

Submerged rooted plant communities on Baltic infralittoral mixed substrata (predominantly soft)

Summary

This habitat occurs in all Baltic sub-basins in the shallow waters of the photic zone. Distribution of the associated biotopes depends on the dominant species and is influenced mainly by salinity and exposure. *Zostera noltei*, for example, is not found east of the Darss Sill in the Arkona basin, while *Potamogeton perfoliatus* occurs mostly in the northern part of the Bothnian Bay, and *Chara horrida* in the central Baltic and Archipelago Sea. The submerged rooted plant communities (higher plants and charophytes) provide structure for the benthic environment and associated communities on the underlying sediment. The best studied biotopes are those dominated by seagrass, brackish water angiosperms and charophytes

Eutrophication (increasing N, P and organic matter) has both direct and indirect negative impacts, for example by reducing light penetration through the water column and therefore the depth penetration of submerged species, increased sedimentation which can prevent settlement and excess of nutrients which often favours opportunistic species with short life cycles and rapid development over perennial species with lower productivity, causing a shift in the community composition. Climate change may also result in a shift in the dominant species due to predicted associated changes in salinity. All actions to reduce eutrophication of the Baltic Sea are important for the conservation of this habitat as are area protection and restrictions on coastal construction and dredging.

Synthesis

The best studied biotopes are those dominated by seagrass, brackish water angiosperms and charophytes and for most of them there have been declines in extent. *Zostera marina* and several species of Charales are on the HELCOM Red List of threatened species. Deeper water eelgrass meadows are at risk of disappearing in the future if there is continued reduction in light levels (e.g. due to eutrophication, sediment disturbance).

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.M1B1, AA.M1B2 and AA.M1B3 as Least Concern (A1) and AA.M1B4 and AA.M1B7 as Near Threatened (A1). The overall assessment for this habitat type based on expert opinion is Near Threatened for both the EU 28 and EU 28+ because of the reduction in quantity of this habitat over the last 50 years.

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

AA.M1B4 Baltic photic mixed sediment dominated by Charales

AA.M1B7 Baltic photic mixed sediment dominated by common eelgrass (*Zostera marina*)

Habitat Type

Code and name

Submerged rooted plant communities on Baltic infralittoral mixed substrata (predominantly soft)



Baltic photic mixed substrate dominated by the common eelgrass, *Zostera marina* (K.Fürhaupter, MariLim GmbH).

Habitat description

This benthic Baltic Sea habitat occurs in the photic zone with more than 10%, but less than 90% coverage of hard and soft substrata according to the HELCOM HUB classification. Coverage of submerged rooted plants which also includes plants with rhizoids (i.e. Charales) cover at least 10% of the seabed, and more than other perennial attached erect groups. Mixed sediments covered by rooted plants are mainly distributed in moderate exposure levels but may also occur in sheltered conditions. The habitat covers the full salinity range of the Baltic Sea and is distributed from the Belt Sea up to the northern part of Bothnian Bay. Depending on the salinity and depth the dominant species (>50% of the biovolume), defining the associated biotope type, varies.

'Baltic photic mixed substrate dominated by pondweed (*Potamogeton perfoliatus* and/or *Stuckenia pectinata*)' (AA.M1B1) is found between 0.2-4 m depth in sheltered sites with up to 6 psu. 'Baltic photic mixed substrate dominated by watermilfoil (*Myriophyllum spicatum* and/or *Myriophyllum sibiricum*)' (AA.M1B3) has a similar distribution but a more narrow depth range (0.2-2 m). 'Baltic photic mixed substrate dominated by Charales' is found in a wider range of salinity (2-15), depth (0.2-7 m) and wave exposure (low to moderate) (AA.M1B4). 'Baltic photic mixed substrate dominated by *Zannichellia* spp. and/or *Ruppia* spp. and/or *Zostera noltii*' is found at 0-4 m depth throughout the salinity gradient of the Baltic Sea and in low to moderate exposure (AA.M1B2). 'Baltic photic mixed substrate dominated by common eelgrass (*Zostera marina*)' (AA.M1B7) differs most strongly from the other sub-biotopes in distribution, occurring mainly at moderate exposure and in salinities of 5 psu or higher. It is typically found deeper than the other associated biotopes (1-6 m) and often marks the lower depth limit distribution of soft bottom vegetation. This biotope is absent from areas with low salinity in the inner part of Gulf of Finland and Gulf of Bothnia.

