ISSN 1314-3379

STATE OF THE BENTHIC COMMUNITIES IN VARNA AND BELOSLAV LAKES DURING THE PERIOD 2010-2011

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СЪСТОЯНИЕ НА ДЪННИТЕ СЪБОЩЕСТВА ВЪВ ВАРНЕНСКО И БЕЛОСЛАВСКО ЕЗЕРО ПРЕЗ ПЕРИОДА 2010 – 2011 г.

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Резюме: Варненско и Белославско езеро са подложени на перманентно антропогенно влияние, в резултат на пристанищната и индустриална активност в региона. Периодичното драгиране на канала, с цел удулбочаване създава допълнителни предпоставки за унищожаване на дънната фауна. Целта на настоящата статия е да се проследят промените в макрозообентоса през периода 2010-2011 г., в сравнение с перидота 2007-2009 г. През изследвания период бяха установени 19 вида макрозообентос. Видовият състав бе доминиран от полихетите, които определяха и стойностите на числеността и биомасата. Количеството на мекотелите е редуцирано до пет вида, установени основно на ст. А22 (в близост до заливната акватория) и силно повлияни от морската фауна. Стойностите на числеността и биомасата през 2010-2011, намаляваха прогресивно от зимата и пролетта към лятото и есента. Най-лоша беше ситуацията през летния сезон, когато нито един вид не бе установен в пробите. Макрозообентосната биомата през изследвания период е изключително ниска, поради доминирането на полихетни видове. Максимумът е установен през пролетта на 2011 - 7.952 g.m^{-2}. Ролята на мекотелите е незначителна, в сравнение с 2007-2009, когато през октомври 2007 са установени стойности 56.827 g.m^{-2}.

Ключови думи: Варненско и Белославско езера, макрозообентос, численост, биомаса.

INTRODUCTION

Varna - Beloslav Lake system is permanently exposed to the negative effects of industrial and harbor activities developed in the region.

At the beginning of past century Varna and Beloslav lakes were still independent freshwater basins with typical limnic fauna, containing relict species.

After 1909 the first channel between Varna Lake and Varna Bay was dredged and the lake salinity increased considerably (8-13‰) (Konsulova, 1992). In 1923 a channel connection between Beloslav and Varna Lakes was created. Second navigation channel connected Varna Lake and Varna Bay in 1976, to facilitate the maritime transport. As a result thermal regime, water quality and ecosystem of the lakes changed irreversibly, causing replacement of freshwater fauna with brackish one.

The improved transport conditions allowed fast development of industrial and harbor activities, including thermo-power stations. As a result during second half of the past century large amount of rich organic matter, pesticides and other pollutants were supplied causing eutrophication (Shtereva et al., 2000). Accumulation at the bottom layers H_2S gas, due to decomposition processes and strong thermal stratification lead to hypoxia and anoxia situations, causing mass mortality of macrobenthic fauna (Konsulova, 1992). Thus eutrophication become the major ecological problem for coastal Black Sea ecosystem and adjacent water bodies like Varna and Beloslav lakes and resulted in dramatical alterations in biological and chemical regimes (Mee, 1992, Zaitzev, 1992). According Moncheva et al. (2001) this area is considered as hypereutrophic.

More recently Trayanova (2003 a,b) reported improvement of the Varna-Beloslav Lake system, based on materials collected in autumn 1999 and March 2000.

The role of the zoobenthic communities, and especially of their sessile component as indicators of the environmental quality has been successfully implemented worldwide in pollution assessment studies and monitoring programs (Dauer et al., 1989; Pearson & Rosenberg, 1978; Rees et al., 1991; Warwick et al., 1987). The quantity of conservative species indicates the environmental quality over a period of time rather than reflecting conditions just at the time of sampling (Gray et al., 1992).

The aim of the present paper is to investigate the changes of the macrozoobenthos during the period 2010-2011 compared to historical data.

MATERIALS AND METHODS

During the period 2010-2011 macrozoobenthic samples were collected from Beloslav and Varna Lakes on seasonal base under five stations schedule (Fig.1).

Fig. 1. Schedule of sampling stations in investigated area in 2010-2011.

Sampling was done on the board of R/V "Prof. Valkanov" from soft bottom sediments, using van Veen grab (mouth opening 0.1 m^{-2}). The materials were sieved through 0.5 mm mesh and preserved in 4% formaldehyde. In laboratory the major zoobenthic groups - *Polychaeta, Mollusca and Crustacea* were identified at lowest possible taxonomic level.

Later quantitative parameters (abundance and biomass) were measured and recalculated per square meter.

RESULTS AND DISCUSSION

Total of 19 taxa, belonging to groups *Polychaeta*, *Mollusca*, and *Crustacea* were identified for the investigated period. Most numerous in species is spring season of 2011, followed by winter season of 2010 (table1). During the two consecutive years lack of species in autumn was recorded. For the summer of 2011 only two mollusks were found, but for 2010 summer none. The low species number is natural for the investigated area, because of the industrial and harbor activities. In summer regular processes of eutrophication are observed and lack of benthic fauna is not surprising, even in early autumn.

