Stable aggregations of unattached perennial vegetation on Baltic infralittoral coarse sediment

Summary

This habitat occurs in all the sub-basins of the Baltic Sea but is more typically found in moderately exposed to sheltered areas. The unattached forms of perennial vegetation can coexist with attached forms and the characteristic rooted vegetation of bays, estuaries and lagoons. These algae provide shelter and surface for attachment of invertebrates. However, if abundances of the unattached form are very high the sediment below may become deoxygenated and the associated infauna may die.

Declines have been observed in the spatial distribution of the unattached *Fucus* spp. dwarf form biotopes and this is believed to be mainly caused by increased eutrophication and its connected impacts/threats. Decreased light penetration depth, massive growth of filamentous algae and increased sedimentation/siltation cause massive alterations in the habitat conditions of sheltered coastal zones. The enclosed characteristic of bays and lagoons intensify the eutrophication impacts. Coastal construction (ditching, deepening of harbour access channels), leisure facilities and increased tourism has led to a further degradation of the habitat. 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. Combatting local sources of eutrophication (mainly from agriculture) as well as conservation measures, such as restrictions on coastal construction and dredging in shallow coastal lagoons and archipelago areas can prevent damage and loss of this habitat.

Synthesis

The presence of this habitat type in the Baltic Sea is well established and it is known to occur in all the sub-basins although favouring sheltered areas. Information is also available on the distribution of the characteristic species (*Fucus* and *Furcellaria*). One of the associated biotopes, the unattached *Fucus* dwarf form biotope is rare, and comparisons of historical records with the present distribution in German coastal lagoons give hints to a decline of >25% during the last 50 years. On the Swedish coast the decline is considerably greater.

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 unattached dwarf form of *Fucus* (AA.I1Q2) as Endangered (A1). The other associated biotopes (AA.I1Q1 and AA.I1Q3) were assessed as Least Concern (A1). The dwarf form may not be present on coarse sediments or is very rare. With no additional information on changes in extent or quality of this habitat, its known occurrence in all the Baltic Sea subbasins, and less than a 25% decline in quantity over the last 50 years, 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

HELCOM (2013) assessed Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (dwarf form) (AA.I1Q2) as Endangered (A1). This biotope requires further examination including confirmation on whether the dwarf form occurs in areas of coarse sediment.

Habitat Type

Code and name

Stable aggregations of unattached perennial vegetation on Baltic infralittoral coarse sediment

The unattached form of *Fucus vesiculosus* from Wieker Bodden, Rügen, Germany (© K.Fürhaupter, MariLim Aquatic Research GmbH).

Habitat description

This habitat is distributed on Baltic bottoms in the photic zone with at least 90% coverage of coarse sediment. Coarse sediment has less than 20% of mud/silt/clay fraction (<63 µm), and the proportion of gravel and pebbles (grain size 2–63 mm) exceeds 30% of the combined gravel and sand fraction according to the HELCOM HUB classification. Stable aggregations of unattached perennial vegetation cover at least 10%, while perennial attached erect groups or *Mytilus* cover less than 10% of the bottom. The habitat is rare but can be found in the photic zone of most of the Baltic Sea area where the salinity is <10 or 5 psu (depending on the area), the exposure is moderate to sheltered, and the seabed is level over wide areas.

Three associated biotopes with different dominant species of vegetation (at least 50% of the biovolume of the unattached perennial vegetation - *Fucus* spp. (typical or dwarf form) and *Furcellaria lumbricalis)* have been identified. ‘Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (typical form)’ (AA.I1Q1) and ‘Baltic photic coarse sediment dominated by stable aggregations of unattached *Furcellaria lumbricalis*’ (AA.I1Q3) are encountered at 0.5 to 5 meters depth. Unattached *Furcellaria lumbricalis* may occur in specific, ball-shaped morphology adapted to soft bottom conditions, historically described as *Furcellaria* cf.a*egagropila*. ‘Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (dwarf form)’ (AA.I1Q2) forms a characteristic biotope of shallow bays and lagoons between 0.25 and 2.5 m. This specific morphology of the *Fucus* spp. dwarf form lacks bladders and holdfasts; it is regularly dichotomous branched with branches of similar length resulting in a fan-shaped appearance of the thalli. The single plants can be loosely anchored in the sediment with its

