

HELCOM Red List Biotope Information Sheets (BIS)

This document was a background document for the
2013 HELCOM Ministerial Meeting



BIOTOPE INFORMATION SHEET

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|--|---|---|-------------------------------------|
| English name: Baltic aphotic muddy sediment dominated by ocean quahog (<i>Arctica islandica</i>) | | Code in HELCOM HUB: AB.H3L3 | |
| Characteristic species: <i>Arctica islandica</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05) Climate Change (M) | |
| Red List Criteria: A2b | Confidence of threat assessment: M | HELCOM Red List Category: | CR Critically Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.7.1. Muddy bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

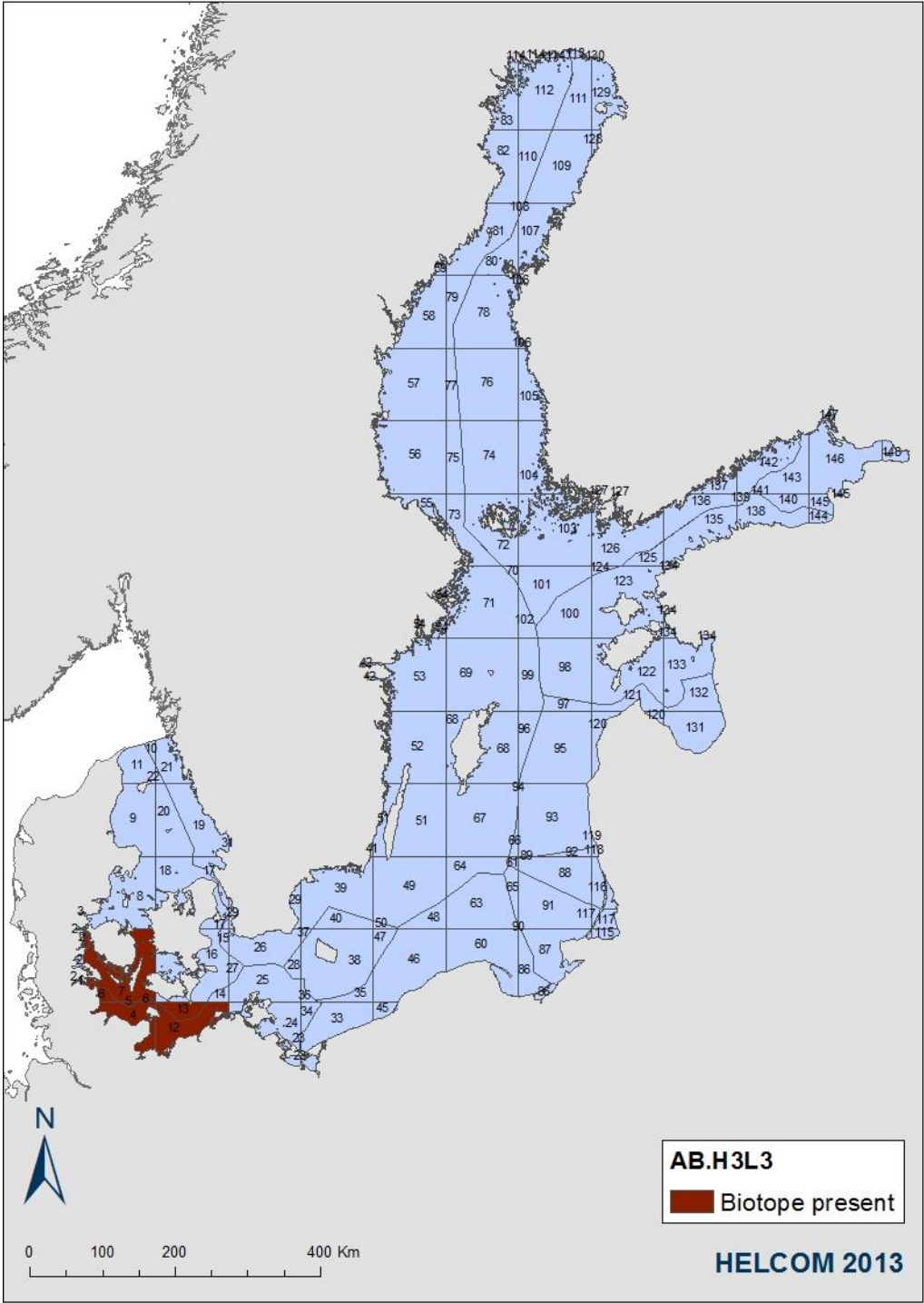
The deep muddy bottoms of the Baltic Sea cover large areas, but communities dominated by the ocean quahog (*Arctica islandica*) can only be found in the southwestern parts where the salinity is high. The salinity range of *Arctica islandica* and therefore of this biotope is > 15 psu (Gogina & Zettler, 2010). The optimum depth range of the species and the biotope is between 25 and 80 m (Morton 2011). The muddy sediment has a grain size of less than < 63 µm and this substrate covers more than 20% of the sea bottom. In the biotope *Arctica islandica* constitutes >50% of the biomass. Compared to shallow bottoms, the deep muddy bottoms are structurally relatively monotonous. The large shells of *Arctica islandica* increase the complexity of the biotope. The species plays an important role as a biomass producer, enhancer of benthopelagic coupling, reducer of water turbidity, and ecosystem engineer. It is a major component of the food chain in this biotope.

Arctica islandica is among the longest-lived and slowest growing marine bivalves (OSPAR 2009). The biotope occurs in deep bottoms and due to the longevity of the dominating bivalve, the biotope regenerates slowly. The deep muddy bottoms are periodically affected by oxygen depletion. Adult individuals of *Arctica islandica* can tolerate periods of anoxia by burrowing deeper into the sediment and remaining inactive. The larvae settling on the surface and younger specimen have not got this potential. Therefore the quantity and quality of the biotope declined as the recruitment was unsuccessful during several consecutive years due to recurring anoxia. It is predicted to decline even faster when the actual present specimen reach the end of their lifespan within the next decades.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The distribution map indicates the area in the 100 x 100 km grid where biotope is believed to occur based on environmental conditions and the availability of the muddy substrate. The biotope has declined severely in the indicated area.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication is considered to be one of the major threats to this biotope. Long lasting and frequent periods of oxygen depletion have caused mortality of *Arctica islandica* populations. Due to the slow population growth rate, the recovery of declined populations is slow, and therefore communities characterized by *Arctica islandica* have been replaced by communities consisting of short living polychaetes (Zettler et al. 2001).

No successful spawning of *Arctica islandica* has occurred in the in the muddy areas of Mecklenburg and the Kiel Bight during the last decades. In samplings carried out during the early summer 2013 in German areas, a lot of tiny 1-2mm small *Arctica islandica* mussels were observed in the shallow sandy areas, but none in the mud. Even if the larvae were able to settle, they are apparently killed by the recurring oxygen depletion in the summer.

Assessment justification

A2b

Aphotic muddy sediments characterized by a community dominated by *Arctica islandica* used to occur on large areas in the southern Baltic Sea. The deep muddy bottoms have been subjected to anoxia, and recent sampling has indicated that this biotope has disappeared or significantly lost in quality in parts of the Lübeck Bight and the Kiel Bight. In large (partly highly polluted) areas, *Arctica islandica* is already missing and it is expected to become extinct within the next 20 years on the muddy bottoms due to the unsuccessful recruitment. To date, the biotope has only disappeared in parts of its distributional range but it is predicted to disappear in most of the Baltic Sea distributional area within the next decades due to missing recruitment.

Recommendations for actions to conserve the biotope

Every action to reduce the level of eutrophication in order to increase the oxygen level on the deep muddy bottoms are urgently needed. Some consecutive years when the oxygen level remains at a good level is needed for the recruitment to be successful.

Restricting bottom trawling in the areas may also improve the potential of the *Arctica islandica* to recolonize the bottoms.

Common names

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References

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http://qsr2010.ospar.org/media/assessments/Species/P00407_Ocean_quahog.pdf
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- Zettler, M. L., Bönsch, R., Gosselck, F. 2001. Distribution, abundance and some population characteristics of the ocean quahog, *Arctica islandica* (Linnaeus, 1767), in the ecklenburg Bight (Baltic Sea). *Journal of Shellfish Research* 20: 161– 169.

BIOTOPE INFORMATION SHEET

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|---|---|---|--------------------------|
| English name: Baltic photic mixed substrate, mud, coarse sediment or sand dominated by stable aggregations of unattached <i>Fucus</i> spp. (dwarf form) | | Code in HELCOM HUB: AA.M1Q2, AA.H1Q2. AA.11Q2, AA.J1Q2 | |
| Characteristic species: <i>Fucus vesiculosus</i> dwarf form | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (local point source pollution H01.03, toxic substances H03.02) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (local point source pollution H01.03, toxic substances H03.02), Climate change (M) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "2" Heavily endangered 2.5.2.2 Sublittoral level sandy bottoms dominated by macrophyte vegetation "3" Endangered 2.4.2.2 Sublittoral level gravel bottoms dominated by macrophyte vegetation 2.4.3.2 Hydrolittoral level gravel bottoms dominated by macrophyte vegetation 2.7.2.2. Sublittoral muddy bottoms dominated by macrophyte vegetation 2.7.3.2. Hydrolittoral muddy bottoms dominated by macrophyte vegetation 2.8.2.2 Sublittoral mixed sediment bottoms dominated by macrophyte vegetation 2.8.3.2. Hydrolittoral mixed sediment bottoms dominated by macrophyte vegetation | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope occurs on mixed substrate and all kinds of soft bottoms (coarse, sandy and muddy sediments) of the photic zone. It consists of submerged stable aggregations of unattached bladder wrack *Fucus vesiculosus* in a specific morphological dwarf form, which constitutes at least 50% of the biovolume.

This specific morphology 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 generate thus new thalli. (Bauch 1954). Under more exposed conditions plants form a ball-shaped form, able to roll over the sea bottom (Bauch 1954).

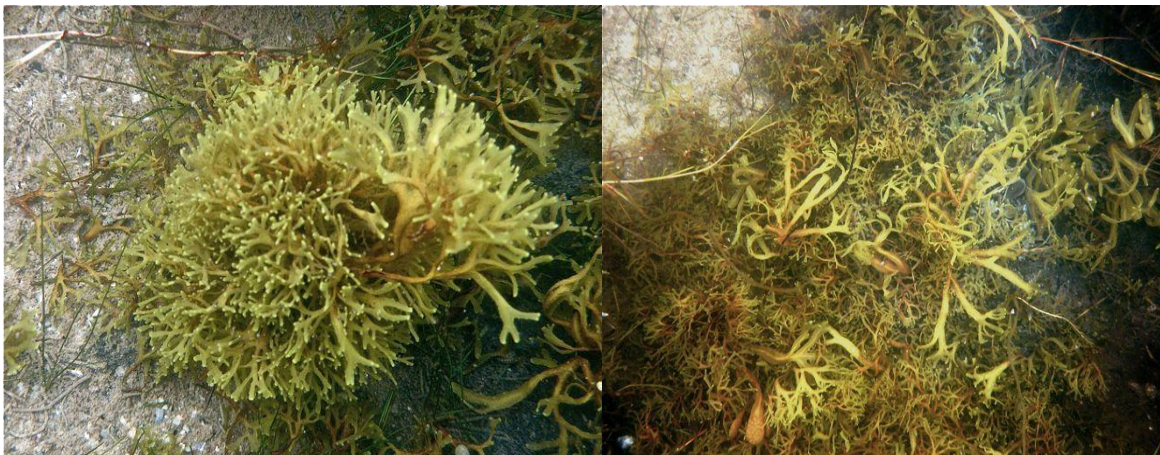
The *Fucus* dwarf forms coexist with attached *F. vesiculosus*, unattached *Furcellaria lumbricalis*, higher plants like *Ruppia* spp., *Zannichellia palustris*, *Stukenia pectinatus*, *Zostera* spp. and several charophytes. The biotope exists in lower mesohaline salinities (7–10 psu) and moderately exposed to very sheltered conditions. It forms a characteristic biotope of shallow bays and lagoons between 0.25 and 2.5 m (Overbeck 1965).

BIOTOPE INFORMATION SHEET

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 (von Oertzen 1968). 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.

Note on taxonomical position: The *Fucus* spp. dwarf form has been historically described from several countries around the Baltic Sea (Sweden, Finland, Germany, Estonia, Poland). Authors have historically used different terms, e.g. *Fucus inflatus* f. *pygmaea* (Sweden) or *Fucus vesiculosus* f. *balticus* (Germany). Nearly all descriptions mention the narrower thalli, the lack of bladders, the higher numbers of branches and the asexual reproduction. In Germany the dwarf form is reported to live unattached in salinities around 7–10 psu. The German descriptions seem to differ from the descriptions from other countries where it is described to live attached to the substrate parallel to attached *F. vesiculosus* at salinities lower than 5 psu (Bergström et al 2005, Tatarenkov et al. 2005, Johannesson et al. 2011). DNA-sequencing of attached “dwarf”-populations in Sweden, Finland and Estonia resulted in the description of a new, endemic *Fucus*-species for the Baltic: *Fucus radicans* (Bergström et al 2005). Looking to the descriptions given for *F. radicans*, the unattached forms establishing the above-mentioned biotope seem to differ from *F. radicans* in terms of morphology (no visible midrib, fan- or ball-shaped) and ecology (higher salinities, soft bottom substrate). Currently it is not scientifically proven, if the unattached dwarf forms are genetically related to *F. vesiculosus*, *F. radicans* or whether it even forms a separate endemic *Fucus* species.

The biotope occurs on mixed substrate and all kinds of soft bottoms (coarse, sandy and muddy sediments) of the photic zone. The *Fucus* spp. dwarf form constitutes at least 50% of the biovolume. It coexists with attached *F. vesiculosus* and possibly with *F. radicans*, unattached *Furcellaria lumbricalis*, higher plants like *Ruppia* spp., *Zannichellia palustris*, *Stukenia pectinatus*, *Zostera* spp. and several charophytes. The biotope exists in lower mesohaline salinities 5–10 psu (possibly lower) and moderately exposed to very sheltered conditions. It forms a characteristic biotope of shallow bays and lagoons between 0.25 and 2 m.



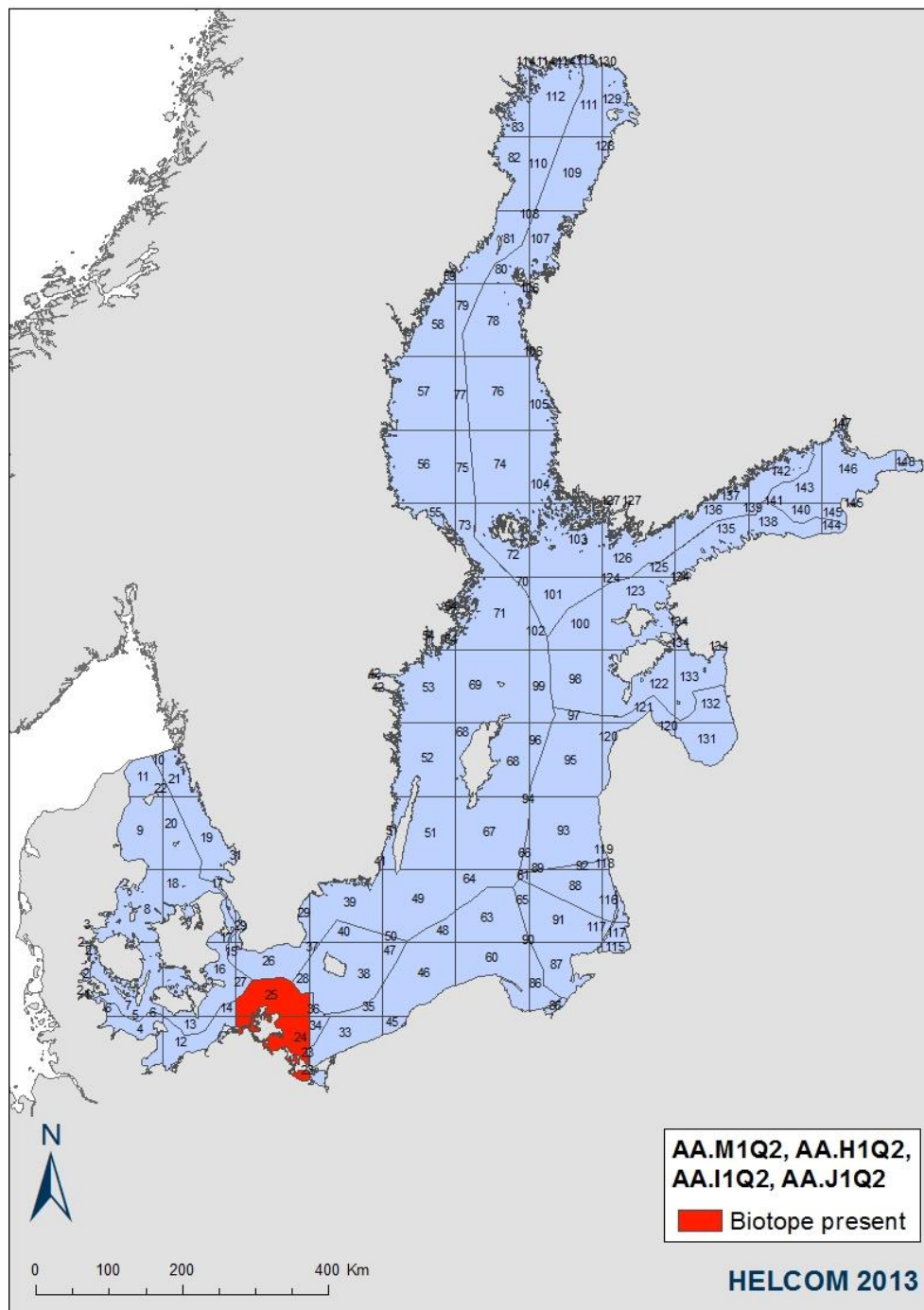
Unattached ball-shaped *Fucus* dwarf form on sandy substrate (left) and fan-shaped of different size on sandy bottom (right) (Photo: Karin Fürhaupter, MariLim GmbH)

The unattached thalli can cover the sediment up to about 10 cm height and thus form a very special three-dimensional habitat comparable to the interstitial space in coarse sediments. Epifauna is seldom attached to the *Fucus* spp. 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.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The *Fucus* spp. dwarf form is known from Sweden, Finland, Germany and Estonia. In all countries plus Poland also unattached *Fucus* spp. occurs widespread in sheltered areas. But it is not clear for each of those countries, if these unattached forms are built of the typical *F. vesiculosus* morphology, the dwarf form or both forms. In Poland the unattached *Fucus* biotope has disappeared from the Puck Lagoon, so it might be difficult to clear this question. Presently this 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 (Vitter Bodden, Kubitzer Bodden, Wieker Bodden). Distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur



BIOTOPE INFORMATION SHEET

Description of Major threats

Observed declines of the spatial distribution of the unattached *Fucus* spp. dwarf form biotopes 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 (OCEANA 2011). In the future climate change (increasing exposure levels, temperatures) or increasing aquaculture in bays may cause additional threats.

Assessment justification

A1

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. As mentioned before for other "Lagoon"-Biotopes, the decline could vary in extent in different Baltic Sea regions with strongest declines in the Western and Southern Baltic Sea. In some bays and lagoons conditions have changed so intensively that the biotope has disappeared completely.

Recommendations for actions to conserve the biotope

Combating 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 the biotope from further decline (HELCOM Website).

Common names

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References

- Bauch R. 1954. Biologisch-ökologische Studien an der Gattung *Fucus*. I. Populationsdynamik der *Fucus*-formen von Hiddensee. *Flora* 142, 1-24: 1-24.
- Bergström, L., Tatarenkov, A., Johannesson, K., Jönsson, R. B., Kautsky, L. (2005). Genetic and morphological identification of *Fucus radicans* sp. nov. (Fucales, Phaeophyceae) in the brackish Baltic Sea. *Journal of Phycology* 41:1025-1038.
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- Overbeck J. 1965. Die Meeresalgen und ihre Gesellschaften an den Küsten der Insel Hiddensee (Ostsee). *bot mar.* Vol VIII, Fasc. 2-4: 218-233.
- Tatarenkov, A., Bergström, L., Jönsson, R. B., Seerao, E. A., Kautsky, L., Johannesson, K. (2005). Intriguing asexual life in marginal populations of the brown seaweed *Fucus vesiculosus*. *Molecular Ecology* 14: 647-651.
- von Oertzen J.-A. 1968. Untersuchungen über die Besiedlung der *Fucus*-vegetation der Gewässer um Hiddensee. *Z. Fischerei NF Bd.* 16, 34: 253-277.

BIOTOPE INFORMATION SHEET

| | | | |
|---|--|---|--------------------------|
| English name: Baltic photic and aphotic maërl beds (unattached particles of coralline red algae) | | Code in HELCOM HUB: AA.D, AB.D | |
| Characteristic species: <i>Lithothamnion</i> spp. and <i>Phymatolithon</i> spp. | | | |
| Past and Current Threats (Habitat directive article 17): Mining and quarrying (C01), Climate change (pH-change M01.04), Construction (wind farms C03.03), Fishing (bottom trawling F02.02.01), Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Mining and quarrying (C01), Climate change (pH-change M01.04), Construction (wind farms C03.03), Fishing (bottom trawling F02.02.01), Eutrophication (H01.05), Random threat factors (–) | |
| Red List Criteria: B1+2a(ii) | Confidence of threat assessment: M, L (AB.D) | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): | | BSEP 113 (HELCOM 2007): Maërl beds under threat and/or in decline in Kattegat | |
| Greater concern stated by: | | | |

Habitat and Ecology

Baltic photic maërl bed bottoms are habitats in the photic zone which have at least 90% coverage of maërl. The term 'maërl' refers to several species of calcareous rhodophyte algae (family *Corallinaceae*, genera *Phymatolithon*, *Lithothamnion*, *Lithophyllum*). Maërl beds form in favourable environmental conditions where the unattached macroalgae form nodules, usually with a diameter <5 cm, and accumulate. Areas where maërl beds occur are generally well ventilated with low levels of turbidity and high salinity. The depth limit of maërl beds is light dependent, beds are often encountered in areas of subdued light conditions, often at depths of 17–22 m.

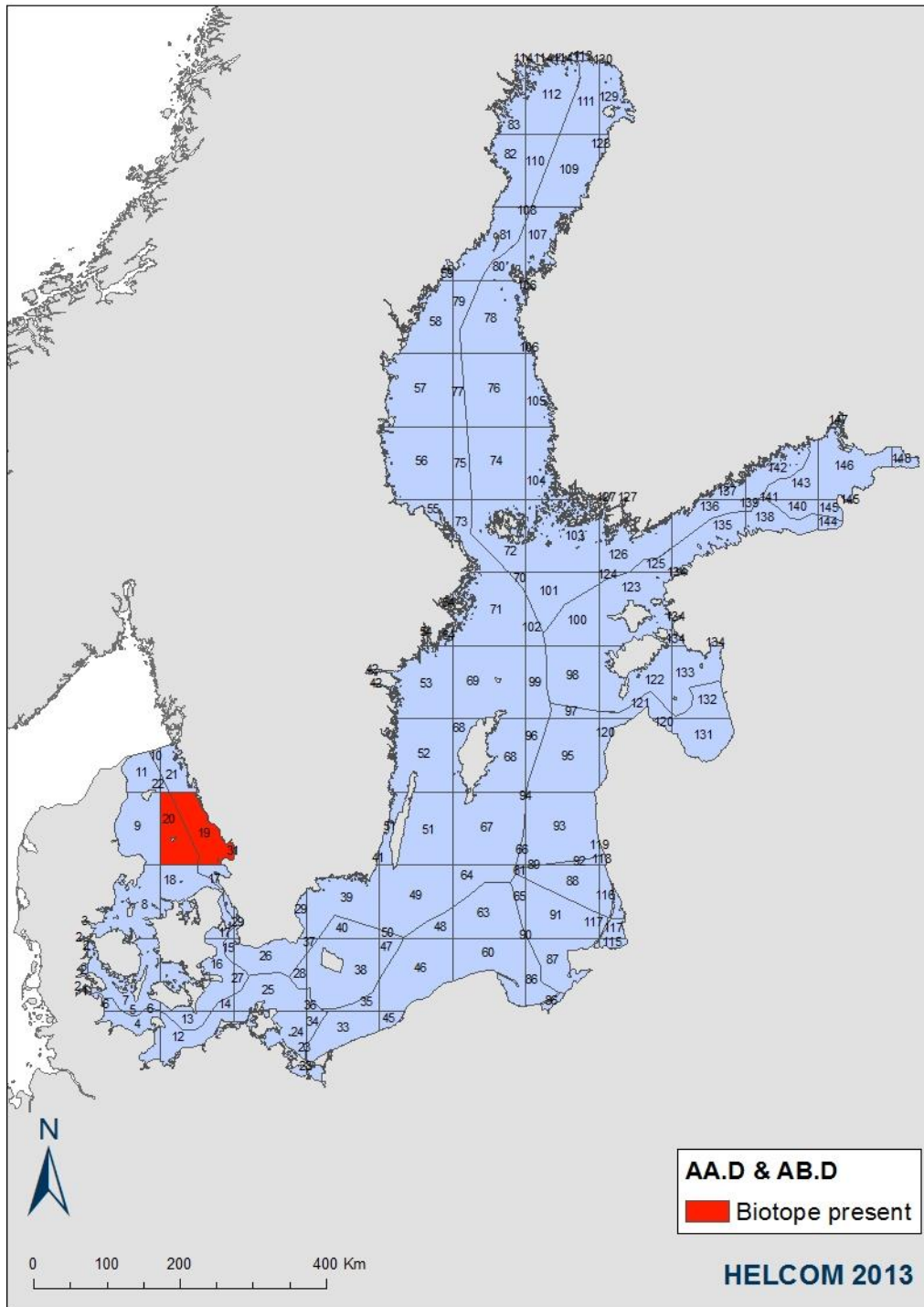
Especially in high latitudes the maërl algae are very slow-growing, resulting to very slow development of maërl beds (Barbera et al. 2003). In fully marine conditions the dominant species is typically *Phymatolithon calcareum*, whilst under variable salinity conditions *Lithothamnion glaciale* may develop beds (OSPAR 2006). Maërl beds are structurally and functionally complex perennial habitats that support a rich species diversity (Barbera et al. 2003). Animals associated with maërl beds include rare crustaceans such as *Corystes cassivelaunus* and *Thia scutellata*, and echinoderms such as *Ophiothrix fragilis* and *Ophiocomina nigra* (OCEANA 2011). In the Baltic Sea these species are only encountered in the Kattegat (HELCOM 2012). The habitat is rare in the Baltic Sea, and occurs somewhat more commonly in the Atlantic.

It is currently not clear if the maërl beds in the aphotic zone can be considered to form an actual habitat, or if aphotic maërl covered areas are merely accumulations of dead algae from the photic zone that are slowly being broken down. It is unclear if the aphotic areas are separate habitats from the photic areas.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Known areas where maërl beds occur are on offshore banks in the Kattegat (e.g. Lilla Middelgrund and Fladen). The presence of dead maërl at some offshore banks indicates that the habitat must have been more widespread in the past. It is unclear how large a proportion of the maërl beds occur in the aphotic zone. Maërl beds have a patchy distribution. The distribution map indicates the area in the 100 x 100 km grid where maërl beds are known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

As the living maërl algae are photosynthesizing and light-dependent. The algae are very sensitive to environmental changes resulting in deprivation of light. Eutrophication is known to increase turbidity, but in the Kattegat eutrophication is not considered to be a severe threat. Other factors causing turbidity include dredging and bottom trawling, activities that disturb the bottom sediment and re-suspend particles. Construction of offshore wind-farms may threaten the habitat, as the wind farms are often planned for shallower off-shore areas which can coincide with the rare maërl bed occurrences.

Historically maërl was commercially extracted to be used as fertilizer, the extraction was mainly carried out in Atlantic occurrences. Extraction mining can still be seen as posing a threat to maërl beds.

The future effects of ocean acidification on maërl beds is still somewhat unclear. Ocean acidification is predicted to have a negative impact on calcified organisms, such as the maërl algae. The regenerative ability of maërl algae is very poor due to a slow growth rate, and the slow growth rate might also make the algae more sensitive to the effects of ocean acidification. The low regenerative potential of maërl beds implies that any negative effects on the quantity and quality of the habitat will be long lasting.

Assessment justification

B1+2a(ii)

The biotope is very rare and is only known to occur in less than 20 locations within a 20 000 km² area in the Kattegat. Water clarity is not inferred to improve, and the uncertain effects of ocean acidification on the habitat are seen as a continuing decline in environmental quality that is relevant to the biotope.

Recommendations for actions to conserve the biotope

Maërl grounds should be regarded as effectively non-renewable resources. Commercial extraction of maërl beds should not be expanded and using fishing gears that damage the maërl beds should be restricted. Further permits for the siting of aquaculture units above maërl grounds should not be granted and the impacts that might affect water quality.

Common names

Maërl beds, rhodolith beds

References

- Barbera, C., Bordehore, C., Borg, JA, Glemarec, M., Grall, J., Hall-Spencer, JM., De la Huz, C., Lanfranco, E., Lastra, M., Moore, PG., Mora, J., Pita, ME., Ramos-Espla, AA., Rizzo, M., Sanchez-Mata, A., Seva, A., Schembri, PJ., Valle, C. 2003. Conservation and management of northeast Atlantic and Mediterranean maerl beds. *Aquatic Conservation-marine And Freshwater Ecosystems* 13: 65–76.
- Grall, J., Le Loc'h, F., Guyonnet, B., Riera, P. 2006. Community structure and food web based on stable isotopes (delta N-15 and delta C-13) analysis of a North Eastern Atlantic maerl bed. *Journal Of Experimental Marine Biology And Ecology* 338(1): 1–15.
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- OCEANA (2011). Conservation proposals for ecologically important areas in the Baltic Sea. http://oceana.org/sites/default/files/reports/OCEANA_Baltic_report_2011_ENG.pdf

BIOTOPE INFORMATION SHEET

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|---|---|---|--------------------------|
| English name: Baltic aphotic hard clay dominated by <i>Astarte</i> spp. | | Code in HELCOM HUB: AB.B1E4 | |
| Characteristic species: <i>Astarte borealis</i> , <i>Astarte elliptica</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Climate change (M), Random threat factors (-) | |
| Red List Criteria: B2c(ii) | Confidence of threat assessment: M | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.3.1 Hard clay bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope is characterized by species preferring cold and saline water. The near bottom water exhibits a salinity range between 10 and 15 psu, a temperature between 3 and 8 °C and relatively good oxygen conditions (Jan Warzocha pers. comm.)

The easternmost occurrence for clams *Astarte borealis* and *Astarte elliptica* is in the Baltic Sea. In the biotope they predominated in terms of biomass, often contributing about 70–90% of the total biomass (Jan Warzocha pers. comm.).

For ecological purposes, hard clay can be considered to be a hard substrate (HELCOM 1998). Very few macrofauna species have the capacity to burrow into the substrate. Hard clay substrates are mostly known to occur mostly in high energy environments.

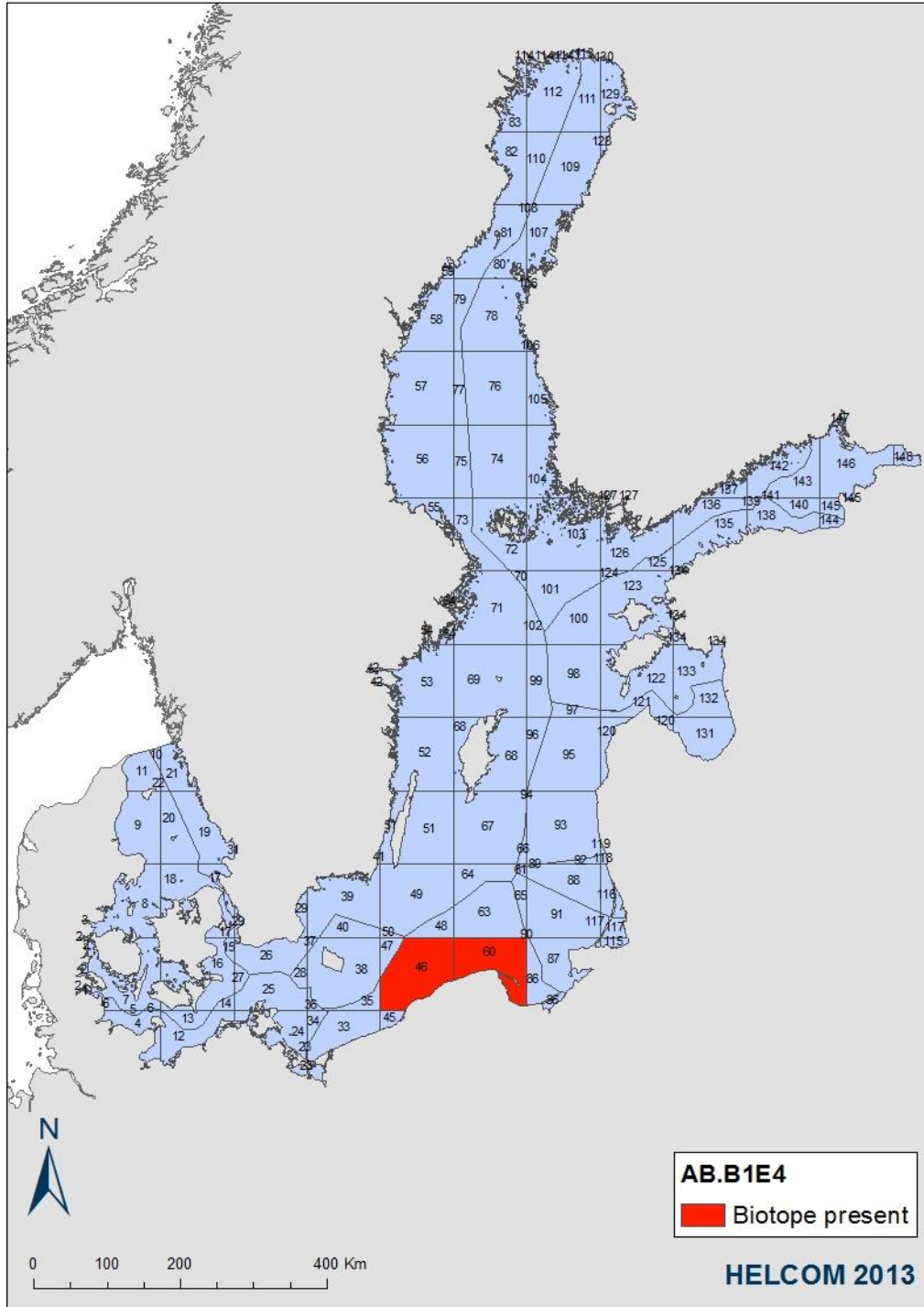


Biotope AB.B1E4 Aphotic hard clay dominated by *Astarte* spp. (Photo Jan Warzocha)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Known from German and Polish waters in the Baltic Sea. Aphotic hard clay dominated by *Astarte* spp. occurs on the sills (thresholds) of the Słupsk Furrow that connects the Bornholm Deep with the Gotland Deep and Gdańsk Deep. Distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur



BIOTOPE INFORMATION SHEET

Description of Major threats

The biotope is characterized by species that require oxic conditions and rather cold and saline water. In the deep areas where the biotope occurs, anoxia is widespread due to eutrophication and low water turnover (HELCOM 2013). Eutrophication has posed a severe threat to the biotope in the past and is likely to also affect the biotope in the future. In the future the changes brought about by climate change are also potential major threats. In the Baltic Sea region climate change is predicted to increase the amount of rain which in turn may cause the salinity to drop in the Baltic Sea. Also a predicted warmer mean temperature may adversely affect the *Astarte* spp. clams that are characteristic to the biotope.

Assessment justification

B2c(ii)

The biotope is red listed due to the very limited area of occupancy. The area of occupancy is assessed to be ≤ 20 10x10km grid cells and the biotope occurs in 5 or fewer locations.

Recommendations for actions to conserve the biotope

Only limited information is available on the biotope, its distribution and persistence. Intensifying the biotope monitoring programs in the region is important in order to better understand the biotope and the conservation needs.

The distribution of the biotope is restricted and patchy. Minimizing anthropogenic pressures from construction and deep water pollution by hazardous substances will reduce the risk of the patches of the biotope disappearing due to random threat effects, such as variation in the reproduction and recruitment success of the clams.

All actions reducing eutrophication and counteracting climate change are beneficial in a conservation perspective for the biotope.

Common names

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References

- HELCOM (1998) Red list of marine and coastal biotopes and biotope complexes of the Baltic Sea, Belt Sea and Kattegat. Balt Sea Environ. Proc. No 75
- HELCOM (2007) HELCOM lists of threatened and/or declining species and biotopes/habitats in the Baltic Sea. Balt. Sea Environ. Proc. No 113
- HELCOM (2013) Approaches and methods for eutrophication target setting in the Baltic Sea region. Balt. Sea Environ. Proc. No. 133
- Jan Warzocha personal communication, National Marine Fisheries Research Institute (Poland), (9.4.2013)

BIOTOPE INFORMATION SHEET

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|---|---|---|--------------------------|
| English name: Baltic aphotic muddy sediment dominated by <i>Astarte</i> spp | | Code in HELCOM HUB: AB.H3L5 | |
| Characteristic species: <i>Astarte</i> spp. | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Climate change (M) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.7.1 Muddy bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope consists of Baltic aphotic zone bottoms with at least 90% coverage of muddy sediment. *Astarte* spp. constitutes at least 50% of the biomass. The biotope is characterized by *Astarte* spp. These bivalve species prefer cold and saline water and therefore the biotope is only found in areas where the near bottom water exhibits a salinity range between 10 and 15 psu, a temperature between 3 and 8 °C and relatively good oxygen conditions.

Astarte borealis is resistant to anoxic conditions, however recurring and long lasting anoxia is fatal. Ideal depth for *Astarte borealis* is around 20 meters, but in the easternmost occurrences in the Baltic Sea outside Poland the bivalve occurs only at depths of 60–70 meters where the salinity is high enough. As an arctic-boreal species, *Astarte borealis* appears in these Baltic biotopes at its southern limit (Zettler 2002).

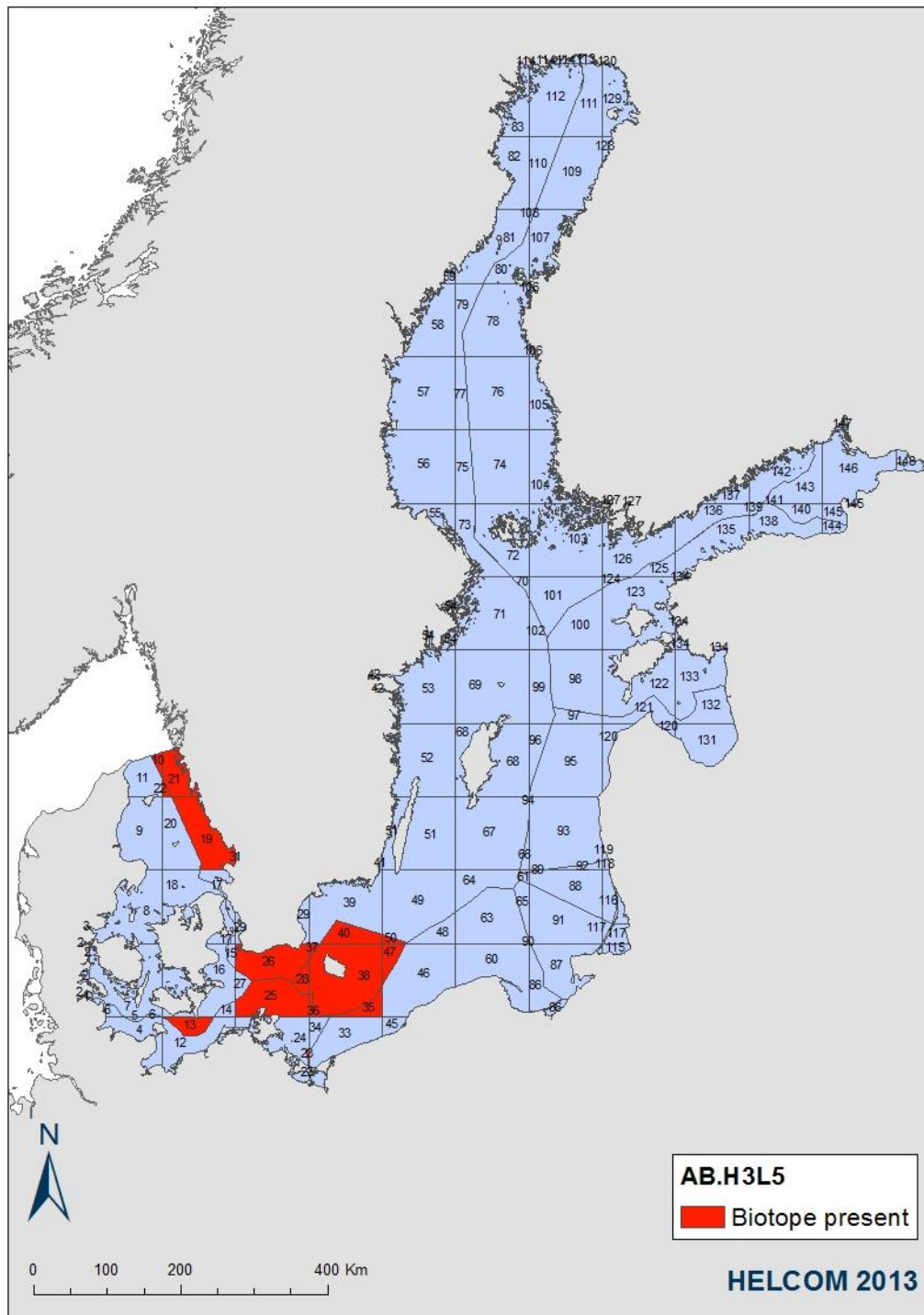


Astarte spp. on mixed sediments (Photo Karin Fürhaupter, MariLim GmbH)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The *Astarte borealis* is found in the Western parts of the Baltic Sea, it's most eastern populations appearing in the Bornholm Basin. Dense populations of the *Astarte elliptica* were common on the muddy sediments of the Kiel Bay at depths greater than 15 meters (Trutschler & Samtleben 1988). The distribution map indicates the area in the 100 x 100 km grid where environmental conditions required by the biotope are known to occur and the biotope is estimated to occur in the grid cells.



BIOTOPE INFORMATION SHEET

Description of Major threats

The main anthropogenic threat of the habitat is eutrophication and the anoxia of the bottoms that follows. Even though resistant to anoxic conditions, longer and repetitive periods can kill or diminish the species (*Astarte borealis*) (Zettler 2002).

Assessment justification

A1

Oxygen depletion is inferred to have decreased the available muddy deep bottoms inhabited by *Astarte* spp. by more than half.

Recommendations for actions to conserve the biotope

All actions to reduce eutrophication of the Baltic Sea are important for the conservation of the habitat.

Common names

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References

- Trutschelt, K., Samtleben, C. (1988). Shell growth of *Astarte elliptica* (Bivalvia) from Kiel Bay (Western Baltic Sea). *Marine Ecology progress Series* 42: 155-162.
- Zettler, M. (2002). Ecological and morphological features of the bivalve *Astarte borealis* (Schumacher 1817) in the Baltic Sea near its geographical range. *Journal of Shellfish Research* 21: 33-40.

BIOTOPE INFORMATION SHEET

| | | | |
|--|---|--|--------------------------|
| English name: Baltic aphotic muddy sediment characterized by sea-pens | | Code in HELCOM HUB: AB.H2T1 | |
| Characteristic species: <i>Virgularia mirabilis</i> , <i>Pennatula phosphorea</i> | | | |
| Past and Current Threats (Habitat directive article 17): Fishing (bottom trawling F02.02.01), Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Fishing (bottom trawling F02.02.01), Eutrophication (H01.05) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.7.1 Muddy bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): Sea-pen communities are under threat and/or in decline in Kattegat. | |
| Greater concern stated by: | | | |

Habitat and Ecology

The habitat is characterized by aphotic zone bottoms with at least 90% coverage of muddy sediment. The biotope is characterized by conspicuous populations of sea pens that usually live scattered over the sea floor and cover less than 10% of the muddy surface. The biotope occurs typically from 15 to 200 meters' depth. It appears in low to moderate energy exposure classes in full marine salinities (>30 psu). To properly identify the biotope both grab samples and visual surveys are often needed as the sea pens are not adequately sampled by typical infauna sampling methods.

These deep water communities are crucially important to the function of the ecosystem. They provide food and shelter for many other species, including commercially important fish. In the Baltic Sea the most common sea pens are *Virgularia mirabilis* and *Pennatula phosphorea*. *Virgularia mirabilis* is found in sheltered areas with soft bottoms such as fine, muddy sand or mud in depths below 10 meters. It lives in colonies partly embedded in the sediment (Bay-Nouailhat 2008a) and can form colonies up to 60 cm tall (Hill and Wilson 2000). *Pennatula phosphorea* forms erect colonies up to 40 cm tall. Only the upper part of the stem is visible, the rest being embedded in sediments (Bay-Nouailhat 2008b). It lives in muddy bottoms, usually below 15 meters (Moen & Svensen 2004).

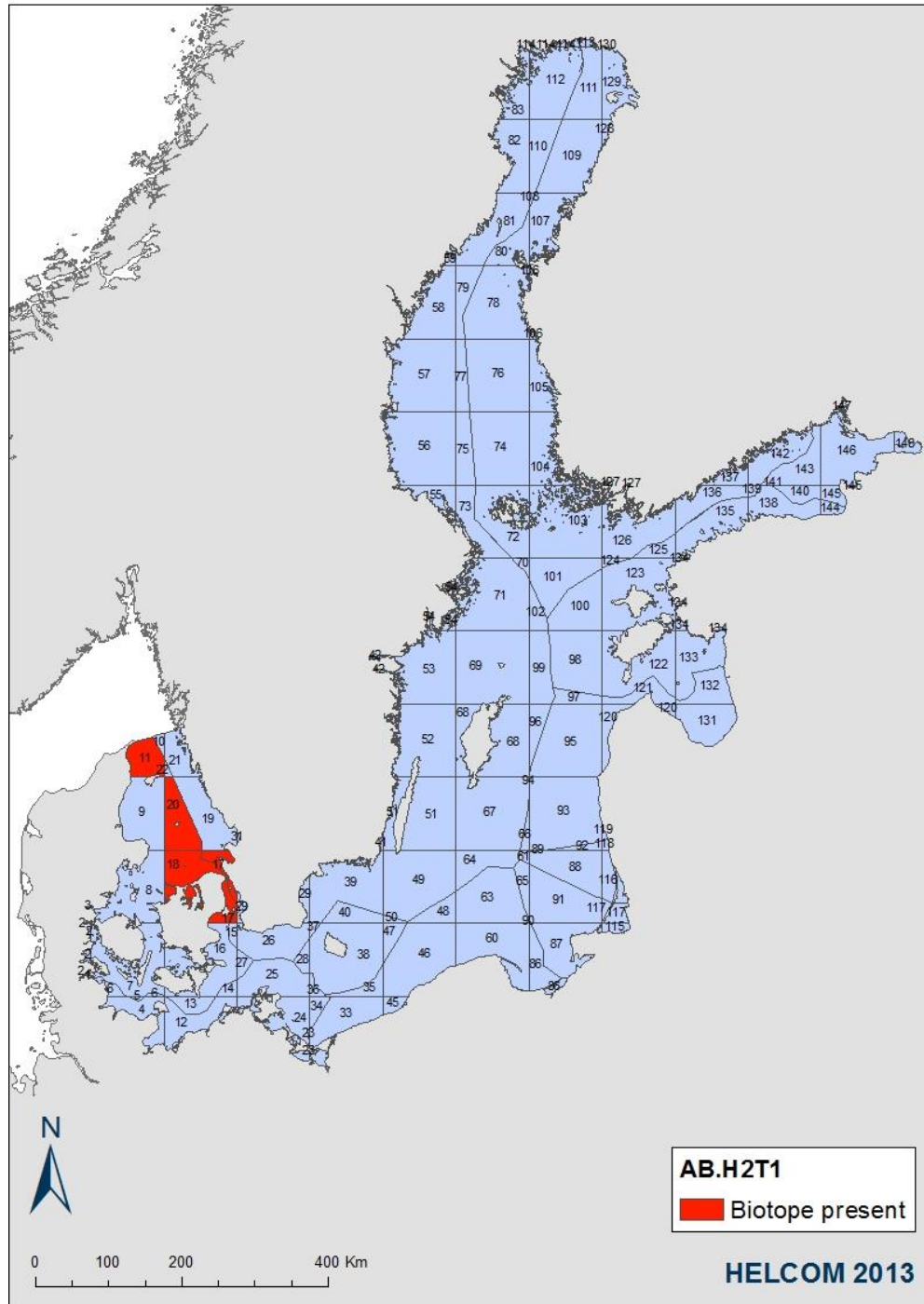


Underwater video images of sea pens living scattered on soft substrates near the island of Ven. The biotope should be sampled using visual methods (Photo Johan Näslund)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Because of its salinity and depth requirements, this habitat occurs mostly in the deeper parts of Kattegat. The most common sea pen species *Virgularia mirabilis* and *Pennatula phosphorea* has been observed for example in the deep trenches of the Kattegat (The Kattegat trench, the Ddupa Rännan trench), in the Groves Flak and near the island Ven in the Sound. The habitat has likely suffered from bottom trawling as trawling marks and badly disturbed seabeds has been recorded in the area of their distribution. Distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

The main anthropogenic threat for the habitat is bottom trawling, and also events of oxygen depletion caused by eutrophication. Bottom touching fishing gear extensively disturbs the habitat in terms of area and quality (OSPAR 2008). The sea pen biotope is negatively affected both by the direct physical disturbance of the fishing activities, and is also likely to be affected indirectly by increased siltation following the fishing activities.