Table 1.

Species composition of macrozoobenthos in Varna-Beloslav Lake system during Winter (W), Spring (Sp), Summer (S) and Autumn (A) seasons of 2010 and 2011

Species	W 2010	Sp. 2010	S 2010	A 2010	Sp. 2011	S 2011	A 2011
Polychaeta							
Alitta succinea (Frey & Leuckart, 1847)					+		
Aonides paucibranchiata Southern, 1914					+		
Harmothoe reticulata (Claparede,					+		

1870)							
Hediste diversicolor (O. F. Muller, 1776)	+	+			+		
Capitella minima Langerhans, 1881					+		
Ficopomatus enigmaticus (Fauvel, 1923)		+					
Melinna palmata Grube, 1870	+						
Phyllodoce mucosa Oersted, 1843					+		
Polydora cornuta Bosc, 1802	+				+	+	
Spio filicornis (O. F. Muller, 1776)	+	+			+		
Crustacea							
Amphibalanus improvisus (Darwin, 1854)					+		
Gammarus aequicauda					+		
Melita palmata (Montagu, 1804)	+						
Monocorophium insidiosum (Crawford, 1937)	+				+		
Mollusca							
Abra prismatica (Montagu, 1808)	+						
Cerastoderma glaucum (Bruguière, 1789)	+	+			+		
Mya arenaria Linne, 1758		+					
Mytilus galloprovincialis Lamarck, 1819					+		
Tellina tenuis da Costa, 1778					+	+	

During the period 2010-2011 maximum values of the total macrozoobenthos abundance were established in winter and spring seasons with a peak in spring 2011 (568 ind.m^{-2}) (fig.2). As a result of summer hypoxia events, in autumn season of the investigated period no species were found.

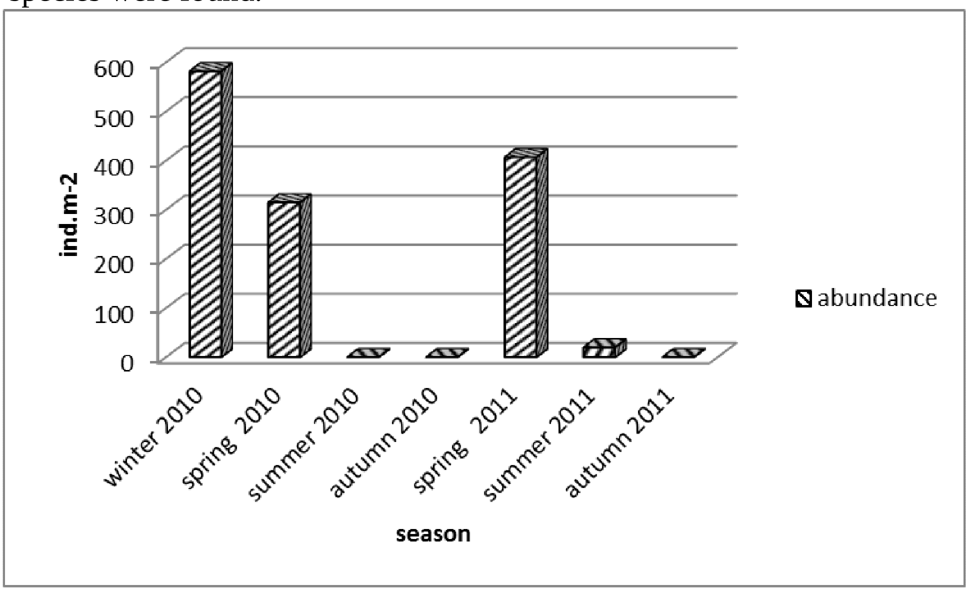

Fig. 2 Seasonal abundance of macrozoobenthos in Varna-Beloslav Lake system during 2010-2011

Dominants in macrozoobenthos abundance structure are *Polychaeta* in winter 2010 and spring 2011, presented mainly by *H. diversicolor, S. filicornis* and *P. cornuta* (fig.3). Only in spring 2010 mollusks have leading role in zoobenthos structure, due to high individual abundance of bivalve species *Cerastoderma glaucum* and *Mya arenaria*.

