



## Exploring the chemical composition of water in the Kandalaksha Bay

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Oil films were noted at the head of the Kandalaksha Bay as far back as in 1971, as soon as the first stage of the oil tank farm had been commissioned (the autumn of 1970). In 1997-1998 there were accidental oil spills posing a real threat to the Kandalaksha Reserve biota. In May 2011, oil spills from the Belomorsk oil tank farm resulted in a local environmental emergency.

In this work we have traced the evolution of polluted water by means of hydrogeochemical monitoring and reconstructing the chemical composition of surface and near-bottom water of the Kandalaksha Bay by using physical-chemical modeling (Selector software package, Chudnenko, 2010).

The surface and near-bottom water was sampled in the summer of 2012 and 2013 at the following sites: under the numbers 3 (N 67.2.673, E 32.23.753); 4 (N 67.3.349, E 32.28.152); 1 (N 67.5.907, E 32.29.779), and 2 (N 67.6.429, E 32.30.539). The monitored objects and sampling time were sensitive to both the effects of the White Sea water (high tide), fresh water, and water affected by human impact (the oil tank farm). At each site, three samples were taken.

The next stage involved reconstructing of the sea water ion composition by modeling within the Al-B-Br-Ar-He-Ne-C-Ca-Cl-F-K-Mg-Mn-N-Na-P-S-Si-Sr-Cu-Zn-H-O-e system, where e is an electron.

Modeling of the chemical composition of near-bottom water (site 3) has revealed high contents of carbon dioxide, hydrogen disulphide, hydrocarbonates, and no oxygen ( $E_h < 0$ ). All this suggests a transformation of hydrocarbons that might have got to the sampling area in May 2011, or as the result of constant leakage of petroleum hydrocarbons from the oil tank farm. Sampling at site 4 in 2013 has revealed petroleum hydrocarbons both in surface (0.09 mg/l) and near-bottom (0.1 mg/l) water. Both monitoring and modeling have demonstrated that hydrobionts on areas adjoining the oil tank farm are far from prospering. Monitoring should be accompanied by express analysis of oxidizing conditions in both the soil and near-bottom water.

Since the water contamination in the White Sea has lasted for decades, it is necessary to examine the near-bottom water, in particular in its deeper areas, to reveal the possible accumulation and destruction of organic substances at the sea floor. It is evident that an unbiased assessment of the environmental situation can be obtained by involving all kinds of information processing technologies.