Perennial algal communities (excluding kelp) on Baltic infralittoral coarse sediment

Summary

This habitat occurs in all the Baltic Sea sub basins although some of the associated biotopes have a more li mited distribution. *Fucus* spp. and *Furcellaria lumbricalis* are the characteristic species creating a canopy and these perennial algal communities can form a dense belt in the shallow sublittoral, The algae provide a habitat for many epiphytic and epibenthic species making this one of the most species-rich habitats in the Baltic.

Eutrophication is one of the principal causes of the changes in macroalgal vegetation in coastal waters of the Baltic. Increasing nutrient levels (N, P, organic matter) can lead to shading effects through increase in turbidity and epiphphytic growth on macroalgae. There may also be a change in the dominant species, for example the kelp *Saccharina latissima* which is adapted to lower light levels can move upwards and out-compete *Fucus*. Improvements in water quality (reduction of nutrient inputs) are considered to have been a major factor in the recovery of the perennial macroalgal habitat by improving light penetration and reducing the scope for rapid and blanketing smothering of the canopy forming species by ephiphytic annual algae. Controls on coastal and offshore construction to avoid increasing turbidity and direct removal or damage to the habitat are also important conservation measures.

Synthesis

Modelling and mapping studies provide information on the location and extent of the habitat in some areas (e.g. Lithuania and Poland) but there is a lack of quantitative data on the full extent of this habitat in the Baltic Sea. Significant changes most particularly in its depth distribution, but also in quality have been reported over the last 60 years but not 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 four relevant Baltic biotopes (AA.I1C1, AA.I1C2, AA.I1C3, AA.I1C5) to be Least Concern (A1). With no additional information on changes in extent or quality of this habitat, a wide geographical distribution in the Baltic and less than a 25% decline in quantity over the last 50 years, the current expert opinion is that this habitat should be assessed as Least Concern for 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

Perennial algal communities (excluding kelp) on Baltic infralittoral coarse sediment

Fucus vesiculosus on coarse sediment. (© K.Fürhaupter, MariLim Aquatic Research GmbH).

Furcellaria on coarse sediment. (© K.Fürhaupter, MariLim Aquatic Research GmbH).

Habitat description

This habitat is distributed on Baltic bottomsin the photic zone with at least 90% coverage of coarse sediment according to the HELCOM HUB classification. Perennial attached algae such as *Fucus* spp., or perennial red algae cover at least 10% of the seabed and more than other perennial attached erect groups. It is most common in areas moderately exposed to wave action and in depths of up to 10 m.

Four associated biotopes with different dominant species of algae and some differences in depth and salnity preferences, resulting in variations in their geographical occurrence in the Baltic Sea have been described by HELCOM. These are: 'Baltic photic coarse sediment dominated by *Fucus* spp.' (AA.I1C1) such as *Fucus radicans, F. serratus or F. vesiculosus:* 'Baltic photic coarse sediment dominated by perennial non-filamentous corticated red algae' (AA.I1C2) such as *Furcellaria lumbricalis;* 'Baltic photic coarse sediment dominated by perennial foliose red algae' (AA.I1C3) such as *Coccotylus* spp., *Phyllophora* spp. and *Delesseria* spp. and 'Baltic photic coarse sediment dominated by perennial filamentous algae' (AA.I1C5) such as *Polysiphonia* spp, *Aegagrophila linnaei, Cladophora rupestris*.

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 algae, especially *Fucus* spp. where applicable, and the amount of epiphytic algae are potential indicators of quality of this habitat.

Characteristic species:

Fucus spp., *Furcellaria lumbricalis, Coccotylus truncatus, Phyllophora* spp., *Deleseria sanguinea, Polysiphonia* spp., *Cladophora rupestris, Sphacelaria* spp.

Classification

EUNIS:

The closest corresponsence in EUNIS (2004) level 4 is A5.11 Infralittoral coarse sediment 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:

1110 Sandbanks slightly covered by seawater

1160 Large shallow inlets and bays

1650 Boreal Baltic narrow inlets

MAES:

Marine - Marine inlets and transitional waters

Marine - Coastal

MSFD:

Shallow sublittoral coarse sediment

Shallow sublittoral mixed sediment

EUSeaMap:

Shallow coarse or mixed sediments

IUCN:

9.3 Subtidal loose rock/pebble/gravel

Other relationships:

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

AA.I1C1 Baltic photic coarse sediment dominated by Fucus spp

AA.I1C2 Baltic photic coarse sediment dominated by perennial non-filamentous corticated red algae

