Interconnections between the Danube River discharge, nutrients level and phytoplankton characteristics in the north-western part of the Black Sea (Zmiinyi Island area)

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Abstract

The results of statistical analysis of the data for 2004-2014 on the coastal waters of the Zmiinyi Island located in the north-western Black Sea 40 km far from the Danube Delta have been presented and analysed. It has been shown that the state of phytoplankton community is mostly influenced by salinity, transparency and nitrate content, whose levels are formed under the influence of the Danube discharge.
Keywords: PERSEUS, Salinity, Transparency

1. Introduction

Results of our latest studies of the coastal waters ecosystem adjacent to the Zmiinyi Island in the Black Sea (Medinets, 2014, Kovalova and Medinets, 2014, Kovalova et al., 2014) have shown that the main factor influencing the North-Western Black Sea (NWBS) water quality is eutrophication caused by nutrients input through river inflow and atmospheric transport. The objective of our work is to study interconnections between the Danube River waters discharge, nutrients level and phytoplankton characteristics in the north-western part of the Black Sea on the example of the Zmiinyi Island coastal waters.

2. Materials and methods

We analysed the data from the Zmiinyi Island Station (2004-2014) on hydrological and hydrochemical characteristics of marine environment and phytoplankton species composition, abundance and biomass, which have been measured every decade yearly from May till December. Monthly Danube River discharge data were provided by the Danube Hydrometeorological Observatory. The methods used are described in (Smyntyna et al., 2008, Medinets, 2014)

3. Results

Detailed analysis of results of our salinity studies in the Zmiinyi Island coastal waters has shown that all the data from the measured series within the limits 10.0-19.2 ‰ can be divided into three groups connected with three types of water masses: Type 1 (10.0-14.0 ‰) – water masses formed under the influence of the Danube discharge, Type 2 (14.1-17 ‰) – typical well mixed water masses from the NWBS and Type 3 (>17 ‰) – masses from open waters of the Black Sea. It was shown that the mean values of the studied characteristics in the Zmiinyi Island coastal waters, which we calculated for the above mentioned three types of water masses, had significant differences. At that, big differences were registered for characteristics of phytoplankton and nutrients. Analysis of phytoplankton community characteristics has shown that increase of the river discharge brings down water salinity significantly (2-fold) and increases the content of total, nitric and ammonium nitrogen in marine water and total abundance and biomass of phytoplankton near the island respectively 2.2, 4.7, 9.5 and 6 times. It has been shown that pollution with nutrients entering the sea with river discharge entails more than 4-fold increase in chlorophyll *a* concentration. The results of correlation and ranking analysis, which have shown the important role of the Danube discharge in forming of

photosynthesis processes, as well as salinity and nutrient regime in the marine area adjacent to the Danube Delta are presented and discussed.

4. Conclusions

The studies performed have shown that the state of phytoplankton community, salinity and nutrient regimes of the Zmiinyi Island coastal waters are mostly influenced by water masses advective transport from the Danube mouth and from the open part of the sea. At that, the biggest changes happen to salinity and transparency of marine water, as well as content of nitrate, which evidences the importance and necessity of their constant monitoring in the open part of the sea, also using the TRIX.

5. Acknowledgements

6. References

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