykes, embankments, artificial beaches, general

Climate change

Changes in abiotic conditions
Wave exposure changes
Sea-level changes
Changes in biotic conditions
Habitat shifting and alteration

Conservation and management

One of the main solutions to stop and reverse degradation of the estuaries is a general protection of this natural habitat type by law. Further, programmes and measures are needed to maintain or restore natural conditions along the whole course of the rivers, which e.g. allow natural erosion and temporary flooding of river banks. A drastic reduction of nutrient and pollution loads in the catchment area of rivers with estuaries would help to improve the environmental situation of the whole Baltic marine area and this habitat.

In some areas, there is an active programme of reed removal to encourage re-establishement of the sedge dominated biotopes. Improvements in water quality are also beneficial although it should be noted that whereas increased eutrophication leads to reed replacing sedges, a later decrease in eutrophication does not necessarily facilitate a process where sedges come back.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving water quality
Restoring/Improving the hydrological regime

Measures related to marine habitats

Other marine-related measures

Measures related to spatial planning

Establish protected areas/sites

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) have assessed biotope AA.H1A1 as LC(A1) and AA.H1A2 as NT(A1).

When severely damaged, does the habitat retain the capacity to recover its typical

character and functionality?

Phragmites is a pioneer species and a strong competitor therefore there is considered to be a good capacity for recovery at least for the reed dominated biotope.

Effort required

10 years
Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	0 %	unknown %	unknown %	unknown %
EU 28+	0 %	unknown %	unknown %	unknown %

There have been different trends in the extent of this habitat depending on which of the associated biotopes is considered. Sedges have declined, quite significantly in some areas, possibly due to the expansion of, and competition with reed. The latter benefits from the nutrient enrichment associated with eutrophication. As a consequence sedges, former considered ecologically typical of sheltered areas in the Baltic are being replaced by another biotope due to a deterioration of the environment (i.e. eutrophication).

Overall this habitat is believed to have been stable or possibly increased in extent over the last 50 years. It 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	unknown	Unknown	Unknown	unknown	unknown
EU 28+	>50,000 Km^2	Unknown	Unknown	Unknown	unknown	Unknown	Unknown	unknown	unknown

This habitat has a large natural range in the Baltic Sea with EOO >50,000 km^2. A lack of a comprehensive of quantitative data on the area covered by this habitat in the Baltic means that EOO and AOO could not be calculated. This habitat has 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 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.

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	LC	DD	DD	DD	DD	DD	DD	LC	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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Reviewers
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Date of assessment
07/07/2015

Date of review
16/01/2016

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