Assessment justification

A1

The amount of undisturbed soft sediment area in the region where sea pens are known to occur has decreased significantly. Some of the areas are intensively trawled and the sediments are disturbed several times a year, which does not give enough time for the sea pen biotope to recover as they have a relatively slow growth rate. Over half of the area classified as the biotope characterized by muddy sediments and sea pens is inferred to have been destroyed in the past 50 years.

Recommendations for actions to conserve the biotope

Prohibiting bottom trawling in the areas where sea pen biotopes are known to remain is the most efficient method to conserve the biotope and enable it to slowly recover in areas where fishing activities has made it collapse. The Kattegat trenches should be prioritized for protection as they provide the most important distribution areas for this biotope. Strengthening the fishing restrictions, especially regarding bottom trawling, in the network of marine protected areas in the Kattegat and increasing protected areas to include sea pen biotopes would help to prevent the biotope from collapsing on a Baltic Sea scale.

Common names

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References

- Bay-Nouailhat W., (2008a). Description of *Virgularia mirabilis*, Available at: <http://www.european-marine-life.org/05/virgularia-mirabilis.php> (viewed 28 May 2013).
- Bay-Nouailhat W., (2008b), Description of *Pennatula phosphorea*, Available at: <http://www.european-marine-life.org/05/pennatula-phosphorea.php> (viewed 28 May 2013).
- HELCOM (1998). Red List of marine and coastal biotopes and biotopes complexes of the Baltic Sea, Belt Sea and Kattegat. Baltic Sea Environmental Proceedings No. 75. Helsinki Commission, Helsinki. 115pp. Available at: <http://www.helcom.fi/stc/files/Publications/Proceedings/bsep75.pdf>
- Hill, J. and Wilson E. (2000) *Virgularia mirabilis*. Slender sea pen. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 11/07/2013]. Available at: <http://www.marlin.ac.uk/speciesfullreview.php?speciesID=4579>
- Moen, F. E., Svensen, E. (2004). Marine fish & invertebrates of Northern Europe. KOM, Kristiansund. 608pp.
- OSPAR 2008. OSPAR List of Threatened and/or Declining Species and Habitats.

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|--------------------------|
| English name: Baltic aphotic muddy sediment dominated by <i>Haploops</i> spp. | | Code in HELCOM HUB: AB.H112 | |
| Characteristic species: <i>Haploops</i> spp. The Ostracod <i>Philomedes brenda</i> and the brittle star <i>Ophiura robusta</i> often co-occur | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Fishing (bottom trawling F02.02.01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Fishing (bottom trawling F02.02.01) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.7.1 Muddy bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

Haploops are small crustacean amphipods living in the deep bottom sediments in tubes of mud and clay that are a few centimetres high. The two *Haploops* spp. species populating the habitat in the Baltic Sea are *Haploops tenuis* (EN; B1ab(i,ii),B2ab(ii,iii)) and *Haploops tubicola* (VU; B1ab(i,iii), B2ab(ii,iii)).

Haploops spp require high salinities (22–34 psu) restricting their Baltic Sea distribution to the very western most parts (Göransson et al. 2010). In the Kattegat the biotope regularly occurs below the halocline, often encountered at a depth of 15 meters. In the HELCOM area the depth range of the biotope is 20–130 m (HELCOM SIS invertebrates). Water movement is relatively limited at the deep soft substrate bottoms, which is thought to be a favourable environment for the small tube-building amphipods (Göransson et al. 2010). The soft sediment biotope dominated by *Haploops* spp. looks like a dense mat of small tubes. The *Haploops* spp. amphipods live inside the tube and catch food particles by sticking out their antennae and legs from the tube, they mainly feed on plankton. The biotope and the *Haploops* amphipods are in turn important feeding grounds for s for many species of fish such as cod and several species of flatfish. Tube worms, sea urchins and brittle stars also occur in the biotope.

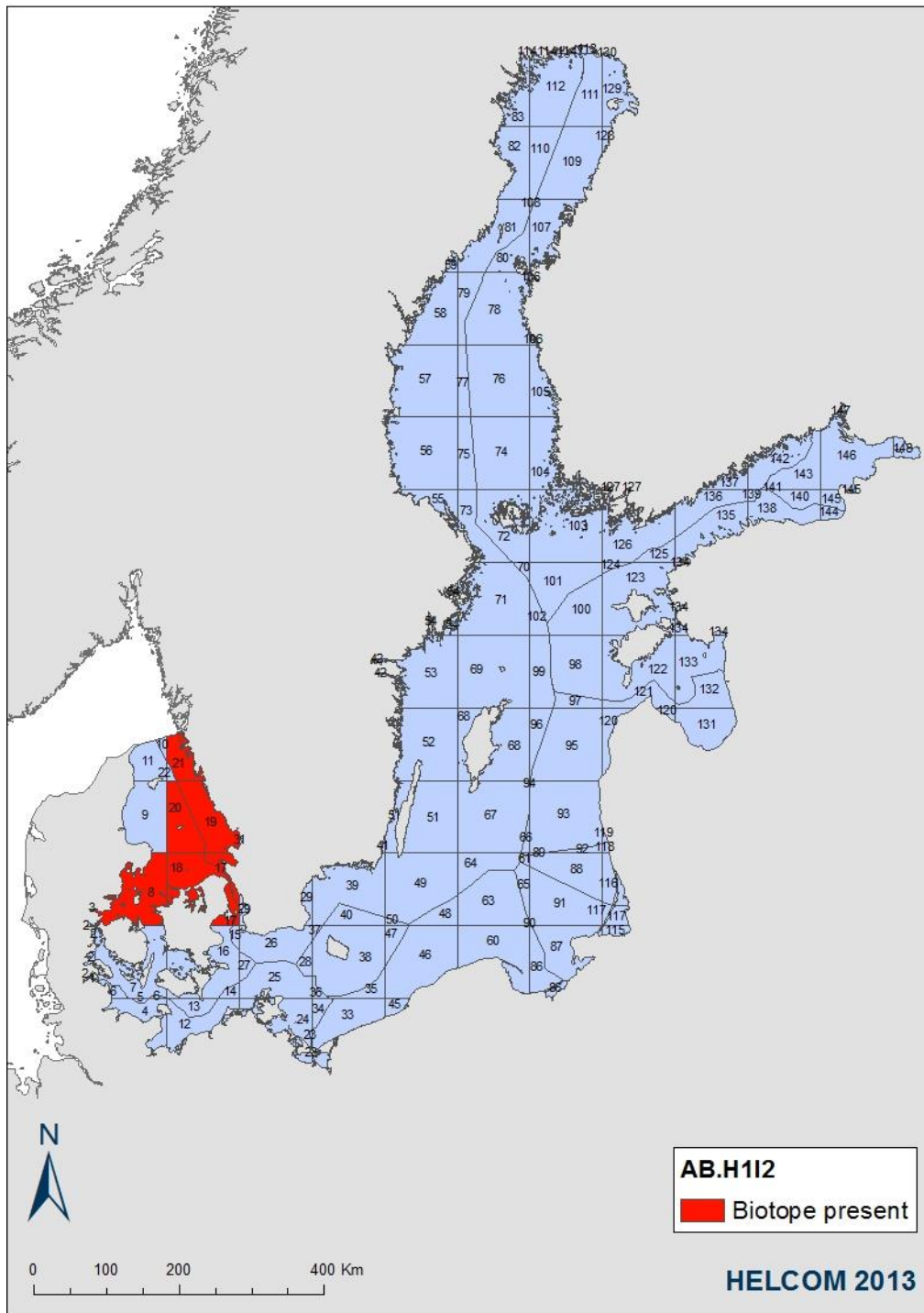


Haploops tubicola (left) and *Haploops tenuis* (right). Photos by Peter Göransson.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope dominated by *Haploops* spp. occur in the Kattegat, the Great Belt and, particularly, the Sound (OCEANA 2011). The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur



BIOTOPE INFORMATION SHEET

Description of Major threats

Bottom trawling has a direct impact on the substrate and is believed to have caused the decline of the *Haploops* spp. communities to some extent in the Belt Sea and Kattegat area (Göransson et al. 2010). Bottom trawling activities have been on-going for a long period of time in the areas where the *Haploops* spp. community has been replaced by a brittle star community (Göransson et al. 2010). Bottom trawling is however not likely to be the only cause for the past decline as the practice is currently forbidden in the area.

Periodic anoxia occurs in the areas where the muddy *Haploops* spp. dominated biotope occurs. The anoxia in the region is believed to occur due to restricted water movement and unusual water stratification, possibly due to changing climatic conditions (Göransson et al. 2010). Increasing temperatures have been noted in the area (Göransson et al. 2010).

Pollution by various hazardous substances can affect the deep muddy biotopes dominated by *Haploops* spp. biotopes. Accumulation bottoms, where hazardous substances accumulate, are rare in the generally shallow Belt Sea area. Accumulation bottoms are typically muddy, so they may coincide with the muddy *Haploops* spp. biotope.

Assessment justification

A1

The biotope abundance has decreased significantly since the 1960's when the biotope is believed to have occurred abundantly at depths greater than 15 meters in the south eastern Kattegat, from Landskrona to Helginborg and the northernmost Öresund (Göransson et al. 2010). In recent years the biotope has declined drastically, and is now encountered north of the Ven island in Öresund (Göransson et al. 2010).

Recent studies in the Sound have shown that *Haploops* spp. dominated communities are being replaced by brittle star communities (Amphiura). This development may already have taken place in the south-eastern Kattegat where Amphiura communities are currently found where *Haploops* spp. communities used to dominate (Göransson et al. 2010). The reproductive capacity of the *Haploops* community appears to be low, giving cause for concern as to the future development of the community (Göransson et al. 2010).

The actual reason for the decline in abundance is yet unknown. A significant decline has, however, also been reported from Skagerrak.

Recommendations for actions to conserve the biotope

Bottom trawling restrictions in Öresund and Kattegat need to be enforced, so that also sporadic illegal trawling activities are stopped (Göransson et al. 2010). AIS should become mandatory for all trawling fishing vessels to facilitate monitoring. Bottom areas deeper than 20 meters in Öresund should be protected from invasive fishing and other similar activities.

Including the small area in Öresund where the *Haploops* spp. biotope occurs, in the Knähaken marine protected area south to the Helsingborg municipality border would benefit the biotope. Furthermore, the bottom areas around Ven island should be mapped and potentially protected.

Common names

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BIOTOPE INFORMATION SHEET

References

Göransson P, Bert ilsson-Vuksan, S., Karlfelt, J., Börjesson L. (2010). Haploops-samhället och Modiolus-samhället utanför Helsingborg 2000- 2009. Miljönämnden i Helsingborg.

OCEANA (2011). Conservation proposals for ecologically important areas in the Baltic Sea.

http://oceana.org/sites/default/files/reports/OCEANA_Baltic_report_2011_ENG.pdf

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|--------------------------|
| English name: Baltic Sea aphotic pelagic below halocline oxic | | Code in HELCOM HUB: AE.O5 | |
| Characteristic species: | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Climate change (reduced water mass exchange M01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Climate change (reduced water mass exchange M01.05) | |
| Red List Criteria: A3 | Confidence of threat assessment: L | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "2" Heavily endangered 1.1.2 Offshore (deep) waters below the halocline | | BSEP 113 (HELCOM 2007): Offshore (deep) waters below the halocline under threat and/or in decline everywhere where they occur. | |
| Greater concern stated by: | | | |

Habitat and Ecology

This pelagic habitat occurs below the permanent halocline which is a characteristic feature of the Baltic Proper. The permanent halocline is usually encountered at depths of 60–80 m. Below the halocline the salinity is typically >12 psu and due to the depth of the permanent halocline this biotope is generally only found in the aphotic zone. This implies that the biotope is mainly populated by a community of marine zooplankton. The copepod *Oicopleura dioica* which has been found in high abundances just below the halocline and down to depths where the oxygen concentration is 1 mL/L⁻¹ is a typical example of a species utilizing the higher salinity water below the halocline in the Bornholm Basin (Schulz & Hirche 2007). Copepods in the biotope are believed to feed on organic matter, ciliates and heterotrophic flagellates that can be found in the water layer (Schulz & Hirche 2007).

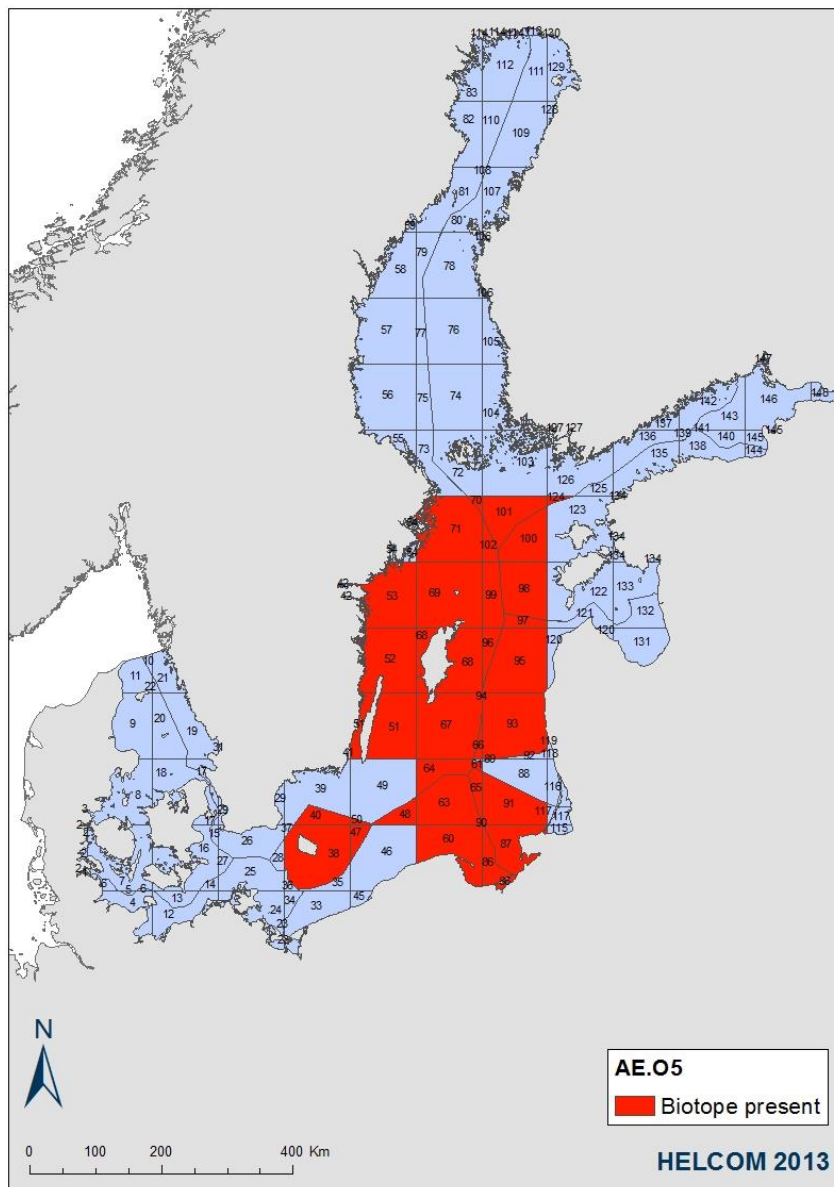
In the areas around the Danish sounds a semi-permanent halocline can sometimes be found, however this halocline is not considered to be a stable habitat forming feature.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The volume of the oxic watermass below the permanent halocline varies. The habitat occurs as a layer of water in the Baltic Proper at a depth usually below 60–80 meters where the permanent halocline is usually found. Due to the variable influx of saltwater from the Atlantic through the Danish sounds and the river run-off that provides the Baltic Sea with fresh water, the depth of the halocline can vary. At times the halocline and the oxic water below reaches into the Gulf of Finland. The thickness of the oxic watermass below the halocline varies mainly due to the spread of the anoxic waterlayer below. The anoxic waterlayer spreads and thickens due to eutrophication, decreasing both the vertical and horizontal distribution of the oxic watermass.

The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur. The habitat only makes up a section of the pelagic water mass in the area indicated by the map. The map is created based on the bathymetric data of the Baltic Proper. According to the depth contours, the grid indicated on the map include areas deeper than 60-80m.



BIOTOPE INFORMATION SHEET

Description of Major threats

The most severe threat for this habitat is the expansion of the deep anoxic water mass due to eutrophication. Eutrophication leads to an increased sedimentation of organic matter in the deep parts of the Baltic Proper. Microbial decomposition of the matter requires oxygen and when the amount of organic matter is large this may lead to oxygen depletion. The habitat is delineated based on the occurrence of oxygen, so the spread of anoxia directly affects the quantity of the habitat. Other chemical pollutants may further degrade the quality of the habitat. The stratification of the Baltic Sea and the shallow Danish straits restricting the water exchange with the Atlantic ocean

Assessment justification

A3

The oxygenic watermass below the halocline is estimated to have declined by more than 70% during the past 100 years for which there is measured data available on the depth of the halocline and the depth of the anoxic zone (Figure 1.).

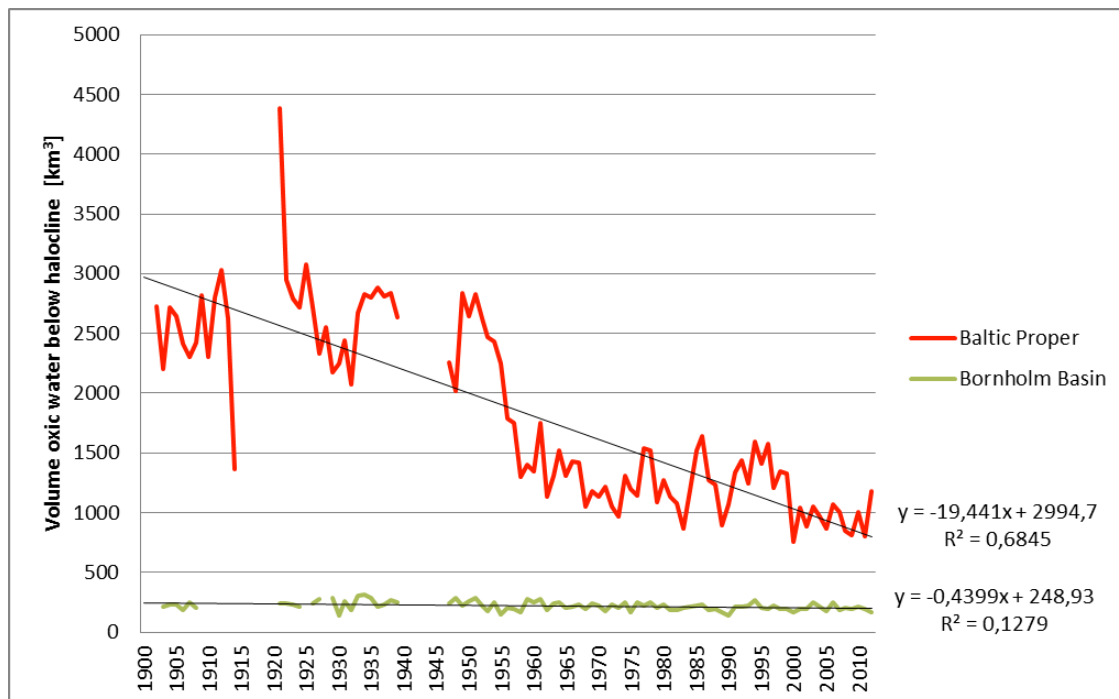


Figure 1. The oxic water volume below the halocline has been calculated as a five year average based on data previously published in the TARGREV report (HELCOM 2013).

The spread of the anoxic watermass in the deep parts of the Baltic Sea has been intensively studied. If the data is analysed for the past 50 years the decline does not indicate a very high threat category, however periodically the depth of the anoxic watermass has been recorded encountered at similar depths as the permanent halocline.

Recommendations for actions to conserve the biotope

All actions that reduce the eutrophication level of the Baltic Sea will support persistence and possible spread of oxic water below the permanent halocline. Actions that reduce eutrophication include agricultural measures that reduce nutrient run-off and efficient waste water treatment plants.

Common names

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BIOTOPE INFORMATION SHEET

References

- HELCOM (1998). Red List of Marine and Coastal Biotopes and Biotope Complexes of the Baltic Sea, Belt Sea and Kattegat - Including a comprehensive description and classification system for all Baltic Marine and Coastal Biotopes. Baltic Sea Environment Proceedings No. 75. Helsinki Commission, Helsinki. 115 pp. Available at: <http://www.helcom.fi/stc/files/Publications/Proceedings/bsep75.pdf> (viewed 28 May 2013)
- HELCOM (2013) Approaches and methods for eutrophication target setting in the Baltic Sea region. Baltic Sea Environmental Proceedings No.133.
- Schulz, J., Hirche, H-J. (2007) Living below the halocline: strategies of deep-living species in the highly stratified brackish Bornholm Basin (central Baltic Basin). *Journal of Plankton Research* 29(10):881-894

BIOTOPE INFORMATION SHEET

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|--|---|---|--------------------------|
| English name: Baltic photic peat bottom | | Code in HELCOM HUB: AA.G | |
| Characteristic species: <i>Barnea candida</i> , <i>Zirfaea crispata</i> , macrophytes may occur | | | |
| Past and Current Threats (Habitat directive article 17): Construction (D03.03, dredging J02.02.02, coastal defence J02.12.01), Eutrophication (H01.05), Contaminant pollution (H03) | | Future Threats (Habitat directive article 17): Construction (D03.03, dredging J02.02.02, coastal defence J02.12.01), Eutrophication (H01.05), Contaminant pollution (H03), Random threat factors (-) | |
| Red List Criteria: B2(b) | Confidence of threat assessment: M | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.11.1 Sublittoral peat bottoms "P" Potentially endangered 2.11.2 Hydrolittoral peat bottoms | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope is formed by least 90% coverage of peat bottoms in the photic zone. 8 000 years ago the water level of the Baltic Sea raised more than 20 m (*Littorina*-Transgression) resulting in flooding of large terrestrial areas between Germany and Denmark characterized by forests, mires (swamps) and sparsely human settlements (Leipe et al. 2011). In the following evolution time of the Baltic Sea those substrata were covered by marine sediments. Marine erosion processes along the German and Danish coastline have laid those subfossile substrates bare.

The natural history of this biotope determines that it exists only in Germany and Denmark at salinity ranges between 7 and 18 psu and at all exposure classes. The vertical depth distribution ranges from 0 to about 20 m.



Protruding peat bottom rim/edge at Zingst,
Mecklenburg- Western Pomerania (Photo: K.
Fürhaupter, MarILim GmbH)

Knowledge about this specific biotope is scarce but the surface can be covered by filamentous annual algae and single juvenile *Fucus* spp. or *Chorda* spp. specimens. But normally peat bottom lacks

BIOTOPE INFORMATION SHEET

epibenthic communities and only some specialized burrowing bivalves like *Barnea candida* or *Zirfaea crispata* may penetrate into peat bottom (Stresemann et al. 1992).

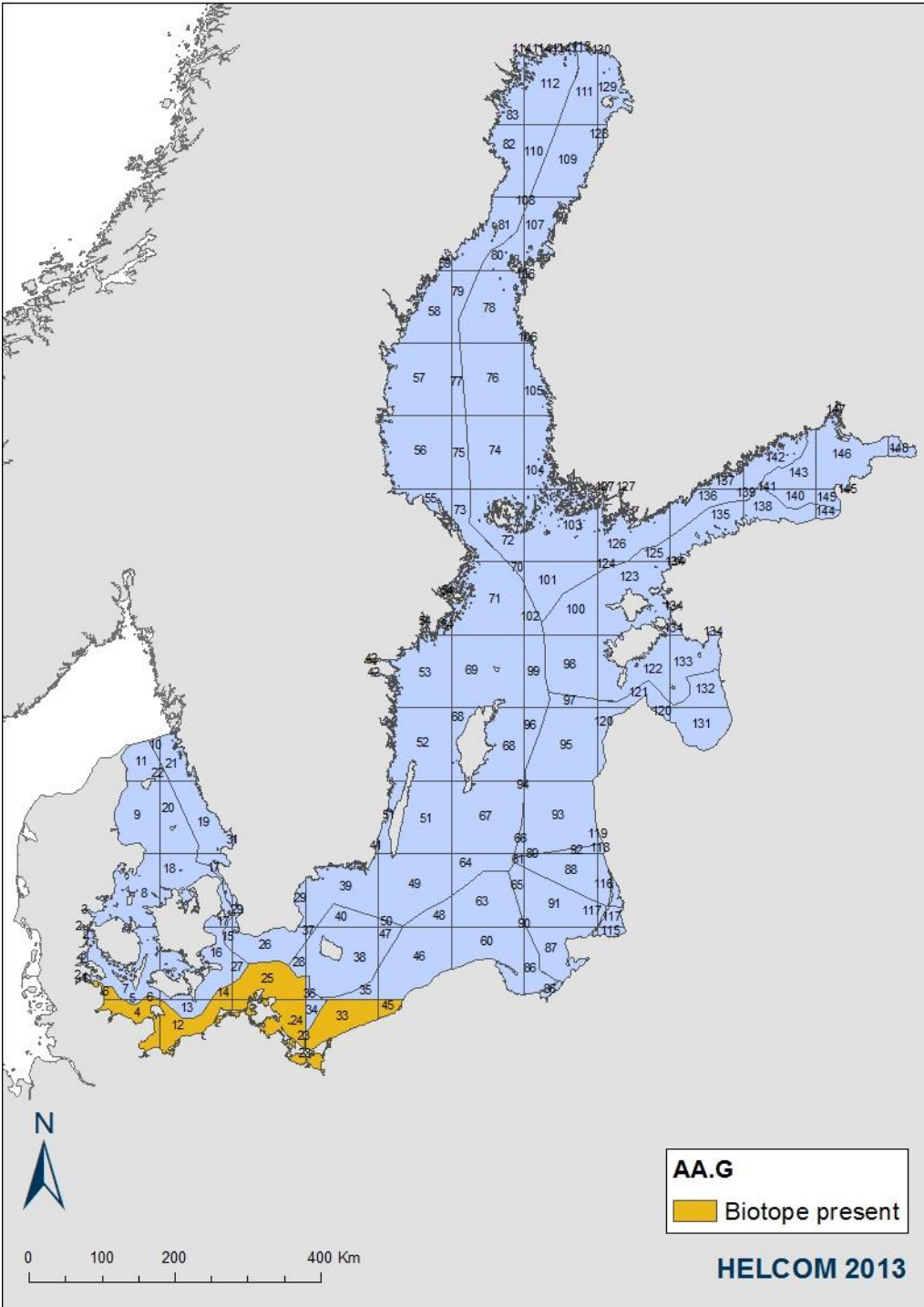


Peat bottom with enclosed wood piece and attached juvenile *Fucus* spp., *Chorda filum* and filamentous algae (Photo: Karin Fürhaupter, MariLim GmbH)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The peat bottom biotope is distributed mainly in the Western and Southern Baltic Sea in the Bay of Mecklenburg and to a lesser extent also in the Kiel Bay. The spatial restriction is due to natural history of the subfossile substrates. Distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Information about the biotope itself and its major threats are scarce but all threats causing physical disturbance to bottom sediments (bottom trawling, construction work, sand and gravel extraction, and coastal defence) may have negative effects on the biotope.

Assessment justification

B2b

The classification of the biotope is caused by a general rarity of the substrate "peat bottom" and the spatial restriction to a specific and comparable small area of the Baltic. AOO is less than 50 as the environmental conditions (subfossile bottom morphology and currents) to enable peat bottoms, exist only within very few and spatially restricted localities.

Recommendations for actions to conserve the biotope

All actions to reduce physical disturbance of peat bottoms in the Baltic Sea are important for the conservation of this biotope.

Appointing areas where the biotope is known to occur as protected sites, where bottom trawling, construction works and exploitation of marine soil resources like sand or gravel is prohibited, would constitute an effective conservation measure.

Common names

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References

Stresemann E., Hannemann H.-J., Klausnitzer B. Senglaub K. 1992. Exkursionsfauna von Deutschland. Band 1, Wirbellose (ohne Insekten). Volk und Wissen Verlag gmbH Berlin.

Leipe, T., Moros, M, Tauber, F.(2011). Die Geschichte der Ostsee. IOW, Leibniz Institute for Baltic Sea Research, Warnemünde. Available at: <http://www.io-warnemuende.de/geschichte-der-ostsee-2489.html> (viewed 24th July)

BIOTOPE INFORMATION SHEET

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|--|---|---|--------------------------|
| English name: Baltic aphotic sand dominated by ocean quahog (<i>Arctica islandica</i>) | | Code in HELCOM HUB: AB.J3L3 | |
| Characteristic species: <i>Arctica islandica</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Mining (sand and gravel extraction C01.01) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered: 2.5.1 Sandy bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

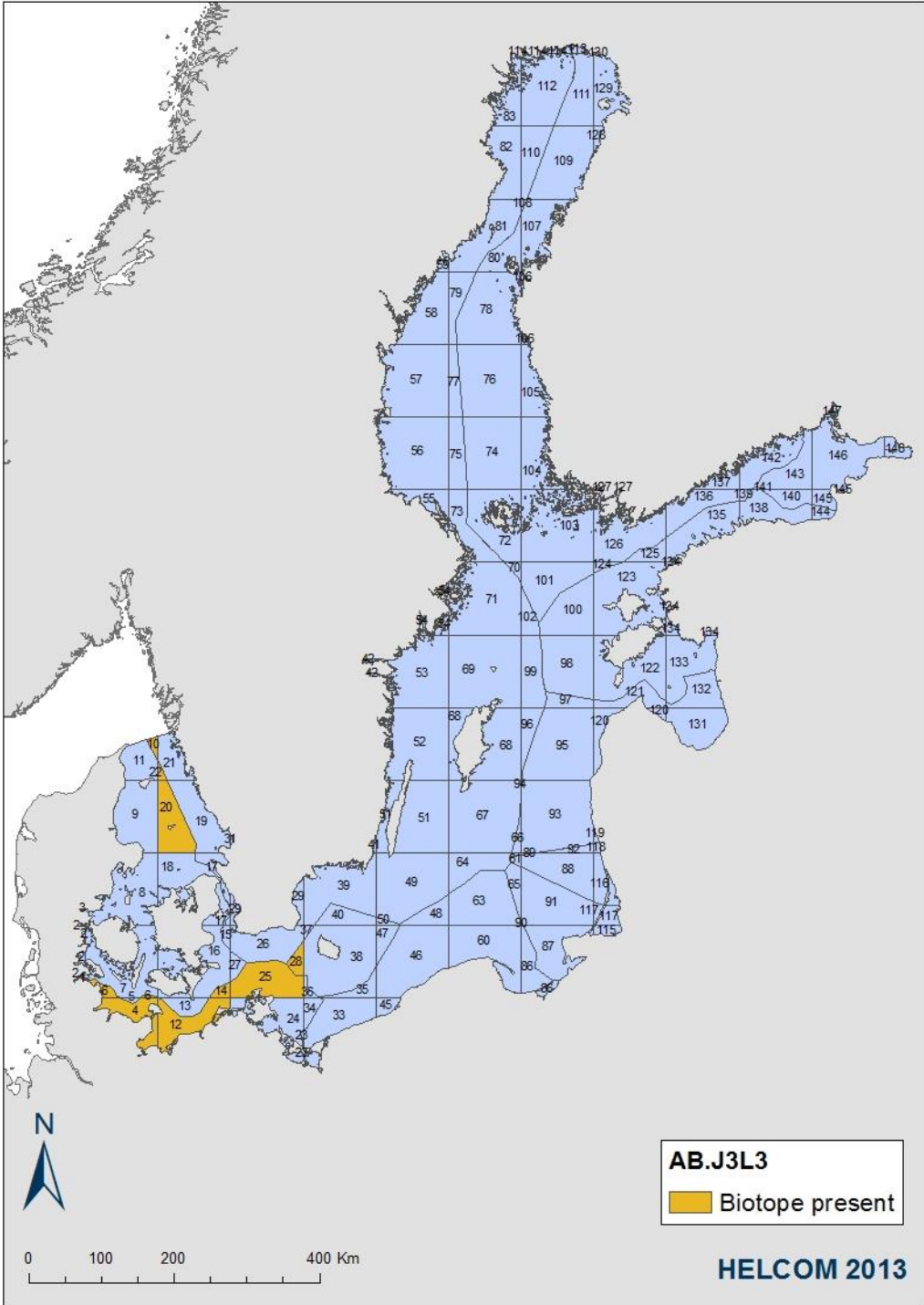
Habitat and Ecology

The biotope occurs in the aphotic zone where sand covers more than 90% of the bottom and *Arctica islandica* constitutes more than 50% of the biomass of the benthic macrofauna community. The sandy aphotic areas with a salinity > 15 psu occur only in the southwestern part of the Baltic Sea. *Arctica islandica* is a longlived bivalve and has a slow growth- and reproductive rate. It is a large species that can grow up to 20 cm length. The species prefers sandy and muddy bottoms, with a high clay content (Moen & Svensen 2004).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The main distribution area of this biotope is the western Baltic Sea. The largest populations of *A. islandica* are found in Kiel and Mecklenburg Bights (Zettler et al. 2001). The distribution map indicates the area in the 100 x 100 km grid where biotope is believed to occur based on the suitability of the environmental conditions.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication is considered to be one of the major threats to this biotope. Long lasting and frequent periods of oxygen depletion have increased the mortality of *Arctica islandica* populations. Due to the slow population growth rate, the recovery of declined populations is slow. Communities previously characterized by *Arctica islandica* have been replaced by communities consisting of short living polychaetes (Zettler et al. 2001).

Assessment justification

A1

In the aphotic zone, sandy substrates occur in areas with some currents close to the bottom. These areas are somewhat less prone to oxygen depletion compared to the muddy sediments in the aphotic zone. Therefore the biotope delineated by a sandy substrate and a benthic macrofauna community dominated by *Arctica islandica* is assessed as less threatened than the biotope AB.H3L3 characterized by muddy sediment and a benthic macrofauna community dominated by *A. islandica*. Even so the anoxic areas in the deep parts of the Baltic Sea have also spread over the sandy bottoms and it is estimated that more than 30 % of the area covered by the biotope has disappeared.

Recommendations for actions to conserve the biotope

All actions that reduce the level of eutrophication in the Baltic Sea will benefit the biotope. 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 aphotic sandy substrates may increasingly be utilized for mineral extraction. Restricting sand extraction in aphotic populated by *Arctica islandica* will support the persistence of the biotope. Sand extraction should be avoided in areas where the biotope is periodically subjected to anoxia, reducing the quality of the biotope over time.

Common names

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References

- OSPAR 2009. OSPAR Background for Ocean quahog *Arctica islandica*. Biodiversity Series.
http://qsr2010.ospar.org/media/assessments/Species/P00407_Ocean_quahog.pdf
- Gogina, M., Zettler, M.L. 2010. Diversity and distribution of benthic macrofauna in the Baltic Sea: Data inventory and its use for species distribution modelling and prediction. *Journal of Sea Research* 64(3): 313–321.
- Moen, F. E., Svensen, E. (2004). *Marine fish & invertebrates of Northern Europe*. KOM, Kristiansund. 608pp.
- Zettler, M. L., Bönsch, R., Gosselck, F. 2001. Distribution, abundance and some population characteristics of the ocean quahog, *Arctica islandica* (Linnaeus, 1767), in the Mecklenburg Bight (Baltic Sea). *Journal of Shellfish Research* 20: 161– 169.

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|--------------------------|
| English name: Baltic Sea seasonal sea ice | | Code in HELCOM HUB: AC | |
| Characteristic species: Phytoplankton (diatoms, autotrophic flagellates, dinoflagellates), heterotrophic bacteria, zooplankton (heterotrophic flagellates, ciliates, rotifer), Baltic ringed seal (<i>Phoca hispida bothnica</i>) | | | |
| Past and Current Threats (Habitat directive article 17): Climate change (reduction of ice M01) | | Future Threats (Habitat directive article 17): Climate change (reduction of ice M01) | |
| Red List Criteria: A1+2a | Confidence of threat assessment: L | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

Sea ice occurs in the Baltic Sea during a few months every year, usually from October–November until March–April. The seasonality of the sea ice underlines its variable nature. The extent of the ice cover also varies significantly from year to year. On average approximately 45% of the Baltic Sea area is ice covered, or 200 000 km². But during some years only the northern most areas are covered, and during other years practically the entire Baltic Sea freezes over from the northern most bays to the Kattegat. The sea ice is affected by wind and wind induced currents. The ice field shifts during the season and open water areas can appear as the ice field becomes more packed in another area.

Ice cover is an active interface between the atmosphere and the sea as it inhabits diverse and abundant ice organisms which participate in nutrient and carbon cycles. Baltic sea-ice organisms include diatoms as the dominant algae, small autotrophic flagellates, dinoflagellates, heterotrophic bacteria, diverse heterotrophic flagellates and ciliates as well as the metazoa of which rotifers are the main representatives. The biota lives in the brine channel system of the sea ice in which changes in physical and chemical factors can be extreme. For example salinity can decrease from 20–30 psu to approx. 6 psu



During the winter months sea ice shifts due to wind and current conditions and can form pack ice (left panel) or large areas of compact ice (right panel) (Photo: Lena Avellan)

within days during the warm period as a consequence of internal melting and increased brine volume (Kartokallio 2005).



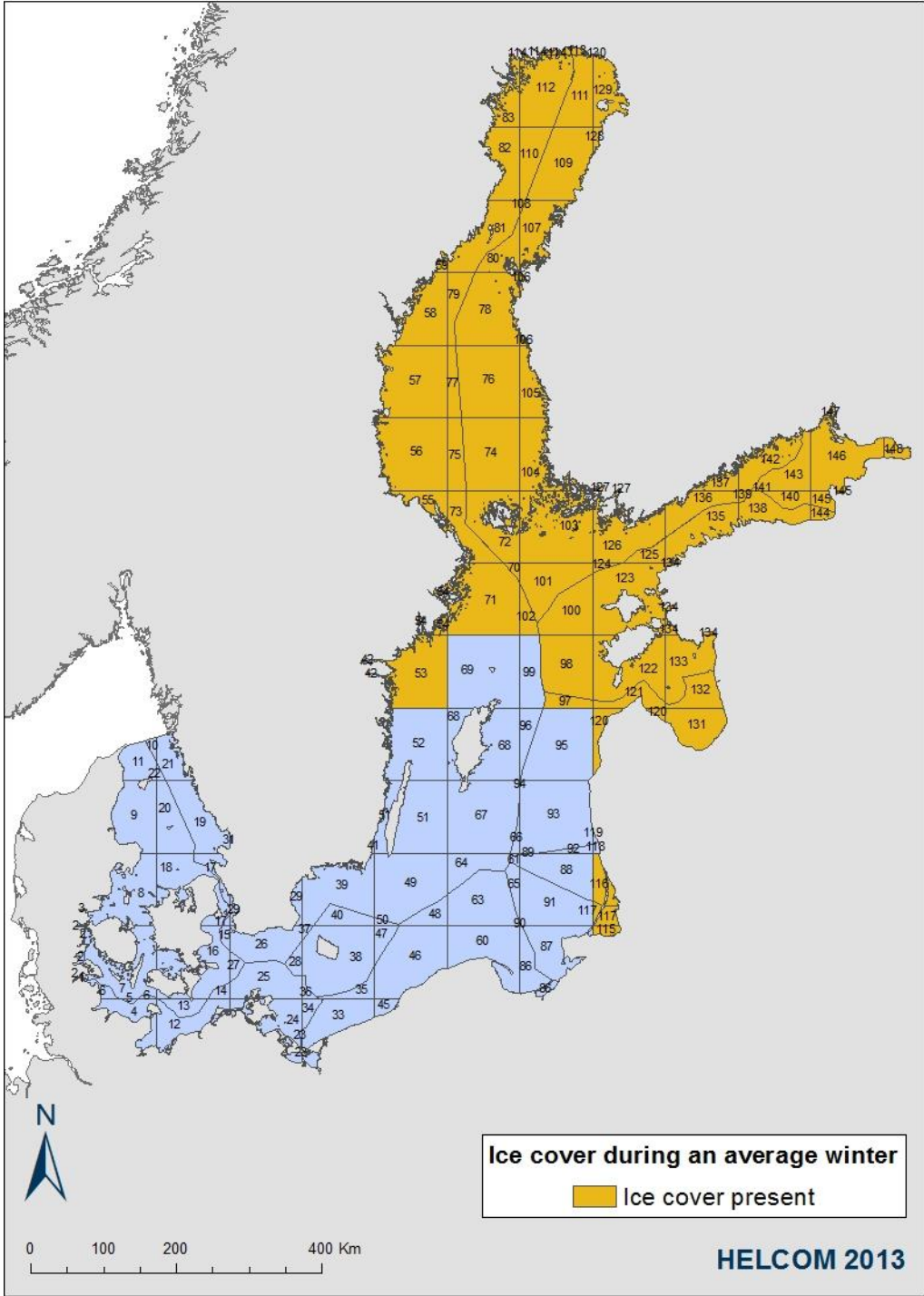
BIOTOPE INFORMATION SHEET

The Sea ice habitat is an important habitat for the breeding of the Baltic ringed seal (*Phoca hispida bothnica*), an arctic seal species adapted to breeding on ice. The Baltic ringed seal has been classified Vulnerable (VU; A3c) in the HELCOM Red List of Baltic Sea species in danger of becoming extinct mainly due to past reductions in breeding potential due to toxins in the environment. However the predicted future decline in sea ice due to climate change has been identified as a severe threat especially to the southern populations where the availability of nesting areas may already have affected the reproductive rate of the seal (HELCOM 2013a).

BIOTOPE INFORMATION SHEET

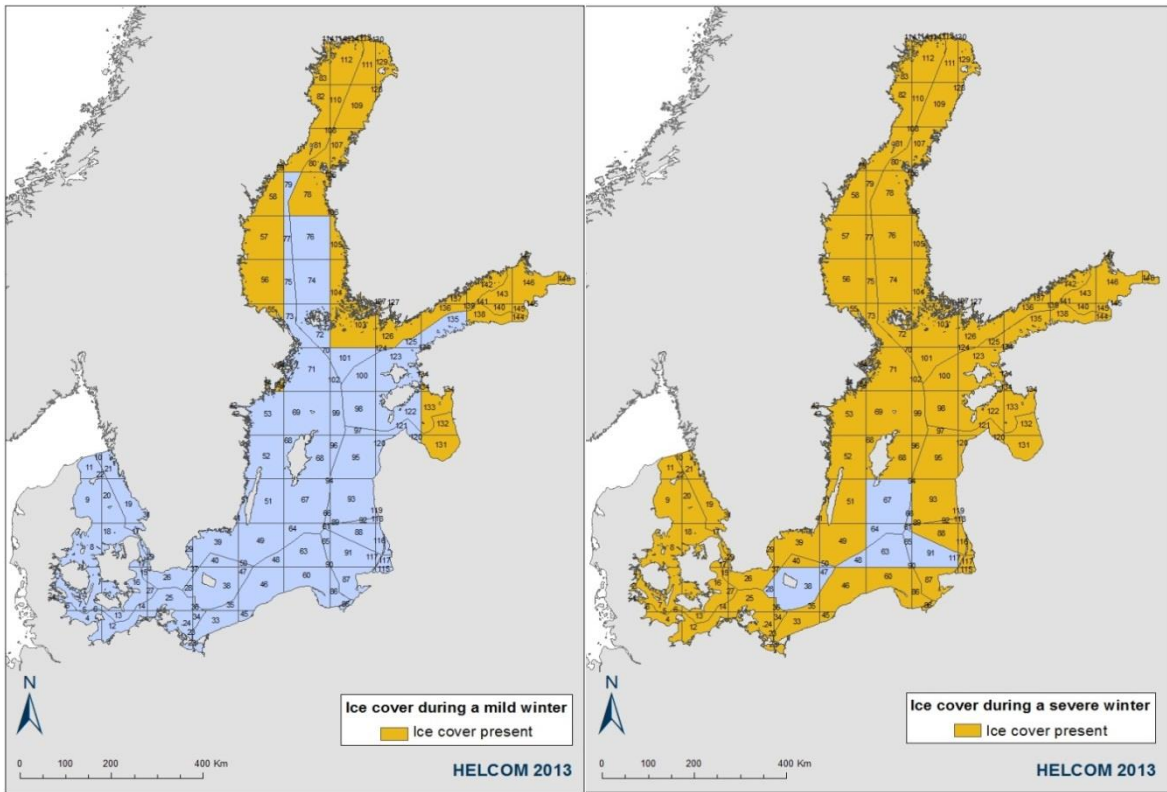
Distribution and status in the Baltic Sea region

The distribution of the biotope covers the whole Baltic Sea, but is most common in the northern regions. From a time series of the maximum annual ice extent of sea ice, a declining trend can be detected. During the last two decades all ice winters of the Baltic Sea have been between average and extremely mild. The length of the ice season shows a decreasing trend by 14–44 days in the latest century (Vihma & Haapala 2009). The distribution area in the 100 x 100 km grid where the biotope occurs during an average ice winter when the ice covers approximately 200 000 km²



BIOTOPE INFORMATION SHEET

The inter-annual variations of the ice cover, ice thickness, period of the ice cover and the movement and packing of the ice is large. During the mildest winters, only the Bothnian Bay, The Gulf of Bothnia, the Gulf of Finland and the northern coastlines of the Baltic Sea are covered with ice. The Belt Sea, the Arkona Basin and the Bornholm basin only freeze during the most severe winters. However, the shallow lagoon and Bodden areas (e.g. Greifswalder Bodden) along those basins (Southern Baltic Sea) are freezing regularly also in milder winters. The seasonal sea ice coverage varies significantly between years of mild ice winters (left panel) and severe ice winters (right panel)



BIOTOPE INFORMATION SHEET

Description of Major threats

Climate change poses the most severe threat to this habitat. Climate change is predicted to increase the surface temperature of the Baltic Sea, and the reduction in sea ice is predicted to depend mainly on the extent of change in the winter surface temperature (HELCOM 2013b). Other predicted changes in environmental factors such as a higher precipitation in the north of the sea and changes in the seasonal wind field are not predicted to have a large effect (HELCOM 2013b). Currently all simulations indicate a drastic decrease in future sea ice cover (HELCOM 2013b).

Assessment justification

A1

Sea ice coverage has been documented for the Baltic Sea for nearly three centuries. During this time the sea ice coverage has varied significantly. During the past 50 years a 35% decline in maximum sea ice extent has been estimated (Figure 1). If a 150 year time period is considered, the data only indicates a 20% decline.

