BIOTOPE INFORMATION SHEET

English name: **Baltic photic muddy sediment, coarse sediment, sand or mixed substrate dominated by common eelgrass (*Zostera marina*)**		Code in HELCOM HUB: **AA.H1B7, AA.I1B7, AA.J1B7, AA.M1B7**	
Characteristic species: *Zostera marina*			
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): *Zostera marina* 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).

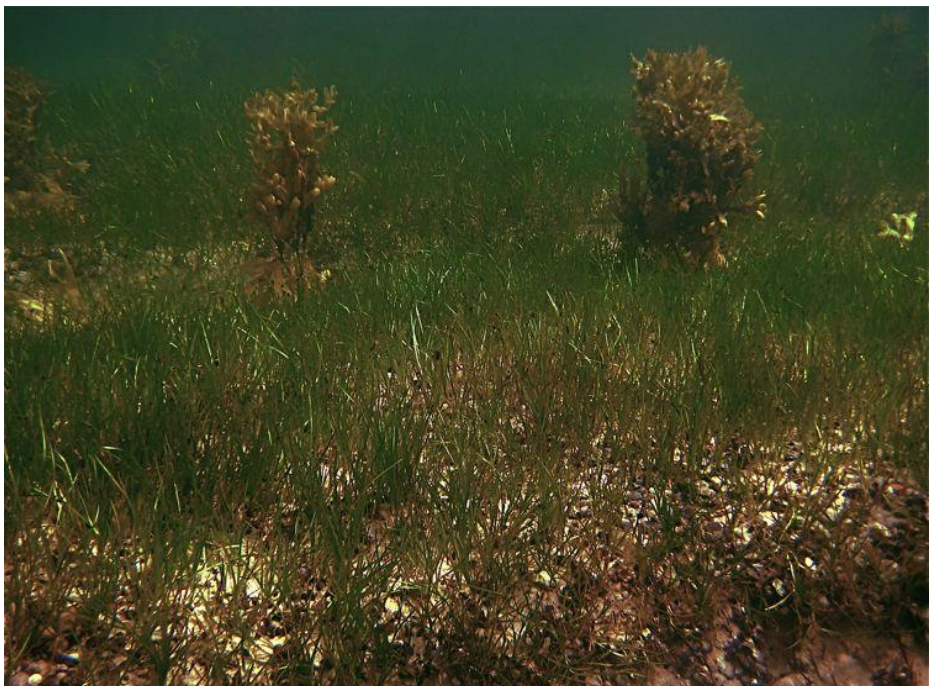
BIOTOPE INFORMATION SHEET

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)

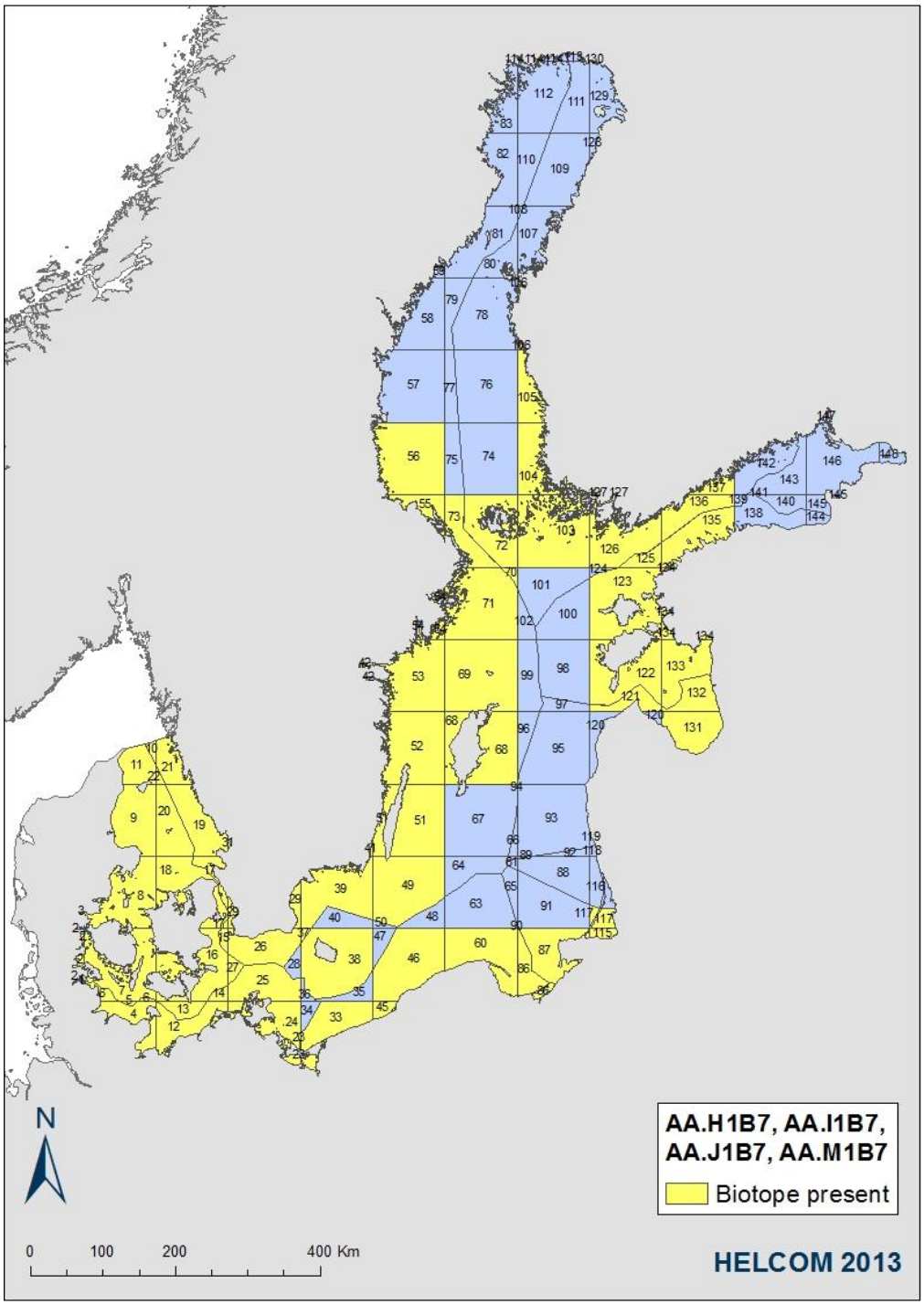
being transported and rooting in a new area. If a *Zostera marina* dominated biotope has disappeared in the region where salinity is around 5 psu, there is no guarantee for the biotope ever becoming re-established even after other environmental conditions have improved.