AA.I1C3 Baltic photic coarse sediment dominated by perennial foliose red algae

AA.I1C5 Baltic photic coarse sediment dominated by perennial filamentous algae

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

Justification

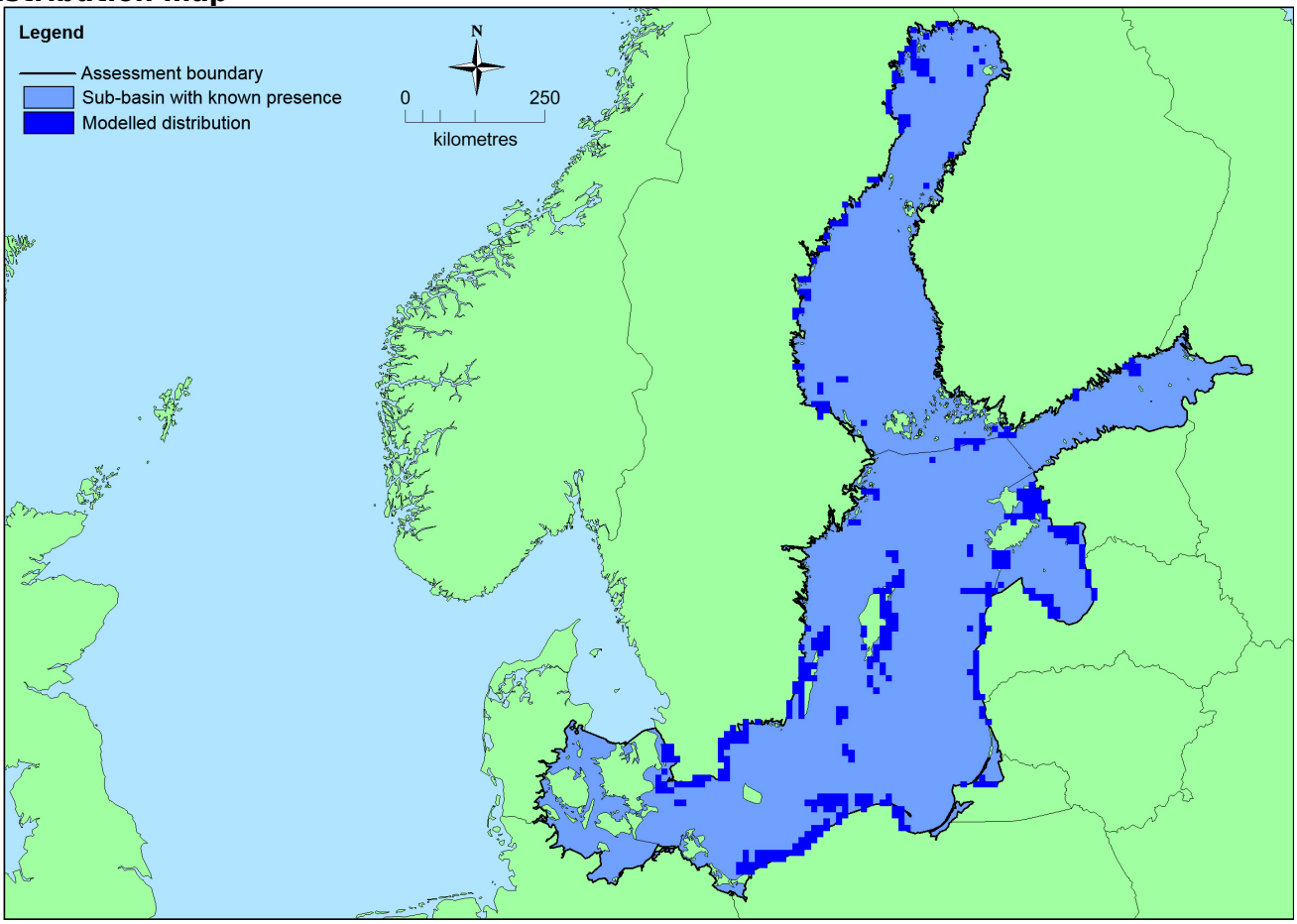
Geographic occurrence and trends

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	670 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	>50	Unknown Km^2	This habitat is present in all the Baltic sub-basins.
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). 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 would be less than 100% but there is insufficient information to establish the proportion.

Trends in quantity

The habitat occurs in all the Baltic Sea sub-basins although some of the associated biotopes have a more limited distribution. Significant changes (up to 50% in places) most particularly in the depth distribution of this habitat, have been reported over the last 60 years due to reduction in Secchi depth. For example in Germany it occurred historically on stony bottoms down to 10 m but is currently never found deeper than 5-6 m. On a whole Baltic Sea scale the loss is estimated to be have been less than 25%. There are no quantitative data on historic changes and a small further reduction of extent is predicted for the coming 50 years.