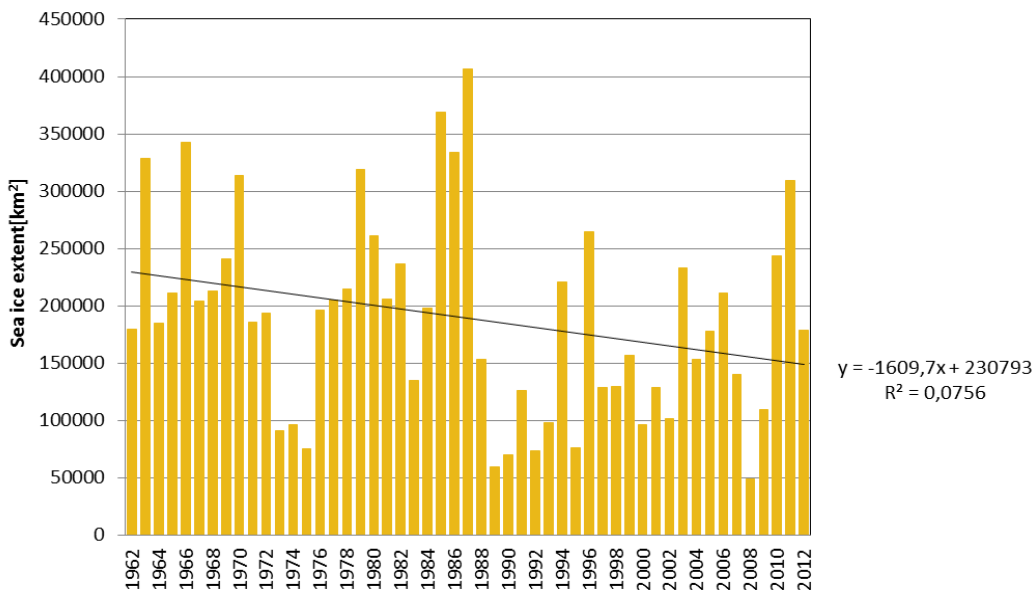


Figure 1. Sea ice extent during the past 50 years (Niskanen et al. 2009)

A2a

The extent of sea ice cover in the Baltic Sea is inferred to decrease on average by $\geq 30\%$. The climate change models indicate an increase in precipitation in the northern areas of the Baltic Sea, milder winters and increased water temperature (HELCOM 2013b). Modelling the sea ice extent for the entire Baltic Sea for the coming 50 years, indicates that the rate of decline may increase compared to the past 50 years (Figure 2.). The model is based on various IPCC scenarios (Friedland et al. 2012). The occurrence of the sea ice habitat will decrease. The models generally do not predict the future change in sea ice quality. The thickness and ice-type affects some of the organisms inhabiting the ice, but these changes have not been assessed.

BIOTOPE INFORMATION SHEET

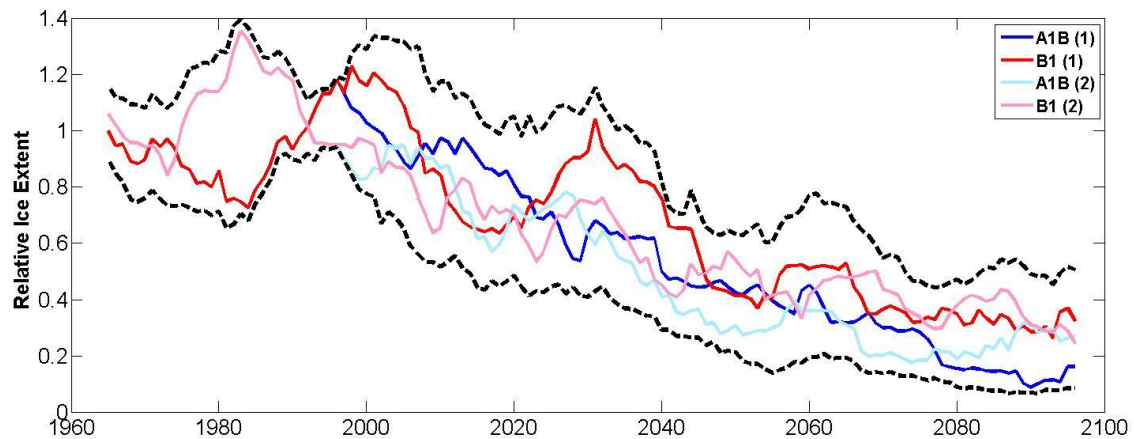


Figure 2. Modelled sea ice extent based on various IPCC models. (Courtesy of IOW)

Recommendations for actions to conserve the biotope

Climate change mitigation actions such as reducing anthropogenic CO₂ and other greenhouse gas emissions globally, is inferred to slow the rate of climatic change. It is unclear how regional measures may affect the sea ice coverage in the Baltic Sea.

Common names

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References

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- HELCOM (2013a) Species information sheet; *Phoca hispida bothnica*. HELCOM Red List Marine Mammal Expert Group. Available at www.helcom.fi > Baltic sea health > Biodiversity > Red List
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- Kaartokallio, H. (2005). Sea-ice ecology in the Baltic Sea with special emphasis on bacteria. Doctoral dissertation. University of Helsinki, Helsinki. 41pp.
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- Vihma, T., Haapala, J. (2009). Geophysics of sea ice in the Baltic Sea: A review. *Progress in Oceanography* 80: 129-148.

BIOTOPE INFORMATION SHEET

| | | | |
|--|---|---|----------------------|
| English name: Baltic photic or aphotic shell gravel dominated by vase tunicate (<i>Ciona intestinalis</i>) | | Code in HELCOM HUB: AA.E1F1, AB.E1F1 | |
| Characteristic species: <i>Ciona intestinalis</i> | | | |
| Past and Current Threats (Habitat directive article 17): Climate change (ocean acidification M01.04), Eutrophication (H01.05), Contaminant pollution (H03), Fishing (bottom trawling F02.02.01), Construction (D03, oil and gas exploration and exploitation C02), Mining and quarrying (sand and gravel extraction C01.01, oil and gas exploration and exploitation C02) | | Future Threats (Habitat directive article 17): Climate change (ocean acidification M01.04), Eutrophication (H01.05), Contaminant pollution (H03), Fishing (bottom trawling F02.02.01), Construction (D03, oil and gas exploration and exploitation C02), Mining and quarrying (sand and gravel extraction C01.01, oil and gas exploration and exploitation C02), Random threat factors (–) | |
| Red List Criteria: B1a(ii) | Confidence of threat assessment: L | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): “?” No data available 2.6.1. Shell gravel bottoms of the aphotic zone 2.6.2 Sublittoral shell gravel bottoms of the photic zone | | BSEP 113 (HELCOM 2007): Shell gravel bottoms Under threat and/or in decline in: All where they occur | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope occurs in areas where the bottom consists largely of mollusc shells or small shell fragments, often constituting small patches inside other sediments. Due to the combination of the extended interstitial space and the presence of biotic hard substrates, it is inhabited by a unique combination of endobenthic and epibenthic species, in this case of the vase tunicate (*Ciona intestinalis*). In offshore areas shell gravel bottoms are often exposed to currents and they are mainly found permanently at the same location, whereas in inner waters they can also shift dynamically from one location to another (HELCOM Website).

In these habitats coverage of epibenthic chordates is at least 10% of the sea floor, of which vase tunicate (*Ciona intestinalis*) constitutes at least 50% of the biomass. The tunicates might be overgrown by *Ectocarpus* spp. or *Desmarestia* spp. during summer in the photic zone.

C. intestinalis is an epibenthic filter feeder. It has no specific substrate preferences, but it has been reported to occur abundantly especially on rocky substrates. The filter feeding of *C. intestinalis* populations can greatly impact on phytoplankton abundance, making it as a key species in habitats where it occurs abundantly (Petersen & Riisgård 1992). In Scandinavia, the most of *C. intestinalis* populations are locally distributed in frords and inlets (Petersen & Svane 2002). As an euryhaline marine species, the distribution of *C. intestinalis* is limited by salinity in the Baltic Sea, where the outermost distribution limit lies at the Danish Straits and the Darss Sill. The minimum salinity is 11 psu (Dybern, 1967). Depth is usually 2–25 m.

Ciona intestinalis can grow to nearly 30 cm height, but most often it does not grow higher than 15 cm. In the Baltic Sea the species is largely annual. After the larvae have settled on a suitable substrate, the vase tunicate grows to a height of 4–5 cm during two summer months (Moen & Svensen 2008).

BIOTOPE INFORMATION SHEET

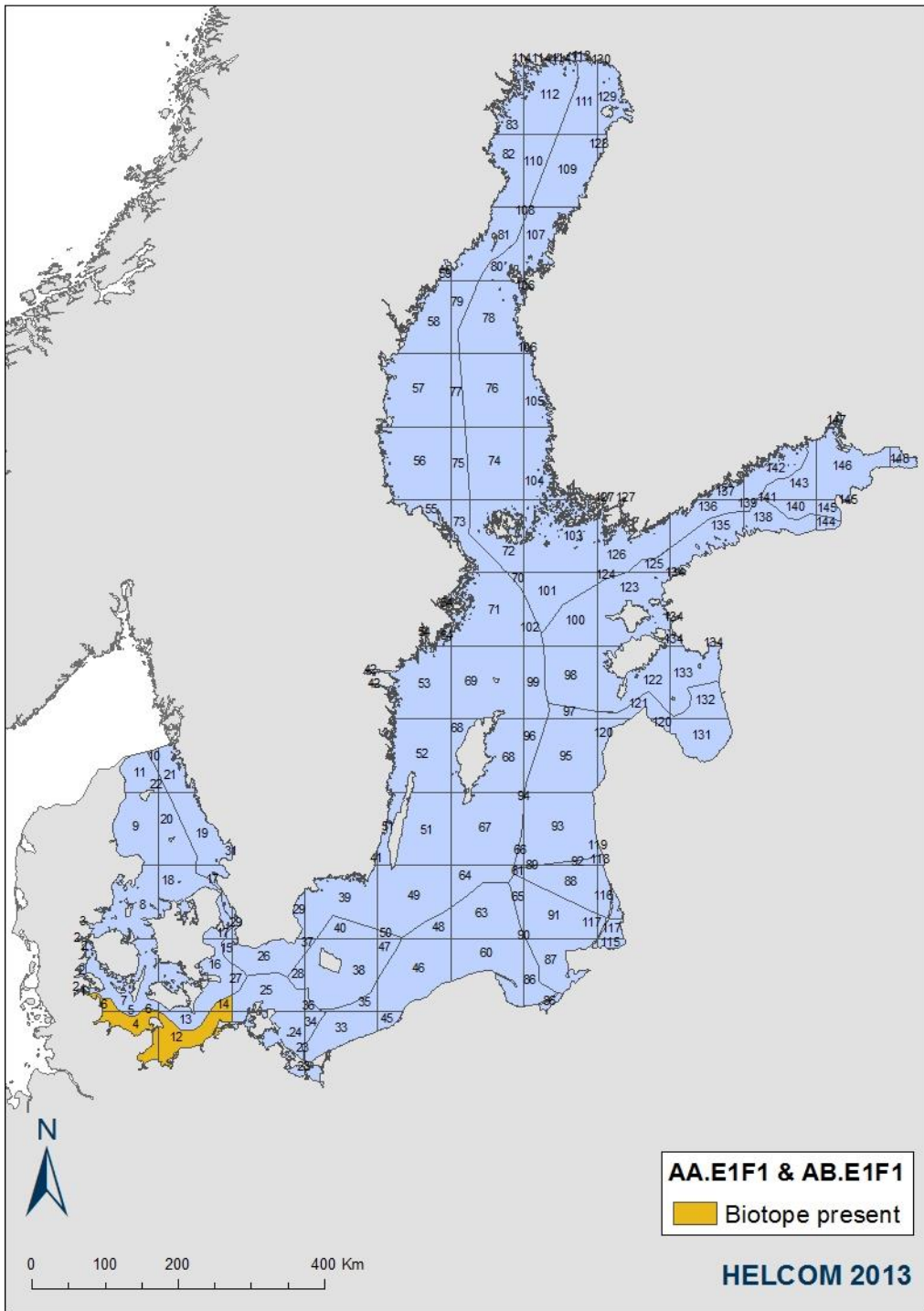


Ciona intestinalis on shellgravel (Photo: Alexander Darr)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope is known from German waters in the Baltic Sea, but may also occur in other areas in the southwestern Baltic Sea where the vase tunicate (*Ciona intestinalis*) occurs. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur. The biotope may potentially occur in other areas with high salinity on shell gravel covered bottoms, but is currently not known from other locations.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication causing oxygen depletion and increased siltation is the main threat of the biotope. Bottom trawling also threaten the physical integrity of the biotope.

The predicted increase in atmospheric CO₂ causing ocean acidification can be seen as a potential future threat of the biotope, as the precise effect of the acidification is currently not known. Ocean acidification may affect the shell gravel substrate severely. The natural degradation process of the calcium-carbonate shells may accelerate if the water becomes more acidic. Therefore the occurrence of the biotope may become more restricted in the future.

Pollution from various sources introducing hazardous substances to the Baltic Sea as well as construction activities such as offshore installations and sand or gravel extraction, pose additional threats to the biotope. However these effects are assumed to be smaller than that posed by eutrophication.

Assessment justification

B1a(ii)

The biotope is assumed to be rather rare and restricted to small patches where it can occur. It is assumed to have been reduced in distribution mainly due to increased siltation and bottom trawling.

Recommendations for actions to conserve the biotope

Mapping the biotope to better understand its distribution needs to be carried out to conserve it. The area where the biotope occurs should be protected and bottom trawling should not be allowed. Further eutrophication should be reduced to improve the oxygen conditions of the biotope and also reduce the overgrowth of annual brown algae on the vase tunicates.

Common names

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References

- Dybern, B. (1967). The distribution and salinity tolerance of *Ciona intestinalis* (L.) *F. typica* with special reference to the waters around Southern Scandinavia. *Ophelia* 4(2): 207–226. DOI: 10.1080/00785326.1967.10409621
(HELCOM Website)
http://www.helcom.fi/environment2/biodiv/endangered/Biotopes/en_GB/Shell_gravel_bottoms/
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BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|-------------------------------|
| English name: Baltic photic or aphotic shell gravel characterized by mixed infaunal macrocommunity in fine sand-like shell fragments | | Code in HELCOM HUB: AA.E3Y, AB.E3Y | |
| Characteristic species: unknown | | | |
| Past and Current Threats (Habitat directive article 17): Climate change (ocean acidification M01.04), Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Random threat factors (–), Climate change (ocean acidification M01.04), Eutrophication (H01.05) | |
| Red List Criteria: B1a(ii) | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): “?” No data available 2.6.1. Shell gravel bottoms of the aphotic zone 2.6.2 Sublittoral shell gravel bottoms of the photic zone | | BSEP 113 (HELCOM 2007): Shell gravel bottoms are under threat and/or in decline everywhere where they occur. | |
| Greater concern stated by: | | | |

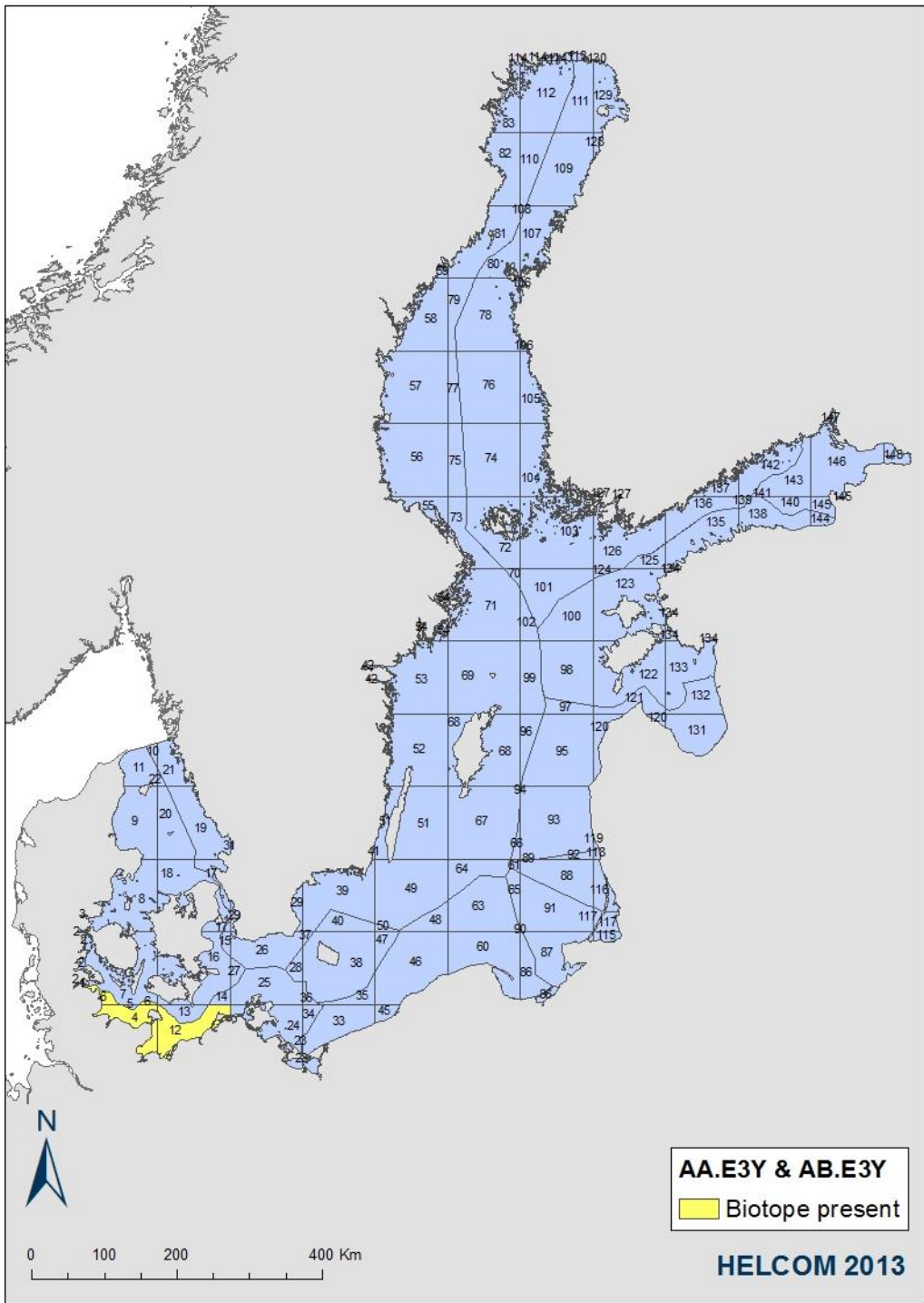
Habitat and Ecology

The biotope is characterized by shell gravel covering more than 90% of the bottom, and most of the shell gravel having been ground down to sand-like fragments. Benthic macroinfauna species that occur in the biotope burrow down in to the substrate that is similar in structure to coarse sand. The community composition of macroinfauna is presumed to be different in the sand like shell gravel sand compared to coarser shell gravel consisting mainly of semi-intact shells among which many different animals can be found including non-burrowing animals. The interstitial space is smaller in the sand-like shell gravel substrate, enabling also burrowing polychaetes and amphipods to build tunnels using the small grains.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The distribution of sand-like shell gravel bottoms in the Baltic Sea is unknown, only few small patches have been recorded from German waters. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur, the biotope may occur in other areas of high salinity but currently no other occurrences are known.



BIOTOPE INFORMATION SHEET

Description of Major threats

Increase in atmospheric CO₂ leading to ocean acidification, eutrophication and pollution are seen as the major threats to the biotope. Ocean acidification is assumed to increase the rate by which the calcium carbonate of mollusc shells dissolve. It is however unclear in what way the process will affect the sand-like shell gravel. Due to a higher acidity, shell gravel may be ground down to a sand-like substrate at an increasing rate possibly making the sand like shell gravel more common, but the acidity may also increase the rate by which the grains are dissolved decreasing the sand-like shell gravel.

Eutrophication affects the sand-like shell gravel biotope adversely by increasing the organic loading the Baltic Sea. The increasing organic load can lead to local oxygen depletion. Some of the sand-like shell gravel patches may also become covered by overgrowth of algae.

Assessment justification

B1a(ii)

The Extent of occurrence of the biotope is $\leq 55\,000\text{ km}^2$ and climate change and pollution that constitute a degradation of the environmental quality affection the biotope adversely.

Recommendations for actions to conserve the biotope

The extent and occurrence of the biotope need to be mapped in more detail to establish whether the biotope also exists in areas outside the German exclusive economical zone.

Common names

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References

(HELCOM Website)

http://www.helcom.fi/environment2/biodiv/endangered/Biotopes/en_GB/Shell_gravel_bottoms/
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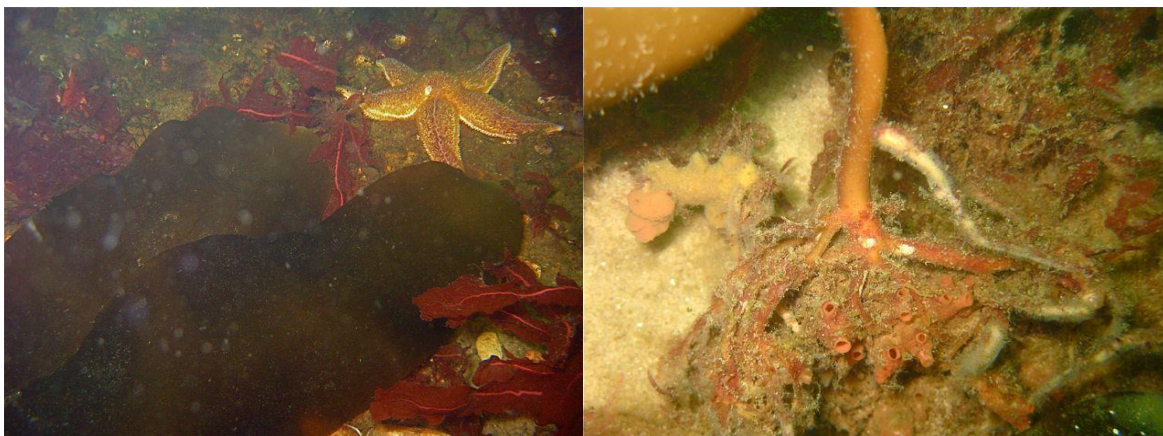
BIOTOPE INFORMATION SHEET

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|--|---|--|-------------------------------|
| English name: Baltic photic shell gravel dominated by kelp | | Code in HELCOM HUB: AA.E1C4 | |
| Characteristic species: <i>Saccharina latissima</i> , <i>Laminaria digitata</i> , <i>Laminaria hyperborea</i> | | | |
| Past and Current Threats (Habitat directive article 17): Climate change (ocean acidification M01.04), Eutrophication (H01.05), Contaminant pollution (H03), Fishing (bottom trawling F02.02.01), Construction (offshore construction work D03.03, oil and gas exploration and exploitation C02, sand and gravel extraction C01.01, Mining and quarrying(oil and gas exploration and exploitation C02) | | Future Threats (Habitat directive article 17): Climate change (ocean acidification M01.04), Eutrophication (H01.05), Contaminant pollution (H03), Fishing (bottom trawling F02.02.01), Construction (offshore construction work D03.03, oil and gas exploration and exploitation C02, sand and gravel extraction C01.01, Mining and quarrying (oil and gas exploration and exploitation C02), Random threat factors (–) | |
| Red List Criteria: B1a(ii) | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): “?” No data available 2.6.2 Sublittoral shell gravel bottoms of the photic zone | | BSEP 113 (HELCOM 2007): Shell gravel bottoms are under threat and/or in decline everywhere, where they occur. | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope consists of submerged perennial kelp species. The claw-like holdfast of the kelp is attached to shell gravel, mainly *Arctica* spp. or *Mya* spp. shells, occurring in the photic zone. *Mytilus* shells are excluded from this substrate type. Kelp constitutes at least 50% of the biovolume. Characteristic species are *Saccharina latissima*, *Laminaria digitata* and to a lesser extent *Laminaria hyperborea*. The particular species dominance depends mainly on the salinity gradient (Schwenke 1964).

The kelp biotope exists only in the Western and to a lower extent also in the Southern Baltic Sea according to the distribution range of the kelp species (HELCOM 2009). *Laminaria hyperborea*, as a pure marine species, occurs only in the Kattegat and the Northern Belt region (>25 psu). *Laminaria digitata* (oarweed) is distributed to Western Mecklenburg Bay/Fehmarn (12–15 psu). *Saccharina latissima* (sugar kelp) has the widest distribution range with findings up to the island of Bornholm (around 10 psu)



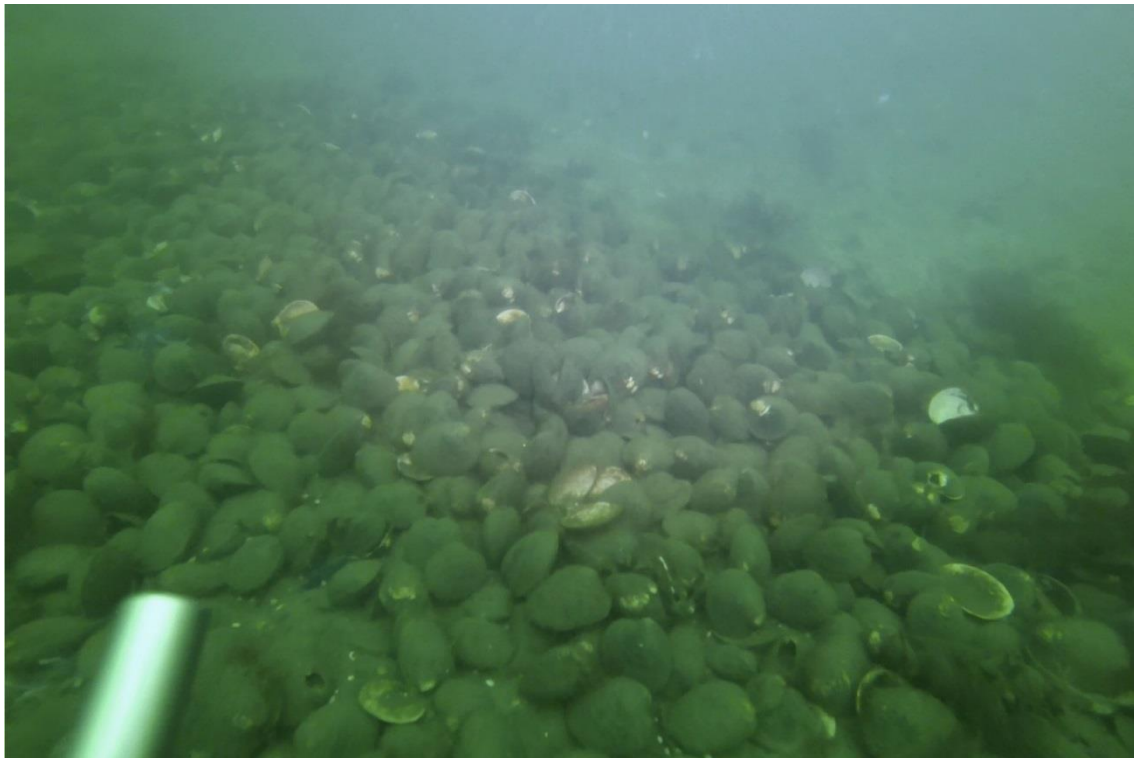
Saccharina latissima mixed with red algae attached to *Arctica islandica* shells (left). Holdfast with different epibenthic species: several sponges, ascidians and some red algae (right) (Photo: Karin Fürhaupter, MariLim GmbH)

BIOTOPE INFORMATION SHEET

(Schwenke 1964). *Saccharina latissima* reproductive germlings need a salinity over 11 psu to survive (Peteiro & Sánchez 2012).

In contrast to pure marine environments, for example the coast of Norway and Great Britain, the kelp biotopes in the Baltic Sea do not grow in the intertidal or the uppermost sublittoral zone. In brackish conditions the depth distribution of the biotope is shifted to deeper areas (with higher salinities = brackish submergence after Remane, 1955). At its eastern distribution limit kelp biotopes mark the lower depth limit of vegetation and therefore the photic zone. They occur down to 30 –35 meters depending on the eutrophication level and availability of suitable substrates. Kelp biotopes are not sensitive to exposure. Due to the deeper distribution in the Baltic Sea they are known to occur at exposed (Kattegat) and moderately exposed sites (Bay of Mecklenburg) in terms of wave action.

Kelp beds form an important biotope for other algae, including the green algae *Chaetomorpha melagonium*, the red algae *Delesseria sanguinea*, *Phycodrys rubens* and *Brongniartella byssoides* and the annual brown algae *Desmarestia aculeata*, which are often growing entangled around the holdfasts. Many other species live attached to the kelp canopy, like hydrozoans (*Clava multicornis*, *Obelia geniculata*) and bryozoans (like *Electra pilosa*, *Membranipora membranacea*, *Cribrilina* spp.) or are grazing on the stipe and blades (*Hydrobia* spp., *Rissoa* spp.). The claw-like holdfast shelters polychaetes, sponges and ascidians (*Dendrodoa grossularia*). Kelp also constitutes an important biotope for many fish, such as goldsinny-wrasse (*Ctenolabrus rupestris*) and two-spotted goby (*Gobisculus flavescens*) (OCEANA 2011).

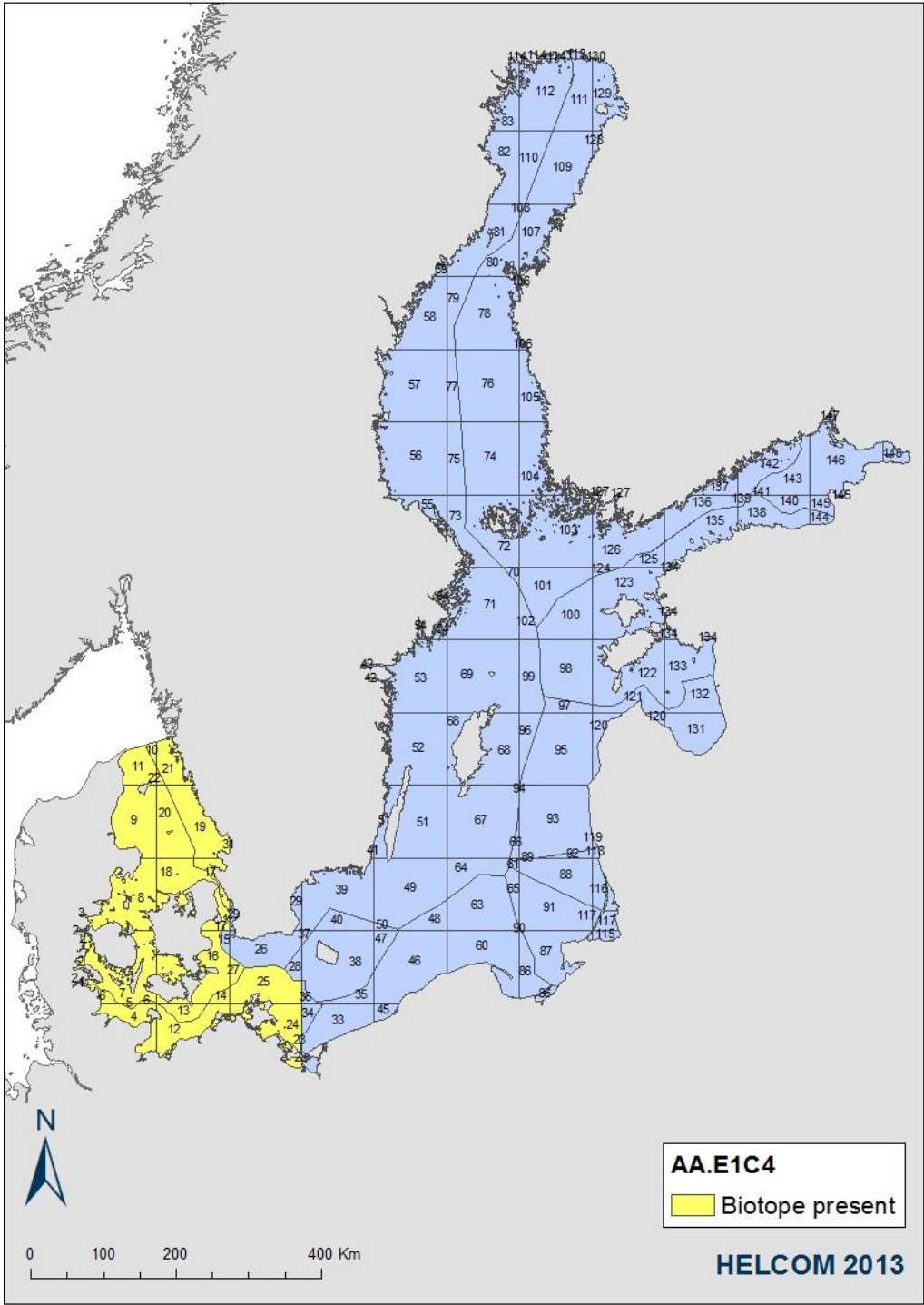


Shellgravel bottom in Germany (Courtesy of IOW)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The kelp biotopes are common from Kattegat to the Bornholm Basin. The spatial restriction to the Western and Southern Baltic Sea is due to the salinity requirements of the dominant kelp species. The higher the salinities, the higher the diversity of the biotope with respect to accompanying plant species and inhabiting invertebrate and fish communities. The distribution map indicates the areas where the biotope can occur in a 100x100 km grid.



BIOTOPE INFORMATION SHEET

Description of Major threats

Observed declines of kelp biotopes are caused by eutrophication. With decreasing light penetration the depth limit is reduced. An increase of the upper distribution limit is not possible due to the too low salinities. Therefore the vertical depth interval, suitable for growth, is restricted. Increasing siltation caused by eutrophication as well as sedimentation due to dumping or marine offshore constructions may prevent germling attachment to the substrate. Also bottom trawling, oil and gas exploration and exploitation, sand and gravel extraction and offshore installations are threatening this habitat (HELCOM Website).

Assessment justification

B1a(ii)

The classification of the biotope is caused by rarity of the specific substrate "shell gravel", as the other kelp biotopes are not threatened. The assessment justification refers therefore to that of the "shell gravel biotope." EOO is $\leq 55,000 \text{ km}^2$ and climate change and eutrophication that affect the environmental quality negatively are predicted and inferred to continue. The necessary environmental conditions (specific bottom morphology and currents) to enable shell gravel bottoms exist only within very few and spatially restricted localities and the conditions to enable kelp species to grow on the shells (light availability, salinity) restricts the spatial distribution of this biotope furthermore.

Recommendations for actions to conserve the biotope

All actions to reduce physical disturbance of shell gravel bottoms and eutrophication in the Baltic Sea are important for the conservation of this biotope dominated by kelp.

Appointing areas where the biotope is known to occur as protected sites, where bottom trawling, and exploitation of marine soil resources like oil, gas, sand or gravel is prohibited, would constitute an effective conservation measure.

Common names

References

(HELCOM Website)

- http://www.helcom.fi/environment2/biodiv/endangered/Biotopes/en_GB/Shell_gravel_bottoms/
 HELCOM (2009). Biodiversity in the Baltic Sea. An integrated thematic assessment on biodiversity and nature conservation in the Baltic Sea. Baltic Sea Environmental Proceedings No. 116B. Helsinki Commission, Helsinki. 189pp. Available at:
<http://www.helcom.fi/stc/files/Publications/Proceedings/bsep116B.pdf>
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 Peteiro, C., Sánchez, N. (2012). Comparing Salinity Tolerance in Early Stages of the Sporophytes of a Non-indigenous Kelp (*Undaria pinnatifida*) and a Native Kelp (*Saccharina latissima*). Russian Journal of Marine Biology 38: 197-200.
 Schwenke H. 1964. Vegetation und Vegetationsbedingungen in der westlichen Ostsee (Kieler Bucht). Kieler Meeresforschungen 20, 1:157-168.

BIOTOPE INFORMATION SHEET

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|---|---|--|-------------------------------|
| English name: Baltic photic or aphotic rock and boulders or mixed substrate dominated by erect moss animals (<i>Flustra foliacea</i>) | | Code in HELCOM HUB: AA.A1H2, AB.A1H2, AA.M1H2, AB.M1H2 | |
| Characteristic species: <i>Flustra foliacea</i> | | | |
| Past and Current Threats (Habitat directive article 17): Fishing (bottom trawling F02.02.01), Construction (other siltation rate changes J02.11.02, offshore construction D03.03) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (other siltation rate changes J02.11.02, offshore construction D03.03) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.1.2.1 Solid rock bottoms of the aphotic zone 2.1.2.2.1 Sublittoral level solid rock bottoms with little or no macrophyte vegetation of the photic zone 2.1.2.2.3 Sublittoral solid rock reefs of the photic zone with or without macrophyte vegetation 2.2.1 Stony bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): Maerl beds under threat and/or in decline in Kattegat | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope is formed by erect growing moss animals (Bryozoa) of which brown-leaved hornwrack (*Flustra foliacea*) constitutes at least 50% in volume or biomass. *Flustra foliacea* occurs on stony sublittoral bottoms and favours areas with bottom currents (Ryland & Hayward 1977) as the bryozoans feed on plankton, detritus and dissolved organic material (Tyler-Walters & Ballerstedt 2007).

Accompanying epibenthic species are other erect growing moss animals like *Eucratea loricata* or crust-shaped bryozoans but also sponges, sea squirts or hydrozoans. Erect and laminar bryozoans form calcified substrata that is attractive to many other marine organisms, e.g. barnacles, hydroids and other bryozoans. Erect bryozoans increase the complexity and diversity of their habitat (Bitschofsky et al. 2011), giving shelter to small invertebrates and fishes. Beside other attached species the bushy colonies



* Aphotic boulder covered by various erect growing moss animals with *Flustra foliacea* as the dominant species (Photo: Karin Fürhaupter) (left), *Flustra foliacea* on sieve (Photo Alexander Darr) (right)

BIOTOPE INFORMATION SHEET

form also shelter for small mobile amphipods or scale worms. Nudibranchs, pynogonids and sea urchins (e.g. *Psammechinus miliaris*) are known to feed on *Flustra foliaceae* (Ryland & Hayward 1977). Therefore they can be regarded as habitat-forming species.

Flustra foliacea can commonly be found between vegetation in the photic zone, but becomes dominant in the aphotic zone with strong currents usually down to 20 – 25 m. The biotope exists only scarcely in the photic zone, where the *Flustra foliacea* colonies mainly cover the negative surfaces of boulders, whereas the macroalgae are dominating on top of the hard substrate. In the aphotic zone the bryozoan can form denser 'meadows' and also live on mixed gravel like substrates. The biotope does not exhibit a distinct lower depth limit in the Baltic Sea, the availability of suitable hard substrates can limit the biotope at greater depths.

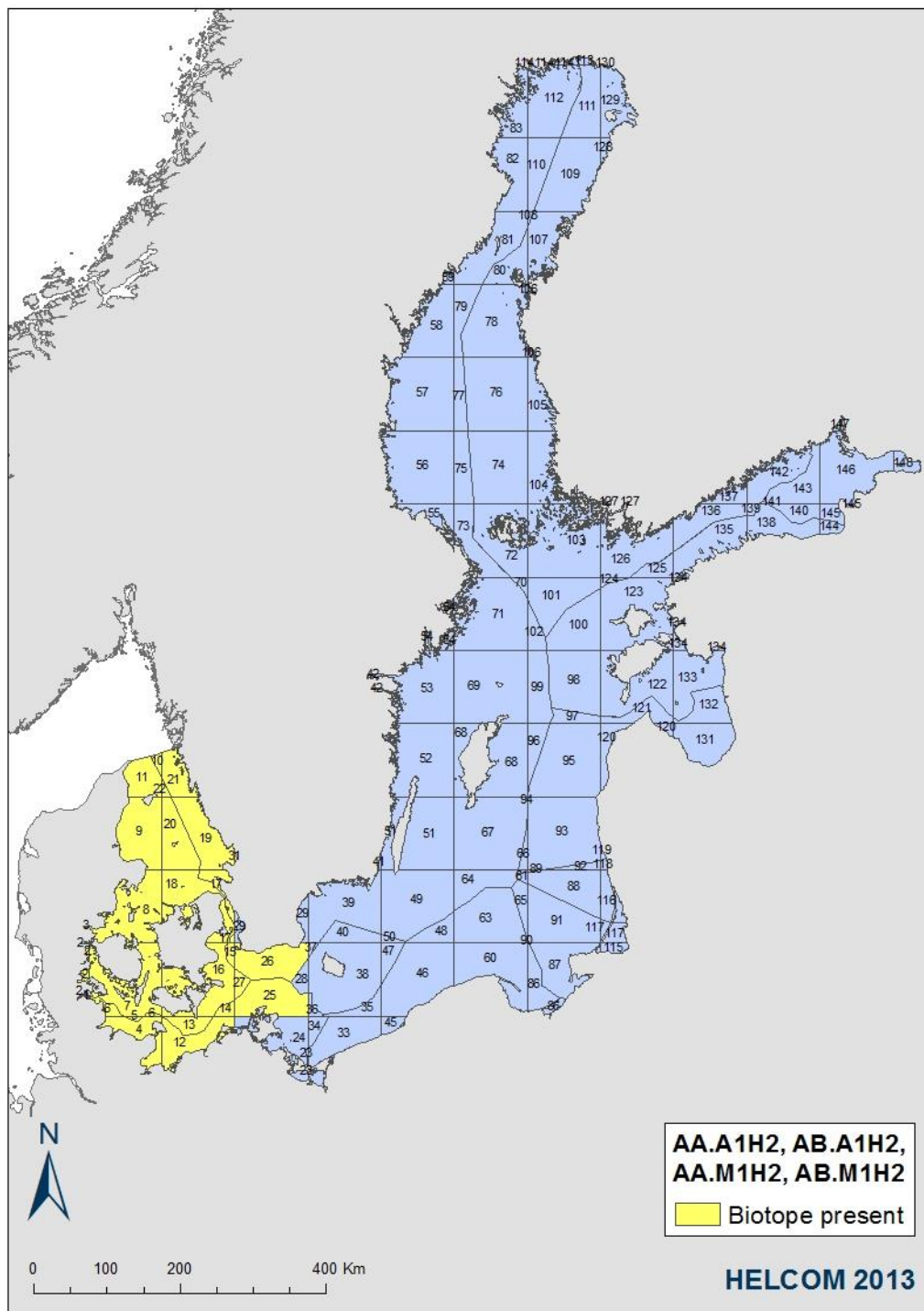
The *Flustra foliacea* colonies are bushy and up to 20 cm high. The fronds are flat, several centimetres broad, branched and have rounded lobes (Ryland & Hayward 1977). Because of its branched flat fronds, the species is often mistaken for a seaweed (Picton & Morrow 2010), especially in videos records without adequate illumination the growth form resembles that of perennial foliose red algae such as *Phyllophora* spp. potentially leading to a biotope misidentification.

Flustra foliacea is a cold-water species (Ryland & Hayward 1977). Compared to the fan-shaped and broad growing specimens of the North Sea, the species tend to reduce branching, width of their fronds and height in brackish waters. *Flustra foliacea* prefers high salinity waters, but can also occasionally be found in areas with salinity as low as 15 psu (Stresemann et al. 1992).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The *Flustra foliacea* dominated biotope commonly occurs from Kattegat to the Mecklenburg Bight and Arkona Basin (Kadetrinne). The spatial restriction to the Western Baltic Sea is due to the salinity requirements of the dominant species *Flustra foliacea*. The more to the west or north-west this biotope occurs the higher the salinities, and in consequence the higher the diversity of inhabiting invertebrate and fish communities. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur, the occurrence of the biotope in the photic zone is restricted to the negative surfaces of for example boulders.



BIOTOPE INFORMATION SHEET

Description of major threats

Due to the scarceness of hard substrates in many areas there the biotope could potentially exist, the extent of occurrence is not very large and currently only little information about the biotope is available. The scarcity of rocks and boulders in the coastal areas around Germany and Denmark is due to historical stone fishing where stones and boulders were extracted from the seabed.

Eutrophication is a major threat to the biotope. The growth rate of annual macrophyte algae is known to increase due to higher nutrient concentrations in the water, which might restrict the available substrate for the biotope. The increased siltation rate due to eutrophication, further reduces the availability of hard substrates for the biotope especially impeding the settlement of larvae. A higher particle concentration in the water may also impede the filter feeding efficiency of the adult *Flustra foliacea*. Oxygen depletion due to eutrophication is seen as a smaller threat. Likewise the biotope may be affected negatively by physical disturbance by bottom trawling, offshore construction work and exploitation of soil resources, in the same way as several other hard bottom biotopes.

Assessment justification

A1

The biotope is assumed to be rather rare and to be restricted to small patches where it occurs. It is assumed to have been reduced in distribution mainly due to increased siltation and habitat lost. In the southern regions of the Baltic Sea where the biotope occurs, hard bottoms are scarce and historically stone fishing has reduced the available substrata for the biotope.

Recommendations for actions to conserve the biotope

The distribution of the biotope and the type of environmental conditions it requires is currently somewhat unclear. Detailed biotope mapping activities are needed in the region where the biotope occurs. The biotope may easily be overlooked or falsely identified as a macrophyte biotope if the mapping activities are not carried out in enough details.

All actions reducing the eutrophication level of the Baltic Sea will benefit the biotope. These activities include measures to reduce the diffuse run-off from agriculture on land to reduction of nutrient run-off from point sources by constructing waste water treatment plants.

All actions to reduce physical disturbance of photic and aphotic stony bottoms in the Baltic Sea are important for the conservation of the epibenthic biotopes dominated by *Flustra foliacea*. Appointing areas where the biotope is known to occur as protected sites, where bottom trawling, offshore construction work and exploitation of soil resources is prohibited, would constitute an effective conservation measure.

Common names

hornwrack

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BIOTOPE INFORMATION SHEET

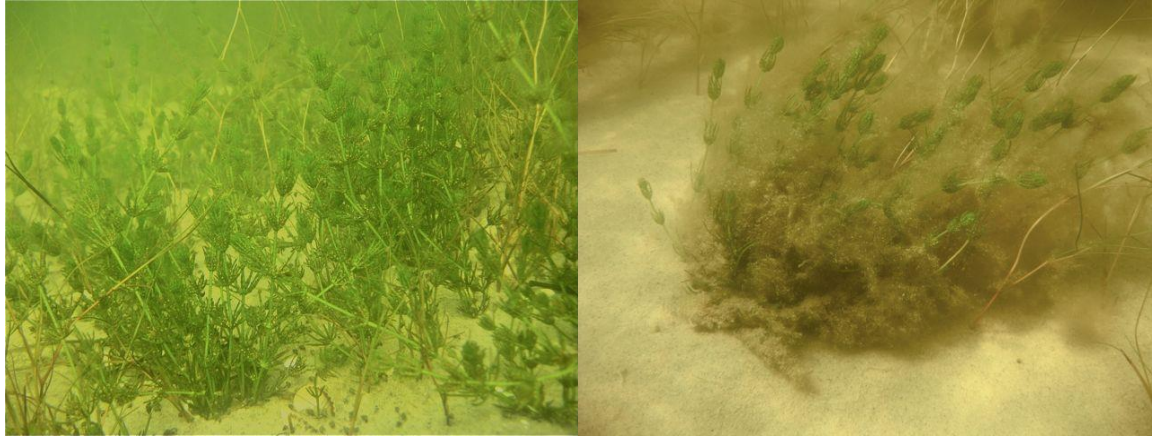
| | | | |
|---|---|--|------------------------------|
| English name: Baltic photic muddy or coarse sediment, sand or mixed substrate dominated by Charales | | Code in HELCOM HUB: AA.H1B4, AA.I1B4, AA.J1B4, AA.M1B4 | |
| Characteristic species: <i>Chara aspera</i> , <i>Chara canescens</i> , <i>Chara baltica</i> , <i>Chara horrida</i> , <i>Chara tomentosa</i> , <i>Tolypella nidifica</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Fishing (bottom trawling F02.02.01), Construction (dredging J02.02.02, dumping J02.11.01), Ditching (J02.01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Ditching (J02.01), Construction (dredging J02.02.02, dumping J02.11.01, J02.12, modification of hydrographic function J02.05), Other threat factors (aquaculture F01), Climate change (M02) | |
| Red List Criteria: A1 | Confidence of threat assessment: L, M (AA.H1B4) | HELCOM Red List Category: | NT NearThreatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "2" Heavily endangered 2.5.2.2 Sublittoral level sandy bottoms dominated by macrophyte vegetation "3" Endangered 2.4.2.2 Sublittoral level gravel bottoms dominated by macrophyte vegetation 2.4.3.2 Hydrolittoral level gravel bottoms dominated by macrophyte vegetation 2.7.2.2. Sublittoral muddy bottoms dominated by macrophyte vegetation 2.7.3.2. Hydrolittoral muddy bottoms dominated by macrophyte vegetation 2.8.2.2 Sublittoral mixed sediment bottoms dominated by macrophyte vegetation 2.8.3.2. Hydrolittoral mixed sediment bottoms dominated by macrophyte vegetation | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope consists of submerged vegetation with rhizoids growing in mixed substrate or all kinds of soft bottoms (coarse, sandy and muddy sediments) of the photic zone. Charales constitutes at least 50% of the biovolume. Characteristic species are *Chara aspera*, *C. baltica*, *C. canescens*, *C. horrida*, *C. tomentosa* and *Tolypella nidifica*. Which species dominate depend partly on the salinity range, the kind of sediment but also on the growth season. *Chara tomentosa* for example has higher densities on muddy sediments (Berg et al. 2004) and *Tolypella nidifica* is a typical early summer species (Schubert et al. 2003).

