Infaunal communities in Baltic infralittoral sand - bivalves

Summary

This is a benthic habitat which occurs in the shallow waters of the photic zone where the predominant substrate is sand. It is present in all the Baltic Sea sub-basins but the distribution of the associated biotopes depends on the dominant species and is influenced by salinity and substrate. For example areas dominated by ocean Quahog (*Arctica islandica*) and by multiple infaunal polychaete species including *Ophelia* spp and *Travisia forbesii* are restricted to the Belt Sea and the Sound. Those dominated by multiple bivalve species including *Macoma calcarea, Mya truncata, Astarte* spp. and *Spisula* spp. are common in the Belt Sea, the Baltic Proper and the Gulf of Riga. There is a lack of macrovegetation or epibenthic macrofauna but infaunal bivalves make up at least 10% of the biomass.

Eutrophication, benthic trawling, water traffic, construction, sand extraction, dredging, dumping, contaminant pollution and coastal works have all been identified as past and current threats. These are also likely to be threats in the future. All actions that reduce the level of eutrophication in the Baltic Sea will benefit this habitat such as measures to reduce the diffuse run off of nutrients from agriculture and tackling point source pollution by installation of waste water treatment plants. The photic sandy substrates may increasingly be utilised for mineral extraction. Restricting or prohibiting sand extraction from some areas is also likely to benefit this habitat as well as similar actions for other activities which disturb the seabed.

Synthesis

The presence of this habitat type in the Baltic is well known but there is a lack of quantitative data on extent and quality. An overall decline in quantity is believed to have occurred over the last 50 years although there are different trends for the various associated biotopes. No signs for a decline were reported in the case of the associated biotope dominated by Baltic tellin (*Macoma balthica*), by cockles (*Cerastoderma* spp.) and by the sand gaper (*Mya arenaria*). In contrast the biotopes dominated by ocean quahog (*Arctica islandica*), by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp*., Spisula* spp. and by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii* are believed to have declined by 25-30% during the past 50 years in major parts of their distributional range. The quantity of Baltic photic sand dominated by multiple infaunal bivalve species: *Cerastoderma* spp.*, Mya arenaria, Astarte borealis, Arctica islandica, Macoma balthica* is believed to have declined by 10% during the past 50 years in parts of their distributional range. There have also been declines in quality of some of these biotopes.

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 associated biotopes AA.J3L1, AA.J3L2, AA.J3L4 and AA.J3L9 as Least Concern (A1) and AA.J3L3, AA.J3L10 and AA.J3L11 as Near Threatened (A1). Current expert opinion is that this habitat should be assessed as Near Threatened (A1) for both the EU 28 and EU 28+ because of recent and predicted future declines.

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.J3L3 Baltic photic sand dominated by ocean quahog (*Arctica islandica*)

AA.J2L10 Baltic photic sand dominated by multiple infaunal bivalve speies: *Macoma calcarea*, *Mya truncata*, *Astarte* spp. *Spisula* spp

AA.J3L11 Baltic photic sand dominated by mulitiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii.*

Habitat Type

Code and name

Infaunal communities in Baltic infralittoral sand - bivalves

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 sand according to the HELCOM HUB classification. There is a lack of macrovegetation or epibenthic macrofauna but infaunal bivalves make up at least 10% of the biomass. The habitat is present in areas of high energy associated with wave action or currents.

Six associated biotopes with different dominant species (at least 50% of the biomass of macrofauna) have been identified. Some have a restricted distribution in the Baltic. For example AB.J3L10 'Baltic aphotic sand dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp., *Spisula* spp.' is only found at high salinities (> 18 psu) as all characteristic bivalves species are eumarine and do not tolerate lower salinities. The characteristic trait of the biotope is high species diversity. and it is encountered in the south-western Baltic Sea, from the Kiel bight to Isle of Fehmarn, and might occasionally occur from Mecklenburg Bight to Darss Sill. Where the substrate is well sorted medium to coarse sand, the large variety of interstitial space, may be inhabited by species of specialised fauna, such as the polychaetes *Ophelia limacina, O. rathkei* and *Travisia forbesii*. This fauna is restricted to the Belt Sea (sandbanks) and parts of the 'submerged belt' of the Arkona Basin.