- 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

Significant changes, most particularly in the depth distribution of this habitat, have been reported over the last 60 years. For example in Germany it occurred historically on stony bottoms down to 10 m but is currently never found deeper than 5-6 m. Currently it is limited to narrow band along most of the German coast except some of the highly eutrophicated inner parts of bays and lagoons such as Schlei Fjord and Dars-Singst Bodden Chain. A continuing decline is predicted if water quality does not improve especially when combined with climate change effects, such as reductions in salinity, as this will reduce the zone for suitable growth. For exampleif trends in temperature, total phosphorus concentration and chlorophyll *a*, continue, water quality in Bothnian Sea is predicted to deteriorate within 2-3 decades and reach levels that may lead to major losses of *F. vesiculosis.*

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

Pressures and threats

Decreased light levels or increased epiphyte growth as a result of eutrophication (nutrient enrichment) are believed to be the main causes for the changes in macroalgae communities in the last 50 years. Eutrophication has many negative effects on macrophytes. Increased nutrient levels stimulate the growth of phytoplankton, which increases the concentration of particles in water and reduces the penetration of light within the water column. As nutrients are available in sufficient amounts for longer times throughout the year, phytoplankton blooms also last longer and occur more often during the season. This shortens the optimal growth periods for macrophytes. The reduced light at the bottom causes a decline in the vertical distribution of vegetation communities and a reduction in the overall amount of plants. Increased nutrient levels also stimulate the growth of opportunistic macrophytes. Their small size with fine, highly branched filamentous habit give a high surface to volume ratio and therefore a high rate of nutrient uptake. This enables opportunistic macrophytes extremely high growth rates if abiotic conditions (light, temperature) are also favourable. The effect of eutrophication has been most apparent as a reduced width of the depth zone occupied by the perennial algae.

Activities which increase turbidity or remove substrate, such as offshore construction and stone fishing, are additional known pressures as is localized pollution, for example in the Stockholm archipelago, Tallinn Bay and Gulf of Riga. Changes in sea temperature, ice cover/scour and salinity associated with climate change will add to these pressures and can be expected to change the species composition in the habitat. For example although *F.lumbricalis* is known for its wide tolerance range for salinity, sexual reproduction is curtailed below 7psu where regeneration occurs via asexual reproduction. This can reduce genetic diversity and therefore make populations vulnerable to sudden environmental changes. Also as the salinity declines, a larger part of the shallow benthic primary production on hard bottom will be taken over by species tolerating low salinities, such as green algal species like gut weed (*Ulva intestinalis*) and *Cladophora* spp.

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

Siltation rate changes, dumping, depositing of dredged deposits

Climate change

Temperature changes (e.g. rise of temperature & extremes)
Habitat shifting and alteration

Conservation and management

Improvements in water quality (reduction of nutrient inputs) are considered to have been a major factor in the recovery of the perennial macroalgal habitat by improving light penetration and reducing the scope for rapid and blanketing smothering of the canopy forming species by ephiphytic annual algae. Controls on coastal and offshore constructions to avoid increasing turbidity and direct removal or damage to the habitat 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

Other marine-related measures

Conservation status

Annex 1:

1110: MBAL U1

1160: MBAL U2

1170: MBAL U1

1650: MBAL U2

HELCOM (2013) assessments:

1110: VU C1

1160: VU C1

1170: VU C1

1650: VU C1

HELCOM (2013) has assessed all four associated biotopes as LC(A1)

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 %	unknown %	unknown %	unknown %
EU 28+	<25 %	unknown %	unknown %	unknown %

There have been significant declines in the extent of this habitat (up to 50% in places) as well as in the depth zone occupied but there has also been some recovery, so overall this habitat is not considered to have declined by more than 25%. There has been no estimate of future trends in quantity. A continuing decline is predicted if water quality does not improve especially when combined with climate change effects, such as reductions in salinity, as this will reduce the zone for suitable growth. This habitat has therefore been assessed as Least Concern under Criteria A for 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	Yes	Unknown	No	>50	Yes	Unknown	No	No
EU 28+	>50,000 Km^2	Yes	Unknown	No	>50	Yes	Unknown	No	No

Expert opinion is that although there are shortcomings with the data used to calculate EOO and AOO, because this habitat is known to be present in all the Baltic Sea sub-basins, does not have a restricted geographic distribution, and the associated threats are not limited to a few locations it should be assessed as Least Concern under Criteria B for 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 %

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 %

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 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	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	LC	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
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

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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

S. A. Wikström.

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30/12/2015

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