BIOTOPE INFORMATION SHEET

Several other charophyte species may accompany those species: *Lamprothamnion papulosum* (in higher salinities only), *Chara braunii*, *Chara connivens*, etc, but seldom reach higher densities. Also higher plants like *Zostera* spp., *Ruppia* spp., *Zannichellia palustris* and *Stukenia* (formerly *Potamogeton*) *pectinata* may occur in the biotope (Berg et al. 2004).



Charophytes (mainly *Chara baltica*) mixed with some higher plants on sandy bottom (left), *Chara baltica* overgrown by epiphytes (right) (Photo: Karin Fürhaupter, MariLim GmbH)

Charophytes are characteristic brackish and freshwater macrophytes and therefore play a very important role within the Baltic Sea vegetation (Schubert & Blindow 2003). Some species occur in salinities up to 18–25 psu, but the typical salinity range of the biotope covers 2–15 psu. In higher salinities usually higher plants dominate the vegetation.

Charophytes are sensitive to wave and current exposure and typically grow in sheltered to moderately sheltered bays, fjords and coastal lagoons (Schubert & Blindow 2003) including flads and gloe-flads. Along the outer coastlines they may grow if islands, peninsulas or sandbanks/reefs give shelter.

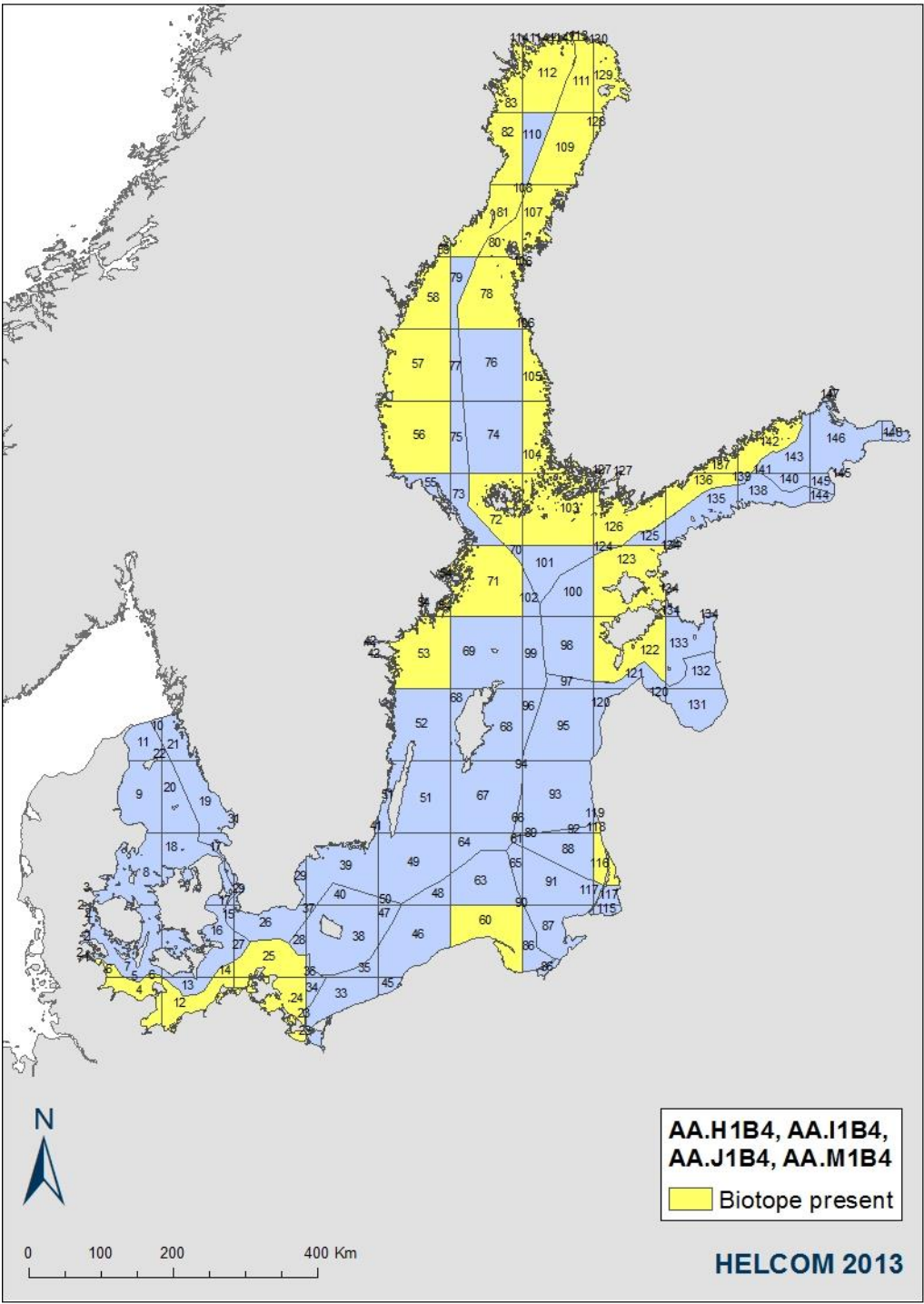
Due to comparable high light requirements of the characteristic species the biotope is distributed only in the upper photic zone around 0.5–8 meters depth (Tolstoy & Österlund 2003). Single specimens and certain species (e.g. *Tolypella nidifica*) may also occur deeper. Those high light requirements cause a high sensitivity to eutrophication (Torn et al. 2004) causing decreasing depth distribution limits and densities.

The specific highly branched growth form of charophytes and their partly calcified plant body offer settling ground for epiphytes and epifauna (Blindow et al. 2000) like hydrozoans or bryozoans (*Electra crustulenta*). Besides attached organisms also grazing snails, amphipods, insects such as specialized beetles (Holmen 1987) and small fish (stickleback, pipefish) use the biotope as living ground. Especially in high eutrophicated areas, epiphytic growth of ephemerals can cover charophytes completely and decrease the production and growth of the Charales. Bacterial decomposition of those high organic masses may lead to oxygen depletion and cause a breakdown of the biotope and its communities. Charophytes are able to recolonize from the spore bank when suitable conditions reoccur.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The Charales biotopes are distributed along the whole Baltic Sea coastline. The biotope covers large areas in the comparatively large, shallow and sheltered German Bodden areas, the Polish and Lithuanian Lagoons, the Latvian Bay of Riga and Estonian, and along the coasts of Finland and Sweden especially in flads. The higher the salinities, the higher the diversity of the biotope with respect to accompanying plant species and inhabiting invertebrate and fish communities. The diversity of Charales and related genera can however increase with decreasing salinity, as the charophytes are brackish and freshwater macrophytes. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Observed declines of the spatial distribution of Charales biotopes 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 (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 (OCEANA 2011). In the future climate change (increasing exposure levels, temperatures) or increasing aquaculture in bays may cause additional threats.

Assessment justification

A1

During the last 50 years the quantity of the *Charales* biotope has declined by >25%. As previously mentioned the biotope has declined to a varying extent in different Baltic Sea regions with the strongest decline in the Western and Southern Baltic Sea. In some bays and lagoons conditions have changed so intensively that the biotope has disappeared completely.

The decline in the Western and Southern Baltic Sea begun almost 100 years ago, however there is not enough reliable information to classify the biotope under A3, which requires data or inference as to the decline in quantity over the last 150 years.

Recommendations for actions to conserve the biotope

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 the biotope from further decline (HELCOM Website).

Common names

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BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|-------------------------------|
| English name: Baltic photic muddy sediment, coarse sediment, sand or mixed substrate dominated by common eelgrass (<i>Zostera marina</i>) | | Code in HELCOM HUB: AA.H1B7, AA.I1B7, AA.J1B7, AA.M1B7 | |
| Characteristic species: <i>Zostera marina</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Epidemics (wasting disease; K03.03), Water traffic (D03, G01), Construction (D03.03, sand extraction C01.01), Fishing (bottom trawling F02.02.01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (D03.03, sand extraction C01.01), Water traffic (D03, G01), Fishing (bottom trawling F02.02.01), Epidemics (wasting disease; K03.03), Climate change (M), Oil spills (oil spills in the sea H03.01) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "2" Heavily endangered 2.5.2.2 Sublittoral level sandy bottoms dominated by macrophyte vegetation "3" Endangered 2.4.2.2 Sublittoral level gravel bottoms dominated by macrophyte vegetation 2.4.3.2 Hydrolittoral level gravel bottoms dominated by macrophyte vegetation 2.7.2.2. Sublittoral muddy bottoms dominated by macrophyte vegetation 2.7.3.2. Hydrolittoral muddy bottoms dominated by macrophyte vegetation 2.8.2.2 Sublittoral mixed sediment bottoms dominated by macrophyte vegetation 2.8.3.2. Hydrolittoral mixed sediment bottoms dominated by macrophyte vegetation | | BSEP 113 (HELCOM 2007): <i>Zostera marina</i> Under threat and/or in decline in The Gulf of Gdansk, Bay of Mecklenburg, Kiel Bay, Little Belt, Great Belt, The Sound, Kattegat | |
| Greater concern stated by: Finland (EN, National Threat Assessment for biotopes), Germany, Poland | | | |

Habitat and Ecology

The biotope is characterized by the submerged rooted aquatic angiosperm common eelgrass (*Zostera marina*), which forms at least 50% biovolume of the vegetation. The biotope is mainly distributed on muddy and sandy sediments of the photic zone, but may in a lesser degree also grow on mixed substrates and coarse sediment (den Hartog 1970). *Zostera marina* is the dominant species, which forms pure stands or grows intermixed with charophytes or other higher plants to a varying degree mainly depending on salinity and exposure. Accompanying species in mixed stands are charophytes such as *Tolypella nidifica* and *Chara baltica* and other aquatic angiosperms like *Zannichellia palustris*, *Ruppia* spp., *Stuckenia pectinata*, or *Myriophyllum spicatum*. The high eelgrass shades other species, therefore they grow scattered between the *Zostera marina* patches and plants and not really intermixed (den Hartog 1970).

BIOTOPE INFORMATION SHEET



Grazing snails (*Rissoa* spp.) on a *Zostera marina* leaf (Photo: Karin Fürhaupter, MariLim GmbH)

The *Zostera marina* dominated biotopes typically marks the lower depth limit distribution of soft bottom vegetation. *Zostera marina* grows at the depth of 2–6 meters (range 1–10 m). The northern and eastern distribution limits of *Z. marina* correlate with the 5 psu salinity gradient of surface seawater (Möller 2008).

Zostera marina is one of the most abundant macrophytes on exposed sandy bottoms in the Baltic Sea, and especially abundant in the southern regions. In exposed conditions it grows typically in pure stands. Common eelgrass occurs also in sheltered and very sheltered conditions, where it exists parallel to other biotopes dominated by taxa such as Charales or *Zannichellia* spp.

Zostera marina requires abundant sunlight. Murky water or a great abundance of epiphytic algae causes the *Z. marina* plants to wilt and die (Hauxwell et al. 2000, McGlathery 2001, Pihl et al. 1995). Especially in the areas where *Z. marina* occurs at the lowest limit of its salinity tolerance the plants are susceptible to these disturbances. In these regions the recruitment is not strong and mainly occurs through shoots



AA.B1B7 Baltic photic mixed substrate dominated by common eelgrass (*Zostera marina*), biomass of *Zostera marina* exceeds that of *Fucus vesiculosus* when assessing the entire biotope patch (Photo: Karin Fürhaupter, MariLim GmbH)

BIOTOPE INFORMATION SHEET

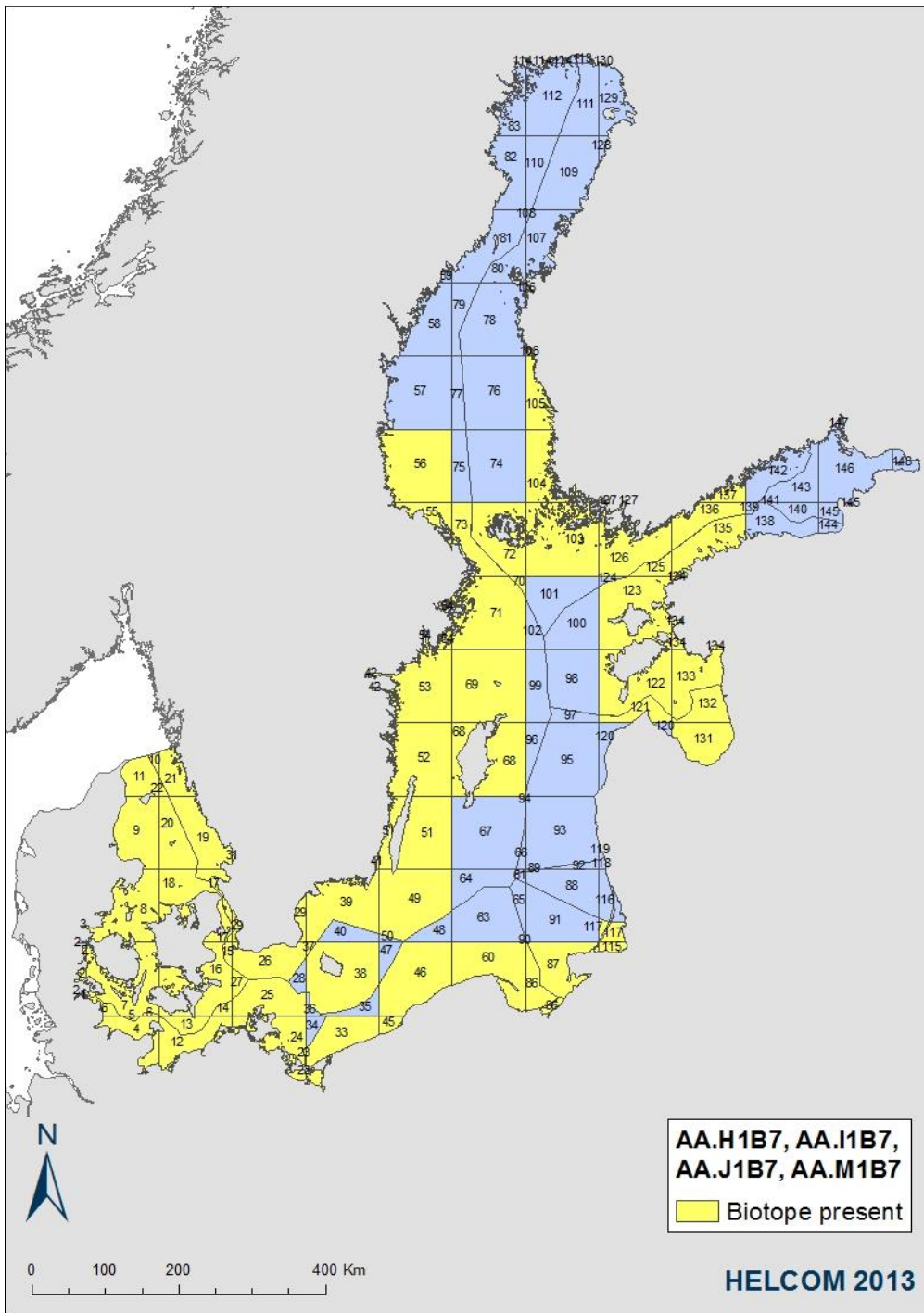
being transported and rooting in a new area. If a *Zostera marina* dominated biotope has disappeared in the region where salinity is around 5 psu, there is no guarantee for the biotope ever becoming re-established even after other environmental conditions have improved.

Patches and beds of *Zostera marina* stabilize bare soft substrates. The community residing in this biotope is different compared to that of a community residing in a neighbouring bare sediment biotope. A diverse invertebrate fauna thrives in the *Zostera* beds with e.g. oligochaets, polychaets and bivalves living in the sediment. Many more species living on or among the leaves, e.g. hydrozoans, young bivalves, grazing snails such as *Hydrobia* spp., *Rissoa* spp., gammarids, other crustaceans and pipefishes (Boström & Bonsdorff 1997). The three-dimensional structure of *Zostera*-beds exemplified by a rich sediment infauna contributes significantly to total biodiversity and abundance in a region

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The *Zostera* beds are common from Kattegat to the Archipelago Sea in the northern Baltic, and the salinity gradient from south to north causes considerable differences to the composition of the associated fauna and flora. In the southern Baltic Sea the eelgrass usually forms pure stands along the outer, exposed coastline, whereas in the northern part of the Baltic Sea and in southern bays and lagoons it often grows intermixed with other aquatic angiosperms. The largest occurrences of the biotopes dominated by *Zostera marina* are found in the southern Baltic Sea, where they represent one of the most abundant biotopes of the sublittoral. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur based on field sampling data.



BIOTOPE INFORMATION SHEET

Description of Major threats

The distribution and depth limits of eelgrass have considerably declined in past 100 years (Boström et al 2003). During the 1930s the “wasting disease” caused about 90% of the North European stock to disappear, which also affected the *Zostera* beds in Danish waters (Möller 2008). More recently, eutrophication of the Baltic Sea has resulted in significant decline of eelgrass meadows in Danish, German, Swedish and Polish coastal areas (Möller 2008). In the northern Baltic, no clear changes in the distribution of eelgrass meadows have been recorded but the long-term changes found in the eelgrass associated invertebrate assemblages are linked to the effects of eutrophication (Lundberg 2005 and references therein). Further eutrophication may cause a shift from eelgrass meadows to communities dominated by fast-growing macro-algae.

Eutrophication has decreased the depth where *Zostera* dominated biotopes can receive enough light. In Danish waters the lower depth limit has been reduced to 2–3 meters in estuaries and 4–5 meters in open waters, compared to the depth levels 5–6 meters and 7–8 meters in the 1900 (Möller 2008). In German coastal lagoons where eutrophication effects are intensified compared to open waters the lower depth limit was observed to have decreased from 6 m in the 1960s to less than 2 m in the 1980s (Schiewer 2002). Dense *Zostera* beds were reported in Poland at depths down to 10 meters in the 1950s (Puck Lagoon) however by the end of the 1980s the meadows had been replaced by filamentous brown algae and *Zannichellia palustris* (Kruk-Dowgiallo 1996). Literature describing the change in depth distribution of *Zostera* dominated biotopes along the coast of the Baltic states is scarce, it is even possible that *Zostera* dominated biotopes disappeared completely from Lithuanian waters before any scientific studies were carried out (Möller 2008).

Climate change is predicted to lower the salinity level in the northern parts of the Baltic Sea due to an increase of precipitation. In the future *Zostera marina* may decline in the northernmost areas where it currently exists on the limits of its salinity tolerance (HELCOM 2013).

Assessment justification

A1

During the last 50 years the distribution of the *Zostera marina* biotope has declined >25%. The biotope has declined to varying extents in the different Baltic Sea regions.

The decline in the southern areas of the Baltic Sea begun almost 100 years ago, however there is not enough reliable information to classify the biotope under A3 which requires data or inference as to the decline in quantity over the last 150 years.

Recommendations for actions to conserve the biotope

All actions to reduce eutrophication of the Baltic Sea are important for the conservation of the soft sediment biotopes dominated by *Zostera marina*.

Appointing areas where the biotope is known to occur as protected sites where anchoring of all types of vessels is prohibited, would constitute an effective conservation measure.

The biotope and its ecology in the different regions has been extensively studied (Baden and Boström 2001, Baden et al. 1990, Borum et al. 2004, Boström 2001, Boström et al. 2003, Boström et al. 2002, den Hartog 1970, Kruk-Dowgiallo 1996, Schiewer 2002). Regional strategies for conservation of the biotope should be developed based on the regional knowledge of the ecology and the local pressures on the biotope.

BIOTOPE INFORMATION SHEET

Common names

Zostera beds, eelgrass beds, *Zostera* meadows,

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BIOTOPE INFORMATION SHEET

| | | | |
|--|---|---|-------------------------------|
| English name: Baltic photic muddy sediment dominated by sedges (Cyperaceae) | | Code in HELCOM HUB: AA.H1A2 | |
| Characteristic species: <i>Schoenoplectus spp</i> , <i>Bolbaschoenus maritimus</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (changes in the water flow J02), Alien species (I01), Tourism (G05), Oil spills (oil spills in the sea H03.01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (changes in the water flow J02), Alien species (I01), Fishing (F02), Tourism (G05), Oil spills (oil spills in the sea H03.01) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.7.3.2 Hydrolittoral muddy bottoms dominated by macrophyte vegetation | | BSEP 113 (HELCOM 2007): Macrophyte meadows and beds are under threat and/or in decline in: All where they occur. | |
| Greater concern stated by: | | | |

Habitat and Ecology

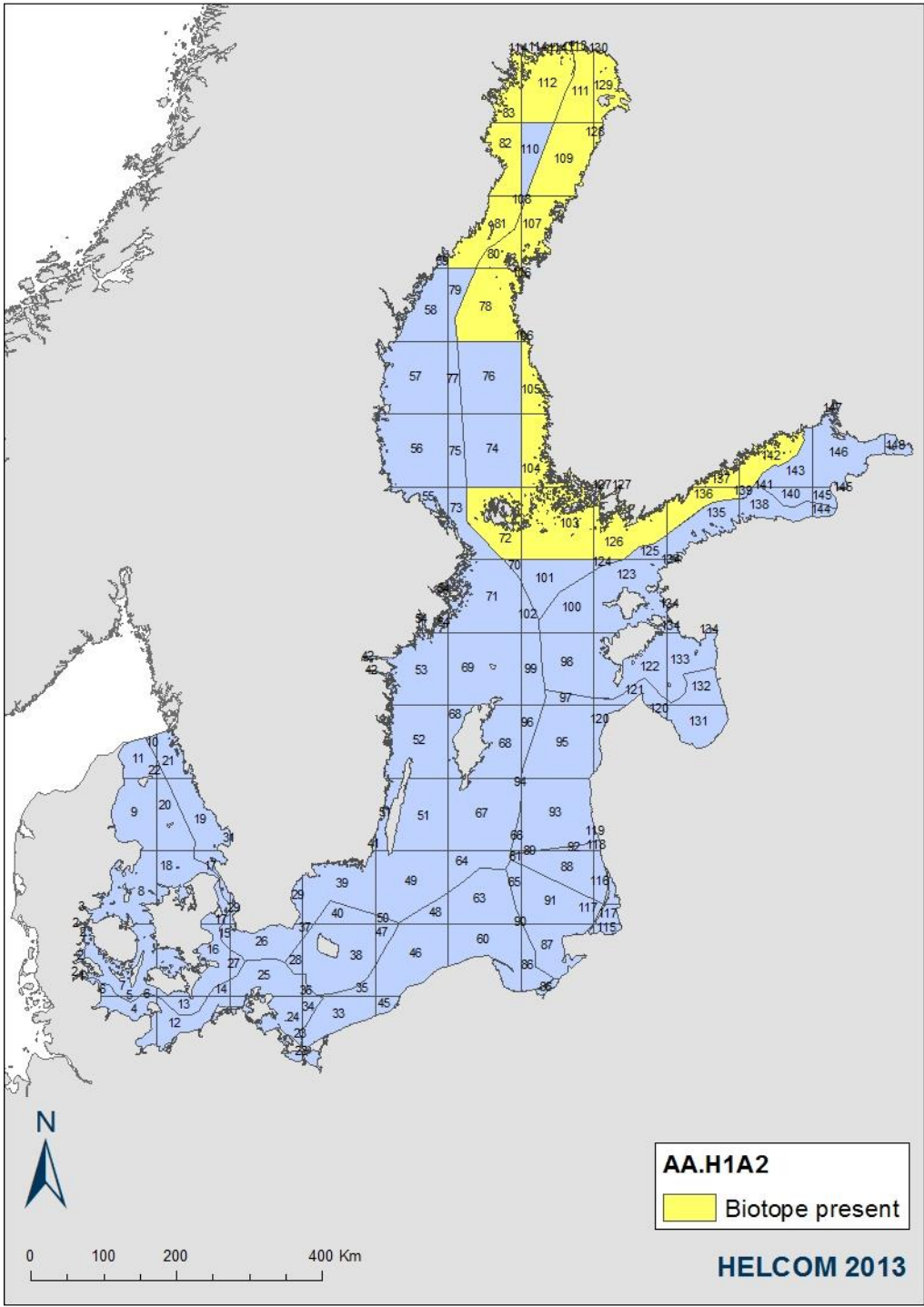
The biotope is defined by the substratum being covered >90% mud or silt with a grainsize >63 µm and emergent vegetation coverage is >10% of which sedges (Cyperacea) constitute at least 50% in biovolume. The biotope occurs in sheltered areas, in the photic zone down to about 1 meter. Sedges are large family of graminoid plants. In the Baltic Sea, sedges form large biotopes in shallow areas.

The biotope typically occurs in estuaries and inlets in the Baltic Sea. The species diversity in the shallow areas is usually high. The biotope is utilized by a large variety and abundance of 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.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The muddy sedge biotope can be found in very sheltered lagoons and in some estuaries around the whole Baltic Sea however the main distribution of the biotope along the coast of the Baltic Sea is in the northern parts. The distribution map indicates the area in the 100 x 100 km grid where biotope is estimated to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication and pollution by drainage from farming and forestry and other sources (like traffic and industry) are serious threats and deterioration factors. Other pressures and threats are mainly caused by shipping, construction or enlargement of harbours and marinas in the river mouths. Changes in the water flow due to hydro-technical constructions, such as dams, cascades and river bank control, may also have adverse effects on estuaries. Other threats can be caused by introduction of non-indigenous, invasive species, unsustainable fishery and tourism as well as oil spills and construction of breakwaters. 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.

Assessment justification

A1

Human activities have caused various pressures in many estuaries, which in some cases resulted in severe damages. Generally, it can be considered that the natural values of the Estuaries in the Baltic Sea region are deteriorating. Moreover, the length of pristine shores of estuaries or estuaries in a natural or near natural state is steadily decreasing.

In the case of inlets, the habitat type is threatened by physical modification due to construction of roads and bridges as well as eutrophication and pollution. Particularly eutrophication causes risks for oxygen deficiency in bottom water.

Recommendations for actions to conserve the biotope

One of the main solutions to stop and reverse degradation of the estuaries is a general protection of this natural habitat type by law. Particularly still unregulated and natural river mouth areas need to become strictly protected sites. Further, programs 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. The introduction of ecologically sound fishing and farming methods is essential in order to reach a more favourable conservation status of the natural habitat type.

Common names

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References

HELCOM websites http://www.helcom.fi/environment2/biodiv/endangered/Biotopes/en_GB/Estuaries/
http://www.helcom.fi/environment2/biodiv/endangered/Biotopes/en_GB/Inlets/

BIOTOPE INFORMATION SHEET

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|---|--|--|-------------------------------|
| English name: Baltic photic muddy sediment or sand dominated by spiny naiad (<i>Najas marina</i>) | | Code in HELCOM HUB: AA.H1B5, AA.J1B5 | |
| Characteristic species: <i>Najas marina</i> , Charales often co-occur | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (dredging J02.02, dykes, embankments and artificial beaches J02.12), Ditching (J02.01), Other threat factors (aquaculture F01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (dredging J02.02, dykes, embankments and artificial beaches J02.12), Ditching (J02.01), Other threat factors (aquaculture F01), Climate change (M02) | |
| Red List Criteria: A1 | Confidence of threat assessment: L (AA.J1B5), M(AA.H1B5) | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "2" Heavily endangered 2.5.2.2 Sublittoral sand bottoms dominated by macrophyte vegetation "3" Endangered 2.5.2.1. Sublittoral level sandy bottoms with little or no macrophyte vegetation of the photic zone 2.5.2.4 Sand banks of the sublittoral photic zone with or without macrophyte vegetation 2.5.3.1 Hydrolittoral level sandy bottoms with little or no macrophyte vegetation 2.5.3.2 Hydrolittoral level sandy bottoms dominated by macrophyte vegetation 2.5.3.4 Hydrolittoral sand banks with or without macrophyte vegetation 2.7.2.1 Sublittoral muddy bottoms with little or no macrophyte vegetation of the photic zone 2.7.2.2 Sublittoral muddy bottoms dominated by macrophyte vegetation 2.7.3.1 Hydrolittoral muddy bottoms with little or no macrophyte vegetation 2.7.3.2 Hydrolittoral muddy bottoms dominated by macrophyte vegetation | | BSEP 113 (HELCOM 2007): Macrophyte meadows and beds are under threat and/or in decline everywhere, where they occur. | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope is characterized by the submerged rooted aquatic angiosperm *Najas marina* (spiny naiad also known as holly-leaved water nymph), which forms at least 50% biovolume of the vegetation. The biotope is distributed on muddy and sandy sediments of the photic zone. Beside the dominant species *Najas marina*, several charophytes such as *Chara aspera* or *Chara tomentosa* and other higher plants such as *Stukenia pectinata* may coexist (Berg et al. 2004).

The species occurs widely in freshwater and brackish environments all over Europe (Preston & Croft 1997). Compared to Charales-biotopes, the distribution of the biotope dominated by spiny naiad is more

BIOTOPE INFORMATION SHEET

strictly restricted to bays and coastal lagoons. The distribution range within the bays give evidence that the biotope is even more sensitive to exposure than charophytes, preferring extremely sheltered conditions. Suitably sheltered bays are often shallow. In Great Britain (Preston & Croft 1997) and the Southern Baltic Sea (Selig et al. 2007b) *N. marina* stands were observed to favour lower phosphorus concentrations than other benthic macrophytes, which highlights a high sensitivity to eutrophication. *Najas marina* requires good light conditions.



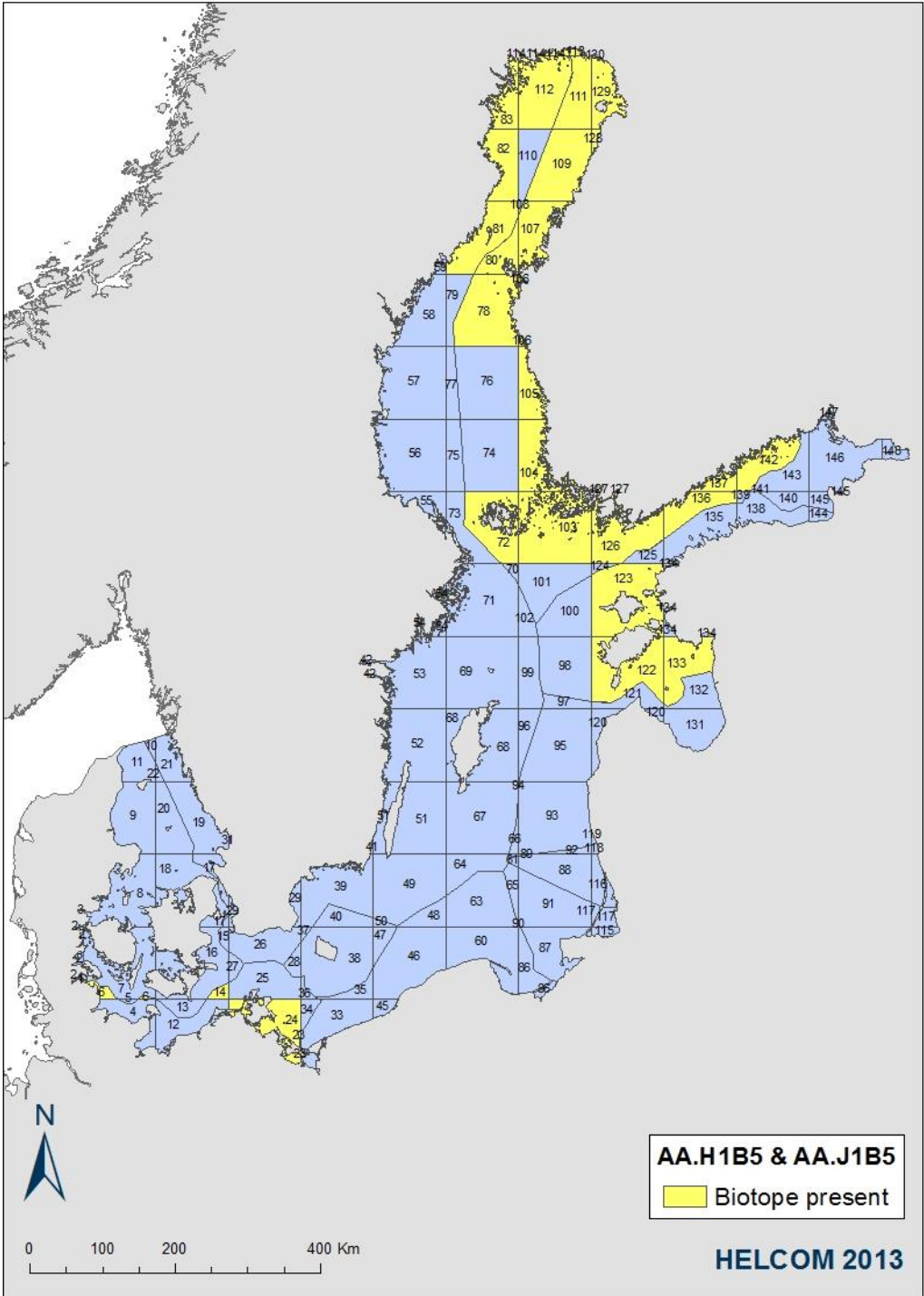
Herbarium specimen of *Najas marina*
(Photo: Karin Fürhaupter, MariLim GmbH)

Like charophytes, *Najas marina* can also easily become overgrown by ephemeral algae having a similar effect on the biotope (breakdown of stands). Sessile animals are seldom found attached to the plant but grazing snails, insects and mobile amphipods occur typically in the spiny naiad biotope. The inhabiting communities are similar to the Charales biotopes in comparable salinities.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The *Najas* biotopes are distributed along the whole Baltic Sea coastline. Especially some very sheltered, oligohaline German Boddens, the Puck, Vistula and Curonian Lagoon, as well as Finnish and Swedish flads and glo-flads are typical localities where the biotope occurs. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Observed declines of the spatial distribution of the spiny naiad biotopes are mainly caused by increased eutrophication and its connected impacts/threats. Decreased light penetration depth, massive growth of ephemerals and increased sedimentation/siltation cause massive alteration in the habitat conditions of sheltered coastal zones. The enclosed characteristic of bays and lagoons intensify the eutrophication threats.

Coastal constructions (ditching, deepening of harbour access channels, leisure facilities and physical disturbance due to increased tourism has led to a further degradation of the biotope. The threat level is particularly high in the Southern Baltic Sea (OCEANA 2011). In the future climate change (increasing exposure levels, temperatures) or increasing aquaculture in bays may cause additional threats.

Assessment justification

A1

According to Berglund et al. (2003), in the Åland Sea area *N. marina* was one of the rarest observed macrophyte species, with only 9% occurrence of the total 27 coastal localities studied. A comparison of the current with the historical distribution status of *Najas marina* within the German Bodden areas of Mecklenburg Western Pomerania (Southern Baltic Sea) resulted in a nearly total loss of the biotope. *Najas marina* exists still with single specimens, but no high densities could be assessed (pers comm. K. Fürhaupter).

The biotope has exhibited a strong decline in the highly eutrophicated areas of the Southern Baltic Sea and it is even known to have disappeared. But in other Baltic Sea areas and in freshwater lakes this species is not known to be extremely sensitive to eutrophication. As the species forms several subspecies, this varying reaction may be caused by the distribution of different subspecies within the Baltic Sea area, but not enough data are available to support this assumption.

Recommendations for actions to conserve the biotope

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 the biotope from further decline (HELCOM Website).

Common names

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References

- Berg Ch., Dengler J., Abdank A., Isermann M. 2004. Die Pflanzengesellschaften Mecklenburg-Vorpommerns und ihre Gefährdung – Textband. Weissdorn-Verlag, Jena: 94–98.
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BIOTOPE INFORMATION SHEET

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|--|---|---|-------------------------------|
| English name: Baltic photic muddy sediment dominated by ocean quahog (<i>Arctica islandica</i>) | | Code in HELCOM HUB: AA.H3L3 | |
| Characteristic species: <i>Arctica islandica</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.7.2.1 Sublittoral muddy bottoms with little or no macrophyte vegetation of the photic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

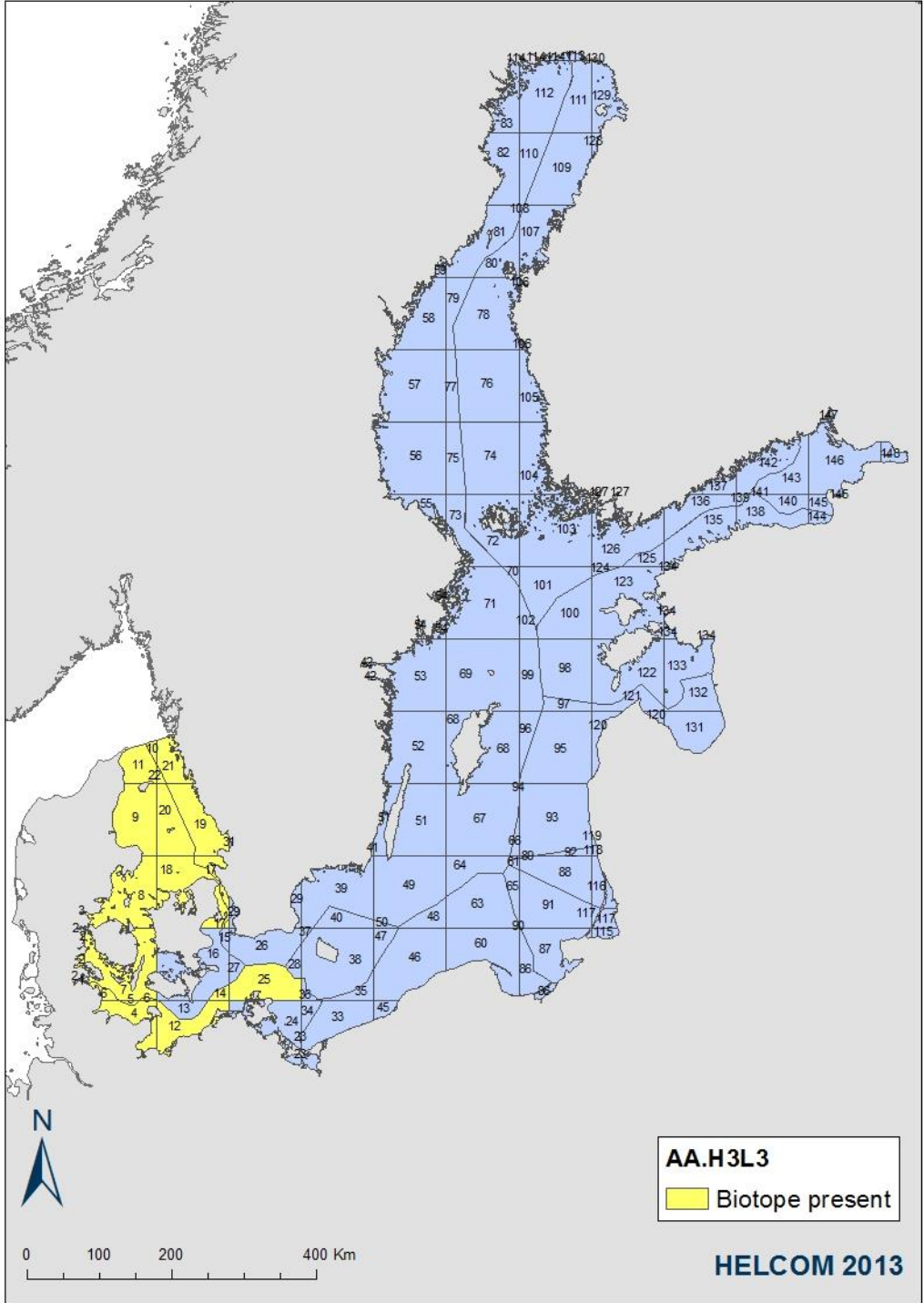
The biotope is defined to have a coverage of muddy sediments >90% and of the macroinfauna the biomass of the ocean quahog (*Arctica islandica*) constitutes at least 50%. The biotope is limited to areas in the Baltic Sea where the salinity is above 15 psu

Ocean quahog (*Arctica islandica*) is a bivalve mollusk found buried in sandy and muddy sediments. *Arctica islandica* is a long-lived species with a very slow growth rate. Populations of 40–80 year old specimens with a substantial proportion over 100 years old have been observed. *A. islandica* is among the longest-lived and slowest growing marine bivalves (OSPAR 2009). It is a large species that can grow up to 20 cm length (Moen & Svensen 2004).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The main distribution area of this biotope is the western Baltic Sea. The largest populations of *A. islandica* are found in Kiel and Mecklenburg Bights (Zettler et al. 2001). The distribution map indicates the area in the 100 x 100 km grid where biotope is estimated to occur based on environmental conditions and the availability of the specific substrate.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication is considered to be one of the major threats to this biotope. Long lasting and frequent periods of oxygen depletion have caused mortality of *A. islandica* populations. Due to the slow population growth rate, the recovery of declined populations is slow, and therefore communities characterized by *A. islandica* have been replaced by communities consisting of short living polychaetes (Zettler et al. 2001). Physical disturbance by bottom-trawling might also affect the biotope, but is assumed to be of minor importance due to the relatively low frequency of bottom trawling in the southern Baltic Sea.

Assessment justification

A1

The quantity of the biotope has declined by $\geq 25\%$ during the past 50 years. The decline in quantity of this biotope has not been as severe as for biotopes dominated by *Arctica islandica* on aphotic muddy bottoms in the Baltic Sea. In the areas where the biotope occurs, the photic muddy sediments have not been subjected to anoxia.

Recommendations for actions to conserve the biotope

All actions that reduce eutrophication will benefit the biotope.

Common names

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References

- OSPAR 2009. OSPAR Background for Ocean quahog *Arctica islandica*. Biodiversity Series. http://qsr2010.ospar.org/media/assessments/Species/P00407_Ocean_quahog.pdf
- Gogina, M., Zettler, M.L. 2010. Diversity and distribution of benthic macrofauna in the Baltic Sea: Data inventory and its use for species distribution modelling and prediction. *Journal of Sea Research* 64(3): 313–321.
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- Zettler, M. L., Bönsch, R., Gosselck, F. 2001. Distribution, abundance and some population characteristics of the ocean quahog, *Arctica islandica* (Linnaeus, 1767), in the Mecklenburg Bight (Baltic Sea). *Journal of Shellfish Research* 20: 161– 169.

BIOTOPE INFORMATION SHEET

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|---|---|--|-------------------------------|
| English name: Baltic photic sand dominated by ocean quahog (<i>Arctica islandica</i>) | | Code in HELCOM HUB: AA.J3L3 | |
| Characteristic species: <i>Arctica islandica</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered 2.5.2.1 Sublittoral sandy bottoms with little or no macrophyte vegetation of the photic zone 2.5.2.3. Sand bars of the sublittoral photic zone | | BSEP 113 (HELCOM 2007): Sandbanks which are slightly covered by sea water all the time are under threat and/or in decline in: The Southern Baltic Proper, The Gulf of Gdansk, Bay of Mecklenburg, Kiel Bay. | |
| Greater concern stated by: | | | |

Habitat and Ecology

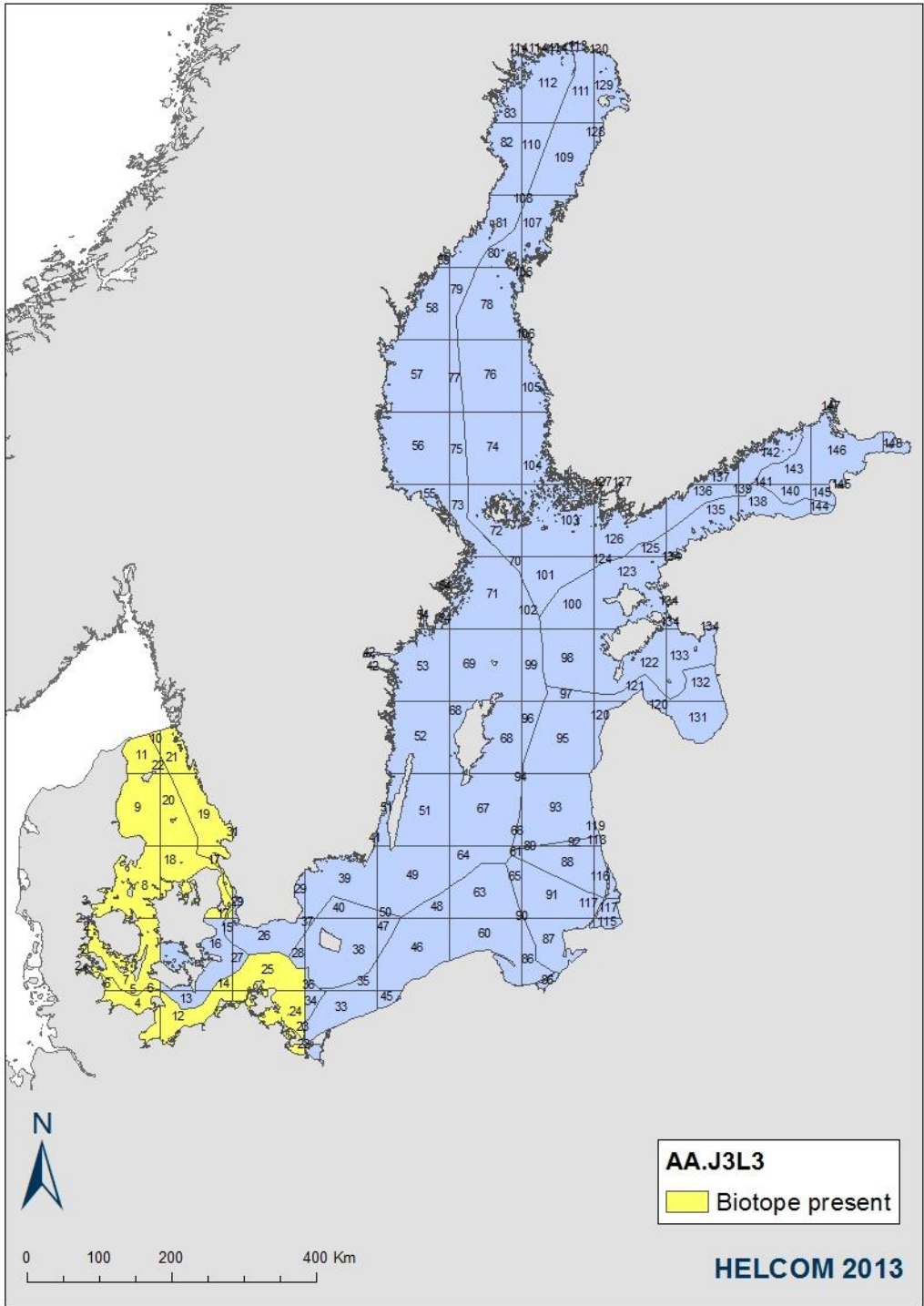
The biotope is defined to have a coverage of sand >90% and of the macroinfauna the biomass of the ocean quahog (*Arctica islandica*) constitutes at least 50%. The biotope is limited to areas in the Baltic Sea where the salinity is above 15 psu.

Ocean quahog (*Arctica islandica*) is a bivalve mollusk found buried in sandy and muddy sediments. *Arctica islandica* is a long-lived species with a very slow growth rate. Populations of 40–80 year old specimens with a substantial proportion over 100 years old have been observed. *A. islandica* is among the longest-lived and slowest growing marine bivalves (OSPAR 2009). It is a large species that can grow up to 20 cm length (Moen & Svensen 2004).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The main distribution area of this biotope is the western Baltic Sea. The largest populations of *A. islandica* are found in Kiel and Mecklenburg Bights (Zettler et al. 2001). The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur



BIOTOPE INFORMATION SHEET

Description of Major threats

Long lasting and frequent periods of oxygen depletion have caused mortality of *A. islandica* populations. Due to the slow population growth rate, the recovery of declined populations is slow, and therefore communities characterized by *A. islandica* have been replaced by communities consisting of short living polychaetes (Zettler et al. 2001).

