



Rogoznica Lake (Croatia), a unique anoxic seawater system on the Adriatic coast under the anthropogenic pressures

Irena Ciglencčki (1), Elvira Bura-Nakić (1), Marija Marguš (1), Milan Čanković (1), Marina Carić (2), Damir Viličić (3), Zrinka Ljubešić (3), Frano Kršinić (4), Mirna Batistić (2), Ivica Janeković (1), and Filip Plavčić (1)

(1) Rudjer Boskovic Institute, Zagreb, Croatia (irena@irb.hr), (2) University of Dubrovnik, Institute for Marine and Coastal Research, Kneza D. Jude 12, POBox 83, 20000 Dubrovnik, Croatia, (3) University of Zagreb, Faculty of Science, Division of Biology, Rooseveltov trg 6, 10001 Zagreb, Croatia, (4) Institute of Oceanography and Fisheries-Split, Laboratory of Plankton Ecology Dubrovnik, Kneza Damjana Jude 12, 20001 Dubrovnik, Croatia

Rogoznica Lake is a typical example of euxinic saline lake, situated on the eastern Adriatic coast (43°32'N 15°58'E). It is a karstic depression filled with seawater, with an area of 10276 m² and a maximum depth of 15m. The lake has circular shape and is surrounded with sheer, karstic cliffs (4-23 m high), which completely protect the lake from the influence of the wind.

During the year the lake is thermally, densely and chemically stratified into oxic and anoxic layers. The surface water is well oxygenated, while hypoxia/anoxia occurs in the bottom layer. The mixolimnion varies seasonally and it is greatly influenced by meteorological conditions (temperature, wind, rainfall) which also influence the water layer mixing. Vertical mixing usually occurs during autumn/winter when cold, oxygen-rich water from the surface sinks downwards. Depending on the intensity of the mixing process anoxic conditions in the entire water column could appear. At the boundary oxic-anoxia usually a pinky colored chemocline layer, cca 50 cm thick develops.

Anoxic deep water is characterized by high concentrations of reduced sulfur compounds (RSS up to 1mM, mainly in the form of sulfide), and nutrients (NH₄⁺, up to 150 μM; PO₄³⁻, up to 22 μM; SiO₄⁴⁻, up to 400 μM) as well as dissolved organic carbon (DOC up to 6 mg l⁻¹) indicating the pronounced remineralization of allochthonous organic matter produced in the surface water. The eutrophication of the lake is strongly influenced by nutrient recycling under anaerobic conditions.

Due to the extreme ecological conditions which prevail in this lake, phyto- and zooplankton populations are represented by a relatively small number of species, some of them, however, in the populations denser than those in the surrounding sea. After the period of total anoxia appearance, the number of species and their abundance are significantly reduced in comparison with the pre-anoxia values. Diatoms were found to be the dominant microphytoplankton group while copepods, the heterotrophic zooplankton organisms, play an important role and control the biochemical processes in the lake, especially in the post-anoxic period. The calanoid copepod *Acartia italica* is the only metazoan plankton species surviving and reaching high abundance in the Rogoznica Lake.

Results of recent investigations (since 2001 up to now) have showed significant change of organic matter properties what most probably is a consequence of changes in phytoplankton abundance and composition in relation with significant change in hydrographic conditions, i.e. temperature and salinity that highly influence stratification process what we believe is closely related with global climate changes.

All our data show how particular sequences of meteorological events, some of which can be regarded as extreme, have affected the internal processes in the Lake. An integration of all results (since 1994 up to now) reveals an interesting possibility that this environment may well potentially serve as valuable sentinels of climate change.