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DYNAMICS OF THE BIOTIC COMPONENTS IN THE AQUATIC ECOSYSTEMS FROM THE DANUBE DELTA BIOSPHERE

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Abstract. The dynamic equilibrium of the aquatic ecosystems is accomplished because of the connections between the species and the environmental conditions and also because of the mutual connections between the existing populations. From this point of view, the study of biotic – phytoplankton, zooplankton and/or benthonic components – from the position of the systemic method and conception, in order to characterise the dynamics and role within the integrated aquatic ecosystems represents a proprietary problem of the research in ecology. The paper presents the research results regarding the biological analyses of the aquatic ecosystems of the Danube delta in two sampling sites: Uzlina and Murighiol for the samplings period April 2003 – August 2006. Investigations of the biological properties of water and sediment samples from Uzlina and Murighiol control sections have been accomplished from the viewpoint of phytoplanktonic, zooplanktonic and benthonic macroinvertebrates components and the analysis of the biotic communities in the sampling site was focused on the quantitative (numerical density, biomass, abundance after numerical density and biomass) and qualitative components (dominant species, indicator species).

Keywords: biological analysis, aquatic ecosystems, the Danube delta, biotic components – phytoplankton, zooplankton, benthonic macroinvertebrates.

AIMS AND BACKGROUND

The aquatic ecosystems are dynamic systems that keep their stability in the conditions of permanent fluctuations of biotic and nonbiotic parameters. The dynamic equilibrium of the aquatic ecosystems is acomplished because of the connections between the species and the environmental conditions and also because of the mutual connections between the existing populations[1,2]. From this point of view, the study of biotic/population – zooplankton and/or benthonic components – from the position of the systemic method and conception, in order to characterise the dynamics and role within the integrated aquatic ecosystems represents a proprietary problem of the research in ecology.

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Our researches are important because in 1994, the Danube countries signed in Sofia the Convention of Cooperation on the Protection and Sustainable Use of the Danube River as an instrument of bilateral and multilateral cooperation between the riverain countries, intended to improve permanently the water protection system in the Danube river basin[3].

The paper proposed for the well carrying out is the characterisation of the biological analysis comparative from aquatic ecosystems of the Danube delta in two sampling sites: Uzlina and Murighiol for the samplings period (April 2003 – August 2006).

It is recommended the researches carrying out also for other control sections in the framework of the Danube Delta Biosphere[2,4], because the main aims that must be achieved in the Danube and Danube delta areas in order to accomplish a sustainable management are represented by:

– the reduction of the nutrient charge in the Danube, especially the Danube delta inputs, controlling the punctiform and diffuse pollution sources[5,6];

– the prevention of a wet lands' loss through the pressure reduction on them;

– the restoration of a wet lands, this being the only way to prove the capacity to support and productivity of the entire Danubian system[7,8].

EXPERIMENTAL

The main objectives proposed for the well carrying out of the paper are:

- Qualitative and quantitative analyses of the aquatic ecosystems (from water and sediment) through month determination of the characteristics for phytoplankton, zooplankton and benthonic macroinvertebrates;
- The evaluation of the present state of the organisation stage of the biotic compounds and their dominating populations;

and for their realisation, the main proposed activities are:

- Carrying out of the development of a sampling program and the samples processing, properly dimensioned:

– at spatial stage: in order to allow the estimation of the structural parameters of the biotic communities starting from the level of the searched ecosystem complexes,

– at the temporal stage: to capture the proportion and sense in which the ecosystems evolution perform;

- The knowledge of the temporal and spatial dynamics of the internal and external controlling factors influencing the structure of the biotic communities – phytoplankton, zooplankton and benthonic macroinvertebrates and the specific activity of their populations;

- Identification in the biotic community structure of some possible bioindicators important in the integrated system monitoring (due to the raised sensitivity of this compartment at the modification of the trophic state of the ecosystems) through saprobic/biodiversity indices.

During the period of our investigations, momentary samples from the two stock compartments – water and sediment – from the sampling sites Uzlina and Murighiol in drawing campaigns period April 2003 – August 2006 were drawn in order to study the most representatives biotic communities of the aquatic ecosystems (phytoplankton, zooplankton, benthonic macroinvertebrates).

The samples were drawn according to methodological guides on studying the evolution of water quality by biological tests, have been preserved in 4% formaldehyde solution and the used sampling techniques were as follows:

– to analyse the phytoplankton, 1 l of sample was drawn directly from the water;

– to analyse the zooplankton, the sample was concentrated by filtering a volume of water of 50 dm^3;

– the benthos samples were drawn using special drawing equipment for aquatic sediments.