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 determinedand applied on a location-specific basis. Diversity, abundance and biomass of fauna are potential indicators of quality.

Characteristic species:

Bivalves *Arctica islandica, Macoma balthica, Cerastoderma* spp., *Mya arenaria, Astarte* spp., *Thracia* spp, *Phaxas pellucidus,* and polychaete species such as *Ophelia rathkei, Ophelia limacina, Travisia forbesii* and *Streptosyllis* spp.

Classification

EUNIS:

The closest correspondence in EUNIS (2004) level 4 is A5.21 Sublittoral sand 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 all the time

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

EUSeaMap:

Shallow sands

IUCN:

9.4. Subtidal sandy

Other relationships:

Level 5 of the HELCOM HUB classification (2013):

AB.J3L Baltic aphotic sand characterized by infaunal bivalves This habitat has seven associated biotopes in HUB level 6, five of which are included in the Baltic Sea list of the European Red List of Habitats; AB.J3L1 Baltic aphotic sand dominated by Baltic tellin (*Macoma balthica);* AB.J3L3 Baltic aphotic sand dominated by ocean quahog (*Arctica islandica*); AB.J3L4 Baltic aphotic sand dominated by sand gaper (*Mya arenaria);* AB.J3L9 Baltic aphotic sand dominated by multiple infaunal bivalve species: *Cerastoderma* spp., *Mya arenaria, Astarte borealis, Arctica islandica, Macoma balthica;* AB.J3L10 Baltic aphotic sand dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp., *Spisula* spp.; and AB.J3L11 Baltic aphotic sand dominated by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii.* One further biotope AB.J3L7 Baltic aphotic sand dominated by strioped venus (*Chamelea gallina*) is only encountered in the Kattegat and is thus excluded from the Baltic assessment.

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

Regions
Baltic

Justification
Common, widespread and typical of areas of sandy seabed in the Baltic.