Assessment justification

A1

The quantity of the biotope has declined by $\geq 25\%$ during the past 50 years. The decline in quantity of this biotope has not been as severe as for biotopes dominated by *Arctica islandica* on aphotic muddy bottoms in the Baltic Sea. In the areas where the biotope occurs, the photic sandy sediments have not been subjected to anoxia.

Recommendations for actions to conserve the biotope

All actions to reduce eutrophication in the Baltic Sea will benefit the biotope.

Common names

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References

- OSPAR 2009. OSPAR Background for Ocean quahog *Arctica islandica*. Biodiversity Series.
http://qsr2010.ospar.org/media/assessments/Species/P00407_Ocean_quahog.pdf
- Gogina, M., Zettler, M.L. 2010. Diversity and distribution of benthic macrofauna in the Baltic Sea: Data inventory and its use for species distribution modelling and prediction. *Journal of Sea Research* 64(3): 313–321.
- Moen, F. E., Svensen, E. (2004). *Marine fish & invertebrates of Northern Europe*. KOM, Kristiansund. 608pp.
- Zettler, M. L., Bönsch, R., Gosselck, F. 2001. Distribution, abundance and some population characteristics of the ocean quahog, *Arctica islandica* (Linnaeus, 1767), in the Mecklenburg Bight (Baltic Sea). *Journal of Shellfish Research* 20: 161– 169.

BIOTOPE INFORMATION SHEET

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|--|---|---|-------------------------------|
| English name: Baltic photic muddy sediment dominated by Unionidae | | Code in HELCOM HUB: AA.H3L6 | |
| Characteristic species: Unionidae, <i>Unio tumidus</i> , Chironomidae larvae often co-occur | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): Category "3" Endangered 2.7.3.1 Hydrolittoral muddy bottoms with little or no macrophyte vegetation | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

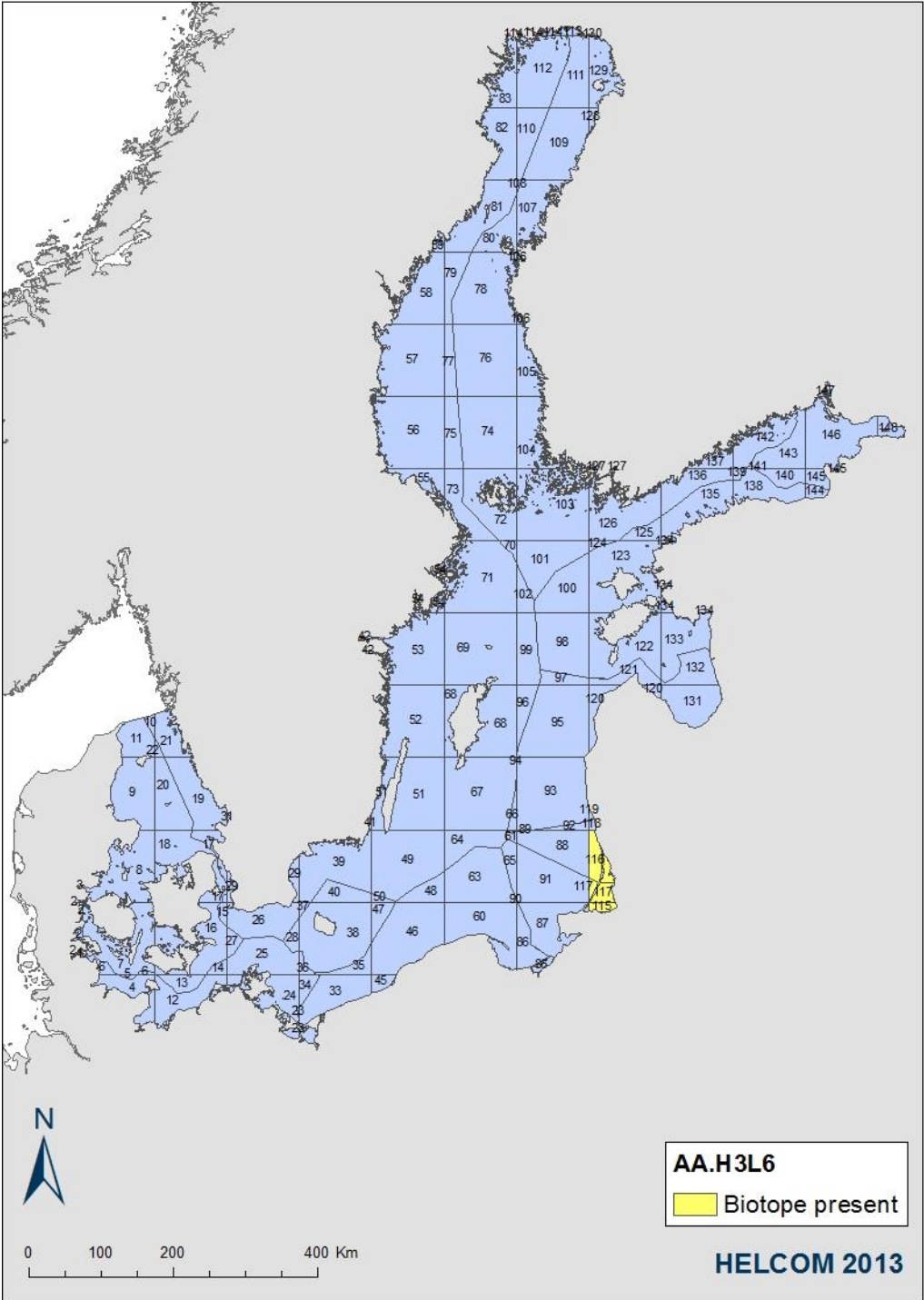
Habitat and Ecology

The biotope occurs mainly in estuaries and very sheltered lagoons. The bivalve mollusk species in the Unionidae family are filter feeding freshwater mussels and make up $\geq 50\%$ of the macroinfaunal biomass. The bivalves are relatively large, approximately 10 cm in length, and can slowly move along in the muddy substrate. They live in soft sediment, solitary or in groups. Unionids have slow growth, low fecundity and are long lived (Karatayev et al. 1997).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope is known to occur in the eastern parts of the Curonian lagoon in Lithuania. Mussel species of the family Unionidae occur in the whole Baltic Sea region and can occur in densities high enough to be habitat forming in estuaries. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication is the major threat to this biotope by increasing the particle concentration in the watermass, impeding the filter-feeding of the Unionidae mussels.

The alien species zebra mussel (*Dreissena polymorpha*) is also thought to pose threat to the biotope. *Dreissena polymorpha* has invaded the Baltic Sea already in the 19th century as a result of the construction of canals in Europe. It originates from the Ponto-Caspian region and was firstly found in the south-eastern Baltic lagoons and estuaries in 1825. It has established in several parts of the Baltic Sea. The spread of the species is restricted by salinity and temperature as it cannot survive freezing. In the Gulf of Finland the recruitment success of new larvae is only possible during more favourable warmer years (Orlova & Panov 2004). In the Curonian Lagoon *D. polymorpha* is the dominant species forming mussel beds over approximately 23% of the Lagoon's bottom area (Leppäkoski et al. 2002) and competes with the Unionidae for food and space. Unionidae shells provide hard substratum for the settlement of zebra mussel juveniles. The overgrowth of Unionidae mussels by *D. polymorpha* impairs their filter-feeding and burrowing and movement along the sediment surface. Evidence of local Unionidae extinction due to a *D. polymorpha* invasion has been found in Belarus lakes (Burlakova et al. 2000), North American Great Lakes (Schloesser & Nalepa 1996) and the Mississippi River (Ricciardi et al. 1998).

Assessment justification

A1

The invasive species *Dreissena polymorpha* has spread throughout the Baltic Sea and occupies large areas that may previously have been Unionidae dominated. During the past 50 years the area covered by the Unionidae dominated biotope has been estimated to have decreased by $\geq 25\%$.

The swollen river mussel (*Unio tumidus*) that is native to countries of the south eastern region of the Baltic Sea is characteristic for the biotope. *U. tumidus* is listed as Vulnerable in the Lithuanian national red list assessment.

Recommendations for actions to conserve the biotope

More research on the interactions of the alien and native species in Baltic Sea condition is needed. Prevention actions to stop alien species from invading the Baltic Sea should be carried out.

Common names

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References

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- Ricciardi, A., Never, R. J., Rasmussen, J. B. (1998). Impending extinctions of North American freshwater mussels (Unionoida) following the zebra mussel (*Dreissena polymorpha*) invasion. *Journal of animal ecology* 67: 613-619.

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BIOTOPE INFORMATION SHEET

Schloesser, D. W., Nalepa, T. F. (1996). Zebra Mussel Infestation of Unionid Bivalves (Unionidae) in North America. *American Zoologist* 36: 300-310.

BIOTOPE INFORMATION SHEET

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|--|---|---|-------------------------------|
| English name: Baltic photic or aphotic coarse sediment or sand dominated by multiple infaunal bivalve species: <i>Macoma calcarea</i>, <i>Mya truncata</i>, <i>Astarte spp.</i>, <i>Spisula spp.</i> | | Code in HELCOM HUB: AA.I3L10, AA.J3L10, AB.I3L10, AB.J3L10 | |
| Characteristic species: <i>Macoma calcarea</i> , <i>Mya truncata</i> , <i>Astarte spp.</i> , <i>Spisula spp.</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered: 2.4.1 Gravel bottoms of the aphotic zone 2.4.2.1 Sublittoral gravel bottoms with little or no macrophyte vegetation of the photic zone 2.4.2.3 Sublittoral gravel banks of the photic zone with or without macrophyte vegetation 2.4.3.1 Hydrolittoral level gravel bottoms with little or no macrophyte vegetation 2.4.3.3 Hydrolittoral gravel banks with or without macrophyte vegetation 2.5.1 Sandy bottoms of the aphotic zone 2.5.2.1 Sublittoral level sandy bottoms with little or no macrophyte vegetation or the photic zone 2.5.2.3 Sand bars of the sublittoral zone 2.5.2.4 Sand banks of the sublittoral photic zone with or without macrophyte vegetation 2.5.3.1 Hydrolittoral level sandy bottoms with little or no macrophyte vegetation 2.5.3.4 Hydrolittoral sand banks with or without macrophyte vegetation | | BSEP 113 (HELCOM 2007): <i>Mya truncata</i> is under threat and/or in decline in Bay of Mecklenburg, The Sound and Kattegat. | |
| Greater concern stated by: | | | |

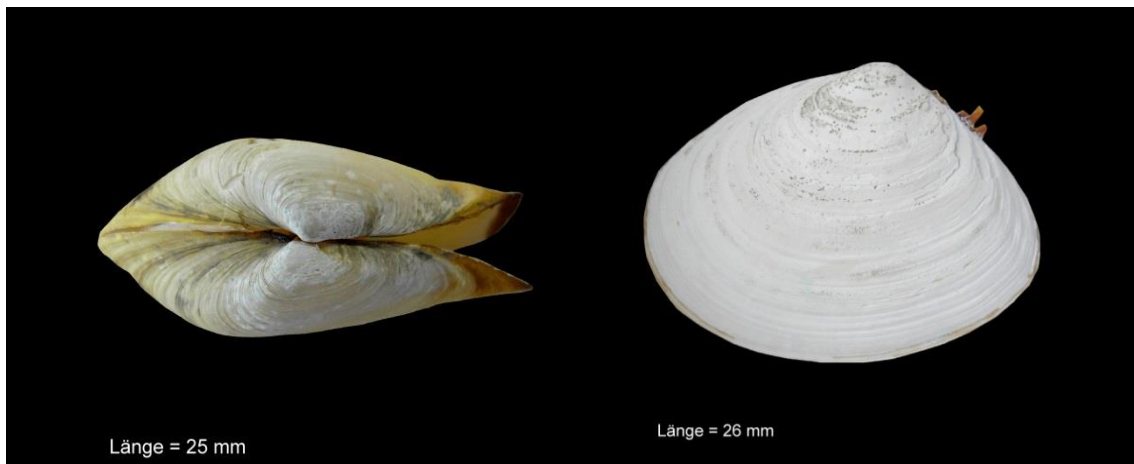
Habitat and Ecology

The substrate of this biotope is usually poorly sorted and contains different proportions of gravel, coarse or medium sand, but may also contain finer sediment fractions. It is mainly restricted to small patches between hard substrates on ridges formed by lag sediment and till (e.g. Fehmarnbelt) in the photic and aphotic zone. The biotope is only found at high salinities (> 18 psu) as all characteristic bivalve species are eumarine and do not accept lower salinities. The characteristic trait of the biotope is a high species diversity. Usually, none of the characteristic species is clearly dominant in an area. Due to the different sediment fractions and the interlocking with surrounding hard substrates, the benthic community combines high biodiversity and high biomass. The biomass of multiple infaunal bivalve species (*Macoma calcarea*, *Mya truncata*, *Astarte spp.*, *Spisula spp.*) constitute at least 50 % of the biomass. The dominance structure might considerably vary between stations within the same patch and single large specimen of *Arctica islandica* might occasionally dominate at single spots.

BIOTOPE INFORMATION SHEET

Mya truncata requires a salinity above 20 psu. This marine species is from time to time rare in the Belt Sea with maximum densities of 1-10 ind./m², but seems to recover recently (NT;A2c). Reproduction takes place from October to January; pelagic larvae. The species is relatively tolerant of periodic, temporary oxygen deficiency (HELCOM Website). The species occurs most often at depths between 10 and 30 meters (Moen & Svensen 2004).

Macoma calcarea (VU; A2c) is a deposit filter feeder with separate sexes and pelagic larvae. The species prefers fine sand or mud, often mixed with gravel. Currently this northern Atlantic arctic species is only found in the western parts of the HELCOM area, it has disappeared from many sites in the Bornholm Basin and Eastern Gotland Basin due to oxygen depletion. The typical depth range of recent records vary from 15 to 30 meters.



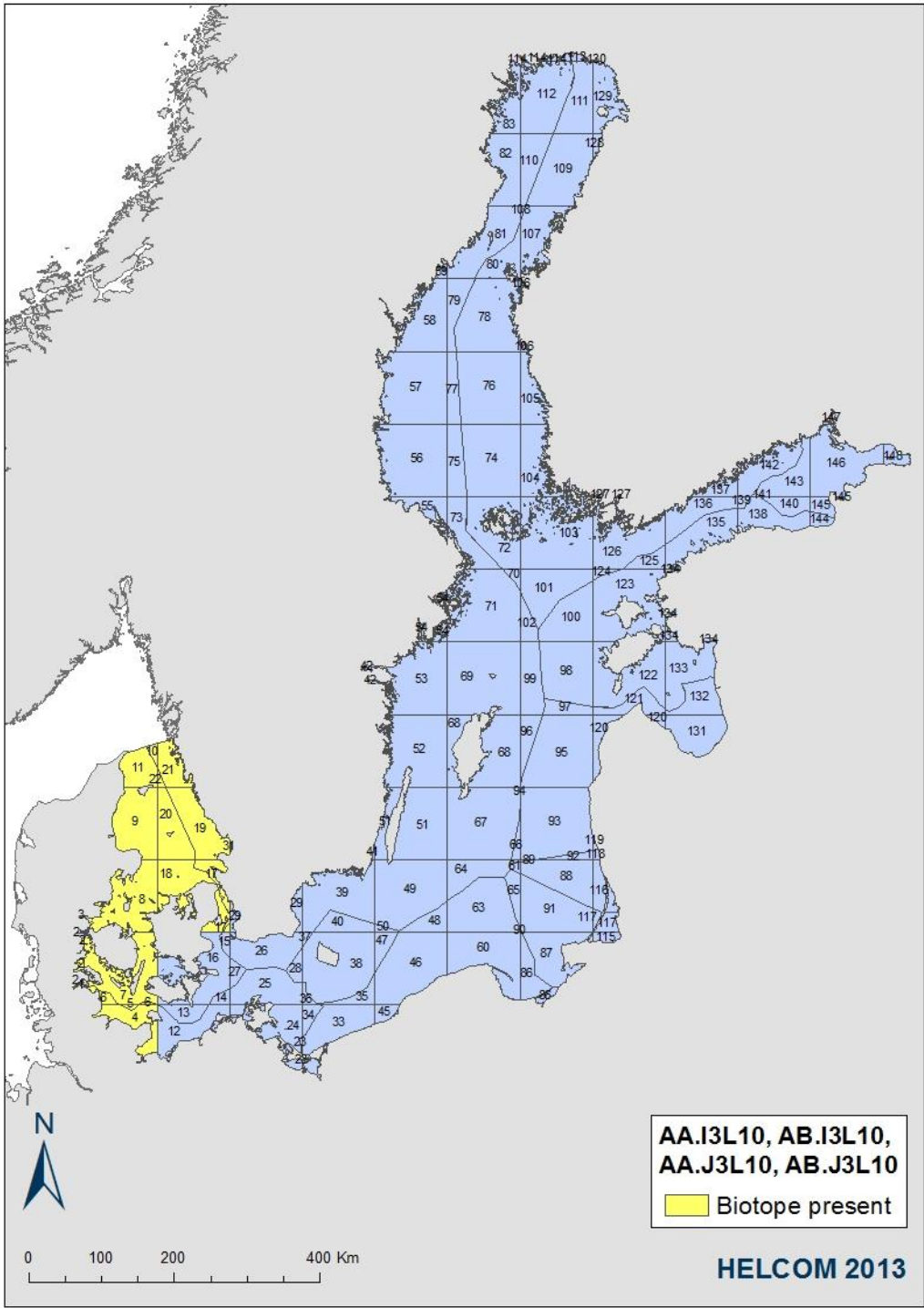
Mya truncata (left) and *Macoma calcarea* (right) (Photo: Michael Zettler)

Astarte borealis is highly resistant to anoxic conditions. Ideal depth for *Astarte borealis* is typically from 10 to 23 meters. As an arctic-boreal species, *Astarte borealis* appears in these Baltic biotopes at its southern limit. *Astarte borealis* prefers sandy and mixed sediments and avoids muddy sediments (Zettler 2002). *Astarte elliptica* is frequently found in Kiel Bay in different sandy sediments below 15 m water depth.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Kiel bight to Isle of Fehmarn, might occasionally occur in Mecklenburg Bight to Darss sill, South-western Baltic Sea. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Reasons for threat are oxygen deficiency often caused by eutrophication in combination with poor water exchange (HELCOM Website). The biotope is threatened by an increase in organic load mainly resulting from eutrophication that causes an increased growth rate in algae. The increase in planktonic phytoplankton increases the siltation rate.

Sources of increased siltation which threatens the biotope can also be found in various construction activities such as dredging and dumping. These activities result in a significant decrease in reproductive success and spread of the characteristic species which results in a loss of connectivity between populations of characteristic species. The biotope occurs relatively close to land. Therefore an increased siltation rate can also be traced back to changes in land use. Run-off from intensively farmed areas can transport organic and inorganic particles out to sea, increasing the siltation rate. Sand extraction and off-shore sand extraction destroys the substrate that the biotope occurs on.

Assessment justification

A1

It is assumed that habitat was lost due to sediment extraction and state was degraded by bottom trawling. The biotope is not widely distributed and depends on the state of its characteristic species. Functional loss occurred due to loss in connectivity and (main reason) organic load of the sediment (change in community structure).

Recommendations for actions to conserve the biotope

Mapping activities on the potential sandy areas where the biotope could potentially occur need to be carried out to identify the remaining occurrences. The area where the biotope occurs should be protected. In the protected areas bottom trawling and sediment extraction should be restricted. All activities that can improve the oxygen conditions through a reduction of eutrophication will support the conservation of the biotope.

Common names

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References

HELCOM Website

- http://www.helcom.fi/environment2/biodiv/endangered/Invertebrates/en_GB/Mya_truncata/
 Schiewer, U. 2008. Ecology of Baltic Coastal Waters. p. 12. Springer, Berlin, Germany.
 Trutschelt, K., Samtleben, C. (1988). Shell growth of *Astarte elliptica* (Bivalvia) from Kiel Bay (Western Baltic Sea). Marine Ecology progress Series 42: 155–162.
 Moen, F. E., Svensen, E. (2004). Marine fish & invertebrates of Northern Europe. KOM, Kristiansund. 608pp.
 Zettler, M. (2002). Ecological and morphological features of the bivalve *Astarte borealis* (Schumacher 1817) in the Baltic Sea near its geographical range. Journal of Shellfish Research 21: 33–40.

BIOTOPE INFORMATION SHEET

| | | | |
|--|--|--|-------------------------------|
| English name: Baltic photic or aphotic coarse sediment dominated by multiple infaunal polychaete species including <i>Ophelia</i> spp Baltic photic or aphotic sand dominated by multiple infaunal polychaete species including <i>Ophelia</i> spp. and <i>Travisia forbesii</i> | | Code in HELCOM HUB: AA.I3L11, AB.I3L11, AA.J3L11, AB.J3L11 | |
| Characteristic species: <i>Ophelia rathkei</i> , <i>Ophelia limacina</i> , <i>Travisia forbesii</i> Several bivalve species such as <i>Macoma calcarea</i> and <i>Mya truncata</i> often co-occur in the area but the biomass of these bivalves is to be disregarded when the characteristic polychaetes are present when delineating the biotope according to HUB | | | |
| Past and Current Threats (Habitat directive article 17): Construction (sand extraction C01.01, D03.03, oil and gas exploration and exploitation C02), Fishing (bottom trawling F02.02.01), Mining and quarrying (oil and gas exploration and exploitation C02), Contaminant pollution (H03) | | Future Threats (Habitat directive article 17): Construction (sand extraction C01.01, D03.03, oil and gas exploration and exploitation C02), Fishing (bottom trawling F02.02.01), Mining and quarrying (oil and gas exploration and exploitation C02), Contaminant pollution (H03) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered: 2.4.1 Gravel bottoms of the aphotic zone 2.4.2.1 Sublittoral gravel bottoms with little or no macrophyte vegetation of the photic zone 2.4.2.3 Sublittoral gravel banks of the photic zone with or without macrophyte vegetation 2.4.3.1 Hydrolittoral level gravel bottoms with little or no macrophyte vegetation 2.4.3.3 Hydrolittoral gravel banks with or without macrophyte vegetation 2.5.1 Sandy bottoms of the aphotic zone 2.5.2.1 Sublittoral level sandy bottoms with little or no macrophyte vegetation or the photic zone 2.5.2.3 Sand bars of the sublittoral zone 2.5.2.4 Sand banks of the sublittoral photic zone with or without macrophyte vegetation 2.5.3.1 Hydrolittoral level sandy bottoms with little or no macrophyte vegetation 2.5.3.4 Hydrolittoral sand banks with or without macrophyte vegetation | | BSEP 113 (HELCOM 2007): Gravel bottoms with <i>Ophelia</i> species are under threat and/or in decline everywhere where they occur | |
| Greater concern stated by: | | | |

Habitat and Ecology

This biotope is characterized by sea bottoms consisting of usually well sorted medium to coarse sand, gravel or small shell fragments, often building small patches inside finer sediments. Biomass of infaunal polychaetes dominates when disregarding the biomass of bivalves.

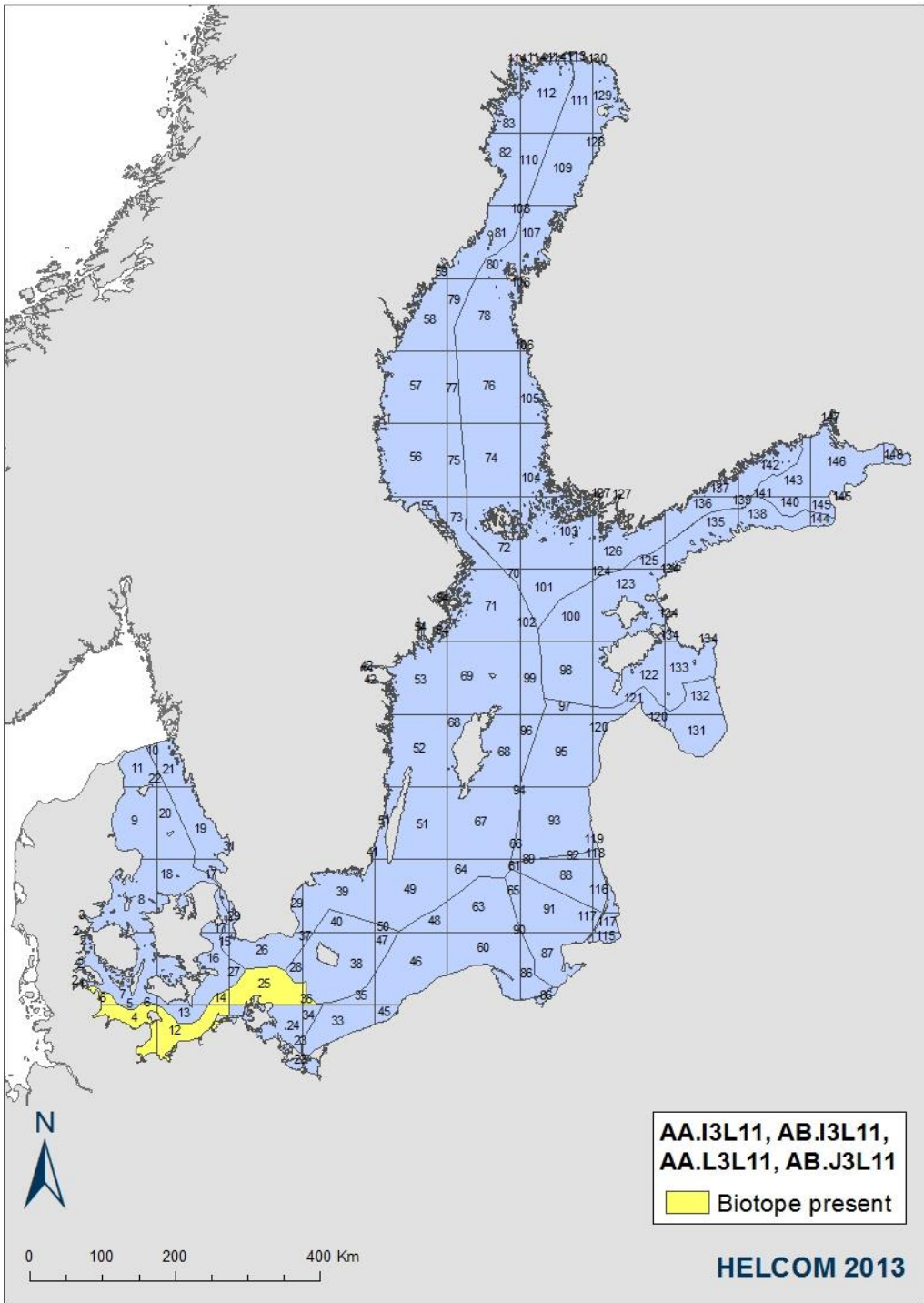
BIOTOPE INFORMATION SHEET

Due to the large variety of interstitial space, the biotope is inhabited by species of specialised fauna, e.g., of the polychaets *Ophelia limacina*, *O. rathkei*, *Travisia forbesii*. This fauna is restricted to the Belt Sea (sandbanks) and parts of the 'submerged belt' of the Arkona Basin. Gravel bottoms are generally exposed to currents and they are mainly found permanently at the same location (Similar to EUNIS classification A 5.111-5.113; A 5.143, A 5.144) (HELCOM Website)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope occurs mainly in the southern and western parts of the Baltic Sea area, but is very rare. They are found in exposed abrasion areas (sandbanks, near-shore wave exposed shallow sublittoral). Kiel bight to Darss sill. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Sand and gravel extraction, bottom trawling, oil and gas exploration and exploitation, pollution, offshore installations.

Assessment justification

A1

Distribution and state of the biotope have been decreased within the last decade mainly due to sediment extraction and bottom trawling. Both activities change the structure of the substrate (sorting, size of interstitial spaces and potentially grain size distribution) affecting the community structure. (Krause 2000).

Recommendations for actions to conserve the biotope

A Baltic-wide biotope inventory and a threat assessment is needed, for the time being this biotope should be considered as highly sensitive and worthy of protection.

Common names

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References

HELCOM website

http://www.helcom.fi/environment2/biodiv/endangered/Biotopes/en_GB/Gravel_bottoms_Ophelia/

Krause, J. Ch. (2000): Der Einfluss von Sand- und Kiesabbau auf bestandsgefährdete Makrofauna-Populationen in der südlichen Ostsee. PhD thesis University of Rostock.

BIOTOPE INFORMATION SHEET

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|--|---|--|-------------------------------|
| English name: Baltic aphotic rock and boulders or mixed hard and soft substrates dominated by sea squirts (Asciacea) | | Code in HELCOM HUB: AB.A1F1, AB.M1F1 | |
| Characteristic species: <i>Ciona intestinalis</i> , <i>Dendrodoa grossularia</i> , <i>Molgula</i> spp, <i>Corella parallellogramma</i> , <i>Ascidia mentula</i> , <i>Ascidia virginea</i> , <i>Ascidia obliqua</i> | | | |
| Past and Current Threats (Habitat directive article 17): | | Future Threats (Habitat directive article 17): | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered 2.1.2.1 Solid rock bottoms of the aphotic zone 2.2.1 Stony bottoms of the aphotic zone 2.8.1 Mixed sediments of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope occurs from a few meters depth and there is no strict maximum depth in the Baltic Sea. The Asciacea are filter feeders and thrive in areas with some current. Most of the species are annual in the Baltic Sea area. The biotope is characterized by at least 10% of the surface being covered by sessile attached chordates which in practice means Asciacea as other attached chordates do not occur in the Baltic Sea.

The biotope occurs most abundantly in deep areas with exposed rocky substrates, but some ascidians such as the *Ascidia mentula* and *Ascidia virginea* can occasionally also be found on gravel or other mixed substrates such as shell gravel if the shells are large enough for the species to attach to and live on. *Ascidia mentula* often lies on its side on the substrate and grows to approximately 20 cm length. *Molgula occulta* prefers muddy gravel and muddy sand substrata. It lives burrowed in the sediment with only the siphons showing (Picton & Morrow 2010). *Corella parallellogramma* is rather common on hard substrates in the Kattegat and can occur in high densities on negative rocky surfaces (Moen & Svenson 2009). It grows to approximately 5 cm height and mostly grows erect. The characteristic gut forms a pattern of white squares inside the see-through organism make it easily identifiable (Moen & Svenson 2009). The species seldom lives past the first spawning which occurs approximately a year after hatching.

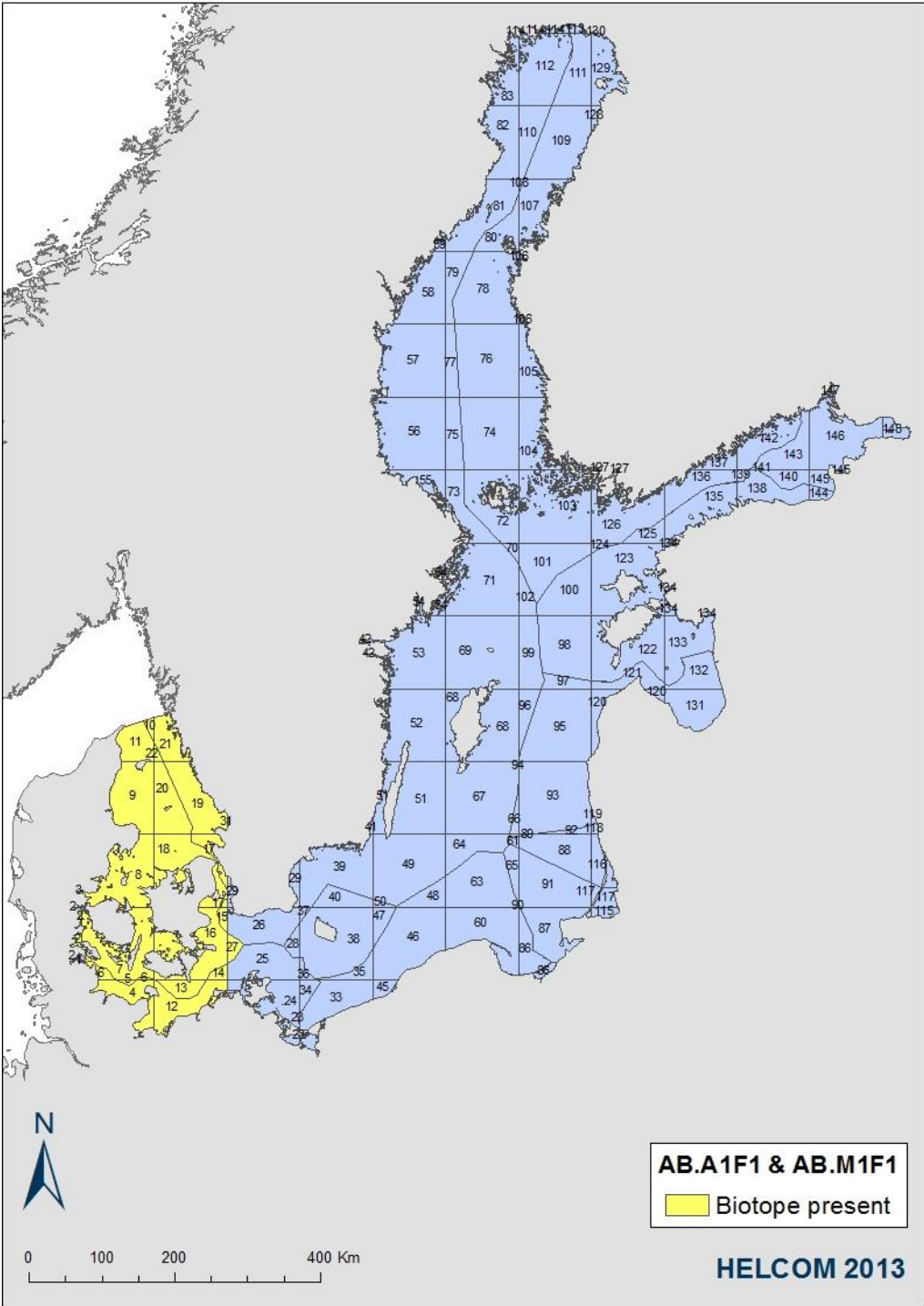
Some snails are known to utilize certain species of tunicates as a food source. *Velutina velutina* is such a snail and both eats and lays its eggs inside the tunicate *Ascidia virginea* (Moen & Svenson 2009). The sea squirt *Ascidia obliqua* only grows to a height of 3-7 cm, but even so other sea squirts, Hydrozoans and Bryozoans attach themselves to the tunic of the sea squirt. Species of the bivalves genus *Musculus* are known to frequently live in side some tunicate species.

Despite the biotope in HUB being defined as aphotic, patchy occurrences of the biotope can be found in the photic zone on the underside of rocks and inside caverns where the light conditions are unfavourable to macroalgae. *Dendrodoa grossularia* lives in a wide range of habitats and often occurs in dense aggregations (Picton & Morrow 2010). In sheltered sites where the rock is not as exposed to currents and *Molgula occulta* can also be found. The biotope is thus rather small and patchily distributed on hard substrates and occurs in abundance in the aphotic zone.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope occurs in the Kattegat and Belt Sea. The distribution map indicates the area in the 100 x 100 km grid where biotope is estimated to occur based on environmental gradients and the availability of the specific substrates.



BIOTOPE INFORMATION SHEET

Description of Major threats

The sea squirt biotope requires clean rocky surfaces. Increased siltation rates due to eutrophication, fishing activities or marine construction decreases the amount of available substrate for the biotopes characteristic sea squirts to attach to.

Assessment justification

A1

The amount of available aphotic clean rocky substrates have decreased during the last 50 years due to increased siltation.

Recommendations for actions to conserve the biotope

All actions to reduce eutrophication on a Baltic Sea scale will support the biotope.

Common names

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References

- Picton, B.E., Morrow, C.C. (2010). Encyclopedia of Marine Life of Britain and Ireland. Available at:
<http://www.habitas.org.uk/marinelife/index.html> (viewed may 29 2013)
- Moen, E., Svenson, E. (2009) Djurliv i havet: Nordeuropeisk marin fauna. Nordstedts. 768 pp.

BIOTOPE INFORMATION SHEET

| | | | |
|--|---|---|-------------------------------|
| English name: Baltic aphotic rock and boulders or mixed hard and soft substrates dominated by sea anemones (Actiniarida) | | Code in HELCOM HUB: AB.A1G2, AB.M1G2 | |
| Characteristic species: <i>Metridium senile</i> , <i>Gonactinia prolifera</i> , <i>Urticina felina</i> , <i>Stomphia coccinea</i> , <i>Sagartia elegans</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered: 2.1.2.1 Solid rock bottoms of the aphotic zone 2.2.1 Stony bottoms of the aphotic zone 2.8.1 Mixed sediments of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope occurs in the aphotic zone on hard substrates. At least 10% of the substrate is covered by attached sessile cnidarians, of which Actiniarida constitutes at least 50% of the biomass. Sea anemones are semi-sessile animals that require relatively high salinities.

Metridium senile is an anemone which lives attached to any suitable hard substratum as pier piles and rock faces down to 100m's depth. It is found in overhangs, caves and beneath boulders (Hiscock & Wilson 2007).



Metridium senile growing attached to a rock on mixed substrate (Photo: IOW)

BIOTOPE INFORMATION SHEET

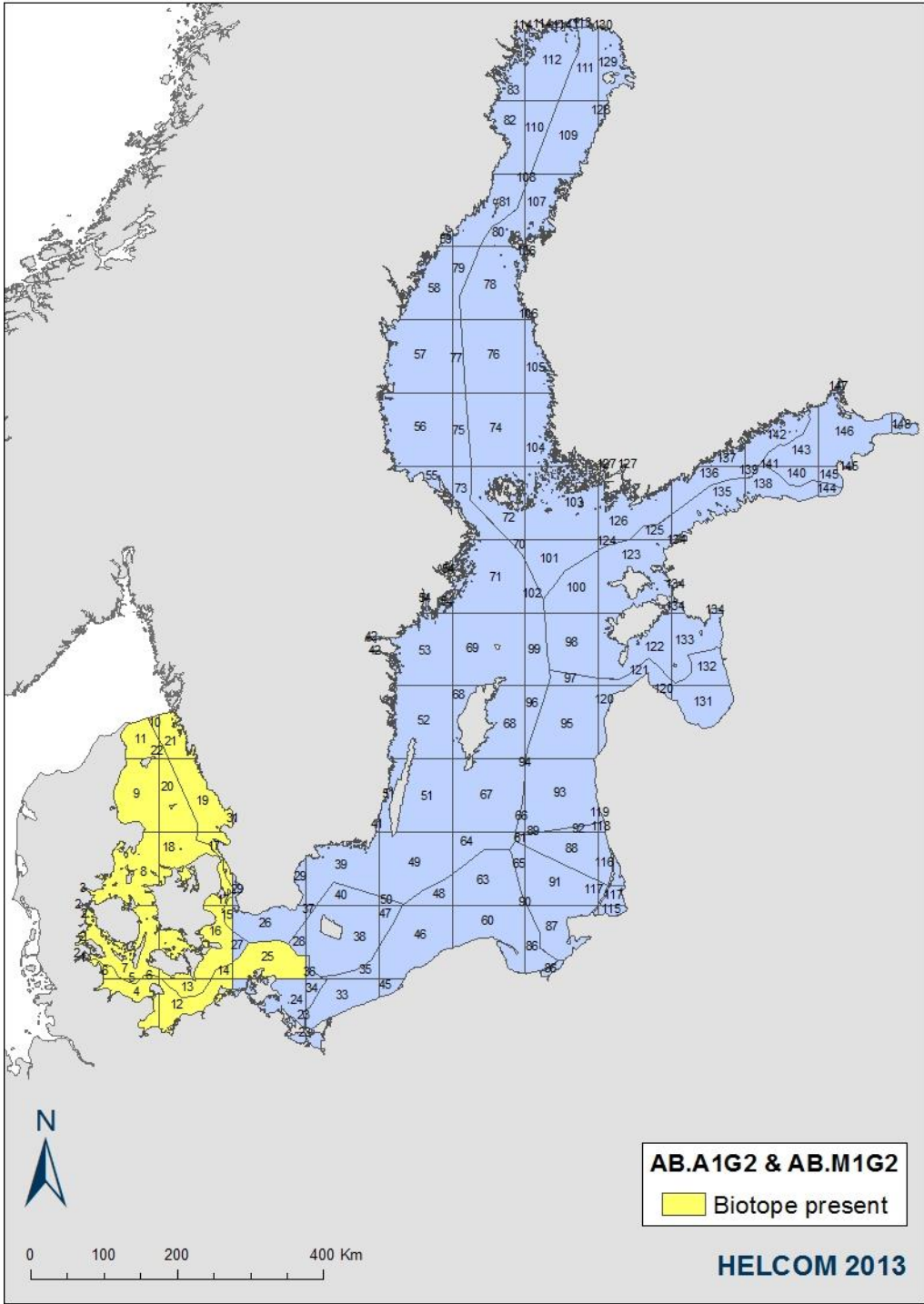
The biotope can be encountered within the depth limit of the photic zone on the underside of rocks, in overhangs or caves where photosynthesising macrophytes cannot establish. *Sagartia elegans* is known to occur in high densities in overhangs, generally attached to a crack in the rock (Moen & Svenson 2009). As a rule anemones do not have strict requirements as to the quality of the substrate, as long as it is somewhat stable. Some species such as *Gonactina prolifera* may also attach to other sessile animals, however in such cases the coverage and biomass of the sea anemones might not be high enough to define the biotope as an anemone biotope in accordance with HELCOM Underwater Biotope and habitat classification system (HELCOM HUB). *Gonactina prolifera* reproduces by splitting and therefore small relatively dense clusters of the anemone can be found on suitable substrates (Moen & Svenson 2009). *Stomphia coccinea*, occurs in the Belt Sea and is always attached to hard substrates such as rock or in some cases *Modiolus modiolus* shells. If attacked by a predator the anemone is known to detach from the substrate.

Urticina felina is a rather common sea anemone in the Kattegat. The species lives from the water surface down to 200 meters depth with the largest individuals living deeper down, attached to stones. This anemone is a predator catching different crustaceans and even small fish.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope occurs on hard substrates in the Kattegat and Belt Sea. The biotope is common on steep vertical cliffs and can also be encountered on the negative surfaces of rocks and overhangs. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur



BIOTOPE INFORMATION SHEET

Description of Major threats

Siltation of hard substrates is the major threat of the biotope. Eutrophication is known to increase the siltation rate. The availability of suitable substrate can also be affected by dredging or stone fishing activities.

Assessment justification

A1

The biotope shows a tendency to decline, but the decline has not been very severe during the past decades. During the past 50 years the quantity of the biotope has decreased by more than 25%.

Recommendations for actions to conserve the biotope

All actions to reduce eutrophication will benefit the conservation status of the biotope.

Common names

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References

- Hiscock, K., Wilson, E. (2007). *Metridium senile*. Plumose anemone. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme. Plymouth: Marine Biological Association of the United Kingdom. Available at: <http://www.marlin.ac.uk/speciesfullreview.php?speciesID=3806>
- Moen, E., Svenson, E. (2009) Djurliv I havet – Nordeuropeisk marin fauna. Nordstedts. 768 pp.

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|--|-------------------------------|
| English name: Baltic aphotic rock and boulders or mixed hard and soft substrates dominated by stone corals (Scleractinida) | | Code in HELCOM HUB: AB.A1G3, AB.M1G3 | |
| Characteristic species: <i>Caryophyllia smithii</i> | | | |
| Past and Current Threats (Habitat directive article 17): Fishing (bottom trawling F02.02.01), Construction (siltation J02.11.02), Eutrophication (H01.05) | | Future Threats (Habitat directive article 17): Fishing (bottom trawling F02.02.01), Construction (siltation J02.11.02), Eutrophication (H01.05) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered 2.1.2.1 Solid rock bottoms of the aphotic zone 2.2.1 Stony bottoms of the aphotic zone 2.8.1 Mixed sediments of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

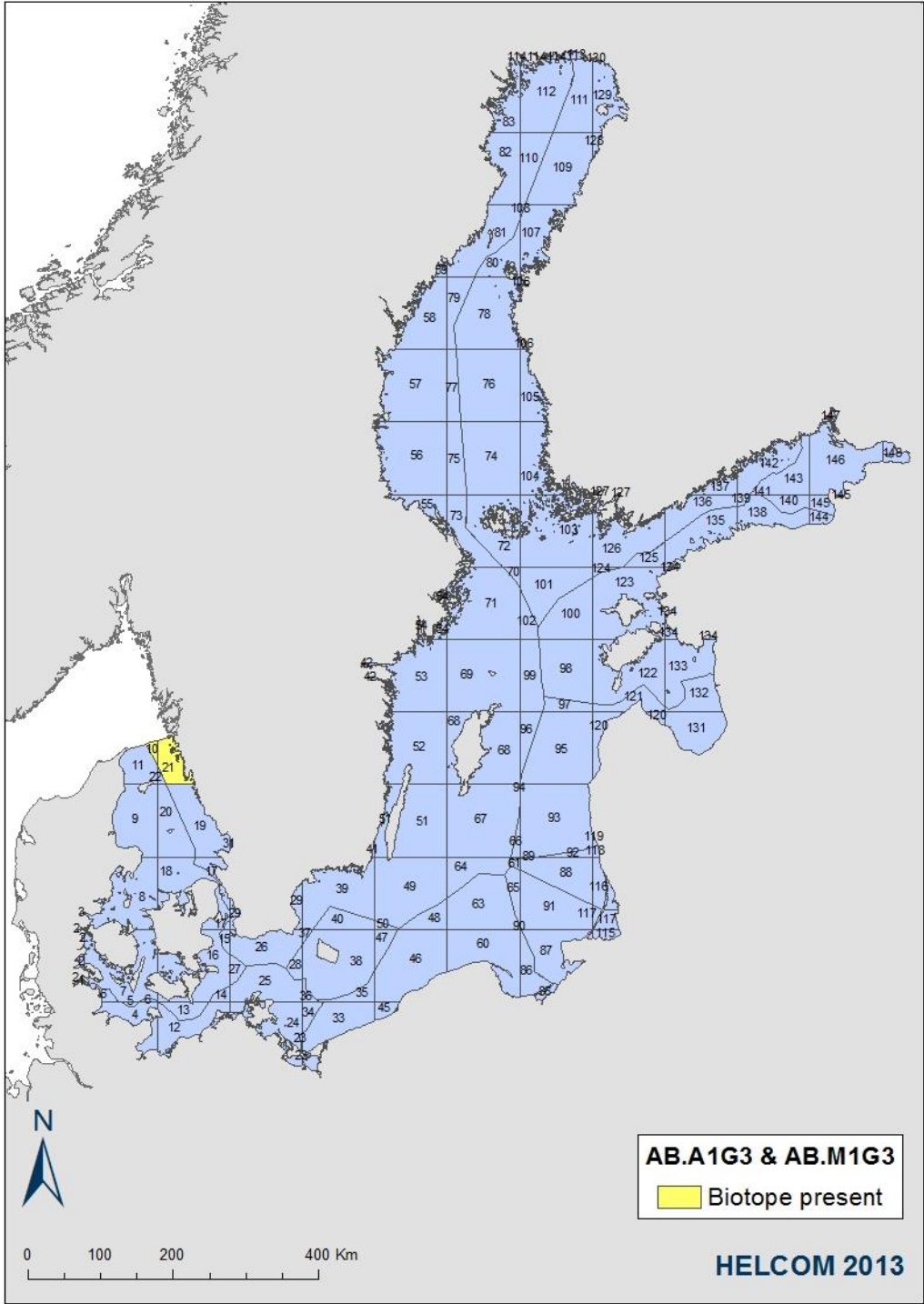
The biotope occurs in the aphotic zone on rock and boulders and is delineated based on a minimum coverage of 10% cnidarians of which hard corals constitute more than 50% of the biomass. In the Baltic Sea the biotope is only found in deep parts in the northern Kattegat where the environment is very nearly fully marine. The stone coral biotope is not typical for a brackish water sea.

Caryophyllia smithii is a solitary stone coral that grows to approximately 2 centimetres in height. The coral lives on rocky substrates. Small aggregations of individuals can occasionally be found. Individuals can live to over 20 years of age (Moen & Svensen 2009). The depth range is 20–130 meters. The coral is a passive suspension feeder, mainly relying on zooplankton (MarLin 2006).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope is restricted to the north Kattegat, where environmental conditions are nearly fully marine. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur. OCEANA (2013) encountered *Carophylla smithii* along the Swedish coast.