lower, dark brownish parts. The thalli are very fragile, break very easily into pieces and thus generate new thalli. Under more exposed conditions plants form a ball-shaped form, able to roll over the sea bottom. The *Fucus* dwarf forms coexist with attached *F. vesiculosus*, unattached *Furcellaria lumbricalis*, higher plants like *Ruppia* spp., *Zannichellia palustris, Stuckenia pectinatus* (formerly known as *Potamogeton pectinatus), Zostera* spp. and several Charophytes. The biotope exists in lower mesohaline salinities (7–10 psu) and moderately exposed to very sheltered conditions. The unattached thalli can cover the sediment up to about 10 cm height and thus form a three-dimensional habitat comparable to the interstitial space in coarse sediments. Epifauna is seldom attached to the *Fucus* dwarf form, but in between the loose lying thalli mobile gastropods, amphipods and insects look for shelter and food. However, if abundances of the unattached form are very high, the sediment below becomes deoxygenated and the associated infauna below the *Fucus* layer may die. Presently the dwarf form biotope is only known to occur in Sweden and Germany. In Germany it exists only in very few coastal lagoons with low to moderate eutrophication pressures and salinities of around 7–10 psu.

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. Density of unattached *Fucus* spp. (typical and dwarf forms), the lower limit of the *Furcellaria* belt, the amount of epiphytic algae, and density of *Furcellaria* are potential indicators of quality of this habitat.

Characteristic species:

Fucus spp., *Furcellaria lumbricalis* with morphologically typical forms and specific, ball-shaped morphologies

Classification

EUNIS:

The closest correspondence in EUNIS (2004) level 4 is A5.11 Infralittoral coarse sediment in low or reduced salinity and A5.52 Kelp and seaweed communities on sublittoral sediment.

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 coarse sediment

Shallow sublittoral mixed sediment

EUSeaMap:

Shallow coarse or mixed sediments

IUCN:

9.3 Sublittoral Loose Rock/Pebble/Gravel

9.7 Macroalgal/Kelp

9.10 Estuaries

Other relationships:

Level 5 of the HELCOM HUB classification (2013):

AA.I1Q Baltic photic coarse sediment characterized by stable aggregations of unattached perennial algae.

This habitat has three biotopes at HUB level 6;

AA.I1Q1 Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (typical form)

AA.I1Q2 Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (dwarf form) (This sub-habitat has been classified as endangered (EN; A1) in the HELCOM Red List Assessment in 2013).

AA I1Q3 'Baltic photic coarse sediment dominated by stable aggregations of unattached *Furcellaria lumbricalis*' .

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

Yes

Regions

Baltic

Justification

The typical species may be found in other regional seas but the unattached forms, especially the ball-shaped morphologies of *Fucus* and *Furcellaria* that are characteristic of this habitat, are unique to the Baltic Sea.