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 overtime. 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 vertical depth limit of submerged rooted plants is used in several countries as a Water Framework Directive parameter for assessing ecological status. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the rooted 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.

Characteristic species:

Stuckenia pectinata, *Potamogeton perfoliatus*, *Zostera marina*, , *Z. noltei*, *Ruppia cirrhosa*, *R. maritima*, *Zanichellia palustris*, *Myriophyllum spicatum*, *Chara baltica*.

Classification

EUNIS:

The closest correspondence in EUNIS (2004) level 4 is A5.53 Sublittoral seagrass beds and A5.54 Angiosperm communities in 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:

1110 Sandbanks slightly covered by seawater

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 sand

Shallow sublittoral coarse sediment

Shallow sublittoral mixed sediment

EUSeaMap:

Shallow sands

Shallow coarse or mixed sediments

IUCN:

9.3 Subtidal Loose Rock/Pebble/Gravel)

9.4 Subtidal Sandy

9.9 Seagrass

9.10 Estuaries

Other relationships:

Level 5 of the HELCOM HUB classification (2013):

AA.M1B Baltic photic mixed substrate characterized by submerged rooted plants

This habitat has five sub-habitats on HUB level 6;

AA.M1B1 'Baltic photic mixed substrate dominated by pondweed (*Potamogeton perfoliatus* and/or *Stuckenia pectinata*)'

AA.M1B2 'Baltic photic mixed substrate dominated by *Zannichellia* spp. and/or *Ruppia* spp. and/or *Zostera noltii*'

AA.M1B3 Baltic photic mixed substrate dominated by watermilfoil (*Myriophyllum spicatum* and/or *Myriophyllum sibiricum*)'

AA.M1B4 'Baltic photic mixed substrate dominated by Charales'

AA.M1B7 'Baltic photic mixed substrate dominated by common eelgrass (*Zostera marina*)'

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

Yes

Regions

Baltic

Justification

This habitat is common on photic mixed substrate in the entire Baltic Sea. Most of the associated biotopes have a very typical and characteristic species composition for the Baltic Sea, dominated by species with freshwater origin.

Geographic occurrence and trends

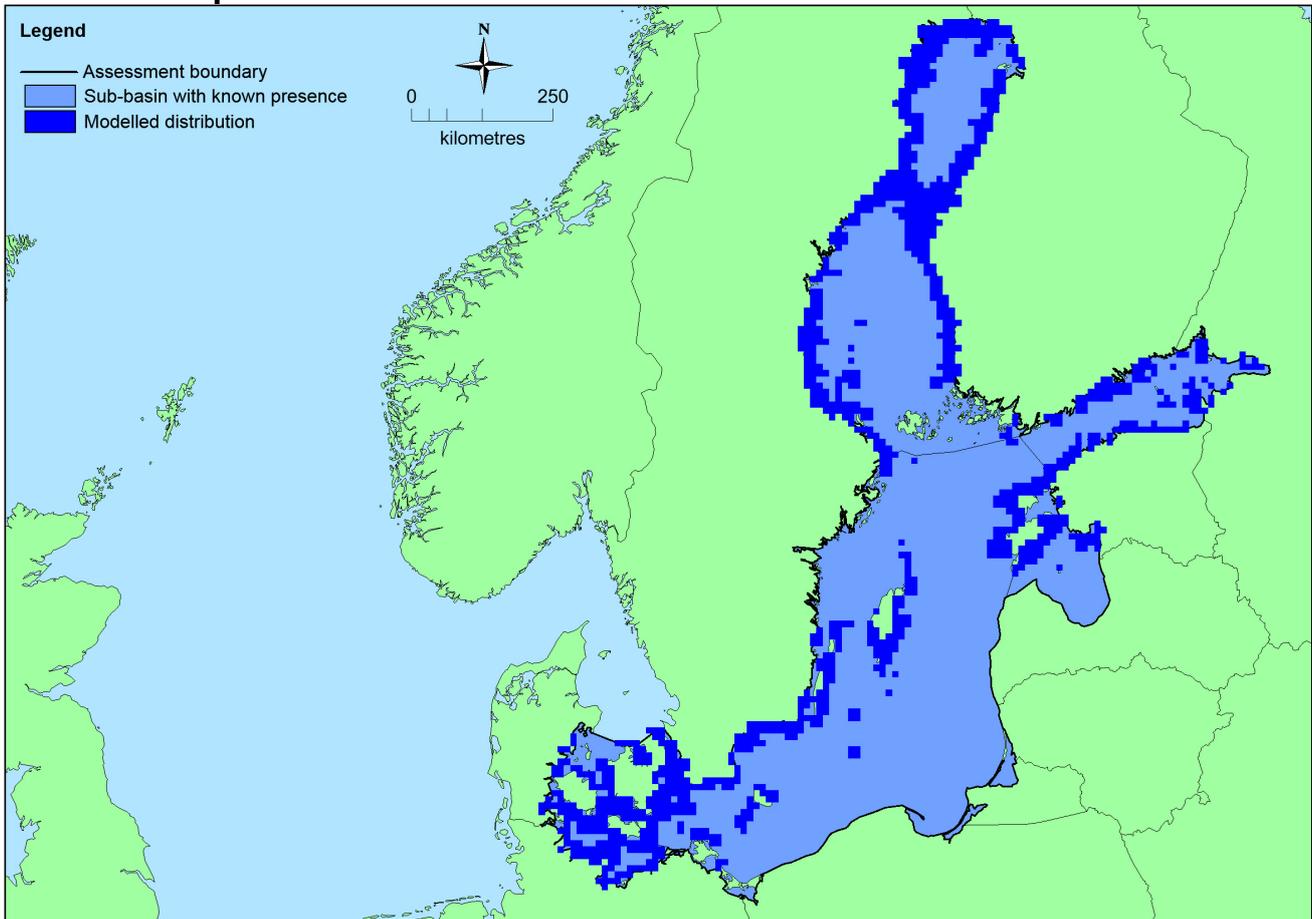
Region	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Baltic Sea</i>	Baltic Proper: Present Belt Sea: Present Gulf of Bothnia: Present Gulf of Finland: Present Gulf of Riga: Present The Sound: Present	Unknown Km ²	Decreasing	Unknown

