

BIOTOPE INFORMATION SHEET

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

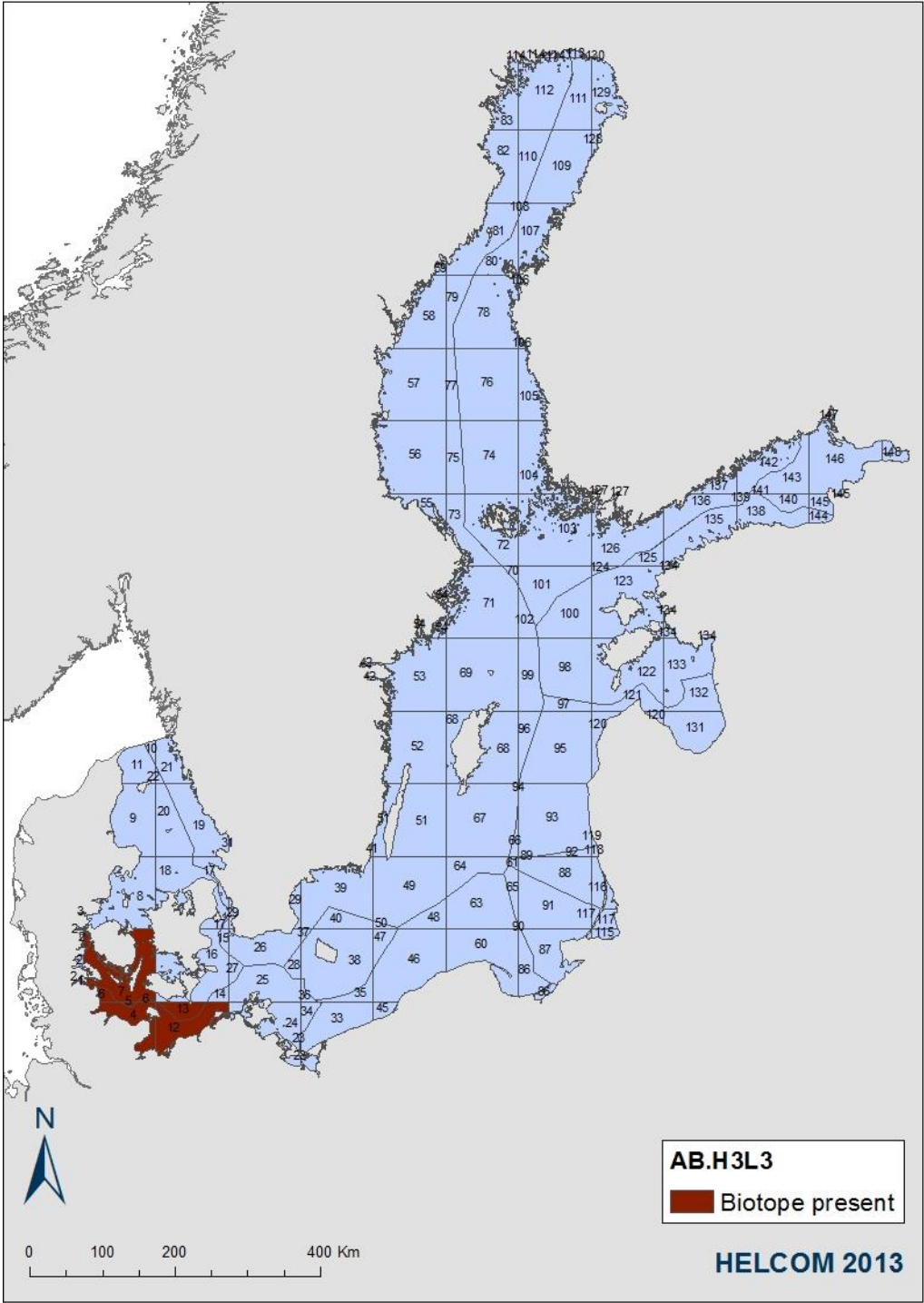
The deep muddy bottoms of the Baltic Sea cover large areas, but communities dominated by the ocean quahog (*Arctica islandica*) can only be found in the southwestern parts where the salinity is high. The salinity range of *Arctica islandica* and therefore of this biotope is > 15 psu (Gogina & Zettler, 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

- 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.
- Morton, B. (2011) The biology and functional morphology of *Arctica islandica* (Bivalvia: Arctiidae): A gerontophilic living fossil. *Marine Biology Research* 7: 540–553.
- 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.