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PERSPECTIVES FOR USING IRON-MANGANESE CONCRETIONS TO IMPROVE THE STATE OF THE BALTIC SEA ENVIRONMENT

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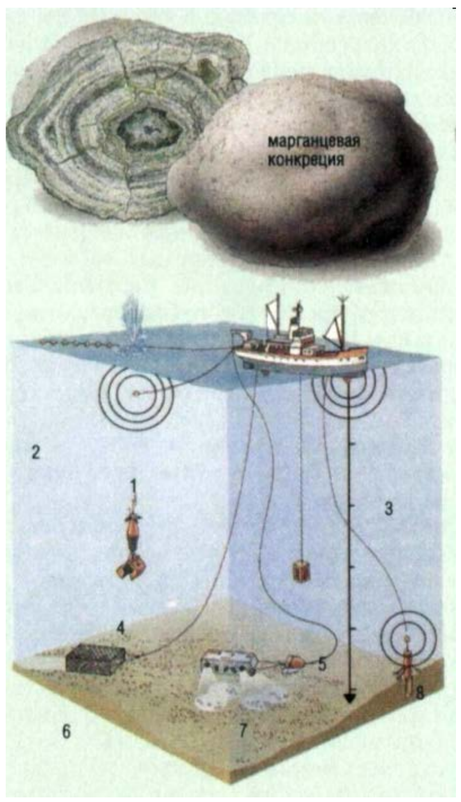
Introduction

The Baltic Sea iron-manganese concretions are studied as a deposit of phosphorus and some toxic metals as well as a new resource of manganese for low-cost production of stainless steel. Resources of iron-manganese concretions and methods of their mining have been discussed. It has been shown that mining of iron-manganese concretions can stimulate and speed-up their formation, restore ore deposits and help removing phosphorus and combating eutrophication of the Baltic Sea.

Research

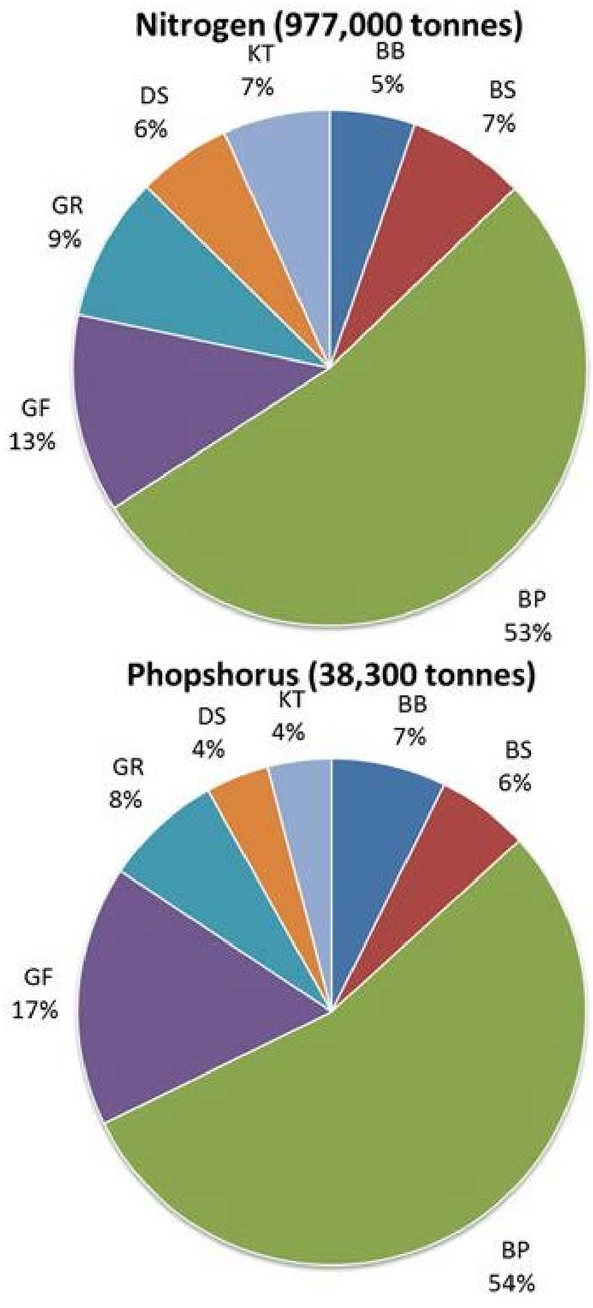
Iron-manganese concretions are products of the ongoing process of biogeochemical formation of ores. These concretions actively accumulate hazardous metals entering marine environment and contain 7-8% of P_2O_5, which is very important since phosphorus plays the key role in the eutrophication of the Baltic Sea. Removal of iron-manganese concretions will help to decrease phosphorus concentrations and thereby to control eutrophication processes.