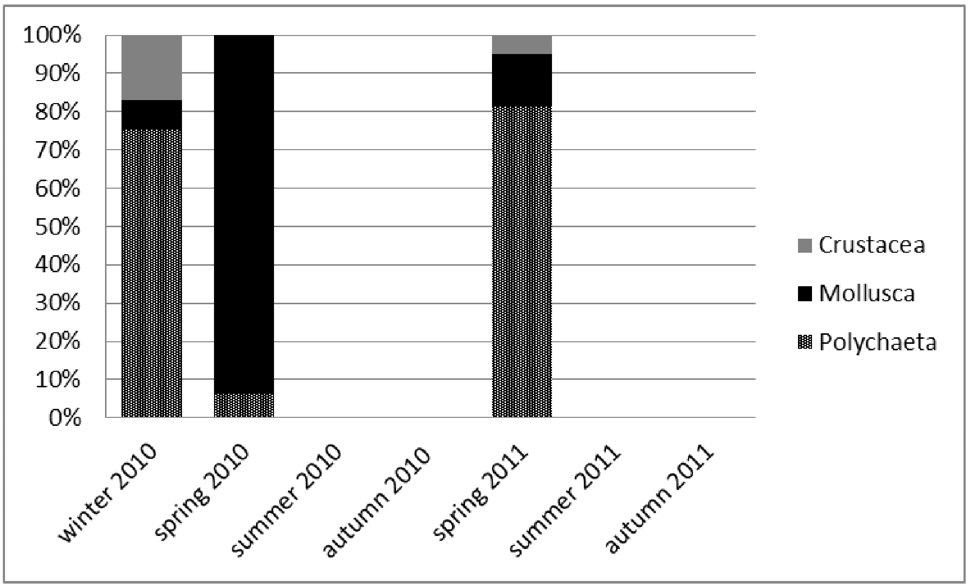

Fig. 3 Share (%) of macrozoobenthos abundance by groups

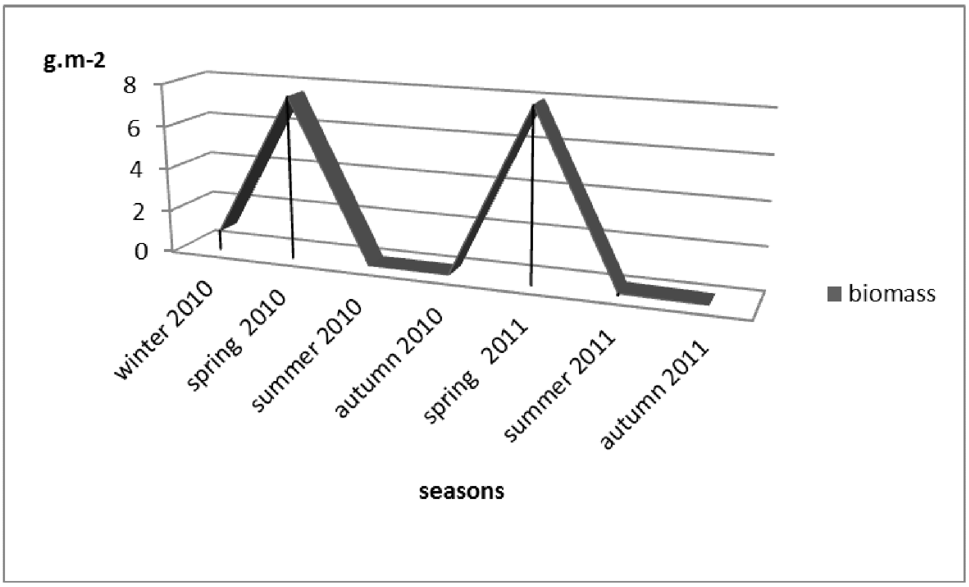

Fig. 4 Seasonal biomass (g.m^{-2}) of macrozoobenthos in Varna – Beloslav lake system for 2010-2011

Biomass values are relatively low, due to predominance of small sized opportunistic polychaete species during the investigated period (fig. 4). Maximum is reached in spring 2011, when the biomass value was 7,952 g.m^{-2}, followed by second maximum in spring 2010. Dominant species during the investigated period was *Hediste diversicolor,* with highest individual biomass at st. A10 (4,16 g.m^{-2}) in spring 2011.

CONCLUSIONS:

During the period 2010-2011 the macrozoobenthos from Varna-Beloslav Lake system showed same species number with comparison to 2007-2009 (Uzunova, 2010). The species composition was dominated by *Polychaeta*, which determine abundance values and biomass. Mollusks quantity is reduced to five species, found mainly in samples from st. A22 (the closest to the Varna Bay) and much influenced by the marine fauna.

Values of abundance and biomass in 2010-2011 decreased progressively from winter–spring to summer-autumn seasons. The worst situation is recorded in summer season when no one species was found in the samples.

Obvious decrease in species abundance is observed with comparison to historical data. Highest quantity were observed in October 2007 – 4258 ind.m^{-2}, defined by the high values of *F. enigmaticus* (Polychaeta) and *M. incidiosum* (Crustacea), but nowadays the maximum of abundance is recorded in winter 2010 – 582 ind.m^{-2}.

Macrozoobenthos biomass in the investigated period is very low, dominated by polychaete species. Parameter`s maximum was established in spring 2011 – 7.952 g.m^{-2}. Role of mollusks is insignificant, compared to the 2007-2009, when value of 56.827g.m^{-2}, was recorded in October 2007.

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