BIOTOPE INFORMATION SHEET

Description of Major threats

The threats affecting the biotope are not quite clear. However, the characteristic species require clean substrates for settlement and are therefore adversely affected by activities that increase siltation. Invasive fishing methods such as bottom trawling are detrimental to the substrate integrity.

Assessment justification

A1

The biotope is thought to have decreased in quantity by more than 25% during the past 50 years.

Recommendations for actions to conserve the biotope

Conservation of the biotope

Common names

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References

- MarLIN (2006) BIOTIC - Biological Traits Information Catalogue. Marine Life Information Network. Plymouth: Marine Biological Association of the United Kingdom.
<http://www.marlin.ac.uk/biotic/browse.php?sp=6000&show=biology> (viewed 25.7.2013)
- Moen, F., Svensen, E. (2009) Djurliv i havet – Nordeuropeisk marin fauna. Nordstedts. 768 pp.
- OCEANA (2013) Oceana proposal for a Marine Protected Area – Marstrandsskærgården. 8 pp. Available at: http://oceana.org/sites/default/files/euo/OCEANA_9_Marstrandsskargarden.pdf

BIOTOPE INFORMATION SHEET

| | | | |
|--|---|---|-------------------------------|
| English name: Baltic aphotic rock and boulders or mixed hard and soft substrates dominated by soft corals (Alcyonacea) | | Code in HELCOM HUB: AB.A1G4, AB.M1G4 | |
| Characteristic species: <i>Alcyonium digitatum</i> , <i>Swiftia rosea</i> | | | |
| Past and Current Threats (Habitat directive article 17): Fishing (bottom trawling F02.02.01) | | Future Threats (Habitat directive article 17): Fishing (bottom trawling F02.02.01) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered 2.1 Rocky bottoms 2.1.1.1 Soft rock bottoms of the aphotic zone 2.2 Stony bottoms 2.2.1 Stony bottoms of the aphotic zone 2.8. Mixed sediment bottoms 2.8.1. Mixed sediments of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope occurs in the aphotic zone on rocks and boulders and various mixed sediments. At least 10% of the substrate is covered by attached sessile cnidarians, of which soft corals constitutes at least 50% of the biomass. The biotope occurs from depths where the light becomes insufficient for macroalgae and down to about 100 meters and can occasionally be encountered deeper.

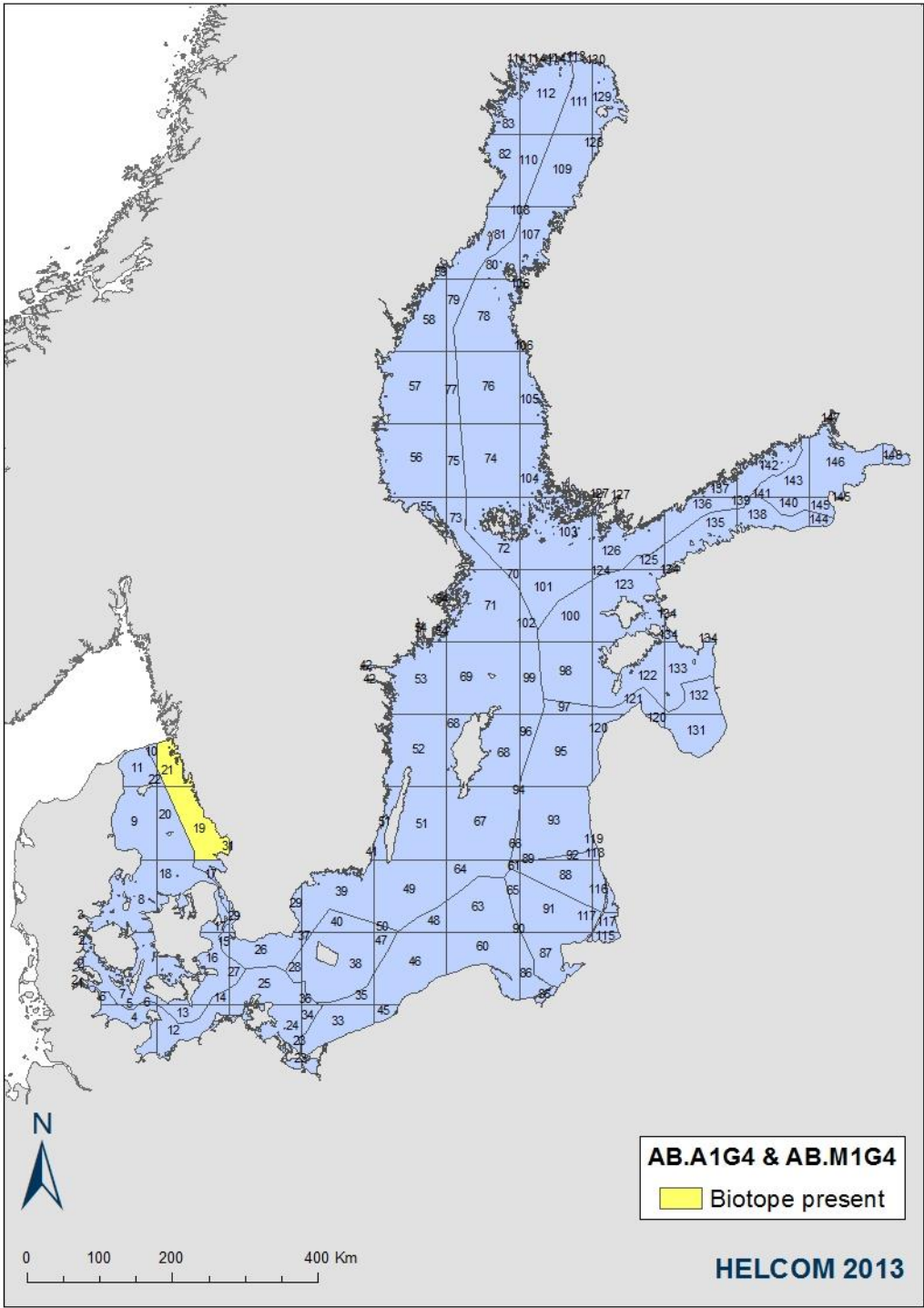
The soft coral dead man's fingers (*Alcyonium digitatum*) is a common species along the north east Atlantic, and also occurs in the Kattegat. The colonial soft coral forms irregular masses that vary in colour from orange to pink or white. *Alcyonium digitatum* is an active suspension feeder and thrives in areas where currents are strong or the hard substrate is exposed to strong wave action (Budd 2008). Colonies are known to live for over 20 years (Budd 2008). The coral reproduces by releasing planktonic larvae during the winter. The nudibranch *Tritonia homberg*, feeds mainly on *Alcyonium digitatum* and can therefore be found in relatively high abundance in the biotope (Moen & Svensen 2009).

Swiftia rosea lives on rocky substrate from 20 meters and deeper. The colony is branched and thin with varying colour and can grow to approximately 20cm height (Lundin 2004). In suitable environmental conditions several coral colonies can grow in close proximity. The corals require high salinity, stable cool temperatures and moderate currents (Moen & Svensen 2009).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope occurs in the Kattegat and Belt Sea on rocky substrates in exposed areas of high salinity. The distribution map indicates the area in the 100 x 100 km grid where biotope is estimated to occur based on environmental gradients and the availability of the specific substrate.



BIOTOPE INFORMATION SHEET

Description of Major threats

The physical integrity of the biotope can be negatively affected by bottom trawling. Currently the severity of the various threats is unknown.

Assessment justification

A1

The quantity of the biotope is estimated to have declined >25% in the past 50 years.

Recommendations for actions to conserve the biotope

Common names

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References

- Budd, G. (2008). *Alcyonium digitatum*. Dead man's fingers. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme. Plymouth: Marine Biological Association of the United Kingdom. Available at: <http://www.marlin.ac.uk/speciesfullreview.php?speciesID=2442> (viewed 3 June 2013).
- Lundin, K. (2004). Faunistiskt nytt – marina evertetrater. Göteborgs Naturhistoriska Museum Årstryck 2004: 37-48.
- Moen, F., Svensen, E. (2009) Djurliv i havet – Nordeuropeisk marin fauna. Nordstedts. 678 pp.

BIOTOPE INFORMATION SHEET

| | | | |
|--|---|--|-------------------------------|
| English name: Baltic aphotic rock and boulders or mixed substrates dominated by sponges (Porifera) | | Code in HELCOM HUB: AB.A1J, AB.M1J | |
| Characteristic species: <i>Haliclona oculata</i> rarely other species such as <i>Halichondria panicea</i> , <i>Halisarca dujardini</i> , <i>Scypha ciliata</i> . In the northern Baltic Sea only <i>Ephydatia fluviatilis</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Fishing (bottom trawling F02.02.01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Fishing (bottom trawling F02.02.01) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered 2.1 Rocky bottoms 2.1.1.1 Soft rock bottoms of the aphotic zone 2.2 Stony bottoms 2.2.1 Stony bottoms of the aphotic zone 2.8. Mixed sediment bottoms 2.8.1. Mixed sediments of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

Sponges are the dominating group on hard substrates of the aphotic zone if currents and siltation are considerably low. The biotope is usually found between 20–30 m in the Belt Sea, but might also occur at greater depths.

The biotope is formed by (mainly) erect growing, branched or un-branched sponges, which constitutes at least 50% in volume or biomass. It occurs on stony sublittoral bottoms and favours areas with bottom currents as the sponges are feeding on plankton, detritus and dissolved organic material. Accompanying epibenthic species are erect growing moss animals, sea squirts or hydroids.



Erect growing, branched sponge (*Haliclona oculata*) attached to a boulder (Photo: K. Fürhaupter, Marilim GmbH)

BIOTOPE INFORMATION SHEET

Depending on the dominant species the biotope may arise up to 15–20 cm above the substrate *Halichondria panicea*, *Haliclona* (Syn: *Chalina*) *oculata*, but also crust-building forms such as *Halisarca dujardini* occur (Stresemann et al. 1992). Sponges are also common in the photic zone of the Western Baltic Sea, where they are growing on perennial red algae (Barthel 1988) or between the holdfasts of kelp. But in the photic zone the algae form the basis of the biotope. In the aphotic zone the sponges grow attached to the stony substrate and form the specific three-dimensional biotope by themselves. The vertical depth distribution of the biotope varies typically between 20 to 150 meters (Stresemann et al. 1992).



Ephydatia fluviatilis growing on boulders in the northern parts of the Baltic Sea (Photo: Essi Keskinen)

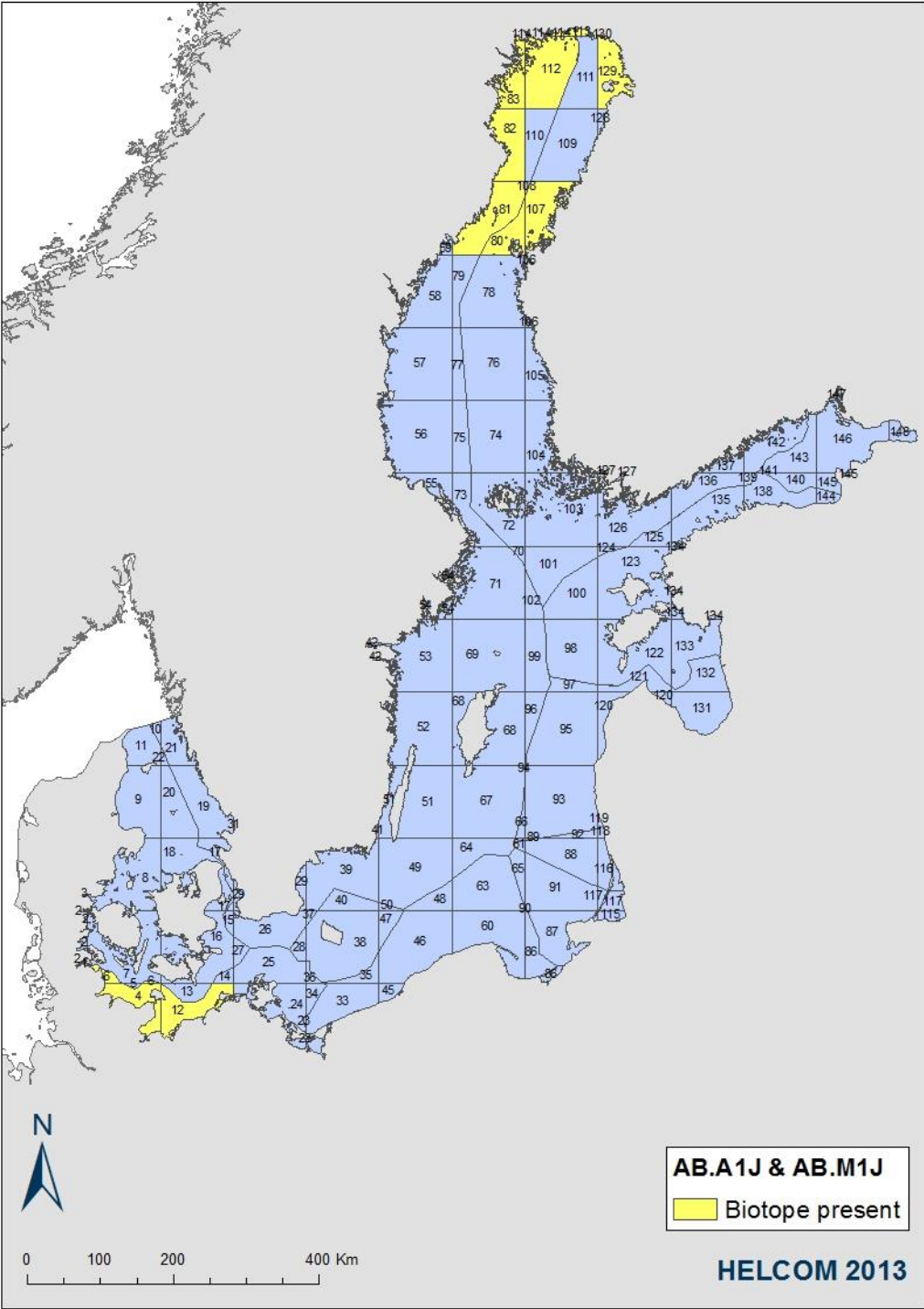
The biotope occurs from fully marine to freshwater conditions, but this is in line with an apparent change of the characteristic species biotope form. Most of the erect and large growing sponges are marine species reaching their distribution limit in the Western Baltic Sea (Stresemann et al. 1992). Freshwater sponges occur at lower salinities to a maximum of 6 psu (Stresemann et al. 1992) in the Northern Baltic Sea or in the lagoons of the Southern Baltic Sea. The freshwater sponges form a more crust-like biotope.

Especially the erect growing, large sponges offer living ground for tube-building polychaetes, echinoderms and hydrozoans. Scale worms, sea spiders or brittle stars crawl within the sponge openings or on their surface. But some sponges have developed specific mechanisms (calcareous spicules, specific bio-active substances or tissue sloughing) to prevent “fouling organisms” in or on top of their tissues (Barthel & Wolfrath 1989).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The sponge biotopes are distributed along the whole Baltic Sea coastline. But as aphotic stony bottoms are scarce in the South-western and Southern Baltic Sea the biotopes are distributed mainly along the Swedish, Danish, Estonian and Finnish coastline or at some offshore reefs. The higher the salinities, the higher the diversity of the sponges and due to the more erect growth also the diversity of the inhabiting invertebrate and fish communities. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur



BIOTOPE INFORMATION SHEET

Description of Major threats

Due to the scarceness of aphotic hard substrates in many areas there exists only scarce information about the biotope in general and their major threats. On the one hand the reduction of the depth limit of macroalgae due to eutrophication may lead to an increasing depth range for the sponge biotopes, but otherwise increased siltation due to eutrophication may have negative effects on the species filtering and settlement of larvae could be reduced. Like many epibenthic communities physical disturbance by bottom trawling or construction work is one of the major threats.

Assessment justification

A1

The biotope is assumed to be rather rare and to be restricted to small patches where it occurs. It is assumed to have been reduced in distribution mainly due to increased siltation and bottom trawling.

Recommendations for actions to conserve the biotope

All actions to reduce physical disturbance of aphotic stony bottoms in the Baltic Sea are important for the conservation of the epibenthic biotopes dominated by sponges.

Appointing areas where the biotope is known to occur as protected sites where bottom trawling, offshore construction work and exploitation of soil resources is prohibited, would constitute an effective conservation measure. Further mapping activities should be carried out to better delineate the area of occurrence.

Common names

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References

- Barthel D., Wolfrath B. 1989. Tissue sloughing in the sponge *Halichondria panacea*: a fouling organism prevent being fouled. *Oecologia* 78: 357-360.
- OCEANA (2011). Conservation proposals for ecologically important areas in the Baltic Sea. http://oceana.org/sites/default/files/reports/OCEANA_Baltic_report_2011_ENG.pdf
- OSPAR 2008. OSPAR List of Threatened and/or Declining Species and Habitats.
- Stresemann E., Hannemann H.-J., Klausnitzer B. Senglaub K. 1992. *Exkursionsfauna von Deutschland*. Band 1, Wirbellose (ohne Insekten). Volk und Wissen Verlag gmbH Berlin.

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|-------------------------------|
| English name: Baltic aphotic muddy sediment dominated by <i>Monoporeia affinis</i> and/or <i>Pontoporeia femorata</i> | | Code in HELCOM HUB: AB.H3N1 | |
| Characteristic species: <i>Monoporeia affinis</i> , <i>Pontoporeia femorata</i> , <i>Saduria entomon</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03.02) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03.02) | |
| Red List Criteria: A1 | Confidence of threat assessment: M | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" (Endangered) 2.7.1 Muddy bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): <i>Monoporeia affinis</i> is under threat and/or in decline in: Gulf of Finland, Gulf of Riga, The Northern Baltic Proper, The Southern Baltic Proper. <i>Pontoporeia femorata</i> is under threat and/or in decline in: Bay of Mecklenburg, Gulf of Finland, Gulf of Riga, The Northern Baltic Proper. | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope occurs mainly on the deep accumulation bottoms on where muddy sediments have a coverage of >90%. *Monoporeia affinis* and/or *Pontoporeia femorata* constitutes at least 50% of the biomass. The species diversity in *M. affinis* community is generally relatively high (Bonsdorff et al. 2003), but some offshore, deep communities have a lower diversity. *M. affinis* requires high oxygen concentrations and a good supply of detritus and algae for food (Bonsdorff et al 2003, Donner et al. 1987). The depth range of this biotope is 10–200 meters. Salinity is usually below 10 psu.



The amphipods *Monoporeia affinis* (left) and *Pontoporeia femorata* (right) (Photo: Ari Laine, Joanna Legeżyńska)

Monoporeia affinis is a small (<1 cm) deposit-feeding amphipod occurring in both fresh and brackish water environments. It occurs in most parts of the Baltic Sea on soft bottoms, and is one of the most ecologically important and dominant native species in the Baltic Sea benthic community at depths of

BIOTOPE INFORMATION SHEET

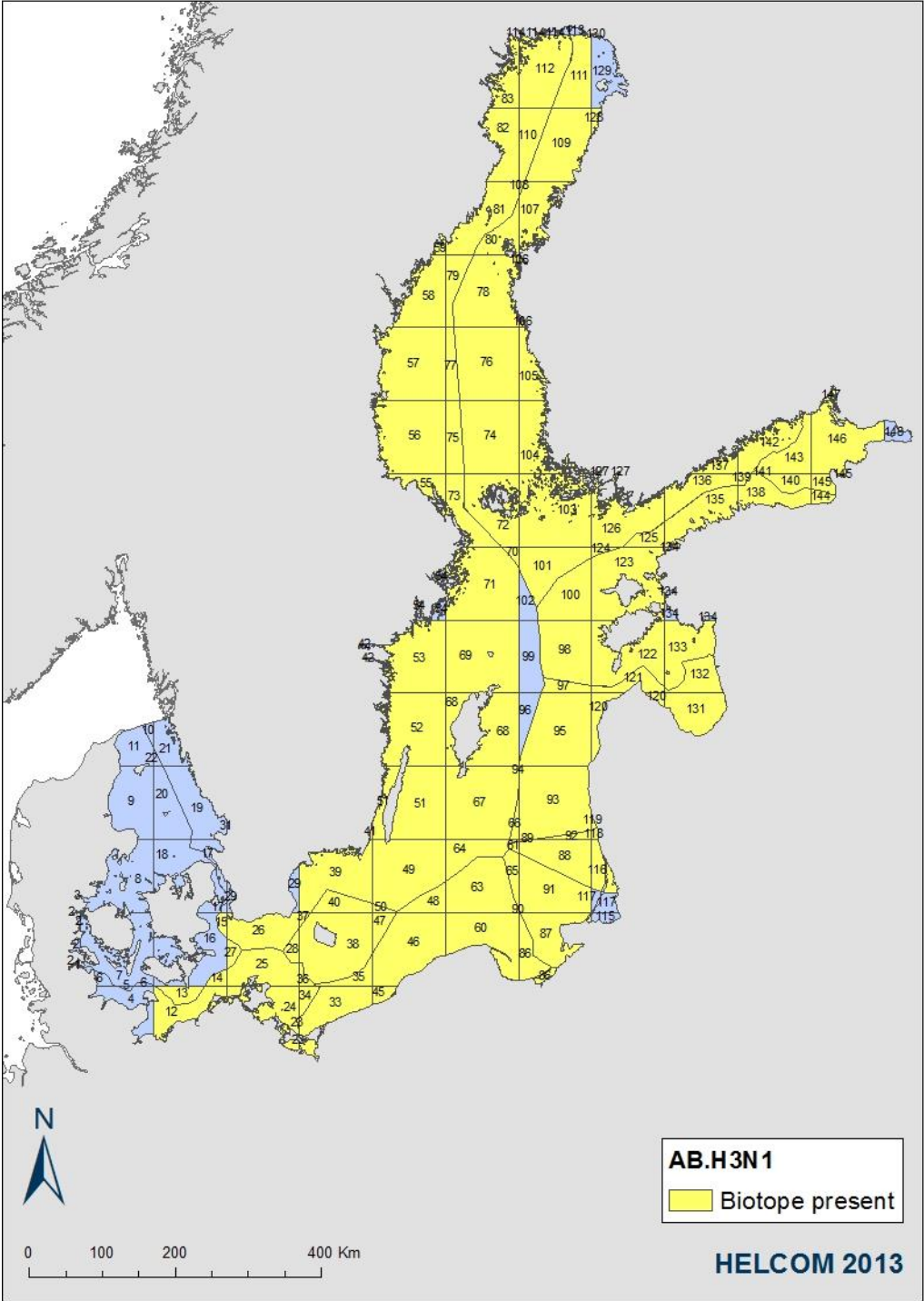
10–80 m (Bonsdorff et al. 2003, Donner et al. 1987). *M. affinis* is an important food source for several fish species, such as cod (*Gadus morhua*), herring (*Clupea harengus*), smelt (*Osmerus eperlanus*) and fourhorn sculpin (*Myoxocephalus quadricornis*) (Donner et al. 1987). *Pontoporeia famorata* prefers more marine conditions and does not tolerate the low salinities of the northernmost Baltic Sea (Leinikki et al. 2004).

In favorable conditions, *Monoporeia affinis* and *Pontoporeia femorata* can occur in great abundances, even several thousand species per square meter (Leinikki et al. 2004). Even though the two species have somewhat different salinity tolerance, they co-occur so often that it is not possible to separate two different biotopes. The isopod *Saduria entomon* often occurs in this biotope. *Saduria entomon* is not considered habitat forming since it is a mobile species that burrows into the sediment but also swims.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur based on field sampling data. While it is the dominant biotope in the deep muddy areas of the Baltic Proper, it only occasionally occurs in the southern Baltic as the communities are most often dominated by bivalve or large polychaet species.



BIOTOPE INFORMATION SHEET

Description of Major threats

A major threat to this biotope is eutrophication leading to anoxia on the deep soft sediment bottoms where it occurs. *Monoporeia affinis* and *Pontoporeia femorata* are both sensitive to anoxia and can move to a new area when anoxia spreads. The crustacean dominated biotope may also be threatened by accumulation of various persistent hazardous substances in the soft sediments of the deep accumulation bottoms.

The further spread of the invasive polychaete species *Marenzelleria* spp. threatens the future persistence of the biotope. *Marenzelleria* spp. is a North-American detritus feeding polychaete. The polychaetes have invaded large areas of the Baltic Sea. Ballast water tanks in ships are the most likely vector for the first introduction of the species to the Baltic Sea. *Marenzelleria* spp. and *Monoporeia affinis* are believed to compete for resources, and the presence of the polychaete might reduce the growth rate of *Monoporeia affinis* (Kotta & Olafsson 2003). In laboratory experiments *M. affinis* avoids burrowing in sediments with high polychaete abundances. *Marenzelleria* spp. is tolerant of anoxic conditions giving it a better competitor if anoxia of the aphotic muddy sediments increases (Neideman et al. 2003).

Assessment justification

A1

The quantity of the biotope has decreased by >25% during the past 50 years. The spread of the polychaete worm *Marenzelleria* spp. is well documented in several sub-basins of the Baltic Sea. The increase in abundance of the polychaetes has co-occurred with a severe decrease in abundance of especially *Monoporeia affinis*. In the deep parts of the Baltic Proper the biotope has disappeared from large areas due to anoxic conditions.

Recommendations for actions to conserve the biotope

All actions to reduce the level of eutrophication on the scale of the whole Baltic Sea will benefit the biotope.

The invasive polychaete *Marenzelleria* spp. has affected the quantity of the biotope. Very little can be done to reduce the population of the polychaete worms in the Baltic Sea, but several measures can be taken to hinder the spread of new invasive species.

Common names

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References

- Donner K. O., Lindström A. and Lindström M (1987) Seasonal variation in the vertical migration of *Pontoporeia affinis* (Crustacea, Amphipoda). *Ann. Zool. Fennica* 24:305–313.
- Bonsdorff, E., Laine, A. O., Hänninen J., Vuorinen I. & Norkko A. 2003. Zoobenthos of the outer archipelago waters (N. Baltic Sea) - the importance of local conditions for spatial distribution patterns. *Boreal Environment Research* 8:135–145
- HELCOM 2007. HELCOM lists of threatened and/or declining species and biotopes/habitats in the Baltic Sea area. Baltic Sea Environmental Proceedings No. 113. Helsinki Commission, Helsinki. <http://www.helcom.fi/stc/files/Publications/Proceedings/bsep113.pdf>
- Kotta, J., Olafsson, E. (2003). Competition for food between the introduced polychaete *Marenzelleria viridis* (Verrill) and the native amphipod *Monoporeia affinis* Lindström in the Baltic Sea. *Journal of Sea Research* 50: 27-35.
- Leinikki, J., Backer, H., Oulasvirta, P., Leinikki, S. (eds.) (2004). Aaltojen alla – Itämeren vedenalaisen luonnon opas. Like, Helsinki. 144pp.

BIOTOPE INFORMATION SHEET

Neideman, R., Wenngren, J., Olafsson, E. (2003). Competition between the introduced polychaete *Marenzelleria* sp. and the native amphipod *Monoporeia affinis* in Baltic soft bottoms Marine Ecology Progress Series 264: 49-55.

BIOTOPE INFORMATION SHEET

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|---|---|---|-------------------------------|
| English name: Baltic aphotic muddy sediment dominated by meiofauna | | Code in HELCOM HUB: AB.H4U1 | |
| Characteristic species: Oligochaeta, Ostracoda, Nematoda | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (sport and leisure structures G02, dredging J02.02) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (sport and leisure structures G02, dredging J02.02) | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered: 2.7 Muddy bottoms 2.7.1 Muddy bottoms of the aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

Habitat and Ecology

The biotope is formed by at least 90% coverage of muddy sediment in the aphotic zone. No macrocommunity is present and meiofauna constitutes at least 50% of the present biomass. Even though the biotope occurs in the aphotic zone, it can be found at relatively shallow depths. Light attenuation is often strong in areas where muddy bottoms are not covered by macrophytes.

The benthic meiofauna in the Baltic Sea is a diverse group of small animals. The group includes e.g. Ostracoda, Nematoda, Oligochaeta, Rotifera, Turbellaria and Copepoda living on and in the sediments (Voipio 1981, Rousi 2013). Generally meiofauna is defined to be smaller than 1 mm.

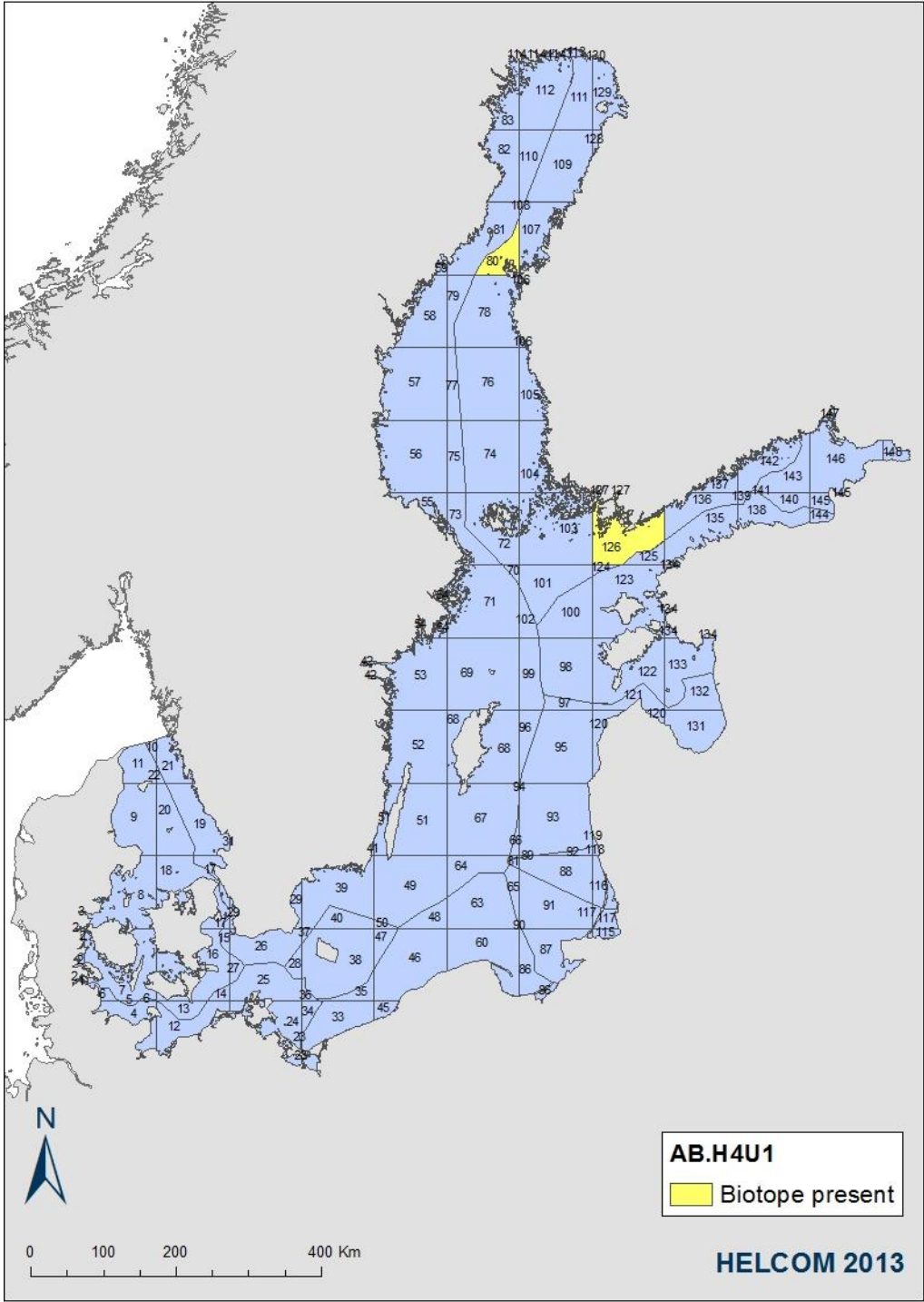
In the north-western Baltic Sea Proper, Nematoda are the most abundant group of benthic meiofauna, ranging between 67–91% of the species observed sediment (Olafsson & Elmgren 1997). Only nematodes are found to be common below 2 cm depth in the sediment (Olafsson & Elmgren 1997). Meiofauna can be split into surface feeders and subsurface feeders. Sedimentation of organic matter may have an effect on the meiofaunal community, as the increased rate of sedimentation can increase the abundance of surface feeder species (Olafsson & Elmgren 1997).

Generally the ecology of meiofaunal communities is less well understood than that of benthic macrofauna communities. Fewer studies have been carried out and in many studies meiofauna is only stated to be present in a certain abundance. Studies looking into the environmental requirements and species interactions are rare. It is also quite rare that meiofauna is taxonomically identified to species level which is the rule in macrofauna studies.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope is assumed to occur throughout the Baltic Sea both in shallow coastal waters and in the deeper central parts of the sea. The distribution map indicates the area in the 100 x 100 km grid where biotope is reported to occur. The biotope may have a significantly wider distribution.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication causing anoxia threatens the biotope. Meiofauna is considered to tolerate anoxia better than macrofauna, however prolonged anoxia will rapidly increase the mortality.

Construction of summer cottages and small marinas in sheltered bays along the coast threatens the biotope by alteration of the substrate and environmental conditions.

Assessment justification

A1

Coastal areas with muddy substrates have been exploited heavily by construction and dredging activities along the Swedish coast. Construction activities have become more prevalent and invasive during the past few decades and have modified a significant proportion of the coastal muddy sediments. The biotope is believed to exist in abundance along the Finnish coast and no severe declines are believed to have occurred. However, due to the large inferred decline along the long Swedish coast, the total trend for the quantity on a Baltic Sea scale a decline $\geq 25\%$ has taken place.

Recommendations for actions to conserve the biotope

More information is needed on the distribution and the ecology of the biotope. Development and construction in the shallow muddy areas along the coast where the biotope occurs should be restricted to conserve the biotope.

Common names

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References

- Olafsson, E., Elmgren, R. (1997). Seasonal Dynamics of Sublittoral Meiobenthos in Relation to Phytoplankton Sedimentation in the Baltic Sea. *Estuarine, Coastal and Shelf Science* 45(2): 149–164.
- Rousi, H. Meiofauna and other groups. In: *The Baltic Sea Portal*, Finnish Environment Institute SYKE. Accessed 3 Jun 2013.
http://www.itameriportaali.fi/en/tietoa/elama/elioryhmat/elaimet/pohjaelaimet/en_GB/meiofauna/
- Voipio, A. (1981). *The Baltic Sea*. Elsevier Oceanography Series, Vol. 30. Elsevier, Amsterdam. pp. 256–257.

BIOTOPE INFORMATION SHEET

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|--|---|--|-------------------------------|
| English name: Baltic aphotic sand dominated by striped venus (<i>Chamelea gallina</i>) | | Code in HELCOM HUB: AB.J2K7 | |
| Characteristic species: <i>Chamelea gallina</i> | | | |
| Past and Current Threats (Habitat directive article 17): | | Future Threats (Habitat directive article 17): | |
| Red List Criteria: A1 | Confidence of threat assessment: L | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" Endangered 2.5 Sandy bottoms 2.5.1 Aphotic zone | | BSEP 113 (HELCOM 2007): | |
| Greater concern stated by: | | | |

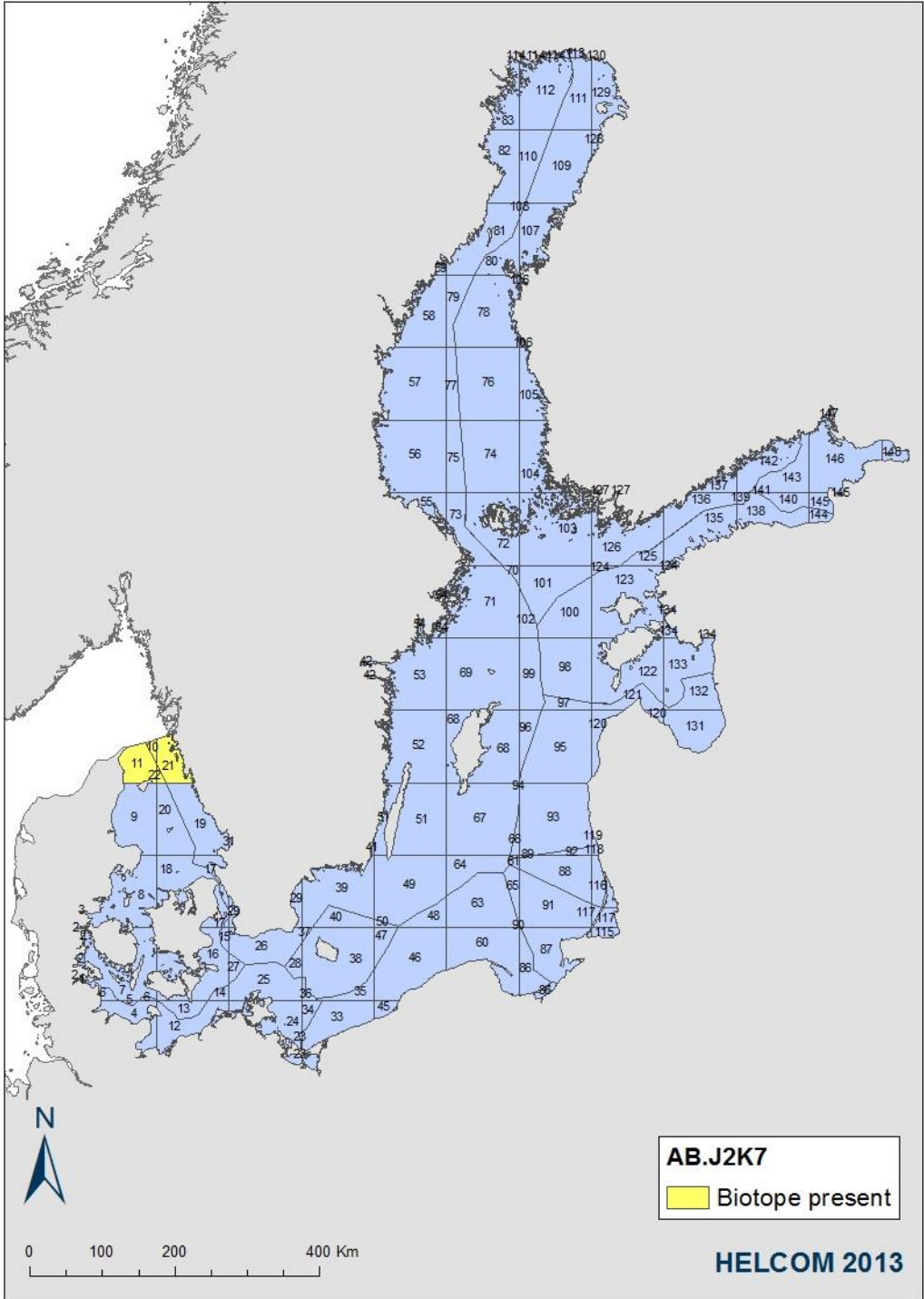
Habitat and Ecology

The biotope occurs in the aphotic zone on bottoms with at least 90% coverage of sand. The biomass is dominated by infauna and the clam *Chamelea gallina* constitutes at least 50% of the biomass. *Chamelea gallina* can live both buried in sand (Carter 2008) or on the sediment surface. The clam is a filter feeder and does not burry very deep into the sediment. The clam requires clean sandy substrates and can reach an age of over 10 years (Carter 2008).

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The biotope is known to occur in the northern Kattegat in Swedish and Danish waters. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur.



BIOTOPE INFORMATION SHEET

Description of Major threats

Globally the clam *Chamelea gallina* is commercially fished with dredges, hackles and occasionally with bottom trawls (FAO).

Eutrophication can lead to an increase of organic matter accumulating on the bottom. The biotope dominated by *Chamelea gallina* requires clean sandy substrates. Eutrophication is not considered to be very severe in the northern Kattegat where the biotope is known to occur, however periodical hypoxia is known to occur due to eutrophication which may have a strong adverse effect on the relatively long lived clam.

Assessment justification

A1

The quantity of the biotope is inferred to have declined by >25% during the past 50 years.

Recommendations for actions to conserve the biotope

Common names

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References

Carter, M. (2008). *Chamelea gallina*. Striped venus clam. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme. Plymouth: Marine Biological Association of the United Kingdom. Available at: <http://www.marlin.ac.uk/speciesinformation.php?speciesID=2952> (viewed 22 July 2013)

FAO Fisheries & Aquaculture. Species Fact Sheet – *Chamelea gallina* (Linnaeus, 1758). Available at: <http://www.fao.org/fishery/species/2697/en> (viewed 22 July 2013)

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|-------------------------------------|
| English name: Estuaries | | Code in HELCOM HUB: 1130 | |
| Characteristic species: <i>Carex spp.</i> , <i>Chara spp.</i> , <i>Myriophyllum spp.</i> , <i>Phragmites australis</i> , <i>Potamogeton spp.</i> , <i>Ruppia spp.</i> , <i>Scirpus spp.</i> , <i>Zannichellia palustris</i> , <i>Zostera marina</i> | | | |
| Past and Current Threats (Habitat directive article 17): Construction (enlargement of harbours and marinas D03.01, dredging J02.02.02, dumping J02.11, coastal engineering J02.12), Eutrophication (H01.05), Water traffic (D03.02), Alien species (I01), Fishing (F02), Tourism (G05), Oil spills (oil spills in the sea H03.01) | | Future Threats (Habitat directive article 17): Construction (enlargement of harbours and marinas D03.01, dredging J02.02.02, dumping J02.11, coastal engineering J02.12), Eutrophication (H01.05), Water traffic (D03.02), Alien species (I01), Fishing (F02), Tourism (G05), Oil spills (oil spills in the sea H03.01) | |
| Red List Criteria: C1 | Confidence of threat assessment: M | HELCOM Red List Category: | CR Critically Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "3" Endangered J – Estuaries and river mouth areas | | BSEP 113 (HELCOM 2007): Regions where the biotope/habitat is under threat and/or in decline: Gulf of Riga, Eastern Gotland Sea, The Southern Baltic Proper, Bay of Mecklenburg, Kiel Bay. | |
| Higher concern stated by: | | | |

Habitat and Ecology

Baltic estuaries are transition zones, where riverine freshwater meets the brackish water of the sea, often forming extensive intertidal sand and mud flats. Due to wind induced backwater effects, which cause irregular tidal effects, the extent of an estuary is determined by the episodically moving mixed water body. Thus, they are always connected to the sea, but in many cases semi-enclosed. Mudflats, sandspits and/or barrier islands separate them from the sea. They can be of different shapes such as bay like river mouth areas, deltas or parts of an archipelago. The organic matter input is generally high. Especially large estuaries with restricted water exchange have an important buffering role for nutrients transported from the drainage area downstream to the Baltic Sea.

Baltic estuaries are considered to be of global importance. They are on one hand areas of high biological productivity in a brackish environment, but on the other hand also ecologically under stress, because of permanently changing physical conditions. They form important breeding, resting, and feeding sites for water birds such as Kentish plover *Charadrius alexandrinus*, black tern *Chlidonias niger*, common tern *Sterna hirundo* or mute swan *Cygnus cygnus*. The vegetation in estuaries can be very diverse, consisting of reeds, sedges and submerged plants. Estuaries are further considered to be very important spawning and nursery grounds for some marine fish species (e.g. herring) and numerous fresh water and migratory fish species.

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays' there is generally a substantial freshwater influence. The mixing of freshwater and sea water and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where the tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary.



BIOTOPE INFORMATION SHEET

Baltic river mouths, considered as an estuary subtype, have brackish water and no tide, with large wetland vegetation (helophytic) and luxurious aquatic vegetation in shallow water areas.

Plants: Benthic algal communities, *Zostera* beds e.g. *Zostera noltii* (Zosteretea) or vegetation of brackish water: *Ruppia maritima* (= *R. rostellata* (Ruppieteae)); *Spartina maritima* (Spartinetea); *Sarcocornia perennis* (Arthrocnemetea). Both species of fresh water and brackish water can be found in Baltic river mouths (*Carex* spp., *Myriophyllum* spp., *Phragmites australis*, *Potamogeton* spp., *Scirpus* spp.).

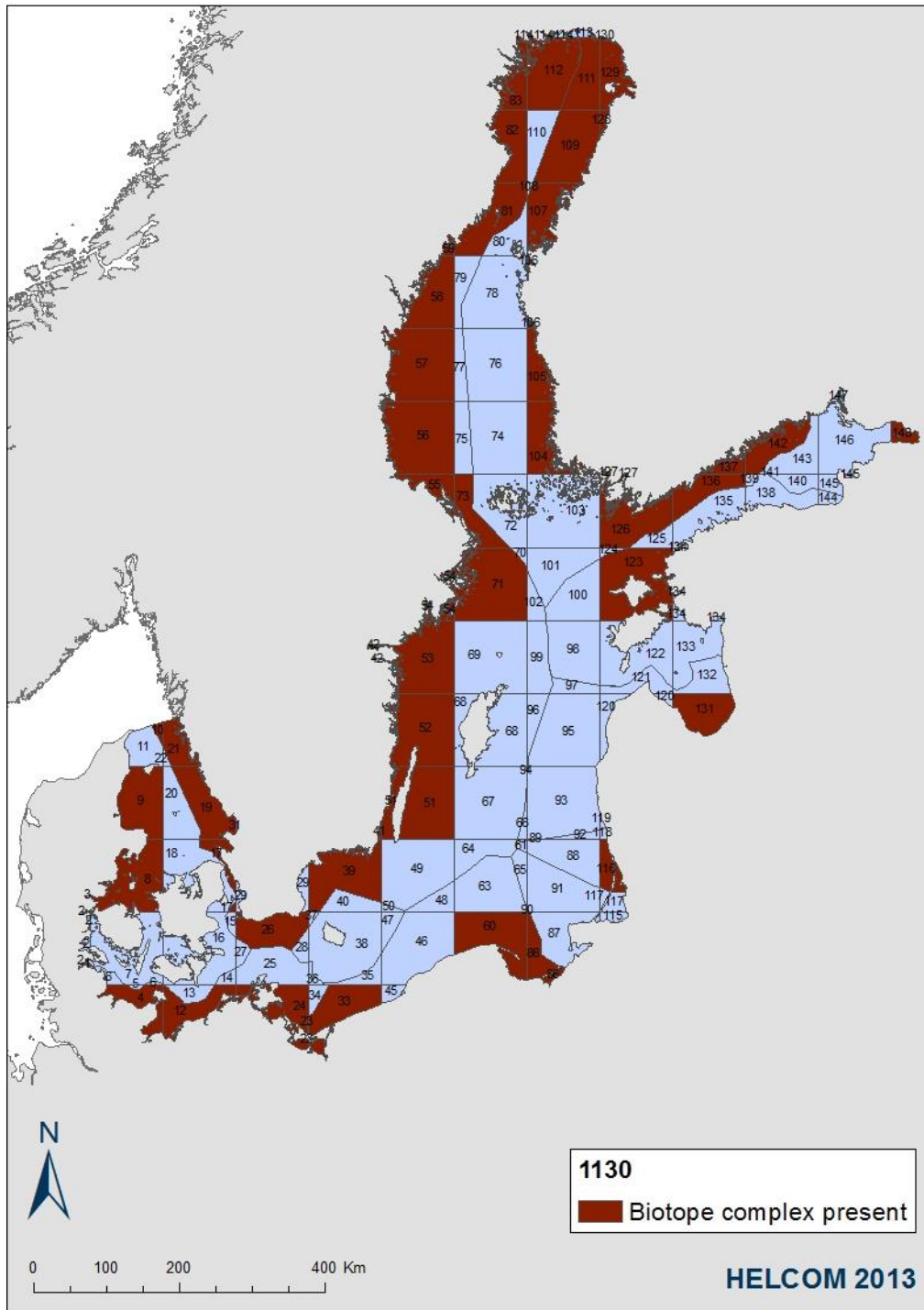
Animals: Invertebrate benthic communities; important feeding areas for many birds.