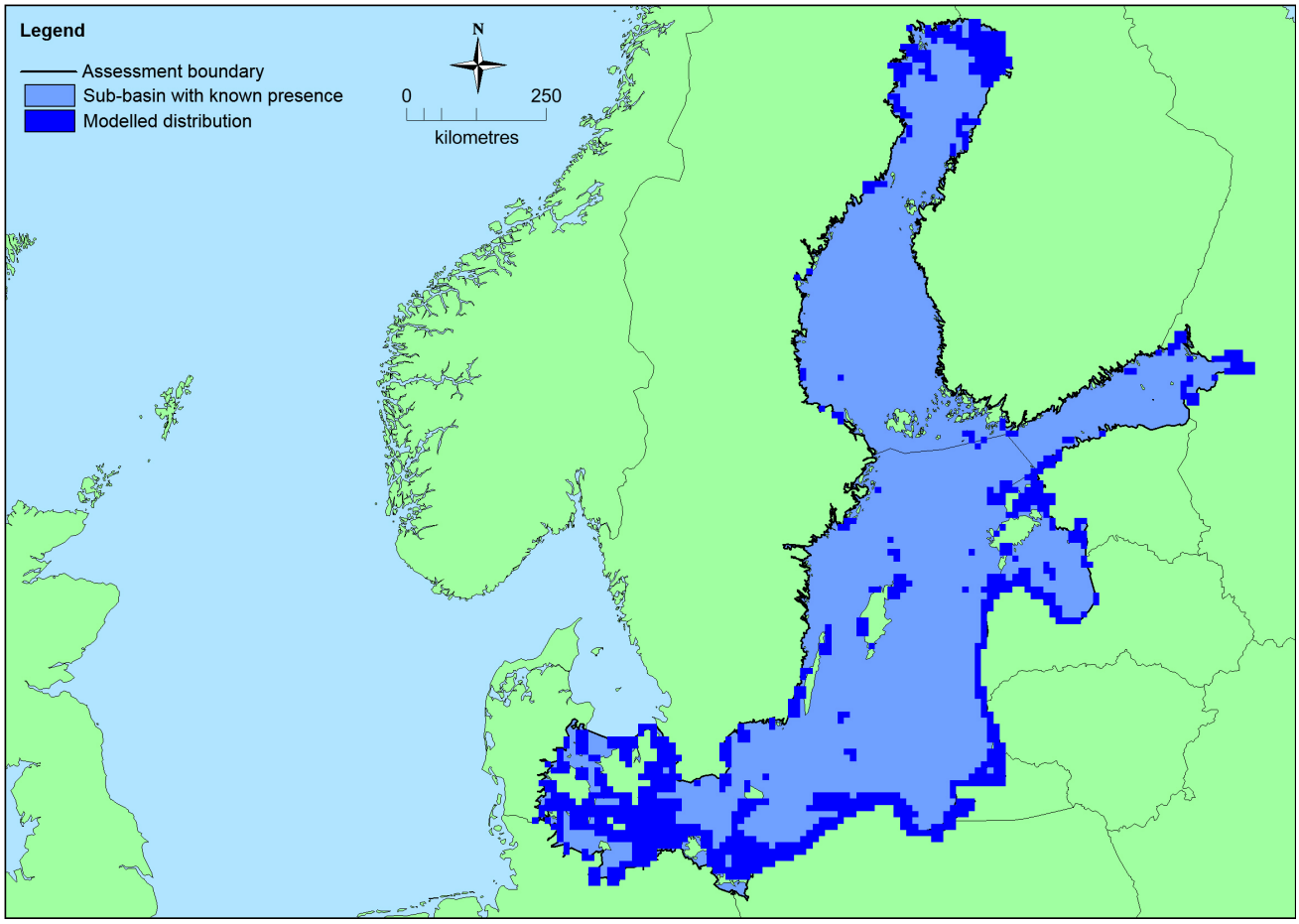
Geographic occurrence and trends

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	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



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?

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. Similar habitats may occur in other European Regional Seas.

Trends in quantity

This habitat is common throughout the Baltic Sea although there are differences in the distribution of associated biotopes. For example, areas dominated by ocean Quahog (*Arctica islandica*) and by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii* are restricted to the Belt Sea and the Sound; areas dominated by by multiple bivalve species including *Macoma calcarea, Mya truncata, Astarte spp.* and *Spisula* spp are common in the Belt Sea, the Baltic Proper and the Gulf of Riga.

Different trends in quantity have been estimated for the seven associated biotopes. No signs of a decline were reported for the biotopes dominated by Baltic tellin (*Macoma balthica*) (AA.J3L1), by cockles (*Cerastoderma* spp.) (AA.J3L2) and by the sand gaper (*Mya arenaria)* (AA.J3L4). The quantity of Baltic photic sand dominated by ocean quahog (*Arctica islandica*) (AA.J3L3), by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp., *Spisula* spp. (AA.J3L10) and by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii* (AA.J3L11) are believed to have declined by 25-30% during the past 50 years in major parts of their distributional range. The quantity of Baltic photic sand dominated by multiple infaunal bivalve species: *Cerastoderma* spp., *Mya arenaria, Astarte borealis, Arctica islandica, Macoma balthic*a (AA.J3L9) is believed to have declined by 10% during the past 50 years in parts

of their distributional range. No estimates of future trends in quantity of this habitat have been made.

- 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
  Overall this habitat does not have a small natural range following regression although this is the case for the associated biotopes; Baltic photic sand dominated by ocean quahog (*Arctica islandica*) (AA.J3L3), Baltic photic sand dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp.*, Spisula* spp. (AA.J3L10) and Baltic photic sand dominated by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii* (AA.J3L11).
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  No
  Justification
  Sandy seabed is common in the photic zone of the Baltic, but the associated biotopes dominated by ocean quahog (*Arctica islandica)* (AA.J3L3), by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp.*, Spisula* spp. (AA.J3L10) and by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii* (AA.J3L11) are restricted to the Sound and the Belt Sea.