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
<i>EU 28</i>	>50,000 Km ²	>50	Unknown Km ²	This habitat is present in all the Baltic sub-basins.

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28+	>50,000 Km ²	>50	Unknown Km ²	This habitat is present in all the Baltic sub-basins

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) and supplemented with expert input. This means it indicates potential areas in which this habitat may occur, not the actual distribution of this EUNIS level 4 habitat.

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 EU 28 is therefore less than 100% but there is insufficient information to establish the proportion. Submerged rooted plant communities on infralittoral mixed substrata do occur in other European regional seas.

Trends in quantity

This habitat is common in along the coastline in all the Baltic Sea sub-basins as are most of the associated biotopes although AA.M1B7 'Baltic photic mixed substrate dominated by common eelgrass (*Zostera marina*)' is absent from areas with low salinity in the Gulf of Finland and Gulf of Bothnia. Reduction in depth distribution for *Zostera marina* from 10 m to currently 4-6 m resulted in area reduction (since 1930s) to about 25-50 % along the German and Danish coastline but to varying extents in the different Baltic Sea regions. The associated biotope AA.M1B4 'Baltic photic mixed substrate dominated by Charales' has declined by >25% during the last 50 years. The decline has been to varying extent in different Baltic Sea regions with the strongest decline occurred again in the Western and Southern Baltic Sea. In some bays

and lagoons conditions have changed so intensively that the habitat has disappeared completely. The remaining associated biotopes are believed to have declined less than 25% during the last 50 years. Detailed historical area data are only available for some areas/countries. Some of the associated biotopes are considered likely to decline in the future (e.g. by more than 20% for those dominated by Charales).

- 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

The quality of the biotope has declined during the past 50 years and historic times, at least in some areas and biotopes, such as those dominated by charophytes around the Hanko peninsula (Finland) and the German Bodden and Haffe, but there is insufficient data on large scale to assess any overall trend in quality.

- Average current trend in quality

EU 28: Unknown

EU 28+: Unknown

Pressures and threats

Eutrophication, epidemics (wasting disease), bottom trawling, water traffic, construction, sand extraction, dredging, dumping, aquaculture, coastal works and localised damage from mooring have all been identified as past and current threats. These are also likely to be threats in the future along with climate change.