An estuary forms an ecological unit with the surrounding terrestrial coastal habitat types. In terms of nature conservation, these different habitat types should not be separated, and this reality must be taken into account during the selection of sites.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Estuaries are present in the entire Baltic Sea area. Examples of river mouth areas in **Denmark:** Gudenåen-Randers Fjord, Horsens Fjord, Vejle Fjord, Kolding Fjord **Sweden:** Bräkneån, Hagbyån, Virån, Loftaån, **Finland:** Porvoonjoki river mouth area, Kymijoki river mouth area, Merikarvianjoki, Aurajoki river mouth area, **Russia:** Neva estuary, **Germany:** Trave estuary, Warnow estuary, Peene mouth area. The known occurrences of the estuary biotope complex in a 100x100 km grid (Naturvårdverket 2011, EUNIS Database, HELCOM 1998)



BIOTOPE INFORMATION SHEET

Description of Major threats

Estuaries have historically been preferred areas for settlement and later on for international trade. Therefore, they have always been under human pressure by both usage of the catchment area and the shoreline and by changes of the marine biotopes.

Changes in the hydrodynamic conditions of estuaries due to deepening of the navigational channels for large ships and technical constructions, such as dams, cascades and river bank control, have severe adverse effects on estuaries. The hydrodynamics of estuaries has changed also due to construction of rivers and the loss of natural flood dynamics. Other severe physical pressures and threats are mainly caused by shipping, construction or enlargement of harbours and marinas in the river mouths (European Commission 2007b). Physical alteration of the geological formations or the flow regime can potentially change the communities living in the area.

Eutrophication and pollution by drainage from farming and forestry and other sources, such as traffic and industry, potentially cause severe deterioration of the quality of the biotope complex. Other threats can be caused by introduction of non-indigenous, invasive species, unsustainable fishery and tourism as well as oil spills and construction of breakwaters. The environmental conditions in river mouths depend highly on inflows from local point sources as well as from the whole catchment area, estuaries are therefore closely related to human activities on land (European Commission 2007b).

Assessment justification

C1

Major estuaries in completely pristine condition are nearly unknown in the Baltic Sea area. During the considered time period of 50 years, the quality decline has been very severe on nearly all estuaries in the Baltic Sea region.

Harbours, cities and other construction activities have altered several estuaries already in historical times. However, during the last 50 years the anthropogenic pressure has increased markedly. The usage intensity of harbours has increased markedly, resulting in more direct disturbance from the marine traffic and also in an increased necessity for dredging the areas. Dredging, dumping of dredge spoils and other construction activities have altered the hydrodynamic conditions of estuaries.

The flow of many rivers has been altered by damming up-stream which also affects the hydrodynamic conditions of the estuary adversely, as the natural flood rhythm is lost and its intensity decreased. Pressures from construction and marine traffic are estimated to remain at the same level or possibly increase during the coming decades. Moreover, the length of pristine or near-pristine shores of estuaries or estuaries in a natural or near natural state is steadily decreasing.

During the assessment period, the quality of estuaries has also decreased due to increasing pollution loads. Some pollution sources can be located in the estuary area, but most point- and diffuse pollution sources are found in the drainage area of the rivers. During the past 50 years the nutrient run-off from drainage areas of nearly all estuaries has increased markedly due to an increased usage of chemical fertilizers, the nutrient run-off from municipalities waste water has also increased. Eutrophication of estuaries due to an increased run-off of nutrients from the drainage area, results in an expansion of reed beds in the estuary that changes the natural composition of organism communities.

BIOTOPE INFORMATION SHEET

Recommendations for actions to conserve the biotope

One of the main solutions to stop and reverse degradation of the estuaries is a general protection of this natural habitat type by law. River mouth areas that still remain in a natural state with unregulated water flow up-stream need to become strictly protected sites. Further, programs 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. Additional beneficial protective measures for estuaries include restriction of the further deepening of shipping channels, construction of new port facilities and marinas, regulation of fisheries, control of the growing tourism and harmful recreational activities.

A drastic reduction of nutrient and pollution loads in the catchment area of estuarine rivers would support the improvement of the environmental situation of the whole Baltic marine area. The introduction of ecologically sound fishing and farming methods is essential in order to reach a more favourable conservation status of the natural habitat type.

EU Member States are obliged to take all appropriate steps to avoid further deterioration of estuaries. This includes the obligation to protect this natural habitat type within the Natura 2000 network, and thus to designate as many SACs as necessary to guarantee a favourable conservation status for estuaries. Member States have to follow Article 6 (3) of the Habitats Directive. Plans and projects which are not directly connected with or necessary to the management of a Natura 2000 site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications.

Common names

Denmark: Flodmundinger, Estonia: -, Finland: Jokisuistot, Germany: Ästuare, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Estuarier

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BIOTOPE INFORMATION SHEET

| | | | |
|---|---|--|----------------------|
| English name: Submarine structures made by leaking gases | | Code in HUB: 1180 | |
| Characteristic species: <i>Polycirrus norwegicus</i> , <i>Kellia suborbicularis</i> | | | |
| Past and Current Threats (Habitat directive article 17): Fishing (F02), Eutrophication (H01.05), Contaminant pollution (H03), Construction (dredging J02.02.02) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Fishing (F02), Construction (dredging J02.02.02), Tourism (scuba diving G01.07) | |
| Red List Criteria: B2c(ii) | Confidence of threat assessment: M | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "P" (Potentially endangered) 2.10 Bubbling reefs | | BSEP 113 (HELCOM 2007): Regions where the biotope/habitat is under threat and/or in decline: Kattegat | |
| Higher concern stated by: | | | |

Habitat and Ecology

Bubbling reefs of the northern Kattegat are unique in Europe and probably world-wide. Similar sand stone formation and seepages have been reported from deeper waters in the North Sea and the Gulf of Mexico (Jensen et al. 1992). The Kattegat bubbling reefs are hot spots for the biodiversity. In the photic zone macroalgae grow attached to the sandstone structures, and several sessile and semi-sessile animals are associated with the structures.

The structures can be either pillars, "shelves" – slab type rock layers and pavements. They are formed by gas seeping from the ocean floor. The methane gas originates from Eemian sediments. They can only form in areas where glaciers have pushed aside other layers allowing the gas to seep out. Subsequent erosion of the surrounding sediments reveals the lithified pillar-structures. The development of the bubbling reef relies on organic sediments approximately 10 meters below the sea floor that are estimated to have been created some 100 000–120 000 years before the present time (Jensen et al. 1992). The seeping gas can be so strong that during calm weather the water surface seems to bubble and 'boil' (Jensen et al. 1992).



Bubbling reef in Danish coastal waters (Photo: Orbicon)

BIOTOPE INFORMATION SHEET

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Submarine structures consist of sandstone slabs, pavements, and pillars up to 4 m high, formed by aggregation of carbonate cement resulting from microbial oxidation of gas emissions, mainly methane. The formations are interspersed with gas vents that intermittently release gas. The methane most likely originates from the microbial decomposition of fossil plant materials.

The first type of submarine structures is known as "bubbling reefs". These formations support a zonation of diverse benthic communities consisting of algae and/or invertebrate specialists of hard marine substrates different to that of the surrounding habitat. Animals seeking shelter in the numerous caves further enhance the biodiversity. A variety of sublittoral topographic features are included in this habitat such as: overhangs, vertical pillars and stratified leaf-like structures with numerous caves.

The second type are carbonate structures within "pockmarks". "Pockmarks" are depressions in soft sediment seabed areas, up to 45 m deep and a few hundred meters wide. Not all pockmarks are formed by leaking gases and of those formed by leaking gases, many do not contain substantial carbonate structures and are therefore not included in this habitat. Benthic communities consist of invertebrate specialists of hard marine substrata and are different from the surrounding (usually) muddy habitat. The diversity of the infauna community in the muddy slope surrounding the "pockmark" may also be high.

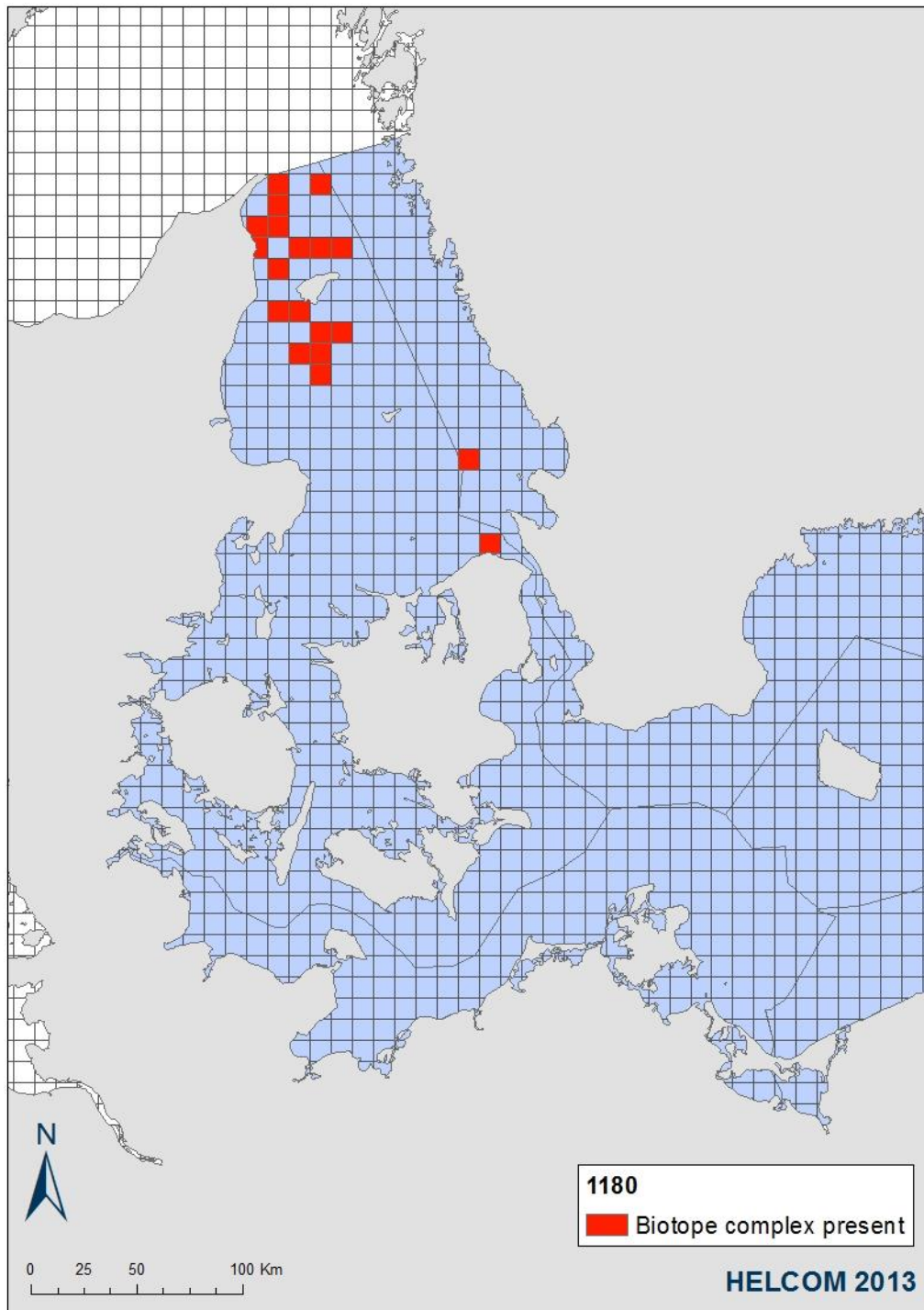
Plants: "Bubbling reefs" - If the structure is within the photic zone, marine macroalgae may be present such as Laminariales, other foliose and filamentous brown and red algae. "Pockmarks" - Usually none.

Animals: "Bubbling reefs" - A large diversity of invertebrates such as Porifera, Anthozoa, Polychaeta, Gastropoda, Decapoda, Echinodermata as well as numerous fish species are present. Especially the polychaete *Polycirrus norwegicus* and the bivalve *Kellia suborbicularis* are typically associated with the habitat and rare elsewhere in the region. "Pockmarks" - Invertebrate specialists of hard substrate including Hydrozoa, Anthozoa, Ophiuroidea and Gastropoda. In the soft sediment surrounding the pockmark Nematodae, Polychaeta and Crustacea are present.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Shallow water examples of “bubbling reefs” colonised by macroalgae and/or animals are observed in Danish waters in the littoral and sublittoral zone from 0 to 30 m water depth. They are present in the northern Kattegat and in the Skagerrak and follow a NW SE direction parallel to the Fennoscandian fault line. Distribution map indicates the 10x10 km grid cells where the biotope complex is known to occur. More specific knowledge of the distribution of the biotope complex allowed its presentation on a higher resolution grid (Seffel 2010, EUNIS Database). If the occurrence had been presented in the 100x100 km grid used for the other biotope complexes, then the squares 11, 9, 20 and 18 had been indicated.



BIOTOPE INFORMATION SHEET

Description of Major threats

The pillars that rise from the sea floor are quite brittle and can be destroyed by physical disturbance caused by fishing gear. The reef areas have long been known to fishermen due to fragments of the pillars becoming entangled in the nets, and have been referred to as 'coral' by the fishermen due to the large amount of attached sessile animals on the fragments (Jensen et al. 1992). The rate of recovery after physical disturbance is very slow. Thus trawling, bottom trawling or other fishing methods causing physical damage to the reefs are the major threat of the system collapsing. Recreational activities such as SCUBA diving and other recreational activities may also potentially harm the bubbling reef structures. Careless movements of the divers or divers touching the underwater structures could cause them to break.

The biologically diverse reefs are also adversely affected by eutrophication and other diffuse and point source pollutions.

Assessment justification

B2c(ii)

The bubbling reefs are threatened due to their rarity. They are known to occur in specific regions in the Kattegat, in a 10x10 km grid cell the biotope can be found in 19 grid cells.

Recommendations for actions to conserve the biotope

Due to the rarity and the fragility of the physical structures that are characteristic for the biotope complex, the most efficient conservation measure is to manage protected areas in the region to restrict human activities which could cause the biotope complex to collapse.

The bubbling reefs occur mainly in the territorial waters of Denmark. Almost all known bubbling reefs occur within eight Natura 2000 sites (7 of which are BSPAs). In all these areas they are part of the areas most important habitats. The current management plans have the goal to improve the protection of the habitat type. Currently the Danish AgriFish Agency are working to implement fishing regulations on locations with bubbling reefs and a 240m buffer around them.

The bubbling reefs will also benefit from programmes and measures that reduce eutrophication and pollution.

Common names

Denmark: Undersøiske formationer forårsaget af udstrømmende gas, Estonia: -, Finland: Kaasuvuotojen synnyttämät rakenteet matalissa vesissä, Germany: Submarine durch Gasaustritte entstrandene Strukturen, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Marina undervattenstrukturer i grunda vatten orsakade av gas läckage

Danish: boblerev,

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types definitions.

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BIOTOPE INFORMATION SHEET

| | | | |
|--|---|--|--------------------------|
| English name: Coastal lagoons | | Code in HELCOM HUB: 1150 | |
| Characteristic species: <i>Charales</i> , <i>Cyperaceae</i> , <i>Phragmites australis</i> , <i>Potamogeton</i> spp., <i>Ruppia</i> spp., <i>Zannichellia palustris</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Construction (dredging J02.02.02), Fishing (F02) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Oil spills (oil spills in the sea H03.01), Construction (dredging J02.02.02), Fishing (F02) | |
| Red List Criteria: C1 | Confidence of threat assessment: M | HELCOM Red List Category: | EN Endangered |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (HELCOM 1998): "2" Heavily endangered G – Lagoons including Bodden, barrier lagoons and fladas | | BSEP 113 (HELCOM 2007): Regions where the biotope/habitat is under threat and/or in decline: All where they occur. | |
| Higher concern stated by: | | | |

Habitat and Ecology

Lagoons are known to be biodiversity hotspots and important spawning and nursing grounds for several fish species. The benthic flora is often rich and may include threatened and/or declining plants such as stoneworts (*Charales*). The bottom of a lagoon can be completely covered in dense underwater vegetation meadows. The lagoon plant vegetation provides habitat for many aquatic invertebrates and these are suitable food for larger animals such as fish or birds. The lagoons are vital habitats for many migrating birds that utilize lagoons both as breeding grounds and as feeding and resting sites during the annual migration.

Baltic Sea lagoons are mostly bay-like features or coastal lakes that are more or less separated from the sea by sandbanks or land thresholds. They are commonly shallow, often with a varying salinity. The salinity of semi-isolated lagoons is usually similar to the surrounding sea area, while lagoons that are nearly- or completely isolated can exhibit a lower salinity due to runoff from the drainage area. The size range is undefined. Large coastal lagoons can cover an areas of some 100 km² or even more, while small lagoons e.g. fladas or gloes only cover a few tens of square meters to a few hectares.

The size of the biotope complex can vary by several orders of magnitude from some tens of square meters to several hectares. Several specific types of lagoons (Bodden, barrier lagoons and Fladas) exist in the Baltic Sea (HELCOM, 1998). In the northern Baltic Sea around the Quark land up-lift is ongoing and can be as much as 9 mm annually. On these coasts many of the smaller lagoons are a result of the up-lift and form a temporal continuum of biotopes characteristic for the Baltic Sea. The seafloor/mainland plain is slightly tilted towards the sea and in combination with land uplift and siltation, this results in a succession where shallow bays with a threshold at the entrances (so called juvenile flads) gradually change into more isolated shallow flads which in the following stage become completely landlocked gloes lakes.

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Lagoons are expanses of shallow coastal salt water, of varying salinity and water volume, wholly or partially separated from the sea by sand bank s or shingle, or, less frequently, by rocks. Salinity may vary from brackish water to hypersalinity depending on rainfall, evaporation and through the addition of fresh seawater from storms, temporary flooding of the sea in winter or tidal exchange.

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Flads and gloes, considered a Baltic variety of lagoons, are small, usually shallow, more or less delimited water bodies still connected to the sea or cut off from the sea very recently by land upheaval. Characterised by well-developed reedbeds and luxuriant submerged vegetation and having several morphological and botanical development stages in the process whereby sea becomes land.

Salt basins and salt ponds may also be considered as lagoons, providing they had their origin on a transformed natural old lagoon or on a saltmarsh, and are characterised by a minor impact from exploitation.

Plants: *Callitriche* spp., *Chara canescens*, *C. baltica*, *C. connivens*, *Eleocharis parvula*, *Lamprothamnion papulosum*, *Potamogeton pectinatus*, *Ranunculus baudotii*, *Ruppia maritima*, *Tolypella nidifica*. In flads and gloes also *Chara* spp. (*Chara tomentosa*), *Lemna trisulca*, *Najasmarina*, *Phragmites australis*, *Potamogeton* ssp., *Stratiotes aloides*, *Typha* spp.

Animals: Cnidaria- *Edwardsia ivellii*; Polychaeta- *Armandia cirrhosa*; Bryozoa- *Victorella pavid*; Rotifera - *Brachionus* spp.; Molluscs- *Abra* spp., *Murex* spp.; Crustaceans- *Artemia* spp.; Fish- *Cyprinus* spp., *Mullus barbatus*; Amphibians- *Hyla arborea*

Saltmarshes form part of this complex.

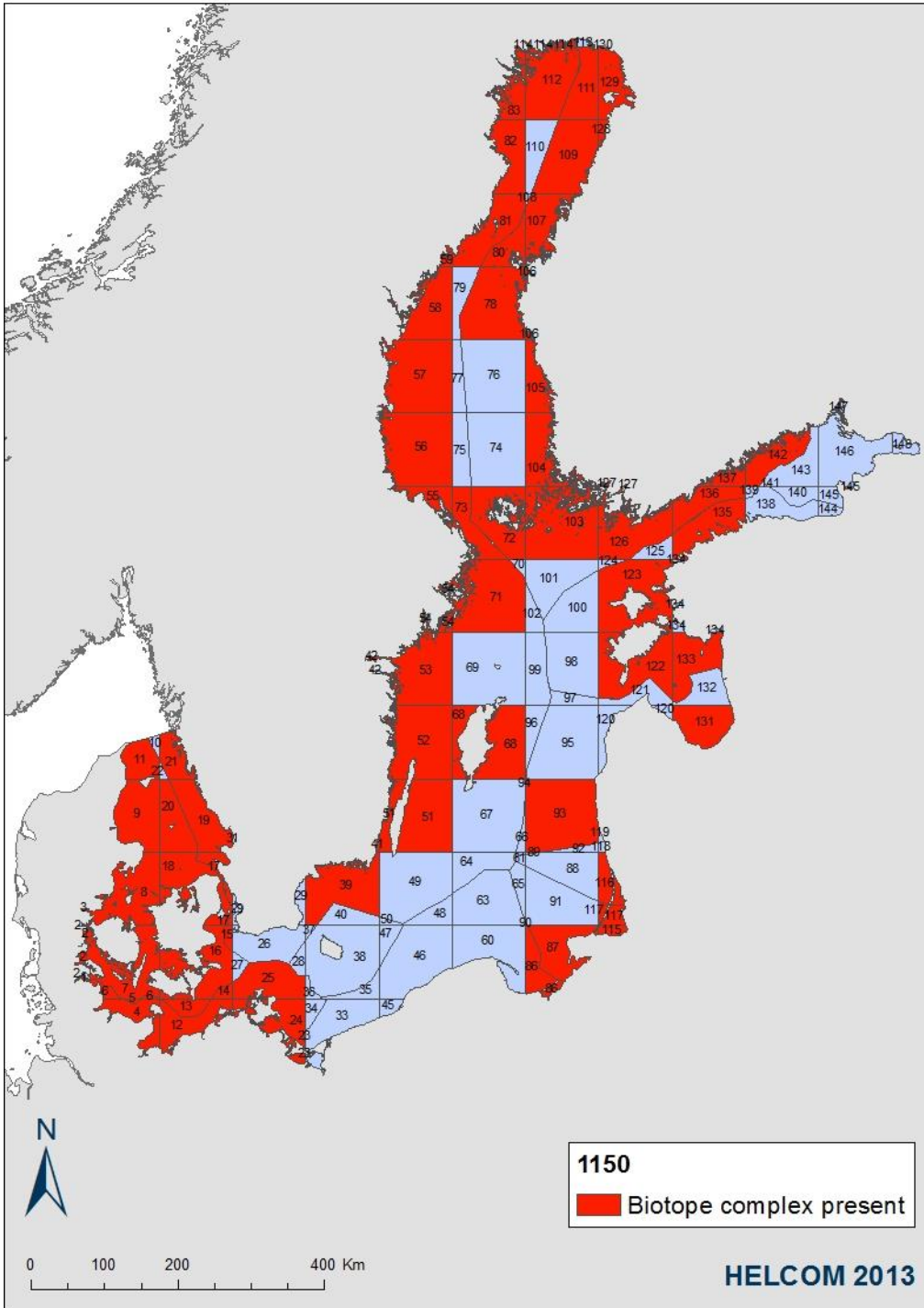


Figure 1 Lagoon in northern Baltic Sea region, Krunnit, Finland (Photo: Pekka Lehtonen)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Lagoons are a typical feature of the dynamic Baltic Sea coast and occurs or occurred in the past in all HELCOM sub-regions.



The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur (Naturvårdverket 2011, EUNIS Database, HELCOM 1998)

BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication and pollution by drainage from agriculture and forestry areas as well as from other sources such as traffic and industry pose serious threats to the lagoon biotope complex. Many of the lagoons biotope forming species are sensitive to eutrophication.

The coastal lagoons are severely affected by various construction activities. Dredging, both small-scale and large-scale projects, affect the lagoons significantly both directly and indirectly. Removing the threshold at the entrance of a lagoon will affect the hydrodynamics of the lagoon on a long time scale. Indirectly dredging can also have an adverse effect on the biotope complex by increasing the turbidity of the water and by releasing nutrients from the sediment. Water turbidity and eutrophication is known to affect the biotope forming community and the natural succession of the biotope might be disrupted. Some of the characteristic biotope forming plants and algae are sensitive to turbidity. If dredging is carried out to enable boat traffic in a lagoon, then the resuspension of sediments due to turbulence from the boats will continuously fuel the eutrophication process.

The lagoon shores are also used for building and other activities which can cause visual, acoustic or physical disturbance to wildlife. Unsustainable fishing methods pose a threat to larger lagoons.

Contaminant pollution threatens coastal lagoons. Run-off from urbanized areas in the catchment of the lagoon can introduce various hazardous substances. Coastal lagoons are also threatened by oil spills at sea. If the oil drifts to shore, the shallow lagoons with dense macrophyte meadows can be difficult to restore after an oil spill accident.

Assessment justification

C1

Human activities have affected the majority of lagoons and have in some cases caused severe or even irreparable damage. The assumedly severe decline in quality on more than half of the lagoon biotope complexes is mainly due to exploitation of the coastal areas. In these lagoons biota performing key roles has been greatly reduced and even disappeared completely in some locations and many lagoons suffer from chronic changes in nutrient cycling and water clarity.

The length of pristine shores of lagoons and the number of lagoons in a natural or near natural state is low and steadily decreasing due to the increased utilization of the coast for construction activities. In many regions in the northern Baltic Sea recreational building of vacation homes along the coast has had a negative impact on the lagoons. Especially in areas where the land up lift is significant and dredging is required for boat access, the anthropogenic impact on the biotope complex has been significant. The quality of lagoons in the southern and western Baltic Sea has deteriorated severely due to exploitation of the coastlines. Lagoons are directly impacted by human activities in the drainage area, and in the southern regions the population density along the coast is high leading to a gradual quality degradation.

Eutrophication of the coastal lagoons increases water turbidity and the siltation rate. Macrophyte meadows of various Charales and spiny naiad biotopes are characteristic. Macrophyte meadows have been severely impacted in several coastal lagoons, to the degree that the meadows have disappeared in some locations. Characteristic species such as *Zostera noltii* has disappeared completely from many lagoons in the southern Baltic Sea.

This biotope complex could possibly be assessed by the A-criterion as a decrease in quantity if for example, dredging of the sill of a flad would be considered as changing the flad to a shallow bay.



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Currently there is insufficient data to assess the biotope complex by the A-criterion. The exact abundance or cover of threatened or declining lagoons is not known.

Recommendations for actions to conserve the biotope

One of the main solutions to stop and reverse degradation of lagoons is a general protection of this natural habitat type by law as already performed in some countries. Particularly still undisturbed and natural lagoon areas should become strictly protected. Moreover, programs and measures are needed to restore natural conditions in affected lagoon areas. This includes a drastic reduction of the eutrophication and pollution in the run off area.

Additional protective measures should be: introduction of ecologically sound fishing methods, preservation of natural dynamics (HELCOM Rec. 16/3), restrictions on building activities and any constructions (HELCOM Rec. 15/1), unregulated growth of tourism and harmful recreational activities.

Common names

Denmark: Kystlaguner, Estonia: -, Finland: Rannikon laguunit, Germany: Lagunen des Küstenraumes (Strandseen), Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Kustnära laguner

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Available at:
http://ec.europa.eu/environment/nature/natura2000/marine/docs/marine_guidelines.pdf (viewed 4 June 2013)
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BIOTOPE INFORMATION SHEET

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|---|---|---|----------------------|
| English name: Sandbanks which are slightly covered by sea water all the time | | Code in HELCOM HUB: 1110 | |
| Characteristic species: | | | |
| Past and Current Threats (Habitat directive article 17): Fishing (Fishing and harvesting aquatic resources F02, bottom trawling F02.02.01), Eutrophication (H01.05), Mining and quarrying (sand and gravel extraction C01.01), Construction (marine constructions D03.03, dredging J02.02.02, dumping J02.11), Contaminant pollution (H03) | | Future Threats (Habitat directive article 17): Fishing (Fishing and harvesting aquatic resources F02, bottom trawling F02.02.01), Eutrophication (H01.05), Mining and quarrying (sand and gravel extraction C01.01), Construction (marine constructions D03.03, windenergy production C03.03, dredging J02.02.02, dumping J02.11), Contaminant pollution (H03) | |
| Red List Criteria: C1 | Confidence of threat assessment: L | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" (Endangered) 2.5 Sandy bottoms 2.5.2 Sublittoral photic zone 2.5.2.1 Sublittoral level sandy bottoms with little or no macrophyte vegetation of the photic zone 2.5.2.4 Sand banks of the sublittoral photic zone with or without macrophyte vegetation | | BSEP 113 (2007): Sandbanks which are slightly covered by sea water all the time are under threat and/or in decline in: The Southern Baltic Proper, The Gulf of Gdansk, Bay of Mecklenburg, Kiel Bay. | |
| Higher concern stated by: | | | |

Habitat and Ecology

Sandbanks consist of sand and gravel. The bank is elevated from the surrounding seafloor and is characterized by an organism community that is distinctly different both in structure and function compared to the surrounding. Several macrofauna species live on the sandbanks, whereas macrophytes are often completely absent or grow very sparsely due to the abrasive effect of waves and the instable substratum. The macrofauna communities can vary significantly within a short distance if the grain size of the sand/gravel in the bank varies. Several demersal species of fish and fish feeding on macrozoobenthos are associated with the deeper underwater sandbanks.

Submerged sandbanks are of special relevance as feeding and wintering grounds for birds, (etc. *Melanitta nigra*, *Gavia stellata* and *Gavia arctica*) and are therefore considered to be of Baltic-wide importance. The sandbanks are also important foraging grounds for several fish species and resting places for seals.

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata.

"Slightly covered by sea water all the time" means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend

BIOTOPE INFORMATION SHEET

beneath 20 m below chart datum. It can, therefore, be appropriate to include in designations such areas where they are part of the feature and host its biological assemblages.

Plants: *Zostera* spp., *Potamogeton* spp., *Ruppia* spp., *Tolypella nidifica*, *Zannichellia* spp., charophytes. On many sandbanks macrophytes do not occur. Animals: Invertebrate and demersal fish communities of sandy sublittoral (fine and medium grained sands, coarse sands, gravely sands), e.g. polychaetes: *Scoloplos armiger*, *Pygospio elegans*, *Nereis diversicolor*, *Travisia* spp., e.g. bivalves: *Macoma balthica*, *Mya arenaria*, *Cerastoderma* spp., e.g. crustaceans: *Crangon crangon*, *Saduria entomon*, e.g. fish species: *Platichthys flesus*, *Nerophis ophidion*, *Pomatoschistus* spp., *Ammodytes tobianus*.

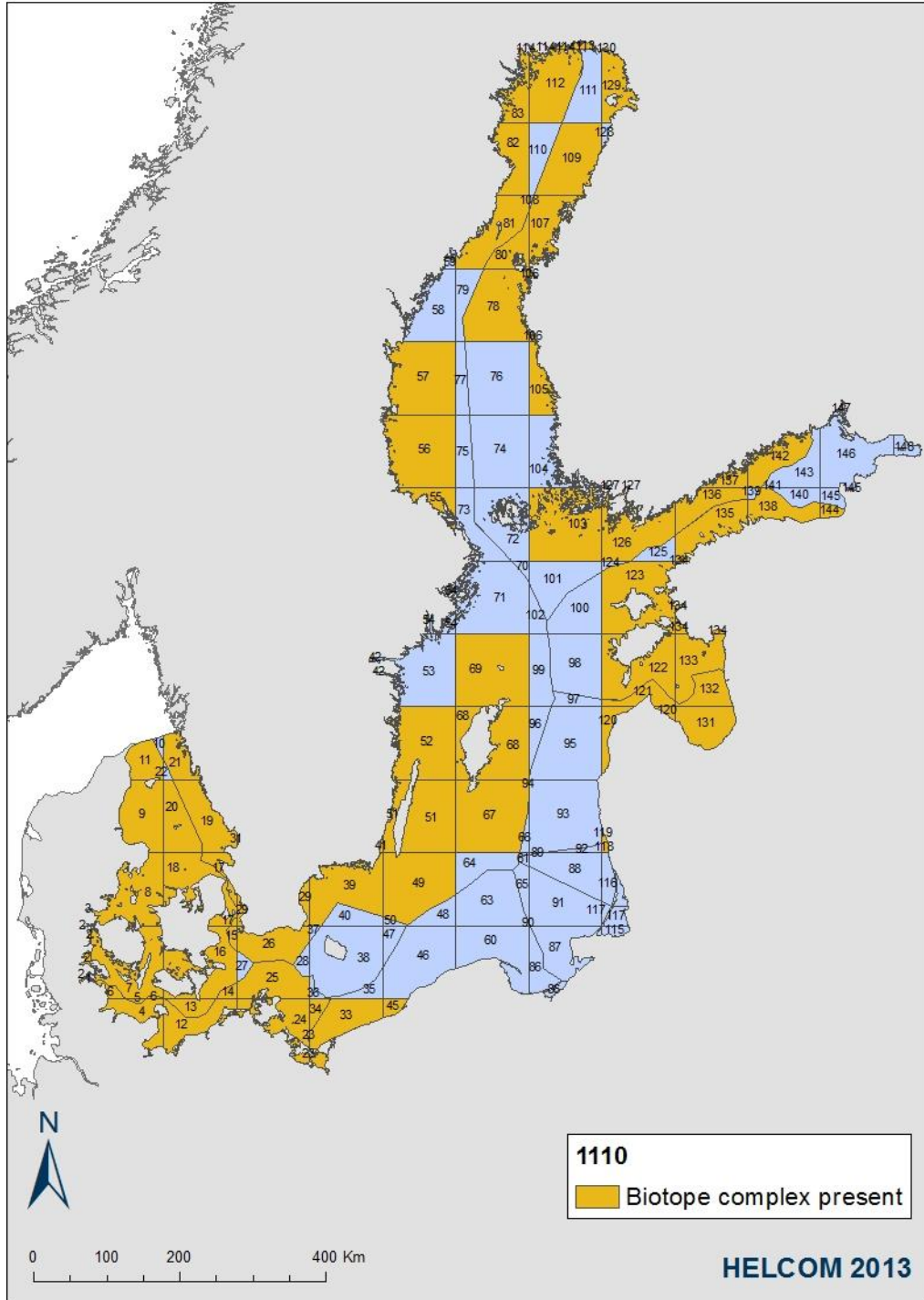


Sandbank in the Fehmarn Belt (photo BfN Krause & Hübner)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Sandbanks are widely spread throughout the whole Baltic Sea area, and occur in all HELCOM sub-regions. The Distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur (Naturvårdverket 2011, EUNIS Database)



BIOTOPE INFORMATION SHEET

Description of Major threats

Sand and gravel extraction from the sandbank areas represent an increasing anthropogenic pressure on the biotope complex. The well-sorted sandy substrate is well suited for mining and use in various construction activities. Offshore constructions in the vicinity of the sandbanks may also pose a threat to the complex, as the constructions may potentially alter the hydrodynamic conditions that constantly reshapes the sandbanks. Off-shore windfarm construction in areas where the sandbanks occur is a major future threat. Dredging and dumping of dredged materials can have a negative effect on the sandbank communities. Fishery activities such as bottom trawling may also have an adverse effect on the complex. Eutrophication and pollution have adverse effects on the specialised macrofauna community that live on the sandbanks.

Assessment justification

C1

The biotope complex is assumed to have experienced very severe quality decline in over 30 % of the original distribution during the past 50 years.

The functional group made up by the bottom feeding fish has experienced very severe quality decline in especially the southern and western regions of the Baltic Sea. Fish communities that perform key roles in the biotope complex have been greatly reduced and several species have been red-listed, such as eel (*Anguilla anguilla*, CR; A3bd+4abde), cod (*Gadus morhua*, VU; A2bc) and whiting (*Merlangius merlangus*, VU; A2bd).

Eutrophication has affected the biotope especially in more sheltered locations where organic matter can build up and cover the sand. Nutrient run-off from agriculture, forestry, waste water treatment plants and locally from fish farming is seen to have affected the biotope complex quality.

To some extent the biotope complex quality has been degraded by direct mechanical damage from marine sand extraction as well as from anchoring and dredging. These human activities are assumed to affect the biotope complex increasingly in the future.

Recommendations for actions to conserve the biotope

Eutrophication must be reduced significantly. This would probably result in a more favourable development of sandbanks. In some countries sandbanks are protected by law. Additional protective measures could be: introduction of ecologically sound fishing methods, restrictions for mineral extractions and dumping of dredged material.

Common names

Denmark: Sandbanker med lavvandet vedvarende dække af havvand, Estonia: -, Finland: Vedenalaiset hiekkasärkät, Germany: Sandbänke mit nur schwacher ständiger Überspülung durch Meerwasser, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Sublittorala sandbankar

References

European Commission. (2007a). Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. Appendix 1: Marine Habitat types definitions.

http://ec.europa.eu/environment/nature/natura2000/marine/docs/appendix_1_habitat.pdf

European Commission (2007b). Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. (EU interpretation manual) Available at:

BIOTOPE INFORMATION SHEET

http://ec.europa.eu/environment/nature/natura2000/marine/docs/marine_guidelines.pdf (viewed 4 June 2013)

Naturvårdsverket (2011) Vägledning för svenska naturtyper i habitatdirektivets bilaga 1, Blottade sand- och lerbottnar. Available at: http://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/natura-2000/naturtyper/kust-och-hav/vl_1110_Sandbankar.pdf (Viewed July 19 2013)

EUNIS Database. <http://eunis.eea.europa.eu/habitats.jsp> (Viewed July 19 2013)

BIOTOPE INFORMATION SHEET

| | | | |
|--|---|--|--------------------------|
| English name: Mudflats and sandflats not covered by seawater at low tide | | Code in HELCOM HUB: 1140 | |
| Characteristic species: | | | |
| Past and Current Threats (Habitat directive article 17): Construction (dredging J02.02.02, dumping J02.11, coastal engineering J02.12.01), Eutrophication (H01.05), Contaminant pollution (H03), Water traffic (D03), Tourism (G05) | | Future Threats (Habitat directive article 17): Construction (dredging J02.02.02, dumping J02.11, coastal engineering J02.12.01), Eutrophication (H01.05), Contaminant pollution (H03), Oil spills (oil spills in the sea H03.01), Water traffic (D03), Tourism (G05) | |
| Red List Criteria: C1 | Confidence of threat assessment: M | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): – | | BSEP 113 (2007): Regions where the biotope/habitat is under threat and/or in decline: Bothnian Bay, The Quarck, The Bothnian Sea, Åland Sea, The Northern Baltic Proper, Western Gotland Basin, Eastern Gotland Sea, The Southern Baltic Proper, The Gulf of Gdansk, The Bay of Mecklenburg, Kiel Bay, Great Belt, The Sound, Kattegat. | |
| Higher concern stated by: | | | |

Habitat and Ecology

The habitat is of particular importance as feeding ground for waterfowl and waders. Diverse species of invertebrates and algae occupy it. Mudflats and sandflats not covered by sea water at low tide are a widespread biotope complex on the North Atlantic coast. In the Baltic Sea the biotope complex does not cover as large areas, since the Baltic Sea is non-tidal. The changes in sea water level are wind-induced and partly depend on the varying seasonal atmospheric pressure. Along large parts of the Baltic Sea coast mud- and sandflats are even so regularly exposed when the water level drops and the ecological function they exhibit is interpreted as being comparable to mud- and sandflats exposed due to tidal effects. The interpretation of the definition of this biotope complex varies somewhat between the Baltic Sea coastal states.

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Sands and muds of the coasts of the oceans, their connected seas and associated lagoons, not covered by sea water at low tide, devoid of vascular plants, usually coated by blue algae and diatoms. They are of particular importance as feeding grounds for wildfowl and waders.

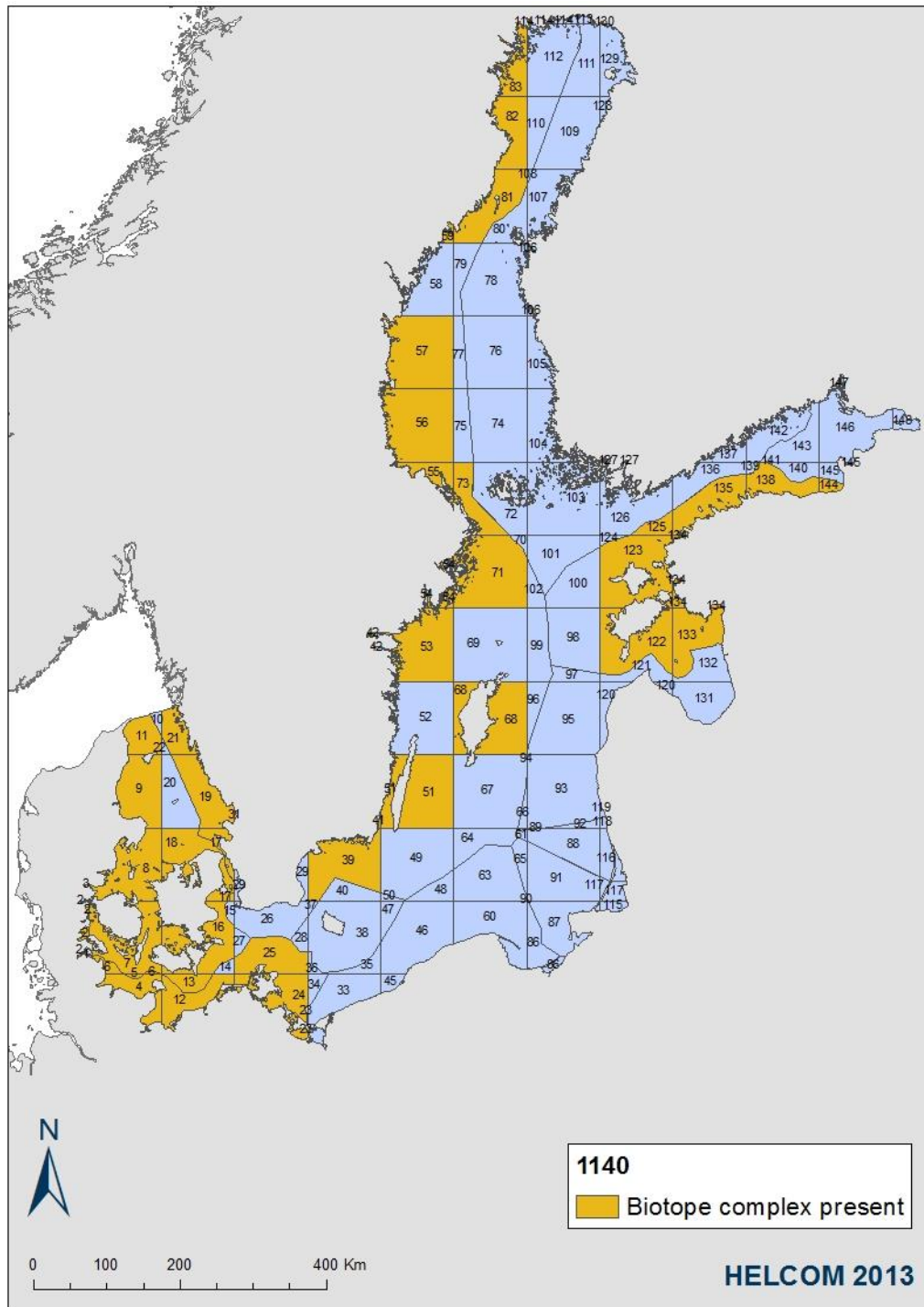
Note: Eelgrass communities (Palaeartic 11.3) are included in this habitat type.

In the Baltic Sea this habitat type is part of the hydrolittoral which means that these sands and muds are episodically dry falling. Thus, they belong to the relatively small wind induced littoral zone below the mean water line. Depending on the exposition such Baltic *Mudflats* and *Sandflats* occur with and without macrophyte vegetation.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Mudflats and sandflats not covered by sea water at low tide occur in all parts of the Baltic Sea area, but patterns and descriptions of their distribution are mostly missing. In the Lahemaa area (Southern Gulf of Finland) for example, they are representing 3% of all habitats and also in the German Baltic Sea region they form a very narrow strip along some the coastlines. No information is available on their historical distribution. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur (Naturvårdverket 2011, EUNIS Database)



BIOTOPE INFORMATION SHEET

Description of Major threats

Coastal defence activities such as dyking and stabilization of sand pose a threat to the biotope complex. Water traffic in shallow areas close to the coast can damage the biotope complex through coastal erosion. Deepening of boating routes through dredging can also pose a threat to the biotope complex. In some areas recreational use of the shore is intense threatening the integrity of the biotope complex. Eutrophication due to nutrient run-off from the catchment area also threatens the quality of the biotope complex. Run-off from urban areas can introduce various hazardous substances to the biotope complex, and various pollutants can accumulate in the soft sediments. Oil spills at sea that are washed ashore on mudflats or sandflats pose a serious threat, as oil is very difficult to remove from this type of soft sediment.

Assessment justification

C1

The biotope complex is threatened in almost every sub-region of the Baltic Sea area. Mudflats are assumed to have experienced severe quality decline in over half of the original occurrences during the past 50 years. Coastal exploitation is the main reason for the biotope complex experiencing quality decline.

Recommendations for actions to conserve the biotope

Particularly natural and unaffected shorelines need to become strictly protected by law. Additionally, programs and measures are needed to restore natural conditions where the habitat type is degraded (BSAP). Further protective measures could be: restriction of new constructions (HELCOM Rec. 15/1), prevention of an unregulated growth of tourism and harmful recreational activities. Furthermore, according to the HELCOM Rec. 16/3, natural processes along the coast have to be preserved. As for all natural habitat types an inventory and a monitoring and assessment programme (also for human activities) is obligatory for EU Member States. They are also obliged to take all appropriate steps to avoid further deterioration. This includes the obligation to protect this natural habitat type within the Natura 2000 network, and thus to designate as many SACs as necessary to guarantee its favourable conservation status. Member States have to follow Article 6 (3) of the Habitats Directive: Plans and projects which are not directly connected with or necessary to the management of a Natura 2000 site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications.

Common names

Denmark: Mudder og sandflader, der er blottet ved ebbe, Estonia: -, Finland: Muta- ja hiekkamatalikot, joita merivesi ei peitä laskuveden aikana, Germany: Vegetationsfreies Schlick-, Sand- und Mischwatt, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Ler-och sandbottnar som blottas vid lågvatten

References

- European Commission. 2007. Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. Appendix 1: Marine Habitat types definitions.
http://ec.europa.eu/environment/nature/natura2000/marine/docs/appendix_1_habitat.pdf
- HELCOM (1998). Red List of marine and coastal biotopes and biotopes complexes of the Baltic Sea, Belt Sea and Kattegat. Baltic Sea Environmental Proceedings No. 75. Helsinki Commission, Helsinki. 115pp. Available at: <http://www.helcom.fi/stc/files/Publications/Proceedings/bsep75.pdf>
- Naturvårdsverket (2011) Vägledning för svenska naturtyper i habitatdirektivets bilaga 1, Blottade sand- och lerbottnar. Available at: <http://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/natura-2000/naturtyper/kust-och->



BIOTOPE INFORMATION SHEET

[hav/vl_1140_Blottadsandlerbotten.pdf](#). (Viewed July 19 2013)

EUNIS Database. <http://eunis.eea.europa.eu/habitats.jsp> (Viewed July 19 2013)



BIOTOPE INFORMATION SHEET

| | | | |
|--|---|---|--------------------------|
| English name: Large shallow inlets and bays | | Code in HELCOM HUB: 1160 | |
| Characteristic species: <i>Chara baltica</i> , <i>Chara canescens</i> , <i>Tolypella nidifica</i> , <i>Ruppia spp.</i> , <i>Stukenia pectinata</i> , <i>Zostera marina</i> | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Construction (dredging J02.02.02, dumping J02.11, marine constructions D03.03), Tourism (G05), Fishing (F02) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Contaminant pollution (H03), Oil spills (oil spills in the sea H03.01), Construction (dredging J02.02.02, dumping J02.11, marine constructions D03.03), Tourism (G05), Fishing (F02) | |
| Red List Criteria: C1 | Confidence of threat assessment: M | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" (Endangered) E – Fjords F – Fjards/fjord-like bays | | BSEP 113 (2007): Regions where the biotope/habitat is under threat and/or in decline: The Bothnian Sea, Åland Sea, Archipelago Sea, Gulf of Finland, The Southern Baltic Proper. | |
| Higher concern stated by: | | | |

Habitat and Ecology

Baltic large shallow inlets and bays are coastal features such as fjords and/or fjord like bays, shallow bights, but also specific subtypes of Bodden. The characteristic physiographic and biological features are more similar to the adjacent open Baltic Sea than it is, for example, the case in lagoons or estuaries.