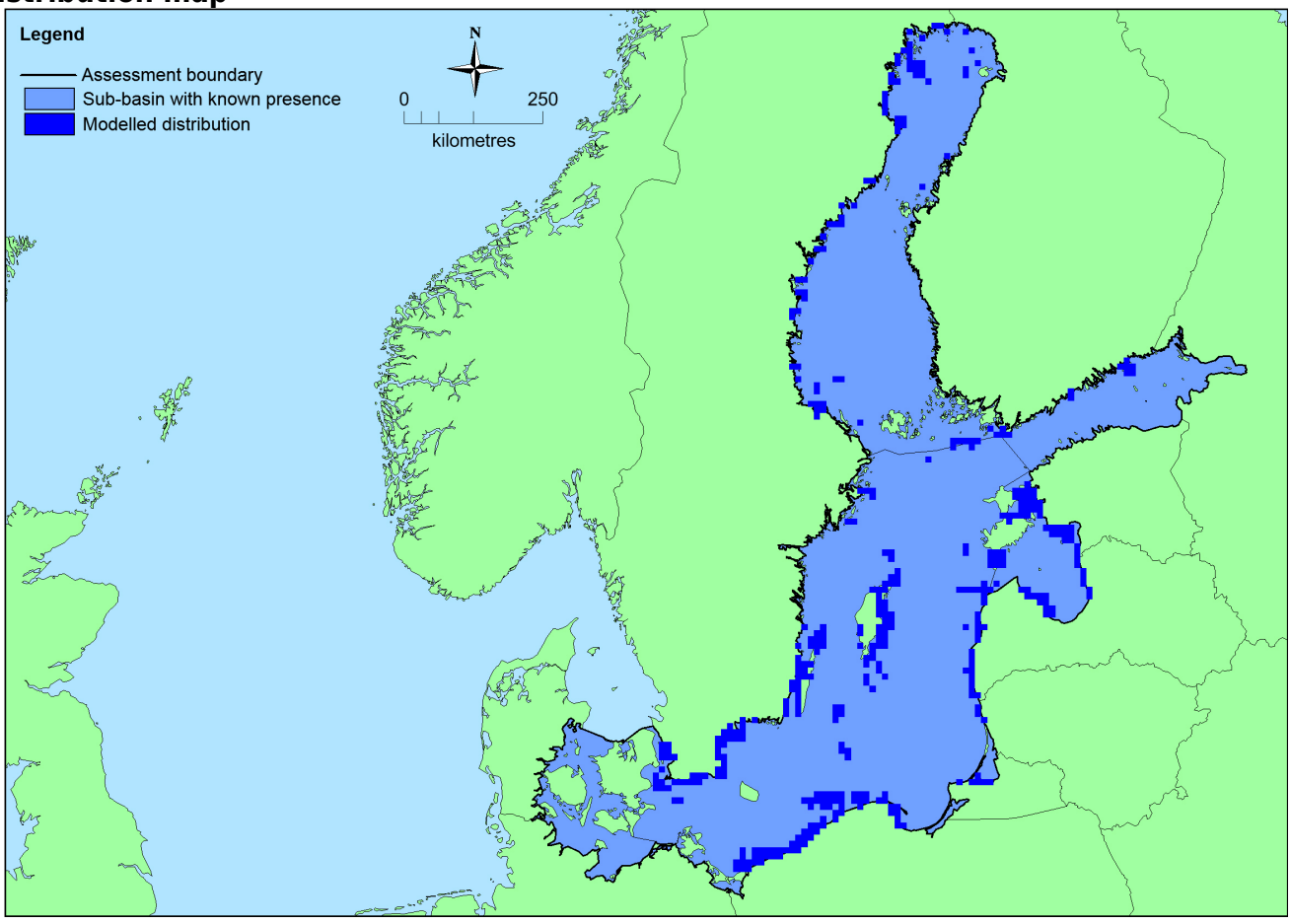
Geographic occurrence and trends

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	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	650,629 Km^2	417	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) 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. EOO and AOO cannot be calculated at the present time, although the habitat is known to occur in all the Baltic Sea regions.

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

This habitat probably 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.

Trends in quantity

This habitat is present in all the Baltic Sea sub-basins. There are distribution records for the characteristic species (*Fucus* spp and *Furcellaria lumbricalis*) and an area estimate for the dwarf form biotope on all substrates (minimum 7.5km^2) however it may not be present on coarse sediments. There is incomplete quantitative data on the area and extent of the entire habitat. The associated biotopes have differing distributions. For example areas characterized by unattached *Furcellaria lumbricalis* can be found in the Estonian west coast, Belt Sea and the German part of the southern Baltic Proper. Areas characterized by *Fucus* spp. (typical form) can be found in northern Bothnian Sea. *Fucus* spp. (dwarf form) can only be found in the southern Baltic Proper off the German coast and may not occur on coarse sediments.

The biotope dominated by stable aggregations of unattached *Fucus* spp. (dwarf form) is estimated to have reduced in extent by more 50% over the past 50 years. Similar pressures appear to have led to a reduction in extent of the other associated biotopes (e.g. *Furcellaria* in Puck Bay) they but there is insufficient quantifiable data on which to make an assessment. Historical trends are unknown and it can be expected that the potential area of occurrence will be reduced in the future due to eutrophication and climate change.