Observed declines of the spatial distribution of the biotope AA.M1B4 'Baltic photic mixed substrate dominated by Charales' are mainly caused by increased eutrophication and connected effects. Decreasing light penetration depth, massive growth of ephemeral algae and increased siltation rates cause massive alterations in the biotopes of sheltered coastal areas. The enclosed characteristic of bays and lagoons intensify the eutrophication impacts. Coastal constructions (e.g. dredging for deepening of harbour access channels, ditching and construction of leisure facilities) and increased tourism has led to a further degradation of the biotope. The threat level is particularly high in the Western and Southern Baltic Sea. In the future climate change (increasing exposure levels, temperatures) or increasing aquaculture in bays may cause additional threats.

The main causes of the observed declines of the spatial distribution of the AA.M1B7 'Baltic photic mixed substrate dominated by common eelgrass (*Zostera marina*)' are (1) the "wasting disease" that caused about 90% of the North European stock to disappear in the 1930 and also affected the *Zostera* beds in Danish and German waters and (2) eutrophication of the Baltic Sea that has resulted in significant decline of eelgrass meadows in mainly Danish, German, Swedish and Polish coastal areas. Eutrophication has

decreased the depth where *Zostera* dominated biotopes can receive enough light and may in addition cause a shift from eelgrass meadows to communities dominated by fast-growing macro-algae. Climate change is predicted to lower the salinity level in the northern parts of the Baltic Sea due to an increase of precipitation, which may threaten *Zostera marina* in the northernmost areas where it currently exists on the limits of its salinity tolerance.

List of pressures and threats

Biological resource use other than agriculture & forestry

- Marine and Freshwater Aquaculture
- Fishing and harvesting aquatic resources
 - Professional active fishing
 - Benthic or demersal trawling
 - Benthic dredging

Pollution

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

Natural System modifications

- Siltation rate changes, dumping, depositing of dredged deposits
- Dumping, depositing of dredged deposits
- Other siltation rate changes
- Dykes, embankments, artificial beaches, general
- Sea defense or coast protection works, tidal barrages
- Other human induced changes in hydraulic conditions

Climate change

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

Conservation and management

All actions to reduce eutrophication of the Baltic Sea are important for the conservation of this habitat. For the biotopes that mainly occurs in bays with limited water exchange with the open ocean (e.g. AA.M1B4 'Baltic photic mixed substrate dominated by Charales'), combating local sources of eutrophication is essential. Conservation measures such as area protection and restrictions on coastal constructions and dredging in shallow coastal lagoons and archipelago areas are also important.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

- Restoring/Improving water quality

Measures related to marine habitats

Restoring marine habitats

Measures related to spatial planning

Establish protected areas/sites

Measures related to urban areas, industry, energy and transport

Other measures

Managing marine traffic

Conservation status

Annex 1:

1110: MBAL U1

1130: MBAL U2

1160: MBAL U2

1650: MBAL U2

HELCOM (2013) assessments: 1110 (VU,C1) 1130 (CR,C1) 1160 (VU,C1), and 1650 (VU,C1) HELCOM (2013) have assessed biotopes AA.M1B4 and AA.M1B7 as NT(A1). AA.M1B1, AA.M1B2 and AA.M1B3 were assessed as LC(A1)

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

In areas where the habitat is dominated by common eelgrass (*Zostera marina*) it can be slow to recover after strong decline (taking more than 20 yrs). Intervention (transplantation) may speed up the recovery but transplantation experiments have had limited success to date. Regeneration from root systems is slow and recovery of entire beds, with characteristic structure and associated species could take many years.

In the northern Baltic low salinity means that any expansion takes place vegetatively. *Zostera* plants are believed to be from the same genotype, estimated to be between 800-1600 years old. Clonal growth and low genetic diversity may reduce the acclimation capacity and survival of the species in rapidly changing environmental conditions. Where other species dominate natural recovery can probably occur within 10 years.

Effort required

10 years	20 years
Naturally	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 are quantitative data for changes in this habitat in some parts of its range in the Baltic Sea and for some of the sub-habitats. Expert opinion is that overall this is probably more than 25% in the last 50 years. This habitat has therefore been assessed as Near Threatened 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	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 Baltic Sea extending from the Danish coast in the west to the Bothnian Bay in the north-east. EOO >50,000 km² and AOO >50 and it is not limited to a few locations, however the precise extent of this habitat over the last 50 years is unknown. This habitat has been assessed as Least Concern 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%

There have been declines in the quality of some of the associated biotopes in some areas e.g. Charophytes and *Zostera marina*, however experts consider there to be insufficient data on which to make an overall assessment of 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	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD

	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	LC	LC	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

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

Assessors

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Contributors

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

Reviewers

K. Fürhaupter.

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