

Part	Contents	Supplementary materials	Time/minutes
<p>Introduction</p> <p>Oxygen showers for the Baltic Cod</p>	<p>Start with the video: At the Market</p> <p>Aim: Student becomes acquainted with cause of decreased baltic cod stocks.</p>	<p>The Baltic Sea cod is divided into two stocks, one smaller stock west of the island of Bornholm and one larger stock east of Bornholm. The cod has an important role in the Baltic Sea ecosystem. As a top predator, it maintains a healthy sea by balancing the food chain. The cod lives at depths between 10-200 metres, but in the Baltic Sea it usually stays quite deep as the level of salt is higher there. Its main pray consist of herring, sprat and capelin. Because of the cod's dependence on water saline levels, the size of the cod stock is partly regulated by natural environmental conditions. But human influence on the Baltic Sea also affects cod reproduction and survival. Eutrophication has contributed to increased oxygen consumption at larger depths, which decrease the potential for cod eggs to survive. Because of the number of cod has decreased in recent years, the Baltic Sea ecosystem has changed. As there are fewer cod around, the sprat stock has increased dramatically.</p>	6
<p>Basic Knowledge</p>	<p>Presentation 1 : Brackish water Aim: Student becomes acquainted with knowledge on formation of brackish water in Baltic Sea.</p> <p>Presentation 2: A stratified sea Aim: Student becomes acquainted with knowledge on stratification of the Baltic Sea.</p> <p>Presentation 3: Oxygen for the bottom water Aim: Student becomes acquainted with knowledge of the North Sea inflows and finds out what are the reasons for the lack of oxygen in the deep parts.</p>	<p>The Baltic Sea's salinity is much lower than that of ocean water (which averages 35‰), as a result of abundant freshwater runoff from the surrounding land, combined with the shallowness of the sea itself; indeed, runoff contributes roughly one-fortieth its total volume per year, as the volume of the basin is about 21,000 km³ and yearly runoff is about 500 km³. The open surface waters of the central basin have salinity of 6 to 8 ‰. Near the Danish straits the salinity is close to that of the Kattegat, but still not fully oceanic, because the saltiest water that passes the straits is still already mixed with considerable amounts of outflow water. The salinity steadily decreases towards North and East. Below 40 to 70 m, the salinity is between 10 and 15 ‰ in the open Baltic Sea, and more than this near Danish Straits. An important source of salty water are infrequent inflows of North Sea water into the Baltic.</p> <p>Because the salt water coming in from the sea is denser than freshwater, the water in the Baltic is stratified, with salt water at the bottom and freshwater at the top. Limited mixing occurs because of the lack of tides and storms, with the result that the fish fauna at the surface is freshwater in composition while that lower down is more marine. Cod are an example of a species only found in deep water in the Baltic, while pike are confined to the less saline surface waters..</p> <p>Below the halocline there is no water mixing. This is the reason for lack of oxygen. The supply of oxygen to the bottom layers is possible only with the irregular North Sea inflows. Unfortunately oxygen conditions are improved only temporarily, because due to marine animals respiration and decomposition of organic matter fresh oxygen level is depleted.</p>	3 3 3

Experiment	Bring some oxygen to the deep water Experiment consists of 3 parts. After each good answer you are presented with the next question. Questions are related to information from Part II - Basic Knowledge.	Answers: Question 1: Wind speed - INCREASE Question 2: Wind speed \geq 8Bft Wind direction - East Duration of wind (days) \geq 6 days Question 3: Wind speed \geq 8Bft Wind direction - West Duration of wind (days) \geq 4 days	6
Additional information	You will find three presentations here and additional movie from r/v Oceania: <ul style="list-style-type: none"> ✓ How scientist can trace down the halocline ✓ Real data ✓ History of Saltwater Intrusions ✓ On board of the Oceania <p>Aim: The student becomes acquainted with the work of oceanographers, getting to know the instruments which are used in the sea studies, additionally learns to interpret oceanographical data.</p>		25
Additional material available after logging in	In the panel Summarise what you have learned students can find: <ul style="list-style-type: none"> ✓ Crossword – examine Basic vocabulary on Water Exchange Processes ✓ Quiz - 10 questions on Water Exchange Processes <p>Panel Please let us know what you think.. Students are kindly asked to give us feedback on our module.</p>		18
			About: 64

Literature:

- ✓ <http://helcom.fi/baltic-sea-trends/environment-fact-sheets/hydrography/hydrography-and-oxygen-in-the-deep-basins>
- ✓ <http://www.savethesea.org/STS%20dead%20zones.htm>