

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)

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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.

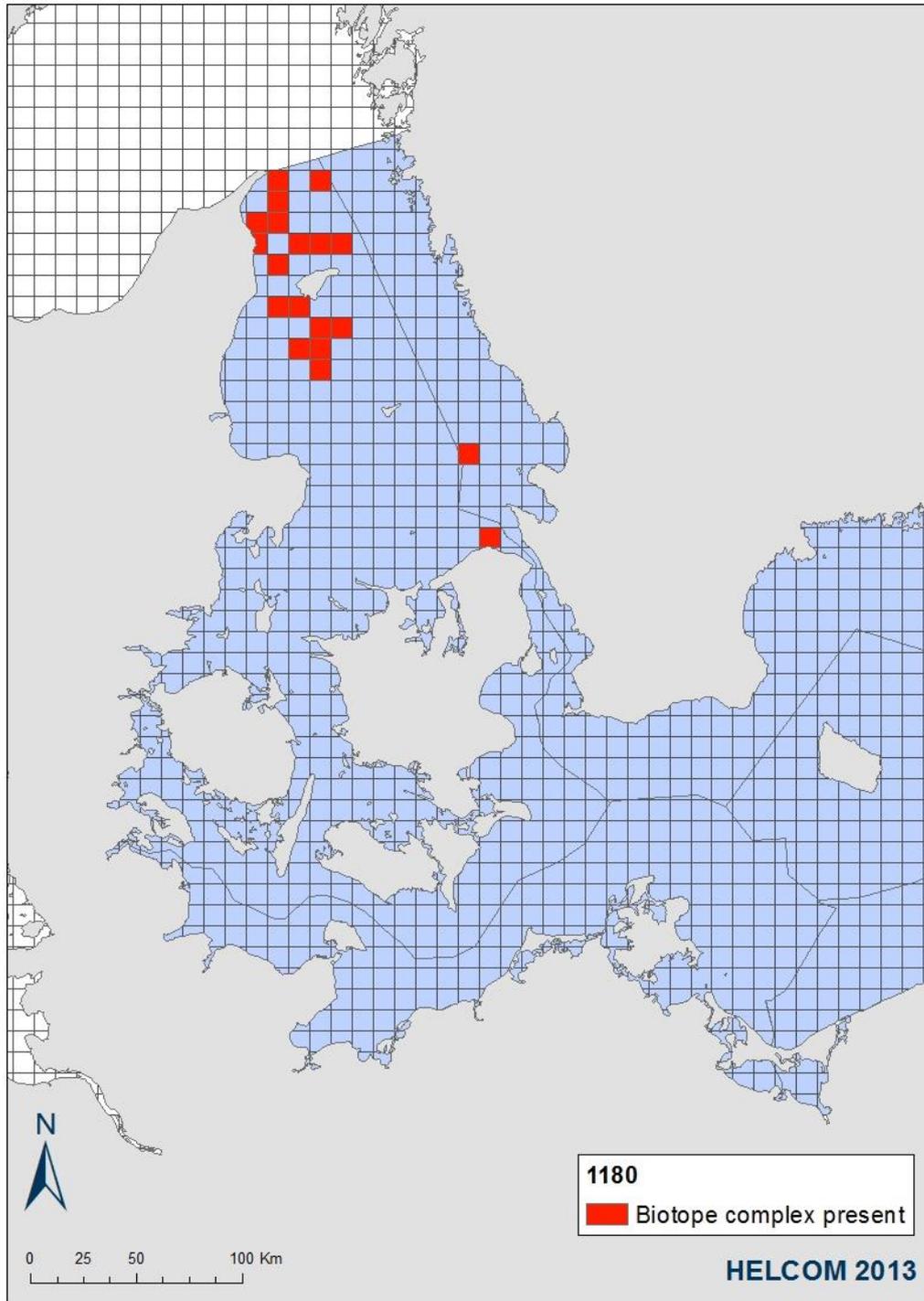
Plants: "Bubbling reefs" - If the structure is within the photic zone, marine macroalgae may be present such as Laminariales, other foliose and filamentous brown and red algae. "Pockmarks" - Usually none.

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.

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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.



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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,

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

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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>

Jensen, P., Aagaard, I., Burke Jr, R.A., Dando, P.R., Jørgensen, N.O., Kuijpers, A., Laier, T., O'Hara, S.C.M., Schmaljohann, R. (1992) 'Bubbling reefs' in the Kattegat: submarine landscapes of carbonate-cemented rocks support a diverse ecosystem at methane seeps. *Mar. Ecol. Prog. Ser.* 83:103-112

Seffel, A. (2010) Habitat 1180 Submarine structures made by leaking gases. Ekologigruppen Ab.

Available at: http://www.ekologigruppen.se/Filer%20uppladdning/submarine_structures.pdf

(Viewed July 19 2013)

EUNIS Database. <http://eunis.eea.europa.eu/habitats.jsp> (Viewed 19.7.2013).