Large shallow inlets and bays are of Baltic-wide importance. Some of them, e.g. the Bodden of the southern Baltic Sea coast, are of global importance. The physiographic features of sheltered bays provide important habitats for aquatic and coastal plants and animals (birds, fish, invertebrates). The benthic flora is often rich. In some cases the benthic and halophytic vegetation (mainly along the shores) may cover large parts of the seafloor of the bay. The plant vegetation provides habitat for many aquatic invertebrates and these are suitable food for larger animals such as fish or birds.

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

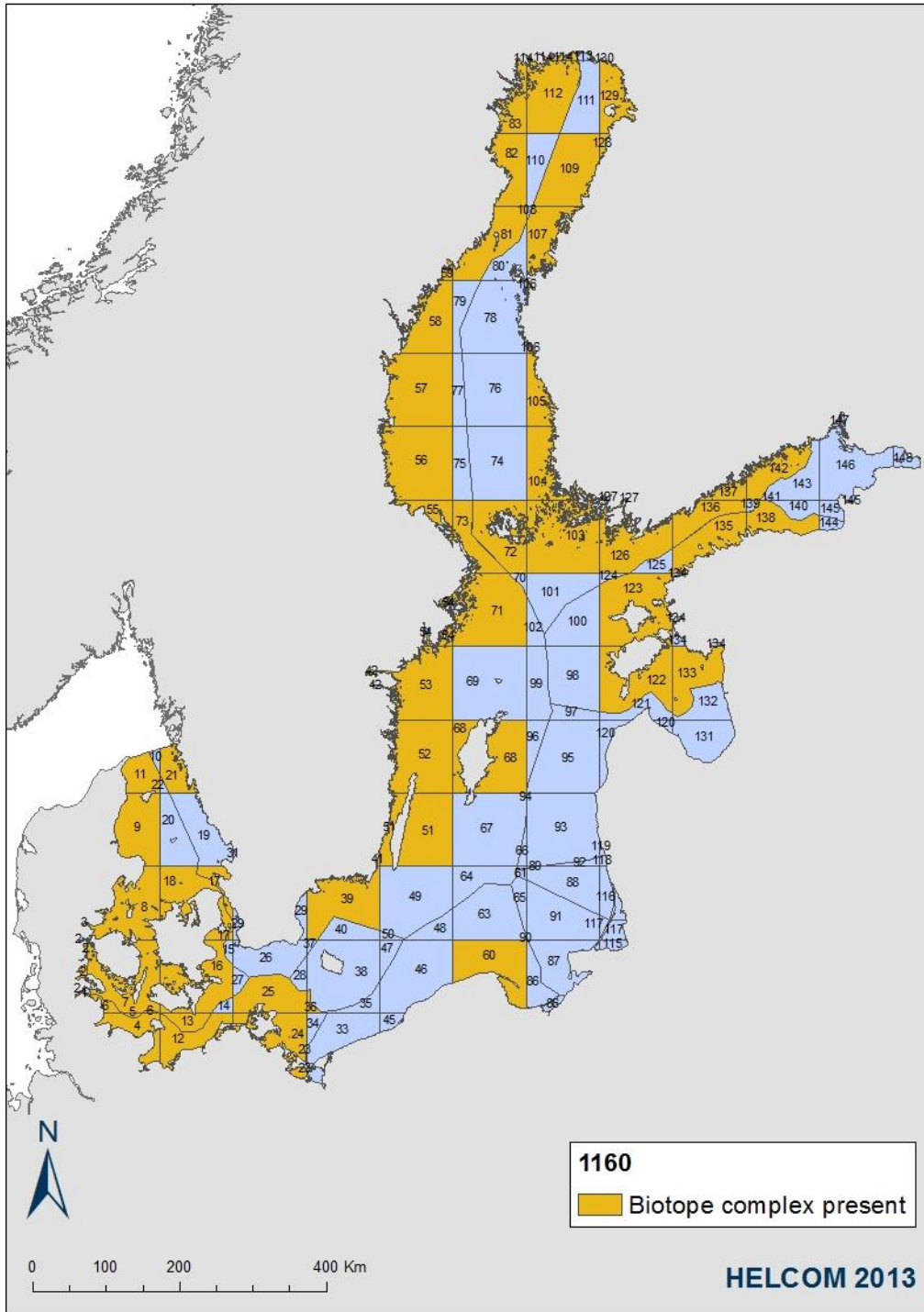
Large indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited. These shallow indentations are generally sheltered from wave action and contain a great diversity of sediments and substrates with a well developed zonation of benthic communities. These communities have generally a high biodiversity. The limit of shallow water is sometimes defined by the distribution of the *Zosteretea* and *Potametea* associations. Several physiographic types may be included under this category providing the water is shallow over a major part of the area: embayments, fjards, rias and voes.

Plants: *Zostera spp.*, *Ruppia maritima*, *Potamogeton spp.* (e.g. *P. pectinatus*, *P. praelongus*), benthic algae. Animals: Benthic invertebrate communities.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Large shallow inlets and bays occur in all HELCOM sub-regions of the Baltic Sea area. The distribution map indicates the area in the 100x100 km grid where biotope is known to occur (Naturvårdverket 2011, EUNIS Database)



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication and pollution by drainage from agriculture and forestry and other sources (like traffic and industry) are serious threats and factors for deterioration. The overgrowth of filamentous algae, which benefits from eutrophication, smothers the communities of vascular plants in the shallow inlets and bays. Furthermore, humans also use this habitat type for other activities such as fishing, offshore constructions, extractions, dredging, dumping of dredged material, tourism and recreation which all may cause visual, acoustic or physical disturbance to wildlife and the habitat (European Commission 2007b, EUNIS Database).

Assessment justification

C1

During the past 50 years the quality deterioration is assumed to have been severe on more than half of the original distribution of the large shallow inlets and bays. The quality degradation is mainly due to coastal exploitation of the shallow areas and nutrient run-off. Eutrophication has deteriorated the quality of the biotope complex in several areas. The decreased water clarity affects the characteristic macrophyte meadows. For example, in the southern and western areas of the Baltic Sea the species *Zostera noltii* that previously occurred in the macrophyte meadows has disappeared from many areas covered by the biotope complex.

The biotope complex is under threat or decline along many central and southern Baltic Sea coasts where the use of coastal areas for recreation is extensive. Coastal construction and physical disturbance has affected the quality negatively.

Recommendations for actions to conserve the biotope

Programs and measures for a drastic reduction of the eutrophication and pollution are needed. Additional protective measures could be: preservation of natural dynamics (HELCOM Rec. 16/3), restriction of building activities along the shores (HELCOM Rec. 15/1), restrictions for offshore constructions, introduction of ecologically sound fishing and farming methods as well as regulations for ship traffic, boating, unregulated growth of tourism and harmful recreational activities. As for all natural habitat types, an inventory and a monitoring and assessment programme (also for human activities) is obligatory for EU Member States. They are further obliged to take all appropriate steps to avoid further deterioration. This includes the obligation to protect this natural habitat type within the Natura 2000 network, and thus to designate as many SACs as necessary to guarantee its favourable conservation status. Member States have to follow Article 6 (3) of the Habitats Directive: Plans and projects which are not directly connected with or necessary to the management of a Natura 2000 site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications.

Common names

Denmark: Større, lavvandede bugter og vige, Estonia: - , Finland: Laajat matalat lahdet, Germany: Flache große Meeressarme und -buchten (Flachwasserzonen und Seegraswiesen), Latvia: - , Lithuania: - , Poland: - , Russia: - , Sweden: Stora grunda vikar och sund

References

European Commission. (2007a). Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. Appendix 1: Marine Habitat types definitions.
http://ec.europa.eu/environment/nature/natura2000/marine/docs/appendix_1_habitat.pdf

BIOTOPE INFORMATION SHEET

European Commission (2007b). Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. (EU interpretation manual) Available at:

http://ec.europa.eu/environment/nature/natura2000/marine/docs/marine_guidelines.pdf (viewed 4 June 2013)

Naturvårdsverket (2011) Vägledning för svenska naturtyper i habitatdirektivets bilaga 1, Blottade sand- och lerbottnar. Available at: http://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/natura-2000/naturtyper/kust-och-hav/vl_1160_Storavikarsund.pdf . (Viewed July 19 2013)

EUNIS Database. <http://eunis.eea.europa.eu/habitats.jsp> (Viewed July 19 2013)

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|--------------------------|
| English name: Reefs | | Code in HELCOM HUB: 1170 | |
| Characteristic species: <i>Modiolus modiolus</i> , <i>Mytilus</i> spp., <i>Dreissena polymorpha</i> , sponges, moss animals, perennial macroalgae such as <i>Fucus</i> spp., <i>Laminaria/Saccharina</i> or foliose red algae (<i>Delesseria sanguinea</i> , <i>Coccotylus/Phyllophora</i> , <i>Furcellaria lumbricalis</i>) | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Fishing (F02), Construction (dredging J02.02.02, dumping J02.11), Mining and quarrying (e.g. stonefishing C01.07), Contaminant pollution (H03) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Fishing (F02), Construction (dredging J02.02.02, dumping J02.11), Contaminant pollution (H03) | |
| Red List Criteria: C1 | Confidence of threat assessment: L | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" (Endangered) 2.1 Rocky bottoms 2.1.1 Soft rock bottoms 2.1.1.2 Sublittoral photic zone 2.1.1.2.3 Sublittoral soft rock reefs of the photic zone with little or no macrophyte vegetation 2.1.1.3 Hydrolittoral 2.1.1.3.3 Hydrolittoral soft rock reefs with or without macrophyte vegetation 2.1.2 Solid rock bottoms 2.1.2.2 Sublittoral photic zone 2.1.2.2.3 Sublittoral solid rock reefs of the photic zone with or without macrophyte vegetation 2.1.2.3 Hydrolittoral 2.1.2.3.3 Hydrolittoral solid rock reefs with or without macrophyte vegetation 2.2 Stony bottoms 2.2.2 Sublittoral photic zone 2.2.2.3 Sublittoral stony reefs of the photic zone with or without macrophyte vegetation | | BSEP 113 (2007): Regions where the biotope/habitat is under threat and/or in decline: The Bothnian Sea, Åland Sea, Archipelago Sea, Gulf of Finland, The Southern Baltic Proper. | |
| Higher concern stated by: | | | |

Habitat and Ecology

Reefs are ridges of solid rock or accumulations of coarse mineral substrata protruding above the level bottoms and found entirely below or extending partly above the surface of the water (HELCOM, 1998). Further, compact sessile mussel beds of the hydrolittoral and sublittoral are considered as reefs. Reefs at great depth are typically characterized by sparse epibenthic communities.

Although the common mussel (*Mytilus edulis*) occurs throughout most of the Baltic Sea area, the horse mussel (*Modiolus modiolus*) is common in the Kattegat and the zebra mussel (*Dreissena polymorpha*) in coastal lagoons and estuaries. All of them form dense colonies and often create multi-layered beds on hard or soft substrata. They act as substratum themselves for other animals and macrophytes. The animal and plant communities of reefs vary with the salinity, light penetration and exposition to water motion. Algal zonation is a characteristic feature for reefs.

Reefs are of Baltic-wide importance and are in many cases hot spots for the biodiversity. They provide shelter for many aquatic animals (fish, invertebrates), and they are important feeding grounds for birds.

BIOTOPE INFORMATION SHEET

The benthic flora is often rich and may include threatened and/or declining plant species.

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Reefs can be either biogenic concretions or of geogenic origin. They are hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sublittoral and littoral zone. Reefs may support a zonation of benthic communities of algae and animal species as well as concretions and corallogenic concretions.

Clarifications:

- "Hard compact substrata" are: rocks (including soft rock, e.g. chalk), boulders and cobbles (generally >64 mm in diameter).
- "Biogenic concretions" are defined as: concretions, encrustations, corallogenic concretions and bivalve mussel beds originating from dead or living animals, i.e. biogenic hard bottoms which supply habitats for epibiotic species.
- "Geogenic origin" means: reefs formed by non biogenic substrata.
- "Arise from the sea floor" means: the reef is topographically distinct from the surrounding seafloor.
- "Sublittoral and littoral zone" means: the reefs may extend from the sublittoral uninterrupted into the intertidal (littoral) zone or may only occur in the sublittoral zone, including deep water areas such as the bathyal.
- Such hard substrata that are covered by a thin and mobile veneer of sediment are classed as reefs if the associated biota are dependent on the hard substratum rather than the overlying sediment.
- Where an uninterrupted zonation of sublittoral and littoral communities exist, the integrity of the ecological unit should be respected in the selection of sites.
- A variety of subtidal topographic features are included in this habitat complex such as: Hydrothermal vent habitats, sea mounts, vertical rock walls, horizontal ledges, overhangs, pinnacles, gullies, ridges, sloping or flat bed rock, broken rock and boulder and cobble fields.

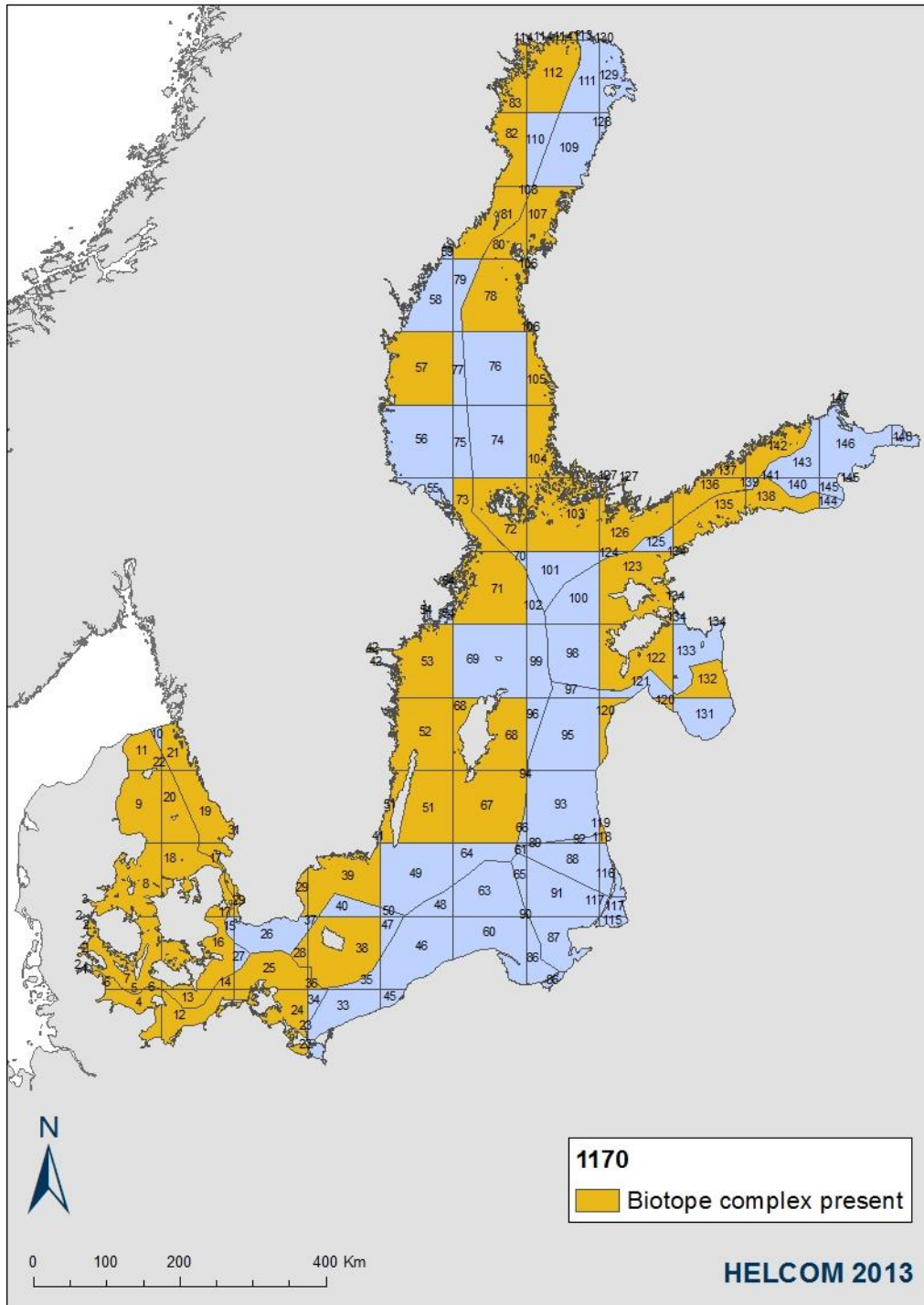
Plants: A large variety of red, brown and green algae (some living on the leaves of other algae).

Animals- Reef-forming species: Bivalves e.g. *Modiolus modiolus*, *Mytilus* spp., *Dreissena polymorpha*). non reef forming species: Typical groups are hydroids, ascidians, cirripedia (barnacles), bryozoans and molluscs as well as diverse mobile species of crustaceans and fish.

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The distribution map indicates the area in the 100x100 km grid where biotope is known to occur (Naturvårdverket 2011, EUNIS Database)



BIOTOPE INFORMATION SHEET

Description of Major threats

Reefs are threatened by eutrophication both due to decreasing light penetration and also by increased siltation rates. Fishing poses a threat to reefs as fish are often abundant around reefs. Fishing gear can get entangled on reefs and can also cause direct physical harm to the epibenthic reef community. In the southern and western parts of the Baltic Sea, stone fishing has historically threatened the integrity of reefs. Contaminant pollution from various hazardous substances threaten the quality of reefs, as the often characteristic filtering mussels can be adversely affected by high levels of hazardous substances.

Assessment justification

C1

Reefs in the southern and western parts of the Baltic Sea are assumed to have experienced a very strong quality decline during the past 50 years. Fishing activities have affected the epibenthic communities and reef associated fish stocks have declined. The physical integrity of the reefs has also been compromised due to historical stone fishing practices and other mining and construction activities.

In the northern Baltic Sea reefs have experienced a moderately severe quality decline mainly due to eutrophication. These reefs are mainly of geogenic origin, and are often covered by macroscopic epibenthic communities dominated by *Mytilus* spp. Within the photic zone, the algal zonation is a typical feature of the reefs. Eutrophication has decreased the water transparency and in many regions the algal zonation is not as distinct and the maximum depth has decreased.

Recommendations for actions to conserve the biotope

The restoration of natural conditions where the habitat type was degraded due to e.g. bottom excavation would help to improve the conservation status of this natural habitat type. It is also essential to introduce ecologically sound fishing methods which do not harm the habitat.

Common names

Denmark: Rev, Estonia: -, Finland: Riutat, Germany: Riffe, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Rev

References

- European Commission. 2007. Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. Appendix 1: Marine Habitat types definitions.
http://ec.europa.eu/environment/nature/natura2000/marine/docs/appendix_1_habitat.pdf
- HELCOM (1998). Red List of marine and coastal biotopes and biotopes complexes of the Baltic Sea, Belt Sea and Kattegat. Baltic Sea Environmental Proceedings No. 75. Helsinki Commission, Helsinki. 115pp. Available at: <http://www.helcom.fi/stc/files/Publications/Proceedings/bsep75.pdf>
- Naturvårdsverket (2011) Vägledning för svenska naturtyper i habitatdirektivets bilaga 1, Blottade sand- och lerbottnar. Available at: http://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/natura-2000/naturtyper/kust-och-hav/vl_1170_Rev.pdf. (Viewed July 19 2013)
- EUNIS Database. <http://eunis.eea.europa.eu/habitats.jsp> (Viewed July 19 2013)

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|--|----------------------|
| English name: Boreal Baltic narrow inlets | | Code in HELCOM HUB: 1650 | |
| Characteristic species: | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (roads and bridges D01, dredging J02.02.02, dumping J02.11) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (roads and bridges D01, dredging J02.02.02, dumping J02.11) | |
| Red List Criteria: C1 | Confidence of threat assessment: M | HELCOM Red List Category: | VU Vulnerable |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" (Endangered) E – Fjords F – Fjards, fjord-like bays | | BSEP 113 (2007): Regions where the biotope/habitat is under threat and/or in decline: The Bothnian Sea, Åland Sea, Archipelago Sea, Gulf of Finland, The Northern Baltic Proper, Western Gotland Basin, The Southern Baltic Proper. | |
| Higher concern stated by: | | | |

Habitat and Ecology

This natural habitat type represents a complex consisting of narrow, elongated bays surrounded mostly by rocky shores. They are often characterized by a more or less pronounced salinity and nutrient gradient caused by riverine water. The presence of a shallow (sill) at the mouth of a fjord limits the exchange of water and causes large fluctuations in salinity.

Flora and fauna in shallow areas are characterized by dense stands of common reed, pondweed and a large variety and abundance of birds and fish. The benthic fauna consists mainly of soft-sediment invertebrates, such as polychaetes, crustaceans, bivalves and insect larvae. Fjords are of Baltic-wide importance.



Myriophyllum spp. and pondweeds are typical underwater vegetation in narrow Baltic inlets (Photo: Mats Westerbomb, FINMARINET)

BIOTOPE INFORMATION SHEET

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Long and narrow bays in the Boreal Baltic sea area, which are partly separated from the open sea by a submerged sill. These inlets consist usually of soft mud. The salinity varies depending on the freshwater contribution or the salinity value of the Baltic Sea. The low tidal range and low salinity of the Baltic Sea creates an ecology that is different from that of the North Atlantic coasts.

Plants: *Ceratophyllum demersum*, *Hippuris vulgaris*, *Myriophyllum spicatum*, *Phragmites australis*, *Potamogeton perfoliatus*, *Sagittaria sagittifolia*, *Schoenoplectus lacustris*, *Schoenoplectus tabernaemontani* Algae: *Cladophora aegagropila*, *Nitellopsis obtusa*
Animals: Birds- *Anas crecca*, *Anas platyrhynchos*, *Circus aeruginosus*, *Cygnus olor*, *Podiceps cristatus*; Insects- *Chironomus plumosus* coll.; Crustaceans- *Monoporeia affinis*; Molluscs- *Macoma baltica*; Polychaeta- *Maldane sarsi* Sponges: *Axinella rugosa*, *Phakellia* spp., *Mycale lingua*, *Polymastica* spp., *Vosmeria* spp.

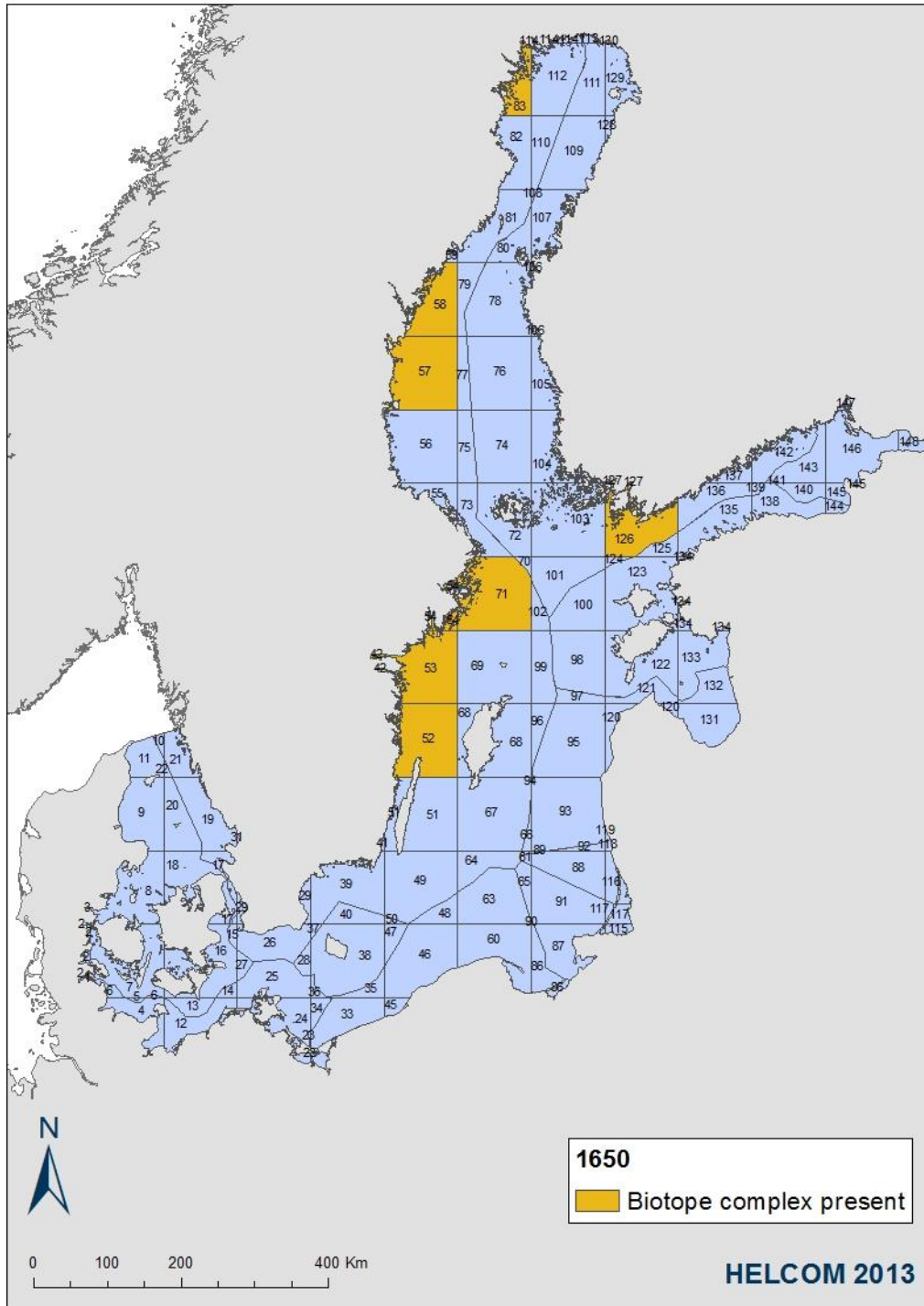


Boreal Baltic narrow inlet in the Åland archipelago (Photo: Tore Lindholm)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Fjords are present in Swedish and Finnish coastal areas of the Bothnian Sea, the Gulf of Finland and the Baltic Proper. The present and past distribution is in areas of crystalline bedrock. The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur (Naturvårdverket 2011)



BIOTOPE INFORMATION SHEET

Description of Major threats

Nutrient run-off from the catchment area causing eutrophication of the biotope complex is the most severe threat of the biotope complex. The nutrient run-off mainly stems from agriculture and forestry. The biotope is further considered to be threatened by physical modification due to construction of roads and bridges (European Commission 2007). Dredging of the entrance may pose a threat to the integrity of the biotope complex in some locations.

Assessment justification

C1

The number of localities where the complex occurs is relatively low. A severe quality decline is assumed to have taken place in more than half of these biotope complexes during the past 50 years. Since only a few number of locations in the Baltic Sea area provide geological structures necessary for the biotope complex to form, regeneration after a collapse is considered to be difficult. Sampling has not been carried out in all boreal narrow inlets. It is assumed that sampling inside the inlets instead of the outside sea-area, would indicate a higher percentage of the biotope complexes having experienced severe to moderately severe quality decline.

Increasing nutrient loads in the catchment areas of the inlets have led to a degradation of water clarity due to eutrophication. In some locations eutrophication is also known to have created semi-permanent anoxic conditions in the deeper parts of the narrow inlets where water turnover is slow.

The entrance of the inlet has been modified through construction activities in several locations, changing the community composition. Construction activities along the shorelines has further caused the quality of the biotope complexes to decline.

Recommendations for actions to conserve the biotope

In a long-term perspective anoxia and other impacts of eutrophication can be alleviated by reduced input of nutrients to the sea. For the boreal Baltic narrow inlets the measures to reduce eutrophication are needed mainly within the drainage basin of the inlet. Local and regional reductions will have a more pronounced effect since the water exchange with the larger Baltic Sea basins is reduced.

Protection and possibly even recovery of this habitat type can be achieved by restricting coastal constructions, dredging and dumping of dredged material. Reconstruction of the complex could possibly be achieved by restoring thresholds that have been dredged.

Common names

Denmark: Boreale smalle havarme i Østersøen, Estonia: -, Finland: Itämeren boreaaliset kapeat murtovesilahdet, Germany: Kleine, enge Buchten des borealen Baltikums, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Smala vikar i boreal Östersjökust

References

- European Commission (2007). Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. (EU interpretation manual)
Available at:
http://ec.europa.eu/environment/nature/natura2000/marine/docs/marine_guidelines.pdf (viewed 4 June 2013)
- Naturvårdsverket (2011) Vägledning för svenska naturtyper i habitatdirektivets bilaga 1, Blottade sand- och lerbottnar. Available at: http://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/natura-2000/naturtyper/kust-och-hav/vl_1650_Smalaostersjovikar.pdf . (Viewed July 19 2013)

BIOTOPE INFORMATION SHEET

| | | | |
|--|---|--|-------------------------------|
| English name: Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation | | Code in HELCOM HUB: 1610 | |
| Characteristic species: | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (dredging J02.02.02), Tourism (G01), Mining and quarrying (both terrestrial and underwater extraction of sand; C01.01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (dredging J02.02.02), Tourism (G01), Mining and quarrying (both terrestrial and underwater extraction of sand; C01.01) | |
| Red List Criteria: C1 | Confidence of threat assessment: M | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" (Endangered) M – Esker islands | | BSEP 113 (2007): Regions where the biotope/habitat is under threat and/or in decline: The Bothnian Sea, Åland Sea, Archipelago Sea, Gulf of Finland, The Southern Baltic Proper. | |
| Higher concern stated by: | | | |

Habitat and Ecology

The esker islands with related terrestrial and marine vegetation are biotope complexes that have been created by the forces of the melting inland ice sheet at the end of the last ice age some 10 000 years ago. The complex is often a very distinct landscape feature. The substrate consists of well sorted sand, gravel, pebbles and rocks. The vegetation community has adapted to the unstable substrate and perennial vegetation communities are often not established directly at the waters edge due to wave action.

Esker islands are often elongated ridges (stretched), consisting mainly of relatively well sorted sand, gravel, stones, boulders, or of till. The sorted material of the esker islands may sometimes form a 'tail/tails' behind a 'head/heads' of bedrock.

The saline environment has an effect on the vegetation on land, favouring halophytic species, e.g. at high water levels or by seawater spray. Drift-walls may occur. Also, the on-going land upheaval cause a succession of different vegetation types that, especially on larger islands, form a complex of biotopes/habitats covering the terrestrial part of the island as well as its underwater areas (base up until the shoreline). Several rare vegetation types e.g. heaths, sand and gravel shores with threatened and or declining species occur.

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

Glaciofluvial islands consisting mainly of relatively well sorted sand, gravel or less commonly of till. May also have scattered stones and boulders. The vegetation of esker islands is influenced by the brackish water environment and often by the ongoing land upheaval, which causes a succession of different vegetation types. Several rare vegetation types (heaths, sands and gravel shores) and threatened species occur.

Plants: *Artemisia campestris*, *Cakile maritima*, *Calluna vulgaris*, *Empetrum nigrum*, *Honkenya peploides*, *Juniperus communis*, *Lathyrus japonicus subsp. maritimus*, *Leymus arenarius*, *Pinus sylvestris*, *Potamogeton filiformis*, *Potamogeton pectinatus*, *Potamogeton perfoliatus*,

BIOTOPE INFORMATION SHEET

Myriophyllum sibiricum, *Salsola kali* Algae: *Ceramium tenuicorne*, *Chorda filum*, *Chara aspera*, *Cladophora glomerata*, *Fucus vesiculosus*, *Pilayella littoralis*

Animals: Insects- *Athetis lepigone*, *Simyra albovenosa*, *Actebia praecox* Molluscs- *Cerastoderma glaucum*, *Mya arenaria*

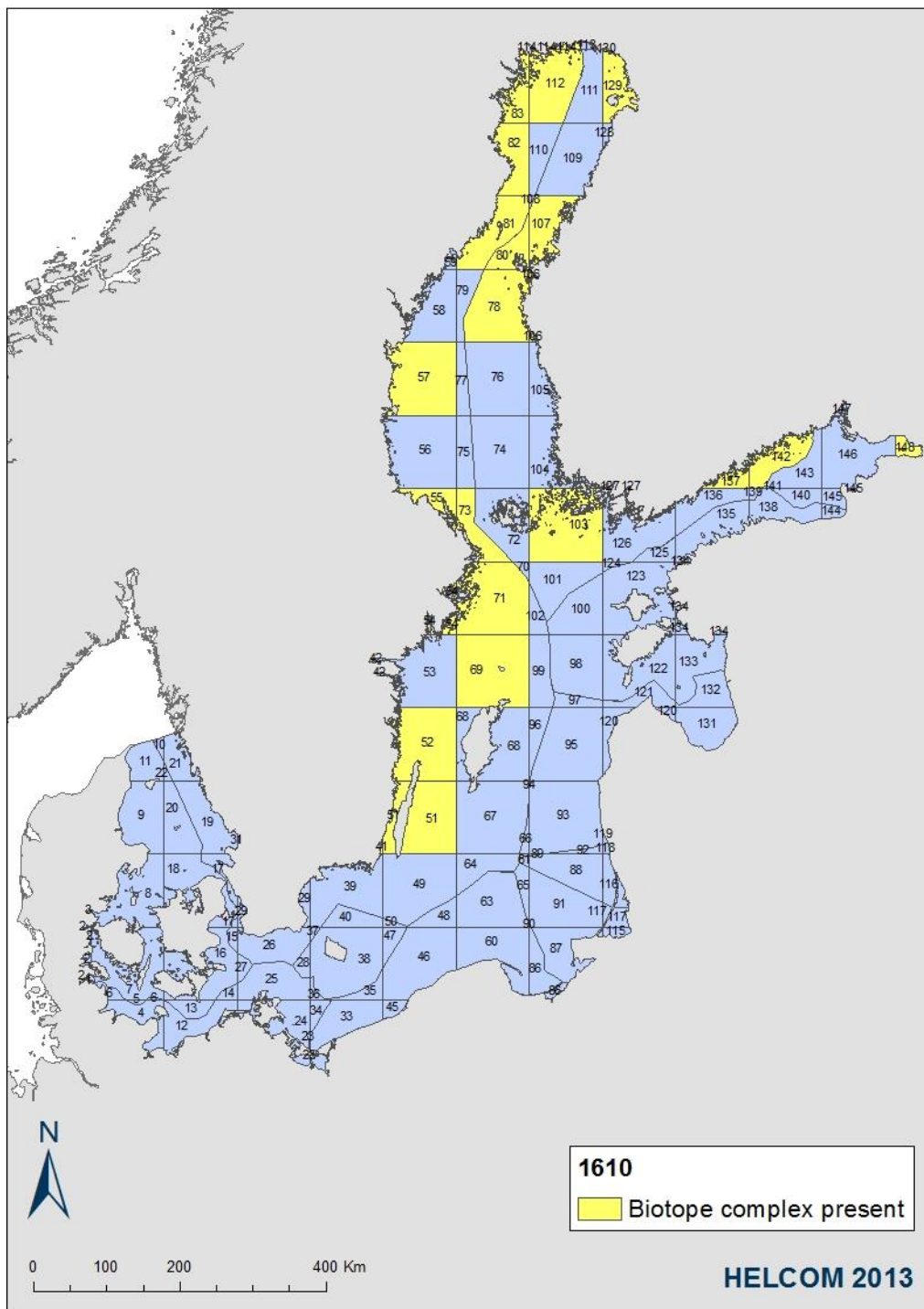


Underwater pebble bottom at an esker island (Photo: Metsähallitus)

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

Esker islands occur mainly in the northern parts of the Baltic Sea but are most abundant on archipelago coasts. Typical esker islands in Finland and Sweden are Hailuoto and Gotska Sandön. The islands may include dune areas, sandy plains, sandy banks or pine forests also common in other areas with sand or gravel. The distribution map indicates the area in the 100 x 100 km grid where biotope is known or inferred to occur (Naturvårdverket 2011, HELCOM 1998). The geologically defined occurrences are considered to be permanent.



BIOTOPE INFORMATION SHEET

Description of Major threats

Eutrophication is a major threat of the biotope complex. Increased siltation and decreased water clarity have adverse effects on the associated underwater floral communities. Various construction activities have also destroyed and changed natural habitats of esker islands and part of the islands are inhabited and utilized year-round. Recreational activities on the islands affect some of the terrestrial features and construction of leisure houses and other constructions can pose a threat both to the terrestrial and underwater features. Dredging of shallow shores threatens the integrity of the underwater features, and extraction of sand and gravel has also affected both the terrestrial and underwater parts of esker islands.

Assessment justification

C1

Over 70 % of the biotope complex is believed to have experienced moderately severe quality decline during the past 50 years. Dispersed habitation and seasonally intensive recreational use of the esker islands are the major cause of the quality decline. Especially beaches that consist of sand or gravel have been negatively impacted by human activities. Frequent recreational activities may cause abrasion/wear as well as visual, acoustic or physical disturbance to wildlife.

The underwater areas surrounding esker islands were previously also threatened by sand uptake but present legislation and improved understanding of the esker islands values prevent this from taking place. However, dredging of shallow shores of esker islands is still a threat in some areas.

Eutrophication of the sea area increases the amount of dead plant material washed ashore, which in turn increases the nutrient level of the shores which gradually changes the shore plant species diversity. In the southern parts of the boreal zone, eelgrass meadows (*Zostera marina*) are a characteristic feature of the sandy areas of the esker islands. Eelgrass meadows are known to have disappeared completely from some locations due to eutrophication. Due to eutrophication the light availability decreases and mats of filamentous algae covering the eelgrass also affects the eelgrass meadows negatively.

Recommendations for actions to conserve the biotope

As for many other biotopes/biotope complexes would a Baltic wide biotope inventory and a threat assessment make it possible to assess the status of esker islands. A decrease of the eutrophication also would result in a favourable development of esker islands.

Common names

Denmark: Marine åse der danner øer med sand-, klippe- eller stenstrandsvegetation og sublittoral vegetation i Østersøen, Estonia: -, Finland: Itämeren harjusaaret ja niiden hiekka-, kallio- ja kivikkorantojen sekä vedenalainen kasvillisuus, Germany: Esker (Moränen)-Inseln des Baltikums mit Sand-, Fels- oder Kiesstrand-Vegetation und sublittoraler Vegetation, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Rullstensåsöar i Östersjön med littoral och sublittoral vegetation

References

European Commission (2007b). Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. (EU interpretation manual) Available at: http://ec.europa.eu/environment/nature/natura2000/marine/docs/marine_guidelines.pdf (viewed

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4 June 2013)

HELCOM website:

http://www.helcom.fi/environment2/biodiv/endangered/Biotopes/en_GB/Esker_islands/ (viewed 26 June 2013)

Naturvårdsverket (2011) Vägledning för svenska naturtyper i habitatdirektivets bilaga 1, Blottade sand- och lerbottnar. Available at: http://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/natura-2000/naturtyper/kust-och-hav/vl_1610_Brackasoar.pdf . (Viewed July 19 2013)

BIOTOPE INFORMATION SHEET

| | | | |
|---|---|---|-------------------------------|
| English name: Boreal Baltic islets and small islands | | Code in HUB: 1620 | |
| Characteristic species: | | | |
| Past and Current Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (dredging J02.02.02), Tourism (G01) | | Future Threats (Habitat directive article 17): Eutrophication (H01.05), Construction (wind energy production C03.03, dredging J02.02.02), Tourism (G01), Oil spills (oil spills in the sea H03.01) | |
| Red List Criteria: C1 | Confidence of threat assessment: M | HELCOM Red List Category: | NT Near Threatened |
| Previous HELCOM Red List threat assessments | | | |
| BSEP 75 (1998): "3" (Endangered) L – Solitary islands | | BSEP 113 (2007): | |
| Higher concern stated by: | | | |

Habitat and Ecology

The biotope complex is made up of groups of small skerries and islets that generally consist of bedrock or moraine. The biotope complex forms in shallow outer archipelago areas. The terrestrial vegetation is adapted to windy conditions and lack of soil cover, trees generally do not grow and any trees are low growing. The underwater macrophyte vegetation is characterized by attached macroalgae that generally form distinct belts, the green algae grow closest to the surface followed by a belt of brown algae and the deepest belt consists of red algae. Islets and skerries are very important nesting sites for birds and resting sites for seals.



Algal belts are a typical feature of the underwater environment on boreal Baltic islets and small islands (Photo: Julia Nyström, FINMARINET)

BIOTOPE INFORMATION SHEET

Definition of the habitat according to the 'Interpretation manual of European Union Habitats' EUR27:

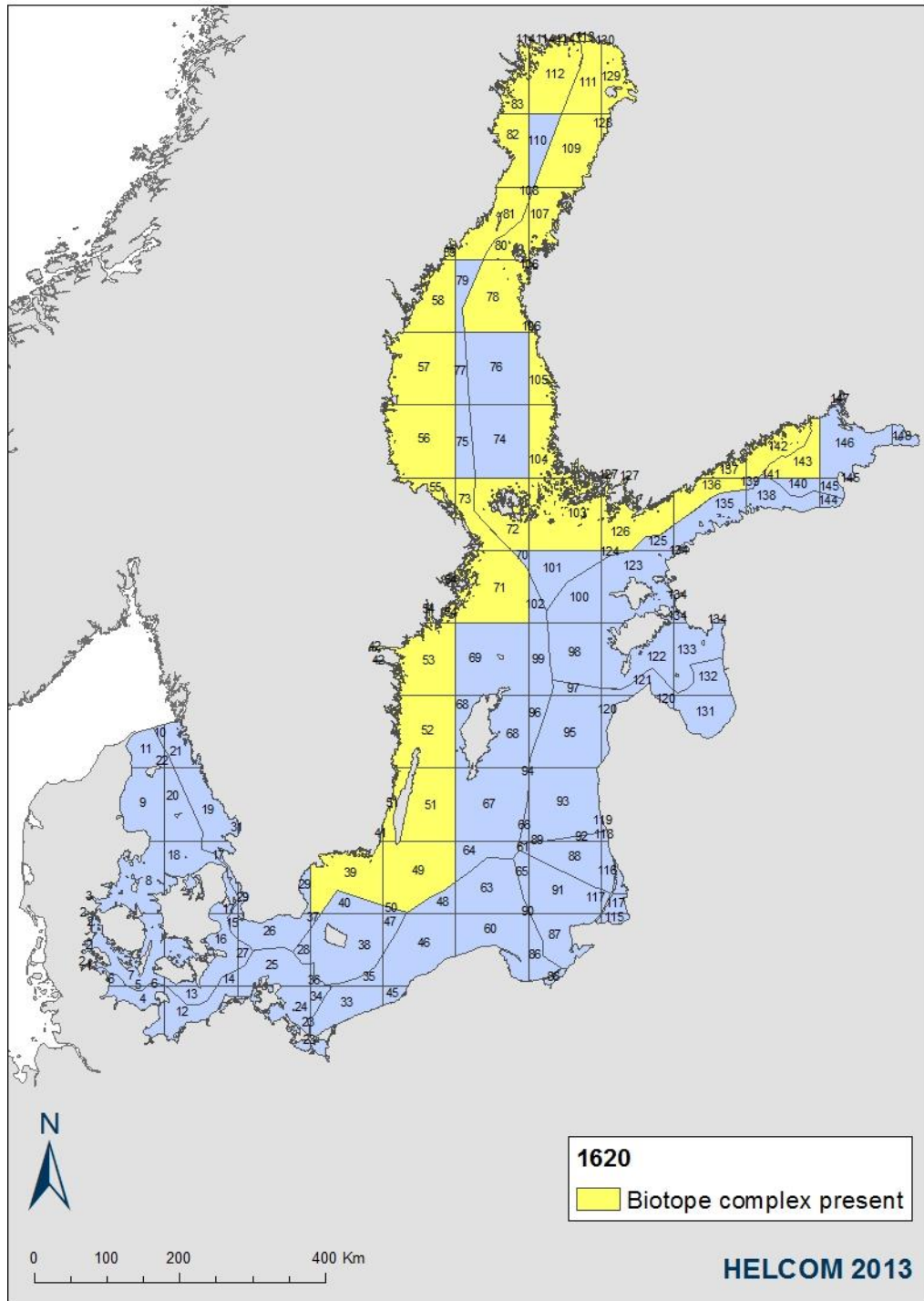
Groups of skerries, islets or single small islands, mainly in the outer archipelago or offshore areas. Composed of Precambrian, metamorphic bedrock, till or sediment. The vegetation of boreal Baltic islets and small islands is influenced by the brackish water environment, the ongoing land upheaval (in areas with intense land upheaval) and the climatic conditions. The vegetation types are influenced by wind, dry weather, salt and many hours of sunlight. Land-upheaval causes a succession of different vegetation types. Bare bedrock is common. A lot of small islands have no trees. The vegetation is usually very sparse and consists often of mosaic-like pioneer vegetation communities. On some islands the species diversity is increased by nitrogenous excrement from birds. Many of the plants are xerophytic and lichens are common. Temporary or permanent rockpools are common and these are inhabited by a variety of aquatic plant and animal species. Boreal Baltic islets and small islands are important nesting sites for birds and resting sites for seals. The surrounding sublittoral vegetation is also included in the type 1620.

Plants: *Agrostis stolonifera*, *Allium schoenoprasum*, *Angelica archangelica* spp. *litoralis*, *Cochlearia danica*, *Juniperus communis*, *Lemna minor*, *Puccinellia distans* ssp. *borealis*, *Sedum acre*, *Sedum telephium*, *Silene viscosa*, *Viola tricolor*. Algae: *Ceramium tenuicorne*, *Chorda filum*, *Cladophora glomerata*, *Cladophora rupestris*, *Fucus vesiculosus*, *Furcellaria lumbricalis*, *Pilayella littoralis*. Animals: Mammals- *Halichoerus grypus*, *Phoca hispida* Birds- *Alca torda*, *Arenaria interpres*, *Cepphus grylle*, *Larus fuscus*, *Stercorarius parasiticus*, *Sterna caspia*, *Uria aalge* Crustaceans- *Amphibalanus improvisus*, *Idotea* sp Molluscs- *Mytilus edulis*

BIOTOPE INFORMATION SHEET

Distribution and status in the Baltic Sea region

The distribution map indicates the area in the 100 x 100 km grid where biotope is known to occur (Naturvårdverket 2011)



BIOTOPE INFORMATION SHEET

Description of Major threats

The integrity of the zonal underwater vegetation is threatened by eutrophication. Eutrophication reduces water clarity, reducing maximum depth the algal belts can occupy and thereby reducing the available area. Eutrophication may also cause excessive growth of annual filamentous algae that can influence the community composition. Increased siltation may further affect the macroalgal community. Eutrophication may further cause oxygen depletion, especially along the seafloor between the islets and skerries where the filamentous algae that break off from the substrate become aggregated. Microbial decomposition of the organic material may cause oxygen depletion.

Future plans for constructing windmill parks in the shallow outer archipelago areas might pose a severe future threat to the biotope complex. Construction and tourism may have severe negative effects on the biotope complex. The terrestrial community is also especially sensitive to human activities, e.g. disturbance to nesting birds caused by tourism.

Oil- or other chemical spills are a threat to the biotope complex. Oil- or other chemical spills that occur on the open sea is likely to first affect the shoreline of the islets and skerries as the spill is being moved by the currents. In case of a large scale oil spill on open water in the northern Baltic Sea, the boreal skerries and islets may suffer severe loss of biodiversity.

Assessment justification

C1

The biotope complex is abundant and common, but has experienced moderately severe quality decline to a large extent of the original distribution in the past 50 years. The majority of the boreal Baltic islets and skerries that occur especially in the Archipelago sea and south of this area have been adversely affected by eutrophication. The algal zonation has become less distinct and the maximum depth of the algalbelts has decreased. In the boreal region, the islets and small islands have been affected by similar threats as the reef biotope complex (1170). Several species, especially birds, which are characteristic for the terrestrial part of the biotope complex are red-listed, and have been negatively affected, for example, by human disturbance, hunting, and contaminant pollution.

Recommendations for actions to conserve the biotope

All measures that reduce eutrophication in the whole Baltic Sea will benefit this wide spread biotope complex.

Common names

Denmark: Boreale holme og småøer i Østersøen, Estonia: -, Finland: Itämeren boreaaliset luodot ja saaret, Germany: Kleine und Kleinstinseln des borealen Baltikums, Latvia: -, Lithuania: -, Poland: -, Russia: -, Sweden: Boreala skär och småöar i Östersjön

References

Naturvårdsverket (2011) Vägledning för svenska naturtyper i habitatdirektivets bilaga 1, Blottade sand- och lerbottnar. Available at: http://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/natura-2000/naturtyper/kust-och-hav/vl_1620_Skariostersjon.pdf. (Viewed July 19 2013)