Trends in quality

Some of the associated biotopes are known to have declined in quality over the last 50 years. The biotope dominated by multiple infaunal polychaete species has shown an intermediate decline in quality in 20-25% of major parts of the distributional area. Baltic photic sand dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp.*, Spisula* spp. has shown an intermediate decline in quality in 20% of the area and the biotope dominated by multiple infaunal bivalve species: *Cerastoderma* spp.*, Mya arenaria, Astarte borealis, Arctica islandica, Macoma balthica* has shown an intermediate decline in quality in 10% of the area.

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

Pressures and threats

Eutrophication, bottom trawling, water traffic, construction, sand extraction, dredging, dumping, contaminant pollution and coastal works have all been identified as past and current threats. These are also likely to be threats in the future.

List of pressures and threats

Transportation and service corridors

Shipping lanes, ports, marine constructions

Biological resource use other than agriculture & forestry

Fishing and harvesting aquatic resources
Professional active fishing
Benthic or demersal trawling
Benthic dredging

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

Siltation rate changes, dumping, depositing of dredged deposits

Dumping, depositing of dredged deposits

Other siltation rate changes

Conservation and management

All actions that reduce the level of eutrophication in the Baltic Sea will benefit this habitat.These actions include measures to reduce the diffuse run off of nutrients from agriculture and tackling point source pollution by installation of waste water treatment plants. The photic sandy substrates may increasingly be utilised for mineral extraction. Restricting sand extraction will support the persistence of the habitat and it is recommended that sand extraction should be avoided in areas where biotopes AA.J3L10 (Baltic photic sand dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp., *Spisula* spp.) or AA.J3L11 (Baltic photic sand dominated by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii)* occur.

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

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:

1110: MBAL U1

1130: MBAL U2

1160: MBAL U2

1650: MBAL U2

HELCOM (2013) assessments:

1110 VU C1

1130 CR C1

1160 VU C1

1650 VU C1

HELCOM (2013) have assessed the associated biotopes AA.J3L1, AA.J3L2, AA.J3L4, AA.J3L9 as (LC(A1) and AA.J3L3, AA.J3L10 and AA.J3.L11 as NT(A1).

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

The habitat forming species of one of the biotopes with the highest threat category (Near Threatened), AA.J3L3 'Baltic photic sand dominated by ocean quahog (*Arctica islandica*)': is the most long-lived species in the world and has a long generation time (>> 50 years). It is difficult to intervene in the re-establishment. The other biotopes classified as Near Threatened AA.J3L10 Baltic photic sand dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp., *Spisula* spp. And AA.J3L11 Baltic photic sand dominated by multiple infaunal polychaete species including *Ophelia* spp. and *Travisia forbesii* are also dominated by bivalve species with life spans of 20 – 40 years. No information on likely recovery capacity exist for the species which dominate the other associated biotopes.

Effort required

50+ years	200+ 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 %

This habitat occurs in all the Baltic sub-basins. There has been a decline in quantity of some of the associated biotopes such as those dominated by the infaunal bivalve *Arctica islandica* and by polychaetes such as *Ophelia* spp and *Travisia forbesii.* The estimated overall decline over the last 50 years is considered to be greater than 25%. This habitat has therefore been assessed as Near Threatened under criterion 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	unknown	Unknown	Unknown	unknown	unknown
EU 28+	>50,000 Km^2	Unknown	Unknown	unknown	unknown	Unknown	Unknown	unknown	unknown

This habitat occurs in all the Baltic Sea sub-basins therefore EOO exceeds 50,000 km^2 although with no quantitative data on habitat extent or area, accurate calculation of EOO or AOO is not possible at the present time. This habitat has therefore 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%

There have been declines in the quality of some of the associated biotopes in some areas however experts considered 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	NT	DD	DD	DD	DD	DD	DD	DD	DD	LC	DD	DD	DD	DD	DD	DD	DD
EU28+	NT	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
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)

Assessors

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Contributors

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Reviewers
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