- 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
  The sub-habitat AA.I1Q2 'Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (dwarf form)' has a small range following regression. All other sub-habitats are not believed to have regressed and as the habitat is present in all Baltic Sea sub-basins the overall conclusion is no small natural range following regression.
- 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 and therefore does not have a small natural range.

Trends in quality

One of the associated biotopes AA.I1Q2 'Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (dwarf form)' has shown a severe decline in quality over 20% of its area. There is insufficient information on which to determine quality of the other three associated biotopes or of past or future trends in quality of this habitat.

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

Pressures and threats

Past and current threats to this habitat are associated with eutrophication (increase in N, P and organic matter), contaminant pollution and the introduction of toxic substances into the marine environment. There has also been some commercial exploitation of the unattached macroalgae in Poland and there is still commercial exploitation on going for the *Furcellaria* sub-biotope in Estonia.

Observed declines of the spatial distribution of the unattached Fucus spp. dwarf form biotope are mainly caused by increased eutrophication and its connected impacts/threats. Decreased light penetration depth, massive growth of filamentous algae and increased sedimentation/siltation cause massive alterations in the habitat conditions of sheltered coastal zones. The enclosed characteristic of bays and lagoons intensify the eutrophication impacts. Coastal constructions (ditching, deepening of harbour access channels, 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 add to the pressures on this habitat.

List of pressures and threats

Biological resource use other than agriculture & forestry

Fishing and harvesting aquatic resources

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)
Changes in biotic conditions
Habitat shifting and alteration

Conservation and management

Combatting local sources of eutrophication (mainly agriculture) as well as conservation measures, such as restrictions on coastal constructions and dredging, in shallow coastal lagoons and archipelago areas can prevent damage and loss of 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

Establish protected areas/sites
Legal protection of habitats and species

Conservation status

Annex 1:

1130: MATL U2, MBAL U2, MBLS U1, MMED U2

1160: MATL U2, MBAL U2, MBLS U1, MMAC FV, MMED XX

1650: MBAL U2

HELCOM (2013) assessments:

1130 CR, C1

1160: VU C1

1650: VU C1

HELCOM (2013) have assessed associated biotopes AA.I1Q2 as EN(A1) and AA.I1Q1 and AA.I1Q3 as LC(A1)

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

The characteristic species *Fucus vesiculosus* and *Furcellaria lumbricalis* have a natural reproductive cycle of 1-2 years, but they take several years to reach full size. If the environmental conditions are favourable and there is a seed population available, the habitat can recover in the time from few years to a decade.

Effort required

10 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 %

Some localised loss has been reported (e.g. Puck Bay, Poland) particularly for the dwarf form of unattached *Fucus* spp. Although information about the unattached *Fucus* dwarf form biotopes is rare, comparisons of historical records with the present distribution in German coastal lagoons give hints to a decline of >25% during the last 50 years. On the Swedish coast the decline is considerably larger but there has been some recovery. The dwarf *Fucus* biotope is believed to make up less than 5% of this habitat type, therefore current expert opinion is that overall reduction in quantity is less than 25%. 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	Unknown	Unknown	unknown	>50	Unknown	Unknown	unknown	unknown
EU 28+	>50,000 Km^2	Unknown	Unknown	unknown	>50	Unknown	Unknown	unknown	unknown

Comprehensive quantitative data on the extent and area covered by this habitat is not available but there are some relevant records such as quotas and landings from the commercial collection of unattached seaweed in Estonia, and modelling studies from the Asko area of Sweden. Some localised loss has been reported (e.g. Puck Bay, Poland) particularly for the dwarf form of unattached *Fucus* spp. As the habitat is present in all Baltic Sea basins the EOO exceeds 50,000km^2 . Although some potential trends have been identified, there is also a lack of information on which to base any estimation of future trends in geographical distribution or threatening processes. Experts therefore consider this habitat to be Data Deficient under Criteria 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	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

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Reviewers
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Date of assessment
06/07/2015

Date of review
07/01/2016

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