RESULTS AND DISCUSSION

The analyses of the biotic communities in the sampling sites Uzlina and Murighiol were focused on the quantitative (numerical density, biomass, abundance after numerical density and biomass) and qualitative components (dominant species, indicator species).

Comparative analyses of the phytoplankton, zooplankton and benthos characteristics within the aquatic ecosystems integrated in the Danube delta, in the Uzlina and Murighiol control sections the period of the study (April 2003 – August 2006) included:

– research of the biotic associations from illustrative aquatic ecosystems of both control points – Uzlina and Murighiol – was achieved from the point of view of conception and systemic analysis, with supposition that these associations are considered subsystems of respective aquatic ecosystems biocenosis;

– are characterised by homogeneous family of algae with representatives of the divisions – Cyanophyta, Bacillariophyta, Chlorophyta; at the Murighiol location was presented also the algae from Euglenophyta division;

– characterisation of the numerical density and biomass on the biotic components in aquatic ecosystems structure, in campaign sampling from April 2003 – August 2006;

– phytoplankton associations are constant and dominant components in aquatic ecosystems structure for numerical density and biomass – oligo-betamesosaprobic diatoms, betamesosaprobic chlorophyte;

– at the all sampling moments, from the qualitative and quantitative point of view, the dominant groups are Bacillariophyceae, and Chlorophyceae are sub-dominant;

– population density and biomass at the Uzlina location present in general elder values comparative with the Murighiol location: in Figs 1-4 is presented the spatio-temporal evolution for numerical density and biomass phytoplanktonic in the Uzlina or Murighiol location in the period of the study;

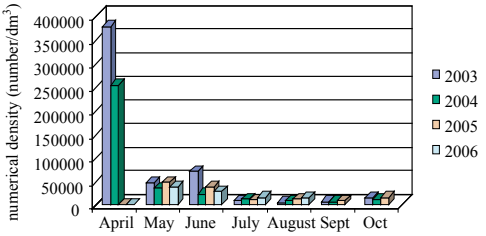

Fig. 1. Numerical density for phytoplankton in the Uzlina location – 2003-2006

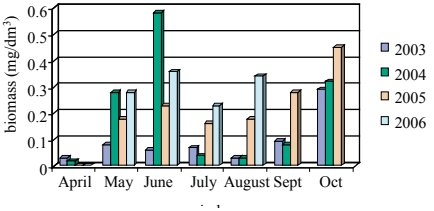

Fig. 2. Biomass for phytoplankton in the Uzlina location – 2003-2006

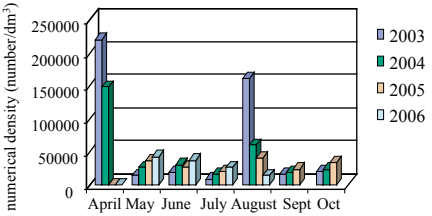

Fig. 3. Numerical density for phytoplankton in the Murighiol location – 2003-2006

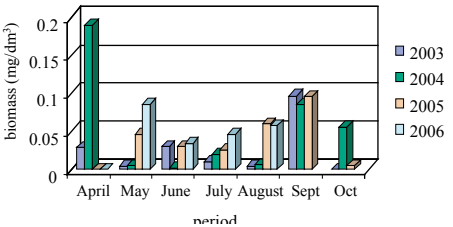

Fig. 4. Biomass for phytoplankton in the Murighiol location – 2003-2006

– in zooplanktonic organisms (after numerical density) for all campaigns of the sampling are presented betamesosaprobic rotifers, betamesosaprobic species of the cladocers and oligo-betamesosaprobic copepoda;

– density and biomass for the zooplankton component in the Uzlina location was small comparative with the Murighiol location: in Figs 5-8 is presented the spatio-temporal evolution for numerical density and biomass zooplanktonic in the Uzlina or Murighiol location in the same period of the study April 2003 – August 2006;