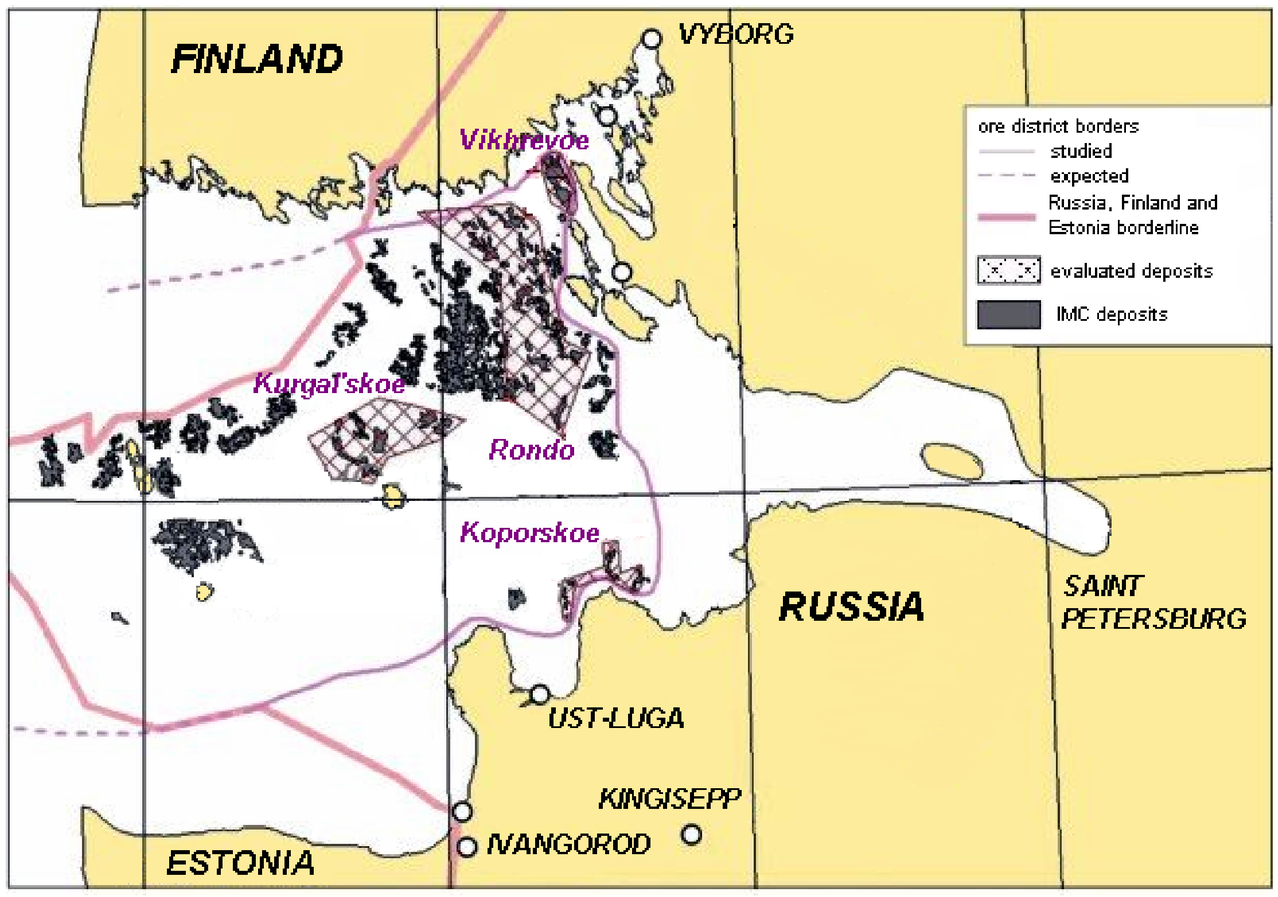
Results

A special technology for the removal of iron-manganese concretions has been developed and tested at the experimental site Vikhrevoye. After two years of the removal, new concretions were found at the same site which proves that modern ore formation processes can be stimulated by removing iron-manganese concretions from the Baltic Sea sediments. Environmental impact assessment is going on; first results prove that since ore formation sites are located quite far from main fish breading grounds, there should not be significant negative impacts on the Baltic Sea fish populations.

It is possible to assume that of iron-manganese concretions can be considered as both a renewable source of manganese and a useful instrument for the improvement of the Baltic Sea environment.



Total water- and airborne inputs of phosphorus to the Baltic Sea by sub-basin in 2010
BB: Bothnian Bay, BS: Bothnian Sea, BP: Baltic Proper, GF: Gulf of Finland, GR: Gulf of Riga, DS: Danish Straits, KT: Kattegat



Conclusion

The Gulf of Finland shelf iron-manganese concretions have been extensively studied since the 1980s. Researchers of key Russian institutions (such as A. Karpinsky Geological Institute, Saint-Petersburg Research institute for Environmental Safety, I. Gramberg Institute for Ocean Geology) believe that mining of shelf iron-manganese concretions can stimulate and speed-up their formation, restore ore deposits and help removing phosphorus and combating eutrophication of the Baltic Sea.

Since iron-manganese concretions are rather fragile and influenced by oxidation and reduction conditions and pH, their degradation processes act as risk factors for the Baltic Sea environment. Degradation can lead to the removal of phosphorus and toxic metals from the concretions and thereby to the deterioration of the environmental situation in the Baltic Sea.

Mining of shelf iron-manganese concretions is a ‘win-win’ solution: while helping to make the Baltic Sea an environmentally safe place, it can also serve as an additional source of manganese needed to support Russian iron and steel metallurgy.