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 1930 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 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, Schiever 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,

References

Baden, S.P., Boström, C. (2001) The leaf canopy of seagrass beds: faunal community structure and function in a salinity gradient along the Swedish coast. In: Reise, K. (ed.), Ecological comparisons of sedimentary shores, Ecological Studies 151, Springer-Verlag, Berlin, pp. 213-236.

Baden, S.P., Loo, L.-O., Pihl, L., Rosenberg, L., (1990) Effects of eutrophication on benthic communities including fish: Swedish west coast. Ambio 19: 113-122.

Borum, J., Duarte, C.M., Krause-Jensen, D., Greve T.M. (eds) (2004) European seagrasses: an introduction to monitoring and management. The M&MS project. 95 pp. http://www.seagrasses.org/handbook/european_seagrasses_low.pdf

Boström, C. (2001) Ecology of Seagrass Meadows in the Baltic Sea. Environmental and Marine Biology, Department of Biology, Åbo Akademi University, Åbo, Finland. 47 pp.

Boström, C., Bonsdorff, E. (1997). Community structure and spatial variation of benthic invertebrates associated with Zostera marina (L) beds in the northern Baltic Sea. Journal Of Sea Research 37(1-2): 153–166.

Boström, C., Baden, S.P., Krause-Jensen, D. (2003) The seagrasses of Scandinavia and the Baltic Sea. In: Green, E. P. & Short, F.T. (eds). World Atlas of Seagrasses. University of California Press. pp. 27-37.

Boström, C., Bondsorff, E., Kangas, P. Norkko, A. (2002) Long-term changes of a brackish water eelgrass (Zostera marina L.) community indicate effects of coastal eutrophication. Est. Coast. Shlef Sci. 55: 795-804.

den Hartog, C. (1970) The seagrasses of the world. Verh K Ned Ak Wet Adf. North-Holland, Amsterdam 59: 1-275.

Hauxwell, J., Cebrian, J., Furlong, C., Valiela, I. (2000) Macroalgal canopies contribute to eelgrass (Zostera marina) decline in temperate estuarine ecosystems. Ecology 82: 1007-1022.

HELCOM (2013) Climate change in the Baltic Sea: HELCOM thematic assessment in 2013. Baltic Sea Environmental Proceedings XXX

Kruk-Dowgiallo, L. (1996) The role of filamentous brown algae in the degradation of the underwater meadows the Gulf of Gdansk. Oceanological Studies XXV (1-2): 125-135.

Lundberg,C. (2005) Eutrophication in the Baltic Sea – from area-specific biological effects to interdisciplinary consequences. Environmental and Marine Biology. Department of Biology. Åbo Akademi University, Åbo Finland 166 pp

McGlathery, K.J. (2001) Macroalgal blooms contribute to the decline of seagrass in nutrient-enriched coastal waters. J. Phycol. 37: 453-456.

Mäkinen, A., Tallberg, P., Anttila, S., Boström, C., Boström, M., Bäck, S., Ekebom, J., Flinkman, J., Henricson, C., Koistinen, M., Korpinen, P., Kotilainen, A., Laine, A., Lax, H.-G., Leskinen, E., Munsterhjelm, R., Norkko, A., Nyman, M., O'Brien, K., Oulasvirta, P., Ruuskanen, A., Vahteri, P. & Westerbom, M. (2008) Itämeren vedenalaiset luontotyypit. In: Raunio, A. Schulman, A. & Kontula, T. (eds). 2008. Suomen luontotyyppien uhanalaisuus − Osa II: Luontotyyppien kuvaukset. Finnish Environment Institute, Helsinki. Suomen ympäristö 8/2008. 572 p.

Möller, T. (2008) Zostera marina (LINNAEUS 1753), Eelgrass (Angiospermophyta). HELCOM Species Fact Sheet: http://www.helcom.fi/environment2/biodiv/endangered/Vascular_plants/en_GB/Zostera_marina/

OSPAR 2008. OSPAR List of Threatened and/or Declining Species and Habitats.

Pihl, L., Isaksson, I., Wennhage, H. Moksnes, P.-O. (1995) Recent increase of filamentous algae in shallow Swedish bays: effects on the community structure of epibenthic fauna and flora. Neth. J. Aquatic Ecol. 29: 349-358.

Schiewer, U. (2002) Recent changes in northern German lagoons with special reference to eutrophication. In: Schernewski, G. & U. Schiewer (eds.), Baltic coastal ecosystems, structure, function and coastal zone management. Central and Eastern European Development Studies, Springer Verlag, Berlin, pp. 19-30.