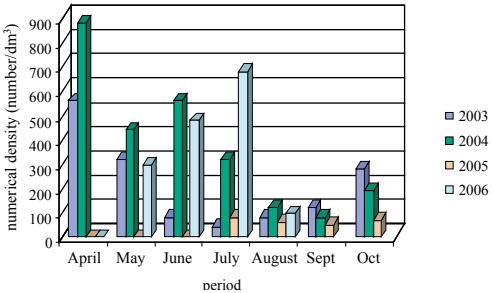

Fig. 5. Numerical density for zooplankton in the Uzlina location – 2003-2006

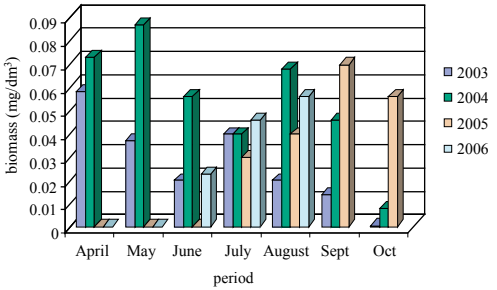

Fig. 6. Biomass for zooplankton in the Uzlina location – 2003-2006

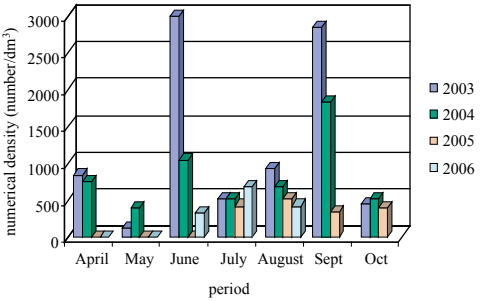

Fig. 7. Numerical density for zooplankton in the Murighiol location – 2003-2006

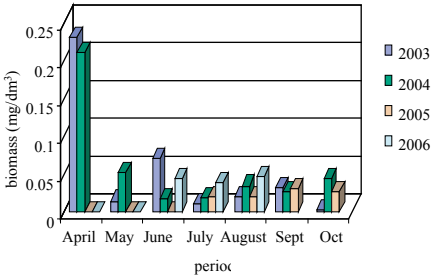

Fig. 8. Biomass for zooplankton in the Murighiol location – 2003-2006

– in benthonic macroinvertebrates: in 2003 were dominant gasteropodes and lamelibranhiates species, in 2004 and 2005 the associations of the oligocheta together with chironomidae organisms are important links in the aquatic ecosystems, for 2006 the oligocheta represents dominant species;

– spatio-temporal distribution of the numerical density and biomass for macrozoobenthos in each of the sampling locations – Uzlina and Murighiol for all period of the study is represented in Figs 9-12.

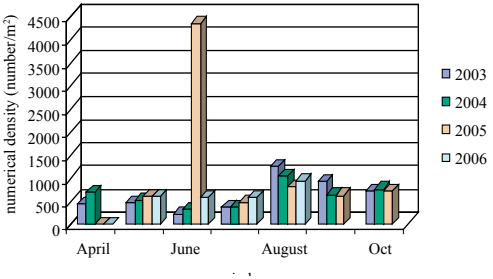

Fig. 9. Numerical density for benthic macroinvertabrates in the Uzlina location – 2003-2006

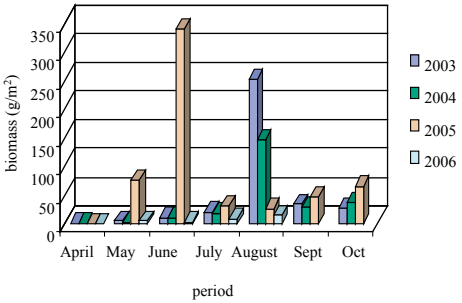

Fig. 10. Biomass for benthic macroinvertabrates in the Uzlina location – 2003-2006

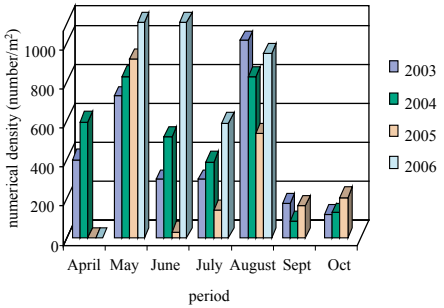

Fig. 11. Numerical density for benthic macroinvertabrates in the Murighiol location – 2003-2006

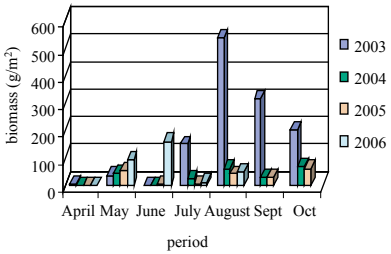

Fig. 12. Biomass for benthic macroinvertabrates in the Murighiol location – 2003-2006

CONCLUSIONS

The results obtained through comparative biological analyses for each sampling site: Uzlina and Murighiol for the samplings period (April 2003 – August 2006) are:

– in the Murighiol and Uzlina control sections from the point of view of phytoplanktonic, zooplanktonic and benthic macroinvertebrates components, the Danube water is an eutroph system equilibrated;

– the phytoplanktonic and zooplanktonic biocenosis represent the trophic basis necessary for ichthiofauna development in the aquatic ecosystems in the both control sections: Murighiol and Uzlina;

– in the Uzlina control section, the phytoplankton is better represented than in the Murighiol control section for numerical density and remanent biomass;

– dominant species from phytoplankton and zooplankton – for numerical density and remanent biomass – are oligo-betamesosaprobic species.

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