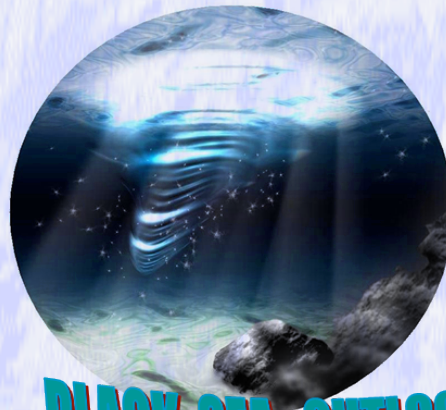




## 3rd Bi-annual BS Scientific Conference and UP-GRADE BS-SCENE Project Joint Conference

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# BLACK SEA OUTLOOK

Drivers, pressures, state, impacts, response and recovery indications  
towards better governance of Black Sea environmental protection.

JOINTLY ORGANIZED BY

THE COMMISSION ON THE PROTECTION OF THE BLACK SEA AGAINST POLLUTION (Black Sea Commission)

&

MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES OF UKRAINE

&

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### **Toxic Algae Investigations in Coastal Waters of Zmiinyi Island**

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**Key words:** Black Sea, trophic state, transparency, salinity, TRIX; chlorophyll “a”, bacterioplankton  
Planktonic microorganisms form the basis of marine biocoenosis, at that, being the initial link of trophic system. It is known [1], that phytoplankton blooms, including development of potentially toxic micro-algae (PTM) are the evidences of abnormalities in functioning of ecosystem, and not only bring down the quality of water, but also cause death of bottom-dwelling organisms and fish due to algotoxins. In the recent years micro-algal blooms, including PTM, in the Black and Azov Seas are occupying the first place among other environmental problems.

Objective of this work is analysis of dynamics of PTM development in the North-Western Black Sea (NWBS), in particular in the Zmiinyi Island area during past twenty years. It became possible to resolve this task after research station «Zmiinyi Island» had been established in 2003. The research staff of the station is regularly conducting integrated observations of the state of the coastal waters of the island; the programme comprises obligatory observations of bacterio- and phytoplankton state. The results of these observations and the authors' historical data for 1993-2001 were used to reveal tendencies of PTM registration in the NWBS waters in two past decades. Identification of PTM species composition was done using [1]. Presented and being discussed are results of analysis of the data collected, which have shown that in the periods 1993-2001 and 2003-2010 the number of phytoplankton/PTM species increased respectively from 196/24 to 409/55 species. It is shown that for the entire period under study, 1993-2010, altogether only 437 phytoplankton species were identified, 55 of which being PTM. The dynamics of PTM development in the main phyla (classes) Bacillariophyta, Haptophyta, Heterokontophyta (Dictyochophyceae and Chrysophyceae), Cryptophyta, Chlorophyta, Craspedophyta (Craspedophyceae), Dinoflagellata, Euglenozoa (Euglenophyceae), Incertae sedis (Ebriophyceae), Cyanobacteria (Cyanophyceae) is considered.

Analysed are the cases of mass blooms of separate PTMs in the Zmiinyi Island area in 2004-2010: dinophyta micro-algae *Akashiwo sanguinea* and cyanobacteria *Pseudanabaena galeatar* and *Nodularia spumigena*. Using space images MODIS Terra and MODIS Aqua the dynamics of *Nodularia spumigena* fields' abnormal development in the NWBS in 2010 was followed, which have been registered even near the Zmiinyi Island. Proposals on establishing in the framework of Convention on the Black Sea Protection Against Pollution of unified PTM monitoring system and elaboration of the programme for PTM pilot studies in the Black and Azov Seas are substantiated. Current technical, medical and environmental problems for organizing and performing of such monitoring are considered. Implementation of the interstate monitoring system would enable us to develop common practical recommendations for damage on human health prevention, forecasting of consequences for hydrobionts, establishing of interstate warning system. As a pilot area NWBS

or the Azov Sea are suggested, as there the highest frequency of the PTM development has been observed in the recent years.

*References* : 1. Ryabushko L.I. Potentially Dangerous Micro-Algae of Azov-Black Seas Basin. – Institute of Biology of Southern Seas Named After A.O.Kovalevskiy, National Academy of Sciences of Ukraine. – Sevastopol: EKOSI–Hydrophysics, 2003. – 288 p. (In Russian)

## On Interconnections between Principal Natural Factors and Trophic State of Sea Water in the Zmiinyi Island Area

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**Key words:** Black Sea, trophic state, transparency, salinity, TRIX; chlorophyll “a”, bacterioplankton  
Our studies of 2003-2007 [1] have shown that the properties of sea water near the Zmiinyi Island were mainly determined by interconnections between high-seas water and the Danube River flow. Assessment of water quality long-term changes carried out by the authors [2] on TRIX index evidences that in the last decade water quality in the Zmiinyi Island area was significantly higher than in the other Black Sea areas. However, the reasons of this phenomenon are not finally clarified yet.

The aim of this work is to reveal the main natural factors that determine trophic state of marine water in the Zmiinyi Island area, assessed using the TRIX index.

As the source materials sets of the principal natural marine water parameters’ observations carried out by the Research Station “Island Zmiinyi” of Odessa National I.I. Mechnikov University in 2004-2010 were used, as well as results of our last study of long-term changes in TRIX index [2]. Methods of observation and results’ analyses are briefly described.

Results of temporal distribution analyses of the sets of hydrological & hydrochemical and hydrobiological parameters studied and characteristics of correlation analysis of their interrelations with the TRIX index are presented.

It was revealed that the values of all the studies hydrological and hydrobiological parameters varied within broad limits, for example salinity varied between 6.5 and 18.5 ‰, transparency - between 0.8 and 10.0 m, TRIX between 2.9 and 6.9, chlorophyll «a» between 0.12 and 28.03 mkg/l, bacterioplankton number between 0.16 and 3.65 million C/ml.

Results of statistical analysis of studied parameters’ sets are described. Significant positive correlation connection between salinity and transparency is revealed, which will enable us to use salinity and transparency variations for assessment of the stage of marine and river waters’ transformation, and to assess indirectly influence of the Danube flow.

Reliably substantiated is that changes of the TRIX trophic index are mainly connected with changes of salinity and transparency (indices of linear correlation are 0.37 and 0.51 respectively). Regression analysis of TRIX index and bacterioplankton content dependence on water transparency and salinity, carried out for averaged groups of data on transparency and salinity with intervals 1 m and 1‰ respectively has shown that correlation between these parameters is best described by logarithmic functions with determination indices  $R^2=0,90-0,94$ . Peculiarities of use of each of these regression dependencies for preliminary assessment of marine water trophicity in the Zmiinyi Island area are discussed.