



Oceana proposal for a Marine Protected Area Bothnian Bay Deep

INTRODUCTION

The Bothnian Bay is located in the northernmost part of the Baltic Sea, with an average depth of 40 meters and its deepest point reaching further than 100 meters¹. An archipelago, consisting mainly of sand and gravel islands lies in the north, while the south of the bay boasts a rocky coast and bedrocks. Relatively rapid land upheaval, of approximately 9 mm a year, occurs particularly on the Finnish side of the bay. The Bothnian Bay is frozen on average 170 to 190 days a year and large freshwater rivers run into it, keeping salinity low, at around 3.5 psu².

The Bothnian Bay is in a relatively healthy status, as it is not suffering from eutrophication, and has good oxygen levels³ even in the deeper areas, unlike most of the Baltic Sea, where anoxic bottoms are common due to eutrophication.

Oceana studied the deeper parts of the Bothnian Sea in 2011 and 2012 using an ROV (*Remote Operating Vehicle*).

DESCRIPTION OF THE AREA

The low salinity, together with the long icy winters, limits the amount of marine species living there to only ten⁴. However, several freshwater species, such as the vendace (*Coregonus albuda*), inhabit the bay, which also serves as an important breeding, feeding and nursing ground for fish and birds⁵. The plankton, fish eggs, and larvae of organisms in the area live in the pelagic water. The photosynthesis by phytoplankton is taking place in the upper layer of the water column, above the halocline, which enrich the water with oxygen.

Due to the low salinity the benthic communities are generally species poor, and dominated by the isopod *Saduria entomon* and the small amphipod *Monoporeia affinis* (also known as *Pontoporeia affinis*)⁶. Both of these communities were documented by Oceana at depths around 115 meters (Table 1 and 2). Few other species were recorded, but among these were the shrimp (*Neomysis integer*), sea-snails (*Liparis liparis*), which are small benthic fish with no scales⁷, and fourhorn sculpin (*Triglopsis quadricornis*), which despite being a marine species can be found in some areas in the inner Baltic⁸ (see Table 2).

Monoporeia affinis lives on mud bottoms and follows a circadian cycle, where it burrows in during the day and swim around in the night⁹. It is a source of food for fish, including cod (*Gadus morhua*), and fourhorn sculpins. *Monoporeia affinis* is threatened and/or declining in the Gulfs of Finland and Riga, as well as in the Northern and Southern Baltic Proper¹⁰.

The *Saduria entomon* isopod is a relatively large crustacean, which reaches almost 9 cm in length, and lives on soft bottoms, at depths reaching 290 meters. This relict of the ice age is an omnivore, acting as a scavenger, a cannibal, and a predator, and preys on the aforementioned *Monoporeia affinis*. It is also eaten by cod and fourhorn sculpin. Its characteristics make it important to the entire benthic environment^{11,12}. The species is threatened and/or declining in the Southern Baltic Proper¹³.

Species of zooplankton found in the area include copepods and cladocerans, crustaceans that serve as an important food supply for herring (*Clupea harengus*) and sprat (*Sprattus sprattus*)¹⁴.

PROPOSAL

The Bothnian Bay Deep is an offshore site in the Swedish part of the Bothnian Bay. Oceana's proposal covers mainly the deeper parts of the southwestern part of the Bothnian Bay, with the deepest spot on 147 meter depth (see the map above). According to HELCOM, pelagic, offshore (deep) waters in the Baltic Sea include the water of the open sea deeper than 15-25 meters¹⁵, and are listed as threatened¹⁶.

The offshore waters are generally poorly protected and no marine protected areas exist in the central part of the Bothnian Bay either. To ensure that the full range of biodiversity is covered and to secure better connectivity between the sites, this area is proposed to be protected. Furthermore, the healthy oxygen conditions and the *Saduria entomon* and *Monoporeia affinis* communities make this an important feeding ground for fish, such as cod and fourhorn sculpin as mentioned above^{17,18,19}.

POSSIBLE THREATS AND MANAGEMENT PROPOSALS

Human activities in the offshore areas of the Gulf of Bothnia are limited, compared to the rest of the Baltic Sea. However, some, including hunting, hazardous substances, and fisheries, do impact the local environment. Bottom trawling targeting vendace and herring occurs in bay, but to a lesser extent than in the southern parts of the Baltic Sea. The population of vendace has decreased since the 1970s, mainly because of fisheries, only recently increasing²⁰. Hazardous substances are a major threat in the Bothnian Bay²¹. As the organisms in the Bothnian Bay grow slower because of the severe physical conditions, such as low temperatures, they accumulate higher amounts of pollutants in their bodies compared to those in more southern regions²².

A management plan for the site should address these threats. Trawling should be banned inside the proposed area. Curbing of hazardous substances will need action from the surrounding countries.

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SPECIES LIST FOR BOTHNIAN BAY DEEP

Table 1: List of species recorded at Bothnian Bay Deep in 2011. Possible threat category indicated in brackets.

Species
CRUSTACEA
<i>Monoporeia affinis</i> (Threatened and/or declining in the Gulfs of Finland and Riga, Northern and Southern Baltic Proper, HELCOM 2007).
<i>Neomysis integer</i>
<i>Saduria entomon</i>

Table 2: List of species at Bothnian Bay Deep in 2012 and their threat category.

Depth (m)	Species
115-117	CRUSTACEA
	<i>Neomysis integer</i>
	<i>Saduria entomon</i> (Threatened and/or declining in the Southern Baltic Proper, HELCOM 2007).
	FISH
	<i>Liparis liparis</i>
	<i>Triglopsis quadricornis</i>

Table 3: List of communities at Bothnian Bay Deep in 2011 and 2012 and their threat category.

Habitats and communities	Red list category
Pelagic, offshore (deep) waters	Listed as threatened by HELCOM (HELCOM 2007).
<i>Monoporeia</i> community	Threatened and/or declining in the Gulfs of Finland and Riga, Northern and Southern Baltic Proper (HELCOM 2007).
<i>Saduria</i> community	<i>Saduria entomon</i> is listed as threatened and/or declining in the Southern Baltic Proper (HELCOM 2007).